

A close-up photograph of several interlocking metal gears. The gears are dark, possibly black or dark grey, with a metallic sheen. The teeth of the gears are sharp and well-defined. The background is a solid, bright green color. The lighting creates highlights on the edges of the gears, emphasizing their three-dimensional form.

**OPERATOR'S MANUAL
ENGINE MAINTENANCE
PREVOST BUS**

VOLVO D13F ENGINE

Foreword

This manual contains information concerning the operation and function of the Volvo D13F engine. Please keep this manual in the vehicle at all times.

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

Volvo Group North America, Inc.

Greensboro, NC USA

Order number: PV776-20158786

© 2008 Volvo Group North America, Inc., Greensboro, NC USA

All rights reserved. No part of this publication may be reproduced, stored in retrieval system, or transmitted in any forms by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written permission of Volvo Group North America, Inc.

Contents

Volvo Engines	1
Introduction	1
Fuel	1
Engine Oil	1
Engine Operation	2
Engine Overview	4
Engine Overview	5
Exhaust Aftertreatment System	6
Safety Information	6
Description	7
Exhaust Aftertreatment System Icons	7
Operation	8
Regeneration	8
Aftertreatment System Maintenance	9
Engine Brake	10
Engine Maintenance Intervals	11
Oil Change Intervals	12
Cooling System	12

Safety 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 manual. Be certain that you fully understand and follow all safety warnings.

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

The following types of advisories are used throughout this manual:



DANGER

Danger indicates an unsafe practice that could result in serious personal injury or death. A danger advisory banner is in **white** type on a **black** background with a **black** border.



WARNING

Warning indicates an unsafe practice that could result in personal injury. A warning advisory banner is in **black** type on a **gray** background with a **black** border.



CAUTION

Caution indicates an unsafe practice that could result in damage to the product. A caution advisory is in **black** type on a **white** background with a **black** border.

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

Introduction

The Volvo D13F engine meets the emissions standards which apply to all heavy-duty diesel engines built after January 1, 2007 for on-highway vehicles. The 2007 standards reduce allowable emissions of nitrogen oxides (NOx) by 50% and emissions of particulates (soot) by 90% from previous levels.

Fuel



CAUTION

Diesel engines for 2007 and later model year vehicles are designed to operate only with Ultra Low Sulfur Diesel (ULSD) fuel. Use of fuel other than ULSD will reduce the efficiency and durability of the engine, permanently damage the advanced emission control systems, reduce fuel economy and possibly prevent the engine from running at all. Manufacturer's warranties are likely to be rendered void by usage of improper or incorrect fuel, and usage of fuels other than ULSD fuel in diesel-powered vehicles is illegal and punishable with civil penalties. Use of fuel additives to compensate for the lower sulfur content is NOT recommended by Volvo.

Engine Oil

VDS-4 or EO-O Premium Plus diesel engine oil is mandatory for use in all 2007 emission compliant Volvo engines. Chassis equipped with a 2007 emission compliant engine, which can be identified by the presence of a

Key Features of the D13F Volvo Engine:

- Improved Fuel Economy
- Extended Oil Drain Intervals
- Improved Cooling Capacity
- Low Maintenance Diesel Particulate Filter
- Enhanced Engine Brake Performance

Fuel sold for use in diesel-powered engines for 2007 and later model year vehicles may only contain a maximum sulfur content of 0.0015% by weight. This was done to reduce particle emissions in the exhaust.

Diesel Particulate Filter (DPF), also require the use of Ultra Low Sulfur Diesel (ULSD) fuel. EO-O Premium Plus oils exceed the new API service category CJ-4.

2 Volvo Engines

Engine Operation



DANGER

Do not use ether or other combustible starting aids in any Volvo engine. Introduction of ether or similar starting aids could cause a fire or explosion resulting in severe property damage, serious personal injury or death.



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.

Note: Some starters are equipped with starter protection. If the engine is running, the starter temperature is too high or the transmission is not in neutral, starter engagement is inhibited.

Allow the engine to slow down and idle for 3 to 5 minutes before shutting it off. This allows the turbo to slow down and the cooling system to dissipate the engine heat. Switch the engine off by turning the ignition key to the OFF position.



CAUTION

Shutting off an engine immediately after high speed or full load operation can damage the turbo and cause heat stress in the engine. Always let the engine idle for 3 to 5 minutes before shutting it off.

Engine Shutdown System



DANGER

Failure to take the necessary precautions when the STOP telltale is on can result in automatic engine shutdown and the loss of power steering. Vehicle crash can occur.



W3005171

The engine shutdown system will automatically derate or stop the engine when one or more of the conditions listed below reaches a critical stage:

- High Coolant Temperature
- Low Oil Pressure
- Low Coolant Level
- High Crankcase Pressure
- High Diesel Particulate Filter Soot Level

When the shutdown is activated, the telltales come on along with display symbols and the buzzer is also activated. After a brief time, the engine shuts down. Find a safe place to pull off the road as soon as possible.

After the engine has been shut down by the system, turn the ignition key to the off position. If necessary, the engine can be restarted for a brief time so that the vehicle may be pulled off the road.

The alarm will remain activated until repairs have been made to correct the problem that caused the shutdown.



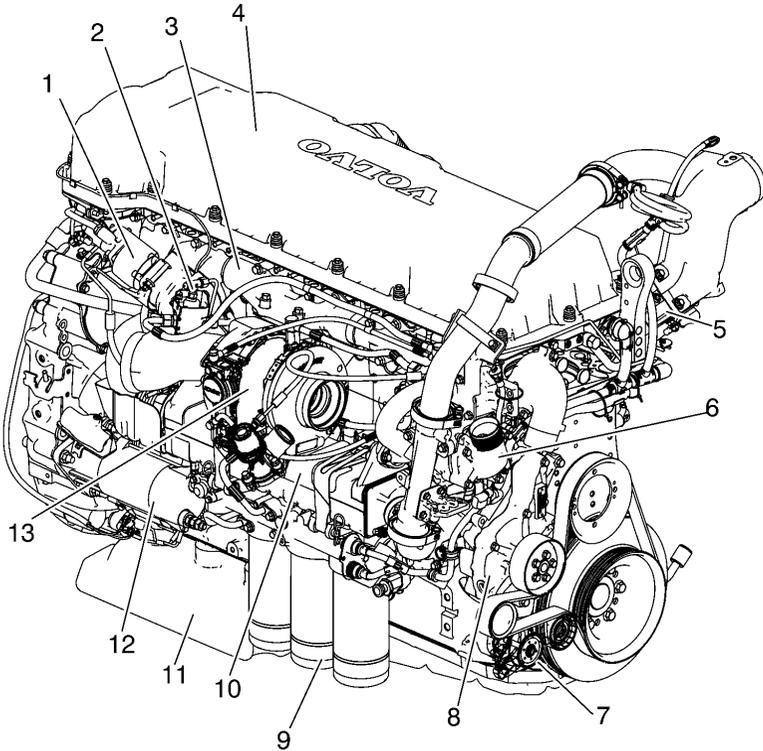
CAUTION

Continuously restarting the engine once the shutdown system is active may result in severe engine damage.

Refer to the Prevost manual for information about the display symbols.

4 Volvo Engines

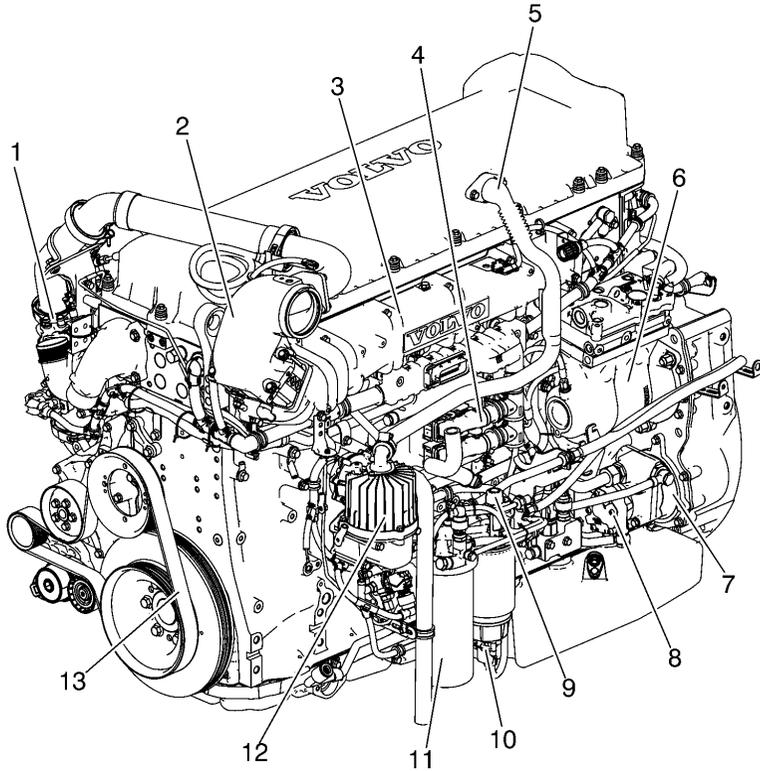
Engine Overview



W2006596

- | | | | |
|---|------------------------------|----|---------------|
| 1 | EGR Valve | 8 | Coolant Pump |
| 2 | Aftertreatment Fuel Injector | 9 | Oil Filters |
| 3 | Exhaust Manifold | 10 | EGR Cooler |
| 4 | Valve Cover | 11 | Oil Pan |
| 5 | Engine Preheater Element | 12 | Starter Motor |
| 6 | Thermostat Cover | 13 | Turbocharger |
| 7 | Belt Tensioner | | |

Engine Overview



- | | | | |
|---|--------------------------------------|----|-----------------------|
| 1 | Venturi Pipe | 8 | Fuel Pump |
| 2 | EGR Mixing Chamber | 9 | Hand Primer |
| 3 | Intake Manifold | 10 | Fuel/Water Separator |
| 4 | Engine Electronic Control Unit (ECU) | 11 | Fuel Filter |
| 5 | Breather Tube | 12 | Crankcase Ventilator |
| 6 | Air Compressor | 13 | Fan/Coolant Pump Belt |
| 7 | Power Steering Pump | | |

W2006598

Exhaust Aftertreatment System

Safety Information

The exhaust aftertreatment system utilizes technology that oxidizes trapped particles of unburned hydrocarbons thereby reducing emissions. This oxidation occurs during the regeneration process. While regeneration is occurring, very high exhaust gas temperatures will occur. In some vehicles, regeneration can occur when the vehicle is stationary.



DANGER

Exhaust gases and components can be at extremely high temperatures during regeneration. When parking the vehicle, keep away from people, or any flammable materials, vapors, or structures.



DANGER

The temperature of the exhaust system components during the regeneration process can exceed 500 degrees C (1000 degrees F). Various factors (including ambient temperature and duration of the regeneration process) determine when these components will return to normal operating temperature after regeneration has completed. Be extremely careful around these hot components. Contact with these components can result in serious personal injury.

Description



CAUTION

Use of diesel fuel other than ULSD and engine oils other than VDS-4 or EO-O Premium Plus, will adversely affect performance, efficiency and durability of the DPF system and the engine, to the point where the engine may not run at all. Manufacturer's warranties can also be rendered void due to usage of improper fuel. Unapproved fuel additives (including engine oil) are NOT permitted. Blends of No. 1D and No. 2D grades of ULSD are recommended and allowable for cold weather operations.

The exhaust aftertreatment system virtually eliminates exhaust smoke. Exhaust vapor (water condensation) may be visible during a cold start. If exhaust smoke is visible during

engine operation, this indicates a problem with the exhaust aftertreatment system. Take the vehicle to an authorized Prevost dealer immediately

Vehicles equipped with a 2007 emission compliant engine have an exhaust aftertreatment system which includes a Diesel Particulate Filter (DPF). The DPF reduces soot and particulate emissions into the atmosphere. The DPF takes the place of the standard muffler. Soot and other particulate matter are collected by a filter where it is eventually oxidized using a regeneration process. Vehicles equipped with a DPF require the use of VDS-4 or EO-O Premium Plus specification high performance diesel engine oil and Ultra Low Sulfur Diesel (ULSD) fuel.

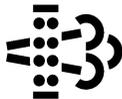
Exhaust Aftertreatment System Icons

There are two aftertreatment icons:

- DPF Regeneration Required
- High Exhaust System Temperature (HEST)

The DPF Regeneration Required icon on the Smart switch illuminates when the diesel particulate filter is becoming full and regeneration is needed. The icon flashes when the filter is full or overfull.

The High Exhaust System Temperature icon in the instrument cluster illuminates when a parked regeneration is initiated. It also indicates high exhaust gas temperature during an at-speed regeneration. When the HEST icon is illuminated, do not park or operate the vehicle near people, or any flammable materials, vapors, or structures.



W3007445
DPF Regeneration Required Icon

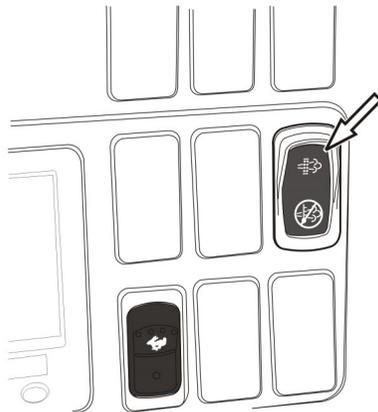


W3007444
High Exhaust System Temperature (HEST) Icon

8 Volvo Engines

Operation

The Smart switch is used to interact with the exhaust aftertreatment system DPF. The switch is located on the left side of the instrument panel.



W2006564

Regeneration



CAUTION

During the regeneration process, the temperature of the exhaust will be elevated. **DO NOT** park the vehicle with the exhaust outlet under low hanging overhead flammable objects such as trees, awnings, etc. that could be damaged by elevated exhaust temperatures.



CAUTION

If the vehicle is in a location that may be hazardous when regeneration begins (i.e., in close proximity to flammable materials or gases, inside tunnels, parked under flammable objects, etc.), the regeneration should be stopped. If regeneration is stopped by the vehicle operator, it should be initiated at a later time when the vehicle is in a safer location. Regenerations that are stopped and never restarted at a later time, however, will require that the vehicle be taken to an authorized Prevost dealer to have the regeneration manually started.

Note: If regeneration occurs during vehicle operation, idle speed may increase when the vehicle is stopped at a traffic light to maintain proper regeneration conditions.

There are two types of regeneration: at-speed automatic and parked. Automatic regeneration only occurs when the vehicle is moving at uninterrupted highway speed. Parked regeneration is manually initiated when the vehicle is stationary. This is the standard configuration. Other configurations are available.

The aftertreatment system is self-monitoring. When the diesel particulate filter is becoming full and regeneration is needed, the DPF Regeneration Required icon on the Smart switch illuminates. Maintain uninterrupted highway speed for an automatic regeneration. To delay the regeneration process, if necessary, press the bottom of the Smart switch. Initiate a parked regeneration at the next stop.

If the regeneration process is not delayed, the regeneration process starts, the DPF Regeneration Required icon turns off and the High Exhaust System Temperature (HEST) icon may illuminate.

Note: It is important to enable regeneration as soon as possible to avoid engine problems. Long-term engine operation with regeneration disabled will result in a loss of engine performance including horsepower, torque and speed derates. Also, the DPF filter will become overloaded with soot and require service.

The regeneration process can be stopped at any time by turning the ignition key to OFF, or by pressing the bottom of the Smart switch.

Regeneration cannot be initiated if it is not required. The following conditions must be met for parked regeneration:

- Parking brake is on and transmission in neutral
- Battery charge is greater than 10 volts
- Engine is running
- Accelerator pedal is released

Aftertreatment System Maintenance

The vehicle must be taken to an authorized Prevost dealer to replace the diesel particulate filter and clean the aftertreatment fuel injector.

- The filter replacement is 400 000 km (250,000 miles) or 4,500 hours, whichever occurs first.
- The aftertreatment fuel injector cleaning interval is 240 000 km (150,000 miles) or 4,500 hours, whichever occurs first.

If the DPF Regeneration Required icon is flashing, the diesel particulate filter is full. Maintain uninterrupted highway speed for an automatic regeneration or move the vehicle to a safe location and initiate a parked regeneration.

If the DPF Regeneration Required icon is flashing and the CHECK light illuminates, the diesel particulate filter is overfull. Engine performance will be limited. To avoid further engine derate, immediately move the vehicle to a safe location and initiate a parked regeneration, or take the vehicle to an authorized Prevost dealer.



If the DPF Regeneration Required icon is flashing and the STOP light illuminates, a serious engine problem has occurred. The diesel particulate filter may be over its maximum capacity and the engine may shut down. The vehicle must be taken immediately to an authorized Prevost dealer for service.



Engine Brake

The engine brake is operated by the Engine Brake buttons on the steering wheel. It works together with the exhaust brake to provide two levels of braking power. There are three Engine Brake buttons on the steering wheel: OFF, (1) LOW and (2) HIGH. When the Engine Brake button (1) LOW is depressed, only the exhaust brake is engaged. When the Engine Brake button (2) HIGH is depressed, both the exhaust brake and the compression brake are activated. The following conditions must be met:

- Engine Brake button (1) LOW or (2) HIGH depressed
- Engine Brake/Transmission Retarder selector switch is set to Engine Brake position (selector switch can be found on the dashboard only if the vehicle is equipped with both systems)
- Vehicle speed over 12 km/h (7.5 mph)
- Engine temperature over 43°C (110°F)
- Accelerator pedal is released
- Engine speed exceeds 1150 rpm

Engine Maintenance Intervals

Component	Operation	Interval
Fuel Filter	Change	Every oil change. Under certain conditions (for example, irregular fuel quality), the fuel/water separator filters may require more frequent replacement.
Water Separator	Filter Change	Every oil change. Under certain conditions (for example, irregular fuel quality), the fuel/water separator filters may require more frequent replacement.
Air Filter	Change	Restriction indicator or 24 months, whichever comes first
Coolant (ELC)	Change	1 000 000 km (600,000 miles) or 48 months, whichever comes first
Coolant Filter (ELC)	Change	240 000 km (150,000 miles) or 12 months, whichever comes first
Valves/Injectors	Initial Adjust	200 000 km (125,000 miles) or 12 months, whichever comes first
Valves/Injectors	Adjust	Every 400 000 km (250,000 miles) or 24 months, whichever comes first
DPF Filter	Change	400 000 km (250,000 miles) or 4,500 hours, whichever occurs first
Aftertreatment Fuel Injector	Clean	240 000 km (150,000 miles) or 4,500 hours, whichever occurs first

Oil Change Intervals

The length of time an engine can operate before an oil change depends on the quality oil used, the type of fuel used, fuel consumption, engine oil consumption, vehicle application, level of dust in the air, and fuel consumption. The change intervals given in this manual are maximum intervals. If the vehicle is operating in heavy-duty

operation, dusty or off-road conditions, etc., reduce the intervals for more frequent oil changes.

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

Engine Operating Condition	Medium	Heavy	Severe
Total Fuel Consumption (mpg)	More than 6	More than 4.7	More than 3.7
Total Fuel Consumption (L/100 km)	Less than 39	Less than 50	Less than 64
Engine Oil and Filter Change Interval, km (miles)	56 000 (35,000)	40 000 (25,000)	24 000 (15,000)
Note: If idle time is greater than 25%, use the next lower drain interval.			

For additional information about oil change intervals, see your Prevost dealer. Also, refer to Bulletin 175-60, Oil and Filters, Volvo Components.

For a complete list of approved oils, see your Prevost dealer. Also, refer to Bulletin 175-61, Approved Oils, Volvo Components.

Cooling System



WARNING

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 and can cause personal injury.



CAUTION

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

Coolant capacity including heating system is approximately 91 liters (24 US gallons).

When the coolant level in the cooling system is low, the CHECK light illuminates. When the coolant level in the cooling system is critically low, the STOP light illuminates. Stop the vehicle in a safe location and add coolant to the cooling system surge tank as soon as possible.

VOLVO

Volvo Group North America, Inc.

P.O. Box 26115 Greensboro, NC 27402-6115

<http://www.volvo.com>