

# 1974-79 FUEL SYSTEMS

## Bosch CIS Fuel Injection – Mercedes-Benz

1976-79 280 Series, 450 Series, 6.9

### DESCRIPTION & OPERATION

The Bosch Continuous Injection System (CIS) is a mechanically operated system. Amount of fuel that is continuously injected to each cylinder is determined from air flow by the air sensor plate. This sensor plate is raised or lowered by the air flowing through the intake system to the engine. This, in turn, raises or lowers a plunger in the fuel distributor which increases or decreases amount of fuel to be injected at each cylinder.

Main components of the CIS system include: control pressure regulator, airflow sensor assembly, fuel distributor, thermo-time switch, auxiliary air valve, cold start valve, injectors, electric fuel pump, fuel accumulator, and a fuel filtering system.

### ADJUSTMENTS

#### PRESSURE REGULATOR

**1977-79 Models** – 1) Relieve system fuel pressure. Remove and plug fuel return line at fuel distributor. Remove pressure regulator from fuel distributor. Use care to avoid losing compression spring and shims. See Fig. 1. If regulator plunger sticks, plunger can be removed with magnet or a pencil.

2) In order to change system pressure add or remove shims with pressure regulator disassembled. To do so, push compression spring back and remove retaining ring. Remove valve stem after removing hex socket plug.

3) Install new "O" rings and compression springs contained in repair kit. Adjusting shims are placed under outer heavy compression spring to increase pressure.

4) Shims are available in thicknesses of .004" (.10 mm), .006" (.15 mm), .012" (.30 mm), .016" (.40 mm), and .020" (.50 mm). A shim thickness of .004" (.10 mm) will result in a pressure change of about 2.9 psi (.2 kg/cm<sup>2</sup>).

5) Reverse disassembly procedure to assemble regulator. Be sure to lubricate "O" rings prior to installation. Recheck system pressure and add or remove shims as necessary to obtain correct pressure reading of 75-84 psi (5.2-5.8 kg/cm<sup>2</sup>).

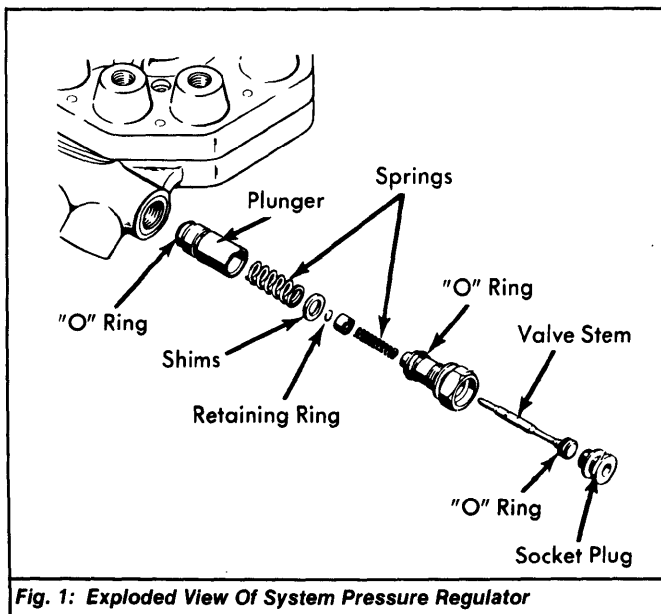


Fig. 1: Exploded View Of System Pressure Regulator

### TEST EQUIPMENT HOOK-UP

#### PRESSURE GAUGE & VALVE

1) Before any pressure tests can be completed, it is necessary to install Pressure Gauge (100 589 13 21 00) and 3-way valve assembly in fuel line between fuel distributor and control pressure regulator. See Fig. 2.

2) After testing, turn ignition off. Remove pressure tester assembly. Avoid fuel spillage on engine. Reconnect fuel lines and electrical connectors. Run engine and check for leaks.

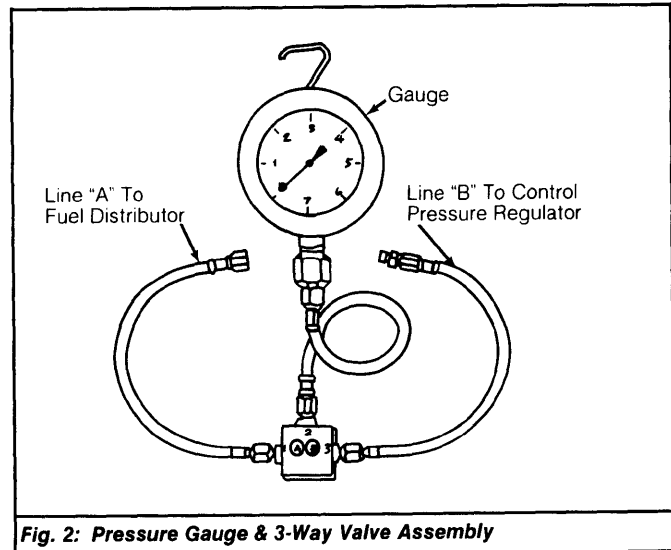


Fig. 2: Pressure Gauge & 3-Way Valve Assembly

### TESTING

#### AIRFLOW SENSOR & MIXTURE CONTROL UNIT

1) Check sensor plate lever for freedom of movement. Remove safety plug and turn ignition on to build up fuel control pressure. Turn ignition OFF and push sensor plate down by hand.

2) Even resistance should be felt over entire range of travel. Release sensor plate suddenly. No binding should be evident. Sensor plate should quickly return and lever should follow more slowly. See Fig. 3.

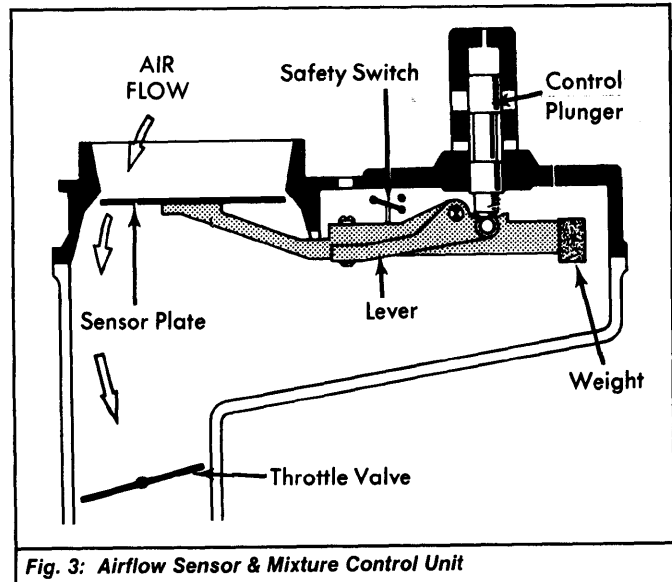


Fig. 3: Airflow Sensor & Mixture Control Unit

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## Bosch CIS Fuel Injection – Mercedes-Benz (Cont.)

### COLD ENGINE CONTROL PRESSURE TEST

**1977-79 Models** – 1) Install pressure gauge and 3-way valve assembly in fuel line, between fuel distributor and control pressure regulator. See TEST EQUIPMENT HOOK-UP in this article. With engine cold, remove plug from control pressure regulator.

2) Open valves for lines "A" and "B" on tester. Start engine and allow it to idle. Quickly read control pressure. Pressure should be as specified in COLD ENGINE CONTROL PRESSURE TEST table. See Fig. 4. If pressure is incorrect, replace control pressure regulator.

#### COLD ENGINE CONTROL PRESSURE TEST<sup>1</sup>

Application	Pressure psi (kg/cm <sup>2</sup> )
1977-78 Models	
Federal & Calif. ....	17-22 (1.2-1.5)
High Alt. ....	20-25 (1.4-1.7)
1979 Models	
280 & 450 Series ....	23-28 (1.6-1.9)
6.9 ....	20-26 (1.4-1.8)

<sup>1</sup> – With temperature at 68°F (20°C). If temperature is higher, pressure will be considerably higher. If temperature is lower, pressure will also be lower. See Fig. 4.

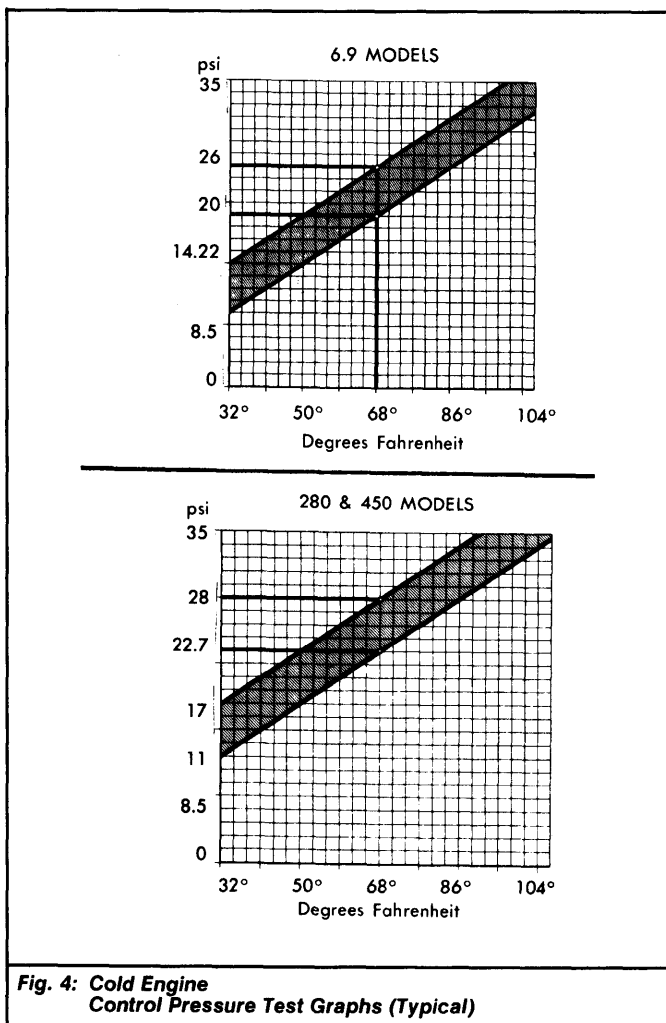


Fig. 4: Cold Engine Control Pressure Test Graphs (Typical)

### WARM ENGINE CONTROL PRESSURE TEST

1) Connect pressure gauge and 3-way valve assembly as in cold engine control pressure test. Tester valves "A" and "B" must be open. With fuel pumps activated, control pressure should be as specified in WARM ENGINE CONTROL PRESSURE TEST table.

2) If pressure is incorrect, check manifold vacuum. Disconnect vacuum hose from control pressure regulator. Install "T" fitting and vacuum gauge into line. Note vacuum reading and compare readings with intake vacuum/control pressure graph. See Fig. 5.

#### WARM ENGINE CONTROL PRESSURE TEST<sup>1</sup>

Application	Pressure psi (kg/cm <sup>2</sup> )
1976 Models ....	49-55 (3.4-3.8)
1977-78 Models	
Federal ....	49-55 (3.4-3.8)
Calif. ....	42-48 (2.9-3.3)
High Alt. ....	52-58 (3.6-4.0)
1979 Models ....	49-55 (3.4-3.8)

<sup>1</sup> – With manifold vacuum at 11.8 in. Hg. If manifold vacuum is higher, pressure will be slightly lower. If manifold vacuum is lower, pressure will be slightly higher. See Fig. 5.

3) Unplug connector and check voltage at control pressure regulator with engine running. Voltage should be minimum of 13.5 volts. With ignition off, check regulator heating coil with ohmmeter. Reading should be about 35 ohms. If not, replace control pressure regulator.

4) To check full-load enrichment, remove vacuum line from control pressure regulator. Pressure should drop to 41-46 psi (2.8-3.2 kg/cm<sup>2</sup>). If not, replace regulator.

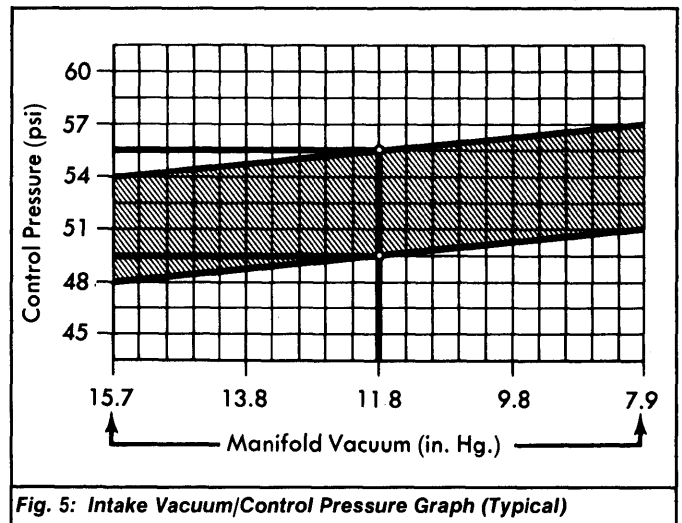


Fig. 5: Intake Vacuum/Control Pressure Graph (Typical)

### SYSTEM (LINE) PRESSURE TEST

Connect pressure gauge and 3-way valve assembly as in cold engine control pressure test. Close valve "B" on tester. System line pressure should be 75-84 psi (5.2-5.8 kg/cm<sup>2</sup>). If not, check for improper fuel delivery rate or improperly adjusted pressure regulator. See ADJUSTMENTS, PRESSURE REGULATOR in this article.

### COLD START VALVE & THERMO-TIME SWITCH

**1976 Models** – 1) Unplug connectors at mixture regulator and cold start valve. Remove cold start valve with fuel line connected, Point cold start valve down into fuel container.

2) Turn ignition on. Connect jumper wires from cold start valve to battery terminals. Valve should spray a cone-shaped pattern of fuel. Disconnect jumper wires from valve.

3) At coolant temperatures below 59°F (15°C), connect voltmeter to cold start valve harness connector and engage starter. Voltmeter should indicate 11 volts for amount of time that thermo-time switch is closed.

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4) At coolant temperatures above 59°F (15°C), switch can be checked with an ohmmeter. Disconnect thermo-time switch plug. Connect test lead to terminal marked "W" in plug (Brown/Black wire) and other lead to ground. See Fig. 6.

5) Ohmmeter reading should be 270 ohms. If correct, connect test lead to "G" terminal in plug. Ohmmeter should read about 62 ohms. If ohmmeter readings are incorrect, replace thermo-time switch.

**1977-79 Models** – 1) Disconnect fuel line and remove cold start valve. Loosen fuel line on fuel distributor and turn so that cold start valve can later be reconnected. Point cold start valve down into fuel container. Disconnect safety switch plug.

2) Turn ignition on. Connect jumper wires from cold start valve to battery terminals. Valve should spray a cone-shaped pattern of fuel. Disconnect jumper wires from valve.

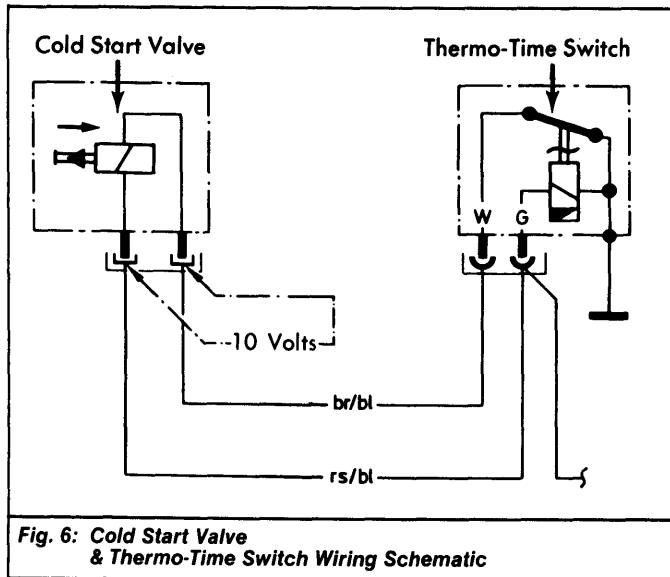
3) Using clean cloth, wipe excess fuel from tip of valve. No fuel should leak out of nozzle. Turn ignition off. Install cold start valve using new gasket. Reconnect safety switch plug and cold start valve plug.

4) Thermo-time switch activates cold start valve at temperatures below 59°F (15°C). Actuating period increases with decreasing temperatures to a maximum of 12 seconds at -4°F (-20°C).

5) At coolant temperatures below 59°F (15°C), connect voltmeter to cold start valve harness connector and engage starter. Voltmeter should indicate 10 volts for amount of time that thermo-time switch is closed.

6) At coolant temperatures above 59°F (15°C), switch can be checked with an ohmmeter. Disconnect thermo-time switch plug. Connect test lead to terminal marked "W" in plug (Brown/Black wire) and other lead to ground. See Fig. 6.

7) Ohmmeter reading should be about 270 ohms. If correct, connect test lead to "G" terminal in plug. Ohmmeter should read about 62 ohms. If ohmmeter readings are incorrect, replace thermo-time switch.



### AUXILIARY AIR VALVE

**1977-79 Models** – With engine cold, engine speed should be about 800-1000 RPM. Engine speed should then increase to about 1200-1300 RPM. As coolant temperature warms up to 158°F (70°C), engine RPM should drop to normal idle. Auxiliary air valve is operating correctly if engine performs as specified.

### INJECTORS

**NOTE: Manufacturer recommends using Injector Tester (EFEP60 H) for this test. If tester is not available, use Pressure Gauge (100 589 13 21 00).**

1) Remove air filter assembly. Unscrew fuel lines at injector nozzles. Ensure nozzles do not rotate when unscrewing fittings. Catch escaping fuel with cloth.

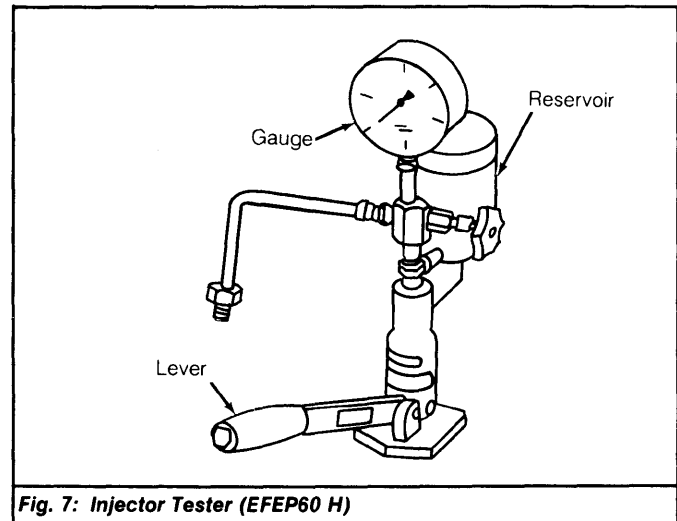
2) Remove hold-down brackets. Hold nozzles in place to avoid pulling out nozzles and insulators. Pull out injectors while keeping insulators in place in opening of intake. If insulators accidentally come out, new "O" rings must be installed before placing them back into intake.

3) Connect injectors to tester. See Fig. 7. Bleed pressure line with shut-off valve open and pressure line nut loose. Several strokes of hand lever should be sufficient for bleeding.

4) Tighten pressure line nut. With shut-off valve still open, depress hand lever slowly to build up pressure to maximum of 22 psi (1.5 kg/cm<sup>2</sup>). If injector leaks (solid stream from nozzle), replace injector.

5) Close shut-off valve on tester and flush out valve with several rapid hand lever strokes. Open shut-off valve and slowly build up pressure with hand lever. Leak test again.

6) No fuel droplets should form within 15 seconds. Replace injectors that do not meet specifications. After installation, start engine and check for fuel leaks.



### REMOVAL & INSTALLATION

**NOTE: Disconnect negative battery cable and relieve fuel pressure before opening fuel system.**

### AIRFLOW SENSOR & MIXTURE CONTROL UNIT

**Removal & Installation** – 1) Remove air filter. Remove fuel lines at injection nozzles and fuel distributor. Plug all disconnected fuel supply and return lines.

2) Remove safety switch connector. Remove bolts and nuts on airflow sensor housing. Remove housing with gasket. To install, reverse removal procedure. Tighten hex head bolts and nuts to 6.5-7.2 ft. lbs (8.8-9.8 N.m). Reconnect all fuel lines and wiring. Start engine and check for leaks.

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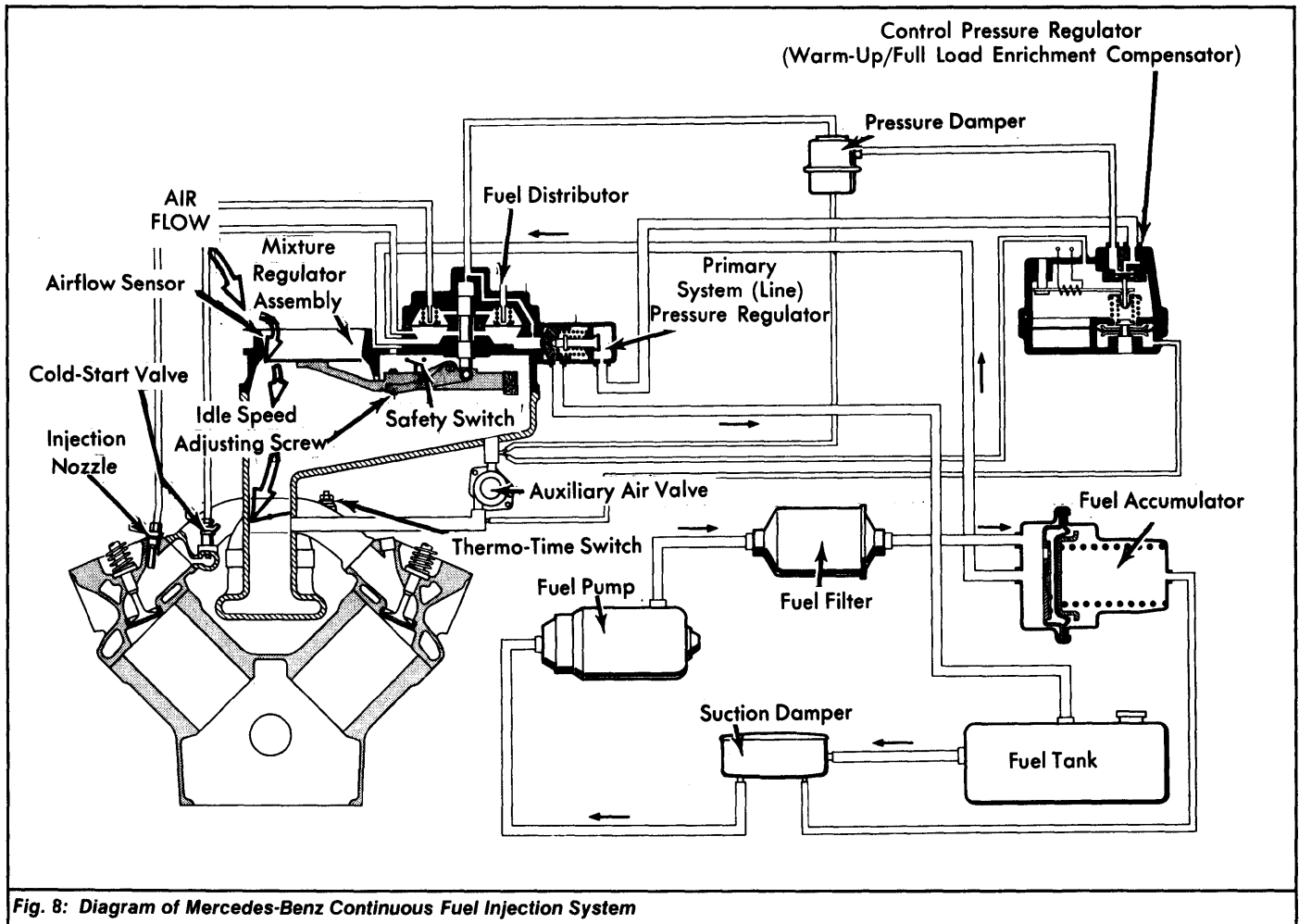


Fig. 8: Diagram of Mercedes-Benz Continuous Fuel Injection System

### FUEL DISTRIBUTOR

**Removal & Installation** – 1) Remove air filter. Remove fuel lines at fuel distributor and injectors. Plug disconnected lines. Unscrew fitting for control pressure line on fuel distributor. Remove (3) retaining screws and remove distributor.

**NOTE:** Use care not to drop control plunger from beneath fuel distributor.

2) To install, reverse removal procedures. Use new lubricated "O" ring and carefully install distributor. Reinstall all lines. Check sensor plate and lever for freedom of movement. Check control plunger for sticking or binding. Start engine and check for leaks. Adjust idle speed if necessary.

### THERMO-TIME SWITCH

**Removal & Installation** – When removing thermo-time switch, use care not to damage electrical contacts on top of switch. Coolant level should be drained to a point lower than level of switch. When reinstalling switch it may be necessary to apply sealer to threads to avoid leaks.

### INJECTORS

**Removal & Installation** – 1) Remove air filter. Remove all fuel lines at injectors and fuel distributor. Do not allow injectors to rotate while loosening fittings.

2) Remove hold-down brackets. Hold nozzles in place so insulators will not pull out with injectors. Carefully pull out injectors. If insulators are accidentally pulled out, new "O" rings must be installed on insulators prior to replacement.

3) To install, reverse removal procedure. When installing injectors, be sure that noses on hold-down brackets face to the LEFT. DO NOT allow injectors to rotate while tightening fittings. Run engine and check for leaks.