1982 Exhaust Emission Systems

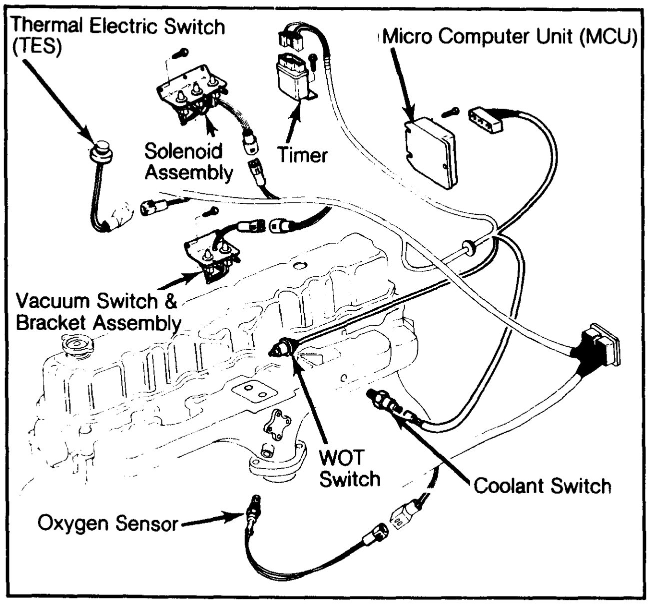
JEEP COMPUTERIZED EMISSION CONTROL

6-Cylinder Except Federal CJ

DESCRIPTION

The Computerized Emission Control (CEC) system is an electronically controlled system that closely controls air/fuel ratio to lower exhaust emissions, while maintaining good fuel economy, and to control the AIR injection system. The main purpose of the CEC system is to maintain an ideal air/fuel ratio of 14.7:1 under all operating conditions. When ideal ratio is maintained, the catalytic converter can effectively control NOx, HC and CO.

Fig. 1: Jeep 6-Cylinder CEC System



Solenoid and vacuum switch assemblies are mounted on right side inner fender panel.

OPERATION

The CEC system consists of 4 sub-systems: Fuel control, data sensors, Micro Computer Unit (MCU) and catalytic converter.

FUEL CONTROL

All models are equipped with feedback carburetors which contain an electronically operated stepper motor. The stepper motor controls the metering pins that vary the size of idle and main air bleed orifices in carburetor body. Stepper motor moves the pins in and out of the orifices by steps, in response to signals received from MCU. The motor has a range of 100 steps, but normal operating area is mid-range.

When the metering pins are "stepped" in direction of orifices, the air/fuel mixture becomes richer. When the pins are "stepped" away from orifices, mixture becomes leaner.

DATA SENSORS

Oxygen Sensor

The oxygen sensor is located in the exhaust manifold to measure oxygen content of exhaust gases. As more oxygen is sensed (lean mixture indication), electrical signal generated by sensor drops in voltage. A lower oxygen content (rich mixture indication) causes an increase in voltage signal output.

Thermal Electric Switch (TES)

TES is attached inside air cleaner. It provides either a ground circuit for MCU, to indicate necessity for cold weather engine start-up (air tmeperature below calibrated value), or an open circuit to indicate normal start-up (air temperature above calibrated value).

Coolant Temperature Switch

This switch is an integral component of the intake manifold heater coolant temperature control switch. It is controlled by coolant temperature and is normally closed. The switch opens when engine temperature is below 160°F (71°C).

4 in. Hg Vacuum Switch

Switch and bracket are mounted on right fender panel. Switch is controlled by carburetor ported vacuum and has a normally closed (NC) electrical contact, indicating a closed throttle condition. When vacuum reaches 4 in. Hg, the switch is opened.

10 in. Hg Vacuum Switch

Switch is mounted with 4 in. Hg switch on fender panel. It is operated by intake manifold vacuum. When vacuum reaches 10 in. Hg, indicating open throttle condition (non-cruise), an electrical contact opens, informing ECM of condition.

Wide Open Throttle Switch (WOT)

This mechanically operated electrical switch is located on carburetor. It is controlled by throttle position to indicate a wide open throttle condition. This switch is normally open.

Engine RPM

Voltage is supplied from tach terminal on distributor. Until a voltage equal to a pre-determined RPM is received by MCU, the system remains in open loop mode, resulting in a fixed rich air/fuel mixture for engine starting.

Timer

Timer is activated whenever system is operating in open loop 2 (OL2) mode (wide open throttle). It remains active for a preset period of time. If a "lean limit" condition (altitude jumper wire installed) occurs, the timer becomes inoperative. Timer has multi-function abilities. In addition to OL2 mode, it is used as a WOT and start-up timer.

MICRO COMPUTER UNIT (MCU)

The MCU is located in the engine compartment, on the left hand inner fender panel. The MCU monitors CEC system data sensors and, based upon mode of operation, generates an output control signal to the stepper motor. The MCU allows the following 3 modes of operation.

Initialization

This function occurs when ignition switch is turned on. Stepper motor drives air bleed metering rods to a full rich position (fully toward front of vehicle) and immediately backs off a pre-programmed number of steps in the lean direction. This serves as a starting point for mixture control operation.

Open Loop

In this mode, the MCU determines the air/fuel mixture based upon engine operation rather than oxygen sensor input signals. There are 5 open loop modes of operation, each with a specific metering pin position.

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However, because 2 or more conditions may be present at the same time, MCU is programmed with a priority ranking for each operation. The MCU complies with the highest priority. Open loop modes (in order of priority) are as follows:

- **Cold Weather Start-Up & Operation**
  If air cleaner air temperature is below calibrated value of TES, the stepper motor positions the metering pins a pre-determined number of steps richer than at initialization. Air injection is diverted "upstream". Lean air/fuel mixtures are not permitted for preset time period following a cold weather start.
- **Open Loop 2 (Wide Open Throttle)**
  Open Loop 2 (OL2) is selected whenever air cleaner air temperature is above calibrated value of the TES and the WOT switch has been engaged. In OL2 mode, the stepper motor drives the metering pins to a calibrated number of steps richer than intialization and the air control valve diverts air "downstream". Timer is activated in this mode.

NOTE: **If a "lean limit" condition (altitude jumper wire installed) is selected, air is diverted "upstream". Timer is inoperative if "lean limit" is selected.**

- **Open Loop 4**
  Open Loop 4 (OL4) mode is selected whenever manifold vacuum falls below a preset value. During OL4 operation, the stepper motor is positioned at the intialization position. Air injection is switched "upstream"; however, air is diverted "downstream" if the extended OL4 timer is activated or "lean limit" (altitude jumper wire) is not installed. Air is also diverted "downstream" if the WOT timer is activated.
- **Open Loop 3**
  This mode is selected when spark advance vacuum level falls below a preset level. In OL3 mode, engine RPM is also determined. If RPM voltage is greater than the calibrated value, an engine deceleration condition is assumed to exist. If the RPM voltage is less than calibrated value, an engine idle condition is assumed to exist.

NOTE: **Both deceleration and idle conditions are independently selected as either open loop or closed loop conditions. If selected as an open loop operation, air is diverted "upstream".**

- **Open Loop 1**
  This mode will be selected if air cleaner temperature is above calibrated value, OL2, OL3 or OL4 is not selected and if engine coolant temperature is below calibrated value. The OL1 mode operates instead of normal closed loop operation during cold engine operating condition. In this mode, 1 of 2 pre-determined metering pin positions are chosen, dependent upon whether or not the "lean limit" (altitude circuit) jumper wire is installed.

NOTE: **With each engine start-up, start-up timer is activated. During timer interval, if engine operating condition would otherwise trigger normal closed loop operation, OL1 mode is selected.**

Closed Loop

When engine operation and all input data meet programmed criteria (after OL1, OL2, OL3 and OL4 modes have been selected and start-up timer has deactivated), the CEC system goes into closed loop operation. In this mode, oxygen sensor input signals are accepted by MCU to determine proper air/fuel mixture based upon oxygen content of exhaust gases. Air injection is routed "downstream" during this mode to aid in oxidation of HC and CO. The predetermined "lean mixture ceiling" is selected for a preset length of time at the start of closed loop operation.

NOTE: **Closed loop operation is characterized by constant movement of the metering pins. The MCU is constantly making small corrections in air/fuel ratio in an attempt to create the ideal air/fuel ratio.**

Open Loop Position Variation

An additional function of the MCU is to correct for changes in ambient conditions (altitude). During closed loop operation, MCU stores movements and positions of metering pins as corrections for oxygen content of exhaust gases are made. If the movements are consistently to the same position, the MCU will vary all open loop operation preset metering pin positions a corresponding amount. This function allows the open loop air/fuel mixture ratios to be adjusted to existing ambient condition during each uninterrupted use of the system. This optimizes emission control and engine performance.

CATALYTIC CONVERTER

Proper emission control is aided by the use of a special catalytic converter. A dual-bed COC and TWC monolithic-type converter, with "downstream" air injection, is used. The injection of air between the 2 beds provides more complete oxidation of air and CO in the closed loop mode. In order for these converters to be effective, precise control of the oxygen content of gases entering converter is necessary. This is accomplished by the oxygen sensor, MCU and feedback carburetor.

DIAGNOSIS & TESTING

CEC DIAGNOSIS

The CEC system should be considered as a possible source of engine performance, fuel economy and/or exhaust emissions problems, only after other basic engine systems have been checked. These include all those systems that would normally be checked on a vehicle not equipped with CEC.

TESTING

The steps listed in the following charts provide a systematic evaluation of each component that could cause an operational malfunction. After completing a repair, repeat the test to ensure that the malfunction has been corrected.

If problem still exists after completing test procedures, check other engine systems which may affect air/fuel mixture, combustion efficiency or exhaust gas composition. These systems include:

- Basic carburetor adjustments.
- Mechanical engine operation (plugs, valves, rings).
- Ignition system.
- Intake manifold, carburetor or base plate gaskets.

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Test Equipment

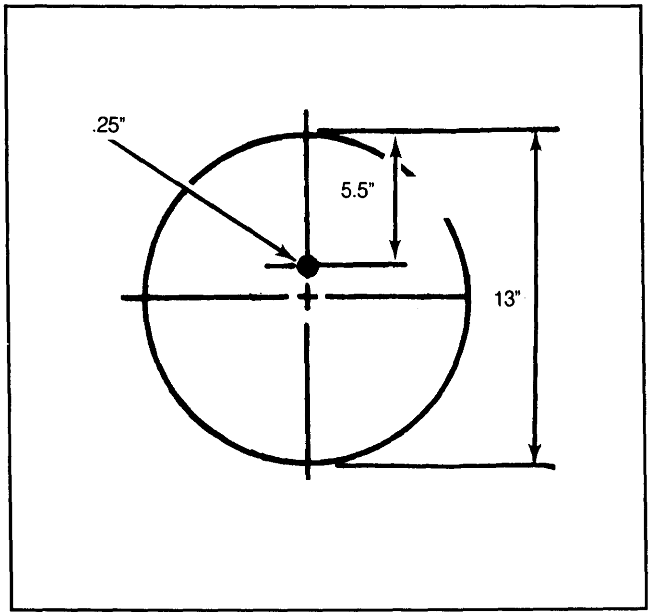
1) Test equipment needed to perform these tests include: tachometer, hand vacuum pump, digital volt-ohmmeter with minimum 10 megohm impedance and jumper wires.

2) Before beginning test procedures, an air cleaner cover must be fabricated from clear acrylic plastic at least ¼" thick. This is secured with air cleaner wing nut, after top of air cleaner has been removed, so that operation and position of metering pins can be observed during testing. *See Fig. 2.*

3) Begin testing with Test No. 1 and proceed to other tests in order. Perform "Basic Engine Test" when refered to in other tests.

NOTE: **The metering pins operate in tandem. Only the upper pin is visible.**

Fig. 2: Dimensions for Clear Air Cleaner Cover

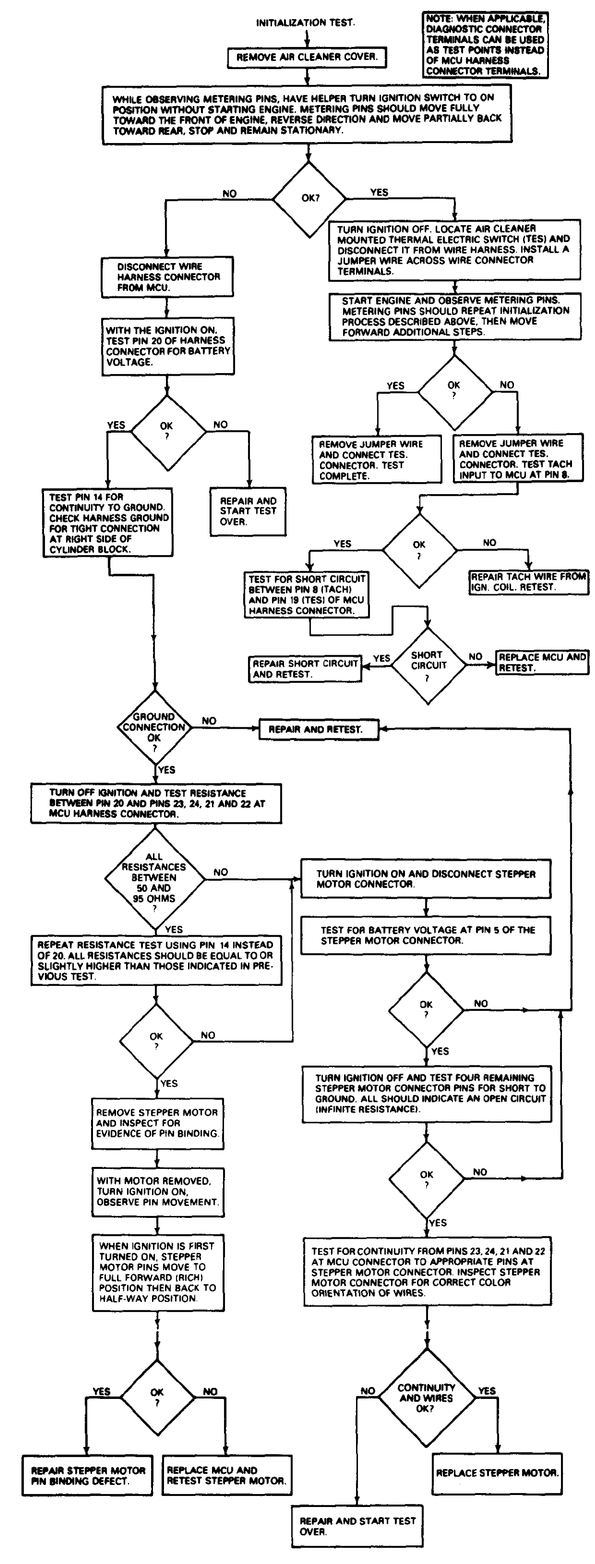


Install clear cover in place of stock air cleaner top to observe metering pin operation.

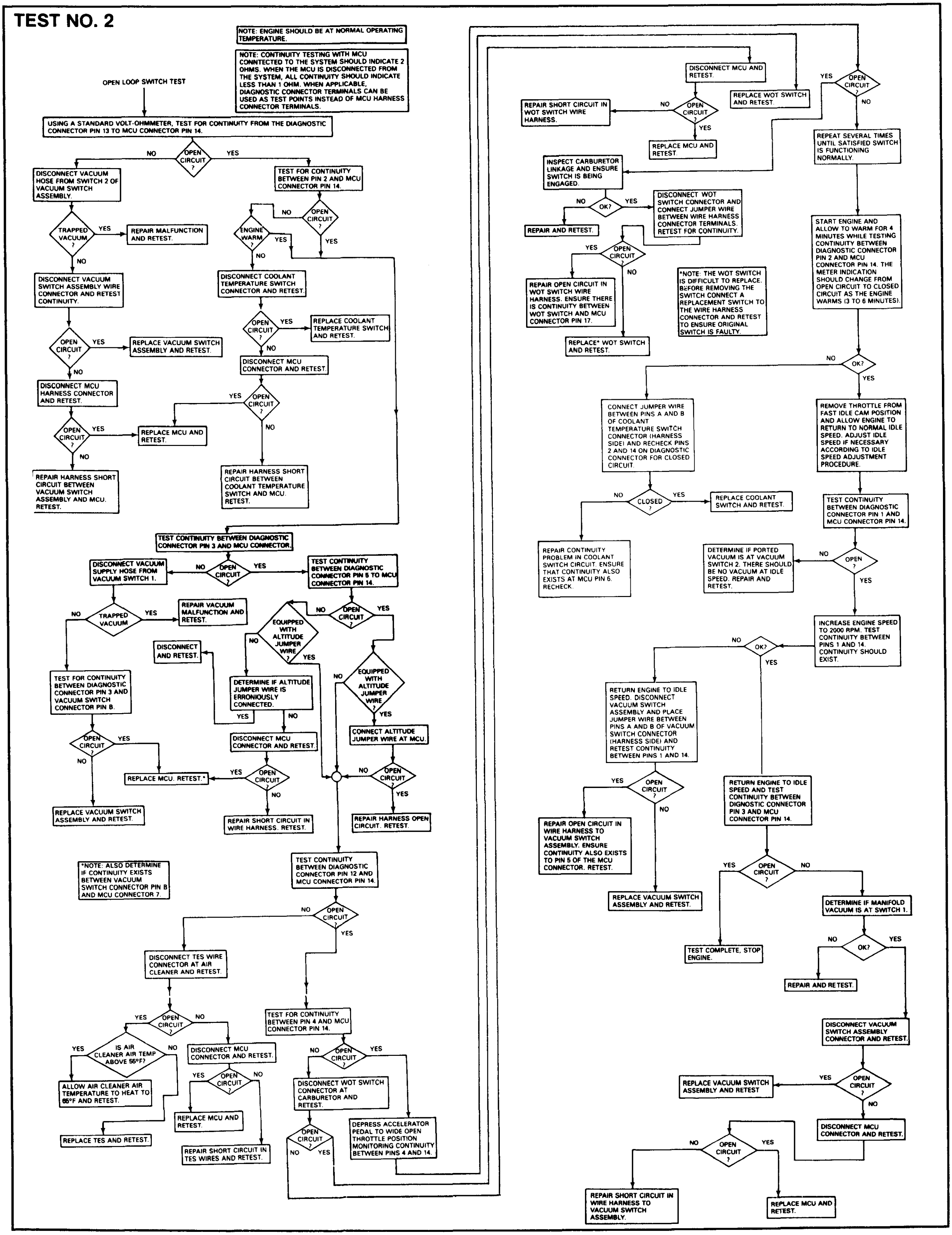
TEST CHARTS

Chart	Condition
......	Basic Engine Test
No. 1	Initialization test.
No. 2	Open loop switch test.
No. 3	Closed loop operational test.
No. 4	Electronic ignition retard test.
No. 5	Oxygen sensor and closed loop test.
No. 6	Air injection system test.
No. 7	Divert solenoid test.
No. 8	Upstream solenoid test.
No. 9	Idle speed control system test.
No. 10	Sole-Vac vacuum switching solenoid test.
No. 11	Sole-Vac idle speed relay test.

TEST NO. 1



JEEP COMPUTERIZED EMISSION CONTROL (Cont.)



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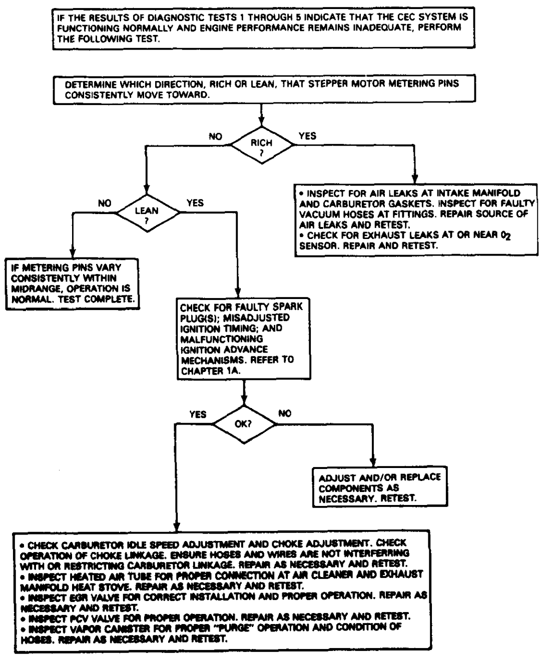
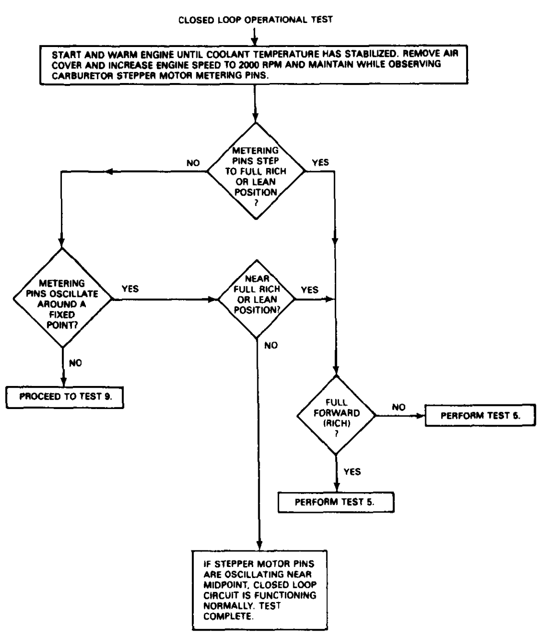
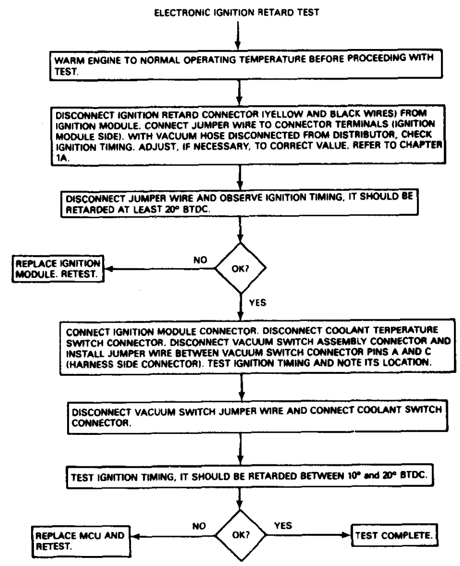
BASIC ENGINE TEST



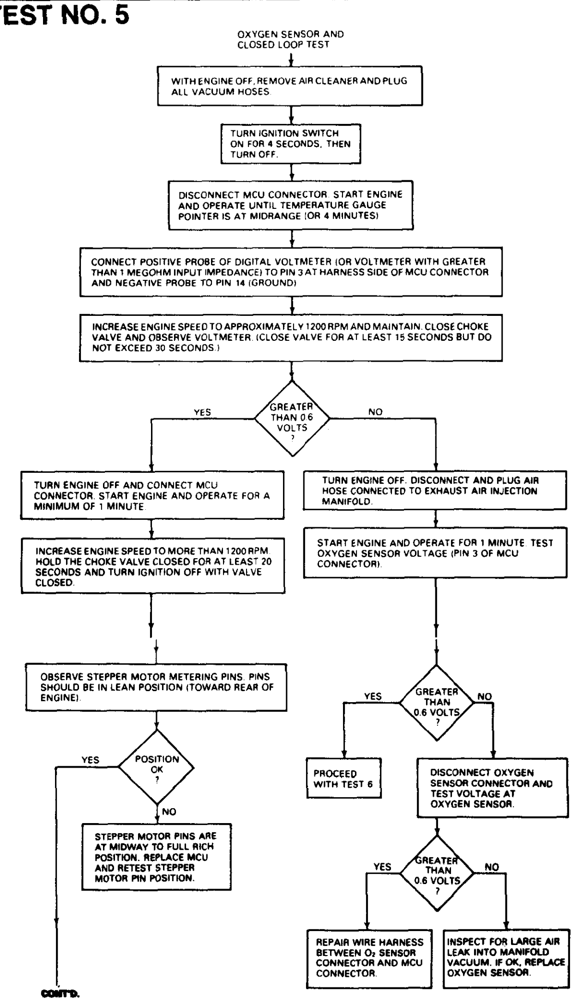
TEST NO. 3



TEST NO. 4

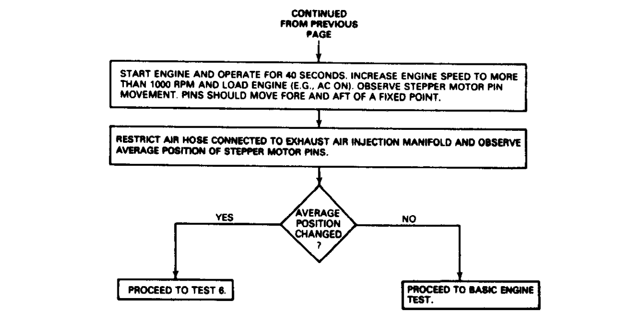


TEST NO. 5

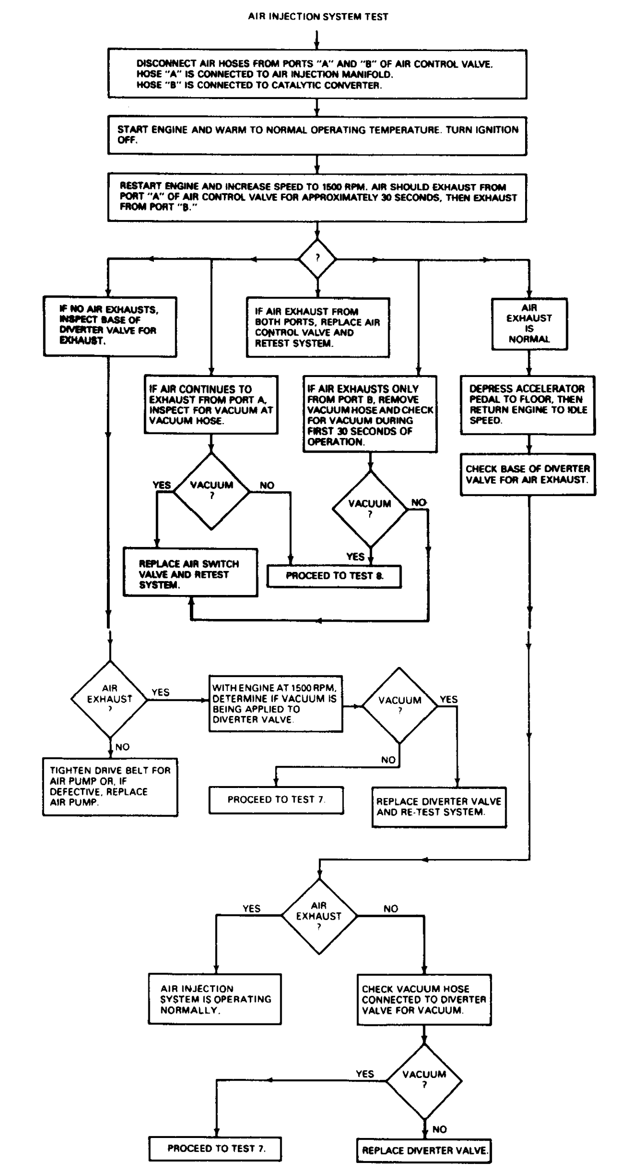


JEEP COMPUTERIZED EMISSION CONTROL (Cont.)

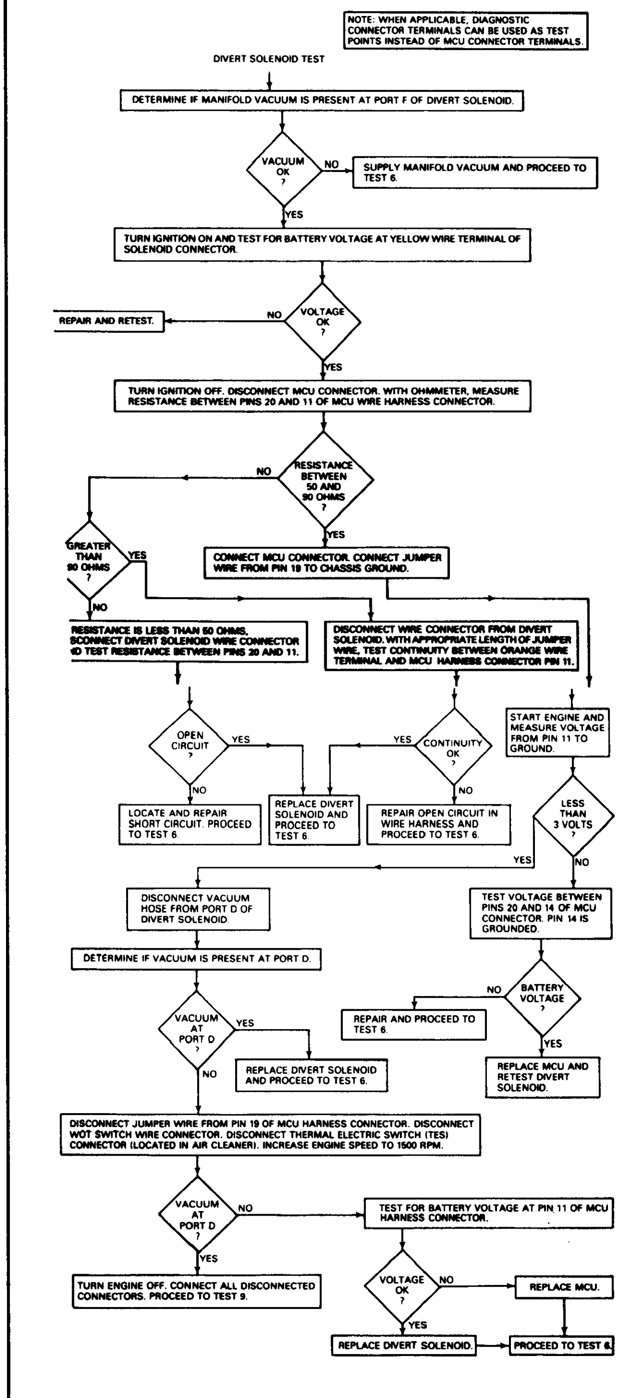
TEST NO. 5 (Cont.)



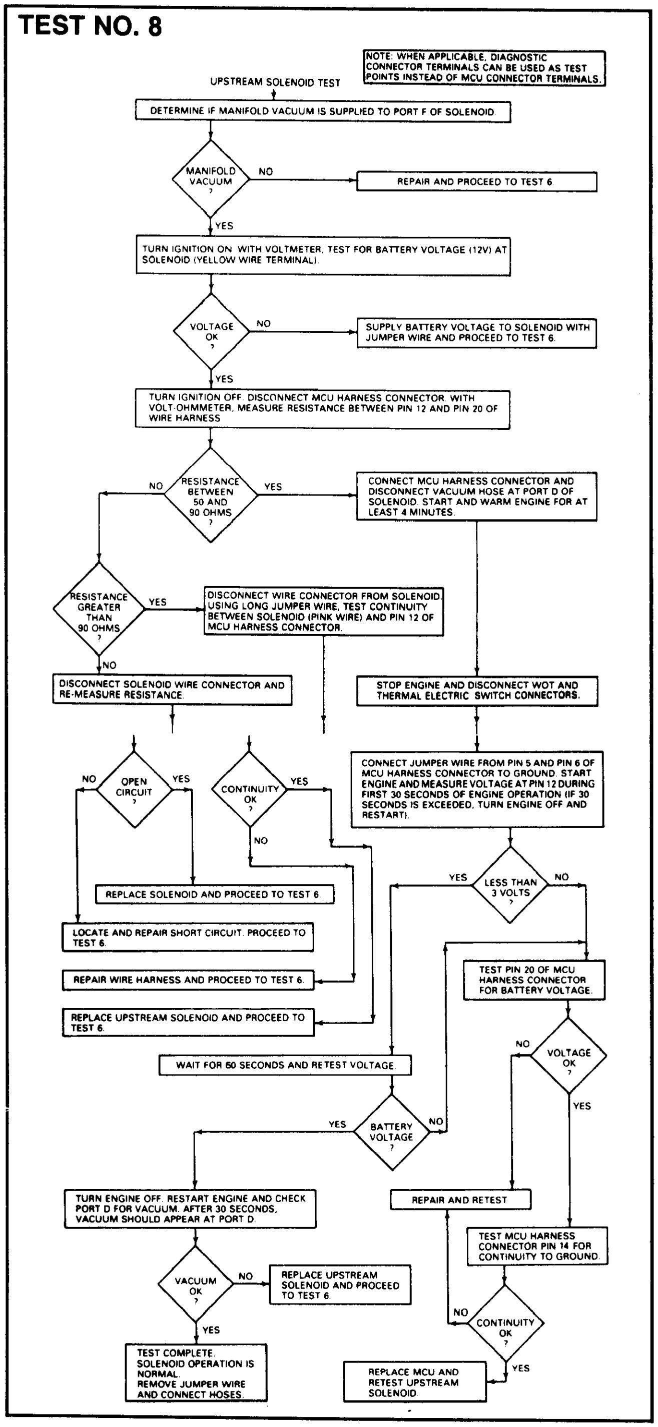
TEST NO. 6

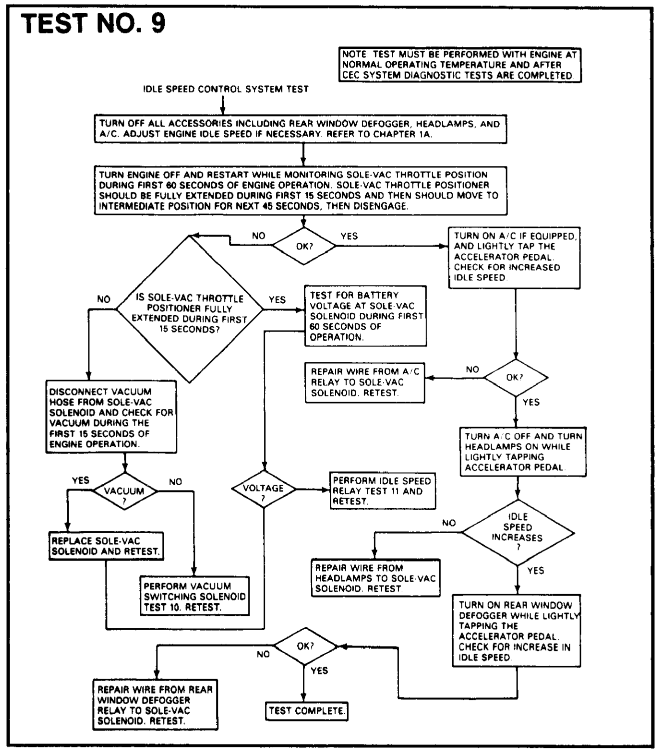


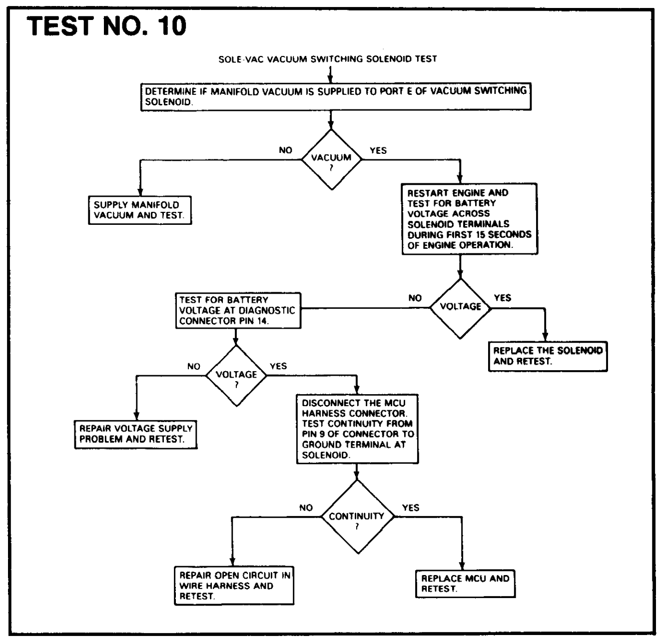
TEST NO. 7



JEEP COMPUTERIZED EMISSION CONTROL (Cont.)

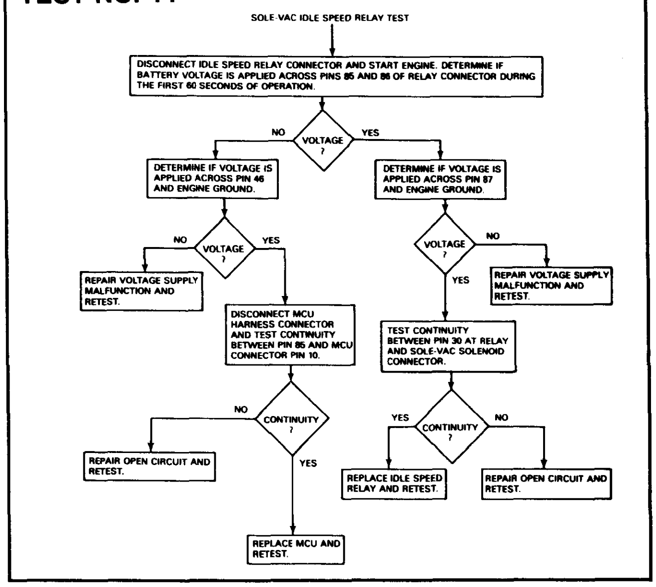






JEEP COMPUTERIZED EMISSION CONTROL (Cont.)

TEST NO. 11



MAINTENANCE

The CEC system does not require periodic maintenance. However, when vehicle is raised for other services, check condition of catalytic converter, oxygen sensor and exhaust system.

REMOVAL & INSTALLATION

MICRO COMPUTER UNIT (MCU)

Removal & Installation

Remove MCU attaching bolts. Disconnect electrical plug connector. To install MCU, reverse removal procedure and ensure terminal ends are not forced out of position when connecting plug.

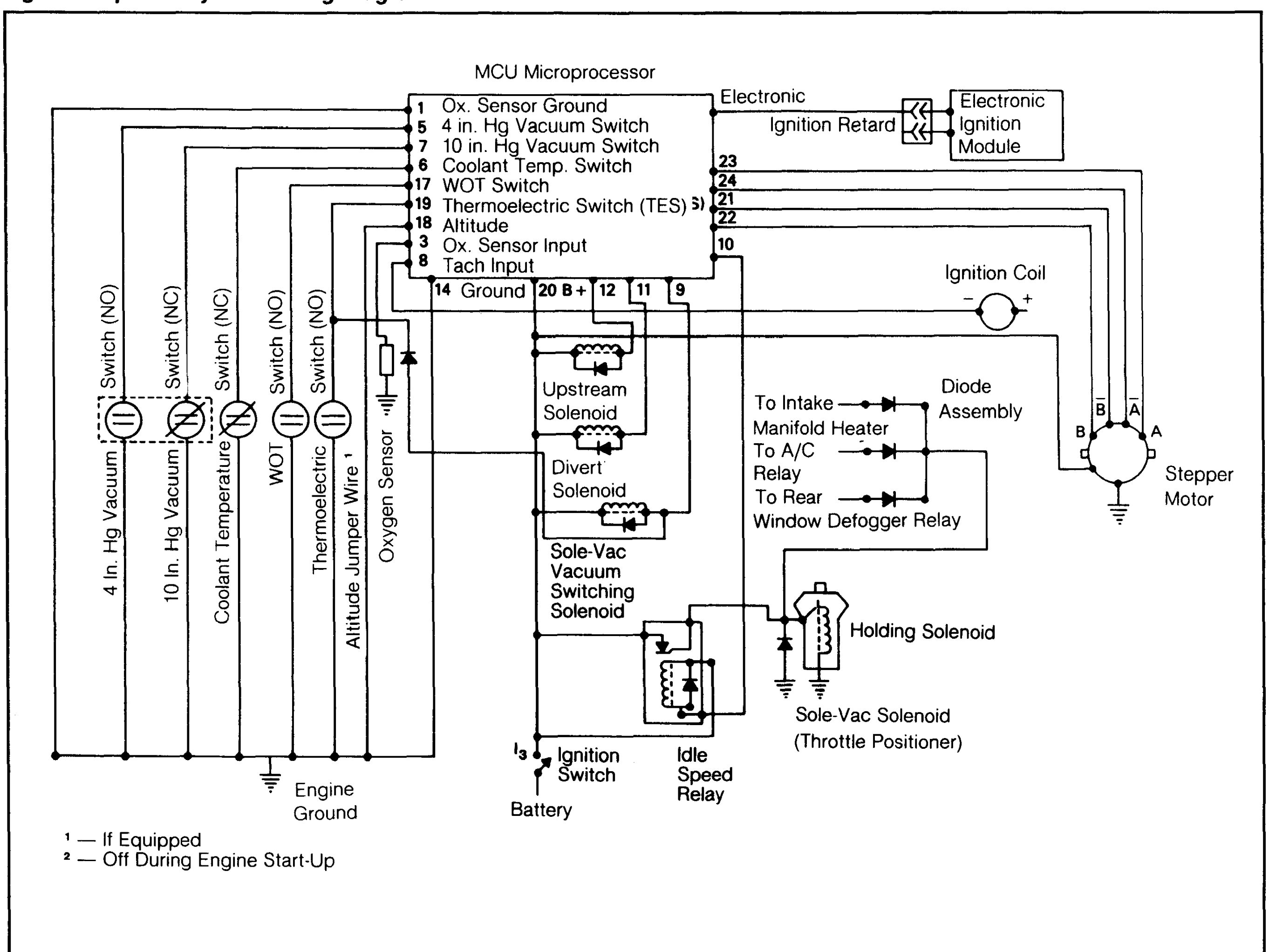
STEPPER MOTOR

CAUTION: Do not drop metering pins and spring when removing motor.

Removal & Installation

Remove air cleaner and disconnect motor connector. Remove retaining screw and stepper unit from carburetor. To install, reverse removal procedure and tighten screw to 25 INCH lbs. (2.8 N.m).

Fig. 3: Jeep CEC System Wiring Diagram



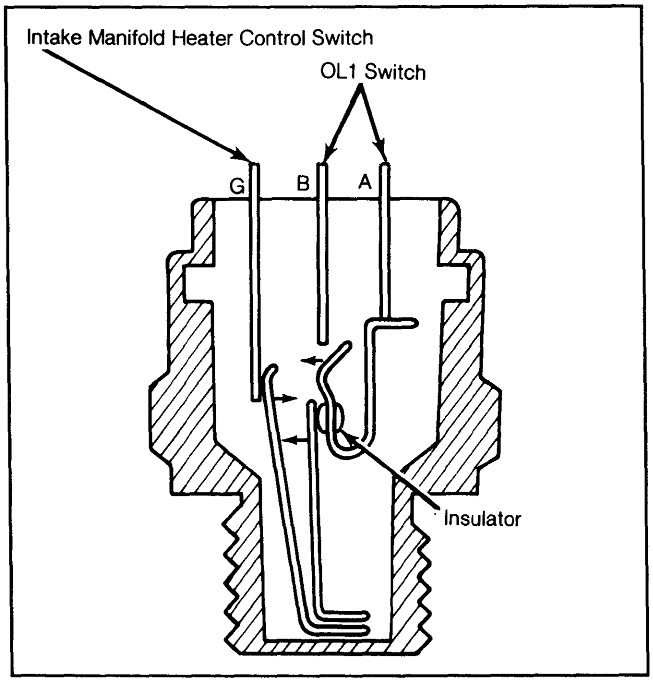
JEEP COMPUTERIZED EMISSION CONTROL (Cont.)

COOLANT TEMPERATURE SWITCH

Removal & Installation

Disconnect electrical connector and remove switch. Install replacement switch and tighten to 72 INCH lbs. (8 N.m). Reconnect electrical lead.

Fig. 4: Intake Manifold Heater/ Coolant Temperature Control Switch



Coolant switch combines functions of the coolant temperature control switch and the intake manifold heater switch.

VACUUM SWITCHES

Removal & Installation

Note positions of vacuum hoses and disconnect from switches. Disconnect wiring harness connector. Remove vacuum switch and bracket assembly. To install, reverse removal procedure. The switch/bracket assembly is serviced as a complete unit only. Components may not be serviced individually.

OXYGEN SENSOR

Removal & Installation

Disconnect electrical lead and remove sensor from manifold. Clean threads of manifold. To install, coat threads of new oxygen sensor with anti-seize compound and install in manifold. Tighten sensor to 31 ft. lbs. (42 N.m). Reconnect electrical lead. Push rubber boot down over sensor. Boot must be at least ½" above base of sensor.

NOTE: **If oxygen sensor pigtail wires are broken, the sensor must be replaced. Wires cannot be spliced or soldered.**

TIMER

Removal & Installation

Disconnect electrical connector. Remove mounting screw and timer. To install, reverse removal procedure.