1982 Diesel Fuel Injection

DATSUN/NISSAN PICKUP

DESCRIPTION

The diesel injection system includes a fuel injection pump, an injection pump controller system, governor, fuel filter, fuel lines, injector nozzles and glow plug system. The pump controller system consists of a gearing assembly, a control unit and a connecting rod.

The purpose of the system is to supply excess fuel for engine firing, and to cut the fuel supply when the ignition is turned off. The glow plug system includes a glow plug timer (in cab, on kick panel below glove box), a glow plug relay (above right shock tower, behind battery) and a water temperature sensor (on front left side of engine block).

OPERATION

FUEL INJECTION PUMP

The injection pump is gear driven off of an idler pulley at the front of the engine. It draws fuel from the tank, pressurizes it, and injects a specific quantity to each cylinder at the proper time. Excess fuel is returned to the tank through another line. In the event of pump failure, the assembly must be replaced as a complete unit.

INJECTION PUMP CONTROLLER

The pump controller system uses a gearing assembly, and a connecting rod linking the gearing assembly to the injection pump control lever. A control unit is also used and is wired to the ignition switch.

When the ignition is in the "START" position, the gears in the assembly rotate, moving the injection pump control lever to an excessive fuel condition. This aids engine starting. When the ignition is turned to "OFF", the lever is moved to a position of no fuel delivery, and the engine stops. During normal engine operation, the system maintains a normal mixture.

INJECTION NOZZLES

The injection nozzles spray fuel into a swirl chamber as each compression stroke occurs. Each nozzle

Fig. 2: Exploded View of Fuel Injection Nozzle

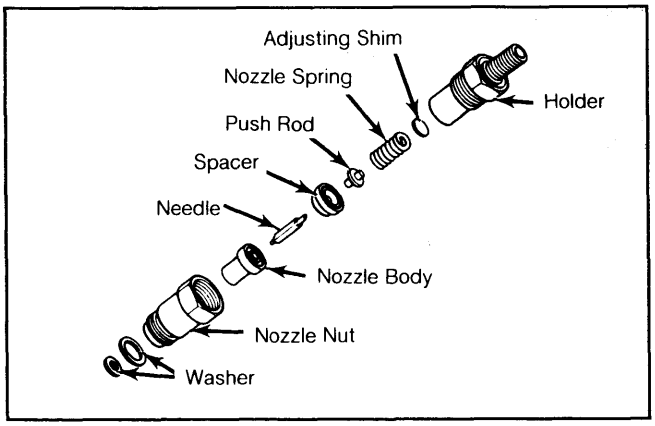


Fig. 3: Injection Pump Controller System

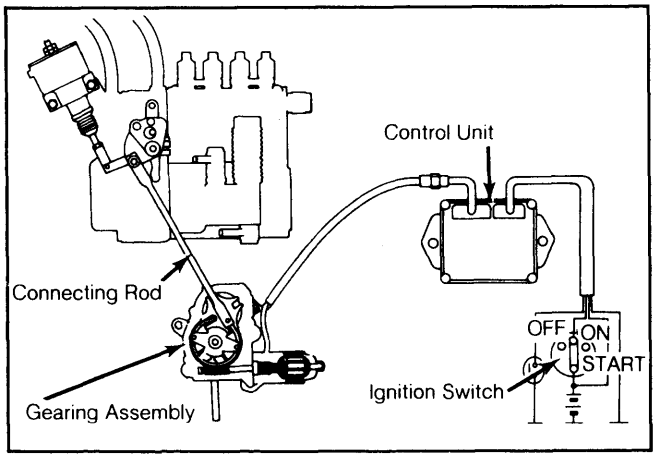
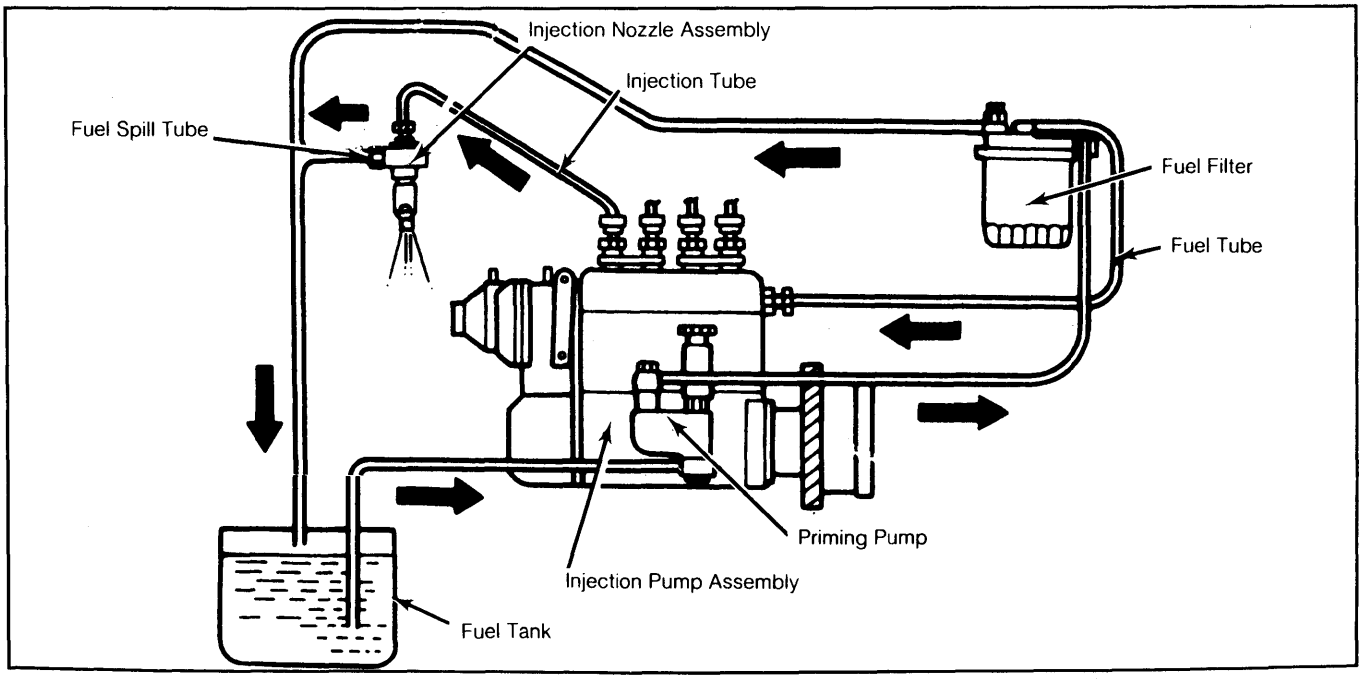


Fig. 1: Datsun/Nissan Diesel Fuel Injection Components



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has a fuel supply and return line. Nozzles can be disassembled, cleaned and adjusted to correct defective spray patterns.

Shims are used to correct nozzle opening pressures. Changing shim size by .002" (.05 mm) will change opening pressure by about 85 psi (6 kg/cm²).

FUEL FILTER

The fuel filter is a sealed cartridge type located on the right side wheel well, just behind the windshield washer fluid reservoir. The cartridge should be replaced every 15,000 miles. Bleed fuel system whenever filter is changed.

GLOW PLUGS

The glow plug system uses a glow plug timer and relay to control glow plug current. The glow plugs allow the engine to start easily and run smoothly during engine warm-up.

Current is applied to glow plugs for a specific time, determined by the coolant temperature. When the key is turned on, an in-dash glow plug warning light will operate for up to 50 seconds. The glow plugs operate for 1-30 seconds.

TROUBLE SHOOTING

DIFFICULT OR WILL NOT START

Check battery and electrical system. Check injection pump controller system, electrical connections and position of connecting rod. Check injection pump alignment and timing and adjust as needed.

Check for fuel at injection nozzles. Inspect fuel lines. Check for clogged fuel lines or filter. Check battery and glow plug relay connections. Check glow plug timer and glow plugs for continuity.

ROUGH IDLE

Check injection pump timing and idle speed. Check fuel lines for clogs or twists, clogged fuel filter or fuel leaks. Bleed fuel system. Check valve clearance and injection nozzles.

LACK OF POWER

Check venturi valve for proper operation. Check throttle linkage. Check and adjust injection pump timing as needed. Check fuel lines and clogged fuel or air filters. Bleed fuel system. Check valve clearances and injection nozzles.

EXCESSIVE SMOKE

Check injection pump alignment. Bleed fuel system. Check air filter. Check engine compression, injection nozzles and injection timing. Check control unit of injection pump controller system.

ENGINE WILL NOT STOP

Check injection pump controller gearing assembly operation. Electrical connections, connecting rod location and condition. Check control unit. Check throttle cable and linkage.

NOTE: If these checks and adjustments do not solve the problem, the fuel injection pump may be inoperative and should be replaced.

TESTING

INJECTION NOZZLES

Opening Pressure

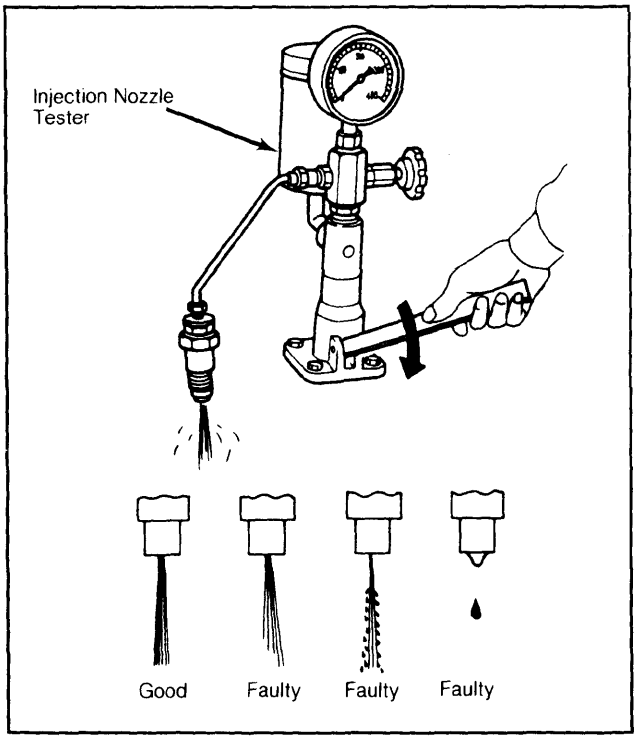
1) Blow out any dirt around injection nozzles, then remove fuel lines, nozzles and nozzle washers. Mark nozzles for correct installation.

2) Install nozzle on pressure tester. Bleed air out, then pump at a rate of 1 stroke per second. Note pressure when nozzle opens.

3) If pressure is not within a range of 1420-1495 psi (100-105 kg/cm²), disassemble and clean nozzle. Change shims as necessary to obtain proper opening pressure.

4) Test nozzle again to ensure opening pressure is correct, then check nozzle spray pattern.

Fig. 4: Injection Nozzle Spray Patterns



Spray Pattern

To test pattern, pump tester handle one time per second. Check spray pattern. If pattern is not correct, clean or replace nozzle.

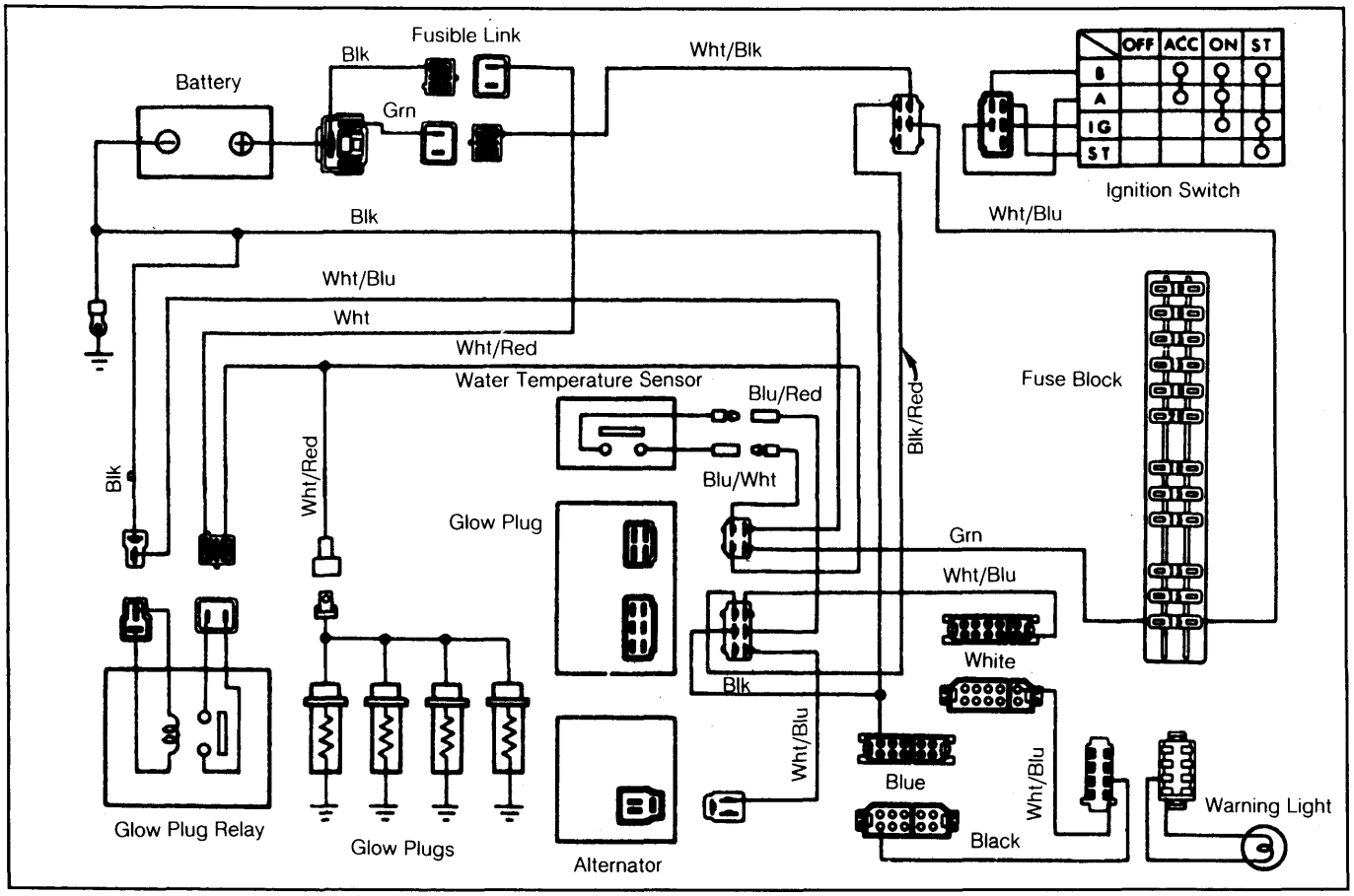
Nozzle Cleaning

1) Disassemble injection assembly. Thoroughly clean all parts in clean solvent. If nozzle needle is damaged, fused, seized or discolored, replace entire nozzle assembly. Check all other parts for excessive wear or damage. Replace as needed.

2) Clean nozzle assembly with a wooden stick and soft brass brush, (Datsun/Nissan Nozzle Cleaning Kit KV11289004). Be sure to remove all deposits from adjusting shims, spring, push rod, spacer, nozzle body, needle and seat and injection hole.

3) Pull needle about halfway out of body and release. Needle should slide smoothly back into place. Repeat this procedure several times, rotating needle slightly each time. If needle does not slide smoothly, replace nozzle body and needle.

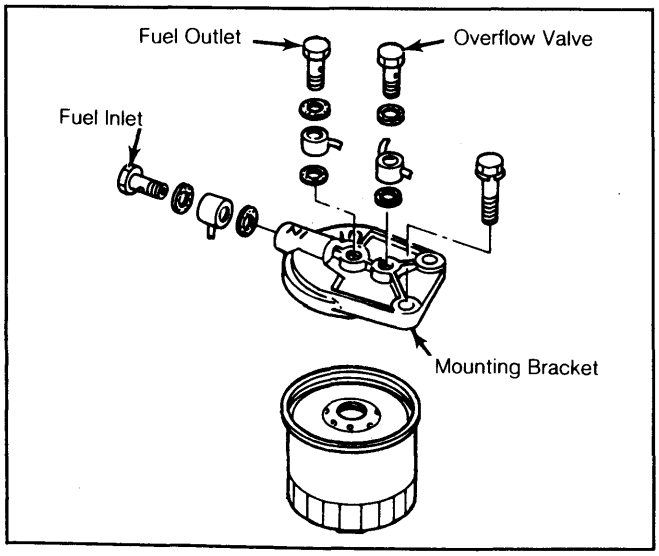
Fig. 5: Glow Plug System Wiring Diagram



FUEL FILTER

The over-flow valve of the filter housing may be tested for proper opening pressure. Attach a pressure gauge to the discharge port, and pump priming pump until valve opens. If opening pressure is not between 16-21 psi (1.1-1.5 kg/cm²), replace over-flow valve.

Fig. 6: Exploded View of Fuel Filter Assembly



GLOW PLUG SYSTEM

Indicator Lamp

1) Indicator lamp should light when the ignition switch is turned "ON" and remain lighted for up to 50 seconds, depending on coolant temperature. If the bulb does not light, check bulb. Replace as needed.

2) If bulb is okay, check glow plug timer. Connect test bulb between the Black wire and White/Blue wire located diagonally opposite the empty terminal. If the bulb lights, timer is okay. If not, replace timer.

System Check

1) If engine will not start, there may be a problem with the glow plug system. Check that the starter, battery, fuel supply and related systems are operating properly. Repair or replace as needed.

2) Check voltage at glow plug. If over 9 volts, check glow plug function. Remove plug and apply battery voltage. If plug does not glow after 15 seconds, it is bad and should be replaced.

3) If voltage at glow plug is less than 9 volts, check for continuity at glow plug relay. If continuity is not present, check at second connector on relay. If continuity is not present, relay is faulty. *See Fig. 8.*

4) If continuity exists at either connection, check the glow plug timer. Use the bulb between Black wire and the White/Blue wire which runs to glow plug relay coil. If bulb does not light, replace glow plug timer. If bulb lights, check wiring harness wires and connections.

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Fig. 7: Injection Pump Controller System Wiring Diagram

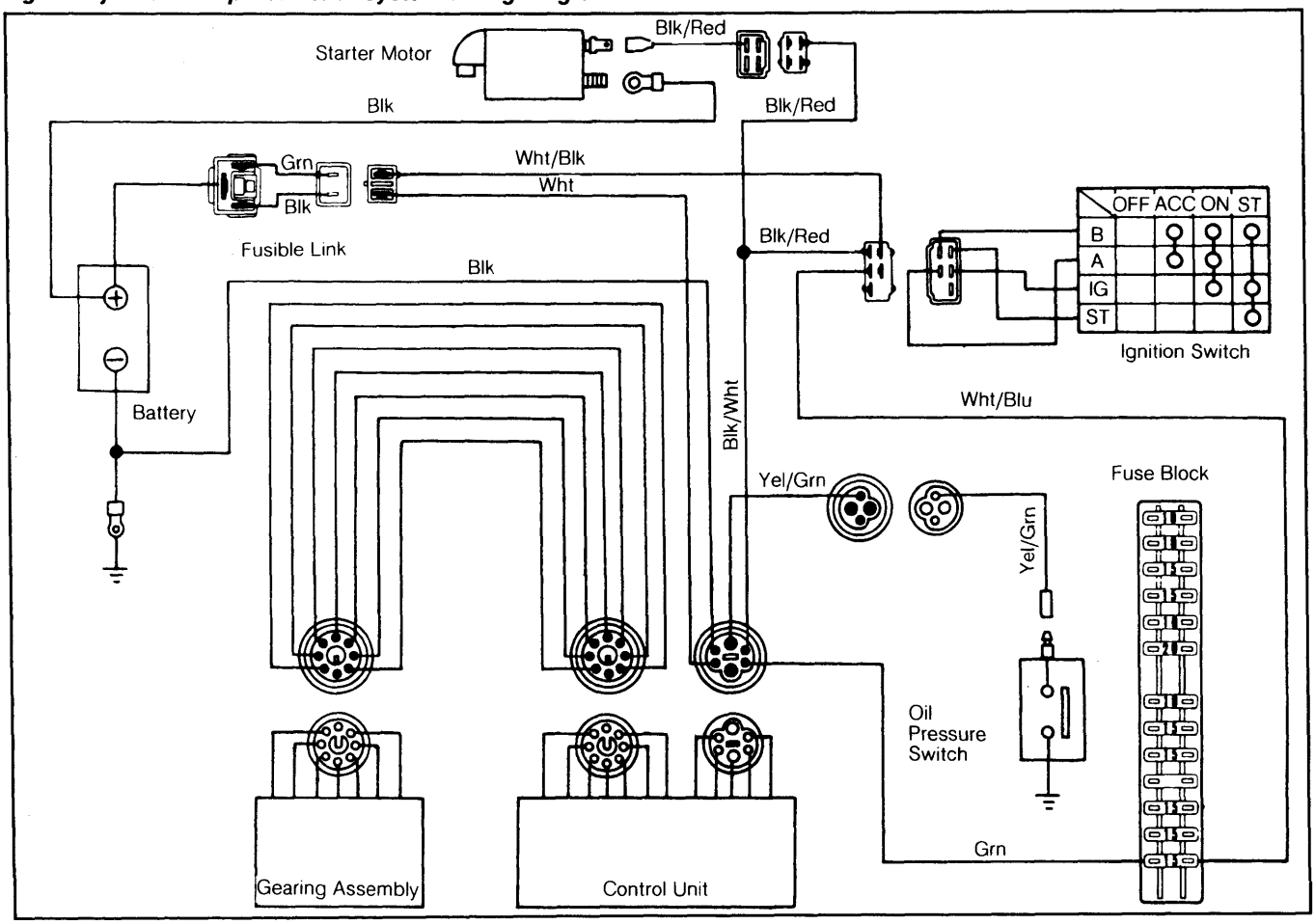


Fig. 8: Checking Continuity at Glow Plug Relay

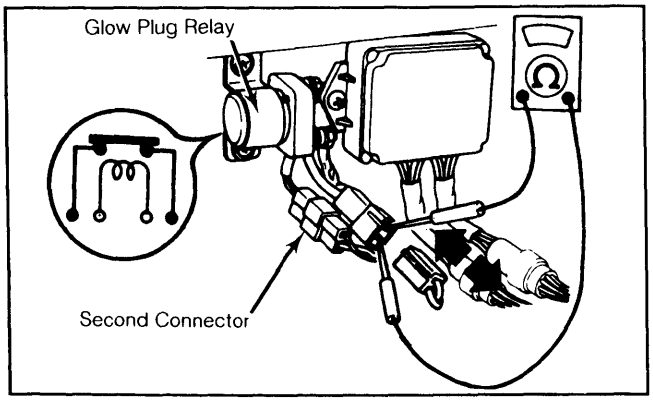
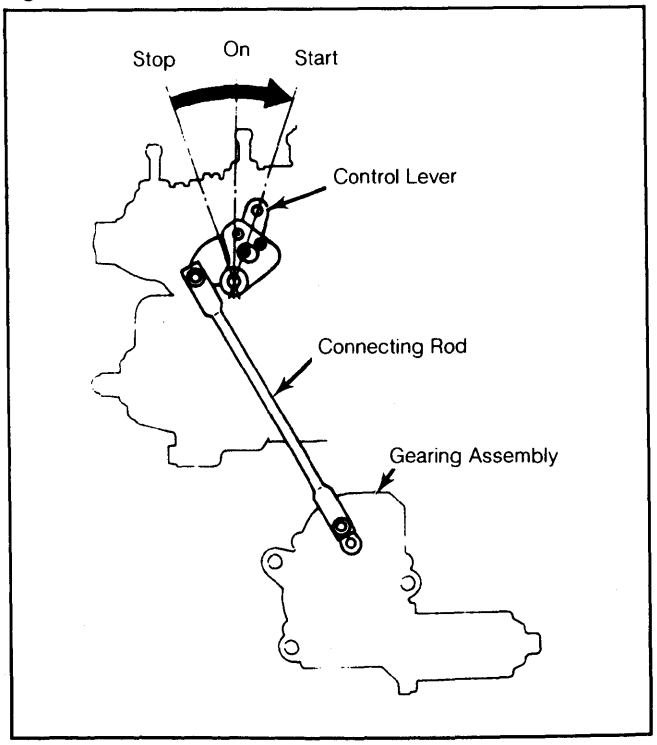


Fig. 9: Control Lever Positions



INJECTION PUMP CONTROLLER SYSTEM

NOTE: **It is important to follow these procedures in the order given if accurate test results are to be obtained. Failure to do so can result in damage to the system.**

System Check

1) Check control lever position during engine starting and operation. Lever should move smoothly to each position as ignition key position is changed. *See Fig. 9.*

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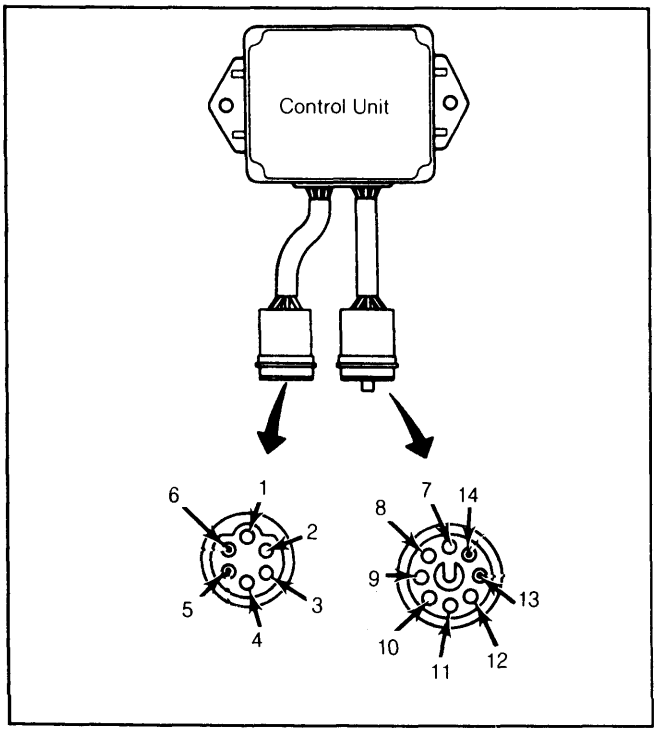
2) Start engine. Disconnect oil pressure switch connector and ground to engine. Control lever should move to stop position. If not, check control unit and gearing assembly.

Control Unit - 1) Connect jumper wires from positive post of battery to terminal 6 and from negative post of battery to terminal 5. Connect a test light between terminals 14 and 13. Place a jumper wire between terminals 12 and 10, or 12 and 8. Test lamp should light and go out in about 15 seconds. With jumper wire between terminals 12 and 11, or 12 and 9, lamp should not light. *See Fig. 10.*

Fig. 10: Control Unit Terminal Test Points



2) Add positive jumper wire connections to terminals 2 and 3, and negative connection to terminal 4. Connect test light between terminals 12 and 9, or 12 and 8. Light should come on and go out in about 15 seconds. With test light between 12 and 11, or 12 and 10, light should not come on.

3) Connect test light between terminals 12 and 9. Remove positive jumper wire from terminal 3, leaving other connections the same. The test light should go out in 10 seconds.

4) At this point, there should be positive jumper wires to terminals 2 and 6 only, and negative jumper wires to terminals 5 and 4. With test lamp between terminals 12 and 10, or 12 and 8, light should come on and go out in about 15 seconds. Lamp should not light when between 12 and 11, or 12 and 9.

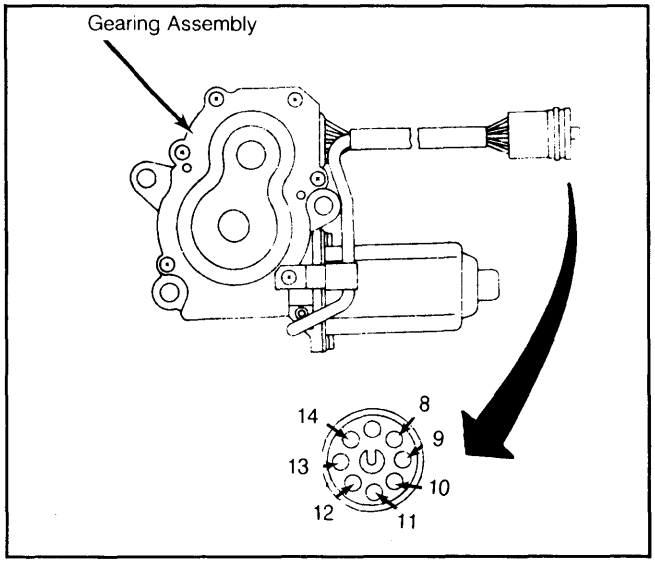
5) Disconnect negative wire to terminal 4, leaving only 1 negative wire at terminal 5. With test light between terminals 12 and 11, or 12 and 8, lamp should come on and go out in about 15 seconds. With test light between 12 and 10, or 12 and 9, lamp should not come on.

NOTE: In all control unit tests, if results are as indicated the unit is good. If not, unit should be replaced.

Gearing Assembly

1) With positive battery lead connected to assembly terminal 13, and negative lead to terminal 14, the gearing assembly motor should run. *See Fig. 11.*

Fig. 11: Gearing Assembly Terminal Test Points



2) Remove positive lead from terminal 13. With negative lead still at terminal 14, connect terminals 12 and 13 to each other with a short piece of insulated wire. Connect positive lead to terminal 8.

3) Connect a second positive lead to terminal 9 and check control lever. It should be in the start position. Move second lead to terminal 10. Lever should be in the on position.

4) Move lead to terminal 11 and lever should move to stop position. If not, assembly should be replaced.

REMOVAL & INSTALLATION

INJECTION PUMP

Removal

1) Drain coolant and disconnect battery ground cable. Remove radiator, fan and fan clutch. Remove injection tubes. Disconnect governor hose, fuel hose, injection pump controller connecting rod and oil feed pipe bolt.

2) Remove timing gear cover. Remove timer assembly retaining nut. Using special tool (ST19530000), remove timer assembly. Remove injection pump retaining nuts and remove pump.

Installation

1) With No. 1 cylinder at TDC, hold injection pump loosely in place. Do not tighten retaining nuts. Mesh injection pump drive gear with idler gear, being sure to align the "Y" marks on the gears. *See Fig. 12.*

2) Align gear to key way of injection pump camshaft while turning crank pulley. Tighten injection pump and timer assembly retaining nuts. Adjust injection timing.

3) Bleed fuel system. Remove priming pump cap cover. Loosen air vent screws and turn priming pump counterclockwise to release.

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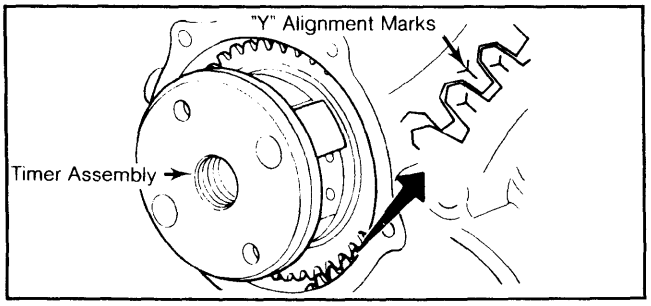
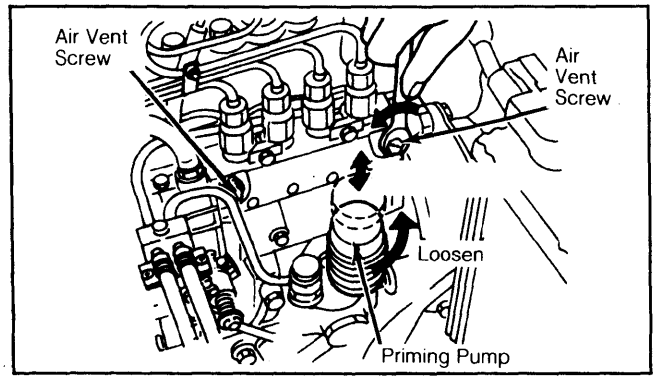
Fig. 12: Injection Pump Drive Gear Installation



4) Operate priming pump until all air is purged from air vents. Tighten air vent screws. Push down on pump and turn clockwise to lock. Install cap cover. *See Fig. 13.*

Fig. 13: Bleeding Fuel System



FUEL FILTER

Removal and Installation

Remove fuel filter bracket with filter attached. Remove filter from bracket and install new filter hand tight only, do not use wrench. Install bracket and bleed fuel system.

ADJUSTMENTS

INJECTION PUMP TIMING

1) Position No. 1 piston at 20° BTDC by lining up mark on crank pulley with mark on timing chain cover. *See Fig. 14.* Remove all injection tubes and governor hoses.

2) Remove No. 1 delivery valve lock plate and holder, valve stopper and valve spring. Reinstall valve holder and lock plate without the spring or stopper. *See Fig. 15.* Change fuel line connections so that the priming pump will supply fuel for test.

3) Connect a short piece of tubing to the No. 1 delivery valve holder. Move injection pump assembly to limit of adjustment toward engine side.

4) With a small container under open end of tubing, operate priming pump while moving injection pump away from engine. Continue to move the pump until fuel flow from the tube stops. Pump is now in proper position.

5) Check the timing marks on the front of the injection pump and the engine front plate. These marks should now be aligned. If not, stamp a new mark on the front plate for future adjustment reference.

Fig. 14: Alignment for Injection Pump Timing

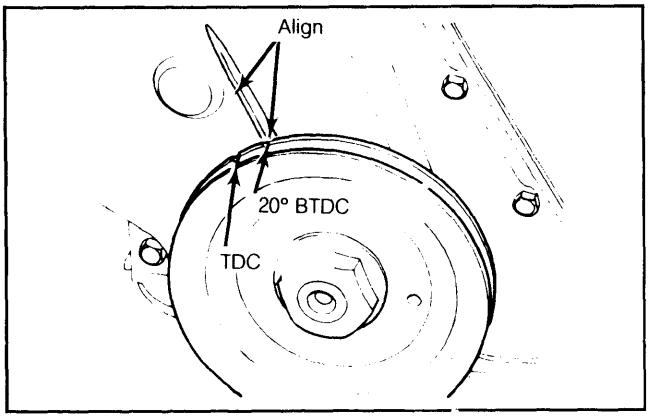
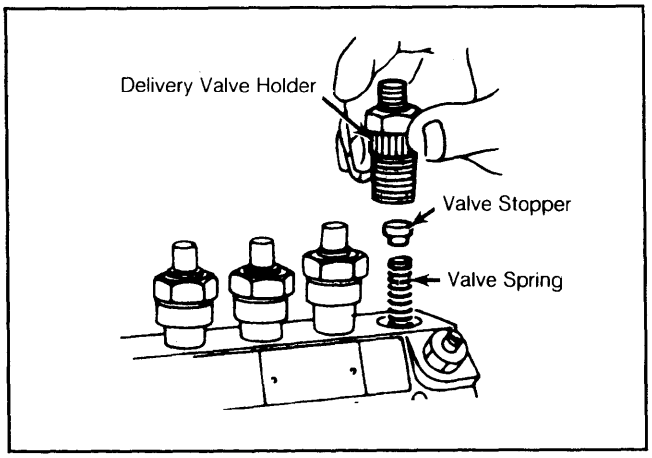


Fig. 15: Exploded View of Injection Pump Valve



6) Remove tubing from delivery valve. Remove valve and reinstall with spring and stopper in proper position. Install injection tubes, fuel line in proper position and governor hoses. Bleed system.

IDLE SPEED & DASH POT ADJUSTMENT

1) With transmission in Neutral and engine at normal operating temperature, attach tachometer and check engine speed. Idle speed should be 550-700 RPM.

2) If not, make sure that the throttle control knob (in cab, under dash) is pushed all the way in. Loosen the idle adjusting screw lock nut and turn the idle adjusting screw until the proper idle speed is attained. Tighten lock nut. Check to ensure idle speed is correct.

3) Whenever idle speed is adjusted, the dash pot must be adjusted. With engine warm and transmission in Neutral, maintain engine speed at 1280-1350 RPM.

4) Loosen dashpot locknut and adjust dashpot so that the control lever tip just touches the dashpot tip. Tighten lock nut and remove test equipment.

TIGHTENING SPECIFICATIONS

Application	Ft. Lbs. (N.m)
Injection Pump-to-Engine	14-18 (19-25)
Pump Delivery Valve Holder	22-25 (31-35)
Timer Assembly Retaining Nut	43-51 (60-71)
Injection Nozzle-to-Engine	43-51 (60-71)
Injection Nozzle-to-Tube	22-25 (31-35)