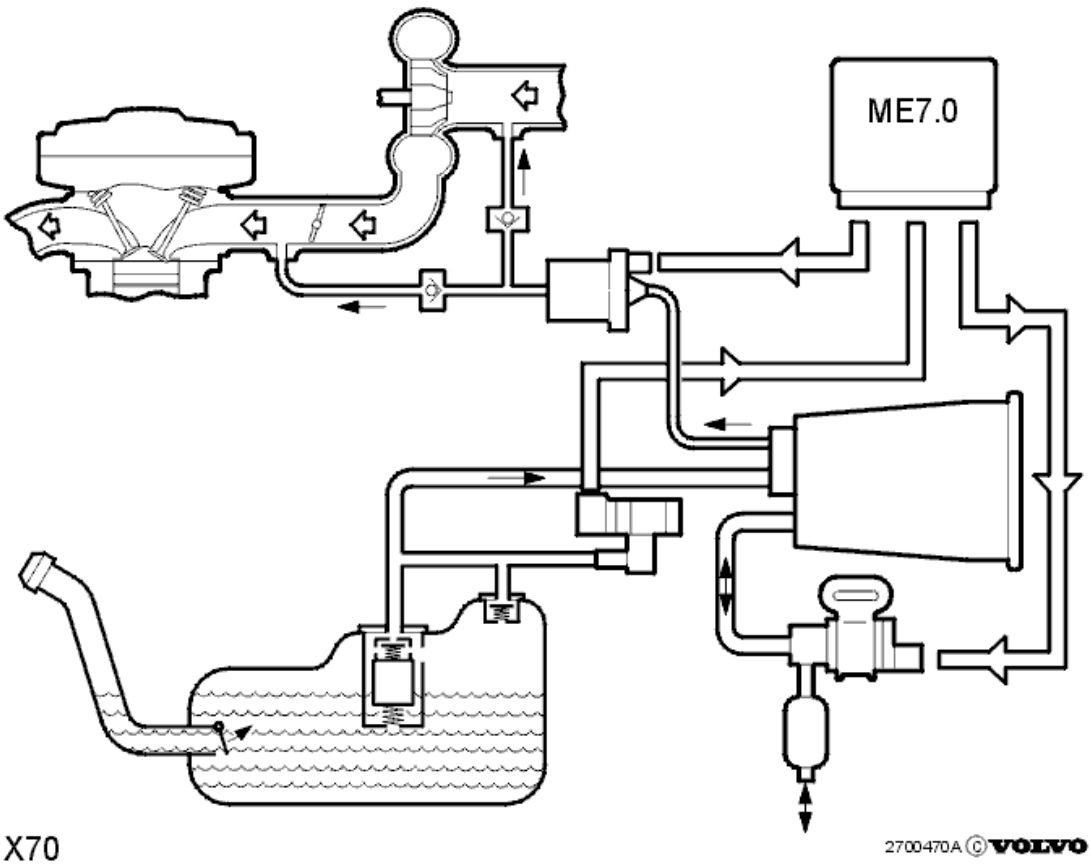
Return Fuel Lacking System (RFLS)



Return Fuel Lacking System

The system has large similarities with the earlier version in the Motronic 4.4 and is market dependent. Some of the components have a new shape but function according to known principles.

Leak diagnostic

Vapor which evaporates from the fuel in the fuel tank is routed to and stored in the EVAP canister from where it is introduced into the combustion process via the canister purge (CP) valve and negative pressure in the intake manifold.

A leak diagnostic has been introduced in certain markets to ensure that there are no leaks in the fuel tank system.

The diagnostic is designed to detect leakage corresponding to a 1mm or larger hole.

The fuel tank system consists of fuel tank, fuel filler pipe, EVAP canister, canister purge (CP) valve and all pipes between these components. To be able to diagnose the fuel tank system, it is also equipped with fuel tank pressure sensor and EVAP canister shut-off valve.

Leak diagnostic different stages

The diagnostic is divided into different phases in which the various components are tested. If a fault is detected in any of the phases the diagnostic is interrupted and the diagnostic trouble code (DTC) for the component identified is stored. Diagnosis is carried out in the following stages:

1. The fuel tank pressure sensor is checked for an unstable signal. Diagnostic trouble code (DTC) for a faulty fuel tank pressure sensor is stored if the signal deviates more than +/- 1 kPa more than 5 times in 5 seconds.

The fuel tank pressure is checked so that it is stable and that the short-term fuel trim is not too low.

2. The EVAP canister shut-off valve closed and an evaporation check is carried out. By gauging how much fuel tank pressure increases value for how much fuel evaporates is provided, and this value is used later to calculate leakage flow. If fuel tank pressure sinks, this indicates that the canister purge (CP) valve is leaking and diagnostic trouble code (DTC) for an open canister purge (CP) valve is stored.
3. The EVAP canister shut-off valve opens, the tank system is open. The canister purge (CP) valve is pulsed and because of the negative pressure in the intake manifold the engine starts to suck air through the EVAP canister. Because EVAP canister shut-off valve is open, the fuel tank pressure sinks slowly. If fuel tank pressure sinks rapidly this indicates that the EVAP canister shut-off valve is clogged and the diagnostic trouble code (DTC) for EVAP canister shut-off valve shut is stored.
4. EVAP canister shut-off valve closes and the canister purge (CP) valve pulses with a duty cycle of approximately 17%. The pressure in the tank then falls to -1 kPa. If this pressure is not reached within 10 seconds it indicates a larger leak in the fuel tank. and the diagnostic trouble code (DTC) for a large leak is stored. If the fuel tank pressure does not change within 2 seconds it indicates a defective fuel tank pressure sensor or clogged piping .The diagnostic trouble code (DTC) for a large leak is stored.
   The canister purge (CP) valve is closed and

5. The canister purge (CP) valve is closed and the EVAP canister shut-off valve is still closed and there is negative pressure in the fuel tank.

This negative pressure will decrease slowly. The decrease rate depends on fuel level, fuel evaporation and any leaks. Leakage flow is calculated by comparing pressure increase speed with the pressure decrease speed from stage 4 and by compensating for the evaporation measured in stage 2. If the calculated leakage flow exceeds a certain level this indicates a smaller leakage in the fuel tank system and diagnostic trouble code for small leak is stored.

6. The EVAP canister shut-off valve opens, the EVAP function is enabled and the diagnostic test is finished.

During the different phases when the system gauges whether the fuel tank system pressure acts normally or not, there are a number of circumstances which are taken account of, for example:

- the amount of fuel in the tank
- height above sea level
- fuel temperature and evaporation

The system can calculate this information. Therefore it is not possible to describe how quickly or how much the pressure is permitted to increase or fall in the different phases.

To carry out the diagnostic it is necessary that:

- there are no diagnostic trouble codes (DTCs) registered for: Vehicle speed signal, canister purge (CP) valve, EVAP canister shut-off valve and fuel tank pressure sensor
- fuel trim must be active
- engine idling
- Speed is 0 km/h (0 mph)
- the car is below 2500 meters above sea level
- outside temperature is above -8°C (17.6°F)
- engine coolant temperature (ECT) must be above -8°C (17.6°F) and below 120°C (248°F)
- the pressure in the tank is above -1 kPa
- the concentration of fuel fumes in the EVAP canister must not be too high

The diagnostic test starts at the earliest 17 minutes after the engine has started when all conditions have been fulfilled, and takes approximately 30 seconds.

If the diagnostic is interrupted for any reason, the engine control module (ECM) will try to start again the next time all conditions are met. The engine control module (ECM) performs a maximum of 4 diagnostic attempts during an operating cycle. If no faults are detected the diagnostic is not active again until the engine is switched off and on again. If a fault is detected two further attempts are made to evaluate the fault.