ENGINE FUEL & EMISSION CONTROL SYSTEM

SECTION EF & EC

EF

EC

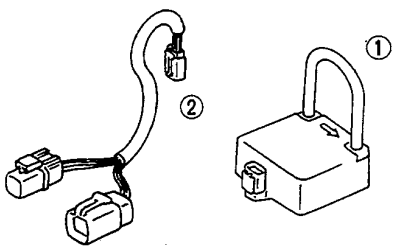
CONTENTS

Contents (Cont'd)

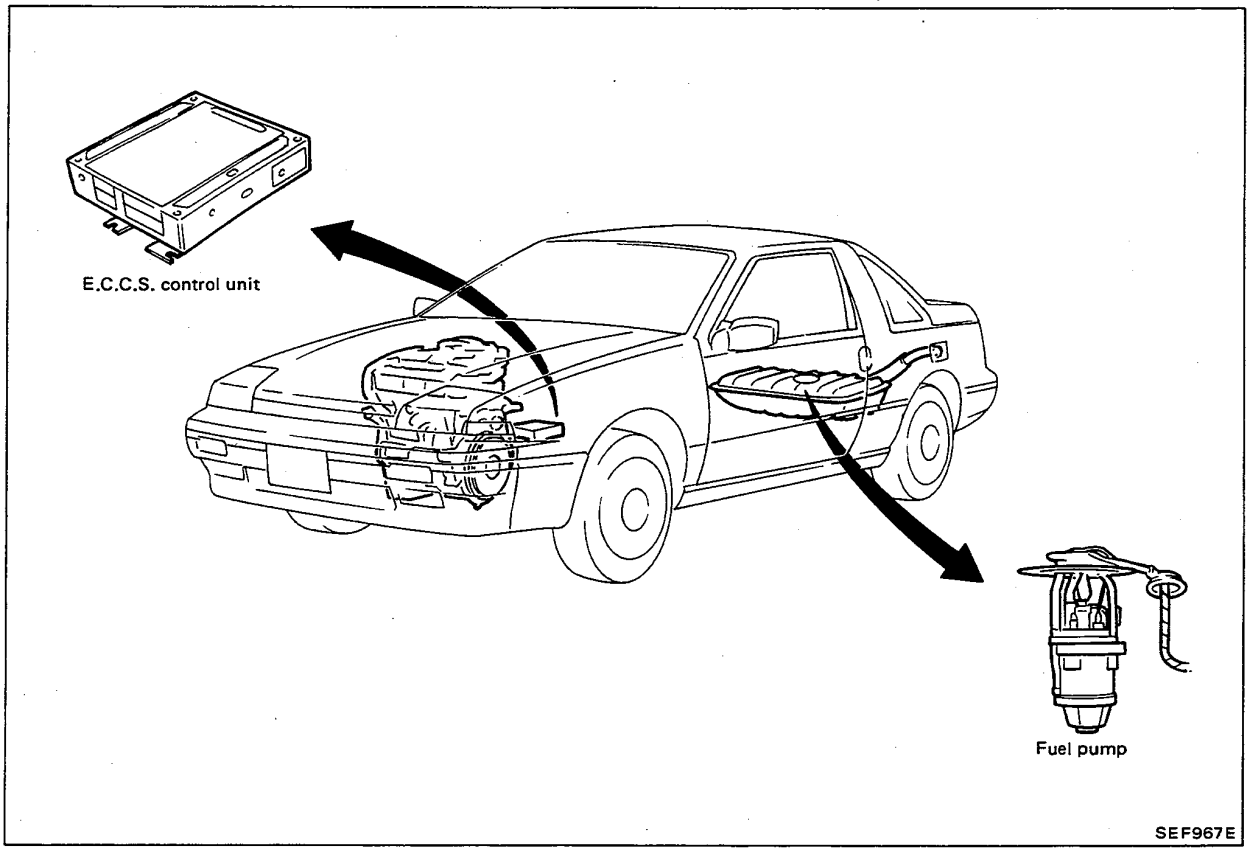
When you read wiring diagrams:

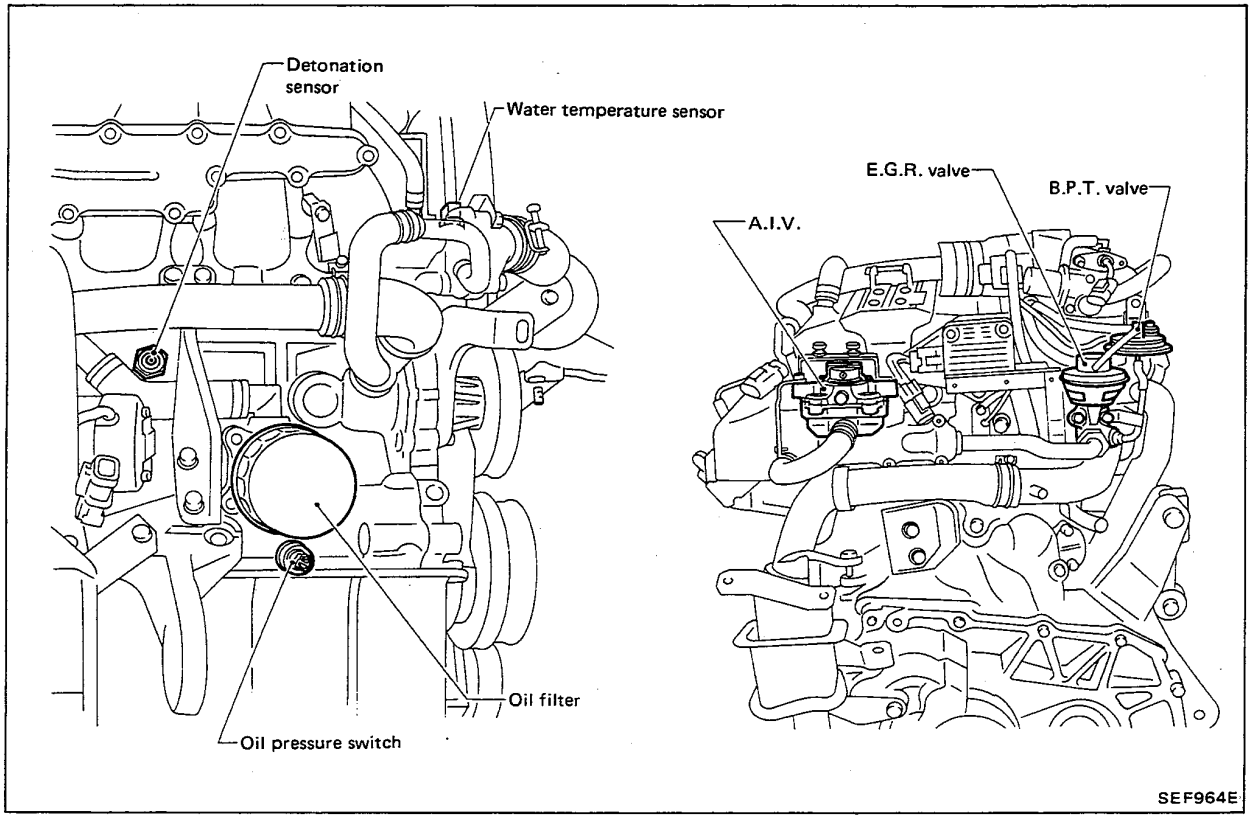
- **Read GI section, "HOW TO READ WIRING DIAGRAMS".**
- **See EL section, "POWER SUPPLY ROUTING" for power distribution circuit.**

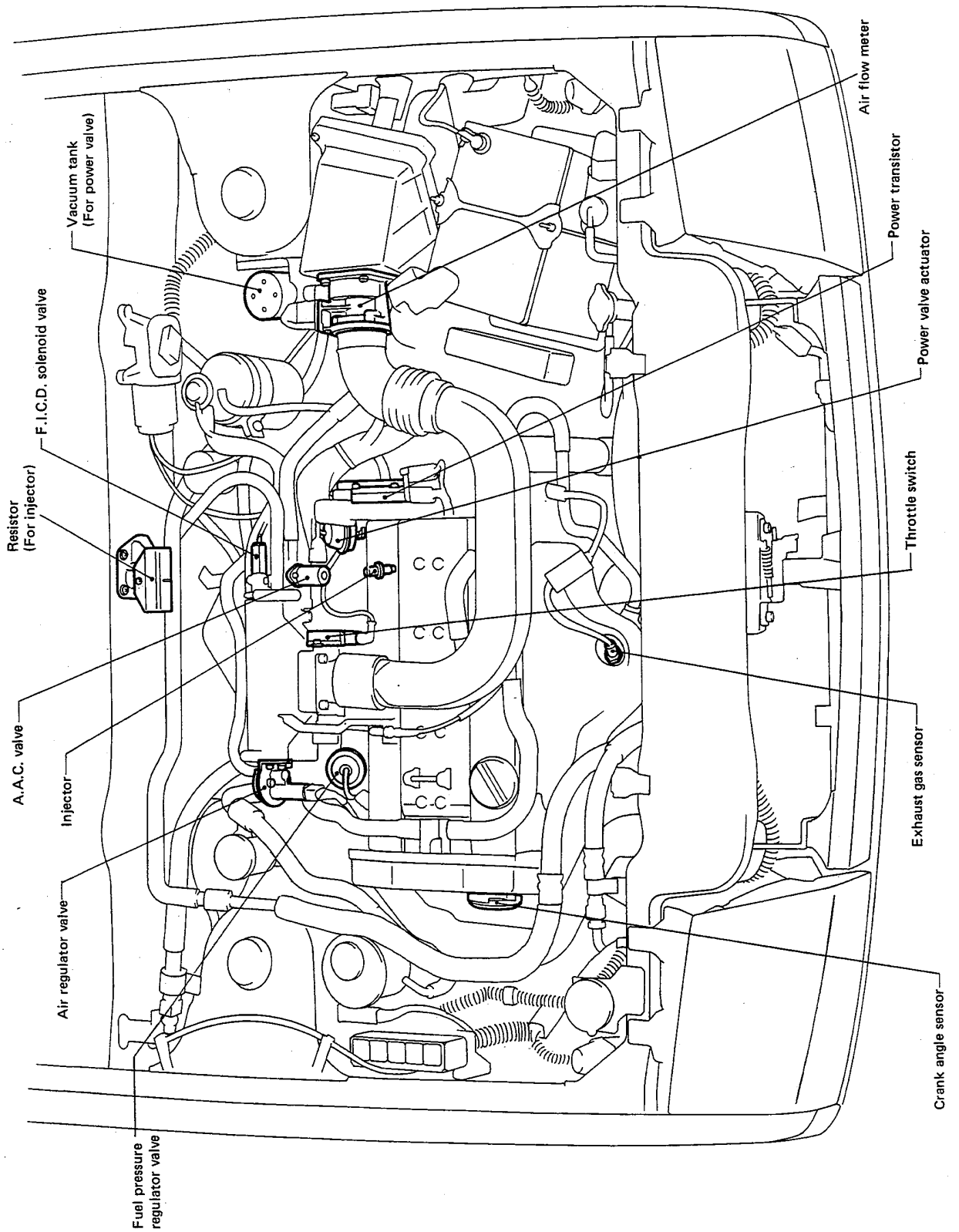
SPECIAL SERVICE TOOL

Tool number Tool name	Description	Engine Application CA
KV109D10S0 Ignition timing adapter coil set ① KV109D0010 Ignition timing adapter coil ② KV109D0020 Adapter harness	Measuring ignition timing 	X

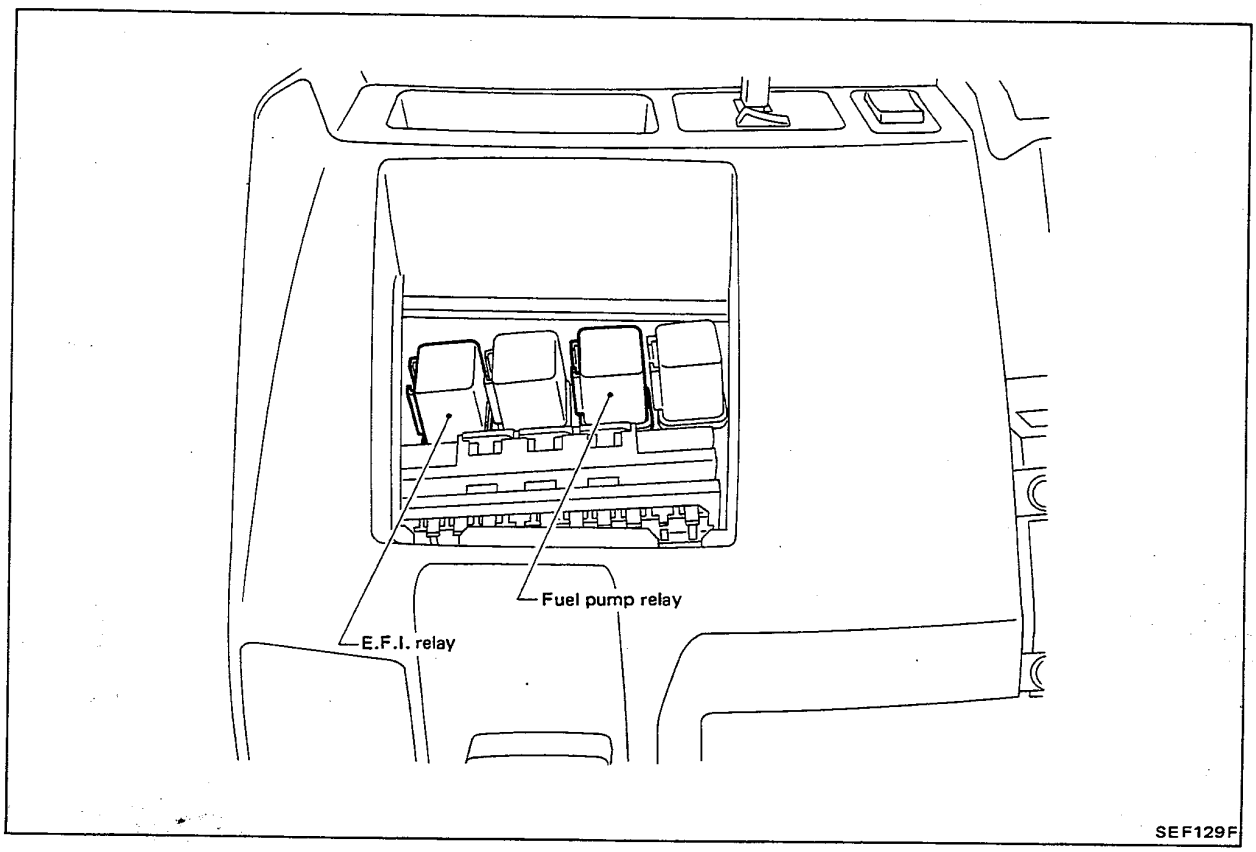
E.C.C.S. COMPONENT PARTS LOCATION

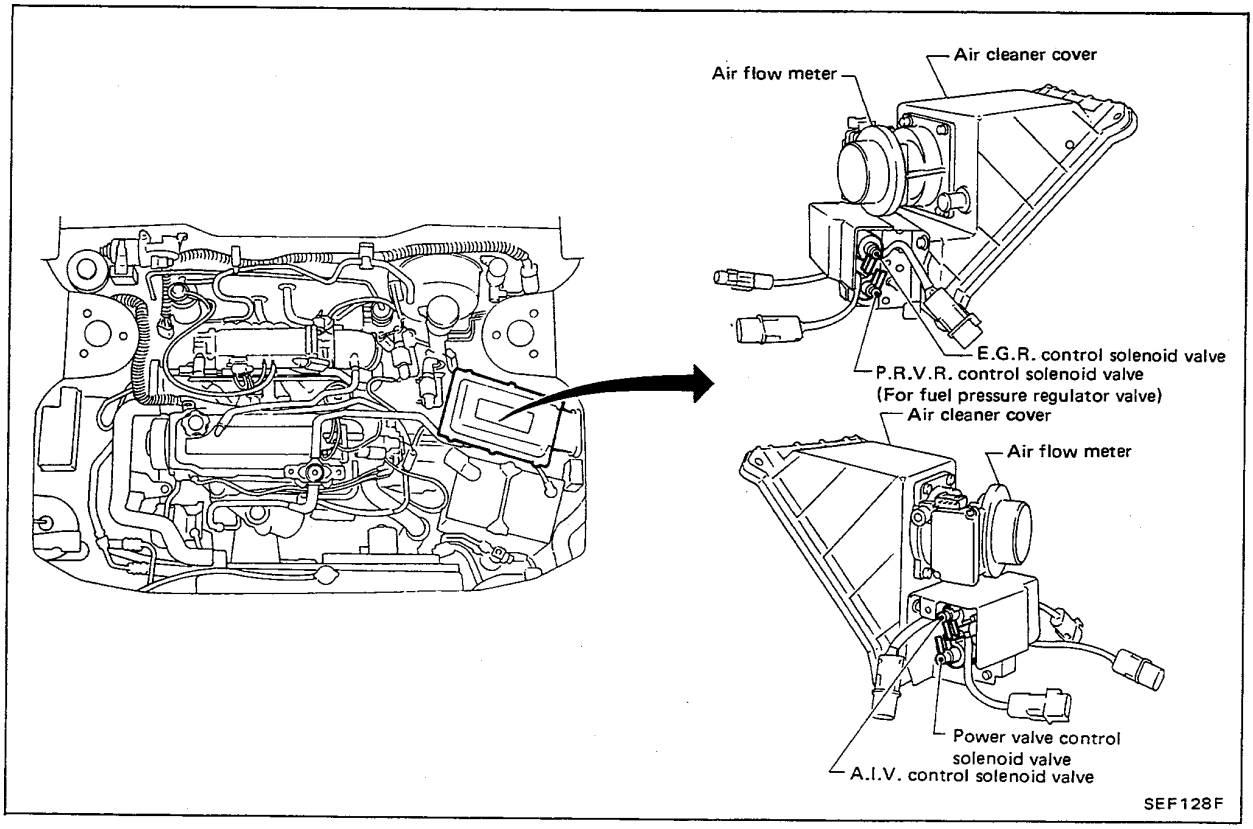




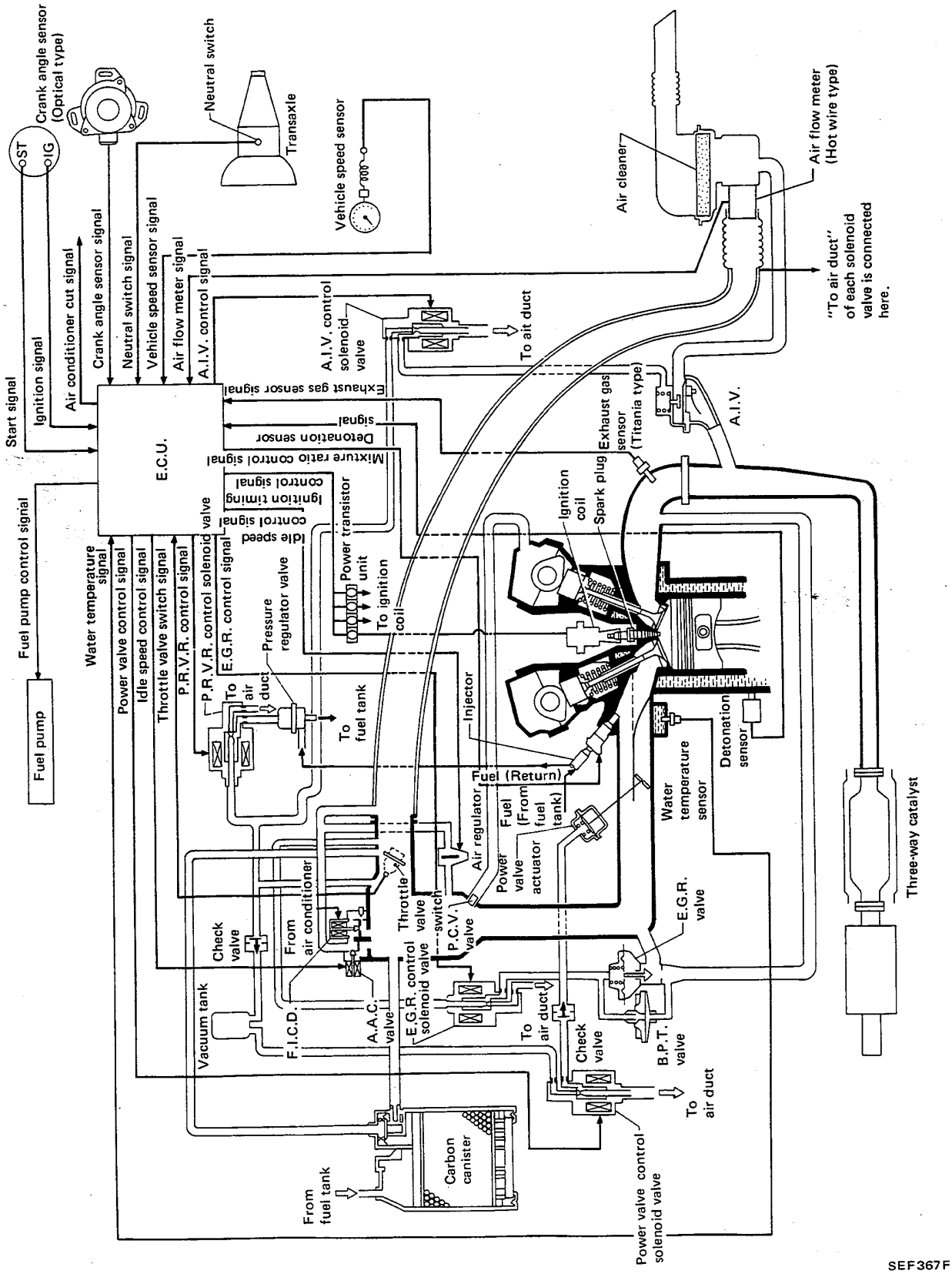

Air flow meter
Vacuum tank (For power valve)
Power transistor
F.I.C.D. solenoid valve
Power valve actuator
Resistor (For injector)
Throttle switch
A.A.C. valve
Injector
Exhaust gas sensor
Air regulator valve
Crank angle sensor
Fuel pressure regulator valve

SEF368F


Fuel pump relay
E.F.I. relay
SEF129F

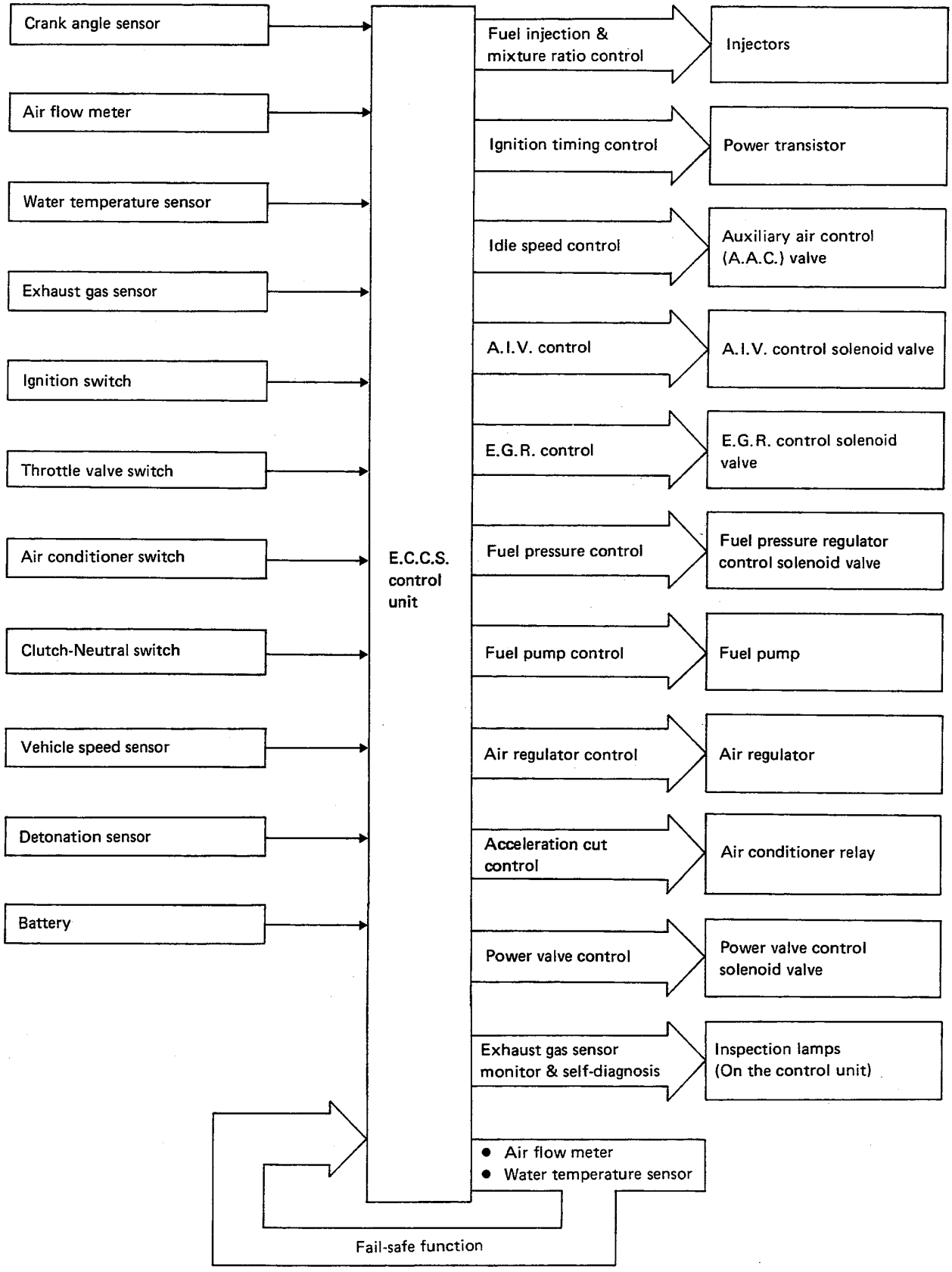

Air cleaner cover
Air flow meter
E.G.R. control solenoid valve
P.R.V.R. control solenoid valve
(For fuel pressure regulator valve)
Air cleaner cover
Air flow meter
Power valve control
solenoid valve
A.I.V. control solenoid valve
SEF128F

E.C.C.S. DIAGRAM

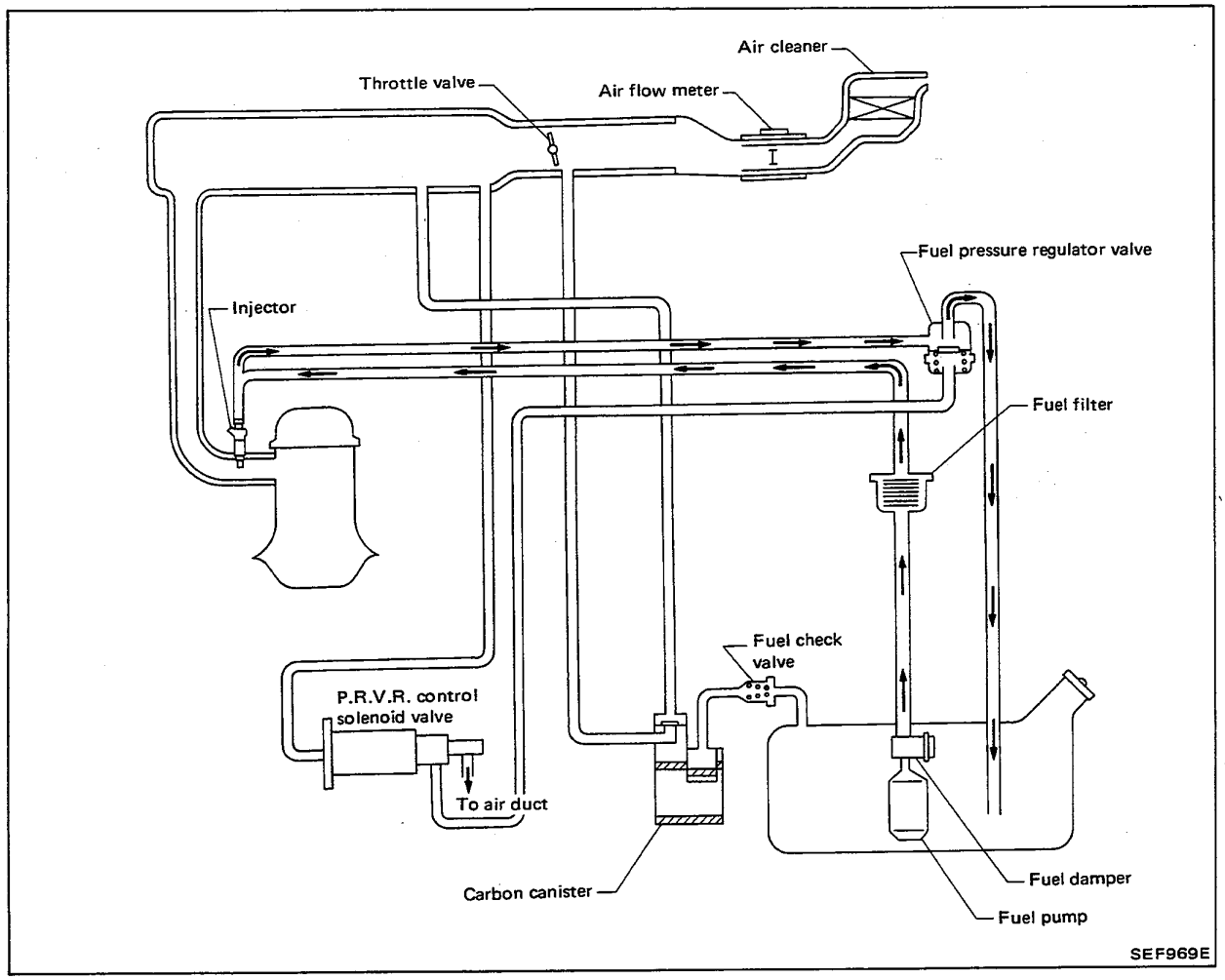


SEF367F

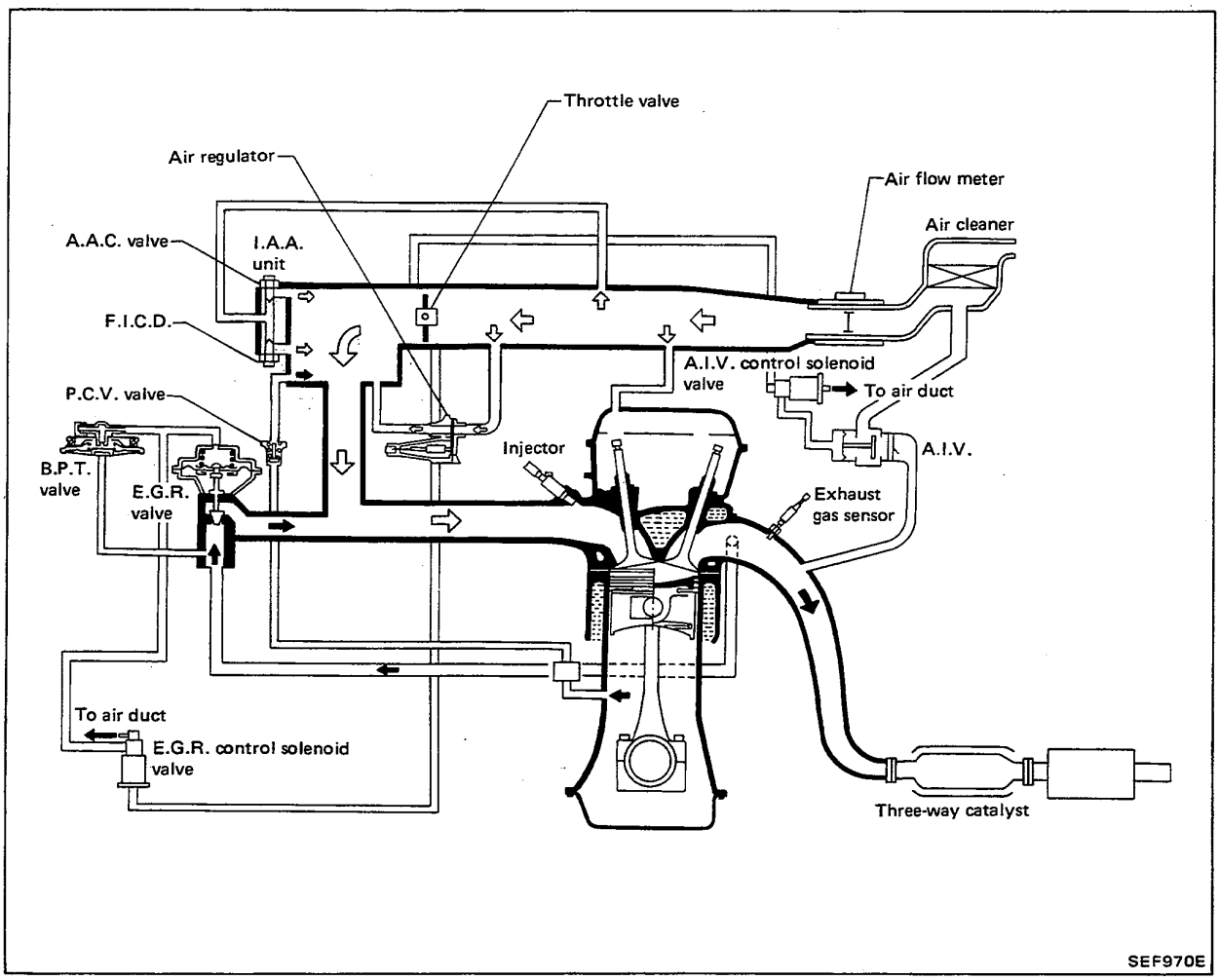
E.C.C.S. CHART


Crank angle sensor
Air flow meter
Water temperature sensor
Exhaust gas sensor
Ignition switch
Throttle valve switch
Air conditioner switch
Clutch-Neutral switch
Vehicle speed sensor
Detonation sensor
Battery
E.C.C.S. control unit
Fuel injection & mixture ratio control
Injectors
Ignition timing control
Power transistor
Idle speed control
Auxiliary air control (A.A.C.) valve
A.I.V. control
A.I.V. control solenoid valve
E.G.R. control
E.G.R. control solenoid valve
Fuel pressure control
Fuel pressure regulator control solenoid valve
Fuel pump control
Fuel pump
Air regulator control
Air regulator
Acceleration cut control
Air conditioner relay
Power valve control
Power valve control solenoid valve
Exhaust gas sensor monitor & self-diagnosis
Inspection lamps (On the control unit)
• Air flow meter
• Water temperature sensor
Fail-safe function

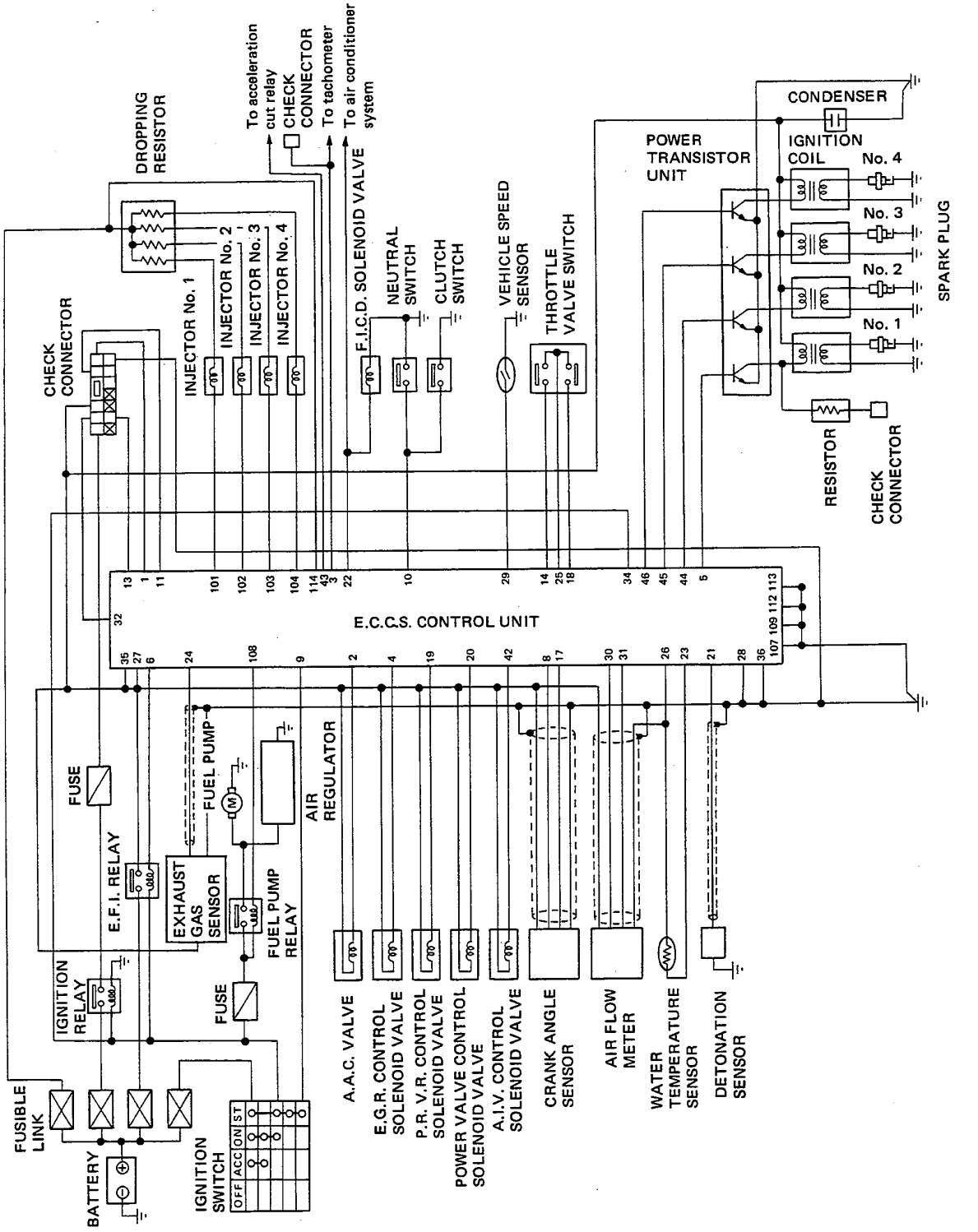
FUEL FLOW SYSTEM DESCRIPTION



AIR FLOW SYSTEM DESCRIPTION

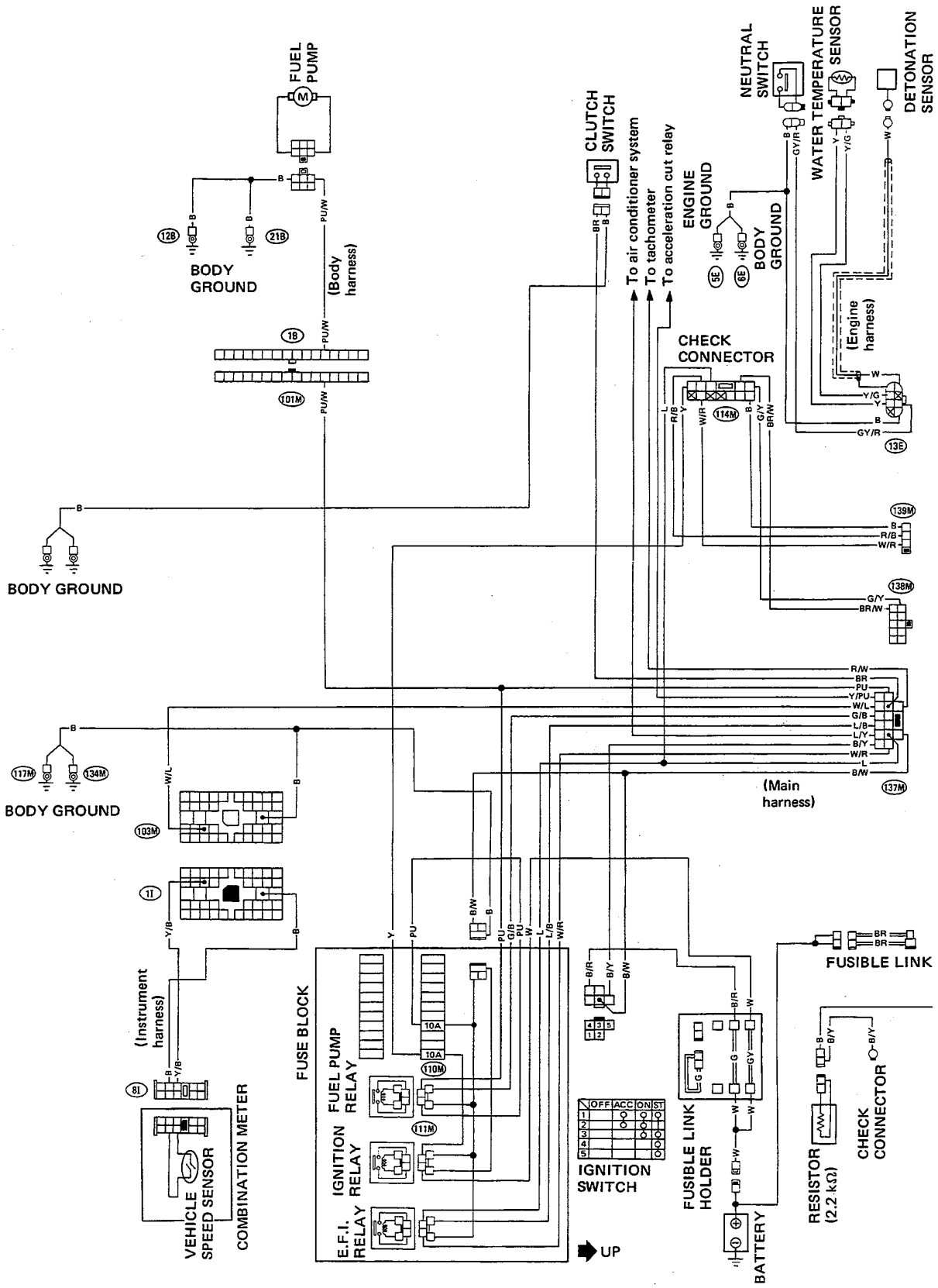


E.C.C.S. CIRCUIT DIAGRAM

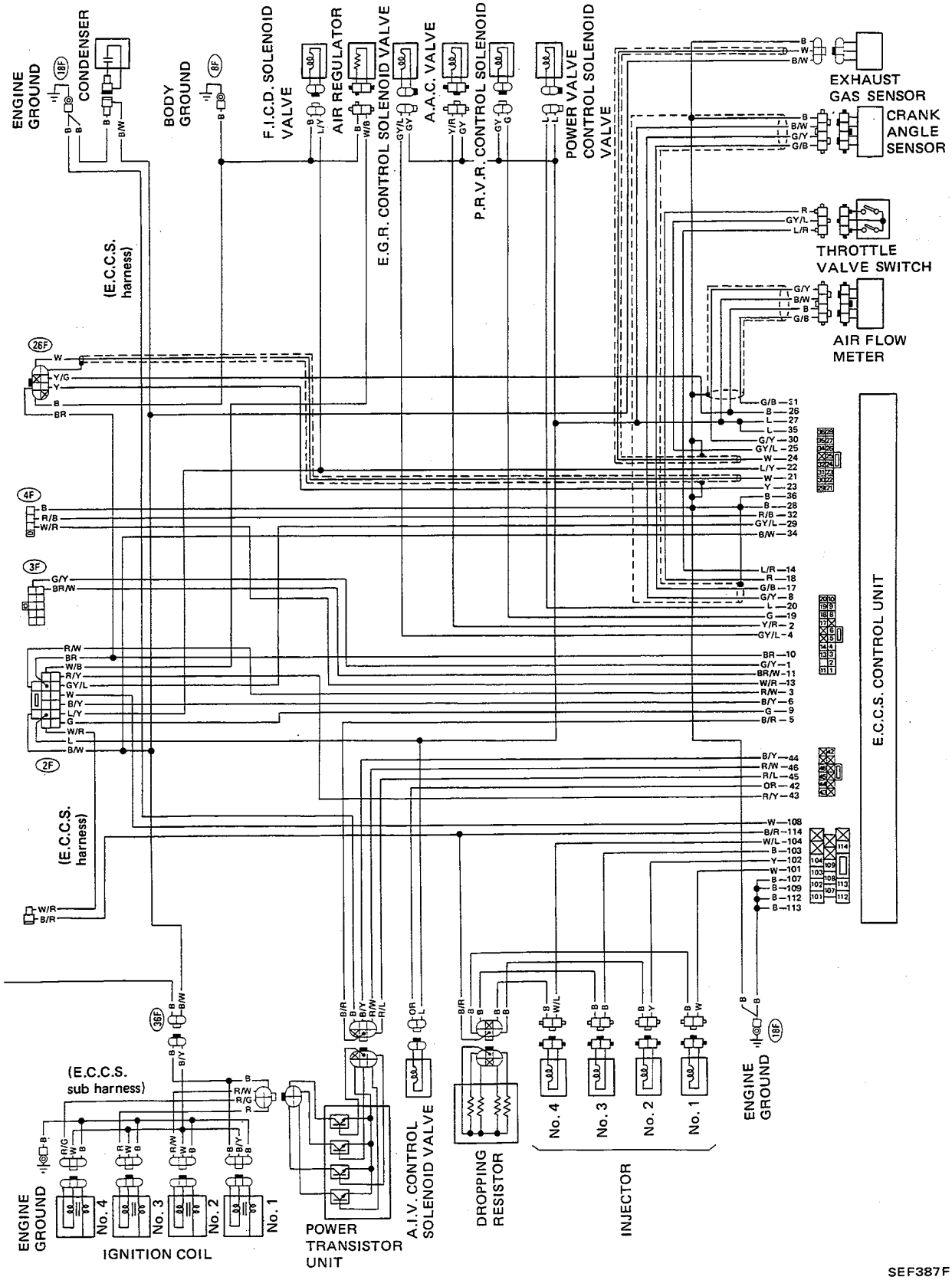


SEF386F

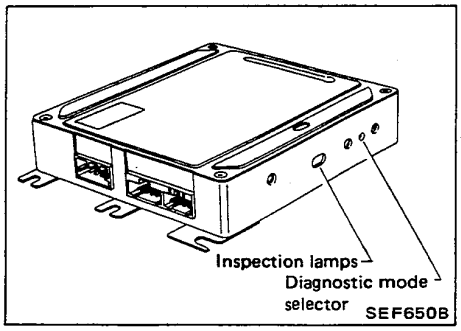
E.C.C.S. WIRING DIAGRAM



E.C.C.S. WIRING DIAGRAM



SEF387F

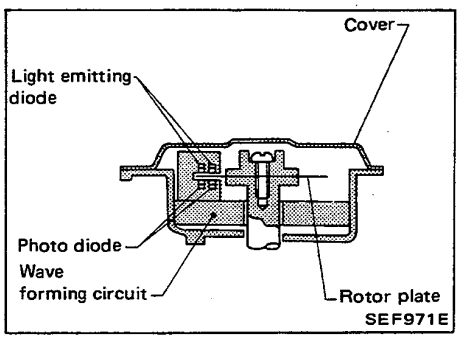


Components

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

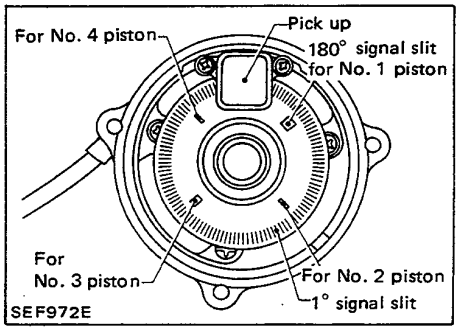
The E.C.U. consists of a microcomputer, inspection lamps and a diagnostic mode selector for signal input and output, and for power supply. The unit has control of the following functions.

- Injected fuel amount
- Mixture ratio feedback
- Ignition timing
- Idle speed
- E.G.R. operation
- A.I.V. operation
- Fuel pressure regulator operation
- Fuel pump operation
- Air regulator operation
- Power valve control
- Acceleration cut control
- Self-diagnosis



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.

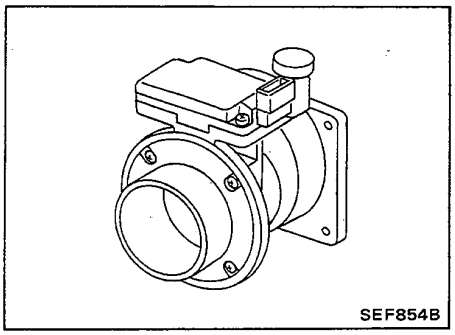


The crank angle sensor has a rotor plate and a wave forming circuit. The rotor plate has 360 slits for 1° signal (crank angle signal) and 4 slits for 180° signal (engine speed signal). Light Emitting Diodes (L.E.D.) and Photo Diodes are built in the wave forming circuit.

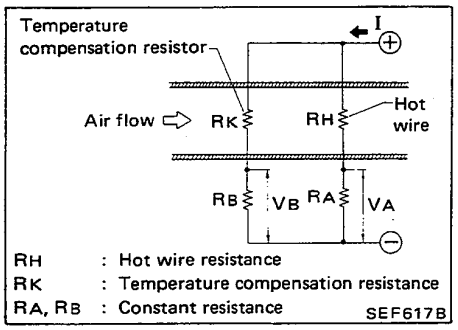
When the rotor plate passes the space between the L.E.D. and the Photo Diode, the slits of the rotor plate continually cut the light which is sent to the photo diode from the L.E.D. This causes generating rough-shaped pulses. They are then converted into on-off pulses by the wave forming circuit, which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

Components (Cont'd)

AIR FLOW METER

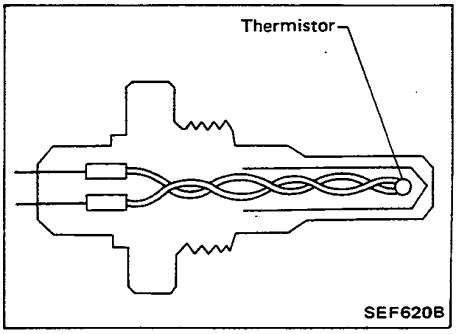

SEF854B

The air flow meter measures the mass flowrate 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 flowrate 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 flowrate 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.

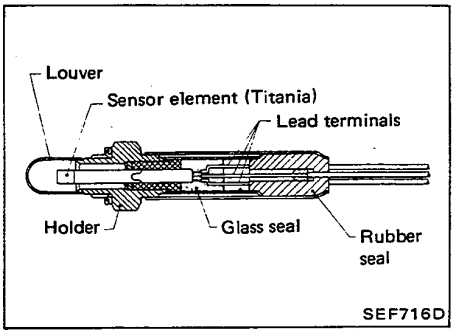
WATER TEMPERATURE SENSOR



The water temperature sensor, built into the thermostat housing, monitors changes in coolant 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.

EXHAUST GAS SENSOR (Titania type)

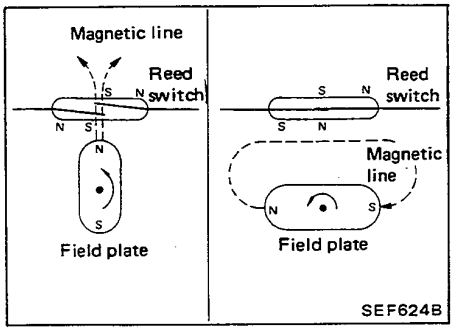


The exhaust gas sensor, which is placed in the exhaust tube, monitors the amount of oxygen in the exhaust gas.

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.

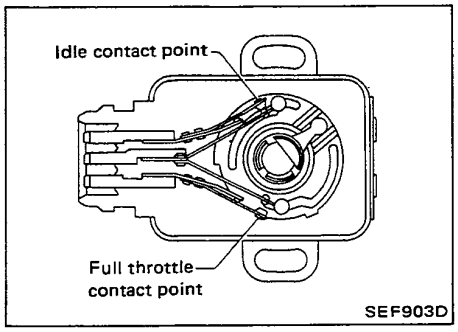
VEHICLE SPEED SENSOR



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

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

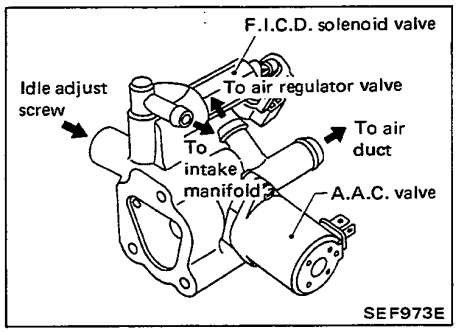
Components (Cont'd)



THROTTLE VALVE SWITCH

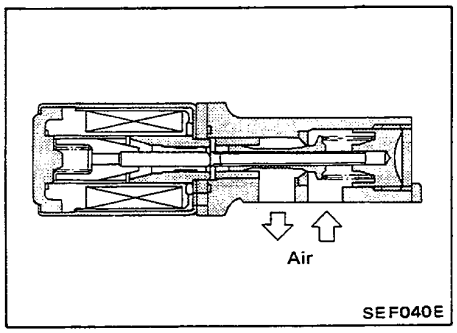
The throttle valve switch is attached to the throttle chamber and actuates in response to accelerator pedal movement.

This switch has idle contact and full throttle contact. The idle contact closes when the throttle valve is positioned at idle and opens when it is at any other position. The full throttle contact closes when the throttle valve is positioned at full throttle and opens when it is at any other position.



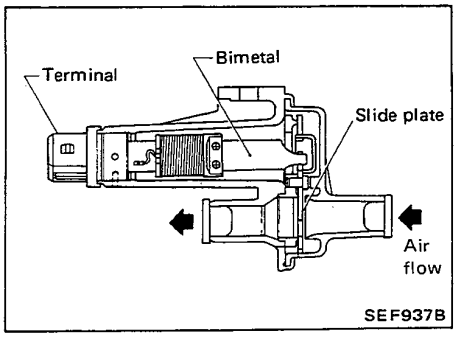
IDLE AIR ADJUSTING (I.A.A.) UNIT

The I.A.A. unit is made up of the A.A.C. valve, F.I.C.D. solenoid valve and idle adjust screw. It receives the signal from the E.C.U. and controls the idle speed at the preset value.



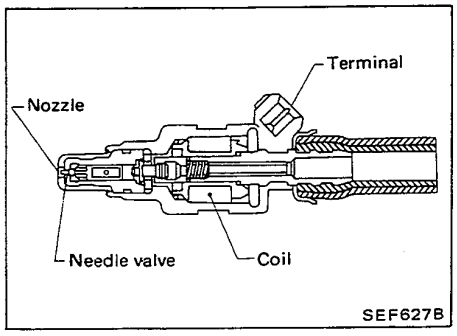
AUXILIARY AIR CONTROL (A.A.C.) VALVE

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



AIR REGULATOR

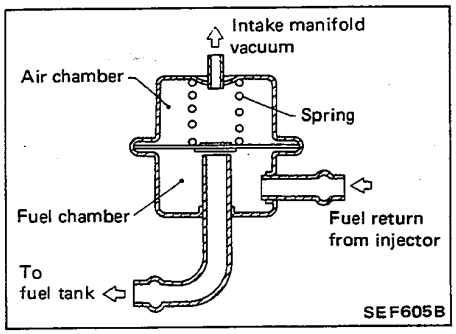
Air regulator provides an air by-pass when the engine is cold to create a fast idle during warm-up. A bimetal, heater and rotary shutter are built into the air regulator. When the bimetal temperature is low, the air by-pass port is open. As the engine starts and electric current flows through a heater, 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.



FUEL INJECTOR

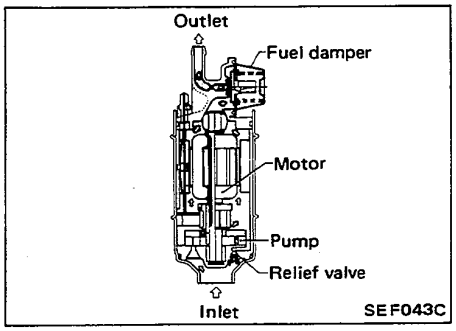
The fuel injector is a small, precision solenoid valve. As the E.C.U. outputs an injection signal to each fuel injector, the coil built into the injector pulls the needls valve back, and fuel is injected through the nozzle to intake manifold. The amount of fuel injected is controlled by the E.C.U. as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

Components (Cont'd)



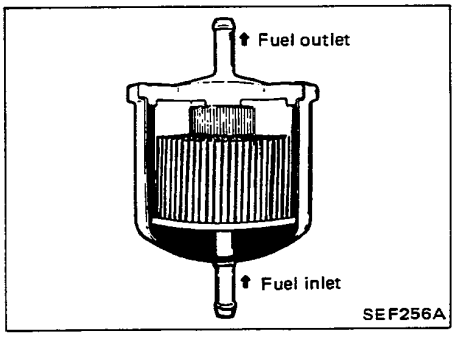
PRESSURE REGULATOR

The pressure regulator maintains the fuel pressure at 250.1 kPa (2.55 kg/cm², 36.3 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value.



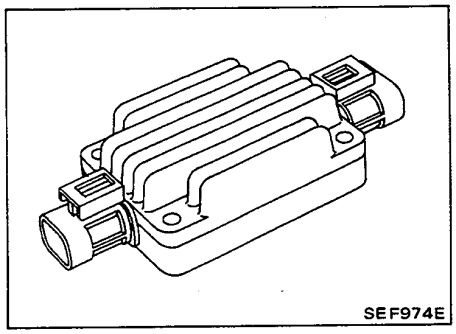
FUEL PUMP

The fuel pump with a fuel damper is an in-take 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.



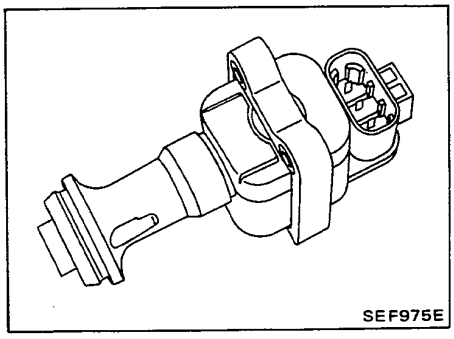
FUEL FILTER

The fuel filter is designed for the fuel injection system, and has a metal case in order to endure the high pressure of fuel.



POWER TRANSISTOR

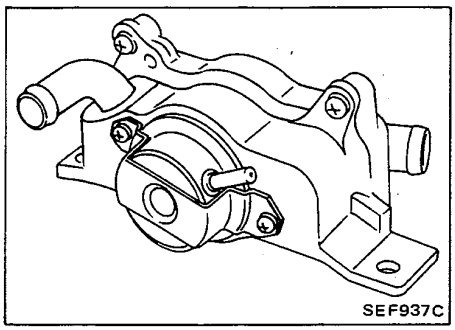
The ignition signal from the E.C.U. is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit.



IGNITION COIL

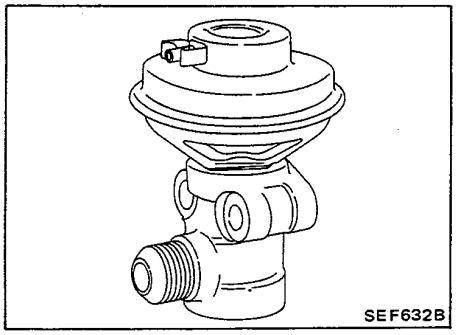
The ignition coil is a small, molded type.

Components (Cont'd)


SEF937C

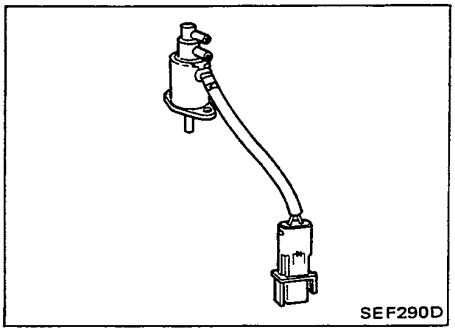
AIR INJECTION VALVE (A.I.V.)

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.


SEF632B

E.G.R. CONTROL VALVE

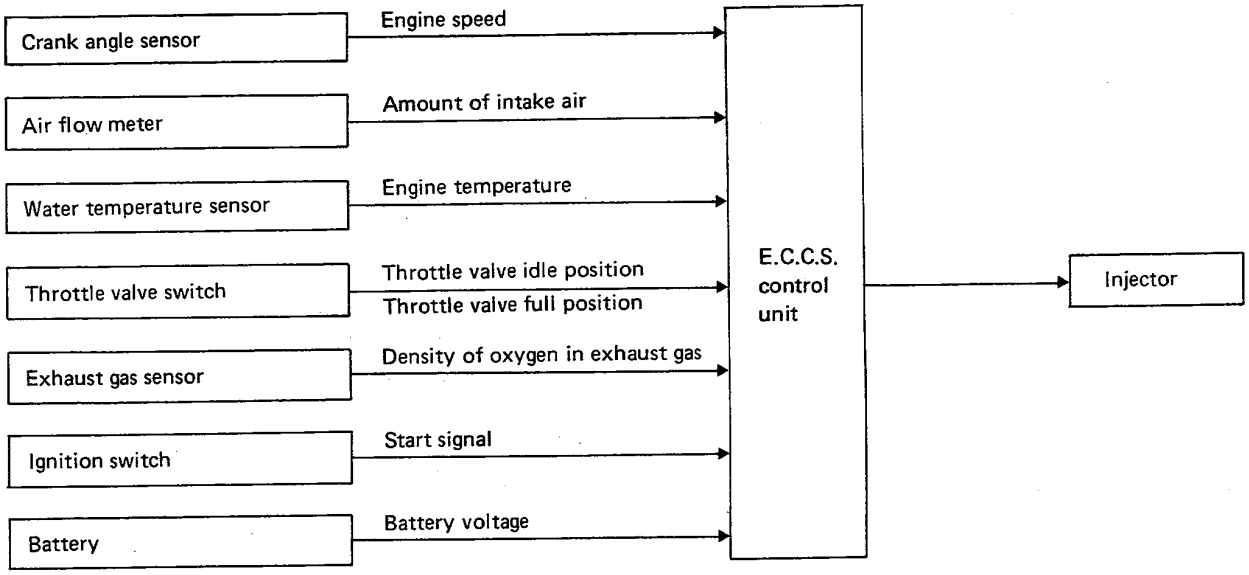
The E.G.R. control valve controls the quantity of exhaust gas to be led to the intake manifold through vertical movement of the taper valve connected to the diaphragm, to which vacuum is applied in response to the opening of the throttle valve.

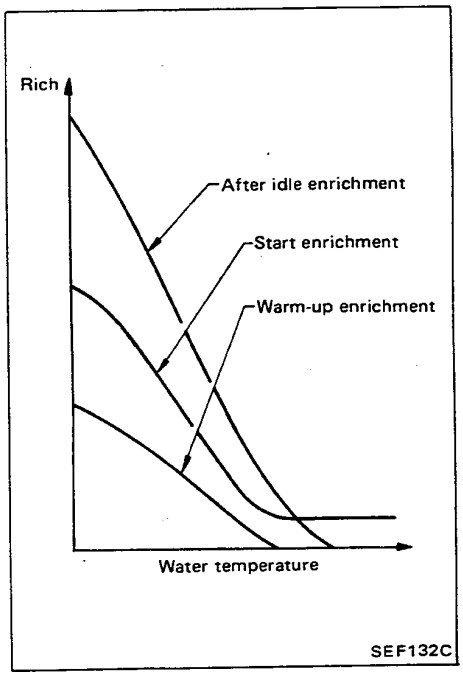

SEF290D

E.G.R. CONTROL SOLENOID VALVE, P.R.V.R. CONTROL SOLENOID VALVE, A.I.V. CONTROL SOLENOID VALVE AND POWER VALVE CONTROL SOLENOID VALVE

The three-port solenoid valve controls above systems based on signals supplied by the E.C.U.

Fuel Injection Control





The E.C.U. calculates the basic injection pulse width by processing signals from the 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 E.C.U. to the basic injection amount. Thus, the optimum amount of fuel is injected through the injectors.

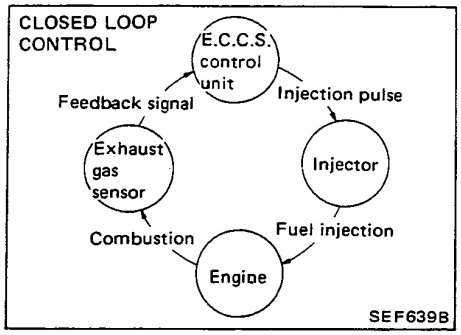
1) Fuel enrichment:
   In each of the following conditions, fuel is enriched.

- When starting
- After idle
- During warm-up
- When accelerating during warm-up period
- Full throttle (with heavy load condition)

For these enrichment conditions, signals from water temperature sensor, crank angle sensor, air flow meter and throttle switch are used.

Fuel Injection Control (Cont'd)

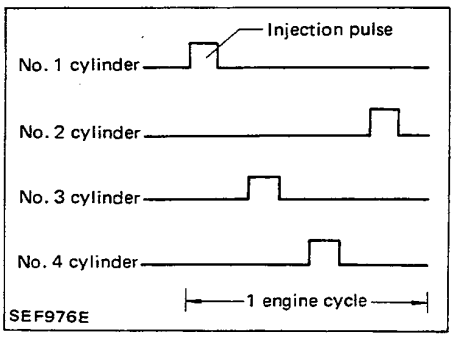
2) Fuel shut-off
The fuel shut-off is operated when the engine runs at higher than pre-set rpm and the throttle valve is closed (throttle switch idle contact "ON"). As the engine speed goes down to the "recovery rpm", which is somewhat lower than the shut-off rpm, the fuel shut-off ceases even if the throttle valve is kept closed. Both "shut-off and recovery rpm" vary with the coolant temperature.



3) Mixture ratio feedback control (Closed loop control)
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 E.C.U. 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.

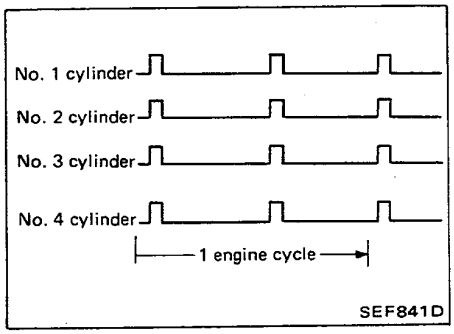
However, this system will operate under open loop under the following conditions:

- **When starting engine.**
- **When engine temperature is cold.**
- **When exhaust gas sensor temperature is cold.**
- **When driving at high speeds or under heavy load.**
- **At idle.**
- **When the exhaust gas sensor monitors a rich condition for more than a few seconds.**
- **When A.I.V. control system is operated.**



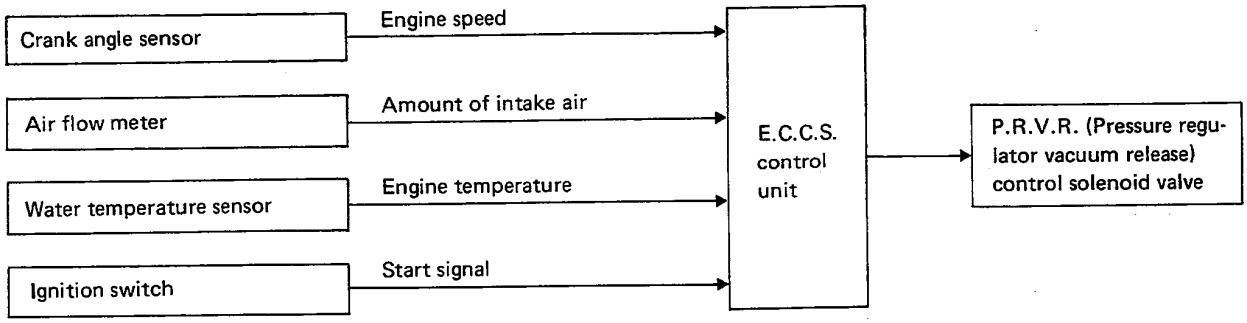
4) Fuel injection pattern.
Fuel is injected once a cycle for each cylinder.

Fuel Injection Control (Cont'd)



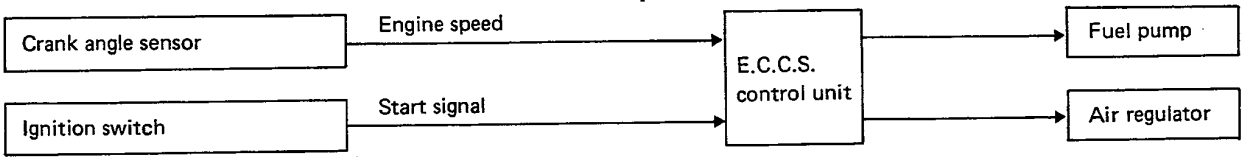
When engine temperature is low, engine starts, and engine load is heavy, fuel is injected into all four cylinders simultaneously twice a cycle.

Fuel Pressure Regulator Control



The fuel pressure regulator control improves hot-restratability by increasing fuel pressure. When the system is in operation, the P.R.V.R. control solenoid valve comes on, and the atmospheric pressure is sent to the fuel pressure regulator valve, thereby increasing the fuel pressure.
P.R.V.R. control solenoid valve is controlled by E.C.U.

Fuel Pump and Air Regulator Control

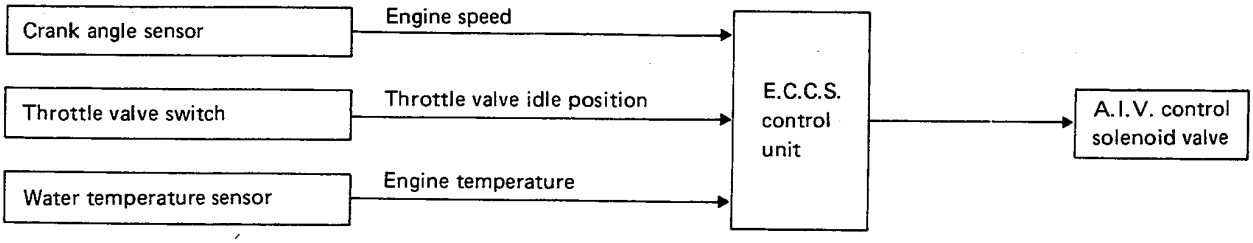


Fuel pump and air regulator control
The fuel pump and air regulator ON-OFF are simultaneously controlled by the E.C.U.

Fuel pump and air regulator ON-OFF control

Ignition switch position	Engine condition	Fuel pump/ Air regulator operation
ON	Stopped	Operates for 5 seconds
	Running	Operates
	After stall	Stops after 1 second
START	Starting	Operates

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

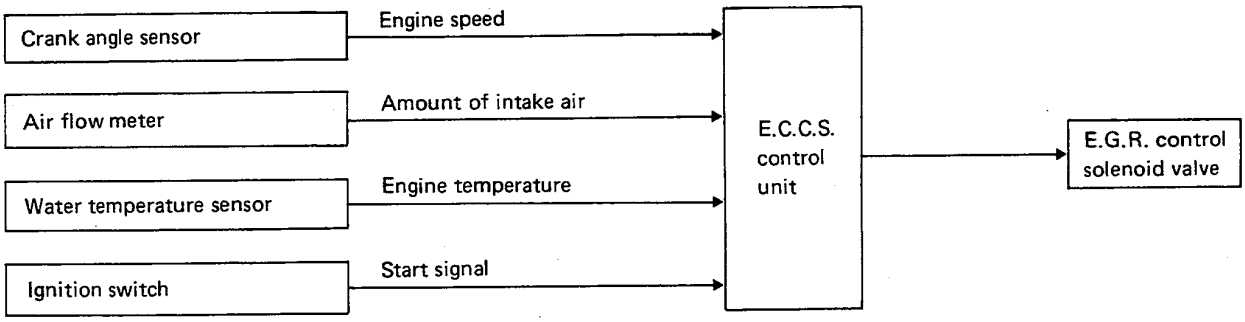


The air injection valve (A.I.V.) system is utilized to reduce HC and CO emissions by supplying air through the air injection valve. This system is composed of the air injection valve, the A.I.V. control valve and the A.I.V. solenoid valve.
The air injection valve is designed for one-way operation and consists of one-way reed valves. It inducts the secondary air into the exhaust manifold via the exhaust pressure pulsations.
The A.I.V. control valve is controlled by the A.I.V. solenoid valve which is controlled by the electrical signal from the E.C.U.

OPERATION

Water temperature	Throttle valve switch	Engine speed (rpm)	Solenoid valve	A.I.V. system
Cool (Engine warm-up condition)	Any	Any	OFF	OFF
Hot [Above approximately 70°C (158°F)]	OFF	Any	OFF	OFF
	ON (Idle contact)	High (Above approximately 1,700)	OFF	OFF
		Low	ON	ON

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



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 B.P.T. valve when any of the following conditions are met.

E.G.R. control solenoid valve operation

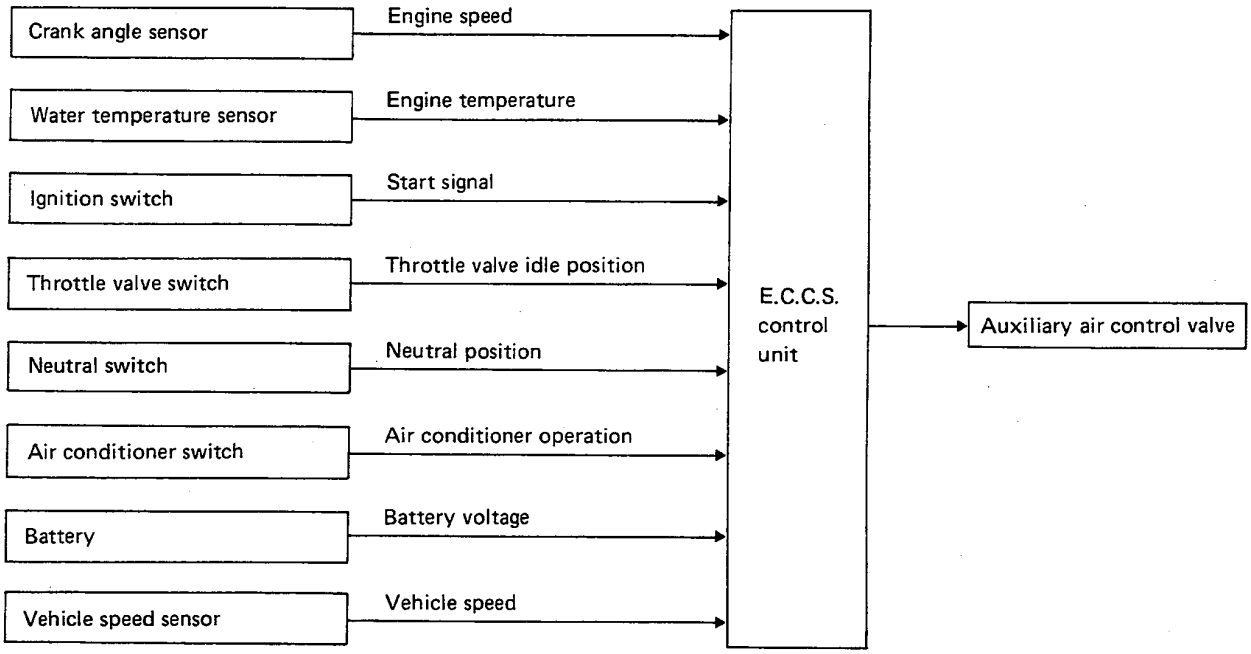
Condition		E.G.R. control solenoid valve
Water temperature °C (°F)	Below 65 (149)	ON
	Above 105 (221)	
Other conditions		OFF

E.G.R. system operation

E.G.R. system operates under only the following conditions.

Water temperature °C (°F)	B.P.T. valve		Throttle position	E.G.R. control solenoid valve	E.G.R. system
	Exhaust gas pressure	Operation			
Above 65 (149) Below 105 (221)	High	Closed	Partially open	OFF	Operates

Idle Speed Control

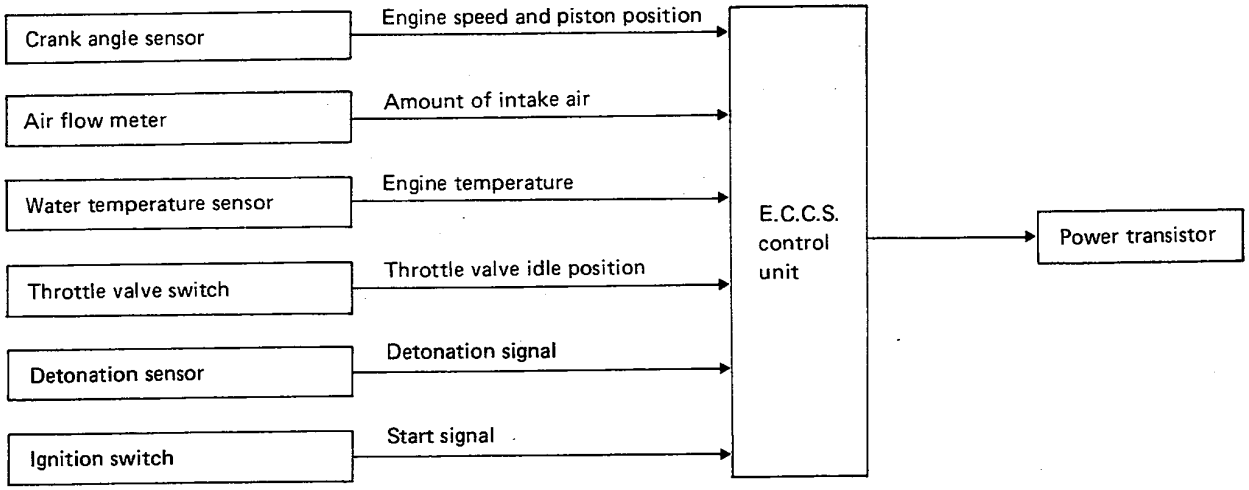


The idle speed is controlled by the E.C.U., corresponding to the engine operating conditions. The E.C.U. senses the engine condition and determines the best idle speed at water temperature and gear position. The control unit then sends an electronic signal corresponding to the difference between the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

The E.C.U. controlled idle speed feedback is carried out when the following conditions are satisfied.

1) Idle switch "ON" and neutral switch "OFF" at low vehicle speed.
2) Idle switch "ON" and vehicle speed is lower than approx. 4 km/h (2 MPH).

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 any driving condition has been pre-programmed in the E.C.U., the ignition timing is determined by electrical signals processed in the E.C.U.

The signal from the E.C.U. is transmitted to the power transistor, and controls ignition timing.

Fail-safe System

Air flow meter malfunctioning

When air flow meter output voltage is lower or higher than the preset value while the engine is running, the fuel injection pulse duration is fixed at the preset value (when engine speed is less than approx. 2,000 rpm) or the fuel is not injected (when engine speed is more than approx. 2,000 rpm).

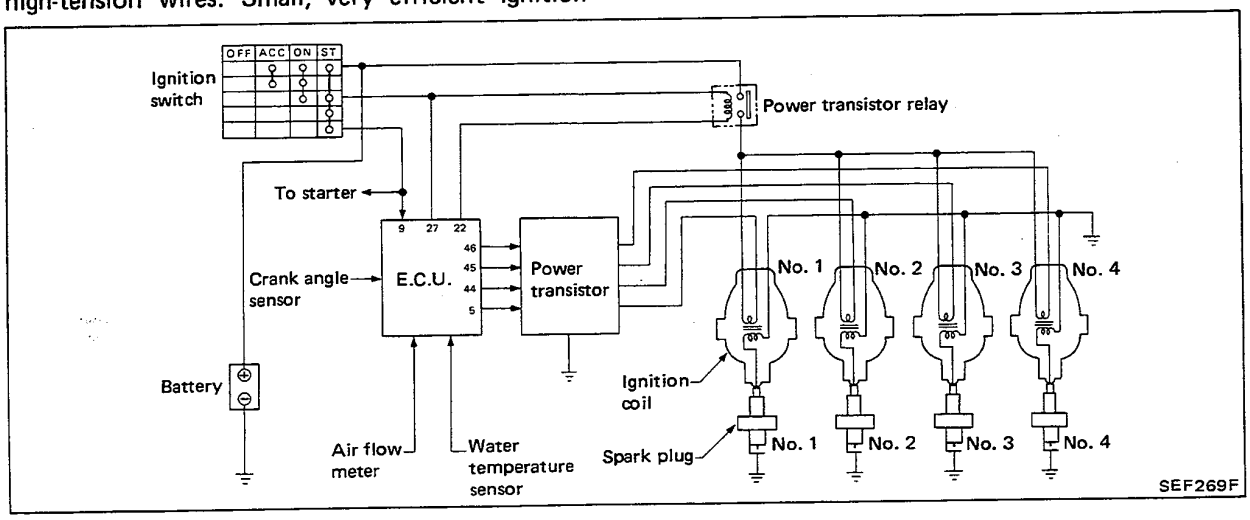
Water temperature sensor malfunctioning

When water temperature sensor output voltage is lower or higher than the specified value, water temperature is fixed at the preset value as follows:

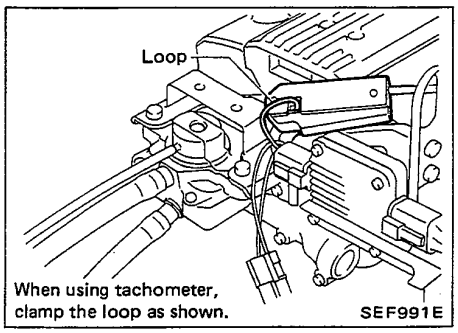
Engine condition	Water temperature preset value °C (°F)
Start	20 (68)
Running	80 (176)

Direct Ignition System

This system has no conventional distributor and high-tension wires. Small, very efficient ignition coils are fitted directly to each spark plug.



Direct Ignition System (Cont'd)



CHECKING IGNITION TIMING AND IDLE SPEED

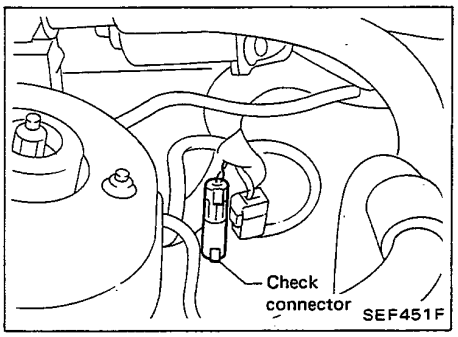
Checking idle speed

Idle speed: 800±50 rpm

If idle speed is not within specific value, refer to MIXTURE RATIO FEEDBACK SYSTEM INSPECTION.

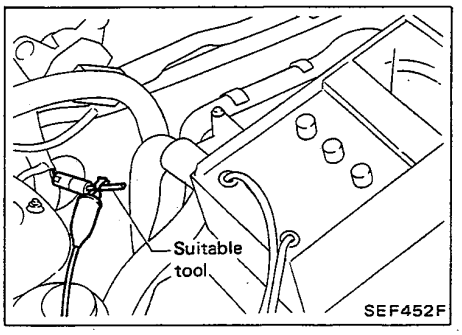
- METHOD A (With pulse type tachometer)

1. Clamp loop wire as shown.

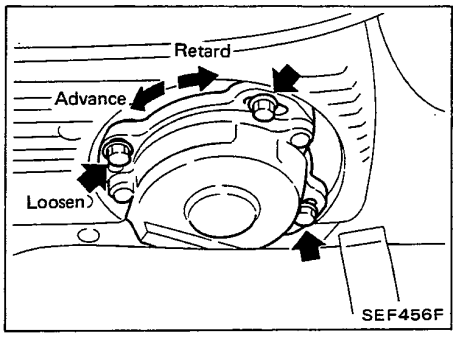


- METHOD B (With voltage type tachometer)

1. Disconnect check connector for tachometer.



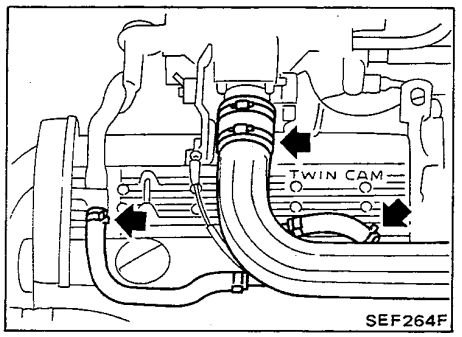
2. Connect tachometer using suitable tool.



Checking ignition timing

Ignition timing: 15°±2° B.T.D.C.

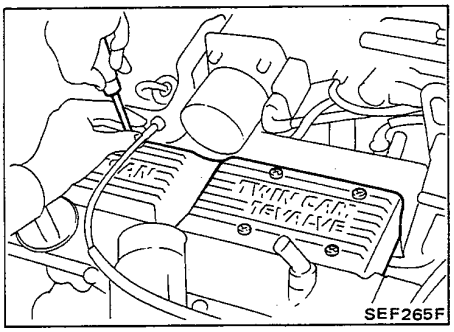
If ignition timing is not within specific value, adjust ignition timing as shown.



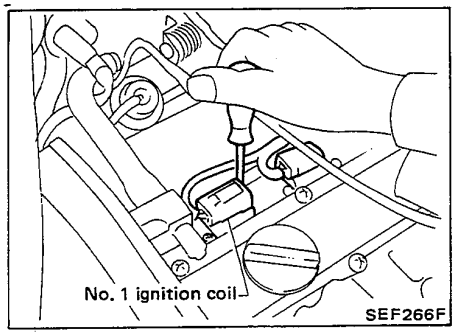
- METHOD A (Without S.S.T.)

1. Disconnect air duct and air hoses.

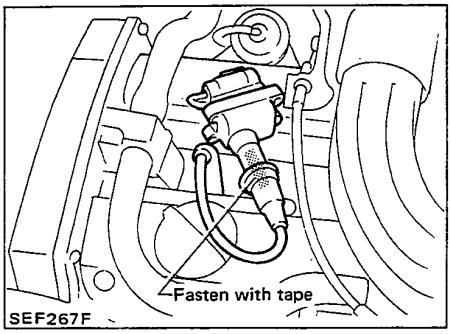
Direct Ignition System (Cont'd)



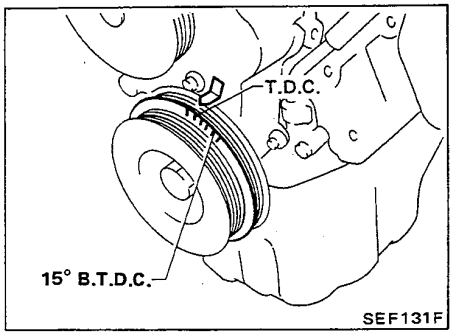
2. Remove ornament cover.
   Acceleration wire does not need removing.



3. Remove No. 1 ignition coil.



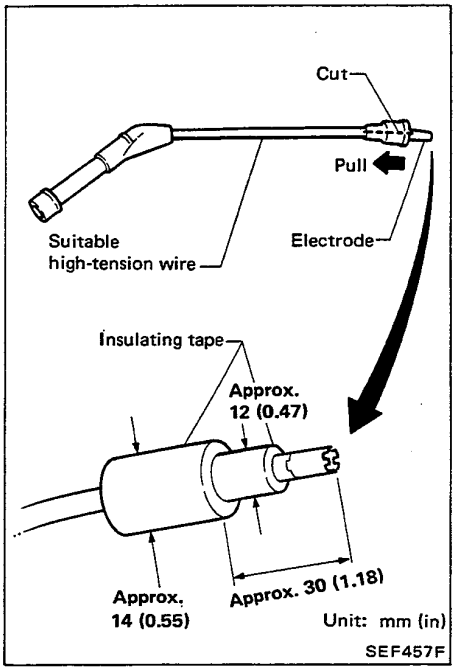
4. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and clamp this wire with timing light clamp.

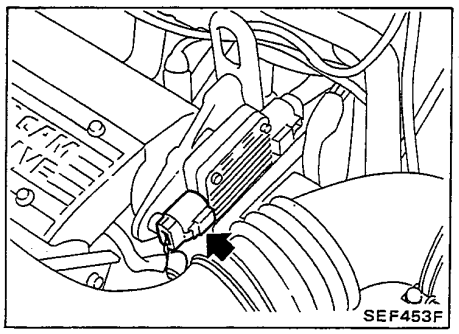


5. Connect air duct and air hoses, then start engine.
   Check ignition timing.
6. Install No. 1 ignition coil and ornament cover, and connect air duct and air hoses.

Direct Ignition System (Cont'd)

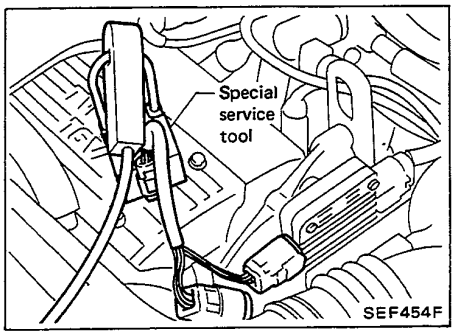
For above procedures, enlarge high-tension wire end as shown.



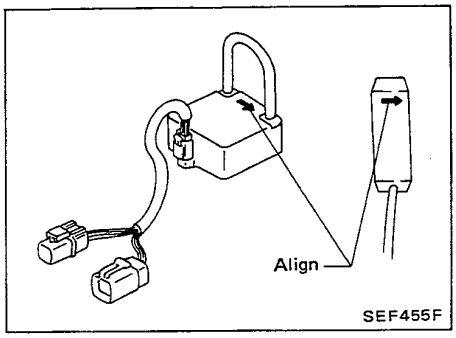


- METHOD B (With S.S.T. KV109D10S0)

1. Disconnect connector of power transistor unit.

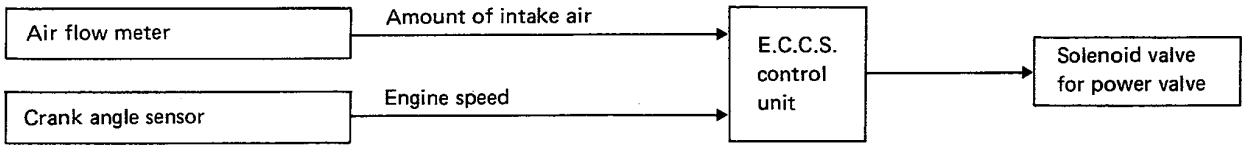


2. Connect S.S.T. and clamp wire as shown.



Align direction marks on S.S.T. and timing light clamp if aligning mark is punched.

Nissan Induction Control System (N.I.C.S.) Control



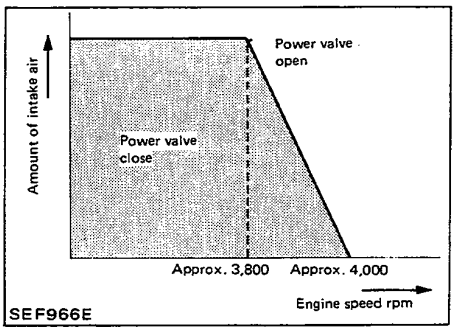
This system has an intake manifold port shut valve (power valve) to the one side of the intake passage for each cylinder.

At low engine speed or low engine load condition, the power valve is closed. Thus the velocity of the air in the intake passage increases, promoting the vapourization of the fuel and producing a swirl in the combustion chamber.

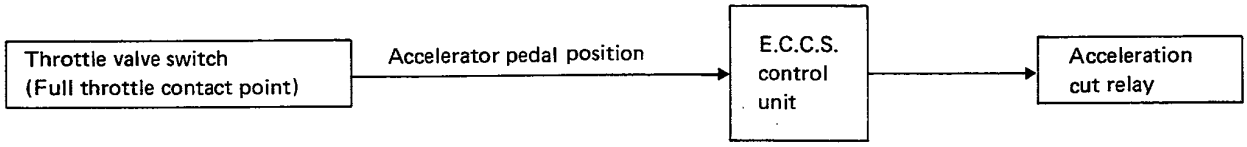
Because of this operation, this system tends to increase the burning speed of mixture gas, improve the fuel consumption, and increase the stability in running condition.

Also, at high speed or heavy engine load condition, this system opens both sides of dual intake passage (power valve is opened). In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

The solenoid valve controls power valve's shut/open condition. This solenoid valve is operated by the E.C.U.



Acceleration Cut Control



When full throttle contact point is turned on, (this means accelerator pedal is fully depressed) air conditioner is turned off for a few seconds.

This system improves acceleration when air conditioner is used.

NOTE

Driveability

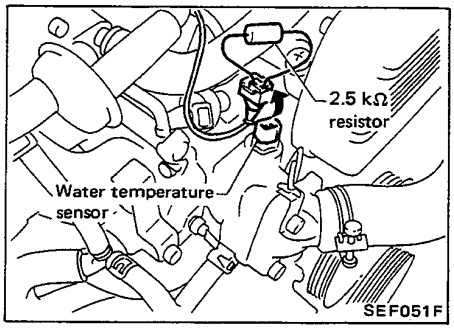
1. Make sure that the following items are in the proper condition.

CHECK DATA:

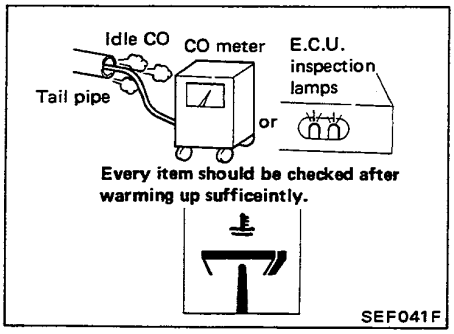
1) Idle speed
   800±50 rpm
2) Ignition timing
   15°±2° B.T.D.C.
3) Idle CO
   Less than 5% under the following conditions.
   - **Throttle valve switch harness connector disconnected (No A.I.V. controlled condition)**
   - **Water temperature sensor harness connector disconnected and then 2.5 kΩ resistor connected**
   - **Exhaust gas sensor harness connector disconnected**

See page EF & EC-98.

4) Mixture ratio at middle engine speed (Approximately 2,000 rpm).
   Number of simultaneous flashes of E.C.U. inspection green and red lamps:
   9 times or more/10 seconds
5) Idle switch OFF — ON speed
   Idle speed + 250±150 rpm
   If N.G., adjust to the specified value.

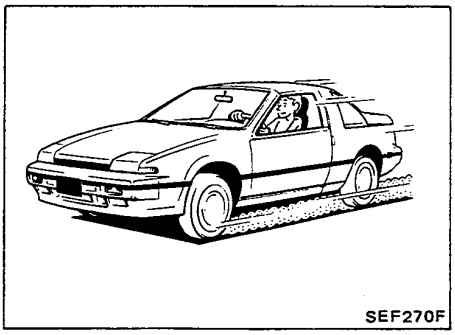


SEF051F



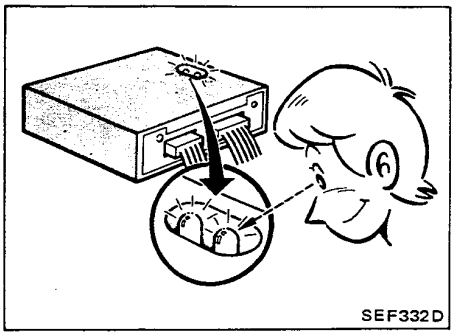
SEF041F

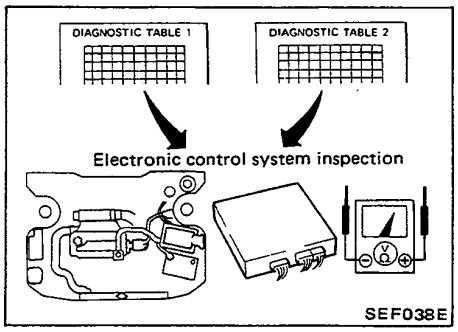
2. Perform driving test.
   Evaluate effectiveness of adjustments by driving vehicle.


SEF270F

3. Perform E.C.C.S. self-diagnosis.

See page EF & EC-36.


SEF332D



Driveability (Cont'd)

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

See page EF & EC-33.

5. Perform driving test.
   Re-evaluate vehicle performance after the inspection.

Diagnostic Table 1

SYSTEM INSPECTION TABLE

Sensor & actuator / Reference pages for inspection / System	Crank angle sensor	Air flow meter	Water temperature sensor	Ignition switch	Injector	Throttle valve switch	Neutral switch	Exhaust gas sensor	Air conditioner switch
	EF & EC-54	EF & EC-56	EF & EC-58	Refer to EL section.	EF & EC-78	EF & EC-68	EF & EC-88	EF & EC-80	Refer to HA section.
Fuel injection & mixture ratio feedback control	O	O	O	O	O	O		O	
Ignition timing control	O	O	O	O		O			
A.I.V. control	O	O	O			O			
Fuel pump control				O					
Pressure regulator control	O	O	O	O	O				
Idle speed control	O		O	O		O	O		O
E.G.R. control	O	O	O	O		O			
Power valve control	O	O							
Acceleration cut control						O			O

Sensor & actuator / Reference pages for inspection / System	A.I.V. control solenoid valve	E.G.R. control solenoid valve	Pressure regulator control solenoid valve	Power valve control solenoid valve	A.A.C. valve	Air regulator	Vehicle speed sensor	E.F.I. relay	Detonation sensor	Battery voltage
	EF & EC-82	EF & EC-84	EF & EC-86	EF & EC-90	EF & EC-72	EF & EC-76	EF & EC-70	EF & EC-52	EF & EC-60	–
Fuel injection & mixture ratio feedback control								O		
Ignition timing control								O	O	
A.I.V. control	O							O		
Fuel pump control								O		
Pressure regulator control			O				O	O		
Idle speed control					O	O	O	O		O
E.G.R. control		O						O		
Power valve control				O				O		
Acceleration cut control								O		

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

Diagnostic Table 2

DRIVEABILITY INSPECTION TABLE

INSPECTION ITEM / REFERENCE PAGES FOR INSPECTION / TROUBLE ITEMS CONCERNED WITH DRIVEABILITY			GENERAL INSPECTION																	E.C.C.S. SYSTEM INSPECTION					
			FUEL FLOW SYSTEM				ELECTRIC SYSTEM					AIR FLOW SYSTEM							A.A.C. VALVE		CRANK ANGLE SENSOR			VEHICLE SPEED SENSOR		
			Fuel level	Fuel pump	Fuel filter	Fuel line	Battery	Spark plug	Ignition coil	Alternator	Starter	Air cleaner	Air flow line	E.G.R. B.P.T. valve	A.I.V. control valve	F.I.C.D. solenoid valve	Air regulator	P.C.V.	Short	Open	180° signal noise	180° signal faults	1° signal faults	Short	Open	Poor connection
			–	EF & EC-64	–	–	–	–	–	Refer to EL section.		–	–	EF & EC-108	–	–	EF & EC-76	–	EF & EC-72		EF & EC-54			EF & EC-70		
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			○	○			○	◎	○	○	○	○	○				○	○	○	○	◎	◎	◎			

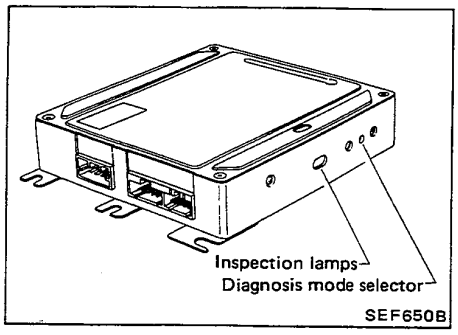
This table indicates the inspection items for each type of symptom. It is necessary for each symptom to check sensors or actuators marked "◎" or "○".
Items marked "◎" have a significant influence no driveability. Prior to items marked "○", check items marked " ".
Improper mixture ratio, improper ignition condition, and an excess of E.G.R. volume can cause any symptom.

Diagnostic Table 2 (Cont'd)

E.C.C.S. SYSTEM INSPECTION

AIR FLOW METER *	WATER TEMPERATURE SENSOR			THROTTLE VALVE SWITCH		EXHAUST GAS SENSOR		INJECTOR	NEUTRAL SWITCH	START SIGNAL		IGNITION SIGNAL		BATTERY VOLTAGE	FUEL PUMP CIRCUIT			E.G.R. CONTROL SOLENOID VALVE		A.I.V. CONTROL SOLENOID VALVE		P.R.V.R. CONTROL SOLENOID VALVE		POWER VALVE CONTROL SOLENOID VALVE (Include check valve)	DETONATION SENSOR
Poor connection	Short	Open	Poor connection	Short	Open	Short	Open	Clogging	Short	Short	Open	Short	Open	Low voltage	Short	Open	Poor connection	Short	Open	Short	Open	Short	Open	Short or open	Short or open
EF & EC-56	EF & EC-58			EF & EC-68		EF & EC-80		–	EF & EC-88	EF & EC-66		EF & EC-60		–	EF & EC-64			EF & EC-84		EF & EC-82		EF & EC-86		EF & EC-90	EF & EC-60
◎	○	○	○			○	○	◎									○	◎	◎						○
◎	○	○	○			○	○	◎									○	◎	◎						○
◎	○	○	○			○	○	◎									○	◎	◎						○
◎	○	○	○	○	○	○	○	◎									○	◎	◎						○
◎	○	○	○	○	○	○	○	◎									○	○	○						○
◎	○	○	○	○	○	○	○	◎									○	○	○						○
◎	○	○	○	○	○	○	○	◎	○								○	○	○					○	○
◎	○	○	○	○	○	○	○	◎	○								○	○	○					○	○
◎	○	○	○	○	○			◎	○								○	○	○			○	○		○
◎	○	○	○	○	○			◎	○								○	○	○			○	○		○
◎	○		○	○	○	○	○	◎	○								○								○
◎		○	○	○	○	○	○	◎										◎	◎	○	○				○
○	○	○	○	○	○	○	○	◎	○								○	○	○						○
◎	○	○	○	○	○	○	○	◎	○			○	○	○	○	○	○					○	○		○
○	○	○	○					◎	○	○	○	○	○	○	○	○	○					○	○		○

* If air flow meter circuit is short or open, the fail-safe system operates and engine revolution does not rise to approx. 2,000 rpm or more.



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.

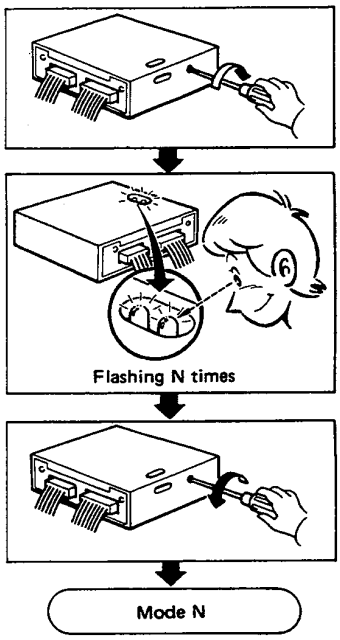
- Idle switch
- Starter switch
- Vehicle speed sensor

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.

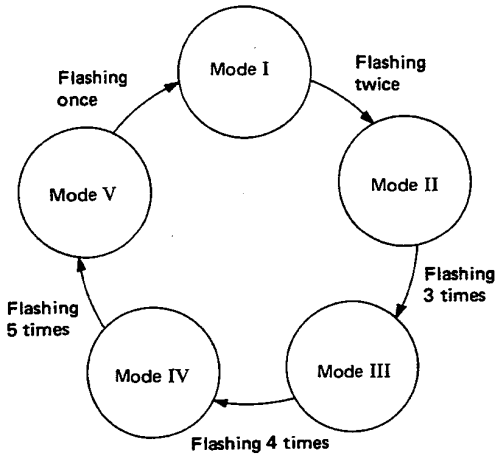
Description (Cont'd)

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.



SEF872D



SEF989D

NOTE:

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>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

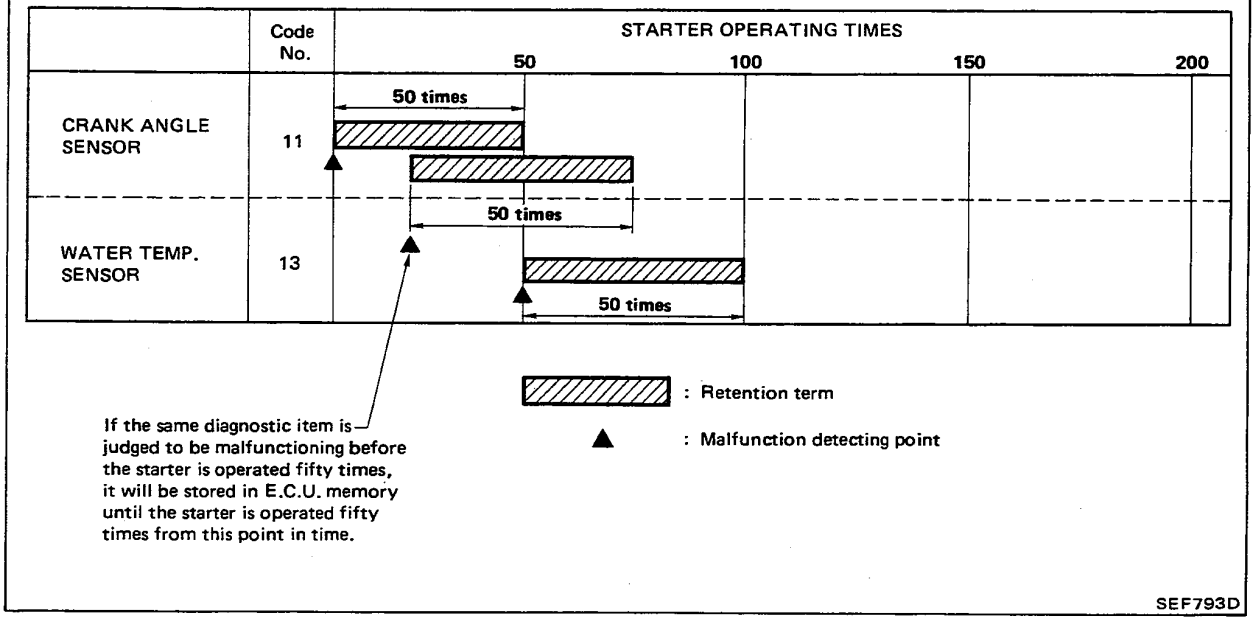
Code No.	Detected items
11	Crank angle sensor circuit
12	Air flow meter circuit
13	Water temperature sensor circuit
21	Ignition signal
34	Detonation sensor
44	No malfunctioning in the above circuit

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

RETENTION OF DIAGNOSTIC RESULTS

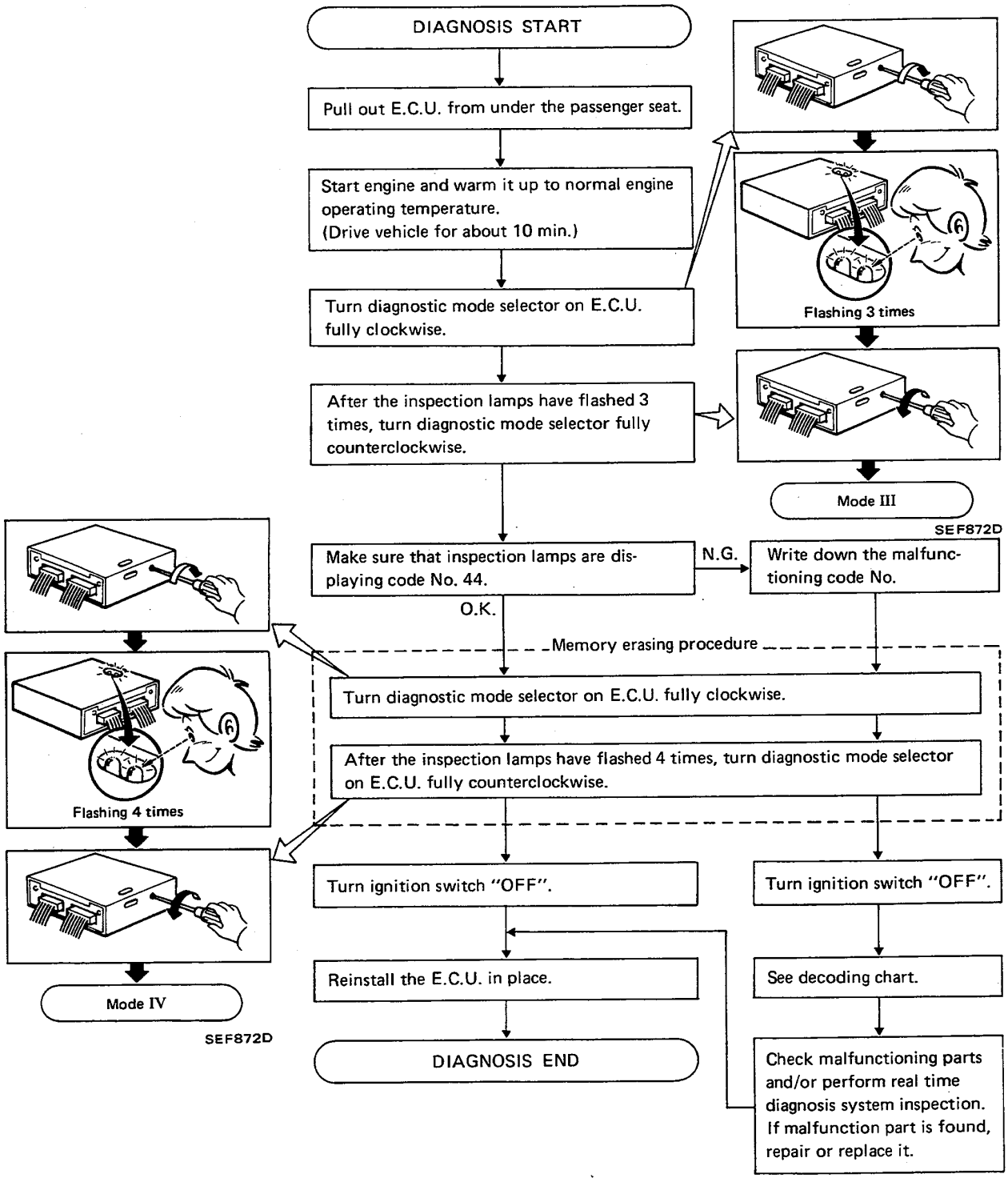
The diagnostic result is retained in E.C.U. memory until the starter is operated fifty times after a diagnostic item is judged to be malfunctioning. The diagnostic result will then be cancelled automatically. If a diagnostic item which has been judged to be malfunctioning and stored in memory is again 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:

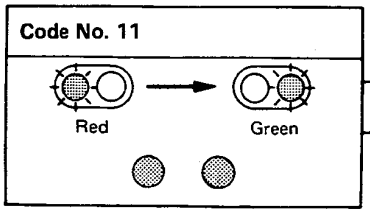
During displaying code No. in self-diagnosis mode (mode III), if the other diagnostic mode should be done, make sure to write down the malfunctioning code No. before turning diagnostic mode selector on E.C.U. fully clockwise, or select the diagnostic mode after turning switch "OFF". Otherwise self-diagnosis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



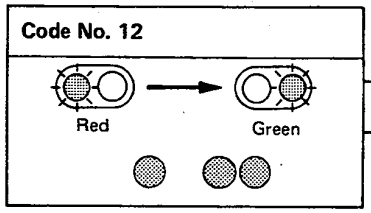
Crank angle sensor circuit

- Either 1° or 180° signal is not entered for the first few seconds during engine cranking.
- Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.

SYSTEM INSPECTION
See page EF & EC-54.

SEF042F

AIR FLOW METER



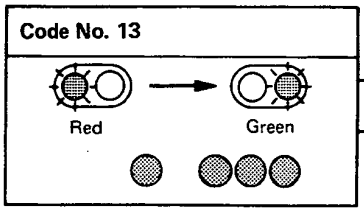
Air flow meter circuit

- The air flow meter circuit is open or shorted.
  (An abnormally high or low voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-56.

SEF043F

WATER TEMPERATURE SENSOR



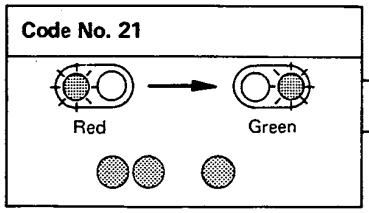
Water temperature circuit

- The water temperature sensor circuit is open or shorted.
  (An abnormally high or low output voltage is entered.)

SYSTEM INSPECTION
See page EF & EC-58.

SEF044F

IGNITION SIGNAL



Ignition signal circuit

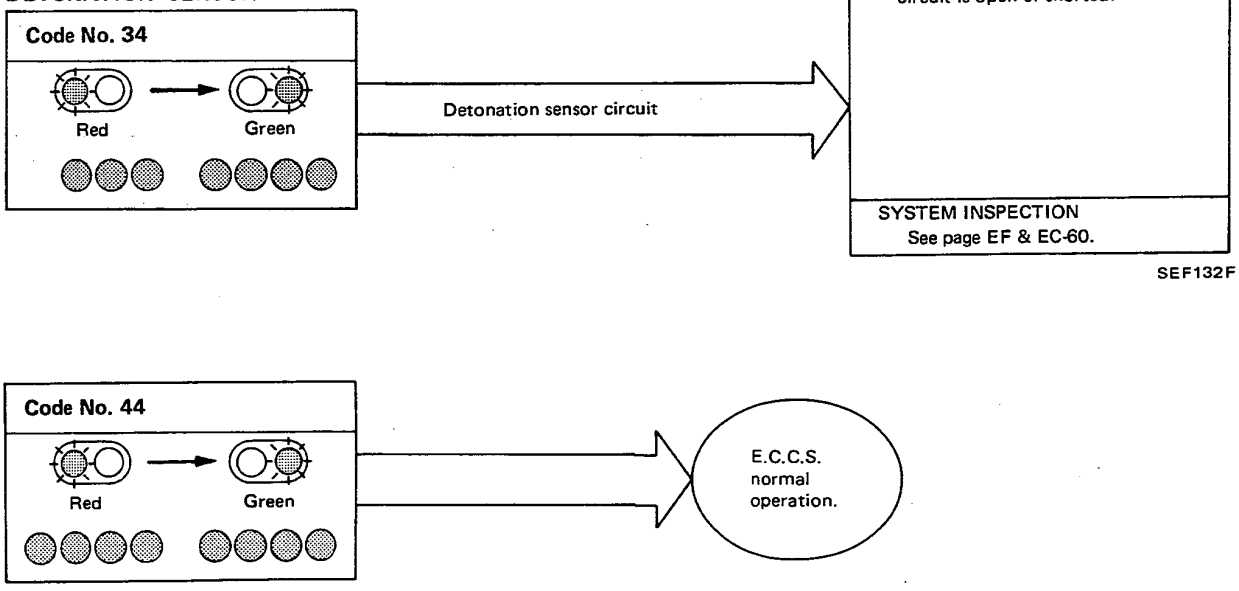
- The circuit between power transistor unit and E.C.U. is opened.

SYSTEM INSPECTION
See page EF & EC-60.

SEF045F

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
DETONATION SENSOR Code No. 34 Red → Green	Detonation sensor circuit	• The detonation sensor circuit is open or shorted. SYSTEM INSPECTION See page EF & EC-60.
Code No. 44 Red → Green		E.C.C.S. normal operation.



SEF132F

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.

- Idle switch
- Starter switch
- Vehicle speed sensor

(1) Idle switch & Starter switch

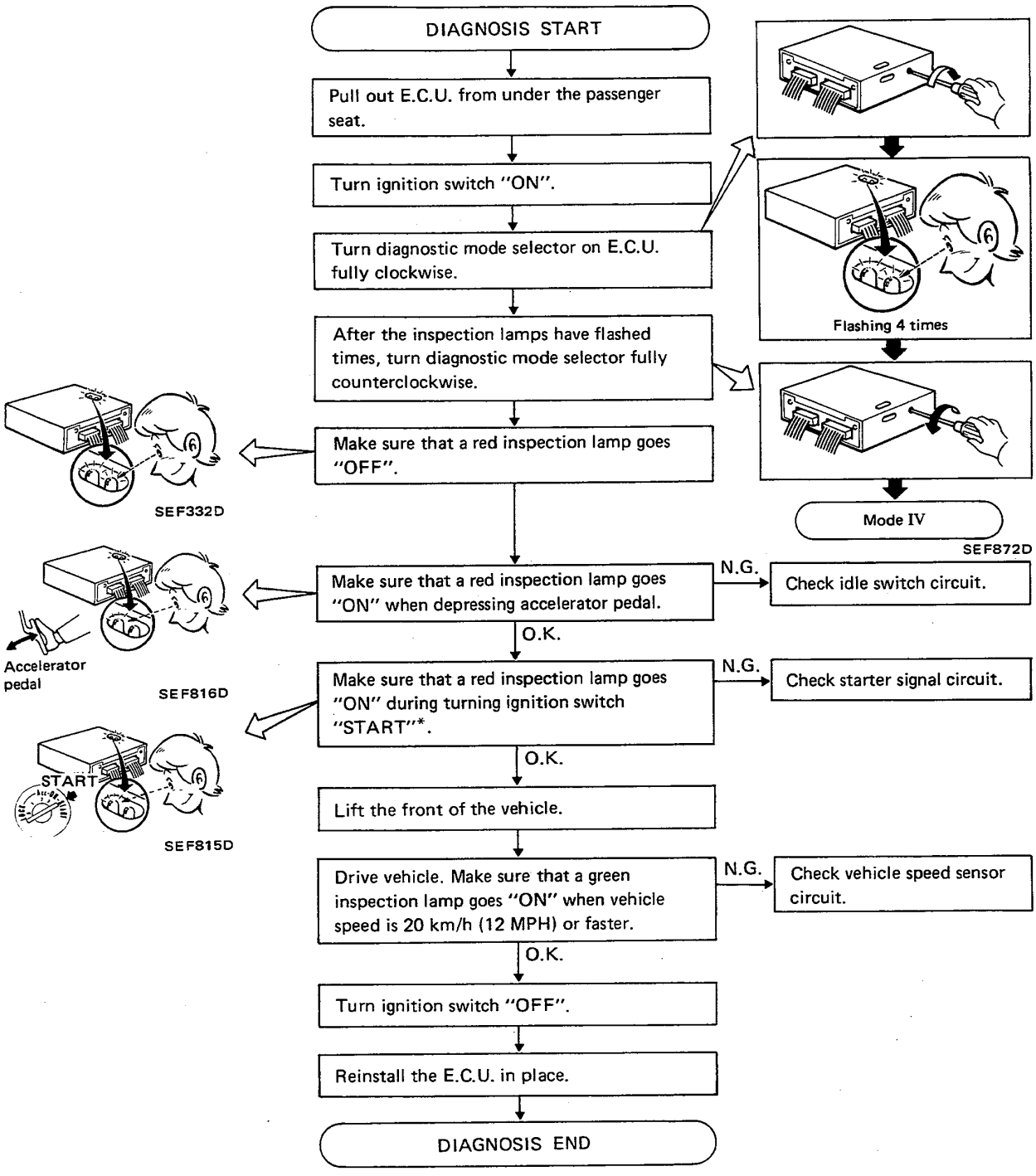
The switches ON/OFF status at the point when mode IV is selected is stored in E.C.U. memory. When either switch is turned from "ON" to "OFF" or "OFF" to "ON", the red L.E.D. on E.C.U. alternately comes on and goes off each time switching is detected.

(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:

- ***If ignition switch is turned to "START" an even number of times, a red inspection lamp goes "OFF" when depressing accelerator pedal.**
- **For safety, do not turn front wheel at higher speed than required.**

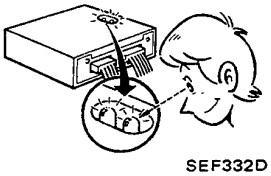
Mode V — Real Time Diagnostic System

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

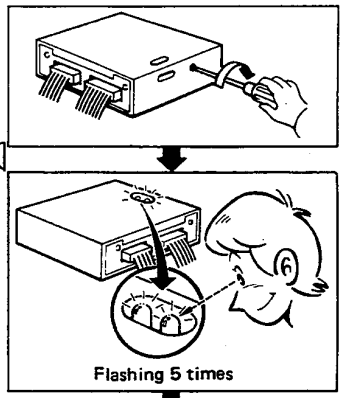
- Crank angle sensor (180° signal & 1° signal)
- Ignition signal
- Air flow meter output signal

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-DIAGNOSITC PROCEDURE



SEF332D



SEF872D

DIAGNOSIS START

Pull out E.C.U. from under the passenger seat.

Start engine.

Turn diagnostic mode selector on E.C.U. fully clockwise.

After the inspection lamps have flashed 5 times, turn diagnostic mode selector fully counterclockwise.

Mode V

Make sure that inspection lamps are not flashing for 5 min. when idling or racing.

N.G.

If flashing, count no. of flashes.

O.K.

Turn ignition switch "OFF".

Turn ignition switch "OFF".

Reinstall the E.C.U. in place.

See decoding chart.

DIAGNOSIS END

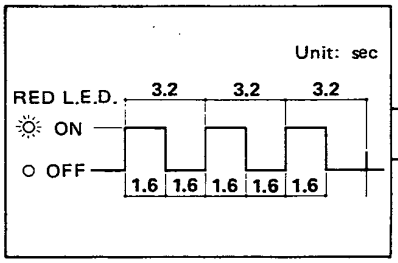
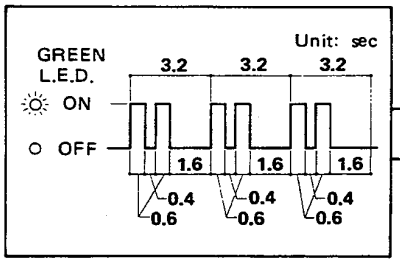
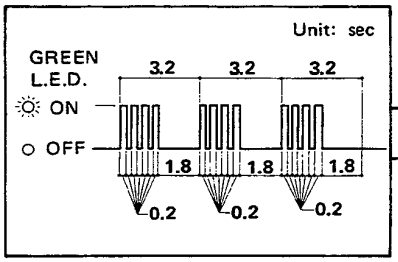
Perform real time-diagnosis system inspection.
If malfunction part is found, repair or replace it.

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

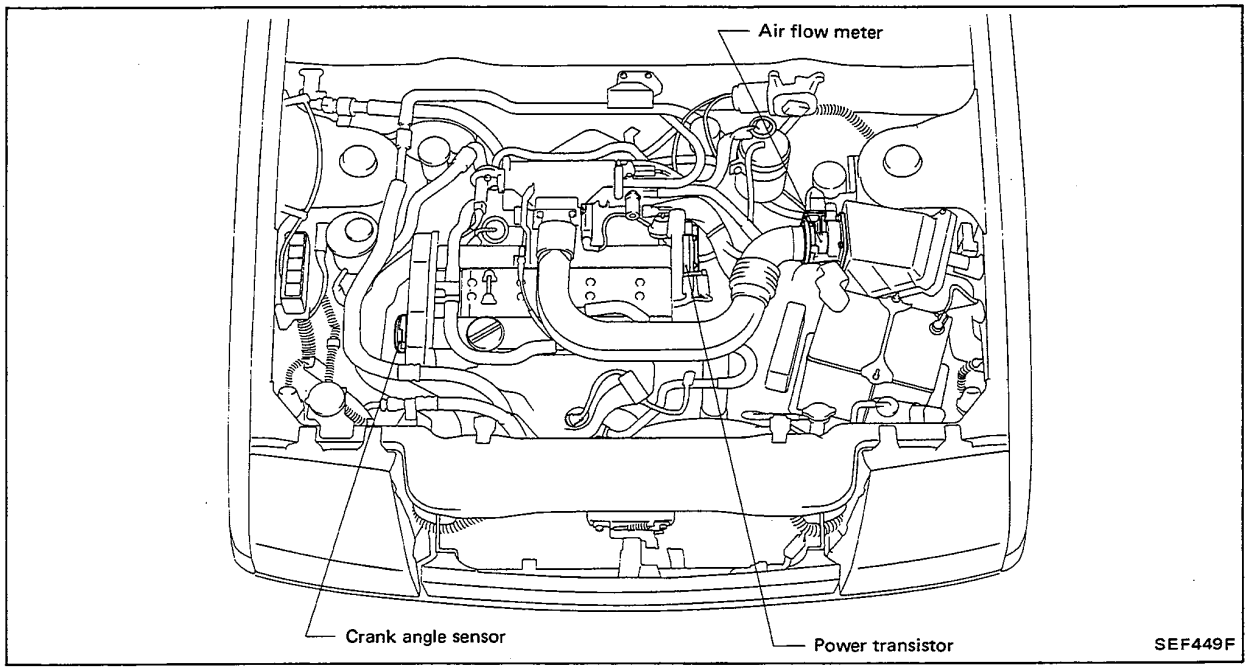
Display presentation	Malfunction circuit or parts	Control unit shows a malfunction signal when the following conditions are detected. (Compare with Self Diagnosis — Mode III.)
CRANK ANGLE SENSOR 	Malfunction of crank angle sensor circuit	The 1° or 180° signal is momentarily missing, or, multiple, momentary noise signals enter. REAL TIME DIAGNOSITC INSPECTION See page EF & EC-54.
SEF047F		
AIR FLOW METER 	Malfunction of air flow meter circuit	Abnormal, momentary increase in air flow meter output signal REAL TIME DIAGNOSITC INSPECTION See page EF & EC-56.
SEF048F		
IGNITION SIGNAL 	Malfunction of ignition signal	Signal from the primary ignition coil momentarily drops off. REAL TIME DIAGNOSITC INSPECTION See page EF & EC-60.
SEF049F		

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

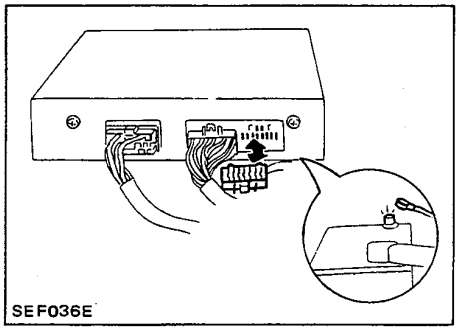
REAL TIME DIAGNOSTIC INSPECTION

Crank Angle Sensor, Air Flow Meter and Ignition Signal

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

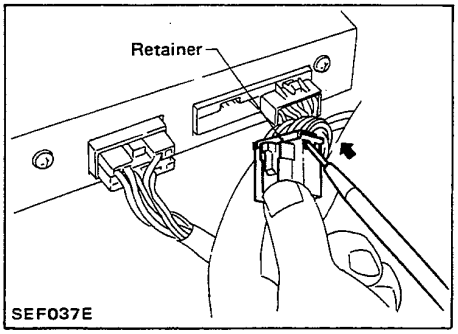


NOTE


SEF036E

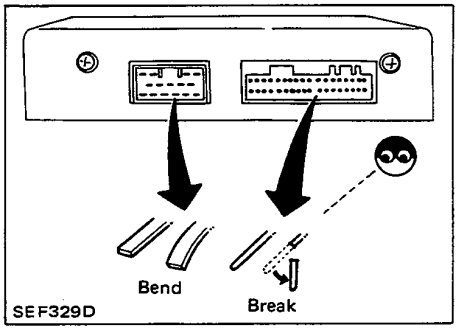
CAUTION:

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.



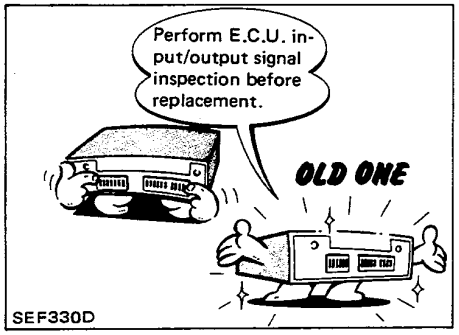
SEF037E

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



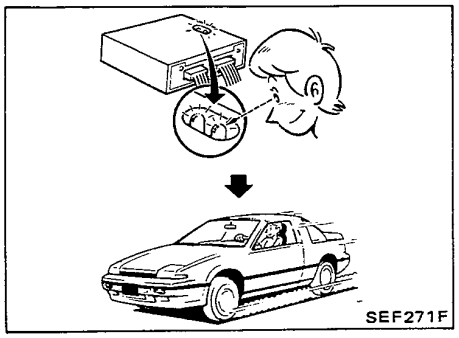
SEF329D

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.

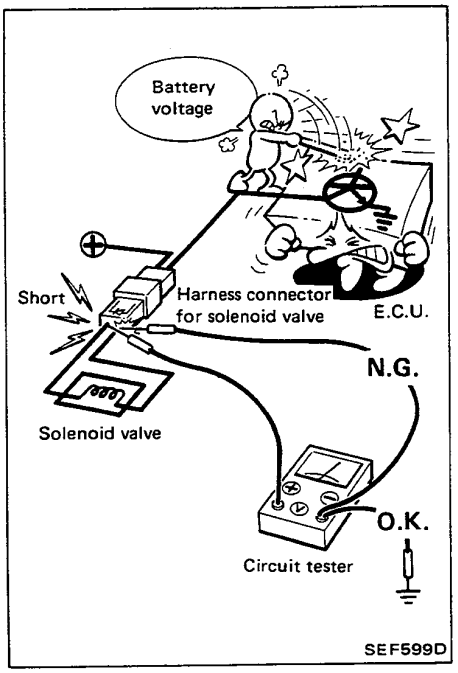


SEF330D

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-93.)


SEF271F

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.

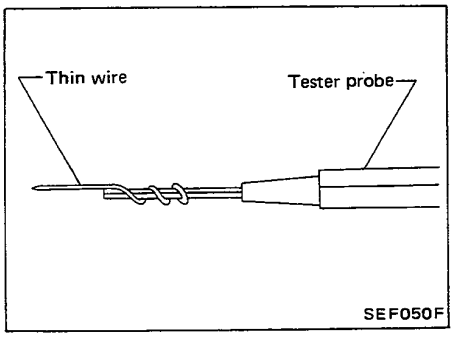
8. When measuring voltage or resistance at connector with tester probes, there are two methods of measurement; one is done from terminal side and the other from harness side. Before measuring, confirm symbol mark again.

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

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

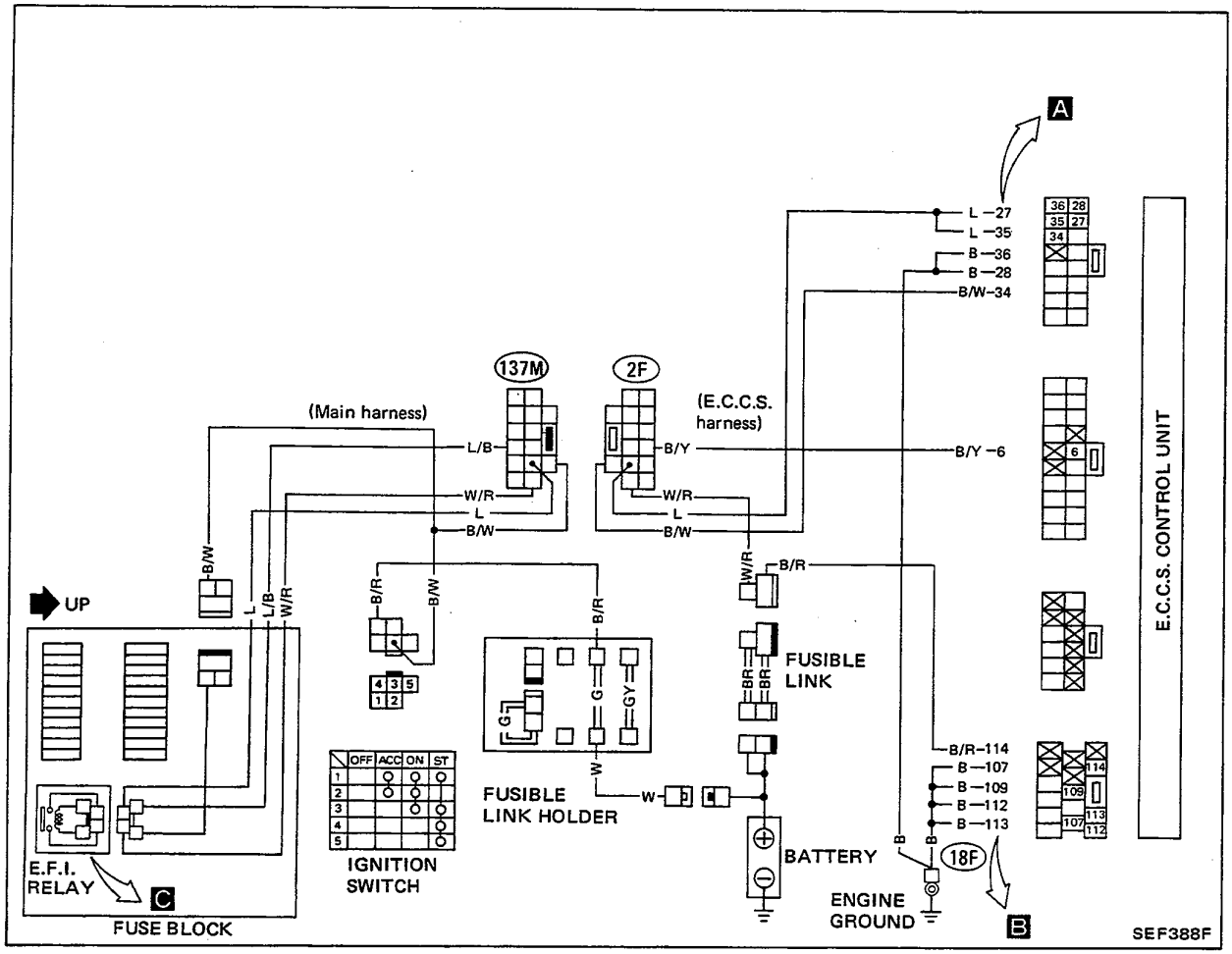
   Refer to GI section.

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

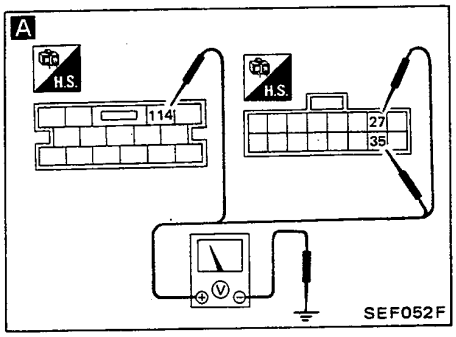


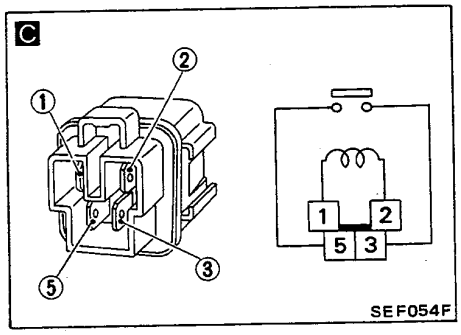
10. Improve tester probe as shown to perform test easily.
11. For the first trouble-shooting procedure, perform POWER SOURCE & GROUND CIRCUIT FOR E.C.U. check.

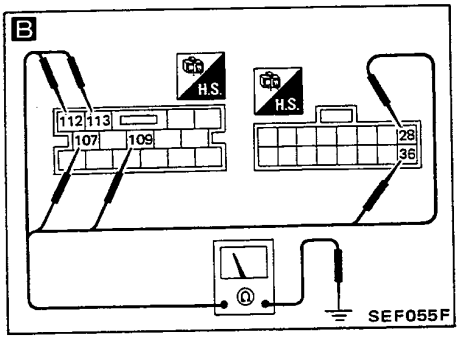
POWER SOURCE & GROUND CIRCUIT FOR E.C.U. (Not self-diagnostic item)



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







INSPECTION START

A

Check power source for E.C.U.
1) Turn ignition switch "ON".
2) Check voltage between terminals (27), (35), (114) and ground.
Voltage: Battery voltage

N.G. (114)

O.K.

N.G. (27), (35)

B

1) Turn ignition switch "OFF".
2) Check resistance between terminals (28), (36), (107), (109), (112), (113) and ground.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

INSPECTION END

Repair harness or connectors.

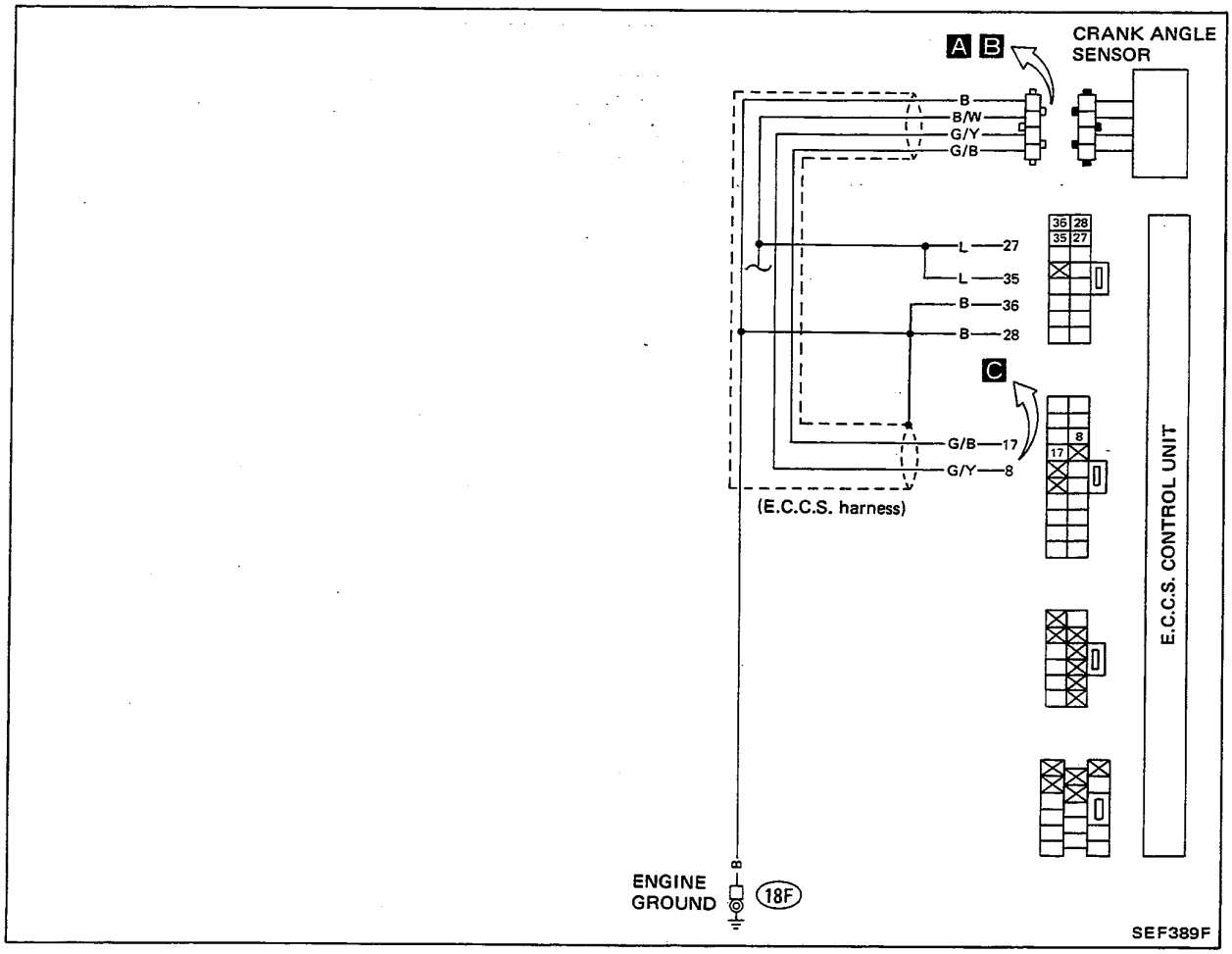
C

Check E.F.I. relay.

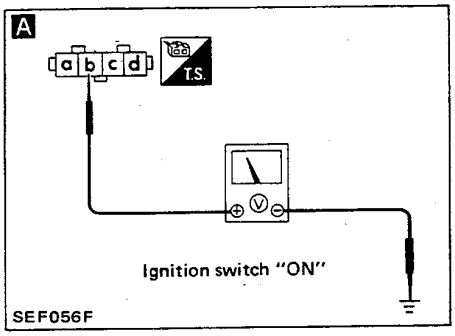
Condition	Continuity between terminals (3) and (5)
Supply 12V direct current between terminals (1) and (2)	Yes
Not supply	No

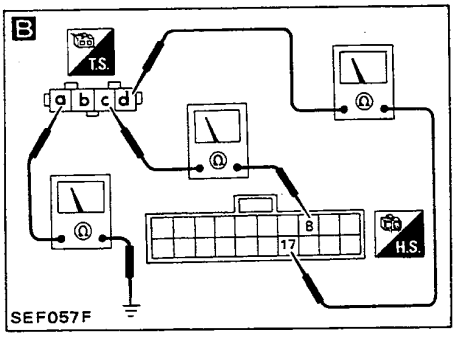
If N.G., replace E.F.I. relay.

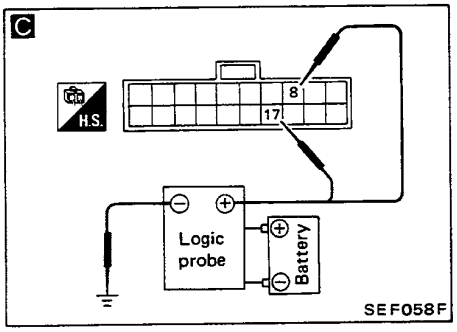
CRANK ANGLE SENSOR (Code No. 11)



CRANK ANGLE SENSOR (Code No. 11)







INSPECTION START

Perform self-diagnosis (Mode III).
Is code No. 11 indicated?
No → INSPECTION END
Yes

A
Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage
If N.G., repair harness or connectors.

O.K.

B
1) Turn ignition switch "OFF".
2) Check continuity between terminal ⓐ and ground, terminals ⓒ and ⑧ and terminals ⓓ and ⑰.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

O.K.

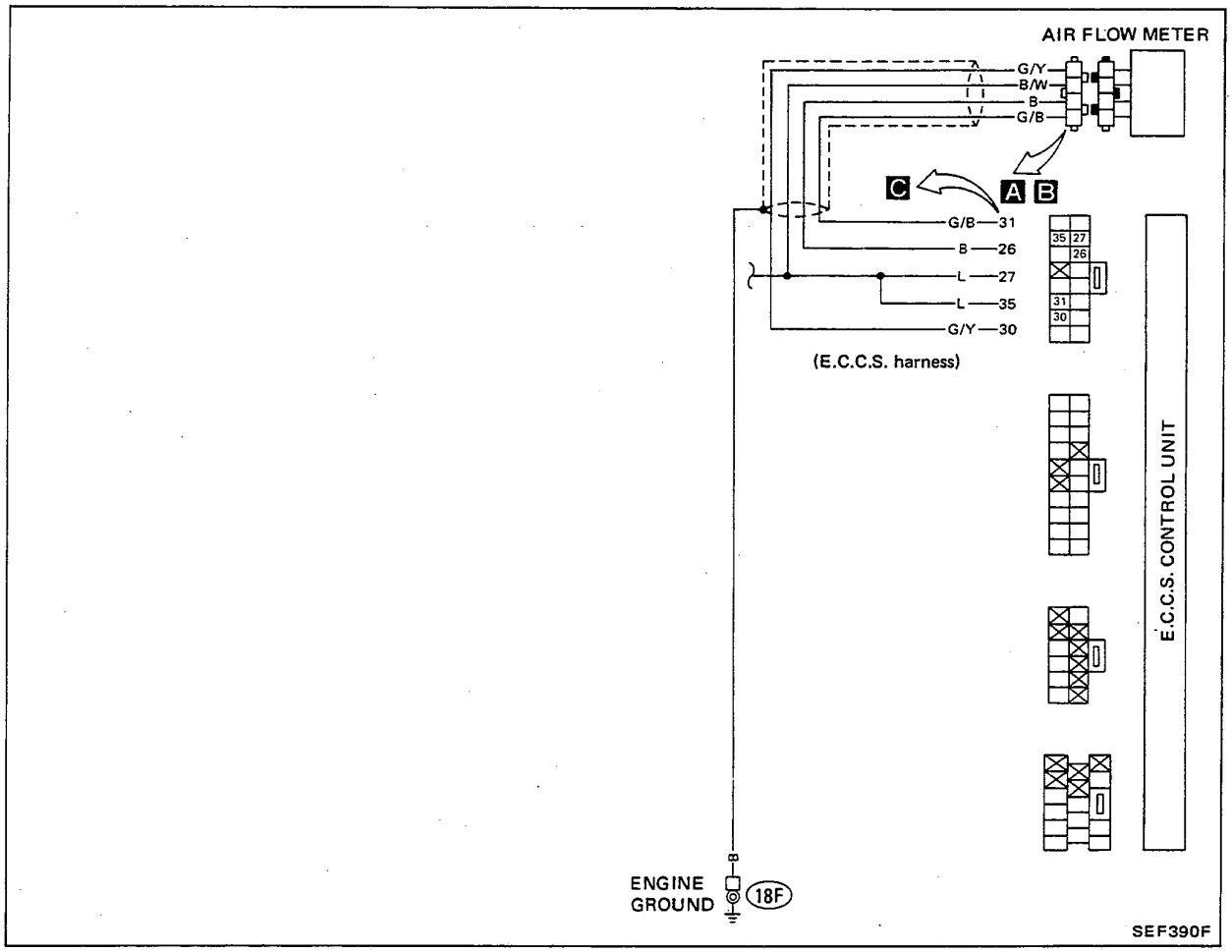
C
Check E.C.U. input signals.
1) Reconnect crank angle sensor harness connector.
2) Start engine.
3) Check that pulse signals exist in E.C.U. terminals ⑧ and ⑰ with logic probe.
Pulse signals should exist.
⑧ : 1° signal
⑰ : 180° signals

O.K. → INSPECTION END

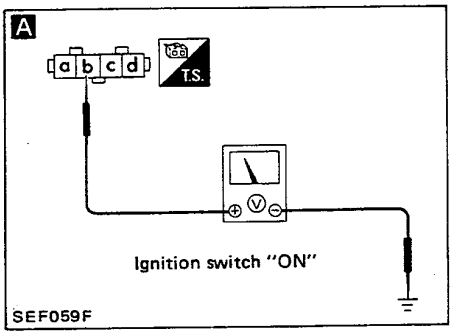
N.G.

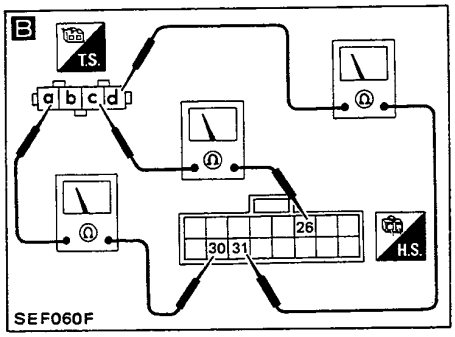
Replace crank angle sensor.

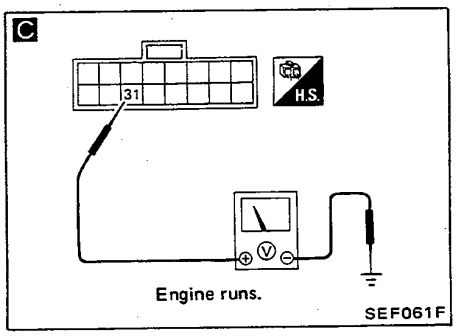
AIR FLOW METER (Code No. 12)



AIR FLOW METER (Code No. 12)







INSPECTION START

Perform self-diagnosis (Mode III).
Is code No. 12 indicated?

No → INSPECTION END

Yes

A

Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Battery voltage should exist.
If N.G., repair harness or connectors.

O.K.

B

Check continuity between terminals ⓐ and ㉚, ⓒ and ㉖ and ⓓ and ㉛.
Resistance:
Approximately 0Ω
If N.G., repair harness or connectors.

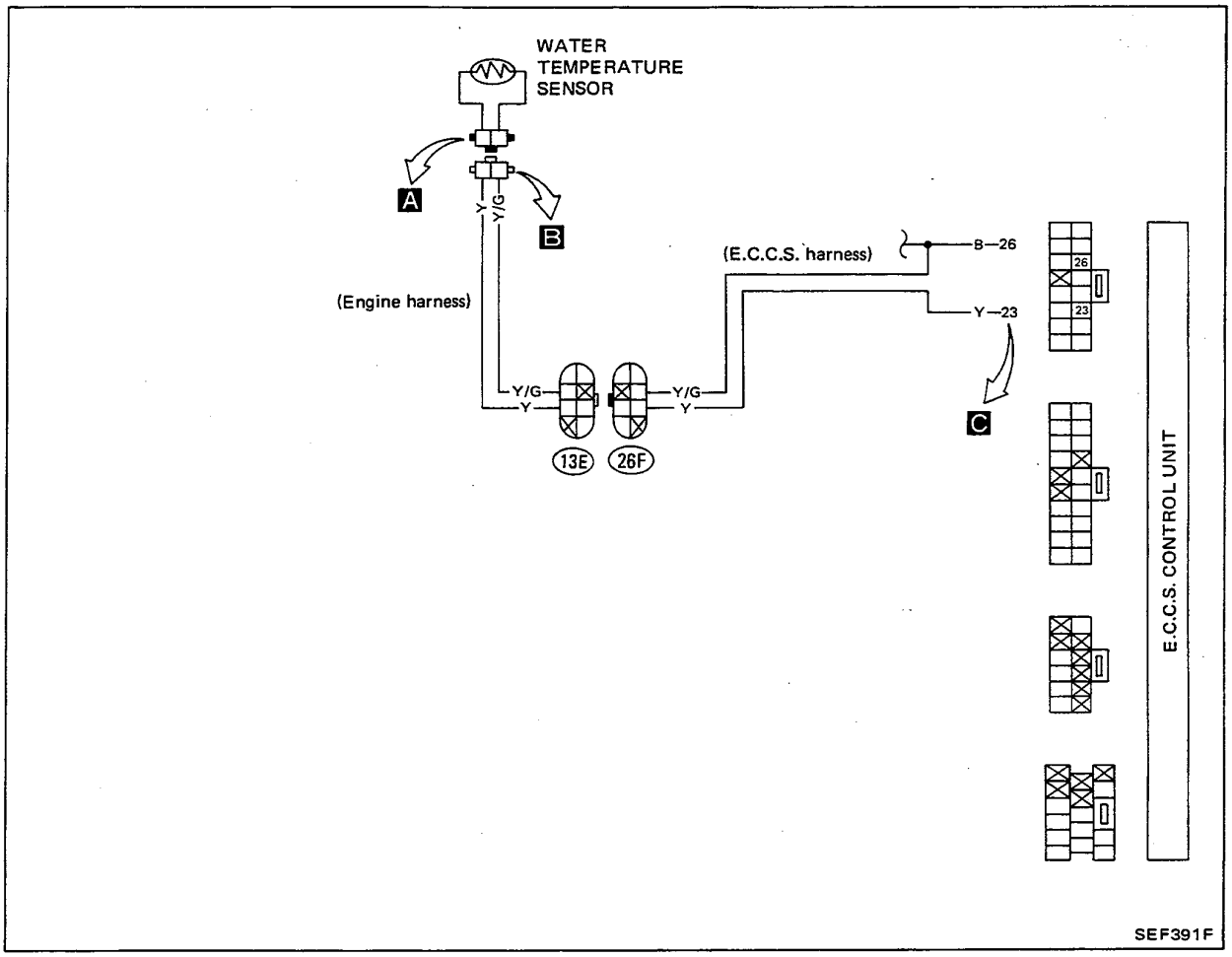
O.K.

C

Check input signal.
1) Reconnect air flow meter harness connector.
2) Start engine.
3) Make sure that voltage exists between E.C.U. terminal ㉛ and ground.
Voltage:
Approximately 1.5V (at idle)

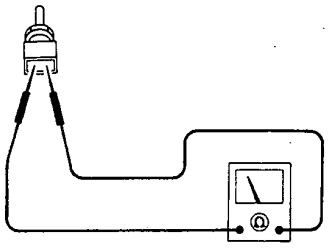
INSPECTION END

WATER TEMPERATURE SENSOR (Code No. 13)



WATER TEMPERATURE SENSOR (Code No. 13)

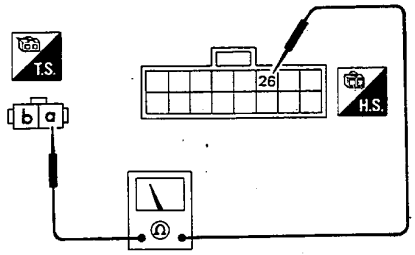
A



Temperature °C (°F)	Resistance (kΩ)
20 (68)	Approx. 2.5
80 (176)	Approx. 0.33

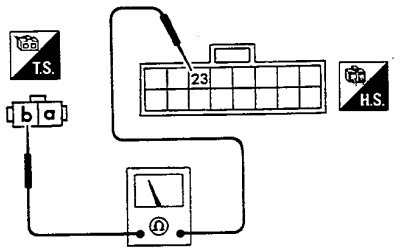
SEF062F

B



SEF063F

C



SEF064F

INSPECTION START

Perform self-diagnosis (Mode III).
Is code No. 13 indicated?

No → INSPECTION END

Yes

A

Check water temperature sensor resistance.
1) Disconnect water temperature sensor harness connector.
2) Check resistance of water temperature sensor.
Resistance is shown in illustration A.
If N.G., replace water temperature sensor.

O.K.

B

Check continuity between terminals ⓐ and ㉖.
Continuity should exist.
If N.G., repair harness or connectors.

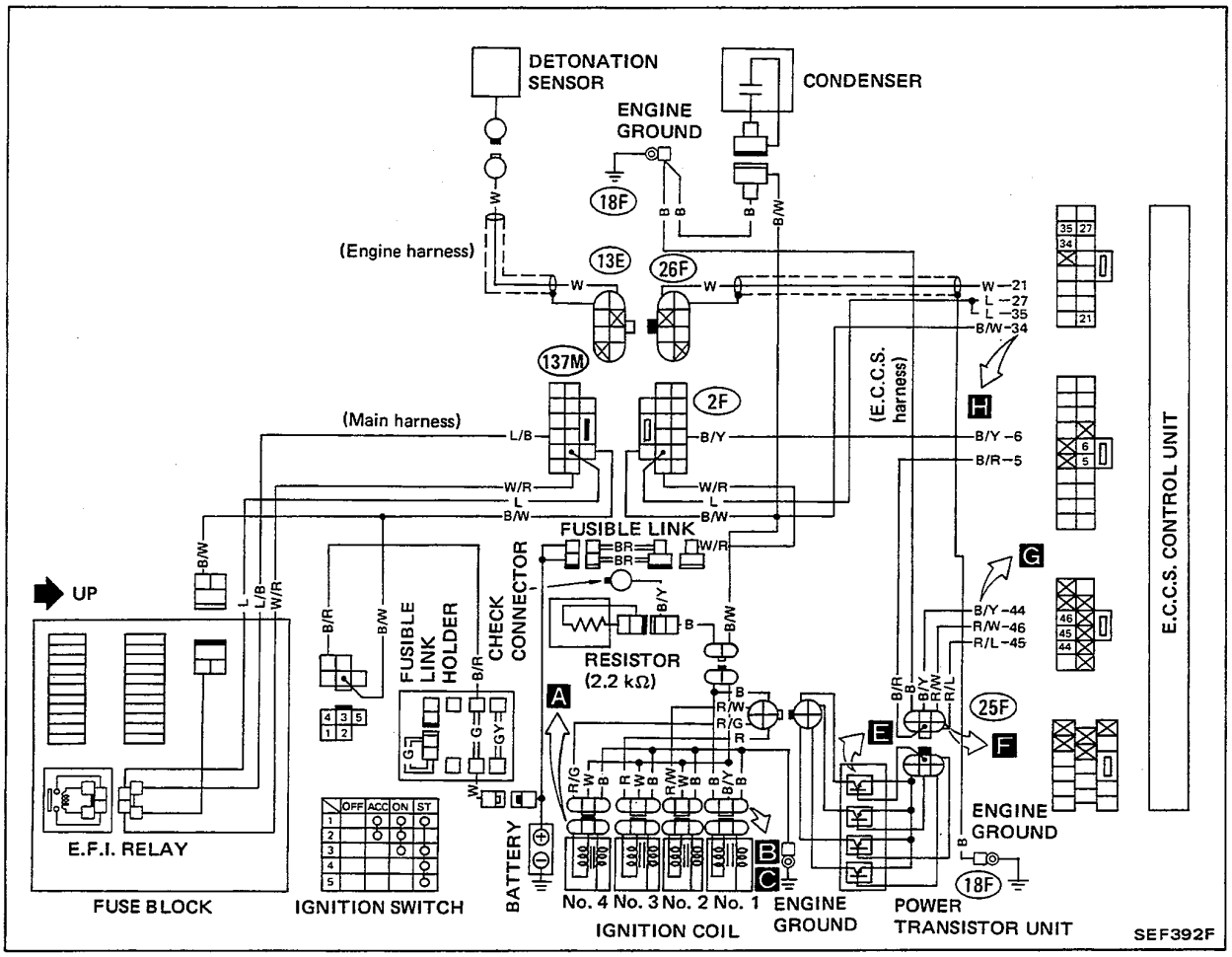
O.K.

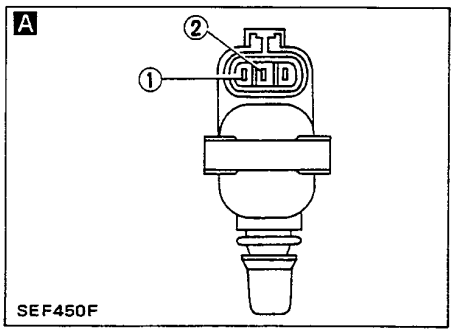
C

Check continuity between terminals ⓑ and ㉓.
Continuity should exist.
If N.G., repair harness or connectors.

INSPECTION END

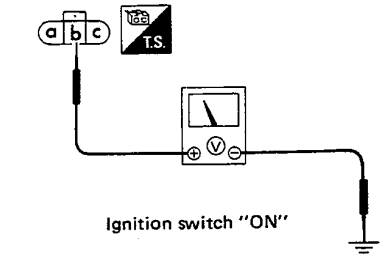
IGNITION SIGNAL (Code No. 21)



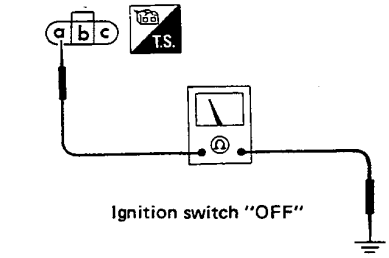


IGNITION SIGNAL (Code No. 21)

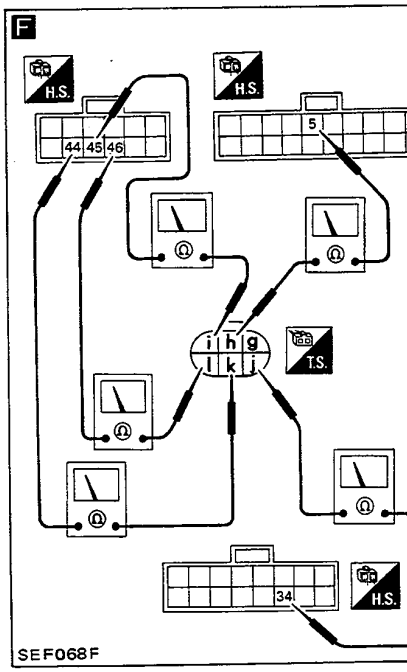
B



C



F



INSPECTION START

Perform self-diagnosis (Mode III).
Are code Nos. 21 or 34 indicated?

No → ⊕

Yes code 21

Yes code 34 → I

I
Check resistance of detonation sensor.
Resistance: 500 - 600 kΩ
If N.G., replace detonation sensor.

A
Check resistance of ignition coil.

Terminal	Resistance
① - ②	Approximately 0.7Ω

If N.G., replace ignition coil.

O.K.

B
Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage
If N.G., repair harness or connectors.

O.K.

C
1) Turn ignition switch "OFF".
2) Check continuity between terminal ⓖ and ground.
Continuity should exist.
If N.G., repair harness or connectors.

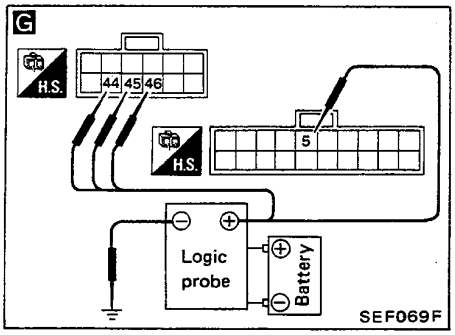
O.K.

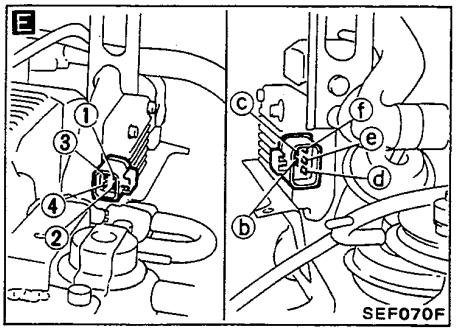
F
Check continuity between terminals ⓗ and ⑤, ⓘ and ㊺, ⓙ and ㉞, ⓚ and ㊹, ⓛ and ㊻.
Continuity:
Approximately 0Ω
If N.G., repair harness or connectors.

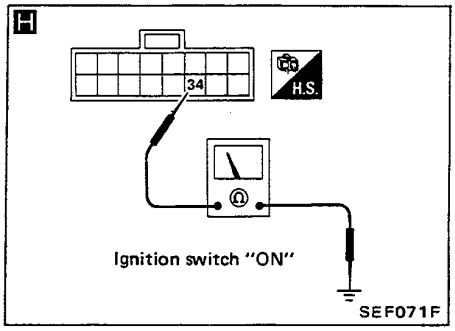
O.K.

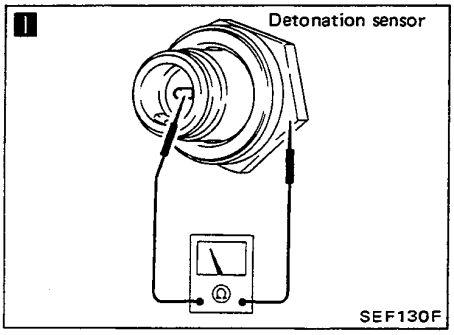
⊕⊕

IGNITION SIGNAL (Code No. 21)









G

Check output signal.
1) Start engine.
2) Make sure that pulse signals exist between E.C.U. terminals ⑤, ㊹, ㊺, ㊻ and ground with logic probe.
Pulse signal should exist.

N.G. → E

O.K.

E

Check power transistor unit.

Terminal combination				Measuring current of tester	Continuity	Measuring current of tester	Continuity
1 d	2 d	3 d	4 d	↑	Yes	↓	No
1 c	2 b	3 f	4 e	↑	Yes	↓	No
d c	d b	d f	d e	↑	Yes	↓	Yes

If N.G., replace power transistor unit.

H

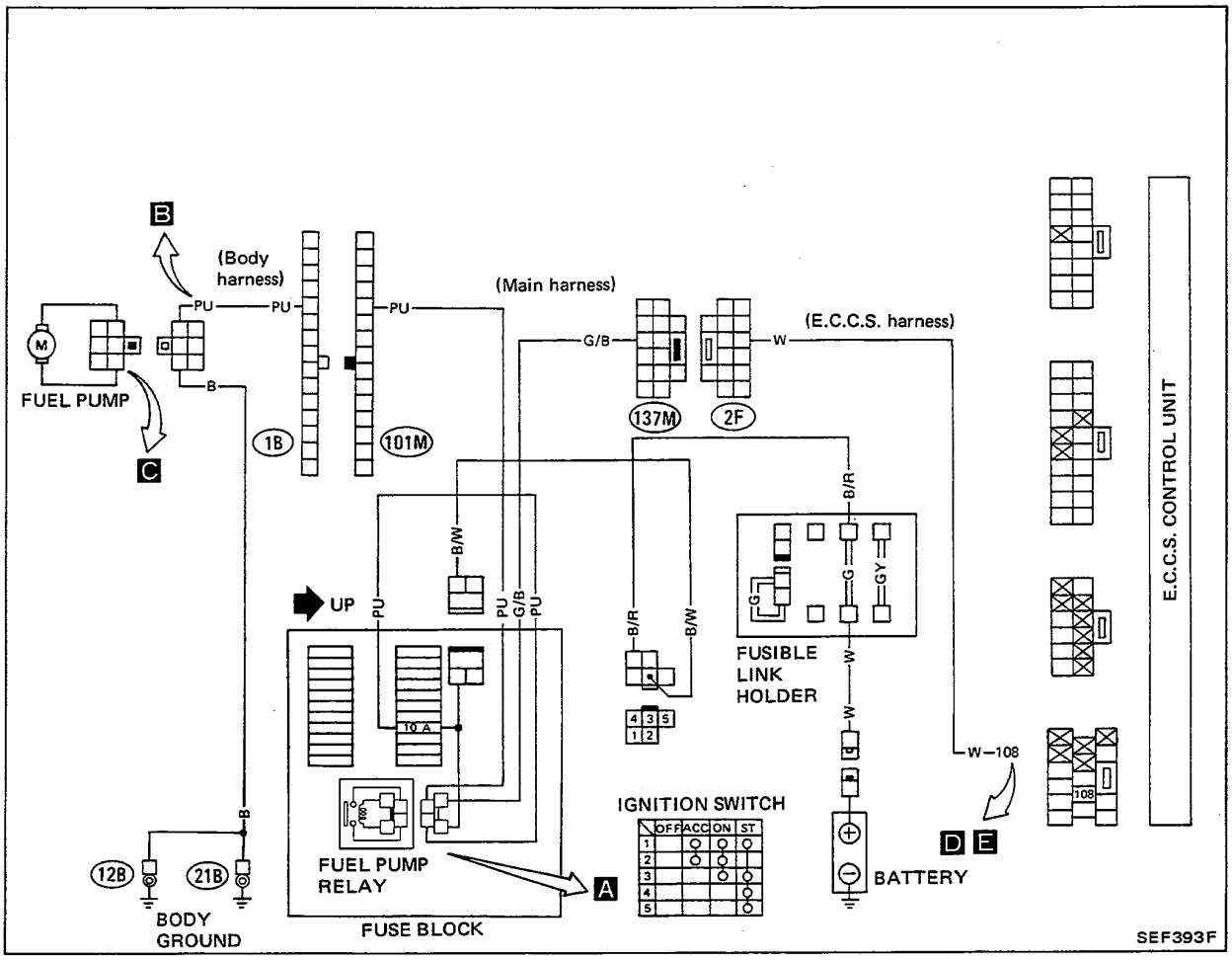
Check input signal.
1) Stop engine.
2) Turn ignition switch "ON".
3) Check voltage between E.C.U. terminal ㉞ and ground.
Voltage: Battery voltage
If N.G., repair harness or connectors.

O.K.

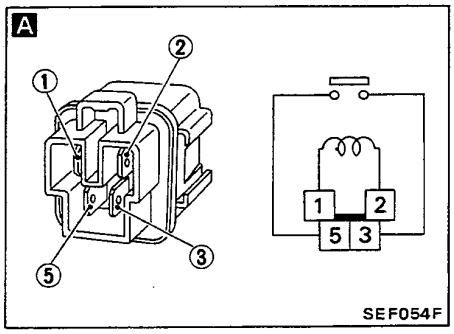
INSPECTION END

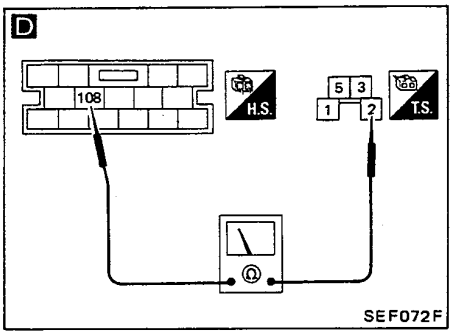
NOTE

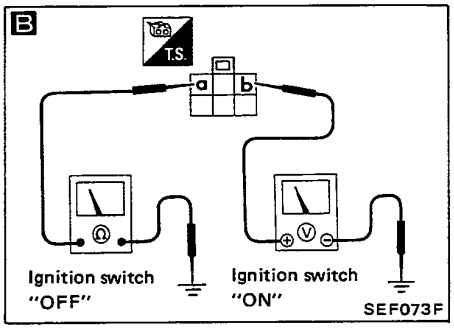
FUEL PUMP (Not self-diagnosis item)

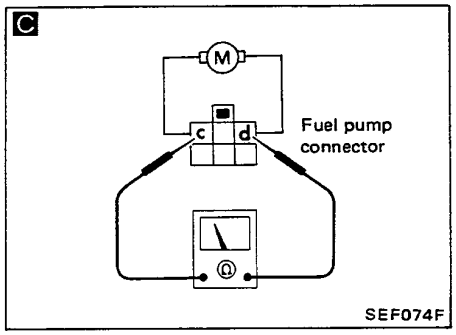


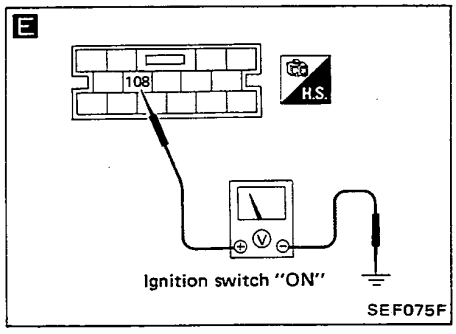
FUEL PUMP (Not self-diagnosis item)











INSPECTION START

A

Check fuel pump relay.

Condition	Continuity between terminals ③ and ⑤
Supply 12V direct current between terminals ① and ②	Yes
Not supply	No

If N.G., replace relay.

O.K.

D

Check continuity between E.C.U. terminal (108) and fuel pump relay harness terminal ③.
If N.G., repair harness or connectors.

O.K.

B

Check power source.
1) Turn ignition switch "ON" and check voltage between terminal ⓑ and ground.
Battery voltage should exist for 5 seconds after turning ignition switch "ON".
2) Turn ignition switch "OFF" and check continuity terminal ⓐ and ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

C

Check fuel pump.
- Disconnect fuel pump harness connector.
- Check resistance between terminals ⓐ and ⓓ.
Continuity should exist.
If N.G., replace fuel pump.

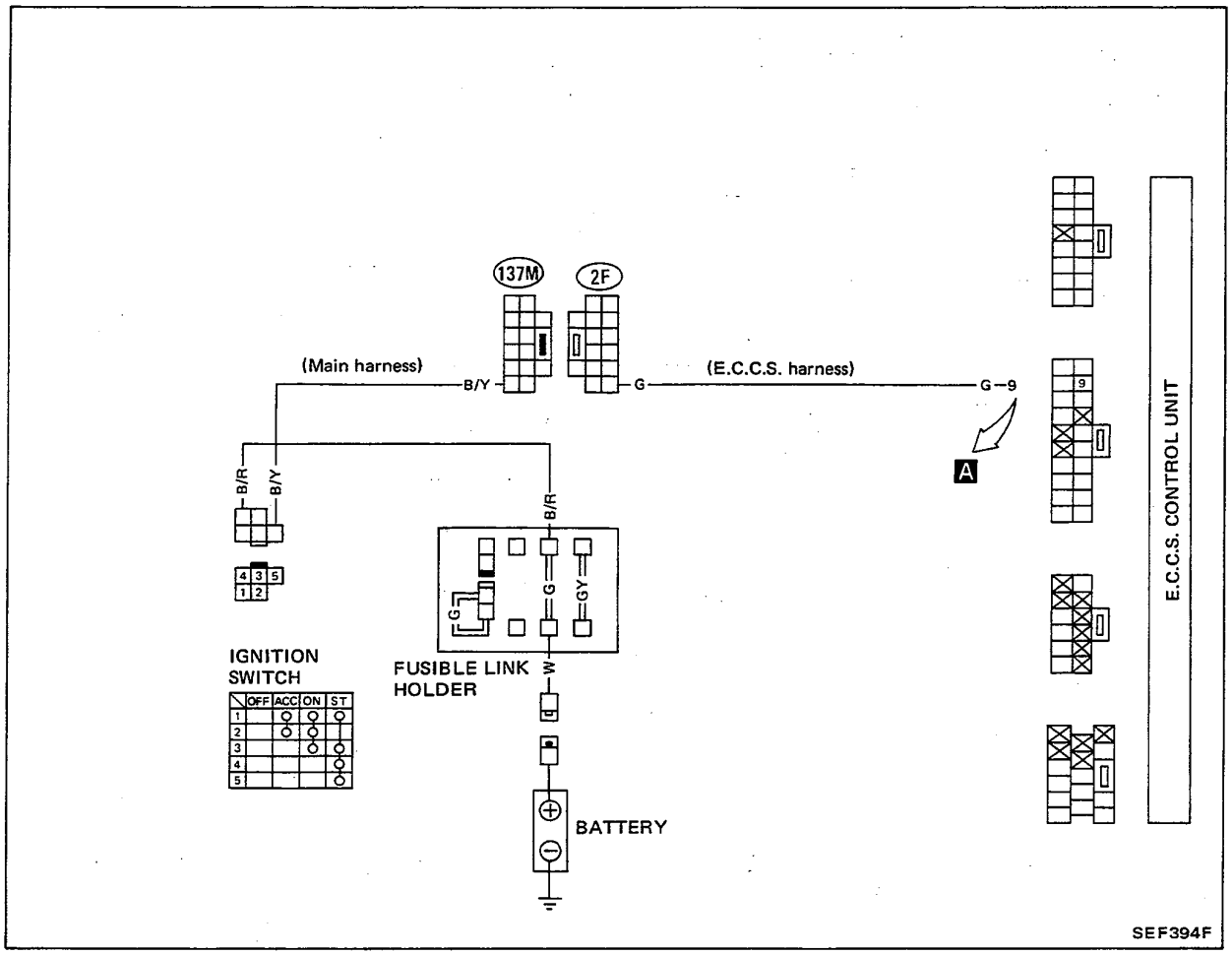
O.K.

E

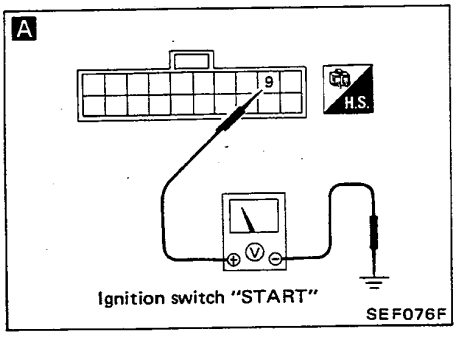
Check output signal.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal (108) and ground.
Battery voltage should exist after 5 seconds.

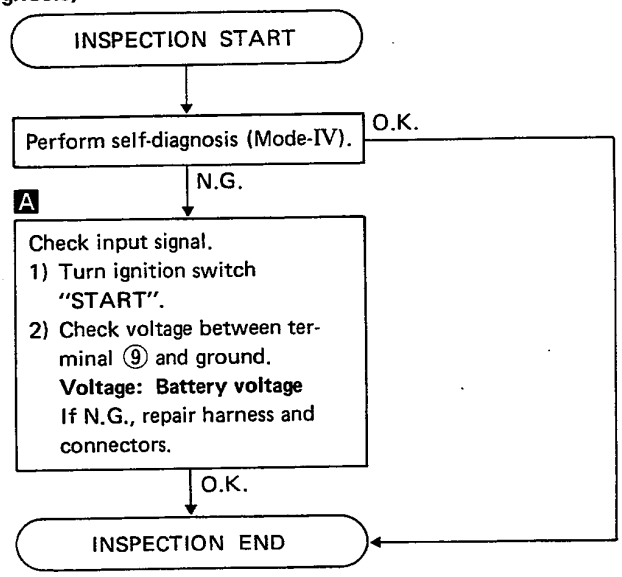
INSPECTION END

START SIGNAL (Switch ON/OFF diagnosis)

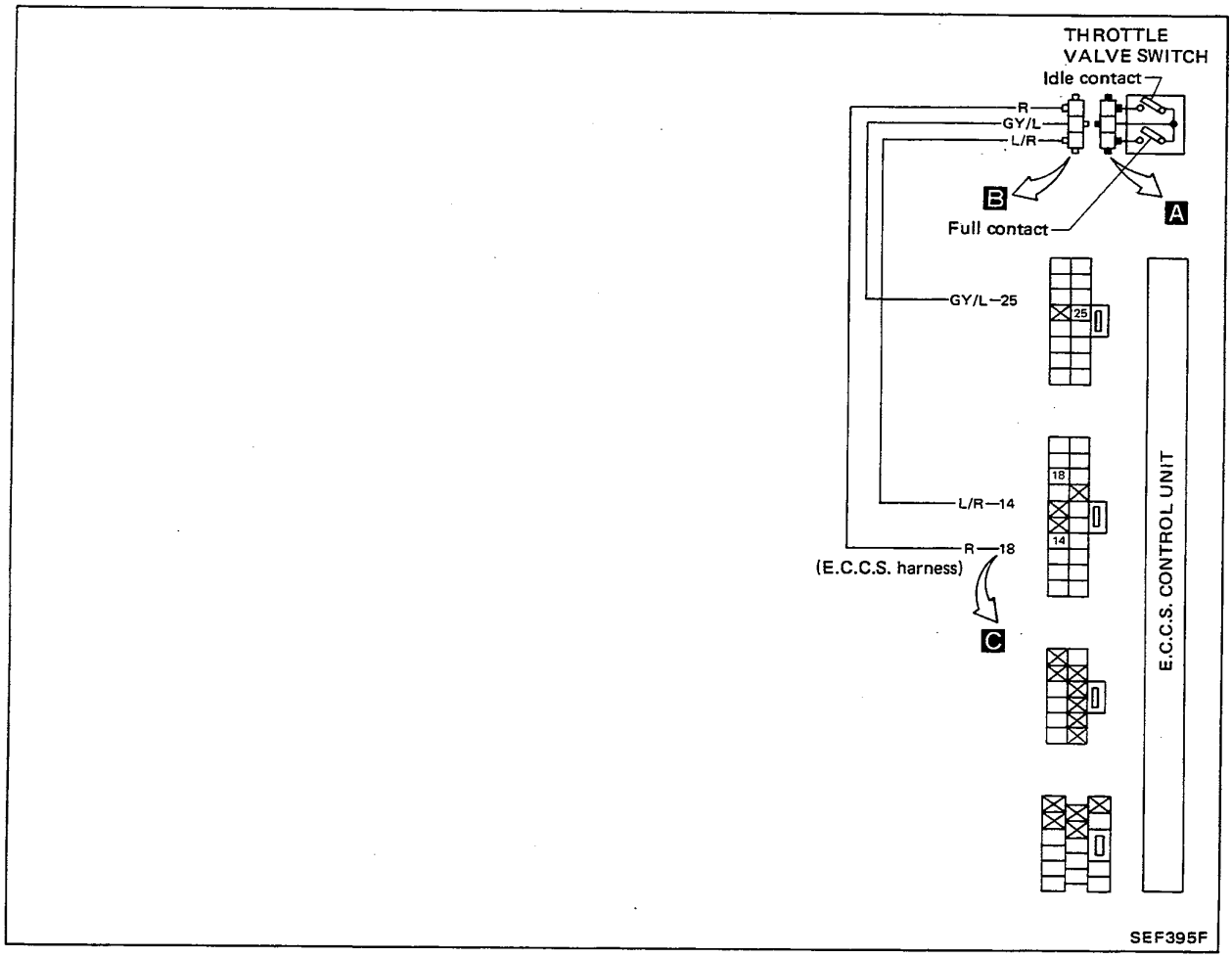


START SIGNAL (Switch ON/OFF diagnosis)

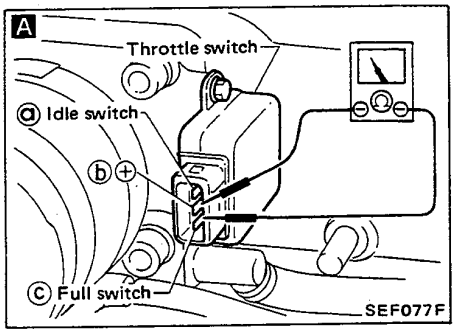


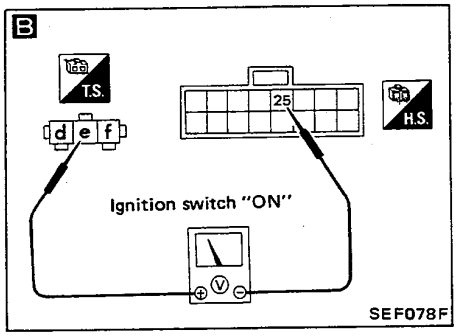


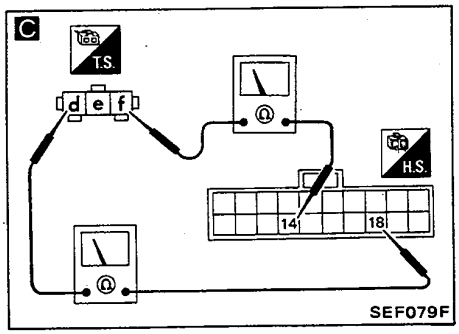
THROTTLE VALVE SWITCH (Switch ON/OFF diagnosis)



THROTTLE VALVE SWITCH (Switch ON/OFF diagnosis)







INSPECTION START

A

Check throttle valve switch (idle switch and full switch).

Accelerator pedal position	Continuity
Released	ⓐ - ⓑ
Depressed	ⓑ - ⓒ

If N.G., replace throttle valve switch.

O.K.

B

Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminals ⓔ and ㉕.
   Voltage: 9 - 10V
   If N.G., repair harness or connectors.

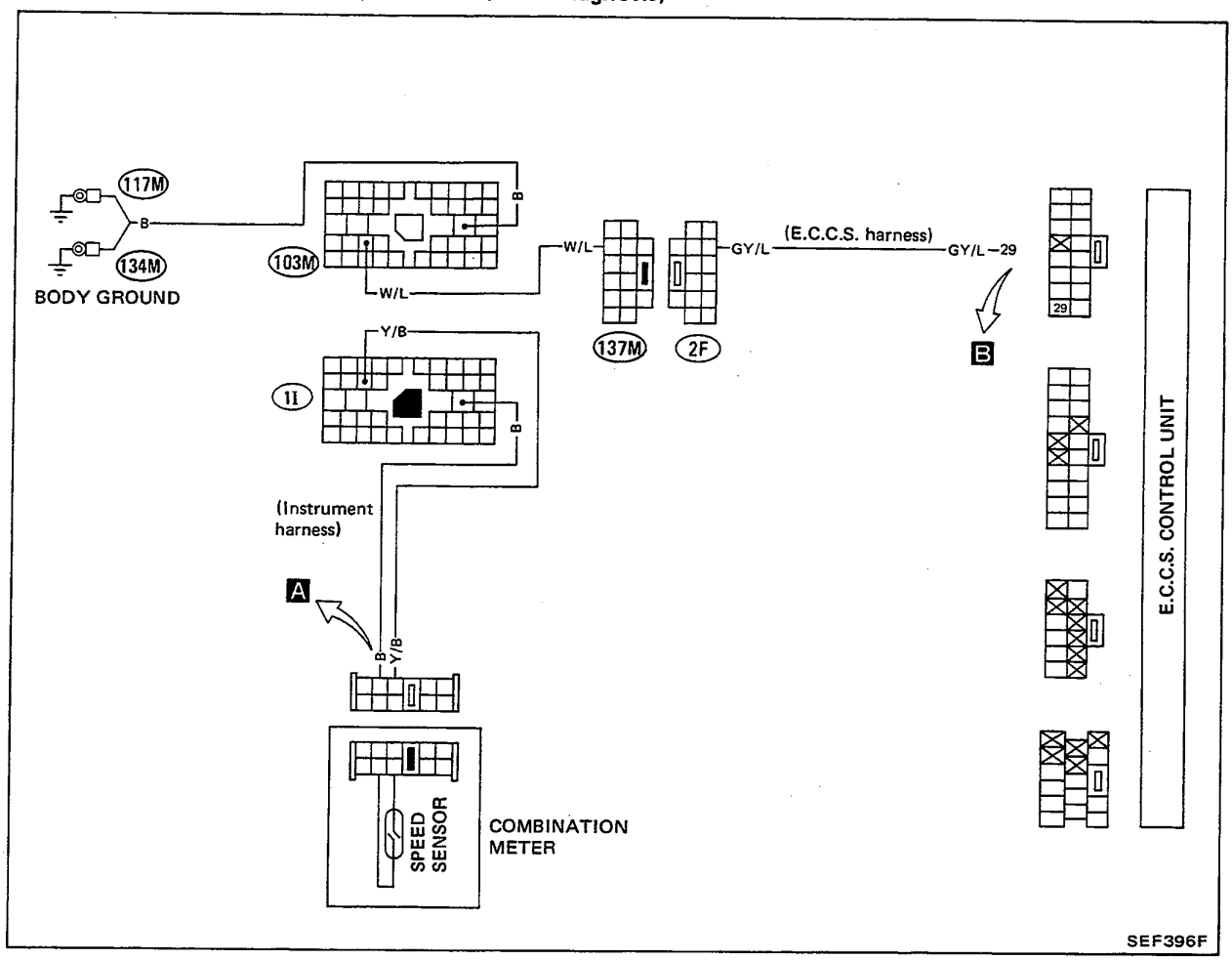
O.K.

C

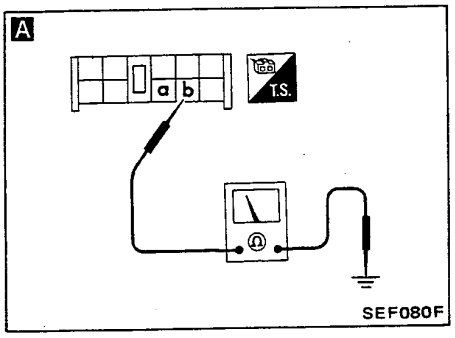
1) Turn ignition switch "OFF".
2) Check continuity between terminals ⓓ and ⑱, ⓕ and ⑭.
   Continuity should exist.
   If N.G., repair harness or connectors.

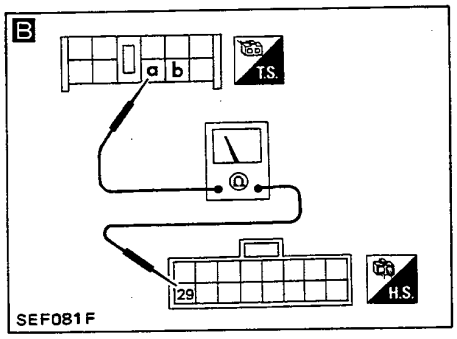
INSPECTION END

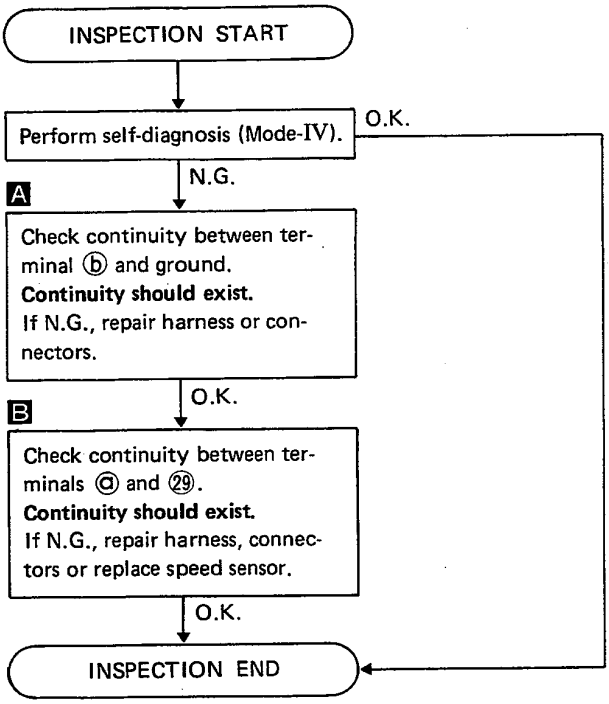
VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis)



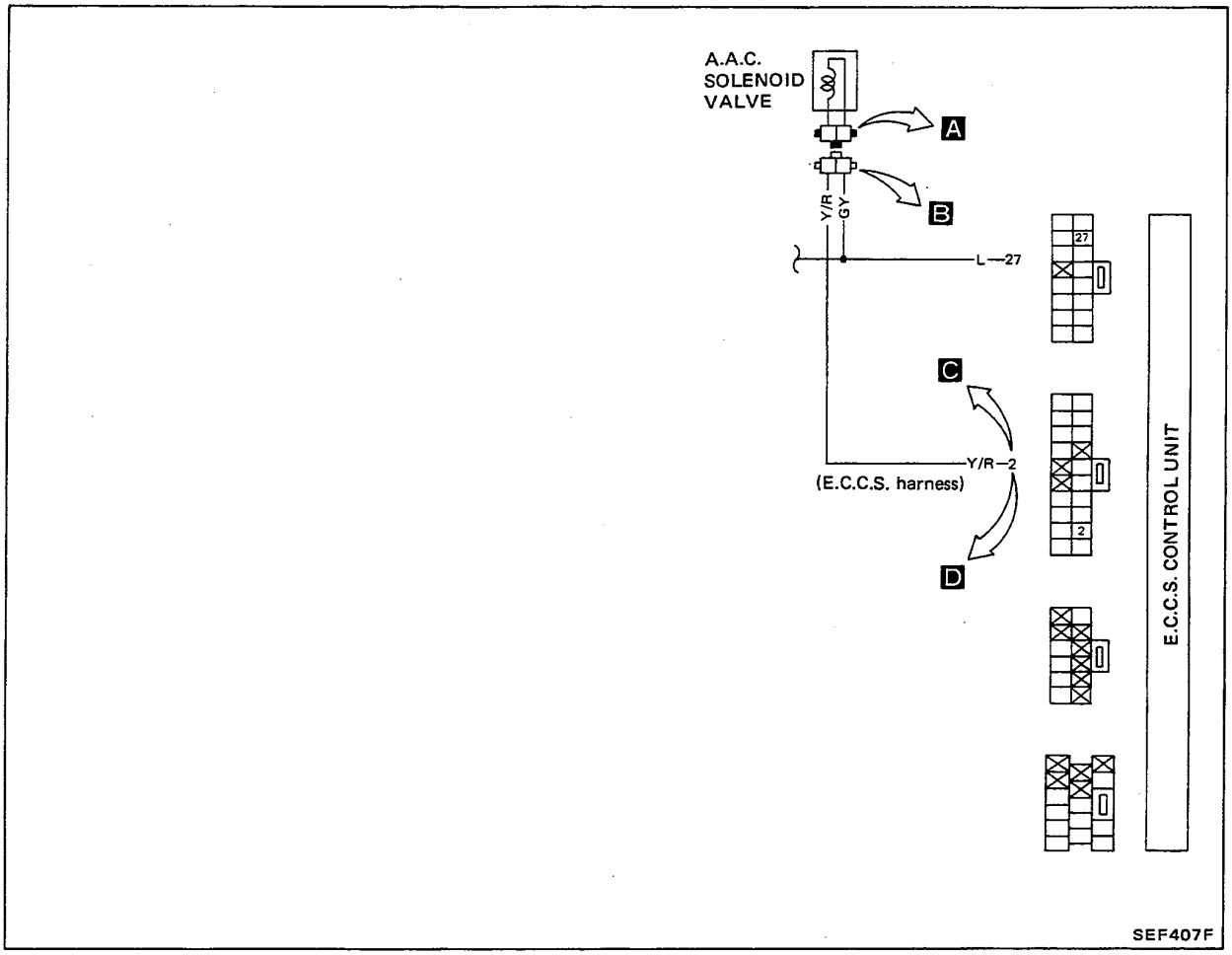
VEHICLE SPEED SENSOR (Switch ON/OFF diagnosis)



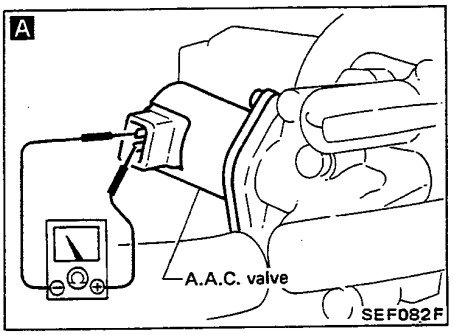


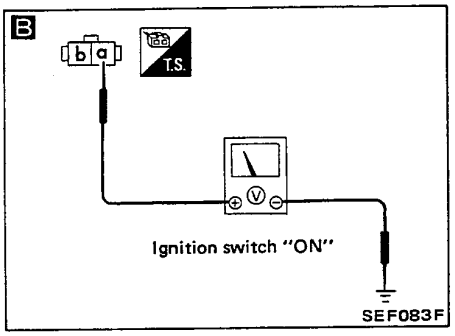


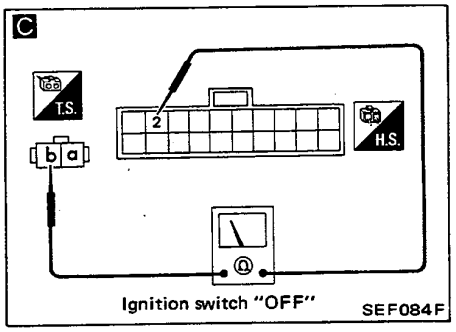
AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnostic item)

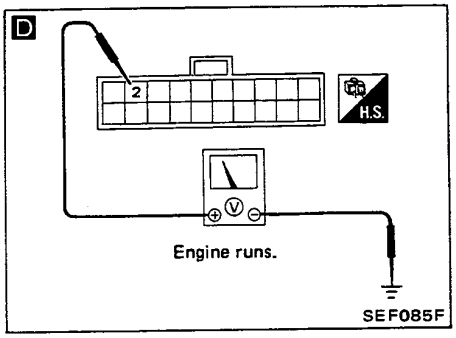


AUXILIARY AIR CONTROL (A.A.C.) VALVE (Not self-diagnostic item)









INSPECTION START

A

Check resistance of A.A.C. valve.
Resistance:
Approximately 10Ω
If N.G., replace A.A.C. valve.

B

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
If N.G., repair harness or connectors.

C

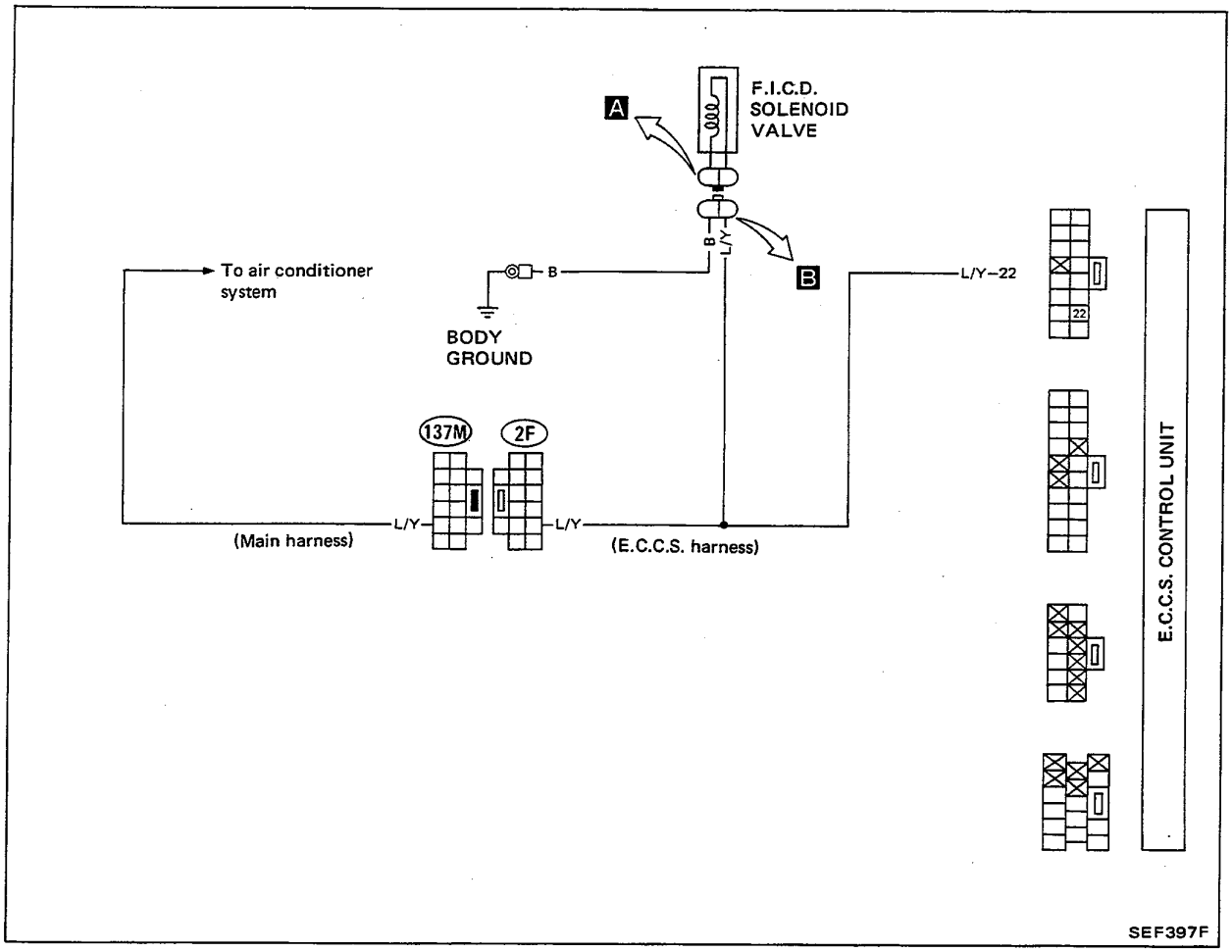
1) Turn ignition switch "OFF".
2) Check continuity between terminals ⓑ and ②.
Continuity should exist.
If N.G., repair harness or connectors.

D

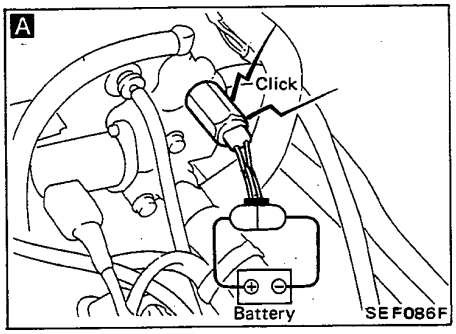
Check input signal.
1) Reconnect E.C.U. connector and A.A.C. valve harness connector.
2) Start engine and warm it up sufficiently.
3) Check voltage between E.C.U. terminal ② and ground.
Voltage: approx. 7 - 11 V

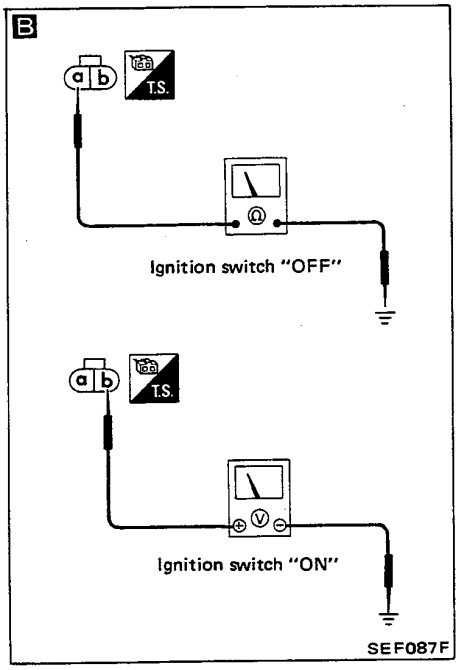
INSPECTION END

I.A.A. CONTROL (F.I.C.D. CONTROL) (Not self-diagnosis item)



I.A.A. CONTROL (F.I.C.D. CONTROL) (Not self-diagnosis item)





INSPECTION START

A

Check F.I.C.D. solenoid valve.
Supply 12V direct current to F.I.C.D. solenoid valve and check for its operating sound.

If N.G., replace F.I.C.D. solenoid valve.

O.K.

B

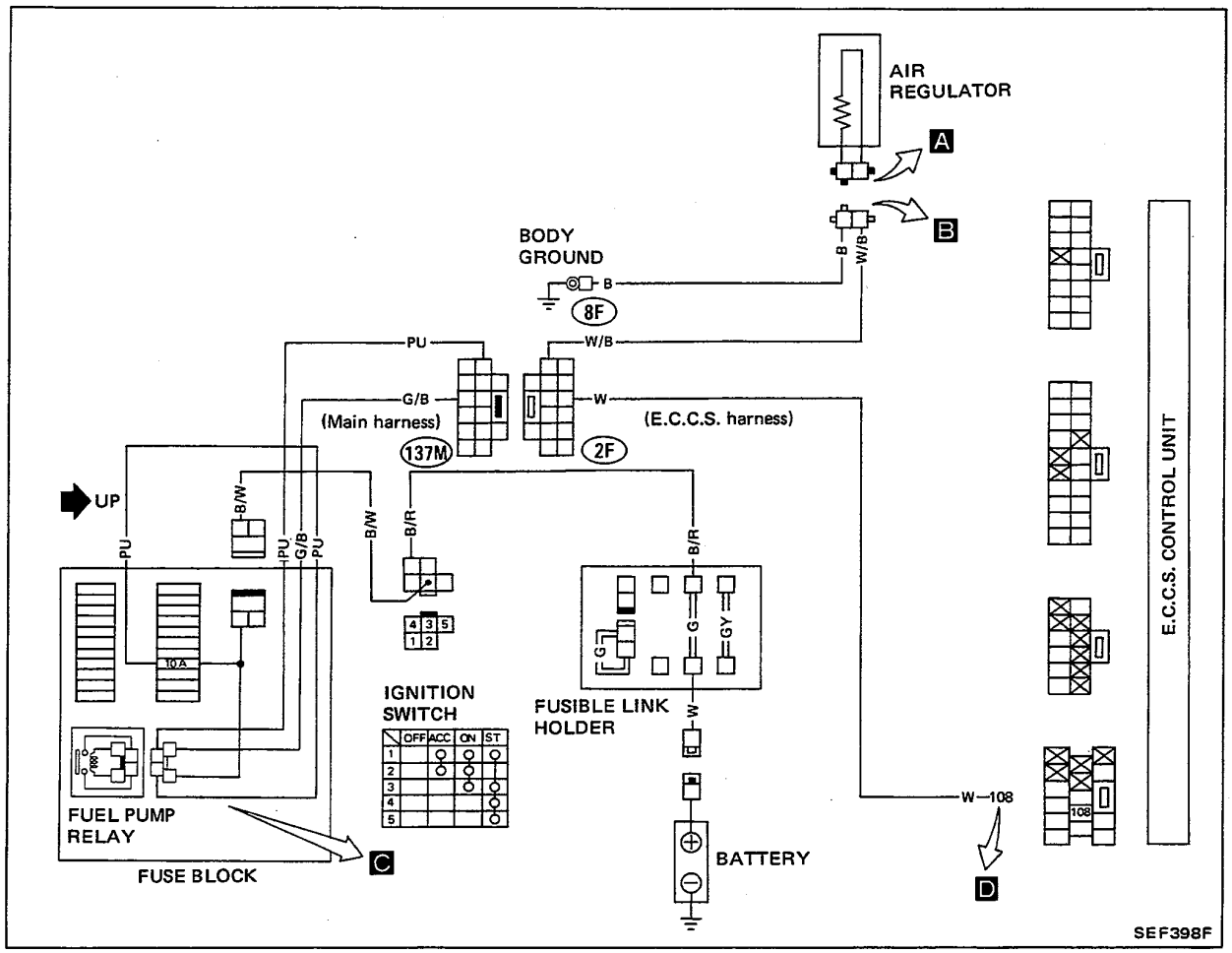
Check power source and ground circuit.
1) Check continuity between ⓐ and ground.
Continuity should exist.
2) Turn ignition switch "ON" and check voltage between terminal ⓑ and ground.

Air conditioner	Voltage between terminal ⓑ and ground
ON	Battery voltage
OFF	0V

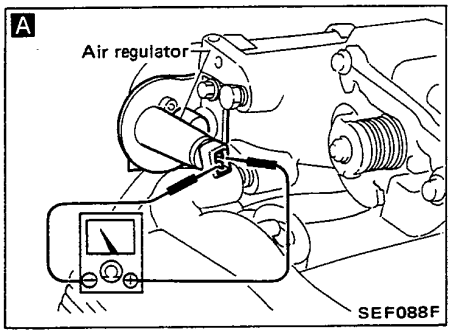
If N.G., repair harness or connectors.

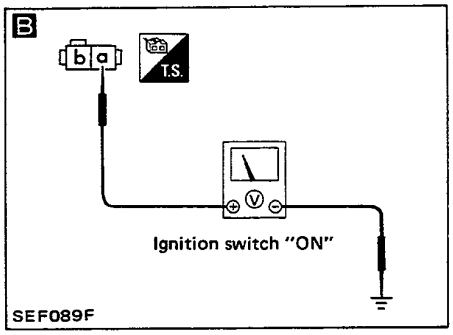
INSPECTION END

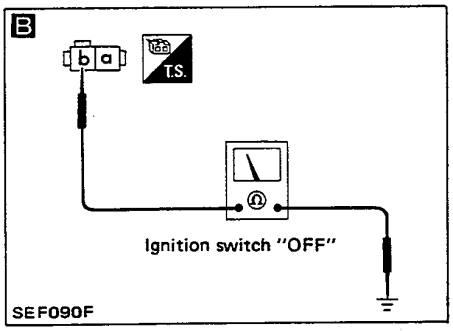
AIR REGULATOR (Not self-diagnostic item)

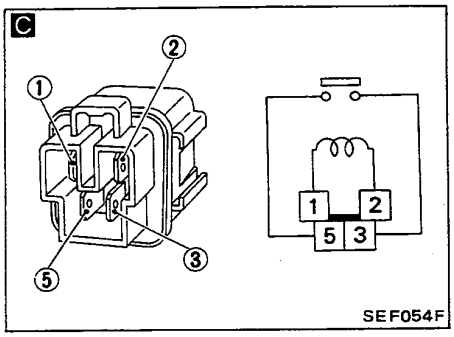


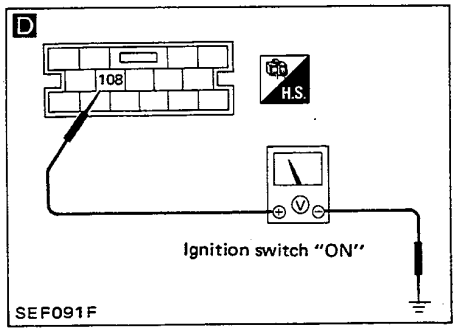
AIR REGULATOR (Not self-diagnostic item)











INSPECTION START

A

Check air regulator.
Check resistance of air regulator.
Resistance:
Approximately 70Ω
If N.G., replace air regulator valve.

B

1) Turn ignition switch "ON".
2) Check voltage between terminal ⓐ and ground.
Battery voltage should exist 5 seconds after turning ignition switch "ON".

N.G. →

C

Check fuel pump relay.

Condition	Continuity between terminals ③ and ⑤
Supply 12V direct current between terminals ① and ②	Yes
Not supply	No

If N.G., replace relay.

O.K. ↓

Repair harness or connectors.

O.K. ↓

B

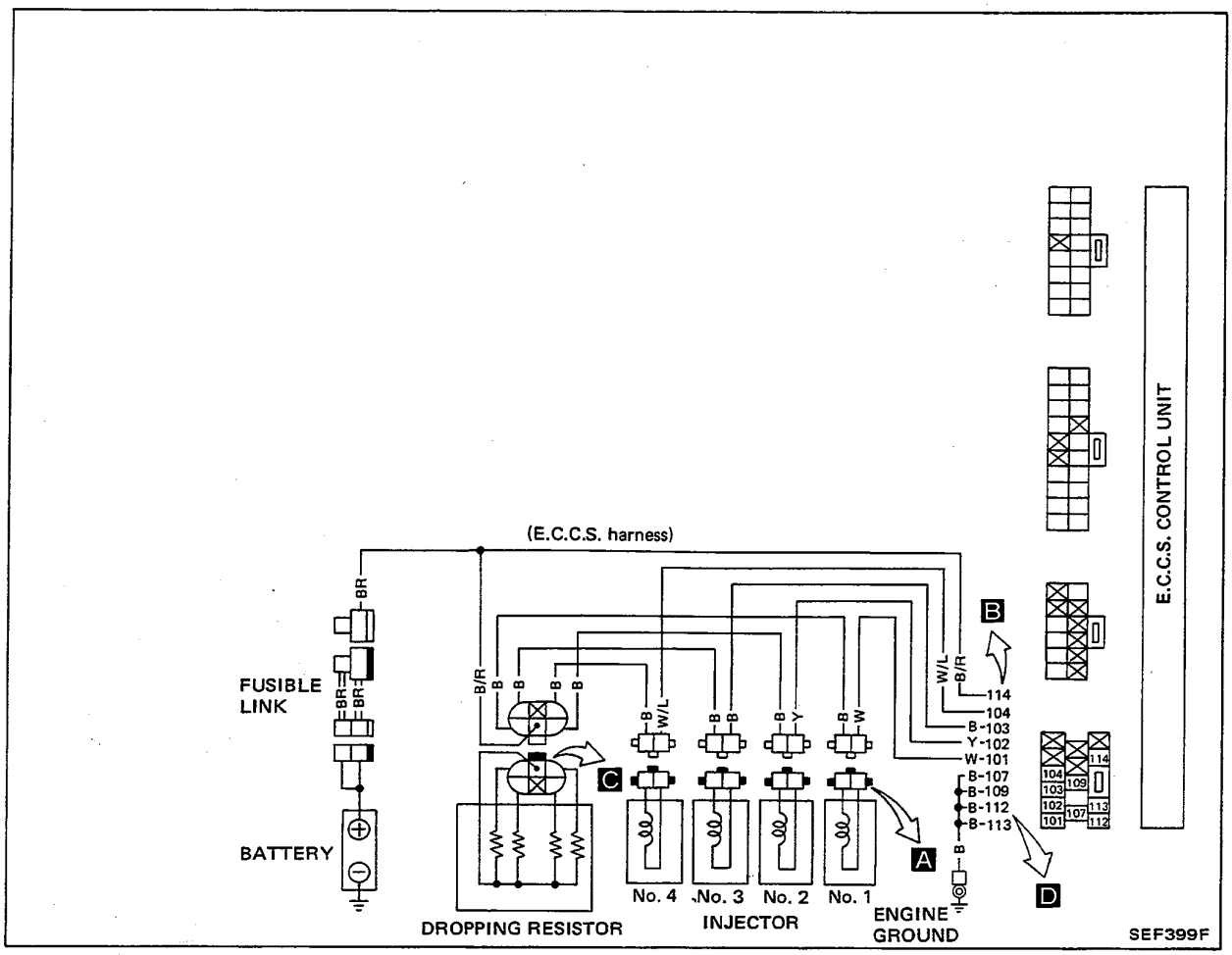
1) Turn ignition switch "OFF".
2) Check continuity between terminal ⓑ and ground.
Continuity should exist.
If N.G., repair harness or connectors.

D

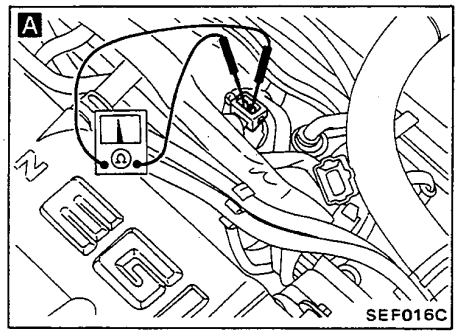
Check output signal.
1) Turn ignition switch "ON".
2) Check voltage between E.C.U. terminal (108) and ground.
Battery voltage should appear after 5 seconds.

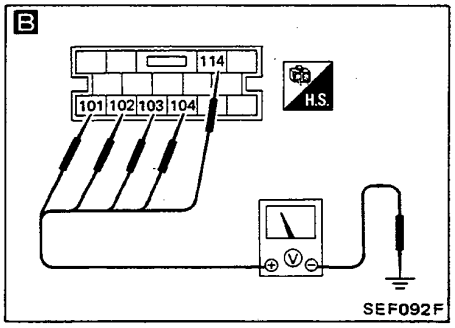
INSPECTION END

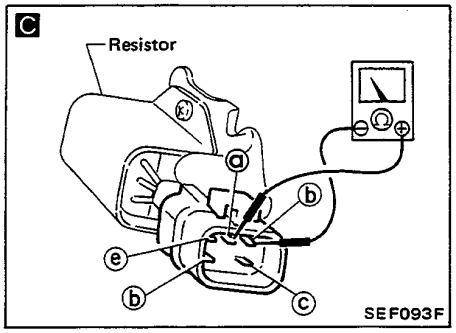
INJECTOR (Not self-diagnosis item)

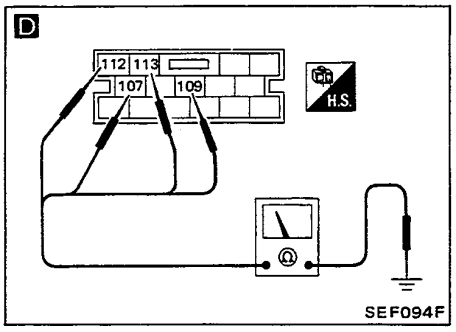


INJECTOR (Not self-diagnosis item)









INSPECTION START

A

Check resistance of each injector.
Resistance:
Approximately 2.5Ω
If N.G., replace injector.

O.K.

B

Check power source.
1) Start engine.
2) Check voltage between terminals (101), (102), (103), (104), (114) and ground.
Voltage:
(114): **Battery voltage**
(101), (102), (103), (104):
Voltage varies between 0V and 12V.

N.G.

C

Check dropping resistor.
1) Check resistance between terminals ⓐ - ⓑ, ⓐ - ⓒ, ⓐ - ⓓ and ⓐ - ⓔ.
Resistance: 6Ω
If N.G., replace resistor.

O.K.

O.K.

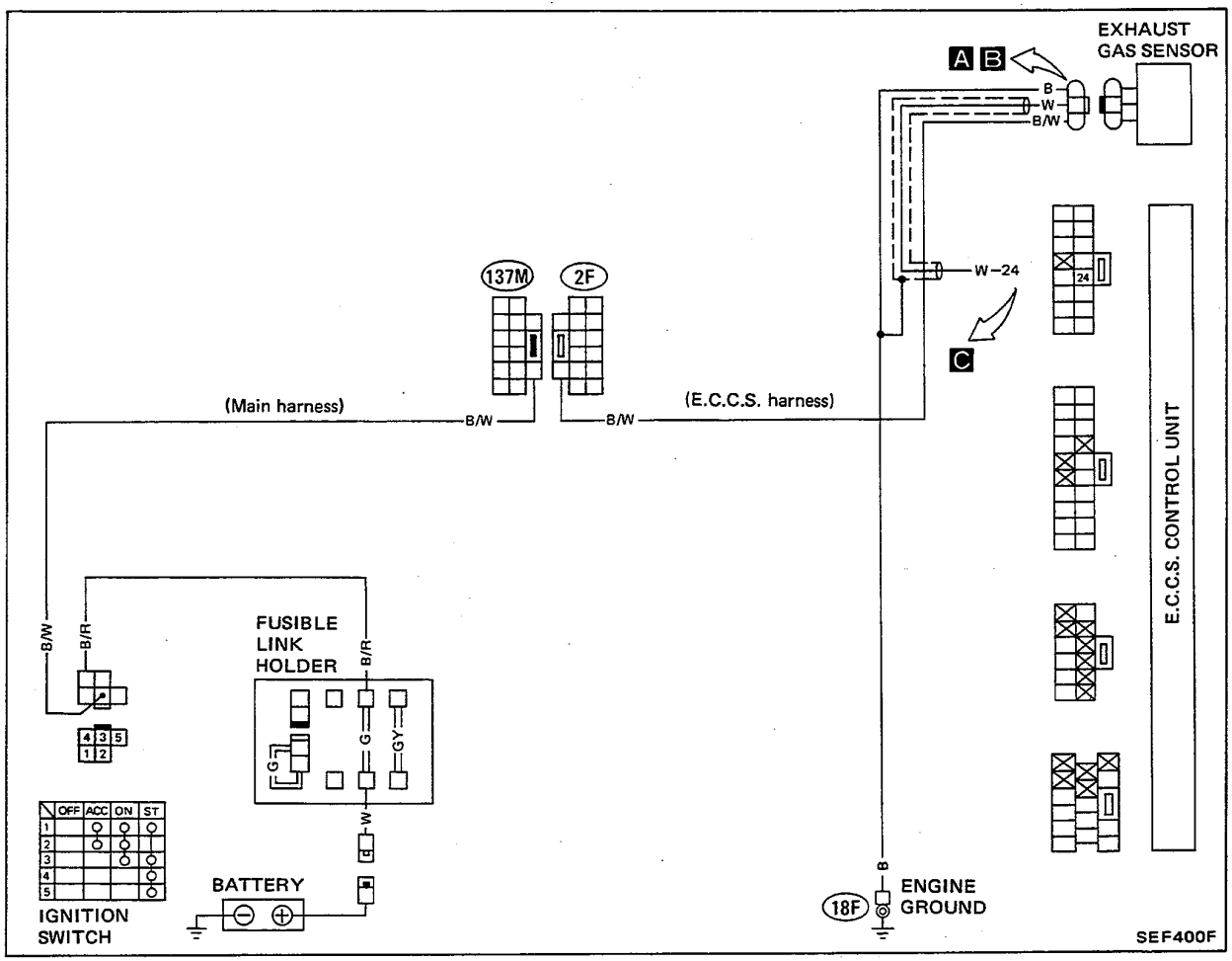
D

1) Check resistance between terminals (107), (109), (112), (113) and ground.
Resistance:
Approximately 0Ω
If N.G., repair harness.

O.K.

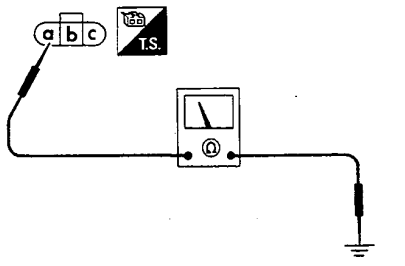
INSPECTION END

EXHAUST GAS SENSOR (Not self-diagnostic item)



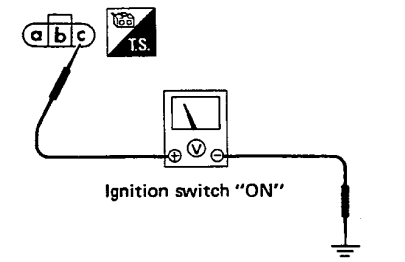
EXHAUST GAS SENSOR (Not self-diagnostic item)

A



SEF095F

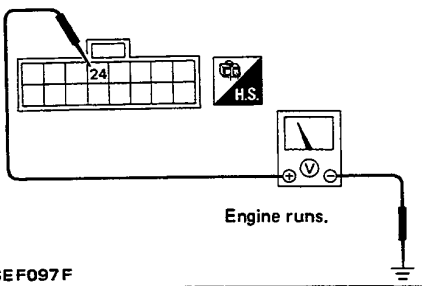
B



Ignition switch "ON"

SEF096F

C



Engine runs.

SEF097F

INSPECTION START

Check flashes of inspection lamps on E.C.U.
1) Warm up engine sufficiently.
2) Make sure that green inspection lamp goes on and off 9 times or more during 10 seconds at 2,000 rpm.

O.K. → INSPECTION END

N.G.

A

Check continuity between terminal ⓐ and ground.
Continuity should exist.
If N.G., repair harness or connectors.

O.K.

B

1) Turn ignition switch "ON".
2) Check voltage between terminal ⓒ and ground.
Voltage: Battery voltage
If N.G., repair harness or connectors.

O.K.

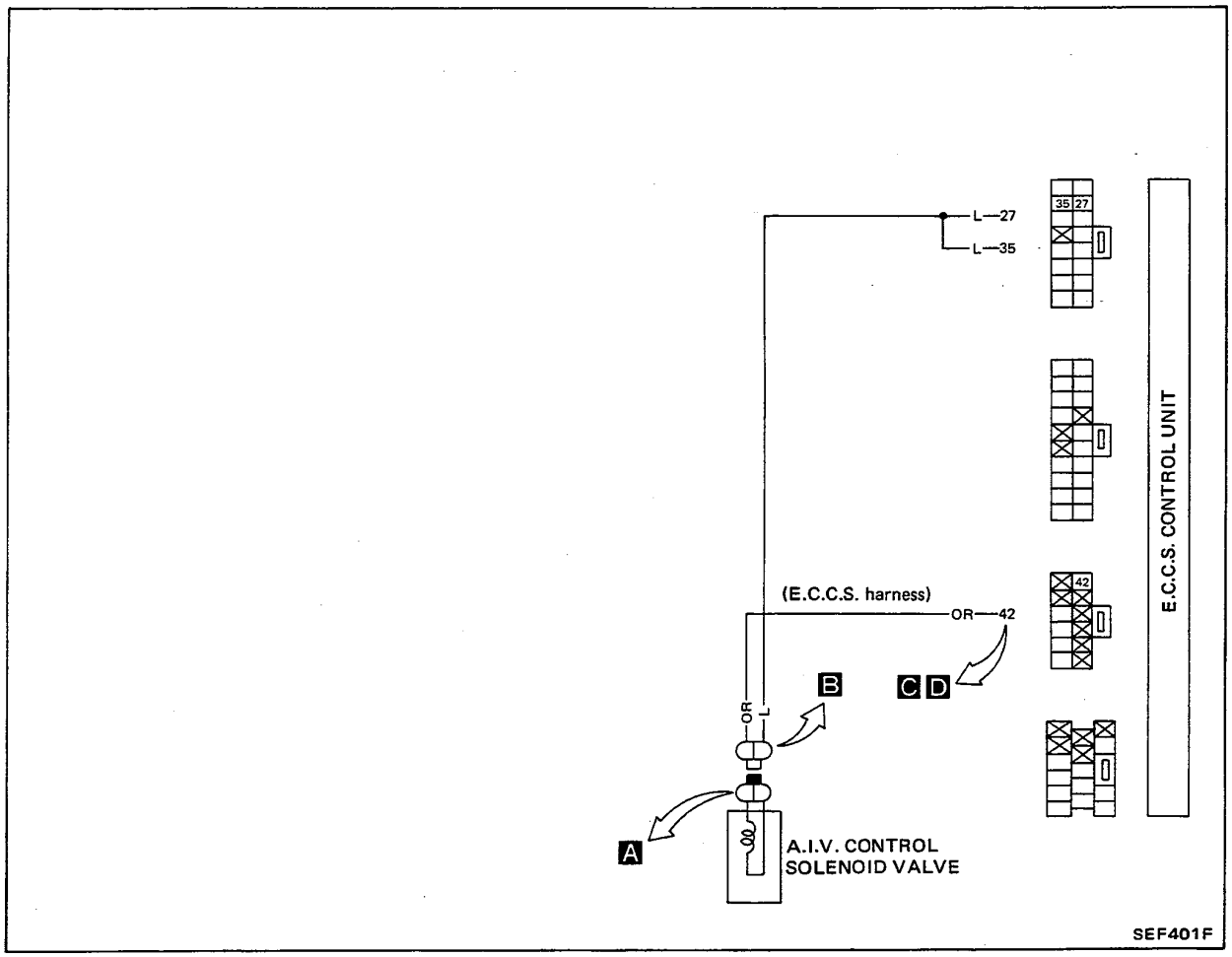
C

Check input signal to E.C.U.
1) Start engine and make sure that engine has warmed up sufficiently.
If not, warm it up.
2) Check voltage between E.C.U. terminal ㉔ and ground.
Voltage should change between 0V and 1V.
If N.G., repair harness, connectors or Exhaust gas sensor.

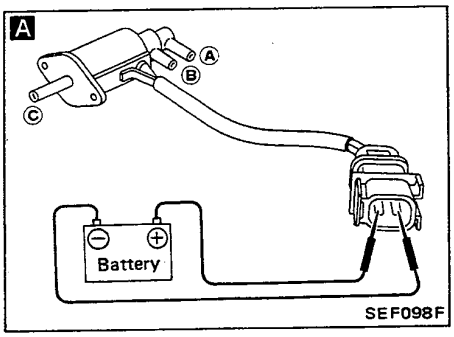
O.K.

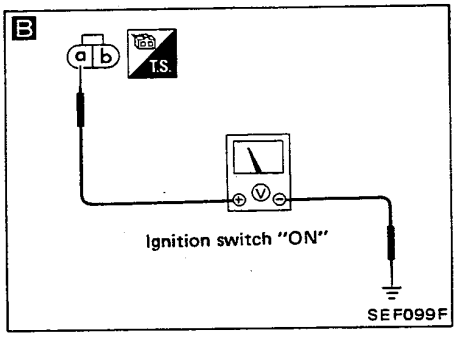
INSPECTION END

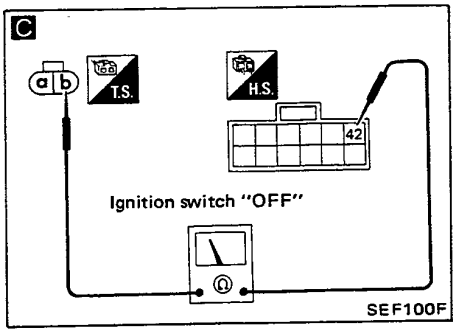
AIR INJECTION VALVE (A.I.V.) CONTROL (Not self-diagnostic item)

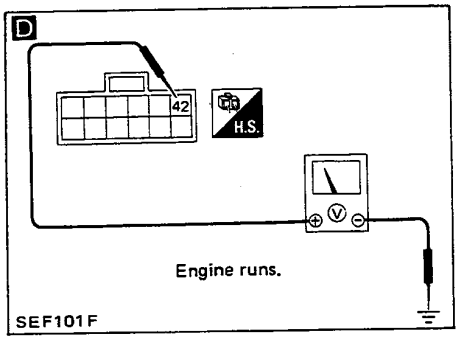


AIR INJECTION VALVE (A.I.V.) CONTROL (Not self-diagnostic item)









INSPECTION START

A

Check A.I.V. control solenoid valve.

Condition	Continuity
Supply 12V direct current to A.I.V. control solenoid valve	Only Ⓐ - Ⓑ
Not supply	Only Ⓑ - Ⓒ

If N.G., replace A.I.V. control solenoid valve.

O.K.

B

Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓐ and ground.
   Voltage: Battery voltage
   If N.G., repair harness or connectors.

O.K.

C

1) Turn ignition switch "OFF".
2) Check continuity between terminals ⓑ and ㊷.
   Continuity should exist.
   If N.G., repair harness or connectors.

O.K.

D

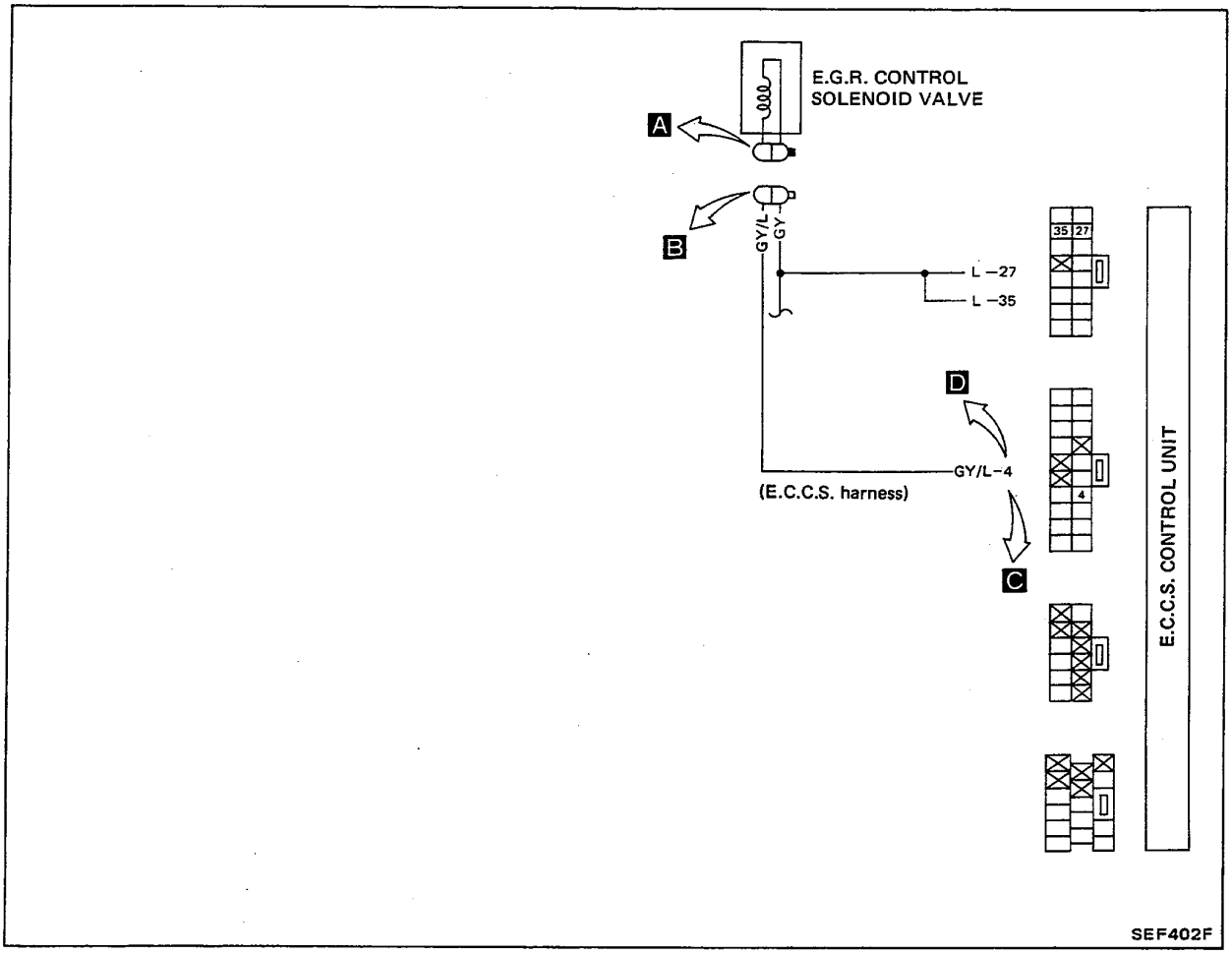
Check output signal.
1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ㊷ and ground.

Accelerator pedal position	Voltage
Released	Approximately 0.8V
Depressed	Battery voltage

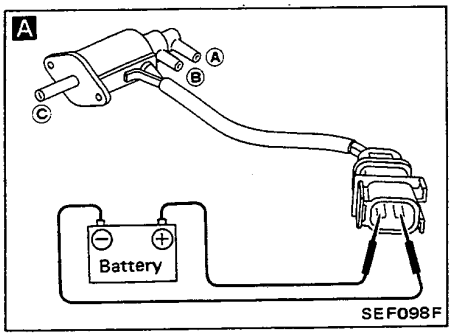
O.K.

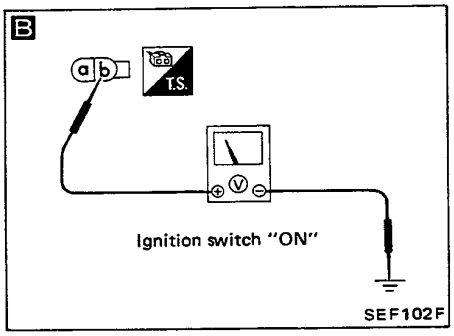
INSPECTION END

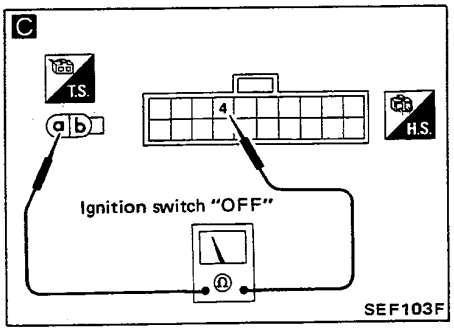
E.G.R. CONTROL (Not self-diagnosis item)

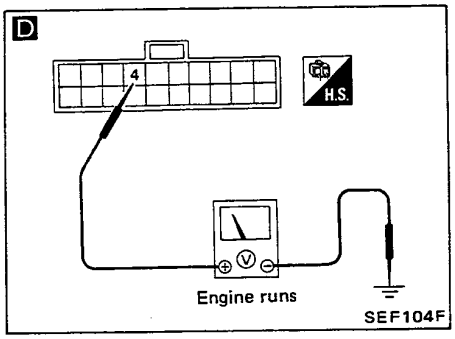


E.G.R. CONTROL (Not self-diagnosis item)









INSPECTION START

A

Check E.G.R. control solenoid valve.

Condition	Continuity
Supply 12V direct current to E.G.R. control solenoid valve	Only Ⓐ - Ⓑ
Not supply	Only Ⓑ - Ⓒ

If N.G., replace E.G.R. control solenoid valve.

O.K.

B

Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
   Voltage: Battery voltage
   If N.G., repair harness.

O.K.

C

1) Turn ignition switch "OFF".
2) Check continuity between terminals ⓐ and ④.
   Continuity should exist.
   If N.G., repair harness or connectors.

O.K.

D

Check output signal.
1) Start engine and warm it up sufficiently.
2) Check voltage between E.C.U. terminal ④ and ground.

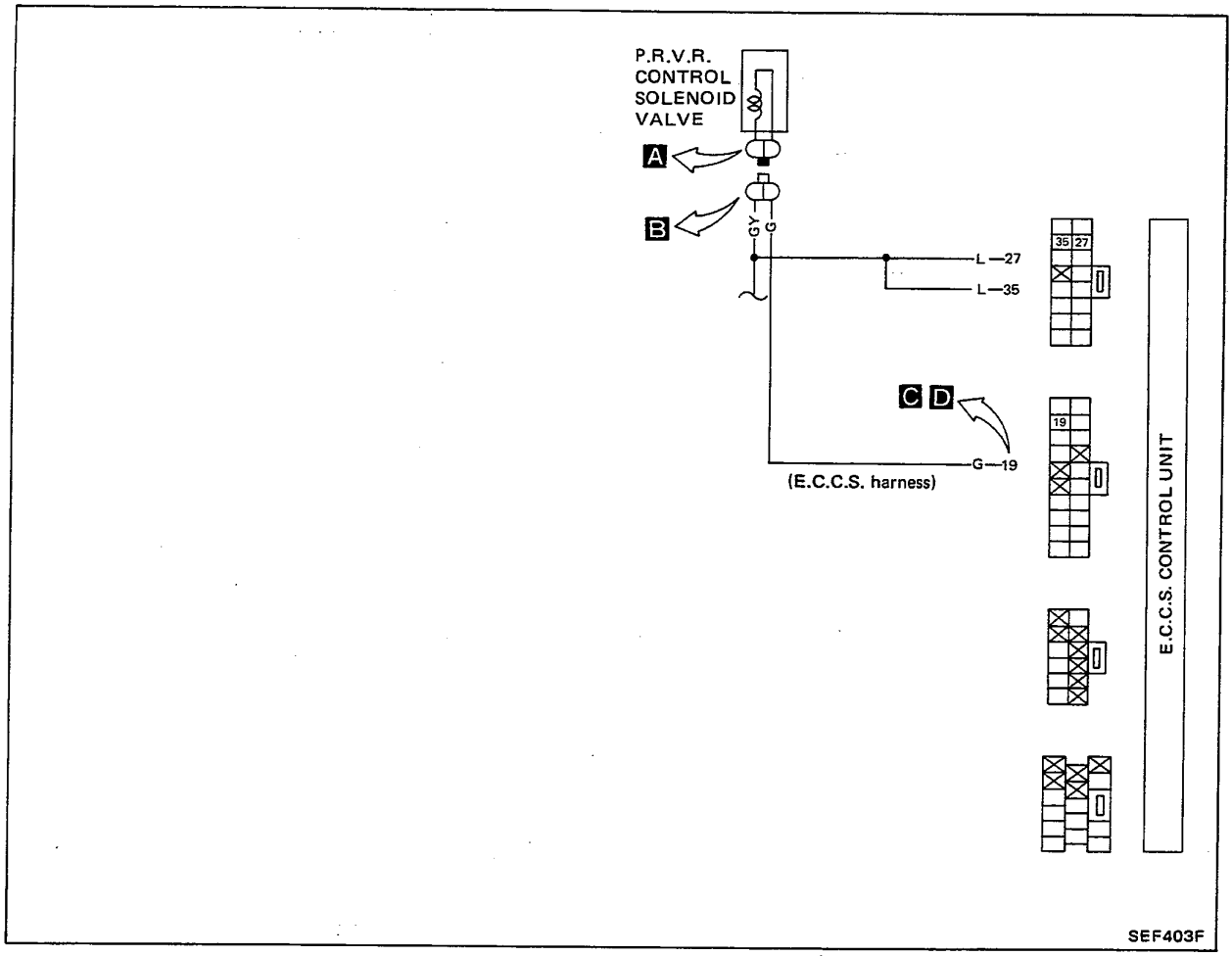
Engine condition	Voltage between ④ and ground
At idle	Battery voltage
When racing	Battery voltage → Approximately 0.8V

O.K.

INSPECTION END

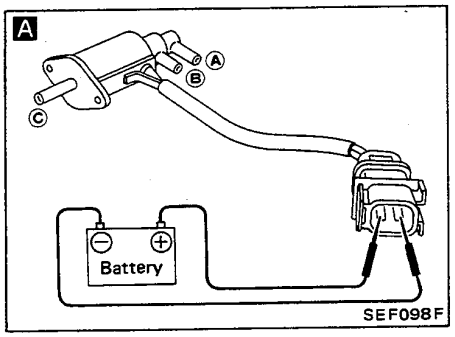
PRESSURE REGULATOR VACUUM RELEASE (P.R.V.R.) CONTROL SOLENOID VALVE

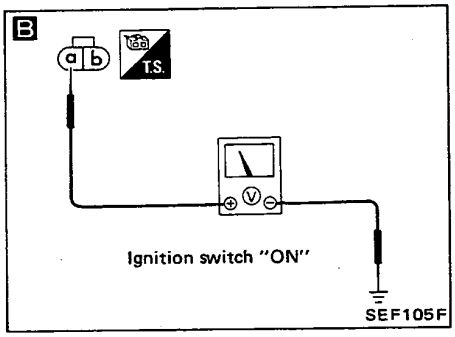
(Not self-diagnostic item)

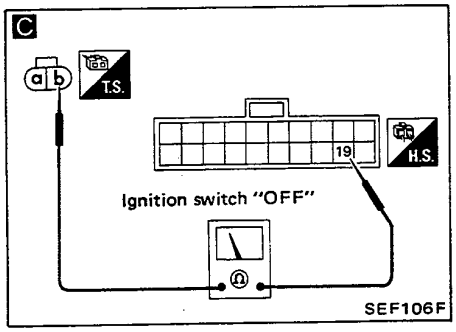


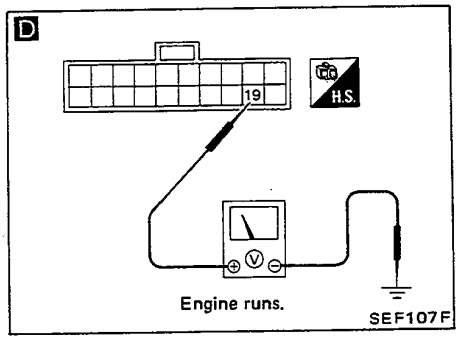
PRESSURE REGULATOR VACUUM RELEASE (P.R.V.R.) CONTROL SOLENOID VALVE

(Not self-diagnostic item)









INSPECTION START

A

Check P.R.V.R. control solenoid valve.

Condition	Continuity
Supply 12V direct current to P.R.V.R. control solenoid valve	Only Ⓐ - Ⓑ
Not supply	Only Ⓑ - Ⓒ

If N.G., replace P.R.V.R. control solenoid valve.

O.K.

B

Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓐ and ground.
   Voltage: Battery voltage
   If N.G., repair harness.

O.K.

C

1) Turn ignition switch "OFF".
2) Check continuity between terminals ⓑ and ⑲.
   Continuity should exist.
   If N.G., repair harness or connectors.

O.K.

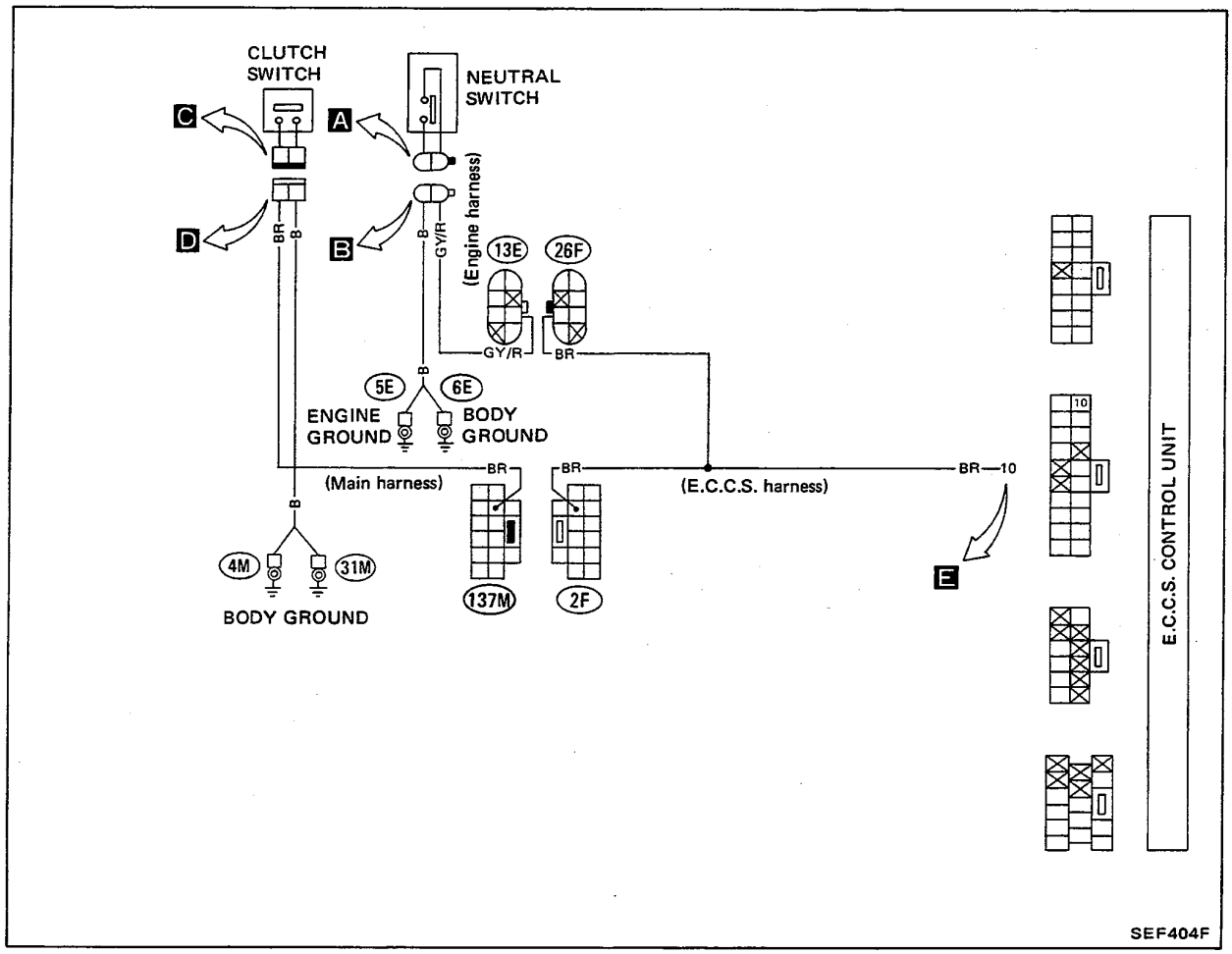
D

Check output signal.
1) Start engine and warm it up sufficiently.
2) Stop engine and restart engine.
3) Check voltage between E.C.U. terminal ⑲ and ground.
   Battery voltage should appear in approx. 3 minutes after turning ignition switch "START".

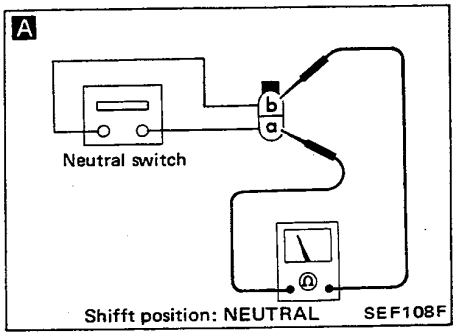
O.K.

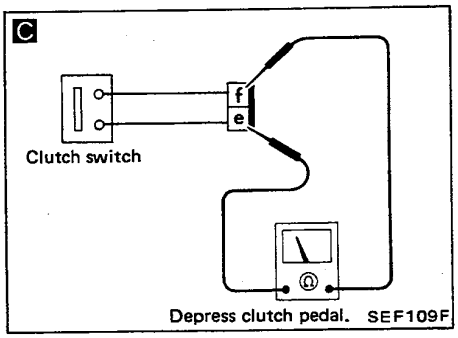
INSPECTION END

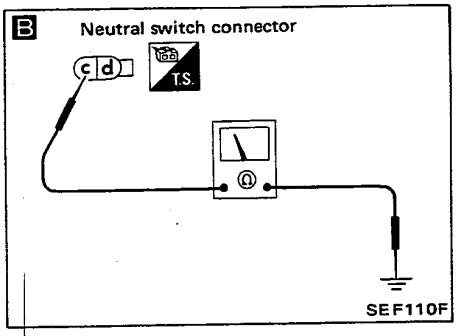
CLUTCH SWITCH AND NEUTRAL SWITCH (Not self-diagnostic item)

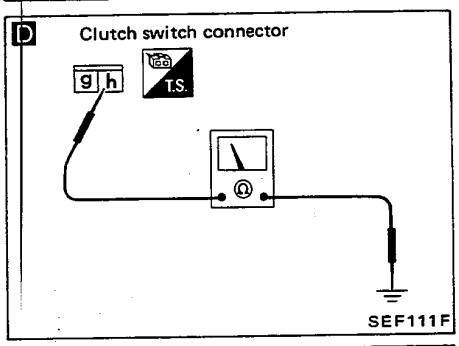


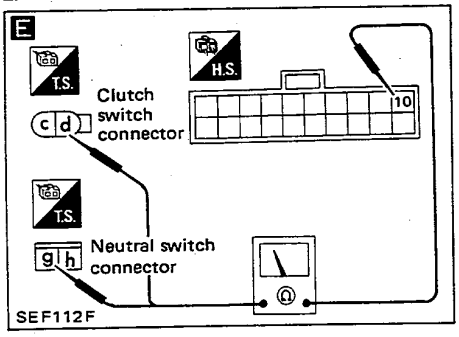
CLUTCH SWITCH AND NEUTRAL SWITCH (Not self-diagnostic item)











INSPECTION START

A C

Check clutch switch and neutral switch.

Clutch switch

Condition	Continuity between terminals ⓐ and ⓑ
Release clutch pedal	No
Depress clutch pedal	Yes

Neutral switch

Condition	Continuity between terminals ⓔ and ⓕ
Shift to "Neutral"	Yes
Shift to other positions	No

If N.G., replace switches.

O.K.

B D

Check continuity between terminal ⓒ and ground (for neutral switch) and terminal ⓗ and ground (for clutch switch).
Continuity should exist.
If N.G., repair harness or connectors.

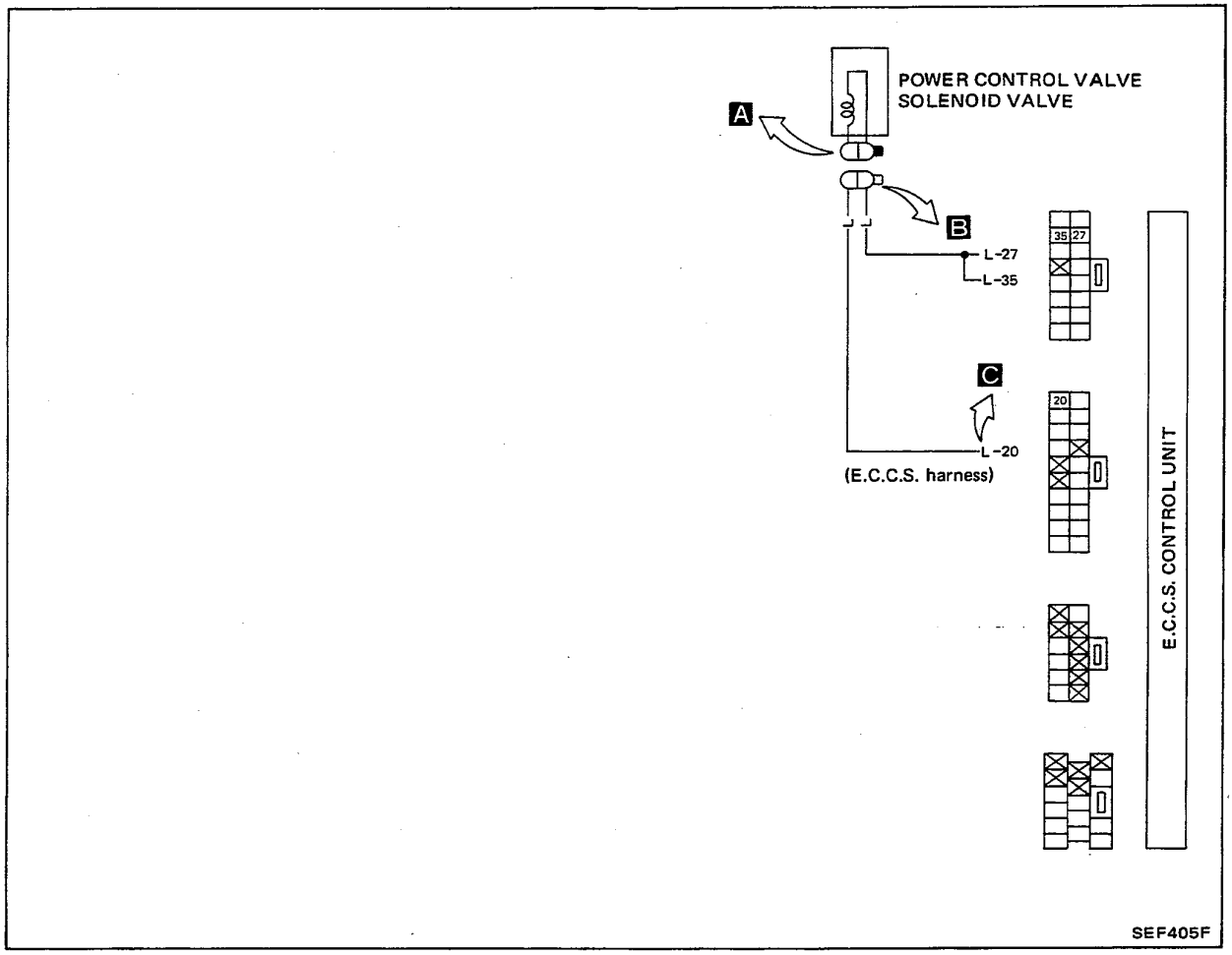
O.K.

E

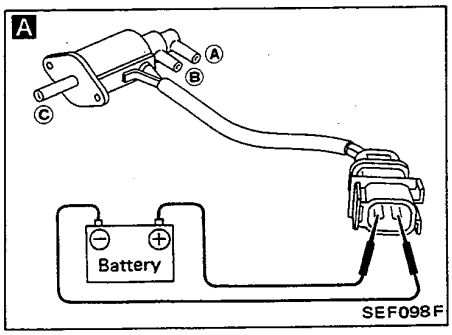
Check continuity between terminals ⓓ and ⑩ (for neutral switch) and terminals ⓖ and ⑩ (for clutch switch).
Continuity should exist.
If N.G., repair harness or connectors.

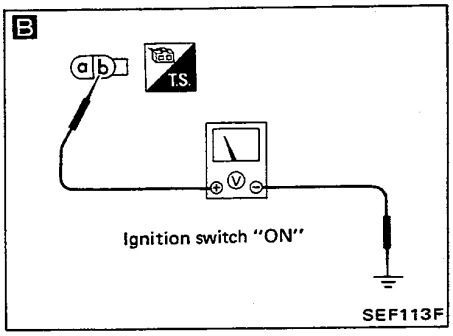
INSPECTION END

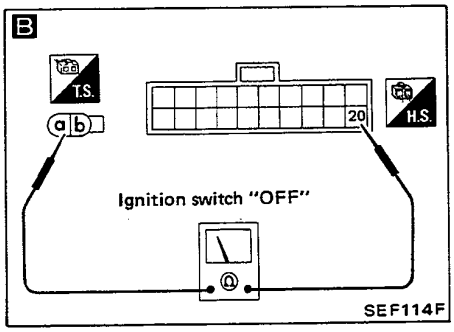
POWER VALVE CONTROL (Not self-diagnosis item)

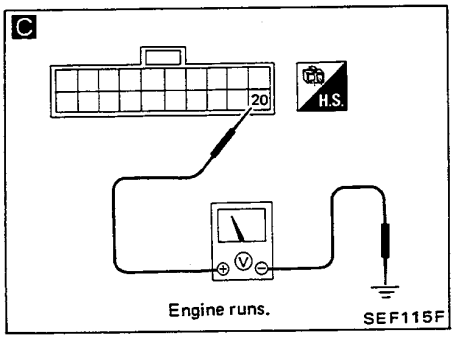


POWER VALVE CONTROL (Not self-diagnosis item)









INSPECTION START

A

Check power control valve solenoid valve.

Condition	Continuity
Supply 12V direct current to power control valve solenoid valve	Only Ⓐ - Ⓑ
Not supply	Only Ⓑ - Ⓒ

If N.G., replace power control valve solenoid valve.

O.K.

B

Check power source.
1) Turn ignition switch "ON".
2) Check voltage between terminal ⓑ and ground.
   Voltage: Battery voltage
   If N.G., repair harness or connectors.

O.K.

B

1) Turn ignition switch "OFF".
2) Check continuity between terminals Ⓒ and ⑳.
   Continuity should exist.
   If N.G., repair harness or connectors.

O.K.

C

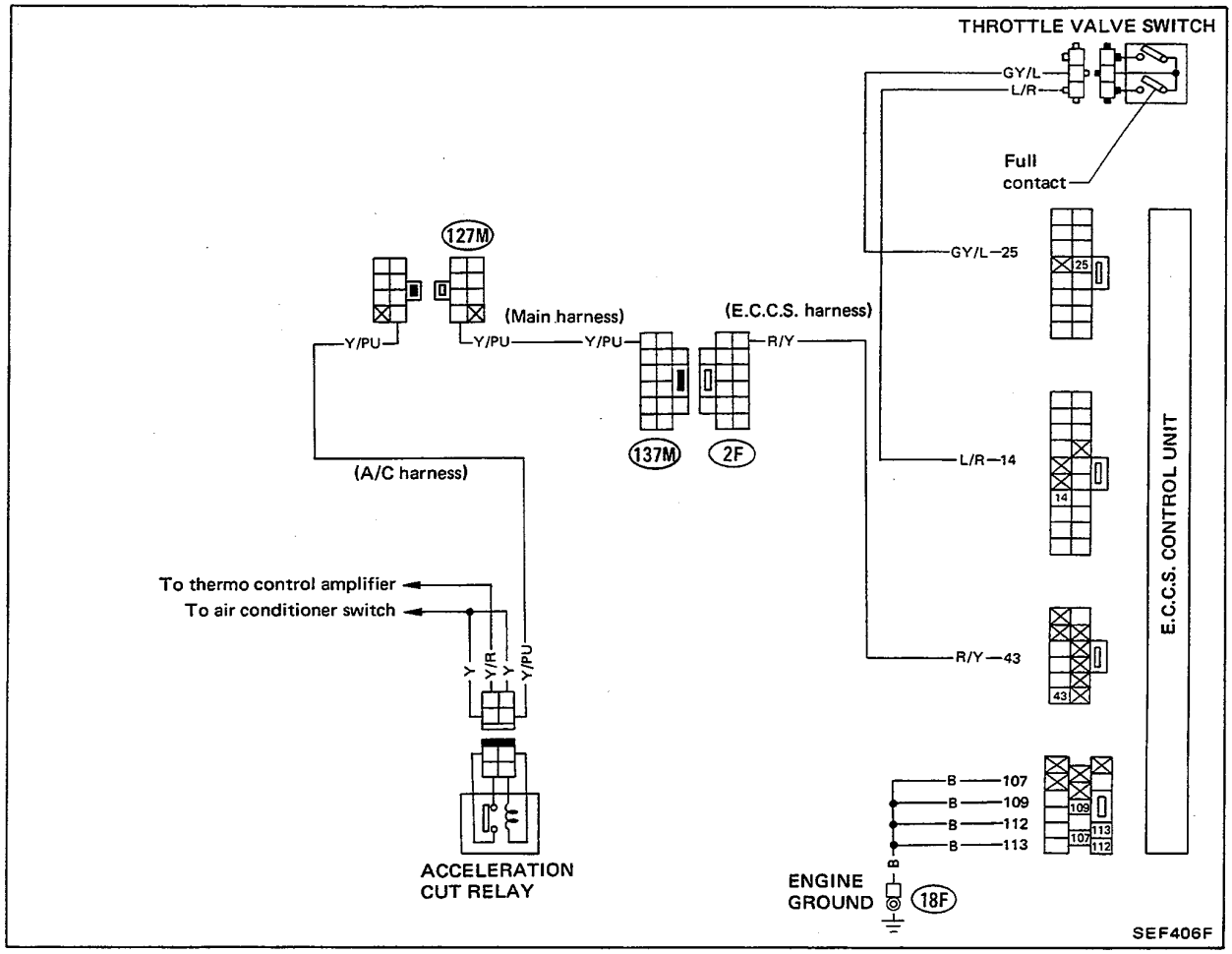
Check output signal.
1) Start engine.
2) Check voltage between terminal ⑳ and ground.

Engine speed	Voltage between terminal ⑳ and ground
Less than approx. 4,000 rpm	Approximately 1V
More than approx. 4,000 rpm	Battery voltage

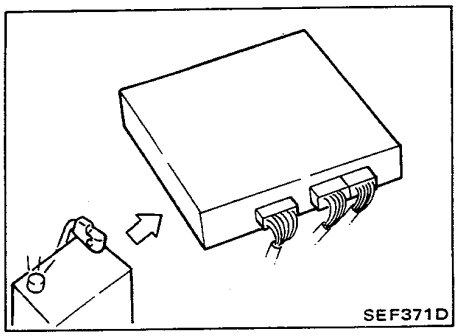
O.K.

INSPECTION END

ACCELERATION CUT CONTROL (Not self-diagnostic item)

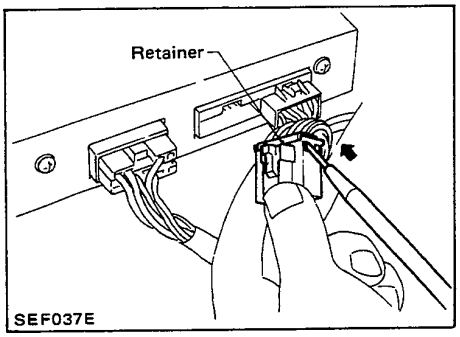


For inspection of this system, refer to HA section.

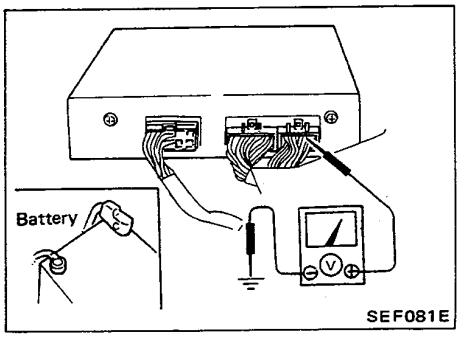


MEASUREMENT VOLTAGE OR RESISTANCE OF E.C.U.

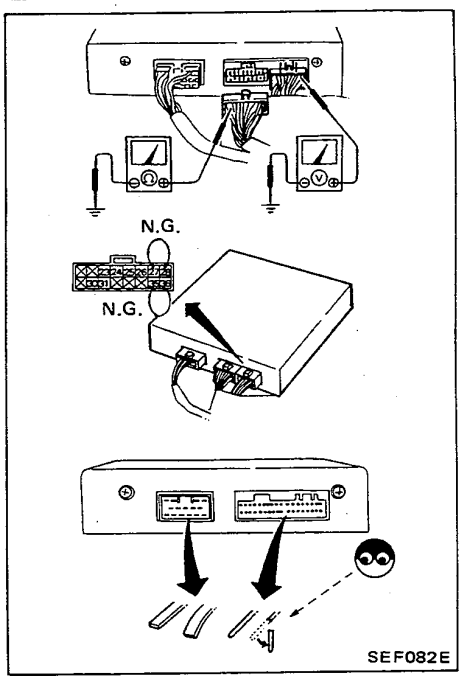
1. Disconnect battery ground cable.
2. Remove assist side or bench seat from vehicle.
3. Disconnect connectors from E.C.U.



4. Remove pin terminal retainer from connectors to make it easier to insert tester probes.



5. Connect connectors to E.C.U. carefully.
6. Connect battery ground cable.
7. 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 are not any bends or breaks 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	A.A.C. valve	Engine is running. └─At idle (after warming up)	7 - 11V (Under no-load condition)
4	E.G.R. control solenoid valve	Engine is running. └─Engine is cold. [Water temperature is below 60°C (140°F).]	0.7 - 0.9V
		Engine is running. └─After warming up [Water temperature is between 65°C (149°F) and 105°C (221°F).]	BATTERY VOLTAGE (11 - 14V)
5 44 45 46	Ignition signal (from power transistor)	Engine is running.	Voltage varies between 0V and approximately 1.0V.
6	E.F.I. relay	Ignition switch "ON"	0.8 - 1.0V
8	Crank angle sensor (position signal)	Idle speed **Do not turn engine at high speed under no-load.**	2.0 - 3.0V
9	Start signal	Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
10	Neutral signal	Ignition switch "ON" └─Gear position: Neutral	0V
		Ignition switch "ON" └─Gear position: Except neutral	BATTERY VOLTAGE (11 - 14V)

*Data are reference values.

TERMINAL NO.	ITEM	CONDITION	*DATA
14	Full throttle switch (⊖ side)	Ignition switch "ON" └Throttle valve: fully open	9 - 10V
		Ignition switch "ON" └Throttle valve: Any position except full throttle	0V
17	Crank angle sensor (Reference signal)	Idle speed **Do not turn engine at high speed under no-load.**	Approximately 0.5V
18	Idle switch (⊖ side)	Ignition switch "ON" └Throttle valve: idle position	9 - 10V
		Ignition switch "ON" └Throttle valve: except idle position	0V
19	Pressure regulator control solenoid valve	Ignition switch "ON" └For approximately 3 minutes after turning ignition switch to "START". [Water temperature is above 60°C (140°F).]	0.7 - 0.9V (Idle switch ON)
		Ignition switch "ON" └Approximately 3 minutes after turning ignition switch to "START". [Water temperature is above 60°C (140°F).]	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" or "START". [Water temperature is below 60°C (140°F).]	(Idle switch ON)
20	Power valve control panel	Engine speed: Less than approximately 4,000 rpm	Approximately 1.0V
		Engine speed: More than approximately 4,000 rpm	BATTERY VOLTAGE (11 - 14V)

*Date are reference values.

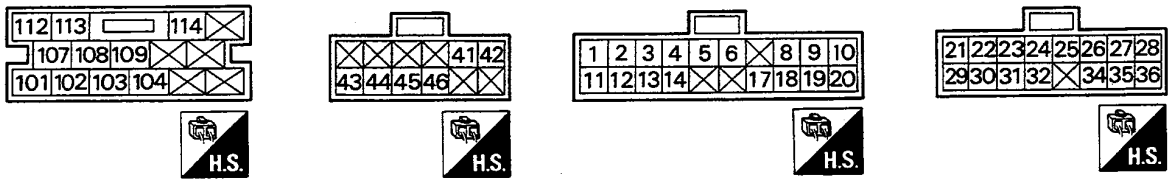
TERMINAL NO.	ITEM	CONDITION	*DATA
22	Air conditioner signal (Air conditioner equipped model)	Ignition switch "ON" & full throttle switch "OFF" └ Air conditioner switch and heater fan switch "ON" & "OFF"	0V
		Ignition switch "ON" & full throttle switch "ON" └ Air conditioner switch "ON"	BATTERY VOLTAGE (11 - 14V) (within approximately 5 seconds)
23	Water temperature sensor	Engine is running.	1.0 - 5.0V Output voltage varies with engine water temperature.
24	Exhaust gas sensor	Engine is running. └ After warming up sufficiently.	0 - Approximately 1.0V
25	Idle switch and full throttle switch (⊕ side)	Ignition switch "ON"	9 - 10V
27 35	Power source for E.C.U.	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
29	Vehicle speed sensor	Ignition switch "ON" └ When rotating front wheel slowly	Voltage varies between 0V and approximately 5V.
31	Air flow meter	Idle speed **Do not turn engine at high speed under no-load.**	1.5V (Output voltage varies with engine revolution.)
34	Ignition switch signal	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
42	A.I.V. control solenoid valve	Engine is running. └ At idle	0.7 - 0.9V
		Engine is running. └ When depressing accelerator pedal Water temperature is above 50°C (122°F).	BATTERY VOLTAGE (11 - 14V)

E.C.U. INPUT/OUTPUT SIGNAL INSPECTION

***Data are reference values.**

TERMINAL NO.	ITEM	CONDITION	*DATA
101 102 103 104	Injector	Engine is running.	Voltage varies between 0V and approximately 12V.
108	Fuel pump	Engine is running.	0.7 - 0.9V
		Ignition switch "ON" └ After 5 seconds	BATTERY VOLTAGE (11 - 14V)
114	Injector power supply	Engine is running.	BATTERY VOLTAGE (11 - 14V)
28 36 107 109 112 113	Ground for E.C.U.	Ignition switch "OFF"	Approximately 0Ω

E.C.U. PIN CONNECTOR TERMINAL LAYOUT



SEF493F

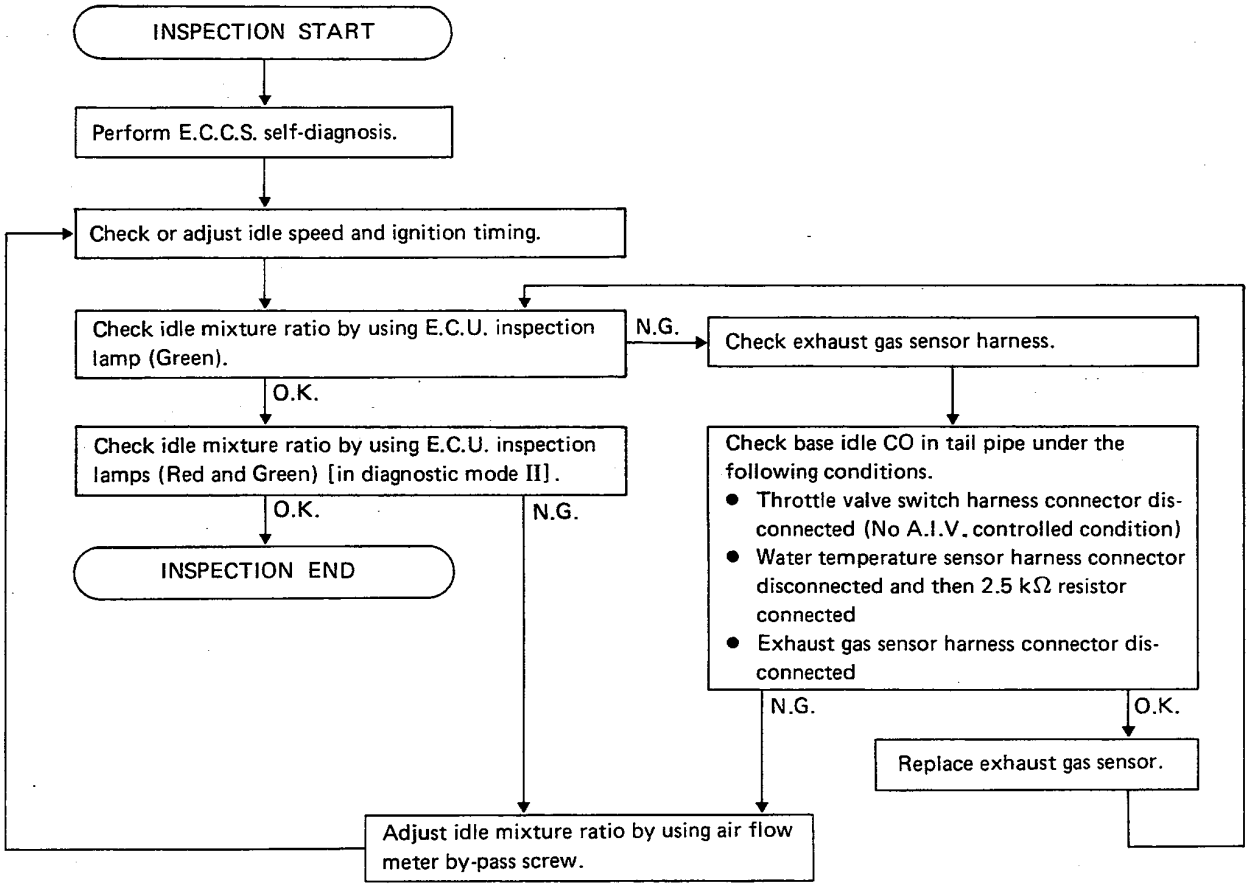
MIXTURE RATIO FEEDBACK SYSTEM INSPECTION

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.)
- Valve clearance, engine compression
- E.G.R. valve operation
- Throttle valve and throttle valve switch operation

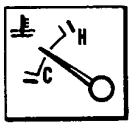
2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
4. Checking and adjusting should be done while the radiator cooling fan is stopped.

Overall inspection sequence



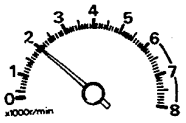
INSPECTION START

Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- E.G.R. valve operation
- Electrical connectors
- Gaskets
- Throttle valve and throttle valve switch operation



SEF457C

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



SEF477B

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

Perform E.C.C.S. self-diagnosis.

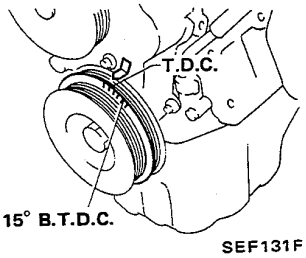
O.K. / N.G.

Check, correct or replace malfunctioning parts.

Does engine run smoothly?

O.K. / N.G.

Check and clean injectors, and replace injectors if necessary.



SEF131F

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

Check idle speed.

M/T: 800±50 rpm

O.K. / N.G.

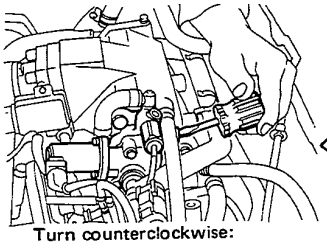
Check ignition timing with a timing light.

15°±2° B.T.D.C.

N.G.

Adjust ignition timing by turning crank angle sensor after loosing crank angle sensor fixing bolts.

O.K.


Turn counterclockwise:
Idle speed becomes lower
SEF119F

Disconnect A.A.C. valve harness connector.

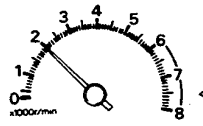
Adjust idle speed to 750 rpm by turning idle speed adjusting screw.

Connect A.A.C. valve harness connector.

Ⓐ

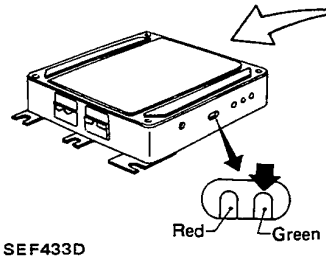
Ⓑ

MIXTURE RATIO FEEDBACK SYSTEM INSPECTION


SEF477B

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

Make sure that inspection lamp (Green) on control unit goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm under no-load.



SEF433D

O.K.

N.G.

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

Set the diagnosis mode of E.C.U. to No. 2 mode and check inspection lamps (Red and Green) on control unit blink at 2,000 rpm under no load. They should blink simultaneously.

No

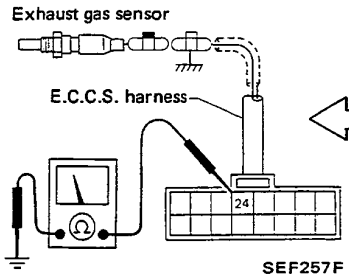
Yes

Connect throttle valve switch harness connector.

INSPECTION END

Check exhaust gas sensor harness:
1) Turn off engine and disconnect battery ground cable.
2) Disconnect connector from Control Unit.
3) Discnonect exhaust gas sensor harness connector and connect terminal for exhaust gas sensor harness connector to ground with a jumping wire.
4) Check for continuity between terminal No. 24 and ground metal on vehicle body.

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

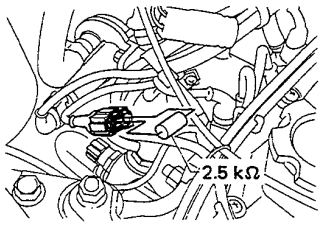


SEF257F

O.K.

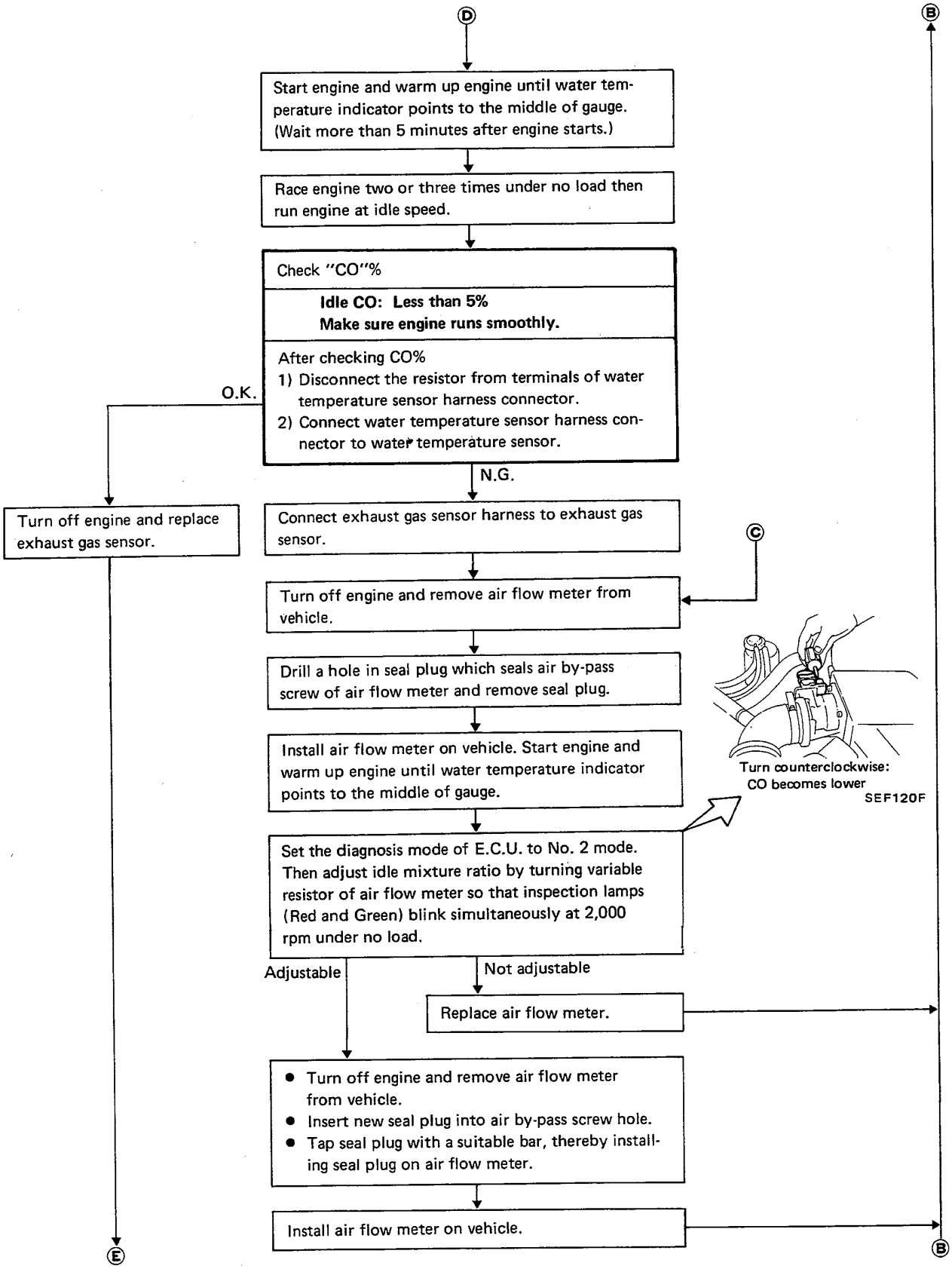
N.G.

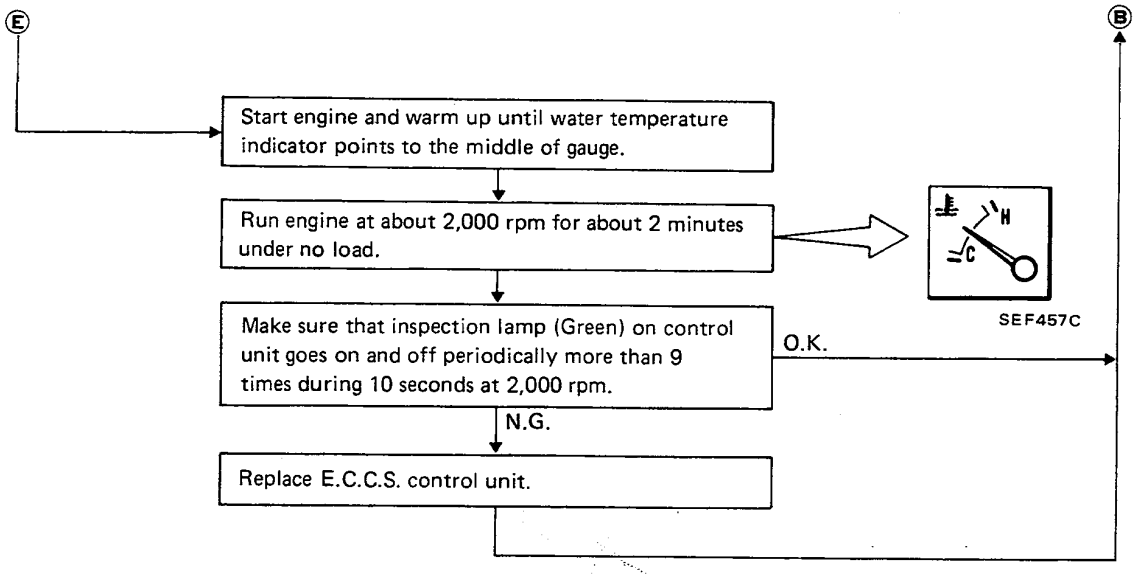
Repair or replace E.C.C.S. harness.

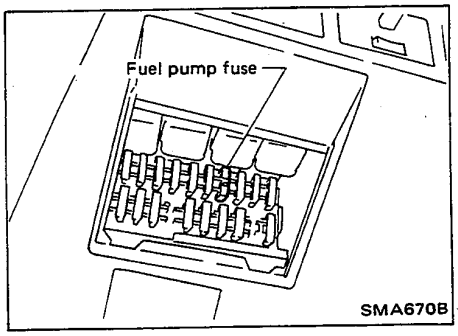


SEF333C

- Disconnect water temperature sensor harness connector.
- Connect a resistor (2.5 kΩ) between terminals of water temperature sensor harness connector.


D
B
Start engine and warm up engine until water temperature indicator points to the middle of gauge. (Wait more than 5 minutes after engine starts.)
Race engine two or three times under no load then run engine at idle speed.
Check "CO"%
Idle CO: Less than 5%
Make sure engine runs smoothly.
After checking CO%
1) Disconnect the resistor from terminals of water temperature sensor harness connector.
2) Connect water temperature sensor harness connector to water temperature sensor.
O.K.
N.G.
Turn off engine and replace exhaust gas sensor.
Connect exhaust gas sensor harness to exhaust gas sensor.
C
Turn off engine and remove air flow meter from vehicle.
Drill a hole in seal plug which seals air by-pass screw of air flow meter and remove seal plug.
Install air flow meter on vehicle. Start engine and warm up engine until water temperature indicator points to the middle of gauge.
Turn counterclockwise: CO becomes lower
SEF120F
Set the diagnosis mode of E.C.U. to No. 2 mode. Then adjust idle mixture ratio by turning variable resistor of air flow meter so that inspection lamps (Red and Green) blink 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.
• Insert new seal plug into air by-pass screw hole.
• Tap seal plug with a suitable bar, thereby installing seal plug on air flow meter.
Install air flow meter on vehicle.
E
B

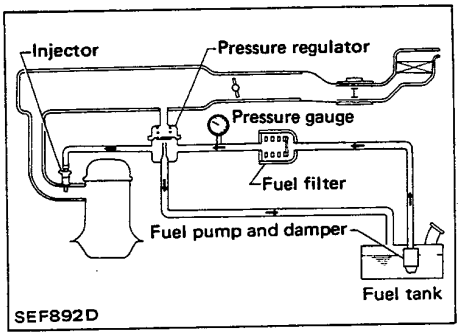

E
B
Start engine and warm up until water temperature indicator points to the middle of gauge.
Run engine at about 2,000 rpm for about 2 minutes under no load.
H
C
SEF457C
Make sure that inspection lamp (Green) on control unit goes on and off periodically more than 9 times during 10 seconds at 2,000 rpm.
O.K.
N.G.
Replace E.C.C.S. control unit.



Releasing Fuel Pressure

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

1. Remove fuel pump fuse.
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 connect fuel pump fuse.



Fuel Pressure Check

a. When reconnecting fuel line, always use new clamps and be sure to position them correctly.
b. Use a torque driver to tighten clamps.
c. Use Pressure Gauge to check fuel pressure.

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

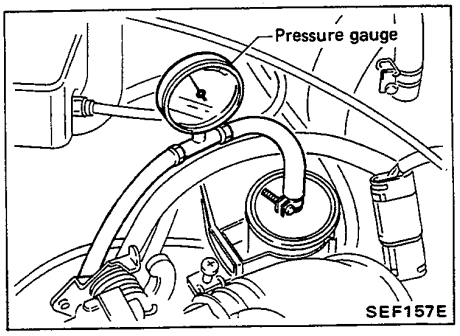
At idling:

When fuel pressure regulator valve vacuum hose is connected.

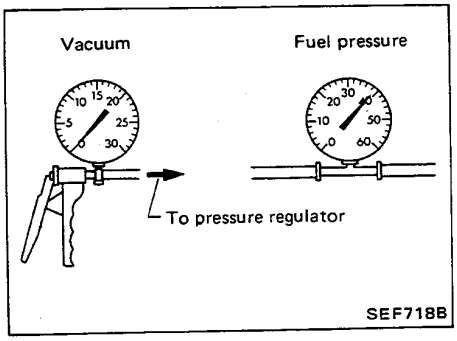
Approximately 196 kPa (2.0 kg/cm², 28 psi)

When fuel pressure regulator valve vacuum is disconnected.

Approximately 245 kPa (2.5 kg/cm², 36 psi)

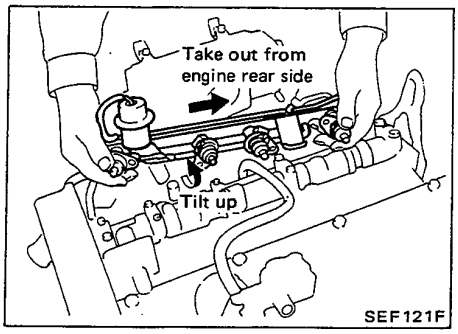


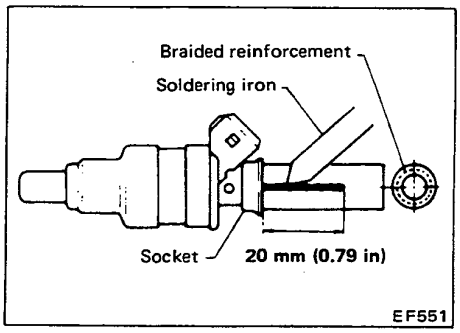
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.



9. Start engine and read the indication of fuel pressure gauge as vacuum is changed.

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





Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove throttle chamber, throttle chamber stay, I.A.A. unit intake side rocker cover and P.C.V.
3. Disconnect fuel hoses and pressure regulator vacuum hose.
4. Remove injector assembly fixing bolts.
5. Take out injector assembly.

Be careful not to damage the injector, nor to deform the fuel tube.

6. Remove injectors from fuel tube.
7. Remove fuel hose.

1) Heat soldering iron (150 watt). Cut hose into braided reinforcement from mark to socket end.

Do not feed soldering iron until it touches injector tail piece.

2) Then pull rubber hose out with hand.

a. Be careful not to damage socket plastic connector, etc. with soldering iron.

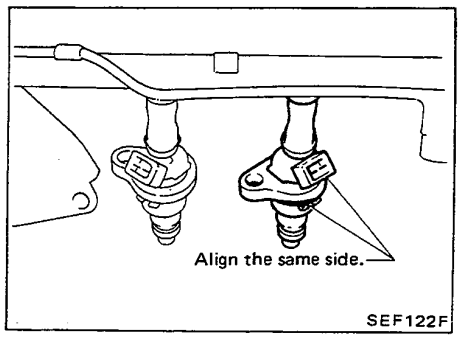
b. Never place injector in a vise when disconnecting rubber hose.

8. Install fuel hose as follows:

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

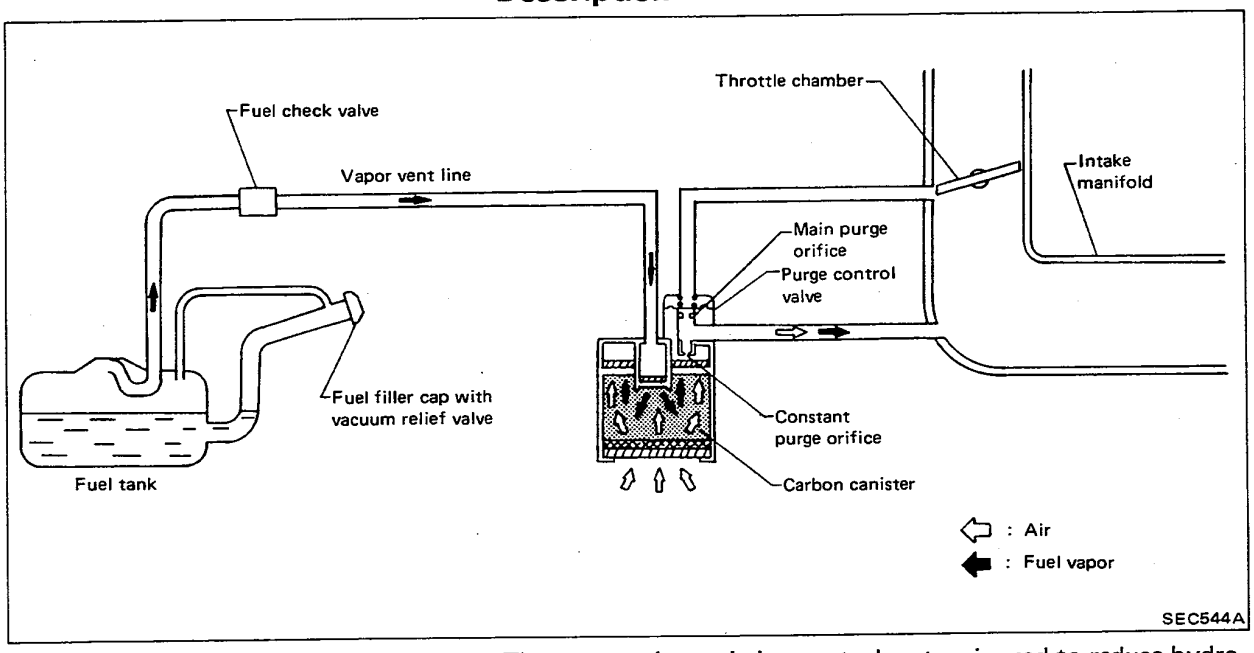
CAUTION:

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



9. Assemble injectors with fuel pipe.
10. Install injectors.

Description

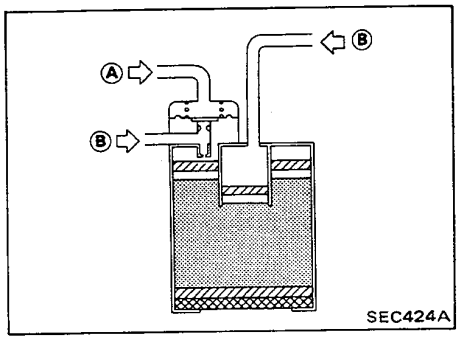


The evaporative emission control system is used to reduce hydrocarbons emitted to the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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

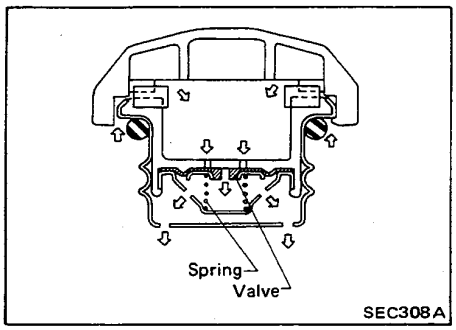
Check carbon canister as follows.

Ⓐ : Blow air and ensure that there is no leakage.

Ⓑ : Blow air and ensure that there is leakage.

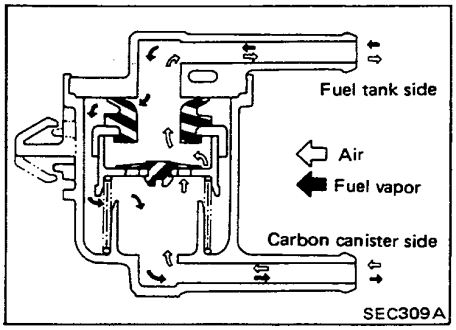
Inspection (Cont'd)

FUEL TANK VACUUM RELIEF VALVE



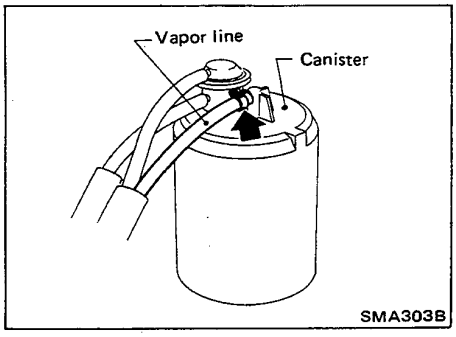
1. Wipe clean valve housing.
2. Inhale air through the cap. A slight resistance accompanied by valve clicks indicates that valve is in good mechanical condition. Note also that, by further inhaling air, the resistance should be disappeared with valve clicks.
3. If valve is clogged, or if no resistance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

FUEL CHECK VALVE

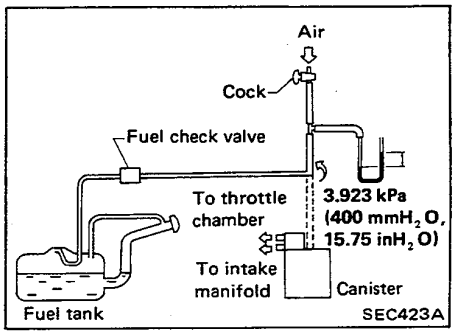


1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow be directed toward the canister.
2. Blow air through connector on the canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected of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

VAPOR VENT LINE

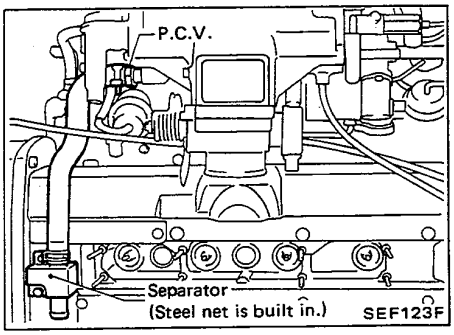


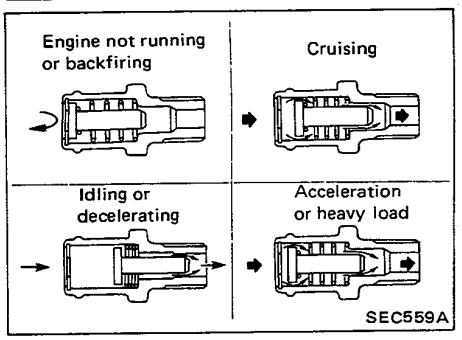
1. Check hoses and fuel tank filler cap.
2. Disconnect the vapor vent line connecting carbon canister to fuel tank.



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 delivery of fuel to engine, or vapor lock. It must, therefore, be repaired.





Description

This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (P.C.V.) valve is provided to conduct crankcase blow-by gas to the intake manifold.

During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the P.C.V. valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air duct, through the hose connecting air cleaner to rocker cover, into the crankcase.

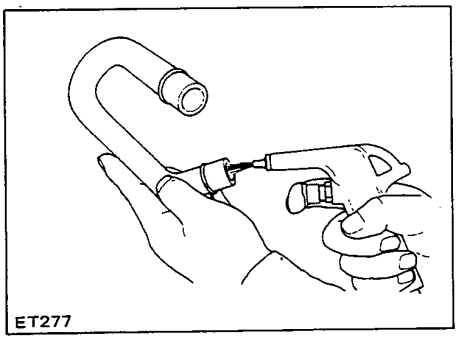
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air duct under all conditions.

Inspection

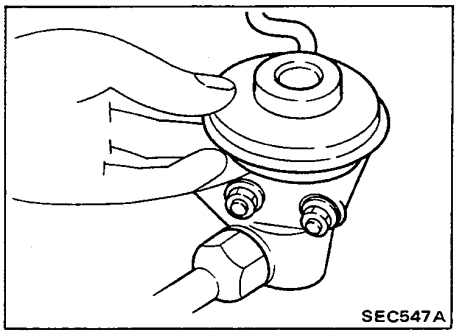
P.C.V. VALVE

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.

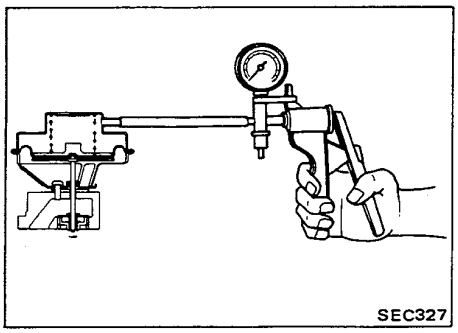

SEC547A

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 when engine is revved up to 3,000 to 3,500 rpm.

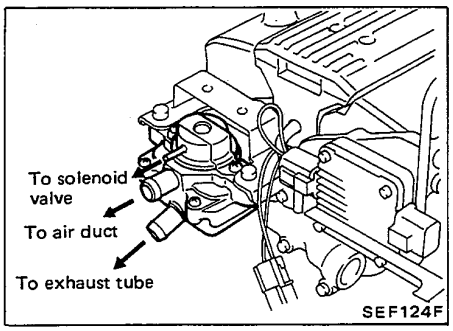
Water temperature °C (°F)	E.G.R. diaphragm
Below 65 (149)	Not moved
Above 65 (149)	Moved


SEC327

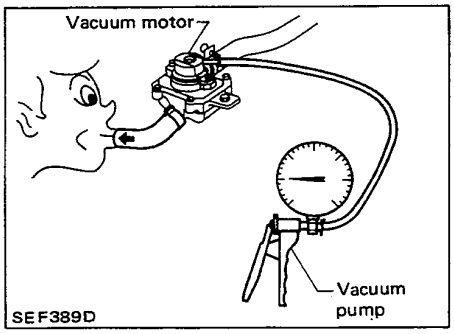
E.G.R. CONTROL VALVE

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)



Check hoses for looseness, collapsing, damage or faulty connections, and each part for proper installation.



Air injection valve

Disconnect air injection hose on air injection pipe side. Apply vacuum to vacuum motor. Suck or blow hose to make sure that air flows only to the air injection pipe side.

General Specifications

IGNITION TIMING °B.T.D.C.		15±2
IDLE SPEED	rpm	800±50

Inspection and Adjustment

WATER TEMPERATURE SENSOR		20°C (68°F)	80°C (176°F)
Thermistor resistance	kΩ	Approx. 2.5	Approx. 0.33
THROTTLE VALVE SWITCH Engine speed when idle switch is changed from "OFF" to "ON"	rpm	Idle speed + 200±150	
FUEL PRESSURE at idling (Measuring point: between fuel filter and fuel pipe) Vacuum hose is connected	kPa (kg/cm², psi)	Approximately 196 (2.0, 28)	
Vacuum hose is disconnected	kPa (kg/cm², psi)	Approximately 245 (2.5, 36)	
FUEL INJECTOR Coil resistance	Ω	Approximately 2.5	
AIR REGULATOR Circuit resistance	Ω	Approximately 65	