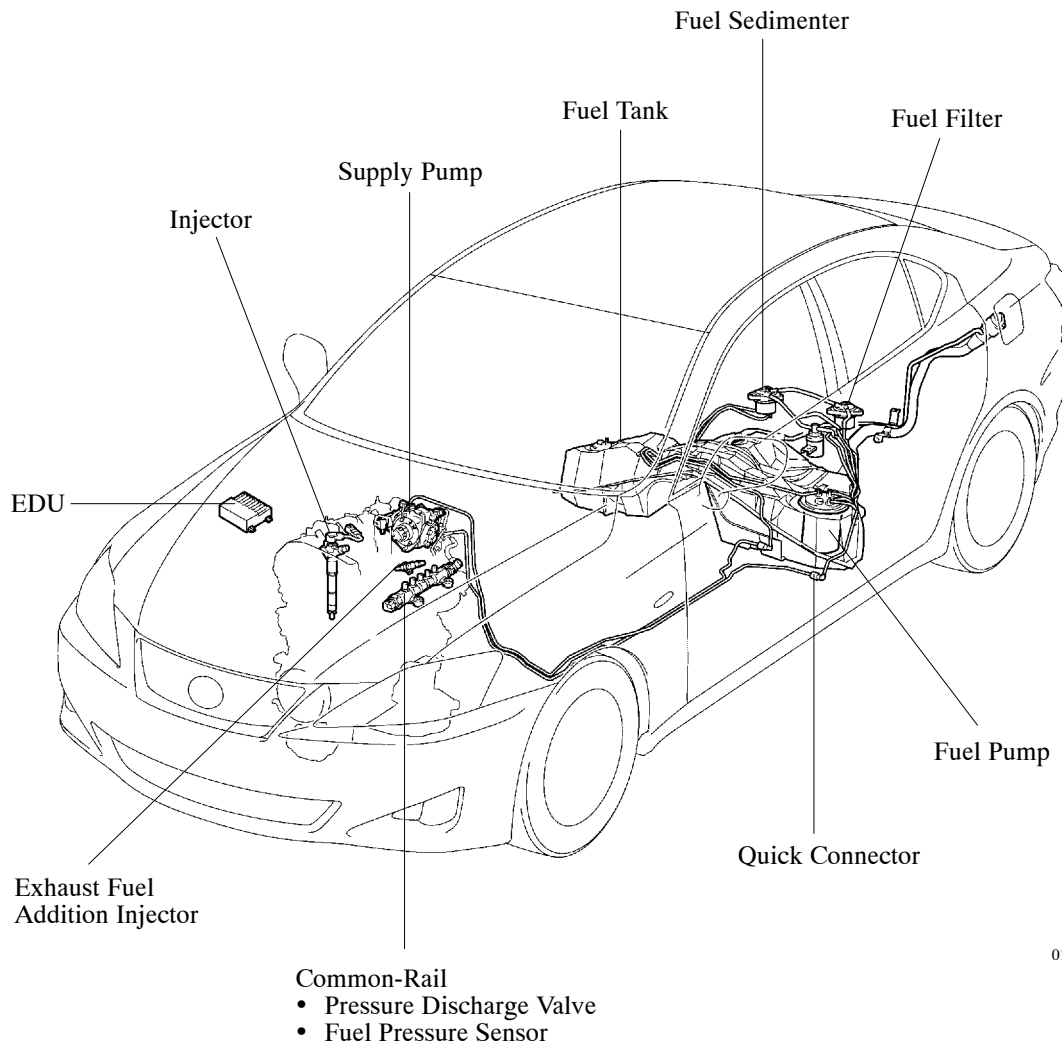


■ FUEL SYSTEM

1. General

- A common-rail system is used for the fuel injection system.
- A HP3 type supply pump, which is compact and lightweight, is used.
- Piezo type injectors are used.
- An injector compensation value and a QR code are printed on each injector to realize high-precision control.
- An exhaust fuel addition injector is used for catalyst support control.
- A quick connector is used to connect the fuel pipe with the fuel hose for excellent serviceability.
- A saddle-shaped fuel tank made of steel is adopted to allow the propeller shaft to pass under the center portion of the tank.
- An electric fuel pump is located in the fuel tank. This fuel pump is controlled by the engine ECU to transfer fuel from one side of the saddle shaped tank to the other side of the tank. It can also be used to perform an auto-priming operation (to remove air) for the main fuel supply pump on the engine. For details, see [page EG-148](#).

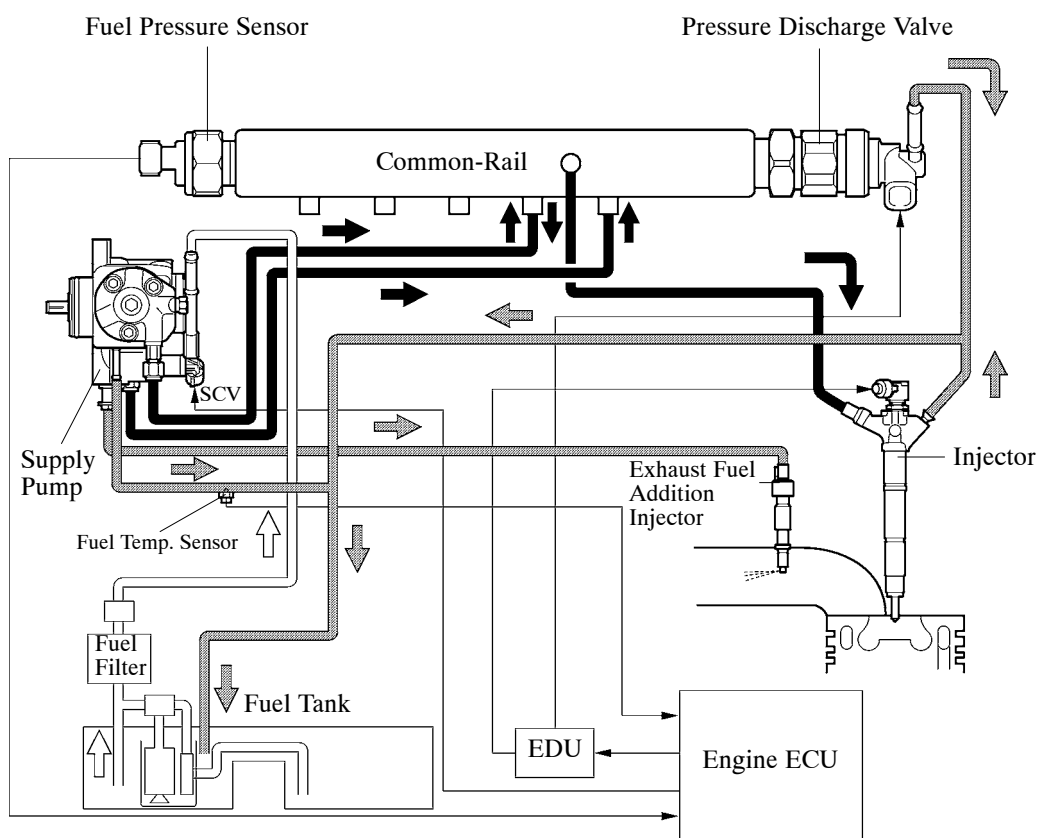


2. Common-Rail System

General

In this system, the highly 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-140.

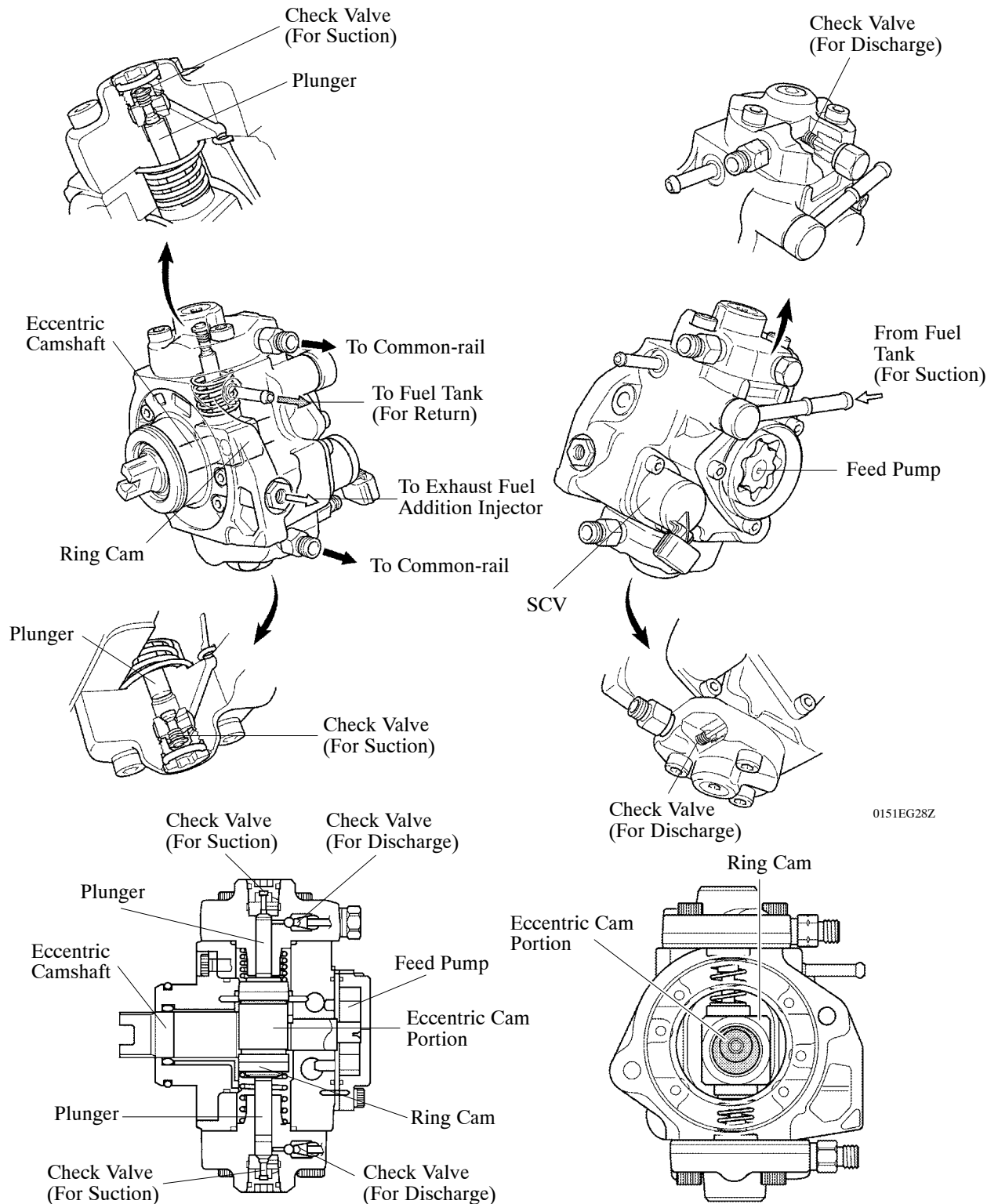
► System Diagram ◀



Supply Pump

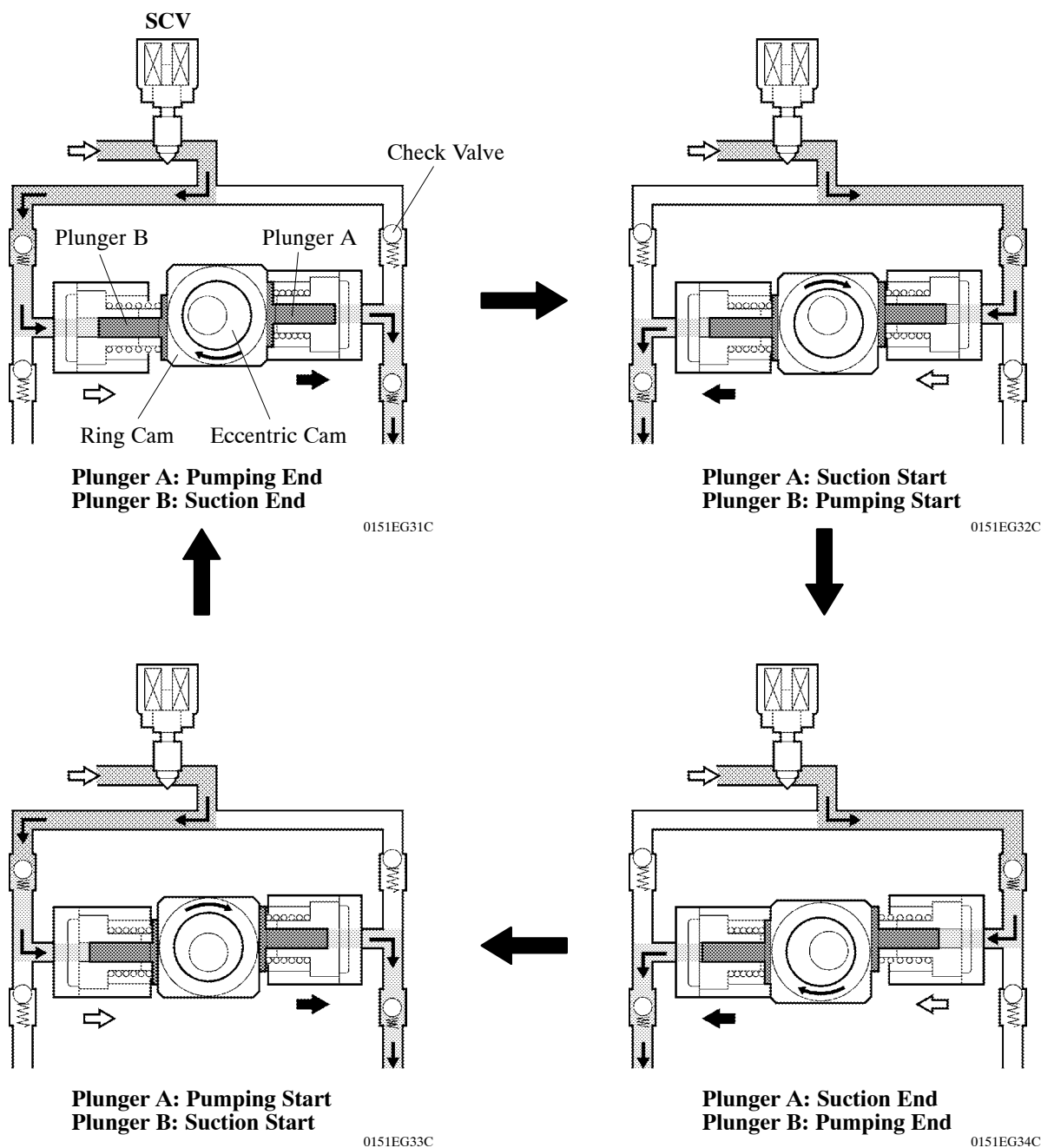
1) General

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



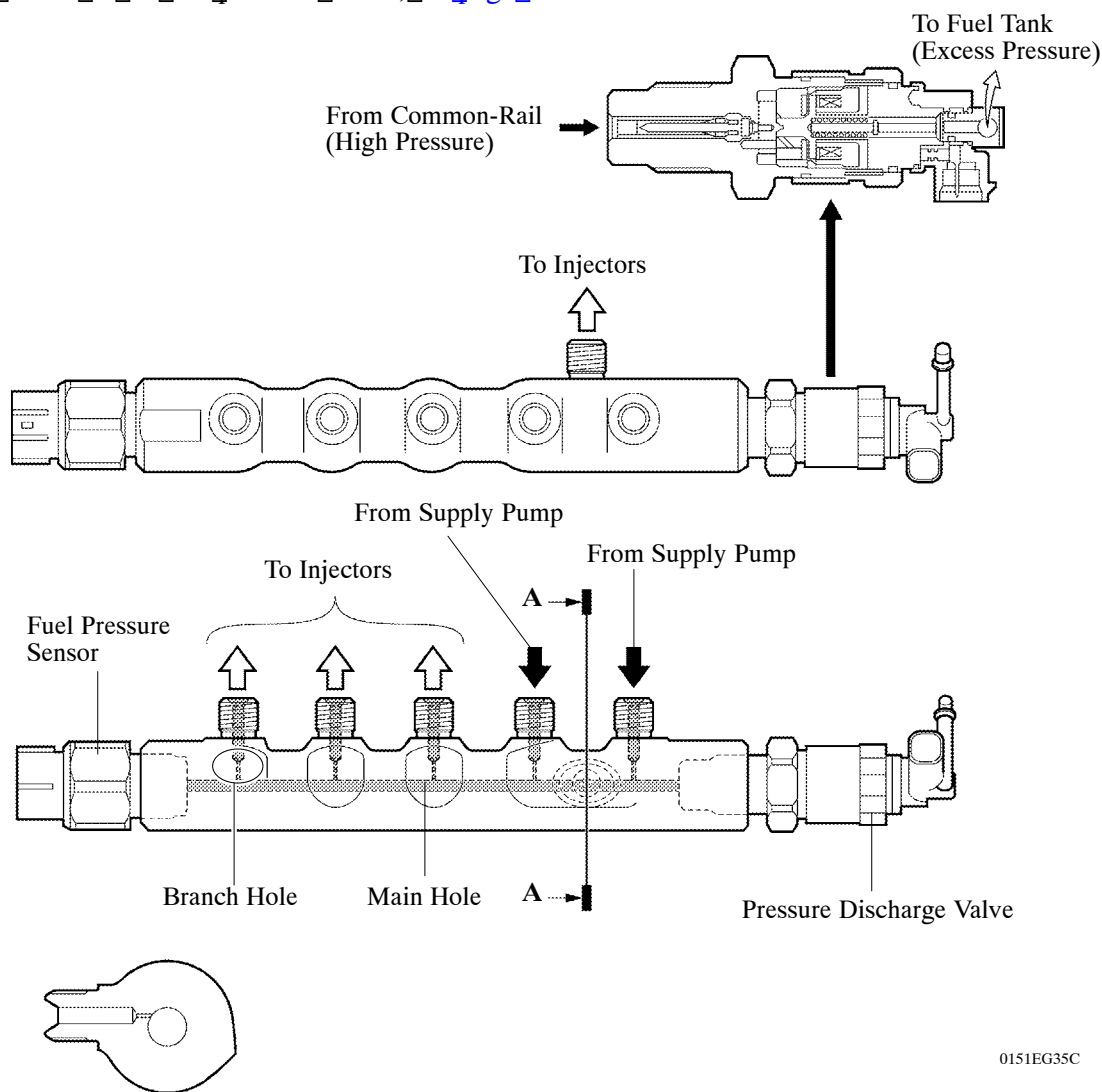
2) Operation

Due to the rotation of the eccentric cam, the ring cam pushes plunger A upward as illustrated below. The force of the spring pushes plunger B back against the retreating ring cam. As a result, plunger B draws fuel in, and plunger A pumps fuel at the same time.



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 discharge valve, which regulates the fuel pressure.
- Internally, the common-rail contains a main hole and six 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 EG-135.



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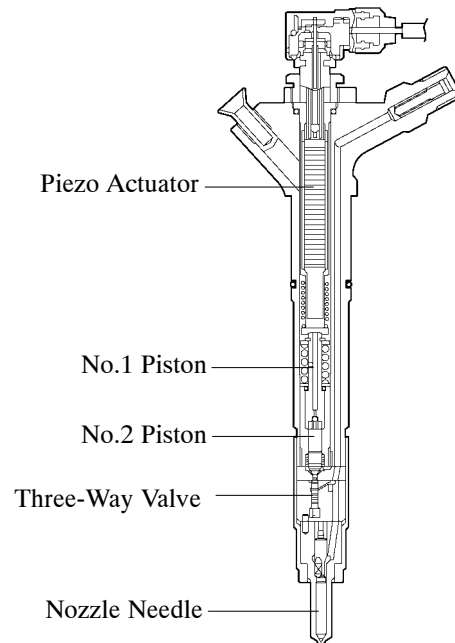
Service Tip

- A portion of the plastic of the fuel pressure sensor deforms in order to achieve effective sealing performance. Do not reuse the fuel pressure sensor if the common-rail is disassembled.
- The fuel pressure sensor and pressure discharge valve are supplied as a set with the common-rail.
- Do not disassemble the pressure discharge valve.
- If parts that affect the alignment have been changed, make sure to replace the pipes with new ones as well. The parts that require the replacement of the pipes are listed below.
 Injection Pipes: Injector, Common-rail, Cylinder Head and Intake Manifold
 Fuel Inlet Pipe: Supply Pump, Common-rail, Cylinder Head and Intake Manifold
 For details, see the LEXUS IS250/220d Repair Manual (Pub. No. RM0151E).

Injector

1) General

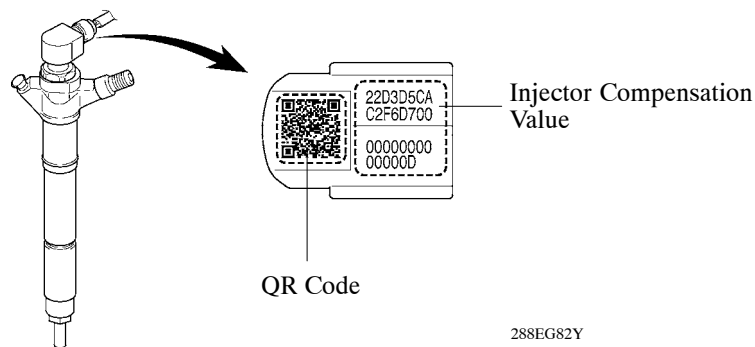
- The actuator in the injector, which operates the nozzle needle, is changed to a piezo type to allow high-speed injector operation. Along with this change, the fuel injection characteristics are optimized, achieving low emissions, low combustion noise, and high output.
- An injector consists of a nozzle 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.



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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 one of the injectors is replaced, input the injector compensation value of the new injector. Then, the proper compensation will be made so that the injection volume precision prior to the replacement will remain unchanged. For details, see the LEXUS IS250/220d Repair Manual (Pub. No. RM0151E).
- 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.

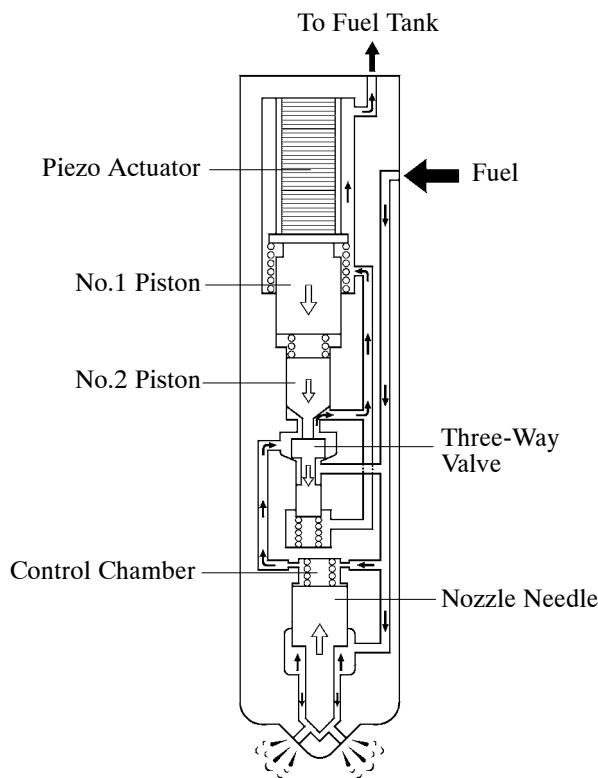
2) Operation

a. During Injection

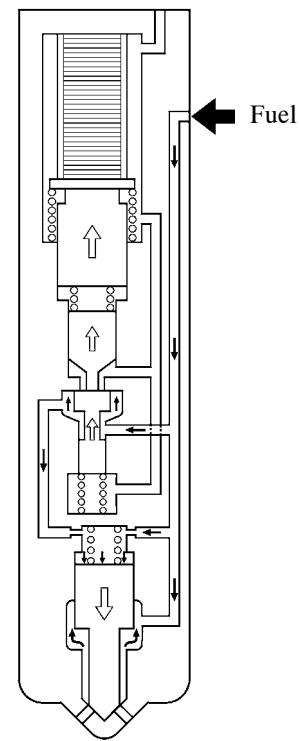
- (1) The piezo actuator is electrically charged when current is applied to it, causing the No.1 piston, No.2 piston and the three-way valve to be pushed down.
- (2) The orifice on the upper part of the three-way valve opens and the fuel in the control chamber flows out.
- (3) The fuel pressure in the control chamber drops.
- (4) As a result, the nozzle needle is pushed up due to fuel pressure, causing fuel injection.

b. While Stopped

- (1) When current is no longer applied to the piezo actuator, it loses its electrical charge, causing the No.1 piston, No.2 piston and the three-way valve to be 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, stopping fuel injection.



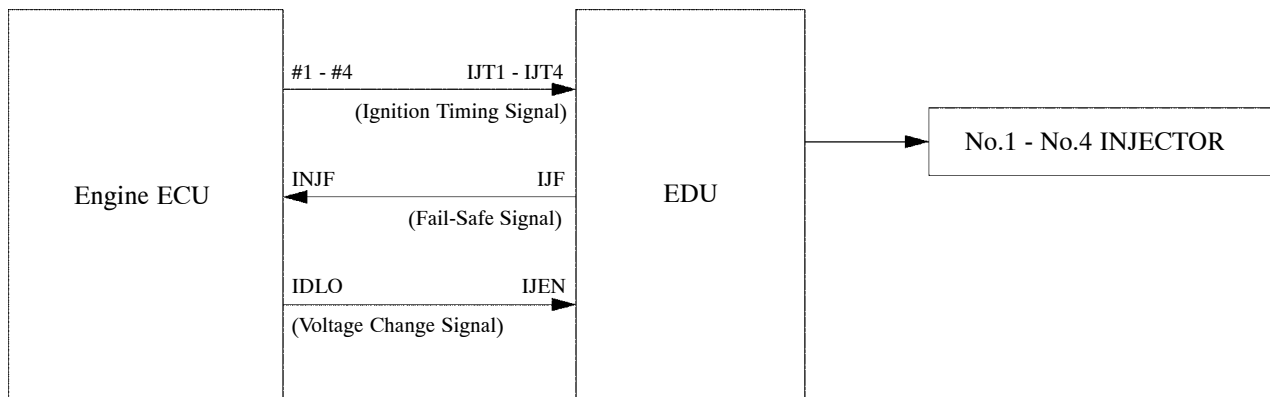
During Injection



While Stopped

3) Control when idling

The engine ECU reduces injector opening speed and voltage applied to the injectors to reduce the sound they produce at idle. To do this, the Engine ECU outputs applied voltage change signals to terminal IJEN of the EDU from terminal IDLO of the Engine ECU.



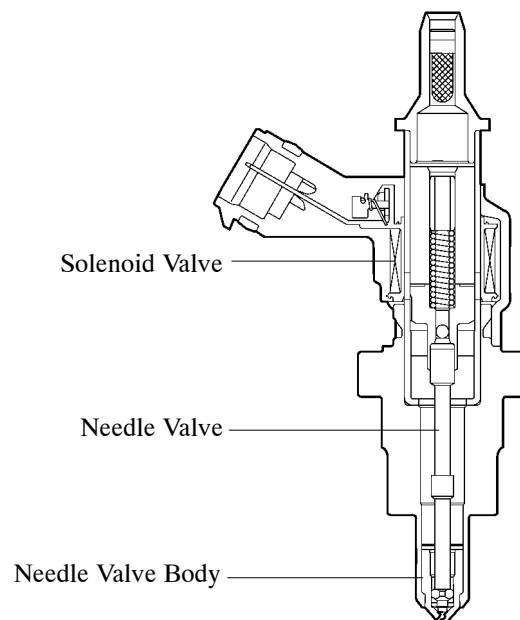
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Service Tip

When there is an open circuit between terminal IDLO of the EDU and terminal IJEN of the engine ECU, DTC (Diagnostic Trouble Code) P1625 is stored in the ECU and the check engine warning light comes on. For details, see the LEXUS IS250/220d Repair Manual (Pub. No. RM0151E).

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 exhaust fuel enrichment (in order to reduce NO_x), to help create and maintain the proper catalyst temperature for the purpose of PM (Particulate Matter) recovery and sulfur poison recovery.
- An exhaust fuel addition injector consists of a needle valve body, needle valve, and solenoid valve.



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