Document Title: **Engine, description**	Function Group: **200**	Information Type: **Service Information**	Date: **2014/7/10**
Profile: **EXC, EC340D L [GB]**			

Engine, description

Engines D11H, D13H, and D16H are straight six-cylinder, four-stroke, direct-injected diesel engines. They are equipped with a single variable geometry turbocharger (VGT) and feature cooled external exhaust gas recirculation (EGR). They have charge-air cooling with mechanically actuated electronically controlled unit injectors, controlled by the EMS-system.
The engines have a one-piece cylinder head with four valves per cylinder and a single overhead camshaft. Rear-mounted timing gear results in a shorter engine and lighter drivetrain installation. The engine brake for articulated haulers, VEB7, does not have the additional Exhaust Pressure Governor, EPG. Sufficient exhaust back-pressure will be controlled via the VGT.

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

For Articulated Haulers:

- 253 Auxiliary brake (engine braking), description

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

Engine identification

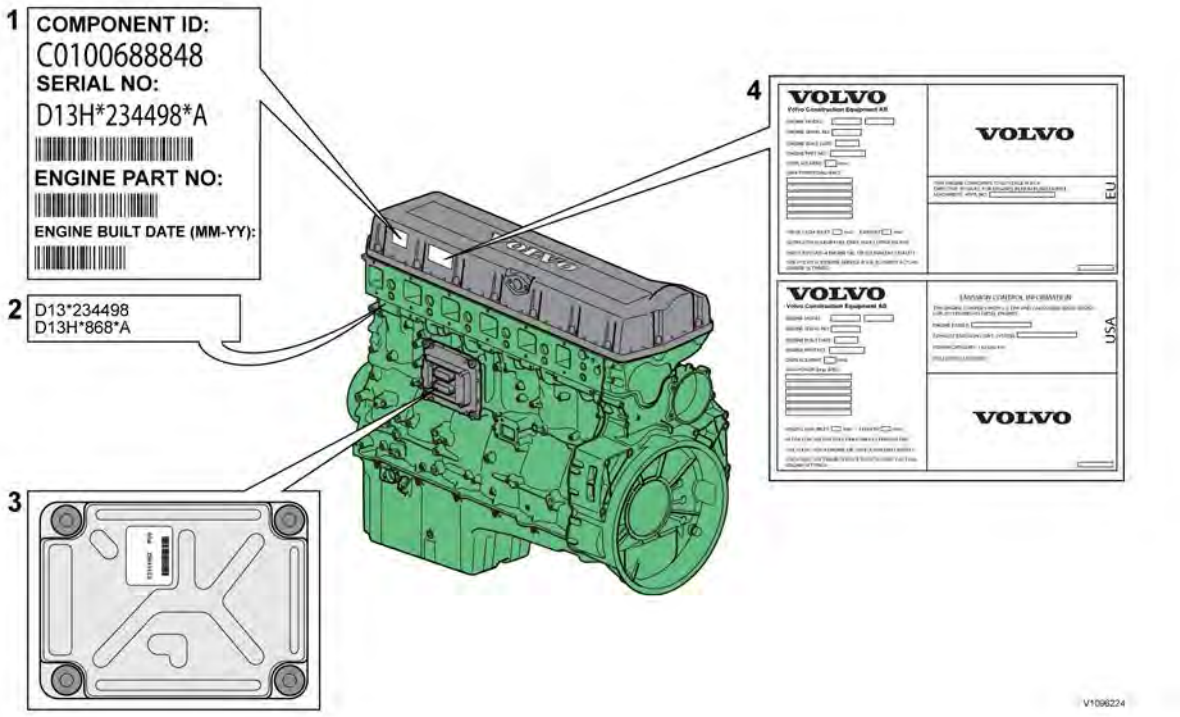


Figure 1
Identification plates, D13H

Identification plate 1

A label located on the valve cover showing the engine's component ID-number, serial number, manufacturing site, engine part number, and engine build date, as well as their bar codes. Manufacturing sites:

A = Skövde, Sweden
E = Curitiba, Brazil
F = Flen, Sweden
L = Lyon, France

Identification plate 2

The engine's serial number, part number, and manufacturing site are stamped into the engine's cylinder block.

Identification plate 3

The hardware component number of the Engine Control Unit (ECU) is located on a label on the back of the ECU.

Identification plate 4

The certification label is located on the valve cover as well as the machine's frame.

Automatic Engine Shutdown

This is a function used to automatically shut down the engine after idling for a certain time. The operator is informed and has the opportunity to cancel the function within one minute, either by increasing the engine speed, shifting gear, or by activating the hand throttle.

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 ones that can be activated are:

- High coolant temperature

- High intake manifold air pressure
- High intake 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
- Variable Geometry Turbo valve and position error
- High temperature of Smart Remote Actuator
- High compressor charge-air temperature (calculated)
- High soot load
- High differential pressure across Diesel Particulate Filter (DPF)
- High exhaust temperature
- High ECU temperature
- High DPF temperature

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 shutdown 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 could request engine protection, such as:

- High Altitude (ensures that high compressor charge-air temperature is never reached)
- Turbo OverSpeed
- 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.

Engine torque limitation
The engine torque can be limited by the engine protection function. Engine torque limitation is active until the parameter has reached a safe level or until the EMS is powered down.

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 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 speed of the vehicle 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 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

- (FAU) Automatic engine shut off
- (FAV) Automatic engine shut off, time

- (JVL) Injector cylinder 1, calibration E3 Glitch Trim
- (JVM) Injector cylinder 2, calibration E3 Glitch Trim
- (JVN) Injector cylinder 3, calibration E3 Glitch Trim
- (JVO) Injector cylinder 4, calibration E3 Glitch Trim
- (JVP) Injector cylinder 5, calibration E3 Glitch Trim
- (JVQ) Injector cylinder 6, calibration E3 Glitch Trim
- (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
EF2112 (ART) PID404 (EXC, WLO)	MID128	PID404
EF2117 (ART) PPID55 (WLO, EXC)	MID128	PPID55
EF2127 (ART) PPID89 (EXC, WLO)	MID128	PPID89
EF2515 (ART) PSID28 (WLO, EXC)	MID128	PSID28
EF2525 (ART) PID173 (EXC) SE2510 (WLO)	MID128	PID173
SE2202 FX1006 (WLO)	MID128	PID175
SE2507 FX1007 (WLO)	MID128	PID105
MO2501	MID128	SID27
PPID326 (WLO, EXC)	MID128	PPID326
SE2203	MID128	PID100
SE2509	MID128	PID153
SE2516	MID128	PID412
SE2519	MID128	PID81
SE2603	MID128	PID111
SE2606	MID128	PID110

Document Title: **Engine, removing**	Function Group: **210**	Information Type: **Service Information**	Date: **2014/7/10**
Profile: **EXC, EC340D L [GB]**			

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. Open the engine hood and remove the bracket from the cowl frame.

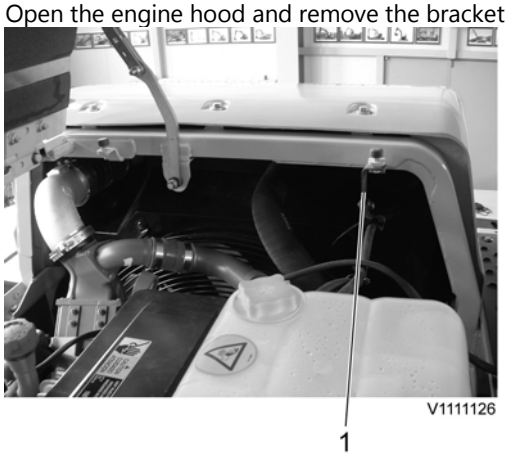


Figure 1

1. Bracket

5. Remove the DPF hood, radiator hood and the rear cover

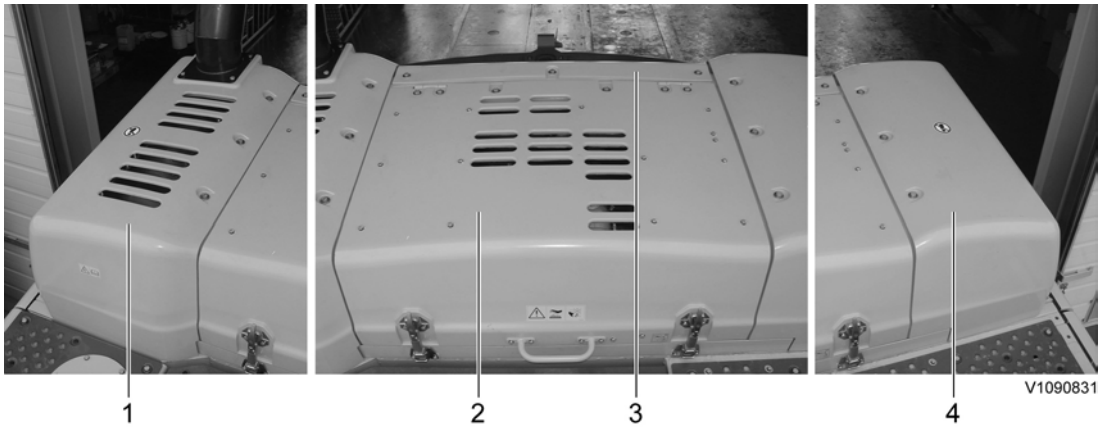


Figure 2

1. DPF hood
2. Engine hood
3. Engine room rear cover
4. Radiator hood

6. Remove the engine room cowl frame with the engine hood using a lifting device.

7. Disconnect the wire harness connector and the hoses.

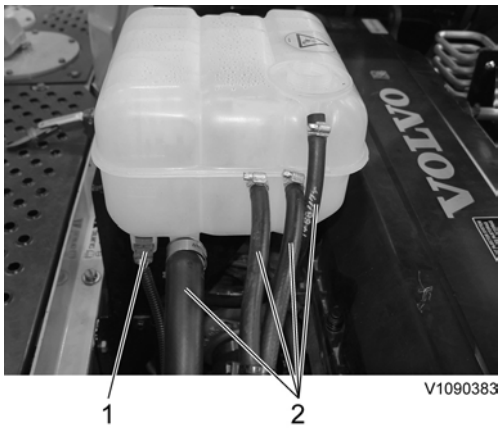


Figure 3

1. Wire harness connector
2. Hose

8. Remove the expansion tank with the bracket.

9. Remove the clamps and then remove the charge air cooler tube and the radiator hoses.

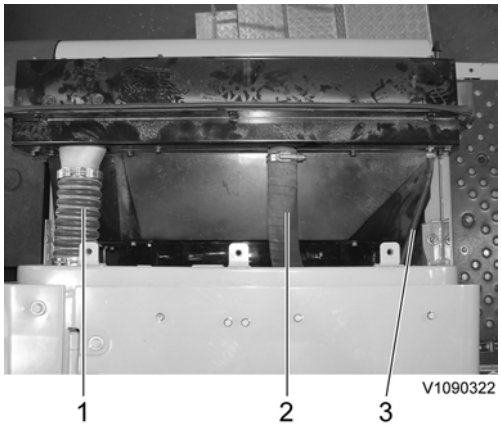


Figure 4

1. Charge air cooler upper tube
2. Radiator upper hose
3. Radiator breathing hose

10. Remove the engine room under covers.

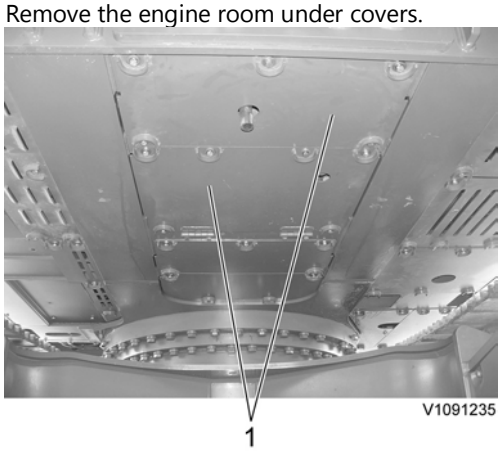


Figure 5

1. Engine room under cover

11. Release the pressure in the air compressed system by pushing up a valve on the air tank.

Figure 6

1. Release valve

2. Air tank

12. Disconnect the radiator under hose and remove the charge air cooler under tube.

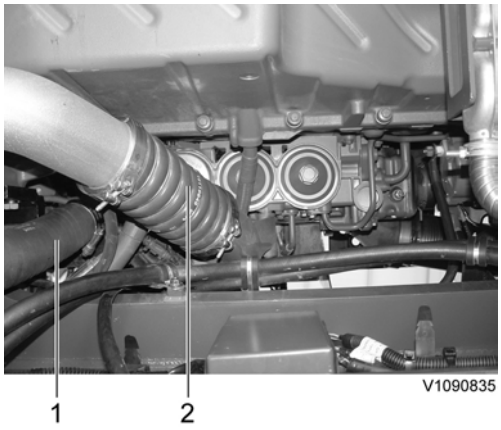


Figure 7

1. Radiator under hose
2. Charge air cooler under tube

13. Remove the screws and separate the shroud from the radiator assembly.
Move the shroud to the engine side.

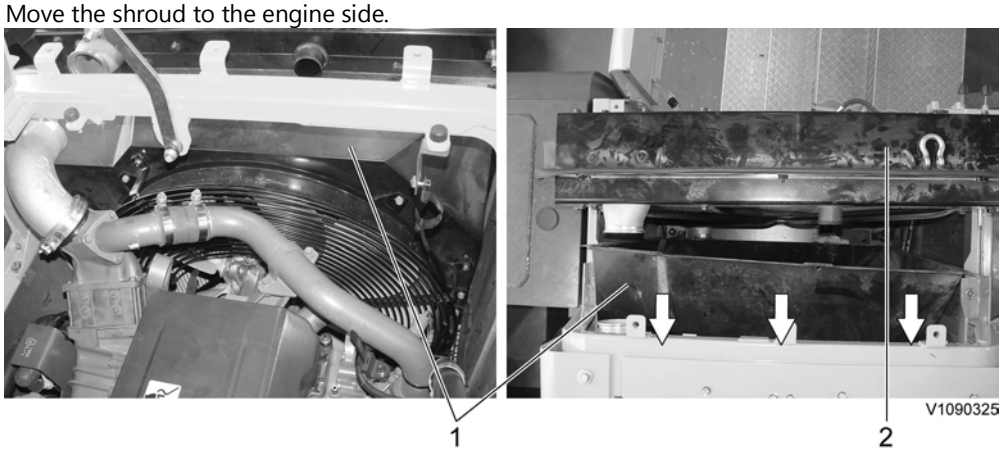


Figure 8

1. Shroud
2. Radiator assembly

14. Remove the main pump. See 913 Hydraulic pump, replacing

15. Remove pump room covers.

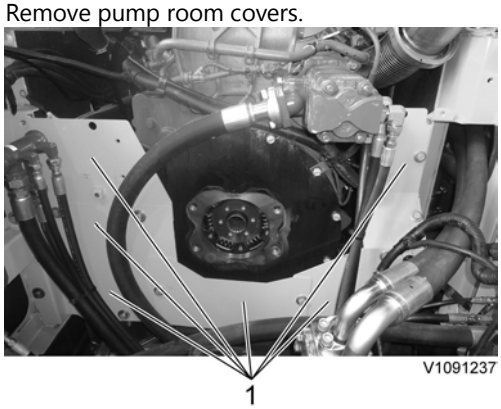


Figure 9

1. Pump room cover

16. Disconnect the hoses, remove the mounting screws and the engine PTO pump.
    NOTE!
    Plug the P.T.O (Power take off) hole to protect from foreign substances.

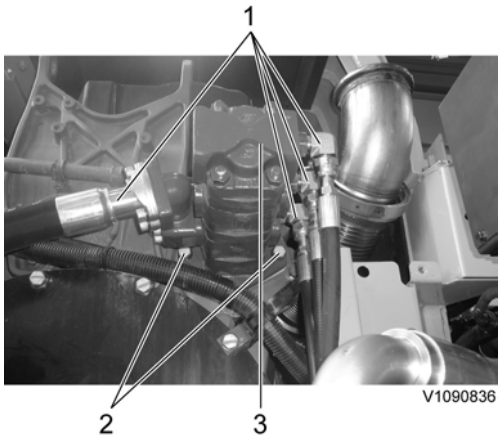


Figure 10

1. Hose
2. Screw
3. Engine PTO pump

17. Disconnect the fuel line hoses (4 pcs).
    NOTE!
    Ports must be plugged after disassembling hoses.

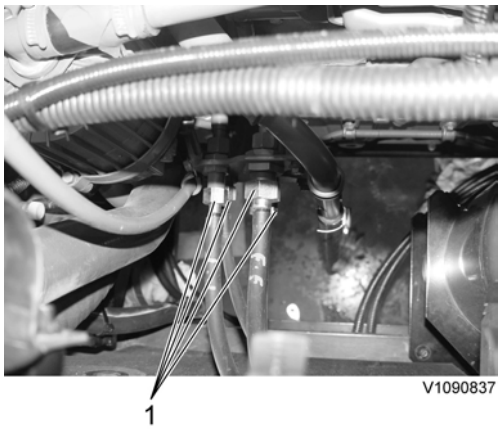


Figure 11

1. Hose

18. Disconnect the hose connected to the air cooler and the compressor head.

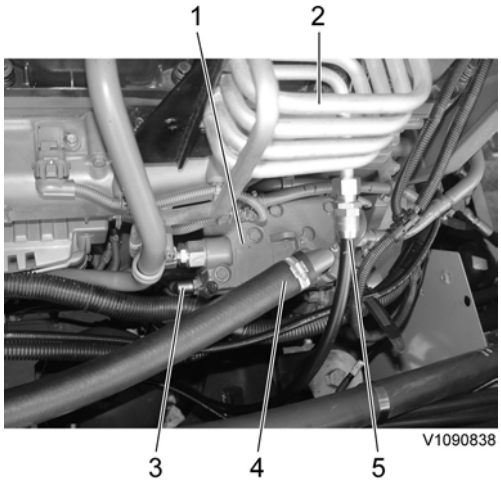


Figure 12

1. Compressor head
2. Air cooler
3. Hose
4. Hose
5. Hose

19. Disconnect hoses connected to the air pump.

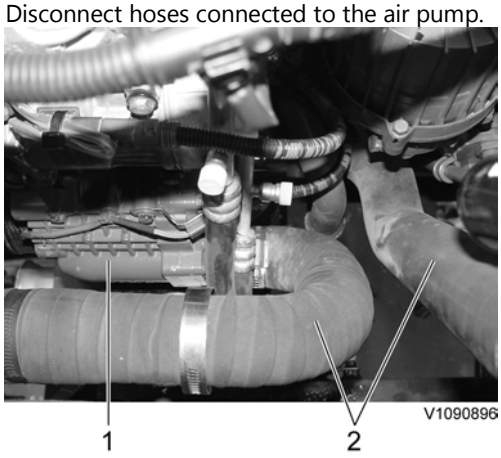


Figure 13

1. Air pump
2. Hose

20. Disconnect the wire-harness connector on the inlet air sensor.

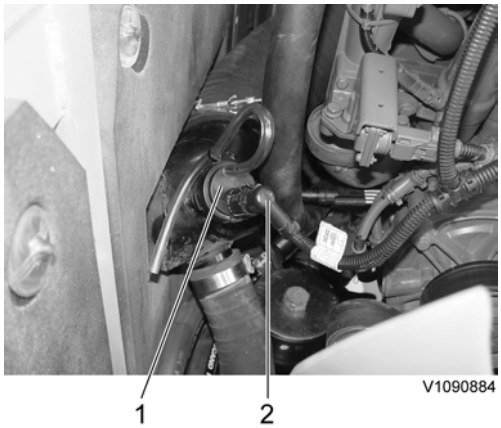


Figure 14

1. Inlet air temperature/pressure sensor
2. Connector

21. Remove the clamps and the air inlet hose.

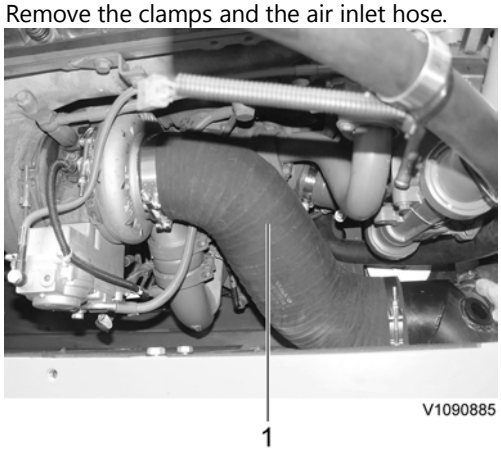


Figure 15

1. Turbocharger air inlet hose

22. Remove the foot step.

Figure 16

23. Remove the clamps and the exhaust flexible tube.

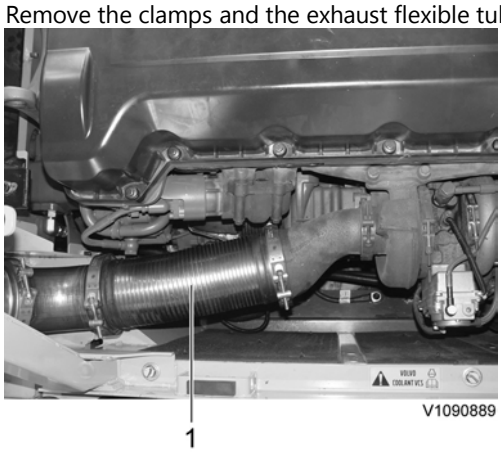


Figure 17

1. Exhaust flexible tube

NOTE!
Leave the markings on the tube before removing to remember the direction of flow direction.

24. Remove the air conditioner compressor belt and disconnect the wire harness.

WARNING

Do not disconnect or loosen connections for the air conditioning unit (AC). Risk of gas leakage.

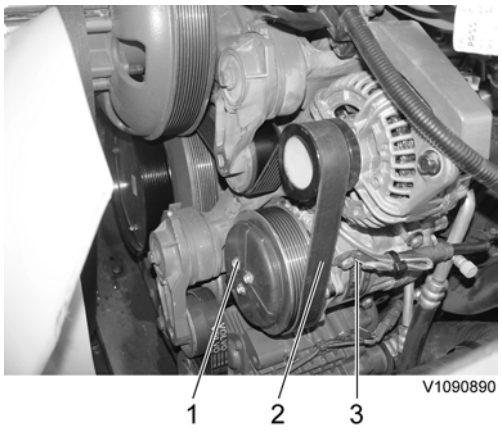


Figure 18

1. Air conditioner compressor
2. Alternator/compressor belt
3. Wire harness

25. Remove the compressor and lay it down on the frame.

26. Disconnect the cab heater hose on the engine block.

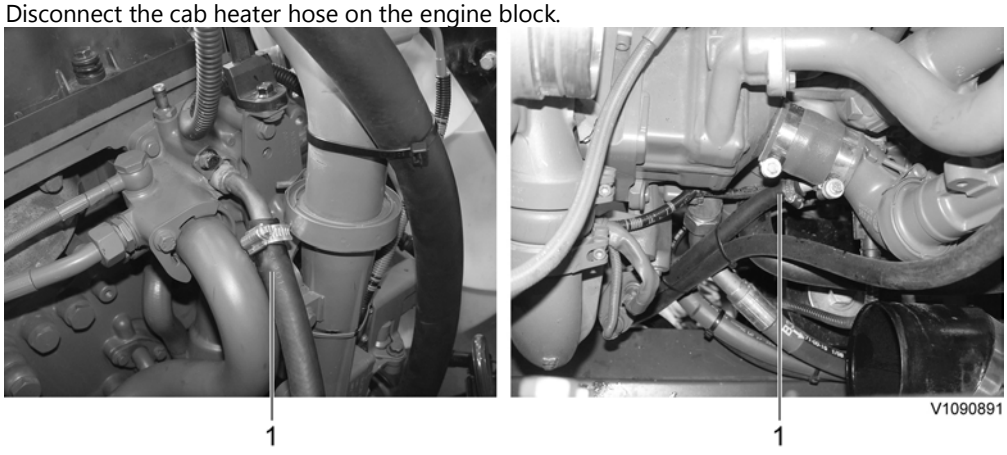


Figure 19

1. Cab heater hose

27. Disconnect the engine oil remote hoses.

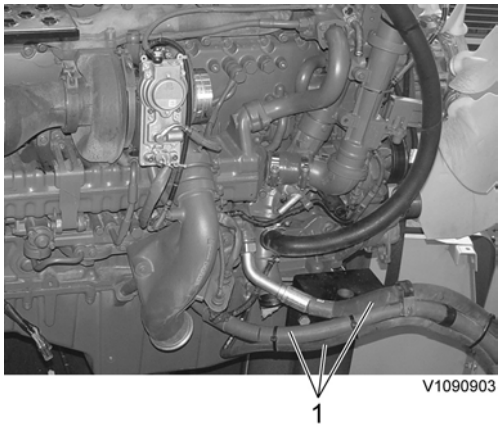


Figure 20

1. Engine oil remote hose

28. Disconnect the starter motor wire harness.

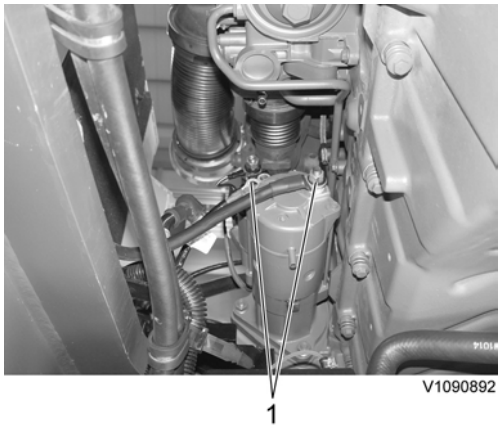


Figure 21

1. Starter motor wire harness

29. Remove the connectors from the fuel filter and the water separator.

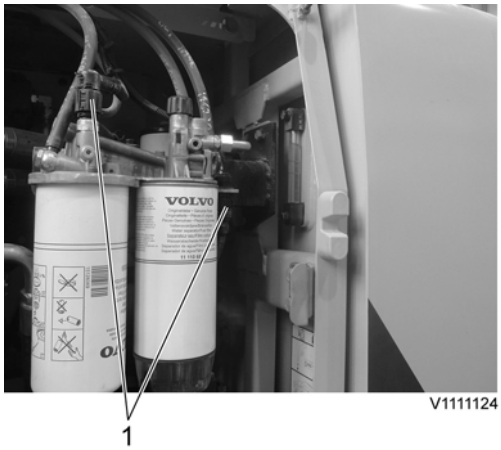


Figure 22

1. Connector

30. Remove the cover and the clamps and then disconnect the main wire harnesses.

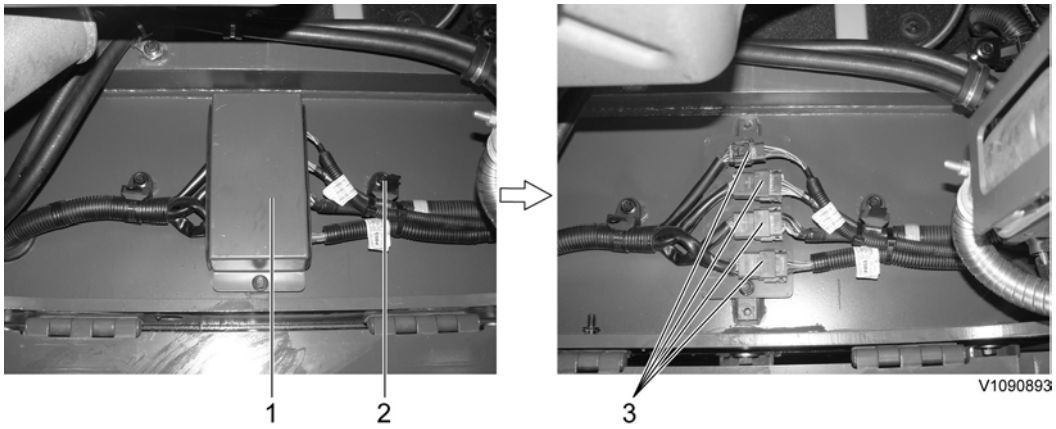


Figure 23

1. Cover
2. Clamp
3. Wire harness

31. Remove the four mounting screws.

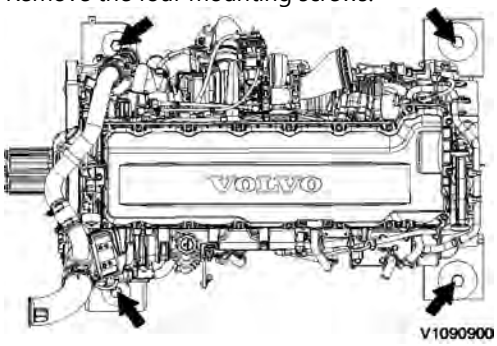
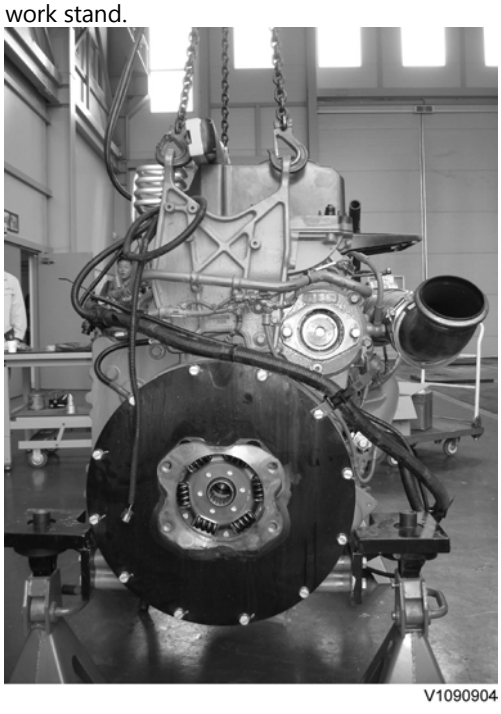


Figure 24

32. Lift the engine just a little using a lifting device, and after confirming safety around, lift it up and out slowly to the work stand.



VOLVO
Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Cylinder head, description	**211**	**Service Information**	**2014/7/10**
Profile: **EXC, EC340D L [GB]**			

Cylinder head, description

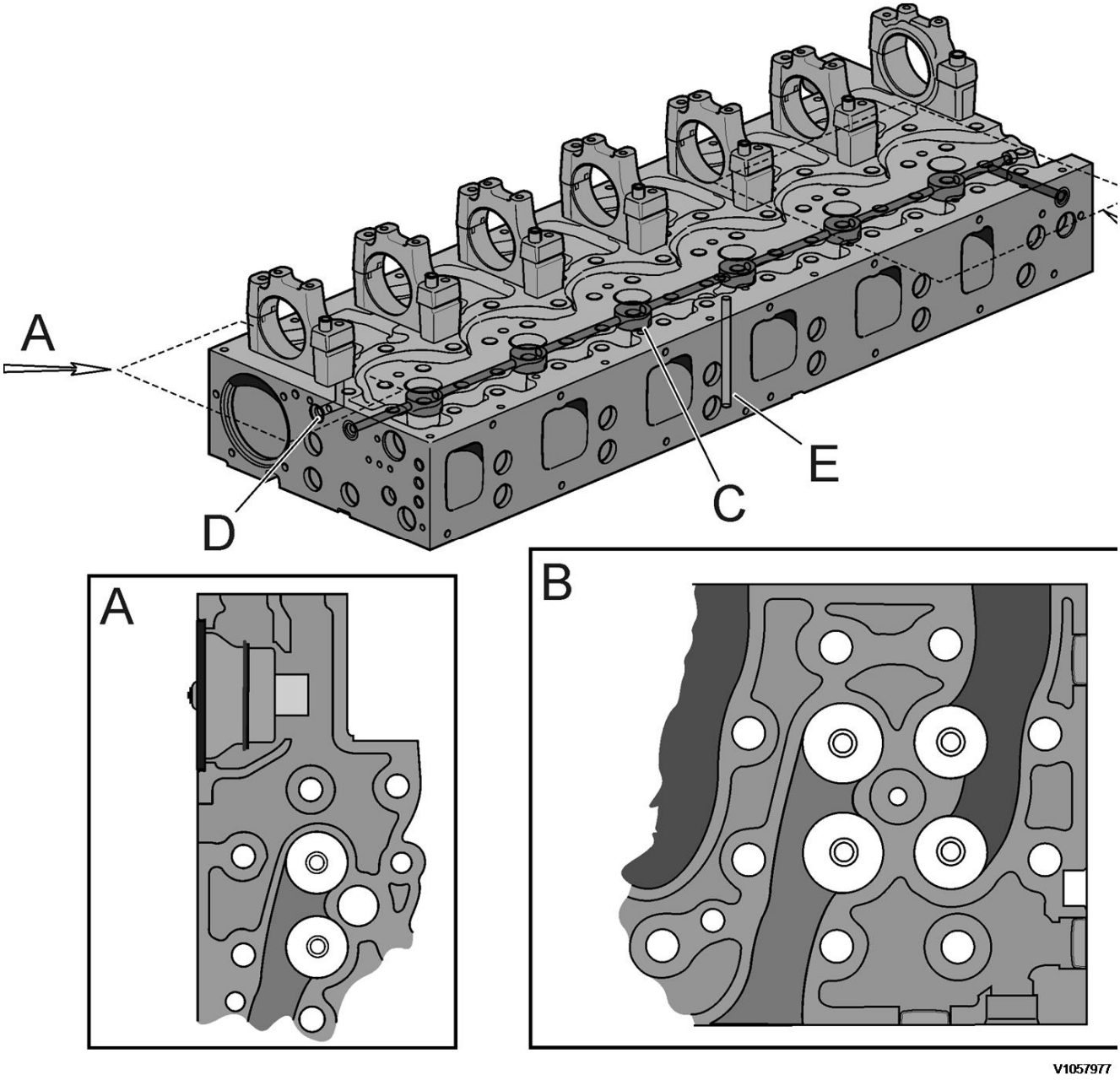


Figure 1

The cylinder head is a one-piece cast iron design, which is a prerequisite for stable bearing positions for the overhead camshaft.
The camshaft is carried in seven horizontally split bearing brackets with replaceable bearings shells. For the rear bearing bracket, the bearing shell is also designed as thrust bearing.
The coolant thermostat's housing is machined directly into the cylinder head and is located at the front on the right side (A).

Each cylinder has separate inlet channels on one side of the cylinder head and separate exhaust channels on the other side, so-called ''crossflow'' (B).

The fuel channel for the unit injectors is drilled longitudinally through the cylinder head, and has a machined ring-shaped groove around each unit injector (C).
At the front there is a plug (D) that leads to the channel for measuring the rocker arm mechanism's oil pressure.
The channel (E) for lubricating the camshaft and rocker arms is drilled centrally in the cylinder head's left side.

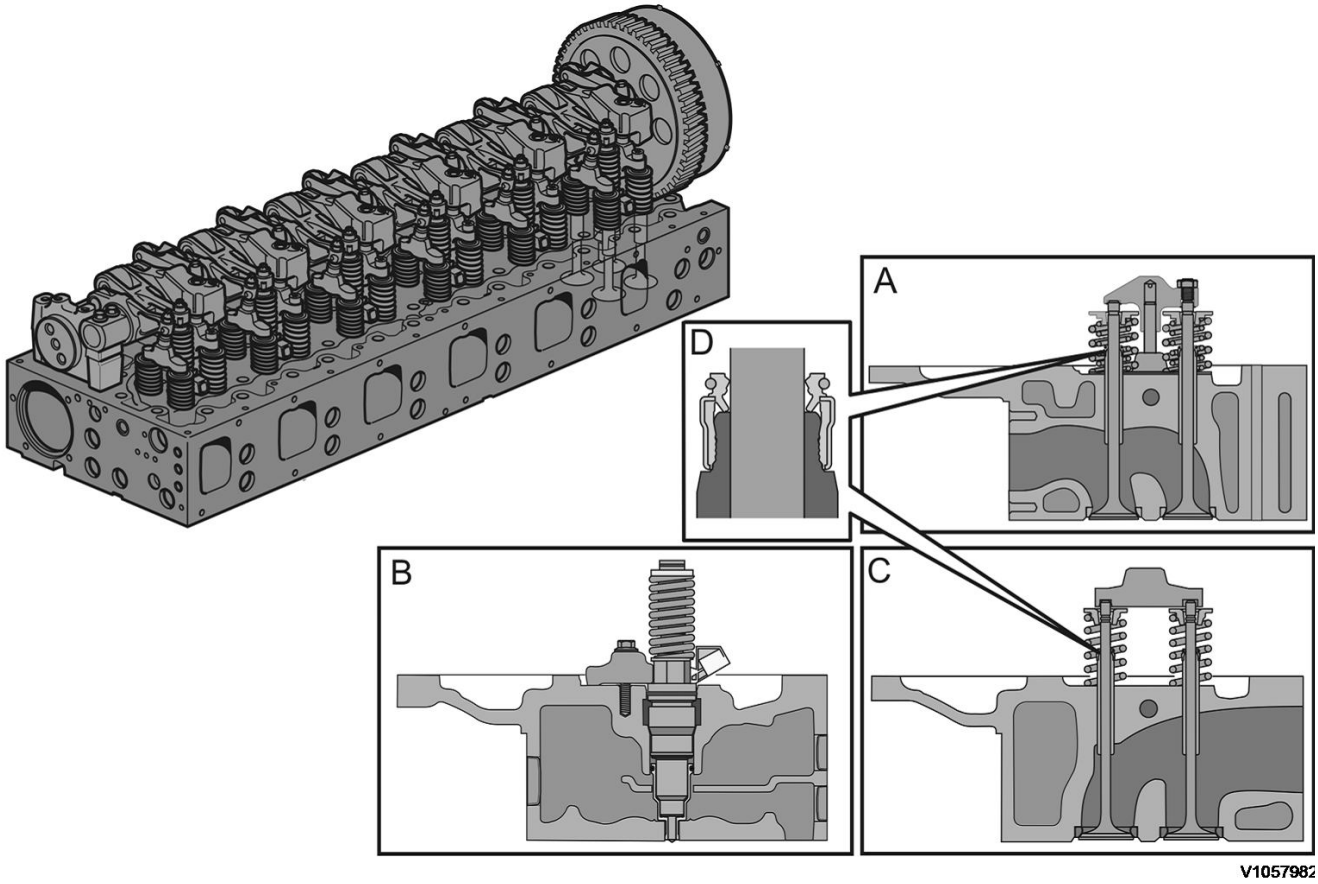


Figure 2

The unit injectors are located vertically in the centre of the cylinder between the four valves and are held in place by a yoke (B). The injector's lower part is separated from the cooling jacket with a copper sleeve, which is flared at the bottom and sealed with an O-ring at the upper part. The ring-shaped space around each injector is sealed with two O-rings.

For maximal cooling, the coolant space in the cylinder head is provided with a horizontal wall that forces the coolant past the lower and hottest parts of the cylinder head.

The valve mechanism has double inlet and exhaust valves. The exhaust valves have double valve springs (A) while the inlet valves have single springs (C). The inlet valves are linked in pairs with so-called 'floating valve yoke', that transfer the rocker arm's movement against the camshaft to the valve pairs, while the exhaust valves are linked with guided yokes. The valves are of a new type with three grooves and matching valve collets for inlet and exhaust valves. The design of the valve collet enables the valve to rotate in its valve seat. For improved heat tolerance and heat dissipation, there is more material in the exhaust valves' valve discs and the diameter is slightly smaller than for the inlet valves.

Valve guides and valve seats are made of alloyed cast iron and hardened steel, respectively, and are replaceable.

All valves have oil seals for the valve stems (D). The valve stem seals on the engine are of a new type with double sealing surfaces.

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