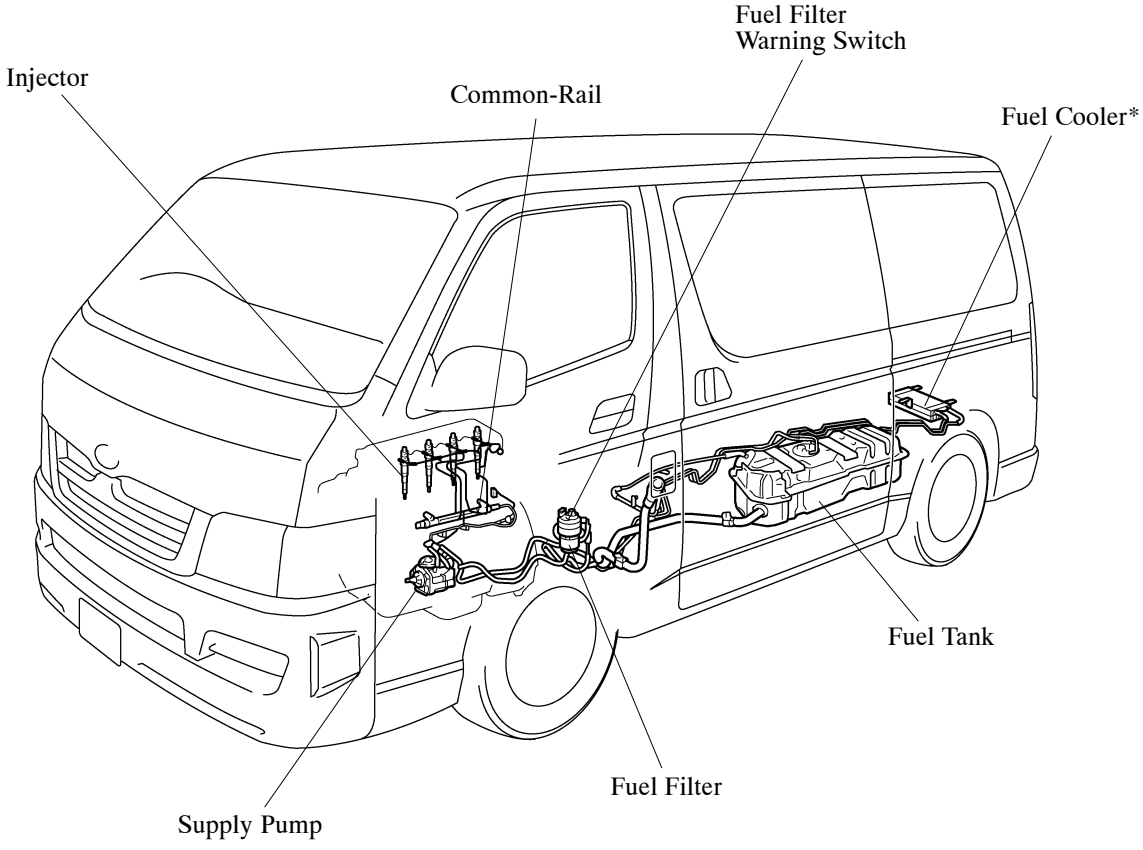
■FUEL SYSTEM

1. General

- A common-rail system is used in the fuel injection system.
- 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 realize high-precision control.
- A new type of fuel filter, in which the fuel filter element alone can be replaced, is used.
- A fuel filter warning switch, which turns OFF when the internal vacuum of the filter increases, is provided in the fuel filter.
- A fuel sedimenter level warning switch, which blinks the warning light when the water in the sedimenter section reaches a certain amount, is used.



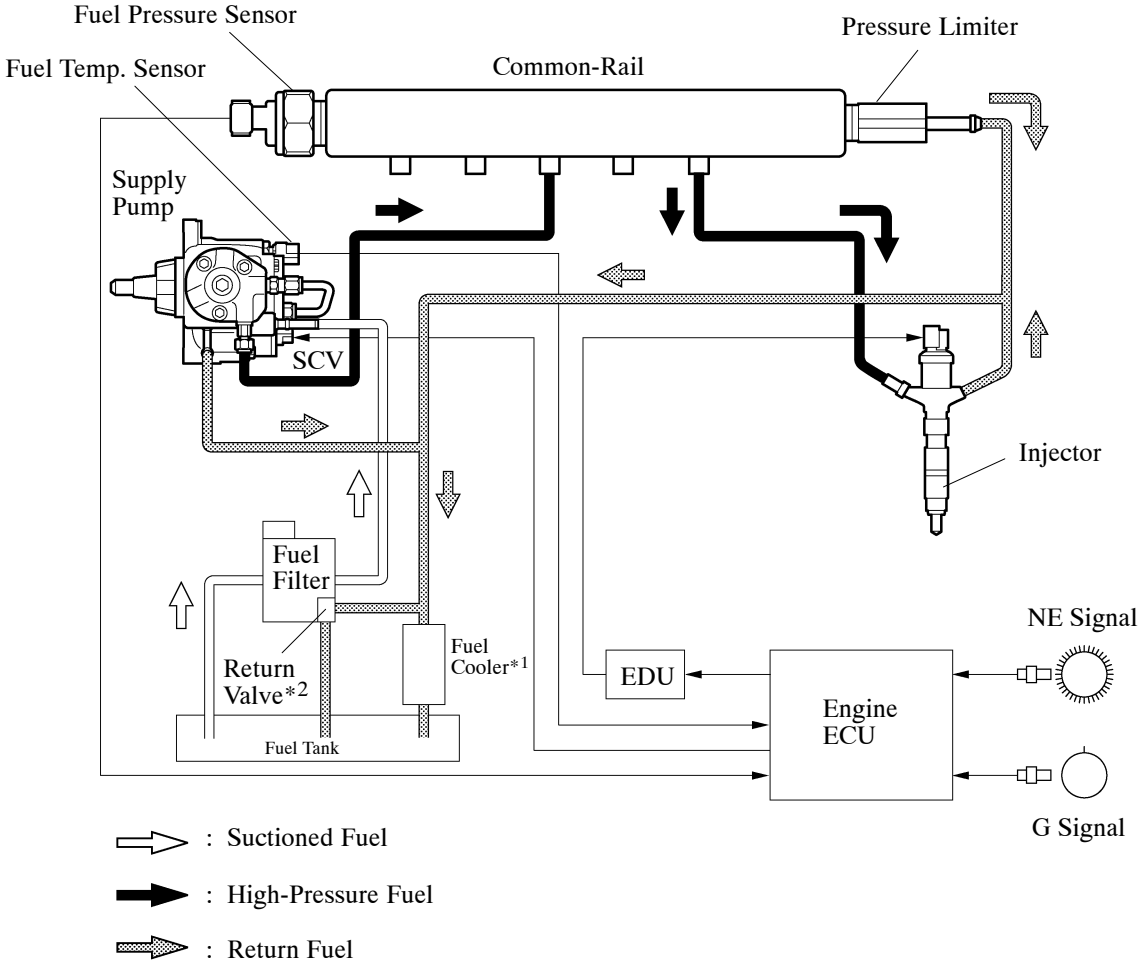
*: Only High Roof Models for Thailand

2. Common-Rail System

General

In this system, the high pressurized fuel that is supplied by the supply pump is stored in the common-rail, and the engine ECU 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-107.

▶ System Diagram ◀



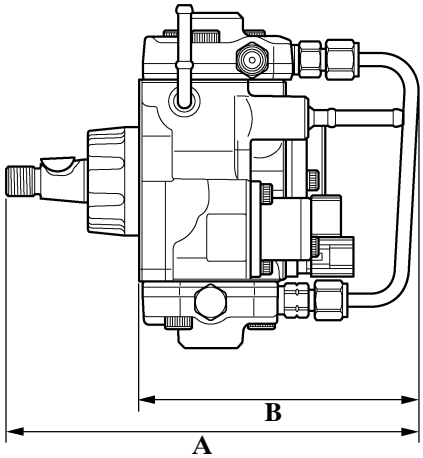
286EG56

*1: Only High Roof Models for Thailand
*2: Cold Area Specification Models

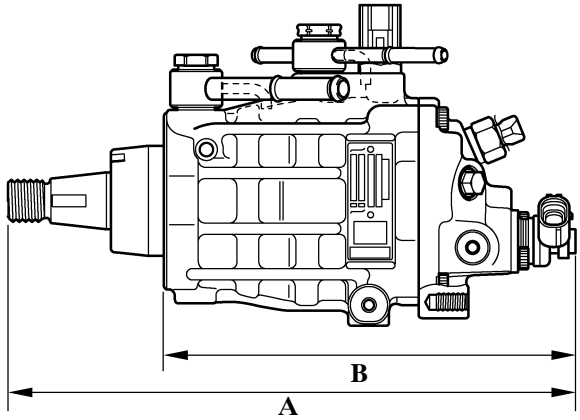
Supply Pump

1) General

This supply pump (HP3 type) has been made shorter than the HP2 type that is used on other models. This has been accomplished through the adoption of an opposing plunger configuration (and by reducing the number of plungers from 4 to 2), resulting in a compact and lightweight supply pump.



HP3 271EG155



HP2 224EG21

▶ Specifications ◀

Model		New	Others
Type		HP3 (Outer Cam)	HP2 (Inner Cam)
Length mm (in.)	A	190.2 (7.49)	252.0 (9.92)
	B	129.0 (5.08)	182.1 (7.17)
Suction Control Valve		1	2
Plunger		ø8.5 × 2	ø7.0 × 4
Weight g (lb.)		3800 (8.38)	6040 (13.32)

Service Tip

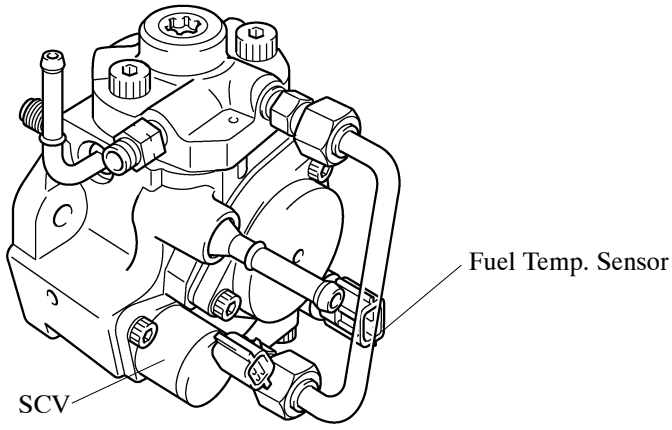
The engine ECU learns and memorizes the pump discharge volume variances associated with the individual differences in the supply pumps. Therefore, make sure to perform the operation described below after replacing the supply pump. For details, refer to the Hiace Repair Manual (Pub No. RM1171E).

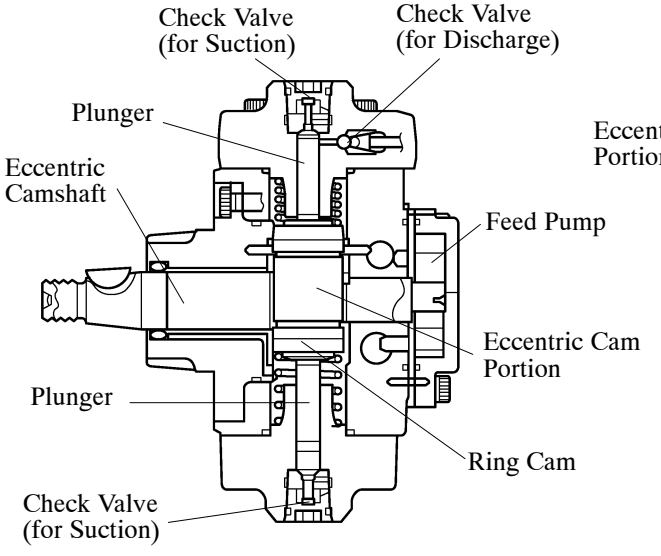
- Connect an intelligent tester II to the DLC3 connector and use the tester to reset the learned value. Alternatively, connect the SST (09843-18040) between the TC and CG terminals of the DLC3 connector, and leave the ignition switch ON for approximately 3 minutes to reset the learned value.
- After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

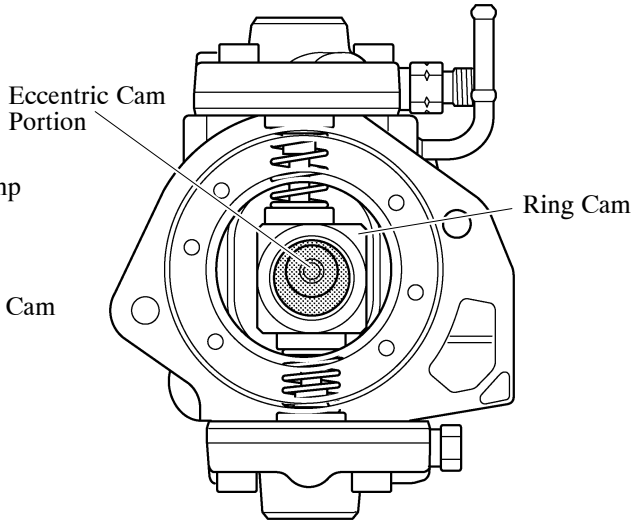
*: The engine coolant temperature should be 60°C (140°F) or more, and the fuel temperature should be 20°C (68°F) or more.

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 to each other outside of the ring cam.





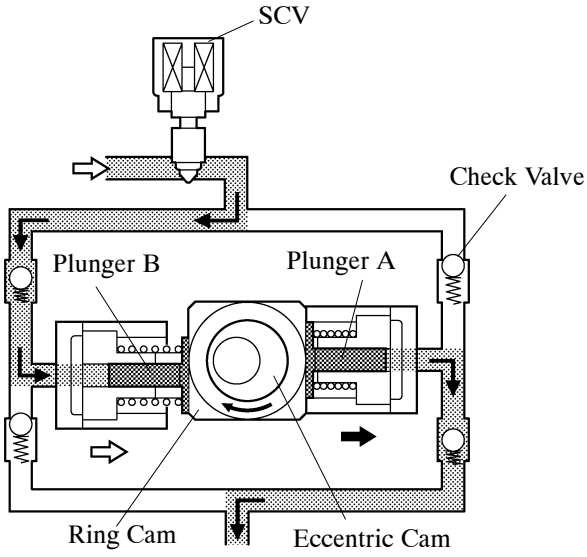


▶ Function of Component ◀

Components		Function
Feed Pump		Pumps fuel to two plungers.
Regulator Valve		Regulates fuel pressure in pump.
Suction Control Valve		Controls volume of fuel drawn into plungers.
Pump Body	Eccentric Cam	Drives ring cam.
	Ring Cam	Drives two plungers.
	Plunger	Effects suction and pumping of fuel.
Delivery Valve		Pumps fuel to common-rail.

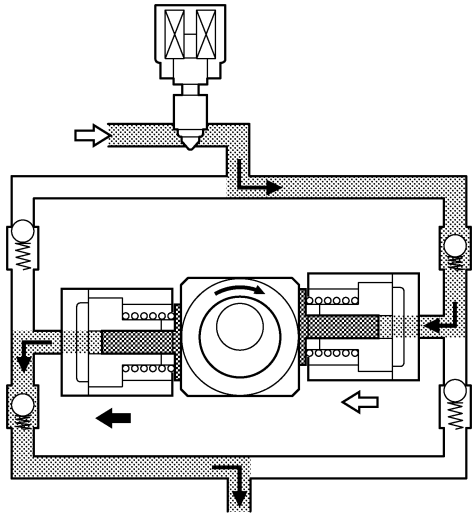
3) Operation

- 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 to 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.



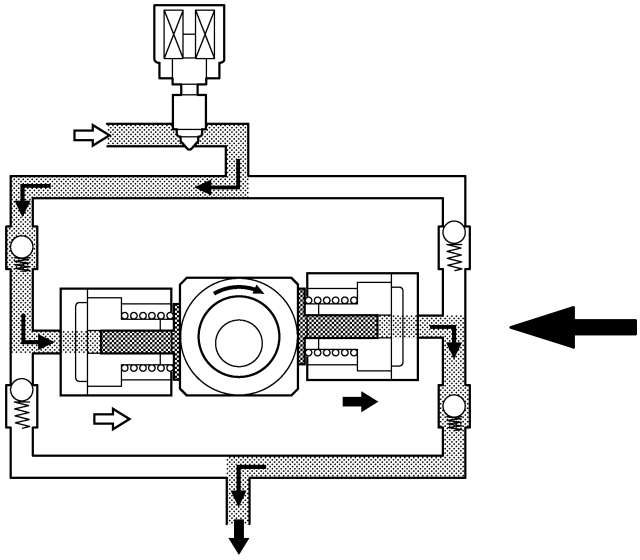
Plunger A: Pumping End
Plunger B: Suction End

240EG48



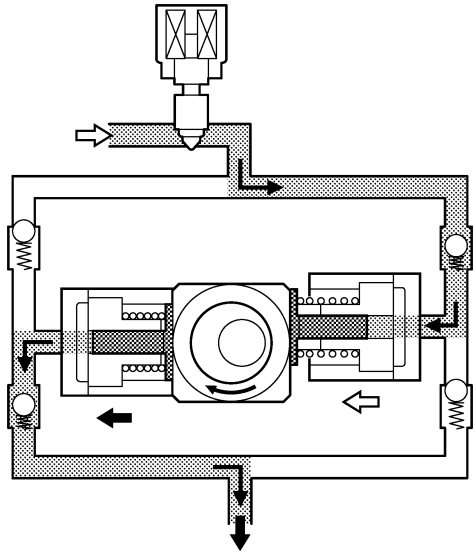
Plunger A: Suction Start
Plunger B: Pumping Start

240EG49



Plunger A: Pumping Start
Plunger B: Suction Start

240EG51



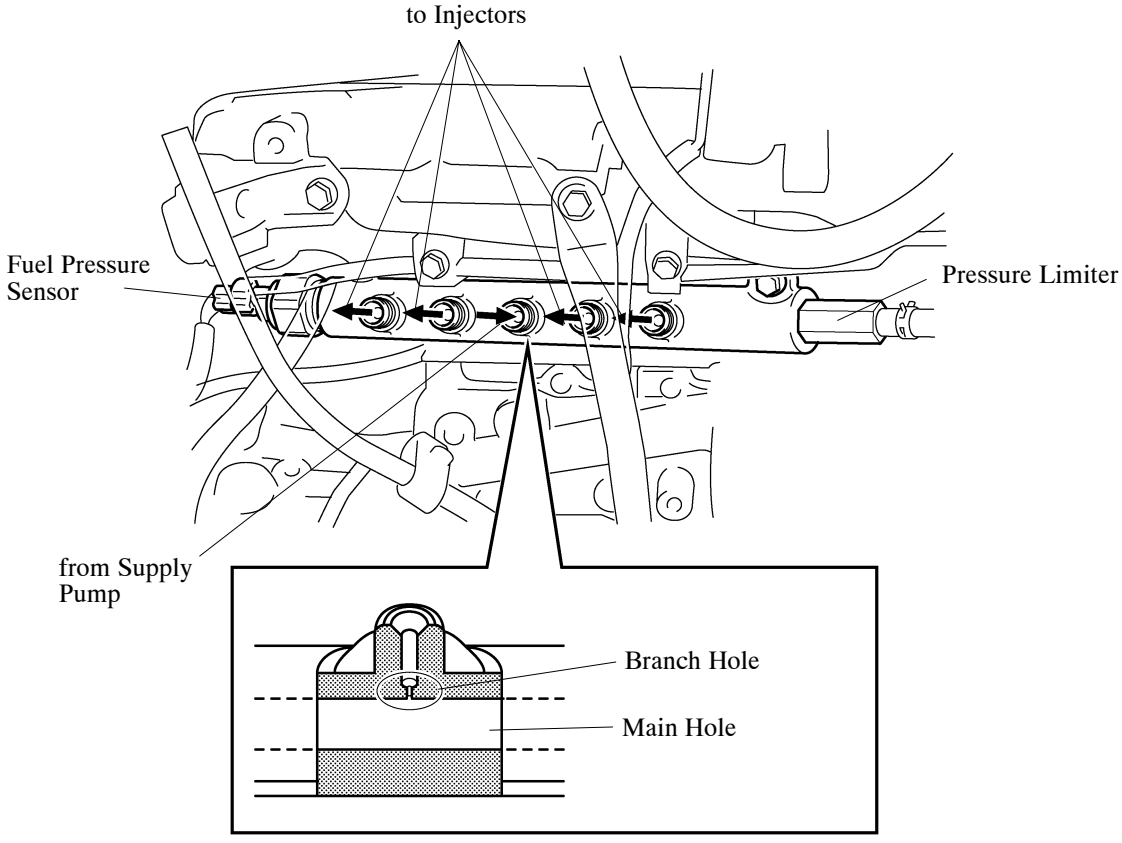
Plunger A: Suction End
Plunger B: Pumping End

240EG50

EG

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 that 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.



Common-Rail Cross Section

286EG30

Service Tip

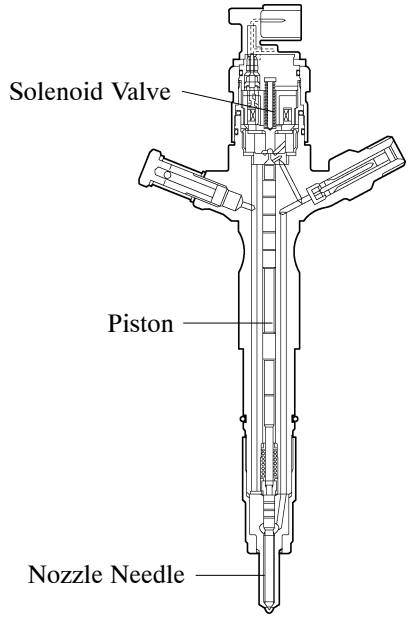
- Fuel pressure sensor has its sealing portion plastic-deformed in order to keep sealing performance. Therefore, do not reuse it after disassembling.
- If parts that affect the alignment have been changed, make sure to replace the pipe with a new one as well. The parts that require the replacement of 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 Hiace Repair Manual (Pub. No. RM1171E).

Injector

1) General

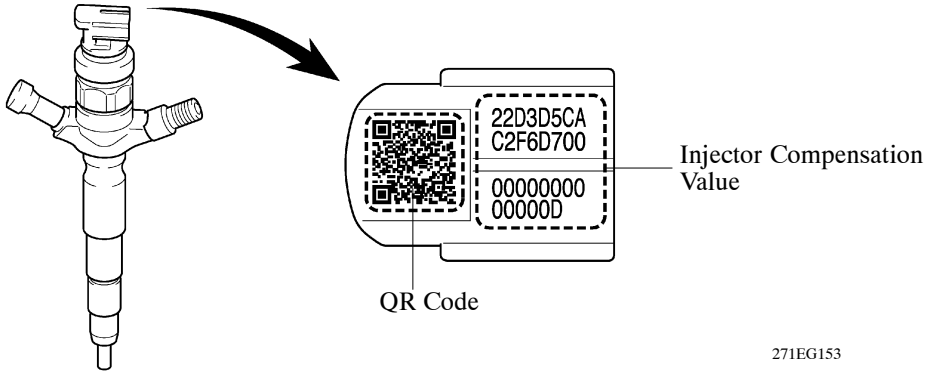
- An injector consists of a nozzle needle, piston, and solenoid valve.
- An injector compensation value and QR (Quick Response) code containing encoded characteristics of the injector are printed on each injector.
- The injector compensation value and QR code contain various pieces of information regarding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



271EG152

Service Tip

- When the engine ECU is replaced, use the intelligent tester II and input the injector compensation values of all 4 injectors. When the injector is replaced, input the injector compensation value of the replaced injector. Then, the proper compensation can be made so that the injection volume precision prior to the replacement will remain unchanged. For details, refer to the Hiace Repair Manual (Pub. No. RM1171E).
- The QR code, which requires a special scan tool, is not used at Toyota dealers.



271EG153

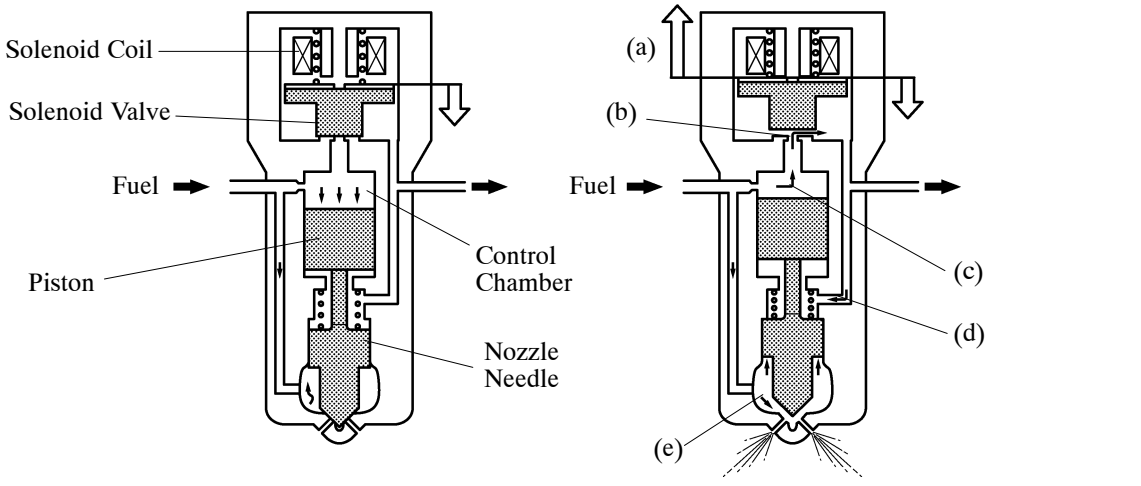
—REFERENCE—

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 7,089 characters (numeric) can be encoded.*
- *QR code (2D code) contains information in the vertical and horizontal direction, whereas a bar code contains date 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.



No Injection (Solenoid Valve OFF)

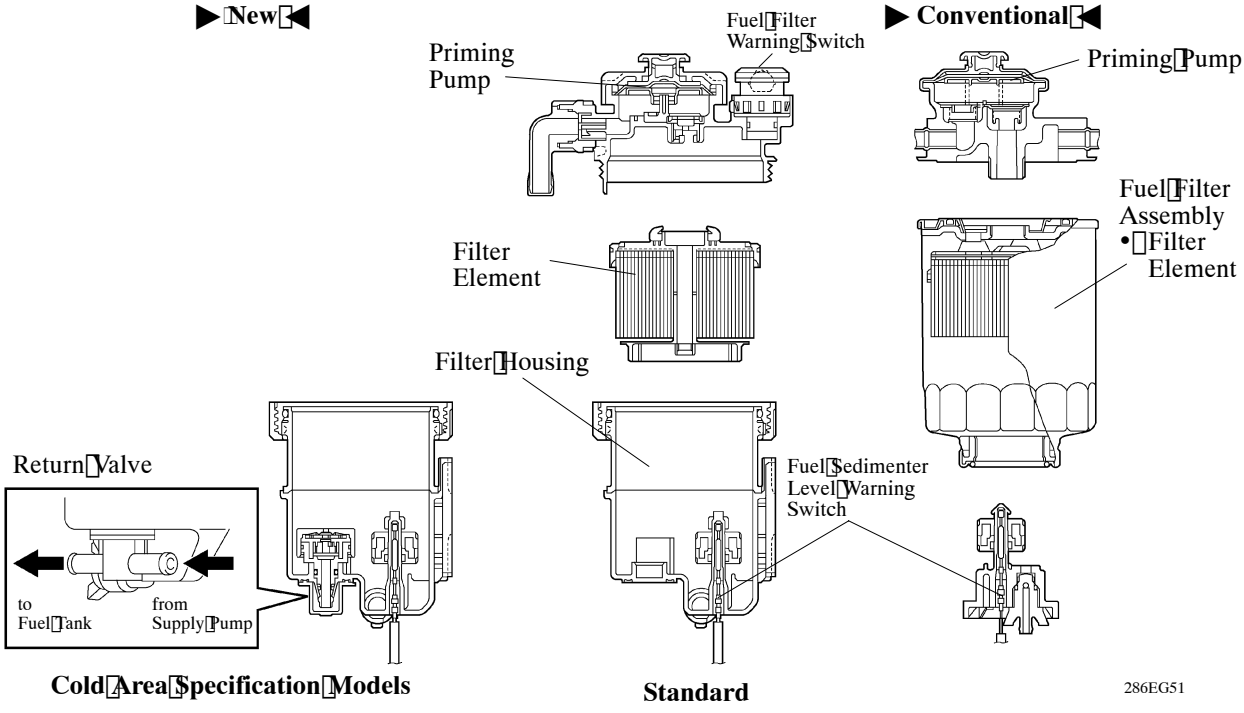
Injection (Solenoid Valve ON)

286EG63

3. Fuel Filter

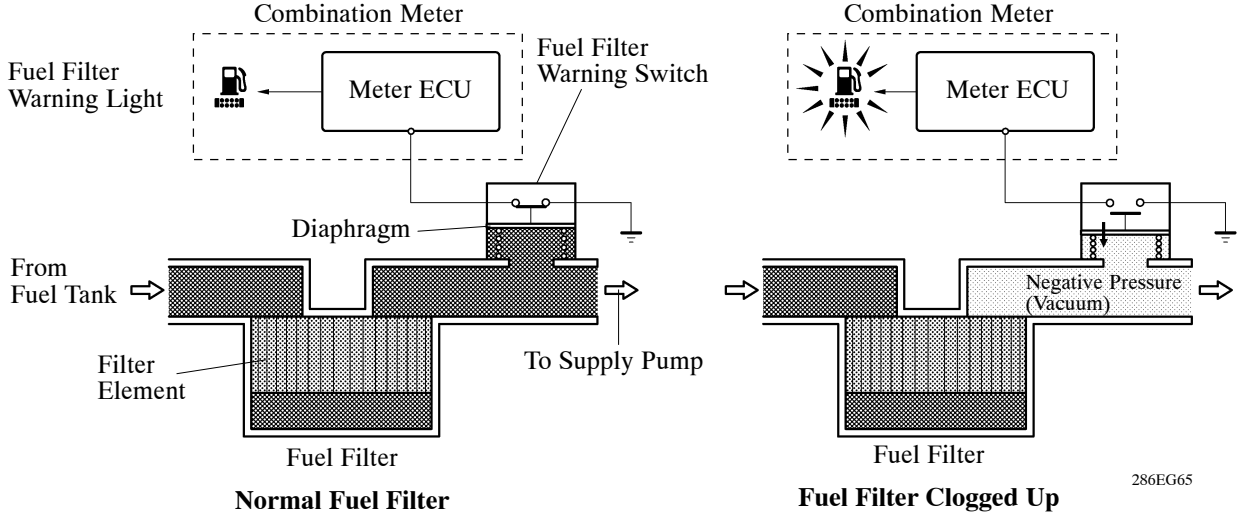
General

- The conventional fuel filter consists of a fuel filter element integrated with a fuel filter housing. By contrast, the new fuel filter consists of a fuel filter housing and a fuel filter element separately.
- A paper filter element that offers high filtering efficiency and captures the minutest particles is used.
- On cold area specification models, a fuel return valve is provided. The fuel from the engine returns to the fuel tank via the return valve. On the other models, the fuel from the engine returns to the fuel tank directly.



Fuel Filter Warning Switch

- A fuel filter warning switch, which turns OFF when the internal vacuum of the filter increases, is provided in the fuel filter. This switch, which turns OFF when the internal vacuum of the fuel filter increases to a predetermined level, is connected by wire to the meter ECU.
- When the meter ECU detects that the internal vacuum of the fuel filter has increased (by way of the fuel filter warning switch OFF signal), it determines that the fuel filter has become clogged. Then, it illuminates the fuel filter warning light on the combination meter to urge the driver to replace the fuel filter. For details on fuel filter warning light control, see page BE-19.

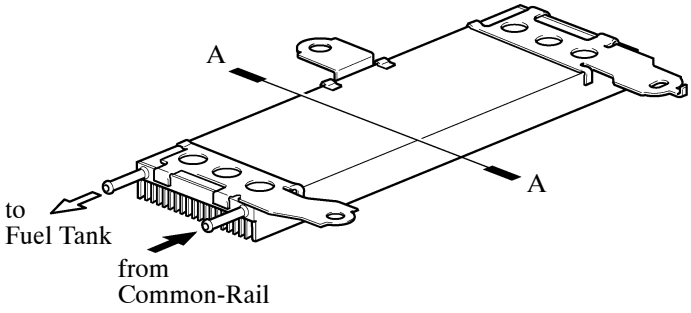


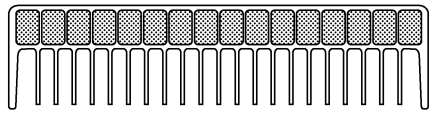
Fuel Sedimenter Level Warning Switch

- When the water in the sedimenter section reaches a certain amount, the level warning switch comes ON and the warning light in the combination meter blinks.
- On models for Thailand, when the warning light blinks, the buzzer sounds.

4. Fuel Cooler

- On high roof models for Thailand, a fuel cooler made of aluminum 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

286EG21