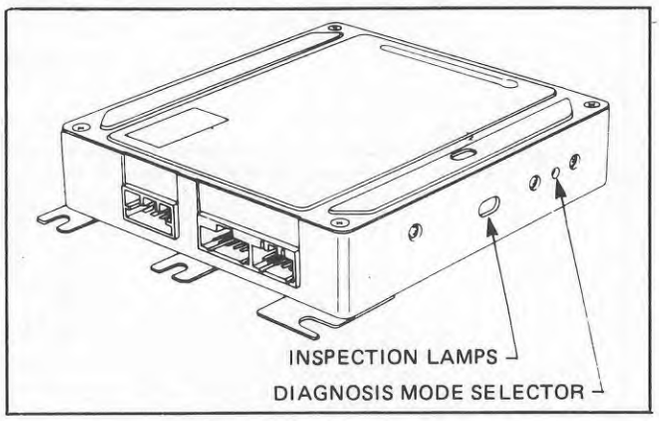
DIAGNOSIS

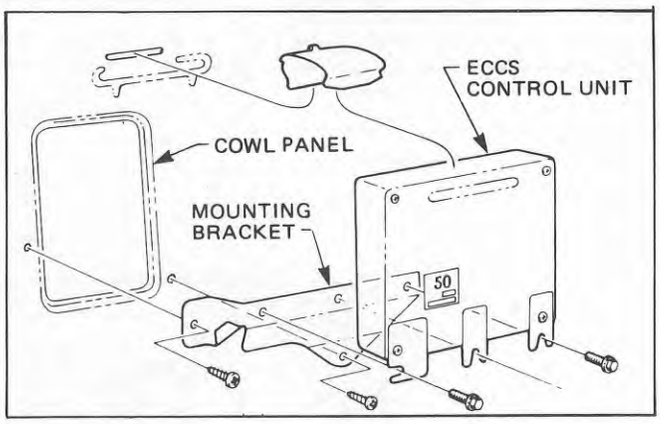
ECCS SELF DIAGNOSIS SYSTEM

The ECCS has a self-diagnostic system which records and displays malfunctions. Self-diagnosis is performed when power is supplied to the ECCS control unit, and the results are retained in the ECCS memory. This storing of information is also effective in detecting intermittent malfunctions. A malfunctioning area is determined by a code which is displayed on two Light Emitting Diodes (LEDS), red and green coloured, located on the side of the ECCS control unit.

ECCS CONTROL MODULE LOCATION

The control module is mounted behind the passenger side, front cowl panel trim.





DISPLAY METHOD

a. Self-diagnosing starts automatically by turning the diagnosis mode selector, which is located above the inspection lamps (LEDS), fully clockwise.

b. The code number needed to identify a problem is determined by the number of blinks of the red and green LEDS. The red lamp refers to the tenth digit while the green lamp refers to the unit digit. For example, when the red LED blinks twice and then the green LED blinks three times, this means that the code number is 23. Code number 23 indicates that the throttle valve switch is malfunctioning.

c. The red and green inspection lamps respectively turn on or off at an interval of 0.3 seconds. They remain off for the first 4.8 seconds immediately after self-diagnosing has started, then, the red lamp blinks for the next 2.4 seconds, followed by a 2.4 second pause and then the green lamp blinks for the next 2.4 seconds and goes out. After one item has been diagnosed in this manner, self diagnosing starts to check the next item after 4.8 seconds has elapsed.

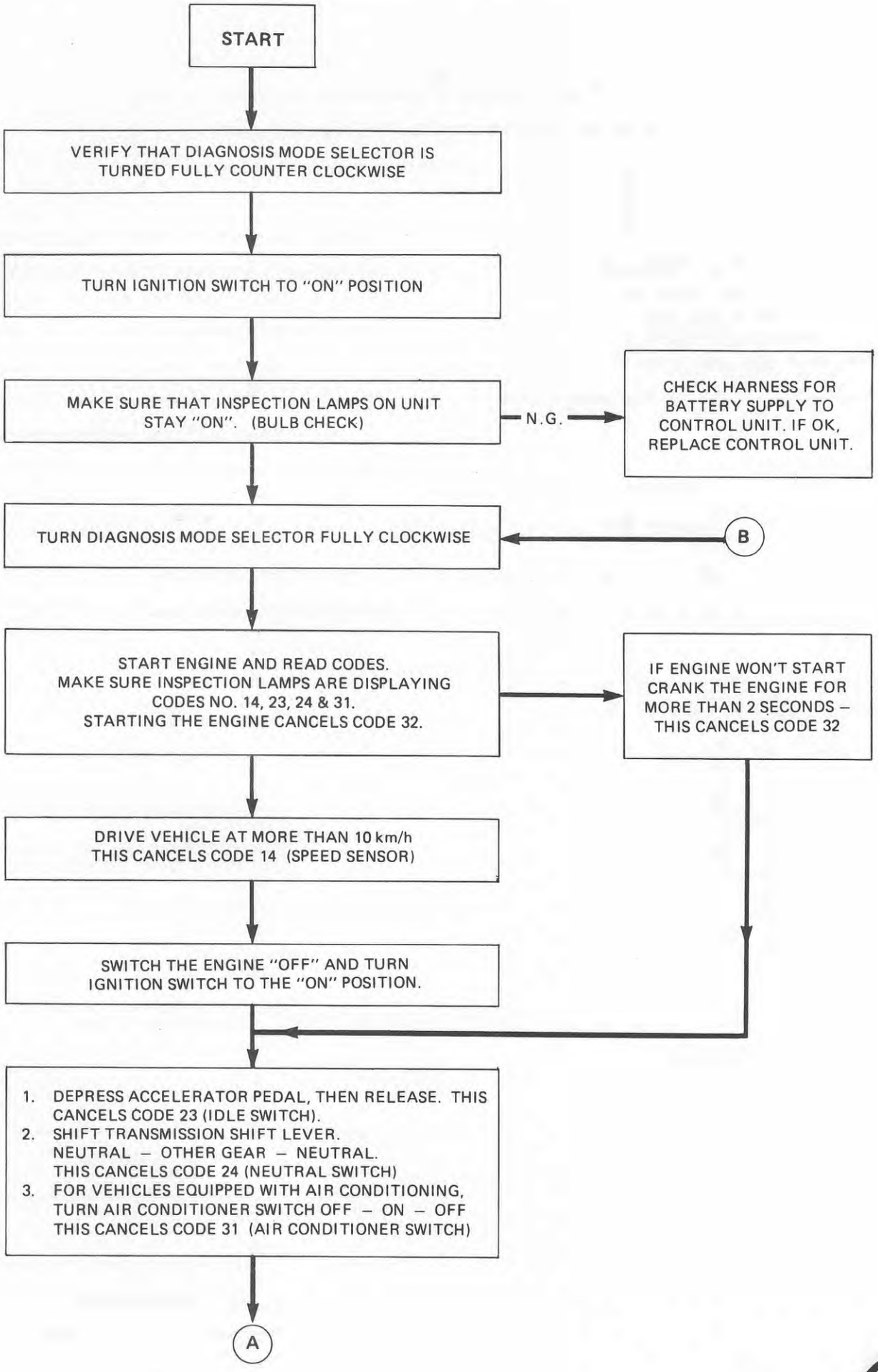
d. If there is more than one fault, the corresponding code numbers are indicated by the number of blinks in numerical order, one at a time, until all faulty items have shown. Then the lamps repeat the code numbers starting with the lowest stored code.

MALFUNCTION CODES

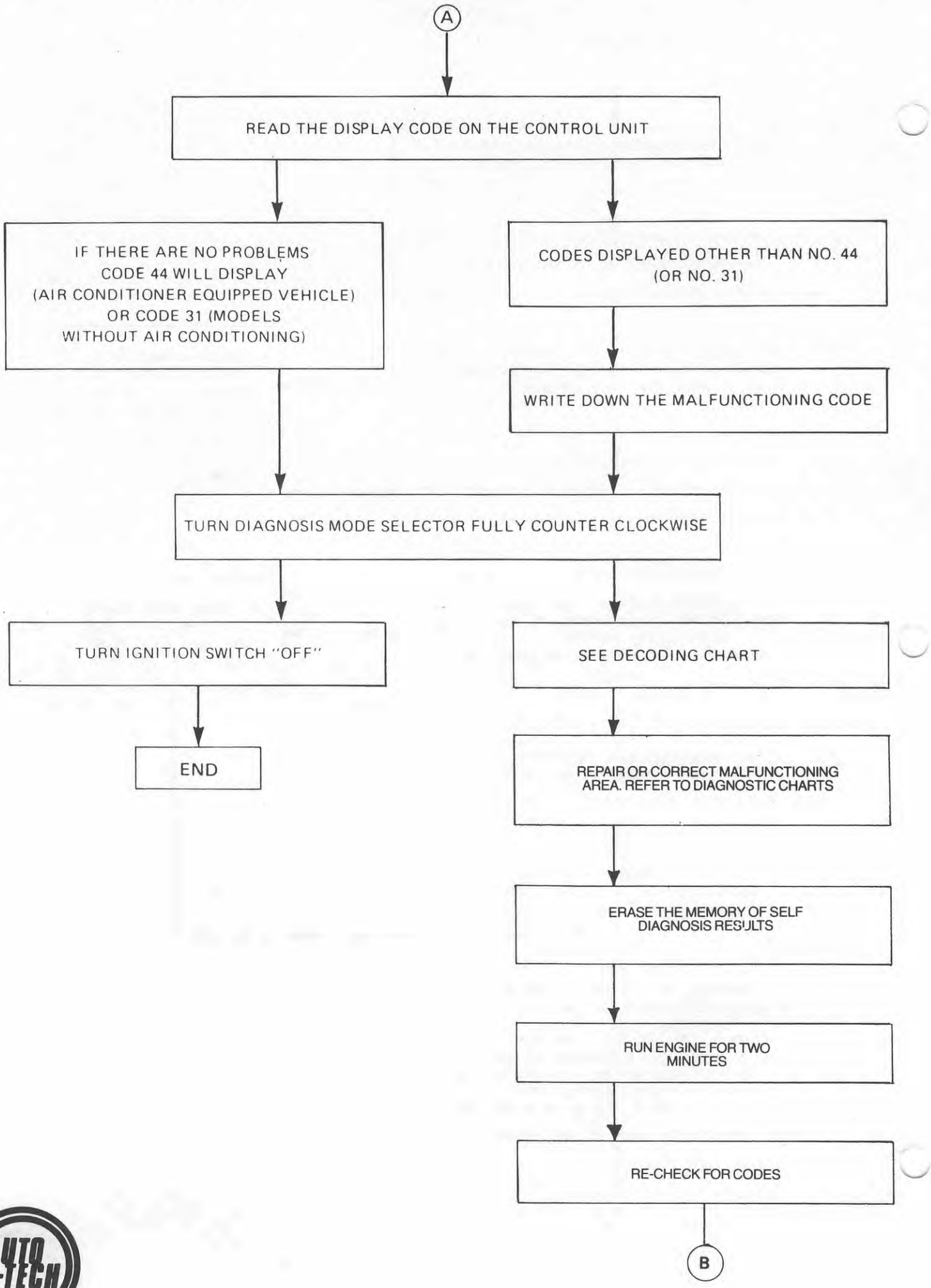
INDICATION METHOD				MALFUNCTION	
The Light Goes Out	Red Light	The Light Goes Out	Green Light	CODE	AREA
4.8 secs.	2.4 secs.	2.4 secs.	2.4 secs		
	o		o	11	Crank Angle Sensor
	o		o o	12	Air Flow Meter
	o		o o o	13	Coolant Temperature Sensor
	o		o o o o	14	Vehicle Speed Sensor System
	o o		o	21	Ignition Signal
	o o		o o o	23	Throttle Valve Switch (Idle Contact)
	o o		o o o o	24	Neutral Switch System
	o o o		o	31	Air Conditioning Switch
	o o o		o o	32	Starter Signal
	o o o		o o o o	34	Detonation Sensor
	o o o o		o o o o	44	ECCS System OK (Refer Note)

NOTE: If the vehicle is fitted with air conditioning, Code 44 will be displayed in diagnostic mode to indicate that the ECCS is operating correctly. If a vehicle is not fitted with air conditioning, Code 31 will be displayed to indicate ECCS is OK.

SELF DIAGNOSTIC PROCEDURE

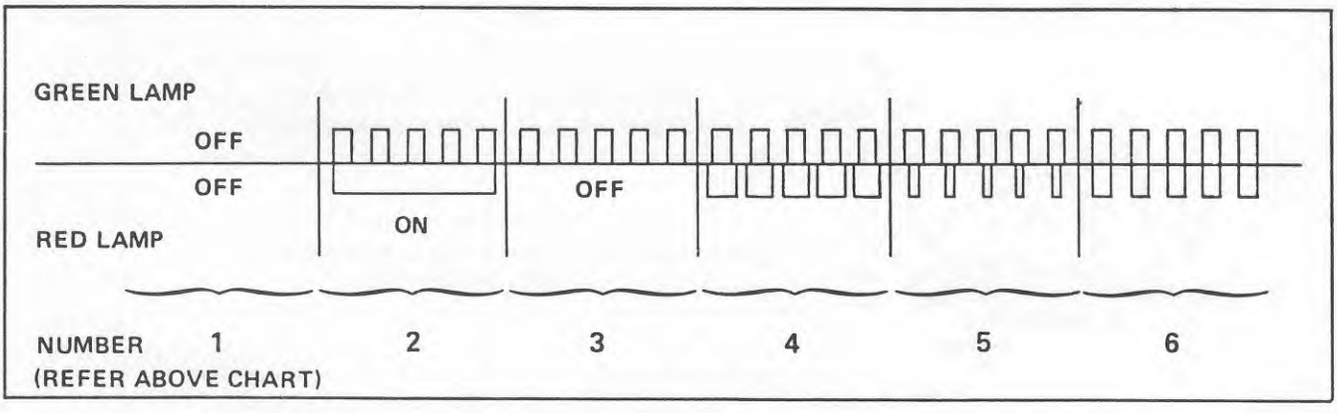


SELF DIAGNOSTIC PROCEDURE (Cont'd.)

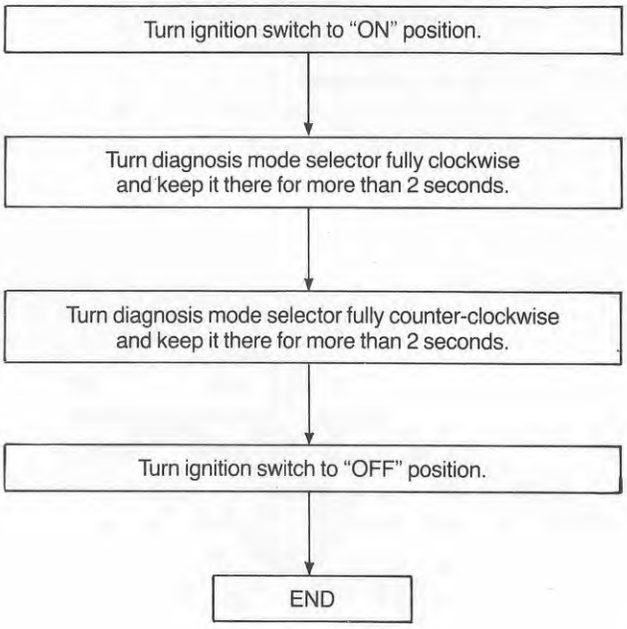


MIXTURE CODE SEQUENCE CHART				
DIAGNOSTIC LAMPS		NO.	DECODING LAMP FUNCTIONS	CAUSE OR STATUS
GREEN	RED			
OFF	OFF	1	Closed Loop Not Functioning	1. Oxygen Sensor and Harness Malfunction 2. Fully Rich 3. Fully Lean
Flashing 5 times per 10 secs. ↑	ON	2	Oxygen Sensor Functioning OK Base Mixture Ratio Lean	Air Flow Meter requires Adjusting
	OFF	3	Oxygen Sensor Functioning OK Base Mixture Ratio Rich	Air Flow Meter requires Adjusting
	Flashing staying 'ON' longer than 'OFF'	4	Oxygen Sensor Functioning OK Base Mixture Slightly Lean	Operation within tolerance (Note 1)
	Flashing staying 'OFF' longer than 'ON'	5	Oxygen Sensor Functioning OK Base Mixture Slightly Rich	Operation within tolerance (Note 1)
↓	Flashing in time with green	6	Oxygen Sensor Functioning OK Base Mixture Ratio Correct (λ = 1)	Optimum Operation
Refer Fig. 6C–42				

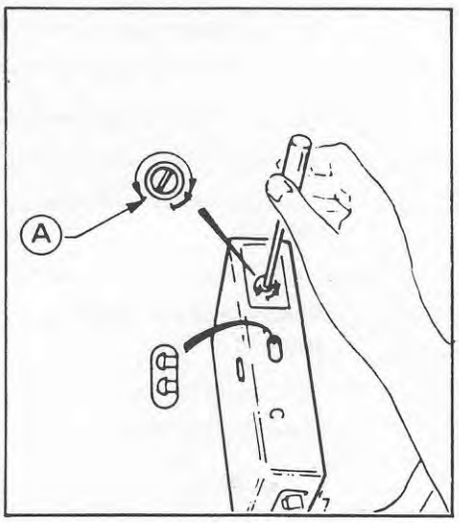
NOTE 1: If adjustment is necessary, the mixture ratio should be adjusted to the No. 6 "Optimum Operation" (Red lamp should flash in-time with the green lamp).

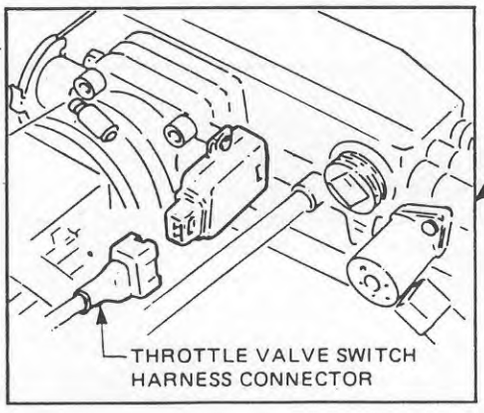


Procedure for memory erasure



MIXTURE ADJUSTMENT AND CLOSED LOOP INSPECTION AND SETTING PROCEDURE





START

Make sure that the following are normal.
- Engine operating temperature
- Idle speed
- Ignition timing

Turn diagnosis mode selector fully counter clockwise
(A)

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

Make sure that Inspection lamps (Green + Red) on control unit go 'ON' and 'OFF' more than 5 times during 10 seconds (2,000 rpm)
Refer to Mixture Sequence Chart

O.K.

N.G.

Disconnect throttle valve switch harness connector and A.A.C. valve harness connector.

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

Check Inspection lamp blinks. (Both red and green lamps.) Inspection lamps should blink.

Do not blink

Blink

Connect throttle valve switch harness connector and A.A.C. valve harness connector.

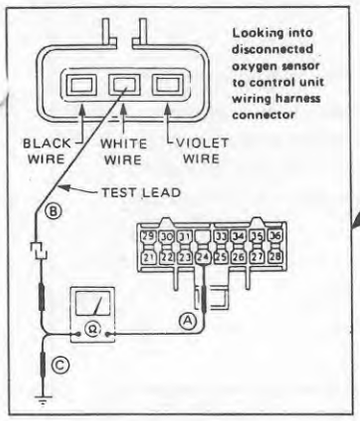
END

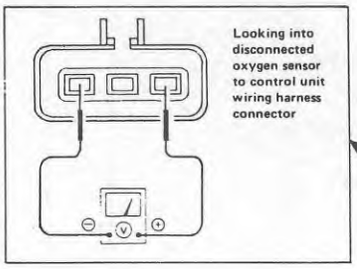
(A)

(B)

(C)

MIXTURE ADJUSTMENT AND CLOSED LOOP INSPECTION AND SETTING PROCEDURE (Cont'd.)





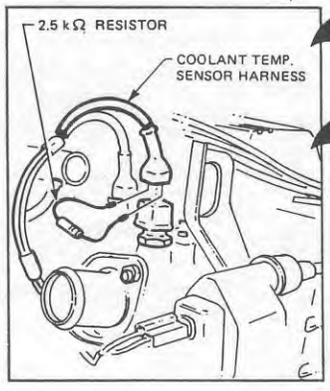
CHECK OXYGEN SENSOR HARNESS

1. Turn off engine and disconnect battery.
2. Disconnect 16-pin connector from control unit.
3. Disconnect oxygen sensor harness connector and connect a test lead, long enough to reach the control unit 16-pin connector inside the vehicle.
4. Check for continuity between terminal (24) of the 16-pin connector and the jumper wire. Refer following table.

From	To	Continuity	No Continuity
Pin (24)	Oxygen Sensor Connector (B)	OK	NG
Probe (A)			
Pin (24)	Earth (C)	NG	OK
Probe (A)			

5. Reconnect 16-pin connector to control unit.
6. Reconnect battery lead.
7. Check for battery power supply to oxygen sensor harness connector as follows.
   a. Connect a voltmeter to the disconnected oxygen sensor harness connector.
   b. Turn ignition "ON" (do not crank)
   c. Hear fuel pump relay click "ON" for 5 seconds. During the five seconds the fuel pump is "ON", 12 volts should exist at the harness connector.
8. Reconnect oxygen sensor harness if OK.

O.K. N.G.



O.K. N.G.

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

Disconnect coolant temperature sensor harness connector.

Connect a resistor (2.5 kΩ) between terminals fo the coolant temperature sensor harness connector.

Start engine and ensure engine is at normal operating temperature

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

CHECK CO%

Is idle CO within the range of 0.2 – 0.4%

After checking CO%
1. Disconnect the resistor from terminals of coolant temperature sensor.
2. Connect coolant temperature sensor harness connector to coolant temperature sensor.

N.G. O.K.

MIXTURE ADJUSTMENT AND CLOSED LOOP INSPECTION AND SETTING PROCEDURE (Cont'd.)

(A)

(B) → Connect oxygen sensor harness and disconnect throttle valve switch harness connector.

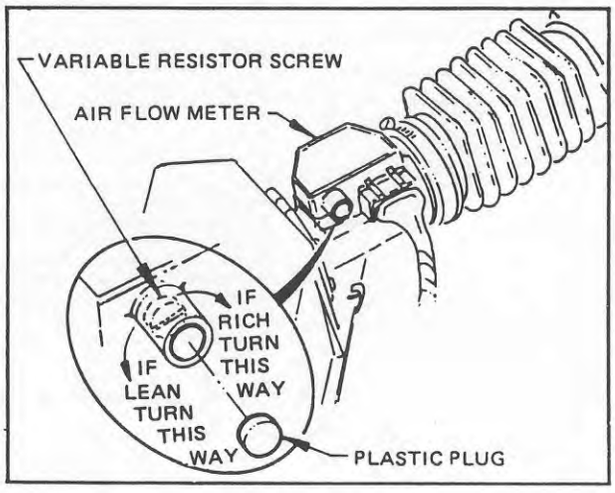
(D) → Replace oxygen sensor and make sure that both inspection lamps control unit go on and off more than 5 times during 10 seconds. (2,000 ± 20 rpm)

O.K. → (C)

N.G. → Replace E.C.C.S. control unit. → (C)

Turn off engine and remove air flow meter from vehicle.

Remove variable resistor screw plug by piercing plug with screwdriver and levering plug out.

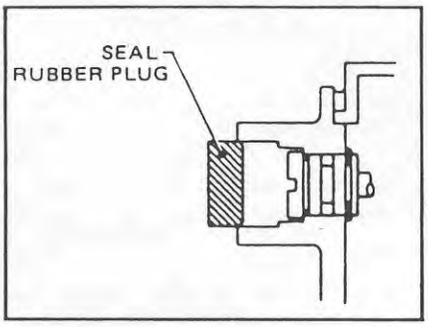


Install air flow meter on vehicle. Start engine and ensure that engine is at normal operating temperature

Adjust mixture ratio by turning variable resistor of air flow meter so that inspection lamps blink simultaneously

Adjustable → Turn off engine

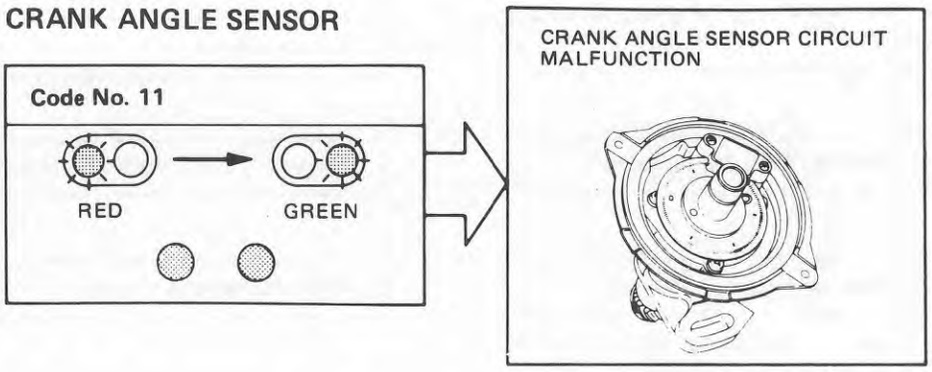
Not adjustable → Replace air flow meter → (C)

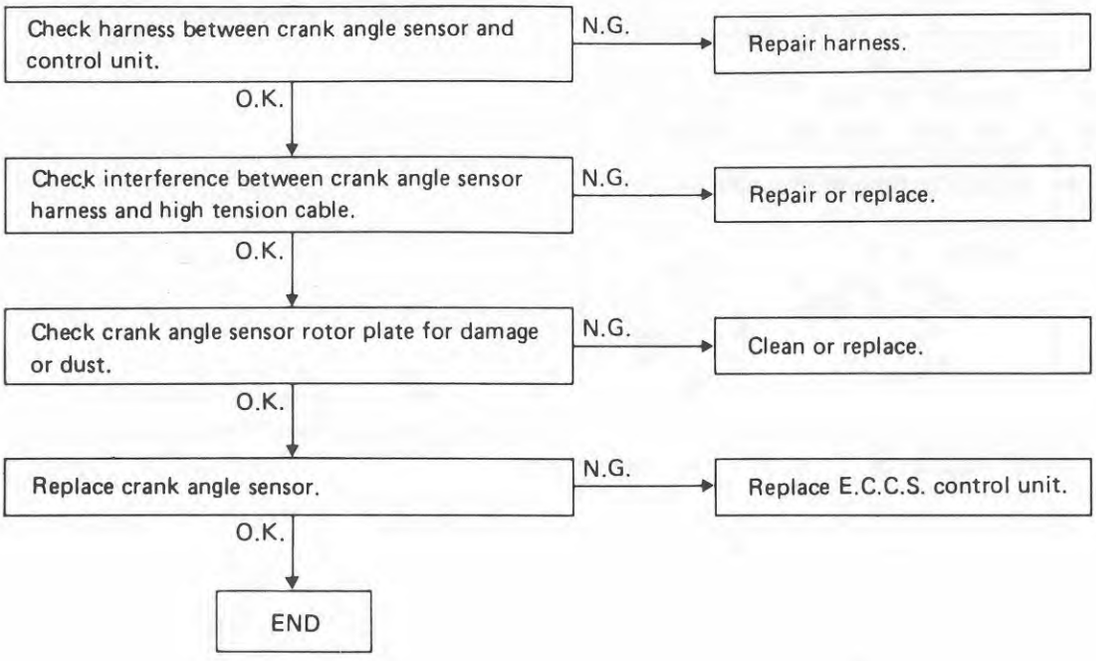


Reseal variable resistor screw plug with a new service plug. The service plug is coloured red and is available from GM P & A, Part Number VS16400.

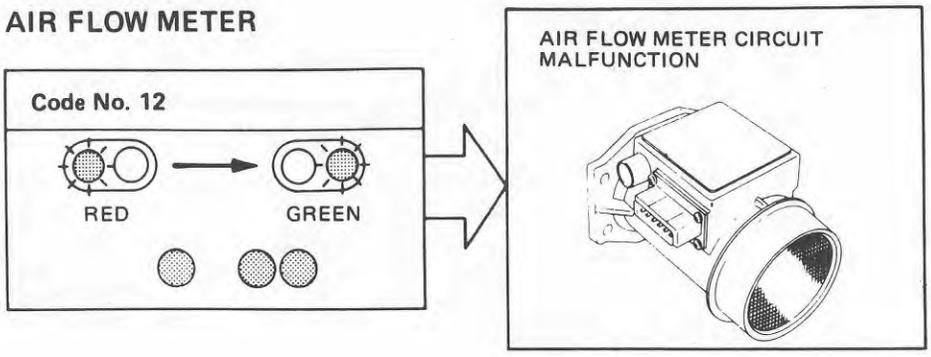
Connect throttle valve switch harness connector and A.A.C. valve harness connector. → (C)

CRANK ANGLE SENSOR





AIR FLOW METER



Does engine start? — N.G. → Erase memory.

O.K. → Run engine at idle speed for a few minutes.

Erase memory while running engine at idle.

O.K. → END

N.G. (No. 12) → Crank engine for more than 2 seconds.

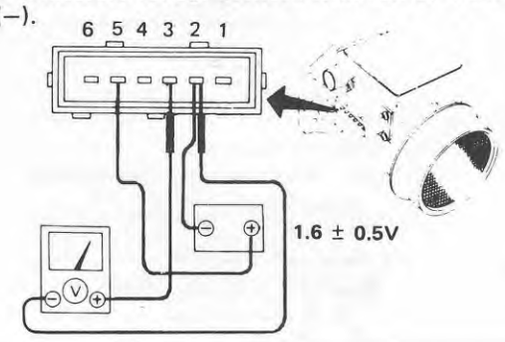
Look at inspection lamps.

N.G. (No. 12) → Check harness between air flow meter and control unit.

O.K. → E.C.C.S. is operating properly. Locate other malfunctions.

Check harness between air flow meter and control unit. — N.G. → Repair or replace harness.

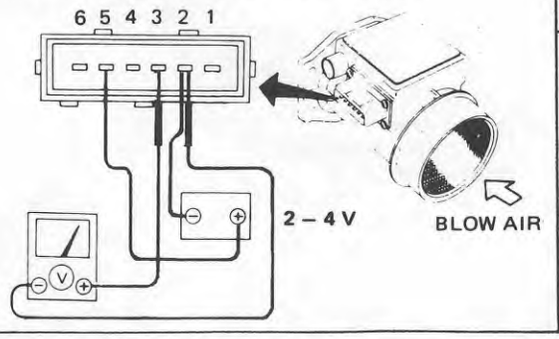
Remove air flow meter. Apply battery voltage to terminals 5(+) and 2(−).
Then measure voltage between terminals 3(+) and 2(−).



N.G. → Replace air flow meter.

O.K. →

Blow air through air flow meter and measure voltage between terminals 3(+) and 2(−).



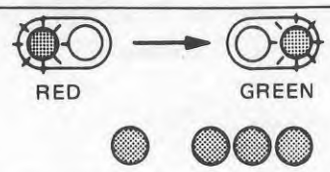
O.K. → Replace control unit.

N.G. → Replace air flow meter.

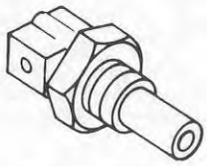
Video available of this procedure at MBS.id.au in the Fuel Injection section.

COOLANT TEMPERATURE SENSOR

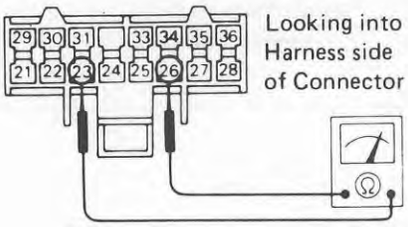
Code No. 13



Coolant temperature sensor circuit malfunction



Disconnect 16-pin connector and measure the resistance between terminals (23) and (26).



Cylinder head temperature	Resistance
Above 20°C	Below 2.9 kΩ
Below 20°C	Above 2.1 kΩ

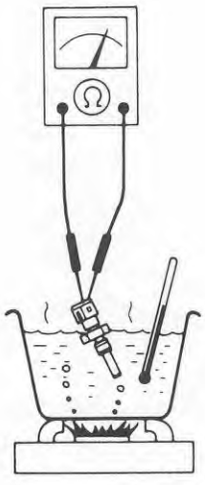
O.K. → Replace control unit.

N.G. → Check harness.

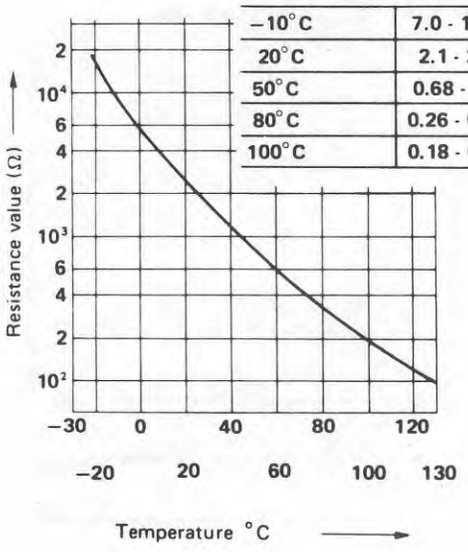
Check harness. N.G. → Repair harness.

Check harness. O.K. →

Dip the sensor into water maintained at a temperature of 20°C, 80°C, etc., and read its resistance.



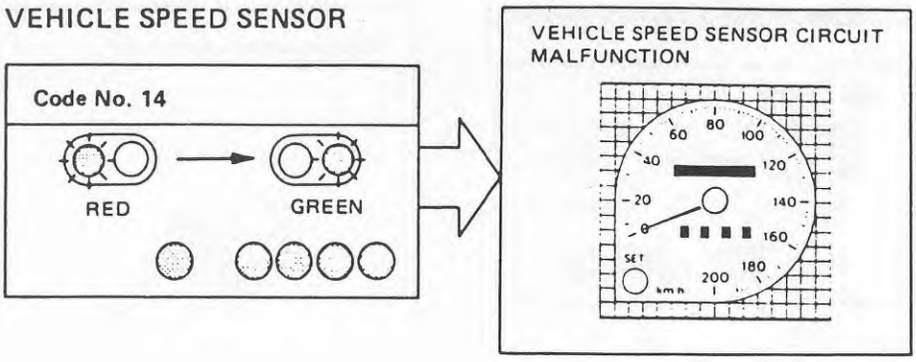
−10°C	7.0 - 11.4 kΩ
20°C	2.1 - 2.9 kΩ
50°C	0.68 - 1.0 kΩ
80°C	0.26 - 0.39 kΩ
100°C	0.18 - 0.20 kΩ



O.K. → Replace control unit.

N.G. → Replace coolant temperature sensor.

VEHICLE SPEED SENSOR

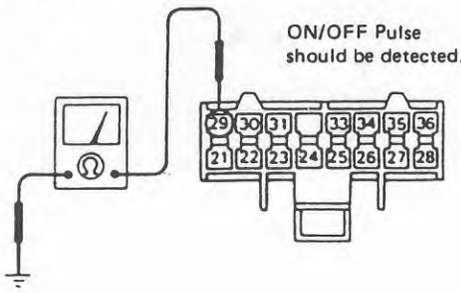


Is speedometer working?

N.G. → Repair or replace faulty component i.e.
- Speedometer cable drive gears
- Speedometer cable
- Speedometer assembly

O.K.

Place voltmeter across terminals (29) and ground. Jack up rear of vehicle. Start engine and allow to idle, transmission in Neutral. Rotate rear wheels by hand. Voltmeter reading from 0 to 5 volts (pulsating).

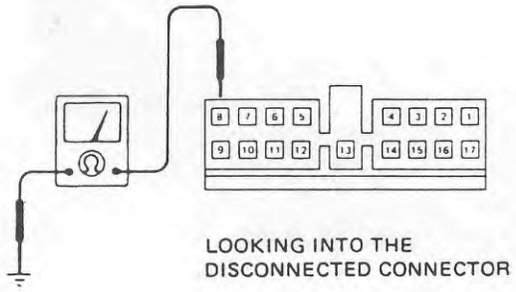


5 volts continuous → Check continuity of harness between terminal (29) and instrument cluster connector (speed sensor signal) terminal No. 8.

- O.K. → Replace speed sensor
- N.G. → Replace or repair harness

0 volts continuous

Disconnect instrument cluster connector (speed sensor signal). Voltage at terminal (8) should be 5 volts.



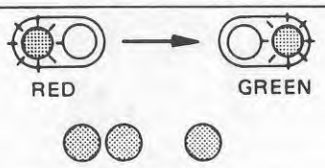
N.G. → Disconnect control unit connectors check terminal (29) to instrument cluster wire for continuity. Check wire is not shorted to ground.

O.K.

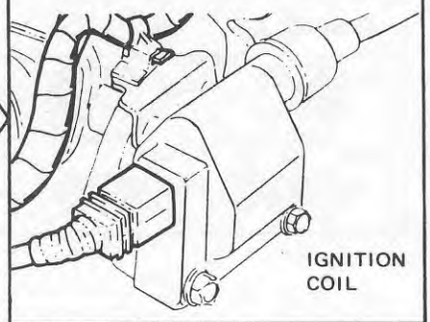
Replace control unit.

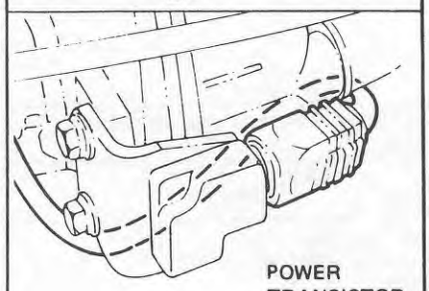
IGNITION SIGNAL

Code No. 21

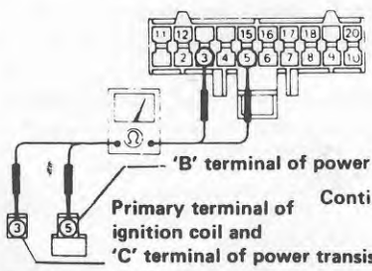


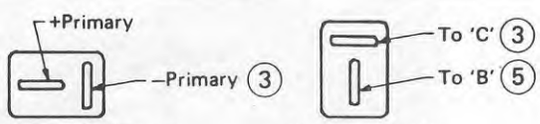
IGNITION SIGNAL MALFUNCTION





Disconnect 20-pin connector, power transistor harness connector and ignition coil harness connector. Then check harness for continuity between (3) - (3) and (5) - (5).





Ignition coil connector

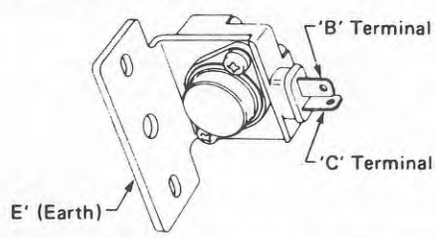
Power Transistor Connector

Looking into wiring harness connectors.

N.G. → Repair or replace harness.

O.K.

Check power transistor.



Tester	Lead to Terminal (+)	Lead to Terminal (–)	Should read
Analogue Type Ohmmeter	E	C	Open Circuit
	C	E	Continuity
	C	B	Continuity
	B	C	Open Circuit
	E	B	Continuity
	B	E	Continuity

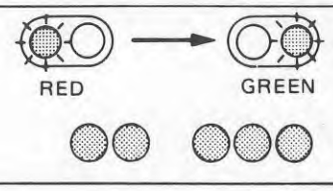
NOTE: Continuity; approximately 50% deflection of ohmmeter needle

N.G. → Replace power transistor.

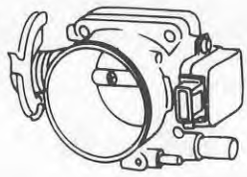
O.K. → Replace E.C.C.S. control unit.

THROTTLE VALVE SWITCH

Code No. 23



THROTTLE VALVE SWITCH (IDLE SWITCH) CIRCUIT MALFUNCTION

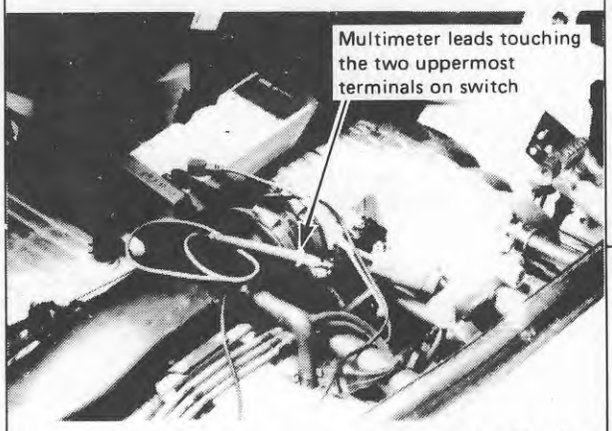


Check harness for continuity between switch and control unit.

N.G. → Repair harness.

O.K. ↓

Check the throttle valve switch idle contacts for continuity.



Continuity should exist.

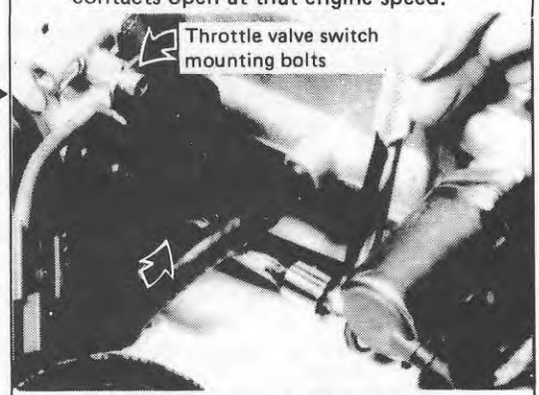
N.G. →

Adjust idle switch.

1) Hold engine speed as follows by manually opening the throttle valve.

M/T: 950 ± 50 rpm
A/T: 950 ± 50 rpm

2) Adjust idle switch so that the switch contacts open at that engine speed.



O.K. ↓

Make sure that continuity breaks when the throttle valve is slightly opened.

N.G. →

3) If idle switch cannot be adjusted, replace throttle valve switch.

Not adjustable ↓

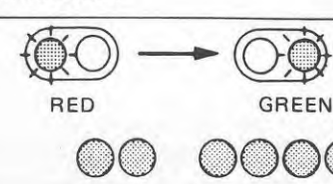
O.K. ↓

Replace E.C.C.S. control unit.

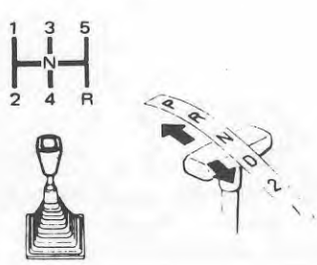
Replace throttle valve switch.

NEUTRAL/INHIBITOR SWITCH

Code No.24



NEUTRAL/INHIBITOR SWITCH MALFUNCTION

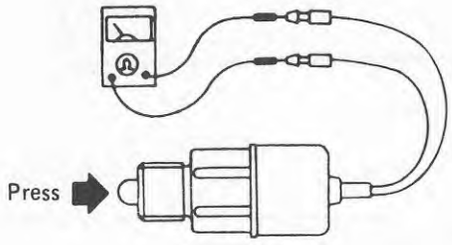


NEUTRAL/INHIBITOR SWITCH

Check harness for continuity. → N.G. → Repair harness.

O.K. ↓

Check neutral/inhibitor switch



Free (Neutral) . . . 0Ω
Press (Others) . . . ∞Ω

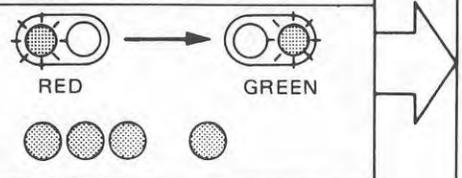
N.G. → Replace neutral/inhibitor switch.

O.K. ↓

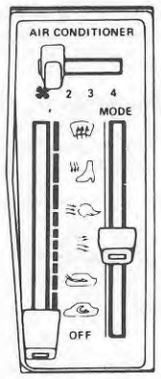
Replace E.C.C.S. control unit.

AIR CONDITIONER

Code No. 31



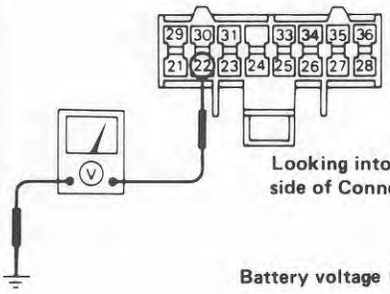
AIR CONDITIONER SYSTEM MALFUNCTION



Start engine, turn air conditioner switch "ON" and check compressor operation. → N.G. → Check air conditioner system.

O.K. ↓

Stop engine and disconnect 16-pin connector. Turn ignition switch "ON" and measure voltage between terminal ㉒ and ground.

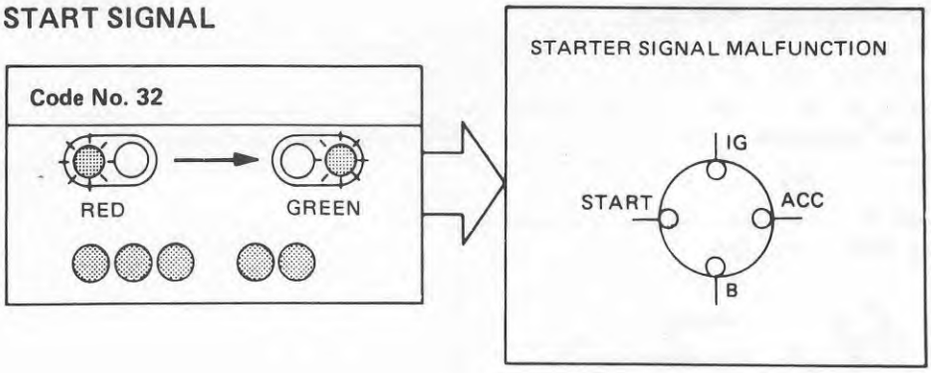


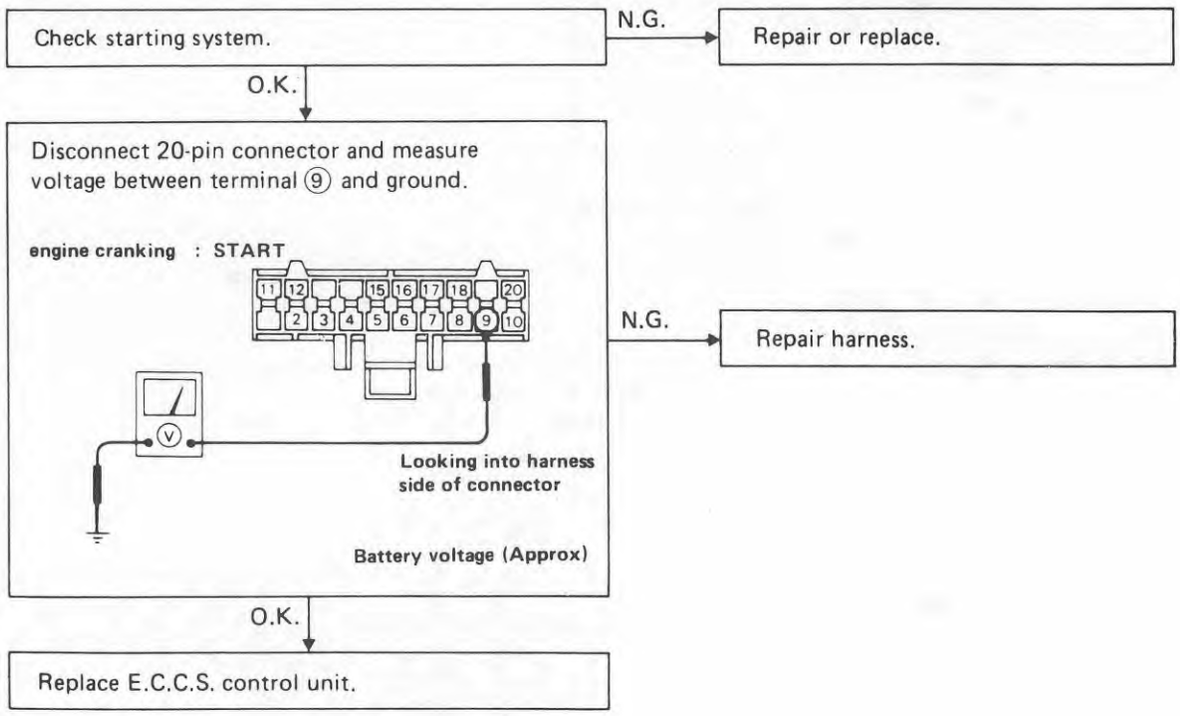
N.G. → Repair harness.

O.K. ↓

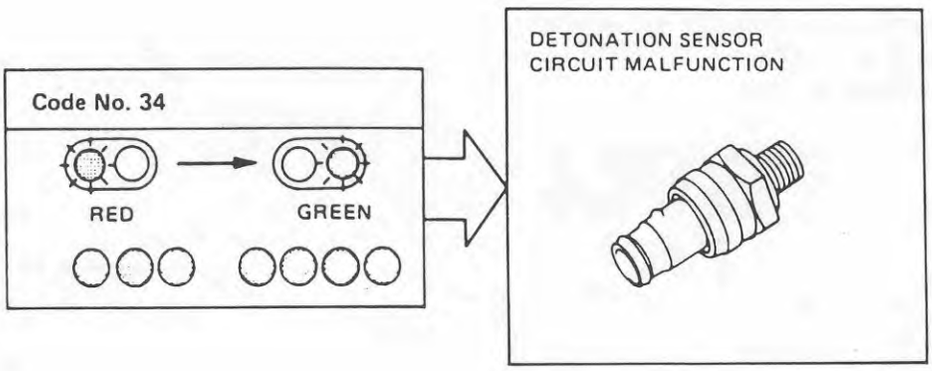
Replace E.C.C.S. control unit.

START SIGNAL





DETONATION SENSOR CIRCUIT MALFUNCTION



DETONATION SENSOR CIRCUIT MALFUNCTION

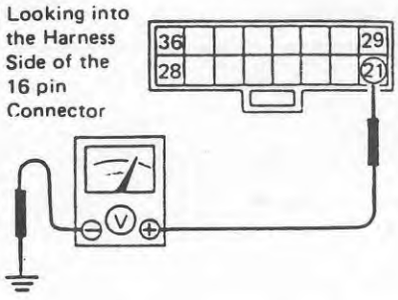
Erasure Control Unit Memory

Road test vehicle and recheck if Code No. 34 is stored in memory

YES

Check harness between control unit and detonation sensor for continuity

(1) Looking into the Harness Side of the 16 pin Connector



Remove Connector for detonation Sensor. Measure voltage at terminal (21) Approx. 7.5 volts with Ignition 'ON'

NG → Check voltage supply to control unit

NG → Check and repair wiring between control unit and battery. Check battery voltage

OK → Replace control unit

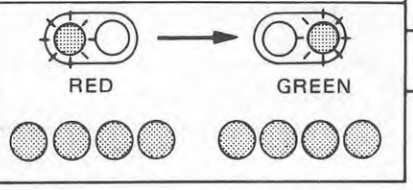
(2) Measure voltage at the disconnected detonation sensor connector approx. 7.5 volts with ignition 'ON'

NG → Repair harness

OK

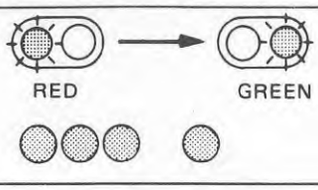
Replace Detonation Sensor

Code No. 44 (if vehicle fitted with A/C)



E.C.C.S. is operating properly.

Code No. 31 (not fitted with A/C)

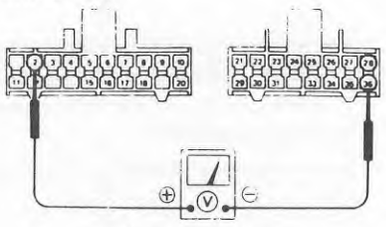


E.C.C.S. is operating properly.

Auxiliary Air Control (A.A.C.) Valve

Check voltage between terminals (2) and (28) (36) with 16-pin and 20-pin connectors connected to the control unit.

Ignition switch : ON



Battery voltage

O.K. → **END**

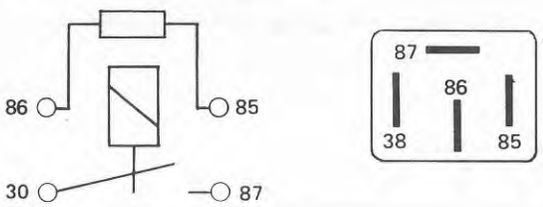
N.G.

Check harness for continuity.

N.G. → Repair harness.

O.K.

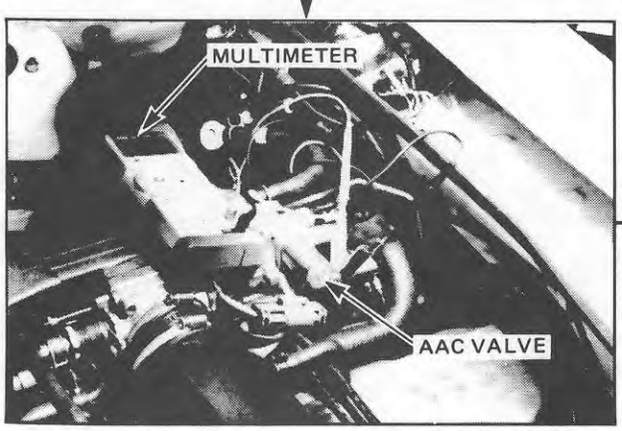
Check EFI relay using ohmmeter.



Check Terminal	Normal Condition	12V direct current is applied between terminals 86 and 85
86 and 85	Continuity	–
30 and 87	No Continuity	Continuity

N.G. → Replace E.F.I. relay.

O.K.



N.G. → Replace A.A.C. valve.

Battery Source and Ground

Verify that diagnosis mode selector on the E.C.C.S. control unit is turned fully counter-clockwise.

↓

Turn ignition switch "ON" and make sure that red and green inspection lamps on the E.C.C.S. control unit stay ON.

O.K. → **END**

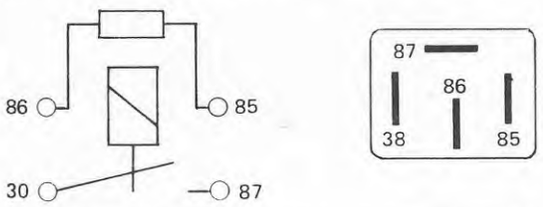
N.G. ↓

Check harness for continuity.

N.G. → Repair harness.

O.K. ↓

Check EFI relay using ohmmeter.



Check Terminal	Normal Condition	12V direct current is applied between terminals 86 and 85
86 and 85	Continuity	—
30 and 87	No Continuity	Continuity

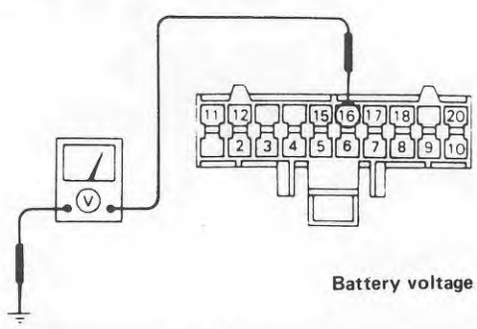
N.G. → Replace E.F.I. relay.

↓

Replace E.C.C.S. control unit.

Air Regulator

Disconnect E.C.C.S. 20-pin connector, and check voltage between terminal 16 and ground when ignition switch is turned to ON.



Battery voltage

O.K. → **END**

N.G. ↓

Check harness.

N.G. → Repair harness.

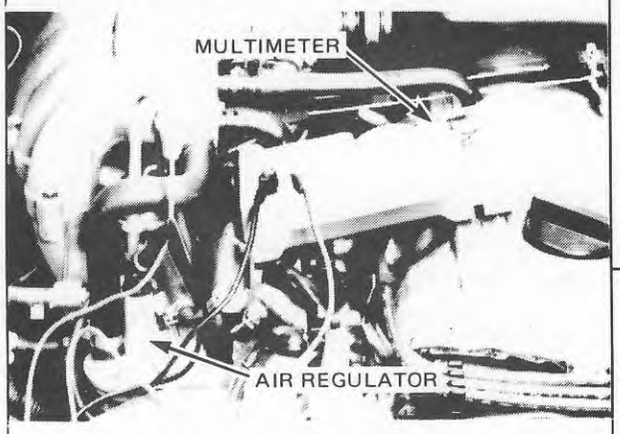
O.K. ↓

Air Regulator

OK

Check air regulator.

a. Check continuity.



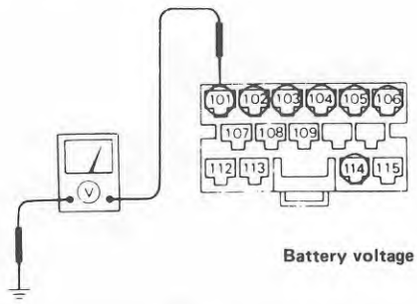
N.G. → Replace air regulator.

b. Remove air regulator and visually check shutter opening.
   - When engine is cold . . . . . Open
   - After warm-up . . . . . Closed

c. Pry air regulator shutter to open with a screwdriver, and check if shutter opens and closes smoothly.

Injector

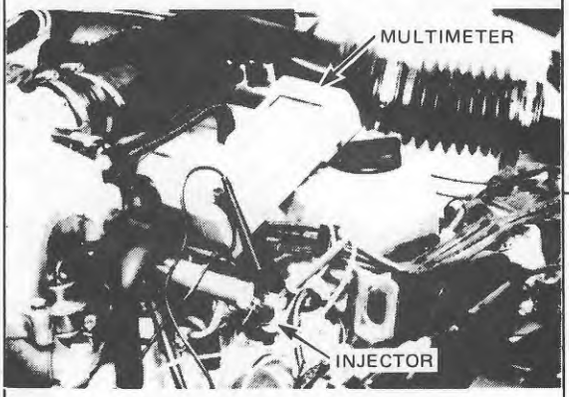
Disconnect E.C.C.S. 15-pin connector, and check voltage between terminal (101), (102), (103), (104), (105), (106), (114) and ground.



O.K. → END

N.G.

Check each injector for continuity.



Continuity should exist 2–7 ohms

O.K. → Check harness.

N.G.

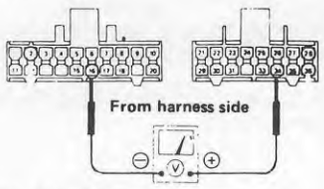
Replace injector.

Oxygen Sensor Heater

Disconnect E.C.C.S. 20 and 16 pin connectors and check voltage between 16 and 34 when ignition switch is turned to ON.

Ignition switch: ON

Battery voltage for approx. 6 secs. then go to zero

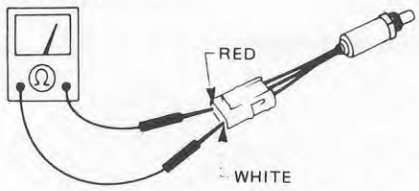


Turn ignition "OFF" after test.

O.K. → END

N.G. ↓

Measure the resistance of exhaust gas sensor heater.



Resistance 5 – 7 Ω

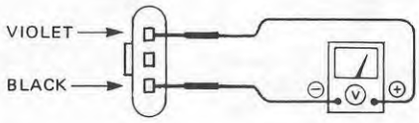
O.K. → Check harness.

N.G. ↓

Replace exhaust gas sensor.

Reconnect 20 and 16 pin connectors to control unit.

Check voltage across disconnect oxygen sensor harness connector



Ignition switch "ON".

Battery voltage for approx. 6 secs., then go to zero.
Turn ignition "OFF" after test.
(Must wait at lease 30 seconds before retesting)

N.G. ←

Repair of replace faulty wiring harness. Retest.

Oxygen Sensor

Ensure the engine is at normal operating temperature.

↓

Verify that diagnosis mode selector is turned fully counterclockwise.

↓

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

↓

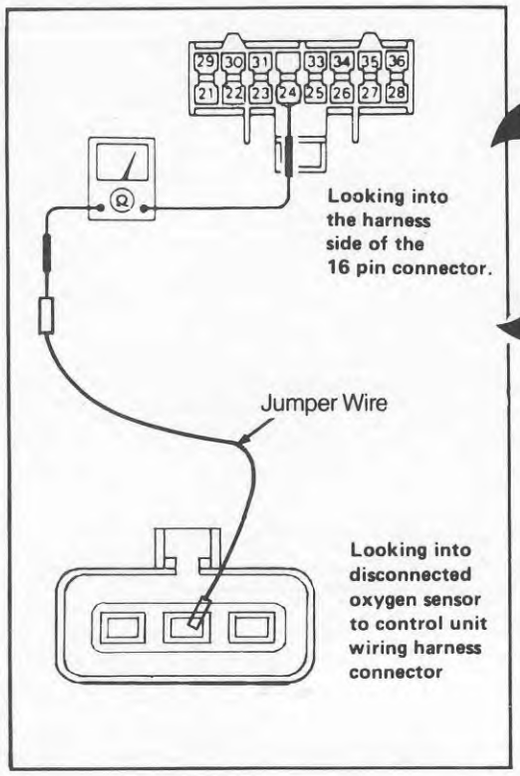
Make sure that inspection lamps (green and red) on control unit both go on and off more than 5 times during 10 seconds at 2,000 rpm.

N.G. ↓

O.K. ↓

END

Oxygen Sensor (Cont'd)



CHECK OXYGEN SENSOR HARNESS

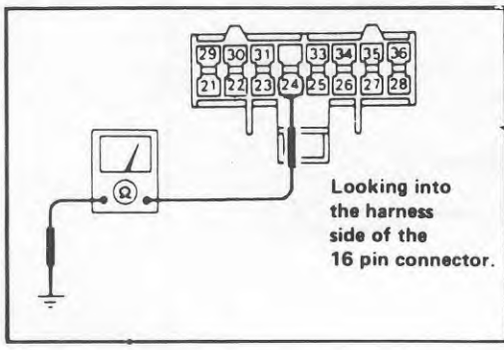
1. Turn off engine and disconnect battery.
2. Disconnect 16-pin connector from control unit.
3. Disconnect oxygen sensor harness connector and connect a jumper wire long enough to reach the control unit, inside the vehicle.
4. Check for continuity between terminal (24) of the 16 pin connector and the jumper wire.

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

O.K.

N.G.

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



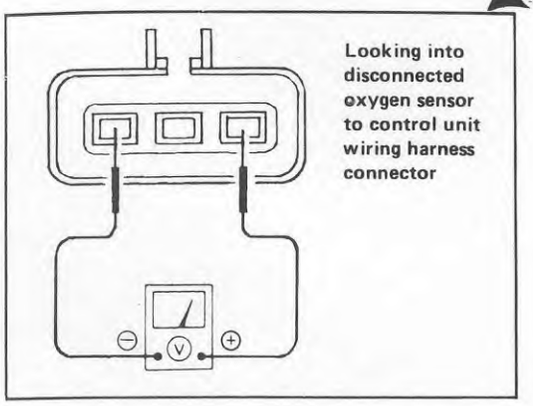
Check for NO continuity between terminal 24 of the 16-pin connector and a good earth.

No Continuity ..... O.K. Continuity ..... N.G.

O.K.

N.G.

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



1. Reconnect 16-pin connector to control unit.
2. Reconnect battery.
3. Check for battery power to oxygen sensor harness connector, heater circuit.
   - 3.1 With oxygen sensor still disconnected, connect voltmeter to wiring harness connector.
   - 3.2 Turn ignition switch 'ON'. (Do not crank).
   - 3.3 During the 5 second period when the fuel pump relay is energised, 12 Volts should be available at the harness connector.

12 Volt ..... O.K. 0 Volt ..... N.G.

O.K.

N.G.

Turn ignition switch 'OFF'.

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

Replace O_2 Sensor.

SERVICE PRECAUTIONS

1. Always use 12 volt batteries as the vehicle power source.
2. Do not attempt to disconnect the battery cables while the engine is running.
3. It is not necessary to depress accelerator pedal when starting.
4. Do not rev up engine just prior to switching the ignition 'OFF'.
5. Before removing any ECCS component, turn off the ignition and then disconnect the battery earth lead.

ECCS CONTROL UNIT

1. Do not disassemble control unit.
2. Do not turn diagnosis mode selector forcibly.
3. Securely connect ECCS harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to integrated circuits.
4. Keep ECCS harness at least 10 cm away from any adjacent harnesses, to prevent possible ECCS malfunction due to electrical transients.
5. Keep ECCS parts and harness dry.

AIR FLOW

1. Handle air flow meter carefully to avoid damage.
2. Do not disassemble air flow meter.
3. Do not clean air flow meter with any type of detergent.
4. Ensure that there are not any air leaks in the induction system as this will upset the air/flow ratio.

FUEL INJECTORS

1. The fuel injectors should be handled with care to avoid damage.
2. Do not apply battery voltage directly to the injectors.

POWER TRANSISTOR

Because of the close proximity of the power transistor wiring harness to the high tension cables, care should be taken to ensure the harness is routed away from the high tension cables.

If installing any sort of large capacity radio equipment or a vehicle phone, be sure to observe the following as it may adversely affect the ECCS depending on its installation location.

a. Keep the antenna as far as possible away from the control unit.

b. Keep the antenna feed line more than 20 cm. away from the harness of electronic controls. Do not let them run parallel for a long distance.

c. Adjust the antenna and feeder line so that the standing wave ratio can be kept smaller.

REFERENCE MATERIAL AND SPECIAL TOOL REQUIREMENTS

REFERENCE MATERIAL —

For System Operating Principles, Specific Servicing Procedures, Specifications and complete E.C.C.S. Diagnosis and Troubleshooting Charts, refer to the Holden Commodore, Holden Calais - VL Series Service Manual Supplement (Part No. M-39434).

SPECIAL SERVICE TOOLS

It is mandatory that only:

— A DIGITAL Multimeter, with a 10 megohm impedance, is used for circuit and system testing.

— If a Test Lamp is required, use a needle probe, UNPOWERED unit (J34142-A or equivalent).

— A 2.5 Kilohm, Carbon Resistor, with a power rating of 0.5 Watt must be used when carrying out the mixture inspection and setting procedure. This resistor can be obtained from electronic component suppliers. Note: If a 2.5 kilohm rating is not available, use either a 2.2 kilohm or 2.7 kilohn resistor. However, the 2.5 kilohm resistor is prefered.

— Non-dispersive infra-red, C.O. meter, calibrated in accord with equipment manufacturers instructions.

AUTO-TECH