GENERAL MOTORS DIESEL MECHANICAL FUEL INJECTION – 4 CYL.

Chevrolet Chevette

DESCRIPTION

The Chevette diesel fuel injection system consists of a mechanical injection pump driven by the camshaft through a cogged belt, 4 high pressure fuel pipes, 4 injection nozzles, a fuel filter with a integral water separator, a fuel cut solenoid mounted on the injection pump and a glow plug system to warm the engine for starting.

Chevette diesel engines are electronically controlled in the start and warm-up modes to make for easier cold starting and cold driving. An electronic module monitors and corrects combustion chamber temperatures during preheat and afterglow modes. System consists of a controller, glow plug relay, dropping resistor, sensing resistor, glow plugs, thermo switch, 2 glow plug relays and 2 fusible links.

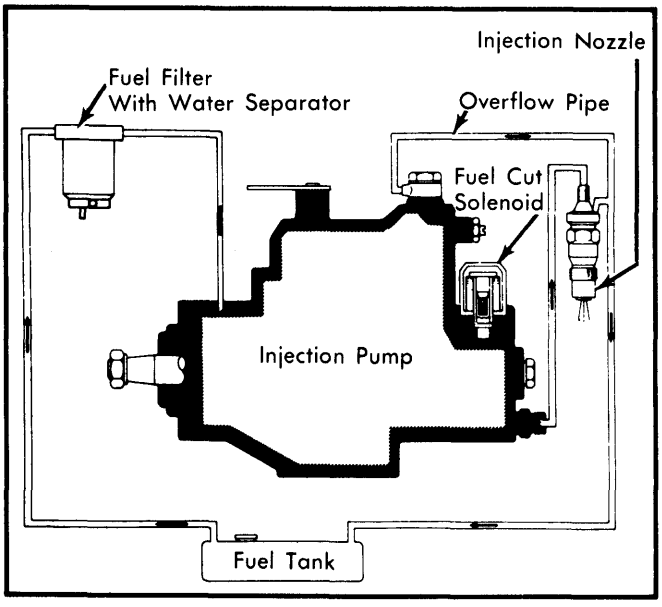

Fig. 1 Chevette Diesel Fuel Injection Fuel System

OPERATION

System is designed to provide a fast chamber preheat if temperature at thermo switch is less than 122° F. Under these conditions, relay 1 is energized and glow plug indicator light is lit for a period of 3.5 seconds. Chamber preheat temperatures are at a level which permits starting vehicle. At temperatures above 122° F, relay 1 is inoperative and relay 2 turns on and provides stabilizing heat during starting.

TROUBLE SHOOTING

GLOW PLUG INDICATOR AND RELAY 1 INOPERATIVE

Blown fuse. Fusible link blown or disconnected. Open circuit in starter wiring. Controller not connected or defective. Starter switch defective.

RELAY 1 INOPERATIVE

Relay not connected. Open in relay coil. Open in circuit between controller and relay or poor connection. Open in relay grounding circuit. Defective controller. Circuit between signal feed wire of sensing resistor and controller open or poorly connected. Sensing resistor terminals disconnected. Relay main terminal disconnected. Defective relay. Quick preheat terminals disconnected, poorly connected or open in wiring. Grounding terminal of engine harness disconnected.

GLOW PLUG INDICATOR INOPERATIVE

Bulb burned out. Circuit has open or poor connection. Defective controller.

RELAY 1 TURNS OFF WITHIN 2 SECONDS

One or more glow plugs inoperative. Loose connections at controller. Defective controller.

RELAY 1 WILL NOT TURN OFF

Defective controller.

RELAY 1 OPERATES WITH COOLANT TEMPERATURE ABOVE 122° F

Coolant temperature above 122° F. Thermo switch defective (switch remains on and does not turn off). Circuit shorted to ground.

GLOW PLUG INDICATOR AND RELAY 2 INOPERATIVE

Starter switch "R" circuit open or poorly connected.

RELAY 2 INOPERATIVE

Relay terminals not connected. Relay coil open. Circuit between relay 2 and starter "R" terminal open or poorly connected.

GLOW PLUG INDICATOR REMAINS ON AND CAUSES RELAY 1 TO TURN ON

Thermo switch defective. Thermo switch circuit open or poorly connected.

NOTE – *See Diesel Fuel Injection Trouble Shooting at the front of the section for general engine diagnosis.*

TESTING

NOZZLE TEST

Opening Pressure – 1) A reliable tester is required to perform test. Use clean test oil (SAE J9670). Care must be taken not to damage gauge with excessive pressure. Connect test line to nozzle holder assembly and tighten fittings.

CAUTION – *When performing test, DO NOT place hands or arms near tip of nozzle. The atomized high pressure spray from the nozzle has the power to penetrate flesh and destroy tissue, and may result in blood poisoning. The tip should always be enclosed in a receptacle, preferably a transparent type, to contain the spray.*

2) Close gauge valve and operate tester handle sharply several times and check for proper nozzle position. Spray should be injected into a clean container.

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3) Open gauge valve and operate tester handle slowly to determine injector opening pressure. Observe gauge reading just before oil is sprayed from tip. A buzzing noise will occur when spray is injected. Minimum opening pressure is 1706 psi.

Spray Pattern – Check spray pattern by operating handle 1 stroke about every 2 seconds and observe spray pattern. The pattern should be uniform and injected at the correct angle of the nozzle being tested.

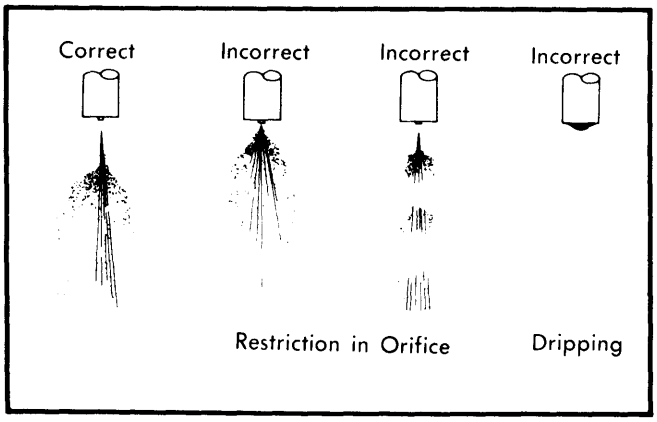

Fig. 2 Diesel Fuel Injector Spray Pattern

CAUTION – *The pressure gauge should be closed for the test or it may be damaged. Test spray is flammable. Keep vapor away from open flames.*

Nozzle Leakage – Check for nozzle leakage by applying 142.2 psi to nozzle. Tip should remain dry without an accumulation of fuel at spray holes. A slight wetting is allowed after 10 seconds if no droplets are formed.

GLOW PLUG SYSTEM

Glow Plug Relay 1 and 2 – With a circuit tester, make a continuity test across terminals "C" and "D" with battery voltage applied to terminals "A" and "B". Replace relay if no continuity is indicated.

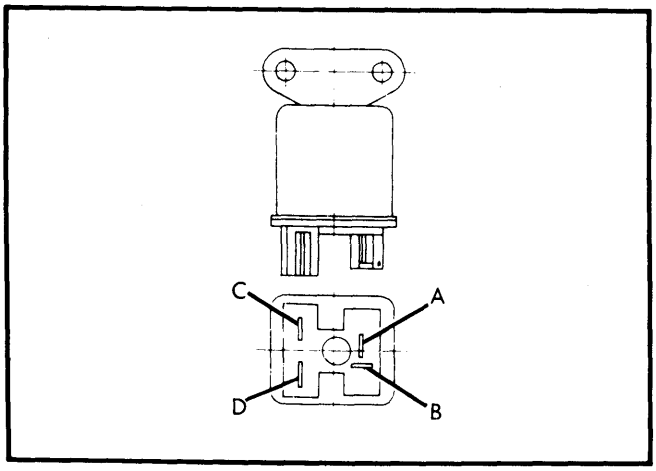

Fig. 3 Glow Plug Relay Terminal Locations

Dropping Resistor – Check for continuity across terminals. If no continuity, replace resistor.

Glow Plug – Check for continuity across plug terminals and plug body. If no continuity, heater wire is broken and should be replaced.

Thermo Switch – Submerge end of thermo switch in water and gradually raise water temperature and make a continuity test across terminal and body. If no continuity, replace switch.

Fusible Link – Check continuity across fusible link terminals. If no continuity, link is fused out and should be replaced.

REMOVAL & INSTALLATION

INJECTION PUMP

Removal – **1)** Disconnect battery ground cable. Drain cooling system. Remove fan shroud, radiator and coolant recovery bottle.

2) Remove upper dust cover. Loosen tension pulley and plate bolt. Remove tension spring and nut attaching pump gear. Using puller (J-22888), remove injection pump gear. Disconnect fuel lines and necessary wiring.

3) Remove fuel filter at bracket. Disconnect injector lines at pump and nozzles and remove lines. Remove 4 bolts attaching pump rear bracket and remove bracket. Remove nuts attaching injection pump flange and remove injection pump together with fast idle device and return spring.

Installation – **1)** Install injection pump, tightening 4 mounting bolts in sequence shown in *Fig. 4*. No clearance should exist between rear bracket and injection pump bracket.

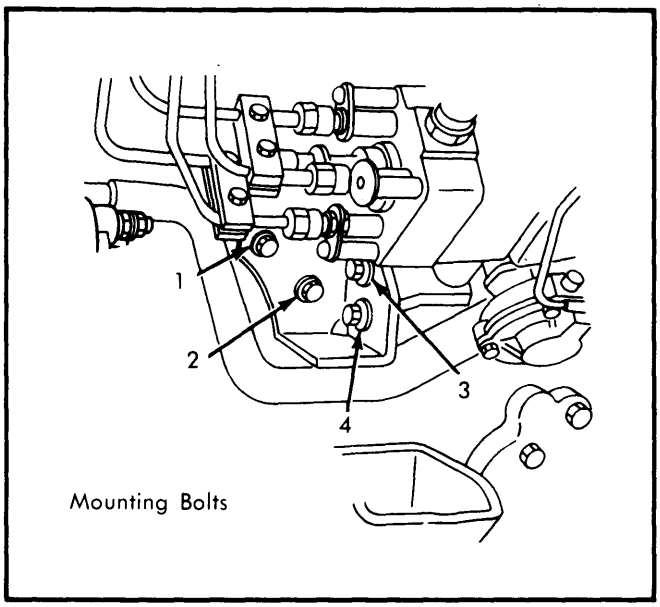

Fig. 4 Tightening Sequence For Injection Pump

2) Install injection pump pulley by aligning it with key groove. Align mark on gear with mark on front plate. *See Fig. 5.* Tighten nut using a 8 mm X 1.25" lock bolt to prevent turning pulley. Remove cam cover.

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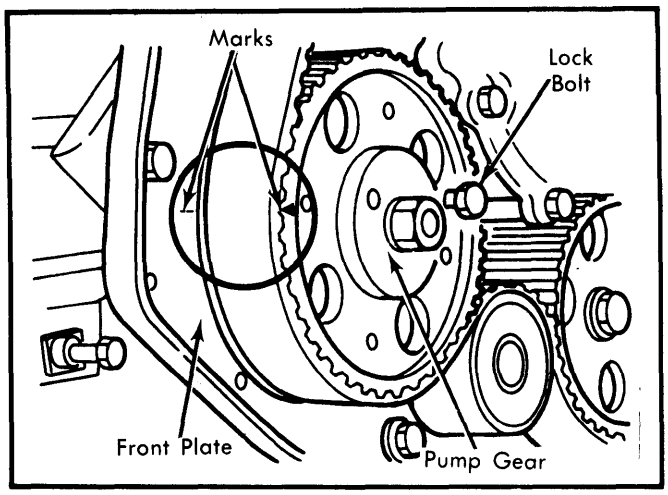

Fig. 5 Aligning Marks For Injection Pump Gear

3) With No. 1 piston at T.D.C., install fixing plate (J-29761) to slot in rear of camshaft to prevent camshaft from rotating. Remove camshaft gear attaching bolt.

4) Using puller (J-22888), remove cam gear. Reinstall cam gear loosely so it can be turned by hand. Install the timing belt noting the following: Belt should be properly tensioned between pulleys, cogs on belt and pulley should be engaged properly, crankshaft should not be turned and timing belt looseness should be concentrated on tension pulley.

5) Depress tension pulley with finger and install tension spring. Semi-tighen tension pulley bolts, tightening top bolt first, to prevent movement of pulley. Tighten camshaft pulley bolt. Remove injection pump gear lock bolt.

6) Remove fixing plate on end of camshaft. Check that piston is in T.D.C. position. DO NOT turn crankshaft in attempt to make adjustment. Check that injection pump pulley mark is in line with mark on plate.

7) Fixing plate should fit smoothly into slot at rear of camshaft, then remove fixing plate. Loosen tensioner pulley and plate bolts. Concentrate looseness on tensioner then tighten bolts in sequence shown in *Fig. 6*. Belt tension should be checked at a point between camshaft gear and injection pump gear.

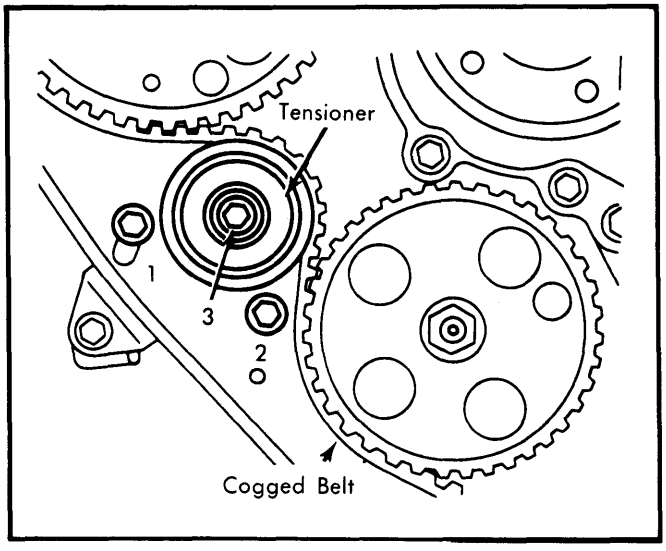

Fig. 6 Tensioner Bolt Tightening Sequence

8) Ensure that No. 1 piston is at T.D.C. Check that timing belt is properly tensioned and that marks are aligned.

9) Remove distributor head screw and washer. Install static timing gauge (J-29763) with lift approximately .04" from plunger. Bring No. 1 piston to a point 45-60° before T.D.C. by turning crankshaft. Turn dial indicator to zero.

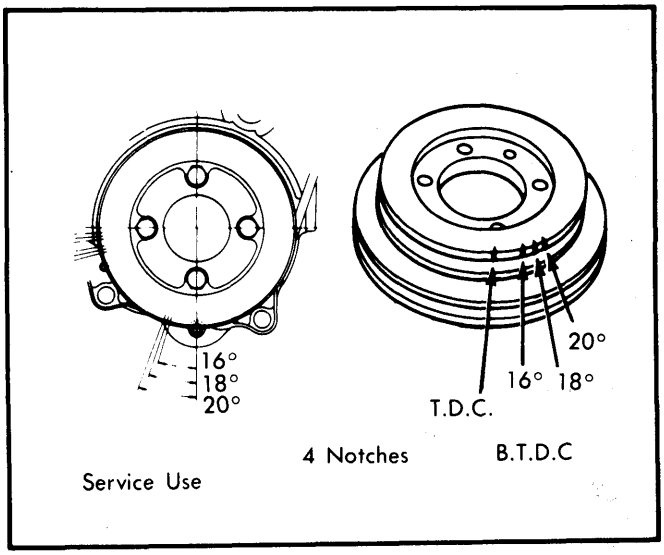

Fig. 7 Damper Pulley Alignment Notches

10) The damper pulley has a series of notched lines on it. There are 4 notches on one side and 7 on the other. The 4 lines are used for static timing. Turn crankshaft until the 18° line is in alignment with pointer on dial indicator, then take reading.

11) Standard reading should be .02". Turn crankshaft in normal direction of rotation. If reading on dial indicator deviates from specified range, hold crankshaft at 18° position and loosen 2 nuts on injection pump flange.

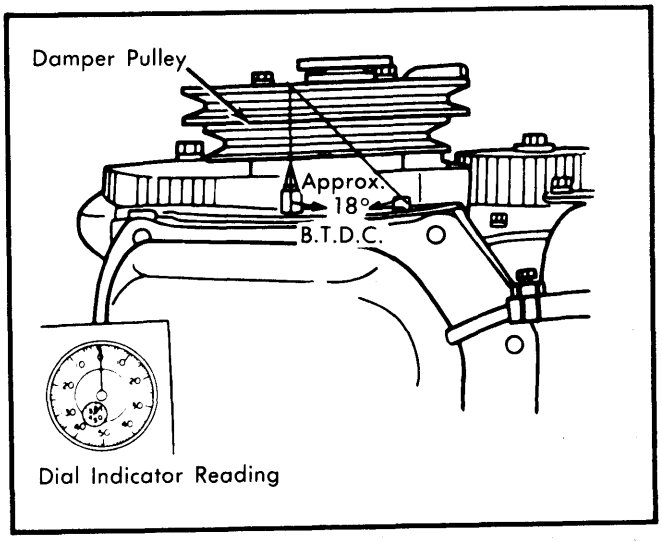

Fig. 8 Static Timing Setting

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12) Move injection pump to a point where proper dial indicator reading is reached and tighten pump flange nuts. Recheck reading and adjust as necessary.

13) Install distributor screw and washer in injection pump. Install cam cover, fuel injection lines and fuel filter. Connect necessary lines and hoses and install upper dust cover.

14) Install coolant recovery bottle, radiator, fan shroud and fill radiator with coolant. Adjust idle speeds.

INJECTION NOZZLE

Removal – Disconnect battery ground cable. Remove fresh air duct. Remove PCV hose. Remove injection lines at injection nozzle and loosen lines at pump. Remove return line and injection nozzle.

Installation – To install, reverse removal procedures.

FUEL FILTER

Removal – Disconnect battery ground cable. Disconnect water sensor wiring at connector. Disconnect fuel hoses at filter and remove 2 screws securing filter to bracket.

Installation – Install 2 screws securing filter to bracket. Connect hoses and water sensor wiring to filter. Disconnect fuel outlet hose and place end of hose in a suitable container. Prime pump by operating priming handle several times. Reconnect fuel outlet hose battery ground cable. Start engine and check for leaks.

ENGINE BLOCK HEATER

Removal – Drain cooling system. Remove screws retaining block heater and remove heater from cylinder body.

Installation – To install, reverse removal procedure.

PCV VALVE

Removal – Disconnect PCV connecting hose. Remove 2 screws securing PCV valve to cam cover, and remove valve and gasket.

Installation – To install, reverse removal procedure.

BAFFLE PLATE

Removal – Remove cam cover and remove 7 screws securing baffle to cam cover.

Installation – To install, reverse removal peocedure.

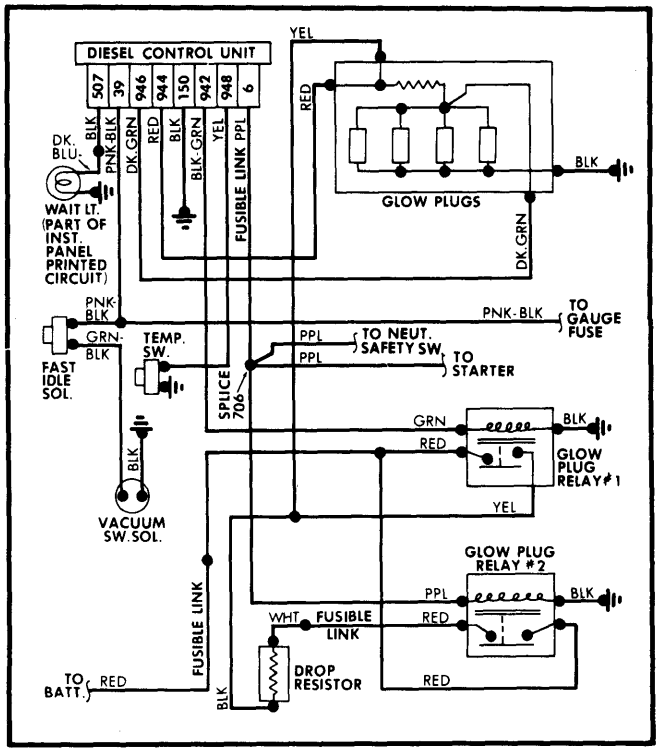

Fig. 9 Glow Plug System Wiring Diagram

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N·m)
Camshaft Pulley Bolt	45 (61)
Tensioner Pulley Nut	45 (61)