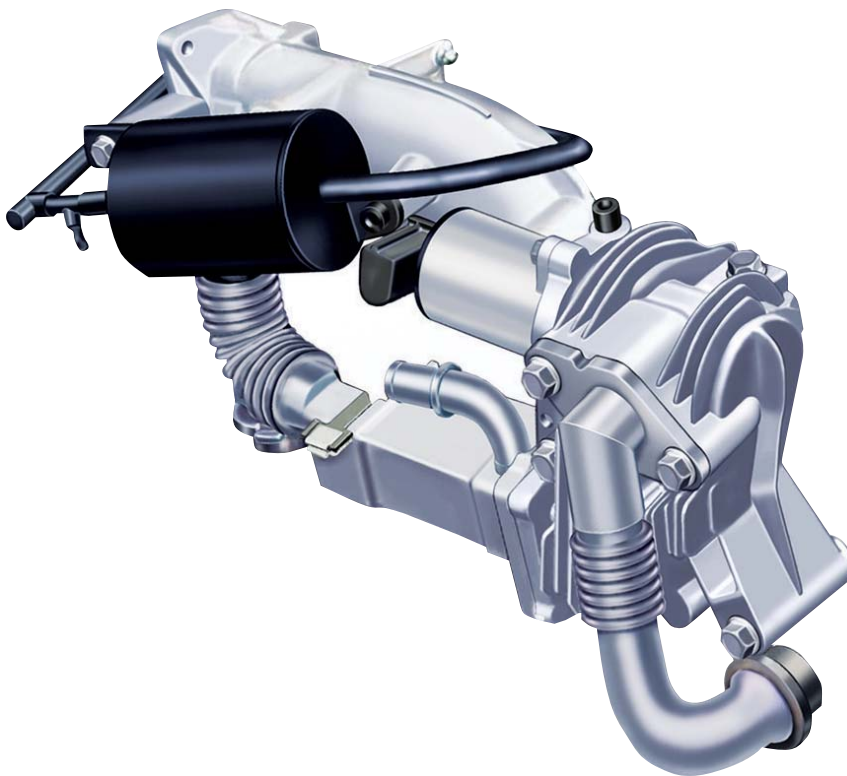




# EGR

## (Exhaust Gas Recirculation)

❖ The aim of EGR is to limit the formation of nitrogen oxides (NO<sub>x</sub>) in diesel engines. This has become vital to achieve compliance with legislation which has been in force since the adoption of the Euro 3 norm.



RENAULT COMMUNICATION

### ❖ BASIC FACTS

**Diesel engines function on lean mix**, which is one that contains a high quantity of air to a low proportion of diesel fuel. This, associated with the high temperatures that predominate in the engine combustion chamber, leads to the appearance of nitrogen oxides (NO<sub>x</sub>). By re-injecting some of the exhaust gases into the fresh air that the air intake circuit supplies to the engine, EGR reduces their formation. This works because recirculation of exhaust fumes slows down the combustion of the mixture and absorbs some of the calories. Moreover, it reduces the concentration of oxygen in the mixture and these two actions converge to reduce the formation of NO<sub>x</sub>. However, this is offset by an increase in the rate of particulates that are released by combustion. It is therefore necessary to adjust

the quantity of recirculated gas precisely in order to find the right trade-off between the reduction of NO<sub>x</sub> and the formation of particulates. This is a delicate adjustment since it depends on engine speed, charge and temperature.

#### IN SHORT ❖❖❖

EGR works through a solenoid valve that re-injects some of the exhaust gases into the engine air intake circuit. By lowering combustion temperature, EGR reduces the formation of NO<sub>x</sub>.



## HOW DOES IT WORK?

### 1 A DELICATE BALANCE

**A quantity of exhaust gas is redirected as it exits the engine**, just upstream of the turbocharger turbine. A by-pass valve first makes it possible to maintain the gas during the priming phase of the catalyser and then cool it as soon as the catalyser is operational. An electric motor controls the EGR valve allowing it to assume any intermediate position between fully closed and fully open. As a result, the computer can command a greater or lesser degree of opening of the EGR valve in order to very precisely proportion the quantity of exhaust gas re-injected into the engine air circuit supply. This

injection is carried out at the entry to the engine, downstream from the turbocharger. A proportioning flap supplements the action of the EGR valve by limiting the fresh air flow to favour an increase in EGR flow. Thanks to the data it receives from numerous sensors – giving it information on, among other details, air flow rate, intake temperature and pressure, engine speed, water temperature and engine output – the computer permanently adjusts the position of the EGR valve in order to strike the right balance between reduction of  $\text{NO}_x$  and an increase in particulate production.

### 2 FOR PETROL ENGINES

**Reduction of the richness of the mix** in direct injection petrol engines also leads to a rise in levels of  $\text{NO}_x$ . This is particularly true of stratified charge engines (see sheet), where the mixture processed in the combustion chamber can be, overall, very lean. To reduce the rate of polluting exhaust gas production, petrol engines will also be equipped with an EGR valve.