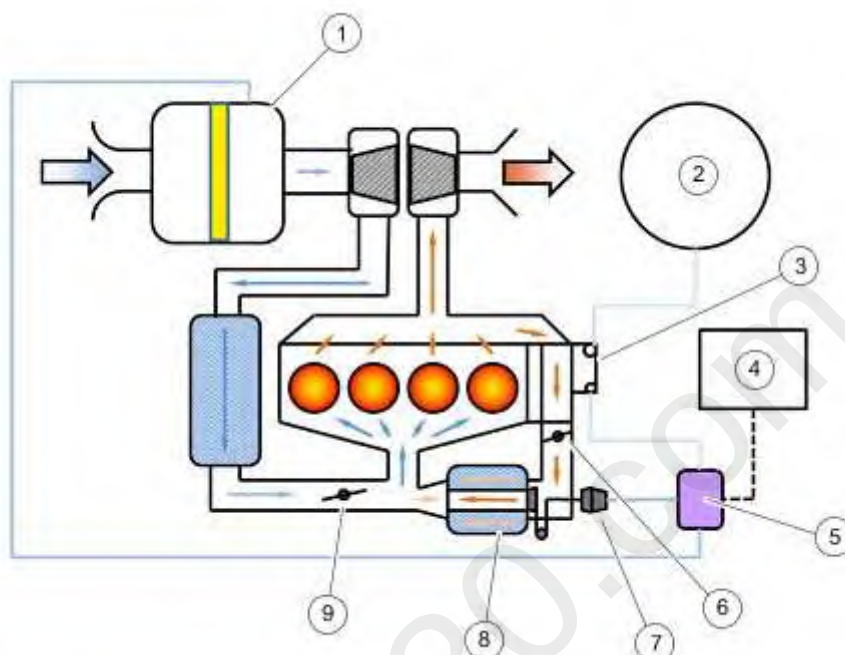


Description and Operation

System Operation

Exhaust Gas Recirculation (EGR) System Operation



E244732

Item	Description
1	Air cleaner line to the clean side of the air cleaner
2	Brake booster
3	Vacuum pump
4	PCM (powertrain control module)
5	EGR cooler bypass valve
6	EGR valve
7	EGR cooler bypass actuator
8	EGR cooler
9	Intake manifold flap

The exhaust gas is extracted directly at the exhaust manifold and routed through the cylinder head runner to the EGR assembly.

The EGR assembly consists of a double-plate EGR valve, an EGR cooler for cooling the exhaust gases and an EGR cooler bypass vacuum actuator.

A DC motor with a non-contacting position transmitter serves as the drive for the EGR valve. The voltage signal range of the EGR valve is between 0.5 volts (valve closed) and 4.5 volts (valve fully open). The valve position and the drive are controlled using a PWM (pulse width modulation) signal. A 10% PWM signal is required to close the EGR valve.

The EGR flow rate is adapted to specific engine operating states by the PCM (powertrain control module) varying the EGR valve PWM signal duty cycle. A position sensor in the EGR valve provides feedback on the exact valve positioning. This means that the PCM is able to learn and adapt to cater for valve position changes caused by soot deposits.

The EGR cooler bypass valve (electro-pneumatic solenoid valve) enables or disables vacuum to the EGR cooler bypass actuator (pneumatic actuator) which opens or closes to enable or disable exhaust flow through the EGR cooler depending on the EGR requirement. The EGR cooler bypass valve is actuated by the PCM using a PWM (pulse width modulation) signal.

In unactuated condition, the EGR cooler bypass valve supplies ambient (no vacuum) air to the EGR cooler bypass actuator. In this state the EGR cooler bypass actuator arm is extended and the exhaust flow is directed through the center (bypass) passage of the EGR cooler (no cooling).

During cold starting the recirculated exhaust gas is routed past the EGR cooler via the bypass. As a result, the engine and catalytic converter reach their operating temperature faster.

As soon as the engine cooling temperature reaches 50 °C or the engine speed exceeds 1750 rpm, the EGR cooler bypass valve is actuated and the system switches to cooling mode.

In cooling mode the EGR cooler bypass valve supplies vacuum (approximately 500 mbar) to the EGR cooler bypass actuator which opens the bypass valve against the spring load.

There is an electronic intake manifold flap upstream of the intake manifold on the fresh-air side. It generates the necessary pressure difference between the exhaust gas and intake sides in order to achieve the high exhaust gas recirculation rates.

The intake manifold flap (throttle body) is actuated by a DC (direct current) motor and controlled via PWM by the PCM.

Depending on the driving situation, the volume air flow drawn in is varied in accordance with the position of the intake manifold valve and thereby influences the composition of the recirculated exhaust gas. Its other function is to ensure the engine does not run on when it has been switched off.