1. CONTROL PARTS COMMON TO ALL SYSTEM

CONTENTS

1. CONTROL PARTS COMMON TO ALL SYSTEMS

DESCRIPTION

The control mechanisms of the main emission control systems comprise of

(1) Sensor and switch that senses the vehicle speed or temperature and transmit the electric signals to the computer.

(2) Computer that interprets the speed or temperature signals and performs the electric circuit switching.

(3) Vacuum switching valve (VSV) that receives the electric signals from the computer and performs the switching of the vacuum circuits.

(4) System units that are installed on the various parts of the engine and which are operated by vacuum and electric signals.

(5) Electric wiring and vacuum hoses that connect together the components (1) through (4).

The operation and the inspection procedures of the parts (1), (2), (3), and (5) common to all systems shall be taken up in this section. Consequently, detailed explanation of these parts will not be repeated in the following sections covering the systems.

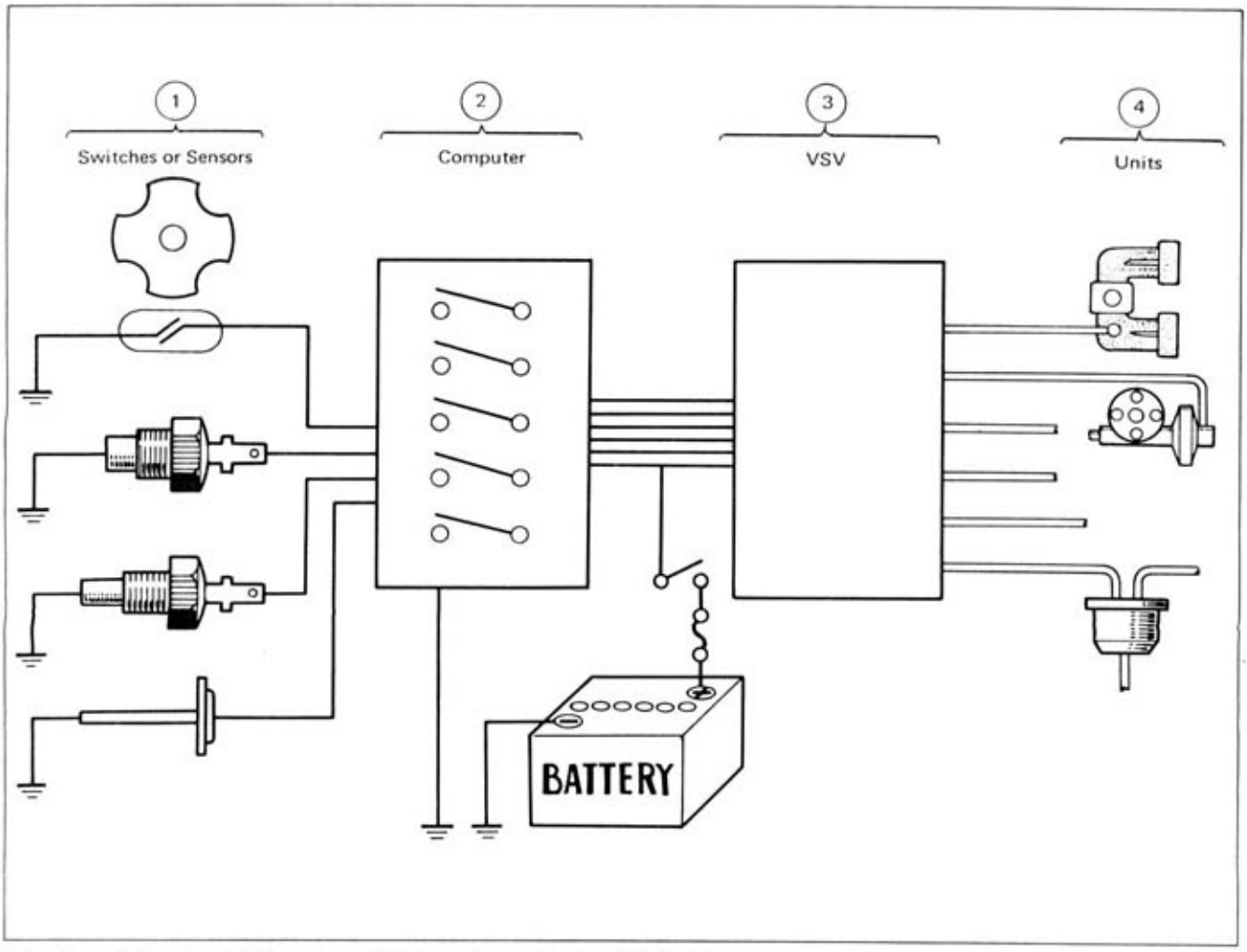

Fig. 1-1 Schematic Diagram of Parts Common to All Systems

OPERATION

1. Speed Sensor

The speed sensor is assembled into the speedometer assembly.
In construction, it comprises of a magnet (four poles), driven by speedometer cable, and a reed switch that performs four ON-OFF cycles for each revolution of the magnet.
The number of ON-OFF cycles made by the reed switch is transmitted to the computer as the vehicle speed.

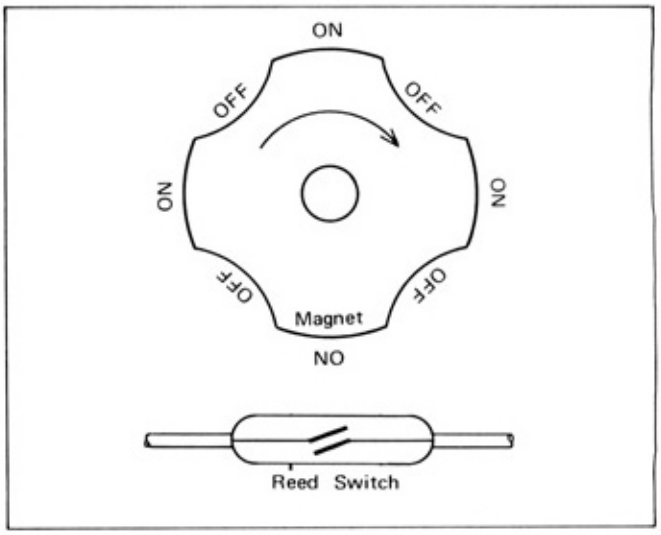

Fig. 1-2 Speed Sensor Operation

2. Thermo Sensor

The built-in thermistor has the property of its resistance varying with the change in temperature. The higher the temperature, the larger will be its resistance.
This variation in resistance is transmitted to the computer as the temperature signal.
The thermo sensors serve to sense the temperatures of the coolant, EGR valve, carburetor flange, and catalytic converter.

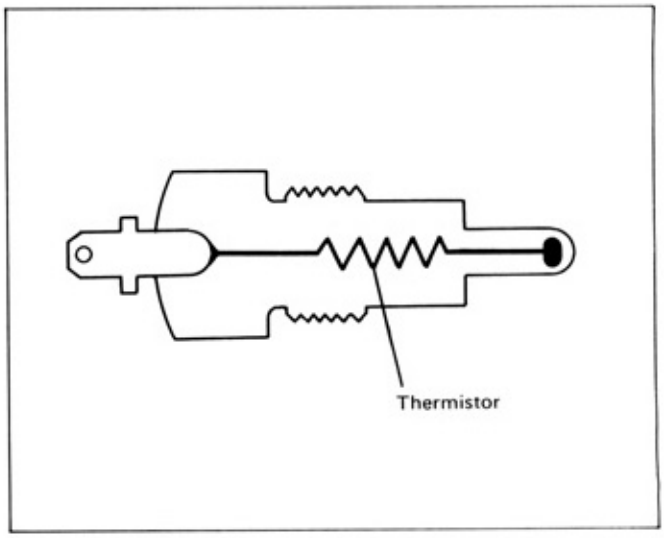

Fig. 1-3 Thermo Sensor

3. Thermo Switch

The thermo switch, through the action of the thermo ferrite, becomes electrically conductive or non-conductive depending on the temperature. This ON-OFF action is transmitted to the computer as the temperature signal.

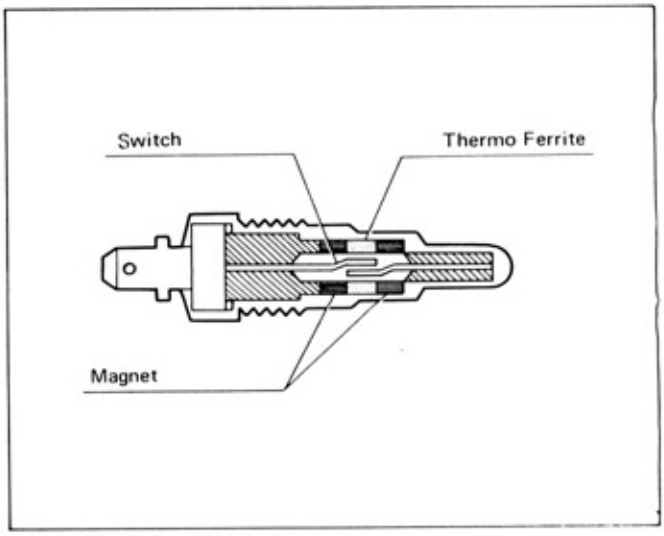

Fig. 1-4 Thermo Switch

4. Computer

The computer interprets the electric signals from the various sensors and opens or closes the VSV or warning light ground circuit accordingly.

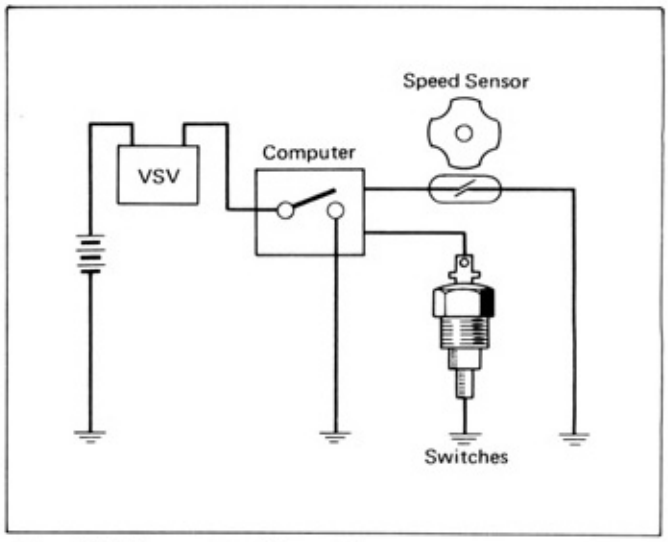

Fig. 1-5 Computer Operation

5. VSV (Vacuum Switching Valve)

When the VSV ground circuit is closed by the computer the VSV magnetic coil is energized by the current from the car battery. The magnetic force produced shifts the valve against spring tension and opens the vacuum passage of the system.
The VSV function is to convert the electric signal into vacuum signal as described above.

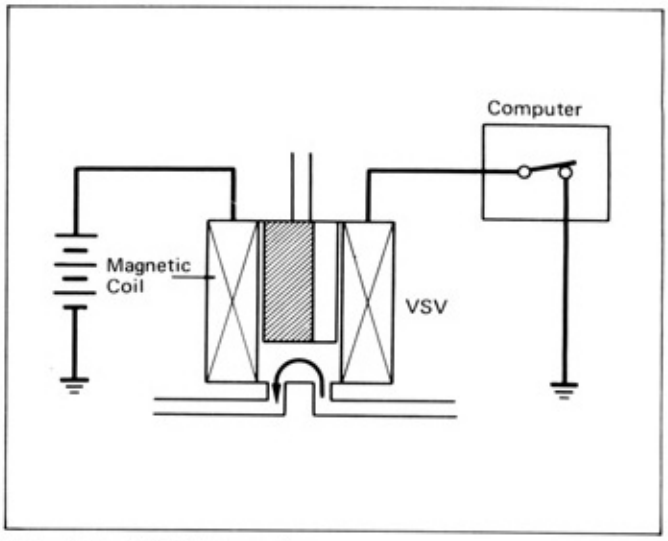

Fig. 1-6 VSV Operation

6. Emission Control System Inspection Terminals

The inspection terminals are installed in the electric circuit between the sensor and computer, and allows checking what kind of signals are being transmitted from the sensor to the computer. It is also possible to use these terminals to send simulated signals to the computer.

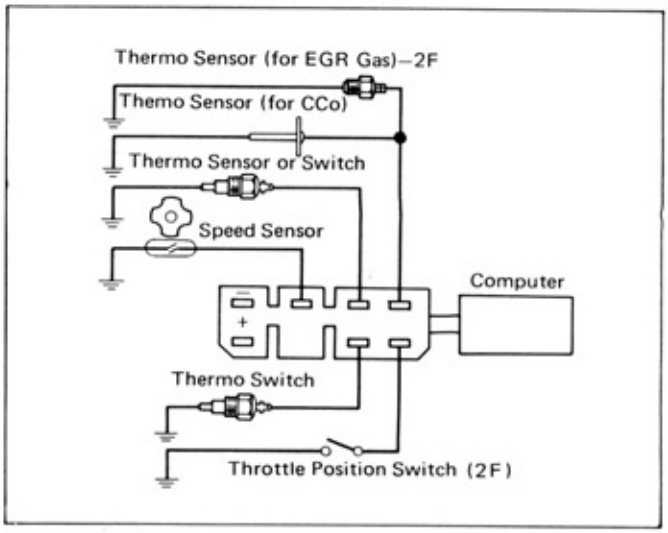

Fig. 1-7 Inspection Terminals

INSPECTION

1. Speed Sensor

[For TE (California), RA, RT, MX, RN, FJ]

Check speed sensor terminals at back side of speedometer to see if properly connected.

↓

Jack up rear axle and free rear wheel at one side only. Release parking brake and set shift lever at "N" range.

↓

Place (+) terminal of circuit tester (ohm-meter) on emission system check terminal and (–) terminal on ground.

↓

Turn the rear wheel slowly and check tester pointer to see if it deflects as specified.

↓ Yes

Speed sensor in normal state.

[For TE (except California)]

TE (except California) is not provided with inspection terminals so check as follows.

↓

Disconnect computer connector.

↓

Jack up rear axle and free rear wheel at one side only. Release parking brake and set shift lever to "N" range.

↓

Place (+) terminal of circuit tester (ohm-meter) on disconnected wiring outer terminal and (–) terminal on ground.

↓

No

If defective, make sure wiring is in good condition and then replace speedometer assembly.

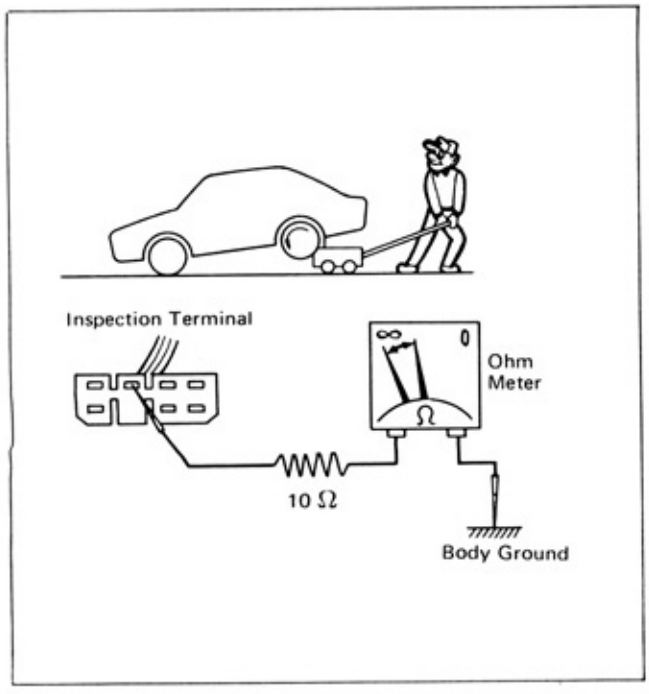

Fig. 1-8 Speed Sensor Inspection

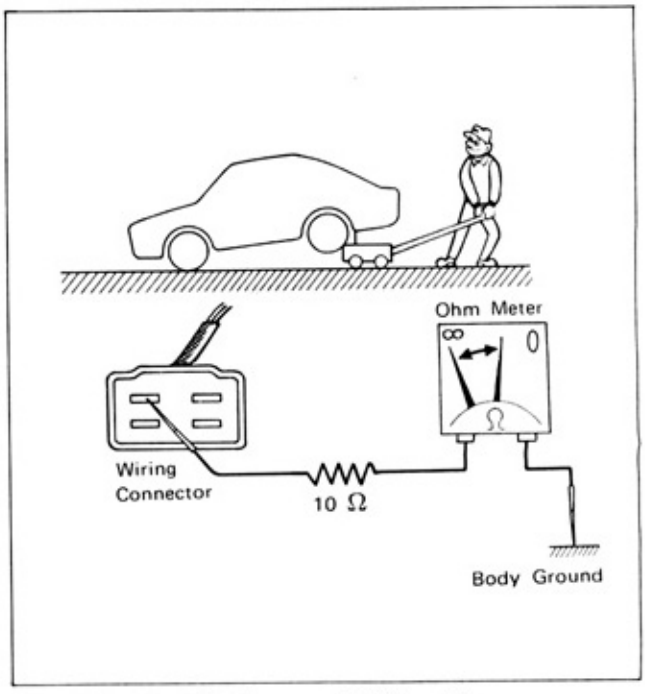

Fig. 1-9 For TE (except California)

2. Thermo Sensor

As shown in Fig. 1-10, heat the thermo sensor in oil bath. Measure the oil temperature with a thermometer and at same time, measure the sensor resistance with a circuit tester (ohm-meter). If the measured temperature and resistance show the specified relationship, the sensor is in good condition.

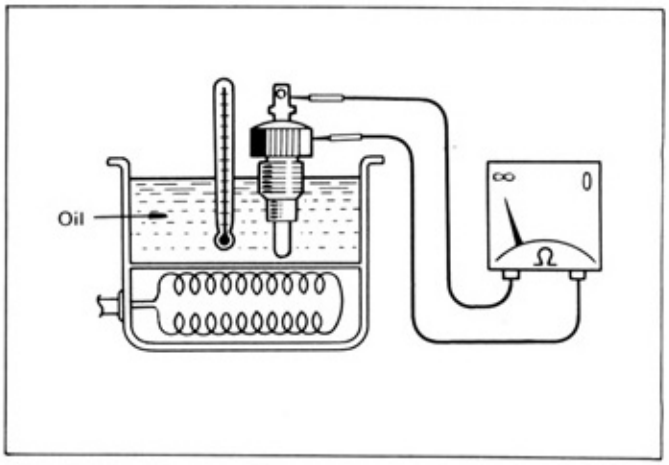

Fig. 1-10 Thermo Sensor Inspection

Table 1-1 Thermo Sensor Resistance (ohm)

Thermo Sensor for	Engine	Temperature	Resistance	Tightening Torque
(1) Coolant temperature (at intake manifold)	4M	70 to 85°F 180°F	15 to 30 kΩ 2 kΩ	21.7 to 36.2 ft-lb
(2) Carburetor flange temperature	2F	41°F 77°F	1.5 to 2.5 kΩ 0.6 to 0.9 kΩ	14.5 to 21.7 ft-lb
(3) EGR valve temperature	2F	212°F 320°F	12.8 to 15.2 kΩ 1.9 to 2.1 kΩ	14.5 to 21.7 ft-lb

Thermo sensor (for catalytic converter temperature)

(a) This sensor does not show resistance change unless the temperature is extremely high (above 572°F), making it necessary to check it by comparative method.
- Use a sensor in good condition as reference.
- Using a gas heater or electric hot plate, heat the reference sensor and the one to be checked under the same condition.
- Measure the resistance between the connector and sensor flange of both sensors with circuit testers.
- The sensor under test is good if same resistance change is shown.

Caution
Sensor will be damaged if overheated. Stop heating when the sensor tube becomes red.

(b) For on-vehicle test, warm up the engine and measure the sensor resistance while idling. The sensor is good if the resistance is from 2 kΩ to 200 kΩ.

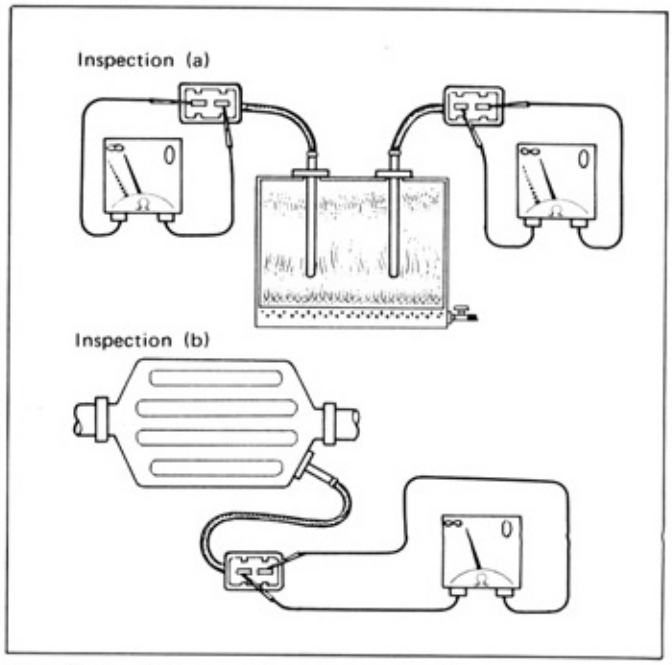

Fig. 1-11 Thermo Sensor Inspection

Table 1-2 Thermo Sensor Resistance (For Reference)

Temperature or State	932°F (500°C)	1382°F (750°C)	Idling after warm up
Resistance	29.81 kΩ	1.34 kΩ	2 kΩ to 200 kΩ

3. Thermo Switch

- As shown in Fig. 1-12, heat the thermo switch in oil bath, and while noting the ON-OFF switch over with a circuit tester (ohm-meter), measure the oil temperature with a thermometer at the time the change takes place.
- With the thermo switch placed in the hot water, cool the bath from the outside by means of dry ice or ordinary ice, and perform the same inspection as above.
- As shown in Fig. 1-13, if there is conductivity in the "ON" range and no conductivity in the "OFF" range, the switch is in good condition.

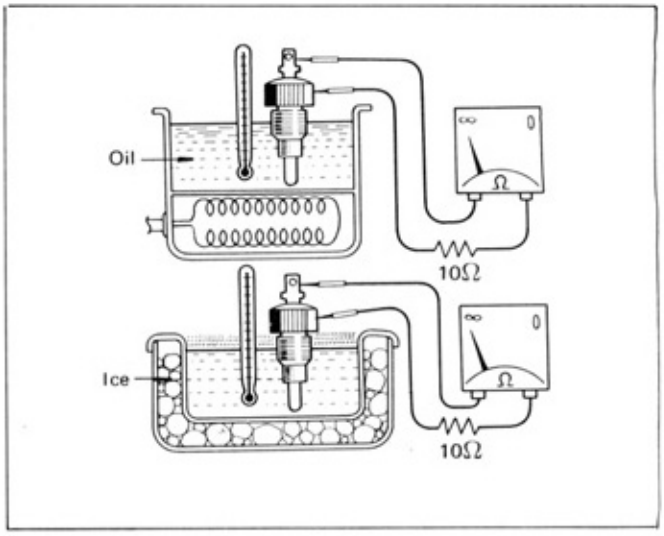

Fig. 1-12 Thermo Switch Inspection

Precautions on Handling Thermo Switch

The thermo switch must be handled with care as it is weak against shocks. Do not use an impact wrench for removing or installing it, and use care not to drop it on the floor.
Thermo switch tightening torque: 21.7 to 28.9 ft-lb.

Caution

It must be remembered that the thermo switch is "ON" (continuity) when the system is "OFF". But it must also be remembered that in the power valve system equipped in 2F engine, when the thermo switch is "ON", the system will also be "ON".

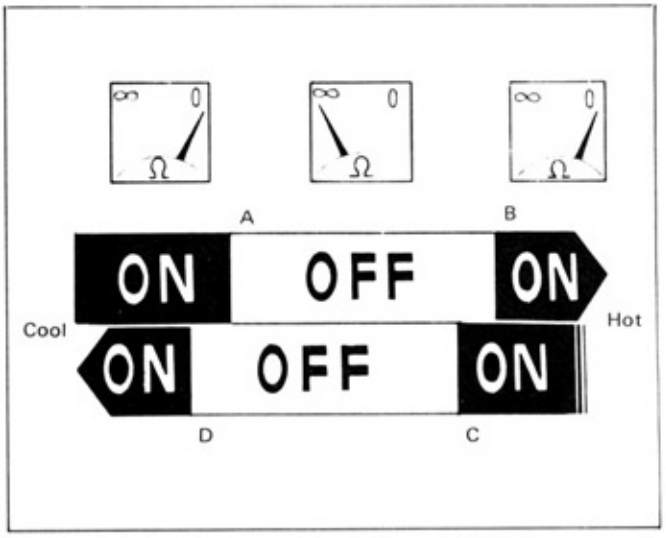

Fig. 1-13 Thermo Switch ON & OFF Ranges

Table 1-3 Thermo Switch ON-OFF Change Over Temperatures (°F)

A	B	C	D	Color	Mark	Mounted Location
55 ± 9	221 ± 9	208 min.	43 min.	White	13 105	Radiator (2T-C) Water outlet (20R, 4M)
140 ± 9	–	–	117 min.	Green	60B	Intake manifold (2T-C)
122 ± 9	–	–	109 min.	Red	50B	Cylinder head (2F)

4. Computer

To determine the condition of the computer itself, refer to the inspection procedures under each system.

5. VSV

(1) Short-circuit test

Pull out the VSV wiring connector and check the continuity between each terminal and the VSV body with a circuit tester (ohm-meter).

If there is no continuity between the terminals and VSV body, the VSV is in good condition.

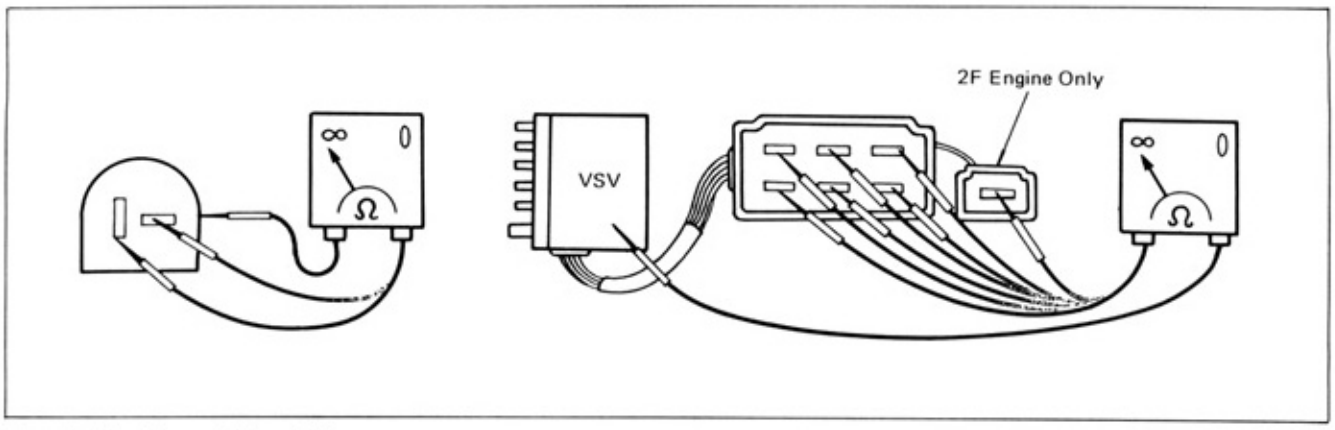

Fig. 1-14 Short-Circuit Test

(2) Open-circuit test

Pull out the VSV wiring connector and measure the resistances between the (+) terminal and the other terminals with a circuit tester (ohm-meter).

If the resistances measured are in proximity of the values shown in Table 1-4, the VSV is in good condition.

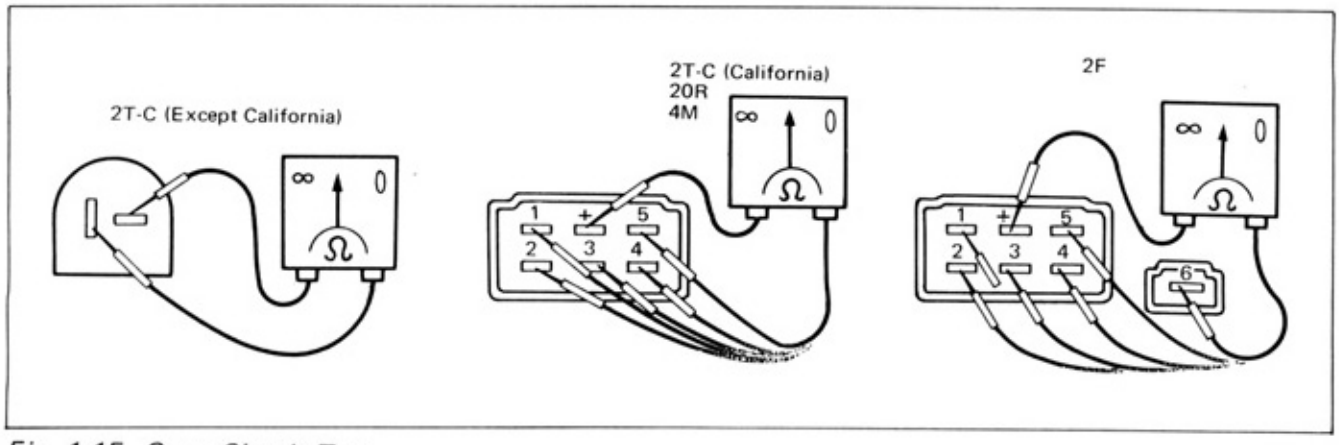

Fig. 1-15 Open-Circuit Test

Table 1-4 Specified Resistances (ohms)

Engine Family	⊕ to 1	⊕ to 2	⊕ to 3	⊕ to 4	⊕ to 5	⊕ to 6
2T-C	56	–	–	–	–	–
2T-C (California)	56	–	56	53	53	–
20R	56	56	–	56	56	–
20R (California)	56	56	–	56	56	–
4M	56	56	–	56	28	–
4M (California)	56	56	–	56	28	–
2F	56	56	–	–	56	53

(3) Vacuum circuit continuity test

["OFF" state test]

With the VSV connector unplugged, make continuity tests between all pipes.

["ON" state test]

Connect the VSV wiring connector (+) terminal to the battery (+) terminal, and the other connector terminals to the ground.

Then make continuity tests between all pipes.

Note

1. Continuity test consists of blowing air or smoke into one pipe and determining from what pipes the air or smoke will blow out.
2. The testing will be made easier if the wiring is made up for six-terminal purpose as illustrated.

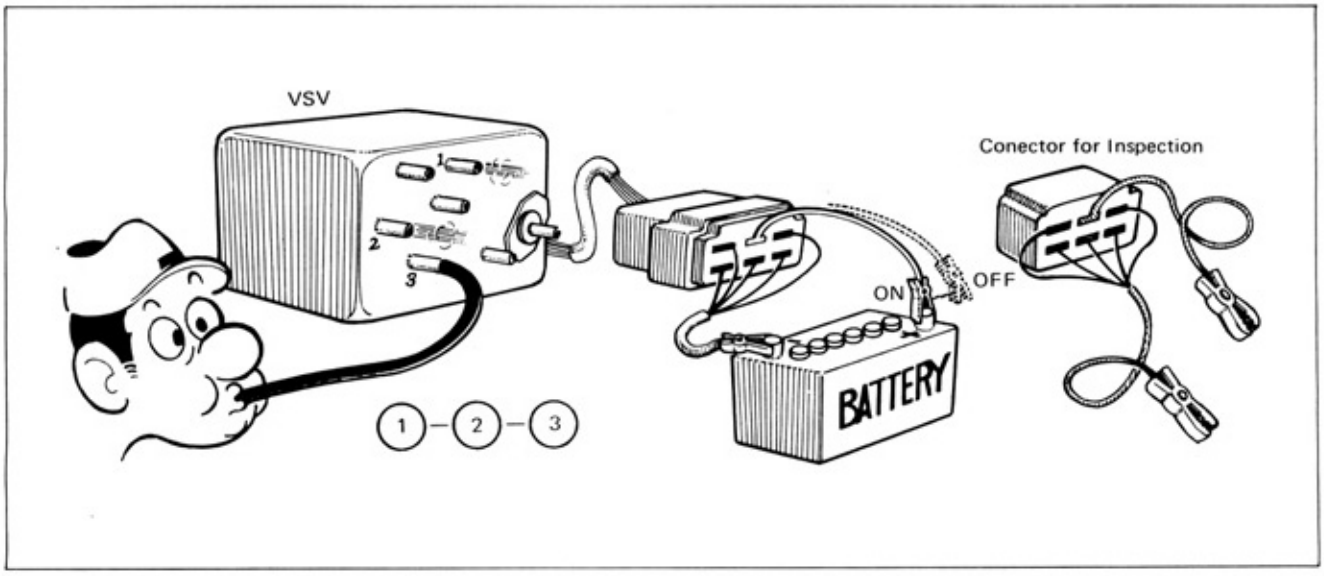

Fig. 1-16 VSV Vacuum Passage Continuity Test

The above procedure is used to make the VSV vacuum continuity tests on all engines.

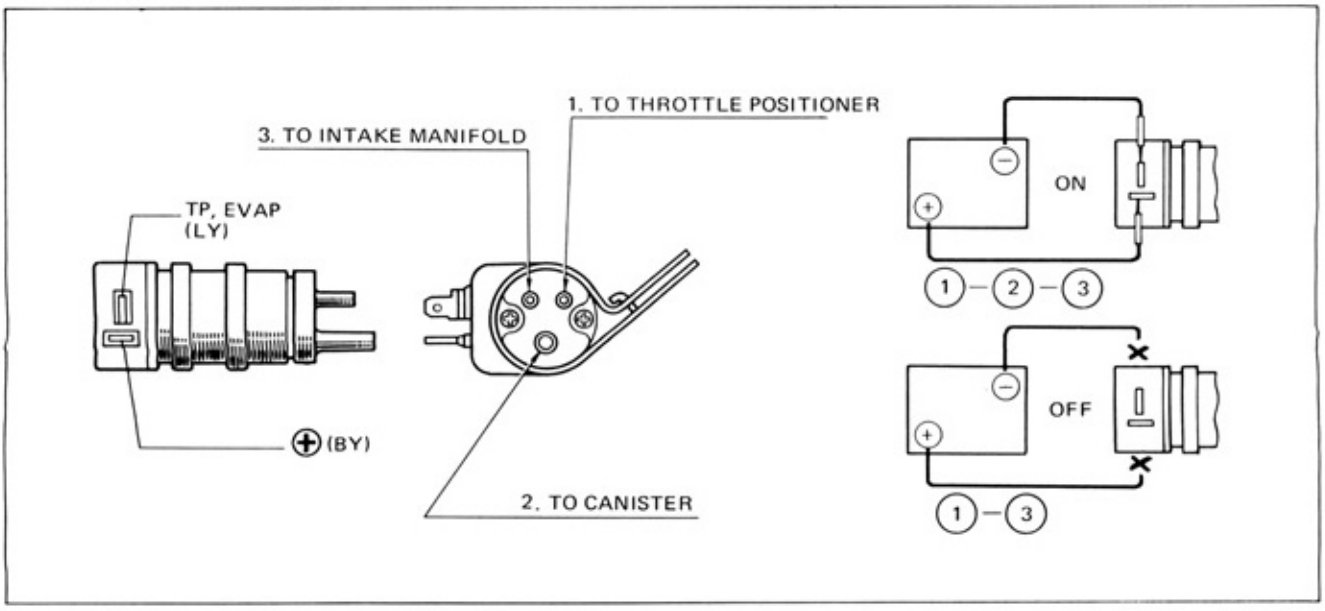

Fig. 1-17 Vacuum Passage Test (2T-C)

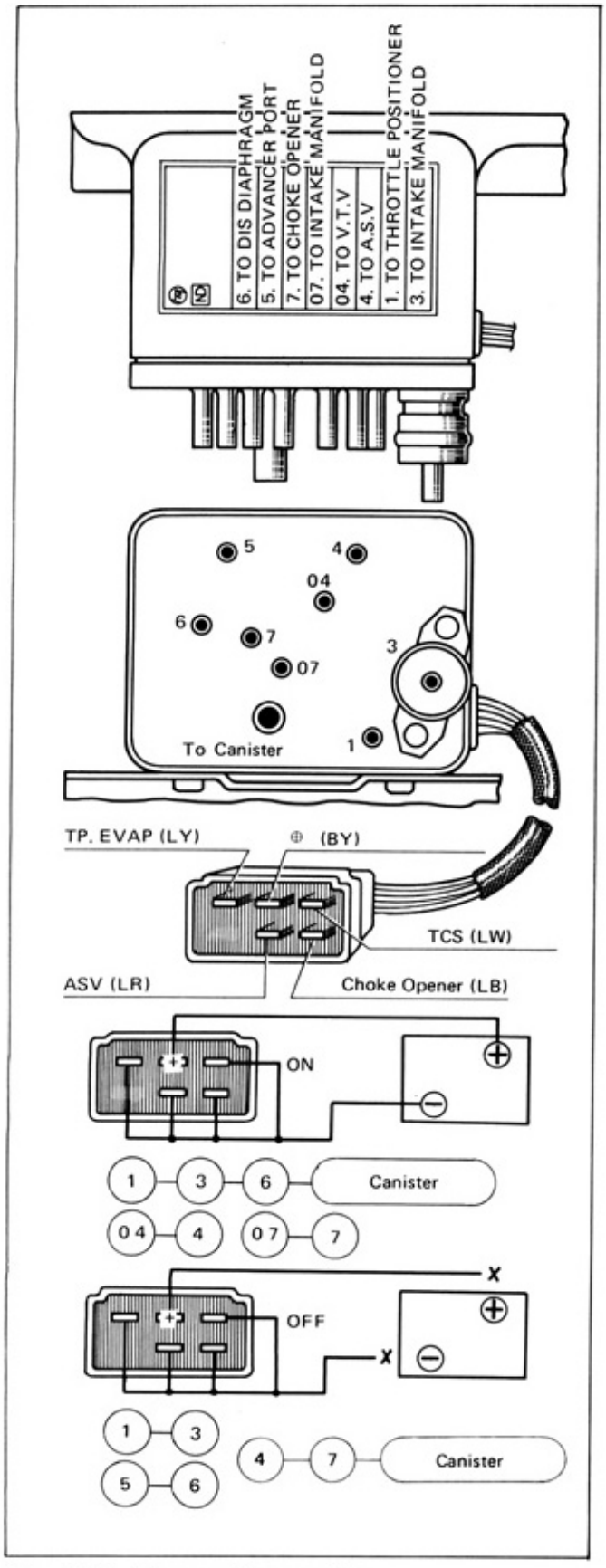

Fig. 1-18 Vacuum Passage Test (2T-C for California)

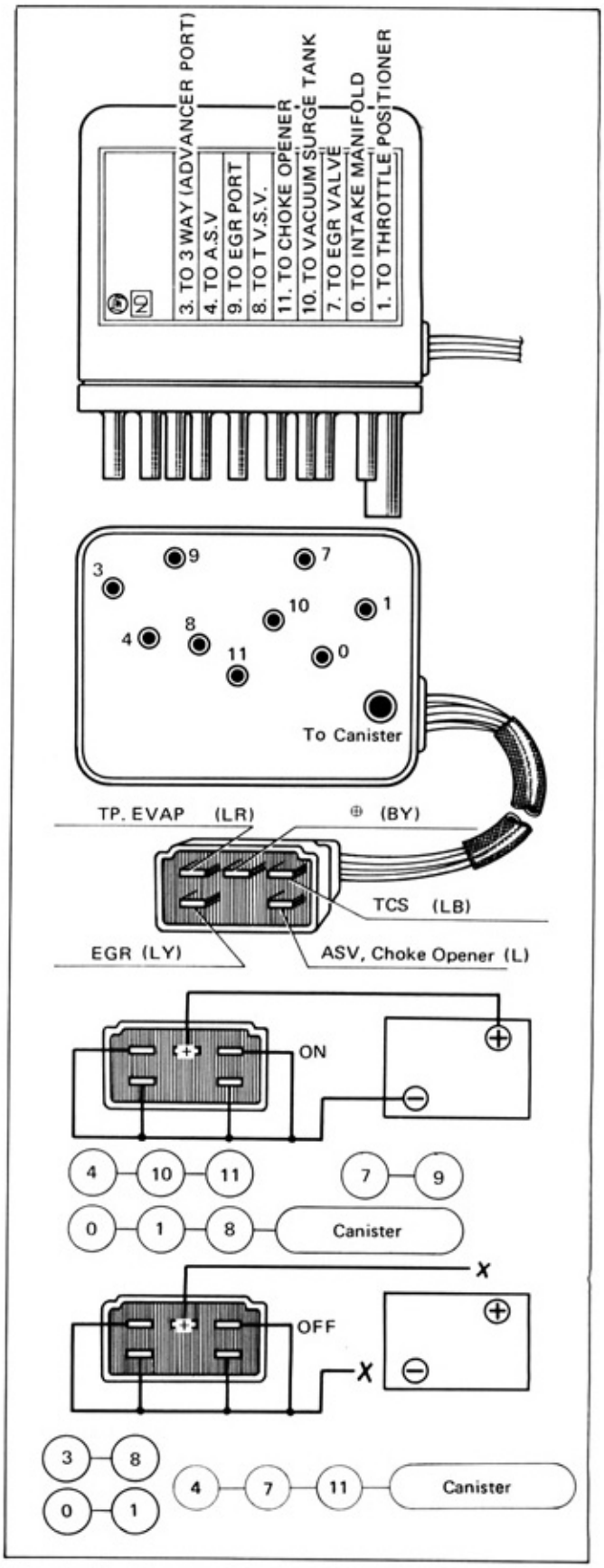

Fig. 1-19 Vacuum Passage Test (20R)

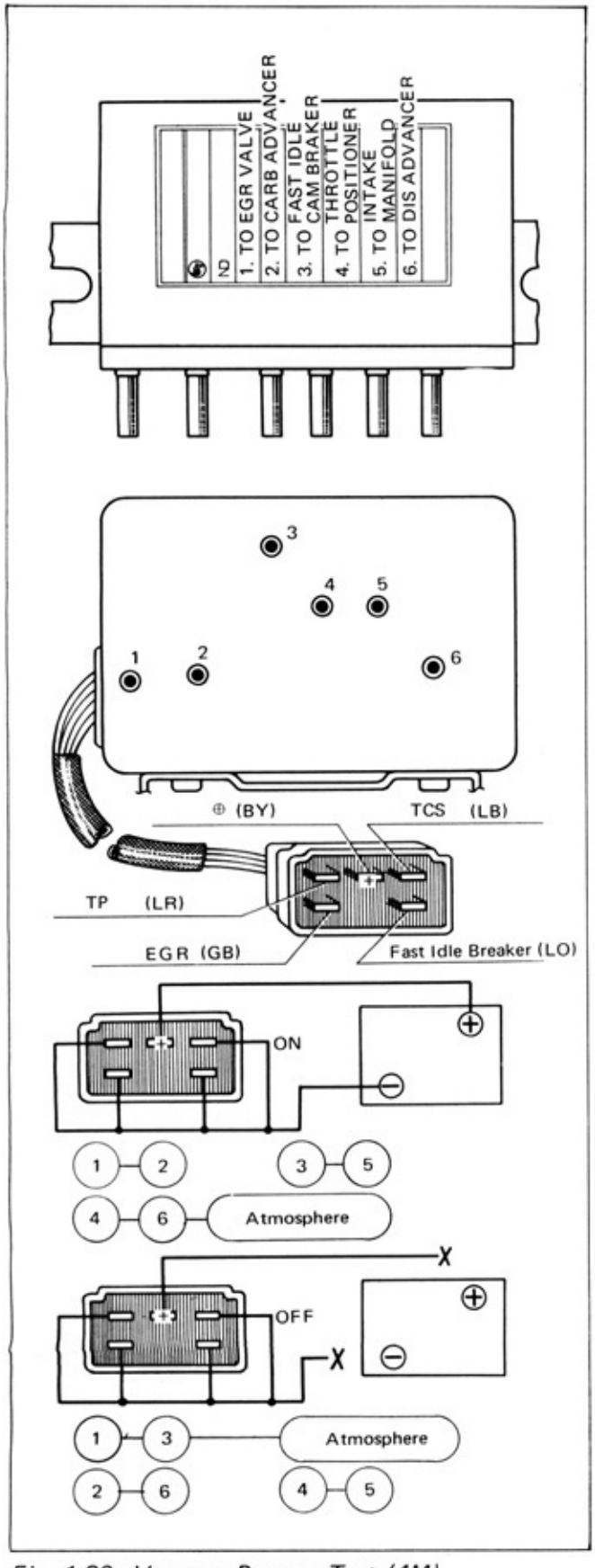

Fig. 1-20 Vacuum Passage Test (4M)

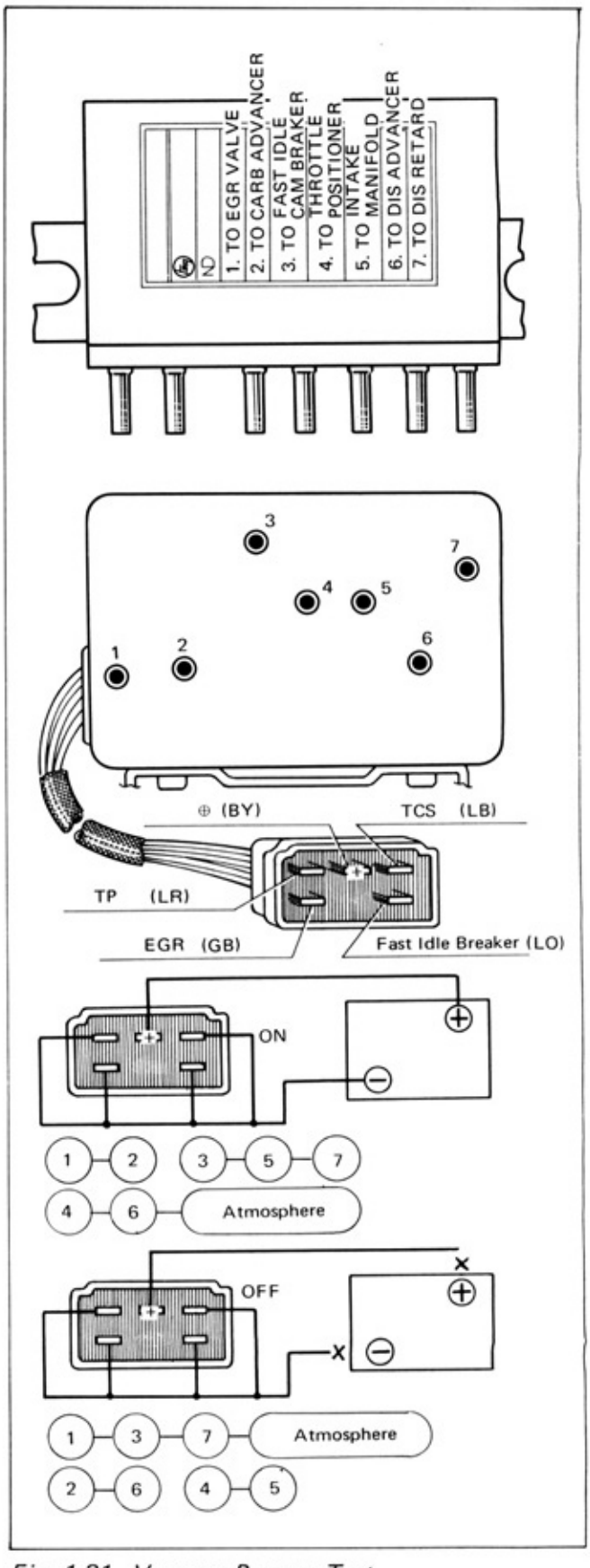

Fig. 1-21 Vacuum Passage Test (4M for California)

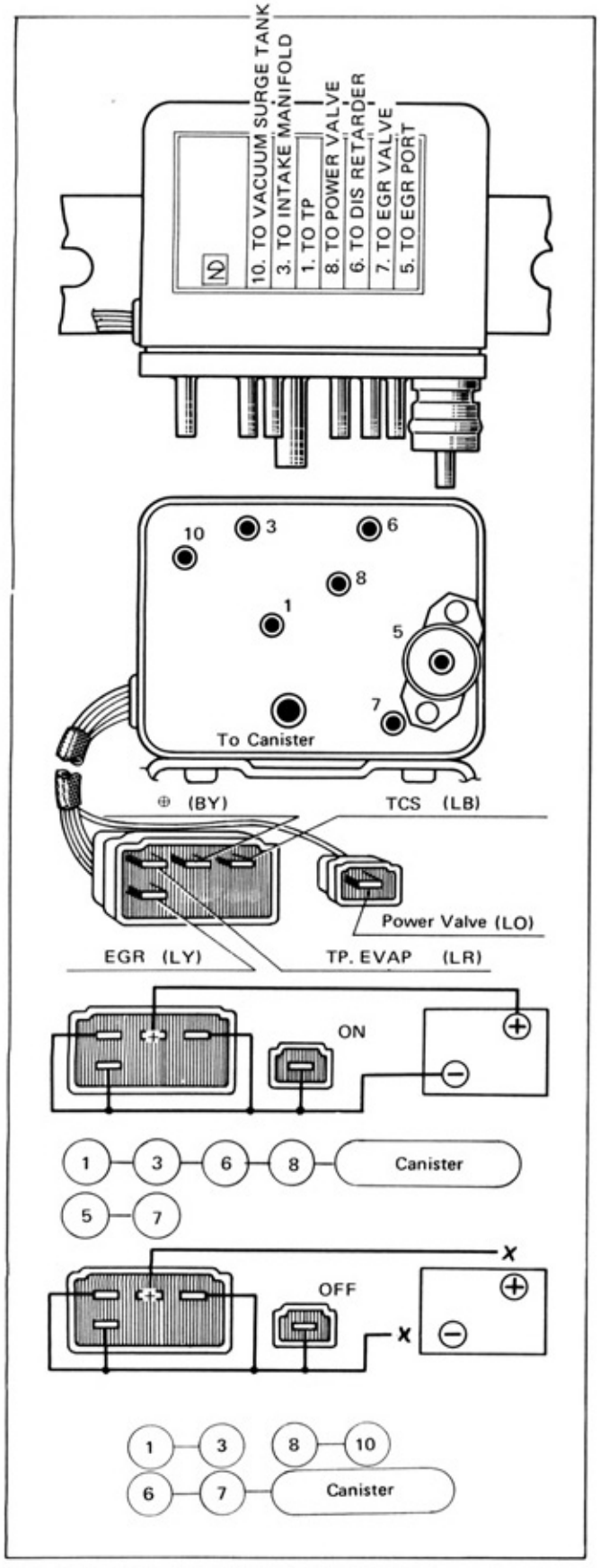

Fig. 1-22 Vacuum Passage Test (2F)

(4) VSV power source check
1) Turn the ignition switch on.
2) Under the condition of the VSV wiring connector plugged in, measure the voltage between the (+) terminal of VSV connector and ground with a voltmeter, as shown in Fig. 1-23.
3) If 12 volts are detected, the power sourse is satisfactory.
4) If zero or lower voltage is detected, check the fuse and wiring.

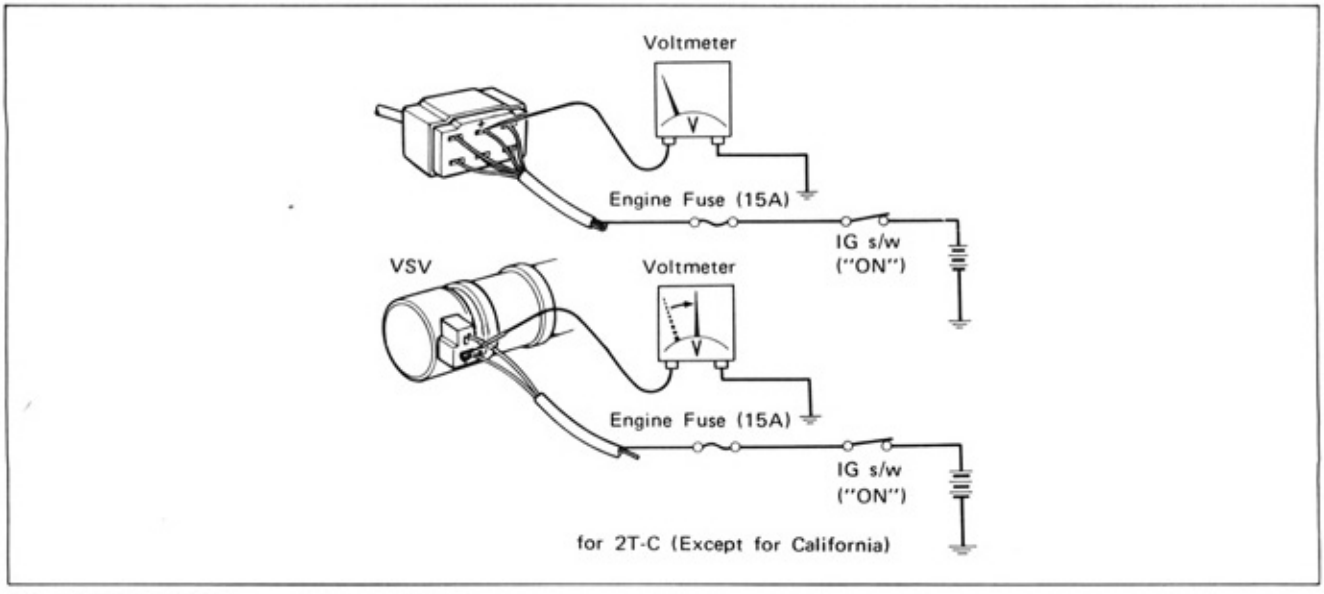

Fig. 1-23 VSV Power Source Check