

ENGINE CONTROL SYSTEM

SECTION EC

MODIFICATION NOTICE:

Gasoline engine

- VG33E engine has been added for Australia.
For specifications other than those described here, refer to the VG30 engine.

Diesel engine

- QD32 engine models with A/T has been added.

CONTENTS

| | |
|---|---|
| PRECAUTIONS AND PREPARATION | 3 |
| Special Service Tools (VG33E engine) | 3 |
| Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"..... | 4 |

KA24DE

| | |
|---|---|
| TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS | 5 |
| Electrical Load Signal | 5 |
| IACV-FICD Solenoid Valve | 7 |

KA24DE (EURO OBD)

| | |
|---|----|
| ENGINE AND EMISSION CONTROL OVERALL SYSTEM | 8 |
| Circuit Diagram | 8 |
| IACV-FICD SOLENOID VALVE | 9 |
| Wiring Diagram | 9 |
| Diagnostic Procedure | 11 |

VG

| | |
|---|----|
| DIAGNOSTIC TROUBLE CODE INDEX | 15 |
| Alphabetical & Numerical Index for DTC | 15 |
| ENGINE AND EMISSION CONTROL OVERALL SYSTEM | 16 |
| Circuit Diagram | 16 |
| System Diagram | 17 |
| Engine Control Component Parts Location..... | 18 |
| Vacuum Hose Drawing | 20 |
| System Chart | 21 |
| ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION | 22 |

| | |
|---|----|
| Multiport Fuel Injection (MFI) System | 22 |
| EVAPORATIVE EMISSION SYSTEM | 23 |
| Description | 23 |
| ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION | 24 |
| Malfunction Indicator Lamp (MIL)..... | 24 |
| CONSULT-II | 29 |
| TROUBLE DIAGNOSIS - Basic Inspection | 32 |
| Basic Inspection..... | 32 |
| TROUBLE DIAGNOSIS - General Description | 36 |
| Symptom Matrix Chart..... | 36 |
| CONSULT-II Reference Value in Data Monitor Mode | 39 |
| Major Sensor Reference Graph in Data Monitor Mode (VG33E models) | 41 |
| ECM Terminals and Reference Value | 43 |
| TROUBLE DIAGNOSIS FOR POWER SUPPLY | 49 |
| Main Power Supply and Ground Circuit..... | 49 |
| TROUBLE DIAGNOSIS FOR "MASS AIR FLOW SEN" (DTC 12) | 51 |
| Mass Air Flow Sensor (MAFS)..... | 51 |
| TROUBLE DIAGNOSIS FOR "COOLANT TEMP SEN" (DTC 13) | 52 |
| Engine Coolant Temperature Sensor (ECTS)..... | 52 |
| TROUBLE DIAGNOSIS FOR "VEHICLE SPEED SEN" (DTC 14) | 53 |
| Vehicle Speed Sensor (VSS) | 53 |
| TROUBLE DIAGNOSIS FOR "O2S1" (DTC 33), "O2S1B2" (DTC 53) | 58 |
| Component Description | 58 |
| CONSULT-II Reference Value in Data Monitor Mode | 58 |
| ECM Terminals and Reference Value | 58 |

CONTENTS (Cont'd)

| | |
|---|----|
| On Board Diagnosis Logic..... | 59 |
| Overall Function Check | 59 |
| Wiring Diagram | 60 |
| Diagnostic Procedure | 62 |
| Component Inspection..... | 63 |
| TROUBLE DIAGNOSIS FOR "KNOCK SENSOR" (DTC 34) | 65 |
| Knock Sensor (KS)..... | 65 |
| TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS | 69 |
| Heated Oxygen Sensor Heater | 69 |
| IACV-FICD Solenoid Valve | 75 |
| EGR Valve and EVAP Canister Purge Volume Control Solenoid Valve - VG33E models - | 79 |
| Ignition Signal | 83 |
| Idle Air Control Valve (IACV) - Auxiliary Air Control (AAC) Valve | 87 |
| Park/Neutral Position Switch | 88 |
| Injector | 89 |
| SERVICE DATA AND SPECIFICATIONS (SDS) | 90 |
| General Specifications..... | 90 |
| Inspection and Adjustment | 90 |

| | | |
|---|-----------------|--|
| | YD25DDTi | |
| ENGINE AND EMISSION CONTROL OVERALL SYSTEM | 91 | |
| Circuit Diagram | 91 | |
| DTC 0208 OVER HEAT | 92 | |
| Wiring Diagram | 92 | |
| GLOW CONTROL SYSTEM | 93 | |
| Wiring Diagram | 93 | |
| AIR CONDITIONER CONTROL | 94 | |
| Wiring Diagram | 94 | |

| | | |
|--------------------------------------|----------------|--|
| | ZD30DDT | |
| BASIC SERVICE PROCEDURE | 96 | |
| Air Bleeding | 96 | |
| DTC 0208 OVER HEAT | 97 | |
| GLOW CONTROL SYSTEM | 98 | |
| Wiring Diagram | 98 | |

| | | |
|--------------------------------|--------------------|--|
| | QD & TD | |
| INJECTION PUMP | 99 | |
| Load Timer Adjustment..... | 99 | |
| QUICK-GLOW SYSTEM | 100 | |
| Wiring Diagram | 100 | |

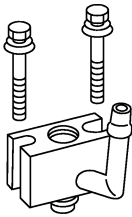
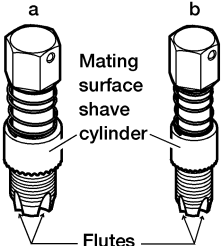
When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

PRECAUTIONS AND PREPARATION

Special Service Tools (VG33E engine)

| Tool number Tool name | Description |
|---|--|
| KV10117600 Fuel pressure check adapter | <div>Checking fuel pressure with pressure gauge</div> <div></div> <div>NT777</div> |
| Oxygen sensor thread cleaner i.e.: (J-43897-18) i.e.: (J-43897-12) | <div>Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti- seize lubricant shown below.</div> <div>a: J-43897-18 18 mm diameter, for Zirconia Oxygen Sensor b: J-43897-12 12 mm diameter, for Titania Oxy- gen Sensor</div> <div></div> <div>AEM488</div> |

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX

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

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER” used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The SRS system composition which is available to NISSAN MODEL D22 is as follows (The composition varies according to the destination and optional equipment.):

Driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioner, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.

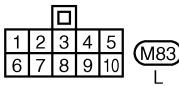
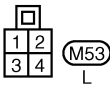
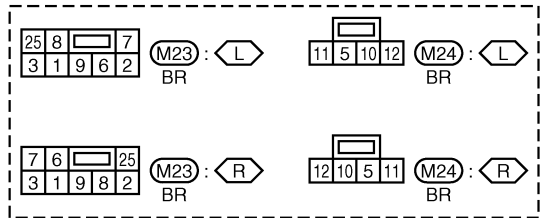
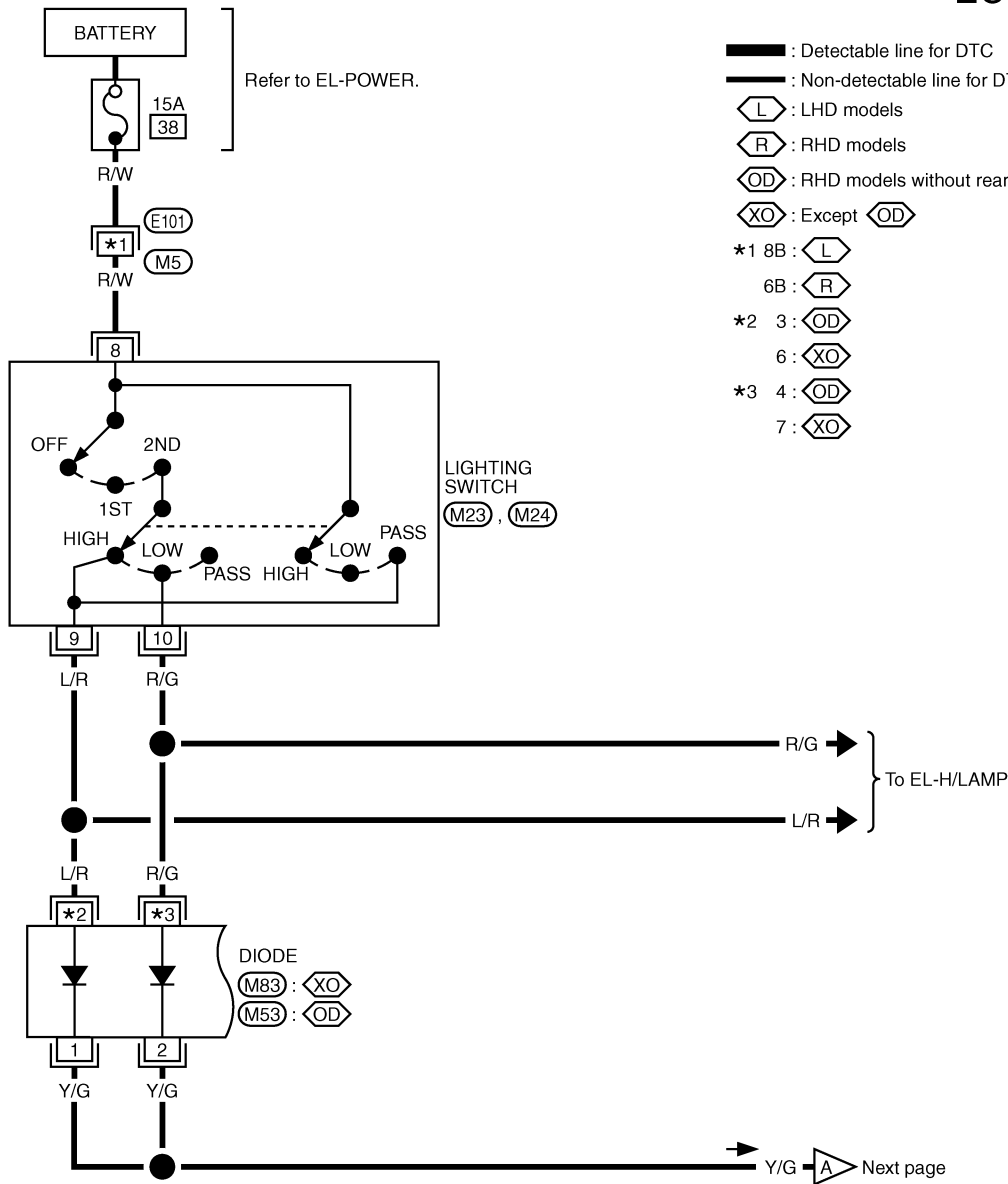
Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.
- Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS section.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral Cable and wiring harnesses (except “SEAT BELT PRE-TENSIONER”) covered with yellow insulation either just before the harness connectors or for the complete harness are related to the SRS.

Electrical Load Signal

EC-LOAD-01

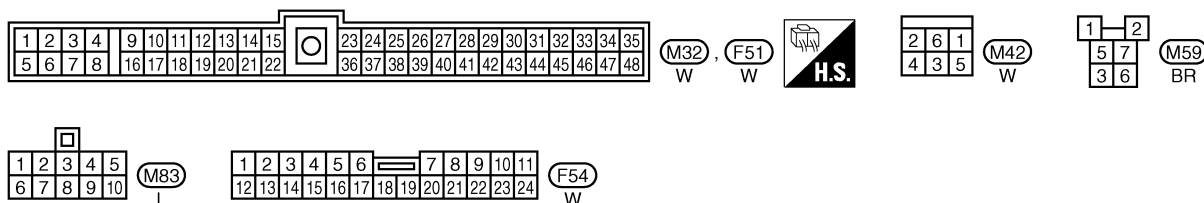
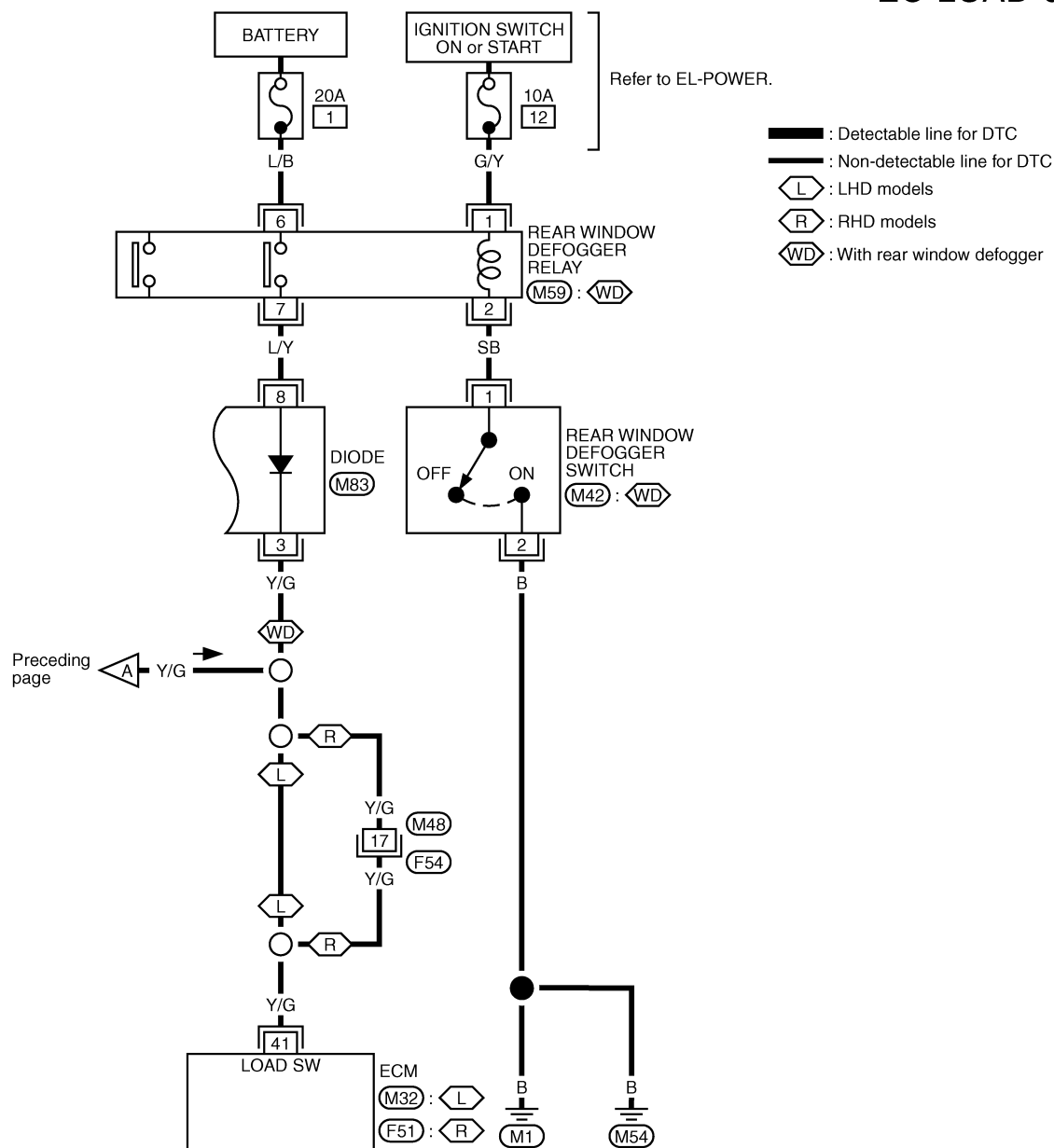


Refer to last page (Foldout page.)

(M5, E101)

Electrical Load Signal (Cont'd)

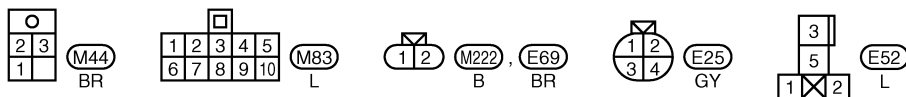
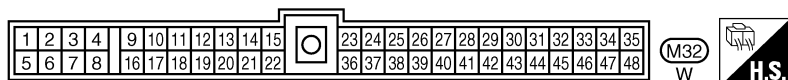
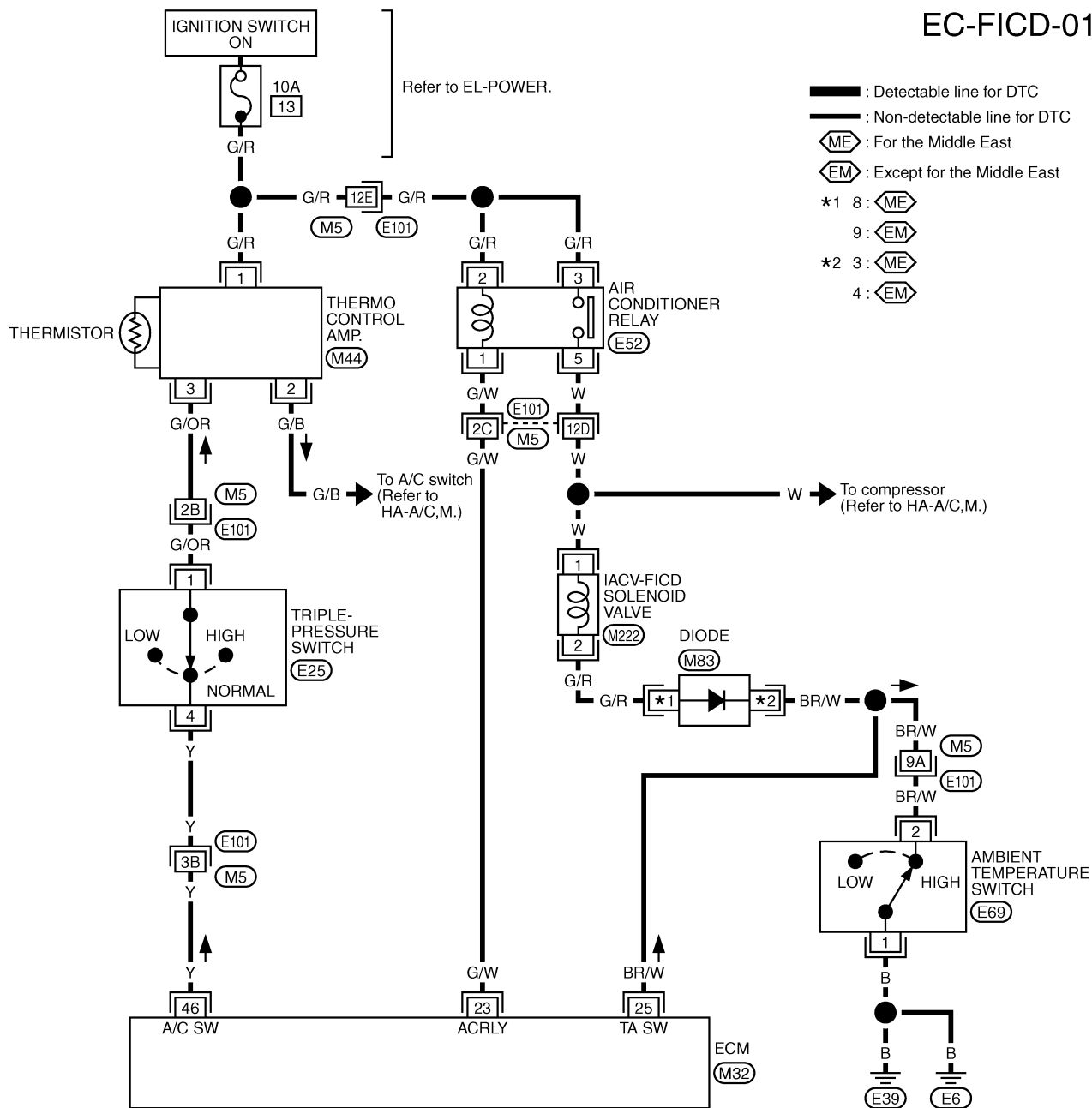
EC-LOAD-02



IACV-FICD Solenoid Valve

FOR LHD MODELS

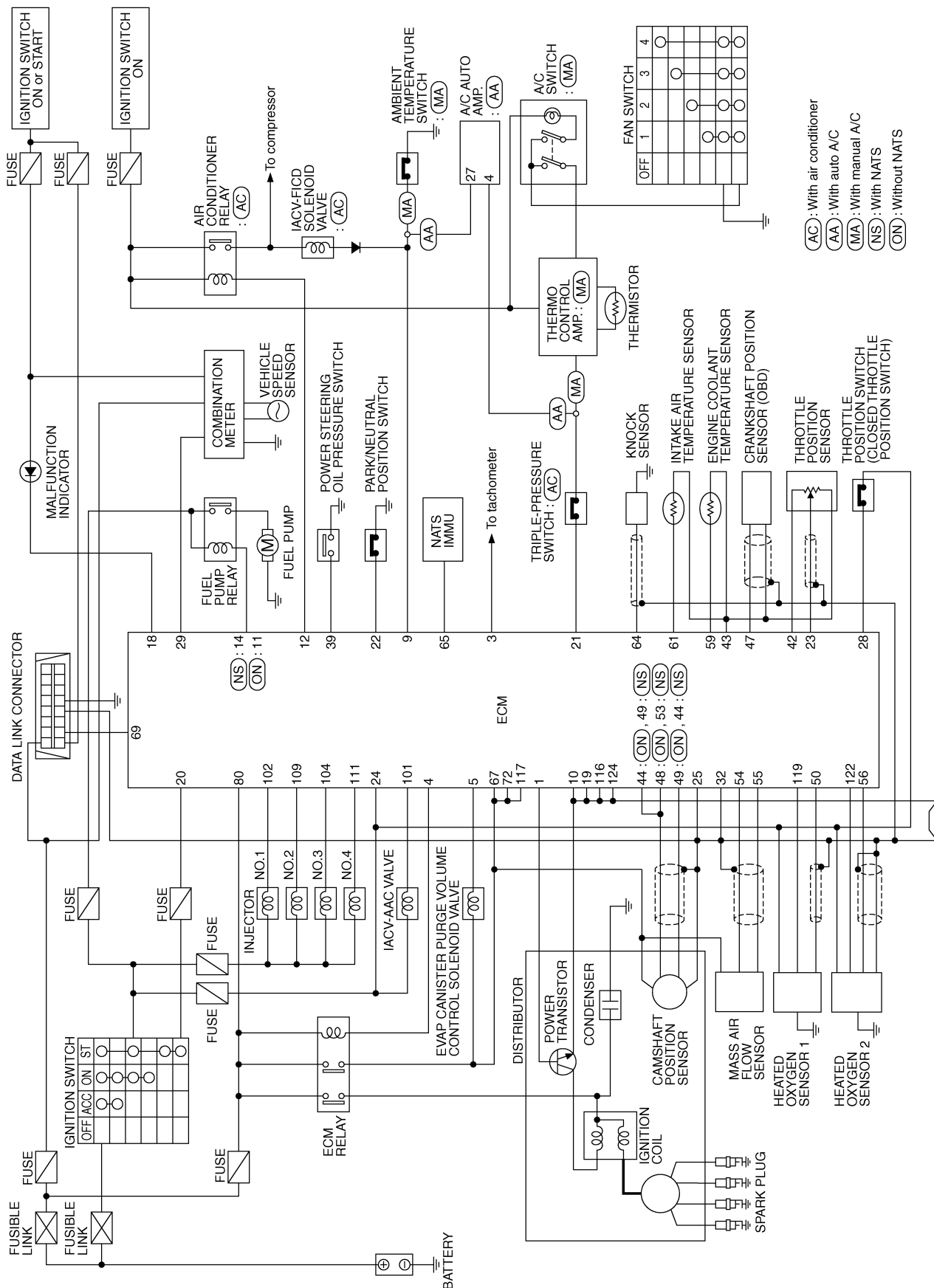
EC-FICD-01



Refer to last page (Foldout page.)

(M5, E101)

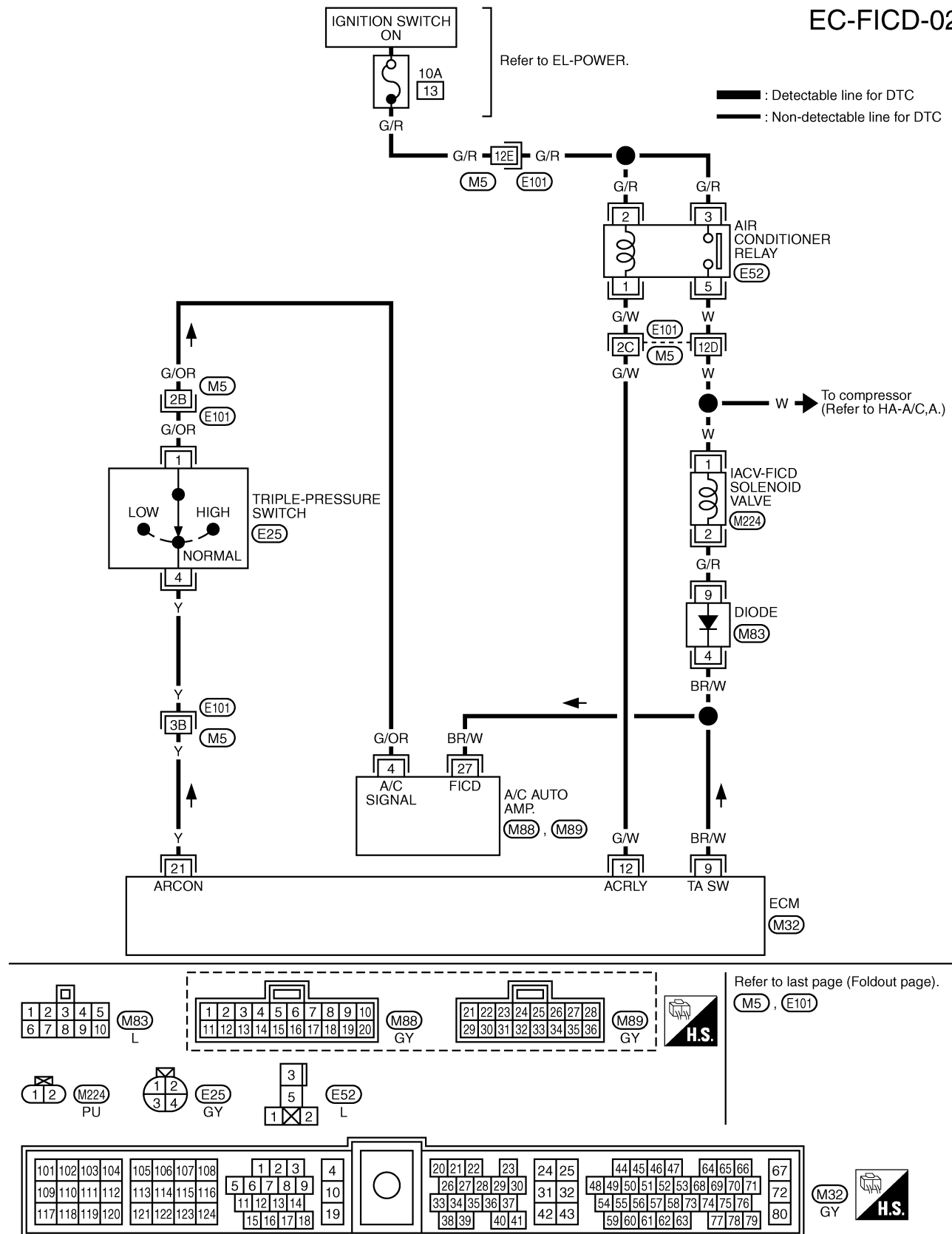
Circuit Diagram



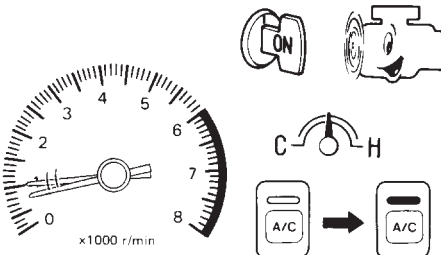
Wiring Diagram (Cont'd)

MODEL WITH AUTO AIR CONDITIONER

EC-FICD-02



Diagnostic Procedure

| | |
|--|--|
| 1 | CHECK OVERALL FUNCTION |
| <div>1. Start engine and warm it up to normal operating temperature.</div> <div>2. Check idle speed.</div> <div>700±50 rpm</div> <div>If NG, adjust idle speed.</div> <div>3. Push air conditioner switch ON and turn fan switch to 4-speed.</div> <div>4. Recheck idle speed.</div> <div></div> <div>850 rpm or more</div> <div>MEF634E</div> <div>OK or NG</div> | |
| OK | INSPECTION END |
| NG | GO TO 2. |
| 2 | CHECK AIR CONDITIONER FUNCTION |
| <div>Check if air conditioner compressor functions normally.</div> <div>OK or NG</div> | |
| OK | GO TO 3. |
| NG | Refer to "Symptom Table" in "TROUBLE DIAGNOSIS", HA section. |

Diagnostic Procedure (Cont'd)

| | |
|----|---|
| 3 | CHECK POWER SUPPLY |
| | <p>1. Stop engine.</p> <p>2. Disconnect IACV-FICD solenoid valve harness connector.</p> <div data-bbox="609 283 1079 619"> <p>View with air cleaner removed</p> </div> <p>3. Start engine, then push A/C switch ON and turn fan switch to 4-speed.</p> <p>4. Check voltage between terminal 1 and ground with CONSULT-II or tester.</p> <div data-bbox="673 787 1006 1039"> </div> <p>Voltage: Battery voltage</p> <p>OK or NG</p> |
| OK | ▶ GO TO 5. |
| NG | ▶ GO TO 4. |

SEF342V

SEC281D

| | |
|---|--|
| 4 | DETECT MALFUNCTIONING PART |
| | <p>Check the following.</p> <p>Harness connectors E101, M5</p> <p>Harness for open or short between IACV-FICD solenoid valve and air conditioner relay</p> |
| | Repair open circuit, short to ground or short to power in harness or connectors. |

Diagnostic Procedure (Cont'd)

5

CHECK GROUND CIRCUIT

1. Turn ignition switch OFF.

2. Check harness continuity as follows.

| Type | Terminal name | Condition | | | |
|-----------------------------------|--|--------------------------|------------------------------|---|--------------------------|
| Model with manual air conditioner | Air conditioner relay terminal 5 | + | Continuity should not exist. | - | Continuity should exist. |
| | Ambient temperature switch terminal 2 | - | | + | |
| | Diode terminal 1 and ECM terminal 9 | Continuity should exist. | | | |
| | Ambient temperature switch terminal 2 and ECM terminal 9 | Continuity should exist. | | | |
| | Ambient temperature switch terminal 1 and ground | Continuity should exist. | | | |
| Model with auto air conditioner | Air conditioner relay terminal 5 | + | Continuity should not exist. | - | Continuity should exist. |
| | ECM terminal 9 | - | | + | |
| | Diode terminal 4 and A/C auto amp. terminal 27 | Continuity should exist. | | | |
| | A/C auto amp. terminal 27 and ECM terminal 9 | Continuity should exist. | | | |

MTBL1755

Continuity should exist.

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

OK or NG

| | | |
|----|---|----------|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

| | |
|---|---|
| 6 DETECT MALFUNCTIONING PART | |
| MANUAL AIR CONDITIONER Check the following. IACV-FICD solenoid valve Ambient temperature switch Diode M53 Harness connectors M5, E101 Check the harness for open or short between air conditioner relay and ambient temperature switch Check the harness for open or short between diode M53 and ECM Check the harness for open or short between ambient temperature switch and ECM Check the harness for open or short between ambient temperature switch and ground | |
| AUTO AIR CONDITIONER Check the following. Harness connectors E101, M5 IACV-FICD solenoid valve Diode M83 Check the harness for open or short between air conditioner relay and ECM Check the harness for open or short between diode M83 and A/C auto amp Check the harness for open or short between A/C auto amp and ECM | |
| ▶ | Repair open circuit or short to power in harness or connectors. |

Diagnostic Procedure (Cont'd)

| | |
|----|---|
| 7 | CHECK IACV-FICD SOLENOID VALVE |
| | <p>Disconnect IACV-FICD solenoid valve harness connector.</p> <div data-bbox="690 273 917 567"> </div> <p>Check for clicking sound when applying 12V direct current to terminals. Check plunger for seizing or sticking. Check for broken spring.</p> <div data-bbox="568 756 1023 987"> </div> <p>⊗ : Always replace after every disassembly.</p> <p style="text-align: right;">SEF610Y</p> <p style="text-align: center;">OK or NG</p> |
| OK | ▶ GO TO 8. |
| NG | ▶ Replace IACV-FICD solenoid valve. |

| | |
|----|---|
| 8 | CHECK AMBIENT AIR TEMPERATURE SWITCH |
| | <p>Refer to HA section, "TROUBLE DIAGNOSIS".</p> <p style="text-align: center;">OK or NG</p> |
| OK | ▶ GO TO 9. |
| NG | ▶ Replace ambient air temperature switch. |

| | |
|---|--|
| 9 | CHECK INTERMITTENT INCIDENT |
| | Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-192 in Service Manual (Pub. No. SM1E-1D22FG1). |
| | ▶ INSPECTION END |

Alphabetical & Numerical Index for DTC

ALPHABETICAL INDEX FOR DTC

VG33E models

X: Applicable
—: Not applicable

| Items (CONSULT-II screen terms) | DTC | MIL illumination | Reference page |
|---|-----------|---------------------|-------------------|
| CAMSHAFT POSI SEN | 11 | — | EC-67*1 |
| COOLANT TEMP SEN | 13 | X | EC-52 |
| KNOCK SENSOR | 34 | | EC-65 |
| MASS AIR FLOW SEN | 12 | — | EC-51 |
| NO SELF DIAGNOSTIC FAILURE INDICATED | 55 | — | — |
| O2S1 | 33 | | EC-58 |
| O2S1 (B2) | 53 | | EC-58 |
| OVER HEAT | 28 | X | EC-90*1 |
| THROTTLE POSI SEN | 43 | — | EC-93*1 |
| VEHICLE SPEED SEN | 14 | | EC-53 |

*1: Reference page on the Service Manual (Pub. No. SM0E-D22CG1).

NUMERICAL INDEX FOR DTC

VG33E models

X: Applicable
—: Not applicable

| DTC | MIL illumination | Items (CONSULT-II screen terms) | Reference page |
|-----------|---------------------|---|-------------------|
| 11 | — | CAMSHAFT POSI SEN | EC-67*1 |
| 12 | — | MASS AIR FLOW SEN | EC-51 |
| 13 | X | COOLANT TEMP SEN | EC-52 |
| 14 | | VEHICLE SPEED SEN | EC-53 |
| 28 | X | OVER HEAT | EC-90*1 |
| 33 | | O2S1 | EC-58 |
| 34 | — | KNOCK SENSOR | EC-65 |
| 43 | — | THROTTLE POSI SEN | EC-93*1 |
| 53 | | O2S1 (B2) | EC-58 |
| 55 | — | NO SELF DIAGNOSTIC FAILURE INDICATED | — |

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

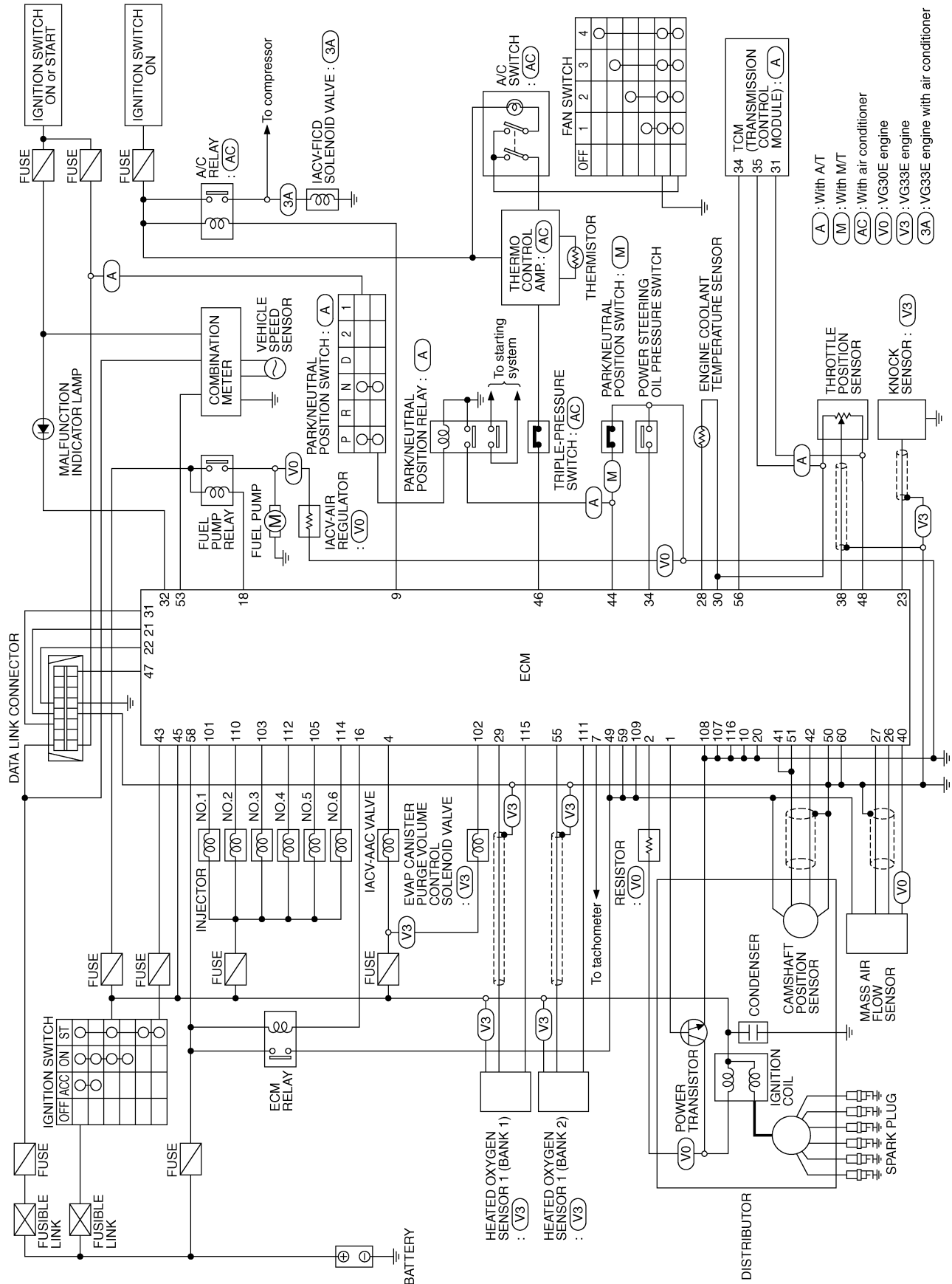
BT

HA

EL

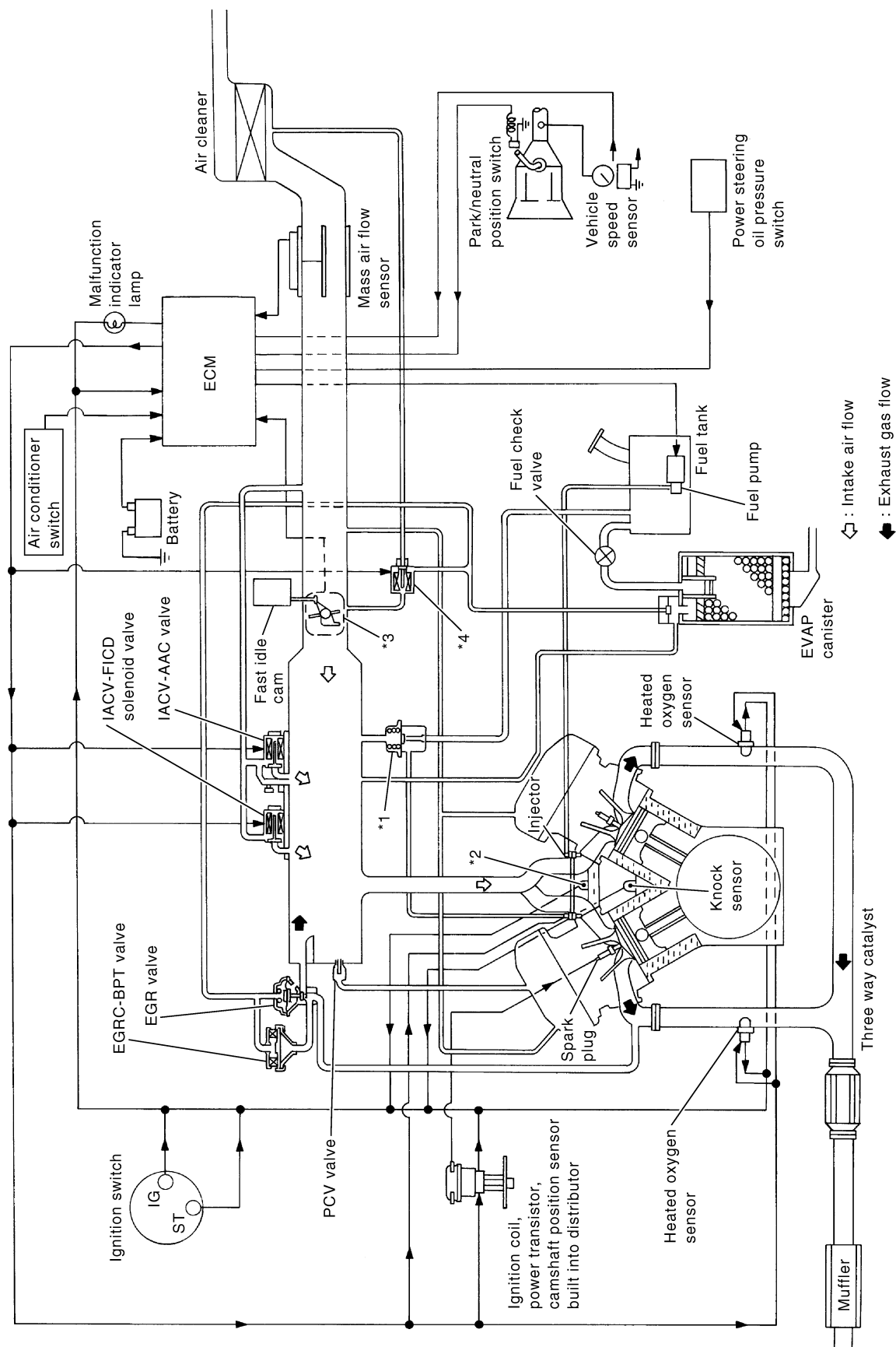
IDX

Circuit Diagram



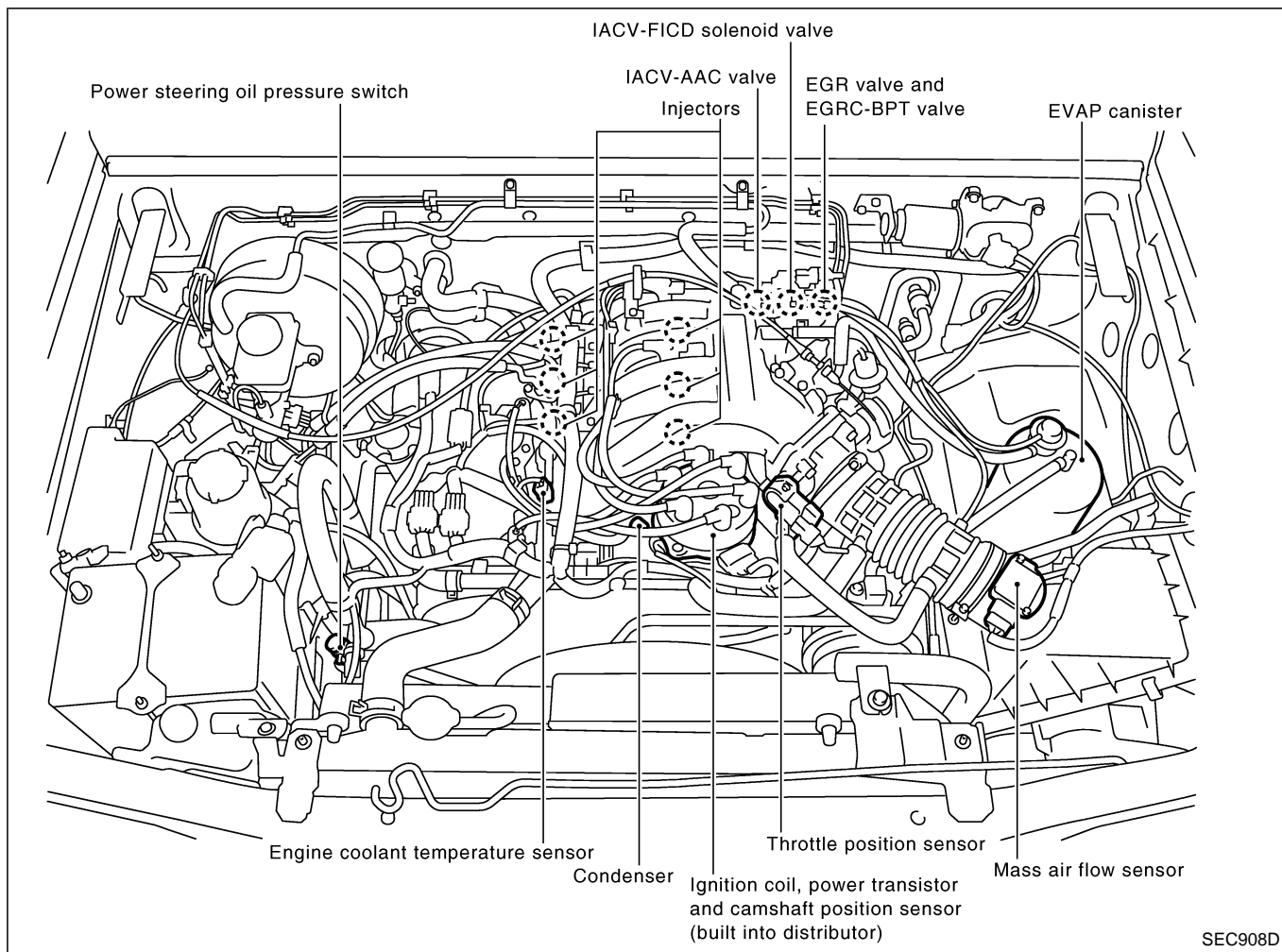
System Diagram

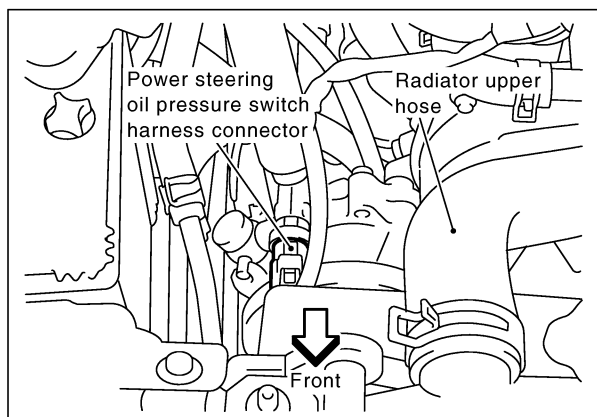
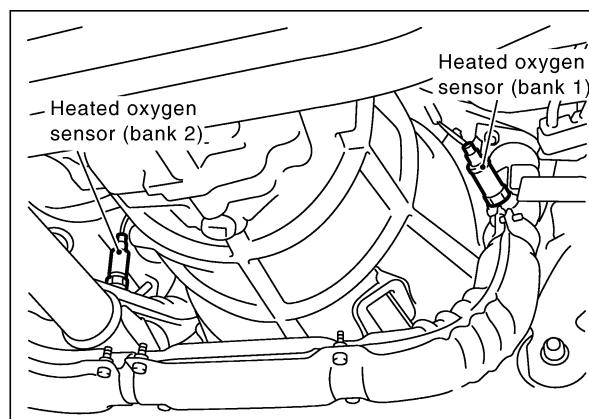
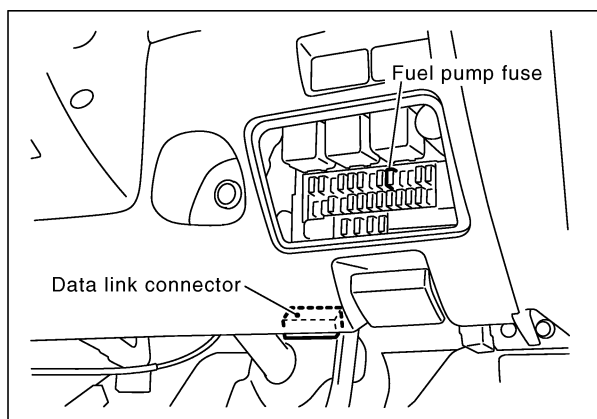
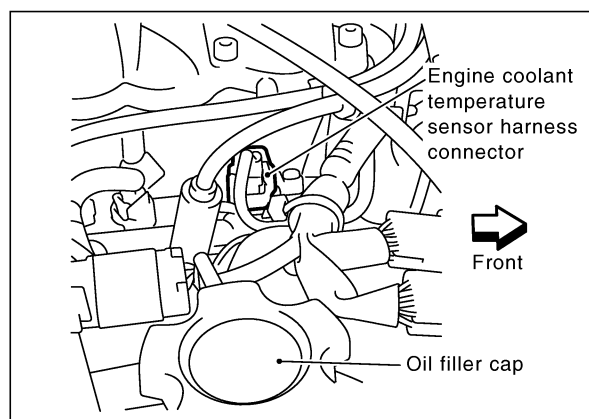
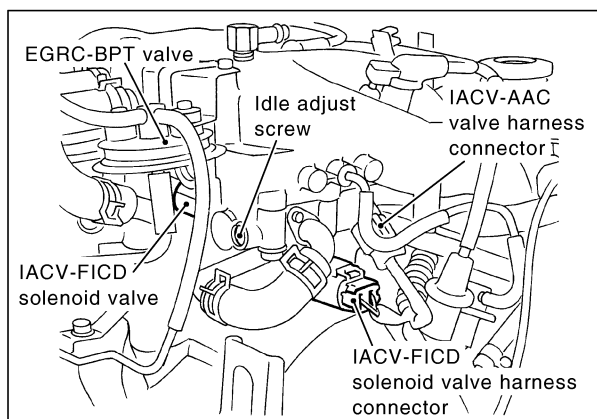
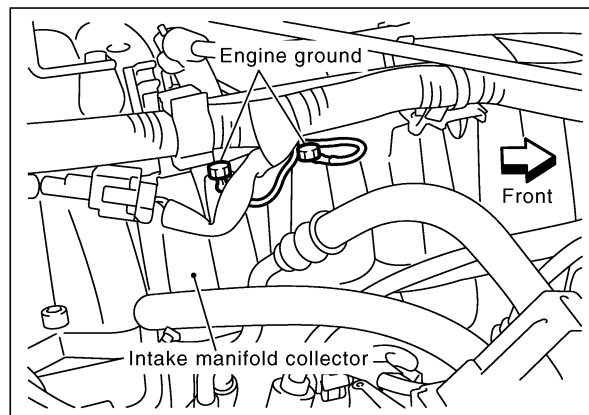
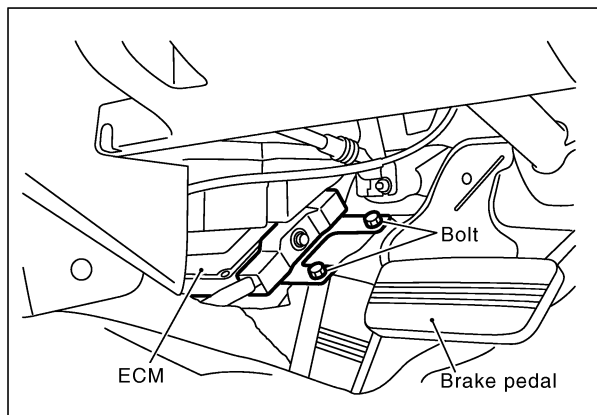
VG33E MODELS



SEC905D

Engine Control Component Parts Location



Engine Control Component Parts Location
(Cont'd)

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

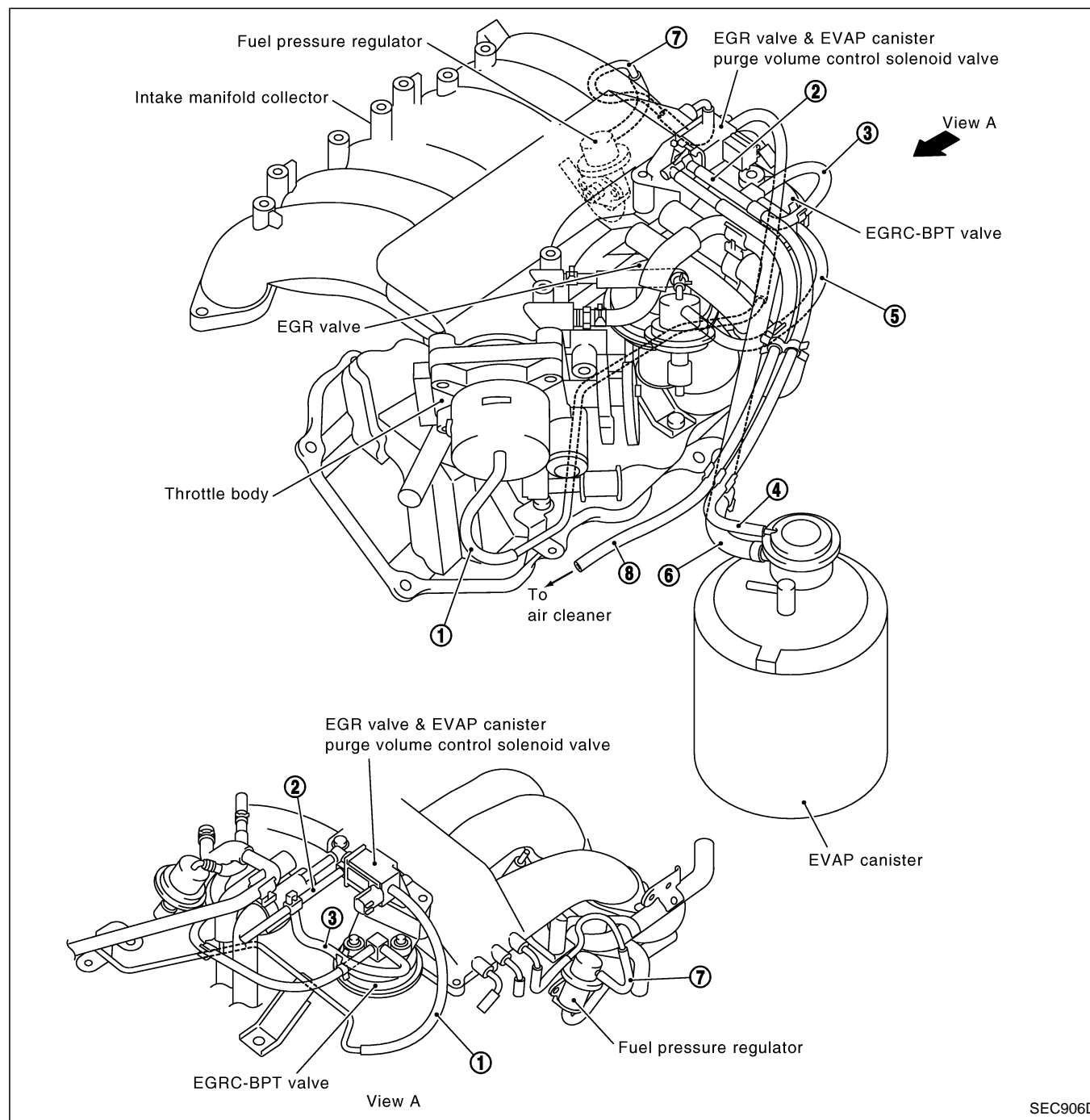
HA

EL

IDX

Vacuum Hose Drawing

VG33E MODELS



SEC906D

- ① Throttle body to EGR valve & EVAP canister purge volume control solenoid valve
- ② EGR valve & EVAP canister purge volume control solenoid valve to 3-way connector
- ③ EGRC-BPT valve to 3-way connector

- ④ EVAP canister purge control solenoid valve to 3-way connector
- ⑤ EGRC-BPT valve to EGR valve
- ⑥ EVAP canister (purge port) to intake manifold collector

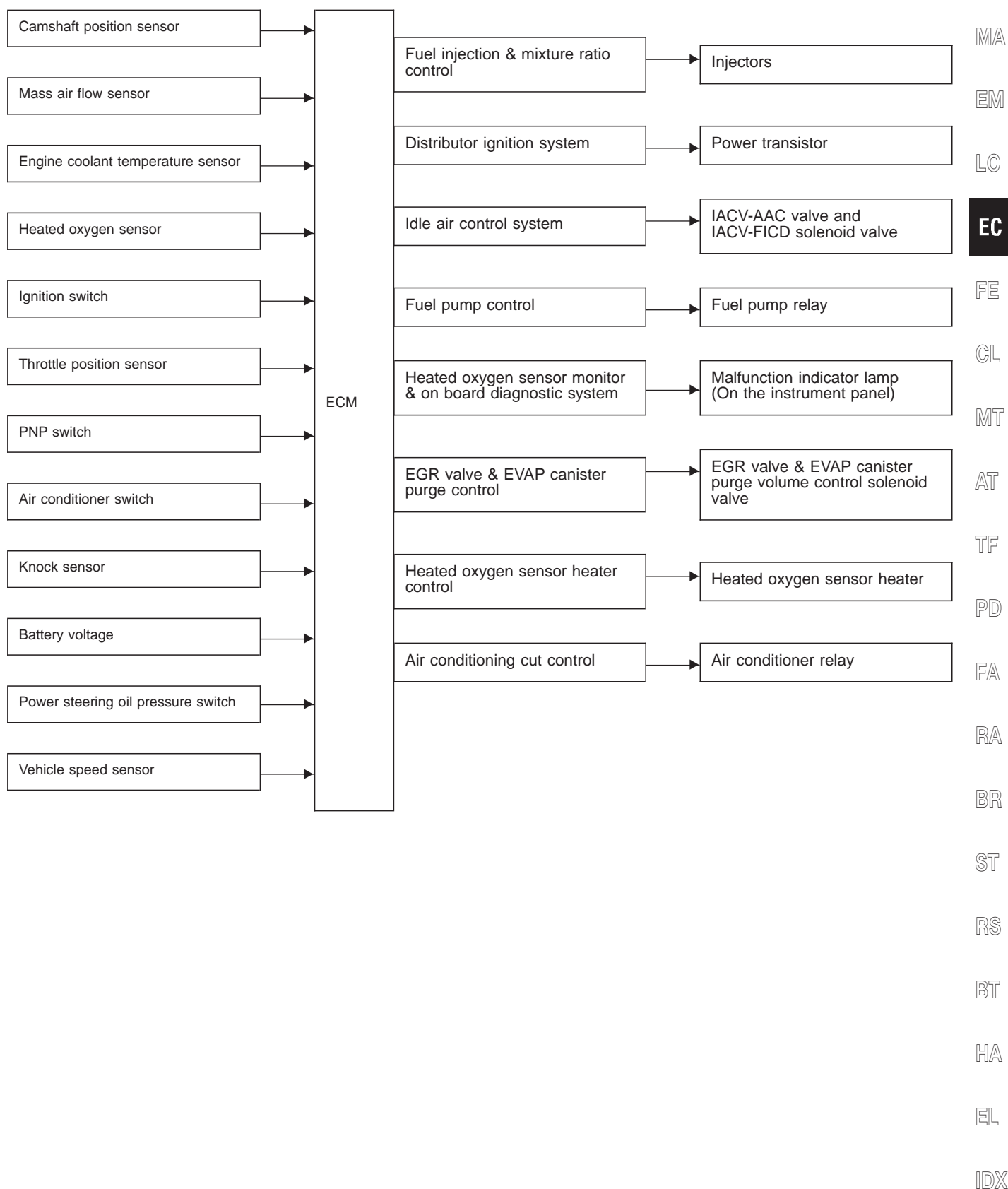
- ⑦ Fuel pressure regulator to intake manifold collector
- ⑧ EGR valve & EVAP canister purge control solenoid valve to air cleaner

Refer to "System Diagram", EC-17 for vacuum control system.

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

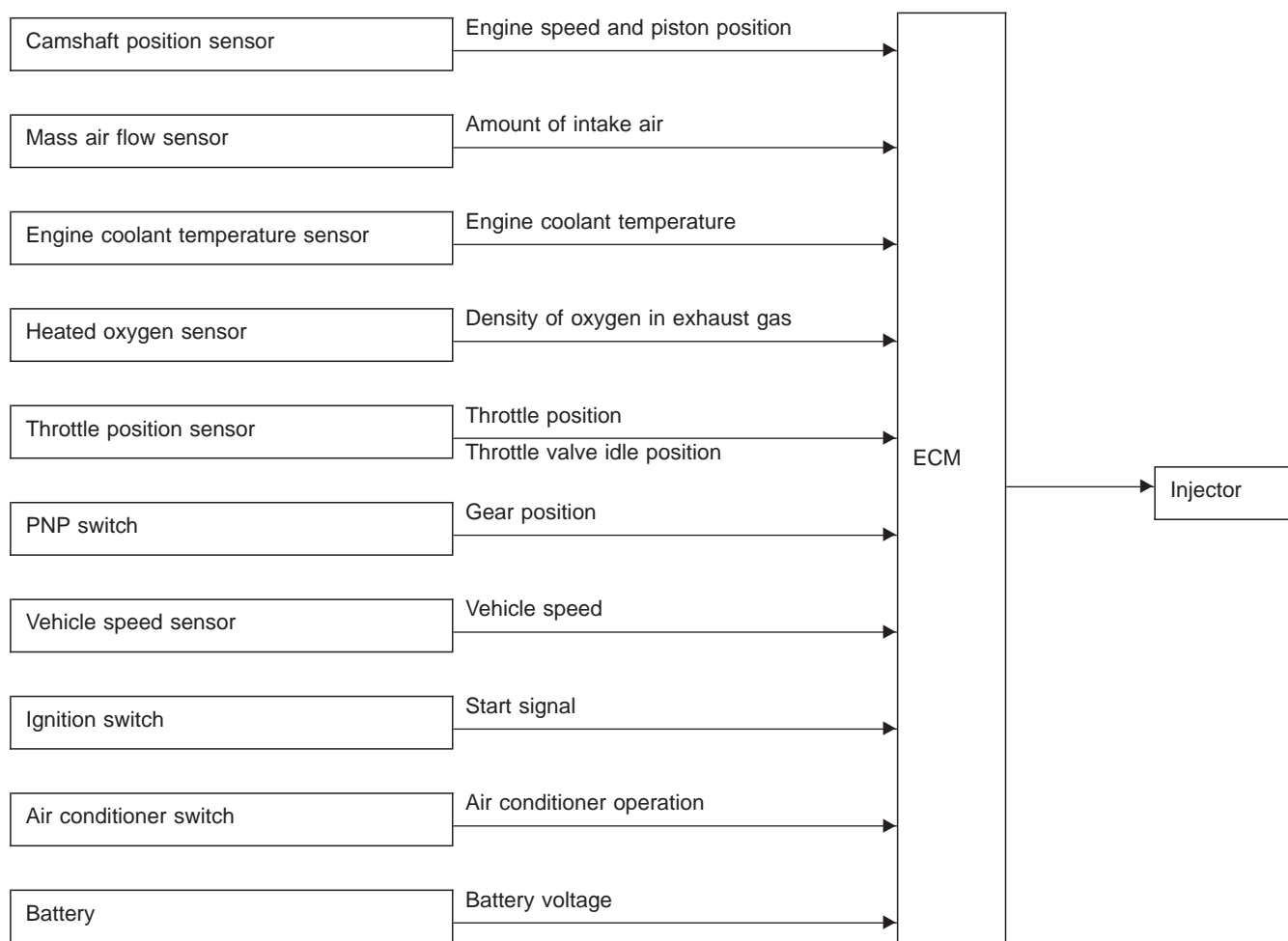
System Chart

VG33E MODELS



Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPOINT FUEL INJECTION SYSTEM

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

The amount of fuel injected is compensated for to improve engine performance. This will be made under various operating conditions as listed below.

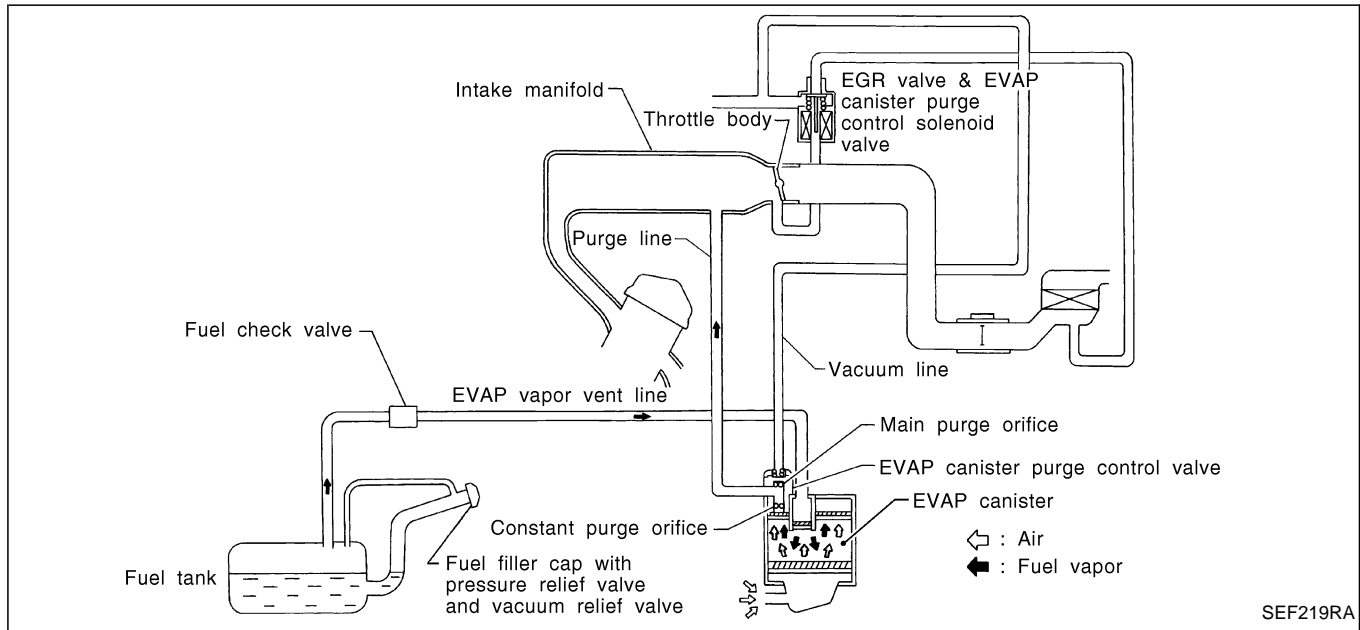
<Fuel increase>

- 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
- Extremely high-engine coolant temperature

Description



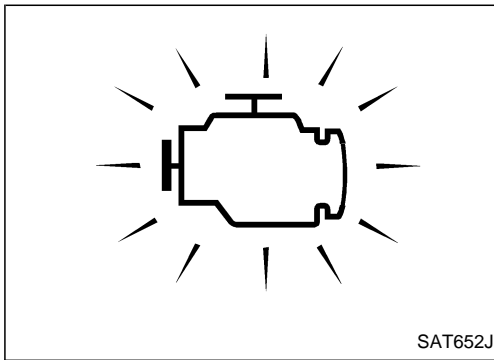
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor from sealed fuel tank is led into the EVAP canister when the engine is off. The fuel vapor is then stored in the EVAP canister. The EVAP canister retains the fuel vapor until the EVAP canister is purged by air.

When the engine is running, the air is drawn through the bottom of the EVAP canister. The fuel vapor will then be led to the intake manifold.

When the engine runs at idle, the EVAP canister purge control valve is closed. Only a small amount of vapor flows into the intake manifold through the constant purge orifice.

As the engine speed increases and the throttle vacuum rises, the EVAP canister purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.



Malfunction Indicator Lamp (MIL)

The malfunction indicator lamp is located on the instrument panel.

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
 - If the malfunction indicator lamp does not light up, refer to "WARNING LAMPS" in the EL section.
2. When the engine is started, the malfunction indicator lamp should go off.

If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION




The on board diagnostic system has the following four functions.

Diagnostic Test Mode I

1. BULB CHECK : This function checks the bulb for damage (blown, open circuit, etc.) of the malfunction indicator lamp.
If the MIL does not come on, check MIL circuit.
2. MALFUNCTION WARNING : This is a usual driving condition. When a malfunction is detected, the MIL will light up to inform the driver that a malfunction has been detected.

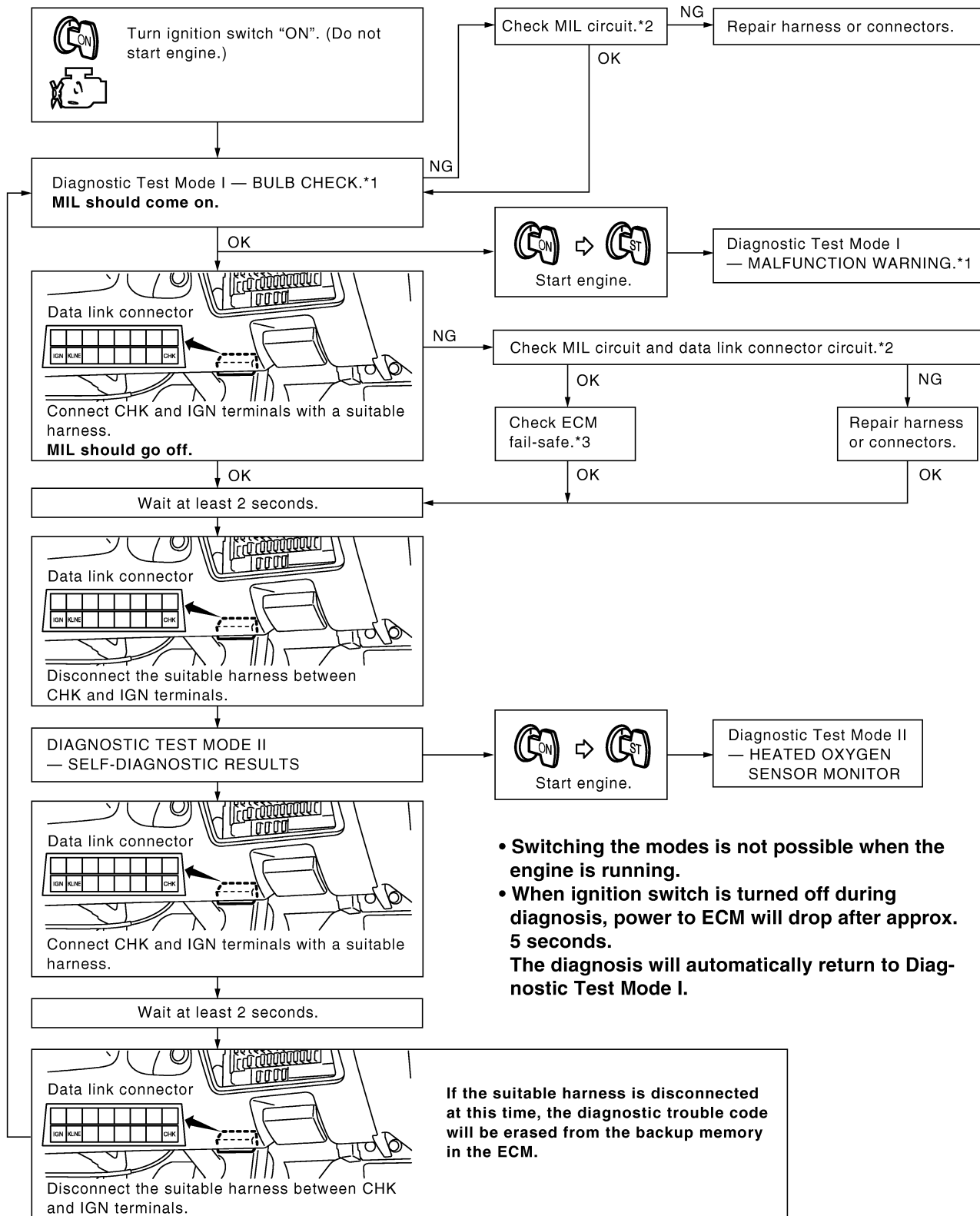
Diagnostic Test Mode II

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

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

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES (VG33E models)



*1: EC-24

*2: EC-49 in Service Manual (Pub. No. SM0E-D22CG1)

*3: EC-77 in Service Manual (Pub. No. SM1E-1D22FG1)

Malfunction Indicator Lamp (MIL) (Cont'd)**DIAGNOSTIC TEST MODE II—HEATED OXYGEN SENSOR MONITOR (VG33E models)**

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

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

*: Maintains conditions just before switching to open loop.

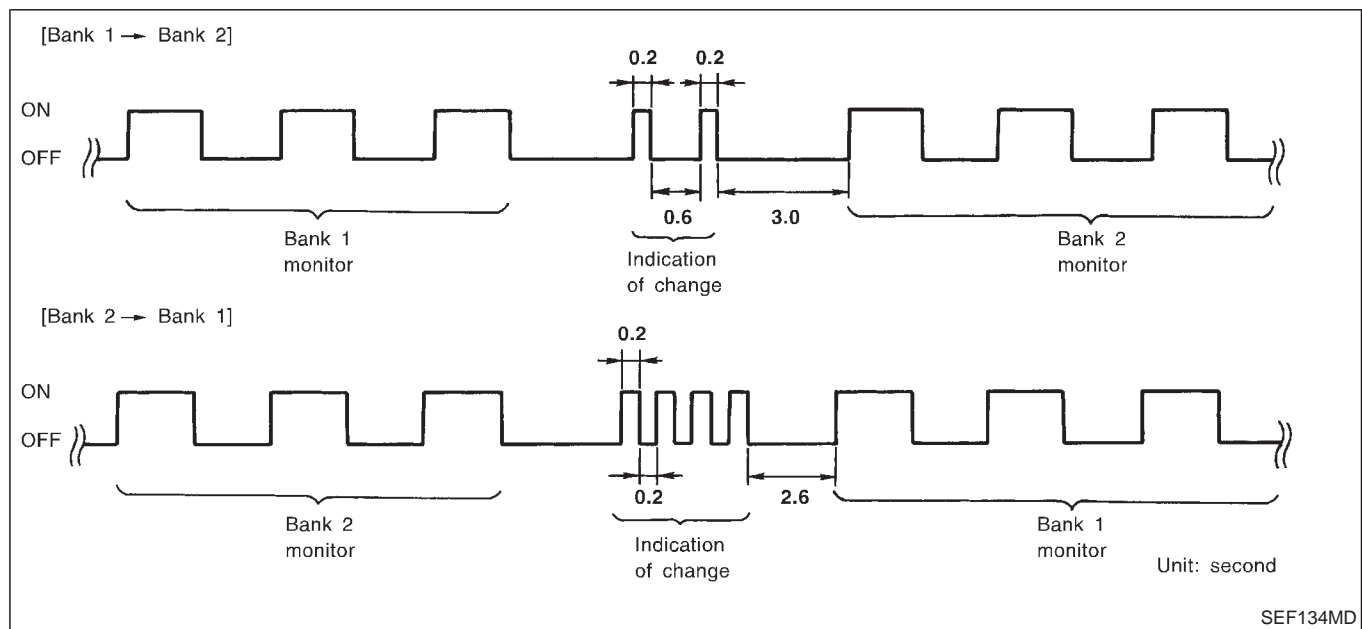
To check the heated oxygen sensor function, start engine in Diagnostic Test Mode II. Then warm it up until engine coolant temperature indicator points to middle of gauge.

Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Make sure that the MALFUNCTION INDICATOR LAMP comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

How to switch monitored sensor from bank 1 to bank 2 or vice versa

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

1. Turn diagnostic test mode selector on ECM fully clockwise.
2. Wait at least 2 seconds.
3. Turn diagnostic test mode selector on ECM fully counterclockwise.



Malfunction Indicator Lamp (MIL) (Cont'd)

WORK SUPPORT MODE

| WORK ITEM | CONDITION | USAGE |
|----------------------------|---|---|
| TP SW/TP SEN IDLE POSI ADJ | CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED | When adjusting throttle position sensor initial position |
| IACV-AAC/V ADJ | SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● ENGINE WARMED UP ● NO-LOAD | — |
| FUEL PRESSURE RELEASE | <ul style="list-style-type: none"> ● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |
| SELF-LEARNING CONT | <ul style="list-style-type: none"> ● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT. | When clear the coefficient of self-learning control value |

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX

Malfunction Indicator Lamp (MIL) (Cont'd)

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION (VG33E models)

| Item | | | DIAGNOSTIC TEST MODE | | | |
|--------------------------------|--------|---|----------------------|---------------------------------|-----------------|----------------|
| | | | WORK SUPPORT | SELF-DIAG- NOSTIC RESULTS | DATA MONITOR | ACTIVE TEST |
| ENGINE CONTROL COMPONENT PARTS | INPUT | Camshaft position sensor | | X | X | |
| | | Mass air flow sensor | | X | X | |
| | | Engine coolant temperature sensor | | X | X | X |
| | | Heated oxygen sensor | | | X | |
| | | Vehicle speed sensor | | | X | |
| | | Throttle position sensor | X | X | X | |
| | | Intake air temperature sensor | | | X | |
| | | Knock sensor | | X | | |
| | | Ignition switch (start signal) | | | X | |
| | | Closed throttle position switch | | | X | |
| | | Air conditioner switch | | | X | |
| | | Park/Neutral position (PNP) switch | | | X | |
| | | Power steering oil pressure switch | | | X | |
| | | Air conditioner pressure switch | | | X | |
| | | Battery voltage | | | X | |
| | OUTPUT | Injectors | | | X | X |
| | | Power transistor (Ignition timing) | | X (Ignition signal) | X | X |
| | | IACV-AAC valve | X | | X | X |
| | | Air conditioner relay | | | X | |
| | | Fuel pump relay | X | | X | X |
| | | EGRC-solenoid valve (EGR valve & EVAP canister purge control solenoid valve) | | | X | X |
| | | Heated oxygen sensor heater | | | X | |

X: Applicable

CONSULT-II

SELF-DIAGNOSTIC MODE

Regarding items detected in “SELF-DIAG RESULTS” mode, refer to “Diagnostic Trouble Code (DTC) INDEX”. (See EC-15.)





DATA MONITOR MODE (VG33E models)

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|----------------------------------|-------------------------|-----------------|--|---|
| CMPS-RPM (POS) [rpm] | | | <ul style="list-style-type: none"> Indicates the engine speed computed from the POS signal (1° signal) of the camshaft position sensor (POS). | |
| MAS AIR/FL SE [V] | | | <ul style="list-style-type: none"> The signal voltage of the mass air flow sensor is displayed. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |
| COOLAN TEMP/S [°C] or [°F] | | | <ul style="list-style-type: none"> The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. | <ul style="list-style-type: none"> 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. |
| O2S1 [V] | | | <ul style="list-style-type: none"> The signal voltage of the heated oxygen sensor is displayed. | |
| O2S1 (B2) [V] | | | | |
| M/R F/C MNT [RICH/LEAN] | | | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> 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. |
| M/R F/C MNT-R [RICH/LEAN] | | | | |
| VHCL SPEED SE [km/h] or [mph] | | | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed sensor signal is displayed. | |
| BATTERY VOLT [V] | | | <ul style="list-style-type: none"> The power supply voltage of ECM is displayed. | |
| THRTL POS SEN [V] | | | <ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. | |
| START SIGNAL [ON/OFF] | | | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the starter signal. | <ul style="list-style-type: none"> After starting the engine, [OFF] is displayed regardless of the starter signal. |
| CLSD THL/P SW [ON/OFF] | | | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the closed throttle position signal. | |
| AIR COND SIG [ON/OFF] | | | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| P/N POSI SW [ON/OFF] | | | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the park/neutral position switch signal. | |
| PW/ST SIGNAL [ON/OFF] | | | <ul style="list-style-type: none"> [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated. | |
| INJ PULSE [msec] | | | <ul style="list-style-type: none"> Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | <ul style="list-style-type: none"> When the engine is stopped, a certain computed value is indicated. |
| IGN TIMING [BTDC] | | | <ul style="list-style-type: none"> Indicates the ignition timing computed by ECM according to the input signals. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |

NOTE:

- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding D22 for VG33 model, “B1” indicates bank 1 and “B2” indicates bank 2.

CONSULT-II (Cont'd)

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|----------------------------------|-------------------------|---|---|---|
| IACV-AAC/V [%] | |  | <ul style="list-style-type: none"> Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals. | |
| A/F ALPHA [%] | | | <ul style="list-style-type: none"> The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. This data also includes the data for the air-fuel ratio learning control. |
| A/F ALPHA-R [%] | | | | |
| AIR COND RLY [ON/OFF] | |  | <ul style="list-style-type: none"> The air conditioner relay control condition (determined by ECM according to the input signal) is indicated. | |
| FUEL PUMP RLY [ON/OFF] | |  | <ul style="list-style-type: none"> Indicates the fuel pump relay control condition determined by ECM according to the input signals. | |
| EGRC SOL/V [ON/OFF] | |  | <ul style="list-style-type: none"> The control condition of the EGR (& canister) control solenoid valve (determined by ECM according to the input signal) is indicated. ON ... EGR (and canister purge) operation cut-off OFF ... EGR (and canister purge) operation not cut-off | |
| VOLTAGE [V] | | | <ul style="list-style-type: none"> Voltage measured by the voltage probe. | |
| Frequency [msec], [Hz] or [%] | | | <ul style="list-style-type: none"> Pulse width, frequency or duty cycle measured by the pulse probe. | <ul style="list-style-type: none"> 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. |
| DUTY-HI | | | | |
| DUTY-LOW | | | | |
| PLS WIDTH-HI | | | | |
| PLS WIDTH-LOW | | | | |

CONSULT-II (Cont'd)

ACTIVE TEST MODE

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---------------------|---|--|--|
| FUEL INJECTION | <ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the amount of fuel injection using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> Harness and connector Fuel injectors Front heated oxygen sensor |
| IACV-AAC/V OPENING | <ul style="list-style-type: none"> Engine: After warming up, idle the engine. Change the IACV-AAC valve opening percent using CONSULT-II. | Engine speed changes according to the opening percent. | <ul style="list-style-type: none"> Harness and connector IACV-AAC valve |
| ENG COOLANT TEMP | <ul style="list-style-type: none"> Engine: Return to the original trouble condition Change the engine coolant temperature using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> Harness and connector Engine coolant temperature sensor Fuel injectors |
| IGNITION TIMING | <ul style="list-style-type: none"> Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> Adjust initial ignition timing |
| POWER BALANCE | <ul style="list-style-type: none"> Engine: After warming up, idle the engine. A/C switch "OFF" Shift lever "Neutral" Cut off each injector signal one at a time using CONSULT-II. | Engine runs rough or dies. | <ul style="list-style-type: none"> Harness and connector Compression Injectors Power transistor Spark plugs Ignition coils |
| FUEL PUMP RELAY | <ul style="list-style-type: none"> 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. | <ul style="list-style-type: none"> Harness and connector Fuel pump relay |
| EGRC SOLENOID VALVE | <ul style="list-style-type: none"> Ignition switch: ON Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound. | Solenoid valve makes an operating sound. | <ul style="list-style-type: none"> Harness and connector Solenoid valve |

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

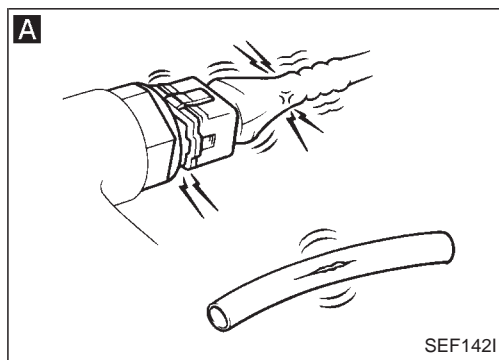
EL

IDX

Basic Inspection

Preparation:

- Make sure that the following parts are in good order.
- (1) Battery
- (2) Ignition system
- (3) Engine oil and coolant levels
- (4) Fuses
- (5) ECM harness connector
- (6) Vacuum hoses
- (7) Air intake system
(Oil filler cap, oil level gauge, etc.)
- (8) Fuel pressure
- (9) Engine compression
- (10) Throttle valve
- (11) Evaporative emission system
- On air conditioner equipped models, checks should be carried out while the air conditioner is “OFF”.
- On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, a check should be carried out with the shift lever in “N” position.
- When measuring “CO” percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
- Turn off headlamps, heater blower, rear window defogger.
- Keep front wheels pointed straight ahead.



Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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

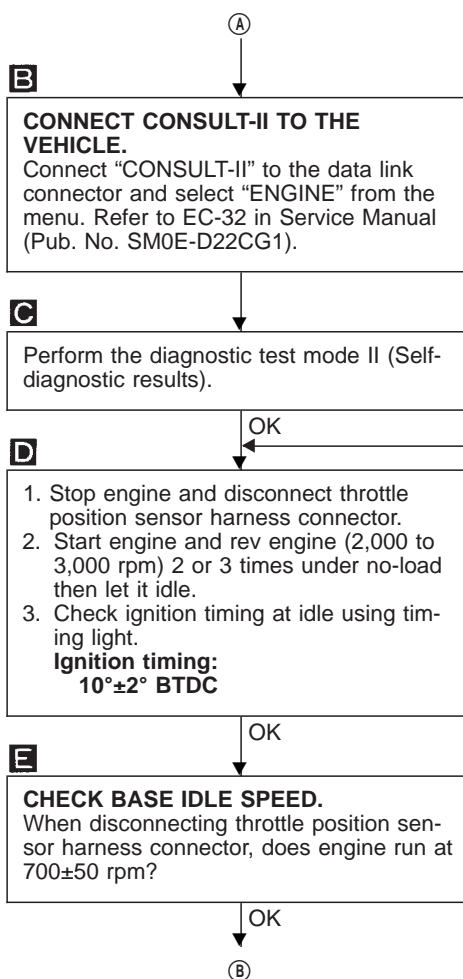
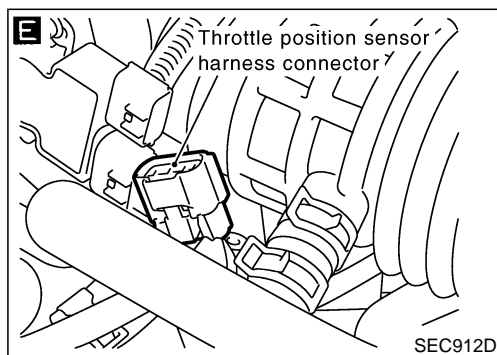
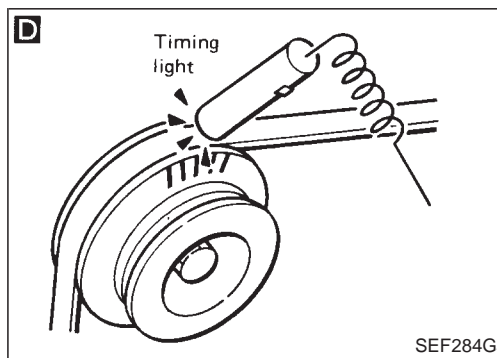
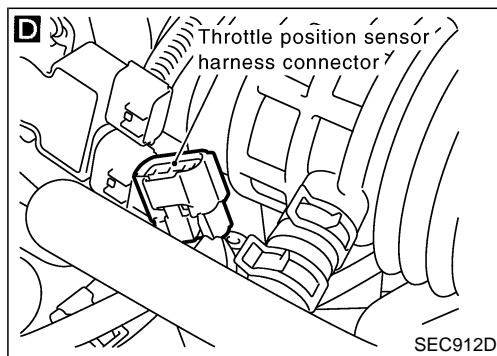
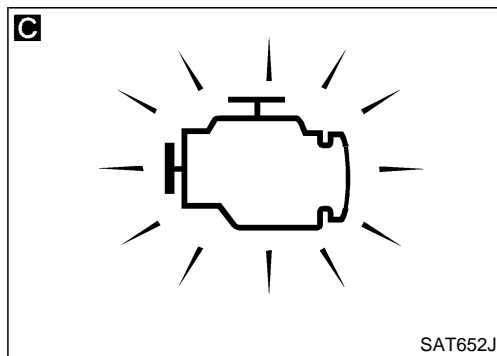
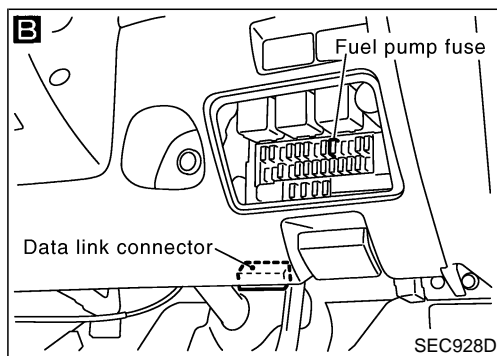
A

BEFORE STARTING

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

↓
(A)

Basic Inspection (Cont'd)



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

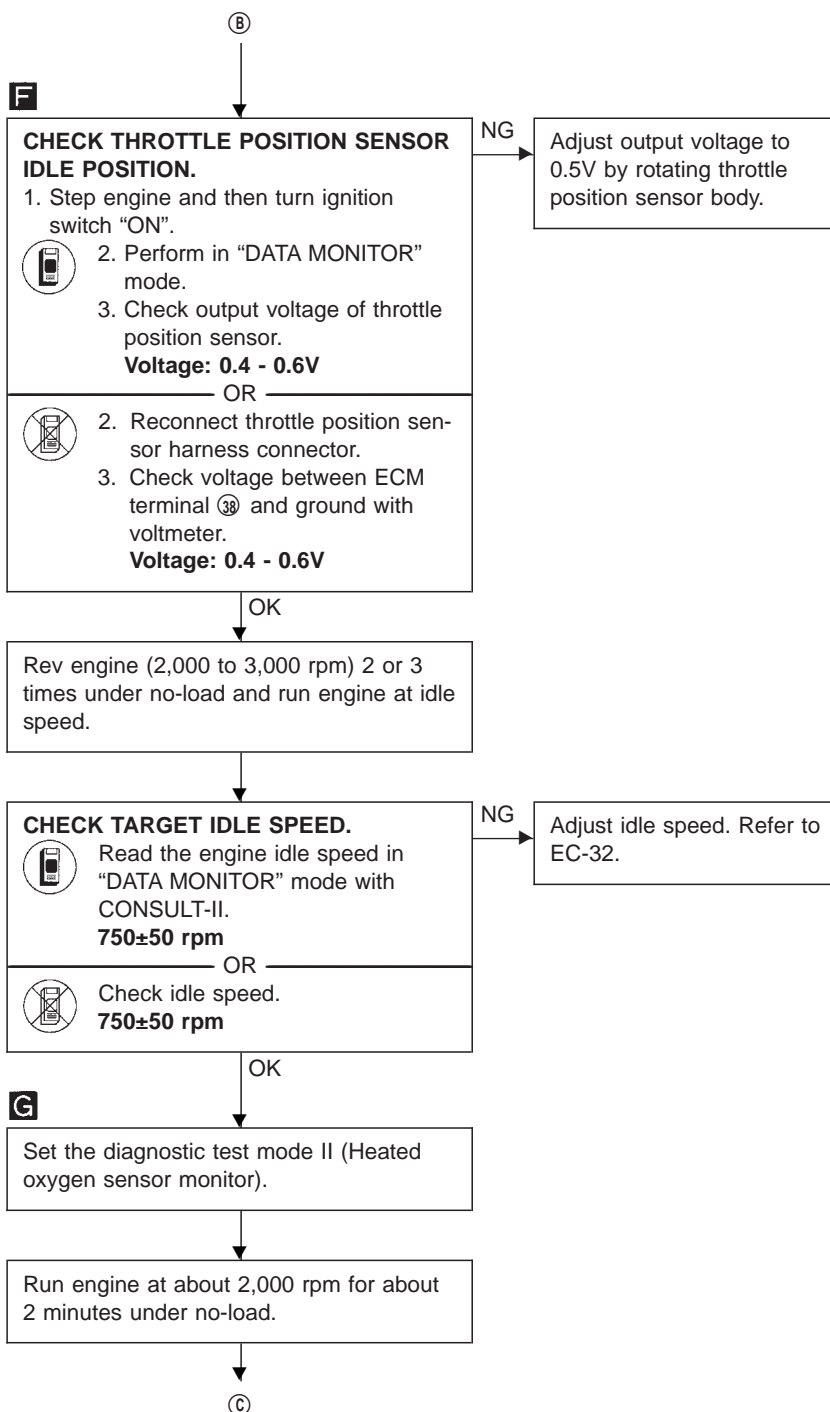
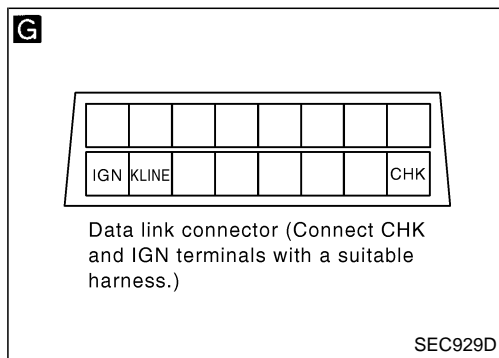
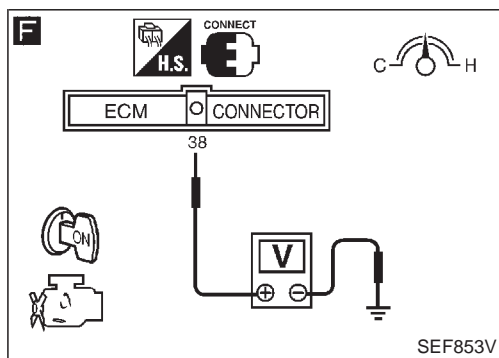
IDX

Basic Inspection (Cont'd)

F

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

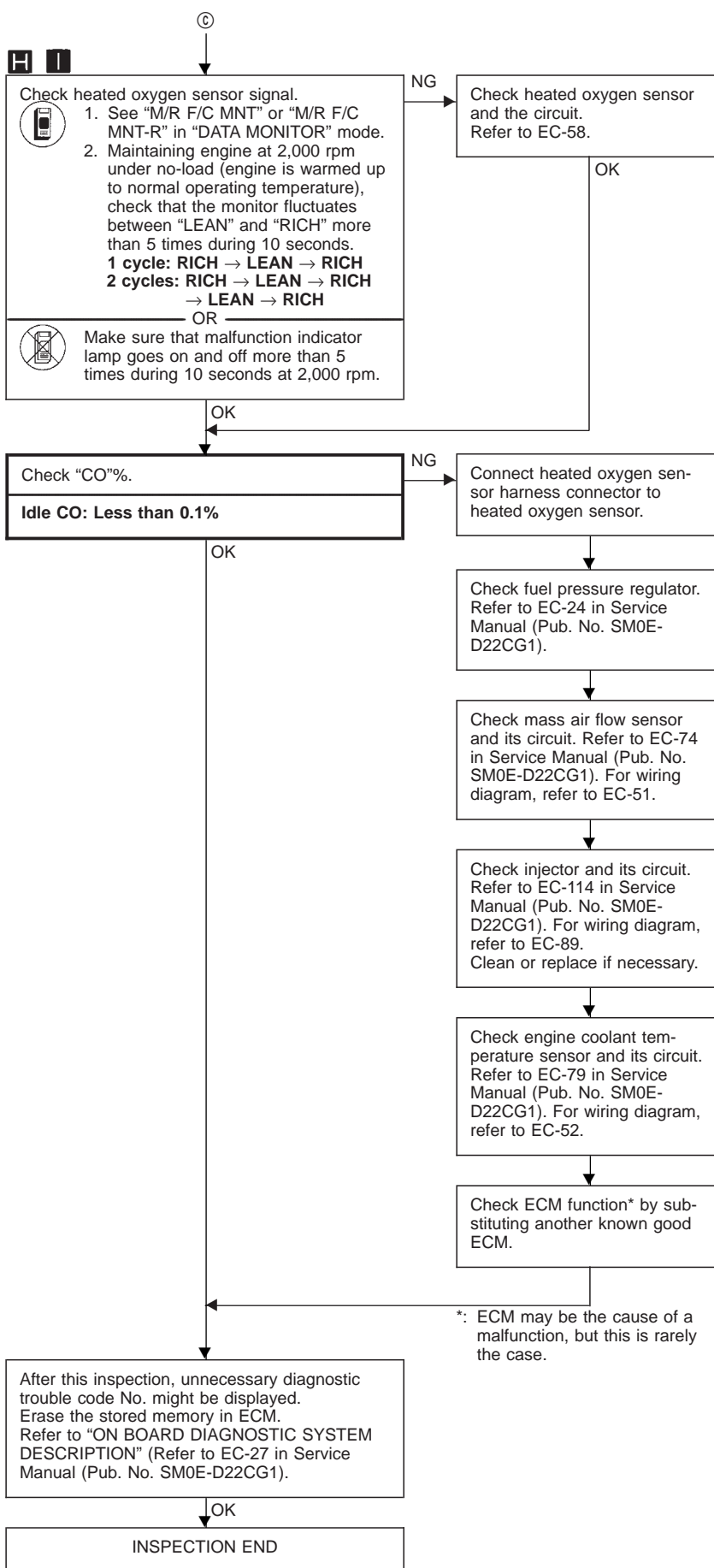
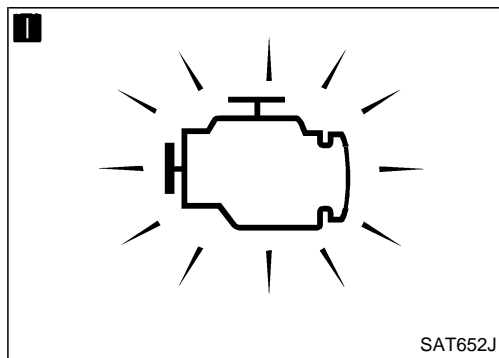
SEF175Y



Basic Inspection (Cont'd)

| DATA MONITOR | |
|----------------|---------|
| MONITOR | NO DTC |
| CMPS-RPM (POS) | XXX rpm |
| M/R F/C MNT-R | RICH |

SEC695D



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX

Symptom Matrix Chart

VG33E models

| | | | 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 | | |
| Basic engine control system | Fuel | Fuel pump circuit | ● | ● | ● | ○ | ● | | ○ | ○ | | | ○ | | ○ | *1 | |
| | | Fuel pressure regulator system | ● | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | | *2 | |
| | | Injector circuit | ● | ● | ● | ○ | ● | | ● | ○ | | | ○ | | | EC-51 | |
| | | Evaporative emission system | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | | *3 | |
| | Air | Positive crankcase ventilation system | ○ | ● | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | *4 |
| | | Incorrect idle speed adjustment | ● | ● | | | | ● | ● | ○ | ○ | | ○ | | | | EC-32 |
| | | IACV-AAC valve circuit | ○ | ● | ○ | ○ | ○ | ● | ● | ○ | ○ | | ○ | | ○ | | EC-87 |
| | | IACV-FICD solenoid valve circuit | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | ○ | | | | EC-76 |
| | Ignition | Incorrect ignition timing adjustment | ● | ● | ● | ● | ● | | ● | ○ | | | ● | | | | EC-32 |
| | | Ignition circuit | ● | ● | ● | ● | ● | | ● | ○ | | | ● | | | | EC-82 |
| | EGR | EGR valve & EVAP canister purge control solenoid valve circuit | | ○ | ● | ○ | ○ | | | | | | | ○ | | | EC-79, 82 |
| | | EGR system | ○ | ● | ● | ● | ● | ○ | ● | ○ | ○ | | | ○ | | | EC-17 |
| | Main power supply and ground circuit | | ● | ○ | ○ | ○ | ○ | | | ○ | ○ | | ○ | ○ | | ○ | EC-49 |
| Air conditioner circuit | | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | ○ | | ○ | HA section | |

● ; High Possibility Item

○ ; Low Possibility Item

(continued on next page)

*1: EC-74 in Service Manual (Pub. No. SM2E-D22GG0)

*2: EC-24 in Service Manual (Pub. No. SM0E-D22CG1)

*3: EC-21 in Service Manual (Pub. No. SM0E-D22CG1)

*4: EC-23 in Service Manual (Pub. No. SM0E-D22CG1)

Symptom Matrix Chart (Cont'd)

VG33E models

| | | | SYMPTOM | | | | | | | | | | | | Reference page | |
|-----------------------|-----|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-------------------|-----------------------------|
| | | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | | BATTERY DEAD (UNDER CHARGE) |
| Warranty Symptom code | | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Engine control system | ECM | Camshaft position sensor circuit | ● | ● | ● | ● | ● | | ● | ○ | | | ● | | | *1 |
| | | Mass air flow sensor circuit | ● | ● | ● | ○ | ● | | ● | ○ | | | ● | | | EC-51 |
| | | Heated oxygen sensor circuit | | ● | ● | ○ | ● | | ● | ○ | | | ● | | | EC-60, 61 |
| | | Engine coolant temperature sensor circuit | ● | ○ | ○ | ○ | ○ | ○ | ● | ○ | ○ | | ○ | | | EC-52 |
| | | Throttle position sensor circuit | | ● | ● | | ● | ● | ● | ○ | ○ | | ● | | | *2 |
| | | Incorrect throttle position sensor adjustment | | ● | ● | | ● | ● | ● | ○ | ○ | | ○ | | | EC-32 |
| | | Vehicle speed sensor circuit | | ○ | ○ | | ○ | | | | | | ○ | | | EC-55 |
| | | Knock sensor circuit | | | ○ | ○ | ○ | | | | | | ○ | | | EC-66 |
| | | ECM | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | | *3 |
| | | Start signal circuit | ○ | | | | | | | | | | | | | *4 |
| | | Park/Neutral position (PNP) switch circuit | | | ○ | | ○ | | ○ | ○ | | | ○ | | | EC-88 |
| | | Power steering oil pressure switch circuit | | ○ | | | | | ○ | ○ | | | | | | *5 |

● ; High Possibility Item

○ ; Low Possibility Item

(continued on next page)

*1: EC-67 in Service Manual (Pub. No. SM0E-D22CG1)

*2: EC-67 in Service Manual (Pub. No. SM2E-D22GG0)

*3: EC-49 in Service Manual (Pub. No. SM0E-D22CG1)

*4: EC-73 in Service Manual (Pub. No. SM2E-D22GG0)

*5: EC-75 in Service Manual (Pub. No. SM2E-D22GG0)

Symptom Matrix Chart (Cont'd)

| SYSTEM | | 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 | OVERHEAT/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | |
| Warranty Symptom Code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA |
| Fuel | Fuel tank | ○ | ○ | | | | | | | | | | | |
| | Fuel piping | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| | Vapor lock | | ○ | | | | | | | | | | | |
| | Valve deposit | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| | Poor fuel (Heavy weight gasoline, Low octane) | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| Air | Air duct | | ○ | ○ | | ○ | | ○ | ○ | | | ○ | | |
| | 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 | ○ | ○ | ○ | | ○ | | ○ | ○ | | | ○ | | ○ |
| | Alternator circuit | ○ | ○ | ○ | | ○ | | ○ | ○ | | | ○ | | ○ |
| | Starter circuit | ● | | | | | | | | | | | | |
| | Flywheel (Drive plate) | ○ | | | | | | | | | | | | — |
| | Clutch interlock switch | ○ | | | | | | | | | | | | CL section |
| | Park/neutral position (PNP) switch | ○ | | | | | | | | | | | | MT section |
| Engine | Cylinder head | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| | Cylinder head gasket | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | ○ | |
| | Cylinder block | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | |
| | Piston | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | |
| | Piston ring | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | |
| | Connecting rod | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| | Bearing | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| | Crankshaft | ● | ● | ● | ○ | ● | | ○ | ○ | | | ○ | | |
| Valve mechanism | Timing belt | ○ | ● | ○ | ○ | ● | | ● | ○ | | | ○ | | |
| | Camshaft | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| | Intake valve | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | |
| | Exhaust valve | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | |
| | Hydraulic lash adjuster | | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | | |
| | Three way catalyst | ○ | ○ | ○ | ○ | ● | | ○ | ○ | | | ○ | | |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery | ● | ● | ○ | ○ | ○ | | ● | ● | | | ○ | ● | |
| | Oil level (Low)/Filthy oil | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | | ○ | ○ | |
| Cooling | Radiator/Hose/Radiator filler cap | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ● | ○ | | |
| | Thermostat | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | Water pump | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ● | ○ | | |
| | Water gallery | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | |
| | Cooling fan | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | | |
| | Coolant level (low)/Contaminated coolant | ○ | ○ | ○ | ○ | ○ | | ○ | ○ | | ○ | ○ | | |

● ; High Possibility Item

○ ; Low Possibility Item

CONSULT-II Reference Value in Data Monitor Mode

Remarks:

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

VG33E MODELS

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---------------------------------------|--|--|---|
| CMPS-RPM (POS) | ● Run engine and compare CONSULT-II value with the tachometer indication. | | Almost the same speed as the tachometer indication. |
| MAS AIR/FL SE | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "Neutral" ● 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) |
| O2S1 O2S1 (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| M/R F/C MNT M/R F/C MNT-R | | | LEAN ↔ RICH Changes more than 5 times within 10 seconds. |
| VHCL SPEED SE | ● Turn drive wheels and compare CONSULT-II value with the speedometer indication | | Almost the same speed as the speedometer indication |
| BATTERY VOLT | ● Ignition switch: ON (Engine stopped) | | 11 - 14V |
| THRTL POS SEN | ● Engine: After warming up, idle the engine. | Throttle valve: fully closed | 0.15 - 0.85V |
| | ● Engine: After warming up ● Ignition switch: ON (Engine stopped) | Throttle valve: fully opened | 3.5 - 4.7 |
| START SIGNAL | ● Ignition switch: ON → START → ON | | OFF → ON → OFF |
| CLSD THL/P SW | ● Engine: After warming up, idle the engine. | Throttle valve: Idle position | ON |
| | ● Engine: After warming up ● Ignition switch: ON (Engine stopped) | Throttle valve: Slightly open | OFF |
| AIR COND SIG | ● Engine: After warming up, idle the engine | Air conditioner switch: "OFF" | OFF |
| | | Air conditioner switch: "ON" (Compressor operates.) | ON |
| P/N POSI SW | ● Ignition switch: ON | Shift lever: "Neutral" | 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 |

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

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|-----------------------------------|--|---------------------------------------|--------------------|
| IGNITION SW | ● Ignition switch: ON → OFF | | ON → OFF |
| INJ PULSE-B2 | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "Neutral" ● No-load | Idle | 2.4 - 3.2 msec |
| INJ PULSE-B1 | | 2,000 rpm | 1.9 - 2.8 msec |
| B/FUEL SCHDL | | Idle | 1.0 - 1.6 msec |
| | ditto | 2,000 rpm | 0.7 - 1.3 msec |
| IGN TIMING | ditto | Idle | 10° BTDC |
| | | 2,000 rpm | More than 20° BTDC |
| IACV-AAC/V | ditto | Idle | 10 - 20% |
| | | 2,000 rpm | — |
| A/F ALPHA A/F ALPHA-R | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 54 - 155% |
| AIR COND RLY | ● Air conditioner switch: OFF → ON | | OFF → ON |
| FUEL PUMP RLY | <ul style="list-style-type: none"> ● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking | | ON |
| | Except as shown above | | OFF |

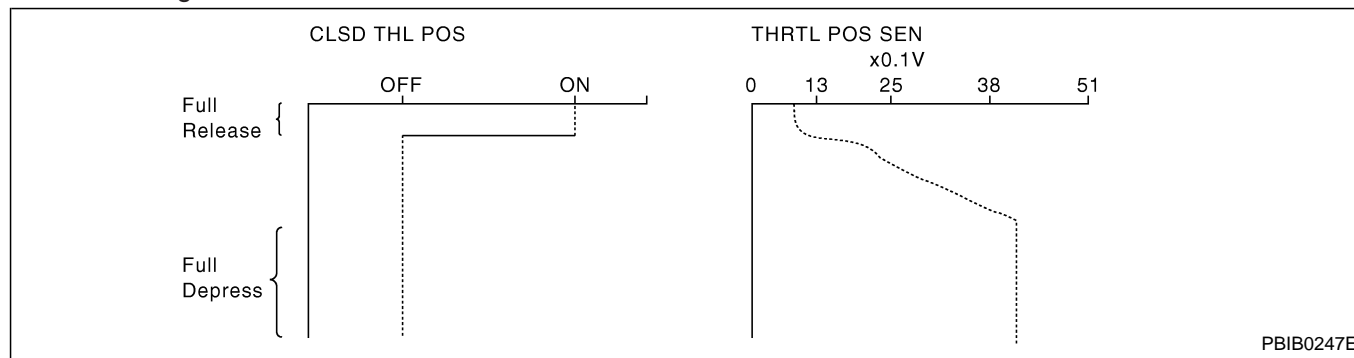
Major Sensor Reference Graph in Data Monitor Mode (VG33E models)

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

THRTL POS SEN, CLSD THL POS

Below is the data for "THRTL POS SEN" and "CLSD THL POS" when depressing the accelerator pedal with the ignition switch "ON".

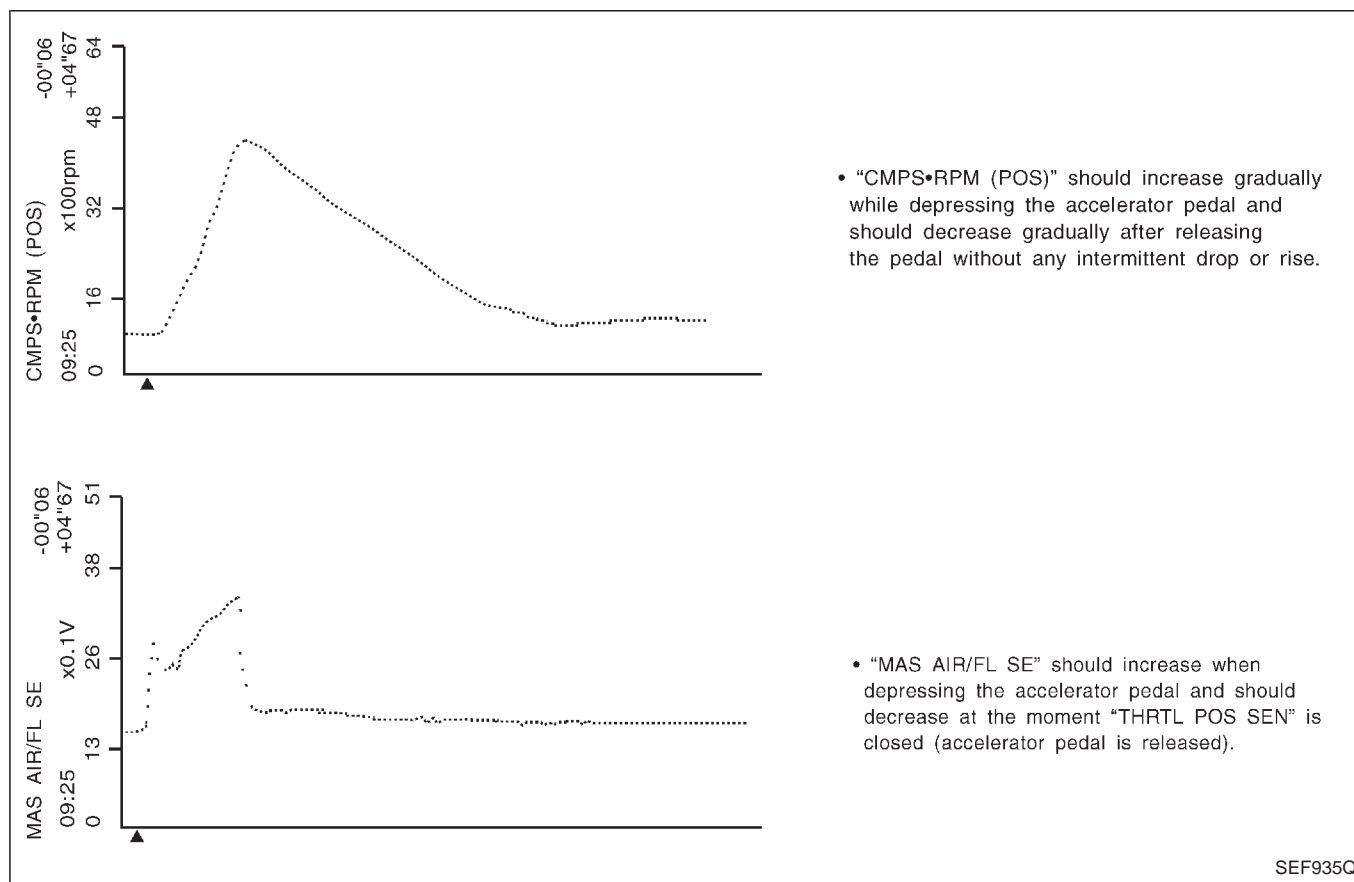
The signal of "THRTL POS SEN" should rise gradually without any intermittent drop or rise after "CLSD THL POS" is changed from "ON" to "OFF".



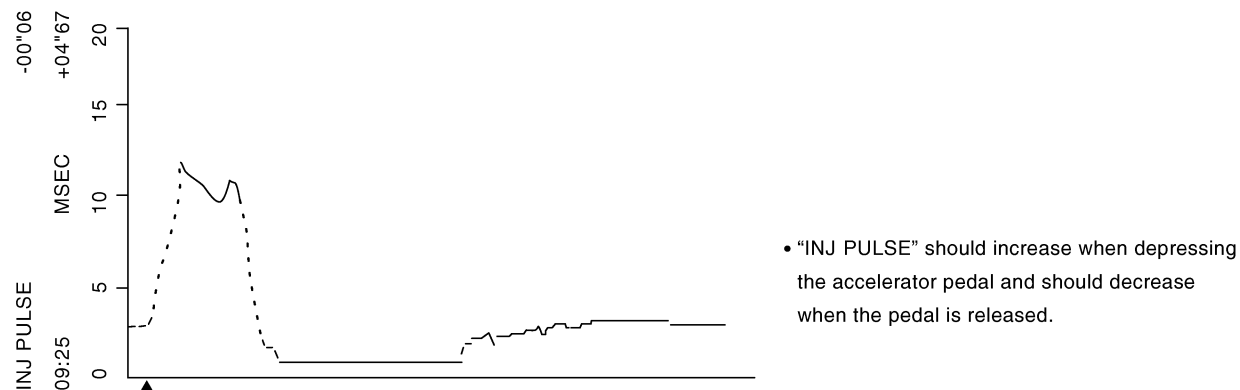
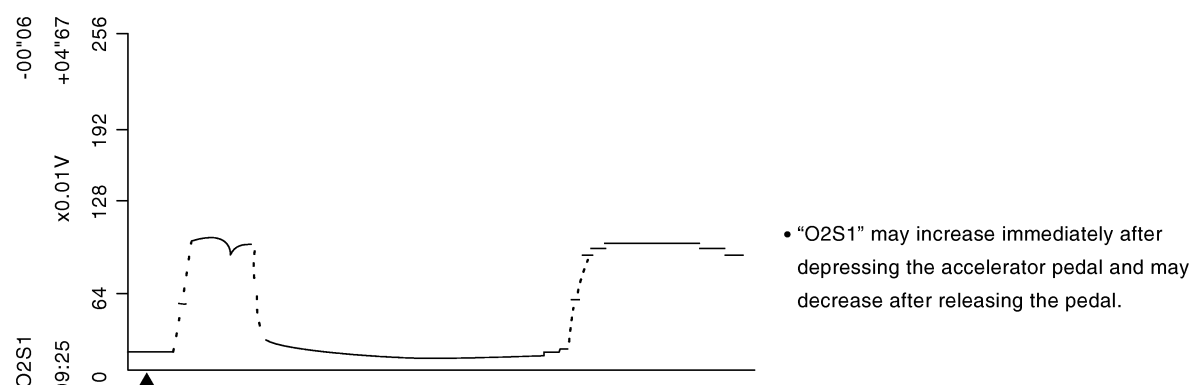
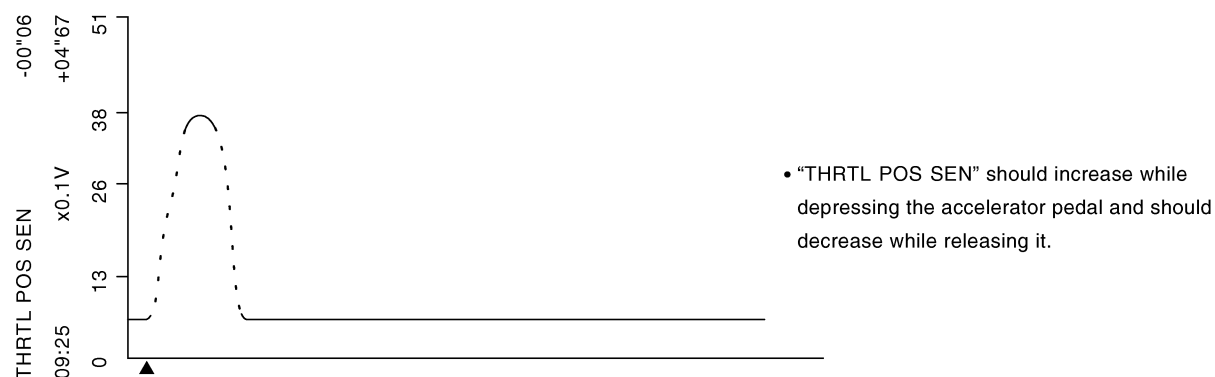
CMPS•RPM (POS), MAS AIR/FL SE, THRTL POS SEN, O2S1, INJ PULSE

Below is the data for "CMPS•RPM (POS)", "MAS AIR/FL SE", "THRTL POS SEN", "O2S1" and "INJ PULSE" when revving quickly up to 4,800 rpm under no load after warming up engine sufficiently.

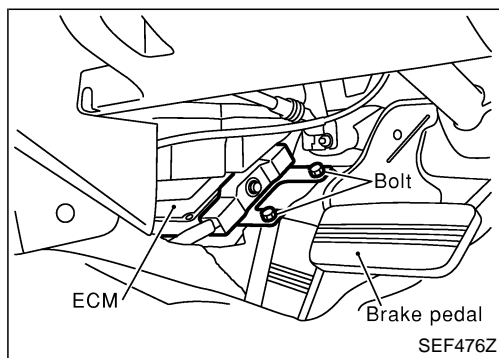
Each value is for reference, the exact value may vary.



Major Sensor Reference Graph in Data Monitor Mode (VG33E models) (Cont'd)



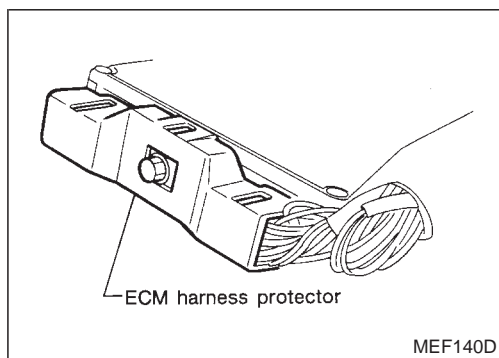
SEF259QD



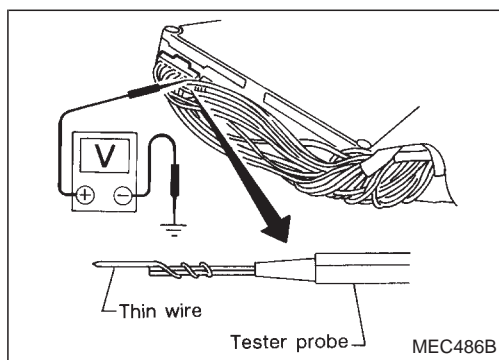
ECM Terminals and Reference Value

PREPARATION

1. ECM is located behind the instrument lower panel.



2. Remove ECM harness protector.



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

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

CAUTION:

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

ECM HARNESS CONNECTOR TERMINAL LAYOUT

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |



MEC487BB

ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

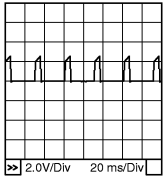
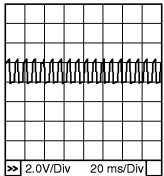
VG33E models

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

Pulse signal is measured by CONSULT-II.

CAUTION:

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-----------------------|---|--|
| 1 | W/PU | Ignition signal | Engine is running. └ Idle speed | Approximately 0.9V★  SEC697D |
| | | | Engine is running. └ Engine speed is 2,000 rpm | Approximately 1.1 - 1.3V★  SEC698D |
| 4 | W/G | IACV-AAC valve | Engine is running. └ Idle speed | 8 - 11V |
| | | | Engine is running. └ Rear window defogger is operating └ Steering wheel is being turned └ Air conditioner is operating └ Headlamps are in high position | 5 - 8V |
| 7 | W | Tachometer | Engine is running. └ Idle speed | 1 - 2V |
| | | | Engine is running. └ Engine speed is 2,000 rpm | 3 - 4V |
| 9 | G/W | Air conditioner relay | Engine is running. └ Both A/C switch and blower switch are "ON" | 0 - 1.0V |
| | | | Engine is running. └ A/C switch is "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 10 | B | ECM ground | Engine is running. └ Idle speed | Engine ground |

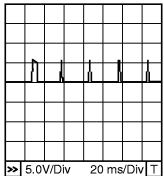
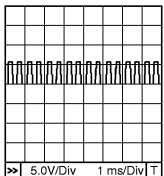
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-----------------------------------|--|--|
| 16 | W/L | ECM relay (Self-shut-off) | Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF" | 0 - 1.0V |
| | | | Ignition switch "OFF" └ A few seconds after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 18 | Y | Fuel pump relay | Engine is running. Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" | 0 - 1.0V |
| | | | Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 20 | B | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 21 | G/B | Data link connector | Engine is running. └ Idle speed | Approximately 0V |
| 22 | GY/L | | | Approximately 5V |
| 31 | Y/R | | | Approximately 3.3V★ |
| 47 | G/R | | | Approximately 0V |
| 23 | W | Knock sensor | Engine is running. └ Idle speed | Approximately 2.5V |
| 26 | L | Mass air flow sensor ground | Engine is running. (Warm-up condition) └ Idle speed | Approximately 0V |
| 27 | G | Mass air flow sensor | Engine is running. (Warm-up condition) └ Idle speed | 1.3 - 1.7V |
| | | | Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm | 1.7 - 2.1V |
| 28 | LG/R | Engine coolant temperature sensor | Engine is running. | 0 - 5.0V Output voltage varies with engine coolant temperature. |
| 29 | LG | Heated oxygen sensor (bank 1) | Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm | 0 - Approximately 1.0V (periodically changes) |
| 30 | B/Y | Sensor's ground | Engine is running. (Warm-up condition) └ Idle speed | Approximately 0V |

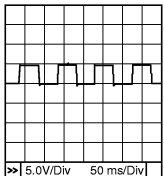
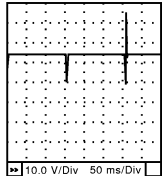
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--|---|---|
| 32 | OR/B | Malfunction indicator lamp | Ignition switch "ON" | 0 - 1.0V |
| | | | Engine is running. └ Idle speed | BATTERY VOLTAGE (11 - 14V) |
| 34 | G | Power steering pressure switch | Engine is running. └ Steering wheel is being turned | Approximately 0V |
| | | | Engine is running. └ Steering wheel is not being turned | Approximately 5V |
| 38 | R | Throttle position sensor | Ignition switch "ON" └ Idle speed └ Accelerator pedal is released | 0.15 - 0.85V |
| | | | Ignition switch "ON" └ Accelerator pedal is fully depressed | 3.5 - 4.7V |
| 41 51 | W W | Camshaft position sensor (REF) (120° signal) | Engine is running. └ Idle speed | Approximately 2.5V★  SEC701D |
| 42 | B | Camshaft position sensor (POS) (1° signal) | Engine is running. └ Idle speed | Approximately 2.5V★  SEC703D |
| 43 | R | Start signal | Ignition switch "ON" | Approximately 0V |
| | | | Ignition switch "START" | BATTERY VOLTAGE (11 - 14V) |
| 44 | Y/R | Park/Neutral position (PNP) switch | Ignition switch "ON" └ Gear position is "Neutral" | Approximately 0V |
| | | | Ignition switch "ON" └ Except above gear position | Approximately 5V |
| 45 | L/W | Ignition switch | Ignition switch "OFF" | 0V |
| | | | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

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

ECM Terminals and Reference Value (Cont'd)

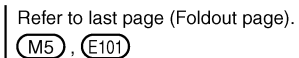
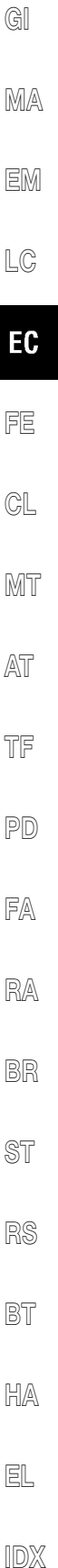
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------------------|---|---|
| 46 | Y | Air conditioner switch | Engine is running. └ Both A/C switch and blower switch are "ON" (Compressor is operating) | Approximately 0V |
| | | | Engine is running. └ A/C switch is "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 48 | G/B | Sensor's power supply | Ignition switch "ON" | Approximately 5V |
| 49 59 | R/W R/W | Power supply for ECM | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 50 | B/W | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 53 | W/L | Vehicle speed sensor | Engine is running. └ Lift up the vehicle. In 2nd gear position Vehicle speed is 40 km/h (25 MPH) | Approximately 0V ↔ Approximately 5V★  SEC705D |
| 55 | L | Heated oxygen sensor (bank 2) | Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm | 0 - Approximately 1.0V (periodically changes) |
| 56 | P | Throttle position sensor signal | Ignition switch "ON" └ Accelerator pedal is released | Approximately 0.4V |
| | | | Ignition switch "ON" └ Accelerator pedal is fully depressed | Approximately 4V |
| 58 | GY/L | Power supply (Back-up) | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 60 | B/W | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 101 | W/B | Injector No. 1 | Engine is running. └ Idle speed | BATTERY VOLTAGE (11 - 14V)★  SEC984C |
| 103 | R | Injector No. 3 | | |
| 105 | W | Injector No. 5 | | |
| 110 | W/L | Injector No. 2 | | |
| 112 | W/G | Injector No. 4 | | |
| 114 | Y | Injector No. 6 | | |

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

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|---|----------------------------|
| 102 | P/B | EGR valve & EVAP canister purge volume control solenoid valve | Engine is running. (Warm-up condition) └ Idle speed | 0 - 1V |
| | | | Engine is running. (Warm-up condition) └ Lift up the vehicle └ In 1st gear position └ Race engine from idle to 2,000 rpm | BATTERY VOLTAGE (11 - 14V) |
| 107 108 | B B | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 109 | R/W | Counter current return | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 111 115 | W/PU SB | Heated oxygen sensor heater (bank 2) | Engine is running. └ Engine speed is below 3,200 rpm | 0 - 0.5V |
| | | Heated oxygen sensor heater (bank 1) | Engine is running. └ Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |
| 116 | B | ECM ground | Engine is running. └ Idle speed | Engine ground |

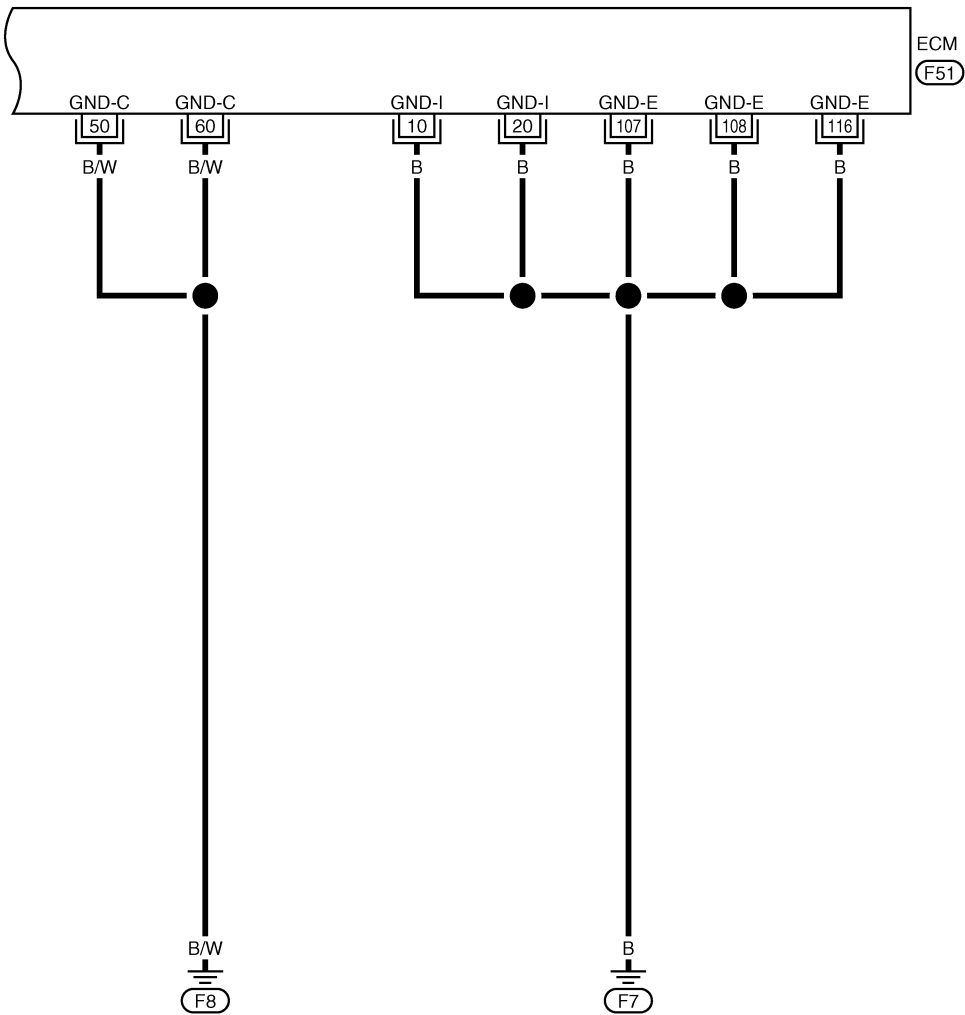
EC-MAIN-01



Main Power Supply and Ground Circuit
(Cont'd)

EC-MAIN-02

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



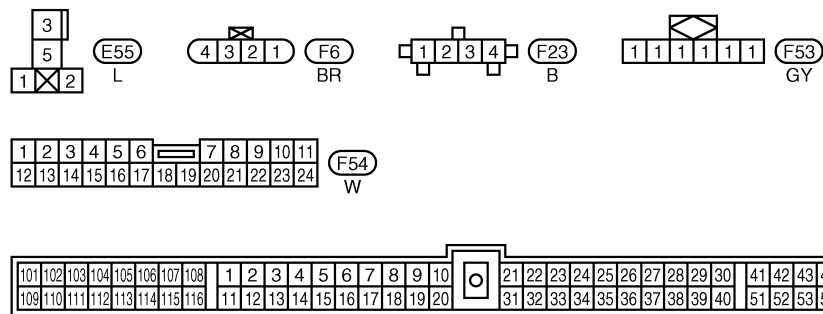
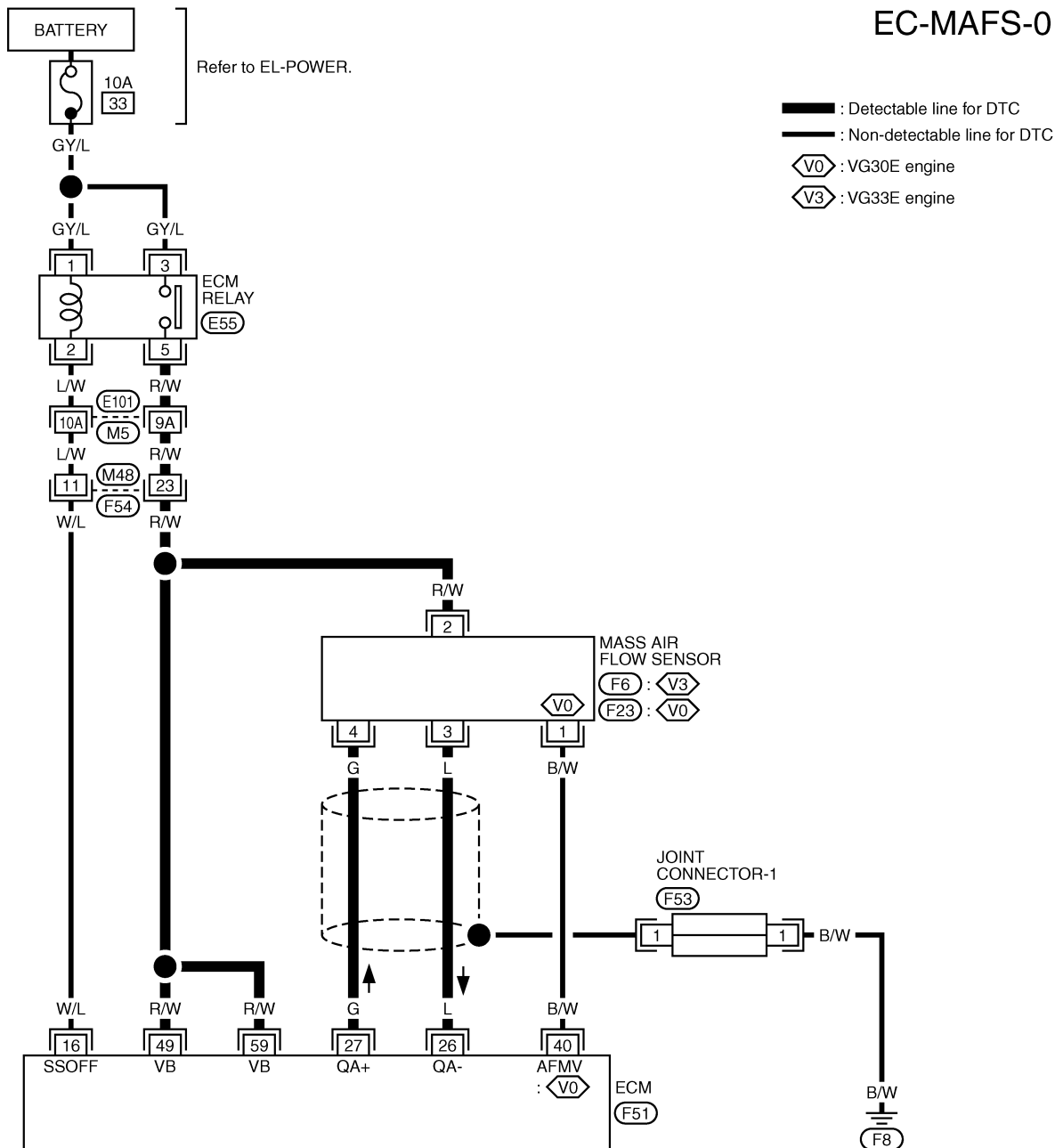
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

F51
W

H.S.

Mass Air Flow Sensor (MAFS)

EC-MAFS-01



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

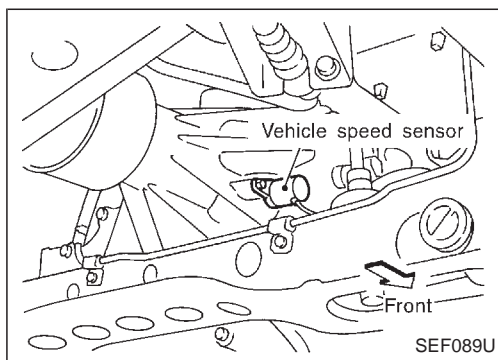
RS

BT

HA

EL

IDX



Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

The vehicle speed sensor is installed in the transmission. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

ECM TERMINALS AND REFERENCE VALUE

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

CAUTION:

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---------------|------------|----------------------|---|--|
| 53 | W/L | Vehicle speed sensor | <div>Engine is running.</div> <div> Lift up the vehicle. Vehicle speed is 40 km/h (25 MPH) in 2nd gear position. </div> | Approximately 0V ↔ Approximately 5V★ SEC705D |

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

ON BOARD DIAGNOSIS LOGIC

| Diagnostic trouble code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|---|
| 14 | The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven. | Harness connector (The vehicle speed sensor circuit is open or shorted.) Vehicle speed sensor |

DTC CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle Speed Sensor (VSS) (Cont'd)

| 5 | DATA MONITOR | |
|---|---------------|----------|
| | MONITOR | NO DTC |
| | ENG SPEED | XXX rpm |
| | COOLAN TEMP/S | XXX °C |
| | B/FUEL SCHDL | XXX msec |
| | PW/ST SIGNAL | OFF |
| | VHCL SPEED SE | XXX km/h |

SEF196Y



With CONSULT-II

- 1) Start engine.
- 2) Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
If NG, go to "Diagnostic Procedure", EC-56.
If OK, go to following step.
- 3) Select "DATA MONITOR" mode with CONSULT-II.
- 4) Warm engine up to normal operating temperature.
- 5) Maintain the following conditions for at least 10 consecutive seconds.

| | |
|----------------|------------------------|
| ENG SPEED | 1,400 - 2,400 rpm |
| COOLAN TEMP/S | More than 70°C (158°F) |
| B/FUEL SCHDL | 4 - 8 msec |
| Selector lever | Suitable position |
| PW/ST SIGNAL | OFF |

- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-56.

OVERALL FUNCTION CHECK

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

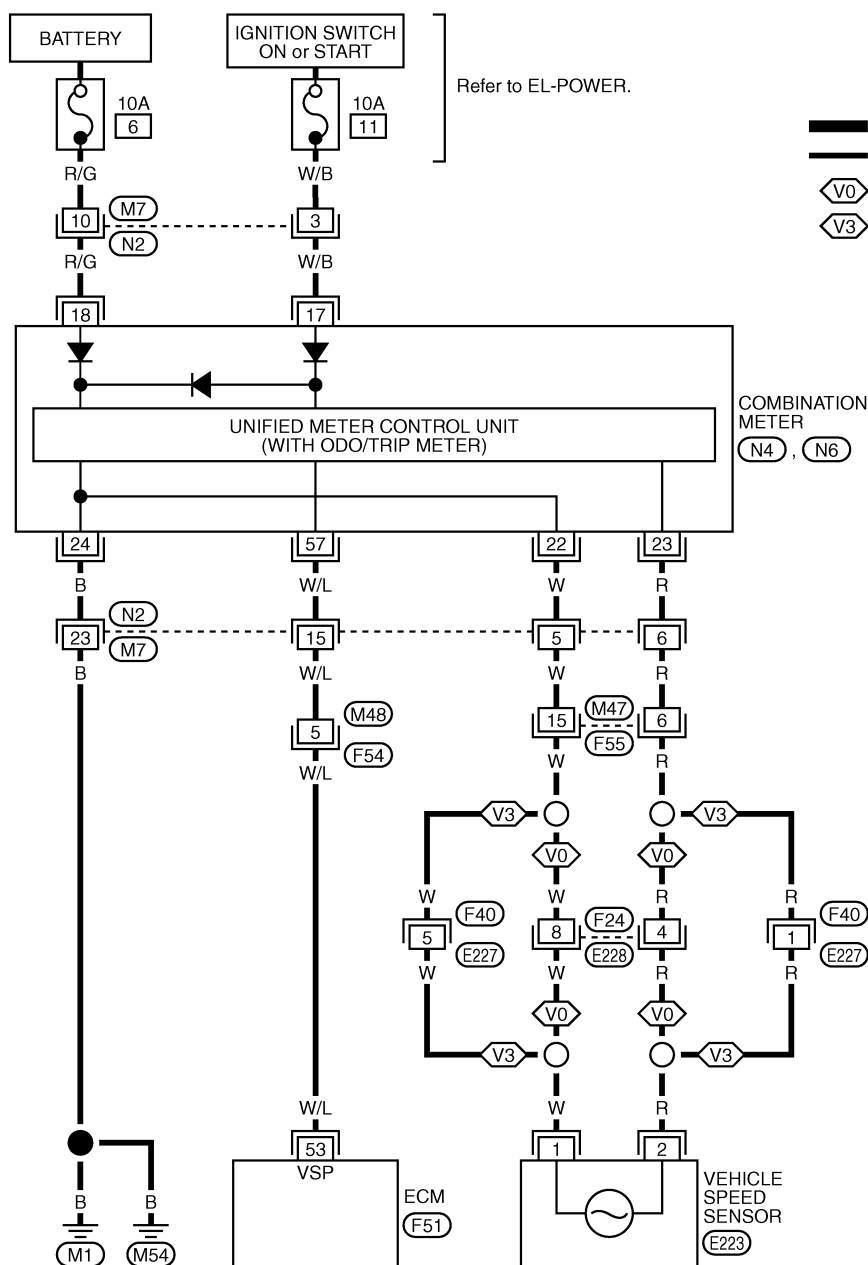


Without CONSULT-II

- 1) Lift up drive wheels.
- 2) Start engine.
- 3) Read vehicle speed sen with combination meter.
The vehicle speed indication should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
- 4) If NG, go to "Diagnostic Procedure", EC-56.

Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01



| | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | | | | | | | | | |

(N2), (F54)
BR W

| | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 |
| 23 | 24 | | | | | | | | | |

(N4) W

| | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|
| 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 53 | 54 | 55 |
| 56 | 57 | 58 | 59 | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| 67 | 68 | | | | | | | | | |

(N6) BR

| | | | | | | | |
|---|---|---|---|---|---|--|--|
| 1 | 2 | | | | | | |
| 3 | 4 | 5 | 6 | 7 | 8 | | |

(E223) GY

| | | | | | | | |
|---|---|---|---|---|----|----|----|
| 1 | 2 | 3 | 4 | | | | |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

(E228) SB

| | | | | | | | |
|---|---|---|---|---|----|----|----|
| 1 | 2 | 3 | 4 | | | | |
| 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

(F40) GY

| | | | | | | | |
|----|---|----|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 16 | | | | | | | |

(F55) W

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

(F51) W



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX

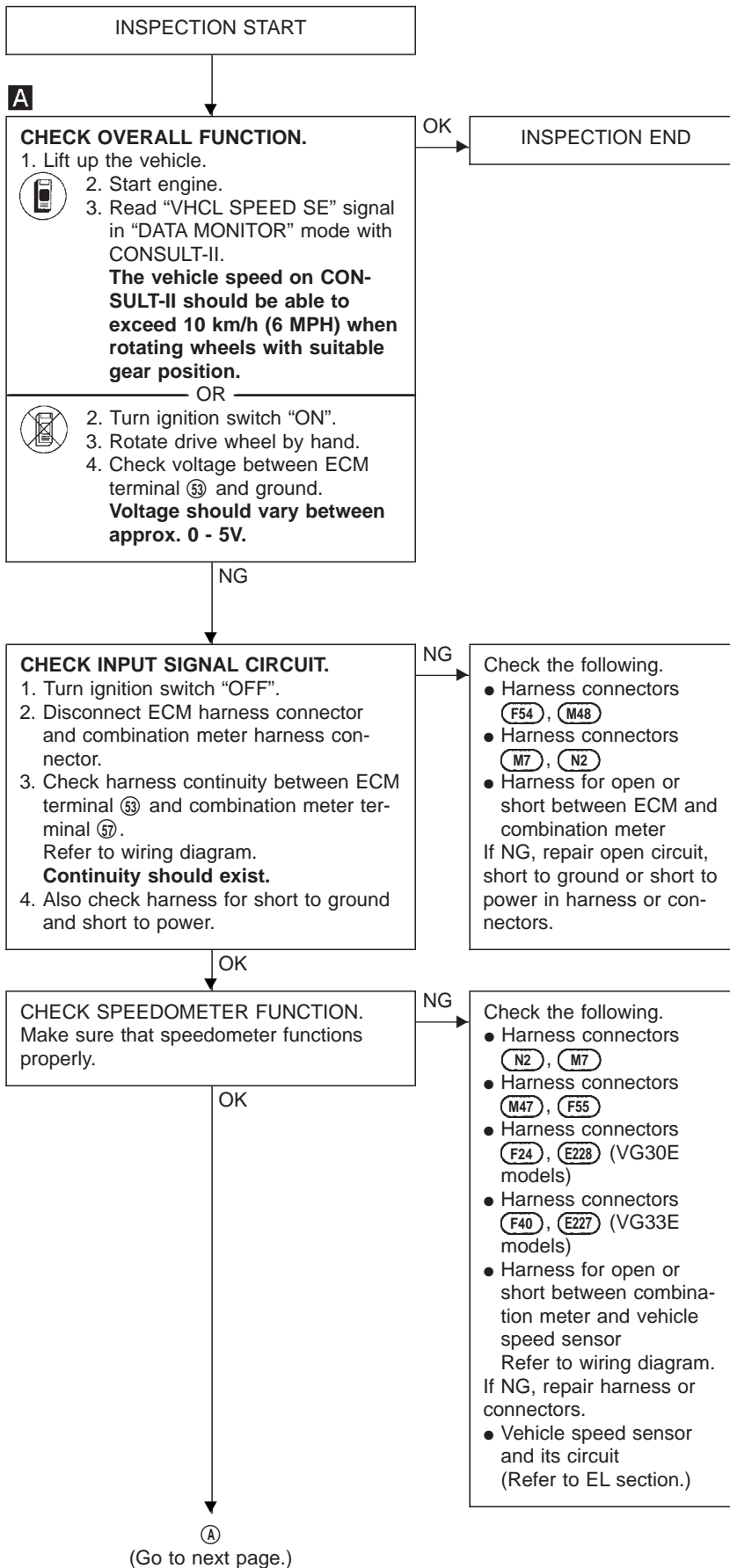
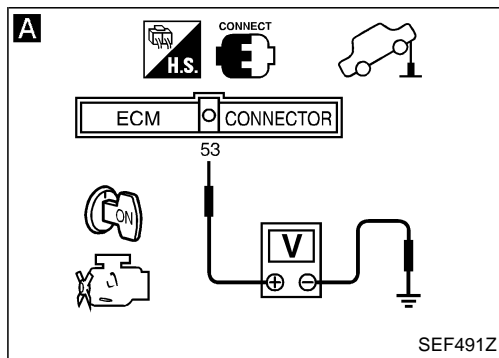
Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE

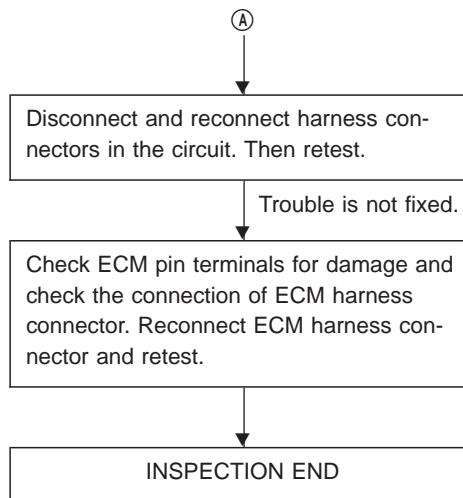
A

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

SEF492Z



Vehicle Speed Sensor (VSS) (Cont'd)



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

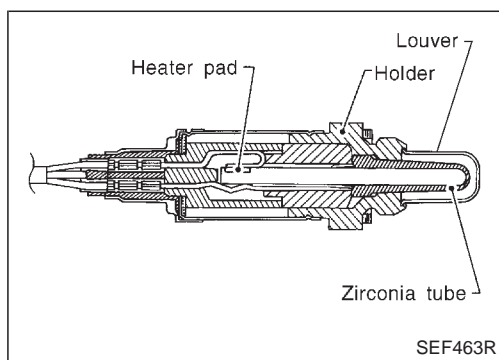
RS

BT

HA

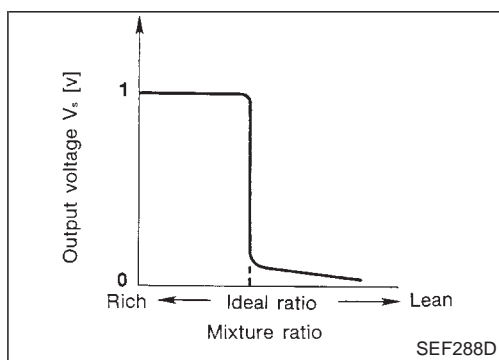
EL

IDX



Component Description

The 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 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 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

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|------------------------------|--|---------------------------------------|---|
| O2S1 O2S1 (B2) | <ul style="list-style-type: none"> Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ 0.6 - 1.0V |
| M/R F/C MNT M/R F/C MNT-R | | | LEAN ↔ RICH Changes more than 5 times during 10 seconds. |

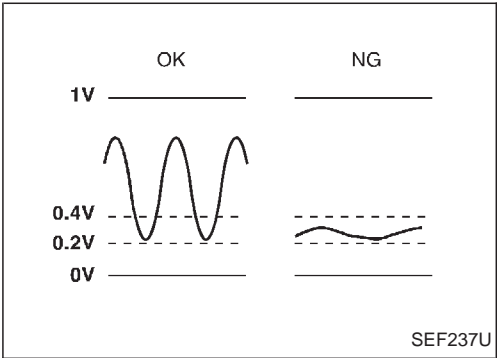
ECM Terminals and Reference Value

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

CAUTION:

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---------------|------------|-----------------------|---|--|
| 29 (B1) | LG | Heated oxygen sensors | Engine is running. | 0 - Approximately 1.0V (periodically change) |
| 55 (B2) | L | | After warming up to normal operating temperature and engine speed is 2,000 rpm. | |



On Board Diagnosis Logic

Under the condition in which the 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.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| 33 (Bank 1) | ● The voltage from the sensor is constantly approx. 0.3V. | ● Harness or connectors (The sensor circuit is open or shorted.) ● Heated oxygen sensor |
| 53 (Bank 2) | | |

| DATA MONITOR | |
|---------------|---------|
| MONITOR | NO DTC |
| ENG SPEED | XXX rpm |
| COOLAN TEMP/S | XXX °C |
| O2S1 | XXX V |
| M/R F/C MNT | LEAN |

SEC916D

Overall Function Check

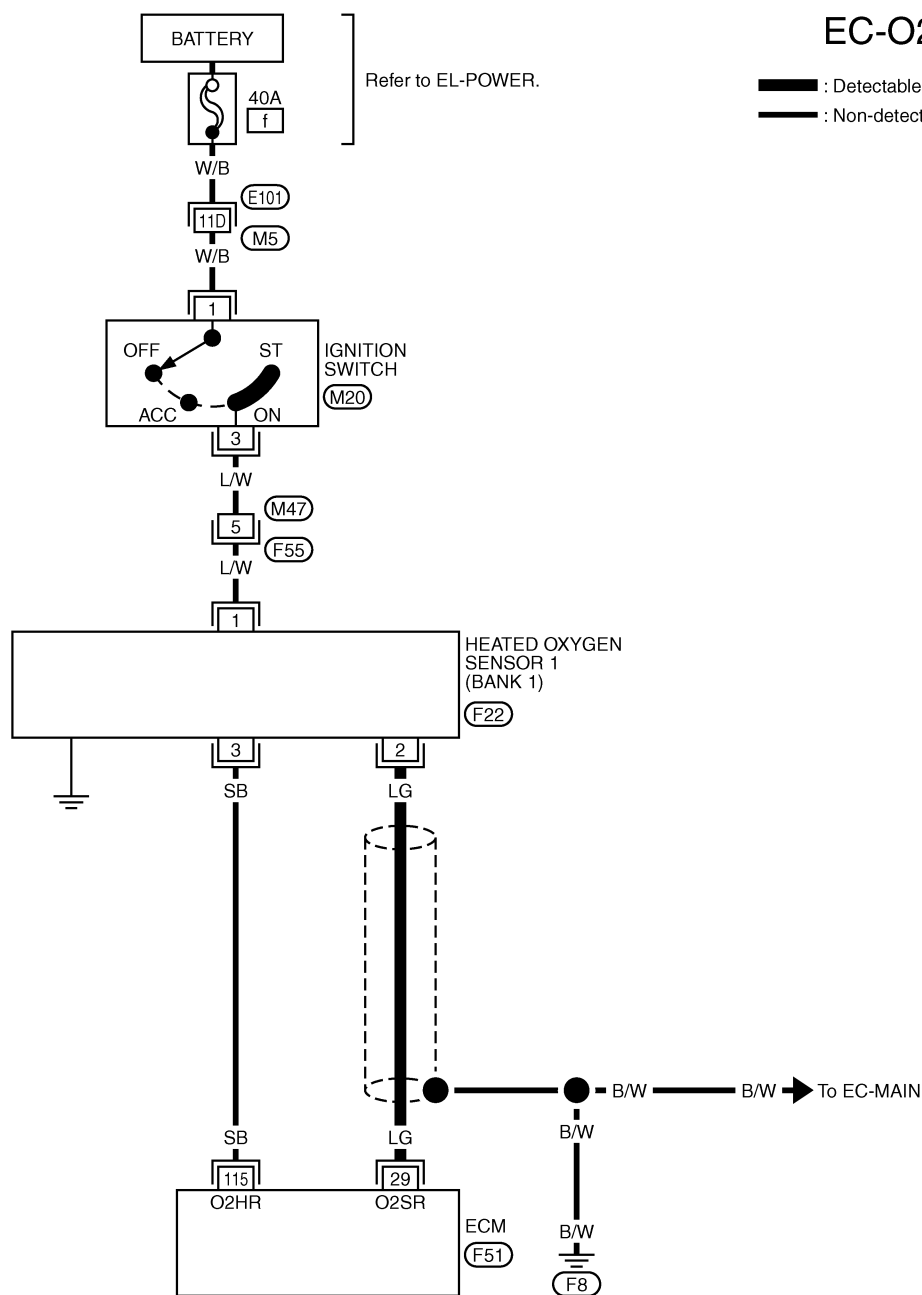
Use this procedure to check the overall function of the heated oxygen sensor circuit.

- 1) Start engine and warm it up to normal operating temperature.
 - 2) Select “MANU TRIG” in “DATA MONITOR” mode with CONSULT-II, and select “O2S1” and “O2S1 (B2)”.
 - 3) Hold engine speed at 2,000 rpm under no load.
 - 4) Make sure that the indications do not remain in the range between 0.2 to 0.4V.
 - 5) If NG, go to “Diagnostic Procedure”, EC-62.
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminal 29 (B1), 55 (B2) (sensor signal) and ground. Refer to wiring diagram.
 - 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-62.

Wiring Diagram

BANK 1

EC-O2S1B1-01



| | | |
|---|---|---|
| 1 | 3 | 5 |
| 6 | 2 | 4 |

M20
W

| | | |
|---|---|---|
| 3 | 2 | 1 |
|---|---|---|

F22
GY

| | | | | | | | | |
|---|---|----|----|----|----|----|----|----|
| 1 | 2 | 3 | | 4 | 5 | 6 | 7 | |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

F55
W

Refer to last page (Foldout page).

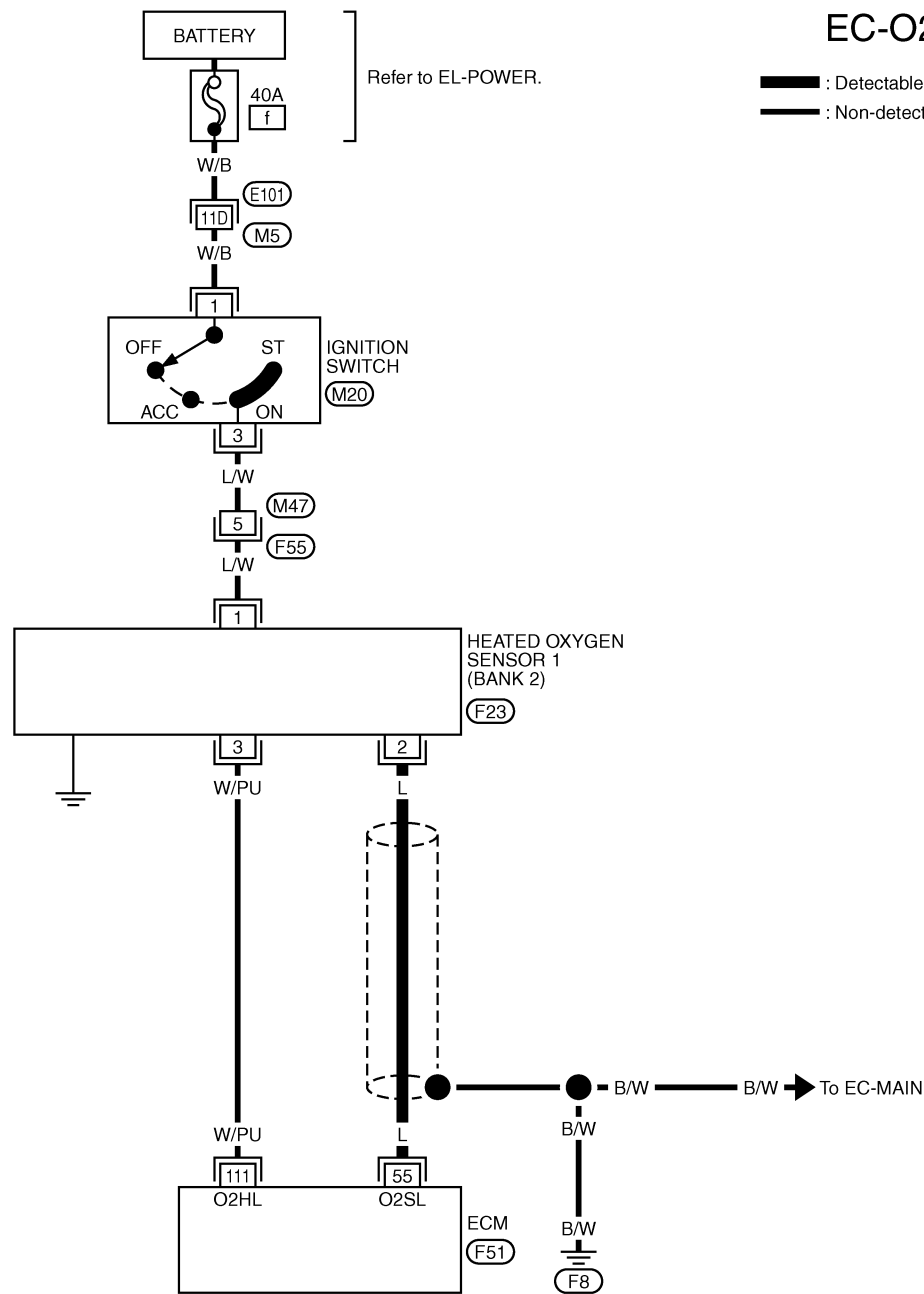
M5, E101

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

F51
W

Wiring Diagram (Cont'd)

BANK 2



| | | |
|---|---|---|
| 1 | 3 | 5 |
| 6 | 2 | 4 |

M20
W

| | | |
|---|---|---|
| 3 | 2 | 1 |
|---|---|---|

F23
GY

| | | | | | | |
|---|---|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |

F55
W

Refer to last page (Foldout page).

M5 , E101

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

F51
W



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

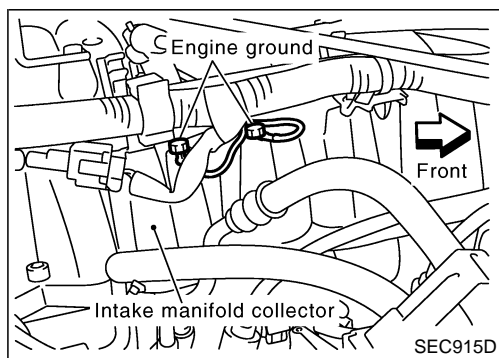
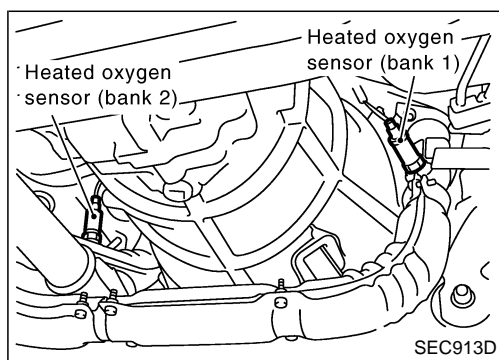
RS

BT

HA

EL

IDX



Diagnostic Procedure

INSPECTION START

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

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect corresponding heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM and sensor terminals.

| DTC | Terminals | |
|-----|-----------|--------|
| | ECM | Sensor |
| 33 | 29 | 2 |
| 53 | 55 | 2 |

Refer to wiring diagram.

Continuity should exist.

4. Check harness continuity between ECM and sensor or ground.

| DTC | Terminals | |
|-----|---------------|--------|
| | ECM or sensor | Ground |
| 33 | 29 or 2 | Ground |
| 53 | 55 or 2 | Ground |

Refer to wiring diagram.

Continuity should not exist.

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

NG

Repair harness or connectors.

OK

CHECK COMPONENT

(Heated oxygen sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG

Replace heated oxygen sensor.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

| DATA MONITOR | |
|---------------|---------|
| MONITOR | NO DTC |
| CMPS-RPM(POS) | XXX rpm |
| COOLAN TEMP/S | XXX °C |
| O2S1 | XXX V |
| M/R F/C MNT | LEAN |
| A/F ALPHA | XXX % |

SEC917D

Component Inspection

HEATED OXYGEN SENSOR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT-II, and select "O2S1/(B2)" and "M/R F/C MNT/M/R F/C MNT-R".
- 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.
 - "M/R F/C MNT/-R" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times within 10 seconds.

5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |
M/R F/C MNT R-L-R-L-R-L-R-L-R-L-R

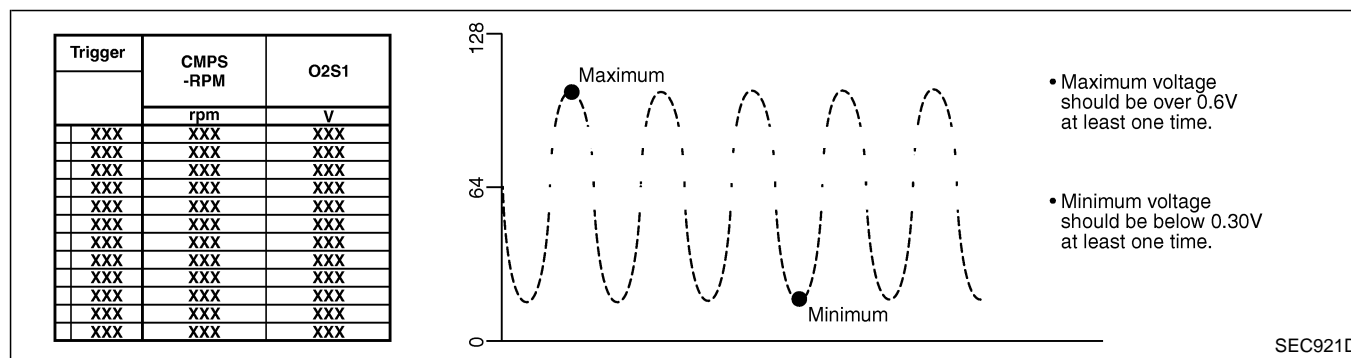
R = "M/R F/C MNT/M/R F/C MNT-R", "RICH"

L = "M/R F/C MNT/M/R F/C MNT-R", "LEAN"

- "O2S1/(B2)" voltage goes above 0.6V at least once.
- "O2S1/(B2)" voltage goes below 0.30V at least once.
- "O2S1/(B2)" voltage never exceeds 1.0V.

CAUTION:

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



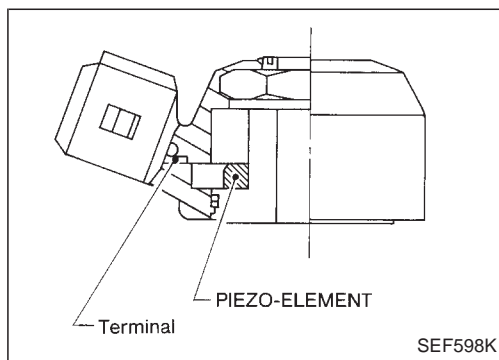
OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminal ②⑨ (B1), ⑤⑤ (B2) (sensor signal) and ground. Refer to wiring diagram.
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (HEATED OXYGEN SENSOR MONITOR, EC-24).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.30V at least one time.
 - The voltage never exceeds 1.0V.

Component Inspection (Cont'd)**CAUTION:**

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



Knock Sensor (KS)

The knock sensor is attached to the cylinder block under the intake manifold. 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.

ECM TERMINALS AND REFERENCE VALUE

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

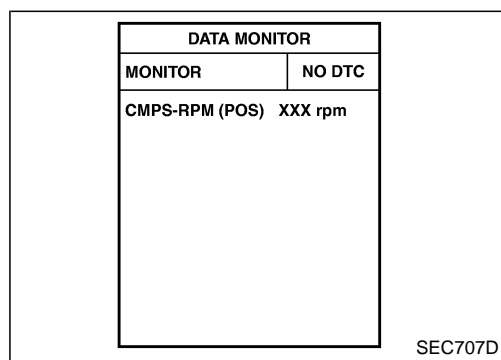
CAUTION:

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---------------|------------|--------------|------------------------------------|--------------------|
| 23 | W | Knock sensor | Engine is running. └ Idle speed | Approximately 2.5V |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|--|
| 34 | <ul style="list-style-type: none"> An excessively low or high voltage from the knock sensor is sent to ECM. | <ul style="list-style-type: none"> Harness or connectors (The knock sensor circuit is open or shorted.) Knock sensor |



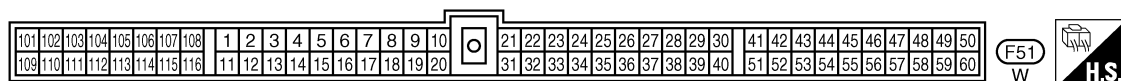
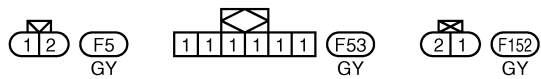
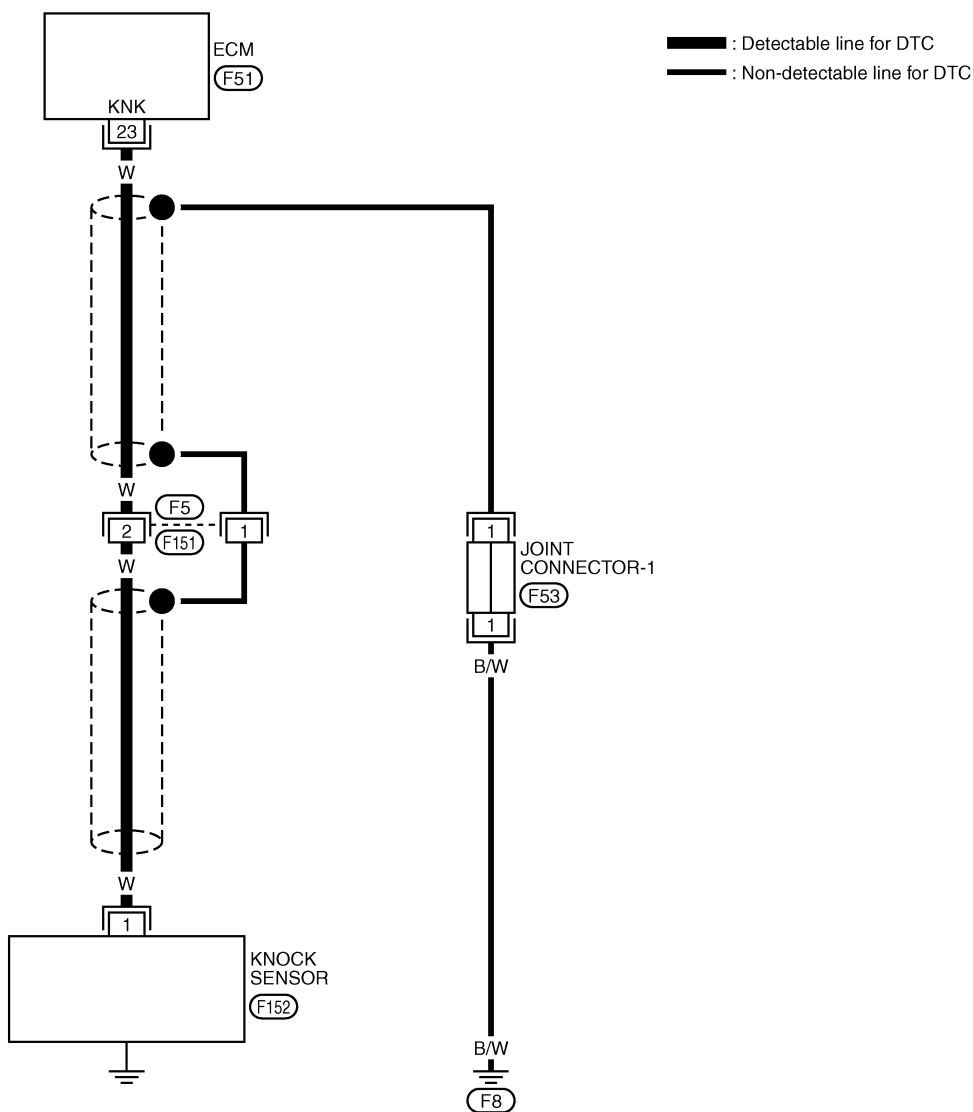
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

- 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.
- OR
- 1) Start engine and run it for at least 5 seconds at idle speed.
 - 2) Turn ignition switch “OFF”, wait at least 5 seconds and then turn “ON”.
 - 3) Perform “Diagnostic Test Mode II” (Self-diagnostic results) with ECM.

Knock Sensor (KS) (Cont'd)

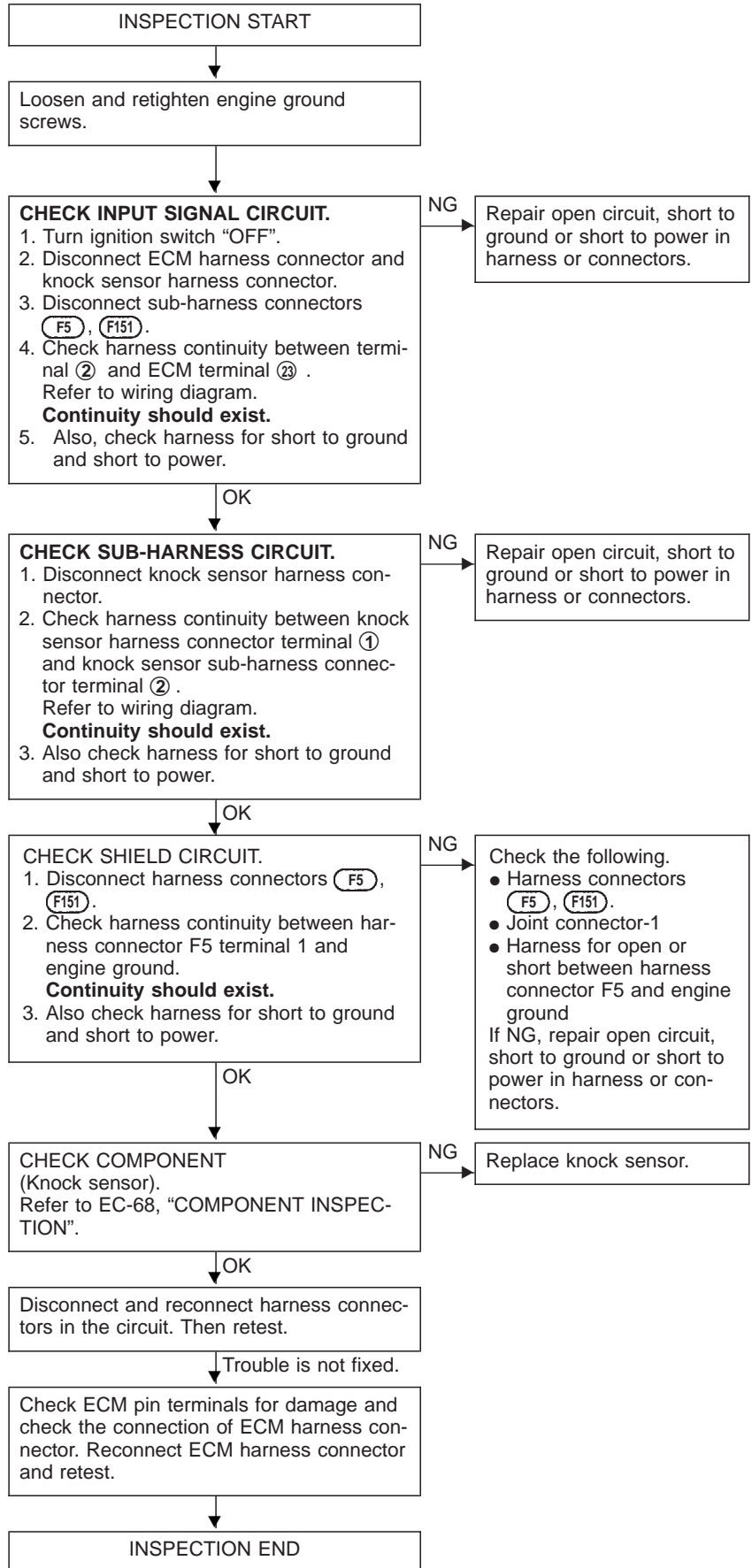
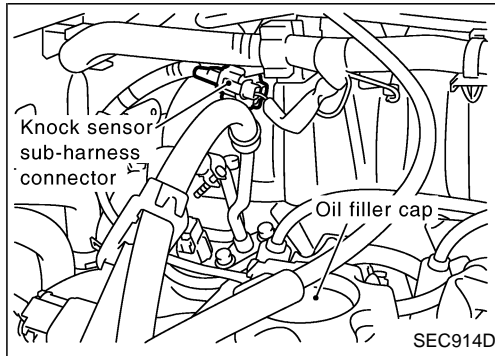
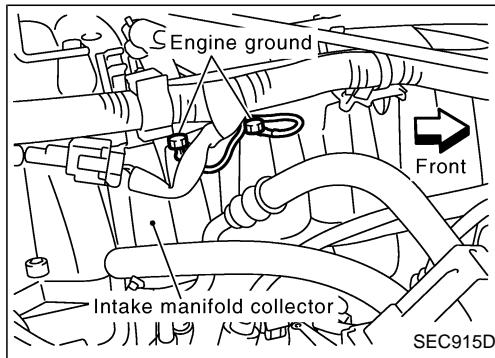
VG33E models

EC-KS-01



Knock Sensor (KS) (Cont'd)

DIAGNOSTIC PROCEDURE



Knock Sensor (KS) (Cont'd)**COMPONENT INSPECTION****Knock sensor**

- Use an ohmmeter which can measure more than 10 M Ω .
 1. Disconnect knock sensor harness connector.
 2. Check resistance between terminal ① and ground.
Refer to wiring diagram.

Resistance: 500 - 620 k Ω [at 25°C (77°F)]

CAUTION:

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

OPERATION

| Engine speed rpm | Heated oxygen sensor heater |
|------------------|-----------------------------|
| Above 3,200 | OFF |
| Below 3,200 | ON |

ECM TERMINALS AND REFERENCE VALUE

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

CAUTION:

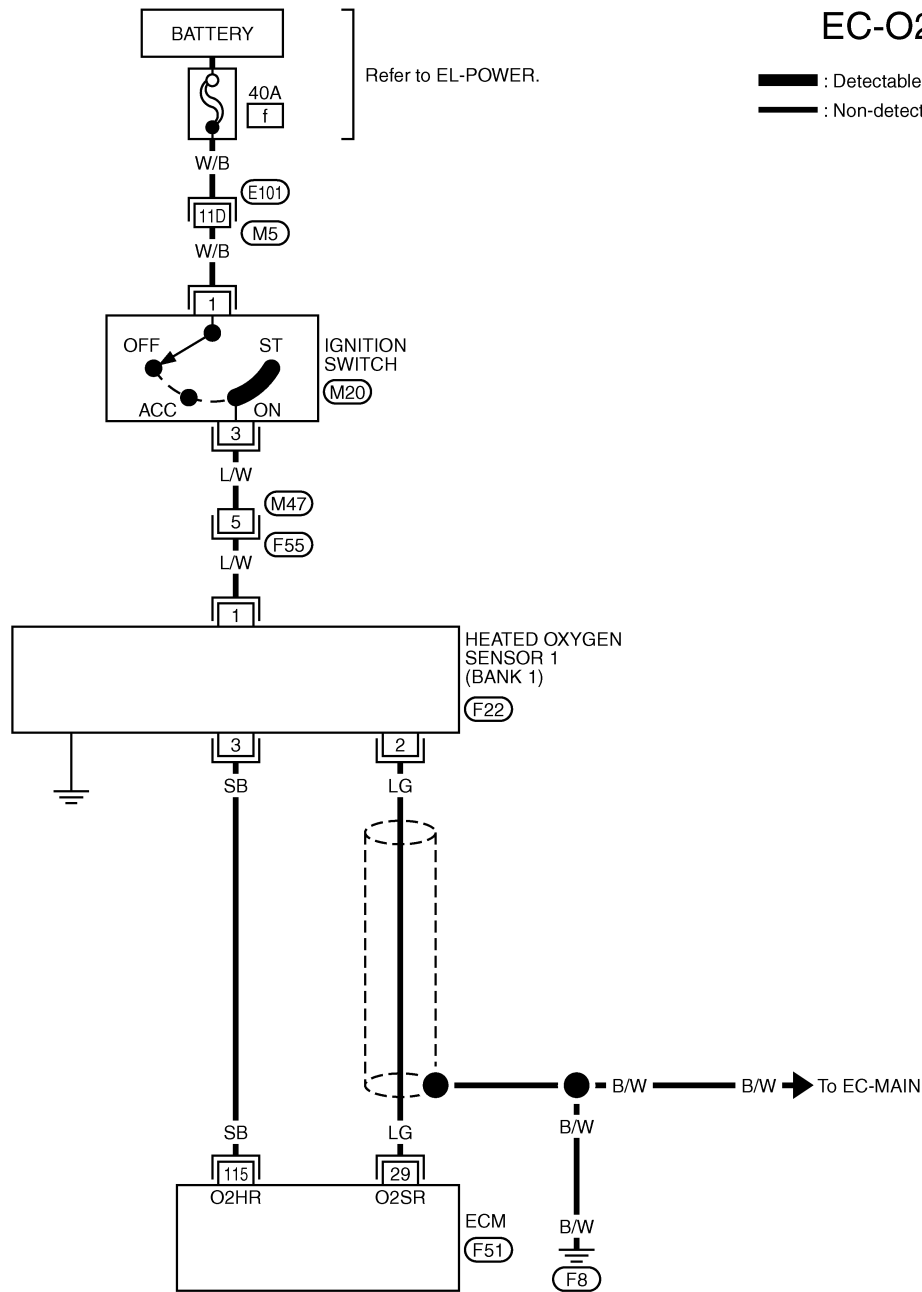
Do not use ECM ground terminals when measuring voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals such as the body ground.

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---------------|------------|-----------------------------|--|----------------------------|
| 115 (B1) | SB | Heated oxygen sensor heater | Engine is running. └ Engine speed is below 3,200 rpm. | 0 - 0.5V |
| 111 (B2) | W/PU | | Engine is running. └ Engine speed is above 3,200 rpm. | BATTERY VOLTAGE (11 - 14V) |

Heated Oxygen Sensor Heater (Cont'd)

BANK 1

EC-O2H1B1-01



| | | |
|---|---|---|
| 1 | 3 | 5 |
| 6 | 2 | 4 |

M20
W

| | | |
|---|---|---|
| 3 | 2 | 1 |
|---|---|---|

F22
GY

| | | | | | | | | |
|---|---|----|----|----|----|----|----|----|
| 1 | 2 | 3 | | 4 | 5 | 6 | 7 | |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

F55

W

F55
W

Refer to last page (Foldout page).

M5, E101

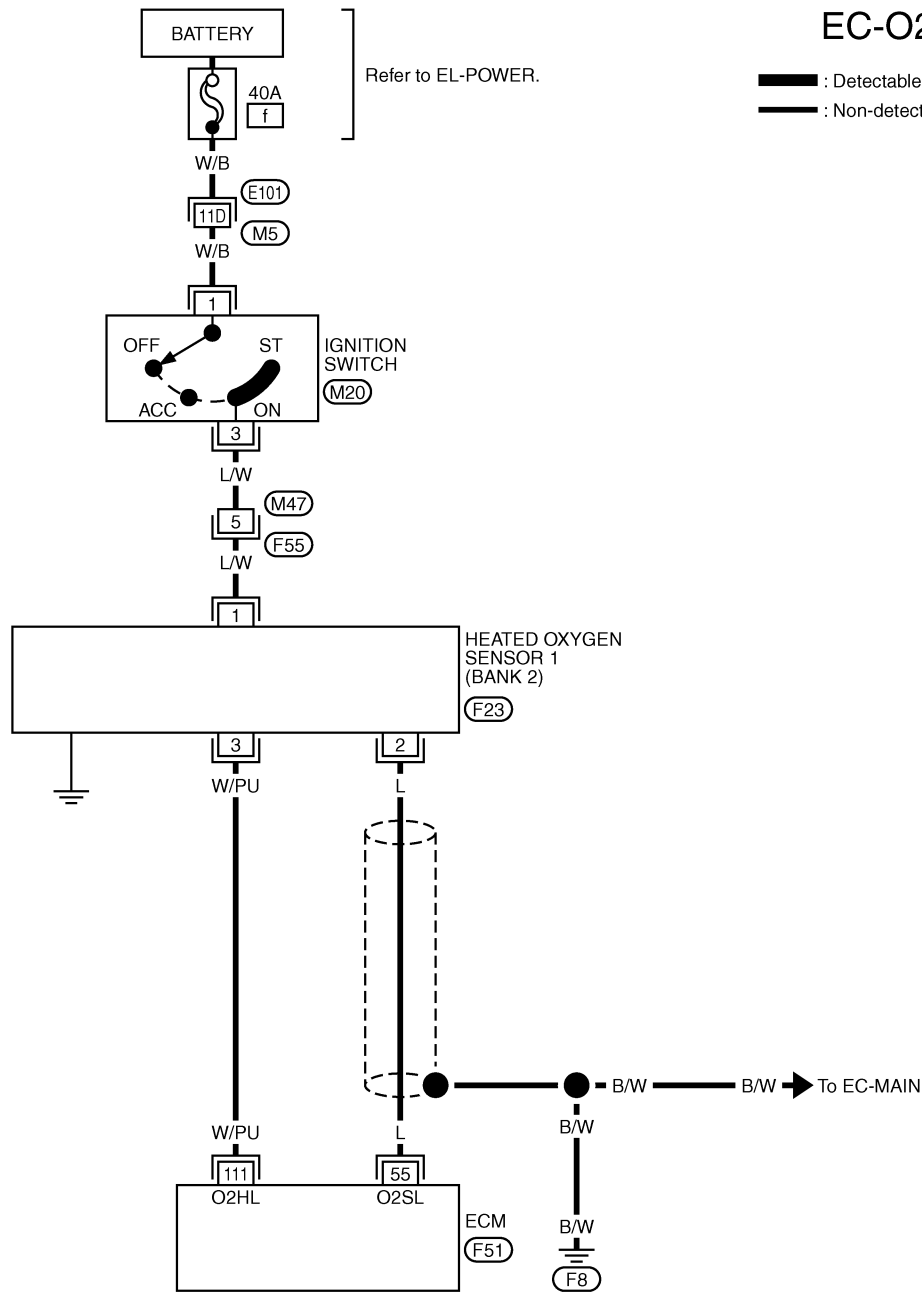
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

F51
W

Heated Oxygen Sensor Heater (Cont'd)

BANK 2

EC-O2H1B2-01



| | | |
|---|---|---|
| 1 | 3 | 5 |
| 6 | 2 | 4 |

M20
W

| | | |
|---|---|---|
| 3 | 2 | 1 |
|---|---|---|

F23
GY

| | | | | | | | | |
|---|---|----|----|----|----|----|----|----|
| 1 | 2 | 3 | | 4 | 5 | 6 | 7 | |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

F55

W

F55
W

Refer to last page (Foldout page).

M5, E101

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

F51
W

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

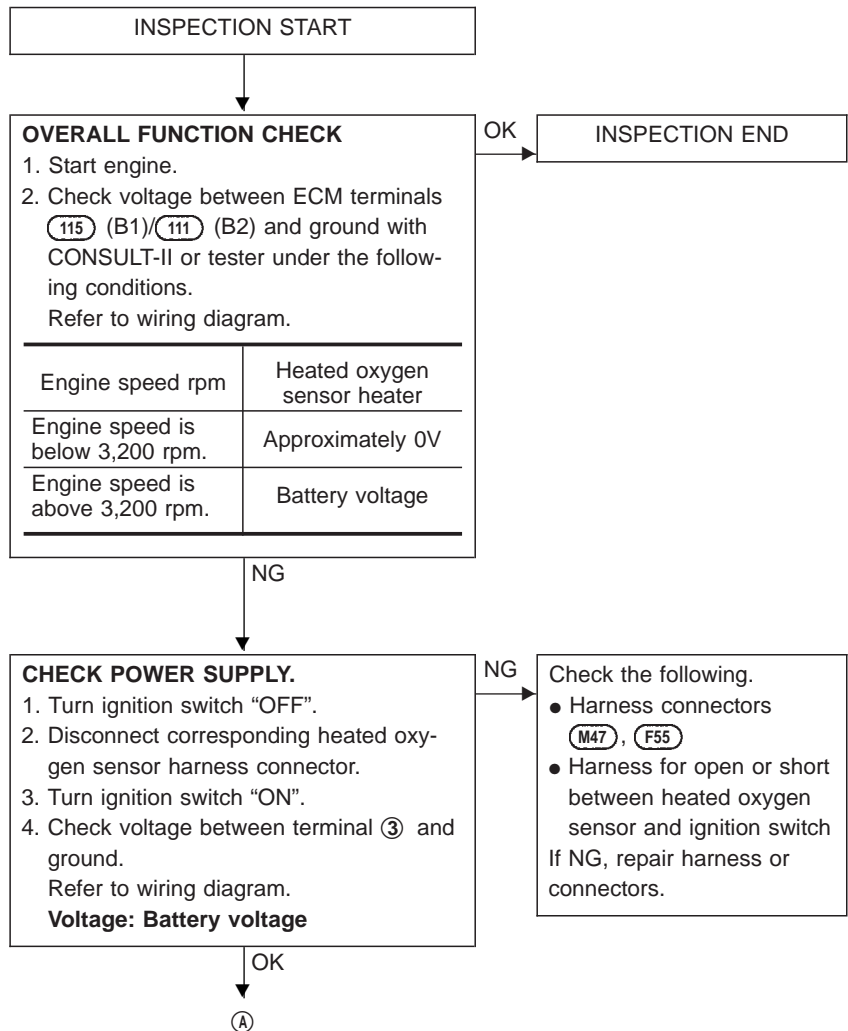
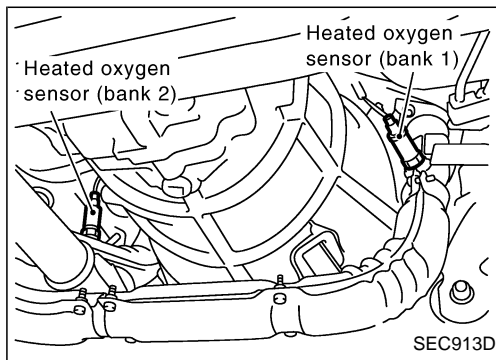
HA

EL

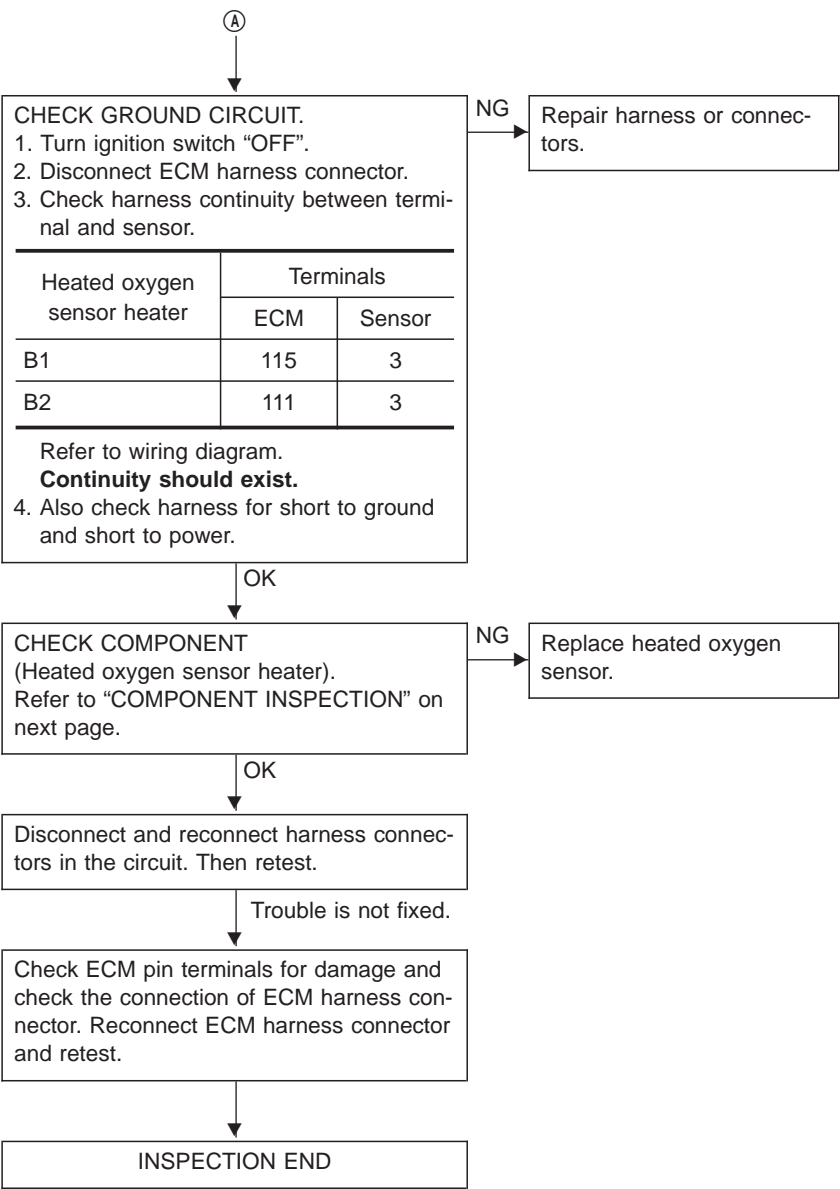
IDX

Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC PROCEDURE



Heated Oxygen Sensor Heater (Cont'd)



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

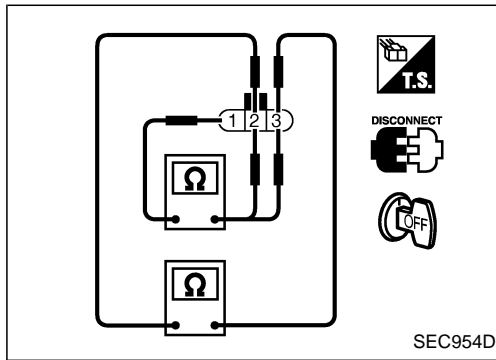
RS

BT

HA

EL

IDX



Heated Oxygen Sensor Heater (Cont'd)

COMPONENT INSPECTION

Heated oxygen sensor heater

Check resistance between terminals ① and ③ .

Resistance: $2.3 - 4.3\Omega$ at 25°C (77°F)

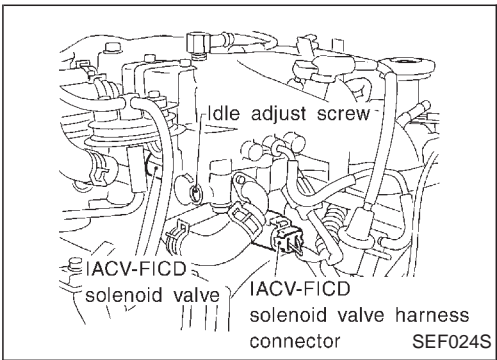
Check continuity between terminals ② and ③ , ① and ② .

Continuity should not exist.

If NG, replace the 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.



IACV-FICD Solenoid Valve

COMPONENT DESCRIPTION

The idle air adjusting (IAA) unit is made up of the IACV-AAC valve, IACV-FICD solenoid valve and idle adjusting screw. It receives the signal from the ECM and controls the idle speed at the preset value. For more information, refer to “DESCRIPTION” in HA section.

ECM TERMINALS AND REFERENCE VALUE

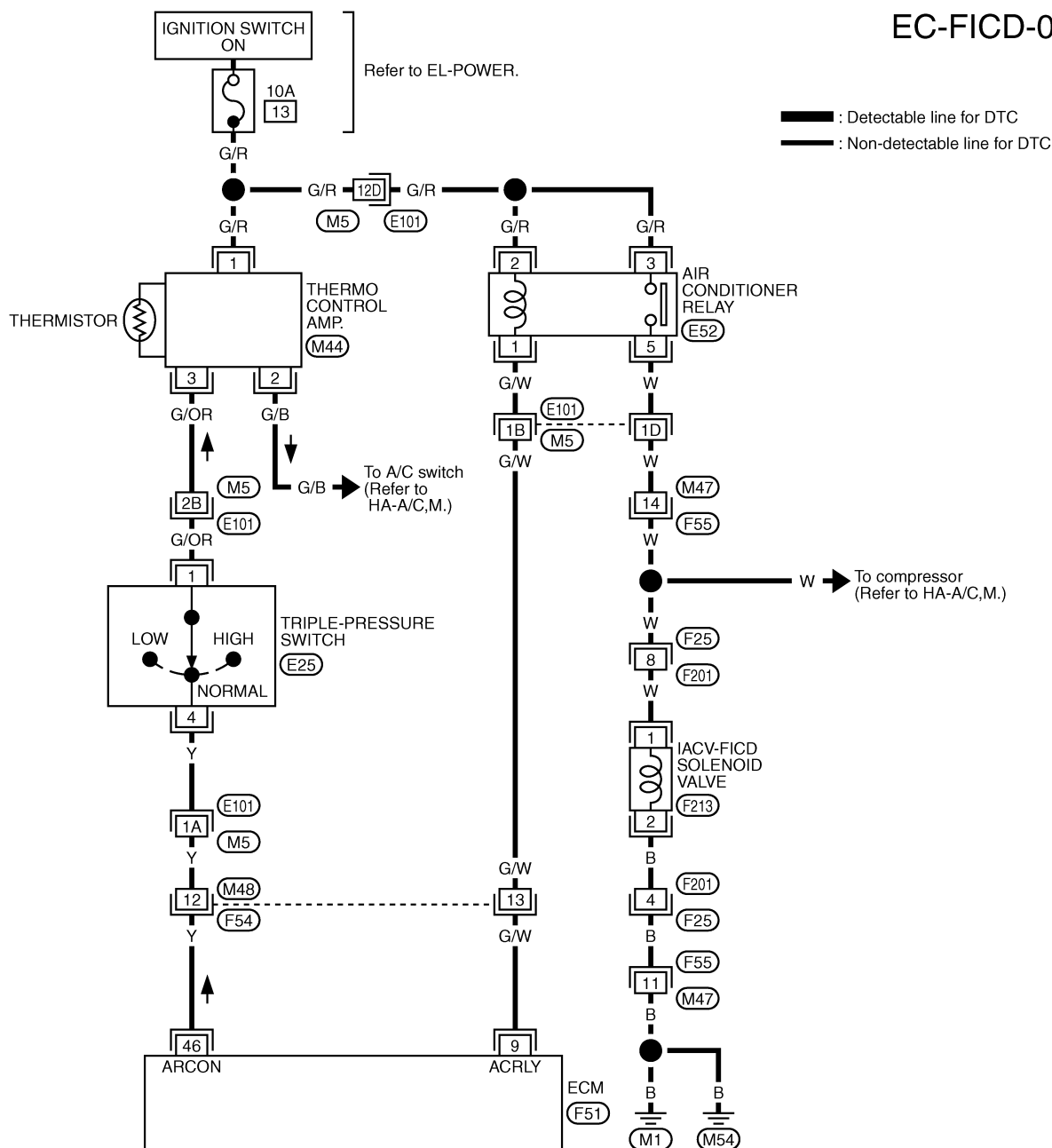
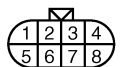
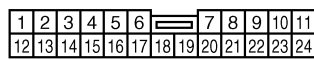
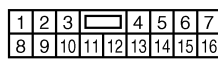
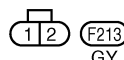
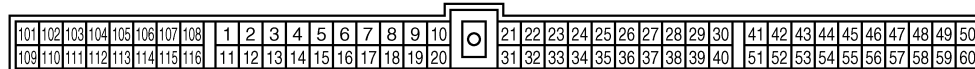
Specification data are reference values and are measured between each terminal and ground with a voltmeter.

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---------------|------------|-----------------------|---|----------------------------|
| 9 | G/W | Air conditioner relay | Engine is running. └ Both air conditioner switch and fan switch are “ON”. (Compressor operates.) | 0 - 1.0V |
| | | | Engine is running. └ Air conditioner switch is “OFF”. | BATTERY VOLTAGE (11 - 14V) |

IACV-FICD Solenoid Valve (Cont'd)

VG33E MODELS

EC-FICD-01

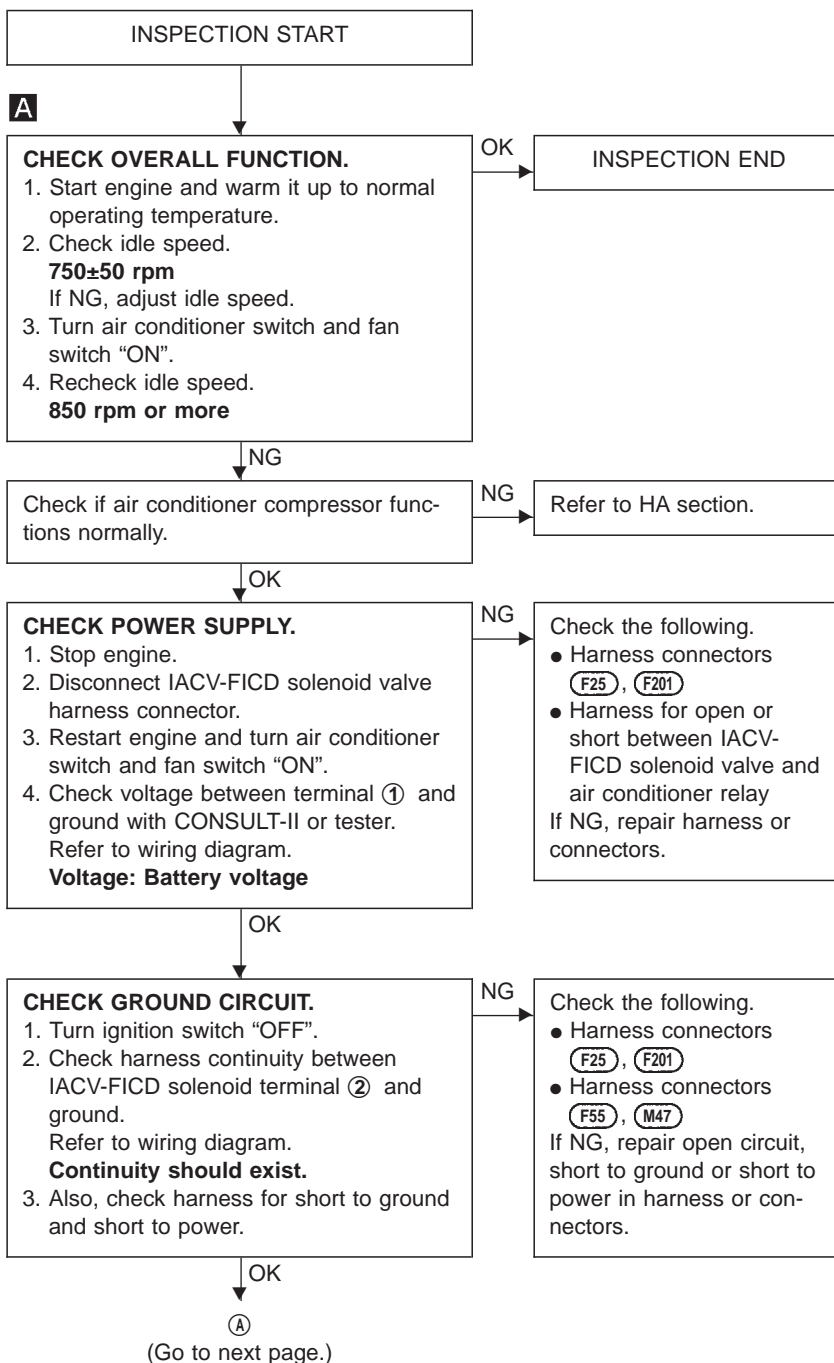
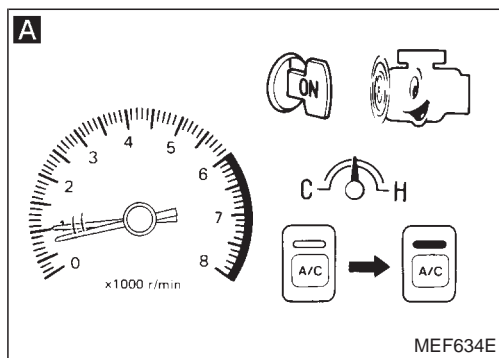
M44
BRE25
GYE52
LF25
SBF54
WF55
WF213
GYF51
W

Refer to last page (Foldout page).

M5, E101

IACV-FICD Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

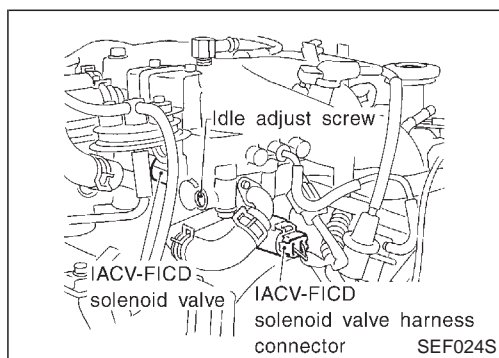
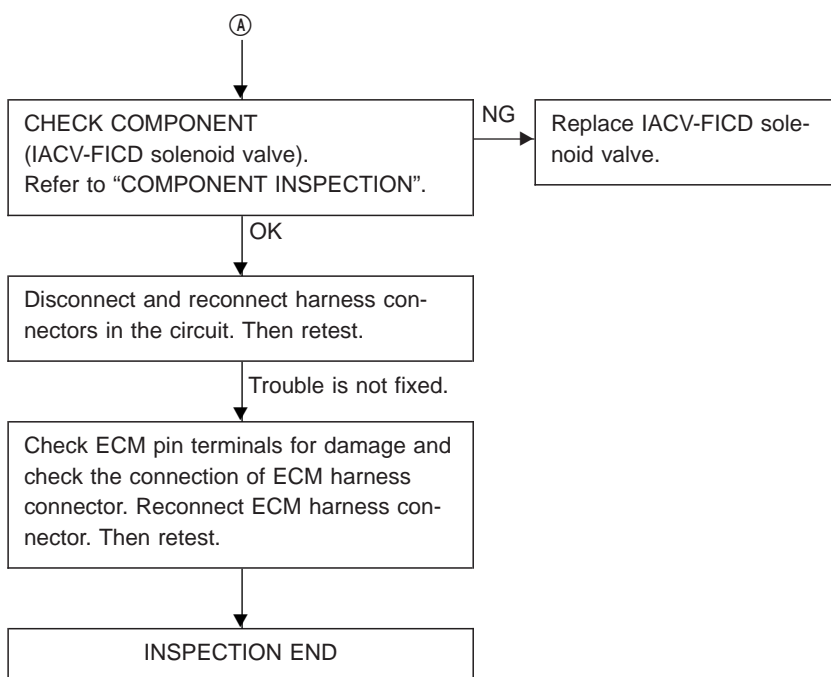
BT

HA

EL

IDX

IACV-FICD Solenoid Valve (Cont'd)

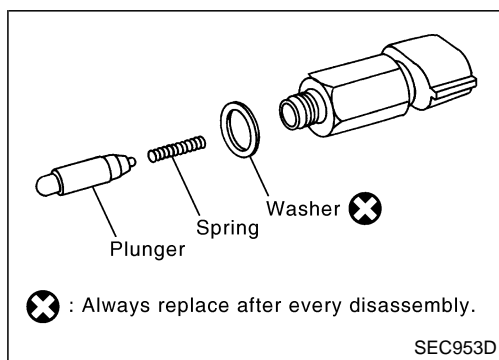


COMPONENT INSPECTION

IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

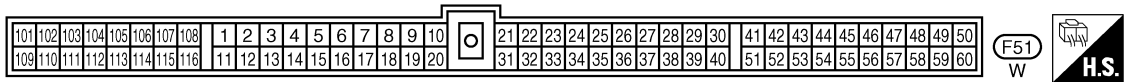
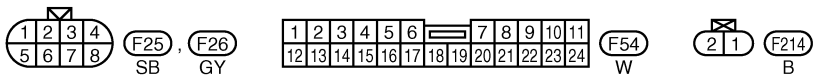
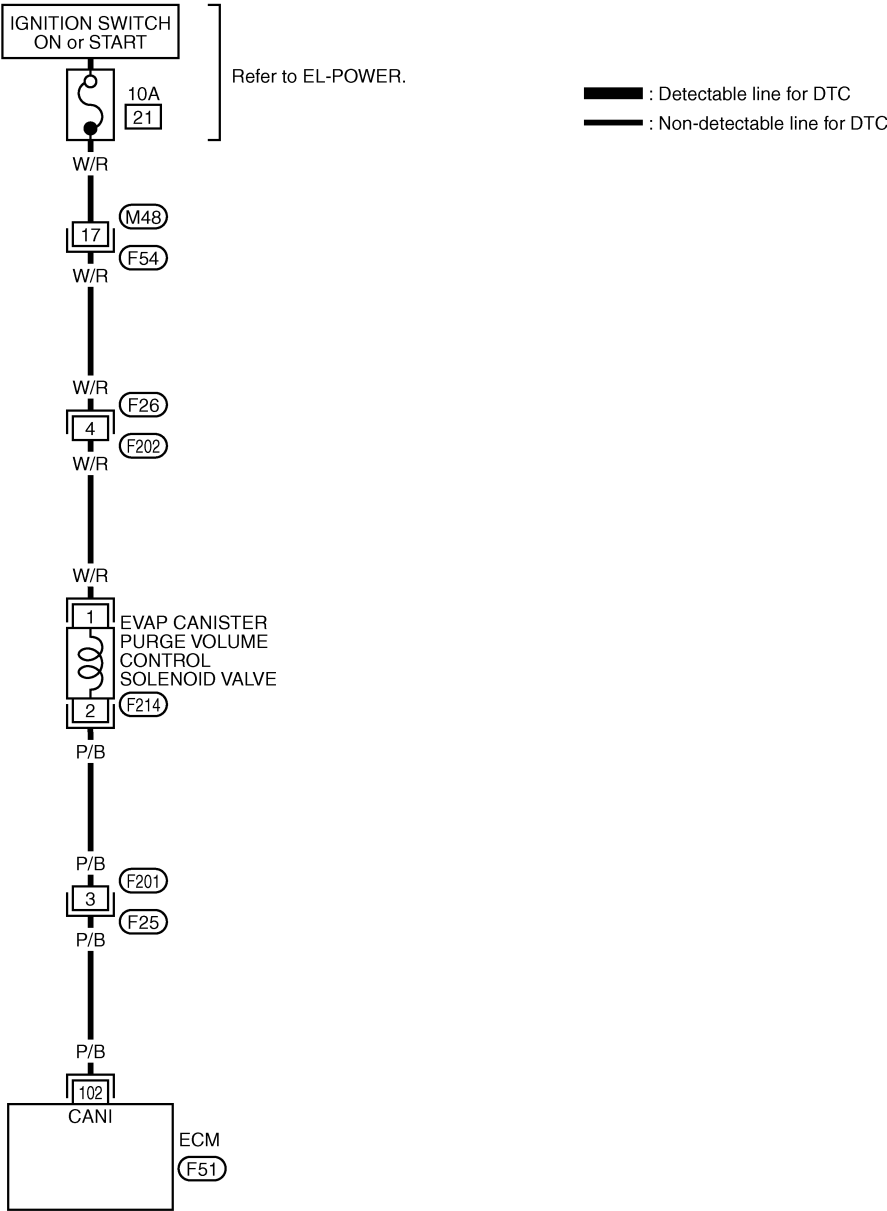
- Check for clicking sound when applying 12V direct current to terminals.



- Check plunger for seizing or sticking.
- Check for broken spring.

EGR Valve and EVAP Canister Purge Volume Control Solenoid Valve — VG33E models —

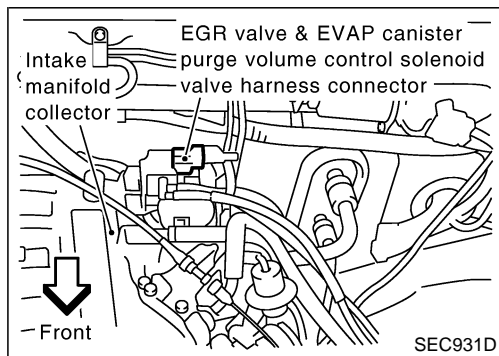
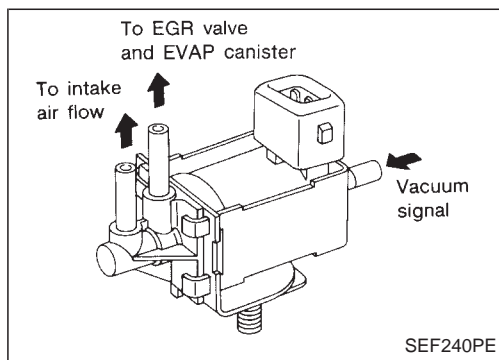
EC-PGC/V-01



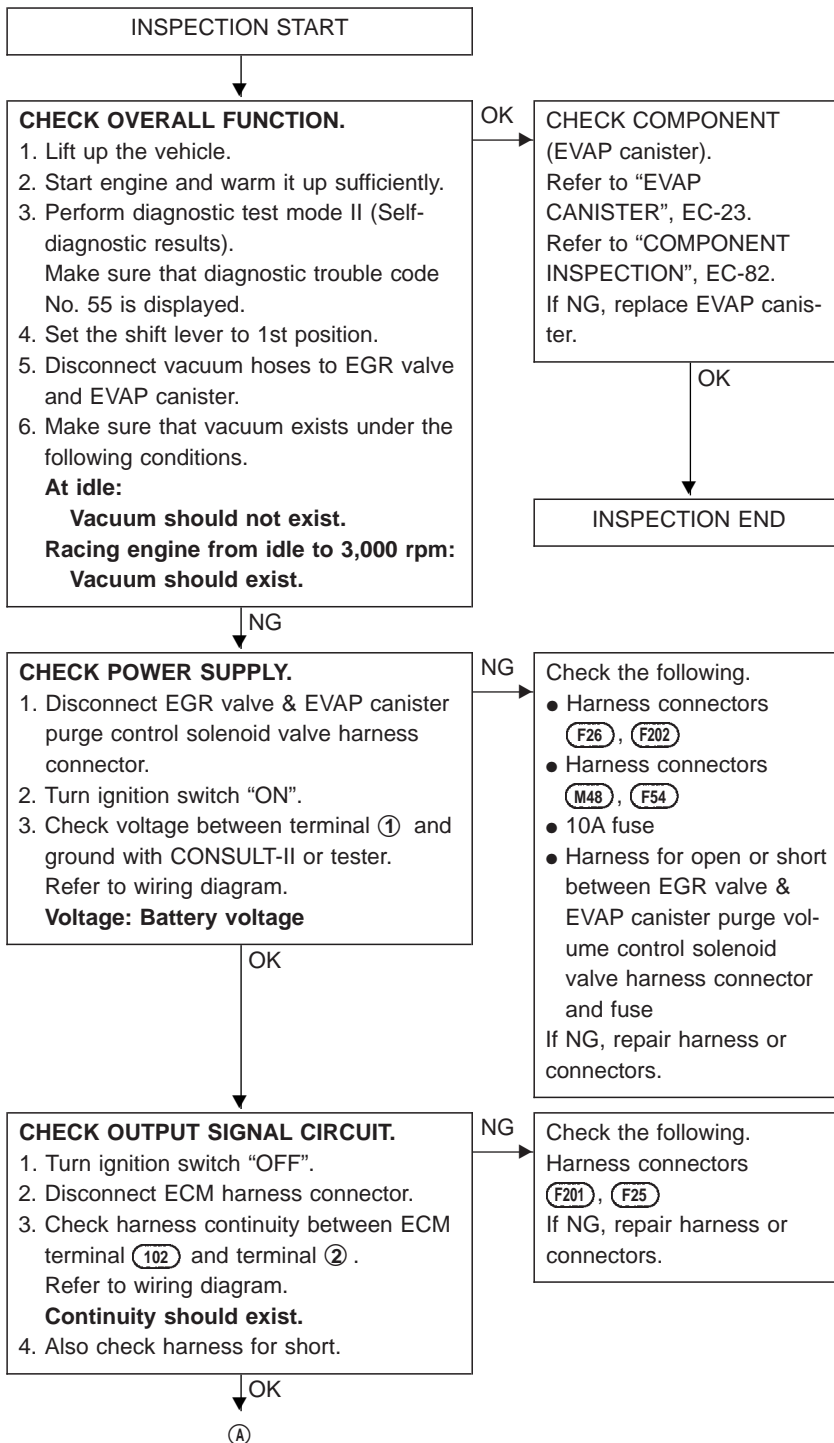
GI
MA
EM
LC
EC
FE
CL
MT
AT
TF
PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX

EGR Valve and EVAP Canister Purge Volume Control Solenoid Valve — VG33E models — (Cont'd)

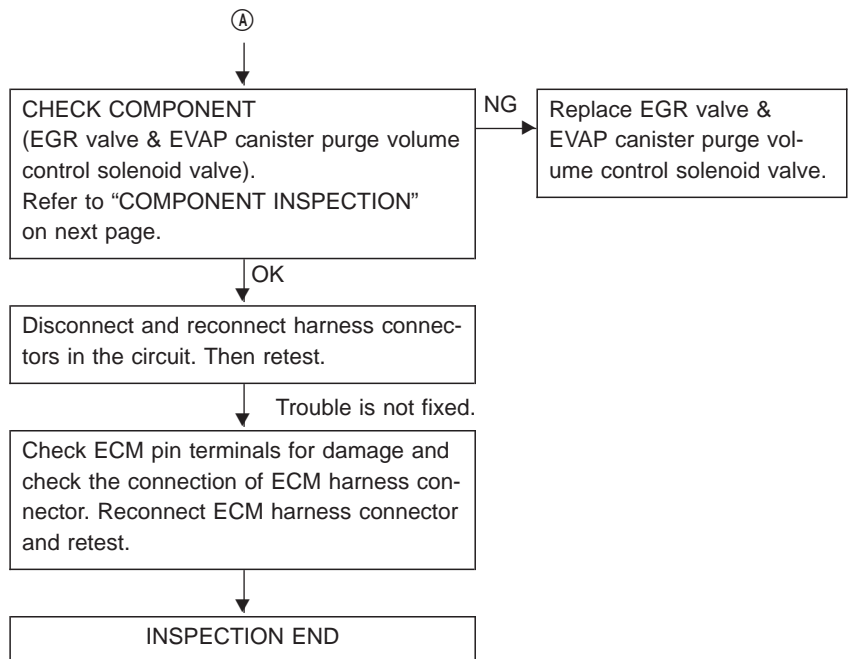
The EGR valve and EVAP canister purge volume control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal from the throttle body to the EGR valve and EVAP canister purge valve. When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve and EVAP canister.



DIAGNOSTIC PROCEDURE



EGR Valve and EVAP Canister Purge Volume Control Solenoid Valve — VG33E models — (Cont'd)



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

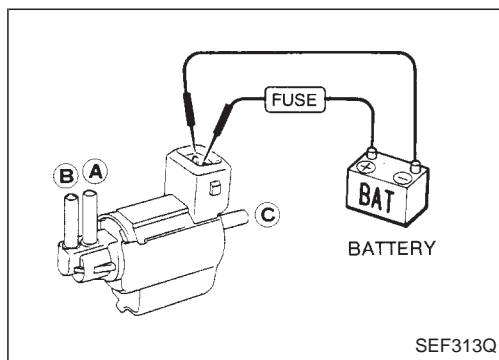
RS

BT

HA

EL

IDX



EGR Valve and EVAP Canister Purge Volume Control Solenoid Valve — VG33E models — (Cont'd)

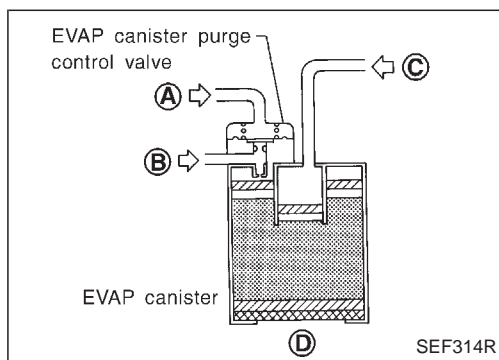
COMPONENT INSPECTION

EGR valve & EVAP canister purge control solenoid valve

Check air passage continuity.

| Condition | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals | Yes | No |
| No supply | No | Yes |

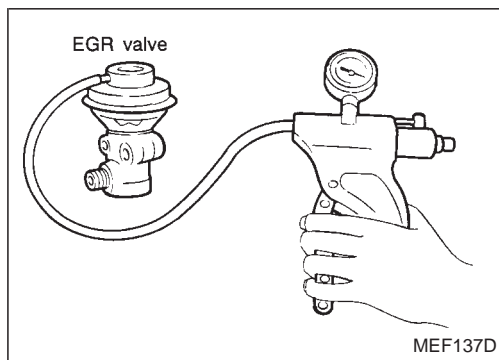
If NG, replace solenoid valve.



EVAP canister purge control valve (built into EVAP canister)

Check EVAP canister purge control valve as follows:

1. Blow air in port (A) and check that there is no leakage.
2.
 - Apply vacuum to port (A). [Approximately -13.3 to -20.0 kPa (-133 to -200 mbar, -100 to -150 mmHg, -3.94 to -5.91 inHg)]
 - Cover port (D) by hand.
 - Blow air in port (C) and check that it flows freely out of port (B).

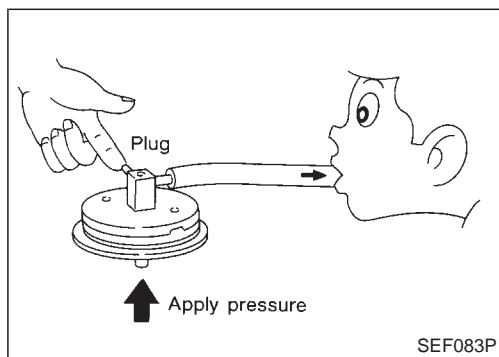


EGR valve

Apply vacuum to EGR vacuum port with a hand vacuum pump.

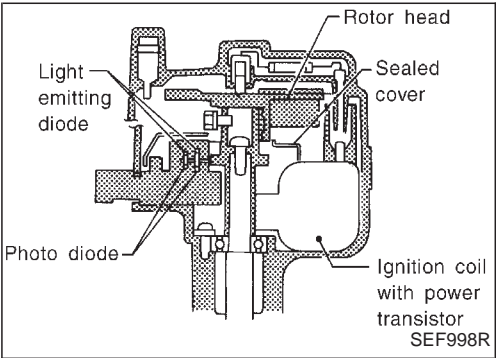
EGR valve spring should lift.

If NG, replace EGR valve.



EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (9.81 mbar, 100 mmH₂O, 3.94 inH₂O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor

The ignition signal from the ECM is sent to the power transistor. The power transistor switches on and off the ignition coil primary circuit. As the primary circuit is turned on and off, the proper high voltage is induced in the coil secondary circuit.

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

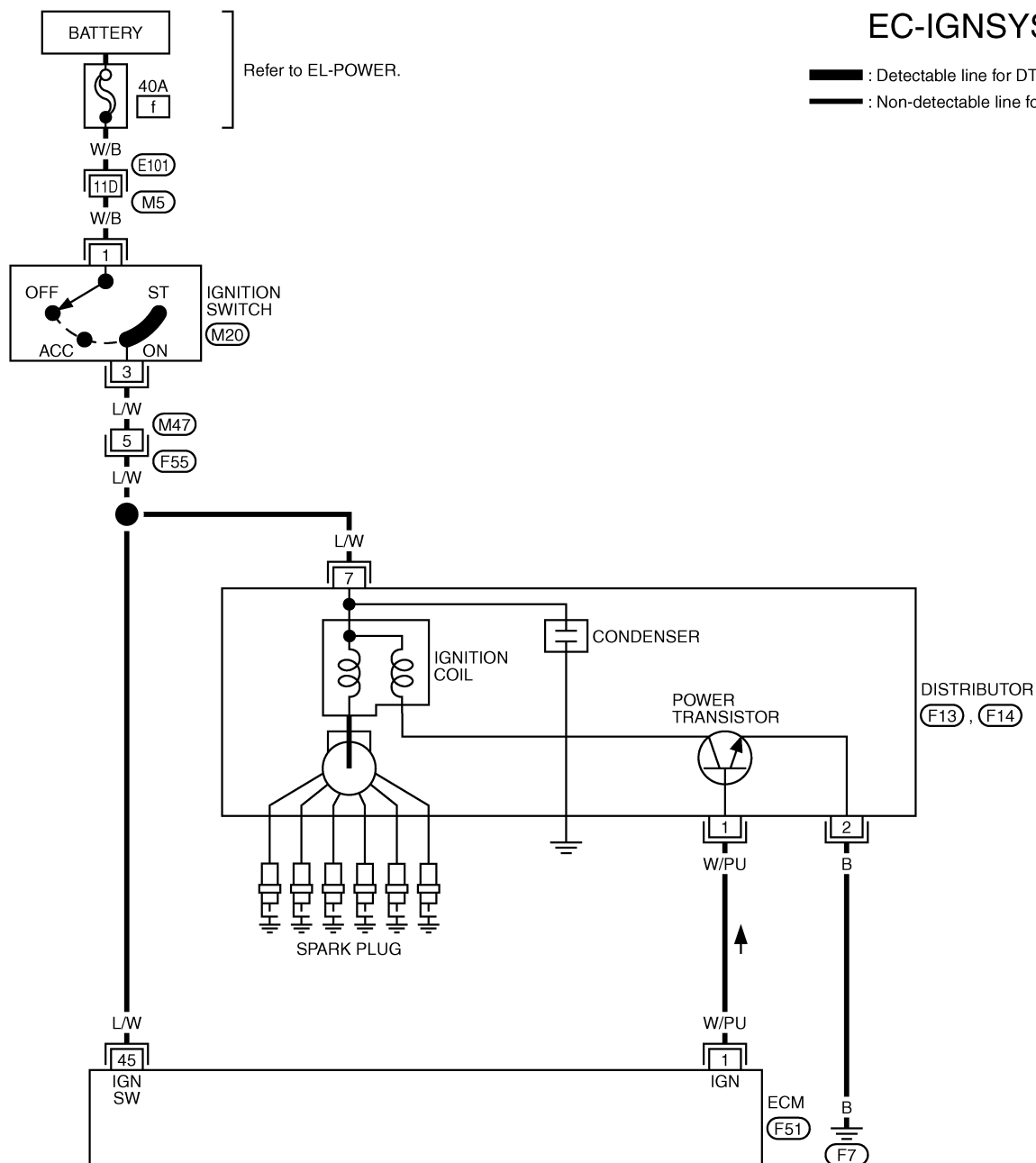
EL

IDX

Ignition Signal (Cont'd)

VG33E MODELS

EC-IGNSYS-01



| | | |
|---|---|---|
| 1 | 3 | 5 |
| 6 | 2 | 4 |

M20
W

| | | | | | |
|-----------|---|-----------|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| F14 GY | | | | | |
| 7 | 8 | F13 GY | | | |

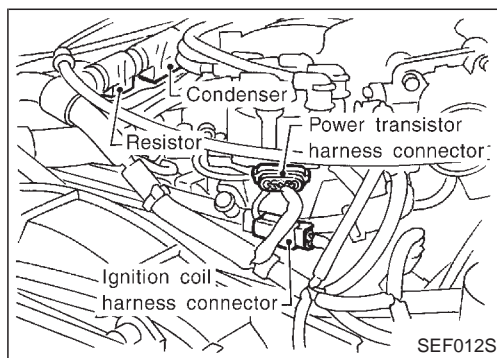
| | | | | | | |
|----|----|----------|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| 15 | 16 | F55 W | | | | |

Refer to last page (Foldout page).

M5, E101

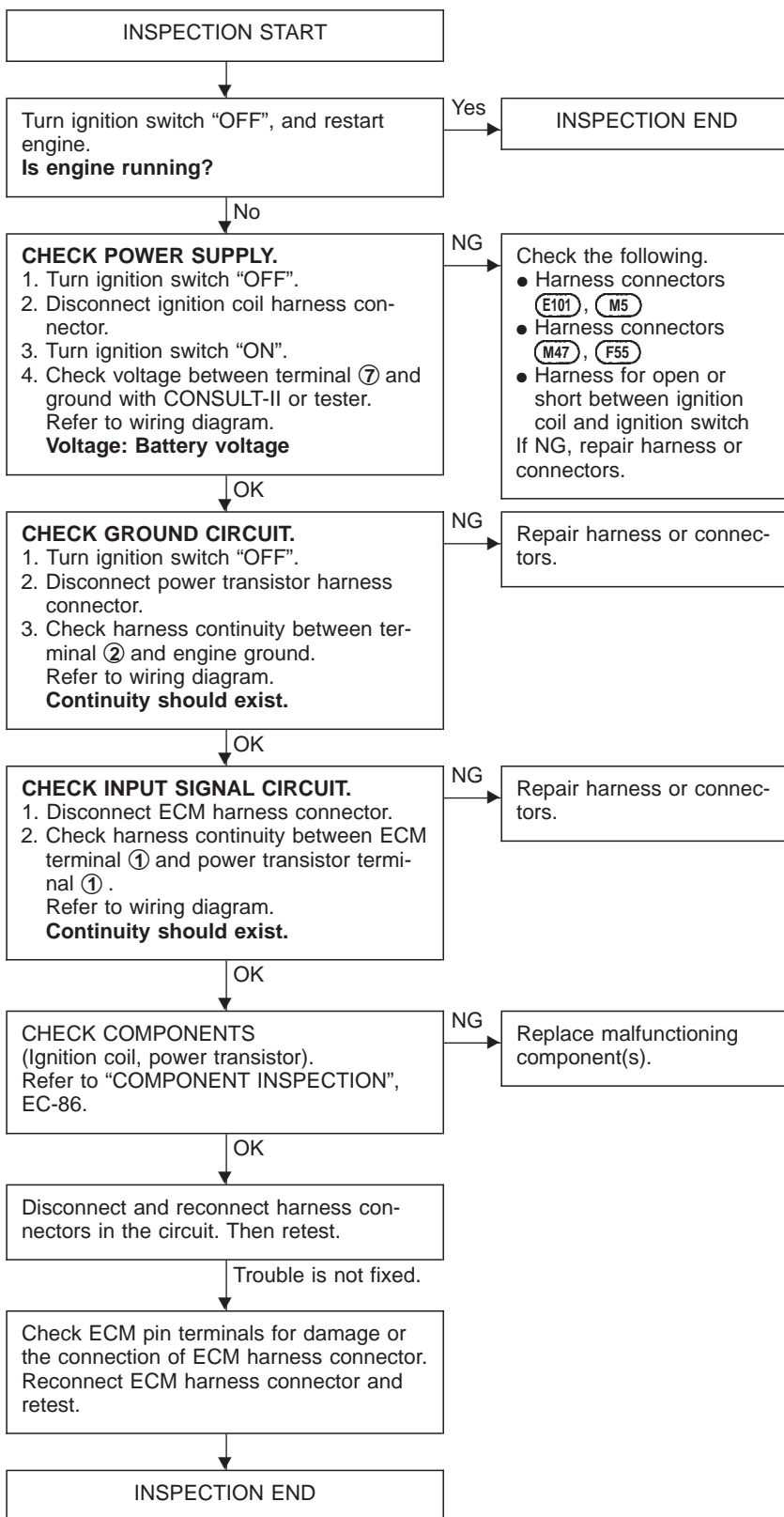
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |

F51
W



Ignition Signal (Cont'd)

DIAGNOSTIC PROCEDURE



GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

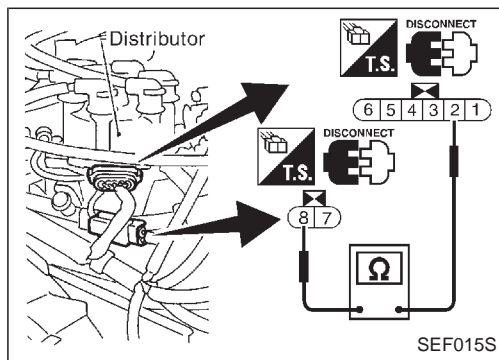
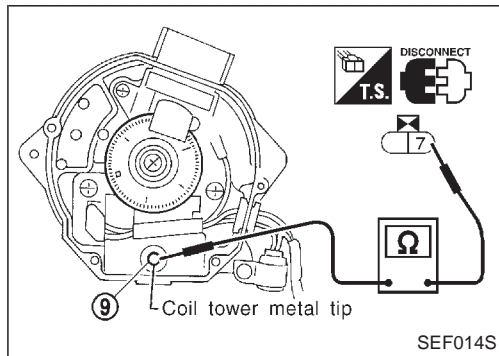
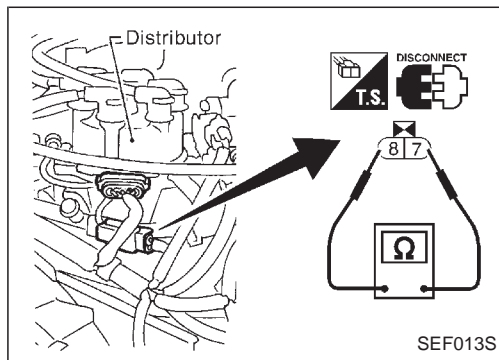
RS

BT

HA

EL

IDX



Ignition Signal (Cont'd)

COMPONENT INSPECTION

Ignition coil

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

| Terminal | Resistance [at 25°C (77°F)] |
|------------------------|-----------------------------|
| ⑦ - ⑧ (Primary coil) | 0.5 - 1.0 Ω |
| ⑦ - ⑨ (Secondary coil) | Approximately 10 kΩ |

For checking secondary coil, remove distributor cap and measure resistance between coil tower metal tip ⑨ and terminal ⑦.

If NG, replace distributor assembly as a unit.

Power transistor

1. Disconnect camshaft position sensor & power transistor harness connector and ignition coil harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

| Terminals | Resistance | Result |
|-----------|------------|--------|
| ② and ⑧ | Except 0Ω | OK |
| | 0Ω | NG |

If NG, replace distributor assembly.

IDX

EC



EC-INJECT-02



General Specifications

VG33E MODELS

PRESSURE REGULATOR

| | |
|--|--------------------------------------|
| Fuel pressure kPa (bar, kg/cm ² , psi) | |
| At idle | Approximately 235 (2.35, 2.4, 34) |
| A few seconds after ignition switch is turned OFF to ON | Approximately 294 (2.94, 3.0, 43) |

Inspection and Adjustment

| | | |
|--|--|------------------|
| Idle speed*1 rpm (in "N" position) | Base idle speed*2 Target idle speed | 700±50 750±50 |
| Air conditioner: ON (in "N" position) | 850 or more | |
| Ignition timing | 10°±2° BTDC | |
| Idle CO% at target idle speed | 0.1 | |

*1: Under the following conditions:

- Air conditioner switch: OFF
- Steering wheel: Kept in straight-ahead position
- Electrical load: OFF (Lights, heater fan & rear window defogger)

*2: Throttle position sensor connector is disconnected.

MASS AIR FLOW SENSOR

| | | |
|------------------------|---|---|
| Supply voltage | V | Battery voltage (11 - 14) |
| Output voltage at idle | V | 1.0 - 1.7 at idle* 1.7 - 2.3 at 2,500 rpm* |

*: Engine is warmed up to normal operating temperature and running under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

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

FUEL PUMP

| | | |
|-----------------------------|---|-----------|
| Resistance [at 25°C (77°F)] | Ω | 0.2 - 5.0 |
|-----------------------------|---|-----------|

IACV-AAC VALVE

| | | |
|-----------------------------|---|--------------------|
| Resistance [at 25°C (77°F)] | Ω | Approximately 10.0 |
|-----------------------------|---|--------------------|

INJECTOR

| | | |
|-----------------------------|---|---------|
| Resistance [at 25°C (77°F)] | Ω | 10 - 14 |
|-----------------------------|---|---------|

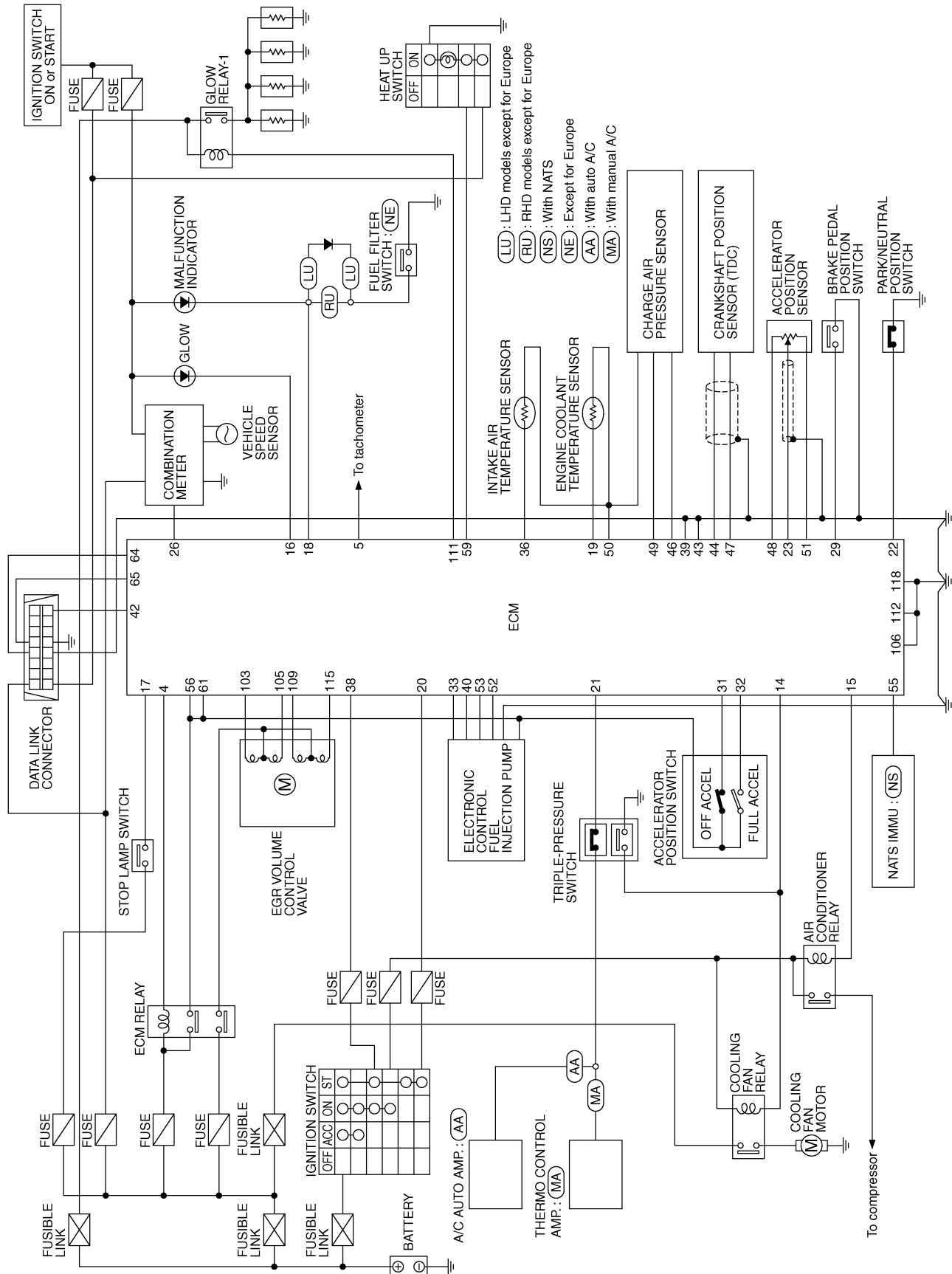
IGNITION COIL

| | | |
|--|----|-------------------|
| Primary voltage | V | 12 |
| Primary resistance [at 20°C (68°F)] | Ω | Approximately 1.0 |
| Secondary resistance [at 20°C (68°F)] | kΩ | Approximately 10 |

THROTTLE POSITION SENSOR

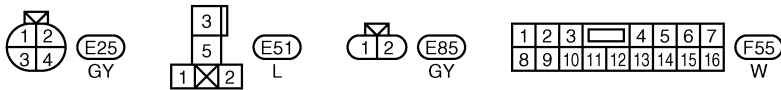
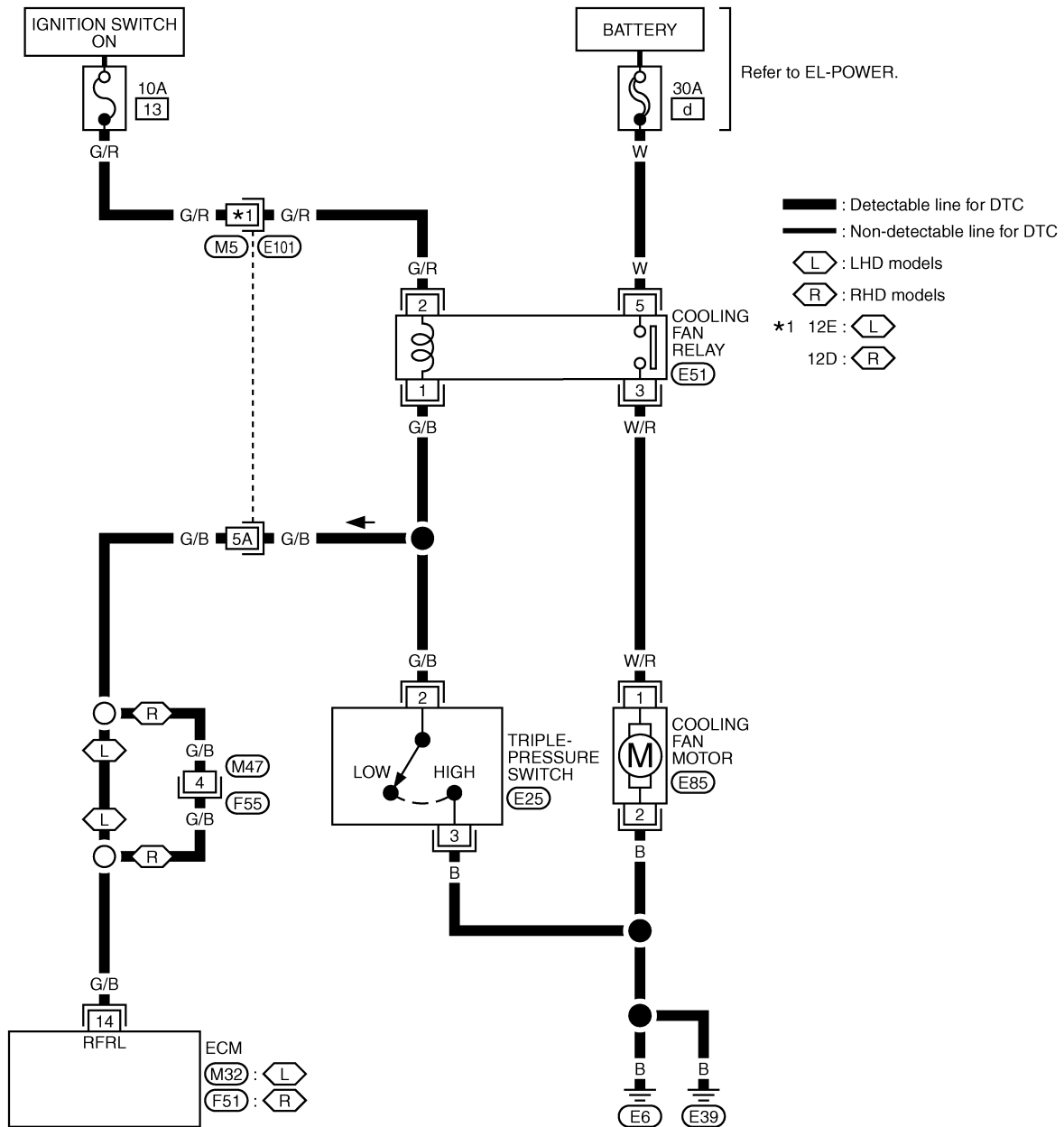
| | |
|---------------------------|---------------------|
| Throttle valve conditions | Voltage |
| Completely closed (a) | 0.15 - 0.85V |
| Partially open | Between (a) and (b) |
| Completely open (b) | Approximately 4.0V |

Circuit Diagram



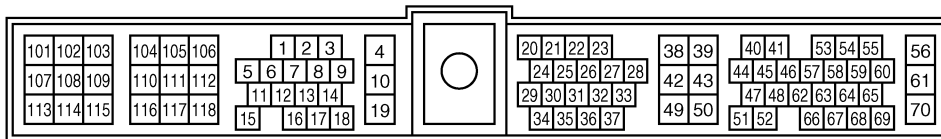
Wiring Diagram

EC-COOL/F-01



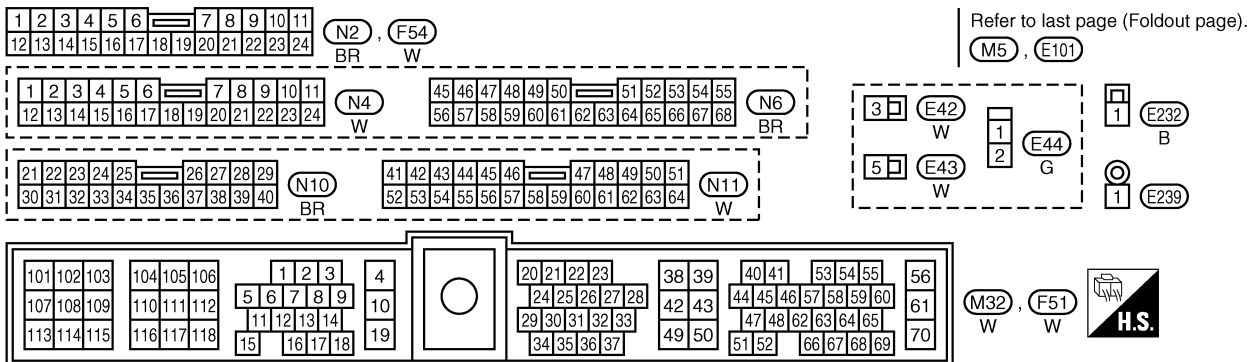
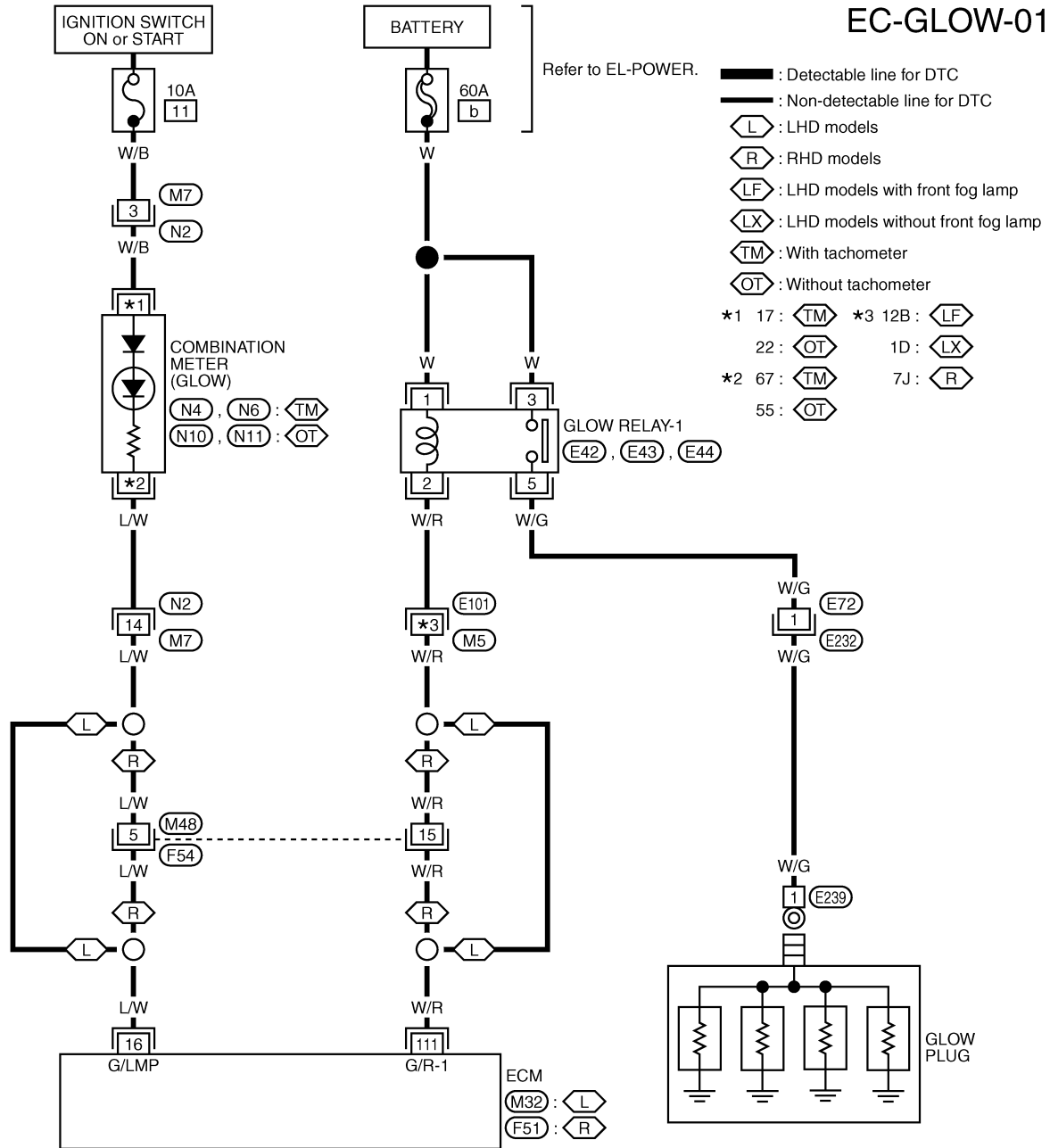
Refer to last page (Foldout page).

(M5), (E101)

(M32), (F51)
W W

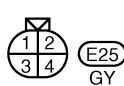
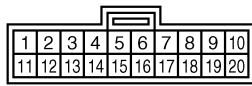
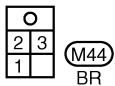
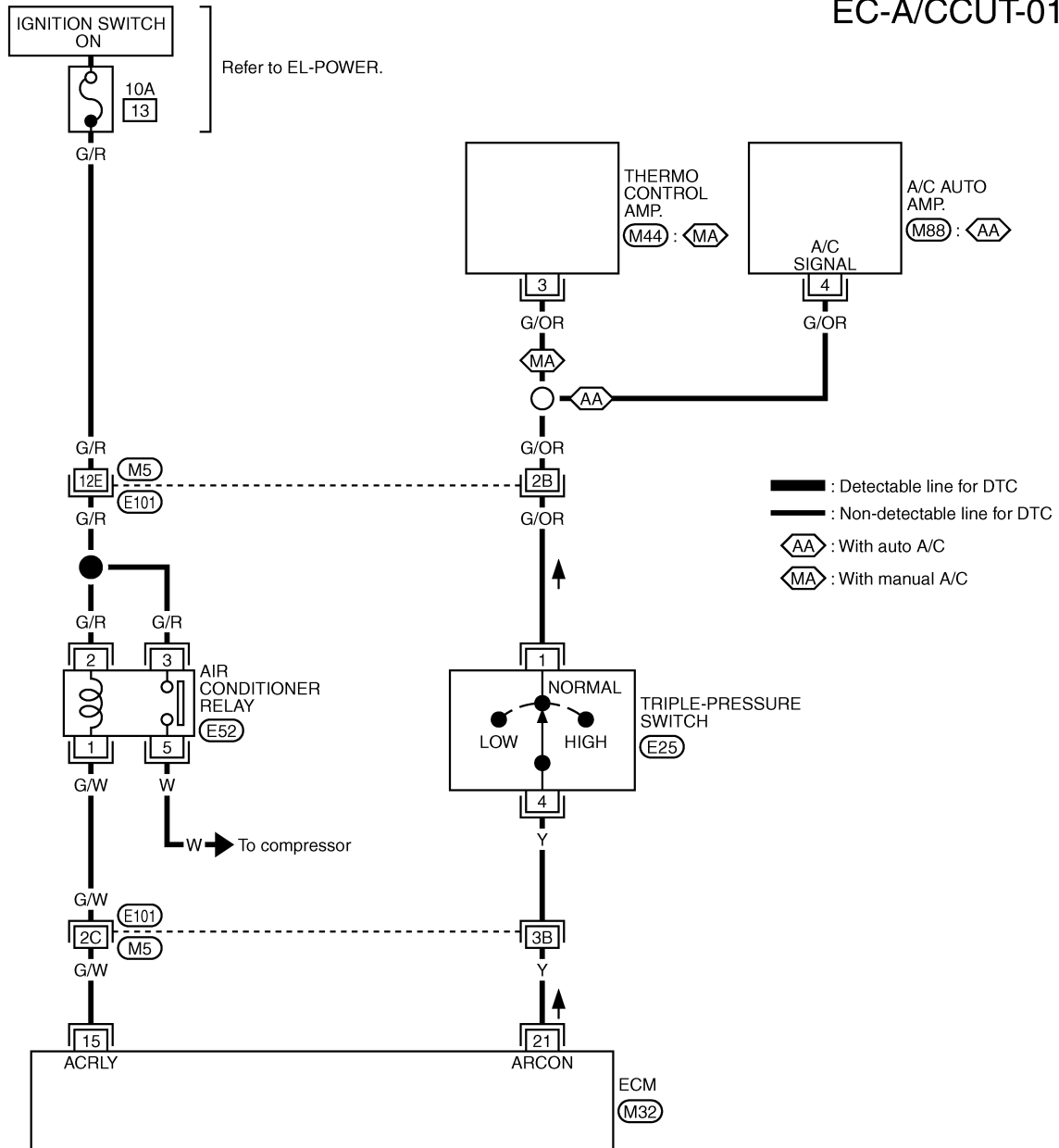
Wiring Diagram

EC-GLOW-01



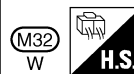
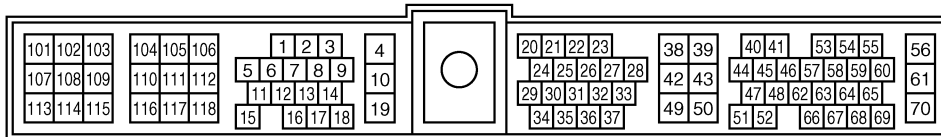
Wiring Diagram

EC-A/CCUT-01



Refer to last page (foldout page).

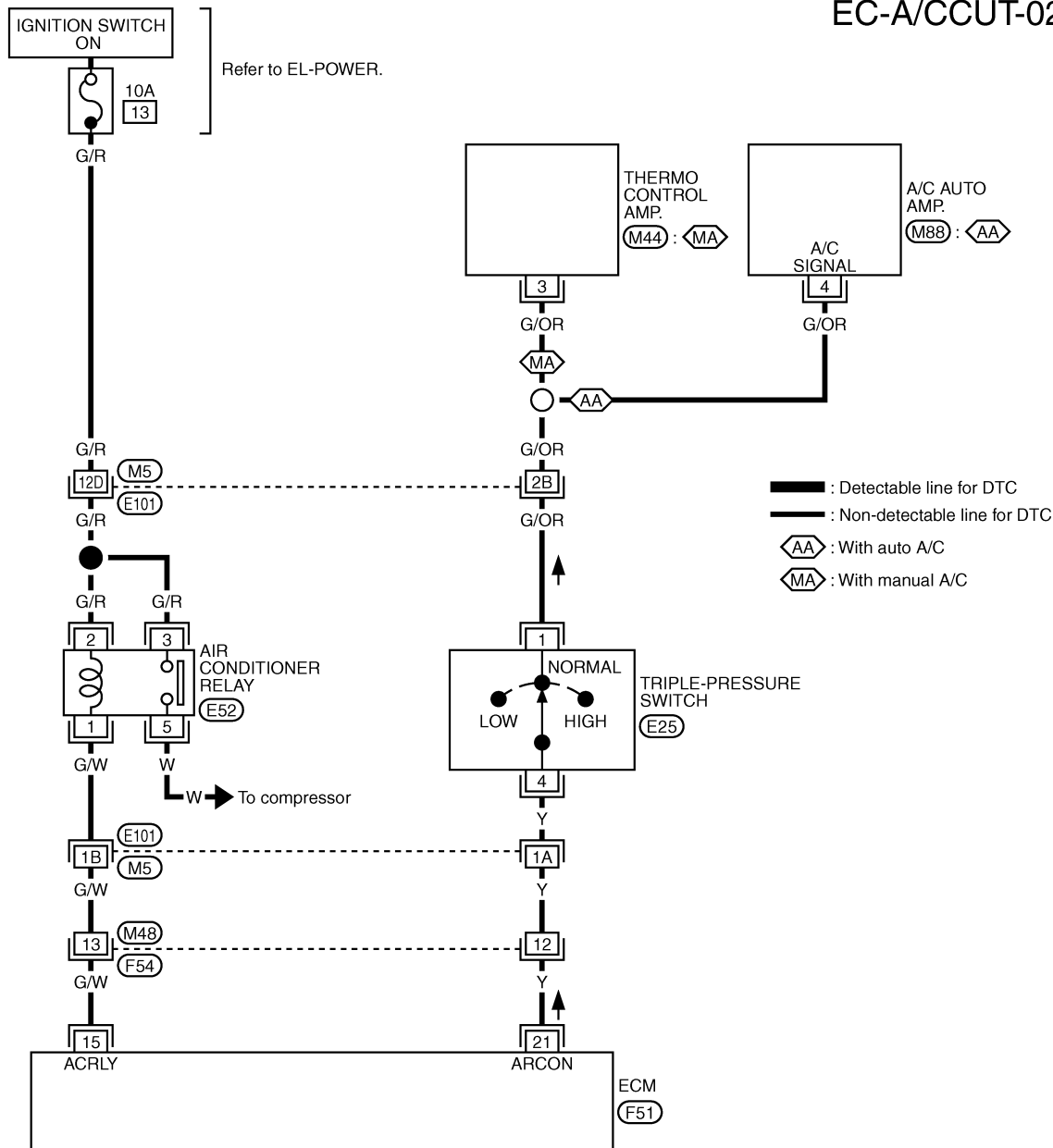
(M5), (E101)



AIR CONDITIONER CONTROL Wiring Diagram (Cont'd)

YD25DDTi

EC-A/CCUT-02

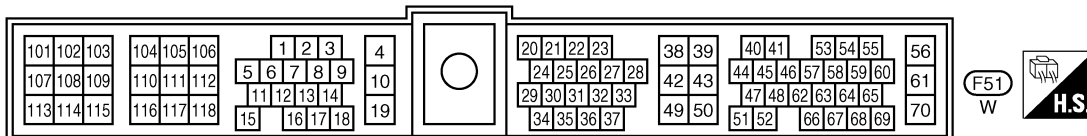
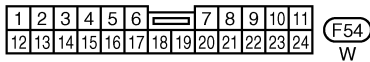


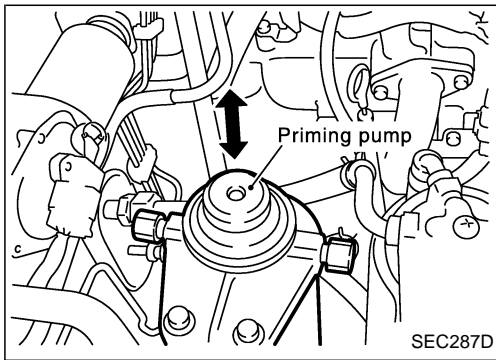
GI
MA
EM
LC
EC
FE
CL
MT
AT
TF
PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX



Refer to last page (foldout page).

(M5), (E101)

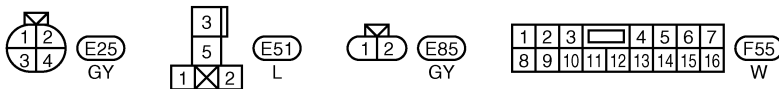
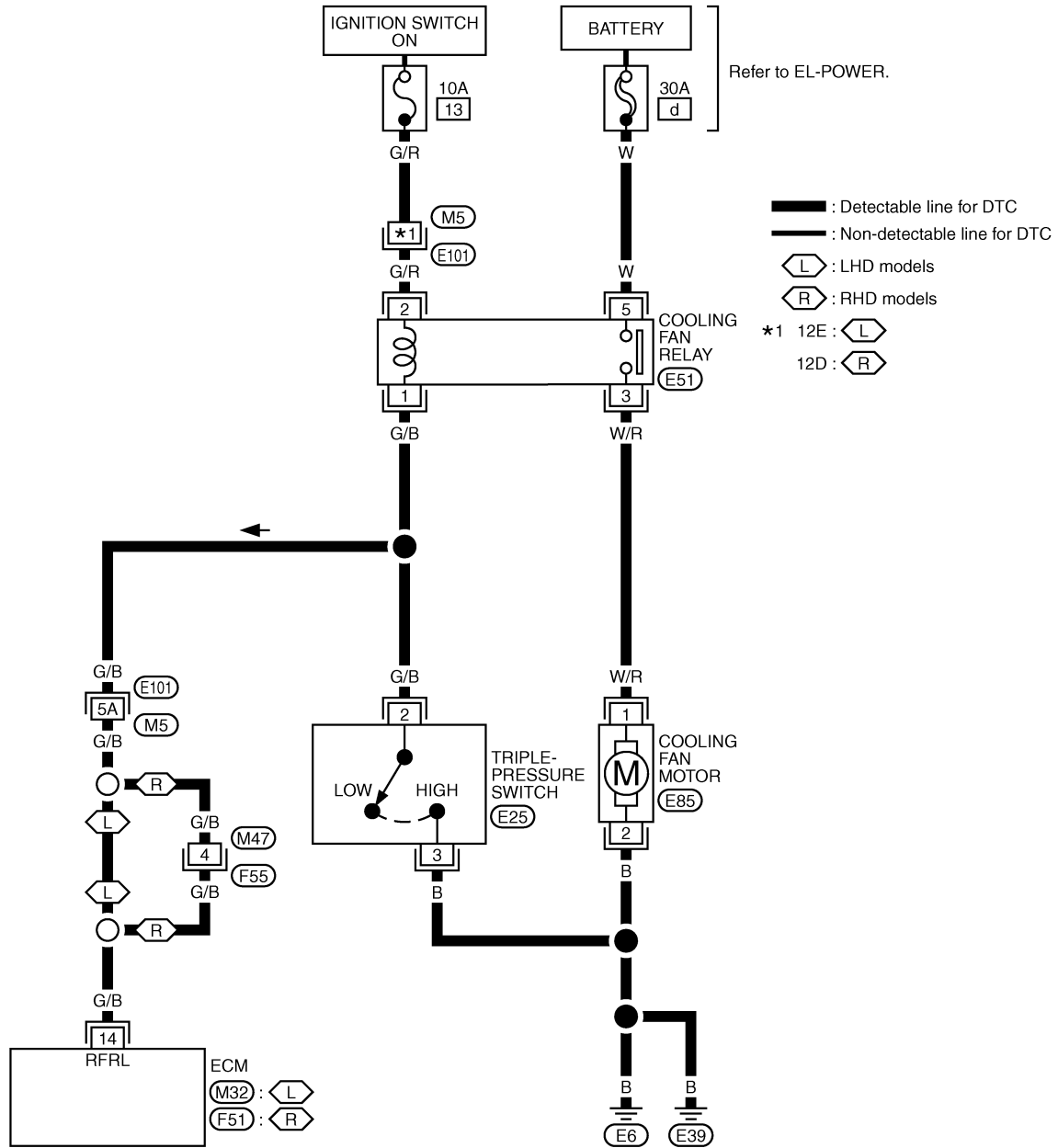




Air Bleeding

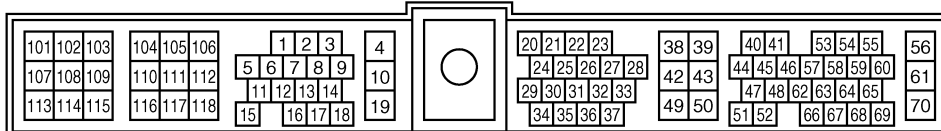
1. After the repair, bleed air from the piping by pumping the priming pump up and down until it becomes heavy.
 2. To start the engine, rotate the starter for a maximum of 30 seconds. To start the engine more quickly, crank the engine while pumping the priming pump (requires two workers).
 3. If the engine does not start after rotating the starter for a maximum of 30 seconds, stop it once, and pump the priming pump again until it becomes heavy.
 4. Rotate the starter again until the engine starts running.
 5. After the engine starts, let it idle for at least 1 minute to stabilize the behavior.
- **When air is bled completely, the pumping of the priming pump suddenly becomes heavy. Stop the operation at that time.**
 - **If it is difficult to bleed air by the pumping of the priming pump (the pumping of the priming pump does not become heavy), disconnect the fuel supply hose between the fuel filter and the injection pump. Then, perform the operation described above, and make sure that fuel comes out. (Use a pan, etc. so as not to spill fuel. Do not let fuel get on engine and other parts.) After that, connect the hose, then bleed air again.**
 - **Start engine and let it idle for at least one minute after performing air bleeding.**

EC-COOL/F-01



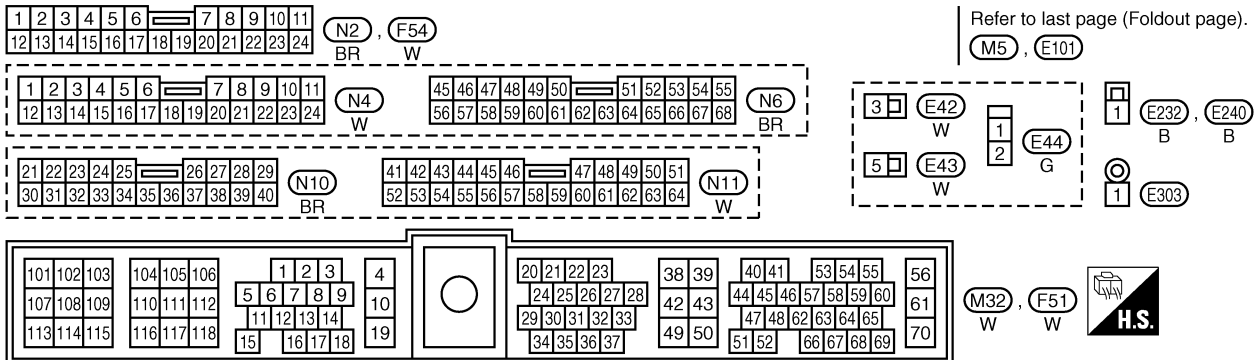
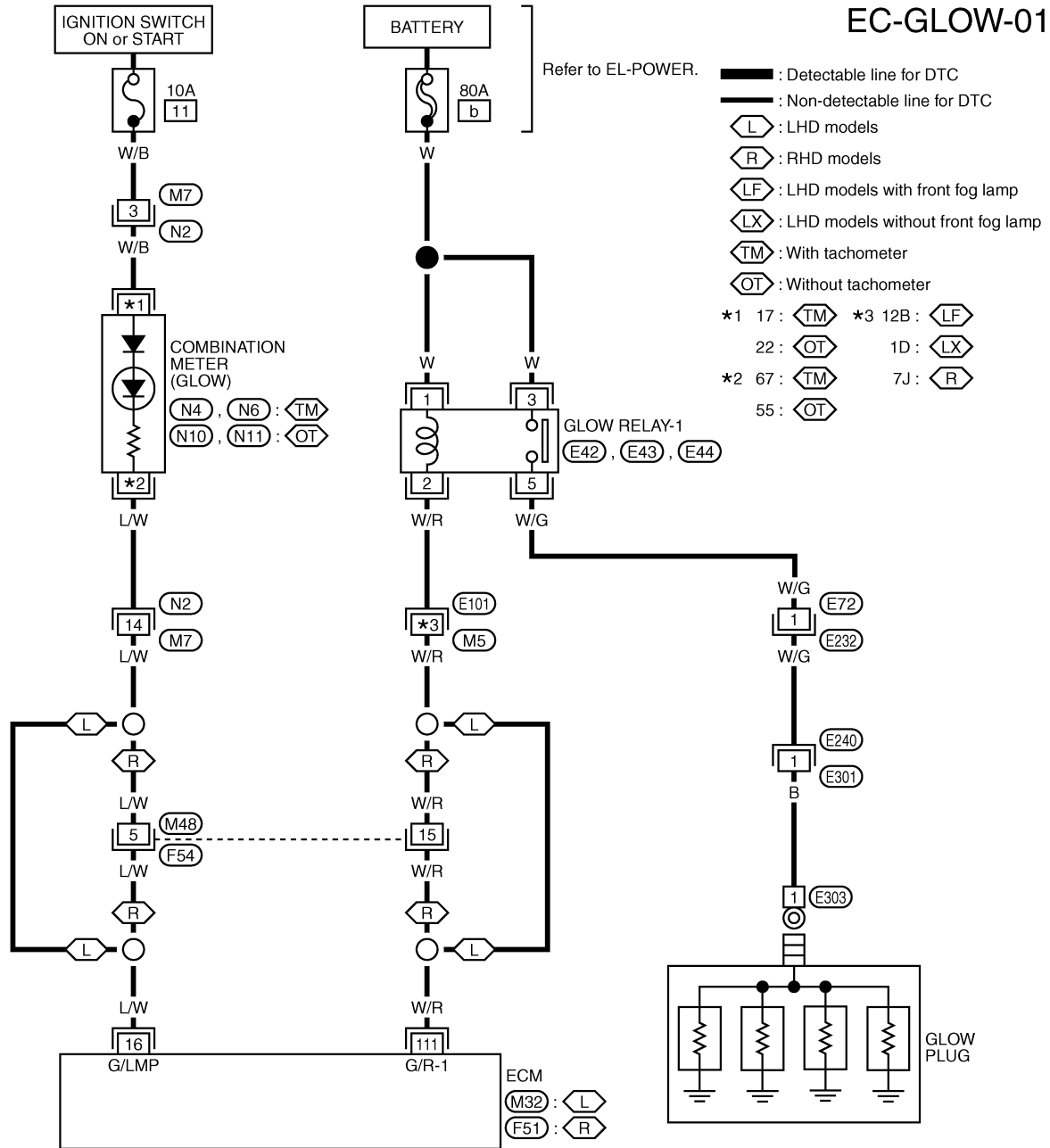
Refer to last page (Foldout page).

(M5), (E101)



Wiring Diagram

EC-GLOW-01



Load Timer Adjustment

This adjustment is not applied to the QD engine models.

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

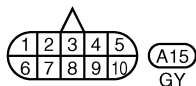
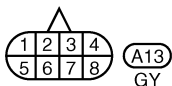
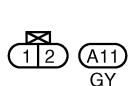
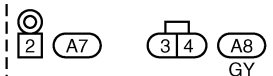
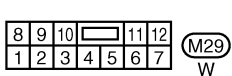
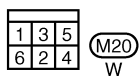
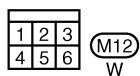
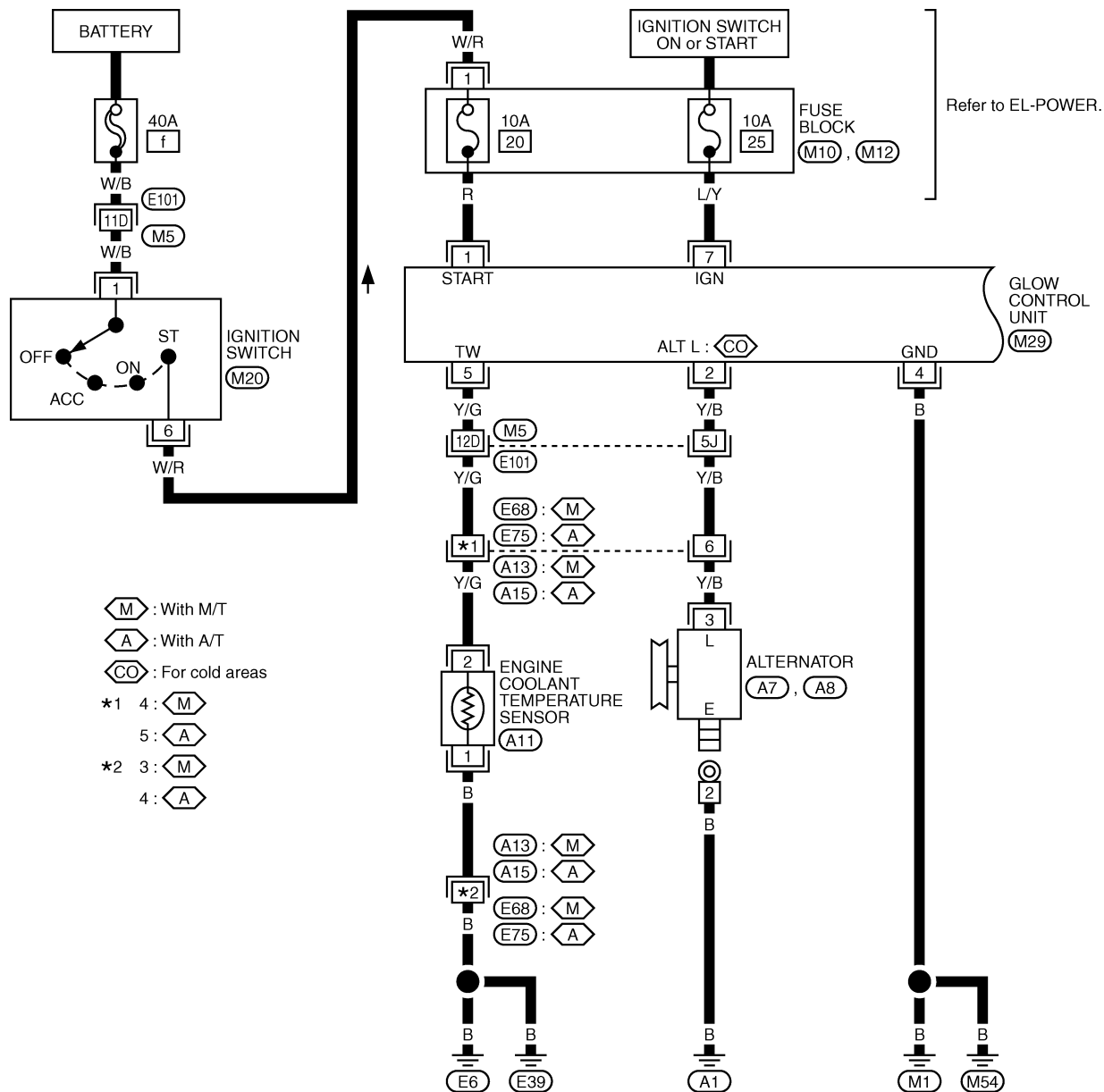
EL

IDX

Wiring Diagram

QD ENGINE (LHD)

EC-GLOW-01



Refer to last page (Foldout page).

M5, E101
M10