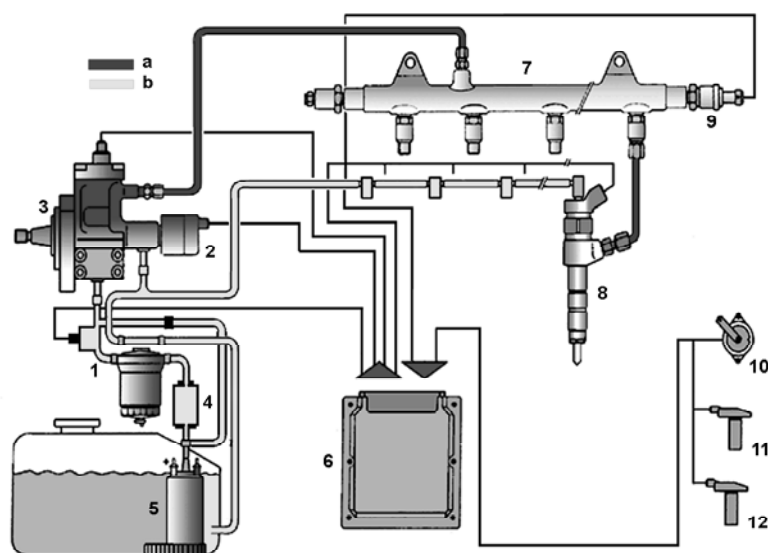


Diesel fuel system

The diesel fuel system (see Figure 11) consists of an extra underbonnet fuel pump and fuel return lines. Also, a diesel cooler is fitted to the fuel tank return line. The right hand venturi on the diesel system is fed directly from the pump in the tank and a tee- joint feeds the venturi in the opposite side. Unlike the in-tank filter fitted to petrol derivatives, the diesel filter is fitted externally to the tank in an underbonnet location.

The extra pump is fitted before the fuel filter and increases the pressure to assist the fuel through any potential blockage of the filter during cold starts. The extra pump helps to ensure all engine fuelling requirements are satisfied in all conditions.

A pressure regulator is located after the filter and relieves fuel into the secondary pump feed.



Fuel system

- a. High-pressure
- b. Low-pressure
- 1. Pressure sensor and fuel filter
- 2. Pressure relief valve
- 3. High pressure pump
- 4. In line electric fuel pump (low-pressure)
- 5. In-tank low-pressure electric fuel pump
- 6. Engine control module
- 7. High-pressure fuel rail
- 8. Injector
- 9. Fuel rail pressure sensor
- 10. Pedal demand sensor
- 11. Crankshaft position sensor
- 12. Camshaft position sensor

Fuel leaves the tank from an outlet on the top of the filter adapter unit and is transferred to a secondary low-pressure fuel pump. Both the primary and secondary low-pressure fuel pumps are controlled by the ECM via a single relay. When the ignition is switched to position II, the fuel pump relay is energised for up to 20 seconds, this operates the low-pressure fuel pumps to build up approximately 2.5 bar line pressure supply to the main fuel filter and high-pressure fuel pump. The spill return from the high-pressure pump and injectors is returned to the tank via a connection to the right hand section of the fuel tank. The excess fuel flow divides into two at a tee connection, one output passes fuel through a venturi which draws fuel from the left side of the tank and delivers it to the right side of the tank. The other output passes fuel through a venturi which draws fuel from the right hand side of the tank and delivers it to the swirl pot. This arrangement ensures that the left side of the tank is scavenged into the right side, and the fuel level in the swirl pot is always maintained regardless of vehicle movement.

Each side of the fuel tank contains a sender unit to detect fuel level. The senders are wired in series to the instrument pack. The instrument pack utilises an algorithm to calculate fuel level from both level sender units.

The ECM detects pressure in the low-pressure side of the system via a pressure sensor installed in the fuel filter head. The sensor output is required by the ECM to determine if the high-pressure fuel pump is receiving sufficient pressure. If the ECM detects insufficient inlet pressure to the high-pressure fuel pump, it will reduce engine speed and fuel rail pressure accordingly to prevent damage to the high-pressure fuel pump.

Comparison of a common rail system to a conventional system

Conventional injection characteristics

In conventional injection systems, such as the use of distributor and in—line injection pumps, only a single injection takes place. Pressure generation is coupled to injection volume preparation. This has the following consequences for the injection characteristics:

- The injection pressure rises as the engine speed and injection quantities increase
- The injection pressure increases during injection

As a result:

- At low pressures small quantities are injected
- The peak pressure is more than twice the average fuel injection pressure

Peak pressure determines the load which can be applied to the components of an injector pump and its drive unit.

The average injection pressure is, however, important for the quality of the fuel/air mixture in the combustion chamber.

Common rail injection characteristics

Common rail fulfils the following demands:

- It is possible to independently determine the injection pressure and injection volume for every operating point of the engine which gives an additional degree of freedom for the ideal mixture preparation
- After the start of combustion, it should be possible to select the injection pressure throughout the entire period of injection