

Document Title: <b>Engine, description</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/11/26</b>
Profile: <b>EXC, EC300D L [GB]</b>			

## Engine, description

Engine D8H is a straight six-cylinder, four-stroke, turbocharged diesel engine with direct injection and intercooler. The engine meets governing legislation according to Tier 4 interim for exhaust emissions.

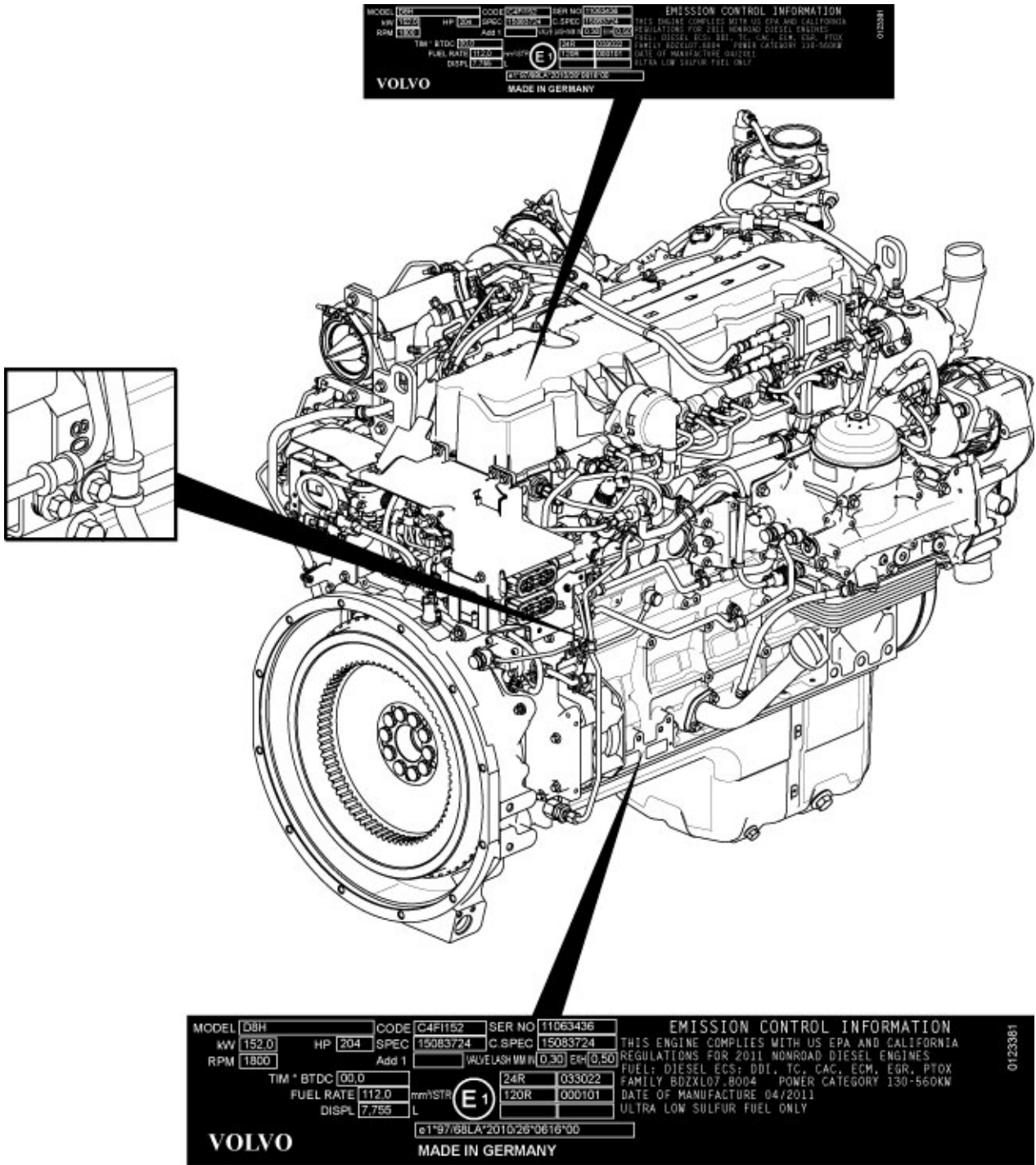
The engine features a Common Rail Fuel System controlled by the Engine Electronic Control Unit (E-ECU). The engine with ACT (Advanced Combustion Technology) features split injection and turbocharger with mechanical wastegate. The Exhaust Aftertreatment System (EATS) is equipped with a Diesel Oxidation Catalyst (DOC) and a Diesel Particulate Filter (DPF) to reduce the particulate content in the exhausts. Cooled Exhaust Gas Recirculation (EGR) reduces NO<sub>x</sub> contents and reduces emissions. All electronic functions in the engine are controlled by Volvo's Engine Management System, EMS2.2.

For more information, see:

- [220 Lubrication system, description](#)
- [230 Fuel system, description](#)
- [250 Inlet and exhaust system, description](#)
- [254 Exhaust Aftertreatment System, description](#)
- [255 Turbocharger, description](#)
- [260 Cooling system, description](#)
- [293 Exhaust Gas Recirculation \(EGR\), description](#)

The cylinders are numbered in sequence, starting at the flywheel. Ignition order: 1-5-3-6-2-4. The engine's rotational direction is counter-clockwise, seen from the flywheel side.

### Engine identification



**Figure 1**  
**Identification plates**

The engine's serial number is stamped on the cylinder block's side. The identification plates on the cylinder block's side and on the valve cover contain model designation, serial number, manufacturing country, recommended fuels, and so on. The identification plates also include emission-related supplementary information. The engine's model designation and serial number must be indicated when ordering spare parts.

### Engine protection

The ECU contains functionality designed to protect the engine from damage during extreme operating conditions or from further damage when an essential engine component fails. There are several proactive functions, and different applications have different functions activated. The functions that can be activated are:

- High coolant temperature

- High inlet manifold air pressure
- High inlet manifold air temperature
- High oil temperature
- Low oil pressure
- Low coolant level
- High temperature of cooled EGR exhausts after the EGR-cooler
- High crankcase pressure
- High temperature of EGR actuator
- High soot load
- High differential pressure across Diesel Particulate Filter (DPF)
- High exhaust temperature
- High ECU temperature
- High DPF temperature
- EATS air pump failure

Various protective actions such as warning lights, engine torque reduction, engine speed limitation, and vehicle speed limitation may be taken when the above functions reach dangerous levels that may damage the engine. In order to always allow the operator to move a machine away from an unsafe situation, there is a delay of at least 30 seconds before the protective actions (such as forced idle and forced shutdown) are activated after a Key-ON. If the engine has been forced to shut down or forced to idle due to an active engine protection function, the operator can obtain a 30 second delay by powering down the EMS with a Key-OFF for 7 seconds and then a Key-ON (the EMS is powered down by the Vehicle-ECU (V-ECU) after the ignition key has been in its OFF position for approx. 7 seconds). In addition to the above protective functions, other software functions may request engine protection, such as:

- High Altitude (ensures that high compressor charge-air temperature is never reached)
- Low Coolant Temp
- Crank Sensor Failure
- Gear Ratio
- Regeneration

### Warning lights

There are two levels for warning lights, an amber caution light and a red stop light.

- The **amber light** indicates a warning situation
- The **red light** indicates that the vehicle must be stopped.

For more information, see [387 Central warning](#).

### Forced Idle

The engine can be forced to idle speed by the engine protection function. Forced idle is active until conditions triggering the problem are back within the normal working range or the EMS is powered down.

### Engine shutdown

The engine can be forced to shut down after conditions have reached levels that may cause engine failure and the machine speed is below a specified value.

### Machine speed and engine speed limits

The engine protection function can limit the machine's speed and/or the engine's rpm.

### Levels of engine protection

Available proactive functions depend not only on the application but also on what level of protection has been activated for the specific machine. Two levels of engine protection are offered; the standard level is Basic protection and the optional level is Extended protection. The general difference between basic and extended engine protection is that no active actions such as forced idle and forced shutdown will be taken in basic engine protection (with the exception of crankcase pressure that can cause shutdown in either setup). Warnings will be given to the operator regardless of engine protection level.

### Parameters

- (MCJ) Trimcode CRIN 3.3 injector cylinder 1
- (MCK) Trimcode CRIN 3.3 injector cylinder 2
- (MCL) Trimcode CRIN 3.3 injector cylinder 3
- (MCM) Trimcode CRIN 3.3 injector cylinder 4
- (MCN) Trimcode CRIN 3.3 injector cylinder 5

- (MCO) Trimcode CRIN 3.3 injector cylinder 6
- (FAU) Automatic engine shut off
- (FAV) Automatic engine shut off, time
- (YA) Idle speed, setting

### Supplementary information

- [200 Component locations](#)

### Function check

- 17030-3 Parameter, programming

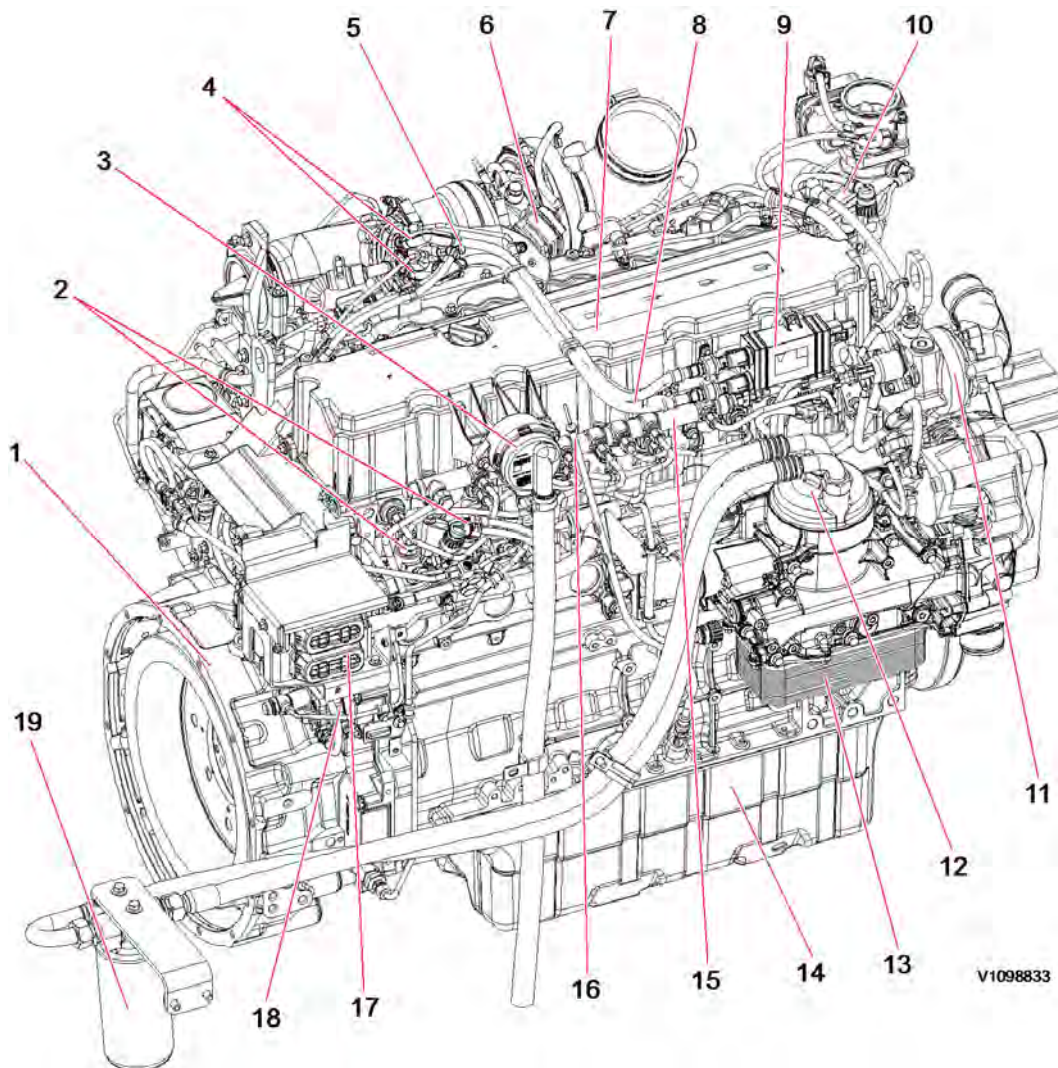
### Diagnostics

Detailed information about the following relevant warnings and error codes is available under the diagnostics tab.

Component	Control unit	Message ID
FX1006	MID128	PID98
	MID128	PID175
SE2203	MID128	PID100
SE2302	MID128	PID97
SE2507	MID128	PID105
SE2508	MID128	PID102
SE2516	MID128	PID412
SE2519	MID128	PID81
SE2603	MID128	PID111
SE2606	MID128	PID110
E-ECU temperature	MID128	PPID55
Emergency stop (Engine shutdown)	MID128	PPID235
Soot load	MID128	PPID326

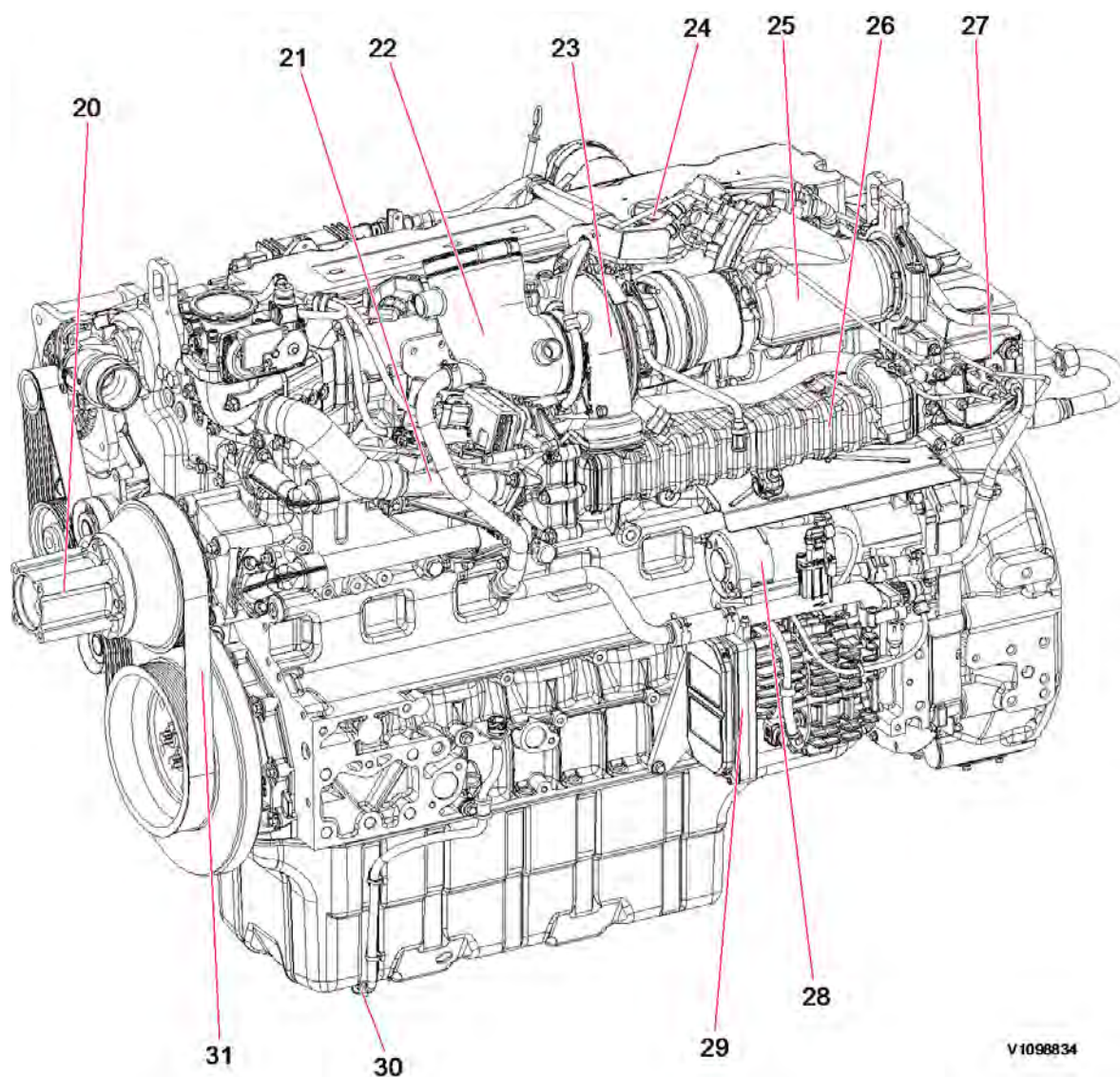
Document Title: <b>Component locations</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/11/26</b>
Profile: <b>EXC, EC300D L [GB]</b>			

## Component locations



**Figure 1**  
**Engine, front side**

1	Flywheel housing	11	Thermostat housing
2	High pressure fuel pump	12	Engine oil remote port
3	Crankcase ventilation duct	13	Engine oil cooler
4	Spark plug	14	Oil pan
5	Glow plug	15	Common rail
6	Turbocharger waste-gate	16	Dipstick gauge
7	Valve cover	17	ECU connecting port
8	Spark plug cable	18	Fuel feed pump
9	Spark plug control unit	19	Engine oil filter



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**Figure 2**  
**Engine, back side**

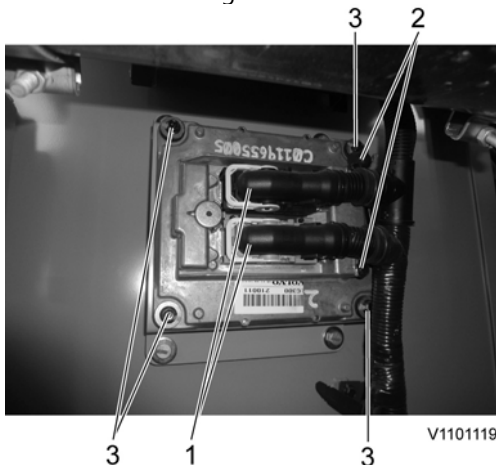
20	Fan pulley	26	EGR cooler
21	EGR Venturi tube	27	EGR actuator
22	Air intake tube	28	Starter motor
23	Turbocharger	29	Electric air pump
24	Engine oil filling port	30	Engine oil level sensor
25	Partial flowburner	31	Fan belt

Document Title: <b>E-ECU, MID 128, changing non-programmed ECU</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/11/26</b>
Profile: <b>EXC, EC300D L [GB]</b>			

## E-ECU, MID 128, changing non-programmed ECU

### Op nbr 200-068

1. Park the machine in the service position A, see [091 Service positions](#).
2. Turn OFF the battery disconnect switch.
3. Download software to VCADS Pro computer for target machine.
4. Connect the VCADS Pro computer to the machine, and perform the operation '28423-7 MID 128 control unit, programming'.
5. When VCADS Pro 'MID 128 ECU, programming' window appears, follow the instructions for replacing E-ECU.
6. Disconnect the wiring harness connectors from E-ECU and remove 2 screws fixing the clamps.



**Figure 1**

1. Connector
2. Screw
3. Screw

#### **NOTE!**

Pull up the locking device to disconnect the connector.

7. Remove 4 screws fixing the E-ECU.
8. Install new E-ECU, and tighten 4 screws.
9. Connect the wiring harness connectors to the E-ECU and tighten 2 screws fixing the clamps.
10. After replacing E-ECU, press OK button of VCADS Pro operation '28423-7 MID 128 control unit, programming'.

Now VCADS Pro starts the programming of software and parameters to the new E-ECU.

**NOTE!**

If not able to read out the parameters with the program operation, the VCADS Pro operation 25438-8 "Nox sensor, age compensation, reset" has to be performed.

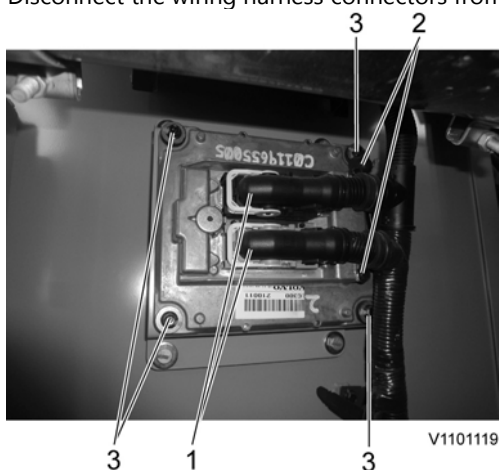


Document Title: <b>E-ECU, MID 128, changing pre-programmed ECU</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/11/26</b>
Profile: <b>EXC, EC300D L [GB]</b>			

## E-ECU, MID 128, changing pre-programmed ECU

### Op nbr 200-070

1. Park the machine in the service position A, see [091 Service positions](#).
2. Turn OFF the battery disconnect switch.
3. Connect VCADS Pro computer to the machine, and perform the operation '17030-3 Parameter, programming'.
4. Use the function 'save all parameters to job card'.
5. Disconnect the wiring harness connectors from E-ECU and remove 2 screws fixing the clamps.



**Figure 1**

1. Connector
2. Screw
3. Screw

#### **NOTE!**

Pull up the locking device to disconnect the connector.

6. Remove 4 screws fixing the E-ECU.
7. Install new E-ECU, and tighten 4 screws fixing the E-ECU.
8. Connect the wiring harness connectors to the E-ECU and tighten 2 screws fixing the clamps.
9. Connect VCADS Pro computer to the machine, and perform the operation 17030-3 Parameter, programming'. Now the customer parameters are changed according to the job card saved at step 2.
10. Perform VCADS Pro operation 25438-8 "Nox sensor, age compensation, reset".

Document Title: <b>VCADS Pro, Operations</b>	Function Group: <b>200</b>	Information Type: <b>Service Information</b>	Date: <b>2014/11/26</b>
Profile: <b>EXC, EC300D L [GB]</b>			

## VCADS Pro, Operations

The following VCADS Pro operations are available for function group 2. Operations used when changing or working on components are mandatory.

### Tests

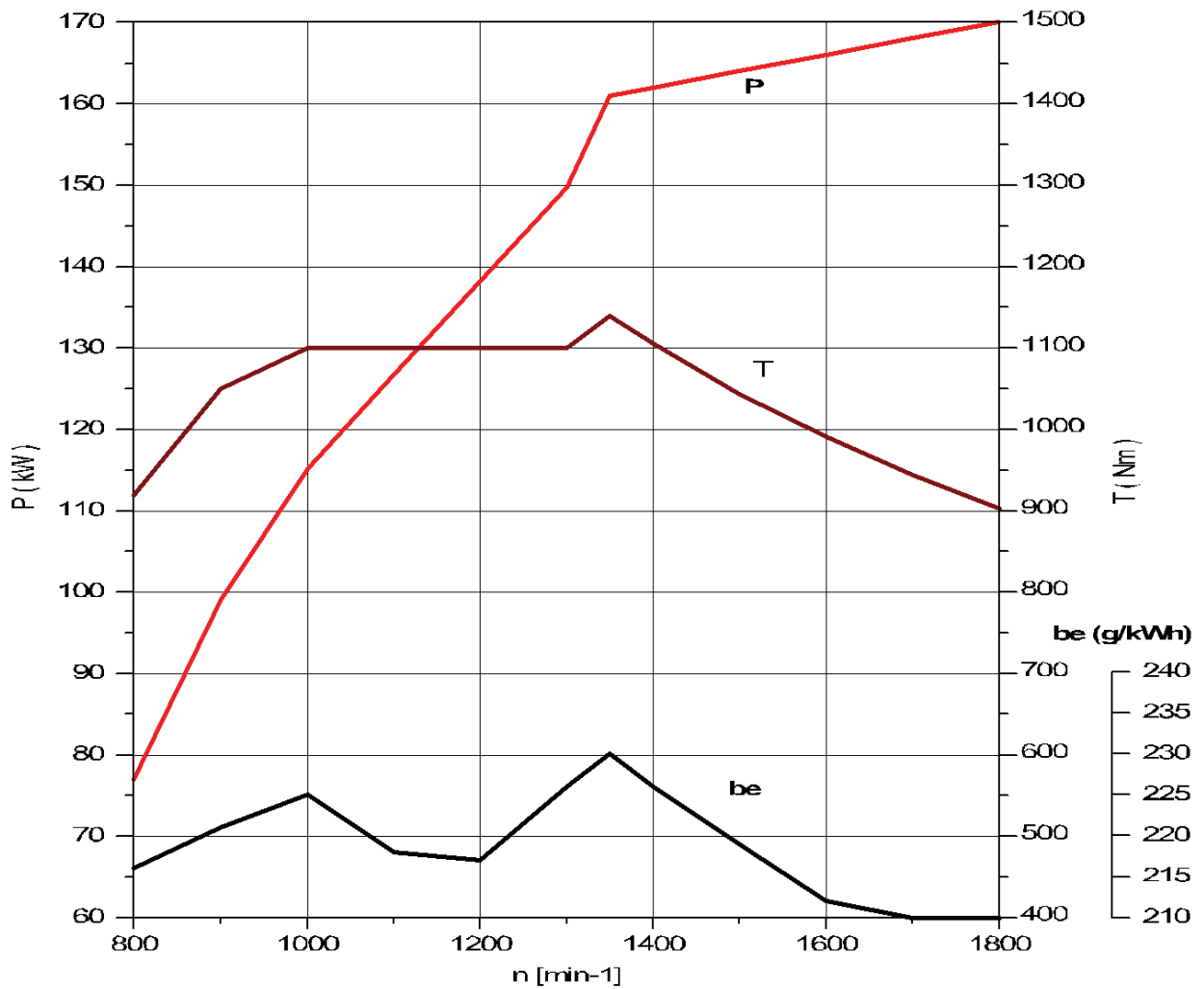
Operation	Application
20046-3 Read out engine information	The operation is used to read out the engine emission and engine certificate information when requested by the customer or other interested parties.
21006-3 Cylinder compression, test	Used when there is a suspicion of fault and/or at abnormal values/readings. This test indicates if there is any deviation in compression in any cylinder in relation to the other cylinders. As a first check this operation is both easy and fast to perform instead of a real compression test.
23017-3 Feed pressure, inspection	Used when there is a suspicion of fault and/or at abnormal values/readings.
23712-3 Injectors shut off, manual	Used when there is a suspicion of fault and/or at abnormal values/readings.
23777-3 Fuel system, check	Check the fuel system on common rail engines. In this test, it is possible to check the engine at different running condition.
25410-3 Air pump exhaust aftertreatment, test	Used when there is a suspicion of fault and/or at abnormal values/readings. Air for combustion and HC injection
25411-3 Burner exhaust aftertreatment, test	Used when there is a suspicion of fault and/or at abnormal values/readings.
25433-3 Fuel system exhaust aftertreatment, bleeding	Used to remove any air in the EATS system.
25438-3, Nox sensor, age compensation, reset	Used to reset the age compensation value stored in the MID 128, E-ECU. A reset is needed either when the E-ECU is replaced and there is no possibility to read out the values from the old E-ECU or when a new Nox sensor is mounted.
25440-3 Fuel pressure, exhaust aftertreatment system, test	The test checks; The fuel supply to the shut off valve, pressure and temperature The pressure after MV1 to the HC injector The pressure after MV2 to the burner
25456-3 Exhaust aftertreatment diagnostics	Perform a simple check of the included components in the exhaust aftertreatment system.
25457-3 Diesel Particulate Filter Service Regeneration	Used when the soot load level becomes higher than what can be removed by the normal regeneration process. See <a href="#">254 Exhaust Aftertreatment System, description</a>
25460-3 Reset soot and ash load	When the diesel particulate filter has been changed, the soot load and the ash load must be reset. The reset is needed to indicate to the system that the filter has been cleaned. The soot load and ash load must only be reset if a clean filter has been installed.
27502-2 Engine speed control, test	Used when there is a suspicion of fault and/or at abnormal values/readings.
28407-3 Sensor values, monitoring	Used when there is a suspicion of fault and/or at abnormal values/readings.
28420-3 Flywheel and camshaft signal, test	Used when there is suspicious of faulty signals or faulty connected sensor.

### Programming

<b>Operation</b>	<b>Application</b>
25801-3 MID 233 Control unit, programming	When changing ACM or only reprogramming. See <a href="#">254 ACM, replacing non-programmed</a>
25802-3 MID 233 Control unit, campaign	
28423-3 MID 128 ECU, programming	When changing ECU or only reprogramming. See <a href="#">200 E-ECU, MID 128, changing non-programmed ECU</a>
28422-3 MID 128 ECU, campaign	

Document Title: <b>Engine characteristic curve</b>	Function Group: <b>210</b>	Information Type: <b>Service Information</b>	Date: <b>2014/11/26</b>
Profile: <b>EXC, EC300D L [GB]</b>			

## Engine characteristic curve



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**Figure 1**  
**Engine characteristic curve, ISO 14396 Gross power**

P	Output power
rpm	Engine speed
T	Torque
be	Fuel consumption

Document Title: <b>Engine, removing</b>	Function Group: <b>210</b>	Information Type: <b>Service Information</b>	Date: <b>2014/11/26</b>
Profile: <b>EXC, EC300D L [GB]</b>			

## Engine, removing

Op nbr 210-070

### **WARNING**

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

### **WARNING**

**Removal of residual pressure from the circuit must be done prior to any maintenance.**

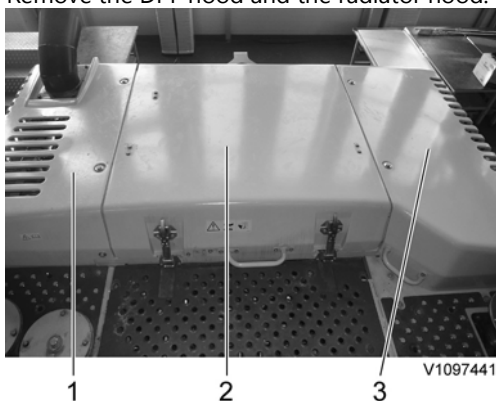
#### **NOTE!**

Cable ties and clamps that secure hoses and electrical wiring must be removed and then replaced when installing components.

#### **NOTE!**

Disconnected hoses, lines and connections must be plugged. Oil that drains from hoses, lines and connections should be collected in a container.

1. Place the machine in the service position B. See [091 Service positions](#)
2. Turn off the battery disconnect switch.
3. Drain the coolant in a collection container. See [261 Coolant changing](#).
4. Remove the DPF hood and the radiator hood.



**Figure 1**

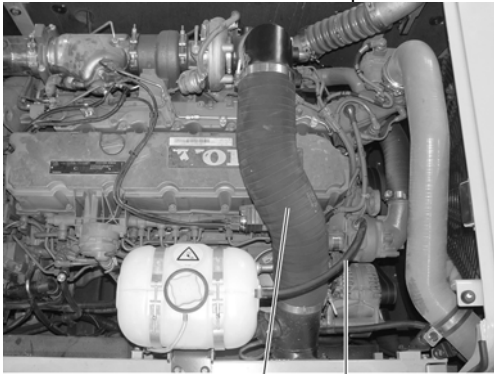
1. DPF hood
  2. Engine hood
  3. Radiator hood
5. Remove the engine room cowl frame with the engine hood using a lifting device.



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**Figure 2**

6. Remove the air inlet hose and expansion tank hose.

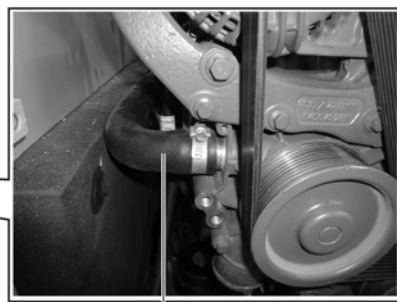
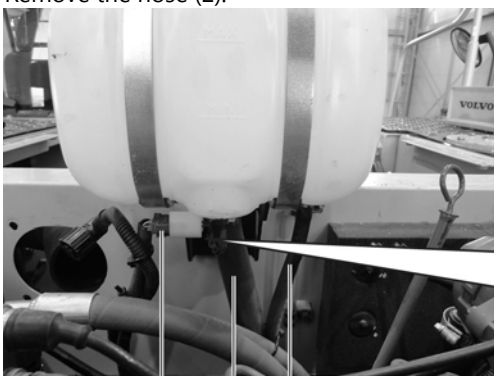


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**Figure 3**

1. Air inlet hose
2. Expansion tank hose

7. Disconnect wire harness connector and the hose (3) from the expansion tank.  
Remove the hose (2).

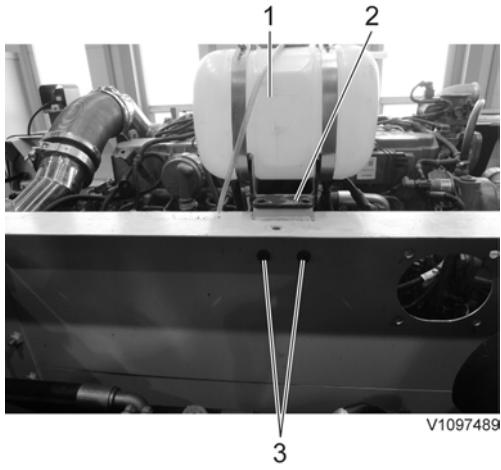


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**Figure 4**

1. Wire harness connector
2. Hose

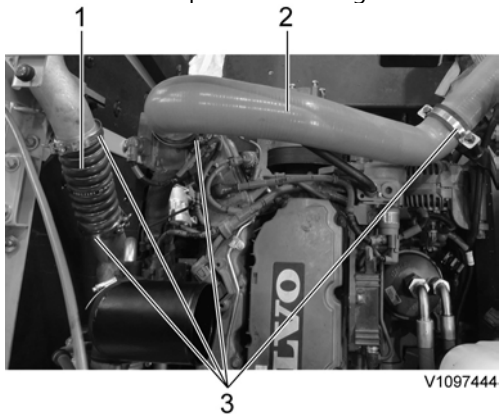
8. Remove the expansion tank with a bracket.



**Figure 5**

1. Coolant expansion tank
2. Bracket
3. Screw

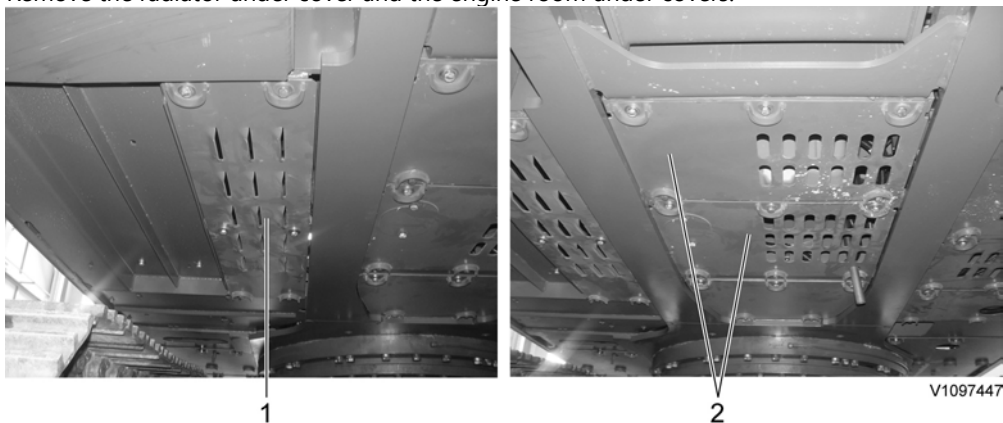
9. Remove the clamps and the charge air cooler tubes.



**Figure 6**

1. Charge air cooler tube (Outlet)
2. Charge air cooler tube (Inlet)
3. Clamp

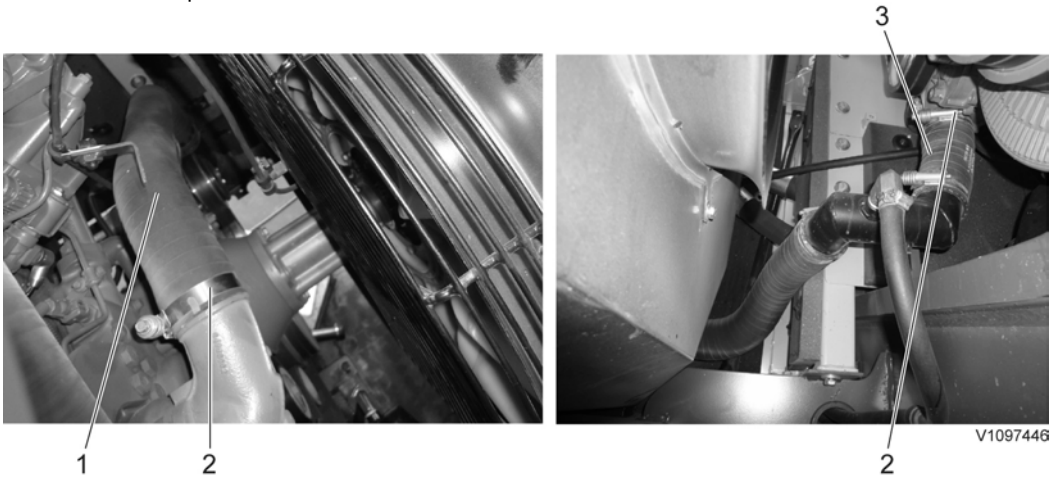
10. Remove the radiator under cover and the engine room under covers.



**Figure 7**

1. Radiator under cover
2. Engine room under cover

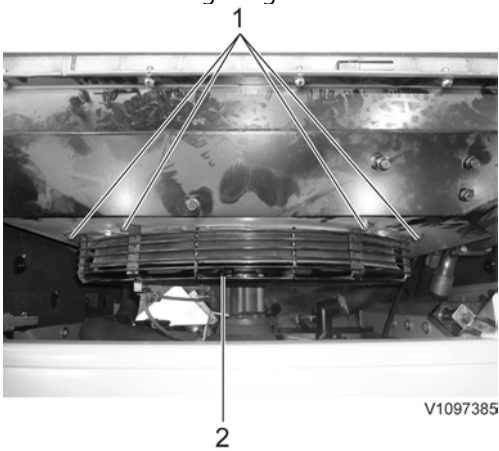
11. Remove the clamps and the radiator hoses.



**Figure 8**

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

12. Remove the cooling fan guard.

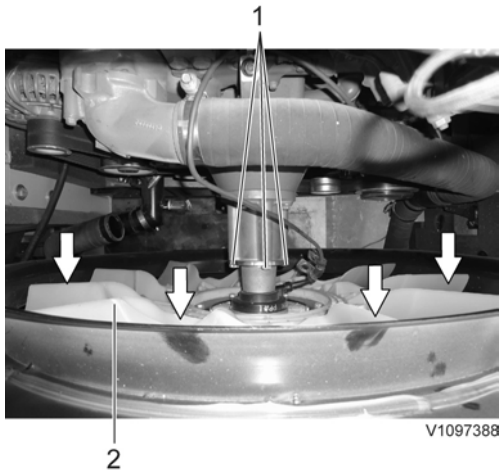


**Figure 9**

1. Screw
2. Cooling fan guard

13. Remove the mounting screws and lay down the cooling fan inside the radiator shroud safely.





**Figure 10**

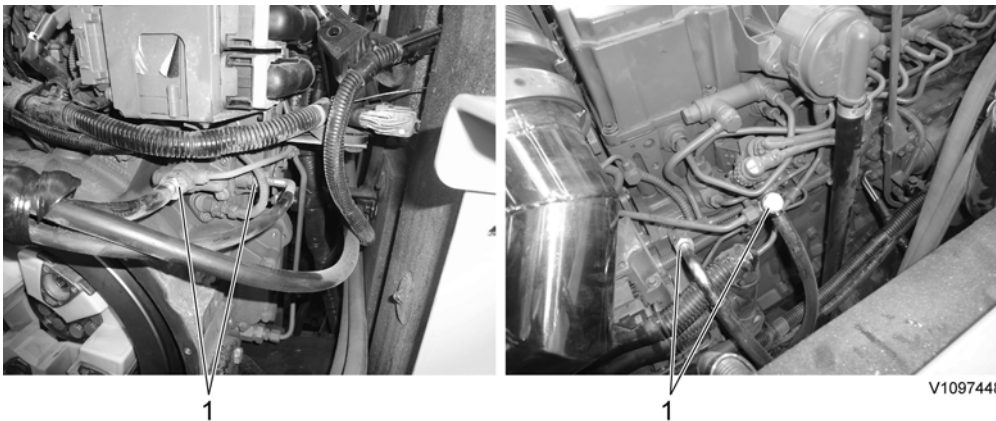
1. Screw
2. Cooling fan

14. Remove the main pump. See [913 Hydraulic pump, replacing](#)

15. Disconnect the fuel line hoses (4 pcs).

**NOTE!**

Ports must be plugged after disassembling hoses.



**Figure 11**

1. Fuel hose

16. Remove the air conditioner compressor belt.



**Thank you very much for reading.**

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