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Foreword

This manual contains information concerning the safe operation of your vehicle. It is extremely important that this information is read and understood before the vehicle is operated. This manual also contains a considerable amount of information concerning the vehicle, such as vehicle identification, Preventive Maintenance recommendations and a log for your service records. Please keep this in the vehicle at all times. Information from other component manufacturers is supplied in separate manuals in the Owner's Package.

Note: It is important that this manual stays with the vehicle when it is sold. Important safety information must be passed on to the new customer. The service information contained in this manual gives the owner important information about maintaining the vehicle but is not intended as a substitute for the Preventive Maintenance Service Manual and must not be regarded as such.

The National Highway Traffic Safety Administration (NHTSA) and Volvo Trucks North America, Inc. should be informed immediately if you believe that the vehicle has a defect that could cause a crash, injury or death.

Contact NHTSA by calling the Auto Safety Hotline at 1 (888) 327–4236 or by writing to: NHTSA, U.S. Department of Transportation, Washington, DC 20590.

Volvo Trucks North America, Inc.
Greensboro, NC USA

Order number: PV776-20707967

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Warning Label Information

IMPORTANT

Before driving this vehicle, be certain that you have read and that you fully understand each and every step of the driving and handling information in this Operator's Manual. Be certain that you fully understand and follow all safety warnings.

IT IS IMPORTANT THAT THE FOLLOWING INFORMATION CONCERNING LABELS IS READ, UNDERSTOOD AND ALWAYS FOLLOWED.

The following types of labels are used throughout this manual:

Note: A note defines an operating procedure, practice, condition, etc., which is essential to the proper operation of the vehicle.

DANGER

A danger label directs the operator's attention to unsafe practices which could result in serious personal injury or death. The danger label is in **white** type on a **black** background with a **black** border.

WARNING

A warning label directs the operator's attention to unsafe practices which could result in personal injury or severe damage to the vehicle. The warning label is in **black** type on a **gray** background with a **black** border.

CAUTION

A caution label directs the operator's attention to unsafe practices where personal injury is not likely but property damage could occur. The caution label is in **black** type on a **white** background with a **black** border.

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Information For the Owner

If there are questions on the maintenance and performance of your vehicle, please discuss them with your Volvo Truck dealer. Your authorized dealer is required to have trained mechanics, special tools and spare parts to fully service your vehicle. If necessary, your dealer will contact Volvo Trucks North America or other manufacturers for any assistance.

In addition to this Maintenance Manual, there may be additional instruction/operator's manuals supplied by component manufacturers. These manuals are placed in the Owner's Package and placed in the cab. Be sure to read all the manuals thoroughly before operating the vehicle.

Also, various safety labels may be placed on components by the component manufacturer. Be sure to read and follow these labels to prevent damage to the vehicle, personal injury or even death.

Information in this manual refers to Volvo components and Volvo drivetrain. There is also certain information regarding the Cummins engine. For detailed information on the Cummins engine or non-Volvo engines and/or drivetrains contact the respective manufacturer.

Establish a Preventive Maintenance Program with the help of your local Volvo Truck dealer. A Preventive Maintenance Program makes it possible to maximize the amount of time your vehicle is up and running, resulting in longer component life. This makes for a safer vehicle by reducing any mechanical failures due to poor maintenance practices.

Note: Federal law requires manufacturers to notify owners of its products in the event of a Federal Motor Vehicle Safety Standard or if a safety related defect is discovered. If you are not the original owner of this vehicle, please notify us about the change in ownership at the address below or through an authorized Volvo Truck dealer. This is the only way we will be able to contact you if necessary.

Volvo Trucks North America, Inc.

P. O. Box 26115

Greensboro, NC 27402–6115

United States of America

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2 General Information

DO NOT Remove this manual from the vehicle. It contains important operational and safety information that is needed by all drivers and owners of this vehicle.

This Maintenance Manual covers all Volvo vehicles manufactured by Volvo Trucks North America, Inc., including the whole chassis and all Volvo manufactured components. For specific maintenance information on vendor components, manufactured by, for example: Cummins, Fuller, Meritor, etc., see the respective manufacturer's service and maintenance literature.

This manual, together with manuals for specific components (for example, Volvo engine, Cummins engine, Eaton transmission, etc.,) contain important information to be able to operate this vehicle safely. They contain advice and instructions which will enable you to get the operating economy and performance that you expect from this quality vehicle.

All information, illustrations and specifications contained in this manual are based upon the latest product information available at the time of publication. If any questions arise concerning the current status of Federal or state laws, the appropriate Federal or state agency should be contacted.

Note: Illustrations are used for reference only and may differ slightly from the actual vehicle, however, key components addressed in this manual are represented as accurately as possible.

Volvo Trucks North America, Inc. reserves the right to make changes at any time or to change specifications or design without notice and without incurring obligation.

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Proper Maintenance Procedure

During Maintenance

Whenever performing maintenance or repair, attach a DO NOT OPERATE or similar warning label or sign to the ignition key or make sure the label or sign is prominently displayed on the instrument panel.

DO NOT allow unauthorized personnel on, around or in the vehicle when maintenance or repair is being performed.

WARNING

DO NOT attempt to repair or service this vehicle without having sufficient training, correct service literature and the proper tools. Failure to follow this could lead to personal injury or making your vehicle unsafe.

WARNING

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects and other reproductive harm.

- When operating the engine in an enclosed area, vent the exhaust to the outside.

DANGER

Exhaust gases contain carbon monoxide. Always run the engine outdoors or use a properly vented exhaust hose. Prolonged or excessive exposure may cause serious illness or death.

- Before servicing your vehicle, apply the parking brakes and adequately chock the wheels in order to prevent unintended vehicle movement. If the service procedure requires the parking brakes to be released — recheck to ensure that the wheels are adequately chocked to prevent any forward and/or rearward movement.

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.

- DO NOT use combustible substances in or around the engine either during repair or maintenance or when running the engine.

DANGER

Never operate the engine in an area where hydrocarbon vapors (gasoline, for example) are present or are suspected to be present. Hydrocarbon vapors can enter the air intake and over speed the engine, causing severe engine damage and/or an explosion and fire. Serious personal injury or death could occur.

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4 Safety Information

- DO NOT wear loose clothing or jewelry that can catch or get snagged by parts or moving components on the engine. Also wear all protective equipment required by the job conditions, such as protective glasses, hearing protection, etc.
- Make certain that all protective covers and guards are in place and secured.
- Never put maintenance fluids into glass containers since glass containers can break.
- Report all problems in a timely manner before they threaten the safety of operating the vehicle.
- DO NOT work on the engine while it is running.
- Make sure protective locks and covers are in their proper place.
- DO NOT use high amperage electronic starting devices for jump-starting the engine. Rely on conventional battery charging for charging the batteries or jump-start with the help of a start battery.
- DO NOT attempt repairs you do not understand or have the proper tools for.
- When starting an engine after repairs have been made to the fuel or injection system, prepare equipment for shutting off the engine intake air and/or fuel supply (to stop the engine), in case there is an over speed on start-up.
- Start the engine only from the driver seat. Never operate the starter motor across the starter terminals or the batteries as this could Bypass the engine neutral-start system as well as causing damage to the electrical or electronic systems.

DANGER

Never try to operate or work on this vehicle while under the influence of alcohol. Your reflexes can be affected by even a small amount of alcohol. Drinking and operating this vehicle can lead to an accident, causing serious personal injury or death.

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Compressed Air and Water

DANGER

Compressed air can cause personal injury. When using compressed air for cleaning, wear a protective face shield, protective clothing and protective shoes. Pressurized water could cause particles and/or hot water to be sprayed in your direction and cause personal injury. The maximum air pressure must be below 30 psi (200 kPa) for cleaning purposes.

Asbestos Information

Note: The Volvo engine and replacement parts for it shipped from the factory are asbestos free. Volvo recommends the use of only genuine Volvo spare parts.
Never use any parts that contain or are thought to contain asbestos. Exposure to asbestos fibers can create serious health risks, including death.

Fluid Penetration

DANGER

Always use a piece of paper or cardboard when checking for a leak. Escaping fluid under high pressure, even a pin-hole sized leak, can penetrate body tissue, causing serious injury or death. If fluid is injected into your skin, immediate treatment must be administered by a doctor familiar with this type of injury.

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6 Safety Information

Injury Prevention

Burn Prevention

Engine Parts

WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or fluid can cause serious burns.

W0001525

DO NOT touch any part of the engine while it is hot. Allow the engine to cool before any repair or maintenance is performed on the engine.

WARNING

DO NOT raise the engine hood or cab if you see or hear steam or coolant escaping from the engine compartment. Wait until steam or coolant cannot be seen or heard any longer before raising the hood or cab. DO NOT remove the coolant fill cap if the coolant in the surge tank is boiling. Also, do not remove the cap while the engine and radiator are still hot. Scalding fluid and steam may be blown out under pressure if the cap is taken off too soon.

Relieve all pressure in air, oil, fuel or cooling systems before any lines, fittings or related items are disconnected or removed.

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Coolant

To prevent personal injury, do not climb up on the engine to remove the filler cap. Use a suitable, properly positioned ladder to reach up to the cap. At normal operating temperature, the engine coolant is very hot and under pressure. If pressure is relieved rapidly in a hot cooling system, the hot coolant can turn into steam. Any contact with hot coolant or steam can cause severe burns. The radiator and all heating system and radiator lines and hoses contain hot coolant.

WARNING

Coolant may be combustible. Coolant leaked or spilled onto hot surfaces or electrical components can cause a fire. Clean up coolant spills immediately.

W0001527

Verify coolant level only by the markings on the expansion tank. Open the filler cap only after the engine is stopped and cooled down. Remove the filler cap slowly to relieve pressure.

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8 Safety Information

Oils

WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or fluid can cause serious burns.

Hot oil can cause severe burns. DO NOT allow hot oil to contact the skin. When changing oil, wear protective gloves.

Batteries

WARNING

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

WARNING

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

Battery electrolyte contains acid and can cause injury. Avoid contact with the skin and eyes. Wash hands after touching batteries and connectors. Use of gloves is recommended. Always wear protective glasses when working with batteries.

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Fire or Explosion Prevention

DANGER

The diesel engine will operate on any fuel which enters the cylinder, whether it is from the injectors or from the air intake system. Therefore, if any solvent is used to flush out the air cleaner element, the engine may over speed during start-up. Engine damage and severe injury and/or death from burns or explosion can occur.

W0001526

The engine should not be operated in an area where combustible gases are suspected to be in the air. These could be drawn into the engine through the engine air intake system and could cause the engine to over speed with possible serious damage to the engine and bodily injury or property damage.

DANGER

Excessive heat may cause the pressurized components of the air conditioned system to explode. Never weld, solder, steam clean or use a gas torch near any part of the air conditioning system. Severe injury or death may occur from an explosion.

DO NOT pressure or leak test R134a refrigerant for air conditioning or servicing equipment using compressed air. Some mixtures of air and R134a refrigerant have proven to be combustible at elevated pressures. These mixtures, if ignited, can cause injury or property damage. Consult the R134a Material Safety Data Sheet (MSDS) for additional information.

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10 Safety Information

DANGER

DO NOT service any part of the fuel system while smoking or in the presence of flames, sparks or hot surfaces. Failure to follow these precautions can result in fire, which can cause serious injury or death.

W0001527

All fuels, most lubricants and some coolant mixtures are flammable. Diesel fuel is flammable. Gasoline is flammable. The mixture of diesel and gasoline fumes is extremely explosive. DO NOT smoke while refueling or when in a refueling area.

WARNING

DO NOT store fuel containers in the vehicle. They may leak, explode and cause or feed a fire. Empty or full, they present a hazard that may lead to burns in the event of a fire.

Keep all fuels and lubricants stored in properly marked containers and away from all unauthorized personnel. Store oily rags or other flammable material in a protective container, in a safe place.

Remove all flammable material such as fuel, oil and other substances before they accumulate on the engine.

DO NOT expose the engine to flames, driving over burning ground, etc., if at all possible.

DO NOT weld or flame cut on or around pipes or tubes that contain flammable fluids.

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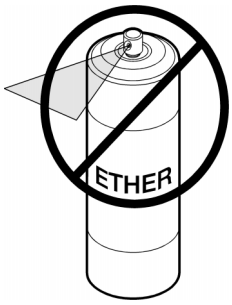
Exhaust heat shields may be installed to protect oil or fuel carrying lines and pipes from hot exhaust parts. To protect from pipe or seal failure, install heat shields correctly.

Provide adequate and proper waste oil disposal. Always dispose of waste liquids according to Federal and local regulations. Oil and fuel filters should be properly installed and housing covers tightened to the proper torque when being changed.

Starting Aids

DANGER

DO NOT use ether or other combustible starting aids on any Volvo engine. The Volvo engine is equipped with a preheater, introduction of ether or similar starting aids could cause a fire or explosion resulting in severe property damage, serious personal injury or death.



W0001484

DO NOT use ether or other combustible starting aids on engines that have a heater element or other heating devices installed in the intake manifold for heating intake air at cold-starts.

Fire Extinguisher

Anytime work is being done to the fuel system or any other area where flammable substances are being used, have a fire extinguisher available and know how to use it. Inspect and have it serviced as recommended on its instruction label.

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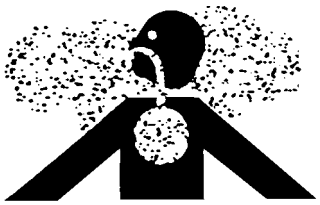
12 Safety Information

Respiratory Hazard Prevention

DANGER

Exhaust gases contain carbon monoxide. Always run the engine outdoors or use a properly vented exhaust hose. Prolonged or excessive exposure may cause serious illness or death.



W0001523

WARNING

Diesel engine exhaust and some of its constituents are known to the state of California to cause cancer, birth defects and other reproductive harm.

Always work in a well ventilated space if the engine needs to be running and use a hose to route the exhaust to the outside.

Poisonous Substances

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.

Cooling system supplemental additive contains alkali. To prevent personal injury, avoid contact with the skin and eyes.

DO NOT drink coolant of any concentration.

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Crushing or Cutting Prevention

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

DO NOT work near the fan with the engine running or the ignition in the ON position. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured.

W0001524

Support equipment and components properly when working beneath them. Never attempt adjustments while the engine is running unless otherwise specified for the service procedure. To help prevent an accident caused by moving parts, work carefully around them. Guards, covers and shields should be in place whenever maintenance is not being performed. Keep objects away from moving fan blades. They will throw or cut any object or tool that falls or is pushed into them.

Inspect the fan blade assembly before service for cracks or loose mounting before starting the engine. *Never* stand alongside a rotating fan assembly, particularly at high fan speeds.

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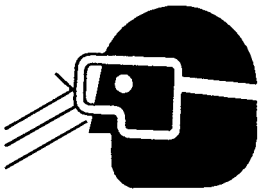
Wear protective glasses when striking objects to avoid injury to your eyes. Chips or other debris can fly off objects that are struck. Make sure no one can be injured by flying debris before striking any object.



W0001528

Climbing Up and Down

DANGER

Always have three limbs (one foot and two hands or two feet and one hand) in contact with the vehicle at all times when entering or exiting the cab or the area behind the cab. Failure to follow this warning can result in serious personal injury or death.

DO NOT climb up on or jump off from the engine or stand on components that cannot support your weight. Use an adequate ladder or scaffolding, suitably situated.

DO NOT use top of engine or cowling ledge as foothold when reaching on top of cab. Clean steps, handholds and areas of the vehicle you will be working on or around. Refer to the Operator's Manual for proper entry and exit procedures.

Always use a three-point stance (two hands and one foot or one hand and two feet) whenever climbing up or down.

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Engine Damage Prevention

Before Starting the Engine

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.

Inspect engine for potential hazards. Make sure all protective guards and covers are properly installed if an engine needs to be started to make adjustments or checks. To help prevent an accident by moving parts, work carefully around them.

DO NOT disable or bypass automatic alarm/shutoff circuits. They are provided to prevent personal injury and engine damage.

DANGER

The diesel engine will operate on any fuel which enters the cylinder, whether it is from the injectors or from the air intake system. Therefore, if any solvent is used to flush out the air cleaner element, the engine may over speed during start-up. Engine damage and severe injury and/or death from burns or explosion can occur.

Make provisions for shutting off the engine intake air or fuel supply to stop the engine if there is an over speed on start-up after performing repair or maintenance on it.

Always consult the proper Volvo Service Manual before any repair is attempted.

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Engine Starting

DO NOT start the engine or move any of the controls or disengage the parking brake if the warning tag “DO NOT OPERATE” is attached to the ignition key or located on the dash. Check with the person who attached the tag before starting.

Make sure no one is working on or close to the engine or components driven by the engine before starting it. Always make an inspection of the engine before and after starting.

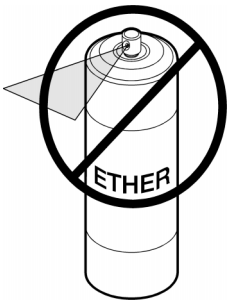
Diesel engine exhaust contains products of combustion which may be harmful to your health. Always start and operate the engine in a well-ventilated area, and if in an enclosed area, vent the exhaust to the outside.

Start the engine only from the driver seat in the cab. Never start the engine by shorting across the starter motor terminals or batteries to start the engine as this could bypass the engine neutral-start system as well as damage the electrical and electronic system. Always start the engine according to the required engine starting procedure described in this operator’s manual to prevent major engine component damage and personal injury.

Starting Aids

DANGER

DO NOT use ether or other combustible starting aids on any Volvo engine. The Volvo engine is equipped with a preheater, introduction of ether or similar starting aids could cause a fire or explosion resulting in severe property damage, serious personal injury or death.



W0001484

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Electric System Damage Prevention

Electric and Electronic Systems

Never disconnect any charging unit circuit or battery circuit cable from the battery when the charging unit is operating. A spark can cause the flammable vapor mixture of hydrogen and oxygen to explode.

To prevent potential sparks from igniting combustible gases produced by some batteries, attach the negative (—) terminal last when hooking up and remove the negative terminal first after the engine has started. Check regularly around the engine and engine compartment for loose or frayed wires. Have all loose or frayed electrical wires tightened, repaired or replaced before operating the vehicle.

W0001526

WARNING

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

Grounding Practices

Proper grounding for vehicle and engine electrical and electronic systems is necessary for proper vehicle and engine performance and reliability. Improper grounding will result in uncontrolled and unreliable electrical paths.

Uncontrolled engine electrical circuit paths can result in damage to main bearings, crankshaft journals surfaces and aluminum components. Uncontrolled electrical circuit paths can also cause electrical noise which may degrade vehicle and radio performance.

Operating engines without the engine-to-frame ground strap installed can cause damage to the engine. To prevent electrical discharge damage, check to make sure the engine's electrical system has an engine-to-frame ground strap. All ground connections should be tight and free of corrosion.

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18 Safety Information

Electronic Engine Control System

Tampering with the electronic system installation can be dangerous and could result in personal injury or death and/or engine damage. It is very important to take the proper precautions with the electrical and electronic system when charging the batteries, jump-starting or performing electric welding on the vehicle. See the vehicle Operator's Manual for correct procedures.

DANGER

The Volvo D12D engine uses high voltage to the electronic unit injectors.
DO NOT come in contact with the unit injector terminals while the engine is running. An electric shock can cause an involuntary muscle spasm and cause balance loss and falls leading to severe personal injury or death.

W0001522

This engine is equipped with monitoring features that may cause reduced power or shutdown under certain conditions. The power output, monitoring and idling features can only be programmed and/or changed with electronic service tools and passwords.

Certain features, such as low oil pressure, high coolant temperature or low coolant level could cause the engine power and/or vehicle speed to be limited and the engine may also shut down. The shutdown will take approximately 30 seconds from the time the warning feature is activated. See the vehicle Operator's Manual for more information.

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Reporting Safety Defects

USA

The National Highway Traffic Safety Administration (NHTSA) and Volvo Trucks North America should be informed immediately if you believe that the vehicle has a defect that could cause a crash, injury or death.

Contact NHTSA by calling the Auto Safety Hotline at 1 (800) 424-9393 or by writing to: NHTSA, U. S. Department of Transport, Washington, DC 20590.

1 (800) 424-9393
or
1 (888) 327-4236

Canada

Refer customer complaints to Volvo Trucks Canada, Inc. or to Transport Canada, Defect Investigations and Recalls.
Canadian customers who wish to report a safety-related defect to Transport Canada, Defect Investigations and Recalls, may telephone the toll free hotline 1-800-333-0510, or contact Transport Canada by mail at: Transport Canada, ASFAD, Place de Ville Tower C, 330 Sparks Street, Ottawa ON K1A 0N5.

For additional road safety information, please visit the Road Safety website at: http://www.tc.gc.ca/roadsafety/menu.htm

1 (905) 795-1555
1 (800) 333-0510

(Bottom number within Canada only)

Mexico

Volvo Trucks de Mexico, S.A. de C.V. should be informed immediately if you believe the vehicle has a defect that could cause a crash, injury or death. Contact Volvo Trucks de Mexico by calling 9-011 52-50-81-68-50 or by writing to: Volvo Trucks de Mexico, S.A. de C.V., Prol. Paseo de la Reforma 600, 1er. Piso — 121, Col. Santa Fe Peña Blanca, C.P. 01210, México, D.F.

01 (800) 90 94 900

(Within Mexico only)

Note: For Roadside assistance information see “Service Assistance and Manuals” page 147.

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Speed Restrictive Tires

DANGER

Operating a vehicle equipped with Speed Restrictive Tires in excess of their stated rating may result in tread separation and/or blowout resulting in the loss of steering control and possible collision. Serious personal injury or death could occur. Always maintain proper air pressure and never exceed the tire ratings.

When a vehicle is equipped with Speed Restrictive Tires it is extremely important that the vehicle is not operated in excess of the indicated speeds.

If your vehicle is equipped with such tires, the speed restrictions will be stated on the sidewall of the tires. The operator of this vehicle is urged to check the tires of the vehicle to determine if there are any limitations.

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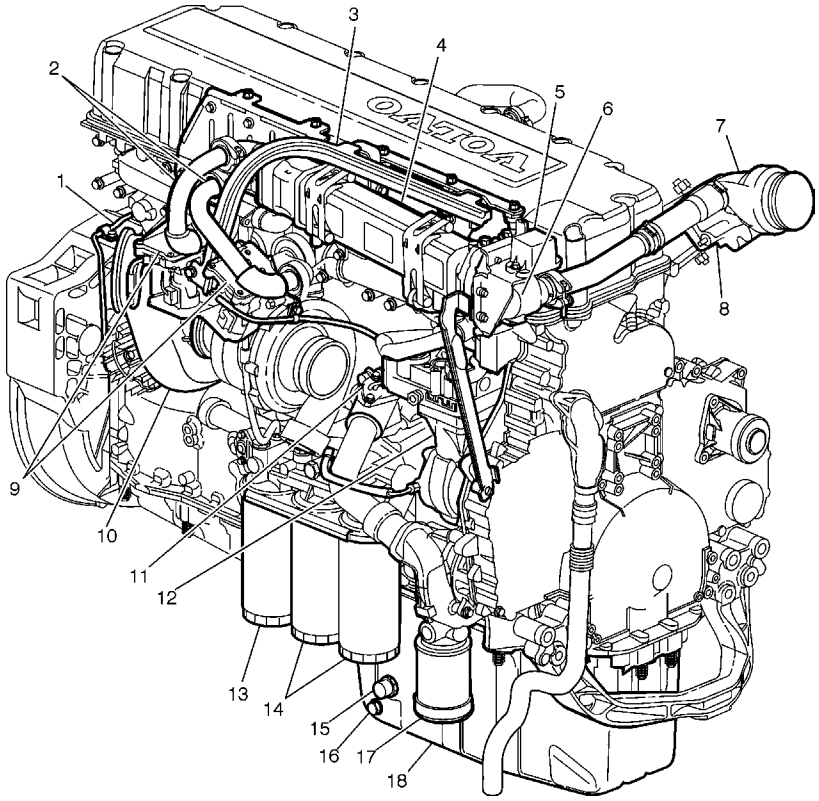
Engine Overview, VN D12D (Volvo V-Pulse) Right Hand View



1. EPG Air Supply Line
2. EGR Pipes
3. Wiring Harness Rail
4. EGR Cooler
5. Vibration Damper
6. Reed Valve Housing
7. Mixing Chamber
8. Pre-Heater (Optional)
9. EGR Valves 1 and 2
10. Shutter Housing
11. Block Heater
12. Air Compressor
13. Oil Filter Bypass
14. Oil Filter Full Flow
15. Oil Pan Heater (Optional)
16. Fast Lube Oil Change System (FLOCS) Optional (VN only)
17. Coolant Filter
18. Oil Pan (Plastic, VN Only)

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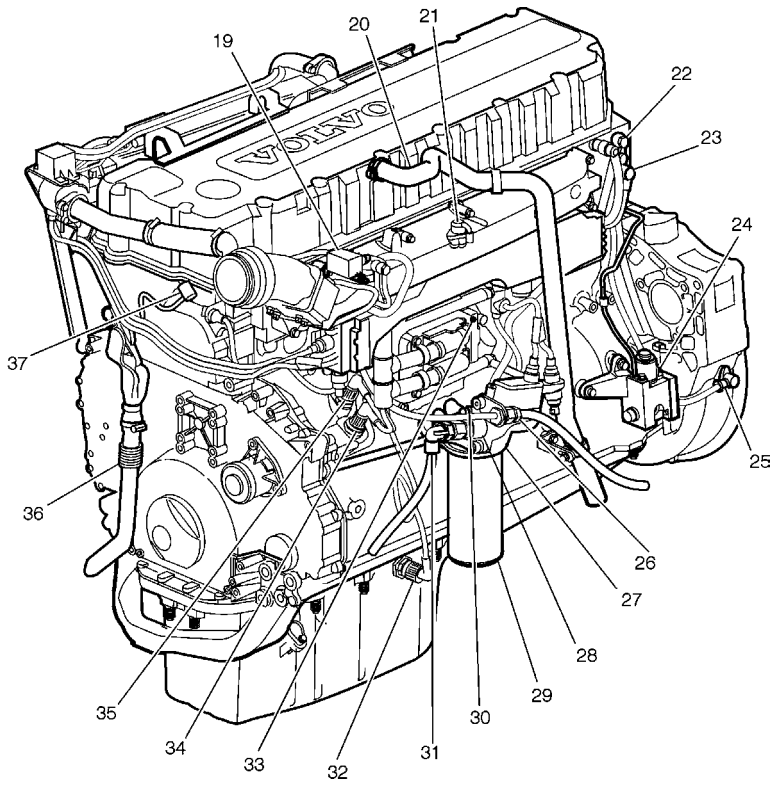
Engine Overview, VN D12D (Volvo V-Pulse) Left Hand View



19. Preheat Relay
20. Engine Breather Tube Crankcase Ventilation
21. Intake Manifold Pressure/Temperature Sensor
22. Fuel Pressure Inlet (injector fuel supply)
23. Coolant Temperature Sensor
24. Air Valve Unit (AVU)
25. Engine Speed Sensor
26. Fuel Return Connection
27. Fuel Filter Housing
28 Electrical Fuel Priming Pump (Inside Housing)
29 Secondary Fuel Filter
30 Fuel Drain Screw
31 Fuel Inlet
32 Oil Level Sensor
33 Engine Electronic Control Unit (EECU)
34 Crankcase Pressure Sensor
35 Oil Pressure Temperature Sensor
36 Engine Breather Tube (Crankcase Ventilation)
37 Engine Position Sensor (CAM)

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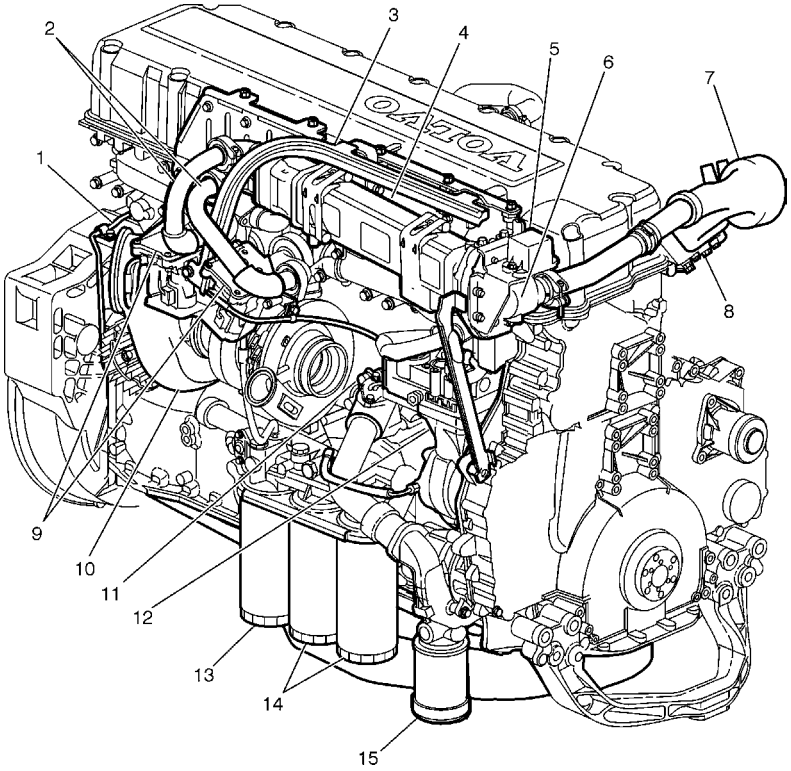
Engine Overview, VHD D12D (Volvo V-Pulse) Right Hand View



1. EPG Air Supply Line
2. EGR Pipes
3. Wiring Harness Rail
4. EGR Cooler
5. Vibration Damper
6. Reed Valve Housing
7. Mixing Chamber
8. Pre-Heater (Optional)
9. EGR Valves 1 and 2
10. Shutter Housing
11. Block Heater
12. Air Compressor
13. Oil Filter Bypass
14. Oil Filter Full flow
15. Coolant Filter

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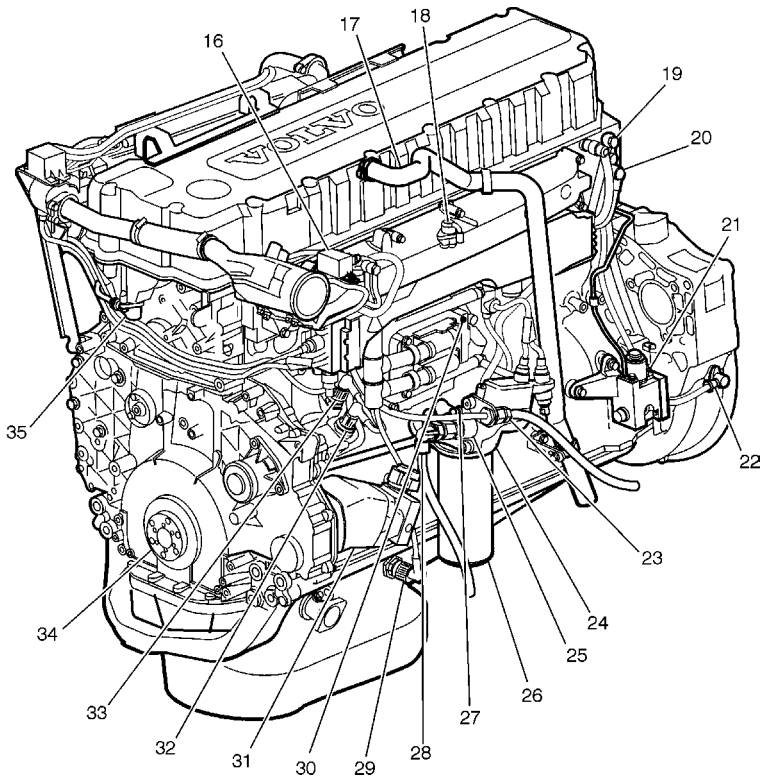
Engine Overview, VHD D12D (Volvo V-Pulse) Left Hand View



16. Preheat Relay
17. Engine Breather Tube Crankcase Ventilation
18. Intake Manifold Pressure/Temperature Sensor
19. Fuel Pressure Inlet (injector fuel supply
20. Coolant Temperature Sensor
21. Air Valve Unit (AVU)
22. Engine Speed Sensor
23. Fuel Return Connection
24. Fuel Filter Housing
25 Electrical Fuel Priming Pump (Inside Housing)
26 Secondary Fuel Filter
27 Fuel Drain Screw
28 Fuel Inlet
29 Oil Level Sensor
30 Engine Electronic Control Unit (EECU)
31 Side Engine Power Take Off (PTO) Pump
32 Crankcase Pressure Sensor
33 Oil Pressure Temperature Sensor
34 Front Power Take Off (PTO) Drive
35 Engine Position Sensor (CAM)

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Engine Features

Feature	Benefit
• VECTRO III - Volvo Engine Electronics System	• Engine Brake Control • Coolant Warmhold Temperature • Differentiated Speed Control • Road Speed Limiter • RPM Limiter • PTO Speed Setting • Engine Protection • Cruise Control • Idle Speed Setting • Idle Shutdown • Performance Bonus
• VECTRO III Diagnostics	• Ease of Troubleshooting
• Air-to-Air Charge Air Cooler	• Superior Fuel Economy • Peak Performance • Low Process Temperature
• Two-Piece Piston and Optimized Compression Ratio	• Minimum White Smoke • Low Internal Friction
• Standard Exhaust Brake	• Efficient Braking on Grades • Superior Temperature Control at Idle • Quick Warm-Up
• Optional Volvo Engine Brake (VEB)	• Exceptional Engine Braking also at Low Engine Speed

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Engine Features Continued

Feature	Benefit
• Optional Pre-Heater	• Excellent Startability down to as Low as -15°F (-25°C) • Minimum Smoke and Odor After Start • No Fuel Dilution of Oil in Cylinder Due to Complete Combustion • Less Engine Wear
• Cylinder Liners with Plateau Honing	• Optimized Oil Consumption
• Engine-Mounted Fan Ring	• Efficient Cooling with Low Parasitic Losses
• Electronically Controlled Fuel Injection	• Precise Control of Combustion • Centrally Located Vertical Unit Injectors • Maximum Fuel Efficiency
• Side—Mounted Engine Power Take-Off • Rear-Mounted Engine Power Take-Off (REPTO)	• Clutch-Independent PTO's

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VECTRO III Customer Parameter Values, D12D

Parameter	Parameter Code	Default Value	Range
Customer Password	DX	000000	1–10 Alphanumeric characters
Road Speed Limit (RSL)	DP	68	30-87
Gear-Down Protection Enabled	AJ	NO	Yes/No
• Gear Down Vehicle Speed (mph)	DV	RSL-5	(RSL-10)-(RSL-3)
Cruise Control Enabled	AG	YES	Yes/No
• Max. Cruise Control Speed (mph)	AI	65	Yes/No
• Min. Cruise Control Speed (mph)	BK	30	30-87
• Engine Brake with Cruise	AF	No	Yes/No
RPM Limits in Top Gears	AZP	YES	Yes/No
Max. Engine Speed (rpm) @ 0 mph	AU	1900	1200-2100
PTO Enabled	QP	YES	Yes/No
• PTO Maz. Engine Speed (rpm)	AA	670	600-2100
• PTO Resume Engine Speed (rpm)	AB	670	600-2100

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VECTRO III Customer Parameter Values, D12D (Continued)

Parameter	Parameter Code	Default Value	Range
Idle Shutdown Enabled	AL	YES	Yes/No
• Idle Shutdown Timer (minutes)	AM	5	1-40
• Engine Load in PTO for Idle Shutdown (%)	CMM	20	0–100
• Allow Permanent Idle Shutdown Override	CMQ	No	Yes/No
• Minimum Ambient for Idle Shutdown (%)	CMN	No	0–60
• Maximum Ambient for Idle Shutdown (%)	CMO	120	70–120

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Parameter	Parameter Code	Default Value	Range
Engine Protection Enabled	AMQ	YES	Yes/No
Coolant Warmhold Temp (°F)	AZN	158	158 - 176
Performance Bonus Enabled	ADZ	No	Yes/No
• Maximum Speed Bonus (mph)	AEB	3	1–5
• Number of Speed Bonus Steps	BTR	3	1, 2 or 3
• Consider Fuel Economy	AEA	Yes	Yes/No
• Fuel Economy Target (mpg)	ADX	7.0	5.0–10.0
• Consider Idle Time	AEA	Yes	Yes/No
• Idle Time Target (%)	ADY	25	5–50
• Running Interval (miles)	ADV	3000	100–10000

Note: This parameter listing is not complete. Contact your Volvo Truck dealer for a complete listing.

Customer Parameters can be changed with VCADS Pro or VCADS Elite. See your Volvo Truck dealer.

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Engine Variants, D12D

Power Output Options					
	D12D-365	**D12D-385**	**D12D-425** [1]	**D12D-435**	**D12D-465**
Output, net [2] @ 1,800 rpm	**365 hp**	**395 hp**	**425 hp**	**435 hp**	**465 hp**
Torque, net, @ 1,200 rpm	**1,350 lb-ft (1,830 Nm)**	**1,450 lb-ft (1,965 Nm)**	**1,450 lb-ft (1,965 Nm)**	**1,550 lb-ft (2,101Nm)**	**1,650 lb-ft (2,237 Nm)**
Governed speed	**1,900 rpm 2,000 rpm 2,100 rpm**	**1,900 rpm 2,000 rpm 2,100 rpm**	**1,900 rpm 2,000 rpm 2,100 rpm**	**1,900 rpm 2,000 rpm 2,100 rpm**	**1,900 rpm 2,000 rpm 2,100 rpm**
Customer Programmable					

[1] For Automatic Transmissions only.

[2] Net output according to ISO 1585 and SAE J1349.

Engine Standard Equipment

- Air-to-air charge air cooler
- Frame-mounted Primary fuel filter and Volvo spin-on secondary fuel filter
- Exhaust pressure governor (EPG)
- Electronically controlled fuel injection
- Double Volvo full-flow and one Volvo bypass oil filters
- Overhead camshaft
- Electronic engine diagnostics system
- Thermostatically — Controlled Viscous fan clutch
- 110 Amp alternator
- Base Warranty: 2 years or 250,000 miles; parts and labor (For covered components, see the warranty certificate)
- Side mounted oil fill/check
- Electronic oil level sensor
- Single Cylinder air compressor
- Gear reduction starter
- Automatic tensioners on drive belts

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Engine Optional Equipment

- Volvo Engine Brake — 350 hp braking power @ 2,300 rpm.
- Side-mounted engine PTO — output up to 60 hp or 300 ft-lb
- Rear-Mounted engine PTO-output up to 250 hp or 610 ft-lb
- Twin cylinder air compressor
- Intake air preheater
- Engine block heater for coolant
- Engine oil pan heater
- 85 or 135 Amp alternator
- Thermostatically-controlled ON/OFF fan clutch
- Fast Lube Oil Change System (FLOCS) (VN only)

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32 General Engine Design Information

Engine Data

Fill in the blanks for future reference:

Vehicle Identification Number (VIN) [.....]

Engine Model [.....]

Engine Serial Number [.....]

Engine Power Output [.....]

Engine Low Idle Speed [.....]

Engine Full Load Speed [.....]

Engine Full Torque [.....]

Primary Fuel Filter P/N [.....]

Secondary Fuel Filter P/N [.....]

Oil Filter P/N, Full Flow [.....]

Oil Filter P/N, By-pass [.....]

Air Cleaner Element P/N [.....]

Coolant Filter P/N [.....]

Fan Drive Belt Set P/N [.....]

Alternator Belt P/N [.....]

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Engine Storage

If the vehicle must be parked for a period (more than 30 days), protect it as follows:

1 Drain the engine oil.

2 Fill up to the proper level with oil of the recommended quality and viscosity.

3 Fill up the fuel tanks with the recommended grade of fuel.

4 Run the engine for two minutes around 1000 rpm. Shut the engine down. DO NOT drain the oil after this run.

5 Check the engine air filter and, if necessary, change it.

6 Check the coolant for proper levels of antifreeze and inhibitor (SCA) protection. Service as necessary.

7 Clean the exterior of the engine.

8 Seal all engine openings using a waterproof, vaporproof and strong tape.

To return an engine preserved in this manner can be done in a short time by removing the seals and checking all engine fluids: coolant, fuel, crankcase oil. Also check all other component fluid levels on the vehicle.

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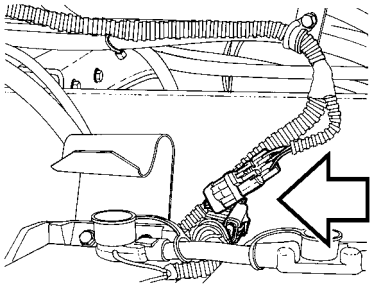
34 Engine Storage

Starting Engine After an Extended Shutdown

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.



W3002417

If an engine has been sitting unused for more than a week or if an oil change has been performed, it is recommended that the oil pressure is established before starting the engine. This can be done by cranking the engine without fuel delivered to the cylinders. Let an experienced technician carry out the following:

1 Separate the in-line fuse feeding the engine electronic control unit. The fuse is located in the battery box.
2 Use the starter to turn the engine over for 15 seconds.

CAUTION

DO NOT crank the engine for more than 30 seconds at a time; wait two minutes after each try to allow the starter to cool. Failure to follow these instructions could cause starter damage.

3 Reconnect the fuse.
4 Start the engine.

Note: This procedure will load a fault in the diagnostic message display but will not interfere with running the engine.

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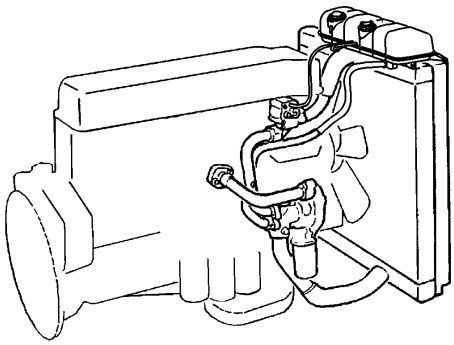
General Coolant Information

General

WARNING

DO NOT raise the engine hood or cab if you see or hear steam or coolant escaping from the engine compartment. Wait until steam or coolant cannot be seen or heard before raising the hood or cab.
DO NOT remove the coolant fill cap if the coolant in the surge tank is boiling. Also, DO NOT remove the cap while the engine and radiator are still hot. Scalding fluid and steam may be blown out under pressure if the cap is taken off too soon.



W2002056

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36 Cooling System

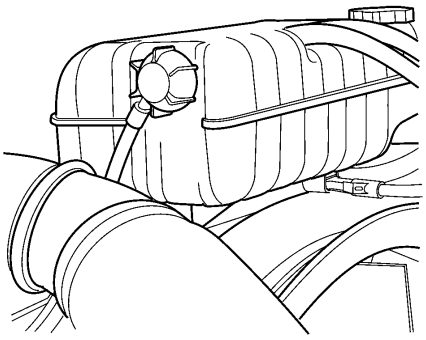
Many engine failures can be traced back to a problem in the cooling system. Always make sure that the coolant level is above the min. mark on the surge tank. If the coolant level is allowed to go below the bottom of the tank, there is the risk of the engine shutting down. See the Operator's Manual for more information on the warning functions. For information on how to change the coolant, see "Flushing Cooling System, D12D" page 96.

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.

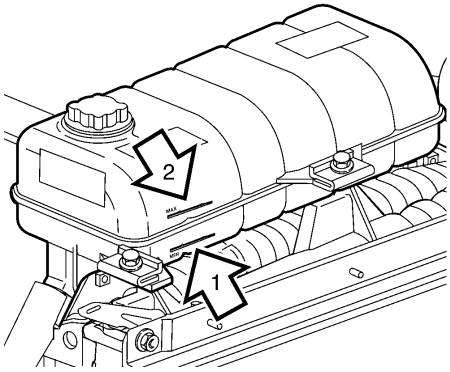
Note: Always dispose of coolant according to Federal or local regulations. Take all used coolant to a recycling or waste collection center.

Note: The VN tank has only one MIN line located on the **Right hand side**, this side should be completely filled to the top with coolant. The Left hand side of the tank should NOT be filled.



W2004470

VN (Left hand side)
(DO NOT FILL)



W2004469

VHD (Right hand side)

1 Minimum
2 Maximum

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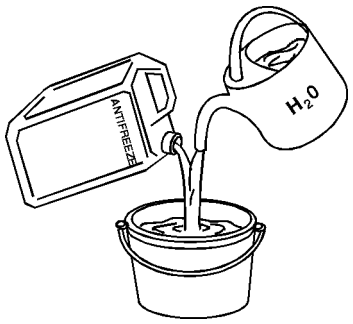
Recommended coolant consists of a 50/50 mixture of antifreeze and clean water. Never run the engine with water only. Regardless of the season, the coolant should always contain at least 40 to 60 percent ethylene glycol (antifreeze). The antifreeze also contains anti-corrosion agents that the cooling system needs to stay functional.



W2003082

Note: DO NOT use a winterfront for the cooling system. See the Operator's Manual, Engine Start and Operation, for more information.

Note: DO NOT mix regular antifreeze into coolant mixed with extended life antifreeze. The extended life properties can not be maintained, with much reduced service interval as a result.

Engine design requires the thermostat in the engine during summer and winter. Correct engine temperature should be a minimum of 165 °F (75 °C) with a properly functioning thermostat.

⚠ WARNING

Coolant may be combustible. Coolant leaked or spilled onto hot surfaces or electrical components can cause a fire. Clean up coolant spills immediately.

DO NOT add cold coolant to an overheated engine because a cracked cylinder head and/or block may result.

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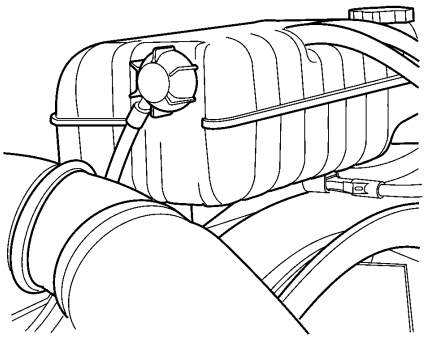
Keep the radiator (including charge air cooler) and the frontal area free from bugs, dirt, leaves, etc. (see page 99 for cleaning information). Always keep the coolant level above the min. mark on the coolant expansion tank.

Inspection of the whole cooling system is important. Check for swollen or deteriorated heater and radiator hoses, loose hose clamps and connections, and radiator leaks.

DANGER

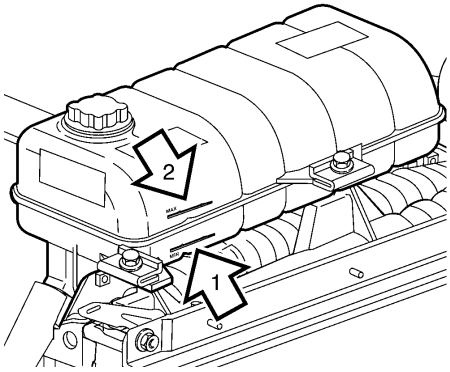
DO NOT work near the fan with the engine running. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured. Before turning on the ignition, be sure that no one is near the fan.

Note: The VN tank has only one MIN line located on the **Right hand side**, this side should be completely filled to the top with coolant. The Left hand side of the tank should NOT be filled.



W2004470

VN (Left hand side)
(DO NOT FILL)



W2004469

VHD (Right hand side)

1 Minimum
2 Maximum

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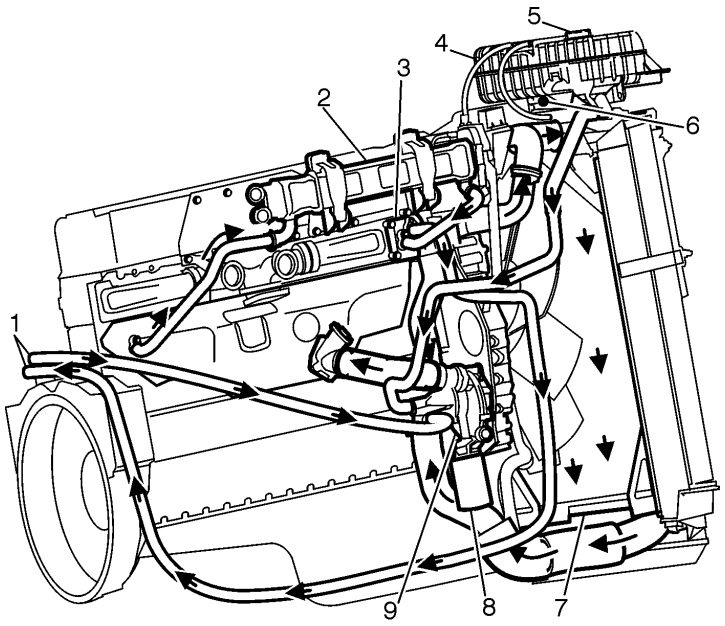

1. To Transmission Cooler
2. EGR Cooler
3. Thermostat Housing
4. Expansion or Surge Tank
5. Coolant Cap
6. Level Sensor
7. Radiator
8. Coolant Filter
9. Coolant Pump

A well functioning and maintained cooling system is as important to the engine as performing regular oil changes or using good fuel. To get the best result it is very important to use quality products and to service the system at the right intervals. Please read this section carefully.

The cooling system consists of a liquid that is pumped by a gear driven coolant pump that keeps the flow through the engine to the radiator. The radiator gives off heat to the air as it passes through and air flow is helped by the engine fan. For a quick warm-up of the engine, a thermostat regulates the flow of coolant.

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.

CAUTION

Never add coolant to a hot or overheated engine. Engine damage can result. Allow the engine to cool first.

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40 Cooling System

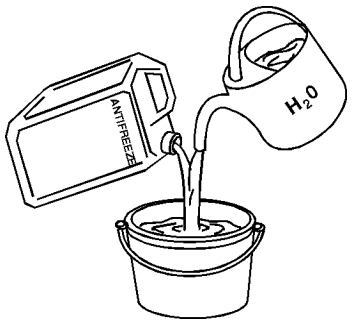
Coolant consists of clean water and antifreeze. This mixture should never be less than 40% antifreeze and 60% clean water or more than 60% antifreeze and 40% clean water. Mix the antifreeze and water to the required concentration before adding to the cooling system.

Note: DO NOT mix different products, such as regular antifreeze and extended life antifreeze.

Note: Volvo Trucks North America, Inc. does not recommend the use of antifreeze based on propylene glycol.

Coolant, consisting of an antifreeze solution in water, should be used year-round to provide freeze and boil-over protection as well as providing a stable environment for seals and hoses. The solution needs to be tested for proper additive levels at regular intervals (see page 47 for testing SCA levels), unless extended life antifreeze is used. Adjust additive concentration if not at the proper levels.

Note: DO NOT use antifreeze formulated for automobile gasoline engines. These have a very high silicate content that will clog the radiator and leave unwanted deposits in the engine.



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The main purpose of coolant is to transport heat from the hot parts of the engine to the radiator and to protect the cooling system from corrosion.

In addition to this, the coolant must:

- Protect against pitting and cavitation erosion damage of the water pump and cylinder liners.
- Protect against freezing and boiling.
- Prevent formation of scale, sludge deposits and clogging.
- Be harmless to polymer materials and seals in the coolant system.
- Maintain its liquid properties in cold climates.

Coolant should consist of these three components:

- Clean water.
- Additives.
- Antifreeze (Glycol).

See the next pages for proper handling, mixtures and specifications.

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Water Specification

CAUTION

Volvo Trucks North America, Inc. does not recommend using plain water in the cooling system. Water alone is corrosive at engine operating temperatures and does not provide adequate boiling protection. The engine may develop corrosion and cavitation problems in engine and radiator, and the boiling point of the coolant is lowered compared with a proper antifreeze/water mixture. The warranty is not valid when using only water in the cooling system.

Use clean water in the coolant mixture. DO NOT use hard tap water or salt softened tap water in the cooling system. If clean water is not available, using distilled water is ideal. Water specification should be:

	Parts per Million	Grains per Gallon	pH Value
Chlorides, maximum	40	2.34	
Sulfates, maximum	100	5.8	
Silica, maximum	20	1.17	
Iron, maximum	0.10	0.0058	
Manganese, maximum	0.05	0.0029	
Total dissolved solids, maximum	340	20	
Total hardness, maximum	170	10	
Water base/acid level			5.5 to 9

If you are not sure of the quality of the water in your area, contact your Volvo Truck dealer, your local water department, agricultural agent or an independent laboratory to analyze the water.

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Additives

Additives are part of most antifreeze and should be tested for and added to all coolant mixtures using normal antifreeze. If extended life coolant is used, the additives are in the product when mixed. Both types need to have additives added to after a time.

Additives help prevent rust, scale and mineral deposits from forming. Additives also protect metals from corrosion, prevent water pump and cylinder liner cavitation and contain anti-foaming agents. Additives are depleted during normal engine operation and need to be replaced. For normal coolant mixture, this means the addition of Supplemental Coolant Additives (SCA) at any time the additive goes below the recommended level. For extended life coolant mixture, this means an extender package added halfway through the coolant lifetime.

Nitrites or nitrite and molybdate additives protect the cylinder liner from cavitation erosion. Nitrites deplete over time, creating the need for SCAs or extender. Other coolant additives also deplete and need replacement.

A too low concentration of additives in the coolant will not provide the protection required by the cooling system. A too high concentration of additives in the coolant can cause additives to solidify and drop out of the solution, depositing inside the cooling system or form a gel in the radiator. Deposits can be in the form of sludge and scale. Deposits accumulate on hot engine surfaces, reducing the effectiveness of the cooling system or causing water pump leaks.

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Antifreeze

General

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.

CAUTION

Never add coolant to a hot or overheated engine this can result in engine damage. Allow the engine to cool first.

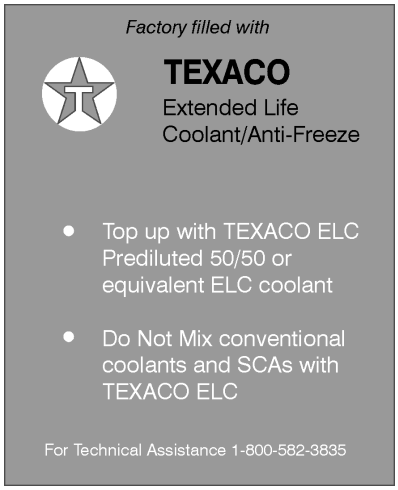
CAUTION

If the recycled antifreeze or coolant has been passed through a fractional distillation or similar process that has removed all hazardous and contaminating materials, including dissolved solids and acids, will produce a sufficient base antifreeze. Correctly inhibited to meet the standard, it can be regarded as a new coolant which is fully accepted.

Antifreeze additives not only protect the cooling system from freezing but also against corrosion and cylinder liner pitting. Antifreeze typically comes in one of two glycol types, ethylene or propylene. Propylene antifreeze is NOT recommended for use in a Volvo engine. There is also regular and extended life antifreeze. If the vehicle is delivered with extended life coolant, there is a label attached to the surge tank.

Note: DO NOT mix regular and extended life antifreeze. DO NOT use extended life antifreeze unless it is of a type approved by the engine manufacturer.

Regardless of the type and make, acceptable antifreeze or premixed coolant must meet or exceed the standards ASTM D 5345 and ASTM D 4985, and be formulated for heavy duty diesel engines.



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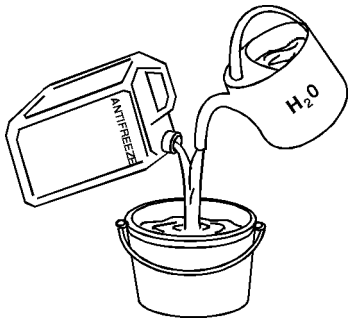
Antifreeze or premixed coolant meeting the standards ASTM D 3306 or ASTM D 4656 are primarily for automotive gasoline engines, containing high levels of silicate, and are unacceptable for heavy duty diesel engines.

Water and antifreeze should generally be filled as a 50/50 mixture. The mixture should never be less than 40% antifreeze and 60% clean water or more than 60% antifreeze and 40% clean water. Mix the antifreeze/water to the required concentration before adding to the cooling system. The following table gives approximate freezing protection for certain mixtures.

Freeze Protection Down To:	Percentage of Antifreeze in Mixture
-13 °F (-25 °C)	40%
-22 °F (-30 °C)	46%
-36 °F (-38 °C)	54%
-51 °F (-46 °C)	60%

Note: 60% antifreeze in the mixture gives maximal freeze protection. To increase the antifreeze content beyond that will only decrease the freeze protection.



W2003082

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Regular Coolant Change Interval

Replace the coolant every 250,000 miles (400,000 km), 4,000 hours or every two years, whichever comes first.

Coolant SCA level must be tested at least twice per year or whenever coolant loss occurs. For maximum coolant system efficiency, test the system every 25,000 to 30,000 miles (40,000 to 56,000 km) depending on engine oil change interval or every 1,000 hours or maximum every 6 months (whichever comes first).

The SCA level must be between 1.5 (Cummins: 1.2) and 3.0 SCA units per gallon (0.4 [Cummins: 0.3] and 0.8 SCA units per liter) of coolant.

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

Coolant Filter Change Intervals

The charged coolant filter contains 8 units of SCA that are released slowly over time to maintain the recommended level during operation.

Change the coolant filter at every 50,000 miles (80,500 km). If the SCA level tests above 3.0, DO NOT replace the coolant filter. When testing indicates that the SCA level has dropped below 1.5 units per US gallon (0.4 units per liter) start changing the filter with the oil changes again.

Note: Test the SCA level every 6 months (whichever comes first).

WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or fluids can cause serious burns.

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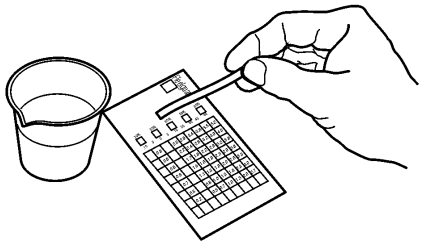
Standard Antifreeze Testing

General

Coolant SCA level must be tested at least twice per year and whenever coolant loss occurs. For maximum coolant system efficiency, test the system every 25,000 to 30,000 miles (40,000 to 56,000 km), depending on the oil change interval, or every 1,000 hours or every 6 months (whichever comes first).



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Use liquid SCA and pre-charged coolant filters to maintain a 1.5 to 3.0 SCA units per gallon (0.4 to 0.8 units per liter) concentration in the coolant.

Depending on the make of antifreeze or premixed coolant, SCAs are added or have to be added to the system after replacement. The SCA level will deplete over time so it is important that the SCA level is tested regularly and maintained. The Volvo pre-charged filter is designed to slowly release the SCA to help maintain the recommended level during operation.

Note: Only change the filter after testing shows depleted SCA in the cooling system. DO NOT exceed the 3.0 units per gallon (0.8 units per liter) concentration. Excessive SCA concentration can form deposits on the higher temperature surfaces of the cooling system, reducing the engine's heat transfer characteristics. Reduced heat transfer could cause cracking of the cylinder head and other high temperature components. Excessive SCA concentration can also result in radiator tube blockage, overheating and/or accelerated water pump seal wear.

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Testing Procedure

Run the engine to operating temperature. After the engine has reached operating temperature, move the heater controls (on dash and in sleeper) to full heat and run the engine for 10 more minutes.

WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or can cause serious burns.

Shut off the engine and allow it to cool. Test the coolant with the test kit. Depending on the concentration of SCA in the coolant:

- If the SCA concentration is below 1.5 units per gallon (0.4 units per liter), replace the coolant filter and calculate the required units of SCA to reach the desired SCA level. See example.
- Between 1.5 and 3.0 units per gallon (0.4 and 0.8 units per liter), replace the coolant filter, P/N 3945411.
- Above 3.0 units per gallon (0.8 units per liter). DO NOT replace the coolant filter until further testing at the next oil change indicates that the level has dropped below 2.3 units per gallon (0.6 units per liter).

CAUTION

SCA levels deplete during normal operation and when coolant is added because of low coolant level. SCA levels should be maintained at the middle of the recommended interval.
Unit per gallon:
1.5 LOW - 2.3 MID - 3.0 HIGH
Units per liter:
0.4 LOW - 0.6 MID - 0.8 HIGH

EXAMPLE

Step 1	Desired SCA level	2.3 units per gallon	*Recommended level 1.5-3.0 units per gallon*
	Subtract:	-	
	Coolant test results	1.5 units per gallon	
		=	
	Required SCA per gallon increase	0.8 units per gallon	
Step 2			
	Cooling system capacity	13 US gallons	*Use actual system capacity*
	Multiply by:	x	
	Required SCA per gallon increase	0.8 units per gallon	
		=	
	Total SCA units required	10.4 units (11 units)	*Round up to nearest whole number*
FINDINGS	Use one (8 unit) filter, P/N 3945411 and 3 units liquid SCA		

See “Cooling System Capacity*” page 142 for system quantities.

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Changing from Regular to Extended Life Coolant

Drain the system of old coolant and dispose of properly. The cooling system should be flushed with clean water. If significant deposits are visible, use a reputable commercial cooling system flush designed for heavy duty diesel engines. For specific information on draining and flushing, see “Flushing Cooling System, D12D” page 96.

Note: Extended Life Coolant is not recommended by all engine manufacturers. Contact other manufacturers for their current recommendations.

WARNING

DO NOT remove the cap to the coolant surge tank while the engine and radiator are still hot. Scalding fluid and/or steam may be blown out under pressure if the cap is taken off too soon.

1 Drain the coolant into a suitable container. Make sure the heater temperature controls and valves are open.

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

2 Flush the system with clean water to remove any settled debris.

Note: Keep the water pressure low so as not to damage the tubes of the radiator.

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3 Use a reputable cleaner to clean the cooling system. Follow the recommendations that come with the cleaner.

4 Drain the cleaner and flush the cooling system with clean water.

5 Fill the cooling system with clean water and operate the engine until the coolant temperature has reached 120 to 150 °F (50 to 65 °C).

6 Drain the water and flush the cooling system with clean water.

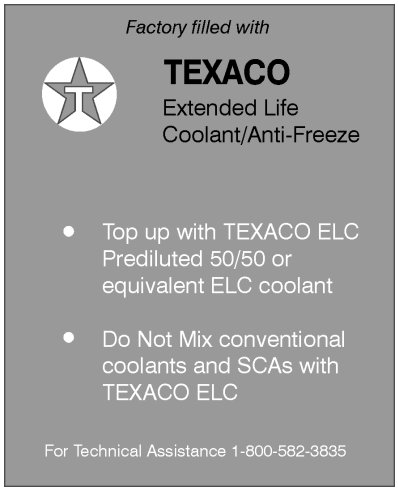
7 Again, fill the cooling system with clean water and operate the engine until the coolant temperature has reached 120 to 150 °F (50 to 65 °C).

8 Drain the water and flush the cooling system with clean water.

9 Fill the cooling system with pre-mixed Extended Life Coolant. Check the specifications section for refill quantity.

10 **Attach label** to the coolant surge tank to indicate that the system is now filled with **Extended Life Coolant**. The label can be ordered from your Volvo Truck dealer spare parts department.

Note: When changing over from standard to extended life antifreeze, tighten all hose clamps and fasteners in the cooling system. Extended life coolant tends to leach out deposited silicate and leaks may appear.



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Extended Life Coolant Change Interval

Replace coolant every 600,000 miles (960,000 km), 12,000 hours or every four years, whichever comes first.

A one-time extender package must be added to the cooling system after 300,000 miles (480,000 km), 6,000 hours or two years, whichever comes first.

Note: DO NOT add supplement coolant additives (SCA) to extended life coolant.

Should the system become contaminated with regular coolant exceeding 10% of the system's total capacity or if SCA is added to the system, either drain the system and refill with new extended life coolant or maintain the system as for regular coolant. Continue treating with SCA and change the coolant at the intervals recommended for regular coolant.

CAUTION

Extended life coolant will test as out of additives (SCA), but SCA should not be added. Shortened engine life may be the result of adding SCA.

Coolant Filter

DO NOT use a filter that contains SCA. Instead use a bypass canister or "empty" filter. Replace the "empty" filter every 125,000 miles (200,000 km) or 2,500 hrs or 12 months, whichever comes first, to prevent external rust damage to the filter walls.

WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or fluids can cause serious burns.

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Fuel Safety Reminders

DANGER

A diesel engine will operate on any fuel which enters the cylinder, whether it is from the injectors or from the air intake system. Therefore, if any solvent is used to flush out the air cleaner element, the engine may over speed during start-up. Engine damage, severe injury and/or death from burns or explosion may occur.

DANGER

DO NOT mix gasoline or alcohol with diesel oil fuel. This mixture can cause an explosion and result in severe personal injury or death.

DANGER

DO NOT remove the fuel tank cap near an open flame. Diesel fumes are combustible and can cause an explosion of fire resulting in severe personal injury or death.

WARNING

If a fuel leak is detected, stop the engine immediately. The vapors from hot fuel are highly flammable which may result in a fire.

WARNING

DO NOT store fuel containers in the vehicle. They may leak, explode and cause or feed a fire. Empty or full, they present a hazard that may lead to burns in the event of a fire.

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Diesel Fuel Specification

Quality

Fuel quality is an important factor in obtaining satisfactory engine performance, long engine life and acceptable exhaust emission levels. Volvo engines are designed to operate on most diesel fuels commercially available today. Volvo Trucks North America, Inc. recommends the use of diesel oil fuel which meets the specification ASTM D975 (grades No. 2–D and No. 1–D).

Note: The use of lighter fuels (grade No. 1–D) can reduce fuel economy.

The fuels used must be clean, completely distilled, stable and non-corrosive. Always try to keep the fuel tank full. DO NOT put alcohol into the fuel tank. Fill the tank after completing driving for the day.

Note: When draining the fuel tank, collect the waste in a fuel proof container. Take the drained fuel and water to a recycle or waste management center.

Open the drain at the bottom of the fuel tank approximately every 30,000 miles (50,000 km) or 300 hours, to drain off any water and/or sediment.

Yearly or at 120,000 miles (200,000 km), tighten all fuel tank mountings and brackets. Check all hoses, pipes and lines to and from the fuel tank. At the same time, inspect tank and connections for any signs of leakage. Make sure that hoses and lines are not resting on or touching shafts, couplings, hot surfaces or sharp areas. Since all machinery vibrates and moves to a certain extent, clamps and ties can fatigue with age. Inspect fasteners frequently and tighten or replace them as necessary.

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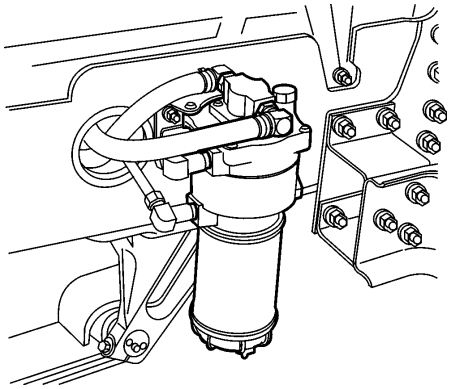
Fuel Filters

Note: When draining the fuel filters, collect the waste in a fuel-proof container. Always dispose of coolant according to Federal or local regulations. Take the drained fuel and water to a recycle or waste management center.

For the Volvo engine, change the fuel filters at every other oil change when running the 15,000 mile (24,000 km) oil drain interval. Change the fuel filters every oil change when running the 25,000 mile (40,000 km) oil drain interval. Drain the primary filter water trap daily.

For other engines, the engine manufacturers recommend changing the fuel filter at every oil change. For bleeding the fuel system, see “Bleeding the Fuel System” page 105. For Cummins engines see manufacturer’s information manual included in your introductory package.



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Fuel Sulfur Content

Fuel sold after 1994 for highway use can only contain a maximum sulfur content of 0.05% by weight. This was done to reduce particle emissions in the exhaust.

The sulfur content for off-highway use continues to be specified at a maximum of 0.5% by weight. The use of a fuel containing 0.5% or higher level of sulfur, necessitates more frequent engine oil changes because of sulfur deposits and higher corrosion risk. If using fuels with high sulfur content, the oil change intervals must be cut in half. See “Sulfur Level and TBN” page 66 for more information.

Note: The use of low sulfur diesel oil fuel does not permit extension of engine oil change intervals or oil filter changes.

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Cetane Number

Direct injected diesel engines require a minimum cetane number of 40 under normal starting conditions. Fuel with a higher cetane value may be required for high altitude or cold weather operation.

Filtration

Fuel should be clean and free of contamination. Clean fuels should have no more than 0.1% of sediment and water.

If fuel is stored on site, make sure that:

- Keep storage tank covered to prevent water entry.
- DO NOT use a tank made of galvanized metal or any galvanized piping for diesel oil storage. Diesel will react with the zinc, forming solids that can clog fuel filters and cause engine damage.
- Fuel stored for a long time may oxidize and form solids, causing filtering problems.
- Keep the area around the fill cap clean. Tilt the tank slightly toward the drainplug area so water and sediment can be easily drained.

Generally, fuel contamination occurs as the result of improper fuel handling. The most common types of contamination are water, dirt and microbial growth (“black slime”). The formation of varnishes and gums resulting from poor fuel stability or long storage (“stale fuel”) also affects fuel quality. The best treatment for contamination is prevention by maintaining a clean storage system and choosing a reputable fuel supplier.

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Fuel Pour Point

Fuel pour point should be at least 10 °F (6 °C) lower than the lowest ambient temperature at which the engine must start and operate. Lower pour points of diesel fuel grade No. 1–D may be necessary in extremely cold weather.

Fuel Cloud Point

The cloud point should be below the lowest ambient temperature at which the engine must start and operate, to prevent the fuel filter elements from plugging with wax crystals.

Fuel Viscosity

Fuel viscosity must be kept above 1.4 cSt at 100 °F (38 °C) to provide adequate fuel system lubrication. The viscosity also has an effect on the atomization of the fuel when it is injected into the cylinders.

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Fuel Additives

General

Fuel additives are generally not recommended or needed for fuels listed earlier. Cetane improvers can be used as necessary. Biocides may be needed to eliminate microorganism growth in storage tanks. In cold conditions, treatment for water in the vehicle tanks may also be necessary.

Consult your fuel supplier about the use of additives to prevent incompatibility among additives already in the fuel and the additives to be used.

Supplemental Fuel Enhancers

CAUTION

Supplemental additives are not recommended because of a high risk of injection system problems or engine damage.

There are many aftermarket products available today which are intended to be added by the customer. They generally increase operating cost without providing benefits. Included are a variety of independently marketed products which claim to be:

- Cetane improvers
- Emission control additives
- Detergents
- Combustion improvers
- Smoke suppressants
- Cold weather flow improvers

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Note: Repair expenses resulting from malfunctions in the fuel system or with engine components when fuel enhancers have been used are not covered under warranty.

Some fuel additives can be used to provide temporary relief but they do not replace good fuel handling practices. These products can be used:

- **Isopropyl Alcohol** — Use 1 pint per 125 gallons (1/2 liter per 500 liters) of fuel for winter freeze-up protection.
- **Biocide** — For treatment of microbe growth or “black slime.” Follow manufacturer’s instruction for treatment.

Prohibited Additives

The following additives are specifically NOT allowed and must NOT be mixed in with the vehicle diesel fuel:

Used Lubricating Oil:
Volvo Trucks North America, Inc. does not recommend the use of any type of used lubricating oil as an extender in the diesel fuel. **Used lubrication oil contains solids and acids from the combustion process that can severely corrode parts of the injection system, resulting in reduced power and higher maintenance cost over time**

Adding gasoline to diesel fuel will reduce the cetane number and increase combustion temperature. If a tank contains a diesel fuel/gasoline mixture, it should be drained and cleaned as soon as possible.

Gasoline:

WARNING

The addition of gasoline to diesel fuel will create a serious fire hazard.

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Alternative Fuels

Alternative fuels can be of several different types. There are vegetable based fuels, aviation fuel and recycled petroleum based fuels that are used in combustion engines. These are in general not compatible with modern heavy duty over-the-road diesel engines.

The use of unauthorized fuels may compromise the levels of pollutants in the exhaust to the point where the engine does not meet the emission requirements. This would make the vehicle illegal to drive on public roads.

DO NOT use any kind of alternative fuel unless specifically authorized by Volvo Trucks North America, Inc.

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Engine Oil

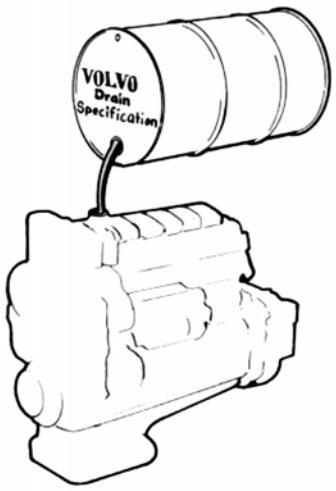
General

Keep the engine oil at the proper level and change it at the recommended intervals. Always replace the oil filters at the same time as when the oil is changed.

Always follow the oil change intervals and use the oil types that are recommended by the engine manufacturers. Oil change intervals for Volvo engines are found on page 62 and page 63. Viscosity and capacity tables can be found beginning on page 142. Other engine manufacturers have different policies regarding their products and should be consulted if a different change interval is desired. Contact your Volvo Truck dealer for more information.

For information on synthetic oil, see page 64.

Note: Always dispose of oil according to Federal or local regulations. Used oil disposed of in nature or waterways contaminates our drinking water and kills wildlife. Take all used oil to a recycling or waste collection center.



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Oil Quality

Volvo Trucks North America, Inc. recognizes and recommends engine oils that meet or exceed the standards given by American Petroleum Institute (API) for the oil classifications listed in this manual. Only oils licensed to carry the API symbol should be used. Lubricants meeting API standards have provided maximum engine life when used together with the recommended oil and oil filter change intervals.

Engines meeting the emission requirements valid from October 2002 operate under higher soot loading conditions than previous engines. This has led Volvo to require a higher grade oil that meets both VDS-2 and EO-N Premium Plus (for extended oil drain interval) or VDS-2 and CI-4 (for normal oil drain intervals) quality standards intervals.

Normal grade engine oils for all engines in vehicles produced by Volvo Trucks North America, Inc. must meet or exceed the API classifications CI-4 VDS-2 is Volvo oil standard.

See page 62 and page 63 for interval recommendations for Volvo engines. See each other engine manufacturer's Operator's Manual for information on when and how to change the oil.

Oils that meet both CI-4 and VDS-2 are required for model year 2002 Volvo engines. Most major oil companies have oils that meet these specifications. A list of approved oils can be found in Service Information group 17 "*Oil and Filter Change Intervals*."

Typical API Symbol

CAUTION

Extra oil additives must not under any circumstances be added to any engine oil used. Additives such as break-in oils, top oils, graphitizers and friction reducing liquids are not necessary and may even harm the engine.

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Oil Change Intervals

The length of time an engine is operated before an oil change depends on which quality oil is used, the type of fuel used, engine oil consumption, vehicle application, level of dust in the air, etc. The change intervals given in this manual are maximum intervals. If the vehicle is operating in heavy-duty operation, dusty or off-road conditions, using high sulfur fuels, etc., adjust the intervals down for more frequent oil changes.

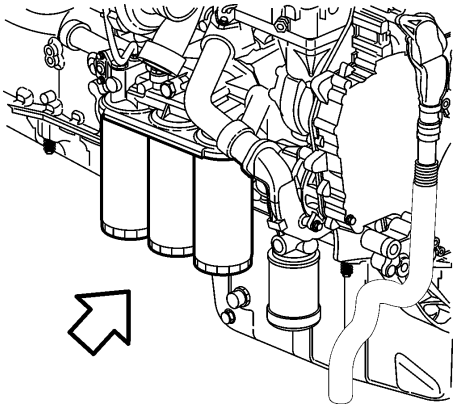
Note: Oil filters should always be changed when changing oil.

Oil Filters

Always change oil filters when changing the oil. There are three filters on the engine, one of which is a bypass filter. This should be changed at the same time as the regular full-flow filter(s).

CAUTION

Volvo branded oil filters are designed to provide the proper level of filtration and protection for Volvo engines. Filters that do not meet the same stringent requirements may cause unsatisfactory results.



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Oil Change Intervals, Volvo D12D Engine

For the D12D engine, there are three columns of different oil change intervals depending on what application the vehicle is used in. Always use the correct oil quality for your application and distance driven.

For example, in long haul transport, oil changes can be done every 25,000 miles (40,000 km) if the oil quality meets or exceeds both VDS-2 and EO-N Premium Plus. For oils meeting VDS-2 and CI-4 oil change intervals is met at 19,000 miles (30,000 km).

Volvo Trucks North America, Inc. does not issue a list of approved oils and oil companies for standard oil that is defined by the API classifications. For oils that meet both VDS-2 and EO-N Premium Plus & VDS-2 and CI-4, which are required for model year 2002–2003 Volvo engines, there is a list that is periodically updated. For the complete list, see your Volvo Truck dealer. The list is contained in the Technical Service Information binders; refer to Bulletin 175-60, "*Oil and Filter Change Intervals*."

Depending on the seasonal temperature changes, select the correct viscosity of the oil. See page 65 for more information over oil viscosity.

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Synthetic Lubrication

Synthetic oils are offered as an alternative to the traditional, petroleum based oils for engines. These oils may be used in Volvo engines, provided they meet the quality levels specified on the previous pages, that is: VDS-2, API CI-4, EO-N Premium Plus.

Product information about synthetic oil should be reviewed carefully. Their use does not permit an automatic extension on recommended oil change intervals.

The ability to protect the engine is better in some ways compared with petroleum based oils but its lifetime in the engine is the same. This is because of the combustion by-products that contaminate the oil. These contaminates will make the change intervals the same as for petroleum based oils. **The use of synthetic oils does not permit the extension of the recommended oil change intervals**.

Synthetic oils offer improved low temperature flow properties and high temperature oxidation resistance. They are generally more costly than petroleum based oils. However, in extreme driving conditions, that is, in extreme cold or in desert operation, a synthetic oil may be the only choice for the application (see next page regarding oil viscosity).

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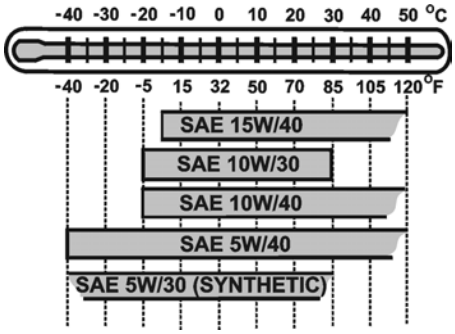
Oil Viscosity

The viscosity grade defines the thickness of the oil. The oil must be thin enough at low temperatures for easy cold starts and thick enough to protect at high temperatures. An oil is not fully defined until both the API quality classification and the viscosity grade are specified.

Choose the viscosity grade for the typical ambient temperature for the application. Multigrade oils have a broad range that suit operation in changing temperature. Only choose a monograde oil if the temperature is holding steady over a long period of time

Volvo Trucks North America, Inc. recommends the viscosities shown in the viscosity/temperature table for Volvo engines. For Cummins engines see your introductory package. Choosing an oil with a lower viscosity can help improve the fuel economy. However, if this is done, make sure the upper temperature limit is not exceeded. Also, with low viscosity oil, oil consumption can increase.



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CAUTION

Extra oil additives must not under any circumstances be added to any engine oil used. Additives such as break-in oils, top oils, graphitizers and friction reducing liquids are not necessary and may even harm the engine.

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Sulfur Level and TBN

Oils are available with different levels of Total Base Number (TBN) to counteract high sulfur levels in fuel. TBN measures an oil's alkalinity and ability to neutralize acid. Normally, the higher the fuel sulfur, the higher the TBN is needed.

Sulfur creates highly acidic pollutants in the oil that break down the additives at a higher rate. The sulfur content in low-sulfur fuel has been regulated to a maximum of 0.05% by weight for No. 2–D diesel fuel. For fuels that have a sulfur content of 0.5% by weight and above, Volvo Trucks North America, Inc. recommends that oil change intervals are cut in half so a shorter mileage is run between oil changes.

Oil Additives

CAUTION

Extra oil additives must not under any circumstances be added to any oil used. A shortened engine life may be the result.

Using oils to the quality standards recommended in this manual makes the use of extra oil additives unnecessary, as these oils already contain a balanced treatment of additives. The use of extra oil additives such as break-in oils, top oils, graphitizers and friction reducing compounds are not necessary and can even be harmful to the engine.

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Oil Consumption

Once the engine is stopped, check the oil level daily. If the engine has just been stopped and it is warm, wait approximately five minutes to allow the oil to drain back to the oil pan before checking. Add oil as necessary.

Note: DO NOT overfill. Oil may be blown out through the engine breather tube if the level is too high.

All diesel engines are designed to use some oil, so it is normal to add oil periodically. An engine used in heavy duty operation will use more oil than one in normal operation.

Owners often ask what is considered "normal" oil consumption. This is dependent on the operation of the engine. Just as one engine in a heavy operation may get only 5 mpg fuel consumption and another gets over 8 mpg, the oil consumption will vary in different applications.

To determine "normal" oil consumption, it is therefore important to establish what is normal for your engine in your application. Establish a record of oil usage and compare with other vehicles in your fleet. There are two methods that are frequently used:

- Miles per quart of oil. Simple way to establish a history of the consumption. Useful as a comparison to others only when vehicle and engine is compared to an identical vehicle and engine under identical operating conditions.
- Amount of fuel used per amount of fuel used (oil consumption relative to fuel consumption). Better way to relate the oil usage to the actual work of the engine. Also only useful in comparison when compared under identical conditions.

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Note: Use the information in the table below to determine the operating condition and usage applicable to your vehicle.

For Cummins information: refer to Cummins literature in the introductory package inside your vehicle.

SEVERE DUTY	HEAVY DUTY	NORMAL DUTY
• **Average fuel consumption is over 4.7 liters per 10 km (under 5.0 miles per gallon)** • **Gross combined weight (GCW) is greater than 45,000 kg (100,000lb.)** • **Idle time is 40% or higher** • **Vehicle operates in inner city delivery**	• **Average fuel consumption is over 4.7 liters per 10 km (under 5.0 miles per gallon)** • **Gross combined weight (GCW) is greater than 45,000 kg (100,000lb.)** • **Vehicle operates in regional distribution**	• **Average fuel consumption is under 3.6 liters per 10km (over 6.5 miles per gallon)** • **Gross combined weight (GCW) is less than 36,000 kg (80,000 lb.)** • **On highway operation only**

HIGHER OIL QUALITIES			
OIL QUALITY	VDS-2 plus EO-N	VDS-2 plus EO-N	VDS-2 plus EO-N
MILEAGE*	12,000 miles (19,000 km)	15,000 miles (24,000 km)	25,000 miles (40,000 km)
MONTHS*	4	4	4
HOURS*	300	400	600
FUEL USAGE*	2,500 gallons (9,500 liters)	3,000 gallons (11,500 liters)	4,000 gallons (15,000 liters)
NORMAL OIL QUALITIES			
OIL QUALITY	VDS-2 plus CI-4	VDS-2 plus CI-4	VDS-2 plus CI-4
MILEAGE*	9,000 miles (14,000 km)	11,000 miles (18,000 km)	19,000 miles (30,000 km)
MONTHS*	4	4	4
HOURS*	250	300	450
FUEL USAGE*	1,9000 gallons (7,100 liters)	2,200 gallons (8,500 liters)	3,000 gallons (11,500 liters)
***Whichever comes first**			

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Note: Once you determine the applicable operating condition for your vehicle, use the information in the table below to perform preventive maintenance.

TYPE OF OPERATION	CHECK / CHANGE BASIC (4 MONTHS)	CHECK / CHANGE ANNUAL (12 MONTHS)	ADDITIONAL SERVICE
Chassis Lubrication	X	X	
Cab Lubrication	X	X	
Check Oil Level in Manual Transmission (If Applicable)	X	X	
Check Oil Level in Power-Take-off (PTO)	X	X	
Check Oil in Retarder	X	X	
Check Oil in Transfer Case	X	X	
Check Oil Level in Front Drive Axle	X	X	
Check Oil Level in Power Steering	X	X	
Check Oil Level in hubs for Oil Lubricated Wheel Bearings	X	X	
Check Air Cleaner	X	X	
Check Fluid Level in Clutch Fluid Reservoir	X	X	
Check Coolant Level	X	X	
Check Fluid Levels in Windshield Wiper Reservoirs	X	X	

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TYPE OF OPERATION	CHECK / CHANGE BASIC (4 MONTHS)	CHECK / CHANGE ANNUAL (12 MONTHS)	ADDITIONAL SERVICE
Check Air Dryer	X	X	
Valve Adjustment		X	**REQUIRED: Once a year, every 130,000 miles, (209,000 km) or every 2,500 hours, (whichever comes first)**
Check Warning and Control Lamps	X	X	
Check Fault Codes **displayed** in the vehicle Instrument Cluster	X	X	
Check Air Compressor's Function and Condition	X	X	
Check Hinges, Doorstops, Locks and Sealing Strips	X	X	
Check External Lamps	X	X	
Check Rear view Mirrors and Reflectors	X	X	
Function Check of Wipers and Washers	X	X	
Check Headlamps	X	X	
Check Hood Attachment and Locking Devices	X	X	

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TYPE OF OPERATION	CHECK / CHANGE BASIC (4 MONTHS)	CHECK / CHANGE ANNUAL (12 MONTHS)	ADDITIONAL SERVICE
Check Batteries-Dirt, Leakage, Attachment, Specific Gravity of Battery Acid, Fluid Level Connections and Battery Box	X	X	
Check Fuel Tank, Hoses, Pipes Venting and Mounting	X	X	
Check Fuel Water Separator for the Fuel system, Draining of Condensation.	X	X	
Check Tire Wear	X	X	
Check Drive Belts	X	X	
Check Radiator Fan, Bearing Tolerance, Bolt Unions, Fan Cover and Fan Ring with Rubber Seal	X	X	
Check Exhaust Leakage	X	X	
Check Turbocharger	X	X	
Check Steering Linkage	X	X	
Check Front Shock Absorbers	X	X	
Check Front Wheels and Bearings	X	X	
Check Rear Spring Bolts	X	X	

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TYPE OF OPERATION	CHECK / CHANGE BASIC (4 MONTHS)	CHECK / CHANGE ANNUAL (12 MONTHS)	ADDITIONAL SERVICE
Check Mounting for Front and Rear Axle	X	X	
Check Chassis Frame and Crossmembers	X	X	
Check Compressed Air Lines and Hoses	X	X	
Check Rear Wheels and Bearings	X	X	
Check Brake Linings	X	X	
Check Brake Cylinders, Levers and Forks	X	X	

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Exhaust and Noise Emissions

General

USA

The Federal Clean Air Act, Section 203 (a) (3), states the following concerning the removal of air pollution control devices or modification of a certified engine to a non-certified configuration:

"The following acts and the causing thereof are prohibited:

(3) For any person to remove or render inoperative any device or element of design installed on or in a motor vehicle or motor vehicle engine in compliance with regulations under this part prior to its sale and delivery to the ultimate purchaser, or for any manufacturer or dealer knowingly to remove or render inoperative any such design after sale and delivery to the ultimate purchaser."

Specifically, please note that no person may make such changes prior to the sale and delivery of the vehicle to the ultimate purchaser, and, in addition, no manufacturer or dealer may take such action after sale and delivery of the vehicle to the ultimate purchaser. The law provides a penalty of up to $10,000 for each violation.

Canada

The same conditions that apply in the USA apply to Canada, with one exception. After the vehicle is sold to a retail customer, that is, the end user, the jurisdiction controlling the emission control devices becomes the province in which the vehicle is licensed. No changes should be made that render any or all of the devices inoperative.

Should the owner/operator wish to make any changes to the emission control devices, check with the provincial authority before making any such changes.

Mexico

The same conditions that apply in the USA apply to Mexico. Refer to the Mexican Federal Law for Emission Control which adheres to EPA regulations. No changes should be made that render any or all of the emissions control devices inoperative.

Should the owner/operator wish to make any changes to the emission control devices, check with the state authority before making any such changes.

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California and EPA Emission Control Warranty Statement

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The California Air Resources Board and Volvo Trucks North America , Inc. (VTNA) are pleased to explain the emission control system warranty on your new vehicle. In California, new motor vehicles must be designed, built and equipped to meet the State's stringent anti-smog standards. Volvo Trucks North America, Inc. must warrant the emission control system on your vehicle for the periods of time listed below provided there has been no abuse, neglect or improper maintenance of your vehicle.
Your emission control system may include parts such as fuel injection system, EGR and engine computer. Also included may be hoses, connectors and other emission-related assemblies.
Where a warrantable condition exists, Volvo Trucks North America, Inc. will repair your vehicle at no cost to you including diagnosis, parts and labor.

EPA EMISSIONS PERFORMANCE WARRANTY

YOUR WARRANTY RIGHTS AND OBLIGATIONS

The U.S. Environmental Protection Agency (EPA) and Volvo Trucks North America, Inc. (VTNA) are pleased to explain the emissions performance warranty on your vehicle. In compliance with section 207(b) of the Clean Air Act, VTNA must warrant the emission control system on your vehicle for the periods of time listed below, provided there has been no abuse, neglect or improper maintenance of your vehicle.
This manual contains maintenance information, including time and/or mileage intervals at which such maintenance should be performed.

For instructions on proper maintenance, including time and/or mileage intervals at which such maintenance should be performed, see your Volvo Maintenance and Engine Operator's Manual VN, VHD.

Your emission control system may include parts such as carburetor or fuel injection system and engine computer. Also included may be hoses, connectors or other emission-related assemblies.
Refer to the Warranty Certificate for complete coverage details.
Federal warranty provisions apply to all vehicles sold in all U.S. states and territories regardless of whether a state has enacted state warranty provisions that differ from the federal provisions.
Where a warrantable condition exists, VTNA will repair your vehicle at no cost to you (including diagnosis, parts and labor) any emission control device or system which causes a vehicle to fail an EPA-approved emission short test during its useful life, if you have maintained and operated the vehicle in accordance with the written instructions of VTNA.

If a facility at which the vehicle is initially presented for repair is unable for any reason to honor the claim, then, unless you waive in writing, the repair facility must forward the claim to VTNA warranty Administration, (336) 393-2000.

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MANUFACTURER'S WARRANTY COVERAGE

This warranty is applicable for a period of five years, 250,000 miles or 6,250 hours of operation, whichever first occurs. If an emission-related part of your vehicle is defective, the part will be repaired or replaced by Volvo Trucks North America, Inc.
This is your emission control system DEFECTS WARRANTY.

OWNER'S WARRANTY RESPONSIBILITIES

As the vehicle owner, you are responsible for the performance of the required maintenance listed in your owner's manual. Volvo Truck North America, Inc (VTNA) recommends that you retain all receipts covering maintenance on your truck, but VTNA cannot deny warranty solely for the lack of receipts or for your failure to ensure the performance of all scheduled maintenance.
You are responsible for presenting your vehicle to a VTNA dealer as soon as a problem exists. The warranty repairs should be completed in a reasonable amount of time, not to exceed 30 days. Claim procedures are outlined in the "Volvo Service Operations Manual."
As the vehicle owner, you should also be aware that VTNA may deny you warranty coverage if your vehicle or a part has failed due to abuse, neglect, improper maintenance or unapproved modifications.
If you have any questions regarding your warranty rights and responsibilities, you should contact VTNA Warranty Administration, (336) 393-2000. For California vehicles, contact the California Air Resources Board at 9480 Telstar Avenue, El Monte, CA 91731.

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EMISSION CONTROL SYSTEM WARRANTY

Volvo Trucks North America, Inc. WARRANTS TO THE ORIGINAL OWNER, AND EACH SUBSEQUENT OWNER, OF A NEW TRUCK POWERED BY A VOLVO DIESEL ENGINE THAT THE EMISSION CONTROL SYSTEM OF YOUR TRUCK:

1 Is designed, built and equipped so as to conform at the time of sale to all regulations of the U.S. Environmental Protection Agency and the California Air Resources Board applicable at the time of the manufacture;

2 Is free from defects in material and workmanship which will cause the emission control components not to function as designed for a period of use of 5 years or 250,000 miles or 6,250 hours of engine operation, whichever comes first.

The 5 years/250,000 miles/6,250 hour warranty period shall begin on the date the vehicle is first delivered to the first retail purchaser or if the vehicle is placed in service as a demonstrator company vehicle prior to the sale at retail, on the date the vehicle is the first placed in service.

The emission control systems of your new VOLVO engine were designed, built and tested using genuine VOLVO parts, and the engine is certified as being in conformity with Federal and California emission control regulations. Accordingly, it is recommended that any replacement parts used for maintenance, repair or replacement of emission control systems by VOLVO parts.

The owner may elect to have maintenance, replacement or repair of the emission control components and systems performed by any vehicle repair establishment or individual and may elect to use parts other than VOLVO parts for such maintenance replacement or repair without invalidating this warranty; the cost of such services or parts, however, will not be covered under the warranty except in an emergency situation. A part not being available or a repair not being completed within 30 days also constitutes an emergency.

Use of replacement parts which are not of equivalent quality may impair the effectiveness of emission control systems. If other than Volvo parts are used for maintenance, owner should obtain assurances that such parts are warranted by their manufacturer to be equivalent to genuine VOLVO parts. However, the use of other than Volvo replacement parts does not invalidate the warranty on other components, unless such parts cause damage to warranted parts.

Repairs and service covered by the warranty will be performed by an authorized Volvo Trucks North America, Inc. dealer at their place of business with no charge for parts or labor including diagnosis using VOLVO parts for the emission control system, that requires replacement and is covered by the warranty and found defective.

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In case of an emergency, where an authorized Volvo Trucks North America, Inc. dealer is not available, repairs may be performed at any available service establishment or by the owner, using any equivalent replacement parts and Volvo Trucks North America, Inc. will reimburse the owner for such repairs including diagnosis not to exceed Volvo Trucks North America, Inc's suggested retail price for the warranted parts and the labor rate appropriate for the geographical area and the tasks performed.
Replaced parts and paid invoices must be presented to a Volvo Trucks North America, Inc. dealer for reimbursement.

The emissions control parts covered by this Emission Control System Warranty are listed under "What Is Covered by the Emissions Warranty." You are responsible for the performance of all required maintenance on your new VOLVO engine, including maintenance or repairs needed due to severe operating conditions. Volvo Trucks North America, Inc. will not deny a warranty claim solely because you have no record of maintenance. However, Volvo Trucks North America, Inc. may deny a warranty claim if your failure to perform required maintenance resulted in the failure of a warranted part. Receipts covering the performance of regular maintenance should be retained in the event questions arise concerning maintenance. The receipts should be transferred to each subsequent owner of the vehicle with the emission warranted engine.

If the warranty claim is denied, VTNA shall provide a written basis for denial within 30 days or a shorter time if required by local, state or federal law. Failure to provide written basis for denial within 30 days or shorter time limit required by state, local or federal law or for reasons not attributable to the vehicle owner or events beyond the control of VTNA shall result in VTNA being responsible for repairing the vehicle free of charge to the vehicle owner.

CUSTOMER ASSISTANCE

Volvo Trucks North America, Inc. wishes to help to assure that the Emission Control System Warranty is properly administered. In the event that you do not receive the warranty service to which you believe you are entitled under the Emission Control System Warranty, you should contact Volvo Trucks North America, Inc. Warranty Administration, (336) 393-2000. The address and telephone number of each Regional Office is in your vehicle owner's manual. If you need additional assistance or information concerning the Emission Control System Warranty, contact: Volvo Trucks North America, Inc., Warranty Administration, (336) 393-2000.

You can obtain further warranty information or report violations of the terms of Emissions Performance Warranty by contacting the Manager, Certification and Compliance Division (6405J), Warranty Claims, Environmental Protection Agency, Ariel Rios Building, 1200 Pennsylvania Ave. N.W., Washington, D.C. 20460.

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WHAT IS NOT COVERED BY THE EMISSION WARRANTY

This warranty does not cover:

1 Malfunctions in any part caused by any of the following: misuse, abuse, improper adjustments unless performed by a Volvo Trucks North America, Inc. dealer, modifications, alterations, tampering, disconnection, improper or inadequate maintenance, or use of fuels not recommended for the engine as described in the owner's manual.
2 Damage resulting from accident, acts of nature or other events beyond the control of Volvo Trucks North America, Inc.
3 The replacement of expendable maintenance items such as filters, hoses, belts, oil, thermostat and coolant made in connection with scheduled maintenance services once these parts have been replaced. Any parts replaced under warranty before the first required replacement point are warranted for the remainder of the warranty period.
4 Replacement items which are not genuine Volvo parts or not authorized by Volvo Trucks North America, Inc.
5 Loss of time, inconvenience, loss of use of vehicle engine, or commercial loss.
6 Any vehicle on which the odometer or hourmeter has been disconnected or the mileage (or hours) has been altered so the actual usage cannot be readily be determined.
7 Any vehicle registered and normally operated outside the United States.

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WHAT IS COVERED BY THE EMISSION WARRANTY

The following is a list of the items that are considered a part of the Emission Control Systems and are covered by the Emission Warranty when installed as original equipment by Volvo Trucks North America, Inc. on vehicles which were built to conform to Environmental Protection Agency and California Air Resources Board regulations
IMPORTANT - This may not include expendable maintenance items. Emission related parts requiring scheduled maintenance are warranted until their first scheduled replacement point.

I. Fuel Injection System

A. Unit Injector

II. Air Induction System

A. Intake Manifold

B. Turbocharger System

C. Charge Air Cooler (Intercooler)

III. Exhaust Manifold

IV. Exhaust Gas Recirculation (EGR) System

A. EGR Valve Assemblies (including EGR function control)
B. EGR Pulse Reflector
C. EGR Valve Sensor
D. EGR Cooler with reed valves
E. Exhaust Pressure Governor

V. Engine Emission Control System

A. Ambient Air Temperature Sensor
B. Electronic Control Unit (including Barometric Absolute Pressure Sensor)
C. Engine Coolant Temperature Sensor
D. Boost Pressure/Charge Air Temperature Sensor
E. Camshaft Position Sensor
F. Speed Sensor, Fly Wheel
G. EGR Temperature Sensor

VI. Miscellaneous Items Used in Above Systems

A. Hose, clamps, fittings and tubing

B. Gaskets and seals

C. Wires, harnesses and connectors

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THIS EMISSIONS PERFORMANCE WARRANTY STATEMENT IN NO WAY REPLACES, MODIFIES, ALTERS OR SUPERSEDES THE TRUCK WARRANTY CERTIFICATE, ITS TERMS AND CONDITIONS, AND ITS LIMITATIONS AND EXCLUSIONS.

BE CERTAIN YOU READ AND UNDERSTAND ALL WARRANTIES WHICH ACCOMPANIED YOUR VEHICLE.

Note: Warranty coverage is subject to change without notice. Contact your Volvo Truck dealer for the current warranty statement.

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Noise Emissions

Volvo Trucks North America, Inc. warrants to the first person who purchases this vehicle for purposes other than resale and to each subsequent purchaser, that this vehicle as manufactured by Volvo Trucks North America, Inc. was designed, built and equipped to conform, at the time it left the control of Volvo Trucks North America, Inc., with all applicable U.S. EPA Noise Control Regulations.

This warranty covers this vehicle as designed, built and equipped by Volvo Trucks North America, Inc., and is not limited to any particular part, component or system of the vehicle manufactured by Volvo Trucks North America, Inc. Defects in design, assembly or in any part, component or system of the vehicle as manufactured by Volvo Trucks North America, Inc., which, at the time it left the control of Volvo Trucks North America, Inc. caused noise emissions to exceed Federal standards, are covered by this warranty for the life of the vehicle.

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Noise Control System, Operator Inspection and Maintenance Requirements

A Noise Control System Maintenance Log is located in “Noise Control Log” page 89. This log should be used to document all Noise Control System related maintenance, whether the maintenance results from a specific noise control system inspection, or a deficiency identified during another general maintenance event.

If additional log space is needed, further entries may be added on a separate sheet of paper. Store these additions with the main log to preserve a comprehensive record. It is recommended that copies of all noise emissions related maintenance invoices be retained.

The following Noise Control System inspection and maintenance instructions contain suggested maintenance intervals. These intervals may need adjustment in order to best accommodate the specific vehicle usage. The following instructions only concern Noise Emissions related items and do not address or modify any general vehicle maintenance requirements.

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Tampering with Noise Control System

Federal law prohibits the following acts or the causing thereof:

(1) The removal or rendering inoperative by any person, other than for purposes of maintenance, repair, or replacement, of any device or element of design incorporated into any new vehicle for the purpose of noise control prior to its sale or delivery to the ultimate purchaser or while it is in use;

or

(2) the use of the vehicle after such device or element of design has been removed or rendered inoperative by any person.

Among the acts that constitute tampering are the acts listed:

- Noise Shielding and Insulation Devices
- Cooling System
- Exhaust System
- Air Intake/Air Induction System
- Engine Control, EGR and Fuel Systems

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Noise Shielding and Insulation Devices

Make sure sound shielding and insulating devices are intact. Inspect components for damage. Primary system components requiring noise related inspection include the hood, engine compartment insulating materials (including hood insulation, bulkhead insulation, doghouse insulation, etc.) splash shields, cab skirts, fender shields, and body panels. Inspect all related fasteners, brackets, and clamps for damage and tightness.

Acts that constitute tampering with the Noise Shielding and Insulation Devices:

Removing or rendering inoperative the engine and/or transmission noise deadening panels, shields or insulating materials.

Removing or rendering inoperative the cab-tunnel or hood noise insulating materials.

Removing or rendering inoperative any vehicle body mounted sound insulation components and/or shields (cab or fender shields, skirts, wheel housing splash shields, etc.).

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Cooling System

WARNING

DO NOT work near the fan with the engine running or the ignition in the ON position. The engine fan can engage at any time without warning. Anyone near the fan when it turns on could be seriously injured.

Visually inspect cooling system components for damage, and/or misalignment.

Primary system components requiring noise related inspection include fan blades, fan clutch, fan shroud, fan ring, and recirculation shields. Check fan blades, fan ring, fan shroud, and recirculation shields for any damage. Verify that fan blades clear the fan ring. Inspect all related fasteners, brackets, and clamps for damage and tightness. Confirm operation of temperature modulated fan clutch.

Acts that constitute tampering with the Cooling System:

Removing or rendering inoperative cooling system components (such as the temperature modulated fan clutch, fan shroud, fan ring, recirculation shields, etc.).

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Exhaust System

Make sure the exhaust system is intact. Inspect for damage, misalignment and/or leakage. Primary system components requiring noise related inspection include muffler body, exhaust manifold, turbocharger, and all exhaust system (rigid and flexible) piping. Closely check the system for exhaust leaks. Special attention should be given to all welds, seams, gaskets, support points, clamps, couplings and connections.

Inspect all exhaust system fasteners, brackets, and clamps for damage and tightness. Check integrity of internal muffler baffling by revving the engine through normal operating speeds. Excessive rattling sounds or very loud operation indicates a failure within the muffler.
Acts that constitute tampering with the Exhaust System:

Removing or rendering inoperative exhaust system components (such as the muffler, pipes, clamps, etc.).

WARNING

Hot engine! Keep yourself clear of all moving parts or hot engine parts, exhaust gases, and/or fluids. A hot engine, exhaust, and/or fluids can cause burns.

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Air Intake/Air Induction System

Make sure the air intake system is intact. Inspect components for damage, misalignment and/or leakage. Primary system components requiring noise related inspection include the air cleaner housing, air cleaner element, turbocharger, charge air cooler and intake manifold.

Also inspect all ducts, pipes, hoses, tubing and elbows used to interconnect the system. Special attention should be given to all welds, seams, gaskets, support points, clamps, couplings and connections.

Inspect all intake system fasteners, brackets, and clamps for damage and tightness.

Acts that constitute tampering with the Air Intake/Air Induction System:

Removing or rendering inoperative air intake/induction system components (filter, filter housings, ducts, etc.).

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Engine Control, EGR and Fuel Systems

Acts that constitute tampering with Engine Control, EGR and Fuel Systems:

Removing rendering inoperative, or modifying the engine control system such as the ECU, EGR system components or the fuel system components, in order to allow the engine to operate outside of the manufacturer's specifications is not allowed and violates both warranty and legislation.

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Noise Control Log

NOISE CONTROL SYSTEM MAINTENANCE LOG			
DATE	MILEAGE	MAINTENANCE PERFORMED	MAINTENANCE FACILITY

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Maintenance Hazards

DANGER

Before working on or inspecting 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

DO NOT attempt to repair or service this vehicle without having sufficient training, correct service literature and the proper tools. Failure to follow this could lead to personal injury or death, or making your vehicle unsafe.

CAUTION

Prolonged contact with used engine oil may be harmful. Use rubber gloves when handling used oil. Wash skin thoroughly if it comes in contact with used oil.

Note: Read all the safety information starting on page 3 before working on the vehicle.

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Oil Change

DANGER

Before working on or inspecting 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

A hot engine or engine oil can be dangerous. Serious burns can result from contact with a hot engine or oil. Take precautions when draining the oil. Wear gloves or let the engine cool down before draining.

For information on the type of oil recommended for your engine, see “Engine Oil” page 60 for application tips and “Viscosity and Capacity Tables” page 142 for quantities and viscosities or refer to other engine manufacturer’s operator’s manual.

WARNING

When draining the oil, use the proper tools and keep away as far as possible. Raise the elbow so the forearm is parallel to the ground to avoid oil running down the arm, causing burns.

It is important to drain as much oil as possible. Try to change oil immediately after driving, when the oil is warm. Always replace the oil filters when changing oil.

Note: Always dispose of oil according to Federal or local regulations. Used oil disposed of in nature or waterways contaminates our drinking water and kills wildlife.

CAUTION

Prolonged contact with used engine oil may be harmful. Use rubber gloves when handling used oil. Wash skin thoroughly if it comes in contact with used oil.

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Oil Filters

DANGER

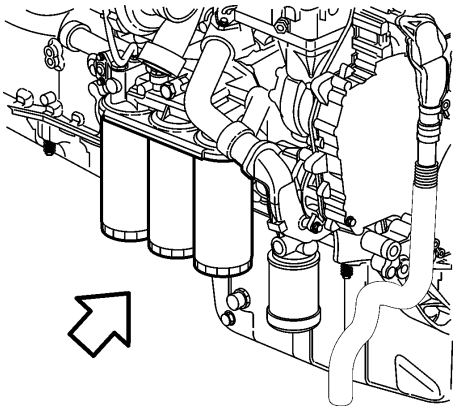
Before working on or inspecting a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

Hot oil can cause severe burns. DO NOT allow hot oil to contact the skin. When changing oil, wear protective gloves.

CAUTION

Volvo branded oil filters are designed to provide the proper level of filtration and protection for Volvo engines. Filters that do not meet the same stringent requirements may cause unsatisfactory results.



W2003930

Note: Always dispose of oil filters according to Federal or local regulations. Used oil disposed of in nature or waterways contaminates our drinking water and kills wildlife.

Install new filters as follows:

- Coat the filter gasket with oil.
- Install the filter and turn it by hand until the gasket makes contact with the sealing surface.
- Then manually turn the filter an additional 3/4 to one full turn.

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Checking Oil Level

Note: DO NOT let the oil level fall below the lower marking on the dipstick. DO NOT overfill so the level is above the upper marking on the dipstick.

Wait five minutes after shutting off the engine before checking the oil level. This gives the oil time to drain back to the oil pan.

Crankcase Air Breather

CAUTION

If the Crankcase Breather tube is not maintained on a regular basis, it will become plugged. When plugged, excessive crankcase pressure buildup may cause crankshaft seal leakage.

Check and clean the crankcase ventilation system at every annual service.

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Engine Air Filter

DANGER

Before working on or inspecting 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.

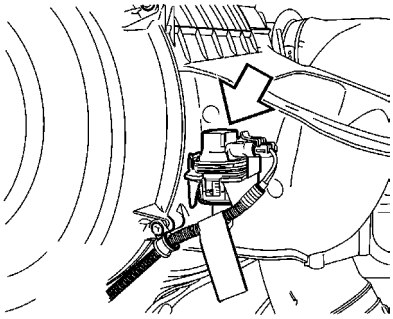
The engine air filter is monitored by a pressure restriction gauge mounted on the air filter housing. The gauge may be connected to the instrumentation to give a telltale signal when the air filter needs to be changed; see the vehicle Operator's Manual. A manual gauge needs to be inspected regularly. **Replace the filter according to the gauge or after a maximum of two years, whichever comes first.** Optional extra filter insert should be changed with every third main air filter.

CAUTION

Continued operation with the gauge showing in the red may cause damage to the engine. Operating the engine with a damaged filter allows dust to pass directly into the engine, causing damage. Replace damaged or clogged filters.

To change the filter, remove the fasteners around the outer cover and remove the cover. Pull out the filter from the container and discard.

Make sure the new filter seal is in good condition. Install the new filter in the filter container so the seal enters the guide in the back of the container. Reinstall the cover.



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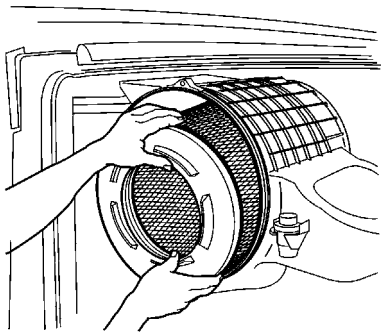

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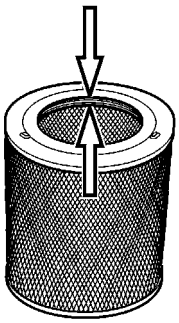

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Fan Drive Belts

DANGER

Before working on or inspecting 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.

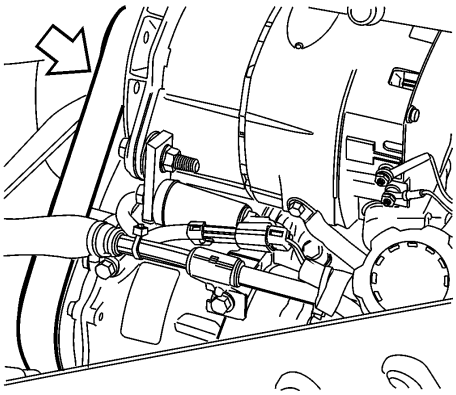
WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or can cause serious burns.

All engine belts should be checked at each service point. Inspect for cracked or frayed material. All belts have automatic belt tensioners to keep the correct tension without adjustment. Check with your dealer to get the correct tension value for the different belts.

CAUTION

DO NOT tighten the belts over recommended values. Over-tightening a belt may damage bearings as well as belts.



W2003814

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Flushing Cooling System, D12D

Draining Cooling System

DANGER

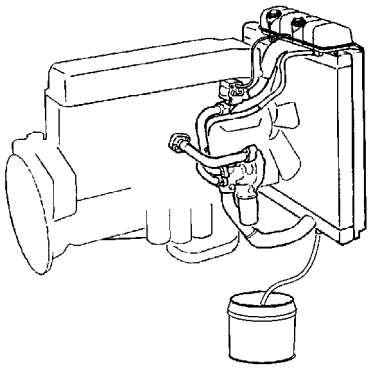
Before working on or inspecting a vehicle, set the parking brakes, place the transmission in neutral and block the wheels. Failure to do so can result in unexpected vehicle movement and can cause serious personal injury or death.

WARNING

DO NOT remove the cap to the coolant surge tank while the engine and radiator are still hot and under pressure. Scalding fluid and/or steam may be blown out under pressure if the cap is taken off too soon.

WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or fluid can cause serious burns.

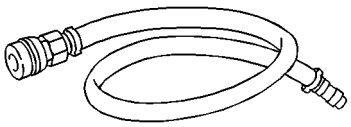


W2003947

1 Remove system fill cap.

2 Open drain cocks located in the bottom of the radiator or on the bottom radiator hose and on the block (You may have to use special tool 9996049 for quick-connect fittings).

3 Open the drain valve on the air compressor.



W0001746

Special tool 9996049

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

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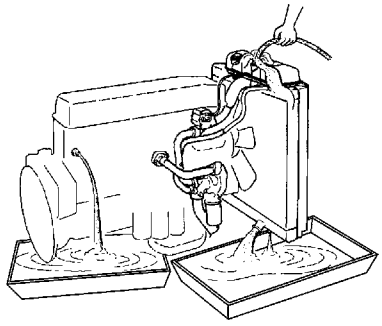
Flushing Cooling System

Before filling, flush out the system thoroughly with clean water. Before flushing out the radiator, remove the lower radiator hose to allow a quicker and more efficient draining.

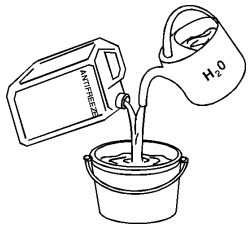
When flushing the radiator, keep the water pressure low so the radiator tubes are not damaged.



W2003948

Filling Cooling System

Always use a pre-mixed solution of 50/50 clean water and antifreeze. DO NOT fill system with water and then add antifreeze. A mixture with less than 40% antifreeze does not give adequate corrosion protection. Concentrations of antifreeze above 60% does not give added freeze protection. The system is self-venting.



W2003082

1 Fill the system with clean coolant through the fill neck in the middle of the surge tank. The fill rate is not to exceed 2 gpm (8 L/min.). The engine should not be running and the heater control should be on WARM.

2 Fill up to the top of the surge tank.

3 Check the level after running the engine at high idle for approximately five minutes. Add coolant as required.

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Turbo and Charge Air Cooler

General

WARNING

DO NOT remove, attach or tighten turbocharger air intake ducting while the engine is operating, or operate the engine while the ducting is removed. Working around the turbo with the ducting removed may cause severe personal injury.

Visually inspect turbo mountings, intake and exhaust ducting and connections for leaks on a daily basis. Check oil inlet and outlet for leaks or signs of restrictions to oil flow. Check for unusual noise or vibration. If any faults are detected, do not operate the engine until the cause is determined and repaired.

DANGER

If oil leaks internally from the turbocharger to the engine intake, the oil acts as a fuel. Watch for excessive exhaust smoke. DO NOT operate engine until problem is corrected. There is no way to regulate the engine speed if it runs on oil and it may over speed. Loss of control of vehicle may lead to an accident causing severe personal injury or death.

Periodically inspect the front of the radiator/charge-air-cooler package for buildup of dirt, mud, insects, etc. Over time, there may be a build-up of dirt, mud, insects, etc., between the radiator and charge-air-cooler. Inspect for build-up and remove the cooler package to clean, if necessary.

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Cleaning Charge-Air-Cooler and Radiator Package

Over time, dirt and insects will accumulate between the fins of the radiator, air conditioning condenser and charge-air-cooler. The reduced air flow reduces the heat transfer from the components to the air. This increases the load on the fan and air conditioning compressor and can result in engine overheating and other performance related problems, such as high fuel consumption, etc. Make sure the radiator/charge-air-cooler package is inspected regularly. Clean if necessary.

DANGER

Before working on or inspecting 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.

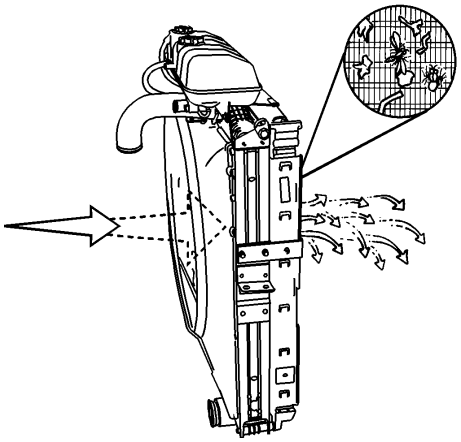
WARNING

Always wear eye protection when cleaning radiator, charge-air-cooler and condenser. Failure to follow this recommendation may result in eye injury.

The simplest method to clean the package is to use air pressure or a water stream. This should be done from the back of the core. Air pressure should not exceed 30 psi (200 kPa) for radiator and charge-air-cooler cores. The use of a fin comb is also a good tool to loosen bugs and dirt from the fins.

If dirt can not be cleaned off with this procedure, consult your Volvo Truck dealer.

Inspect the charge-air-cooler for cracks at every inspection. DO NOT operate the vehicle with a damaged or broken charge-air-cooler. To do so would void the warranty and the engine will not meet emission regulation requirements.



W2001496

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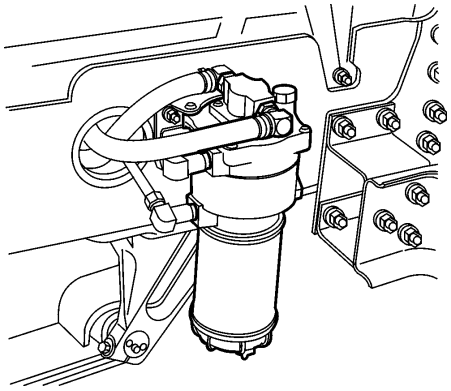
Replacing Fuel Filters

General

The filters are an important part of the fuel system. Always replace the filters at the recommended intervals and use the recommended filter types for the best engine operation and service life.

A primary fuel filter is located on the outer right, inside front wheel or outer left frame rail, behind the cab. This filter consists of a filter cartridge, a water separation bowl and may have a fuel heater built in.



W2003931

The secondary fuel filter is located on the left side, under the engine control unit (ECU) on the D12D. The filter is contained in a disposable cartridge.

Note: Some fuel filters are located on the left hand frame rail, beside the engine.

Fuel Filter Change Intervals

Filter change intervals should be tied to the oil change intervals. Depending on the oil change intervals and/or the fuel cleanliness, the filters can be changed every or every other oil change.

Maximum mileage between fuel filter change is 25,000 miles (40,000 km) or 600 hours.

Note: The Fuel Filter for the D12D engine must be “mounted.” Use only fuel within the fuel system to refill filter. This process can be carried out with an electric fuel primer pump.

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Fuel System Service

Changing the Primary Fuel Filter

DANGER

Before working on or inspecting 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.

The standard primary filter is manufactured by Racor. Use only the **30 micron** (red coded) element. Failure to do so could result in reduced power.

To replace the primary fuel filter element:

1

WARNING

To avoid potential fire hazard, DO NOT service any part of the fuel system while smoking or in the presence of flames, sparks or hot surfaces, or when working on an operating engine. Failure to follow these precautions can result in fire. To guard against burns from direct contact with hot fuel, wear adequate protective clothing (face shield, heavy gloves and apron, etc.) when working on a hot engine.

Open the drain valve and drain off some fuel into a container. Use a strap wrench to remove the filter cartridge together with the bowl.

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2 Separate the filter and the bowl.

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

3 Clean and dry the bowl. Attach it to a new filter. Use new seals at both bowl and filter head joint. Install both on the filter head in the vehicle.

CAUTION

Never fill filter with fuel before installing. Contaminated fuel causes accelerated wear to fuel system components.

4 To eliminate air from the filter, operate the primer pump to draw fuel and fill the filter.

5

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.

Start the engine and check for leaks. Correct any leaks with the engine stopped.

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Changing the Secondary Fuel Filter

DANGER

Before working on or inspecting 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.

1

WARNING

Hot engine. Keep yourself clear of all hot engine parts and/or fluids. A hot engine and/or can cause serious burns.

Clean around the fuel filter. This is important — if dirt mixes with the fuel from this filter, it will end up in the injection system.

2

DANGER

To avoid potential fire hazard, do not service any part of the fuel system while smoking or in the presence of flames, sparks or hot surfaces, or when working on an operating engine. Failure to follow these precautions can result in fire. To guard against burns from direct contact with hot fuel, wear adequate protective clothing (face shield, heavy gloves and apron, etc.) when working on a hot engine.

Remove the filter element. Dispose of it in a safe and responsible manner.

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3 Wet the seal on the new filter with clean engine oil or fuel.

4

CAUTION

Never fill filter with fuel before installing. Contaminated fuel causes accelerated wear to fuel system components.

Spin on the new filter onto the filter head until it fully contacts the seal (no side movement evident). Tighten an additional 1/2 to 3/4 turn **by hand.** DO NOT overtighten!

5 To eliminate air from the filter, operate the primer pump to draw fuel and fill the filter.

6

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.

Start the engine and check for leaks. Correct any leaks with the engine stopped.

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Bleeding the Fuel System

DANGER

Before working on or inspecting 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.

The fuel system will need to be bled if:

- The tank has been emptied of fuel.
- The engine has not been running for some time. (See also page 34 for oil pressure preparation).
- Service work has been done on the fuel system, for example cleaning or replacing fuel filter elements.
- The engine is new or rebuilt.

Note: It is very important to maintain high cleanliness when working in the fuel system. If dirt is mixed in with the fuel after it is filtered, it will cause damage to the injectors. Dirt can also cause air leakages that rob the engine of power.

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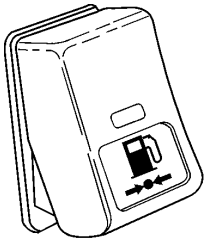
Bleeding the D12D Engine

Note: Prior to bleeding the engine, make sure the key is in the ignition in the "ON" mode (engine is stopped) and the parking brakes are applied. Once the 4 minute bleeding process is complete, you can start the engine.



W3005378

To bleed the D12D engine simply press or push the fuel priming activation switch located on the right hand side of the steering column, in the dash. This is a non-locking switch, which when pressed, sends a signal to the Vehicle ECU (VECU). The VECU then transmits the request via a control data link to the EECU. The EECU activates the pump for approximately 4 minutes.

If you have problems starting the engine, restart the bleeding procedure and try restarting the engine again after bleeding is complete. If the engine does not start following this procedure contact your local Volvo Truck dealer.

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Draining Water from the Fuel Tank

DANGER

Before working on or inspecting 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.

Water accumulates in the fuel tank in the process of air entering the tank and water vapor condensating. This water will collect in the bottom of the tank and should be emptied out regularly.

To minimize the water vapor condensing inside the tank, the fuel level should be kept high when the vehicle is parked. Always fill up the tank at the end of the trip to minimize the amount of air in the tank.

WARNING

DO NOT service any part of the fuel system while smoking or while in the presence of flames, sparks or hot surfaces. Failure to follow these precautions can result in fire.

Note: When draining the fuel tank, collect the waste in a fuel proof container. Take the drained fuel and water to a recycle or waste management center.

To drain the tank, place a container under the tank. Remove the plug in the bottom. Drain fluid until there is only fuel coming out. Install the plug and check for leaks.

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

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Transmission and Rear Axle Maintenance

Transmission

General

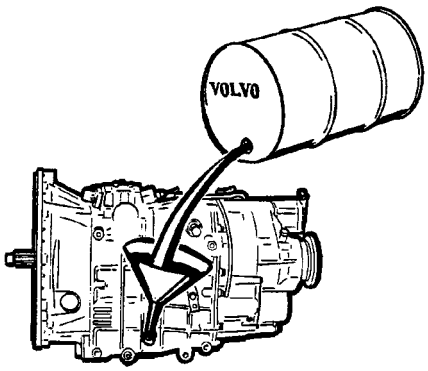
Transmissions should not be operated consistently at temperatures above 250 °F (120 °C).

If the temperature reaches 285 °F (140 °C), stop the vehicle to let the temperature go down (see the vehicle Operator's Manual for information on the optional transmission temperature gauge).

Operating temperatures above 250 °F (120 °C) increase the lubricant's rate of oxidation and shorten its effective life.

If the transmission oil temperatures are consistently high, change oil more often or install an oil cooler. With lengthy or continuous driving at altitudes of more than 6,000 ft (2,000 m) above sea level, more frequent oil changes will be necessary.

Note: Always dispose of oil according to Federal or local regulations. Used oil disposed of in nature or waterways contaminates our drinking water and kills wildlife. Take all used oil to a recycling or waste collection center.



W4001387

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Oil Quality

CAUTION

Use only the specified type of single weight oils. DO NOT use multigrade oils or EP gear oils (for example axle lube oil such as GL-5 gear oils) as they may damage components.

Monograde motor oils or transmission oil type API GL-1 are recommended for transmissions. Choose the correct viscosity for the outside temperature the vehicle will be operated in. See page 142 for the beginning of viscosity charts.

If using synthetic base oils, the change interval goes up to 250,000 miles (400,000 km), or 500,000 miles (800,000 km) if using the manufacturer approved brand of oil filled from the factory.

Oil Filter

Oil filters should be changed at the same time as the oil. Also, make sure that magnetic bottom plugs are cleaned before installing. Change the filters in accordance with the manufacturer's Operator's Manual.

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DriveShaft

DANGER

If the driveshaft universal joints are not lubricated properly, they can be damaged to the point of the driveshaft separating from the vehicle. Driveshaft separation may cause loss of control of the vehicle resulting in severe personal injury or death.

Note: RPL drivelines are not greaseable.

Note: Make sure grease is purging from all four ends of the universal joint. If the universal joint can not be properly lubricated, replace it.

Rear Axle

General

Note: Most rear axles today are run with a synthetic base oil. The Volvo rear axles are an exception. DO NOT use a synthetic base oil in Volvo rear axles. Seals will deteriorate and leaks will develop.

Rear axles should not be operated if the oil temperature exceeds 250 °F (120 °C).

Choose the correct viscosity for the temperature the vehicle is operated in. See page 142 for the beginning of viscosity charts.

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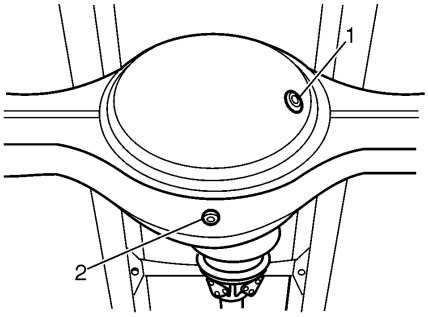
Checking and Draining Oil

Check the oil level through the top plug 1. The oil should be level with the hole. Add oil if necessary.

Drain oil through the bottom plug 2. Oil should be drained immediately after driving while it is still hot.



W0002103

WARNING

Hot oil can cause severe burns. DO NOT allow hot oil to contact the skin. When changing oil, wear protective gloves.

Note: Also check the rear axle ventilation for blockage. A blockage can cause overpressure in the axle and start oil leaks.

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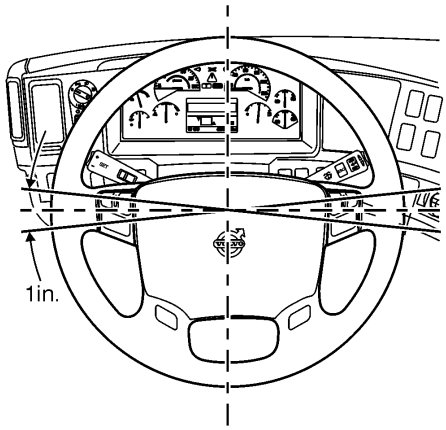
Steering and Brakes Maintenance

Steering System

Excessive play in the steering system is checked by turning the steering wheel while the engine is stopped. With the front wheels pointing straight ahead, turn the steering wheel until the front wheel starts moving. Then, turn the steering wheel the other way until the front wheel moves. Play should not be more than 1 in. (25 mm) at the rim of the steering wheel.

If the steering play is excessive, check the steering linkage for looseness, wear, etc. Make necessary repairs before driving the vehicle.

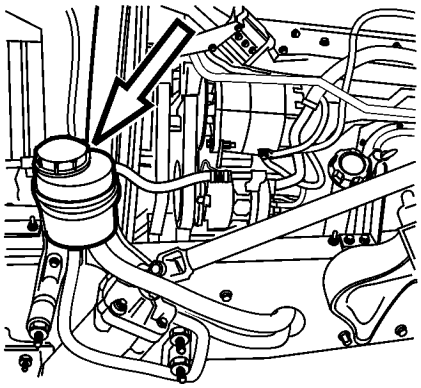


W6001506

Power Steering Reservoir

The power steering fluid reservoir is filled with Automatic Transmission Fluid (ATF) Dexron® III for the power steering system. Change fluid every 150,000 miles (240,000 km). Change filter every year or more often if necessary.

If the fluid has darkened, it indicates that the power steering system is running hotter than normal and the fluid is overheating. Take the vehicle to a Volvo Truck dealer for troubleshooting the overheating and to have the fluid changed.



W6001505

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Steering Linkage Wear Check

Wear is checked by gripping the linkage, tie rod or draglink, close to the ball joint and moving the seat of the ball axially. If there is a larger movement, remove the vehicle from service and have the linkage replaced before driving.

Inspection Station Criteria

The joint should not move more than maximum 1/8 in. (3mm) measured with hand pressure only.

Any motion, other than rotational, between any linkage member and its attachment point of 1/8" (3mm) or more, measured with hand pressure only, is cause to remove the vehicle from service for immediate socket replacement.

Truck Shop Inspection Criteria

If no **AXIAL** movement is detected, the socket is operable. Any free lash detected by hand requires replacement of the socket.

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Brake Safety Information

Note: The brake system is a critical vehicle safety system. For your safety and for those around you, follow the recommended preventive maintenance checks. If any problems occur, have them investigated immediately by an authorized service facility.

DANGER

Failure to properly maintain the brake system can result in compromised brake efficiency and may lead to loss of control of the vehicle resulting in severe personal injury or death.

DANGER

DO NOT use replacement parts anywhere in the brake system unless it conforms exactly to original specifications. A nonconforming part in your vehicle's brake system could cause a malfunction, leading to loss of control of the vehicle resulting in severe personal injury or death.

DANGER

DO NOT release the parking brake or attempt to move the vehicle until brake air pressure in both circuits is at least 100 psi (690 kPa). Failure to follow this procedure may lead to uncontrolled vehicle movement and cause severe personal injury or death.

DANGER

Drain the air system tanks at the recommended intervals. If condensation accumulates, moisture can enter the brake system air valves, causing corrosion or clogging. The safety of the brake system could be compromised, leading to an accident causing severe personal injury or death.

DANGER

DO NOT inspect or adjust parts or components in the brake system without setting the parking brake, placing the transmission in neutral and securely chocking the wheels. If the vehicle is not secured to prevent uncontrolled vehicle movement, it could roll and cause severe personal injury or death.

CAUTION

DO NOT use penetrating oil, brake fluid or wax-based oils in the air system. These fluids may cause severe damage to air system components.

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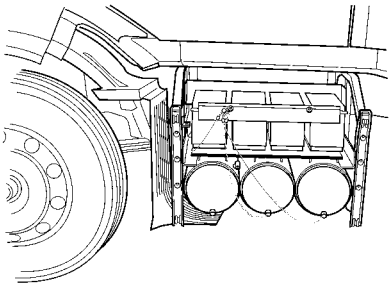
Air Tanks

WARNING

When draining the air tanks, DO NOT look into the area of the draining air. Dirt or sludge particles may be in the air stream that could cause eye injury.



W8003393

Air tanks should be drained daily. Make sure the drain cocks close properly after draining. Empty moisture from air tanks by pulling the drain valve lanyard or pull cord. The tanks should be checked for condensation fluid, even if an automatic drain valve is installed.

It is very important that the air system is kept clean. Air reservoirs should be drained daily or even twice a day on very hot days. Daily drainage expels any condensation in the air reservoirs. If sludge or oil is found in the drainage, the air compressor should be checked for proper operation.

If an excessive amount of fluid is drained out of the tanks (even when drained daily) have the system checked for possible problems with the air dryer.

Air Dryers

Air dryers have a regeneration system that cleans out the accumulated moisture but eventually the drying medium will be filled up. Change the dryer cartridge when more water than usual is noticed at the daily tank drainings. The volume of daily drain water will change depending on temperature, geographical location and how much the brakes are used.

Dryer manufacturers recommends changing the cartridge every 2 to 3 years but the intervals need to be adjusted for vehicle application. In hot, coastal climates, the cartridge may have to be changed every year.

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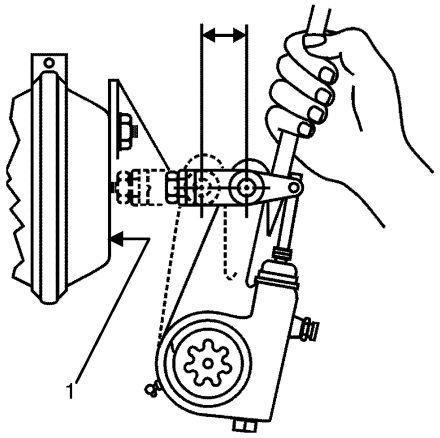
Brake Slack Adjusters and Cam

DANGER

Before checking the slack adjusters, 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.

To check the slack adjusters for proper throw, use a breaker bar to lever the slack adjuster out. Measure the distance of the travel. It should not exceed 1 to 1 1/4 in. (25 to 30 mm) for a 6 in. slack adjuster and should not exceed 3/4 to 1 in. (20 to 25 mm) for a 5 1/2 in. slack adjuster. Also make sure that the length of the slack adjuster is the same on an axle.

Note: Travel is measured from the chamber face. See 1 in illustration.



W5001492

1 Chamber face

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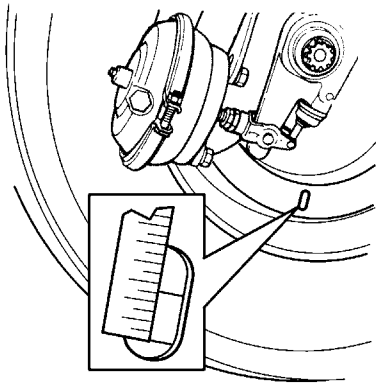
Brake Linings

DANGER

Before measuring the brake linings, 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.

Measure the brake lining thickness. If the brakes are equipped with backing plates, measure through the inspection holes in the plate. Reline the brake shoes if the lining thickness is 1/4 in. (6 mm) or less at the middle of the shoe.

Check the brake drums for any visible cracks or signs of oil or grease.



W7001278

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Check Valves

Follow the procedure below to check out the air tank check valves at least once a year. This is to see if air pressure is maintained in the tanks when the air pressure is depleted in the supply tank (wet tank).

Note: The check valves should be checked at least once per year.

1 Chock the rear wheels.
2 Let the compressor build up air pressure to the governor cut-off.
3 Bleed the air pressure from the supply tank (wet tank).
4 Check the air pressure gauges on the instrument panel to see if the pressure is maintained in both primary and secondary air tanks.
5 Any bleed-off from one or both of the tanks indicates a defective check valve; replace valve.
6 Repressurize the system and remove the wheel chocks.

WARNING

To prevent personal injury, always drain the air supply from the vehicle before attempting to repair or replace a component. Wear eye protection and take care not to get fingers caught in the slack adjusters when spring brakes are applied.

WARNING

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

DANGER

Before working on or inspecting the 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

Compressed air components can separate violently during disassembly if air pressure is present. Before servicing any part of the brake air system, completely release the air pressure. Failure to do so can result in serious personal injury or death.

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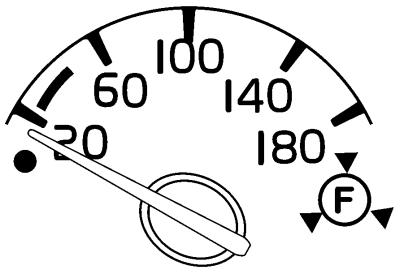
Front and Rear Brake System Air Pressure

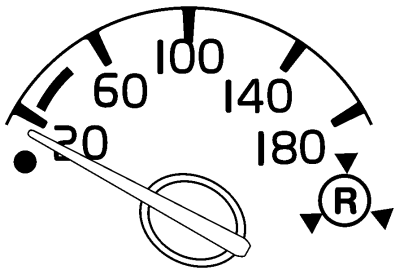
Air pressure in the two circuits is monitored by two pressure gauges on the right side of the instrument panel. The gauge for the secondary (front) brake circuit is marked with an “F” within a symbol and The gauge for the primary (rear) brake circuit is marked with an “R” within a symbol. The two pointers should register equal or nearly equal pressure. By observing the gauge pointers, the operator is forewarned in the event of a pressure drop in either or both of the circuits, and also may readily identify the specific circuit.

Before operating the vehicle, check the air gauges which indicate air pressure.

The LED lights up if the air pressure drops below 65 psi. DO NOT operate the vehicle in this condition of air pressure being below 65 psi.



Gauge 1

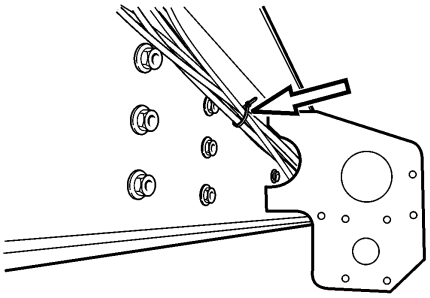


Gauge 2

Air Tubing and Hoses

All compressed air tubing and hoses need regular inspection. Check for signs of wear and that the routing is not near parts that can cause damage.

Have any damaged tubing or hoses replaced by your local Volvo Truck dealer.



W3005381

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Electrical System Maintenance

Battery Care

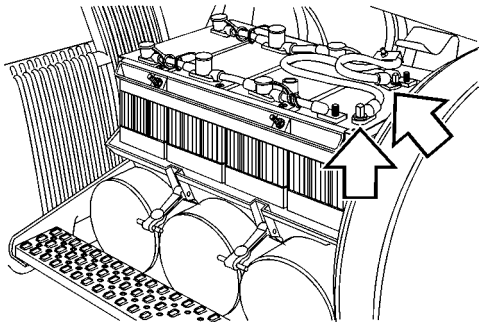
WARNING

Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the State of California to cause cancer and reproductive harm. Wash hands after handling.

The electrolyte level on maintenance free batteries cannot be checked. Periodically, the condition and the state-of-charge of each battery should be checked by a Volvo Truck dealer. Maintenance free batteries DO NOT require any attention other than keeping them clean and firmly clamped in place in their respective trays. Keep the cable connections clean and tight. Check the battery state-of-charge indicators periodically to determine battery condition.

Check for worn cables at every major inspection. Replace worn cables. Check battery terminals for cracks.

When disconnecting battery terminals, always disconnect the ground terminal first. When reconnecting, always connect the ground terminal last.



W3001022

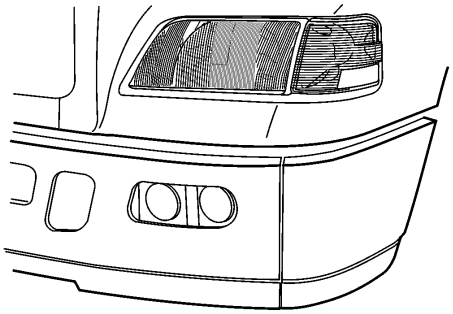
WARNING

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

Lighting

Check the lights on the vehicle daily. Replace burned out inserts and bulbs. Following is a listing of bulb types. Replace any broken or cracked side or rear reflectors.

Headlights should be checked for aim at least once per year.



W3005266

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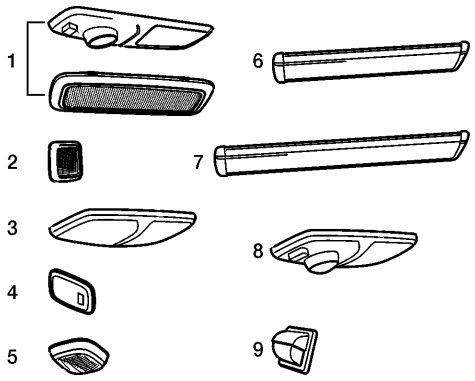
Note: The illustration refers to the information in the VN interior lights table that follows.

WARNING

Using bulbs or lamps other than those specified may result in failures that could lead to a fire or a vehicle accident caused by improper lighting.



Bulb Replacement List, VN, VHD

Interior Lights VN, VHD				
Chart Number	**Bulb**	**Volvo Number**	**Bulb Number**	**Maximum Wattage Rating**
1	Overhead Dome Lamp	946777	5008 (2x)	10W
1	Overhead Dome/Spot Lamp (connected to door)	85107036 946777	Dome: 577 Spot: 5008	18W 10W
2	Door Courtesy Lamp	82039	578 (T-3)	10W
3	Dome Lamp-Sleeper	85107036	577 (T-4 3/4) (2x)	18W
4	Reading Lamp (under bunk storage)	946777	5008	10W
5	Reading Lamp	85107036	577 (T-4 3/4)	18W
6	Overhead Fluorescent Lamp -Short	3948411	GE F27/24BX/SPX30**or** Pro-quip FPL24EX-L **or** Phillips PL-L24W/830	24W
7	Overhead Fluorescent Lamp -Long	3099132	GE F39/36BX/SPX30**or** Philips PL-L36W/830 **or** Pro-quip FPL 36EX-L	36W

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Interior Lights VN, VHD				
Chart Number	**Bulb**	**Volvo Number**	**Bulb Number**	**Maximum Wattage Rating**
8	Overhead Dome/Spot Lamp	85107036 946777	Dome: 577 Spot: 50082	18W 10W
9	Control Panel Lamp	3132931	193 (T-3)	4.6W

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Exterior Lights, VNM			
Bulb	**Volvo Number**	**Number**	**Maximum Wattage Rating**
High/Low Beam	3098653	9007 9007	55W 65W
Driving lights	85103971	886	50W
Fog Lights	3946923	H3-55	62W
Front Turn Lamp	85104039	3157AK	28W
Front Parking Light	85104039	194NA	3.8W
Side Repeater Lamp	3132939	1156	28W
Cab Mounted Light	3132929	67	8W
Sunvisor Mounted	20414610	LED	2W
Brake Lights	3132940	1157	28W/8W
Parking Rear Lights	3132940	1157	28W/8W
Left/Right Turn/Stop Rear	3132940	1157	28W/8W
Trailer Marker Light	3132932	2 x 194/168	4.9W
License Plate Light	3132940	1157	28W/8W
Back-of-Cab	3132939	1156	28W
Backup Lights	3132939	1156	28W

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Exterior Lights, VNL			
Bulb	**Volvo Number**	**Number**	**Maximum Wattage Rating**
High/Low Beam	85104041 85104040	H11 HB3	55W 65W
Driving lights	85103971	886	50W
Fog Lights	85103970	896	50W
Front Turn Lamp	85104039	3157AK	28W/8W001
Front Parking Light	85107045	194NA	3.8W
Marker Front Side	3132932	194	3.8W
Side Repeater Lamp	965826	1156	28W
Cab Mounted Light	3132929	67	8W
Sunvisor Mounted Light	20414610	LED	2W
Brake Lights	3132940	1157	28W/8W
Left/Right Turn/Stop Rear	3132940	1157	28W/8W
Parking Rear Lights	3132940	1157	28W/8W
Trailer Marker Light	3132932	2 x 194/168	2W
License Plate Light	3132940	1157	32W/3W
Back-of-Cab	3132939	1156	32W
Backup light	3132939	1156	32W

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Bulb Replacement List, VHD

Exterior Lights VHD			
Bulb	**Volvo Number**	**Number**	**Maximum Wattage Rating**
High/Low Beam	3131227 3132904	H5001–18522 H5006-18523	50W 35W
Fog Lights	39416923	H3-55	62W
Front Turn Lamp	3132941	1157NA	24W
Left/Right Turn/Stop Rear	3132940	1157	28W/8W
Front Parking Light	3132940	1157	28W/8W
Side Repeater Lamp	965826	1156	28W
Brake Lights	3132939	1156	28W
Parking Rear Lights	3132940	1157	28W/8W
Cab Marker Light	3132929	67	8W
Trailer Marker Light	3132932	2 x 194/168	4.9W
License Plate Light	3132940	1157	28W/8W
Back-of-Cab	3132939	1156	28W
Backup light	3132939	1156	28W

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Tires, Wheels and Hub Maintenance

Wheel Safety Information

DANGER

DO NOT attempt to repair wheels or tires unless you are trained and equipped to do so. Wheel and tire assemblies cannot be worked on without proper tools and equipment. Failure to follow this may lead to serious personal injury or death.

DANGER

Failure to properly torque-tighten the wheel nuts can result in the breakage of wheel studs and the subsequent loss of wheels. Loss of vehicle control and serious personal injury or death can occur.

DANGER

DO NOT use oil or grease on studs or nuts. The tightening torque is affected and can lead to incorrect clamping loads between the rim and hub. This could lead to a loss of the wheel. Loss of vehicle control and serious personal injury or death can occur.

DANGER

DO NOT install regrooved, retreaded or repaired tires on the steering axle(s). They could fail unexpectedly and cause the loss of vehicle control, leading to serious personal injury or death.

DANGER

DO NOT use mismatched wheel components. If they do not exactly match the original design specifications, they may cause failure or separation leading to blowout and an accident and personal injury or death.

DANGER

DO NOT install tires with a load rating that is less than stated on the Certification Label in the door frame. The tire could be unintentionally overloaded, leading to an accident, causing serious personal injury or death.

DANGER

DO NOT use mismatched tires on the same axle. Always use the same type (radial or bias ply) or size. Mixing tires on the same axle will affect the roadholding and can lead to an accident, and serious personal injury or death.

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Wheels

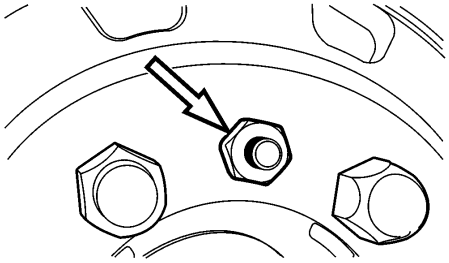
DANGER

Before checking the wheels, 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

Wheels must be serviced only by a qualified technician. DO NOT do this work yourself. Inflated tires on wheels contain compressed air and if suddenly released, do so with an explosive force, resulting in serious personal injury or death.

Check wheels for signs of rust streaks around the wheel nuts. This indicates looseness (steel rims). Inspect all types of rims for cracks. Cracks can appear in many places but typically radiate out from where a load is applied. Inspect closely around wheelnuts, handholes and inside circumference.



W7001279

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Wheel Nut Tightening

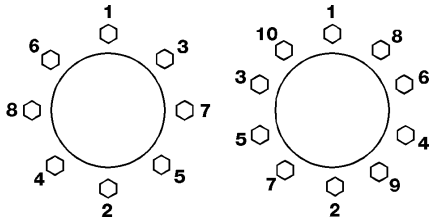
After the initial tightening, retightening must be made within the first 500 miles (800 km). After the first retightening, only normal inspection of nut tightness is needed.

Check front and rear wheel nut tightness with a torque wrench. All disc wheels for Volvo vehicles have a tightening torque of 610 Nm (450 ft-lb). Tighten the nuts in the correct sequence. For spoke wheels, check the manufacturer's specifications. Inspect bolts and nuts for signs of wear or cracks. Make sure that the bolts are not bent.

DANGER

Failure to properly torque-tighten the wheel nuts can result in the breakage of wheel studs and the subsequent loss of wheels. This can lead to loss of vehicle control and serious personal injury or death.

This check tightening is particularly important when rims or brake drums are newly painted. Paint can flake off from these surfaces, causing the nuts to lose their grip and the wheel to loosen.



8 and 10–stud wheelnut tightening sequence.

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Tire Inflation and Wear

DANGER

Before checking the tires, 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.

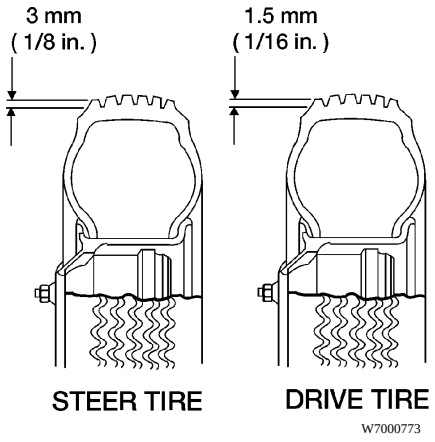
Measure the tread depth. The depth should not be less than 6/32 in. (4.8 mm) on front tires and not less than 2/32 in. (1.6 mm) on drive tires.

Note: Most premium steer tires start with 18/32 in. (14.2 mm) tread depth when new. Usually remove steer tires at 6/32 in (4.8 mm). Drive tires should be removed at not less than 2/32 in. (1.58 mm)

It is important to have the wheels correctly aligned. Check for uneven tire wear frequently. Uneven tire wear is a sign of wheels out of alignment. Refer to page 158 for examples of typical tire wear.

WARNING

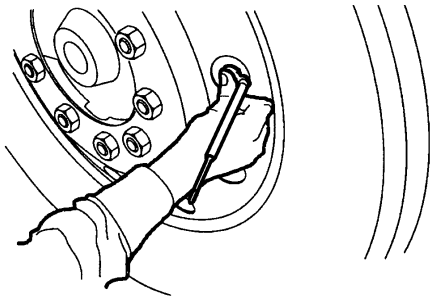
Check tire pressure when the tire is cool. Never bleed the air from hot tires. Increased tire pressure measured in a hot tire is normal. Low pressures may cause side wall flexing, resulting in increased heat, leading to tire failure and vehicle accident.



WARNING

DO NOT operate the vehicle with under-inflated tires. Always keep your tires inflated to the manufacturer's recommendation. Increased flexing in the tire sidewall produces heat. The heat can build to the point of blowing the tire out causing an accident.

Remove stones lodged in ribs or in between double-mounted wheels. Check the tire pressure and leak-test the valve stems.



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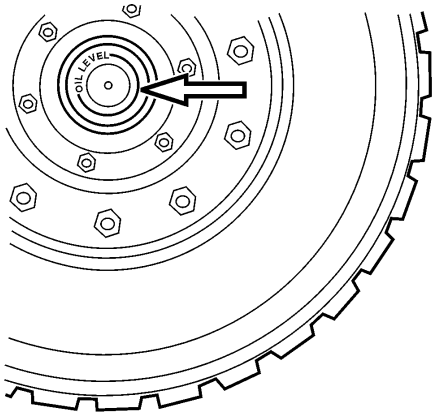
Front Wheel Hubs

The front wheel hubs can be filled with one of several types of oil. Motor oil should be SAE 30 or 15W40. The oil can be either petroleum based or synthetic (synthetic should not be used for the Volvo axle). Axle oil, API GL-5, SAE 75W-90, can also be used.

There are no set change intervals for hub lubrication. The only requirement is that if the hub is opened, the lubricant must be changed.



W7001271

DANGER

Failure to keep wheel bearings properly adjusted may result in accelerated tire wear, poor handling and, in extreme cases, wheel separation from the hub or from the spindle resulting in loss of vehicle control and serious personal injury or death.

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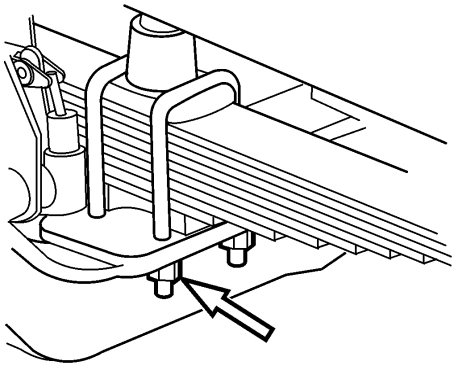
Chassis Maintenance

Springs

Note: This work is best performed by a Volvo Truck dealer or other service outlet having the proper equipment.



The spring package is fastened to the axle beam with U-bolts. It is important that the U-bolt nuts are properly tightened. The nuts may loosen up with time. Severe roads and service will loosen them faster. Loose U-bolts can cause springs to break, axle misalignment, hard steering and abnormal tire wear.

Inspect the chassis for broken springs, shocks, loose or broken axle U-bolts. If any of these are found, contact your local Volvo dealer.

The U-bolt nuts, front and rear axle(s) must be retightened to the proper torque specifications after the first 15,000 miles (24,000 km).

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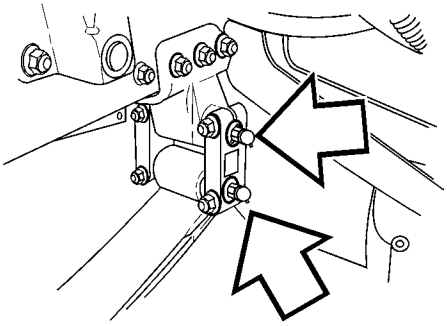
Spring Bushings

DANGER

Before working on or inspecting 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.

When lubricating the springs, lift the axle off of the floor, suspend the frame with axle stands and lower the axle. The spring bushings are now in the position where grease can be added to the contact surfaces. If the spring bushings are greased without taking the load off, high wear and lower lifetime will occur because of no grease reaching the contact surfaces.

If the vehicle is being driven in severe climates with a lot of wet, slushy, highly dusty roads, or in off-road service, increase the frequency of spring bushing lubrication.



W7000449

Rubber Bushings

Rubber bushings are used for extended service life. If your vehicle is equipped with rubber bushings DO NOT lubricate them.

Replace the leaf spring if it is damaged or has premature or excessive wear.

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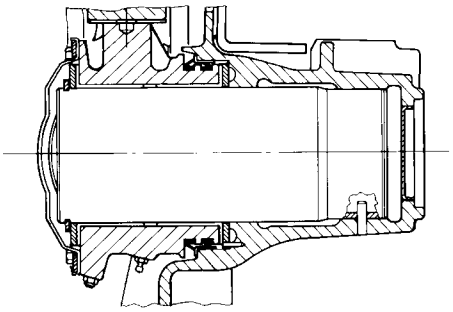
T-Ride Equalizer Beams

The Volvo T-Ride suspension has equalizer beams between the tandem axles. The beam bushing needs to be lubricated at the normal lube intervals for normal highway driving. If the vehicle is being driven in severe climates with a lot of wet, slushy, highly dusty roads, or in off-road service, increase the frequency of lubrication. If driving in severe duty, where water may enter the bushing, daily lubrication may be necessary.

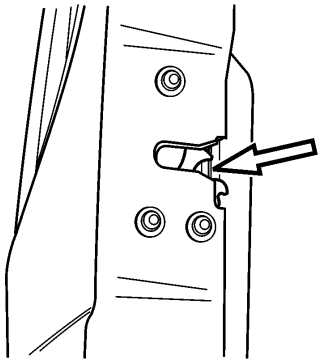


W6000838

Cab Maintenance

Doors

The door lock mechanism should be greased annually using white grease. Lubricate the door lock cylinder with liquid graphite annually, or more often in climates with a lot of snow and salt on the roads. Coat the door stop arm with white grease annually.



W8003203

On wet and salted roads, roadspray can enter the door lock key cylinder. Lubricate the cylinder with liquid graphite annually or more often if necessary.

The door hinge pins are treated at manufacturing and then sealed. No lubrication is necessary.

To keep the door rubber moldings and seals around the windows in good working order and to prevent them from freezing shut during the cold season, occasionally spray on a silicone compound.

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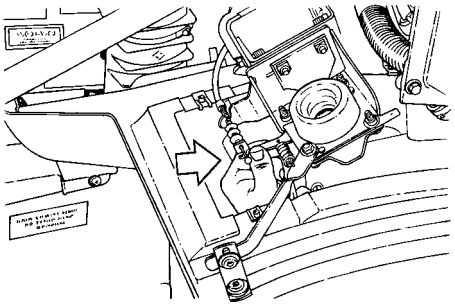
Hood

The hood latch mechanism should be greased with white grease yearly. If the mechanism is hard to work or binds, the latch should be cleaned before greasing.



W8001132

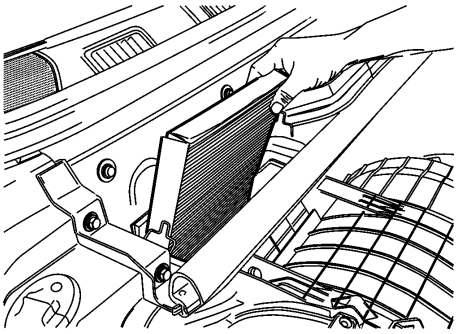
Rustprotection

The rustprotection applied when the cab was produced is adequate for normal use and service. If an extension of the cab rustprotection is desired or if the vehicle is used in a severe application, it is recommended that cavity wax is re-applied every 3rd year.

Cab Air Filter

Air going into the cab passes a filter located on the right, front side of the cab. Remove the filter and clean with an air gun (no more than 20 psi pressure) after 40,000 miles (64,000 km), (in dusty conditions as often as every 10,000 miles [16,000 km]). Make sure the air stream is directed from the inside out.

The filter should not be cleaned and reused more than once. Replace with a new filter after maximum 70,000 miles (110,000 km), or earlier if driving in dusty conditions. A clogged filter decreases the efficiency of the air conditioning system.



W8003189

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Paint and Brightwork Care

Cab
Wash all exterior painted surfaces frequently to remove dirt. It is especially important to wash off salt-laden snow and ice during the cold season. A mild detergent can be used but avoid strong detergents.

Note: DO NOT aim the water jet directly at door and window seals or door locks. If locks are filled with water, use compressed air to clean the water out and then apply liquid graphite. Be especially careful of leaving water in locks or around seals during freezing weather.

Wet the surface with water to loosen dirt. The use of steam or high pressure water will help in removing loose dirt. Wash the surface with a sponge using a lot of water to flush away dirt. Dry the surface with a towel or chamois. DO NOT wait until it is dry as dry-dusting will scratch the surface.

Apply a coat of wax regularly. This will help the paint and other surfaces keep their luster. If the surface gets dull, use a restoring cleaner specially designed for this. Clean off all tar spots and tree sap before waxing.

When the vehicle is new, allow for enough time for the paint to cure. Wait about 30 days after the date of manufacture before putting on the first coat of wax. Never wax on a hot day under the sun and do not apply too much pressure with a buffer as burns may develop from the friction.

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Chassis
Keep the chassis free from buildup of dirt. Make sure the chassis is cleaned before the maintenance inspections to help spotting leaks, etc. As salt can be part of the road sludge during the cold season, remove buildup of snow and ice so it does not promote corrosion. At the end of the cold season, thoroughly flush away all collected dirt from the chassis.

Stainless Steel

Stainless steel will rust if exposed to salt for too long. Wash frequently, especially during the cold season, to remove salt-laden snow and ice. If rust appears, wash the surface and use a rubbing compound to remove the rust. Apply a coat of wax as a finish (do not wax parts that get hot, such as exhaust pipes, etc.).

Note: Never use steel wool to clean stainless steel. Pieces of the steel wool breaks off and give rust stains on the surface.

Chrome

Chromed surfaces will rust if they are not protected. This is especially important during the cold season when roads are salted or in coastal areas where the salt level in the air is high.

Clean chrome surfaces with clean water. If the surface has heavy dirt or tar spots, use a tar remover. To remove rust spots, use a non-abrasive chrome cleaner and apply a coat of wax as a finish (do not wax parts that get hot, such as exhaust pipes, etc.).

Note: Never use steel wool to clean chrome. Pieces of the steel wool breaks off and give rust stains on the surface.

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Aluminum

Unprotected aluminum surfaces will form an oxide layer if not maintained. This is especially important during the cold season when roads are salted or in coastal areas where the salt level in the air is high. Clean with steam or high pressure water. Use a mild detergent if the dirt is heavy. Rinse well.

Clean aluminum surfaces with warm water. If the surface has heavy dirt or tar spots, use a tar remover. To prevent spotting, wipe aluminum surfaces dry after washing.

Upholstery

Clean vinyl and cloth upholstery with light brushing or vacuuming. If heavily soiled, use warm water with mild soap such as saddle or oil soap.

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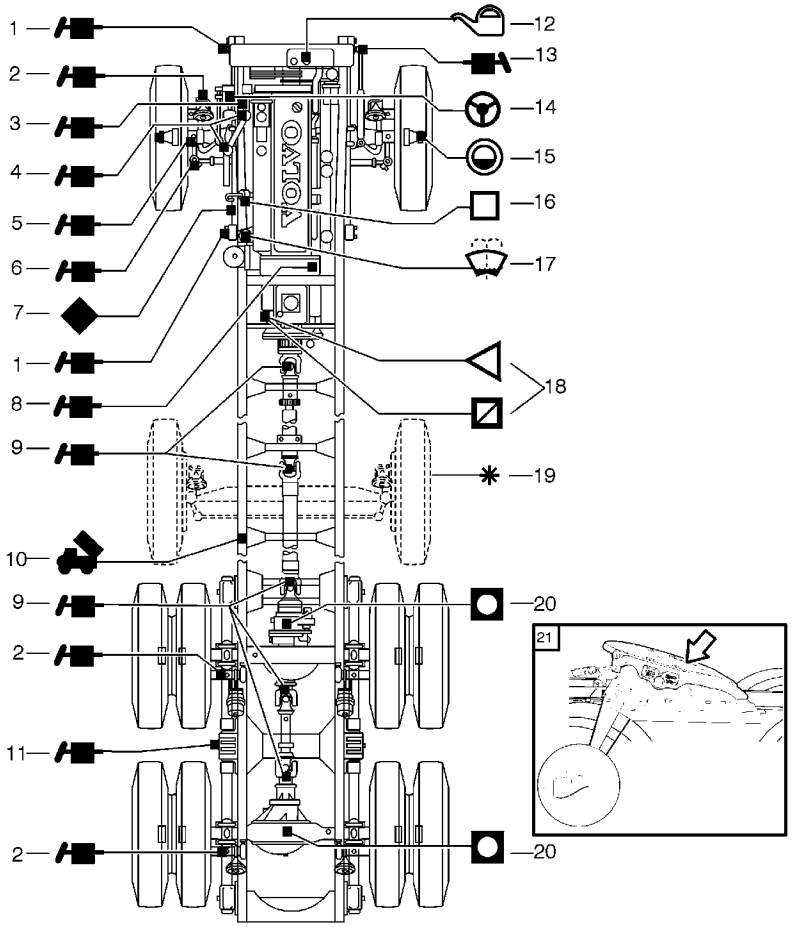
Lubrication Chart



The numbers in the lubrication chart correspond with the numbered notes on page 140 and page 141. Read these notes before selecting a lubricant.

Grease		Coolant	
Hub Oil		Aut. Transm. Fluid	
Engine Oil		Man. Transm. Oil	
Hydraulic Oil		Rear Axle Oil	
Steering Fluid		Brake Fluid	
Auxiliary axle(s)		Windshield washer fluid level	

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Lubrication VN, VHD

Chassis Lubrication

DANGER

Before working on or servicing 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.

General lubrication includes lubricating all the grease fittings in the drivetrain, front and rear suspensions, power steering, and front axle, using a grease gun.

Grease the chassis every 15,000 miles (24,000 km). However, if the vehicle is in a demanding application or running in a dirty or corrosive atmosphere, adjust the lubrication intervals to reflect heavy-duty use. For example, if driven in heavy stop-and-go traffic with a lot of maneuvering, the lubrication intervals should be every 10,000 miles (16,000 km) or less.

All lubricating points are found on the chassis lubrication chart on the next page.

Lubricating Grease

Use grease with a lithium base with EP additives and a consistency of NLGI No. 2. The No. 2 consistency is suitable for most temperatures. Use NLGI No. 1 or No. 0 for extremely low temperatures.

Care should be taken not to use any grease other than one with EP additives for the driveshaft. DO NOT use any solid lubricants, such as graphite, copper or molybdenum disulfide.

Lubrication Procedure

Make sure the grease fittings are cleaned off before filling grease. Dirt on the fitting that is not cleaned off is pushed into the part together with the new grease. Always fill grease to the point where old grease and contaminants are forced out from the part and only new grease comes out. If new grease cannot be filled so old grease is flushed out, the part needs to be checked for problems. If a fitting does not accept lubrication due to damage or internal stoppage, replace it with a new fitting.

Note: Think of greasing the same way as an oil change. All old grease should come out and be replaced with new grease.

Where rubber or plastic parts are involved, do not heat part for better grease application.

Remove excess grease from fittings, shackles and other surfaces.

Note: Always grease a Volvo front axle with the wheels on the ground.

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Lubrication Chart Notes

1 **Spring hanger:** Use a lithium based grease with specification API NLGI No. 2. When lubricating the **left** and **right** sides of the **front** springs, lift the axle off of the floor, suspend the frame with axle stands and lower the axle. The spring bushings are now in the position where grease can be added to the contact surfaces.

Note: Always grease a Volvo front axle with the wheels on the ground.

Note: To grease non-Volvo axles, they are typically greased with the wheels on the ground. Consult with the axle manufacturer for the latest recommendation.

2 **Slack adjuster and brake cam:** Use a lithium based grease with EP additives to specification API NLGI No.

Note: If the brake cam seal does not purge, make sure the inner seal does not purge into the brake drum and onto the brake linings.

3 **Steering gear:** Use a lithium based grease with specification API NLGI No. 2. Only use a hand operated grease gun. The high pressure from an air operated grease gun will damage the seal.

4 **Draglink and Steering Shaft.** Use a lithium based grease with specification API NLGI No. 2.

5 **Kingpin, upper and lower:** Use a lithium based grease with specification API NLGI No. 2.

Note: Always grease a Volvo front axle with the wheels on the ground.

Note: To grease non-Volvo axles, they are typically greased with the wheels on the ground. Consult with the axle manufacturer for the latest recommendation.

6 **Tie-rod:** Use a lithium based grease with specification API NLGI No. 2.

Note: Volvo axles may use a greased-for-life tie-rod. No provisions for adding grease are available.

7 **Brake fluid and clutch reservoir.** Check the fluid level in the reservoir. Add brake fluid if necessary. Use only DOT 4 brake fluid in the clutch release system. Mixing DOT 4 brake fluid with petroleum based oil will cause seal damage which will cause leakage.

8 **Clutch bearing linkage:** Use a lithium based grease with EP additives to specification API NLGI No. 2.

9 **U-Joints:** Use a lithium based grease with EP additives to specification API NLGI No. 2.

Note: Ensure that grease purges out of all four seals of the U-joints.

10 **PTO/Hydraulic reservoir.**

11 **T-Ride bogie beam (48K-70K suspension):** Use a lithium based grease with EP additives to specification API NLGI No. 2. Make sure the grease purges out of both the outer and inner seals. If necessary, adjust the lubrication schedule to include greasing the bogie bearing as often as daily, in applications where the bogie runs in corrosive conditions or is submerged in water.

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Lubrication Chart notes Continued.

12 **Coolant level:** Add coolant if necessary. Only use pre-mixed clean water and antifreeze in a 50/50 mix. Add only the same type antifreeze, that is: extended life or standard.

13 **Steering assist cylinder:** Use a lithium based grease with EP additives to specification API NLGI No. 2 to grease both ball joints.

14 **Power steering fluid:** Check the fluid in the reservoir with the dipstick. Add oil if necessary. Use ATF Dexron® III. Change fluid every 150,000 miles (240,000 km). Change filter every year. Use a lithium based grease with specification API NLGI No. 2.

15 **Front oil lubricated wheel bearings:** There is no set change interval. Change the oil (or grease) only in connection with work on the hub or if dirt is found in the lubrication. Use motor oil SAE 30. Lubricate both the right and the left wheel bearings.

16 **Engine oil and filter:** For oil change see schedule on page 63 to page 67.

17 **Windshield washer fluid level.**

18 **Automatic and manual transmission:**
Automatic transmission: Use Dexron® III Automatic Transmission fluid. See the manufacturer's Operator's Manual for intervals and quantity.

Manual transmission: Use a mineral or synthetic oil. Check oil level periodically. Level should be to the bottom of the inspection hole.

19 **Auxiliary axle(s):** If equipped with auxiliary lift axles use a lithium based grease with specification API NLGI No. 2. Also, lubricate the Brake, Cams, Slack adjuster and Tie-rod ends.

20 **Rear axle:** Check the oil level in the differential by removing the fill/level plug in the housing. The oil should be level with the bottom of the fill/level plug hole. Add oil if necessary.

21 **Fifth wheel:** The fifth wheel and slider assemblies should always be re-lubricated after steam cleaning or at least every 15,000 miles (24,000 km).

Note: A heavy coating of grease is recommended on the fifth wheel plate by using the grease fitting under the fifth wheel top plate or by direct application to the top of the plate. The fifth wheel can be greased with the trailer connected, by using the grease fittings under the top plate.
Grease the support brackets trunnions through the fittings over the bracket pins.
Grease the fittings at the saddle plate (1 each side) and the saddle plate lock pockets (1 each side).

Note: See page 142 to page 146 for oil types.

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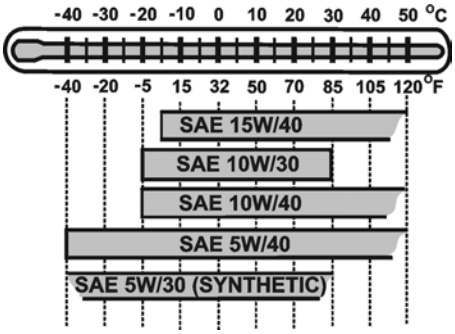
Viscosity and Capacity Tables

Volvo Engine D12D

For oil change intervals, see page 62 and page 63	
First oil and filter change	After 1 month or 6,000 miles (10,000 km)
Capacity (including filters)	
D12 service	37 quarts (35 liters)
Oil volume between high and low on dipstick	7.5 quarts (7.0 liters)



1 Only completely synthetic and/or VDS/VDS-2 oils.

2 Only VDS-2 oils.

Cooling System Capacity*

VN, D12D	43.5 liters (11.50 US gal.)
VHD, D12D	39 liters (10.30 US gal.)

* approximate volumes

Clutch Hydraulic System

Clutch system fluid	brake fluid according to DOT 4 (SAE J 1703)
Replacement interval	every two years

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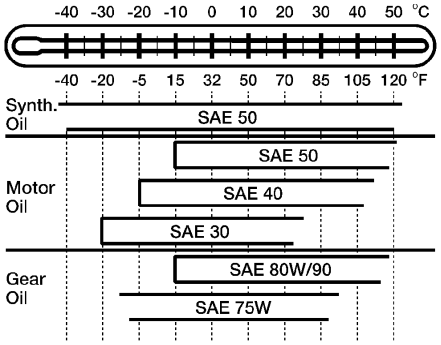
Fuller Transmission 9,10, 13, 15 and 18–speed

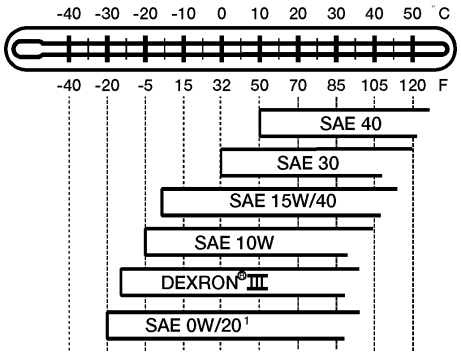
For oil change intervals, see the manufacturer's Oparator's Manual	
Capacity:	
9-speed	13.5 quarts (12.0 liters)
10, 13, 15 and 18-speed	14.0 quarts (13.0 liters)



W1000179

Allison Automatic Transmission

For oil change intervals, see the manufacturer's Operator's Manual.	
Approximate Capacity:	
MD3560P 5-speed MD3060P 5-speed	19.0 quarts (18.0 liters)
HD4060P 5-speed HD4560P 5-speed	39.0 quarts (37.0 liters)
Oil drain plug torque	18-24 ft-lb (25-32 Nm)



W1000143

1) "Arctic" as defined by MIL-L-46167B

Note: Fluid may require change sooner than listed intervals depending on operating conditions. Fluid must also be changed whenever there is evidence of dirt or high temperature condition as indicated by discoloration, strong odor or fluid analysis.

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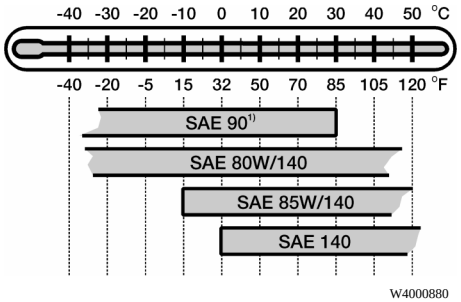
Volvo Tandem CTEV87 and RT3210

Oil type:	
Petroleum based oil	API-GL5, MIL-PRF-2105E
First oil change	After one month or 6,000 miles (10,000 km)
Normal oil change interval	every 12 month or 75,000 miles (120,000 km)
Synthetic lubricant	NOT USED
Capacity:	
CTEV87	
front tandem, EV87	21.0 quarts (20.0 liters)
rear tandem	9.5 quarts (9.0 liters)
RT2610	
front tandem	24.5 quarts (23.0 liters)
rear tandem	20 quarts (19.0 liters)
hub reduction, each hub [1]	3.7 quarts (3.5 liters)
RT3210	
front tandem	29.5 quarts (28.0 liters)
rear tandem	24.5 quarts (23.0 liters)
hub reduction, each hub[1]	3.2 quarts (3.0 liters)

[1] Fill each hub before filling the rear axle.



1) For very hard or continuous operation above an altitude of 6,000 ft (2,000 m) above sea level, a viscosity of SAE 140, SAE 80W/140 or SAE 85W/140 is recommended for use instead of SAE 90.

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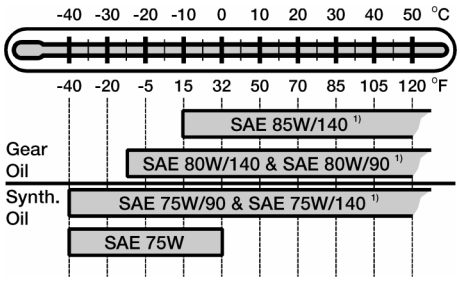
Meritor Single RS23, 25, 26 and 30
Meritor Tandem RT40, 44 and 46

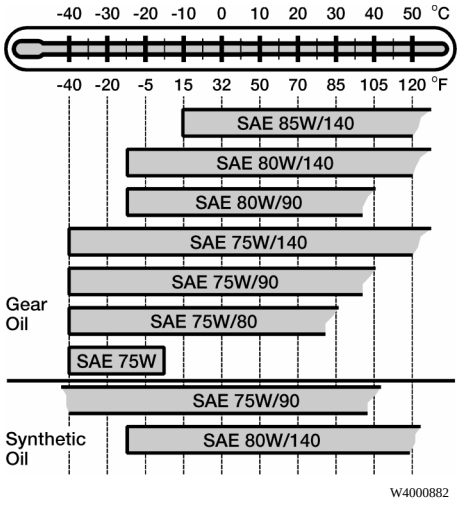
For oil change intervals, see the manufacturer's Operator's Manual	
Capacity:	
RS23-160	20 quarts (19 liters)
RS23-185	23.5 quarts (22.5 liters)
RT40-145, front tandem RT40-145, rear tandem	15 quarts (14 liters) 13 quarts (12 liters)



1) Select viscosity from the table above. Temperatures refer to stable ambient temperature readings. There is no upper limit to these outside temperatures but the axle sump temperature **MUST NEVER EXCEED** 250 °F (120 °C).

Eaton Single 23080, 23105, 26105 and 30105
Eaton Tandem DS405, DD405, DDH44 and DS462

For oil change intervals, see the manufacturer's Operator's Manual	
Capacity:	
23080	20 quarts (19 liters)
23105 and 26105	28 quarts (26.5 liters)
DD404, front tandem DD404, rear tandem	15.5 quarts (14.5 liters) 14 quarts (13 liters)
DS404, front tandem DS404, rear tandem	15.5 quarts (14.5 liters) 14 quarts (13 liters)



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Steering Hydraulic System

Fluid type	Automatic Transmission Fluid (ATF) Dexron® lll
Change interval	every 150,000 miles (240,000 km)

Hubs

Oil type[1]	**Temperature**
Motor oil API CD or CE, SAE 30, 15W40 or synthetic	Minimum: -15 °F (-25 °C) Maximum: No limit
Gear oil API GL5, SAE 75W90	Minimum: -40 °F (-40 °C) Maximum: No limit

[1]For axles with hub reduction, see page 144

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Service Assistance and Manuals

Your Volvo Truck dealer is trained and equipped to perform expert service on your Volvo vehicle. Your dealer has direct access to Volvo Trucks North America, Inc. for technical help, parts or service information.

There is also a direct number to Volvo Action Service (VAS), staffed 24 hours a day, if you are in need of assistance. The number to the Customer Support Center is:
1 (800) 528–6586 (or (800) 52–VOLVO).
Also on the internet:
www.vas.volvo.com

VAS offers:

Delivery Assurance	If you need roadside assistance, VAS can arrange for load forwarding or equipment rental.
Personal Assurance	Trained staff for handling any vehicle problems.
Uptime Assurance	VAS will locate the nearest service provider and guarantee payment so you can get on the road as soon as possible.
Price Assurance	VAS audits service and parts billing to ensure guaranteed labor rates and preferred parts pricing for Volvo components.

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148 Literature

To order a single Service Manual or a Service Manual Set for your vehicle, contact your authorized Volvo Truck dealer.

In order to process the request correctly, please give the model, year and VIN (**last six digits of VIN**). For VIN location, refer to the General Information section, under Vehicle Data, in the VN/VHD Operator's Manual.

Service Manual prices will vary depending on the make and model of engine in the vehicle. (A Cummins engine manual is included in your introductory owners package).

Note: Please allow 30 days for delivery of Manuals.

Name	Company
Address	
CSZ (Province, Postal Code)	
Vehicle Model	Telephone/Fax
Model Year	VIN
Item 1:	
Item 2:	
Item 3:	
Item 4:	
Item 5:	

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Scheduled Services

The vehicle had a pre-delivery inspection before being delivered to you, the customer. Regular maintenance inspections should be continued. The maintenance program and lubrication intervals that are listed in this manual may not suit your operation. Contact your nearest Volvo dealer, who can help with designing a maintenance program that works in your application.

For regular service or maintenance, call the dealer in advance and arrange for a service appointment. This gives the dealer time to schedule the correct equipment and provide a trained technician to service the vehicle. Setting an appointment can decrease vehicle downtime.

When in for service at an authorized dealer, ask for outstanding safety related recalls that relate to the vehicle. This service is available only at an authorized dealership.

Note: It is strongly recommended that you do not attempt to service, repair or maintain the vehicle yourself unless you are fully trained and have the proper tools, equipment and parts. Some procedures are better performed by your Volvo Truck dealer who has the proper equipment and trained technicians.

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Work C	eted	Preventive Maintenance (See local dealer for Service Information in group 17, "Preventive Maintenance Basic Service VN, VHD VERSION2" and group 17, "Preventive Maintenance Annual Service VN, VHD VERSION2.")	Sched-uled Ser-vice Date	Vehicle Age at Service
Date	ileage			

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Work C	eted	Preventive Maintenance (See local dealer for Service Information in group 17, "Preventive Maintenance Basic Service VN, VHD VERSION2" and group 17, "Preventive Maintenance Annual Service VN, VHD VERSION2.")	Sched-uled Ser-vice Date	Vehicle Age at Service
Date	ileage			

Repair Record

Keep track of repairs being made. This helps over the lifetime of the vehicle to spot trends that can be used to alter maintenance schedules, for example.

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Repair Record

Date	Mileage	Work Order or Invoice No.	Dealer	Notes

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Repair Record

Date	Mileage	Work Order or Invoice No.	Dealer	Notes

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Repair Record																			
Date	Mileage	Work Order or Invoice No.	Dealer	Notes															

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Repair Record

Date	Mileage	Work Order or Invoice No.	Dealer	Notes

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Tire Record

Tire Hints

Hints on How to Avoid Unnecessary Tire Wear

- Maintain correct tire pressure
- Check the tire pressure when the tires are cold
- Check that valve caps are not missing
- Keep the wheels balanced
- Tire wear increases with speed
- Overloading not only decreases tire life but also creates a hazard
- Incorrect front end alignment causes increased wear
- Unnecessary tire rotation may cause excessive wear

Note: A cold weather initial driving period will increase the life of new or retreaded tires. Dual mounted wheels should always be of the same type and diameter (maximal diameter difference allowed is 1/4 in. [6 mm]).

VTNA is committed to repair procedure 642 (RP 642), American Tire Association (ATA) and The Maintenance Council (TMC).

Representatives from VTNA actively participated, along with twenty-two companies, in developing recommended practice 642 entitled “Total Vehicle Alignment:” Recommendations for Maximizing Tire and Alignment related Component Life.” Recommended Practice 642 (RP 642) is published by the Maintenance Council, American Trucking Associations, Inc.

Companies that participated in the development of RP 642 are listed in the RP.

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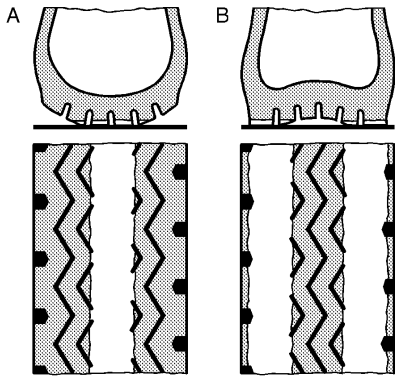
Typical Wear Patterns

Incorrect Air Pressure

A Too high air pressure gives rapid wear in the middle.

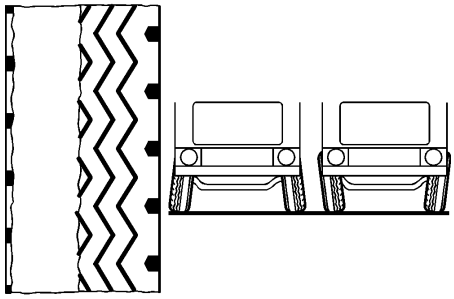
B Too low air pressure gives rapid shoulder wear.



T1006457

Incorrect Camber

Incorrect camber gives abnormal wear on one half of the tire.



T1006458

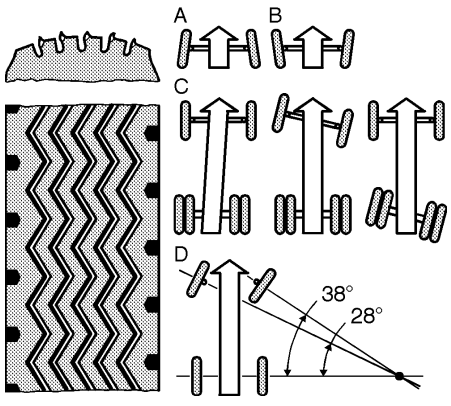
Incorrect Toe and Axle Alignment

A Incorrect toe-in.

B Incorrect toe-out.

C Out-of-line axle

D Steering arm defect



T1006459

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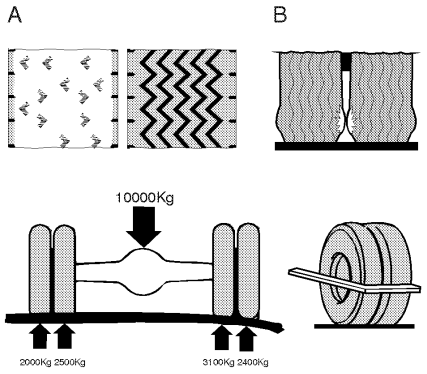
Dual Wheel Mounting

A Excessive road camber, different types of tire, different circumference or off-center loading gives faster wear on one tire.

B Too low air pressure, mismatched rims for the tire type and dimension, excess flexing in tire wall, or different types of tires in inner and outer tires gives contact wear.



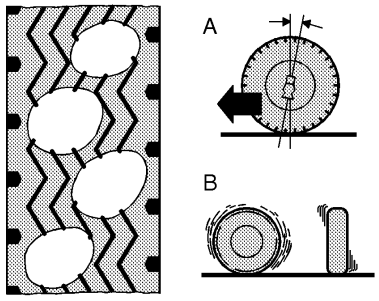
T1006718

Incorrect Caster and Imbalance

A Caster angle.

B Imbalance.

Also rapidly wears the mechanical parts of steering linkage, kingpin and wheel bearing.



T1006460

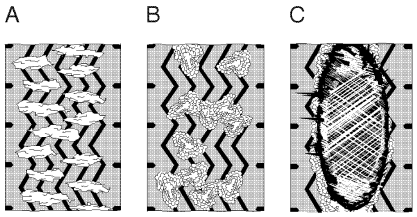
Cuts in the Tire Tread

A Cuts.

B Flaking cuts.

C Rubber flaking.

Cuts are due to poor roads, air pressure too high or incorrect tire type.



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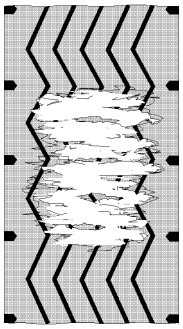
Spot Wear

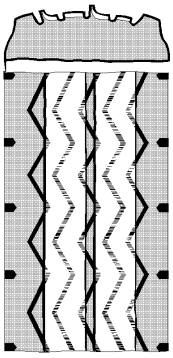
Sudden braking, locking brakes or out-of-round brake drums gives spot wear.



T1006721

Feathered Edges

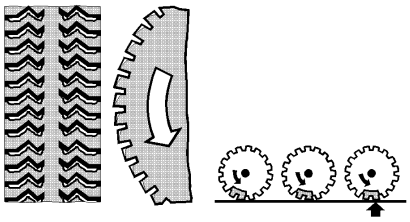
Normal occurrence on non-driving wheels on good roads and high mileage.



T1006722

Cupping

Cupping is a normal occurrence that depends on the tread pattern; the higher the load, the greater the wear.



T1006723

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AXLE LOAD/TIRE PRESSURE

Axle Load lb (kg)	Recommended tire pressure psi (kPa)
_____	1 ---------- 2
_____	3 4 ---------- 5 6
_____	7 8 ---------- 9 10
_____	11 12 ---------- 13 14
_____	15 16 ---------- 17 18

W1000109

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Tire Record				
Size	**Ply Rating**	**Make**	**Type**	**Serial No.**

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Tire Record					
Date Installed	Date Removed	Mileage		Tire Mileage	Notes
		At Installation	At Removal		

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Tire Record				
Size	**Ply Rating**	**Make**	**Type**	**Serial No.**

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Tire Record					
Date Installed	Date Removed	Mileage		Tire Mileage	Notes
		At Installation	At Removal		

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Tire Record				
Size	**Ply Rating**	**Make**	**Type**	**Serial No.**

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Tire Record					
Date Installed	Date Removed	Mileage		Tire Mileage	Notes
		At Installation	At Removal		

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Fuel and Oil Record

Keeping track of the fuel and oil consumption gives a record of what is normal for the vehicle. This can be compared with other vehicles in the same service application to indicate what is normal fuel and oil consumption for a certain application.

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Date	Mileage	Filled			Notes
		Fuel Qty.	Oil Qty.	SAE No.	

NEED THESE PARTS? Get a fast quote from Pro Gear >>

Date	Mileage	Filled			Notes
		Fuel Qty.	Oil Qty.	SAE No.	

NEED THESE PARTS? Get a fast quote from Pro Gear >>

Date	Mileage	Filled			Notes
		Fuel Qty.	Oil Qty.	SAE No.	

NEED THESE PARTS? Get a fast quote from Pro Gear >>

Date	Mileage	Filled			Notes
		Fuel Qty.	Oil Qty.	SAE No.	

NEED THESE PARTS? Get a fast quote from Pro Gear >>

Date	Mileage	Filled			Notes
		Fuel Qty.	Oil Qty.	SAE No.	

NEED THESE PARTS? Get a fast quote from Pro Gear >>

Date	Mileage	Filled			Notes
		Fuel Qty.	Oil Qty.	SAE No.	

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Date	Mileage	Filled			Notes
		Fuel Qty.	Oil Qty.	SAE No.	

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- If you need assistance on the road or if you need service repairs, contact the VAS support center. VAS is available 24 hours per day, 7 days per week at **1-800-528-6586**.
- Please report the specific nature of the service problem to the Volvo Customer Support Specialist, who will answer your questions and arrange for the assistance you need.

Truck Model & Serial _____

Engine Model & Serial _____

Transmission Model & Serial _____

Rear Axle Model & Serial _____

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