# CHRYSLER CORP. ELECTRONIC FEEDBACK CARBURETOR

## DESCRIPTION

The Electronic Feedback Carburetor (EFC) is used with the Electronic Combustion Computer on all California vehicles, and on Federal vehicles with 318" 4-barrel engines. The EFC system includes a special carburetor with computer controlled mixture and idle circuits, an exhaust oxygen sensor, a control computer and other related components. Engine sensors include distributor pick-up coil, coolant switch, vacuum transducer, carburetor switch, speed sensor, detonation sensor (V8 only), and intake manifold charge temperature switch (not used on 4 cylinder engines).

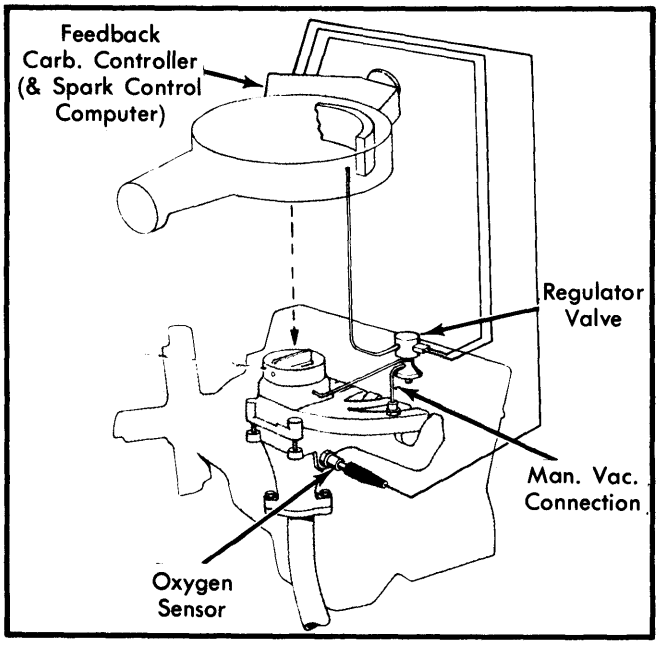


***Fig. 1 Major Components of Electronic Feedback Carburetor System (6 Cylinder Shown)***

### FEEDBACK CARBURETOR

A specially calibrated carburetor is used to keep air/fuel ratios within narrow limits for best emission control. The carburetors used on 4 and 8 cylinder engines have an electronic solenoid valve, controlled by the computer, which is capable of adjusting the main mixture circuits.

Carburetors used on the 6 cylinder engines are controlled by a vacuum signal. The combustion computer electrically operates a solenoid regulator, which sends a vacuum signal to the carburetor. Two diaphragms in the carburetor are moved by the vacuum signal and adjust idle and mixture ratios.

### COMBUSTION COMPUTER

The housing on the air cleaner or fender panel contains the combustion computer. This unit controls both the ignition system and the feedback carburetor. Information from the engine sensors is analyzed by the computer, then it transmits electrical signals to the ignition system and feedback carburetor. Wiring which is specific to systems with a feedback carburetor enters the computer at the 6-pin connector.

### OXYGEN SENSOR

Located in exhaust manifold, the oxygen sensor detects changes in air/fuel ratio. When beyond a narrow range which is very close to 14.7:1, maximum emission control cannot be accomplished by 3-way converter.

When heated by exhaust gases, oxygen sensor generates a voltage signal which varies with amount of oxygen sensed. At high oxygen content (lean mixture) voltage signal is low. With low oxygen (rich mixture), high voltage signal is created.

The oxygen sensor must be replaced at 30,000 mile intervals to ensure proper operation. A mileage counter activates a warning light when the replacement interval has elapsed. A 9-volt battery supplies power to the electronic counter to prevent memory loss when the vehicle battery is disconnected. See *"Maintenance"in this article.*

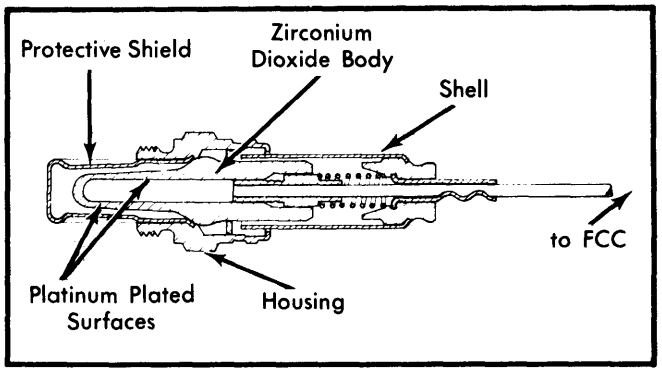


***Fig. 2 Sectional View of Oxygen Sensor***

### CATALYTIC CONVERTERS

Two types of catalytic converters are used with this system, an oxidation catalyst for controlling HC and CO and a 3-way catalyst for controlling all 3 emissions (HC, CO and NOx). The 3-way converter is specially coated with Rhodium, which gives it the ability to convert NOx to nitrogen and oxygen.

## OPERATION

The Electronic Feedback Carburetor system operates in 2 modes: Open Loop Mode and Closed Loop Mode. During the Open Loop Mode, system operates in response to preprogrammed electronic commands and signals other than those from the oxygen sensor. In the Closed Loop Mode, system is responsive to oxygen levels in the exhaust as picked up by the oxygen sensor.

### OPEN LOOP MODE

During start-up and acceleration, the EFC controller disregards any oxygen sensor signals. This results in temporarily richer mixtures for better performance. During warm-up, the air injection system supplies air to the exhaust manifold (ahead of both converters). This additional air allows complete oxidation of HC and CO in the main converter during this rich mixture

## CHRYSLER CORP. ELECTRONIC FEEDBACK CARBURETOR (Cont.)

period (NOx is not a factor since low temperatures do not create this emission). This "burning" helps quickly raise exhaust system temperatures, allowing the oxygen sensor and 3-way catalyst to warm-up faster.

At normal operating temperatures, the air switching valve in the air injection system directs additional air from the exhaust ports to the exhaust pipe, just ahead of the oxidation catalyst. The Closed Loop Mode comes into operation.

### CLOSED LOOP MODE

During this mode, EFC is operational and continuously corrects the air/fuel mixture toward 14.7:1 (best emission control ratio).

When the combustion computer receives signals from the oxygen sensor, and the throttle switch indicates the engine is not at idle, the computer sends a signal to the carburetor solenoid or vacuum regulator solenoid, causing the air/fuel ratio to be changed. This cycle repeats continuously to ensure proper mixture control at all times.

In addition, during the Closed Loop Mode, this system offers the built-in ability to maintain a constant air/fuel mixture regardless of altitude, because of its oxygen-sensing operation.

## MAINTENANCE

### OXYGEN SENSOR

When the oxygen sensor reminder light illuminates, the sensor must be replaced and the counter reset. Some models are equipped with an electronic counter; others use a mechanical switch which is located in the engine compartment.

**Oxygen Sensor Replacement** – 1) Disconnect battery cable and remove air cleaner. Disconnect lead at sensor. Remove sensor using special tool C-4589.

2) Coat threads of new sensor with nickel-based anti-seize compound. Do not use graphite or other compounds. Start sensor by hand and torque to 35 ft. lbs. with special tool C-4589. Install air cleaner and connect battery cable.

**Electronic Switch Reset** – 1) Locate green plastic case behind instrument panel in lower left cluster area. Slide case off bracket and open cover.

NOTE – *Vehicle battery MUST be connected while resetting switch.*

2) Remove 9 volt battery and insert small rod or screwdriver into hole in switch, closing contacts. Replace battery with a new 9 volt alkaline battery, close case, and slide switch back onto bracket.

**Mechanical Switch Reset** – Locate switch on front of dash in engine compartment, in line with speedometer cable. Slide rubber boot up and turn small screw to reset switch. Replace boot.

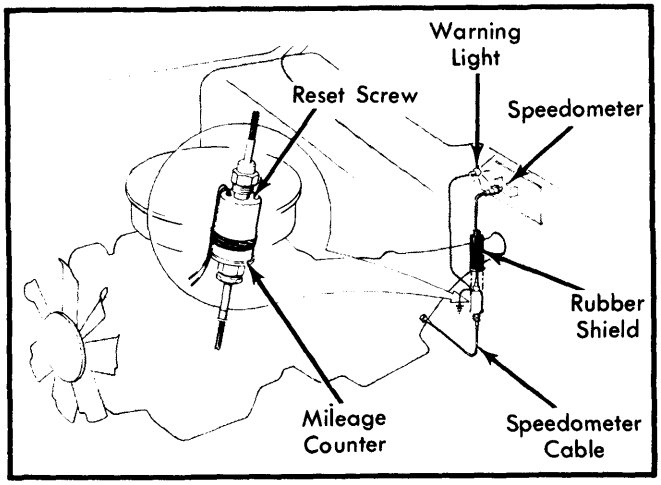


*Fig. 3 Oxygen Sensor Lamp Mileage Counter (Mechanical Switch Shown)*

## TESTING & DIAGNOSIS

### PRELIMINARY TESTING

EFC malfunction may result in engine surge, hesitation, rough idle and/or poor fuel economy. Before making any tests, check all vacuum and electrical wiring for proper routing and connections, and check for exhaust and intake manifold leaks. If these are in order, testing may begin.

NOTE – *Systems must be tested in order as listed below. In addition, the Air Switching System must be working properly. See Chrysler Corp. Air Switching System article in this section.*

### FEEDBACK CARBURETOR

**Four Cylinder Models** – 1) Start engine and let it warm up at 1200 RPM for a minimum of 2 minutes. Connect an auxiliary vacuum source to the vacuum transducer at the combustion computer, and apply 12 in. Hg. Do not ground the carburetor switch.

2) Disconnect the solenoid connector on the carburetor. Average engine speed should increase at least 50 RPM. If not, disconnect the 4-way "T" from the temperature sensor on the air cleaner and allow engine to draw air. Repeat test, and if engine speed does not increase, replace computer.

3) Reconnect solenoid connector. Engine speed should return to 1200 RPM. Disconnect 6-pin connector from combustion computer and connect a jumper wire between pin 15 and ground. Engine speed should decrease at least 50 RPM. If not, check carburetor for air leaks.

**Six Cylinder Engines** – 1) Connect a 0-5 in. Hg. vacuum gauge in to the supply line from vacuum regulator to carburetor, using a "T" fitting. Start engine and let it warm up for at least 2 minutes at 1200 RPM. Do not ground carburetor switch.

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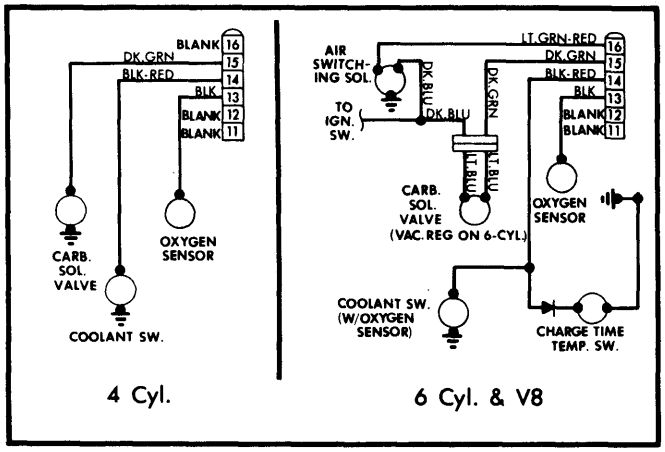


***Fig. 4 Electronic Feedback Carburetor Wiring Diagrams***

**2)** Disconnect wiring connector at the vacuum regulator. Carburetor vacuum should be zero, and engine speed should increase at least 50 RPM. Connect a jumper wire from battery voltage to one regulator terminal, and ground the other regulator terminal.

**3)** Engine speed should decrease at least 50 RPM, and vacuum gauge should indicate 5 in. Hg. If regulator does not operate properly, replace it. Repeat test, and if response is still wrong, replace carburetor.

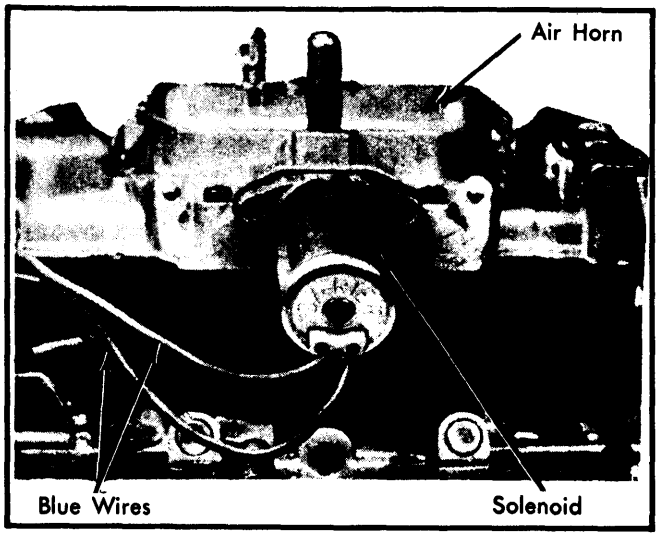


***Fig. 5 Electronic Feedback Solenoid Thermo-Quad Shown***

**Eight Cylinder Engines – 1)** Start engine and warm up for at least 2 minutes at 1200 RPM. Disconnect regulator solenoid connector at carburetor. Average engine speed should increase at least 50 RPM. Reconnect the solenoid; engine speed should slowly return to 1200 RPM.

**2)** Disconnect the 6-pin connector at the combustion computer. Connect a jumper wire between pin 15 and ground. Engine speed should increase a minimum of 50 RPM. If not, check carburetor for air leaks.

**3)** With all wires connected and engine in closed loop operation, place hand on solenoid. A pulsing should be felt. If not, shut off engine and disconnect solenoid. Measure resistance across the 2 blue wires. Resistance should be 22 ohms, and should measure infinity when tested from either blue wire to ground.

### COOLANT SWITCH TEST

**All Models –** Disconnect coolant switch lead. With engine coolant cold, switch should have continuity to ground, with less than 10 ohms resistance. With coolant temperature higher than 150° F (or 98° F with computer number 4145088), switch should be open. Replace switch if necessary.

### COMBUSTION COMPUTER TEST

**All Models – 1)** With engine hot, disconnect coolant temperature switch and charge temperature switch (6 and 8 cylinder only). Do not ground the idle stop switch. Using an accurate tachometer, maintain engine speed at 1200 RPM.

**2)** Separate connector from oxygen sensor and ground the harness end. Engine speed should increase a minimum of 50 RPM, then after 15 seconds, return to 1200 RPM. On 4 cylinder engines, if engine does not respond, disconnect 4-way "T" from temperature sensor on air cleaner and allow engine to draw air. Repeat test.

**3)** Hold jumper wire with 1 hand. With your other hand, touch the positive battery terminal. Engine speed should decrease at least 50 RPM. If not (on 4-cylinder engines only), disconnect 4-way "T" fitting from air cleaner temperature sensor and allow air to draw in. Repeat test.

**4).** If computer fails these tests, replace it and reconnect wiring and vacuum lines.

### OXYGEN SENSOR TEST

**All Models – 1)** Be sure sensor was changed at proper interval (30,000 miles). If not, replace sensor. If sensor is not due for change, test as follows.

**2)** Run engine at 1200 RPM and connect a voltmeter to the Dark Green wire to carburetor (or regulator) from computer. Hold choke blade closed. During the next 10 seconds, voltage should decrease to 3 volts or less and maintain at that level.

**3)** On 4 cylinder models, if engine does not respond, disconnect the 4-way "T" from temperature sensor on air cleaner and allow engine to draw air. Repeat test.

**4)** Disconnect PCV system and/or canister purge hose. During the next 10 seconds, voltage should be greater than 9 volts. Voltage should then decrease slightly and maintain that level until hoses are reconnected.

**5)** If oxygen sensor fails test, replace it. Ensure that threads are coated with anti-seize compound and sensor is tightened to 35 ft. lbs. with special tool C-4589.