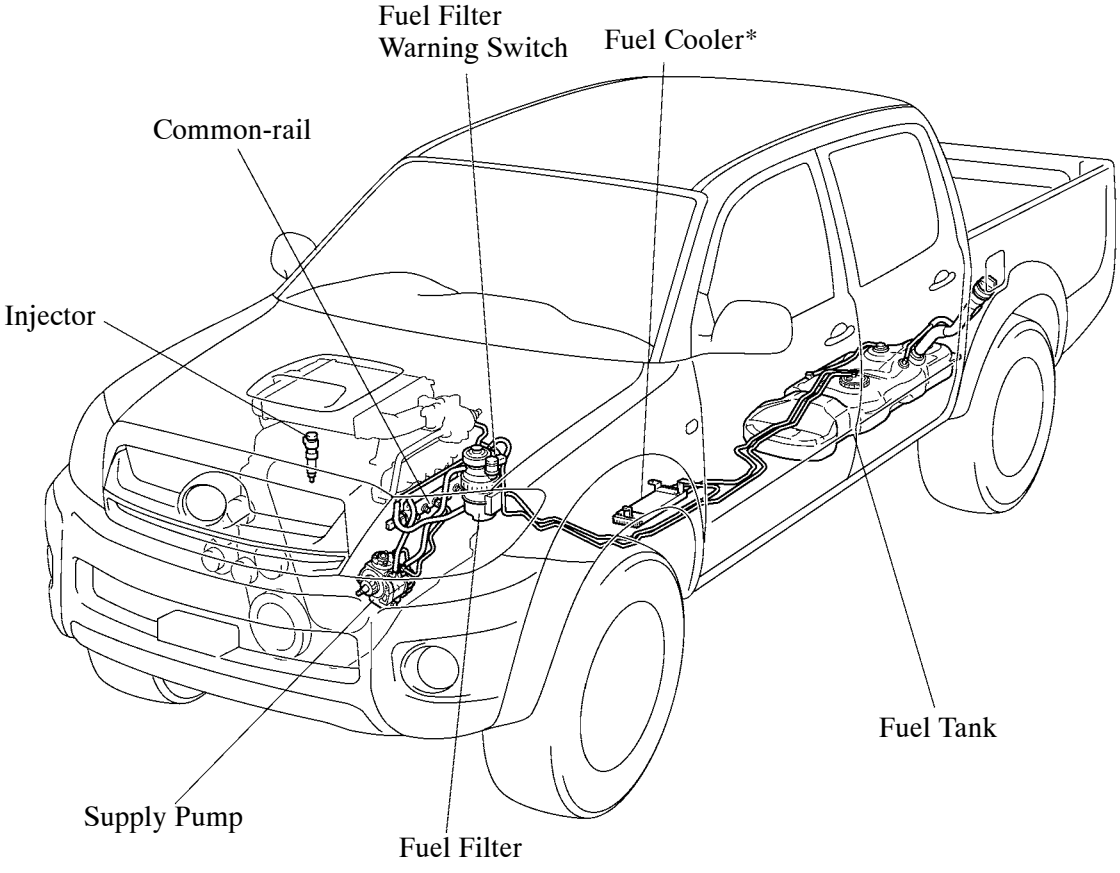
■FUEL SYSTEM

1. General

- A common-rail system is used in the fuel injection system.
- An HP3 type supply pump, which is compact and lightweight, is used.
- An injector compensation value and a QR code are printed on the injector to achieve high-precision control.
- A fuel filter, in which the fuel filter element alone can be replaced, is used.
- A fuel filter warning switch, which turns on or off when the internal vacuum of the filter increases, is provided in the fuel filter.
- On the models with 1KD-FTV engine and models with 2KD-FTV High Version engine with intercooler, a fuel cooler made of aluminum is used.
- A fuel tank made of single-layer plastic is used.
- On the models for Europe, a recirculation type fuel heater is used.



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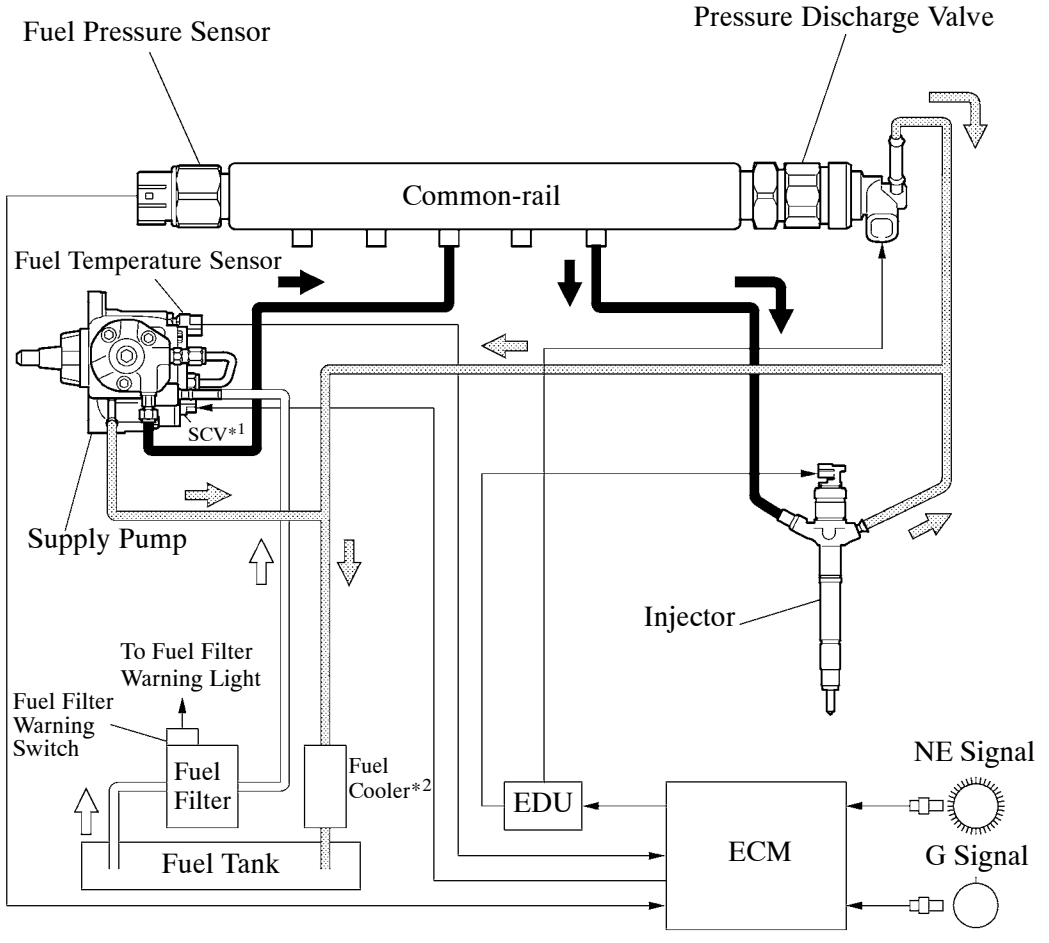
*: Models with 1KD-FTV engine and models with 2KD-FTV High Version engine with intercooler

2. Common-rail System

General

In this system, the high pressurized fuel supplied by the supply pump is stored in the common-rail, and the ECM sends signals to the injectors via the EDU (Electronic Driver Unit) in order to control the injection timing and injection volume. For details of this control, see page EG-226.

▶ System Diagram ◀



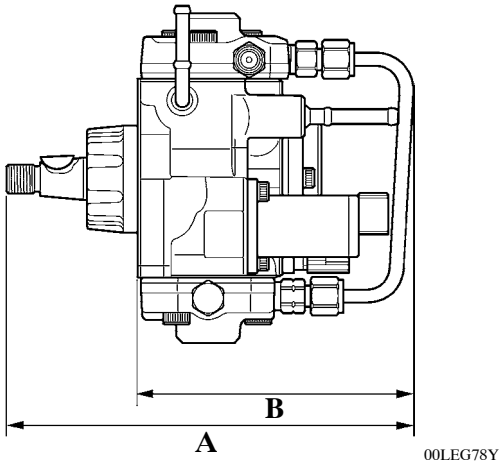
Models Compliant with EURO IV Emission Regulations, and 4WD and PreRunner Models for Thailand with 2KD-FTV High Version Engine

*1: Suction Control Valve
*2: Models with fuel cooler

Supply Pump

1) General

An HP3 type supply pump is used.



▶ Specifications ◀

Type		HP3 (Outer Cam)
A	Length	190.2 mm (7.49 in.)
B	Length	129.0 mm (5.08 in.)
Suction Control Valve		1
Plunger		ø8.5 mm × 2
Weight		3800 g (8.38 lb.)

Service Tip

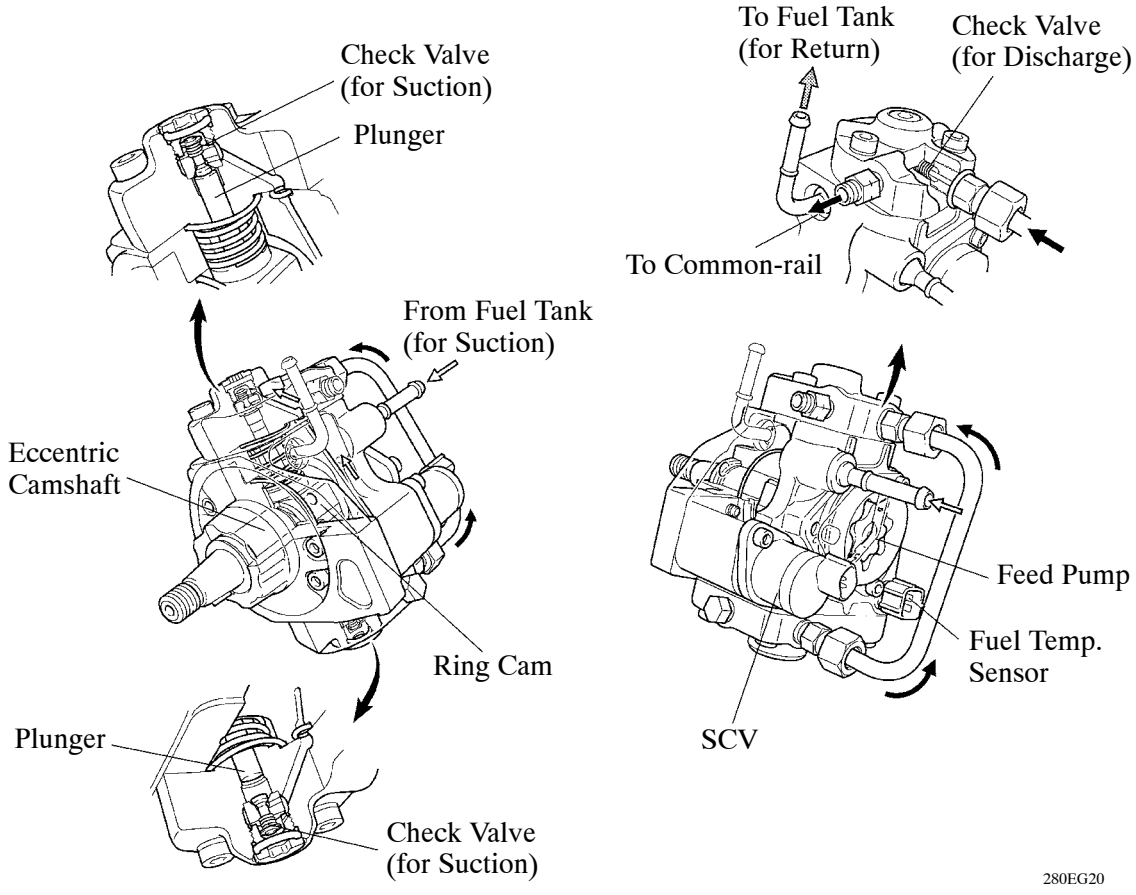
The ECM learns and memorizes the pump discharge volume variances associated with the individual differences in the supply pumps. Therefore, make sure to perform the operation described below after replacing the supply pump. For details, refer to the Hilux Repair Manual.

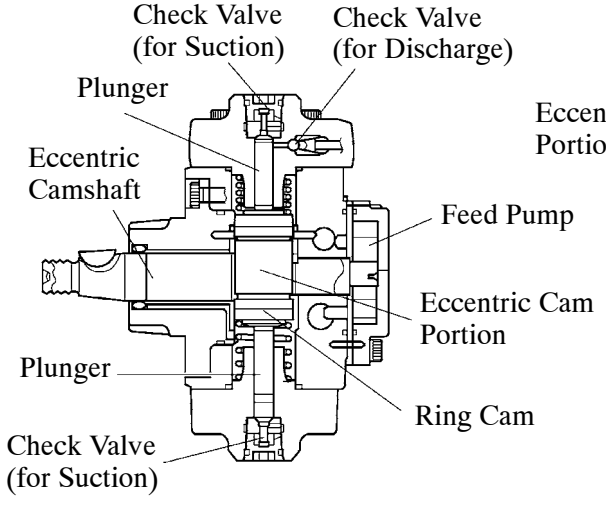
- Connect an intelligent tester II to the DLC3 connector and use the tester to reset the learned value. Alternatively, connect the SST (09843-18040) between the TC and CG terminals of the DLC3 connector, and leave the ignition switch ON for approximately 3 minutes to reset the learned value.
- After resetting, start the engine, allow it idle* for approximately 1 minute, and turn the ignition switch OFF to enable the engine to memorize the learned value.

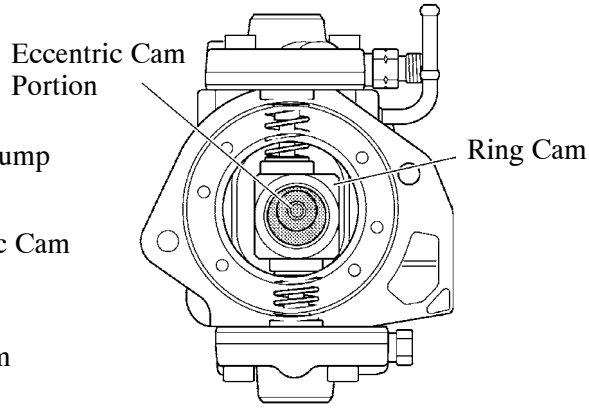
*: The engine coolant temperature should be 60°C (140°F) or more, and the fuel temperature should be 20°C (68°F) or more.

2) Construction

- The supply pump consists of an eccentric camshaft, ring cam, two plungers, four check valves, SCV (Suction Control Valve), fuel temperature sensor, and a feed pump.
- The two plungers are placed opposite each other outside of the ring cam.

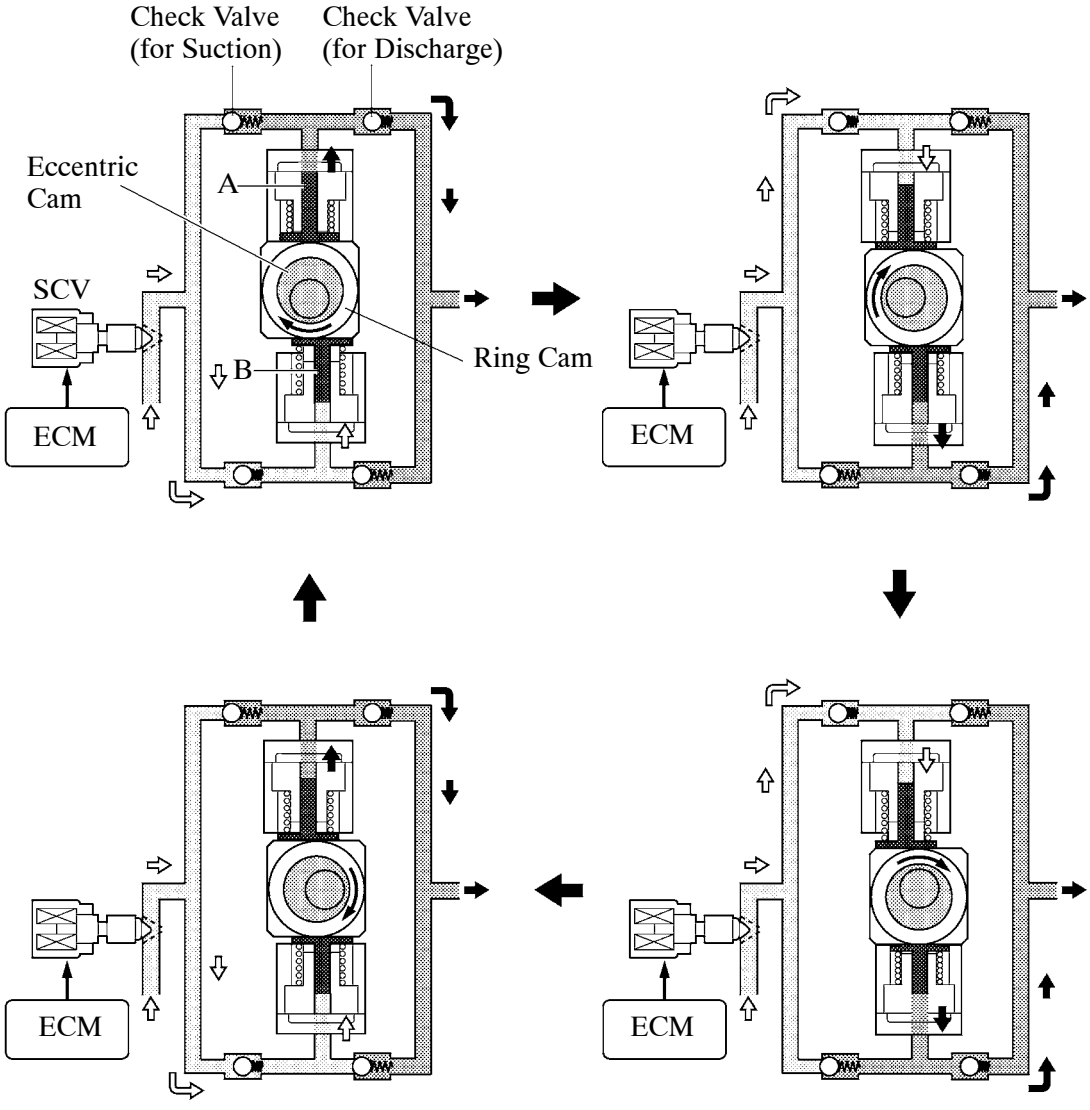






3) Operation

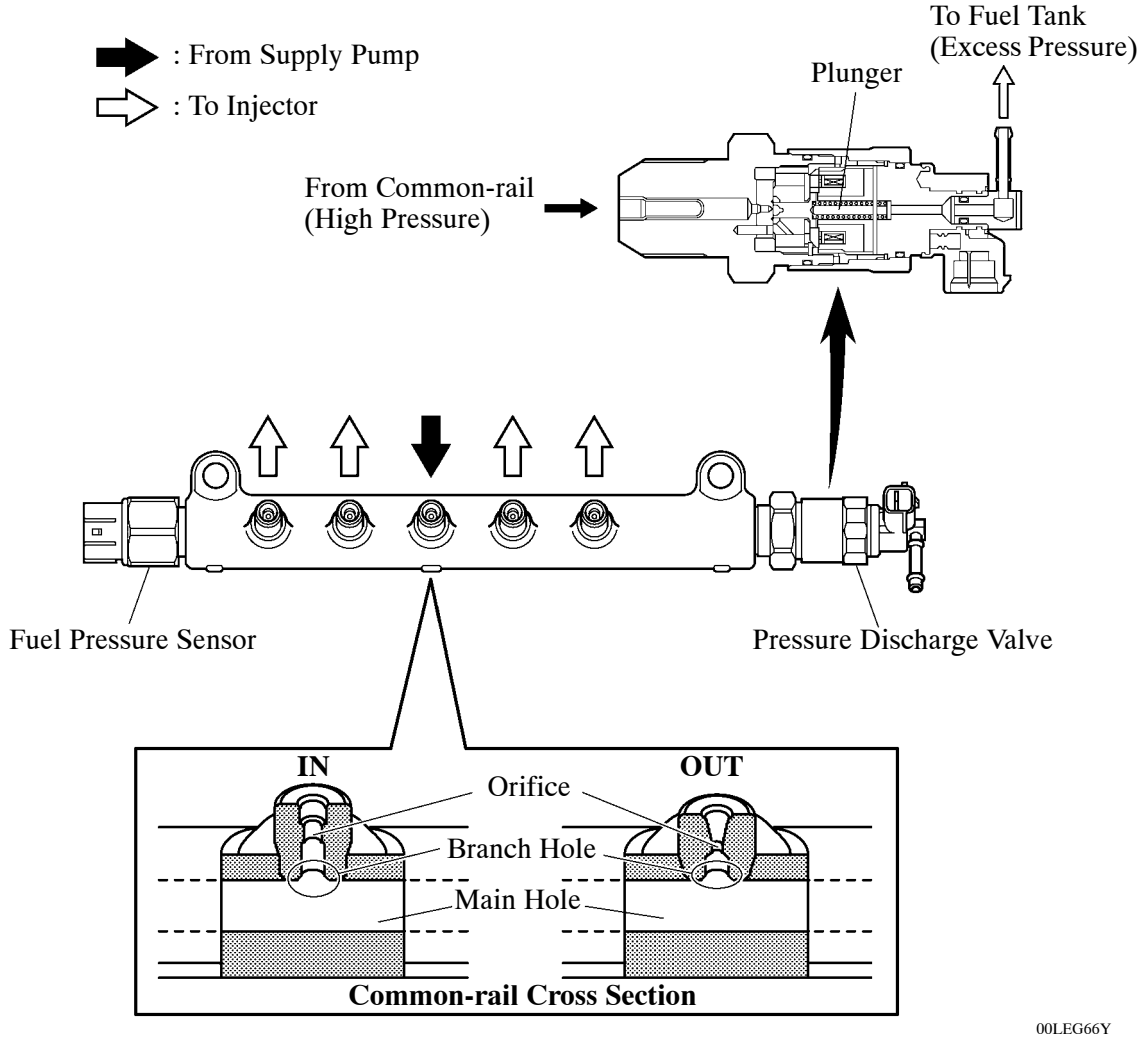
- Due to the rotation of the eccentric cam, the ring cam pushes plunger "A" upward as illustrated below. The force of the spring pulls plunger "B" (which is located opposite plunger "A") upward. As a result, plunger B draws fuel in, and plunger "A" pumps fuel at the same time.
- The SCV controls the volume of fuel that is drawn into the plungers in accordance with the signals from the ECM.



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Common-rail

- The function of the common-rail is to store the fuel that has been pressurized by the supply pump.
- The common-rail is provided with a fuel pressure sensor and pressure discharge valve.
- The fuel pressure sensor detects the fuel pressure in the common-rail.
- The pressure discharge valve regulates the fuel pressure in accordance with fuel pressure sensor signals. The pressure discharge valve controlled by ECM via the EDU.
- Internally, the common-rail contains a main hole and five branch holes that intersect the main hole. Each branch hole functions as an orifice that dampens the fluctuation of the fuel pressure.



Service Tip

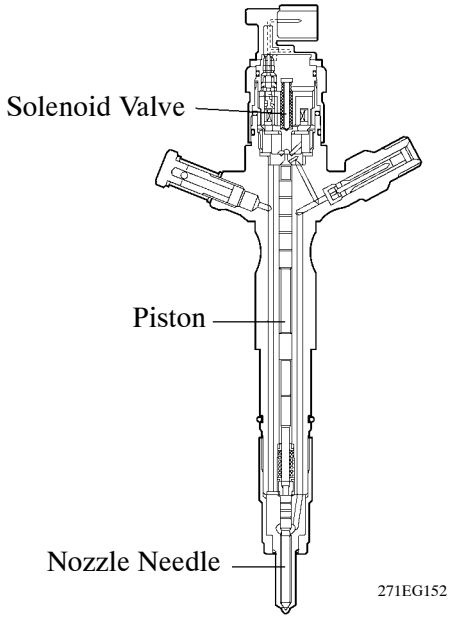
- Fuel pressure sensor has its sealing portion plastic-deformed in order to keep sealing performance, so do not reuse it after disassembling.
- If parts that affect the alignment have been changed, make sure to replace the pipe with a new one as well. The parts that require the replacement of a pipe are listed below.
  Injection pipe: injector, common-rail, and cylinder head
  Fuel inlet pipe: supply pump, common-rail, cylinder block, water pump, and cylinder head

For details, refer to the Hilux Repair Manual.

Injector

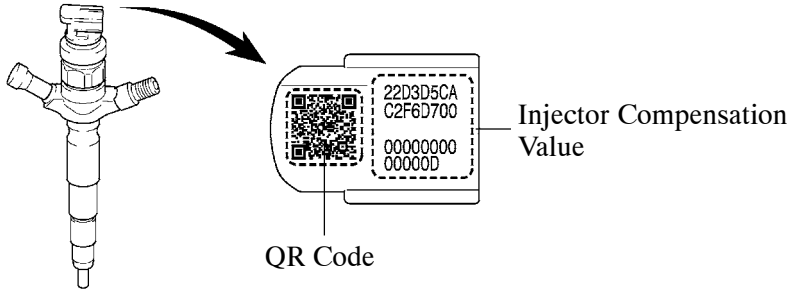
1) General

- Each injector consists of a nozzle needle, a piston, and a solenoid valve.
- An injector compensation value and QR (Quick Response) code containing encoded characteristics of the injector are printed on each injector.
- The injector compensation value and QR code contain various pieces of information regarding the injector, such as model code, and injection volume correction.



Service Tip

- If the ECM is replaced, use the intelligent tester II and input the injector compensation values of all 4 injectors. If the injector is replaced, input the injector compensation value of the replaced injector. Then, the proper compensation will be made so that the injection volume precision prior to the replacement will remain unchanged. For details, refer to the Hilux Repair Manual.
- The QR code, which requires a special scan tool, is not used at TOYOTA dealers.



— REFERENCE —

What is QR (Quick Response) Code?

- *QR code, a matrix symbology consisting of an array of nominally square cells, allows omni-directional, high-speed reading of large amounts of data.*
- *QR code encodes many types of date such as numeric, alphanumeric, kanji, kana and binary code. A maximum of 7089 characters (numeric) can be encoded.*
- *QR code (2D code) contains information in the vertical and horizontal direction, whereas a bar code contains data in one direction only. QR code (2D code) holds a considerably greater volume of information than a bar code.*

2) Operation

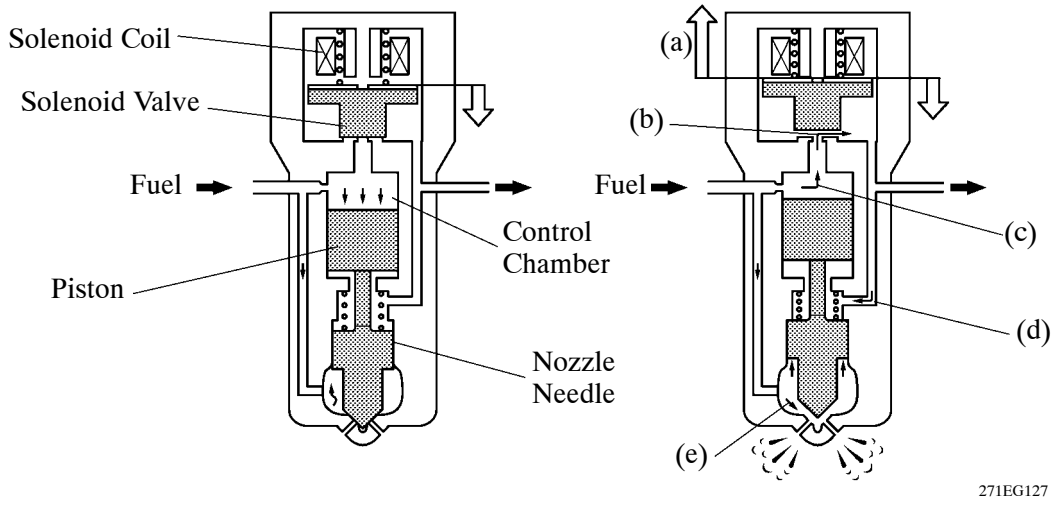
(a) When electrical current is applied to the solenoid coil, it pulls the solenoid valve up.

(b) The orifice of the control chamber opens, allowing the fuel to flow out.

(c) The fuel pressure in the control chamber drops.

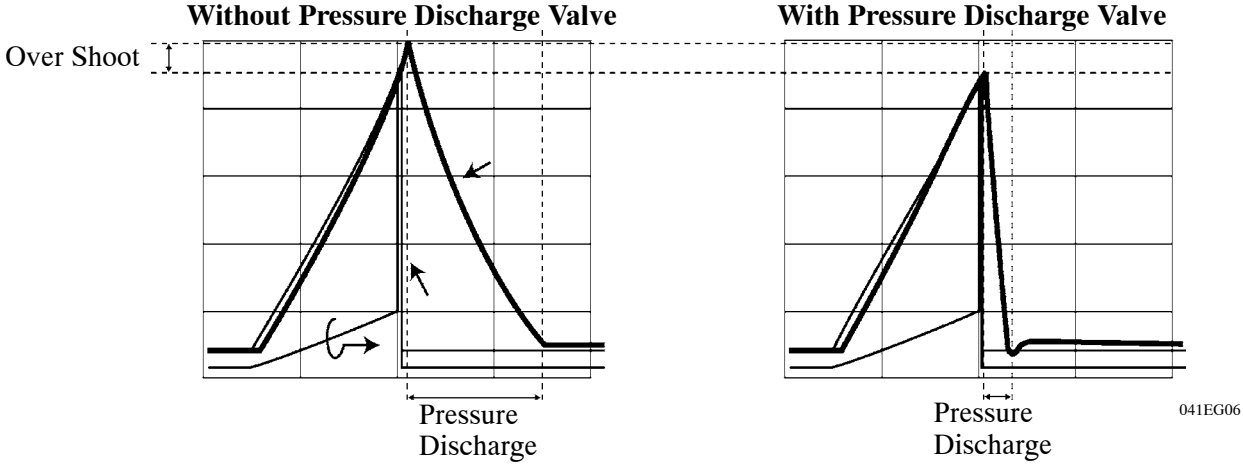
(d) Simultaneously, fuel flows from the orifice to the bottom of the piston and raises the piston up (to enhance response).

(e) As a result, the piston raises the nozzle needle to inject fuel.



Pressure Discharge Valve

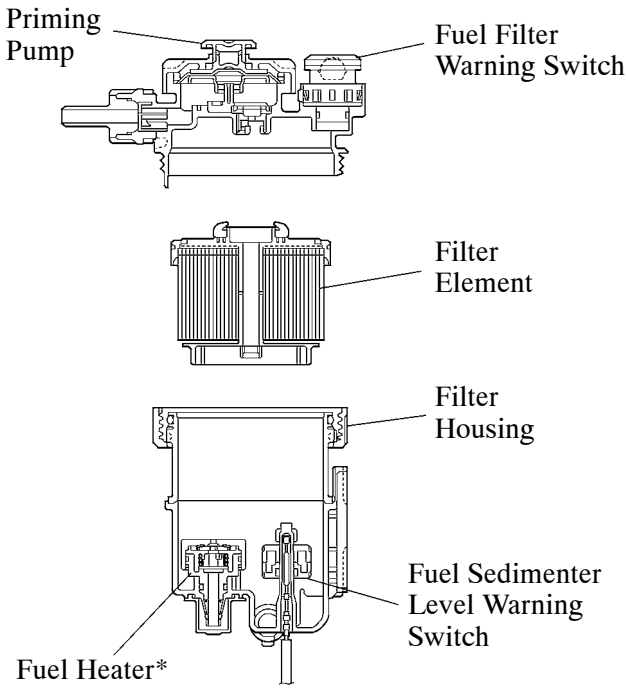
- An electronic controlled pressure discharge valve is used in the common-rail.
- The pressure discharge valve restrains the overshoot which exceeds the target pressure temporarily during the application of the pressure. In addition, it improves the valve response during the reduction of the pressure.



3. Fuel Filter

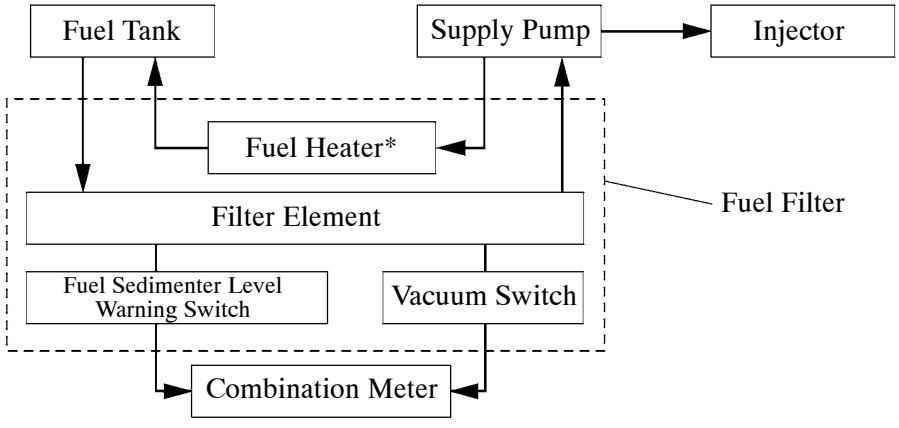
General

- A fuel filter consists of a separate filter element and a filter housing.
- A paper filter element that offers high filtering efficiency and captures the minutest particles is used.
- A fuel filter warning switch is provided in the fuel filter. For details of fuel filter warning switch, see page EG-152.
- On the models for Europe, a recirculation type fuel heater is used.



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▶ System Diagram ◀



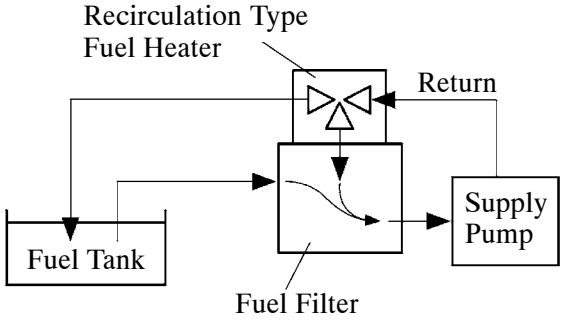
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*: Models for Europe

Fuel Heater

1) General

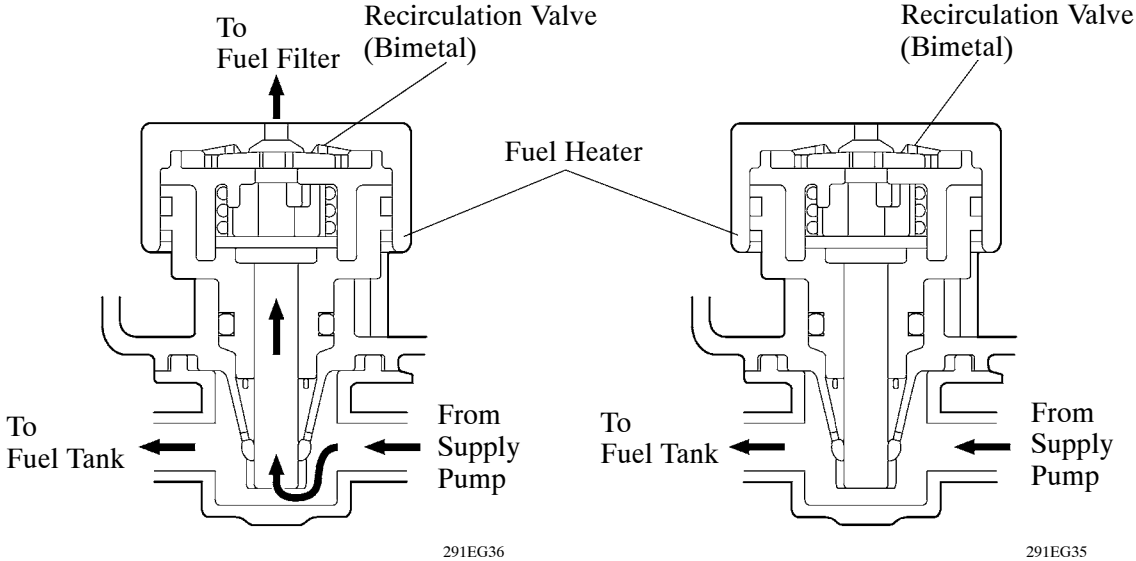
- On the models for Europe, in order to improve the fuel heating performance, a recirculation type fuel heater is used.
- This heater heats the fuel by recirculating the returned fuel, which is made to have a high temperature by the fuel pumping of the supply pump, to the fuel filter.



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2) Operation

- While the engine is cold, the recirculation valve inside the fuel heater will open due to the bimetal action, so the return fuel will return to the fuel filter and the fuel tank.
- While the engine is warm, the recirculation valve will close due to the bimetal action, so all the return fuel will return to the fuel tank.

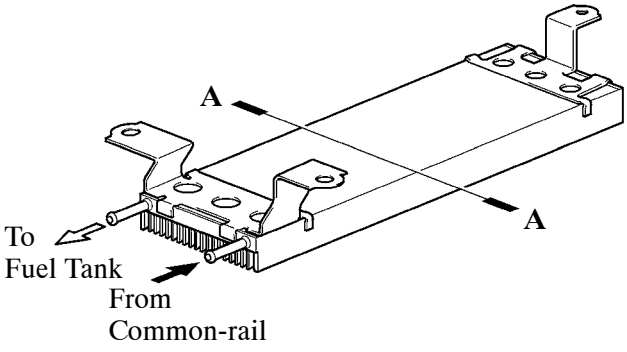


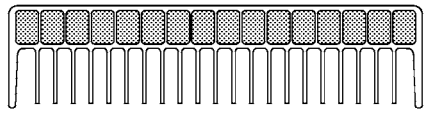
Cold Engine
(Recirculation Valve: Open)

Warm Engine
(Recirculation Valve: Closed)

4. Fuel Cooler

- On the models with 1KD-FTV engine and models with 2KD-FTV High Version engine with intercooler, a fuel cooler is used.
- The fuel cooler, which is provided in the fuel return path, cools the return fuel that has reached a high temperature as a result of the pumping of the supply pump. This prevents the reduction in fuel viscosity that is caused by the rise in fuel temperature, and improves the reliability of the fuel system.





A – A Cross Section

271EG130

■CHARGING SYSTEM

- A conventional type alternator (KCB1) made by Bosch or a compact and lightweight segment conductor type alternator (SE08) made by DENSO is used.
  For the type of alternator used, see the table below:

Vehicle Model	Supplier	Alternator Type
TMT made (except KUN25L-CRMDHW, KUN25L-CRMDHW3 and KUN25L-CRMSHW)	DENSO	SE08
Models for Pakistan		
Models for Malaysia		
Models for Europe with 1KD-FTV engine with cold area specification		
Extra cab models for South Africa		
KUN25L-CRMDHW, KUN25L-CRMDHW3 and KUN25L-CRMSHW	BOSCH	KCB1
TSAM made (except extra cab models for South Africa and except models for Europe with 1KD-FTV engine with cold area specification)		
TASA made		
TDV made		

- For details of the segment conductor type alternator, see page EG-28.