VOLVO
Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Cooling system, description	**260**	**Service Information**	**2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Cooling system, description

The cooling system is a pressurized closed system. It uses a pump which pumps the coolant throughout the system. The coolant transfers heat from parts and oils that need cooling, both inside the engine as well as outside. The coolant is cooled in the radiator by an air flow generated by a cooling fan. A thermostat regulates the coolant's path. When the engine is cold, the coolant by-passes the radiator to conserve heat instead of removing it. An expansion tank is used to handle expansion of the coolant. It has a pressure relief valve integrated in its cap. Coolant is refilled via the refill nipple.

For information about other systems that affect the cooling system, see:

- 220 Lubrication system, description
- 293 Exhaust Gas Recirculation (EGR), description

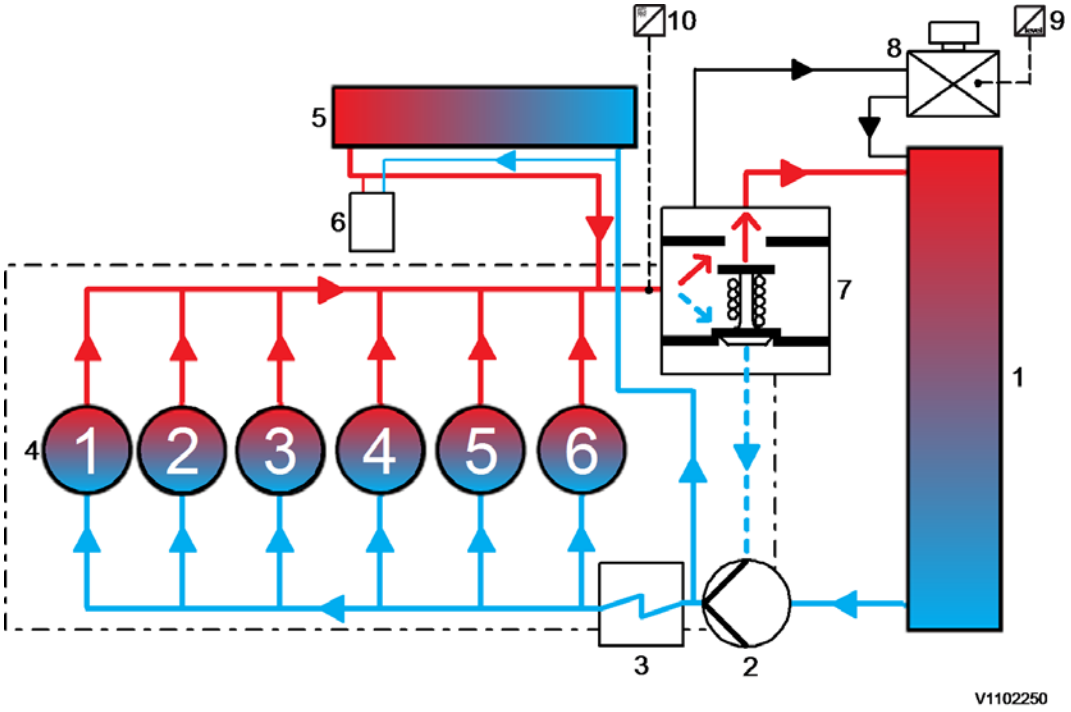

Figure 1
Engine cooling system

1. Radiator
2. Coolant pump
3. Oil cooler/oil filter housing
4. Cylinder liner
5. EGR-cooler
6. EGR actuator
7. Thermostat
8. Expansion tank
9. Coolant level sensor (SE2603)
10. Coolant temperature sensor (SE2606)

The coolant pump delivers the coolant to the engine via the lubrication oil cooler and into the engine, around the cylinder liners and through the thermostat housing. The thermostat controls the coolant's flow out to the radiator or in by-pass flow

back into the engine, depending on the coolant temperature.

The coolant pump also forces some coolant to the EGR-cooler via internal channels inside the pump and external pipes. A small amount of the EGR coolant flow is routed through external pipes to cool the EGR actuator. After cooling the exhausts in the EGR-cooler, the coolant is routed back to the engine via external pipes and then enters channels inside the engine before the thermostat.

The coolant is cooled in the radiator and is then transported back into the engine's cooling system.

The coolant is also transported via external pipes and hoses to parts on the machine. For example, the cab heater or the transmission oil cooler. The cab heater takes its coolant from the warm side of the engine, before the thermostat, and the return leading to the pump's suction side. The transmission oil cooler takes its coolant after its been cooled in the radiator and the return leading back to the pump's suction side.

Coolant pump

The coolant pump is of impeller type and is belt-driven. The rear of the pump is bolted to the cylinder block, oil cooler, and oil filter housing, and it has channels for coolant distribution.

Thermostat

The coolant circulation thermostat is of the piston type and has a temperature-sensitive wax body which controls opening and closing. The thermostat begins to open when the coolant temperature reaches a level which indicates that the engine is warm and the coolant needs to transport heat away from the engine. The thermostat is located inside a thermostat housing containing channels for coolant distribution. The thermostat housing is bolted to the cylinder head.

Parameters

- There are no parameters for this function.

Supplementary information

- 260 Cooling system, component location
- 263 Cooling fan, description
- 263 Reversible cooling fan, description

Function check

- 28407-3 Sensor values, monitoring

Diagnostics

Component	Control unit	Message ID
SE2603	MID128	PID111
SE2604 (Only EXC)	MID128	PID26
SE2606	MID128	PID110
PWM2602 (Only EXC)	MID128	SID33

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Document Title: **Cooling system, component location**	Function Group: **260**	Information Type: **Service Information**	Date: **2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Cooling system, component location

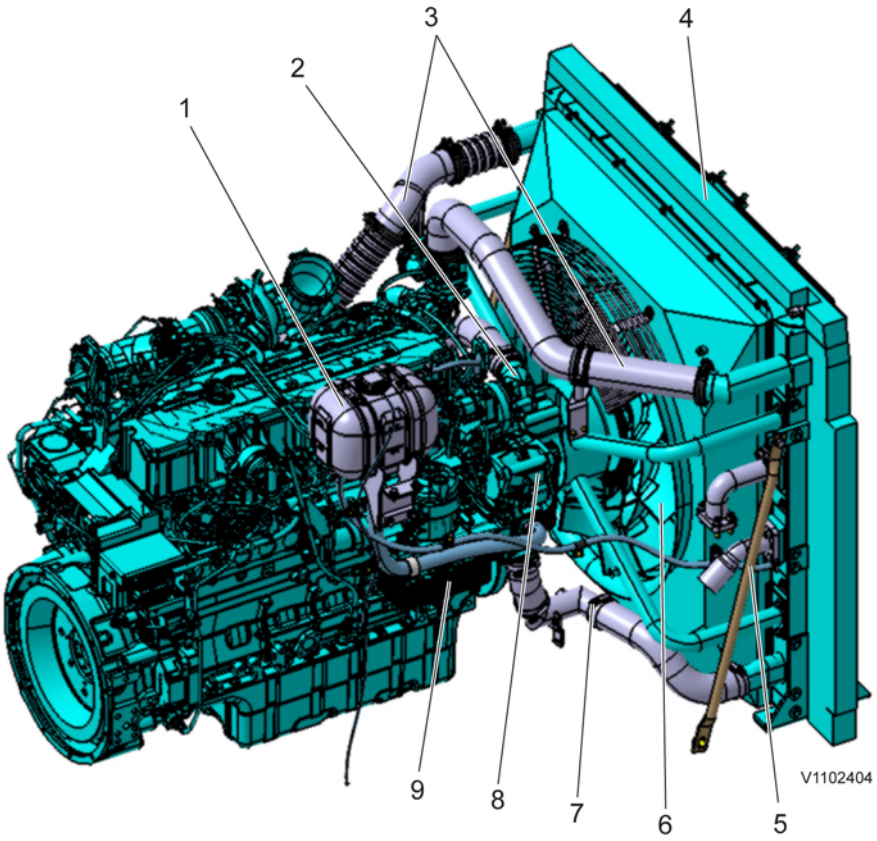

Figure 1

1. Expansion tank
2. Thermostat
3. Charge air cooler tube
4. Radiator assembly
5. Stay bar
6. Fan
7. Radiator hose
8. Coolant pump
9. Engine oil cooler

Description

- 260 Cooling system, description

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Construction Equipment

Service Information

Document Title: **Carbon monoxide in coolant system, check**	Function Group: **260**	Information Type: **Service Information**	Date: **2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Carbon monoxide in coolant system, check

Op nbr 260-001

9808038 Leak detector

1. Check the coolant level according to the machine's operator's manual.
2. Warm up the engine, and let the engine run during the entire test.
3. Dismantle 9808038 Leak detector.
   Lubricate the O-rings with silicone grease or clean vaseline.
4. Fill both chambers with reaction fluid up to the marked line.
5. Cover the inlet hole at the same time as the carbon monoxide detector is assembled so that no fluid is pressed out.
   NOTE!
   The carbon monoxide detector and its fluids must not be exposed to cigarette smoke, exhausts, or similar.

   WARNING
   Open the radiator cap carefully if the engine is warm. High pressure in the radiator may cause hot coolant to jet out.
6. Open the radiator cap.
7. Install 9808038 Leak detector over the opening on the expansion tank and pump 3–5 times with the rubber bulb to suck in air from the tank. Wait 10–15 seconds to see if the reaction fluid changes colour.
   NOTE!
   Coolant may not be sucked in to the carbon monoxide detector.

   If the reaction fluid changes colour, it means that there is carbon monoxide in the cooling system. Often there are very small quantities in the machine's systems, and that is why the measurement should be repeated if the first measurement produces a reaction.
8. Suck fresh air in to 9808038 Leak detector by pumping a few times on the rubber bulb. Pump until the reaction fluid has returned to its original colour.
9. Ventilate the air above the expansion tank.
   NOTE!
   Do not blow by exhaling since exhaled air contains carbon dioxide.

   Repeat the test.
   Carbon monoxide in the coolant indicates that exhausts are forced into the cooling system. This may be due to leakage by a unit injector's copper sleeve, leaking cylinder head gasket, or cracks in the cylinder head. These defects may also cause low compression.

   To determine if compression is low, perform a compression test with VCADS Pro.

10. Reinstall the radiator cap.
    Stop the engine.

Document Title: **Radiator, description**	Function Group: **261**	Information Type: **Service Information**	Date: **2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Radiator, description

The cooling unit cells and tanks are made of aluminium. The hydraulic oil cooler and the charge air cooler are installed to the radiator frame.
Air is drawn into the engine compartment passing through the radiator, the oil cooler and the charge air cooler as the fan rotates.

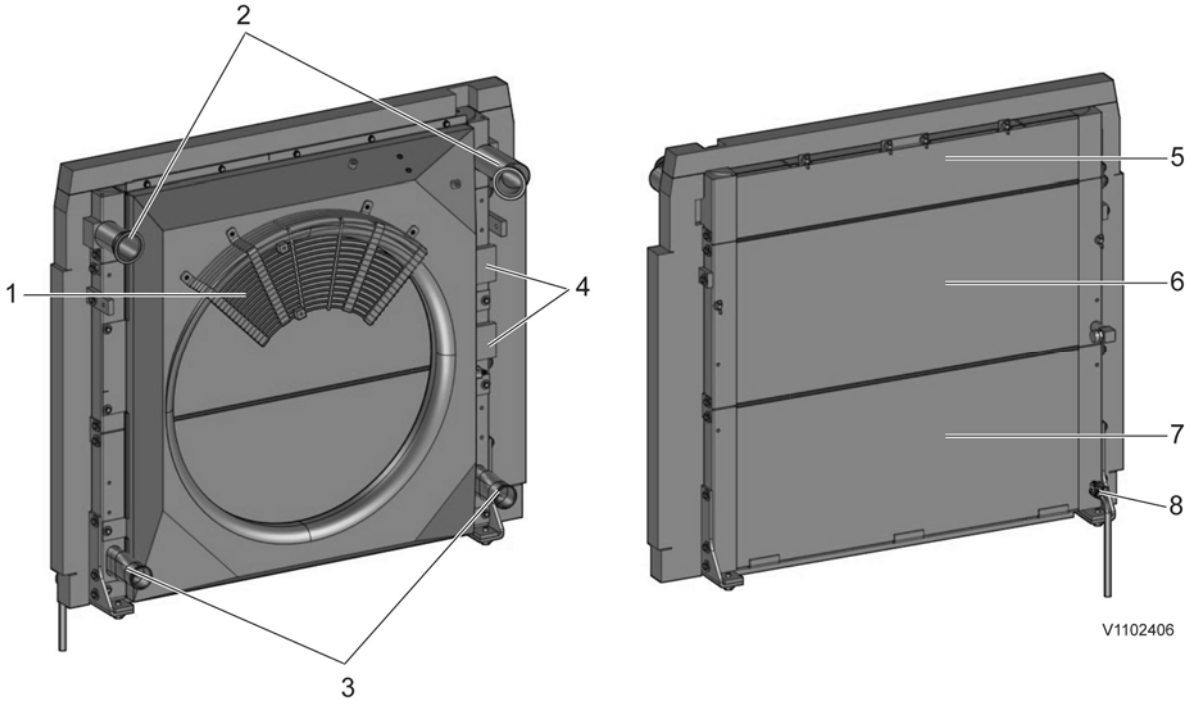

Figure 1

1. Fan guard
2. Charge air inlet/outlet
3. Coolant inlet/outlet
4. Hydraulic oil inlet/outlet
5. Charge air cooler
6. Hydraulic oil cooler
7. Radiator
8. Coolant drain valve

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Service Information

Document Title: **Coolant, checking anti-freeze resistance**	Function Group: **261**	Information Type: **Service Information**	Date: **2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Coolant, checking anti-freeze resistance

Op nbr 261-002

88890105 Refractometer

WARNING

Open the expansion tank cap slowly and carefully. The cooling system operates at high pressure and hot coolant may rush out and cause severe burns.

1. Check the freezing protection with 88890105 Refractometer.
   Open the cover on the refractometer and place a few drops of the coolant on the glass surface. Close the cover and read off the value against strong light source.
   Read off the value on the ethylene scale. The coolant should be taken from the filling point on the expansion tank.

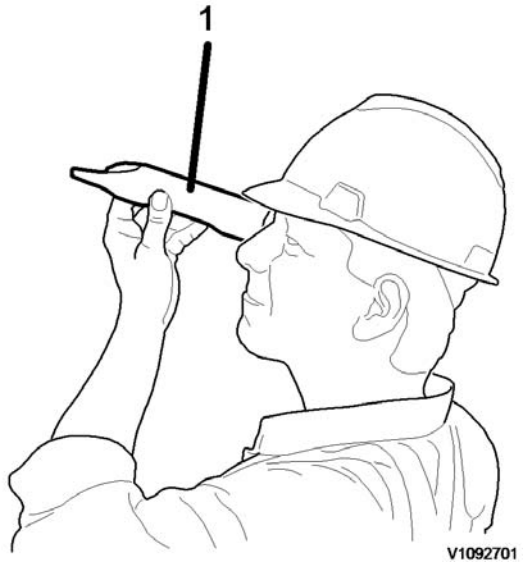

Figure 1

2. The machine is delivered with a coolant mixture for optimal cooling and corrosion characteristics.
   That is why the same coolant mixture shall be filled, regardless of ambient temperature conditions. See 160 Coolant and 160 Coolant with freezing and corrosion protection.

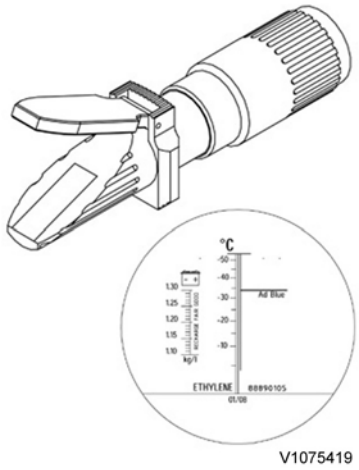

Figure 2

NOTE!
Volvo Construction Equipment concentrated coolant with anti-freeze must not be mixed with other brands of anti-freeze or additives as this type of mixture could have negative effects.

Document Title: **Coolant, changing**	Function Group: **261**	Information Type: **Service Information**	Date: **2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Coolant, changing

Op nbr 261-004

WARNING

Risk of burns - stop the diesel engine and allow it to cool down before starting any work.

WARNING

Risk of scalding and burns when the expansion tank cap (radiator cap) is opened due to high pressure in the cooling system.

Draining coolant

1. Open the engine hood and slowly remove the cap from the expansion tank.

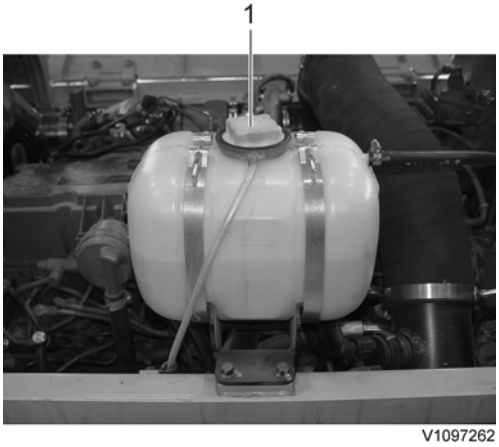

Figure 1

1. Expansion tank cap

2. Open the left side door of the machine.

3. Loosen the drain valve handle and drain off the coolant.
   NOTE!
   Prepare a suitable container.

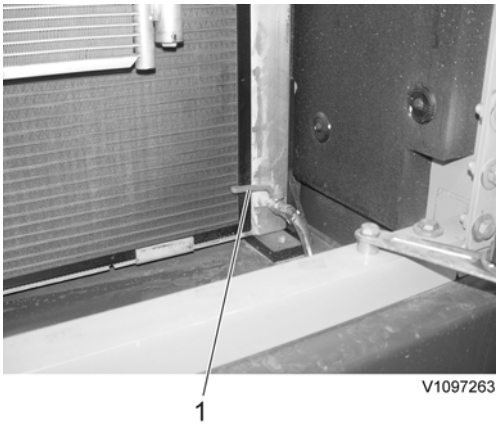

Figure 2

1. Drain valve

NOTE!
The cooling system is not protected from freezing after draining. There may still be pockets of water in the system.

NOTE!
Handle and take care of waste oil/fluids in an environmentally safe manner.

NOTE!
The Volvo Construction Equipment Group's concentrated coolant with anti-freeze must not be mixed with other brands of anti-freeze or additives as this type of mixture could have negative effects.

NOTE!
Anti-freeze must always be used, see Section 1, Coolant with freezing and corrosion protection, Section S.

Refilling coolant into drained cooling system

4. Refill coolant through the expansion tank.
   NOTE!
   Coolant refill capacity: see 160 Specification, filling capacities.

   NOTE!
   Fill coolant to 2/3 of the expansion tank volume.

5. Start and run the engine to operating temperature and top up with coolant so that the cooling system is completely filled with coolant and is free of air.

6. Check the coolant level after the engine has been run to operating temperature and then cooled down.
   NOTE!
   Never fill or top up the cooling system with cold coolant when the engine is warm. This can cause cracking of the engine block and the cylinder head.

Document Title: **Radiator, replacing**	Function Group: **261**	Information Type: **Service Information**	Date: **2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Radiator, replacing

Op nbr 261-008

WARNING

Risk of burns - stop the diesel engine and allow it to cool down before starting any work.

WARNING

The parts are heavy. Take appropriate safety precautions.

1. Place the machine in the service position B. See 091 Service positions
2. Remove the intercooler (charge air cooler) assembly. See 258 Intercooler, replacing.
3. Remove the hydraulic oil cooler.
4. Remove the radiator and replace it as a new one.
   NOTE!
   Use a new sponge when installing a radiator assembly to the machine.

Figure 1

1. Charge air cooler
2. Hydraulic oil cooler
3. Radiator

5. For assembling, reverse disassembly procedure.
   NOTE!
   Do not reuse O-rings and gaskets.
6. Refill coolant through the expansion tank.

NOTICE

Never fill a hot engine with cold coolant, as this may cause the cylinder block or the cylinder head to crack. Failure to change coolant will cause clogging of the cooling system and the risk of engine damage.

NOTICE

Volvo Coolant VCS must never be mixed with any other coolant or corrosion protection to avoid damage to the engine.

NOTE!

Coolant refill capacity: see 160 Specification, filling capacities

NOTE!

Fill coolant to 2/3 of the expansion tank volume.

NOTE!

Anti-freeze must always be used, see Section 1, Coolant with freezing and corrosion protection, Section S.

7. After completion of the work, start the engine and check for leaks.

8. Run the engine to operating temperature and top up with coolant so that the cooling system is completely filled with coolant and is free of air.

   NOTE!

   Check the coolant level after the engine has been run to operating temperature and then cooled down.

Document Title: **Radiator hoses all, replacing**	Function Group: **261**	Information Type: **Service Information**	Date: **2015/2/15**
Profile: **EXC, EC300D LR [GB]**			

Radiator hoses all, replacing

Op nbr 261-016

WARNING

Risk of burns - stop the diesel engine and allow it to cool down before starting any work.

1. Drain off coolant, See 261 Coolant, changing
   Close the drain valve after draining the coolant in about 4 minutes.

2. Remove the radiator under cover.

Figure 1

3. Remove the clamps and replace the radiator hoses as a new one.

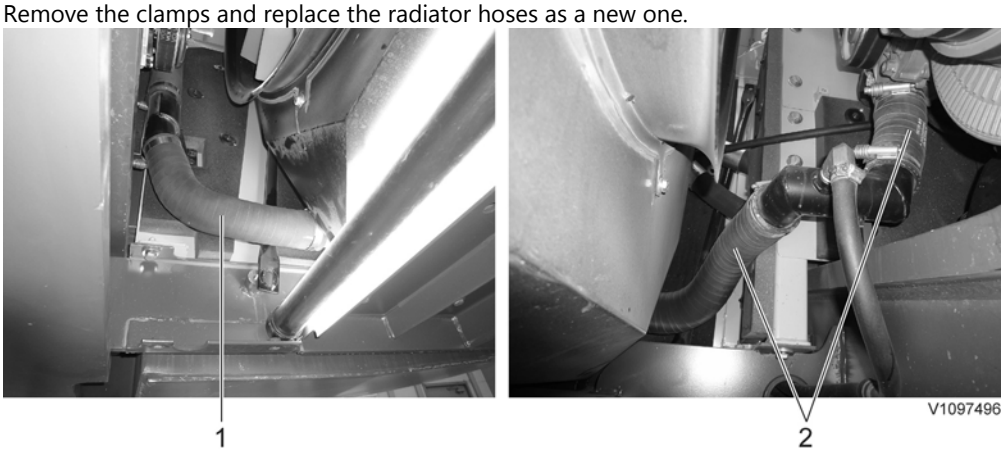

Figure 2

1. Radiator hose (Outlet)
2. Radiator hose (Inlet)

4. Refill coolant through the expansion tank.

   NOTICE

   Never fill a hot engine with cold coolant, as this may cause the cylinder block or the cylinder head to crack. Failure to change coolant will cause clogging of the cooling system and the risk of engine damage.

   NOTICE

   Volvo Coolant VCS must never be mixed with any other coolant or corrosion protection to avoid damage to the engine.

   NOTE!

   Coolant refill capacity: see 160 Specification, filling capacities

   NOTE!

   Fill coolant to 2/3 of the expansion tank volume.

   NOTE!

   Anti-freeze must always be used, see Section 1, Coolant with freezing and corrosion protection, Section S.

5. Install the radiator under cover.

6. After completion of the work, start the engine and check for leaks.

7. Run the engine to operating temperature and top up with coolant so that the cooling system is completely filled with coolant and is free of air.

   NOTE!

   Check the coolant level after the engine has been run to operating temperature and then cooled down.

8. Close the engine hood.

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