

Document Title: Engine, description	Function Group: 200	Information Type: Service Information	Date: 2014/7/17
Profile: EXC, EW210C [GB]			

Engine, description

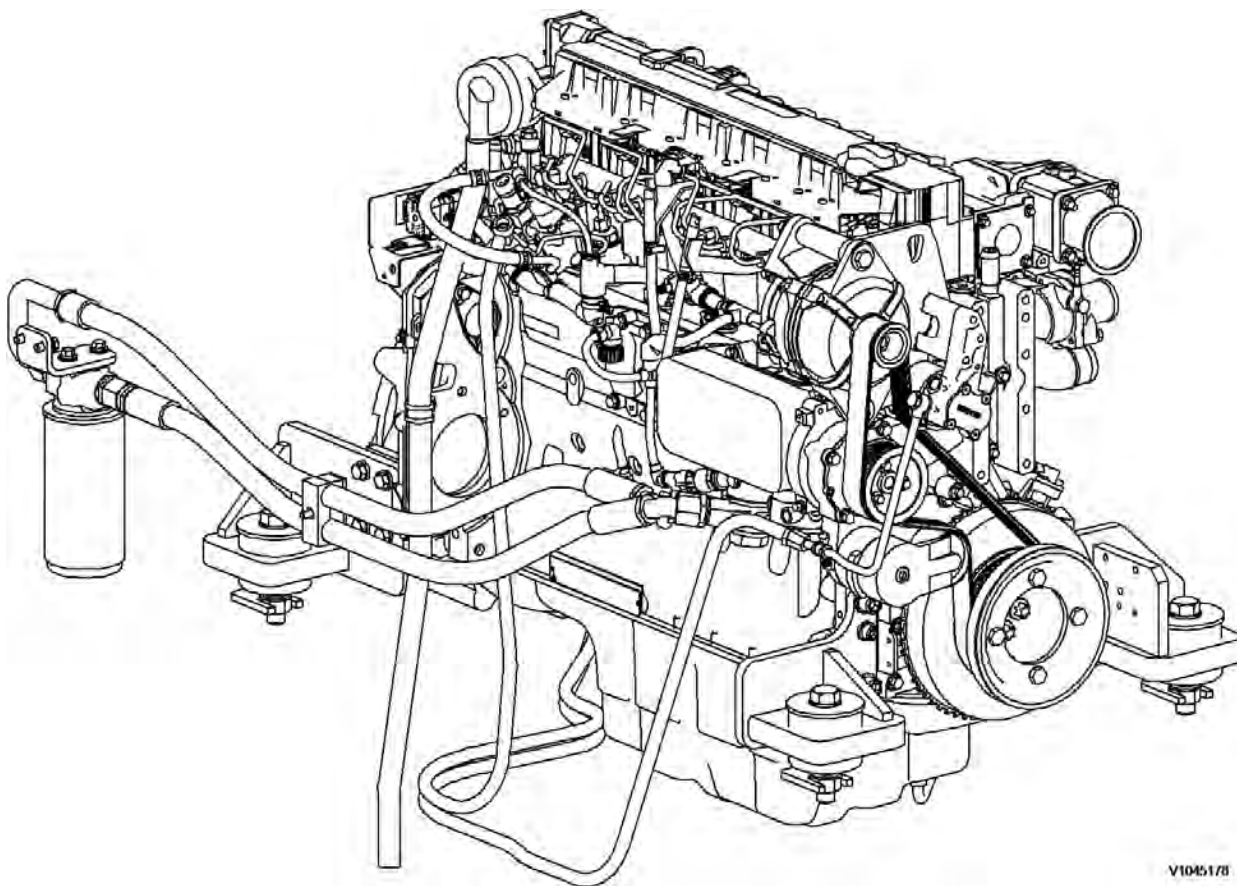
D6E - tier 3 compliant

The D6E configuration is a four stroke, straight six cylinder, turbocharged, direct injected diesel engine with charge air cooling and wet, replaceable cylinder liners.

The D6E engine uses a Common Rail Fuel System controlled by the engine electronic control (E-ECU) software.

Electronically controlled IEGR (Internal Exhaust Gas Recirculation) reduces NO_x formation and lowers emissions without the need for exhaust after treatment. Volvo's latest engine management system, E-ECU is used to control all engine electronic functions.

The cylinders are numbered consecutively beginning at the flywheel end. Engine rotational direction is counterclockwise as seen from the flywheel end.



V10451/8

Figure 1
Engine, D6E

Document Title: Engine, identification	Function Group: 200	Information Type: Service Information	Date: 2014/7/17
Profile: EXC, EW210C [GB]			

Engine, identification

Identification plate

The engine model, serial number and performance data are stamped on an identification plate which is attached on the cylinder head cover. The engine model designation and serial number must be indicated when ordering spare parts.

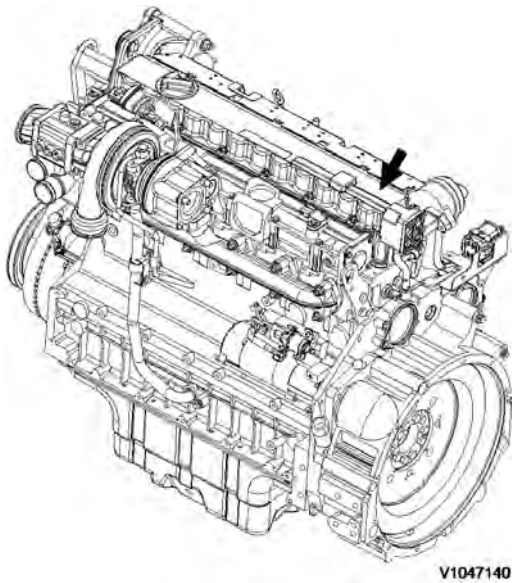


Figure 1
Engine identification, D6E

Document Title: Component locations	Function Group: 200	Information Type: Service Information	Date: 2014/7/17
Profile: EXC, EW210C [GB]			

Component locations

Component position, engine D6E. The following figures show the position of a number of components on engine D6E.

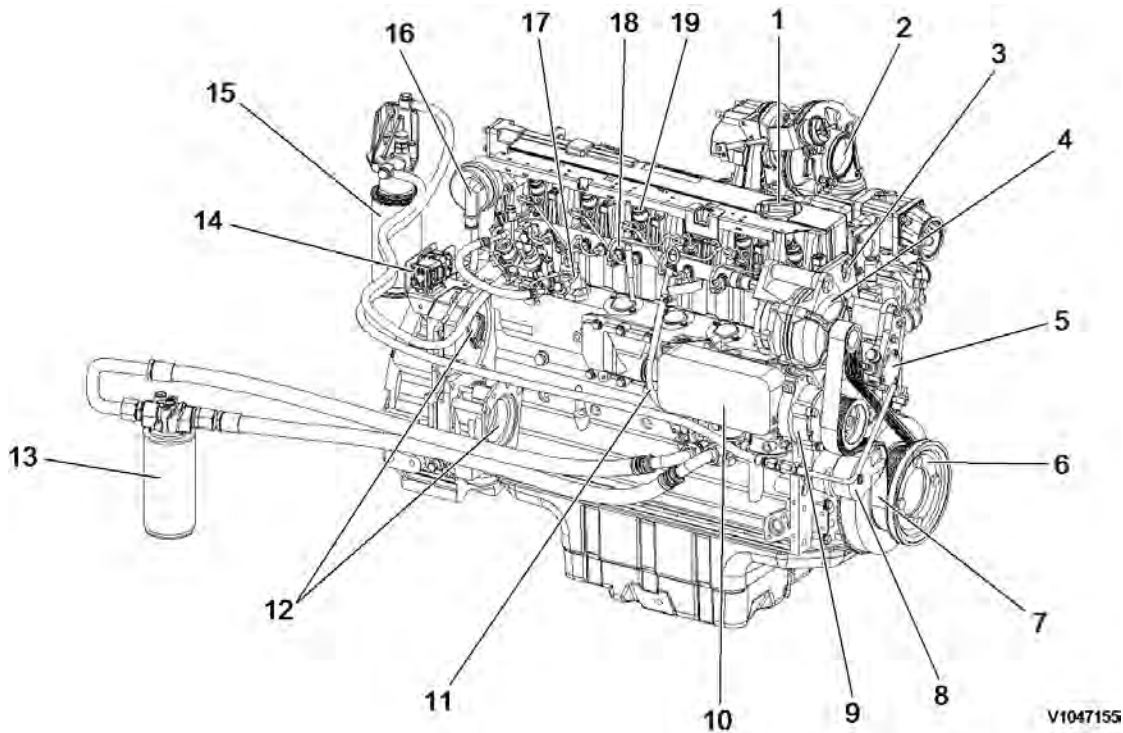
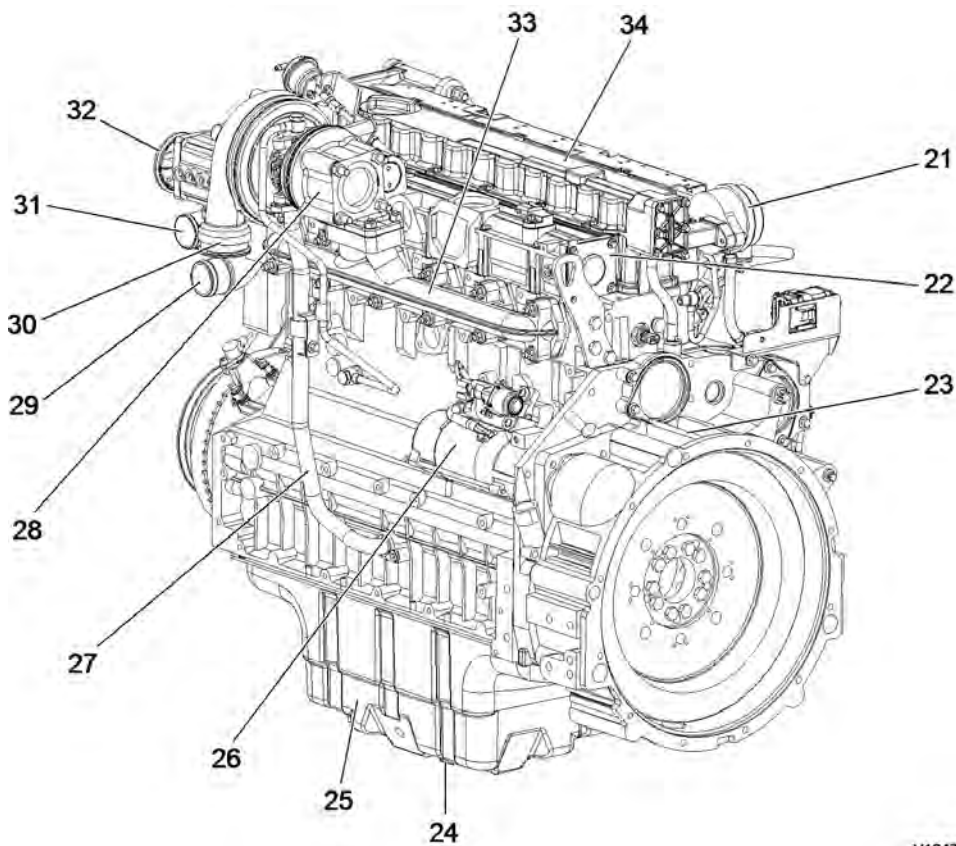


Figure 1
Component locations, front side

1	Engine oil filler	11	Oil dipstick
2	Air inlet	12	Power take off
3	Transport eye	13	Engine oil filter
4	Alternator	14	Connection to E-ECU
5	Fuel feed pump	15	Fuel filter
6	V-rib belt drive on crankshaft	16	Crankcase bleeding valve
7	V-rib belt	17	High pressure fuel pump
8	Automatic belt tensioner	18	Common rail
9	Coolant pump	19	Injector
10	Engine oil cooler		



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Figure 2
Component locations, flywheel side

21	Crankcase bleeding valve	28	Turbocharger
22	Charge air manifold	29	Coolant inlet
23	Flywheel housing	30	Air outlet (to charge air cooler)
24	Drain plug	31	Coolant outlet
25	Oil pan	32	Air inlet (from charge air cooler)
26	Starter motor	33	Exhaust manifold
27	Oil return line from turbocharger	34	Cylinder rocker arm cover

Document Title: Engine, replacing	Function Group: 210	Information Type: Service Information	Date: 2014/7/17
Profile: EXC, EW210C [GB]			

Engine, replacing

Op nbr 210-076

[9998547 Lifting tool](#)

! WARNING

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

! WARNING

Hot oil and hot engine coolant can cause severe burns!

! WARNING

The parts are heavy. Take appropriate safety cautions when handling them.

1. **Engine removal**

Park the machine in service position B, see [091 Service positions](#).

2. Remove the counterweight, see [716 Counterweight, removing](#).

3. Remove engine hood (1).

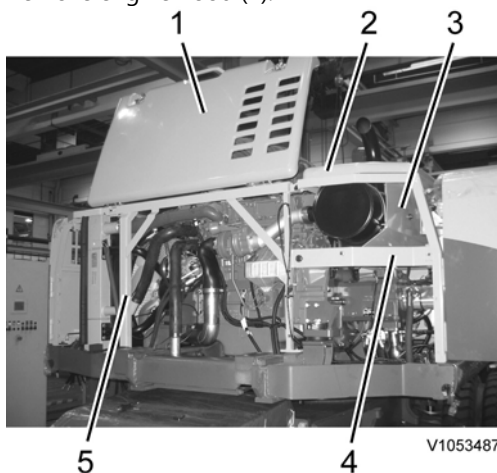


Figure 1
Rear side frame, removal

4. Remove silencer hood (2).

5. Remove silencer undercover (3).

6. Remove right side door frame with door (4).

7. Remove rear side frame (5).

8. Drain the hydraulic oil, see [173 Hydraulic system, changing oil](#).
9. Drain the engine coolant, see [173 Coolant, change](#).
10. Remove the coolant expansion tank, see [261 Expansion tank, replacing](#).
11. Disconnect charge air hoses (2 and 3), coolant hoses (4 and 6) and air inlet hose (5) from cooling unit (1) side.

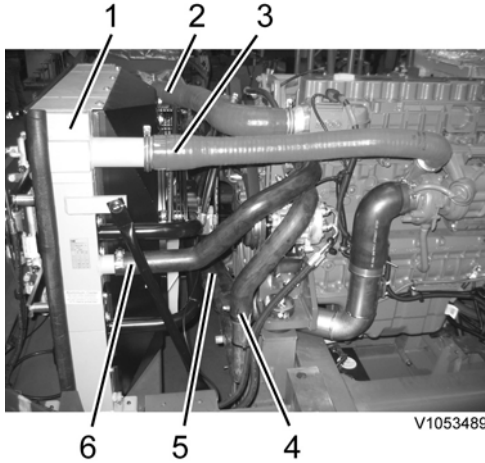


Figure 2
Cooling unit, disconnection

12. **NOTICE**
Refrigerant under pressure. Do not disconnect any hoses or connections on the air conditioning, thereby involuntarily releasing refrigerant.

Loosen belt tension adjusting nuts (2 and 3) and screw (1).

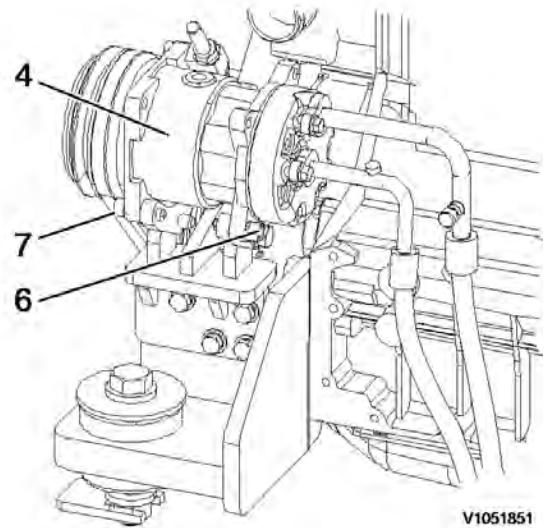
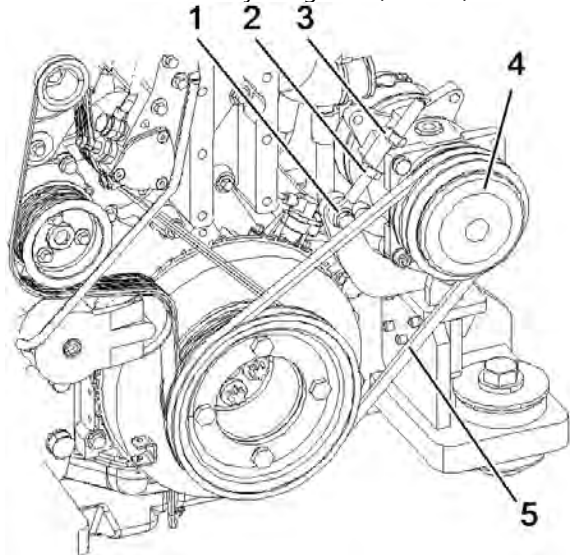


Figure 3
Air conditioner compressor

13. Remove air conditioner compressor belt (5).
14. Undo screws (6 and 7), and disconnect air conditioner compressor (4) from the engine.
15. Unplug connector (1) for E-ECU and wire harness connector (5).

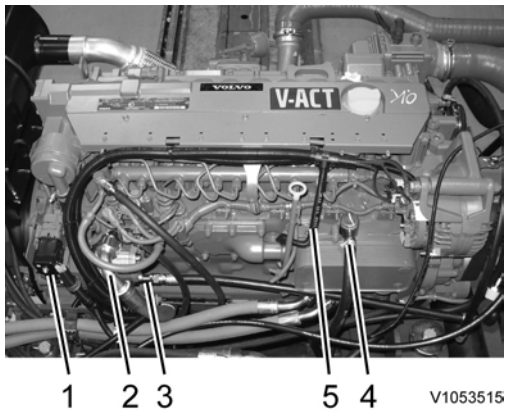


Figure 4
Engine connections

16. Disconnect hydraulic hoses (2 and 3) from the cooling fan pump. Plug open connections.
17. Disconnect coolant hose (4) from the engine oil cooler. Plug open connections.
18. Disconnect fuel supply line (1) and return line (2). Plug open connections.

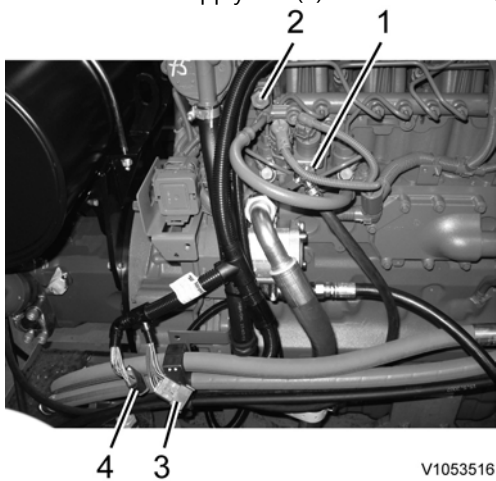


Figure 5
Fuel line connections

19. Disconnect wire harness connectors (3 and 4).
20. Disconnect air preheating cable (1), starter motor cable (2) and ground cable (3) from the engine.

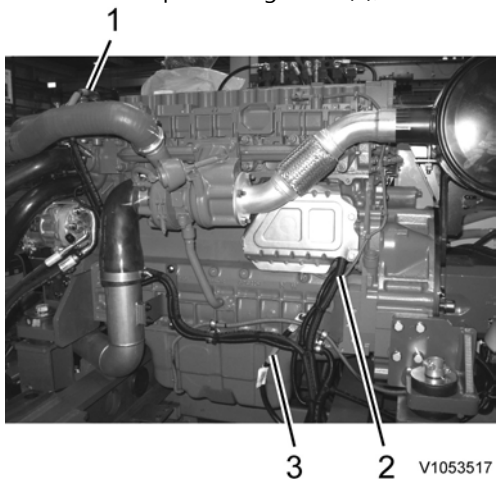


Figure 6

Engine wire harness

21. Disconnect wire harness connector (1) and hydraulic hoses (2, 3, 4, 7, 8 and 9) from the hydraulic pump. Plug open connections.

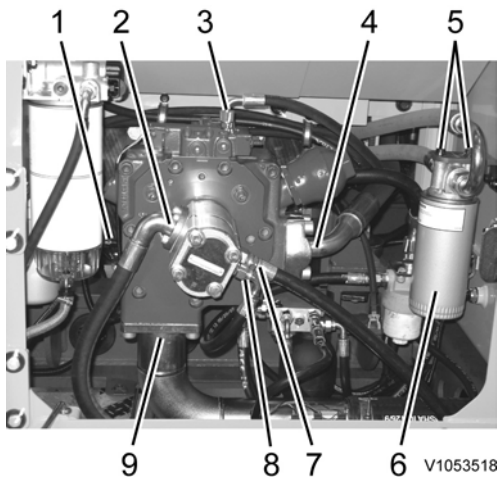


Figure 7
Pump connections

22. Loosen screws (5), and attach engine oil filter (6) to the hydraulic pump.
23. Remove the engine mounting screws, see [218 Engine mounting](#).
24. Connect the lifting device **9998547** to the engine lifting eyes. Adjust the lifting device to the correct angle.
Take up the slack in the lifting device.



Figure 8
Engine, removal



The parts are heavy. Take appropriate safety cautions when handling them.

25. Lift away the engine from the machine, and put it onto a suitable workbench. Weight approx. **600 kg (1323 lbs)**.
26. **Engine installation**
Move charge air hoses (1 and 2), coolant hoses (7 and 8) and air inlet hose (6) to new engine.

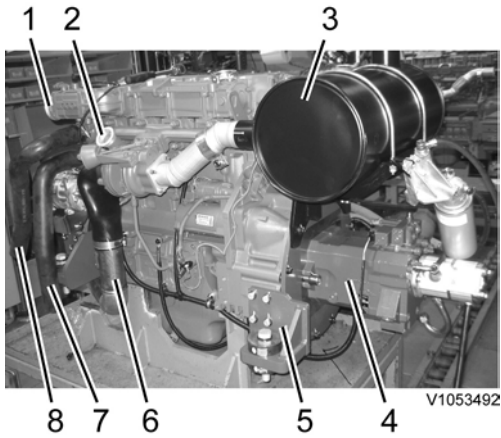


Figure 9
Engine components moving

27. Remove silencer including the turbocharger flexible tune and the silencer bracket from the old engine. see [252 Silencer, replacing](#), [252 Exhaust pipe, flexible tube, replacing](#).
28. Move hydraulic pump (4) including the pump coupling to new engine, see [913 Pump, removal](#), [913 Pump, installation](#), [442 Pump coupling, removing](#), [442 Pump coupling, installing](#).
29. Move engine mounting brackets (5) at 4 places to new engine, see [218 Engine mounting](#).
30. Move cooling fan pump (1) to new engine, see [911 Cooling fan pump, removal](#), [911 Cooling fan pump, installation](#).

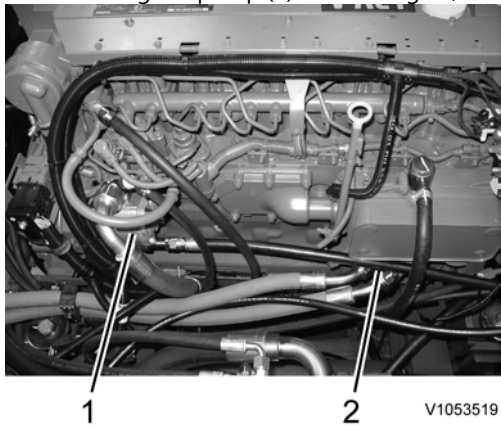


Figure 10
Cooling fan pump, moving

31. Move engine oil filter connection (2) to new engine.
32. Connect the lifting device **9998547** to the engine lifting eyes. Adjust the lifting device to the correct angle.
Take up the slack in the lifting device.



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Figure 11
Engine, installation



The parts are heavy. Take appropriate safety cautions when handling them.

33. Put the engine onto the machine carefully.
Weight approx. **600 kg (1323 lbs)**.
34. Tighten the engine mounting screws, see [218 Engine mounting](#).
35. Connect wire harness connector (1) and hydraulic hoses (2, 3, 4, 7, 8 and 9) to the hydraulic pump, see [913 Pump, installation](#).

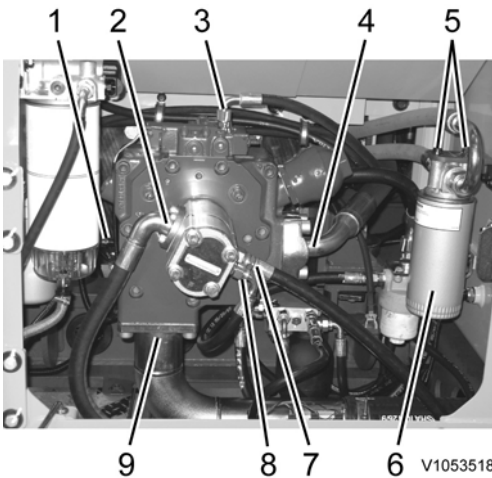


Figure 12
Pump connections

36. Install engine oil filter (6) to the hydraulic tank.
37. Plug in connector (1) for E-ECU and wire harness connector (5).

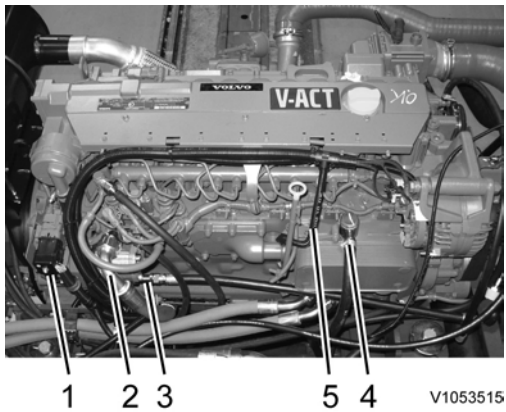


Figure 13
Engine connections

38. Connect hydraulic hoses (2 and 3) to the cooling fan pump, see [911 Cooling fan pump, installation](#).
39. Connect coolant hose (4) to the engine oil cooler.
40. Connect fuel supply line (1) and return line (2).

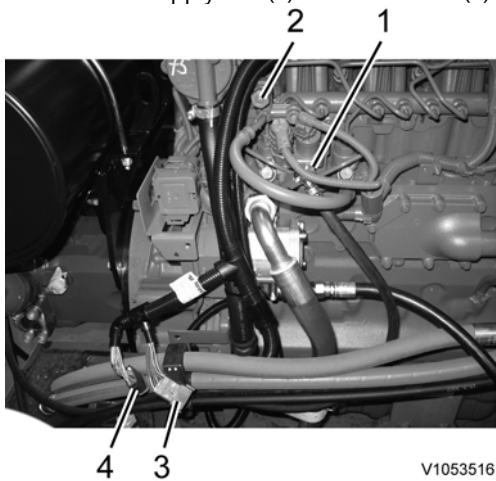


Figure 14
Fuel line connections

41. Connect wire harness connectors (3 and 4).
42. Connect air preheating cable (1), starter motor cable (2) and ground cable (3) to the engine.



Figure 15

Engine wire harness

43. Install the air conditioner compressor including the belt, see [874 Compressor, replacing incl draining and filling](#).
44. Connect charge air hoses (2 and 3), coolant hoses (4 and 6) and air inlet hose (5) to cooling unit (1) side.

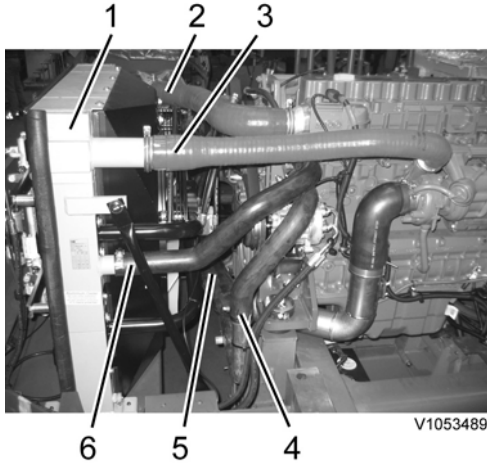


Figure 16
Cooling unit connections

45. Install rear side frame (5).

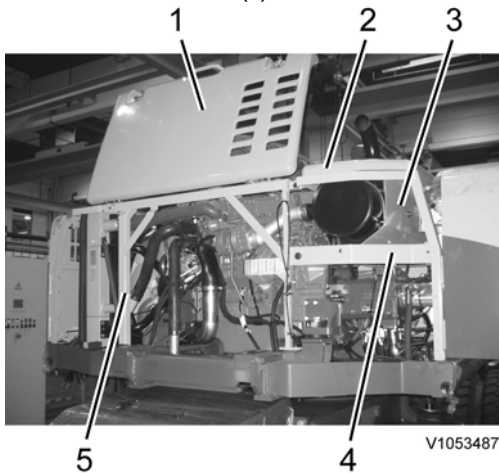


Figure 17
Rear side frame, installation

46. Install right side door frame with door (4).
47. Install silencer undercover (3).
48. Install silencer hood (2).
49. Install engine hood (1).
50. Install the coolant expansion tank and fill the coolant, see [261 Expansion tank, replacing](#).
51. Fill the hydraulic oil, see [173 Hydraulic system, changing oil](#).
52. Fill the engine oil, see [173 Engine, oil and filter, change](#).
53. Bleed the fuel system, see [233 Fuel system, bleeding](#).



The parts are heavy. Take appropriate safety cautions when handling them.

54. Install the counterweight, see [716 Counterweight, removing](#).
55. Check the engine operation.

Document Title: Internal Exhaust Gas Recirculation description	Function Group: 214	Information Type: Service Information	Date: 2014/7/17
Profile: EXC, EW210C [GB]			

Internal Exhaust Gas Recirculation (IEGR), description

A system for IEGR (**I**nternal **E**xhaust **G**as **R**ecirculation) is used as part of V-ACT (Volvo Advanced Combustion Technology). On D6E and D7E this takes place by an IEGR-opening piston, controlled by the lubrication oil's system pressure, acting on the exhaust rocker arm which enables a second opening of the exhaust valves. When activated, the secondary piston will give a limited valve opening of the exhaust valves during the induction phase, which leads exhausts back into the cylinder.

Included components

IEGR-unit

The hydraulic mechanism is housed in two interconnected IEGR-units, located on the rocker arm holders. Lubrication oil is routed from the cylinder head via the solenoid valve to the high-pressure channel in the IEGR-unit through a channel in one of the rocker arm holders.

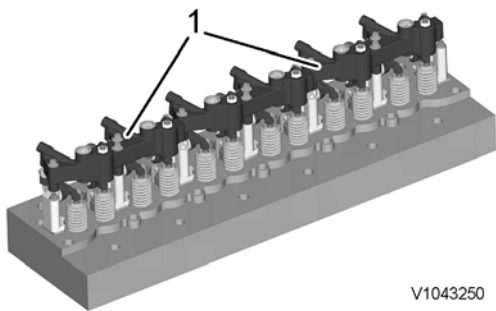


Figure 1

1. IEGR-unit

Solenoid valve

The solenoid valve is located in the cylinder head on the flywheel side and is activated by the EECU via the control system EMS 2. When IEGR is not activated, the solenoid valve is closed and no oil flow is allowed into the IEGR-unit. At activation of IEGR, the solenoid valve opens the channel from the engine's lubrication system to the IEGR-unit.

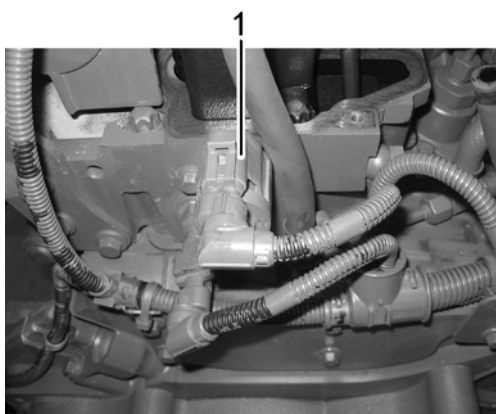


Figure 2

1. Solenoid valve

Control valve

The control valve is located in the IEGR-unit between the high-pressure circuit and low-pressure circuit. When the low-pressure circuit is supplied from the lubrication oil system, the control valve is lifted and closes the high-pressure circuit. The ball in the control valve enables filling of the high-pressure circuit when IEGR is activated. The lubrication oil is drained through the control valve.

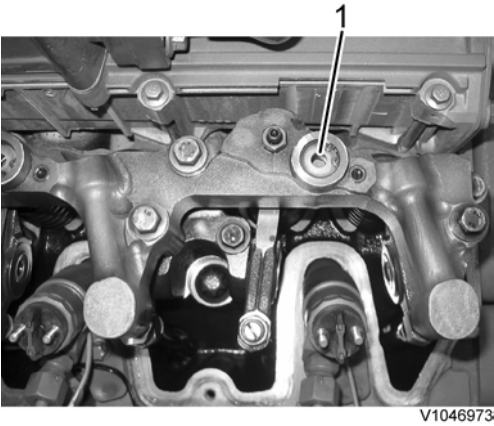


Figure 3

1. Control valve

Main piston

The main piston is acted on by the adjusting screw on the inlet valve's rocker arm, and affects the oil pressure in the IEGR-unit's high-pressure channel. At the end of the IEGR-phase, a pressure of 100 bar is generated in the high-pressure circuit.

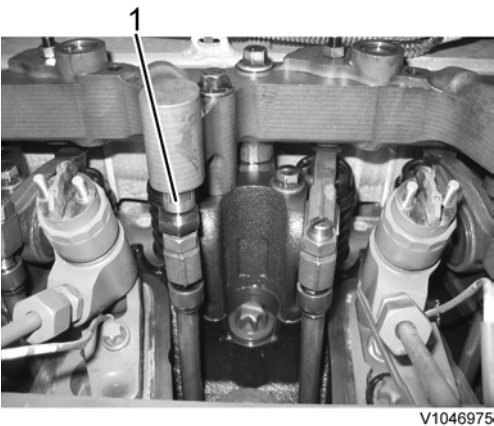
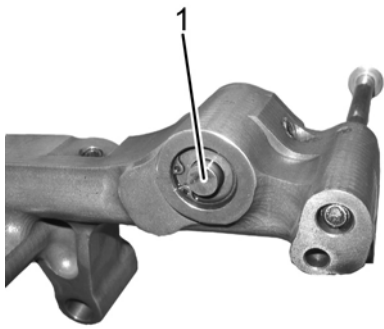


Figure 4

1. Main piston

Servo piston

The servo piston is activated by the hydraulic pressure from the main piston via a channel in the IEGR-unit when the IEGR-function is active/on (solenoid valve in open position). Then the servo piston opens the exhaust valves via the rocker arm an extra time during the induction stroke.



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Figure 5

1. Servo piston

Function

IEGR is activated by the system being supplied with full lubrication oil system pressure via the solenoid valve. The solenoid valve is activated by the E-ECU.

The control valve closes the high-pressure circuit and the ball inside the valve enables filling of the system.

With the same movement as the inlet valve's rocker arm opens the valve, the main piston is forced upward. The pressure in the IEGR-unit's high-pressure channel (up to 100 bar) overcomes the spring force in the servo piston. The servo piston forces down the rocker arm, which results in the exhaust valve being open for a short time at the end of the induction stroke.

Exhausts from the exhaust manifold are sucked into the cylinder by vacuum from the other cylinders. The breather hole between the low-pressure channel and the high-pressure channel in the IEGR-unit enables longer exhaust recirculation at high engine speed.

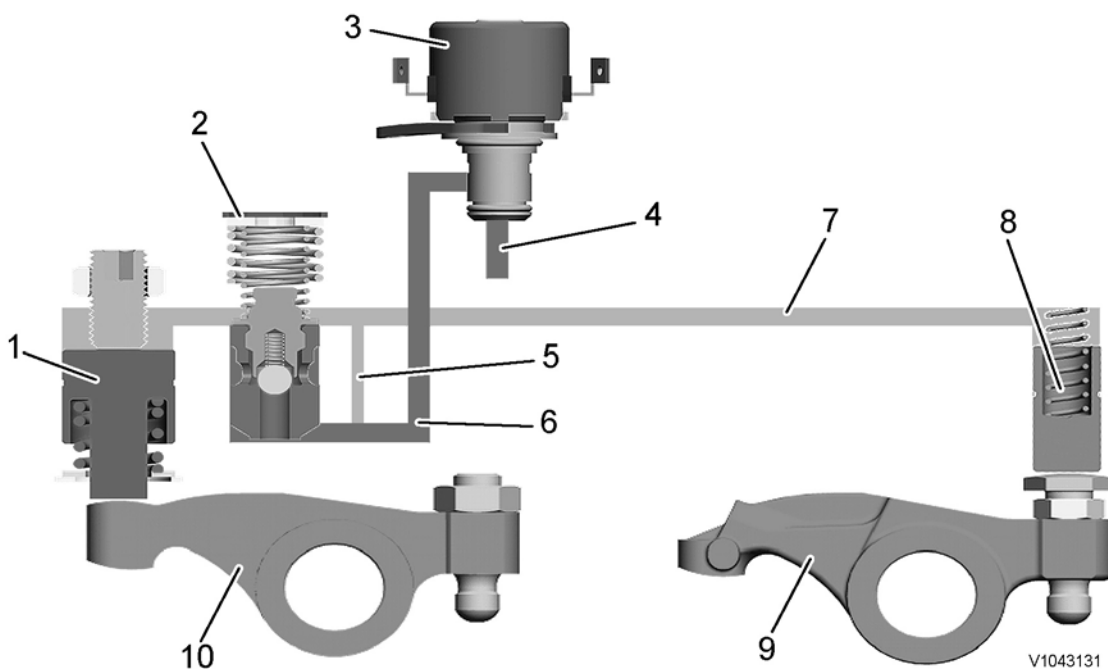


Figure 6

IEGR-system (inactive)

1. Servo piston
2. Control valve
3. Solenoid valve
4. 2–5 Bar lubrication oil pressure
5. Breather hole
6. Oil channel, low-pressure

7. Oil channel, high-pressure
8. Main piston
9. Induction rocker arm
10. Exhaust rocker arm

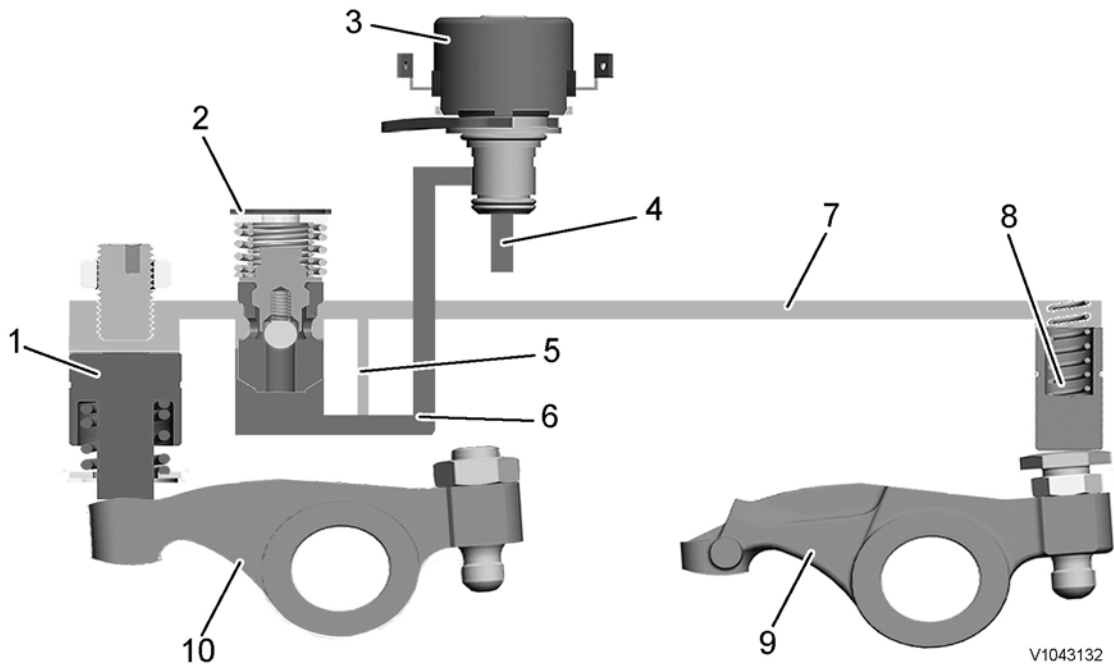


Figure 7
IEGR-system activated

1. Servo piston
2. Control valve
3. Solenoid valve
4. 2–5 Bar lubrication oil pressure
5. Breather hole
6. Oil channel, low-pressure
7. Oil channel, high-pressure
8. Main piston
9. Induction rocker arm
10. Exhaust rocker arm

Checking and adjusting

Checking and adjusting of the IEGR-opening piston's clearance against the exhaust rocker arm should be done in connection with checking and adjusting valves according to [214 Valves, adjusting](#).

Software

The function monitors the EGR valve for return of combustion gases and informs the operator if the function is not ensured or if there is a system malfunction.

The function is also used as input signal for Engine protection, see [301 Engine Protection](#).

See also [370 Wiring diagram SCH03](#).

Input signals	Conditions for output functions	Output functions
---------------	---------------------------------	------------------

<ul style="list-style-type: none"> ○ EGR-valve, MA2504 	<ul style="list-style-type: none"> ○ Mechanical problem 	<ul style="list-style-type: none"> ○ Amber central warning ○ Check — Engine system failure ○ Reduction of engine's torque (engine protection)
<ul style="list-style-type: none"> ○ Monitoring, MA2504 	<ul style="list-style-type: none"> ○ System error, signal outside limits See Diagnostics 	<ul style="list-style-type: none"> ○ Amber central warning ○ Check — Engine system failure

Document Title: Valves, adjusting	Function Group: 214	Information Type: Service Information	Date: 2014/7/17
Profile: EXC, EW210C [GB]			

Valves, adjusting

Op nbr 214-012

[9998681 Rotation tool](#)

[885812 Timing tool](#)

NOTE!

Following adapters: 15mm crowfoot adapter ; $\square 1/2$ "(inner) to $\square 3/8$ "(outer) adapter, are necessary for the timing tool.



WARNING

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

1. Place the machine in service position B, see [091 Service positions](#).
2. Turn **OFF** the battery disconnect switch.

Disassembly

3. Open the engine hood.
4. Remove cover plate (1) and lay aside.



Figure 1
Removal, cover plate

5. Remove the screws (arrows) and crankcase ventilation duct (1).

Thank you very much for reading.

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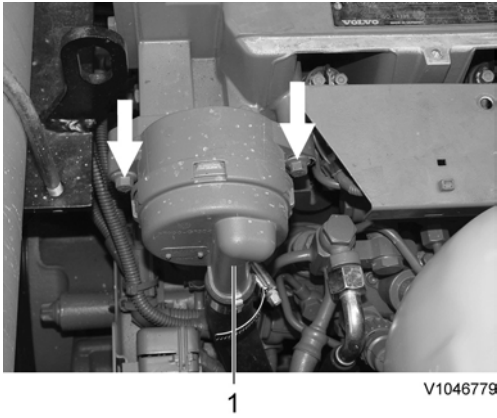


Figure 2
Crankcase ventilation duct, removal

6. Disconnect hoses (1 and 2) from the crankcase ventilation duct.

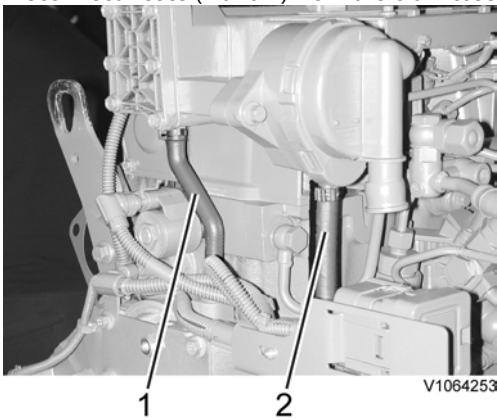


Figure 3

7. Remove rocker arm valve cover (1) with the gasket.

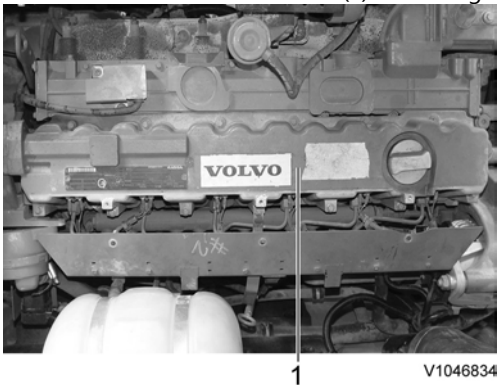
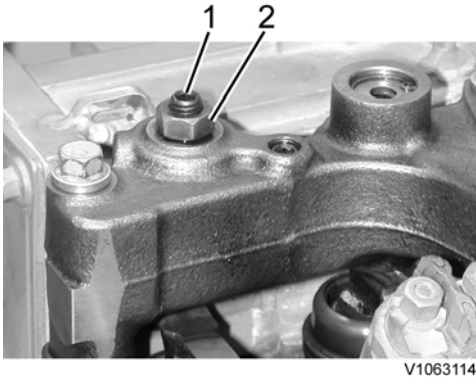


Figure 4
Rocker arm cover, removal

8. Loosen **all IEGR** lock nuts (2) counterclockwise and turn setting screws (1) counterclockwise until the resistance is gone.



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Figure 5
IEGR, lock nut and adjusting screw

Setting the valve overlap for cylinder 1