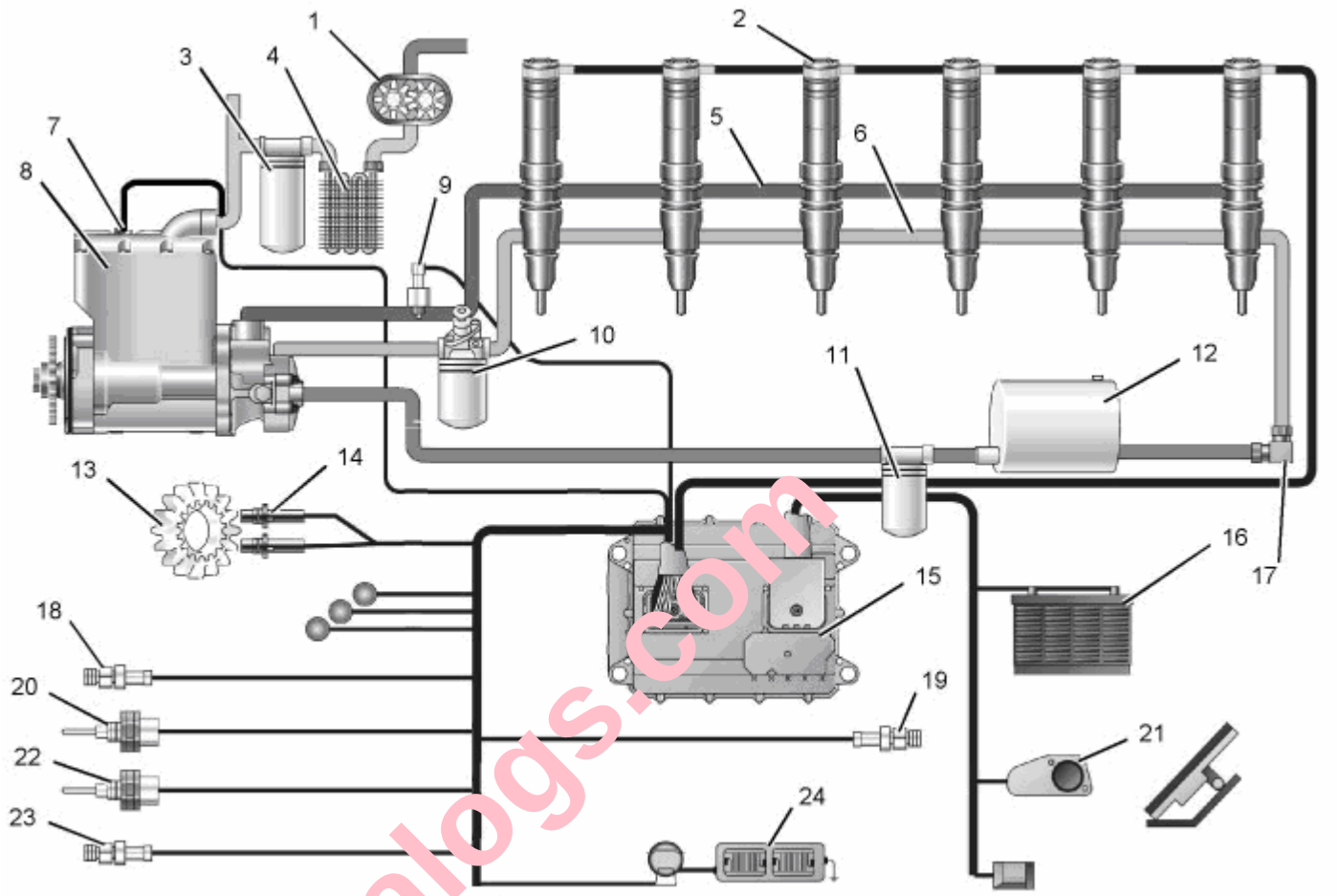
C-9 HUEI Fuel System



(1) Oil pump

(2) Hydraulic electronic unit injectors

(3) Oil filter

(4) Oil cooler

(5) High pressure oil

(6) Fuel

(7) Connector for the Injection Actuation Pressure Control Valve (IAPCV)

(8) Unit injector hydraulic pump

(9) Sensor for the Injection Actuation Pressure (IAP)

(10) Fuel filter

(11) Primary fuel filter and water separator

(12) Fuel tank

(13) Camshaft gear

(14) Speed/Timing sensors

(15) Engine Control Module (ECM)

(16) Battery

(17) Fuel pressure regulator

(18) Boost pressure sensor

(19) Oil pressure sensor

(20) Coolant temperature sensor

(21) Throttle position sensor

(22) Inlet air temperature sensor

(23) Atmospheric pressure sensor

Introduction

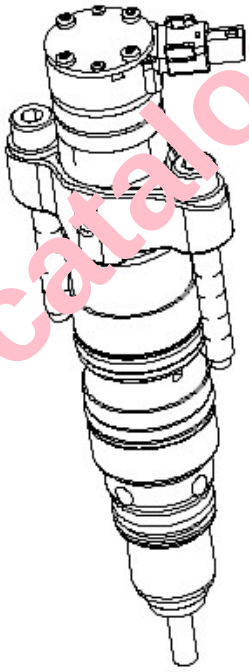
The operation of the Hydraulic Electronic Unit Injector fuel system is completely different from any other fuel system that is actuated mechanically. The HEUI fuel system is completely free of adjustment. Adjustments to the components that are mechanical can not be made. Changes in performance are made by installing different software in the ECM.

This fuel system consists of four basic components:

- Hydraulic Electronic Unit Injector (HEUI)
- ECM
- Unit injector hydraulic pump
- Fuel transfer pump

Note: The fuel transfer pump is a serviceable part. The internal components of the HEUI fuel system are not serviceable. These fuel system components must not be disassembled. Disassembly will damage the components. If the components have been disassembled, Caterpillar may not allow a warranty claim or Caterpillar may reduce the warranty claim.

Component Description



Hydraulic Electronic Unit Injector

The fuel system utilizes a hydraulically actuated electronically controlled unit injector.

All fuel systems for diesel engines use a plunger and barrel in order to pump fuel under high pressure into the combustion chamber. The HEUI uses engine oil under high pressure in order to power the plunger.

The HEUI uses engine lubrication oil that is pressurized from 6 MPa (870 psi) to 28 MPa (4061 psi) in order to pump fuel from the injector. The high pressure oil is called the injection actuation pressure. The HEUI operates in the same way as a hydraulic cylinder in order to multiply the force of the high pressure oil. This multiplication of pressure is achieved by applying the force of the high pressure oil to a piston. The piston is larger than the plunger by approximately six times. The piston that is powered by engine lubrication oil under high pressure pushes on the plunger. The actuation pressure of the oil generates the injection pressure that is delivered by the unit injector. Injection pressure is greater than actuation pressure of the oil by approximately six times.

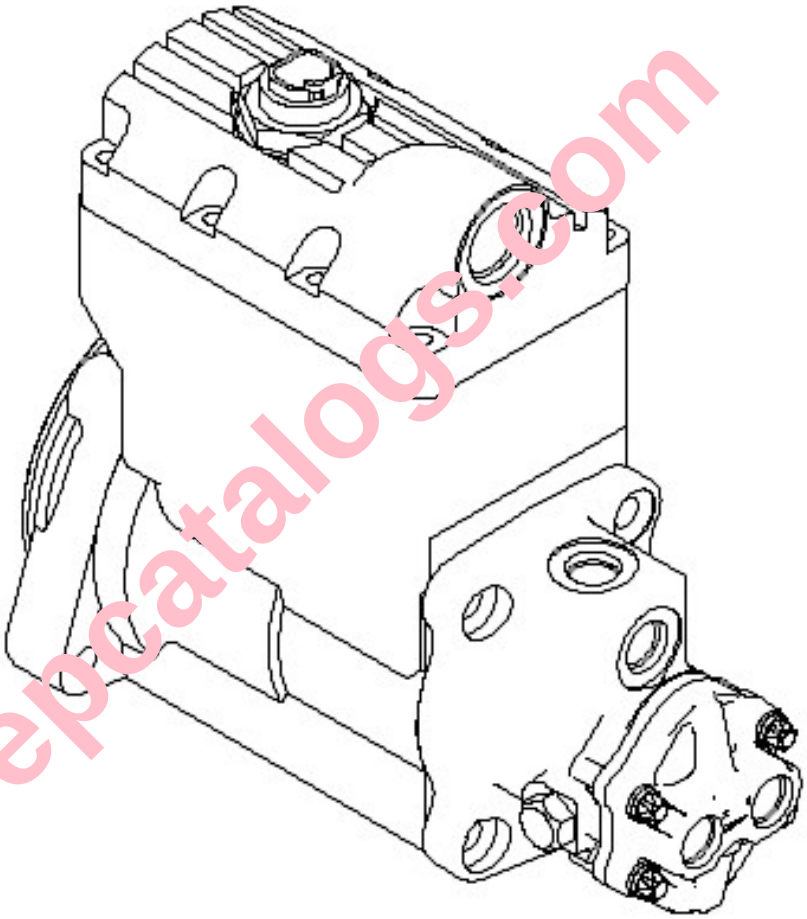
Low actuation pressure of the oil results in low injection pressure of the fuel. High actuation pressure of the oil results in high injection pressure of the fuel.

ECM

The ECM is located on the left side of the engine. The ECM is a powerful computer that provides total electronic control of engine performance. The ECM uses data from engine performance that is gathered by several sensors. The ECM uses this data in order to make adjustments to the fuel delivery, injection pressure and injection timing. The ECM contains programmed performance maps (software) in order to define horsepower, torque curves and rpm.

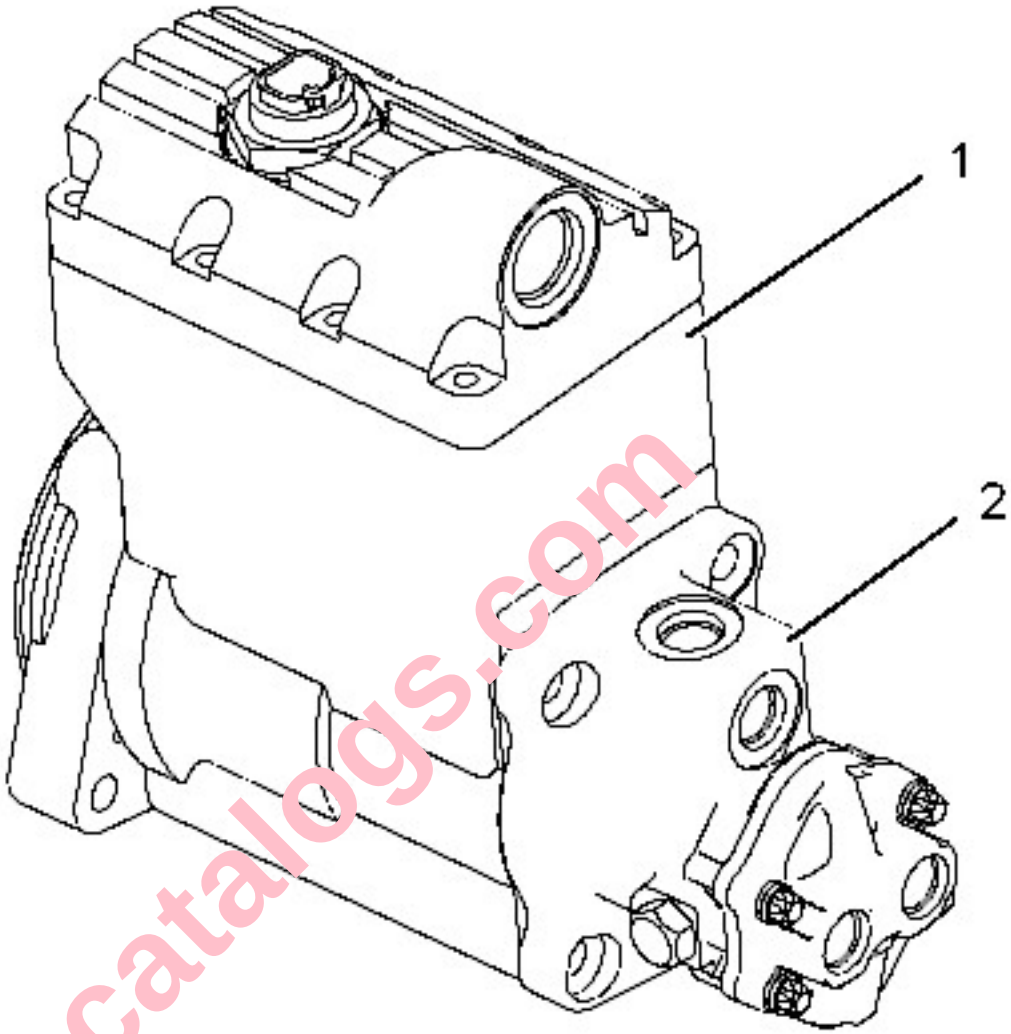
The ECM logs faults of engine performance. The ECM is also capable of running several diagnostic tests automatically when the ECM and Caterpillar Electronic Technician (ET) are used together.

Unit Injector Hydraulic Pump



The unit injector hydraulic pump is a variable delivery piston pump. The unit injector hydraulic pump uses a portion of the engine lubrication oil. The unit injector hydraulic pump pressurizes the engine lubrication oil to the injection actuation pressure that is required in order to power the HEUI injectors.

Fuel Transfer Pump



(1) Unit injector hydraulic pump

(2) Fuel transfer pump

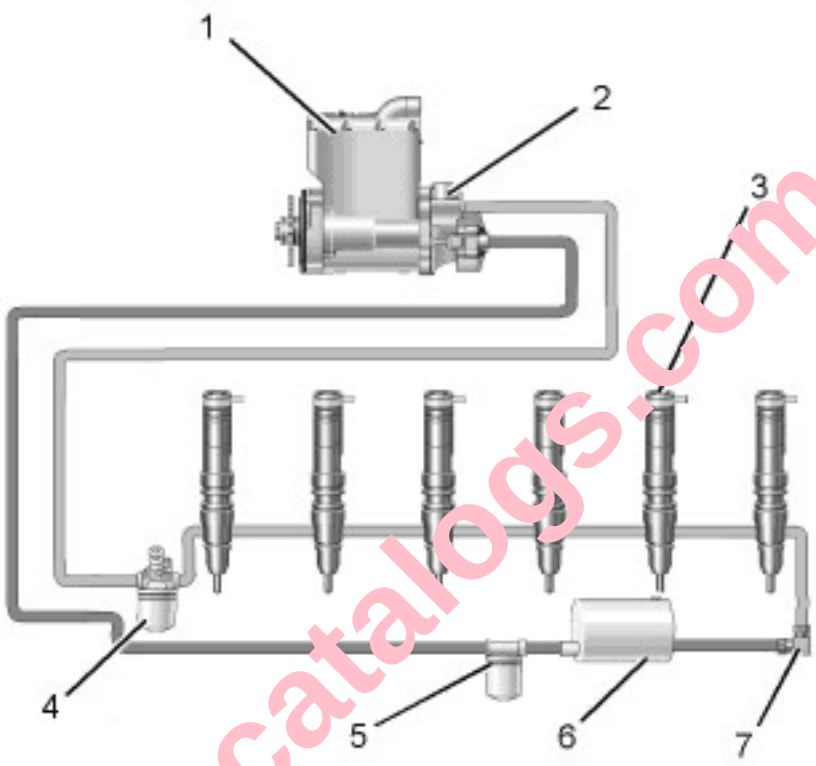
The fuel transfer pump is mounted on the back of the unit injector hydraulic pump. The fuel transfer pump is the only serviceable part of the unit injector hydraulic pump. The fuel transfer pump is used in order to draw fuel from the fuel tank . Also, the fuel transfer pump is used in order to pressurize the fuel to 450 kPa (65 psi). The fuel transfer pump has an internal relief valve in order to protect the system. The pressurized fuel is supplied to the injectors.

Injection Actuation Pressure Sensor (IAP)

The IAP Sensor monitors injection actuation pressure. The IAP Sensor sends a continuous voltage signal back to the ECM . The ECM interprets the signal. The ECM is aware of the injection actuation pressure at all times. The ECM analyzes the voltage from the sensor. The ECM then adjusts the current to the solenoid.

HEUI Fuel System

Low Pressure Fuel System



(1) Unit injector hydraulic pump

(2) Fuel transfer pump

(3) Hydraulic electronic unit injector

(4) Secondary fuel filter

(5) Primary fuel filter and water separator

(6) Fuel tank

(7) Fuel pressure regulator

The low pressure fuel system serves two functions. The low pressure fuel system supplies fuel for combustion to injectors. The low pressure fuel system also supplies excess fuel flow in order to remove air from the system.

The low pressure fuel system consists of five basic components:

- Fuel tank
- Primary fuel filter/water separator
- Two micron secondary fuel filter
- Fuel transfer pump
- Fuel pressure regulator

Fuel is drawn from the fuel tank and flows through a thirteen micron primary fuel filter/water separator. The primary fuel filter/water separator removes large debris from the fuel. The primary filter element also separates water from the fuel. The water is collected in the bowl at the bottom of the primary fuel filter/water separator.

Fuel flows from the primary fuel filter/water separator to the inlet side of fuel transfer pump. An inlet check valve in the inlet port of the fuel transfer pump opens in order to allow the flow of fuel into the pump. After the fuel flow has stopped, the inlet check valve closes in order to prevent fuel flow out of the inlet port. Fuel flows from the inlet port in the pump to the outlet port. Pressurized fuel flows from the outlet port of the pump to the two micron secondary fuel filter. A two micron secondary fuel filter is standard on all Caterpillar engines. These fuel filters are high efficiency. This filter removes very small abrasive contaminants from the fuel.