ENGINE CONTROL SYSTEM

SECTION EC

CONTENTS

QG18DE

CONTENTS (Cont'd)

CONTENTS (Cont'd)

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CONTENTS (Cont'd)

Alphabetical & P No. Index for DTC

NCEC0001

ALPHABETICAL INDEX FOR DTC

NCEC0001S01

Items (CONSULT-II screen terms)	DTC*5		Reference page
	CONSULT-II GST*2	ECM*1	
Unable to access ECM	—	—	EC-QG-91
AIR TEMP SEN/CIRC*6	P0110	0110	EC-QG-121
CAM POS SEN/CIRC	P0340	0340	EC-QG-241
CLOSED TP SW/CIRC*6	P0510	0510	EC-QG-278
COOLANT T SEN/CIRC*3	P0115	0115	EC-QG-125
CPS/CIRCUIT (POS)*6	P0335	0335	EC-QG-235
CYL 1 MISFIRE*6	P0301	0301	EC-QG-225
CYL 2 MISFIRE*6	P0302	0302	EC-QG-225
CYL 3 MISFIRE*6	P0303	0303	EC-QG-225
CYL 4 MISFIRE*6	P0304	0304	EC-QG-225
ECM*6	P0605	0605	EC-QG-284
EGR SYSTEM*6	P0400	0400	EC-QG-247
EGR SYSTEM*6	P1402	1402	EC-QG-312
EGR TEMP SEN/CIRC*6	P1401	1401	EC-QG-307
EGR VOL CON/V CIR*6	P0403	0403	EC-QG-255
ENG OVER TEMP	P1217	P1217	EC-QG-296
FR O2 SE HEATER-B1*6	P0135	0135	EC-QG-169
FRONT O2 SENSOR-B1*6	P0130	0130	EC-QG-138
FRONT O2 SENSOR-B1*6	P0131	0131	EC-QG-144
FRONT O2 SENSOR-B1*6	P0132	0132	EC-QG-150
FRONT O2 SENSOR-B1*6	P0133	0133	EC-QG-156
FRONT O2 SENSOR-B1*6	P0134	0134	EC-QG-164
FUEL SYS-LEAN/BK1*6	P0171	0171	EC-QG-209
FUEL SYS-RIGH/BK1*6	P0172	0172	EC-QG-215
FUEL TEMP SEN/CIRC*6	P0180	0180	EC-QG-221
IACV/AAC VLV/CIRC*6	P0505	0505	EC-QG-273
INT/V TIM V/CIR-B1*6	P1111	1111	EC-QG-285
KNOCK SEN/CIRC-B1	P0325	0325	EC-QG-231
MAF SEN/CIRCUIT*3	P0100	0100	EC-QG-115
MULTI CYL MISFIRE*6	P0300	0300	EC-QG-225
NATS MALFUNCTION	P1610 - P1615	1610 - 1615	Refer to EL section.
NO SELF DIAGNOSTIC FAILURE INDICATED	**P0000**	**0000**	—
NO SELF DIAGNOSTIC FAILUTRE INDICATED	No DTC	Flashing*4	EC-QG-55
P-N POS SW/CIRCUIT*6	P1706	1706	EC-QG-320
PURG VOLUME CONT/V*6	P0443	0443	EC-QG-264

Items (CONSULT-II screen terms)	DTC*5		Reference page
	CONSULT-II GST*2	ECM*1	
REAR O2 SENSOR-B1*6	P0137	0137	EC-QG-174
REAR O2 SENSOR*6	P0138	0138	EC-QG-182
REAR O2 SENSOR*6	P0139	0139	EC-QG-190
REAR O2 SENSOR*6	P0140	0140	EC-QG-198
RR O2 SE HEATER-B1*6	P0141	0141	EC-QG-204
SWIRL CONT SOL/V*6	P1131	1131	EC-QG-290
THRTL POS SEN/CIRC*3	P0120	0120	EC-QG-130
TW CATALYST SYS-B1*6	P0420	0420	EC-QG-260
VEH SPEED SEN/CIRC	P0500	0500	EC-QG-241

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by ISO15031-6.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: While engine is running.
*5: 1st trip DTC No. is the same as DTC No.
*6: Not available for ''Eastern Europe model''.

P NO. INDEX FOR DTC

NCEC0001S02

DTC*5		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*1		
—	—	Unable to access ECM	EC-QG-91
No DTC	Flashing*4	NO SELF DIAGNOSTIC FAILURE INDICATED	EC-QG-55
P0000	**0000**	**NO SELF DIAGNOSTIC FAILURE INDICATED**	**—**
P0100	0100	MAF SEN/CIRCUIT*3	EC-QG-115
P0110	0110	AIR TEMP SEN/CIRC*6	EC-QG-121
P0115	0115	COOLANT T SEN/CIRC*3	EC-QG-125
P0120	0120	THRTL POS SEN/CIRC*3	EC-QG-130
P0130	0130	FRONT O2 SENSOR-B1	EC-QG-138
P0131	0131	FRONT O2 SENSOR-B1*6	EC-QG-144
P0132	0132	FRONT O2 SENSOR-B1*6	EC-QG-150
P0133	0133	FRONT O2 SENSOR-B1*6	EC-QG-156
P0134	0134	FRONT O2 SENSOR-B1*6	EC-QG-164
P0135	0135	FR O2 SE HEATER-B1*6	EC-QG-169
P0137	0137	REAR O2 SENSOR-B1*6	EC-QG-174
P0138	0138	REAR O2 SENSOR-B1*6	EC-QG-182
P0139	0139	REAR O2 SENSOR-B1*6	EC-QG-190
P0140	0140	REAR O2 SENSOR-B1*6	EC-QG-198
P0141	0141	RR O2 SE HEATER-B1*6	EC-QG-204
P0171	0171	FUEL SYS-LEAN/BK1*6	EC-QG-209

TROUBLE DIAGNOSIS — INDEX

Alphabetical & P No. Index for DTC (Cont'd)

DTC*5		Items (CONSULT-II screen terms)	Reference page
CONSULT-II GST*2	ECM*1		
P0172	0172	FUEL SYS-RICH/BK1*6	EC-QG-215
P0180	0180	FUEL TEMP SEN/CIRC*6	EC-QG-221
P0300	0300	MULTI CYL MISFIRE*6	EC-QG-225
P0301	0301	CYL 1 MISFIRE*6	EC-QG-225
P0302	0302	CYL 2 MISFIRE*6	EC-QG-225
P0303	0303	CYL 3 MISFIRE*6	EC-QG-225
P0304	0304	CYL 4 MISFIRE*6	EC-QG-225
P0325	0325	KNOCK SEN/CIRC-B1	EC-QG-231
P0335	0335	CPS/CIRCUIT (POS)*6	EC-QG-235
P0340	0340	CAM POS SEN/CIRC	EC-QG-241
P0400	0400	EGR SYSTEM*6	EC-QG-247
P0403	0403	EGR VOL CON/V CIR*6	EC-QG-255
P0420	0420	TW CATALYST SYS-B1*6	EC-QG-260
P0443	0443	PURG VOLUME CONT/V*6	EC-QG-264
P0500	0500	VEH SPEED SEN/CIRC	EC-QG-269
P0505	0505	IACV/AAC VLV/CIRC*6	EC-QG-273
P0510	0510	CLOSED TP SW/CIRC*6	EC-QG-278
P0605	0605	ECM	EC-QG-284
P1111	1111	INT/V TIM V/CIR-V1*6	EC-QG-285
P1131	1131	SWIRL CONT SOL/V*6	EC-QG-290
P1217	1217	ENG OVER TEMP	EC-QG-296
P1401	1401	EGR TEMP SEN/CIRC*6	EC-QG-307
P1402	1402	EGR SYSTEM*6	EC-QG-312
P1610 - 1615	1610 - 1615	NATS MALFUNCTION	Refer to EL section.
P1706	1706	P-N POS SW/CIRCUIT*6	EC-QG-320

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by ISO15031-6.
*3: When the fail-safe operation occurs, the MI illuminates.
*4: While engine is running.
*5: 1st trip DTC No. is the same as DTC No.
*6: Not available for ''Eastern Europe model''.

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

NCEC0002

The Supplemental Restraint System ''AIR BAG'' and ''SEAT BELT PRE-TENSIONER'', used along with a seat belt, help to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.

In addition to the supplemental air bag modules for a frontal collision, the supplemental side air bag used along with the seat belt helps to reduce the risk or severity of injury to the driver and front passenger in a side collision. The supplemental side air bag consists of air bag modules (located in the outer side of front seats), satellite sensor, diagnosis sensor unit (one of components of supplemental air bags for a frontal collision), wiring harness, warning lamp (one of components of supplemental air bags for a frontal collision). Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses (except ''SEAT BELT PRE-TENSIONER'' connector) can be identified with yellow harness connector (and with yellow harness protector or yellow insulation tape before the harness connectors).**

Precautions for On Board Diagnostic (OBD) System of Engine

NCEC0003

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

CAUTION:

- **Be sure to turn the ignition switch ''OFF'' and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector.**
  For description and how to disconnect, refer to EL section, ''Description'', ''HARNESS CONNECTOR''.
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the EGR system or 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

NCEC0004

BATTERY

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

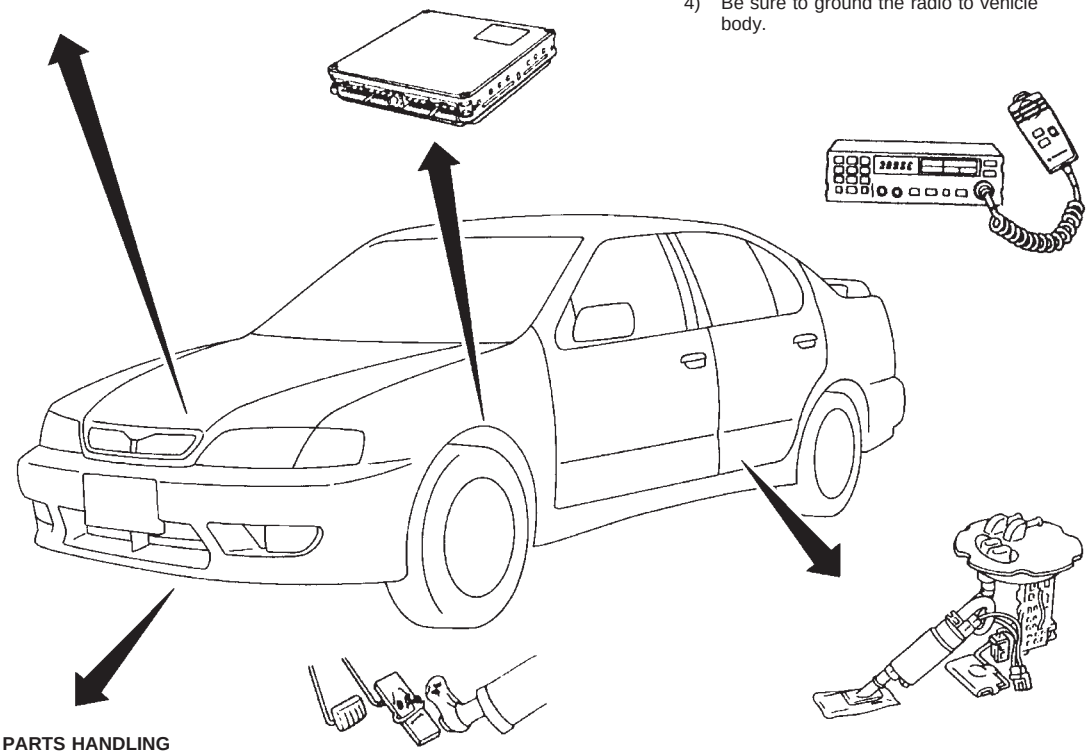
ECM

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

WIRELESS EQUIPMENT

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

1) Keep the antenna as far as possible from the electronic control units.
2) Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.



ENGINE CONTROL PARTS HANDLING

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

WHEN STARTING

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

FUEL PUMP

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

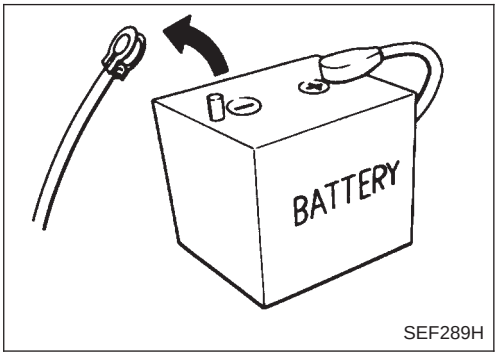
ECM HARNESS HANDLING

- Securely connect ECM harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (4 in) away from adjacent harness, to prevent an ECM system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harness dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

SEF331WB

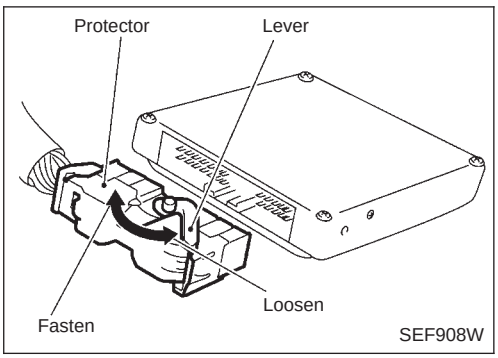
Precautions

NCEC0005



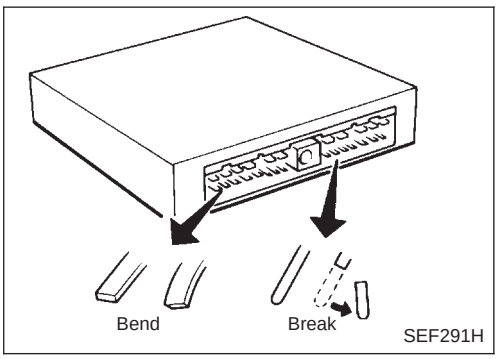
SEF289H

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



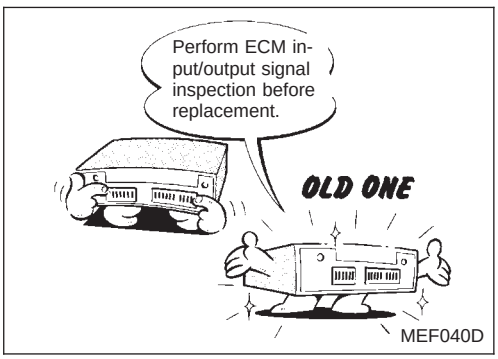
SEF908W

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



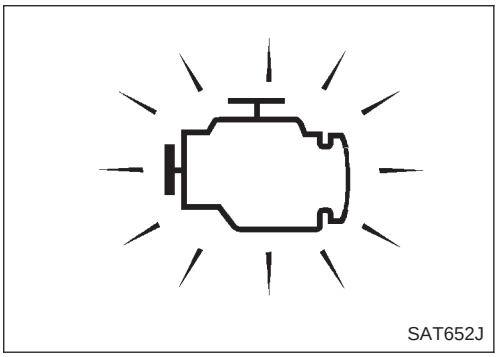
SEF291H

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminals when connecting pin connectors.

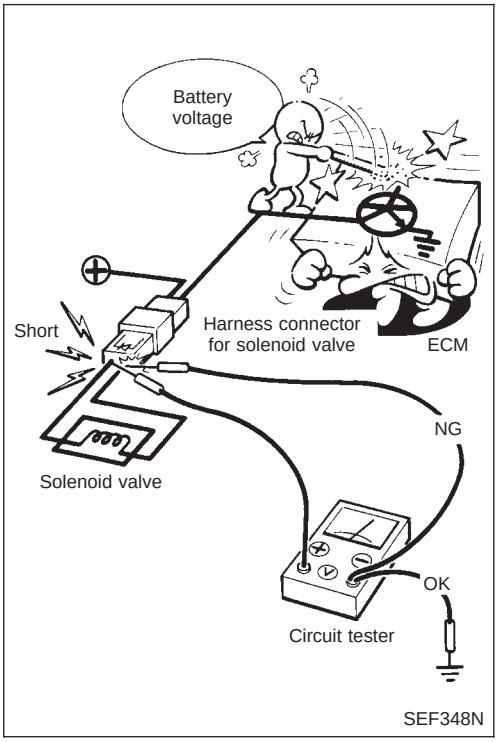


MEF040D

- **Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-QG-101.**


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.

Wiring Diagrams and Trouble Diagnosis

NCEC0006

When you read Wiring diagrams, refer to the followings:

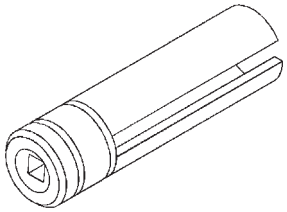
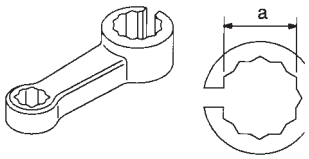
- ‘‘HOW TO READ WIRING DIAGRAMS’’ in GI section
- ‘‘POWER SUPPLY ROUTING’’ for power distribution circuit in EL section

When you perform trouble diagnosis, refer to the followings:

- ‘‘HOW TO FOLLOW TEST GROUP IN TROUBLE DIAGNOSIS’’ in GI section
- ‘‘HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT’’ in GI section

Special Service Tools

NCEC0007

Tool number Tool name	Description	
KV10117100 Heated oxygen sensor wrench	 NT379	Loosening or tightening front heated oxygen sensor with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 NT636	Loosening or tightening rear heated oxygen sensor **a: 22 mm (0.87 in)**

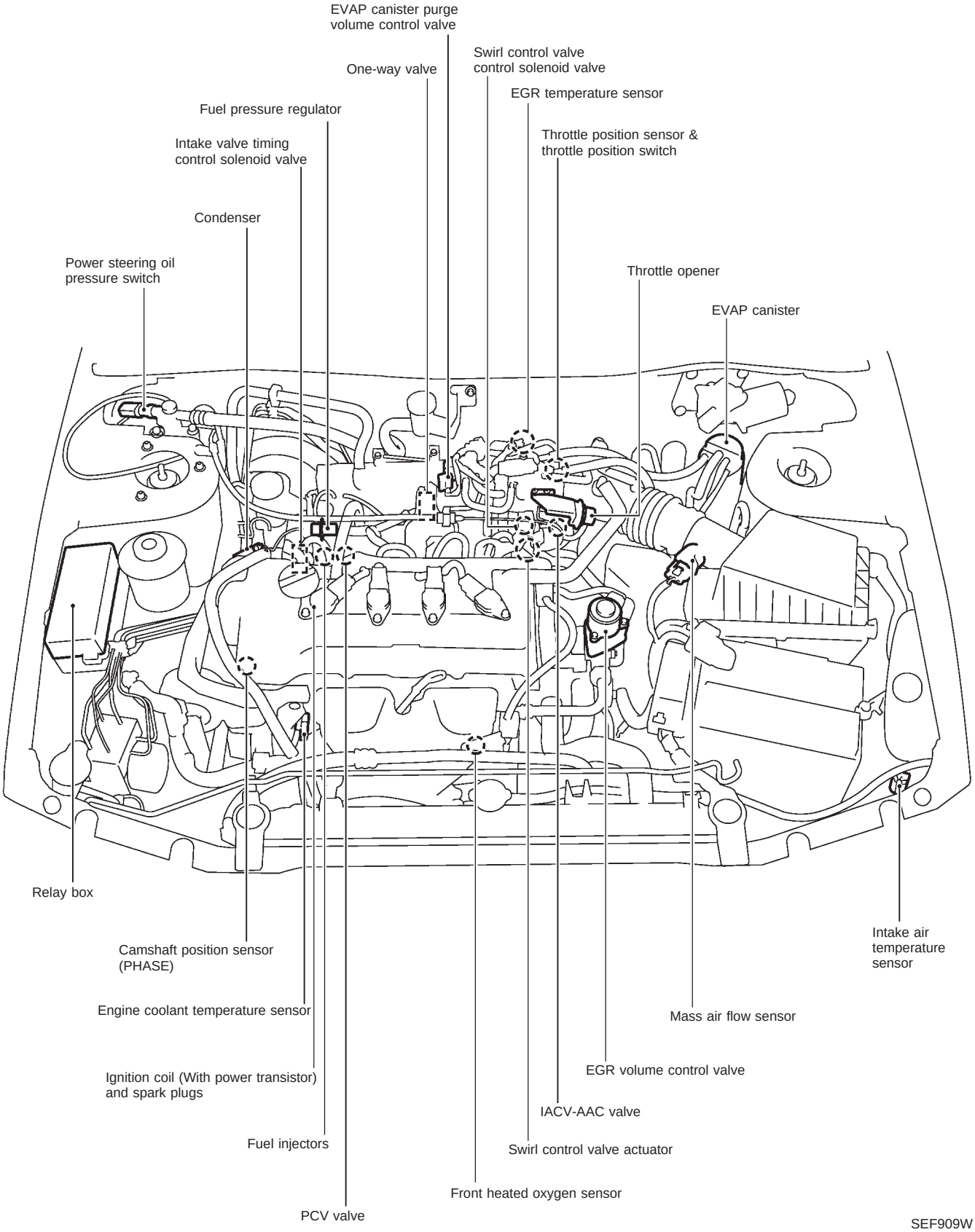
Commercial Service Tool

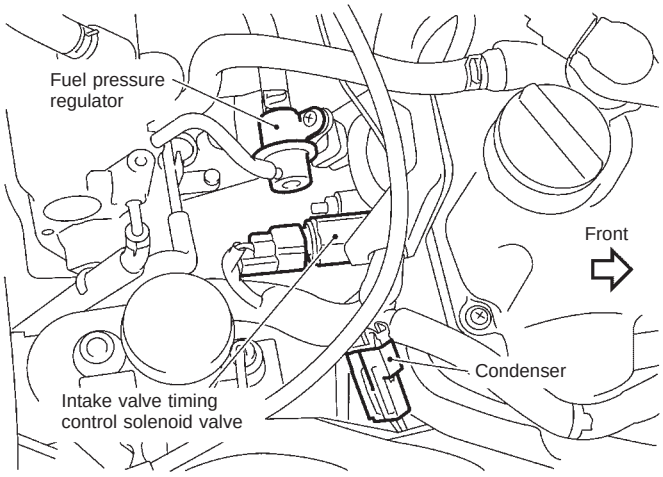
NCEC0008

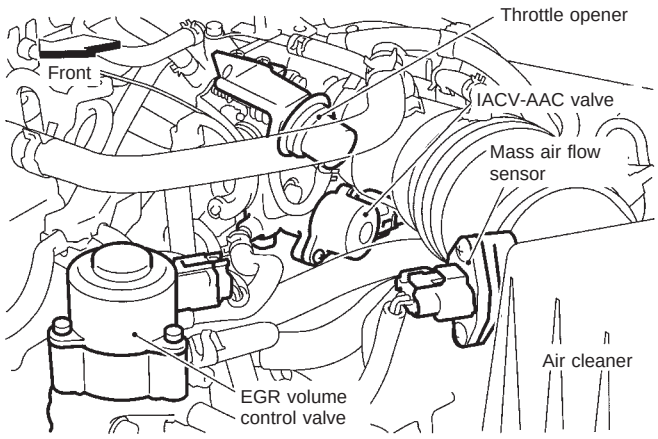
Tool name	Description	
Fuel filler cap adapter	 NT653	Checking fuel tank vacuum relief valve opening pressure

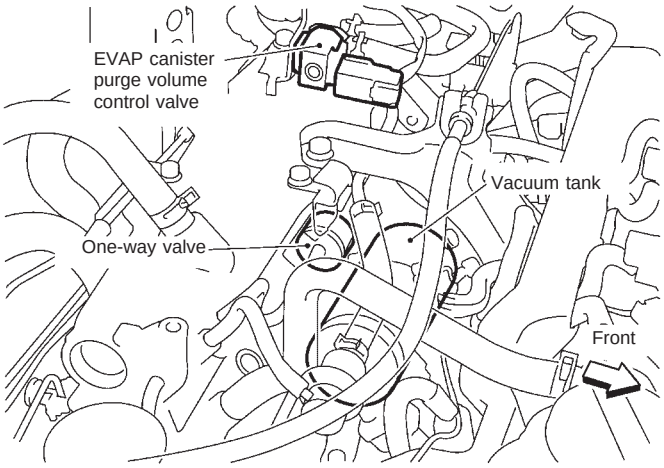
Engine Control Component Parts Location

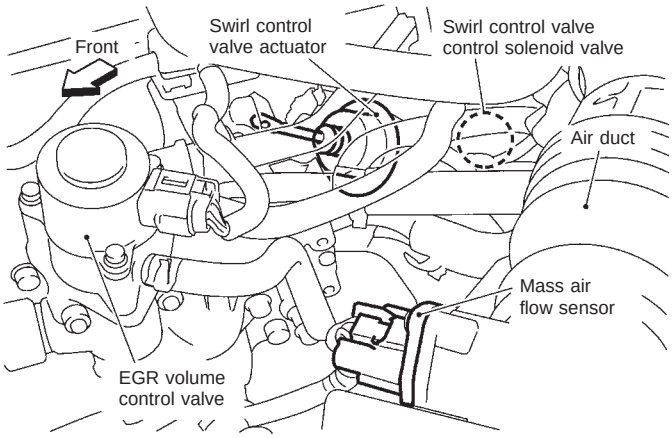
NCEC0009

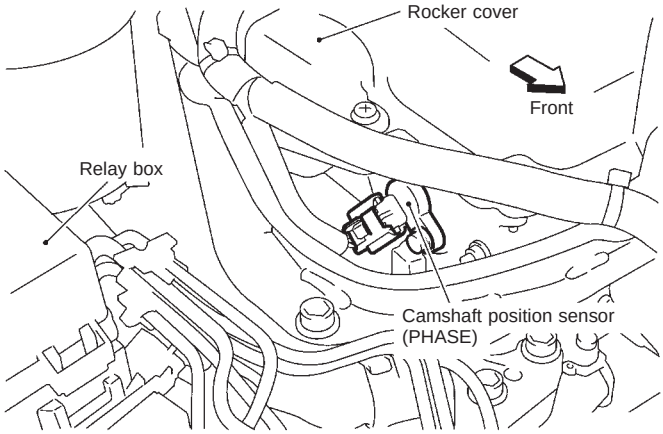


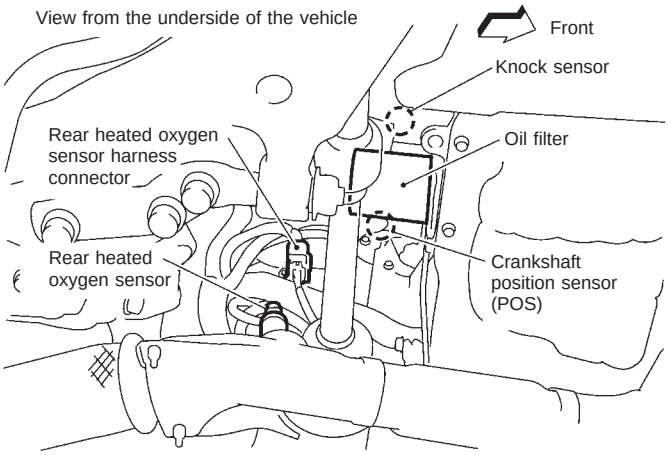

Fuel pressure regulator
Front
Condenser
Intake valve timing control solenoid valve


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

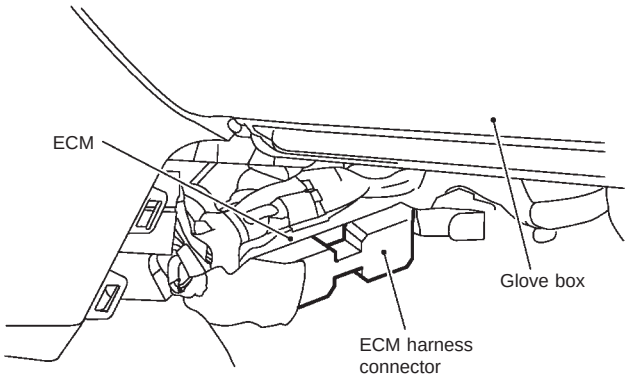

EVAP canister purge volume control valve
Vacuum tank
One-way valve
Front

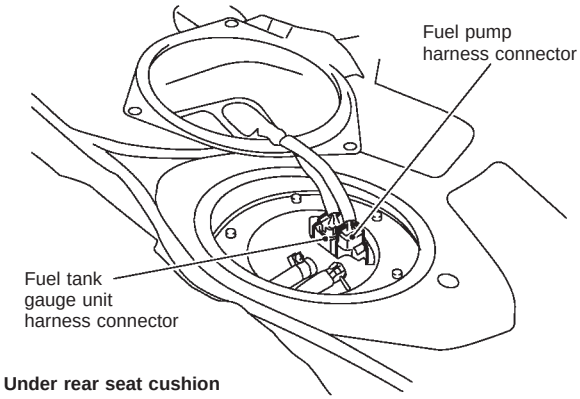

Front
Swirl control valve actuator
Swirl control valve control solenoid valve
Air duct
Mass air flow sensor
EGR volume control valve


Rocker cover
Front
Relay box
Camshaft position sensor (PHASE)

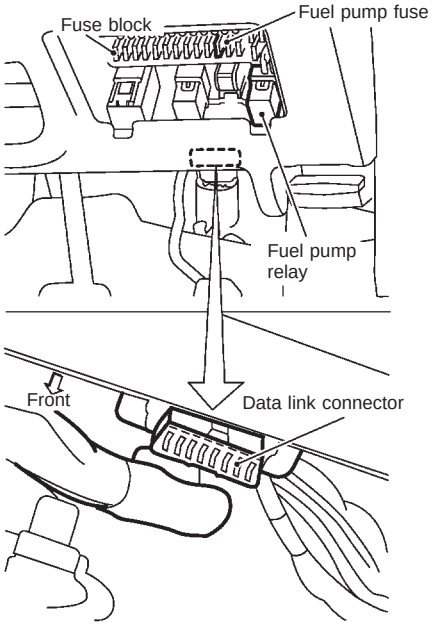

View from the underside of the vehicle
Front
Knock sensor
Rear heated oxygen sensor harness connector
Oil filter
Rear heated oxygen sensor
Crankshaft position sensor (POS)

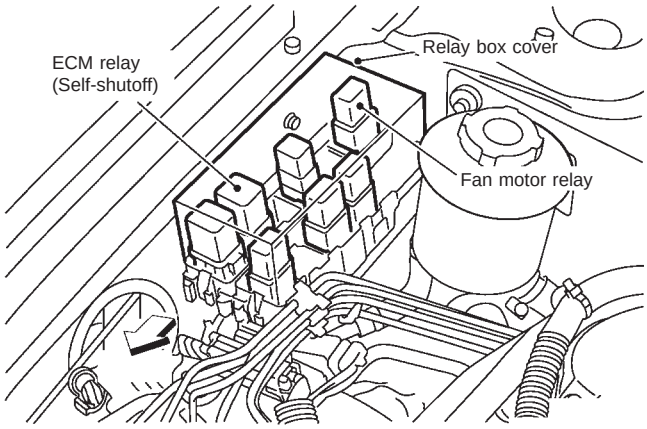
SEF910W





Under rear seat cushion

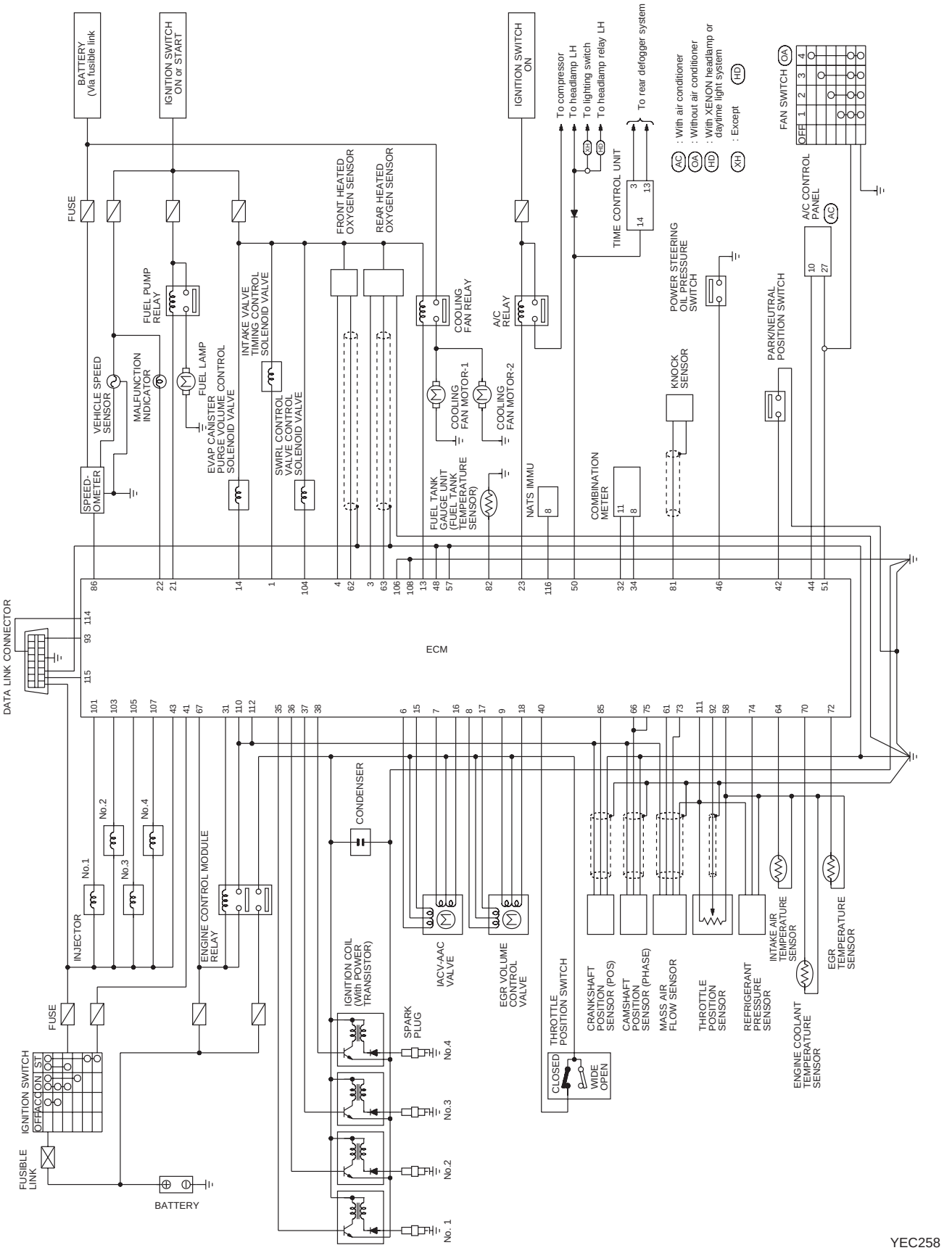




SEF911W

Circuit Diagram

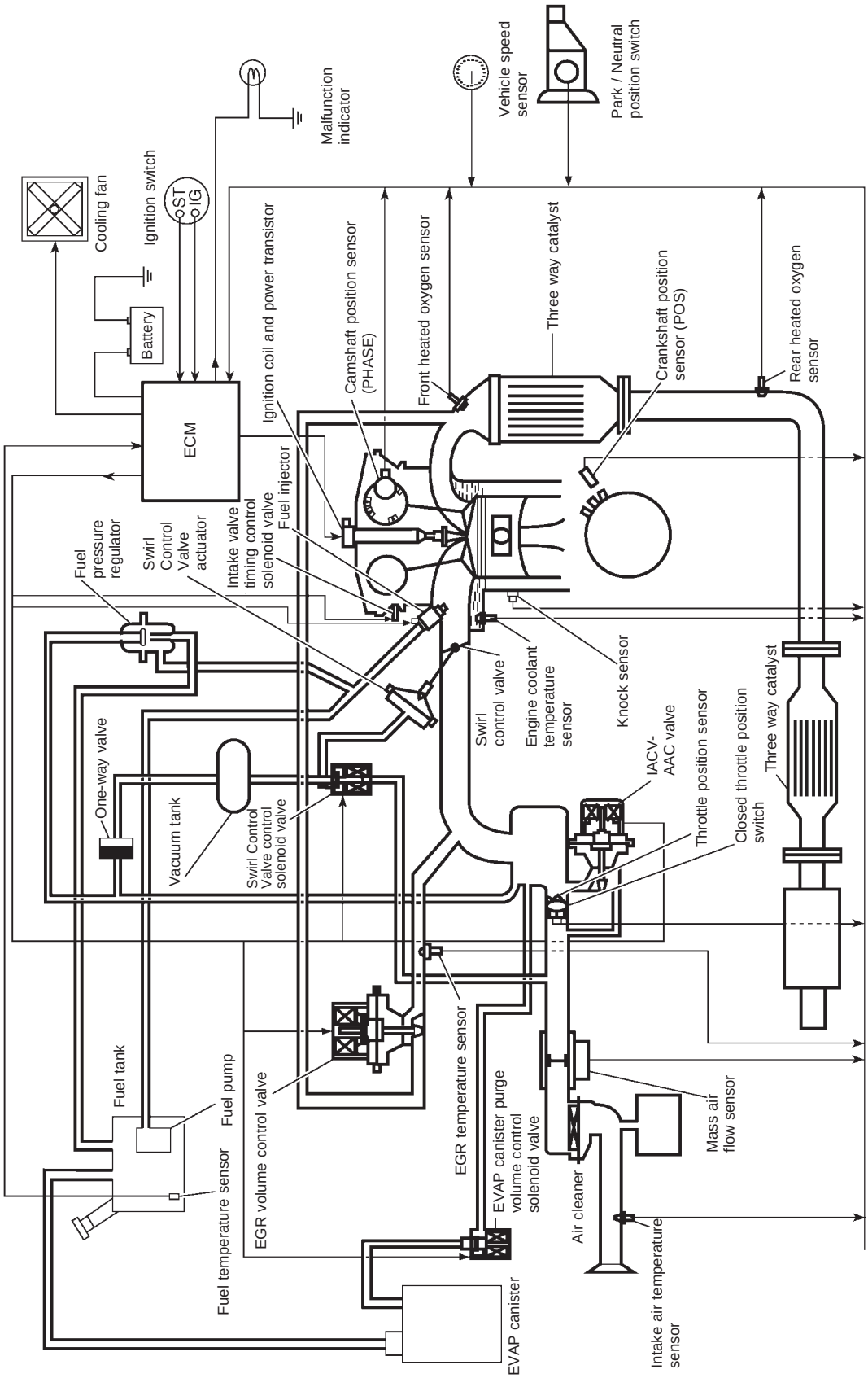
NCEC0010



YEC258

System Diagram

NCEC0011

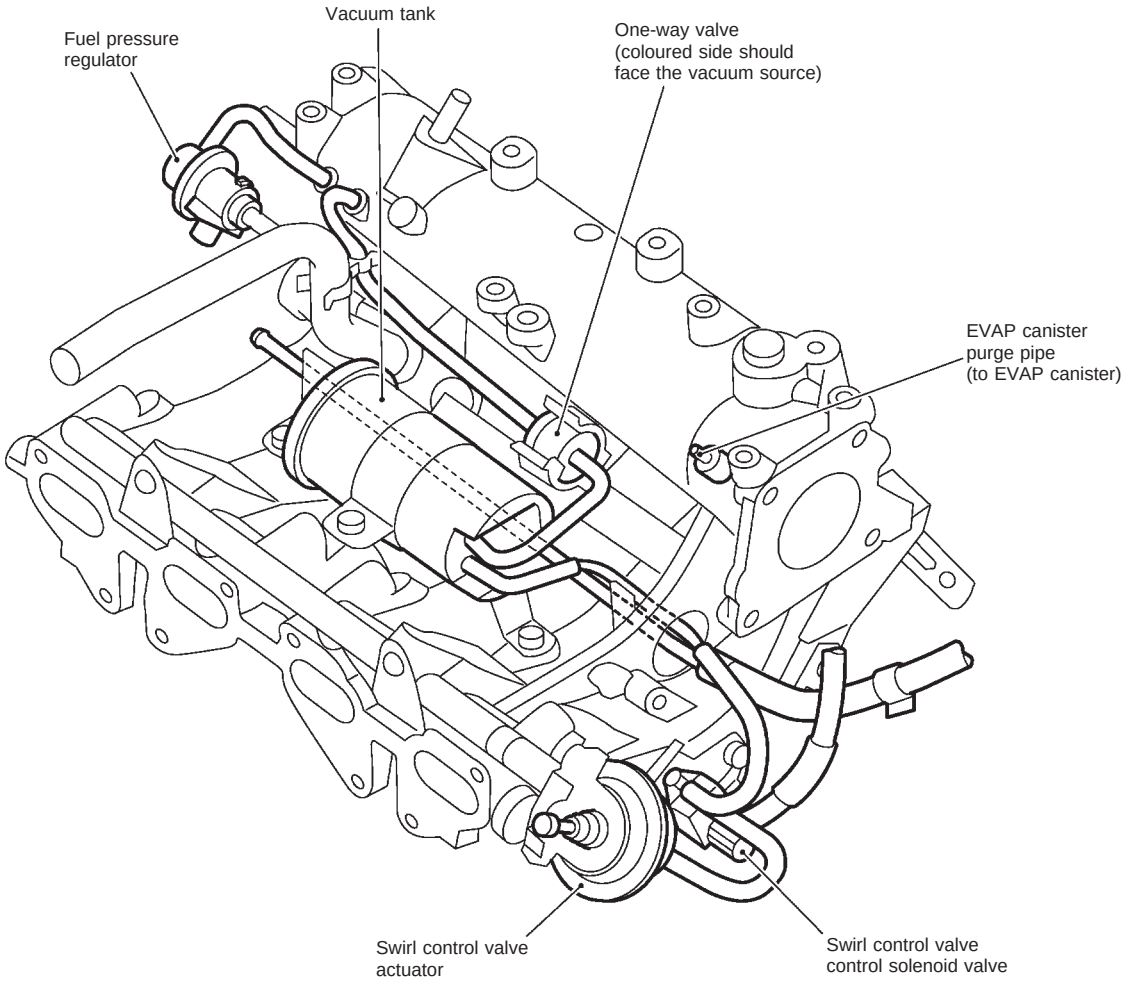


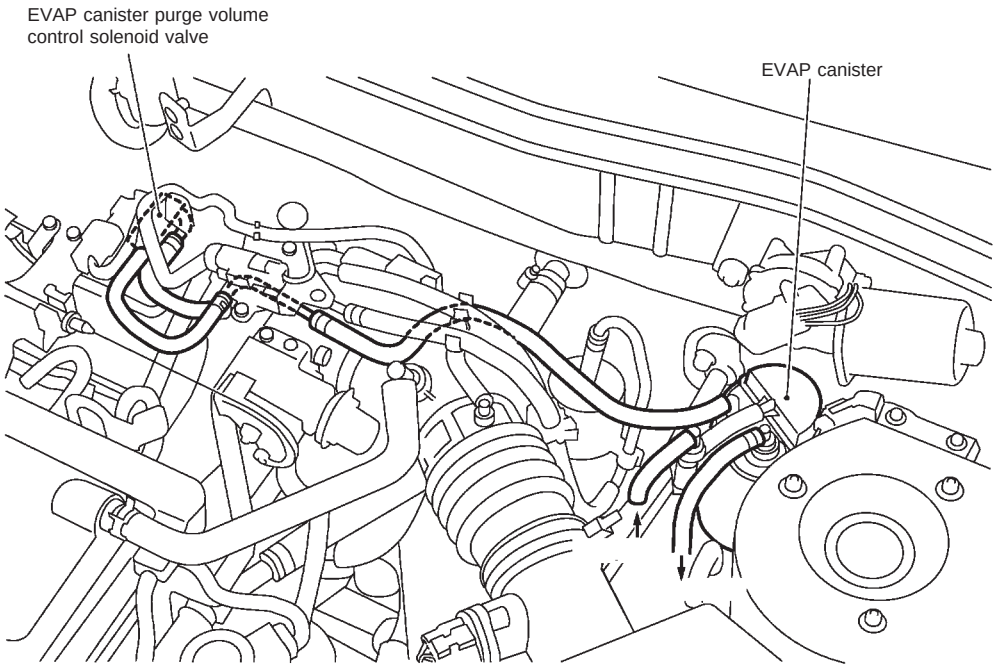
SEF914W

Vacuum Hose Drawing

NCEC0012

Refer to ‘‘System Diagram’’ on EC-QG-18 for vacuum control system.





SEF915W

System Chart

NCEC0013

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

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

Multiport Fuel Injection (MFI) System

DESCRIPTION

Input/Output Signal Chart

NCEC0014

NCEC0014S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed and piston position	Fuel injection & mixture ratio control	Injector
Camshaft position sensor (PHASE)	Cylinder number		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Front heated oxygen sensor	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position Throttle valve idle position		
PNP switch	Gear position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Electrical load	Electrical load signal		
Battery	Battery voltage		
Power steering oil pressure switch	Power steering operation		
Rear heated oxygen sensor*	Density of oxygen in exhaust gas		

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

Basic Multiport Fuel Injection System

NCEC0014S02

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

NCEC0014S03

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

<Fuel increase>

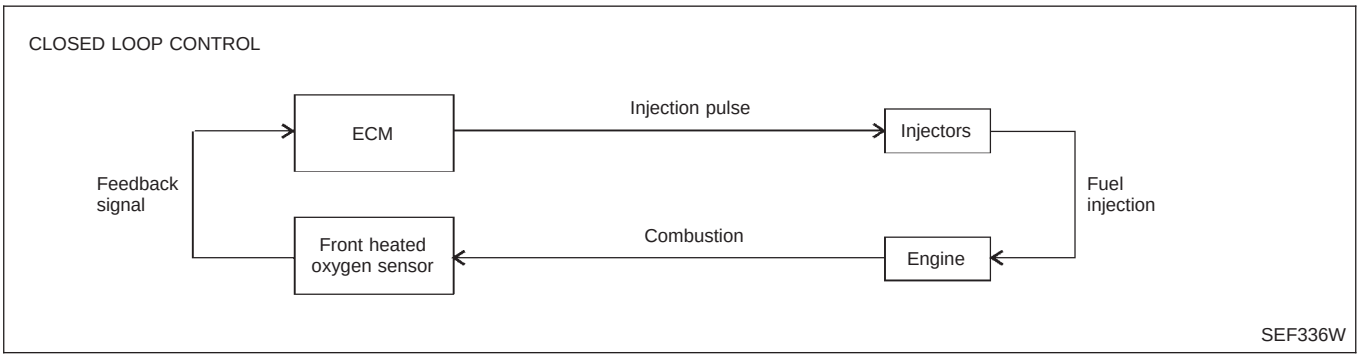
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation
- During high vehicle speed operation (M/T models)
- Extremely high engine coolant temperature

Mixture Ratio Feedback Control (Closed loop control)

NCEC0014S04



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 front heated oxygen sensor 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 front heated oxygen sensor, refer to EC-QG-157. 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.
Rear heated oxygen sensor is located downstream of the three way catalyst. Even if the switching characteristics of the front heated oxygen sensor shift, the air-fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.

Open Loop Control

NCEC0014S05

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 front heated oxygen sensor or its circuit
- Insufficient activation of front heated oxygen sensor at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

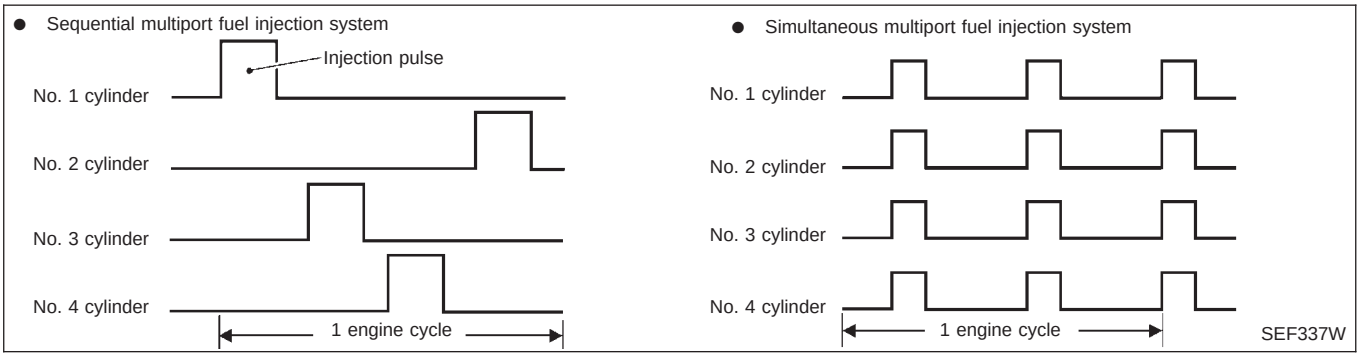
Mixture Ratio Self-learning Control

NCEC0014S06

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

NCEC0014S07



Two types of systems are used.

Sequential Multiport Fuel Injection System

NCEC0014S0701

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

NCEC0014S0702

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

NCEC0014S08

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

Electronic Ignition (EI) System

DESCRIPTION

Input/Output Signal Chart

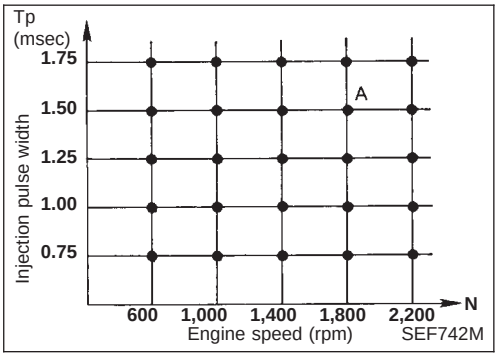
NCEC0015

NCEC0015S01

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

System Description

NCEC0015S02



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

- At starting
- During warm-up
- At idle
- During acceleration

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

Air Conditioning Cut Control

DESCRIPTION

NCEC0016

Input/Output Signal Chart

NCEC0016S01

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

System Description

NCEC0016S02

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

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.

- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.

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

DESCRIPTION

NCEC0017

Input/Output Signal Chart

NCEC0017S01

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

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

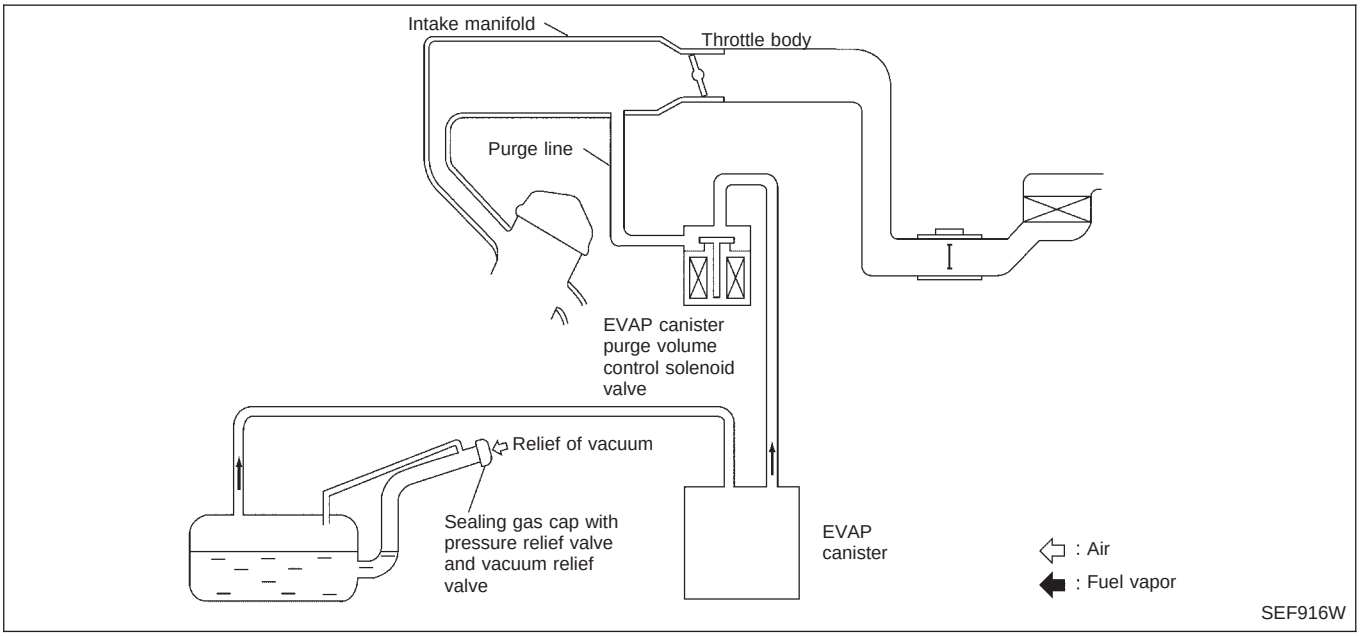
NOTE:

This function is different from deceleration control listed under ‘‘Multiport Fuel Injection (MFI) System’’, EC-QG-21.

Evaporative Emission System

DESCRIPTION

NCEC0018



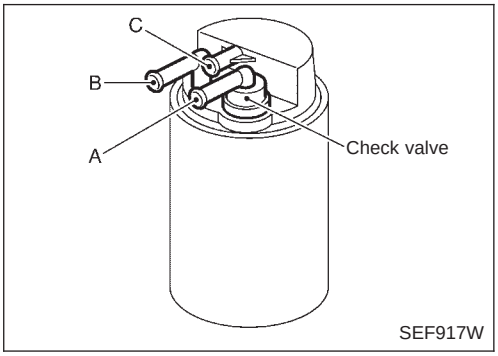
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

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

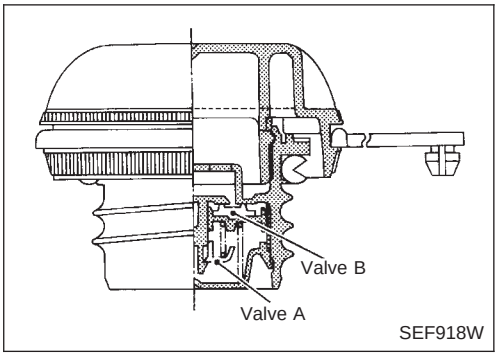
NCEC0019

EVAP Canister

NCEC0019S01

Check EVAP canister as follows:

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



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

NCEC0019S03

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

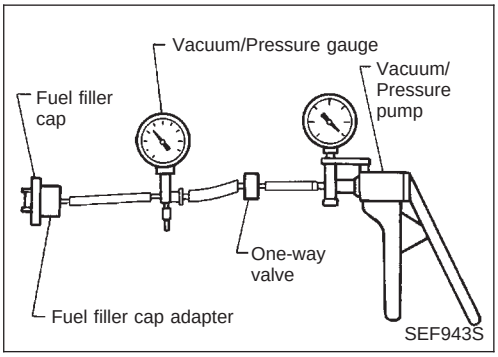
Pressure:

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

Vacuum:

−6.0 to −3.5 kPa (−0.060 to −0.035 bar, −0.061 to −0.036 kg/cm^2, −0.87 to −0.51 psi)

3. If out of specification, replace fuel filler cap as an assembly.



Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve

NCEC0019S07

Refer to EC-QG-268.

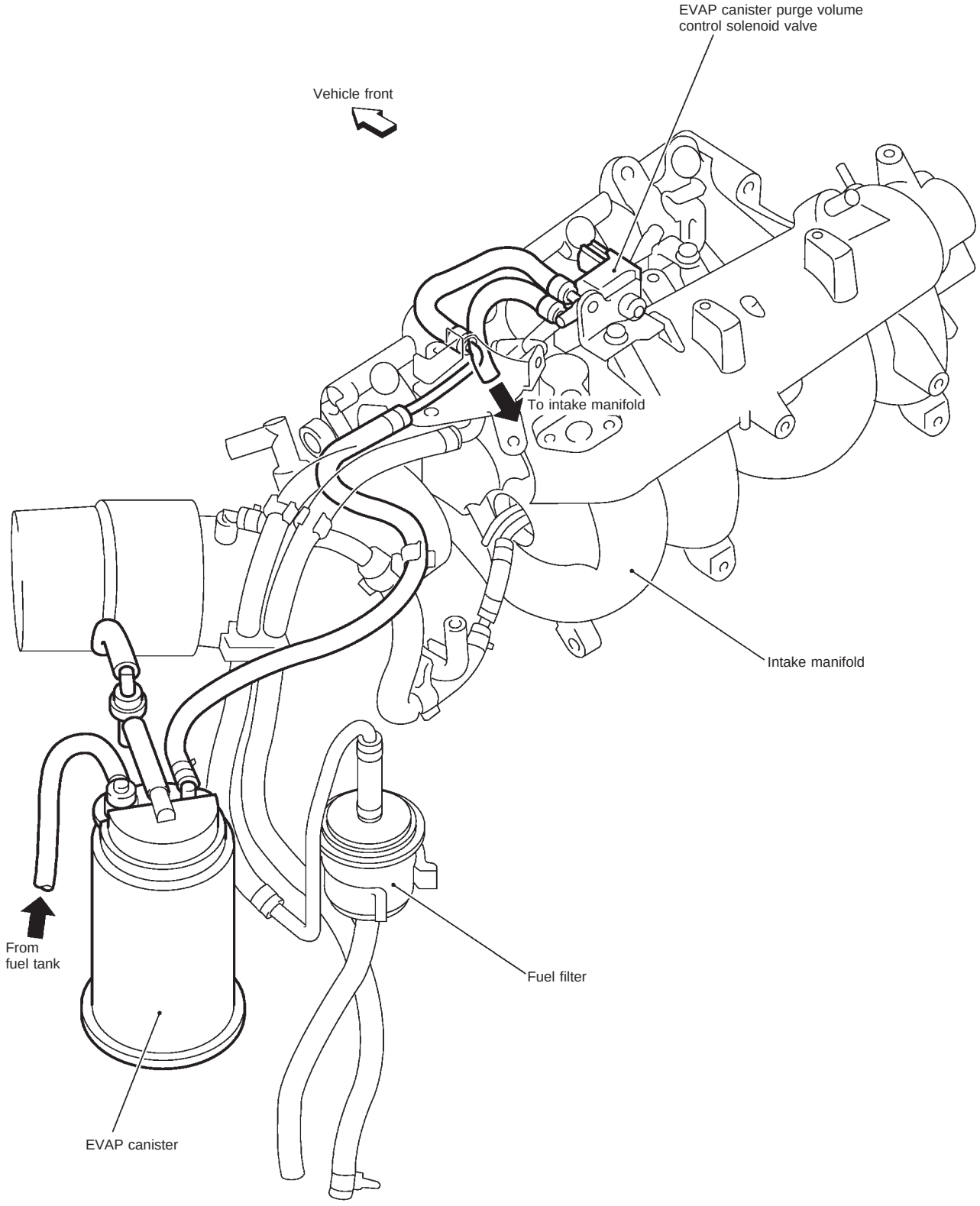
Tank Fuel Temperature Sensor

NCEC0019S08

Refer to EC-QG-224.

EVAPORATIVE EMISSION LINE DRAWING

NCEC0020



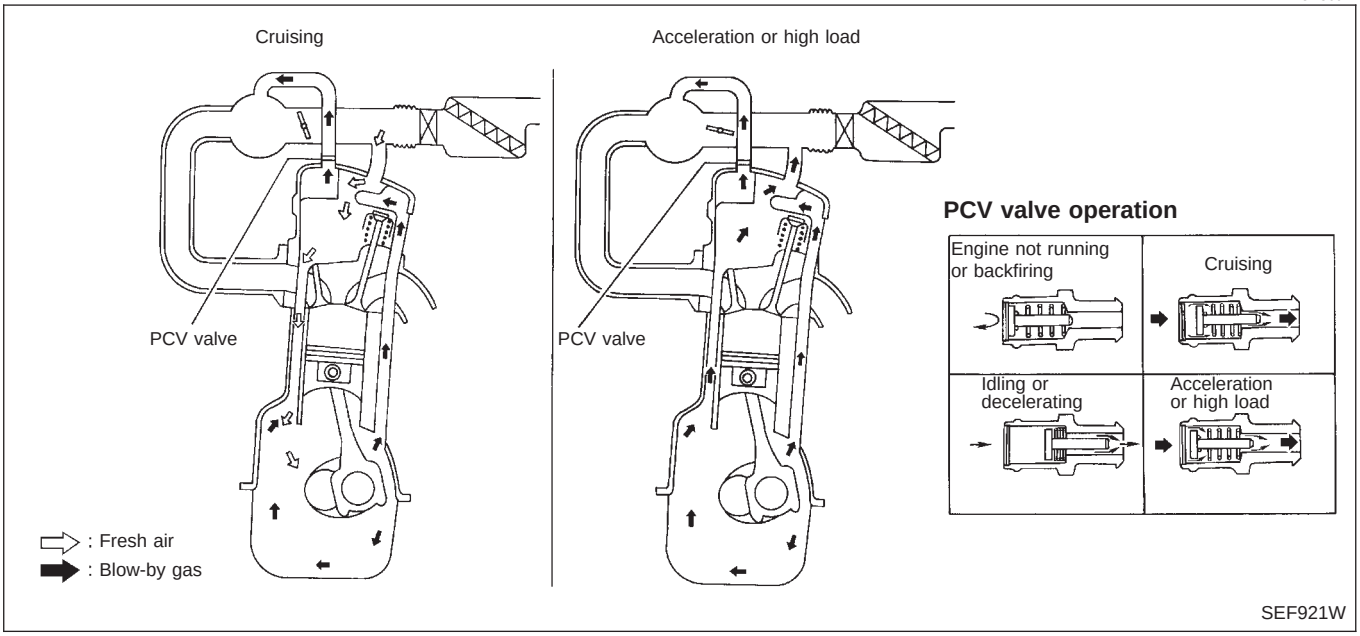
NOTE: Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

SEF919W

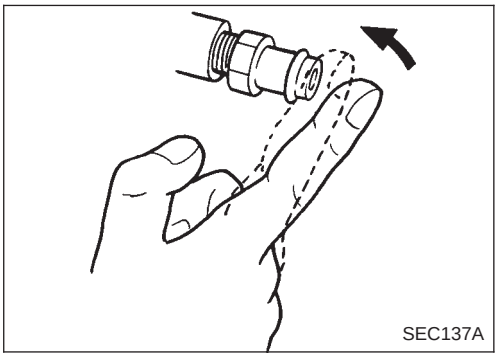
Positive Crankcase Ventilation

DESCRIPTION

NCEC0022



This system returns blow-by gas to the intake collector.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air duct into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the intake collector under all conditions.



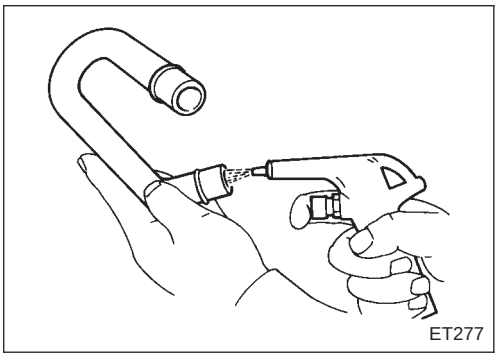
INSPECTION

NCEC0023

PCV (Positive Crankcase Ventilation) Valve

NCEC0023S01

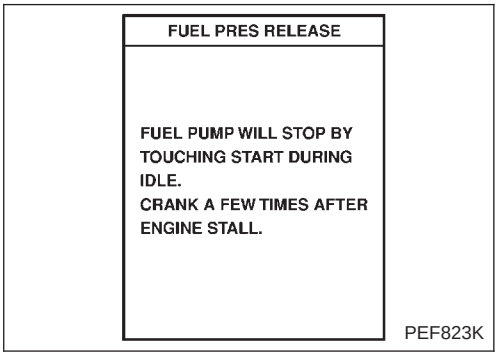
With engine running at idle, remove PCV valve from breather separator. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.



Ventilation Hose

NCEC0023S02

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

NCEC0024

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

WITH CONSULT-II

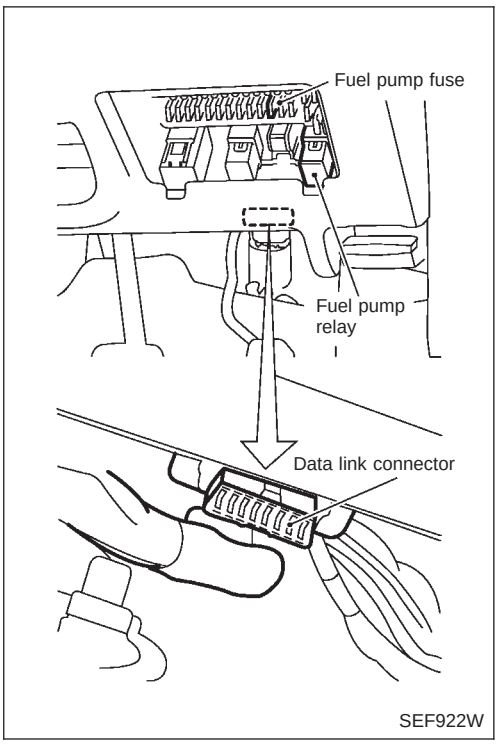
NCEC0024S01

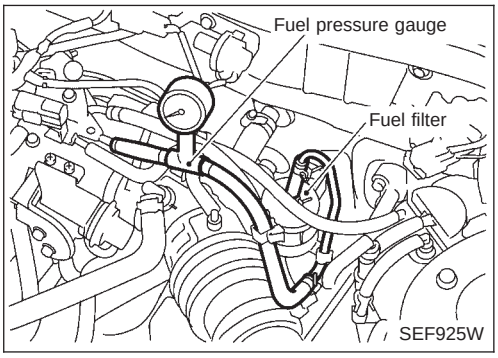
1. Start engine.
2. Perform "FUEL PRES RELEASE" in "WORK SUPPORT" mode with CONSULT-II.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.

WITHOUT CONSULT-II

NCEC0024S02

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





Fuel Pressure Check

NCEC0025

- **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:

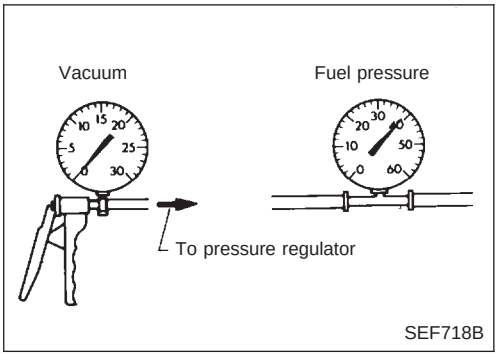
With vacuum hose connected

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-QG-30.

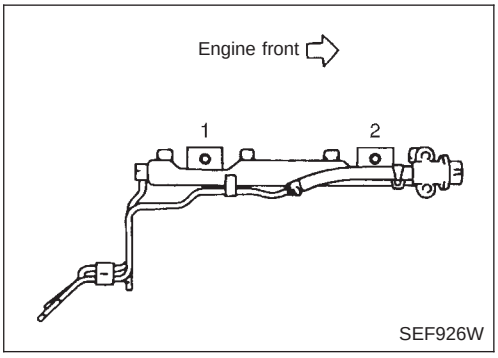


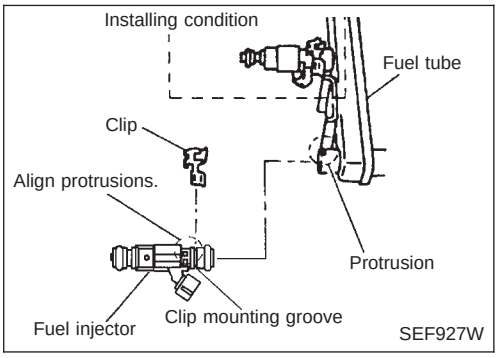
Fuel Pressure Regulator Check

NCEC0026

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

NCEC0027

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

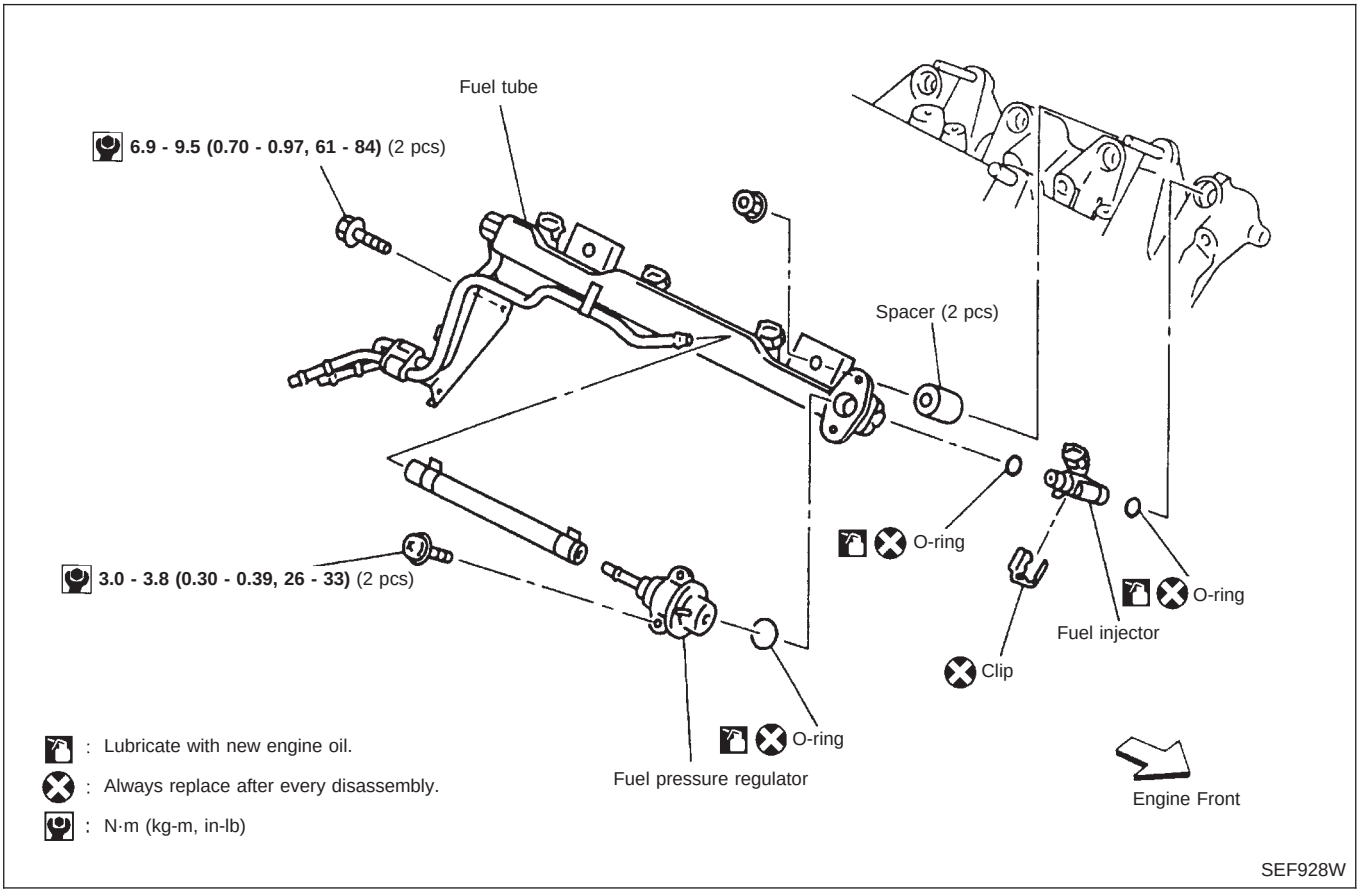
- **Be careful not to damage injector nozzles during removal.**
- **Do not bump or drop fuel injectors.**
- **Do not disassemble or adjust fuel injectors.**

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

- **Use bare hands to install O-rings. Do not wear gloves.**
- **Apply a coat of engine oil (with a low viscosity of 5W-30, etc.) to O-rings before installation.**
- **Do not use solvent to clean O-rings and other parts.**
- **Make sure that O-rings and other parts are clean and free from foreign particles.**
- **Be careful not to damage O-rings with service tools or finger nails. Do not expand or twist O-rings. If stretched, do not insert them into fuel tubes immediately after stretching.**
- **Always insert O-rings straight into fuel tubes. Do not tilt or rotate them during installation.**

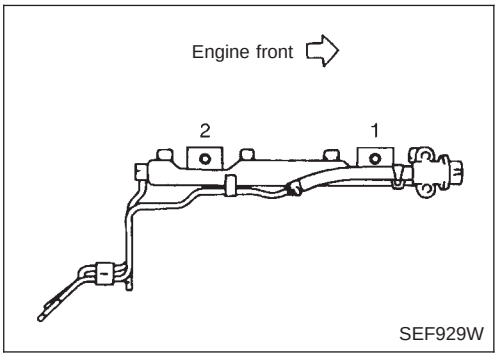
6. Position clips in grooves on fuel injectors.

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



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

- **Discard old clips; replace with new ones.**



9. Tighten fuel tube assembly mounting nuts in numerical sequence (indicated in the Figure at left) and in two stages.

: Tightening torque N·m (kg-m, ft-lb)

1st stage:

12 - 13 (1.2 - 1.4, 9 - 10)

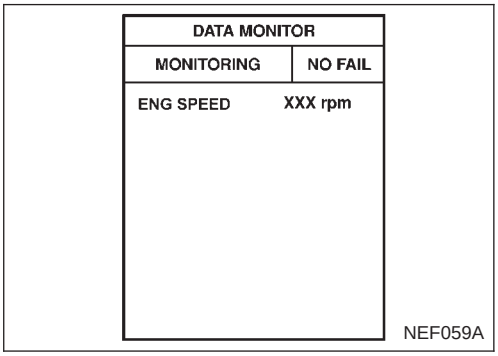
2nd stage:

17 - 23 (1.7 - 2.4, 13 - 17)

10. Insert fuel hoses into fuel tubes so that ends of fuel hoses butt up against fuel tubes; fasten with clamps, avoiding bulges.

CAUTION:

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



Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

NCEC0028

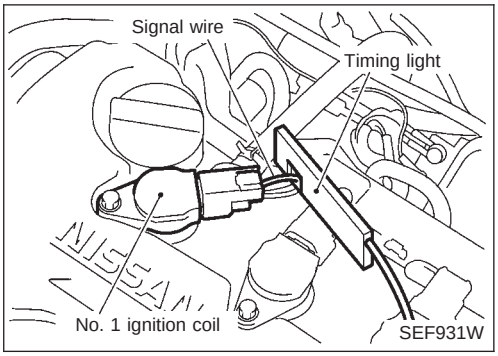
DIRECT IGNITION SYSTEM — HOW TO CHECK IDLE SPEED AND IGNITION TIMING

NCEC0028S03

Idle Speed

NCEC0028S0301

- **Using CONSULT-II**
  Check idle speed in ‘‘DATA MONITOR’’ mode with CONSULT-II.



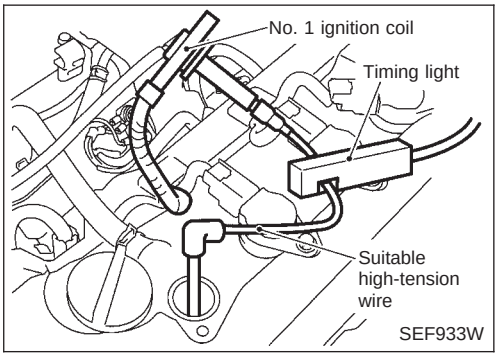
Ignition Timing

NCEC0028S0302

Any of following two methods may be used.

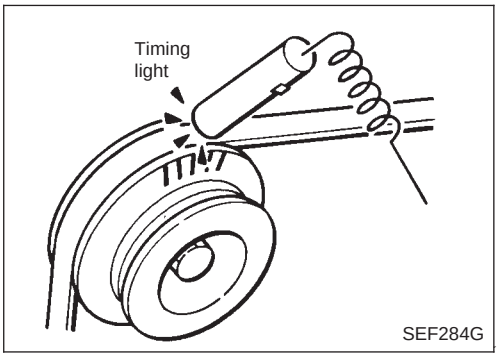
- **Method A**

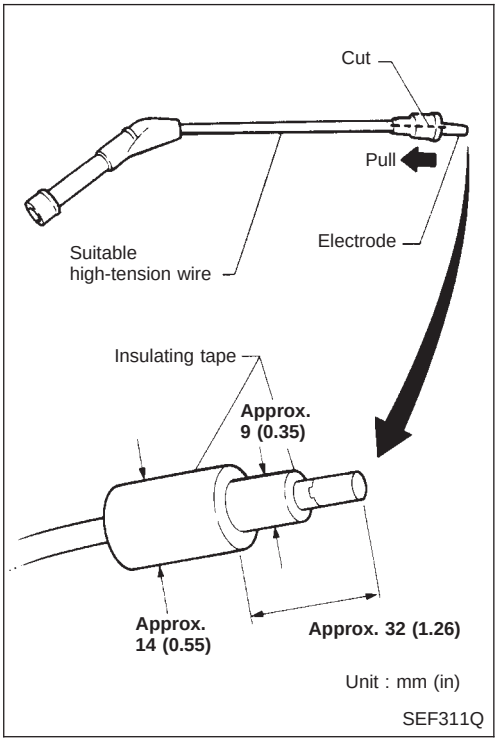
a) Attach timing light to loop wire as shown.
b) Check ignition timing.



- **Method B**

a) Remove No. 1 ignition coil.
b) Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.
c) Check ignition timing.





PREPARATION

NCEC0028S01

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

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

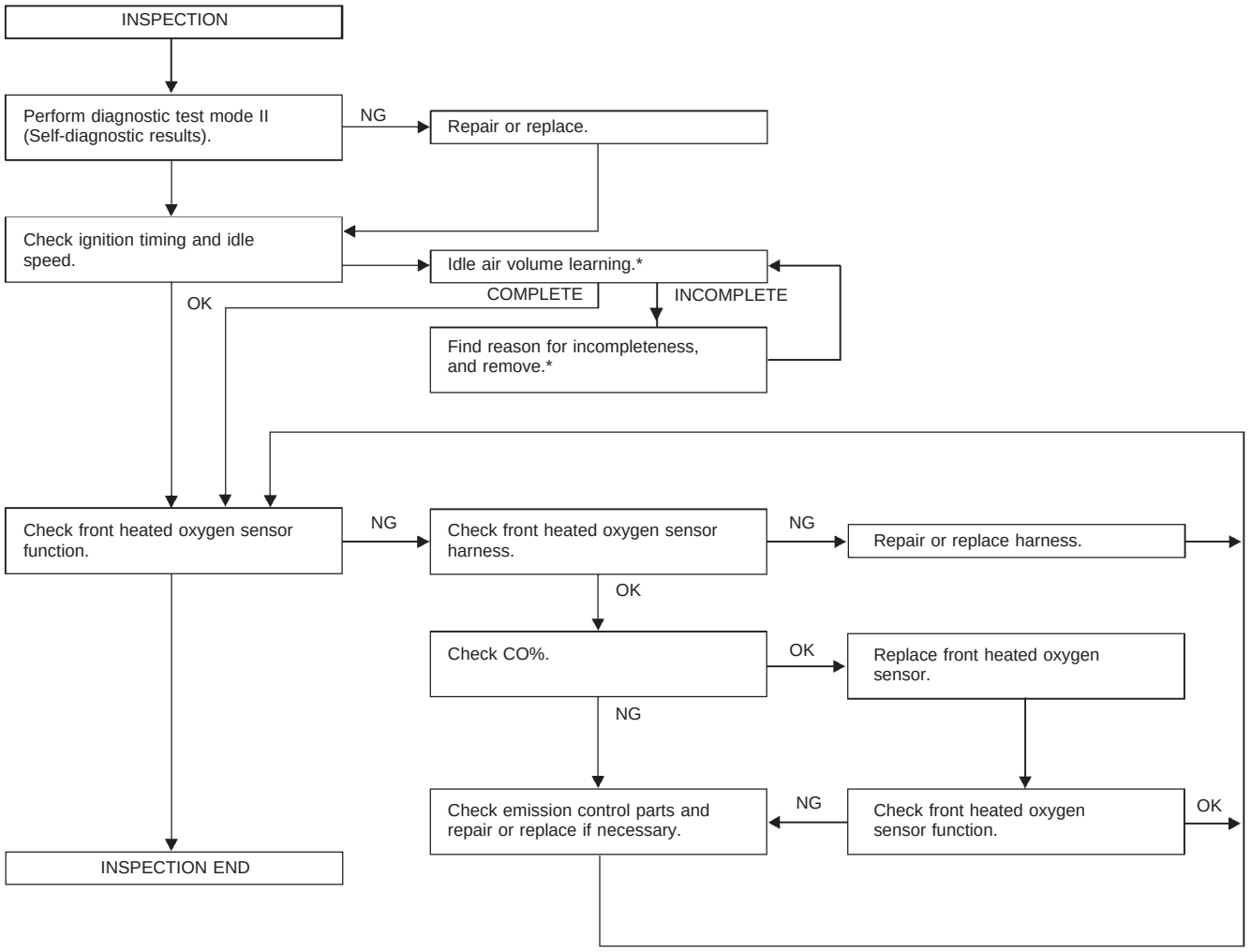
- **On models equipped with air conditioner, checks should be carried out while the air conditioner is ''OFF''.**
- **When measuring ''CO'' percentage, insert probe more than 40 cm (15.7 in) into tail pipe.**
- **Turn off headlamps, heater blower, rear window defogger.**
- **On vehicles equipped with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

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

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

Overall Inspection Sequence

NCEC0028S0101



SEF104X

*: Refer to EC-QG-43.

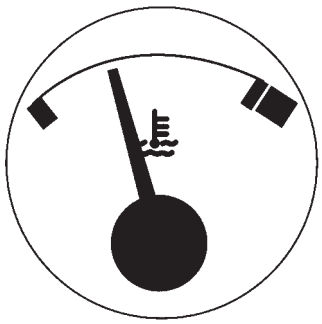
INSPECTION PROCEDURE

=NCEC0028S02

1	INSPECTION START

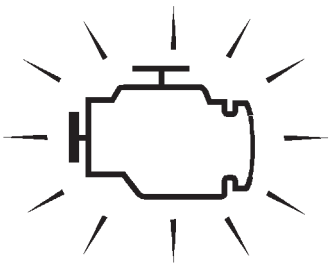
1. Visually check the following:
- Air cleaner clogging
- Hoses and duct for leaks
- EGR valve operation
- Electrical connectors
- Gasket (intake manifold, cylinder head, exhaust system)
- Throttle valve and throttle position sensor operation

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.



SEF935W

3. Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.
4. Perform the Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-QG-57.



SAT652J

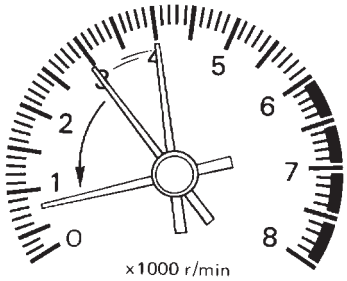
OK or NG

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.



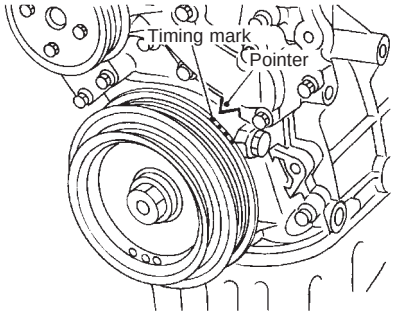
SEF978U

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.



SEM872F

M/T: 8°±2° BTDC

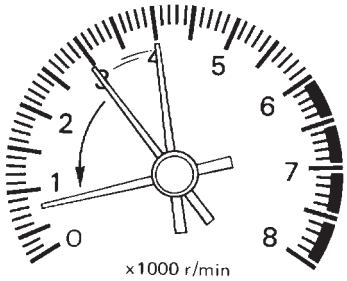
Only check ignition timing as the timing is not adjustable.

▶	GO TO 4.

3	CHECK IGNITION TIMING

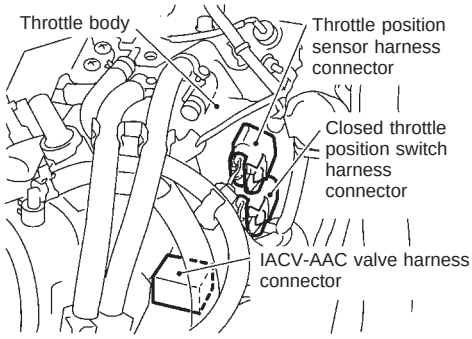
Without CONSULT-II

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.



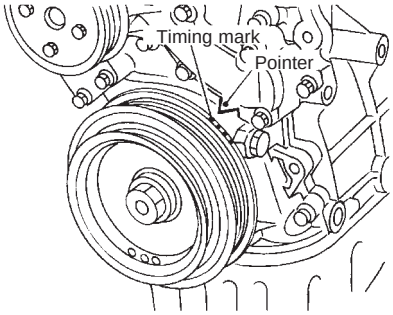
SEF978U

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



SEF938W

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.



SEM872F

M/T: 8°±2° BTDC

Only check ignition timing as the timing is not adjustable.

▶	GO TO 5.

4	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.
3. Read idle speed in "DATA MONITOR" mode with CONSULT-II.

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm

NEF059A

M/T: 700±50 rpm

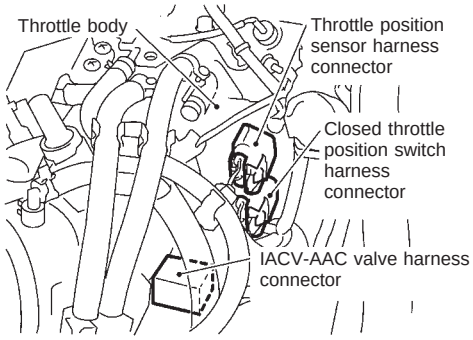
OK or NG

OK	▶	GO TO 7.
OK (Ignition timing NG)	▶	GO TO 6.
NG	▶	GO TO 6.

5	CHECK TARGET IDLE SPEED

Without CONSULT-II

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



SEF938W

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 7.
OK (Ignition timing NG)	▶	1. Perform "Base idle air volume initializing". Refer to EC-QG-43. 2. If still NG, GO TO 6.
NG	▶	

6	DETECT MALFUNCTIONING PART

Check the following.
1. Check closed throttle position switch idle position. Refer to EC-QG-80.
2. Check IACV-AAC valve and replace if necessary. Refer to EC-QG-273.
3. Check IACV-AAC valve harness and repair if necessary. Refer to EC-QG-273.
4. Perform ''Idle Air Volume Learning''. Refer to EC-QG-43.
5. Check ECM function by substituting another known good ECM.
   (ECM may be the cause of a problem, but this is rarely the case.)

▶	GO TO 7.

7	CHECK FRONT HEATED OXYGEN SENSOR SIGNAL

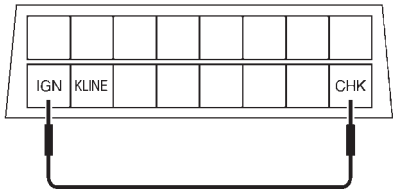
With CONSULT-II
1. See ''FR O2 MNTR'' in ''DATA MONITOR'' mode.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintain engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature) and check that the monitor fluctuates between ''LEAN'' and ''RICH'' more than five times during 10 seconds.

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm
FR O2 MNTR-B1	RICH

NEF060A

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

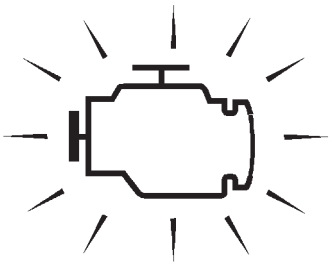
Without CONSULT-II
1. Set ''Front heated oxygen sensor monitor'' in the Diagnostic Test Mode II. (See page EC-QG-55.)



→ Diagnostic Test Mode II

SEF945W

2. Run engine at about 2,000 rpm for about 2 minutes under no-load (engine is warmed up to normal operating temperature).
3. Maintain engine at 2,000 rpm under no-load and check that MI goes on more than five times during 10 seconds.



OK or NG

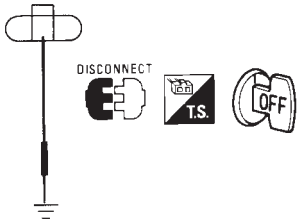
SAT652J

OK	▶	**INSPECTION END**
NG	▶	GO TO 8.

8	CHECK FRONT HEATED OXYGEN SENSOR HARNESS

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

Front heated oxygen sensor harness connector



MEF031DA

5. Check for continuity between terminal 62 of ECM harness connector and body ground.
   Continuity exists...OK
   Continuity does not exist...NG

OK or NG

OK	▶	1. Connect ECM harness connector to ECM. 2. GO TO 9.
NG	▶	1. Repair or replace harness. 2. GO TO 4. (With CONSULT-II) 3. GO TO 5. (Without CONSULT-II)

9	PREPARATION FOR "CO" % CHECK

With CONSULT-II

1. Connect ECM harness connector to ECM.
2. Connect battery ground cable.
3. Select "ENGINE COOLANT TEMP" in "ACTIVE TEST" mode.
4. Set "COOLANT TEMP" to 5°C (41°F) by touching "Qu" and "Qd" and "UP", "DOWN".

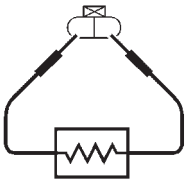
ACTIVE TEST	
COOLANT TEMP	XXX
MONITOR	
ENG SPEED	XXX rpm
INJ PULSE	XXX msec
IGN TIMING	XXX BTDC

NEF061A

Without CONSULT-II

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.

Engine coolant temperature sensor harness connector



4.4 kΩ resistor

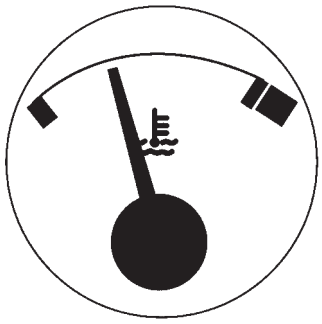
SEF053RA

4. Connect battery ground cable.

▶	GO TO 10.

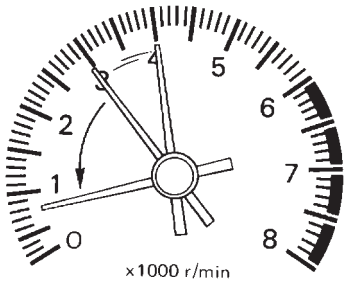
10	CHECK ''CO'' %

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.)



SEF935W

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



SEF978U

3. Check ''CO'' %.
   Idle CO: Less than 11% and engine runs smoothly.
4. **Without CONSULT-II**
   After checking CO%, stop engine and

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 11.
NG	▶	GO TO 12.

11	CHECK FRONT HEATED OXYGEN SENSOR SIGNAL

With CONSULT-II
1. Replace front heated oxygen sensor.
2. See ''FR O2 MNTR'' 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

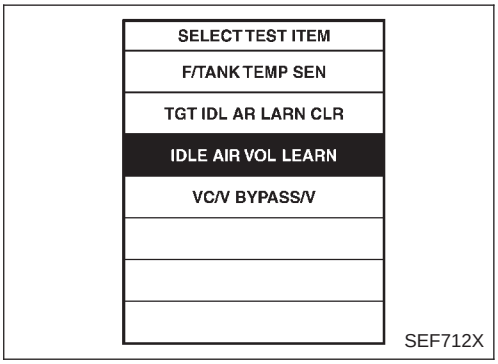
Without CONSULT-II
1. Replace front heated oxygen sensor.
2. Set ''Front heated oxygen sensor monitor'' in the Diagnostic Test Mode II.
   (See page EC-QG-55.)
3. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator goes on and off more than five times during 10 seconds.

OK or NG

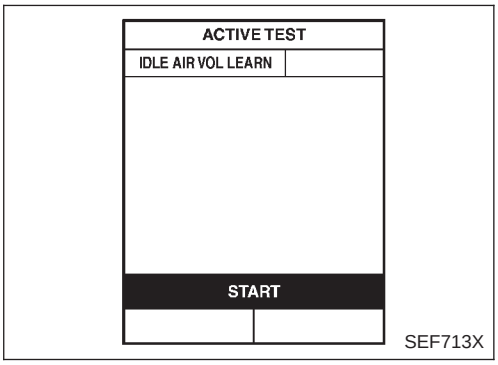
OK	▶	GO TO 4. (With CONSULT-II) GO TO 5. (Without CONSULT-II)
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART
1. Connect front heated oxygen sensor harness connector to front heated oxygen sensor. 2. Check fuel pressure regulator. Refer to EC-QG-30. 3. Check mass air flow sensor and its circuit. Refer to EC-QG-115. 4. Check injector and its circuit. Refer to EC-QG-325. Clean or replace if necessary. 5. Check engine coolant temperature sensor and its circuit. Refer to EC-QG-125. 6. Check ECM function by substituting another known good ECM. (ECM may be the cause of a problem, but this is rarely the case.)	
▶	1. GO TO 4. (With CONSULT-II) 2. GO TO 5. (Without CONSULT-II)

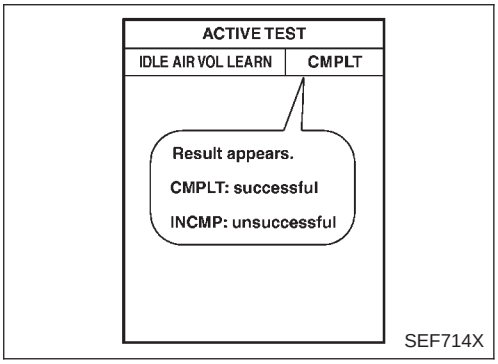
- **If a vehicle contains a part which is operating outside of design specifications with no MI illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected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



SEF712X



SEF713X



SEF714X

Idle Air Volume Learning

NCEC0541

DESCRIPTION

NCEC0541S01

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

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

PRE-CONDITIONING

NCEC0541S04

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

- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 99°C (158 - 210°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)

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

- Cooling fan motor: Not operating
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped

OPERATION PROCEDURE

NCEC0541S02

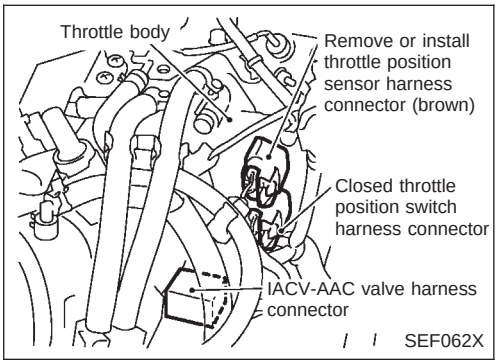
With CONSULT-II

NCEC0541S0201

1. Start the engine and warm it up to normal operating temperature.
2. Check that all items listed under the topic "PRE-CONDITIONING" (previously mentioned) are in good order.
3. Turn ignition switch "OFF" and wait at least 9 seconds.
4. Start the engine and let it to idle for at least 28 seconds.
5. Select "IDLE AIR VOL LEARN" in "ACTIVE TEST" mode.

6. Touch ''START'' and wait 20 seconds.
7. Make sure that ''CMPLT'' is displayed on CONSULT-II secreen.
   If ''INCMP'' is displayed, ''Idle Air Volume Learning'' will not be carried out successfully. In this case, find the cause of the problem by referring to the NOTE below.
8. Rev up the engine two or three times. Make sure that idle speed and ignition timing are close to or within specifications.

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



Without CONSULT-II

NCEC0541S0202

1. Start the engine and warm it up to normal operating temperature.
2. Check that all items listed under the topic ''PRE-CONDITIONING'' (previously mentioned) are in good order.
3. Turn ignition switch ''OFF'' and wait at least 9 seconds.
4. Start the engine and let it to idle for at least 28 seconds.
5. Disconnect throttle position sensor harness connector (brown), then re-connect it within 5 seconds.
6. Wait 20 seconds.
7. Make sure that idle speed is within specifiecations. If not, the result will be incomplete. In this case, find the cause of the problem by referring to the NOTE below.
8. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

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

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

1) **Check that throttle valve is fully closed.**
2) **Check that downstream of throttle valve is free from air leakage.**
3) **Adjust closed throttle position switch and reset memory. (Refer to Basic Inspection, EC-QG-80.)**
4) **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
5) **If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform ''Idle air volume learning'' all over again:**

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

Introduction

NCEC0029

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 ISO15031-5
Freeze Frame data	Mode 2 of ISO15031-5
System Readiness Test (SRT) code	Mode 1 of ISO15031-5
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Mode 7 of ISO15031-5
1st Trip Freeze Frame data	
Test values and Test limits	Mode 6 of ISO15031-5
Calibration ID	Mode 9 of ISO15031-5

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

X: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
ECM*3	X	X*1	—	—	—	—
CONSULT-II*4	X	X	X	X	X	—
GST*4	X	X*2	X	—	X	X

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

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-QG-91.)

Two Trip Detection Logic

NCEC0030

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 lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up					
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0300 - 0304) is being detected	X	—	—	X	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0300 - 0304) has been detected	—	X	—	X	—	X	—
Fail-safe items (Refer to EC-QG-91.)	—	X	—	X*1	—	X*1	—
Except above	—	—	X	—	X	X	X

*1: Except ‘‘ECM’’.

Emission-related Diagnostic Information

NCEC0031

DTC AND 1ST TRIP DTC

NCEC0031S01

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-QG-53.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-QG-51. 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 ISO15031-5. 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-QG-78. 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

NCEC0031S0101

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

1) **No Tools**
   The number of blinks of MI in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0340, 1320, 0705, 0750, etc.
   These DTCs are controlled by NISSAN.
2) **With CONSULT-II**
   With GST
   CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc.
   These DTCs are prescribed by ISO15031-6.
   (CONSULT-II also displays the malfunctioning component or system.)

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

A sample of CONSULT-II display for DTC is shown below. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be ‘‘0’’.
If a 1st trip DTC is stored in the ECM, the time data will be ‘‘[1t]’’.

DTC display

SELF DIAG RESULTS	
FAILURE DETECTED	TIME
IACV-AAC VALVE [P0505]	0

1st trip DTC display

SELF DIAG RESULTS	
FAILURE DETECTED	TIME
IACV-AAC VALVE [P0505]	1t

NEF065A

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

NCEC0031S02

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 and absolute pressure sensor 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-QG-67.

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

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0304 (0300 - 0304) Fuel Injection System Function — DTC: P0171 (0171), P0172 (0172)
2		Except the above items
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in ''HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION''. Refer to EC-QG-53.

SYSTEM READINESS TEST (SRT) CODE

NCEC0031S03

System Readiness Test (SRT) code is specified in Mode 1 of ISO15031-5. It indicates whether the self-diagnostic tests for non-continuously monitored items have been completed or not.

Inspection/Maintenance (I/M) tests of the on board diagnostic (OBD) II system may become the legal requirements in some states/areas. All SRT codes must be set in this case. Unless all SRT codes are set, conducting the I/M test may not be allowed.

SRT codes are set after self-diagnosis has been performed one or more times. This occurs regardless of whether the diagnosis is in ''OK'' or ''NG'', and whether or not the diagnosis is performed in consecutive trips. The following table lists the four SRT items (14 test items) for the ECM used in P11 models.

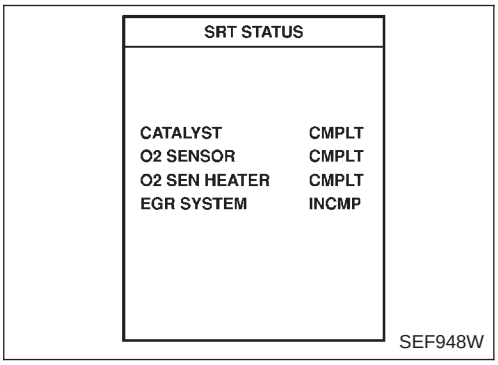
SRT items	Self-diagnostic test items
Catalyst monitoring	● Three way catalyst function P0420 (0420)
Oxygen sensor monitoring	● Front heated oxygen sensor (Circuit) P0130 (0130) ● Front heated oxygen sensor (Lean shift monitoring) P0131 (0131) ● Front heated oxygen sensor (Rich shift monitoring) P0132 (0132) ● Front heated oxygen sensor (Response monitoring) P0133 (0133) ● Front heated oxygen sensor (High voltage) P0134 (0134) ● Rear heated oxygen sensor (Min. voltage monitoring) P0137 (0137) ● Rear heated oxygen sensor (Max. voltage monitoring) P0138 (0138) ● Rear heated oxygen sensor (Response monitoring) P0139 (0139) ● Rear heated oxygen sensor (High voltage) P0140 (0140)
Oxygen sensor heater monitoring	● Front heated oxygen sensor heater P0135 (0135) ● Rear heated oxygen sensor heater P0141 (0141)
EGR system monitoring	● EGR function (Close) P0400 (0400) ● EGR function (Open) P1402 (1402)

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-QG-53). In addition, after engine control components/system are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

How to Display SRT Code

NCEC0031S0301

1. **With CONSULT-II**
   Selecting ''SRT STATUS'' in ''DTC CONFIRMATION'' mode with CONSULT-II.
   For items whose SRT codes are set, a ''CMPLT'' is displayed on the CONSULT-II screen; for items whose SRT codes are not set, ''INCMP'' is displayed as shown below.



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

How to Set SRT Code

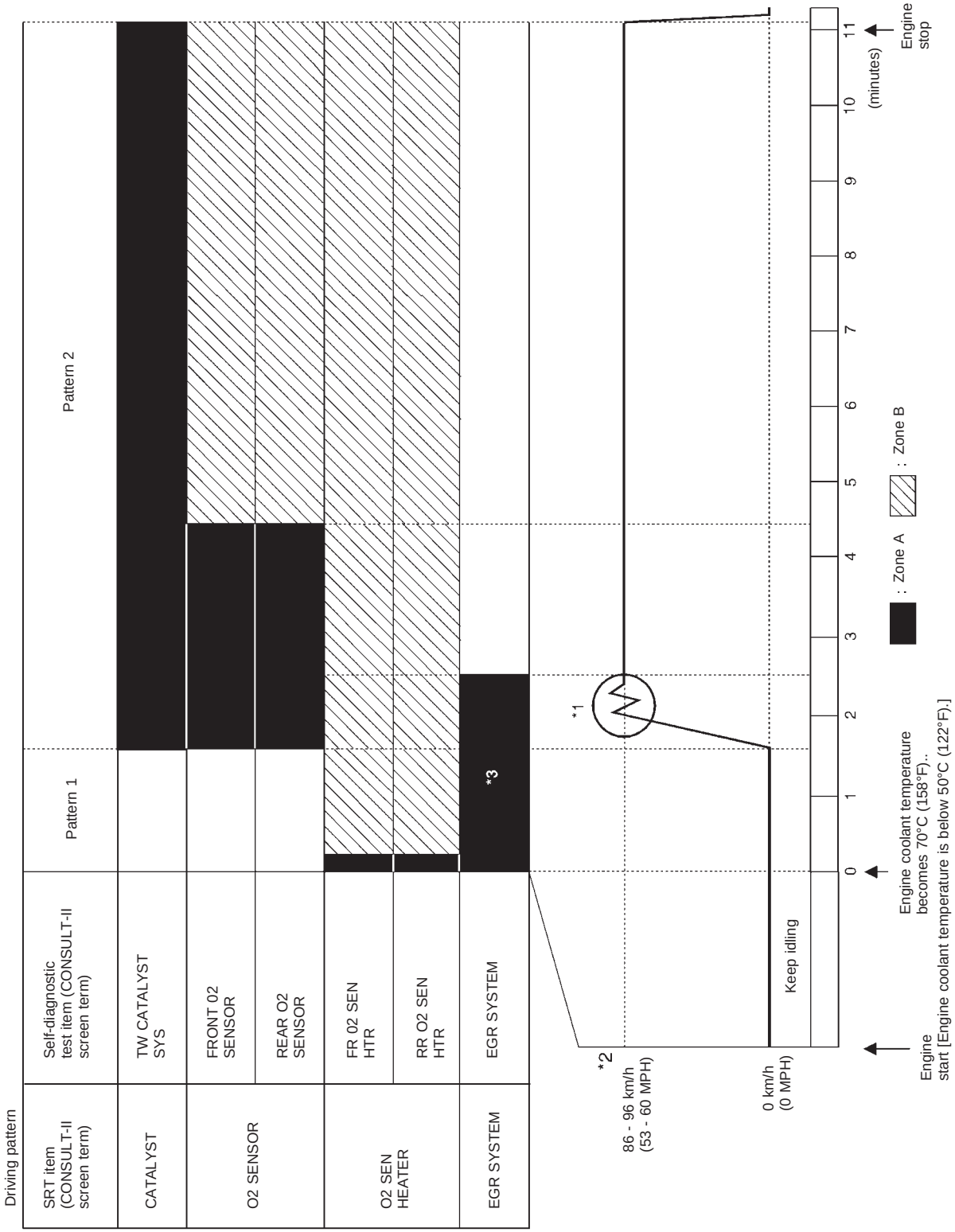
NCEC0031S0302

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

Driving Pattern

NCEC0031S0303

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.



SEF949W

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

*: Normal conditions refer to the following:

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

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals 70 and 58 is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals 70 and 58 is lower than 1.4V).**
- **The engine is started at the tank fuel temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 82 and ground is less than 4.1V).**

Pattern 2:

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

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.
*2: Checking the vehicle speed with CONSULT-II or GST is advised.
*3: The driving pattern may be omitted when all the followings are performed using the ''DTC WORK SUPPORT'' mode with CONSULT-II.

- ''EGR SYSTEM P0400''
- ''EGR SYSTEM P1402''

Suggested upshift speeds

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

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

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

NCEC0031S04

The following is the information specified in Mode 6 of ISO15031-5.
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 (6 test items).
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

X: Applicable —: Not applicable

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
CATALYST	Three way catalyst function	01H	01H	Max.	X
		02H	81H	Min.	X
O2 SENSOR	Front heated oxygen sensor	09H	04H	Max.	X
		0AH	84H	Min.	X
		0BH	04H	Max.	X
		0CH	04H	Max.	X
		0DH	04H	Max.	X
	Rear heated oxygen sensor	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X
O2 SENSOR HEATER	Front heated oxygen sensor heater	29H	08H	Max.	X
		2AH	88H	Min.	X
	Rear heated oxygen sensor heater	2DH	0AH	Max.	X
		2EH	8AH	Min.	X
EGR SYSTEM	EGR function	31H	8CH	Min.	X
		32H	8CH	Min.	X
		33H	8CH	Min.	X
		34H	8CH	Min.	X
		35H	0CH	Max.	X

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

NCEC0031S05

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*4		SRT code	Test value/ Test limit (GST only)	1st trip DTC*4	Reference page
	CONSULT-II GST*2	ECM*1				
NO SELF DIAGNOSTIC FAILURE INDICATED	**P0000**	**0000**	—	—	—	—
MAF SEN/CIRCUIT	P0100	0100	—	—	X	EC-QG-115
AIR TEMP SEN/CIRC	P0110	0110	—	—	X	EC-QG-121
COOLANT T SEN/CIRC	P0115	0115	—	—	X	EC-QG-125
THRTL POS SEN/CIRC	P0120	0120	—	—	X	EC-QG-130
FRONT O2 SENSOR-B1	P0130	0130	X	X	X*3	EC-QG-138
FRONT O2 SENSOR-B1*5	P0131	0131	X	X	X*3	EC-QG-144
FRONT O2 SENSOR-B1*5	P0132	0132	X	X	X*3	EC-QG-150
FRONT O2 SENSOR-B1*5	P0133	0133	X	X	X*3	EC-QG-156
FRONT O2 SENSOR-B1*5	P0134	0134	X	X	X*3	EC-QG-164
FR O2 SE HEATER-B1*5	P0135	0135	X	X	X*3	EC-QG-169

Items (CONSULT-II screen terms)	DTC*4		SRT code	Test value/ Test limit (GST only)	1st trip DTC*4	Reference page
	CONSULT-II GST*2	ECM*1				
REAR O2 SENSOR-B1*5	P0137	0137	X	X	X*3	EC-QG-174
REAR O2 SENSOR-B1*5	P0138	0138	X	X	X*3	EC-QG-182
REAR O2 SENSOR-B1*5	P0139	0139	X	X	X*3	EC-QG-190
REAR O2 SENSOR-B1*5	P0140	0140	X	X	X*3	EC-QG-198
RR O2 SE HEATER-B1*5	P0141	0141	X	X	X*3	EC-QG-204
FUEL SYS LEAN/BK1*5	P0171	0171	—	—	X	EC-QG-209
FUEL SYS RICH/BK1*5	P0172	0172	—	—	X	EC-QG-215
FUEL TEMP SEN/CIRC*5	P0180	0180	—	—	X	EC-QG-221
MULTI CYL MISFIRE*5	P0300	0300	—	—	X	EC-QG-225
CYL 1 MISFIRE*5	P0301	0301	—	—	X	EC-QG-225
CYL 2 MISFIRE*5	P0302	0302	—	—	X	EC-QG-225
CYL 3 MISFIRE*5	P0303	0303	—	—	X	EC-QG-225
CYL 4 MISFIRE*5	P0304	0304	—	—	X	EC-QG-225
KNOCK SEN/CIRC-B1	P0325	0325	—	—	—	EC-QG-231
CPS/CIRCUIT (POS)*5	P0335	0335	—	—	X	EC-QG-235
CAM POS SEN/CIRC	P0340	0340	—	—	X	EC-QG-241
EGR SYSTEM*5	P0400	0400	X	X	X*3	EC-QG-247
EGR VOL CON/V CIR*5	P0403	0403	—	—	X	EC-QG-255
TW CATALYST SYS-B1*5	P0420	0420	X	X	X*3	EC-QG-260
PURG VOLUME CONT/V*5	P0443	0443	—	—	X	EC-QG-264
VEH SPEED SEN/CIRC	P0500	0500	—	—	X	EC-QG-269
IACV/AAC VLV/CIRC*5	P0505	0505	—	—	X	EC-QG-273
CLOSED TP SW/CIRC*5	P0510	0510	—	—	X	EC-QG-278
ECM	P0605	0605	—	—	X	EC-QG-284
INT/V TIM V/CIR-B1*5	P1111	1111	—	—	X	EC-QG-285
SWIRL CONT SOL/V	P1131	1131	—	—	X	EC-QG-290
ENG OVER TEMP	P1217	1217	—	—	X	EC-QG-296
EGR TEMP SEN/CIRC*5	P1401	1401	—	—	X	EC-QG-307
EGR SYSTEM*5	P1402	1402	X	X	X*3	EC-QG-312
P-N POS SW/CIRCUIT*5	P1706	1706	—	—	X	EC-QG-320

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by ISO15031-6.
*3: These are not displayed with GST.
*4: 1st trip DTC No. is the same as DTC No.
*5: Not available for ''Eastern Europe model''.

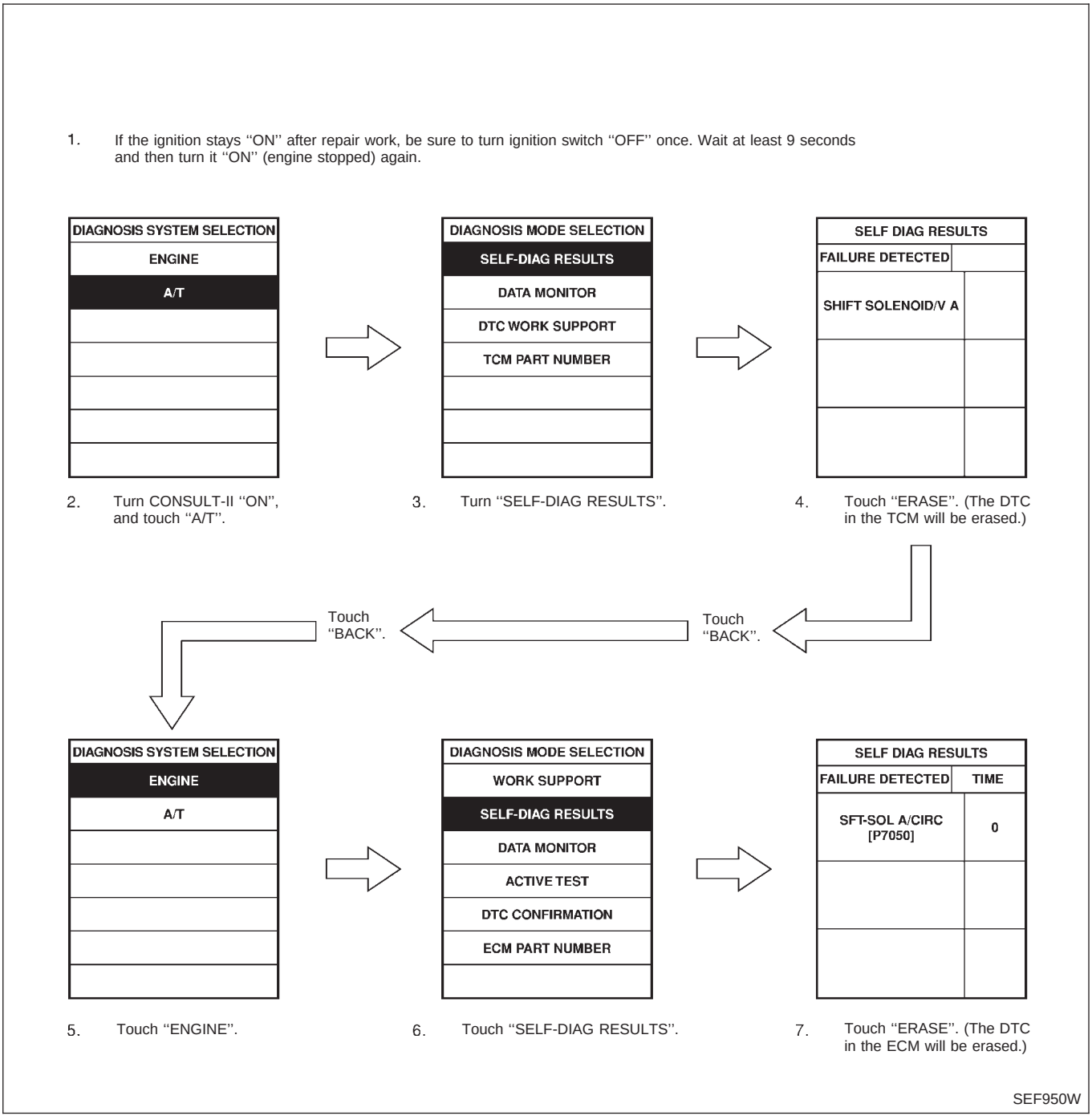
HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

NCEC0031S06

How to Erase DTC (With CONSULT-II)

NCEC0031S0601

1. If the ignition switch stays ''ON'' after repair work, be sure to turn ignition switch ''OFF'' once. Wait at least 9 seconds and then turn it ''ON'' (engine stopped) again.
2. Touch ''ENGINE''.
3. Touch ''SELF-DIAG RESULTS''.
4. Touch ''ERASE''. (The DTC in the ECM will be erased.)



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)

NCEC0031S0602

1. If the ignition switch stays ''ON'' after repair work, be sure to turn ignition switch ''OFF'' once. Wait at least 9 seconds and then turn it ''ON'' (engine stopped) again.

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

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

How to Erase DTC (No Tools)

NCEC0031S0603

1. If the ignition switch stays ''ON'' after repair work, be sure to turn ignition switch ''OFF'' once. Wait at least 9 seconds and then turn it ''ON'' again.
2. Change the diagnostic test mode from Mode II to Mode I by using the data link connector. (See EC-QG-57.)

The emission-related diagnostic information can be erased by changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by using the data link connector. (Refer to EC-QG-57.)

NOTE:

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

1) Diagnostic trouble codes
2) 1st trip diagnostic trouble codes
3) Freeze frame data
4) 1st trip freeze frame data
5) System readiness test (SRT) codes
6) Test values
7) Distance traveled while MI is activated
8) Others

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

Malfunction Indicator (MI)

NATS (Nissan Anti-Theft System)

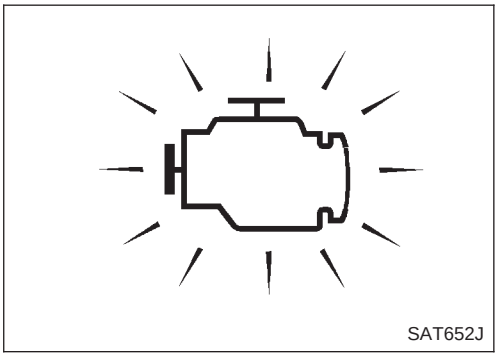
SELF DIAG RESULTS	
DTC RESULTS	TIME
NATS MALFUNCTION [P1610]	0

SEF543X

- **If the security indicator lights up with the ignition switch in the ''ON'' position or ''NATS MALFUNCTION'' is displayed on ''SELF-DIAG RESULTS'' screen, preform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to ''NATS (Nissan Anti-Theft System)'' in in EL section.**
- **Confirm no self-fiagnostic 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.

DESCRIPTION

NCEC0032



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-QG-353.
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

=NCEC0032S01

The on board diagnostic system has the following four functions.

Diagnostic Test Mode I

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

Diagnostic Test Mode II

3. SELF-DIAGNOSTIC RESULTS:
   This function allows DTCs and 1st trip DTCs to be read.
4. FRONT HEATED OXYGEN SENSOR MONITOR:
   This function allows the fuel mixture condition (lean or rich), monitored by front heated oxygen sensor, to be read.

MI Flashing without DTC

NCEC0032S0101

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM test mode selector following ''HOW TO SWITCH DIAGNOSTIC TEST MODES''.
How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-QG-57.)

Malfunction Indicator (MI) (Cont'd)

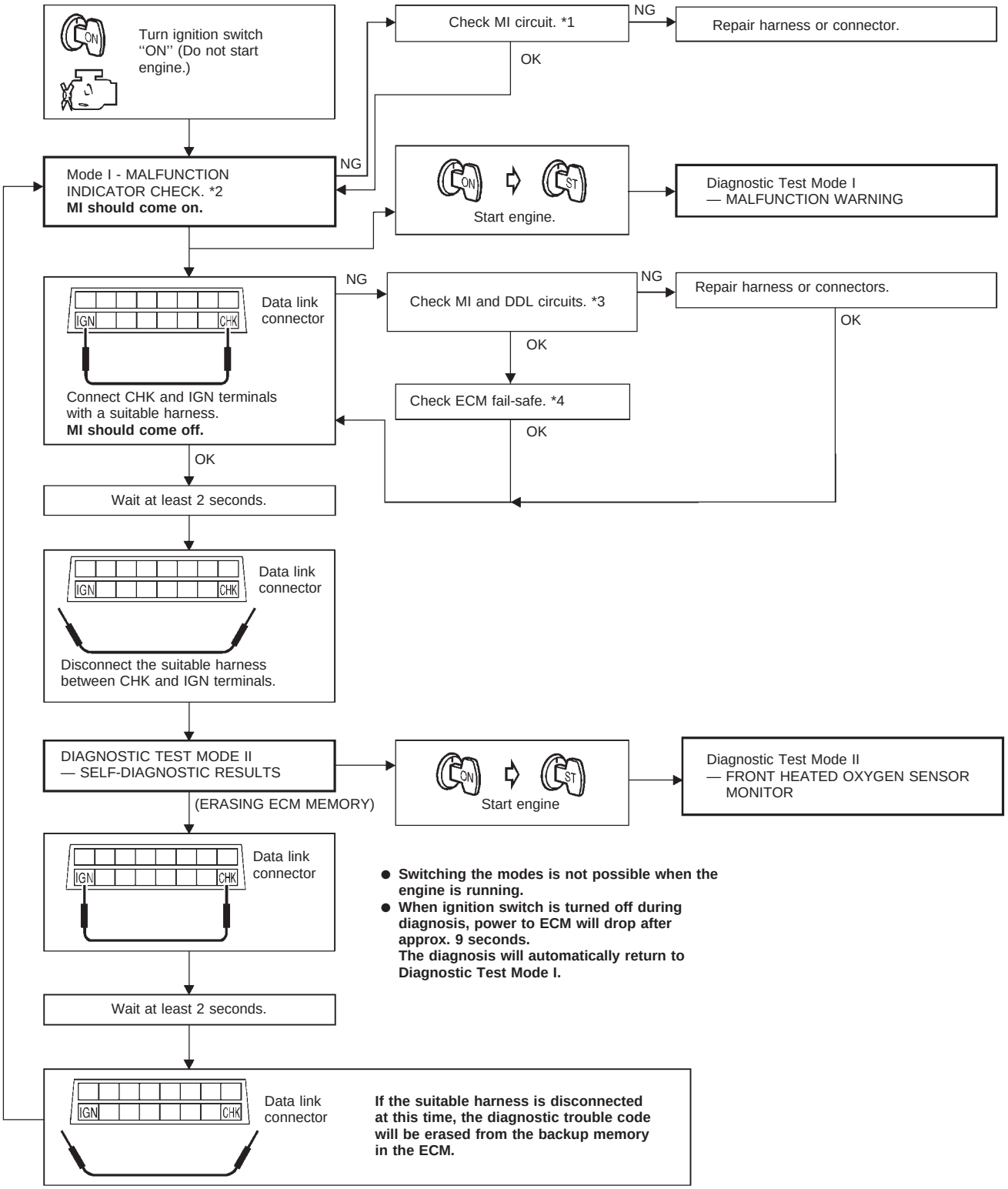
Condition		Diagnostic Test Mode I	Diagnostic Test Mode II
Ignition switch in "ON" position 	Engine stopped 	BULB CHECK	SELF-DIAGNOSTIC RESULTS
	Engine running 	MALFUNCTION WARNING	FRONT HEATED OXYGEN SENSOR MONITOR

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

1) Diagnostic trouble codes
2) 1st trip diagnostic trouble codes
3) Freeze frame data
4) 1st trip freeze frame data
5) System readiness test (SRT) codes
6) Test values
7) Distance traveled while MI is activated
8) Others

How to Switch Diagnostic Test Modes

NCEC0032S02



SEF951W

*1: EC-QG-353
*2: EC-QG-55
*3: EC-QG-353
*4: EC-QG-91

Diagnostic Test Mode I — Bulb Check

NCEC0032S03

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the MI bulb. Refer to EL section (''WARNING LAMPS'') or see EC-QG-353.

Diagnostic Test Mode I — Malfunction Warning

NCEC0032S04

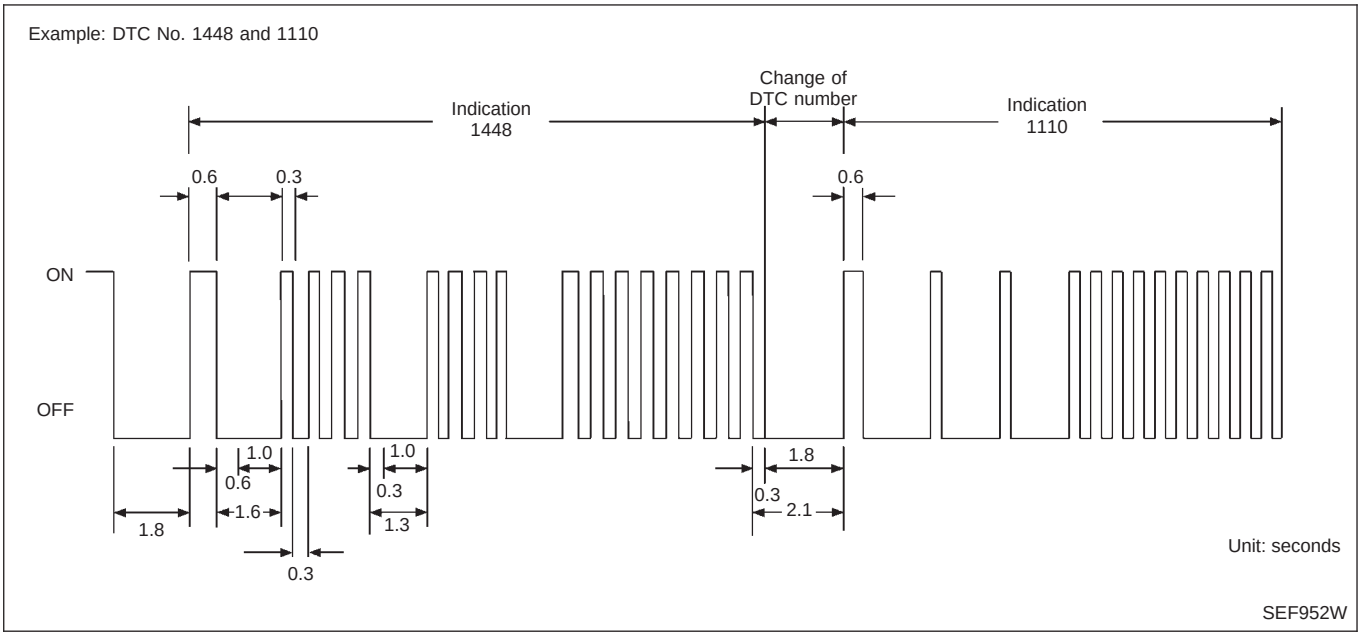
MI	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

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

Diagnostic Test Mode II — Self-diagnostic Results

NCEC0032S05

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



A particular trouble code can be identified by the number of four-digit numeral flashes. The ''zero'' is indicated by the number of ten flashes. The length of time the 1000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second)-OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0 second OFF. In other words, the latter numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8 second off.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC ''0000'' refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-QG-6.)

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

NCEC0032S0501

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''.)

- **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 — Front Heated Oxygen Sensor Monitor

NCEC0032S06

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

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 front heated oxygen sensor 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

NCEC0033

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

NCEC0033S01

- 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-QG-45.
- 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

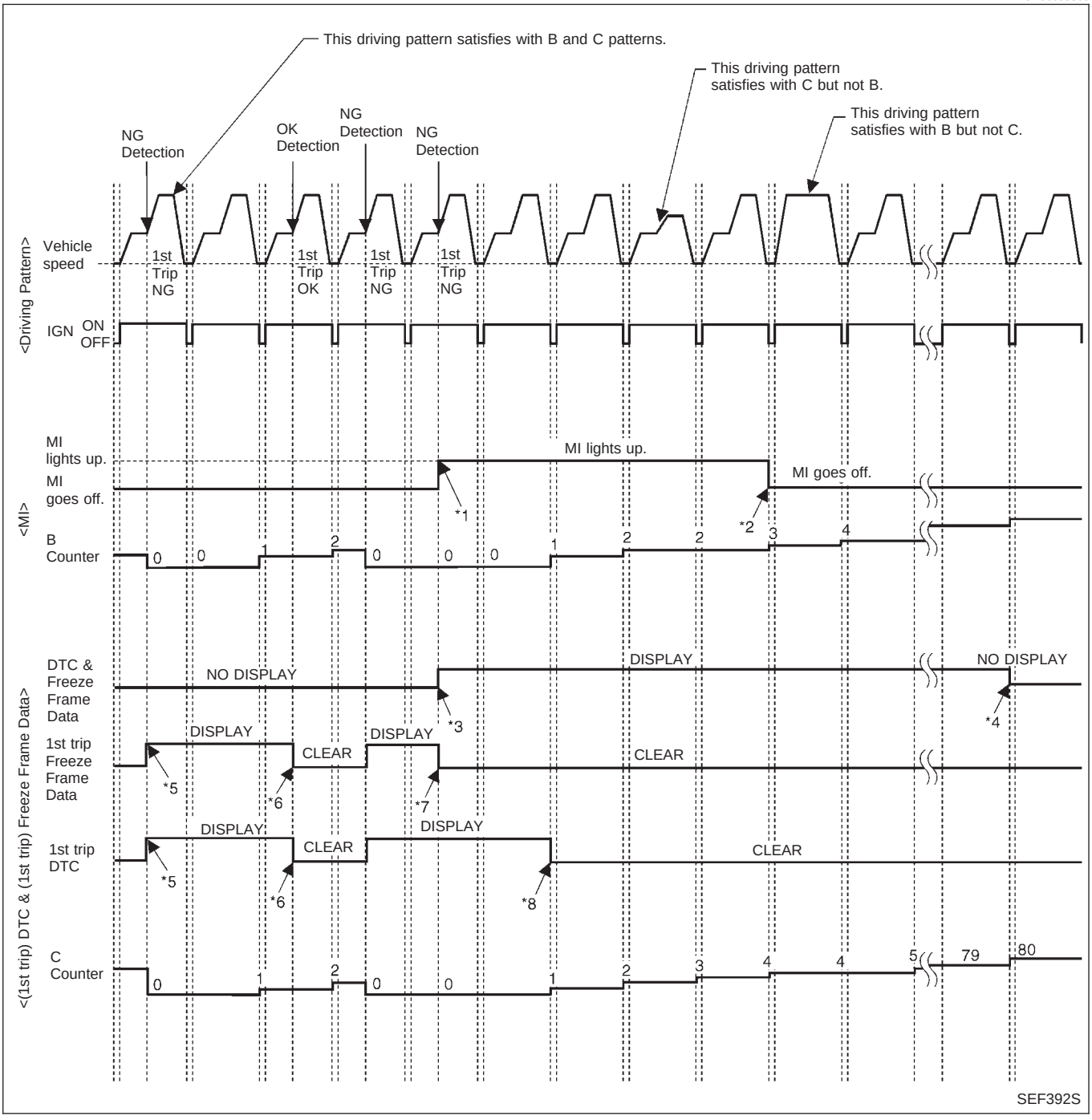
NCEC0033S02

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-QG-61.
For details about patterns ''A'' and ''B'' under ''Except'', see EC-QG-63.
*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''

NCEC0033S03



*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''

NCEC0033S04

Driving Pattern B

NCEC0033S0401

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

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MI will go off when the B counter reaches 3. (*2 in EC-QG-60)

Driving Pattern C

NCEC0033S0402

Driving pattern C means the vehicle operation as follows:

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

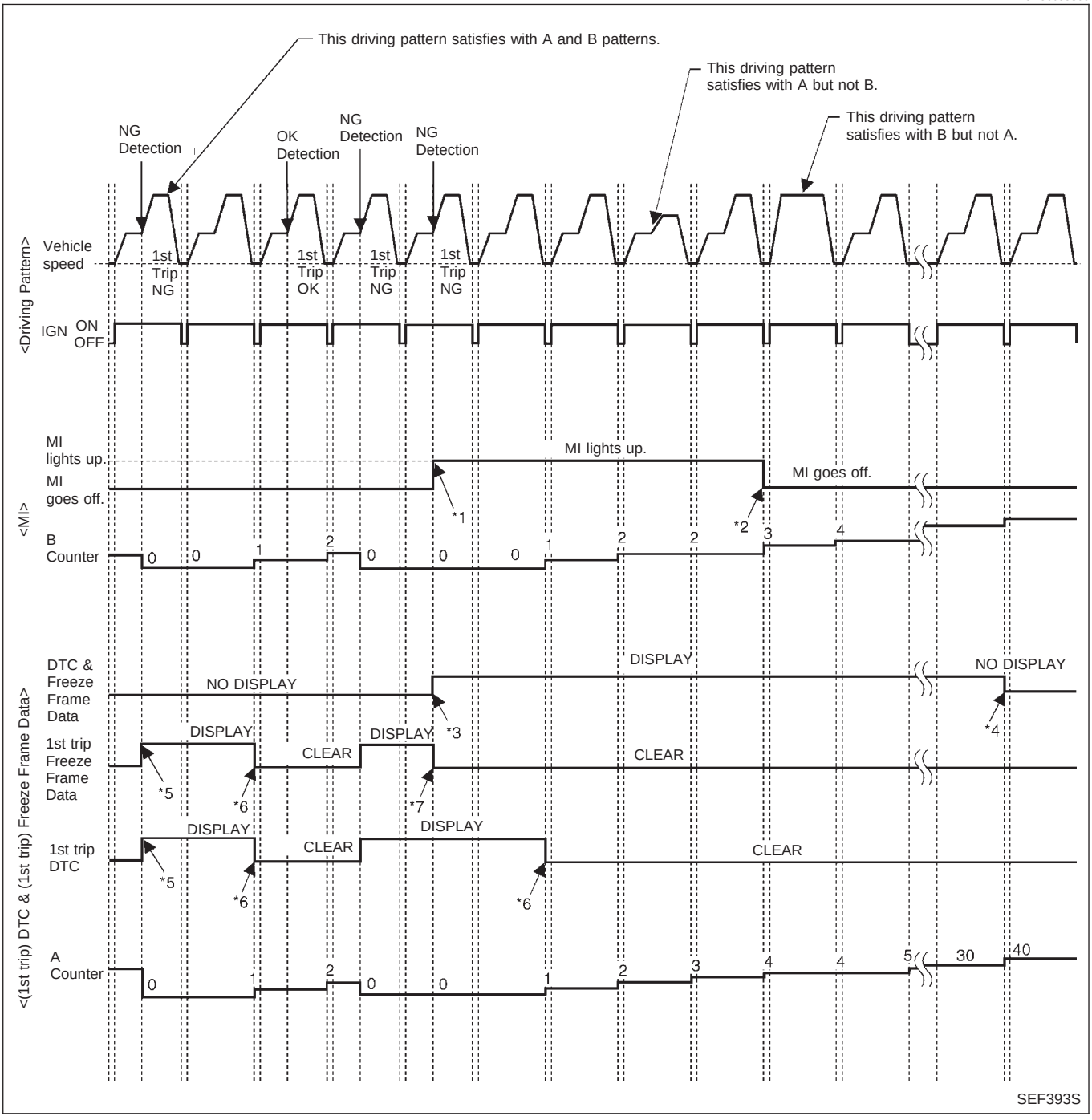
- When the freeze frame data shows lower than 70°C (158°F), ''T'' should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), ''T'' should be higher than or equal to 70°C (158°F).

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

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

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

NCEC0033S05



*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.

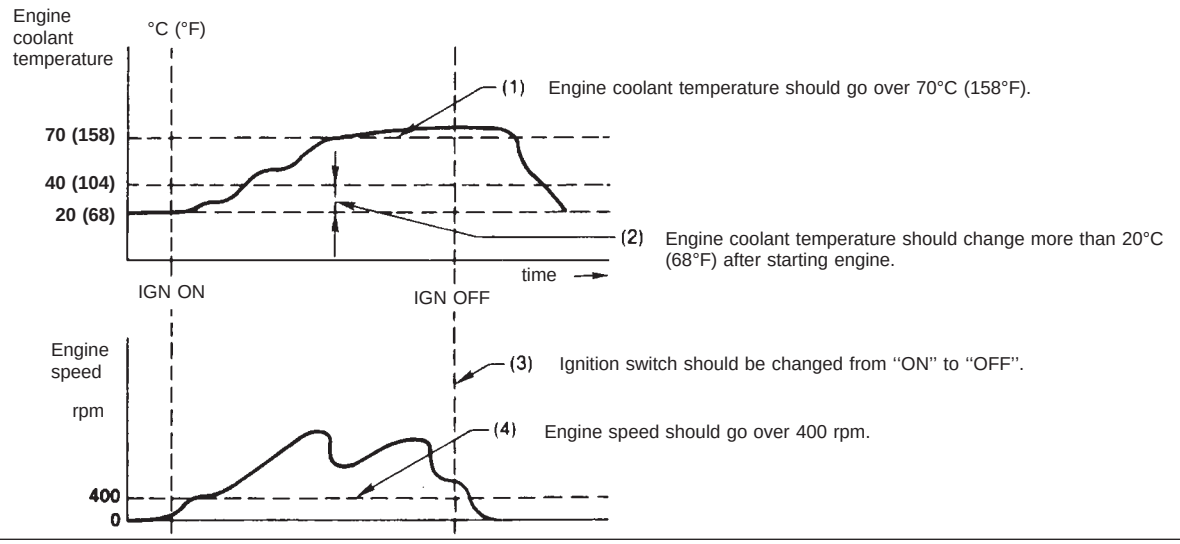
*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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

NCEC0033S06

Driving Pattern A

NCEC0033S0601



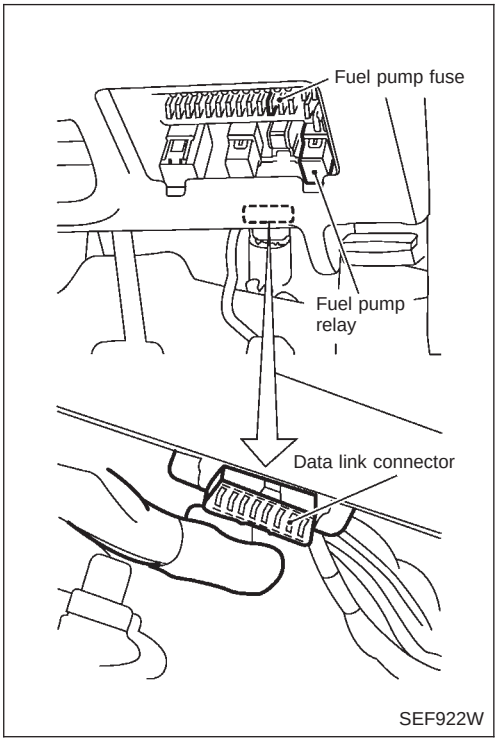
- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

Driving Pattern B

NCEC0033S0602

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

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MI will go off when the B counter reaches 3 (*2 in EC-QG-62).



SEF922W

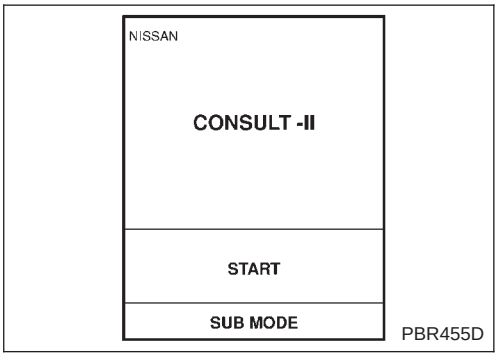
CONSULT-II

=NCEC0034

CONSULT-II INSPECTION PROCEDURE

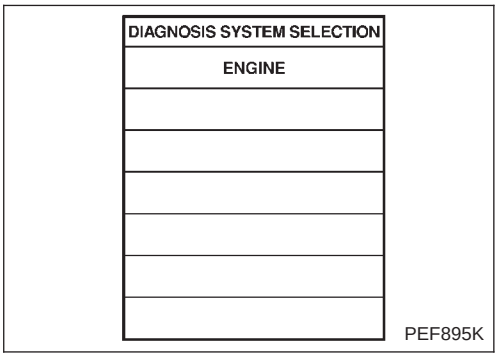
NCEC0034S01

1. Turn ignition switch OFF.
2. Connect ‘‘CONSULT-II’’ to data link connector. (Data link connector is located behind the fuse box cover.)



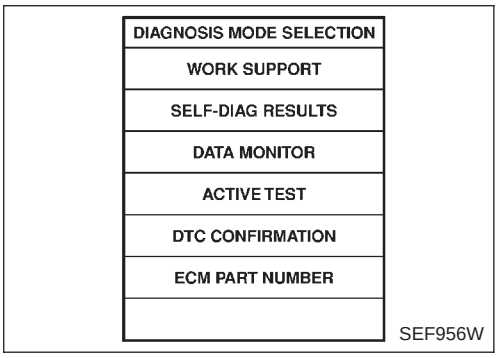
PBR455D

3. Turn ignition switch ON.
4. Touch ‘‘START’’.



PEF895K

5. Touch ‘‘ENGINE’’.



SEF956W

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

This sample shows the display when using the DEE990 program card. Screen differs in accordance with the program card used.

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

NCEC0034S02

Item			DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	ACTIVE TEST	DTC CONFIRMATION		
				DTC*1	FREEZE FRAME DATA*2			SRT STATUS	SRT WORK SUPPORT	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Camshaft position (PHASE) sensor		X	X	X				
		Mass air flow sensor		X		X				
		Engine coolant temperature sensor		X	X	X	X			
		Front heated oxygen sensor		X		X		X	X	X
		Rear heated oxygen sensor		X		X		X	X	X
		Vehicle speed sensor		X	X	X				
		Throttle position sensor		X		X				
		Tank fuel temperature sensor		X		X	X			
		EGR temperature sensor		X		X				
		Intake air temperature sensor		X		X				
		Crankshaft position sensor (POS)		X	X	X				
		Knock sensor		X						
		Ignition switch (start signal)				X				
		Closed throttle position switch		X		X				
		Closed throttle position switch (throttle position sensor signal)				X				
		Air conditioner switch				X				
		Refrigerant pressure sensor				X				
		Park/Neutral position (PNP) switch		X		X				
		Power steering oil pressure switch				X				
		Electrical load				X				
		Battery voltage				X				

CONSULT-II (Cont'd)

Item			DIAGNOSTIC TEST MODE							
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	ACTIVE TEST	DTC CONFIRMATION		
				DTC*1	FREEZE FRAME DATA*2			SRT STATUS	SRT WORK SUPPORT	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				X	X			
		Power transistor (Ignition timing)		X (Ignition signal)		X	X			
		IACV-AAC valve	X	X		X	X			
		Intake valve timing control solenoid valve				X	X			
		EVAP canister purge volume control solenoid valve		X		X	X			
		Air conditioner relay				X				
		Fuel pump relay	X			X	X			
		EGR volume control valve		X		X	X	X	X	X
		Front heated oxygen sensor heater		X		X		X		
		Rear heated oxygen sensor heater		X		X		X		
		Cooling fan		X		X	X			
		Swirl control valve control solenoid valve		X		X	X			
		Calculated load value			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-QG-47.

FUNCTION

NCEC0034S03

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.
Active test	Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
DTC confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
ECM part number	ECM part numbers can be read.

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

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

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

WORK SUPPORT MODE

NCEC0034S04

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING ''START'' DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
TARGET IDLE RPM ADJ	● IDLE CONDITION	When setting target idle speed
TARGET IGNITION TIMING ADJ	● IDLE CONDITION	When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light.

SELF DIAGNOSTIC MODE

NCEC0034S05

DTC and 1st Trip DTC

NCEC0034S0501

Regarding items of ''DTC and 1st trip DTC'', refer to ''TROUBLE DIAGNOSIS — INDEX'', EC-QG-6.

Freeze Frame Data and 1st Trip Freeze Frame Data

NCEC0034S0502

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-QG-6).]
FUEL SYS DATA	● ''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 [%]	● ''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 [%]	● ''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.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.

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

CONSULT-II (Cont'd)

DATA MONITOR MODE

NCEC0034S06

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	○	○	● Indicates the engine speed computed from the POS signal of the crankshaft position sensor.	● Accuracy becomes poor if engine speed drops below the idle rpm. ● If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1 [V]	○	○	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
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.
FR O2 SEN-B1 [V]	○	○	● The signal voltage of the front heated oxygen sensor is displayed.	
RR O2 SEN-B1 [V]	○		● The signal voltage of the rear heated oxygen sensor is displayed.	
FR O2 MNTR-B1 [RICH/LEAN]	○		● Display of front heated oxygen sensor 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.
RR O2 MNTR-B1 [RICH/LEAN]	○		● Display of rear heated oxygen sensor 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.
SWRL CONT S/V [ON/OFF]			● The control condition of the swirl control valve control solenoid valve (determined by ECM according to the input signals) is indicated. ● ON ... Swirl control valve is closed. OFF ... Swirl control valve is opened.	
VHCL SPEED SE [km/h] or [mph]	○	○	● The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○		● The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	● The throttle position sensor signal voltage is displayed.	
FUEL T/TMP SE [°C] or [°F]			● The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed.	
EGR TEMP SEN [V]	○	○	● The signal voltage of the EGR temperature sensor 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.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
START SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL/P SW [ON/OFF]			● Indicates mechanical contact [ON/OFF] condition of the closed throttle position switch.	
CLSD THL POS [ON/OFF]	○	○	● Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal.	
AIR COND SIG [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioning signal.	
P/N POSI SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the PNP switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure switch signal.	
LOAD SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the electrical load signal and/or lighting switch. ON ... rear defogger is operating and/or lighting switch is on. OFF ... rear defogger is not operating and lighting switch is not on.	
IGNITION SW [ON/OFF]	○		● Indicates [ON/OFF] condition from ignition switch.	
HEATER FAN SW [ON/OFF]	○		● Indicates [ON/OFF] condition from the heater fan switch.	
INJ PULSE-B1 [msec]		○	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
B/FUEL SCHDL [msec]			● ''Base fuel schedule'' indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
IGN TIMING [BTDC]		○	● Indicates the ignition timing computed by ECM according to the input signals.	
IACV-AAC/V [step]		○	● Indicates the IACV-AAC valve control value computed by ECM according to the input signals.	
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.
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.	

CONSULT-II (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
INT/V SOL-B1 [ON/OFF]			● The control condition of the valve timing solenoid valve (determined by ECM according to the input signal) is indicated. ON ... Intake valve timing control operating OFF ... Intake valve timing control not operating	
COOLING FAN [ON/OFF]		○	● Indicates the control condition of the cooling fan determined by ECM according to the input signals. HI ... High speed operation LOW ... Low speed operation OFF ... Stop	
EGR VOL CON/V [step]		○	● Indicates the EGR volume control valve computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
FR O2 HTR-B1 [ON/OFF]			● Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals.	
RR O2 HTR-B1 [ON/OFF]			● Indicates [ON/OFF] condition of rear heated oxygen sensor heater determined by ECM according to the input signals.	
PURG VOL C/V [%]			● Indicates the EVAP canister purge volume control solenoid valve computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
CAL/LD VALUE [%]			● ''Calculated load value'' indicates the value of the current air flow divided by peak air flow.	
ABSOL TH.P/S [%]			● ''Absolute throttle position sensor'' indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor.	
MASS AIRFLOW [gm/s]			● Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
TRVL AFTER MIL [km] or [Mile]			● Distance travelled while MI is activated	
VOLTAGE [V]			● Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			● Pulse width, frequency or duty cycle measured by the pulse probe.	● Only ''#'' is displayed if item is unable to be measured. ● Figures with ''#''s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
IDL A/V LEAN			● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully. INCMP ... Idle air volume learning has not been performed successfully.	

NOTE:

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

ACTIVE TEST MODE

NCEC0034S07

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 ● Front heated oxygen sensor
IACV-AAC/V OPENING	● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening steps using CONSULT-II.	Engine speed changes according to the opening steps.	● Harness and connector ● IACV-AAC valve
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
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.	● ''Base Idle Air Volume Initializing'' (Refer to EC-QG-43.) ● Camshaft position sensor (PHASE) ● Crankshaft position sensor (POS) ● Engine component parts and installing conditions
POWER BALANCE	● Engine: After warming up, idle the engine. ● Air conditioner switch ''OFF'' ● Shift lever ''N'' ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: ON ● Turn the cooling fan ''ON'' and ''OFF'' using CONSULT-II.	Cooling fan moves and stops.	● Harness and connector ● Cooling fan motor
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay ''ON'' and ''OFF'' using CONSULT-II and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connector ● Fuel pump relay
EGR VOL CONT/V	● Engine: After warming up, idle the engine. ● Change the EGR volume control valve opening step using CONSULT-II.	Engine speed changes according to the opening step.	● Harness and connector ● EGR volume control valve
SWIRL CONT SOL VALVE	● Ignition switch: ON ● Turn solenoid valve ''ON'' and ''OFF'' with CONSULT-II and listen for operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
VALVE TIMING SOL	● Ignition switch: ON ● Turn intake valve timing control solenoid valve ''ON'' and ''OFF'' using CONSULT-II and listen for operating sound.	Intake valve timing control solenoid valve makes an operating sound.	● Harness and connector ● Intake valve timing control solenoid valve
SELF-LEARNING CONT	● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching ''CLEAR'' on the screen.		
FUEL/T TEMP SEN	● Change the tank fuel temperature using CONSULT-II.		

CONSULT-II (Cont'd)

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
PURG VOL CONT/V	● Engine: After warming up, idle the engine. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connector ● EVAP canister purge volume control solenoid valve
IDLE AIR VOL LEARN	● In this test, the idle air volume that keeps the engine within the specified range is memorised in ECM.		

DTC CONFIRMATION MODE

NCEC0034S08

SRT STATUS Mode

NCEC0034S0801

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

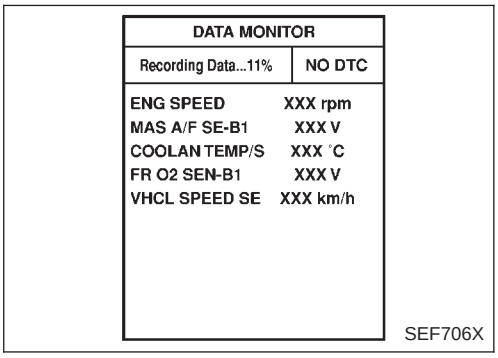
SRT Work Support Mode

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

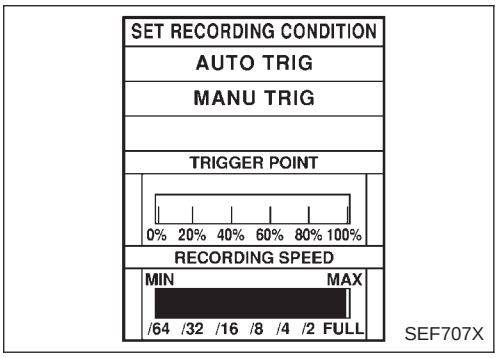
DTC Work Support Mode

NCEC0034S0802

TEST MODE	TEST ITEM	CONDITION	REFERENCE PAGE
FR O2 SENSOR	FR O2 SEN-B1 P0130	Refer to corresponding trouble diagnosis for DTC.	EC-QG-157
	FR O2 SEN-B1 P0131		EC-QG-144
	FR O2 SEN-B1 P0132		EC-QG-150
	FR O2 SEN-B1 P0133		EC-QG-156
RR O2 SENSOR	RR O2 SEN-B1 P0137		EC-QG-174
	RR O2 SEN-B1 P0138		EC-QG-182
	RR O2 SEN-B1 P0139		EC-QG-190
EGR SYSTEM	EGR SYSTEM P0400		EC-QG-247
	EGR SYSTEM P1402		EC-QG-312



SEF706X



SEF707X

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

NCEC0034S10

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

1) ''AUTO TRIG'' (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, ''MONITOR'' in ''DATA MONITOR'' screen is changed to ''Recording Data...xx%'' as shown at left, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, ''REAL-TIME DIAG'' screen is displayed. If 'STOP'' is touched on the screen during ''Recording Data ... xx%, ''REAL-TIME DIAG'' screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by ''TRIGGER POINT'' and ''Recording Speed''. Refer to CONSULT-II OPERATION MANUAL.

2) ''MANU TRIG'' (Manual trigger):

- DTC/1st trip DTC and malfunction item will not be displayed

automatically on CONSULT-II screen even though a malfunction is detected by ECM.
DATA MONITOR can be performed continuously even though a malfunction is detected.

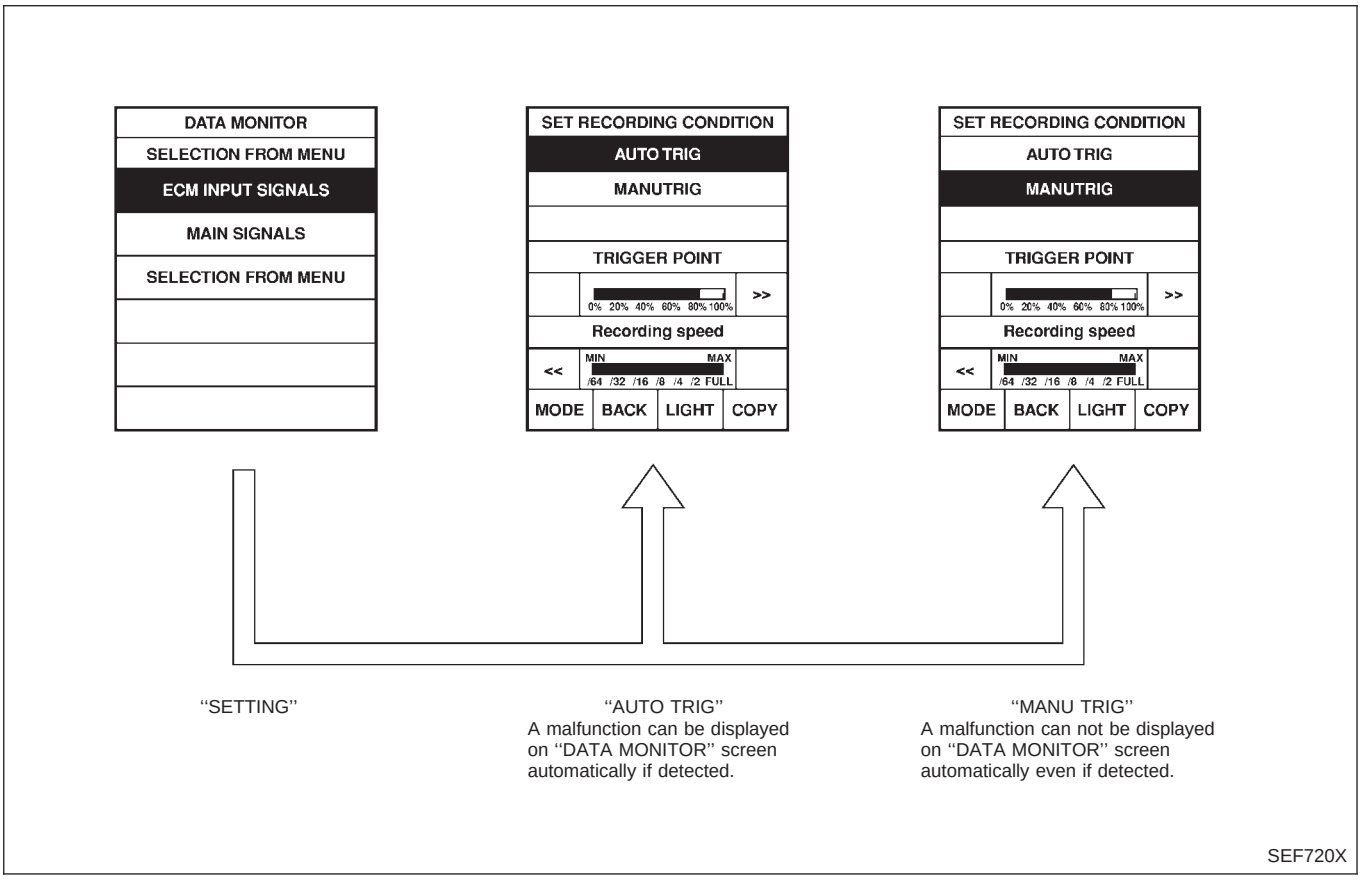
Use these triggers as follows:

1) ''AUTO TRIG''

- While trying to detect the DTC/1st trip DTC by performing the ''DTC Confirmation Procedure'', be sure to select ''DATA MONITOR (AUTO TRIG)'' mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in ''DATA MONITOR (AUTO TRIG)'' mode, especially in case the incident is intermittent.
  When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the ''DTC Confirmation Procedure'', the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI section, ''Incident Simulation Tests'' in ''HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT''.)

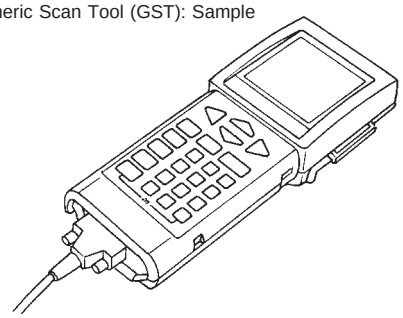
2) ''MANU TRIG''

- 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.



SEF720X

Generic Scan Tool (GST): Sample



SEF139P

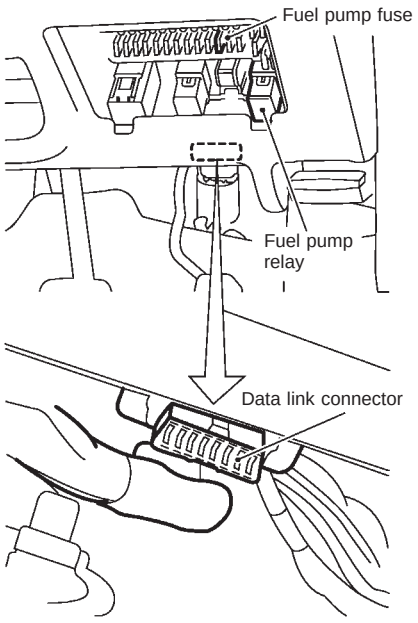
Generic Scan Tool (GST)

=NCEC0035

DESCRIPTION

NCEC0035S01

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

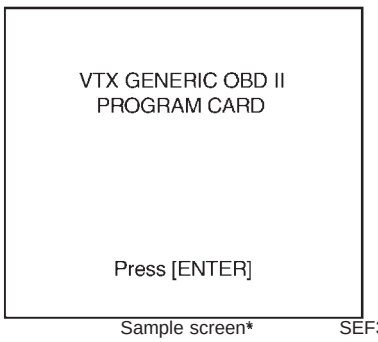


SEF922W

GST INSPECTION PROCEDURE

NCEC0035S02

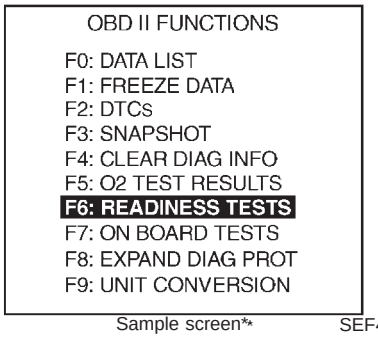
1. Turn ignition switch OFF.
2. Connect ‘‘GST’’ to data link connector. (Data link connector is located under the fuse box cover.)



Sample screen* SEF398S

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.)



Sample screen** SEF416S

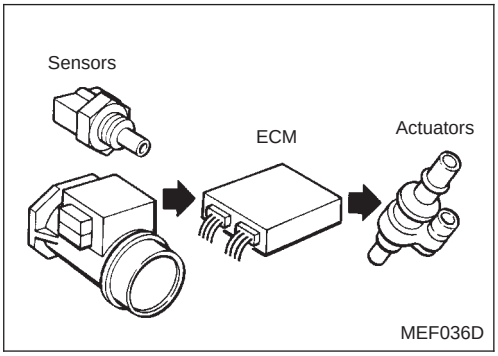
5. Perform each diagnostic mode according to each service procedure.

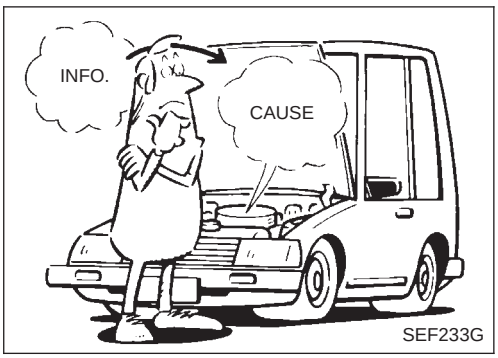
For further information, see the GST Operation Manual of the tool maker.

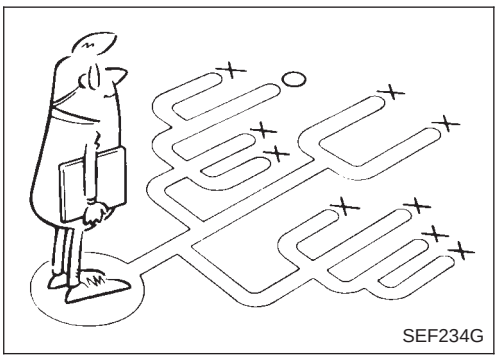
FUNCTION

NCEC0035S03

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, distance traveled while MI is activated and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to ''Freeze Frame Data'' (EC-QG-67).]
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode is not applicable on this vehicle.
MODE 9	(CALIBRATION ID)	This mode enables the off-board (External test equipment) to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.







KEY POINTS

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

SEF907L

Introduction

NCEC0036

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-QG-78.

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

NCEC0036S01

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 to come on steady or blink and DTC to be detected.

Example:

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

Worksheet Sample

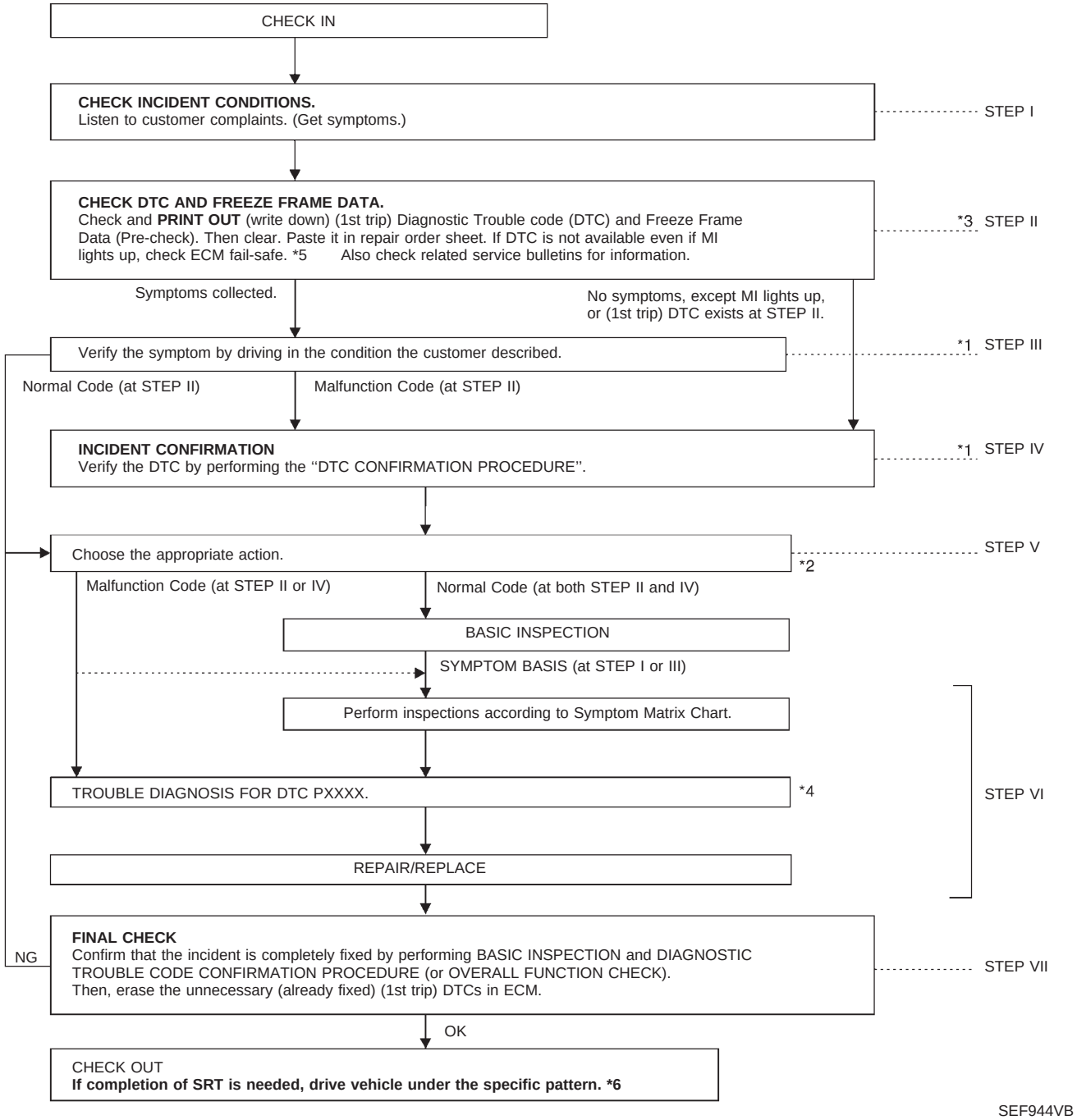
NCEC0036S0101

Customer name MR/MS	Model & Year	VIN
Engine #	Trans.	Mileage
Incident Date	Manuf. Date	In Service Date
Fuel	☐ Vehicle ran out of fuel causing misfire	
Symptoms — ☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
Symptoms — ☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
Symptoms — ☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake back fire ☐ 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 20 40 60 80 100 120 Km/h	
Malfunction indicator	☐ Turned on ☐ Not turned on	

MTBL0311

Work Flow

NCEC0037



SEF944VB

*1: If the incident cannot be duplicated, refer to ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.

*2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to ''TROUBLE DIAGNOSIS FOR POWER SUPPLY'', EC-QG-109.

*3: If time data of ''SELF-DIAG RESULTS'' is other than ''0'' or ''1t'' refer to ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.

*4: If the malfunctioning part cannot be found, refer to ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.

*5: EC-QG-91

*6: EC-QG-49

DESCRIPTION FOR WORK FLOW

NCEC0037S01

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the ''DIAGNOSTIC WORK SHEET'', EC-QG-77.
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-QG-53.) 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-QG-92.) 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-QG-80.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-QG-92.)
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-QG-101. The ''DIAGNOSTIC PROCEDURE'' in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section (''HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT'', ''Circuit Inspection''). Repair or replace the malfunction parts.
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 0000] 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-QG-53.)

Basic Inspection

NCEC0038

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,

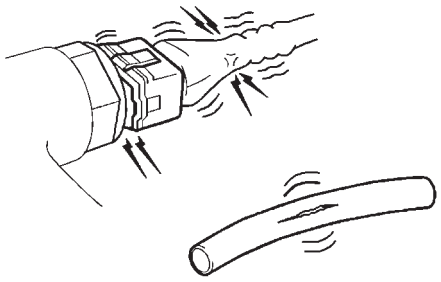
On vehicle equipped with daytime running light systems, set lighting switch to the 1st position to light only small lamps.

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

1	INSPECTION START

1. Check service records for any recent repairs that may indicate a related problem, or 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



SEF983U

Models with CONSULT-II	▶	GO TO 2.
Models with GST	▶	GO TO 2.
Models with No Tools	▶	GO TO 13.

2	CONNECT CONSULT-II OR GST TO THE VEHICLE

With CONSULT-II

Connect ‘‘CONSULT-II’’ to the data link connector and select ‘‘ENGINE’’ from the menu. Refer to EC-QG-64.

With GST

Connect ‘‘GST’’ to the data link connector. Refer to EC-QG-74.

Models with CONSULT-II	▶	GO TO 3.
Models with GST	▶	GO TO 13.

3	CHECK IGNITION TIMING

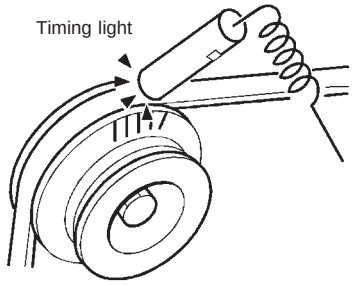
With CONSULT-II

1. Warm up engine to normal operating temperature.
2. Select "IGNITION TIMING ADJ" in "WORK SUPPORT" mode and 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

3. Check ignition timing at idle using a timing light.



SEF984U

Ignition timing: 8°±2° BTDC

Only check ignition timing as the timing is not adjustable.

▶	GO TO 4.

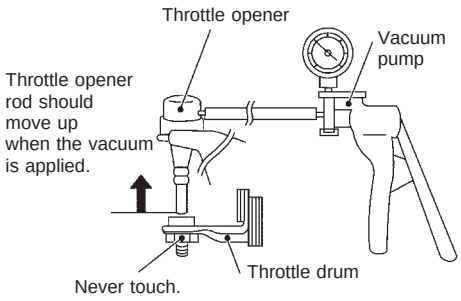
4	CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION-I

With CONSULT-II

NOTE:

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

1. Warm up engine to normal operating temperature.
2. Stop engine.
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to vacuum pump as shown below.



SEF793W

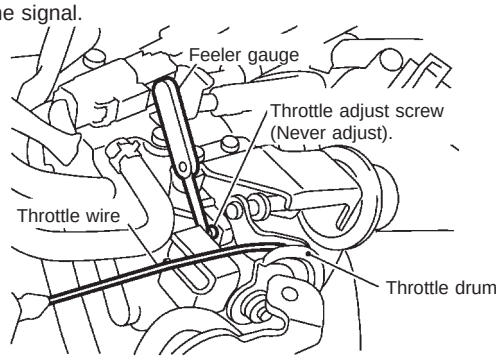
5. Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener. During adjustment procedure, vacuum should be applied.

▶	GO TO 5.

5	CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION-II

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

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



SEF073X

DATA MONITOR	
MONITORING	NO FAIL
CLSD THL/P SW	ON

PEF577W

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

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 6.

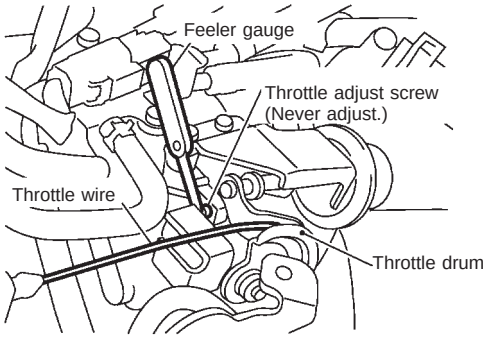
6	ADJUSTMENT CLOSED THROTTLE POSITION SWITCH IDLE POSITION-II

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 up engine to normal operating temperature.
2. Stop engine.
3. Loosen throttle position sensor fixing bolts.
4. Turn ignition switch "ON".
5. Select "CLSD THL/P SW" in "DATA MONITOR" mode.
6. Insert 0.05 mm (0.0020 in) feeler gauge between throttle adjust screw and throttle drum as shown in the figure.



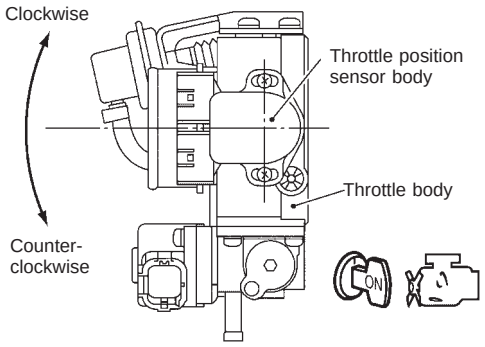
SEF073X

	▶	GO TO 7.

7	ADJUSTMENT CLOSED THROTTLE POSITION SWITCH IDLE POSITION-II

With CONSULT-II

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



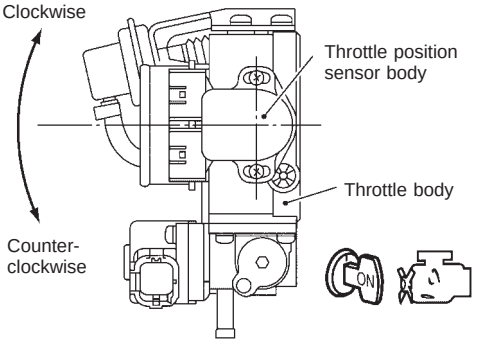
SEF964W

▶	GO TO 8.

8	ADJUSTMENT CLOSED THROTTLE POSITION SWITCH IDLE POSITION-III

With CONSULT-II

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



SEF964W

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

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 6.

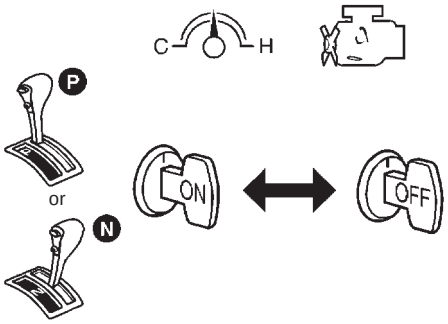
9	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

With CONSULT-II

NOTE:

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

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



SEF864V

7. Turn ignition switch "OFF" and wait at least 9 seconds.
8. Repeat steps 6 and 7 until "CLSD THL POS" signal changes to "ON".

DATA MONITOR	
MONITORING	NO FAIL
CLSD THL/P SW	ON

PEF123W

▶	GO TO 10.

10	REMOVE VACUUM PUMP

1. Release vacuum from the throttle opener.
2. Remove vacuum pump and vacuum hose from the throttle opener.
3. Reinstall the original vacuum hose to the throttle opener securely.

▶	GO TO 11.

11	IDLE AIR VOLUME LEARNING

With CONSULT-II

1. Perform "Idle Air Volume Learning". Refer to EC-QG-43.
2. Select "ENG SPEED" in "DATA MONITOR" mode.
3. Check idle speed and ignition timing.
   700±50 rpm
   8°±2° BTDC

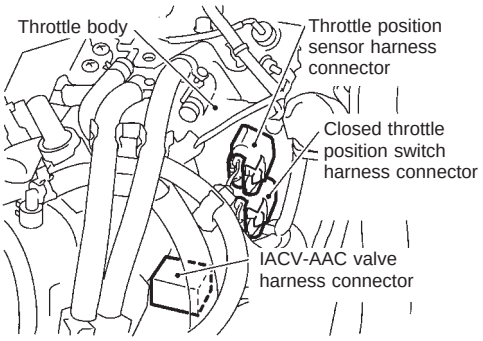
OK or NG

OK	▶	**INSPECTION END**
NG	▶	1. Perform "Idle Air Volume Learning" again. 2. If it checks out NG, perform INSPECTION PROCEDURE outlined under BASIC SERVICE PROCEDURE and eliminate the cause of the problem. Refer to EC-QG-35.

12	CHECK IGNITION TIMING

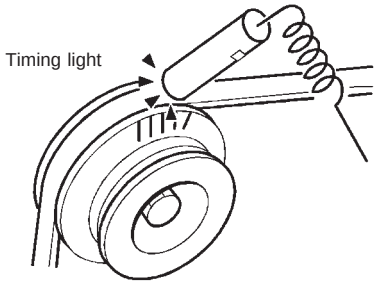
Without CONSULT-II

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



SEF938W

3. Start engine.
4. Check ignition timing at idle using a timing light.



SEF984U

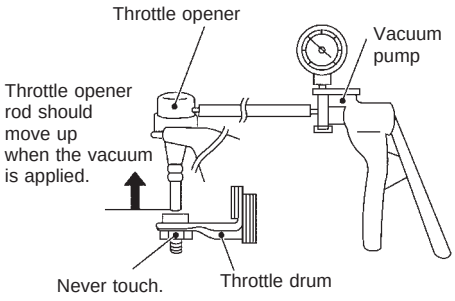
Ignition timing: 8°±2° BTDC

Only check ignition timing as the timing is not adjustable.

	▶	GO TO 13.

13	CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION

Without CONSULT-II
NOTE:
Always check ignition timing and idle speed before performing the following.
1. Warm up engine to normal operating temperature.
2. Stop engine.
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to vacuum pump as shown below.



SEF793W

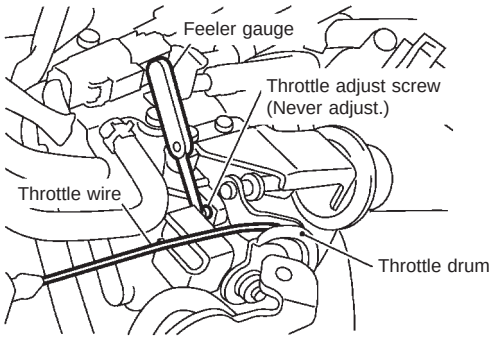
5. Apply vacuum [more than −40.0 kPa (−400 mbar, −300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener. During checking procedure, vacuum should be applied.

▶	GO TO 14.

14	CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION-I

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

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



SEF073X

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

OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 15.

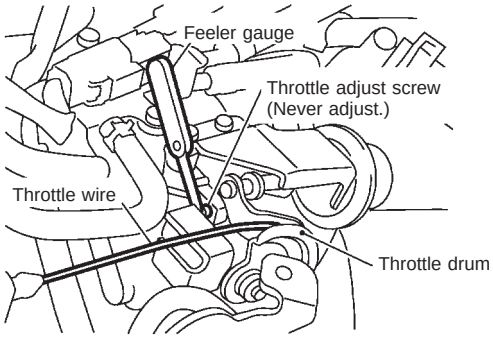
15	ADJUSTMENT CLOSED THROTTLE POSITION SWITCH IDLE POSITION-I

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 up engine to normal operating temperature.
2. Stop engine.
3. Loosen throttle position sensor fixing bolts.
4. Disconnect closed throttle position switch harness connector.
5. Insert 0.05 mm (0.0020 in) feeler gauge between the throttle adjust screw and throttle drum as shown in the figure.



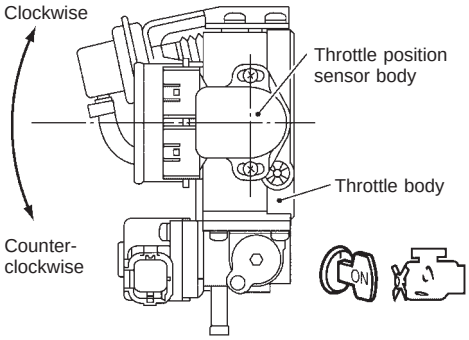
SEF073X

▶	GO TO 16.

16	ADJUSTMENT CLOSED THROTTLE POSITION SWITCH IDLE POSITION-II

Without CONSULT-II

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



SEF964W

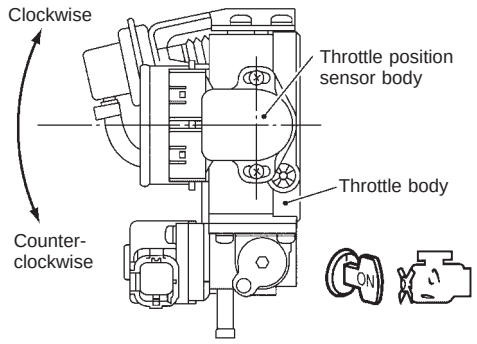
▶	GO TO 17.

17	ADJUSTMENT CLOSED THROTTLE POSITION SWITCH IDLE POSITION-III

Without CONSULT-II

1. Temporarily tighten sensor body fixing bolts as follows.

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



SEF964W

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

Continuity does not exist while closing the throttle valve.

OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 15.

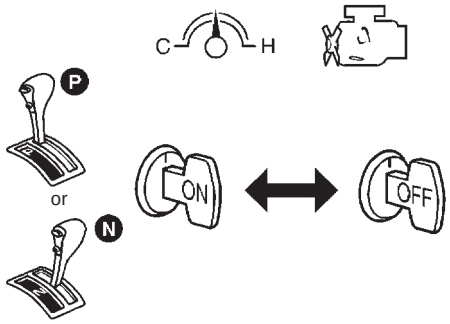
18	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

Without CONSULT-II

NOTE:

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

1. Remove feeler gauge.
2. Start engine.
3. Warm up engine to normal operating temperature.
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 9 seconds.
7. Repeat steps 5 and 6, 20 times.

	▶	GO TO 19.

19	REINSTALLATION
Without CONSULT-II 1. Release vacuum from the throttle opener. 2. Remove vacuum pump and vacuum hose from the throttle opener. 3. Reinstall the original vacuum hose to the throttle opener securely. 4. Reconnect throttle position sensor harness connector and closed throttle position switch harness connector. 5. Start engine and rev it (2,000 to 3,000 rpm) two or three times under no-load and then run engine at idle speed.	
▶	GO TO 20.

20	IDLE AIR VOLUME LEARNING
Without CONSULT-II 1. Perform ''Idle Air Volume Learning''. Refer to EC-QG-43. 2. Check idle speed and ignition timing. **700±50 rpm** **8°±2° BTDC** **OK or NG**	
OK ▶	GO TO 21.
NG ▶	1. Perform ''Idle Air Volume Learning'' again. 2. If it checks out NG, perform INSPECTION PROCEDURE outlined under BASIC SERVICE PROCEDURE and eliminate the cause of the problem. Refer to EC-QG-35.

21	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-QG-53.	
▶	**INSPECTION END**

DTC Inspection Priority Chart

NCEC0039

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

Priority	Detected items (DTC)
1	● P0100 Mass air flow sensor ● P0110 Intake air temperature sensor ● P0115 Engine coolant temperature sensor ● P0120 Throttle position sensor ● P0180 Tank fuel temperature sensor ● P0325 Knock sensor ● P0340 Camshaft position sensor (PHASE) circuit ● P0403 EGR volume control valve ● P0500 Vehicle speed sensor ● P0605 ECM ● P0335, P1336 Crankshaft position sensor (POS) ● P1706 Park/Neutral position switch
2	● P0130 - P0134 Front heated oxygen sensor ● P0135 Front heated oxygen sensor heater ● P0137 - P0140 Rear heated oxygen sensor ● P0141 Rear heated oxygen sensor heater ● P0443 EVAP canister purge volume control solenoid valve ● P0510 Closed throttle position switch ● P1217 Overheat (cooling system) ● P1401 EGR temperature sensor
3	● P0171, P0172 Fuel injection system function ● P0300 - P0304 Misfire ● P0400, P1402 EGR function ● P0420 Three way catalyst function ● P0505 IACV-AAC valve ● P1111 Intake valve timing control ● P1131 Swirl control valve control solenoid

Fail-safe Chart

=NCEC0040

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

DTC No.		Detected items	Engine operating condition in fail-safe mode
CONSULT-II GST	ECM*1		
P0100	0100	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.
P0115	0115	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the time after turning ignition switch ''ON'' or ''START''. CONSULT-II displays the engine coolant temperature decided by ECM. The radiator fan operates.
			Condition: Just as ignition switch is turned ON or Start — Engine coolant temperature decided (CONSULT-II display): 40°C (104°F)
			Condition: More than approx. 4 minutes after ignition ON or Start — Engine coolant temperature decided (CONSULT-II display): 80°C (176°F)
			Condition: Except as shown above — Engine coolant temperature decided (CONSULT-II display): 40 - 80°C (104 - 176°F) (Depends on the time)
P0120	0120	Throttle position sensor circuit	Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.
			Condition: When engine is idling — Driving condition: Normal
			Condition: When accelerating — Driving condition: Poor acceleration
Unable to access ECM	Unable to access Diagnostic Test Mode II	ECM	**ECM fail-safe activating condition** The computing function of the ECM was judged to be malfunctioning. When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MI on the instrument panel lights to warn the driver. However it is not possible to access ECM and DTC cannot be confirmed. **Engine control with fail-safe** When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation and IACV-AAC valve operation are controlled under certain limitations.
			ECM fail-safe operation: **Engine speed** — **Engine speed will not rise more than 3,000 rpm**
			ECM fail-safe operation: Fuel injection — Simultaneous multiport fuel injection system
			ECM fail-safe operation: Ignition timing — Ignition timing is fixed at the preset valve
			ECM fail-safe operation: Fuel pump — Fuel pump relay is ''ON'' when engine is running and ''OFF'' when engine stalls
			ECM fail-safe operation: IACV-AAC valve — Full open
			Replace ECM, if ECM fail-safe condition is confirmed.

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

Symptom Matrix Chart

SYSTEM — ENGINE CONTROL SYSTEM

NCEC0041

NCEC0041S01

		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-QG-340
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-QG-30
	Injector circuit	1	1	2	3	2		2	2			2			EC-QG-326
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-QG-25
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-QG-28
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-QG-32
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-QG-273
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-QG-32
	Ignition circuit	1	1	2	2	2		2	2			2			EC-QG-330
EGR	EGR volume control valve circuit		2	2	3	3						3			EC-QG-255
	EGR system	2	1	2	3	3	3	2	2	3		3			EC-QG-247, 255, 312
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-QG-109
Air conditioner circuit		2	2	3	3	3	3	3	3	3		3		2	HA section

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

(continued on next page)

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Crankshaft position sensor (POS) circuit	2	2												EC-QG-235
Camshaft position sensor (PHASE) circuit	3	2									3			EC-QG-241
Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-QG-115
Front heated oxygen sensor circuit		1	2	3	2		2	2			2			EC-QG-157, 144
Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-QG-125,
Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-QG-130
Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-QG-80
Vehicle speed sensor circuit		2	3		3						3			EC-QG-269
Knock sensor circuit			2								3			EC-QG-231
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-QG-284, 91
Start signal circuit	2													EC-QG-336
PNP switch circuit			3		3		3	3			3			EC-QG-320
Power steering oil pressure switch circuit		2					3	3						EC-QG-345
Electrical load signal circuit							3	3						EC-QG-350

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

Symptom Matrix Chart (Cont'd)

SYSTEM — ENGINE MECHANICAL & OTHER

NCEC0041S03

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

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

(continued on next page)

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM section
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM section
	Camshaft														
	Intake valve												3		
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			FE section
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			MA, EM and LC sections
	Oil level (Low)/Filthy oil														
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			LC section
	Thermostat									5					
	Water pump														
	Water gallery														
	Cooling fan									5					EC-QG-296
	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

NCEC0042

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

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: ‘‘N’’ ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.1V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
FR O2 SEN-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ 0.6 - 1.0V
FR O2 MNTR-B1			LEAN ←→ RICH Changes more than 5 times during 10 seconds.
RR O2 SEN-B1	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ←→ 0.6 - 1.0V
RR O2 MNTR-B1			LEAN ←→ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	● Engine: Idle	Throttle valve fully closed	0.35 - 0.65V
	● Ignition switch: ON (Engine stopped)	Throttle valve fully opened	3.7 - 4.5V
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW CLSD THL POS	● Engine: Idle	Throttle valve: Idle position	ON
	● Ignition switch: ON (Engine stopped)	Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	A/C switch ‘‘OFF’’	OFF
		A/C switch ‘‘ON’’ (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever ‘‘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 → OFF

MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 3.2 msec
LOAD SIGNAL	● Engine: running	Rear window defogger or headlamp "ON"	ON
		Except the above	OFF
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	1.5 - 2.5 msec
		2,000 rpm	1.5 - 2.5 msec
IGN TIMING	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	8° BTDC
		2,000 rpm	Approx. 30° BTDC
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	5 - 20 steps
		2,000 rpm	—
PURG VOL C/V	● Engine: After warming up ● No-load ● M/T models: Lift up drive wheels and shift to 1st gear position.	Idle	0%
		Rev engine up from 2,000 to 4,000 rpm.	—
A/F ALPHA-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	75 - 125%
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 1 second) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)		ON
	● Except as shown above		OFF
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: OFF	Engine coolant temperature is 99°C (210°F) or less	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON
FR O2 HTR-B1	● Engine speed: Below 3,200 rpm		ON
	● Engine speed: Above 3,200 rpm		OFF
RR O2 HTR-B1	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF
INT/V SOL-B1	● Engine: After warming up	Idle	OFF
		Revving engine with full throttle opening (Under 4,600 rpm)	ON
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 steps

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

MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 40°C (104°F)	ON
		Engine coolant temperature is above 40°C (104°F)	OFF
HEATER FAN SW	● Heater fan switch is "ON"		ON
	● Heater fan switch is "OFF'		OFF
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	Not used
		2,500 rpm	Not used
ABSOL TH·P/S	● Engine: Idle	Throttle valve fully closed	0.0°
	● Ignition switch: ON (Engine stopped)	Throttle valve fully opened	Approx. 80°
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: N ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s
IDL A/V LEARN	● Ignition switch: ON	IDLE AIR VOL LEARN in ACTIVE TEST has not been performed	YET
		IDLE AIR VOL LEARN in ACTIVE TEST has already been performed successfully	CMPLT
		IDLE AIR VOL LEARN in ACTIVE TEST has not been performed successfully	INCMP
TRVL AFTER MIL	● Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,535 km (0 - 40,722 mile)

Major Sensor Reference Graph in Data Monitor Mode

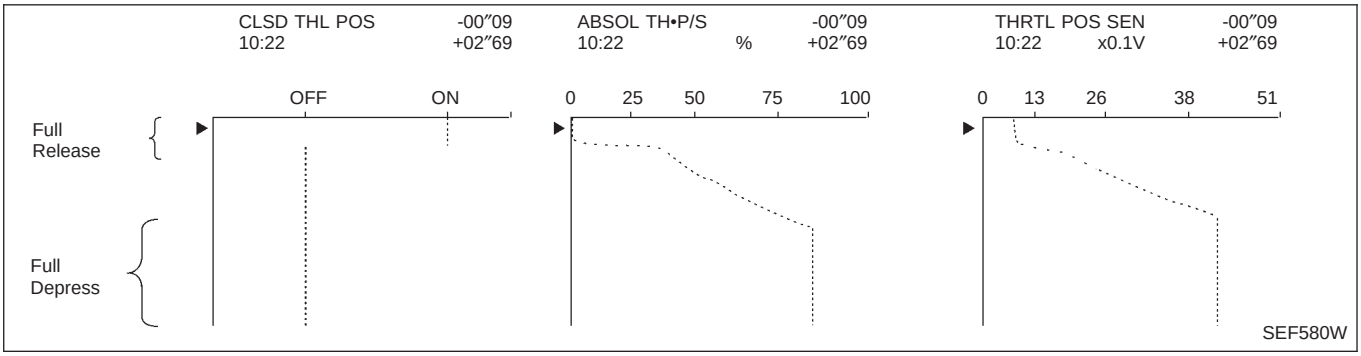
NCEC0043

The following are the major sensor reference graphs in "DATA MONITOR" mode.
(Select "HI SPEED" in "DATA MONITOR" with CONSULT-II.)

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

NCEC0043S01

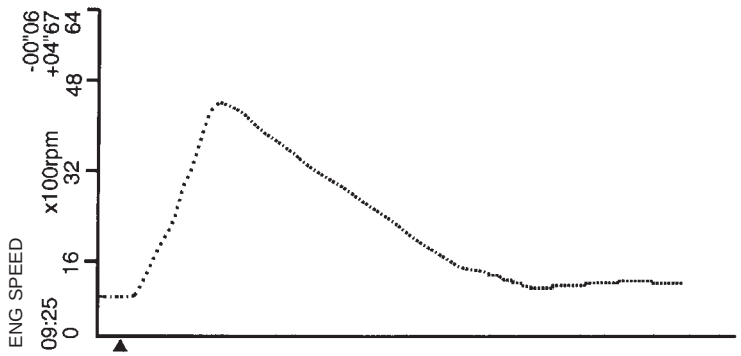
Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL POS" when depressing the accelerator pedal with the ignition switch "ON".
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL POS" is changed from "ON" to "OFF".



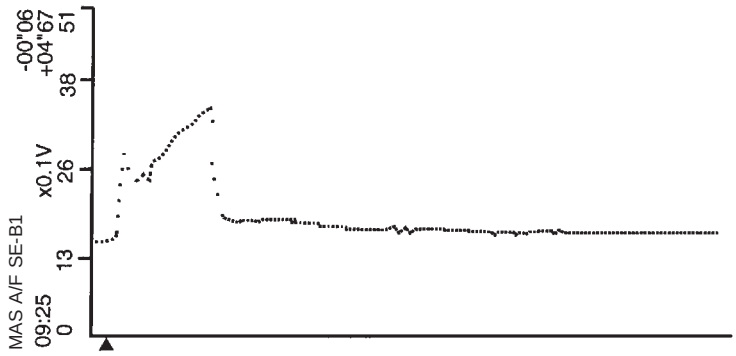
ENG SPEED, MAS A/F SE-B1, THRTL POS SEN, RR O2 SEN-B1, FR O2 SEN-B1, INJ PULSE-B1

NCEC0043S02

Below is the data for ''ENG SPEED'', ''MAS A/F SE-B1'', ''THRTL POS SEN'', ''RR O2 SEN-B1'', ''FR O2 SEN-B1'' and ''INJ PULSE-B1'' when revving engine quickly up to 4,800 rpm under no load after warming up engine to normal operating temperature.
Each value is for reference, the exact value may vary.

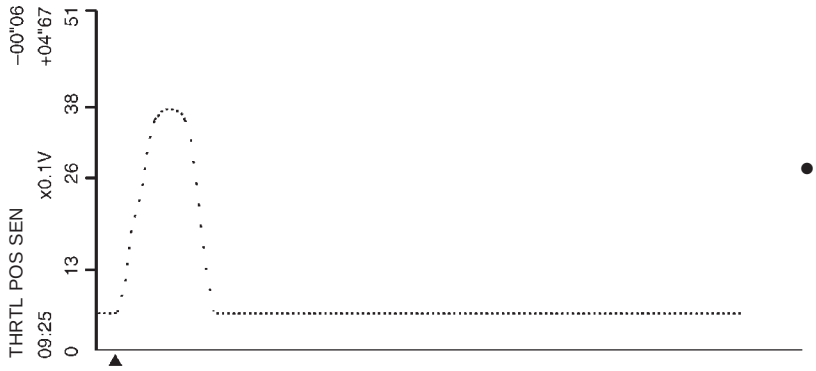


- ''ENG SPEED'' should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop.

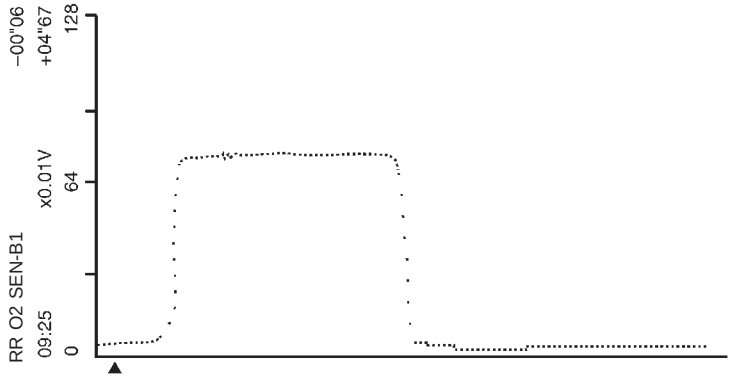


- ''MAS A/F SE-B1'' should increase when depressing the accelerator pedal and should decrease at the moment ''THRTL POS SEN'' is closed (accelerator pedal is released).

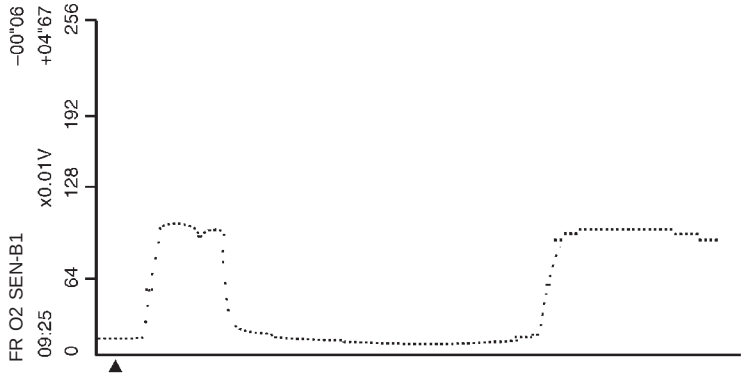
NEF066A



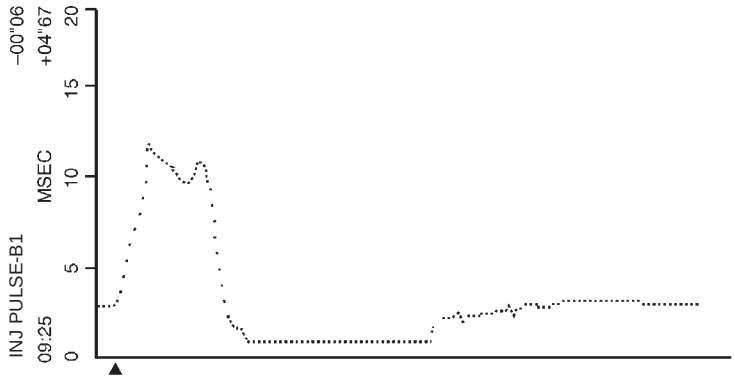
- "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



- "RR O2 SEN-B1" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.

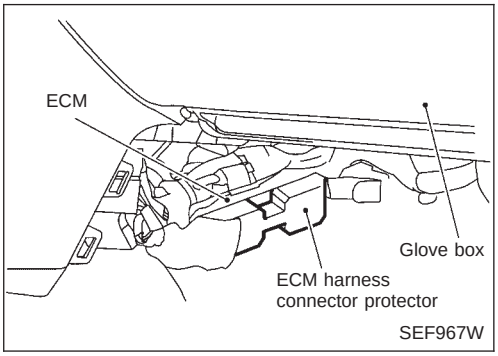


- FR O2 SEN-B1" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



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

NEF067A



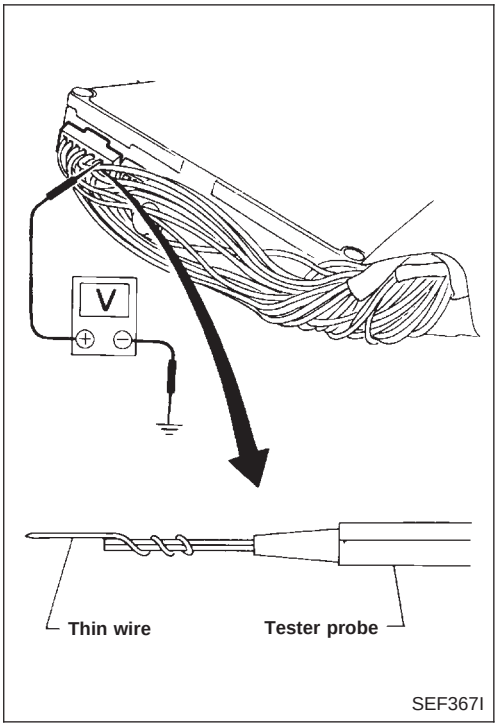
ECM Terminals and Reference Value

NCEC0044

PREPARATION

NCEC0044S01

1. ECM is located behind the center console. For this inspection: Remove the front passenger center console panel.
2. Remove ECM harness protector.

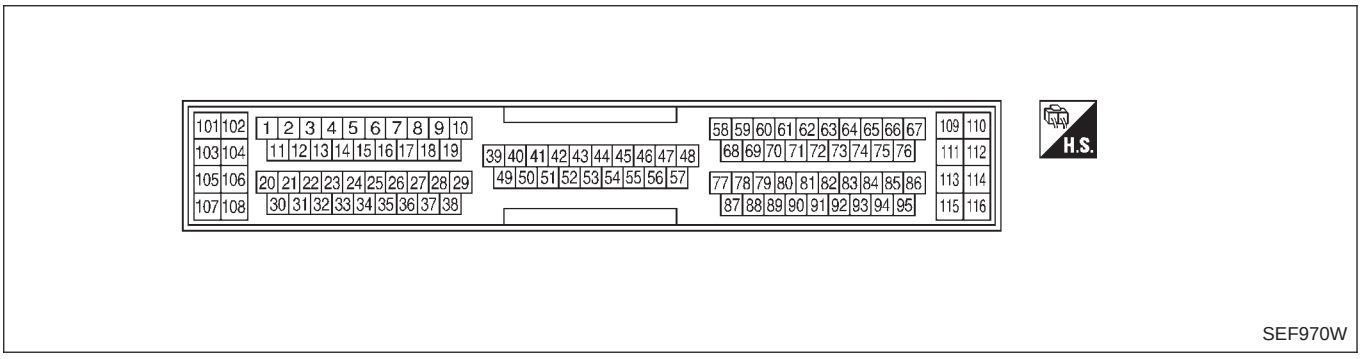


3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.

- 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

NCEC0044S02

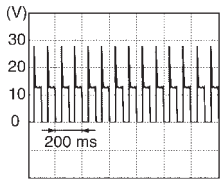


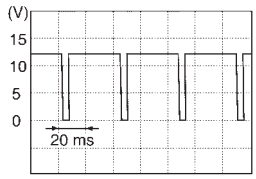
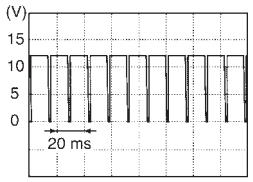
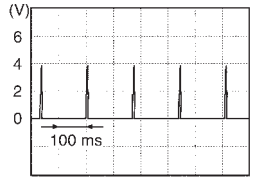
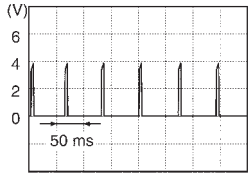
ECM INSPECTION TABLE

NCEC0044S03

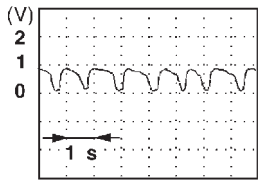
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

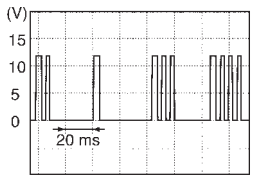
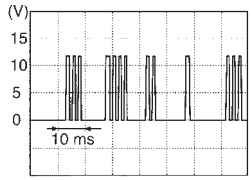
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	Y/R	Intake valve timing control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Lift up drive wheels and shift gear "ON" ● Rev engine up from 1,200 to 3,000 rpm	Approximately 0V
3	W/R	Rear heated oxygen sensor heater	**[Engine is running]** ● Engine speed is below 3,600 rpm ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more	Approximately 0.7V
			[Ignition switch "ON"] ● Engine stopped ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
4	L	Front heated oxygen sensor heater	**[Engine is running]** ● Engine speed is below 3,200 rpm	Approximately 0V
			[Engine is running] ● Engine speed is above 3,200 rpm	BATTERY VOLTAGE (11 - 14V)
6 7 15 16	BR YB P OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V
8 9 17 18	W/B SB LG/R	EGR volume control valve	**[Engine is running]** ● **Warm-up condition** ● Rev engine up from 2,000 to 4,000 rpm	0 - 14V
13	LG/R	Cooling fan relay	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	Approximately 0V
14	P/B	EVAP canister purge volume control valve (ON/OFF duty)	**[Engine is running]** ● **Warm-up condition** ● Accelerator pedal depressed	5 - 12V  SEF975W
21	B/P	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1V
			[Ignition switch "ON"] ● More than 1 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
22	OR/L	Malfunction indicator	**[Ignition switch "ON"]**	0 - 1V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
23	L/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)

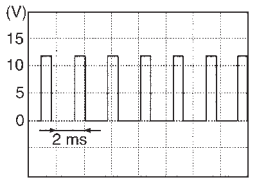
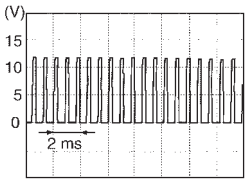
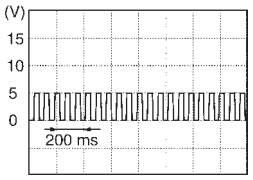
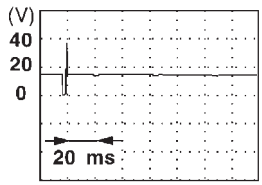
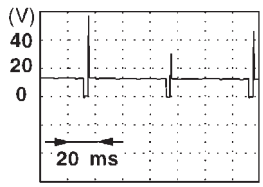
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
31	W/G	ECM relay (Self shut-off)	**[Ignition switch "OFF"]** ● For 9 seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● 9 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
32	L/OR	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	10 - 11V  SEF973W
			[Engine is running] ● Engine speed is 2,000 rpm	10 - 11V  SEF974W
35 36 37 38	Y/R PU/G L/Y GY/L	Ignition signal (No. 1) Ignition signal (No. 2) Ignition signal (No. 3) Ignition signal (No. 4)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.3V  SEF971W
			[Engine is running] ● Engine speed is 2,000 rpm	0.2 - 0.4V  SEF972W
40	Y	Throttle position switch (Closed position)	**[Engine is running]** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Accelerator pedal depressed	Approximately 0V
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V
42	G/OR	PNP switch	**[Ignition switch "ON"]** ● Gear position is "Neutral position"	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	Approximately 5V

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
43	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
44	GY	Air conditioner switch	**[Engine is running]** ● Both air conditioner switch and blower switch are "ON" (Compressor operates)	Approximately 0V
			[Engine is running] ● Air conditioner switch is "OFF"	Approximately 5V
46	PU/W	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is fully turned	Approximately 0V
			[Engine is running] ● Steering wheel is not turned	Approximately 5V
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
50	R	Electrical load signal (Headlamp Rear defogger)	**[Engine is running]** ● Headlamp switch or rear defogger switch is "ON"	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Headlamp switch and rear defogger switch are "OFF"	Approximately 0V
51	LG/B	Blower fan SW	**[Ignition switch "ON"]** ● Blower fan switch is "ON"	Approximately 0V
57	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
58	B	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
61	B	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V
62	R	Front heated oxygen sensor	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm	0 - Approximately 0.7V  SEF008W
63	L	Rear heated oxygen sensor	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V
64	G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
66 75	W W	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	2.0 - 3.0V  SEF977W
			[Engine is running] ● Engine speed is 2,000 rpm	2.0 - 3.0V  SEF978W
67	W/L	Power supply for ECM (Back-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
70	BR/Y	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature
72	PU	EGR temperature sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating	0 - 1.0V
73	W	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
74	R/L	Refrigerant pressure sensor	**[Engine is running]** ● Air conditioner switch is "ON" (Compressor operates)	More than 1.5V
			[Engine is running] ● Air conditioner switch is turned from "ON" to "OFF"	Voltage is decreasing gradually
81	W	Knock sensor	**[Engine is running]** ● Idle speed	1.0 - 4.0V
82	R/W	Tank fuel temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with fuel temperature

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
85	W	Crankshaft position sensor (POS)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	3.0 - 4.0V  SEF979W
			[Engine is running] ● Engine speed is 2,000 rpm	3.0 - 4.0V  SEF980W
86	OR/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 2nd gear position ● Vehicle speed is 40 km/h (25 MPH)	2.0 - 3.0V  SEF976W
92	Y	Throttle position sensor	**[Engine is running]** ● Accelerator pedal released	0.35 - 0.65V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.7 - 4.5V
93	G/R	Data link connector	**[Engine is running]** ● Idle speed (CONSULT-II or GST is disconnected)	Approximately 0V
101 103 105 107	R/B YB GB L/B	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF011W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF012W

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
104	SB	Swirl control valve control solenoid valve	**[Engine is running]** ● Engine coolant temperature is between 15°C (59°F) to 40°C (104°F) ● Idle speed	0 - 1V
			[Engine is running] ● Engine coolant temperature is above 40°C (104°F) ● Idle speed	BATTERY VOLTAGE (11 - 14V)
106 108	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	R R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
111	G	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
114	G/W	Adjust switch	**[Engine is running]** ● Idle speed	0V
115	G/W	Data link connector	**[Engine is running]** ● Idle speed (CONSULT-II or GST is disconnected)	0 - 10V
116	Refer to EL section	Immobilizer	**[Engine is running]** ● Idle speed (GST is disconnected)	BATTERY VOLTAGE (11 - 14v)

Description

NCEC0045

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

NCEC0045S01

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

NCEC0046

1	INSPECTION START
Erase (1st trip) DTCs. Refer to ''HOW TO ERASE EMISSION-RELATED INFORMATION'' (EC-QG-53).	
▶	GO TO 2.

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

3	SEARCH FOR ELECTRICAL INCIDENT
Perform ''Incident Simulation Tests'' in GI section.	
OK or NG	
OK ▶	GO TO 4.
NG ▶	Repair or replace.

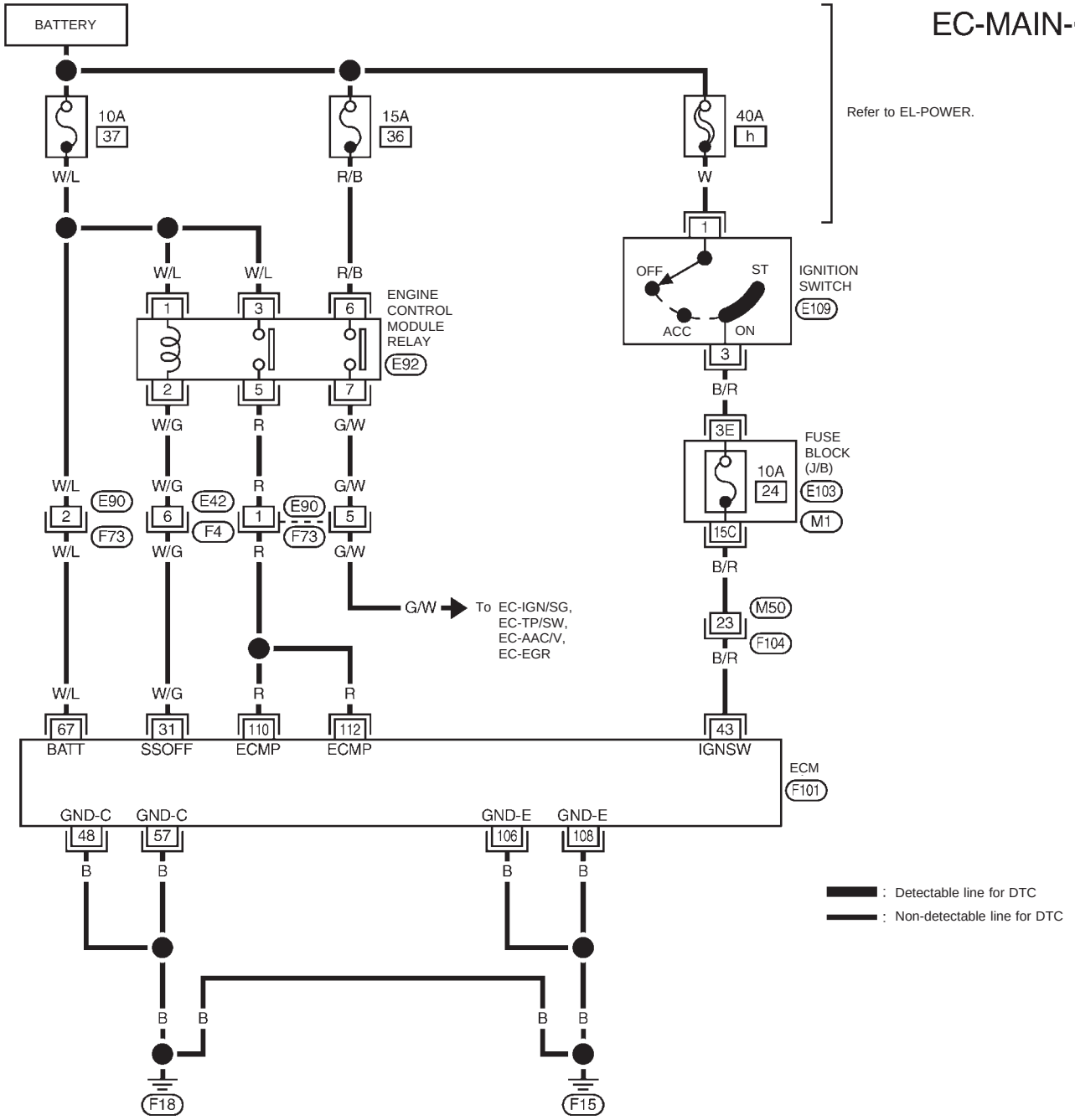
4	CHECK CONNECTOR TERMINALS
Refer to ''How to Check Enlarged Contact Spring of Terminal'' in GI section.	
OK or NG	
OK ▶	**INSPECTION END**
NG ▶	Repair or replace connector.

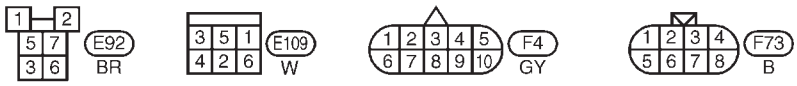
Main Power Supply and Ground Circuit

WIRING DIAGRAM

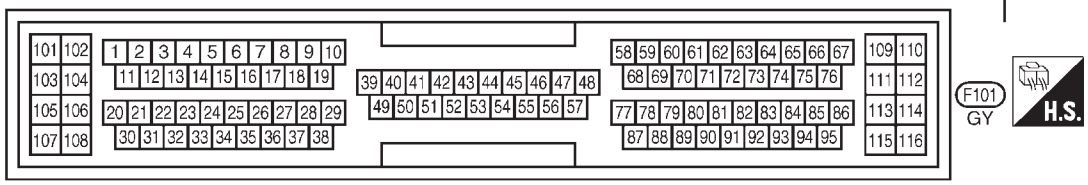
NCEC0047

EC-MAIN-01





REFER TO THE FOLLOWING
M1 FUSE BLOCK - Junction Box (J/B)
E103 FUSE BLOCK - Junction Box (J/B)



YEC259

ECM TERMINALS AND REFERENCE VALUE

NCEC0048

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
31	W/G	ECM relay (Self shut-off)	**[Ignition switch "OFF"]** ● For 9 seconds after turning ignition switch "OFF"	0 - 1V
			[Ignition switch "OFF"] ● 9 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
43	B/R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground (Probe this terminal with (−) tester probe when measuring)
57	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
67	W/L	Power supply for ECM (Back-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
106 108	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	R R	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

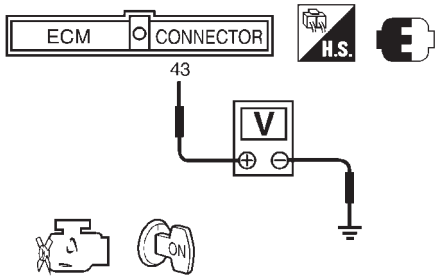
DIAGNOSTIC PROCEDURE

NCEC0049

1	INSPECTION START	
Start engine. Is engine running? **Yes or No**		
Yes	▶	GO TO 4.
No	▶	GO TO 2.

2	CHECK POWER SUPPLY-I

1. Turn ignition switch ''OFF'' and then ''ON''.
2. Check voltage between ECM terminal 43 and ground with CONSULT-II or tester.



SEF981W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

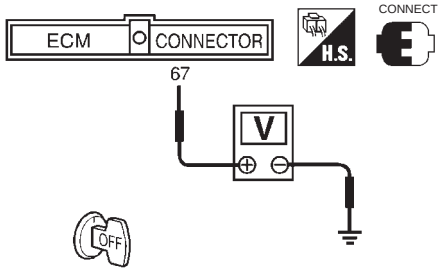
3	DETECT MALFUNCTIONING PART

Check the following.
- Fuse 10A, 40A
- Harness connectors M50, F104
- Harness for open or short between ECM and fuse block
- Harness for open or short between fuse block and ignition switch
  Refer to wiring diagram.

	▶	Repair harness or connectors.

4	CHECK POWER SUPPLY-II

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



SEF982W

Voltage: Battery voltage

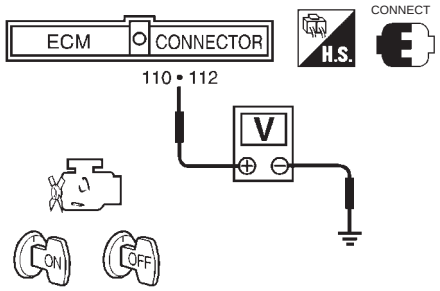
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E90, F73 ● 10A fuse ● Harness for open or short between ECM and fuse	
▶	Repair harness or connectors.

6	CHECK POWER SUPPLY-III

1. Turn ignition switch "ON" and then "OFF".
2. Check voltage between ECM terminals 110, 112 and ground with CONSULT-II or tester.



SEF983W

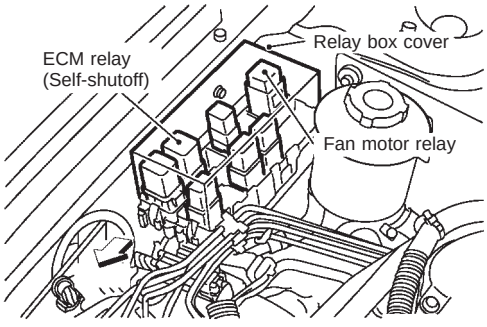
Voltage:
After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

OK or NG

OK	▶	GO TO 14.
NG (Battery voltage does not exist.)	▶	GO TO 7.
NG (Battery voltage exists for more than a few seconds.)	▶	GO TO 13.

7	CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM

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



SEF984W

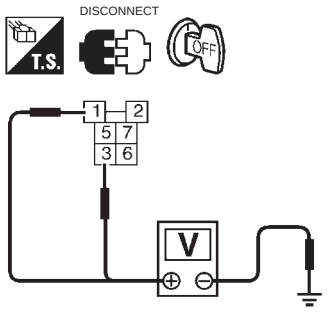
3. Check harness continuity between ECM terminals 110, 112 and relay terminal 5.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E90, F73 ● 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 VOLTAGE BETWEEN ECM RELAY AND GROUND
Check voltage between relay terminals 1, 3 and ground with CONSULT-II or tester.	



SEF985W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART
Check the harness for open or short between ECM relay and fuse.	
▶	Repair harness or connectors.

11	CHECK OUTPUT SIGNAL CIRCUIT

1. Check harness continuity between ECM terminal 31 and relay terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

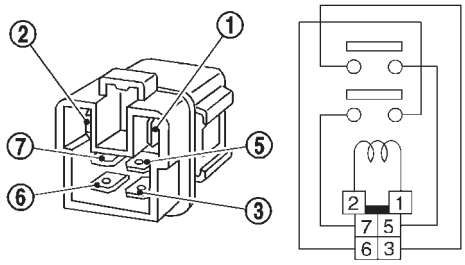
OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E42, F4 ● 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.

13	CHECK ECM RELAY

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



SEC202BC

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

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace ECM relay.

14	CHECK GROUND CIRCUIT

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

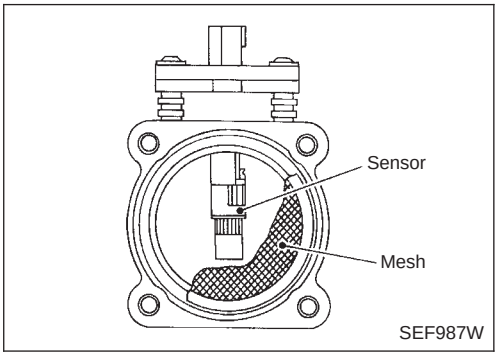
OK or NG

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

15	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-QG-108.

	▶	**INSPECTION END**



Component Description

NCEC0050

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

NCEC0051

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	1.0 - 1.7V
		2,500 rpm	1.5 - 2.1V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	Not used
		2,500 rpm	Not used
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	5.0 - 10.0 g·m/s

ECM Terminals and Reference Value

NCEC0052

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
61	B	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.0 - 1.7V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm	1.5 - 2.1V
73	W	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NCEC0053

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

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

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

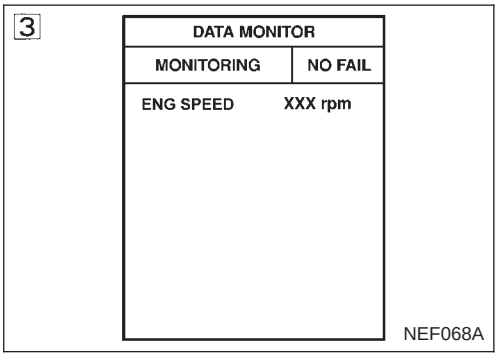
NCEC0054

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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



PROCEDURE FOR MALFUNCTION A

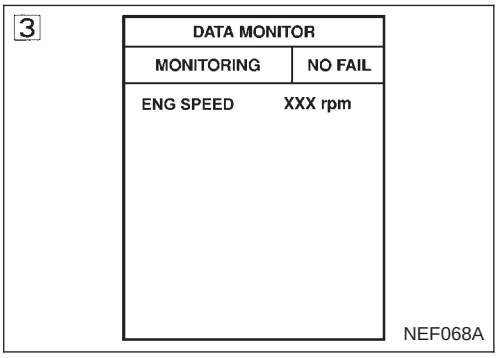
NCEC0054S01

With CONSULT-II

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Wait at least 2 seconds.
4) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-118.

With GST

Follow the procedure ''With CONSULT-II'' above.



PROCEDURE FOR MALFUNCTION B

NCEC0054S02

With CONSULT-II

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Start engine and wait 2 seconds at most.
4) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-118.

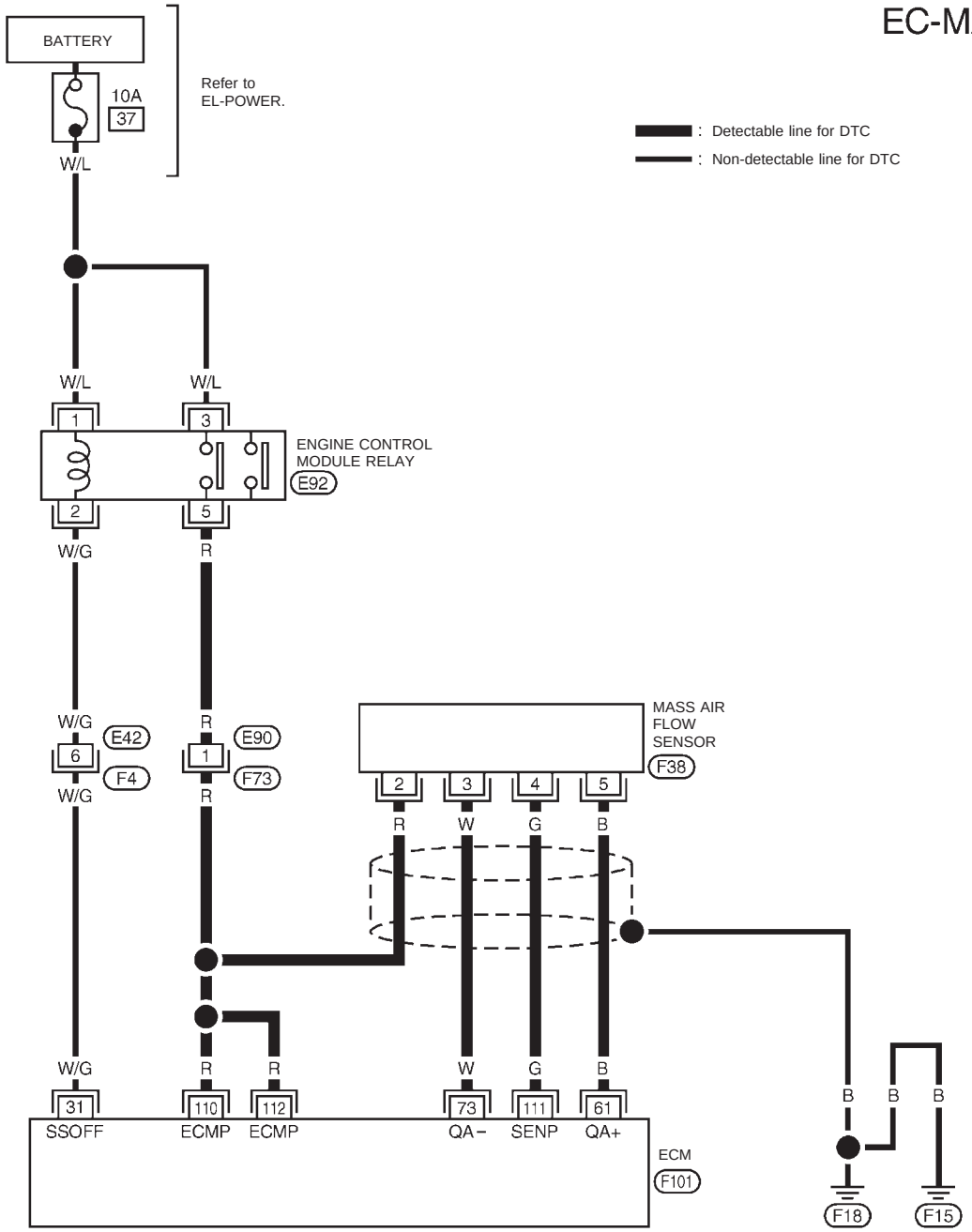
With GST

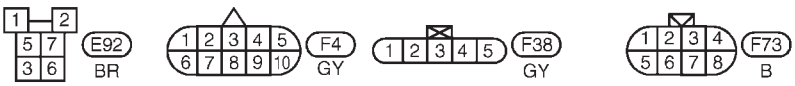
Follow the procedure ''With CONSULT-II'' above.

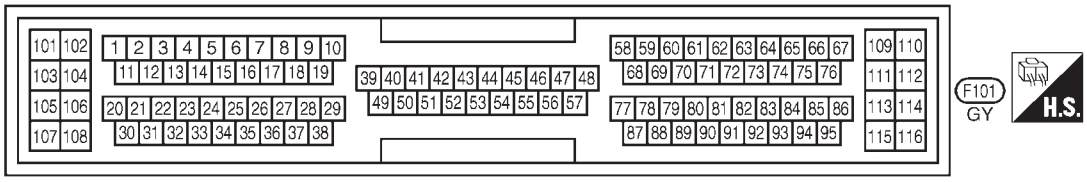
Wiring Diagram

NCEC0056

EC-MAFS-01







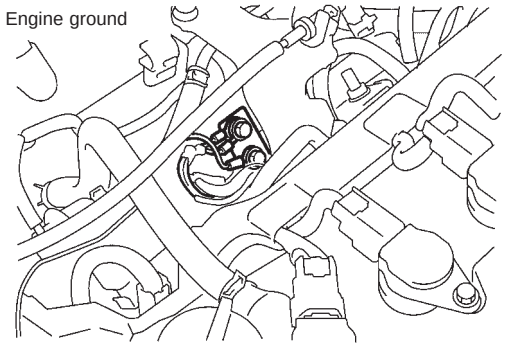
YEC223

Diagnostic Procedure

NCEC0057

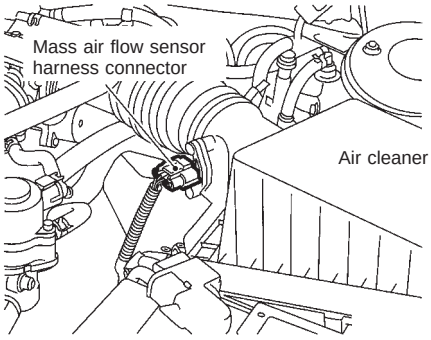
1	INSPECTION START	
Which malfunction (A, or B) is duplicated?		
Malfunction A or B		
A	▶	GO TO 3.
B	▶	GO TO 2.

2	CHECK INTAKE SYSTEM	
Check the following for connection. ● Air duct ● Vacuum hoses ● Intake air passage between air duct to collector		
OK or NG		
OK	▶	GO TO 3.
NG	▶	Reconnect the parts.

3	RETIGHTEN GROUND SCREWS	
1. Turn ignition switch ‘‘OFF’’. 2. Loosen and retighten engine ground screws.  SEF994W		
	▶	GO TO 4.

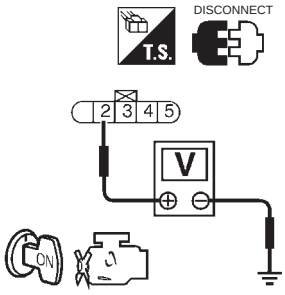
4	CHECK POWER SUPPLY

1. Disconnect mass air flow sensor harness connector.



SEF995W

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



SEF996W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E42, F4
- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

	▶	Repair harness or connectors.

6	CHECK GROUND CIRCUIT

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

OK or NG

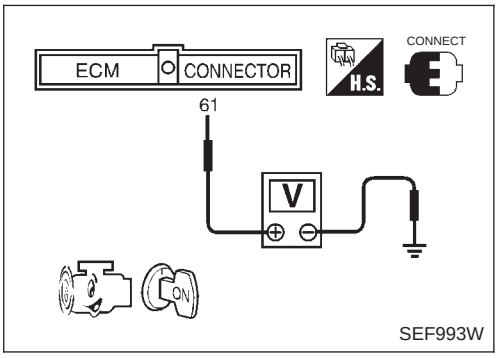
OK	▶	GO TO 7.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

Diagnostic Procedure (Cont'd)

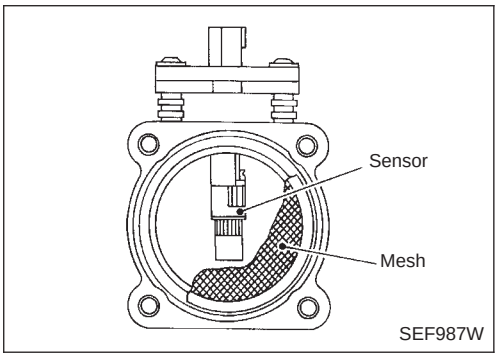
7	CHECK INPUT SIGNAL CIRCUIT	
1. Check harness continuity between mass air flow sensor harness connector terminal 5 and ECM terminal 61. Refer to wiring diagram. **Continuity should exist.** 2. Also check harness for short to ground and short to power. **OK or NG**		
OK	▶	GO TO 8.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK MASS AIR FLOW SENSOR	
Refer to ''Component Inspection'', EC-QG-120. **OK or NG**		
OK	▶	GO TO 9.
NG	▶	Replace mass air flow sensor.

9	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



SEF993W



SEF987W

Component Inspection

MASS AIR FLOW SENSOR

NCEC0058

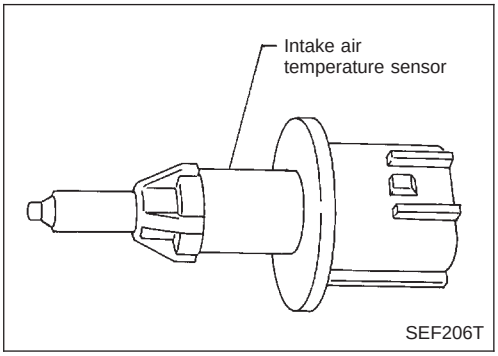
NCEC0058S01

1. Turn ignition switch ''ON''.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 61 (Mass air flow sensor signal) and ground.

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

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

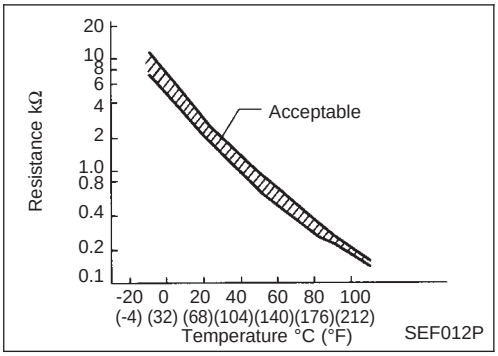
4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Repeat above check.
5. If NG, remove mass air flow sensor from air duct. Check hot film for damage or dust.



Component Description

NCEC0066

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



<Reference data>

Intake air temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.1 - 2.9
80 (176)	1.23	0.27 - 0.38

*: These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) and ECM terminal 48 (ECM ground).

On Board Diagnosis Logic

NCEC0067

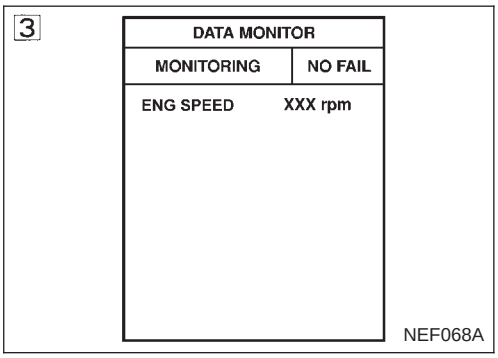
DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0110 0110	An excessively low or high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor

DTC Confirmation Procedure

NCEC0068

NOTE:

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



With CONSULT-II

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-123.

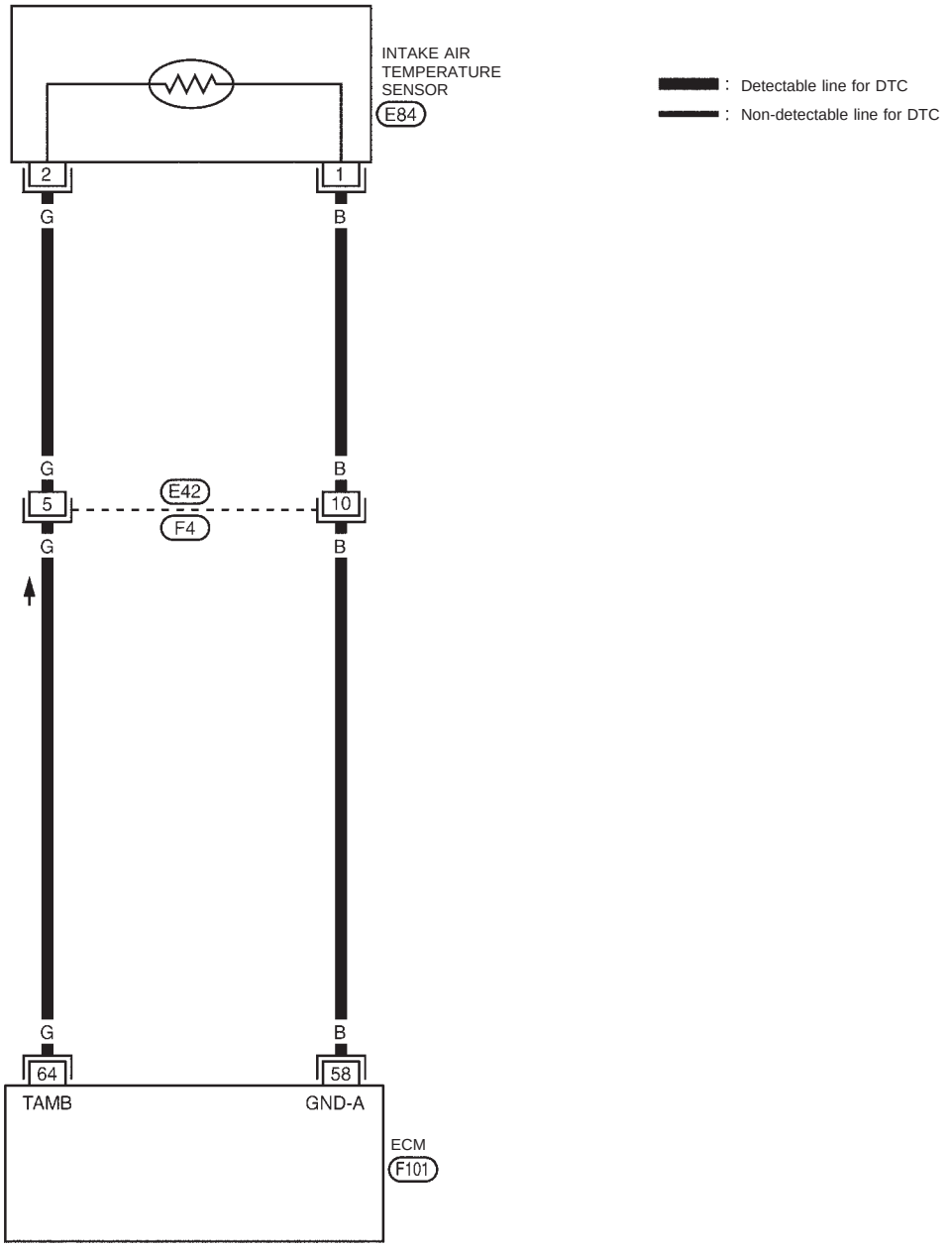
With GST

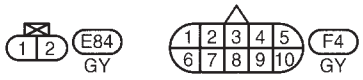
Follow the procedure ''With CONSULT-II'' above.

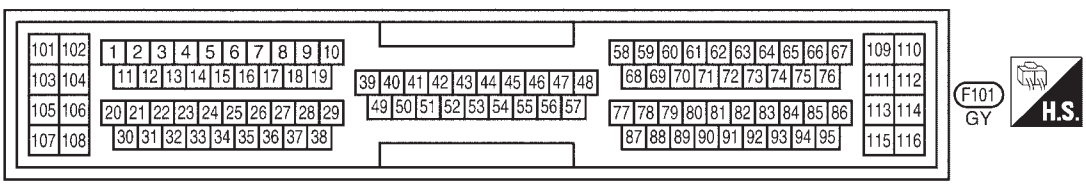
Wiring Diagram

NCEC0069

EC-IATS-01







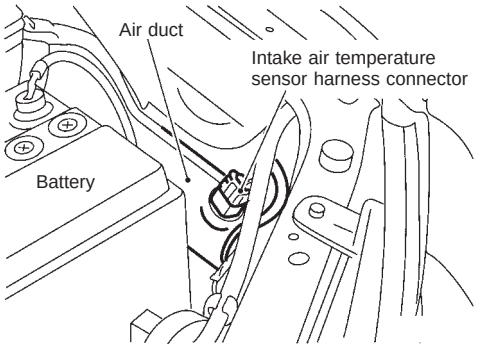
YEC260

Diagnostic Procedure

NCEC0070

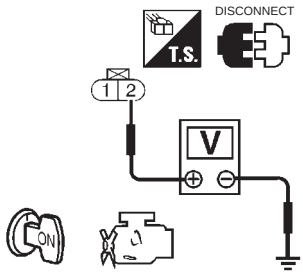
1	CHECK POWER SUPPLY

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



SEF912W

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



SEF997W

Voltage: Approximately 5V

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E42, F4
- Harness for open or short between ECM and intake air temperature sensor

	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

1. Turn ignition switch “OFF”.
2. Check harness continuity between intake air temperature sensor harness connector 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

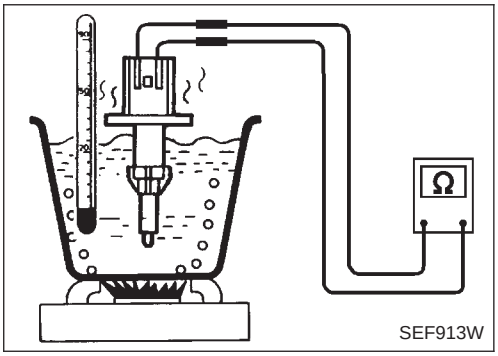
OK	▶	GO TO 5.
NG	▶	GO TO 4.

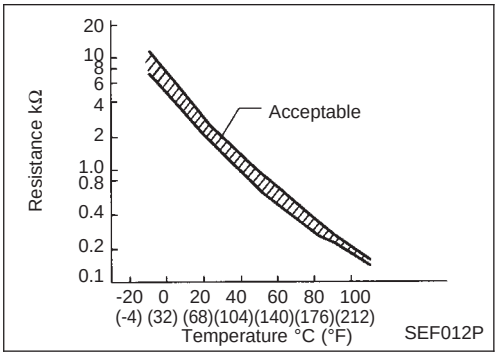
Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E42, F4 ● Harness for open or short between ECM and intake air temperature sensor ● Harness for open or short between intake air temperature sensor	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTAKE AIR TEMPERATURE SENSOR	
Refer to ''Component Inspection'', EC-QG-124.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Replace intake air temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**





Component Inspection

NCEC0071

INTAKE AIR TEMPERATURE SENSOR

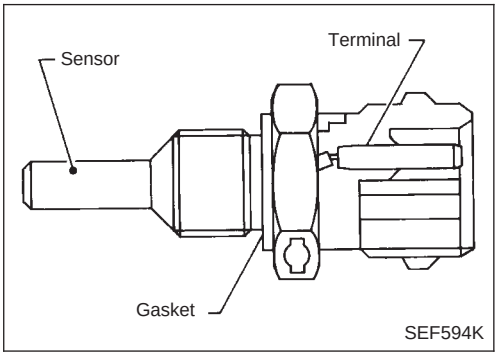
NCEC0071S01

Check resistance as shown in the figure.

<Reference data>

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

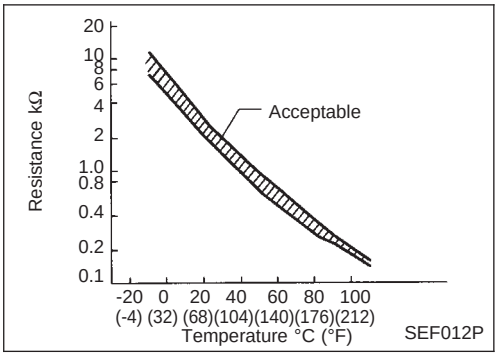
If NG, replace intake air temperature sensor.



Component Description

NCEC0072

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



<Reference data>

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

*: These data are reference values and are measured between ECM terminal 70 (Engine coolant temperature sensor) and ECM terminal 48 (ECM ground).

CONSULT-II Reference Value in Data Monitor Mode

NCEC0073

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

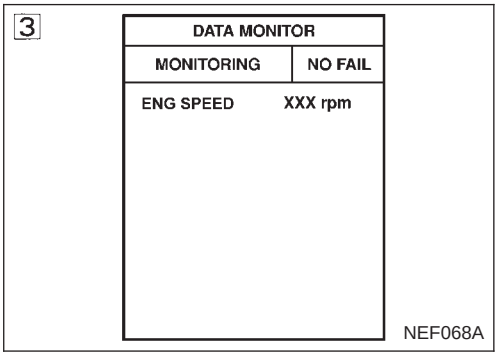
On Board Diagnosis Logic

NCEC0074

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

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

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



DTC Confirmation Procedure

NCEC0075

NOTE:

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

With CONSULT-II

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-128.

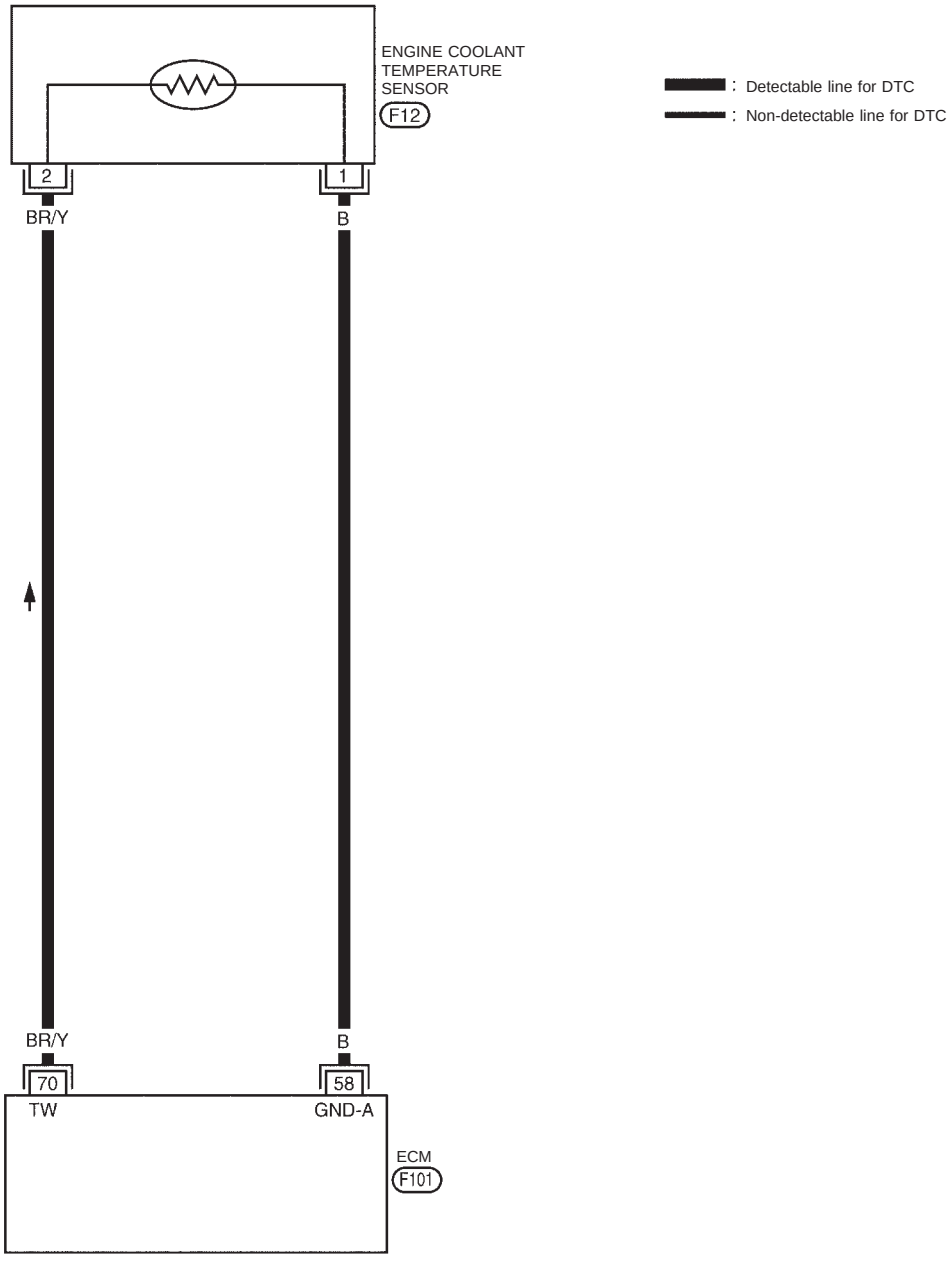
With GST

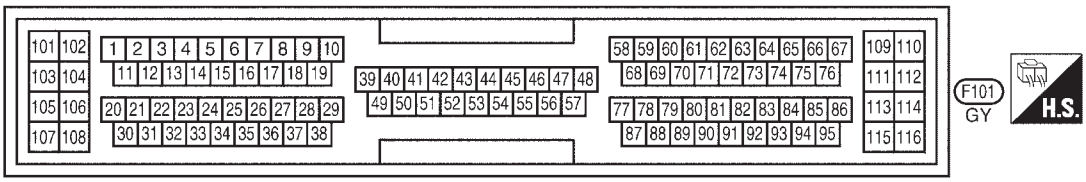
Follow the procedure ‘‘With CONSULT-II’’ above.

Wiring Diagram

NCEC0076

EC-ECTS-01





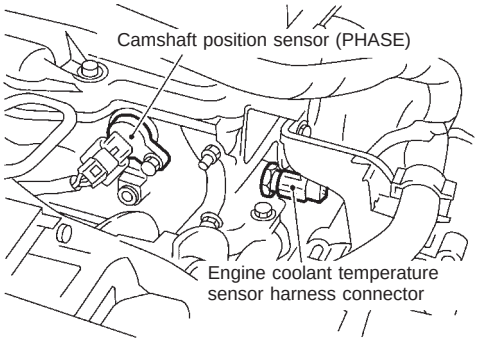
YEC261

Diagnostic Procedure

NCEC0077

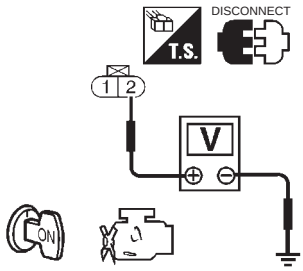
1	CHECK POWER SUPPLY

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



SEF999W

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



SEF997W

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 harness connector terminal 1 and engine ground. Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

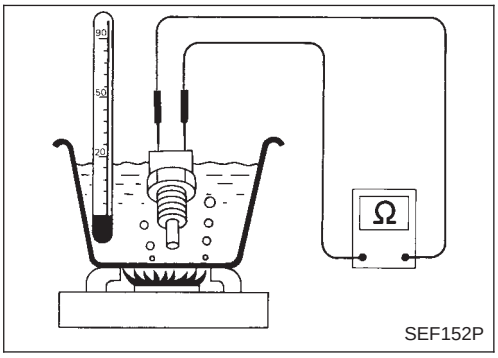
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

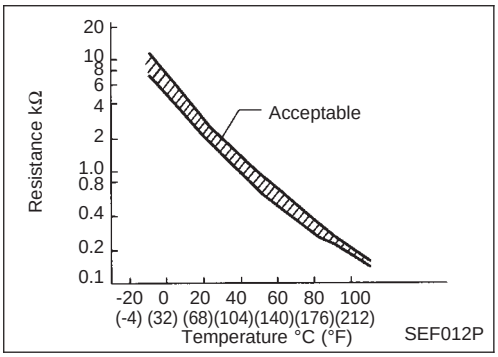
4	DETECT MALFUNCTIONING PART
Check the following. ● Harness for open or short between ECM and engine coolant temperature sensor ● Harness for open or short between engine coolant temperature sensor.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK ENGINE COOLANT TEMPERATURE SENSOR	
Refer to ''Component Inspection'', EC-QG-129.		
	OK or NG	
OK	▶	GO TO 6.
NG	▶	Replace engine coolant temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



SEF152P



SEF012P

Component Inspection

ENGINE COOLANT TEMPERATURE SENSOR

NCEC0078

NCEC0078S01

Check resistance as shown in the figure.
<Reference data>

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

If NG, replace engine coolant temperature sensor.

Component Description

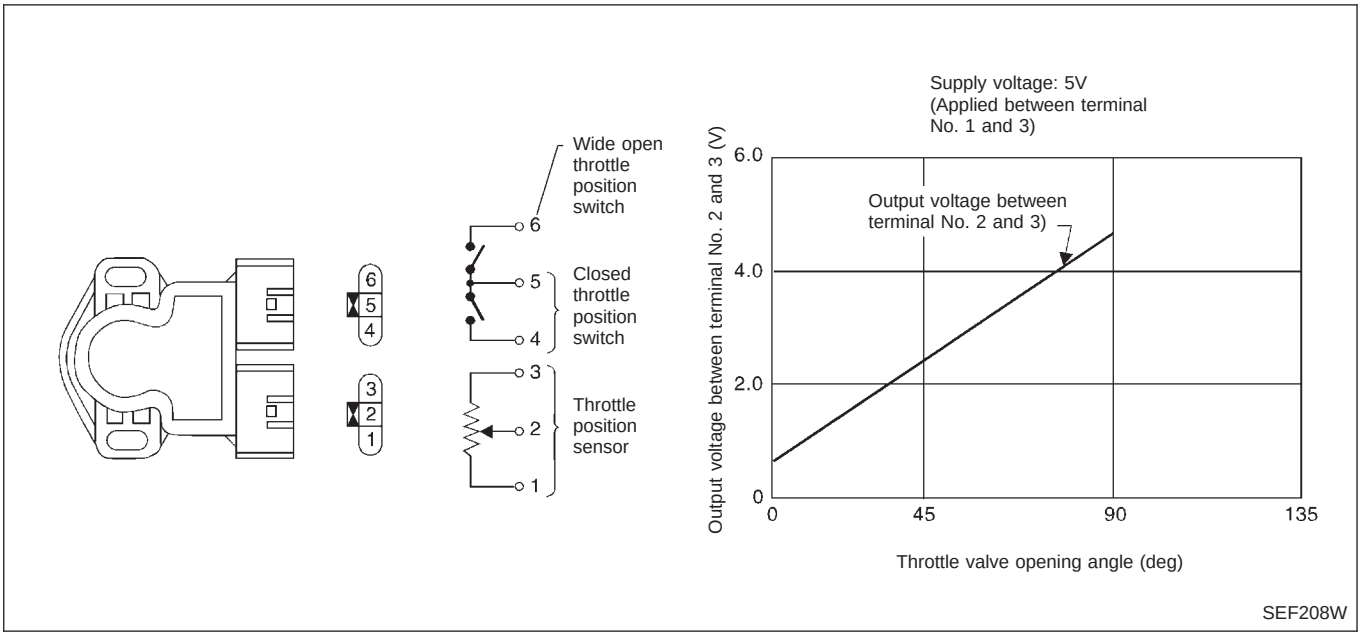
NCEC0079

NOTE:

If DTC P0120 (0120) is displayed with DTC P0510 (0510), first perform trouble diagnosis for DTC P0510, EC-QG-278.

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

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



SEF208W

CONSULT-II Reference Value in Data Monitor Mode

NCEC0080

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Engine: Idle	Throttle valve fully closed	0.35 - 0.65V
	● Ignition switch: ON (Engine stopped)	Throttle valve fully opened	3.7 - 4.5V
ABSOL TH·P/S	● Engine: Idle	Throttle valve fully closed	0.0°
	● Ignition switch: ON (Engine stopped)	Throttle valve fully opened	Approx. 80°

ECM Terminals and Reference Value

=NCEC0081

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
58	B	Sensors' ground	**[Engine is running]** ● Warm up condition ● Idle speed	Approximately 0V
92	Y	Throttle position sensor	**[Engine is running]** ● Accelerator pedal fully released	0.35 - 0.65V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.7 - 4.5V
111	G	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V

On Board Diagnosis Logic

NCEC0082

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

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

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

NCEC0083

NOTE:

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

CAUTION:

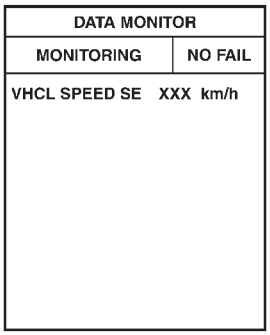
Always drive vehicle at a safe speed.

TESTING CONDITION:

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

DTC Confirmation Procedure (Cont'd)

2



PEF651U

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-QG-134.

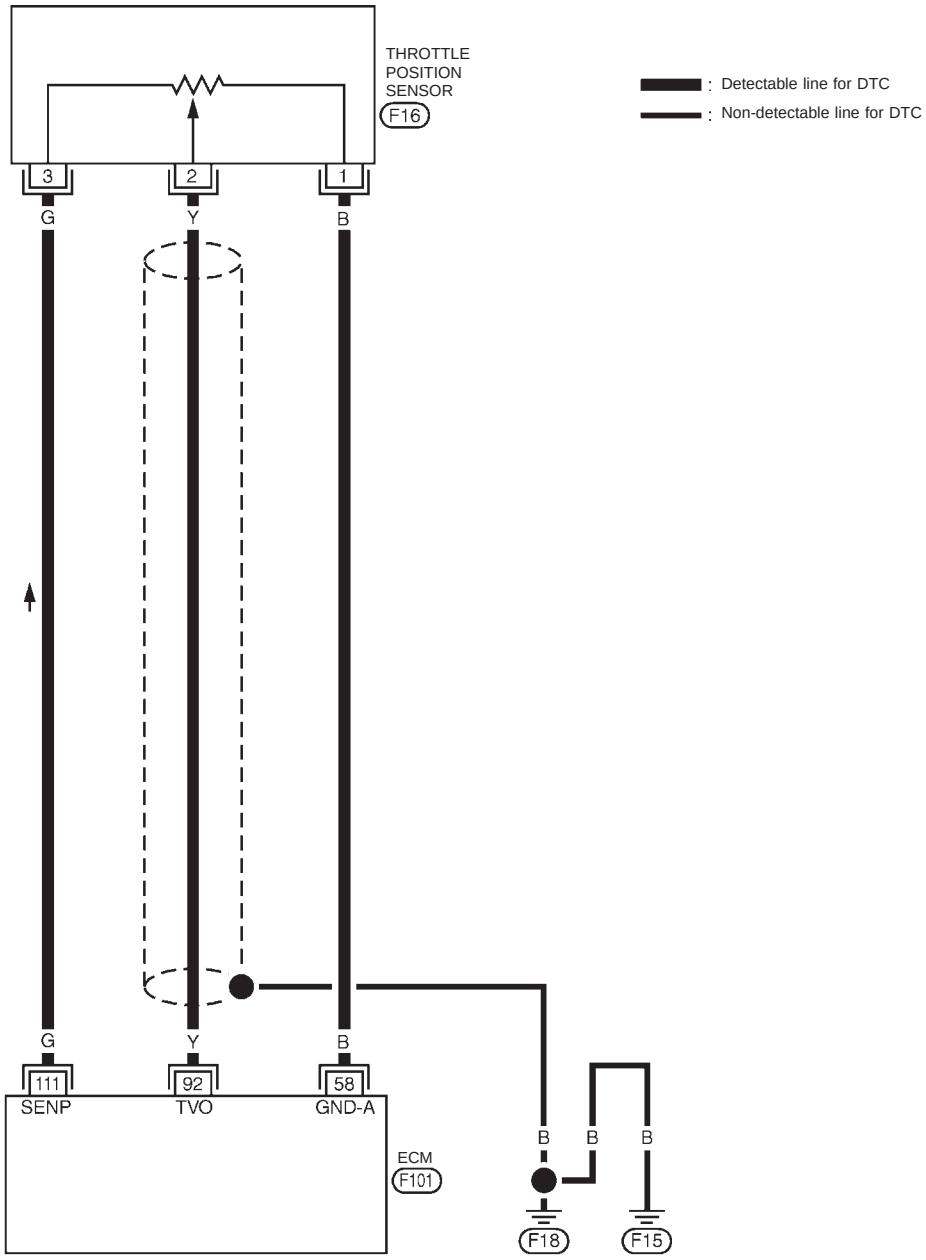
With GST

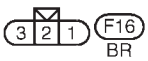
Follow the procedure ''With CONSULT-II'' above.

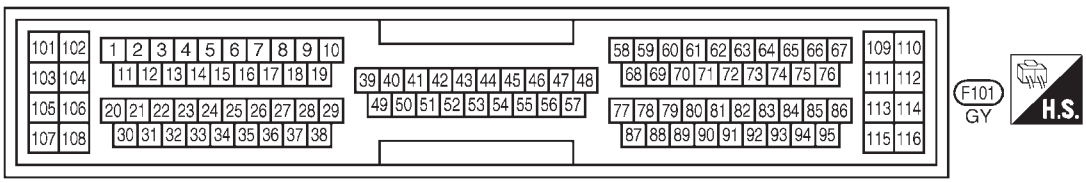
Wiring Diagram

NCEC0084

EC-TPS-01







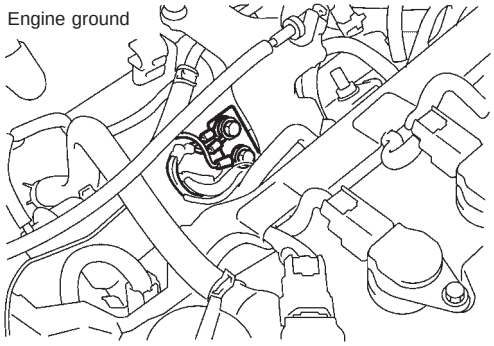
YEC262

Diagnostic Procedure

NCEC0085

1	RETIGHTEN GROUND SCREWS

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

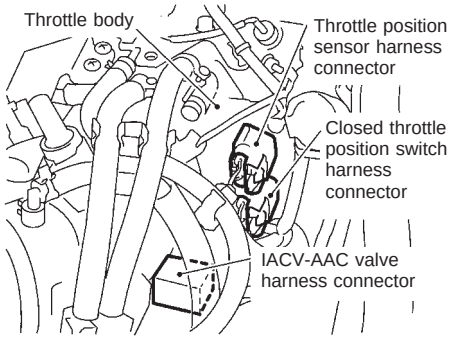


SEF994W

▶	GO TO 2.

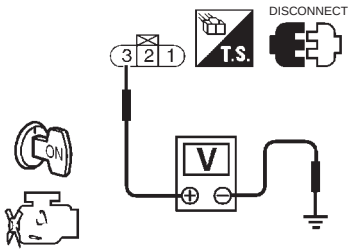
2	CHECK POWER SUPPLY

1. Disconnect throttle position sensor harness connector.



SEF938W

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



SEF209W

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 harness connector 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.

4	DETECT MALFUNCTIONING PART

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

	▶	Repair open circuit or short to ground 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 92 and throttle position sensor harness connector terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

6	CHECK THROTTLE POSITION SENSOR

Refer to ''Component Inspection'', EC-QG-136.

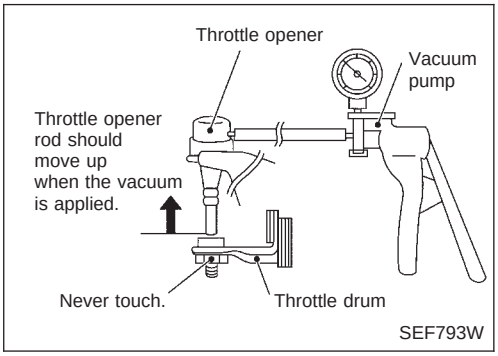
OK or NG

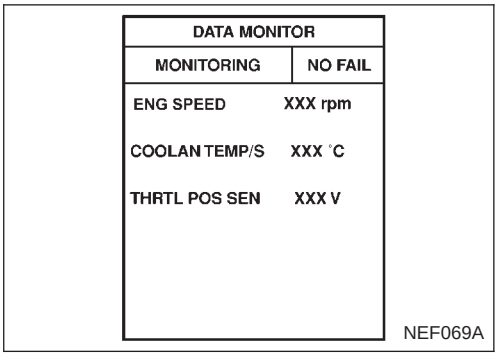
OK	▶	GO TO 7.
NG	▶	Replace throttle position sensor. To adjust it, perform ''Basic Inspection'', EC-QG-80.

7	CHECK INTERMITTENT INCIDENT

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.

	▶	**INSPECTION END**





Component Inspection

NCEC0086

THROTTLE POSITION SENSOR

NCEC0086S01

With CONSULT-II

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

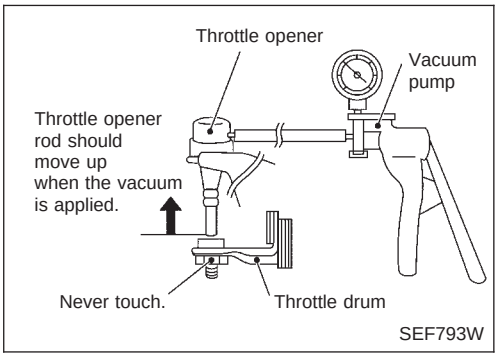
NOTE:

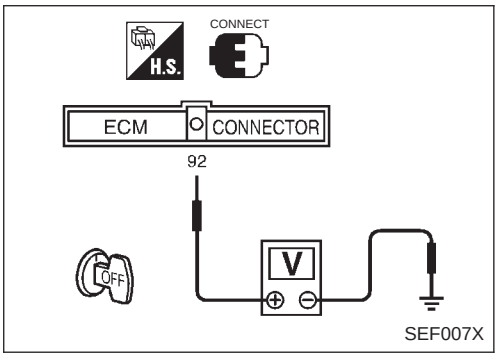
Voltage measurement must be made with throttle position sensor installed in vehicle.

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

If NG, adjust closed throttle position switch. Refer to ‘‘Basic Inspection’’, EC-QG-80.

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





Without CONSULT-II

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

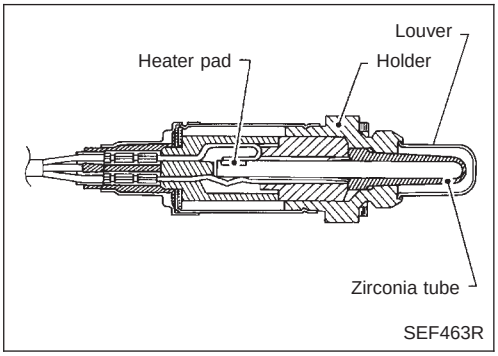
NOTE:

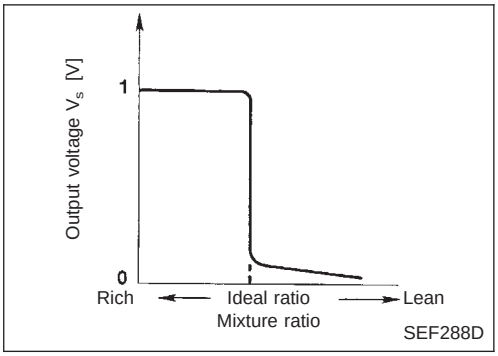
Voltage measurement must be made with throttle position sensor installed in vehicle.

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

If NG, adjust closed throttle position switch. Refer to ''Basic Inspection'', EC-QG-80.

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





Component Description

NCEC0094

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

NCEC0095

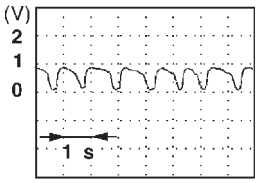
Specification data are reference values.

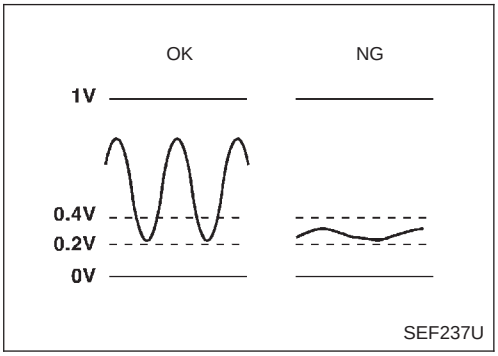
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SEN-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
FR O2 MNTR-B1			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM Terminals and Reference Value

NCEC0096

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	R	Front heated oxygen sensor	**[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

NCEC0097

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

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0130	• The voltage from the sensor is constantly approx. 0.3V.	• Harness or connectors (The sensor circuit is open or shorted.) • Front heated oxygen sensor

5

FR O2 SEN-B1 P0130	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF070A

5

FR O2 SEN-B1 P0130	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF071A

5

FR O2 SEN-B1 P0130
COMPLETED

NEF072A

DTC Confirmation Procedure

NCEC0098

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Select ‘‘FR O2 SEN-B1 P0130’’ of ‘‘FRONT O2 SENSOR’’ in ‘‘DTC WORK SUPPORT’’ mode with CONSULT-II.
3) Touch ‘‘START’’.
4) Let it idle for at least 3 minutes.

NOTE:

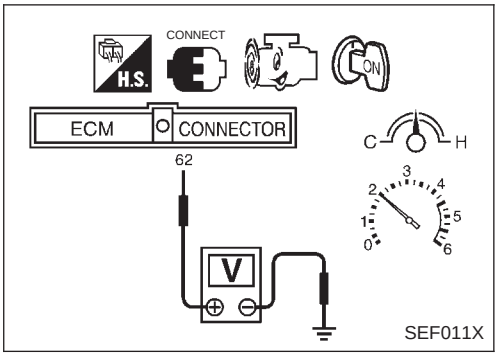
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 4.

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

ENG SPEED	1,700 - 3,200 rpm
Vehicle speed	Above 64 km/h (40 MPH)
B/FUEL SCHDL	Above 3.0 msec
Selector lever	Suitable position

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

6) Make sure that ‘‘OK’’ is displayed after touching ‘‘SELF-DIAG RESULTS’’. If ‘‘NG’’ is displayed, refer to ‘‘Diagnostic Procedure’’, EC-QG-142.



Overall Function Check

NCEC0099

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 62 (Front heated oxygen sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

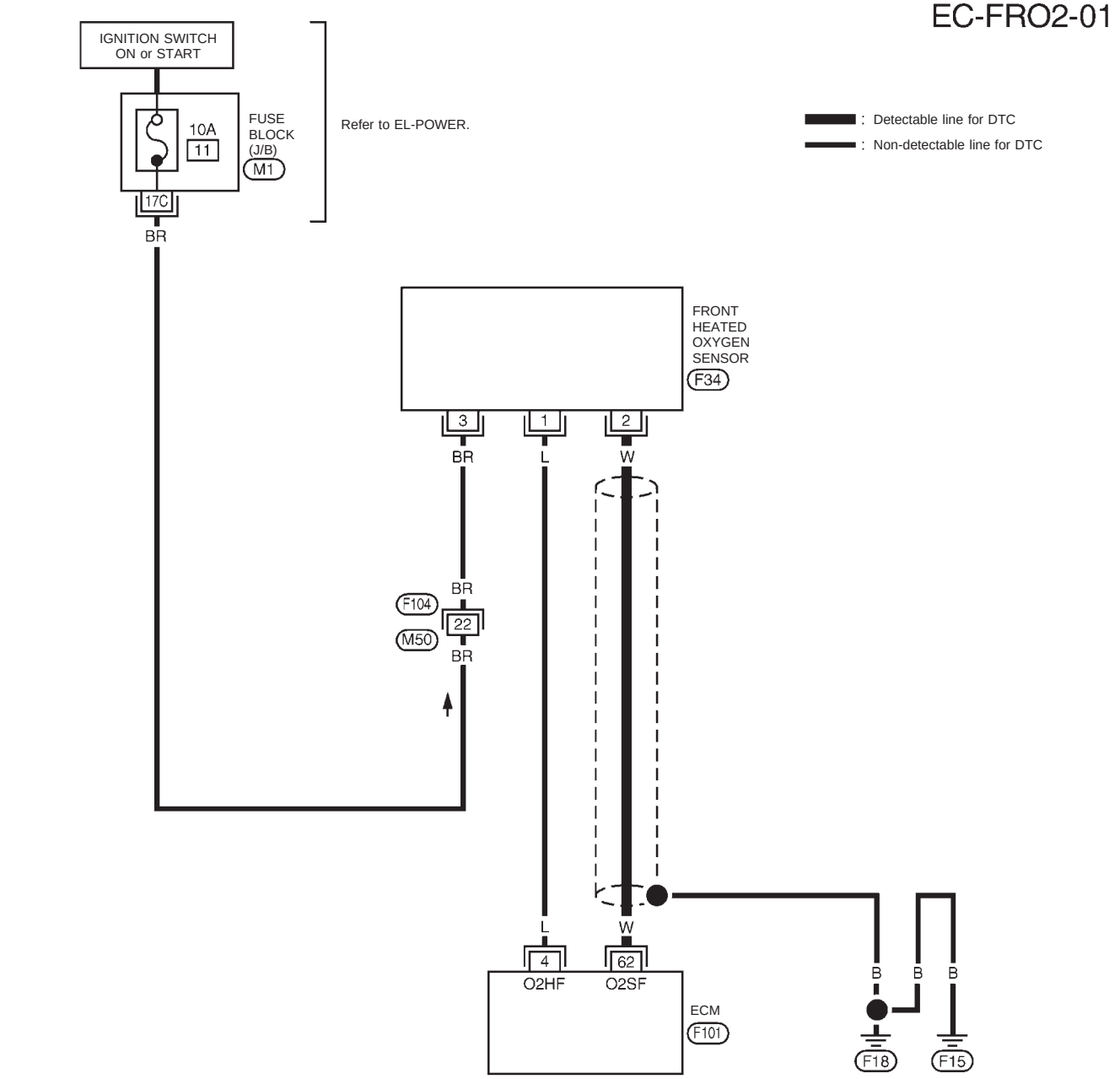
- The voltage does not remain in the range of 0.2 - 0.4V.

4) If NG, go to ‘‘Diagnostic Procedure’’, EC-QG-142.

Wiring Diagram

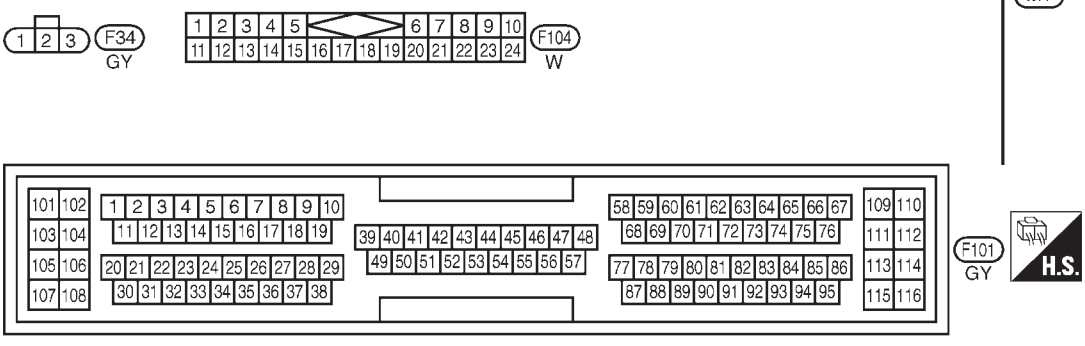
NCEC0100

EC-FRO2-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)



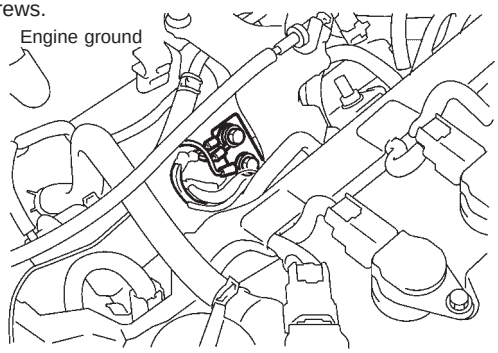
YEC263

Diagnostic Procedure

NCEC0101

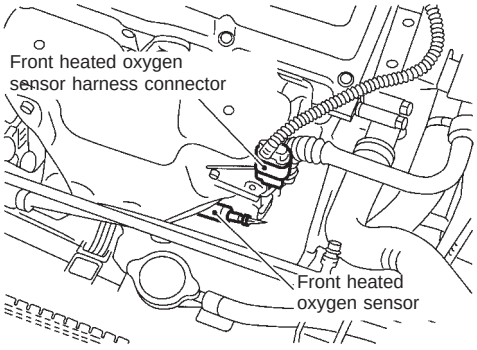
1	INSPECTION START

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



SEF994W

3. Disconnect front heated oxygen sensor harness connector.



SEF012X

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

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

OK or NG

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

3	CHECK FRONT HEATED OXYGEN SENSOR

Refer to ‘‘Component Inspection’’, EC-QG-143.

OK or NG

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

4	CHECK INTERMITTENT INCIDENT

Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-QG-108.

	▶	**INSPECTION END**

4

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
FR O2 MNTR-B1	LEAN
INJ PULSE-B1	XXX msec

NEF073A

5

cycle	1	2	3	4	5
FR O2 MNTR-B1	R-L	R-L	R-L	R-L	R-L

NEF074A

Component Inspection

NCEC0102

FRONT HEATED OXYGEN SENSOR

NCEC0102S01

With CONSULT-II

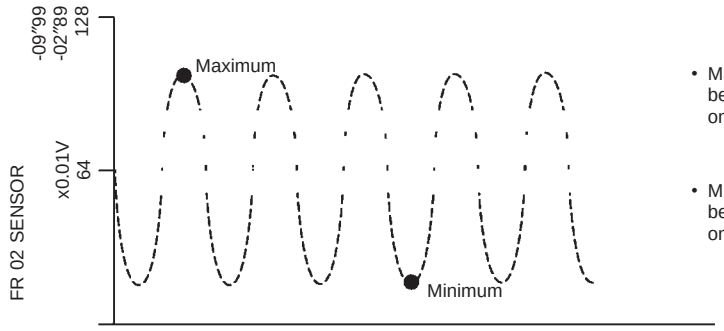
1) Start engine and warm it up to normal operating temperature.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode, and select "FR O2 SEN-B1" and "FR O2 MNTR-B1".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT-II screen.
5) Check the following.

- "FR O2 MNTR-B1" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "FR O2 MNTR-B1", "RICH"
  L = "FR O2 MNTR-B1", "LEAN"
- "FR O2 SEN-B1" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1" voltage goes below 0.3V at least once.
- "FR O2 SEN-B1" voltage never exceeds 1.0V.

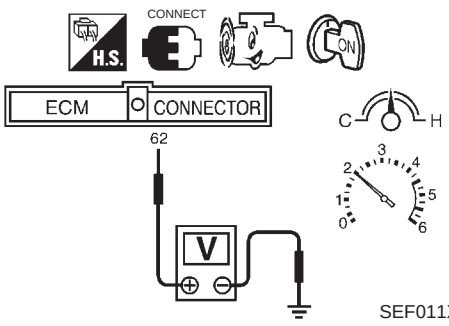
CAUTION:

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

SPREADSHEET			
REPLAY MODE	REPLAY MODE		
NUMERICAL	SHOW TRIGGER		
	CMPS-RPM	FR O2 SEN	
	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	



PEF736W



SEF011X

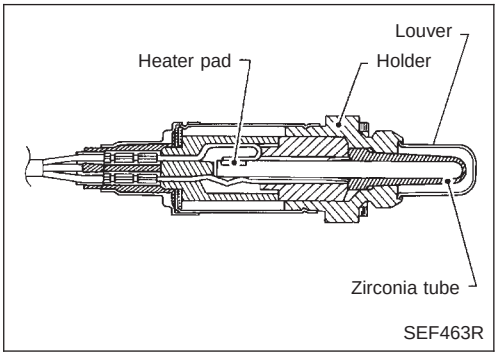
Without CONSULT-II

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

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

CAUTION:

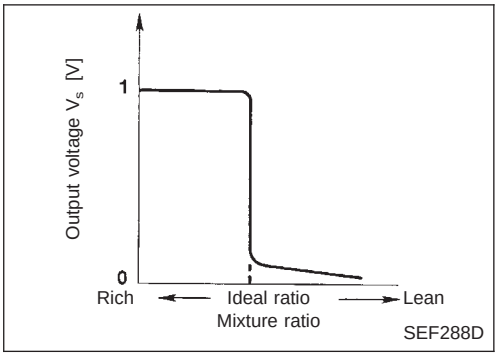
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



Component Description

NCEC0103

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

NCEC0104

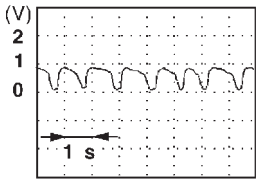
Specification data are reference values.

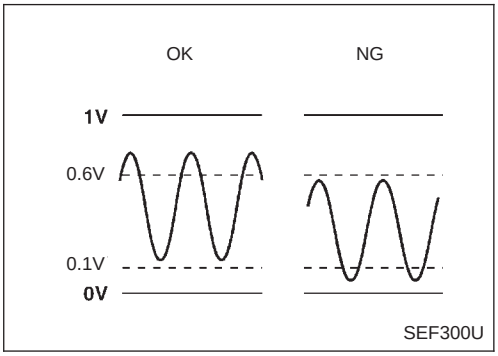
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SEN-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
FR O2 MNTR-B1			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM Terminals and Reference Value

NCEC0105

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

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

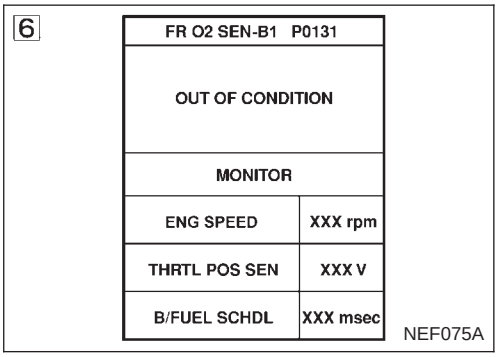


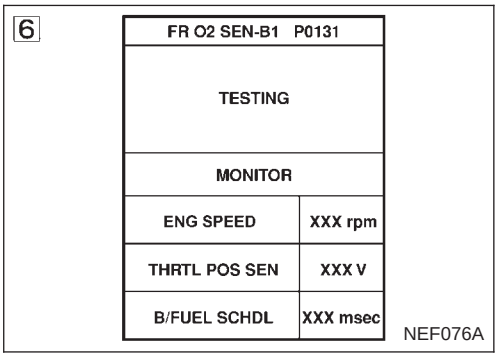
On Board Diagnosis Logic

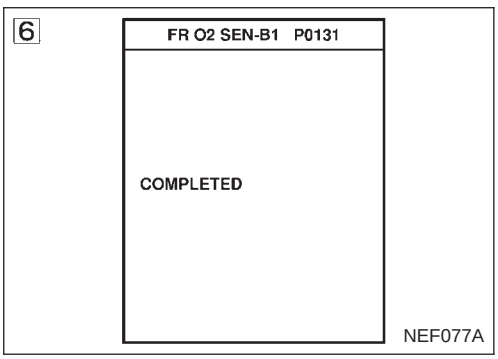
NCEC0106

To judge the malfunction, the output from the front heated oxygen sensor is monitored to determine whether the ''rich'' output is sufficiently high and whether the ''lean'' output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.

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







DTC Confirmation Procedure

NCEC0107

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 9 seconds.
3) Turn ignition switch ''ON'' and select ''FR O2 SEN-B1 P0131'' of ''FRONT O2 SENSOR'' in ''DTC WORK SUPPORT'' mode with CONSULT-II.
4) Touch ''START''.
5) Start engine and let it idle for at least 3 minutes.

NOTE:

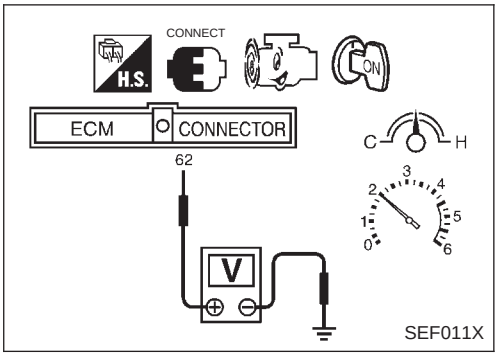
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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

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

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

7) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''. If ''NG'' is displayed, refer to ''Diagnostic Procedure'', EC-QG-146.



Overall Function Check

NCEC0108

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 62 (Front heated oxygen sensor 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-QG-146.

Diagnostic Procedure

NCEC0109

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

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

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

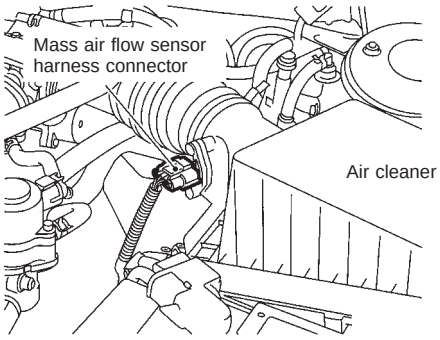
ACTIVE TEST	
SELF-LEARN CONTROL	100 %
MONITOR	
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA	XXX %

NEF078A

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.



SEF995W

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to ''HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION'', EC-QG-53.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0171 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171. Refer to EC-QG-209.
No	▶	GO TO 3.

3	CHECK FRONT HEATED OXYGEN SENSOR HEATER

Refer to ''Component Inspection'', EC-QG-173.

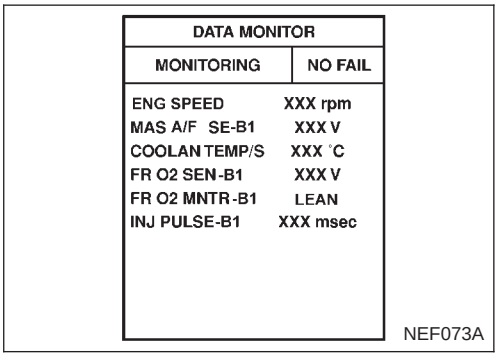
OK or NG

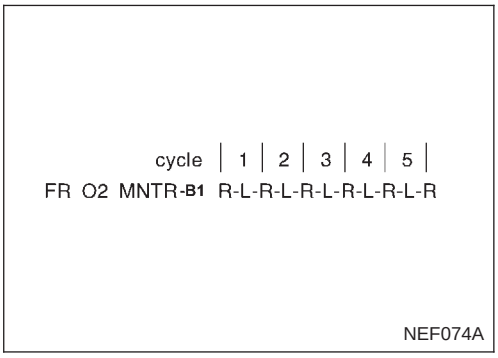
OK	▶	GO TO 4.
NG	▶	Replace front heated oxygen sensor.

Diagnostic Procedure (Cont'd)

4	CHECK FRONT HEATED OXYGEN SENSOR	
Refer to ''Component Inspection'', EC-QG-148. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Replace front heated oxygen sensor.

5	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108. Refer to ''Wiring Diagram'', EC-QG-141, for circuit.		
	▶	**INSPECTION END**





Component Inspection

NCEC0110

FRONT HEATED OXYGEN SENSOR

NCEC0110S02

With CONSULT-II

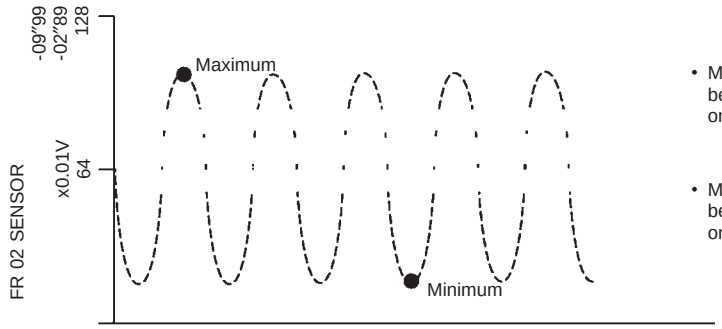
1) Start engine and warm it up to normal operating temperature.
2) Select ''MANU TRIG'' and ''HI SPEED'' in ''DATA MONITOR'' mode, and select ''FR O2 SENSOR'' and ''FR O2 MNTR''.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch ''RECORD'' on CONSULT-II screen.
5) Check the following.

- ''FR O2 MNTR'' in ''DATA MONITOR'' mode changes from ''RICH'' to ''LEAN'' to ''RICH'' 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = ''FR O2 MNTR'', ''RICH''
  L = ''FR O2 MNTR'', ''LEAN''
- ''FR O2 SENSOR'' voltage goes above 0.6V at least once.
- ''FR O2 SENSOR'' voltage goes below 0.3V at least once.
- ''FR O2 SENSOR'' voltage never exceeds 1.0V.

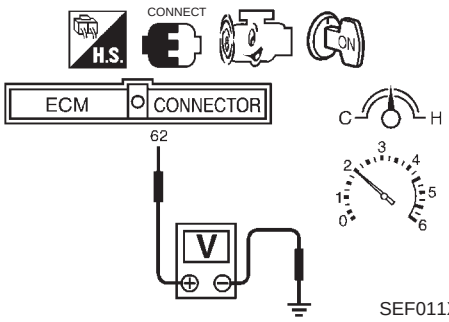
CAUTION:

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.

SPREADSHEET			
REPLAY MODE	REPLAY MODE		
NUMERICAL	SHOW TRIGGER		
	CMPS·RPM	FR O2 SEN	
	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	



- Maximum voltage should be over 0.6 V at least one time.
- Minimum voltage should be below 0.3 V at least one time.



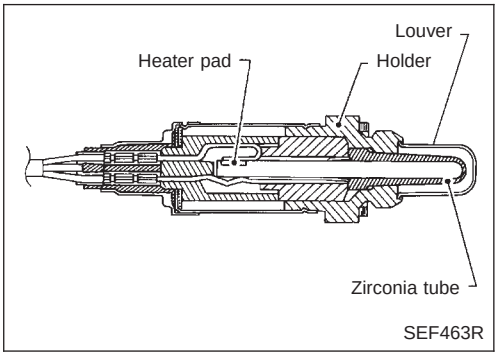
Without CONSULT-II

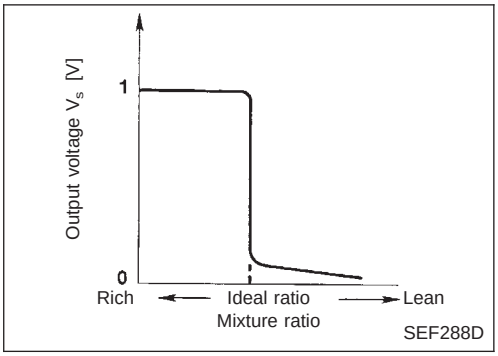
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (Front heated oxygen sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

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.





Component Description

NCEC0111

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

NCEC0112

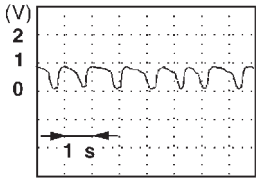
Specification data are reference values.

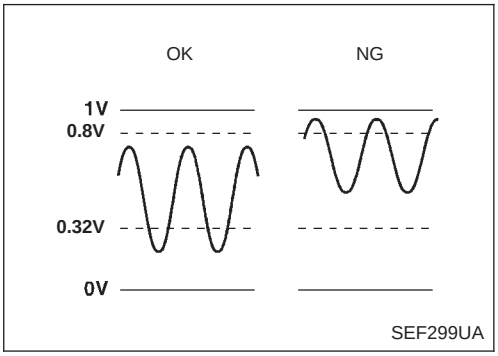
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SEN-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
FR O2 MNTR-B1			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM Terminals and Reference Value

NCEC0113

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

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

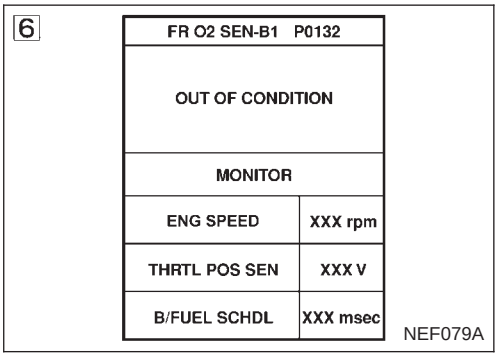


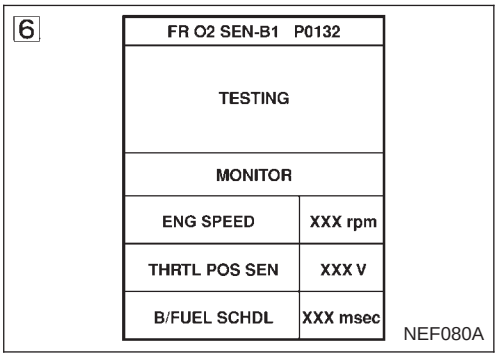
On Board Diagnosis Logic

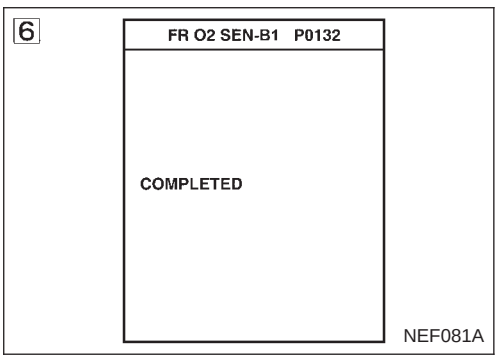
NCEC0114

To judge the malfunction, the output from the front heated oxygen sensor is monitored to determine whether the ''rich'' output is sufficiently high. The ''lean'' output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.

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







DTC Confirmation Procedure

NCEC0115

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 9 seconds.
3) Turn ignition switch ''ON'' and select ''FR O2 SEN-B1 P0132'' of ''FRONT O2 SENSOR'' in ''DTC WORK SUPPORT'' mode with CONSULT-II.
4) Touch ''START''.
5) Start engine and let it idle for at least 3 minutes.

NOTE:

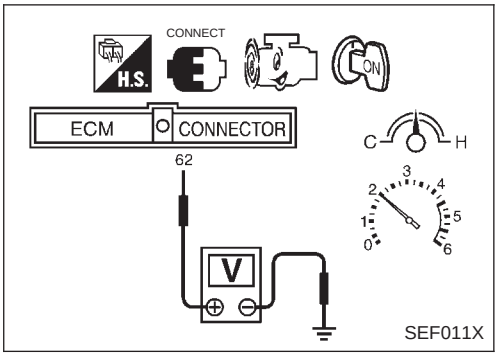
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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

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

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

7) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''. If ''NG'' is displayed, refer to ''Diagnostic Procedure'', EC-QG-152.



Overall Function Check

NCEC0116

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 62 (Front heated oxygen sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.
- The maximum voltage is below 0.8V at least one time.
- The minimum voltage is below 0.3V at least one time.

4) If NG, go to ''Diagnostic Procedure'', EC-QG-152.

Diagnostic Procedure

NCEC0117

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

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

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

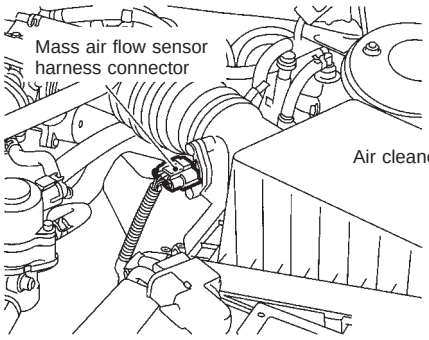
ACTIVE TEST	
SELF-LEARN CONTROL	100 %
MONITOR	
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA	XXX %

NEF078A

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.



SEF995W

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to ''HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION'', EC-QG-53.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-QG-215.
No	▶	GO TO 3.

3	CHECK HARNESS CONNECTOR

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

OK or NG

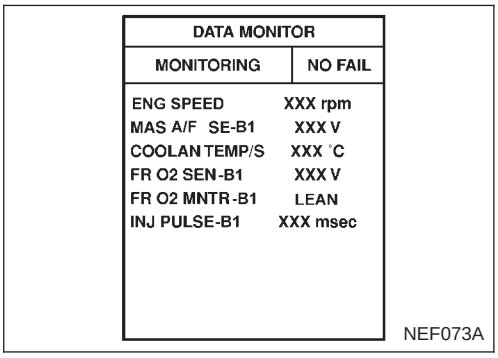
OK	▶	GO TO 4.
NG	▶	Repair or replace harness connector.

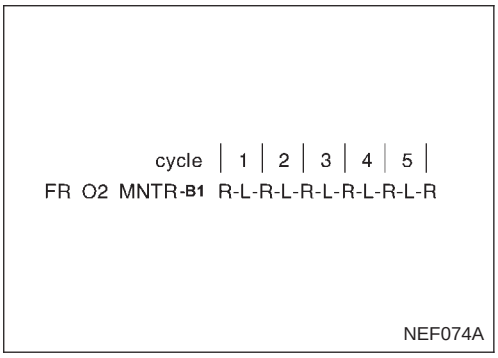
Diagnostic Procedure (Cont'd)

4	CHECK FRONT HEATED OXYGEN SENSOR HEATER	
Refer to ''Component Inspection'', EC-QG-173.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace front heated oxygen sensor.

5	CHECK FRONT HEATED OXYGEN SENSOR	
Refer to ''Component Inspection'', EC-QG-154.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Replace front heated oxygen sensor.

6	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108. Refer to ''Wiring Diagram'', EC-QG-141, for circuit.		
	▶	**INSPECTION END**





Component Inspection

NCEC0118

FRONT HEATED OXYGEN SENSOR

NCEC0118S02

With CONSULT-II

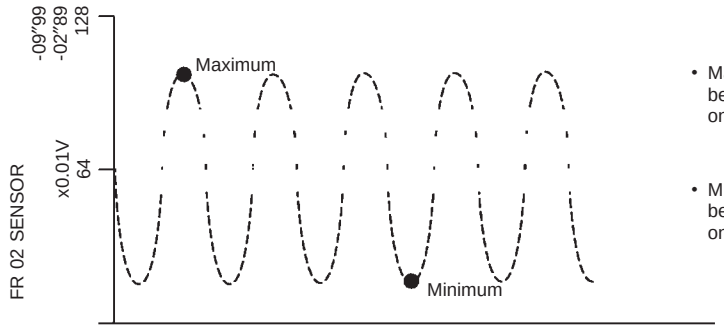
1) Start engine and warm it up to normal operating temperature.
2) Select ''MANU TRIG'' and ''HI SPEED'' in ''DATA MONITOR'' mode, and select ''FR O2 SEN-B1'' and ''FR O2 MNTR-B1''.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch ''RECORD'' on CONSULT-II screen.
5) Check the following.

- ''FR O2 MNTR-B1'' in ''DATA MONITOR'' mode changes from ''RICH'' to ''LEAN'' to ''RICH'' 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = ''FR O2 MNTR-B1'', ''RICH''
  L = ''FR O2 MNTR-B1'', ''LEAN''
- ''FR O2 SEN-B1'' voltage goes above 0.6V at least once.
- ''FR O2 SEN-B1'' voltage goes below 0.3V at least once.
- ''FR O2 SEN-B1'' voltage never exceeds 1.0V.

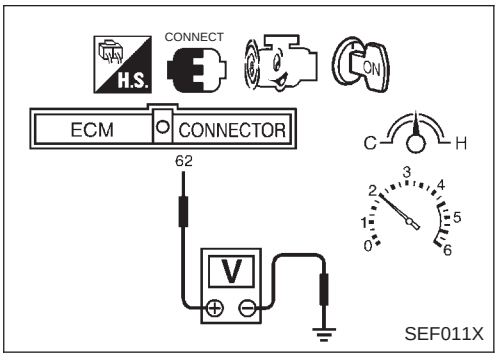
CAUTION:

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

SPREADSHEET			
REPLAY MODE	REPLAY MODE		
NUMERICAL	SHOW TRIGGER		
	CMPS·RPM	FR O2 SEN	
	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	



- Maximum voltage should be over 0.6 V at least one time.
- Minimum voltage should be below 0.3 V at least one time.



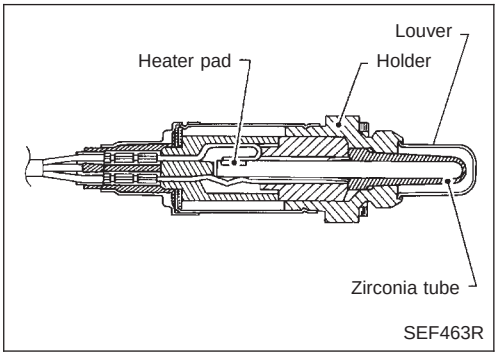
Without CONSULT-II

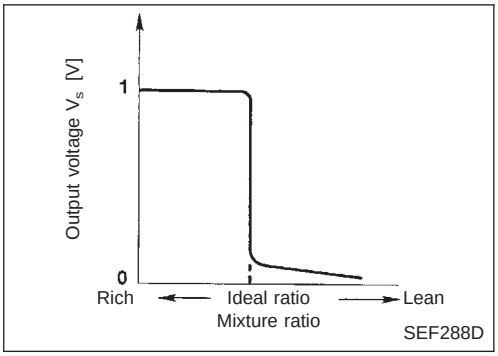
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (Front heated oxygen sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

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.





Component Description

NCEC0119

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

NCEC0120

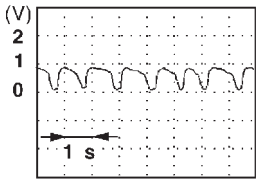
Specification data are reference values.

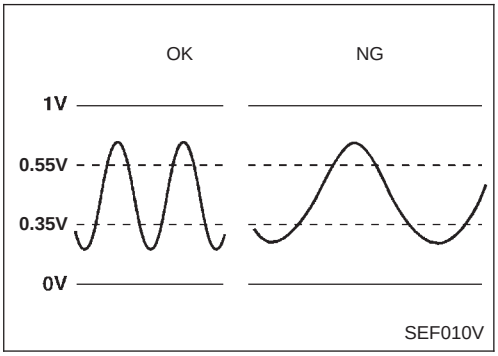
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SEN-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
FR O2 MNTR-B1			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM Terminals and Reference Value

NCEC0121

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	R	Front heated oxygen sensor	**[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

NCEC0122

To judge the malfunction of front heated oxygen sensor, this diagnosis measures response time of front heated oxygen sensor signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and front heated oxygen sensor temperature index. Judgment is based on whether the compensated time (front heated oxygen sensor 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.) ● Front heated oxygen sensor ● Front heated oxygen sensor heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV ● Mass air flow sensor

6

FR O2 SEN-B1 P0133	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF082A

6

FR O2 SEN-B1 P0133	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF083A

6

FR O2 SEN-B1 P0133
COMPLETED

NEF084A

DTC Confirmation Procedure

NCEC0123

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 9 seconds.
3) Turn ignition switch ‘‘ON’’ and select ‘‘FR O2 SEN-B1 P0133’’ of ‘‘FRONT O2 SENSOR’’ in ‘‘DTC WORK SUPPORT’’ mode with CONSULT-II.
4) Touch ‘‘START’’.
5) Start engine and let it idle for at least 3 minutes.

NOTE:

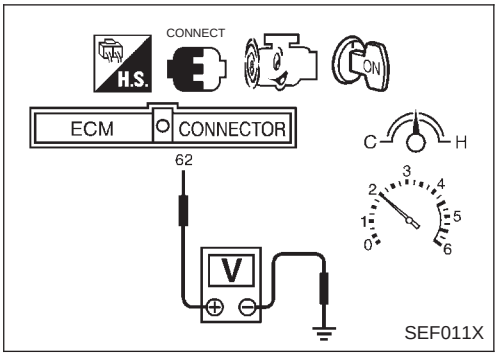
Never raise engine speed above 3,200 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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

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

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

7) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''. If ''NG'' is displayed, refer to ''Diagnostic Procedure'', EC-QG-160.



Overall Function Check

NCEC0124

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 62 (Front heated oxygen sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

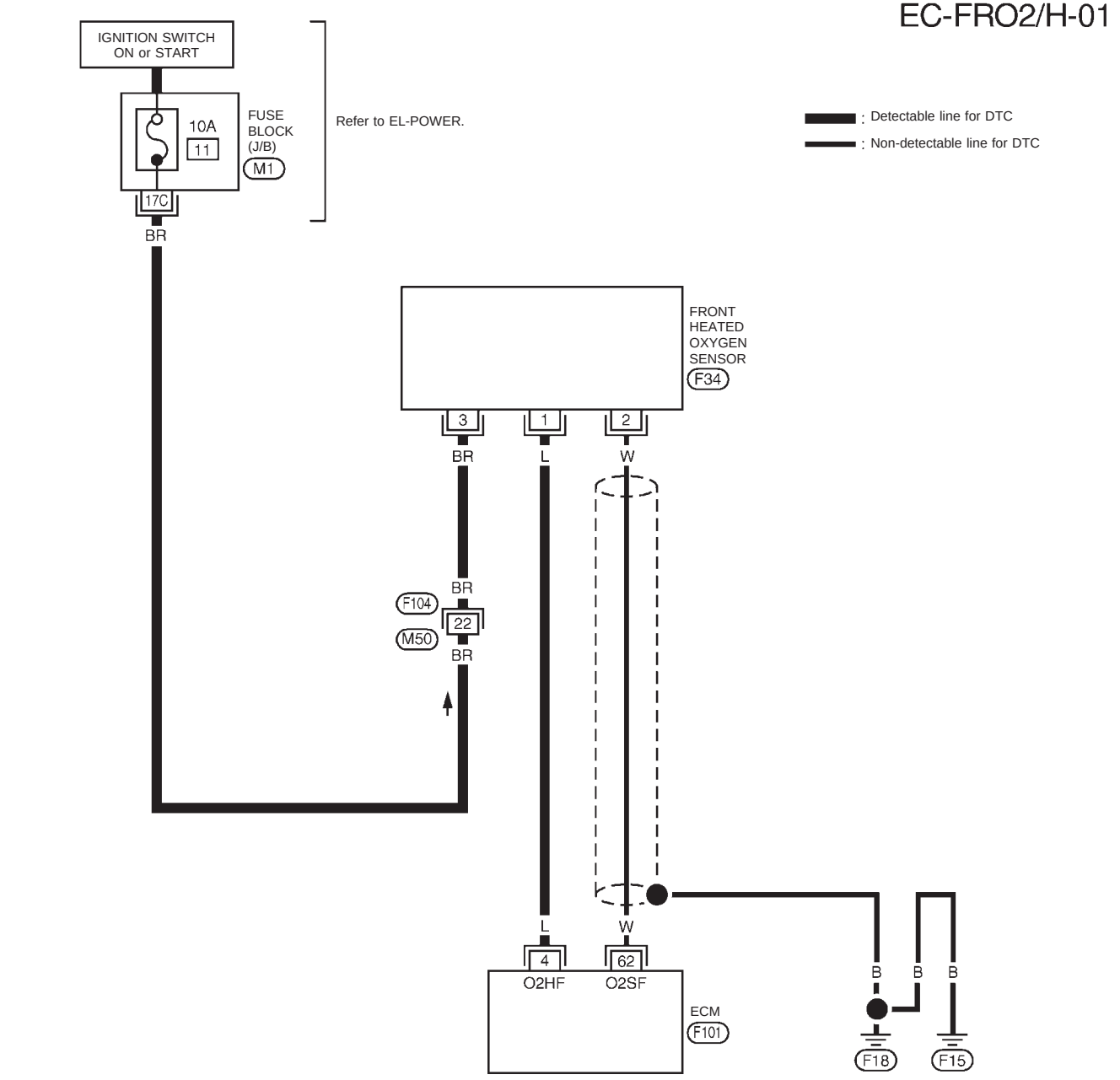
- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).

4) If NG, go to ''Diagnostic Procedure'', EC-QG-160.

Wiring Diagram

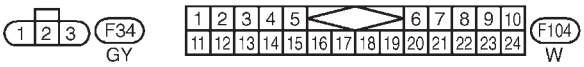
NCEC0125

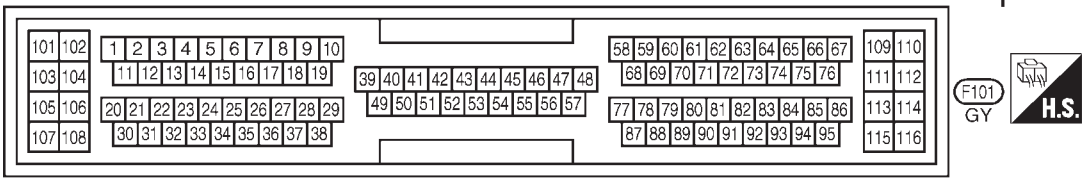
EC-FRO2/H-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)





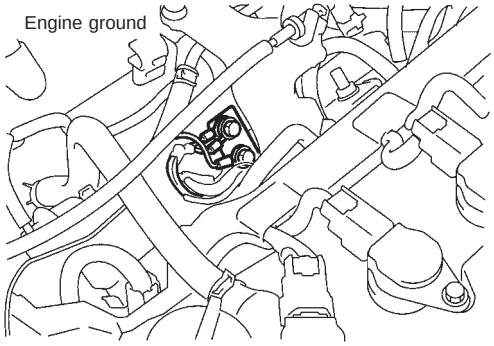
YEC264

Diagnostic Procedure

NCEC0126

1	RETIGHTEN GROUND SCREWS

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



SEF994W

▶	GO TO 2.

2	RETIGHTEN FRONT HEATED OXYGEN SENSOR

Loosen and retighten front heated oxygen sensor.

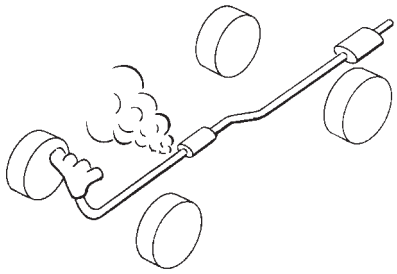
Tightening torque:

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

▶	GO TO 3.

3	CHECK EXHAUST AIR LEAK

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



SEF099P

OK or NG

OK	▶	GO TO 4.
NG	▶	Repair or replace.

4	CHECK FOR INTAKE AIR LEAK

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

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair or replace.

5	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

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

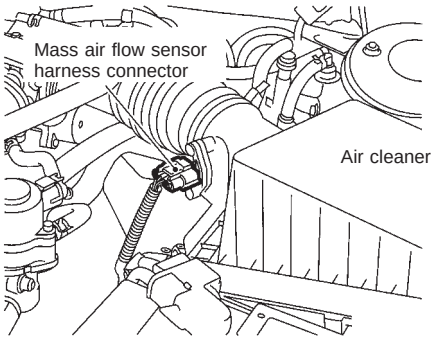
ACTIVE TEST	
SELF-LEARN CONTROL	100 %
MONITOR	
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA	XXX %

NEF078A

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.



SEF995W

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to ''HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION'', EC-QG-53.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0171 or 0172 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171, P0172. Refer to EC-QG-209, 215.
No	▶	GO TO 6.

6	CHECK INPUT SIGNAL CIRCUIT

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

OK or NG

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

Diagnostic Procedure (Cont'd)

7	CHECK FRONT HEATED OXYGEN SENSOR HEATER	
Refer to ''Component Inspection'', EC-QG-173.		
OK or NG		
OK	▶	GO TO 8.
NG	▶	Replace front heated oxygen sensor.

8	CHECK FRONT HEATED OXYGEN SENSOR	
Refer to ''Component Inspection'', EC-QG-163.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	Replace front heated oxygen sensor.

9	CHECK MASS AIR FLOW SENSOR	
Refer to ''Component Inspection'', EC-QG-120.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	Replace mass air flow sensor.

10	CHECK PCV VALVE	
Refer to ''Positive Crankcase Ventilation'', EC-QG-28.		
OK or NG		
OK	▶	GO TO 11.
NG	▶	Repair or replace PCV valve.

11	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**

4

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
FR O2 MNTR-B1	LEAN
INJ PULSE-B1	XXX msec

NEF073A

5

cycle	1	2	3	4	5
FR O2 MNTR-B1	R-L	R-L	R-L	R-L	R-L

NEF074A

Component Inspection

NCEC0127

FRONT HEATED OXYGEN SENSOR

NCEC0127S02

With CONSULT-II

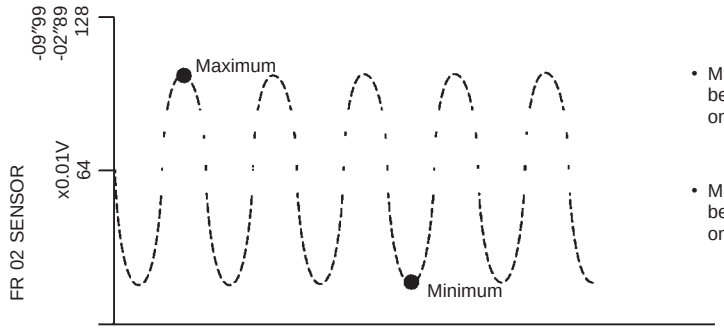
1) Start engine and warm it up to normal operating temperature.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode, and select "FR O2 SEN-B1" and "FR O2 MNTR-B1".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT-II screen.
5) Check the following.

- "FR O2 MNTR-B1" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" five times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "FR O2 MNTR-B1", "RICH"
  L = "FR O2 MNTR-B1", "LEAN"
- "FR O2 SEN-B1" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1" voltage goes below 0.3V at least once.
- "FR O2 SEN-B1" voltage never exceeds 1.0V.

CAUTION:

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

SPREADSHEET			
REPLAY MODE	REPLAY MODE		
NUMERICAL	SHOW TRIGGER		
	CMPS-RPM	FR O2 SEN	
	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	



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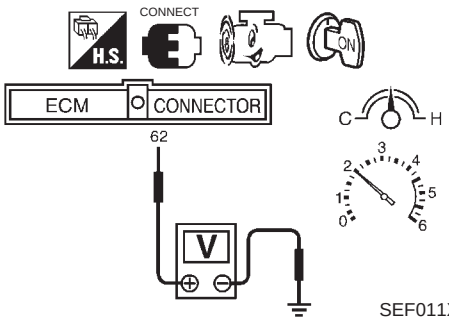


SEF011X

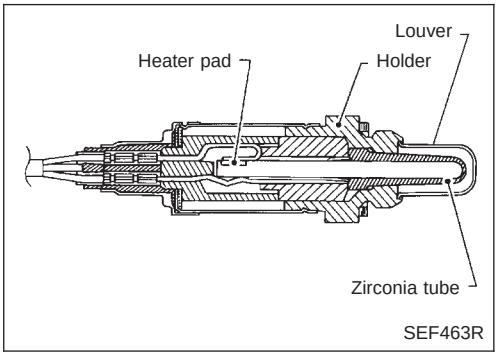
Without CONSULT-II

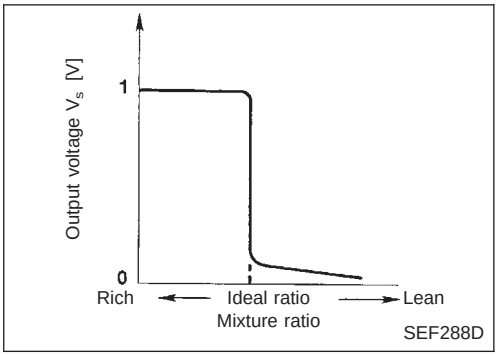
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 62 (Front heated oxygen sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

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.





Component Description

NCEC0128

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

NCEC0129

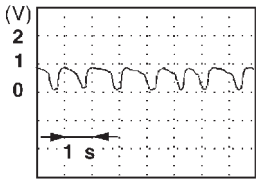
Specification data are reference values.

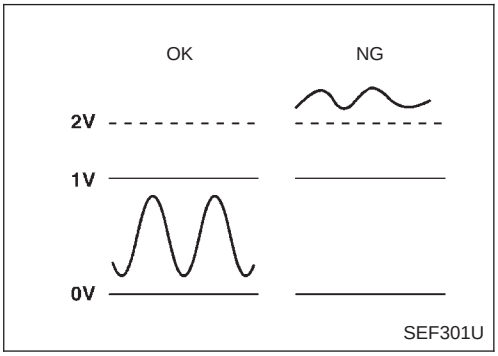
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SEN-B1	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
FR O2 MNTR-B1			LEAN ←→ RICH Changes more than 5 times during 10 seconds.

ECM Terminals and Reference Value

NCEC0130

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

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

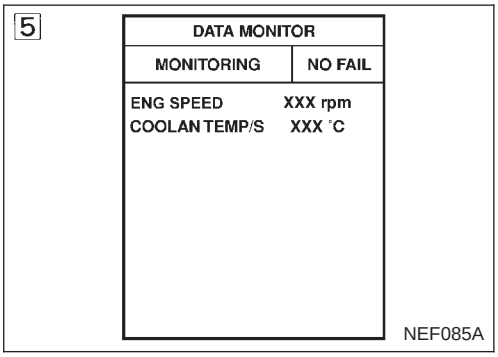


On Board Diagnosis Logic

NCEC0131

To judge the malfunction, the diagnosis checks that the front heated oxygen sensor 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.) ● Front heated oxygen sensor



DTC Confirmation Procedure

NCEC0132

NOTE:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 9 seconds.
3) Turn ignition switch ''ON''.
4) Select ''DATA MONITOR'' mode with CONSULT-II.
5) Restart engine and let it idle for 2 minutes.
6) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-167.

With GST

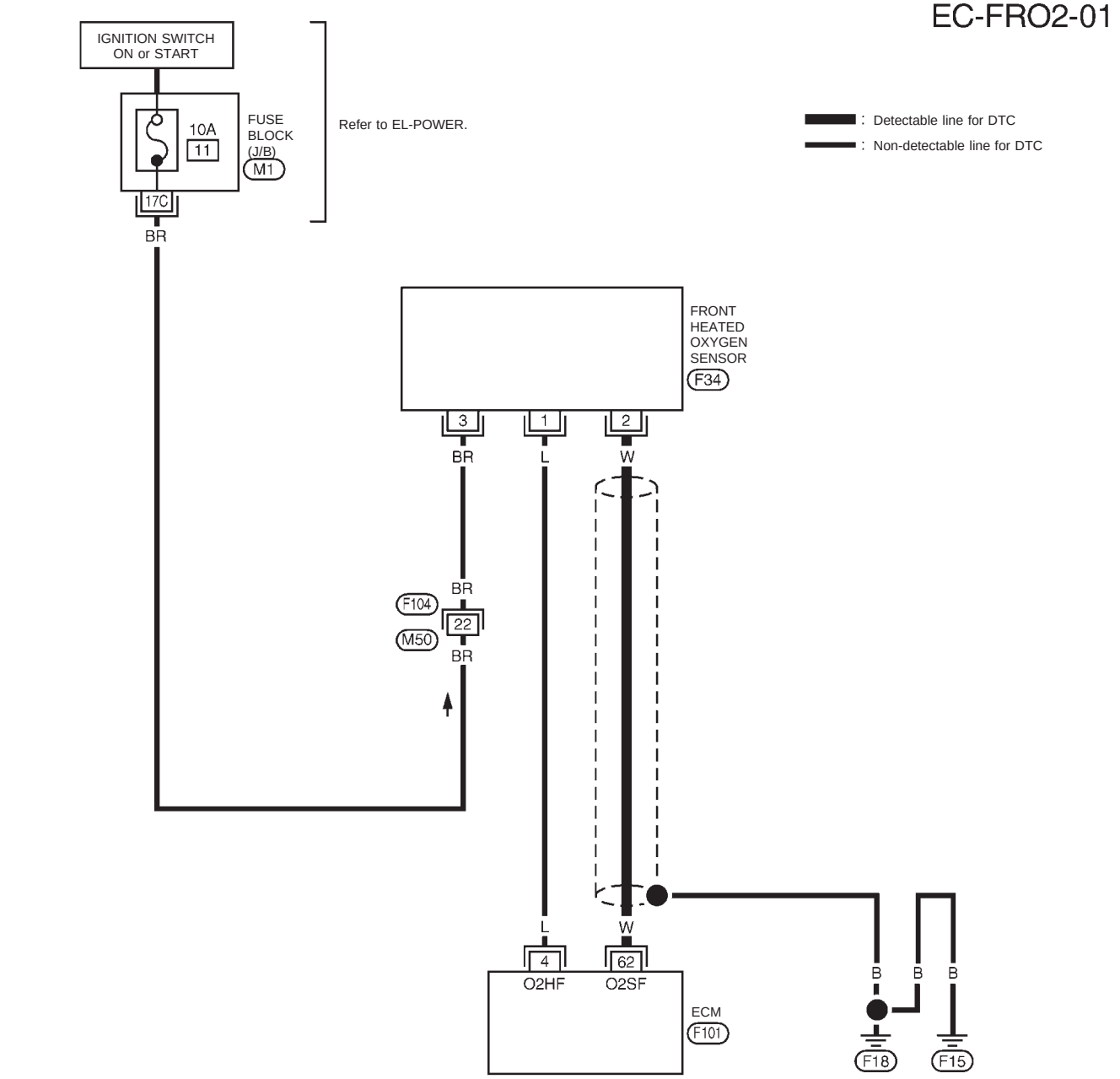
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 9 seconds.
3) Restart engine and let it idle for 2 minutes.
4) Turn ignition switch ''OFF'' and wait at least 9 seconds.
5) Restart engine and let it idle for 2 minutes.
6) Select ''MODE 3'' with GST.
7) If DTC is detected, go to ''Diagnostic Procedure'', EC-QG-167.

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

Wiring Diagram

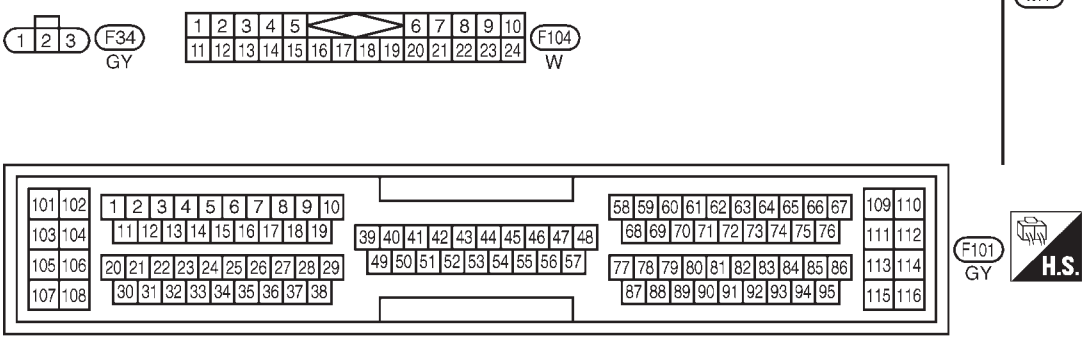
NCEC0133

EC-FRO2-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)



YEC263

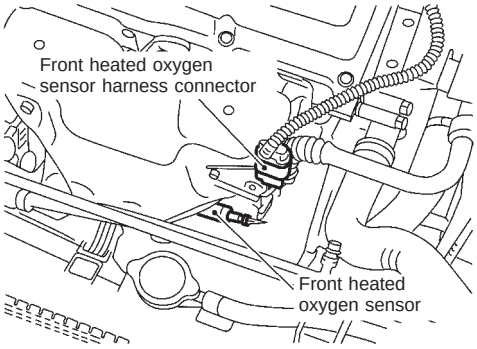
Diagnostic Procedure

NCEC0134

1	RETIGHTEN FRONT HEATED OXYGEN SENSOR
Loosen and retighten front heated oxygen sensor. **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 front heated oxygen sensor harness connector and ECM harness connector.



SEF012X

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

OK or NG

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

3	CHECK HARNESS CONNECTOR
Check front heated oxygen sensor harness connector for water. **Water should not exist.**	
OK or NG	
OK ▶	GO TO 4.
NG ▶	Repair or replace harness connector.

4	CHECK FRONT HEATED OXYGEN SENSOR
Refer to ‘‘Component Inspection’’, EC-QG-168.	
OK or NG	
OK ▶	GO TO 5.
NG ▶	Replace front heated oxygen sensor.

5	CHECK INTERMITTENT INCIDENT
Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-QG-108.	
▶	**INSPECTION END**

4

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
FR O2 MNTR-B1	LEAN
INJ PULSE-B1	XXX msec

NEF073A

5

cycle	1	2	3	4	5
FR O2 MNTR-B1	R-L	R-L	R-L	R-L	R-L

NEF074A

Component Inspection

NCEC0135

FRONT HEATED OXYGEN SENSOR

NCEC0135S01

With CONSULT-II

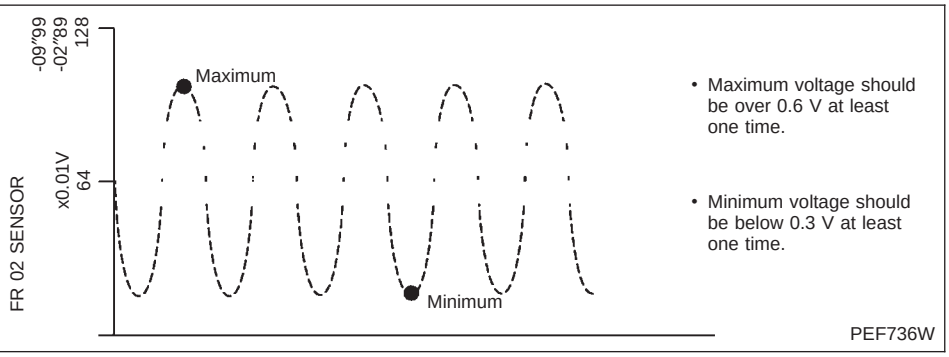
1) Start engine and warm it up to normal operating temperature.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode, and select "FR O2 SEN-B1" and "FR O2 MNTR-B1".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT-II screen.
5) Check the following.

- "FR O2 MNTR-B1" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" five times in 10 seconds.
  5 times (cycles) are counted as shown below:
  R = "FR O2 MNTR-B1", "RICH"
  L = "FR O2 MNTR-B1", "LEAN"
- "FR O2 SEN-B1" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1" voltage goes below 0.3V at least once.
- "FR O2 SEN-B1" voltage never exceeds 1.0V.

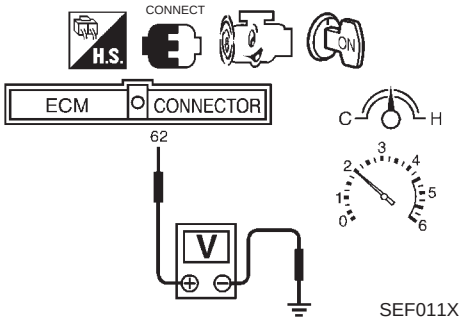
CAUTION:

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

SPREADSHEET			
REPLAY MODE	REPLAY MODE		
NUMERICAL	SHOW TRIGGER		
	CMPS-RPM	FR O2 SEN	
	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	



PEF736W



SEF011X

Without CONSULT-II

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

- Malfunction indicator goes on more than five times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

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.

Description

NCEC0136

SYSTEM DESCRIPTION

NCEC0136S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Front heated oxygen sensor heater control	Front heated oxygen sensor heater

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

OPERATION

NCEC0136S02

Engine speed	Front heated oxygen sensor heater
Above 3,200 rpm	OFF
Below 3,200 rpm	ON

CONSULT-II Reference Value in Data Monitor Mode

NCEC0137

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 HTR-B1	● Engine speed: Below 3,200 rpm	ON
	● Engine speed: Above 3,200 rpm	OFF

ECM Terminals and Reference Value

NCEC0138

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

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

On Board Diagnosis Logic

NCEC0139

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

DTC Confirmation Procedure

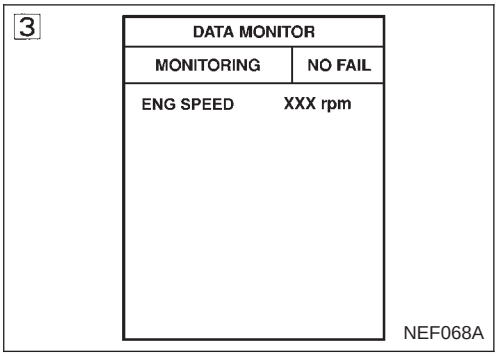
NCEC0140

NOTE:

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

TESTING CONDITION:

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



With CONSULT-II

1) Turn ignition switch ‘‘ON’’ and select ‘‘DATA MONITOR’’ mode with CONSULT-II.
2) Start engine and run it for at least 5 seconds at idle speed.
3) If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-172.

With GST

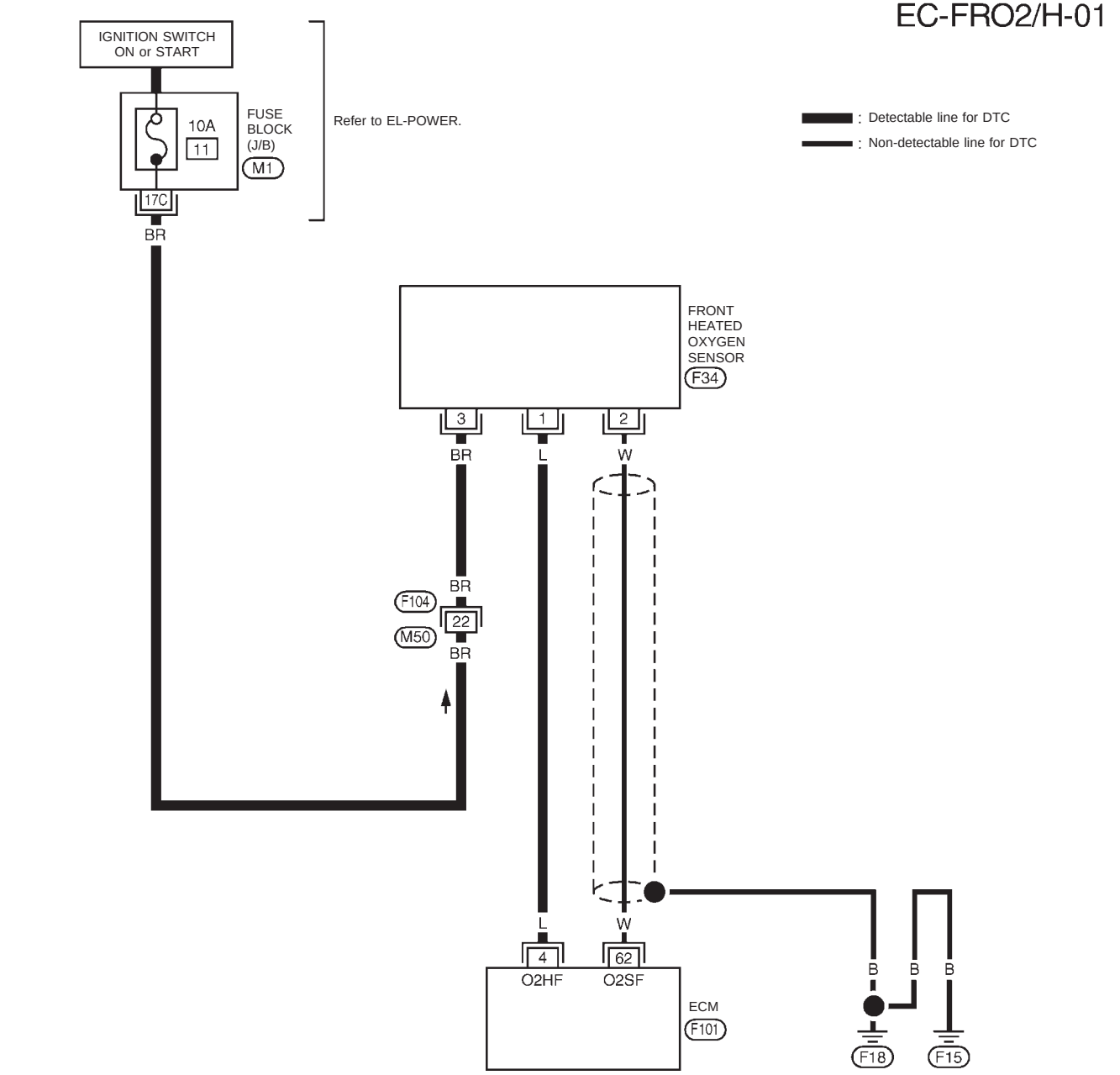
1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch ‘‘OFF’’ and wait at least 9 seconds.
3) Start engine and run it for at least 5 seconds at idle speed.
4) Select ‘‘MODE 3’’ with GST.
5) If DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-172.

- **When using GST, ‘‘DTC Confirmation Procedure’’ should be performed twice as much as when using CONSULT-II or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II or ECM (Diagnostic Test Mode II) is recommended.**

Wiring Diagram

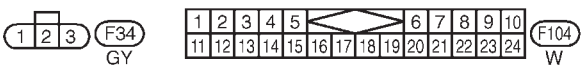
NCEC0141

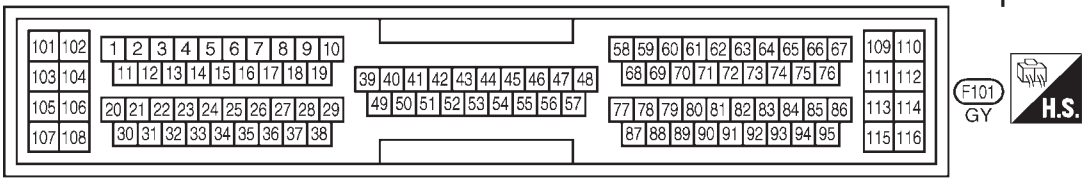
EC-FRO2/H-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)





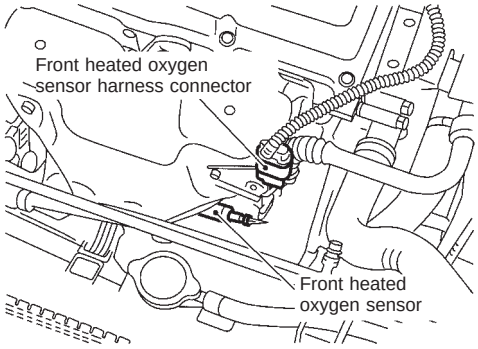
YEC264

Diagnostic Procedure

NCEC0142

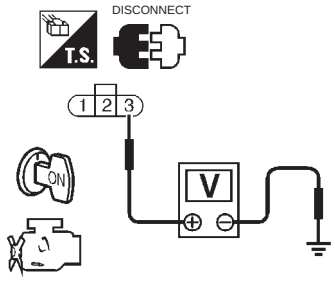
1	CHECK POWER SUPPLY

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



SEF012X

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



SEF025X

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M63, F3
- 10A fuse
- Harness for open or short between front heated oxygen sensor and fuse

	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

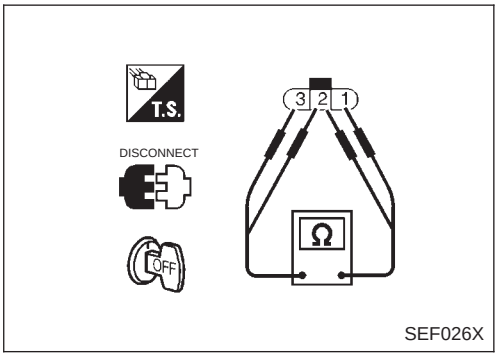
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between front heated oxygen sensor harness connector terminal 1 and ECM terminal 4.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK FRONT HEATED OXYGEN SENSOR HEATER	
Refer to ''Component Inspection'', EC-QG-173. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Replace front heated oxygen sensor.

5	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



SEF026X

Component Inspection

NCEC0143

FRONT HEATED OXYGEN SENSOR HEATER

NCEC0143S01

Check resistance between terminals 3 and 1.

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

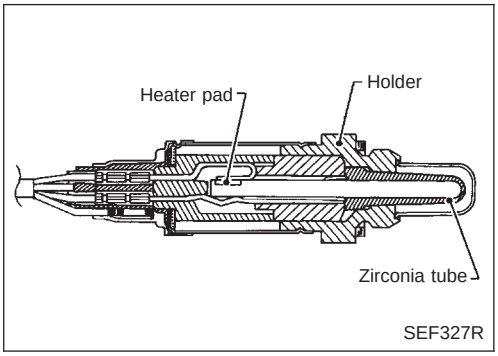
Check continuity between terminals 2 and 1, 3 and 2.

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

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.



Component Description

NCEC0144

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.
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 rear heated oxygen sensor is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0145

Specification data are reference values.

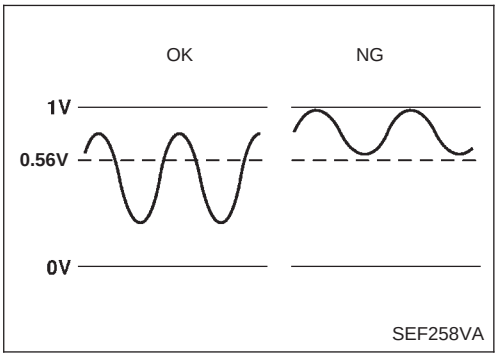
MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SEN-B1	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
RR O2 MNTR-B1			LEAN ←→ RICH

ECM Terminals and Reference Value

NCEC0146

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63	L	Rear heated oxygen sensor	**[Engine is running]** ● After warming up to normal operating temperature and engine speed is 3,000 rpm	0 - Approximately 1.0V

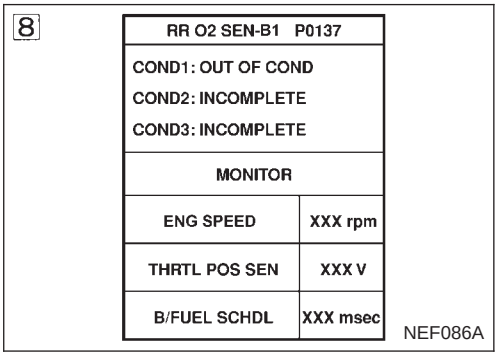


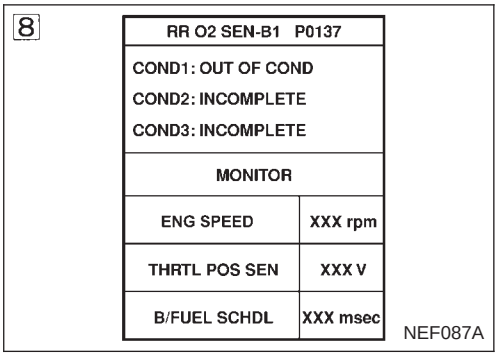
On Board Diagnosis Logic

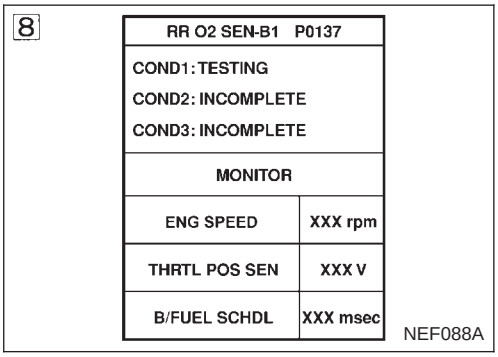
NCEC0147

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

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0137 0137	● The minimum voltage from the sensor does not reach the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors







DTC Confirmation Procedure

NCEC0148

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- **''COMPLETED'' will appear on CONSULT-II screen when all tests ''COND1'', ''COND2'' and ''COND3'' are completed.**
- If ''DTC Confirmation Procedure'' has been previously conducted, always turn ignition switch ''OFF'' and wait at least 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

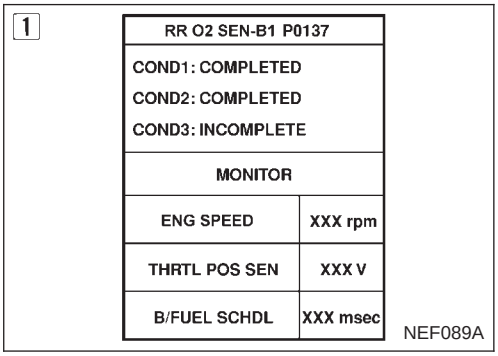
Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 9 seconds.
3) Turn ignition switch ''ON'' and select ''RR O2 SEN-B1 P0137'' of ''REAR O2 SEN-B1'' in ''DTC WORK SUPPORT'' mode with CONSULT-II.
4) Touch ''START''.
5) Start engine and let it idle for at least 30 seconds.
6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load. If ''COMPLETED'' appears on CONSULT-II screen, go to step 2 in ''Procedure for COND3''.
   If ''COMPLETED'' does not appear on CONSULT-II screen, go to the following step.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) When the following conditions are met, ''TESTING'' will be displayed at ''COND1'' on the CONSULT-II screen. Maintain the conditions continuously until ''TESTING'' changes to ''COMPLETED''. (It will take approximately 60 seconds.)

ENG SPEED	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
B/FUEL SCHDL	Above 2.7 msec
Selector lever	Suitable position

NOTE:

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

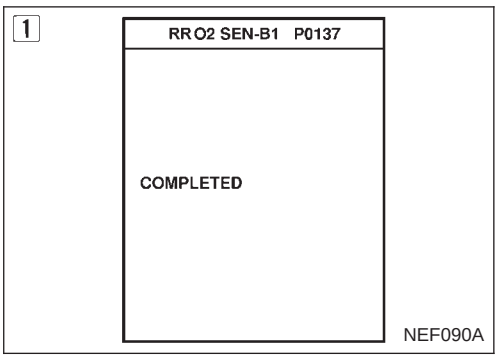


Procedure for COND2

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

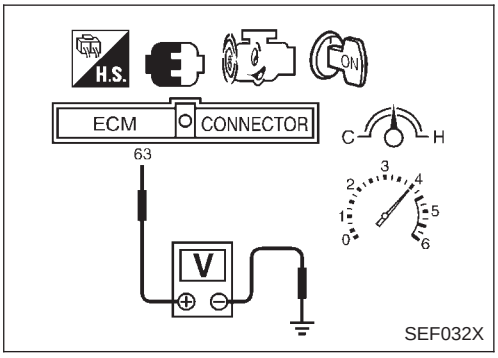
NOTE:

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



Procedure for COND3

1) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT-II screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
2) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-QG-178.



Overall Function Check

NCEC0149

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

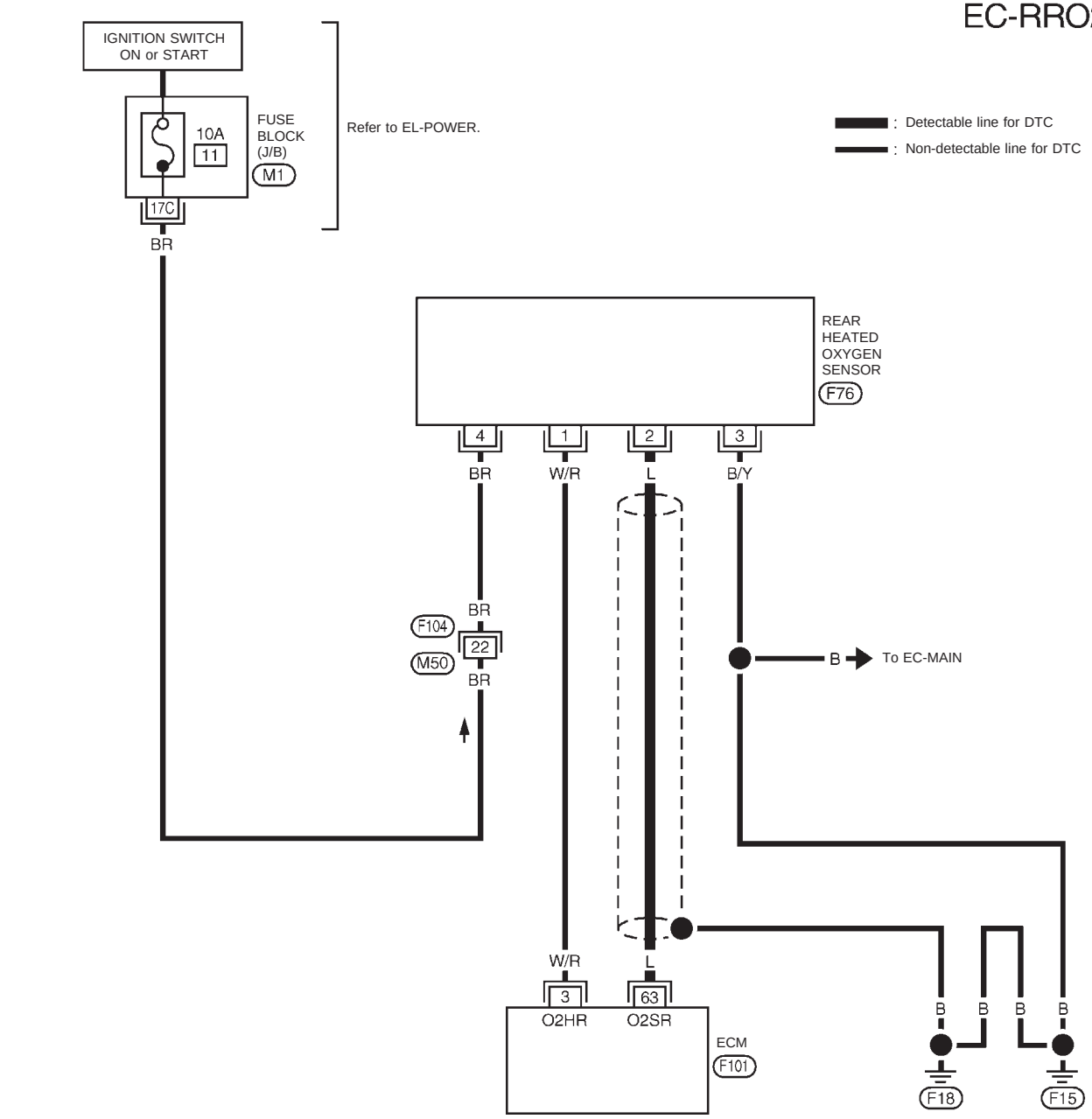
Without CONSULT-II

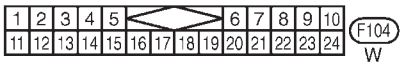
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.56V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage.
   Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-QG-178.

Wiring Diagram

NCEC0150

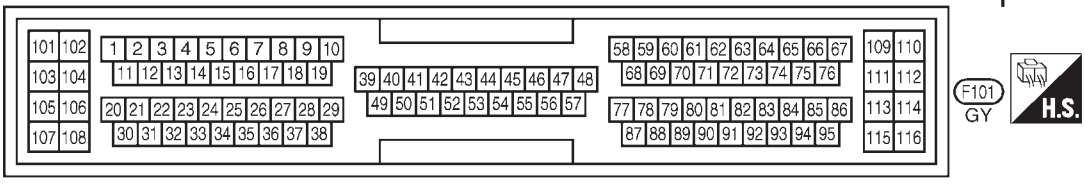
EC-RRO2-01





REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

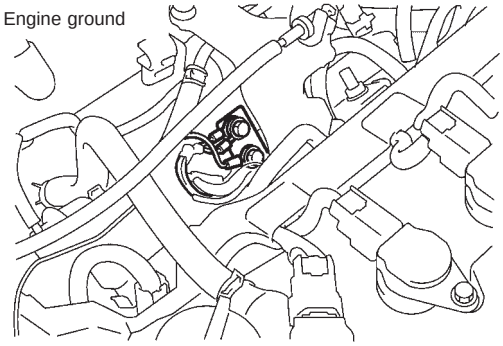


Diagnostic Procedure

NCEC0151

1	RETIGHTEN GROUND SCREWS

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



SEF994W

►	GO TO 2.

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

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

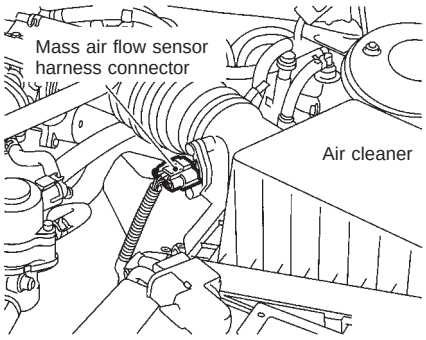
ACTIVE TEST	
SELF-LEARN CONTROL	100 %
MONITOR	
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA	XXX %

NEF078A

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.



SEF995W

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to ''HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION'', EC-QG-53.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0172 detected? Is it difficult to start engine?

Yes or No

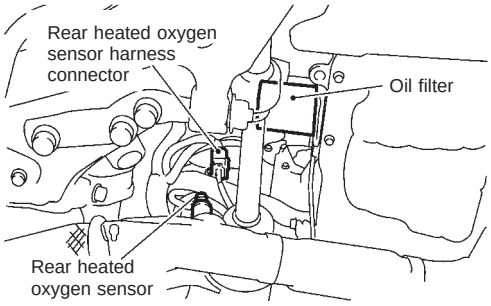
Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-QG-215.
No	▶	GO TO 3.

Diagnostic Procedure (Cont'd)

3	CHECK INPUT SIGNAL CIRCUIT

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

View from the underside of the vehicle



SEF033X

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

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the harness for open or short between rear heated oxygen sensor 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 rear heated oxygen sensor harness connector terminal 3 and body ground. Refer to wiring diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

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

6	CHECK REAR HEATED OXYGEN SENSOR

Refer to "Component Inspection", EC-QG-181.

OK or NG

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

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-QG-108.

	▶	**INSPECTION END**

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
	XXX rpm
FR O2 SEN-B1	XXX V
RR O2 SEN-B1	XXX V
FR O2 MNTR-B1	RICH
RR O2 MNTR-B1	RICH

NEF091A

Component Inspection

NCEC0152

REAR HEATED OXYGEN SENSOR

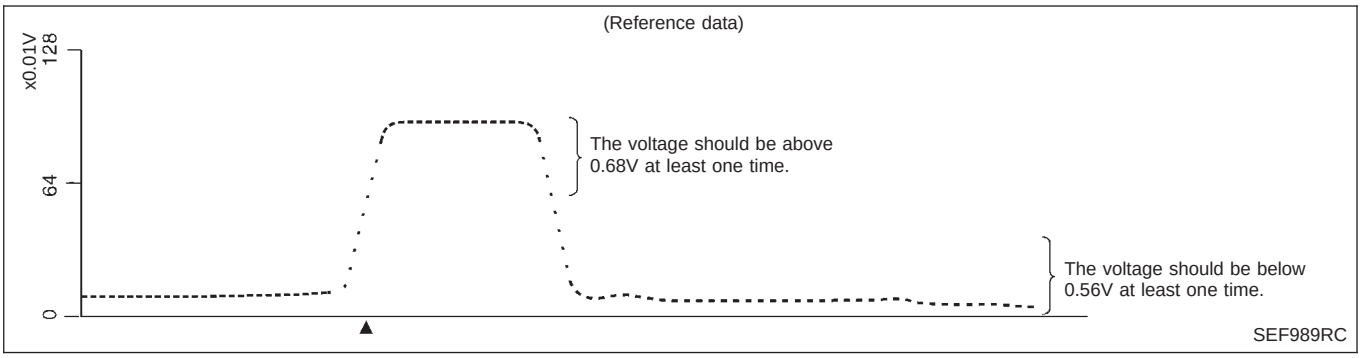
NCEC0152S01

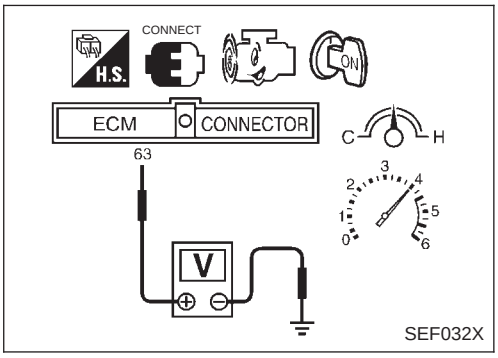
With CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select ‘‘FUEL INJECTION’’ in ‘‘ACTIVE TEST’’ mode, and select ‘‘RR O2 SEN-B1’’ as the monitor item with CONSULT-II.
4) Check ‘‘RR O2 SEN-B1’’ at idle speed when adjusting ‘‘FUEL INJECTION’’ to ±25%.
   ‘‘RR O2 SENSOR’’ should be above 0.68V at least once when the ‘‘FUEL INJECTION’’ is +25%. ‘‘RR O2 SEN-B1’’ should be below 0.56V at least once when the ‘‘FUEL INJECTION’’ is −25%.

CAUTION:

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



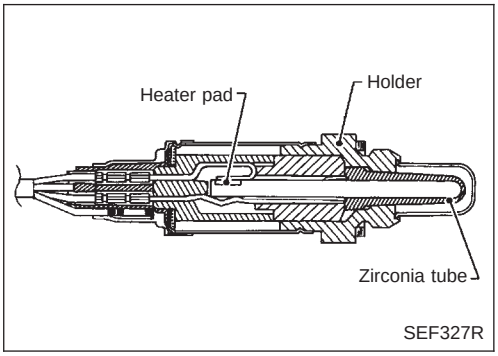


Without CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once.

CAUTION:

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



Component Description

NCEC0153

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.
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 rear heated oxygen sensor is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0154

Specification data are reference values.

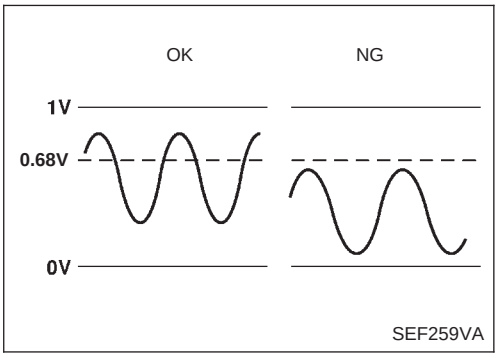
MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SEN-B1	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
RR O2 MNTR-B1			LEAN ⟷ RICH

ECM Terminals and Reference Value

NCEC0155

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

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



On Board Diagnosis Logic

NCEC0156

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

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0138 0138	● The maximum voltage from the sensor does not reach the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

RR O2 SEN-B1 P0138	
COND1: OUT OF COMD	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF092A

RR 02 SEN-B1 P0138	
COND1: TESTING	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF093A

RR O2 SEN-B1 P0138	
COND1: COMPLETED	
COND2: INCOMPLETE	
COND3: INCOMPLETE	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF094A

DTC Confirmation Procedure

NCEC0157

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- **''COMPLETED'' will appear on CONSULT-II screen when all tests ''COND1'', ''COND2'' and ''COND3'' are completed.**
- If ''DTC Confirmation Procedure'' has been previously conducted, always turn ignition switch ''OFF'' and wait at least 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

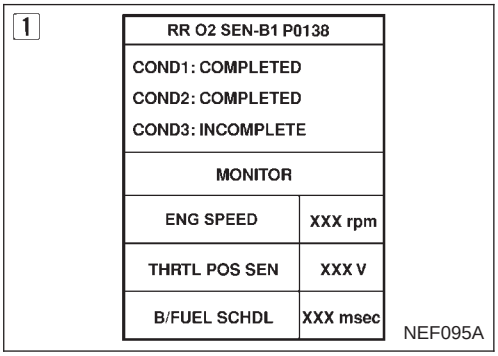
Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 9 seconds.
3) Turn ignition switch ''ON'' and select ''RR O2 SEN-B1 P0138'' of ''REAR O2 SEN-B1'' 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 3 in ''Procedure for COND2''.
   If ''COMPLETED'' does not appear on CONSULT-II screen, go to the following step.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) When the following conditions are met, ''TESTING'' will be displayed at ''COND1'' on the CONSULT-II screen. Maintain the conditions continuously until ''TESTING'' changes to ''COMPLETED''. (It will take approximately 60 seconds.)

ENG SPEED	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
B/FUEL SCHDL	Above 2.7 msec
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
Selector lever	Suitable position

NOTE:

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

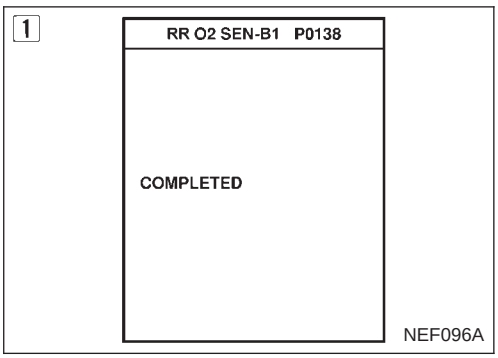


Procedure for COND2

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

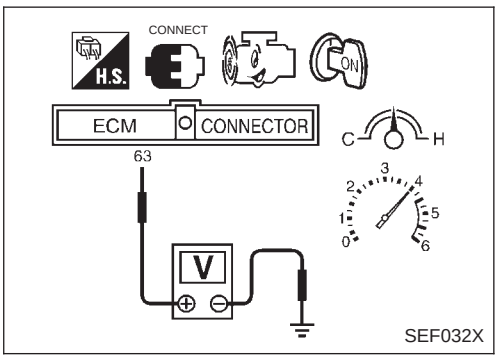
NOTE:

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



Procedure for COND3

1) Stop vehicle and let it idle until ''INCOMPLETE'' of ''COND3'' on CONSULT-II screen has turned to ''COMPLETED''. (It will take a maximum of approximately 6 minutes.)
2) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''.
   If ''NG'' is displayed, refer to ''Diagnostic Procedure'', EC-QG-186.



Overall Function Check

NCEC0158

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

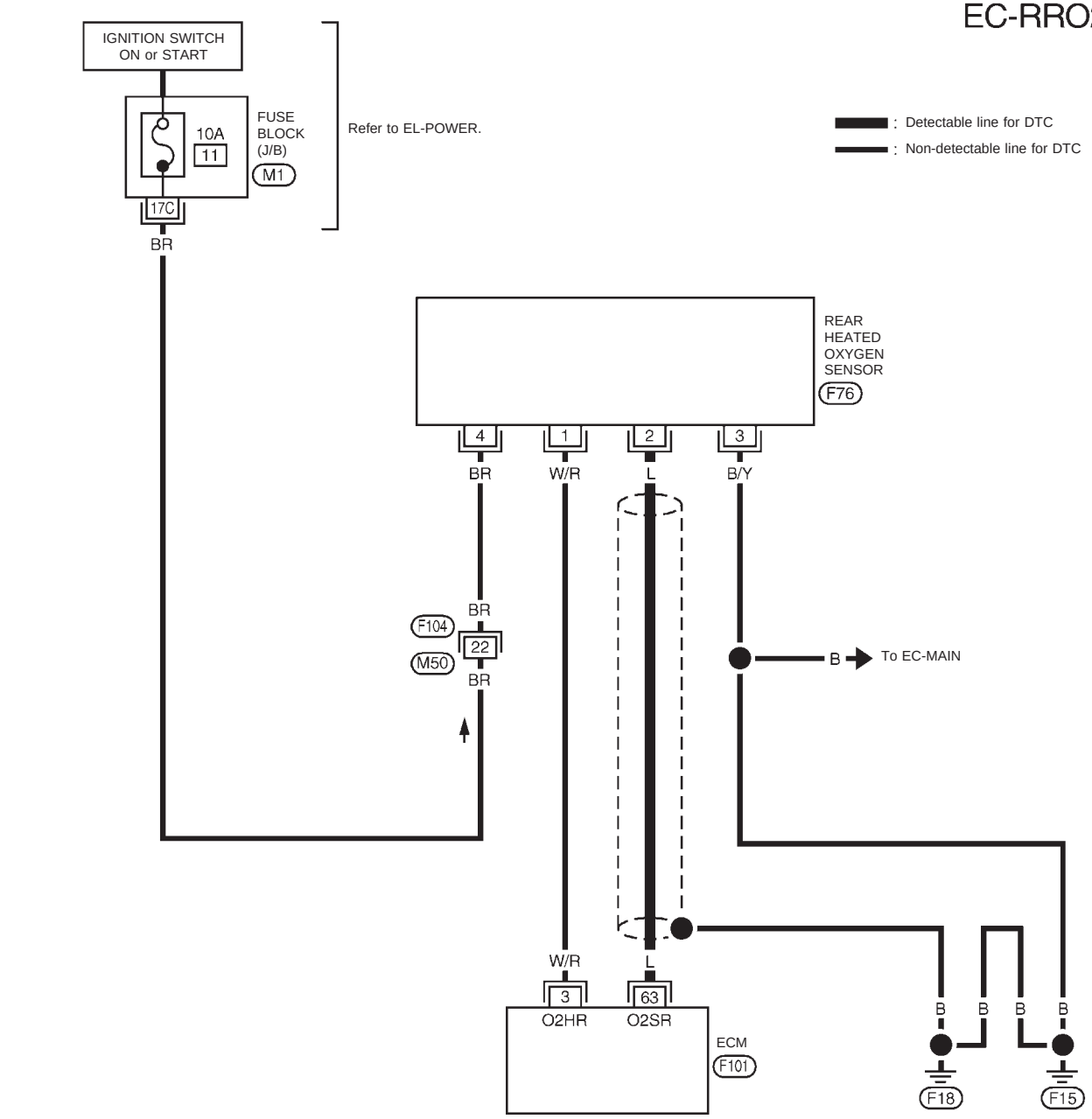
Without CONSULT-II

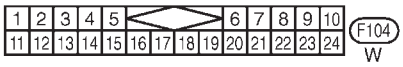
1) Start engine and drive vehicle at a speed of 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be above 0.68V at least once during this procedure.
6) If NG, go to ''Diagnostic Procedure'', EC-QG-186.

Wiring Diagram

NCEC0159

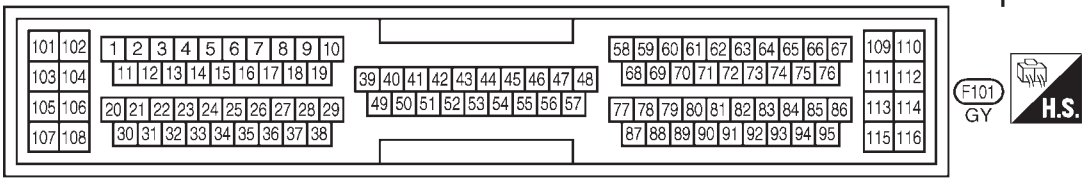
EC-RRO2-01





REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

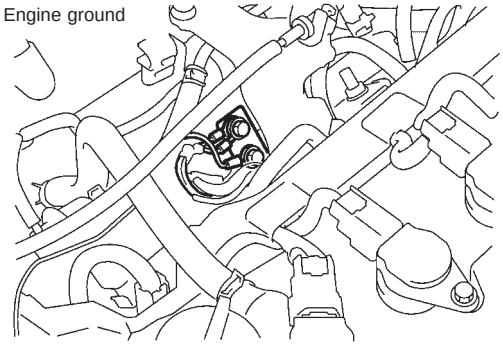


Diagnostic Procedure

NCEC0160

1	RETIGHTEN GROUND SCREWS

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



SEF994W

▶	GO TO 2.

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

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

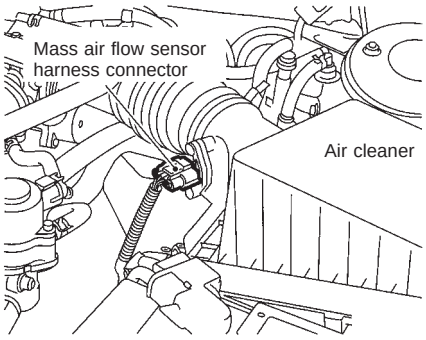
ACTIVE TEST	
SELF-LEARN CONTROL	100 %
MONITOR	
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA	XXX %

NEF078A

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.



SEF995W

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to ''HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION'', EC-QG-53.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0171 detected? Is it difficult to start engine?

Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0171. Refer to EC-QG-209.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

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

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

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

5	CHECK GROUND CIRCUIT
1. Check harness continuity between rear heated oxygen sensor harness connector terminal 1 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 6.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK REAR HEATED OXYGEN SENSOR
Refer to ''Component Inspection'', EC-QG-188.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	Replace rear heated oxygen sensor.

7	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
	XXX rpm
FR O2 SEN-B1	XXX V
RR O2 SEN-B1	XXX V
FR O2 MNTR-B1	RICH
RR O2 MNTR-B1	RICH

NEF091A

Component Inspection

NCEC0161

REAR HEATED OXYGEN SENSOR

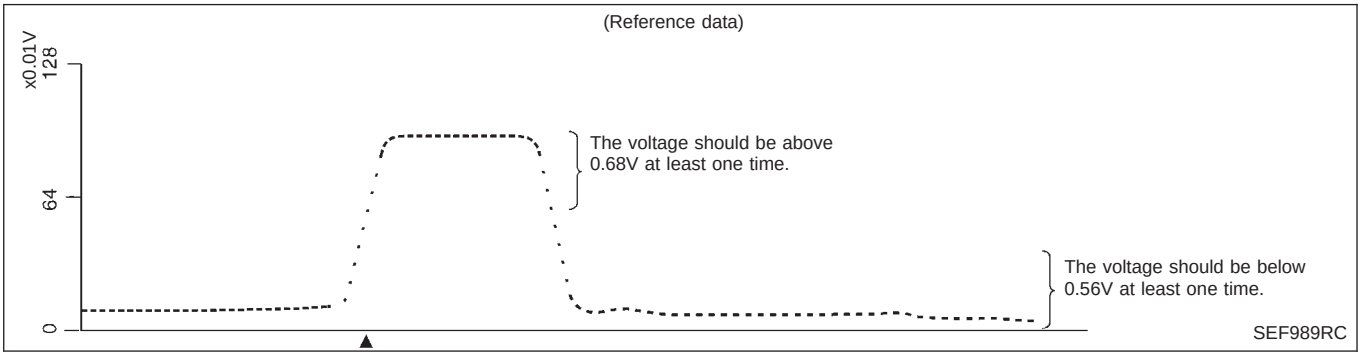
NCEC0161S01

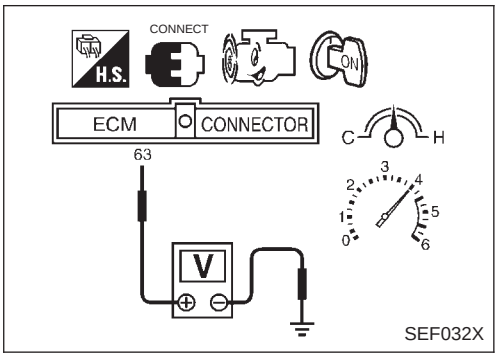
With CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select ''FUEL INJECTION'' in ''ACTIVE TEST'' mode, and select ''RR O2 SEN-B1'' as the monitor item with CONSULT-II.
4) Check ''RR O2 SEN-B1'' at idle speed when adjusting ''FUEL INJECTION'' to ±25%.
   ''RR O2 SEN-B1'' should be above 0.68V at least once when the ''FUEL INJECTION'' is +25%.
   ''RR O2 SEN-B1'' should be below 0.56V at least once when the ''FUEL INJECTION'' is −25%.

CAUTION:

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



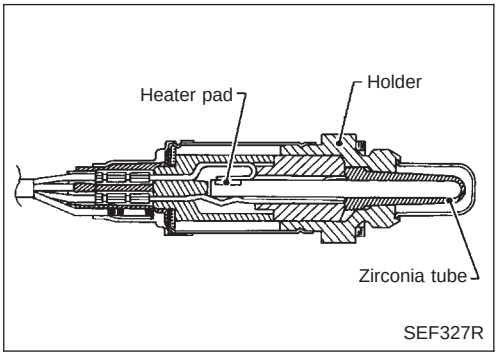


Without CONSULT-II

1) Start engine and drive vehicle at a speed of 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once.

CAUTION:

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



Component Description

NCEC0162

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.
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 rear heated oxygen sensor is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0163

Specification data are reference values.

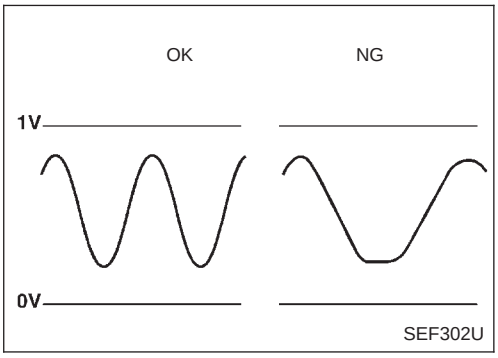
MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SEN-B1	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
RR O2 MNTR-B1			LEAN ⟷ RICH

ECM Terminals and Reference Value

NCEC0164

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63	L	Rear heated oxygen sensor	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V



On Board Diagnosis Logic

NCEC0165

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, 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.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

RR O2 SEN-B1 P0139	
COND1: OUT OF COND COND2: INCOMPLETE COND3: INCOMPLETE	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF097A

RR O2 SEN-B1 P0139	
COND1: TESTING COND2: INCOMPLETE COND3: INCOMPLETE	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF098A

RR O2 SEN-B1 P0139	
COND1: COMPLETED COND2: INCOMPLETE COND3: INCOMPLETE	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF099A

DTC Confirmation Procedure

NCEC0166

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- **''COMPLETED'' will appear on CONSULT-II screen when all tests ''COND1'', ''COND2'' and ''COND3'' are completed.**
- If ''DTC Confirmation Procedure '' has been previously conducted, always turn ignition switch ''OFF'' and wait at least 9 seconds before conducting the next test.

TESTING CONDITION:

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

With CONSULT-II

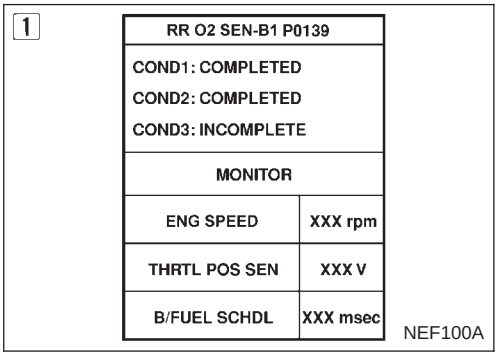
Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 9 seconds.
3) Turn ignition switch ''ON'' and select ''RR O2 SEN-B1 P0139'' of ''REAR O2 SENSOR'' in ''DTC WORK SUPPORT'' mode with CONSULT-II.
4) Touch ''START''.
5) Start engine and let it idle for at least 30 seconds.
6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load. If ''COMPLETED'' appears on CONSULT-II screen, go to step 2 in ''Procedure for COND3''.
   If ''COMPLETED'' does not appear on CONSULT-II screen, go to the following step.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) When the following conditions are met, ''TESTING'' will be displayed at ''COND1'' on the CONSULT-II screen. Maintain the conditions continuously until ''TESTING'' changes to ''COMPLETED''. (It will take approximately 60 seconds.)

ENG SPEED	1,500 - 3,600 rpm
Vehicle speed	Above 70 km/h (43 MPH)
B/FUEL SCHDL	Above 2.7 msec
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
Selector lever	Suitable position

NOTE:

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

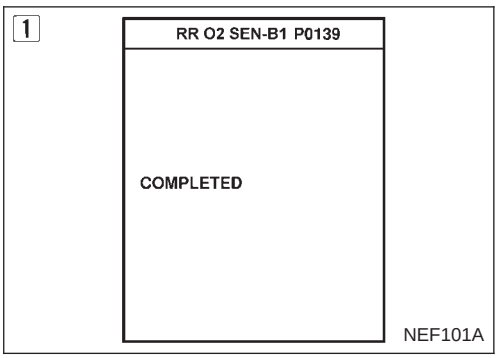


Procedure for COND2

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

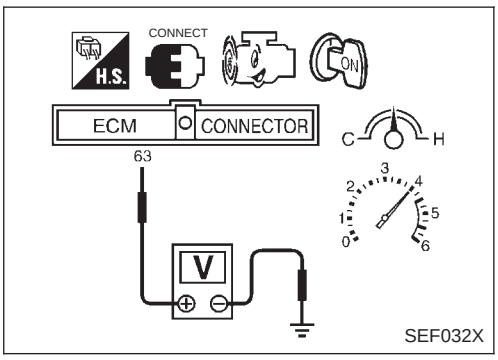
NOTE:

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



Procedure for COND3

1) Stop vehicle and let it idle until ''INCOMPLETE'' of ''COND3'' on CONSULT-II screen has turned to ''COMPLETED''. (It will take a maximum of approximately 6 minutes.)
2) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''.
   If ''NG'' is displayed, refer to ''Diagnostic Procedure'', EC-QG-194.



Overall Function Check

NCEC0167

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

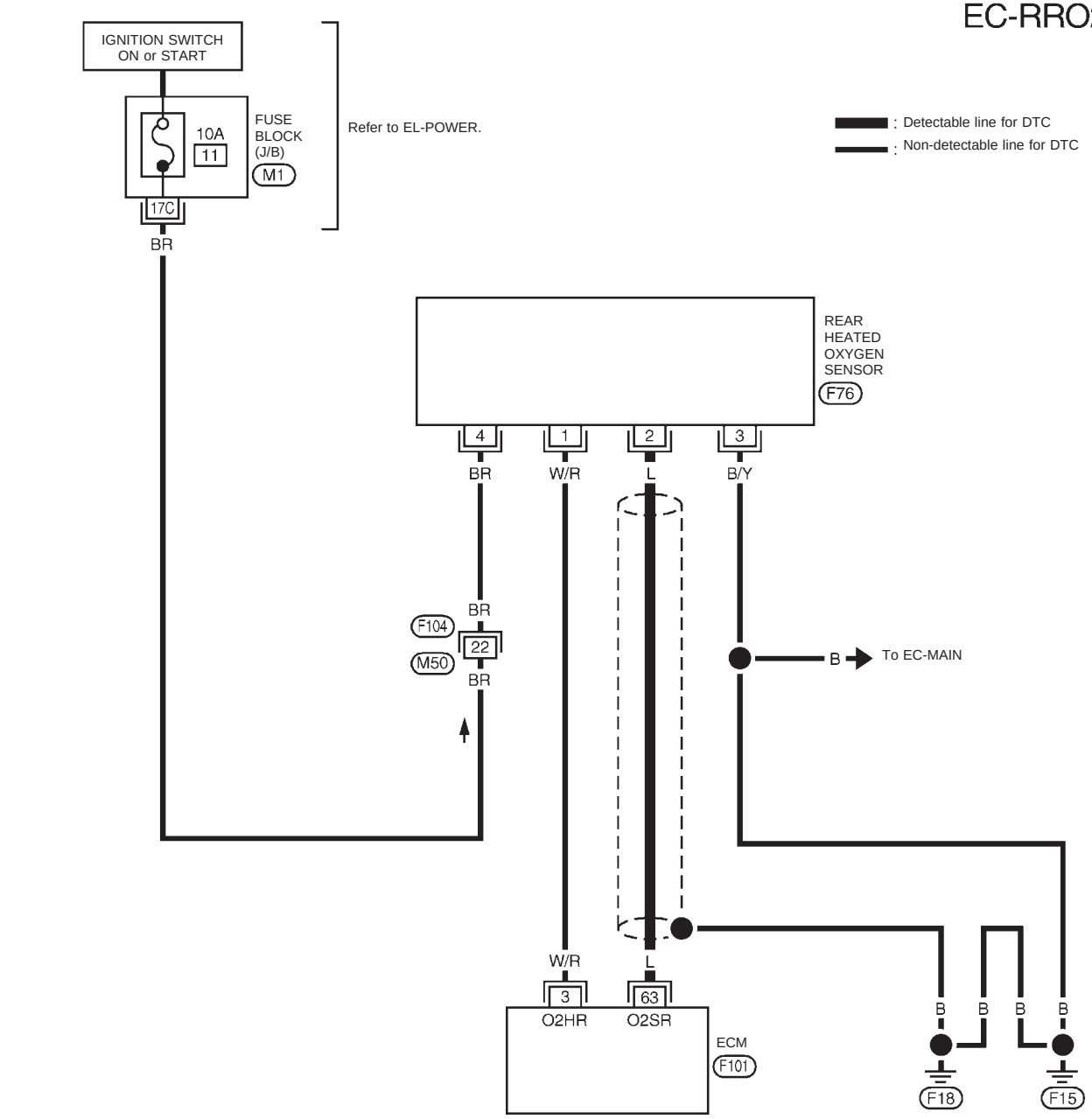
Without CONSULT-II

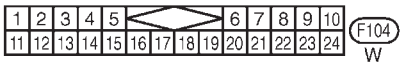
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage when revving up to 4,000 rpm under no 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-QG-194.

Wiring Diagram

NCEC0168

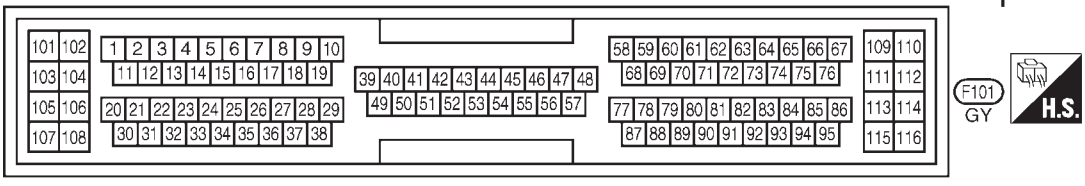
EC-RRO2-01





REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

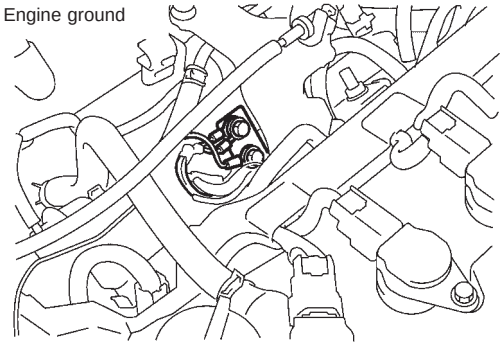


Diagnostic Procedure

NCEC0169

1	RETIGHTEN GROUND SCREWS

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



SEF994W

▶	GO TO 2.

2	CLEAR THE SELF-LEARNING DATA

With CONSULT-II

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

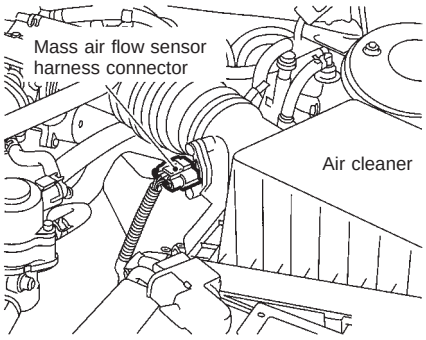
ACTIVE TEST	
SELF-LEARN CONTROL	100 %
MONITOR	
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA	XXX %

NEF078A

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.



SEF995W

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0100 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to ''HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION'', EC-QG-53.
7. Make sure diagnostic trouble code No. 0000 is displayed in Diagnostic Test Mode II.
8. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0172 detected? Is it difficult to start engine?

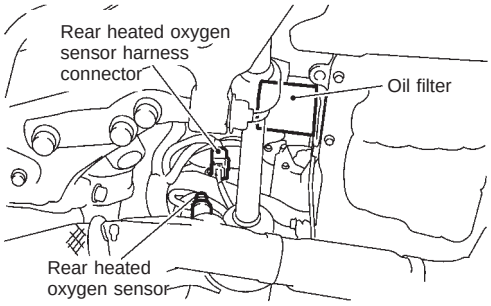
Yes or No

Yes	▶	Perform trouble diagnosis for DTC P0172. Refer to EC-QG-215.
No	▶	GO TO 3.

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.

View from the underside of the vehicle



SEF033X

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

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the harness for open or short between rear heated oxygen sensor 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 rear heated oxygen sensor harness connector terminal 1 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 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK REAR HEATED OXYGEN SENSOR

Refer to ''Component Inspection'', EC-QG-197.

OK or NG

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

7	CHECK INTERMITTENT INCIDENT

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.

	▶	**INSPECTION END**

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
	XXX rpm
FR O2 SEN-B1	XXX V
RR O2 SEN-B1	XXX V
FR O2 MNTR-B1	RICH
RR O2 MNTR-B1	RICH

NEF091A

Component Inspection

NCEC0170

REAR HEATED OXYGEN SENSOR

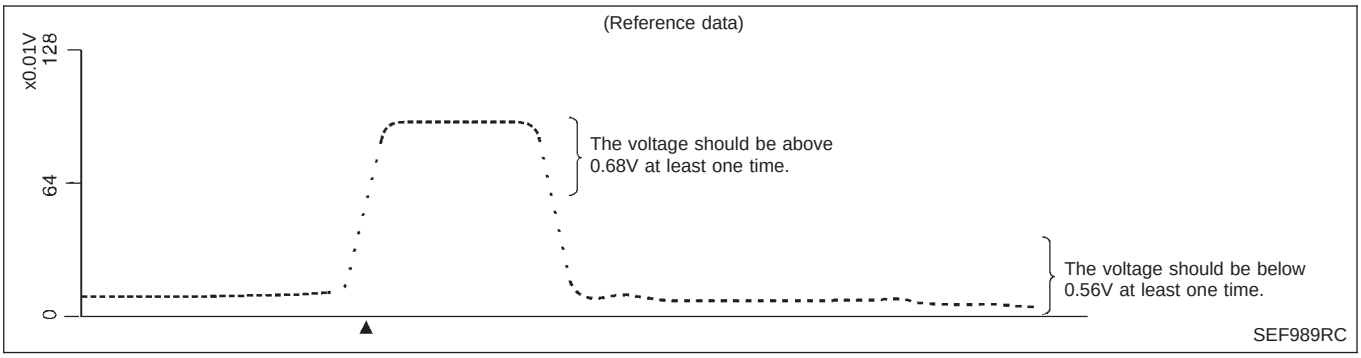
NCEC0170S01

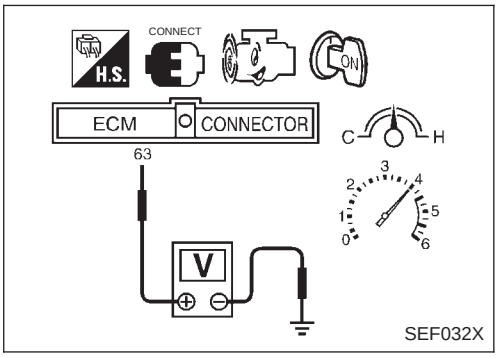
With CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select ‘‘FUEL INJECTION’’ in ‘‘ACTIVE TEST’’ mode, and select ‘‘RR O2 SEN-B1’’ as the monitor item with CONSULT-II.
4) Check ‘‘RR O2 SEN-B1’’ at idle speed when adjusting ‘‘FUEL INJECTION’’ to ±25%.
   ‘‘RR O2 SEN-B1’’ should be above 0.68V at least once when the ‘‘FUEL INJECTION’’ is +25%.
   ‘‘RR O2 SEN-B1’’ should be below 0.56V at least once when the ‘‘FUEL INJECTION’’ is −25%.

CAUTION:

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



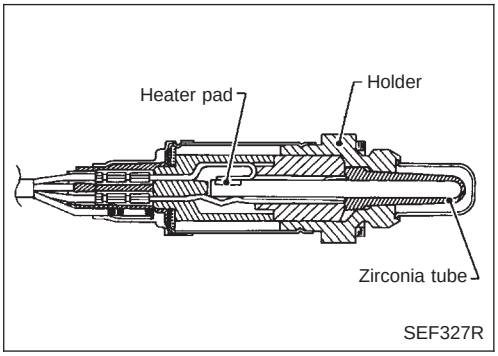


Without CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once.

CAUTION:

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



Component Description

NCEC0171

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.
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 rear heated oxygen sensor is not used for engine control operation.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0172

Specification data are reference values.

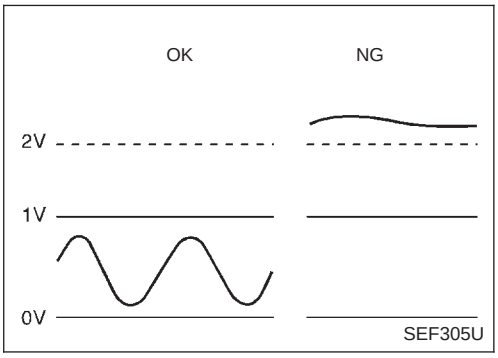
MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SEN-B1	● Engine: After warming up	Revving engine from idle to 3,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
RR O2 MNTR-B1			LEAN ←→ RICH

ECM Terminals and Reference Value

NCEC0173

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
63	L	Rear heated oxygen sensor	**[Engine is running]** ● After warming up to normal operating temperature and revving engine from idle to 2,000 rpm	0 - Approximately 1.0V

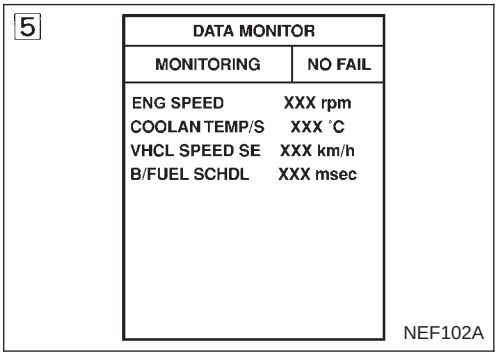


On Board Diagnosis Logic

NCEC0174

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors whether or not the voltage is too high during various driving conditions such as fuel-cut.

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



DTC Confirmation Procedure

NCEC0175

NOTE:

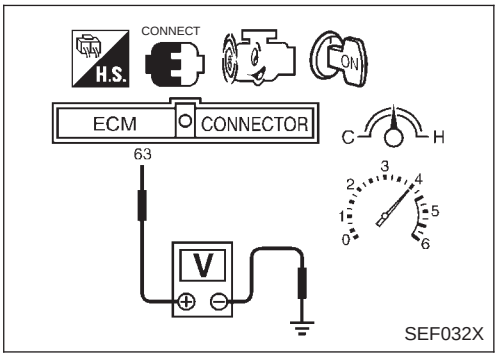
If ‘‘DTC Confirmation Procedure ’’ has been previously conducted, always turn ignition switch ‘‘OFF’’ and wait at least 9 seconds before conducting the next test.

With CONSULT-II

1) Turn ignition switch ‘‘ON’’ and select ‘‘DATA MONITOR’’ mode with CONSULT-II.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) Stop vehicle with engine running.
4) Let engine idle for 1 minute.
5) Maintain the following conditions for at least 5 consecutive minutes.

ENG SPEED	Above 1,500 rpm
VHCL SPEED SE	Above 70 km/h (43 MPH)
B/FUEL SCHDL	Above 2.7 msec
COOLAN TEMP/S	70 - 105°C (158 - 221°F)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-201.



Overall Function Check

NCEC0176

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

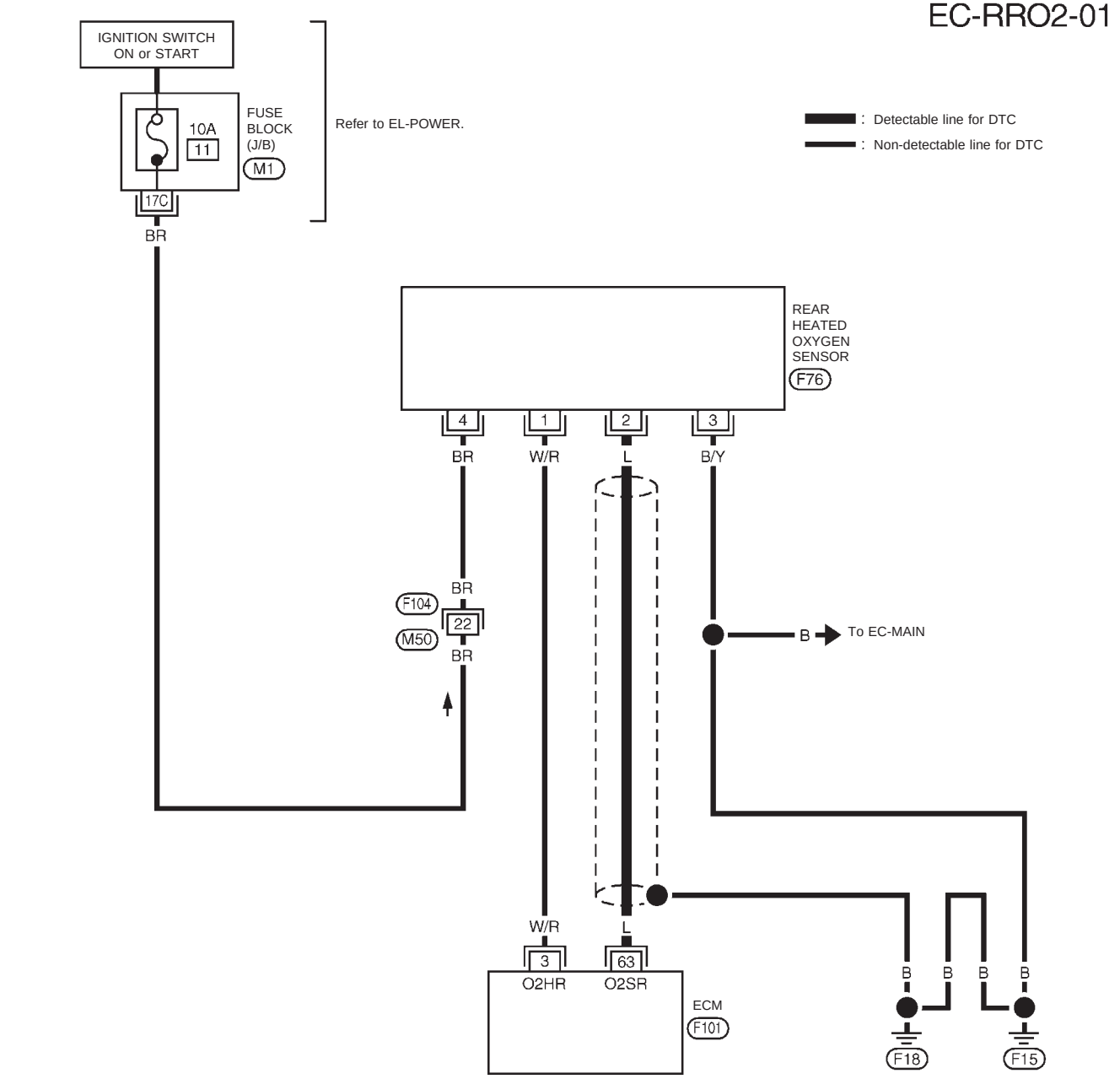
Without CONSULT-II

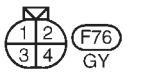
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage after revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 2V during this procedure.
5) If NG, go to ‘‘Diagnostic Procedure’’, EC-QG-201.

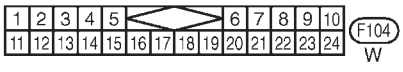
Wiring Diagram

NCEC0177

EC-RRO2-01

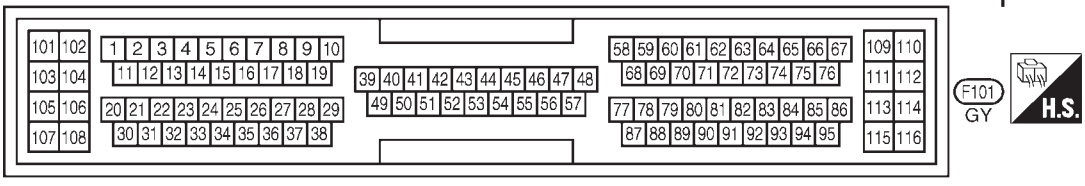






REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

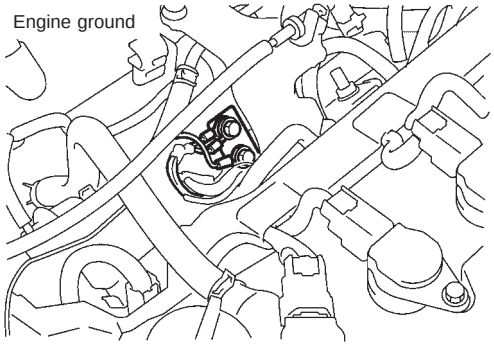


Diagnostic Procedure

NCEC0178

1	RETIGHTEN GROUND SCREWS

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

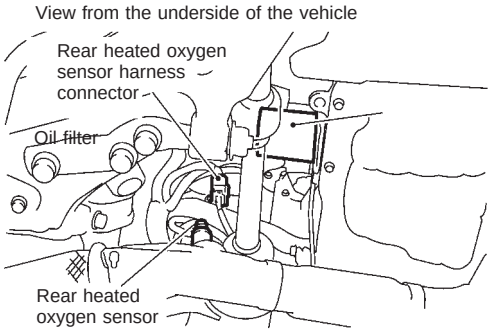


SEF994W

▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.



SEF033X

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

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

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

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

Diagnostic Procedure (Cont'd)

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

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

6	CHECK REAR HEATED OXYGEN SENSOR	
Refer to ''Component Inspection'', EC-QG-202.		
OK or NG		
OK	▶	GO TO 7.
NG	▶	Replace rear heated oxygen sensor.

7	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**

ACTIVE TEST	
FUEL INJECTION	25 %
MONITOR	
	XXX rpm
FR O2 SEN-B1	XXX V
RR O2 SEN-B1	XXX V
FR O2 MNTR-B1	RICH
RR O2 MNTR-B1	RICH

NEF091A

Component Inspection

NCEC0179

REAR HEATED OXYGEN SENSOR

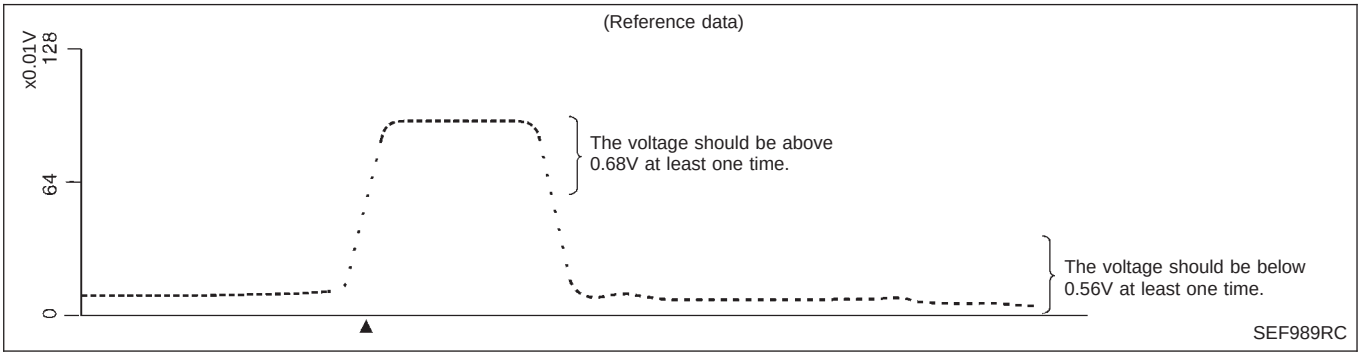
NCEC0179S01

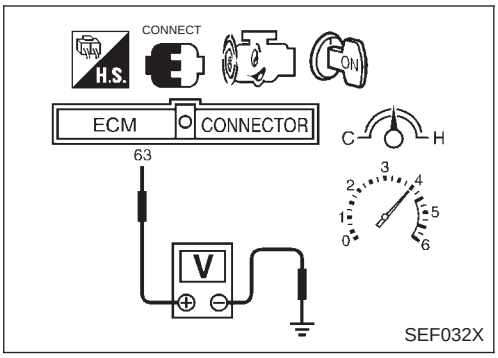
With CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Select ''FUEL INJECTION'' in ''ACTIVE TEST'' mode, and select ''RR O2 SEN-B1'' as the monitor item with CONSULT-II.
4) Check ''RR O2 SEN-B1'' at idle speed when adjusting ''FUEL INJECTION'' to ±25%.
   ''RR O2 SEN-B1'' should be above 0.68V at least once when the ''FUEL INJECTION'' is +25%.
   ''RR O2 SEN-B1'' should be below 0.56V at least once when the ''FUEL INJECTION'' is −25%.

CAUTION:

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





Without CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminals 63 (Rear heated oxygen sensor signal) and engine ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.68V at least once.
   If the voltage is above 0.68V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 6,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be below 0.56V at least once.

CAUTION:

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

Description

NCEC0180

SYSTEM DESCRIPTION

NCEC0180S01

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor	Engine speed	Rear heated oxygen sensor heater control	Rear heated oxygen sensor heater

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

OPERATION

NCEC0180S02

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

CONSULT-II Reference Value in Data Monitor Mode

NCEC0181

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 HTR-B1	● Engine speed	Below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	ON
		Above 3,600 rpm	OFF
	● Ignition switch ON (Engine stopped)		OFF

ECM Terminals and Reference Value

NCEC0182

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	W/R	Rear heated oxygen sensor heater	**[Engine is running]** ● Engine speed is below 3,600 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]	Approximately 0.7V
			[Engine is running] ● Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch "ON"] ● Engine stopped	

On Board Diagnosis Logic

NCEC0183

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

DTC Confirmation Procedure

NCEC0184

NOTE:

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

TESTING CONDITION:

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

2

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm
VHCL SPEED SE	XXX km/h
THRTL POS SEN	XXX v

NEF103A

With CONSULT-II

1) Turn ignition switch ‘‘ON’’ and select ‘‘DATA MONITOR’’ mode with CONSULT-II.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes. Engine speed must be maintained at speeds of 3,600 rpm or less during vehicle operations.
3) If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-207.

With GST

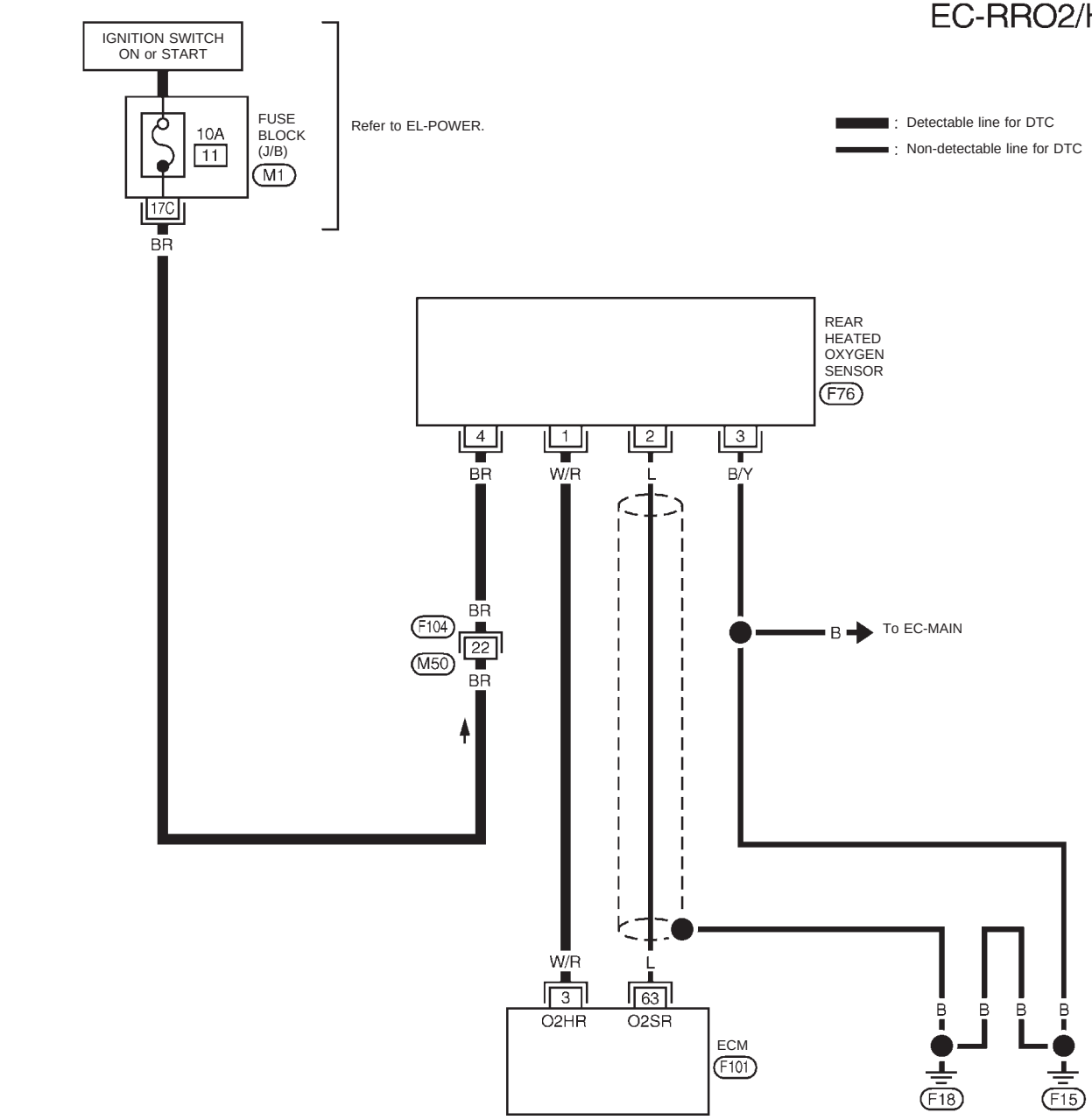
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes. Engine speed must be maintained at speeds of 3,600 rpm or less during vehicle operations.
2) Turn ignition switch ‘‘OFF’’ and wait at least 9 seconds.
3) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
4) Select ‘‘MODE 3’’ with GST.
5) If DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-207.

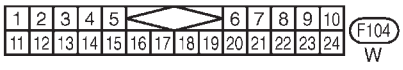
When using GST, ‘‘DTC Confirmation Procedure’’ should be performed twice as much as when using CONSULT-II or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II or ECM (Diagnostic Test Mode II) is recommended.

Wiring Diagram

NCEC0185

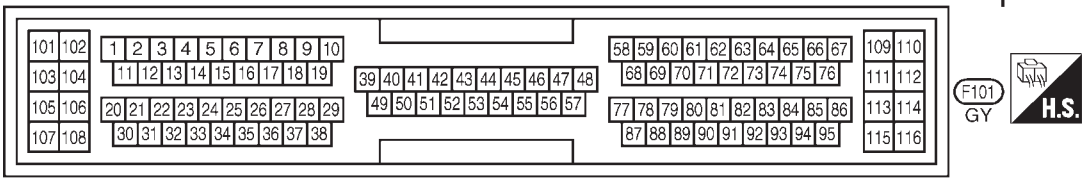
EC-RRO2/H-01





REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

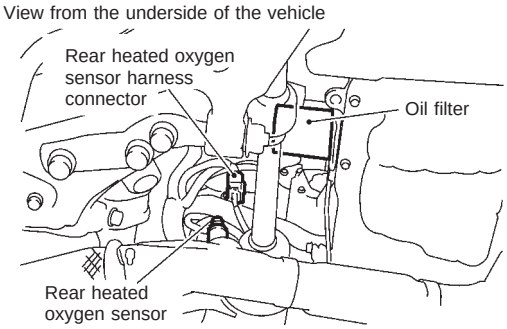


Diagnostic Procedure

NCEC0186

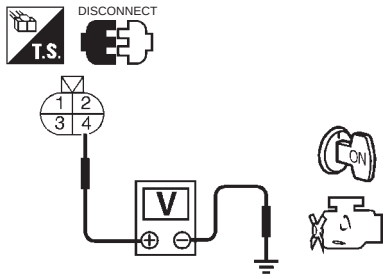
1	CHECK POWER SUPPLY

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



SEF033X

3. Turn ignition switch "ON".
4. Check voltage between terminal 4 and ground.



SEF047X

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M50, F104
- Harness for open or short between rear heated oxygen sensor and fuse

	▶	Repair harness or connectors.

3	CHECK GROUND CIRCUIT

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

OK or NG

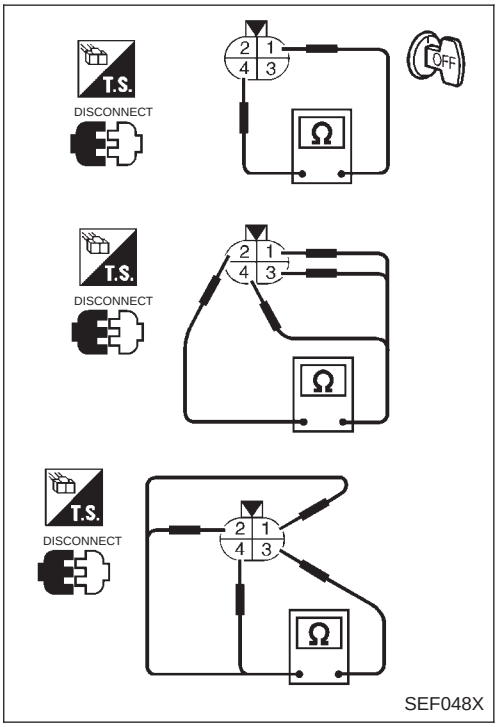
OK	▶	GO TO 5.
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

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

5	CHECK REAR HEATED OXYGEN SENSOR HEATER
Refer to ''Component Inspection'', EC-QG-208.	
OK or NG	
OK ▶	GO TO 6.
NG ▶	Replace rear heated oxygen sensor.

6	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



SEF048X

Component Inspection

NCEC0187

REAR HEATED OXYGEN SENSOR HEATER

NCEC0187S01

Check the following.

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

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

If NG, replace the rear heated oxygen sensor.

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.

On Board Diagnosis Logic

NCEC0188

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 front heated oxygen sensor. 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
Front heated oxygen sensor	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 • Front heated oxygen sensor • Injectors • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor

4

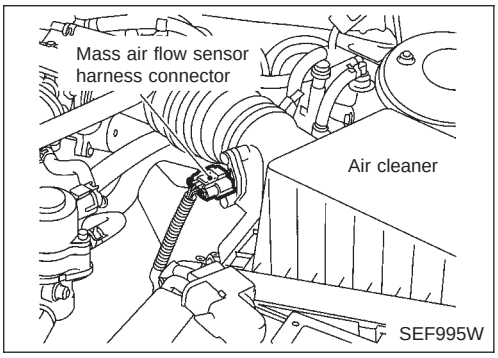
ACTIVE TEST	
SELF~LEARN CONTROL	100 %
MONITOR	
COMP~LEARN	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA-B1	XXX %

NEF104A

3

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm

NEF068A



DTC Confirmation Procedure

NCEC0189

NOTE:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 9 seconds.
3) Turn ignition switch ''ON'' and select ''SELF-LEARN CONTROL'' in ''ACTIVE TEST'' 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-QG-211.
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-QG-211. If engine does not start, visually check for exhaust and intake air leak.

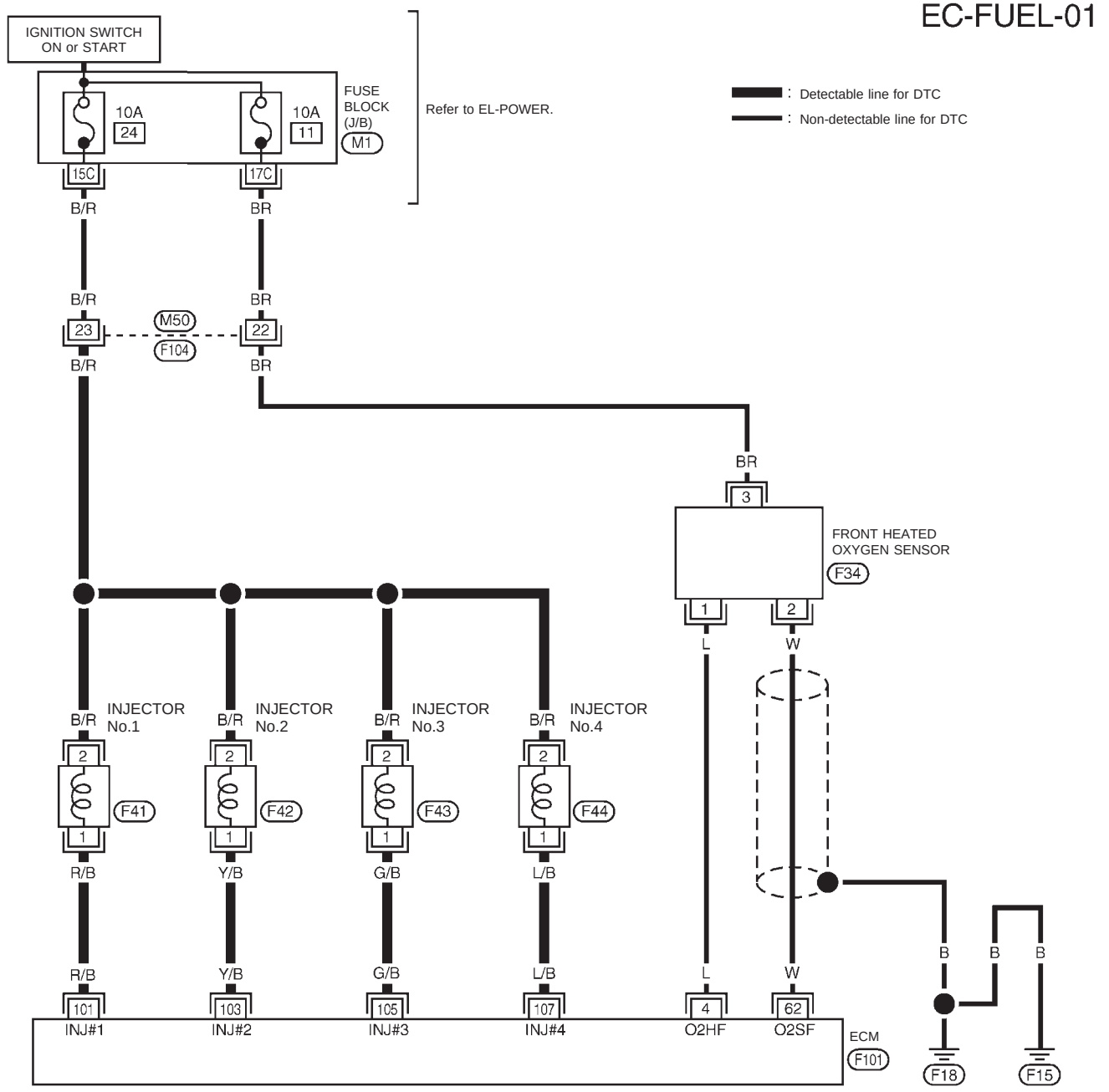
With GST

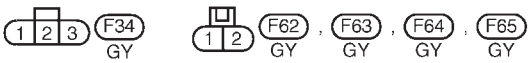
Follow the procedure ''With CONSULT-II'' above.

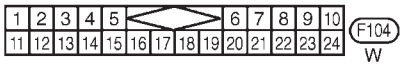
Wiring Diagram

NCEC0190

EC-FUEL-01

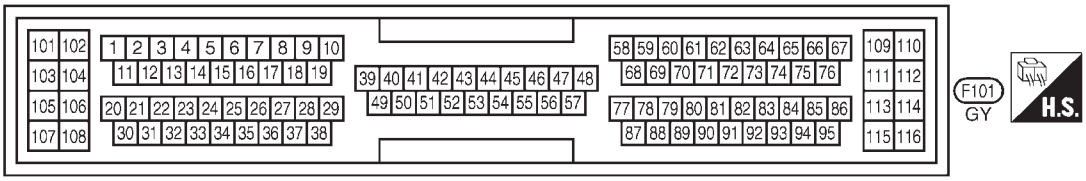






REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

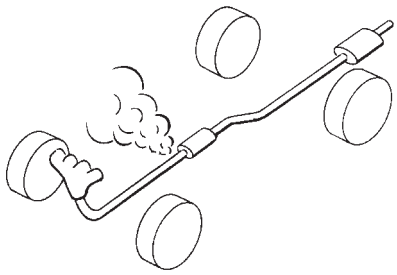


Diagnostic Procedure

NCEC0191

1	CHECK EXHAUST AIR LEAK

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



SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK FOR INTAKE AIR LEAK

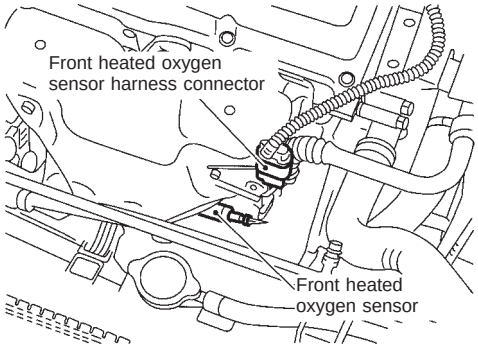
Listen for an intake air leak after the mass air flow sensor.

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace.

3	CHECK FRONT HEATED OXYGEN SENSOR CIRCUIT

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



SEF012X

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

OK or NG

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

Diagnostic Procedure (Cont'd)

4	CHECK FUEL PRESSURE

1. Release fuel pressure to zero.
   Refer to EC-QG-29.
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-QG-340.
- Fuel pressure regulator Refer to EC-QG-30.
- Fuel lines Refer to "ENGINE MAINTENANCE" in MA section.
- Fuel filter for clogging

	▶	Repair or replace.

6	CHECK MASS AIR FLOW SENSOR

With CONSULT-II
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II.
at idling: 1.0 - 4.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

With GST
Check mass air flow sensor signal in MODE 1 with GST.
at idling: 1.0 - 5.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

OK or NG

OK	▶	GO TO 7.
NG	▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-QG-115.

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.

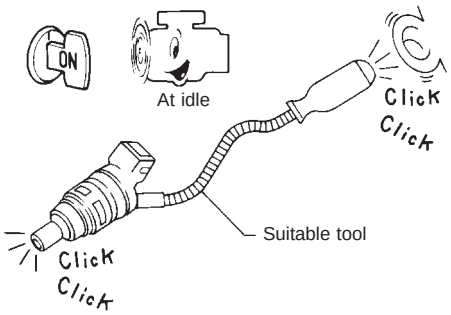
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SEN-B1	XXX V
IACV-AAC/V	XXX %

NEF105A

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-QG-326.

8	REMOVE INJECTOR

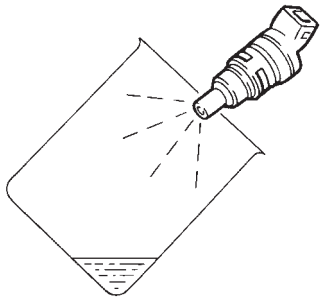
1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Remove injector with fuel tube assembly. Refer to EC-QG-30.
   Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors should remain connected.

	▶	GO TO 9.

Diagnostic Procedure (Cont'd)

9	CHECK INJECTOR

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



SEF595Q

Fuel should be sprayed evenly for each cylinder.

OK or NG

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

10	CHECK INTERMITTENT INCIDENT

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.

	▶	**INSPECTION END**

On Board Diagnosis Logic

NCEC0192

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 front heated oxygen sensor. 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
Front heated oxygen sensor	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.)	• Front heated oxygen sensor • Injectors • Exhaust gas leaks • Incorrect fuel pressure • Mass air flow sensor

4

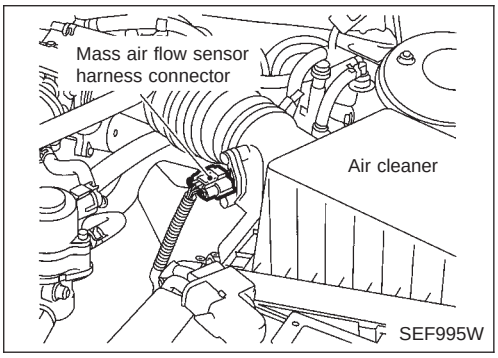
ACTIVE TEST	
SELF~LEARN CONTROL	100 %
MONITOR	
COMP~LEARN	XXX rpm
COOLAN TEMP/S	XXX °C
FR O2 SEN-B1	XXX V
A/F ALPHA-B1	XXX %

NEF104A

3

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm

NEF068A



DTC Confirmation Procedure

NCEC0193

NOTE:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ‘‘OFF’’ and wait at least 9 seconds.
3) Turn ignition switch ‘‘ON’’ and select ‘‘SELF-LEARN CONTROL’’ in ‘‘ACTIVE TEST’’ 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-QG-217.
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-QG-217. If engine does not start, remove ignition plugs and check for fouling, etc.

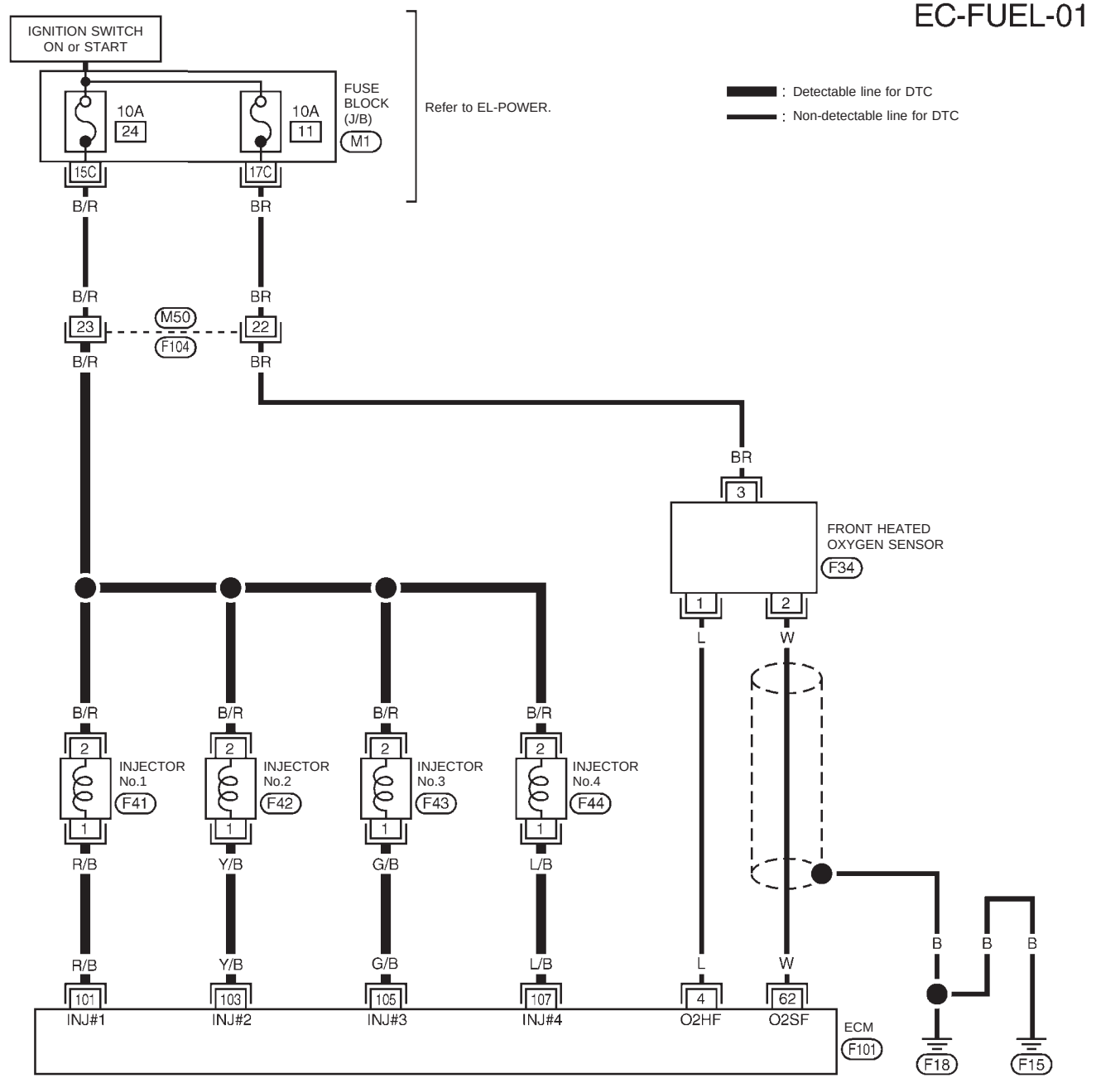
With GST

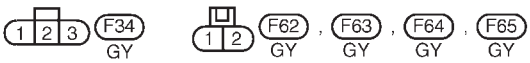
Follow the procedure ‘‘With CONSULT-II’’ above.

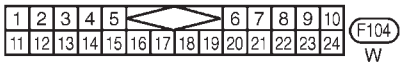
Wiring Diagram

NCEC0194

EC-FUEL-01

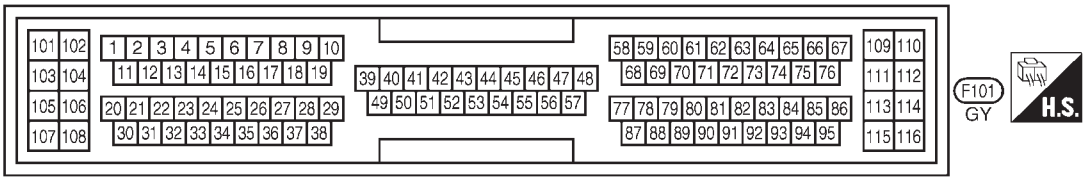






REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

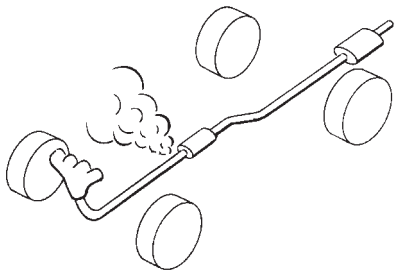


Diagnostic Procedure

NCEC0195

1	CHECK FOR EXHAUST AIR LEAK

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



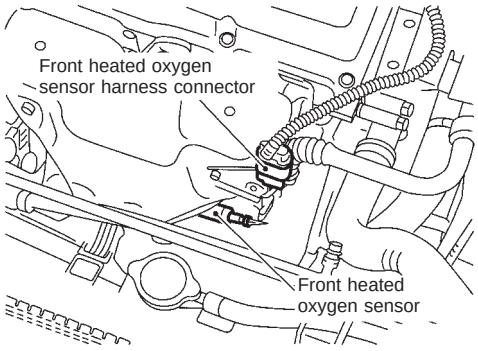
SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK FRONT HEATED OXYGEN SENSOR CIRCUIT

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



SEF012X

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

OK or NG

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

Diagnostic Procedure (Cont'd)

3	CHECK FUEL PRESSURE

1. Release fuel pressure to zero.
   Refer to EC-QG-29.
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-QG-340.)
- Fuel pressure regulator (Refer to EC-QG-30.)

	▶	Repair or replace.

5	CHECK MASS AIR FLOW SENSOR

With CONSULT-II
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II.
at idling: 1.0 - 4.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

With GST
Check mass air flow sensor signal in MODE 1 with GST.
at idling: 1.0 - 4.0 g·m/sec
at 2,500 rpm: 5.0 - 10.0 g·m/sec

OK or NG

OK	▶	GO TO 6.
NG	▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-QG-118.

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.

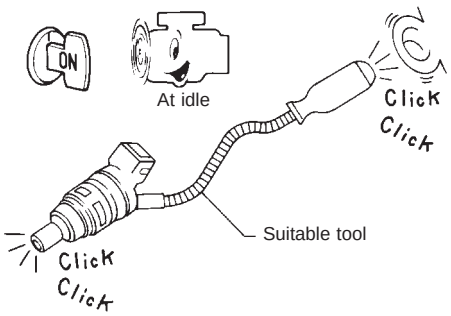
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SEN-B1	XXX V
IACV-AAC/V	XXX %

NEF105A

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-QG-326.

7	REMOVE INJECTOR

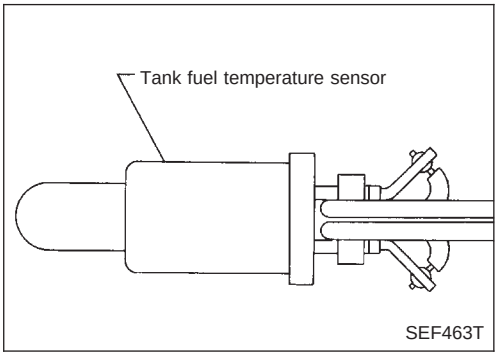
1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Remove injector assembly. Refer to EC-QG-30.
   Keep fuel hose and all injectors connected to injector gallery.

	▶	GO TO 8.

Diagnostic Procedure (Cont'd)

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.

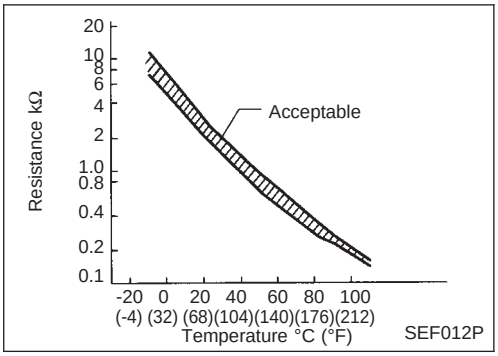
9	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



Component Description

NCEC0196

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



<Reference data>

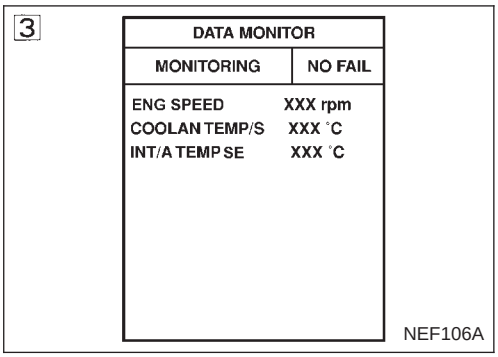
Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 82 (Tank fuel temperature sensor) and ECM terminal 48 (ECM ground).

On Board Diagnosis Logic

NCEC0197

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0180 0180	• An excessively high or low voltage is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Tank fuel temperature sensor



DTC Confirmation Procedure

NCEC0198

NOTE:

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

With CONSULT-II

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 5 seconds.
   If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-223.

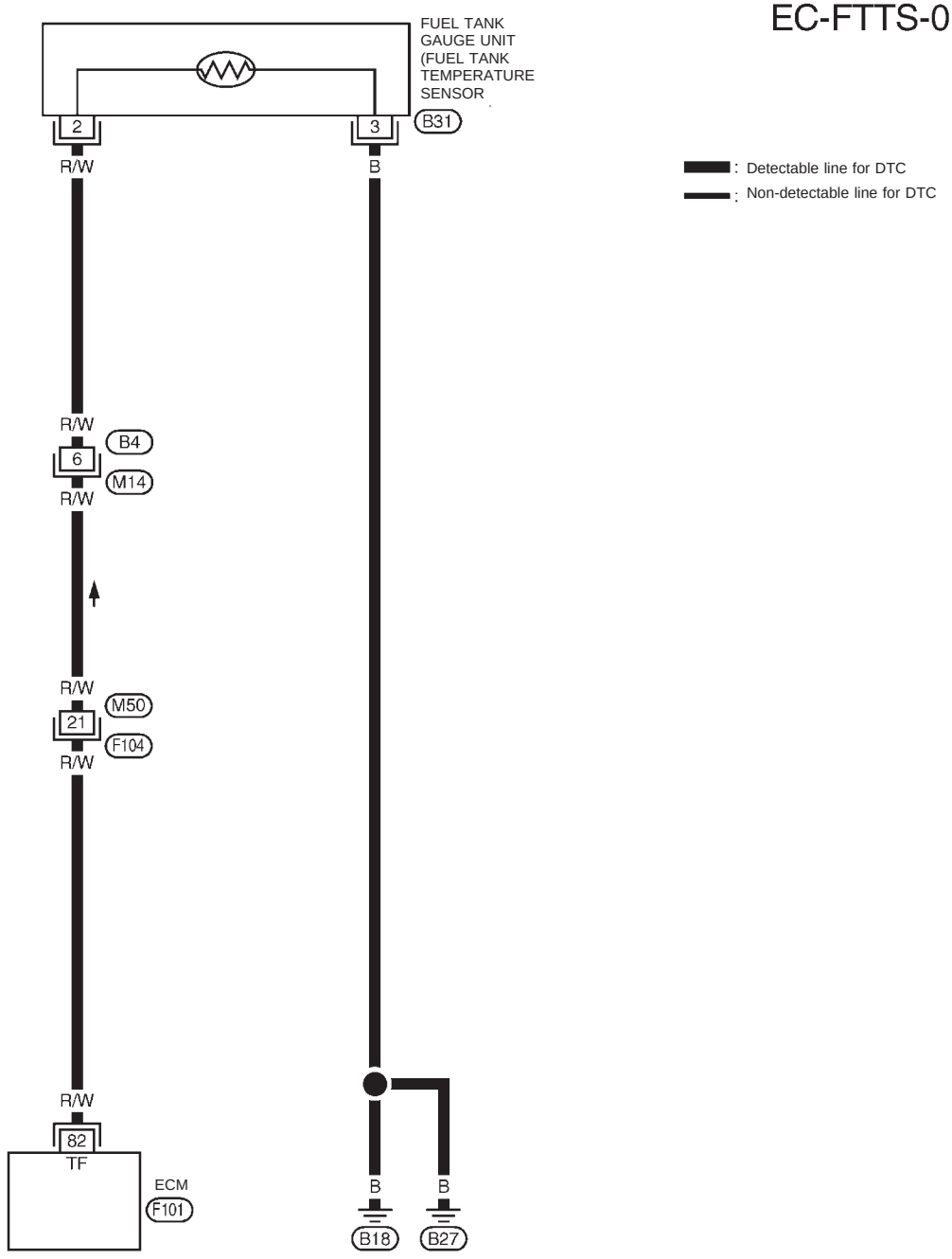
With GST

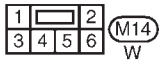
Follow the procedure ‘‘With CONSULT-II’’ above.

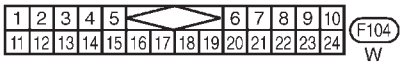
Wiring Diagram

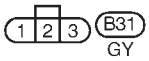
NCEC0199

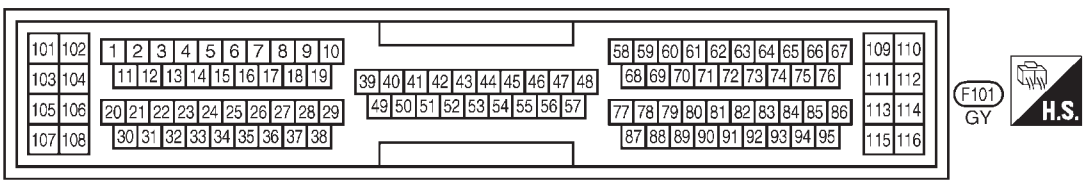
EC-FTTS-01











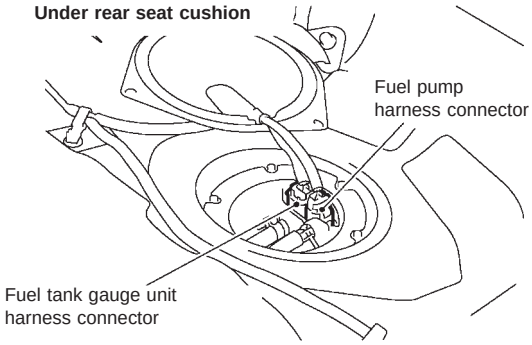
YEC268

Diagnostic Procedure

NCEC0200

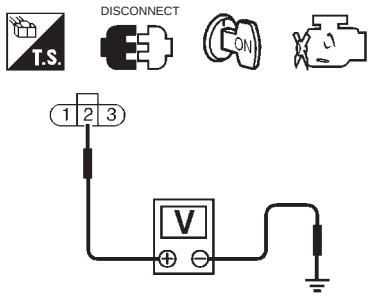
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect fuel tank gauge unit harness connector.



SEF299W

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



SEF052X

Voltage: Approximately 5V

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B4, M14
- Harness connectors M50, F104
- Harness for open or short between ECM and fuel tank gauge unit

	▶	Repair harness or connector.

3	CHECK GROUND CIRCUIT

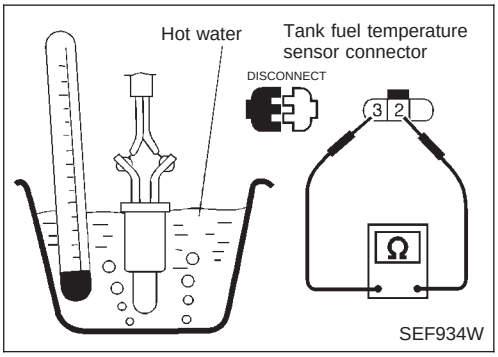
1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel tank gauge unit harness connector terminal 1 and body ground.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK TANK FUEL TEMPERATURE SENSOR	
Refer to ''Component Inspection'', EC-QG-224. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Replace tank fuel temperature sensor.

5	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



Component Inspection

NCEC0201

TANK FUEL TEMPERATURE SENSOR

NCEC0201S01

Check resistance by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace tank fuel temperature sensor.

On Board Diagnosis Logic

NCEC0202

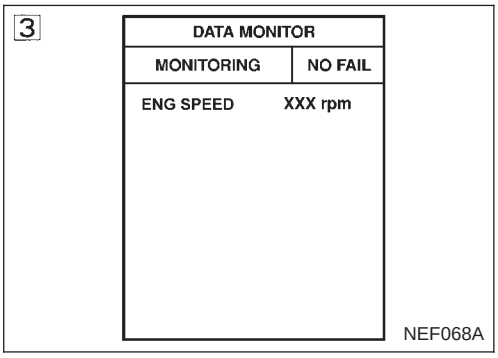
If a misfire occurs, the engine speed will fluctuate. If the fluctuation is detected by the crankshaft position sensor (POS), the misfire is diagnosed.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   When a misfire is detected which will overheat and damage the three way catalyst, the MI will start blinking; even during the first trip. In this condition, ECM monitors the misfire every 200 revolutions.
   If the misfire frequency decreases to a level that will not damage the three way catalyst, the MI will change from blinking to lighting up. (After the first trip detection, the MI will light up from engine starting. If a misfire is detected that will cause three way catalyst damage, the MI will start blinking.)
2. Two Trip Detection Logic (Exhaust quality deterioration)
   When a misfire that will not damage the three way catalyst (but will affect exhaust emission) occurs, the MI will light up based on two trip detection logic. In this condition, ECM monitors the misfire for every 1,000 revolutions of the engine.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300 0300	• Multiple cylinders misfire.	• Improper spark plug • Insufficient compression • Incorrect fuel pressure • EGR volume control valve • The injector circuit is open or shorted • Injectors • Intake air leak • Insufficient ignition spark • Lack of fuel • Front heated oxygen sensor
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

NCEC0203

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

With CONSULT-II

1) Turn ignition switch ''ON'', and select ''DATA MONITOR'' mode with CONSULT-II.
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch ''OFF'' and wait at least 9 seconds.
4) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.

NOTE:

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

5) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-226.

With GST

Follow the procedure ''With CONSULT-II'' above.

Diagnostic Procedure

NCEC0204

1	CHECK FOR INTAKE AIR LEAK	
1. Start engine and run it at idle speed. 2. Listen for the sound of the intake air leak. **OK or NG**		
OK	▶	GO TO 2.
NG	▶	Discover air leak location and repair.

2	CHECK FOR EXHAUST SYSTEM CLOGGING	
Stop engine and visually check exhaust tube, three way catalyst and muffler for dents. **OK or NG**		
OK	▶	GO TO 3.
NG	▶	Repair or replace it.

3	CHECK EGR FUNCTION	
Perform DTC Confirmation Procedure for DTC P1402 EGR FUNCTION (OPEN). Refer to EC-QG-312. **OK or NG**		
OK	▶	GO TO 4.
NG	▶	Repair EGR system.

4	PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

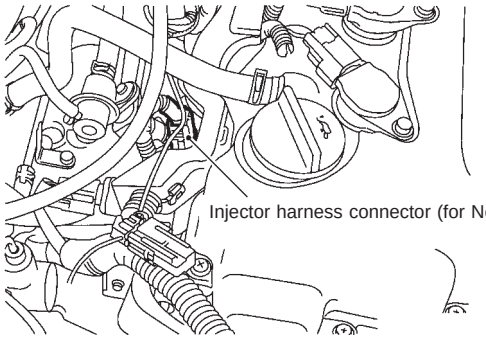
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SEN-B1	XXX V
IACV-AAC/V	XXX %

NEF105A

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?



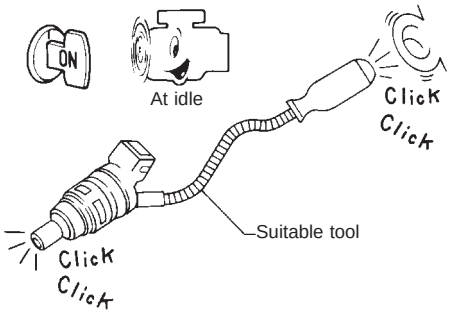
SEF055X

Yes or No

Yes	▶	GO TO 5.
No	▶	GO TO 7.

5	CHECK INJECTOR

Does each injector make an operating sound at idle?



MEC703B

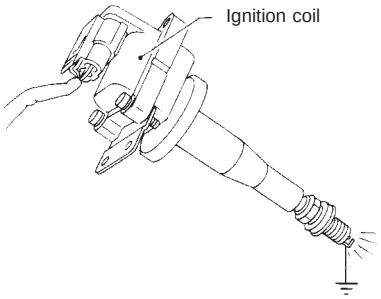
Yes or No

Yes	▶	GO TO 6.
No	▶	Check injector(s) and circuit(s). Refer to EC-QG-326.

Diagnostic Procedure (Cont'd)

6	CHECK IGNITION SPARK

1. Turn Ignition switch "OFF".
2. Disconnect ignition coil assembly from rocker cover.
3. Connect a known good spark plug to the ignition coil assembly.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.



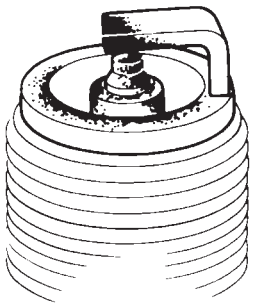
SEF575Q

OK or NG

OK	▶	GO TO 7.
NG	▶	Check ignition coil, power transistor and their circuits. Refer to EC-QG-330.

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" in MA section.

8	CHECK COMPRESSION PRESSURE

Refer to EM section.

- Check compression pressure.

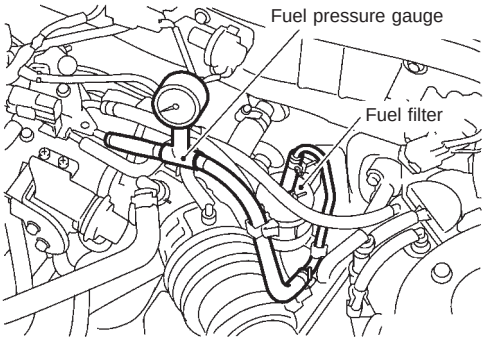
Standard:
1,324 kPa (13.24 bar, 13.5 kg/cm^2, 192 psi)/350 rpm
Minimum:
1,128 kPa (11.28 bar, 11.5 kg/cm^2, 164 psi)/350 rpm
Difference between each cylinder:
98 kPa (0.98 bar, 1.0 kg/cm^2, 14 psi)/350 rpm

OK or NG

OK	▶	GO TO 9.
NG	▶	Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

9	CHECK FUEL PRESSURE

1. Install any parts removed.
2. Release fuel pressure to zero. Refer to EC-QG-29.
3. Install fuel pressure gauge and check fuel pressure.



SEF925W

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-QG-340.
- Fuel pressure regulator Refer to EC-QG-30.
- Fuel lines Refer to ''ENGINE MAINTENANCE'' in MA section.
- Fuel filter for clogging

	▶	Repair or replace.

11	CHECK IGNITION TIMING

Perform ''Basic Inspection''.
Refer to EC-QG-80.

OK or NG

OK	▶	GO TO 12.
NG	▶	1. Perform ''Idle Air Volume Learning''. Refer to EC-QG-43. 2. Check camshaft position sensor (PHASE) (EC-QG-241) and crankshaft position sensor (POS) (EC-QG-235).

12	CHECK FRONT HEATED OXYGEN SENSOR

Refer to ''Component Inspection'', EC-QG-148.

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace front heated oxygen sensor.

Diagnostic Procedure (Cont'd)

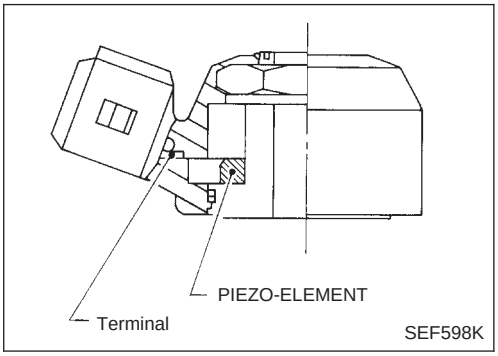
13	CHECK MASS AIR FLOW SENSOR
With CONSULT-II Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec**	
With GST Check mass air flow sensor signal in MODE 1 with GST. **at idling: 1.0 - 4.0 g·m/sec** **at 2,500 rpm: 5.0 - 10.0 g·m/sec**	
OK or NG	
OK ▶	GO TO 15.
NG ▶	GO TO 14.

14	CHECK CONNECTORS
Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-QG-115.	
OK or NG	
NG ▶	Repair or replace it.

15	CHECK SYMPTOM MATRIX CHART
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-QG-92.	
OK or NG	
OK ▶	GO TO 16.
NG ▶	Repair or replace.

16	ERASE THE 1ST TRIP DTC
Some tests may cause a 1st trip DTC to be set. Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-QG-53.	
▶	GO TO 17.

17	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-QG-108.	
▶	**INSPECTION END**



Component Description

NCEC0206

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

Freeze frame data will not be stored in the ECM for the knock sensor. The MI will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

ECM Terminals and Reference Value

NCEC0207

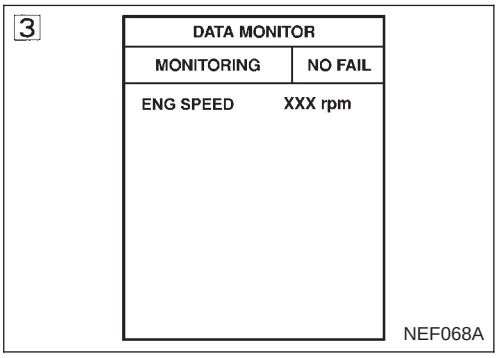
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
81	W	Knock sensor	**[Engine is running]** ● Idle speed	1.0 - 4.0V

On Board Diagnosis Logic

NCEC0208

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0325 0325	● An excessively low or high voltage from the knock sensor is sent to ECM.	● Harness or connectors (The knock sensor circuit is open or shorted.) ● Knock sensor



DTC Confirmation Procedure

NCEC0209

NOTE:

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

TESTING CONDITION:

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

With CONSULT-II

1) Turn ignition switch ‘‘ON’’ and select ‘‘DATA MONITOR’’ mode with CONSULT-II.
2) Start engine and run it for at least 5 seconds at idle speed.
3) If DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-233.

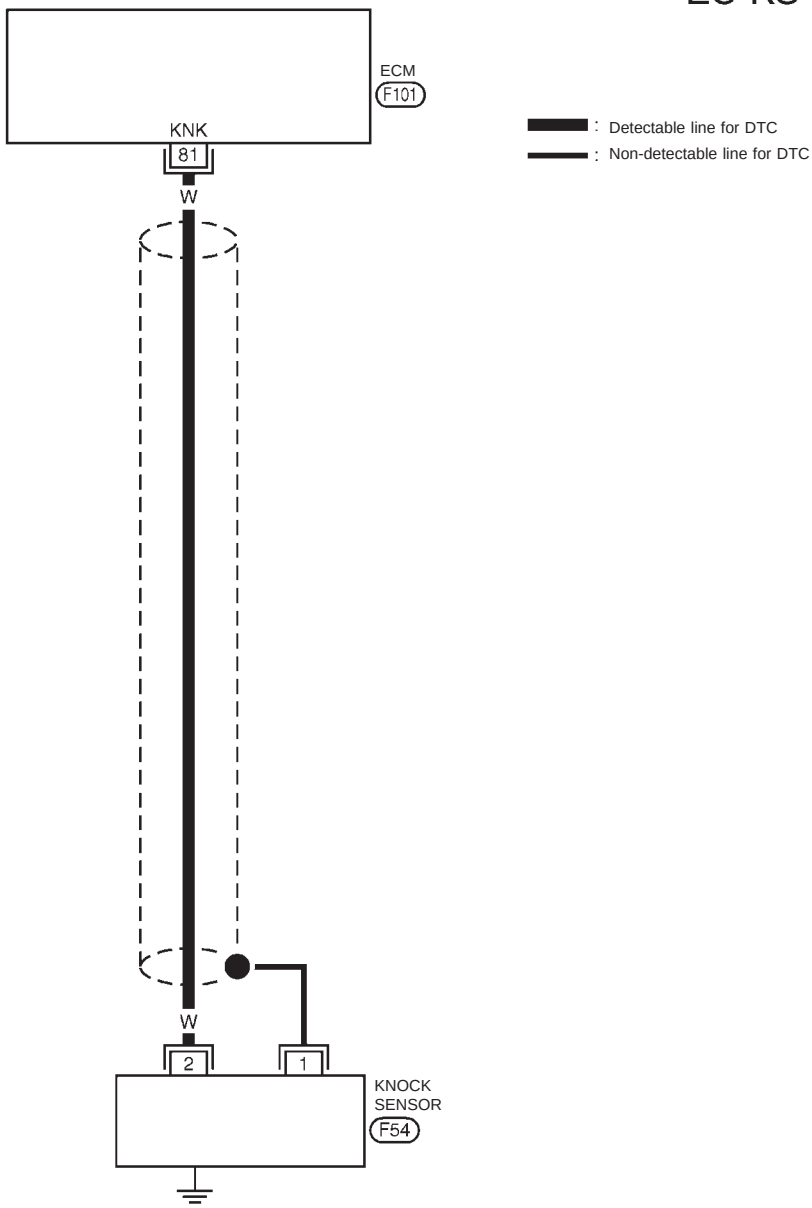
With GST

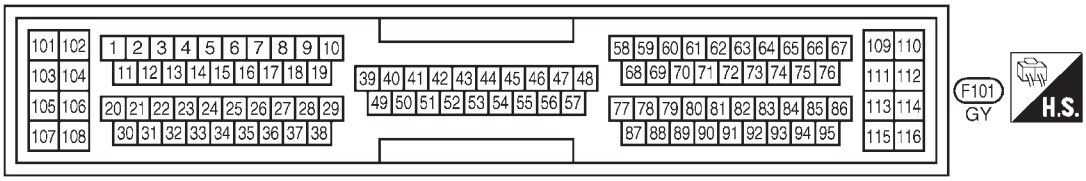
Follow the procedure ‘‘With CONSULT-II’’ above.

Wiring Diagram

NCEC0210

EC-KS-01



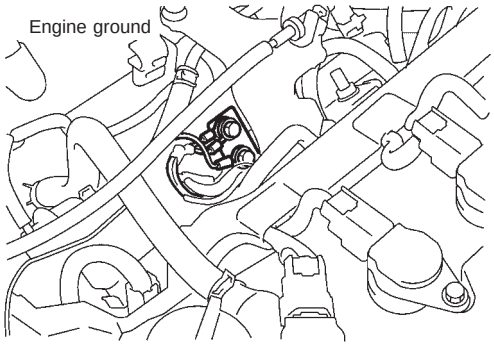


Diagnostic Procedure

NCEC0211

1	RETIGHTEN GROUND SCREWS

Loosen and retighten engine ground screws.



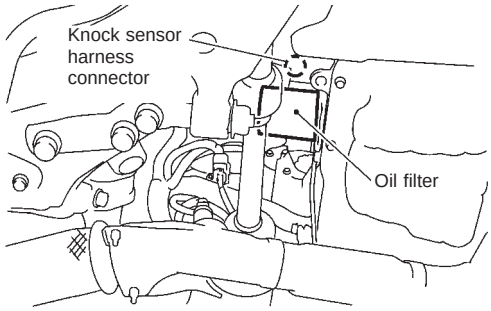
SEF994W

	▶	GO TO 2.

2	CHECK INPUT SIGNAL CIRCUIT-1

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and knock sensor harness connector.

View from the underside of the vehicle



SEF056X

3. Check harness continuity between knock sensor signal terminal 2 and ECM terminal 81.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

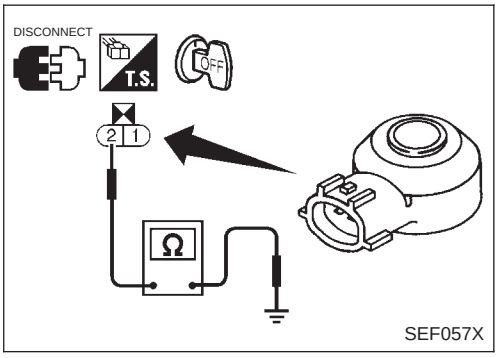
3	DETECT MALFUNCTIONING PART

Check the harness for open or short between knock sensor and ECM.

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

4	CHECK KNOCK SENSOR	
Knock sensor Refer to ''Component Inspection'', EC-QG-234.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace knock sensor.

5	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



Component Inspection

NCEC0212

KNOCK SENSOR

NCEC0212S01

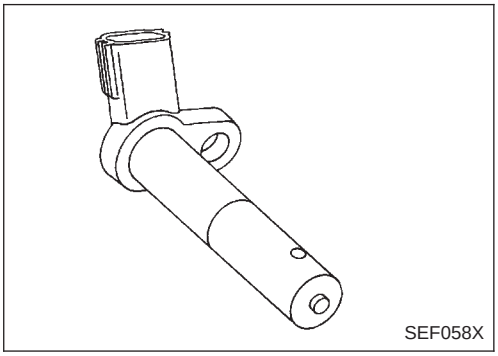
- Use an ohmmeter which can measure more than 10 MΩ.

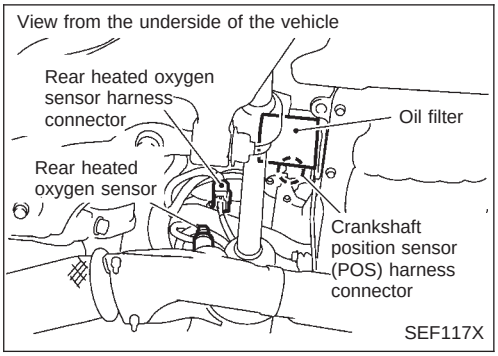
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal 2 and ground.

Resistance: 500 - 620 kΩ [at 25°C (77°F)]

CAUTION:

Discard any knock sensors that have been dropped or physically damaged. Use only new ones.


SEF058X



SEF117X

Component Description

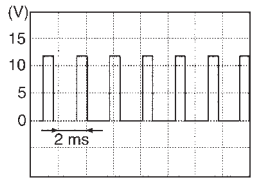
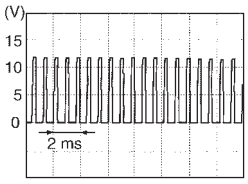
NCEC0551

The crankshaft position sensor is located on the right rear wall of the cylinder block in relation to the signal plate on the No. 6 counterweight.
The crankshaft position sensor is a basic component of the engine control system. It monitors engine speed, piston position, and fluctuation of the engine revolution. These input signals to the engine control system are used to control fuel injection, ignition timing and other functions.
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 signal plate is provided with 34 teeth to emit a signal at an interval of 10° during crankshaft operations. However, it is not provided with 2 teeth to emit a signal at an interval of 180°.
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 a voltage signal to provide ‘‘time processing’’ for engine speed, piston position and fluctuation of engine revolutions.
This sensor is not used to control the engine system. It is used only for the on board diagnosis.

ECM Terminals and Reference Value

NCEC0552

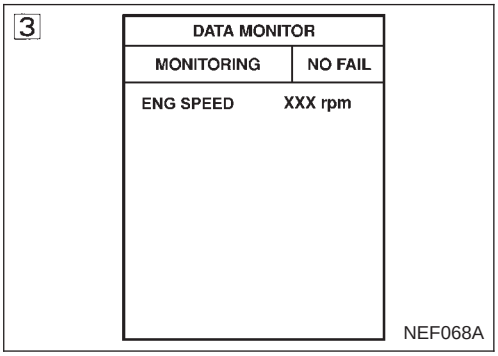
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (AC Voltage)
85	W	Crankshaft position sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	3 - 4V  SEF979W
			[Engine is running] ● Engine speed is 2,000 rpm	3 - 4V  SEF980W

On Board Diagnosis Logic

NCEC0553

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0335 0335	● The 10° signal is not entered to ECM for the first few seconds during engine cranking. ..... ● The 10° signal is not entered to ECM during engine running. ..... ● The 10° signal is not in the normal pattern at each engine revolution.	● Harness or connectors (The crankshaft position sensor (POS) circuit is open or shorted.) ● Crankshaft position sensor (POS) ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.) ● Dead (Weak) battery



DTC Confirmation Procedure

NCEC0554

NOTE:

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

With CONSULT-II

1) Turn ignition switch ‘‘ON’’ and select ‘‘DATA MONITOR’’ mode with CONSULT-II.
2) Start engine and run it for at least 2 seconds at idle speed.
3) If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-238.

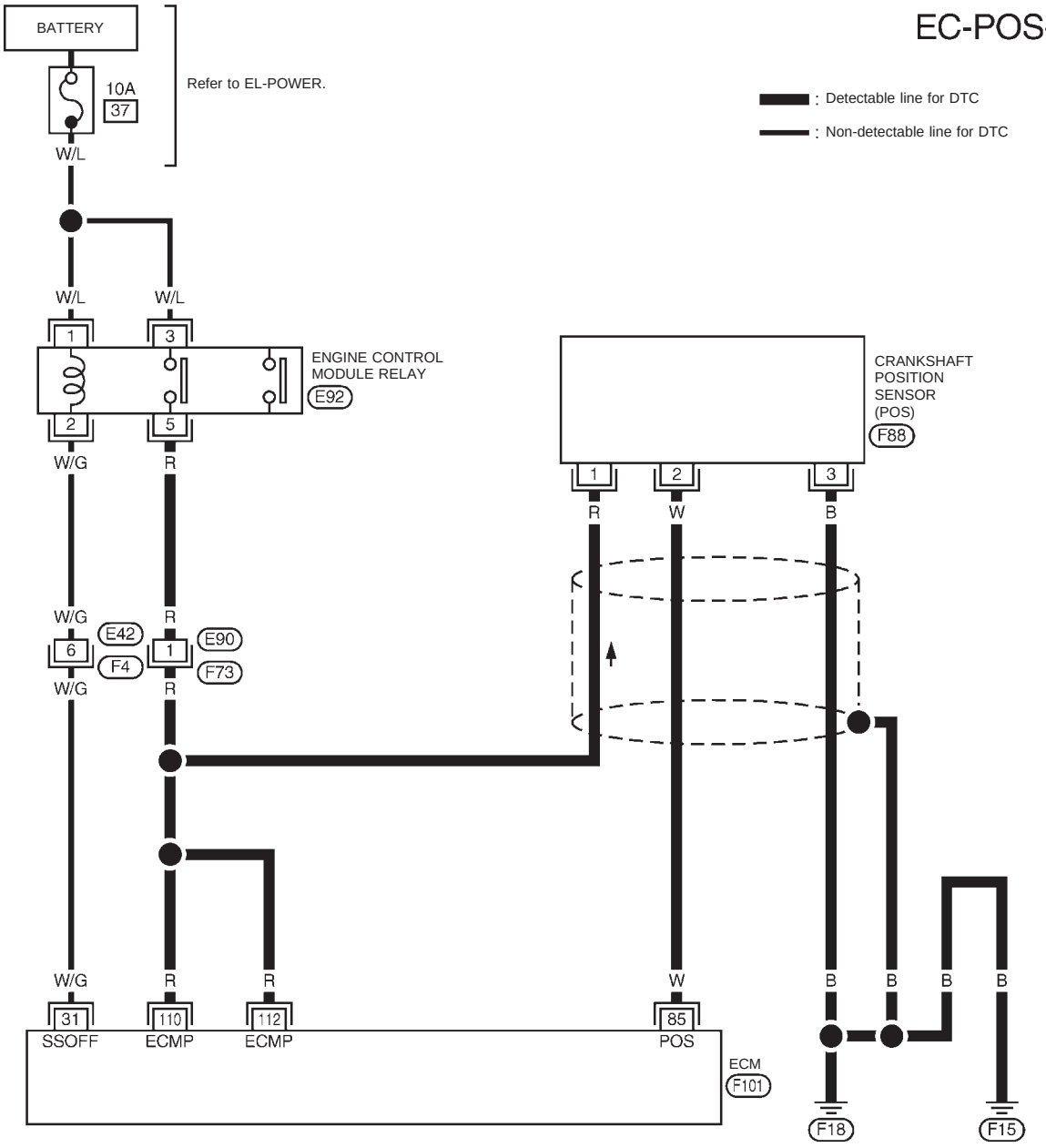
With GST

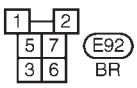
Follow the procedure ‘‘With CONSULT-II’’ above.

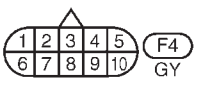
Wiring Diagram

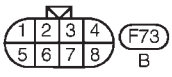
NCEC0555

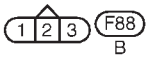
EC-POS-01

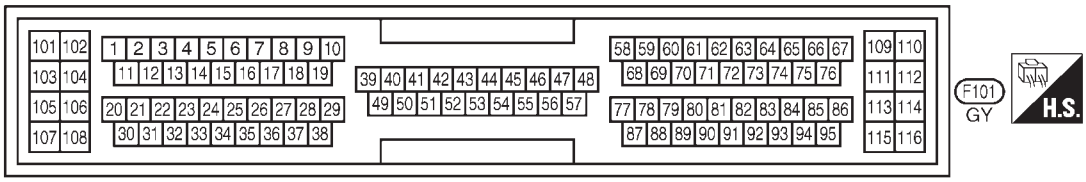










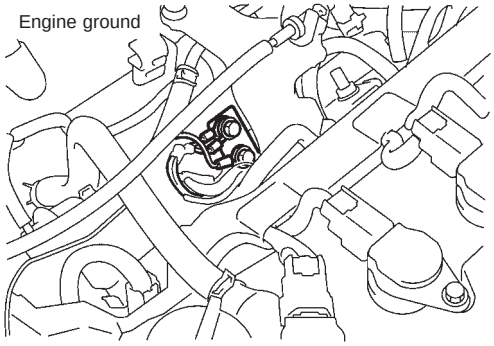


Diagnostic Procedure

NCEC0556

1	RETIGHTEN GROUND SCREWS

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

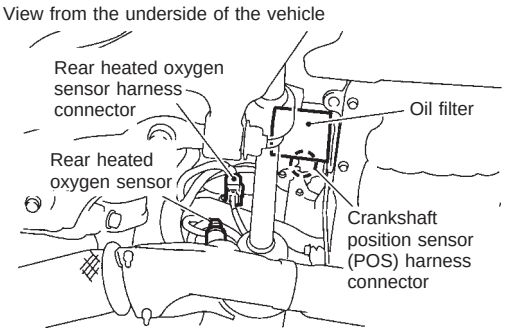


SEF994W

▶	GO TO 2.

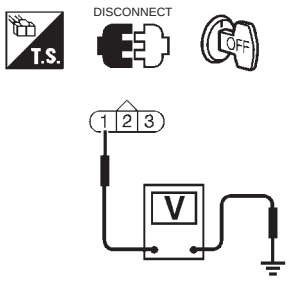
2	CHECK POWER SUPPLY

1. Disconnect crankshaft position sensor harness connector.



SEF117X

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



SEF120X

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

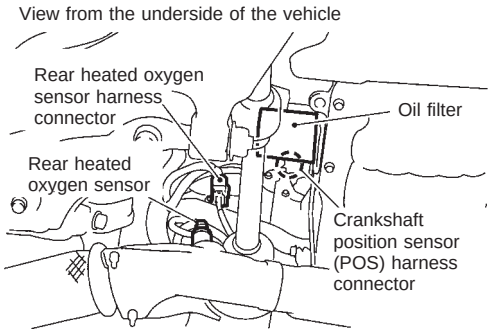
3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E90, F73
- Harness for open or short between crankshaft position sensor and ECM relay
- Harness for open or short between crankshaft position sensor and ECM
- ECM relay

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

4	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect crankshaft position sensor and ECM harness connectors.



SEF117X

2. Check continuity between ECM terminal 85 and crankshaft position sensor harness connector terminal 2.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

5	CHECK GROUND CIRCUIT

1. Reconnect ECM harness connector.
2. Check harness continuity between terminal 3 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 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK CRANKSHAFT POSITION SENSOR

Refer to ''Component Inspection'', EC-QG-240.

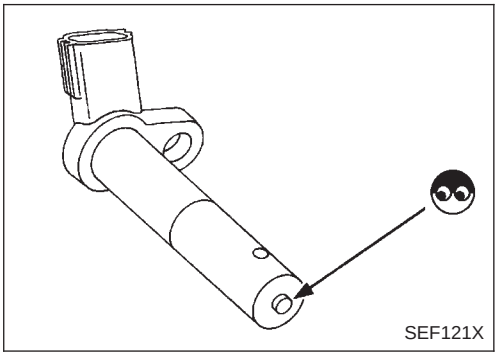
OK or NG

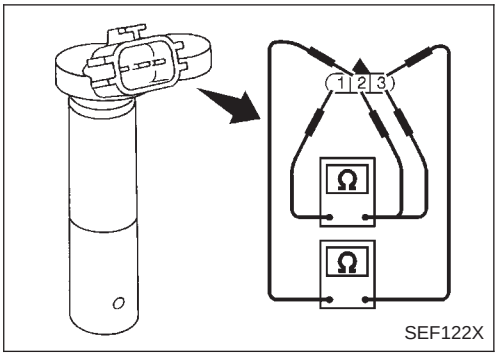
OK	▶	GO TO 7.
NG	▶	Replace crankshaft position sensor.

7	CHECK INTERMITTENT INCIDENT

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.

	▶	**INSPECTION END**


SEF121X



SEF122X

Component Inspection

NCEC0557

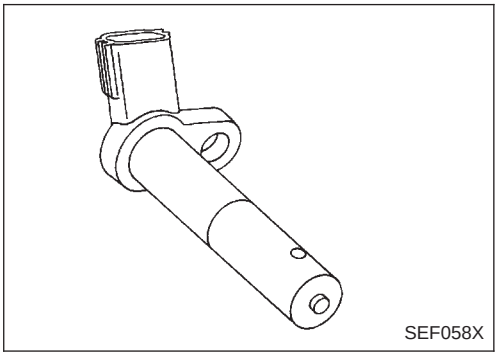
CRANKSHAFT POSITION SENSOR (POS)

NCEC0557S01

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (–)	Except 0 or ∞
2 (+) - 1 (–)	
3 (+) - 2 (–)	

If NG, replace crankshaft position sensor.


SEF058X

Component Description

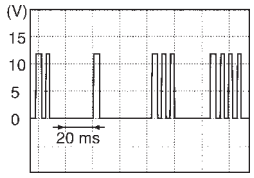
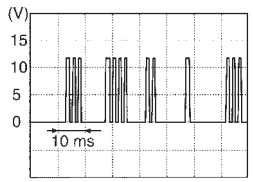
NCEC0220

The camshaft position sensor senses the protrusion provided with exhaust valve cam sprocket to identify a particular cylinder. The crankshaft position sensor senses the piston position.
When the crankshaft position sensor system becomes inoperative, the camshaft position sensor provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
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.

ECM Terminals and Reference Value

NCEC0221

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
85	W	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	3 - 4V  SEF977W
			[Engine is running] ● Engine speed is 2,000 rpm	3 - 4V  SEF978W

On Board Diagnosis Logic

NCEC0222

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0340 0340	● The cylinder No. signal is not entered to ECM for the first few seconds during engine cranking. ..... ● The cylinder No. signal is not enter to ECM during engine running. ..... ● The cylinder No. signal is not in the normal pattern during engine running.	● Harness or connectors (The camshaft position sensor (PHASE) circuit is open or shorted.) ● Camshaft position sensor (PHASE) ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.)

DTC Confirmation Procedure

NCEC0223

NOTE:

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V.

2

DATA MONITOR	
MONITORING	NO FAIL
COOLAN TEMP/S	XXX °C

PEF002P

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-QG-244.

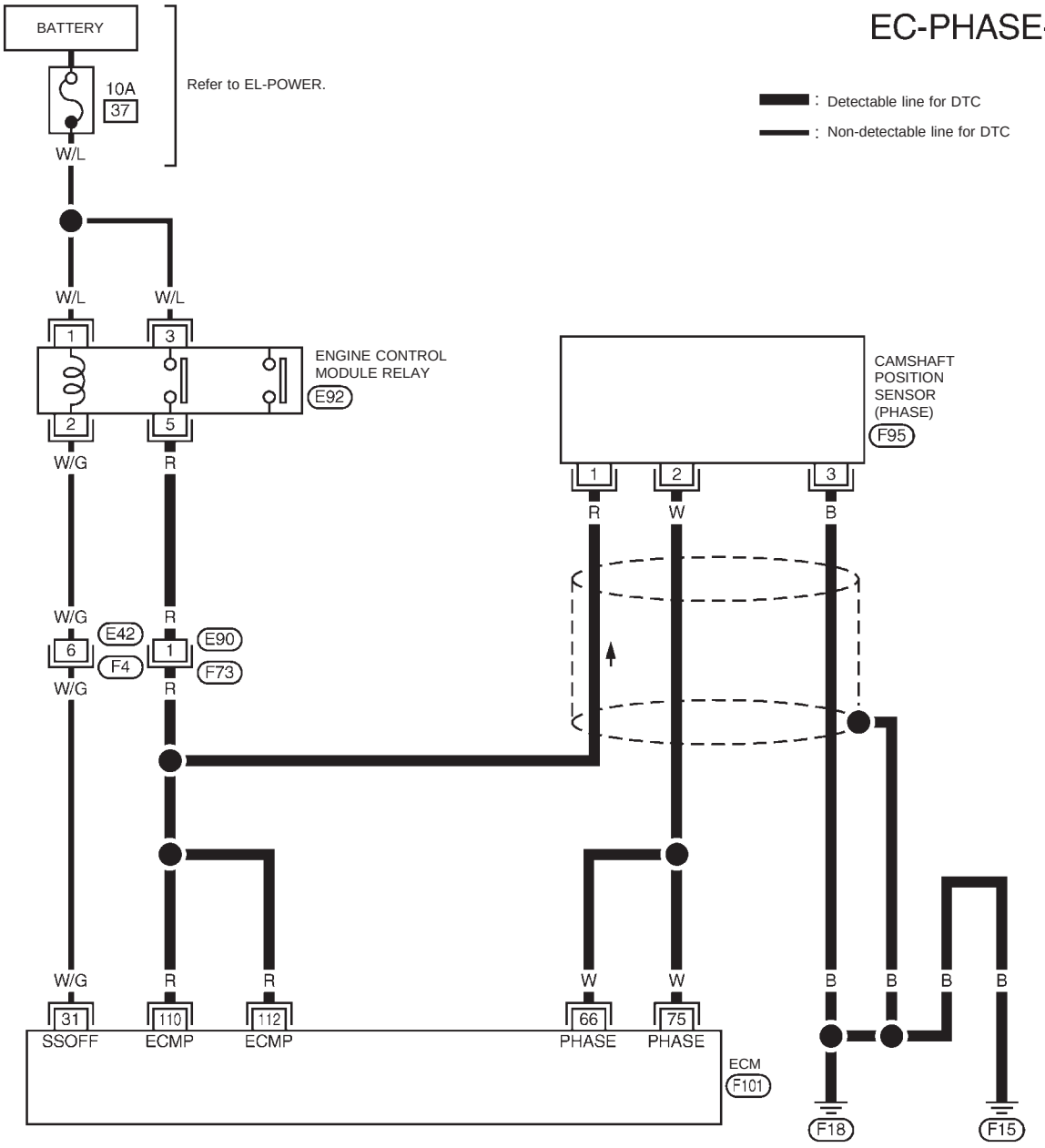
With GST

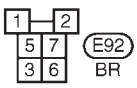
Follow the procedure ‘‘With CONSULT-II’’ above.

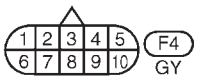
Wiring Diagram

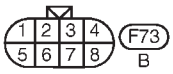
NCEC0224

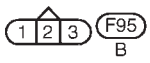
EC-PHASE-01

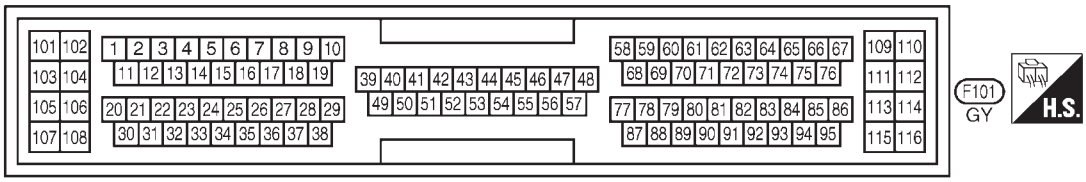










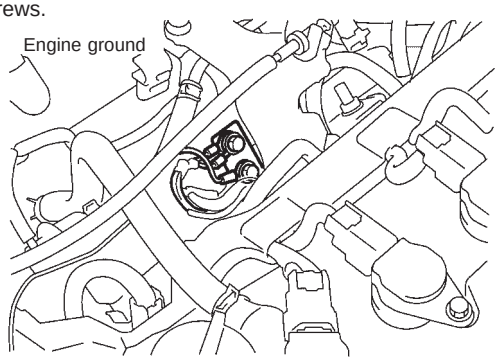


Diagnostic Procedure

NCEC0225

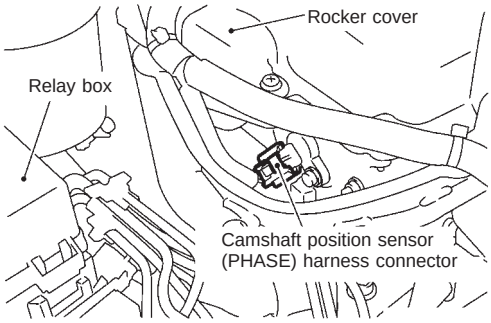
1	CHECK STARTING SYSTEM	
Does the engine turn over? (Does the starter motor operate?) **Yes or No**		
Yes	▶	GO TO 2.
No	▶	Check starting system. (Refer to EL section.)

2	RETIGHTEN GROUND SCREWS	
1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws.		
	▶	GO TO 3.

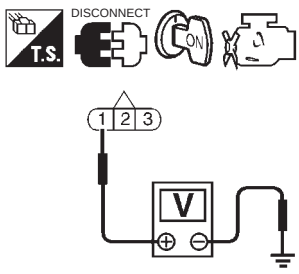


SEF994W

3	CHECK POWER SUPPLY	
1. Disconnect camshaft position sensor harness connector.		
2. Turn ignition switch "ON". 3. Check voltage between terminal 1 and ground with CONSULT-II or tester. **Voltage: Battery voltage** **OK or NG**		
OK	▶	GO TO 5.
NG	▶	GO TO 4.



SEF060X



SEF061X

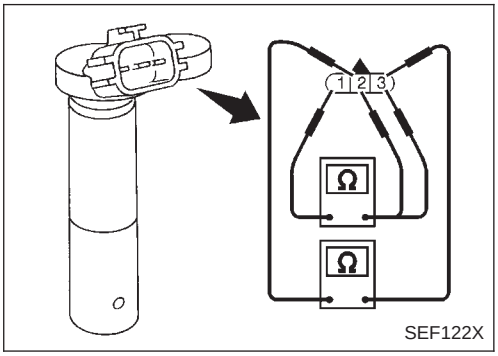
4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E90, F73 ● Harness for open or short between camshaft position sensor and ECM relay ● Harness for open or short between camshaft position sensor and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INPUT SIGNAL CIRCUIT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between sensor terminal 2 and ECM terminal 75. Refer to wiring diagram. **Continuity should exist.** 4. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 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 sensor terminal 3 and engine ground. Refer to wiring diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK CAMSHAFT POSITION SENSOR
Refer to "Component Inspection", EC-QG-246. **OK or NG**	
OK ▶	GO TO 8.
NG ▶	Replace camshaft position sensor.

8	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-QG-108.	
▶	**INSPECTION END**



Component Inspection

=NCEC0226

CAMSHAFT POSITION SENSOR

NCEC0226S01

1. Disconnect camshaft position sensor (PHASE) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (–)	Except 0 or ∞
2 (+) - 1 (–)	
3 (+) - 2 (–)	

If NG, replace camshaft position sensor.

Description

SYSTEM DESCRIPTION

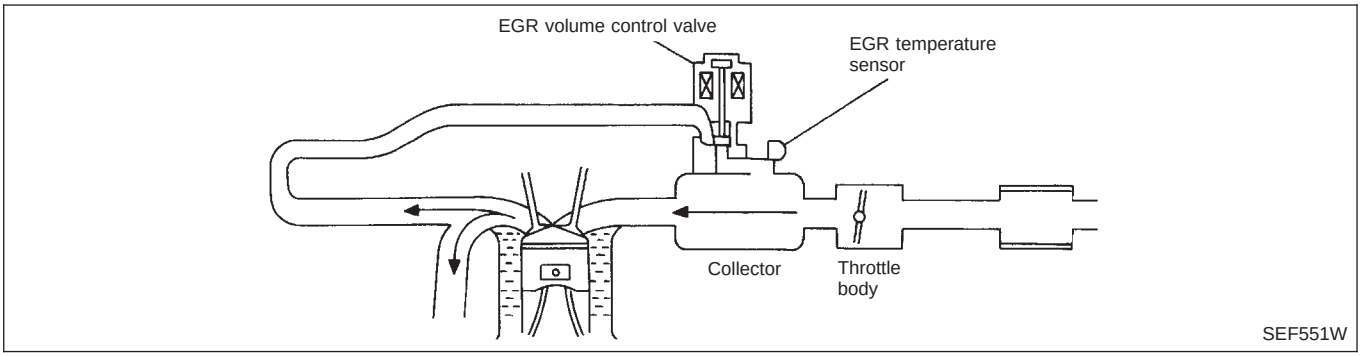
NCEC0227

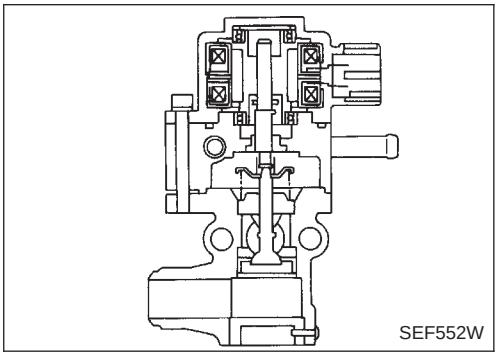
NCEC0227S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed	EGR control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		

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 closed under the following conditions.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage





COMPONENT DESCRIPTION

NCEC0227S02

EGR Volume Control Valve

NCEC0227S0201

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

NCEC0502

Specification data are reference values.

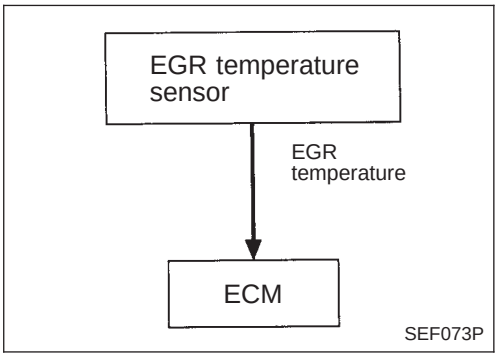
MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: ''OFF'' ● Shift lever: ''N'' ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

NCEC0503

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8 9 17 18	W/B SB G/R R/Y	EGR volume control valve	**[Engine is running]** ● **Warm-up condition** ● Rev engine up from 2,000 to 4,000 rpm	0 - 14V
58	B	Sensor's ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0V
72	PU	EGR temperature sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Less than 4.5V
			[Engine is running] ● **Warm-up condition** ● EGR system is operating.	0 - 1V

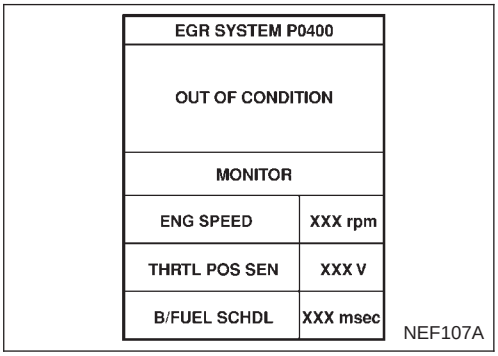


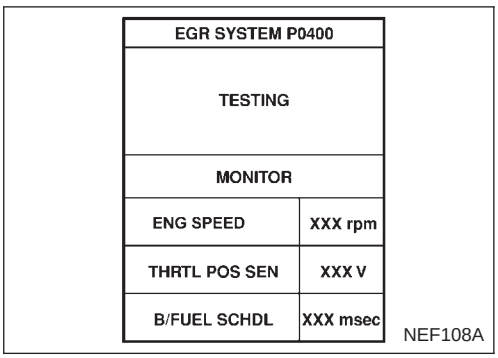
On Board Diagnosis Logic

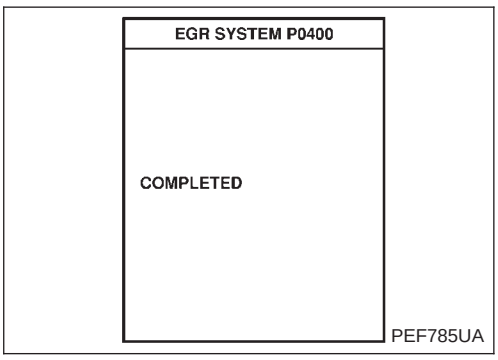
NCEC0228

If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0400	● No EGR flow is detected under conditions that call for EGR.	● Harness or connectors (The valve circuit is open or shorted.) ● EGR valve stuck closed ● Dead (Weak) battery ● EGR passage ● EGR temperature sensor ● Exhaust gas leaks







DTC Confirmation Procedure

NCEC0229

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- If ‘‘DTC Confirmation Procedure’’ has been previously conducted, always turn ignition switch ‘‘OFF’’ and wait at least 9 seconds before conducting the next test.
- P0400 will not be displayed at ‘‘SELF-DIAG RESULTS’’ mode with CONSULT-II even though DTC work support test result is ‘‘NG’’.

TESTING CONDITION:

- **Before performing the following procedure, confirm battery voltage is more than 10V at idle, then stop engine immediately.**
- **It will be better to perform the test at a temperature above 0°C (32°F).**

With CONSULT-II

1) Turn ignition switch ‘‘ON’’.
2) Check ‘‘COOLAN TEMP/S’’ in ‘‘DATA MONITOR’’ mode with CONSULT-II and confirm it is within the range listed below.

   COOLAN TEMP/S: Less than 40°C (104°F)

   If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.
3) Start engine and let it idle monitoring ‘‘COOLAN TEMP/S’’ value. When the ‘‘COOLAN TEMP/S’’ value reaches 70°C (158°F), immediately go to the next step.
4) Select ‘‘EGR SYSTEM P0400’’ of ‘‘EGR SYSTEM’’ in ‘‘DTC WORK SUPPORT’’ mode with CONSULT-II.
5) Touch ‘‘START’’.
6) Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle with engine running.
   If ‘‘COMPLETED’’ appears on CONSULT-II screen, go to step 8.
   If ‘‘COMPLETED’’ does not appear on CONSULT-II screen, go to the following step.
7) When the following conditions are met, ‘‘TESTING’’ will be displayed on the CONSULT-II screen. Maintain the conditions until ‘‘TESTING’’ changes to ‘‘COMPLETED’’. (It will take approximately 45 seconds or more.)

ENG SPEED	Above 2,400 rpm
Vehicle speed	Above 90 km/h (56 MPH)
B/FUEL SCHDL	4.0 - 8.0 msec
Selector lever	4th or 5th

   If ‘‘TESTING’’ is not displayed after 5 minutes, retry from step 2.
8) Make sure that ‘‘OK’’ is displayed after touching ‘‘SELF-DIAG RESULTS’’. If ‘‘NG’’ is displayed, refer to ‘‘Diagnostic Procedure’’, EC-QG-252.

With GST

1) Turn ignition switch ‘‘ON’’.

2) Check engine coolant temperature in MODE 1 with GST.

Engine coolant temperature: Less than 40°C (104°F)

If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

3) Start engine and let it idle monitoring the value of ''COOLAN TEMP/S''. When the engine coolant temperature reaches 70°C (158°F), immediately go to the next step.

4) Maintain the following conditions for at least 1 minute.

Engine speed	Above 2,400 rpm
Vehicle speed	Above 90 km/h (56 MPH)
Selector lever	4th or 5th

5) Stop vehicle.

6) Turn ignition switch ''OFF'' and wait at least 9 seconds, then turn ''ON''.

7) Repeat step 2 to 4.

8) Select ''MODE 3'' with GST.

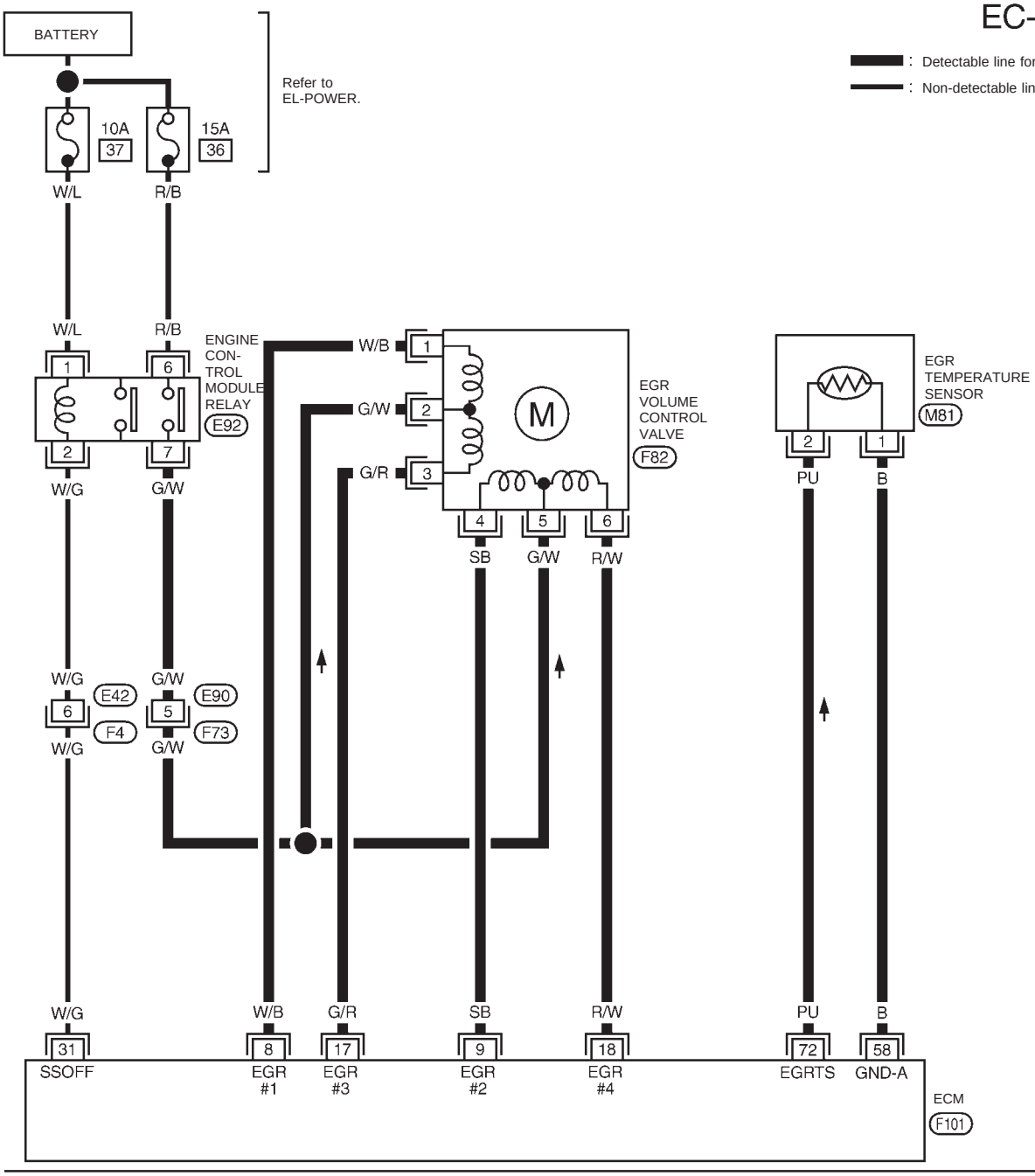
9) If DTC is detected, go to ''Diagnostic Procedure'', EC-QG-252.

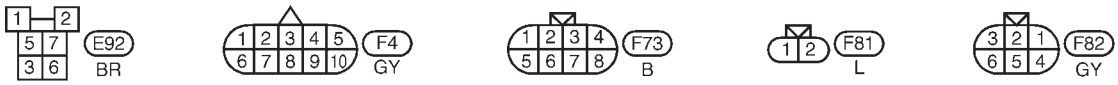
- **When using GST, ''DTC CONFIRMATION PROCEDURE'' should be performed twice as much as when using CONSULT-II or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II or ECM (Diagnostic Test Mode II) is recommended.**

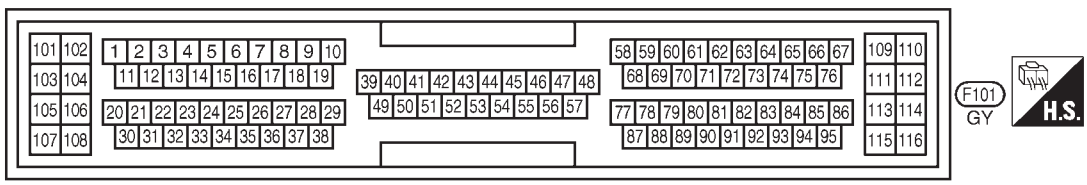
Wiring Diagram

NCEC0231

EC-EGR-01





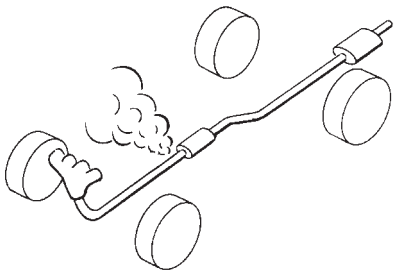


Diagnostic Procedure

NCEC0232

1	CHECK EXHAUST SYSTEM

1. Start engine.
2. Check exhaust pipes and muffler for leaks.



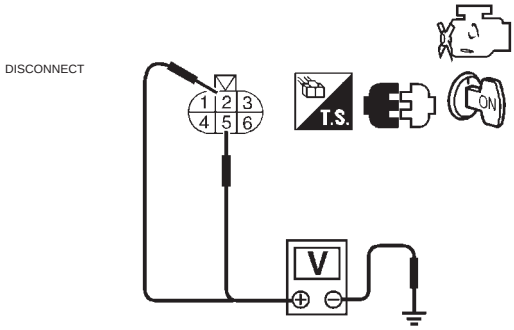
SEF099P

OK or NG

OK (With CONSULT-II)	▶	GO TO 2.
OK (Without CONSULT-II)	▶	GO TO 3.
NG	▶	Repair or replace exhaust system.

2	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch ‘‘ON’’.
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



SEF556WA

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	**Check the following.** ● Harness or connectors E90, F73 ● Harness for open or short between EGR volume control valve and engine control module relay If NG, repair harness or connectors.

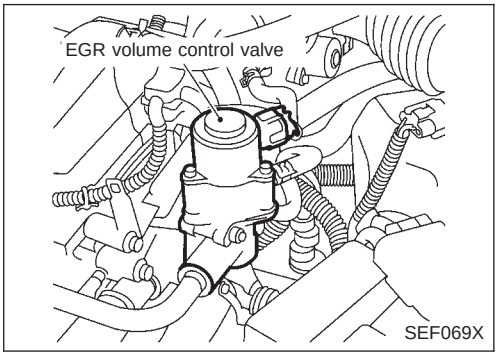
3	CHECK OUTPUT SIGNAL CIRCUIT	
1. Turn ignition switch ''OFF''. 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 8 and terminal 1, ECM terminal 9 and terminal 4, ECM terminal 17 and terminal 3, ECM terminal 18 and terminal 6. Refer to wiring diagram. **Continuity should exist.** If OK, check harness for short to ground and short to power. **OK or NG**		
OK	▶	GO TO 4.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

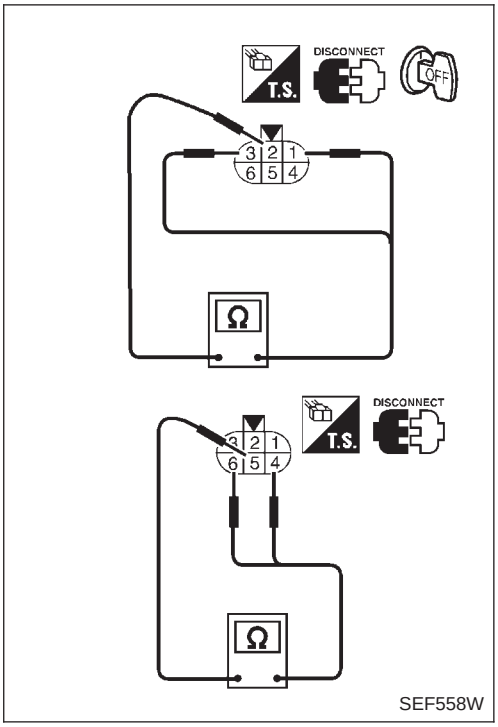
4	CHECK EGR PASSAGE	
Check EGR passage for clogging and cracks. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Repair or replace EGR passage.

5	CHECK EGR TEMPERATURE SENSOR	
Refer to ''TROUBLE DIAGNOSIS FOR DTC P1401'', EC-QG-307. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	Replace EGR temperature sensor.

6	CHECK EGR VOLUME CONTROL VALVE	
Refer to ''Component Inspection'', EC-QG-254. **OK or NG**		
OK	▶	GO TO 7.
NG	▶	Replace EGR volume control valve.

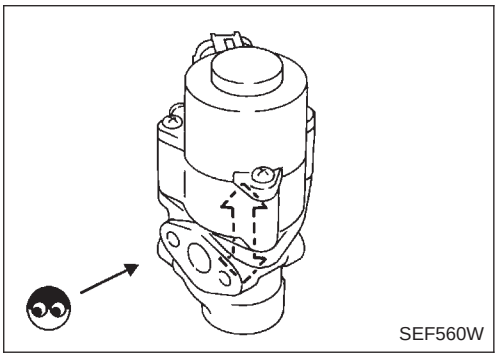
7	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**





ACTIVE TEST	
EGR VOL CONT/V	20 Step
MONITOR	
ENG SPEED	XXX rpm

NEF109A



Component Inspection

NCEC0233

EGR VOLUME CONTROL VALVE

NCEC0233S01

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch ‘‘ON’’.
6) Perform ‘‘EGR VOL CONT/V’’ in ‘‘ACTIVE TEST’’ mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EGR volume control valve.

Without CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Turn ignition switch ‘‘ON’’ and ‘‘OFF’’. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.

Description

SYSTEM DESCRIPTION

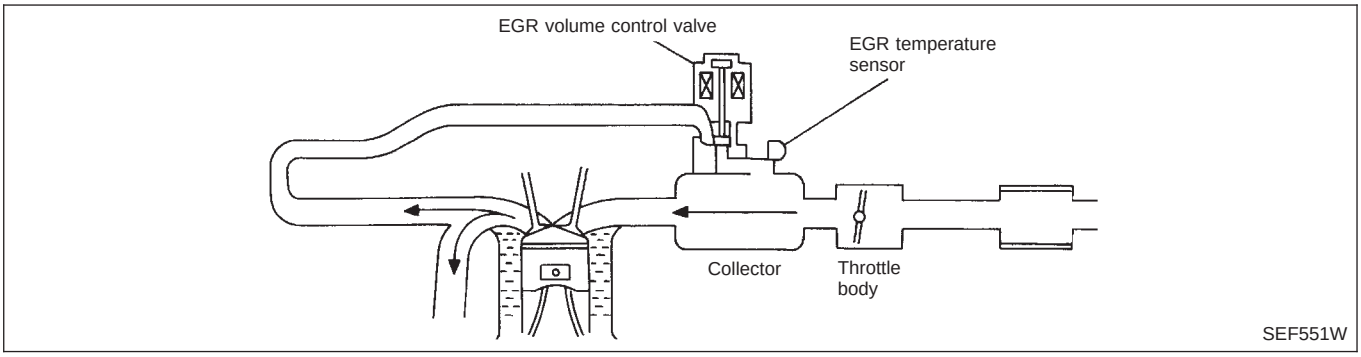
NCEC0504

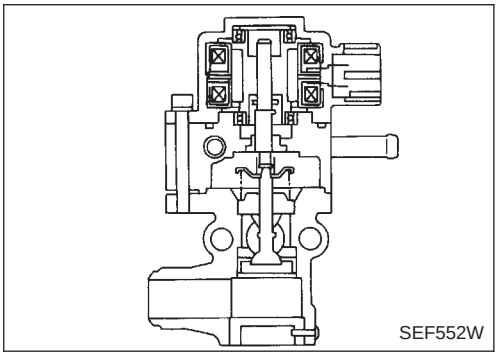
NCEC0504S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed	EGR control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		

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 closed under the following conditions.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Extremely light load engine operation
- Engine idling
- Excessively high engine coolant temperature
- Wide open throttle
- Mass air flow sensor malfunction
- Low battery voltage





COMPONENT DESCRIPTION

NCEC0504S02

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

NCEC0506

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR VOL CON/V	● Engine: After warming up ● Shift lever: "N" ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

NCEC0507

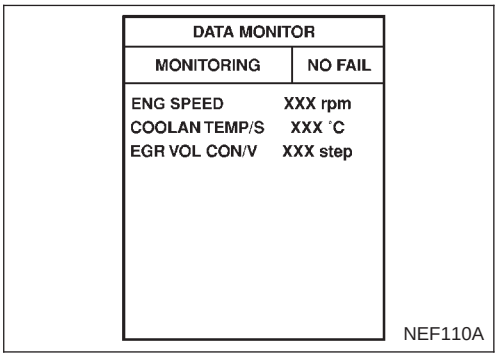
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8 9 17 18	W/B SB G/R R/Y	EGR volume control valve	**[Engine is running]** ● **Warm-up condition** ● Rev engine up from 2,000 to 4,000 rpm	0 - 14V

On Board Diagnosis Logic

NCEC0508

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0403 0403	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The EGR volume control valve circuit is open or shorted.) ● EGR volume control valve



DTC Confirmation Procedure

NCEC0509

NOTE:

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

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Rev engine from idle to 2,000 rpm 20 times.
   If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-QG-258.

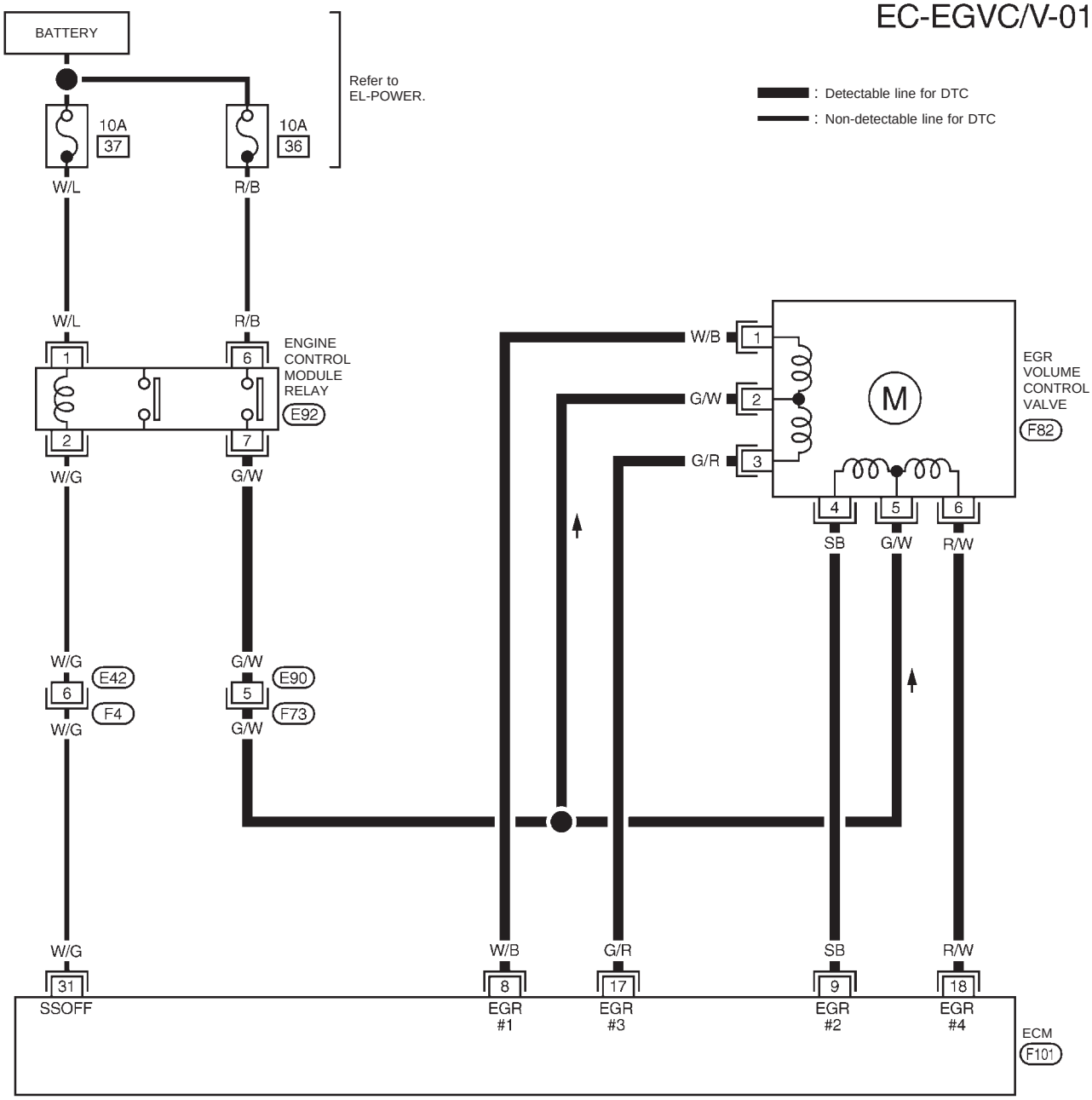
With GST

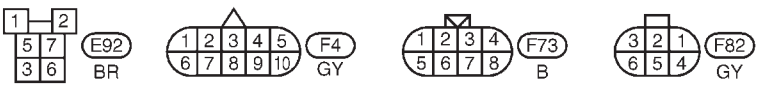
Follow the procedure "With CONSULT-II" above.

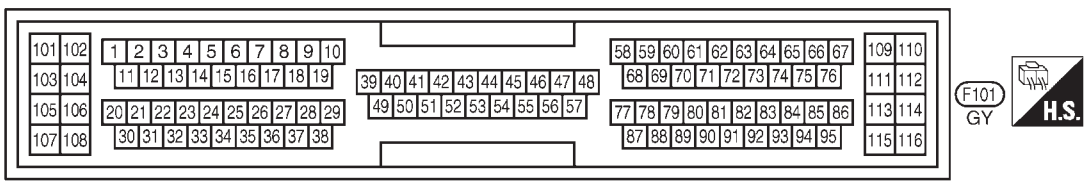
Wiring Diagram

NCEC0510

EC-EGVC/V-01





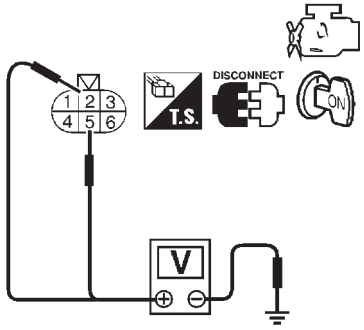


Diagnostic Procedure

NCEC0511

1	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch ‘‘ON’’.
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



SEF556W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 2.
NG	▶	**Check the following.** ● Harness or connectors E90, F73 ● Harness for open or short between EGR volume control valve and engine control module relay If NG, repair harness or connectors.

2	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch ‘‘OFF’’.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and terminal 1,
   ECM terminal 9 and terminal 2,
   ECM terminal 17 and terminal 3,
   ECM terminal 18 and terminal 4.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

OK or NG

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

3	CHECK EGR VOLUME CONTROL VALVE

Refer to ‘‘Component Inspection’’, EC-QG-259.

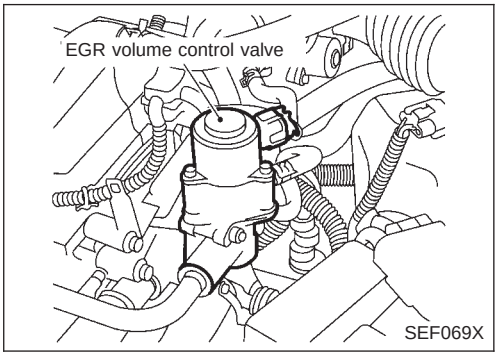
OK or NG

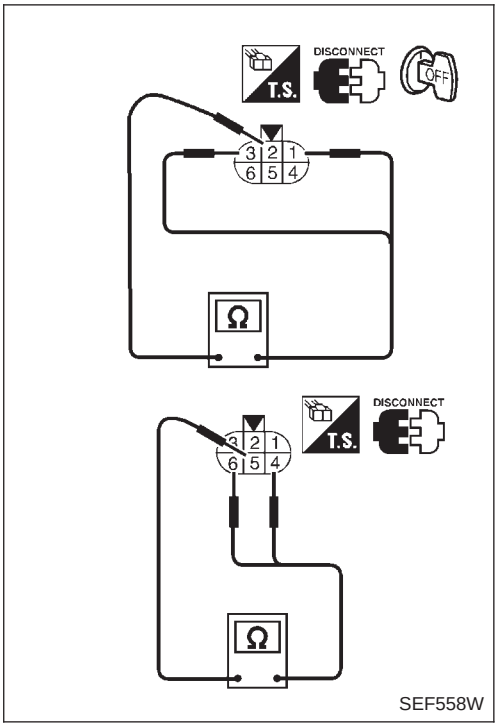
OK	▶	GO TO 4.
NG	▶	Replace EGR volume control valve.

4	CHECK INTERMITTENT INCIDENT

Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-QG-108.

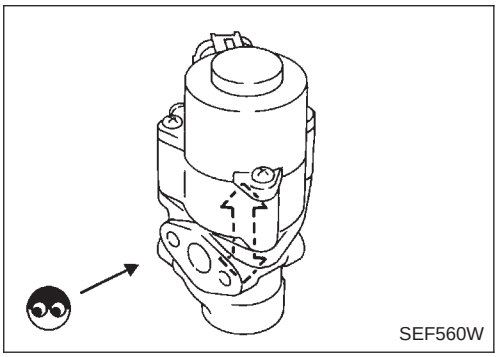
	▶	**INSPECTION END**





ACTIVE TEST	
EGR VOL CONT/V	20 Step
MONITOR	
ENG SPEED	XXX rpm

NEF109A



Component Inspection

NCEC0512

EGR VOLUME CONTROL VALVE

NCEC0512S01

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

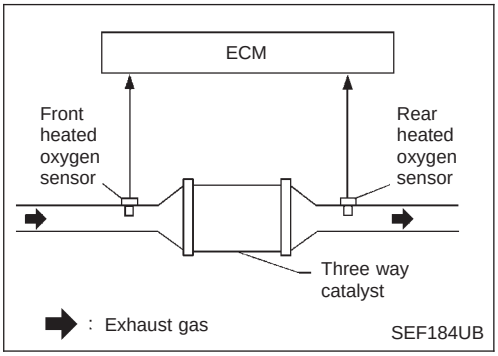
3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch ‘‘ON’’.
6) Perform ‘‘EGR VOL CONT/V’’ in ‘‘ACTIVE TEST’’ mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening.
   If NG, replace the EGR volume control valve.

Without CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Turn ignition switch ‘‘ON’’ and ‘‘OFF’’. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.

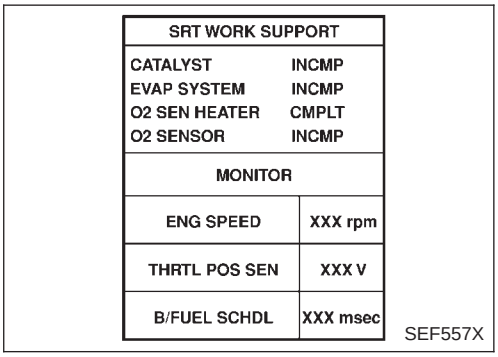


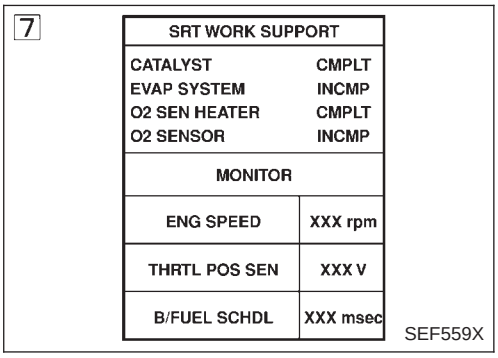
On Board Diagnosis Logic

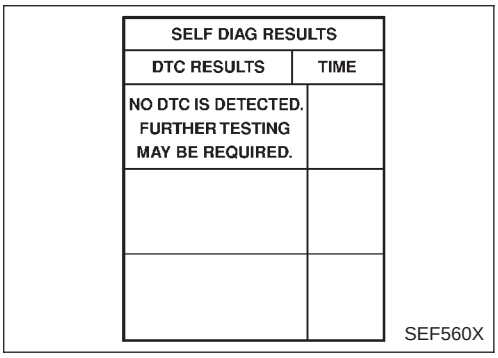
NCEC0240

The ECM monitors the switching frequency ratio of front and rear heated oxygen sensors.
A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.
When the frequency ratio of front and rear heated oxygen sensors approaches a specified limit value, the three way catalyst malfunction is diagnosed.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0420	● Three way catalyst does not operate properly. ● Three way catalyst does not have enough oxygen storage capacity.	● Three way catalyst ● Exhaust tube ● Intake air leaks ● Injectors ● Injector leaks ● Spark plug ● Improper ignition timing







DTC Confirmation Procedure

NCEC0241

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

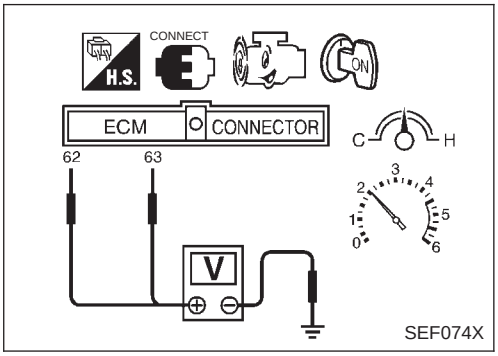
If ''DTC Confirmation Procedure'' has been previously conducted, always turn ignition switch ''OFF'' and wait at least 9 seconds before conducting the next test.

With CONSULT-II

TESTING CONDITION:

- **Open engine hood before conducting following procedure.**
- **Do not hold engine speed for more than specified minutes below.**

1) Turn ignition switch ''ON''.
2) Select ''DTC & SRT CONFIRMATION'' then ''SRT WORK SUPPORT'' mode with CONSULT-II.
3) Start engine.
4) Rev engine up to 3,000±500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
5) Wait 5 seconds at idle.
6) Rev engine up to 2,500±500 rpm and maintain it until ''INCMP'' of CATALYST changes to ''CMPLT'' (it will take approximately 5 minutes.)
   If not ''CMPLT'', stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.
7) Select ''SELF-DIAG RESULTS'' mode with CONSULT-II.
8) Confirm that the 1st trip DTC is not detected.
   If the 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-142.



Overall Function Check

NCEC0242

Use this procedure to check the overall function of the three way catalyst. During this check, a 1st trip DTC might not be confirmed.

Without CONSULT-II

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeters probes between ECM terminals 62 (Front heated oxygen sensor signal), 63 (Rear heated oxygen sensor signal) and engine ground.
4) Keep engine speed at 2,000 rpm constant under no load.
5) Make sure that the voltage switching frequency (high & low) between ECM terminal 63 and engine ground is much less than that of ECM terminal 62 and engine ground.
   Switching frequency ratio = A/B
   A: Rear heated oxygen sensor voltage switching frequency
   B: Front heated oxygen sensor voltage switching frequency
   This ratio should be less than 0.75.
   If the ratio is greater than above, it means three way catalyst does not operate properly.

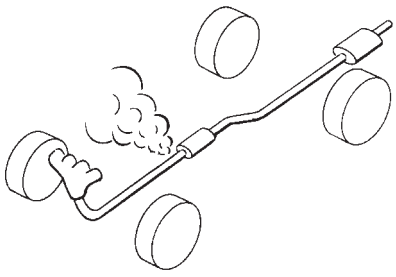
NOTE:

If the voltage at terminal 62 does not switch periodically more than 5 times within 10 seconds at step 4, perform trouble diagnosis for DTC P0133 first. (See EC-QG-157.)

Diagnostic Procedure

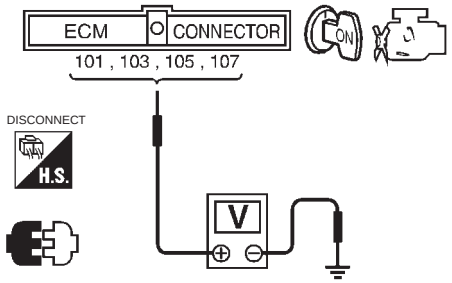
NCEC0243

1	CHECK EXHAUST SYSTEM	
Visually check exhaust tubes and muffler for dent. **OK or NG**		
OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK EXHAUST AIR LEAK	
1. Start engine and run it at idle. 2. Listen for an exhaust air leak before the three way catalyst.  SEF099P **OK or NG**		
OK	▶	GO TO 3.
NG	▶	Repair or replace.

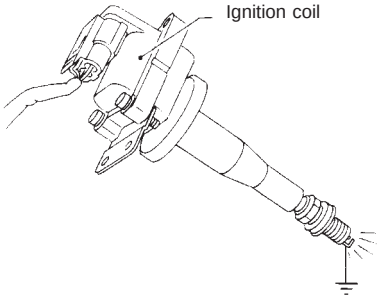
3	CHECK INTAKE AIR LEAK	
Listen for an intake air leak after the mass air flow sensor. **OK or NG**		
OK	▶	GO TO 4.
NG	▶	Repair or replace.

4	CHECK IGNITION TIMING	
Check for ignition timing. Refer to TROUBLE DIAGNOSIS — "BASIC INSPECTION", EC-QG-80. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Check camshaft position sensor (PHASE) (EC-QG-241) and crankshaft position sensor (POS) (EC-QG-235).

5	CHECK INJECTORS	
1. Refer to Wiring Diagram for Injectors, EC-QG-326. 2. Stop engine and then turn ignition switch "ON". 3. Check voltage between ECM terminals 101, 103, 105 and 107 and ground with CONSULT-II or tester.		
 SEF075X **Battery voltage should exist.** **OK or NG**		
OK	▶	GO TO 6.
NG	▶	Perform "Diagnostic Procedure" INJECTOR, EC-QG-327.

6	CHECK IGNITION SPARK

1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.



SEF575Q

OK or NG

OK	▶	GO TO 7.
NG	▶	Check ignition coil, power transistor and their circuits. Refer to EC-QG-330.

7	CHECK INJECTOR

1. Turn ignition switch "OFF".
2. Remove injector assembly. Refer to EC-QG-30.
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect camshaft position sensor harness connector.
4. Turn ignition switch "ON".
   Make sure fuel does not drip from injector.

OK or NG

OK (Does not drip)	▶	GO TO 8.
NG (Drips)	▶	Replace the injector(s) from which fuel is dripping.

8	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-QG-108.

Trouble is fixed	▶	**INSPECTION END**
Trouble is not fixed	▶	Replace three way catalyst.

Description

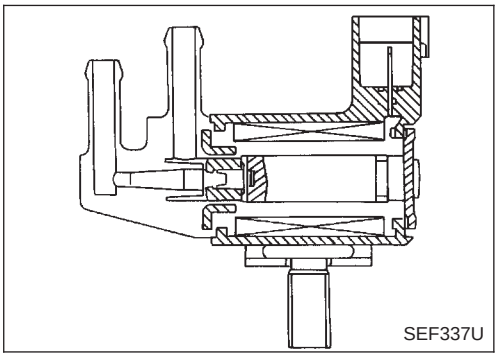
SYSTEM DESCRIPTION

NCEC0248

NCEC0248S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EVAP canister purge control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage		
Ignition switch	Start signal		
Closed throttle position switch	Closed throttle position		
Throttle position sensor	Throttle position		
Front heated oxygen sensor	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Tank fuel temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor	Vehicle speed		

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.


SEF337U

COMPONENT DESCRIPTION

NCEC0248S02

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

NCEC0249

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● No-load ● Lift up drive wheels and shift to 1st gear position. ● Air conditioner switch “OFF”	Idle	0%
		More than 2,000 rpm	—

ECM Terminals and Reference Value

NCEC0250

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	P/B	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Vehicle is running] ● **Warm-up condition** ● 2,000 rpm	5 - 12V

On Board Diagnosis Logic

NCEC0251

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0443 0443	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve

DTC Confirmation Procedure

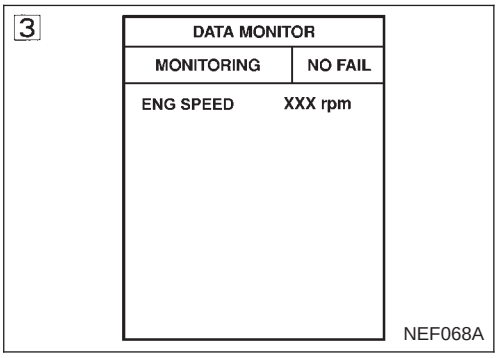
NCEC0252

NOTE:

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

TESTING CONDITION:

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



With CONSULT-II

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Start engine and let it idle for at least 5 seconds.
4) If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-267.

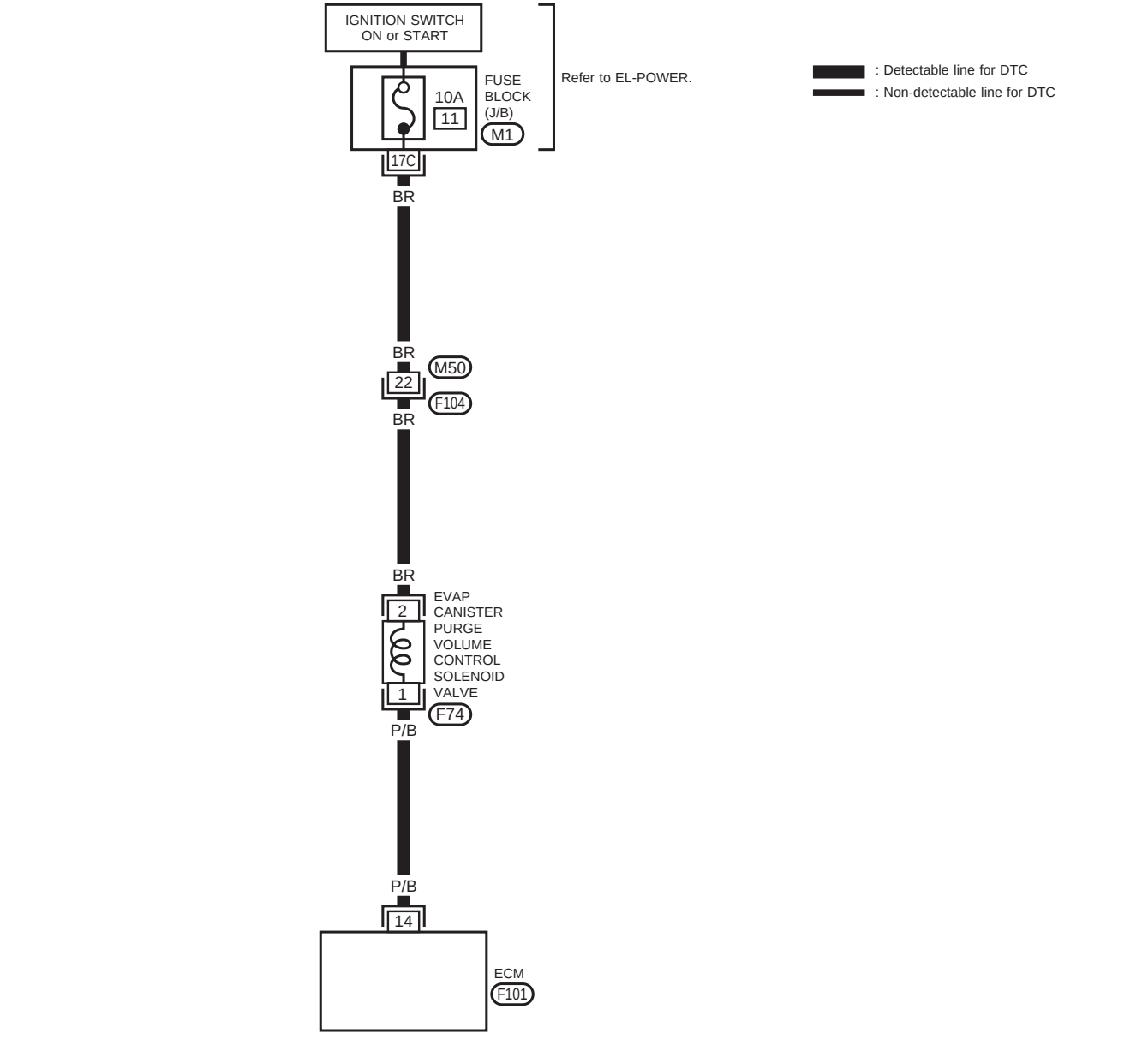
With GST

Follow the procedure ‘‘With CONSULT-II’’ above.

Wiring Diagram

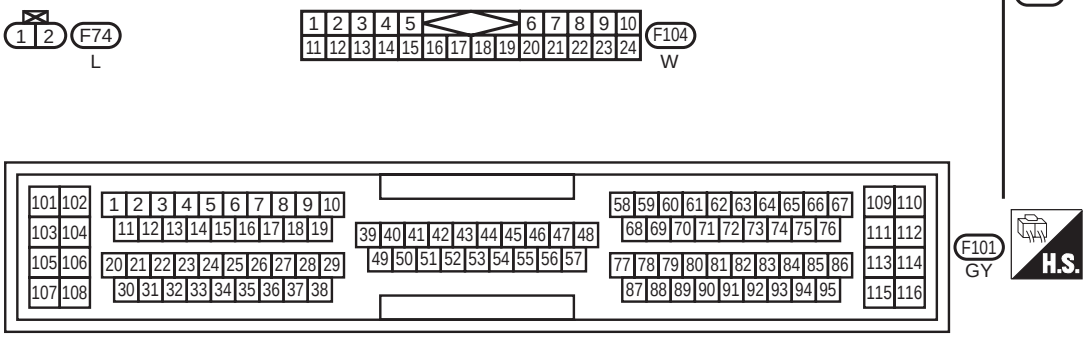
NCEC0253

EC-PGC/V-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

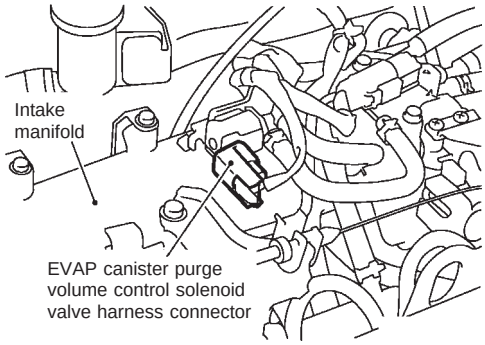


Diagnostic Procedure

NCEC0254

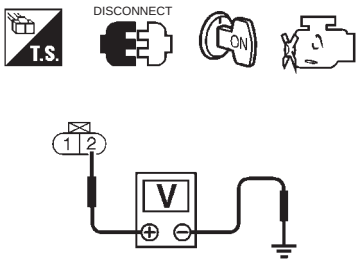
1	CHECK POWER SUPPLY

1. Turn ignition switch ‘‘OFF’’.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF076X

3. Turn ignition switch ‘‘ON’’.
4. Check voltage between terminals 2 and engine ground with CONSULT-II or tester.



SEF077X

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the harness connectors M50, F104.

▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch ‘‘OFF’’.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 14 and terminal 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.

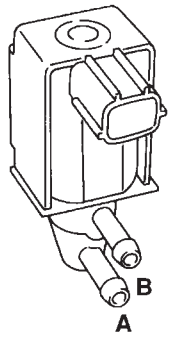
Diagnostic Procedure (Cont'd)

4	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	
Refer to ''Component Inspection'' EC-QG-268. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

5	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**

ACTIVE TEST	
PURG VOL CONT/V	0.0 %
MONITOR	
ENG SPEED	XXX rpm

NEF111A



SEF079X

Component Inspection

NCEC0255

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

NCEC0255S01

With CONSULT-II

1) Start engine.
2) Perform ''PURG VOL CONT/V'' in ''ACTIVE TEST'' mode with CONSULT-II. Check that engine speed varies according to the valve opening.
   If OK, inspection end. If NG, go to following step.
3) Check air passage continuity.

Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

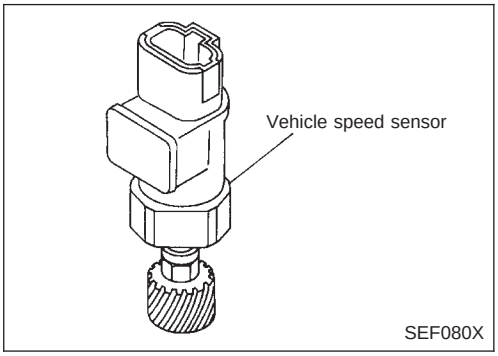
If NG, replace the EVAP canister purge volume control solenoid valve.

Without CONSULT-II

Check air passage continuity.

Condition	Air passage continuity between A and B
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace solenoid valve.



Component Description

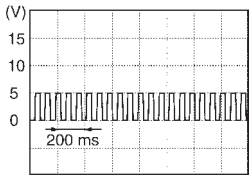
NCEC0272

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

NCEC0273

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
86	OR/W	Vehicle speed sensor	**[Engine is running]** ● Lift up the vehicle ● In 2nd gear position ● Vehicle speed is 40 km/h (25 MPH)	2.0 - 3.0 V  SEF976W

On Board Diagnosis Logic

NCEC0274

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

NCEC0275

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

6

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
B/FUEL SCHDL	XXX msec
PW/ST SIGNAL	OFF
VHCL SPEED SE	XXX km/h

NEF112A

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-QG-272.
   If OK, go to following step.
4) Select ''DATA MONITOR'' mode with CONSULT-II.
5) Warm engine up to normal operating temperature.

6) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	2,600 - 4,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	6.0 - 11.7 msec
Selector lever	Suitable position
PW/ST SIGNAL	OFF

7) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-272.

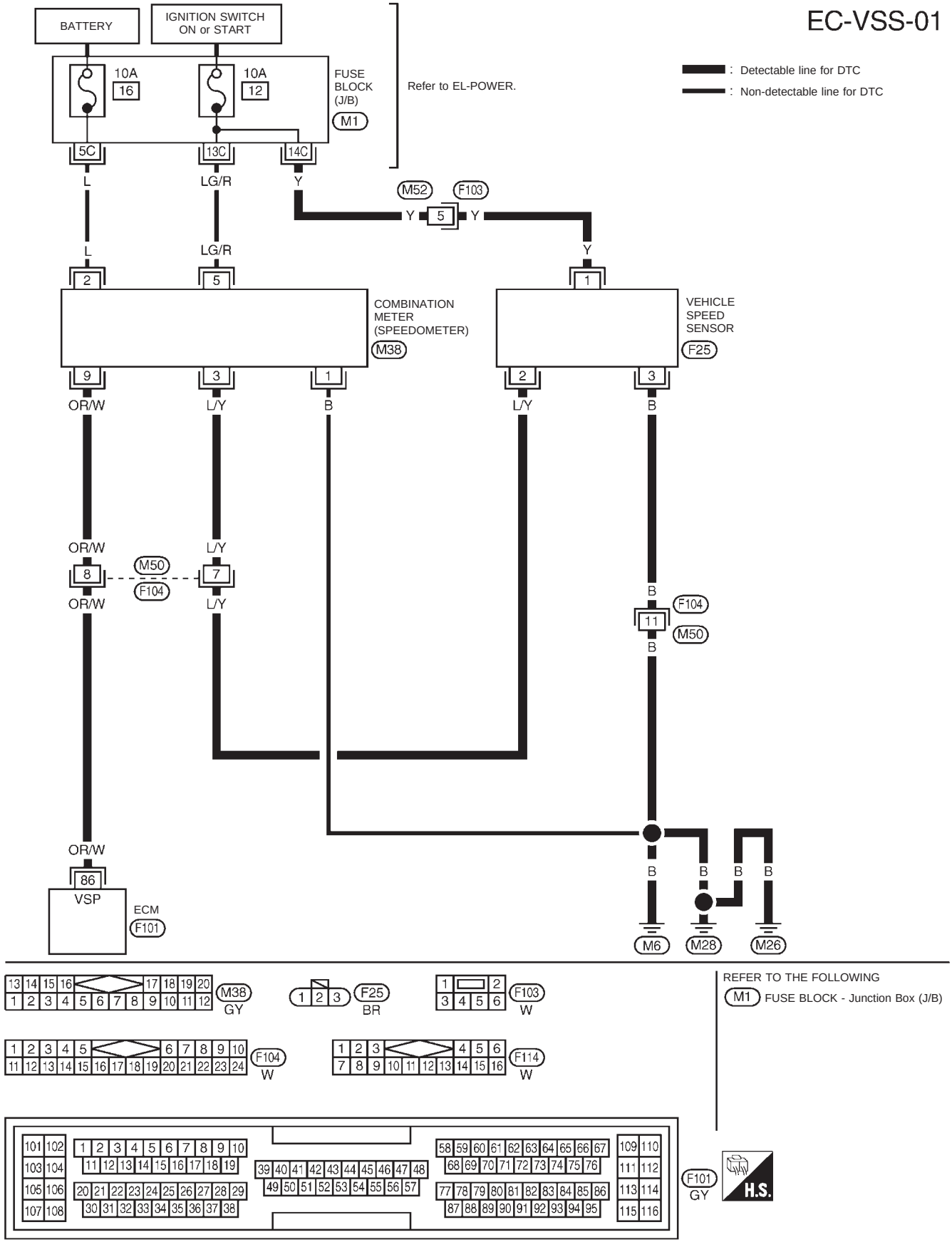
With GST

Follow the procedure ''With CONSULT-II'' above.

Wiring Diagram

NCEC0277

EC-VSS-01



Diagnostic Procedure

NCEC0278

1	CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch ‘‘OFF’’.
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal 86 and meter terminal 9.
   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 F104, M50
- 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. Check Audio circuit and other linked circuit for short to ground or short to power. Refer to EL section.

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 M50, F104 and M52, F103
- 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

Check combination meter internal circuit for short to ground or short to power. Refer to EL section.
Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-QG-108.

	▶	**INSPECTION END**

Description

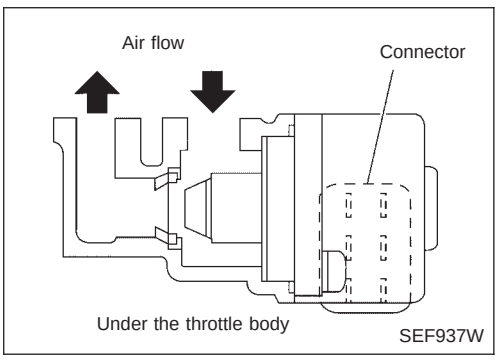
NCEC0279

SYSTEM DESCRIPTION

NCEC0279S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	ECM	IACV-AAC valve
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
PNP switch	Park/Neutral position		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		
Cooling fan	Cooling fan operation		
Electrical load	Electrical load signal		

This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering, cooling fan operation and electrical load).



COMPONENT DESCRIPTION

NCEC0279S02

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in sequence. Each time the IACV-AAC valve opens or closes to change the auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0280

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: ‘‘N’’ ● No-load	Idle	5 - 20 steps
		2,000 rpm	—

ECM Terminals and Reference Value

NCEC0281

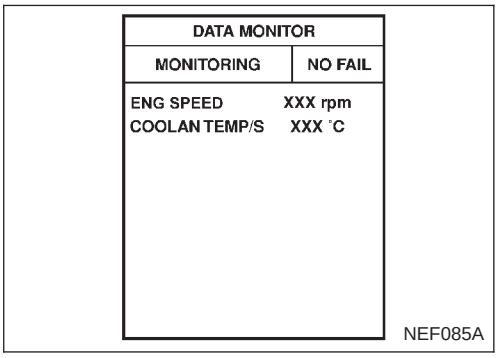
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6 7 15 16	BR Y/B P OR	IACV-AAC valve	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0.1 - 14V

On Board Diagnosis Logic

NCEC0282

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0505 0505	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The IACV-AAC valve circuit is open.) ● IACV-AAC valve



NEF085A

DTC Confirmation Procedure

NCEC0283

NOTE:

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

With CONSULT-II

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Rev engine from idle to more than 2,000 rpm 20 times.
   If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-276.

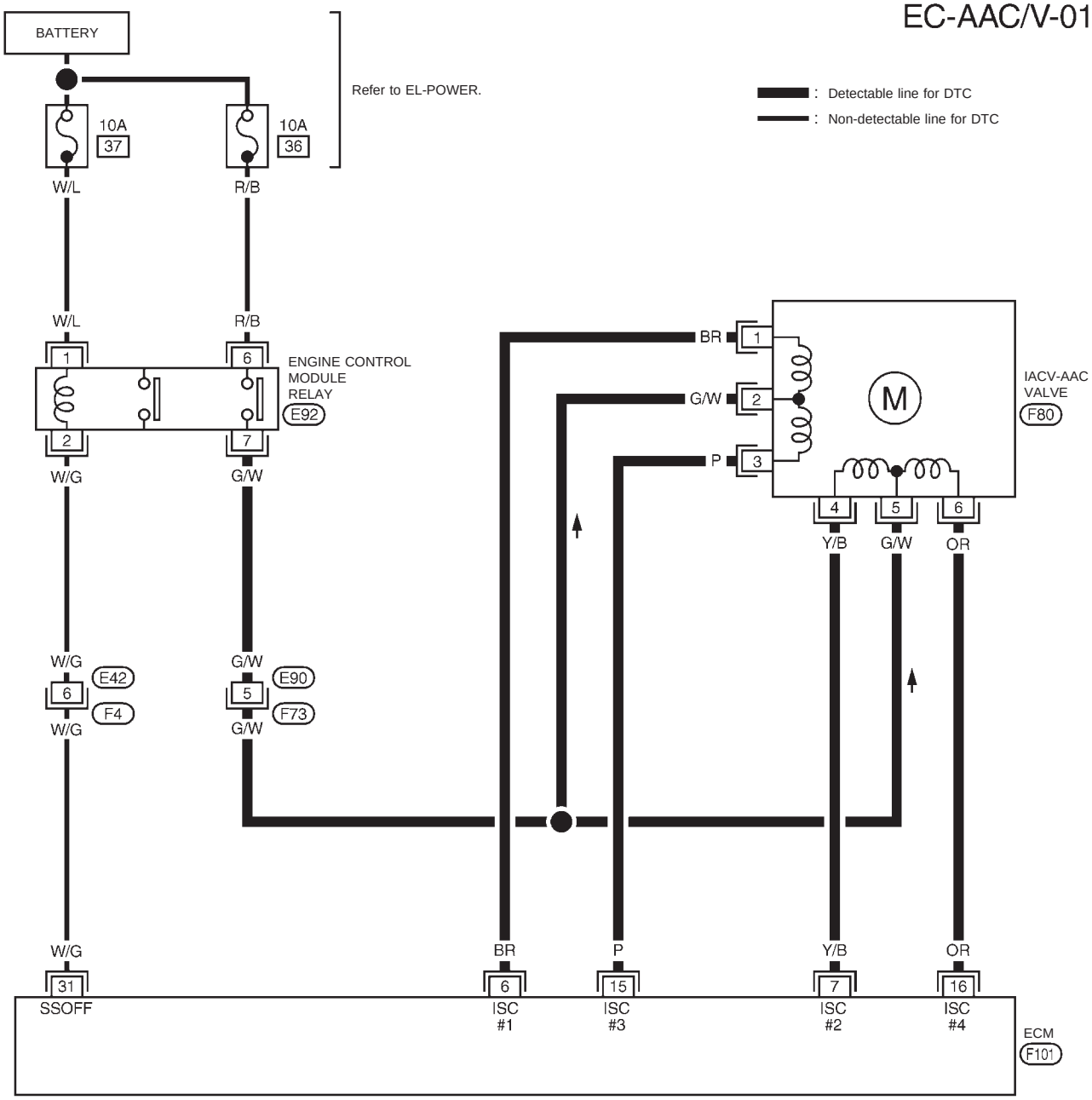
With GST

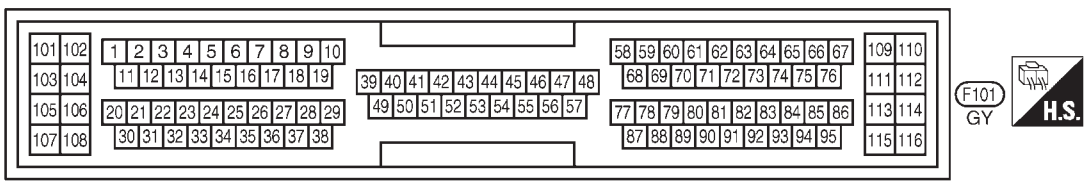
Follow the procedure ‘‘With CONSULT-II’’ above.

Wiring Diagram

NCEC0284

EC-AAC/V-01





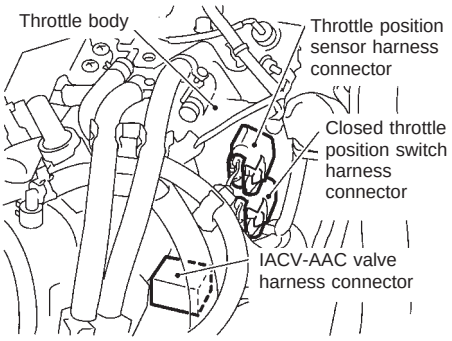
YEC240

Diagnostic Procedure

NCEC0285

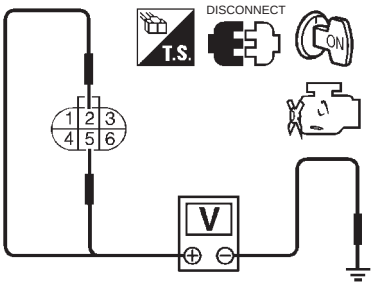
1	CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect IACV-AAC valve harness connector.



SEF938W

3. Turn ignition switch "ON".
4. Check voltage between terminal 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF352QA

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F73, E90
- Harness for open or short between IACV-AAC and engine control module relay
- 10A fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

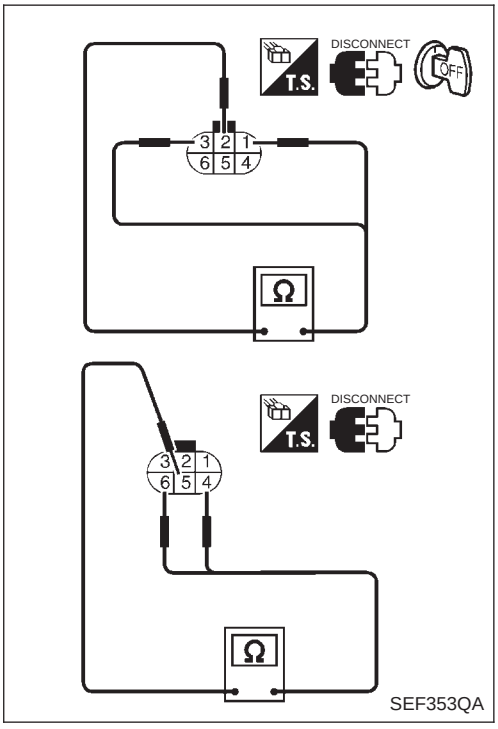
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 6 and terminal 1,
   ECM terminal 7 and terminal 4,
   ECM terminal 15 and terminal 3,
   ECM terminal 16 and terminal 6.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

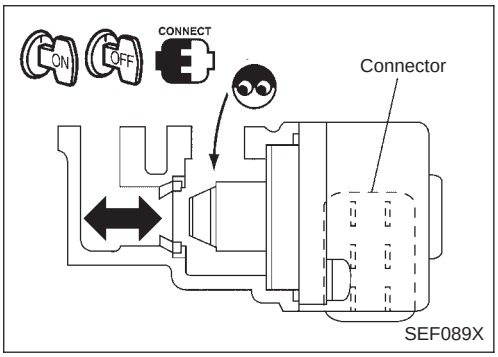
OK	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK IACV-AAC VALVE	
Refer to ''Component Inspection'', EC-QG-277. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Replace IACV-AAC valve.

5	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



SEF353QA



SEF089X

Component Inspection

NCEC0286

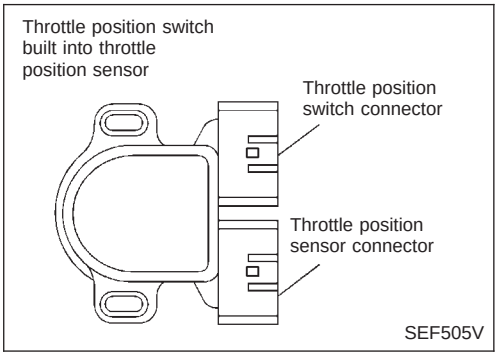
IACV-AAC VALVE

NCEC0286S01

1) Disconnect IACV-AAC valve harness connector.
2) Check IACV-AAC valve resistance.

Condition	Resistance
Terminal 2 and terminals 1, 3	20 - 24Ω [at 20°C (68°F)]
Terminal 5 and terminals 4, 6	

3) Reconnect IACV-AAC valve harness connector.
4) Remove idle air adjusting unit assembly (IACV-AAC valve is built-in) from engine.
   (The IACV-AAC valve harness connector should remain connected.)
5) Turn ignition switch ''ON'' and ''OFF'', and ensure the IACV-AAC valve shaft smoothly moves forward and backward, according to the ignition switch position.
   If NG, replace the IACV-AAC valve.



Component Description

NCEC0287

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is not used.
When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge control valve when the throttle position sensor is malfunctioning.

CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
CLSD THL/P SW	● Engine: Idle	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

ECM Terminals and Reference Value

NCEC0288

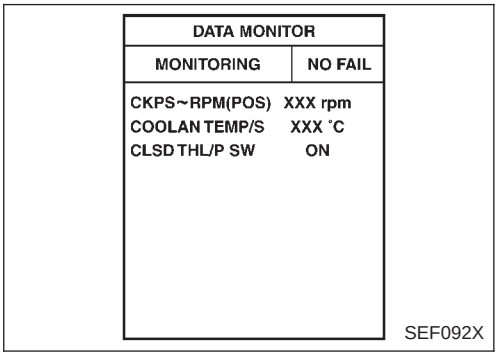
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

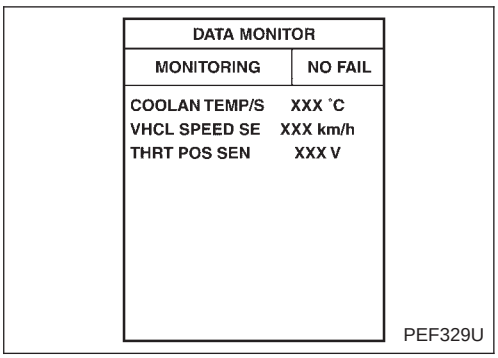
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	Y	Throttle position switch (Closed position)	**Engine is running** ● Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			[Ignition switch ‘‘ON’’] ● Accelerator pedal depressed	Approximately 0V

On Board Diagnosis Logic

NCEC0289

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0510 0510	● Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.	● Harness or connectors (The closed throttle position switch circuit is shorted.) ● Closed throttle position switch ● Throttle position sensor





DTC Confirmation Procedure

NCEC0290

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

With CONSULT-II

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'', wait at least 9 seconds and then start engine.
3) Select ''CLSD THL/P SW'' in ''DATA MONITOR'' mode. If ''CLSD THL/P SW'' is not available, go to step 5.
4) Check the signal under the following conditions.

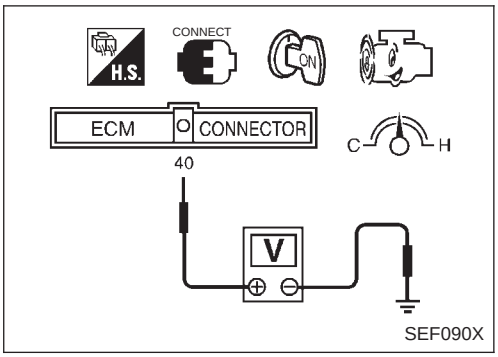
Condition	Signal indication
Throttle valve: Idle position	ON
Throttle valve: Slightly open	OFF

If the result is NG, go to ''Diagnostic Procedure'', EC-QG-281. If OK, go to following step.

5) Select ''DATA MONITOR'' mode with CONSULT-II.
6) Drive the vehicle for at least 5 consecutive seconds under the following condition.

THRTL POS SEN	More than 2.3V
VHCL SPEED SE	More than 4 km/h (2 MPH)
Selector lever	Suitable position
Driving pattern	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

7) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-281.



Overall Function Check

NCEC0291

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.
2) Check the voltage between ECM terminal 40 (Closed throttle position switch signal) and ground under the following conditions.

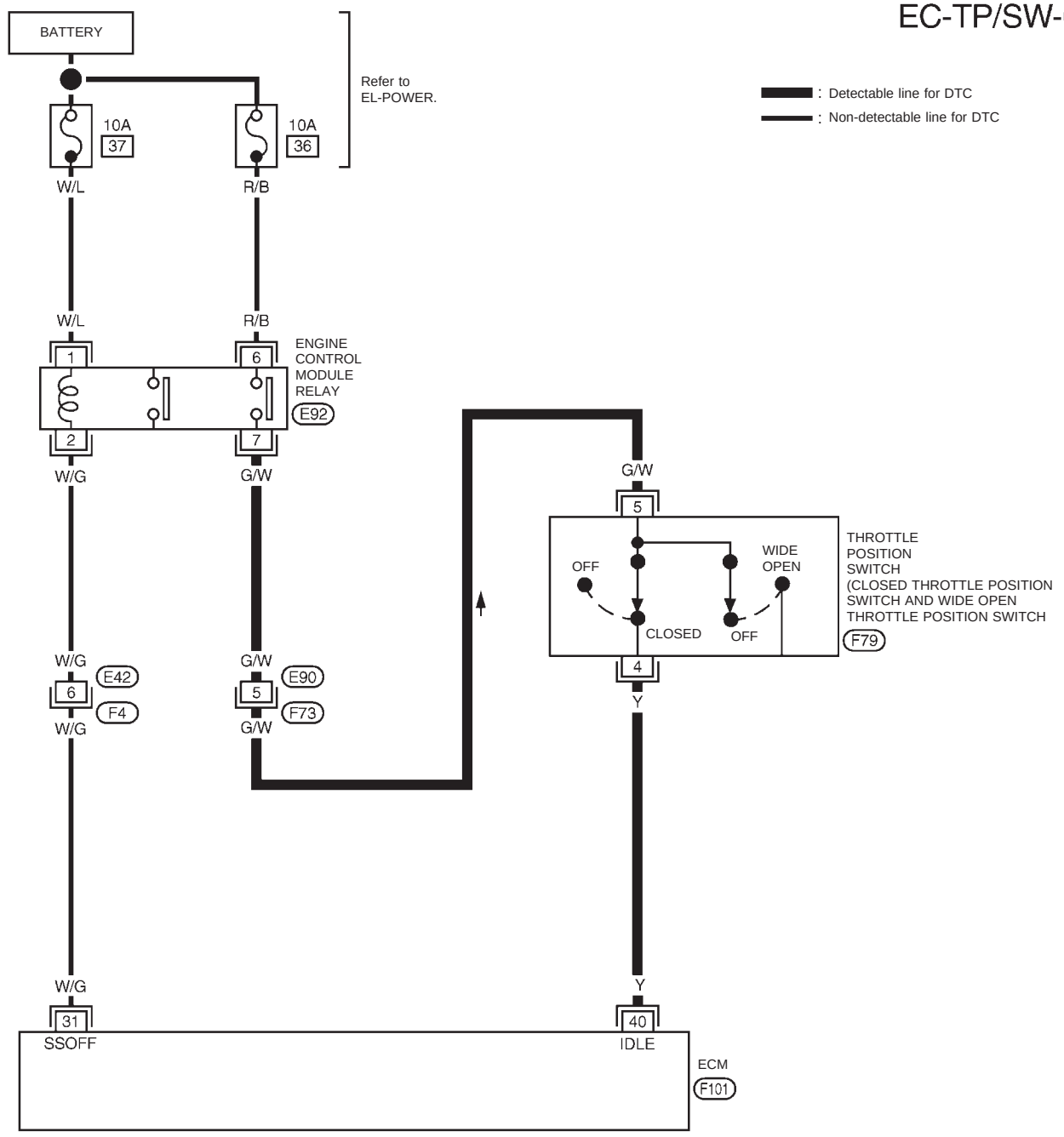
Condition	Voltage
At idle	Battery voltage
At 2,000 rpm	Approximately 0V

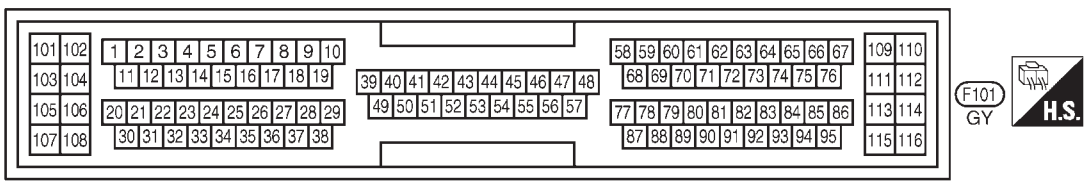
3) If NG, go to ''Diagnostic Procedure'', EC-QG-281.

Wiring Diagram

NCEC0292

EC-TP/SW-01





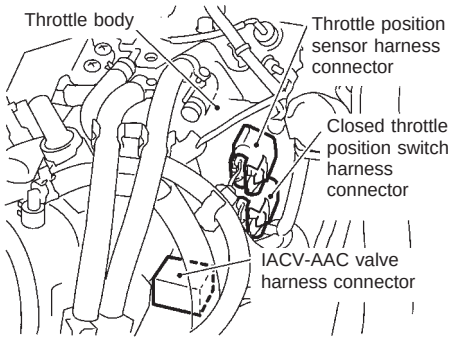
YEC241

Diagnostic Procedure

NCEC0293

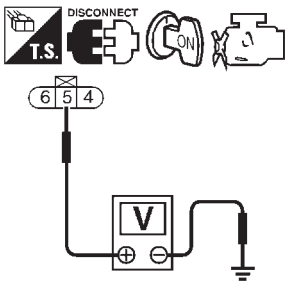
1	CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect throttle position switch harness connector.



SEF938W

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



SEF250W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F73, E90
- Harness for open or short between throttle position switch and engine control module relay
- 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 40 and terminal 4.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

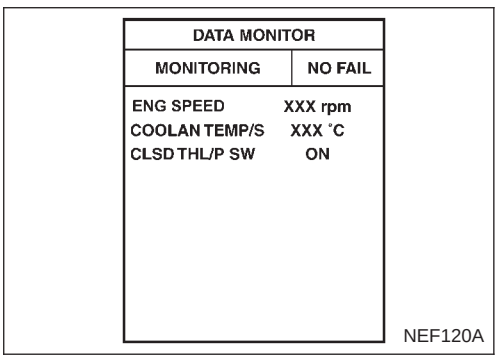
4	DETECT MALFUNCTIONING PART
Check the harness for open or short between throttle position switch and ECM.	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	ADJUST THROTTLE POSITION SWITCH IDLE POSITION
Perform Basic Inspection, EC-QG-80.	
▶	GO TO 6.

6	CHECK CLOSED THROTTLE POSITION SWITCH
Refer to ''Component Inspection'', EC-QG-282.	
OK or NG	
OK ▶	GO TO 7.
NG ▶	Replace throttle position switch.

7	CHECK THROTTLE POSITION SENSOR
Refer to ''Component Inspection'', EC-QG-136.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Replace throttle position sensor.

8	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



NEF120A

Component Inspection

NCEC0294

CLOSED THROTTLE POSITION SWITCH

NCEC0294S01

With CONSULT-II

1) Stop engine and turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Check indication of ''CLSD THL/P SW'' under the following conditions.

NOTE:

Measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

If NG, adjust closed throttle position switch. Refer to ''Basic Inspection'', EC-QG-80.

4) If it is impossible to adjust closed throttle position switch in ''Basic Inspection'', replace closed throttle position switch.

Without CONSULT-II

1) Turn ignition switch ''OFF''.
2) Disconnect throttle position switch harness connector.
3) Check continuity between terminals 4 and 5 under the following conditions. Refer to wiring diagram.

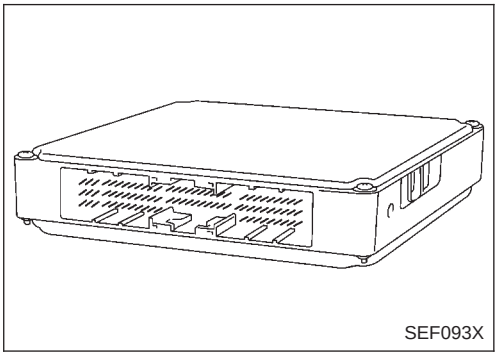
NOTE:

Continuity measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

If NG, adjust closed throttle position switch. Refer to ''Basic Inspection'', EC-QG-80.

4) If it is impossible to adjust closed throttle position switch in ''Basic Inspection'', replace closed throttle position switch.



SEF093X

Component Description

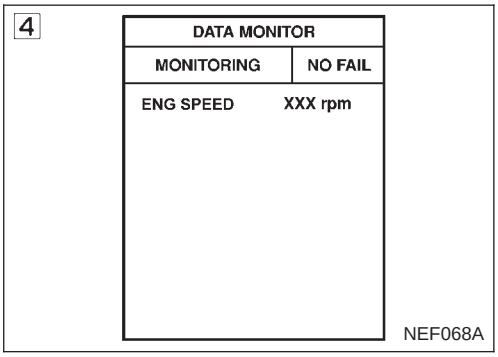
NCEC0295

The ECM consists of a microcomputer, diagnostic test mode selector, and connectors for signal input and output and for power supply. The ECM controls the engine.

On Board Diagnosis Logic

NCEC0296

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0605 0605	● ECM calculation function is malfunctioning.	● ECM



NEF068A

DTC Confirmation Procedure

NCEC0297

NOTE:

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

With CONSULT-II

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Start engine.
4) Run engine for at least 1 second at idle speed.
5) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-284.

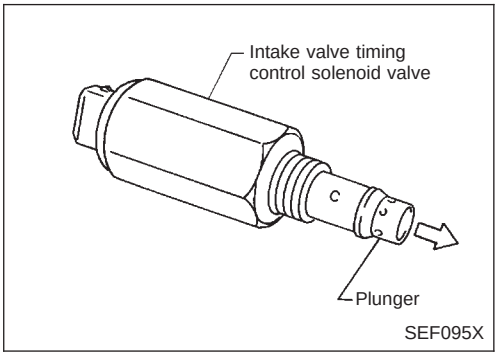
With GST

Follow the procedure ''With CONSULT-II'' above.

Diagnostic Procedure

=NCEC0298

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	▶	Replace ECM.
No	▶	**INSPECTION END**



Component Description

NCEC0513

The valve timing control system is utilized to control intake valve opening and closing timing. Engine coolant temperature signals, engine speed and throttle position are used to determine intake valve timing.

The intake camshaft sprocket position is regulated by oil pressure controlled by the intake valve timing control.

When ECM sends ON signal to intake valve timing control solenoid valve, oil pressure is transmitted to camshaft sprocket. Then, intake side camshaft is advanced.

Operation

NCEC0514

Engine operating condition				Intake valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap
Engine coolant temperature	Engine speed	B/FUEL SCHDL	Neutral switch			
20°C (68°F) - 70°C (158°F)	1,150 - 4,600 rpm	Above 3 msec	OFF	ON	Advance	Increased
Above 70°C (158°F)		Above 7 msec				
Conditions other than those above				OFF	Normal	Normal

CONSULT-II Reference Value in Data Monitor Mode

NCEC0515

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL-B1	● Engine: After warming up	Idle	OFF
		Revving engine with full throttle opening (Under 4,600 rpm)	ON

ECM Terminals and Reference Value

NCEC0516

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	Y/R	Intake valve timing control solenoid valve	Ignition ‘‘ON’’	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NCEC0517

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1111 1111	● An improper voltage signal is entered to ECM through intake valve timing control solenoid valve.	● Harness or connectors (The intake valve timing control solenoid valve circuit is open or shorted.) ● Intake valve timing control solenoid valve

DATA MONITOR	
MONITORING	NO FAIL
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX ℃
VHCL SPEED SE	XXX km/h
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec
INT/V TIM SOL	OFF

NEF121A

DTC Confirmation Procedure

NCEC0518

NOTE:

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

With CONSULT-II

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-288.

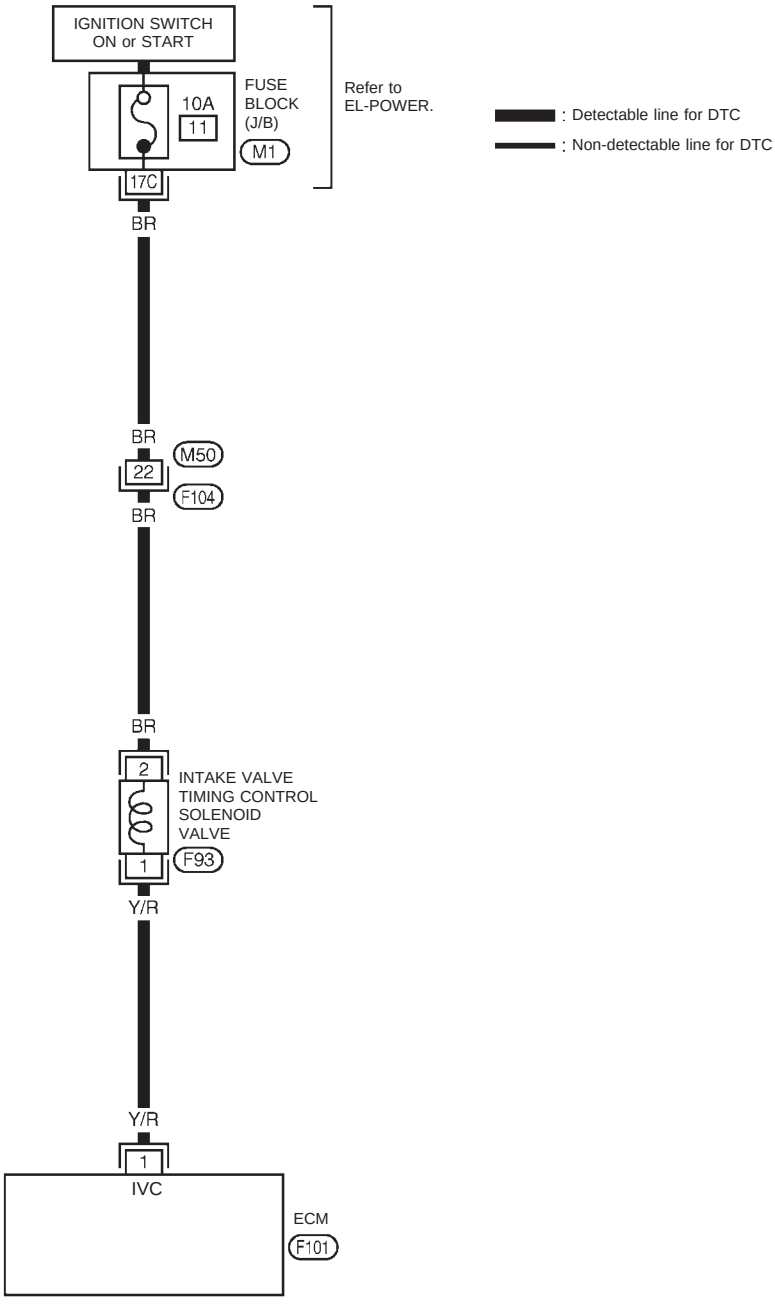
Without CONSULT-II

Follow the procedure ‘‘With CONSULT-II’’ above.

Wiring Diagram

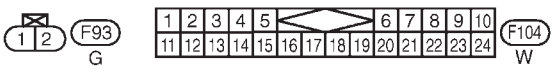
NCEC0519

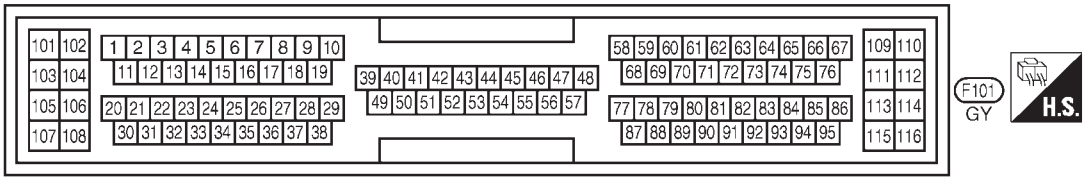
EC-IVC-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)



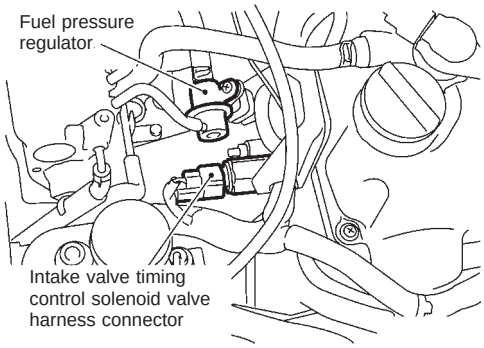


Diagnostic Procedure

NCEC0520

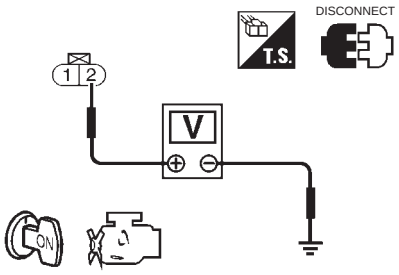
1	CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect intake valve timing control solenoid valve harness connector.



SEF149X

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



SEF097X

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F104, M50
- 10A fuse
- Harness for open or short between valve timing control solenoid valve and fuse

	▶	Repair harness or connectors.

3	CHECK OUTPUT SIGNAL CIRCUIT

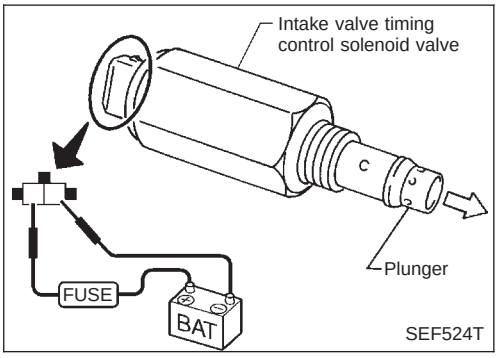
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 1 and intake valve timing control solenoid valve harness connector terminal 1. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

4	CHECK VALVE TIMING CONTROL SOLENOID VALVE	
Refer to ''Component Inspection'', EC-QG-289. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Replace valve timing control solenoid valve.

5	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



Component Inspection

NCEC0521

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

NCEC0521S01

1. Check oil passage visually for any metal debris.
2. Supply intake valve timing control solenoid valve terminals with battery voltage.
3. Make sure that inside plunger protrudes.
   If NG, replace intake valve timing control solenoid valve.

Description

NCEC0522

SYSTEM DESCRIPTION

NCEC0522S01

Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position	Swirl control valve system control	Swirl control valve control solenoid valve via swirl control valve
Ignition switch	Start signal		
Crankshaft position sensor	Engine speed		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		

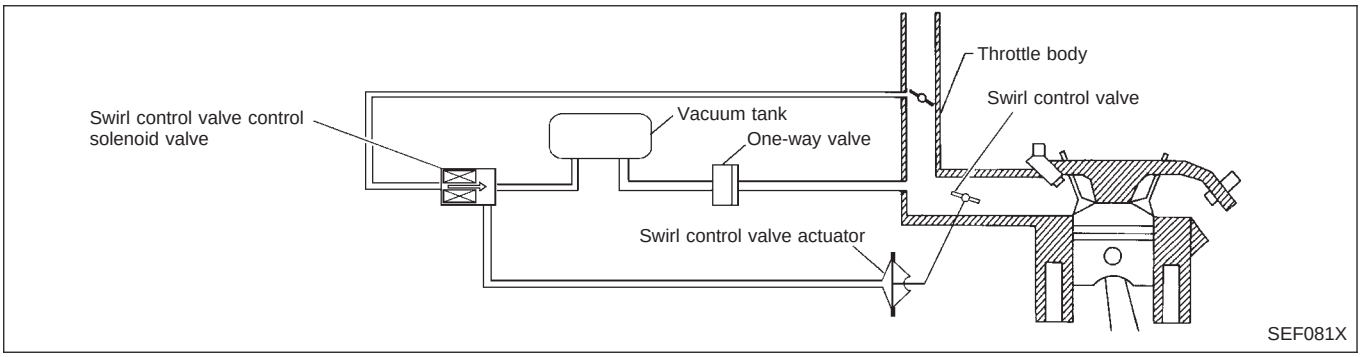
This system has a swirl control valve in the intake passage of each cylinder.
While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.
Also, except when idling and during low engine speed operation, this system opens the swirl control valve.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

OPERATION

NCEC0522S02

Engine coolant temperature	Throttle position sensor (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
15 - 40°C	ON	—	ON	Closed
	OFF	Below 2,400 rpm*		
Except above			OFF	Open

*: Value may vary according to accel pedal operation.



CONSULT-II Reference Value in Data Monitor Mode

NCEC0523

Specification data are reference values.

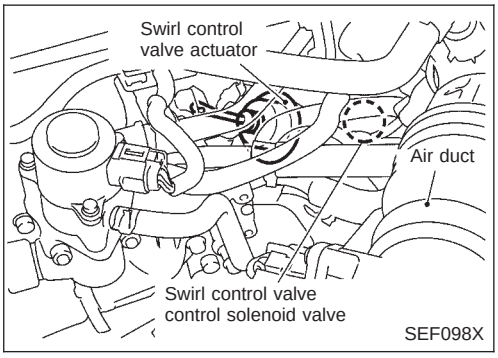
MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 40°C (104°F)	ON
		Engine coolant temperature is above 40°C (104°F)	OFF

ECM Terminals and Reference Value

=NCEC0524

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
104	SB	Swirl control valve control solenoid valve	**[Engine is running]** ● Engine coolant temperature is between 15°C (59°F) to 40°C (104°F). ● Idle speed	0 - 1V
			[Engine is running] ● Engine coolant temperature is except above 40°C (104°F). ● Idle speed	BATTERY VOLTAGE (11 - 14V)



Component Description

NCEC0525

SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

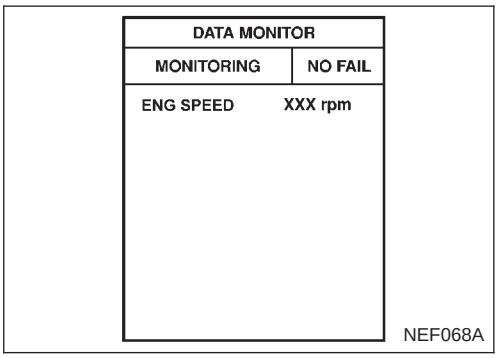
NCEC0525S01

The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

On Board Diagnosis Logic

NCEC0526

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1131 1131	An improper voltage signal is sent to ECM through swirl control valve control solenoid valve.	● Harness or connectors (The swirl control valve control solenoid valve circuit is open or shorted.) ● Swirl control valve control solenoid valve



DTC Confirmation Procedure

NCEC0527

NOTE:

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

With CONSULT-II

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT-II.
3) Wait at least 5 seconds.
   If 1st trip DTC is detected, go to ‘‘Diagnostic Procedure’’, EC-QG-293.

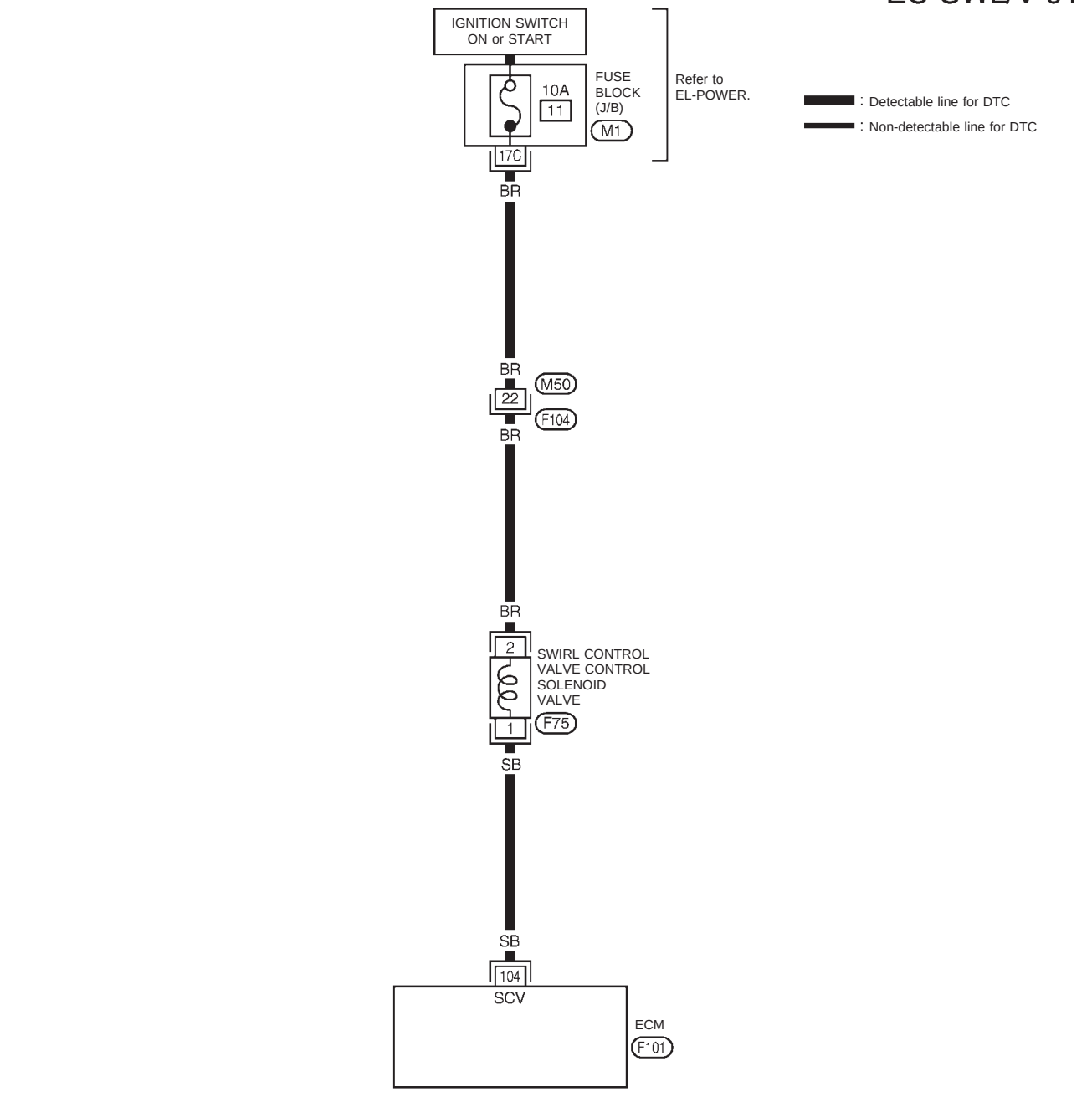
With GST

Follow the procedure ‘‘With CONSULT-II’’ above.

Wiring Diagram

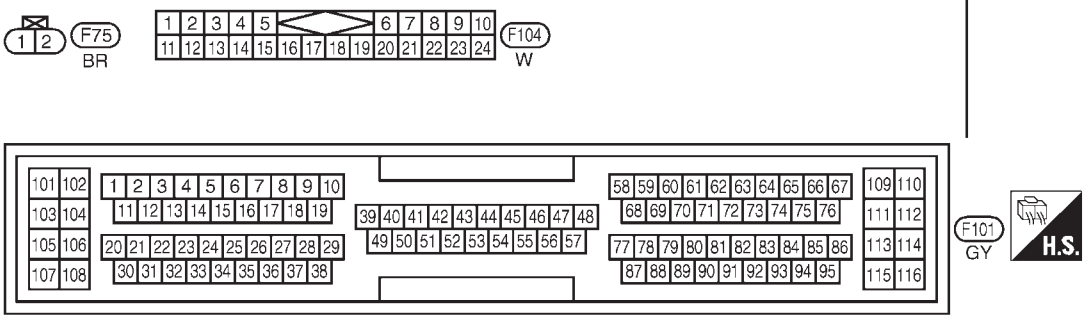
NCEC0528

EC-SWL/V-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

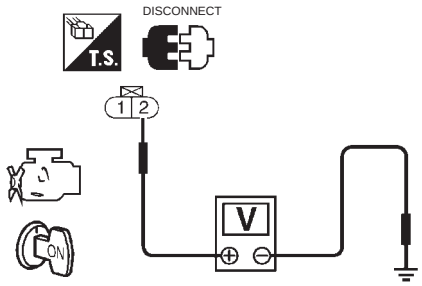


Diagnostic Procedure

NCEC0529

1	INSPECTION START
Do you have CONSULT-II? **Yes or No**	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK CIRCUIT
1. Perform ‘‘SWIRL CONT SOL/V’’ in ‘‘ACTIVE TEST’’ mode. 2. Make sure that clicking sound is heard from the swirl control valve control solenoid valve. **OK or NG**	
OK ▶	GO TO 4.
NG ▶	GO TO 3.

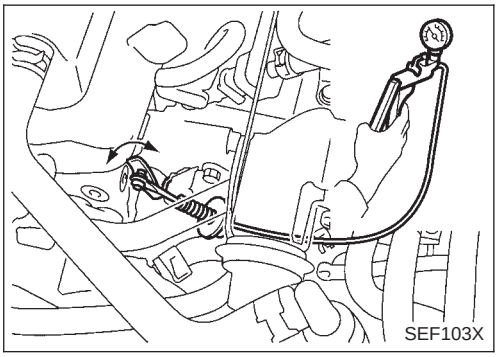
3	CHECK POWER SUPPLY
1. Disconnect swirl control valve control solenoid valve harness connector. 2. Turn ignition switch ‘‘ON’’. 3. Check voltage between terminal 2 and ground with CONSULT-II or tester.  SEF541PA **Voltage: Battery voltage** **OK or NG**	
OK ▶	GO TO 4.
NG ▶	**Check the following.** ● Harness connectors M50, F104 ● 10A fuse ● Harness for open or short between swirl control valve control solenoid valve and fuse If NG, repair harness or connectors.

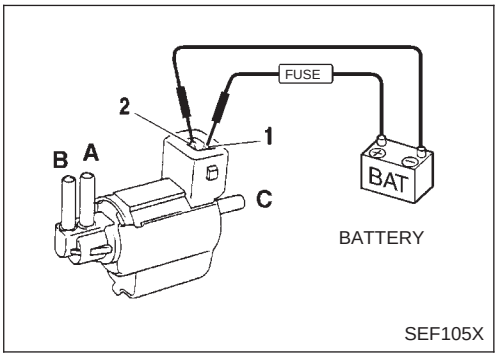
4	CHECK OUTPUT SIGNAL CIRCUIT
1. Turn ignition switch ‘‘OFF’’. 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 104 and swirl control valve control solenoid valve harness connector terminal 1 with CONSULT-II or tester. Refer to wiring diagram. **Continuity should exist.** If OK, check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	Repair open circuit, short to ground or short to power in harness connectors.

Diagnostic Procedure (Cont'd)

5	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE	
Refer to ''Component Inspection'', EC-QG-294. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	Replace swirl control valve control solenoid valve.

6	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**


SEF103X



SEF105X

Component Inspection

NCEC0530

SWIRL CONTROL VALVE AND ACTUATOR

NCEC0530S01

Supply vacuum to actuator and check swirl control valve operation.

Condition	Swirl control valve
Supply vacuum to actuator	Close
No supply	Open

If NG, replace swirl control valve and actuator.

SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

NCEC0530S02

Check solenoid valve air passage continuity.

With CONSULT-II

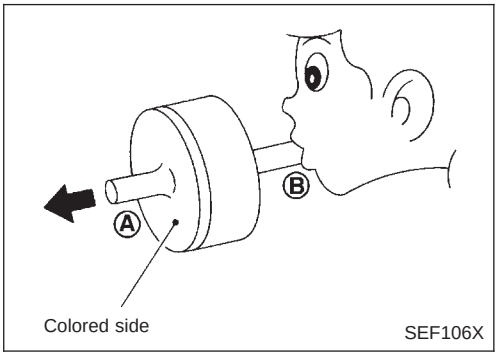
Turn ignition switch ''ON'' and perform ''SWIRL CONT SOL VALVE'' in ''ACTIVE TEST'' mode.

Condition SWIRL CONT SOL/V	Air passage continuity between A and B	Air passage continuity between A and C
ON	Yes	No
OFF	No	Yes

Without CONSULT-II

Condition	Air passage continuity between A and B	Air passage continuity between A and C
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace solenoid valve.



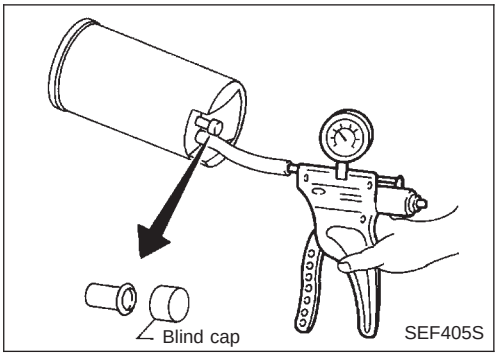
ONE-WAY VALVE

NCEC0530S03

Check one-way valve air passage continuity.

Condition	Air passage continuity
Blow air from side B to A	Yes
Blow air from side A to B	No

If NG, replace one-way valve.



VACUUM TANK

NCEC0530S04

Check vacuum tank leakage.

Apply vacuum −80.0 kPa (−800 mbar, −600 mmHg, −23.62 inHg, −11.60 psi). Then keep it for 10 seconds and check there is no leakage.

If NG, replace vacuum tank.

System Description

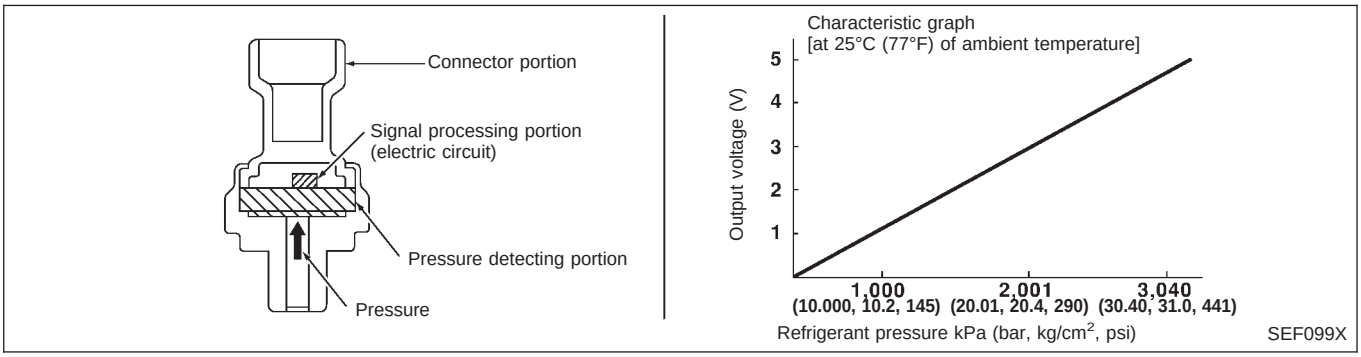
NCEC0433

COOLING FAN CONTROL

NCEC0433S01

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	ECM	Cooling fan relay(s)
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner ‘‘ON’’ signal		
Ignition switch	Start signal		
Refrigerant pressure sensor	Refrigerant pressure		

The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, refrigerant pressure, and air conditioner ON signal. The control system has ON-OFF control.
The refrigerant pressure sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The transducer is installed in the liquid tank of the air conditioner system.



OPERATION

NCEC0433S02

Engine coolant temperatures at which the cooling fan turns ‘‘ON’’ are indicated in the Table below.

		Vehicle speed km/h (MPH)		
Air conditioner switch	High pressure of refrigerant kPa (bar, kg/cm^2, psi)	Less than 20 (12)	20 - 80 (12 - 50)	More than 80 (50)
ON	More than 1,760 (17.6, 17.95, 255)	Always	Always	More than 95°C (203°F)
	Less than 1,760 (17.6, 17.95, 255)	Always	More than 95°C (203°F)	More than 95°C (203°F)
OFF		More than 100°C (212°F)	More than 95°C (203°F)	More than 95°C (203°F)

CONSULT-II Reference Value in Data Monitor Mode

NCEC0486

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
COOLING FAN	• After warming up engine, idle the engine. • Air conditioner switch: OFF	Engine coolant temperature is less than 99°C (210°F)	OFF
		Engine coolant temperature is 100°C (212°F) or more	ON

ECM Terminals and Reference Value

=NCEC0487

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	LG/R	Cooling fan relay	**[Engine is running]** ● Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Cooling fan is operating	Approximately 0V
23	L/W	Air conditioner switch	**[Engine is running]** ● Both air conditioner switch and blower switch are ''ON'' (Compressor operates)	Approximately 0V
			[Engine is running] ● Air conditioner switch is ''OFF''	BATTERY VOLTAGE (11 - 14V)
74	R/L	Refrigerant pressure sensor	**[Engine is running]** ● Air conditioner switch is ''ON'' (Compressor operates)	More than 1.5V
			[Engine is running] ● Air conditioner switch is turned from ''ON'' to ''OFF''	Voltage is decreasing gradually

On Board Diagnosis Logic

NCE0488

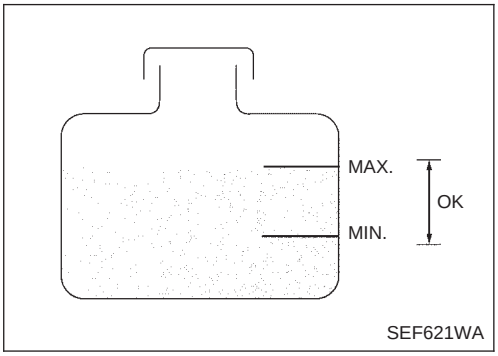
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1217 1217	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted). ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to ''MAIN 12 CAUSES OF OVERHEATING'', EC-QG-305.

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.

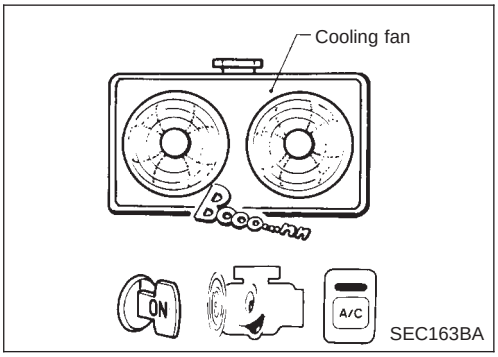
1) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section (''Anti-freeze Coolant Mixture Ratio'', ''RECOMMENDED FLUIDS AND LUBRICANTS'').
2) After refilling coolant, run engine to ensure that no water-flow noise is emitted.



SEF621WA

ACTIVE TEST	
COOLING FAN	OFF
MONITOR	
COOLAN TEMP/S	XXX °C

SEF111X



SEC163BA

Overall Function Check

NCEC0489

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

With CONSULT-II

1) Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to ‘‘Diagnostic Procedure’’, EC-QG-301.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to ‘‘Diagnostic Procedure’’, EC-QG-301.
3) Turn ignition switch ‘‘ON’’.
4) Perform ‘‘COOLING FAN’’ in ‘‘ACTIVE TEST’’ mode with CONSULT-II.
5) If the results are NG, go to ‘‘Diagnostic Procedure’’, EC-QG-301.

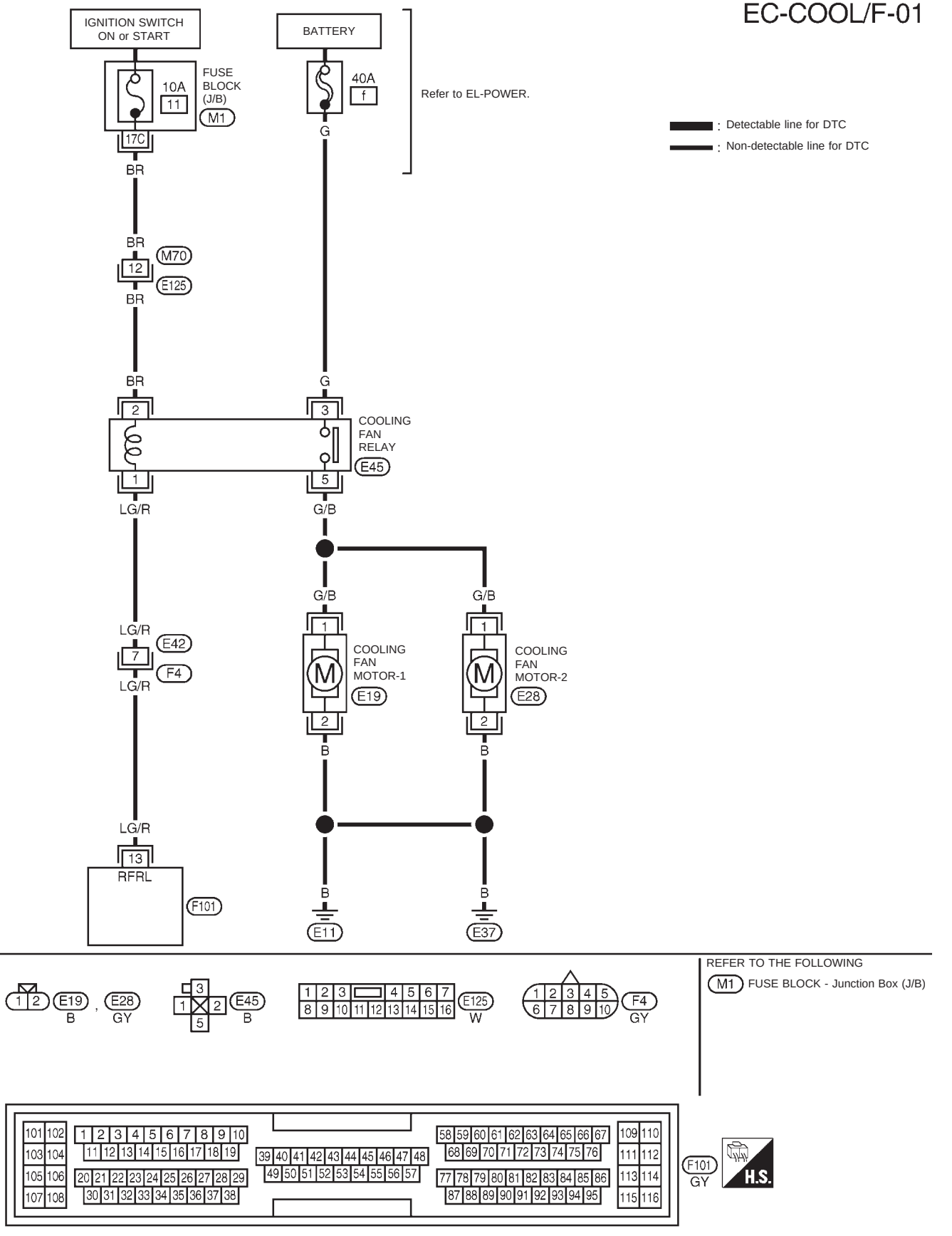
Without CONSULT-II

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-QG-301.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to ‘‘Diagnostic Procedure’’, EC-QG-301.
3) Start engine.
Be careful not to overheat engine.
4) Set temperature control lever to full cold position.
5) Turn air conditioner switch ‘‘ON’’.
6) Turn blower fan switch ‘‘ON’’.
7) Run engine at idle for a few minutes with air conditioner operating.
Be careful not to overheat engine.
8) Make sure that cooling fan operates.
If NG, go to ‘‘Diagnostic Procedure’’, EC-QG-301.

Wiring Diagram

NCEC0490

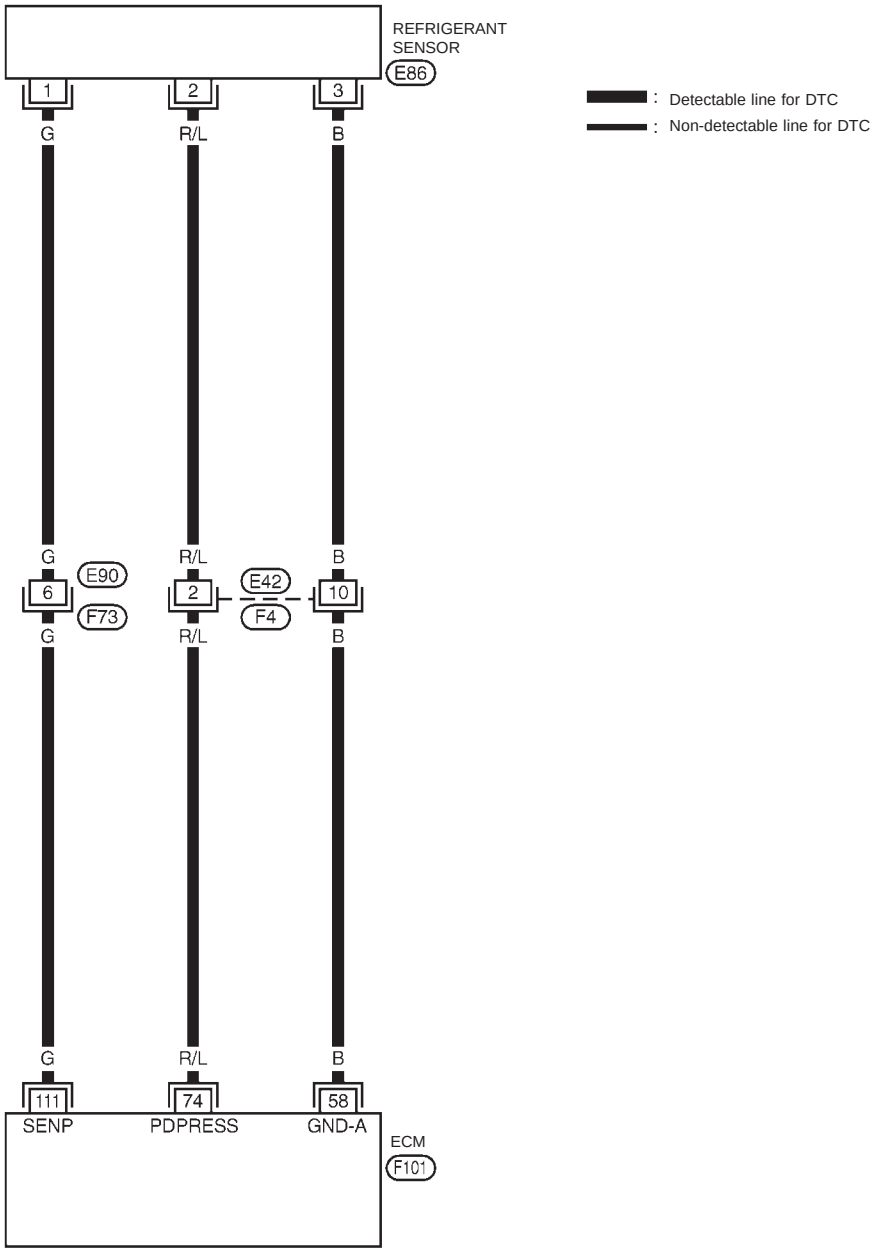
EC-COOL/F-01

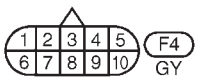


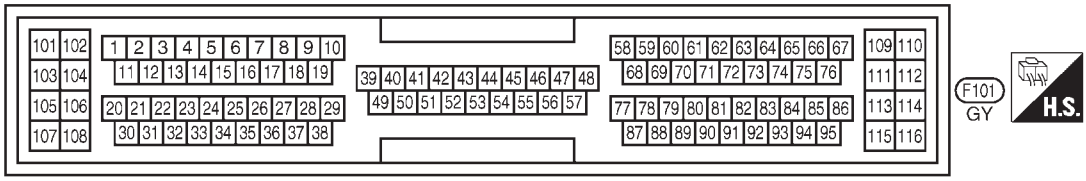
DTC P1217 OVERHEAT (COOLING SYSTEM)

Wiring Diagram (Cont'd)

EC-DP/SEN-01







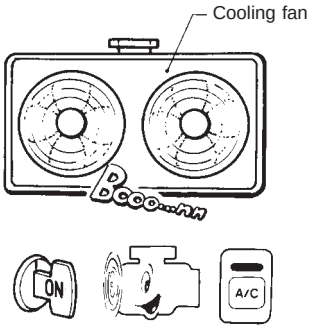
YEC284

Diagnostic Procedure

NCEC0491

1	CHECK COOLING FAN OPERATION

1. Start engine and let it idle.
2. Set temperature lever at full cold position.
3. Turn air conditioner switch ‘‘ON’’.
4. Turn blower fan switch ‘‘ON’’.
5. Make sure that cooling fans-1 and -2 operate.



SEC163BA

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 2.

2	CHECK AIR CONDITIONER OPERATION

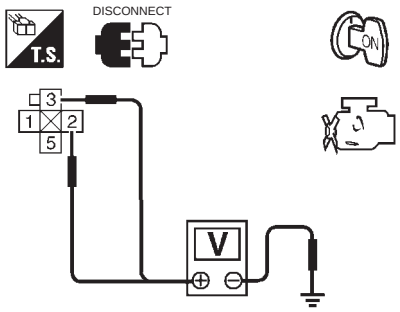
Is air conditioner operating?
(Check operation of compressor and blower motor.)

OK or NG

OK	▶	GO TO 3.
NG	▶	Check for failure of air conditioner to operate. Refer to HA section.

3	CHECK POWER SUPPLY

1. Turn ignition switch ‘‘OFF’’.
2. Disconnect cooling fan relay.
3. Turn ignition switch ‘‘ON’’.
4. Check voltage between terminals 2, 3 and ground with CONSULT-II or tester.



SEF112X

Voltage: Battery voltage

OK or NG

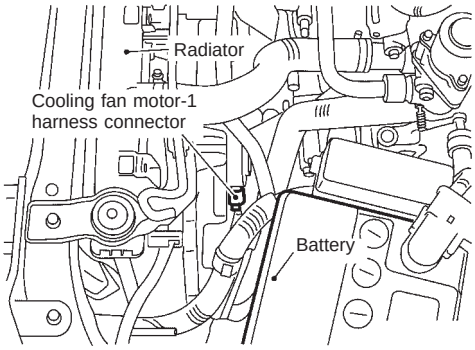
OK	▶	GO TO 5.
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M70, E125 ● 10A fuse ● 40A fusible link ● Harness for open or short between cooling fan relay and fuse	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.



SEF113X

3. Check harness continuity between relay terminal 5 and motor-1 terminal 1, motor-1 terminal 2 and body ground. Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.
5. Check harness continuity between relay terminal 5 and motor-2 terminal 1, motor-2 terminal 2 and body ground. Refer to wiring diagram.
   Continuity should exist.
6. Also check harness for short to 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 OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and 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

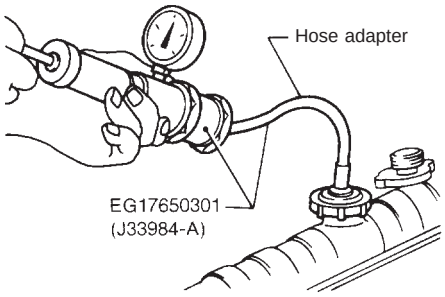
OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E42, F4 ● Harness for open or short between cooling fan relay and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK COOLING FAN RELAY	
Refer to ''Component Inspection'', EC-QG-306.		
OK or NG		
OK	▶	GO TO 9.
NG	▶	Replace cooling fan relay.

9	CHECK COOLING FAN MOTORS-1 AND -2	
Refer to ''Component Inspection'', EC-QG-306.		
OK or NG		
OK	▶	GO TO 10.
NG	▶	Replace cooling fan motors.

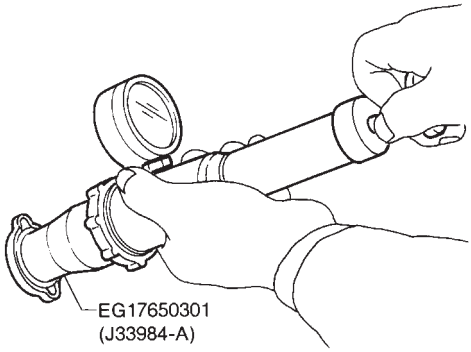
10	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**

11	CHECK COOLING SYSTEM FOR LEAK	
Apply pressure to the cooling system with a tester, and check if the pressure drops. **Testing pressure: 157 kPa (1.57 bar, 1.6 kg/cm^2, 23 psi)** **CAUTION:** **Higher than the specified pressure may cause radiator damage.**  SLC754A Pressure should not drop.		
OK or NG		
OK	▶	GO TO 12.
NG	▶	**Check the following for leak** ● Hose ● Radiator ● Water pump Refer to LC section (''Water Pump'').

Diagnostic Procedure (Cont'd)

12	CHECK RADIATOR CAP

Apply pressure to cap with a tester.



SLC755A

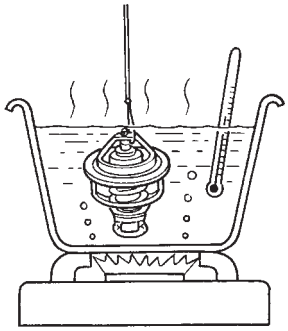
Radiator cap relief pressure:
59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi)

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace radiator cap.

13	CHECK THERMOSTAT

1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.



SLC343

Valve opening temperature:
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 14.
NG	▶	Replace thermostat

14	CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to ''Component Inspection'', EC-QG-129.

OK or NG

OK	▶	GO TO 15.
NG	▶	Replace engine coolant temperature sensor.

15	CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to ''MAIN 12 CAUSES OF OVERHEATING'', EC-QG-305.

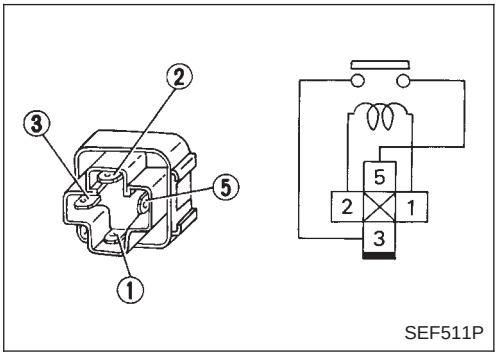
	▶	**INSPECTION END**

Main 12 Causes of Overheating

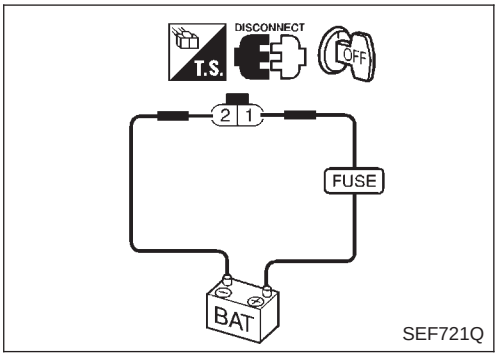
NCEC0492

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 ''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	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	● CONSULT-II	Operating	See ''TROUBLE DIAGNOSIS FOR OVERHEAT'' (EC-QG-296).
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: 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 ''OVERHEATING CAUSE ANALYSIS'' in LC section.



SEF511P



SEF721Q

Component Inspection

NCEC0493

COOLING FAN RELAYS

NCEC0493S01

Check continuity between terminals 3 and 5.

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

If NG, replace relay.

COOLING FAN MOTORS-1 AND -2

NCEC0493S02

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation.

	Terminals	
	(+)	(−)
Cooling fan motor	1	2

Cooling fan motor should operate.
If NG, replace cooling fan motor.

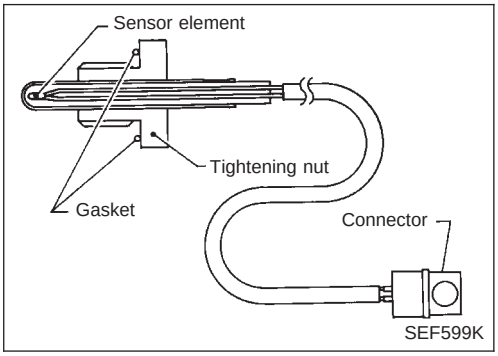
REFRIGERANT PRESSURE SENSOR

NCEC0493S03

With the refrigerant pressure sensor installed on the vehicle, start the engine and while idling, read the voltage at refrigerant pressure sensor terminals 1 and 2. (Refer to wiring diagram.)

Air conditioner condition	Voltage V
OFF	More than approx. 0.3V
ON	More than approx. 1.5V
ON to OFF	Decreasing gradually

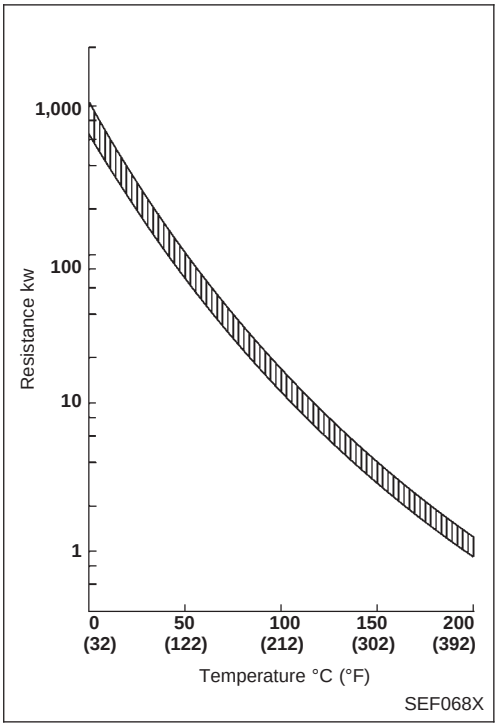
If results are NG, check for 5V between refrigerant sensor terminal 3 and ground. If there is 5V, replace sensor.



Component Description

NCEC0342

The EGR temperature sensor detects temperature changes in the EGR passageway. When the EGR volume control valve opens, hot exhaust gases flow, and the temperature in the passageway changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.
It is used only for the on board diagnosis.



<Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

*: These data are reference values and are measured between ECM terminal 72 (EGR temperature sensor) and ECM terminal 48 (ECM ground).
When EGR system is operating.
Voltage: 0 - 1.5V

On Board Diagnosis Logic

NCEC0343

DTC No.		Malfunction is detected when ...	Check Items (Possible Cause)
P1401 1401	A)	An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low.	● Harness or connectors (The EGR temperature sensor circuit is shorted.) ● EGR temperature sensor ● Malfunction of EGR function
	B)	An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high.	● Harness or connectors (The EGR temperature sensor circuit is open.) ● EGR temperature sensor ● Malfunction of EGR function

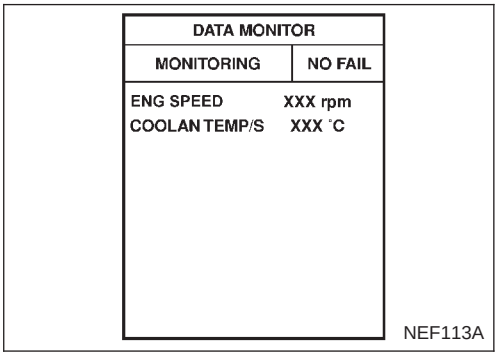
DTC Confirmation Procedure

NCEC0344

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

NOTE:

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



PROCEDURE FOR MALFUNCTION A

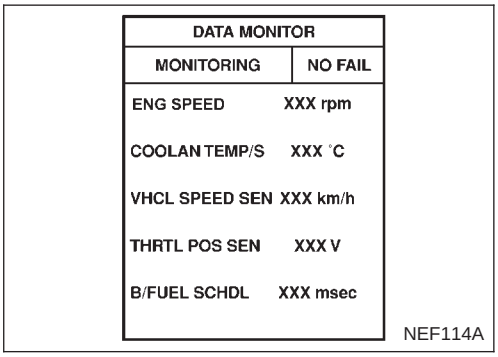
=NCEC0344S01

With CONSULT-II

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Verify that engine coolant temperature is less than 50°C (122°F).
   If the engine coolant temperature is above the range, cool the engine down.
4) Start engine and let it idle for at least 5 seconds.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-QG-310.

With GST

Follow the procedure "With CONSULT-II" above.



PROCEDURE FOR MALFUNCTION B

NCEC0344S02

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

Always perform the test at a temperature above −10°C (14°F).

With CONSULT-II

1) Start engine and warm it up to above 80°C (176°F).
2) Select "EGR VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.
3) Hold engine speed at 1,500 rpm.
4) Touch "Qu" and set the EGR volume control valve opening to 50 step and check EGR TEMP SEN.
   EGR TEMP SEN should decrease to less than 1.0V.
   If the check result is NG, go to "Diagnostic Procedure", EC-QG-310.
   If the check result is OK, go to the following step.
5) Turn ignition switch "OFF" and wait at least 9 seconds.
6) Start engine and maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	Above 2,400 rpm
VHCL SPEED SE	Above 90 km/h (56 MPH) or more
B/FUEL SCHDL	4.0 - 4.8 msec
Selector lever	4th or 5th

7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-QG-310.

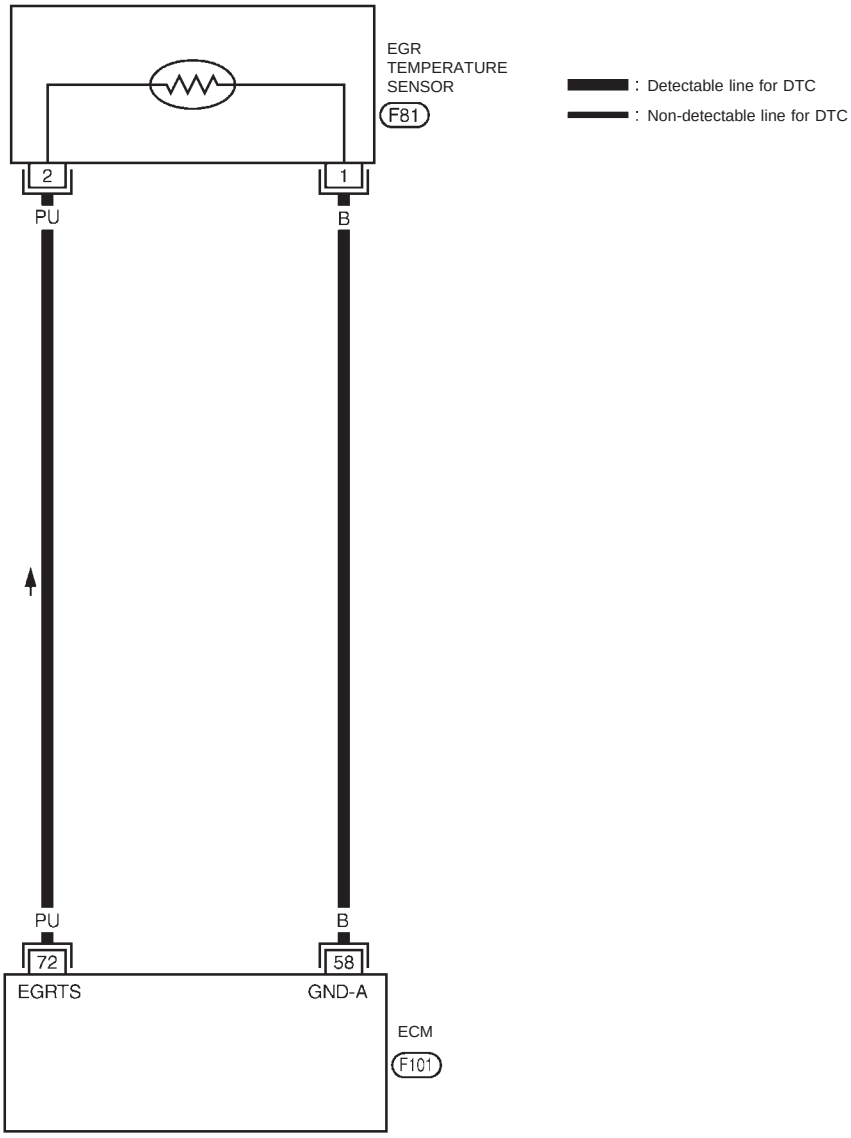
With GST

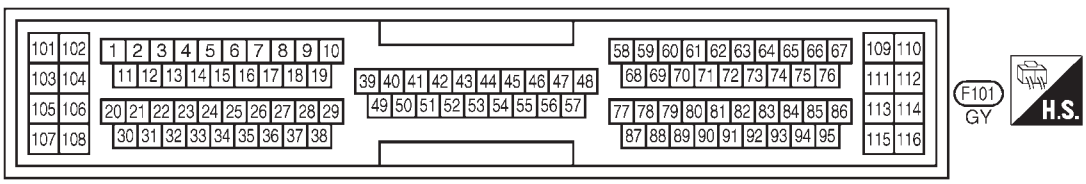
Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NCEC0346

EC-EGR/TS-01





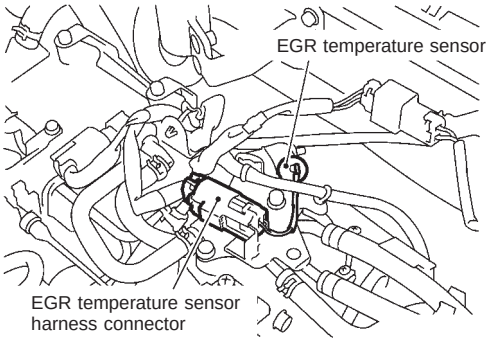
YEC273

Diagnostic Procedure

NCEC0347

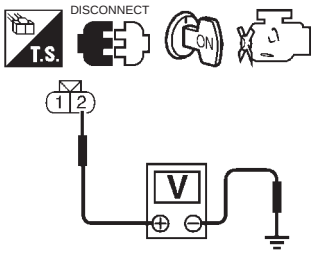
1	CHECK POWER SUPPLY

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



SEF127X

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



SEF128X

Voltage: Approximately 5V

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair harness or connectors.

2	CHECK GROUND CIRCUIT

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

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

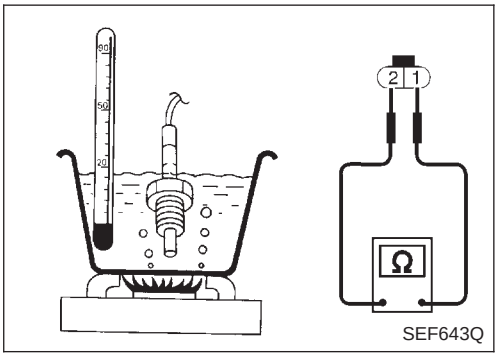
Check the harness for open or short between EGR temperature sensor and ECM.

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

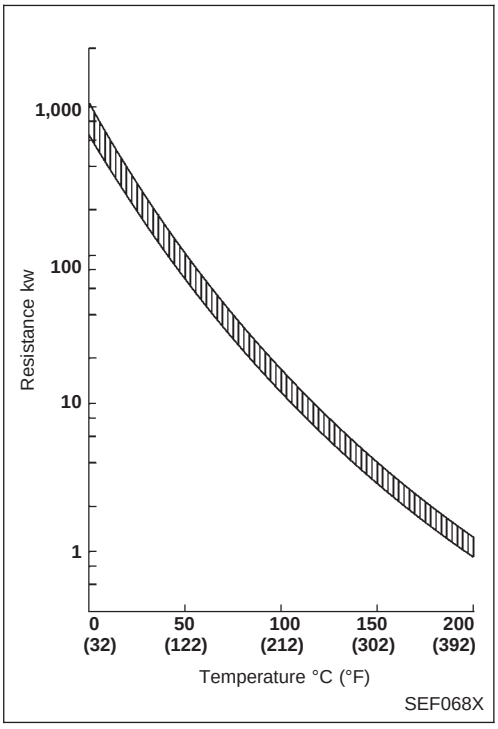
4	CHECK EGR TEMPERATURE SENSOR	
Refer to ''Component Inspection'', EC-QG-311.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace EGR temperature sensor.

5	CHECK EGR VOLUME CONTROL VALVE	
Refer to ''Component Inspection'', EC-QG-254.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Replace EGR volume control valve.

6	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



SEF643Q



SEF068X

Component Inspection

NCEC0348

EGR TEMPERATURE SENSOR

NCEC0348S01

Check resistance change and resistance value.
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

If NG, replace EGR temperature sensor.

Description

NCEC0349

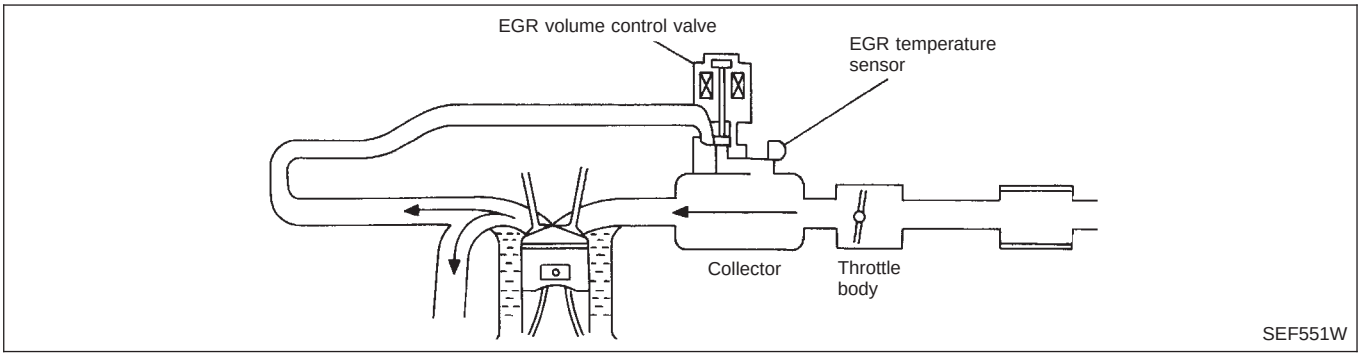
SYSTEM DESCRIPTION

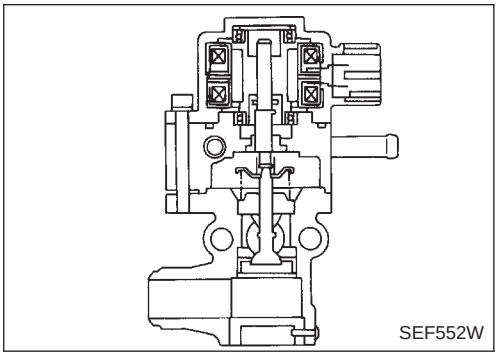
NCEC0349S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	EGR control	EGR volume control valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Vehicle speed sensor	Vehicle speed		
Battery	Battery voltage		

This system controls flow rate of EGR led from exhaust manifold to intake manifold. The opening of the EGR by-pass passage in the EGR volume control valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. The EGR volume control valve remains close under the following conditions.

- Extremely light load engine operation
- Mass air flow sensor malfunction
- Engine idling
- Low engine coolant temperature
- Excessively high engine coolant temperature
- High-speed engine operation
- Wide open throttle
- Low battery voltage
- Engine starting





COMPONENT DESCRIPTION

NCEC0349S02

EGR Volume Control Valve

NCEC0349S0201

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

NCEC0539

Specification data are reference values.

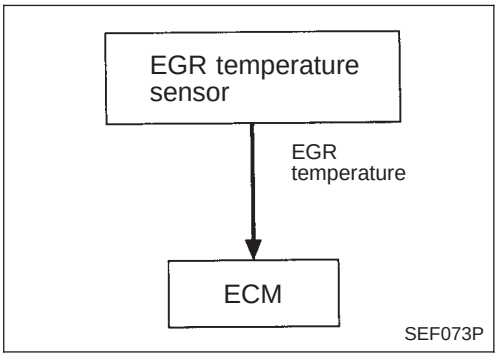
MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
EGR VOL CON/V	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	0 step
		Revving engine up to 3,000 rpm quickly	10 - 55 step

ECM Terminals and Reference Value

NCEC0540

Specification data are reference values, and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8 9 17 18	W/B SB G/R R/Y	EGR volume control valve	**[Engine is running.]** ● Warm-up condition ● Rev engine up from 2,000 to 4,000 rpm.	0 - 14V
58	B	Sensor’s ground	**[Engine is running.]** ● Warm-up condition ● Idle speed	0V
72	PU	EGR temperature sensor	**[Engine is running.]** ● Warm-up condition ● Idle speed	Less than 4.5V
			[Engine is running.] ● Warm-up condition ● EGR system is operating.	0 - 1.0V



On Board Diagnosis Logic

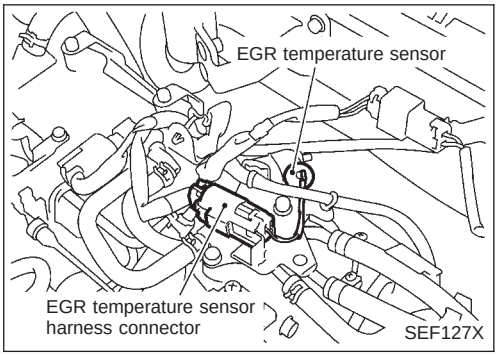
NCEC0350

If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

DTC No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1402 1402	● EGR flow is detected under conditions that do not call for EGR.	● Harness or connectors (The valve circuit is open or shorted.) ● EGR volume control valve leaking or stuck open ● EGR temperature sensor

DATA MONITOR	
MONITORING	NO FAIL
COOLAN TEMP/S	XXX °C
EGR TEMP SEN	XXX V

PEF347U



DTC Confirmation Procedure

NCEC0351

NOTE:

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

TESTING CONDITION:

- **Always perform at a temperature above −10°C (14°F).**
- **Engine coolant temperature and EGR temperature must be verified in ‘‘DATA MONITOR’’ mode with CONSULT-II before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.**
  COOLAN TEMP/S: −10 to 40°C (14 to 104°F)*
  EGR TEMP SEN: Less than 4.8V
  If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the engine coolant or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

*: Although CONSULT-II screen displays ‘‘−10 to 40°C (14 to 104°F)’’ as a range of engine coolant temperature, ignore it.

EGR SYSTEM P1402	
OUT OF CONDITION	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF115A

EGR SYSTEM P1402	
TESTING	
MONITOR	
ENG SPEED	XXX rpm
THRTL POS SEN	XXX V
B/FUEL SCHDL	XXX msec

NEF116A

EGR SYSTEM P1402
COMPLETED

PEF897U

With CONSULT-II

1) Turn ignition switch ''OFF'' and wait at least 9 seconds, then turn ignition switch ''ON''.
2) Select ''EGR SYSTEM P1402'' of ''EGR SYSTEM'' in ''DTC WORK SUPPORT'' mode with CONSULT-II.
3) Touch ''START''. Follow instructions of CONSULT-II.
4) Start engine and let it idle until ''TESTING'' on CONSULT-II screen is turned to ''COMPLETED''. (It will take 45 seconds or more.)
   If ''TESTING'' is not displayed after 5 minutes, turn ignition ''OFF'' and cool the engine coolant temperature to the range of −10 to 40°C (14 to 104°F). Retry from step 1.
5) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''. If ''NG'' is displayed, refer to ''Diagnostic Procedure'', EC-QG-317.

With GST

1) Turn ignition switch ''ON'' and select ''MODE 1'' with GST.
2) Check that engine coolant temperature is within the range of −10 to 40°C (14 to 104°F).
3) Check that voltage between ECM terminal 72 (EGR temperature sensor signal) and ground is less than 4.8V.
4) Start engine and let it idle for at least 45 seconds.
5) Stop engine.
6) Perform from step 1 to 4.
7) Select ''MODE 3'' with GST.
8) If DTC is detected, go to ''Diagnostic Procedure'', EC-QG-317.

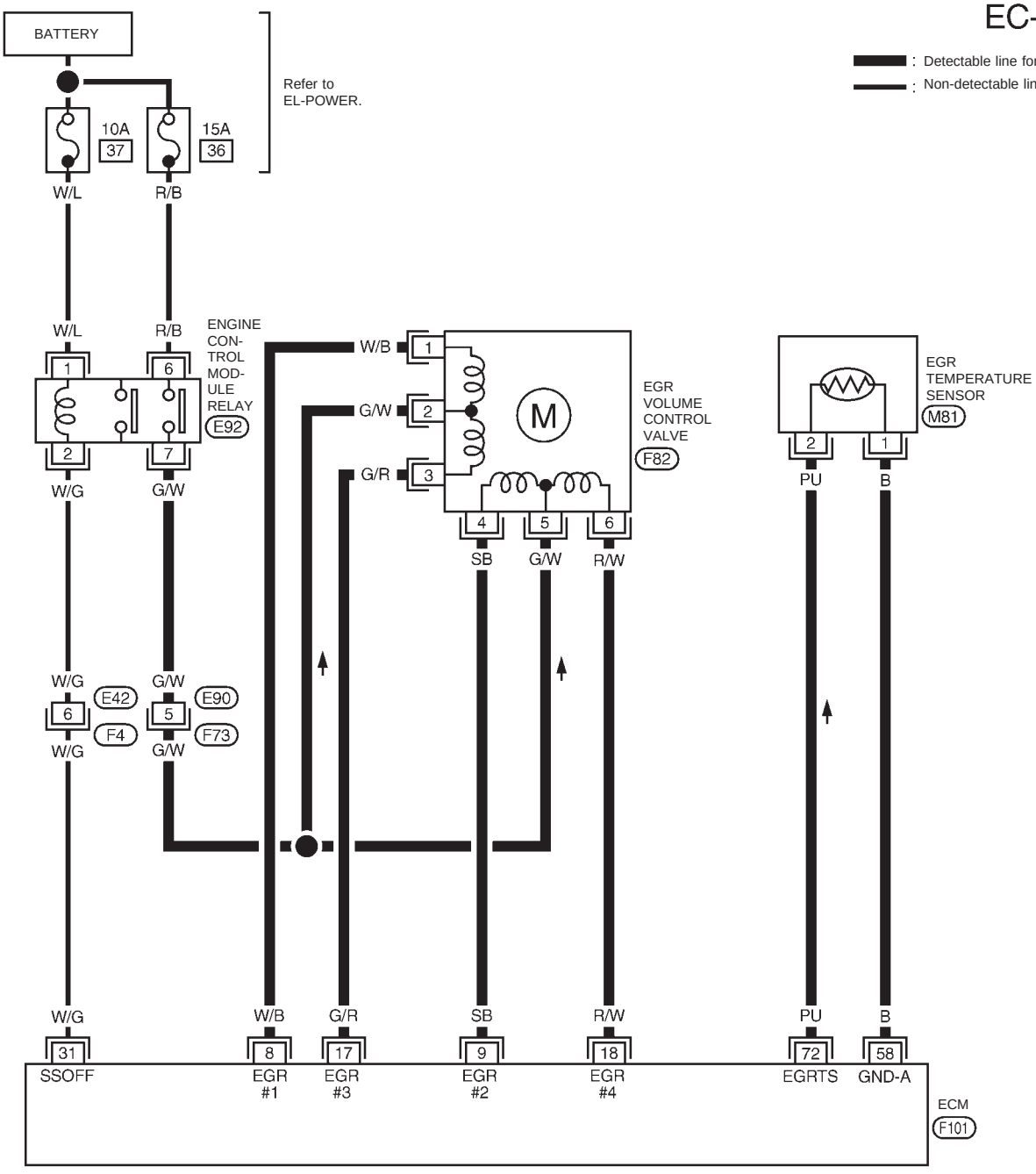
DTC P1402 EGR FUNCTION (OPEN)

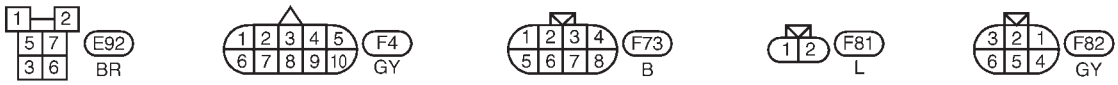
Wiring Diagram

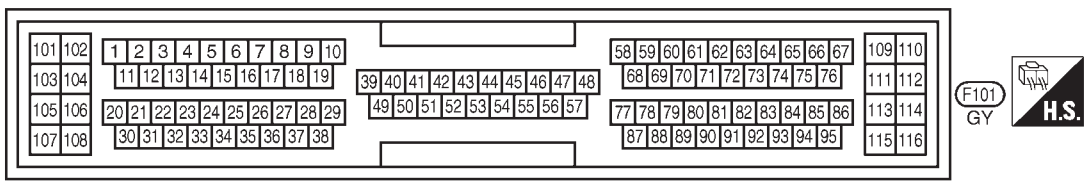
Wiring Diagram

NCEC0352

EC-EGR-01







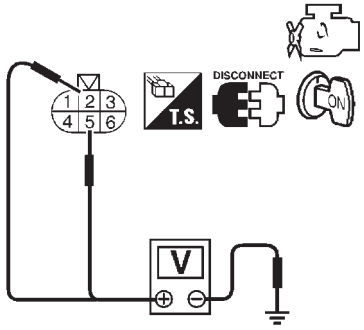
YEC272

Diagnostic Procedure

NCEC0353

1	CHECK POWER SUPPLY

1. Disconnect EGR volume control valve harness connector.
2. Turn ignition switch ‘‘ON’’.
3. Check voltage between terminals 2, 5 and ground with CONSULT-II or tester.



SEF556W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 2.
NG	▶	**Check the following.** ● Harness or connectors E90, F73 ● Harness for open or short between EGR volume control valve and engine control module relay If NG, repair harness or connectors.

2	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch ‘‘OFF’’.
2. Disconnect ECM harness connector.
3. Check harness continuity between
   ECM terminal 8 and terminal 1,
   ECM terminal 9 and terminal 4,
   ECM terminal 17 and terminal 3,
   ECM terminal 18 and terminal 6.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

OK or NG

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

3	CHECK EGR TEMPERATURE SENSOR

Refer to ‘‘Component Inspection’’, EC-QG-311.

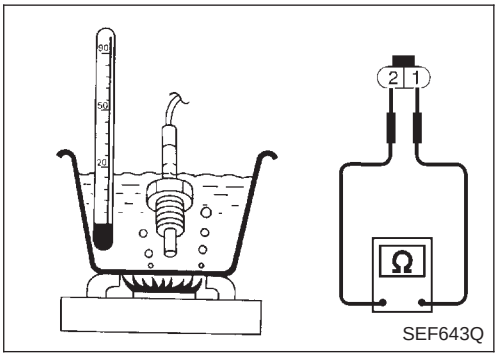
OK or NG

OK	▶	GO TO 4.
NG	▶	Replace EGR temperature sensor.

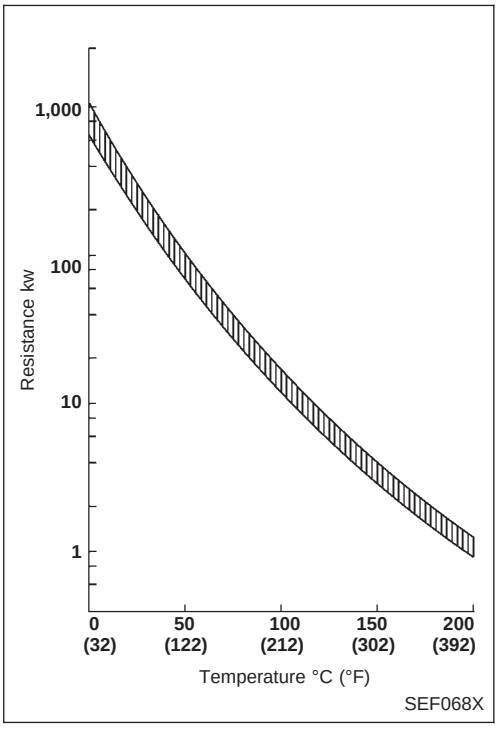
Diagnostic Procedure (Cont'd)

4	CHECK EGR VOLUME CONTROL VALVE	
Refer to ''Component Inspection'', EC-QG-254. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	Replace EGR volume control valve.

5	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



SEF643Q



SEF068X

Component Inspection

NCEC0354

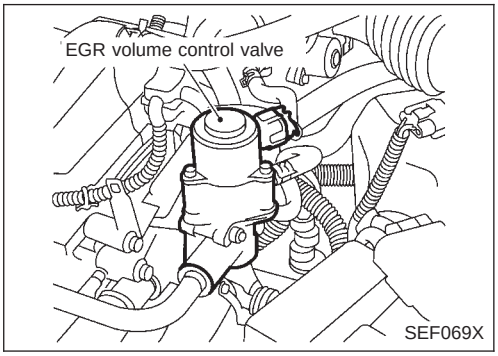
EGR TEMPERATURE SENSOR

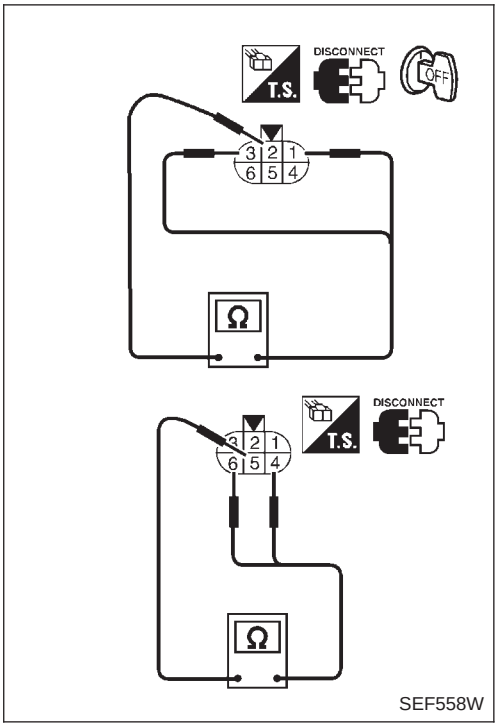
NCEC0354S01

Check resistance change and resistance value.
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

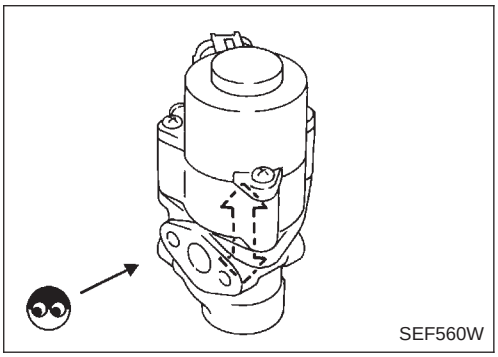
If NG, replace EGR temperature sensor.





ACTIVE TEST	
EGR VOL CONT/V	20 STEP
MONITOR	
ENG SPEED	XXX rpm

NEF122A



EGR VOLUME CONTROL VALVE

NCEC0354S04

With CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

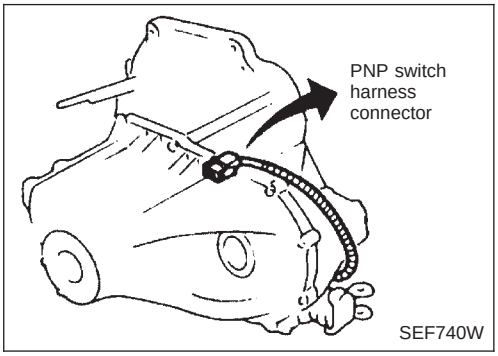
3) Reconnect EGR volume control valve harness connector.
4) Remove EGR volume control valve from cylinder head.
   (The EGR volume control valve harness connector should remain connected.)
5) Turn ignition switch ''ON''.
6) Perform ''EGR VOL CONT/V'' in ''ACTIVE TEST'' mode with CONSULT-II. Check that EGR volume control valve shaft moves smoothly forward and backward according to the valve opening
   If NG, replace the EGR volume control valve.

Without CONSULT-II

1) Disconnect EGR volume control valve harness connector.
2) Check resistance between the following terminals.
   terminal 2 and terminals 1, 3
   terminal 5 and terminals 4, 6

Temperature °C (°F)	Resistance Ω
20 (68)	20 - 24

3) Turn ignition switch ''ON'' and ''OFF''. Check that EGR volume control valve shaft moves smoothly forward and backward according to the ignition switch position.
   If NG, replace the EGR volume control valve.



Component Description

NCEC0424

When the gear position is ''N'', park/neutral position (PNP) switch is ''ON''.
ECM detects the park/neutral position when continuity with ground exists.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0425

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

NCEC0426

Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	G/OR	PNP switch	**[Ignition switch ''ON'']** ● Gear position is ''Neutral position''	Approximately 0V
			[Ignition switch ''ON''] ● Except the above gear position	Approximately 5V

On Board Diagnosis Logic

NCEC0427

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

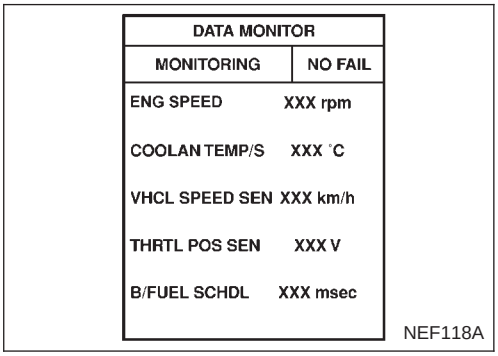
NCEC0428

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

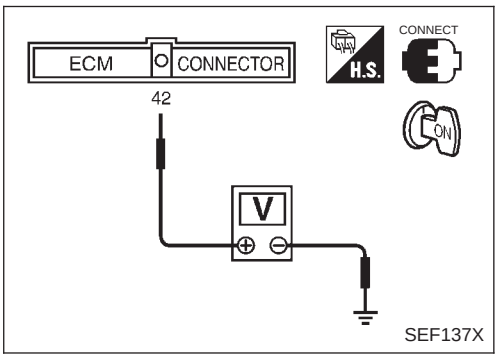


With CONSULT-II

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Maintain the following conditions for at least 50 consecutive seconds.

ENG SPEED	1,550 - 3,800 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.0 msec or more
VHCL SPEED SE	70 - 100 km/h (43 - 62 MPH)
Selector lever	Suitable position (Except ''N'' position)

5) If 1st trip DTC is detected, go to ''Diagnostic Procedure'', EC-QG-323.



Overall Function Check

NCEC0429

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.

Without CONSULT-II

1) Turn ignition switch ''ON''.
2) Check voltage between ECM terminal 42 (PNP switch signal) and body ground under the following conditions.

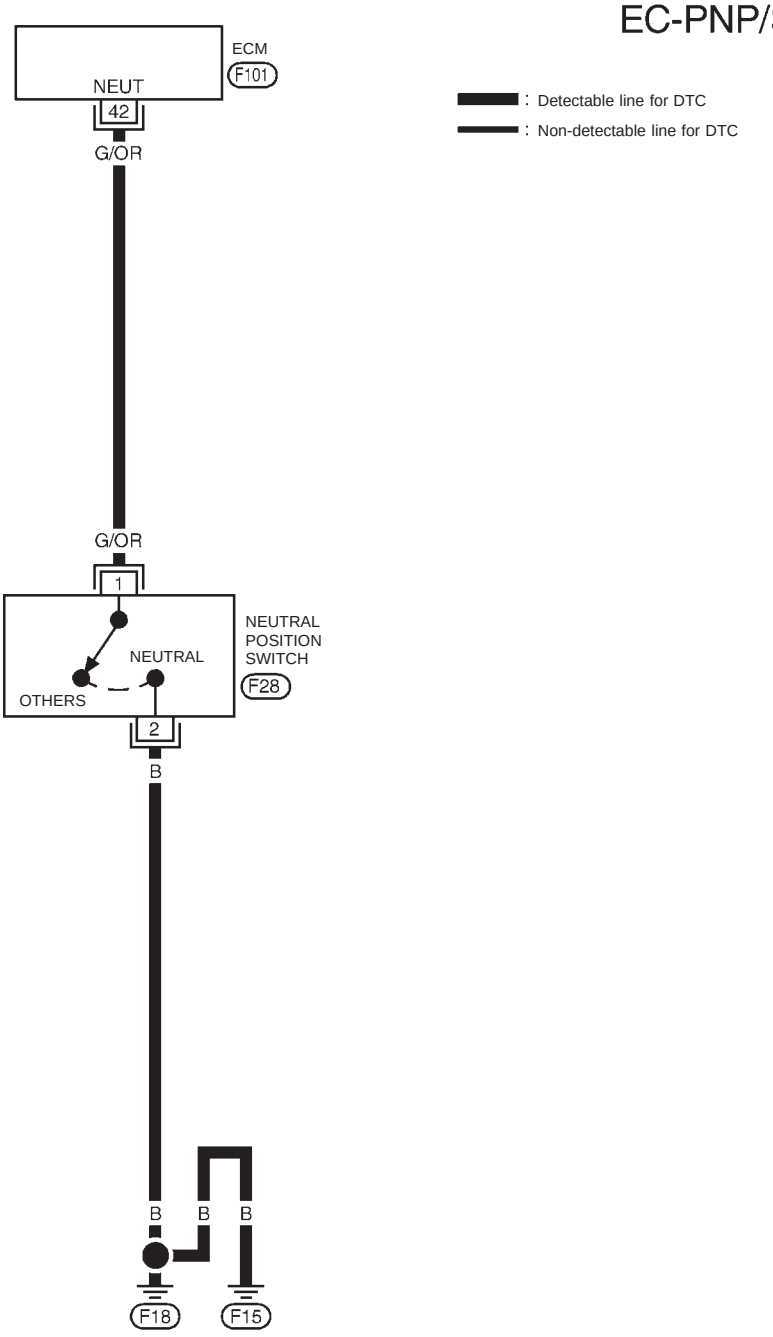
Condition (Gear position)	Voltage (V) (Known good data)
''N'' position	Approx. 0
Except the above position	Approx. 5

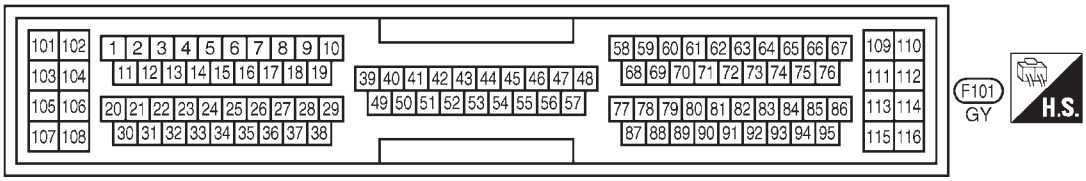
3) If NG, go to ''Diagnostic Procedure'', EC-QG-323.

Wiring Diagram

NCEC0430

EC-PNP/SW-01



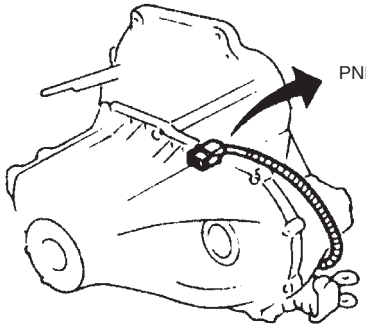


Diagnostic Procedure For M/T Models

NCEC0431

1	CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect PNP switch harness connector.



SEF740W

3. Check harness continuity between PNP switch harness connector terminal 2 and body ground.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the harness for open or short between PNP switch and body ground.

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

3	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 42 and PNP switch harness connector terminal 1.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and PNP switch.

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

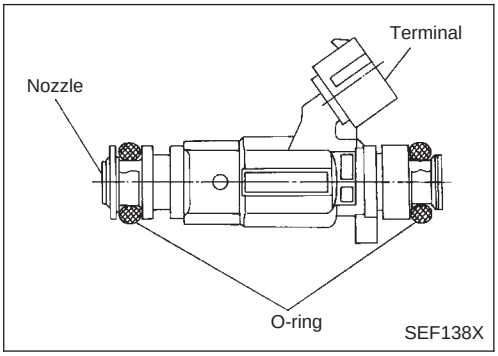
5	CHECK PNP SWITCH

Refer to MT section.

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace PNP switch.

6	**CHECK INTERMITTENT INCIDENT**
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



Component Description

NCEC0435

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

CONSULT-II Reference Value in Data Monitor Mode

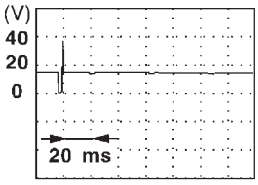
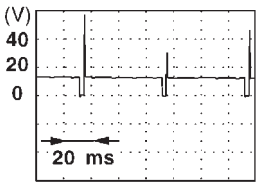
NCEC0436

MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE - B1	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: ‘‘N’’ ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 3.2 msec
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: ‘‘N’’ ● No-load	Idle	1.5 - 2.5 msec
		2,000 rpm	1.5 - 2.5 msec

ECM Terminals and Reference Value

NCEC0437

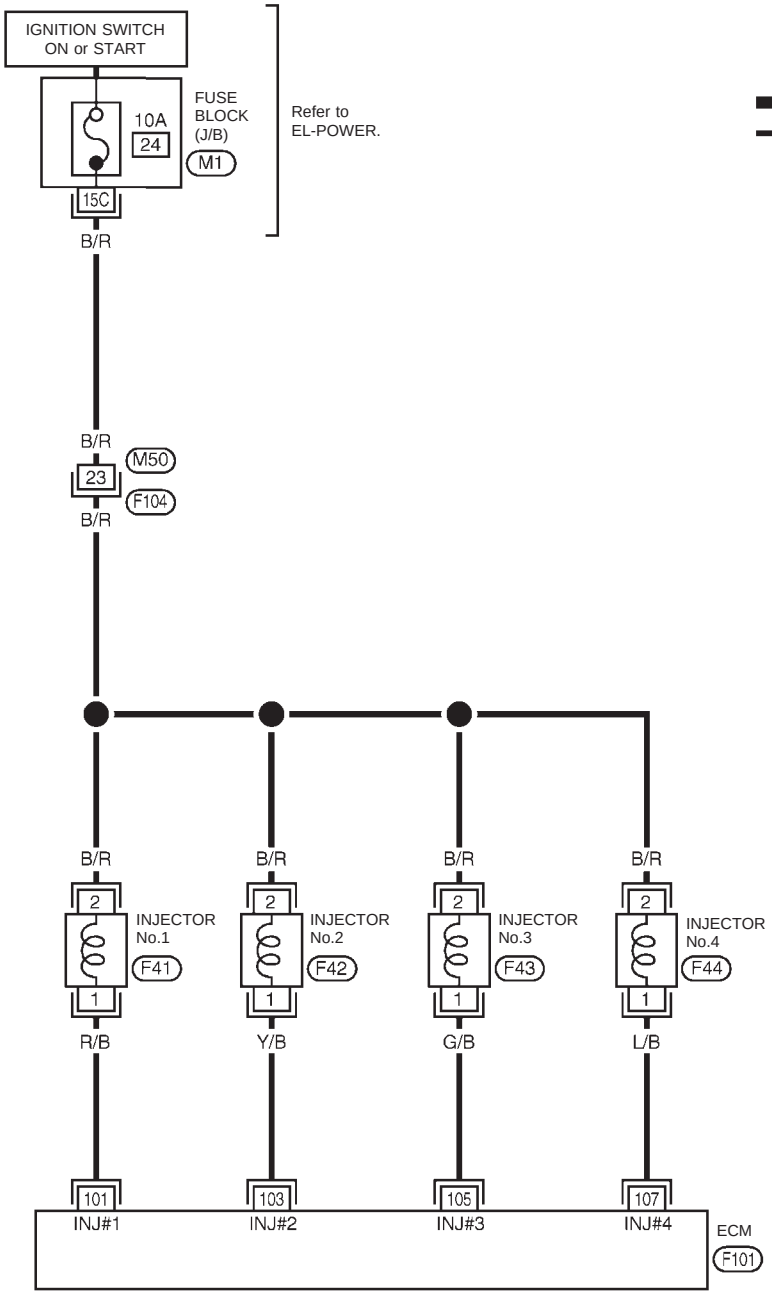
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

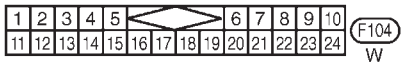
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101 103 105 107	R/B Y/B G/B L/B	Injector No. 1 Injector No. 2 Injector No. 3 Injector No. 4	**[Engine is running]** ● **Warm-up condition** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF011W
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)  SEF012W

Wiring Diagram

NCEC0434

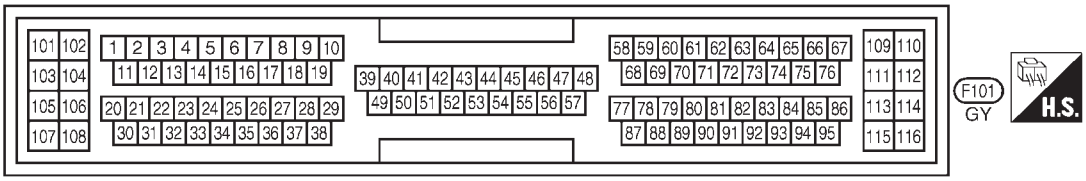
EC-FUEL-01





REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)



Diagnostic Procedure

NCEC0438

1	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Perform ‘‘POWER BALANCE’’ in ‘‘ACTIVE TEST’’ mode with CONSULT-II.

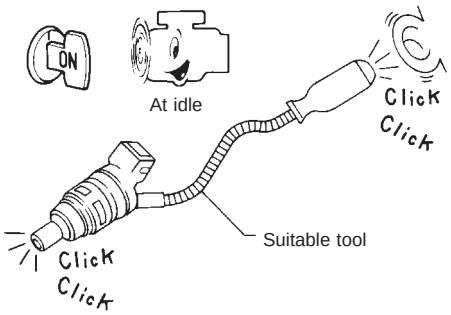
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SEN-B1	XXX V
IACV-AAC/V	XXX %

NEF105A

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

Without CONSULT-II

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



MEC703B

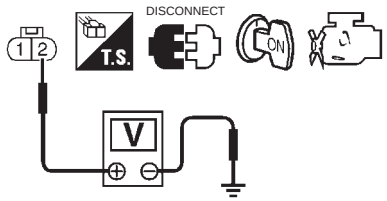
Clicking noise should be heard.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK POWER SUPPLY

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT-II or tester.



SEF986W

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness connectors M50, F104
- Harness for open or short between injector and fuse

	▶	Repair harness or connectors.

4	CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal 1 and ECM terminals 101, 103, 105, 107.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

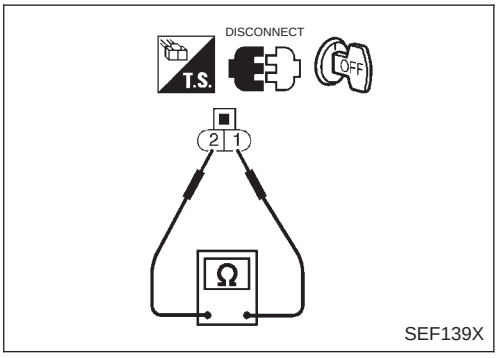
5	DETECT MALFUNCTIONING PART

Check the harness for open or short between ECM and injector.

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

6	CHECK INJECTOR	
Refer to ''Component Inspection'', EC-QG-329. **OK or NG**		
OK	▶	GO TO 7.
NG	▶	Replace injector.

7	CHECK INTERMITTENT INCIDENT
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.	
▶	**INSPECTION END**



Component Inspection

NCEC0439

INJECTOR

NCEC0439S01

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

   Resistance: 13.5 - 17.5Ω [at 25°C (77°F)]

   If NG, replace injector.

Component Description

NCEC0542

IGNITION COIL AND POWER TRANSISTOR

NCEC0542S01

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0543

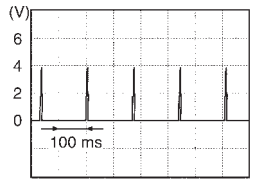
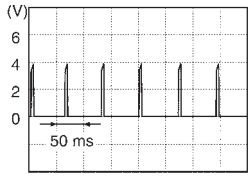
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
IGNITION SW	● Ignition switch: ON → OFF → ON	ON → OFF → ON

ECM Terminals and Reference Value

NCEC0544

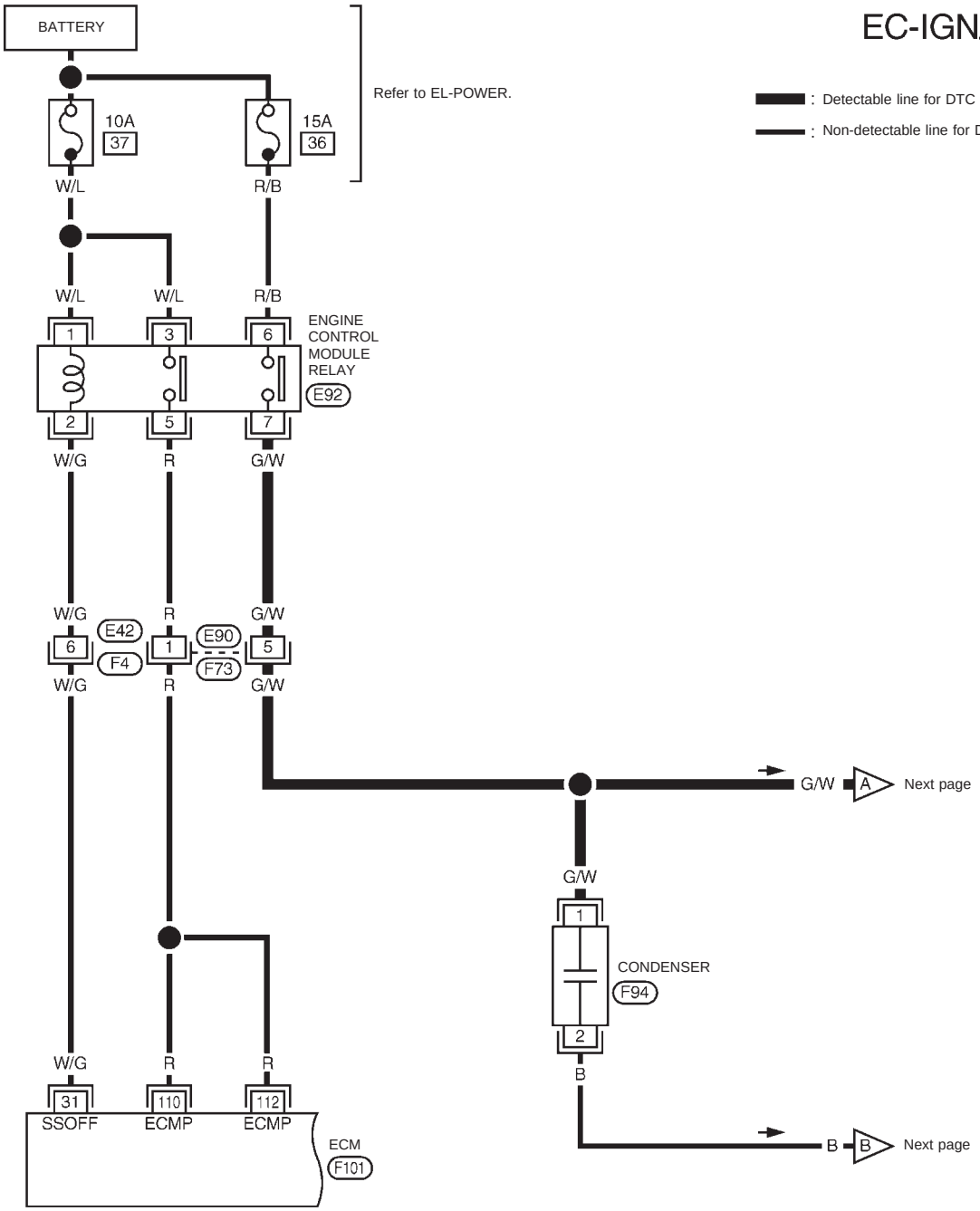
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

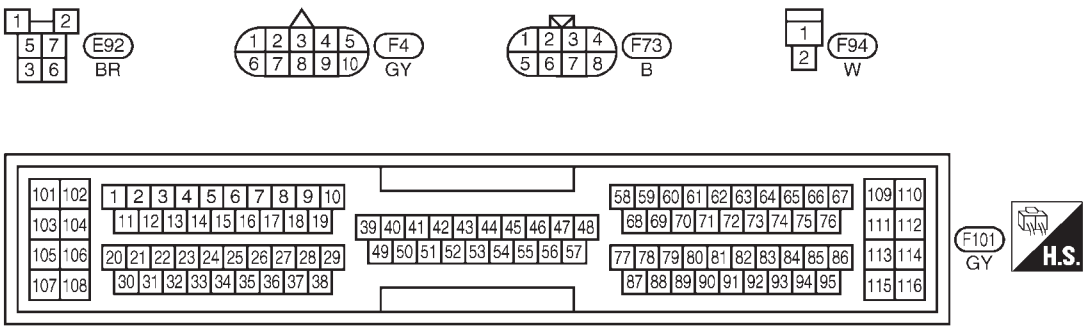
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
35 36 37 38	Y/R PU/G L/Y GY/L	Ignition signal (No. 1) Ignition signal (No. 2) Ignition signal (No. 3) Ignition signal (No. 4)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.3V  SEF971W
			[Engine is running] ● Engine speed is 2,000 rpm	0.2 - 0.4V  SEF972W

Wiring Diagram

NCEC0545

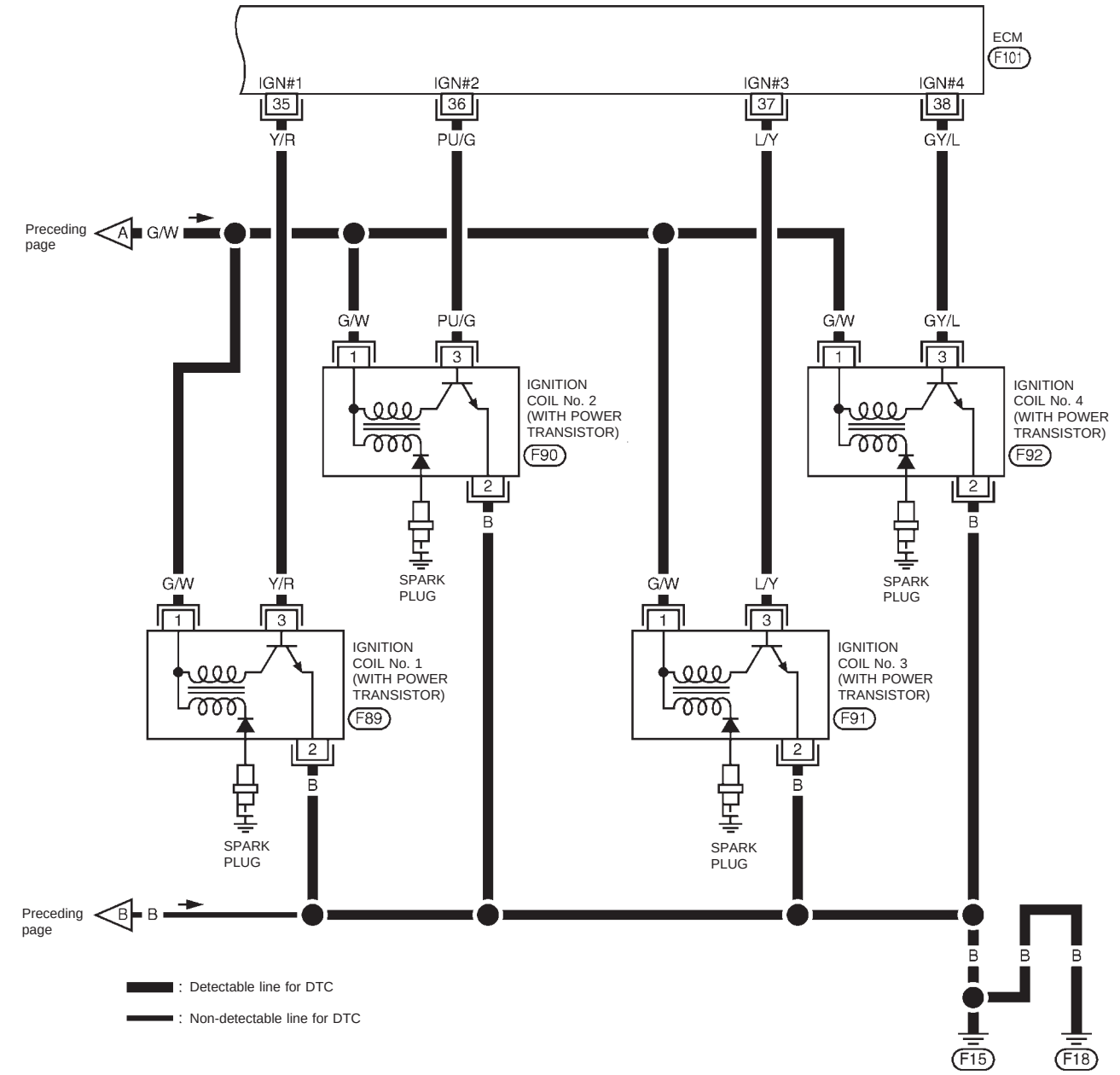
EC-IGN/SG-01

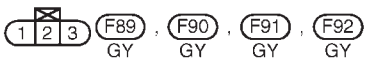


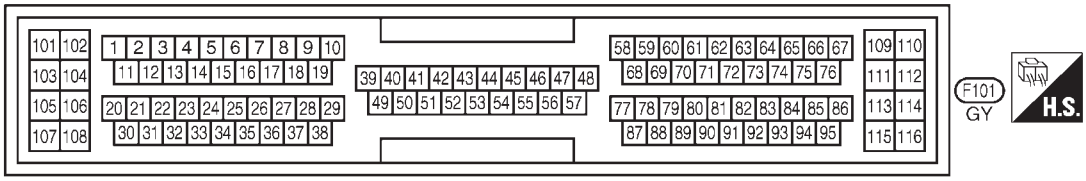


Wiring Diagram (Cont'd)

EC-IGN/SG-02







YEC278

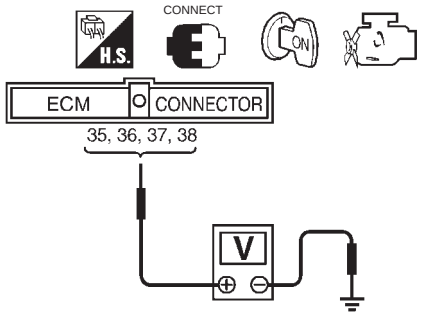
Diagnostic Procedure

NCEC0546

1	INSPECTION START
Does engine start? **Yes or No**	
Yes (With CONSULT-II) ▶	GO TO 3.
Yes (Without CONSULT-II) ▶	GO TO 2.
No ▶	GO TO 2.

2	SEARCH FOR MALFUNCTIONING CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between ECM terminals 35, 36, 37, 38 and ground.



SEF991W

Voltage: 0.01 - 0.1V

▶	GO TO 4.

3	SEARCH FOR MALFUNCTIONING CIRCUIT

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.
3. Search for circuit which does not produce a momentary engine speed drop.

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

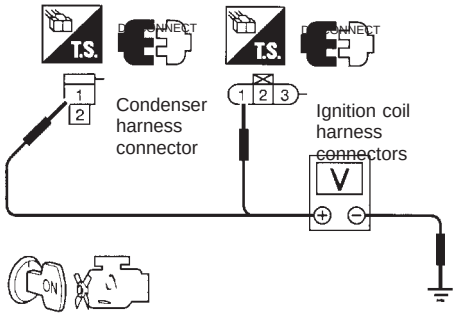
NEF105A

▶	GO TO 4.

Diagnostic Procedure (Cont'd)

4	CHECK POWER SUPPLY

1. Disconnect each ignition harness connector and condenser harness connector.
2. Turn ignition switch ''ON''.
3. Check voltage between each ignition coil harness connector terminal 1 and ground, condenser harness connector terminal 1 and ground.



SEF680P

Voltage: Battery voltage

OK or NG

OK	▶	GO TO 5.
NG	▶	**Check the following.** ● Harness connectors E90, F73 ● Harness for open or short between engine control module relay and ignition coils or condenser ● Condenser Refer to ''Component Inspection''. (See on next page.) If NG, repair harness, connectors or component.

5	CHECK GROUND CIRCUIT

1. Disconnect each ignition coil harness connector.
2. Check harness continuity between each ignition coil harness connector terminal 2 and engine ground.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

OK or NG

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

6	CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect each ignition coil harness connector and ECM harness connector.
2. Check harness continuity between each ignition coil harness connector terminal 3 and each ECM harness connector terminal.
   Refer to wiring diagram.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

OK or NG

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

7	CHECK IGNITION COIL WITH POWER TRANSISTOR

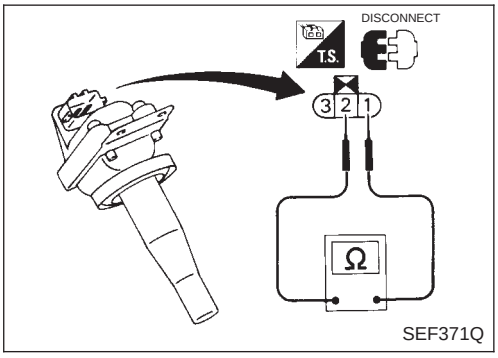
Refer to ''Component Inspection'', EC-QG-335.

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace ignition coil assembly.

7	CHECK IGNITION COIL WITH POWER TRANSISTOR	
Refer to ''Component Inspection'', EC-QG-335. **OK or NG**		
OK	▶	GO TO 8.
NG	▶	Replace ignition coil assembly.

8	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



Component Inspection

NCEC0547

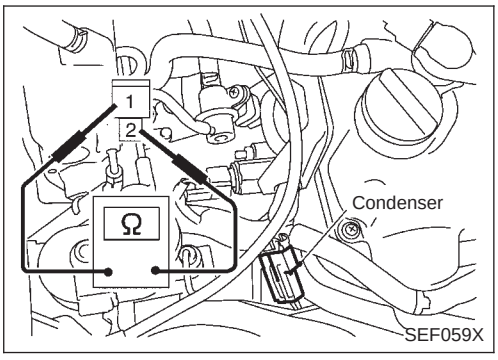
IGNITION COIL WITH POWER TRANSISTOR

NCEC0547S01

1. Disconnect ignition coil with power transistor harness connector.
2. Check ignition coil with power transistor for resistance as show in the figure.

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 2 (−)	Except 0 or ∞
1 (+) - 3 (−)	Except 0
1 (+) - 2 (−)	

If NG, replace ignition coil with power transistor assembly.



CONDENSER

NCEC0547S02

1. Disconnect condenser harness connector.
2. Check condenser continuity between terminals 1 and 2.

Resistance: Above 1 MΩ at 25°C (77°F)

CONSULT-II Reference Value in Data Monitor Mode

NCEC0441

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

ECM Terminals and Reference Value

NCEC0442

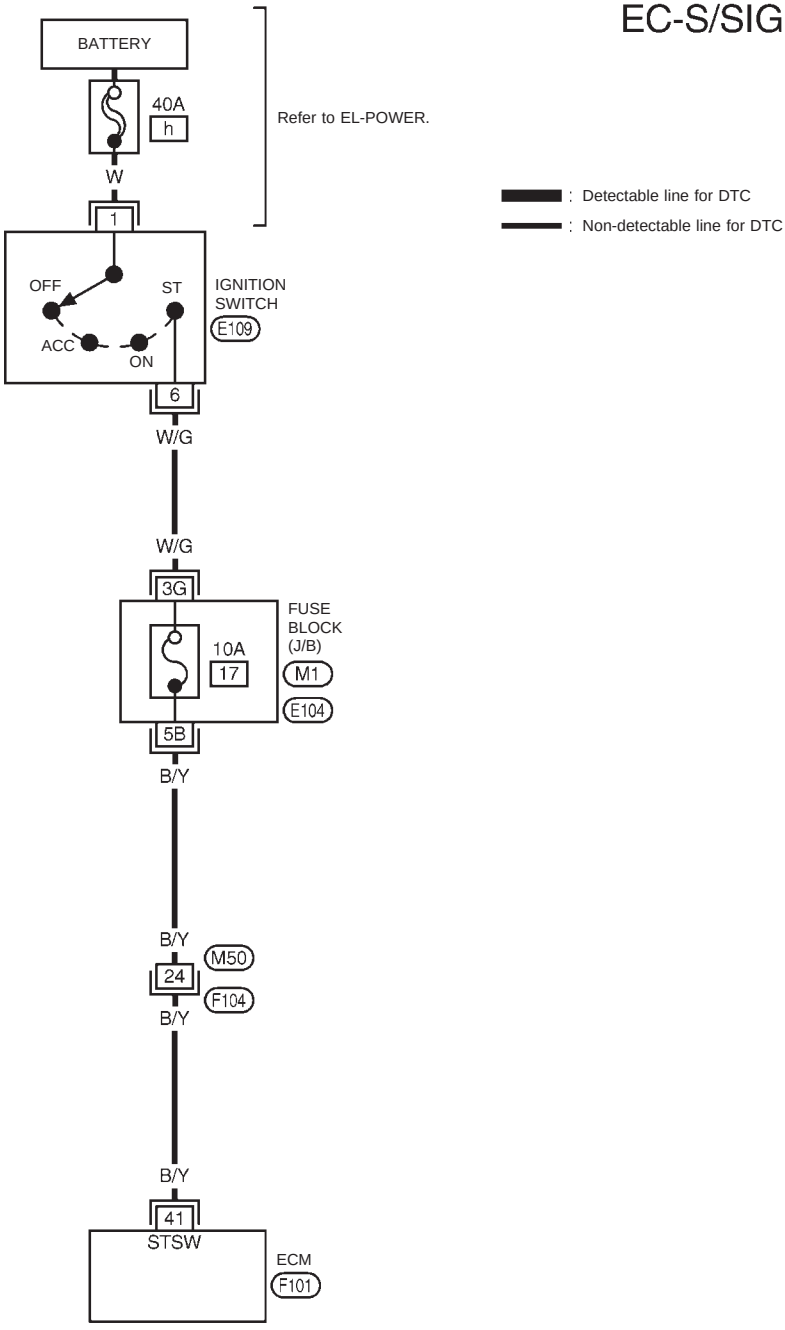
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
41	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V

Wiring Diagram

NCEC0440

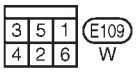
EC-S/SIG-01

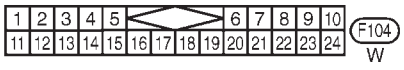


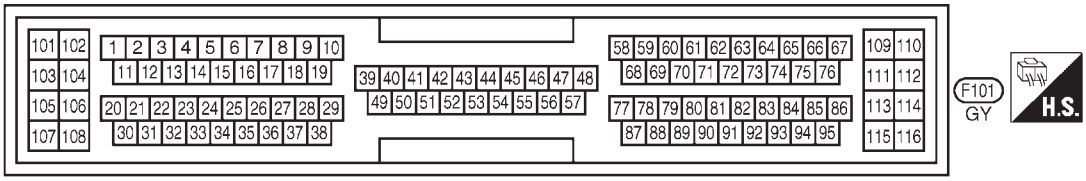
REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

E104 FUSE BLOCK - Junction Box (J/B)







Diagnostic Procedure

=NCEC0443

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	
Monitoring	NO FAIL
START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

PEF111P

Condition	‘‘START SIGNAL’’
IGN ‘‘ON’’	OFF
IGN ‘‘START’’	ON

MTBL0140

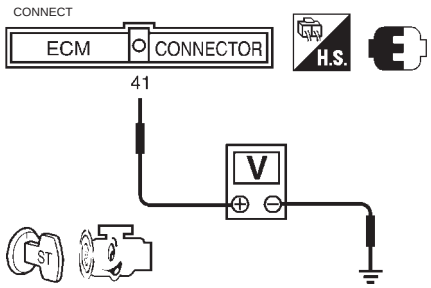
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal 41 and ground under the following conditions.



SEF142X

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.

- Harness connectors M50, F104
- 10A fuse
- Harness for open or short between ECM and ignition switch

OK or NG

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

5	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-QG-108.

	▶	**INSPECTION END**

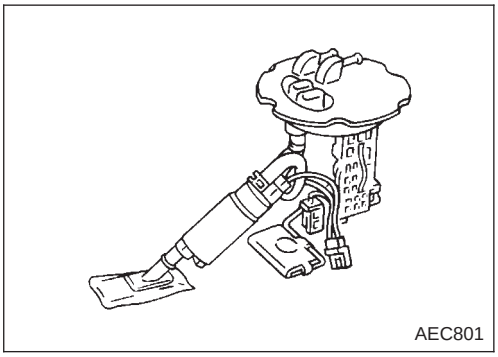
System Description

NCEC0444

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE)	Engine speed	ECM	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 1 second
Engine running and cranking	Operates
When engine is stopped (Signal is not sent from camshaft position sensor.)	Stops in 1.5 seconds
Except as shown above	Stops


AEC801

Component Description

NCEC0501

A turbine type design fuel pump is used in the fuel tank.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0445

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 1 second) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)	ON
	● Except as shown above	OFF

ECM Terminals and Reference Value

NCEC0446

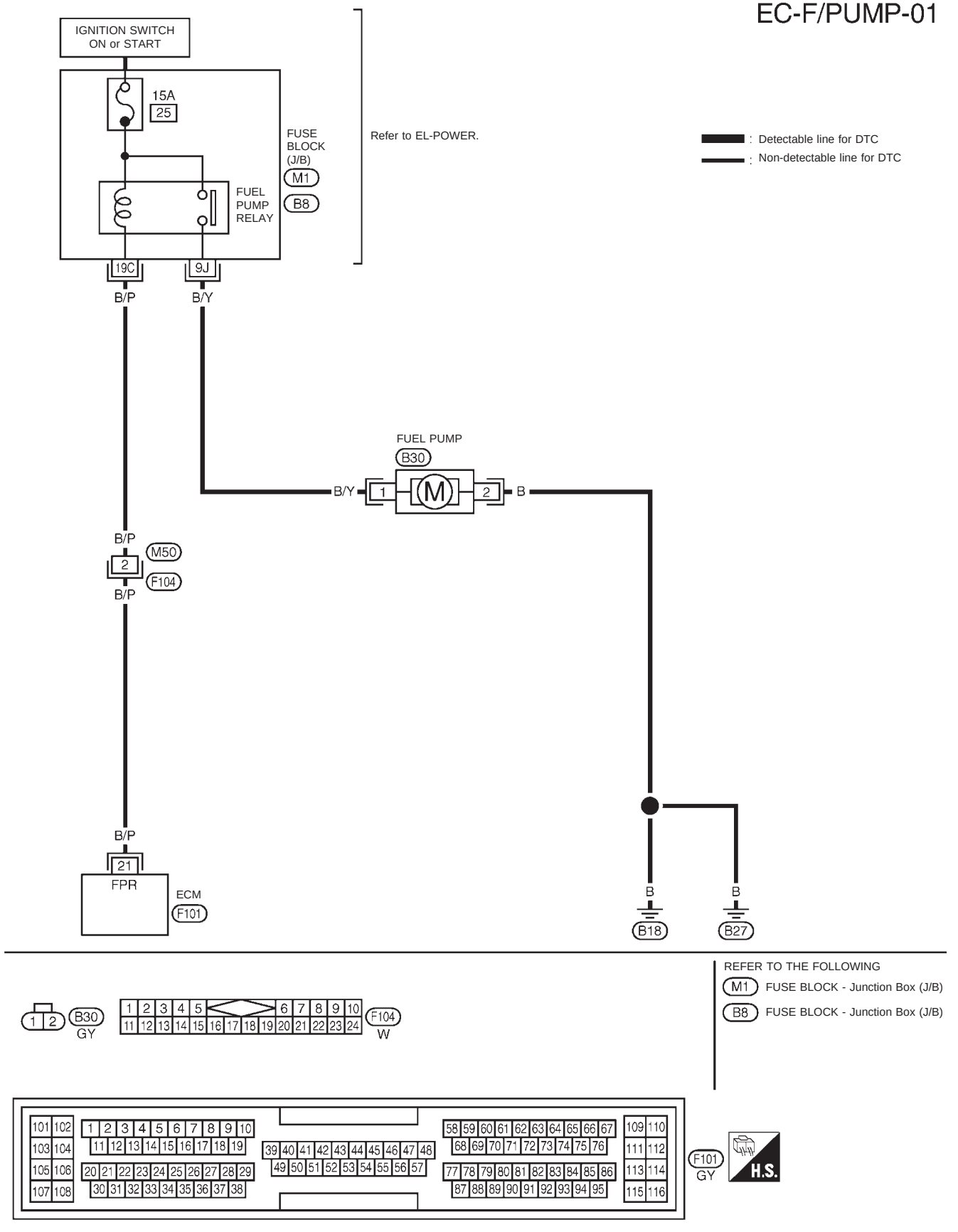
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21	B/P	Fuel pump relay	**[Ignition switch ''ON'']** ● For 1 second after turning ignition switch ''ON'' **[Engine is running]**	0 - 1V
			[Ignition switch ''ON''] ● More than 1 second after turning ignition switch ''ON''	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

NCEC0447

EC-F/PUMP-01

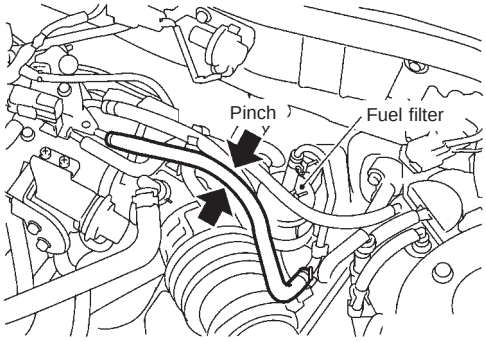


Diagnostic Procedure

NCEC0448

1	CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.



SEF143X

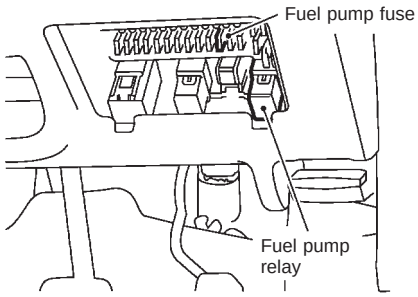
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned "ON".

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

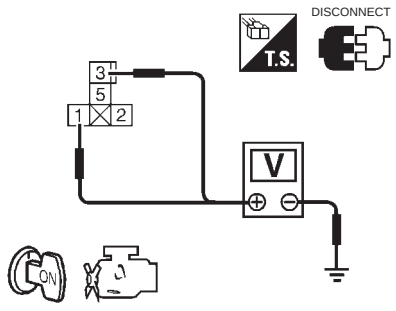
2	CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.



SEF071X

3. Turn ignition switch "ON".
4. Check voltage between terminals 1, 3 and ground with CONSULT-II or tester.



SEF144X

Voltage: Battery voltage

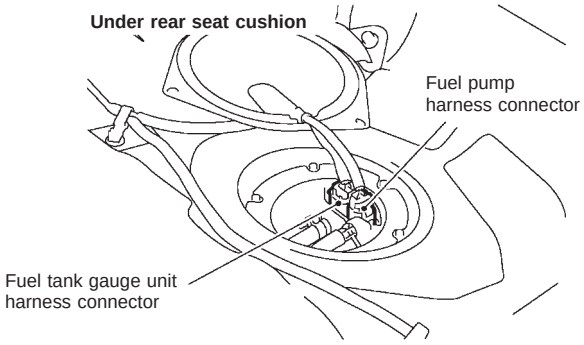
OK or NG

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 POWER GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.



SEF299W

3. Check harness continuity between fuel pump harness connector terminal 2 and body ground, terminal 1 and fuel pump relay connector terminal 9J.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness for open or short between fuel pump and body ground ● Harness for open or short between fuel pump and fuel pump relay	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK OUTPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 21 and fuel pump relay connector terminal 19C.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

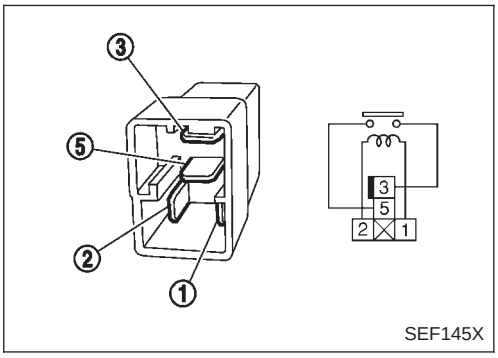
Diagnostic Procedure (Cont'd)

7	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors M50, F104 ● Harness for open or short between ECM and fuel pump relay		
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

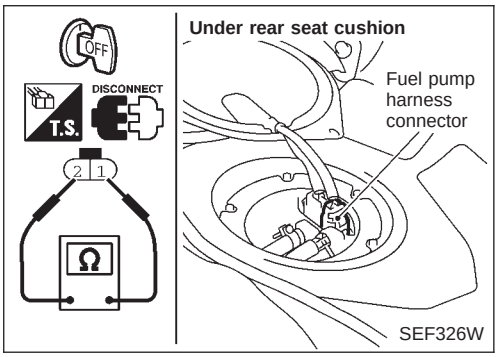
8	CHECK FUEL PUMP RELAY	
Refer to ''Component Inspection'', EC-QG-344.		
	OK or NG	
OK	▶	GO TO 9.
NG	▶	Replace fuel pump relay.

9	CHECK FUEL PUMP	
Refer to ''Component Inspection'', EC-QG-344.		
	OK or NG	
OK	▶	GO TO 10.
NG	▶	Replace fuel pump.

10	CHECK INTERMITTENT INCIDENT	
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-QG-108.		
	▶	**INSPECTION END**



SEF145X



SEF326W

Component Inspection

FUEL PUMP RELAY

NCEC0449

NCEC0449S01

Check continuity between terminals 3 and 5.

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

If NG, replace relay.

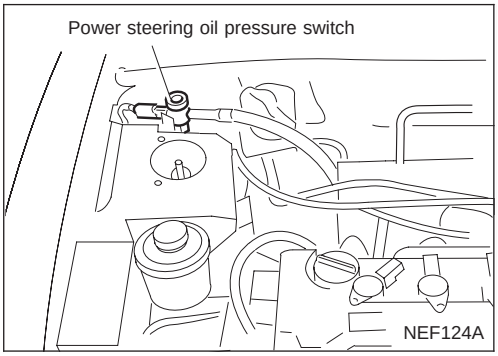
FUEL PUMP

NCEC0449S02

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals 1 and 2.

Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]

If NG, replace fuel pump.



Component Description

NCEC0451

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

NCEC0452

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

NCEC0453

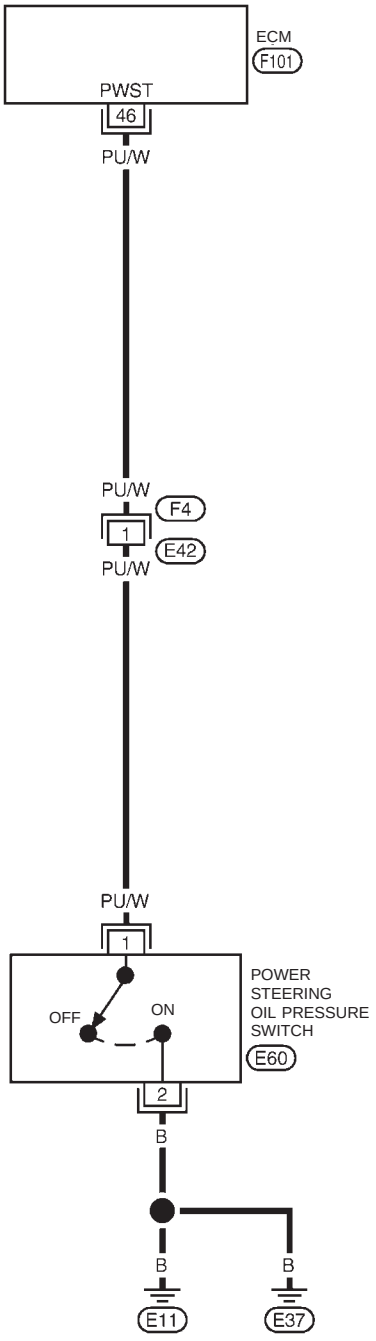
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46	PU/W	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is fully turned	Approximately 0V
			[Engine is running] ● Steering wheel is not turned	Approximately 5V

Wiring Diagram

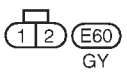
NCEC0450

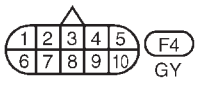
EC-PST/SW-01

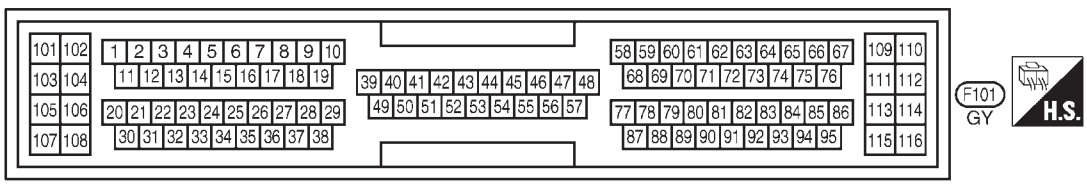


: Detectable line for DTC

: Non-detectable line for DTC







YEC254

Diagnostic Procedure

=NCEC0454

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	
MONITORING	NO FAIL
PW/ST SIGNAL	OFF

PEF591I

Steering is in neutral position	OFF
Steering is turned	ON

MTBL0141

OK or NG

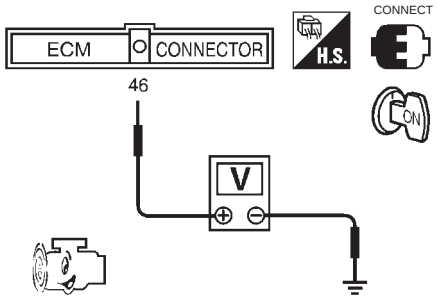
OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

Diagnostic Procedure (Cont'd)

3	CHECK OVERALL FUNCTION

Without CONSULT-II

1. Start engine.
2. Check voltage between ECM terminal 46 and ground under the following conditions.



SEF148X

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 GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.
3. Check harness continuity between power steering oil pressure switch harness terminal 2 and engine ground.
   Refer to wiring diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

5	CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 46 and power steering oil pressure switch harness terminal 1.
   Refer to wiring diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F4, E42
- Harness for open or short between ECM and power steering oil pressure switch

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

7	CHECK POWER STEERING OIL PRESSURE SWITCH	
Refer to ''Component Inspection'', EC-QG-349.		
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-QG-108.		
	▶	**INSPECTION END**

Component Inspection

NCEC0455

POWER STEERING OIL PRESSURE SWITCH

NCEC0455S01

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals 1 and 2. Refer to wiring diagram.

Conditions	Continuity
Steering wheel is being turned.	Yes
Steering wheel is not being turned.	No

If NG, replace power steering oil pressure switch.

CONSULT-II Reference Value in Data Monitor Mode

NCEC0548

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
LOAD SIGNAL	● Ignition switch: ON	Rear window defogger is operating and/or lighting switch is on.	ON
		Rear window defogger is not operating and lighting switch is not on.	OFF
HEATER FAN SW	● Ignition switch: ON	Blower fan motor is operating	ON
		Blower fan motor is not operating	OFF

ECM Terminals and Reference Value

NCEC0549

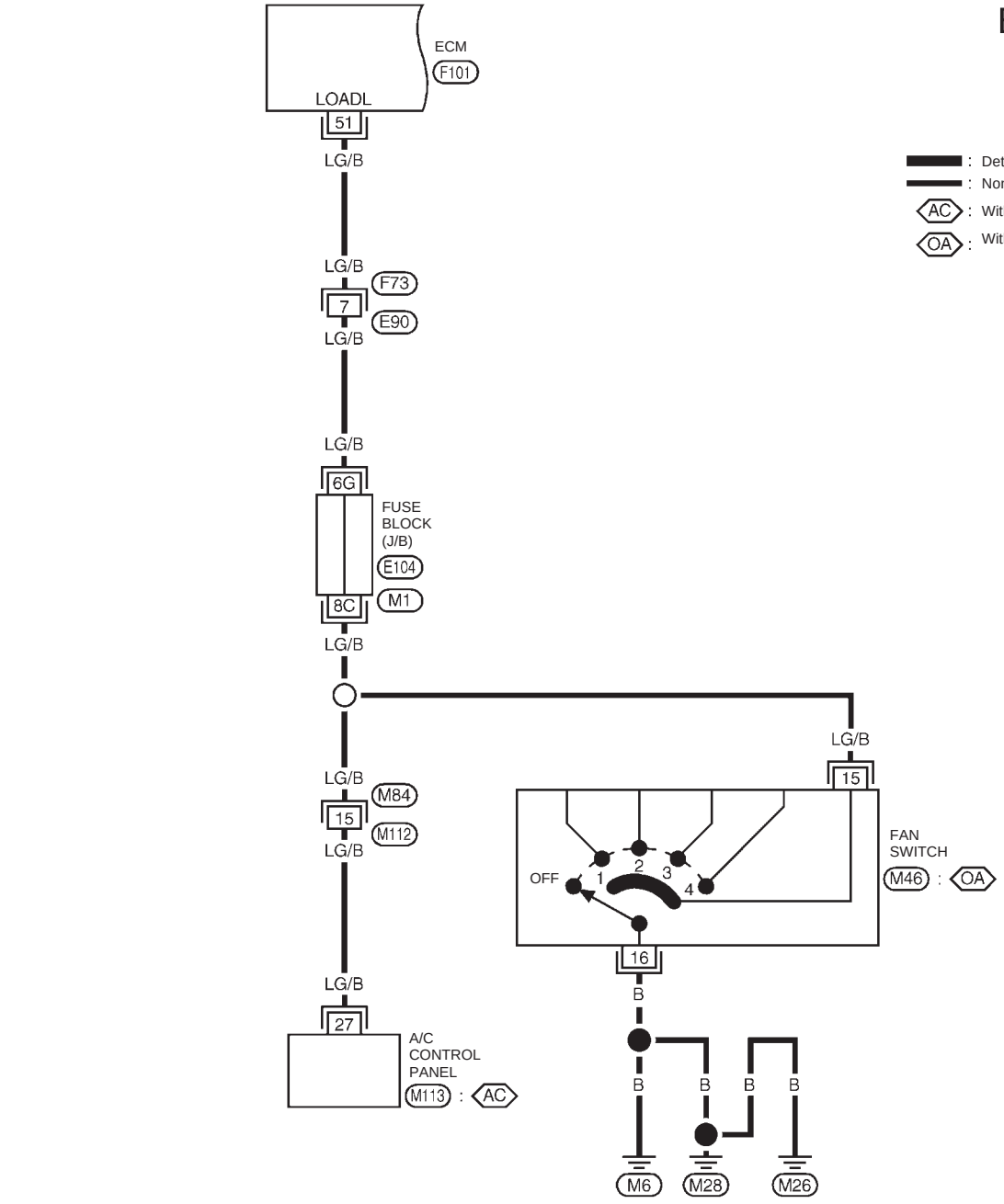
Specification data are reference values and are measured between each terminal and 48 (ECM ground).

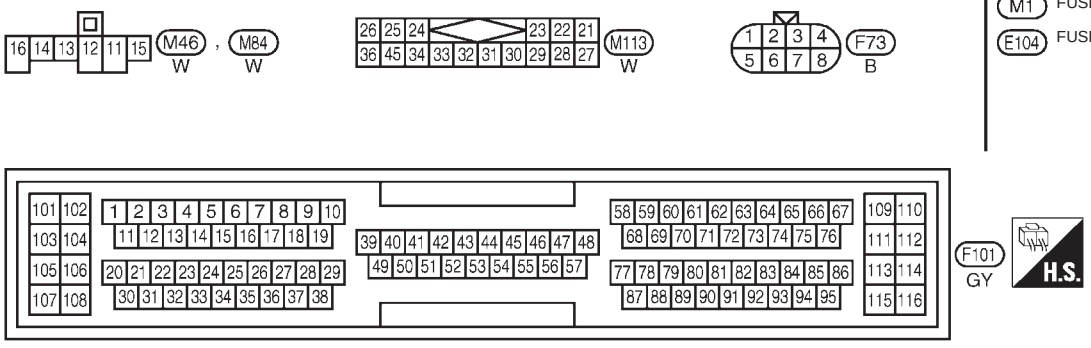
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	R	Electric load signal (Load switch)	**[Engine is running]** ● Rear window defogger is operating and/or lighting switch is on	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Rear window defogger is not operating and lighting switch is not on	Approximately 0V
51	LG/B	Blower fan motor switch	**[Engine is running]** ● Blower fan motor is operating	Approximately 0V
			[Engine is running] ● Blower fan motor is not operating	Approximately 5V

Wiring Diagram

NCEC0550

EC-LOAD-01





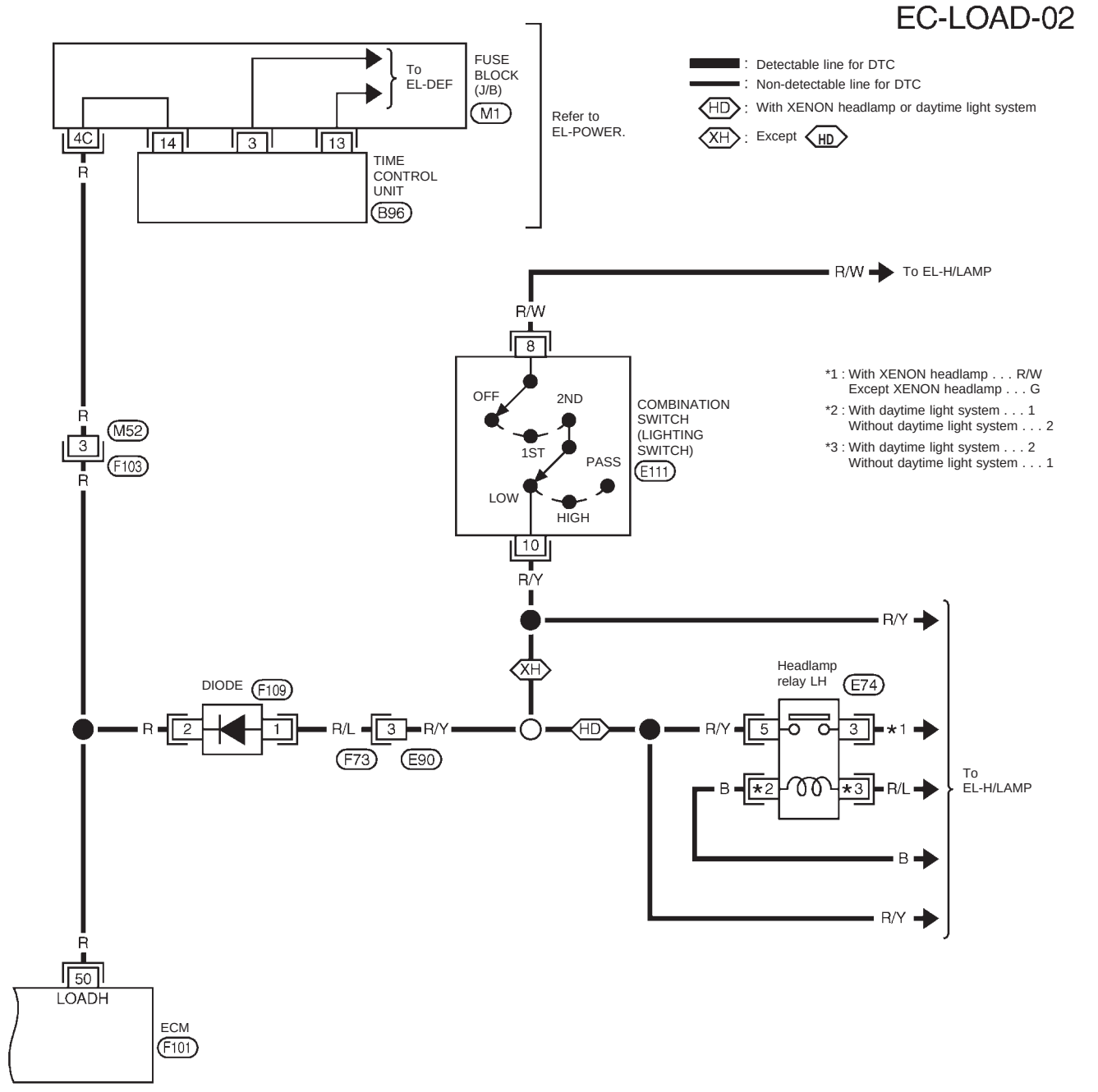
REFER TO THE FOLLOWING

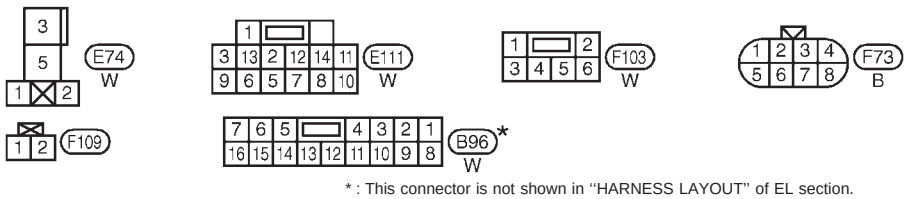
M1 FUSE BLOCK - Junction Box (J/B)

E104 FUSE BLOCK - Junction Box (J/B)

YEC255

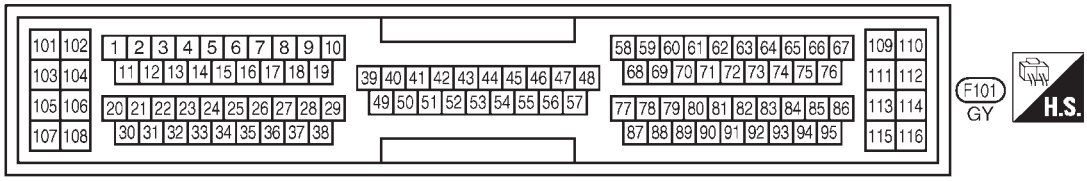
EC-LOAD-02





REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

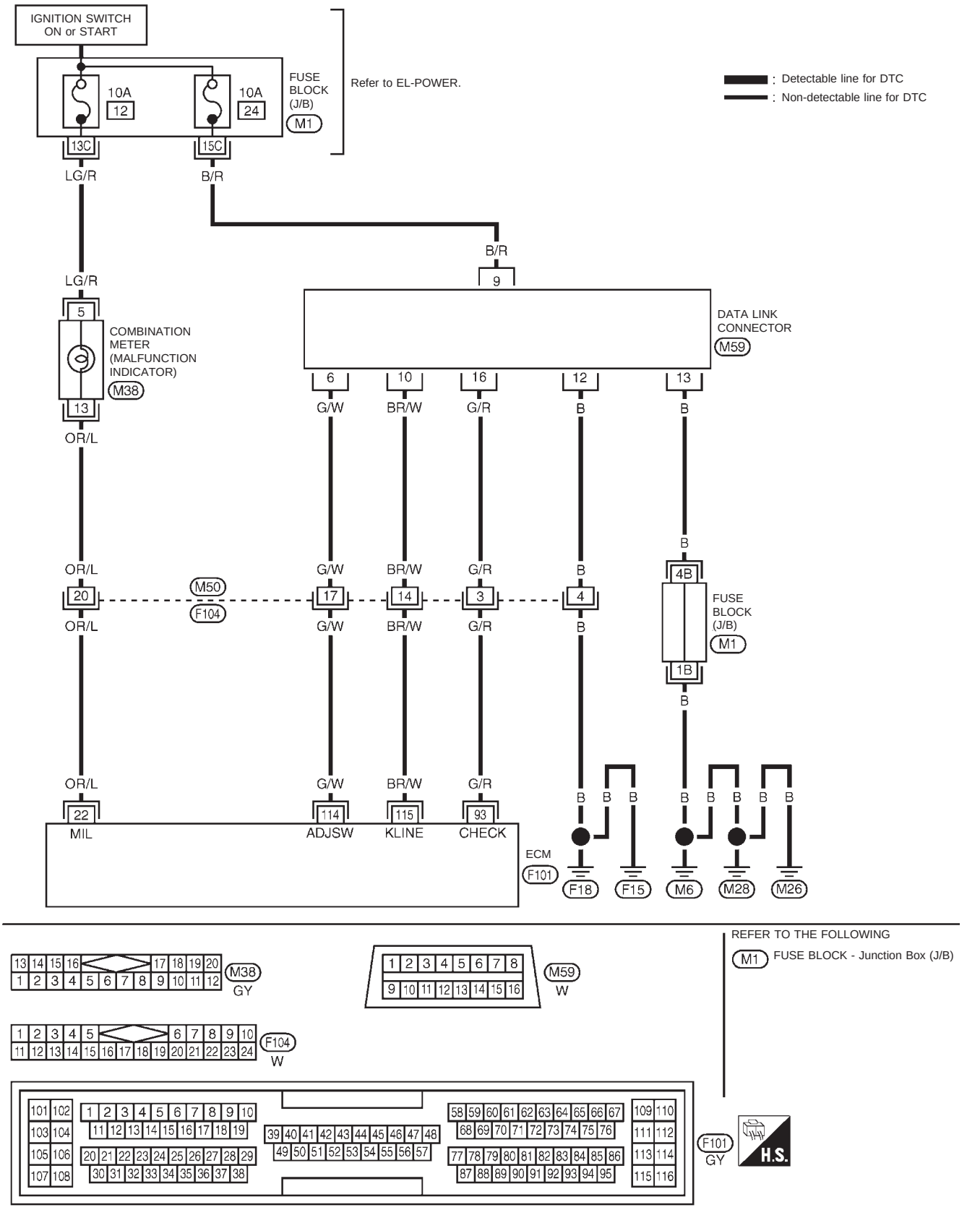


YEC286

Wiring Diagram

NCEC0466

EC-MIL/DL-01



REFER TO THE FOLLOWING

M1 FUSE BLOCK - Junction Box (J/B)

YEC283

Fuel Pressure Regulator

NCEC0467

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

NCEC0468

Target idle speed* rpm	700±50
Air conditioner: ON rpm	825 or more
Ignition timing	8°±2° BTDC
Throttle position sensor idle position V	0.35 - 0.65

*: Under the following conditions:

- Air conditioner switch: OFF
- Electrical load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Mass Air Flow Sensor

NCEC0470

Supply voltage (Heater) V	Battery voltage (11 - 14)
Supply voltage (Sensor) V	Approximately 5
Output voltage V	1.0 - 1.7*
Mass air flow (Using CONSULT-II or GST) g·m/sec	1.0 - 4.0 at idle* 5.0 - 10.0 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and idling under no-load.

Intake Air Temperature Sensor

NCEC0480

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

Engine Coolant Temperature Sensor

NCEC0471

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

Throttle Position Sensor

NCEC0477

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 0.6 kΩ (a)
Partially open	Between (a) and (b)
Completely open	Approximately 4.0 kΩ (b)

Front Heated Oxygen Sensor Heater

NCEC0478

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

Rear Heated Oxygen Sensor Heater

NCEC0483

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

Tank Fuel Temperature Sensor

NCEC0485

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

Crankshaft Position Sensor (POS)

NCEC0558

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (−)	Except 0 or ∞
2 (+) - 1 (−)	
3 (+) - 2 (−)	

Camshaft Position Sensor (PHASE)

NCEC0559

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 1 (−)	Except 0 or ∞
2 (+) - 1 (−)	
3 (+) - 2 (−)	

EGR Volume Control Valve

NCEC0560

Terminal No.	Resistance Ω [at 20°C (68°F)]
1 - 2	20 - 24
2 - 3	
4 - 5	
5 - 6	

EGR Temperature Sensor

NCEC0472

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.56	0.62 - 1.05
50 (122)	2.25	0.065 - 0.094
100 (212)	0.59	0.011 - 0.015

EVAP Canister Purge Volume Control Valve

NCEC0481

Resistance [at 20°C (68°F)] Ω	31 - 35

IACV-AAC Valve

NCEC0474

Terminal No.	Resistance Ω [at 20°C (68°F)]
1 - 2	20 - 24
2 - 3	
4 - 5	
5 - 6	

Injector

NCEC0475

Resistance [at 25°C (77°F)] Ω	13.5 - 17.5

Ignition Coil with Power Transistor

NCEC0561

Terminal No. (Polarity)	Resistance Ω [at 25°C (77°F)]
3 (+) - 2 (−)	Except 0 or ∞
1 (+) - 3 (−)	Except 0
1 (+) - 2 (−)	

Fuel Pump

NCEC0473

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0