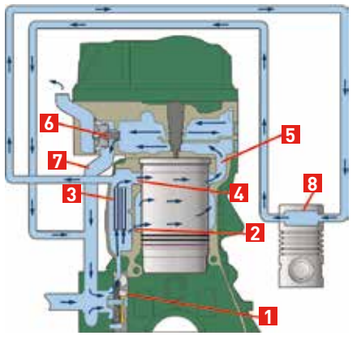
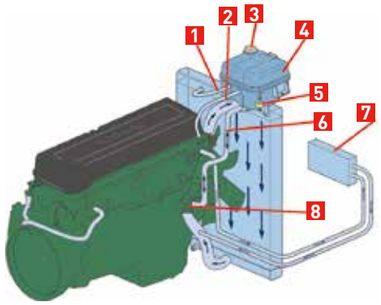
THE COOLING SYSTEM COMPONENTS



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.

PRACTICAL ADVICE

MAXIMISE THE SALE

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

- Cleaning of the entire coolant system.
- Pressure test of the coolant system to check for leaks.
- Don't forget you will need the latest specification of Renault Trucks coolant.
- Radiator to intercooler mounting bolts, they always seize solid and have to be drilled out.
- Replacement of the lower intercooler hose.
- Condenser damaged in removal of intercooler.
- Drain & re-gas the air conditioning system – condenser being dropped forward for access.

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.

ALL ABOUT RADIATORS

RENAULT TRUCKS

RENAULT TRUCKS GENUINE APPROVED PARTS

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RENAULT TRUCKS

FACT

You can avoid a breakdown due to overheating by fitting a GENUINE Renault Trucks radiator.
If your radiator is not working properly you risk a rise in coolant temperature, which will result in the cooling fan cutting in more often and an increase in fuel consumption. You also risk a loss of engine power and, indirectly, increased wear on engine components. In addition it has a very exposed position at the very front of the vehicle where it is subject to the ingress of dirt, and this calls for extreme material properties.

THE DIAMOND DISTINCTION

1 | Renault Trucks tin dipped end plate
In a non-Renault Trucks radiator the end plate is often left uncoated meaning that the seal for the coolant pipes can be compromised by vibration. Leaking coolant causes the remaining fluid to increase in temperature until it creates steam, thereby lowering cooling efficiency and ultimately resulting in an out-of-service vehicle.
A GENUINE Renault Trucks radiator end plate is tin-dipped which provides a perfect seal, **resisting corrosion** and a build-up of limescale meaning a **longer component life, resulting in better operational economy.**

2 | Renault Trucks fin type vanes
As opposed to tubes and pipes, Renault Trucks uses a **brazed flattube/corrugated fin system as it offers a much greater surface cooling area** making it far more efficient at dissipating heat. This means the fan does not need to operate so often and therefore **giving better fuel economy.**

3 | The Renault Trucks construction
An example of Renault Trucks's high standards when it comes to the cooling effect – if you unfolded the radiator core it would cover 32 m^2 – the size of a studio flat.

4 | Renault Trucks quality
Since the introduction of long life material in GENUINE Renault Trucks radiators c.1994 – **the service life of a radiator has been extended fivefold in respect of corrosion.**

Greater efficiency means lower operating costs, reduced fuel consumption and a longer product life.

RISKS OF FITTING NON GENUINE

If a radiator is not working properly, it does not provide enough cooling effect to the engine, leading to the following consequences:

- Increased fuel consumption due to the cooling fan cutting in more often to provide the correct cooling effect. The increased engagement of the cooling fan results in reduced engine power of up to 30 hp for the D13 and 50 hp for the D16. The reduction in engine power is compensated for through an increased engine power output, which leads to increased fuel consumption.
- De-rating, for example, on the D13 engine, derating takes place on the following scale:
  - 107°C = 100% output from the engine,
  - 110°C = 90% output from the engine,
  - 111°C = limp-home output = 40% reduction,

and if you drive at less than 3 km/h the engine cuts out.

FEATURES	BENEFITS
The radiator is developed together with the GENUINE Renault Trucks intercooler for optimal cooling of the engine.	Always providing the correct cooling function.
A GENUINE Renault Trucks Exchange radiator has a 28-29% higher cooling effect than non-Renault Trucks radiators at normal engine speed.	Operational economy and reliability.
Tin-dipped end plate to provide a perfect seal for coolant pipes and cannot be damaged by vibrations.	Fewer unexpected stoppages, better operational economy, increased life cycle – therefor lower costs.
Fin type vanes delivering efficient cooling.	The fan does not need to operate as frequently, ensuring better fuel economy. Correct operational temperature to provide maximum engine output.
Correct cooling of the coolant.	Lower fuel consumption and long life of the engine secures the performance.
Correct choice of the material.	Manufactured of aluminium for low weight, strength and long life of the component.
Manufactured to Renault Trucks quality specifications: ▪ cooling coil has an exact fit, ▪ attachment points are correct, ▪ high performance.	With Renault Trucks specifications, you avoid: ▪ unexpected stoppages, ▪ unnecessary damage, ▪ unnecessary costs.

TWO PARTS MAY LOOK ALIKE, BUT...

There will always be non-genuine suppliers wanting to sell radiators to Renault Trucks operators. The quality of these non-genuine makes naturally varies as much as their prices.
However, even if a well-known non-genuine Renault Trucks make is chosen – it is by no means certain that the radiator is tailored and to the specification of a Renault Trucks cooling system in the same way as a GENUINE Renault Trucks part.

DEVELOPED IN HARMONISATION
All of the component parts of a Renault Trucks cooling system have been **developed together as a complete system** so as to create the necessary flawless interplay between them – **to ensure the maximum performance and service life** from the cooling system and the engine components.

EXTENSIVE TESTING
Renault Trucks develops, tests and verifies the cooling system as a complete system – not as individual components. The Renault Trucks cooling system is a complete system, with each component subjected to **thousands of hours of demanding performance testing.** Tests are carried out on every component, and then finally the complete cooling system is field tested in **extreme road and weather conditions.** These tests are undertaken to achieve an exact balance between components, to give a Renault Trucks engine the maximum efficiency and performance. In addition Renault Trucks's GENUINE radiators are approved by Renault Trucks's extensive quality assurance process.

INCREASED DEMANDS
Very high performance requirements – a radiator must cool up to 480 litres per minute.

OPERATING CONDITIONS
The radiator operates in conditions of extreme vibration, temperature (between -50°C and +110°C) and pressure (up to 2.0 Bar for the D13). In addition it has a very exposed position at the very front of the vehicle where it is subject to the ingress of dirt, and this puts a very high demands on the choice of material and the technical specifications.

CONSTRUCTION
Made in aluminium to provide the component with a low weight, strength and a long service life.

WHY GENUINE RENAULT TRUCKS PARTS FOR YOUR COOLING SYSTEM?
- To ensure a reliable and durable cooling system.
- Maximum engine power and optimum emission levels, in both hot and cold climates.
- Long service intervals and low maintenance costs.

✔ **By choosing a GENUINE Renault Trucks radiator, you are sure to reach the performance requirements that Renault Trucks has specified for a complete cooling system in a Renault Trucks vehicle.**

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.

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.

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 permanently lubricated 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 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 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.