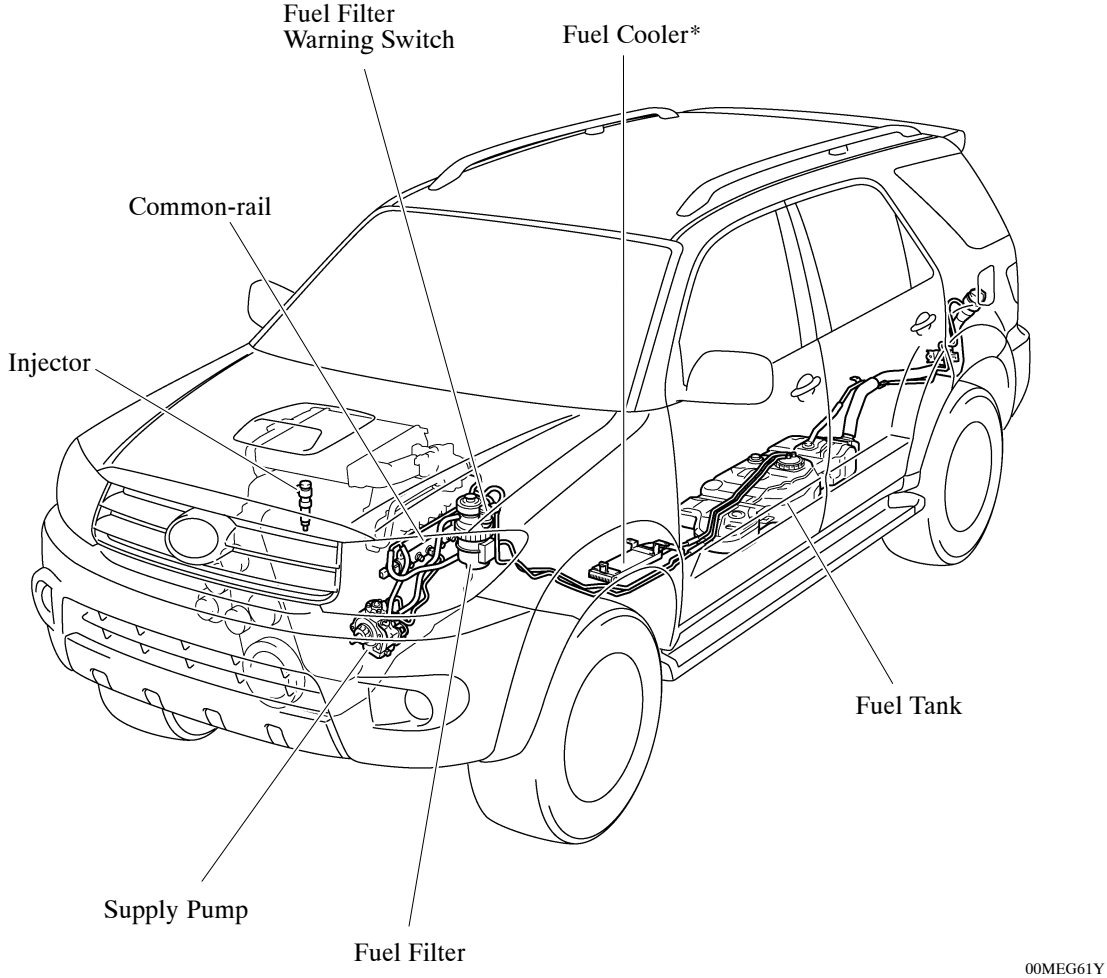
■ FUEL SYSTEM

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. For details, see page EG-129.
- A fuel filter warning switch, which turns on or off when the internal vacuum of the filter increases, is provided in the fuel filter. For details, see page EG-192.
- On the models with 1KD-FTV engine, a fuel cooler made of aluminum is used.
- A fuel tank made of single-layer plastic is used.



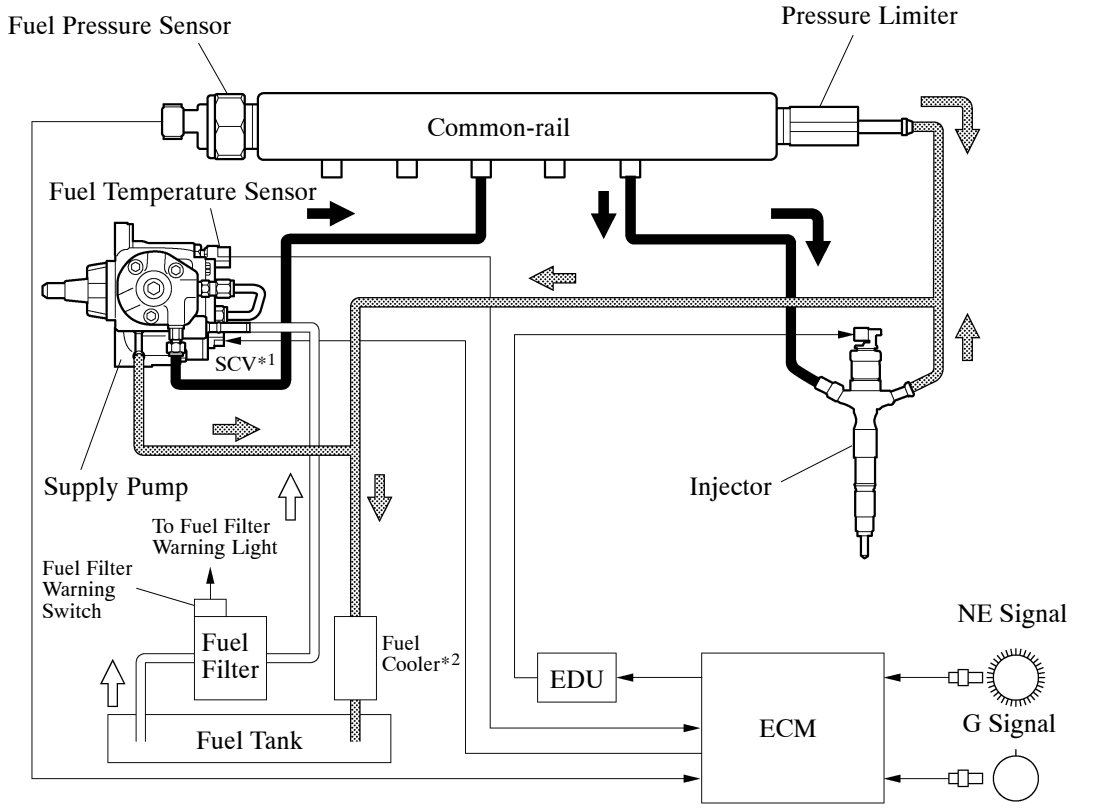
*: Models with 1KD-FTV engine

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-191.

▶ System Diagram ◀



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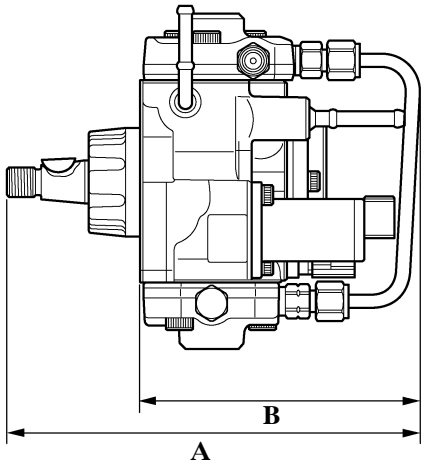
*1: Suction Control Valve
*2: Models with 1KD-FTV engine

EG

Supply Pump

1) General

An HP3 type supply pump is used.



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▶ 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

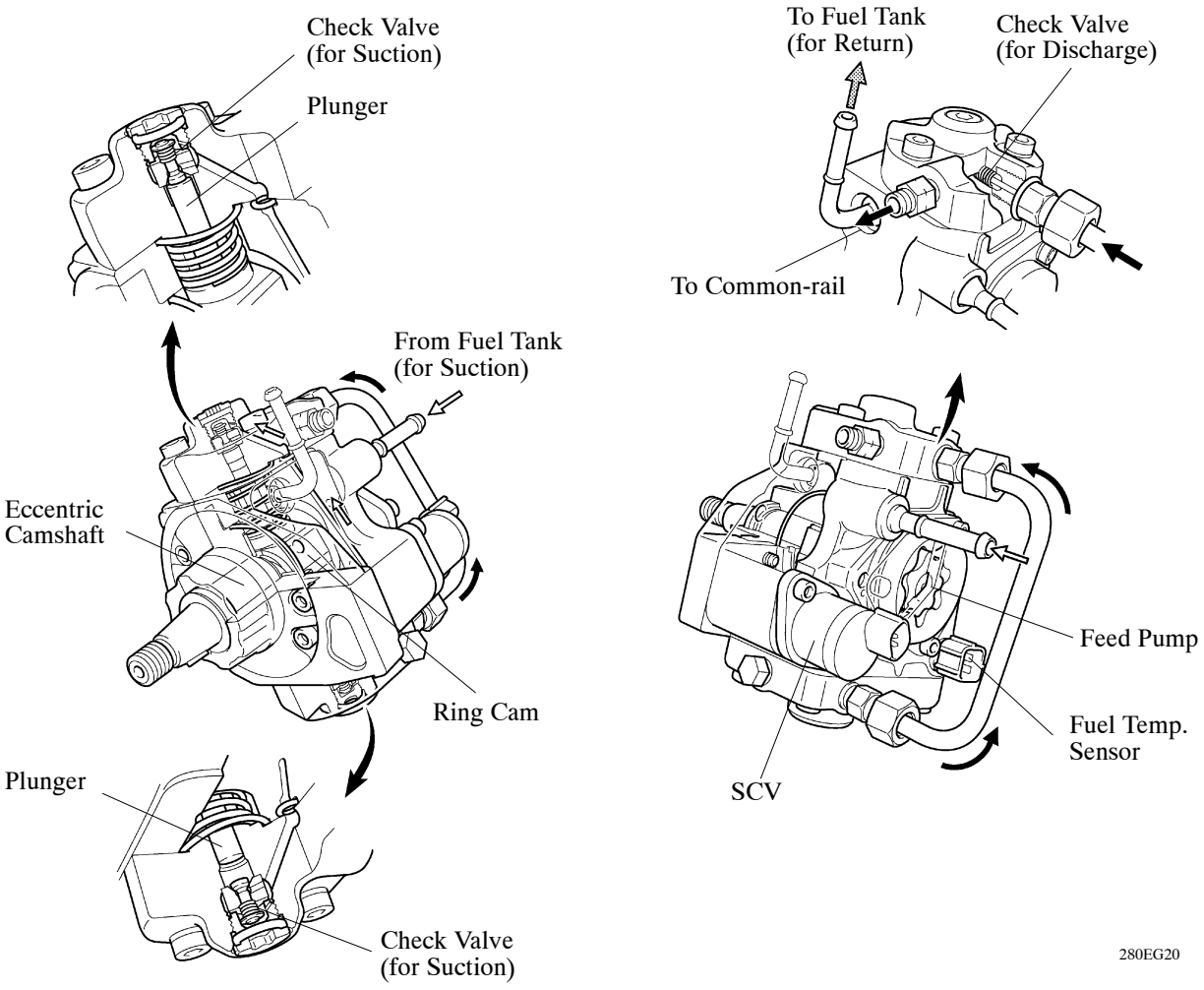
The ECM learns and memorizes the pump discharge volume variances associated with the individual differences in the supply pumps. Therefore, make sure to perform the operation described below after replacing the supply pump. For details, refer to the Fortuner/Hilux SW4 Repair Manual.

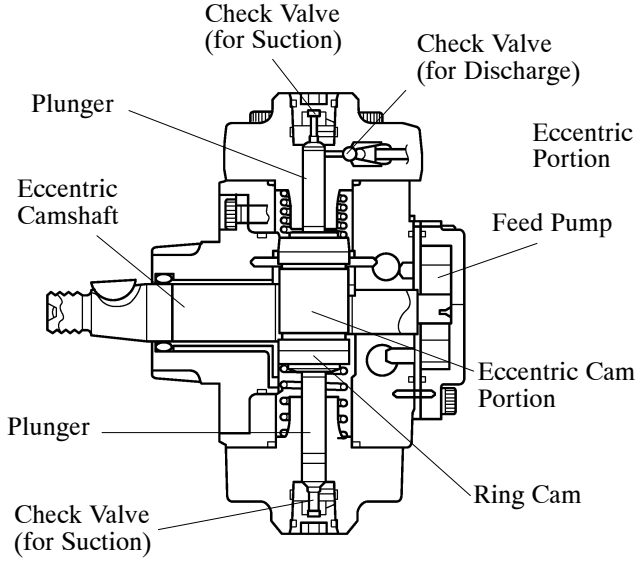
- Connect an intelligent tester II to the DLC3 connector and use the tester to reset the learned value. Alternatively, connect the SST (09843-18040) between the TC and CG terminals of the DLC3 connector, and leave the ignition switch ON for approximately 3 minutes to reset the learned value.
- After 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.

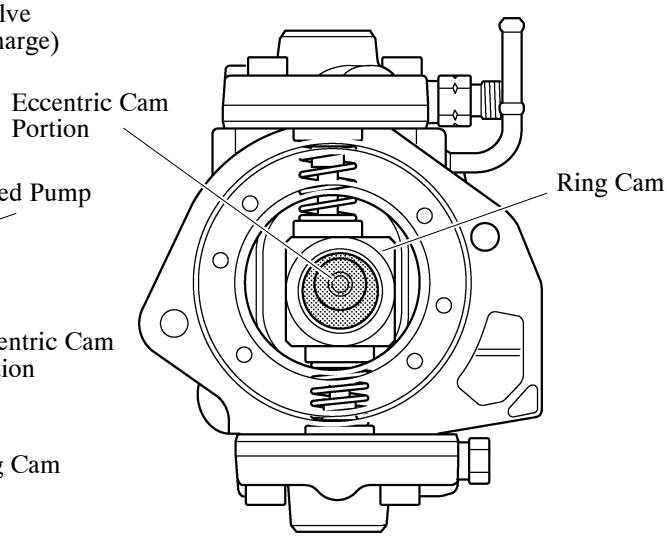
*: The engine coolant temperature should be 60°C (140°F) or more, and the fuel temperature should be 20°C (68°F) or more.

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.

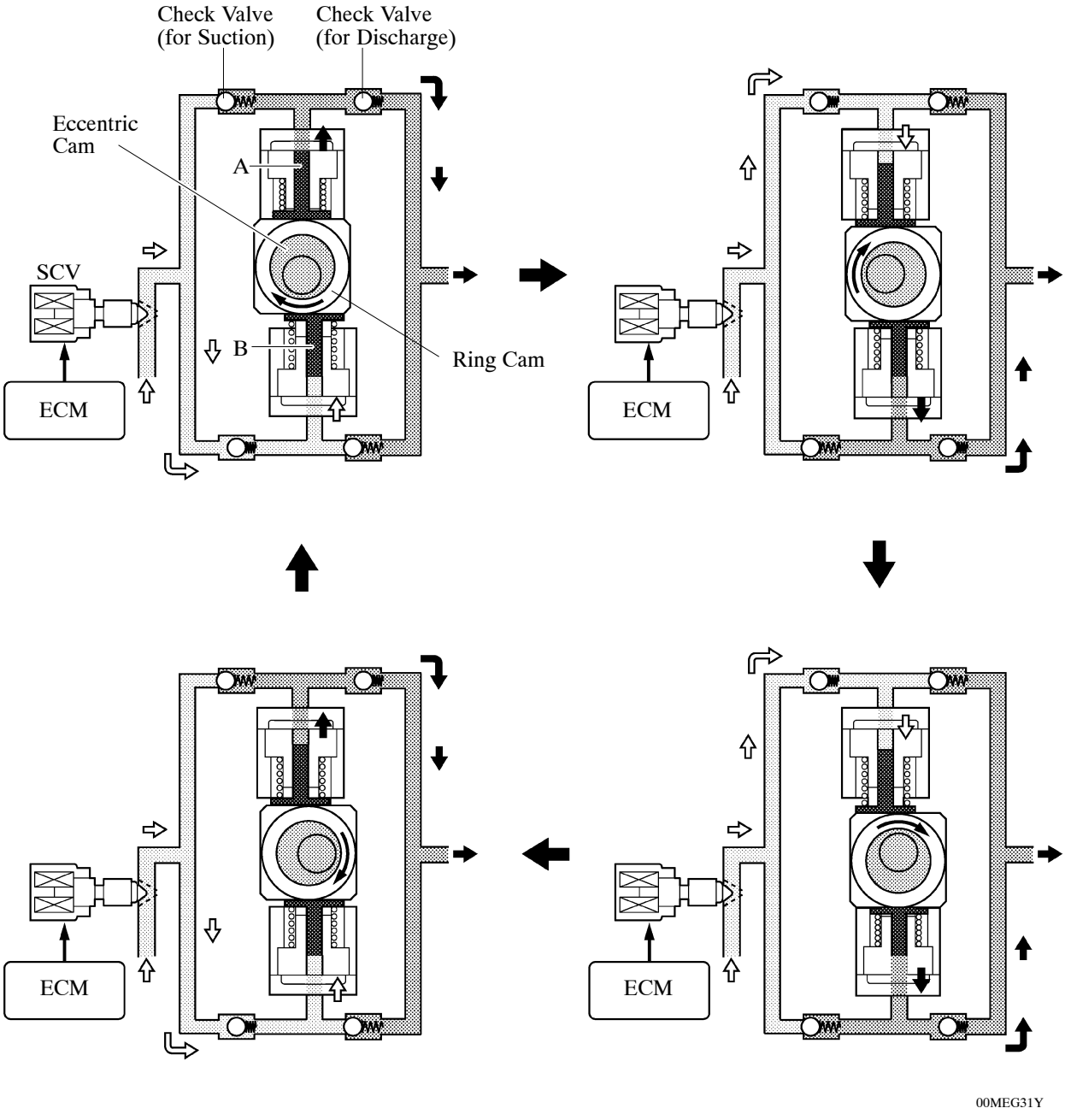






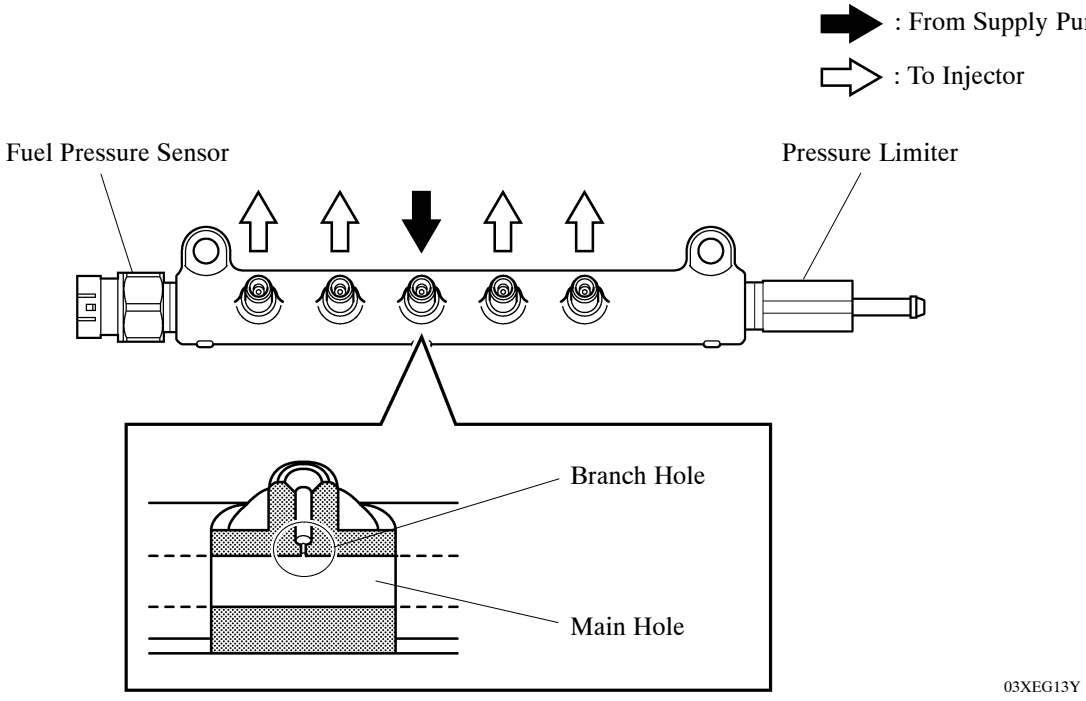
3) Operation

- 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.



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, which detects the fuel pressure in the common-rail, and a pressure limiter that mechanically relieves the pressure in case the internal pressure of the common-rail rises abnormally.
- 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

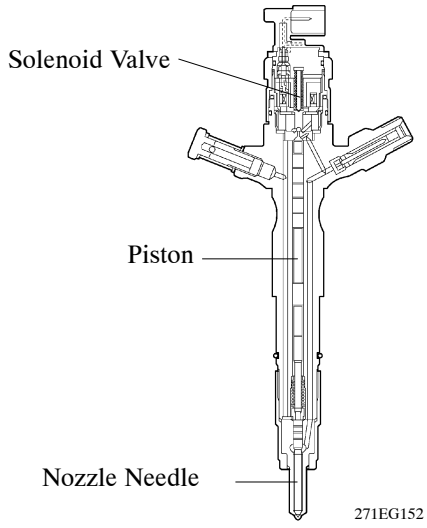
- Fuel pressure sensor has its sealing portion plastic-deformed in order to keep sealing performance, so do not reuse it after disassembling.
- If parts that affect the alignment have been changed, make sure to replace the pipe with a new one as well. The parts that require the replacement of a pipe 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 Fortuner/Hilux SW4 Repair Manual.

Injector

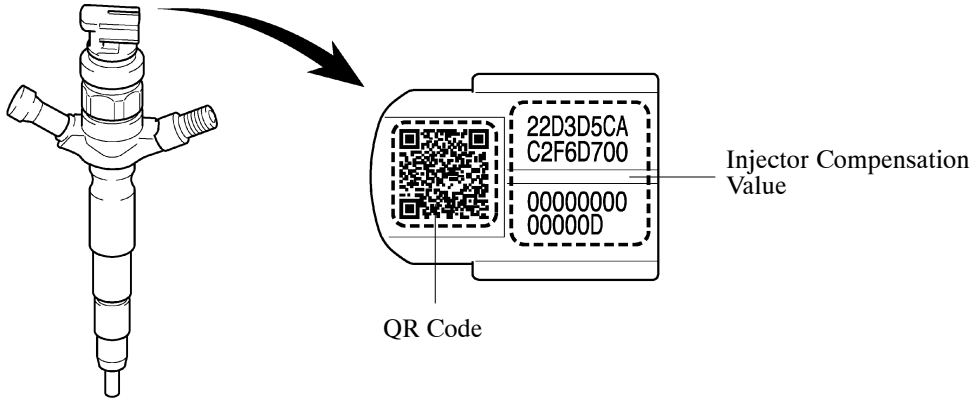
1) General

- 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 Fortuner/Hilux SW4 Repair Manual.
- The QR code, which requires a special scan tool, is not used at TOYOTA dealers.



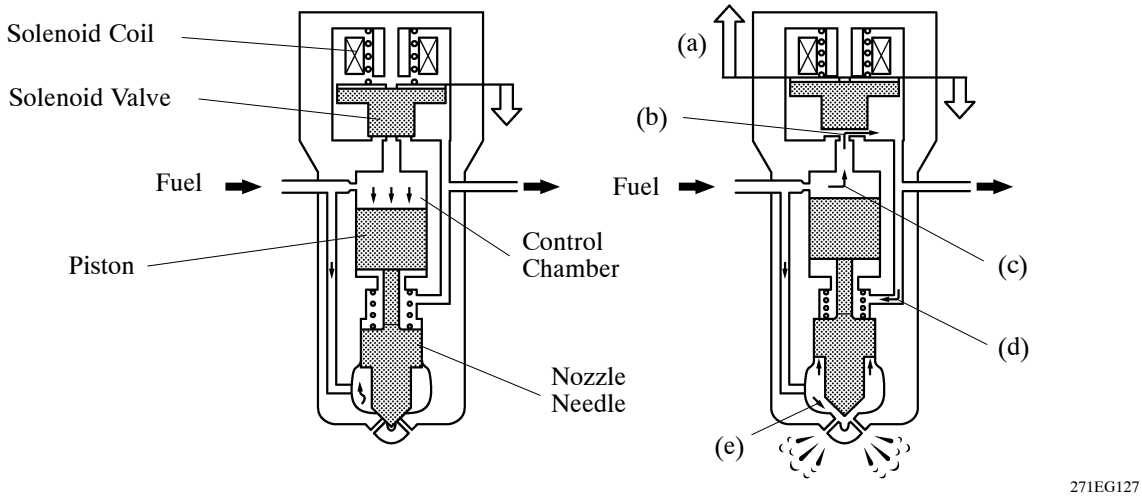
*— **REFERENCE** —*

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

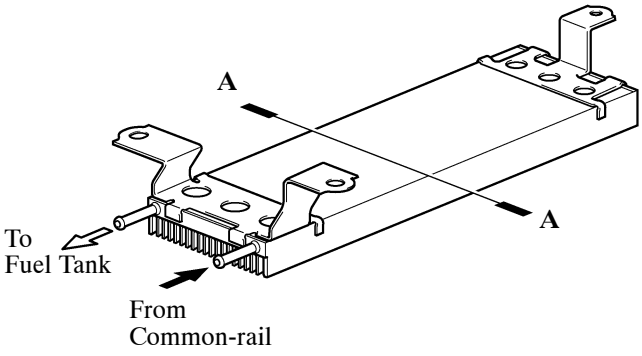
(a) When electrical current is applied to the solenoid coil, it pulls the solenoid valve up.
(b) The orifice of the control chamber opens, allowing the fuel to flow out.
(c) The fuel pressure in the control chamber drops.
(d) Simultaneously, fuel flows from the orifice to the bottom of the piston and raises the piston up (to enhance response).
(e) As a result, the piston raises the nozzle needle to inject fuel.

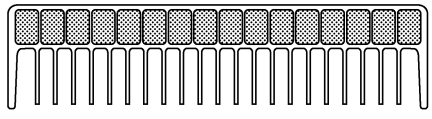


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3. Fuel Cooler

- On the models with 1KD-FTV engine, 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