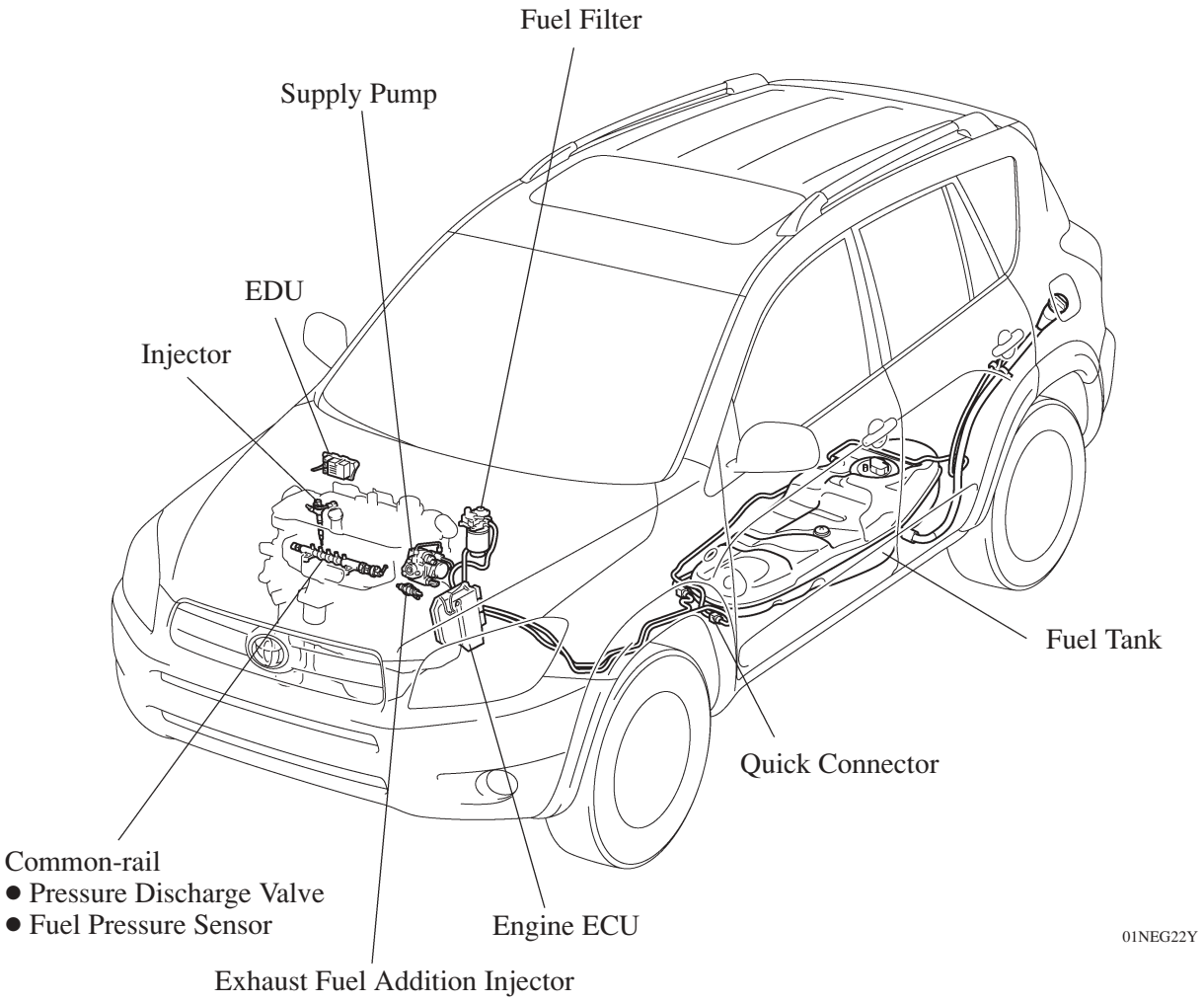
■FUEL SYSTEM

1. General

- A fuel outlet for the exhaust fuel addition injector is added to the supply pump.
- A pressure discharge valve is added to the common-rail.
- A piezo type injector is used.
- The exhaust fuel addition injector is added for catalyst support control.
- Along with the changes in the common-rail system from the 2AD-FTV engine, the fuel cooler is not used in the 2AD-FHV engine.

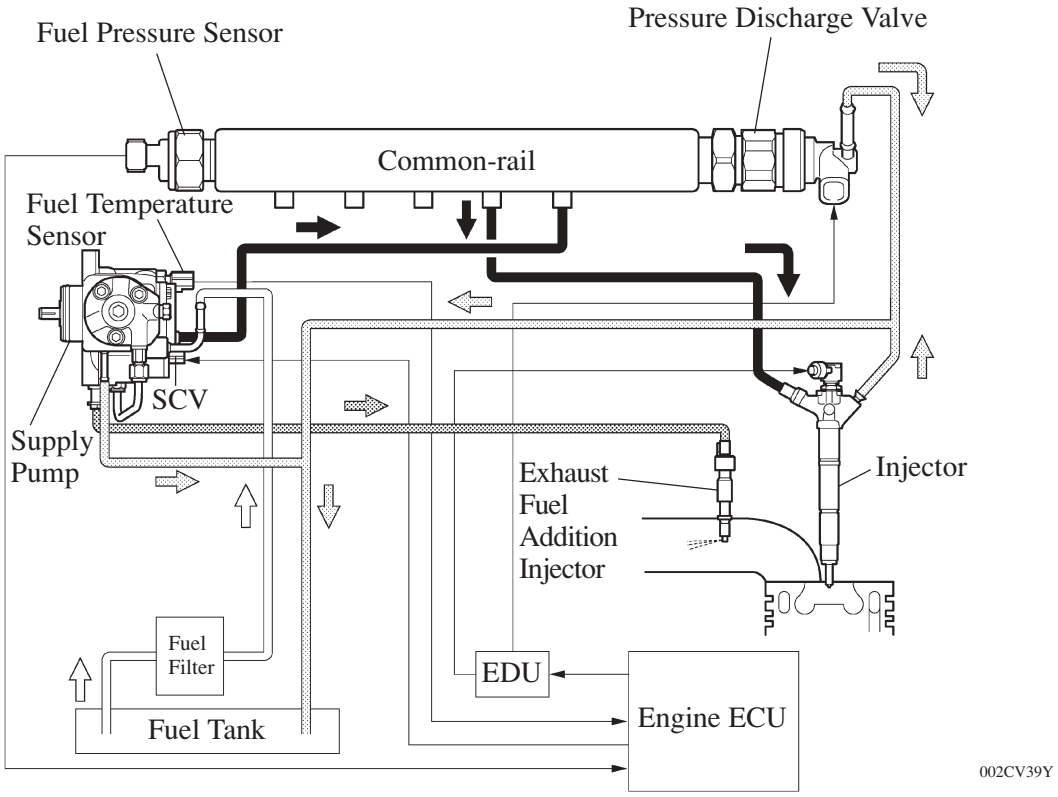


2. Common-rail System

General

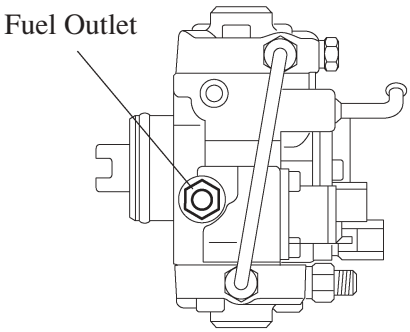
In this system, the high-pressurized fuel that is supplied by the supply pump is stored in the common-rail, and the engine ECU sends signals to the injectors by way of the EDU (Electronic Driver Unit) in order to control the injection timing and injection volume. For details of this control, see page EG-129.

▶ System Diagram ◀



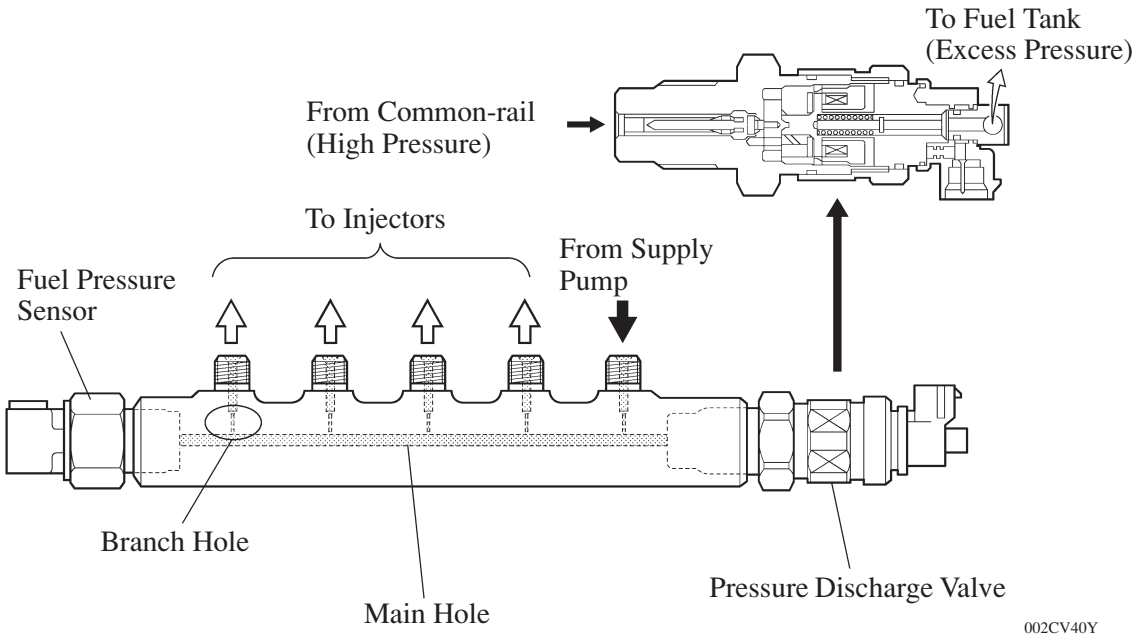
Supply Pump

The fuel outlet for the exhaust fuel addition injector is added.



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 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 EDU. 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 EG-137.



Service Tip

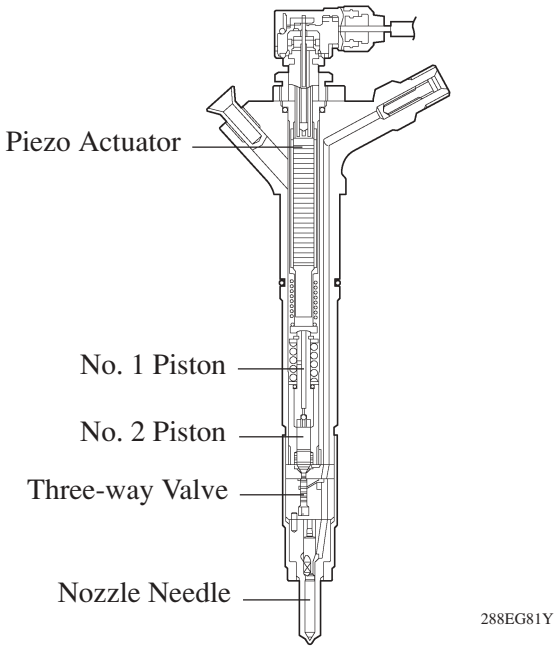
- Fuel pressure sensor has its sealing portion plastic-deformed in order to keep sealing performance, so do not reuse it after disassembling.
- The fuel pressure sensor and pressure discharge valve are supplied as a set with the common-rail.
- Do not disassemble the fuel pressure sensor and pressure discharge valve.
- 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, Cylinder Head and Intake Manifold
  Fuel Inlet Pipe: Supply Pump, Common-rail, Cylinder Head and Intake Manifold

For details, refer to the RAV4 Repair Manual (Pub. No. RM01N0E).

Injector

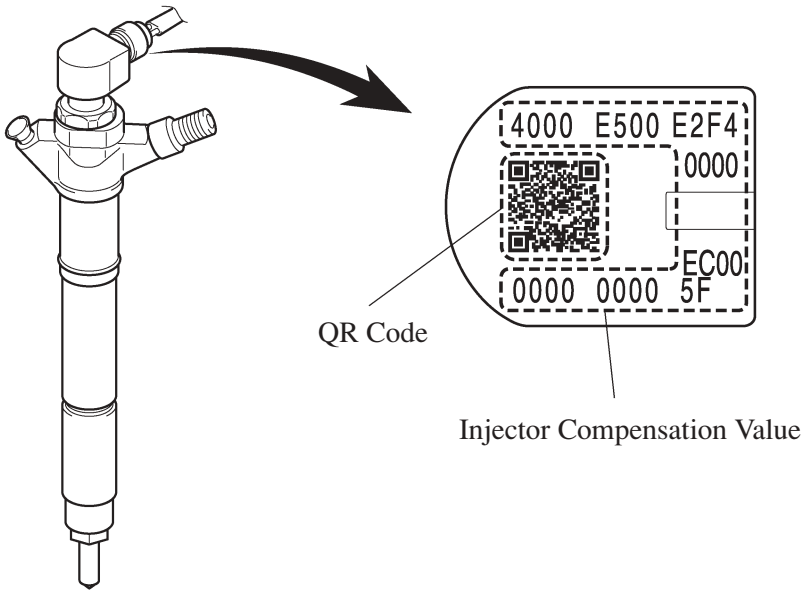
1) General

- The actuator in the injector, which operates nozzle needle, is changed to a piezo type for high-speed operation. Along with this change, the fuel injection characteristics are optimized, achieving low emissions, low combustion noise, and high output.
- The injector consists of a nozzle needle, two pistons, a three-way valve and a piezo actuator.
- 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 engine ECU is replaced, use the intelligent tester II and input the injector compensation values of all 4 injectors. If one of the injectors 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 RAV4 Repair Manual (Pub. No. RM01N0E).
- The QR code, which requires a special scan tool, is not used at Toyota dealers.
- For details of QR code, see page EG-88.



2) Operation

a. During Injection

(1) When charge is applied to the piezo actuator, the No. 1 piston, No. 2 piston and three-way valve are pushed down.

(2) The orifice on the upper part of the three-way valve opens and the fuel in the control chamber flows out.

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

(4) As a result, the nozzle needle is pushed up due to fuel pressure, causing fuel injection.

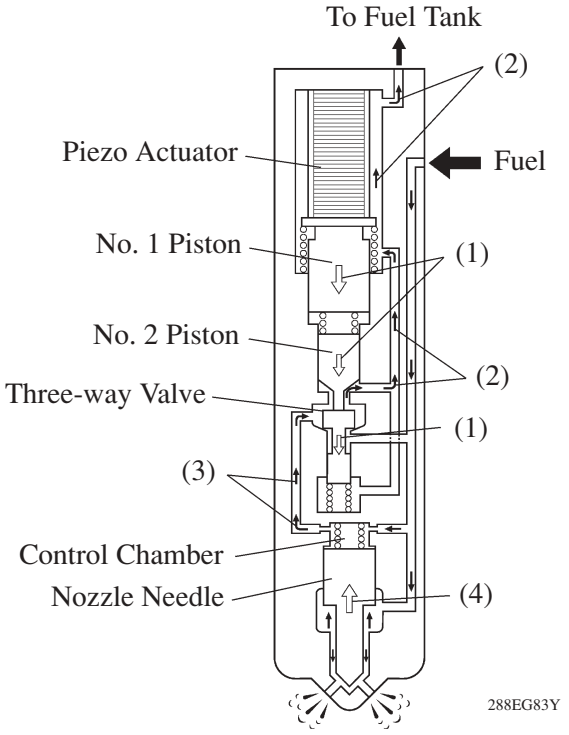
b. While Stopped

(1) The piezo actuator is discharged and the No. 1 piston, No. 2 piston and three-way valve are pushed up due to spring tension.

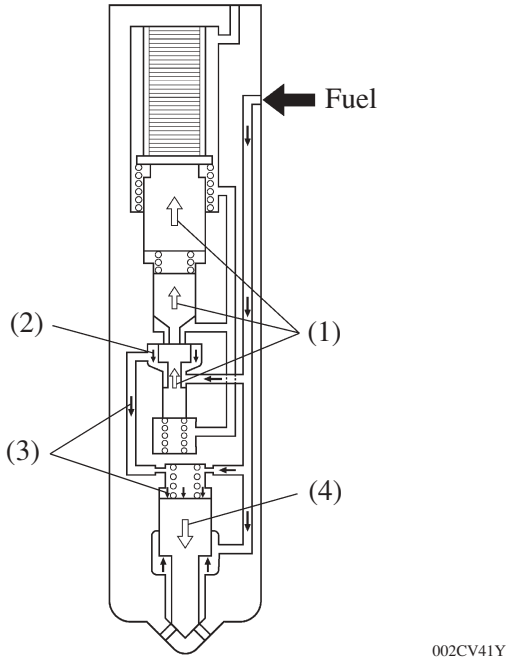
(2) The orifice on the upper part of the three-way valve closes to stop fuel flow.

(3) The fuel pressure in the control chamber rises.

(4) As a result, the nozzle needle goes down to stop fuel injection.



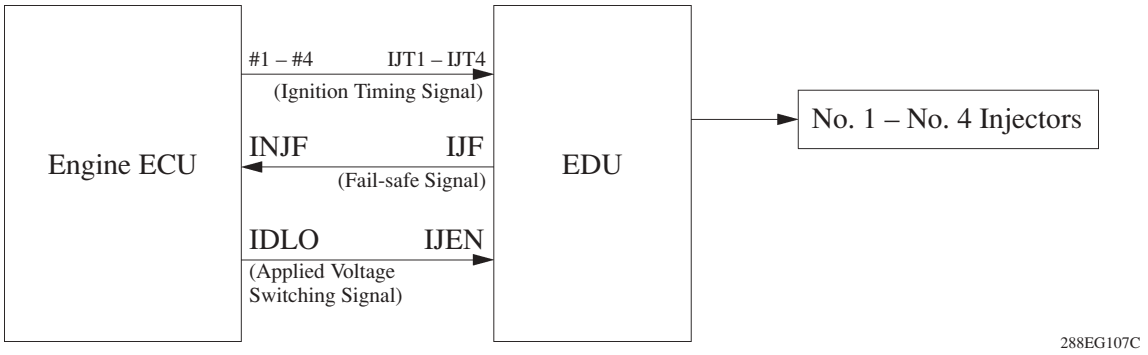
During Injection



While Stopped

3) Control when idling

The engine ECU reduces the charging speed and the applied voltage to the injector to reduce the sound it produced during idling. To do this, the engine ECU outputs applied voltage switching signals to terminal IJEN of the EDU from the terminal IDLO of the engine ECU.



Service Tip

When there is an open circuit between terminal IDLO of the engine ECU and terminal IJEN of the EDU, DTC (Diagnostic Trouble Code) P1625 is stored in the engine ECU and the check engine warning light comes on. For details, refer to the RAV4 Repair Manual (Pub. No. RM01N0E).

Exhaust Fuel Addition Injector

- An exhaust fuel addition injector is installed on the No. 4 exhaust port of the cylinder head. This injector supplies additional fuel into the No. 4 exhaust port for the purpose of realizing fuel enrichment (in order to reduce NOx), and maintains the proper catalyst temperature for the purpose of PM recovery and sulfur poison recovery.
- The exhaust fuel addition injector consists of a needle valve body, needle valve, and solenoid valve.

