1975-79 COMPUTERIZED ENGINE CONTROLS
General Motors Electronic Fuel Control

1978-79 General Motors
DESCRIPTION

The Electronic Fuel Control (EFC) system is used on some 151" 4-cylinder engines built for California (VIN 1). The applicable models include Chevrolet Monza, Oldsmobile Starfire, and Pontiac Sunbird. This system controls emissions through close regulation of air/fuel mixture and use of the Phase II (3-way) catalytic converter.

Major components are the Electronic Control Unit (ECU), oxygen sensor, bimetal input switch, vacuum input switch, vacuum modulator, special 6510C carburetor and the Phase II converter.

NOTE: Some 1979 General Motors models with 151" 4-cylinder and 231" V6 engines for California, including 1980 Skylark, Citation, Omega and Phoenix, use a similar system. Refer to GENERAL MOTORS C-4 SYSTEM in this section.

OPERATION

OXYGEN SENSOR

The oxygen sensor is a special electrical switch placed in the exhaust pipe so that it can sense exhaust gas flow and measure its oxygen content. As more oxygen is sensed (showing a leaner mixture), the electrical signal generated by the switch drops in voltage. A lower oxygen content (richer mixture) causes an increase in the voltage signal.

This signal enables the computer to determine whether to richen or lean the mixture to maintain the correct air/fuel ratio. The voltage range for the ideal air/fuel mixture is around .45-.55 volt.

ELECTRONIC CONTROL UNIT (ECU)

The ECU monitors the system's sensor signals and sneds a control signal to the vacuum modulator. This signal is constant current which is continually cycling between on and off. The on time to off time depends on signals received from the sensors. As more input voltage is received, the ECU output signal also increases until a drop in input voltage is sensed.

BIMETAL SWITCH INPUT

During warmup, a bimetal switch senses cylinder head temperature and provides either an open circuit or ground path, signaling that engine temperature is below or above the calibration value. Below the value, the ECU restricts the amount that the carburetor can go lean. Above the value, the restriction operation is cancelled.

VACUUM INPUT SWITCH

Another input sensor is the vacuum input switch. It provides either another ground path or an open circuit. This depends on manifold vacuum levels. Under heavy load (low vacuum), the ECU (in response to the vacuum input signal) again reduces the rate at which the system can go lean, reducing NOx emissions.

VACUUM MODULATOR

This unit provides a modulated vacuum signal to carburetor control vacuum circuit. Vacuum signal is determined by on/off control signal from ECU. This causes vacuum modulator to cycle on and off at a fixed rate. Control vacuum signal is a function of ratio between on time and off time.

6510C CARBURETOR

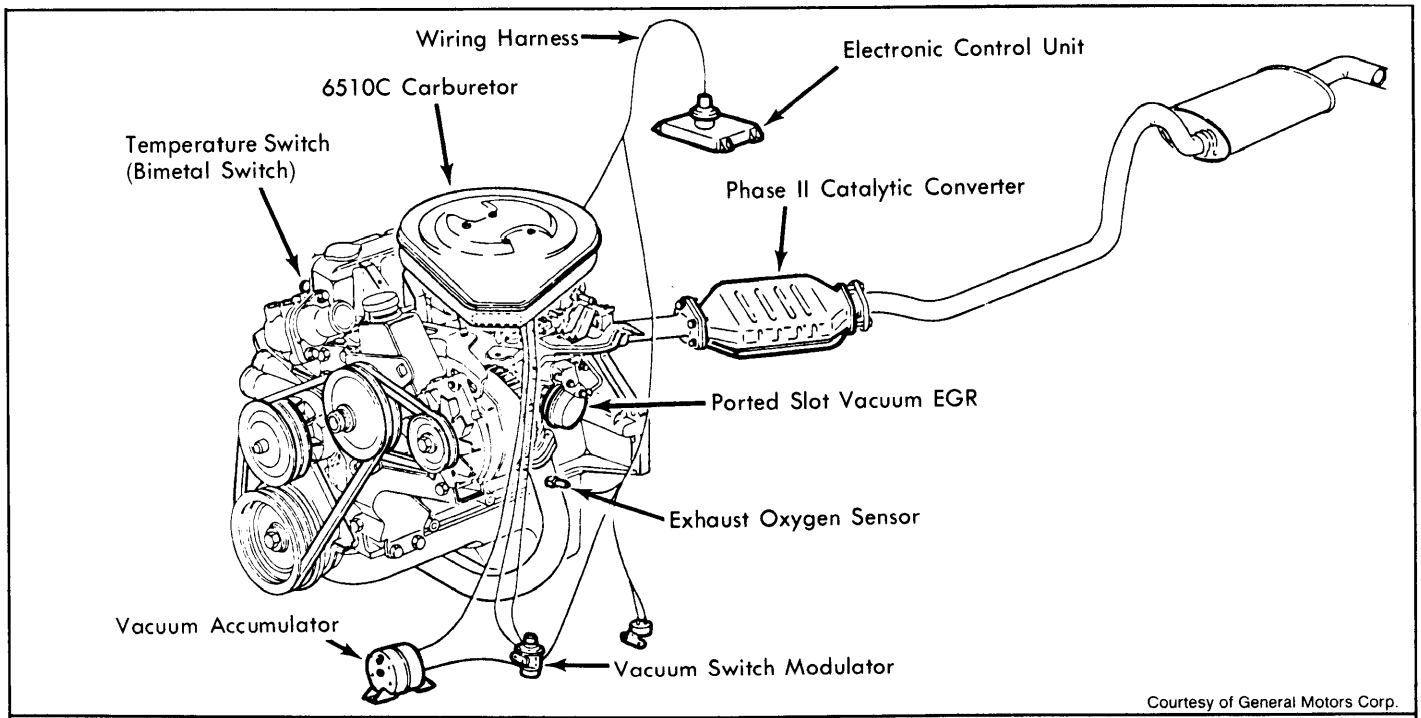
This carburetor is a 2-Bbl., controlled air/fuel ratio unit. The primary bore is smaller than the secondary bore. The secondary throttle is mechanically operated (linkage). A feedback air/fuel metering system works directly in relation with the EFC system. A vacuum signal from the modulator is sent to the feedback diaphragms. One diaphragm controls the air bleed needle in the air horn. The other (main metering diaphragm) controls fuel flow through the main feedback metering orifice. As modulated vacuum increases, the air bleed needle is opened, allowing more air into the idle system. This results in a leaner air/fuel mixture.

NOTE: For full carburetor adjustment and service procedures, see Holley 6500/6510C article in FUEL SYSTEMS section.

PHASE II CATALYTIC CONVERTER

This converter, also called a 3-way converter, is able to control all three major exhaust emissions: NOx, HC and CO. A special coating on the catalyst beads makes this possible.

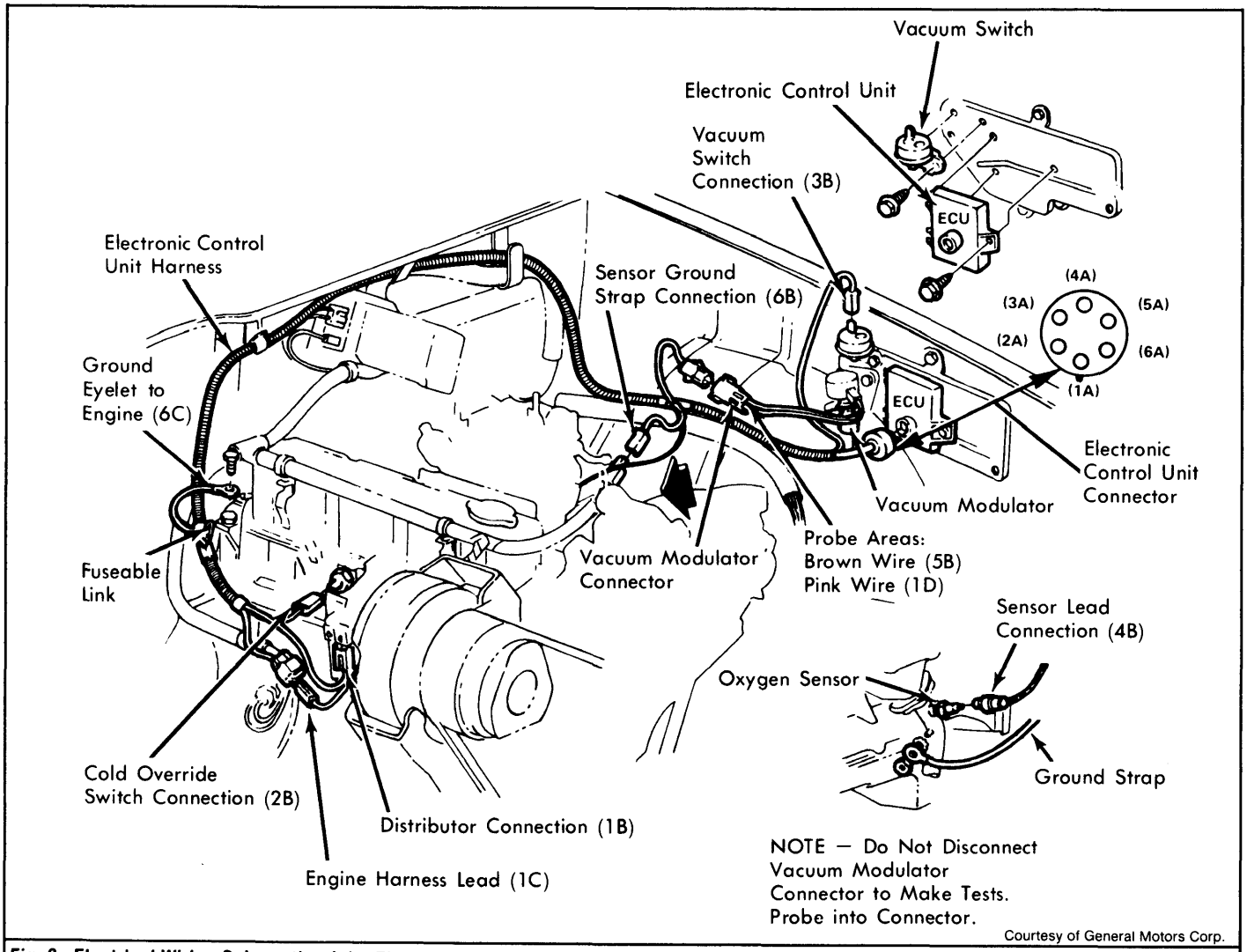
NOTE: For further information, refer to CATALYTIC CONVERTERS article in EXHAUST EMISSION SYSTEMS section.



Courtesy of General Motors Corp.

Fig. 1: Illustrating the Electronic Fuel Control (EFC) System

1975-79 COMPUTERIZED ENGINE CONTROLS
General Motors Electronic Fuel Control (Cont.)



Courtesy of General Motors Corp.

Fig. 2: Electrical Wiring Schematic of the Electronic Fuel Control System

TESTING & DIAGNOSIS

PRE-DIAGNOSIS CHECKS

1) Before starting any diagnostic routines, make the following general checks first: check all vacuum hoses for proper routing and connections. Check for kinked, cracked or plugged hoses. Inspect all electrical wiring for cracked, frayed or broken wires.

2) Make sure the ignition system has proper amount of available voltage. Ensure engine is in good mechnical condition, exhaust system is clear and good quality fuel is present.

NOTE: The ECU wiring harness may be difficult to plug into the unit. A locator clip is provided on the harness and it must be aligned with slot on ECU. Check this connection.

2) If any of the following vehicle symptoms are noticed, the Electronic Fuel Control system should be checked:

- Detonation
- Stalls or rough idle
- Missing
- Hesitation
- Surges
- Sluggish performance
- Poor economy
- Hard starting
- Excessive exhaust odor
- Cut outs

VACUUM SYSTEM CHECKS

NOTE: Increased altitude will change vacuum readings. For example, at 4,000 feet, vacuum reading will be approximately 1½" lower for the same reading at sea level. Note and make necessary allowances.

1) Check vacuum hose diagram in this section or on emission control decal under hood and note proper routing.

2) Disconnect vacuum hose from vacuum storage tank (to vacuum modulator) and "tee" in a vacuum gauge to this line.

3) Start engine and run for one minute then turn off. Observe gauge. It should read minimum of 13-15 in. Hg. After 5 minutes, vacuum level should still be around 10 in. Hg or more. If not, vacuum leaks are present. If hose leaks are not found, replace vacuum supply reservoir and repeat test.

4) Check carburetor diaphragm(s) by applying vacuum to control port and watching for bleed-down. If vacuum will not hold, replace diaphragm(s).

5) Disconnect vacuum gauge and reconnect all vacuum lines.

ECU WIRING HARNESS TEST

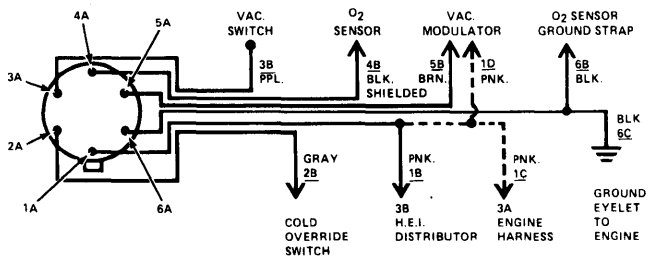
Follow sequence in WIRE HARNESS CONTINUITY TEST chart. *See Fig. 3.* Make sure you disconnect ECU connector with ignition off. Connect test light lead to harness side of connector only. If harness and components test good, replace ECU. Refer to electrical schematic for all wiring connections. *Fig. 2.*

General Motors Electronic Fuel Control (Cont.)

CAUTION: Use of jumper wire requires extreme care, especially when making connections to battery, as short circuit can cause damage to components and personal injury.

1. ENGINE AT NORMAL OPERATING TEMPERATURE.
2. KEY IN "ON" POSITION.
3. ENGINE NOT RUNNING.
4. REMOVE MAIN WIRE HARNESS AT ECU AND TEST AS FOLLOWS.

TEST LIGHT CLIP LEAD	PROBE	RESULT	ACTION
GROUND	1A	LIGHTS	OK
		NO LIGHT	CHECK WIRING, CONNECTIONS FUSIBLE LINK, ETC. REPAIR
POSITIVE BATTERY TERMINAL	2A	LIGHTS	OK
		NO LIGHT	UNPLUG CONNECTOR WIRE AT COLD OVERRIDE SWITCH AND GROUND CONNECTOR WIRE. LIGHTS–WIRE OK, REPLACE SWITCH. NO LIGHT–WIRING PROBLEM, REPAIR.
POSITIVE BATTERY TERMINAL	3A	LIGHTS	OK
		NO LIGHT	UNPLUG WIRE CONNECTOR AT VACUUM SWITCH AND GROUND CONNECTOR WIRE. LIGHT–WIRE OK, REPLACE SWITCH. NO LIGHT–WIRING PROBLEM, REPAIR.
CAUTION: BEFORE CHECKING TEST POINT 4A, REMOVE WIRE CONNECTOR AT 02 SENSOR AND GROUND THE WIRE CONNECTOR. APPLYING 12 VOLTS TO THE SENSOR MAY DAMAGE THE SENSOR.			
POSITIVE BATTERY TERMINAL	4A	LIGHTS	OK
		NO LIGHT	CHECK WIRING, REPAIR.
GROUND	5A	LIGHTS	OK
		NO LIGHT	1. IF 1A WAS OK, WIRING PROBLEM OR DEFECTIVE VACUUM MODULATOR. 2. IF 1A WAS NOT OK, CORRECT 1A PROBLEM AND THEN RECHECK 5A.
POSITIVE BATTERY TERMINAL	6A	LIGHTS	OK
		NO LIGHT	CHECK WIRING, GROUND EYELET AT ENGINE BLOCK, REPAIR.



Courtesy of General Motors Corp.

Fig. 3: EFC System Harness Test Chart

1975-79 COMPUTERIZED ENGINE CONTROLS
General Motors Electronic Fuel Control (Cont.)