ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

CONTENTS

Contents (Cont'd)

When you read wiring diagrams:

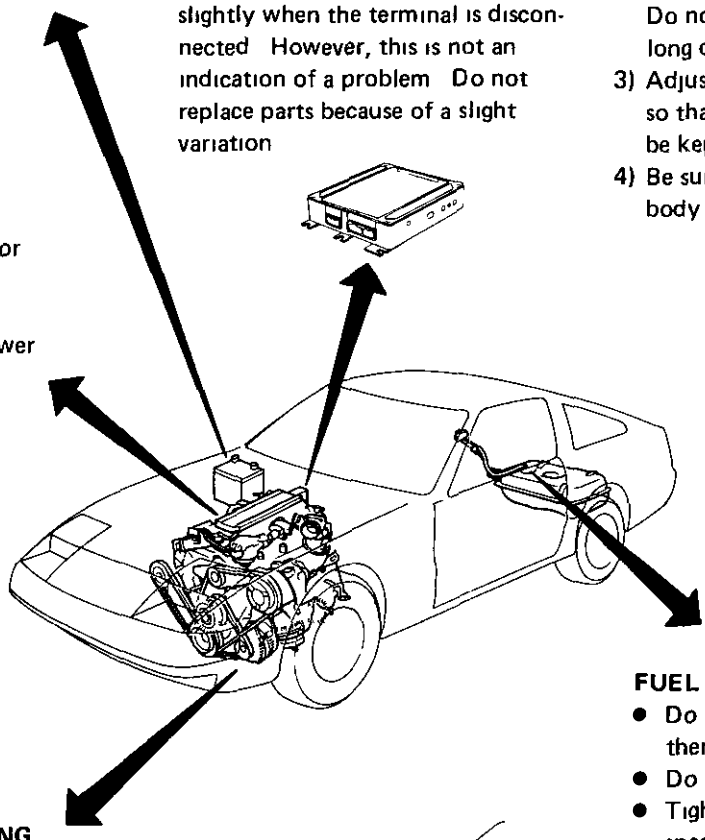
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

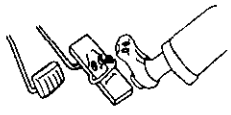
BATTERY
- Always use a 12 volt battery as power source
- Do not attempt to disconnect battery cables while engine is running

INJECTOR
- Do not disconnect injector harness connectors with engine running
- Do not apply battery power directly to injectors

E C C.S PARTS HANDLING
- Handle air flow meter carefully to avoid damage
- Do not disassemble air flow meter
- Do not clean air flow meter with any type of detergent
- Do not disassemble auxiliary air control valve (VG30ET engine)
- Even a slight leak in the air intake system can cause serious problems
- Do not shock or jar the crank angle sensor

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

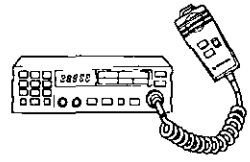


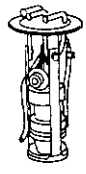


WHEN STARTING
- Do not depress accelerator pedal when starting
- Immediately after starting, do not rev up enigne unnecessarily
- Do not rev up engine just prior to shutdown

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

1) Keep the antenna as far as possible away from the electronic control units
2) Keep the antenna feeder line more than 20 cm (7 9 in) away from the harness of electronic controls
   Do not let them run parallel for a long distance
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller
4) Be sure to ground the radio to vehicle body



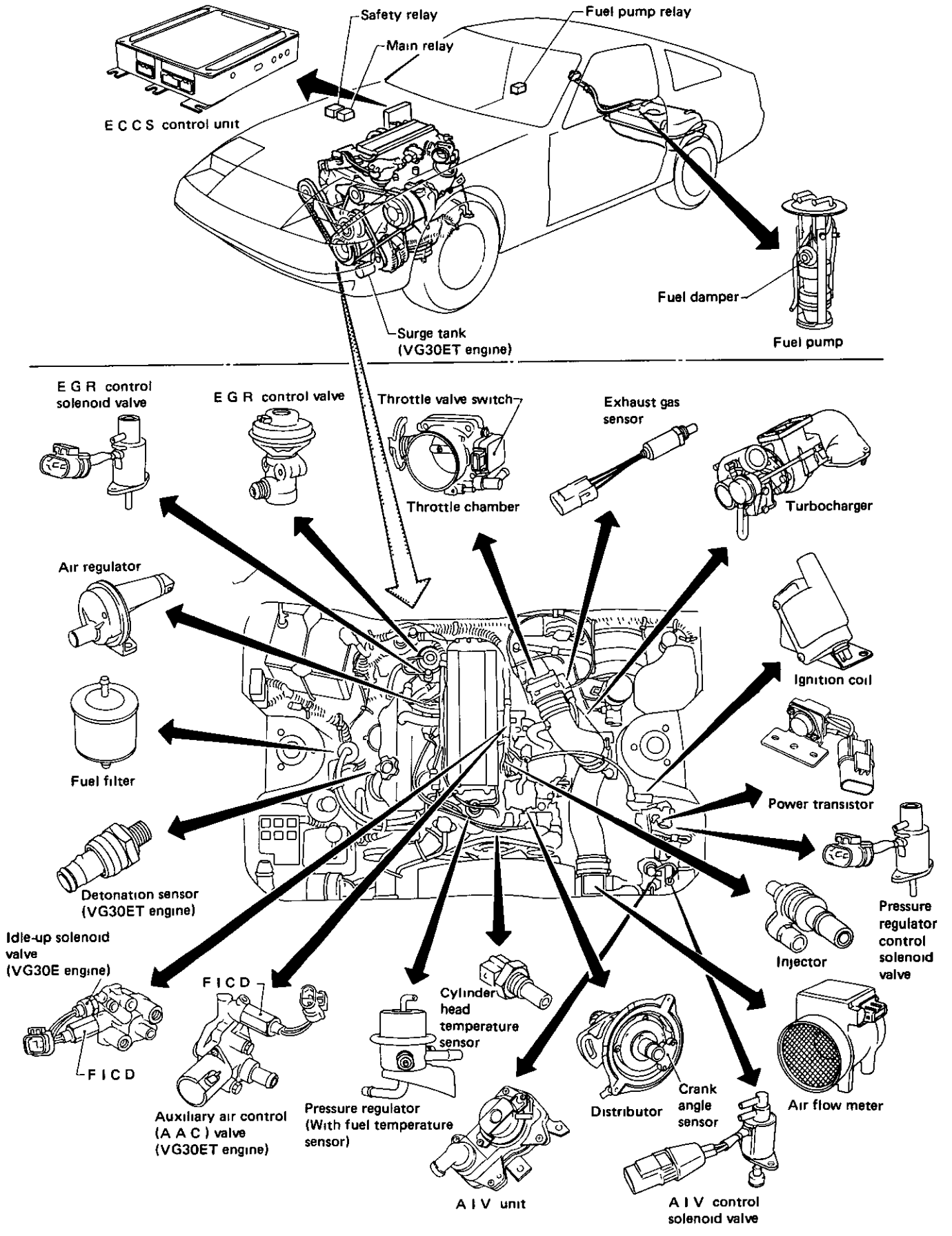


FUEL PUMP
- Do not operate fuel pump when there is no fuel in lines
- Do not reuse fuel hose clamps
- Tighten fuel hose clamps to the specified torque

E C C S PARTS HANDLING
- Securely connect E C C S harness connectors
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs
- Keep E C C S harness at least 10 cm (3 9 in) away from adjacent harnesses, to prevent an E C C S system malfunction due to receiving external noise, degraded operation of ICs, etc
- Keep E C C S parts and harnesses dry
- Before removing parts, turn off ignition switch and then disconnect battery ground cable

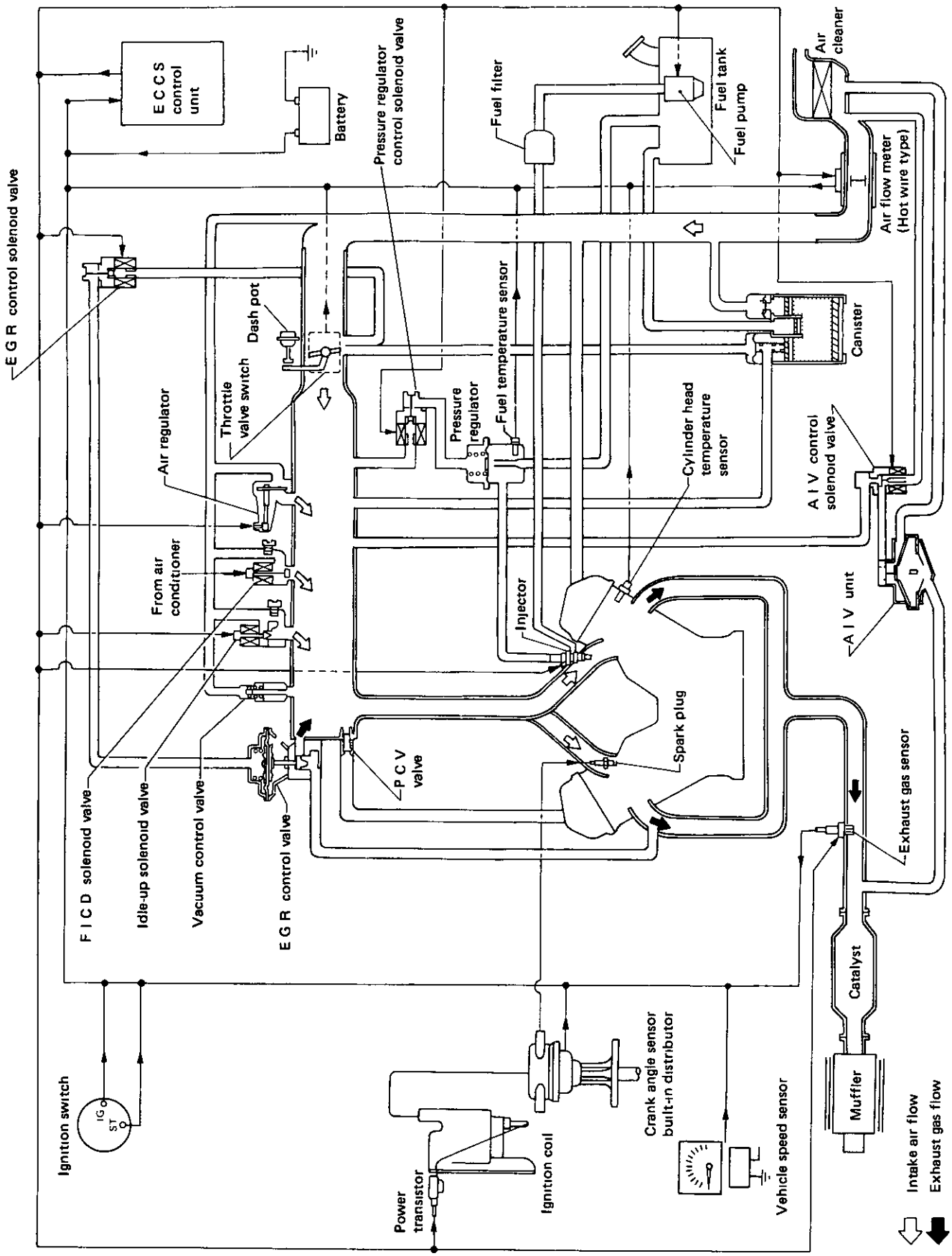
SEF179F

ENGINE AND EMISSION CONTROL PARTS LOCATION



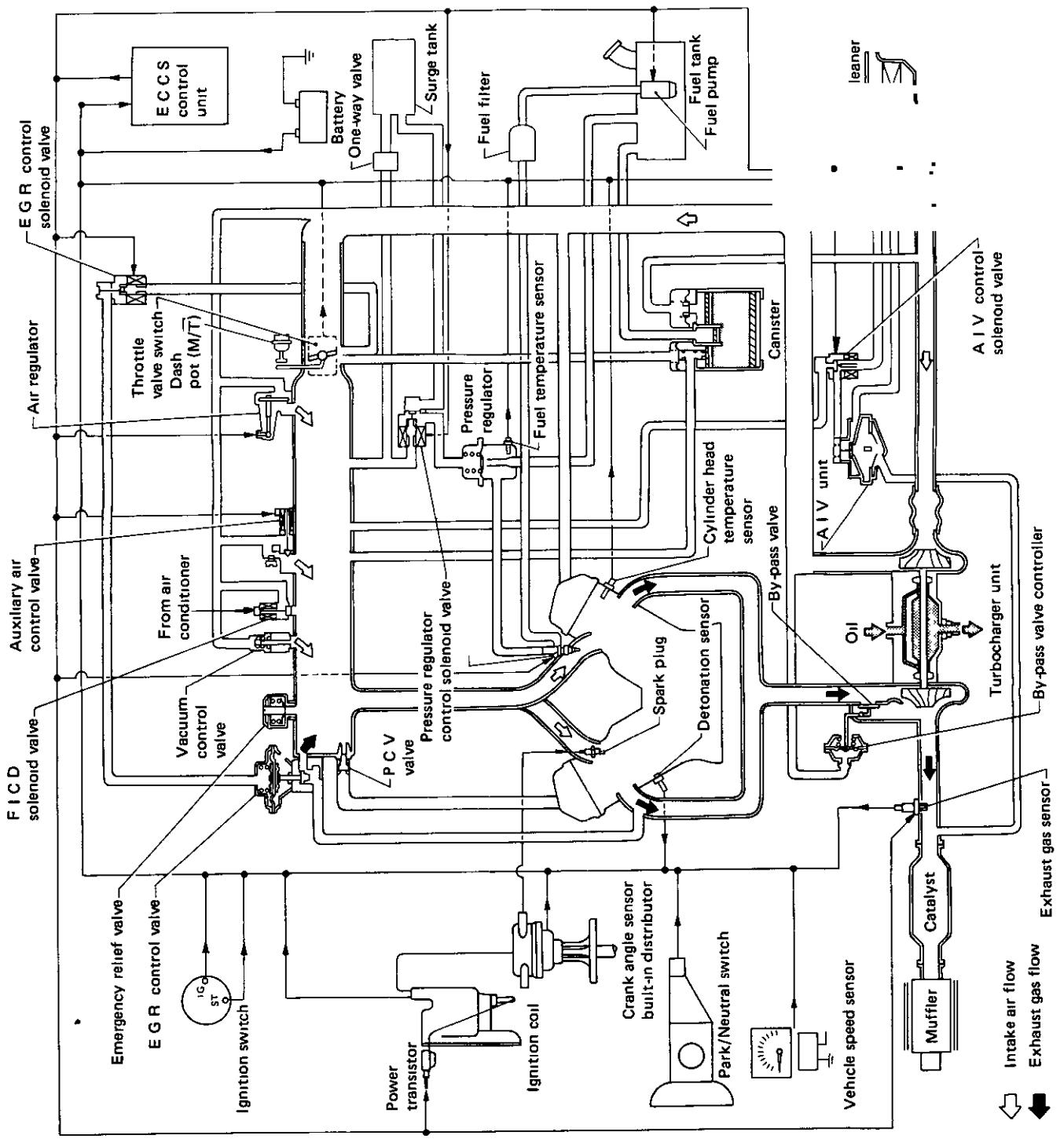
SEF182F

VG30E Engine (Without turbocharger)



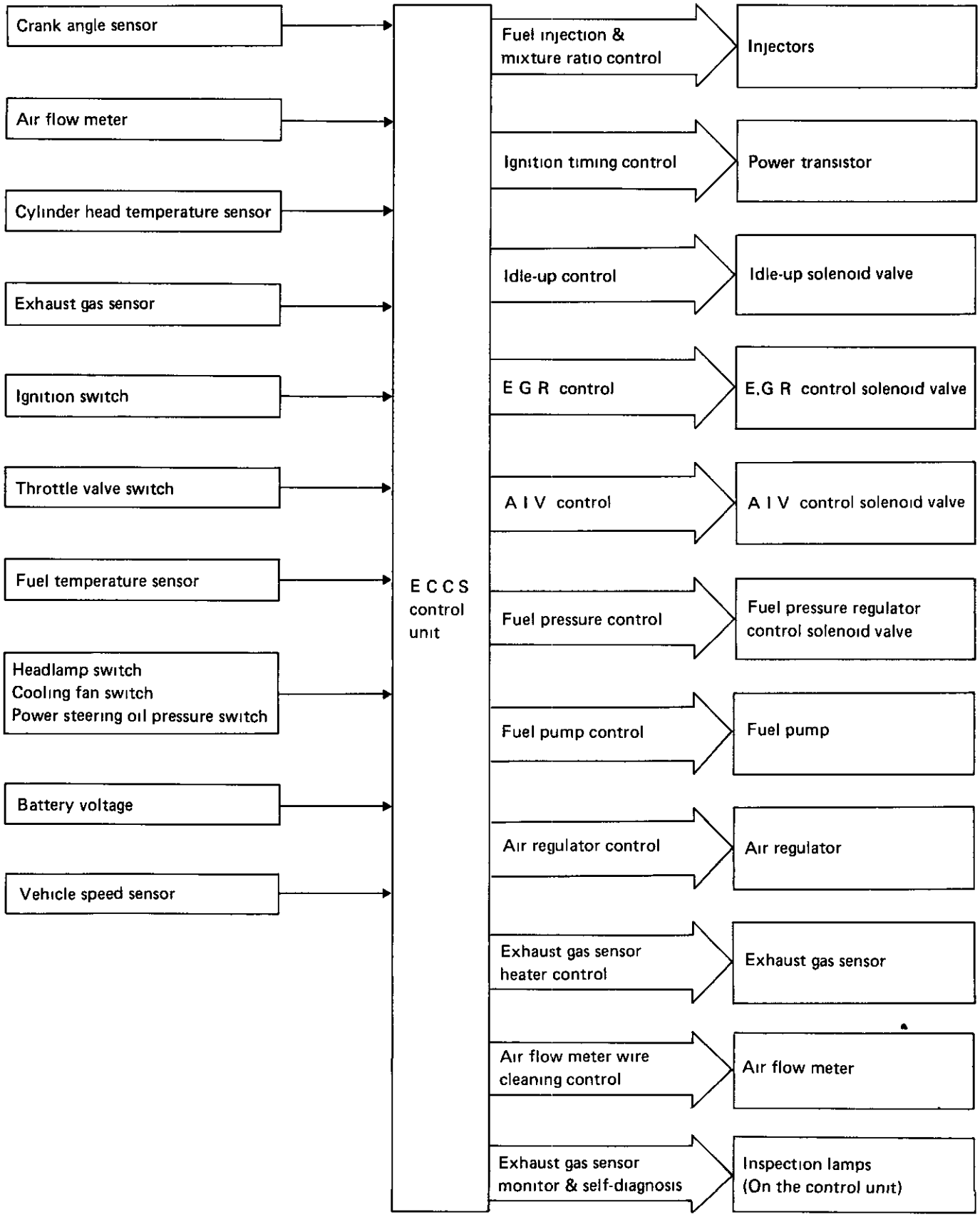
SEF183F

VG30ET Engine (With turbocharger)

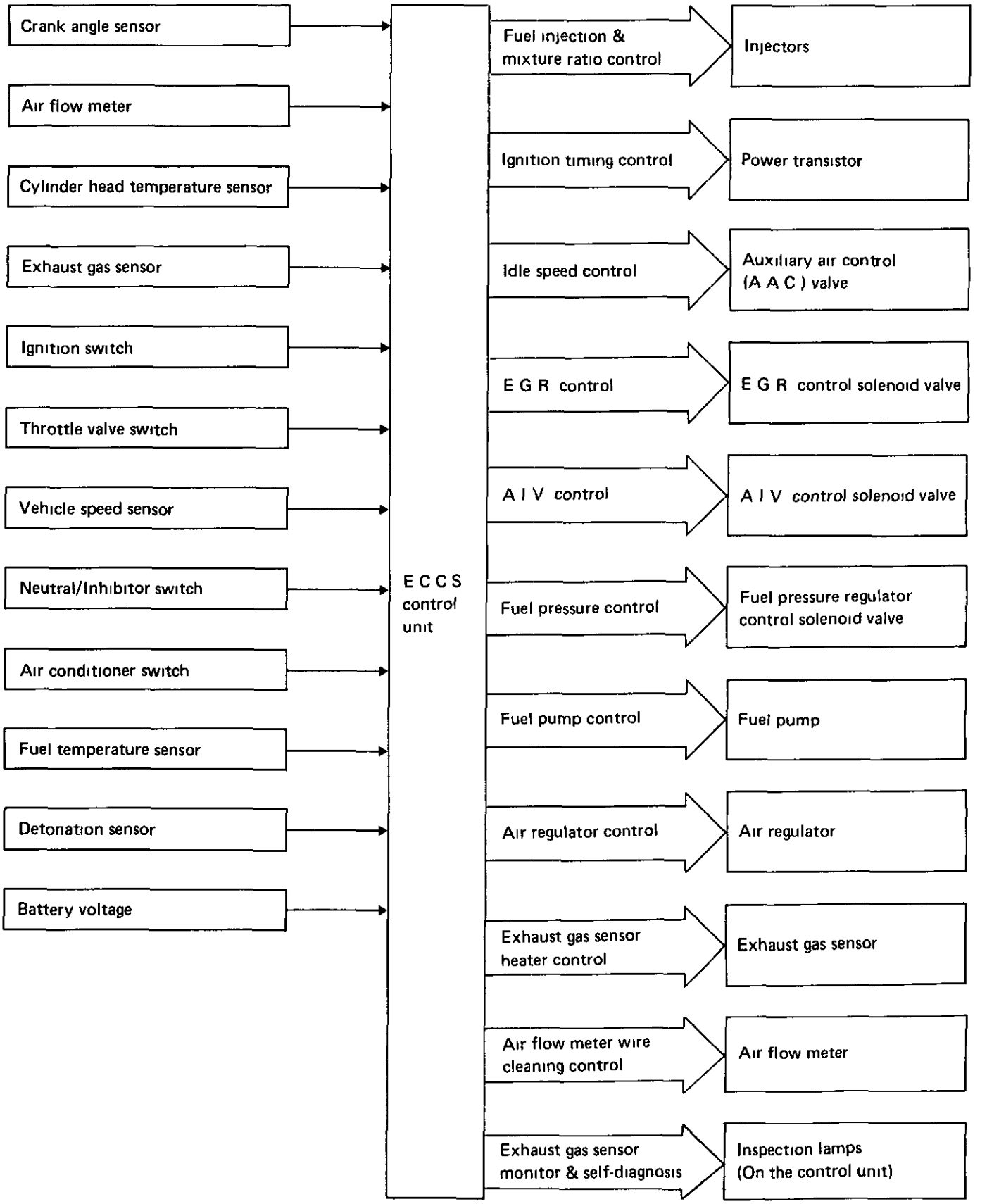


SEF184F

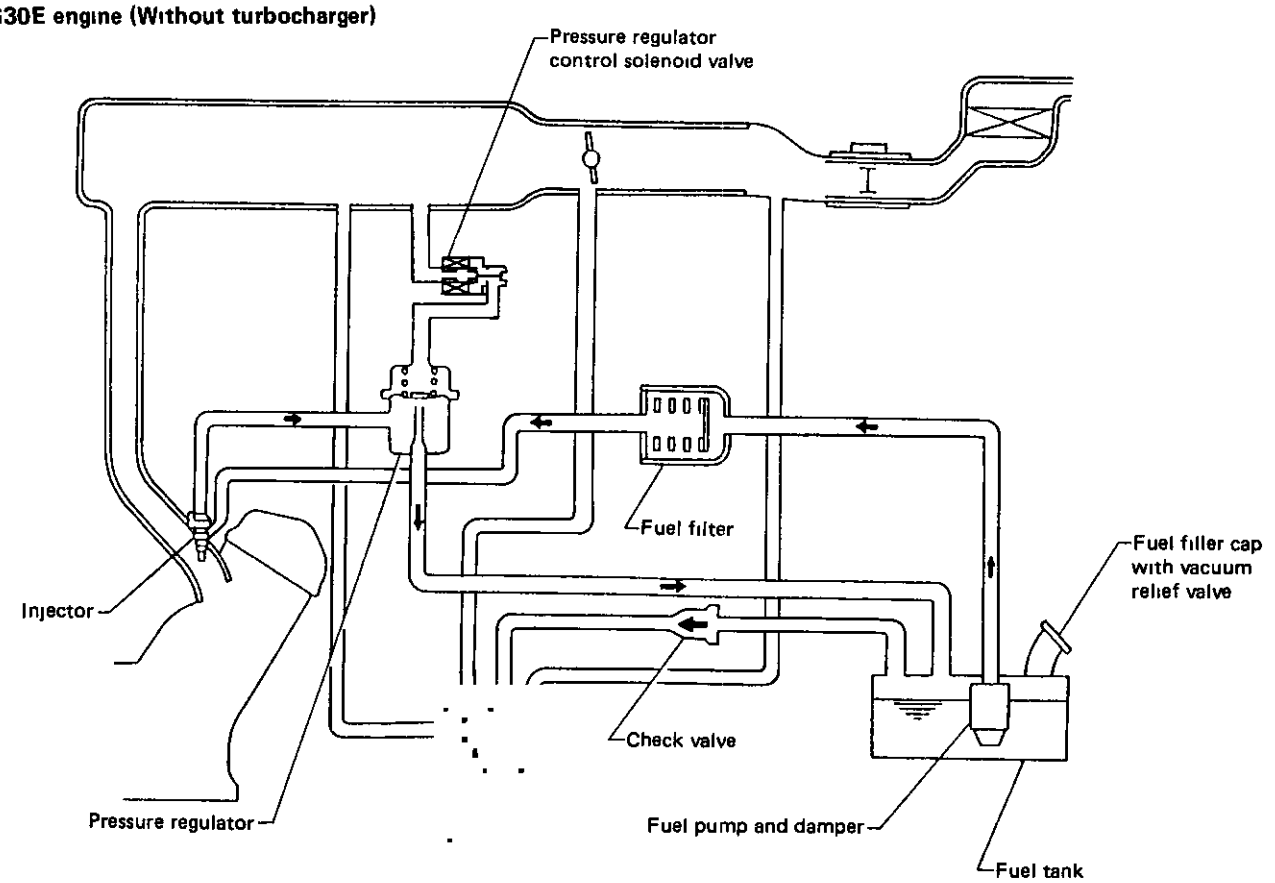
VG30E Engine (Without turbocharger)



VG30ET Engine (With turbocharger)

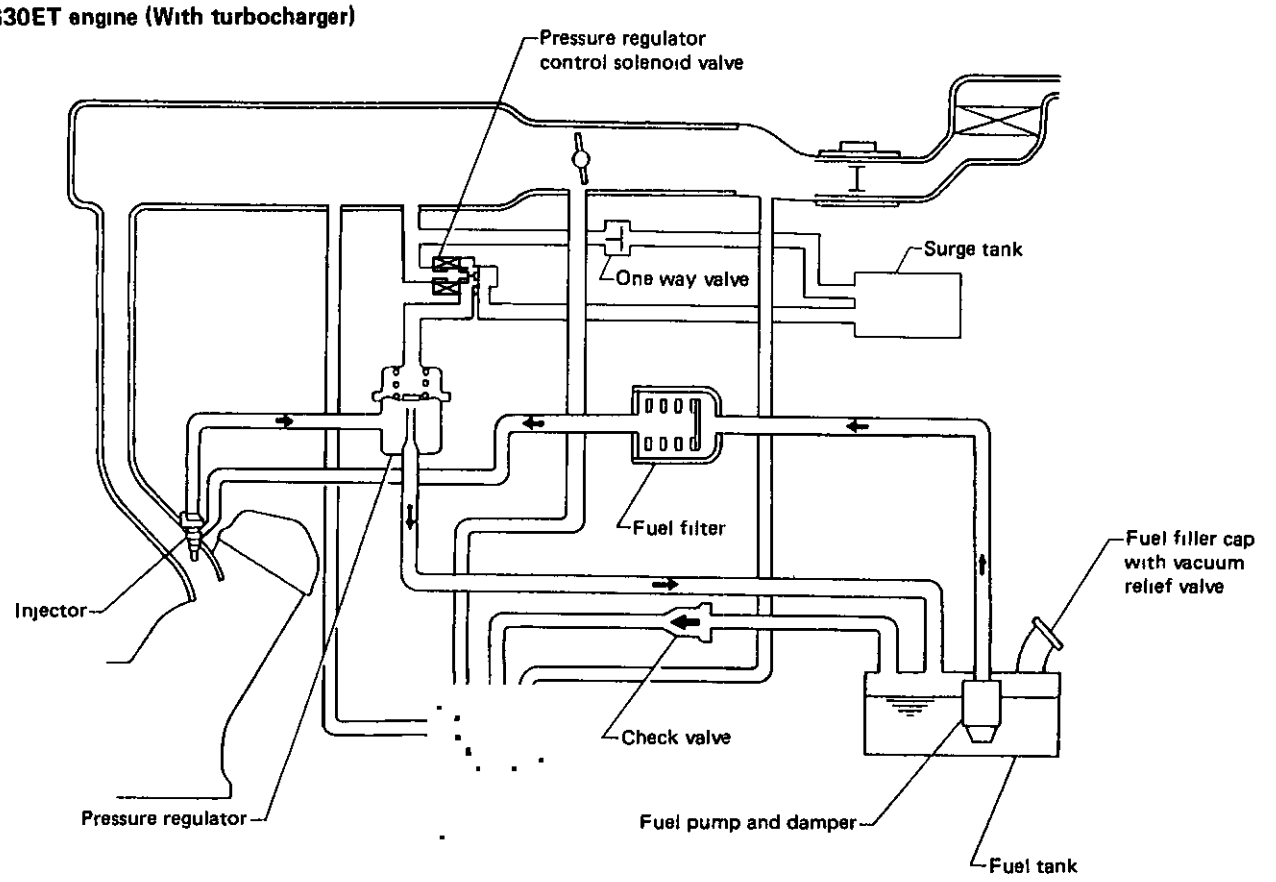


VG30E engine (Without turbocharger)



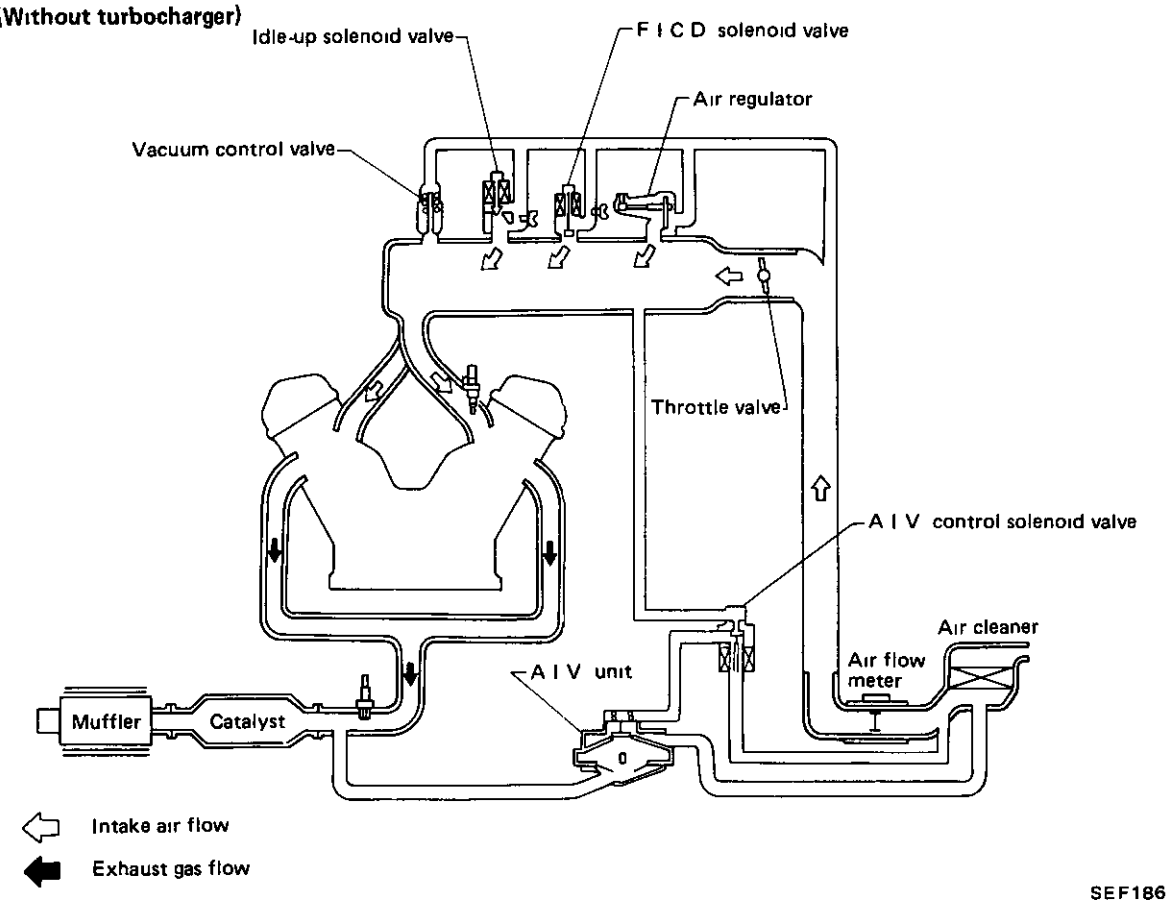
SEF283F

VG30ET engine (With turbocharger)



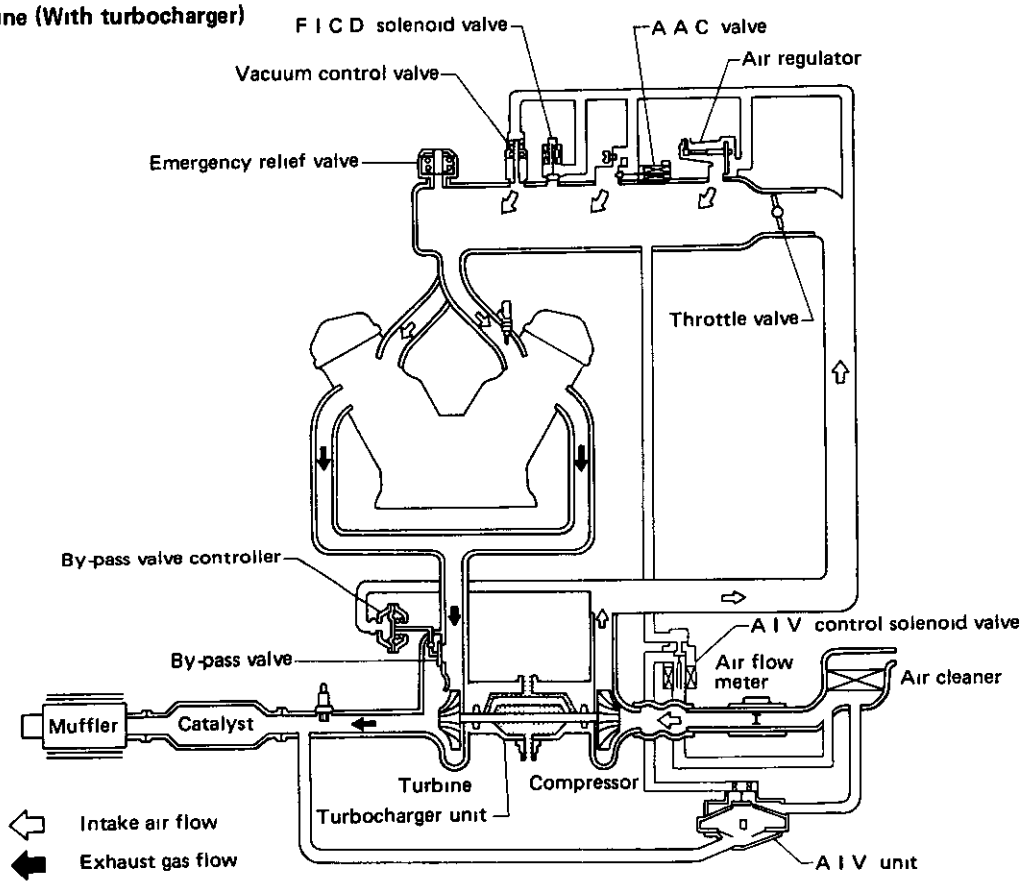
SEF284F

VG30E engine (Without turbocharger)



SEF186F

VG30ET engine (With turbocharger)



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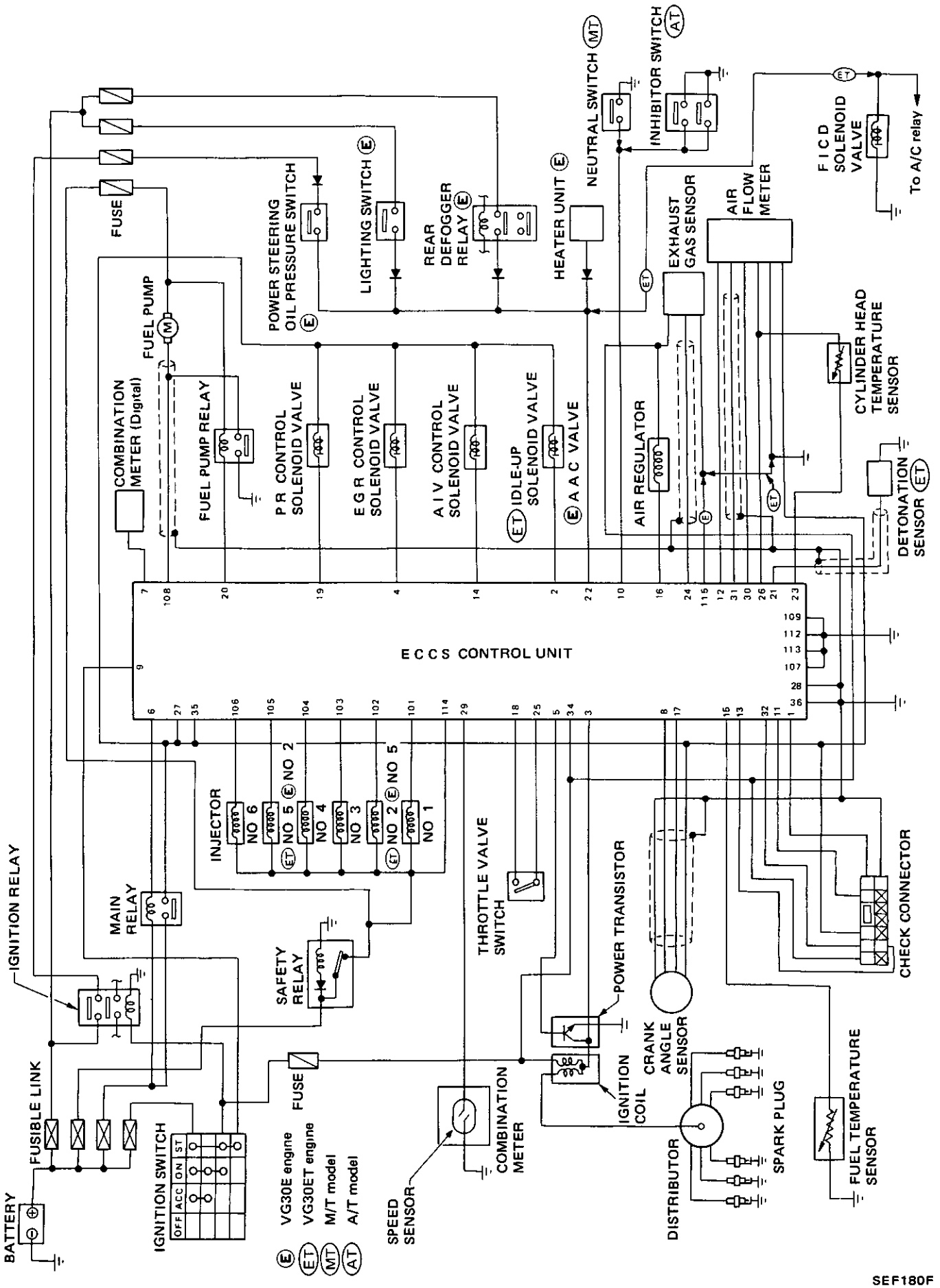
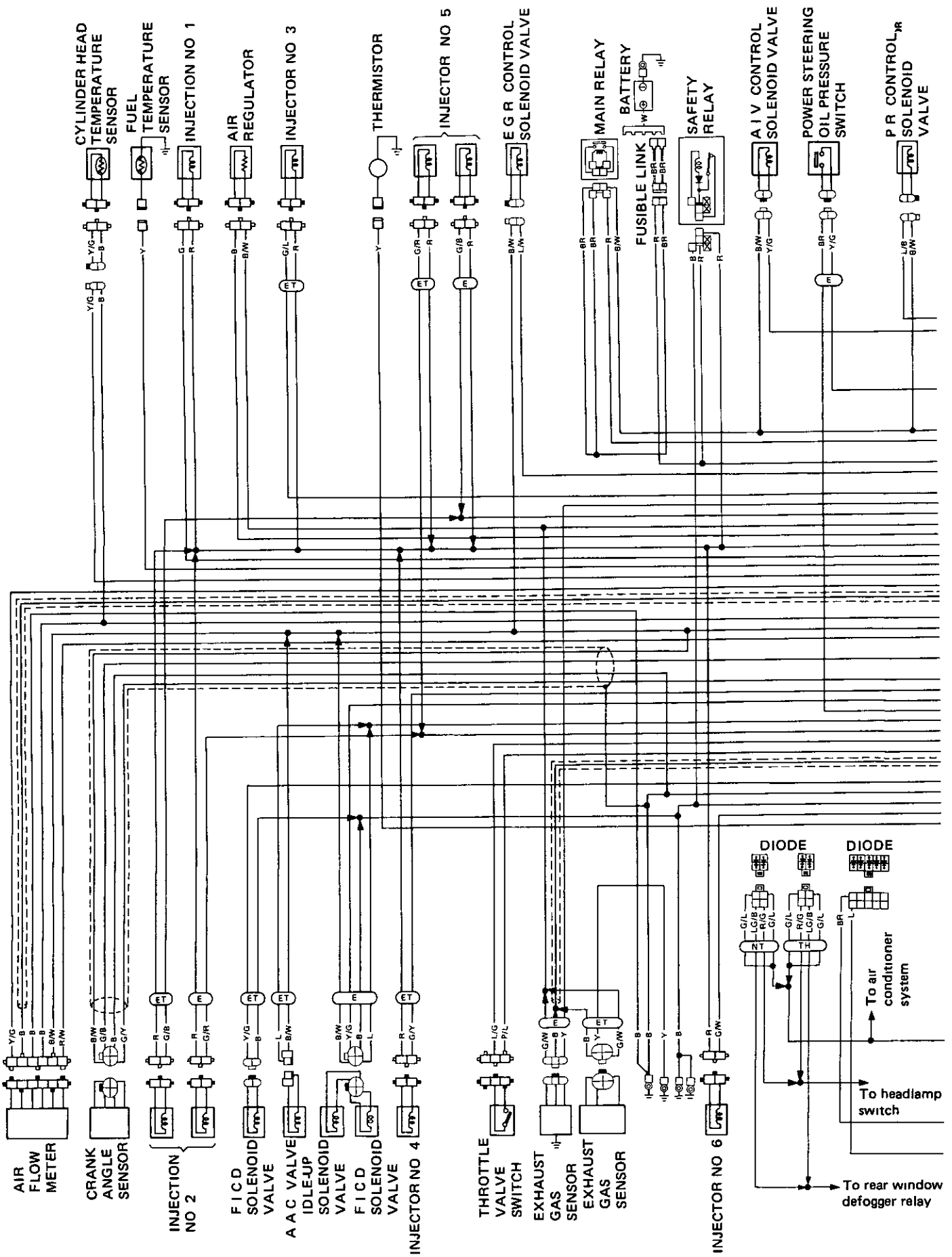
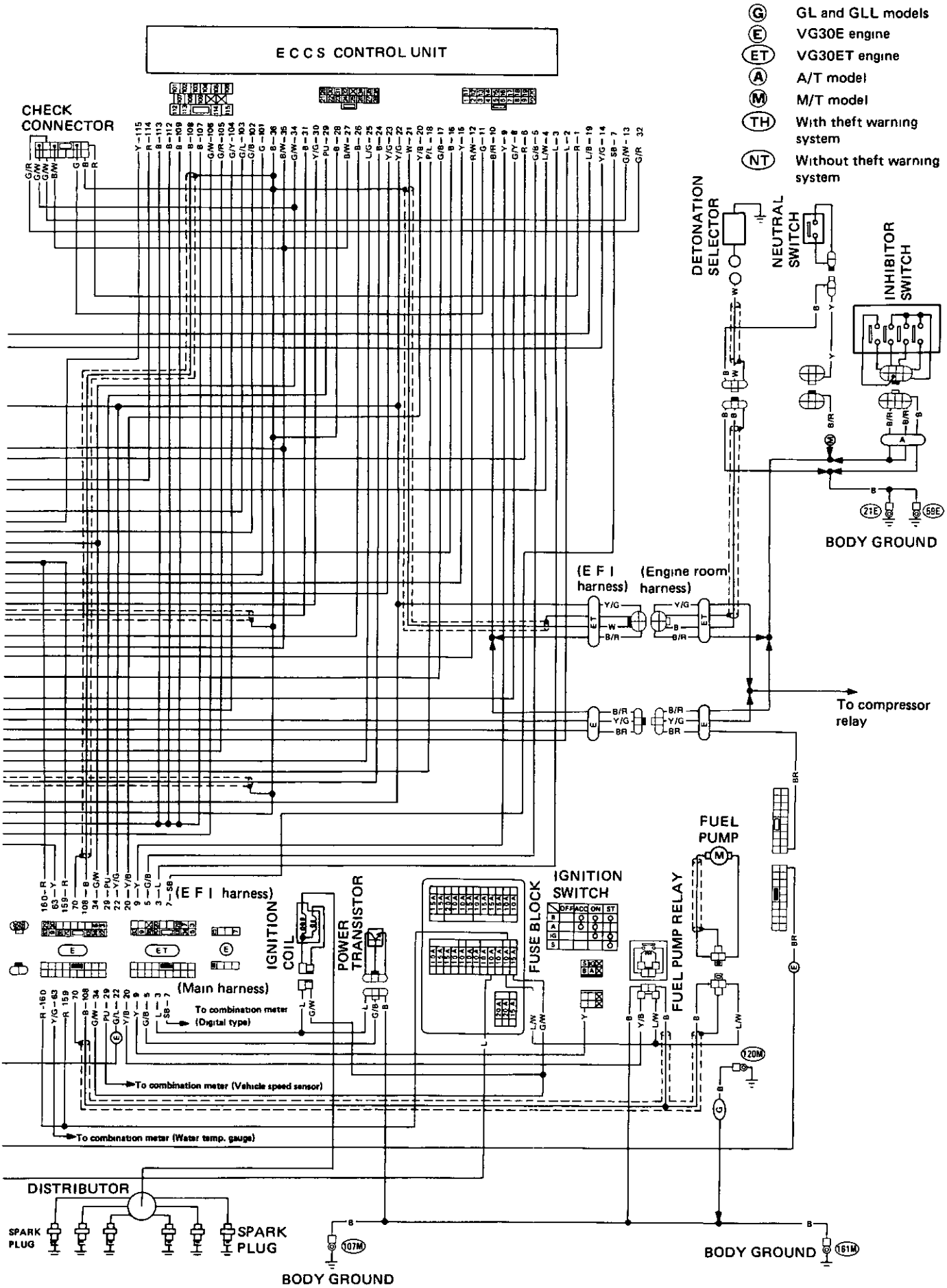
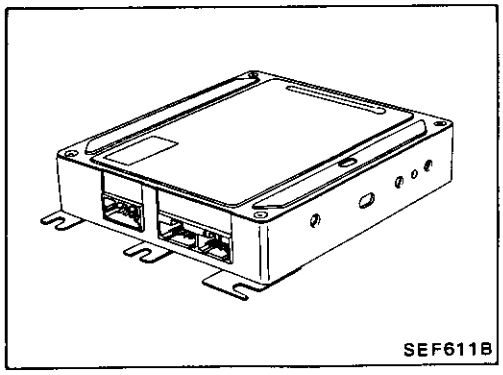

BATTERY
FUSIBLE LINK
IGNITION SWITCH
OFF ACC ON ST
IGNITION RELAY
MAIN RELAY
SAFETY RELAY
FUSE
FUSE
FUEL PUMP
FUEL PUMP RELAY
COMBINATION METER (Digital)
POWER STEERING OIL PRESSURE SWITCH
LIGHTING SWITCH
REAR DEFOGGER RELAY
HEATER UNIT
NEUTRAL SWITCH
INHIBITOR SWITCH
F I C D SOLENOID VALVE
To A/C relay
EXHAUST GAS SENSOR
AIR FLOW METER
CYLINDER HEAD TEMPERATURE SENSOR
DETONATION SENSOR
P R CONTROL SOLENOID VALVE
E G R CONTROL SOLENOID VALVE
A I V CONTROL SOLENOID VALVE
IDLE-UP SOLENOID VALVE
A A C VALVE
AIR REGULATOR
ECCS CONTROL UNIT
INJECTOR
NO 6
NO 5
NO 4
NO 3
NO 2
NO 1
THROTTLE VALVE SWITCH
POWER TRANSISTOR
CHECK CONNECTOR
CRANK ANGLE SENSOR
IGNITION COIL
DISTRIBUTOR
SPARK PLUG
FUEL TEMPERATURE SENSOR
SPEED SENSOR
COMBINATION METER
VG30E engine
VG30ET engine
M/T model
A/T model
SEF180F

E.C.C.S. WIRING DIAGRAM



E.C.C.S. WIRING DIAGRAM

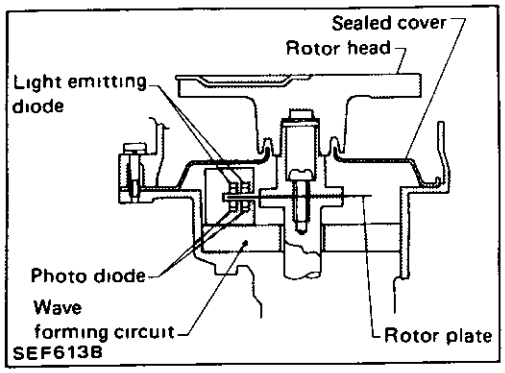



SEF611B

Components

E.C.U. (E.C.C.S. control unit)

The E C.U consists of a microcomputer, inspection lamps, a diagnostic mode selector, and connectors for signal input and output, and for power supply The unit has control of the engine



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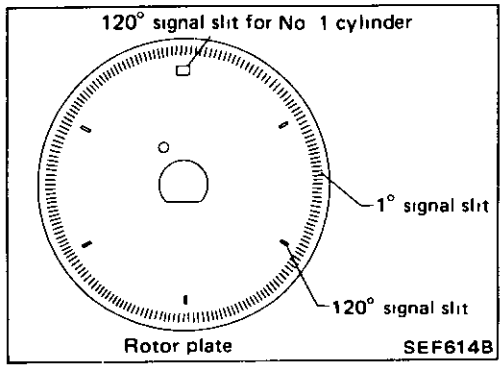
CRANK ANGLE SENSOR

The crank angle sensor is a basic component of the entire E C C S It monitors engine speed and piston position, and sends to the E C U signals on which the controls of fuel injection, ignition timing and other functions are based

The crank angle sensor has a rotor plate and a wave forming circuit The rotor plate has 360 slits for 1° signal (crank angle signal) and 6 slits for 120° signal (engine speed signal) Light Emitting Diodes (L E D) and Photo Diodes are built in the wave forming circuit

When the rotor plate passes the space between the L E D and the Photo Diode, the slits of the rotor plate continually cut the light which is sent to the photo diode from the L E D This causes generating rough-shaped pulses They are then converted into on-off pulses by the wave forming circuit, which are sent to the E C U



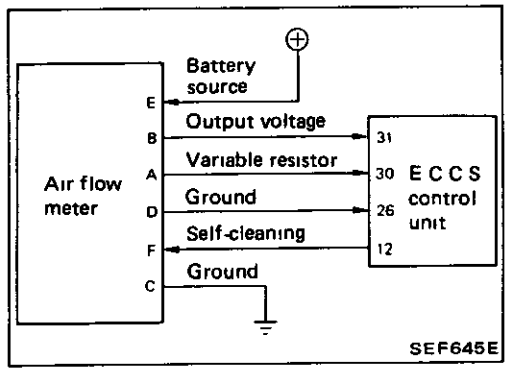
SEF614B

AIR FLOW METER

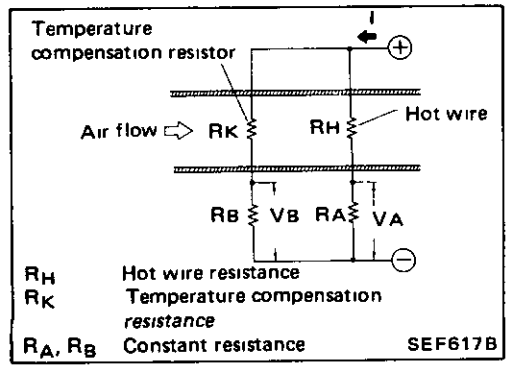
The air flow meter measures the mass flow rate of intake air Measurements are made in such a manner that the control circuit emits an electrical output signal in relation to the amount of heat dissipated from the hot wire placed in the stream of intake air

The air flowing around the hot wire removes the heat from the hot wire The temperature of the hot wire is very sensitive to the mass flow rate of the air The higher the temperature of the hot wire, the higher its resistance value This change in the temperature (or resistance) is determined by the mass flow rate of the air The control circuit accurately regulates current (I) in relation to the varying resistance value (R_H) so that V_A always equals V_B The air flow meter transmits an output for voltage V_A to the control unit where the output is converted into an intake air signal

Also, this air flow meter has self-burning off system in order to make hot wire clean.



SEF645E



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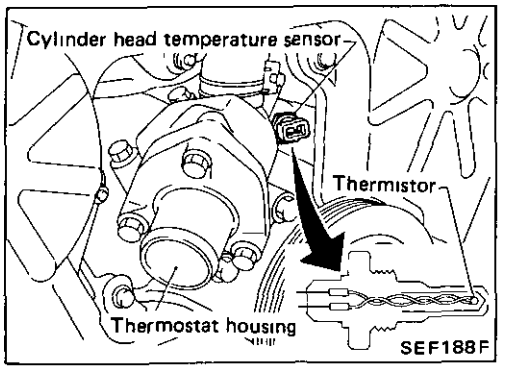
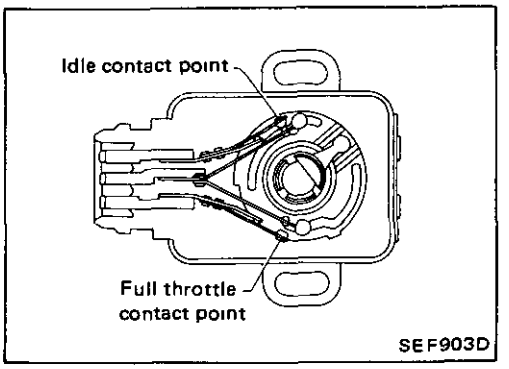
Components (Cont'd)



CYLINDER HEAD TEMPERATURE SENSOR

The cylinder head temperature sensor, built into the cylinder head, monitors changes in cylinder head temperature and transmits a signal to the E C U

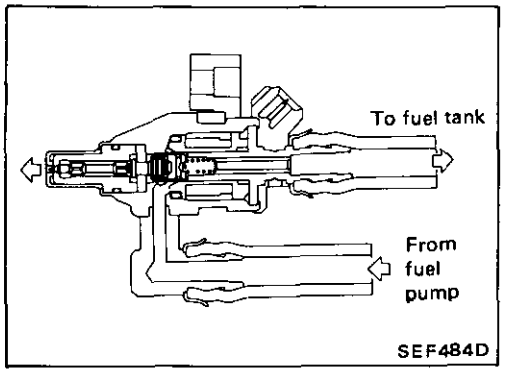
The temperature sensing unit employs a thermistor which is sensitive to the change in temperature Electrical resistance of the thermistor decreases in response to the temperature rise



THROTTLE VALVE SWITCH

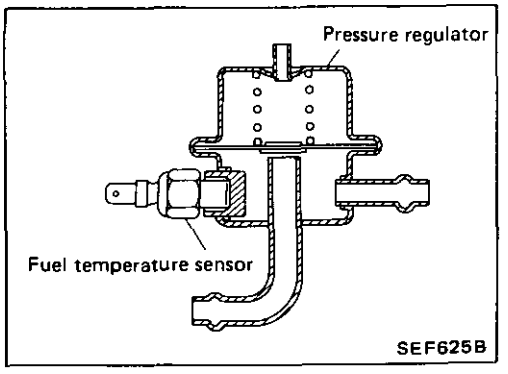
The throttle valve switch is attached to the throttle chamber and actuates in response to accelerator pedal movement

This switch has idle contact and full throttle contact The idle contact is used for engine control It closes when the throttle valve is positioned at idle, and opens when it is at any other position



FUEL INJECTOR

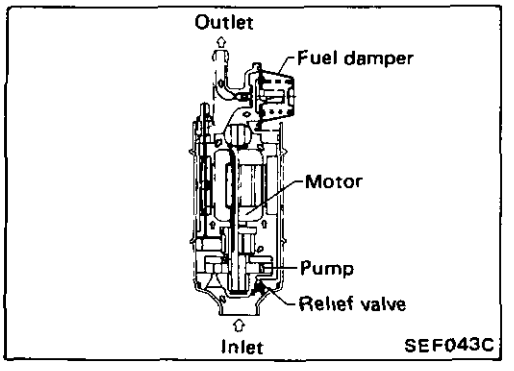
The fuel injector is a small, precision solenoid valve As the E C U. outputs an injection signal to each fuel injector, the coil built into the injector pulls the needle valve back, and fuel is injected through the nozzle to intake manifold The amount of fuel injected is controlled by the E.C U as an injection pulse duration.



FUEL TEMPERATURE SENSOR

The fuel temperature sensor is built into the pressure regulator, and senses fuel temperature When the fuel temperature is higher than the specified level, the E C U enriches fuel injected.

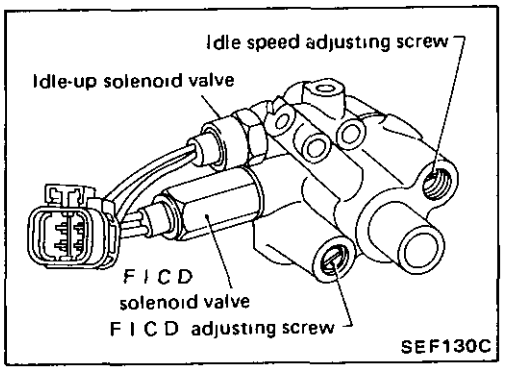
Do not remove fuel temperature sensor from pressure regulator. Always replace as an assembly.



FUEL PUMP

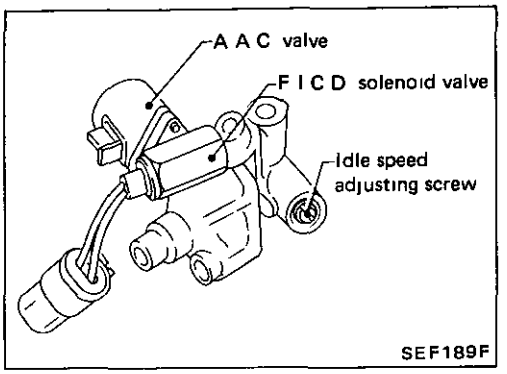
The fuel pump with a fuel damper is an in-tank type, that is the pump and damper are located in the fuel tank The vane rollers are directly coupled to a motor which is cooled by fuel

Components (Cont'd)



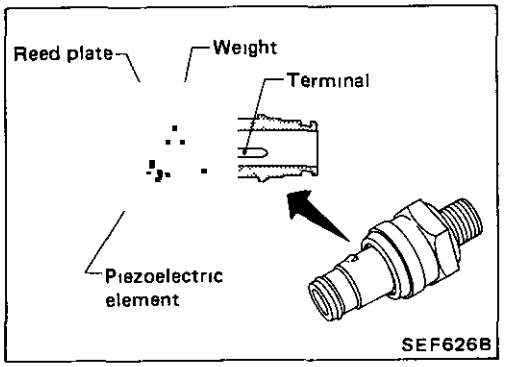
IDLE-UP SOLENOID VALVE [VG30E]

The idle-up solenoid valve is attached to the intake collector The solenoid valve actuates to stabilize idle speed when engine load is heavy because of electric load, power steering oil pump, etc.



A.A.C. (AUXILIARY AIR CONTROL) VALVE [VG30ET]

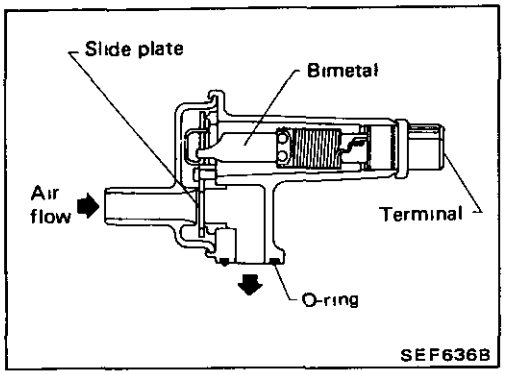
The A.A.C. valve is attached to the intake collector. The E.C U. actuates the A.A C. valve by an ON/OFF pulse of approximately 160 Hz The longer that ON duty is left on, the larger the amount of air that will flow through the A.A C valve.



DETONATION SENSOR [VG30ET]

The detonation sensor is attached to the cylinder block and senses engine knocking conditions.

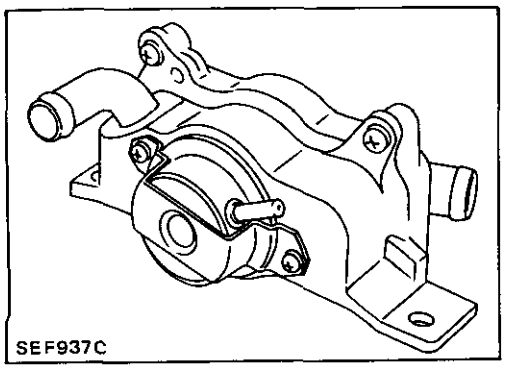
A knocking vibration from the cylinder block is applied as pressure to the piezoelectric element This vibrational pressure is then converted into a voltage signal which is delivered as output



AIR REGULATOR

The air regulator provides an air by-pass when the engine is cold for the purpose of a fast idle during warm-up

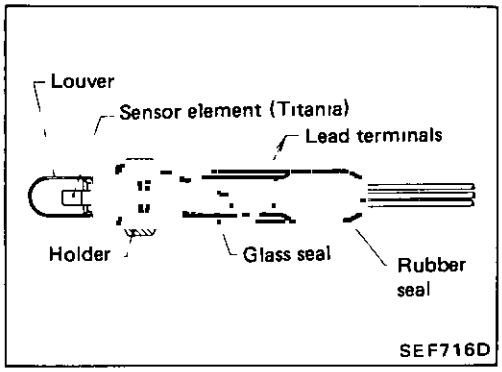
A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port is open As the engine starts and electric current flows through a heater, the bimetal begins to rotate the shutter to close off the by-pass port The air passage remains closed until the engine is stopped and the bimetal temperature drops



A.I.V. (AIR INJECTION VALVE)

The air injection valve sends secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold When the exhaust pressure is below atmospheric pressure (negative pressure), secondary air is sent to the exhaust manifold When the exhaust pressure is above atmospheric pressure, the reed valves prevent secondary air from being sent back to the air cleaner

Components (Cont'd)

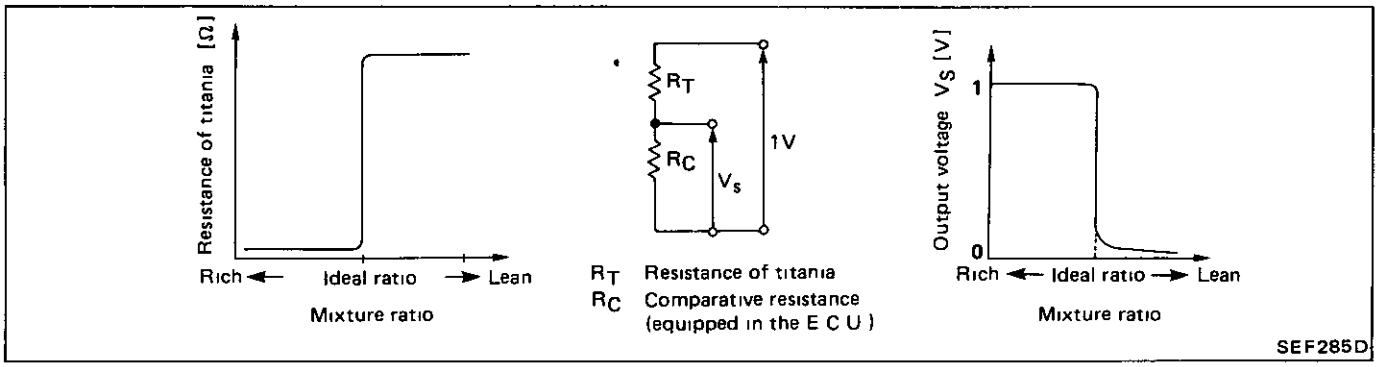


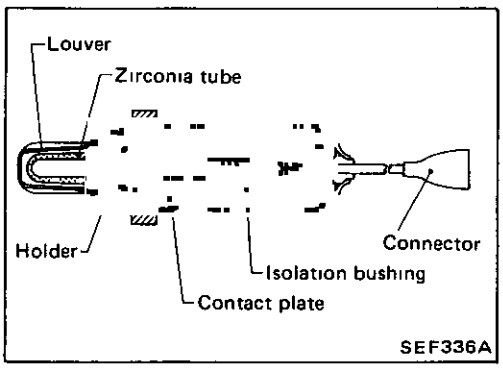
EXHAUST GAS SENSOR (Titania type) [VG30ET]

The exhaust gas sensor, which is placed in the exhaust tube, monitors the amount of oxygen in the exhaust gas

This sensor is made of ceramic titania which electric resistance drastically changes at the ideal air-fuel ratio

The E C U supplies the sensor with approximately 1V and takes an output voltage of the sensor depending on its resistance In order to activate the sensor element, it is equipped with a heater

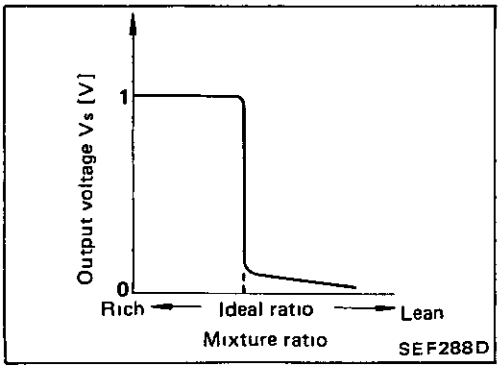


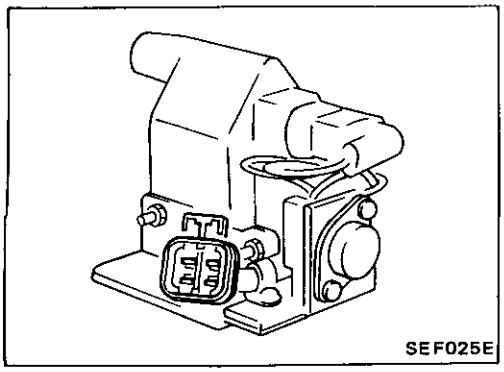


EXHAUST GAS SENSOR (Zirconia type) [VG30E]

The exhaust gas sensor, which is placed into the exhaust manifold, monitors the amount of oxygen in the exhaust gas

The sensor has a closed-end tube made of ceramic zirconia The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity In order to improve generating power of the zirconia, its tube is coated with platinum The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions The radical change from 1V to 0V occurs at around the ideal mixture ratio In this way, the exhaust gas sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the E C U

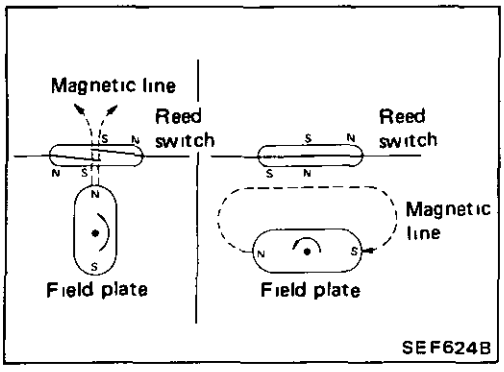




POWER TRANSISTOR AND IGNITION COIL

The ignition signal from the E C U is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit

Components (Cont'd)

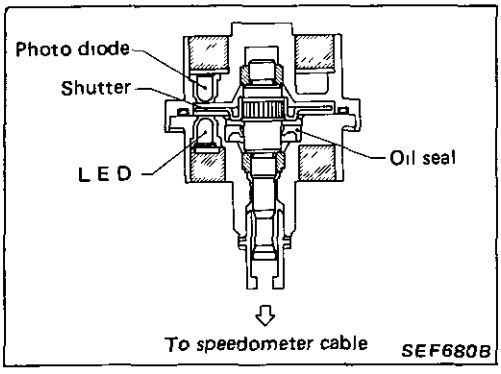


VEHICLE SPEED SENSOR

The vehicle speed sensor provides a vehicle speed signal to the E C.U.

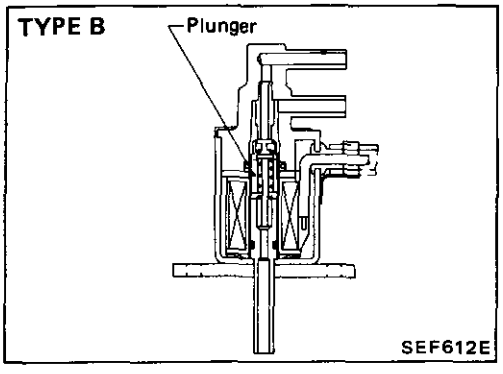
- **Needle type speedometer models**

The speed sensor consists of a reed switch, which is installed in the speed meter unit and transforms vehicle speed into a pulse signal.



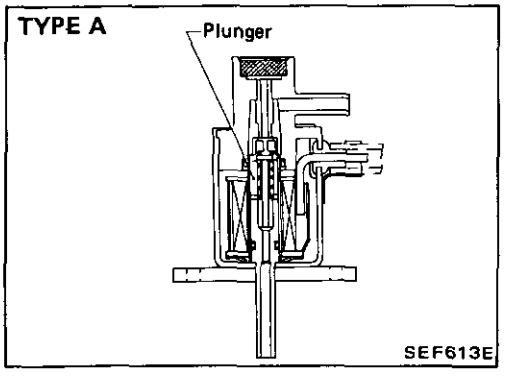
- **Digital type speedometer models**

The speed sensor consists of an L E.D., photo diode, shutter and wave forming circuit. Its principle is the same as that of the crank angle sensor



A.I.V. CONTROL SOLENOID VALVE (TYPE B)

The A I.V control solenoid valve cuts intake manifold vacuum signal for A I V control The solenoid valve actuates in response to the ON/OFF signal from the E.C.U When the solenoid is off, the vacuum signal from the intake manifold is cut. As the control unit outputs an ON signal, the coil pulls the plunger downward, and feeds the vacuum signal to the A I V. control valve

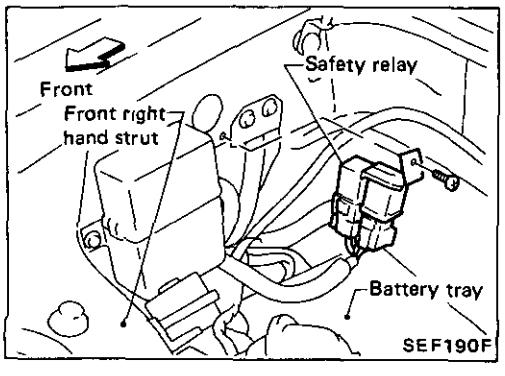


E.G.R. CONTROL SOLENOID VALVE (TYPE A)

The E G R. system is controlled only by the E C U. At both low and high speed revolution of engine, the solenoid valve turns on and accordingly the E.G R valve cuts the exhaust gas leading to the intake manifold.

P.R. (PRESSURE REGULATOR) CONTROL SOLENOID VALVE (VG30E: TYPE A, VG30ET: TYPE B)

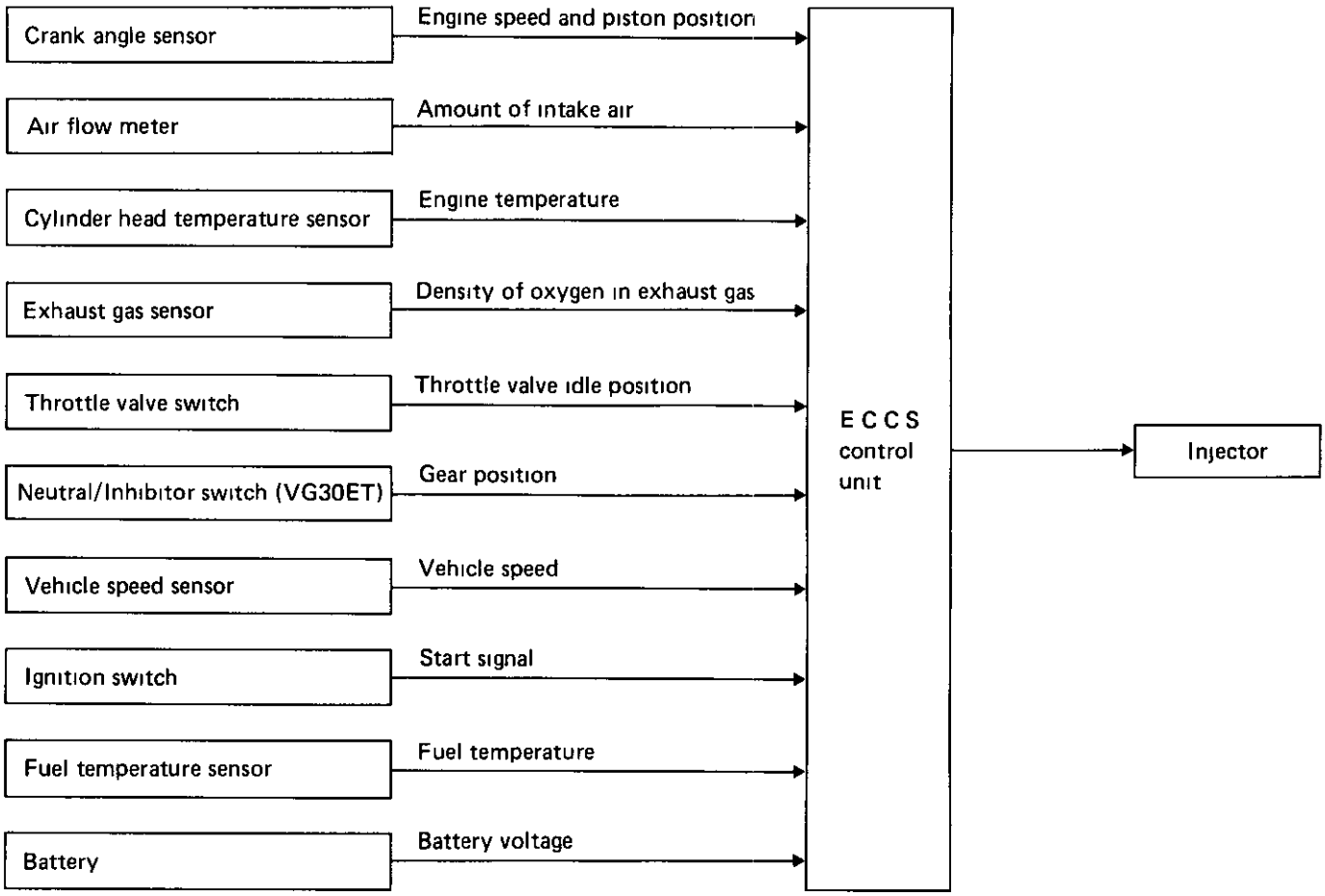
The solenoid valve actuates in response to the ON/OFF signal from the E C U When it is off, a vacuum signal from the intake manifold is fed into the pressure regulator. As the control unit outputs an ON signal, the coil pulls the plunger downward, and cuts the vacuum signal

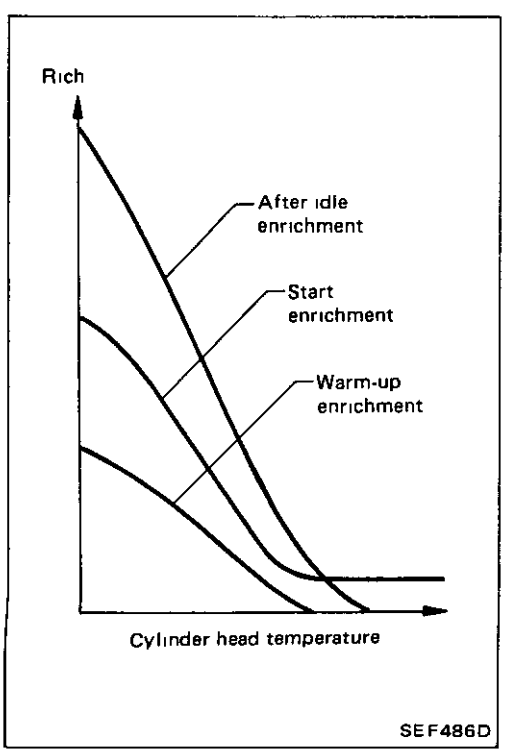


SAFETY RELAY

Safety relay, which is located behind the right side of hoodledge, prevents any damage to the E C U. and injectors when battery terminals are connected in reverse

Fuel Injection Control





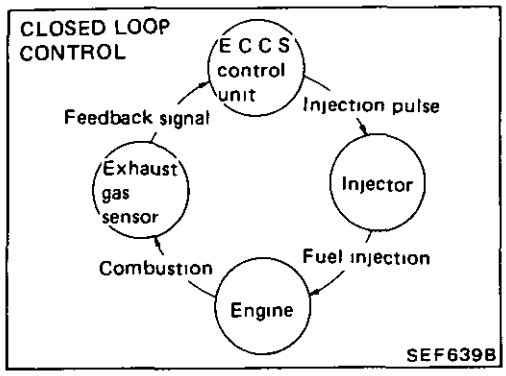
The E.C.U calculates the basic injection pulse width by processing signals from crank angle sensor and air flow meter Receiving signals from each sensor which detects various engine conditions, the E C U. adds various enrichments, which are pre-programmed in the control unit, to the basic injection amount Thus, the optimum amount of fuel is injected through the injectors.

1) Fuel enrichment
   In each of the following conditions, fuel is enriched.

- During warm-up
- When starting
- After idle
- With heavy load
- When cylinder head temperature is high.

The enrichment rate for "when accelerating" and "with heavy load" are pre-programmed for engine speed and basic injection pulse width.

Fuel Injection Control (Cont'd)

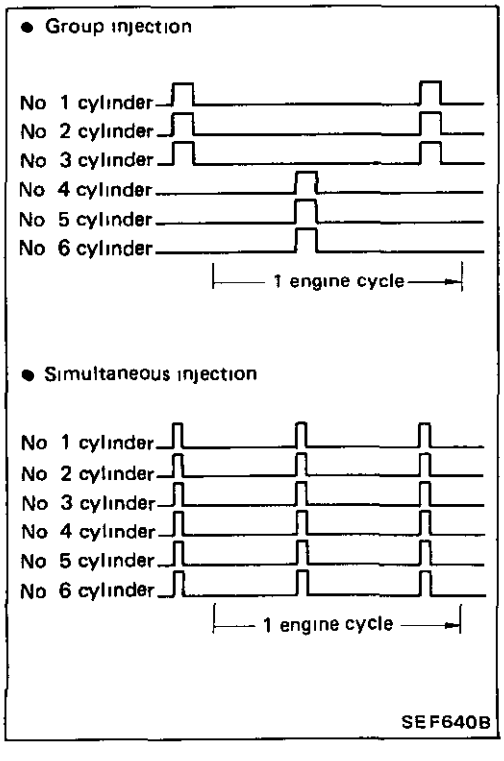


2) Mixture ratio feedback control

The mixture ratio feedback system is designed to control the mixture ratio precisely to the stoichiometric point so that the three-way catalyst can minimize CO, HC and NOx emissions simultaneously. This system uses an exhaust gas sensor located in the exhaust manifold to give an indication of whether the air-fuel ratio is richer or leaner than the stoichiometric point The control unit adjusts the injection pulse width according to the sensor voltage so the mixture ratio will be within the narrow window around the stoichiometric air fuel ratio

However, this system will open under the following conditions:

- When starting
- When engine and exhaust gas sensor is cold.
- When driving at high speeds or under heavy load.
- At idle
- When exhaust gas sensor monitors a too lean condition for more than 10 seconds.
- When fuel shut-off is in operation
- When exhaust gas sensor is malfunctioning
- When pressure regulator control system is in operation



3) Injection timing

Two types of fuel injection systems are used — simultaneous injection and group injection In the former, fuel is injected into all six cylinders simultaneously twice each engine cycle.

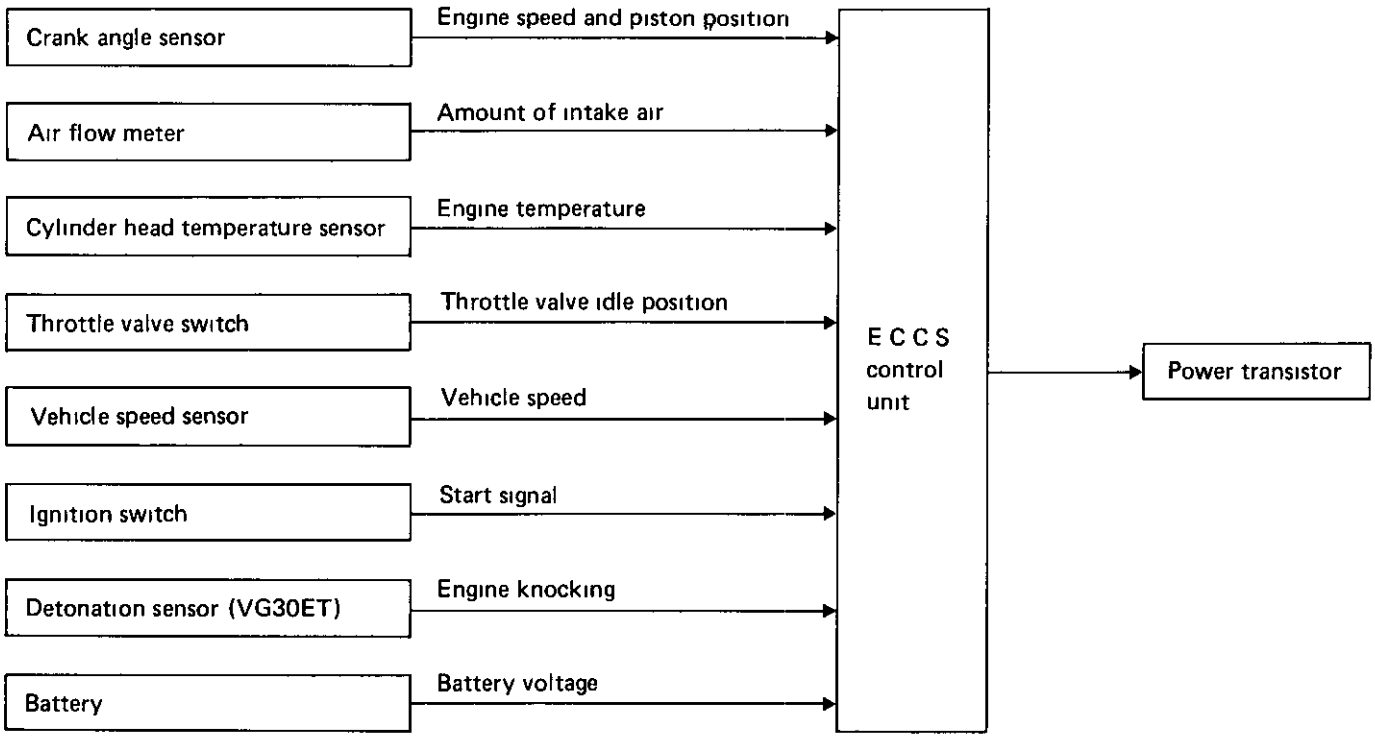
In other words, pulse signals of the same width are simultaneously transmitted from the E.C.U to the six injectors two times for each engine cycle.

In the group injection system, six injectors are divided into two groups — No 1, No. 2, No 3 and No 4, No 5, No. 6. And fuel is injected into each group separately once each engine cycle.

When any of the following conditions are met, fuel injection shifts to simultaneous injection from group injection

- Engine speed is more than 3,000 rpm
- Cylinder head temperature is below 60°C (140°F).
- When starting

Ignition Timing Control

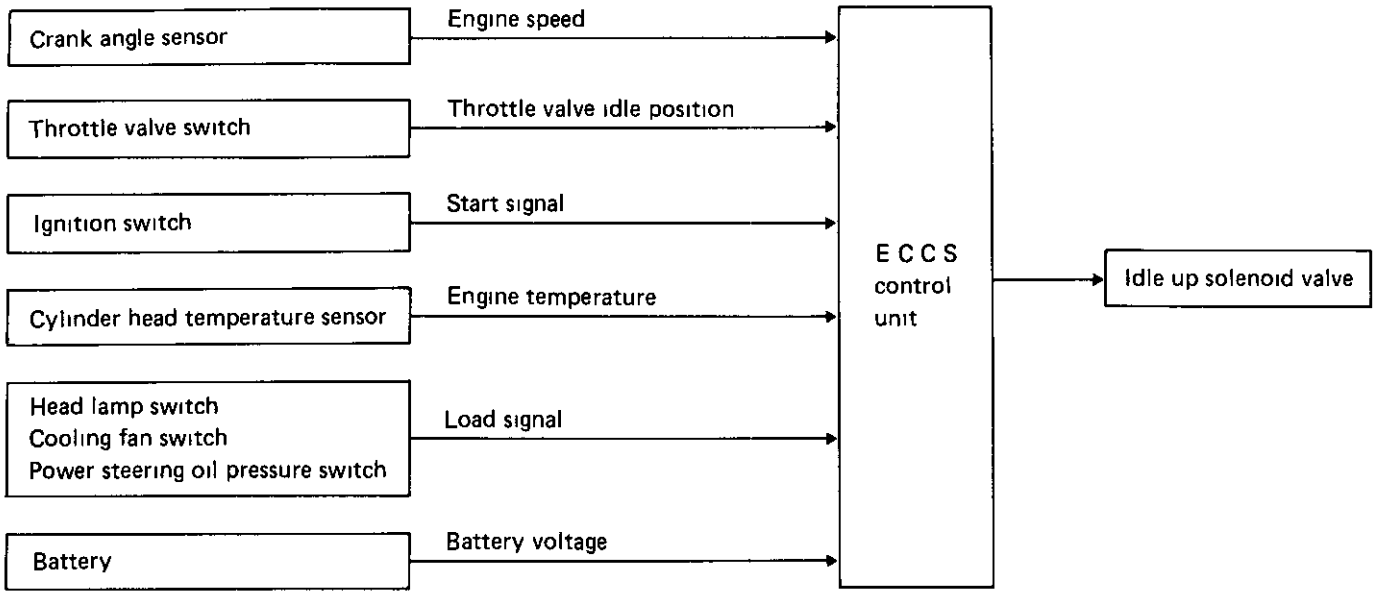


Ignition timing is controlled, corresponding to the engine operating conditions, by the E.C.U. that is, as the optimum ignition timing in each driving condition has been pre-programmed in the control unit, the ignition timing is determined by electrical signals processed in the unit
The signal from the E.C.U. is transmitted to power transistor, and controls ignition timing

Detonation feedback operation

The retard system by detonation sensor is designed only for emergencies on VG30ET engines. The basic ignition timing is pre-programmed within the anti-knocking zone, even if recommended fuel is used under dry conditions Consequently, the retard system does not operate under normal driving conditions.
However, if engine knocking occurs, the detonation sensor monitors the knocking condition and the signal is transmitted to the E.C.U. After receiving it, the control unit retards the ignition timing to avoid the knocking condition.

Idle-up Control (VG30E engine)



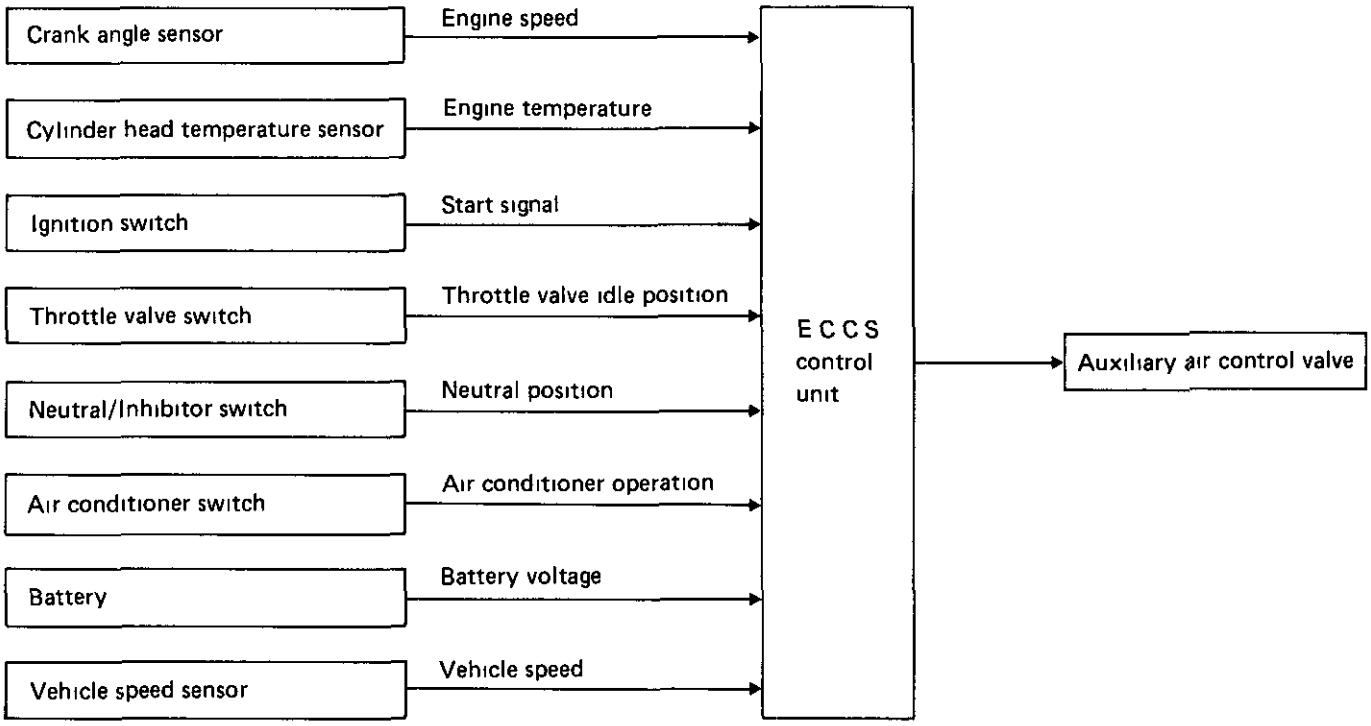
The idle speed is compensated by the E.C.U to prevent rough idle when any of the following conditions are met.

The control unit senses the idle condition, and determines ON/OFF signal The signal from the control unit is transmitted to the idle-up solenoid valve to stabilize idle speed

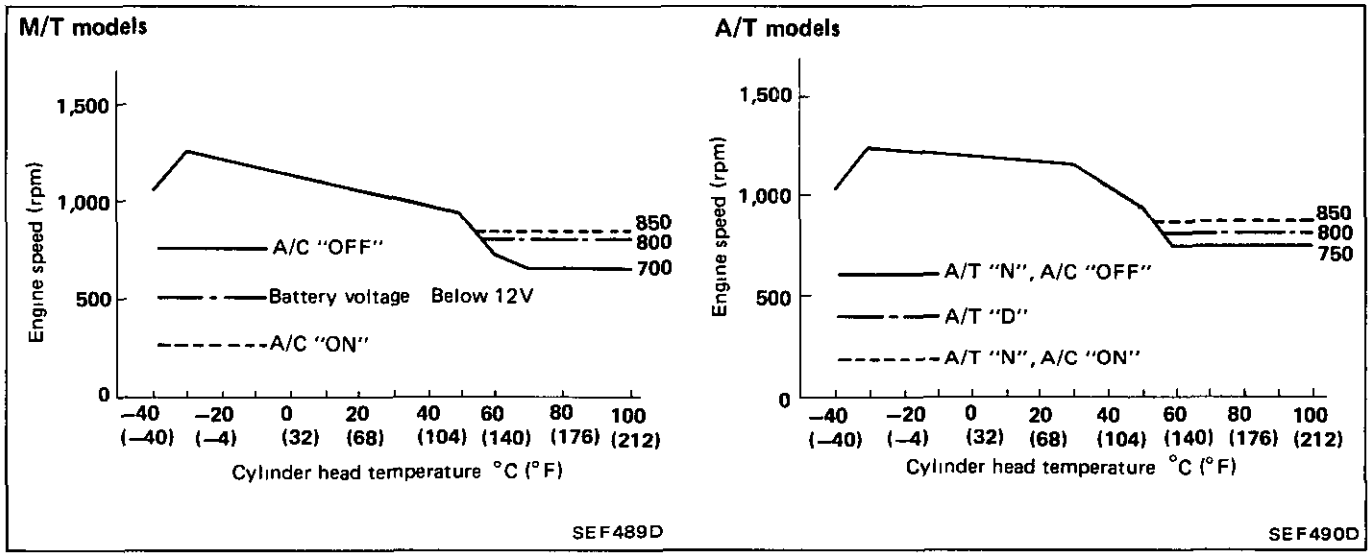
Operation

Condition	Idle-up solenoid operation
During engine start 20 seconds after engine start Battery voltage is below 12V Headlamp switch ON Cooling fan switch ON Power steering oil pressure switch ON	ON
Except above	OFF

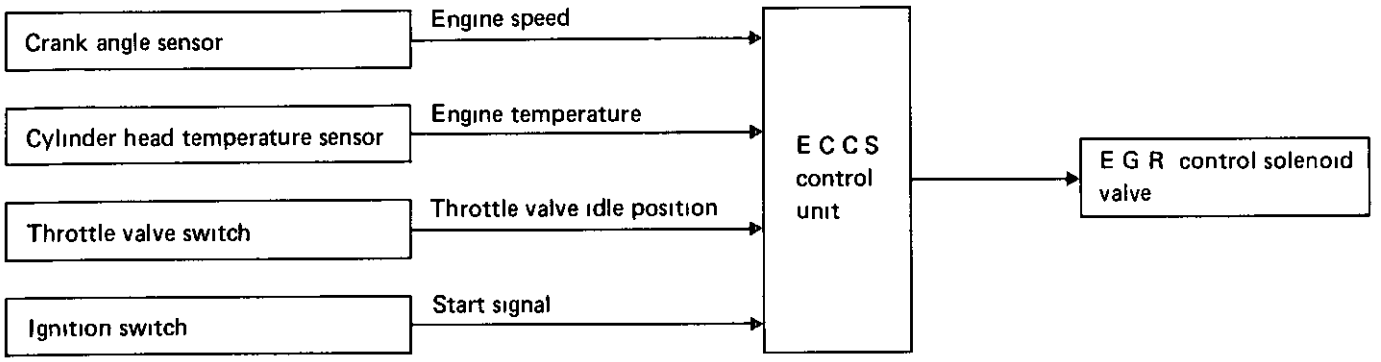
Idle Speed Control (VG30ET engine)

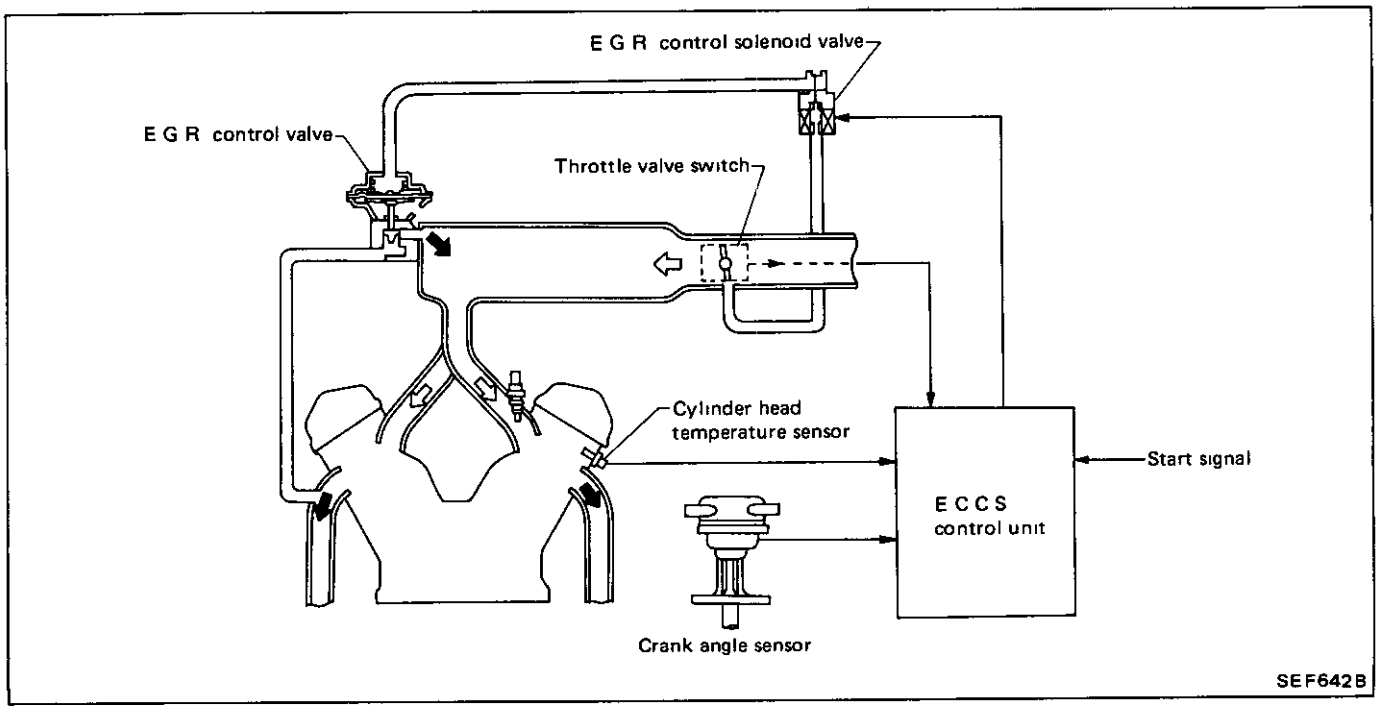


The idle speed is controlled by the E.C U., corresponding to the engine operating conditions. The E.C.U senses the engine condition and determines the best idle speed at each cylinder head temperature and gear position. The control unit then sends an electronic signal corresponding to the difference between the best idle speed and the actual idle speed to the A.A.C. valve



Exhaust Gas Recirculation (E.G.R.) Control





OPERATION

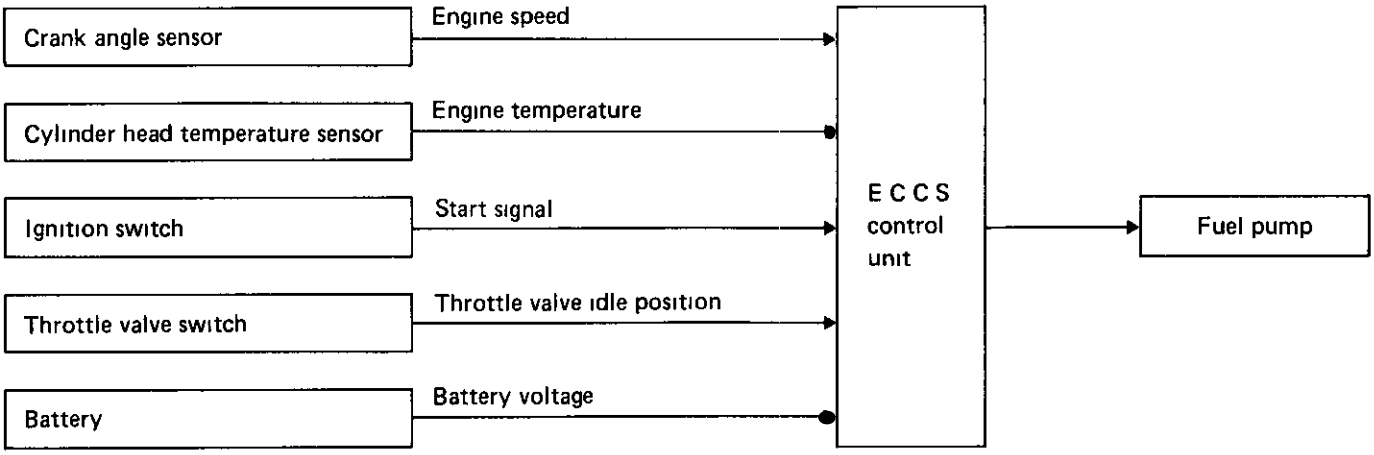
In the exhaust gas recirculation system, some of the exhaust gas is returned to the combustion chamber to lower the flame temperature during combustion This results in a reduction of the nitrogen oxide density in the exhaust gas.

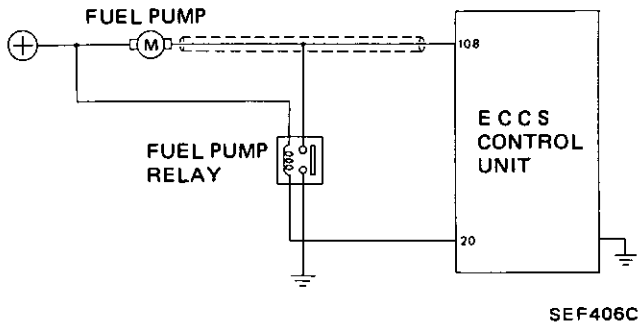
When the E.G.R. control valve is open, some of the exhaust gas is led from the exhaust manifold to the E G.R. tube The exhaust gas is then regulated by E.G R. valve, and is introduced into the intake manifold

The signal from the E C.U. is sent to the E.G.R control solenoid valve, which cuts the vacuum line for the E.G.R. control valve when any of the following conditions are met

Condition	E G R control solenoid	E G R system
Engine starting Throttle valve switch "ON" Under heavy load driving Low engine temperature High engine temperature Engine speed above 2,700 rpm	ON	Does not operate
Except above	OFF	Operates

Fuel Pump Control





Description

The fuel pump is controlled by the E.C.U adjusting the output voltage supplied to the fuel pump

Fuel pump ON-OFF control

1) Fuel pump ON-OFF control (terminal (108))

Condition	Fuel pump operation
Ignition switch is tunred to ON	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1 second
Except as shown above	Stops

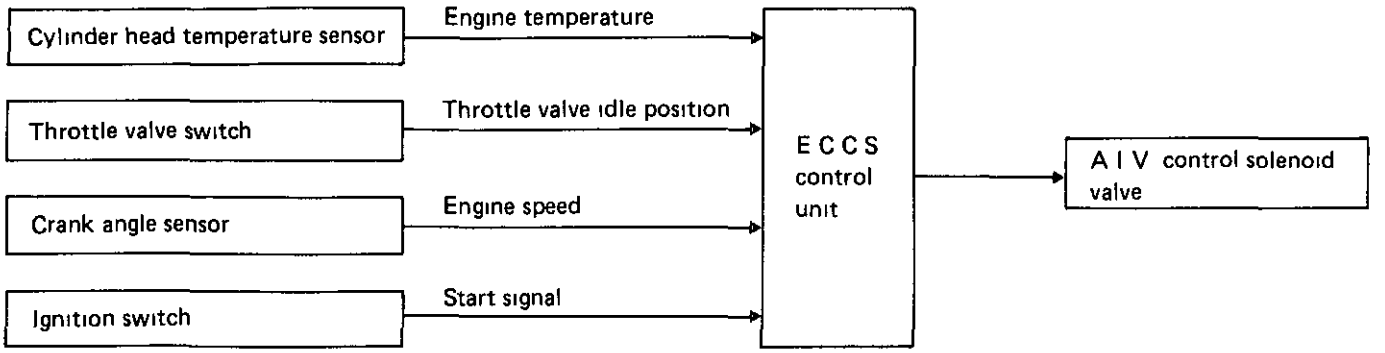
2) Fuel pump relay ON-OFF control (terminal (20))

Condition	Fuel pump relay operation	Fuel pump operation
Ignition switch is turned to ON	ON for 5 seconds	Operates for 5 seconds
When engine is starting [Engine temp above 100°C (212°F)]	ON	Operates
After started [Engine temp above 100°C (212°F)]	ON for 30 seconds	Operates
When engine stalls and except as shown above	OFF	Stops

Fuel pump voltage control

Conditions	Voltage
5 seconds after ignition switch is turned to ON Engine cranking 30 seconds after engine start [above 50°C (122°F)] Engine temp above 90°C (194°F) [Idle switch "OFF"] Engine temp below 10°C (50°F)	Approximately 13 4 [V]
Except above	9 4 ~ 13 4 [V]

Air Injection Valve (A.I.V.) Control



The exhaust air induction system is designed to send secondary air to the exhaust manifold, utilizing a vacuum caused by exhaust pulsation in the exhaust manifold.

The exhaust pressure in the exhaust manifold usually pulsates in response to the opening and closing of the exhaust valve and it decreases below atmospheric pressure periodically.

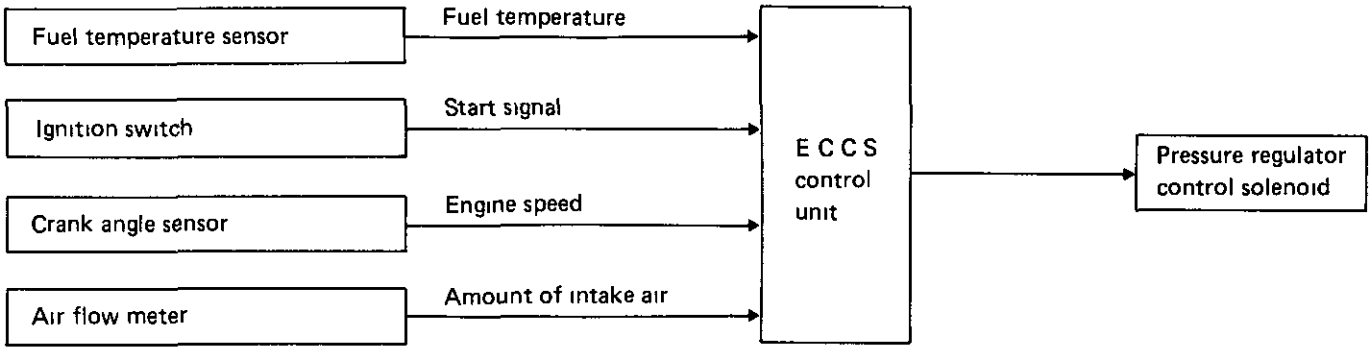
If a secondary air intake pipe is opened to the atmosphere under vacuum conditions, secondary air can be drawn into the exhaust manifold in proportion to the vacuum.

The air injection valve is controlled by the E.C.U., corresponding to the engine temperature. When the engine is cold, the A.I.V. control system operates to activate the 3-way catalytic converter quickly. This system also operates during deceleration for the purpose of blowing off water around the air injection valve.

Condition	A I V control solenoid	A I V control system
Low engine temp	ON	Operates
During deceleration		
Except above*	OFF	Does not operate

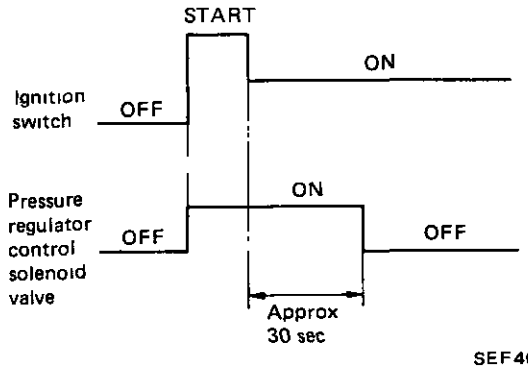
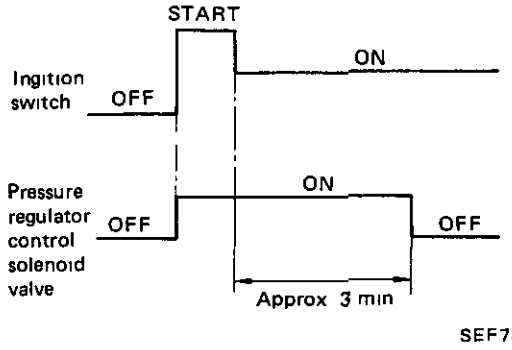
* Including cylinder head temperature sensor circuit malfunctioning

Pressure Regulator Control

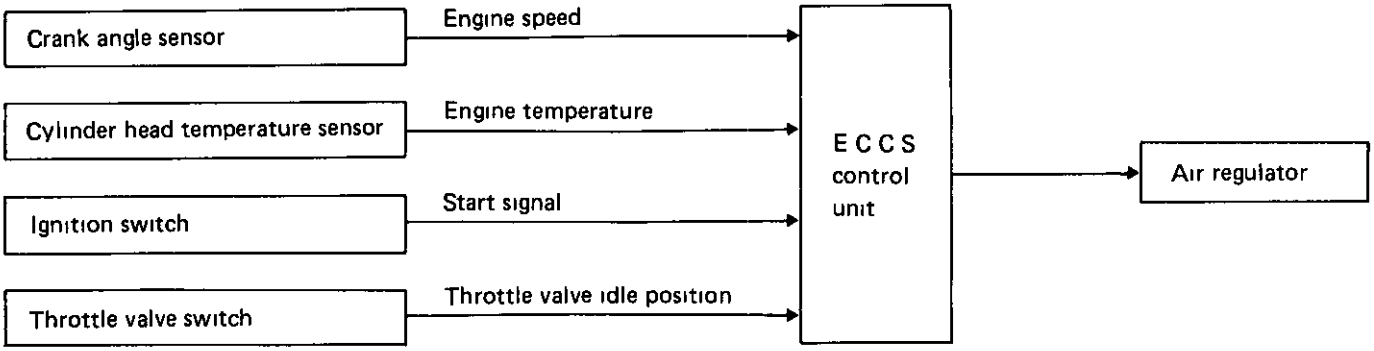


This system improves the startability in hot condition by cutting off the intake manifold vacuum and increasing the fuel pressure.
For VG30ET engine, the fuel line is imparted with high pressure which has been stored in the surge tank while the engine was running with turbocharger.

Operation

Fuel temp 40 - 78°C (104 - 172°F)	above 78°C (172°F)
	
SEF408C	SEF741B

Air Regulator Control



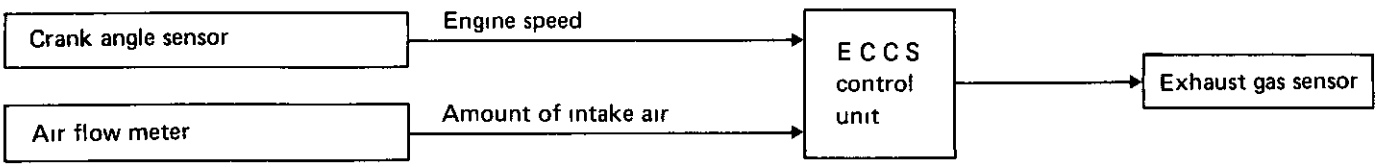
Description

The air regulator is controlled by the E.C.U at the same time as fuel pump ON-OFF control

Operation (Air regulator ON-OFF control)

Condition	Air regulator operation
Ignition switch is turned to ON	Operates for 5 seconds
While engine is running and cranking	Operates
When engine is stopped	OFF in 1 second
Except as shown above	OFF

Exhaust Gas Sensor Heater Control

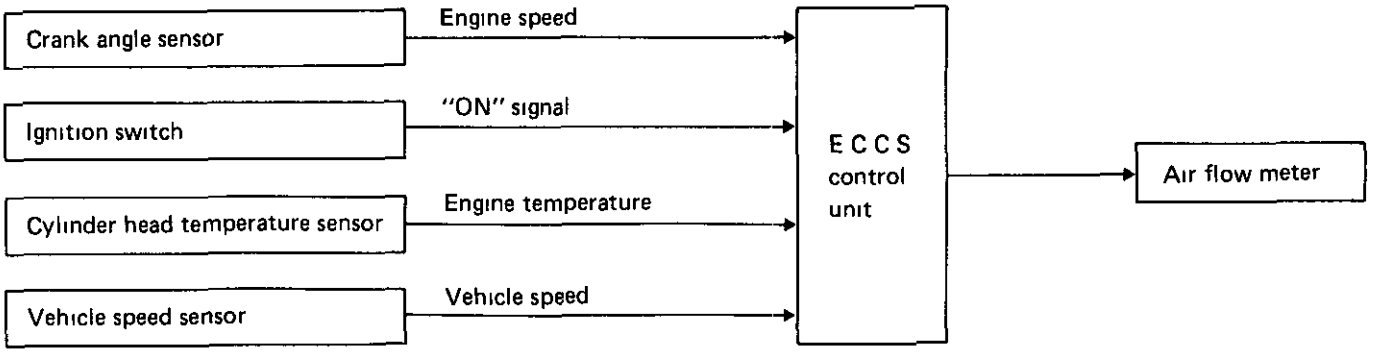


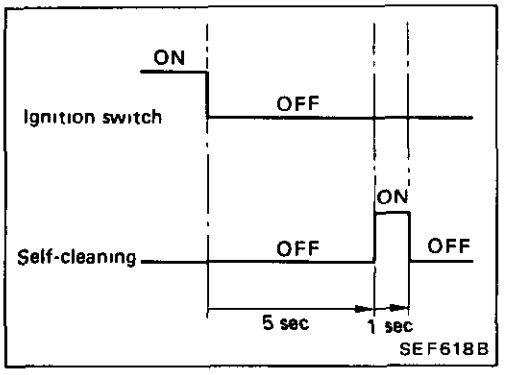
The E.C.U. controls the heater operation in the following way.

Operation

Condition	Exhaust gas sensor heater
• Engine speed is less than 2,800 rpm (VG30ET) 3,200 rpm (VG30E) • Except under heavy load	ON
Except as shown above	OFF

Air Flow Meter Self-cleaning Control





Description

After the engine is stopped, the E.C.U. heats up the hot wire to approximately 1,000°C (1,832°F) to burn out dust which adhered to the hot wire.

Operation

Condition	Self-cleaning system
• Engine speed has not exceeded 1,500 rpm before key off • Vehicle speed has not exceeded 20 km/h (12 MPH) before key off • Cylinder head temperature is higher than 115°C (239°F) when key off • Engine stall with key in ON position	Does not operate
Except as shown above	Operates

Fail-safe System

AIR FLOW METER

Description

When the output voltage of air flow meter is lower than the preprogrammed value, the E.C.U. judges it as a malfunctioning of air flow meter The E.C.U. fixes the systems in the following condition

Operation

System	Fixed condition
E G R control system	OFF
Idle speed control system	A duty ratio is fixed at the preprogrammed value
Fuel injection control system	Fuel is shut off above 2,000 rpm (Engine speed does not exceed 2,000 rpm)

CYLINDER HEAD TEMPERATURE SENSOR

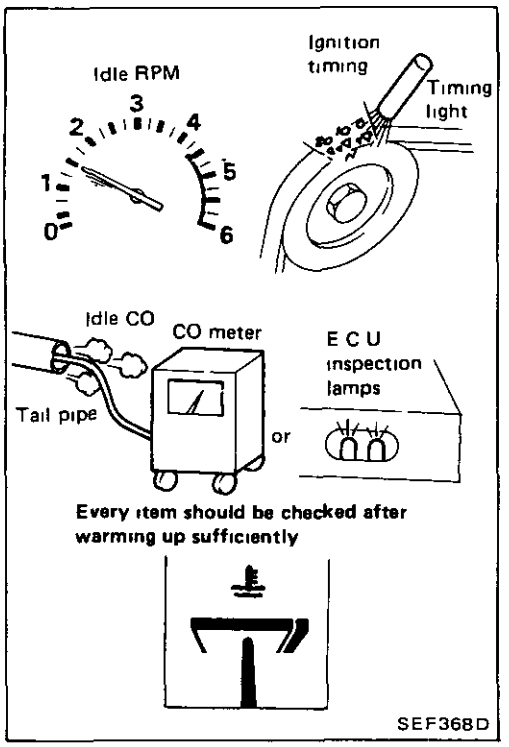
Description

When the output signal of cylinder head temperature sensor is abnormal the E C.U. judges it as a malfunctioning of cylinder head temperature sensor.

The E.C.U. decides the cylinder head temperature according to the time from ignition switch ON.

Operation

Condition	Cylinder head temperature decided
Just as ignition switch is turned ON or Start	20°C (68°F)
More than 6 minutes after ignition ON or Start	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)



Driveability

1. Make sure that the following items are in proper condition CHECK DATA.

1) Idle speed

VG30E (M/T & A/T in "D" position):
700±50 rpm at sea level
650±50 rpm at high altitudes
VG30ET:
M/T
700±50 rpm
A/T
650±50 rpm (in "D" position)

2) Ignition timing

VG30E:
20° ±2° B.T.D.C.
VG30ET:
15° ±2° B.T.D.C.

3) Idle CO

○ **0.2 - 4.0% (in tail pipe)**

- **Throttle valve switch harness connector disconnected (No A.I.V. controlled condition)**
- **Cylinder head temperature sensor harness connector disconnected and then 2.5 kΩ resistor connected.**
- **Exhaust gas sensor harness connector disconnected.**

○ **Flashes of E.C.U. red inspection lamp in mode II (If flashes, O.K.)**

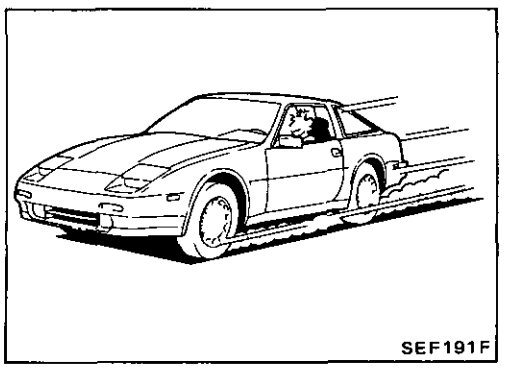
4) Mixture ratio at approximately 2,000 rpm of engine speed.

Number of flashes of E.C.U. inspection green lamp in mode I
5 times or more/10 seconds

5) Engine speed of idle switch OFF → ON

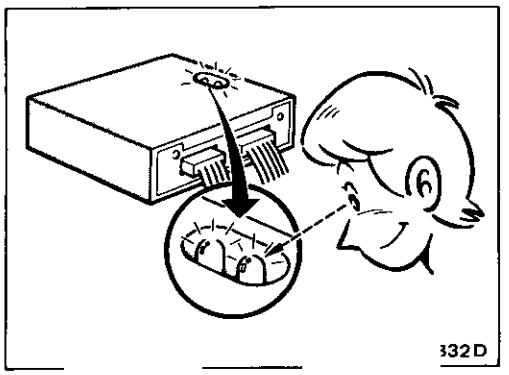
M/T: Idle speed + 250± 150 rpm
A/T: Engine speed (In "N" position) + 250± 150 rpm

If N.G., adjust to the specified value.
See page EF & EC-99.



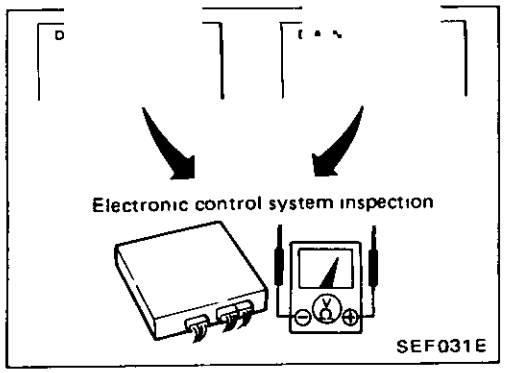
2. Perform driving test
Evaluate effectiveness of adjustments by driving vehicle
During driving vehicle, perform real time diagnostic test

Driveability (Cont'd)



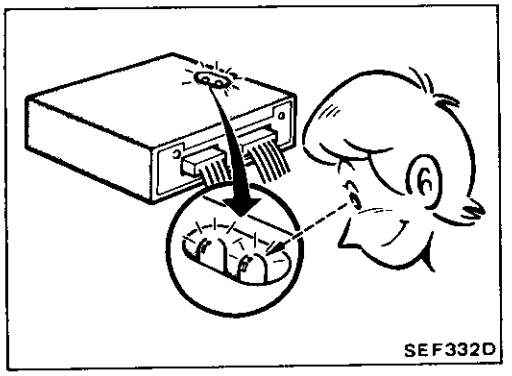
3. Perform E C C S self-diagnosis

See page EF & EC-36.



4 If the result of driveability test is unsatisfactory, or malfunctioning conditions are found in performing E C C.S self-diagnosis and real time diagnostic test, perform general inspection, electronic system inspection and real time diagnostic inspection by following DIAGNOSTIC TABLES 1 and 2 in response to driveability trouble items If N G, repair or replace

See page EF & EC-33.



5 Perform switches ON/OFF diagnostic test

See page EF & EC-44.

6 Perform driving test
Re-evaluate vehicle performance after all inspections

Diagnostic Table 1

SYSTEM INSPECTION TABLE

Sensor & actuator / Reference pages for inspection / System	Crank angle sensor	Air flow meter	Cylinder head temperature sensor	Ignition switch	Injector	Throttle valve switch	Neutral switch	Exhaust gas sensor
	EF & EC-54	EF & EC-56	EF & EC-58	Refer to EL section	EF & EC-76	EF & EC-70	EF & EC-88	EF & EC-74
Fuel injection & mixture ratio feedback control	○	○	○	○	○	○	○	○
Ignition timing control	○	○	○	○		○		
Idle speed control	○		○	○		○	○	
E G R control	○		○	○		○		
A I V control			○	○		○		
Fuel pump control	○		○	○		○		
Fuel pressure control				○				
Air regulator control	○			○				
Air flow meter self-cleaning control	○		○	○				

Sensor & actuator / Reference pages for inspection / System	Battery voltage	A I V control solenoid valve	E G R control solenoid valve	Idle-up solenoid/ A A C valve	Fuel temperature sensor	Vehicle speed sensor	Air regulator	P R control solenoid valve
	—	EF & EC-80	EF & EC-82	EF & EC-84/86	EF & EC-66	EF & EC-72	EF & EC-92	EF & EC-90
Fuel injection & mixture ratio feedback control	○				○	○		
Ignition timing control	Power transistor					○		
Idle speed control	○			○*		○		
E G R control			○					
A I V control		○						
Fuel pump control	Fuel pump relay							
Fuel pressure control					○			○
Air regulator control							○	
Air flow meter self-cleaning control						○		

* Input switch
① Power steering oil pressure switch
② Heater or Air conditioner switch
③ Lighting switch & rear defogger switch
④ Radiator fan switch

This table indicates the inspection items for the E C C S. control system For each system, it is necessary to check sensors or actuators marked "○".

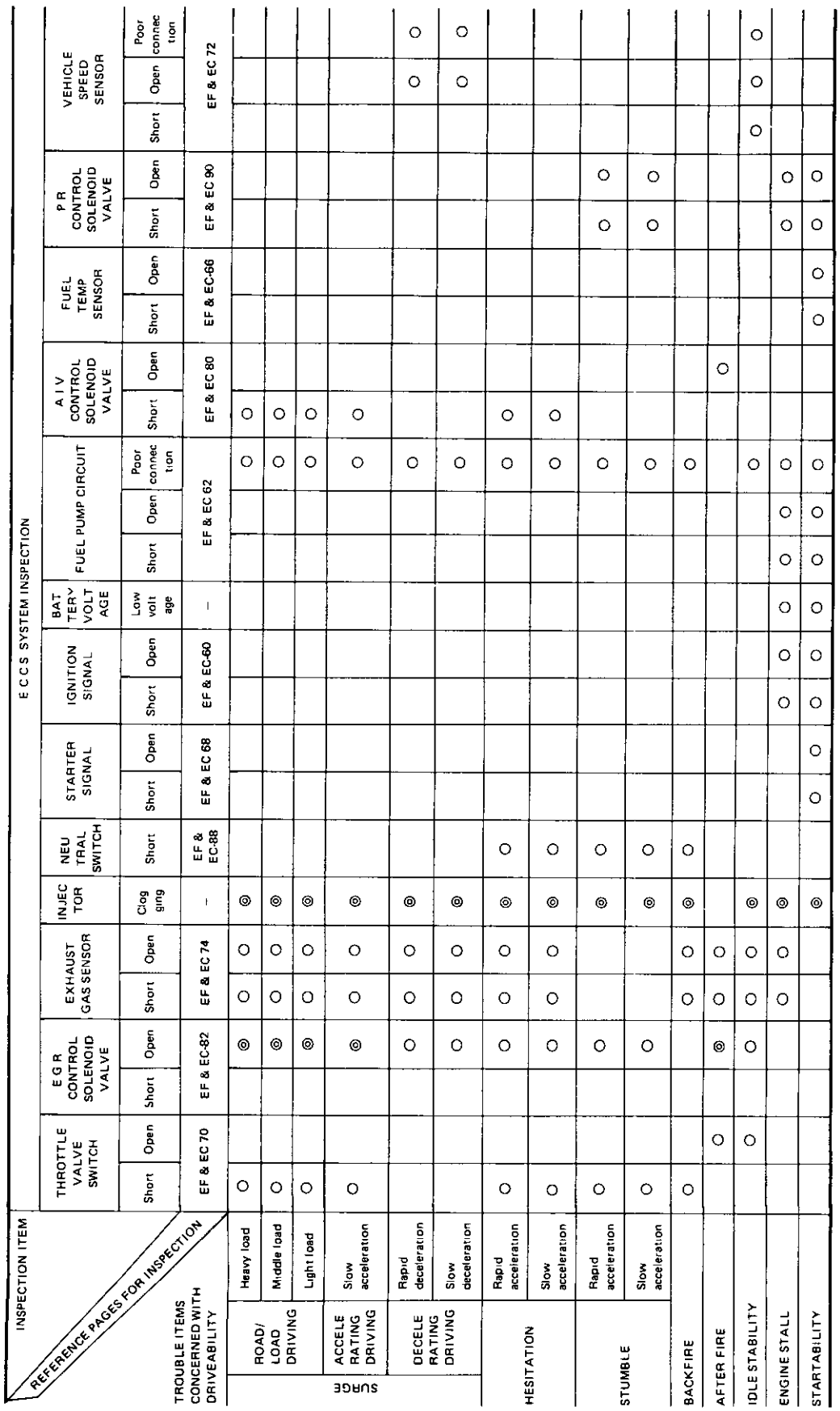
DRIVEABILITY INSPECTION TABLE

Diagnostic Table 2

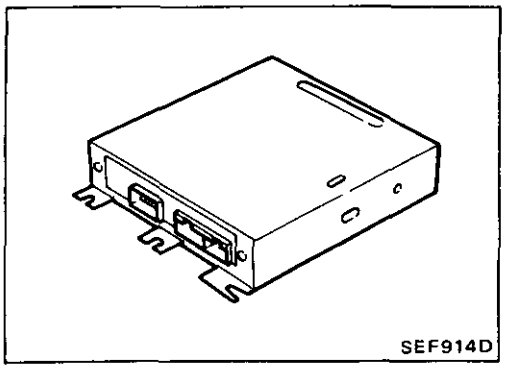
INSPECTION ITEM / REFERENCE PAGES FOR INSPECTION / TROUBLE ITEMS CONCERNED WITH DRIVEABILITY			GENERAL INSPECTION																	ECSS SYSTEM INSPECTION						
			FUEL FLOW SYSTEM				ELECTRIC SYSTEM					AIR FLOW SYSTEM						IDLE UP SOLENOID VALVE		CRANK ANGLE SENSOR			AIR FLOW METER	CYLINDER HEAD TEMPERATURE SENSOR		
			Fuel level	Fuel pump	Fuel filter	Fuel line	Battery	Spark plug	Ignition wire	Alternator	Starter	Air cleaner	Air flow line	EGR valve	FICD solenoid valve	Air regulator	PCV	Short	Open	120° signal noise	120° signal faults	1° signal faults	Poor connection	Short	Open	Poor connection
			–	–	–	–	–	–	–	Refer to EL section		–	–	EF & EC 112	–	EF & EC 93	–	–		EF & EC 54			EF & EC 56	EF & EC 58		
SURGE	ROAD/ LOAD DRIVING	Heavy load			○	○		◎	○			○	○	○			○			○	○	○	◎	○	○	○
		Middle load			○	○		◎	○			○	○	◎			○			○	○	○	◎	○	○	○
		Light load			○	○		◎	○			○	○	◎			○			○	○	○	◎	○	○	○
	ACCELERATING DRIVING	Slow acceleration			○	○		◎	○			○	○	◎			○			○	○	○	◎	○	○	○
	DECELERATING DRIVING	Rapid deceleration			○	○		◎	○			○	○	○			○			○	○	○	◎	○	○	○
		Slow deceleration			○	○		◎	○			○	○	○			○			○	○	○	◎	○	○	○
HESITATION		Rapid acceleration			○	○		◎	○			○	○	○			○			○	○	○	◎	○	○	○
		Slow acceleration			○	○		◎	○			○	○	○			○			○	○	○	◎	○	○	○
STUMBLE		Rapid acceleration			○	○		◎	○			○	○	○			○			○	○	○	◎	○	○	○
		Slow acceleration			○	○		◎	○			○	○	○			○			○	○	○	◎	○	○	○
BACKFIRE					○	○			○				○				○			○	○	○	◎	○		○
AFTER FIRE									○			○					○			○	○	○	◎		○	○
IDLE STABILITY								◎	○	○		○	○	◎	○	○	○		◎	○	○	○	○	○	○	○
ENGINE STALL			○	○	○	○	○	◎	○	○		○	○	○	○	○	○			◎	◎	◎	◎	○	○	○
STARTABILITY			○	○			○	◎	○	○	○	○	○			○	○			◎	◎	◎	○	○	○	○

This table indicates the inspection items for each type of symptom It is necessary for each symptom to check sensors or actuators marked ◎" or "○
Items marked "◎" have a significant influence on driveability Prior to items marked "○", check items marked "◎
Improper mixture ratio, improper ignition condition and an excess of EGR volume can cause any symptom
* If injector or air flow meter circuit is short or open, the fail safe system operates

Diagnostic Table 2 (Cont'd)



TROUBLE ITEMS CONCERNED WITH DRIVEABILITY			INSPECTION ITEM / REFERENCE PAGES FOR INSPECTION	ECCS SYSTEM INSPECTION																													
				THROTTLE VALVE SWITCH		EGR CONTROL SOLENOID VALVE		EXHAUST GAS SENSOR		INJECTOR	NEUTRAL SWITCH	STARTER SIGNAL		IGNITION SIGNAL		BAT TERY VOLTAGE	FUEL PUMP CIRCUIT			AIV CONTROL SOLENOID VALVE		FUEL TEMP SENSOR		PR CONTROL SOLENOID VALVE		VEHICLE SPEED SENSOR		
				Short	Open	Short	Open	Short	Open	Clogging	Short	Short	Open	Short	Open	Low voltage	Short	Open	Poor connection	Short	Open	Short	Open	Short	Open	Short	Open	Poor connection
				EF & EC 70		EF & EC-82		EF & EC 74		–	EF & EC-88	EF & EC 68		EF & EC-60		–	EF & EC 62			EF & EC 80		EF & EC-66		EF & EC 90		EF & EC 72		
SURGE	ROAD/LOAD DRIVING	Heavy load				◎		○	○	◎									○	○								
		Middle load		○		◎		○	○	◎									○	○								
		Light load		○		◎		○	○	◎									○	○								
	ACCELE RATING DRIVING	Slow acceleration		○		◎		○	○	◎									○	○								
	DECELE RATING DRIVING	Rapid deceleration				○		○	○	◎									○							○		○
		Slow deceleration				○		○	○	◎									○							○		○
HESITATION		Rapid acceleration		○		○		○	○	◎	○								○	○								
		Slow acceleration		○		○		○	○	◎	○								○	○								
STUMBLE		Rapid acceleration		○		○				◎	○								○						○			
		Slow acceleration		○		○				◎	○								○						○			
BACKFIRE				○				○	○	◎	○								○									
AFTER FIRE					○		◎	○	○											○								
IDLE STABILITY					○		○	○	○	◎									○						○	○		○
ENGINE STALL								○	○	◎				○	○	○	○	○	○					○	○			
STARTABILITY										◎		○	○	○	○	○	○	○	○			○	○	○	○			


SEF914D

Description

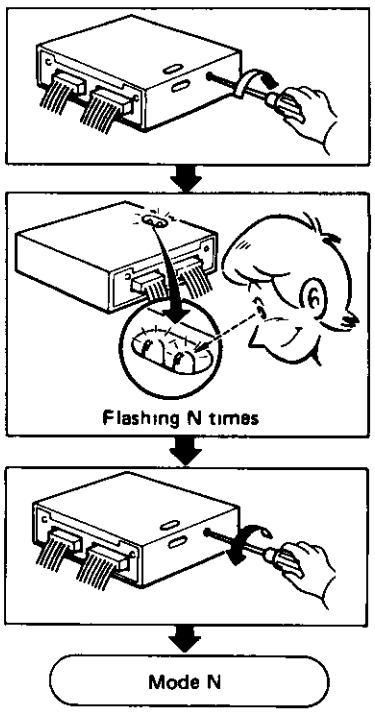
The self-diagnosis is useful to diagnose malfunctions in major sensors and actuators of the E C C S system. There are 5 modes in the self-diagnosis system

1. **Mode I – Mixture ratio feedback control monitor A**
- During closed loop condition
  The green inspection lamp turns ON when lean condition is detected and goes OFF by rich condition
  With clamping, mixture conditions (lean or rich) just before clamping are maintained
- During open loop condition
  The green inspection lamp keeps OFF

2 **Mode II – Mixture ratio feedback control monitor B**
The green inspection lamp function is the same as Mode I.
- During closed loop condition
  The red inspection lamp turns ON and OFF simultaneously with the green inspection lamp when the mixture ratio is controlled within the specified value
- During open loop condition
  The red inspection lamp stays OFF.

3. **Mode III – Self-diagnosis**
   This mode is the same as the former self-diagnosis in self-diagnosis mode
4. **Mode IV – *Switches ON/OFF diagnosis***
   During this mode, the inspection lamps monitor the switch ON-OFF condition
- Throttle valve switch
- Starter switch
- Vehicle speed sensor

5. **Mode V – Real time diagnosis**
   The moment the malfunction is detected, the display will be presented immediately That is, the condition at which the malfunction occurs can be found by observing the inspection lamps during driving test.

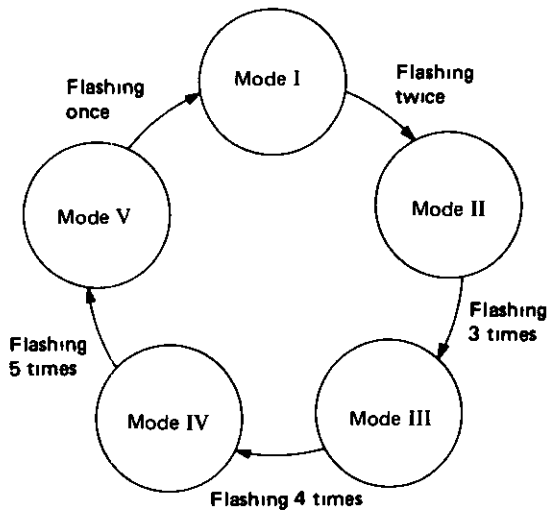


SEF872D

Description (Cont'd)

SWITCHING THE MODES

1 Turn ignition switch "ON".
2 Turn diagnostic mode selector on E.C.U. fully clockwise and wait the inspection lamps flash
3 Count the number of the flashing time, and after the inspection lamps have flashed the number of the required mode, turn diagnostic mode selector fully counterclockwise immediately



SEF989D

When the ignition switch is turned off during diagnosis, in each mode, and then turned back on again after the power to the E.C.U. has dropped off completely, the diagnosis will automatically return to Mode I.

The stored memory would be lost if

1 Battery terminal is disconnected
2 After selecting Mode III, Mode IV is selected
However, if the diagnostic mode selector is kept turned fully clockwise, it will continue to change in the order of Mode I → II → III → IV → V → I etc., and in this state the stored memory will not be erased

Modes I & II — Mixture Ratio Feedback Control Monitors A & B

In these modes, the control unit provides the Air-fuel ratio monitor presentation and the Air-fuel ratio feedback coefficient monitor presentation

<table>
<tr><th rowspan="2">Mode</th><th rowspan="2">LED</th><th rowspan="2">Engine stopped</th><th colspan="4">Engine running</th></tr>
<tr><th>Open loop condition</th><th colspan="3">Closed loop condition</th></tr>
<tr><td rowspan="2">Mode I
(Monitor A)</td><td>Green</td><td>ON</td><td>OFF</td><td colspan="3">• OFF rich condition
• ON lean condition
• Maintains conditions just before clamping</td></tr>
<tr><td>Red</td><td>ON</td><td>OFF</td><td colspan="3">OFF</td></tr>
<tr><td rowspan="3">Mode II
(Monitor B)</td><td>Green</td><td>ON</td><td>OFF</td><td colspan="3">• OFF rich condition
• ON lean condition
• Maintains conditions just before clamping</td></tr>
<tr><td rowspan="2">Red</td><td rowspan="2">OFF</td><td rowspan="2">OFF</td><td colspan="3">Compensating mixture ratio</td></tr>
<tr><td>More than 5% rich</td><td>Between 5% lean and 5% rich</td><td>More than 5% lean</td></tr>
<tr><td></td><td>OFF</td><td>Synchronized with green LED</td><td>ON</td></tr>
</table>

Mode III — Self-diagnostic System

The E C U constantly monitors the function of these sensors and actuators, regardless of ignition key position If a malfunction occurs, the information is stored in the E C U and can be retrieved from the memory by turning on the diagnostic mode selector, located on the side of the E C U When activated, the malfunction is indicated by flashing a red and a green L E D (Light Emitting Diode), also located on the E C U Since all the self-diagnostic results are stored in the E C U 's memory even intermittent malfunctions can be diagnosed

A malfunctioning part's group is indicated by the number of both the red and the green L E D s flashing First, the red L E D flashes and the green flashes follow The red L E D refers to the number of tens while the green one refers to the number of units For example, when the red L E D flashes once and then the green one flashes twice, this means the number "12" showing the air flow meter signal is malfunctioning In this way, all the problems are classified by the code numbers

- **When engine fails to start, crank engine more than two seconds before starting self-diagnosis**
- **Before starting self-diagnosis, do not erase stored memory If doing so, self-diagnosis function for intermittent malfunctions would be lost**

The stored memory would be lost if

1 **Battery terminal is disconnected**
2 **After selecting Mode III, Mode IV is selected.**

DISPLAY CODE TABLE

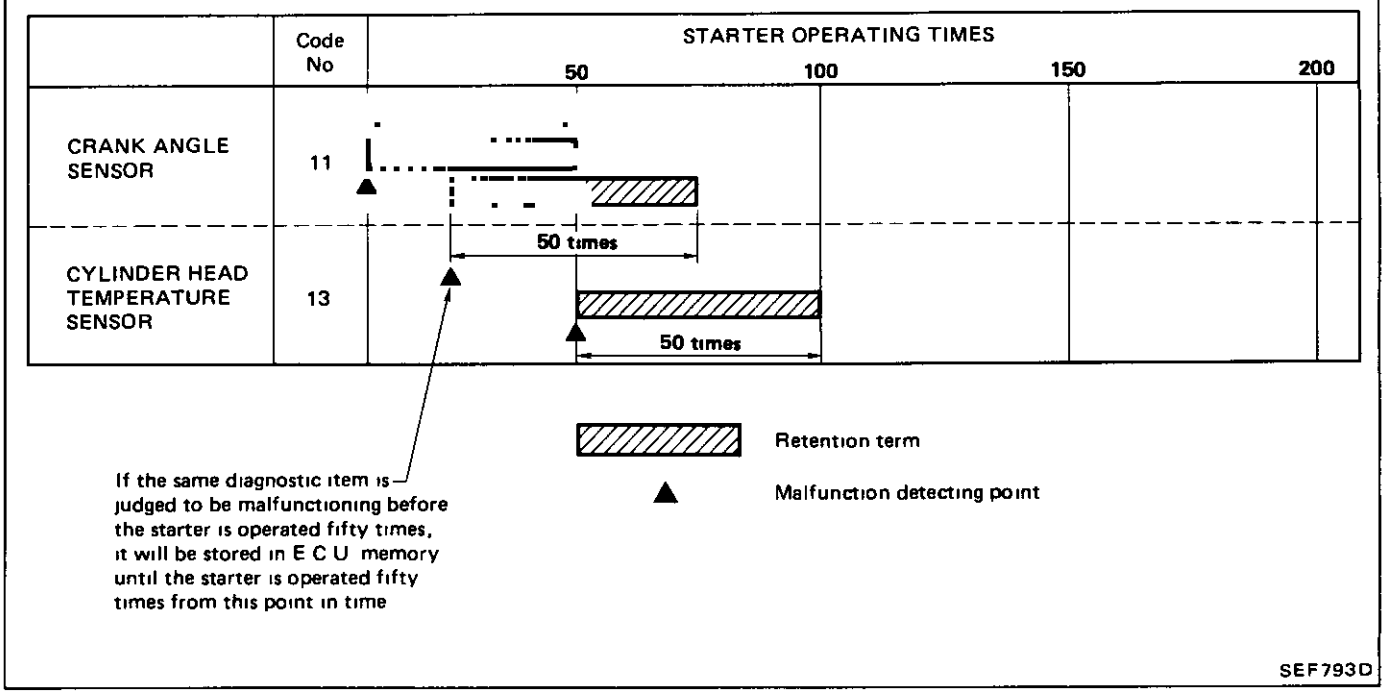
Code No	Detected items
11	Crank angle sensor circuit
12	Air flow meter circuit
13	Cylinder head temperature sensor circuit
21	Ignition signal missing in primary coil
22	Fuel pump circuit
34	Detonation sensor circuit [VG30ET]
41	Fuel temperature sensor circuit
44	No malfunctioning in the above circuits

Mode III — Self-Diagnostic System (Cont'd)

RETENTION OF DIAGNOSTIC RESULTS

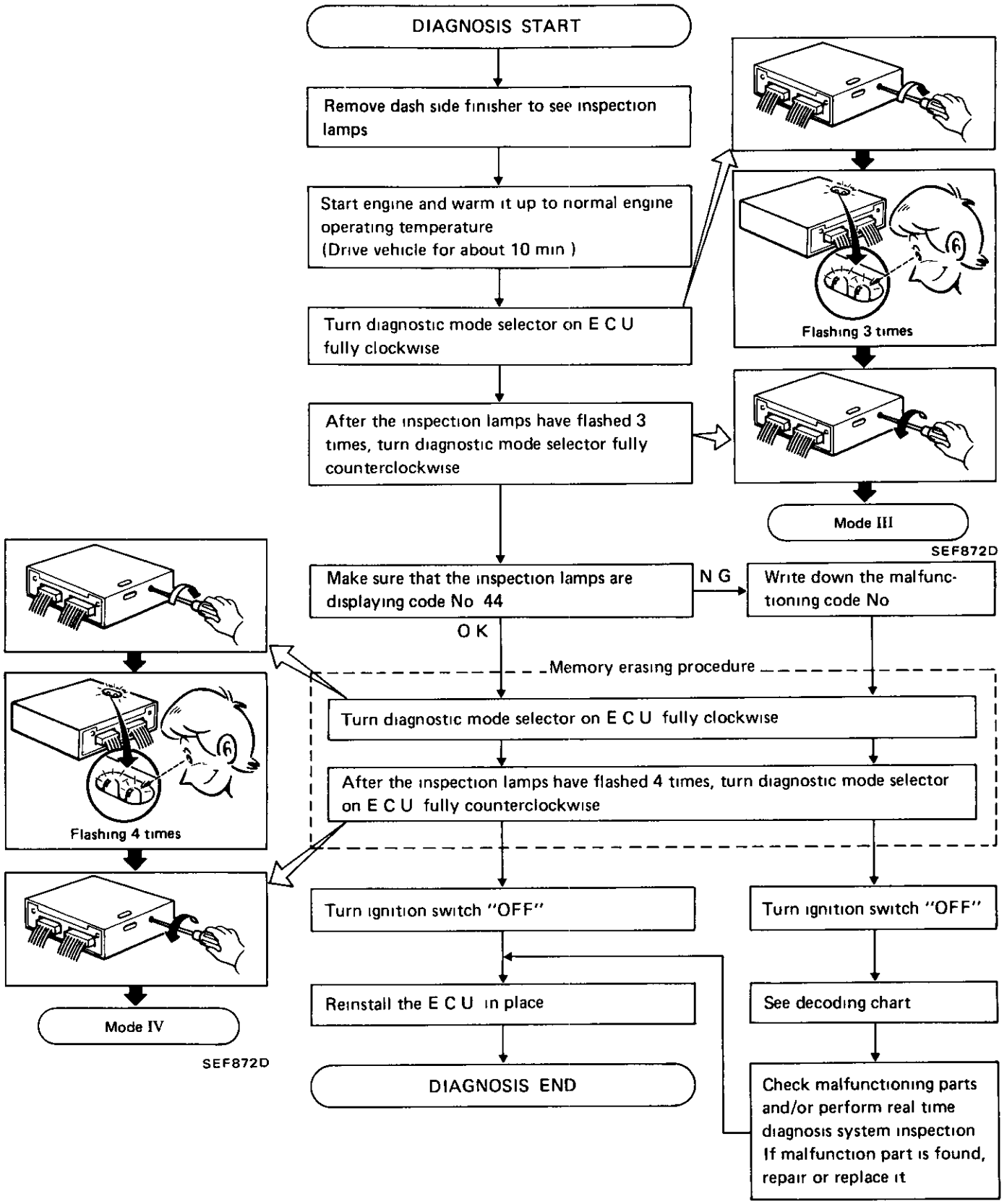
The diagnostic result is retained in E C.U. memory until the starter is operated fifty times after a diagnostic item is judged to be malfunctioning The diagnostic result will then be cancelled automatically If a diagnostic item which has been judged to be malfunctioning and stored in memory is again judged to be malfunctioning before the starter is operated fifty times, the second result will replace the previous one It will be stored in E C U memory until the starter is operated fifty times more

RETENTION TERM CHART (Example)



Mode III — Self-diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE

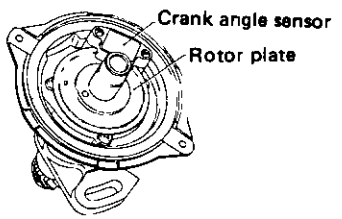
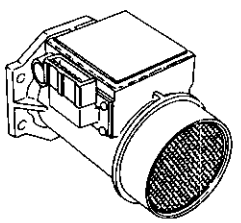
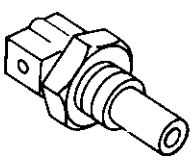
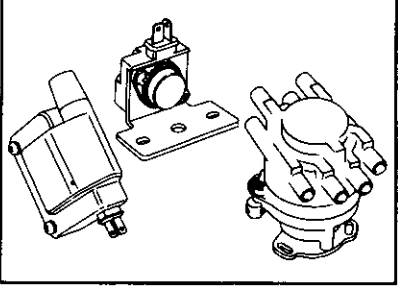


CAUTION

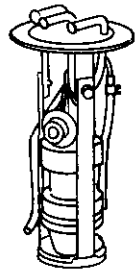
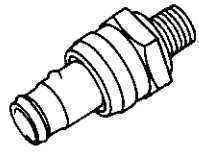
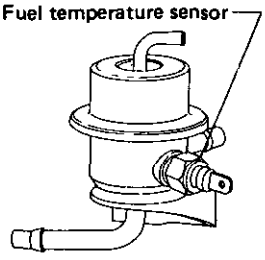
During displaying code No. in self-diagnosis mode (mode III), if the other diagnostic mode should be done, make sure to write down the malfunctioning code No. before turning diagnostic mode selector on E.C.U. fully clockwise, or select the diagnostic mode after turning switch "OFF". Otherwise self-diagnosis information stored in E.C.U. memory until now would be lost.

Mode III — Self-diagnostic System (Cont'd)

DECODING CHART

Display code	Malfunctioning circuit or parts	Control unit shows a malfunction signal when the following conditions are detected.
CRANK ANGLE SENSOR **Code No 11** Red — Green	Crank angle sensor circuit is malfunctioning 	• Either 1° or 120° signal is no entered for the first few seconds during engine cranking • Either 1° or 120° signal is not input often enough while the engine speed is higher than the specified rpm SYSTEM INSPECTION See page EF & EC-54
SEF990D		
AIR FLOW METER **Code No 12** Red — Green	Air flow meter circuit is malfunctioning 	• The air flow meter circuit is open or shorted (An abnormally high or low voltage is entered.) SYSTEM INSPECTION See page EF & EC-56
SEF280E		
CYLINDER HEAD TEMPERATURE SENSOR **Code No 13** Red — Green	Cylinder head temperature sensor circuit 	• The cylinder head temperature sensor circuit is open or shorted (An abnormally high or low output voltage is entered.) SYSTEM INSPECTION See page EF & EC-58
SEF833C		
IGNITION SIGNAL **Code No. 21** Red — Green	Ignition signal is malfunctioning 	• The ignition signal in primary circuit is not entered during engine cranking or running SYSTEM INSPECTION See page EF & EC-60
SEF993D		

Mode III — Self-diagnostic System (Cont'd)

Display code	*Malfunctioning circuit or parts*	*Control unit shows a malfunction signal when the following conditions are detected*
FUEL PUMP CONTROL **Code No 22** Red → Green	Fuel pump circuit is malfunctioning 	• *Idle speed control valve circuit is open* or short (Idle speed is higher than target idle speed in spite of feedback control) • Fuel circuit is open or short (An extremely high or low current is entered) SYSTEM INSPECTION See page EF & EC-62
DETONATION SENSOR [VG30ET] **Code No 34** Red → Green	Detonation sensor circuit is malfunctioning 	• The detonation circuit is open or shorted (An abnormally high or low voltage is entered) SYSTEM INSPECTION See page EF & EC-64
FUEL TEMPERATURE SENSOR **Code No 41** Red → Green	Fuel temperature sensor circuit is malfunctioning Fuel temperature sensor 	• Fuel temperature circuit is open or short (An abnormally high or low voltage is entered) SYSTEM INSPECTION See page EF & EC-66
Code No 44 Red → Green	ECCS normal operation	

SEF994D SEF191F SEF281E SEF841C

Mode IV — Switches ON/OFF Diagnostic System

In switches ON/OFF diagnosis system, ON/OFF operation of the following switches can be detected continuously

- Throttle valve switch
- Starter switch
- Vehicle speed sensor

(1) Throttle valve switch & Starter switch

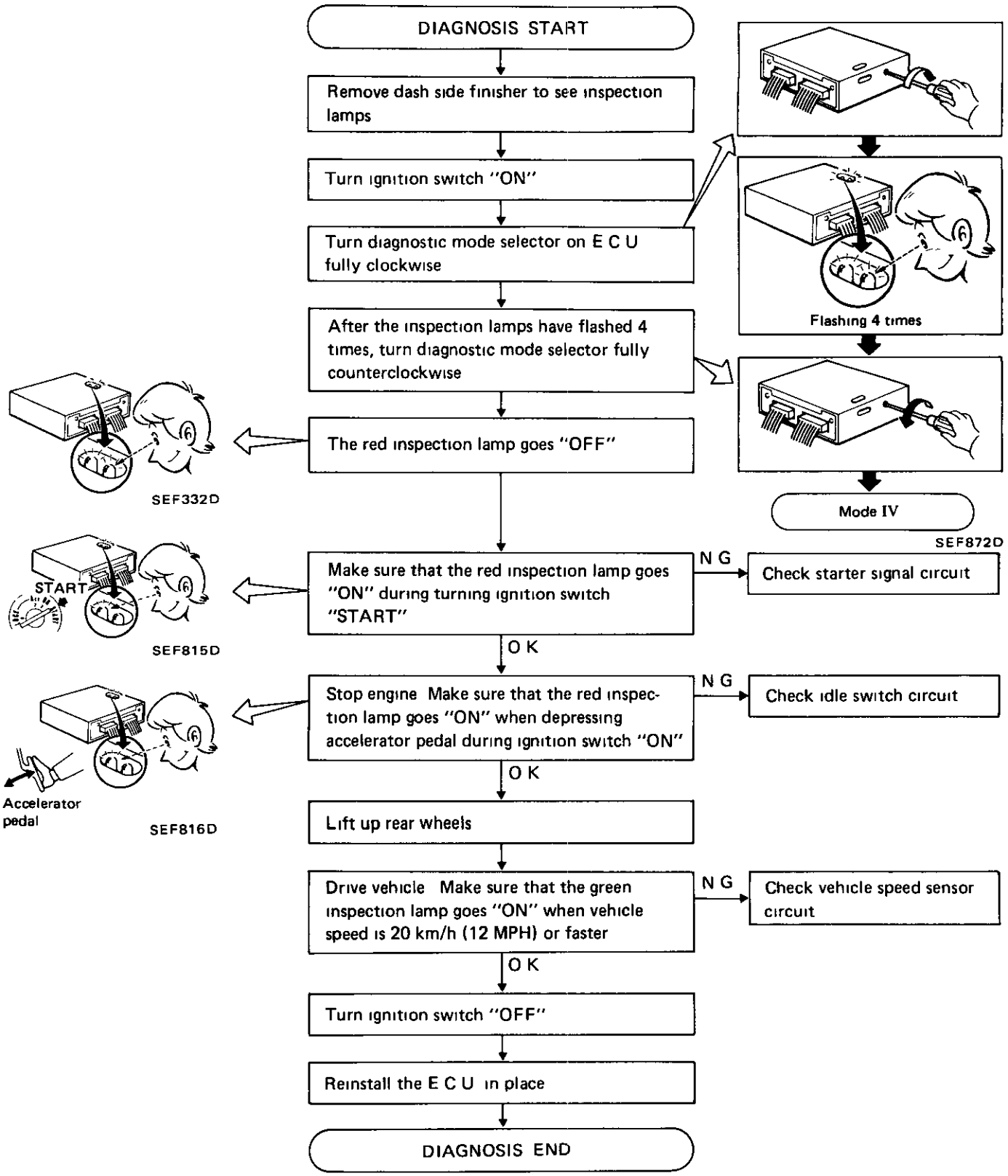
The switches ON/OFF status at the point when mode IV is selected is stored in E C U memory When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D on E C U alternately comes on and goes off each time switching is detected

(2) Vehicle Speed Sensor

The switches ON/OFF status at the point when mode IV is selected is stored in E C U memory When vehicle speed is 20 km/h (12 MPH) or slower, the green L E D on E C U is off When vehicle speed exceeds 20 km/h (12 MPH), the green L.E D on E C U comes "ON"

Mode IV — Switches ON/OFF Diagnostic System (Cont'd)

SELF-DIAGNOSTIC PROCEDURE



CAUTION:

- **For safety, do not drive rear wheels at higher speed than required.**

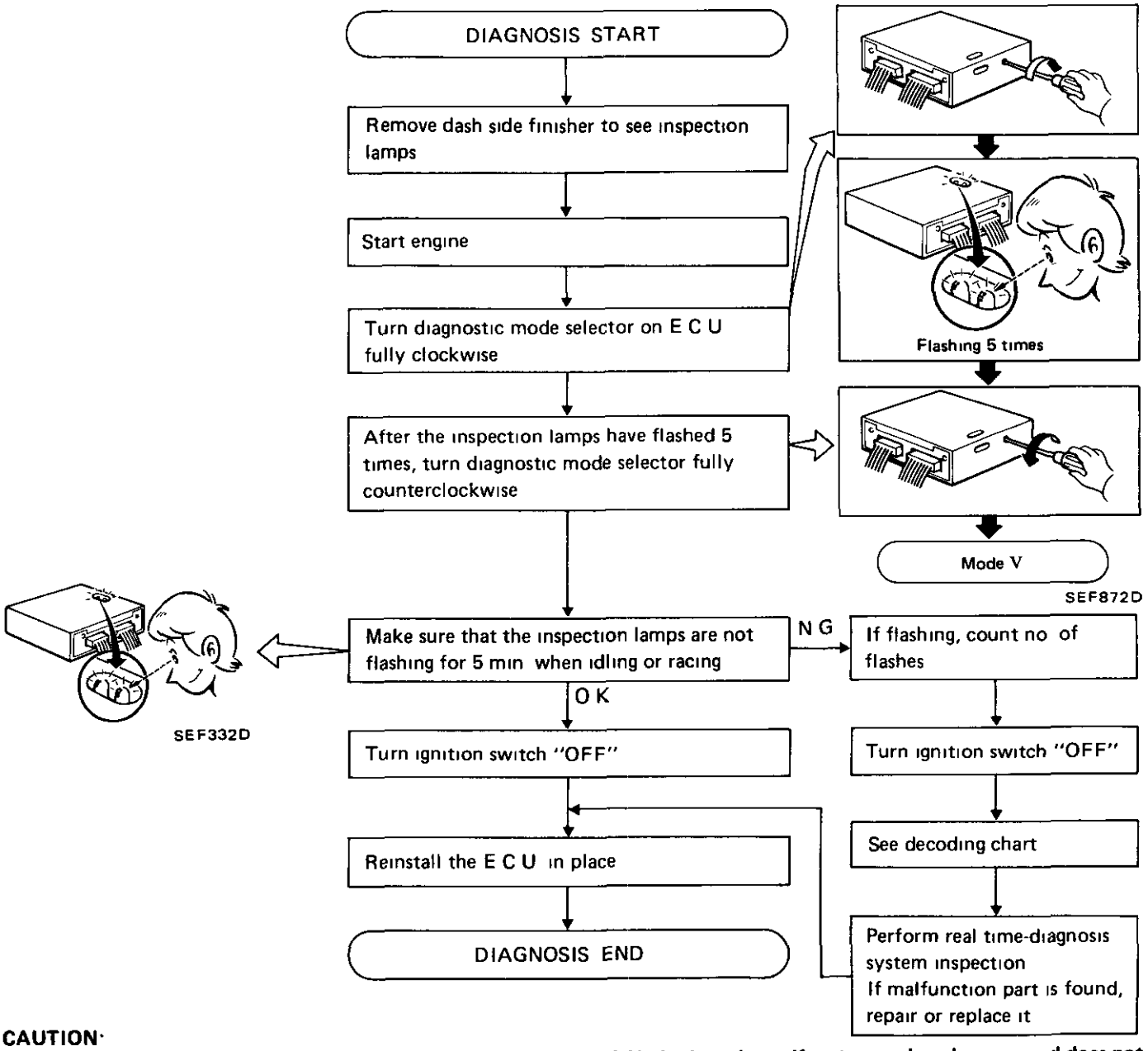
Mode V — Real Time Diagnostic System

In real time diagnosis, if any of the following items are judged to be faulty, a malfunction is indicated immediately

- Crank angle sensor (120° signal & 1° signal)
- Ignition signal
- Air flow meter output signal
- Fuel pump

Consequently, this diagnosis is a very effective measure to diagnose whether the above systems cause the malfunction or not, during driving test Compared with self-diagnosis, real time diagnosis is very sensitive, and can detect malfunctioning conditions in a moment Further, items regarded to be malfunctions in this diagnosis are not stored in E C U memory

SELF-DIAGNOSTIC PROCEDURE

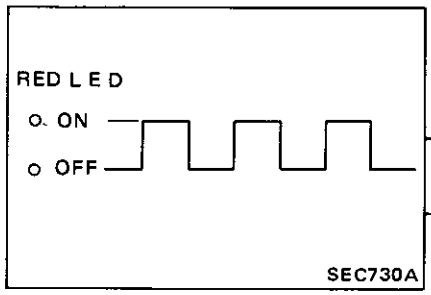
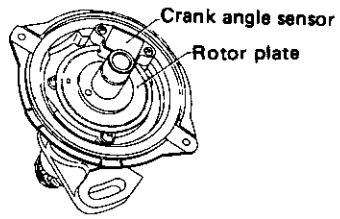
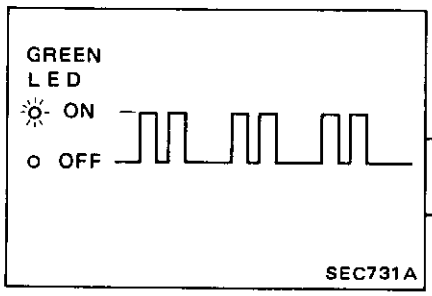
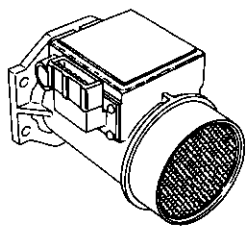
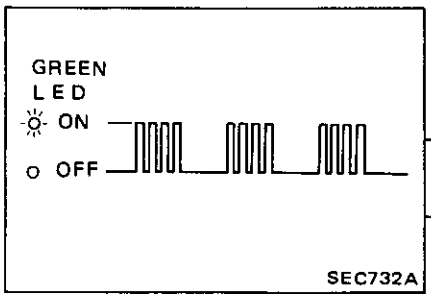
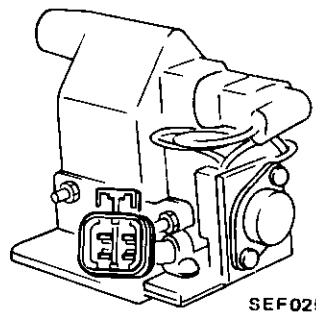
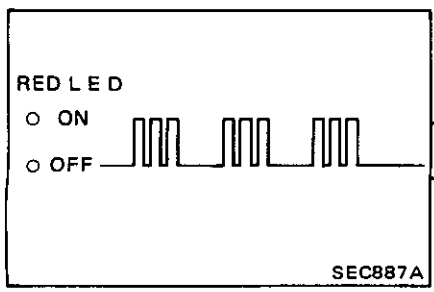
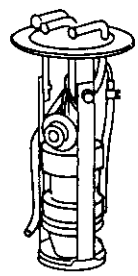


CAUTION:

In real time diagnosis, pay attention to inspection lamp flashing. E C U displays the malfunction code only once, and does not memorize the inspection

Mode V — Real Time Diagnostic System (Cont'd)

DECODING CHART

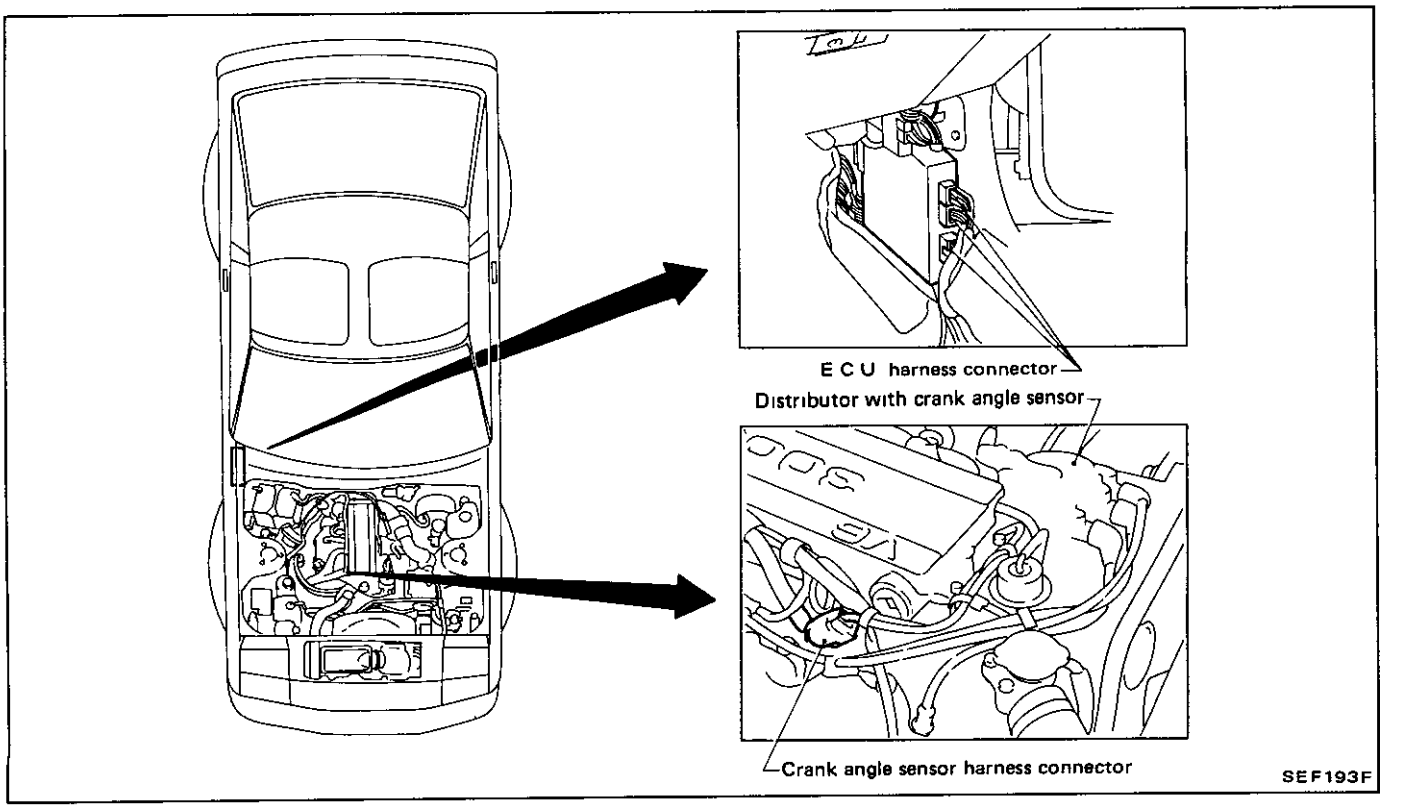
Display presentation	Malfunction circuit or parts	Control unit shows a malfunction signal when the following conditions are detected (Compare with Self Diagnosis — Mode III.)
CRANK ANGLE SENSOR		
	Crank angle sensor circuit is malfunctioning 	The 1° or 120° signal is momentarily missing, or, multiple, momentary noise signals enter REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-48
AIR FLOW METER		
	Air flow meter circuit is malfunctioning 	Abnormal, momentary increase in air flow meter output signal REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-49
IGNITION SIGNAL		
	Ignition signal is malfunctioning 	Signal from the primary ignition coil momentarily drops off REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-50
FUEL PUMP		
	Fuel pump circuit is malfunctioning 	Fuel pump circuit is momentarily open or shorted REAL TIME DIAGNOSTIC INSPECTION See page EF & EC-51

Mode V — Real Time Diagnostic System (Cont'd)

REAL TIME DIAGNOSTIC INSPECTION

Crank Angle Sensor

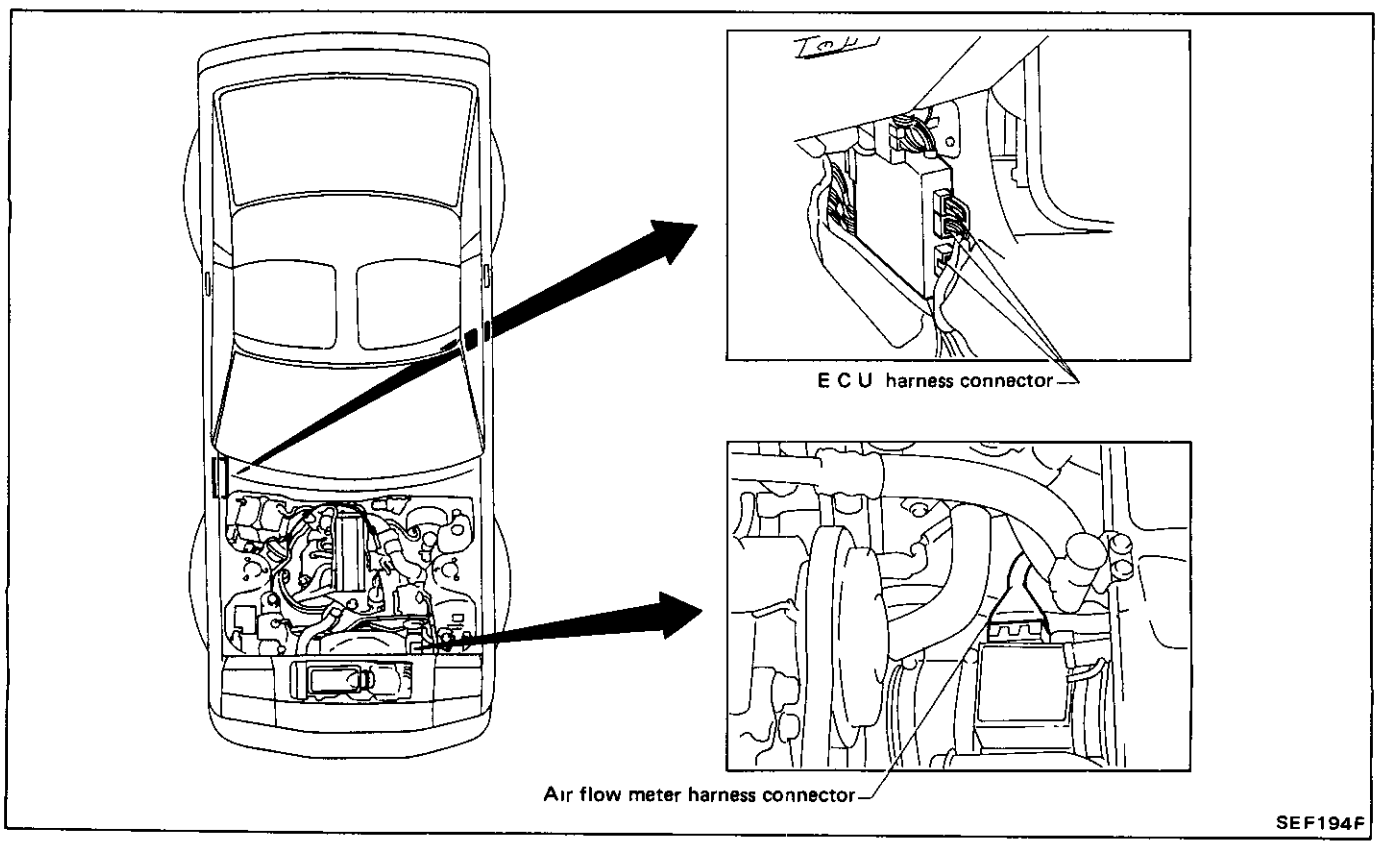
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items
			Crank angle sensor harness connector	Sensor & actuator	E C U 20- & 16-pin connector	
1	Tap and wiggle harness connector or component during real time diagnosis	During real time diagnosis	○	○	○	Go to check item 2
2	Check harness continuity at connector	Engine stopped	○	X	X	Go to check item 3
3	Disconnect harness connector, and then check dust adhesion to harness connector	Engine stopped	○	X	○	Clean terminal surface
4	Check pin terminal bend	Engine stopped	X	X	○	Take out bend
5	Reconnect harness connector and then recheck harness continuity at connector	Engine stopped	○	X	X	Replace terminal
6	Tap and wiggle harness connector or component during real time diagnosis	During real time diagnosis	○	○	○	If malfunction codes are displayed during real time diagnosis, replace terminal



Mode V — Real Time Diagnostic System (Cont'd)

Air Flow Meter

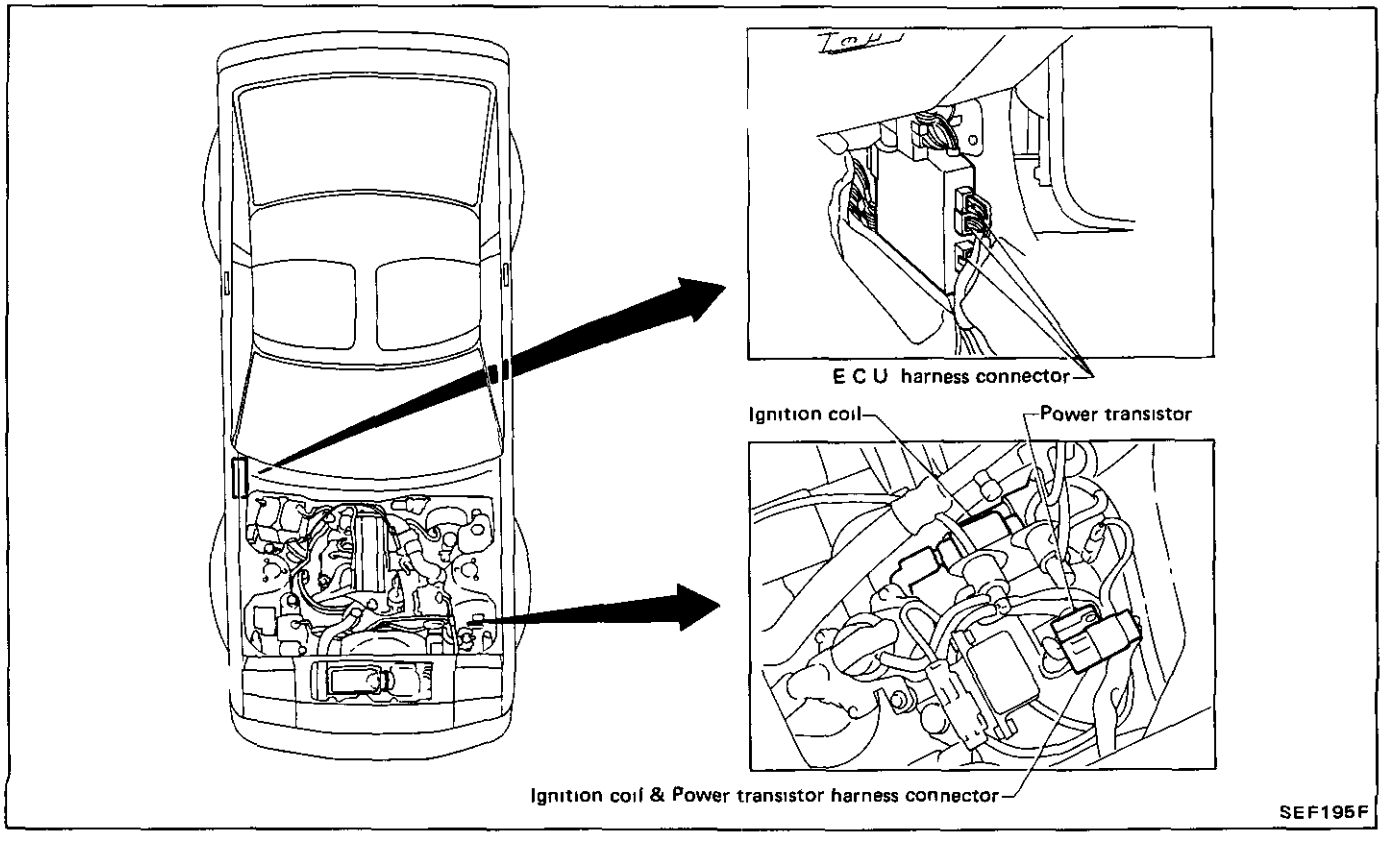
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items
			Air flow meter harness connector	Sensor & actuator	E C U 20- & 16-pin connector	
1	Tap and wiggle harness con nector or component during real time diagnosis	During real time diagnosis	○	○	○	Go to check item 2
2	Check harness continuity at connector	Engine stopped	○	X	X	Go to check item 3
3	Disconnect harness con-nector, and then check dust adhesion to harness connector	Engine stopped	○	X	○	Clean terminal surface
4	Check pin terminal bend	Engine stopped	X	X	○	Take out bend
5	Reconnect harness con nector and then recheck harness continuity at connector	Engine stopped	○	X	X	Replace terminal
6	Tap and wiggle harness con-nector or component during real time diagnosis	During real time diagnosis	○	○	○	If malfunction codes are displayed during real time diagnosis, replace terminal



Mode V — Real Time Diagnostic System (Cont'd)

Ignition Signal

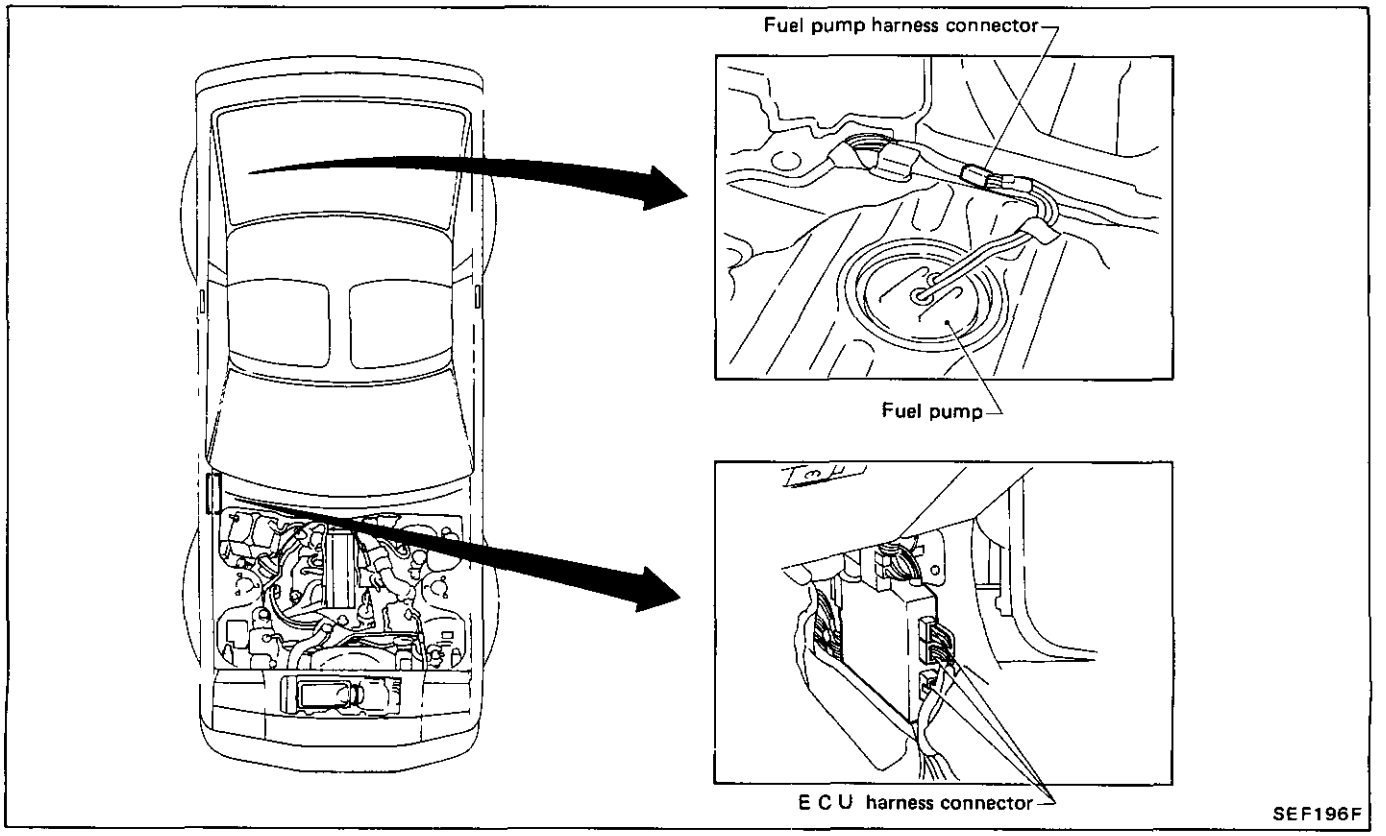
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items
			Ignition signal harness connector	Sensor & actuator	E C U 20- & 16-pin connector	
1	Tap and wiggle harness connector or component during real time diagnosis	During real time diagnosis	○	○	○	Go to check item 2
2	Check harness continuity at connector	Engine stopped	○	X	X	Go to check item 3
3	Disconnect harness connector, and then check dust adhesion to harness connector	Engine stopped	○	X	○	Clean terminal surface
4	Check pin terminal bend	Engine stopped	X	X	○	Take out bend
5	Reconnect harness connector and then recheck harness continuity at connector	Engine stopped	○	X	X	Replace terminal
6	Tap and wiggle harness connector or component during real time diagnosis	During real time diagnosis	○	○	○	If malfunction codes are displayed during real time diagnosis, replace terminal

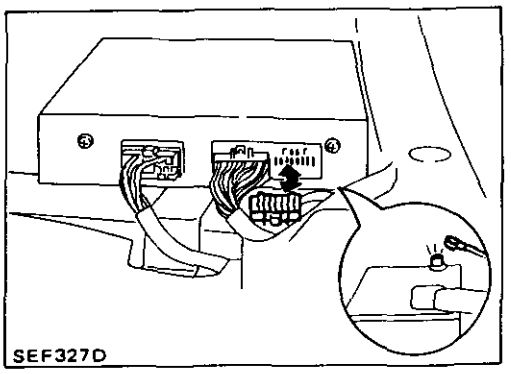


Mode V — Real Time Diagnostic System (Cont'd)

Fuel pump

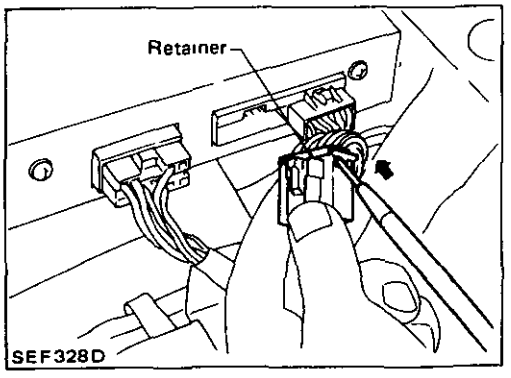
Check sequence	Check items	Check conditions	Check parts			If malfunction, perform the following items
			Fuel pump harness connector	Sensor & actuator	E C U 20- & 16-pin connector	
1	Tap and wiggle harness connector or component during real time diagnosis	During real time diagnosis	○	○	○	Go to check item 2
2	Check harness continuity at connector	Engine stopped	○	X	X	Go to check item 3
3	Disconnect harness connector, and then check dust adhesion to harness connector	Engine stopped	○	X	○	Clean terminal surface
4	Check pin terminal bend	Engine stopped	X	X	○	Take out bend
5	Reconnect harness connector and then recheck harness continuity at connector	Engine stopped	○	X	X	Replace terminal
6	Tap and wiggle harness connector or component during real time diagnosis	During real time diagnosis	○	○	○	If malfunction codes are displayed during real time diagnosis, replace terminal




SEF327D

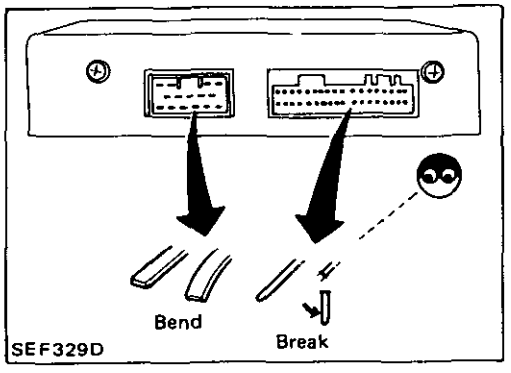
CAUTION:

1. Before connecting or disconnecting E C U. harness connector to or from any E.C U., be sure to turn the ignition switch to the "OFF" position and disconnect the negative battery terminal in order not to damage E.C.U. as battery voltage is applied to E.C.U. even if ignition switch is turned off Otherwise, there may be damage to the E.C.U.



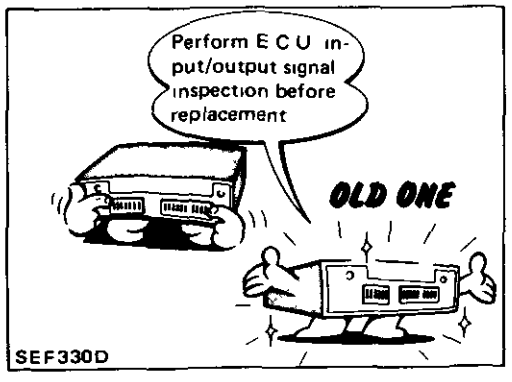
SEF328D

2 When performing E.C.U input/output signal inspection, remove pin terminal retainer from 20- and 16-pin connector to make it easier to insert tester probe into connector.



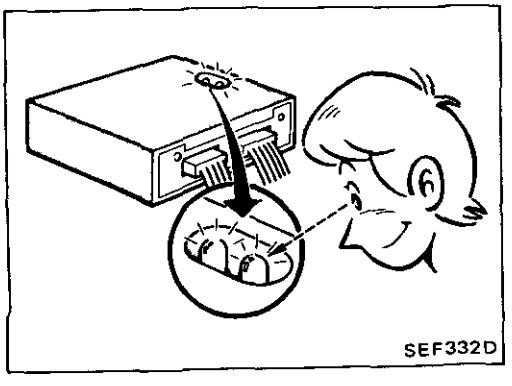
SEF329D

3. When connecting pin connectors into E C.U. or disconnecting them from E.C.U., take care not to damage pin terminal of E C.U. (Bend or break).
4 Make sure that there are not any bends or breaks on E.C.U. pin terminal, when connecting pin connectors into E.C.U.

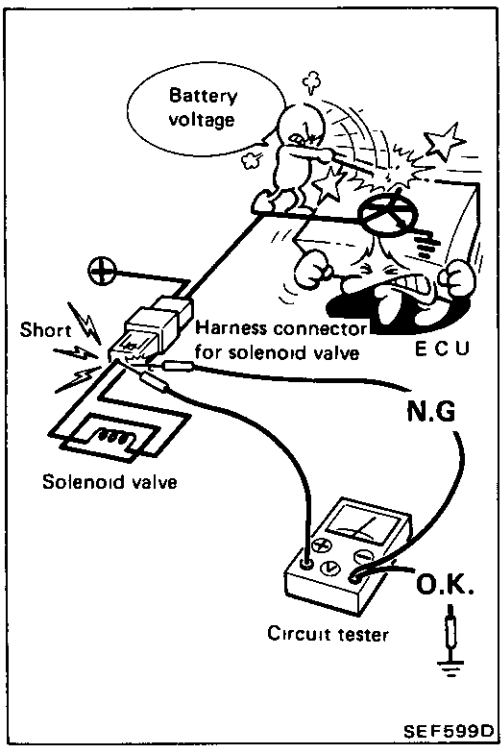


SEF330D

5. Before replacing E.C.U., perform E.C.U. input/output signal inspection and make sure whether E.C U functions properly or not. (See page EF & EC-94.)


SEF332D

6. After performing this "ELECTRONIC CONTROL SYSTEM INSPECTION", perform E.C.C.S self-diagnosis and driving test.



7. When measuring supply voltage of E.C.U. controlled components with a circuit tester, separate one tester probe from the other.
   If the two tester probes accidentally make contact with each other during measurement, the circuit will be shorted, resulting in damage to the power transistor of the control unit.

8. Keys to symbols

   DISCONNECT : Check after disconnecting the connector to be measured

   CONNECT : Check after connecting the connector to be measured.

9. When measuring voltage or resistance at connector with tester probes, there are two methods of measurement; one is done from terminal side and the other from harness side. Before measuring, confirm symbol mark again.

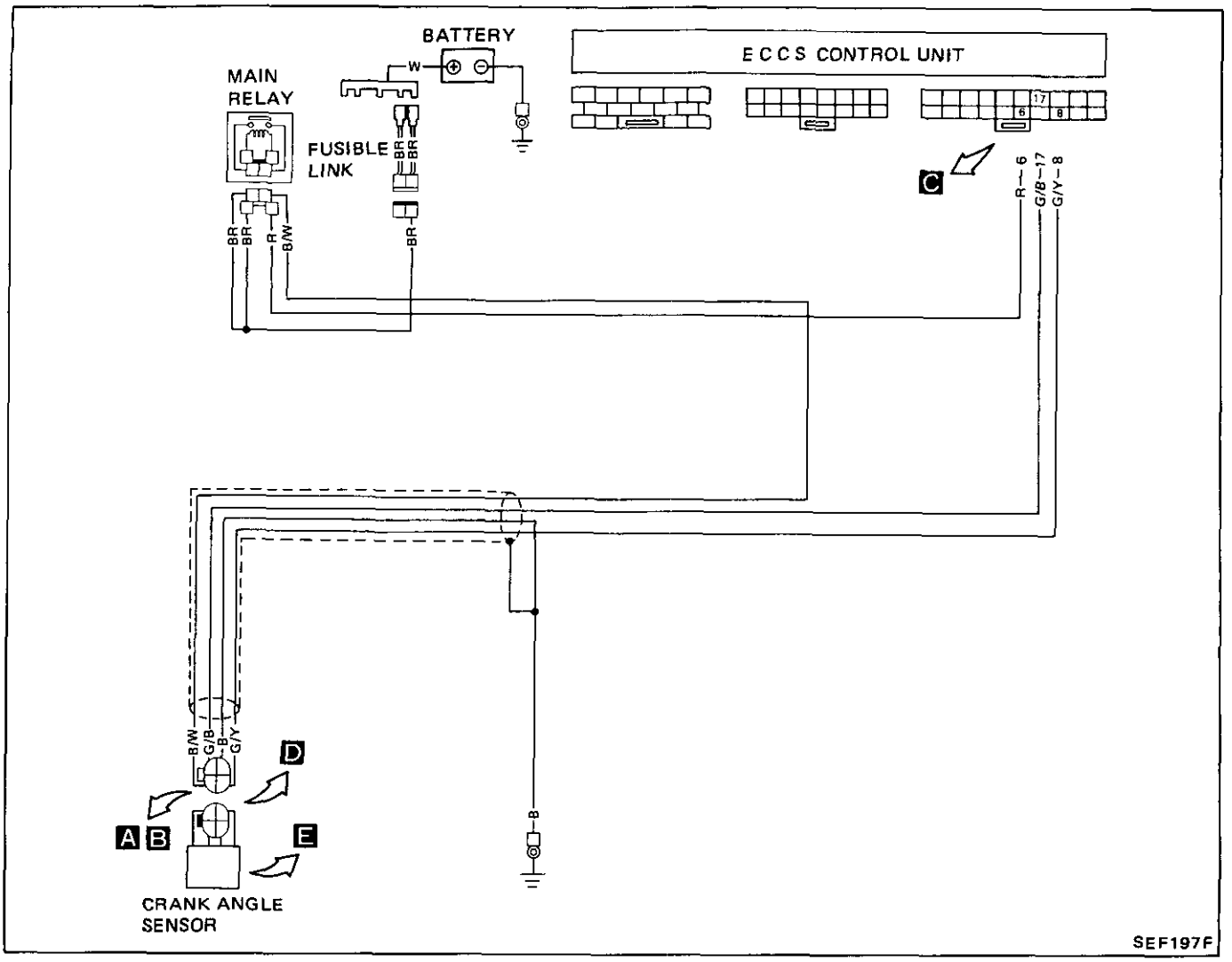
   H.S. : Inspection should be done from harness side.

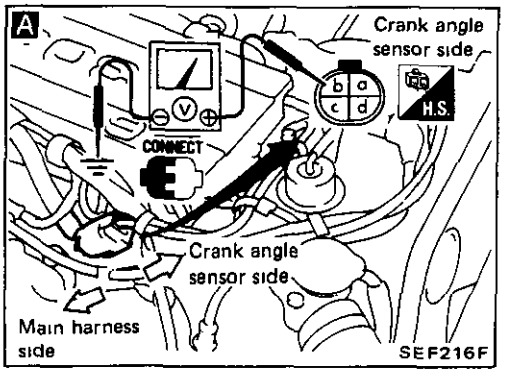
   T.S. : Inspection should be done from terminal side

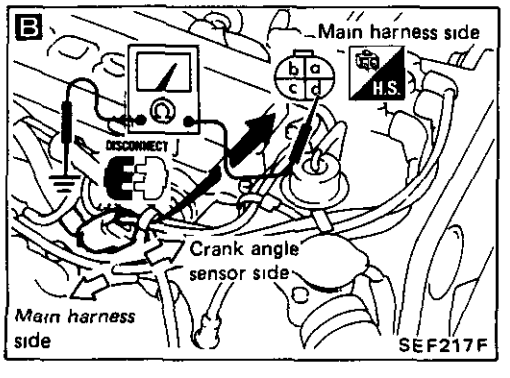
   Refer to GI section.

10. As for continuity check of joint connector, refer to EL section.

CRANK ANGLE SENSOR (Code No. 11)







INSPECTION START

A

CHECK POWER SOURCE
1) Turn ignition switch "ON"
2) Check voltage between terminal ⓑ and ground
Battery voltage should exist

N G →
Check the following items
1) Harness continuity between crank angle sensor and battery
2) Main relay (Refer to EL section)
3) "BR" fusible link
4) Power source for E C U (See page EF & EC-78)

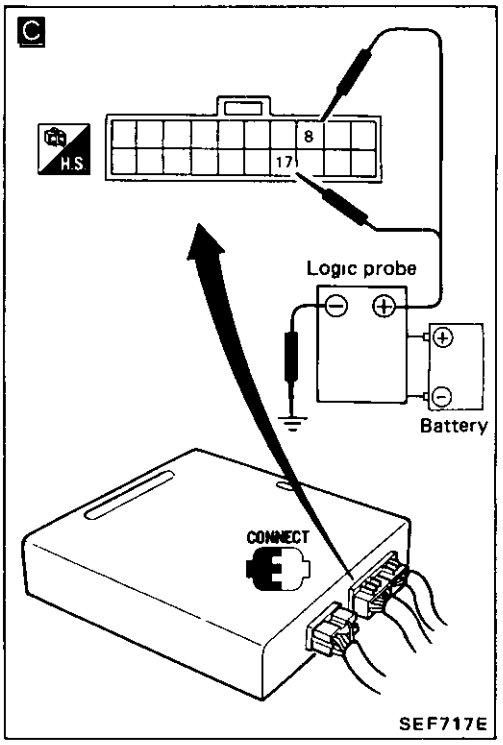
O K ↓

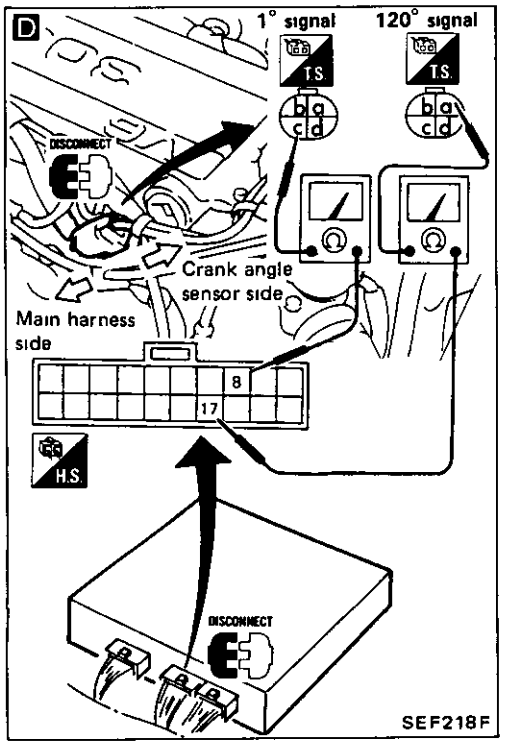
B

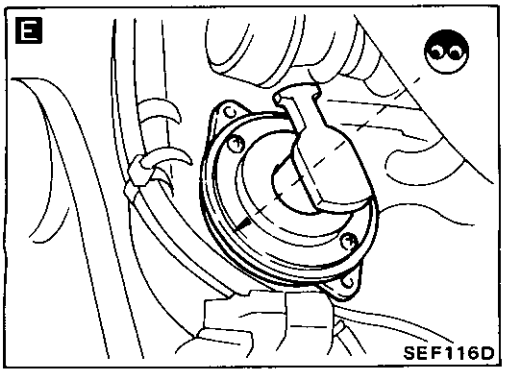
CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF"
2) Disconnect crank angle sensor harness connector
3) Check resistance between terminal ⓓ and ground
Resistance
Approximately 0Ω

N G →
Check the following items
1) Harness continuity between crank angle sensor and ground
2) Ground circuit for E C U (See page EF & EC-78)

CRANK ANGLE SENSOR (Code No. 11)







C

CHECK E C U INPUT SIGNALS
1) Reconnect crank angle sensor harness connector
2) Start engine
3) Check that pulse signals exist in E C U terminals ⑧ and ⑰ with logic probe
Pulse signals should exist
⑧ **1° signal**
⑰ **120° signal**

N G → D

D

Check harness continuity between crank angle sensor and E C U
- Stop engine
- Disconnect crank angle sensor harness connector
- Disconnect E C U 20-pin connector from E C U

1° signal circuit
Continuity between terminals Ⓒ and ⑧
120° signal circuit
Continuity between terminals Ⓞ and ⑰
Resistance
Approximately 0Ω

O K ↓

Stop engine and check interference between crank angle sensor harness and high-tension cable

N G → Separate them

O K ↓

E

Visually check rotor plate for damage or dust

N G → Clean or replace crank angle sensor

O K ↓

Reinstall any part removed ↓

Erase the self-diagnosis memory ↓

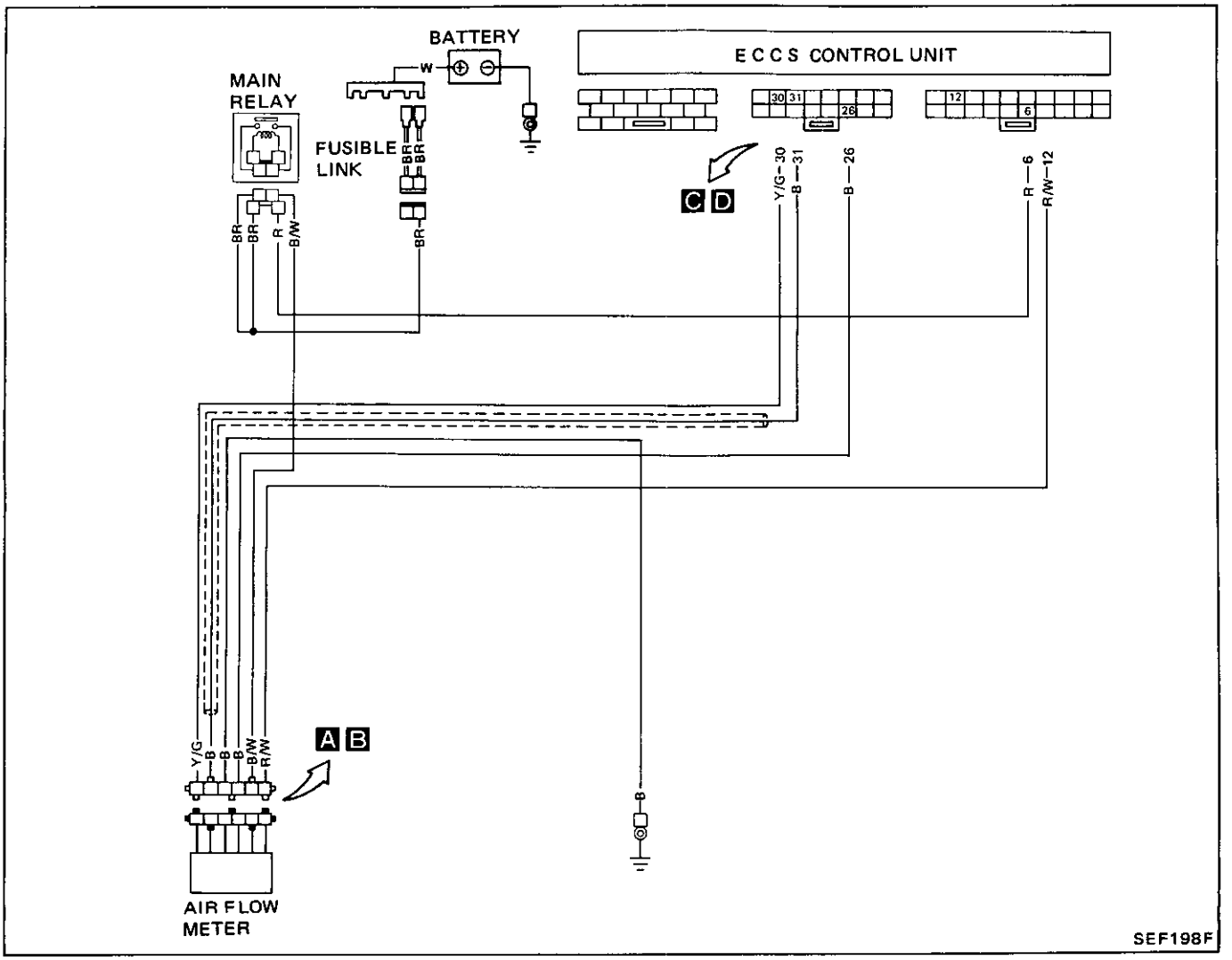
Perform driving test and then perform self-diagnosis (Mode-III) again

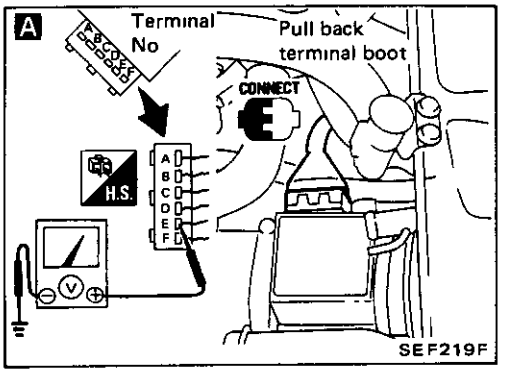
N G → 1) Perform E C U input/output signal inspection test
2) If N G, recheck the E C U pin terminals damage or the connection of E C U harness connector

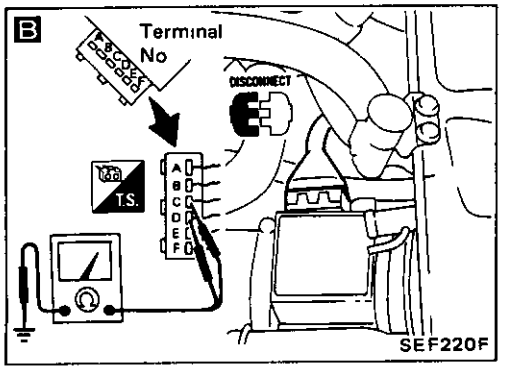
O K ↓

INSPECTION END

AIR FLOW METER (Code No. 12)







INSPECTION START

A

CHECK POWER SOURCE
1) Turn ignition switch "ON"
2) Check voltage between terminal Ⓔ and ground
Battery voltage should exist

N G → Check the following items
1) Harness continuity between air flow meter and battery
2) Main relay (Refer to EL section)
3) "BR" fusible link
4) Power source for E C U (See page EF & EC-78)

O K

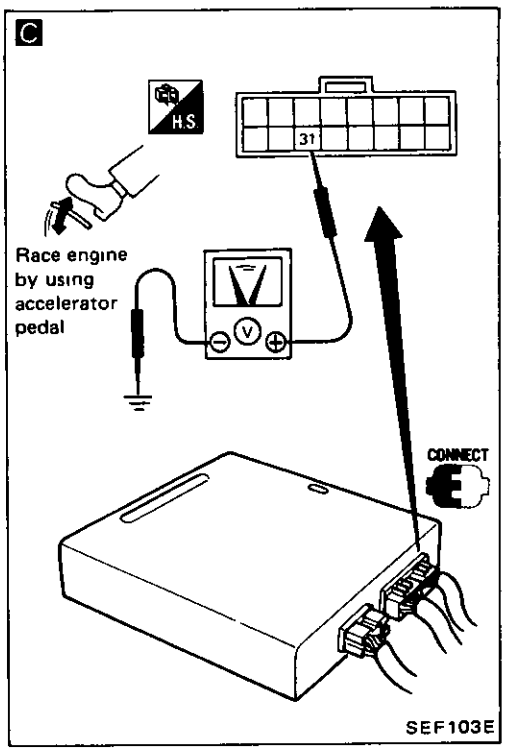
B

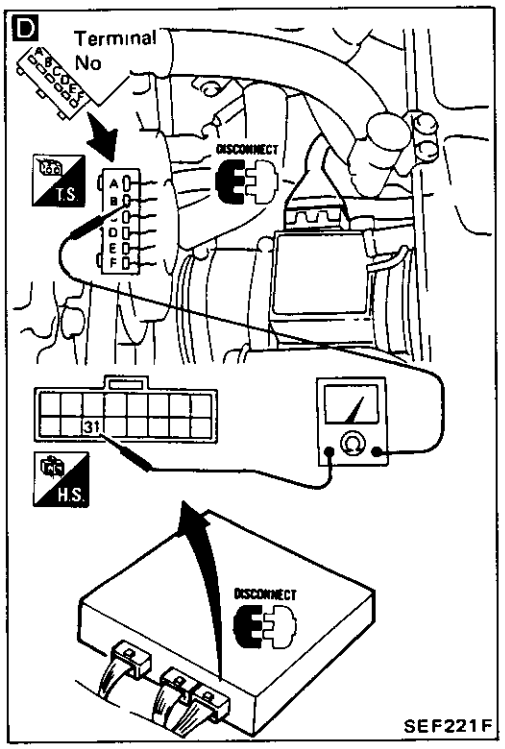
CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF"
2) Disconnect air flow meter harness connector
3) Check resistance between terminals Ⓒ, Ⓓ and ground
4) Shield wire
Resistance
Approximately 0Ω

N G → Check engine ground and harness connection between air flow meter and ground

O K

AIR FLOW METER (Code No. 12)





C

CHECK E C U INPUT SIGNAL
1) Reconnect air flow meter harness connector
2) Start engine
3) Make sure that voltage between E C U terminal (31) and ground changes by racing engine with accelerator pedal
Output voltage should change
Approximately 2 - 4V

N G → D

Check harness continuity between E C U and air flow meter
- Stop engine
- Disconnect air flow meter harness connector
- Disconnect E C U 16-pin harness connector
- Check resistance between terminal (B) and E C U terminal (31)

Resistance
Approximately 0Ω
If O K , replace air flow meter

O K ↓

Reinstall any part removed ↓

Erase the self-diagnosis memory ↓

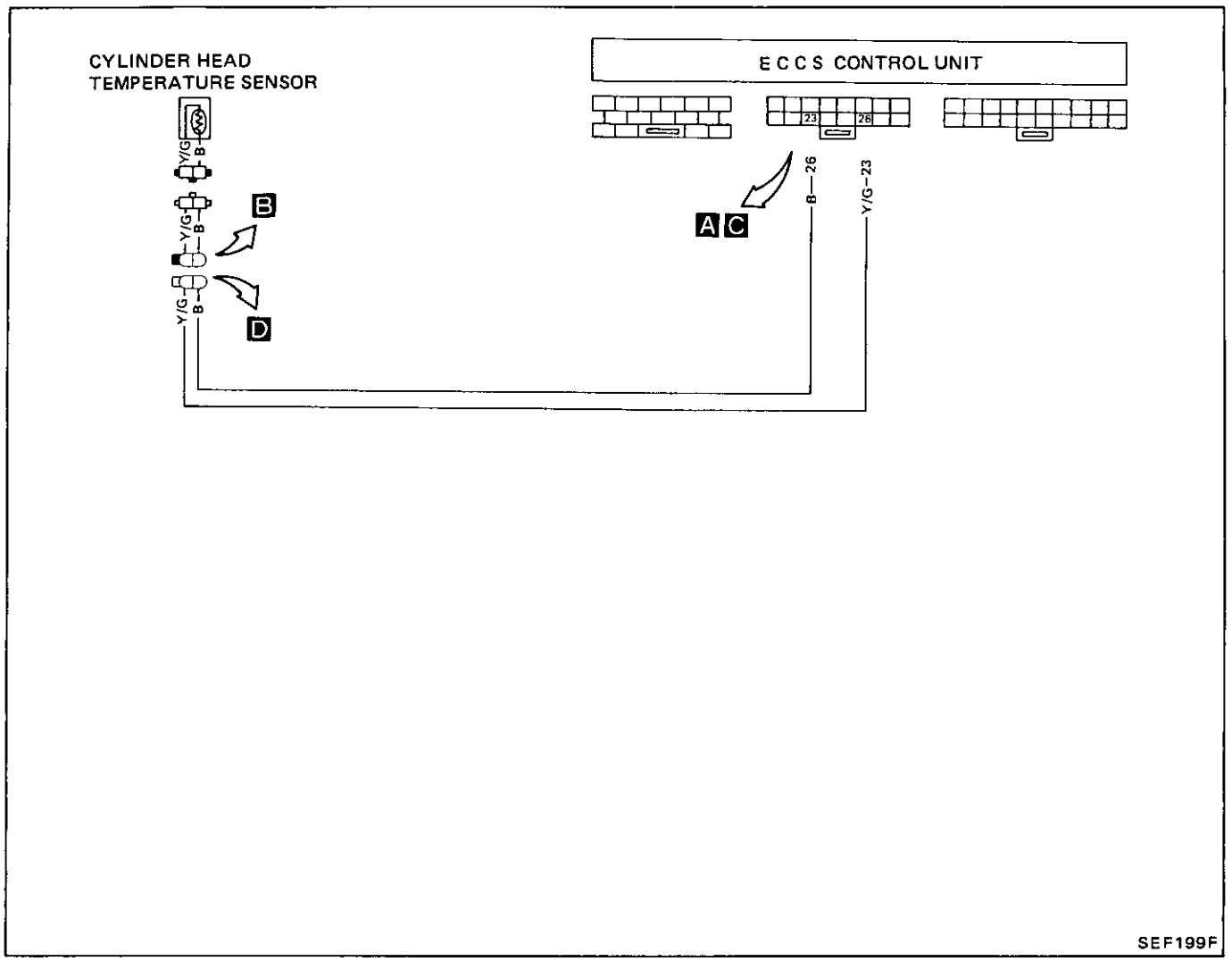
Perform driving test and then perform self-diagnosis (Mode-III) again

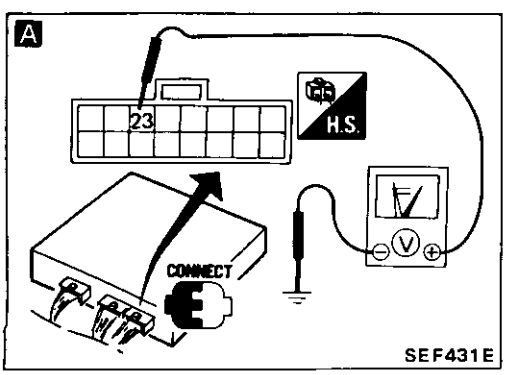
N G →
1) Perform E C U input/output signal inspection test
2) If N G , recheck the E C U pin terminals damage or the connection of E C U harness connector

O K ↓

INSPECTION END

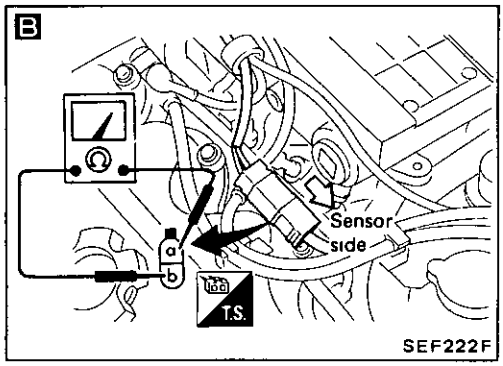
CYLINDER HEAD TEMPERATURE SENSOR (Code No. 13)





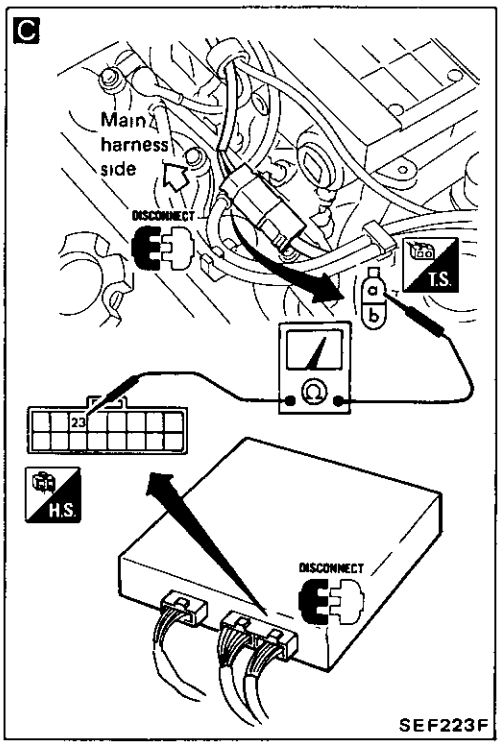
CYLINDER HEAD TEMPERATURE SENSOR (Code No. 13)

B



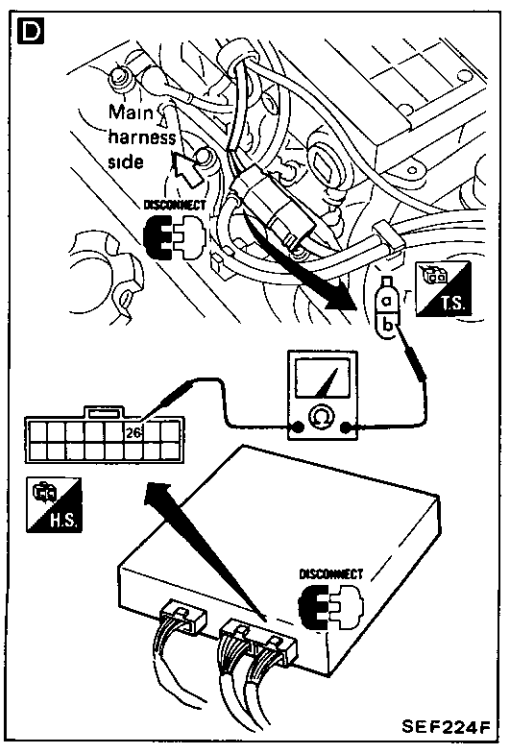
SEF222F

C



SEF223F

D



SEF224F

INSPECTION START

A

CHECK INPUT SIGNAL
1) Start engine
2) Make sure that voltage between E C U terminal ㉓ and ground changes during engine warm up
Cold → Hot
Approximately 5 - 0V

N G

B 1) Check cylinder head temperature sensor resistance
- Stop engine
- Disconnect cylinder head temperature sensor harness connector
- Check resistance between terminals

20°C (68°F)	2.3 - 2.7 kΩ
50°C (122°F)	0.77 - 0.87 kΩ
80°C (176°F)	0.30 - 0.33 kΩ

If no continuity, replace cylinder head temperature sensor

2) Check power source for E C U (See page EF & EC-78)

C 3) Check harness continuity between E C U and cylinder head temperature sensor
- Disconnect 16-pin connector from E C U
- Disconnect cylinder head temperature sensor connector

Check resistance between terminal ⓐ and E C U terminal ㉓
Resistance
Approximately 0Ω

O K

D

CHECK GROUND CIRCUIT
1) Stop engine and disconnect 16-pin connector from E C U
2) Disconnect cylinder head temperature sensor harness connector
3) Check resistance between terminal ⓑ and E C U terminal ㉖
Resistance.
Approximately 0Ω

N G

Check harness connection between cylinder head temperature sensor and ground

O K

Reinstall any part removed

Erase the self-diagnosis memory

Perform driving test and then perform self-diagnosis (Mode-III) again

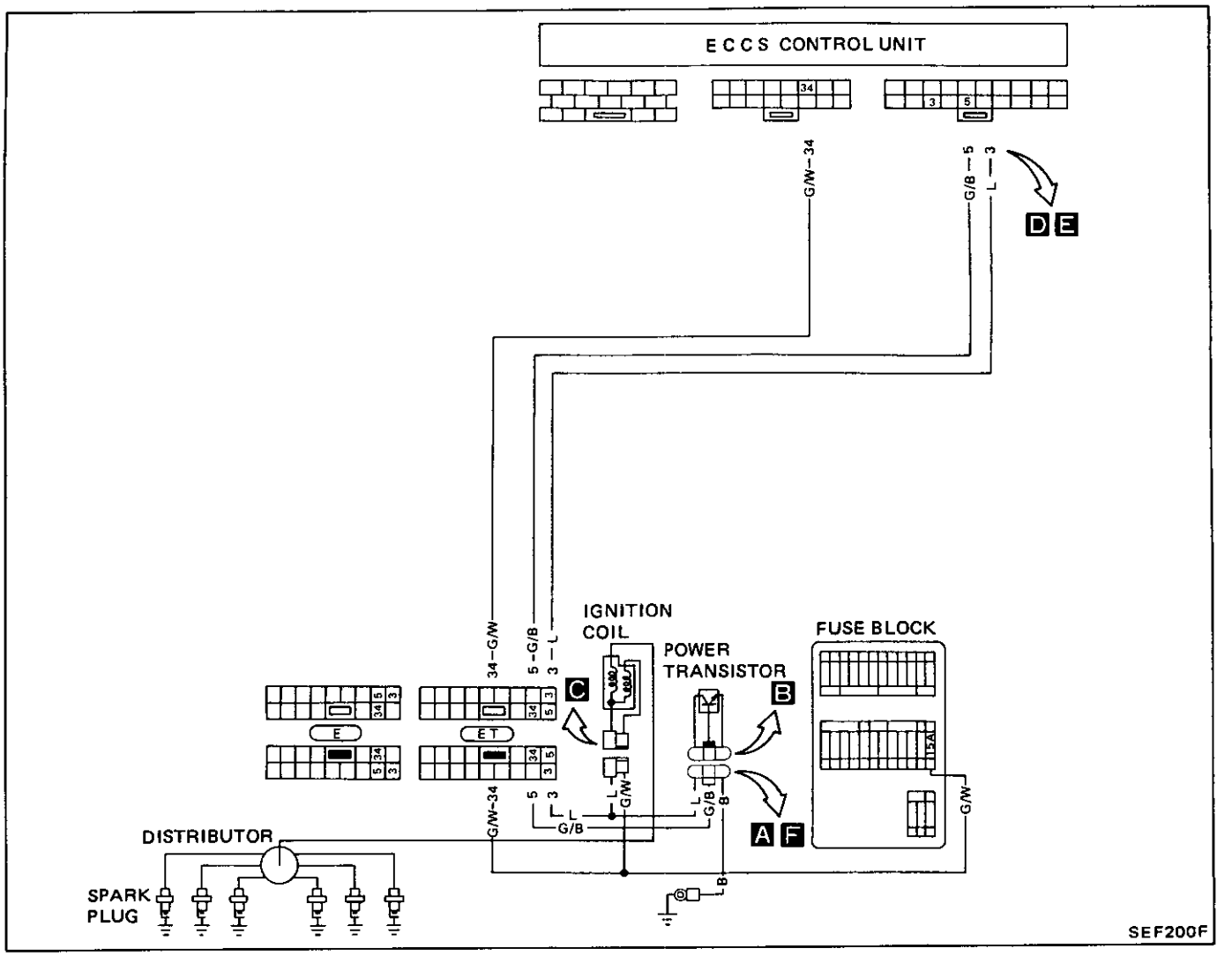
N G

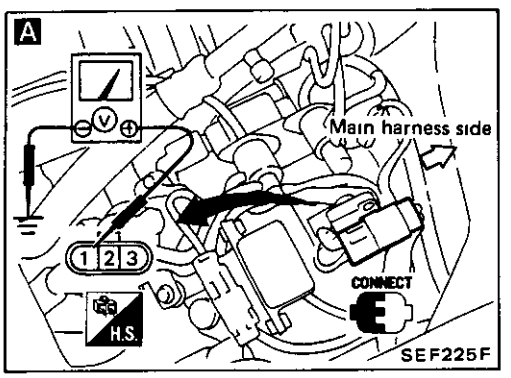
1) Perform E C U in-output signal inspection test
2) If N G, recheck the E C U pin terminals damage or the connection of E C U harness connector

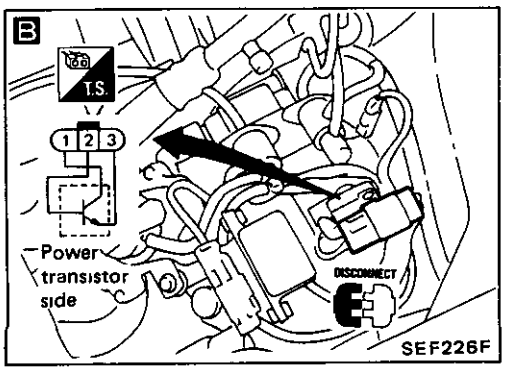
O K

INSPECTION END

IGNITION SIGNAL (Code No. 21)







INSPECTION START

A

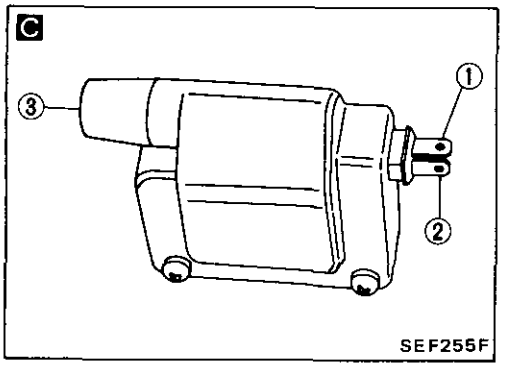
CHECK POWER SOURCE
1) Turn ignition switch "ON"
2) Check voltage between terminal ① and ground
Battery voltage should exist.

N G → Check the following items
1) Fuse
2) Harness connection between battery and power transistor

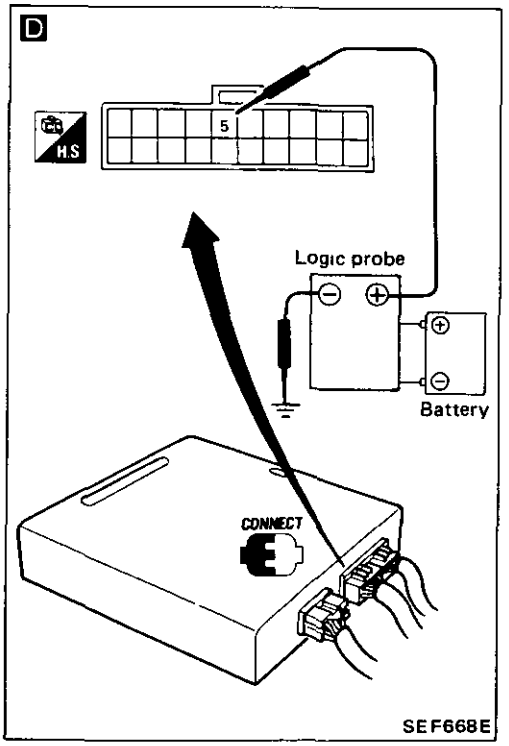
O K

IGNITION SIGNAL (Code No. 21)

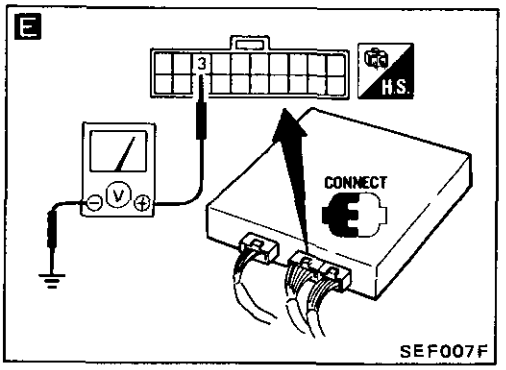
C



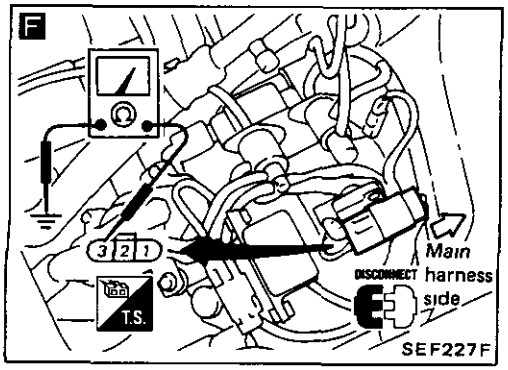
D



E



F



D

CHECK INPUT SIGNAL
1) Start engine
2) Make sure that pulse signals exist between terminal ⑤ and ground with logic probe
Pulse signal should exist.

N G →
1) Stop engine and check harness continuity between power transistor and E C U
B 2) Check power transistor with circuit tester
- Disconnect harness connector for power transistor
  - ① To ignition coil (+) side
  - ② To E C U
  - ③ To engine ground

Terminal No	Tester polarity	Continuity
①	+	No continuity
③	−	
①	−	Continuity should exist
③	+	
①	+	No continuity
②	−	
①	−	Continuity should exist
②	+	

If N G, replace power transistor

C 3) Check resistance of ignition coil

Terminal No	Resistance
① - ②	1Ω
① - ③	10 kΩ

If N G, replace ignition coil

O K ↓

E

CHECK INPUT SIGNAL
1) Stop engine
2) Turn ignition switch "ON"
3) Check voltage between terminal ③ and ground
Battery voltage should exist

N G →
Check harness continuity between E C U and battery

O K ↓

F

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF"
2) Disconnect power transistor harness connector
3) Check resistance between terminal ③ and ground
Resistance
Approximately 0Ω

N G →
Check the following items
1) Harness connection between power transistor and ground
2) Engine ground

O K ↓

Reinstall any part removed

↓

Erase the self-diagnosis memory

↓

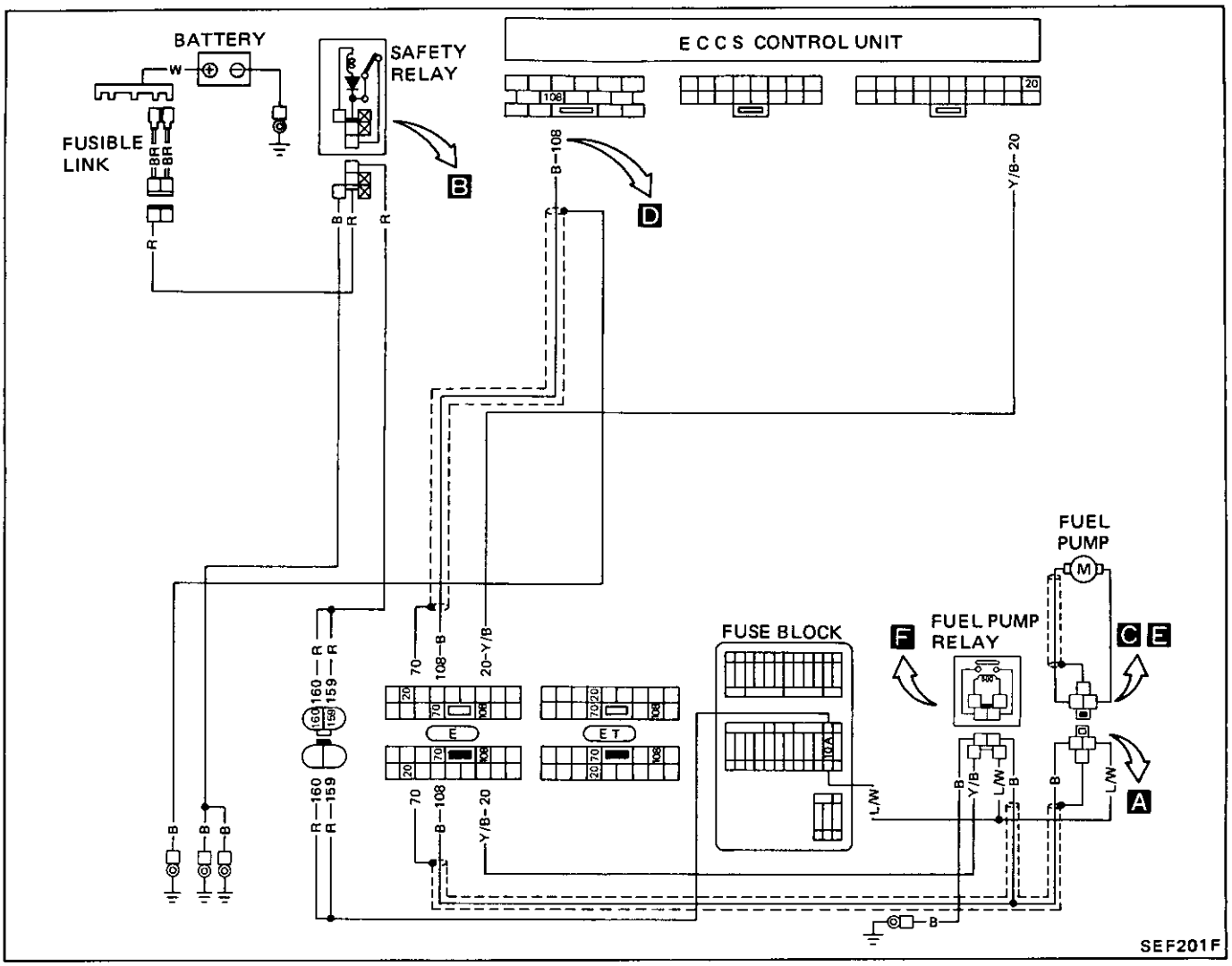
Perform driving test and then perform self-diagnosis (Mode-III) again

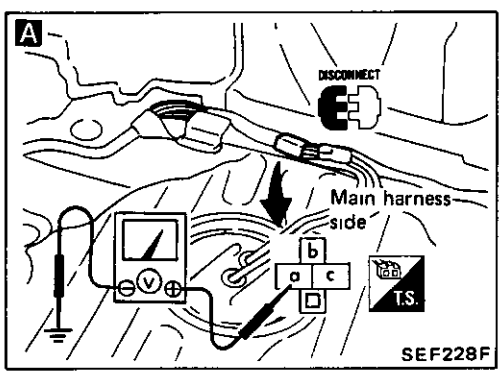
N G →
1) Perform E C U input/output signal inspection test
2) If N G, recheck the E C U pin terminals damage or the connection of E C U harness connector

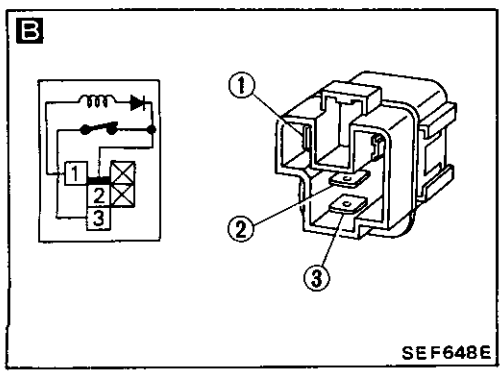
O K ↓

INSPECTION END

FUEL PUMP (Code No. 22)

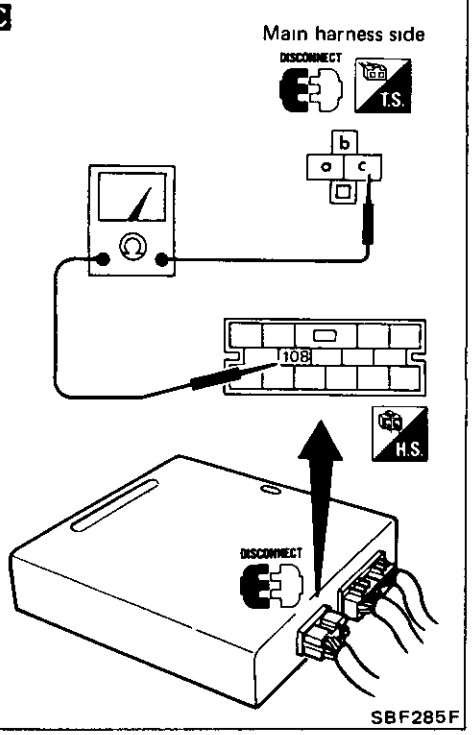






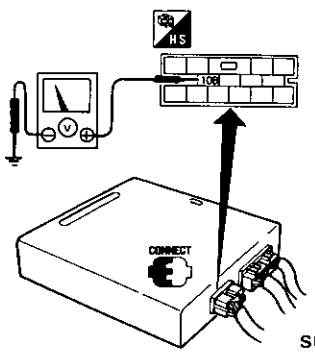
FUEL PUMP (Code No. 22)

C



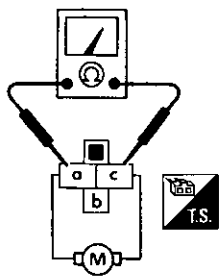
SBF285F

D



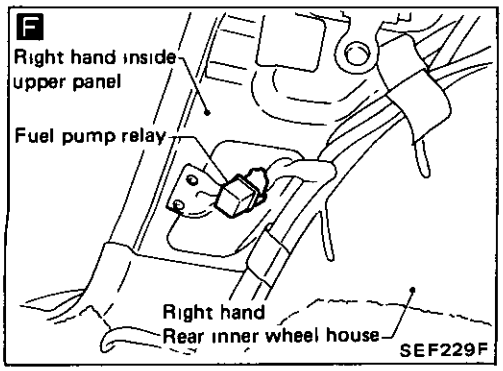
SEF008F

E



Fuel pump
SEF286F

F



SEF229F

INSPECTION START

A

CHECK POWER SOURCE
1) Disconnect fuel pump harness connector
2) Turn ignition switch "ON"
3) Check voltage between terminal ⓐ and ground
Voltage Battery voltage

N G →
Check the following items
1) Harness continuity between battery and fuel pump
2) Fuse
3) "BR" fusible link
4) Ignition switch
B 4) Safety relay

12V direct current is applied between terminals ① and ②		Continuity between terminals ② and ③
①	②	
–	+	Yes
+	–	No

O K ↓

C

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF"
2) Disconnect E C U 15-pin connector
3) Check resistance between E C U terminals (108) and ⓒ
Resistance
Approximately 0Ω

N G → Repair harness

O K ↓

D

CHECK OUTPUT SIGNAL
1) Reconnect E C.U 15-pin connector and fuel pump harness connector
2) Turn ignition switch "ON"
3) Check voltage between E C U terminal (108) and ground
i) **Water temperature is below 60°C (140°F).**
The indicator should read 0V, for 5 seconds after turning ignition switch "ON".
ii) **Water temperature is above 60°C (140°F).**
The indicator should read 0V, for 4 minutes after turning ignition switch "ON".

N G →
E 1) Check fuel pump
- Disconnect fuel pump harness connector
- Check resistance between terminals ⓐ and ⓒ
Continuity should exist.
If N G, replace fuel pump

F 2) Fuel pump relay
(Refer to EL section)

O K ↓

Erase the self-diagnosis memory ↓

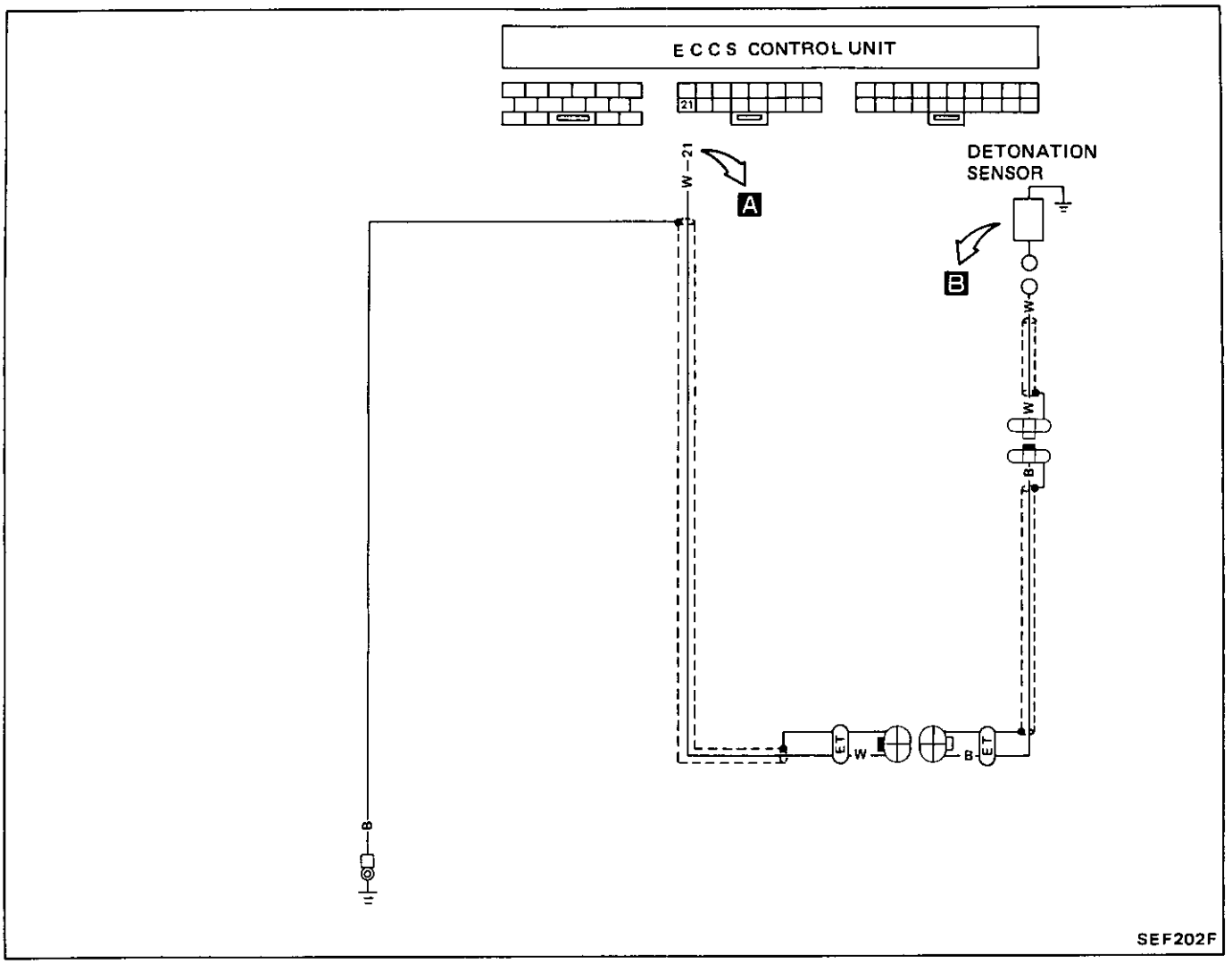
Perform driving test and then perform self-diagnosis again (Mode-III)

N G →
1) Perform E C U input/output signal inspection test
2) If N G, recheck the E C U pin terminals damage or the connection of E C U harness connector

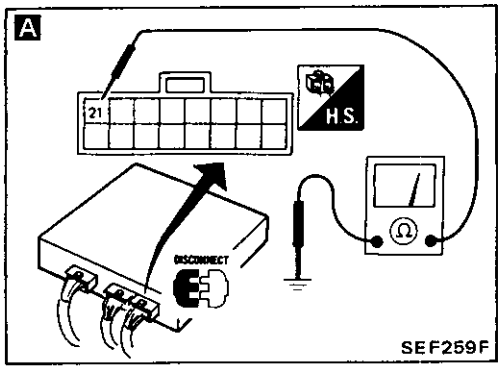
O K ↓

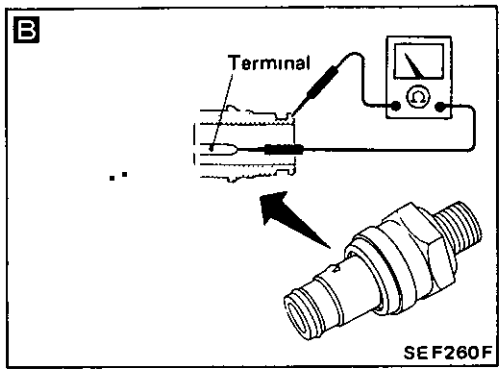
INSPECTION END

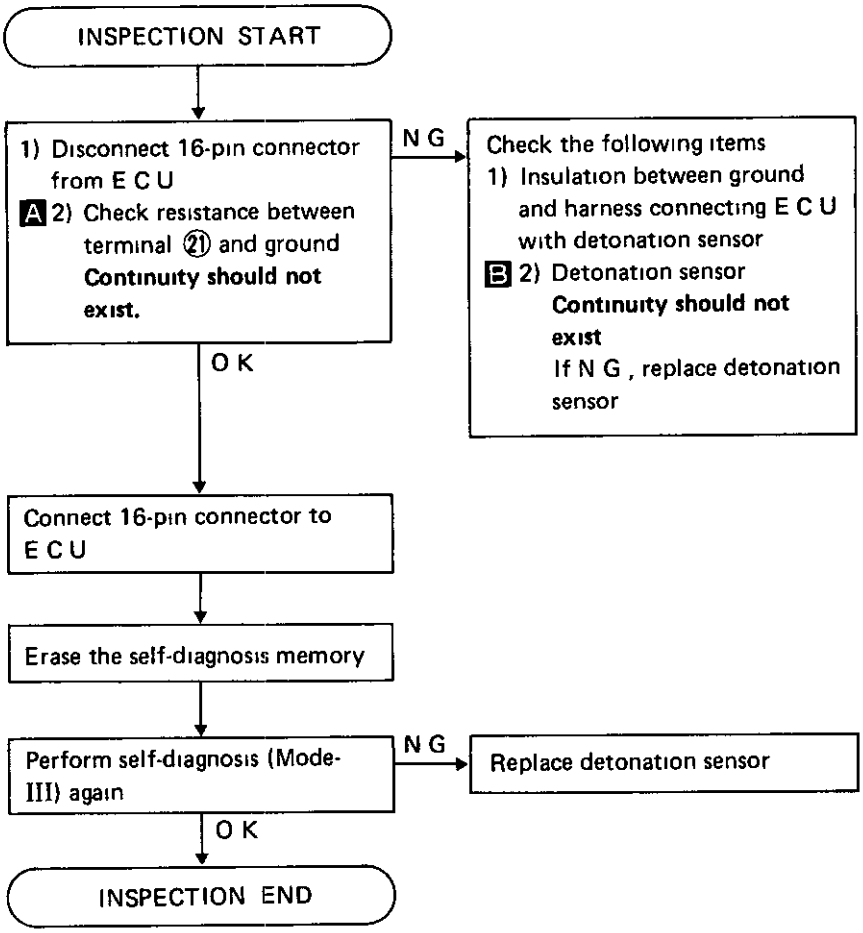
DETONATION SENSOR (Code No. 34)



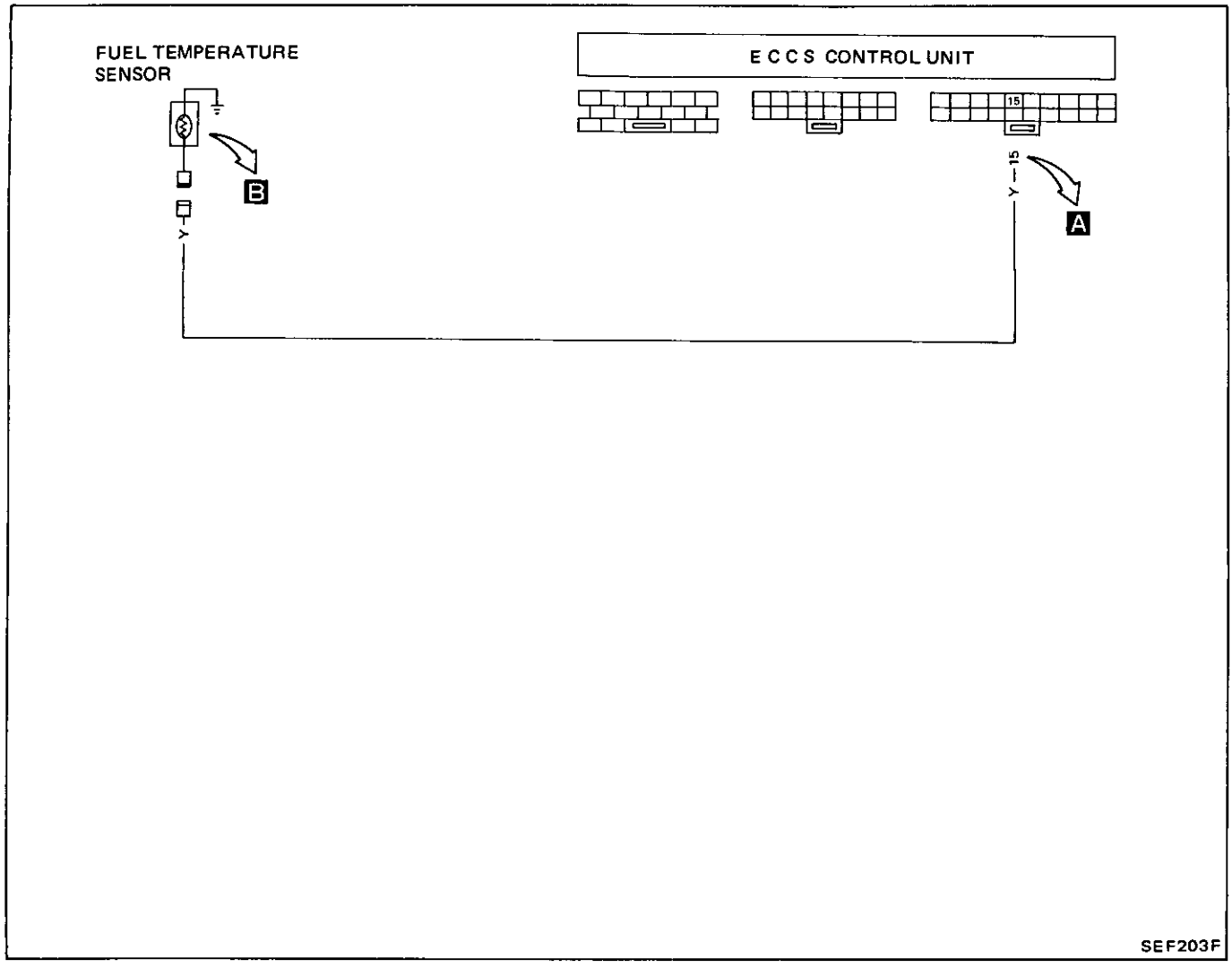
DETONATION SENSOR (Code No. 34)





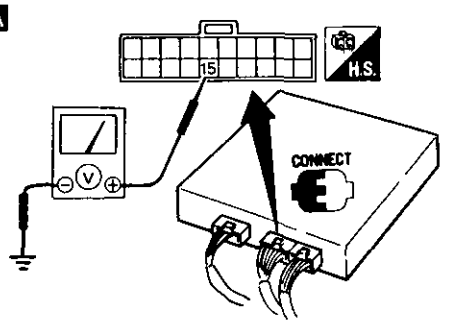


FUEL TEMPERATURE SENSOR (Code No. 41)



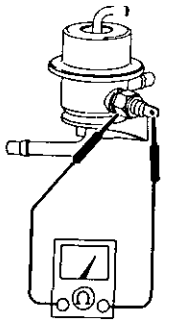
FUEL TEMPERATURE SENSOR (Code No. 41)

A



SEF673E

B



SEF208E

INSPECTION START

A

CHECK INPUT SIGNAL
1) Start engine
2) Make sure that voltage between E C U terminal ⑮ and ground changes during engine warm up
Cold → Hot
Approximately 5 - 0V

N G

B 1) Check fuel temperature sensor resistance
- Stop engine
- Disconnect fuel temperature sensor harness connector
- Check resistance between terminal and ground

20°C (68°F)	2.3 - 2.7 kΩ
50°C (122°F)	0.77 - 0.87 kΩ
80°C (176°F)	0.30 - 0.33 kΩ

If no continuity, replace fuel temperature sensor

2) Check power source for E C U & ground circuit for E C U *(See page EF & EC-78)*

O K

Reinstall any part removed

Erase the self-diagnosis memory

Perform driving test and then perform self-diagnosis (Mode-III) again

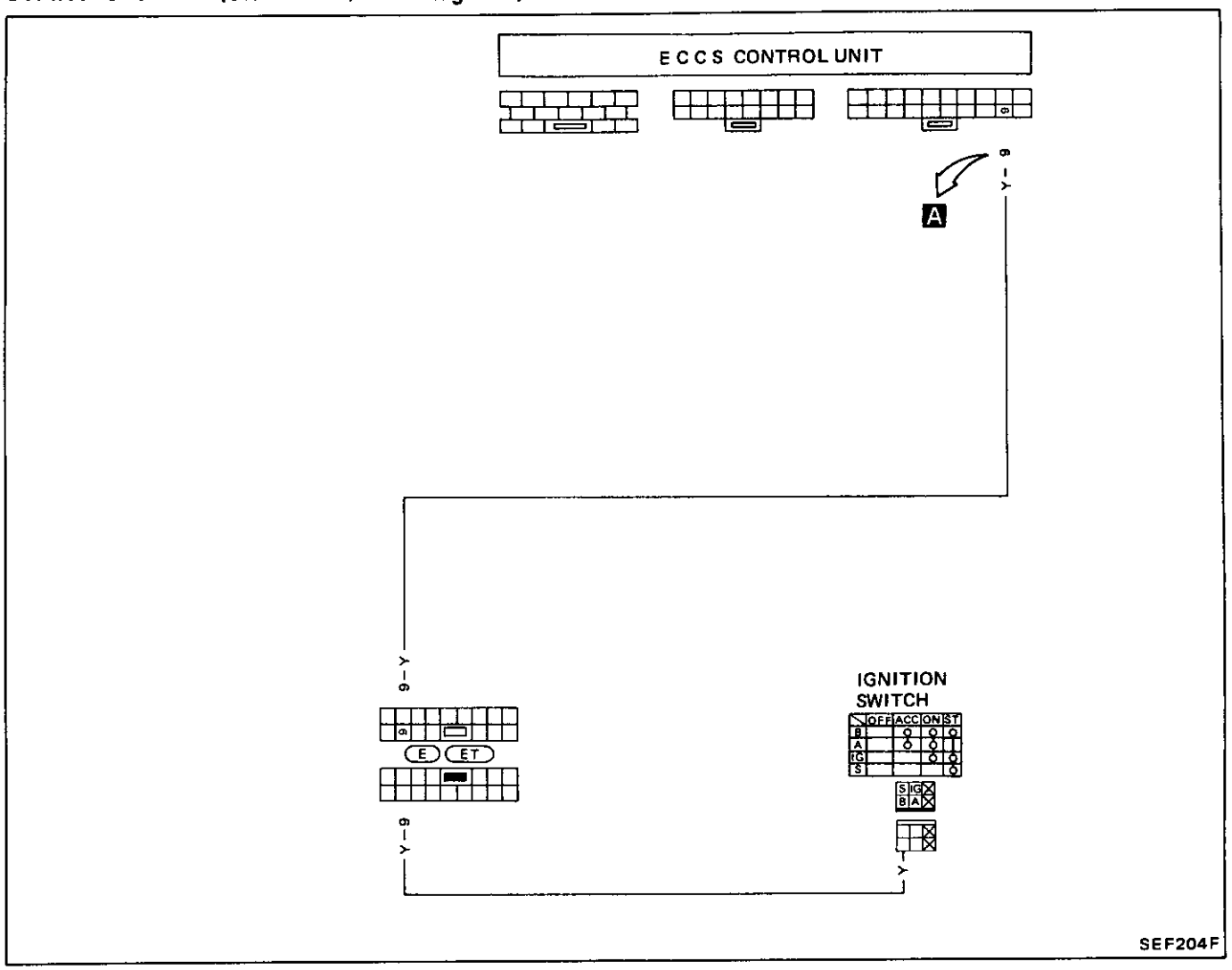
N G

1) Perform E C U input/output signal inspection test
2) If N G , recheck the E C U pin terminals damage or the connection of E C U harness connector

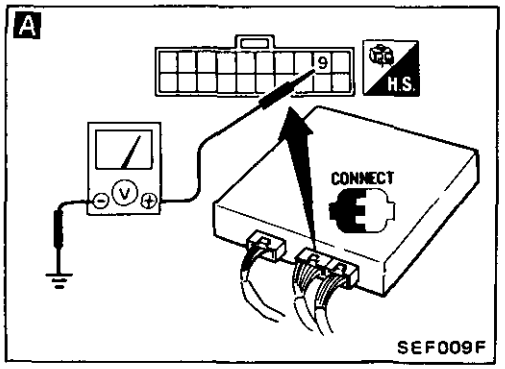
O K

INSPECTION END

START SIGNAL (Switch ON/OFF diagnosis)



START SIGNAL (Switch ON/OFF diagnosis)



INSPECTION START

A

CHECK INPUT SIGNAL
1) Turn ignition switch to "START"
2) Check voltage between terminal ⑨ and ground
Battery voltage should exist

N G → Turn ignition switch "OFF" and check the following items
1) Ignition switch
2) Harness continuity between ignition switch and E C U

O K

Reinstall any part removed

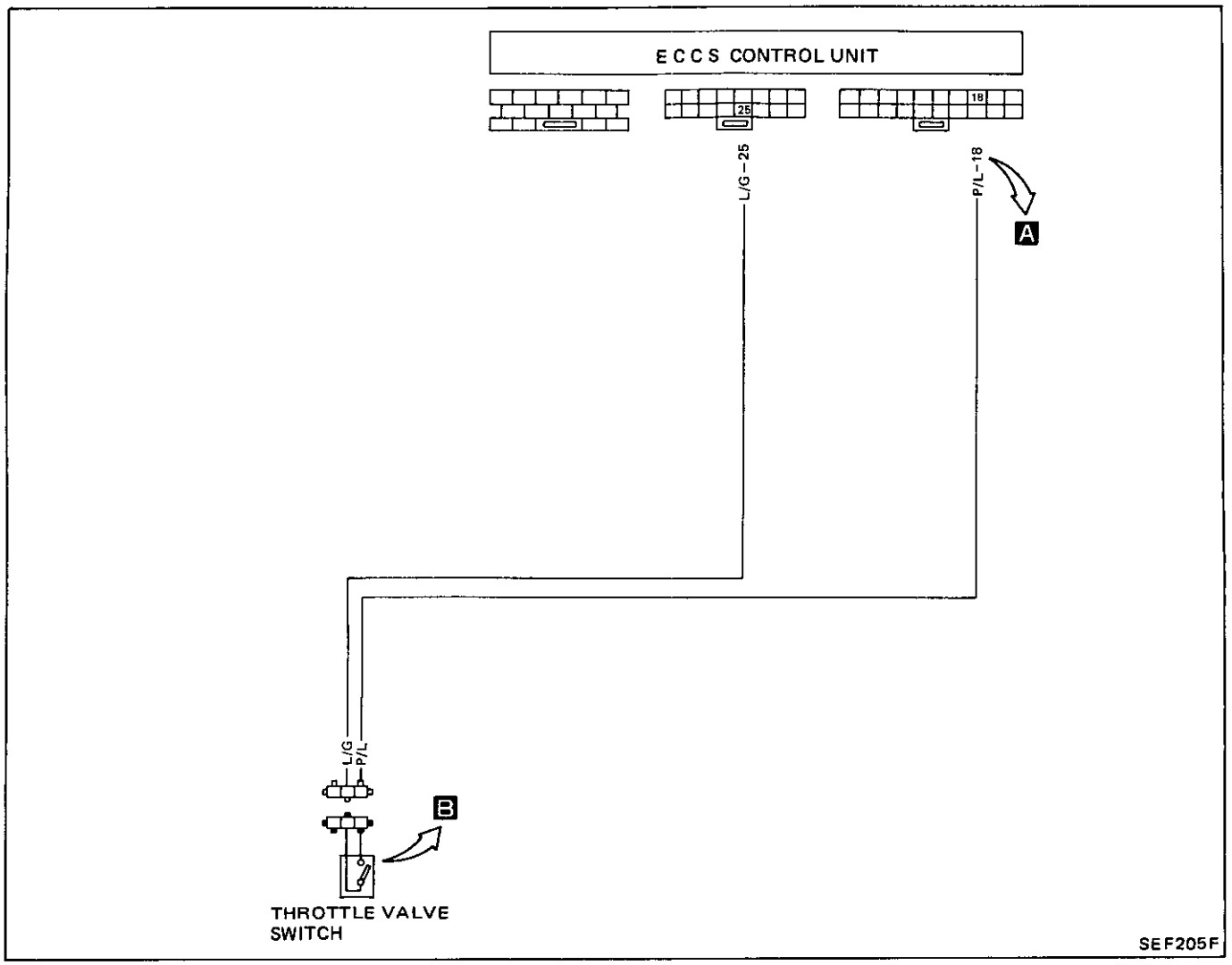
Perform self-diagnosis (Mode-IV) again

N G → 1) Perform E C U input/output signal inspection test
2) If N G, recheck the E C U pin terminals damage or the connection of E C U harness connector

O K

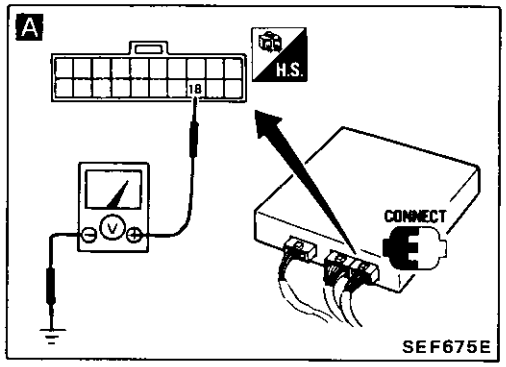
INSPECTION END

THROTTLE VALVE SWITCH (Switch ON/OFF diagnosis)



THROTTLE VALVE SWITCH (Switch ON/OFF diagnosis)

A



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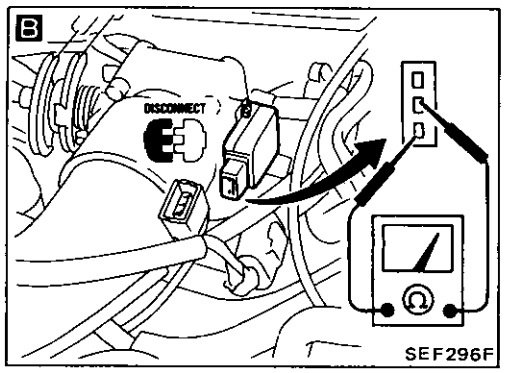


INSPECTION START

A

CHECK INPUT SIGNAL
1) Turn ignition switch "ON"
2) Check voltage between E C U terminal ⑱ and ground

Accelerator pedal condition	Voltage
Released	9 10V
Depressed	0V

N G →
Check the following items
1) Harness continuity between E C U and throttle valve switch
2) Continuity of throttle valve switch
- Disconnect throttle valve switch harness connector

B
- Make sure that continuity exists when throttle valve is fully closed

3) Main relay (Refer to EL section)
4) Power source for E C U & ground circuit for E C U (See page EF & EC-78)

O K ↓

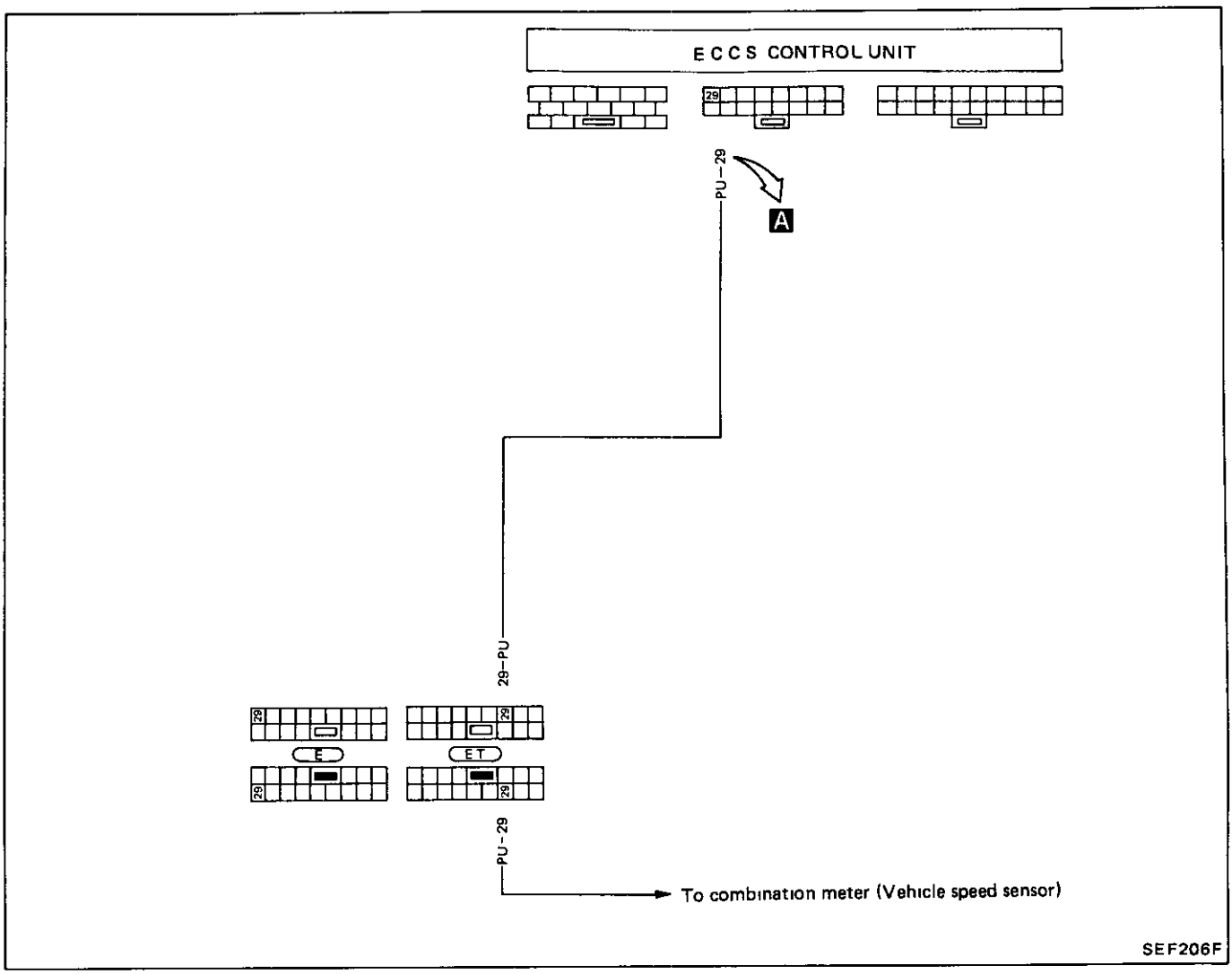
Perform self-diagnosis (Mode-TV) again

N G →
1) Perform E C U input/output signal inspection test
2) If N G, recheck the E C U pin terminals damage or the connection of E C U harness connector

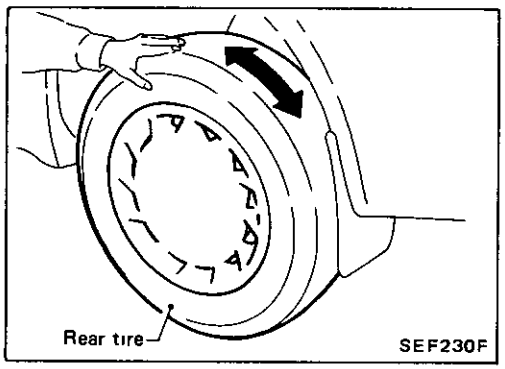
O K ↓

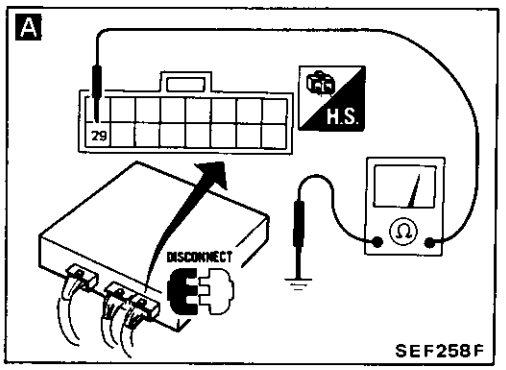
INSPECTION END

VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis)



VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis)





INSPECTION START

CHECK INPUT SIGNAL
1) Jack up rear wheels
2) Disconnect E C U 16-pin connector
A 3) Check resistance between terminal ㉙ and ground while rotating rear wheel by hand
Continuity should exist intermittently

N G → Check the following items
1) Harness continuity between speed sensor and E C U
2) Speed sensor
(See EL section)

O K

Reinstall any part removed

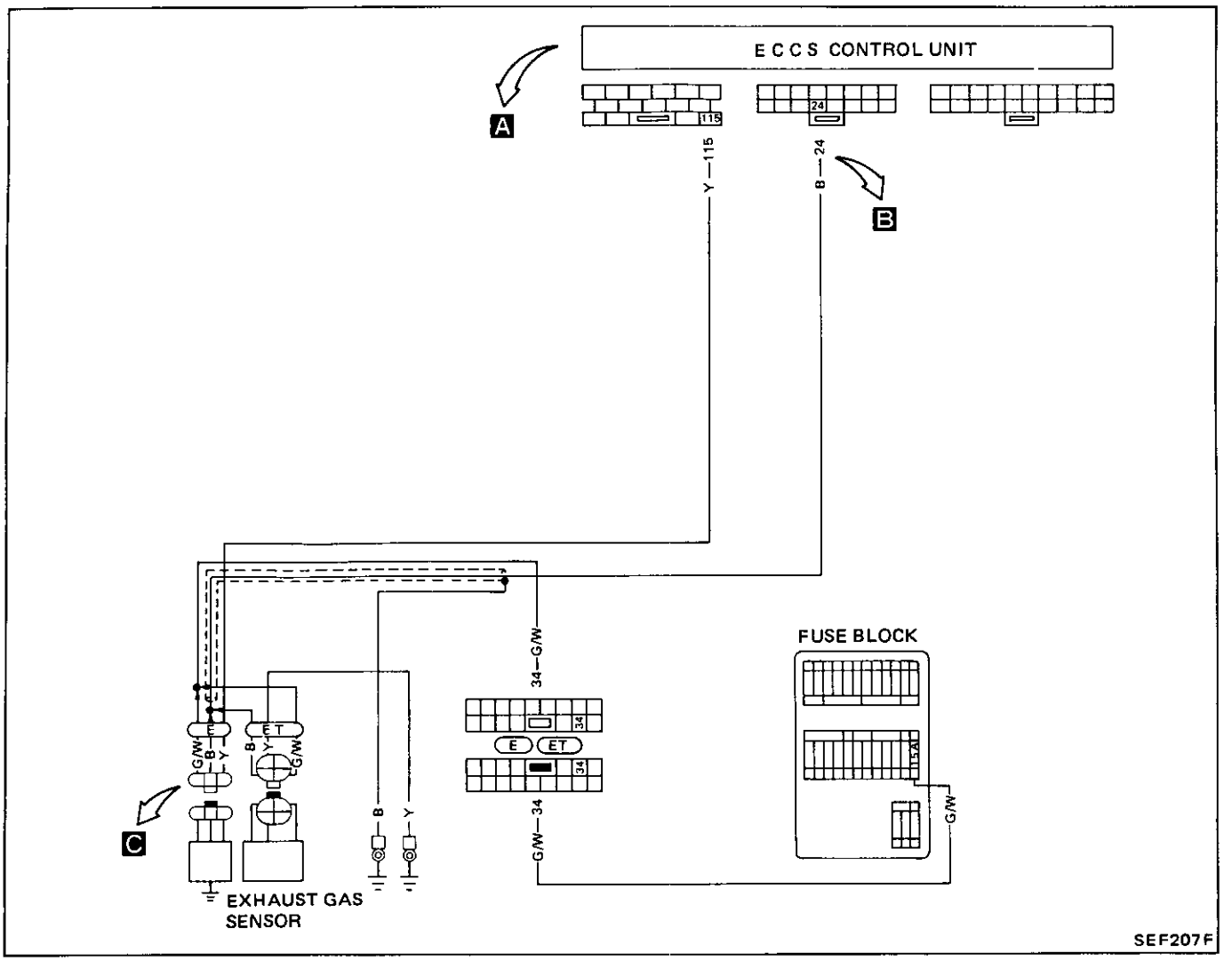
Perform self-diagnosis (Mode-IV) again

N G → 1) Perform E C U input/output signal inspection test
2) If N G , recheck E C U pin terminals for damage or the connection of E C U harness connector

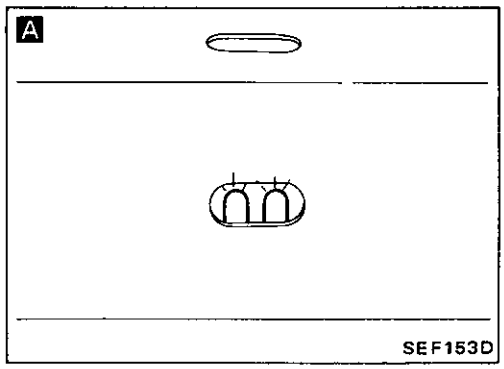
O K

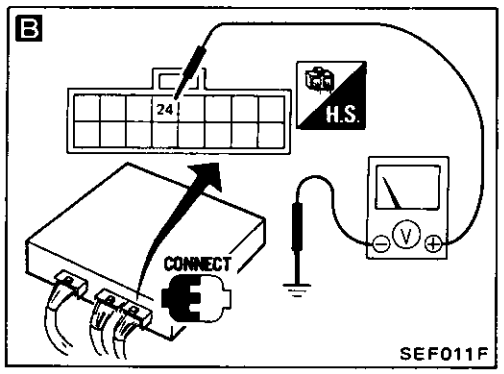
INSPECTION END

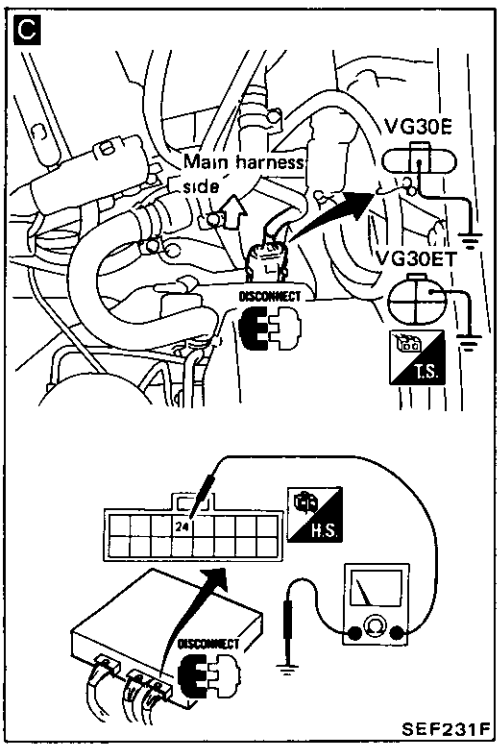
EXHAUST GAS SENSOR (Not self-diagnostic item)



EXHAUST GAS SENSOR (Not self-diagnostic item)







INSPECTION START

CHECK FLASHES OF INSPECTION LAMPS ON E C U
1) Warm up engine sufficiently
A 2) Make sure that green inspection lamp goes on and off 5 times or more during 10 seconds at 2,000 rpm

N G

B
CHECK INPUT SIGNAL
1) Stop engine
2) Start engine and make sure that engine has warmed up sufficiently
If not, warm it up
3) Check voltage between E C U terminal ㉔ and ground
Voltage 0 - 1.0V

O K

INSPECTION END

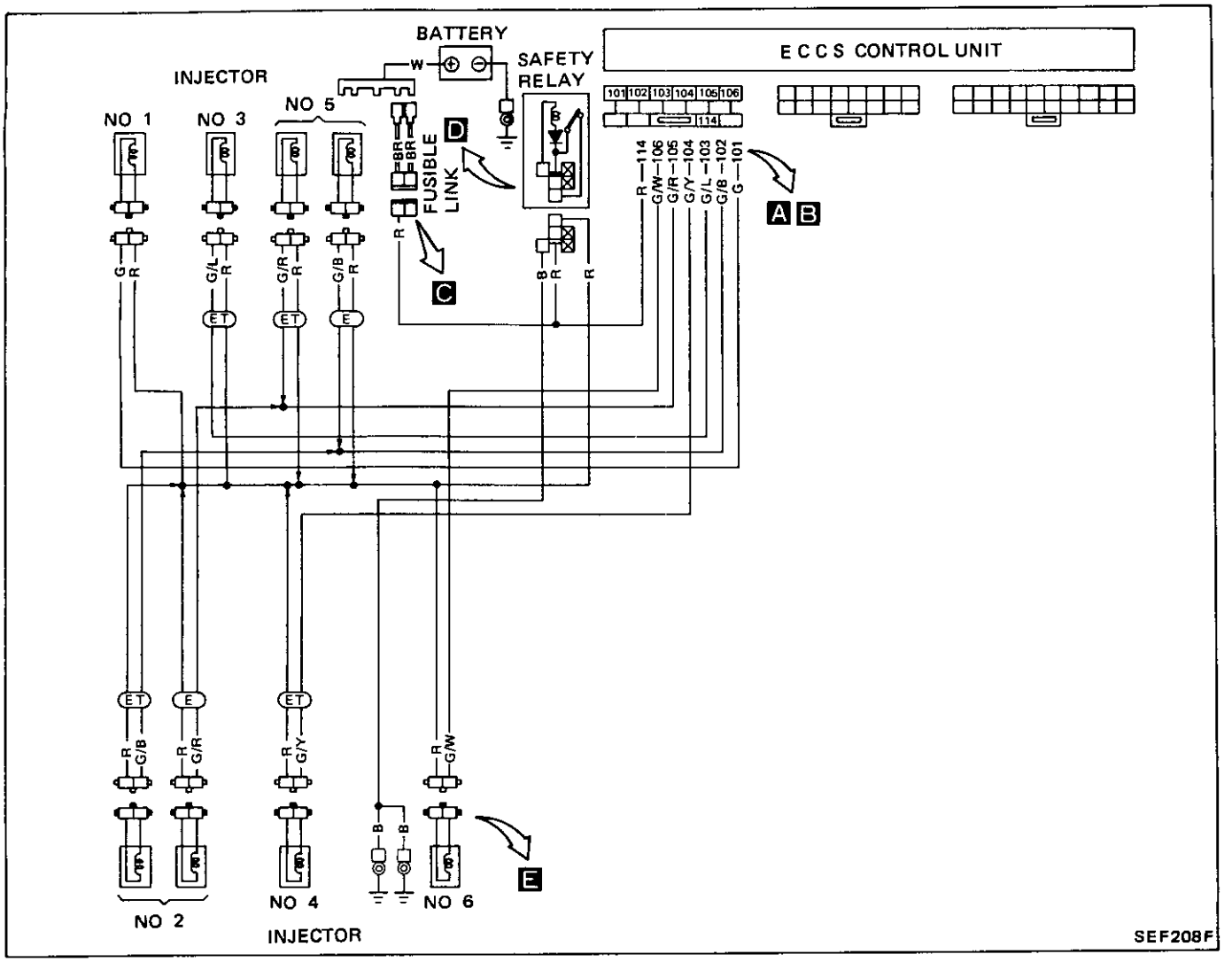
N G

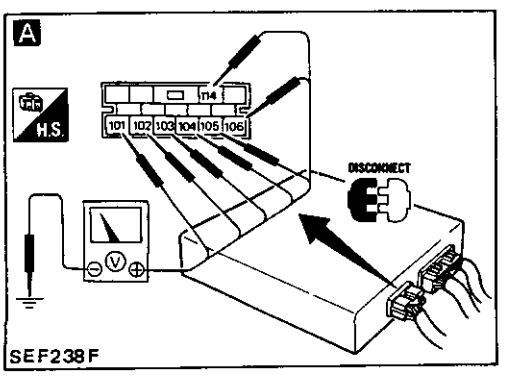
C
Check harness continuity between E C U and ground
- Stop engine
- Disconnect exhaust gas sensor harness connector, and connect main harness side terminal for sensor signal to ground with a jumper wire
- Disconnect 16-pin connector from E.C U
- Check resistance between E C U terminal ㉔ and ground
Resistance.
Approximately 0Ω

N G

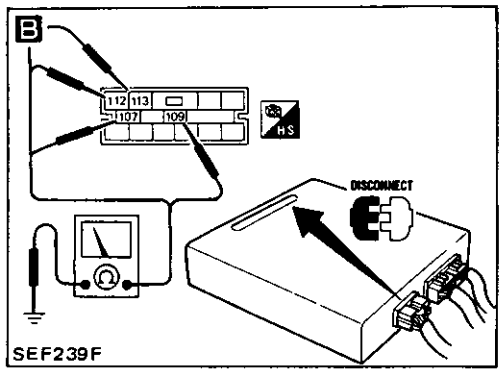
Replace exhaust gas sensor

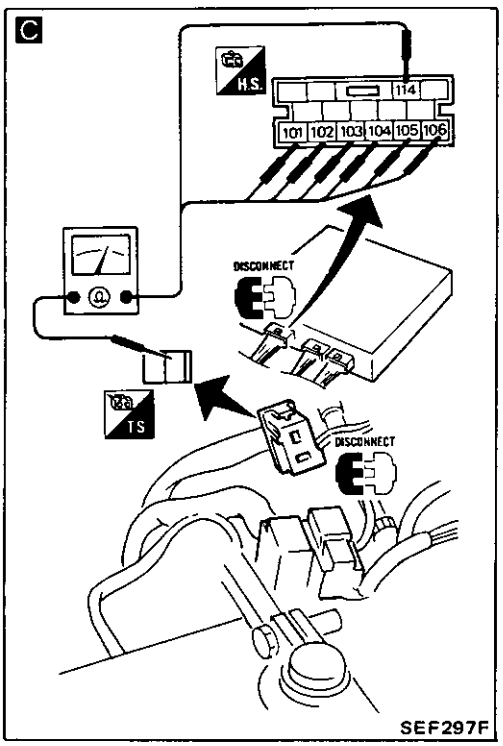
INJECTOR (Not self-diagnostic item)

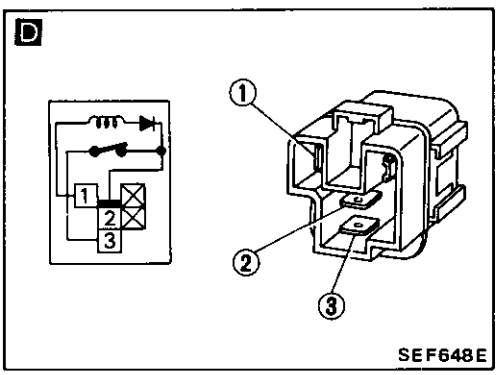


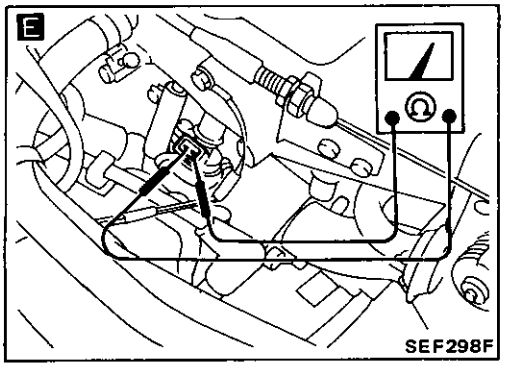


INJECTOR (Not self-diagnostic item)









INSPECTION START

CHECK POWER SOURCE
1) Disconnect 15-pin connector
A 2) Check voltage between terminals (101), (102), (103), (104), (105), (106), (114) and ground
Battery voltage should exist exist

N G

Check the following items
1) Harness continuity between E C U and battery
- Disconnect fusible link connector

C
- Check resistance between fusible link connector and E C U
  Resistance between terminals (101), (102), (103), (104), (105), (106) and fusible link connector
  Resistance
  Approximately 1 5Ω
  Resistance between terminal (114) and fusible link connector
  Resistance:
  Approximately 0Ω

2) Harness connector for injector
3) "BR" fusible link
D 4) Safety relay

12V direct current is applied between terminals ① and ②		Continuity between terminals ② and ③
①	②	
−	+	Yes
+	−	No

N G

E
Check resistance of individual injectors
- Disconnect injector harness connector

Resistance.
Approximately 1 5Ω

N G

Replace injector

O K

B
CHECK GROUND CIRCUIT
1) Disconnect 15-pin connector from E C U
2) Check resistance between terminals (107), (109), (112), (113) and ground
Resistance
Approximately 0Ω

N G

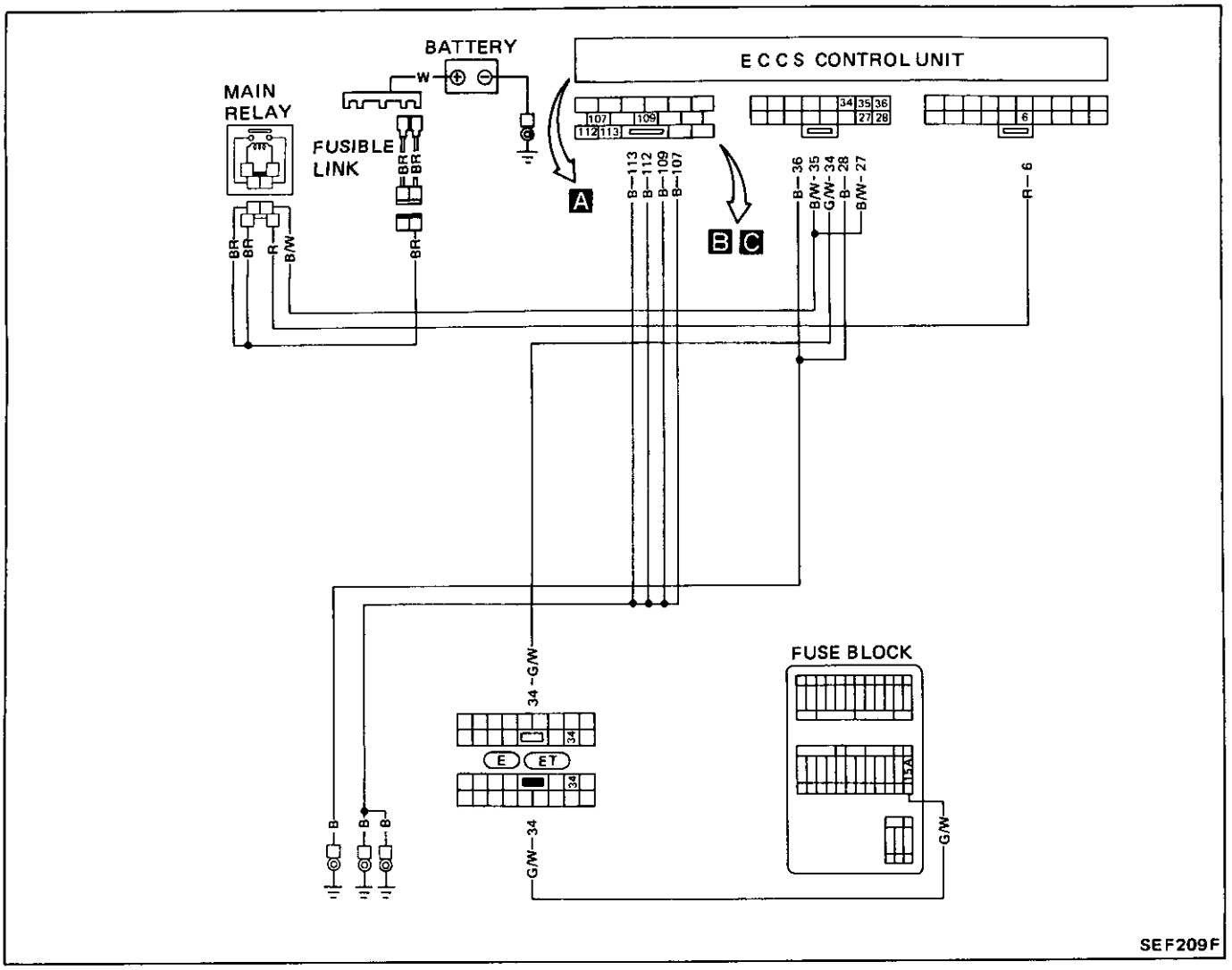
Check engine ground and harness continuity between E C U and engine ground

O K

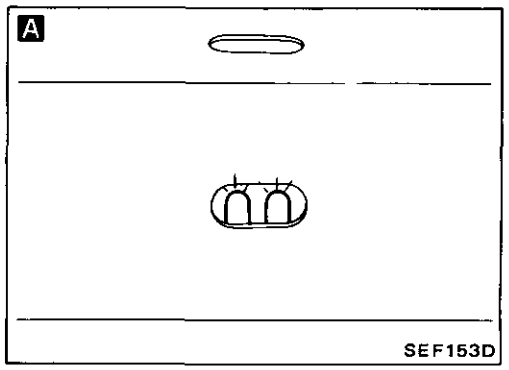
Reinstall any part removed

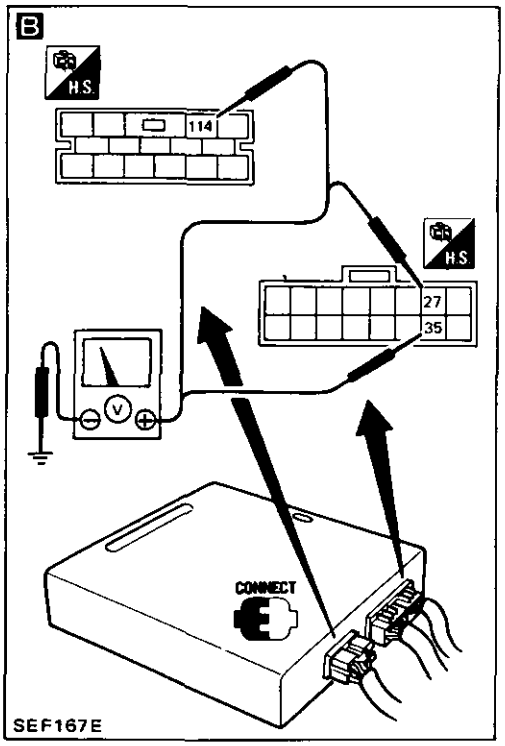
INSPECTION END

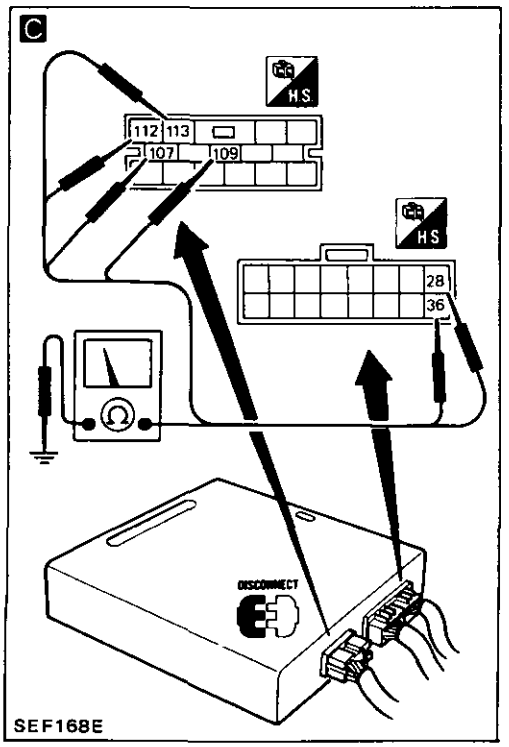
POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnostic item)



POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnostic item)







INSPECTION START

CHECK DIAGNOSTIC MODE ON THE E C U
Verify that diagnostic mode selector on the E C U is turned "OFF"

A

CHECK POWER SOURCE FOR E C U
1) Turn ignition switch "ON"
2) Verify that red and green inspection lamps on the E C U illuminate

N G → B
1) Turn ignition switch "ON"
2) Check voltage between terminals (27), (35), (114) and ground
Battery voltage should exist

Check the following items
1) Harness continuity between battery and E C U
2) Main relay (Refer to EL section)
3) "BR" fusible link

O K

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF"
2) Disconnect 16-pin, 15-pin connector from E C U
C 3) Check resistance between terminals (E C U side) (28), (36), (107), (109), (112), (113) and ground
Resistance
Approximately 0Ω

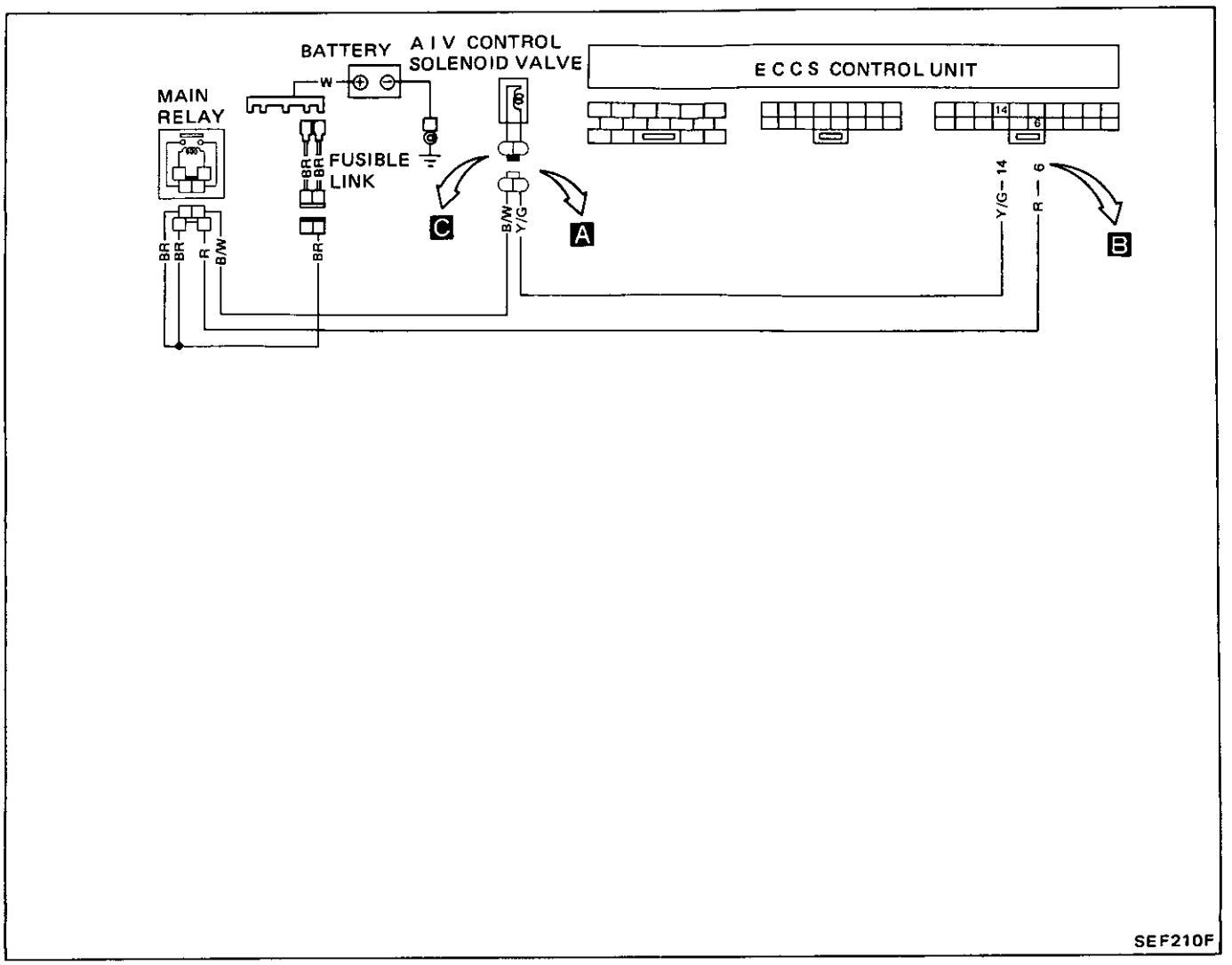
N G → Check harness continuity between E C U and engine ground

O K

Reinstall any part removed

INSPECTION END

A.I.V. CONTROL SOLENOID VALVE (Not self-diagnostic item)



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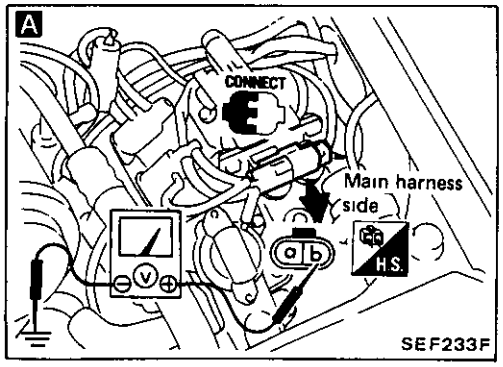
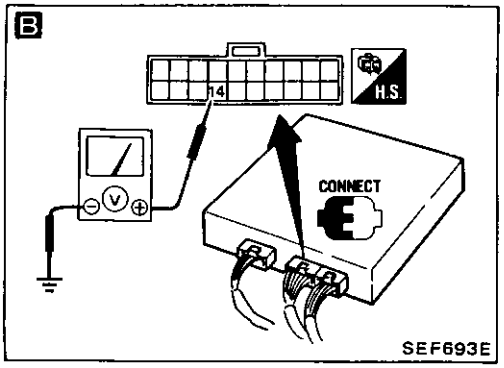
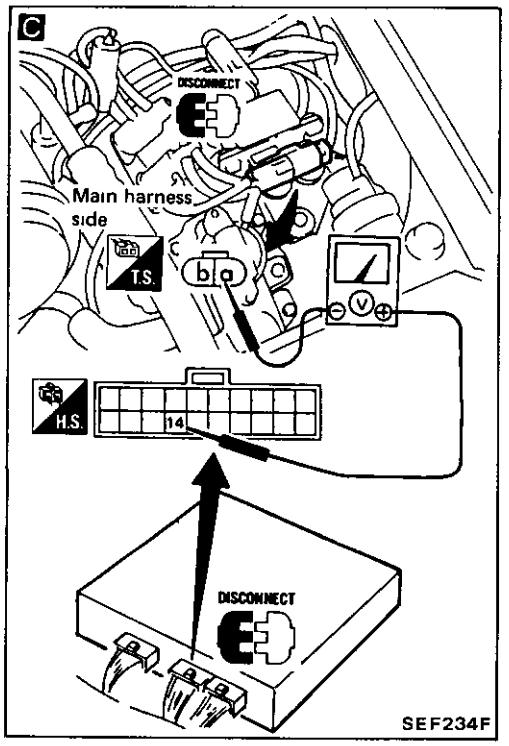
A.I.V. CONTROL SOLENOID VALVE (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE
1) Turn ignition switch "ON"
2) Check voltage terminal ⓑ and ground
Battery voltage should exist

N G → Check the following items
1) Harness continuity between A I V solenoid valve and battery
2) "BR" fusible link
3) Main relay (Refer to EL section)

O K

B

1) Start engine and warm it up sufficiently
2) Check voltage between E C U terminal ⑭ and ground

Accelerator pedal position	Voltage
Released	Approximately 0.8V
Depressed	Battery voltage

N G → Check the following items
C 1) Harness continuity between A I V solenoid valve and E C U
- Stop engine
- Disconnect A I V solenoid valve harness connector
- Disconnect 20-pin connector from E C U
- Check resistance between terminal ⓐ and E C U terminal ⑭
Resistance
Approximately 0Ω

2) A I V solenoid valve
Check resistance
Approximately 40Ω
3) Ground circuit of E C U
(See page EF & EC-78)

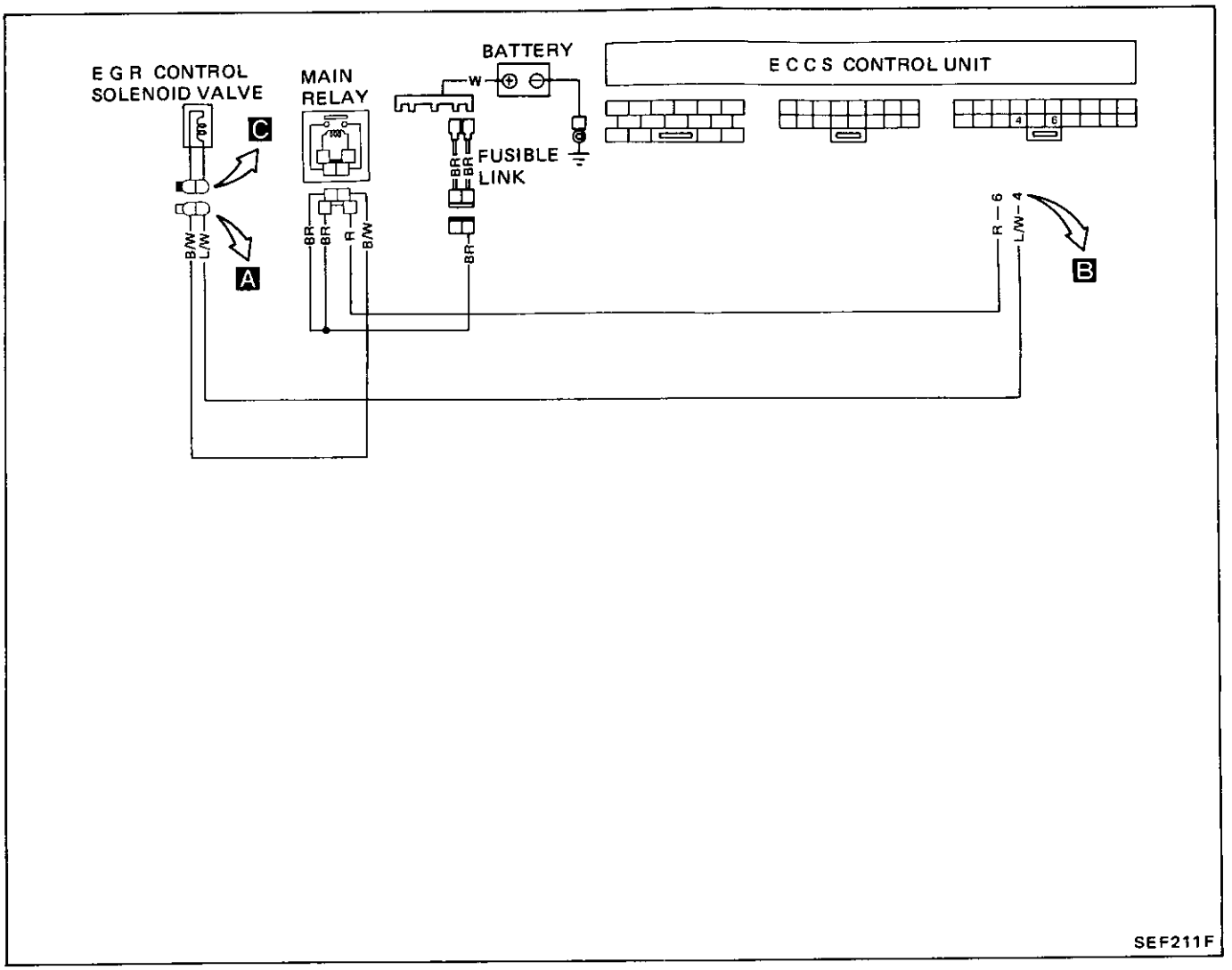
O K

CHECK GROUND CIRCUIT
Check ground circuit for E C U
(See page EF & EC-78)

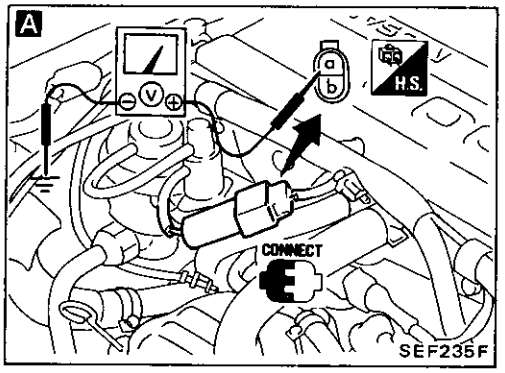
Reinstall any part removed

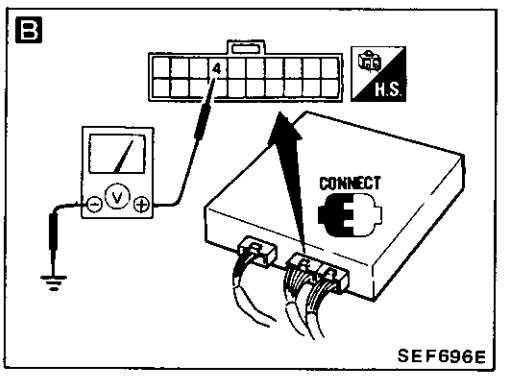
INSPECTION END

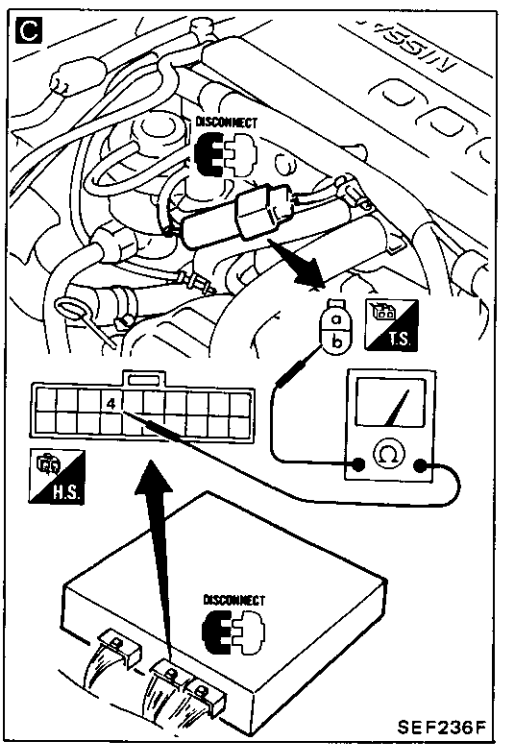
E.G.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)



E.G.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE
1) Turn ignition switch "ON"
2) Check voltage between terminal ⓐ and ground
Battery voltage should exist

N G → Check the following items
1) Harness continuity between E G R solenoid valve and battery
2) "BR" fusible link
3) Main relay circuit (Refer to EL section)

O K

B

CHECK OUTPUT SIGNAL
1) Start engine and warm it up sufficiently
2) Check voltage between E C U terminal ④ and ground

Engine condition	Voltage
At idle	Approximately 1.0V
Around 2,000 rpm	Battery voltage

N G → Check the following items
1) Harness continuity between E G R solenoid valve and E C U
2) E G R solenoid valve
Check resistance between terminals ⓐ and ⓑ
Resistance
Approximately 40Ω
3) Ground circuit of E C U
(See page EF & EC-78)

O K

C

CHECK GROUND CIRCUIT
1) Stop engine
2) Disconnect 20-pin connector from E C U
3) Disconnect E G R solenoid harness connector
4) Check resistance between terminal ⓑ and E C U terminal ④
Resistance
Approximately 0Ω

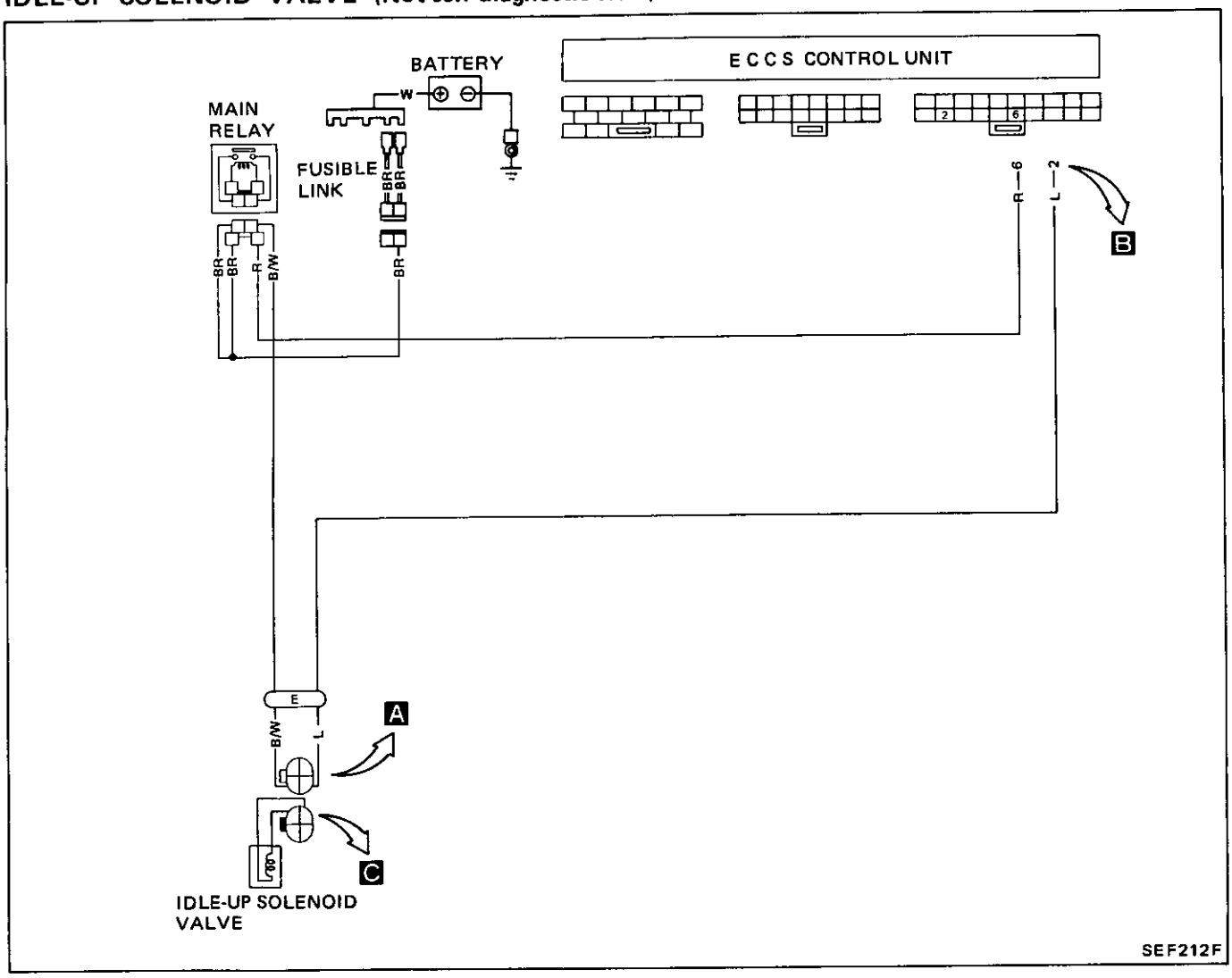
N G → Check E C U ground circuit
(See page EF & EC-78)

O K

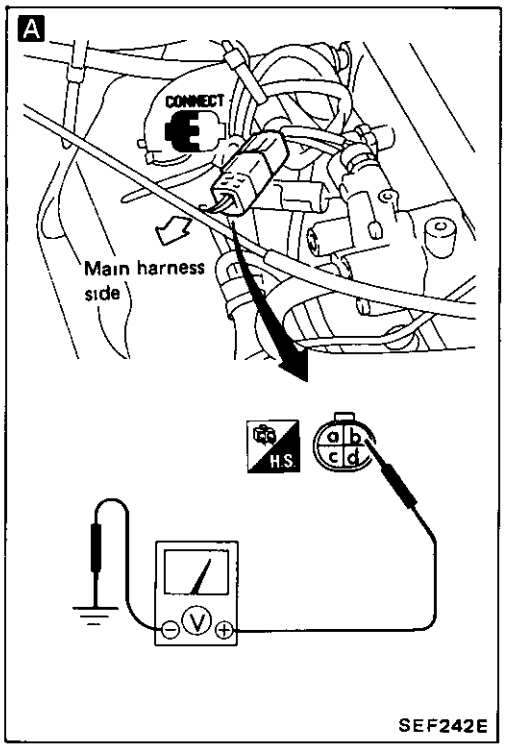
Reinstall any part removed

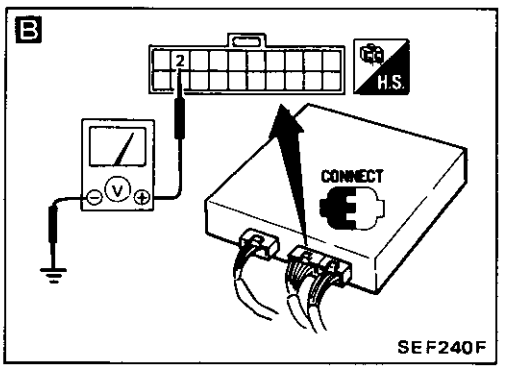
INSPECTION END

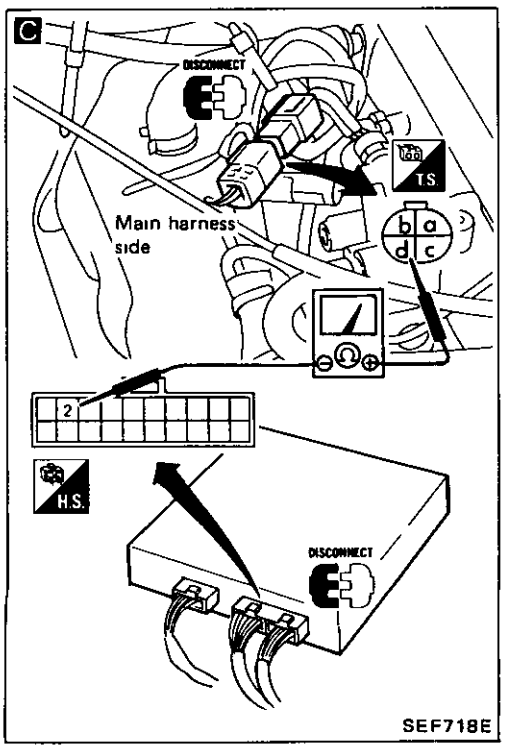
IDLE-UP SOLENOID VALVE (Not self-diagnostic item)



IDLE-UP SOLENOID VALVE (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE
1) Turn ignition switch "ON"
2) Check voltage between terminal ⓑ and ground
Battery voltage should exist.

N G → Check the following items
1) Harness continuity between Idle-up solenoid valve and battery
2) "BR" fusible link
3) Main relay
(Refer to EL section)

O K

B

CHECK OUTPUT SIGNAL
1) Turn ignition switch "OFF"
2) Check voltage between terminal ② and ground under the following conditions
3) Start engine
For about 20 seconds after engine has started
Voltage: 0.1 - 0.4V
4) Turn load switches "ON"
- Lighting switch
- Power steering oil pressure switch
- Rear defogger switch
- Heater or air conditioner switch

Voltage
0.1 - 0.4V

N G → Check the following items
C 1) Harness continuity between Idle-up solenoid valve and E C U
- Disconnect 20-pin connector from E C U
- Check resistance between terminal ⓓ and E C U terminal ②

Resistance
Approximately 0Ω

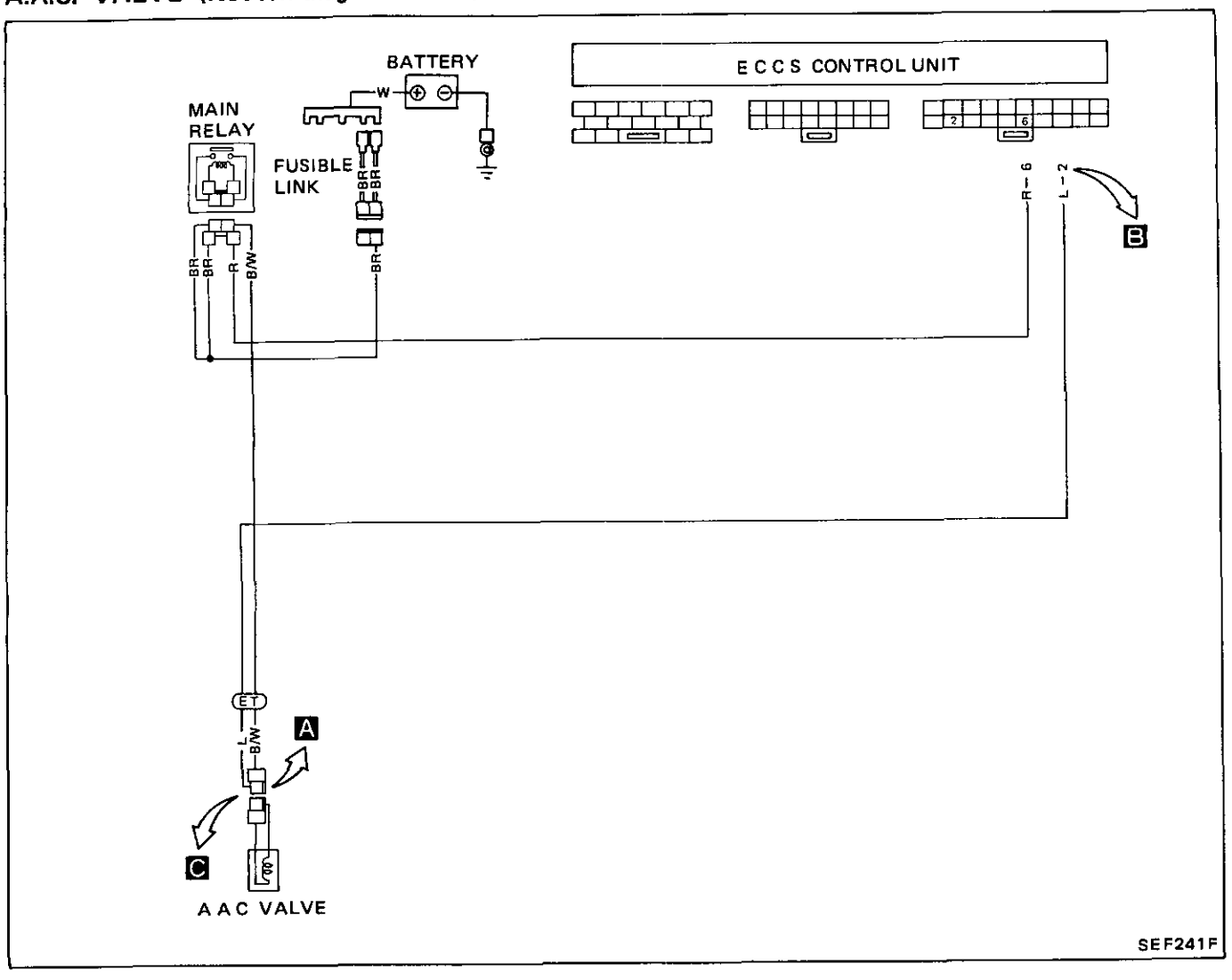
2) Idle-up solenoid valve
3) Ground circuit of E C U
(See page EF & EC-78)

O K

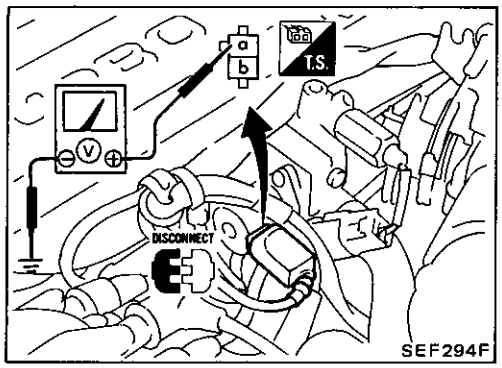
Reinstall any part removed

INSPECTION END

A.A.C. VALVE (Not self-diagnostic item)



A.A.C. VALVE (Not self-diagnostic item)



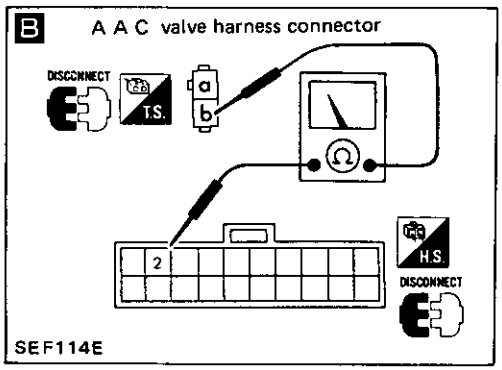
INSPECTION START

A

CHECK POWER SOURCE
1) Disconnect A A C valve harness connector
2) Turn ignition switch "ON"
3) Check voltage between terminal ⓐ and ground
Voltage Battery voltage

N G → Check the following items
1) Harness continuity between battery and A A C valve
2) "BR" fusible link
3) Main relay
(Refer to EL section)

O K

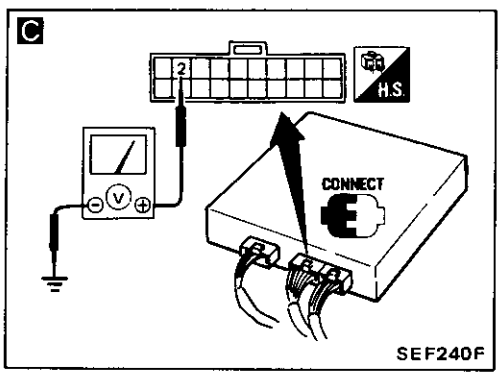


B

CHECK GROUND CIRCUIT
1) Turn ignition switch "OFF" and disconnect E C U 20-pin connector
2) Check resistance between terminal ⓑ and E C U terminal ②
Resistance
Approximately 0Ω

N G → Repair harness

O K



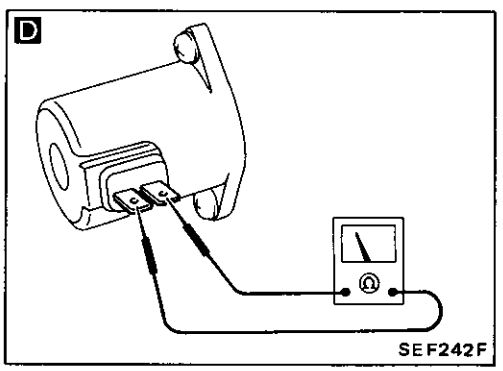
C

CHECK INPUT SIGNAL
1) Reconnect E C U 20-pin connector and A A C valve harness connector
2) Start engine and warm it up sufficiently
3) Check voltage between E C U terminal ② and ground
Voltage
Approximately 6 - 8V
(at idle)

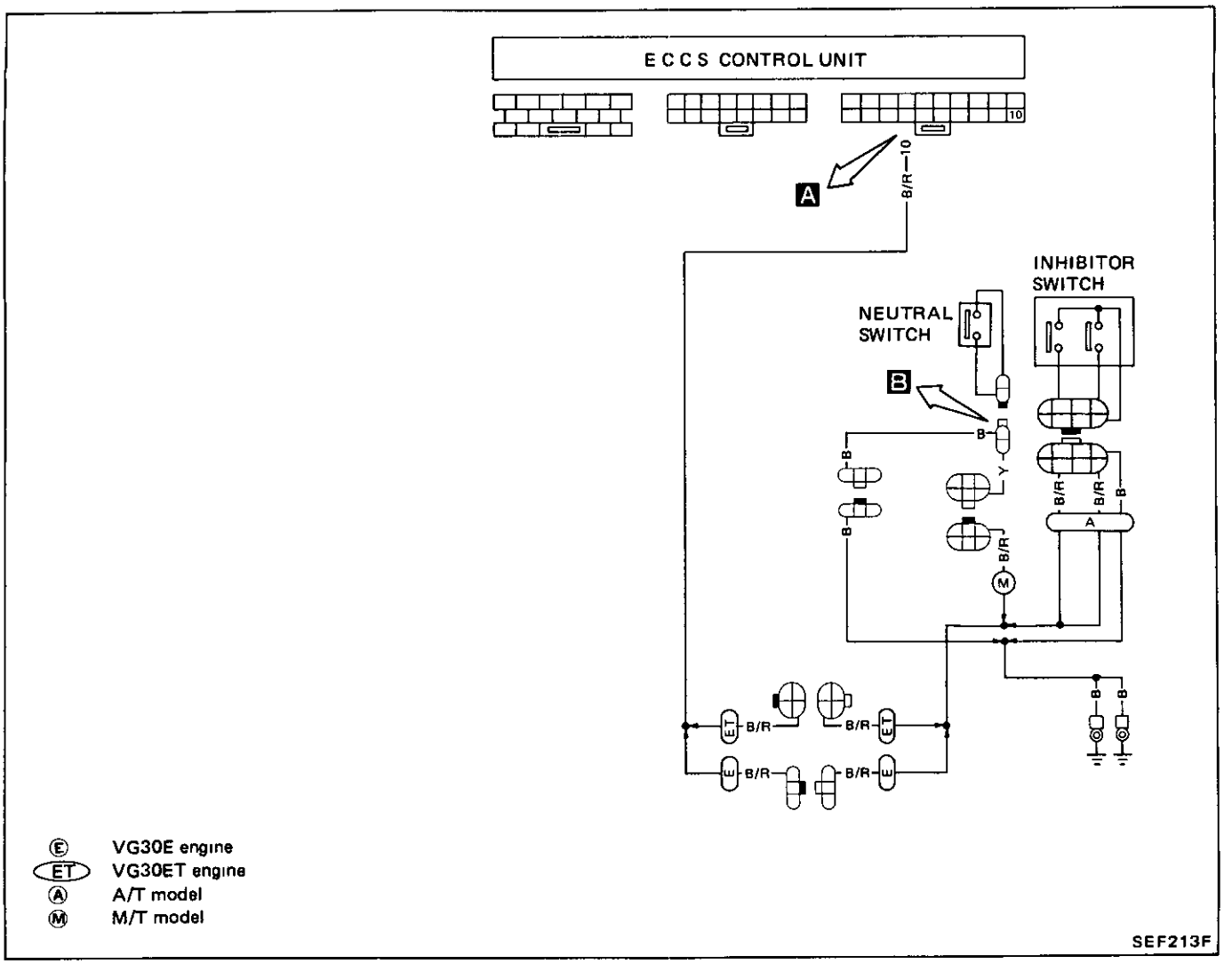
N G → **D**
Check A A C valve
Check resistance of A A C valve
Continuity should exist

O K

INSPECTION END

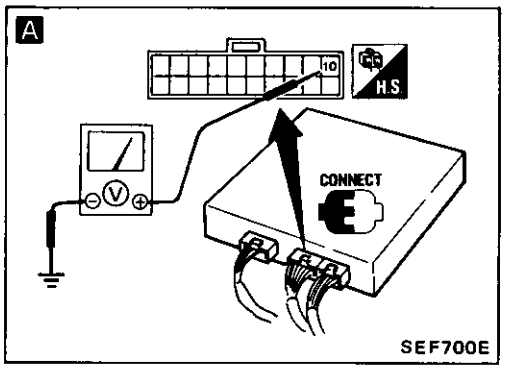


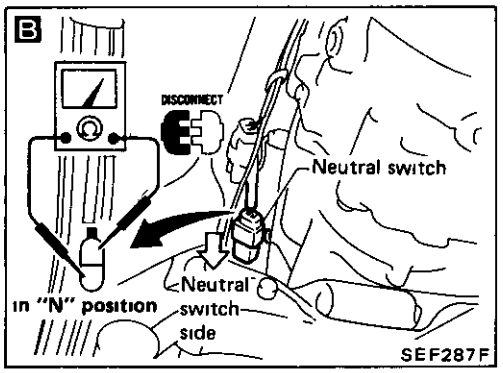
NEUTRAL/INHIBITOR SWITCH (Not self-diagnostic item)



Ⓔ VG30E engine
ET VG30ET engine
Ⓐ A/T model
Ⓜ M/T model

NEUTRAL/INHIBITOR SWITCH (Not self-diagnostic item)





INSPECTION START

A

CHECK INPUT SIGNAL
1) Turn ignition switch "ON"
2) Check voltage between E C U terminal ⑩ and ground

Gear position	Voltage
Neutral/Park	0V
Others	Battery voltage

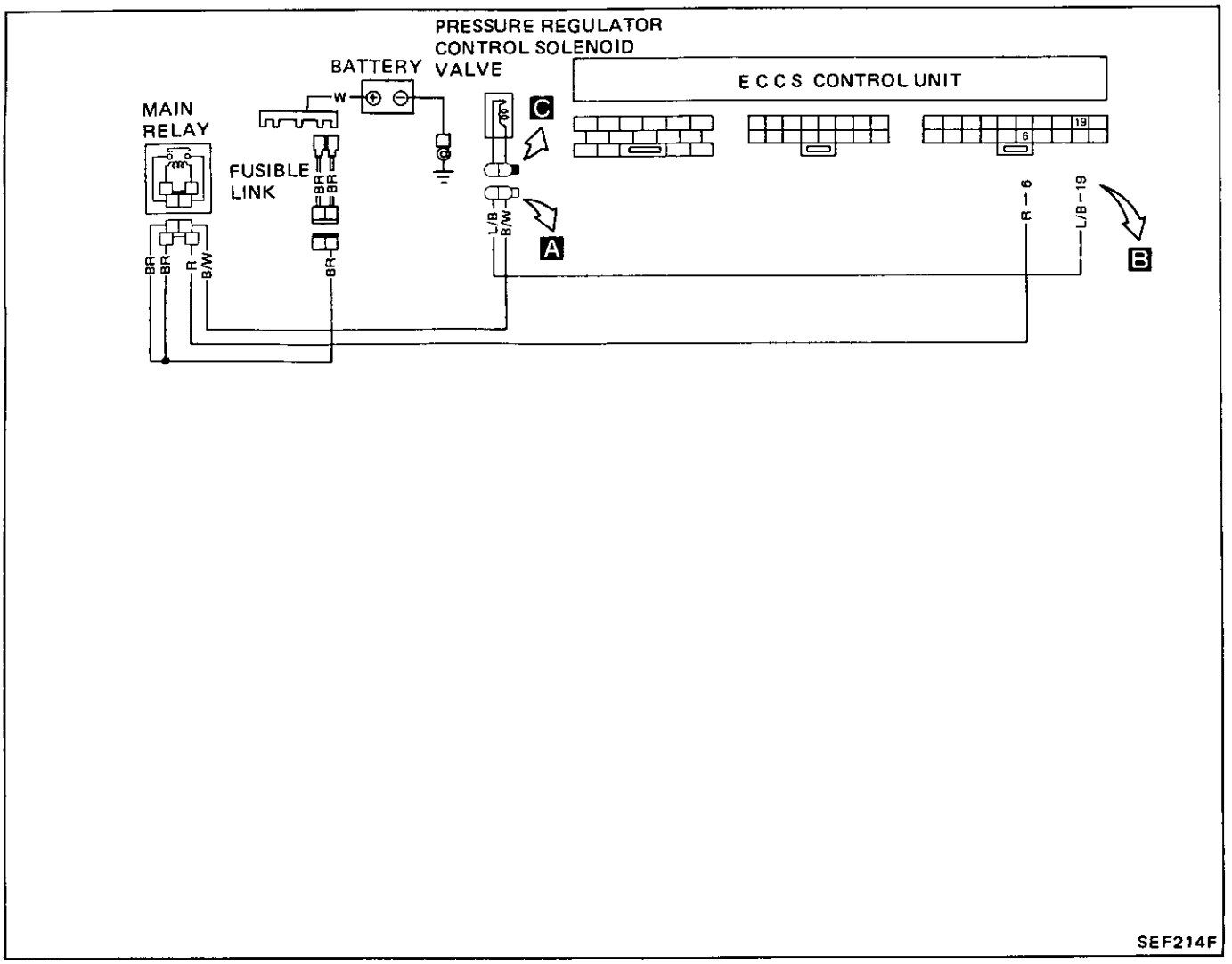
N G →

Check the following items
1) Power source & ground circuit for E C U (See page EF & EC-78)
2) Main relay (Refer to EL section)
3) Harness continuity between battery and E C U
4) Harness continuity between E C U and Neutral switch
B 5) Check resistance Neutral/ Inhibitor switch and ground
Resistance:
Approximately 0Ω

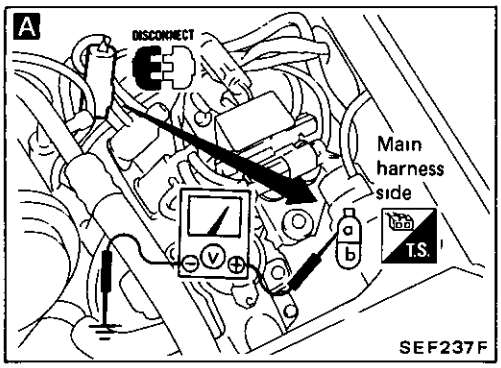
O K ↓

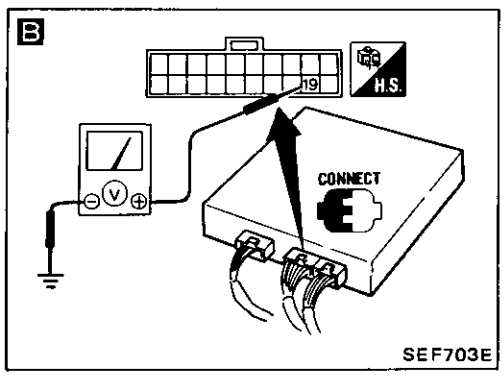
INSPECTION END

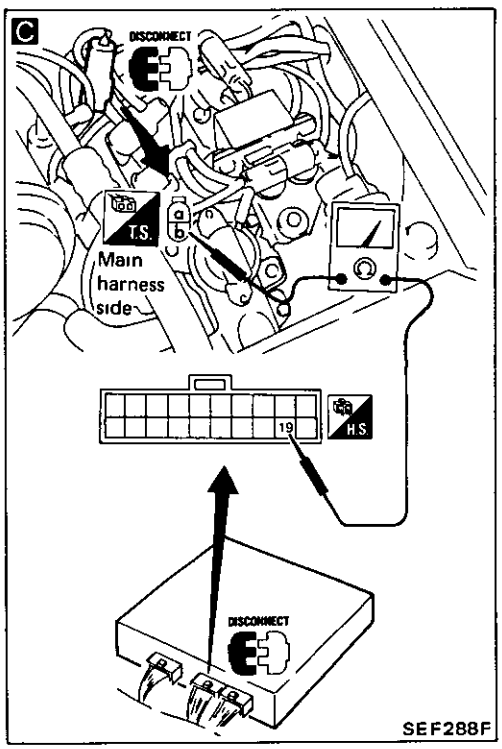
P.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)



P.R. CONTROL SOLENOID VALVE (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE
1) Disconnect pressure regulator control solenoid connector
2) Turn ignition switch "ON"
3) Check voltage between terminal ⓐ and ground
Battery voltage should exist

N G →
Check the following items
1) Harness continuity between battery and pressure regulator control solenoid
2) Main relay
(Refer to EL section)
3) Fusible link "BR"

O K ↓

B

CHECK OUTPUT SIGNAL
1) Turn ignition switch "OFF"
2) Connect pressure regulator control solenoid
3) Turn ignition switch to "START"
4) Check voltage between E C U terminal ⑲ and ground
Voltage
Approximately 0 9V

N G →
Check the following items
C 1) Harness continuity between pressure regulator control solenoid valve and E C U
- Stop engine
- Disconnect pressure regulator control solenoid valve harness connector
- Disconnect 20-pin connector from E C U
- Check resistance between terminal ⓑ and E C U terminal ⑲
Resistance
Approximately 0Ω

2) Pressure regulator control solenoid valve
Check resistance
Approximately 40Ω
3) Ground circuit for E C U
(See page EF & EC-78)

O K ↓

CHECK GROUND CIRCUIT
Check ground circuit for E C U
(See page EF & EC-78)

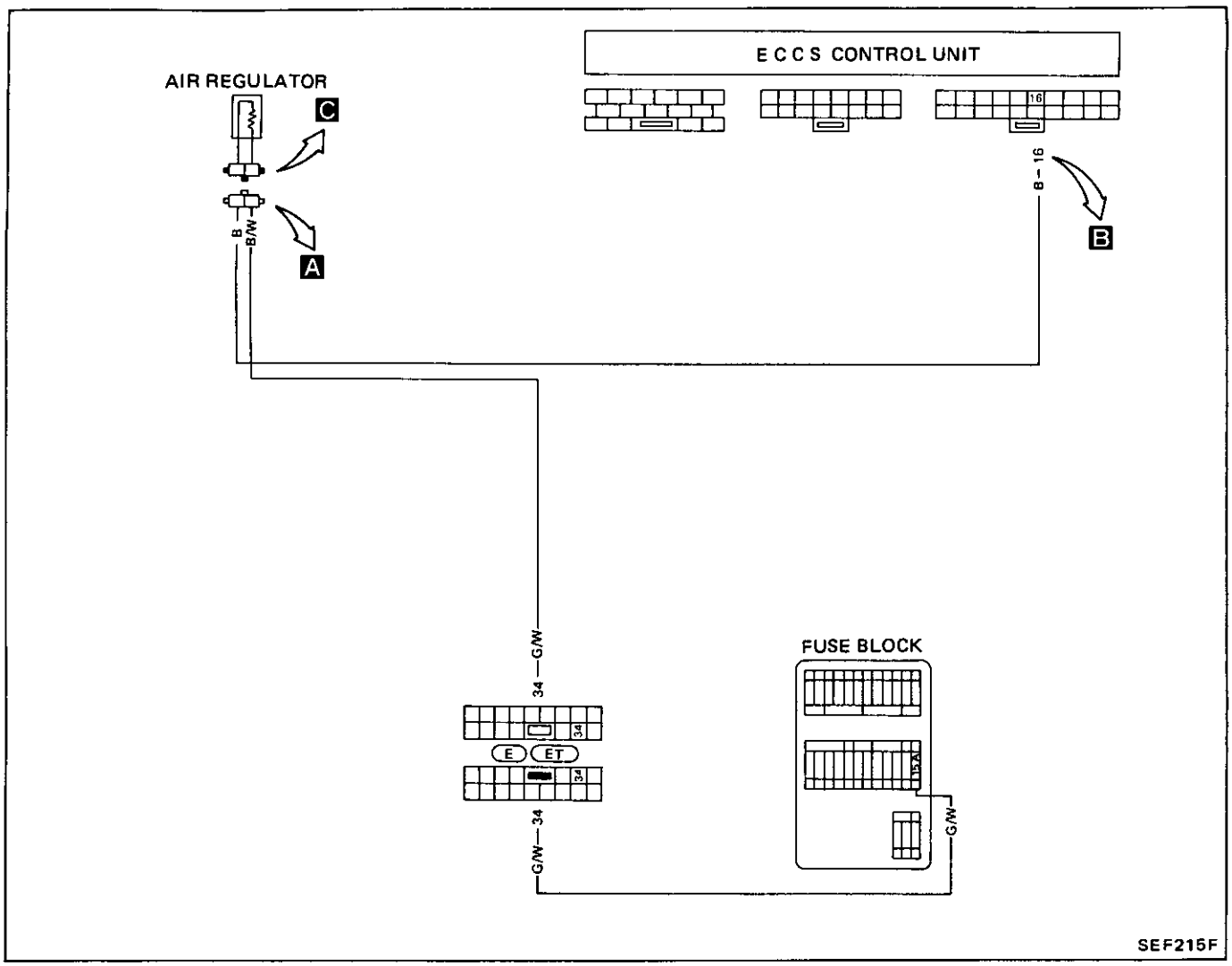
↓

Reinstall any part removed

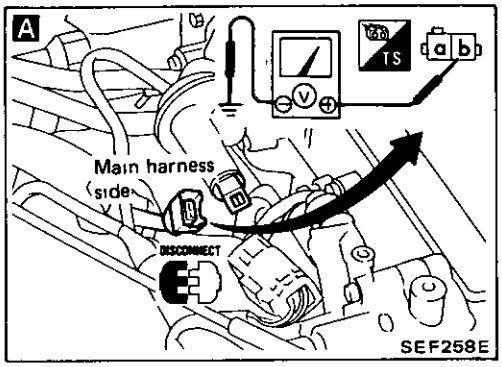
↓

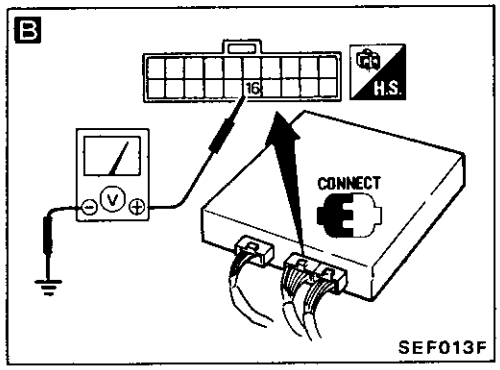
INSPECTION END

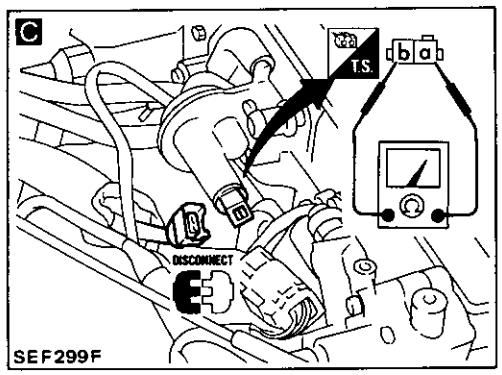
AIR REGULATOR (Not self-diagnostic item)



AIR REGULATOR (Not self-diagnostic item)







INSPECTION START

A

CHECK POWER SOURCE
1) Disconnect air regulator harness connector
2) Turn ignition switch "ON"
3) Check voltage between terminal ⓑ and ground
Battery voltage should exist

N G → Check the following items
1) Harness continuity between battery and air regulator
2) Fuse

O K

B

CHECK OUTPUT SIGNAL
1) Turn ignition switch "OFF"
2) Connect air regulator harness connector
3) Turn ignition switch "ON"
4) Check voltage between E C U terminal ⑯ and ground
Battery voltage should appear for 5 seconds after turning ignition switch "ON"

N G →
1) Check harness continuity between E C U and air regulator
C 2) Check air regulator
- Disconnect air regulator harness connector
- Check resistance between terminals ⓐ and ⓑ
Resistance
Approximately 70Ω

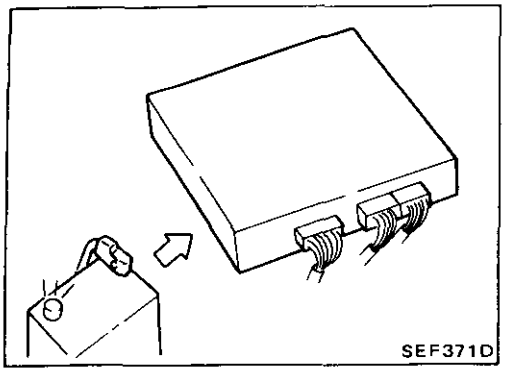
3) Check power source for E C U

O K

CHECK GROUND CIRCUIT
Check ground circuit for E C U
(See page EF & EC-78)

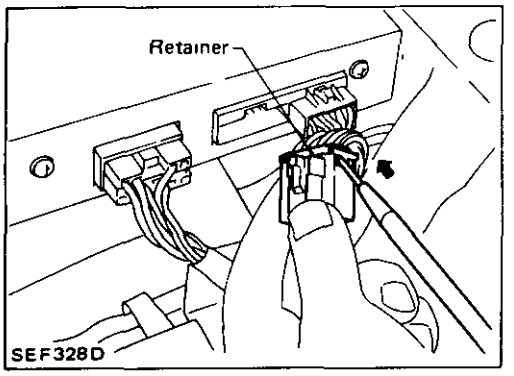
Reinstall any part removed

INSPECTION END

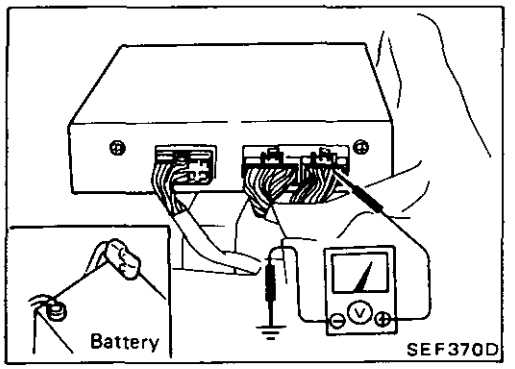


MEASUREMENT VOLTAGE OR RESISTANCE OF E C.U.

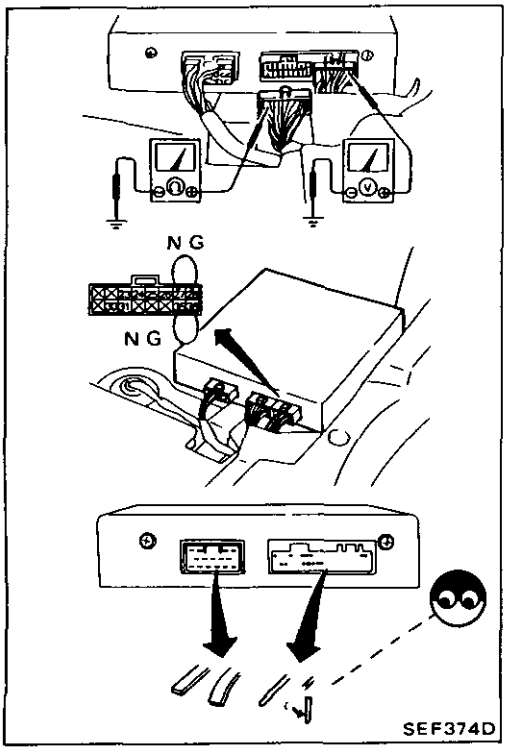
1 Disconnect battery ground cable
2 Disconnect 20- and 16-pin connectors from E C U



3 Remove pin terminal retainer from 20- and 16-pin connectors to make it easier to insert tester probes



4 Connect 20- and 16-pin connectors to E C U carefully
5 Connect battery ground cable.
6 Measure the voltage at each terminal by following "E C U inspection table"



CAUTION.

a. ***Perform all voltage measurements with the connectors connected***
b. **Perform all resistance measurements with the connectors disconnected**
c. **Make sure that there is not any bend or break on E.C.U. pin *terminal before measurements.***
d. **Do not touch tester probes between terminals ㉗ and ㉘, ㉟ and ㊱.**

E.C.U. inspection table

*Data are reference values

TERMINAL NO	ITEM	CONDITION	*DATA
2	Idle-up solenoid valve [VG30E]	Engine is running and gear position is in P or N (A/T) — For about 20 seconds after starting engine — When turning steering wheel — Heater or air conditioner switch is "ON" — Lighting switch position is "ON"	0.1 - 0.4V
		Engine is running — Except the conditions shown above	BATTERY VOLTAGE (11 - 14V)
	A.A.C. valve [VG30ET]	Engine is running — At idle (After warming up)	6.0 - 8.0V
3	Ignition signal	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
4	E.G.R. control solenoid valve	Engine is running after being warmed up — High engine revolution — Idle speed (Throttle valve switch "ON")	Approximately 1.0V
		Engine is running — Low engine revolution	BATTERY VOLTAGE (11 - 14V)
5	Ignition signal (from power transistor)	Engine is running. **Do not turn engine at high speed under no-load**	0.5 - 2.0V
6	Main relay	Ignition switch "ON"	0.7 - 0.9V
8	Crank angle sensor (position signal)	At idle	2.0 - 3.0V
9	Start signal	Cranking	BATTERY VOLTAGE (11 - 14V)

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

*Data are reference values.

TERMINAL NO	ITEM	CONDITION	*DATA
10	Neutral switch (M/T) Inhibitor switch (A/T) [VG30ET]	Ignition switch "ON" └Gear position is in Neutral or Parking	0V
		Ignition switch "ON" └Any gear position except Neutral or Parking	4.0 - 5.0V
12	Air flow meter (Self-cleaning signal)	Race engine at more than 1,500 rpm and then turn ignition switch "OFF" └For 6 seconds	0V
		Race engine at more than 1,500 rpm and then turn ignition switch "OFF" └For one second after 6 seconds	9.0 - 10.0V
14	A.I.V. control solenoid valve	Ignition switch "ON" └Release accelerator pedal (Throttle valve switch "ON")	0.7 - 0.9V
		Ignition switch "ON" └Depress accelerator pedal (Throttle valve switch "OFF")	BATTERY VOLTAGE (11 - 14V)
15	Fuel temperature sensor	At idle	0 - 5V Output voltage varies with engine temperature
16	Air regulator	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON"	0.1 - 0.3V
		Ignition switch "ON" └After 5 seconds with ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
17	Crank angle sensor (Reference signal)	Engine is running. **Do not turn engine at high speed under no-load**	0.2 - 0.4V

*Data are reference values

TERMINAL NO	ITEM	CONDITION	*DATA
18	Throttle valve switch (⊖ side)	Ignition switch "ON" └Release accelerator pedal (Throttle valve switch "OFF")	9 0 - 10 0V
		Ignition switch "ON" └Depress accelerator pedal (Throttle valve switch "ON")	0V
19	Pressure regulator control solenoid valve	Stop and restart engine after warming it up └For 30 seconds	0 8 - 1 0V
		Stop and restart engine after warming it up └After 3 minutes	BATTERY VOLTAGE (11 - 14V)
20	Fuel pump relay	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON"	0 1 - 0 3V
		Ignition switch "ON" └After 5 seconds with ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
22	Load signal	Engine is running and gear position is in P or N (A/T) └When turning steering wheel └Air conditioner switch is "ON" └Rear defogger switch is "ON" └Lighting switch position is "ON"	BATTERY VOLTAGE (11 - 14V)
		Engine is running └Except the conditions shown above	0V
23	Cylinder head temperature sensor	Engine is running	0 - 5 0V Output voltage varies with engine temperature
24	Exhaust gas sensor	Engine is running └After warming up sufficiently	0 - Approximately 1 0V
25	Throttle valve switch (⊕ side)	Ignition switch "ON"	9 0 - 10.0V

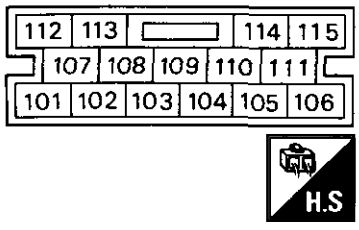
E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

*Data are reference values.

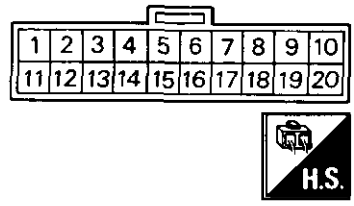
TERMINAL NO	ITEM	CONDITION	*DATA
27 35	Power source for E C U	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
29	Vehicle speed sensor	Ignition switch "ON" └While rotating rear wheel slowly	0 or 7 4V
30	Air flow meter	Ignition switch "ON"	2 0 - 4 0V
31	Air quantity signal	Race engine from idle to 3,000 rpm	2 0 - 4 0V
34	Ignition switch signal	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
101 102 103 104 105 106 114	Injector	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
108	Fuel pump	Ignition switch "ON" └For 5 seconds after turning ignition switch "ON"	0 1 - 0 3V
		Ignition switch "ON" └After 5 seconds with ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
115	Exhaust gas sensor heater	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

VG30 PIN CONNECTOR TERMINAL LAYOUT

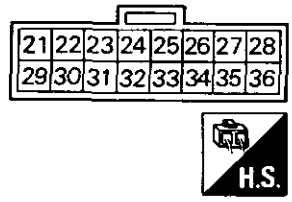
15-pin connector



20-pin connector



16-pin connector



SEF262F

MIXTURE RATIO FEEDBACK SYSTEM INSPECTION

PREPARATION

1. Make sure that the following parts are in good order.

- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- E.C.C.S. harness connectors
- Vacuum hoses
- Air intake system
  (oil filler cap, oil level gauge, etc.)
- Fuel pressure
- A.I.V. hose
- Engine compression
- E.G R. valve operation
- Throttle valve

2 On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".

3. On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture ratio, checks should be carried out while shift lever is in "D" position.

4 When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.

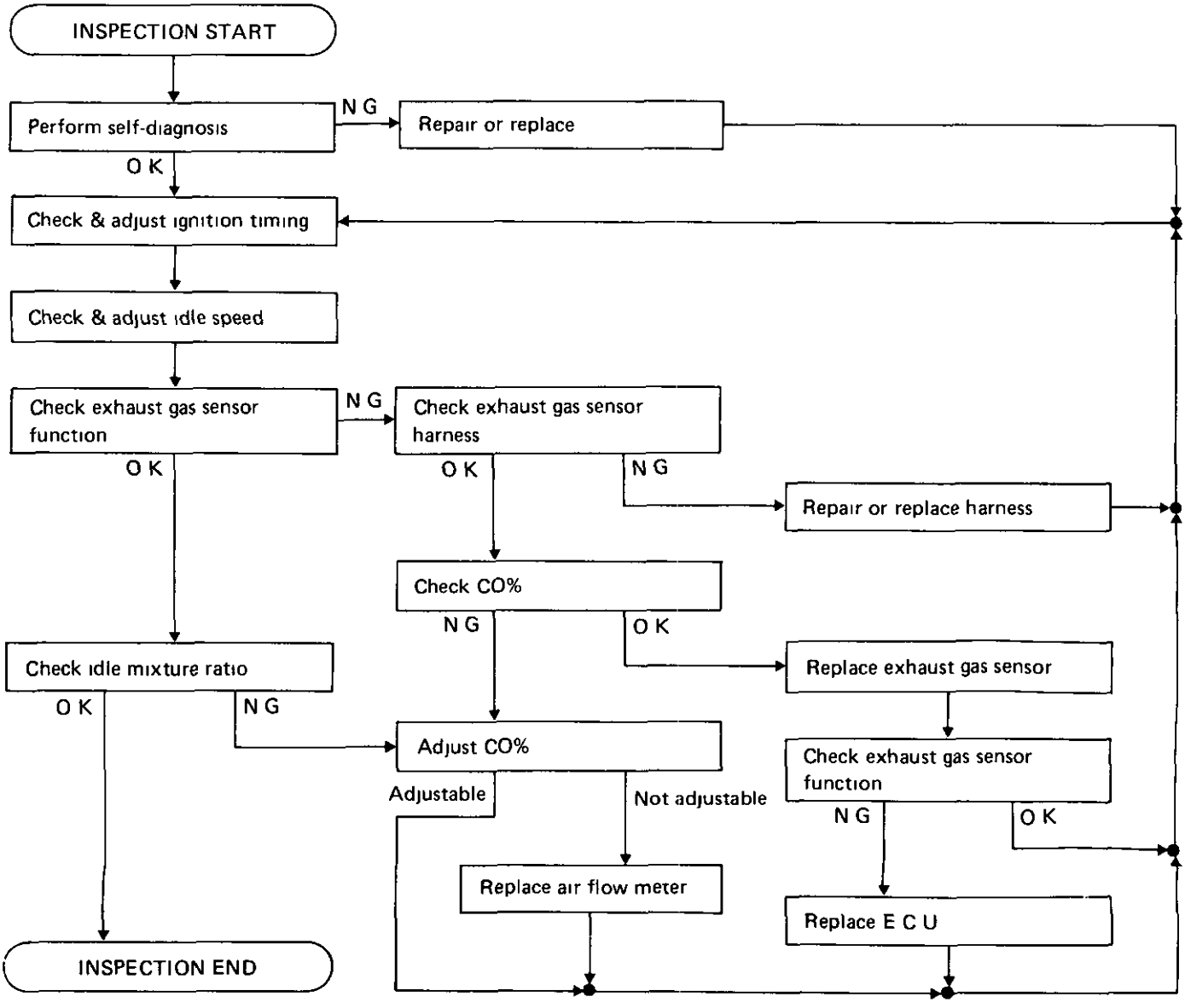
WARNING:

a. When selector lever is shifted to "D" position, apply parking brake and block both front and rear wheels with chocks.

b. Depress brake pedal while racing the engine to prevent forward surge of vehicle.

c. After the adjustment has been made, shift the lever to the "N" or "P" position and remove wheel chocks.

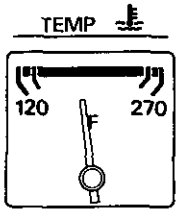
Overall inspection sequence



Idle Check and Set Procedure

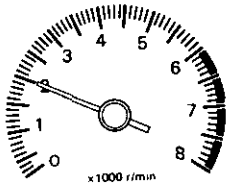
INSPECTION START

Visually check the following
- Air cleaner clogging
- Hoses and ducts for leaks
- E G R valve operation
- Electrical connectors
- Gaskets
- Throttle valve switch operation
- A I V hose



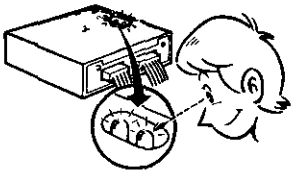
SEF246F

Start engine and warm up until water temperature indicator points to the middle of gauge



SEF247F

Run engine at about 2,000 rpm for about 2 minutes under no-load


SEF332D

Perform E C C S self-diagnosis

O K

N G

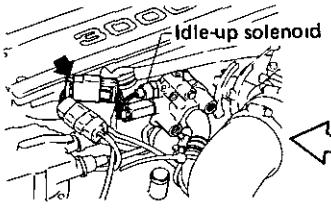
Repair or replace components as necessary

Does engine run smoothly?

Yes

No

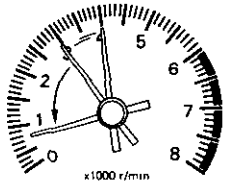
Clean injectors



SEF644B

VG30E only

Stop engine and disconnect idle-up solenoid valve harness connector Start engine



SEF248F

Race engine two or three times under no-load and run engine for about one minute at idle speed

Check ignition timing

VG30E· 20°±2° B.T.D C.
VG30ET 15°±2° B.T D.C.

O K

N G

Adjust ignition timing by turning distributor after loosening bolt which secures distributor

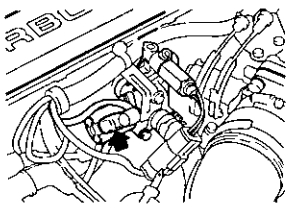
Ⓐ

Ⓑ

Ⓐ

Check idle speed (A/T in "D" position)

VG30E· M/T & A/T
700±50 rpm at sea level
650±50 rpm at high altitudes
VG30ET.
M/T. 700±50 rpm
A/T· 650±50 rpm



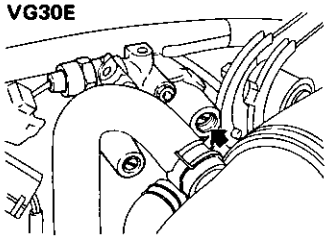
SEF646B

O K

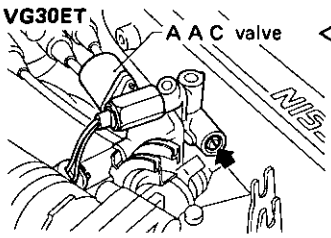
N G

VG30E only

Stop engine and disconnect A A C valve harness connector Start engine


VG30E

VG30ET A A C valve



SEF261F

Adjust engine speed by turning idle speed adjusting screw (A/T in "D" position)

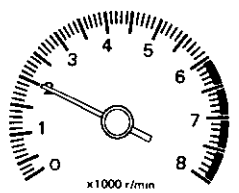
VG30E: M/T & A/T
700±50 rpm at sea level
650±50 rpm at high altitudes
VG30ET
M/T 650 rpm
A/T 600 rpm

Stop engine and securely connect idle-up solenoid or A A C valve harness connector

VG30ET only

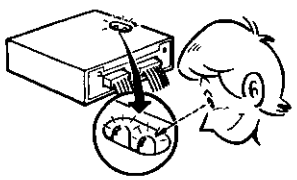
Make sure that idle speed is in the specified range

Run engine at about 2,000 rpm for about 2 minutes under no-load



SEF247F

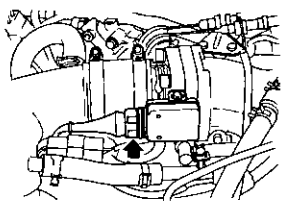
O K


SEF332D

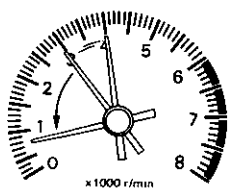
Keep engine speed at 2,000 rpm and make sure that green inspection lamp on E C U goes ON and OFF more than 5 times during 10 seconds

N G

Disconnect throttle valve switch harness connector

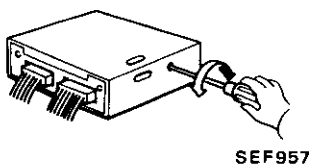

SEF707B

Race engine two or three times under no-load, then run engine at idle speed



SEF248F

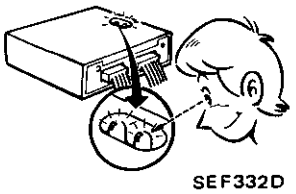
Set the diagnosis mode selector of E C U to Mode-II


SEF957D

Ⓒ

Ⓓ

Ⓑ

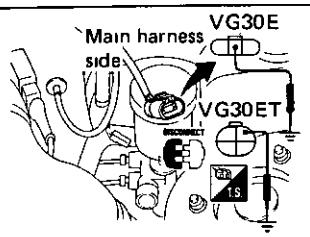

SEF332D

Check whether green and red inspection lamps on E C U flash simultaneously

O K | N G

Connect throttle valve switch harness connector

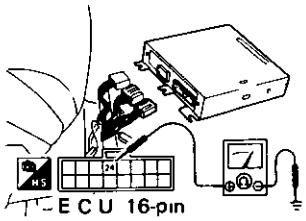
INSPECTION END



SEF249F

Check exhaust gas sensor harness
1) Turn off engine and disconnect battery ground cable
2) Disconnect 16-pin connector from E C U
3) Disconnect exhaust gas sensor harness connector and connect main harness side terminal for exhaust gas sensor to ground with a jumper wire
4) Check for continuity between terminal No 24 of 16-pin connector and body ground

Continuity exists	**O K**
Continuity does not exist	**N G**

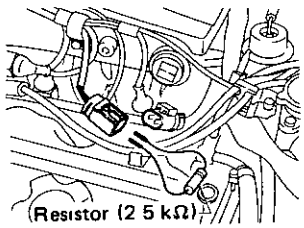


SEF959D

O K | N G

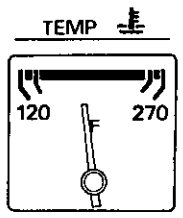
Repair or replace harness

Connect 16-pin connector to E C U



SEF711B

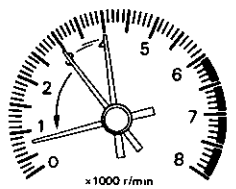
- Disconnect cylinder head temperature sensor harness connector
- Connect a resistor (2 5 kΩ) between terminals of cylinder head temperature sensor harness connector



SEF246F

Connect battery ground cable, start engine and warm it up until water temperature indicator points to middle of gauge

Race engine two or three times under no-load, then run engine at idle



SEF248F

Check CO%

Idle CO 0 2 - 4 0%

After checking CO%,
1) Disconnect the resistor from terminals of cylinder head temperature sensor harness connector
2) Connect cylinder head temperature sensor harness connector to cylinder head temperature sensor

O K

N G

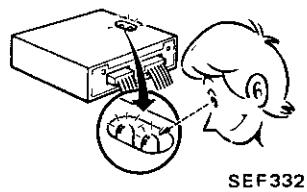
Replace exhaust gas sensor

Run engine at 2,000 rpm and make sure that green inspection lamp on E C U goes ON and OFF more than 5 times during 10 seconds

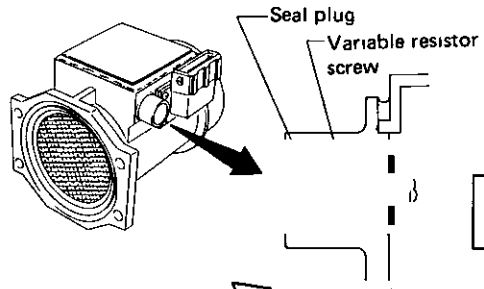
O K

N G

Replace E C U



SEF332D



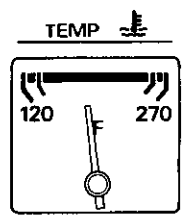
SEF273E

Connect exhaust gas sensor harness connector to exhaust gas sensor

Turn off engine and remove air flow meter from vehicle

Drill a hole in seal plug which seals variable resistor of air flow meter and remove seal plug

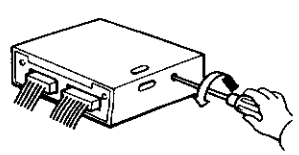
Install air flow meter body on vehicle



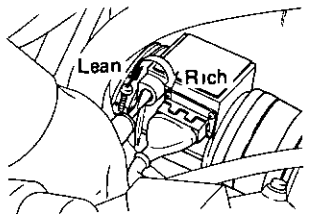
SEF246F

Start engine and warm it up until water temperature indicator points to middle of gauge

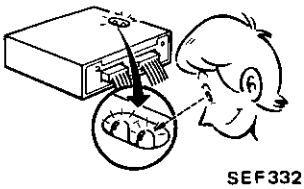
Set the diagnosis mode selector of E C U to Mode-II

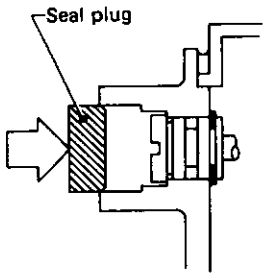


SEF957D



SEF649B


SEF332D



SEF713B

(G)

Adjust idle mixture ratio by turning variable resistor of air flow meter so that green and red inspection lamps on E C U flash simultaneously at 2,000 rpm under no-load

Adjustable

Not adjustable

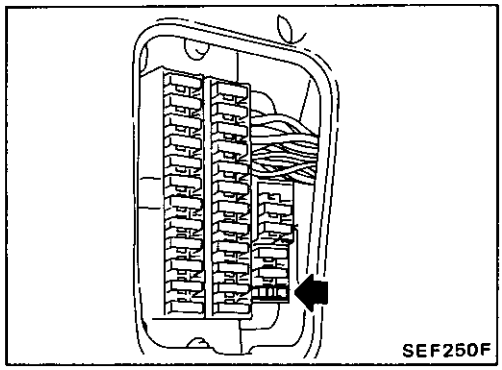
Replace air flow meter

Turn off engine and remove air flow meter from vehicle

Install new seal plug into variable resistor hole of air flow meter

Install air flow meter on vehicle

(B)


SEF250F

Releasing Fuel Pressure

WARNING:

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

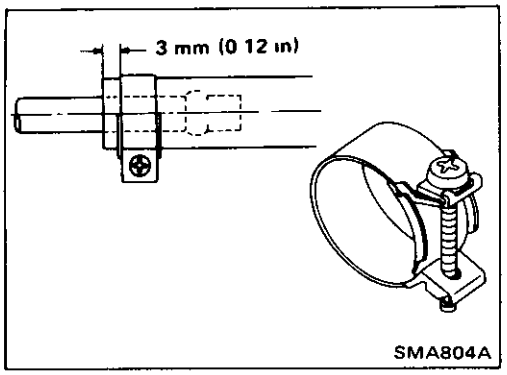
1. Remove fuse for fuel pump.

2 Start engine

3 After engine stalls, crank engine two or three times to make sure that pressure is released

4 Turn ignition switch off and install the fuse

Erase the memory (Code No. 22) of the self-diagnosis in E.C.C.S. control unit



SMA804A

Fuel Pressure Check

a. **When reconnecting fuel line, always use a new clamp.**

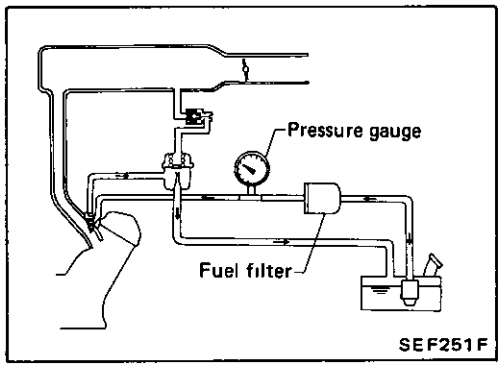
b. **Tighten the clamp so its end is 3 mm (0.12 in) from the hose end.**

c. **Make sure that the screw of the clamp does not contact with any adjacent parts.**

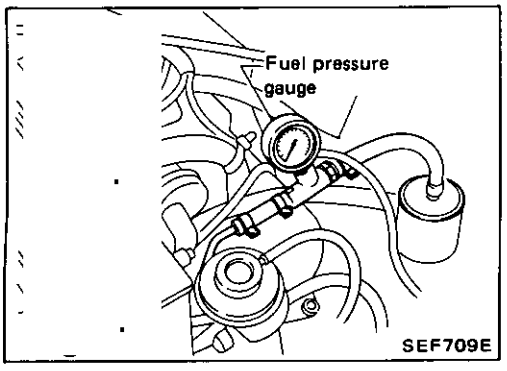
: Fuel hose clamps
1.0 - 1.5 N·m
(0.10 - 0.15 kg-m, 0.7 - 1.1 ft-lb)

d. **Disconnect pressure regulator control solenoid valve harness connector.**

e. **Use Pressure Gauge to check fuel pressure.**



SEF251F



SEF709E

1 Release fuel pressure to zero

2 Disconnect fuel hose between fuel filter and fuel tube (engine side).

3 Install pressure gauge between fuel filter and fuel tube

Fuel Pressure Check (Cont'd)

4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge

   At idling:

   Approximately 206 kPa
   (2 1 kg/cm², 30 psi)

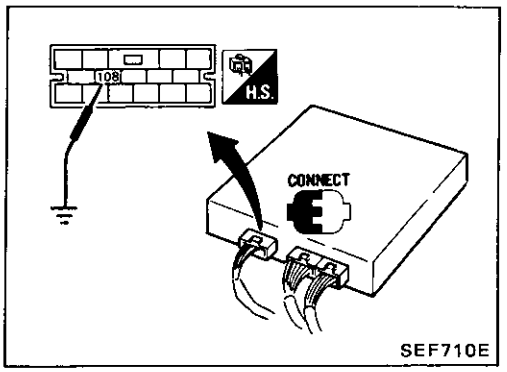
   The moment accelerator pedal is fully depressed:

   [VG30E]

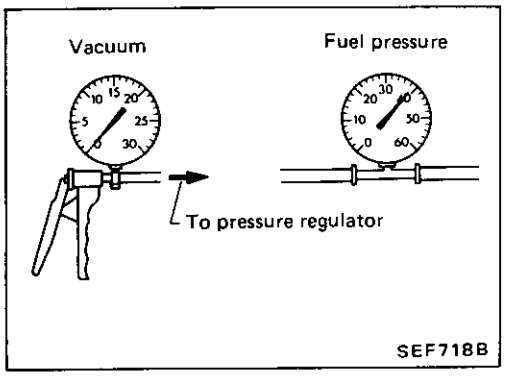
   Approximately 255 kPa
   (2.6 kg/cm², 37 psi)

   [VG30ET]

   Approximately 304 kPa
   (3.1 kg/cm², 44 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake collector
7. Plug intake collector with a rubber cap
8. Connect variable vacuum source to fuel pressure regulator



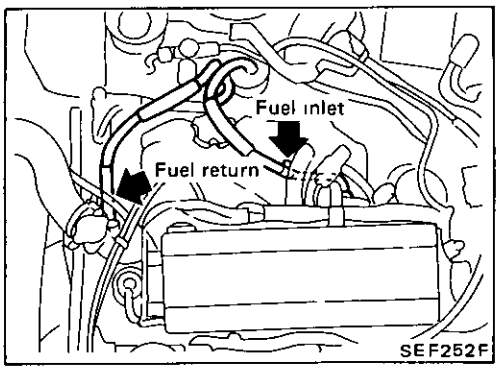
9. Jump No. (108) connector of E C U. to body ground.



10. Turn ignition switch to "ON" and read the indication of fuel pressure gauge as vacuum is changed

Vacuum kPa (mmHg, inHg)	Fuel pressure kPa (kg/cm², psi)
0 (0, 0)	248 1 - 255 0 (2 53 - 2 60, 36 0 - 37 0)
16 9 (127, 5 00)	227 5 - 241 3 (2 32 - 2 46, 33 0 - 35 0)
33 9 (254, 10 00)	213 8 - 220 7 (2 18 - 2 25, 31 0 - 32 0)
50 8 (381, 15 00)	200 1 - 206 9 (2 04 - 2 11, 29 0 - 30 0)
67 7 (508, 20 00)	179 5 - 193 2 (1 83 - 1 97, 26 0 - 28 0)

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

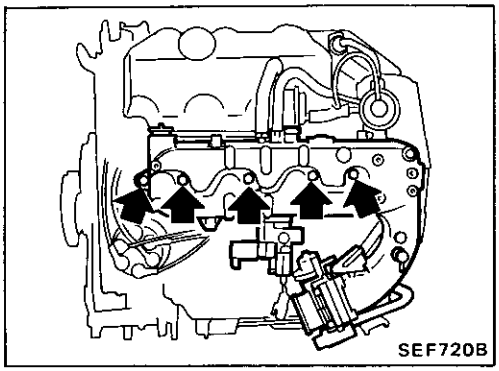


Injector Removal and Installation

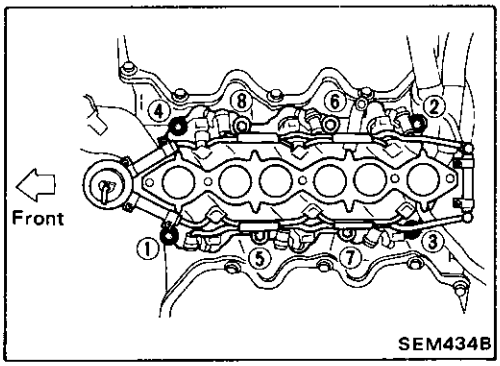
1 Release fuel pressure to zero
2 Disconnect the following from intake collector

- Air duct
- Accelerator wire
- Blow-by hoses
- Air regulator hose
- E G R. tube
- Harness clamps
- Harness connectors
- Intake collector cover
- Water hoses

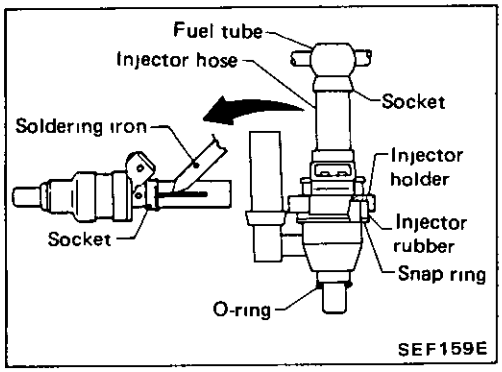
3 Disconnect fuel hoses



4 Remove intake collector.



5. Remove bolts securing fuel tube
6 Remove bolts securing injectors and remove injectors, fuel tubes and pressure regulator as an assembly.



7. Remove fuel hose
1) Heat sharp knife for 15 minutes. Cut into hose braided reinforcement from mark to socket end and fuel tube end

Do not allow sharp knife to cut all the way through the hose and touch injector tail piece.

2) Then pull rubber hose out with hand.

Never place injector in a vise when disconnecting rubber hose.

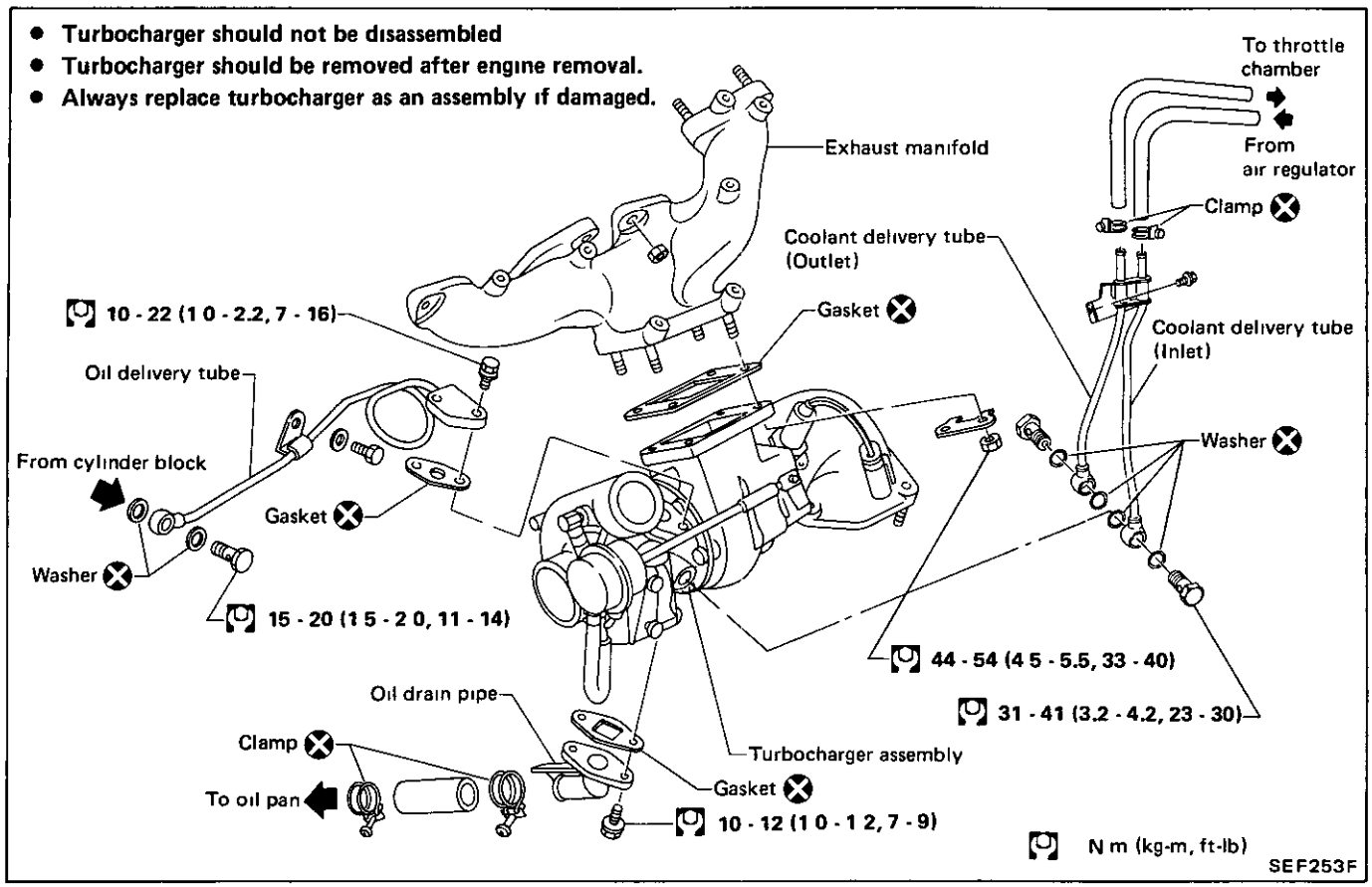
8. Install fuel hose as follows
1) Clean exterior of injector tail piece and fuel tube end.
2) Wet inside of new rubber hose with fuel.
3) Push end of rubber hose with hose sockets onto injector tail piece and fuel tube end by hand as far as they will go

Clamp is not necessary at the connections.

CAUTION:

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

Disassembly and Assembly



Inspection

Condition 1 Low engine power	
Probable cause	**Corrective action**
Air leak at the connection of compressor housing and suction hose/inlet tube, or inlet tube and intake manifold	Correct the connection
Exhaust gas leak at the connection of turbine housing and exhaust manifold, connecting tube or exhaust outlet	Correct the connection or replace gasket
By-pass valve is stuck open	Replace turbocharger assembly
Stuck or worn journal or bearing	
Broken shaft	
Sludge on back of tubine wheel	
Broken turbine wheel	

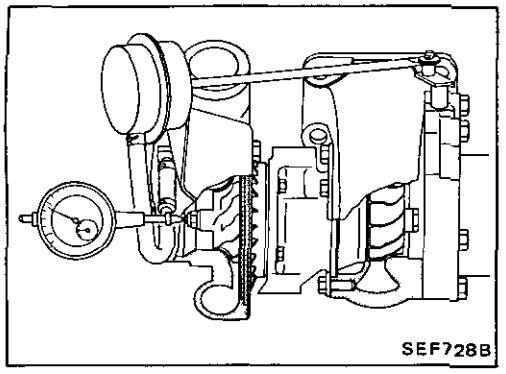
Inspection (Cont'd)

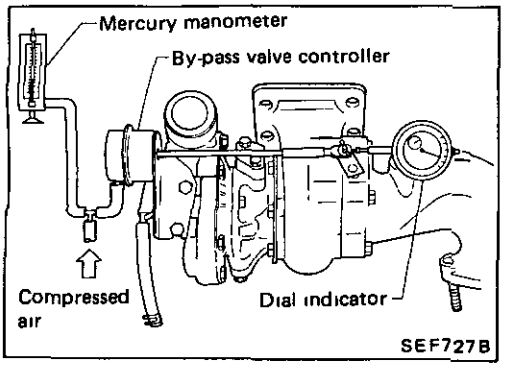
Condition 2 Excessively high engine power

Probable cause	Corrective action
Disconnected or cracked rubber hose on by-pass valve	Correct or replace rubber hose
By-pass valve is stuck closed.	Replace turbocharger assembly
Controller diaphragm is broken	

Condition 3 Excessively high oil consumption or exhaust shows pale blue smoke

Probable cause	Corrective action
Oil leak at the connection of lubricating oil passage	Correct the connection
Oil leak at oil seal of turbine	Replace turbocharger assembly
Oil leak at oil seal of compressor	
Worn journal or bearing	


SEF728B



SEF727B

1 Inspect turbine and compressor wheel as follows:
- Visually check for cracks, clogging, deformity or other damage.
- Revolve wheels to make sure that they turn freely without any abnormal noise or friction.
- Measure play in axial direction.

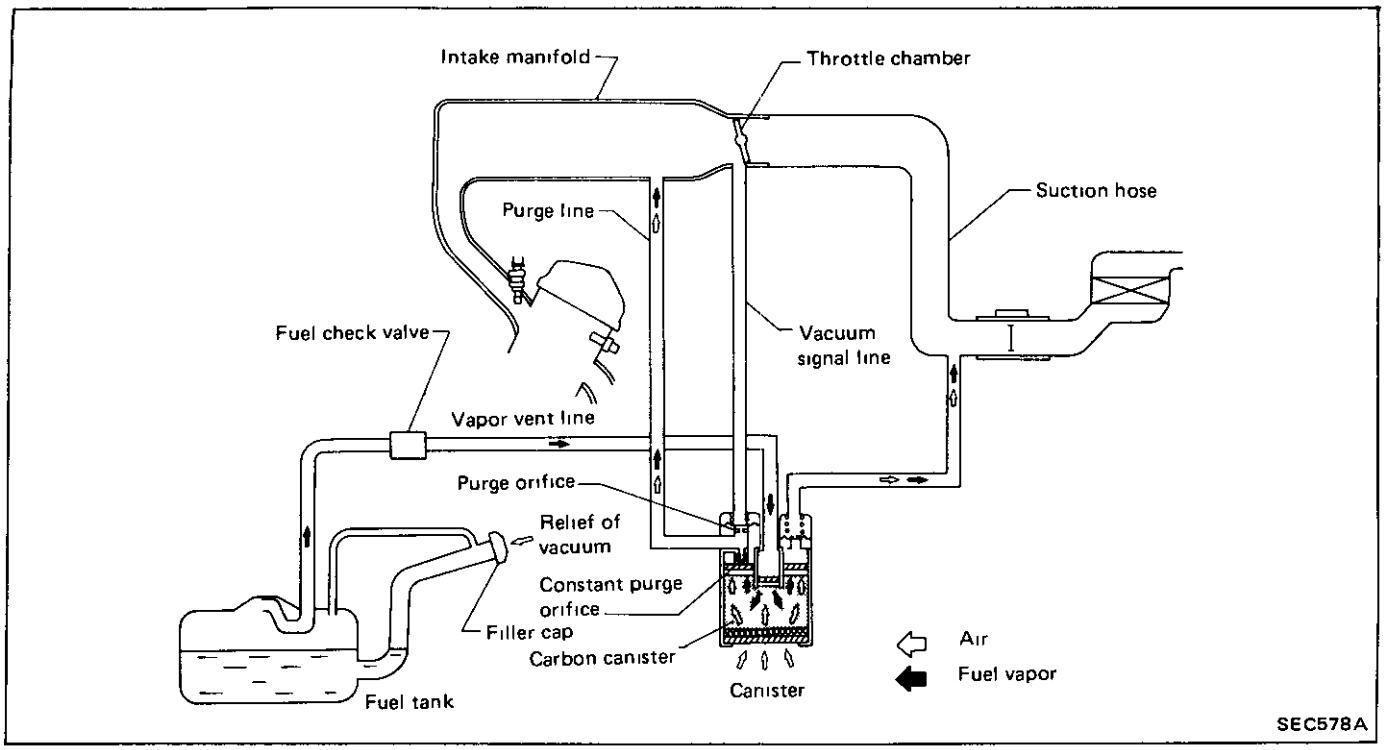
Play (axial direction):
0.013 - 0.091 mm (0.0005 - 0.0036 in)

2 Check operation of by-pass valve controller.
- Move by-pass valve to make sure that it is not sticking or scratched.
- Measure rod end play of the by-pass valve controller.

Do not apply more than 66.7 kPa (500 mmHg, 19.69 inHg) pressure to controller diaphragm.

By-pass valve controller stroke/pressure:
0.38 mm (0.0150 in)/51.3 - 56.7 kPa
(385 - 425 mmHg, 15.16 - 16.73 inHg)

Description

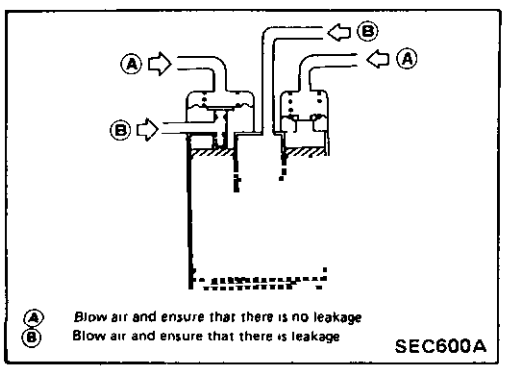


The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon and the vapor is stored there when the engine is not running

The canister retains the fuel vapor until the canister is purged by the air drawn through the bottom of the canister to the intake manifold when the engine is running When the engine runs at idle, the purge control valve is closed

Only a small amount of stored vapor flows into the intake manifold through the constant purge orifice As the engine speed increases, and the throttle vacuum rises higher, the purge control valve opens and the vapor is sucked into the intake manifold through both the main purge orifice and the constant purge orifice.



Inspection

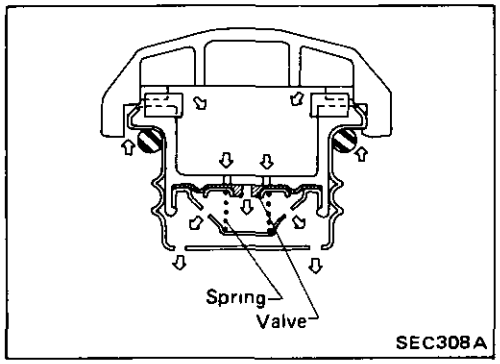
CARBON CANISTER

Check carbon canister as follows

Ⓐ Blow air and ensure that there is no leakage.

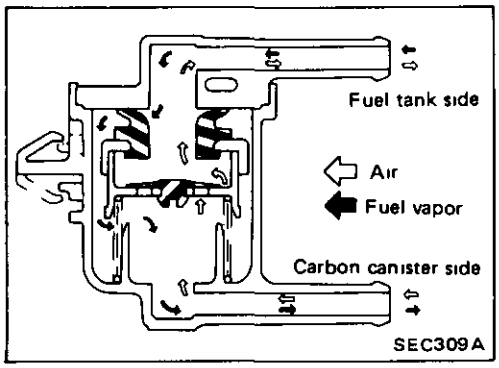
Ⓑ Blow air and ensure that there is leakage

Inspection (Cont'd)



FUEL TANK VACUUM RELIEF VALVE

1 Wipe clean valve housing
2 Inhale air through the cap A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition Note also that, by further inhaling air, the resistance should be disappeared with valve clicks
3 If valve is clogged, or if no resistance is felt, replace cap as an assembly

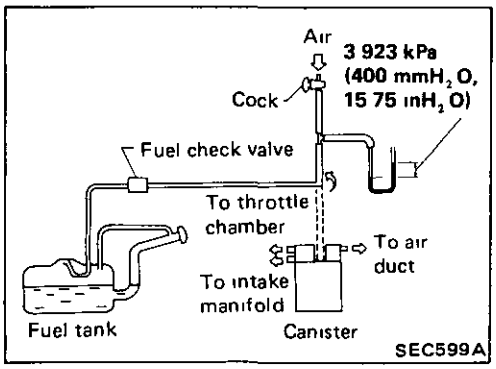


FUEL CHECK VALVE

1 Blow air through connector on fuel tank side
A considerable resistance should be felt and a portion of air flow be directed toward the canister
2 Blow air through connector on the canister side
Air flow should be smoothly directed toward fuel tank
3 If fuel check valve is suspected of not being properly functioning in steps 1 and 2 above, replace it

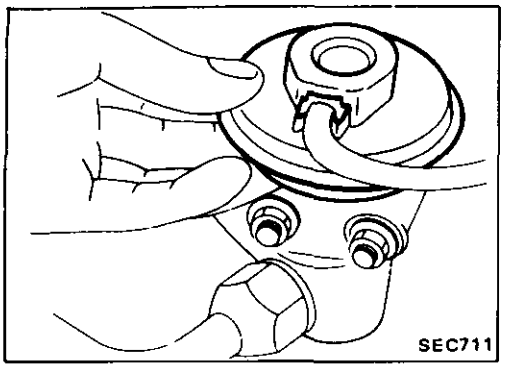
VAPOR VENT LINE

1 Check hoses and fuel tank filler cap
2 Disconnect the vapor vent line connecting carbon canister to fuel tank



3 Connect a 3-way connector, a manometer and a cock (or an equivalent 3-way charge cock) to the end of the vent line
4 Supply fresh air into the vapor vent line through the cock little by little until pressure becomes 3 923 kPa (400 mmH_2O, 15 75 inH_2O)
5 Shut the cock completely and leave it unattended
6 After 2 5 minutes, measure the height of the liquid in the manometer
7 Variation in height should remain at 0 245 kPa (25 mmH_2O, 0 98 inH_2O)
8 When filler cap does not close completely, the height should drop to zero in a short time
9 If the height does not drop to zero in a short time when filler cap is removed, the cause is a blocked hose or a clogged fuel check valve

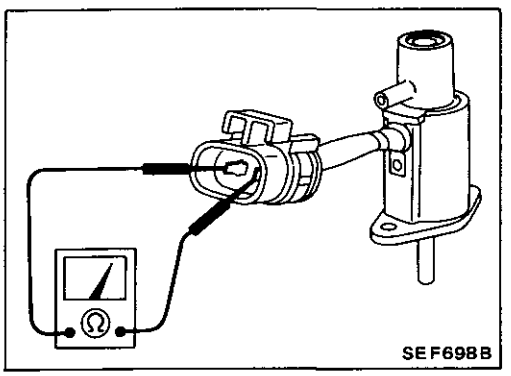
In case the vent line is blocked, the fuel tank is not vented properly causing insufficient deliver of fuel to engine, or vapor lock It must, therefore, be repaired.



ENTIRE SYSTEM

Ensure that E G R. system is functioning properly by placing your finger on E.G R control valve diaphragm.
Make sure that E.G R control valve operates as follows.

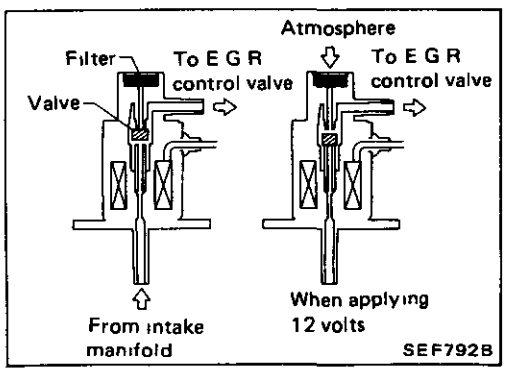
Conditions	E G R control solenoid	E G R system
① Engine starting ② Throttle valve switch "ON" ③ Low engine temperature ④ High engine temperature ⑤ High engine speed ⑥ With heavy load	ON	Does not operate
Except above	OFF	Operates



E.G.R. CONTROL SOLENOID VALVE

1 Check the solenoid valve for electric continuity, after disconnecting the harness connector

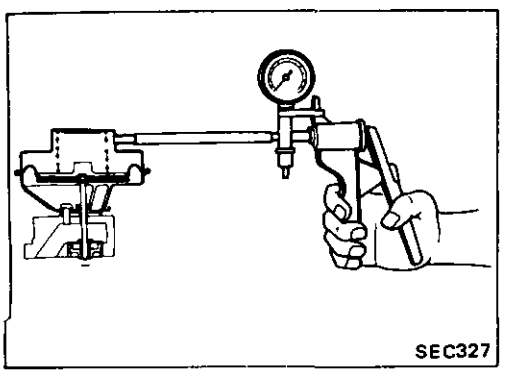
Resistance: 30 - 40Ω



2. Check the solenoid valve for normal operation as shown.

CAUTION:

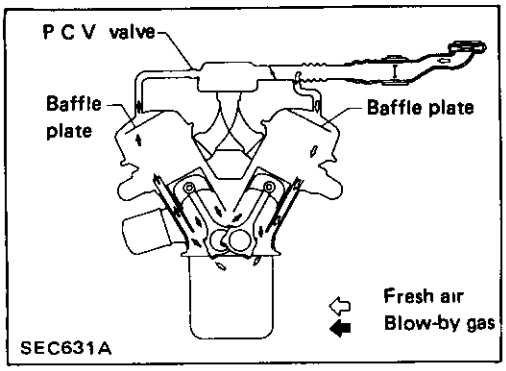
- **Be sure to connect ⊕ terminal of battery with white harness of solenoid valve.**
- **Perform E.G.R. circuit test. (See page EF & EC-82.)**
- **Perform E.C.U. input/output test. (See page EF & EC-94.)**

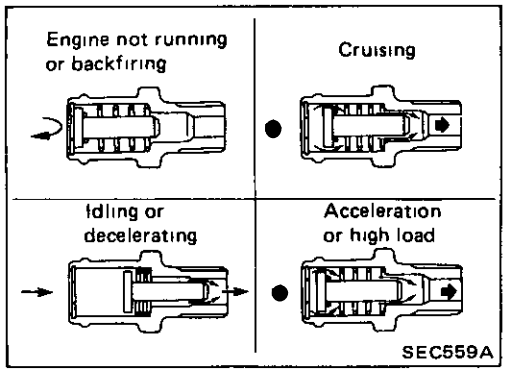


E.G.R. CONTROL VALVE

1. Supply the E.G.R control valve with vacuum using a handy vacuum pump.
2 Place a finger on the diaphragm of the valve, and make sure that the diaphragm lifts up and down in response to the vacuum leading to the valve.

Full open of E.G.R. valve:
Over −16.0 kPa
(−120 mmHg, −4.72 inHg)



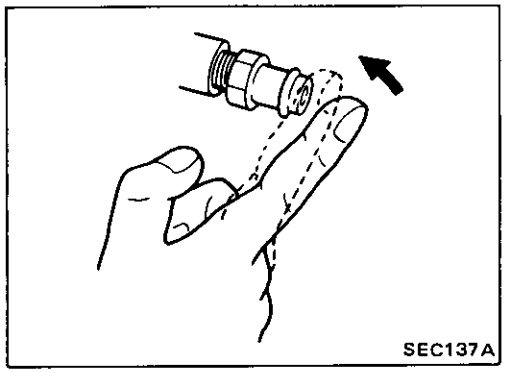


Description

The fuel vapor from the sealed fuel tank is led into the canister which contains activated carbon The vapor is stored there when the engine is not running

The canister retains the fuel vapor until the canister is purged by the air drawn through the purge line to the intake manifold when the engine is running When the engine is at idle, the purge control valve is closed.

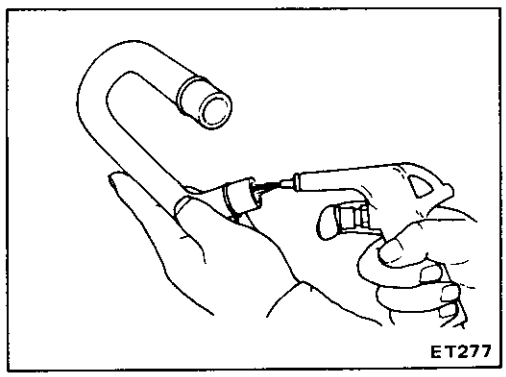
Only a small amount of purged air flows into the intake manifold through the constant purge orifice As the engine speed increases, and the throttle vacuum rises higher the purge control valve opens and the vapor is drawn into the intake manifold through both the purge orifice and the constant purge orifice



Inspection

P.C.V. VALVE

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



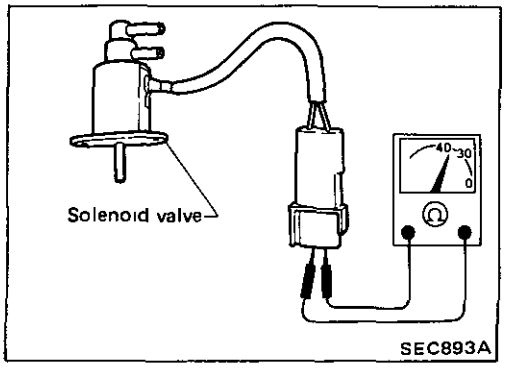
VENTILATION HOSE

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

VISUAL CHECK

Check the hoses and tubes for loosening, flatting damage or faulty connections, and each part for proper installation

- Replace, if necessary

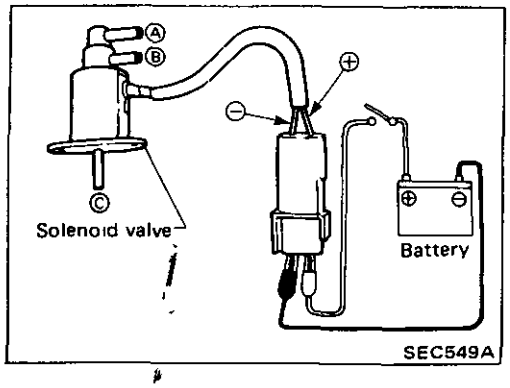


A I.V CONTROL SOLENOID

Subject the solenoid valve to independent inspection, after disconnecting the harness connector and all the vacuum hoses

1) Check it for electric continuity

Resistance Approximately 40Ω

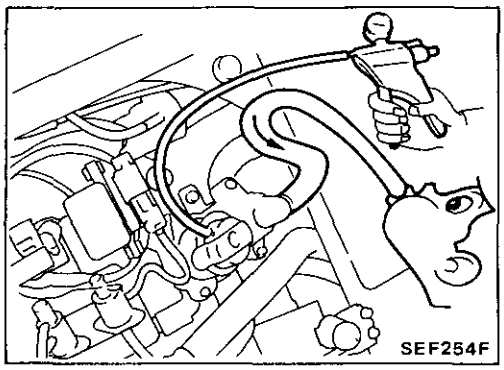


2) Check the solenoid valve for normal operation Supply it with battery voltage, and check whether there is continuity between ports A, B and C

Item \ Solenoid valve	OFF	ON
Continuity	B-C	A-B

CAUTION

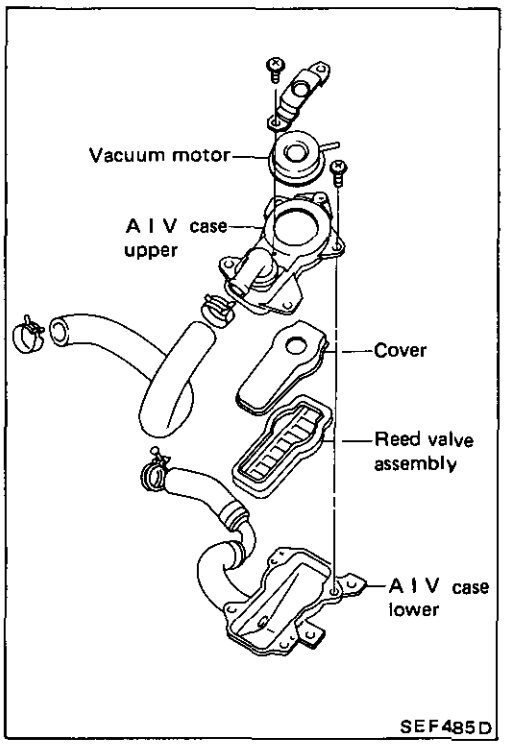
- **Be sure to connect ⊕ terminal of battery with white harness of solenoid valve.**
- **Perform A.I.V. circuit test. (See page EF & EC-80.)**
- **Perform E.C.U. input/output test. (See page EF & EC-94.)**



A.I.V. UNIT

1 Disconnect vacuum hose leading to vacuum motor and set a handy vacuum pump there
2 Disconnect hose between A.I.V. unit and air cleaner
3 Subject A.I.V. unit to inspection in the following way
Connect suitable hose to A.I V. unit and try to blow A I V unit through the hose, when vacuum is lead to vacuum motor and when no vacuum exists

	Vacuum	No vacuum	Parts condition
Can you blow?	Yes	No	O K
	No	Yes	N G



4 If the inspection shows N G , disassemble the A I V case and check such parts as the reed valve, the vacuum motor, and the connecting hoses

General Specifications

Fuel pump	
Cut off discharge pressure kPa (kg/cm², psi)	422 - 490 (4 3 - 5 0, 61 - 71)
Pressure regulator	
Regulated pressure kPa (kg/cm², psi)	250 (2 55, 36 3)
Air regulator	
Air flow amount [at 20°C (68°F)] m³ (cu ft)/hr	14 5 (512)

Inspection and Adjustment

Item	
Fuel pressure	
At idle kPa (kg/cm², psi)	Approximately 206 (2 1, 30)
The moment accelerator pedal is fully depressed kPa (kg/cm², psi)	
VG30E	Approximately 255 (2 6, 37)
VG30ET	Approximately 304 (3 1, 44)
Air flow meter	
Voltage between terminals B and D	2 - 4V
Cylinder head temperature sensor and fuel temperature sensor	
Thermistor resistance	
at 20°C (68°F)	2 3 - 2 7 kΩ
at 50°C (122°F)	0 77 - 0 87Ω
at 80°C (176°F)	0 30 - 0 33Ω
Throttle valve switch	
Engine speed when idle switch is turned from "OFF" to "ON"	Idle speed + 250 rpm allowance ±150 rpm

Tightening Torque

Unit	N m	kg-m	ft-lb
Throttle chamber securing bolt	18 - 22	1 8 - 2 2	13 - 16
Intake collector cover bolt	6 - 8	0 6 - 0 8	4 3 - 5 8
Intake collector bolt	18 - 22	1 8 - 2 2	13 - 16
Cylinder head temperature sensor	12 - 16	1 2 - 1 6	9 - 12
Exhaust gas sensor			
(VG30E)	40 - 50	4 1 - 5 1	30 - 37
(VG30ET)	18 - 24	1 8 - 2 4	13 - 17
E G R control valve	18 - 23	1 8 - 2 3	13 - 17
E G R tube	34 - 44	3 5 - 4 5	25 - 33
Fuel hose clamp	1 0 - 1 5	0 10 - 0 15	0 7 - 1 1

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