

7. Fuel System

General

As with the previous model, the new model uses a common-rail fuel injection system.

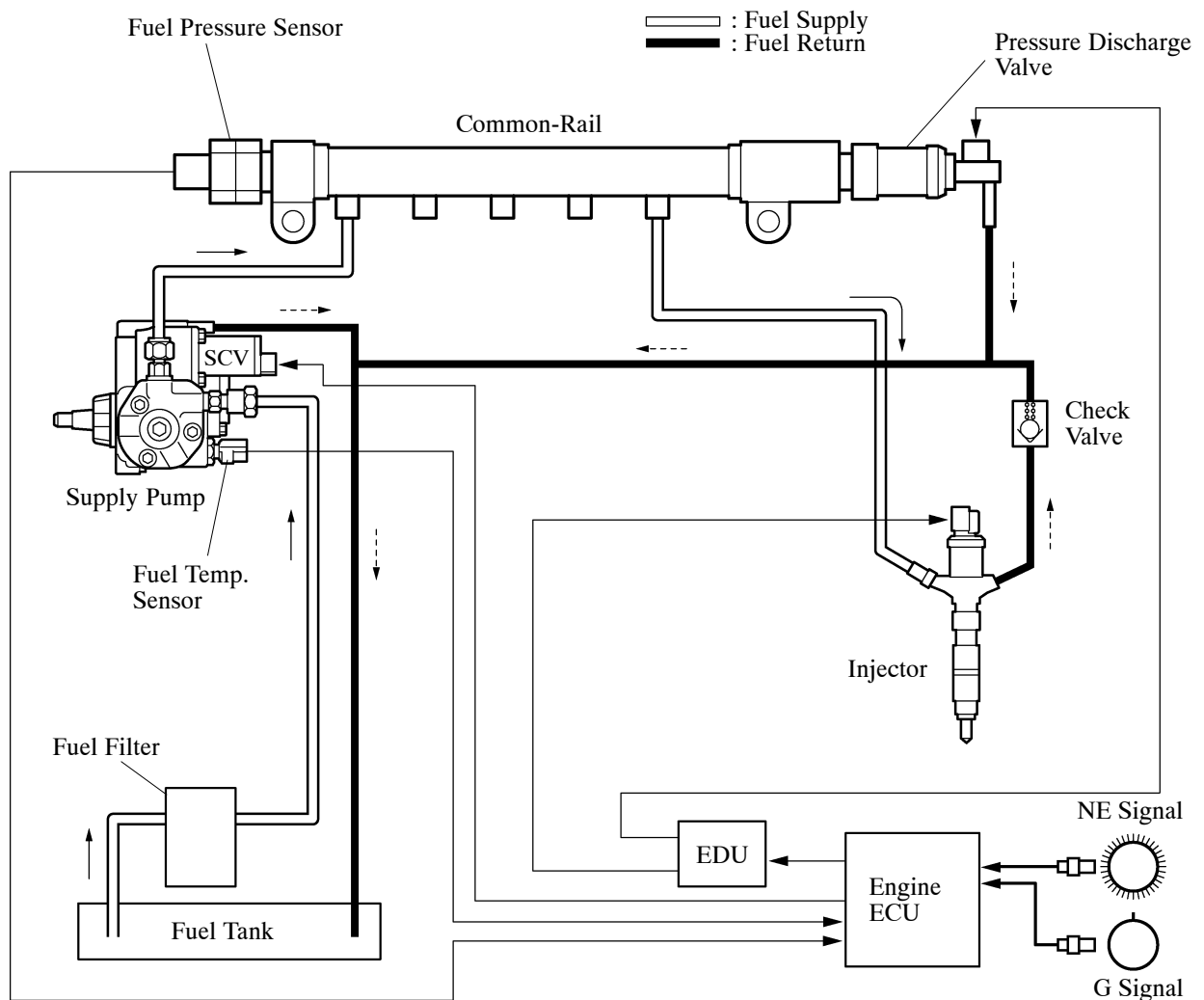
— Change (from Previous Land Cruiser) —

In order to achieve higher performance and low emission at accelerated levels, the new Land Cruiser has adopted a common-rail system that supports high injection pressure.

Accordingly, the following changes have been made:

- Changes of the common-rail, fuel pressure sensor, supply pump, and injector.
- The pressure limiter is discontinued.
- Adoption of the pressure discharge valve.

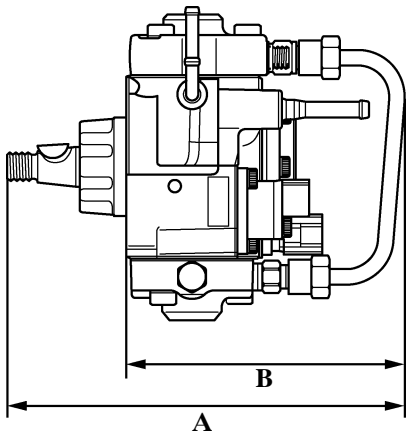
► System Diagram ◀



Supply Pump

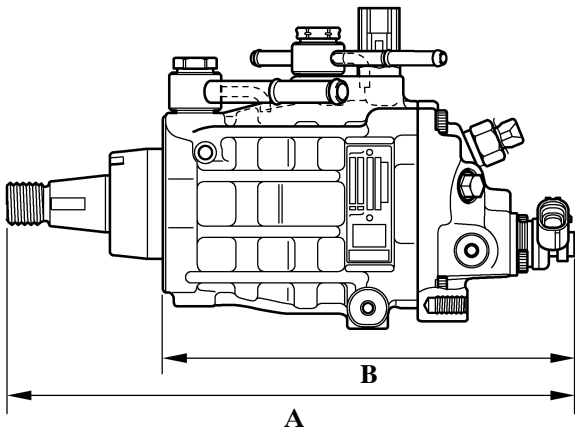
1) General

The supply pump has been changed from HP2 (4-plunger, inner cam) type to HP3 (2-plunger, outer cam) type. As a result, the pump has been made more compact and its overall length has been shortened.



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HP3 Type (New Land Cruiser)



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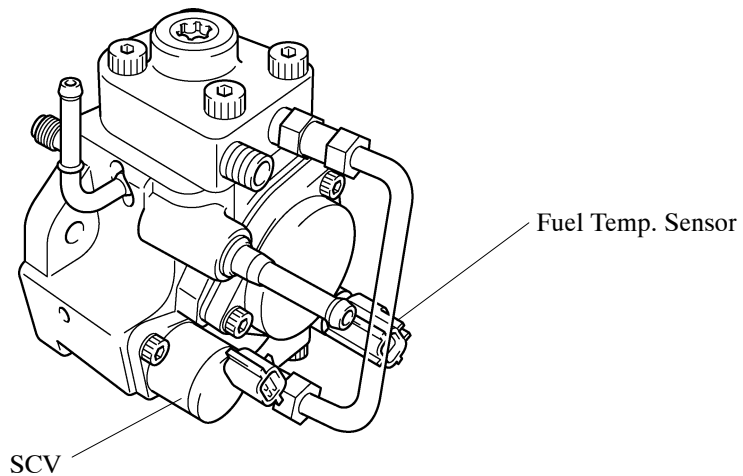
HP2 Type (Previous Land Cruiser)

► Specifications ◀

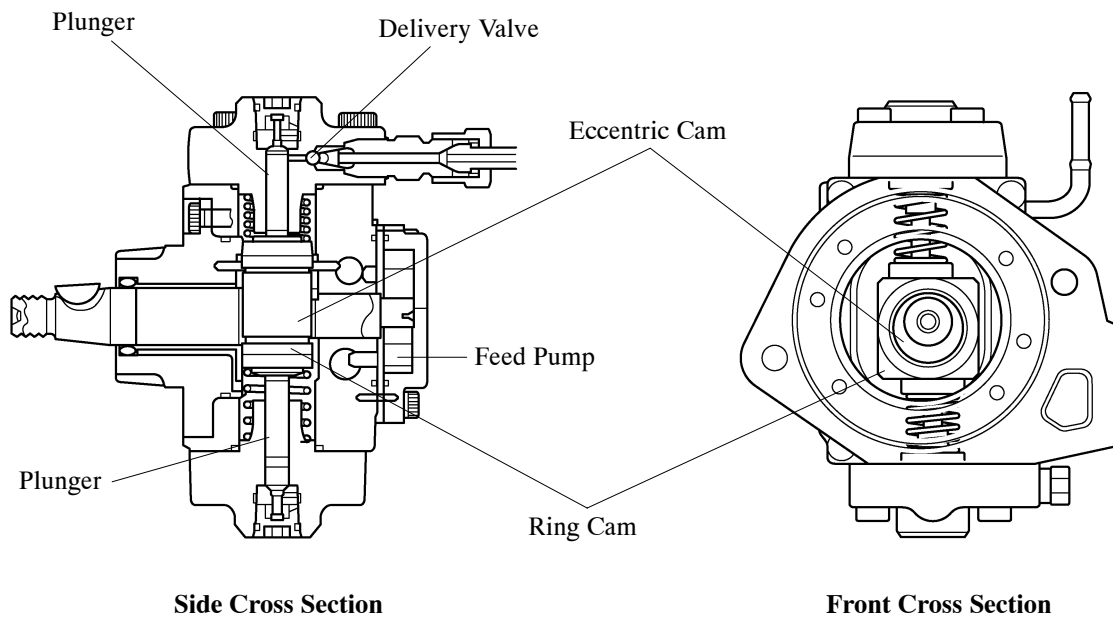
Type			HP3 (Outer Cam)	HP2 (Inner Cam)
A	Length	mm (in.)	190.2 (7.49)	252.0 (9.92)
B	Length	mm (in.)	129.0 (5.08)	182.1 (7.17)
Suction Control Valve			1	2
Plunger			ø 8.5 × 2	ø 7.0 × 4
Weight			3800 (8.38)	6040 (13.32)

2) Construction

- The supply pump mainly consists of a pump body (eccentric cam, ring cam, two plungers) SCV (Suction Control Valve), fuel temperature sensor, and feed pump.
- The 2 plungers in the pump body are placed opposite each other outside of the ring cam.



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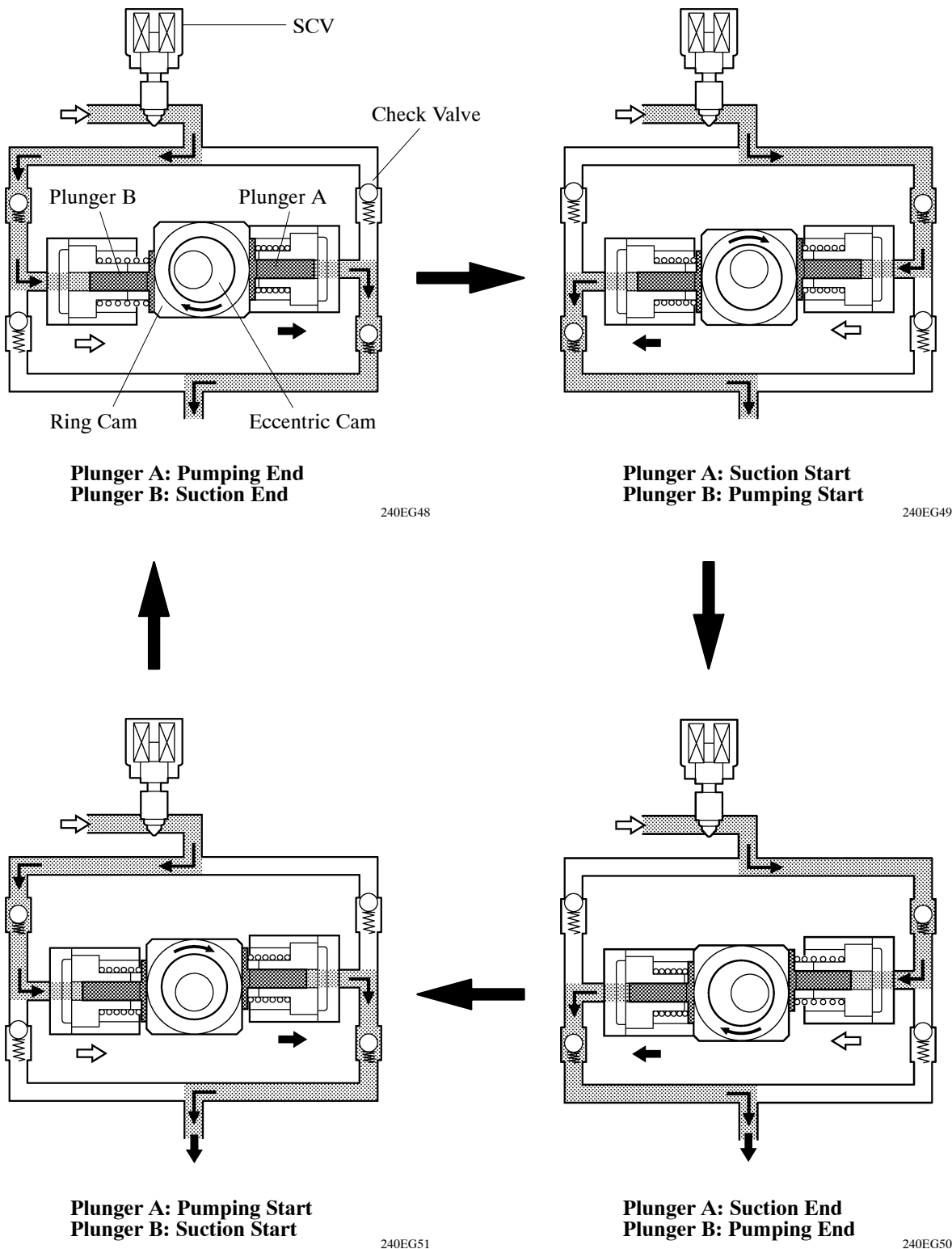


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3) Operation

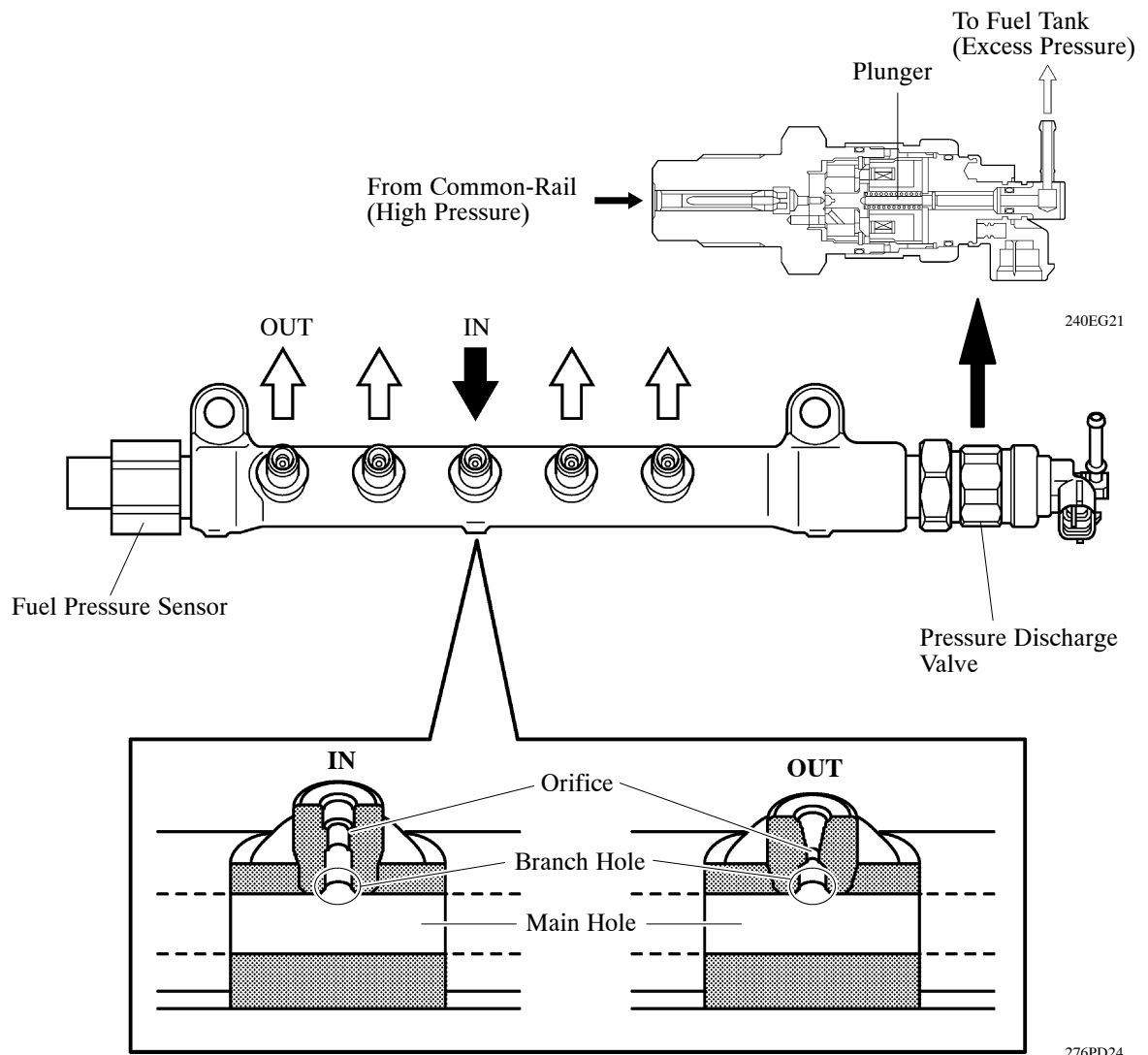
- Due to the rotation of the eccentric cam, the ring cam pushes plunger A upward as illustrated below. The force of the spring pulls plunger B (which is located opposite plunger A) upward. As a result, plunger B draws fuel in, and plunger A pumps fuel at the same time.
- The SCV controls the volume of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



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 equipped with a fuel pressure sensor, which detects the fuel pressure in the common-rail, and a pressure discharge valve, which regulates the fuel pressure.

- 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.
- In the pressure discharge valve, the plunger opens and closes in accordance with the actuation signals from the ECU. Thus, it regulates pressure by releasing excess pressure from the common-rail. In addition, it has a pressure reduction function in case of emergency.
- For details on the fuel pressure sensor, see page 77.



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 has 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, Cylinder Head

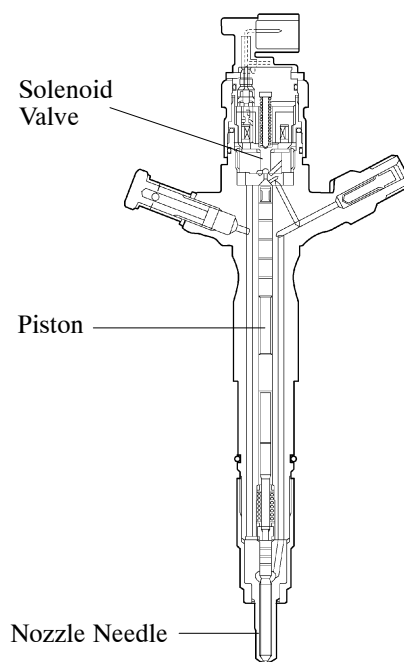
Fuel Inlet Pipe: Supply Pump, Common-Rail, Cylinder Block, Water Pump, Cylinder Head

For details, refer to the Land Cruiser/ Land Cruiser Prado Repair Manual Supplement (Pub. No. RM1151E).

Injector

1) General

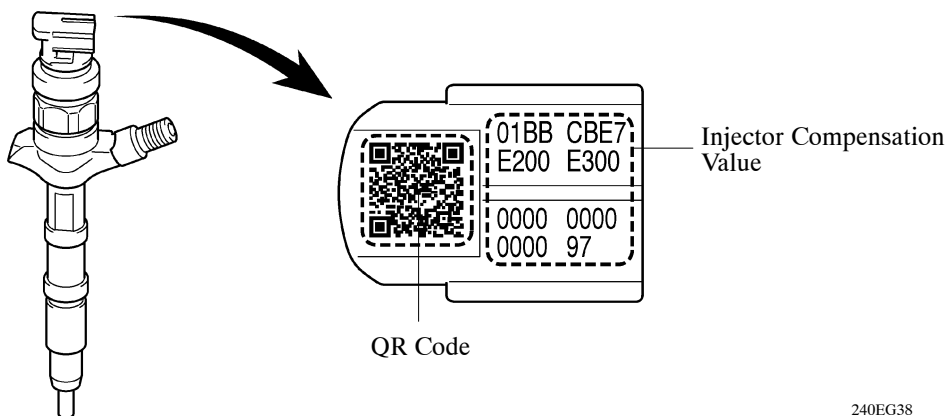
- An injector consists of a nozzle needle, piston, and solenoid valve.
- An injector compensation value and QR (Quick Response) code containing encoded characteristics of the injector are printed on each injector.
- The injector compensation value and QR code contain various pieces of information regarding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



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Service Tip

- If the engine ECU 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 Land Cruiser/ Land Cruiser Prado Repair Manual Supplement (Pub. No. RM1151E).
- The QR code, which requires a special scan tool, is not used at TOYOTA dealers.



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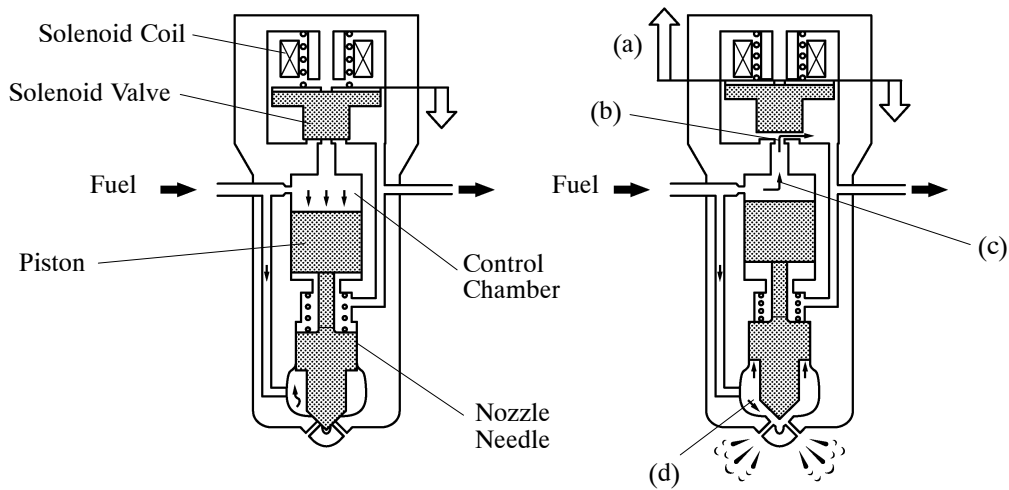
— Reference —

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 data such as numeric, alphanumeric, kanji, kana and binary code. A maximum of 7,089 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) As a result, the piston raises the nozzle needle to inject fuel.



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