

Engine Cooling



WARNING:

NEVER REMOVE THE COOLANT PRESSURE CAP UNDER ANY CIRCUMSTANCES WHILE THE ENGINE IS OPERATING. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY. TO AVOID HAVING SCALDING HOT COOLANT OR STEAM BLOW OUT OF THE COOLING SYSTEM, USE EXTREME CARE WHEN REMOVING THE COOLANT PRESSURE CAP FROM A HOT COOLING SYSTEM. WAIT UNTIL THE ENGINE HAS COOLED, THEN WRAP A THICK CLOTH AROUND THE COOLANT PRESSURE CAP AND TURN IT SLOWLY UNTIL THE PRESSURE BEGINS TO RELEASE. STEP BACK WHILE THE PRESSURE IS RELEASED FROM THE SYSTEM. WHEN CERTAIN ALL THE PRESSURE HAS BEEN RELEASED (STILL WITH A CLOTH) TURN AND REMOVE THE COOLANT PRESSURE CAP FROM THE COOLANT EXPANSION TANK. FAILURE TO FOLLOW THESE INSTRUCTIONS MAY RESULT IN PERSONAL INJURY.



WARNING:

REMOVE FUSES 40 AND 16 FROM THE ENGINE COMPARTMENT FUSE BOX PRIOR TO PERFORMING ANY UNDER HOOD SERVICE IN THE AREA OF THE COOLING FANS WHEN THE ENGINE IS HOT, SINCE THE COOLING FAN MOTORS COULD OPERATE IF THE ENGINE HAS BEEN SWITCHED OFF. FAILURE TO FOLLOW THIS INSTRUCTION MAY RESULT IN PERSONAL INJURY.

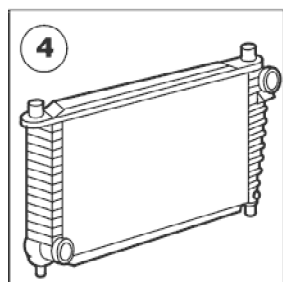
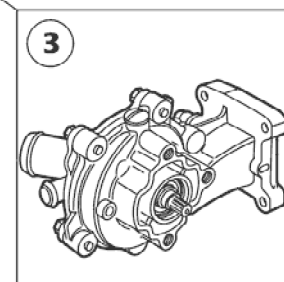
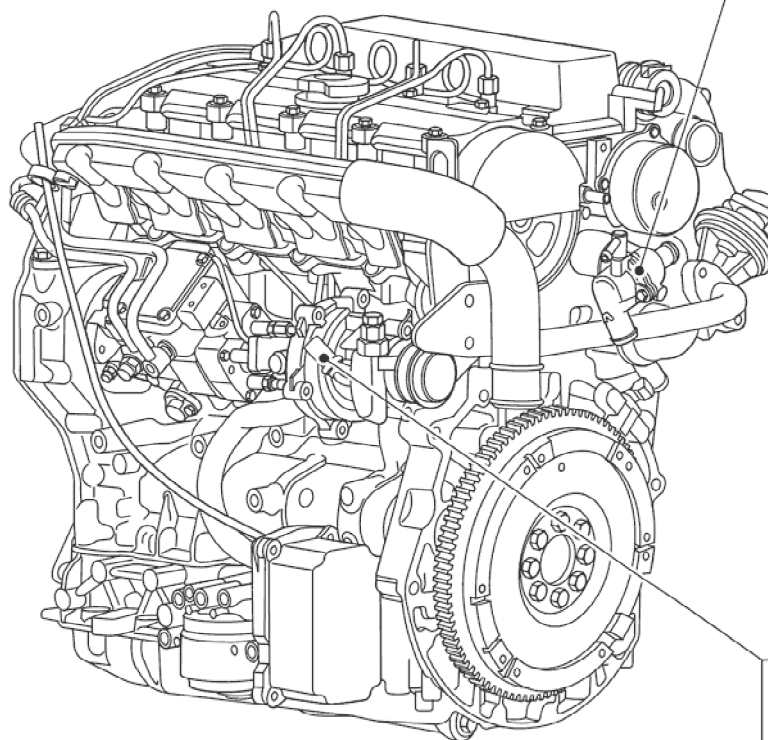
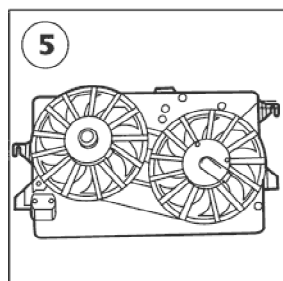
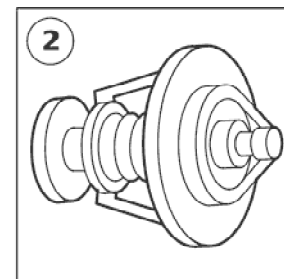
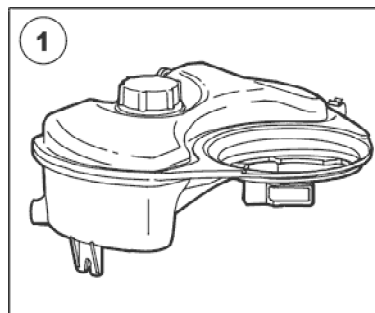


CAUTION:

The engine cooling system must be maintained with the correct concentration and type of anti-freeze solution to prevent corrosion and frost damage. Failure to follow this instruction may result in damage to the engine.

Vehicles with diesel engine

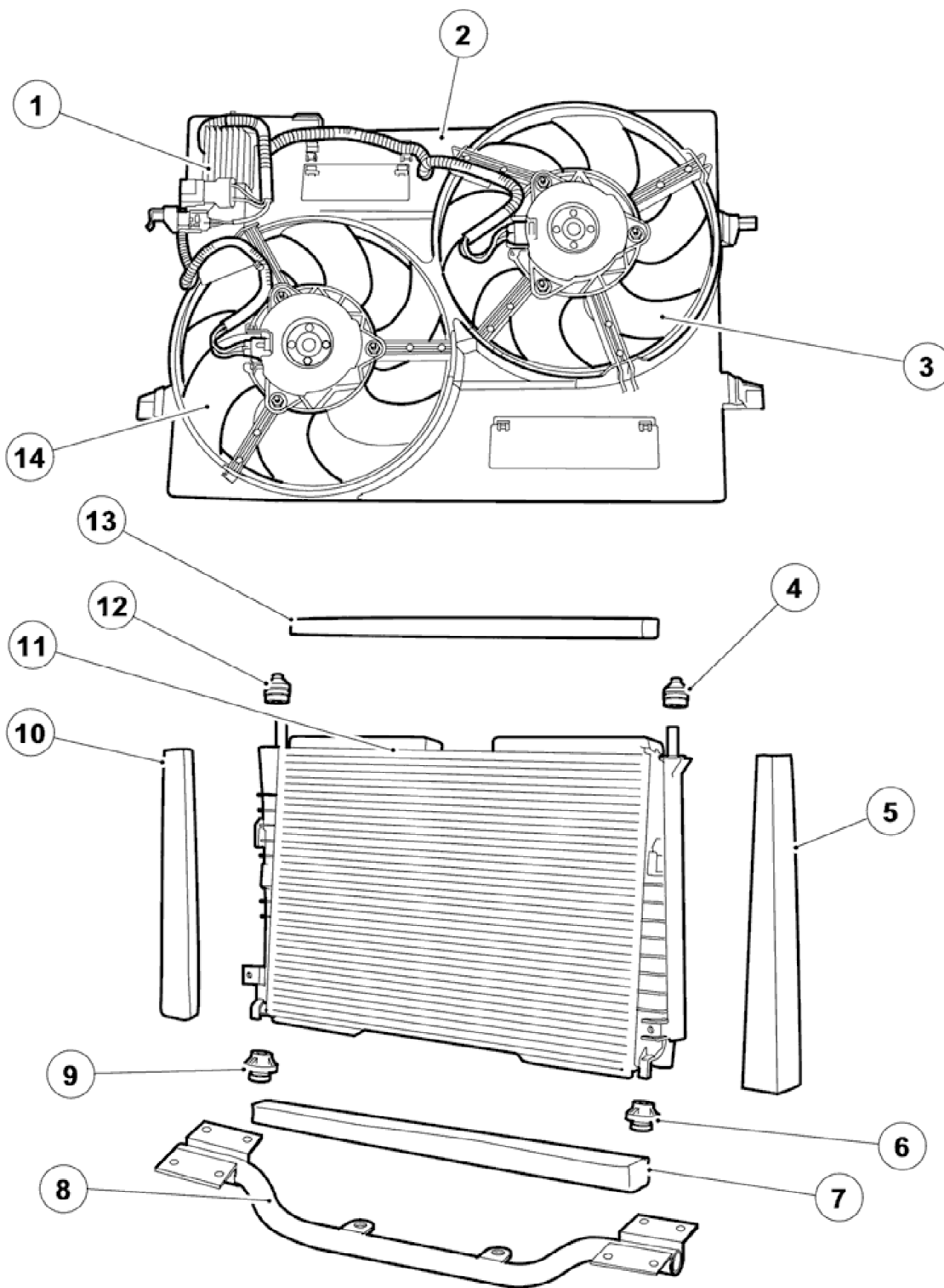
2004.25 X-TYPE - Engine Cooling - 2.0L Diesel - 303-03B



E45775

Item	Description
1	Coolant expansion tank
2	Thermostat
3	Water pump
4	Radiator
5	Cooling fan motor and shroud

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E45776

Item Description

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1	Cooling module
2	Cooling fan motor and shroud
3	Cooling fan
4	Radiator upper isolator mounting
5	Radiator side seal
6	Radiator lower isolator mounting
7	Radiator lower seal
8	Radiator support beam
9	Radiator lower isolator mounting
10	Radiator side seal
11	Radiator
12	Radiator upper isolator mounting
13	Radiator upper seal
14	Cooling fan

The cooling system consists of a:

- water pump.
- thermostat.
- radiator.
- coolant expansion tank.
- coolant pressure cap.
- two electric cooling fans.
- cooling module.
- engine oil cooler.
- engine oil temperature control thermostat.

Water Pump

The water pump is of a conventional design and is located at the rear left-hand side of the engine. It is driven by power assisted steering pump via the intake camshaft through the water pump drive pulley and water pump belt. The water pump belt tension is maintained by an automatic drive belt tensioner. <<303-05>>[Water Pump Belt]

Thermostat

The thermostat is located in the thermostat housing which is bolted to the cylinder head and allows rapid engine warm-up by restricting coolant flow through the radiator below 88°C (190°F). The thermostat also assists in keeping the engine operating temperature within predetermined limits. The thermostat begins to open at 88°C (190°F) and is fully open at 102°C (216°F).

When the engine is cold and the thermostat is closed, coolant flows from the water pump through the engine. It then returns to the water pump through the upper coolant hose.

When the engine is warm and the thermostat is open, coolant flows into the radiator through the upper coolant hose. It then returns to the water pump from the radiator through the lower coolant hose and engine oil cooler.

The heater core is on a parallel circuit and is unaffected by the position of the thermostat.

Radiator

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The radiator is of aluminium construction with plastic end tanks. Foam seals are fitted to the radiator to prevent the cooling air from by passing the radiator core. The radiator is located by four isolator mountings and supported by the radiator support beam. A coolant drain plug is provided in the lower coolant hose for the draining of the cooling system. The cooling fan motor and shroud is attached to the radiator via retaining clips.

Electric Cooling Fans

Two variable speed electric cooling fans are housed in the cooling fan shroud for the cooling of the radiator. The speed of the electric cooling fans is adjusted by the cooling fan control module, which is controlled by the engine control module (ECM).

The ECM determines the cooling fan speed by receiving inputs from the cylinder head temperature (CHT) sensor. The ECM sends a variable pulse width modulated (PWM) signal to the cooling fan control module to operate the cooling fans at the required speed. The cooling fans are operated at slow speed when the engine coolant temperature is at 95°C (203°F) and are operated at full speed when the engine coolant temperature is at 105°C (221°F). A coolant temperature between these temperatures will cause the cooling fans to be operated at a speed which is proportional to the engine coolant temperature.

When the engine is running with the CHT above 100°C (212°F), if the ignition switch is turned to the **OFF** position the cooling fans will continue to operate for a time which is determined by the ECM.

If the PWM signal from the ECM to the cooling fan control module is between 7% and 95% the cooling fan control module will operate the cooling fans at the required speed. If the PWM signal from the ECM to the cooling fan control module is below 3% and above 95% the cooling fan control module will operate the cooling fans at maximum speed. If the PWM signal from the ECM to the cooling fan control module is between 3% and 7% the cooling fans will not operate.

Coolant Recovery System

A pressurized coolant expansion tank system is used which continuously separates the air from the cooling system and replenishes the system through the coolant expansion tank outlet hose, attached to the heater return hose.

A continuous vent from the engine and radiator to the coolant expansion tank prevents air locks from forming in the cooling system.

The coolant expansion tank serves as the location for:

- service filling.
- coolant expansion during warm-up.
- air separation during operation.
- system pressurization by the coolant pressure cap.

Engine Oil Cooler

The engine oil cooler is a oil to water type. The oil cooler is mounted to the oil filler housing and sealed with two O-ring seals.

The coolant supply for the engine oil cooler is through the radiator bottom hose.

Engine oil cooler thermostat

The engine oil cooler thermostat is located in the water pump housing and helps to reduce the warm-up time by limiting the coolant flow through the lubrication system until the engine reaches its optimum operating temperature. The engine oil cooler thermostat starts to open at 75°C (167°F) and is fully open at 89°C (192°F).