

JEEP COMPUTER CONTROLLED CATALYTIC CONVERTER

California CJ Models with
4-Cylinder Engines

DESCRIPTION

The Computer Controlled Catalytic Converter system (C-4 system) is used on all California Jeep CJ models equipped with 2.5L 4-cylinder engines. The C-4 system closely controls air/fuel ratio through a feedback system from an oxygen sensor mounted in the exhaust manifold. The major components of this system include an exhaust gas oxygen sensor, an electronic control module (ECM), a special electronically controlled carburetor (Rochester Model E2SE) and a three-way catalytic converter.

OPERATION

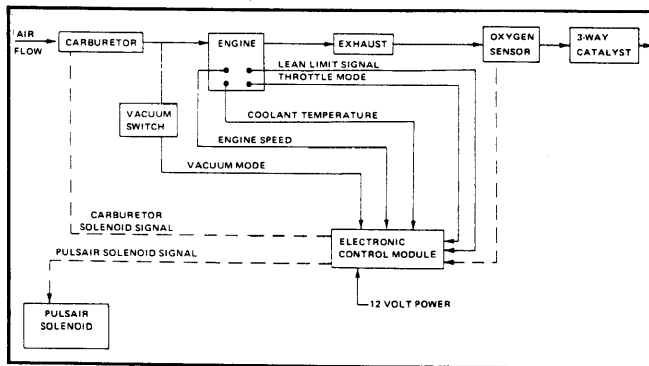
OXYGEN SENSOR

This unit is positioned in the exhaust manifold so it can sense exhaust gas composition as it comes from the engine. The sensor detects oxygen content in order to relay a signal to the ECM. This sensor is actually a (Zirconia) battery which reacts to oxygen levels by generating a voltage signal of 100 to 900 millivolts. If the oxygen content of exhaust gas is high (indicating a lean mixture), the voltage signal created by the sensor will be low. If oxygen content is low (indicating a rich mixture), the voltage signal to the ECM is high. The oxygen sensor should be replaced every 30,000 miles to ensure proper function.

ELECTRONIC CONTROL MODULE (ECM)

The ECM reads and computes the signal from the oxygen sensor. In response, it sends an electrical signal to the mixture control solenoid (in carburetor), which creates either a lean or rich mixture, as required. The signal which is sent from the ECM to the mixture control solenoid is also modified by inputs from throttle position vacuum switches and coolant temperature sensor (CTS).

Fig. 1: Typical C-4 Flow Diagram Showing Operating Relationships



Test bulb taps into system at ECM.

The ECM contains an integrated circuit "chip" which contains stored data unique to each vehicle (i.e., axle ratio, body style, etc.). This is called a Programmable Read Only Memory (PROM). The PROM's memory system stores an average set of operating conditions with the ideal air/fuel ratio for these conditions. When settings

change from these stored conditions (as determined by engine sensors), the ECM makes necessary adjustments to bring engine back to "ideal" conditions.

Ten seconds must elapse after startup before C-4 air/fuel ratio control begins. Engine coolant temperature must be above 150°F (65°C), and oxygen sensor temperature above 600°F (315°C) before ECM can react. During cold engine startup, ECM is off-line and a fixed carburetor condition is maintained.

CARBURETOR

Carburetors used in conjunction with the C-4 system are designed with an electrically operated solenoid in the fuel bowl. In the Rochester E2SE carburetor, this solenoid provides a controlled restriction to the main metering system. The solenoid responds to impulses (cycles) generated from the ECM to make the mixture leaner or richer, as determined by the system of engine sensors and switches.

NOTE: For additional information, including adjustments and specifications, see Rochester E2SE carburetor article in FUEL SYSTEMS section of this manual.

CATALYTIC CONVERTER

Proper emission control is maintained with the special three-way catalytic converter which converts all 3 major pollutants (HC, CO and NOx). In order for this catalytic converter to be effective, precise control of the oxygen content of gases entering the converter is necessary, thus the need for the oxygen sensor, ECM and special carburetor.

ENGINE SENSORS & SWITCHES

Coolant Temperature Sensor (CTS)

The CTS senses engine coolant temperature and sends appropriate signal to the ECM. C-4 system closed loop operation cannot occur while coolant temperature is below 150°F (65°C).

Wide Open Throttle (WOT) Switch

This switch is used to detect full throttle condition. When activated, a signal from the WOT to ECM sets a temporary full rich mixture until throttle moves off wide open position. The switch is closed at wide open throttle and opens with 5 in. Hg, or more, of ported vacuum.

Closed Throttle Switch

This switch detects closed or part throttle conditions and sends appropriate signal to ECM. The switch is used in conjunction with WOT to determine intermediate throttle positions. This switch is normally closed until 12 in. Hg, or more, manifold vacuum is present.

COMPONENT REPLACEMENT

OXYGEN SENSOR

Every 30,000 miles, it is necessary to replace oxygen sensor to prevent system failure. A maintenance reminder light, located in the instrument panel, will come on at 30,000 mile intervals as a reminder to perform this service.

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"FLASH", followed by a longer pause, indicates trouble code 12. Signal will repeat itself 2 more times. If more than one trouble code is stored, lowest numbered code will be displayed first, followed in order by any other stored codes.

3) Trouble codes are used to assist in diagnosis and correction of system faults. See C-4 SYSTEM DIAGNOSTIC TROUBLE CODES table.

C-4 SYSTEM DIAGNOSTIC TROUBLE CODES

Trouble Code	Area of Malfunction
12	No tach or reference signal to ECM.
13	Oxygen sensor circuit.
14	Shorted coolant sensor circuit.
15	Open coolant sensor circuit.
21 & 22	(Same Time) Grounded WOT switch circuit.
22	Grounded closed throttle or WOT switch circuit.
23	Open or grounded mixture control solenoid circuit.
44	Lean oxygen sensor.
44 & 45	(Same Time) Faulty oxygen sensor.
45	Rich oxygen sensor.
51	Faulty PROM unit.
52 & 53	Test light off — Intermit. ECM problem.
52 & 53	Test light on — Faulty ECM.
54	Faulty mixture control solenoid and/or ECM.
55	Faulty oxygen sensor circuit or ECM.

SYSTEM PERFORMANCE CHECK

Since it is not possible to store a code for every possible problem, one may develop in which the "CHECK CARB" light does NOT come on. If C-4 system is suspected, make a System Performance Check. A dwell meter, digital volt-ohmmeter, test light, tachometer, vacuum gauge and jumper wire will be required to perform test. Refer to SYSTEM PERFORMANCE CHECK chart. All system tests should be performed with engine at normal operating temperature.

Connecting Dwell Meter

Set to 6-cylinder position and connect dwell meter to mixture control solenoid test lead (Green connector at carburetor). Do not allow terminal to contact any engine (or other) ground. This includes rubber hoses which may be electrically conductive. When instructed, install test light in place of meter.

On normally operating engines, dwell at both idle and at part throttle will fluctuate from 10-50°. This is the "closed loop" system, meaning the dwell is varying due to reaction from the oxygen sensor through the ECM. At wide open throttle, or cold engine, dwell will be fixed (needle steady). This is "open loop" since oxygen sensor has no effect upon dwell.

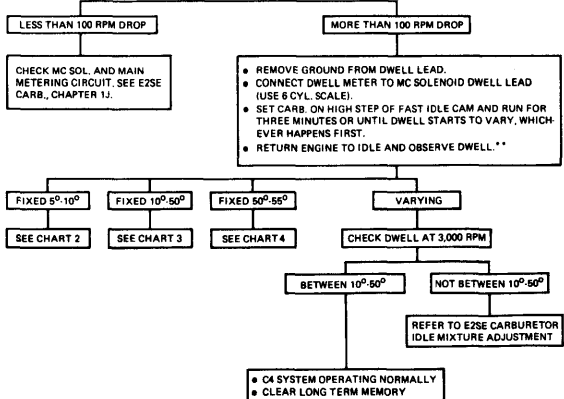
Some dwell meters may not be compatible with system. If engine operation is affected when meter is attached, a different meter should be used.

DIAGNOSTIC PROCEDURES

Follow the sequence given in the following "Diagnostic Charts" until proper problem identification and correction can be made.

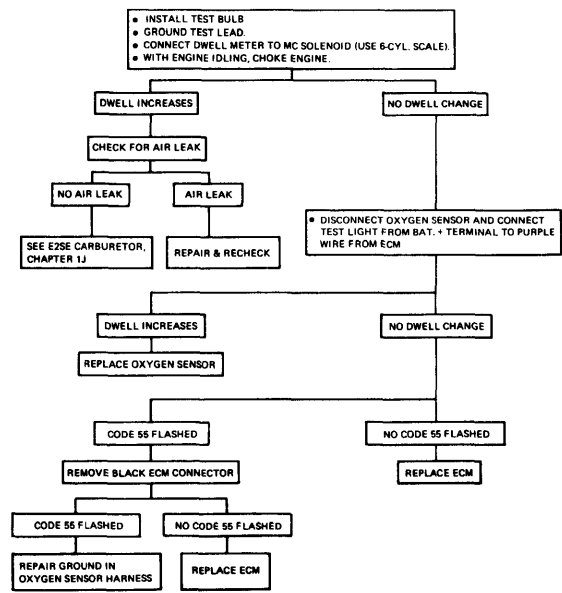
CHART 1 SYSTEM PERFORMANCE CHECK

1. INSTALL TEST BULB. TURN IGNITION SWITCH ON, GROUND TROUBLE CODE "TEST" LEAD, OBSERVE CODE.**
2. PLACE TRANSMISSION IN NEUTRAL AND SET PARKING BRAKE.
3. DISCONNECT PURGE HOSE FROM CANISTER AND PLUG. DISCONNECT BOWL VENT HOSE AT CARBURETOR.
4. CONNECT TACHOMETER. (DISTRIBUTOR SIDE OF TACH. FILTER, IF USED.)
5. DISCONNECT MIXTURE CONTROL (MC) SOLENOID AND GROUND DWELL LEAD.
6. START ENGINE.
7. RUN ENGINE AT 3,000 RPM AND, WITH THROTTLE CONSTANT, RECONNECT MC SOLENOID.
8. OBSERVE RPM.



- * IF TEST BULB IS NOT ILLUMINATED, SEE CHART 8.
** OXYGEN SENSOR TEMPERATURE MAY COOL AT IDLE CAUSING THE DWELL TO CHANGE FROM VARYING TO A FIXED INDICATION BETWEEN 100-500°. IF THIS HAPPENS, RUN THE ENGINE AT FAST IDLE TO HEAT THE SENSOR.

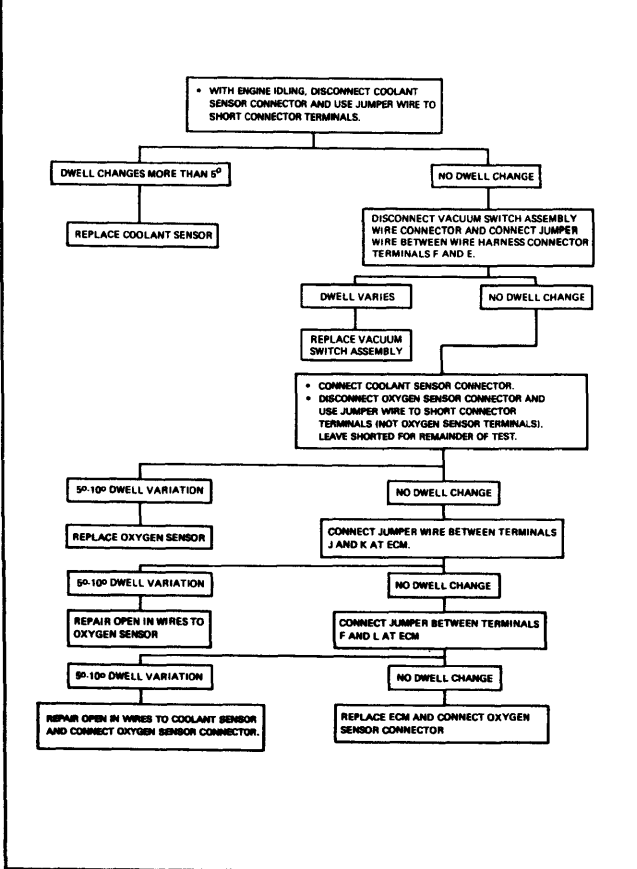
CHART 2 DWELL FIXED 5-10°



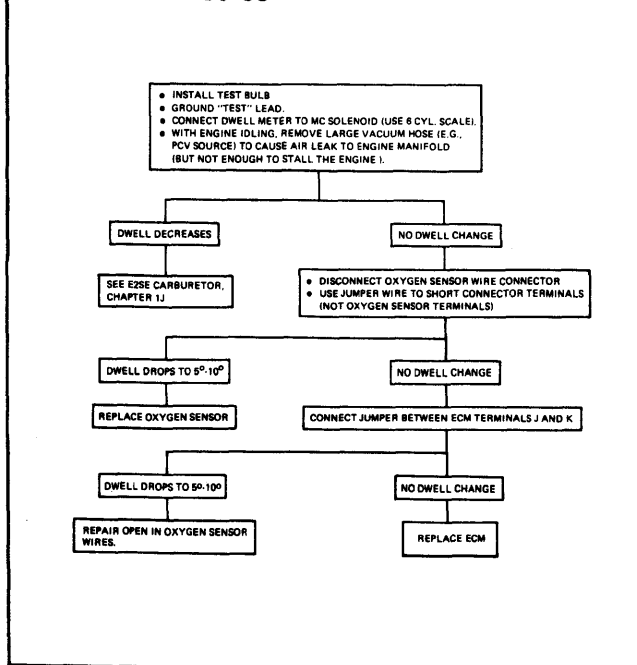
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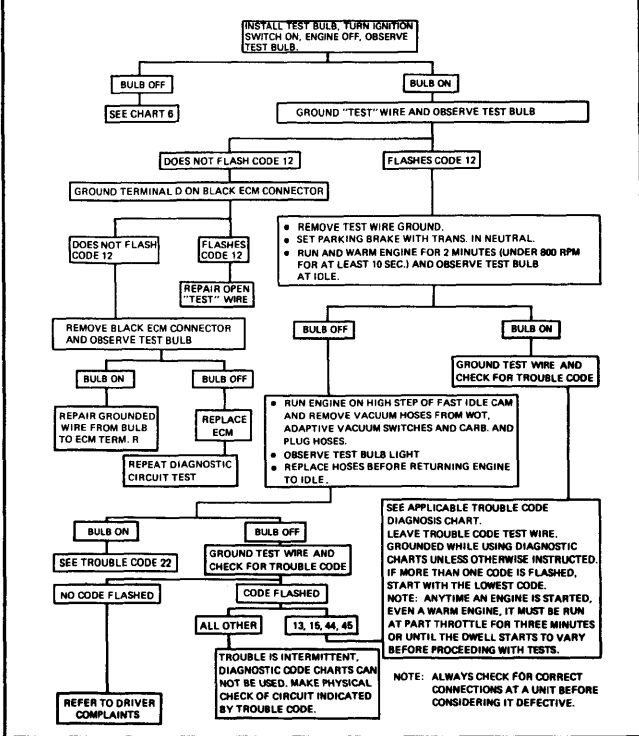
**CHART 3
DWELL FIXED 10-50°**



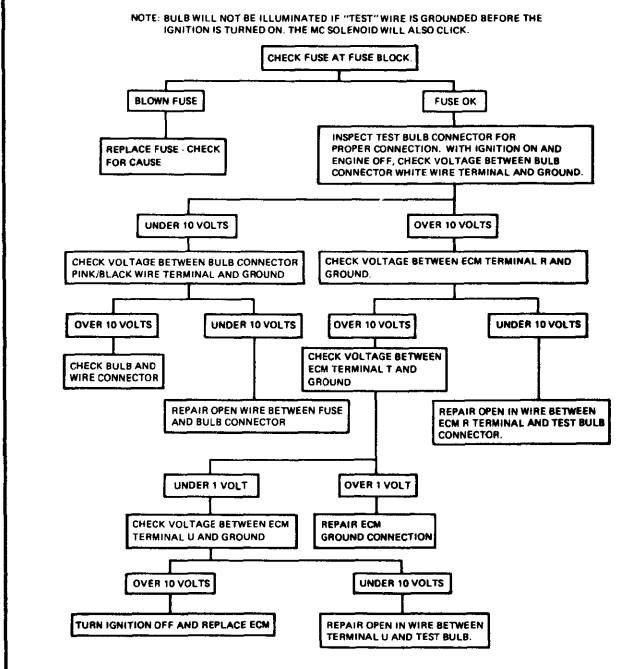
**CHART 4
DWELL FIXED 50-55°**



**CHART 5
SELF DIAGNOSTIC CIRCUIT TEST**



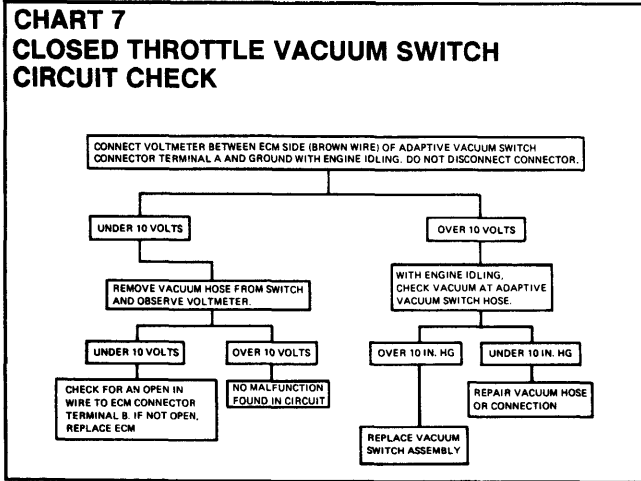
**CHART 6
TEST BULB CIRCUIT INOPERATIVE**



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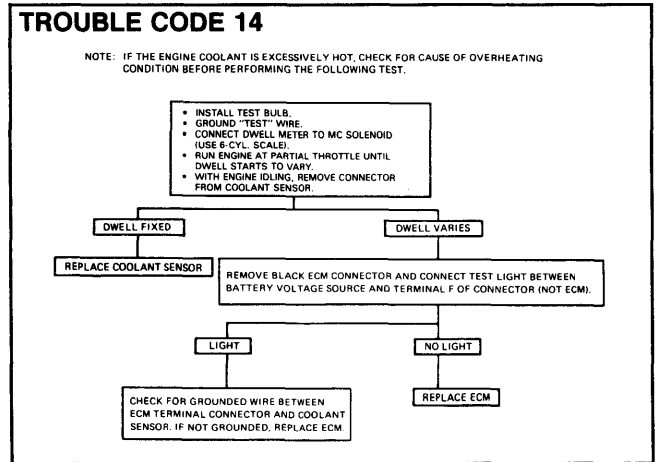
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**CHART 7
CLOSED THROTTLE VACUUM SWITCH
CIRCUIT CHECK**

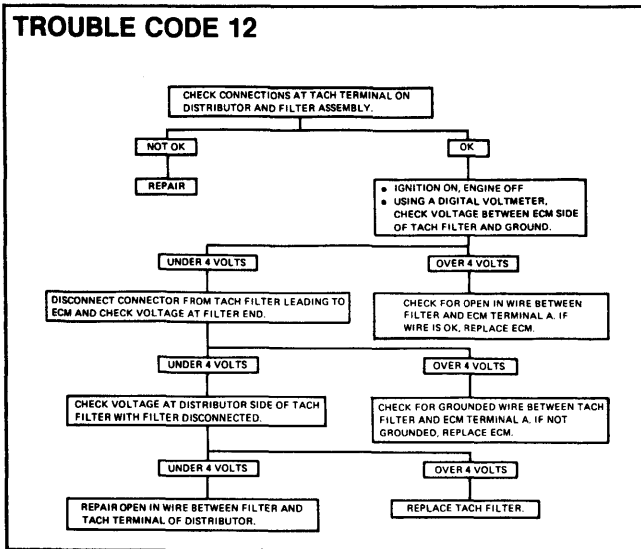


TROUBLE CODE 14

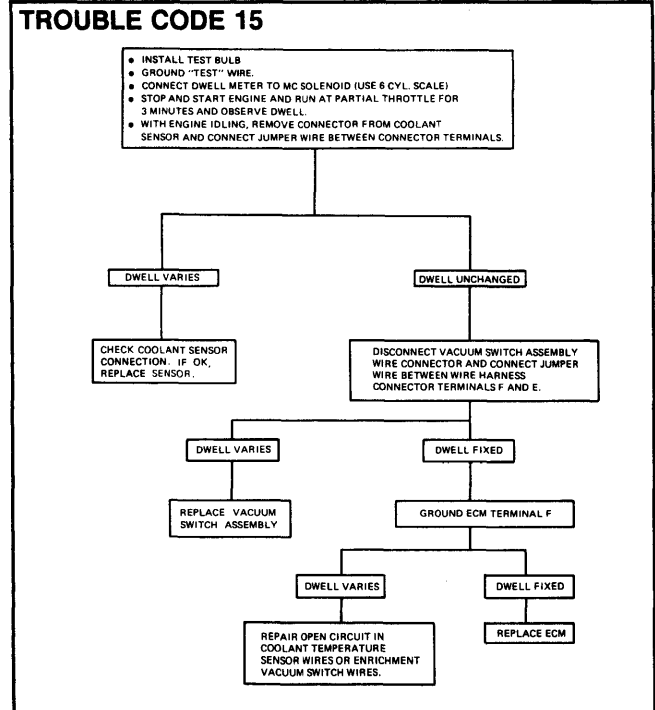
NOTE: IF THE ENGINE COOLANT IS EXCESSIVELY HOT, CHECK FOR CAUSE OF OVERHEATING CONDITION BEFORE PERFORMING THE FOLLOWING TEST.



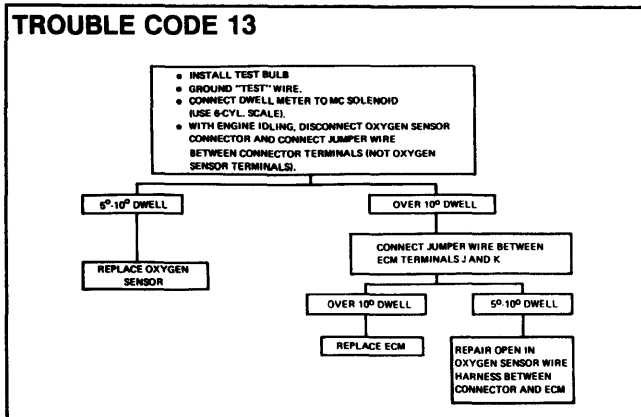
TROUBLE CODE 12



TROUBLE CODE 15

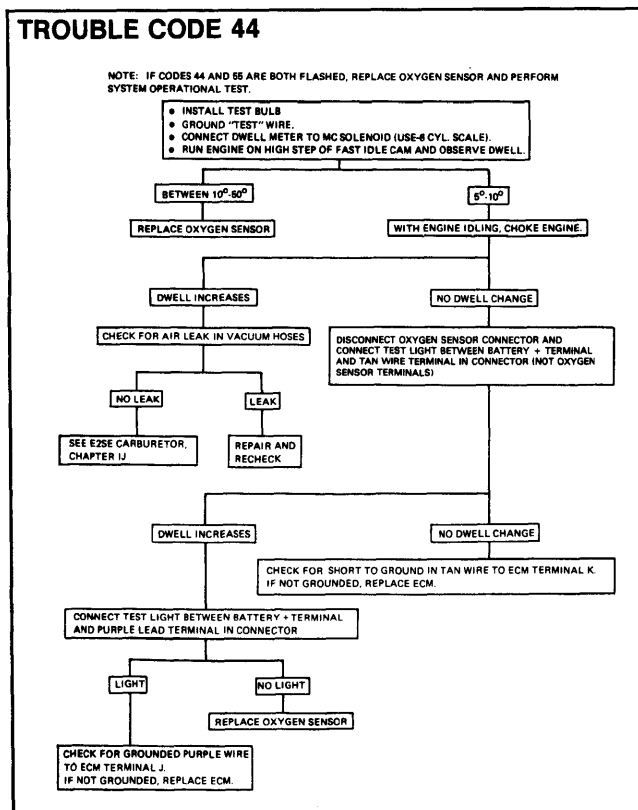
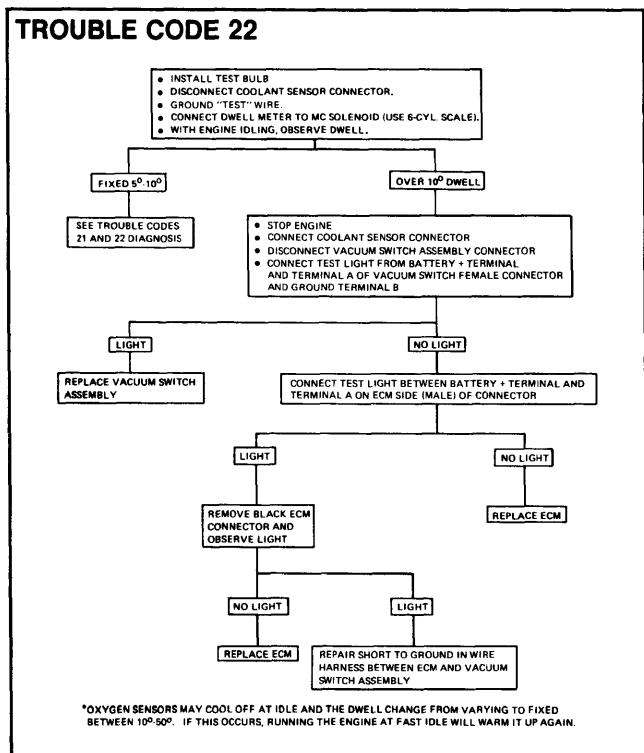
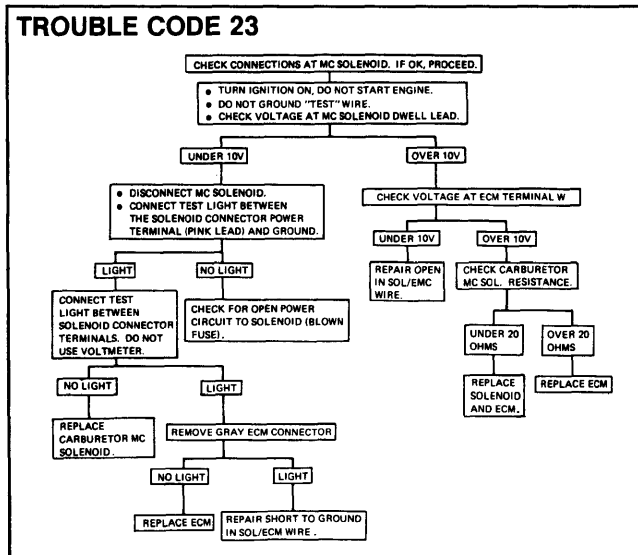
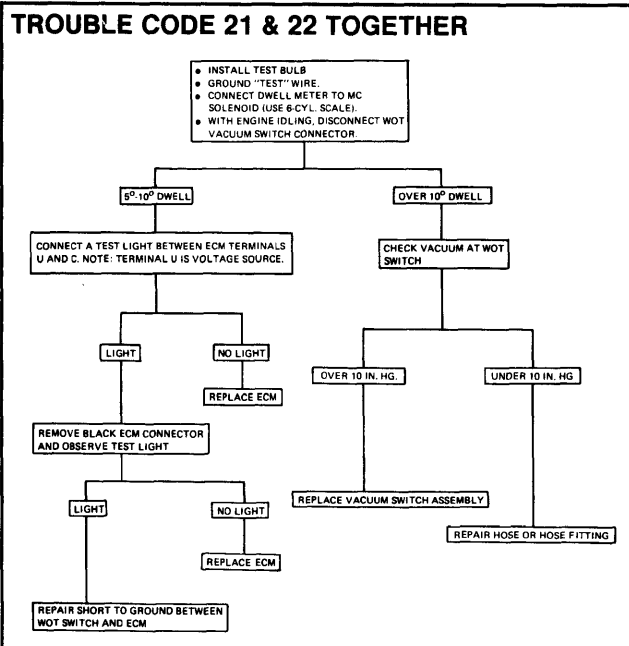


TROUBLE CODE 13



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