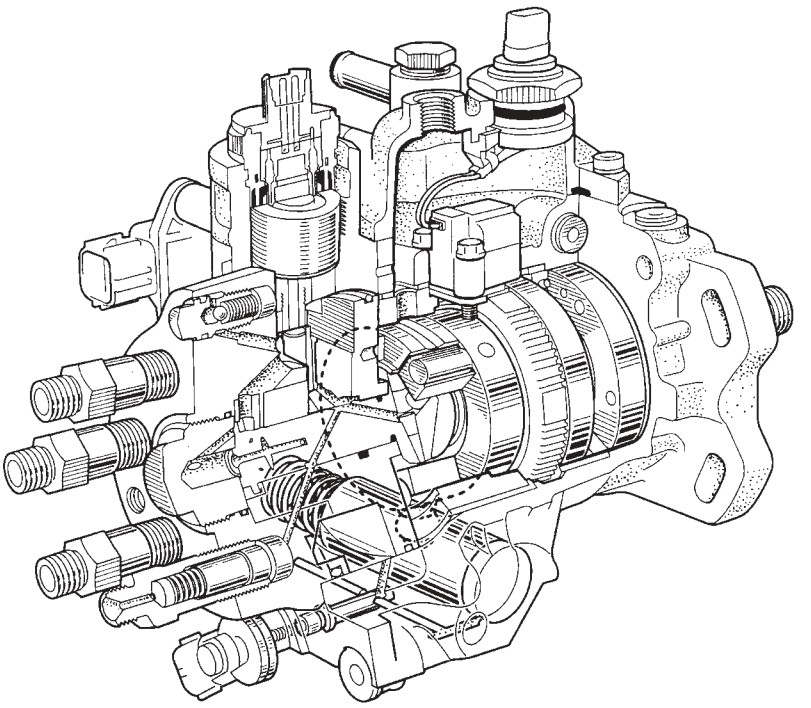
■FUEL SYSTEM

1. Injection Pump

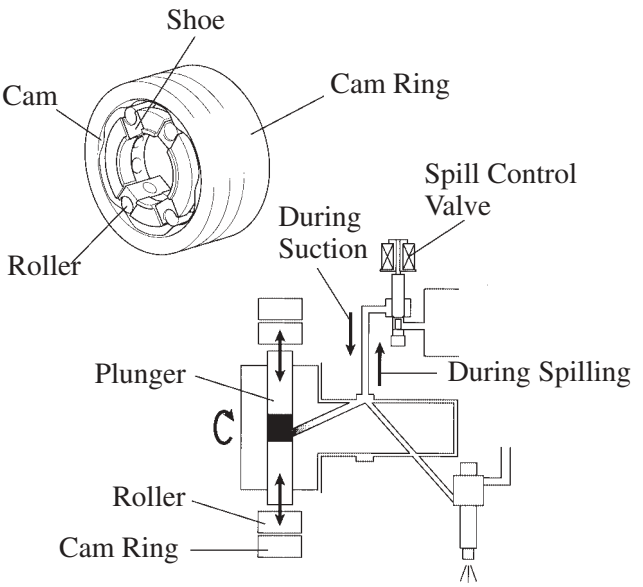
General

An electronically controlled distributor type injection pump has been adopted. A radial plunger type that produces a higher injection pressure than the previous axial plunger type has been adopted. As a result, it has become possible for the injected fuel to become finely atomized in order to realize both improved engine performance and reduced exhaust emissions.
In the axial plunger type pump, the rollers slip as they roll along the cam plate. Because this slippage does not occur in a radial plunger type pump, it can inject fuel at a higher pressure.

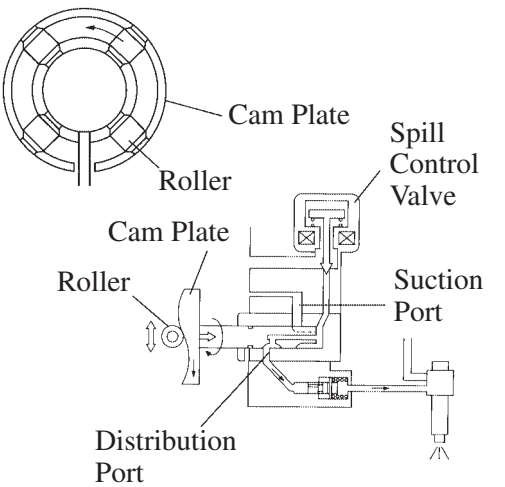


147EG80

Radial Plunger Type Injection Pump

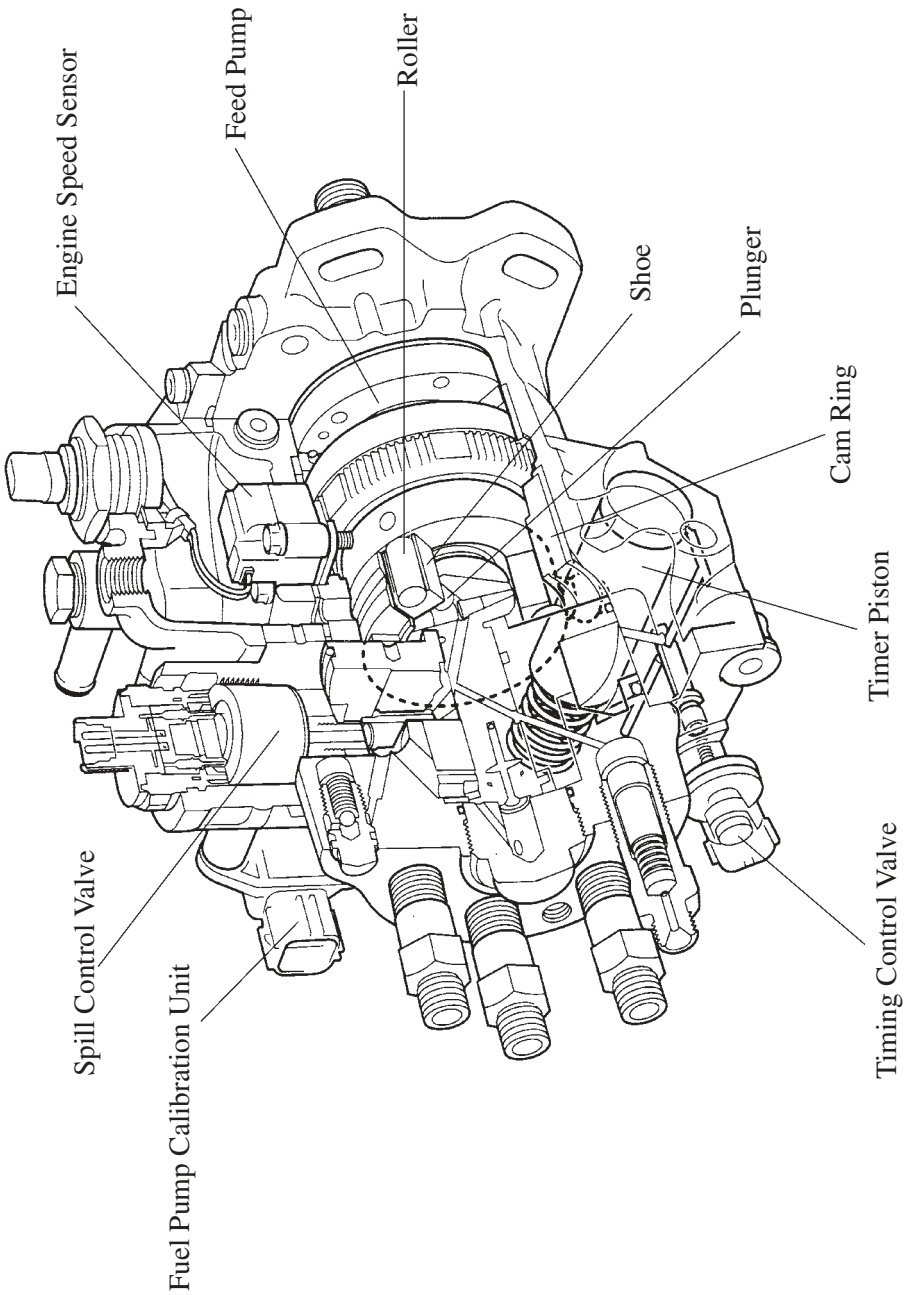


Radial Plunger Type 147EG92



Axial Plunger Type 147EG93

Construction and Operation



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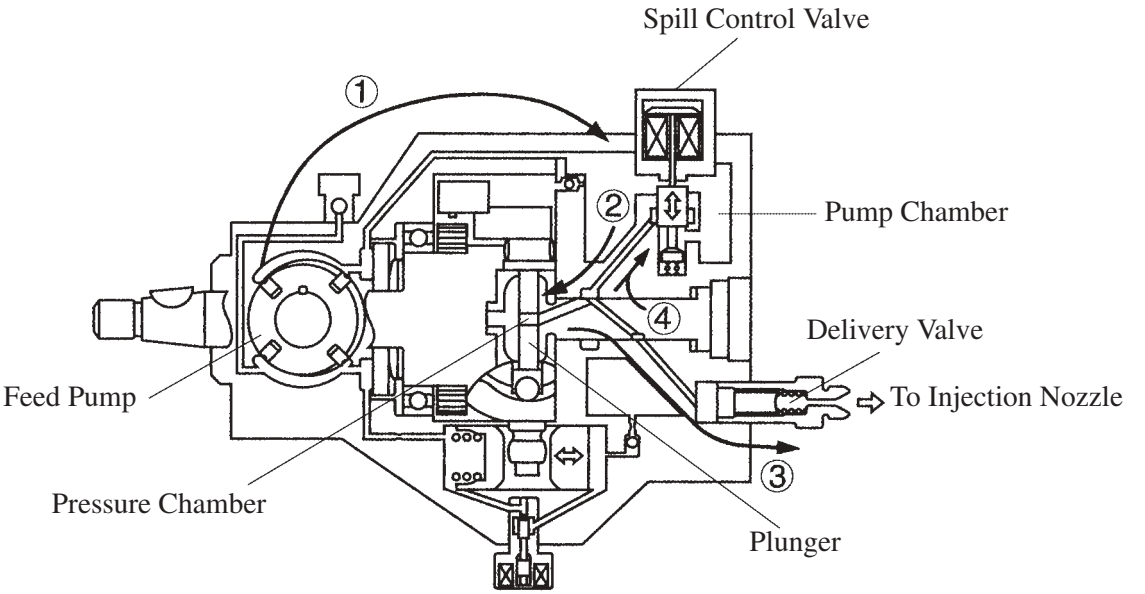
1) Operation Outline

①: The feed pump delivers the fuel from the fuel tank to the pump chamber and maintains its pressure between 1.5 – 2.0 MPa.

②: When the spill control valve opens, the fuel fills the pressure chamber.

③: After the spill control valve closes, the fuel that is charged in the pressure chamber is compressed by the plunger. Passing through the delivery valve and injection pipe, the pressurized fuel is pumped to the injection nozzle and injection starts.

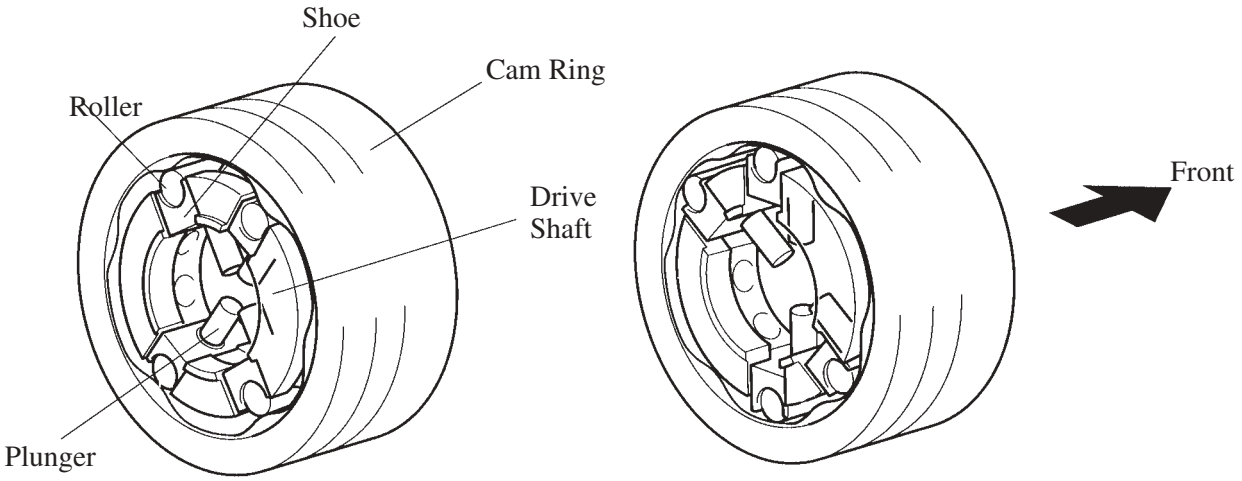
④: As the spill control valve opens and the pressure in the pressure chamber drops, the injection of fuel is completed.



147EG82

2) High-Pressure Generation Mechanism

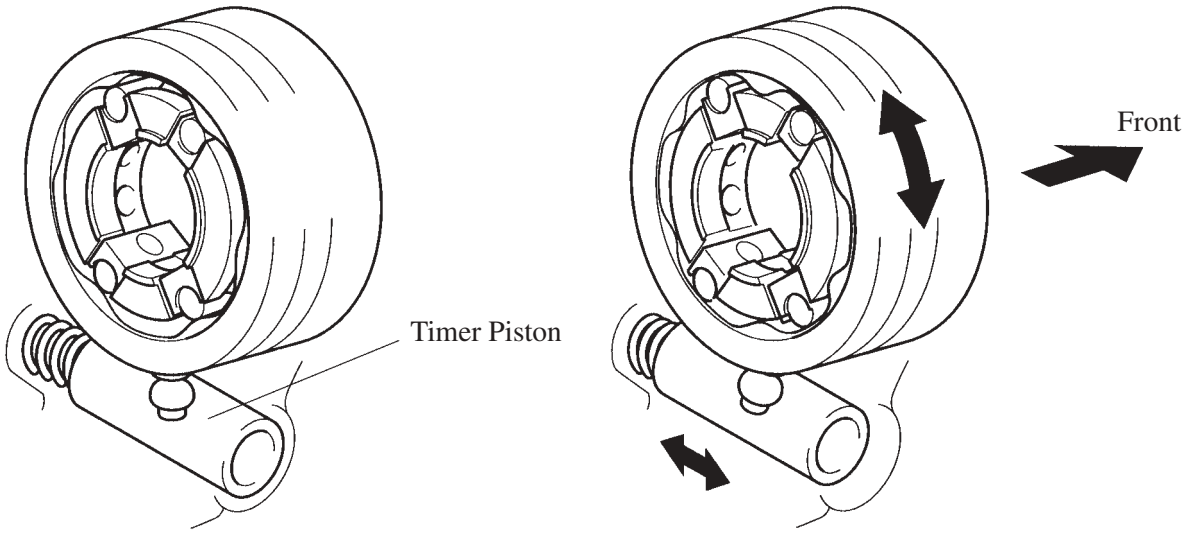
This mechanism consists of a cam ring, drive shaft, rollers, shoes and plungers. As the drive shaft rotates, the shoes, rollers and the plungers that are attached to the shaft rotate along the inside of the cam ring. At that time, the protrusions on the cam ring cause the 4 rollers and plungers to move simultaneously to the center, causing the fuel pressure to increase.



During Generation of High Pressure **During Suction** 147EG83

3) Timer Mechanism

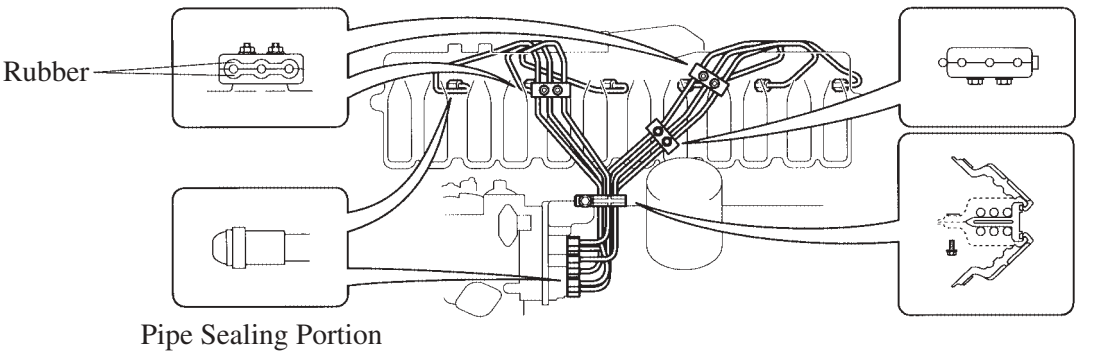
The movement of the timer piston, which is linked to the cam ring, causes the cam ring to oscillate. As a result, the relational positions of the drive shaft and the cam ring change, which causes the plunger to compress the fuel, thus changing the starting position (injection timing).



Most Retarded Timing **During Operation** 147EG84

2. Injection Pipes

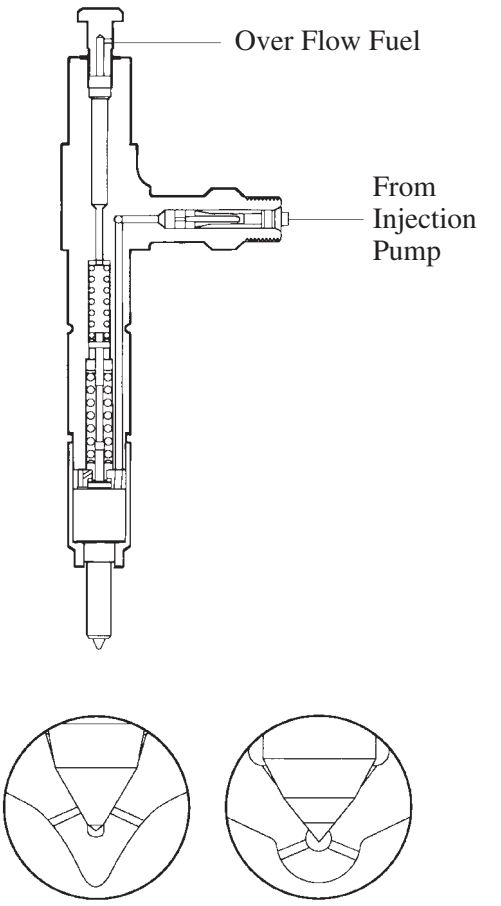
- Along with the adoption of the high-pressure injection, the seal portions at the both ends of the pipes have been spherically shaped to improve their sealing performance.
- The pipes are clamped together up in the air adjacent to the injection pump. Also, at the areas where the pipes are clamped to the intake manifold, rubber cushions are used to achieve a floating construction. As a result, improved reliability and quieter operation have been realized.



147EG85

3. Injection Nozzle

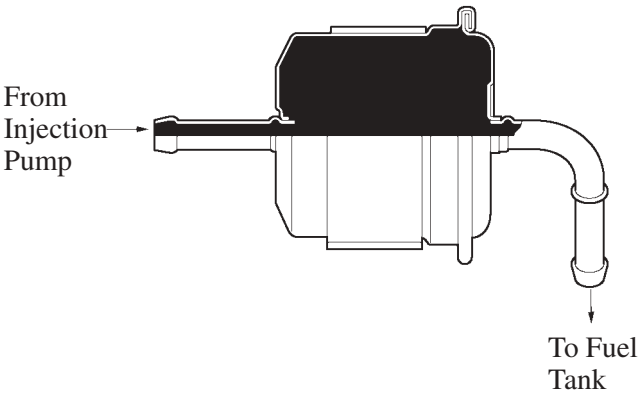
- As in the previous engine, 2-stage injection nozzles are used. For this model, the amount of pre-lift has been decreased to reduce the combustion sound.
- The VCO (Valve Covered Orifice) nozzles that provide excellent injection characteristics have been adopted to reduce white smoke and exhaust odor.
- The nozzle needle seats more gently to improve the nozzle's durability.



147EG86

4. Fuel Damper

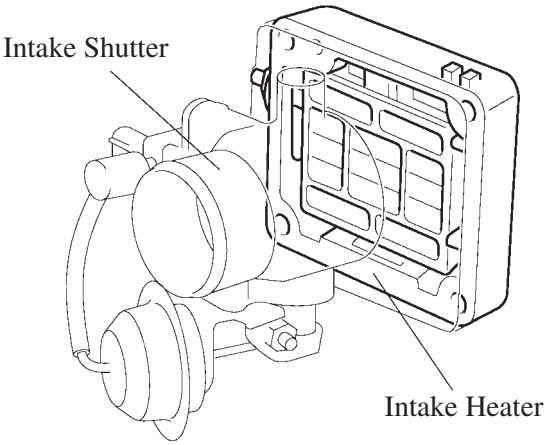
A fuel damper has been adopted to reduce the vibration of the fuel return pipe.



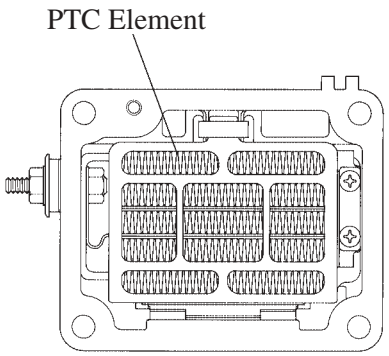
147EG128

■ INTAKE HEATER

- An intake heater has been adopted to heat the intake air at low temperature to improve the cold starting performance of the engine. The intake heater continues to operate for a prescribed length of time even after the engine has started in order to reduce the generation of diesel knocks and white smoke immediately following the starting of the engine.
- The intake heater uses a PTC (Positive Temperature Coefficient) element and is controlled by the engine ECU.



147EG87



Intake Heater

147EG88

■ STARTING SYSTEM

The previous 12/24 volt switchover system has been discontinued to simplify the system. The resistance in the wiring between the batteries and the starter is minimized by connecting the batteries in parallel in order to ensure the same level of starting performance as that of the previous model.