1974-79 FUEL SYSTEMS
Bosch CIS Fuel Injection - BMW

1977-79 320i

DESCRIPTION & OPERATION

The Bosch Continuous Injection System (CIS) is a mechanical system. It injects fuel to each cylinder in amounts determined by the volume of air flow through the air intake system. Intake air required by the engine is metered by an air flow sensor located in the air inlet.

Sensor is activated by a circular plate attached to an arm and pivot assembly which is extremely sensitive to air flow. This sensor plate is raised or lowered by the incoming flow of air, and in turn, raises or lowers a plunger in the fuel distributor. This plunger acts to increase or decrease amount of fuel to be injected at each cylinder.

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

ADJUSTMENTS

THROTTLE VALVE

1) Disconnect accelerator cable. Loosen lock nut and screw on adjuster stand. Adjust distance between stop and lever to .039-.058" (1-1.5 mm). When correct clearance has been achieved, tighten lock nut and adjusting screw.
2) Loosen throttle lever shaft set screw. Position throttle valve in housing so that there is no play or slack. Retighten set screw. Loosen lock nut on adjuster stand, turn adjusting screw one full turn clockwise, and tighten lock nut.

TEST EQUIPMENT HOOK-UP

PRESSURE GAUGE & VALVE

Before any pressure tests can be completed, it is necessary to install a fuel pressure gauge, 2-way valve, and 3-way "T" fitting in fuel line between fuel distributor and control pressure regulator. Ensure that valve is installed between pressure gauge and control pressure regulator. *See Fig. 1.*

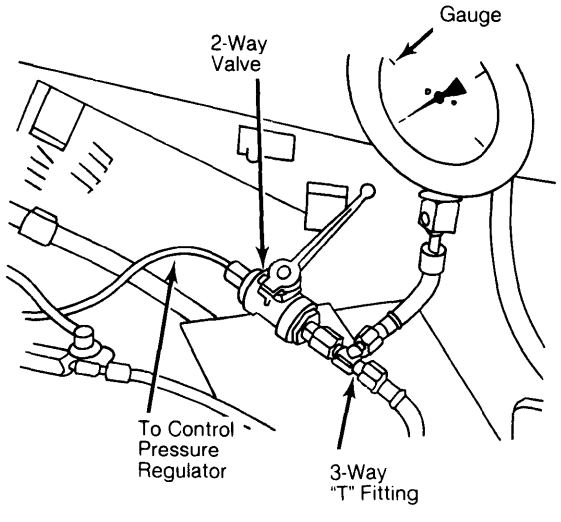

Fig. 1: Connecting Pressure Gauge & Valve

TESTING

AIRFLOW SENSOR & MIXTURE CONTROL UNIT

1) Detach and remove intake cowl at mixture control unit and throttle housing. Turn ignition on for about 5 seconds, then turn ignition OFF. Raise sensor plate by using magnet or pliers. As plate is slowly raised, resistance felt should be even throughout range of travel.
2) When sensor plate is quickly pushed down, no resistance should be felt. Do not allow plate to scrape on air horn wall. If necessary to center sensor plate, loosen centering bolt in middle of plate and adjust.
3) Check sensor plate height. Plate should be even with beginning of taper in air cone. If plate is no more than .019" (.5 mm) deeper than edge of tapered area, adjustment is not needed.
4) To adjust height of sensor plate, remove mixture control unit and bend spring beneath plate assembly. If sensor plate is too high in air cone, engine will diesel (run on). If plate is too low, poor cold or warm engine starting will result.
5) Check for sticking or binding fuel control piston (plunger) in fuel distributor. Remove fuel distributor, remove plunger and clean thoroughly with solvent. Plunger binding or sticking is evident when resistance to sensor plate movement is uneven.

COLD ENGINE CONTROL PRESSURE TEST

1) Install valve between pressure gauge and control pressure regulator. See TEST EQUIPMENT HOOK-UP in this article. Hang gauge from convenient point above level of units to be tested.
2) Unplug electrical connector at auxiliary air regulator to avoid overheating unit. Unplug connector at mixture control unit. Turn ignition on. Open 2-way valve for flow-through operation and check fuel pressure. *See Fig. 2.*
3) If fuel pressure reads too low, warm-up regulator is defective and should be replaced. If fuel pressure reads too high, regulator is defective of fuel return flow is insufficient of restricted. Turn ignition off.

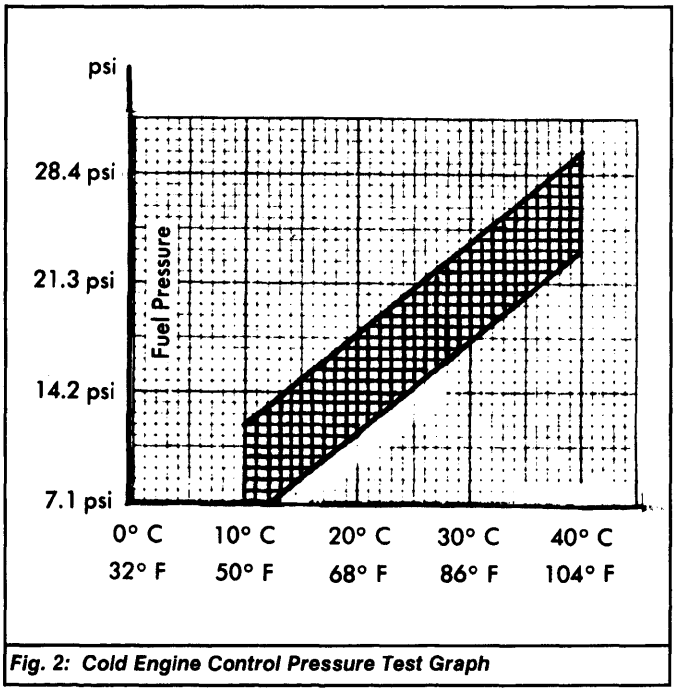

Fig. 2: Cold Engine Control Pressure Test Graph

WARM ENGINE CONTROL PRESSURE TEST

1) Connect pressure gauge and valve as in cold engine control pressure test. Open 2-way valve for flow-through operation. Unplug connector to mixture control unit. Turn ignition on, but DO NOT start engine.
2) Control pressure should rise steadily to 48-54 psi (3.4-3.8 kg/cm²) for about 3 minutes. If not, check for voltage at connector. If voltage is present, heating coil is defective.

1974-79 FUEL SYSTEMS
Bosch CIS Fuel Injection - BMW (Cont.)

3) Replace warm-up regulator. Install air inlet assembly. Reconnect electrical connectors to auxiliary air regulator and mixture control unit. Start engine. Allow engine to idle. Control pressure should stabilize at 48-54 psi (3.4-3.8 kg/cm²).

SYSTEM (LINE) PRESSURE TEST

1) Install valve between pressure gauge and control pressure regulator. See TEST EQUIPMENT HOOK-UP in this article. Hang gauge from convenient point above level of units to be tested.
2) Close 2-way valve to stop flow-through of fuel. Unplug connector at mixture control unit. Turn ignition on. System pressure should be 64-74 psi (4.5-5.2 kg/cm²).
3) If system fuel pressure is too low, check for leaks at fuel lines or connections. Check for a clogged/restricted fuel filter, improper fuel pump delivery rate, or incorrect system pressure adjustment.
4) If system fuel pressure is too high, check for clogged/restricted fuel return line, incorrect system pressure adjustment, or pressure regulator control piston binding
5) If necessary, adjust system pressure by adding or removing shims to pressure regulator. Pressure will change by 4 psi (.3 kg/cm²) by a .020" (.5 mm) shim.
6) Transfer valve should open at 50-57 psi (3.5-4.0 kg/cm²). *See Fig. 3.* If not, engine will be difficult to start. Check by replacing valve and restarting engine.

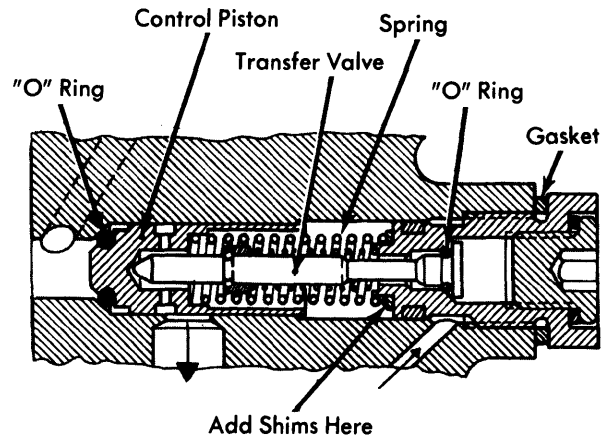

Fig. 3: Pressure Regulator Adjustment

REST PRESSURE & LEAK TEST

1) Install valve between pressure gauge and control pressure regulator. Open 2-way valve for flow-through operation. Turn ignition on. Unplug connector at mixture control unit, and then plug it in again.
2) Turn ignition off. Observe cut-off pressure on gauge. Pressure should not drop below 24 psi (1.7 kg/cm²) for several minutes. If pressure drops too soon, check one or both "O" rings in pressure regulator for leaks.
3) Also check warm-up regulator or supply line for leaking. Fuel pump check valve for leaking or pressure reservoir for leaks. Repair or replace parts as necessary and recheck system.

COLD START VALVE

1) Unplug connector at thermo-time switch. Connect Brown/Black wire (terminal W) to ground. *See Fig. 4.* Disconnect wire from lowest terminal of starter solenoid to prevent engine from starting during test.
2) Remove cold start valve. Remove fuel pump relay from fuse/relay block. Apply battery voltage to terminal No. 87 marked on fuse/relay plate to activate fuel pump.
3) Cold start valve should spray fuel. If not, replace cold start valve and recheck. Reinstall fuel pump relay and reattach connector.

THERMO-TIME SWITCH

Unplug connector at thermo-time switch. Connect test light between battery positive terminal and Brown/Black wire (terminal W) of thermo-time switch. *See Fig. 4.* Test light should come on, and remain on for 8 seconds, if engine coolant temperature is below 95°F (35°C). If not, replace defective thermo-time switch.

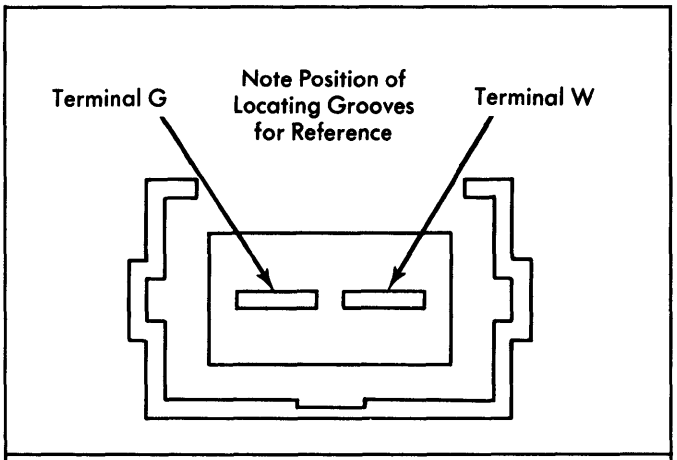

Fig. 4: Thermo-Time Switch Terminals

AUXILIARY AIR VALVE

With engine cold, start engine. Engine should run past fast idle speed for a brief period, then return to normal idle (850-950 RPM). If no increase in idle speed is evident, or if engine RPM fails to return to normal idle speed after a few minutes, replace auxiliary air valve.

INJECTORS

1) Install Pressure Tester (13 3 060) to measure fuel pressure applied to injector(s). Remove injector(s). Carefully lift sensor plate with magnet or pliers. Observe injector tips. Injectors are good if no more than one drop leaks from tip every 15 seconds. Replace defective injector(s).
2) Open 2-way valve for flow-through operation. Turn ignition ON. Unplug connector at mixture control unit. Lift sensor plate for about 4 seconds maximum.
3) System pressure should not drop more than 4 psi (.3 kg/cm²). If pressure drop is more than 4 psi, check for a restricted/blocked fuel filter, improper fuel pump delivery rate, or low fuel level in fuel tank.

REMOVAL & INSTALLATION

NOTE: Disconnect negative battery cable and relieve fuel system pressure when any fuel system component is being removed.

MIXTURE CONTROL UNIT

Removal & Installation - **1)** Remove intake cowl. Loosen (3) screws on top of fuel distributor. Bend wire fuel line clips open and remove wire holder. Carefully lift off top of fuel distributor. DO NOT not allow control piston to fall out.
2) Disconnect mixture control unit and remove all vacuum hoses. Loosen (2) bracket nuts on side of control unit and lift out mixture control unit assembly.
3) To install, reverse removal procedure. Be sure to replace gasket between upper and lower halves of unit and replace "O" ring seal beneath fuel distributor at control piston opening.

NOTE: Whenever venturi is being replaced, take notice that there are two different applications. Federal vehicles use Bosch Part No. 0 438 120 030; California vehicles use Bosch Part No. 0 438 120 039.

1974-79 FUEL SYSTEMS
Bosch CIS Fuel Injection - BMW (Cont.)

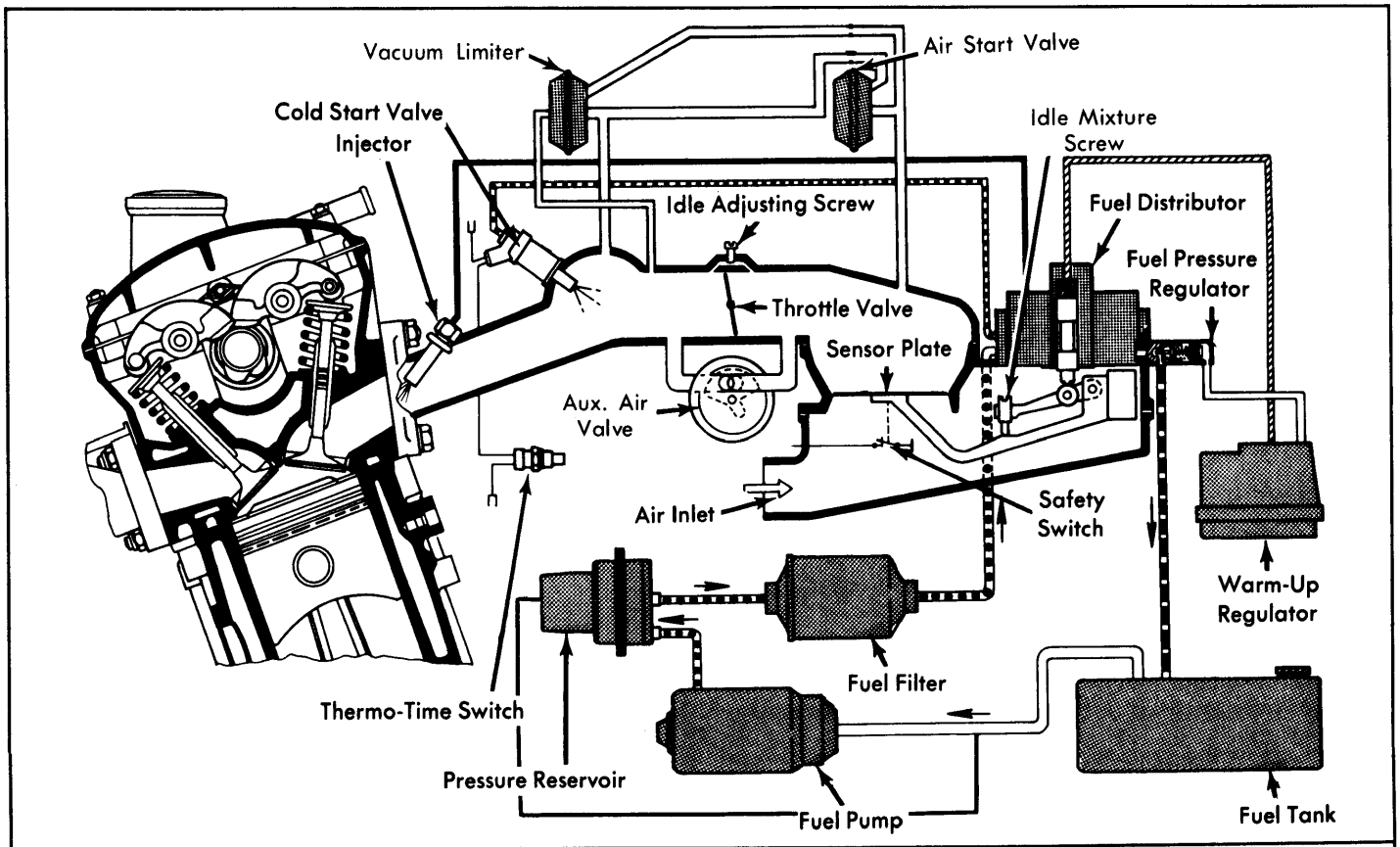

Fig. 5: Bosch CIS Fuel Injection System - BMW

FUEL DISTRIBUTOR

Removal & Installation - **1)** Relieve fuel pressure and disconnect fuel lines at fuel distributor. Remove (3) screws on top of distributor unit. Remove fuel distributor from mixture control unit, being careful not to drop control piston from beneath distributor housing.
2) To install, reverse removal procedure. Thoroughly clean piston in solvent before installing. Check control piston for dirt or any damage. Be sure to replace "O" ring around control piston opening.

CONTROL PRESSURE REGULATOR

Removal & Installation - Disconnect fuel control line and fuel return line fittings at regulator. Unplug connector at control pressure regulator. Remove altitude control line (if equipped). Remove control pressure regulator. *See Fig. 6.* To install, reverse removal procedure.

AUXILIARY AIR REGULATOR

Removal & Installation - Disconnect electrical plug from end of regulator. Detach hoses and remove auxiliary air regulator. To install, reverse removal procedure.

THERMO-TIME SWITCH

Removal & Installation - Unplug connector at thermo-time switch. Drain radiator to lower coolant level below thermo-time switch. Remove thermo-time switch using a deep well socket. To install, reverse removal procedure. Apply sealer on threaded portion of thermo-time switch.

COLD START VALVE

Removal & Installation - Clean thoroughly fuel line connections. Remove fuel line at fitting. Detach connector from cold start valve. Remove bolts and cold start valve. To install, reverse removal procedure.

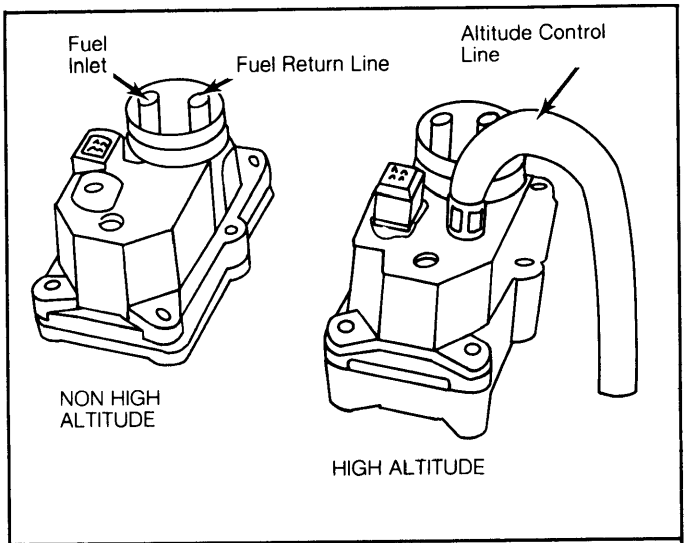

Fig. 6: Control Pressure Regulators

INJECTORS

Removal & Installation - **1)** Remove intake cowl and intake pipes at No. 2 and No. 3 cylinders. Gently pry injectors out of intake manifold. Remove injectors from fuel lines and mark location of each injector.
2) To install, reverse removal procedure. Ensure insulator is properly seated in intake opening. Place "O" ring in intake opening and insert injector. Use new gaskets when installing intake pipes.