1982 Diesel Fuel Injection

DIESEL KIKI — MAZDA

B2200 Pickup

DESCRIPTION

The Mazda diesel pickup fuel injection system consists of a combination injection pump and fuel distributor, 4 fuel injection nozzles, a fuel filter with an integral priming pump, a water separator, fuel lines and the fuel tank. The injection system is also tied in with a quick start (glow plug) system.

The injection pump is a vane type pump and is driven by the engine timing gears. An altitude compensator and a cold start device are installed on the pump to modify injection duration as necessary. The distributor portion of the pump contains a fuel cut solenoid to stop fuel flow to the injectors after the ignition switch is turned off. *See Fig. 1.*

The injectors use a needle type valve at the end of the nozzle. Injector opening pressure can be changed by adding or subtracting adjusting shim thickness. The adjusting shim is located just above the needle valve return spring in the injector.

The quick start system consists of a glow plug in each cylinder, 2 relays, a ballast resistor, a glow plug control unit as well as various switches and warning lights.

OPERATION

FUEL INJECTION PUMP

The Diesel Kiki single plunger mechanical injection pump contains a low pressure vane-type fuel pump, a high pressure distributor-type injection pump, a centrifugal governor and an injection timing advance mechanism.

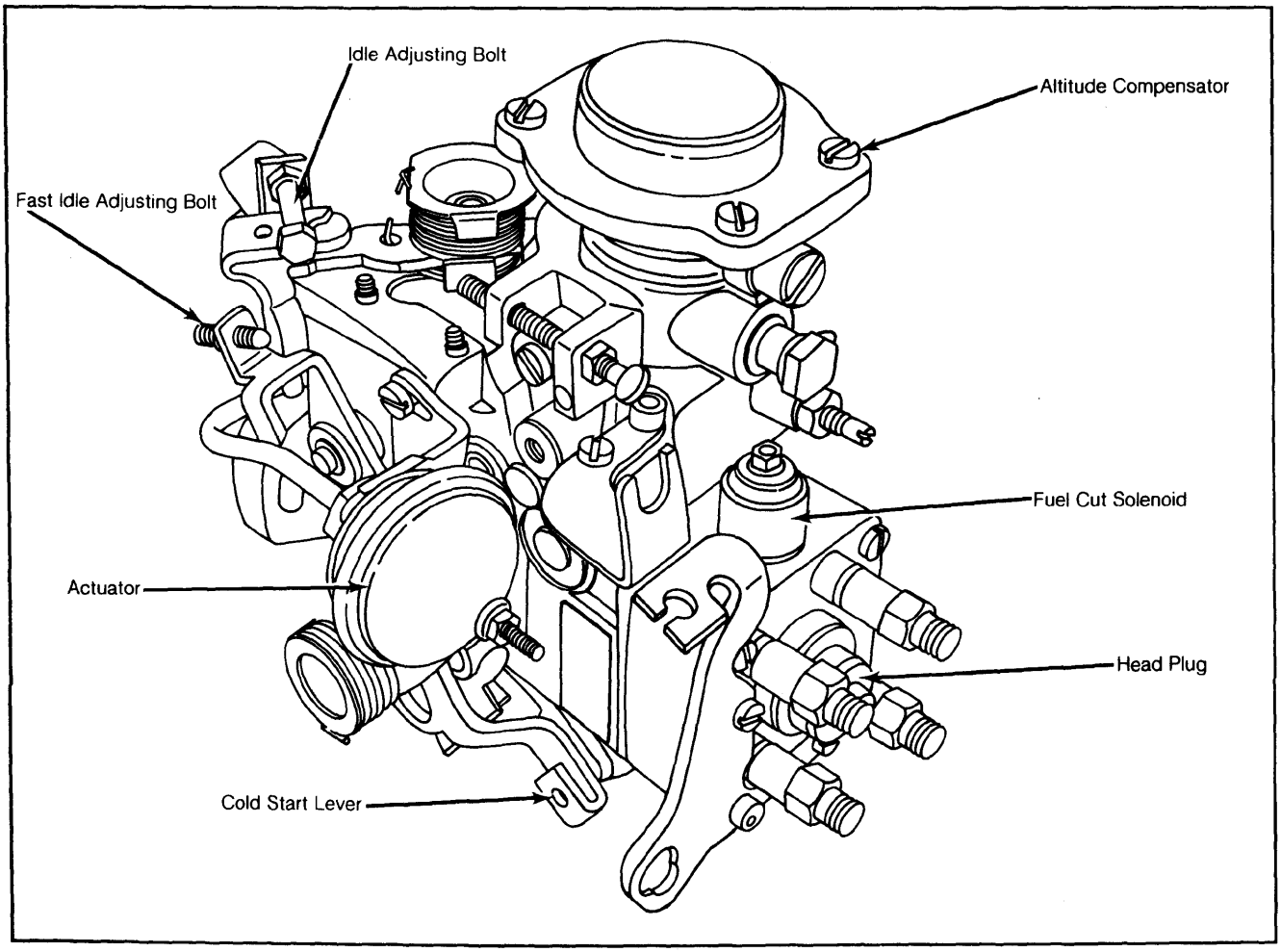
The vane pump output pressure (sometimes referred to as injection pump body pressure) averages between 50 to 100 psi depending upon engine speed and application. The plunger injection pump boosts the fuel pressure to about 2000 psi. The pump assembly is also equipped with an electric fuel shut-off valve.

INJECTORS

The injection nozzles spray fuel into a prechamber as each compression stroke occurs. Nozzles can be disassembled, cleaned and adjusted to correct improper spray patterns.

Injector opening pressure is adjusted with a shim on top of the needle valve return spring. *See Fig. 3.* The injector receives a high pressure pulse of fuel which forces open the needle valve allowing the fuel to pass into the prechamber.

Fig. 1: Diesel Kiki Diesel Fuel Injection Pump



Shop dissassembly of injection pump is not recommended.

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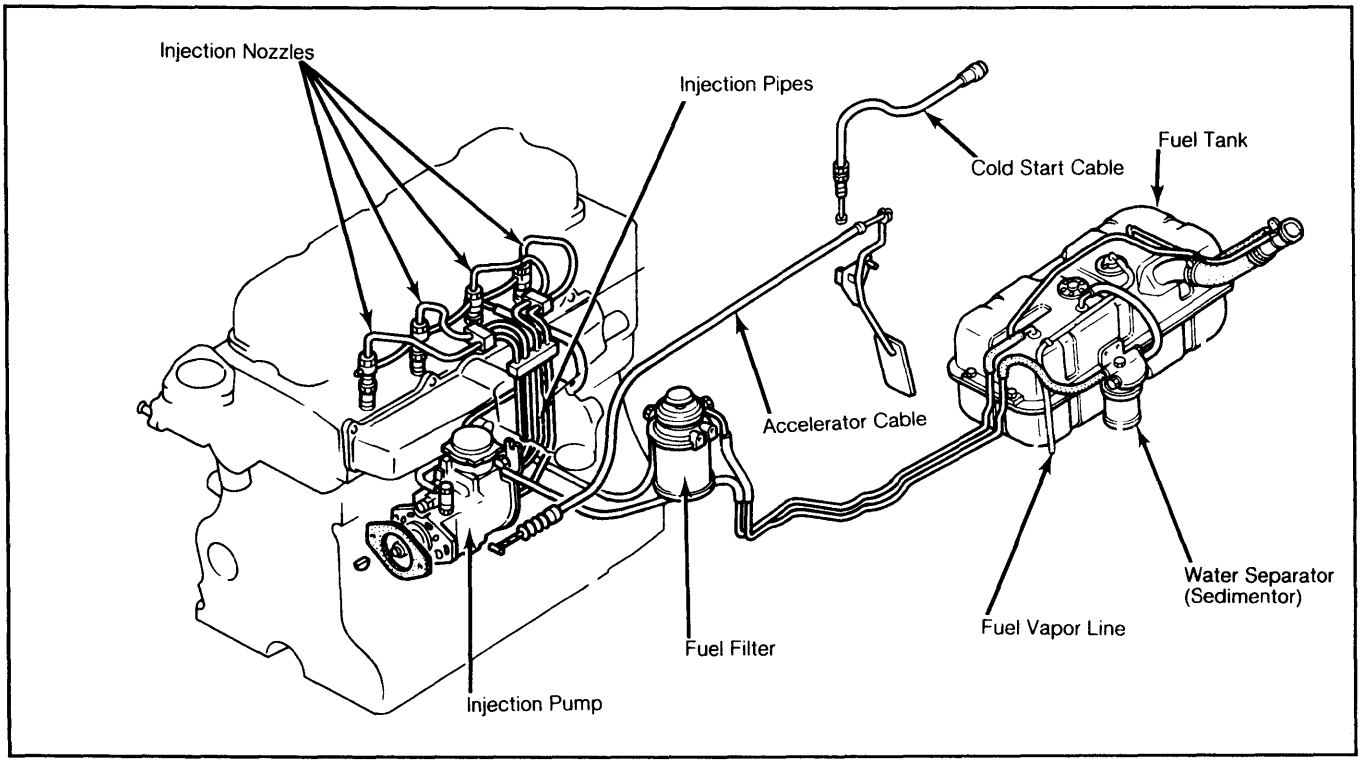
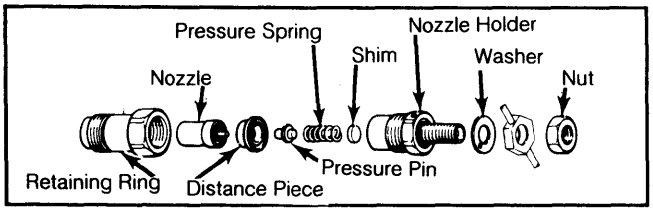
Fig. 2: Mazda B2200 Fuel System



Bleed air from system whenever fuel lines are opened.

Fig. 3: Mazda B2200 Injector



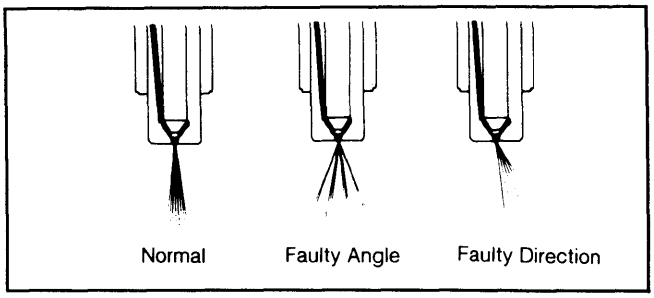
Injector must be free of dirt prior to reassembly.

GLOW PLUGS

The glow plug system uses 4 glow plugs (heaters) to assist in cold starting. When engine coolant is below 122°F (50°C), the No. 2 glow plug relay supplies full battery voltage to quickly heat the glow plugs.

When the glow plug reaches maximum temperature, relay No. 2 is turned off and relay No. 1 provides a reduced voltage to maintain glow plug temperature. When the engine starts, the glow plug system is turned off. *See Fig. 5.*

Fig. 4: Injector Spray Pattern



Injector must not drip when needle valve is closed.

TESTING

NOTE: Any time the fuel system is opened for testing or repair, air must be bled from the system prior to restarting the engine.

INJECTORS

1) Remove injection nozzles from engine and install each nozzle in turn on an injector tester. Test the injectors using diesel fuel at room temperature. Bleed the air out of the tester by pumping the handle several times.

2) Slowly lower tester handle and note the pressure shown on gauge when injector nozzle opens. Injection starting pressure should be 1920-1990 psi (135-140 kg/cm^2). If injection starting pressure is not to specifications, adjust pressure by changing the return spring shim.

3) Shims are available in sizes from 0.0197" (0.5 mm) to 0.06" (1.54 mm) in increments of 0.016" (0.04 mm). Changing shim thickness 1 size should result in a 68 psi (4.8 kg/cm^2) change in injection starting pressure.

4) Using the injector tester, apply 1636-1706 psi (115-120 kg/cm^2) to injector. No fuel leakage should occur at this pressure range. If leakage does occur, injector must be disassembled and repaired or replaced.

5) Build up pressure in the injector tester to just below injection starting pressure. Quickly lower handle on tester and observe fuel spray pattern. Fuel should be uniformly atomized and should form a narrow cone projecting straight out of the end of the nozzle. *See Fig. 4.*

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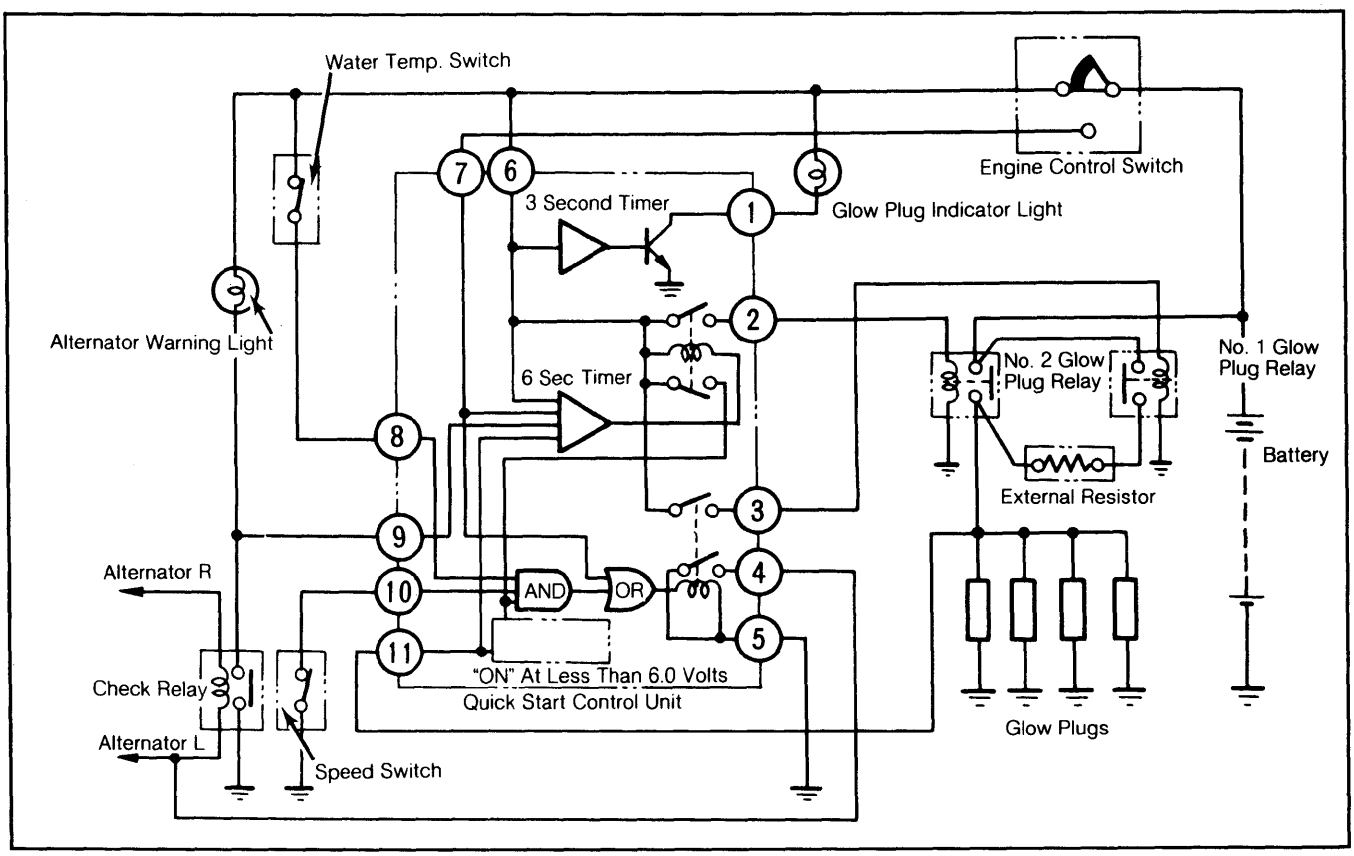
Fig. 5: Quick Start System Schematic Diagram



GLOW PLUG SYSTEM

Connect a voltmeter between glow plug positive terminal and ground. Set the parking brake and shift the transmission out of gear. Turn the ignition switch to the "ON" position and check the following:

- The voltmeter should indicate battery voltage as soon as the ignition switch is turned on and the glow plug indicator lamp should be lit.
- The glow plug indicator lamp should turn off 3 seconds after the ignition switch is turned on.
- The voltmeter should read 4.3-5.2 volts about 6 seconds after the ignition switch is turned on.

FUEL CUT VALVE

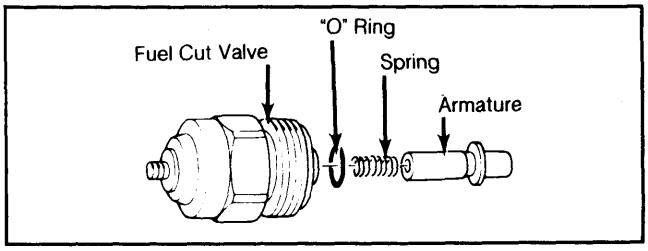
1) If the engine does not stop when the ignition switch is turned off or if an insufficient amount of fuel is being delivered to the injectors, the fuel cut valve may require replacement.

2) To check the operation of the fuel cut valve, disconnect the wiring harness connector leading to the valve and connect a voltmeter.

3) Voltage should be present at the connector when the ignition switch is on and should drop to zero immediately after turning the ignition switch off.

4) If the voltage at the connector is as specified, the fuel cut valve is at fault and must be replaced. *See Fig. 6.*

Fig. 6: Fuel Cut Valve

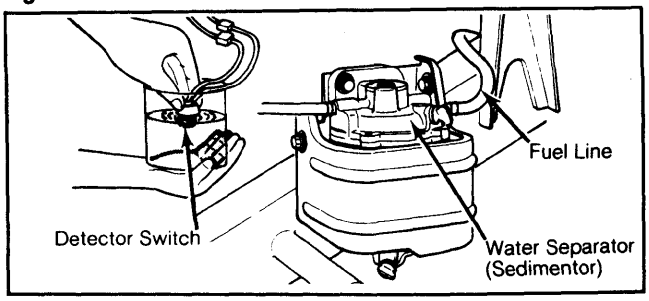


Armature should extend when current is turned off.

WATER SEPARATOR (SEDIMENTOR)

Remove the water detector switch from the top of the water separator. Disconnect detector switch wires

Fig. 7: Water Detector Switch Test



Continuity should only exist when switch is upright.

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from harness. Connect an ohmmeter to water detector switch. The detector is operating properly when continuity exists with switch upright and no continuity exists with switch upside down. *See Fig. 7.*

REMOVAL & INSTALLATION

FUEL INJECTION PUMP

Removal

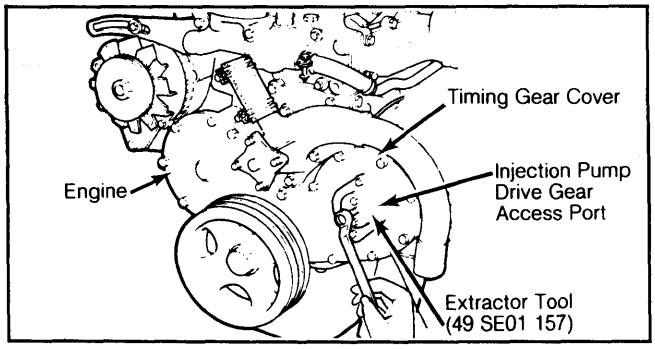
1) Scribe an alignment mark on injection pump mounting flange and timing gear housing for reassembly reference. Disconnect battery negative cable, accelerator cable, cold start device cable and the fuel cut valve connector.

2) Remove the fuel injection pipes and fuel hoses from the fuel pump. Remove the injection pump drive gear cover. Remove the injection pump drive gear lock nut and spring washer, taking care not to drop the spring washer into the timing gear case. If necessary use a steel wire to remove spring washer.

3) Remove the lock plate from the drive gear. Rotate the engine until the injection pump shaft key groove is facing up. Remove the injection pump attaching nuts and bolt.

4) Using the injection pump extractor tool (49 SE01 157) or similar tool, remove the injection pump. Take care when withdrawing the pump from the timing gear case so as not to drop the pump shaft key into the timing gear case. *See Fig. 8.*

Fig. 8: Injection Pump Removal



Use care to avoid dropping lock nut, spring washer or shaft key into timing gear housing.

Installation

To install, reverse removal procedure and note the following:

- Before installing the pump shaft key onto the shaft, tap the key groove in the shaft with a hammer to insure a tight fit for the key.
- After installing the injection pump, evacuate any air present from the pump.
- Tighten the pump drive gear lock nut to 29-52 ft. lbs. (39-71 N.m).

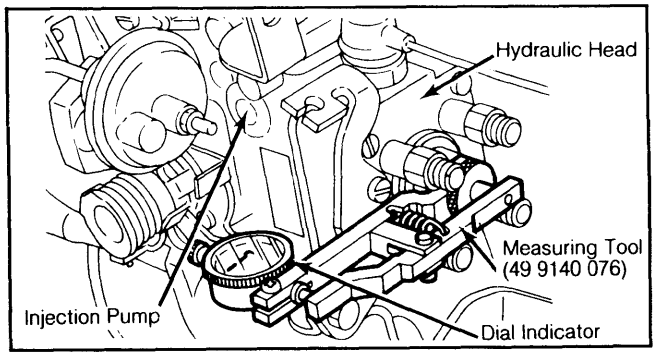
ADJUSTMENTS

INJECTION PUMP TIMING

1) Disconnect fuel injection pipes from fuel injection pump. Remove the hydraulic head plug from the pump. Align the timing mark (2° ATDC) on the crankshaft pulley with the indicator pin by turning the crankshaft.

2) Mount the injection timing measuring device (49 9140 076) into the hydraulic head plug hole. With the tip of the measuring tool firmly against the pump plunger, set the dial indicator to read about 0.08" (2 mm). *See Fig. 9.*

Fig. 9: Injection Pump Timing



Dial indicator should read about 0.04" (1 mm) when timing mark is aligned with pointer.

3) Turn the crankshaft pulley slowly counterclockwise (in reverse direction of engine rotation) about 30-50°. Make sure the dial indicator pointer stops.

4) Set the dial indicator pointer to zero. Turn the crankshaft slightly left and right to make sure that the indicator pointer does not move from zero.

5) Turn the crankshaft pulley clockwise (in direction of engine rotation) to align timing mark with indicator pin. If timing is adjusted correctly dial indicator will read 0.04" ±0.0008" (1 mm ±0.02 mm) when the timing mark is aligned with the indicator pin.

6) If timing is not to specifications, loosen injection pump attaching nuts and bolt. Turn injection pump housing until dial indicator reading is correct.

INTAKE SHUTTER VALVE SYSTEM

Connect a vacuum gauge to intake manifold vacuum. Start engine and run at idle. Disconnect coupler at 3-way solenoid valve. Vacuum gauge should read 17 in. Hg. If not, turn adjusting screw on intake shutter valve until vacuum reads 17 in. Hg at 700 RPM.

COLD START SYSTEM

Attach a tachometer to engine. Pull cold start knob out to the full extent of its travel. Turn the cold start lever adjusting screw (on injection pump) until engine speed is 1150-1250 RPM.

IDLE SPEED

1) Start and run engine to normal operating temperature. Connect a tachometer to engine and check idle speed. Idle speed should be 700 RPM. If idle speed is not to specifications, first check to ensure that accelerator cable has 0.02-0.06" (0.5-1.5 mm) of play.

2) Loosen the lock nut on the idle stop screw and adjust idle stop screw until idle meets specifications. After completing adjustment, race the engine 2 or 3 times to ensure that the accelerator cable is returning properly.