VOLVO
Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Engine, description	**200**	**Service Information**	**2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

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Engine, description

Engines D11F, D13F, and D16F are straight six-cylinder, four-stroke, direct-injected diesel engines. Engines D13F and D16F are equipped with a single turbocharger with wastegate and engine D11F has a turbocharger without wastegate. 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. Engine brake for Articulated Hauler; VEB+ (EPG, Exhaust Pressure Governor, and VCB, Volvo Compression Brake).

For more information, see:

- 220 Lubrication system, description
- 230 Fuel system, description
- 250 Inlet and exhaust system, description
- 255 Turbocharger, description
- 260 Cooling system, description

For Articulated Haulers:

- 253 Auxiliary brake (engine braking), description
- 253 Exhaust pressure governor

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

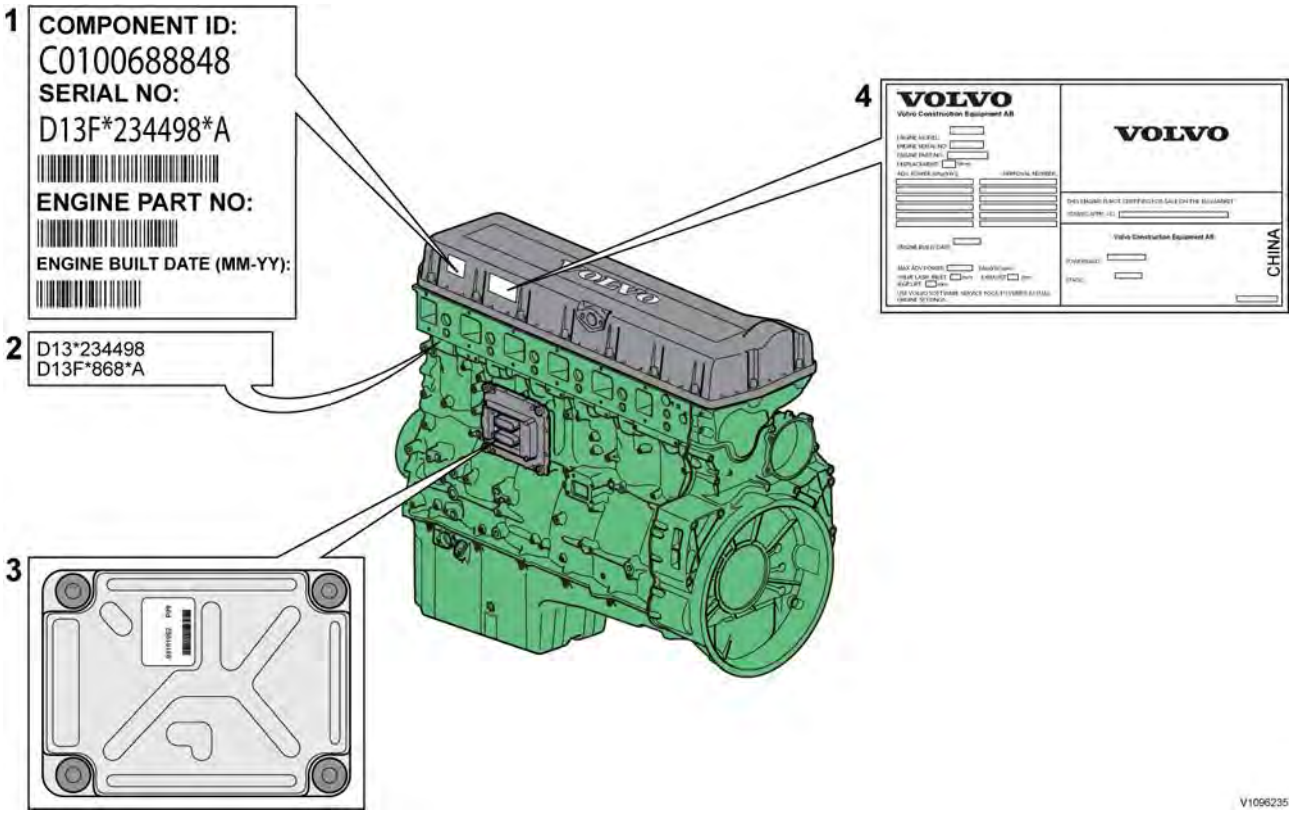

Figure 1
Identification plates, D13F

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 crankcase pressure
- High ECU 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 discharge temperature is never reached)
- Turbo OverSpeed
- Low Coolant Temp
- Crank Sensor Failure
- Gear Ratio

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

- (ATJ) Injector cylinder 1, calibration
- (ATK) Injector cylinder 2, calibration
- (ATL) Injector cylinder 3, calibration
- (ATM) Injector cylinder 4, calibration
- (ATN) Injector cylinder 5, calibration
- (ATO) Injector cylinder 6, calibration
- (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
EF2117 (ART) PPID55 (WLO, EXC)	MID128	PPID55
SE2202 FX1006 (WLO)	MID128	PID175
SE2507 FX1007 (WLO)	MID128	PID105
SE2203	MID128	PID100
SE2509	MID128	PID153
SE2603	MID128	PID111
SE2606	MID128	PID110

Document Title: **Engine, description**	Function Group: **200**	Information Type: **Service Information**	Date: **2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

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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

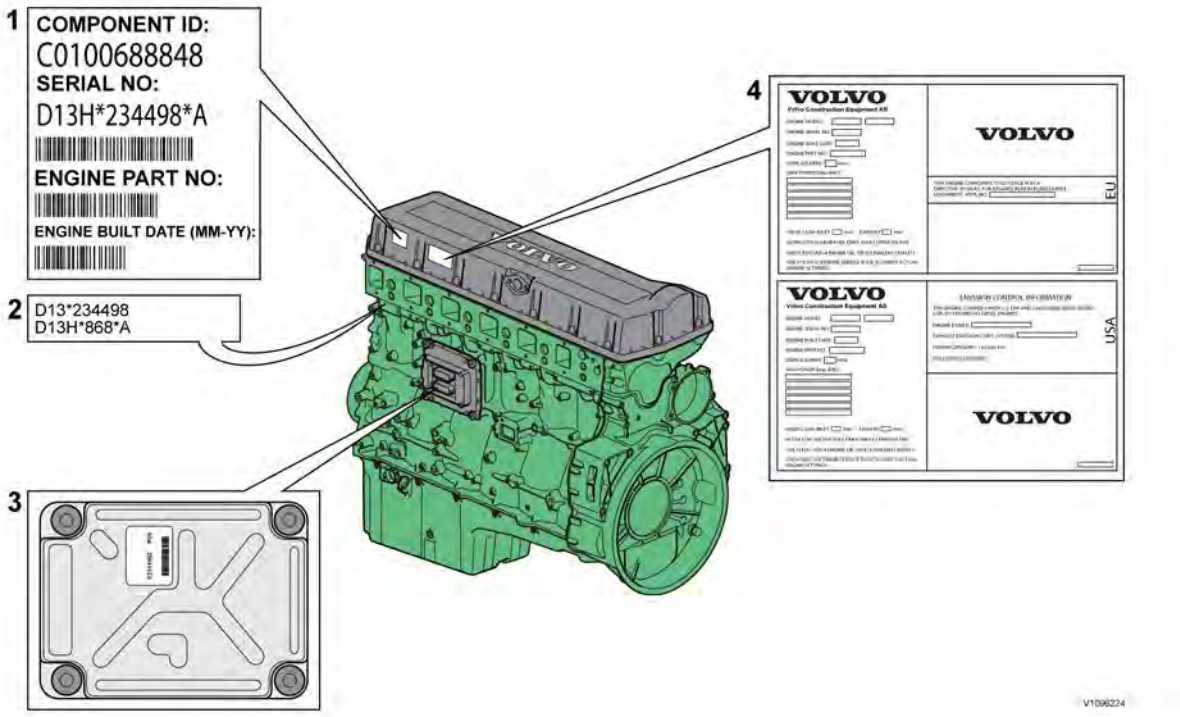

Figure 1
Identification plates, D13H

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

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Service Information

Document Title:	Function Group:	Information Type:	Date:
Engine, sensor positions	**200**	**Service Information**	**2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

Engine, sensor positions

Control unit sensors

This is a brief description of the sensors that are found on the engine.

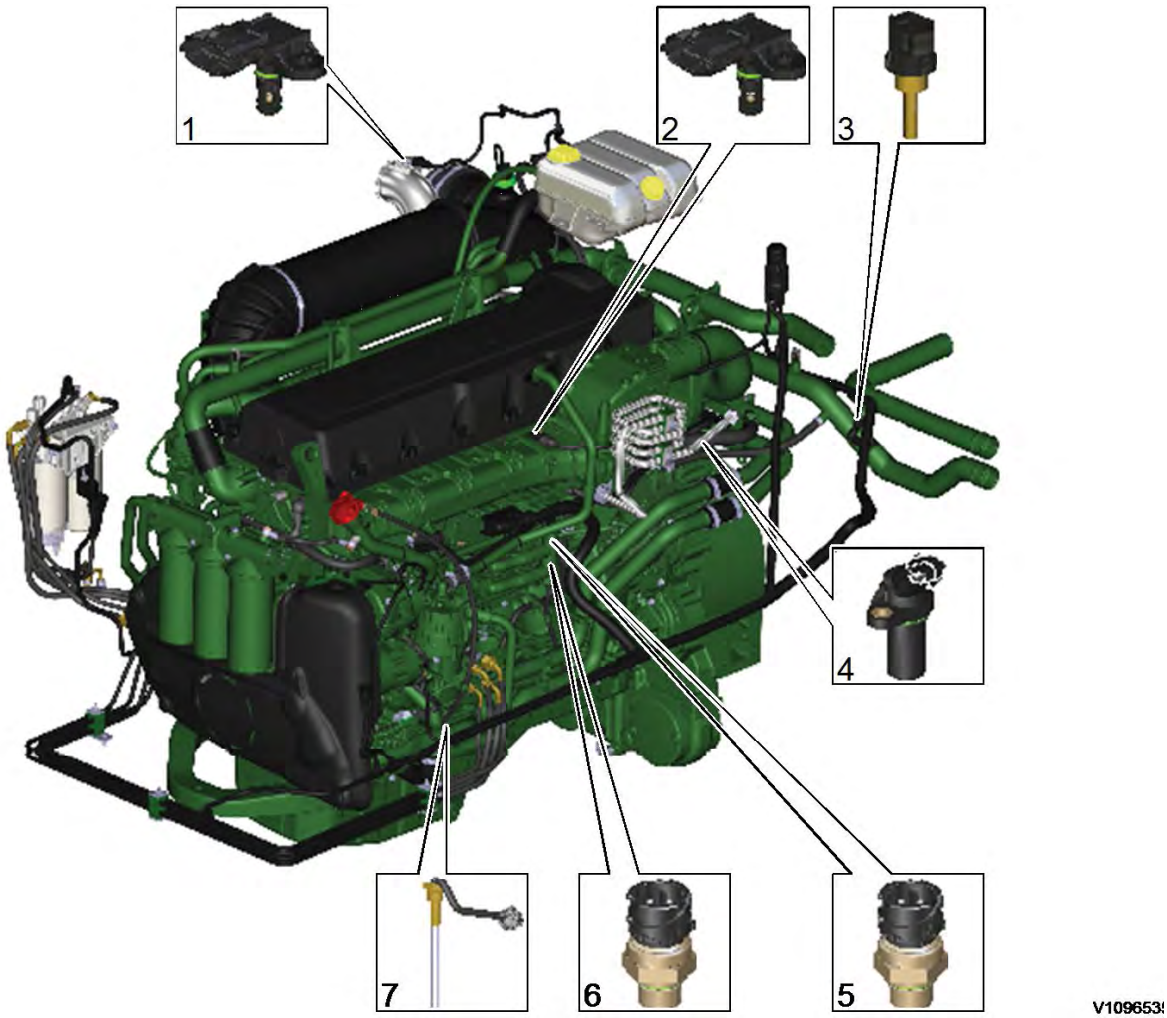

Figure 1

1. Sensor for charge-air temperature, SE2512 (only engine with EGR)
2. Sensor for boost pressure/charge-air temperature, SE2507/SE2508 FX1007
3. Sensor for coolant temperature, cooling circuit converter, SE2601
4. Tachometer sensor, flywheel, SE2701
5. Sensor for oil pressure, SE2203
6. Sensor for crankcase pressure, SE2509
7. Sensor for oil level/oil temperature, SE2205/SE2202 FX1006

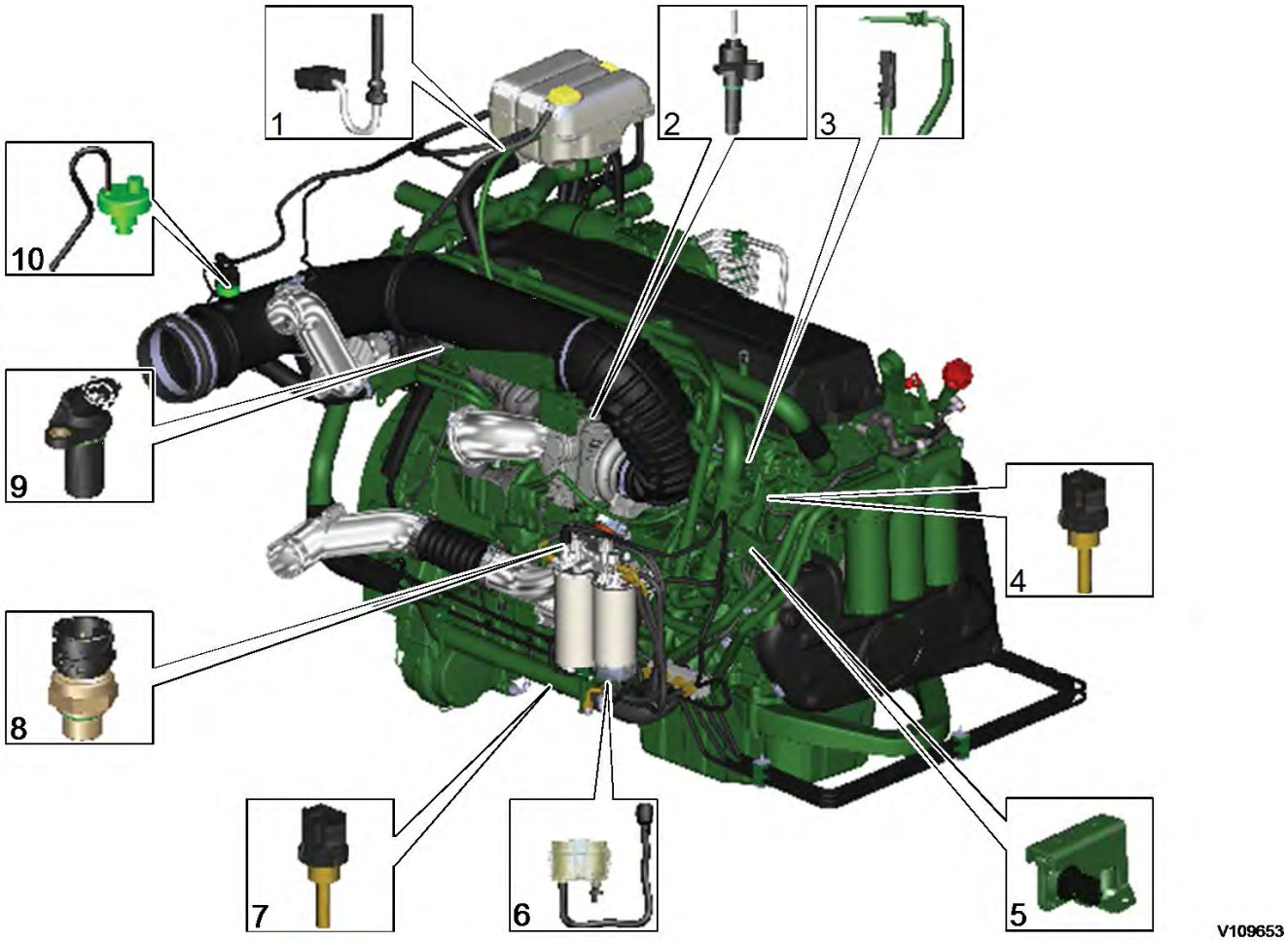

Figure 2

1. Sensor for coolant level, SE2603
2. Speed sensor (rpm), turbocharger SE2514
3. Temperature sensor EGR SE2516
4. Sensor, coolant temperature SE2606
5. Sensor, EGR-flow SE2515
6. Sensor for water indicator, SE2302
7. Sensor for coolant temperature, cooling circuit engine/retarder, SE2602
8. Sensor for fuel pressure, SE2301
9. Camshaft sensor, engine position, SE2703
10. Sensor for air pressure/air temperature, SE2501/SE2502 FX1008

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Service Information

Document Title:	Function Group:	Information Type:	Date:
Engine, identification	**200**	**Service Information**	**2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

Engine, identification

Identification plate 1

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.

Identification plate 2

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

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

Identification plate 3

The engine control unit (ECU) has its component number on a plate on the back.

Identification plate 4

The certification decal is located on the valve cover as well as on the left side of the machine's front frame.

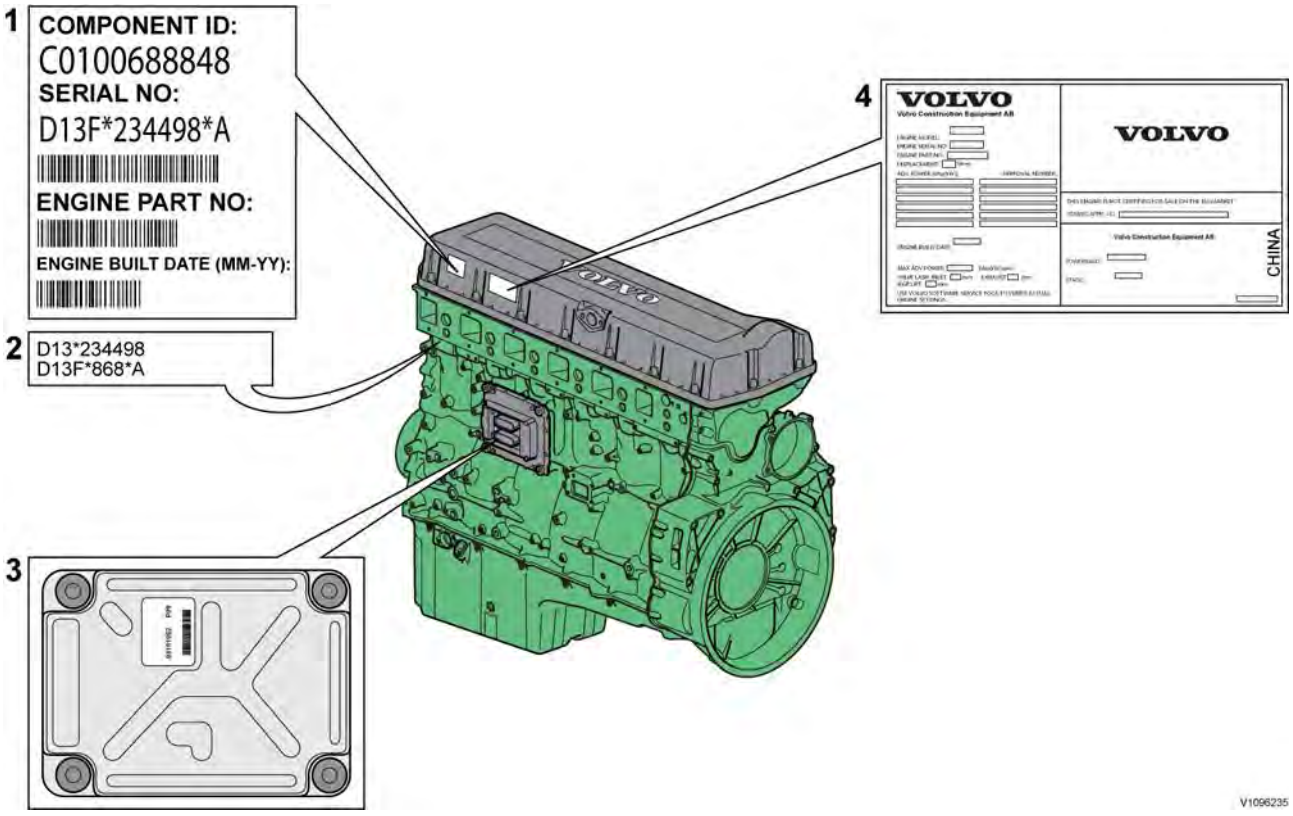

Figure 1

Product plate

Figure 2

Engine versions

In order to offer machines with lower environmental impact, two main engine types have been developed for machines in the F-series. One version developed for generally available fuel and oil grades, and a version that meets higher emission requirements. The easiest way to see on the machine what version it is, check if it has a diesel particle filter (Diesel Particulate Filter) in the muffler. See: 254 Exhaust Aftertreatment System, description.

Machine	Engine designation	Diesel Particulate Filter
A25F	D11F	No
A25F	D11H	Yes
A30F	D11F	No
A30F	D11H	Yes
A35F	D13F	No
A35F	D13H	Yes
A40F	D16F	No
A40F	D16H	Yes

Document Title: **VCADS Pro, Operations**	Function Group: **200**	Information Type: **Service Information**	Date: **2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

VCADS Pro, Operations

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

NOTE!
Operations used when changing or repairing components are mandatory.

NOTE!
New operations are developed regularly. For a current list of all tests, see VCADS Pro software.

Tests

Operation	Application
20046-3 Read out engine information	The test is used to read out engine emissions and engine certification information.
21006-3 Cylinder compression, test	The test shows whether the compression of any cylinder differs from that of the other cylinders.
23016-3 Cylinder balancing, test	The test shows whether fuel injection on any cylinder differs from that on the other cylinders.
23017-3 Feed pressure, inspection	The test is used to check feed pressure.
23712-3 Injectors shut off, manual	The test supplements cylinder balancing. In the test, one injector at a time can be turned off manually.
25410-3 Air pump exhaust aftertreatment, test	The test is used to check cut-in and cut-out of the air pump for the exhaust aftertreatment system.
25411-3 Burner exhaust aftertreatment, test	The test is used to diagnose the exhaust aftertreatment system. The test activates the built-in diagnostic function in the control unit. The test indicates any failure with a red light. Read out error codes with operation 17012-3, Error codes.
25412-3 Components ASU, test	This subtest is used to check function of the atomization unit's air valve, main air valve, the fuel's shut-off valve, and the fuel pump.
25433-3 Fuel system exhaust aftertreatment, bleeding	The test is used to purge any air in the fuel system for the atomization unit.
25434-3 Atomization unit, fuel pressure, adjust	The test is used to adjust the fuel pressure in the atomization unit.
25456-3 Exhaust aftertreatment diagnostics	The test is used to check status of the included components for the exhaust aftertreatment.
25457-3 Diesel Particulate Filter Service Regeneration	This operation is used when the soot load is above 1.7, see 254 Exhaust Aftertreatment System, description In this operation, status and a number of sensor values can be read out during on-going regeneration. Also check that "DPF differential pressure" is within permitted values, both before and after regeneration, see 254 Exhaust aftertreatment system, specifications
25537-3 Variable geometry turbo function test	The test is used to check function of the variable geometry turbo (VGT).
26351-3 Hydraulic cooling fan, test	The test controls the cooling fans' speed control (independent of ordinary control) and is used when adjusting speed.
27102-3 Accelerator pedal, test	The test is used to check function of the throttle pedal.

28407-3 Sensor values, monitoring	The tests show values (temperature, rpm, etc.) that the system receives from connected sensors and monitors.
28420-3 Flywheel and camshaft signal, test	The test is used to use an oscilloscope to check signals from the flywheel and camshaft position sensors.
29332-3 Exhaust gas circulation, function test	The test is used to check function of the exhaust gas recirculation.

Calibrations

Operation	Application
25536-3 Variable geometry turbo, calibration	When changing actuator, see 255 Actuator, variable turbocharger, replacing

Programming

Operation	Application
25801-3 MID 233 Control unit, programming	When changing control unit or when reprogramming complete or part of the software.
25802-3 MID 233 Control unit, campaign	Use for campaign programming of the control unit.
28422-3 MID 128 ECU, campaign	Use for campaign programming of the control unit.
28423-3 MID 128 ECU, programming	When changing control unit or when reprogramming complete or part of the software.

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Service Information

Document Title:	Function Group:	Information Type:	Date:
E-ECU, MID 128, changing pre-programmed ECU	**200**	**Service Information**	**2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

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

Op nbr 200-070

This operation also includes required tools and times for applicable parts of the following operations:

- 191 Service positions
- 200 E-ECU, MID 128, changing non-programmed ECU

1. Place the machine in service position, see 191 Service positions.
2. Connect VCADS Pro computer and perform 17030-3 Parameter, programming.
    - Use the function: Save all read parameters to job card.
3. Run 200 E-ECU, MID 128, changing non-programmed ECU from and including step 3 and on.
4. Connect VCADS Pro computer and perform 17030-3 Parameter, programming.
    - Program earlier read-out parameters according to the job card.
5. Restore the machine to operating condition.

Document Title: **E-ECU, MID 128, changing non-programmed ECU**	Function Group: **200**	Information Type: **Service Information**	Date: **2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

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

Op nbr 200-068

This operation also includes the tools and times needed for required parts of the following actions:

- 191 Service positions

1. Place the machine in service position, see 191 Service positions.
2. Connect VCADS Pro computer and perform 28423-3 MID 128 ECU, programming.
   - When instructed to connect the new control unit, perform steps 3-15.

CAUTION

Always follow instructions according to Electrical system, work instructions, electronic components

3001 Electrical system, special instructions for servicing, electronic components

CAUTION

Always follow instructions according to Electrical system, work instructions, electronic components

3. **Removing**
   Open the engine hood.
4. Turn off the main electric power with the battery disconnector.
5. Remove the three screws (1) that disconnect the clamps from the E-ECU.

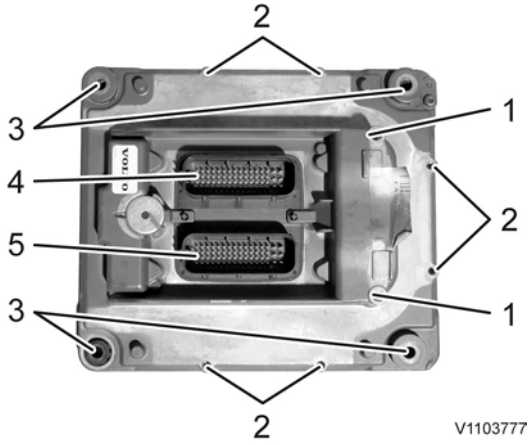

Figure 1
E-ECU

1. Mounting point for clamp
2. Mounting point for cooling unit

3. Mounting point for E-ECU
4. Connector EA
5. Connector EB

6. Unplug the connectors EA (4) and EB (5) from the E-ECU.

7. Loosen the cooling unit (2) from the E-ECU (6 bolts).

8. Carefully move aside the cooler and remove the E-ECU.
   NOTE!
   Work carefully so that hoses for the cooler are not damaged.

9. **Installing**
   Fit the E-ECU.

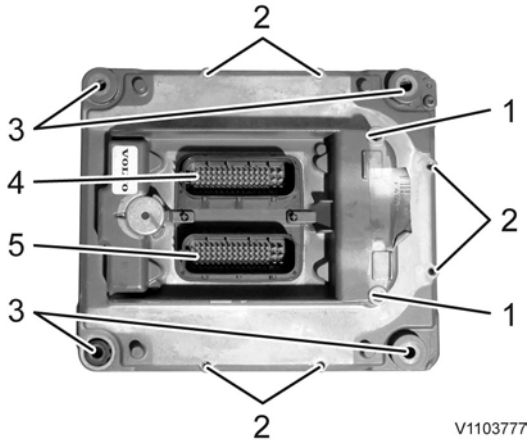

Figure 2
E-ECU

1. Mounting point for clamp
2. Mounting point for cooling unit
3. Mounting point for E-ECU
4. Connector EA
5. Connector EB

10. Connect the cooling unit (2) to the E-ECU.

11. Plug in the connectors EA (4) and EB (5) for the E-ECU.

12. Install the screws (1) that fasten the clamps to the E-ECU.

13. Close the engine hood.
    NOTE!
    When changing pre-programmed control unit, go back to 200 E-ECU, MID 128, changing pre-programmed ECU step 4.

14. Finish VCADS Pro operation 28423-3 MID 128 ECU, programming.

15. Restore the machine to operating condition.

Document Title:	Function Group:	Information Type:	Date:
Cylinder compression, PC test	**210**	**Service Information**	**2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

Cylinder compression, PC test

Connect the VCADS Pro computer and carry out 21006-3 Cylinder compression, test.
(21006-3) This test indicates if there is any deviation in compression in any cylinder in relation to the other cylinders.

Document Title: **Engine and transmission, removing**	Function Group: **210**	Information Type: **Service Information**	Date: **2014/8/6 0**
Profile: **ART, A35F FS (37141) [GB]**			

Engine and transmission, removing

Op nbr 210-073

This operation also includes required tools and times for applicable parts of the following operations:

- 191 Service positions
- 173 Coolant, change
- 900 Vacuum pump, connection
- 715 Protective plate, removing
- 821 Engine hood, removing

WARNING

Changing control units between machines, when troubleshooting or repairing, may not take place for any reason without reprogramming.

Incorrect individual settings in the control unit may result in personal injury or machine damage.

For reprogramming and read-out of software, see "VCADS Pro User manual".

1. Place the machine in service position, see 191 Service positions.
   NOTE!
   If the height between the workshop floor and the overhead crane member is less than 450 cm (15 ft), the engine hood shall be removed. If higher, the engine unit can be lifted out with the engine hood left on the machine.

   See: 821 Engine hood, removing

2. Drain the machine's compressed air tank. Press in the valve to release the air.


V1076354

Figure 1

3. Remove the front and rear underbody skid plates, see 715 Protective plate, removing.

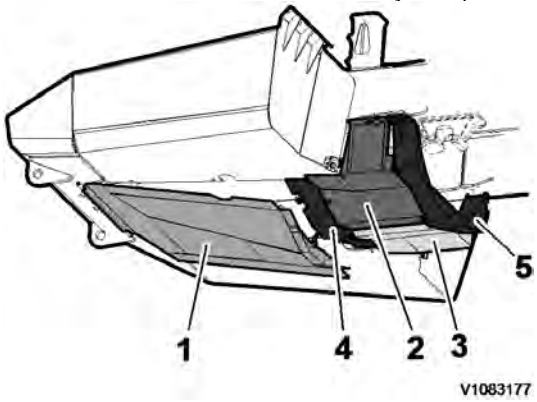

Figure 2
Underbody skid plates

1. Front underbody skid plate
2. Rear underbody skid plate, left
3. Rear underbody skid plate, right
4. Front cross member
5. Rear cross member

4. Loosen the oil drain bracket and move it aside. Fasten it so that it so that it follows along with the engine when it is lifted out of the machine.

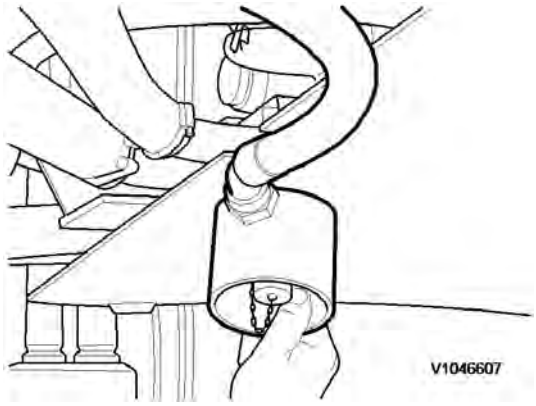

Figure 3

5. Drain the coolant, see 173 Coolant, change.

6. Drain the transmission oil. Connect the drain hose to the drain connection. Insert the drain hose into a suitable container.
   NOTE!
   Take care of waste oil/fluids in an environmentally sound manner.

   NOTE!
   The oil drain hose is inserted in the pipe for the ladder on the inside of the front grill.

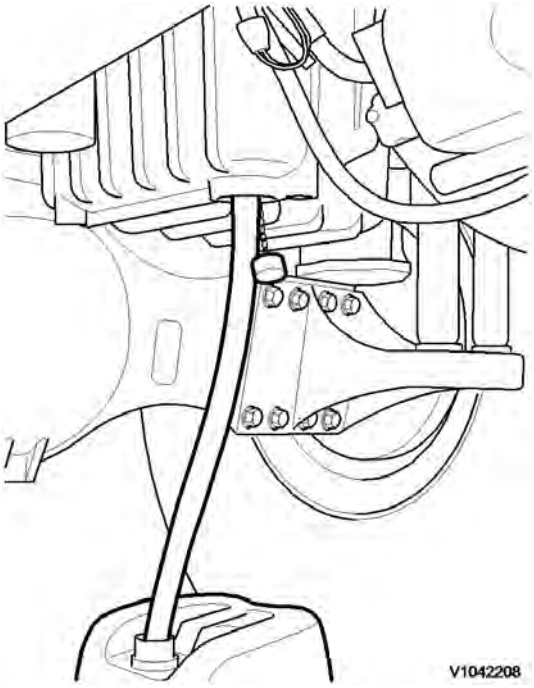

Figure 4

7. Loosen the bolts and unhook the bracket for the brake cooling oil's breather filter. Loosen the bolt and swing out the radiator.

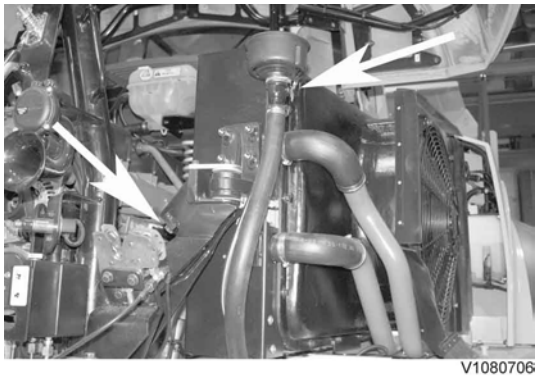

Figure 5

8. Loosen and remove the belt guard.

Figure 6

The figure shows engine D16

9. Loosen the three belt tensioners with a ratchet handle and remove the belts.

Figure 7

The figure shows engine with EGR.

10. Mark up and remove the connection (AL 3201), the plus cable, and the ground cable from the alternator.

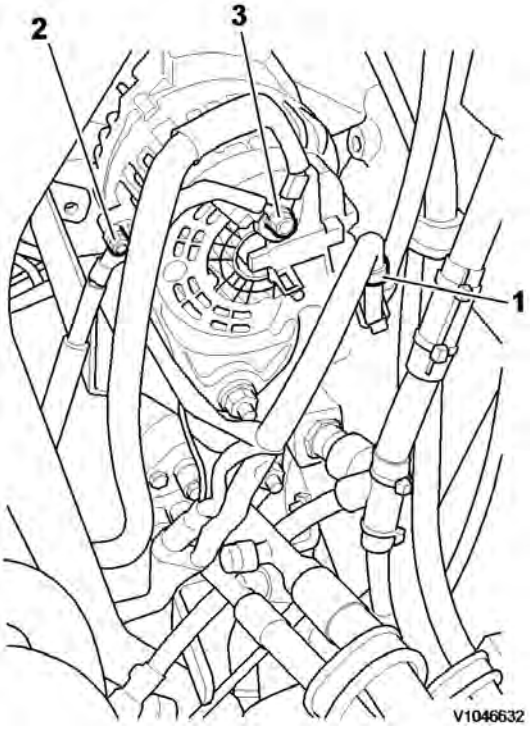

Figure 8

WARNING

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

11. Remove the bracket for the belt guard and loosen the AC compressor. Loosen the electric connections for control current to the AC compressor and remove the bolts that hold the AC compressor.
Loosen the connections for the air pump (only EGR-engine).

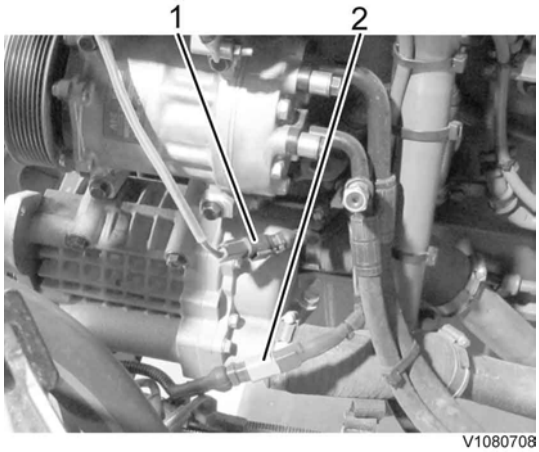

Figure 9
Connectors

1. AC Compressor
2. Air pump (only EGR-engine)

12. Lay aside the AC compressor with hoses.

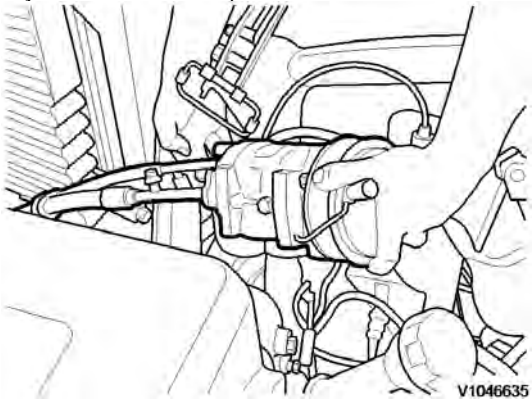

Figure 10

13. For engine with EGR: Loosen the connections for inlet and outlet air. Secure the pump with a tensioning strap and remove it. Remove the bolts that hold the air pump. Plug open air connections.

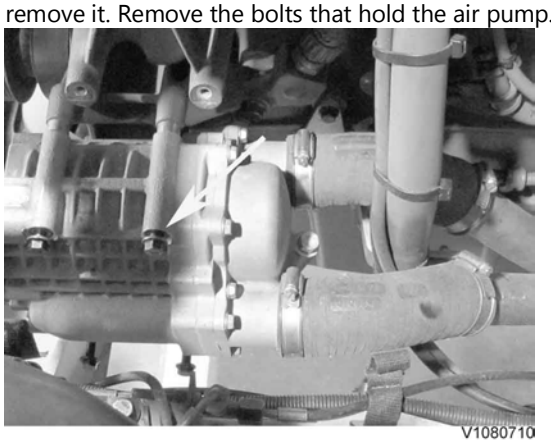

Figure 11

14. Unplug the connector (EL). Remove the cable clamp.

Figure 12

15. Loosen the plus cable for the preheating coil and the hose to the compressed air pipe. On D13, the preheating coil is installed with the connections facing down.

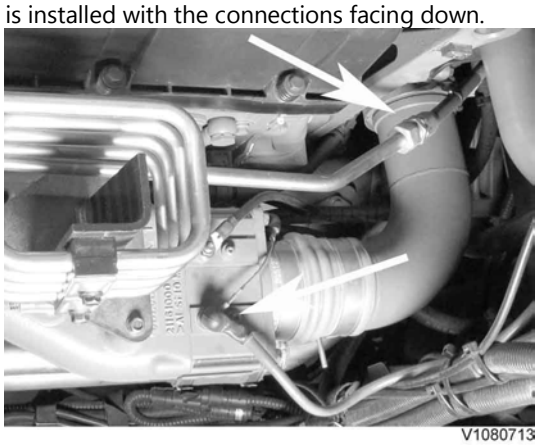

Figure 13

The figure shows the preheating coil on engine D16

16. For engine **without** EGR: Loosen the air connection for PWM-valve, PWM 2501, for the exhaust brake.

Figure 14

17. Loosen and plug the fuel connections.