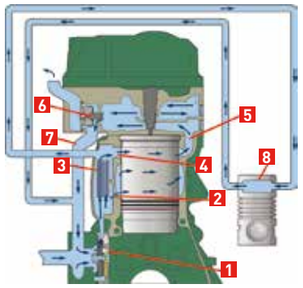
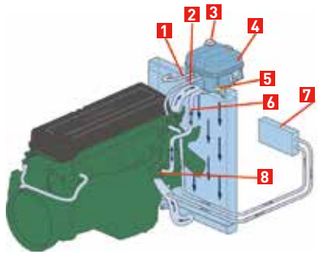
THE COOLING SYSTEM COMPONENTS



THE COOLING SYSTEM – INTERNAL COMPONENTS:

1 **Coolant Pump**
2 **Cylinder Liners**
3 **Oil Cooler Flanges**
4 **Coolant Channels**
5 **Cylinder Liner Cooling Jackets**
6 **Thermostat**
7 **Coolant Duct**
8 **Air Compressor**

The largest amount of coolant is routed up through the oil cooler flanges 3 and is distributed via channels 4 to the upper part of the cylinder liner cooling jackets, while a smaller fraction is diverted to the lower part of the liners via holes 2. From the liner cooling jackets the coolant flows through channels 5 up to the cylinder head, cooling the hot areas surrounding the exhaust ports and injector copper sleeves and finally reaches the thermostat 6. The thermostat is located where the fluid leaves the engine. When the coolant is cold the thermostat is closed, directing the coolant directly back to the suction side of the pump, via a duct 7, to shorten the engine warm-up time. When the engine reaches operating temperature and the thermostat starts to open, the duct to the coolant pump gradually closes and at the same time opens up for the coolant to flow through the radiator. Above a certain coolant temperature all coolant is directed via the radiator. The air compressor 8 is cooled via a separate external cooling circuit.



THE COOLING SYSTEM – EXTERNAL COMPONENTS:

1 + 2 **Overflow Tubes**
3 **Filling Cap**
4 **Expansion Tank**
5 **Level Indicator**
6 **Coolant Hose**
7 **Cab Heater/Heat Exchanger**
8 **Coolant Pump**

When the fluid in the cooling system heats up, it expands, causing some of the coolant to flow through the overflow tube 1 on top of the radiator into the bottom of the expansion tank 4. If there is air in the system it will be evacuated via tubes 1 and 2 into the expansion tank. When the coolant cools back down, a vacuum is created, sucking water back in from the bottom of the expansion tank via hose 6 to replace the water that was expelled. The vacuum then created in the expansion tank is evened out via a breather valve located in the expansion tank filling cap 3. This valve is a dual function valve also acting as a pressure limiting valve, which determines the maximum pressure in the cooling system. In the expansion tank there is also a level indicator 5 connected to a warning lamp on the dashboard. There is a separate circuit for the cab heating system. Coolant from the cylinder head is routed through a heater cell package 7 and is then returned back to the coolant pump 8.

SPECIALIST EQUIPMENT

It is worth noting that the cooling system also has the task of dissipating heat from the retarder and LNG evaporator when fitted – whilst delivering heat to the Webasto in-cab heater (very much in the same way as the cab heater – although working whilst the ignition is switched to the off position).

PRACTICAL ADVICE

MAXIMISE THE SALE

Don't just sell the coolant fluid – look for further opportunities to maximise the sale:

- Why not pressure test the truck's coolant system to check for leaks.
- Does the coolant pump drive belt need replacing.
- Does the coolant pump belt tensioner require replacement.
- Does the coolant pump need replacing.

Renault Coolant RCS is available as a concentrate or ready mixed:

CONCENTRATE	READY MIXED (25% concentrate)
5 L (packaged) - Réf. 85 108 900	5 L (packaged) - Réf. 85 108 913
210 L (packaged) - Réf. 85 108 901	210 L (packaged) - Réf. 85 108 914

RENAULT FITTED-PART

- One year warranty.
- Fitted by Renault Trucks trained technicians.

RENAULT TRUCKS 24/7

- Professional roadside assistance 24 hrs a day, 7 days a week, 365 days a year.
- Dedicated to getting customers' trucks back on the road with minimum delay.

renault-trucks.com

RENAULT TRUCKS

RENAULT TRUCKS GENUINE APPROVED PARTS

renault-trucks.com

RENAULT TRUCKS

ALL ABOUT COOLANT

RENAULT TRUCKS DELIVER

PRODUCT COMMERCIAL KNOWLEDGE

FACT

RENAULT TRUCKS COOLANT SYSTEM – RCS

- To protect the engine from overheating, the components within and in close proximity to the combustion chamber (e.g. pistons, valves, liners and cylinder head) need to be cooled. Pure water is excellent in transferring heat, but water at sea level freezes at 0ºC and boils at 100ºC.
- It is therefore necessary to add an antifreeze agent to form a coolant, with its primary function to divert heat away from those components within the region of the combustion chamber.
- Renault Trucks coolant RCS has a technical specification of ethylene glycol and significantly improves both the boiling and freezing points - whilst also containing additives and inhibitors to resist corrosion, deposits and pitting damages.
- The inhibitor technology used in Renault Trucks coolant RCS is such that the chemical components are never fully consumed during its service interval of 48 months and its introduction eliminated the need for a coolant filter on the engine (where as previously the coolant filter would contain the necessary chemicals and additives).

COOLANT CIRCULATION

The cooling system circulates the coolant through pipes and passageways in the engine. While circulated through the engine the coolant absorbs heat, cooling the engine, where after it passes through a radiator, which in turn transfers the heat from the fluid to the air blowing through the radiator.
The cooling system uses pressure to further raise the boiling point of the coolant. Just as the boiling temperature of water is higher in a pressure cooker, the boiling temperature of coolant is higher if you pressurise the system.

COOLANT STRENGTH

To achieve the correct coolant strength to deliver optimum engine anti-freeze protection (freezing point), the blend percentage is as follows:

- 40% concentrated coolant to water -25°C anti-freeze protection.
- 50% concentrated coolant to water -35°C anti-freeze protection.
- 60% concentrated coolant to water -46°C anti-freeze protection

It is essential that a minimum of 40% concentrated coolant should be used to maintain the coolant's preserving properties.
Exceeding 60% concentrated coolant gives no additional anti-freeze protection and it is recommended to never use less than 40% concentrated coolant.
In case of uncertainty in water quality – RCS ready-mixed concentrated coolant is recommended.

RISKS OF FITTING NON GENUINE

Whilst not a safety critical item – an engine's coolant has a very specific and important role to play in ensuring the maximisation of uptime in a vehicle.
Using an inferior coolant or even mixing coolant will rapidly diminish the performance and longevity of an engine leading to premature wear through the extremities in heat or cold in high value engine and cooling system components and as a consequence, some seriously expensive parts and labour costs as well as costs incurred as a result of unplanned downtime.
A clogged radiator is almost always caused by an unsuitable and inferior coolant.

WARNING

Under 'NO' circumstances, must Renault Trucks coolant RCS be mixed with another coolant of different specification, as this can cause the possible occurrence of a chemical reaction. Such a chemical reaction resulting in the coolant becoming aggressive to metals, seals and components within the cooling system. This aggression can cause acceleration in the process of corrosion, cavitation, and can reduce the service life of the coolant and the components within the cooling system (coolant pump, radiator and hoses) and therefore not delivering the required engine protection.

FEATURES	BENEFITS
GENUINE Renault Trucks coolant RCS is based on organic acids and therefore does not contain nitrate, amines, phosphate and silicate.	Low environmental impact.
Contains Ethylene glycol and special inhibitors.	▪ Protects against freezing. ▪ Prevents corrosion on all metal surfaces. ▪ Prevents rubber from swelling or cracking. ▪ Prevents plastic from ageing and degradation. ▪ Leaves no deposits in the cooling system.
Inhibitor technology.	Prevents harmful coating 48 month service life and the elimination of the need for a coolant filter reducing vehicle running costs.
High boiling point.	Protects the engine at the cooling system components against overheating and unexpected downtime and costs.
Anti-freeze protection.	Low viscosity providing easy flowing even at temperatures far below freezing point.
Easily mixed with both soft and hard water for the correct coolant strength.	To achieve the optimum anti-freeze protection.
Renault Trucks coolant RCS – GENUINE Renault Trucks part.	Tested according to Renault Trucks quality standards and developed in conjunction and harmonisation with the Renault Trucks engines cooling system.

TWO PARTS MAY LOOK ALIKE BUT ....

Renault Trucks coolant RCS is a product designed specifically for Renault Trucks engines and their cooling systems (pump, radiators). It contains ethylene glycol which prevents the coolant from freezing, as well as special additives, called inhibitors. These protect the cooling system against corrosion and deposits. The inhibitors are matched with all the materials in the engine and the cooling system. For the latest generation of engines, Renault Trucks has developed an entirely new type of coolant, Renault Trucks coolant RCS, which contains organic acids.

COOLANT SPECIFICATIONS

Through containing the necessary chemicals and additives, Renault Trucks coolant RCS eliminated the need for a coolant filter on the engine (where as previously the coolant filter would be required to contain such chemicals and additives).

PRESERVING PROPERTIES

The chemical properties of Renault Trucks coolant RCS ensures the protection of the cooling system components from corrosion, ageing, swelling and cracking – leading to premature failure.

COOLING SYSTEM HARMONISATION

To ensure maximum cooling performance and the best overall economy the Renault Trucks coolant RCS and the cooling system are developed in harmonisation and are specific to Renault engines.

EXTENSIVE TESTING

Renault Trucks extensively tests its coolant properties to ensure the best chemical composition to deliver component longevity and a service interval change of 48 months.

THE COOLING SYSTEM HOW IT WORKS

- A great deal of the energy that is generated during combustion is converted to heat. Some of this heat must be conducted away from the engine to prevent it from overheating – this is the task of the cooling system.
- Modern powerful engines place very high demands on the cooling system, which with the help of coolant; its main purpose is to cool the engine, maintaining the correct temperature for maximum engine power and optimum emission levels. In turn, this prevents increased fuel consumption, loss of engine power and indirect and premature wear on engine components and the lubricating oil.
- The cooling system also ensures that the temperature in the cab is kept at a comfortable level. It is therefore very important that all the cooling system components are calibrated for optimised performance.

PISTON TYPE THERMOSTAT

The thermostat regulates the flow of coolant through the radiator to provide the right operating temperature for the engine. It allows high coolant flow, with relatively low pressure drop. The piston-type thermostat has a probe, sensing the coolant temperature. The probe is filled with a thermo-reactive wax. When the wax melts, its volume expands acting on a pushrod-piston assembly.

1 | Engine Cold

The thermostat piston is completely shut. All coolant is routed back to the suction side of the pump, as shown in the picture to the left.

2 | Warm-up Phase

The thermostat piston is in an intermediate position between shut and fully opened, determined by the coolant temperature. The amount of coolant routed to the radiator is then gradually increased with increased coolant temperature, until the engine is warm and the piston is in fully open position.

3 | Engine Warm

The thermostat piston is fully opened. All coolant is routed to the radiator, as shown in the picture to the right.

CAB HEATER/ HEAT EXCHANGER

- The purpose of the heat exchanger is to transfer heat from the hot coolant in the engine's cooling system to the air in the cab. The heat exchanger consists of a number of elements through which coolant from the engine flows. On the outside, the elements are fitted with flanges that emit heat to the passing air.
- A heat control valve is operated by the heater controls on the instrument panel. The valve regulates the flow of coolant through the heat exchanger, thereby regulating the temperature of the heated air. In addition to the heat control valve, trucks fitted with automatic temperature control also have a solenoid valve connected to the coolant hose leading to the heat exchanger. The solenoid valve is electrically controlled by the climate control system's control module. By opening and closing the flow to the heat exchanger, the temperature in the cab is regulated.

COOLING FAN

- Sometimes the flow of air against the vehicle is not sufficiently powerful to ensure adequate flow through the radiator, so an additional element of the cooling system and equally as important is the cooling fan and its corresponding belt drive which increases the flow of air in the following circumstances:
  - when the vehicle is driving at low speed or is at a standstill with the engine running,
  - when the engine is under a severe load and extra amounts of heat has to be dissipated,
  - hot climates – when the surrounding air is hot and offers poor cooling.
- The cooling fan is driven via a poly-v belt which in turn is driven by the timing gears. This same drive mechanism also drives the alternator and the air conditioning pump.
- The belt system is being driven as long as the engine is running, whilst the fan itself is only driven when a silicon fluid is released into the fans drive coupling.
- The release of such silicon fluid is controlled via the engine management system – in the past this would have been controlled by a temperature sensitive bi-metallic strip on earlier engines.

RADIATOR

- The radiator is a heat exchanger in which heat is transferred to the surrounding air. The purpose of the radiator is to reduce the temperature of the coolant circulating within the engine and the climate system.
- The radiator consists of two containers, the upper tank and the lower tank, today mostly manufactured of plastic, with a honeycomb mesh between, connecting these two tanks.
- After leaving the engine the coolant enters the upper tank and is then distributed through a tubular system consisting of a multitude of narrow tubes through which the air passes. On the outside of the tubular system there is a series of thin steel fins (honeycomb mesh) which increases the surface contact area with the slipstream of air, and thus enhance the cooling effect. After the coolant has been cooled it enters the lower tank and is then recirculated by the coolant pump to return to the engine once again.

COOLANT PUMP

- The coolant pump builds up the correct pressure in the cooling system and provides the right coolant circulation to achieve optimum cooling performance.
- The back of the coolant pump with its ducts for the distribution of coolant is machined directly into the cylinder block. The front (external) section comprises an aluminium housing containing a nonmetallic (ceramic material) impeller, shaft seals, bearings and pulley. The bearing is a permanentlylubricated combined roller and ball bearing. Between the shaft seals and the bearing there is a ventilated space, which leads into a duct behind the pulley.
- When the impeller (attached to the drive shaft) begins to rotate the pump inducts coolant from the radiator. The coolant enters the pump in the centre of the impeller and then with the aid of centrifugal force is pressed against the walls of the aluminium housing where the outlet is situated.
- The coolant then leaves the coolant pump and circulates around the engine before it returns to the radiator.
- To aid fuel consumption on the modern truck technology on the D11C, D13C and D16G the coolant pump now has an electronically controlled internal clutch. This is a dual stage clutch controlled by the engine ECU via a signal from the engine coolant temperature sensors.
- The first stage controls the temperature to approx. 81°C degrees and then once the engine is producing maximum torque for prolonged periods of time the second stage is engaged to regulate the temperature of the coolant and to increase the coolant flow through the engine and radiator. Once the coolant has reduced back to below 81°C degrees the second stage is then disengaged. The purpose of this is to reduce the amount of friction consumed when the coolant pump is controlled therefore improving the fuel consumption potential of the engine.