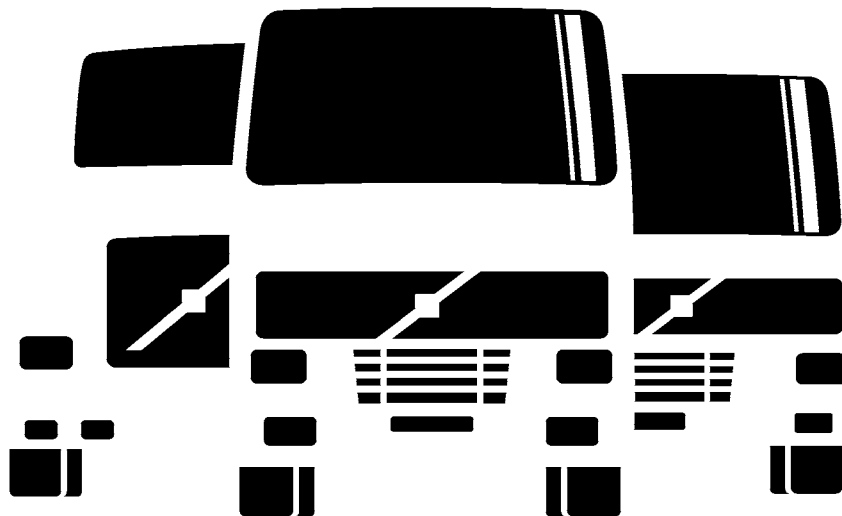


Service Manual Trucks

Group **260–600**

Cooling System

D12, D12A, D12B, D12C



Foreword

The descriptions and service procedures contained in this manual are based on designs and methods studies carried out up to August 2000.

The products are under continuous development. Vehicles and components produced after the above date may therefore have different specifications and repair methods. When this is believed to have a significant bearing on this manual, supplementary service bulletins will be issued to cover the changes.

The new edition of this manual will update the changes.

In service procedures where the title incorporates an operation number, this is a reference to an S.R.T. (Standard Repair Time).

Service procedures which do not include an operation number in the title are for general information and no reference is made to an S.R.T.

The following levels of observations, cautions and warnings are used in this Service Documentation:

Note: Indicates a procedure, practice, or condition that must be followed in order to have the vehicle or component function in the manner intended.

Caution: Indicates an unsafe practice where damage to the product could occur.

Warning: Indicates an unsafe practice where personal injury or severe damage to the product could occur.

Danger: Indicates an unsafe practice where serious personal injury or death could occur.

Volvo Trucks North America, Inc.
Greensboro, NC USA

Order number: PV776-TSP142854

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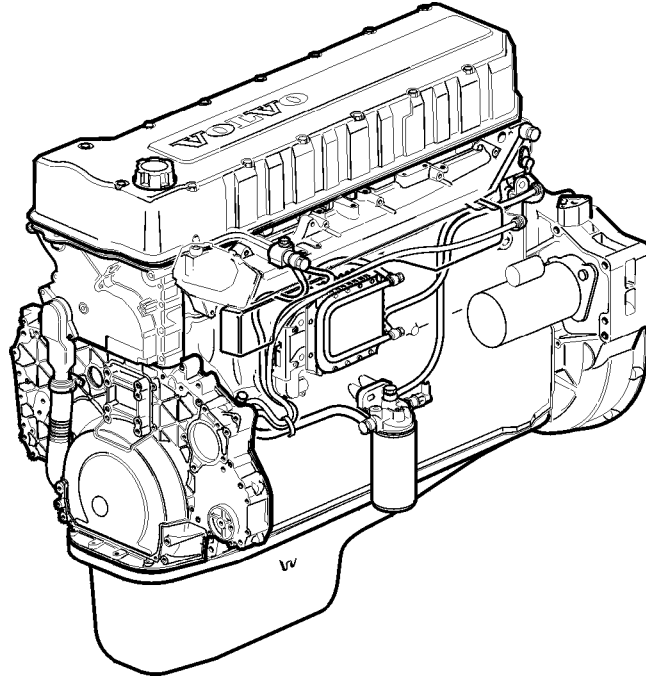
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General



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This information covers the Cooling System for the D12, D12A, D12B, and D12C engines.

Tools

Special Tools

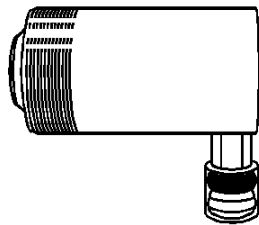
The following special tools are required to work on the cooling system of the D12 engine. The tools are available from the Parts Department of Volvo Trucks North America, Inc.

Please specify the complete part number when ordering.



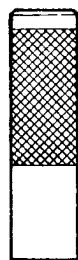
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9992071 Drift for Overhauling Coolant Pump



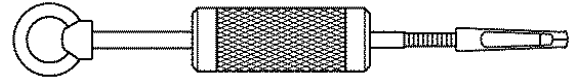
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9992671 Hydraulic Cylinder



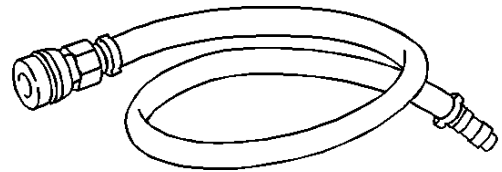
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9994034 Hollow Drift for Overhauling Coolant Pump



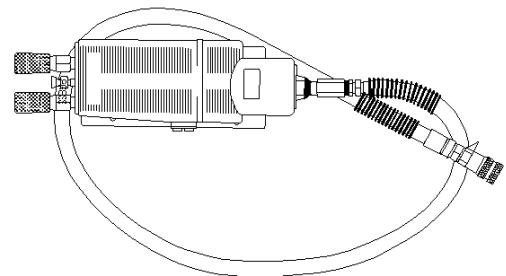
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9994090 Puller for Coolant Pump Seal



W0001746

9996049 Drain Hose for coolant



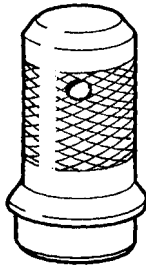
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9996222 Air Powered Hydraulic Pump



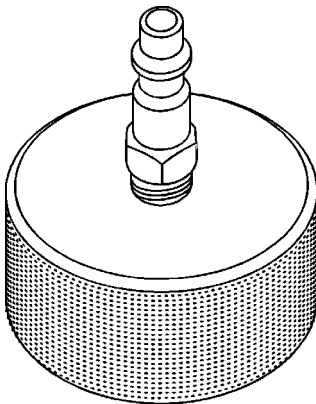
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9996315 Spindle for Overhauling Coolant Pump



W0001763

9996383 Hollow Drift for Overhauling Coolant Pump



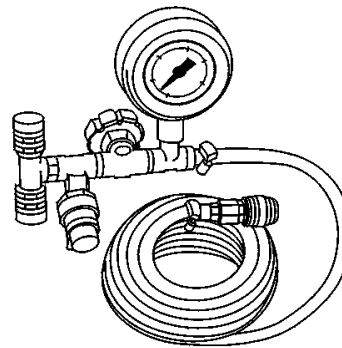
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9996441 Expansion Tank Cap-VN



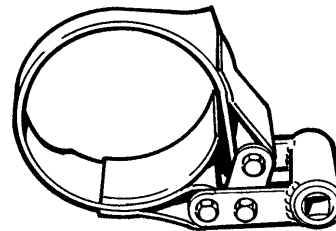
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9996626 Hollow Drift for Overhauling Coolant Pump



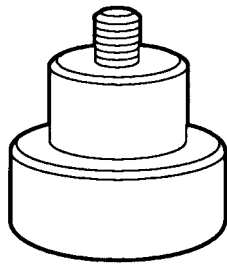
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9996662 Pressure Gauge



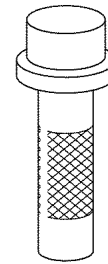
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9996671 Filter Wrench for Coolant Filter



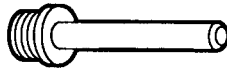
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9996883 Adapter for Overhauling Coolant Pump



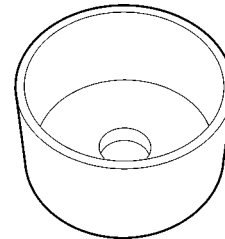
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9998113 Drift for Overhauling Coolant Pump



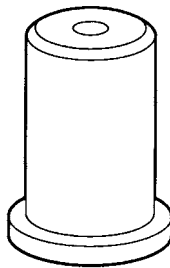
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9996884 Drift for Overhauling Coolant Pump



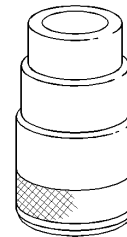
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9998244 Sleeve for Overhauling Coolant Pump



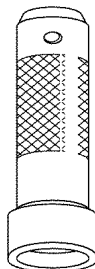
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9998012 Hollow Drift for Overhauling Coolant Pump



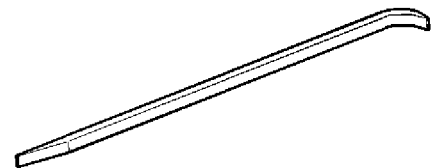
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9998291 Drift for Installing Thermostat Sealing Ring on the D12 A & B engine



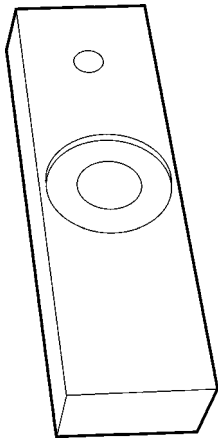
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9998039 Drift for Overhauling Coolant Pump



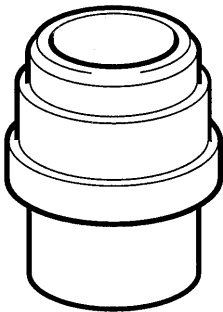
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9998511 Drift for Installing Thermostat Sealing Ring on the D12 A & B engine



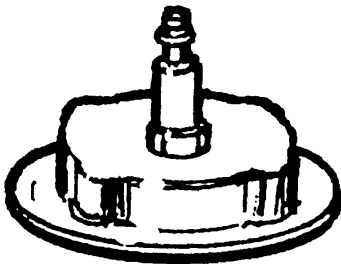
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9998541 Tool for Pressing Impeller onto Coolant Pump Shaft



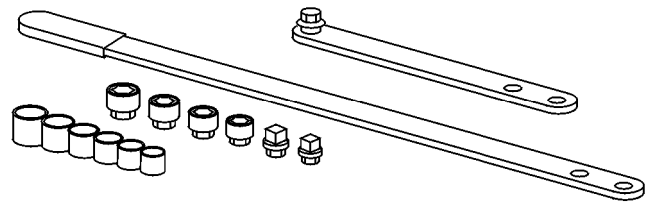
W0001806

9998619 Drift for Installing Thermostat Sealing Ring on the D12C engine



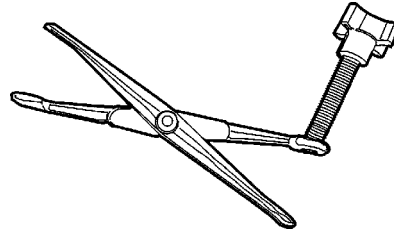
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J-42397-A Expansion Tank Cap-VHD



W2003340

J-44392 Belt Tensioner Release Tool (Kent Moore)



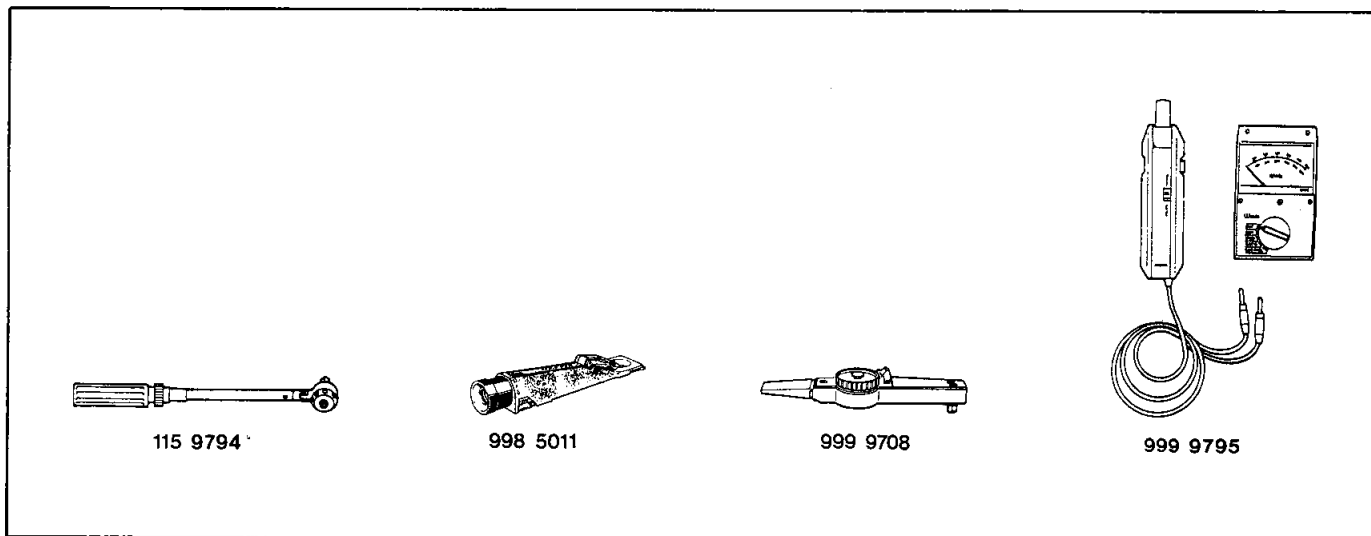
W0001929

J-44772 Thermostat Housing Install Tool

Special Equipment

Like the special tools, the following are also available from the Parts Department of Volvo Trucks North America, Inc.

Please specify the complete part number when ordering.



1159794 Torque wrench 10-100 Nm
(7-74 ft-lb)

9985011 Hydrometer for antifreeze
9999708 Torque wrench 0-17.5 Nm
(0-13 ft-lb)

9999795 Tachometer

T2007271

Design and Function

Cooling System

Charge Air Cooler

Charge Air Cooler Systems are essential today to meet emissions regulations. However, they also improve power density, lower fuel consumption, and reduce thermal stresses on the engine by cooling the turbocharged air before it enters the engine. The turbocharged air is heated up to 200° C (400° F) or even higher as it enters the charge cooler, and is cooled to around 40° C (100° F) when it leaves for the engine.

Accumulation of bugs and dirt in the finned areas of a Charge Air Cooler are known problems. If there is a build up of any debris like road film, bugs, etc. in just a section of a charge air cooler, that section overheats and torsional (twisting) stresses develop in the charge air cooler core. The fin passage cleanliness may not be as critical in an over-the-highway vehicle, but in construction, logging and mining equipment, it can be.

Before performing the actual leak test, make sure the pressure regulator is functioning properly; see "Cooling System, Flow" page 12.

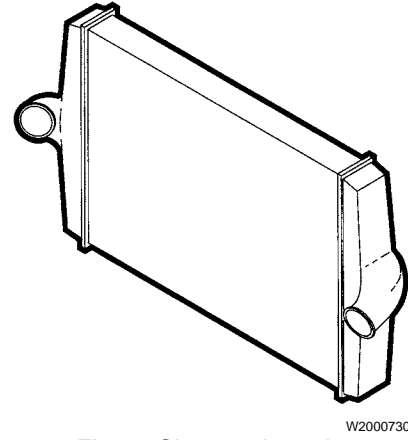
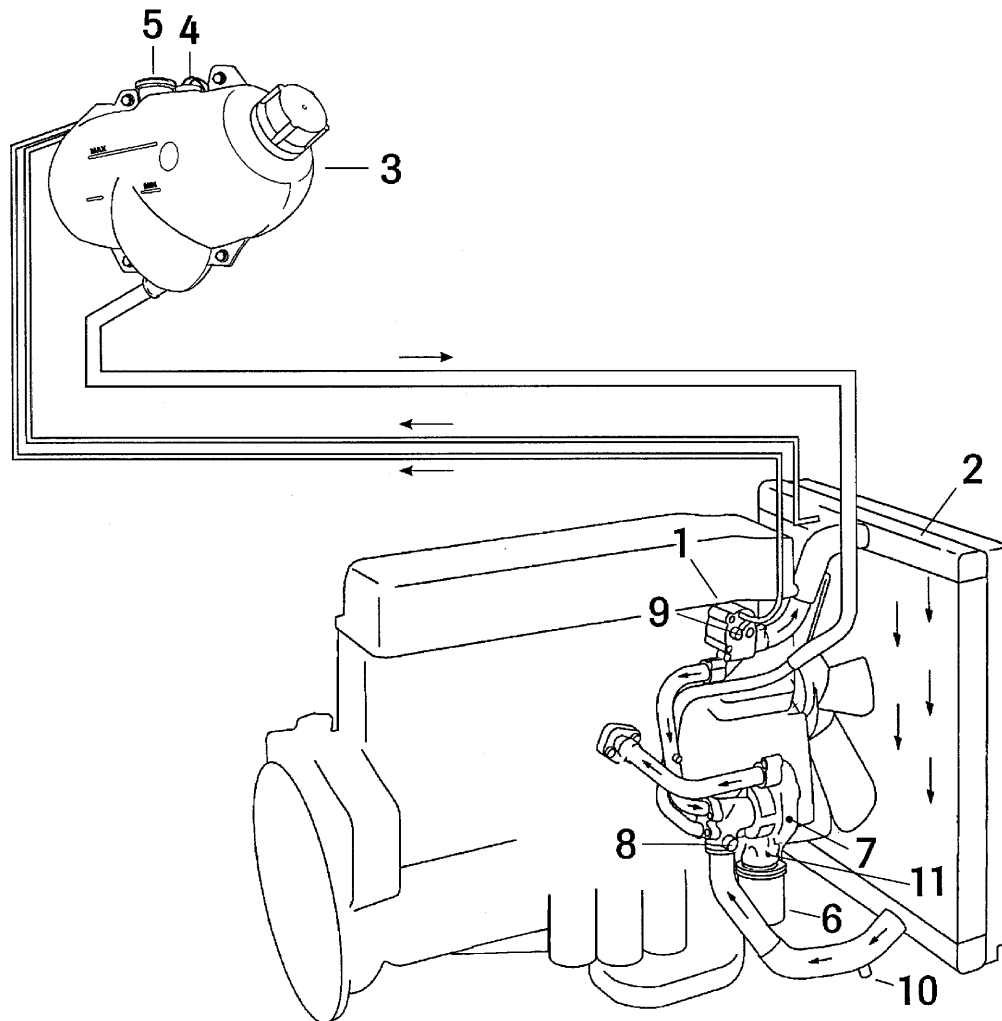


Fig. 1: Charge air cooler

Cooling System, Flow



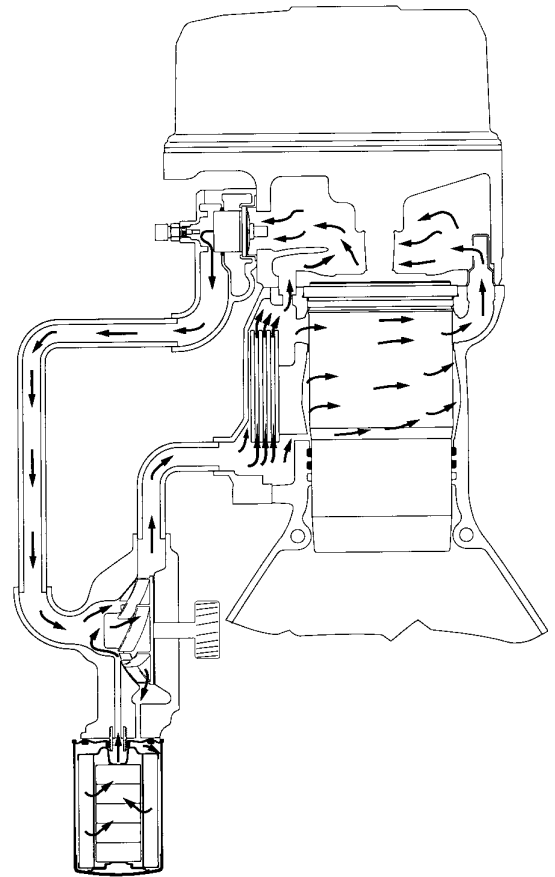
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Fig. 2: Cooling system

- | | |
|----------------------|--------------------------------|
| 1 Thermostat housing | 7 Coolant pump |
| 2 Radiator | 8 Heater return |
| 3 Expansion tank | 9 Heater supply |
| 4 Level sensor | 10 Radiator drain valve |
| 5 Pressure cap | 11 Shut-off valve—coolant pump |
| 6 Coolant filter | |

Coolant Circulation in Engine

The coolant is forced through the system by a gear-driven pump. The coolant enters the cylinder block through a pipe and first passes the area where the oil cooler is installed. The coolant is then distributed through galleries in the cylinder block and cylinder head to reach the cylinder liners and other parts of the engine before leaving the cylinder head through the thermostat housing. The illustration shows the engine during the warm-up period. The thermostat is closed and the coolant is flowing back to the coolant pump.

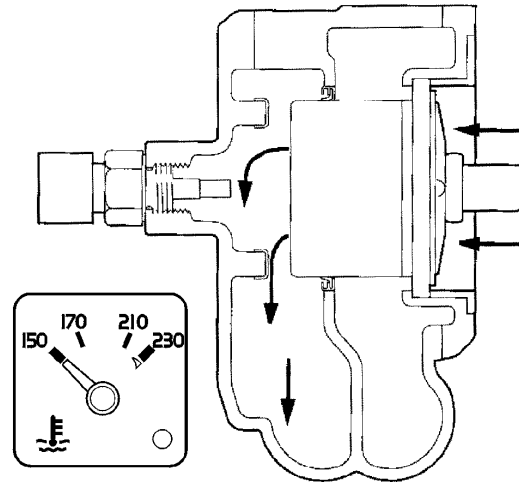


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Fig. 3: Coolant circulation

Thermostat

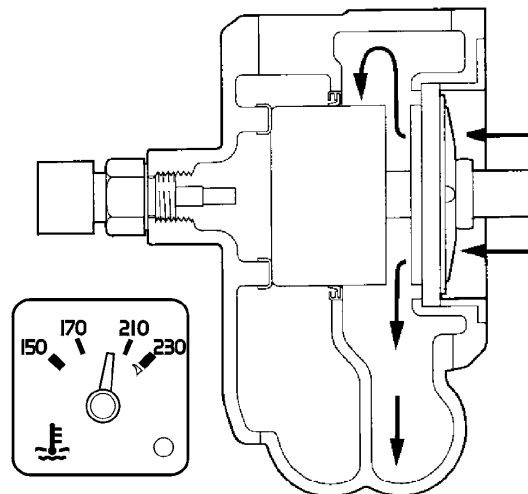
The engine is equipped with a thermostat. The thermostat housing incorporates a sensor for coolant temperature. During engine warm-up, the thermostat is closed, (see Fig. 4: Thermostat closed , page 14) and coolant flows from the cylinder head through the outer section of the thermostat back to the coolant pump.



W2003283

Fig. 4: Thermostat closed

When the engine has reached operating temperature and the thermostat is open (see Fig. 5: Thermostat open, page 14) , the outlet to the coolant pump is gradually closed. The coolant now passes through the inner section of the thermostat housing and then to the radiator.



W2003284

Fig. 5: Thermostat open

Thermostat Housing

D12C

The thermostat housing has been integrated into the cylinder head.

The thermostat (1) is located at the right front side of the cylinder head and its seal ring (2) is accessible once the connection housing (3) and thermostat have been removed (see illustration, Fig. 6: Thermostat Housing, D12C, page 15).

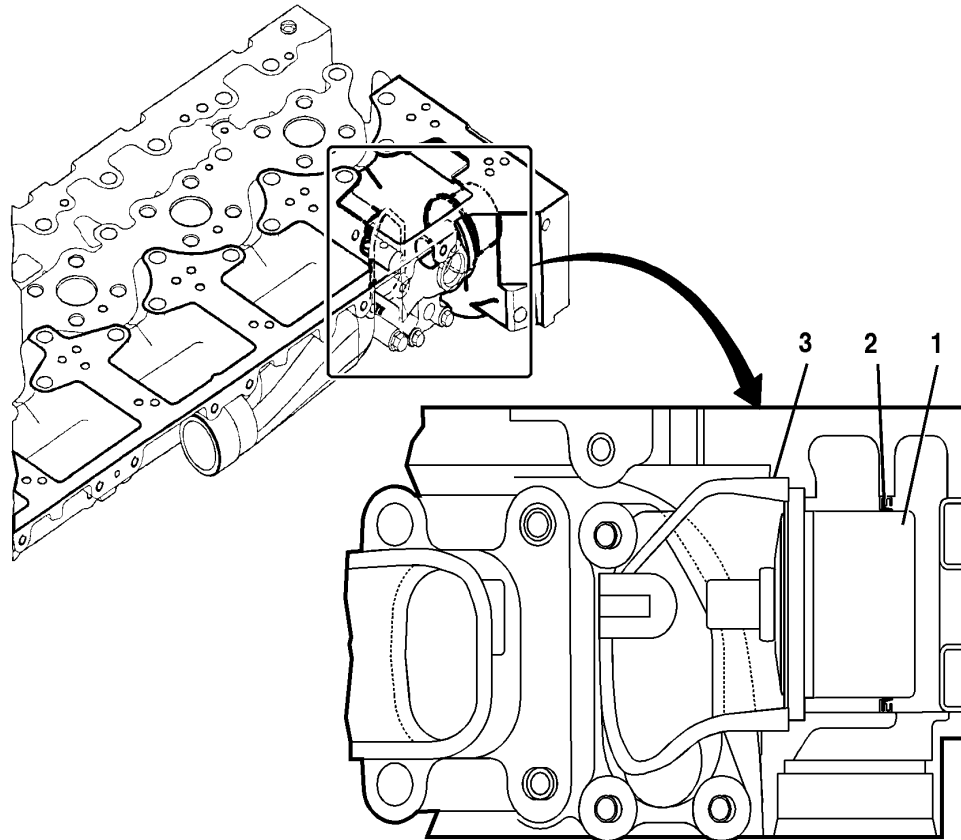


Fig. 6: Thermostat Housing, D12C

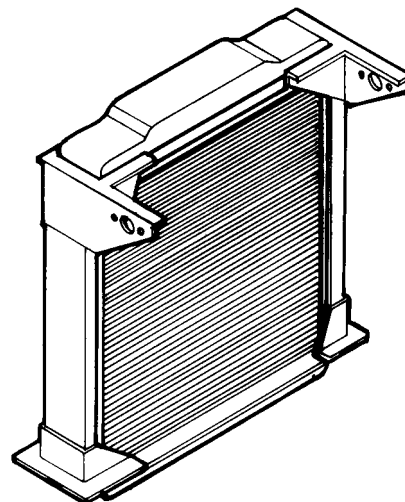
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Radiator

AC, WG

There are two (2) sizes of radiators furnished for use with the D12 engines in different applications:

Vehicle Type	Radiator Area	System Capacity
Autocar	84 dm ² (1300 in ²)	43 (52 qts)
WG	67 dm ² (1032 in ²)	50 (52 qts)



W2003214

Fig. 7: Radiator, AC, WG

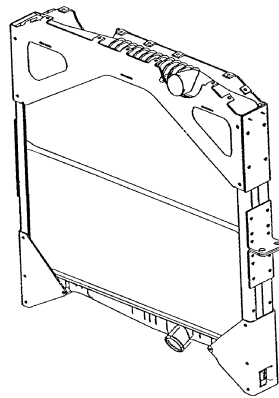
VN/VHD

Do to the unique design of the radiator, do not attempt to replace any of the components on the VN/VHD radiator, including tanks, seals or core.

Specialized tooling is needed to perform quality repairs when crimping the tanks and seals to the core. Therefore, you should:

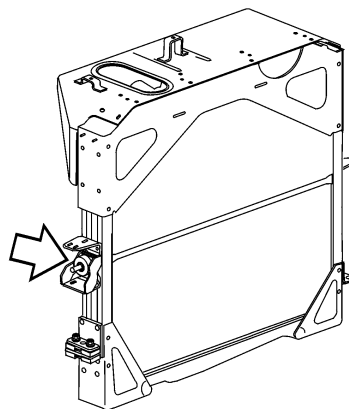
- have the radiator repaired by an authorized radiator service center; or
- replace the complete unit

Vehicle Type	Radiator Area	System Capacity
VN	124 n ²	39
VHD	849 n ²	39



W2003376

Fig. 8: Radiator, VN



W2003472

Fig. 9: Radiator, VHD (with unique mounting bracket)


Coolant Mixture


Always mix water and antifreeze to the correct concentration before filling the cooling system.

The recommended mixture is 50% antifreeze/coolant in the water.

Note: Mixing concentrated coolants of a different type can result in a loss of anti-corrosion properties with damage to the engine as a result.

At the factory, the cooling system is normally filled with a mixture of tap water and concentrated coolant which gives protection down to minimum -29° C (-20° F). If the vehicle is destined for climates colder than this, the antifreeze level of the coolant should be adjusted; see approximate values in the following table.

	CAUTION
60% antifreeze in the mixture gives optimum freeze protection. Increasing the antifreeze content beyond that will only decrease the freeze protection.	

	CAUTION
Never use a mixture weaker than 40% antifreeze to 60% water. Ignoring this increases the risk of corrosion in the cooling system and cylinder liner pitting leading to damage of the engine.	

For more detailed information on Coolants, refer to:

TSI 184-001
Coolant Requirements, Volvo Engines

IMPACT Function Group 184
 Information Type: Service and Maintenance
 "Coolant Requirements"

Freeze Protection

down to:	Amount concentrated antifreeze, WG	Amount concentrated antifreeze, WI and AC	Percentage of antifreeze in mixture
-25° C (-13° F)	17 liters	20 liters	40%
-30° C (-22° F)	20 liters	23 liters	46%
-38° C (-36° F)	21 liters	25 liters	50%
-46° C (-51° F)	26 liters	30 liters	60%

Flushing Cooling System

The cooling system should always be cleaned when the coolant is replaced.



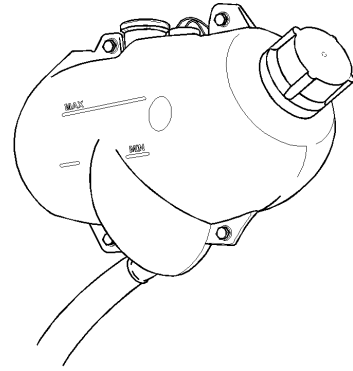
DANGER

Coolant is toxic; risk of poisoning. Do not drink coolant. Use proper hand protection when handling. Keep coolant out of reach of children and animals. Failure to follow these precautions can cause serious illness or death.

Note: Always dispose of coolant according to Federal or local regulations. Take all used coolant to a recycling or waste collection center.

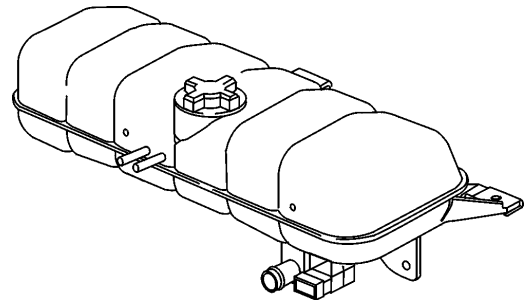
Expansion Tank

The expansion tank includes a pressure valve and a coolant level sensor. The tank material is clear and has maximum (MAX) and minimum (MIN) markings to allow visual fluid level checks.



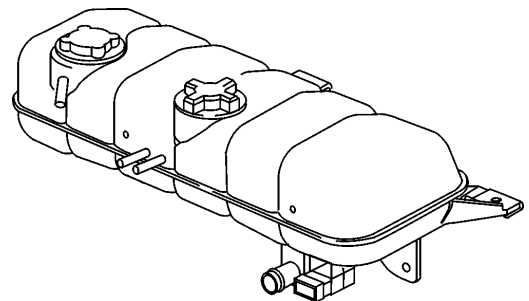
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Fig. 10: Expansion tank for WG and AC



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Fig. 11: Expansion tank for VHD



W2003515

Fig. 12: Expansion tank for VN

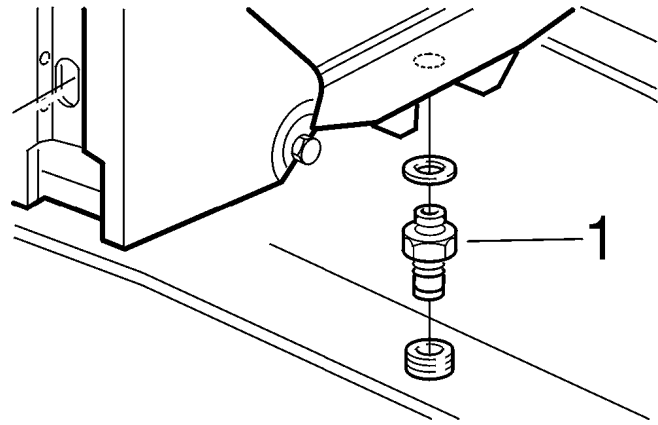
Draining Points

To drain the cooling system, all drain points should be opened. In addition, the expansion tank cap should be removed while the system is draining.

Draining points:

- Radiator
- Cylinder block
- Oil cooler, transmission (when installed)
- Coolant pump

Note: In some locations the draining point consists of a quick-connect valve (1) covered with a rubber cap; see Fig. 13: Quick-connect drain valve in bottom of radiator, page 20. In this case use tool 9996049 for draining. This is a quick-connect hose needed for draining.



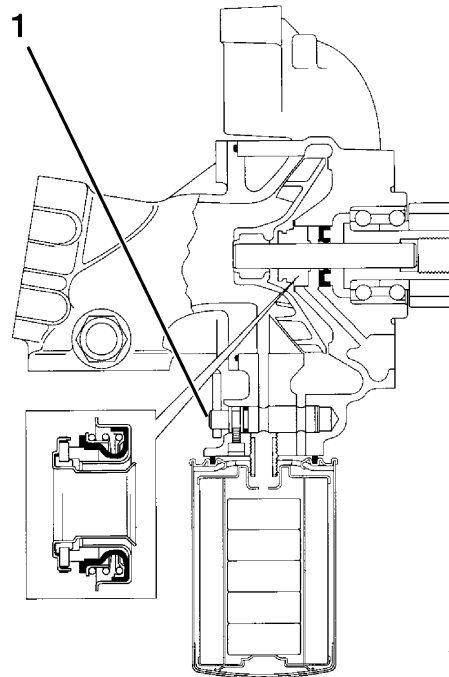
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Fig. 13: Quick-connect drain valve in bottom of radiator

Coolant Pump

The coolant pump is mounted to the timing gear plate and is driven by the timing gears. The coolant pump includes a one-piece carbon/ceramic seal and a double ball bearing for the pump shaft. The pump is equipped with a shut-off valve (1) which prevents coolant from draining out when changing the coolant filter; see Fig. 14: Coolant pump, page 20. To close the valve, the handle is turned to the horizontal position.

Note: The shut-off valve must always be in the open position. That is, the handle should point vertically, except when replacing the lines.



W2003282

Fig. 14: Coolant pump

Coolant Filter

A coolant filter is mounted to the coolant pump. On D12 engines and an adapter is mounted to the pump with lines to a remote-mounted coolant filter situated on the right side of the engine.

Coolant filters used with standard coolant include an anti-corrosive agent, SCA (Supplemental Coolant Additive), which is added to the standard coolant during filtration.

Coolant filters used with Extended Life Coolant, ELC, are "blanks" and do not contain any SCA.

Note: The valve must always be in the open position, i.e. the handle should point vertically, except when changing the filter.

For more detailed information on coolants, refer to

TSI	184-001 <i>Coolant Requirements, Volvo Engines</i>
IMPACT	Function Group 184 Information Type: Service and Maintenance "Coolant Requirements"

Winterfront

Volvo Trucks North America, Inc. does not recommend the use of winterfronts, shutters or any other shield in front of the grille or radiator package under normal circumstances. These devices, if not used properly, can cause higher exhaust temperatures, power loss, excessive fan usage and a reduction in fuel economy.

Today's electronically controlled engines are designed to operate in temperatures without a winterfront. Volvo Trucks North America, Inc. does not recommend the use of a winterfront while the vehicle is being driven. If a winterfront is used, it must conform to these specifications:

Note: Please see your local Volvo Truck Dealer for Volvo recommended winterfronts. If there is engine or related damage that can be followed back to an improperly used winterfront, the warranty is no longer valid for those parts.

VHD-Failure to remove the winterfront when temperatures go above 15° F (-25° C.) could cause severe damage to engine, charge-air-cooler and/or loss of fuel economy. The grille cover should be able to let airflow through to the charge-air-cooler at a uniform rate over the entire area. This means that a single, small opening in the winterfront is not acceptable. Air passage must be distributed evenly across the grille and no more than 85% can be covered.

VN-Winterfronts are properly used for overnight parking in the winter or very cold temperatures (below -5° F [-20° C]). In these cases, coolant and inlet manifold temperatures must be carefully monitored and controlled.

Viscous Fan

The Viscous fan consists of a fan section and a drive section connected by a visco-static clutch. The clutch consists of a drive plate (6) which is mounted in a housing (7); see Fig. 17: Fan, cross-section, page 23.

On each side of the drive plate (6) is an air gap. When the fan is engaged, these gaps are filled with fluid. With the fan in operation, the flow of fluid in the fan hub takes place in two different ways. The temperature around the bimetallic plate (2) determines which path the fluid takes and thereby the degree to which the fan is engaged.

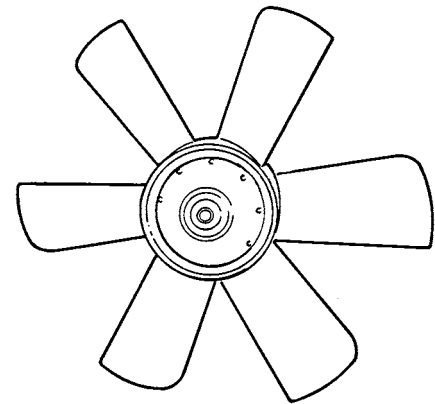
The control device regulates the amount of fluid reaching the drive chamber to meet the cooling requirements. The more fluid in the drive chamber, the less "slip," thus resulting in higher fan speed. The fluid circulates between the storage and drive chambers. When the engine and fan stop, the fluid runs out into the drive chamber, which is why the fan is generally engaged during the first minutes after starting the engine.

A. Disengagement

The valve (1) closes and fluid is pumped out into the storage chamber (5).

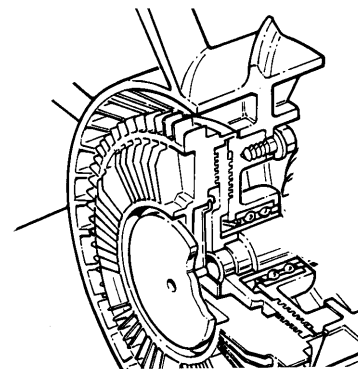
B. Engagement

The valve (1) opens and fluid can enter the drive chamber (8).



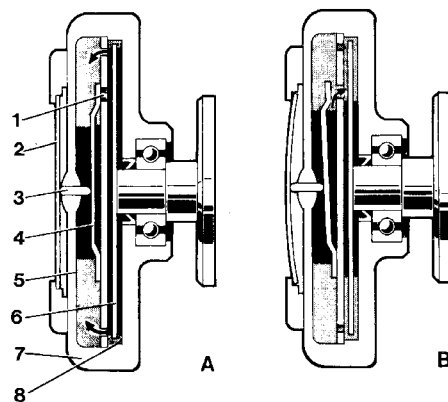
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Fig. 15: Cooling fan



T2007216

Fig. 16: Sensor, bimetallic plate



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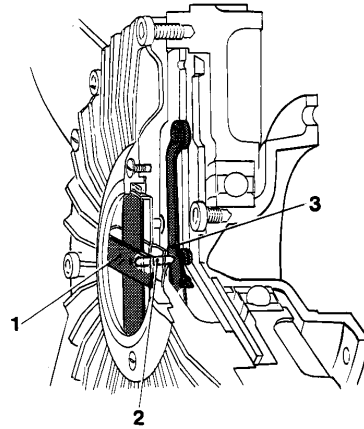
Fig. 17: Fan, cross-section

Fan, cross section shows valve disengaged (B) and engaged (A)

- 1 Valve
- 2 Bimetallic plate
- 3 Control pin
- 4 Valve lever
- 5 Fluid storage chamber
- 6 Drive plate
- 7 Housing
- 8 Drive chamber

Control Device

The fan rotates at reduced speed. The bimetallic plate (1) presses against the control pin (2) moving it towards the valve lever (3).



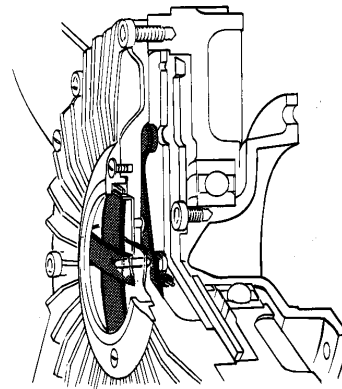
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Fig. 18: Control valve closed

- 1 Bimetallic plate
- 2 Control pin
- 3 Valve lever

The fan is fully engaged. The bimetallic plate flexes outwards due to the temperature increase in the ambient air.

For function check, see "Viscous Fan, Checking" page 68.



T2007219

Fig. 19: Control valve open

Troubleshooting

Cooling System Troubleshooting

Coolant Temperature Too High

Excessively high coolant temperature can be due to:

- Blocked radiator (low airflow)
- Blocked cooling system
- Contaminated coolant
- Low coolant level
- Broken fan belt
- Faulty temperature gauge
- Poor grounding between engine and chassis
- Faulty thermostat
- Faulty temperature-controlled cooling fan
- Leaking cylinder head gasket, lower liner seals
- Leaking coolant hoses

Coolant Temperature Too Low

- Faulty thermostat
- Faulty temperature gauge

Loss of Coolant

External Leaks

- Leaks in hoses or connections
- Leaks in radiator and/or expansion tank
- Leaks in cab heater
- Leaks in coolant pump
- Cylinder head gasket leakage

Internal Leaks—Engine

- Leak at injector copper sleeve
- Defective liner seals
- Liners pitted or cracked
- Cylinder head gasket leakage
- Crack(s) in cylinder head
- Crack(s) in cylinder block

Coolant Leaks Through Overflow

- Faulty pressure cap/relief valve
- Engine running too hot
- Expansion tank installed incorrectly
- Cylinder head gasket leakage
- Cylinder block cracked
- Liners pitted or cracked
- Coolant losses, warm engine switched off

Coolant losses after having switched off a warm engine are generally due to heavy load operation and subsequent stopping without allowing the engine first to run at idling speed to cool down, or a faulty pressure cap valve.

Temperature Gauge, Checking

Remove the temperature sensor from the thermostat housing and reconnect the electric connector. Connect a ground between the temperature sensor and the cylinder block. Submerge the temperature sensor in heated water. Using a thermometer, read off the temperature. Compare this reading with the reading of the temperature gauge.

Air Flow-through, Checking

Should higher than normal coolant temperatures be observed, the passage of air through the charge air cooler, A/C condenser and radiator must always be checked and cleaned if necessary. Any obstruction must be removed.

In cases of more serious blockage, the radiator/charge air cooler and A/C condenser must be removed entirely and thoroughly cleaned, especially if the pollutant is oil based.

If the fins of the radiator have been bent by flying stones etc., straighten them with a fin comb.

Check that the rubber seals between the fan shroud and the radiator, and in some cases between the radiator and the front shroud, have not loosened or for any other reason are not providing a good seal.

Polluted Coolant

If the coolant is polluted it could mean that there is an internal leak (oil) or that the cooling system is clogged (deposits). Check for leaks.

A clogged system is usually a result of not changing the coolant according to the specific change intervals or using the wrong mixture of coolant and water, or that polluted water has been used.

Speed Check



DANGER

Coolant is toxic; risk of poisoning. Do not drink coolant. Use proper hand protection when handling. Keep coolant out of reach of children and animals. Failure to follow these precautions can cause serious illness or death.



DANGER

Keep your hand, clothing, and the measuring instrument at a safe distance from the blades of the fan when checking RPM. Contact may cause personal injury or death.



WARNING

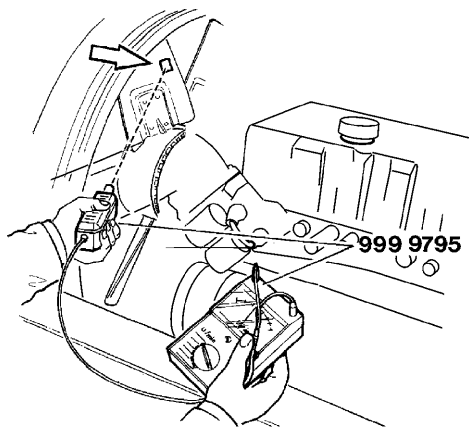
HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.



WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Fan Disengaged



W2003338

Fig. 20: Using hand-held tachometer

1

Run the engine at idling speed for approximately 5 minutes. Air temperature in front of the fan must not exceed 30° C (85° F). The silicone fluid, which drains into the drive chamber when the engine is switched off, is now pumped back to the storage chamber.

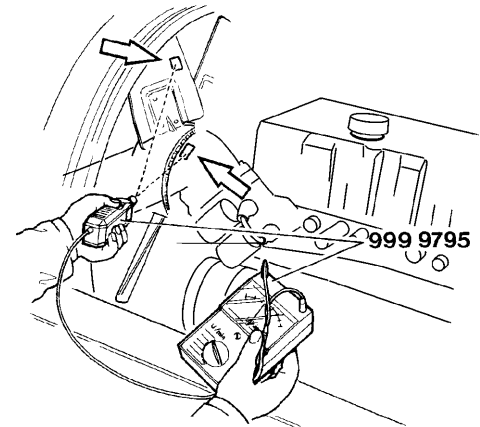
1

Increase engine speed to maximum RPM and measure fan speed with special tool 9999795. Fan speed should be **less than half engine speed** when the fan is fully disengaged.

9999795

Fan Engaged

Air temperature around the sensor should be approximately 85° C (185° F) for the fan to be fully engaged.



W2003339

Fig. 21: Measuring fan speed

1

Run the engine at maximum output RPM and measure the fan speed and fan drive pulley speed using tool 9999795. Fan speed must **not be less than 90% of pulley speed** when the fan is fully engaged.

9999795

Service Procedures

2611-03-02-01**Radiator, Replacement****DANGER**

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

**WARNING**

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

**WARNING**

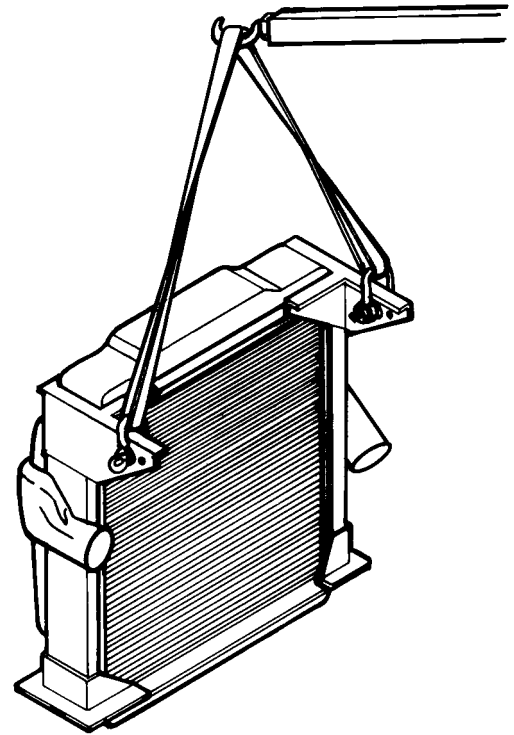
Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

**WARNING**

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

**WARNING**

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

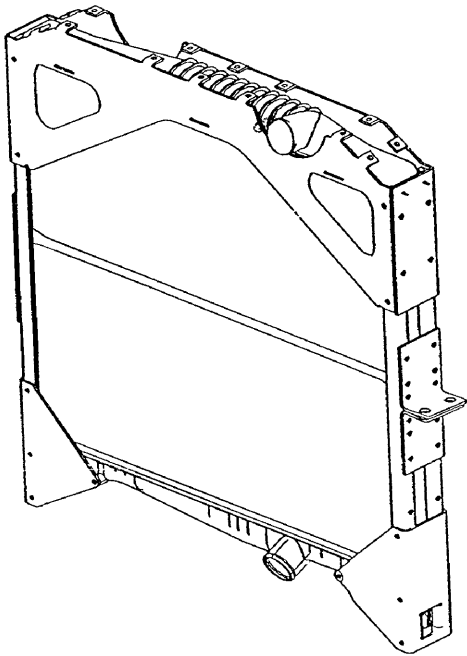


W2002101

Fig. 22: Lifting radiator and charge air cooler assembly

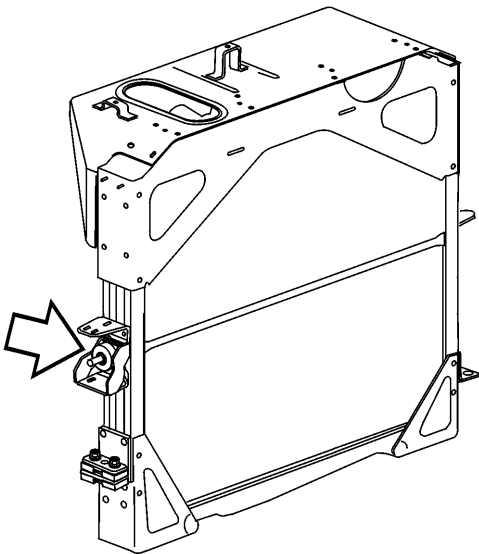
Note: WG, AC

The radiator and charge air cooler are removed and installed as an assembly. Use of a lifting strap during removal and installation will help to prevent damage to the radiator/charge air cooler assembly.



W2003376

Fig. 23: VN radiator



W2003472

Fig. 24: VHD radiator

Important: Do not attempt to replace any of the components on the VN/VHD radiator, including tanks, seals, or core.

Specialized tooling is needed to perform quality repairs when crimping the tanks and seals to the core. Therefore, you should:

- have the radiator repaired by an authorized radiator service center; or
- replace the complete unit.

Removal

1

- **(VHD only)** For removal of the grille in a VHD model truck refer to procedure:

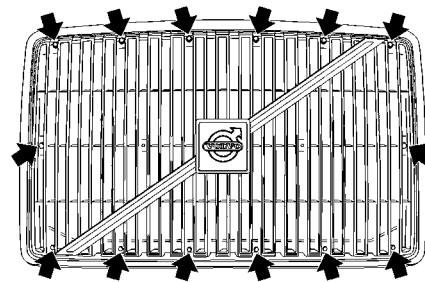
T25 Torx bit
8 mm wrench

TSI

820–500
"Hood, VHD"

Impact

Function Group
82
Information Type:
Repair
Hood, VHD



W2002077

Fig. 25: VN model- screw fasteners

(VN only)

Remove the 14 Torx screws fastening the grille to the hood, and set the grille aside.

2

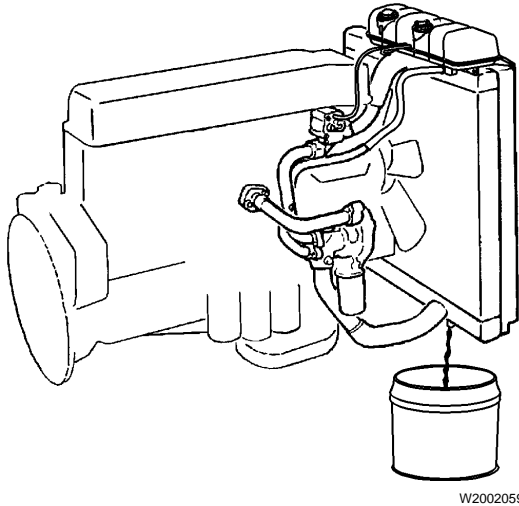


Fig. 26: Drain the cooling system

**DANGER**

Risk of poisoning. Coolant is toxic. Do not drink coolant. Use proper eye and hand protection when handling. Keep coolant out of reach from children. Personal injury or death could result.

Drain the cooling system. Open the drain on the bottom of the radiator and drain into a suitable container.

Note: On most older models, use tool 9996049 to drain radiator or engine.

3

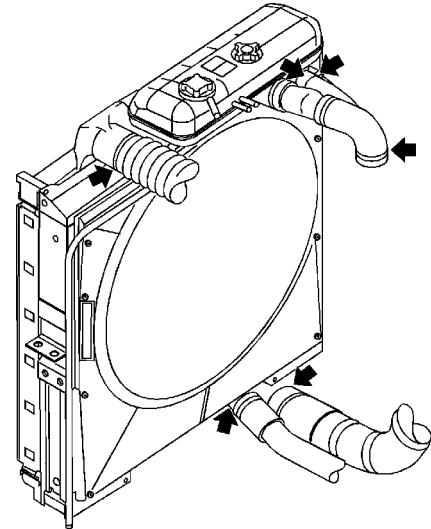


Fig. 27: Disconnect radiator hoses

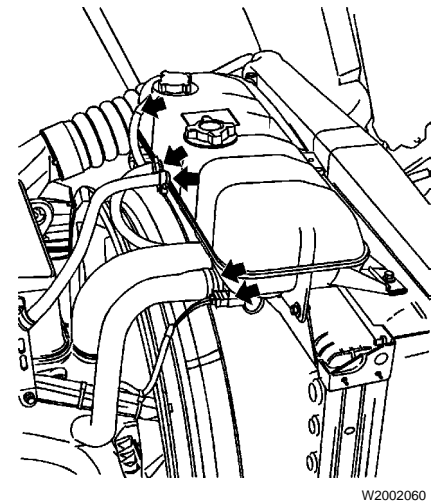


Fig. 28: Disconnect wires/hoses for coolant sensor

Disconnect the hoses to the radiator and the charge air cooler assembly:

10 mm socket
7 mm socket

- Top radiator hose
- Bottom radiator hose
- Fill hose from the water pump to the expansion tank
- Top charge air cooler hose
- Bottom charge air cooler hose
- Wires for the low coolant sensor

4

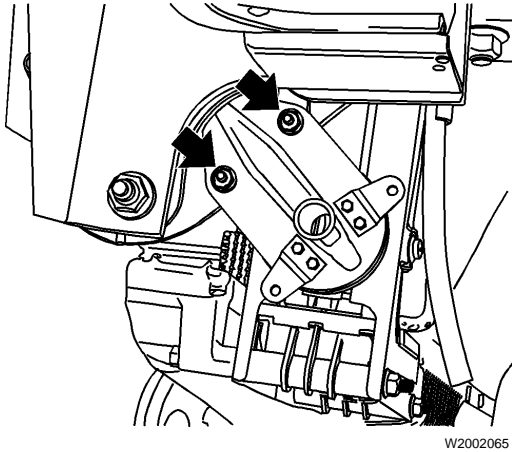


Fig. 29: Remove radiator mounts

Remove the four bolts fastening the lower radiator mounts. 13 mm socket

5

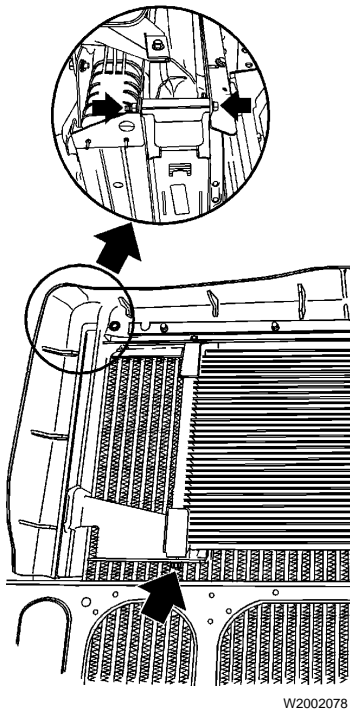


Fig. 30: Remove bolts for support bracket

Remove the two upper bolts that fasten the air conditioning condenser upper support bracket to the charge air cooler assembly. 12 mm wrench
12 mm socket
13 mm wrench

Note: These bolts also mount the upper CAC to the radiator. Remove the lower two bolts that fasten the condenser itself to its lower support brackets.

6

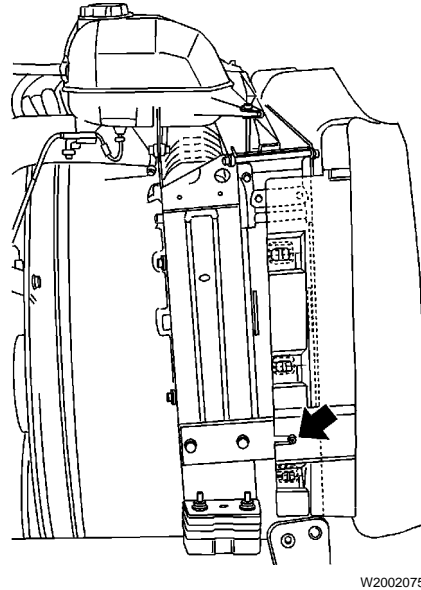


Fig. 31: Remove head screws

Remove the two torx head screws fastening the side shroud to the radiator. T25 torx bit

7

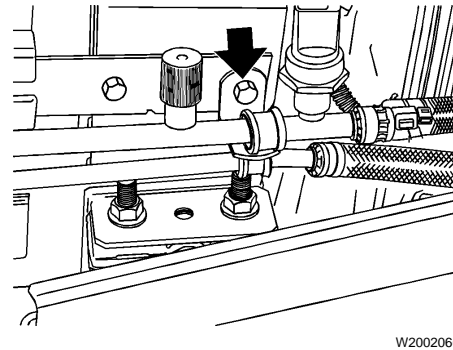
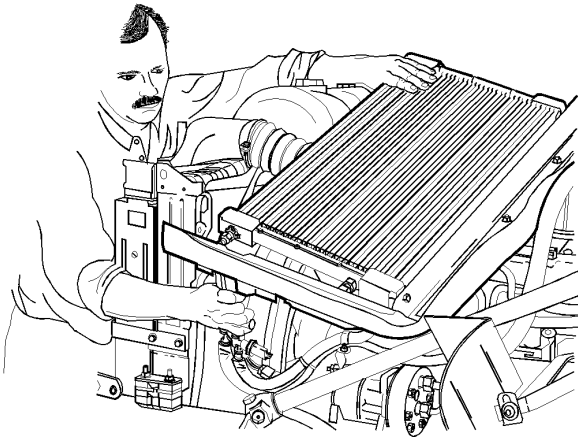


Fig. 32: Remove radiator fastener

Remove the one bolt that fastens the air conditioning lines to the radiator. 12 mm wrench

8

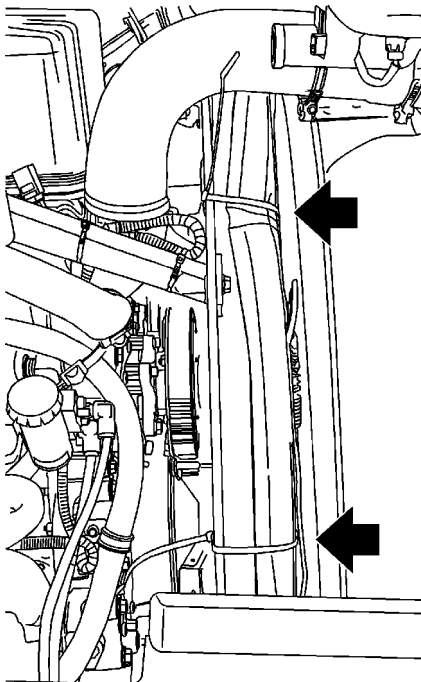


W2002071

Fig. 33: Lift out the condenser

Lift out the condenser, raise across the top of the radiator and let rest on top of the engine valve cover.

9

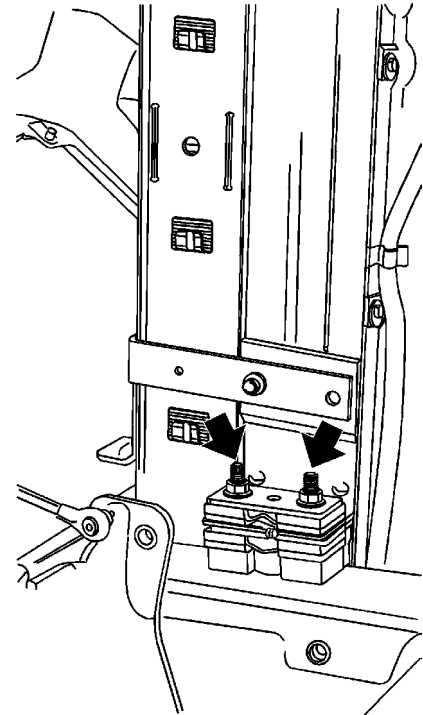


W2002072

Fig. 34: Plastic tie placement

Using plastic ties, tie the rubber part of the fan ring back away from the fan shroud.

10



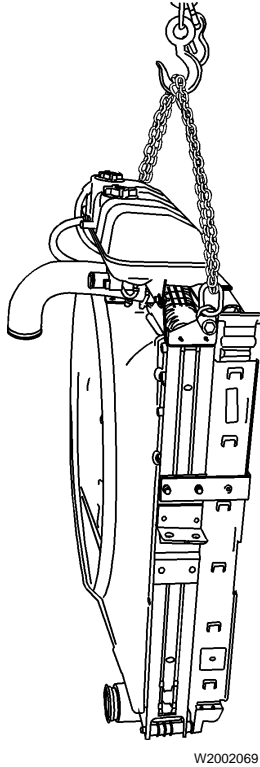
W2002105

Fig. 35: Remove mounting bolts

Remove the four upper radiator mounting bolts.

15 mm deep socket

11



W2002069

Fig. 36: Radiator removal

Fasten an acceptable lifting device to the top of the radiator in the holes that are provided. Lift out the radiator and the charge air cooler assembly.

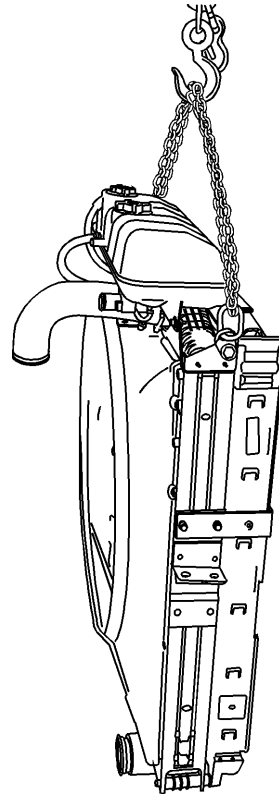
OEM 4129

**CAUTION**

Be careful not to damage the radiator assembly when removing. Damage to the radiator and/or engine could result in severe damage to the engine.

Installation

1



W2002069

Fig. 37: Lowering radiator

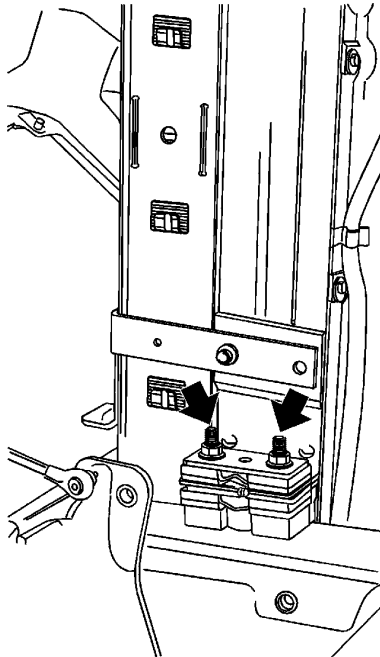
Position the radiator into the truck.

Note: Be very careful when lowering the radiator into the truck. Watch for any hoses or wires that might interfere or be damaged. Make sure the fan does not damage the radiator core assembly.

2

Remove the lifting device from the radiator.

3



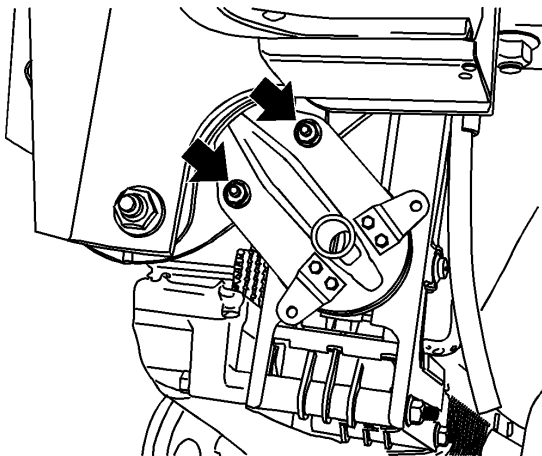
W2002105

Fig. 38: Install the radiator mounts

Install the upper radiator mounts and nuts. Torque to 48 ± 8 Nm (36 ± 6 ft-lb).

15 mm socket
 48 ± 8 Nm
 (18 ± 3 ft-lb)

4



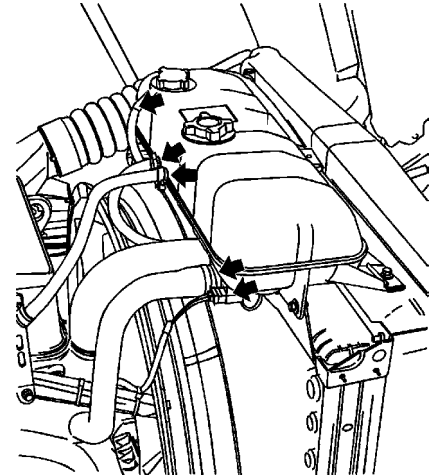
W2002065

Fig. 39: Install the supports and ties

Install the lower radiator supports and nuts. Torque to 24 ± 4 Nm (18 ± 3 ft-lb).

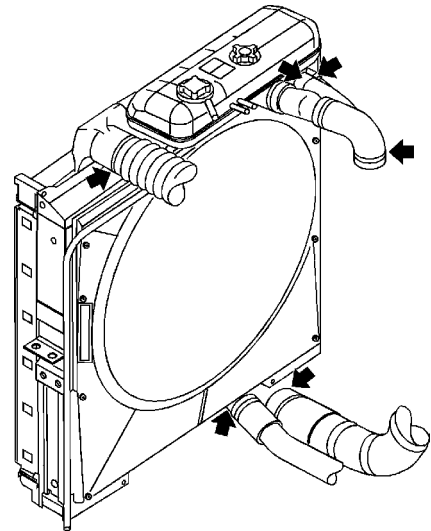
13 mm socket
 24 ± 4 Nm
 (18 ± 3 ft-lb)

5



W2002060

Fig. 40: Install expansion tank hoses



W2002063

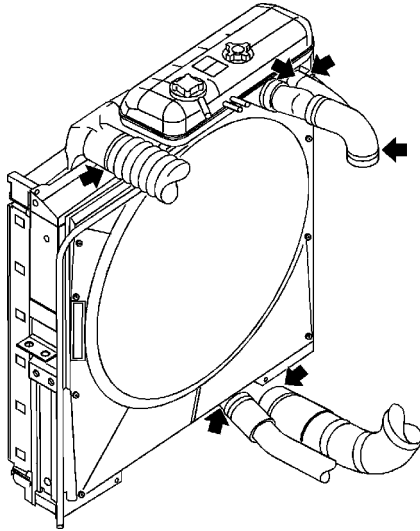
Fig. 41: Connect top hose clamps

Install all coolant hoses on the top side of the radiator. Connect the following:

- charge air cooler hose
 - low coolant sensor harness
- Torque the hose clamps as follows:
- top radiator hose 5.5 ± 0.8 Nm (50 ± 8 in-lb).
 - fill hose clamp 4 ± 0.6 Nm (35 ± 5 in-lb).
 - small bleed hose clamp 2.3 ± 0.3 Nm (20 ± 3 nibble)
 - charge air cooler hose clamp to 10 ± 1.5 Nm (90 ± 3 in-lb).

7 mm socket
 10mm socket
 screwdriver
 5.5 ± 0.8 Nm
 (50 ± 8 in-lb)
 4 ± 0.6 Nm
 (35 ± 5 in-lb)
 2.3 ± 0.3 Nm
 (20 ± 3 in-lb)
 10 ± 1.5 Nm
 (90 ± 3 in-lb)

6



W2002063

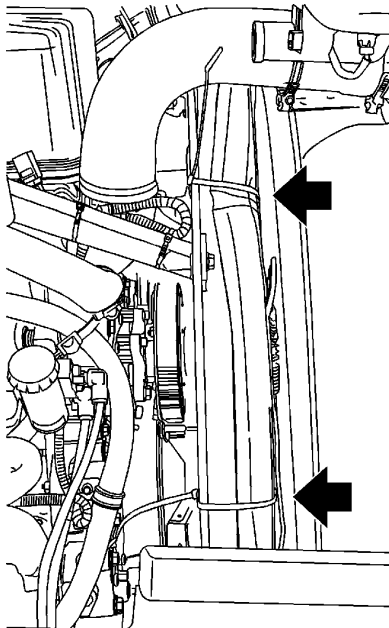
Fig. 42: Connect bottom hose clamps

Install the bottom radiator hose and the lower charge air cooler hose. Torque the hose clamps as follows:

- bottom radiator hose clamp 5.5 ± 0.8 Nm (50 ± 8 in-lb).
- lower charge air cooler hose clamp 10 ± 1.5 Nm (90 ± 13 in-lb).

7 mm socket
10 mm socket
torque wrench
 5.5 ± 0.8 Nm
(50 ± 8 in-lb)
 10 ± 1.5 Nm
(90 ± 13 in-lb)

7

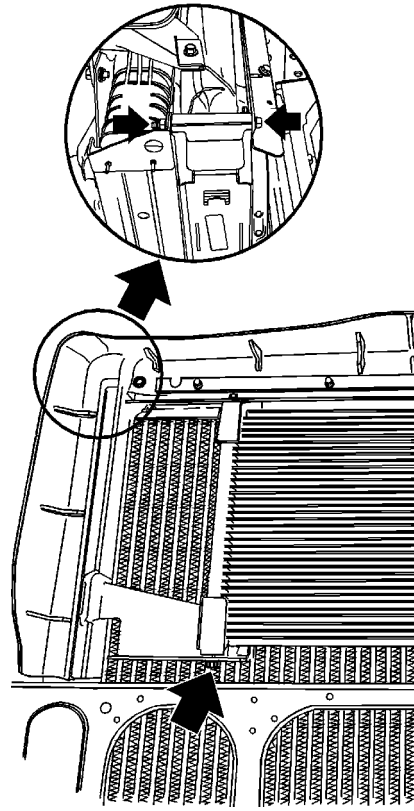


W2002072

Fig. 43: Tie removal

Cut the four ties holding the rubber shrouding away from the radiator.

8



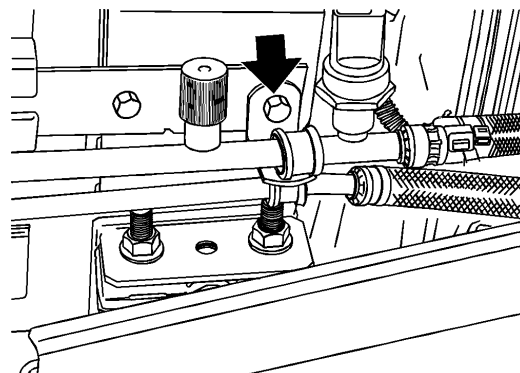
W2002078

Fig. 44: Install mounting brackets

Position the condenser onto the lower mounting brackets. Install the condenser mounting bolts and torque to 24 ± 4 Nm (18 ± 3 ft-lb). Torque the lower condenser mounting bracket bolts (previously hand tight) to 24 ± 4 Nm (18 ± 3 ft-lb).

12 mm socket
 24 ± 4 Nm
(18 ± 3 ft-lb)
 24 ± 4 Nm
(18 ± 3 ft-lb)

9



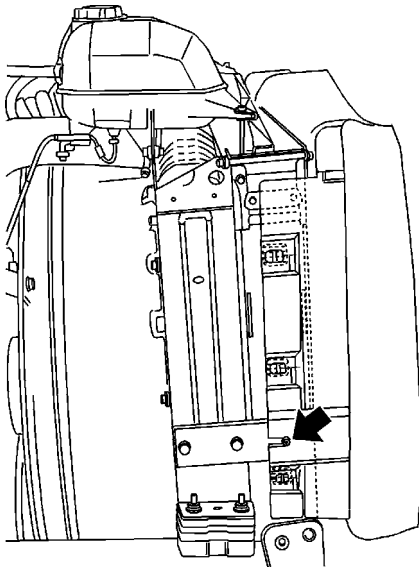
W2002066

Fig. 45: Install air conditioner line clamp

Install the bolt supporting the air conditioner line clamp. Torque the line clamp bolt to 24 ± 4 Nm (18 ± 3 ft-lb).

12mm wrench
 24 ± 4 Nm
(18 ± 3 ft-lb)

10

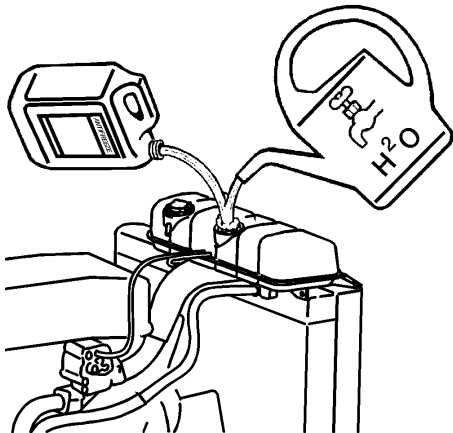


W2002075

Fig. 46: Install head screws

Position the side shroud into place, install two torx head screws and hand tighten. T25 torx bit

11



W2002058

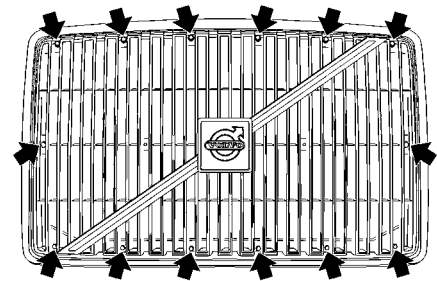
Fig. 47: Add coolant

Add the drained coolant. Maximum fill rate of 9.5 liter per minute (2.5 gallons per minute). For more detailed information on Coolants, refer to;

TSI 184-001
Coolant Requirements, Volvo Engines

IMPACT Function Group 184
Information Type: Service and Maintenance
"Coolant Requirements"

12



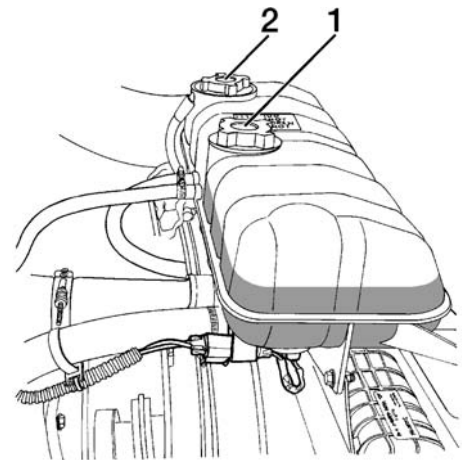
W2002077

Fig. 48: Install grille

Install grille and torque the 14 Torx head screws to 5 Nm (44 in-lb).

T25 Torx bit
8mm wrench
5 Nm
(44 in-lb)

13



W2002104

Fig. 49: Cap replacement

- 1 Fill cap
- 2 Pressure cap (do not remove)

Start engine and check for leaks. Run the engine to operating temperature. After the engine has reached operating temperature, move the heater controls to warm and run the engine an additional 10 minutes.

14

Shut off engine and re-check coolant level.

Note: To pressure test the system, see "Cooling System Leak Test, Checking" page 41.

2611-06-02-01

Radiator, Checking

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

WARNING

Always wear eye protection when working around batteries to prevent the risk of injury due to contact with sulfuric acid or an explosion.

(Checking CAC and Radiator Air Flow-Through)

1

If coolant temperatures are higher than normal, check the passage of air through the charge air cooler, A/C condenser and radiator. Clean if necessary.

2

Check the radiator to make sure that its external sections are not blocked by insects or other foreign objects which can obstruct airflow. If obstructions are found, use a mild detergent and water to clean them off. If the fins of the pipe system have been bent (by flying stones, etc.), straighten them out.

3

Make sure that the sealing moldings between the fan shroud and the radiator are not loose or for any reason are not providing a good seal. Check the condition of the recirculation shield. Also make sure it is properly installed.

2612-03-02-01

Radiator Surge Tank, Replacement

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

**WARNING**

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Removal

1

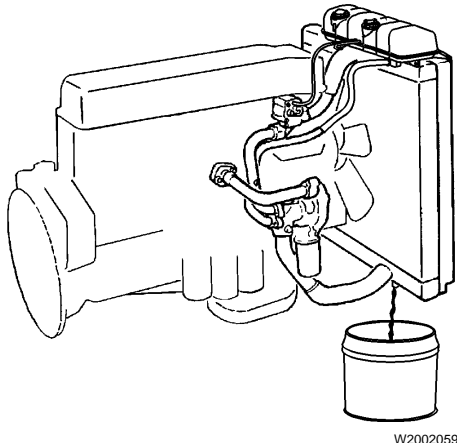


Fig. 50: Draining the coolant system

Open the drain on the bottom of the radiator and drain into a suitable container. Drain coolant below the expansion tank level.

**DANGER**

Risk of poisoning. Coolant is toxic. Do not drink coolant. Use proper eye and hand protection when handling. Keep coolant out of reach of children. Personal injury or death could result.

2

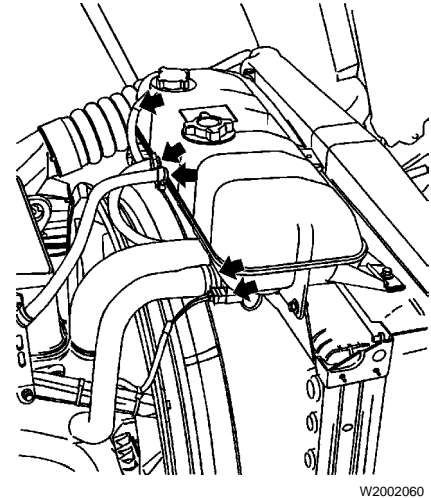


Fig. 51: Remove expansion tank hoses

Remove the four expansion tank hoses:

12 mm socket
6 in. extension

- overfill tube
- fill line
- air bleed hose (to thermostat housing)
- hose from expansion tank to radiator top tank

Unplug the wire harness to the low coolant sensor.

3

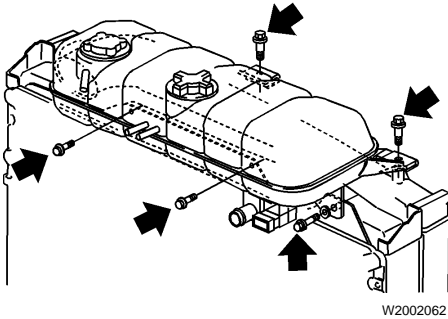


Fig. 52: Remove mounting bolts

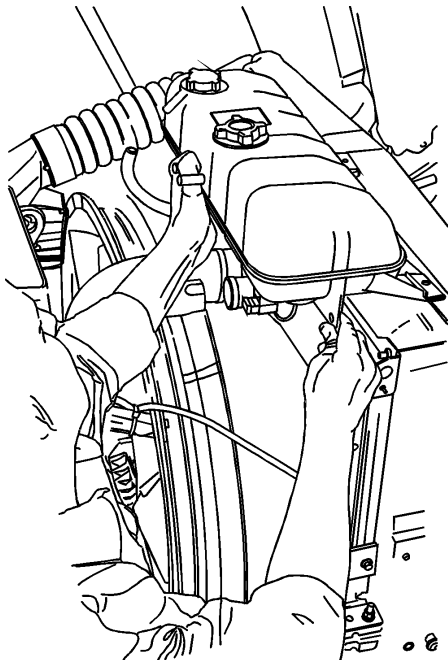


Fig. 53: Lift the expansion tank

Remove the expansion tank mounting bolts (two in the front, three in the rear). Lift away the expansion tank.

12 mm socket

Installation

4

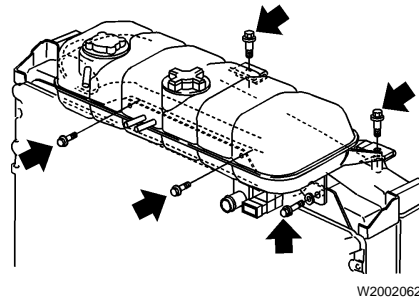


Fig. 54: Install mounting bolts

Position the expansion tank into place and install the five mounting bolts. Torque to 24 ± 4 Nm (18 ± 3 ft-lb).

12 mm socket
 24 ± 4 Nm
 $(18 \pm 3$ ft-lb)

5

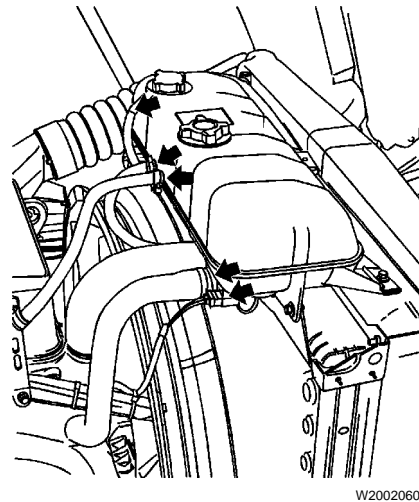


Fig. 55: Connect expansion tank hoses

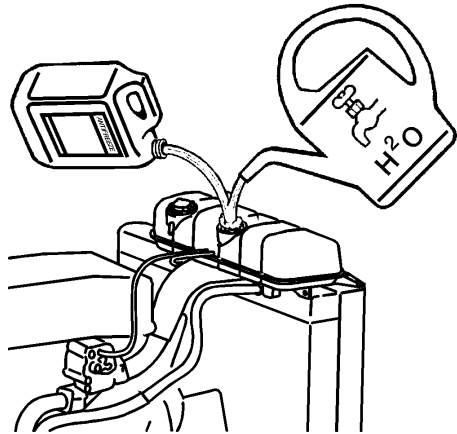
Connect the four expansion tank hoses:

7 mm socket
 screwdriver

- overfill tube
- fill line
- air bleed hose (to thermostat housing)
- hose from expansion tank to radiator top tank

Connect the wire harness to the low coolant sensor.

6



W2002058

Fig. 56: Add coolant

Install the drained coolant. Maximum fill rate of 9.5 l/min (2.5 gpm).

Note: For current coolant requirements;

Service Bulletin 184-001
Coolant Requirements, Volvo Engines

IMPACT Function group 184
Information type:
Maintenance
"Coolant Requirements"

7

Start engine and check for leaks. Run the engine to operating temperature. After the engine has reached operating temperature, move the heater controls to warm and run the engine an additional 10 minutes.

8

Shut off engine and recheck coolant level.

Note: To pressure test the system, see "Cooling System Leak Test, Checking" page 41.

2619-06-02-01

Cooling System Leak Test, Checking

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

To be carried out in the vehicle

Note: Before using pressure gauge 9996662, check its operation. Do this by attaching it to an air supply and setting the pressure to 100 kPa (14 psi) with the regulator valve.

**DANGER**

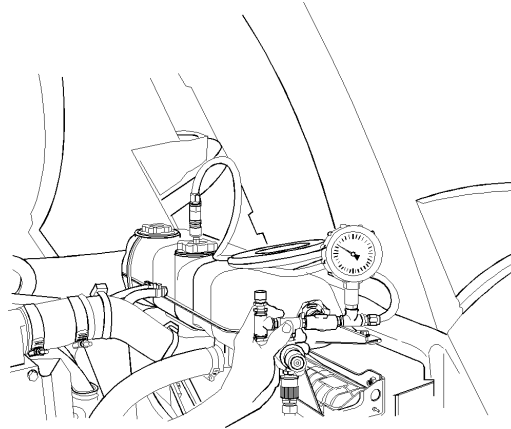
Check that the pressure on the gauge never exceeds 100 kPa (14 psi). Excessive pressure may cause air supply to burst which can cause personal injury or death.

Procedure

Special tools: 9996049, 9996662

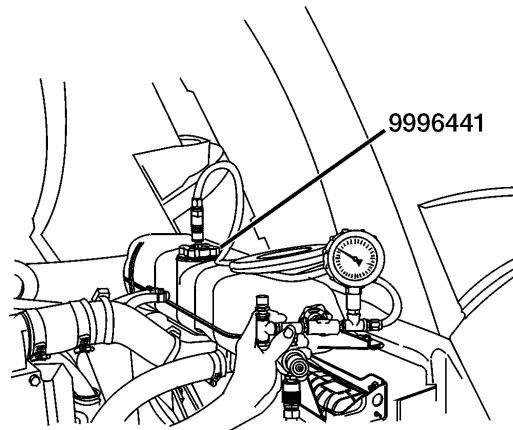
1

Check the hoses and connections of the cooling system for leaks and to make sure they are in good working condition.

2

W2001430

Fig. 57: Remove fill cap –VN Model



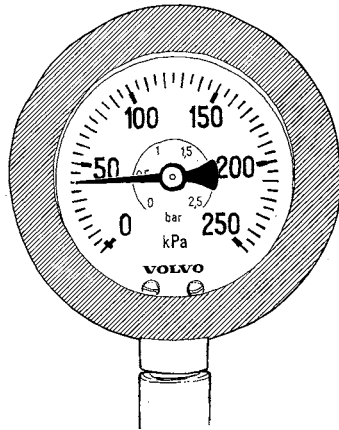
W2003473

Fig. 58: Remove fill cap –VHD Model

Remove the fill cap and install 9996662 pressure regulator, gauge and cap assembly. J-42397

Note: Make sure the cooling system is full of coolant before performing this test.

3

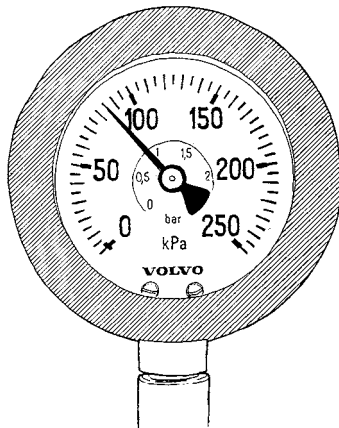


T2007258

Fig. 59: Increase pressure to 40 kPa (6 psi)

Using the knob of the reduction valve, slowly increase pressure to 40 kPa (6 psi). Maintain this pressure for approximately 5 minutes. Look over the entire engine, radiator, and coolant hoses for any leaks and then perform a leakage check on the radiator, hoses, connections, and the coolant pump.

4



T2007257

Fig. 60: Increase pressure to 100 kPa (14 psi)

Slowly increase the pressure to 100 kPa (14 psi) and check that the valve opens. At this pressure, the air flow should be continuous. End this test after approximately 10 seconds.

5

Slowly release the pressure from the cooling system. Remove the cap assembly and replace the fill cap.

2621-03-02-01 Coolant Pump, Replacement

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

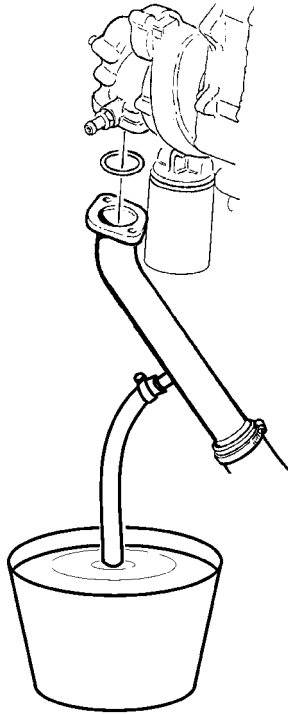
WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Special tools: 9996049

Removal

1



W2003324

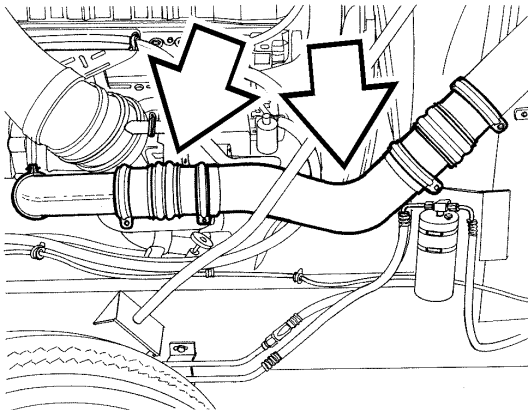
Fig. 61: Draining the coolant

Attach hose 9996049 to lower coolant pipe and drain the coolant into a suitable container.

9996049

Note: If the coolant is not reusable, dispose of used coolant in a proper and responsible manner according to EPA and local environmental regulations

2



W2003334

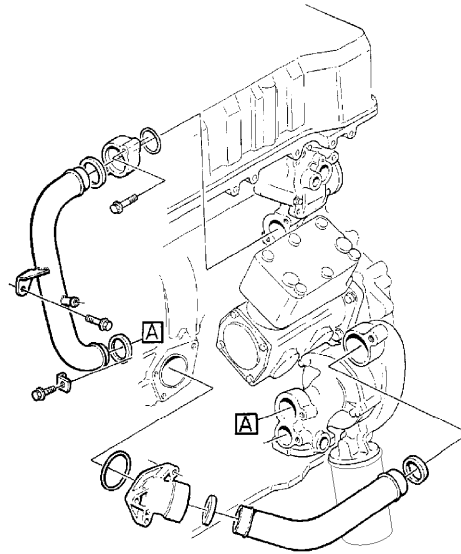
Fig. 62: Charge air cooler piping

Remove charge air cooler pipe and mounting brackets.

3

Remove the elbow outlet from the turbocharger.

4



W2003328

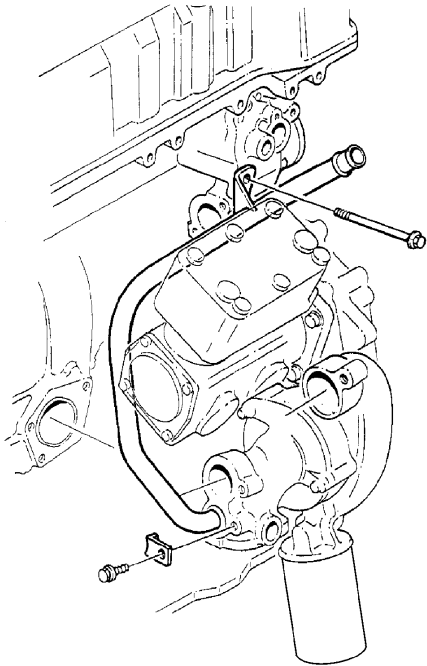
Fig. 63: Removing coolant pipes

Remove the pipe between the coolant pump and the cover over the oil cooler.

5

Remove the pipe between the pump and the thermostat housing.

6



W2003329

Fig. 64: Bolt location

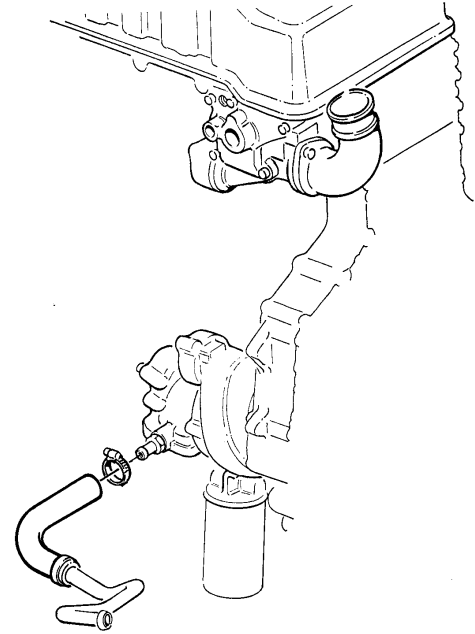
Remove the bolt beside the thermostat housing holding the pipe between coolant pump and the expansion tank.

7

Remove the bolt from the coolant pump and pull the pipe out of the pump.

Note: The bolt beside the thermostat housing runs through a bracket on the pipe. With the air compressor in position, the pipe cannot be removed.

8



T2007246

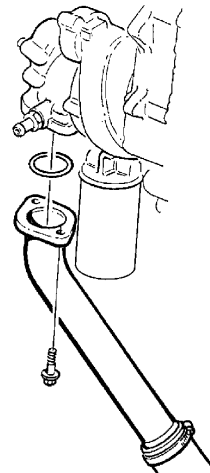
Fig. 65: Heater hose location

Remove the heater hose from the coolant pump.

9

Remove the drain hose from the lower coolant pipe.

10



W2003330

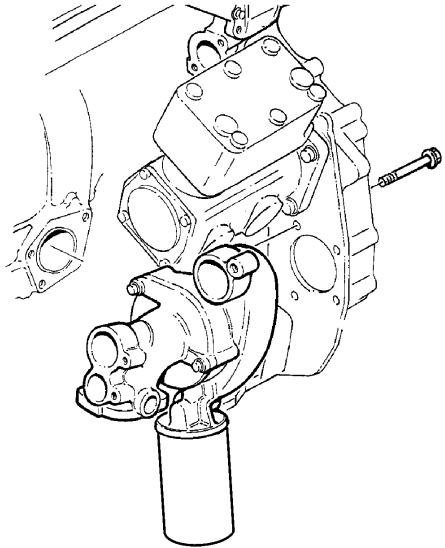
Fig. 66: Lower radiator pipe location

Remove the bolts holding the lower coolant pipe to the pump.

Note: Leave the pipe attached to the lower radiator hose.

11

Remove the coolant filter hoses.

12

W2003332

Fig. 67: Removing coolant pump

Remove the bolts and lift off the coolant pump.

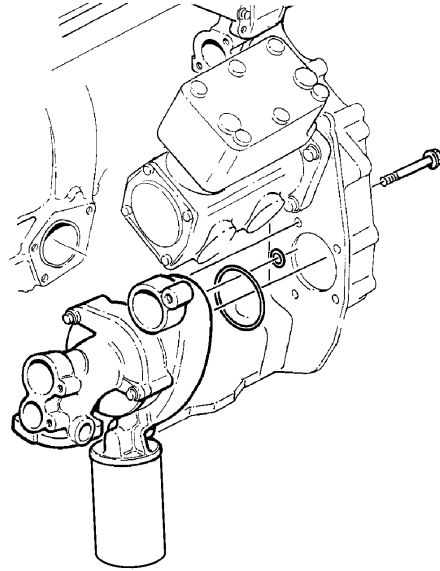
13

Remove the adapter for the remote coolant filter from the bottom of the coolant pump.

Installation

1

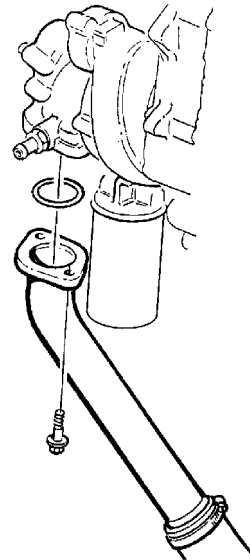
Clean all sealing surfaces.

2

W2003331

Fig. 68: Installing coolant pump

Install the new coolant pump using new seals. Tighten the bolts to 48 ± 8 Nm (35 ± 6 ft-lb).

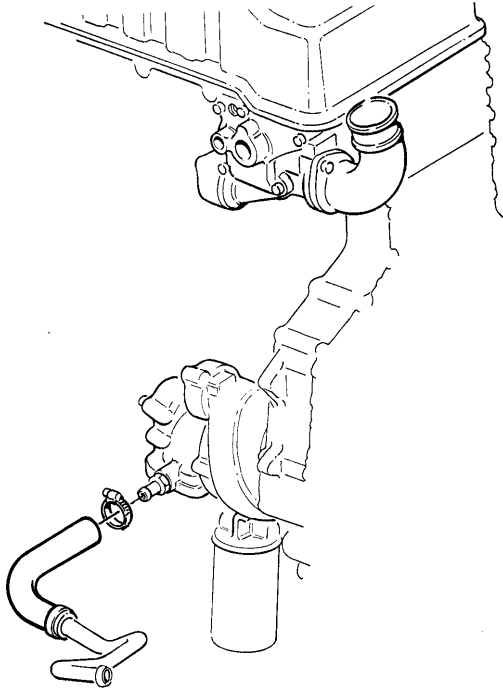
3

W2003330

Fig. 69: Pipe from radiator to coolant pump

Install the pipe from the radiator to the coolant pump using a new sealing ring.

4



T2007246

Fig. 70: Heater hose connection

Connect the heater hose to the coolant pump and tighten the hose clamp.

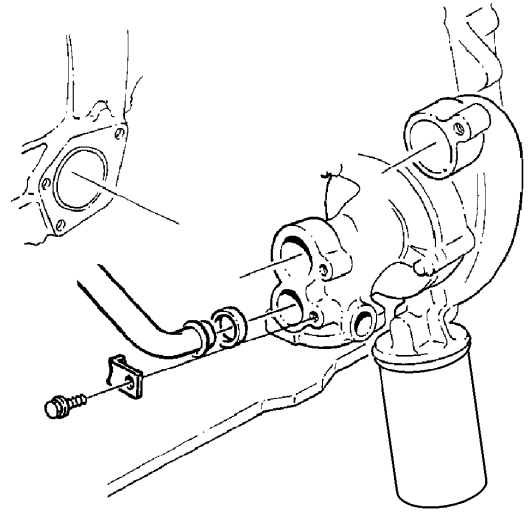
5

Reinstall the coolant filter.

6

Connect the remote-mounted coolant filter hoses to the adapter and tighten the hose clamps.

7



W2003333

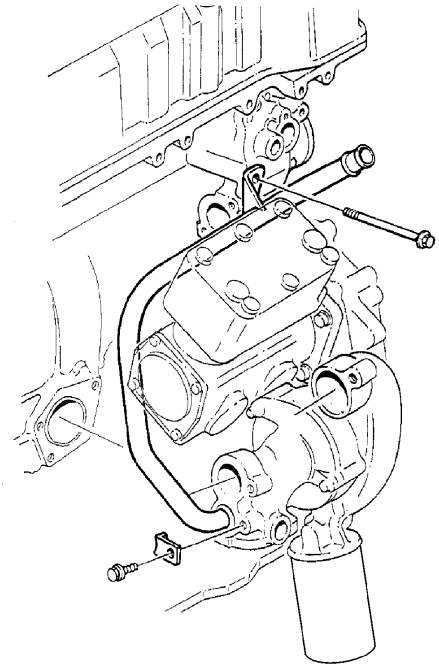
Fig. 71: Install sealing ring

Install a new sealing ring to the pipe from the expansion tank and bolt the pipe to the coolant pump.

8

Coat the sealing ring with soapy water to make installing the pipe into the coolant pump easier.

9

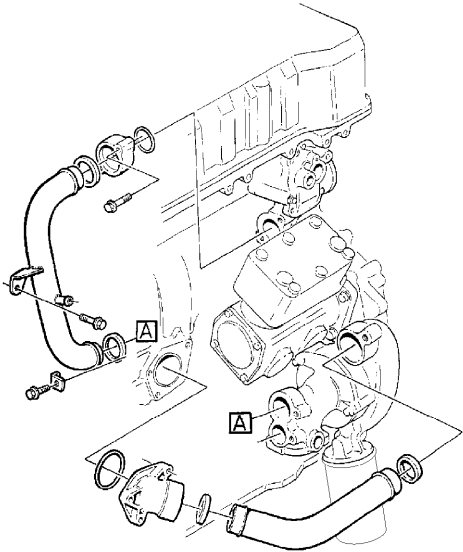


W2003329

Fig. 72: Bolt location

Install the bolt holding the pipe beside the thermostat housing.

10



W2003328

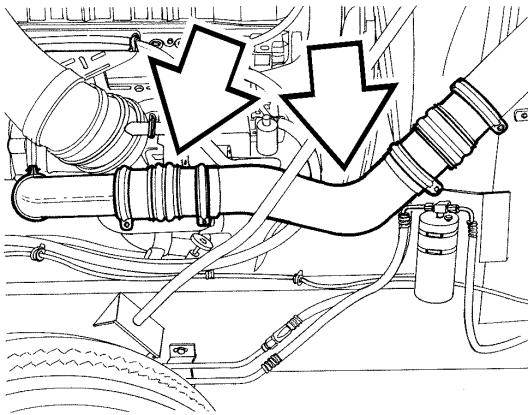
Fig. 73: Installing coolant pipe

Using new sealing rings, install the pipe between the coolant pump and the thermostat housing and the pipe between the coolant pump and the oil cooler cover.

11

Coat the sealing rings with soapy water.

12



W2003334

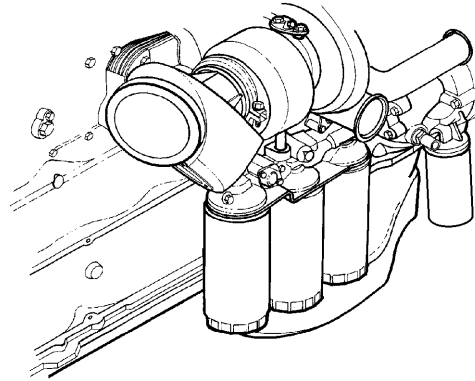
Fig. 74: Charge air cooler piping

Reinstall the charge air cooler pipe and mounting brackets.

13

Reinstall the elbow outlet on the turbocharger.

14



W2003335

Fig. 75: Coolant filter

Install a new coolant filter on the coolant pump.

15

Fill the system with coolant.

16

Start the engine and check the cooling system for leaks.

2621-04-04-01 Coolant Pump, Overhaul (Unit Removed)



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.



WARNING

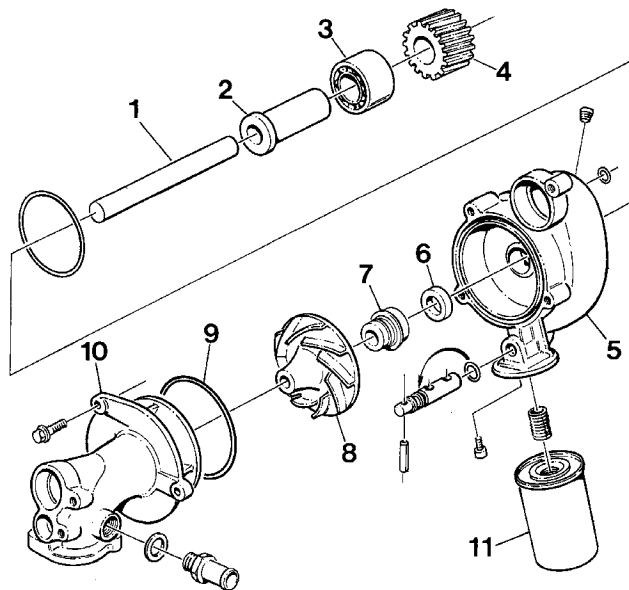
Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

**WARNING**

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

**WARNING**

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.



T2007117

Fig. 76: Exploded view of coolant pump

Note: Reference is made in the text to component positions as shown in picture.

- 1 Shaft
- 2 Shaft sleeve
- 3 Ball Bearing
- 4 Gear
- 5 Pump Housing
- 6 Oil Sealing Ring
- 7 Coolant Sealing Ring
- 8 Impeller
- 9 O-ring
- 10 Rear Cover
- 11 Coolant Filter

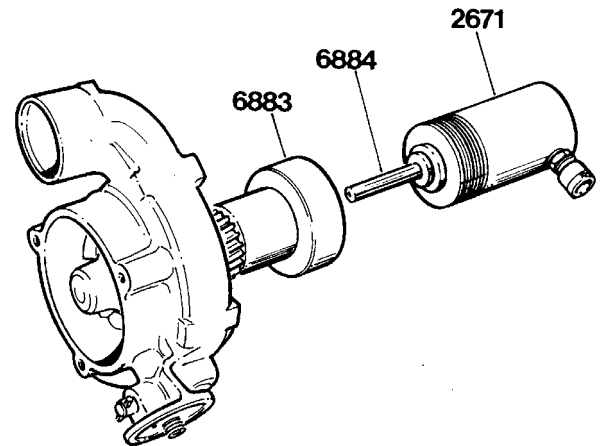
Special tools: 9992071, 9992671, 9994034, 9994090, 9996222, 9996315, 9996383,

9996626, 9996883, 9996884, 9998012, 9998039, 9998113, 9996671

Disassembly

- 1 Remove the coolant filter (11), using filter wrench 9996671. Remove the rear cover (10); see Fig. 76: Exploded view of coolant pump, page 49.

2

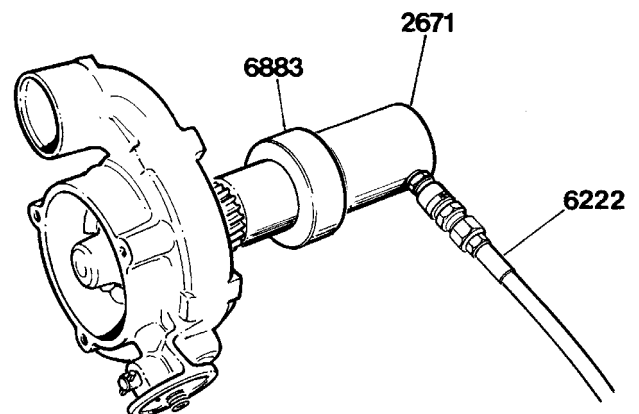


T2007116

Fig. 77: Attaching tools to coolant pump

- Screw adapter 9996883 into the shaft sleeve (2) of the coolant pump and thread drift 9996884 onto hydraulic cylinder 9992671; see Fig. 76: Exploded view of coolant pump, page 49.

3

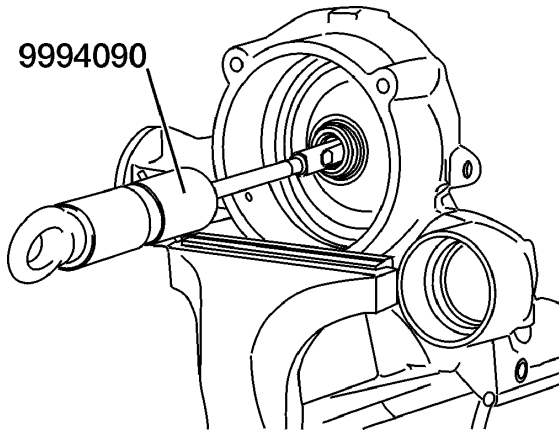


T2007118

Fig. 78: Removing the shaft

- Assemble the hydraulic cylinder and the adapter. Using hydraulic pump 9996222, press out the shaft (1) the impeller (8) and the seal (7); see Fig. 76: Exploded view of coolant pump, page 49.

4



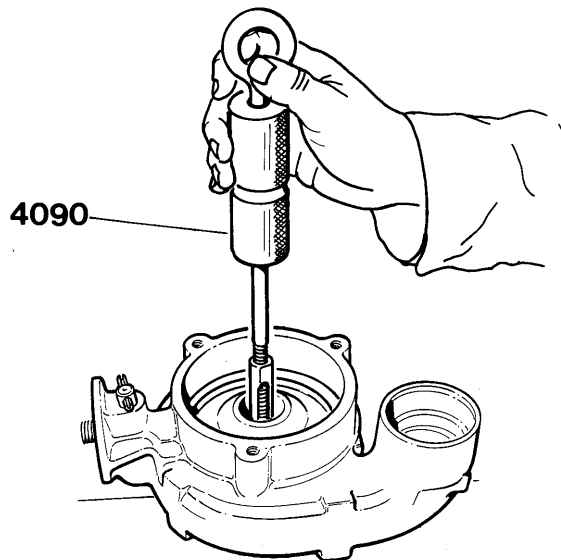
W2003285

Fig. 79: Coolant seal, removal

If parts of the coolant seal do not come out with the shaft when pressing this out, use puller 9994090 to remove the rest of the sealing ring.

9994090

5



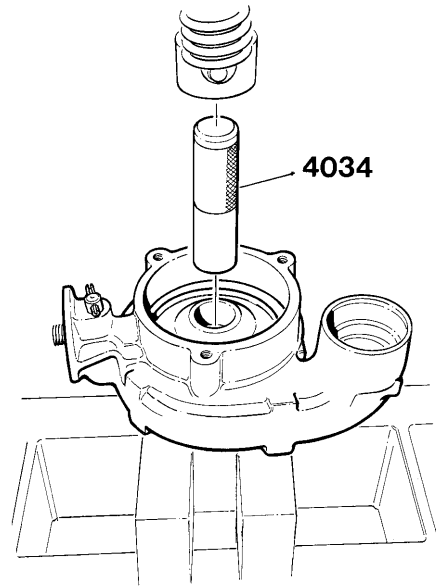
T2007108

Fig. 80: Removing the oil sealing ring

Remove the seal (6) using tool 9994090; see Fig. 76: Exploded view of coolant pump, page 49.

9994090

6



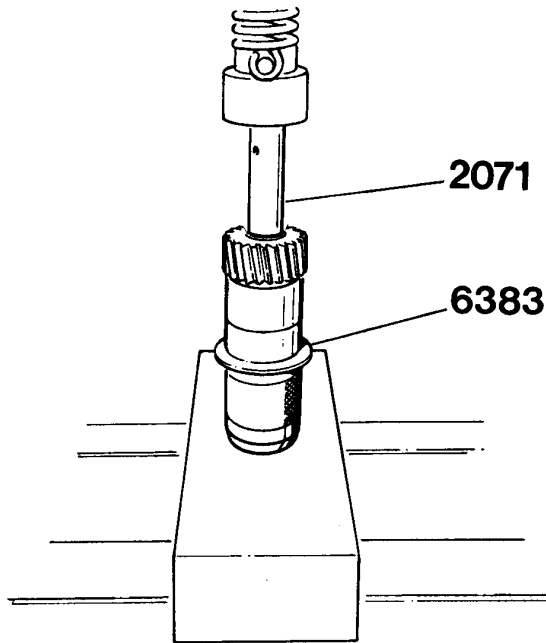
T2007109

Fig. 81: Removing shaft sleeve, drive gear and bearing

Place the pump housing in a press. Using 9994034, carefully press out the shaft sleeve (2) together with the drive gear (4) and bearing (3); see Fig. 76: Exploded view of coolant pump, page 49.

9994034

7

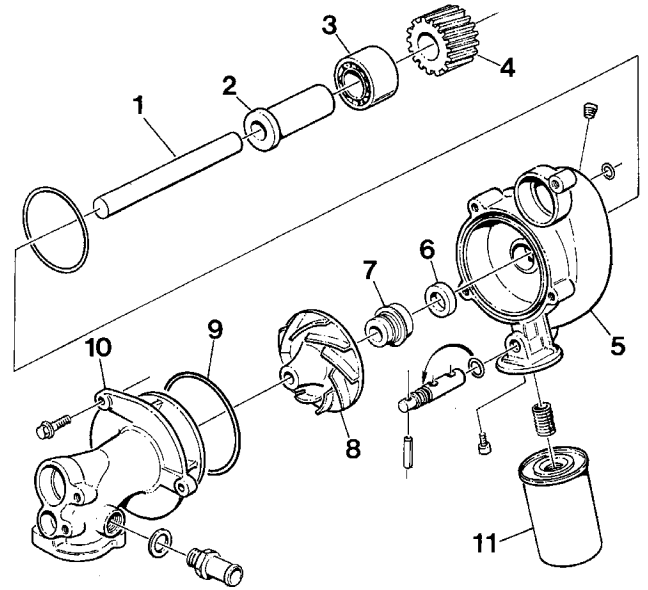


T2007248

Fig. 82: Removing the shaft sleeve from drive gear

Using 9992071 and 9996383, press the shaft sleeve (2) out of the drive gear (4); see Fig. 76: Exploded view of coolant pump, page 49.

Cleaning and Inspection



T2007117

Fig. 83: Exploded view of coolant pump

1
Clean all parts which are to be reused.

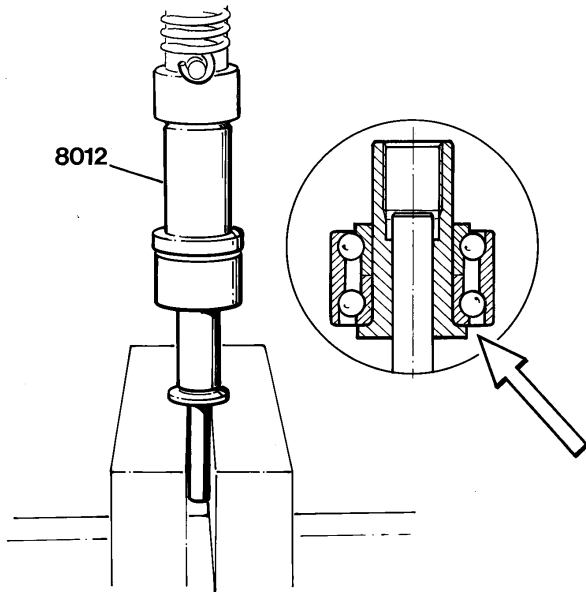
2
The seals and bearing must always be changed. Check the fit of the bearing races to the pump housing and shaft sleeve.

Note: If the impeller is damaged, it must be replaced.

Note: If the pump housing or rear cover is to be replaced, transfer pipe fittings to the replacement unit, etc.

Assembly

1



T2007111

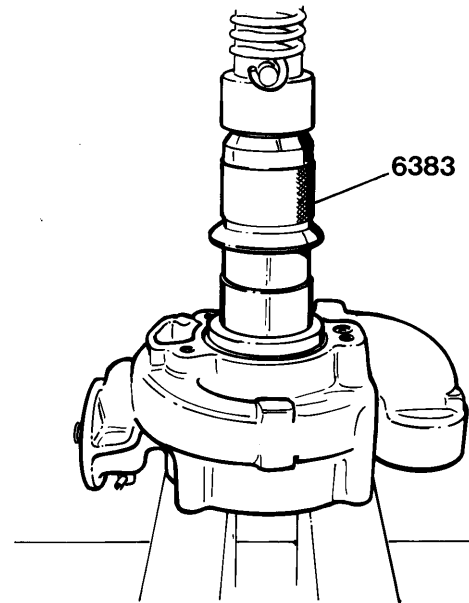
Fig. 84: Installing bearing to shaft sleeve

Install the new bearing (3) to the shaft sleeve (2) and, using hollow drift 9998012, carefully press down on the inner race of the bearing until it lies up against the flange of the shaft sleeve; see Fig. 83: Exploded view of coolant pump, page 51.

Note: Install the bearing with the side at which the outer and inner races are level facing the flange of the shaft sleeve. The shaft (1) and the shaft sleeve (2) are supplied as a single spare part unit; see Fig. 83: Exploded view of coolant pump, page 51.

9998012

2



T2007112

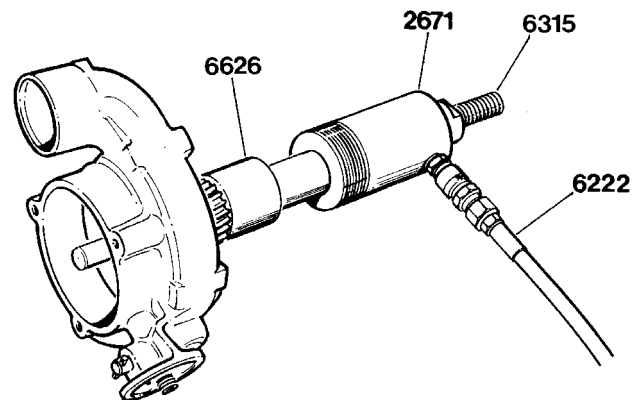
Fig. 85: Installing bearing and shaft into pump

Place the pump housing (5) in a press. Using hollow drift 9996383, carefully press in the bearing and shaft until the bearing bottoms out in the pump housing; see Fig. 83: Exploded view of coolant pump, page 51.

9996383

Note: Press on the outer race of the bearing and check to make sure that the shaft does not hit the press table.

3



T2007119

Fig. 86: Press drive gear onto shaft

Screw the shorter threaded section of spindle 9996315 into the shaft sleeve (2); see Fig. 83: Exploded view of coolant pump, page 51.

9996315

4
Place the drive gear (4), hollow drift 9996266 and hydraulic cylinder 9992671 on the spindle and install the nut; see Fig. 83: Exploded view of coolant pump, page 51.

5
Using hydraulic pump 9996222, carefully press the drive gear down until it bottoms out against the bearing. 9996222

6
Remove the tools

7

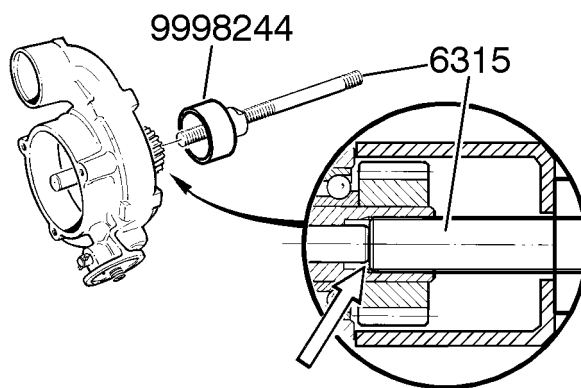


Fig. 87: Using tool 9996315

Insert the spindle 9996315 through the hole of sleeve 9998244 and screw the long threaded end of the spindle into the shaft until it bottoms out against the shaft. Tighten the nut by hand. 9996315 9998244

Note: Make sure that the spindle 9996315 is threaded in until it bottoms out against the shaft before tightening the nut.

8
Install the pump in a press so that the spindle's nut rests flat against the surface of the press.

9

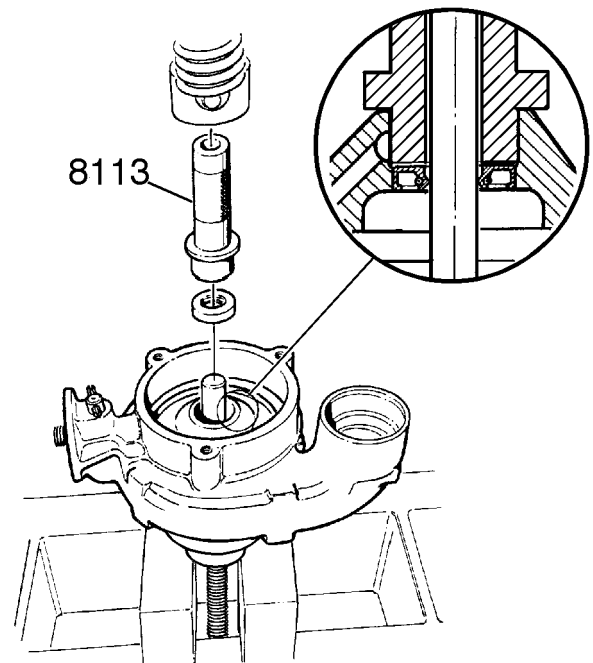


Fig. 88: Installing the oil seal

Install the oil seal (6) with the sealing lip against the drive gear; see Fig. 83: Exploded view of coolant pump, page 51.

10
Using drift 9998113, carefully press the seal into position until it is level with the edge of the pump housing. 9998113

Note: Do not press in the drift until it hits the pump housing.

11

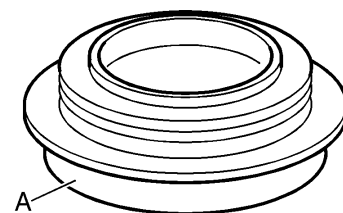


Fig. 89: Coolant seal, applying Loc-TiteTM

Apply Loc-TiteTM locking fluid to the coolant seal's contact surface (A) against the housing.

12

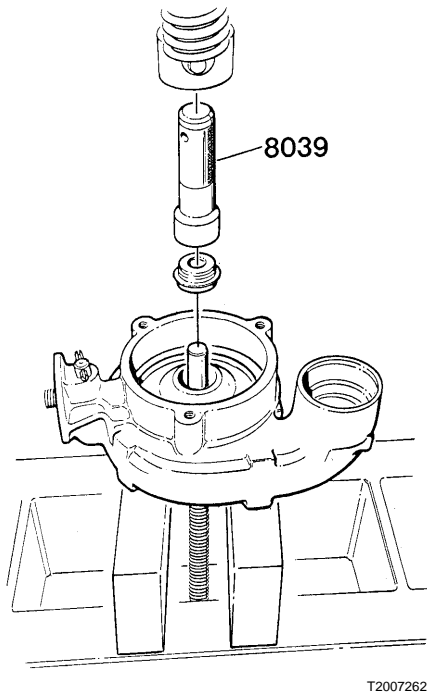


Fig. 90: Installing the coolant seal

Carefully press in the coolant seal using the drift 9998039.

Note: To prevent damage due to excessive pressing force, pressure should be removed when the seal flanges out against the housing.

13

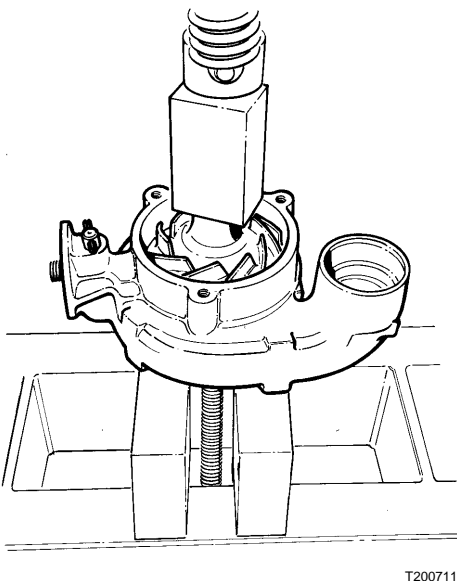


Fig. 91: Installing new impeller

Place the pump with the spindle nut resting on a flat surface.

14

Press the impeller approximately 10 mm (1/2 in.) on to the shaft.

15

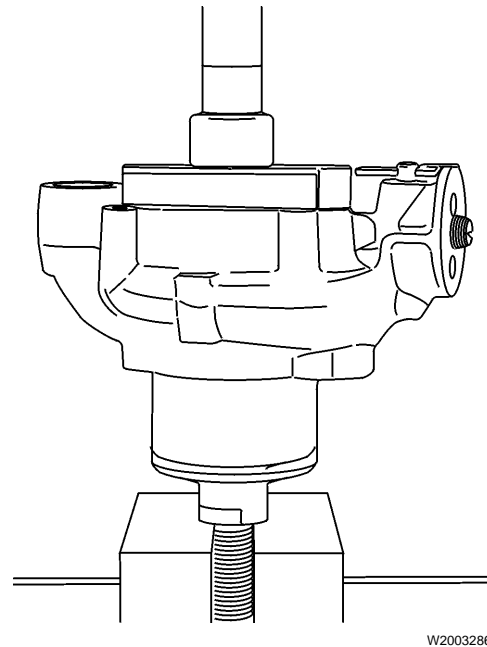


Fig. 92: Pressing on the impeller

Install the tool 9998541 on the impeller and carefully press it down until the tool rests against the pump housing.

16

Remove the spindle 9996315 from the shaft sleeve.

17

Install the rear cover using a new O-ring in the pump housing.

Note: Turn the drive gear and check that it rotates easily. Bearing noise or axial play is not permitted.

18

Install a new coolant filter. Coat the filter gasket with a light film of grease and hand tighten only.

2627-03-02-01

Thermostat, Replacement D12, D12A, D12B



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.



WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.



WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.



WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Special tools: 9996049 , 9998291

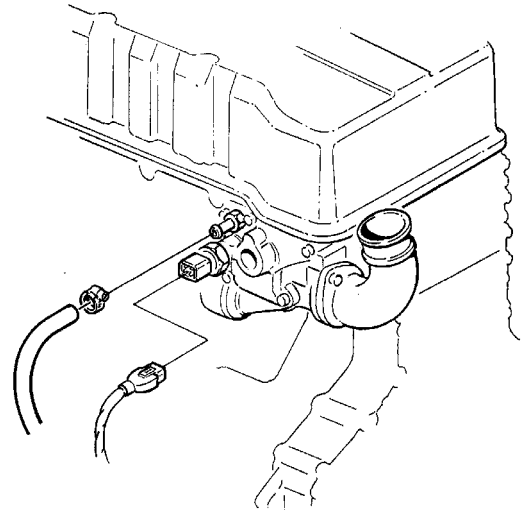
1

Using drain hose 9996049, drain the coolant into suitable container.

2

Remove the pipe between the air cleaner housing and the turbo-compressor.

3



T2007264

Fig. 93: Removing hoses from thermostat housing

Remove the expansion tank hose and the connector for the temperature sensor from the thermostat housing.

4

Remove the fan ring stay bolt holding the upper radiator cooling pipe.

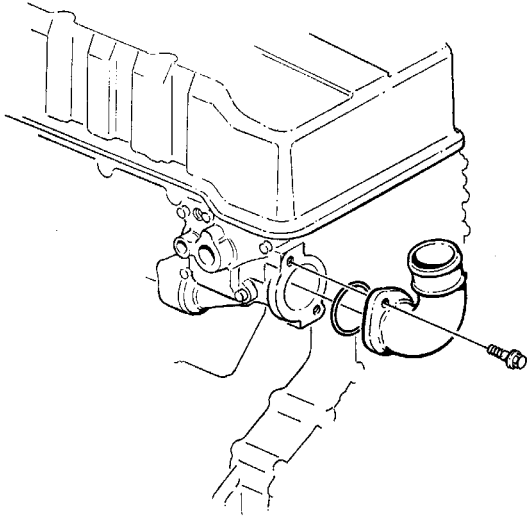
5

Remove the bolt from the thermostat housing and timing gear cover which hold the pipe to the cab heat exchanger.

6

Loosen the cooling coil nut from the air compressor. Remove the bolt holding the cooling coil bracket to the timing gear cover and push the coil to one side.

7



T2007234

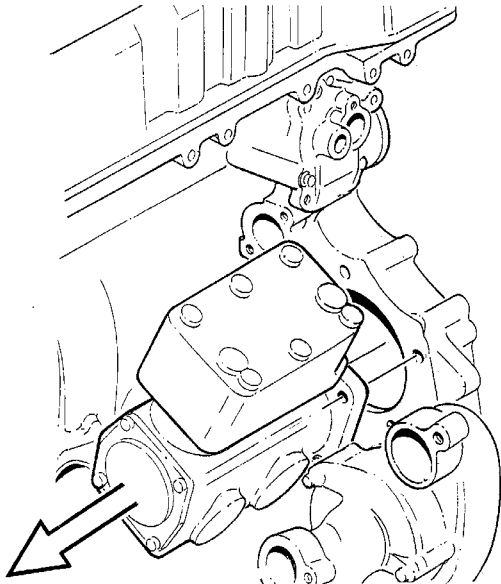
Fig. 94: Removing the upper radiator hose elbow

Remove the upper radiator hose connecting pipe from the thermostat housing.

8

Remove all of the coolant/air/oil lines from the air compressor.

9



T2007250

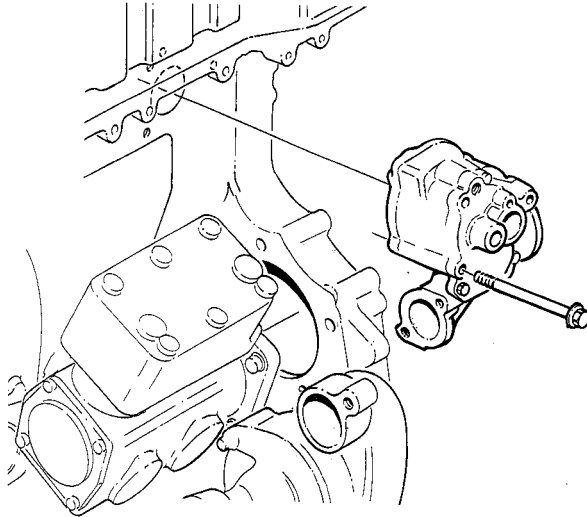
Fig. 95: Rotate the air compressor

Remove the air compressor attaching bolts and rotate the compressor out far enough to allow clearance to remove the thermostat housing.

10

Remove retaining bolts holding "C" shaped cooling pipe attached to rear of thermostat housing.

11

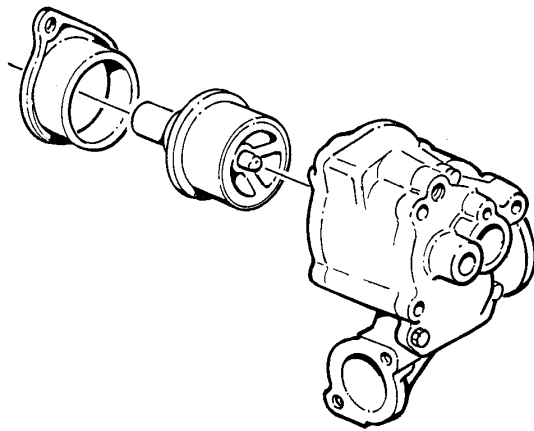


T2007235

Fig. 96: Removing the housing

Remove the bolts and the thermostat housing.

12



T2007236

Fig. 97: Removing the thermostat

Remove the thermostat from the thermostat housing.

13

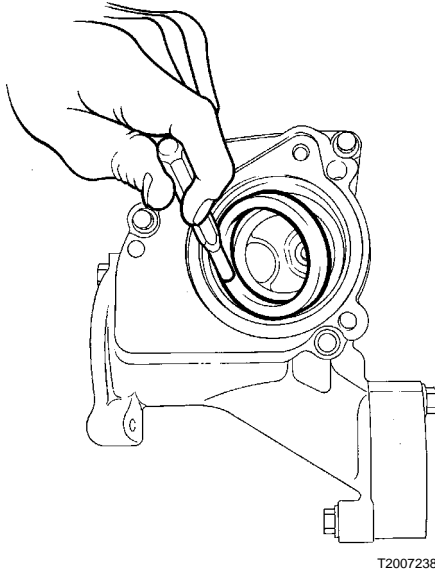


Fig. 98: Removing the sealing ring

Remove the sealing ring from the thermostat housing by tapping with a drift until it tips over and can be removed.

14

Clean the sealing surfaces of the thermostat housing and the sealing surfaces of the cylinder head and pipe connections.

15

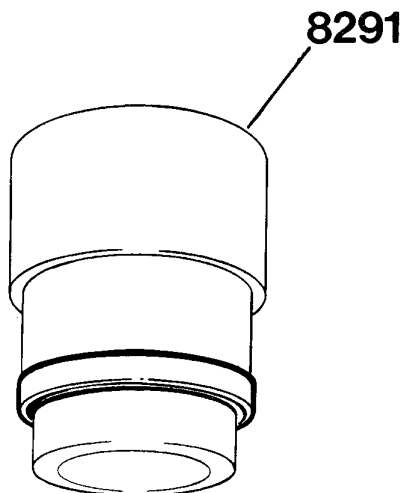


Fig. 99: Installing a new sealing ring

Install a new sealing ring to drift 9998291.

Note: The sealing ring must be installed with the broad metal plate facing the ledge on the drift.

16

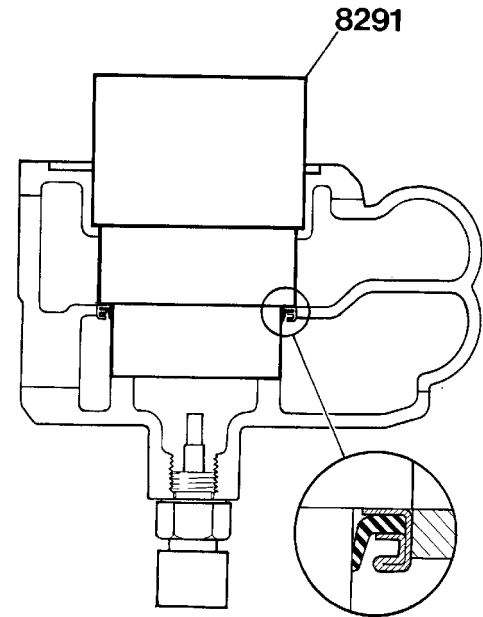


Fig. 100: Installing a new sealing ring

Using drift 9998291, carefully tap the sealing ring in until it bottoms out in the housing.

17

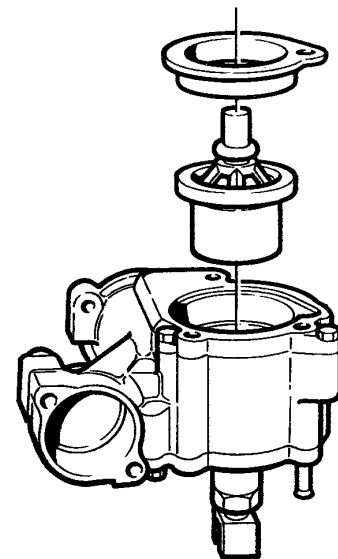


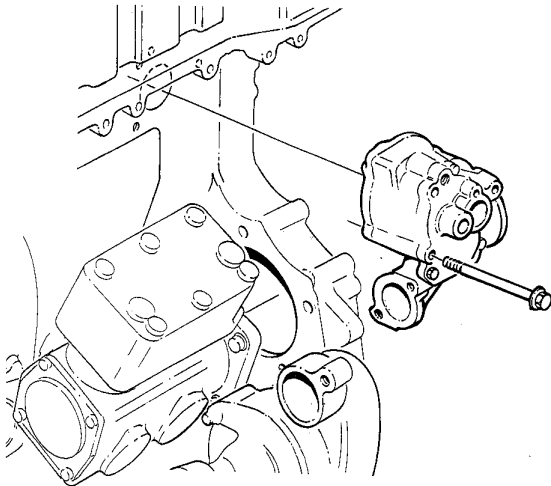
Fig. 101: New thermostat and seal

Install a new thermostat and a new seal into the housing.

18

Remove the bolts holding the spacer between the coolant pump and the thermostat housing. Install a new sealing ring to the spacer and coat it with grease.

19



T2007235

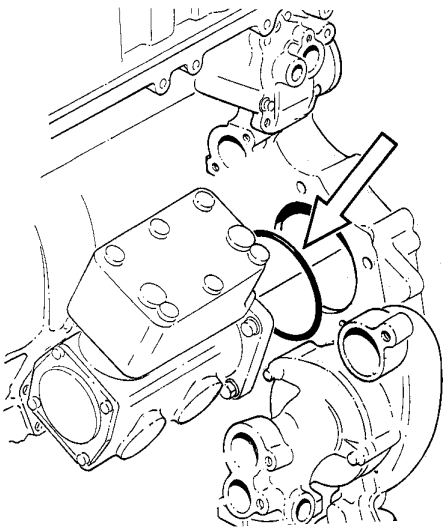
Fig. 102: Reattaching the thermostat housing

Install and attach the thermostat housing to the cylinder head.

20

Push the pipe from the coolant pump into the thermostat housing entry and install the bolts holding the pipe.

21



T2007240

Fig. 103: New air compressor seal

Install a new seal between the air compressor and the timing gear plate. Attach the air compressor.

22

Reinstall all of the coolant/air/oil lines to the air compressor.

23

Install the pipe between the radiator and the thermostat housing. Use a new sealing ring.

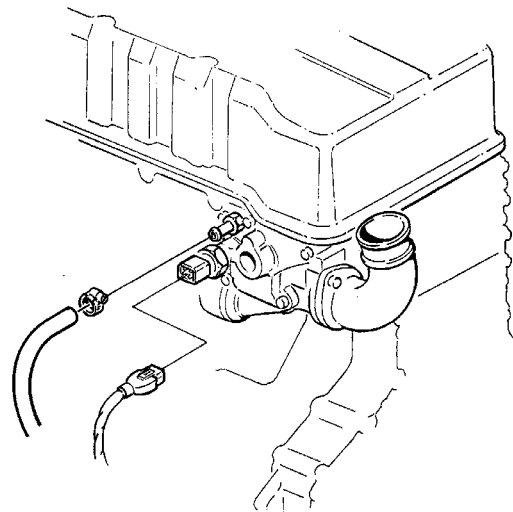
24

Attach the cab heater pipe to the thermostat housing. Install a new sealing ring.

25

Attach the fan ring stay.

26



T2007264

Fig. 104: Reattaching the hoses to thermostat housing

Plug in the temperature sensor connector and attach the expansion tank hose.

27

Fill with coolant and carry out a leakage check.

2627-03-02-01

Thermostat, Replacement

D12C



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.



WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.



WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.



WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Special tools: 9996049, 9998619, 9998511
Other special equipment: 945408, 946173, 949873, 955894

1

Drain off the coolant with drain hose 9996049.

2

Remove the two bolts for the exhaust collector pipe located next to the thermostat housing.

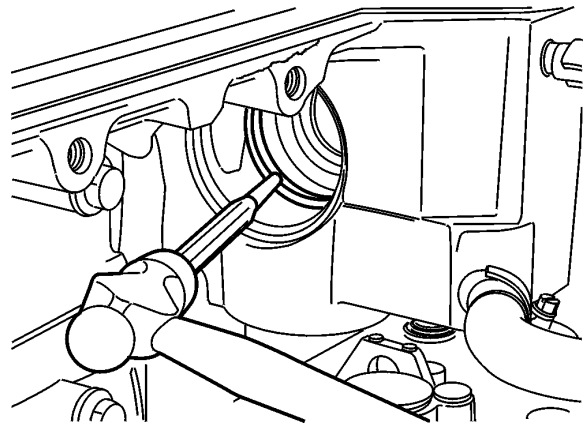
3

Remove the thermostat housing from the engine.

4

Remove piston thermostat from the cylinder head.

5



W2003428

Fig. 105: Remove the sealing ring

Remove the sealing ring from the cylinder head, tapping the sealing ring with a drift so that it is lifted up and can be removed.

6

Clean all the sealing surfaces and pipe connections.

7

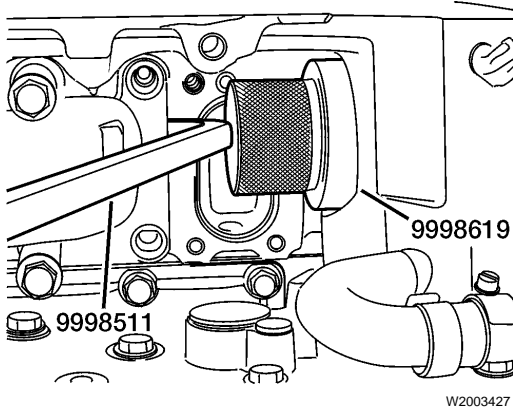


Fig. 106: Checking that the sealing ring is correctly positioned

Place a new sealing ring on drift 9998619.

Note: The ring should be turned with the wide plate edge facing the shoulder of the drift.

8

Install the thermostat housing and tighten the bolts by hand.

9

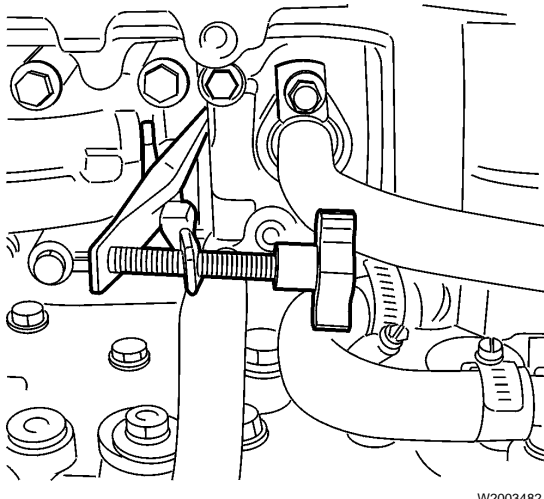


Fig. 107: Thermostat housing remove tool

Press drift J-44472 into the cylinder head until the drift reaches the bottom of the cylinder head.

10

Install the new piston thermostat. Lubricate the seal on the piston thermostat with soapy water.

11

Install the thermostat housing and tighten the bolts by hand.

Note: Make sure that the gasket to the cylinder head is correctly positioned. Use a new gasket.

12

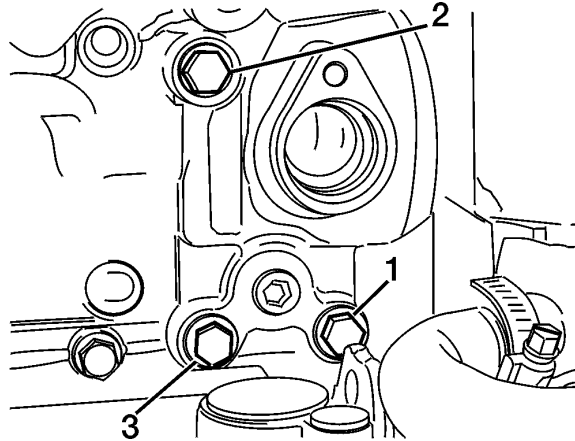


Fig. 108: Tighten the thermostat housing bolts in the sequence shown

Tighten the thermostat housing's bolts in the sequence shown in the illustration (1-2-3). Tighten to a torque as per the specifications for standard bolts.

Note: Remember to remove the tensioning bolt (M8x20).

13

Install the bolts between the exhaust manifold and the thermostat housing until they push against the seal. Tighten to the specified torque.

14

Connect the remaining coolant line.

15

Fill with approved coolant.

16

Start the engine.

Run the engine until it is at operating temperature. Then run at 1800 rpm and check for leaks.

2627-06-05-01 Thermostat, Checking



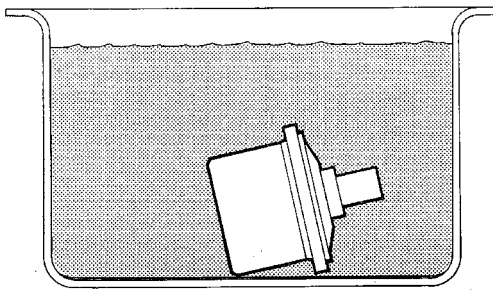
WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

A function check must be carried out before installing a new thermostat.

Note: Check to be sure that the thermostat closes fully. This can be done by holding it up to the light to check that there is no visible gap at the opening point. If the thermostat does not close properly, replace it.

1



T2007256

Fig. 109: Checking the thermostat

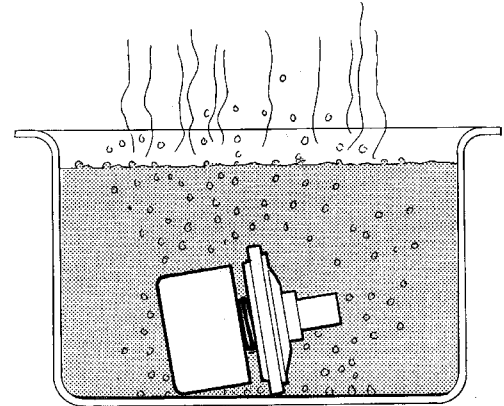
Warm up water in a receptacle to 75 °C (167° F) and immerse the thermostat in the water as illustrated.

Use a piece of wire attached to the thermostat.

2

After at least 30 seconds, check that the thermostat is still closed.

3



T2007255

Fig. 110: Checking the thermostat

Now warm the water to 100° C (212° F). After at least 30 seconds at boiling point, check that the thermostat has opened at least 7 mm (9/32 in). If the thermostat has not opened, it must be replaced. A good thermostat starts to close at 95° C (203° F) and is fully closed at approximately 85° C (185° F).

2631-03-02-01 Viscous Fan, Replacement



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.



WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

**WARNING**

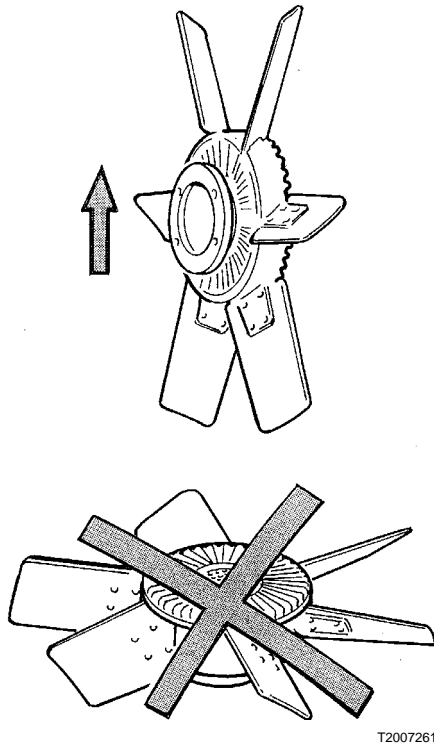
Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

**WARNING**

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

(Includes removal and installation of fan blade.)

Note: Before replacing the fan, carry out a function check. See "Viscous Fan, Checking" page 68.

Removal

T2007261

Fig. 111: Proper storage of fan

The temperature controlled fan is filled with a precise amount of silicone fluid; this determines its functional properties. When out of the vehicle, the temperature controlled fan must always be stood vertically. If placed horizontally, leakage will occur and the fan will lose its properties. Before replacing a fan, always make sure that the new fan has not leaked fluid. If fluid has leaked out, special instruments are required to check both engagement temperature and fan speed.

Special tools: J-44392

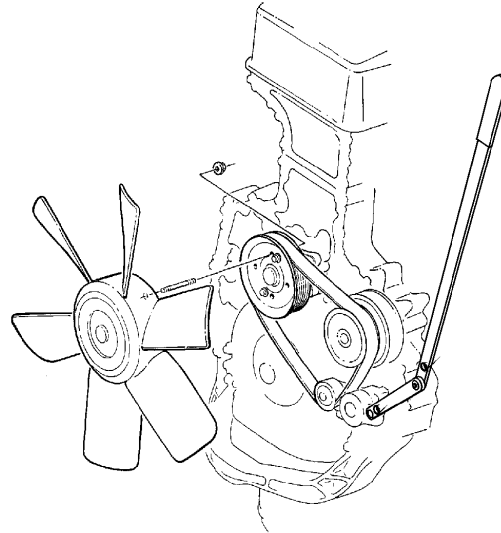
1

Remove the charge air hose between the charge air cooler and inlet pipe, or where applicable, between the charge air cooler and starting heater.

2

Remove the bolts holding the fan ring.

3



W2003337

Fig. 112: Removing the fan

Using the Belt Tensioner Release Tool, J-44392, loosen the drive belt. Remove the fan nuts and lower the fan carefully into the fan shroud.

Note: Some engines may have the belt tensioner mounted on the other side, compared to shown picture

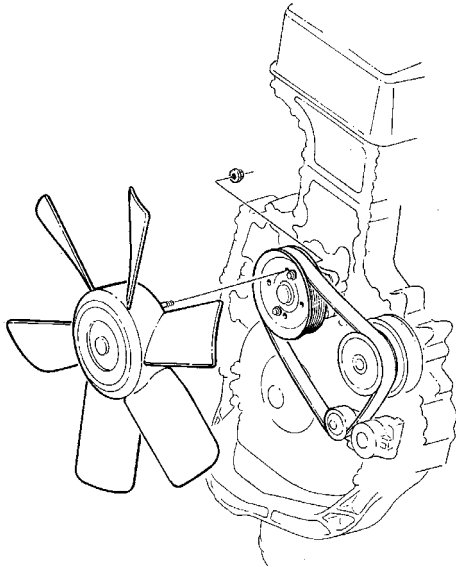
4

Remove the studs from the fan hub and carefully lift the fan out. Stand the fan vertically to avoid leakage of fluid.

Installation

1
Place the new fan in the fan shroud.
Install the studs.

2



T2007244

Fig. 113: Installing the fan

Lift the fan into position. Install and tighten the nuts. Make sure that the drive belt runs properly in the pulleys. Remove the lever.

3
Install the bolts for the fan ring.

4
Install the charge air hose using new seals.

2634-03-02-01

Fan Belt Tensioner, Replacement

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

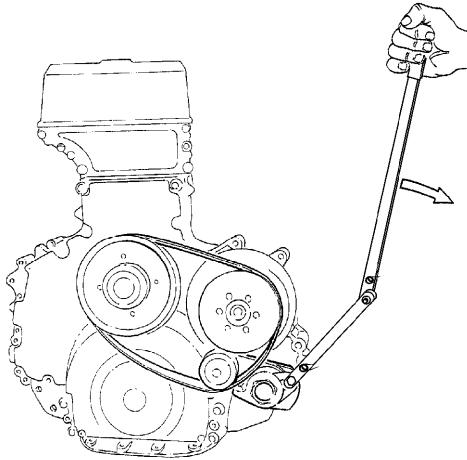
WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Removal



W2003336

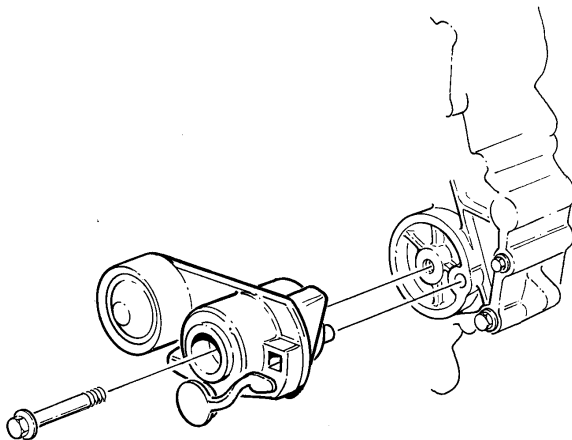
Fig. 114: Loosening fan belt tension

1

Apply special tool J-44392, to the belt tensioner to loosen and remove the belt.

J-44392

2



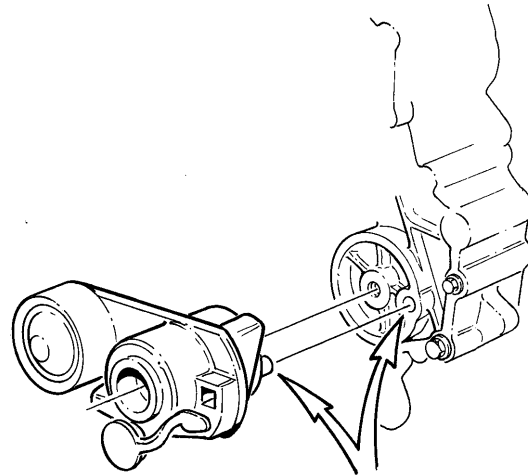
T2007223

Fig. 115: Removing the belt tensioner

Remove the protective cover. Remove the bolt and the belt tensioner.

Installation

1



T2007224

Fig. 116: Installing the belt tensioner

Install the belt tensioner, making sure that the stud in the tensioner fits correctly into the hole in the timing gear cover.

2

Tighten the bolt to 24 ± 4 Nm (18 ± 3 ft-lb) and install the cover.

24 ± 4 Nm
(18 ± 3 ft-lb)

3

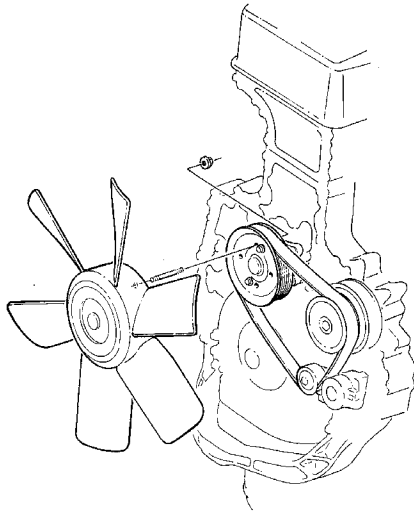
Check that the fan belt is not damaged and does not need to be changed before installing it into the correct grooves of the pulleys.

4

Remove the lever from the belt tensioner.

2634-03-02-04 Cooling Fan Drive Belt, Re- placement

1

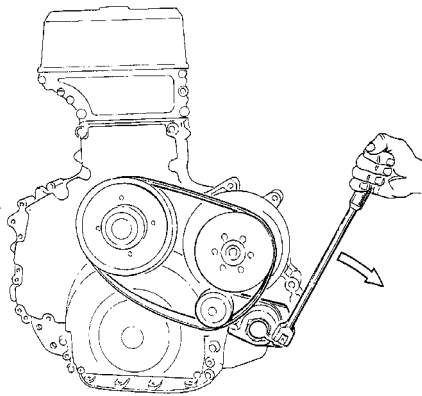


T2007253

Fig. 117: Removing the fan assembly

Remove the nuts holding the fan to the pulley. Lift off the fan and lower it into the fan shroud.

2



T2007222

Fig. 118: Loosening fan belt tension

Apply a breaker bar to the belt tensioner to loosen and remove the belt.

3

Install the new belt making sure that it runs properly in the pulley grooves.

4

Install the fan and bolts. Remove the breaker bar from the belt tensioner.

2634-04-02-01 Fan Belt Tensioner, Overhaul

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

WARNING

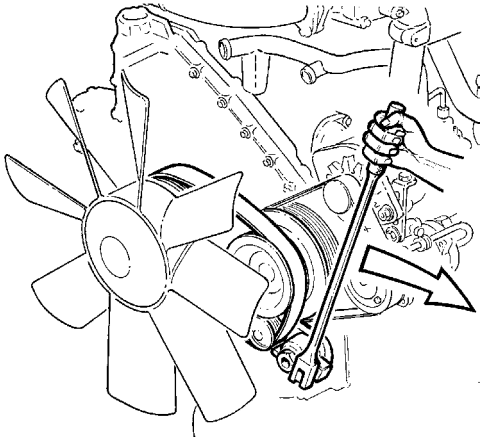
Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Removal

1



T2008291

Fig. 119: Remove belt tensioner

Use a 1/2 in. drive ratchet to move the belt tensioner to a position that will allow the fan belt to be removed from its pulleys.

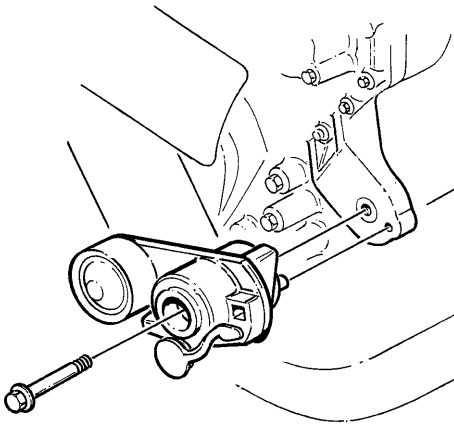
1/2 in. drive
ratchet



WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

2



T2008345

Fig. 120: Remove protective cap

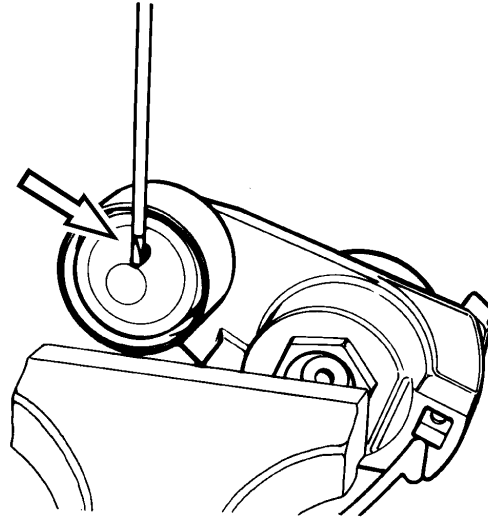
Remove the protective cap from the belt tensioner. Remove the bolt and lift off the belt tensioner from the timing cover.

Overhaul

3

Place the tensioner in a vice.

4



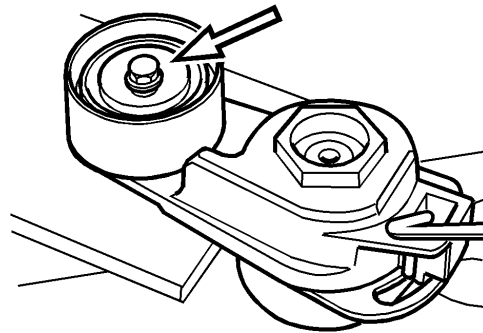
T2008723

Fig. 121: Remove protective cover

Remove the protective cover from the pulley. Make a hole in the protective cover with a screwdriver or punch and carefully pry the cover off the pulley.

Note: Make sure you do not damage the pulley if it will be reused

5

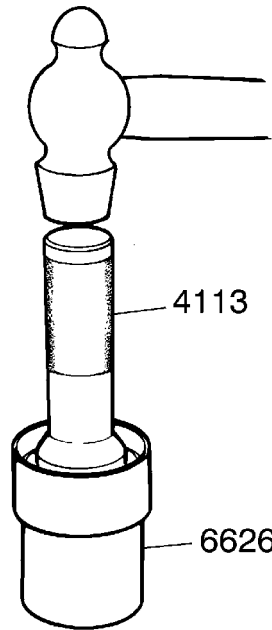


T2008724

Fig. 122: Remove center bolt

Remove the center bolt and lift off the pulley and bearing.

6



T2008725

Fig. 123: Remove the belt tensioner

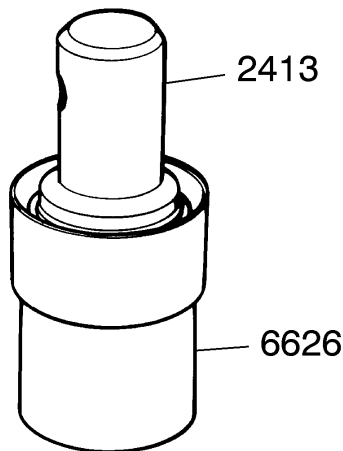
Remove the belt tensioner from the vice. Place sleeve 9996626 under the pulley and tap out the bearing using drift 9994113.

9994113
9996626

7

Clean and inspect the parts.

8



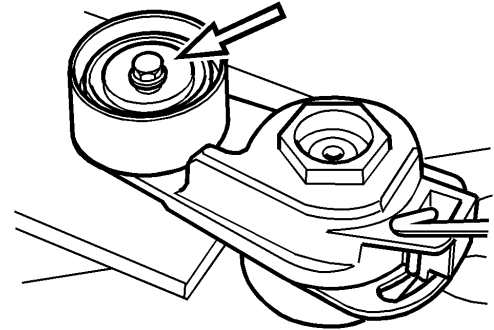
T2008726

Fig. 124: Sleeve placement in pulley

Place sleeve 9996626 under the pulley and press on the bearing using drift 9992413. Make sure that the bearing bottoms in the pulley.

9992413
9996626

9

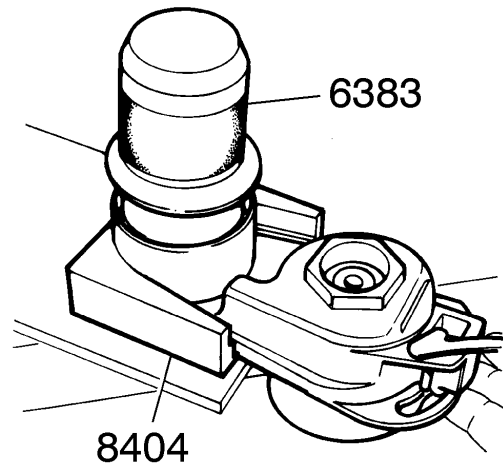


T2008724

Fig. 125: Install the pulley on the belt tensioner

Install the pulley on the belt tensioner and tighten the center bolt. Check that the pulley rotates easily.

10



T2008727

Fig. 126: Install a new protective cover

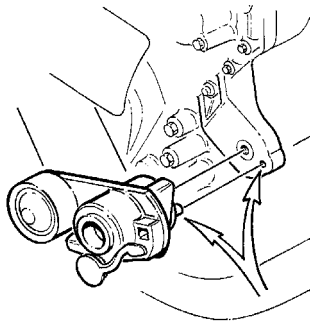
Install a new protective cover using drift 9996383 and counter-hold 9998404. Check that the pulley rotates easily.

9996383
9998404

Note: It is important that the counter-hold is used, otherwise there is a risk that the bearing will not seat properly in the pulley.

Installation

11



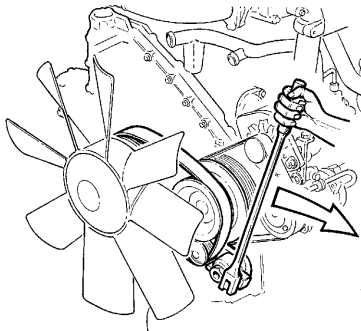
T2008346

Fig. 127: Install the belt tensioner

Install the belt tensioner, make sure that the mounting bolt on the tensioner correctly enters the hole in the timing gear cover. Torque the mounting bolt to 24 ± 4 Nm (18 ± 3 ft-lb). Install the protective cap.

24 ± 4 Nm
(18 ± 3 ft-lb)

12



T2008291

Fig. 128: Adjust the belt tensioner

Use a 1/2 in. drive ratchet to move the belt tensioner to a position that will allow the fan belt to be installed on its pulleys.

1/2 in. drive
ratchet

13

Check the fan belt, if cracks or chafing marks are present, replace the fan belt. Check that the belt is correctly positioned in the grooves on the pulleys. Remove the lever from the belt tensioner and check fan belt tension with Kent-Moore tool J -23600-B.

J-23600-B

2631-06-02-01 Viscous Fan, Checking

**DANGER**

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

**DANGER**

Never work under or around a vehicle unless it is supported on jack stands of adequate rating. Failure to use adequate jack stands can result in the vehicle falling, which can cause serious injury or death to anyone under the vehicle.

**WARNING**

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

**WARNING**

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50°C (120°F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

**WARNING**

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

**WARNING**

Always wear eye protection when working around batteries to prevent the risk of injury due to contact with sulfuric acid or an explosion.

If any of the following characteristics are observed, it is possible that the fan could be faulty. However, be sure to go through the **check list** below:

- 1 The fan does not engage, i.e. low fan speed despite high engine load. This will result in high coolant temperature and thereby a drop in engine output.
- 2 The fan does not disengage despite low engine load.

Check the following before measuring fan speed:

- That the radiators are not blocked by insects or leaves etc.
- Coolant level is between MIN and MAX.
- Fan drive belt is not loose or cracked.
- The radiator is not blocked by insects or leaves etc.
- The coolant temperature gauge sensor is functioning properly.
- The cooling system is not blocked.
- The fan is clean and undamaged.
- Fluid has not leaked out of the fan hub.
- The bimetallic spring/plate of the fan is not damaged or blocked.

Note: Operational disturbances concerning the fan can also be due to wear in the control mechanism.

Note: If the thermostat in the cooling system is faulty, this will also result in faulty fan operation.

Note: The fan drive or clutch is an exchange unit and cannot be repaired since special instruments are required for adjustment and checking of the engagement temperature and speed.

Note: If fluid has leaked out of the fan drive or clutch, no attempt must be made to refill with silicone fluid since a precise amount of fluid is required to give the fan its properties.

Note: The fan should be stored upright or to a maximum angle of 45°. If the angle is higher or if lying flat on the ground, the silicone fluid will drain out of the fan.

2651-03-04-01 Charge Air Cooler, Replacement

(Radiator Removed)



Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.



Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.



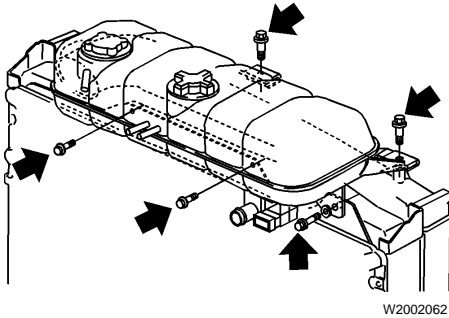
Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.



Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Removal

1



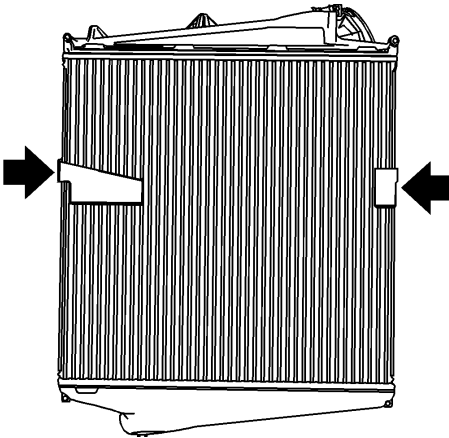
W2002062

Fig. 129: Remove expansion tank from radiator

Remove the five bolts fastening the expansion tank to the radiator. Disconnect the hose from expansion tank to the radiator top tank. Lift off the expansion tank and set aside.

12 mm socket
screwdriver

2



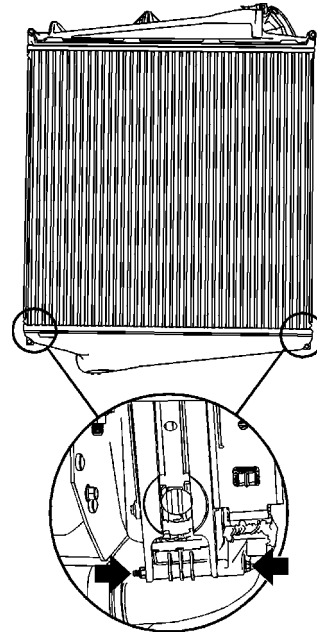
W2002124

Fig. 130: Remove support brackets

Remove the four bolts holding the two lower air conditioning condenser support brackets to the radiator assembly.

12 mm socket

3



W2002125

Fig. 131: Remove charge air cooler

Remove the remaining bolts fastening the charge air cooler to the radiator, and set the charge air cooler aside.

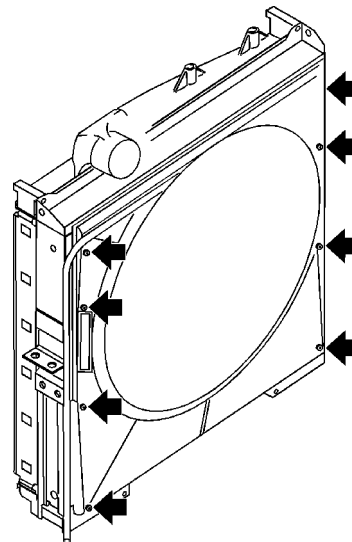
13 mm socket
12 mm wrench

4

Remove the one bolt holding the overflow tube to the radiator assembly.

12 mm socket

5



W2002126

Fig. 132: Remove head screws from shroud

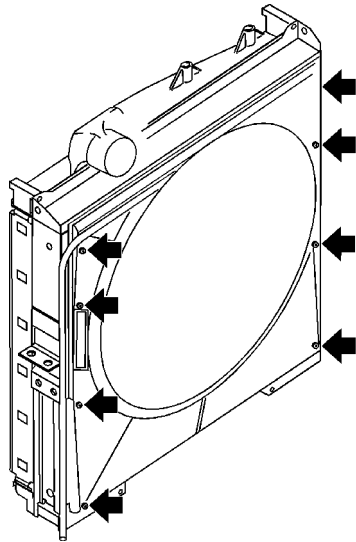
Remove the eight torx head screws fastening the shroud to the radiator, and set the shroud aside.

T 30 torx bit

Installation

- 1**
Install the overflow hose and bracket, the top radiator hose and the bleed hose to the radiator. 7 mm socket
screwdriver

2

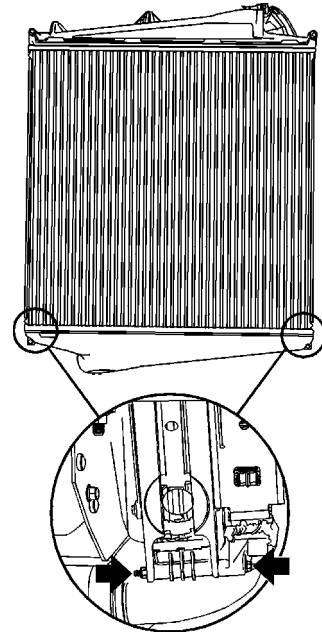


W2002126

Fig. 133: Position the shroud into place, install head screws

Position the shroud into place, install eight torx head screws and hand tighten. T 30 torx bit

3

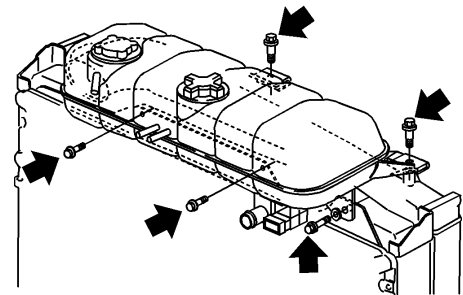


W2002125

Fig. 134: Install mounting bolts

Position the charge air cooler onto the radiator. Install the four mounting bolts leaving the upper two hand tight. 13 mm socket
12 mm wrench
Torque the lower bolts to 24 ± 4 Nm (18 ± 3 ft-lb).

4

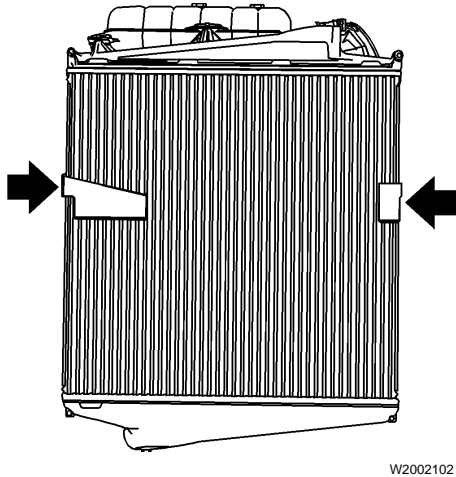


W2002062

Fig. 135: Install expansion tank bolts

Position the expansion tank into place and install the five mounting bolts. 12mm socket
 24 ± 4 Nm
Torque to 24 ± 4 Nm (18 ± 3 ft-lb).

5



W2002102

Fig. 136: Install support brackets

Position the air conditioning condenser 12 mm socket mounting brackets. Install the four mounting bolts hand tight.

3821-06-02-01 Coolant Temperature Gauge, Checking

DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.

WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.

WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

- 1 Remove the temperature sensor from the thermostat housing and connect the electric cable.
- 2 Connect a ground between the temperature sensor and the cylinder block.
- 3 Submerge the temperature sensor in heated water.
- 4 Using a thermometer, measure the temperature. Compare this reading with the temperature gauge reading.

2611-11-04-01 Radiator, Cleaning

(Unit Removed)



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



WARNING

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WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.



WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.



WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

If you see or suspect that the cell packages of the charge air cooler or radiator cell packages are dirty, these components should be cleaned. Depending on the installation, it may be necessary to completely remove the components from the vehicle; see "Radiator, Replacement" page 29.

Note: Regardless of cleaning method, extreme caution should be observed so as not to damage the radiator fins.

External Cleaning

1

Separate the radiator and the charge air cooler if they have been removed from the vehicle as a single unit. This ensures proper cleaning of each component.

2

Cover the inlet and outlet pipes to prevent degreasing agents or dirt to enter.

3

Clean the radiator with compressed air if it is clogged with dust.

Note: Air pressure should not exceed 210 kPa (30 psi) for the radiator and should not exceed 170 kPa (25 psi) for the condenser.

4

When rinsing, start with the back of the radiator and then turn it around and rinse from the front. Use hot water and make sure that the cells get clean.

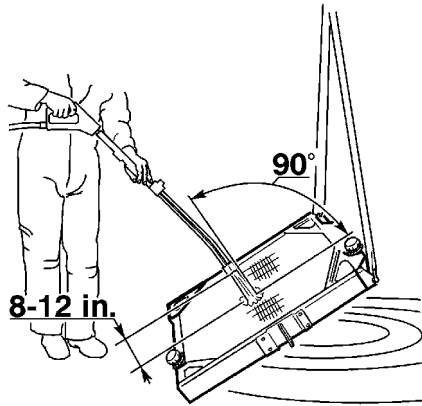
5

Gummed up dirt can be removed by using CALCLEAN cleaners, either in regular or heavy-duty strength. These cleaners can be sprayed on the cores using a hand pump sprayer and rinsed off. They will not harm the core materials.

6

In case a degreasing agent is used, be sure to thoroughly clean plastic and rubber parts if these get covered with degreasing agent.

7



W2003373

Fig. 137: Correct positioning of high pressure car wash.

A high pressure car wash with a max working pressure of 100–120 bar (1450–1750 psi) may be used, but with extreme caution. Make sure that the nozzle is held perpendicular to cell package at all times and that it is moved from side to side. The nozzle should always be positioned at a distance of 8–12 inches from the cell package.

Note: Using a high pressure car wash will necessitate the removal of the radiator(s) from the vehicle in order to correctly clean the radiator without the risk of damaging the fins with the high pressure.

8

Rinse the radiator starting with the back and then turn it around and rinse from the front.

2651-11-02-01 Charge Air Cooler, Cleaning



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



WARNING

HOT ENGINE! Keep yourself and your test equipment clear of all moving parts or hot engine parts and/or fluids. A hot engine and/or fluids can cause burns or can permanently damage test equipment.



WARNING

Never remove the cap on the expansion tank while the engine is still hot. Wait until the coolant temperature is below 50° C (120° F). Scalding steam and fluid under pressure may escape and cause serious personal injuries.



WARNING

Do not work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.



WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

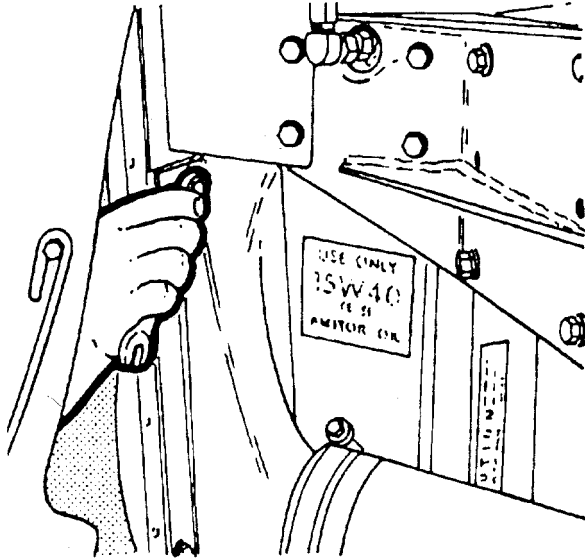
1

Remove the grille

2

Tilt the hood. Support the hood to allow removal of the safety cables.

3

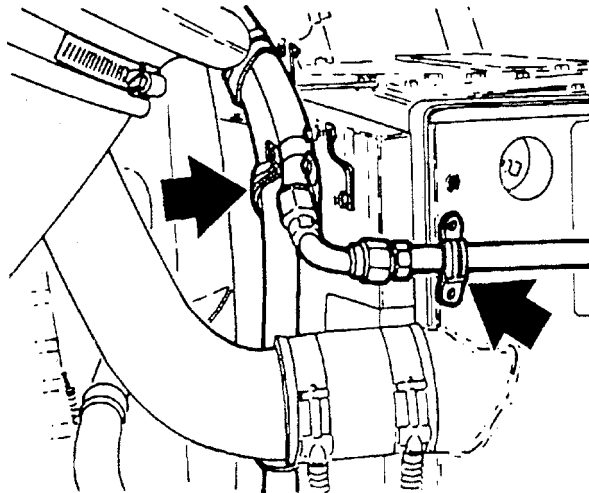


W2000460

Fig. 138: Loosening charge air cooler clamps.

Loosen the charge air cooler clamps on the side of the charge air cooler.

4

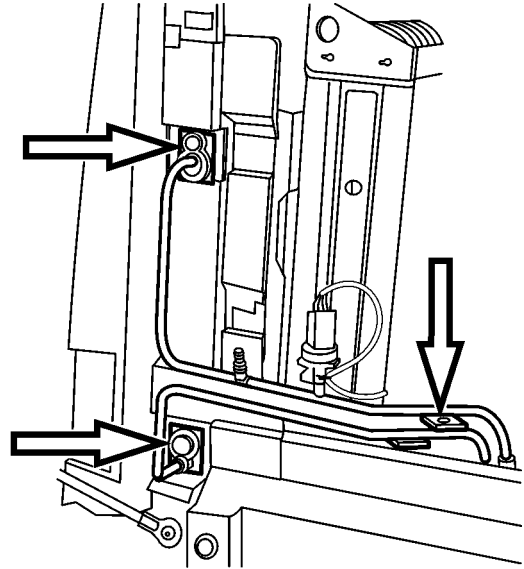


W2000461

Fig. 139: Unfasten A/C lines

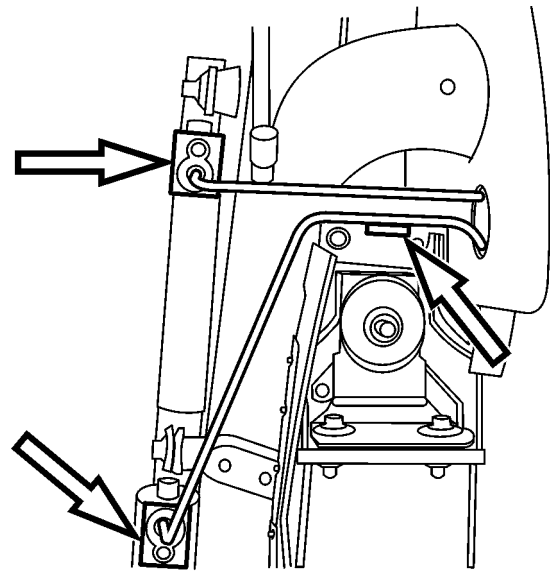
Unfasten the A/C lines from the right side of the radiator.

5



W2003523

Fig. 140: Removing A/C condenser mounting bolts on VN model



W2003524

Fig. 141: Removing A/C condenser mounting bolts on VHD model

After removing the A/C condenser line clamps and the A/C condenser mounting bolts, the condenser can be laid aside.

Note: All A/C lines on the VN/VHD are locted on the left side of the cooling package. When removing the A/C condenser line clamps make sure not to lossen the A/C lines.

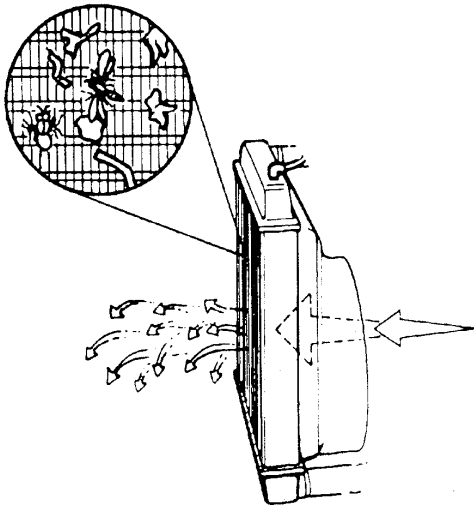
6

Remove the clamps from the charge air cooler hoses on both sides. Remove the left side radiator shield.

7

Remove the charge air cooler.

8



W2000462

Fig. 142: Direction of air pressure

Clean dirt and debris from the cores by using air pressure. This should be done from the backside of the core. The use of a radiator fin comb will also loosen dirt and debris from the fins.

Note: The air pressure should not exceed 30 psi (210kPa) for charge air cooler core.

Note: The air pressure should not exceed 25 psi (170 kPa) for the condenser.

9

Hard to remove gummed up dirt can be removed by using Calgon cleaners CALCLEAN, either in regular or heavy duty strengths. These cleaners can be sprayed on the cores using a hand pump sprayer, rinsed off and will not harm the core materials.

10

Reassemble the charge air cooler and condenser. Remember to install the isolators and teflon pads on the charge air cooler.

11

Install the radiator recirculation shields on the top, bottom and both sides of the radiator. These shields will help reduce the contaminations that get between the components.

Note: VN/NVHD model trucks are equipped with air deflectors mounted on the sides of the radiator.

System Check

2619-09-02-01 Cooling System, Servicing

(Flush — includes draining and re-filling coolant)



DANGER

Before working on a vehicle, set the parking brakes, place the transmission in neutral, and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.



DANGER

Coolant is toxic; risk of poisoning. Do not drink coolant. Use proper hand protection when handling. Keep coolant out of reach of children and animals. Failure to follow these precautions can cause serious illness or death.



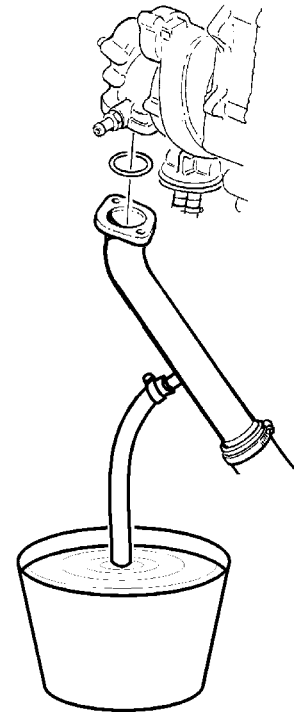
WARNING

Always wear appropriate eye protection to prevent the risk of eye injury due to contact with engine debris or fluids.

Note: Should the cooling system have substantial rust and sludge deposits, the following cleaning method is recommended:

Draining and Flushing

1



W2000751

Draining the coolant

Drain the cooling system into suitable container. Open all drain points. In addition, remove the expansion tank cap before draining the system.

Draining points:

- Radiator
- Cylinder block
- Oil cooler, transmission (when installed)
- Water pump (remove water filter and leave drain valve open)

2

Drain the cooling and heating systems and flush them with a good commercial cooling system cleaner (flush). Follow the instructions provided on the cleaner (flush) packaging.

3

Drain the cooling and heating systems and flush through with clean water. For quick, efficient draining, remove the lower and upper radiator hoses and the drain valves. Do not forget to drain the heater element and the engine heater.

4

Run the engine for 10–15 minutes at normal working temperature and then repeat the flushing procedure.

5

The heating system must be flushed separately with hoses disconnected to ensure removal of any impurities left in the system. Also remove the expansion tank cap. For effective cleaning, flush the expansion tank from below with the cap removed.

6

When the system is entirely free from impurities, it is ready to be refilled with new coolant, see table page 17

7

If the system is cleaned on a regular basis (for example, when the concentrated coolant is drained or filled) or when the system is relatively free from deposits, a smaller amount of cleaner additive or simply flushing with clean water may be sufficient.

Note: Chemicals for cleaning the cooling system are not marketed by Volvo Trucks North America and must be obtained elsewhere. Dispose of all cleaner's and coolant fluids according to local and state regulations.

Filling**8**

The cooling system is filled through the expansion tank. The engine must be switched off and the heater controls set at WARM.

9

Fill with coolant to the maximum level on the expansion tank. The cooling system will vent itself automatically.

10

Place shift lever in neutral and apply parking brake.

11

After running the engine warm and then allowing it to cool, check the coolant level again.

Feedback

One of our objectives is that workshop personnel should have access to correct and appropriate service manuals where it concerns fault tracing, repairs and maintenance of Volvo trucks.

In order to maintain the high standards of our literature, your opinions and experience when using this manual would be greatly appreciated.

If you have any comments or suggestions, make a copy of this page, write down your comments and send them to us, either via telefax or mailing directly to the address listed below.

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From

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Comments/proposals

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