

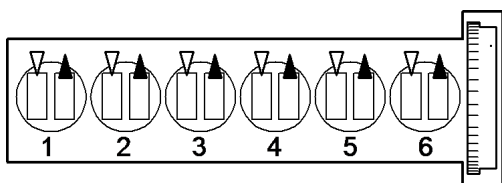
Document Title: Engine, description	Function Group: 200	Information Type: Service Information	Date: 2014/5/30
Profile: WLO, L180F, L180F HL [GB]			

Engine, description

D12D is straight, six-cylinder, four-stroke turbocharged diesel engine with direct injection and intercooler, as well as wet, replaceable cylinder liners. The engine is equipped to meet the legal requirements according to Tier 3/stage IIIA for exhaust emissions.

D12D uses V-ACT (Volvo Advanced Combustion Technology) and has split injection, optimized air handling, and turbocharger with wastegate. Electronically controlled IEGR (Internal Exhaust Gas Recirculation) lowers the content of NOX and gives lower emissions without aftertreatment of the exhausts. All electronic functions in the engine are controlled by Volvo's engine management system EMS2.

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



V1052455

Figure 1
Cylinder orientation

Engine identification

Identification plate 1

Engine designation, serial number, part number and assembly plant are stamped in one field on the engine block's left rear edge

Identification plate 2

A decal with the software's ID-number, the engine's serial number and assembly plant is located on the valve cover to ensure installation of correct ECU on the engine in production. On the back of the ECU, there is a decal indicating its hardware number.

Assembly plants:

A = Skövde, Sweden

E = Curitiba, Brazil

F = Flen, Sweden

L = Lyon, France

Identification plate 3

The certification decal is located on the valve cover as well as on the machine frame.

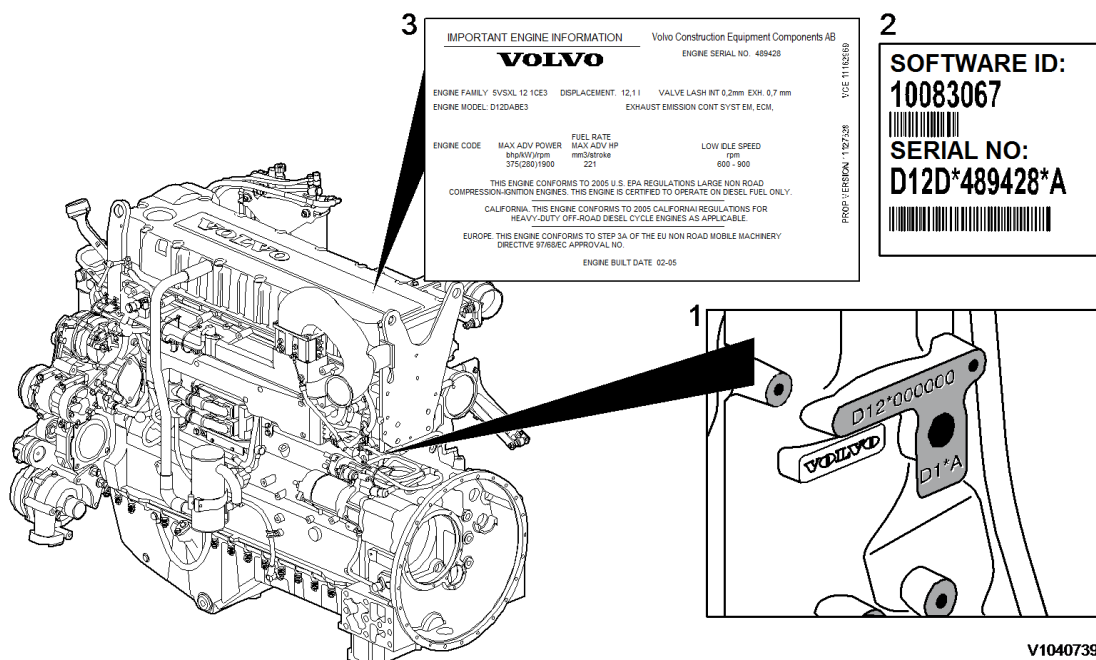


Figure 2
Engine identification, D12D

Engine protection — Software

The function informs the operator and limits the engine's rpm and torque as well as machine speed to prevent any engine damage. Engine shut-off takes place first when speed is below 2 km/h (1.2 mph). This makes it possible to move the machine away from hazardous situations before engine shut-off takes place.

The function is monitored by the engine control unit E-ECU and, depending on which component is generating the alarm, then any of the following functions is activated:

- Reduction of engine's torque
- Limitation of engine rpm
- Limitation of machine speed
- Engine shut-down

See also [370 Wiring diagram 202](#), [370 Wiring diagram 203](#), [370 Wiring diagram 204](#) and [370 Wiring diagram 206](#)

Input signals	Conditions for output functions	Output functions
○ Engine oil pressure, SE2203	○ (Critical) Low engine oil pressure, see also 220 Lubrication system description ○ Low engine oil pressure ○ No or incorrect signal from the sensor	○ Red central warning ○ Warning — Low engine oil press. ○ Warning — Stop vehicleTurn Off Engine ○ Reduction of engine's torque ○ Amber central warning ○ Check — Engine failure

○ Engine oil temperature, SE2202	○ High engine oil temperature 127–130 °C (260–266 °F) ○ No or incorrect signal from the sensor ○ (Critical) High engine oil temperature > 130°C (266 °F)	○ Amber central warning ○ Check — High engine oil temp. ○ Red central warning ○ Warning — Stop vehicleTurn Off Engine ○ Warning — High engine oil temp.
○ EGR-valve, MA2504	○ Mechanical or electrical malfunction	○ Amber central warning ○ Check — Engine system failure ○ Reduction of engine's torque by max. 12% (to reduce the turbo's rpm)
○ Charge air temperature, SE2507	○ (Critical) High charge-air temperature > 83 °C (181 °F) ○ High charge-air temperature > 81°C ○ No or incorrect signal from the sensor	○ Red central warning ○ Warning — Stop vehicleTurn Off Engine ○ Warning — High charge-air temp. engine ○ Reduction of engine's torque dependent on charge-air temperature and engine rpm ○ Amber central warning ○ Check — High charge-air temp. engine ○ Reduction of engine's torque dependent on charge-air temperature and engine rpm ○ Amber central warning ○ Check — Engine system failure
○ Coolant level, SE2603	○ (Critical) Low coolant level ○ Low coolant level ○ No or incorrect signal from the sensor	○ Red central warning ○ Warning — Stop vehicleTurn Off Engine ○ Warning — Coolant level low ○ Amber central warning ○ Check — Coolant level lowCheck at next stop ○ Amber central warning ○ Check — Engine failure

○ Coolant temperature, SE2606	○ (Critical) High coolant temperature >104 °C (219 °F) ○ High coolant temperature 102–104 °C (216–219 °F) ○ Electrical malfunction.	○ Red central warning ○ Warning — Stop vehicleTurn Off Engine ○ Warning — High coolant temp. engine ○ Reduction of engine's torque dependent on coolant temperature and engine rpm ○ Amber central warning ○ Check — High coolant temp. engine ○ Reduction of engine's torque dependent on coolant temperature and engine rpm ○ Amber central warning ○ Check — Engine failure
○ Crankcase pressure, SE2509	○ (Critical) High crankcase pressure > 5 kPa (0.73 psi) above atmospheric pressure ○ Electrical malfunction.	○ Red central warning ○ Warning — Stop vehicleTurn Off Engine ○ Warning — High crankcase pressure ○ Reduction of the engine's rpm (750 rpm) and the vehicle's speed (5 km/h). Limitation of the engine's torque. ○ Amber central warning ○ Check — Engine failure
○ Engine rpm flywheel, SE2701	○ No or incorrect signal from the sensor	○ Amber central warning ○ Check — Engine failure ○ Reduction of engine's torque by 2% per second ○ Max. torque engine 90%

Engine speed (engine speed for E-ECU) — Software

This function monitors boost pressure and informs the operator if there is a system malfunction.

Engine speed is used internally in the E-ECU for engine control and as input signal for engine protection.

In case of engine speed sensor malfunction, the E-ECU uses sensor SE2703 for camshaft speed instead.

See also [370 Wiring diagram 202](#)

Input signals	Conditions for output functions	Output functions
○ Monitoring, SE2701	○ System malfunction, signal missing or abnormal frequency See Diagnostics	○ Amber central warning ○ Check — Engine system failure ○ Reduction of engine's torque by 2% per

- second Max. torque engine 90%. Included in (engine protection)

Status engine — Software

The function is used as a condition in software functions to define which status the engine is considered to be in.

See also [370 Wiring diagram 201](#).

Input signals	Conditions for output functions	Output functions
○ Engine speed, SE2704	○ Engine speed < 39 rpm ○ Engine speed < 35 rpm (from "cranking") ○ Engine speed > 39 rpm (from "Off") ○ Engine speed < 90 rpm (from "On") ○ Engine speed > 500 rpm (from "cranking") ○ Engine speed < 2300 rpm (from "overspeeding") ○ Engine speed > 2500 rpm (from "On")	○ Engine = Off (no fuel injection) ○ Engine = Cranking (optimized fuel injection occurs) ○ Engine = On ○ Engine = Overspeeding (too high engine rpm)

Automatic engine shutdown — Software

The function control engine shut-off when the conditions according to the table have been fulfilled, and informs the operator that the engine will be shut off within 1 minute. When the engine is shut off the parking brake will also be applied.

The operator can interrupt engine shutdown by affecting the throttle pedal, hand throttle, or the gear selector.

See also [370 Wiring diagram 201](#), [370 Wiring diagram 205](#), [370 Wiring diagram 404](#) and [370 Wiring diagram 408](#)

Input signals	Conditions for output functions	Output functions
○ VCADS Pro parameter FAU ○ VCADS Pro parameter FAV ○ Directional gear, SW4205 ○ Throttle pedal, SE2702 APS ○ Hand throttle, SE2701 ○ Engine On/Off ○ Travel speed	Overall conditions for the function ○ VCADS Pro parameter FAU "On" ○ VCADS Pro parameter FAV "4–99 minutes" ○ Directional gear in position N ○ Accelerator pedal < 5% ○ Hand throttle not activated ○ Engine On ○ Travel speed < 5 km/h (3 mph)	1. Activation of the function automatic engine shut-off (4–50 min.) 2. When 1 minute remains of set time Check — AutomaticEngine shutdown is shown. [T1] 3. Engine shutdown and parking brake is applied (MA5501 without voltage)

[T1] Engine shutdown is interrupted in case of activation of throttle pedal, hand throttle, or if the gear selector is moved to position F or R.

Document Title: E-ECU, MID 128, changing non-programmed ECU	Function Group: 200	Information Type: Service Information	Date: 2014/5/30
Profile: WLO, L180F HL [GB]			

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

Op nbr 200-068

[VCADS Pro VCADS Pro Service Tool](#)

[88890180 Interface](#)

[88890027 Cable](#)

1. Ställ maskinen i serviceposition 1, se [191 Service position](#).
2. Anslut VCADS Pro och utför operationen 28423-3 MID 128 ECU, programming.
3. Öppna motorhuven på höger sida.
4. Lossa och vik undan kylslingan.
5. Ta bort kontaktstyckena från E-ECU:n och lossa kablageklammorna.

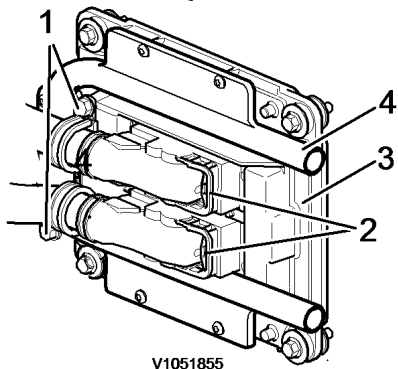


Figure 1

1. Kablageklammor
 2. Kontaktstycken
 3. E-ECU
 4. Kylslinga
6. Byt E-ECU:n.
 7. Sätt dit kylslingan.
 8. Anslut kontaktstyckena till E-ECU:n och sätt dit kablageklammorna.
 9. Slå på spänningen med batterifrånskiljaren.
 10. Slutför VCADS Pro operationen 28423-3 MID 128 ECU, programming.
 11. **NOTE!**

Efter ingrepp i säkerhetsrelaterade system skall funktionskontroll utföras på samtliga tillämpbara system enligt [191 Checking function](#).

12. Efter genomförd och godkänd funktionskontroll återställ maskinen.

Document Title: E-ECU, MID 128, changing pre-programmed ECU	Function Group: 200	Information Type: Service Information	Date: 2014/5/30
Profile: WLO, L180F HL [GB]			

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

Op nbr 200-070

[VCADS Pro VCADS Pro Service Tool](#)

[88890180 Interface](#)

[88890027 Cable](#)

1. Ställ maskinen i serviceposition 1, se [191 Service position](#).
2. Den nya styrenheten har grundinställda parametrar för maskinen. Om det är möjligt att utläsa kundparametrar, anslut VCADS Pro och utför operationen 17030-3 Parameter, programming. Save all read parameters to job card. Operationen används för att läsa ut kundparametrar från den gamla styrenheten för att sedan kunna jämföra med parametrar i den nya styrenheten.
3. Öppna motorhuven på höger sida.
4. Lossa kylslingan och vik undan den.

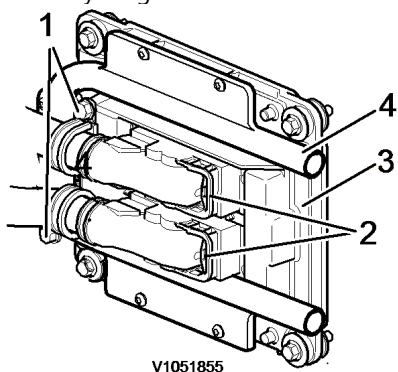


Figure 1

1. Kablageklammor
 2. Kontaktstycken
 3. E-ECU
 4. Kylslinga
5. Ta bort kontaktstyckena från E-ECU:n och lossa kablageklammorna.
 6. Byt E-ECU:n.
 7. Sätt dit kylslingan.
 8. Anslut kontaktstyckena till E-ECU:n och sätt dit kablageklammorna.
 9. Slå på spänningen med batterifrånskiljaren.

10. Om kundparametrar lästs ut från den gamla styrenheten ska de jämföras med parametrarna i den nya styrenheten.
 - Anslut VCADS Pro och utför operationen 17030-3 Parameter, programming. Save all read parameters to job card.
 - Jämför parameterinställningarna på jobbkorten.
 - Utför operationen 17030-3 Parameter, programming och ändra kundparametrarna enligt jobbkort för den gamla styrenheten.
11. **NOTE!**

Efter ingrepp i säkerhetsrelaterade system skall funktionskontroll utföras på samtliga tillämpbara system enligt [191 Checking function](#).
12. Efter genomförd och godkänd funktionskontroll återställ maskinen.

Document Title: Engine, removing	Function Group: 210	Information Type: Service Information	Date: 2014/5/30
Profile: WLO, L180F HL [GB]			

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Engine, removing

Op nbr 210-070

[9998547 Lifting tool](#)

Sling, 3 m, 2 pcs.

Sling, 4 m, 1 pcs.

Lifting eye M12, 2 pcs.

Washer M12, 2 pcs.

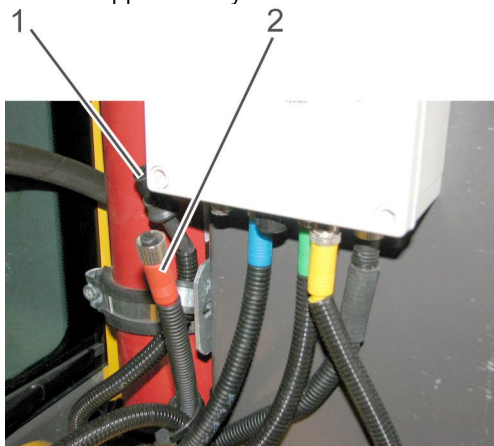
Nut M12, 2 pcs.

Shackle, 6 pcs.

Ratchet block, 750 kg

The operation also includes tools and times for steps to which references are given.

1. Place the machine in service position, see [191 Safety rules when servicing](#).
2. Turn off the main electric power with the battery disconnect switch.
3. Disconnect the (red) electric power cable and squib cable (gas generator cable) from the control unit to deactivate the fire suppression system.



V1077444

Figure 1
Control unit

1. Squib cable (gas generator cable)

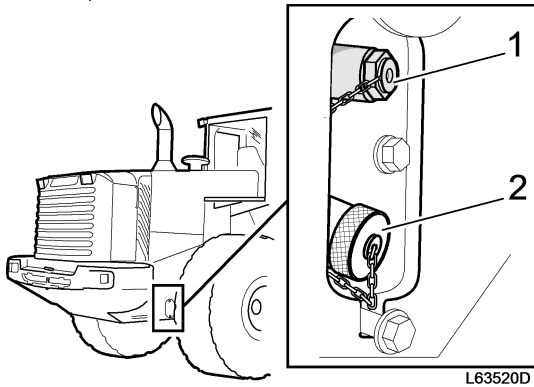
2. Electric power cable



WARNING

Risk of burns when removing the header tank cap because of excess pressure in the cooling system.

4. Remove the cap from the expansion tank.
Drain the coolant. Use the drain hose located in the machine's toolbox.
Volume, see [030 Cooling system, volume](#).

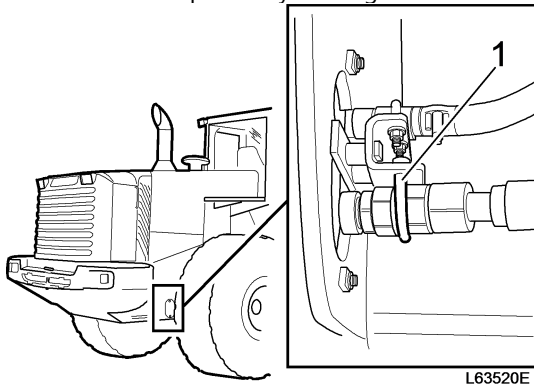


L63520D

Figure 2

1. Drain point for coolant
2. Drain for engine oil

5. Remove the engine hood, see [821 Engine hood, removing](#).
6. Drain the engine oil. Use the drain hose located in the machine's toolbox.
Volume, see [030 Engine, capacities](#).
7. Remove the side panels by the engine and remove the clamp that holds the oil drain.



L63520E

Figure 3

1. Clamp

8. Drain the transmission oil. Volume, see [030 Hydraulic transmission, capacity](#)
9. Remove the oil pipe from the flywheel housing.

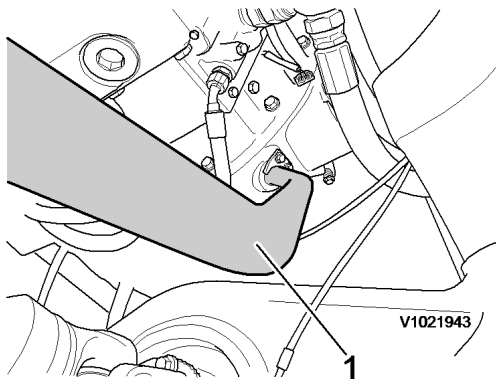


Figure 4

1. Oil pipe

Left side

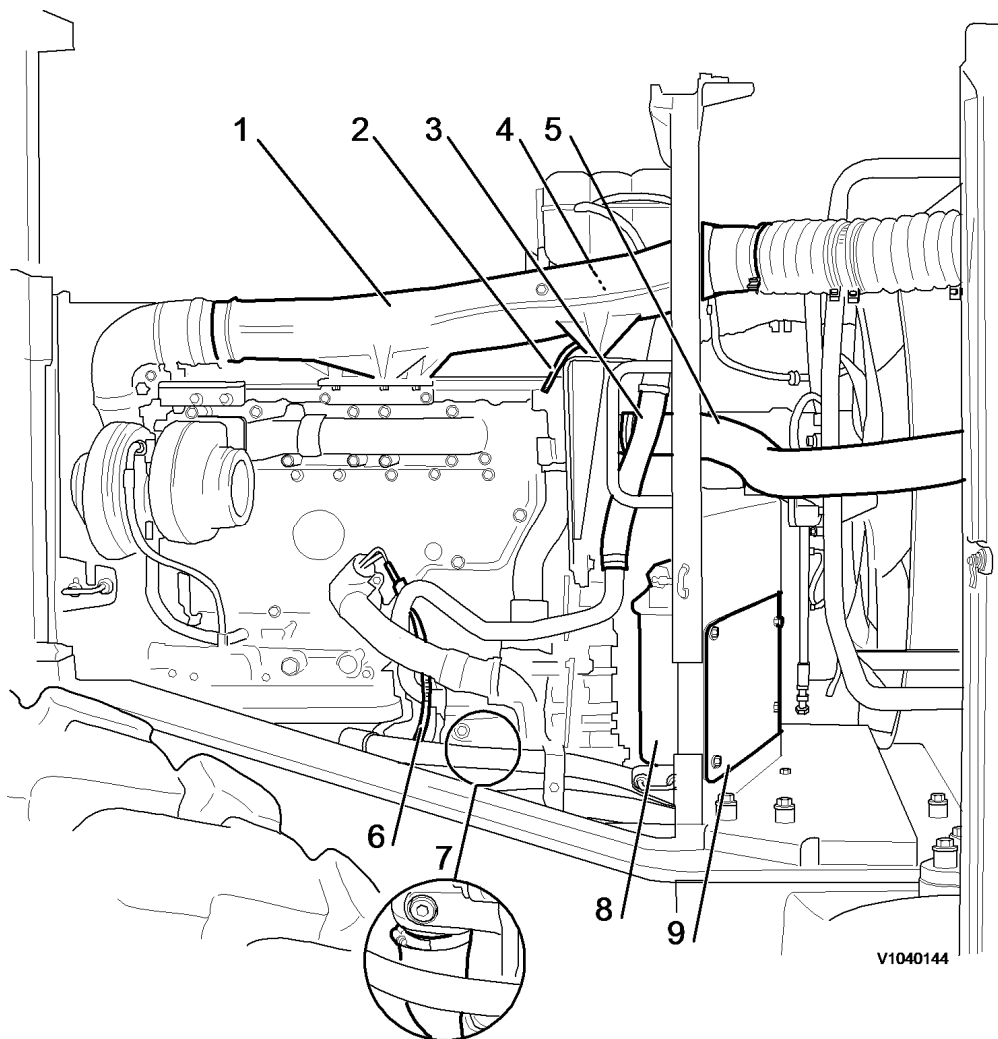
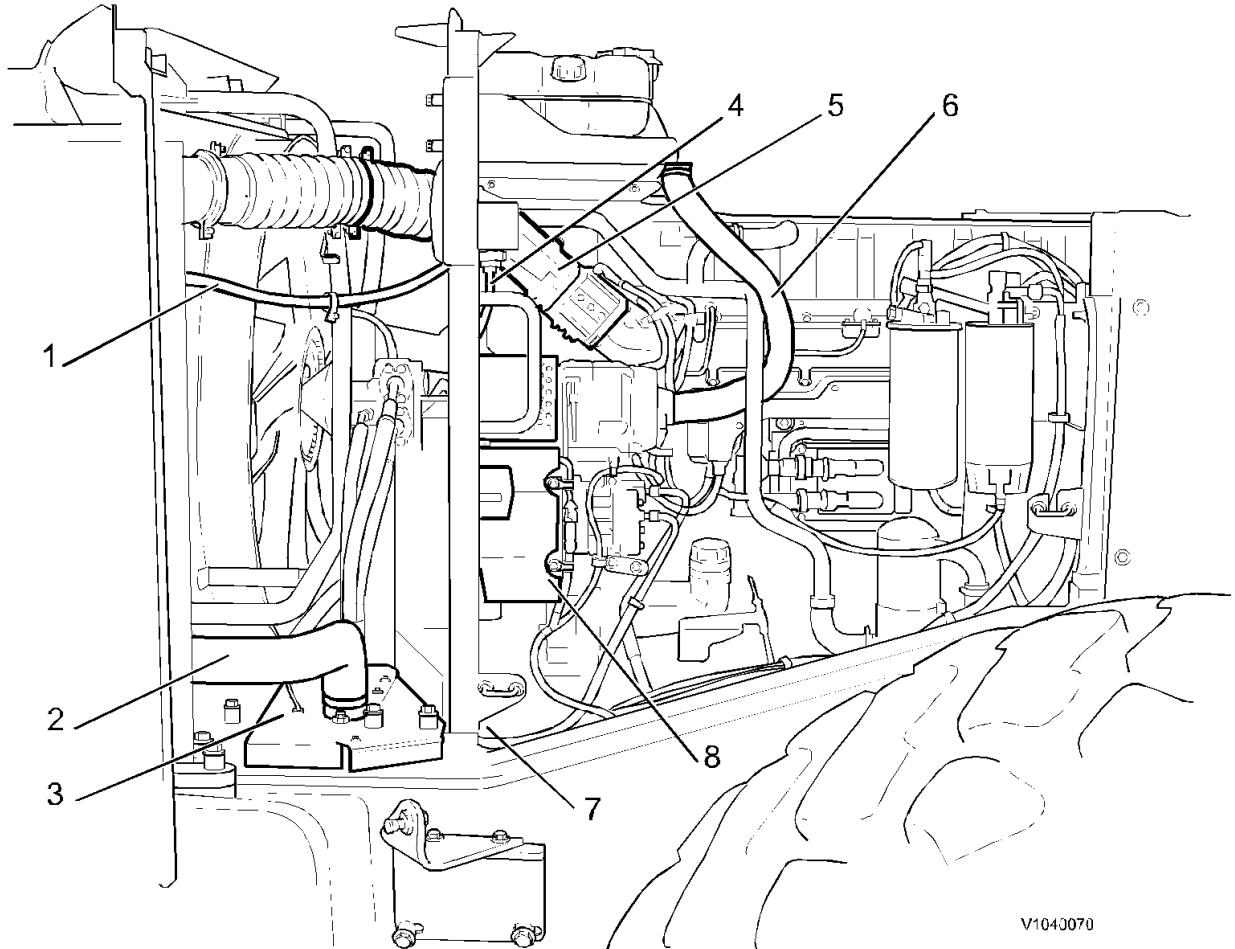


Figure 5

- | | |
|-------------------------|-------------------------|
| 1. Charge-air pipe | 6. Cable, engine heater |
| 2. Radiator hose | 7. Radiator hose, lower |
| 3. Hose | 8. Filter housing |
| 4. Connector (SE2603) | 9. Plate |
| 5. Radiator hose, upper | |

10. Remove the charge-air pipe.
11. Disconnect the upper and lower radiator hose from the engine.
12. Disconnect the cable to the optional engine heater.
13. Disconnect the hose at the cylinder head and the hose at the expansion tank.
Unplug the connector for the coolant level sensor (SE2603) on the expansion tank.
14. Remove the plate by the oil filters.
15. Remove the filter housing from the intermediate wall and remove the clamp.

Right side



V1043070

Figure 6

- | | |
|------------------------|--------------------|
| 1. Upper radiator hose | 5. Charge-air pipe |
| 2. Radiator hose | 6. Air hose |
| 3. Bottom plate | 7. Bracket |
| 4. Breather hose | 8. Guard |

16. Remove the protection for the AC compressor.
17. Disconnect the hose from the radiator.
18. Remove the clamps for the breather hose and drain hose. Disconnect the hose from the breather filter.
19. Disconnect the air hose from the alternator.

WARNING

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

20. Disconnect the charge-air pipe in the space between the radiator and the intermediate wall. Remove the bolts that hold the preheating coil. Fold aside the heating coil and remove the pipe.
21. Disconnect the bracket for the AC hoses from the intermediate wall.
22. Disconnect the radiator hose and remove the bottom plate.
23. Remove the intermediate wall.
Weight approx.: **65 kg (143 lbs)**

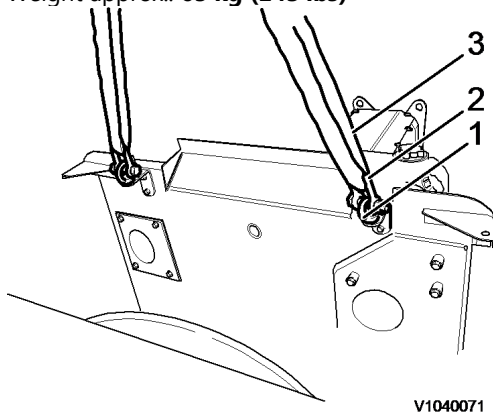
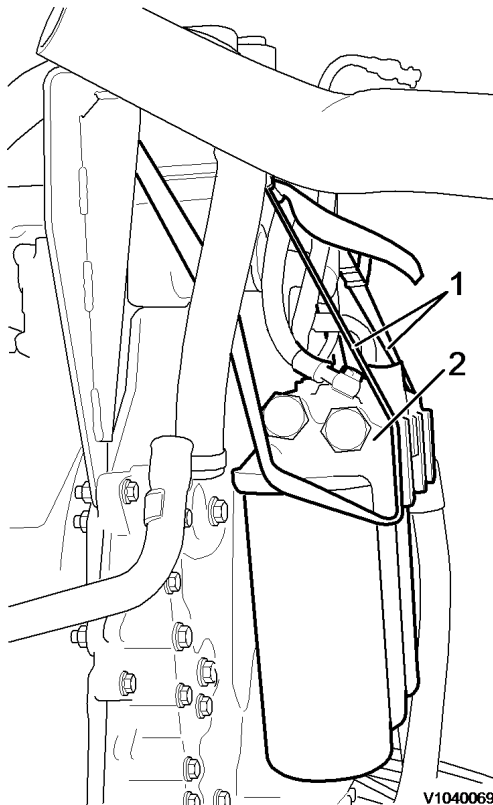


Figure 7

1. Lifting eye M12, 2 pcs.
2. Shackle M16, 2 pcs.
3. Sling, 4 m (13 ft)



24.

Figure 8



Our support email:

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