

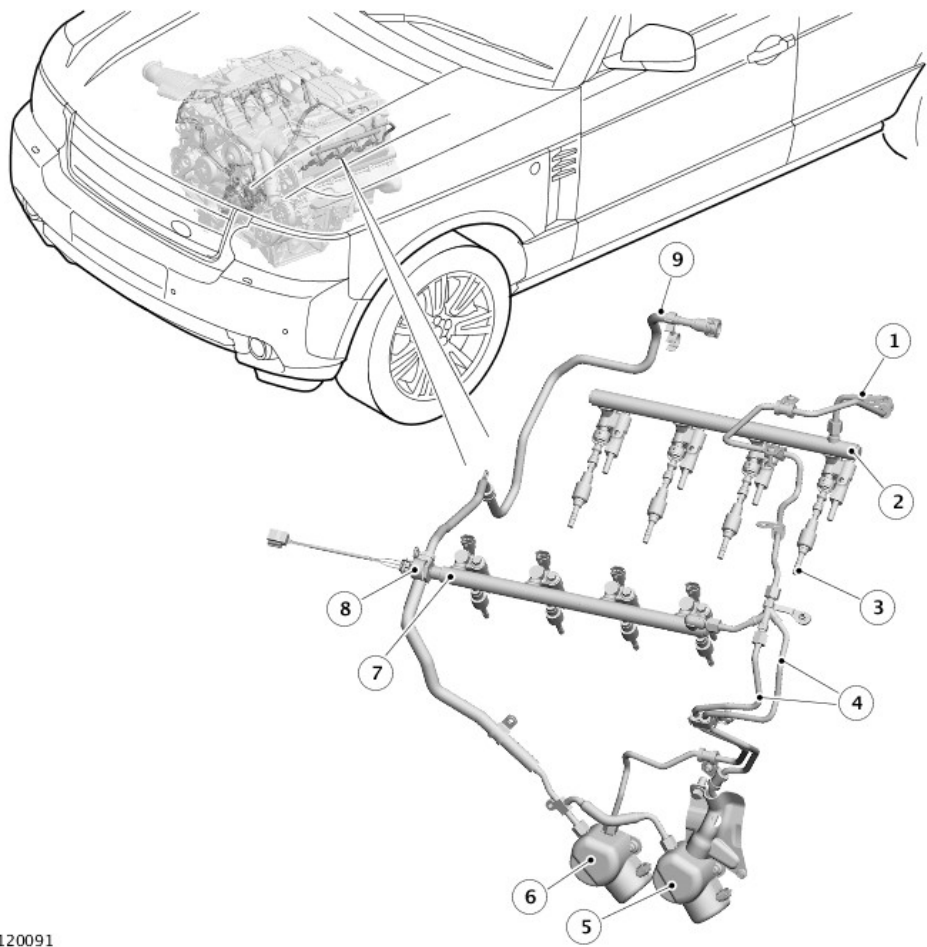
L322 fuel charging controls 5.0l petrol

15 December 2020 20:05

PUBLISHED: 04-JUN-2015
2012.0 RANGE ROVER (LM), 303-04E

FUEL CHARGING AND CONTROLS - V8 S/C 5.0L PETROL (G1219994)

DESCRIPTION AND OPERATION
COMPONENT LOCATION



E120091

ITEM	DESCRIPTION
1	Crossover tube
2	LH (left hand) fuel rail
3	Fuel injector
4	HP (high pressure) fuel lines
5	HP fuel pump - No.1 (Front)
6	HP fuel pump - No.2 (Rear)
7	RH (right hand) fuel rail
8	FRP (fuel rail pressure) sensor
9	LP (low pressure) fuel lines

INTRODUCTION

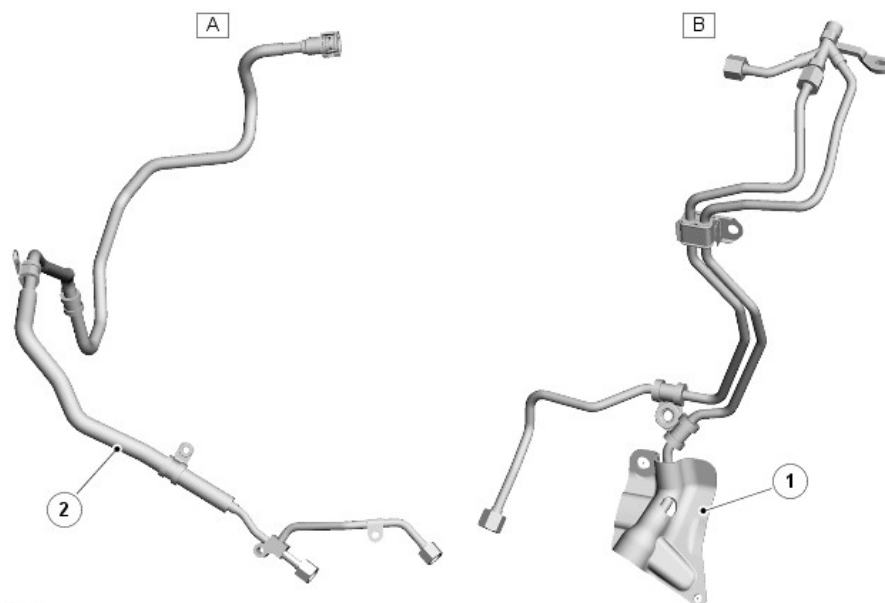
The fuel charging and controls system is a gasoline DI (direct injection) system controlled by the engine control module (ECM).

The fuel charging and controls system consists of:

- LP and HP fuel lines.
- Two HP fuel pumps.
- Two fuel rails and a crossover tube.
- A fuel rail pressure (FRP) sensor.
- Eight fuel injectors.

LP fuel from the pump in the fuel tank is pressurized by the HP fuel pumps and supplied to the fuel injectors via the fuel rails and crossover tube. The ECM controls the fuel injectors and HP fuel pumps to inject the required volume of fuel into the combustion chambers.

LOW AND HIGH PRESSURE FUEL LINES



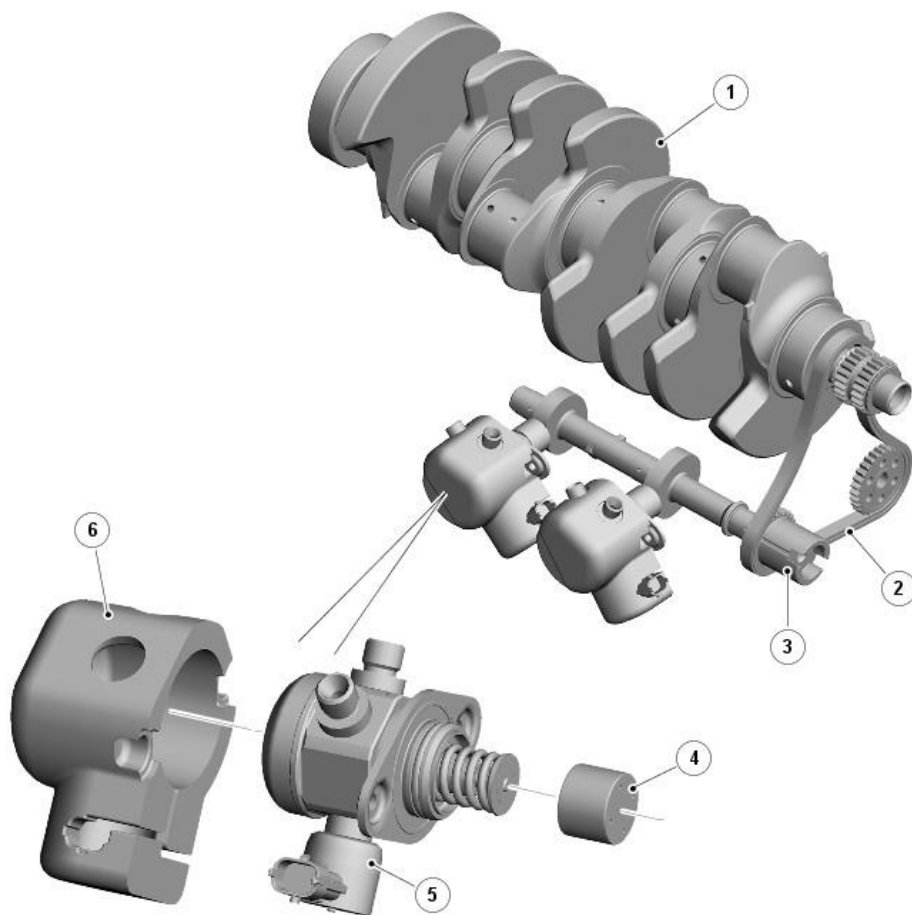
E113515

ITEM	DESCRIPTION
A	LP fuel lines
B	HP fuel lines
1	Acoustic cover
2	Heat reflective and insulation sleeves

The LP fuel line connects the HP fuel pumps to the fuel delivery line from the fuel tank and lines system. A quick release connector at the start of the LP fuel line is held in a clip integrated into the left-hand (LH) ignition coils cover. P-clips secure the LP fuel line to the rear of each cylinder head and to the right-hand (RH) side of the cylinder block. A heat reflective and insulation sleeves are installed on the LP fuel line where it runs behind the RH exhaust manifold.

The HP fuel lines connect the HP fuel pumps to the RH fuel rail and the crossover tube. Two P-clips and a pipe clamp attach the HP fuel lines to the cylinder block and the RH cylinder head respectively. An integral bracket on the front HP fuel line is attached to a stud on the front-upper RH timing cover. An acoustic cover is installed on the bottom of the front HP fuel line.

HIGH PRESSURE FUEL PUMPS



E114701

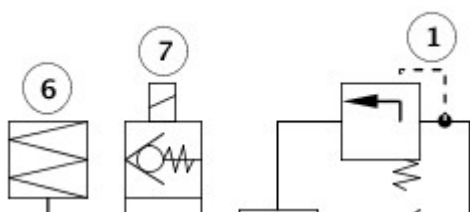
ITEM	DESCRIPTION
1	Crankshaft
2	Auxiliary drive chain
3	Auxiliary camshaft
4	Tappet
5	HP fuel pump - No.2
6	Acoustic cover

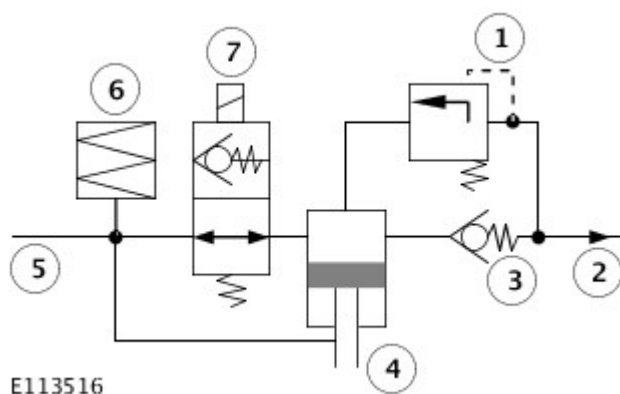
The two HP fuel pumps are identical mechanically-driven pumps installed on the RH side of the sump body, behind the generator. An O-ring seals each of the HP fuel pumps in the sump body. The front HP fuel pump is identified as No. 1 pump; the rear HP fuel pump is identified as No. 2 pump. An acoustic cover is installed on each of the HP fuel pumps.

The HP fuel pumps are single-plunger pumps. The plunger of each pump extends through the sump body and the carrier of the auxiliary camshaft. A tappet on the end each plunger is operated by a two-lobed cam on the auxiliary camshaft. A spring installed on the outside of the plunger ensures the plunger and tappet remain in contact with the cam.

The auxiliary camshaft is driven by the crankshaft, via the auxiliary drive chain, at engine speed. The auxiliary camshaft is timed to match the pump delivery strokes with crankshaft position.

HP Fuel Pump Schematic





ITEM	DESCRIPTION
1	PRV (pressure relief valve)
2	To HP fuel lines
3	Check valve
4	Plunger
5	From LP fuel lines
6	Damper chamber
7	Fuel metering valve

In addition to the plunger, each HP fuel pump contains:

- A damper chamber.
- A fuel metering valve.
- A check valve.
- A PRV.

The damper absorbs pressure pulses from the plunger when the fuel metering valve is open at the start of the delivery stroke.

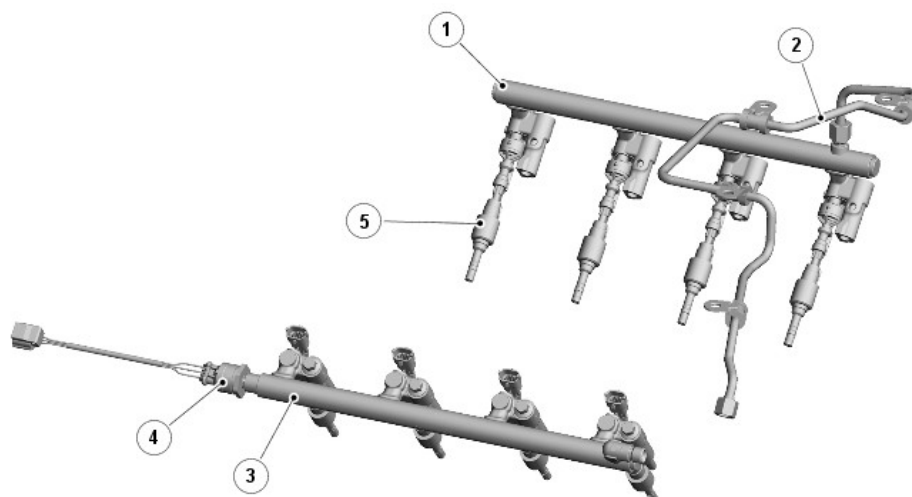
The fuel metering valve regulates the output pressure from the HP fuel pump. The fuel metering valve is a normally open solenoid valve controlled by the ECM. During the inlet stroke of the plunger the fuel metering valve is de-energized, which allows LP fuel into the pumping chamber.

The ECM energizes the fuel metering valve closed during the delivery stroke of the plunger, which forces the fuel in the pumping chamber through the check valve into the HP lines. By changing the closing point of the fuel metering valve, the ECM can determine the volume of fuel output during the delivery stroke, and thus the pressure in the HP side of the system.

The check valve prevents the return of HP fuel to the pumping chamber during the inlet stroke of the plunger.

The PRV protects the HP side of the system from excessive pressure if there is a failure of the fuel metering valve. If the pump delivery pressure increases to 195 - 204 bar (2828 - 2959 lbf/in²), the PRV opens and returns fuel to the inlet side of the plunger.

FUEL RAILS AND CROSSOVER TUBE



E113517

ITEM	DESCRIPTION
1	LH fuel rail
2	Crossover tube
3	RH fuel rail
4	FRP sensor
5	Fuel injector

The fuel rails and crossover tube are made from stainless steel. Bolts attach each fuel rail to the related cylinder head. The crossover tube connects the front high pressure line to the LH fuel rail, which ensures there is equal pressure in the two fuel rails. Four P-clips attach the crossover tube to the intercooler-tank top.

The rear of the RH fuel rail incorporates a threaded boss for installation of the FRP sensor.

FUEL RAIL PRESSURE SENSOR

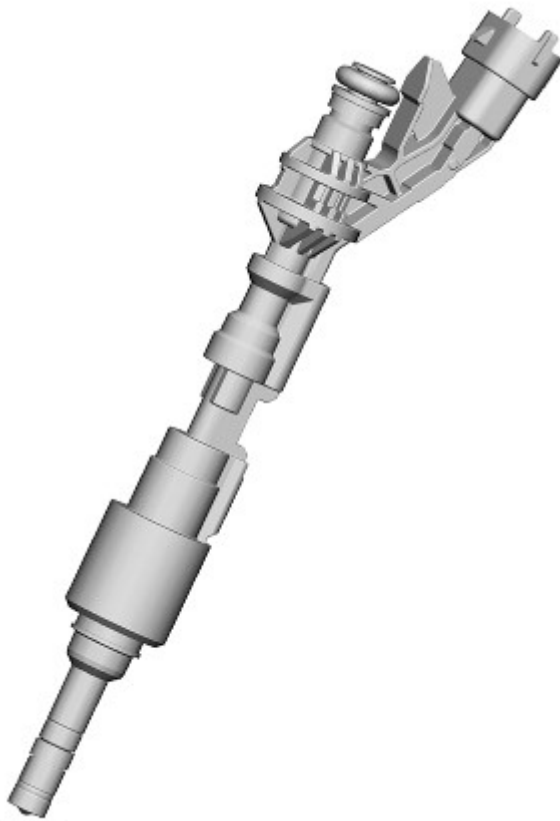


E113518

The FRP sensor provides the ECM with a continuous signal of fuel rail pressure. The FRP sensor is installed in the rear of the RH fuel rail. The FRP sensor is screwed into a threaded boss in the fuel rail. A flying lead and three pin connector provides the interface with the engine harness.

The FRP sensor contains a steel diaphragm fitted with strain gages, which are incorporated into a Wheatstone bridge. The output from the Wheatstone bridge is processed by the ECM to derive a pressure value.

FUEL INJECTORS



E113519

The fuel injectors spray fuel from the fuel rail directly into the combustion chambers. The fuel injectors are installed close to the center of the combustion chambers, between the inlet and exhaust valves and next to the spark plug.

The fuel injectors are a push fit in the fuel rails and the cylinder heads. On each fuel injector, a rubber O-ring seals the head of the fuel injector in the fuel rail. A teflon ring seals the nozzle of the fuel injector in the cylinder head. A clamp locks each fuel injector to the fuel rail.

Each fuel injector contains a solenoid-operated needle valve, which opens when the solenoid winding is energized. While the needle valve is open, fuel is sprayed into the combustion chamber. The solenoid winding is connected to a power feed and a ground from the ECM, which operates the fuel injectors with a two stage power supply. Initially the ECM supplies the fuel injectors with 65 V, then once the boost current reaches 11 A the power supply is switched to battery voltage. The ECM meters the amount of fuel injected into the combustion chambers by adjusting the time that the solenoid winding is energized.

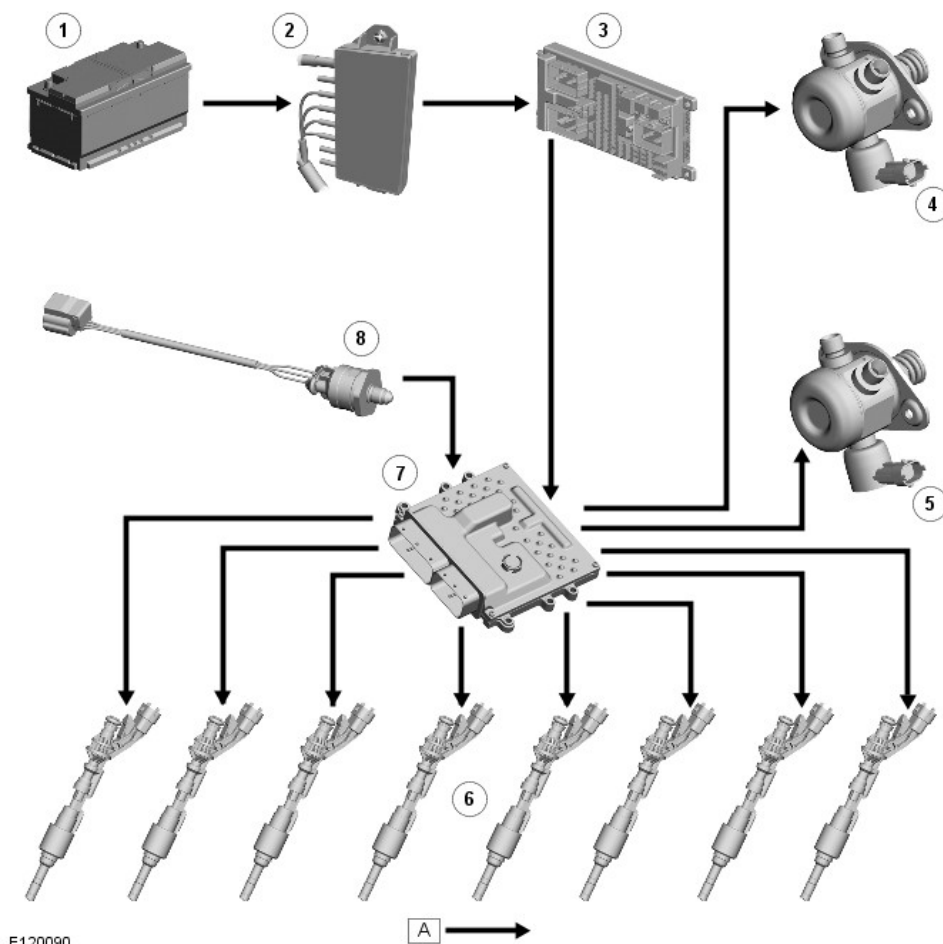
There are six holes around the tip of the nozzle through which the fuel is sprayed. Two of the holes direct fuel below the spark plug. The other four holes direct fuel evenly around the remainder of the combustion chamber.

If a fuel injector fails, the engine will suffer from unstable idle speed, poor noise, vibration and harshness (NVH) and poor emissions performance.

CONTROL DIAGRAM

NOTE:

A = Hardwired



ITEM	DESCRIPTION
1	Battery
2	BJB (battery junction box) (50 A megafuse)
3	CJB (central junction box) (ignition relay)
4	No. 1 HP fuel pump
5	No. 2 HP fuel pump
6	Fuel injectors
7	ECM
8	FRP sensor

PRINCIPLES OF OPERATION

The ECM controls the output from the HP fuel pumps to deliver the required volume of fuel at pressures up to 150 bar (2175 lbf/in²).

The ECM uses the signal from the FRP sensor to calculate the time the fuel injectors need to be energized to deliver the correct mass of fuel to the combustion chambers.

From <https://topix.jaguar.ilrext.com/topix/service/procedure/167833/ODYSSEY/G1219994/en_US?uid=G1440933>