VOLVO

Construction Equipment

Service Information

Document Title: **Component locations**	Function Group: **000**	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Component locations

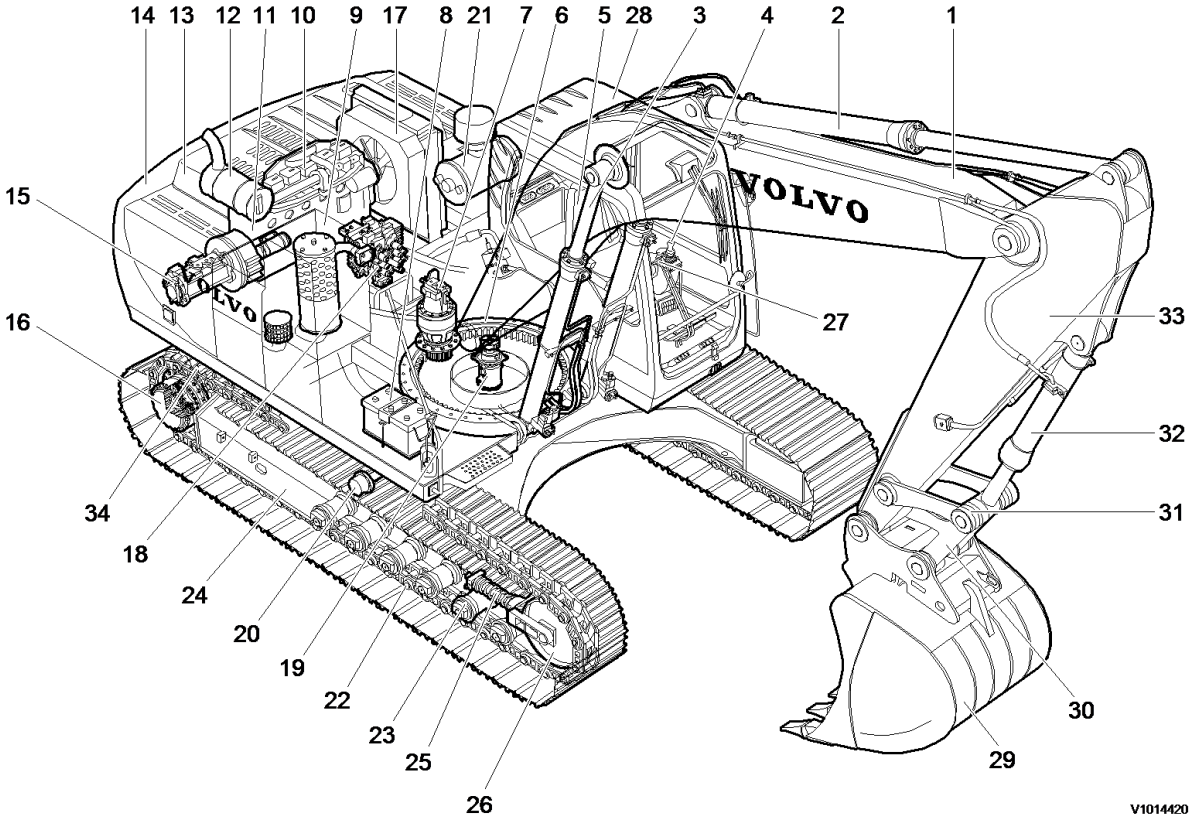


Figure 1
Location of components

1	Boom	13	Cowl	25	Recoil spring
2	Arm cylinder	14	Counterweight	26	Idler
3	Boom cylinder	15	Hydraulic pump	27	Control lever (travel)
4	Control lever	16	Track motor and gearbox	28	Operator cab
5	Operator's seat	17	Radiator and oil cooler	29	Bucket
6	Slew ring gear	18	Main control valve	30	Connecting rod
7	Slew motor and gearbox	19	Center passage	31	Yoke
8	Battery	20	Top roller	32	Bucket cylinder
9	Fuel tank	21	Air cleaner	33	Arm
10	Engine	22	Track link	34	Sprocket
11	Hydraulic tank	23	Bottom roller		
12	Muffler	24	Superstructure		

3	4	Nut	M16
4	4	Washer φ16 × φ35 × 10 t	

Use tools properly

Figure 4
Use tools safely

- Use a tool only for its designed application.
- Keep all tools in good condition and know the correct way to use them.
- Decide on a place in the repair workshop to keep tools and removed parts.
- Always keep the work area clean and make sure that there is no dirt or oil on the floor.
- Before adding oil or making any repairs, park the machine on hard, level ground and put blocks under the wheels or tracks to prevent the machine from moving.
- Before starting work, lower the blade, ripper, bucket or any other work equipment to the ground.
  If that is not possible, insert the safety pin or use blocks to prevent the work equipment from falling.

Control lockout system

WARNING

Place the control lockout lever securely to "Locked" position to lock out the control hydraulics before starting the engine or leaving the operator's seat. Unless the control lockout lever is in the "Locked" position, control levers can be operated by careless touch, which could cause serious injury.

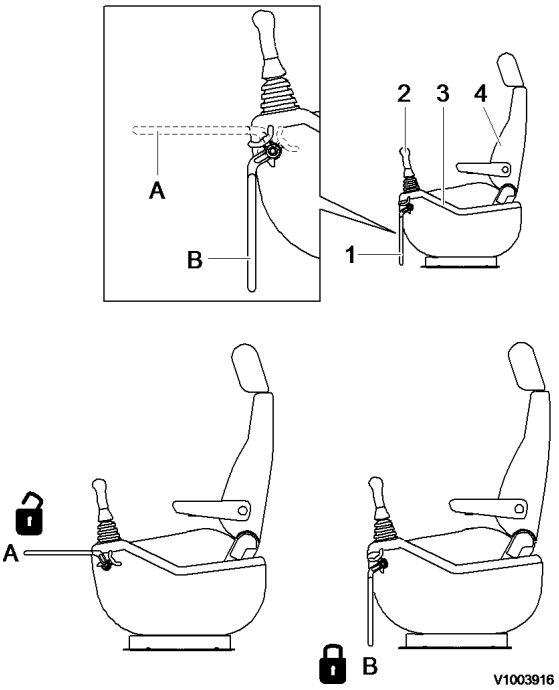


Figure 5
Control lockout system

A. Unlocked position (When this lever is put at this position the engine can not be started)
B. Locked position (When this lever is put at this position the engine can be started)

1. control lockout lever
2. Control lever (left)
3. Left control console
4. Backrest

VOLVO
Construction Equipment

Service Information

Document Title: **Measuring of swing bearing clearance**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Measuring of swing bearing clearance

Specifications

Slew bearing clearance

			Specification
Clearance of bearing in axial direction	Removed condition	Standard	0.05 ~ 0.2 mm (0.002″ ~ 0.008″)
		Allowable clearance	0.4 mm (0.016″)
	Installed condition	Standard	0.2 ~ 1.7 mm (0.008″ ~ 0.07″)
		Allowable clearance	2.5 mm (0.10″)
Tightening torque	Outer screw	kgf·m (lbf·ft)	26.7 ± 2.7 (262 ± 26)
	Inner screw		

Measurement

NOTE!

Prior to proceeding ensure that the mounting screws are properly tightened.

Removed condition

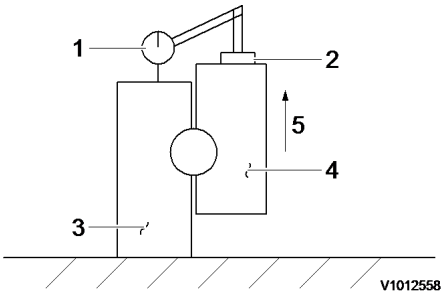


Figure 1
Measurement, bearing clearance (removed)

1. Dial gauge
2. Magnet base
3. Inner race
4. Outer race
5. Lifting direction

- Put the slew gear on a flat surface and then set 3 magnetic bases on the outer race at 120° intervals.
- Set 3 dial gauges on the inner race.
- Lifting the outer race vertically, axial clearance is the movement between bearing races.
- Read the values of dial gauges.

Installed condition

Clean the outer race of slew gear and the underside of undercarriage.
The slew gear wear is not uniform over the entire circumference.
To obtain the exact play, it is necessary to take two measurements and pivot the superstructure by 90°.

1st measurement

Fuel filter side view (step 1)

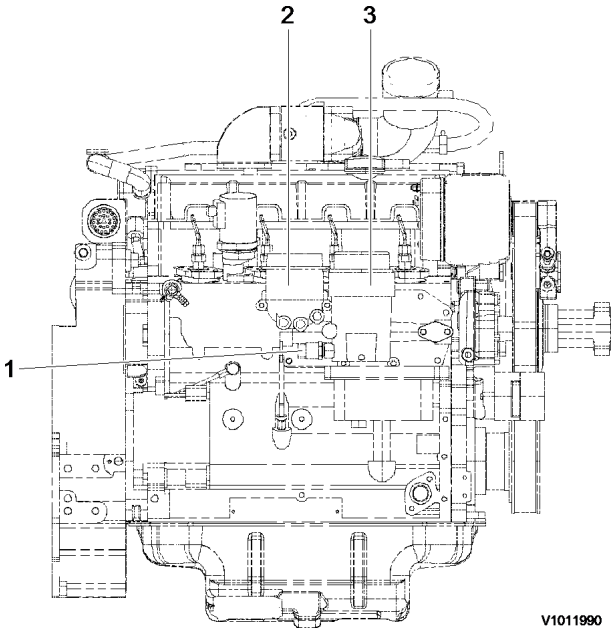


Figure 7
Engine, fuel filter side view (step 1)

1. Lube oil pressure port (M14 × 1.5)
2. Fuel filter
3. Engine oil filter

Fuel filter side view (step 2)

Document Title:	Function Group:	Information Type:	Date:
Crankshaft, description	**216**	**Service Information**	**2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Crankshaft, description

- The forged crankshaft of the D4D engine is provided with integrated balance weights. The drive gear for the timing gears and the flywheel flange are shrunk on.

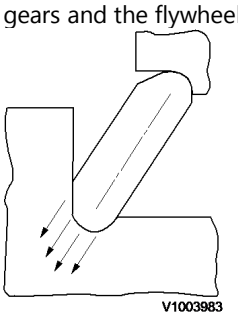


Figure 2
Fillet radii on the bearing journal

- The material microstructure of the fillet radii on the bearing journals is strengthened by rolling.
- Remachining of the fillet radii is therefore not permissible.

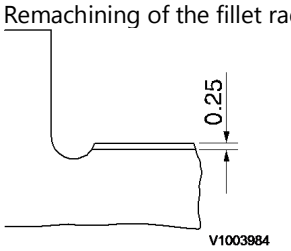


Figure 3
Allowable repair limit

- In case of repair, there is available one undersize of 0.25 mm (referred to the diameter) for the crank pins and main bearing journals.

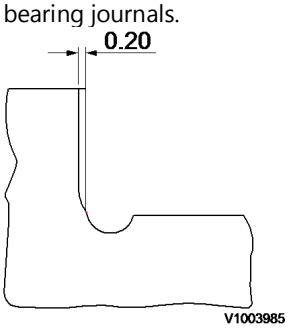


Figure 4
Allowable thrust bearing face repair limit

- The thrust bearing face can only be remachined once (oversize: 0.4 mm, 0.2 mm each side).
  Thrust bearing clearance of the crankshaft in installed condition: 0.1 to 0.28 mm (0.004 to 0.011 in).

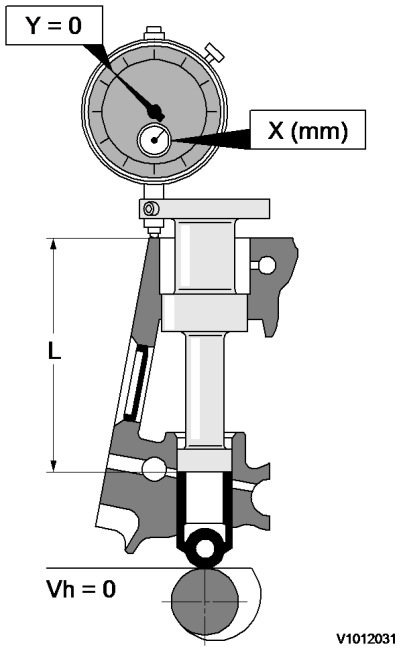


Figure 10
Setting, zero position

- After the standard dimension (L) has been determined, the gauge fitted in the crankcase is set to zero position, with the roller tappet positioned on the camshaft base circle.

Table for commencement of delivery, pre-stroke, basic dimension Lo

From the following table the "Vh" value is determined for the pre-stroke according to the commencement of delivery to be set - see nameplate. It is determined depending on engine type and installed camshaft.

"Vh" value

Commencement of delivery (FB)	Camshaft type	Pre-stroke (Vh)	Pre-stroke correction factor	Standard dimension (Lo) injection pump
	[°C/A BTDC]	[mm]	[mm/°C/A]	[mm]
2.0	L	5.14	0.14	Step 1 (Part No. 20460072): 117.5 Step 2 (Part No. 24425954): 111.15
3.0		4.97		
4.0		4.80		
5.0		4.62		
6.0		4.44		
7.0		4.26		
8.0		4.11		
9.0		3.95		

NOTE!
Commencement of delivery and camshaft type are indicated on the nameplate.

- The crankshaft is turned in direction of engine rotation until the dial gauge precisely indicates the "Vh" value given in the table. The crankshaft assembly is now in commencement of delivery position for the cylinder to be set. On the fitted protractor disc (exact TDC position of the piston had to be determined before), the actual commencement of delivery "FB_{actual}" is now compared with commencement of delivery "Fb_{nom}.". Each deviation is corrected.

Document Title:	Function Group:	Information Type:	Date:
Cooling system, description	**260**	**Service Information**	**2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Cooling system, description

The radiator core is a wave fin type and the oil cooler is a plate fin type. Air is drawn into the engine compartment passing through the radiator and oil cooler as the fan rotates.
The hydraulic oil cooler is installed to the radiator frame.

WARNING

Before removing the radiator cap, stop the engine and let it cool down sufficiently. When removing it, turn it slowly to release the pressure.

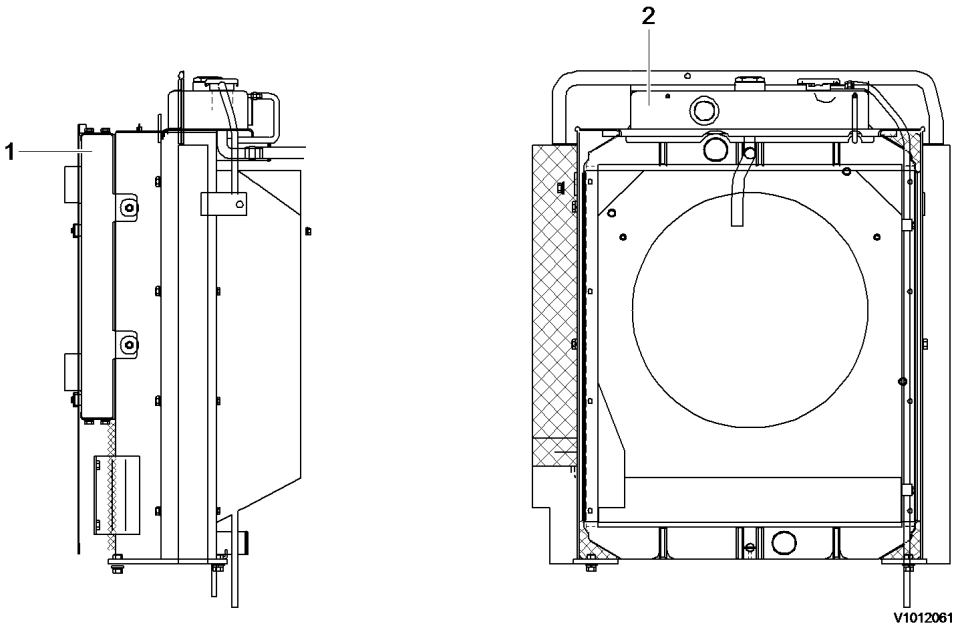


Figure 1
Radiator and hydraulic oil cooler

1. Oil cooler
2. Radiator

Document Title: **Auxiliary start**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Auxiliary start

WARNING

Never boost-start the machine by connecting directly to the starter motor. This may result in uncontrolled machine movements. When using another machine to boost-start, it must not touch the machine that is being started.

Auxiliary start with start cables

Check the following before connecting;

- That the ignition is OFF in **both** machines.
- That the machine cannot start to move when started.
- That the machines have the same system voltage.
- That the start cables are dimensioned for the max. current rating that the battery can generate.
- Start cables, with regards to cracks, oxidation and other defects.
- That battery cables are intact and connections are connected securely.
- That the machines do not touch each other.

WARNING

When using start cables, the positive and negative connection must not come into contact. Risk of personal injury.

Connect start cables as follows:

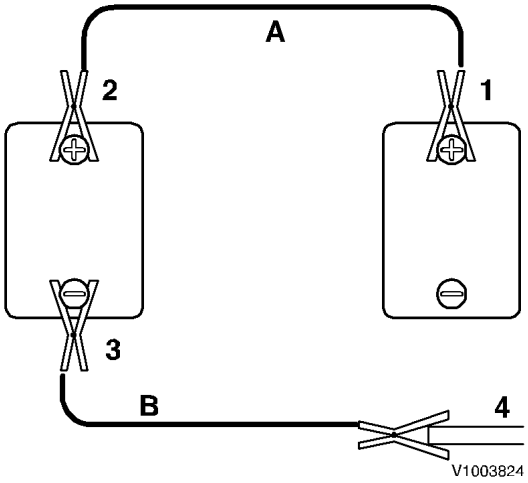


Figure 1
Connecting start cables

- Connect the first start cable (A) to the battery's plus terminal (1) on the machine to be started.
- Connect the other end of the cable (A) to the battery's plus terminal (2) on the assisting machine.
- Connect the other start cable (B) to the battery's minus terminal (3) on the assisting machine.
- Connect the other end of the cable (B) to the frame (4) on the machine to be started. Check that good electric contact is obtained.

Auxiliary start:

- Check that the start cables are connected securely and correctly (figure).
- Start the engine in the assisting machine.
- Start the engine in the machine to be started. If the engine does not started within 30 seconds, wait for at least two minutes before the next start attempt.

- The engine speed and the actual work mode (P-, T-, W-mode) are shown on the display window.
- Values for battery voltage, hammer operating hour (option) and error codes can also be shown on the display window and in some cases changed.

I-ECU, checking

Before engine starting

- Before starting the engine, if you turn the start switch to the ON position all lamps are turned ON for 3 seconds. At the same time the buzzer is operated 2 times with the cycle of 1.0 second ON and 1.0 second OFF.
- Check if all indicator lights come on, and if not, check for burnt-out light bulbs, and the plug–in connectors (connector A, B) of the printed circuit board.

After engine starting

- Before start–up, the battery charge warning lamp and engine oil pressure warning lamp remain ON.
- Once the engine starts, the above indicators should go out.
- When the engine is run at very low speed, the battery charge warning lamp may remain ON. If this happens, increase the engine speed, and check if the light goes off. If it remains ON, it is necessary to check the charging system.
- If the engine oil pressure warning lamp remains ON for 2 ~ 3 seconds after the engine is running, stop the engine and check the engine lubricating system.

Float position is a function that is used when the bucket is moved along irregular objects like underground bedrock to do levelling operation.
If the engine stops with float position switch ON, this function is still effective when the engine is restarted.

Input signals	**Conditions for out functions**	**Out functions**
○ Float position switch, SW9116 ○ Float position pilot pressure switch, SE9111	○ Float position switch ON	○ Instrument panel indicator lamp ON ○ Float position Solenoid valve ON
	○ With float position switch ON, press the float position switch again	○ Instrument panel indicator lamp OFF ○ Float position solenoid valve OFF

[1]P mode and H mode are selected in rotation each push of power maximum mode selection switch.

[2]mode-F3/F2/F1/G3/G2/G1/H for North America

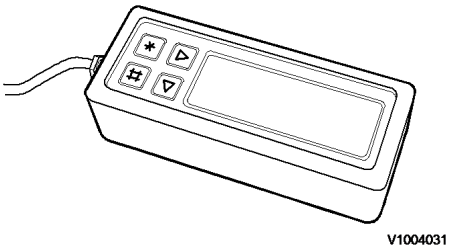


Figure 2
Contronics service display unit

The contronics service display unit can be used to read out error codes and parameters, etc.

Machine display unit (MDU)

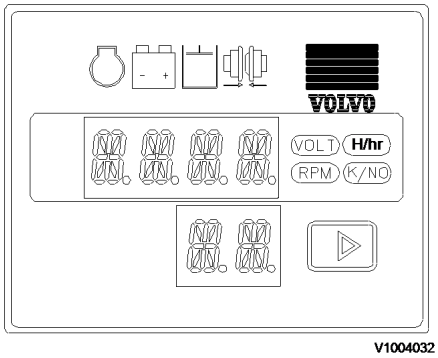


Figure 3
Machine display unit

The machine display unit can be used to read out error codes.

It is possible to select any menu or function you would like to see on the display unit.

Message center display

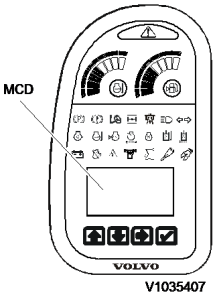


Figure 4
Message center display on I-ECU

The message center display unit can be used to read out error codes.

It is possible to select any menu or function you would like to see on the screen.

- Are there abnormal sounds from the engine?
- Have changes in fuel consumption, oil consumption or engine power been confirmed?
- What type of fuel is used?
- Are additives used in the fuel? If yes, which ones?
- What previous repairs, adjustments/service have been done to the engine?
- Other information?

B11	K–line (ISO 9141 interface) — Service socket			
B12	CAN H (J1939)	B12 - B13	R ≈ 59Ω	When EOL conncected.
B13	CAN L (J1939)	B13 - B12	R ≈ 59Ω	When EOL conncected.
B14	Emergency engine speed control switch — power supply			
B15	**Not** connected			
B16	**Not** connected			
B17	**Not** connected			
B18	**Not** connected			
B19	**Not** connected			
B20	**Not** connected			
B21	**Not** connected			
B22	**Not** connected			
B23	**Not** connected			
B24	**Not** connected			
B25	**Not** connected			

JA34	VECU status	JA34 - JB8	R ≈ 320–345 KΩ	
JA35	FU27, fuse for conflux shut off			See active measuring.
JA36	MA9107, power boost solenoid valve	JA36 - JB8	R ≈ 20–30 Ω	
JA37	MA9105; Boom conflux shut off solenoid valve, MA9106; Arm conflux shut off solenoid valve	JA37 - JB8	R ≈ 10–15 Ω	
JA38	RE9102, travel motor relay	JA38 - JB8	R ≈ 315 Ω ± 10 %	
JA39	SW2701, engine speed control switch	JA39 - JA14	R ≈ 46.5–47.5 KΩ	
JA40	**Not** connected			
JA41	SE9107, overload pressure sensor			See active measuring.
JA42	SW9105, quickfit switch (confirm)			See active measuring.
JA43	SE9103, travel pilot pressure switch			See active measuring.
JA44	SW2702, Power maximum mode select switch	JA44 - JB8	R ≈ 0 Ω (power maximum mode select switch: ON only)	See active measuring.
JA45	SW9107, shear select switch			See active measuring.
JA46	SW2705, overload select switch			See active measuring.
JA47	**Not** connected			
JA48	Contronics key "*"			See active measuring.
JA49	Contronics enable			See active measuring.
JA50	RE2501, preheater relay coil			See active measuring.
JA51 JA52 JA53 JA54 JA55	**Not** connected			
JA56	MA9101, flow control proportional valve signal	JA56 - JA30	R ≈ 15–20 Ω	
JA57 JA58	**Not** connected			
JA59	MA9107, float position solenoid valve	JA59 - JB8	R ≈ 20–30 Ω	
JA60	FU27, fuse for power boost solenoid valve			See active measuring.
JA61	RE3101, battery relay shut off signal			See active measuring.
JA62	**Not** connected			
JA63	SE2303, fuel level sensor ground			See active measuring.
JA64	SE2502, air cleaner clogging sensor			See active measuring.
JA65	SE2603, coolant level sensor			See active measuring.
JA66	SE9102, hammer pilot pressure switch			See active measuring.
JA67	SW2703, auto idle select switch			See active measuring.
JA68	MA9117, hammer selection solenoid valve (hammer select check) (option)			
JA69	SW9116, float position switch			See active measuring.
JA70	SW9109 / SW9110, Rotator switch, left / right (option)			See active measuring.
-----	----------	----------	----------	----------
JB1	SW9107, boost / hammer / shear selecting switch			See active measuring.
JB2	SW3301, engine start key (R2)			See active measuring.
JB3	**Not** connected			
JB4	J1587 B (white color)			See active measuring.
JB5	Shield ground (J1939)			

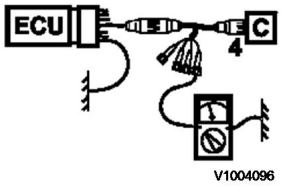


Figure 7
Checking only cable harness with 4-pin cable

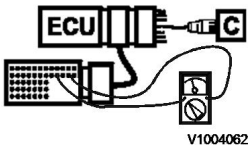


Figure 8
Checking specific part of a system

Checking specific part of a system
When checking specific parts of systems, active measurement is used with a multi-pin breaker box (break out box) between the control unit and the cable harness. The measuring instrument is connected to the multi-pin breaker box and is set to voltage measurement (V DC).

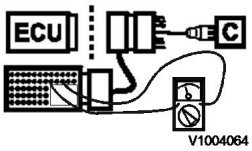


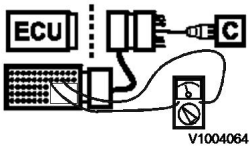
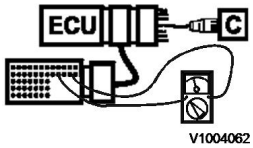
Figure 9
Checking cable harness and component

Checking cable harness and component
If it is difficult to access the component for troubleshooting, it is advantageous to measure on the cable harness and component. The measuring instrument is connected to the multi-pin breaker box (break out box) and is set to resistance measurement (ohm).

Components, conditions for measuring

NOTE!
When checking components, for example, relays and solenoid valves which are controlled by control unit, certain conditions must be met. These conditions are described in Control units, software functions.

NOTE!
The connectors should be checked with regards to loose connections and oxidation according to "Checking electrical cabling and connectors".

Symbol	Description	Symbol	Description
 V1004092	Master switch OFF (battery disconnected)	 V1004093	Key position **0=OFF, 1=ON, 2=Start**
 V1012133	1. Resistance measurement 2. Voltage measurement	 V1004095	Engine idling
 V1004064	Multi-pin breaker box (break out box) and adapter connected to cable harness.	 V1004062	Multi-pin breaker box (break out box) and adapter connected between ECU and cable

Document Title: **128 PID102**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

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128 PID102

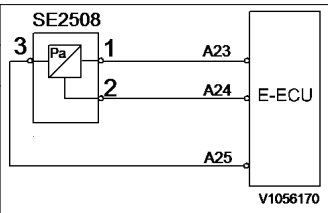
Error codes

SAE-code: MID128 PID102 FMI3	
Boost pressure sensor, high voltage	
Conditions: Engine control unit (E-ECU) registers a voltage on A24 that is above 4.95 V.	
Possible cause: ○ Signal line short-circuited to 5 V or higher voltage. ○ Defective sensor.	Reaction from control unit: ○ Engine control unit stops sending value for charge-air pressure. ○ Error code is set.
Noticeable symptom/malfunction: ○ Low power output.	Troubleshooting information: ○ SE2508 ○ See "Checking electrical cabling and connectors"

SAE-code: MID128 PID102 FMI4	
Boost pressure sensor, low voltage	
Conditions: Engine control unit (E-ECU) registers a voltage on A24 that is below 0.08 V.	
Possible cause: ○ Sensor not connected (open circuit). ○ Supply cable (5 V) short-circuited to frame ground or open circuit. ○ Signal line short-circuited to frame ground or open circuit. ○ Defective sensor.	Reaction from control unit: ○ Engine control unit stops sending value for charge-air pressure. ○ Error code is set.
Noticeable symptom/malfunction: ○ Low power output.	Troubleshooting information: ○ SE2508 ○ See "Checking electrical cabling and connectors"

Description and measuring

SE2508	**Charge-air (Boost) pressure sensor**
Function	Measures charged-air (boost) pressure.
Wiring diagram	



A23, frame ground
A24, charge-air pressure signal

Document Title: **128 SID231**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

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128 SID231

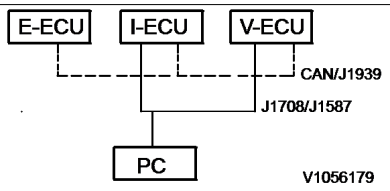
Error codes

SAE-code: MID128 SID231 FMI9	
Communication J1939, communication error	
Conditions: Engine control unit (E-ECU) does not function about the control link (SAE J1939).	
Possible cause: ○ Cables in control link (SAE J1939) short-circuited to each other. ○ Break in control link (SAE J1939). ○ Temporary malfunction in hardware. ○ Loose connection. ○ Intermittent fault in cables.	Reaction from control unit: ○ Error code is set. ○ Information is read / sent instead on the information link (use SAE J1587).
Noticeable symptom/malfunction: ○	Troubleshooting information: ○ See "SAE J1939" ○ See "Checking electrical cabling and connectors"

SAE-code: MID128 SID231 FMI12	
Communication J1939, defective unit or component	
Conditions: Engine control unit (E-ECU) does not communicate with V-ECU, or defective E-ECU.	
Possible cause: ○ No contact with vehicle control unit.	Reaction from control unit: ○ Error code is set. ○ Information is read / sent instead on the information link (use SAE J1587).
Noticeable symptom/malfunction: ○	Troubleshooting information: ○ See "SAE J1939" ○ See "Checking electrical cabling and connectors"

Description and measuring

SID231	**SAE J1939 control link, failure**
Function	Checks if the communication between ECUs is down.
Wiring diagram	
Installing/ Adjusting:	Tightening torque:



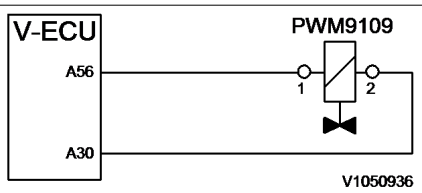
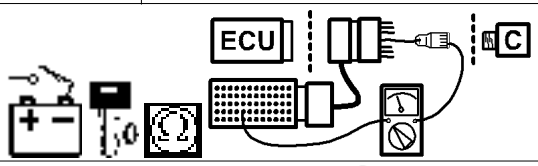
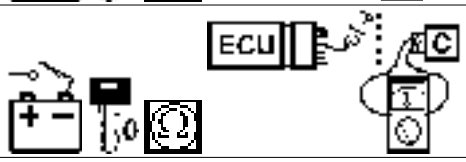
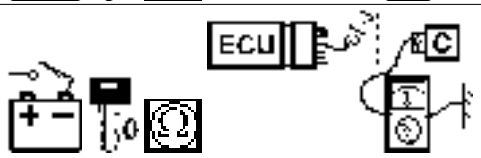
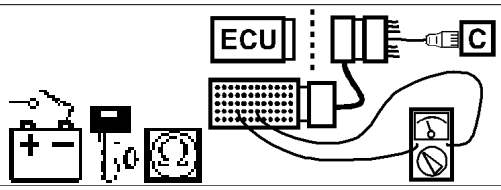
VOLVO
Construction Equipment

Service Information

Document Title: **187 PPID1191**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LC, EC140B LCM [GB]**			

187 PPID1191

Description and measuring

PWM9109	**Proportional solenoid valve for X1 flow control**		
Function	Controls the X1 flow.		
Wiring diagram			
Installing/ Adjusting:	Tightening torque: VCADS Pro:		
Control unit/ cable harness:	**Control cable (+)** 1–A56	≈ 0 Ω	
	Return cable (-) 2–A30		
Component:	1–2	≈ 11.5 Ω (20 °C)	
	1– 2–	≈ ∞ Ω	
Subsystem:	A56–A30	≈ 11.5 Ω (20 °C)	

Document Title: **187 SID251**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

187 SID251

Error codes

SAE-code: MID187 SID251 FMI0	
Battery voltage (V-ECU input power voltage), too high voltage	
Conditions: Vehicle control unit (V-ECU) registers too high voltage (above 32V) on JB15, JB16.	
Possible cause: ○ Fault regulator in the alternator. ○ Supply cable short-circuited to excessive resistance between battery and V-ECU. ○ The power supply part of V-ECU has failed.	Reaction from control unit: ○ Error code is set.
Noticeable symptom/malfunction: ○ Warning lights up on instrument panel (battery charge warning lamp). ○ I-ECU shows the voltage on screen.	Troubleshooting information: ○ See "Checking electrical cabling and connectors" ○ Check the alternator, battery post, fuse, relay, etc for corrosion or incorrect assembly.

SAE-code: MID187 SID251 FMI1	
Battery voltage (V-ECU input power voltage), too low voltage	
Conditions: Vehicle control unit (V-ECU) registers too low voltage (below 18V) on JB15, JB16.	
Possible cause: ○ Fault regulator in the alternator. ○ The power supply part of V-ECU has failed. ○ Supply cable open circuit.	Reaction from control unit: ○ Error code is set. ○ Red warning lamp is requested.
Noticeable symptom/malfunction: ○ Warning lights up on instrument panel (battery charge warning lamp). ○ I-ECU displays the voltage on screen.	Troubleshooting information: ○ Checking electrical cabling and connectors ○ Check the alternator, battery post, fuse, relay, etc for corrosion or incorrect assembly.

Document Title:	Function Group:	Information Type:	Date:
Battery, description	**311**	**Service Information**	**2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Battery, description

The battery consists of two 12 V batteries connected in series, which together give 24 V.
The batteries are used to start the engine, supply the current to the electrical components and store the current from the alternator.

The batteries should be in good condition when troubleshooting the electrical system. If needed, charge the batteries with a battery charger. If the batteries do not take a charge, check the electrolyte in the battery cell.

WARNING

If a tool touches a cable connected between the positive terminal and the chassis, there is danger that it will cause sparks. Battery post clamps must be tightly connected. If loosely connected, the terminal may burn or be eroded by sparks caused by defective contact. Battery acid can burn or blind you. If acid gets on your skin or in your eyes, immediately wash with plenty of clean water and consult a doctor immediately.

NOTE!
When removing the battery, first disconnect the cable with the black tube from the ground (normally, from the negative (–) terminal).

NOTE!
Battery power may be lowered under severe cold weather. In this case, warm up the batteries and start the engine.

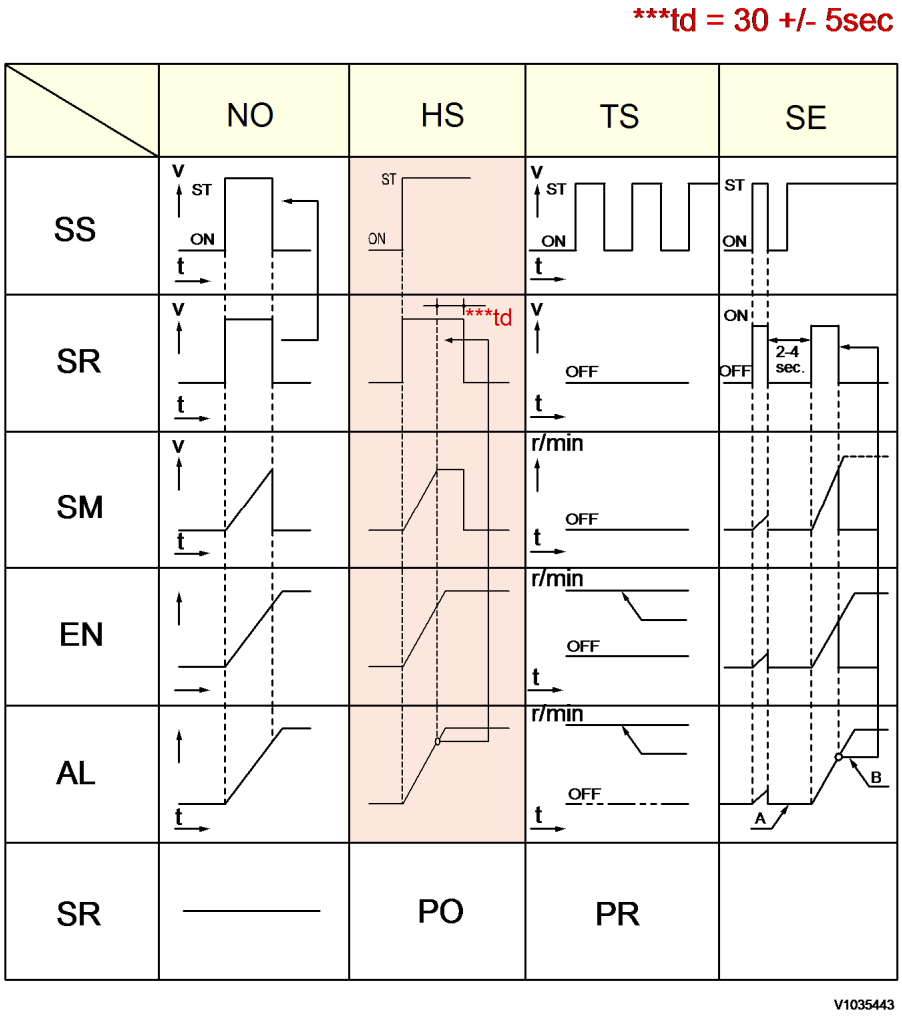


Figure 3
Starting operation sequence (new)

SS Start switch
SR Safety relay
SM Starter motor
EN Engine
AL Alternator
NO Normal operation
HS Hold start switch on START position after engine started
TS Turn the start switch to START and ON while engine is running
SE Start the engine again after the failure
PO Prevent overrunning
PR Prevent restarting
A Prevent restart
B Prevent overrunning
V Voltage
T Time
r/min Revolution per minutes

Document Title: **Battery disconnect switch, description**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Go back to Index Page

Battery disconnect switch, description

- To disconnect the electrical system from the batteries for protection of electrical components when welding, servicing of circuits and as a safety precaution when parking the machine.
- If battery disconnect switch is turned to the ON position, diesel heater (option) and audio are available even when the start switch is in the OFF position.

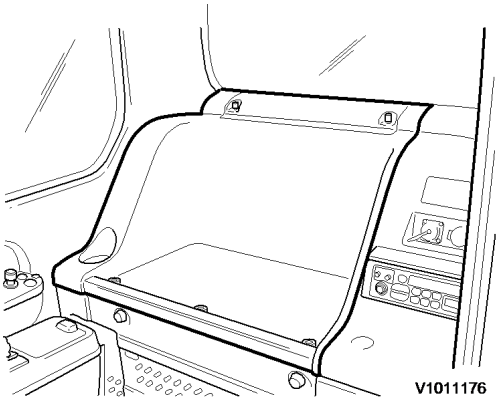


Figure 6
Cab fan casing

12. Return the operator's seat to the position it was in before the work was started.

13. After replacing V-ECU, press OK button of VCADS Pro operation '36646-2 MID 187 control unit, programming'. Now VCADS Pro starts the programming of software and parameters to the new V-ECU.

10	MO8702	Air conditioner compressor	SCH15-1

Components list

No.	Marking	Designation	Wiring diagram
Fuses			
1	FU1	Feed I-ECU	-
2	FU2	Feed headlights	SCH04-1
3	FU3	Feed work lights	SCH05-1
4	FU4	Feed wiper & washer	SCH10-1
5	FU5	-	-
6	FU6	Feed cigar lighter	SCH09-1
7	FU7	Feed horn	SCH09-1
8	FU8	Feed air conditioner	SCH14-1
9	FU9	Feed extra work lights	SCH08-1
10	FU10	Feed extra work lights	SCH08-1
11	FU11	Feed beacon light (option)	SCH08-1
12	FU12	Feed safety solenoid valve	SCH12-1
13	FU13	Feed auto/manual switch	SCH11-1
14	FU14	-	-
15	FU15	Feed EMS power	SCH02-1
16	FU16	Feed start switch	SCH01-1
17	FU17	Feed room light	CH08-1
18	FU18	Feed cassette radio	SCH09-1
19	FU19	Feed auxiliary heater	SCH14-1
20	FU20	Feed power outlet	SCH08-1
21	FU21	Feed fuel filler pump	-
22	FU22	-	-
23	FU23	-	-
24	FU24	Feed emergency engine speed control & stop switch	SCH02-1
25	FU25	Feed V-ECU	SCH06-1
26	FU26	Feed seat heater, air suspension seat	SCH09-1
27	FU27	Feed hammer/booster/shear select switch	SCH12-1, SCH13-1
28	FU28	Feed quickfit, rotator switch	SCH13-1
29	FU29	Feed travel alarm switch	SCH08-1
30	FU30	Feed automatic greasing	SCH23-1
31	FU50	Slow blow fuse, 40A	SCH01-1
32	FU51	Slow blow fuse, 40A	SCH01-1
33	FU52	Slow blow fuse 80A	SCH01-1
34	-	-	-
35	FU54	Slow blow fuse 140A	SCH20-1

Components list

No.	Marking	Designation	Wiring diagram
Solenoid valves			
1	MA9101	Flow control proportional valve (option)	SCH11-1

Marking	Designation	Marking	Designation
FU50	Slow blow fuse, 40 A	SW3101	Master switch
FU51	Slow blow fuse, 40 A	MO3301	Start motor
FU52	Slow blow fuse, 80 A	AL3201	Alternator
FU16	Feed start switch	RE3301	Safety relay
RE3101	Battery relay	BA3101	Battery
SW3301	Start switch	BA3102	Battery
IM3812	Hour meter		

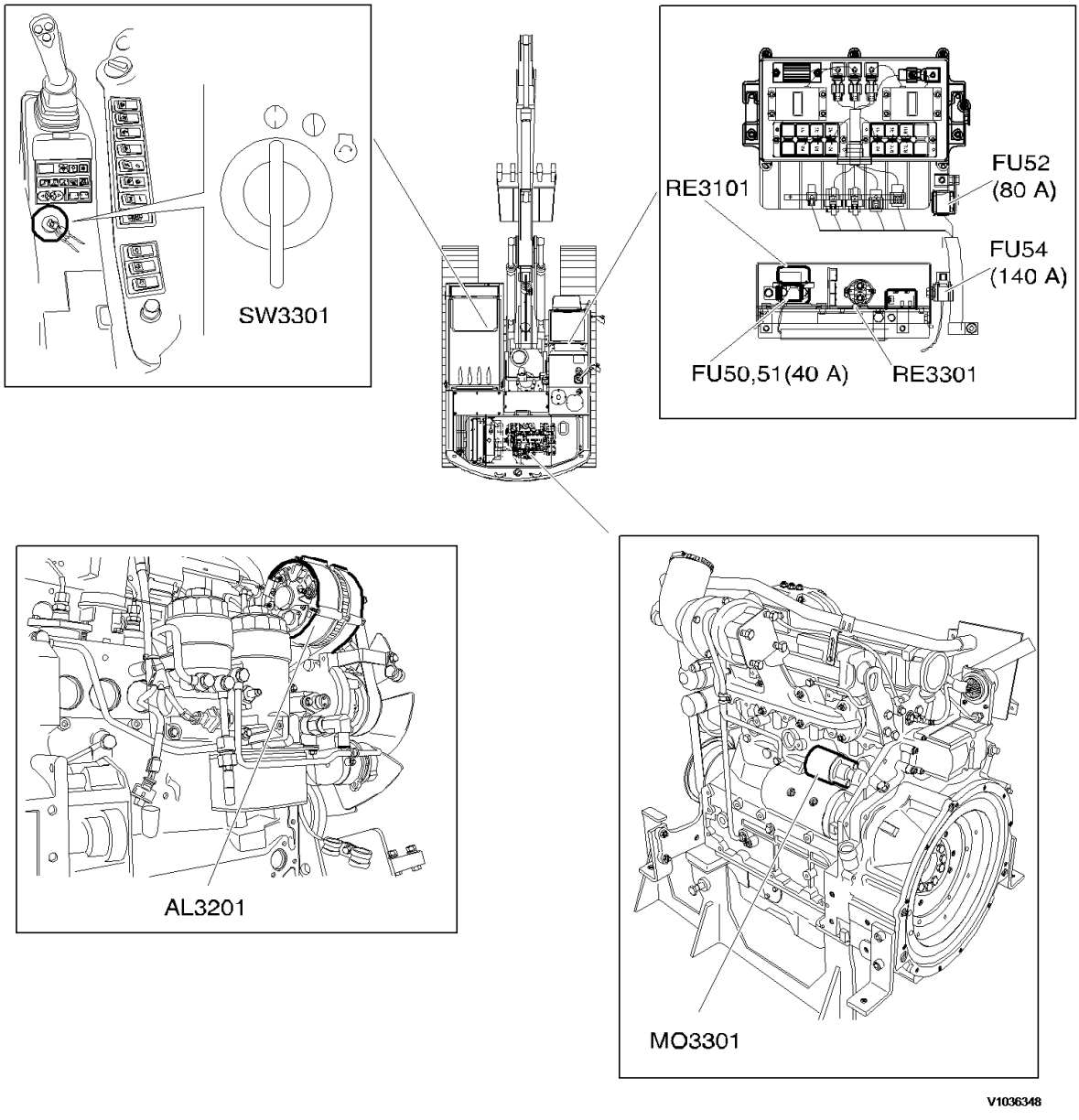


Figure 2
Component position

VOLVO
Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Wiring diagram SCH04	**370**	**Service Information**	**2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Wiring diagram SCH04

Machine	Serial number	Remark
EC140B	10000 - 11522	

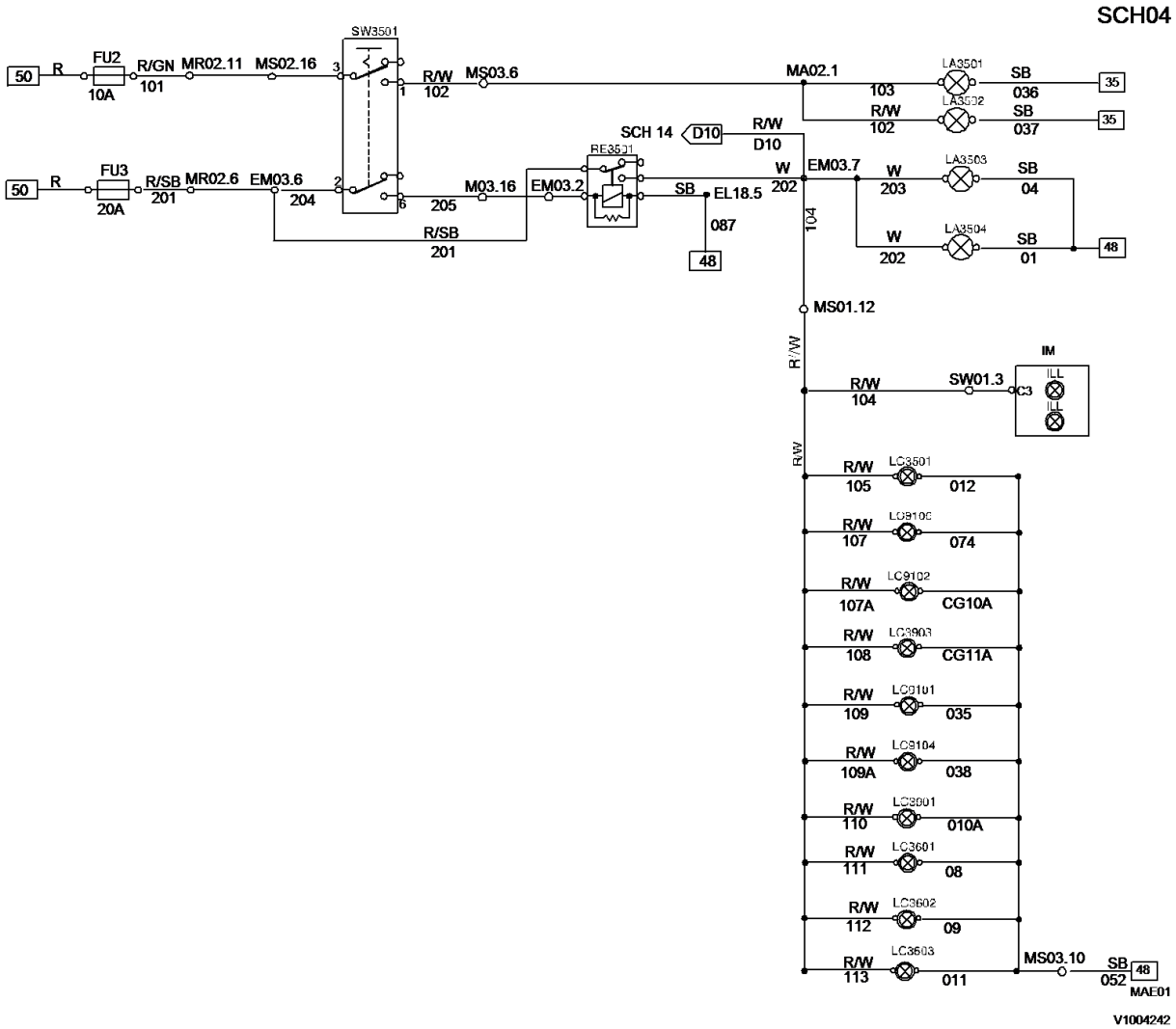
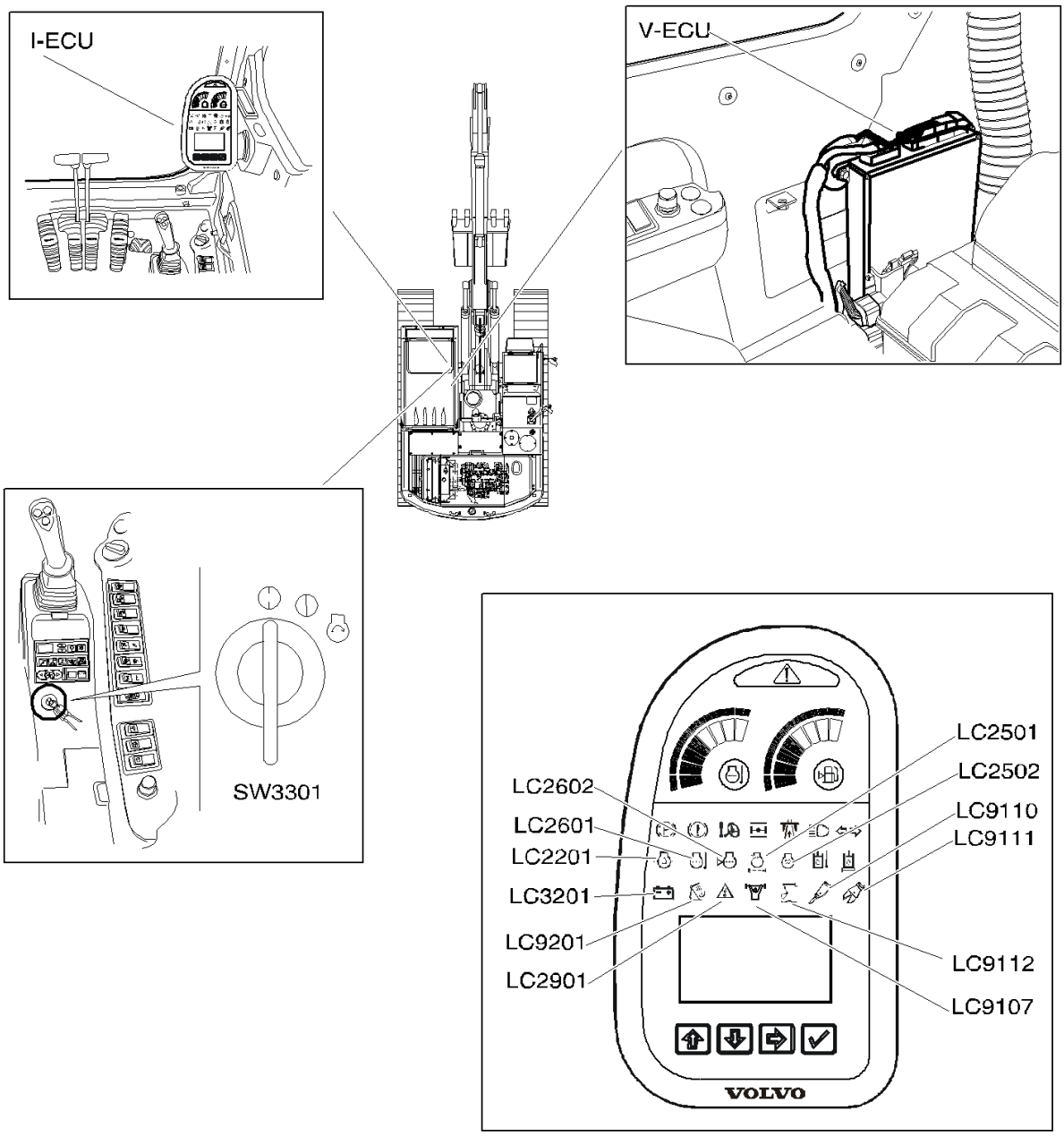


Figure 1
Wiring diagram SCH04

Marking	Designation	Marking	Designation
FU2	Feed head lamp	LA3503	Boom work lamp
FU3	Feed work lamp	LA3504	Boom work lamp
SW3501	Working lights switch	LC3501	Working lights switch
RE3501	Relay- light	LC9106	Travel speed select switch
LA3501	Head lamp - right-hand	LC9102	Power maximum mode select switch

Figure 1
Wiring diagram SCH06-1

Marking	Designation	Marking	Designation
FU25	Feed V-ECU	LC2602	Indicator - Radiator coolant level warning
I-ECU	Instrument control unit	LC2501	Indicator - air cleaner clogging warning
V-ECU	Vehicle control unit	LC2502	Indicator - air preheating
SW3301	Start switch	LC3201	Indicator - battery charge warning
SE2303	Sensor - fuel level	LC9201	Indicator - quickfit operation
SW2705	Over load switch	LC2901	Indicator - over load warning
SE9107	Sensor - over load	LC9107	Indicator - boost operation
IM3811	Gauge - coolant temperature	LC9112	Indicator - boom float operation
IM3803	Gauge - fuel level	LC9110	Indicator - hammer operation
LC2201	Indicator - engine oil pressure warning	LC9111	Indicator - shear operation
LC2601	Indicator - engine coolant temperature warning		



SW3601	Washer switch	MM3601	Wiper controller
SE3602	Sensor - upper wiper		

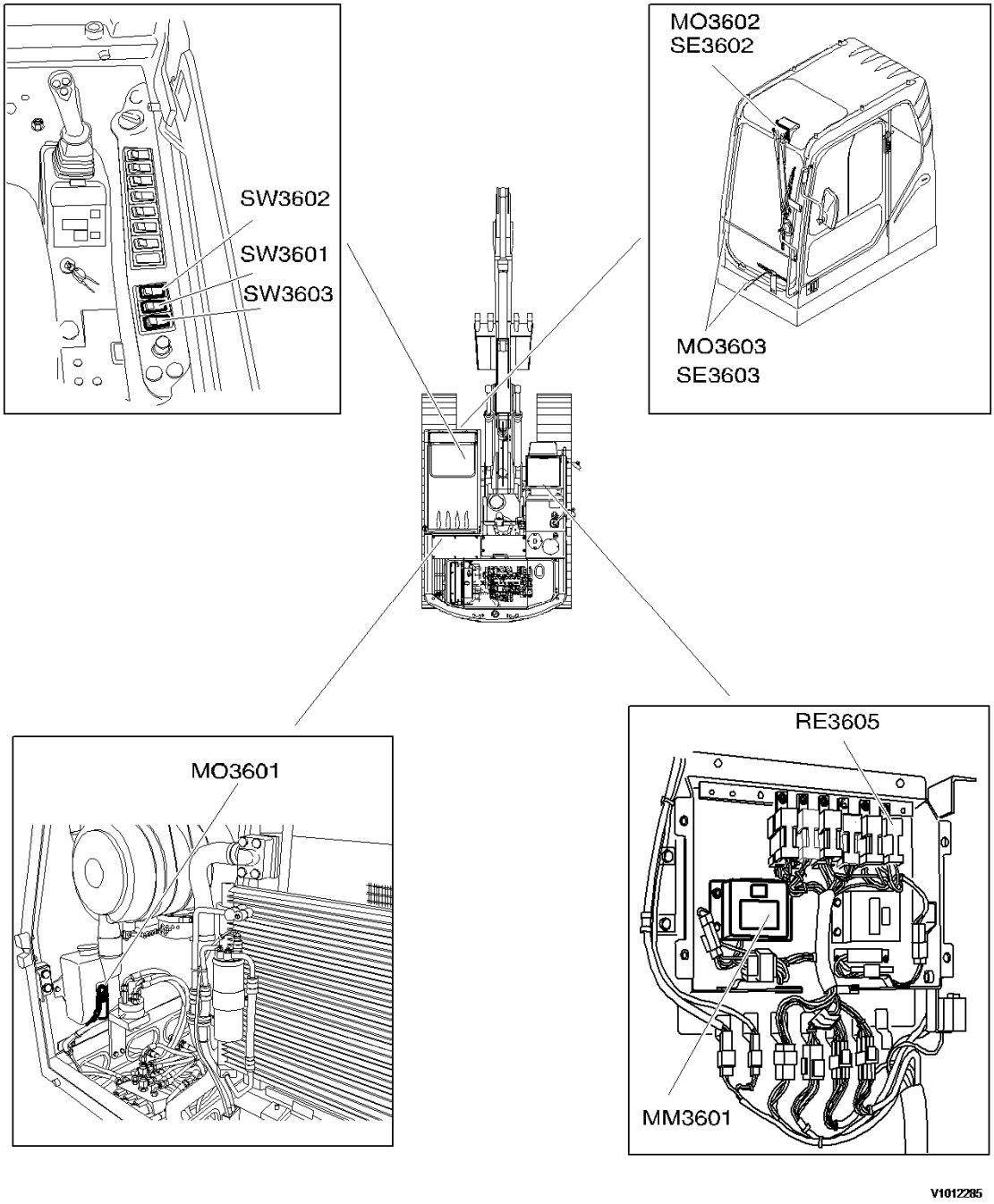


Figure 2
Component position

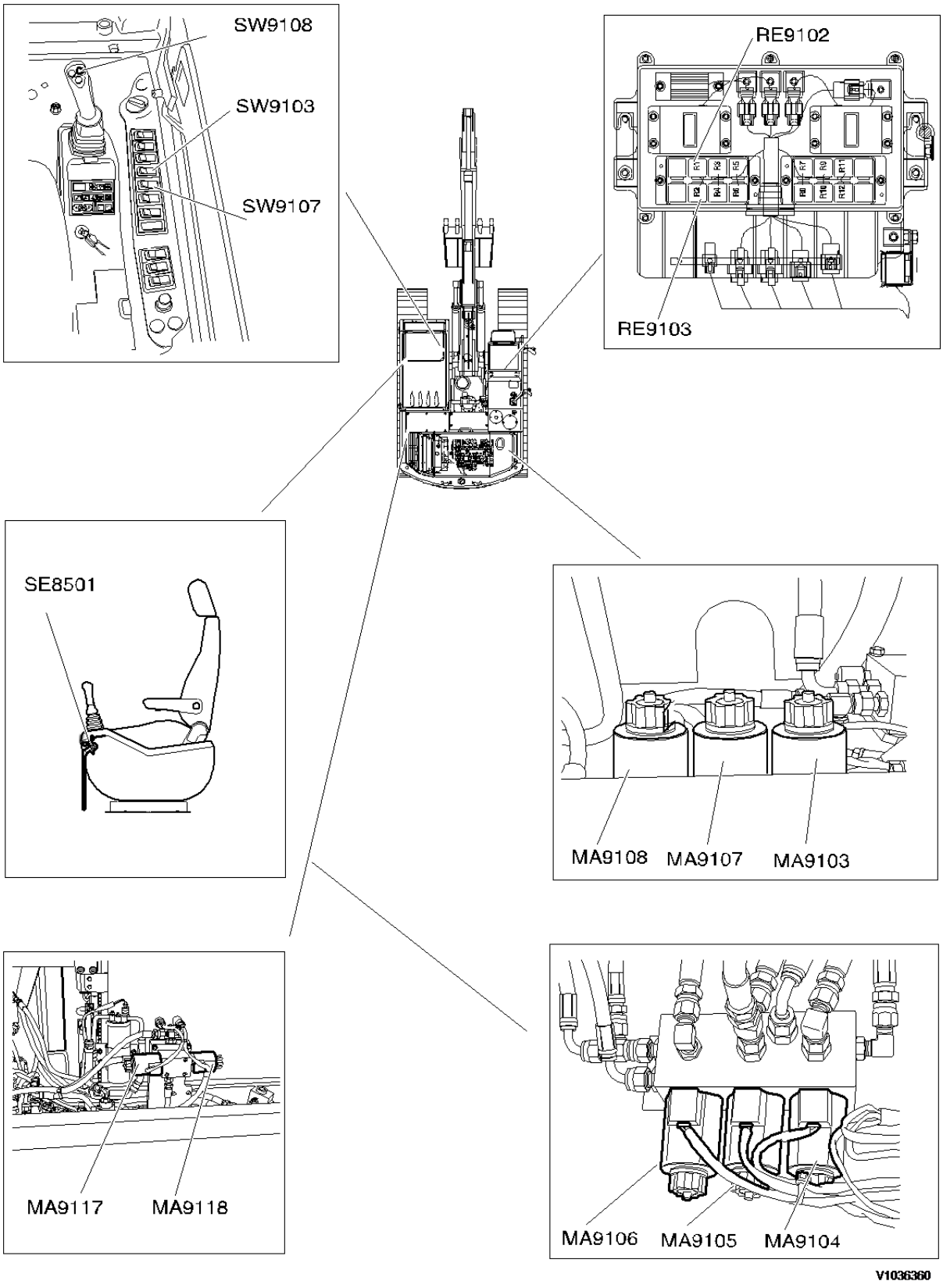


Figure 2
Component position

FU19	Feed aux. heater fuse	AC	Air conditioner
SE2503	Sensor - ambient air pressure	SW3301	Start switch
SE2504	Sensor - recirculation air temperature (option)		
RE3501	Relay - light		

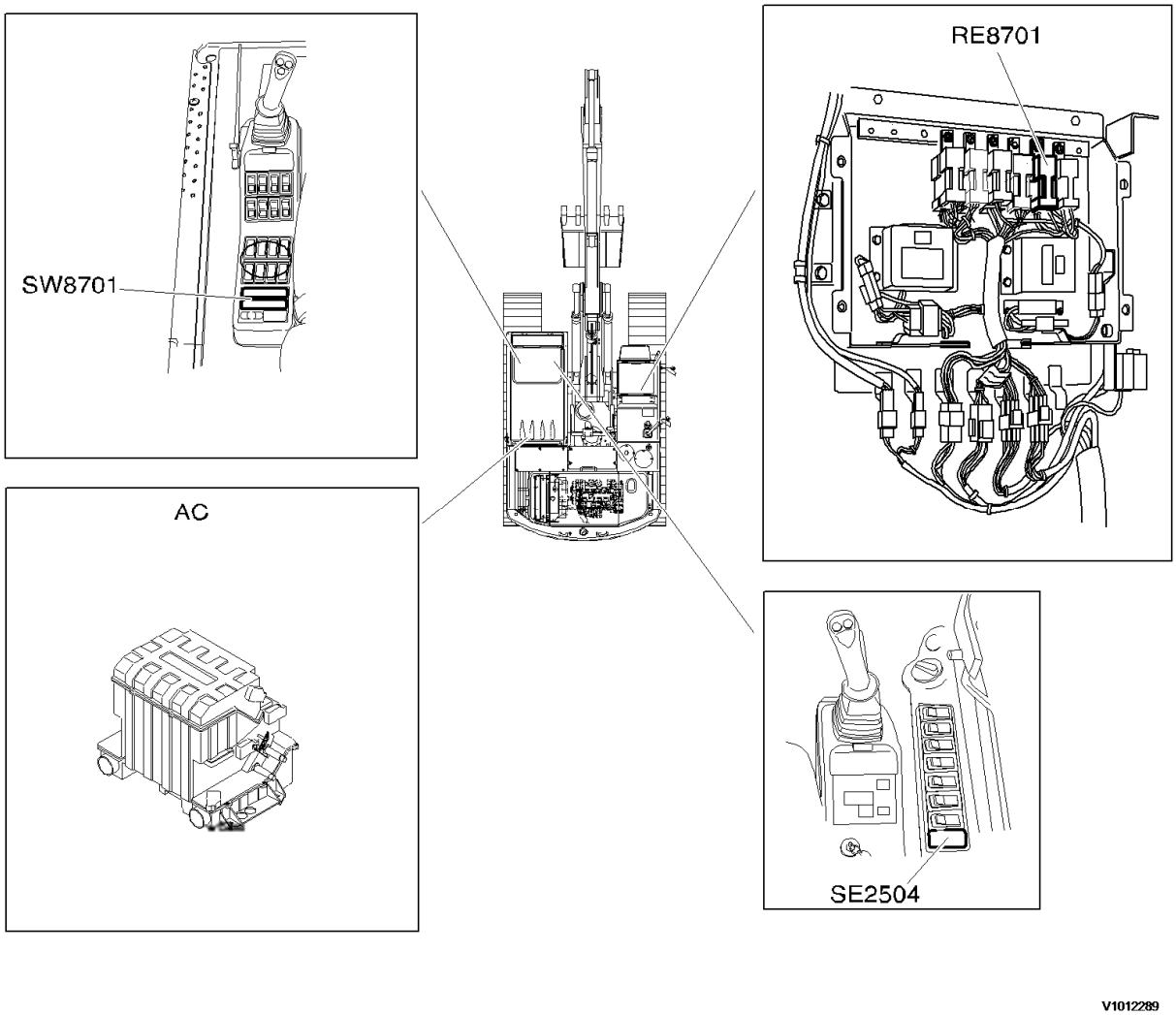


Figure 2
Component position

SE2606	Sensor - coolant temperature, engine	SE2203	Sensor - oil pressure, engine
SE2701	Sensor - crankshaft speed, engine	SE2703	Sensor - camshaft speed, engine
MA2309	EMR actuator	MA2310	Shut down solenoid
SE2508	Sensor - charge air pressure, engine	E-ECU	Engine electronic control unit

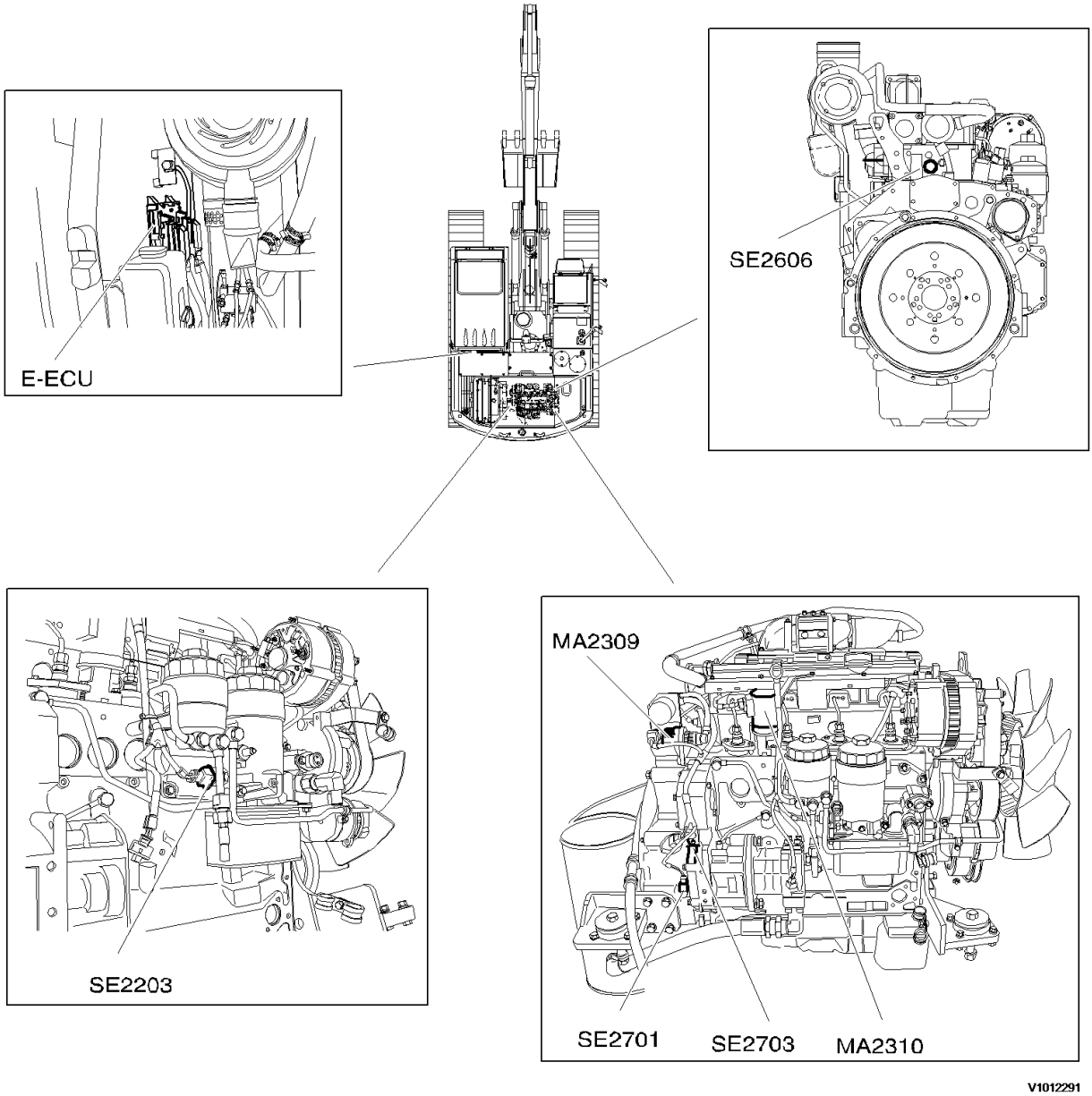


Figure 2
Component position

Document Title: **Slow blow fuse, description**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Slow blow fuse, description

When large-capacity current flows, the slow blow fuse protects components allowing operation until the overload causes a circuit disconnect, and when small capacity flows, it is fused slowly enough to solve the inconvenience of frequent fuse replacement.

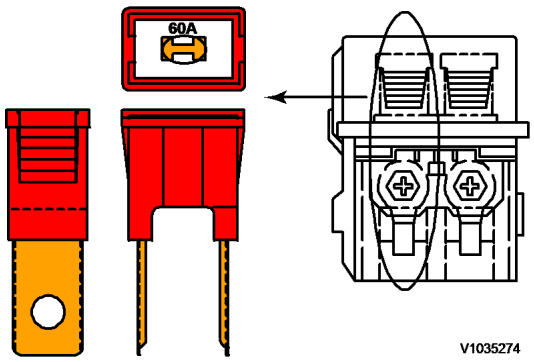


Figure 1
Slow blow fuse

Housing color codes

Amperage rating	Color
20 A	Light blue
30 A	Pink
40 A	Green
50 A	Red
60 A	Yellow
70 A	Brown
80 A	Black
100 A	Blue
120 A	Chestnut colored
140 A	Crimson

Fuse exchange procedure

Op nbr 37291

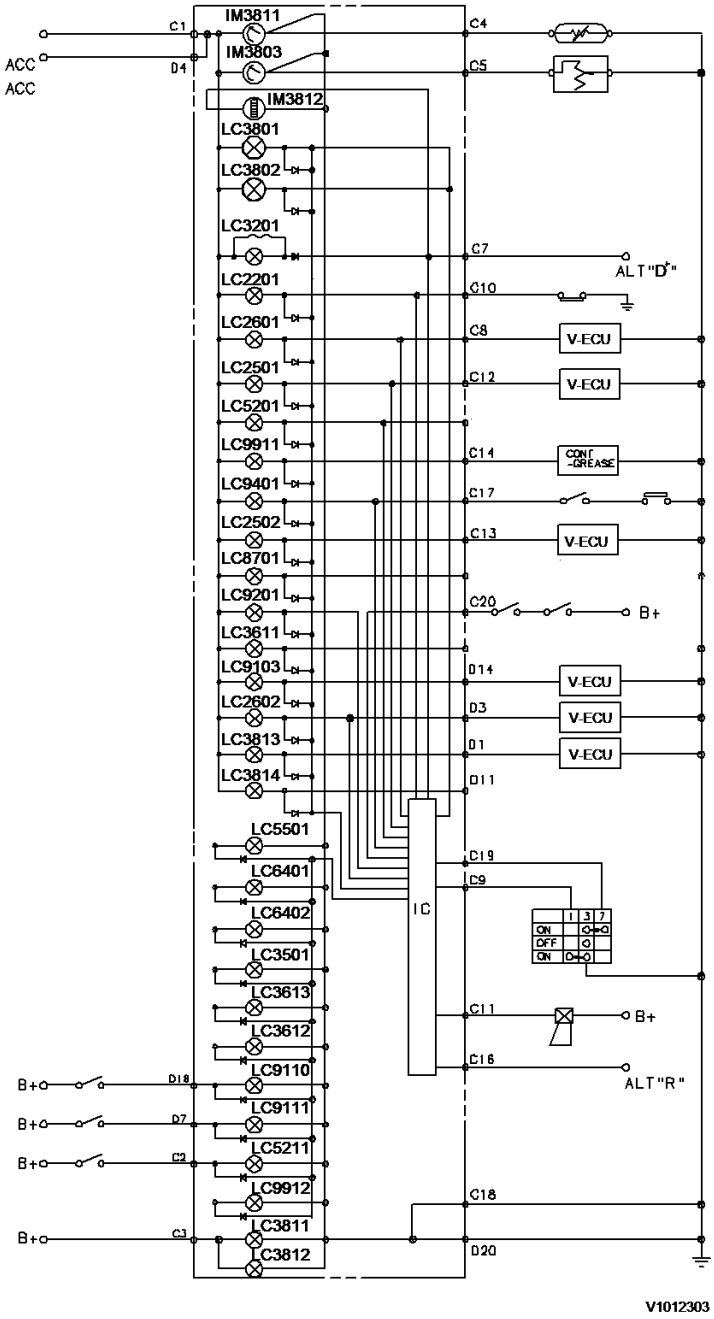


Figure 2
Instrument panel, electrical circuit

IM3803	Fuel level gauge	LC3612	Not used	LC6401	Not used
IM3811	Engine coolant temperature gauge	LC3613	Not used	LC6402	Not used
IM3812	Hour meter	LC3801	Central warning lamp 1	LC8701	Not used
LC2201	Engine oil pressure warning lamp	LC3802	Central warning lamp 2	LC9103	Hydraulic oil temperature warning lamp
LC2501	Air cleaner clogging warning lamp	LC3811	Illumination 1	LC9110	Hammer lamp
LC2502	Air preheating indication lamp	LC3812	Illumination 2	LC9111	Shear lamp
LC2601	Engine coolant temperature warning lamp	LC3813	Boom float lamp	LC9201	Quickfit indication lamp (option)
LC2602	Engine coolant level warning lamp	LC3814	Spare	LC9401	Overload warning lamp (option)
LC3201	Battery charge warning lamp	LC5201	Not used	LC9911	Automatic lubricating lamp (option)

Figure 3

Engine 3	
The following information is displayed on the unit:	
Coolant Temp. xxx °C	Shows engine coolant temperature according to the unit that was selected for display (if fault is detected, error code is displayed).
Coolant Level yyyyyy	Shows "normal" at normal coolant level and "low" at low coolant level.
Fuel Used zzzzzzzz l	Shows total amount of used fuel according to the unit that was selected for display.

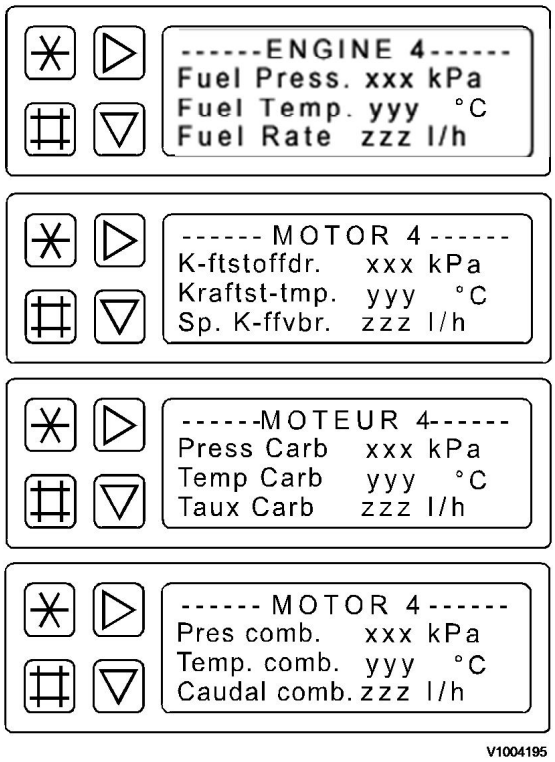


Figure 4

Engine 4	
The following information is displayed on the unit:	
Fuel Press. xxx kPa[2] ⓘ	Shows fuel pressure according to the unit that was selected for display (if fault is detected, error code is displayed).
Fuel Temp. yyy °C	Shows fuel temperature according to the unit that was selected for display (if fault is detected, error code is displayed).
Fuel Rate zzz l/h	Shows fuel consumption rate.

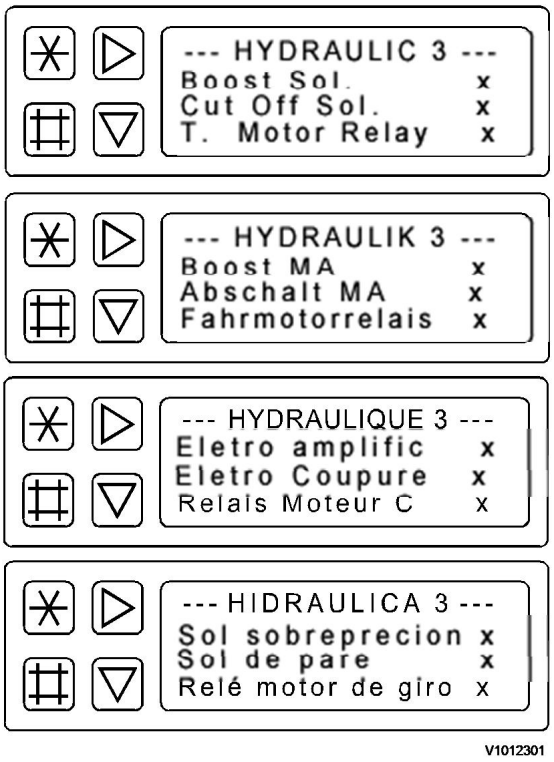


Figure 3

Hydraulic 3	
The following information is displayed on the unit:	
Boost Sol. x	Shows input signal of the power boost Solenoid switch as 0 (OFF) or 1 (ON).
Cut off Sol. x	Shows input signal of the conflux cut off Solenoid switch as 0 (OFF) or 1 (ON).
T. Motor Relay x	Shows input signal of the travel motor relay as 0 (OFF) or 1 (ON).

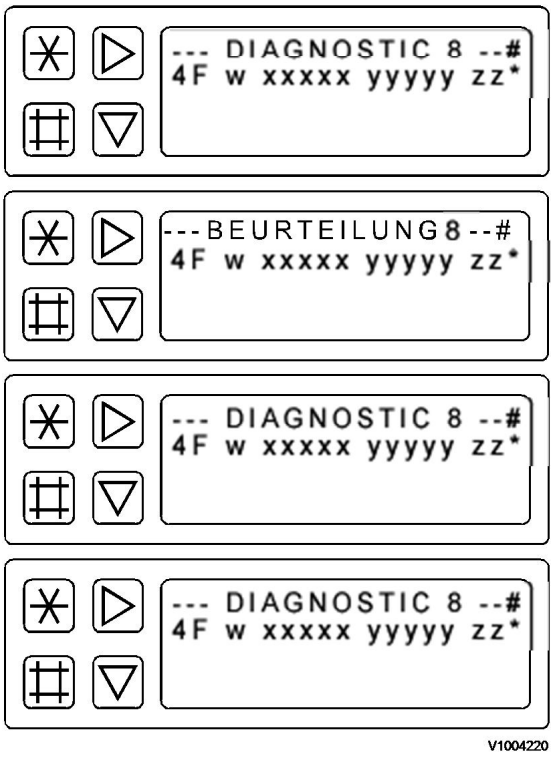


Figure 9

Diagnostic 8	
The following information is shown on the display:	
4 F[2] ⓘ	Shows error code of engine speed sensor (pump).
w	Shows active error status as s (error) or c (no error).
x x x x x	Shows the time in initial occurrence of the error according to machine hour.
y y y y y	Shows the time in the latest occurrence of the error according to machine hour.
z z	Shows the total number of occurrence of the error.

Press key V1004183 to select error code item.

The cursor "*" indicates the selected error code item.

Press key V1004182 to erase the logged error history.

If there is no error or the logged error history has been erased, the value "w xxxxx yyyyy zz" is displayed as "----------".

[1]Not supported in this model.

[2]Not supported in this model.

Document Title: **Contronic service display unit, display group 1, general information (I-ECU equipped)**	Function Group: **387**	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Contronic service display unit, display group 1, general information (I-ECU equipped)

General information

Title	Screen	Description
Initial screen	—SERVICE CONTRONIC— Excavator xxxx xx Serial No yy yyyy Key No zz V1030347	xxxxxx : Value (EC140B/EC160B/...) yyyyyy : Value zz : Value
Information	——INFORMATION —— Prod. Date 01/MA Y/04 Total Hours xxx xxx h Rated Power yyy/zzzz V1030348	xxxxxx : Value yyy : Value (kW) zz : Value (rpm)
Setting	—— SETTING —— # Language xxxxxx * Units C kPa lit ^ V1035563	- Press "#" key to select language or units (with wraparound) - Cursor "*" indicates the selected item between language and unit. - Press "*" key to change language or unit. - Cursor "^" indicates the selected item of units. xxxxxxxx : Language (with wraparound), English/ German/French/Spanish/Portuguese. Measurement units (with wraparound) : ° C → ° F/kPa → bar → psi/lit → gal
ECU version	—— ECU VERSION —— VECU xxxxx xxx EECU xxxxx xxx IECU xxxxx xxx V1030350	XXXXXXXX : ECU part number
MSW version	—— MSW VERSION —— VECU xxxxx xxx EECU xxxxx xxx IECU xxxxx xxx V1030351	XXXXXXXX : Main software part numbers
DST1 version	—— DST1 VERSION —— VECU xxxxx xxx EECU xxxxx xxx IECU xxxxx xxx V1030352	XXXXXXXX : Dataset 1 part numbers
DST2 version	—— DST2 VERSION —— VECU xxxxx xxx EECU xxxxx xxx IECU xxxxx xxx V1030353	XXXXXXXX : Dataset 2 part numbers

Document Title: **DC–DC converter, description**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

DC–DC converter, description

- The converter lowers battery voltage of 24V to supply the working voltage for cassette.

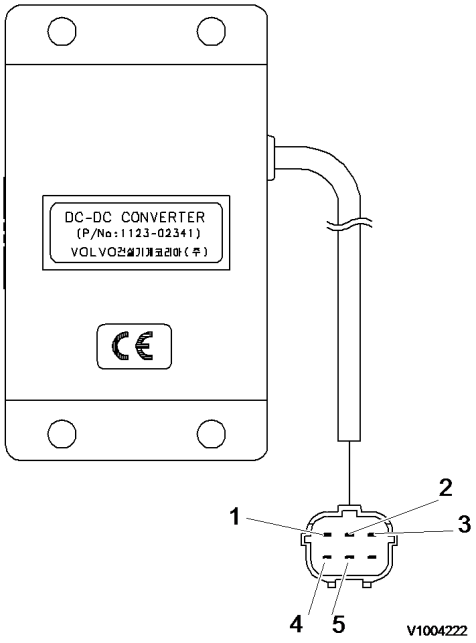


Figure 1
DC-DC converter

1	AVS 0.85 W (24 V)	4	AVS 0.85 BL (ACC)
2	AVS 0.85 R (12 V)	5	AVS 0.85 GN (B/U)
3	AVS 0.85 SB (GND)		

Inspection method

- Put the tester in the voltage measuring position, and measure the voltage across the output and ground terminals.

More than one document matches chosen profile

- Track gearbox, troubleshooting

  Product Line: EXC
  Model Variant: EC140B LCM (Volvo)

- Track gearbox, troubleshooting

  Product Line: EXC
  Model Variant: EC140B LCM (Volvo)

			gauge pin: 2.700 mm.	
106	Holder	Width of the inner tooth	Diameter of the gauge pin: 30.484 mm or Diameter of the gauge pin: 2.700 mm.	Replace the holder
104	Sun gear	Width of the tooth	73.048 mm (4 teeth)	Replace the sun gear
		Tooth surface	Pitting below 10% of the tooth surface.	
97	Planetary gear	Width of tooth	58.298 mm (7 teeth)	Replace the planetary gear.
		Tooth surface	Pitting below 10% of the tooth surface.	
		Shaft / bearing bore	Flaking of the bore surface.	
98	Needle bearing	Surface of the rollers.	Flaking of the roller surface	Replace the needle bearing assembly.
99	Needle bearing	Surface of the rollers.	Flaking of the roller surface	Replace the needle bearing assembly.
95	Housing	width of the tooth	Diameter of the spline : 307.067 mm or Diameter of the gauge pin: 5.500 mm	Replace the housing
		Tooth surface	Pitting below 10% of the tooth surface.	
93 94	Ring nut Plug			If they are dismantled, they must be replaced.
90	Flange holder	Clearance between the outer diameter of the piston assembly and the bore for the 2 speed piston	Clearance 0.040 mm	Replace the flange holder kit.
		The inner diameter 2 speed piston hole.	Roughness: 1.2 a or Scuffed depth: 0.02 mm	
112	Thrust plate	Plate thickness	Thickness: 2.7 mm or Thickness: 2.5 mm or Thickness: 2.0 mm.	Replace the thrust plate.
92	Angular bearing	Surface of the balls.	No flaking	Replace angular bearing.
		Operation	Abnormal noise and rolling characteristics.	
91	Seal	Friction surface	Deep scuffing to occur the oil leakage.	Replace seal and o-ring.
		O-ring	Crack at the surface	
O-ring				If they are dismantled, they must be replaced.

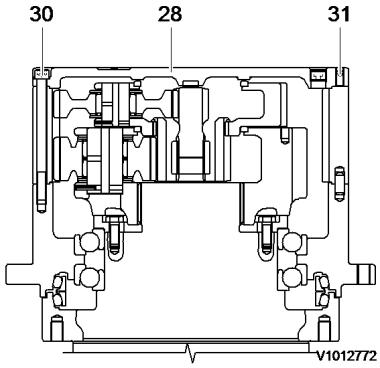


Figure 10
Installation, cover

11. Install plugs (32) into cover (28) and tighten to specified torque.

    - Tools: Torque wrench, Hexagon L wrench 10 mm (PT 1/2)

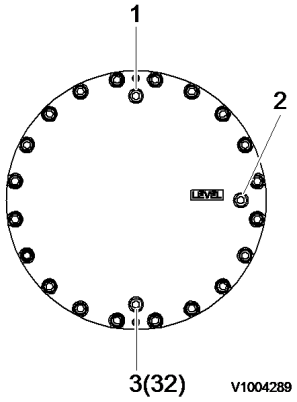


Figure 11
Installation, plug

1. Fill port
2. Level check port
3. Drain port

5. Bearing cone

- Press collar and bearing cone from shaft.
  NOTE!
  Be careful not to damage collar by excessive force.

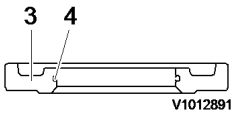


Figure 9
Removal, O-ring
3. Collar
4. O-ring

- Remove the O-ring from collar.
  NOTE!
  Do not reuse the O-ring.

9. Bearing and seal

- Remove the seal.
  NOTE!
  Do not reuse seal.

  - Tools: (–) Screwdriver

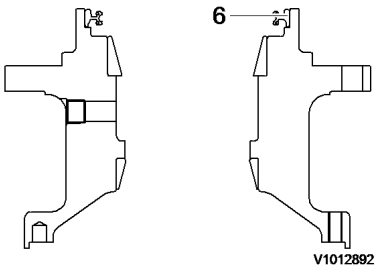


Figure 10
Removal, seal (6)

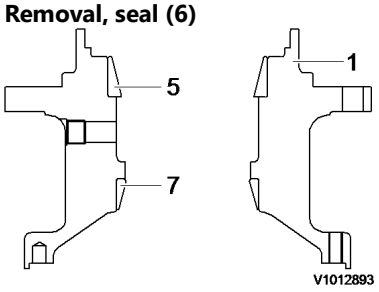


Figure 11
Removal, taper roller bearing cup (5,6)
1. Case
5. Bearing cup
7. Bearing cup

- Remove the taper roller bearing cup from case using puller.

  - Tools: Bearing puller

Track motor, exploded view

1	Valve casing	26	Plug (for check)	61	Piston
2	Shaft (main)	27	V/V (for check)	62	Shoe
3	Swash plate	28	Spring (for main)	63	RO plug
4	Cylinder block	30	Spring (for check)	65	Spool (two speed)
5	Piston	32	Oil seal	66	Spring (two speed)
6	Shoe	33	O-ring	67	Pivot
7	Retainer plate	35	O-ring	68	Steel ball
8	Thrust ball	36	O-ring	69	Set screw
9	Valve plate	37	O-ring	71	Orifice
10	Washer	39	O-ring	74	O-ring
11	Roller	41	Parallel pin	75	O-ring
12	Brake piston	42	Parallel pin	91	PT plug
13	Brake spring	43	Socket bolt	101	Spindle
14	Spring	45	Snap ring	126	O-ring
15	Friction plate	46	O-ring	202	Seat
16	Mating plate	47	Back up ring	203	Plunger
18	V/V seat (T-valve)	48	Back up ring	204	Spring
19	V/V (T-valve)	49	Roller bearing	205	Body
20	Spring (T-valve)	50	Ball bearing	206	Shim
22	Ring (T-Type)	51	Roller	207	Piston
23	Main spool (E type)	52	RO plug	208	Rod
24	Plug (for main)	54	NPTF plug	209	Plug
25	Retainer spring	60	Spring	210	Backup ring

Operation, hydraulic motor

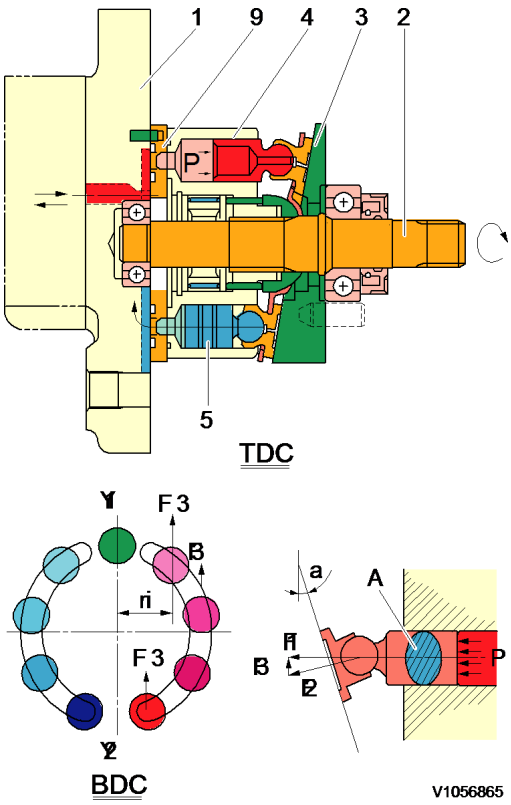


Figure 5

port moves spool (263) upward overcoming the force of spring (266), and blocks port (C).

At the same time the pressurized oil in chamber (P) drains to the motor case. This allows the forces acting on the rotary group to move swash plate (3) to maximum swash angle θ1, contacting y plane. Piston stroke is increased, cylinder revolutions decrease, resulting in low speed with high torque.

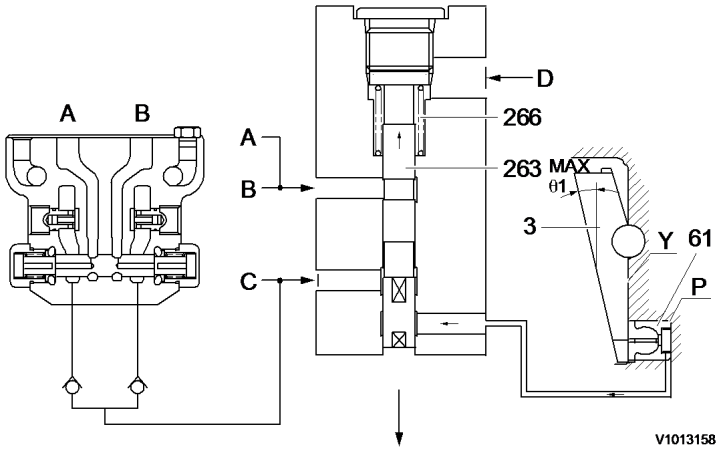


Figure 11
Displacement changeover valve, low speed

High speed

When the travel solenoid is energized (ph) servo hydraulic oil will flow to port (D).
The hydraulic pressure (40 kgf/cm2) at port (D) combined with the force of spring (266) moves spool (263) downward overcoming the force of the hydraulic oil pressure at port (A, B) and opens port (C).
The pressurized oil from port (C) flows into chamber (P) and pushes piston (61) moving swash plate (3) to minimum swash angle θ2, contacting x plane. Piston stroke is decreased, cylinder revolutions increase, resulting in high speed with low torque.

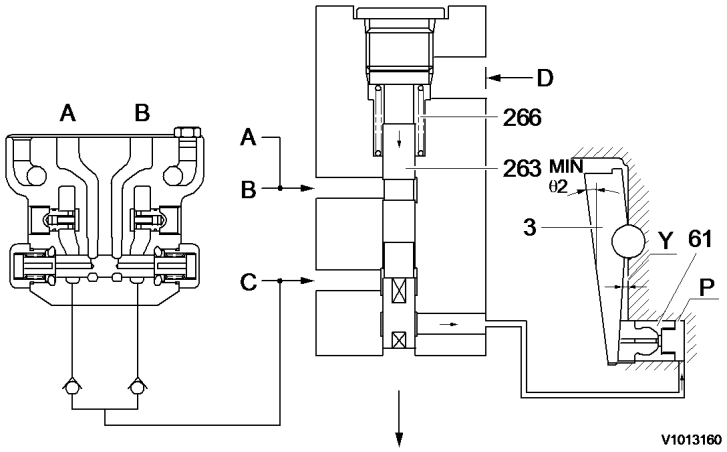


Figure 12
Displacement changeover valve, high speed

Automatic speed shifting to low speed during high speed traveling

When the load (tractive effort) is increased during high speed travel the oil pressure at port (A, B) increases.

If the pressure is approximately 260 kgf/cm2 it overcomes the combined force of spring (266) and (ph) servo hydraulic flow 40 kgf/cm2 at port (D), and moves spool (263) upward, blocking port (C). At the same time the pressurized oil in chamber (P) drains to the motor case, and swash plate (3) moves to maximum swash angle θ1, contacting Y plane, and the motor rotates at low speed.

A. Cylinder chamber E

When the main control valve travel spool is actuated, pressurized oil flow supplied to port P1 at the counterbalance valve, is routed via port P3, through oil path D, to brake cylinder chamber E. As it reacts on brake piston (63), the pressure overcomes the force of brake springs (87), the piston moves left, and brake discs (62) separate, releasing the braking force.

Operation of the parking brake

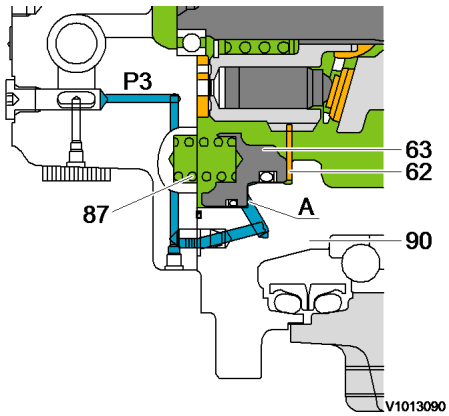


Figure 15
Operation of the parking brake

A. Cylinder chamber E

When the main control valve spool is returned to neutral, the pressurized oil flow to port P1 is blocked, the counterbalance valve moves to its neutral position and the motor stops. At the same time oil path D is closed, port P3 is connected with oil path F to the motor case, and the pressurized oil in brake chamber E is drained to the motor case. As the pressure decreases the force of brake springs (87), push brake piston (63), to the right against brake discs (62) and flange holder (90), generating sufficient braking force to hold the motor output shaft.

Piston motor

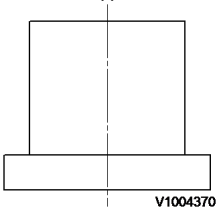
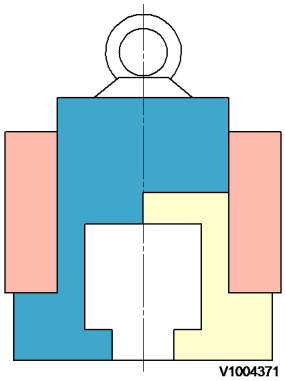
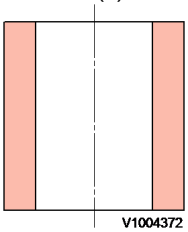
High pressure oil from the hydraulic pump delivered via the main control valve travel spool enters port MA on the rear flange of the travel motor and flows through valve plate (70) to half of the 9 pistons in cylinder block (81).
The top dead center (TDC) port is the starting point of the high pressure rotational cycle; for 180° the pressurized oil pushes pistons (82) out of the bores against the inclined swash plate, generating axial force F, as they slide on it toward the bottom dead center (BDC) port. Then as the remaining pistons slide toward a higher position on the swash plate, they move into the bores discharging low pressure oil to the return circuit.
Force F, causes the piston shoes to slide on inclined swash plate (2) fixed to the motor casing at angle (α), so that it is divided into radial force F1, F2. The forces vector analyzed through the piston shoes, generate a rotational force that is transmitted sequentially via pistons (82) to cylinder block (81), which is splined to output drive shaft (1), forcing it to rotate as the 9 equally spaced pistons connect with the high pressure port MA.
As the pressure and volume of oil increase, the torque and rotational speed of the piston motor increase.
To reverse motor rotation, the high pressure inlet flow is changed from port MA to MB.

5	Piston	The sliding surface is damaged.		

General tools

No.	Description	Size	Quantity
1	Allen wrench	5 mm, 10 mm, 8 mm, 14 mm	1
2	Ratchet	1/2″ drive, 3/4″ drive	1
3	Torque wrench	Approximately 280 n·m Approximately 850 n·m	1
4	Socket	32, 41 mm	1
5	L wrench socket	5, 6, 8, 10, 14, 19 mm	2
6	Hammer	Nominal 12	1
7	Plastic hammer	Approximately L = 300 mm	1
8	Screwdriver	Approximately L = 150 mm	1
9	Snap ring pliers	Expansion Retraction	1
10	Hoist	Capacity 300kg or over	
11	Eye bolt	M16 PF 1 / 2	
12	Bench press	Capacity 200kg or over	
13	Compressed air Hose & nozzle	Capacity 3 ~ 5 kgf / cm2	
14	Drain pan	W450 × D300 × H120	
15	Heating vessel	Temperature rise ability : 100°C or over Volume 500 × 500 × 500 (mm) or over	
16	Leather gloves		
17	Seal tape		
18	Depth micrometer	Measuring range : approximately 30 mm Min. scale : 0.01 mm	
19	Feeler gauge	Measuring range : 0.04 ~ 0.3 mm	
20	Grinder	Cast cutting	
21	Air chisel	BRH – 8 (compressed air 6 kgf/cm2)	

Special tools

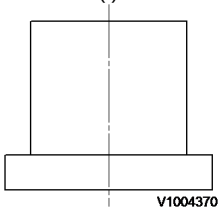
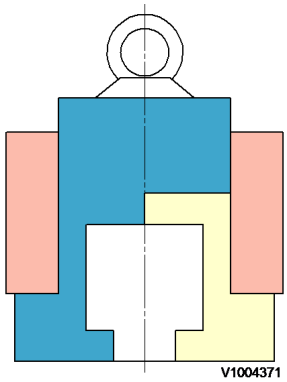
No.	Description & Part No.	Quantity	No.	Description & Part No.	Quantity
1	Retainer (I)  Part No. : 8932 – 00160	1	4	Lifter  Part No. : 8932 – 00210	1
2	Retainer (II)  	2			

263	Spool	The sliding surface or bore is damaged.		
101	Piston	The sliding surface is damaged.		
102	Sleeve	The seat surface is damaged. The clearance against piston (101) is excessive.		

General tools

No.	Description	Size	Quantity
1	Allen wrench	5 mm, 10 mm, 8 mm, 14 mm	1
2	Ratchet	1/2″ drive, 3/4″ drive	1
3	Torque wrench	Approximately 280 N·m Approximately 850 N·m	1
4	Socket Hexagon L. wrench socket	32, 41 mm 5, 6, 8, 10, 14, 19 mm	1
5	Extension bar	150 mm	2
6	Hammer	Nominal 12	1
7	Plastic hammer	Approximately L = 300 mm	1
8	Screwdriver	Approximately L = 150 mm	1
9	Snap ring pliers	Expansion Retraction	1
10	Hoist Eye bolt Eye bolt	Capacity 300 kg or over M16 PF 1 / 2	
11	Bench press	Capacity 200 kg or over	
12	Compressed air Hose & nozzle	Capacity 3 ~ 5 kgf / cm2	
13	Drain pan	W450 × D300 × H120	
14	Heating vessel	Temperature rise ability: 100°C or over Volume 500 × 500 × 500 or over	
15	Leather gloves		
16	Seal tape		
17	Depth micrometer	Measuring range: approximately 30 mm Min. scale: 0.01 mm	
18	Feeler gauge	Measuring range: 0.04 ~ 0.3 mm	
19	Grinder	Cast cutting	
20	Air chisel	BRH – 8 (compressed air 6 kgf/cm2)	

Special tools

No.	Description & Part no.	Quantity	No.	Description & Part no.	Quantity
1	Retainer (I)  Part no.: 8932 – 00160	1	3	Lifter  	1
2	Retainer (II)	2			

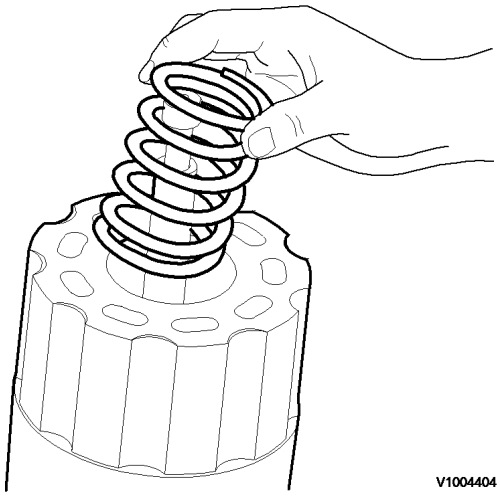


Figure 25
Removal, spring

VOLVO
Construction Equipment

Service Information

Document Title: **Slew motor, principle of operation**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Slew motor, principle of operation

Hydraulic motor

When high pressure oil from the hydraulic pump delivered via the main control valve, enters port (a) of valve plate (1), it flows to half of the 9 pistons spaced parallel in cylinder block (4) and pushes the pistons out of the bores against the inclined swash plate, generating force F in an axial direction.
Force F vector divides into components of radial force F1, F2, and is transmitted sequentially via pistons (5) to cylinder block (4), generating a rotational torque causing the cylinder block splined to output drive shaft (6) to rotate.
The top dead center port (A) is the starting point of the high pressure rotational cycle: for 180° the pistons move out of the bores as they slide along the swash plate toward bottom dead center port (B), then they begin moving into the bores discharging low pressure oil to the return circuit. If the supply port and return port are interchanged, the slew motor rotates in the opposite direction.
The theroretical output torque T is calculated by the following formula.

$T = p \times q / 2 \times \pi$
p: Effective differential pressure, kgf/cm2
q: Capacity per one rotation, cc/rev

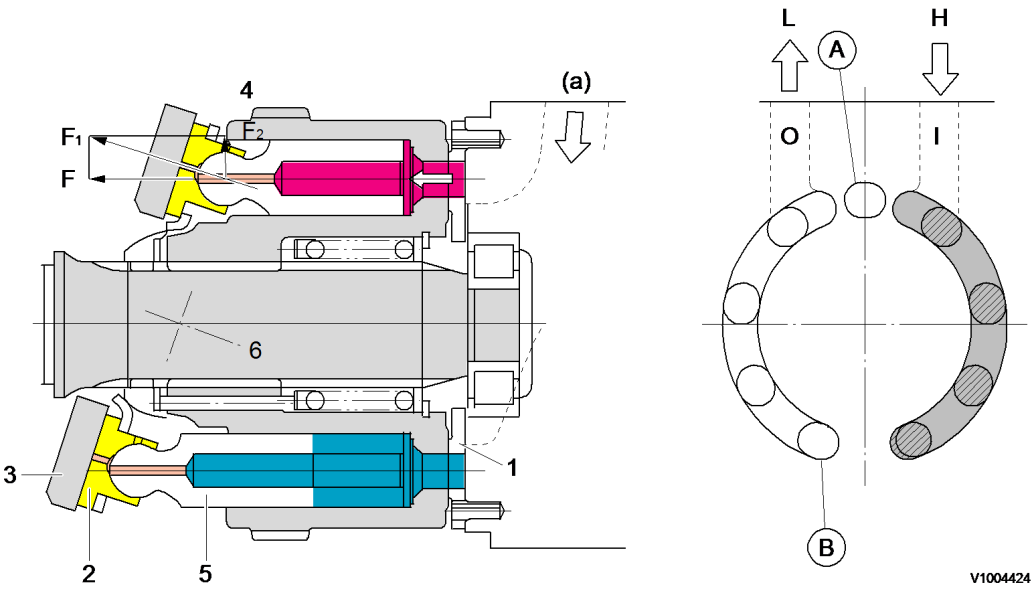


Figure 1
Operation, slew motor

1	Valve plate	L	Low pressure oil
2	Shoe	H	High pressure oil
3	Swash plate	O	Outlet port
4	Cylinder block	I	Inlet port
5	Piston		
6	Drive shaft		

Valve casing, anti–cavitation check valve

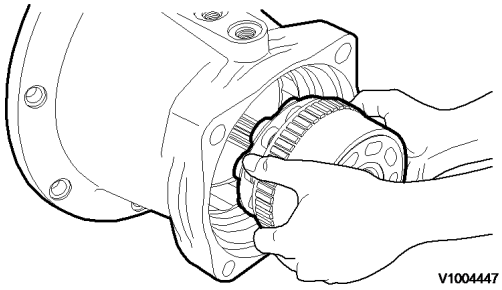


Figure 7
Removal, cylinder

13. Pull out friction discs (742) and mating discs (743) from casing (301).

14. Remove snap ring (437) from casing (301).

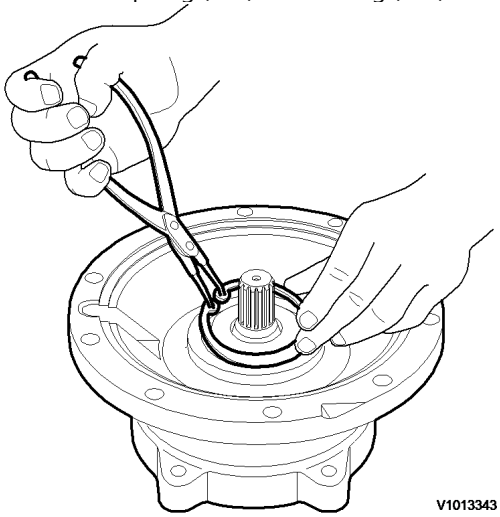


Figure 8
Removal, snap ring

15. Remove seal cover (304) from casing (301).
    NOTE!
    When removing seal cover, be careful not scratch the surface. (If it is difficult remove seal cover with drive shaft)

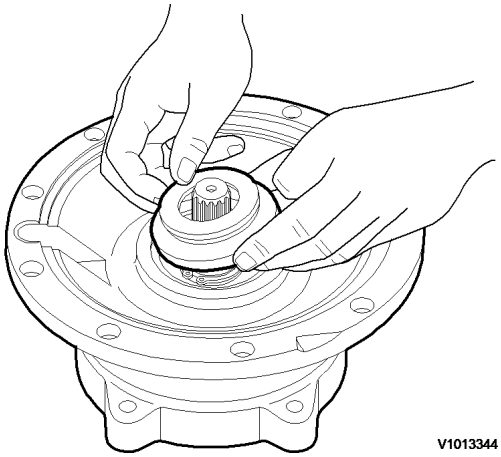


Figure 9
Removal, seal cover

16. Remove drive shaft (101) by tapping the output end through casing.

VOLVO

Construction Equipment

Service Information

Document Title: **Center passage, description**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Center passage, description

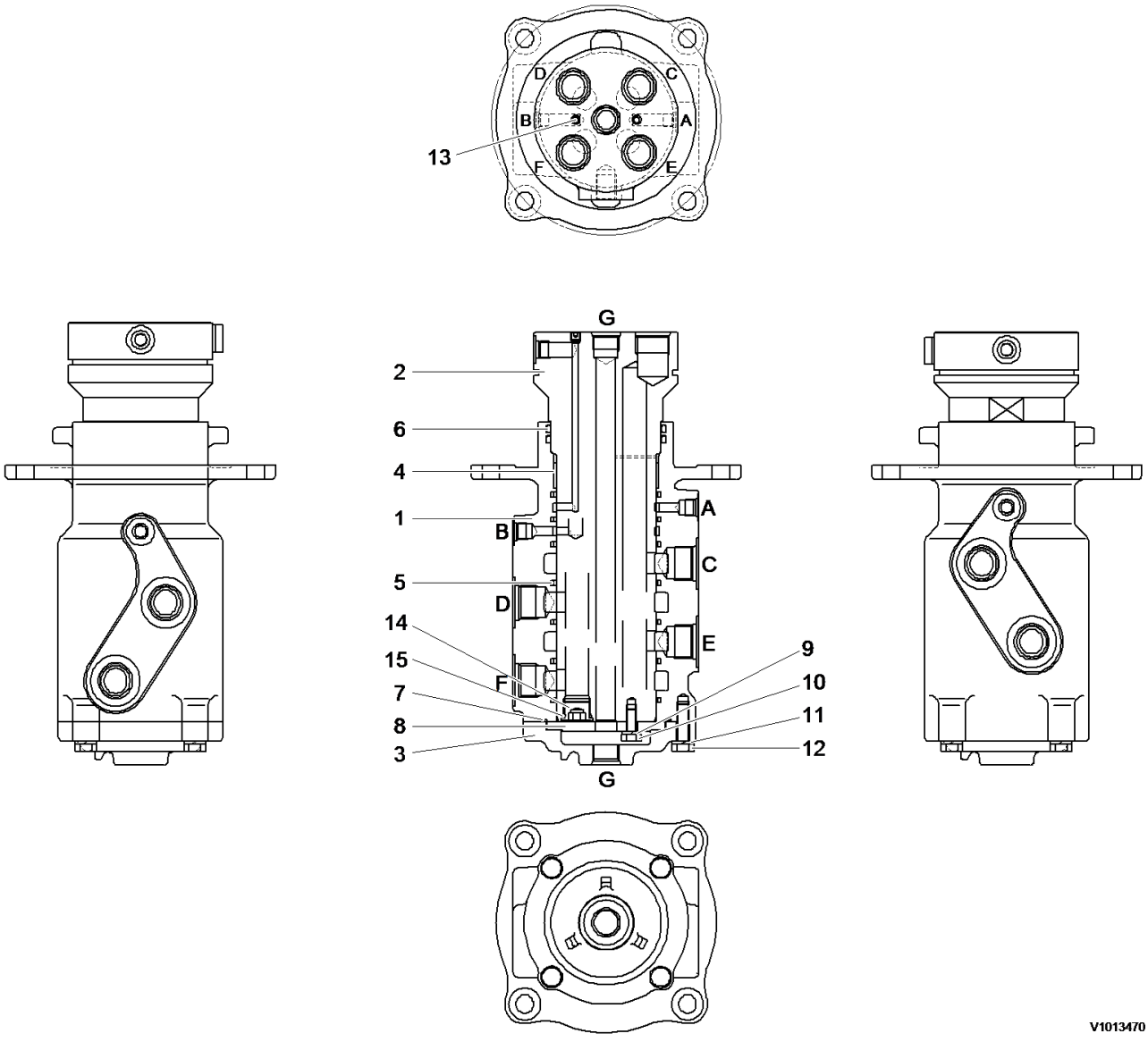
Structure

The center passage consists of hub (1), shaft (2), seal (5), cover (3), plug (13), spacer (8) and screws (9).
The hub contains oil grooves to route the flow of oil. The shaft has passages to supply oil into the hub. The seal prevents oil leakage between shaft and hub. The cover prevents external oil leakage and with screws (9), fix spacer (8), hub (1) and shaft (2) together.

Operation

High pressure oil from the main control valve is delivered to the center passage, and flows through ports A-B or C–D to the left and right track motor, to drive the track motors.
Drain oil returns to the reservoir via port G, also track (high speed) control servo hydraulic oil flows into port B.
Hub assembly (1) is fixed to the under carriage and shaft (2) rotates freely in the hub with the superstructure. The oil flows through circumferential grooves in the hub, therefore oil flow is not obstructed by slew.

Sectional view



Troubleshooting

Troubleshooting

Trouble	Cause	Remedy
External / internal leakage, machine does not track straight on level ground or a slope, even if the track motor and pump are normal.	(1) When the pressure between pump and valve drops. –The circuit for valve is defective.	(1) Check the circuit between pump and valve, and repair or replace. Check pump, valve, and center passage by pressure gauge in that sequence.
	(2) When the pressure between pump and center passage drops. –The circuit for center passage is defective.	(2) Check for leakage between center passage and valve. If it is normal, separate center passage and test the pressure by gauge. If the pressure drops, disassemble and check the o-ring, etc. visually.
When noise comes from the center passage.	Check the center passage plumbing for vibration or abnormal heating.	If the center passage is defective, disassemble to check the shaft and seals. Repair or replace a worn shaft.

Document Title: **Counterweight, installation**	Function Group: **716**	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

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Counterweight, installation

Casting type

Op nbr 71602

WARNING

Lift the counterweight just a little, and after confirming safety and horizontal position, proceed to install it.

1. Attach lifting cables or slings to the lifting eye (C) of counterweight, and lift to the desired position.

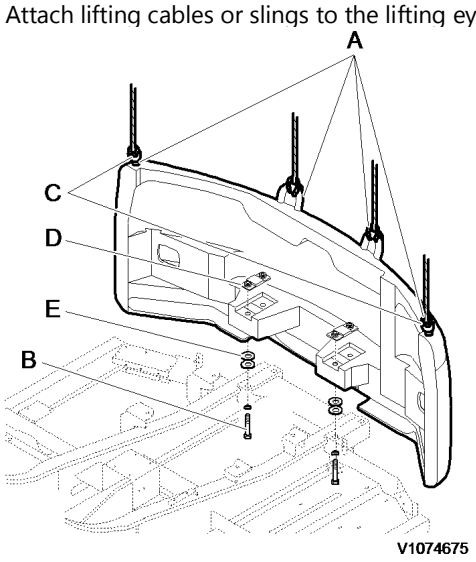

Figure 1

2. Match the screw hole. Insert the lock plate (D) and washer (E), and tighten screws (B).
   Tightening torque, unit: Nm (kgf m) (lbf ft)

Machine	Korea	Mounting screw (B), Tightening torque	Konz
EC140B	11001 ~ 11956	1324 ±49 (135 ±5) (975 ±36)	20001 ~ 20517
EC135B	–		
EC140B	11957 ~	1400 ±140 (143 ±14) (1036 ±104)	20518 ~
EC135B	–		

   - Lower the counterweight to the mounting face at the rear of the superstructure.

NOTE!
Apply loctite #277 onto the threads of screws (B).

Document Title: **Idler, measurement of wear**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

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Idler, measurement of wear

LC

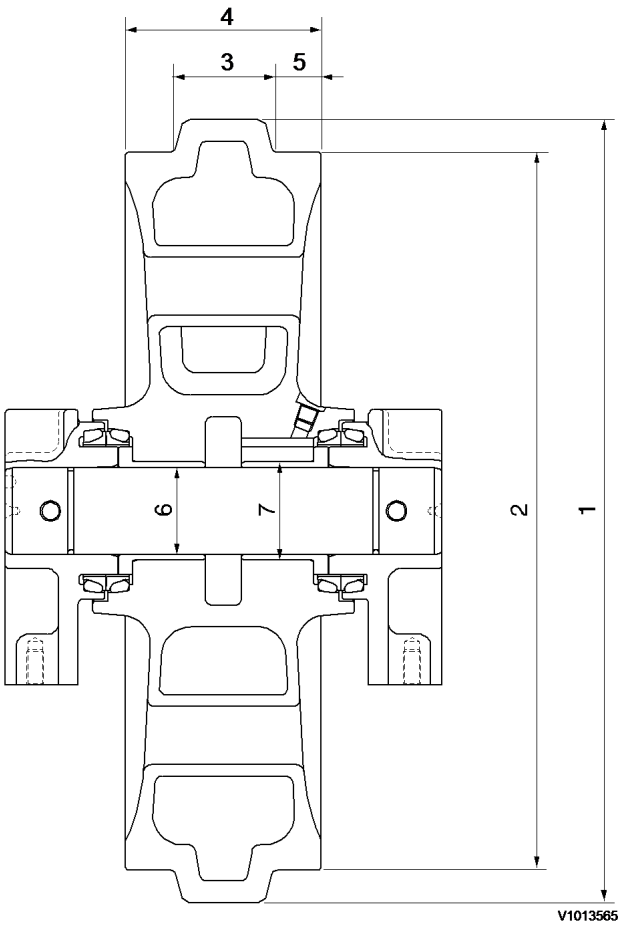


Figure 1
Measurement, wear (LC)

Limit of wear (LC), unit: mm (in)

No.	Check item	Standard size			Repair limit	Remedy
1	Outer diameter of flange	540 (21.3)			–	Reinforcement welding or replace
2	Outer diameter of tread	495 (19.5)			483 (19.0)	
3	Width of flange	68 (2.7)			60 (2.4)	
4	Total width of tread	140 (5.5)			–	
5	Width of tread	36 (1.4)			40 (1.6)	
6	Clearance between	Standard size	Tolerance	Clearance		Replace bushing

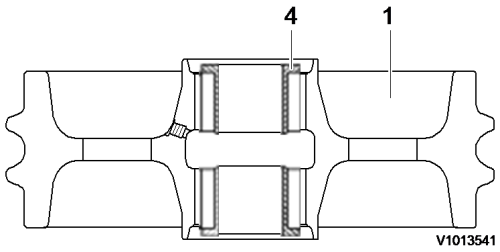
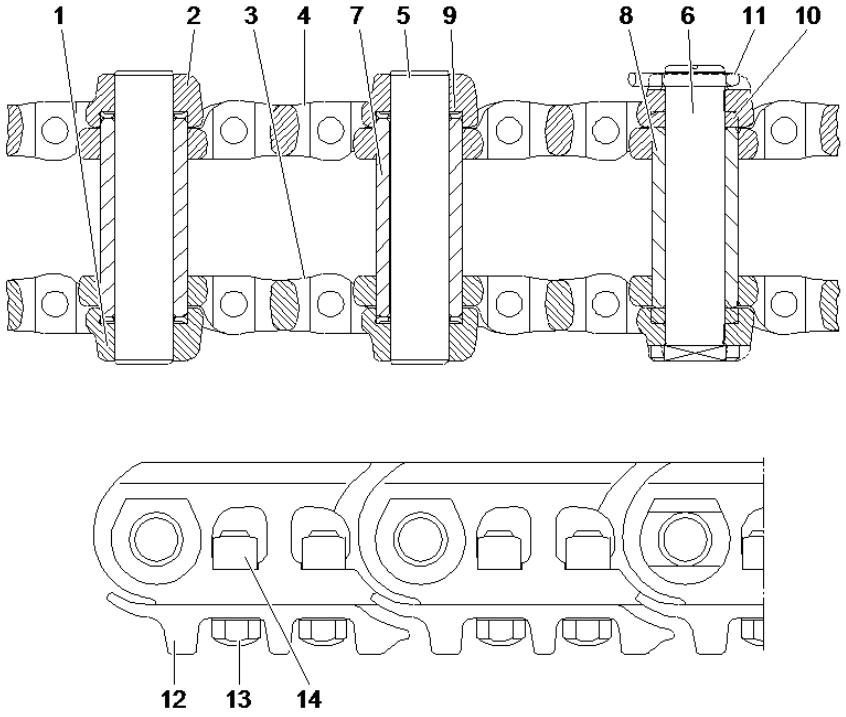


Figure 5
Location to be inspected

1	Idler wheel
4	Bushing

10. Confirm that any wear of shaft or bushing is within the allowable range.

LC



LCM

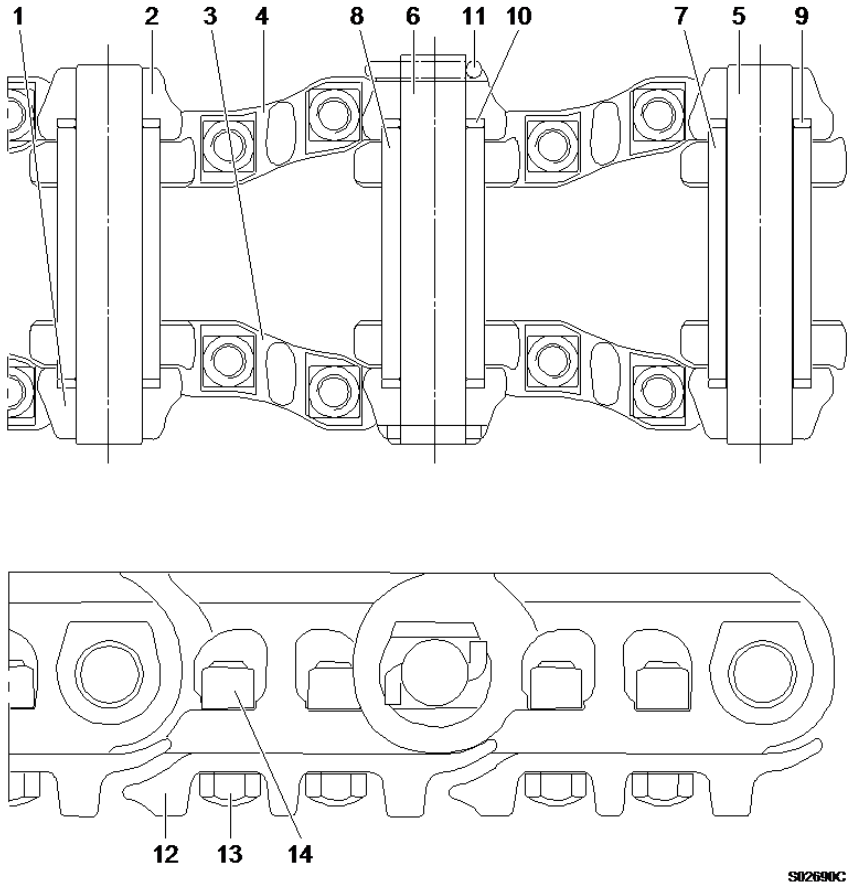


Figure 1
Structure, track chain (Machine serial no. : ~ 11741)

1	Link (left)	8	Master bushing
2	Link (right)	9	Regular seal
3	Master link (left)	10	Spacer

1. Measure at direction of D1 and D2, and determine the small value between two dimension (D1 and D2).
    - Tools: Vernier calipers
2. Measure 2 places to take average value.
   Measure right and left alternately.
    - Tools: Vernier calipers
3. If the measuring value is over wear limit, repair or replace the bushing.

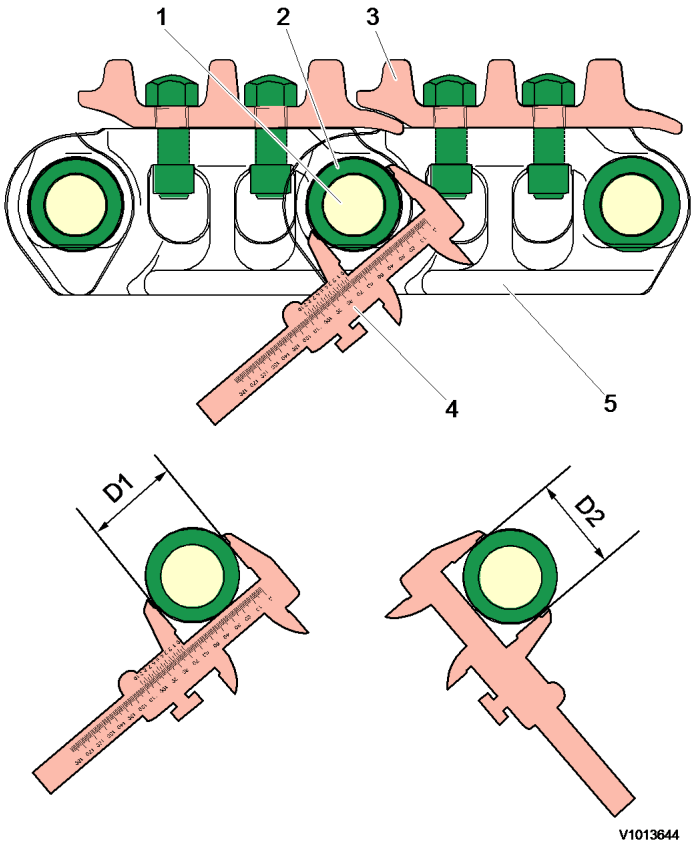


Figure 2
Measurement, bushing outer diameter wear

1. Pin
2. Bushing
3. Shoe
4. Vernier calipers
5. Link

Measuring of link height wear

1. Clean the link.
2. Measure the height (4) of link (2) using vernier calipers (3).
   NOTE!
   Measure the height of link (2) at the center of link (2).
3. Measure at direction of D1 and D2, and determine the small value between two dimension (D1 and D2).
4. Measure 2 places to take average value.
   Measure right and left alternately.
5. If the measuring value is over wear limit, repair or replace the track link.

Figure 3
Removal, master pin

Model	Serial no.	
	Type A	**Type B**
EC140B	~ 11741	11742 ~
EC160B	~ 10730	10731 ~
EC180B	~ 10156	10157 ~
EC210B	~ 14882	14883 ~
EC240B	~ 12042	12043 ~
EC290B	~ 12894	12895 ~ 80001 ~
EC330B/EC360B NLC	~ 10554	10555 ~ 80001 ~
EC360B LC	~ 11463	11464 ~ 80001 ~

5. Disassemble the opposite track repeating the above procedure.

6. Drive the machine slowly backward and off the track. At this time, drive the machine onto a track or thick steel plate.

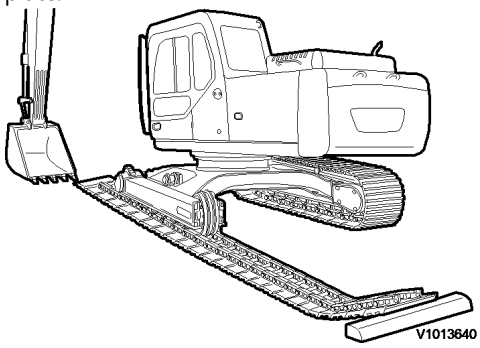


Figure 4
Driving the machine slowly

Document Title: **Top roller, description**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

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Top roller, description

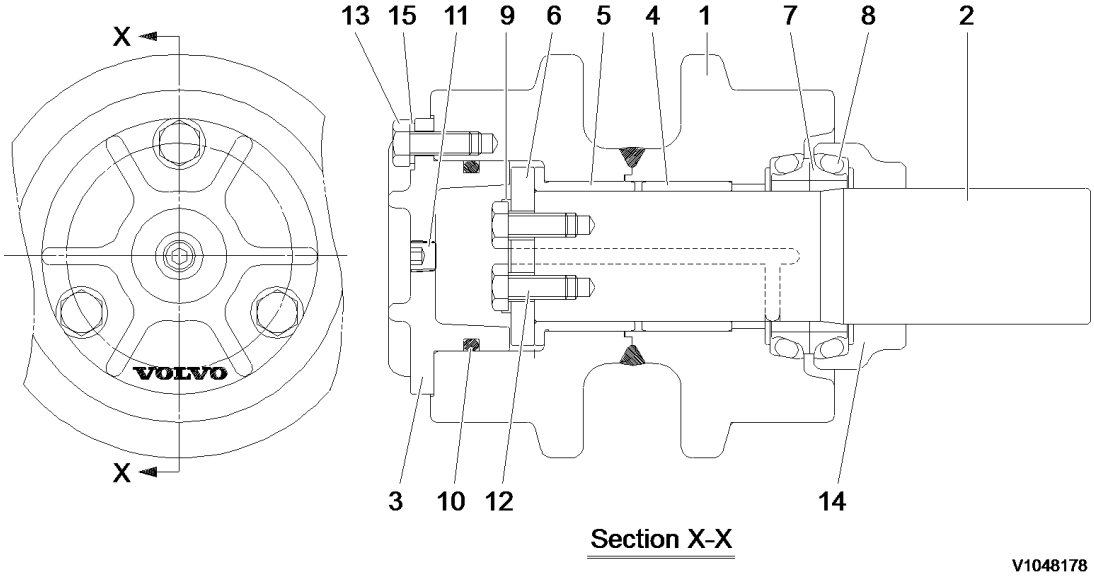

Figure 1
Structure, top roller

1	Roller shell	9	Lock plate
2	Shaft	10	O-ring
3	Cover	11	Plug
4	Bushing	12	Screw
5	Bushing	13	Screw
6	Plate	14	Collar
7	Seal	15	Spring washer
8	O-ring		

NOTE!
Oil filling specification. SAE 10W-30, 90 cc (5.5 cu.in)

Tightening torque: No. 9, 12, 13: 64 Nm (6.5kgf m) (47 lbf ft)

Roller assembly mounting screws: 510 ±49 Nm (52 ±5 kgf m) (375 ±36 lbf ft)

8. Put bushing driver jig (h) on bushings (4, 5), and force out them using press (d).

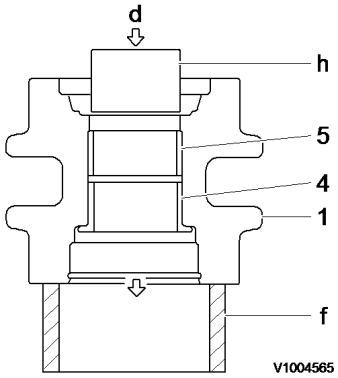

Figure 3
Removal, bushing

- Confirm that there is no damage or rust on the sealing face of the seals.
- Confirm that any wear of the roller is within the allowable range.
- Confirm that any wear of the shaft and the bushing is within the allowable range.
- Confirm that the interference between the bushing and the roller is within the allowable range.

Inspection after disassembly

VOLVO
Construction Equipment

Service Information

Document Title: **Bottom roller, measurement of wear**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

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Bottom roller, measurement of wear

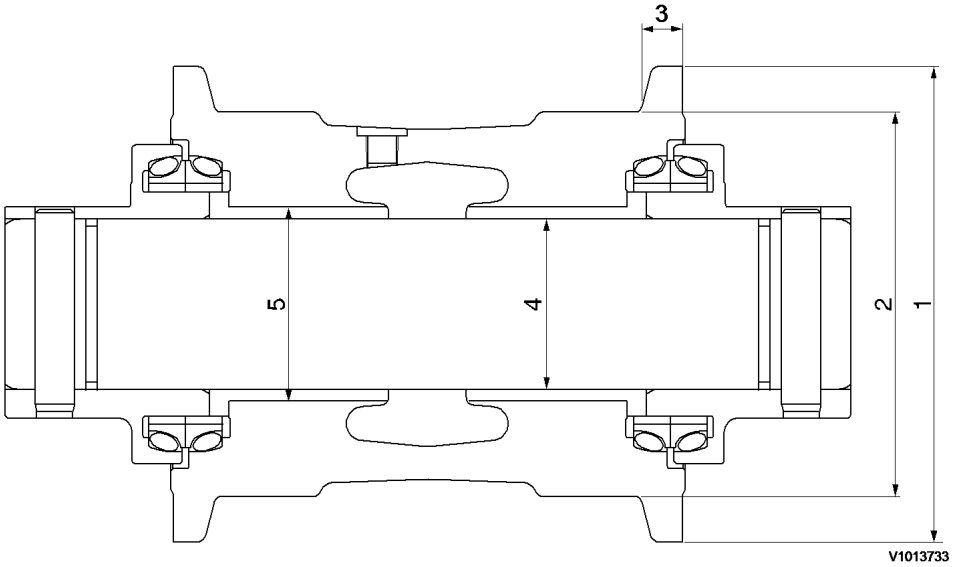


Figure 1
Dimensions, bottom roller

Wear limit (LC), unit: mm (in)

No.	Check item	Machine serial no.	Standard size	Repair limit	Remedy
1	Outer diameter of flange		185 (7.3)	–	Reinforcement welding or replace
2	Outer diameter of tread	~ 11539	150 (5.9)	140 (5.5)	
		11540 ~		135 (5.31)	
3	Width of flange	~ 11539	24 (0.9)	13.5 (0.5)	
		11540 ~	22 (0.9)		

No.	Check item	Machine serial no.	Standard size	Tolerance		Clearance		Remedy
				Shaft	Hole	Standard	Repair limit	
4	Clearance between shaft and bushing	~ 11539	60 (2.4)	0 –0.019	+0.31 +0.26	+0.26 ~+0.329	1.5	Replace bushing
		11540 ~			+0.35 +0.30	+0.30 ~+0.369		
5	Clearance between roller and bushing		68 (2.7)	+0.110 +0.075	+0.030 0	-0.045 ~ -0.110	–	Replace bushing
6	Mounting screw torque		27 ± 3 kgf·m (195 ± 22 lbf·ft)					

Wear limit (LCM), unit: mm (in)

Document Title: **Bottom roller, disassembly**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Bottom roller, disassembly

Op nbr 00000

The numbers in parenthesis following each part name in the text correspond to those in figure.

1. Remove plug (7), and drain the oil.
   NOTE!
   Prepare a container to catch the oil flowing out of bottom roller (1).

2. Drive out pin (8) through collar (3) Using jig (c).

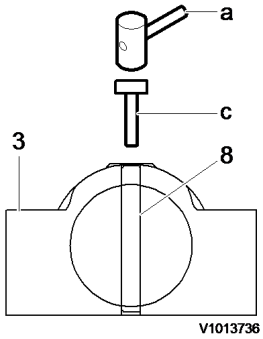


Figure 1
Removal, spring pin

3. Place bottom roller shell (1) on support jig (d), put shaft extruding jig (e) on shaft (2), and force out the shaft with press (b).

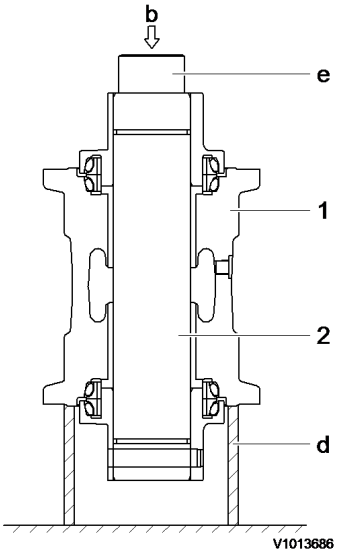


Figure 2

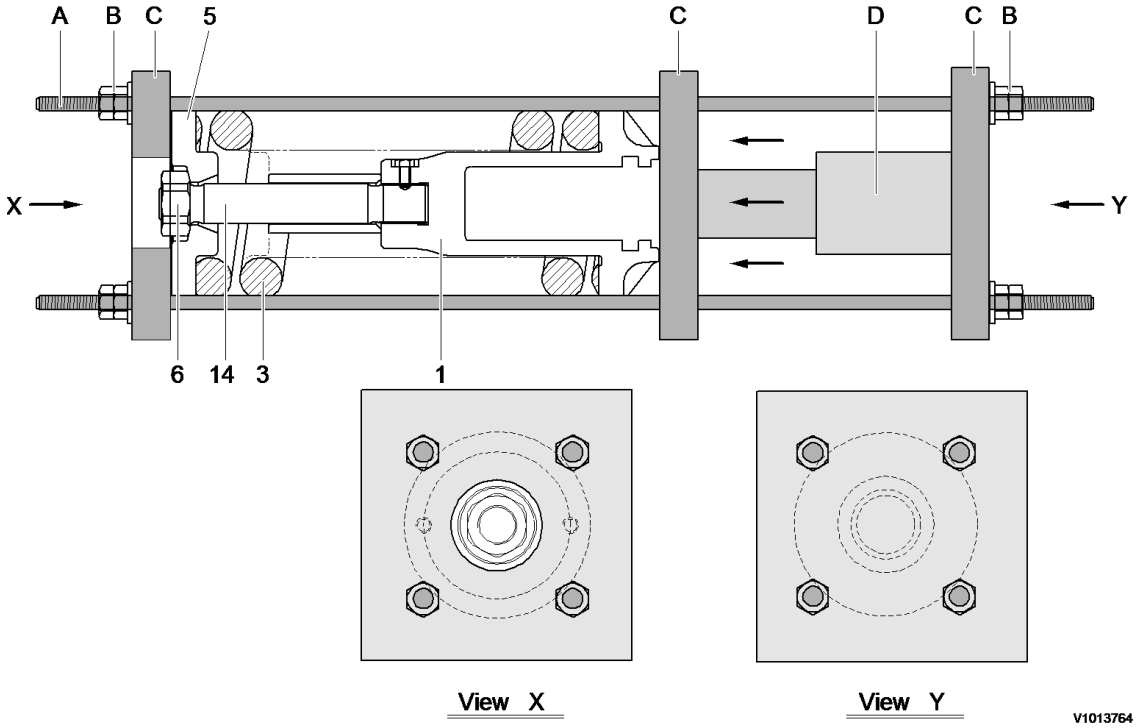


Figure 2
Installation, nut, yoke and spring

A	Screw bar	C	Plate
B	Nut	D	Press

4. Install packing (9), back-up ring (10), and dust seal (11) to cylinder (1).

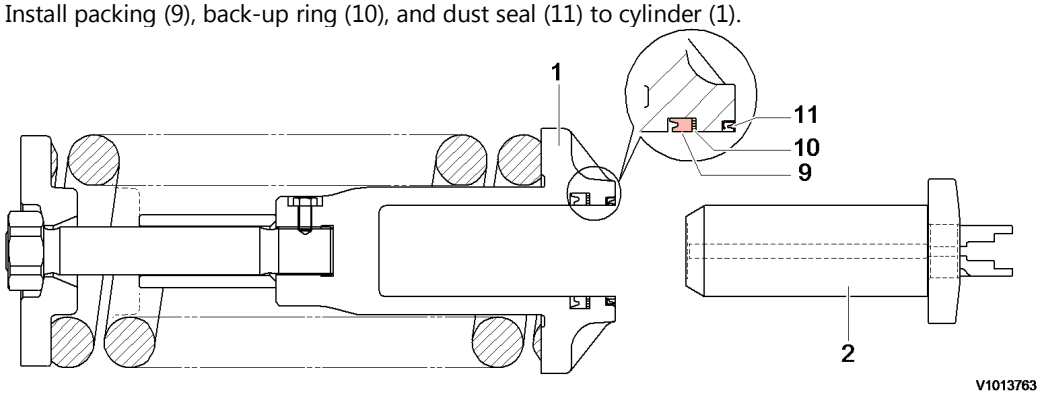


Figure 3
Installation, piston, seal, back-up ring and packing

5. Fill cylinder body (1) with grease and push piston (2) in. Release the air from the cylinder.

6. Install grease valve (8) to piston (2).

   - Tightening torque (Grease valve): 7 ± 0.25 kgf·m (50 ± 1.8 lbf·ft)

Document Title: **Air conditioning unit, description**	Function Group: **870**	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Air conditioning unit, description

Air cooling and heating type

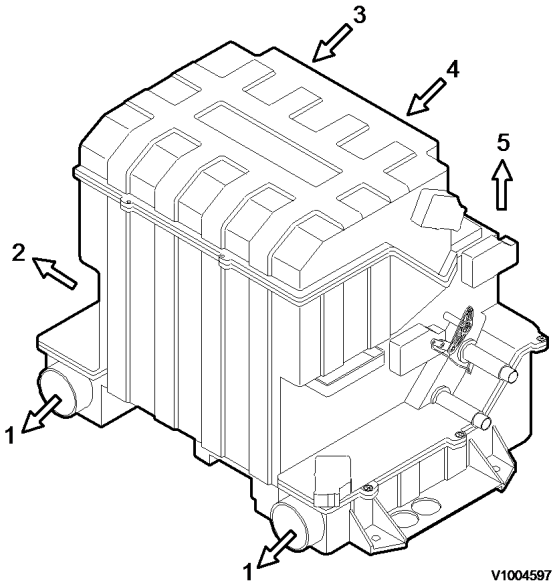


Figure 1
Structure, air conditioning system

1	Foot	4	Indoor air
2	Defrost	5	Face
3	Outdoor air		

The advanced integrated air conditioning system, with the heating and the cooling system installed in a single unit is designed to provide a comfortable indoor environment in all seasons.
The integrated system is ergonomically designed for the most efficient air flow distribution. The easy to use control panel provides a selection of cooling/heating and indoor/outdoor air through 8 levels and 4 fan speeds.
According to the indoor and outdoor air condition, indoor or outdoor air circulation can be selected. All fresh air is drawn through the air filter installed between the duct and the cab vent.

Air cooling type

The air cooling type is used only for cooling. If heating is required, use the integrated system with heating and cooling systems.

Air conditioning (AC), basic principles

The AC unit conducts heat away from the cab air to the surrounding atmosphere. At the same time as the temperature is lowered, the air is also dehumidified as the moisture in the air condenses on the cold fins while it passes through the evaporator.

In order to conduct heat away from the cab air, a medium with a lower temperature than the air is required, since heat always moves from a warmer object to a colder one.

If water is heated to 100 °C (212 °F), it begins to boil since the water has reached its limit for storing heat. If you continue to heat the water, it must release an amount of heat equal to the heat that is added. This is accomplished by boiling which means that some of the water is converted to steam. The steam carries excess heat with it as it leaves the water.

A. Cooling
B. Heating

- Cooling and heating operations are composed of 4 steps respectively.
- By pressing the right or left switch, temperature control moves by 1 step. Two LEDs light to indicate the current position.

Indoor or outdoor air select switch

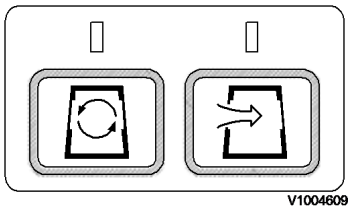
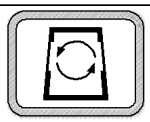
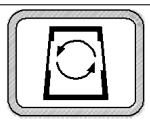
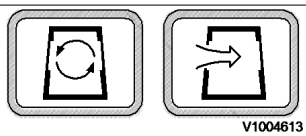
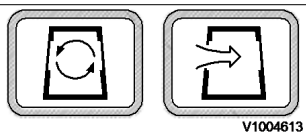
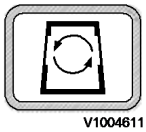
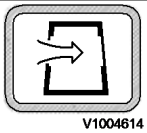
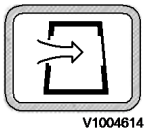


Figure 5
Switch, air select

- Indoor or outdoor air can be selected.
- Indoor air: 90% of Indoor air + 10% of outdoor air
- Outdoor air: 50% of outdoor air + 50% of Indoor air

Method of operation

Operation, air conditioning system

Function	Air direction	Temperature control	Indoor or outdoor air	Fan	Compressor
Quick cooling	 V1004610	Cool 4 step	 V1004611	High speed	ON
Cooling	 V1004610	Cool 1 ~ 3step	 V1004611	Lower or medium speed	ON
Defrost in the summer	 V1004612	Cool 4 step	 V1004613	High or medium speed	ON
Defrost in the spring & fall	 V1004612	Heat 2 ~ 3 step	 V1004613	medium speed	ON
Quick heating	 V1004610	Heat 4 step	 V1004611	High speed	OFF
Heating	 V1004610	Heat 2 ~ 3 step	 V1004614	medium speed	OFF
Ventilation	 V1004610	Neutral	 V1004614	Low or medium	OFF

Document Title: **Refrigerant hoses**	Function Group: **870**	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Refrigerant hoses

The refrigerant hoses have an inner tube of polyamide in order to reduce refrigerant leakage from the system.

NOTE!
The polyamide inner tube makes the hoses prone to breakage, see minimum allowed bend radius in the table below.

Each hose has unions with o-rings at the ends, and lengths and dimensions are tailored to the specific location in the unit.

NOTE!
Hoses and O-rings must not be replaced by parts with different rubber quality.

When disconnecting hoses, protective plugs must be fitted immediately on the ends of the hoses and components to - protect the system from any contaminants.

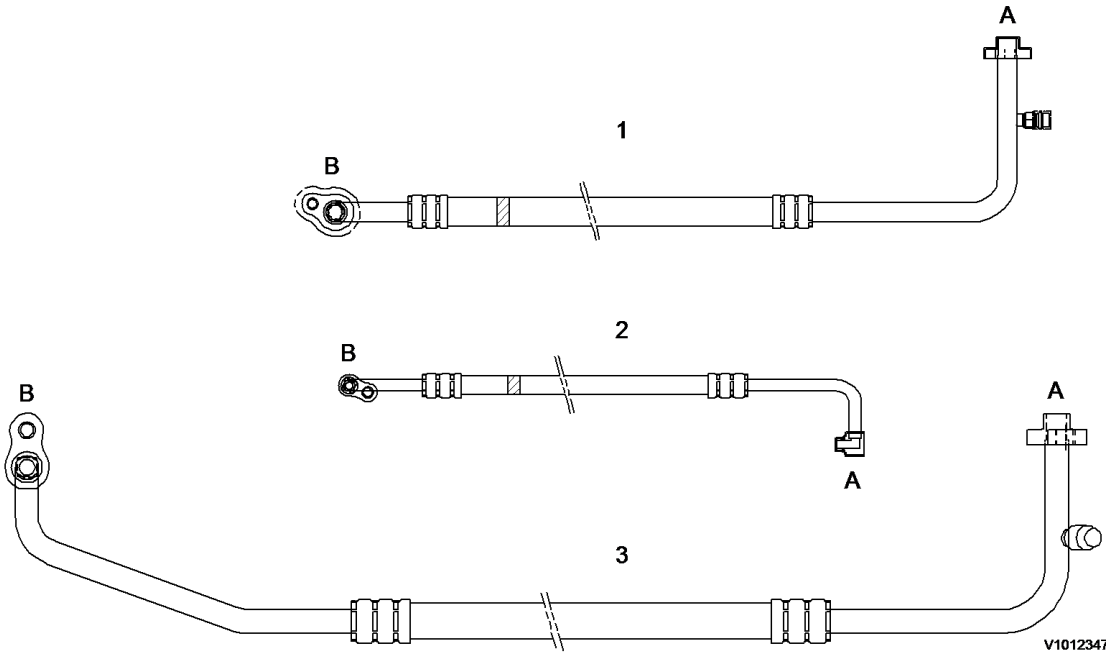


Figure 1
Refrigerant hose with unions

		A side	**B side**
1	Hose	Compressor	Air conditioning unit
2	Hose	Receiver drier	Air conditioning unit
3	Hose	Compressor	Condenser

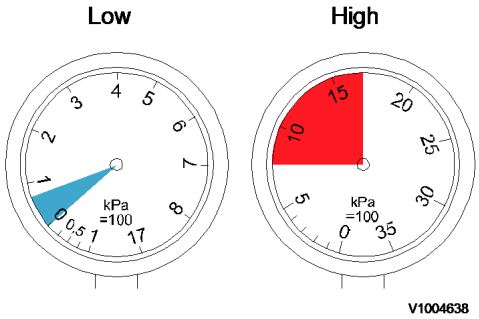


Figure 4
Reading pressure gauge

Pressure reading	Possible causes
• Low pressure gauge (blue), low • High pressure gauge (red), normal	1. Defective thermostat 2. Moisture in system 3. Expansion valve closed if low pressure gauge shows negative pressure

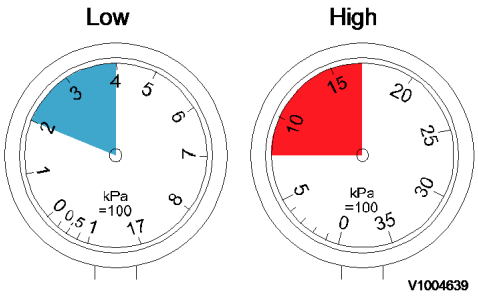


Figure 5
Reading pressure gauge

Pressure reading	Possible causes
• Low pressure gauge (blue), high • High pressure gauge (red), normal	1. Expansion valve not working 2. Compressor not working

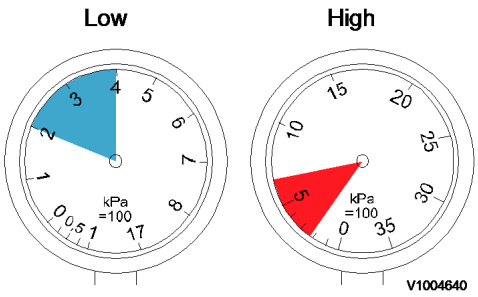


Figure 6
Reading pressure gauge

Pressure reading	Possible causes

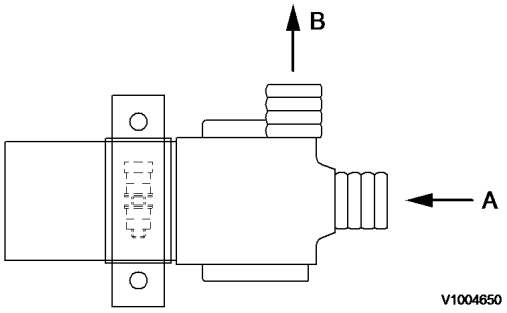


Figure 4
Water pump

A. From engine block
B. To diesel coolant heater

Heating unit

The heating unit raises the temperature of the coolant using the fuel combustion unit, consists of the glow plug, the thermostats, the flame sensor, the controller, the electric motor and the fuse. The case of the unit has the fuel supplying port, the coolant inlet/outlet port, the air inlet port and the exhaust port.

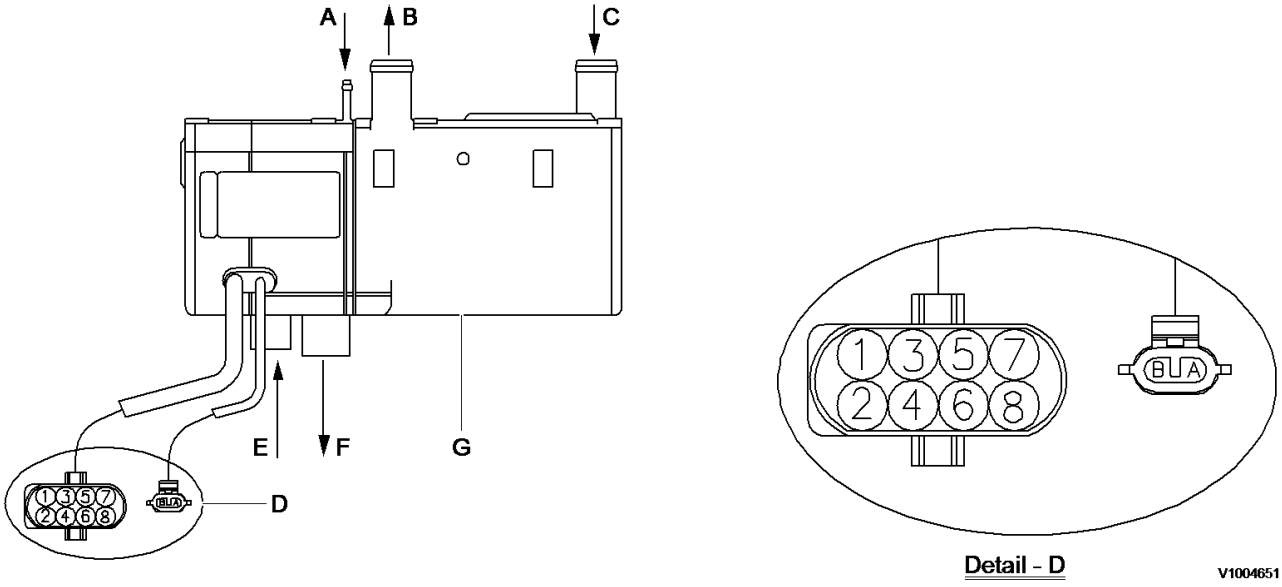
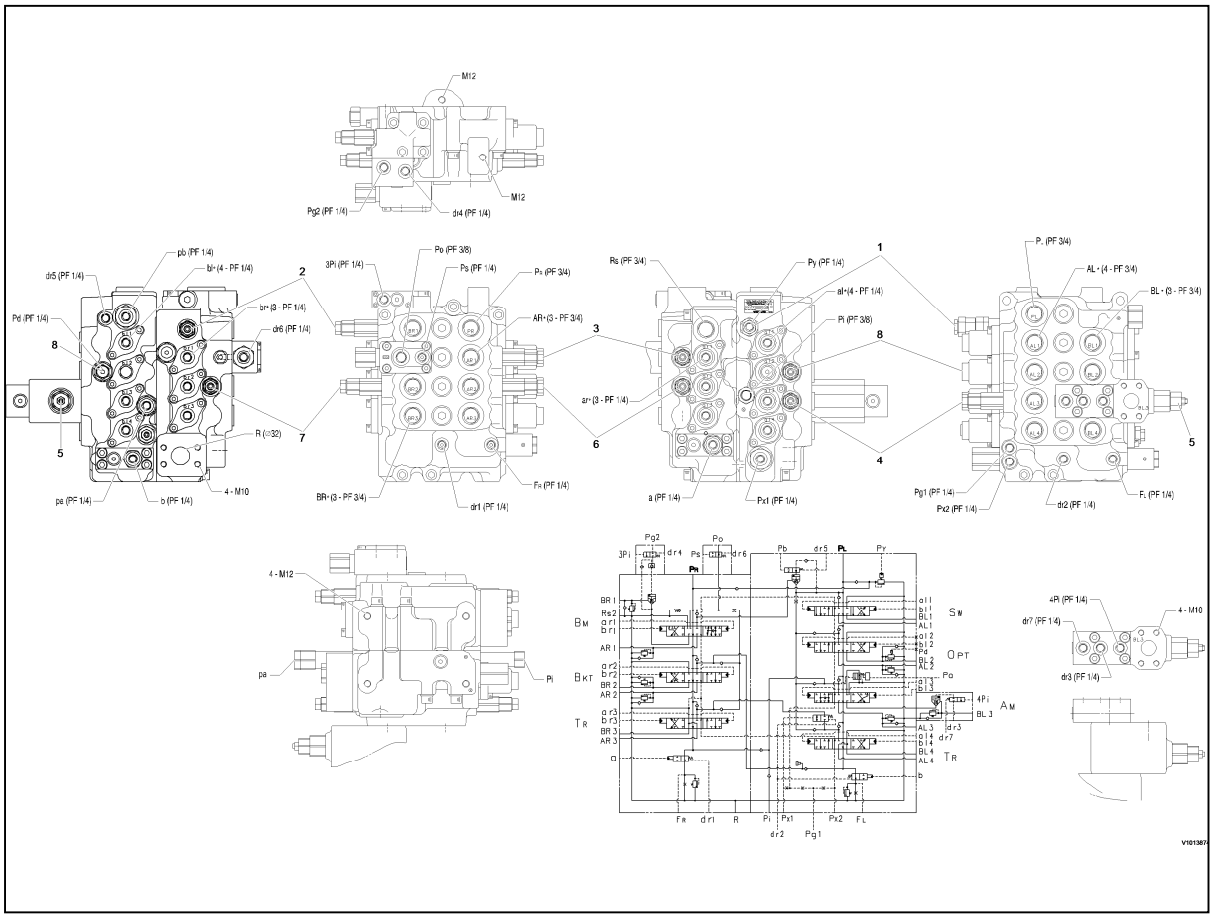


Figure 5
Heating unit

			Connector - D		
			No	**Color**	**Remark**
A	Fuel inlet		1	Red	B+
B	Water outlet		2	Brown	GND
C	Water inlet		3	Red / Black	Air conditioning fan "ON"
D	Connector		4	Green	Fuel pump
E	Air inlet		5	Blue / White	
F	Exhaust		6	Blue	
G	Case		7	Yellow	Timer "ON"
			8	Black / White	

mechanical power, which actuates the travel action, slew action and digging units.

1	Remote control valve (lever)	17	BD: from remote control valve (lever) right "2"
2	Main control valve	18	BU: from remote control valve (lever) right "4"
3	Block (1)	19	SR: from remote control valve (lever) left "1"
4	Shuttle valve	20	SL: from remote control valve (lever) left "3"
5	al3: from shuttle valve "AI1"	21	AI: from remote control valve (lever) left "4"
5-1	al3: from block (3) "1"	22	AO: from remote control valve (lever) left "2"
6	ar2: from shuttle valve "BO1"	23	BO: from remote control valve (lever) right "3"
7	ar1: from shuttle valve "BD1"	24	BI: from remote control valve (lever) right "1"
7-1	ar1: from block (2) "1"	25	BI1: to main control valve "br2"
8	al1: from shuttle valve "SL1"	26	BO1: to main control valve "ar2"
9	br2: from shuttle valve "BI1"	27	AO1: to main control valve "bl3"
10	bl3: from shuttle valve "AO1"	28	AI1: to main control valve "al3"
11	bl1: from shuttle valve "SR1"	28-1	AI1: to servo hydraulic selector valve "Pi"
12	br1: from shuttle valve "BU1"	29	SL1: to main control valve "al1"
13	P3: to remote control valve (lever) right "P"	30	SR1: to main control valve "bl1"
14	T3: to remote control valve (lever) right "T"	31	BU1: to main control valve "br1"
15	T5: to remote control valve (lever) left "T"	32	BD1: to main control valve "ar1"
16	P5: to remote control valve (lever) left "P"		


M12
M12
Pg2 (PF 1/4)
dr4 (PF 1/4)
pb (PF 1/4)
dr5 (PF 1/4)
br (4 - PF 1/4)
Pd (PF 1/4)
br (3 - PF 1/4)
dr6 (PF 1/4)
R (ø32)
pa (PF 1/4)
b (PF 1/4)
4 - M10
3Pi (PF 1/4)
Po (PF 3/8)
Ps (PF 1/4)
Px (PF 3/4)
AR (3 - PF 3/4)
BR (3 - PF 3/4)
dr1 (PF 1/4)
Fx (PF 1/4)
Rs (PF 3/4)
Py (PF 1/4)
al (4 - PF 1/4)
Pi (PF 3/8)
ar (3 - PF 1/4)
a (PF 1/4)
Px1 (PF 1/4)
P. (PF 3/4)
AL (4 - PF 3/4)
BL (3 - PF 3/4)
Pg1 (PF 1/4)
Px2 (PF 1/4)
dr2 (PF 1/4)
F. (PF 1/4)
4 - M12
pa
Pi
Pg2
Po
3Pi
dr4
Ps
dr6
Pb
dr5
PL
Pr
PR
BR 1
Rs2
dr1
AR 1
dr2
BR 2
AR 2
dr3
BR 3
AR 3
a
BM
BKT
TR
al 1
bl 1
BL 1
AL 1
al 2
bl 2
Pd
BL 2
AL 2
Po
al 3
bl 3
4Pi
BL 3
AL 3
dr3
al 4
dr7
BL 4
AL 4
b
SM
OPT
AM
TR
FR
dr1
R
Pi
Px1
dr2
Pg1
Px2
FL
4Pi (PF 1/4)
dr7 (PF 1/4)
4 - M10
dr3 (PF 1/4)
V1013874

Document Title: **Port relief valve, description**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

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Port relief valve, description

(for arm out)

Overload operation

Hydraulic oil from the cylinder port (P) flows through orifice of piston A to chamber (2). As section area d1 > d2, main poppet B will not move.

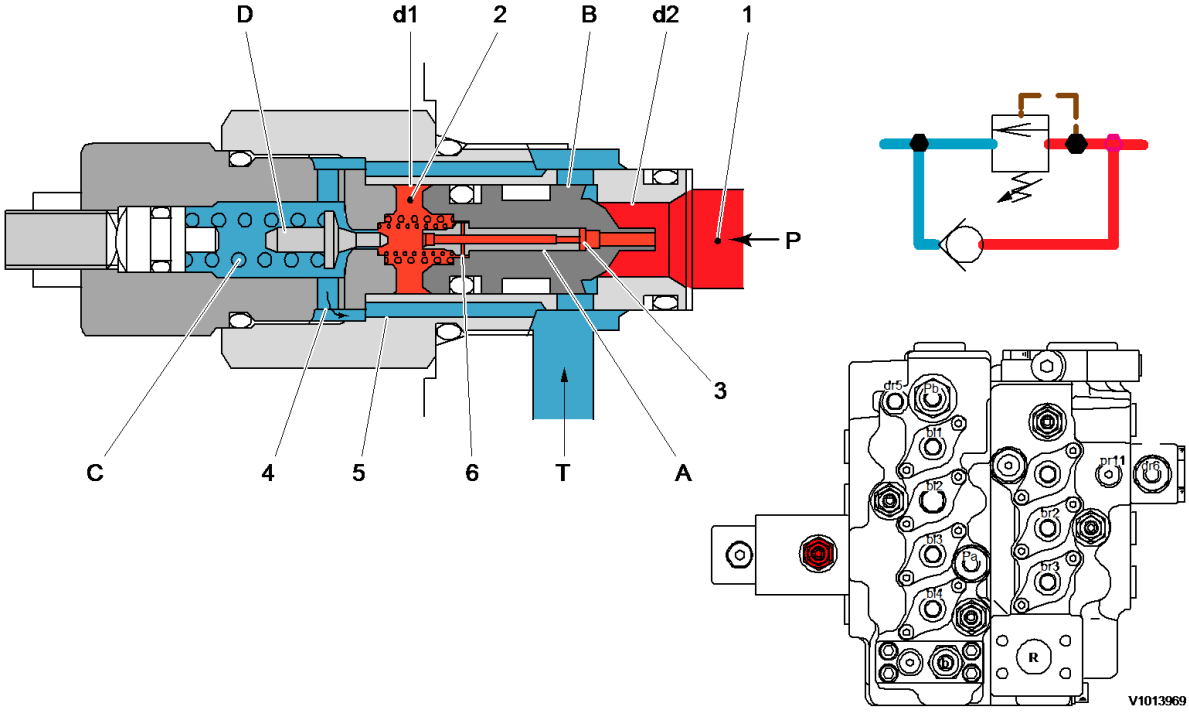


Figure 1
Normal condition

If the pressure reaches set value of spring C, servo hydraulic poppet D will open so that the oil flows to tank through the lateral hole and circular passage, so the pressure in chamber (2) will be lowered.

The oil supplied when servo hydraulic poppet D is opened (the pressure of chamber (2) is low) creates a pressure differential between front and rear of orifice in piston A (chamber (1) and (2)), so piston A moves to the left side and stops at the end of servo hydraulic poppet D.

A	Check valve	H	High pressure supply passage
B	Piston	P	Center bypass passage
C	Spool	R	Reserve passage
D	Spring	T	Tank passage

Pressure on rod side is high [PA < PB]

The return oil flows from port BL3, to the circular notch of the spool, to restricted passage (1) and (2) where the pressure rises, moving spool C and opening a narrow path to check valve A. When the check valve opens the oil flows via the passage in the spool to merge with the flow through port AL3 to the cylinder, piston side. At this time the oil in spring chamber (3) flows port Pa (Dr) through check valve E, so the pressure in spring chamber (3) becomes Pa (Dr). This process prevents cylinder cavitation during arm in operation.

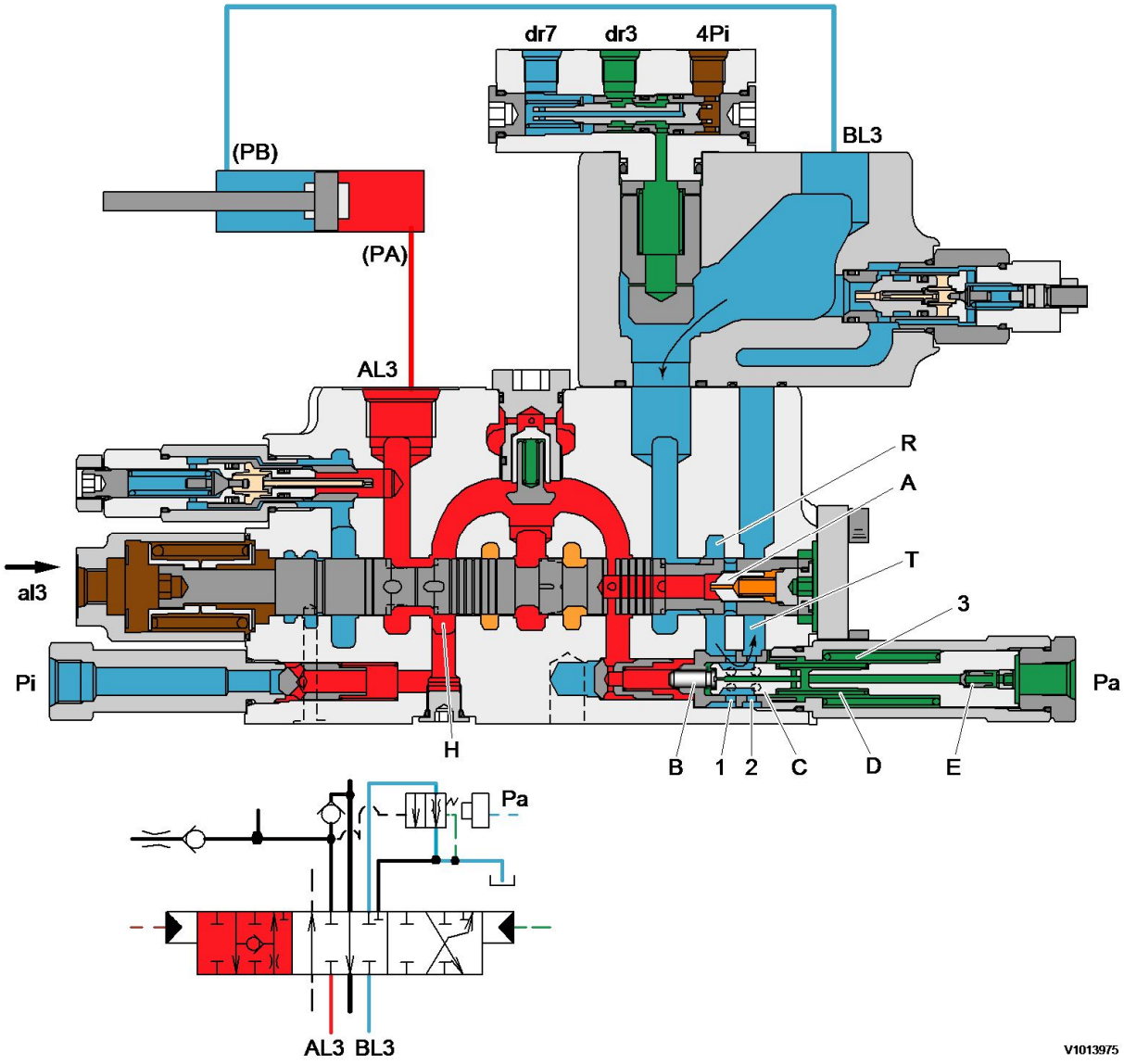


Figure 2
When pressure on rod side is high

A	Check valve
C	Spool
H	High pressure supply passage
R	Reserve passage
T	Tank passage

Pressure on piston is high [PA > PB]

VOLVO
Construction Equipment

Service Information

Document Title: **Port relief valve pressure, measurement**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Port relief valve pressure, measurement

Measuring condition

- Place the machine in the service position B. See 091 Service positions
- Hydraulic oil temperature : 50 ±5°C (122 ±41°F)
- Working mode : "P" mode (North America : **H mode**)
- Measuring location : P1, P2 gauge ports at hydraulic main pump
- Adjusting the pump displacement
- Main relief valve pressure : 44.1 MPa (450 kgf/cm2) (6400 psi) (441.3 bar)

NOTE!
Adjustment temperature should be kept within 50 ±5°C (122 ±41°F), as unnecessary relief (valve loading) causes rapid temperature rise.

WARNING

Lower the digging units to the ground and stop the engine. Operate the control levers several times to release the remaining pressure in the hydraulic piping. Pull the left control console safety lock lever backward into lock position. Then release the pressure inside the hydraulic tank prior to removing any hoses or port plugs.

Measurement

- Connect two oil pressure gauges (58.8 MPa, 600 kgf/cm2, 8530 psi, 588 bar) to the gauge ports (Refer to **Port connection**.
- Start the engine, set to "P" mode (North America : H mode), and measure the main pressure with the engine at high idle.
- Condition of digging unit to be measured.
  - For the working equipment, set each cylinder to the end of its stroke.
  - For slew, put the bucket against an immovable object or put it in a trench.
  - For travel, fit a pin between the sprocket and frame to lock the sprocket against the frame.
  - Operate the switch on the upper part of operating lever (right) to measure the boost pressure.

Hydraulic pressure

See 9121 Main control valve, specifications.

Primary pump supply to each actuator and test port location.

Port connection

Plug	Pump	Actuator (test port)
(1)	P1 (PL) pump	• Slew motor (on the motor head) • Option digging unit • Arm cylinder • Left track motor (on the motor head)
(2)	P2 (PR) pump	• Boom cylinder • Bucket cylinder • Right track motor (on the motor head)

Document Title: **Boom back pressure check valve, disassembly and assembly**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Boom back pressure check valve, disassembly and assembly

(For assembly, reverse disassembly procedure)

Op nbr 00000

When disassembling, mark each part to make assembling easier.

1. Remove cap (1) and pull out spring (2) and poppet (3).
   - Tools: Socket wrench 30 mm
   - Tightening torque: 6 kgf·m (43 lbf·ft)

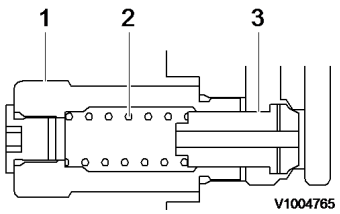


Figure 1
Boom back pressure check valve

VOLVO

Construction Equipment

Service Information

Document Title: **Load check valve – single, disassembly and assembly**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Load check valve – single, disassembly and assembly

(For assembly, reverse disassembly procedure)

Op nbr 00000

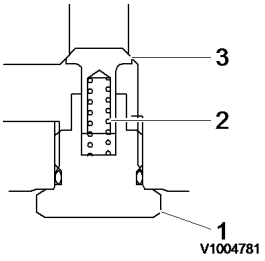


Figure 1
Load check valve

When disassembling, mark each part to make assembling easier.

1. Remove cap (1) and pull out spring (2) and check valves (3, 4).

   - Tools: Spanner 22 mm
   - Tightening torque: 4 kgf·m (28.9 lbf·ft)

   NOTE!
   There is no check valve (4) in the boom and slew.

   NOTE!
   The hole diameter of the cap is different in each assembling portion, so pay attention during assembly.

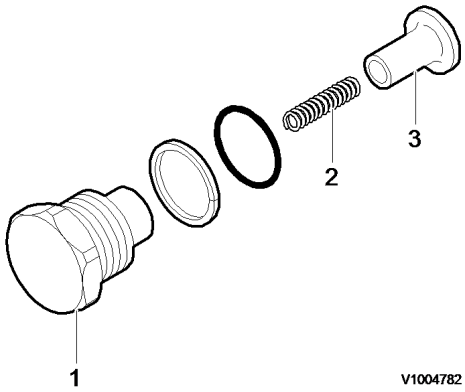


Figure 2
Removal, check valve etc.

when operating the remote control valve (lever) to arm out, servo hydraulic valve spool (25) and logic valve (27) are in the neutral position. Pressurized oil from the main control valve is routed through P1 port, pushes open check valve (16), then flows via P2 to the rod side of the hydraulic cylinder moving the arm out.

When the arm is out and the remote control valve (lever) is returned to neutral position (P1 = P2), as described previously check valve (16) poppet blocks the passage and the pressurized oil on the arm rod side is trapped in the cylinder preventing the arm from dropping.

When a pipe or hose ruptures during arm out, pressurized oil flow will be cut off to passage P1. As a result the pressure in passage P1 drops quickly and the poppet of check valve (16) will be pushed forward by its spring blocking passage P1, and pressurized oil flow from the rod side of the arm cylinder is blocked.

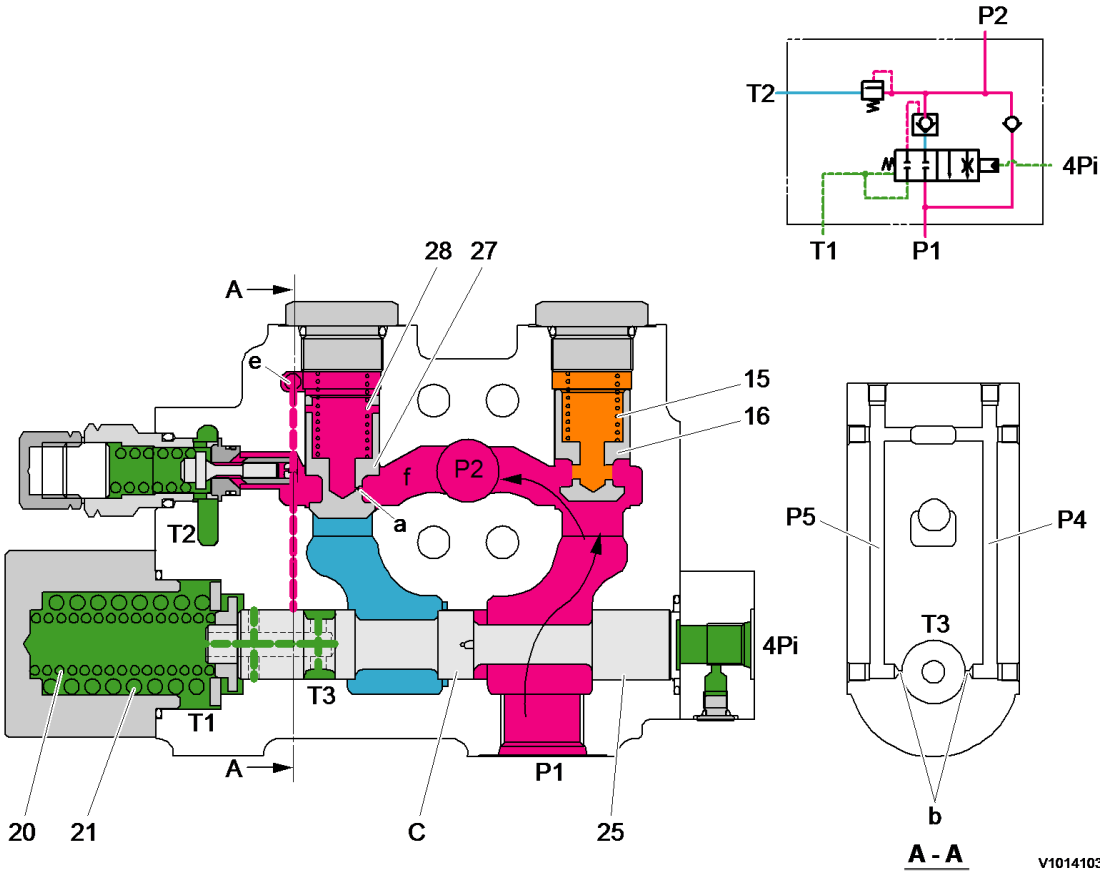


Figure 3
Line rupture valve (arm), arm out

Arm in (P2 → P1)

When operating the remote control valve (lever) to arm in (lower the arm), servo (pilot) hydraulic oil is supplied to passage (4Pi) and pushes servo hydraulic valve spool (25) to the left against springs (20, 21).

As spool (25) moves, passage **T3** aligns with position **b**, and the oil in the spring chamber of logic valve (27) drains to the hydraulic tank through passage P4 and P5.

The pressure difference of area **e** and **f** causes logic valve (27) to open and the oil from P2 flows past the poppet of logic valve (27) to servo spool (25).

The return oil from the rod side of the arm cylinder will flow from passage P2 → P3 → P1 →main control valve → tank.

The oil passage opening from P3 to P1 will be varied because of the area of notch (C), which controls the return oil flow rate (speed) from the arm cylinder.

When a pipe or hose ruptures during arm lowering, the pressure at port P1 will be lower than passage P3, P2, so the poppet of logic valve (27) will be pushed forward by its spring blocking passage P3, and return oil flow from the arm cylinder is blocked.

When the remote control valve (lever) is released to neutral position, pilot pressure at (**4Pi**) is cut off, and springs (20, 21) move spool (25) to the right blocking passage P3.

7. Assemble logic valve (27), spring (28) and plug (30) with o-ring (29).
   NOTE!
   If you replace logic valve (27) with a new one, press-fit with a driver and hammer.

8. Assemble relief valve (4).

   - Tools: Socket wrench 32 mm

Yes — Is normal pressure delivered to slew motor inlet?

Yes — Is normal pressure delivered to port P_S of slew parking brake release valve?

Yes — Is normal pressure delivered to port SH of slew parking brake release valve while slew lever is operated?

Yes — Machine does not slew though slew motor is rotating.

Yes — Repair or replace slew motor.

No — Repair or replace control valve.

No — Slew device is abnormal.

No — Check servo hydraulic circuit.

No — Is slew motor drain amount normal?

Yes — Control valve spool sticking. Repair or replace.

No — Repair or replace left remote control valve.

No — Repair or replace slew motor.

No — Only slew system and arm do not move?

Yes — Is normal pressure delivered to left remote control valve port P?

Yes — Is pressure normal at left remote control valve ports 1,2,3 and 4?

Yes — Check slew system and arm separately.

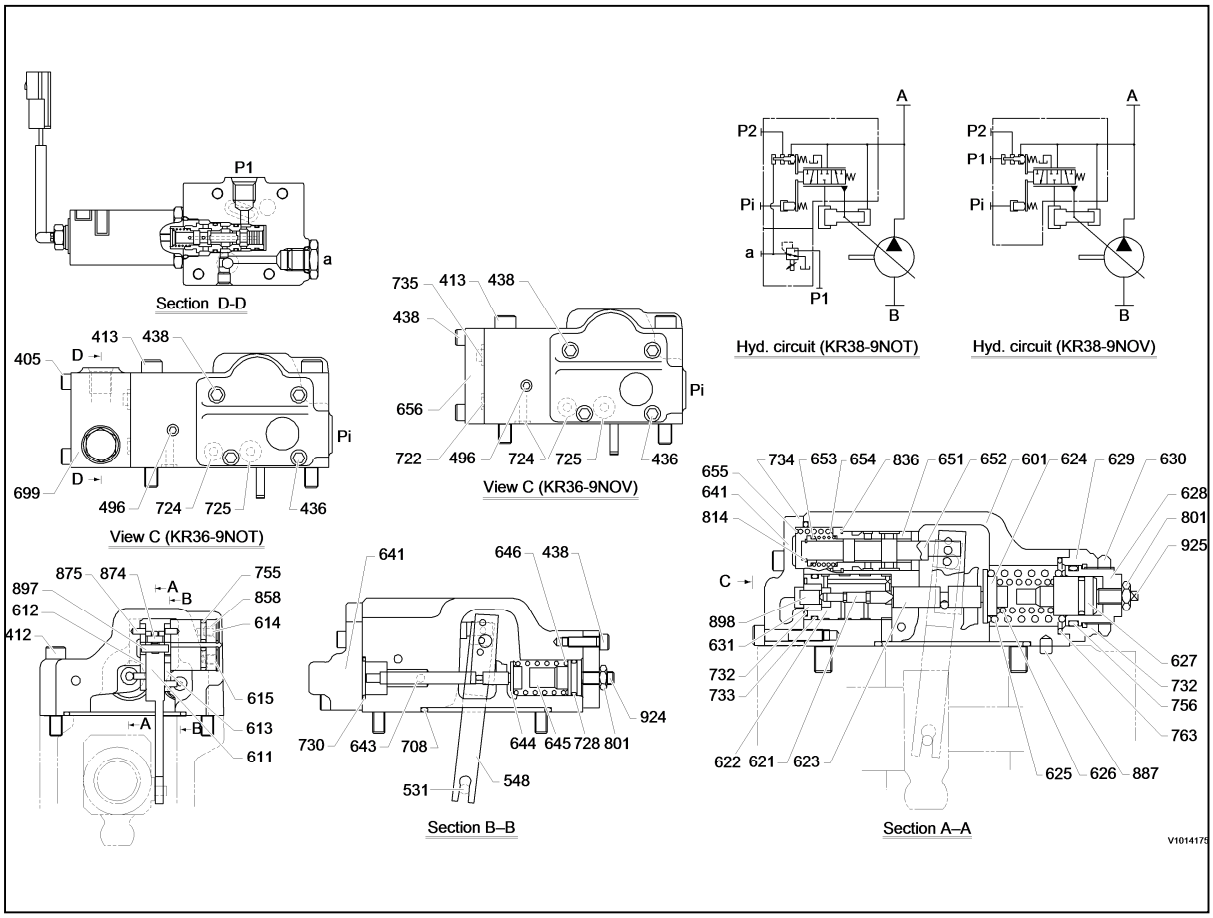
No — Is filter of remote control valve clogged?

No — Repair or replace left remote control valve.

Yes — Clean filter.

No — Repair or replace remote control valve.

Slow/weak slew power


P1
a
Section D-D
413
438
405
D
Pi
699
496
724
725
436
View C (KR36-9NOT)
735
413
438
438
656
Pi
722
496
724
725
436
View C (KR36-9NOV)
A
P2
Pi
a
P1
B
Hyd. circuit (KR38-9NOT)
A
P2
P1
Pi
B
Hyd. circuit (KR38-9NOV)
875
874
A
B
755
897
858
612
614
412
615
A
B
613
611
641
646
438
730
643
708
644
645
728
801
924
531
548
Section B–B
734
653
654
836
651
652
601
624
629
630
655
641
628
814
801
925
C
898
631
627
732
733
732
756
763
622
621
623
625
626
887
Section A–A
V1014175

Wear limit of parts

D - d	Clearance between piston and cylinder bore	L	Free height of cylinder spring
δ	Play between piston and shoe	H - d	Assembled height of set plate and spherical bushing
t	Thickness of shoe		

Wear limits for cylinder, valve plate and swash plate

Repair standards

Surface roughness of cylinder, valve plate and swash plate	Surface roughness requiring correction	3Z
	Standard surface roughness (correction value)	0.4Z max. (lapping)

NOTE!

Lap the cylinder and valve plate together to correct the surface roughness.

Tightening torque

Tightening torque

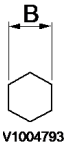
Description	**Size**	**Torque kgf · m (lbf · ft)**	**B (mm)**	**Tool**
Screw (Material : SCM 435)	M5 M6 M8 M10 M12 M14 M16 M18 M20	0.7 (5.1) 1.2 (8.7) 3.0 (22) 5.8 (42) 10 (72) 17 (120) 24 (170) 34 (250) 44 (320)	4 5 6 8 10 12 14 14 17	Allen wrench 
PT plug (Material : S45C) **NOTE!** Apply loctite #577	PT 1/16 PT 1/8 PT 1/4 PT 3/8 PT 1/2	0.7 (5.1) 1.05 (7.6) 1.75 (13) 3.5 (25) 5.0 (36)	4 5 6 8 10	Allen wrench
PO plug (Material : S45C)	PF 1/4 PF 1/2 PF 3/4 PF 1 PF 1 1/4 PF 1 1/2	3.0 (22) 10 (72) 15 (110) 19 (140) 27 (190) 28 (200)	6 10 14 17 17 17	Allen wrench

Figure 3
Change of control curve

X	Servo hydraulic pressure Pi
Y	Delivery flow, Q

Document Title: **Servo hydraulic pressure, adjustment**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Servo hydraulic pressure, adjustment

Op nbr 00000

- Engine speed: high idle
- Oil temperature when measuring: 50 ~ 60°C (120 ~ 140°F)

Measurement

Install a pressure gauge 100 kgf/cm2 (1422 psi) to the accumulator block gauge port (G).

NOTE!
The material of the accumulator block is aluminium. If tightened excessively, the threads can be damaged.

Adjustment

- Loosen nut (312) and turn screw (311) to adjust.
- Adjust the screw as follows.
    - To **increase** pressure, turn clockwise.
    - To **decrease** pressure, turn counterclockwise.

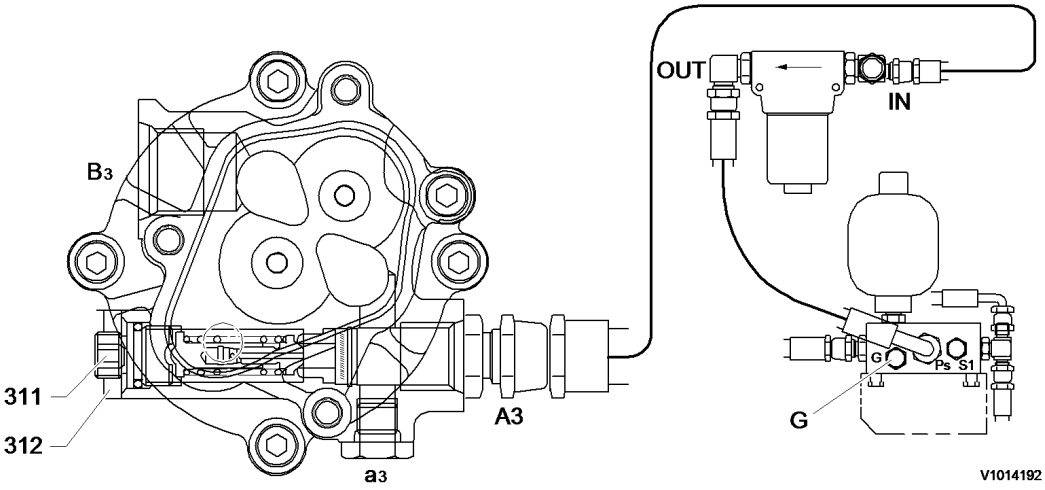


Figure 1
Adjustment, servo pump pressure

G	Gauge connecting port

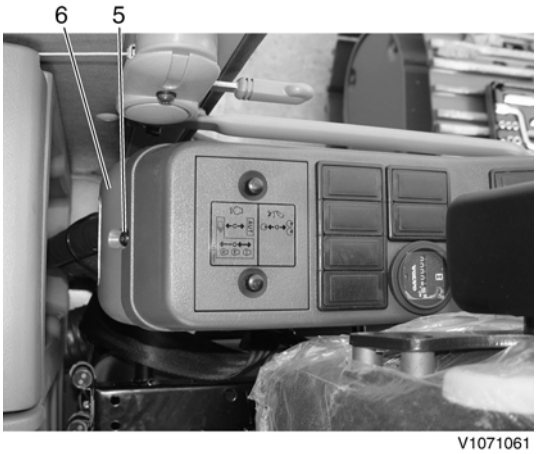


Figure 11
Installation, screw

12. Install screws (4) and cover (3).

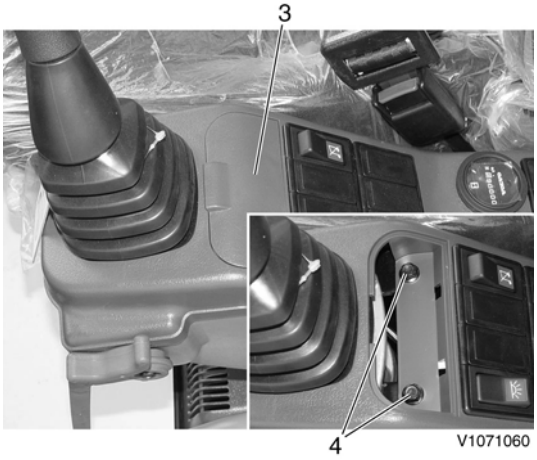


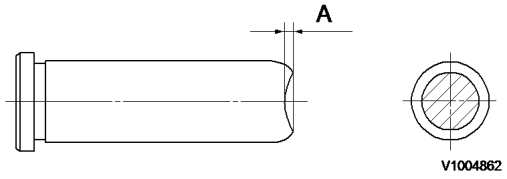
Figure 12
Installation, screws

13. Check the operation of the control lever and switchs.

Document Title: **Remote control valve (Lever), maintenance standard**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Remote control valve (Lever), maintenance standard

Maintenance standard

Maintenance check item	Criteria	Remark
Leakage	The valve is to be replaced when the leakage becomes more than 1000 cc/min at neutral handle position, or more than 2000 cc/min during operation.	Conditions: - Primary pressure:30 kgf/cm2 (426 psi) - Oil viscosity: 23 cSt
Spool	This is to be replaced when the sliding surface has worn more than 10 µm, compared with the non–sliding surface.	The leakage is estimated to be nearly equal to the above leakage.
Push rod	 A. Worn more than 1mm This is to be replaced when the top end has worn more than 1mm (0.004″).	
Play at operating section	The pin, shaft, and joint of the operating section are to be replaced when the play becomes more than 2 mm (0.008″)	When the play is due to loose parts / screws, tighten to specifications.
Operation stability	When abnormal noises, hunting, primary pressure drop, etc. are generated during operation, and these cannot be remedied, see causes of troubles and countermeasures, replace the related parts.	

NOTE!
In principle, replace seals and o-rings during reassembly.

NOTE!
When loosening the screws (125), replace the seal washers (121) without fail.

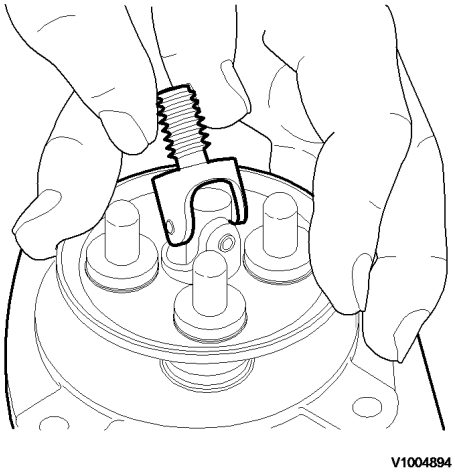


Figure 14
Assembly, 4 sets of plug

13. Fit plate (151).

    - E- tool part no.: 8940 - 00200

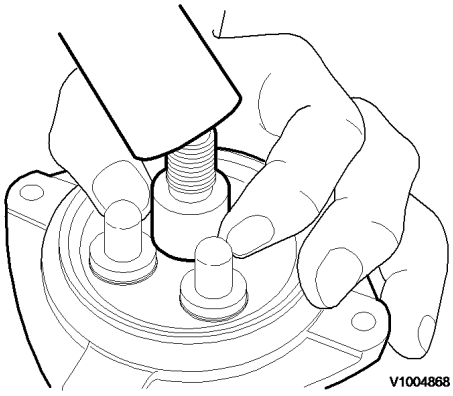


Figure 15
Fit, plate

14. Tighten joint (301) to the specified torque to casing, utilizing jig.

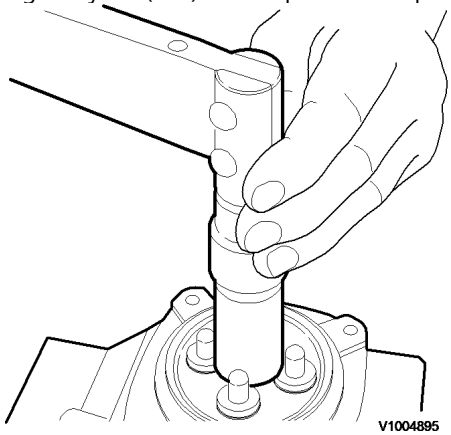


Figure 16
Tightening, joint

15. Assemble disc (302) to joint (301).
    NOTE!
    Screw it to a position that it contacts the 4 push rods evenly.

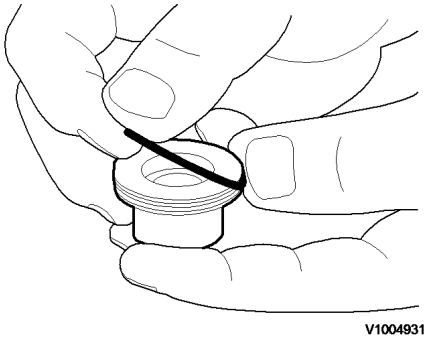


Figure 24
Removal, o-ring

24. Cleaning of parts:

    - Initially wash the remote control valve assembly with clean solvent to remove the heavy accumulation of dirt.
      NOTE!
      Allow the parts to soak in the solvent to soften the dirt. Do not wash the internal parts with contaminated solvent. Ensure that all parts are thoroughly cleaned prior to reassembly.
    - In the final stage, wash all passages, chambers, grooves etc. to ensure the utmost cleanliness.
      Wipe off the parts with a clean cloth.
      NOTE!
      Do not dry parts with compressed air. They may be damaged and/or rust may develop due to moisture in the air.

25. Apply rust inhibitor to all parts.
    NOTE!
    If left untreated after being cleaned, they will rust and will not function properly after being reassembled.

Document Title: **Solenoid valve, troubleshooting**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Solenoid valve, troubleshooting

For minor problems, refer to the following causes and corrective actions.

Troubleshooting

No.	Problem	Cause	Remedy
1	Spool does not move.	Solenoid voltage is low.	Check the electric wiring. Test the solenoid coil.
		Solenoid coil is burnt.	Replace the coil.
		Spool spring is broken.	Replace the spring.
		Contamination in the casing.	Check the circuit and hydraulic oil for contamination, clean as required.
2	Leakage from coil case or spring guide.	O-rings are damaged.	Replace the o-rings.
		Coil case nut, spring guide are loose.	Tighten to specified tightening torque.

VOLVO

Construction Equipment

Service Information

Document Title: **Hammer and Shears (X1 Line option), hydraulic circuits (Machine serial no.: 11820 ~)**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Go back to Index Page

Hammer and Shears (X1 Line option), hydraulic circuits (Machine serial no.: 11820 ~)

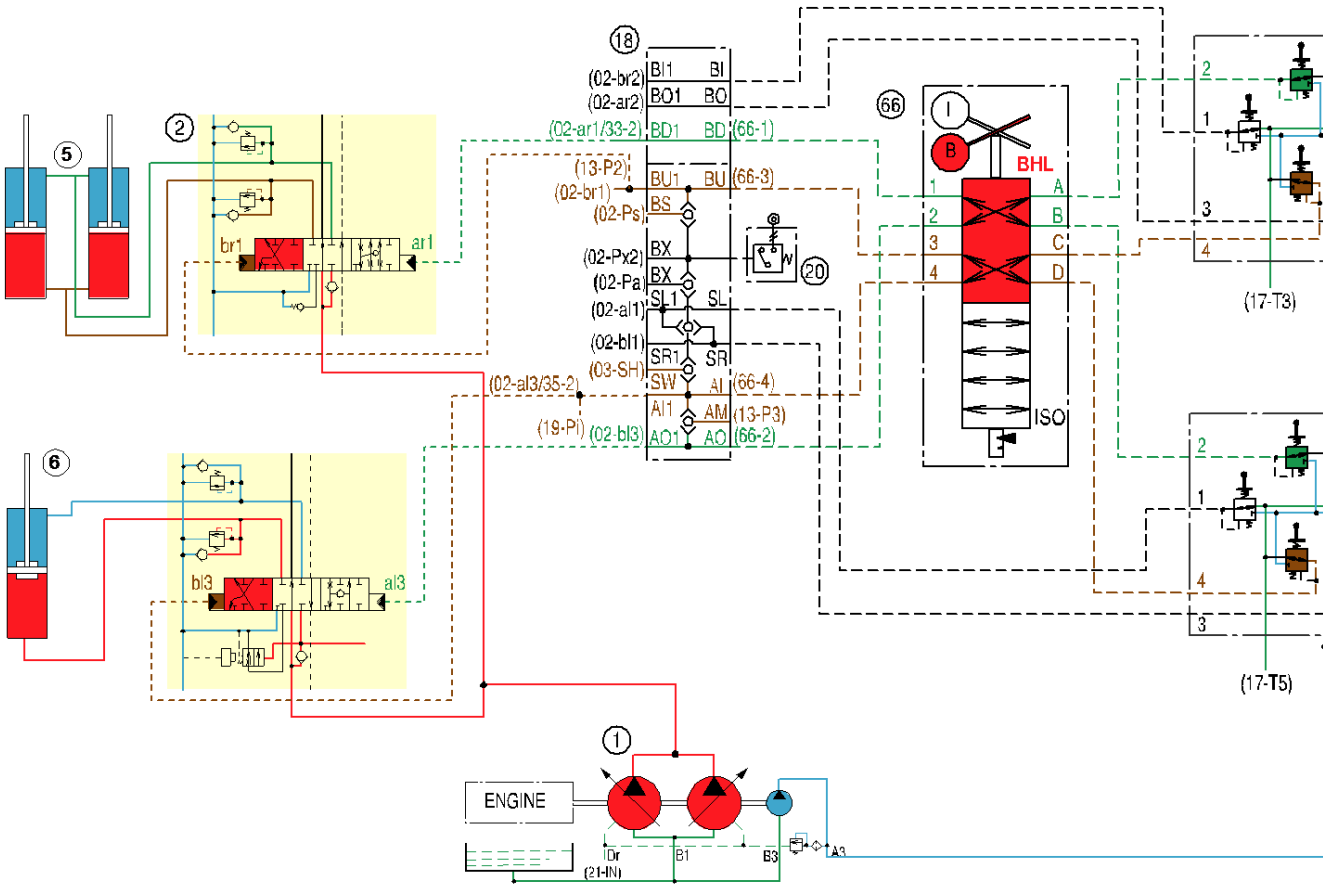


Figure 2
Hydraulic circuits, backhoe loader position

Right control lever (15) - Arm operation

When control lever (15) is operated to the "ARM IN", secondary oil from port 4 of remote control valve (lever) (15) flows to port C and to port 4 of control pattern selector valve (66), then through port AI & AI1 of shuttle valve (18), to port bl3 of main control valve (2), moving the arm spool to the right.
Now P1/P2 pump flow is routed through main control valve (2), to the piston side of arm cylinder (6), moving the arm in.

Left control lever (14) - Boom operation

When control lever (14) is operated to the "BOOM RAISE", secondary oil from port 4 of remote control valve (lever) (14) flows through port D to port 3 of control pattern selector valve (66), then through port BU & BU1 of shuttle valve (18), to port br1 of main control valve (2), moving the boom spool to the right.
Now P1/P2 pump flow is routed through main control valve (2), to the piston side of boom cylinders (5), raising the boom.

WARNING

When operating control levers after converting pattern change valve from the "ISO Position" to the "Backhoe Position", the operation for boom and arm will be changed. Exercise extreme caution when using the control levers until you are familiar with the control pattern.

VOLVO
Construction Equipment

Service Information

Document Title: **Adjustable boom valve, disassembly**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Adjustable boom valve, disassembly

Op nbr

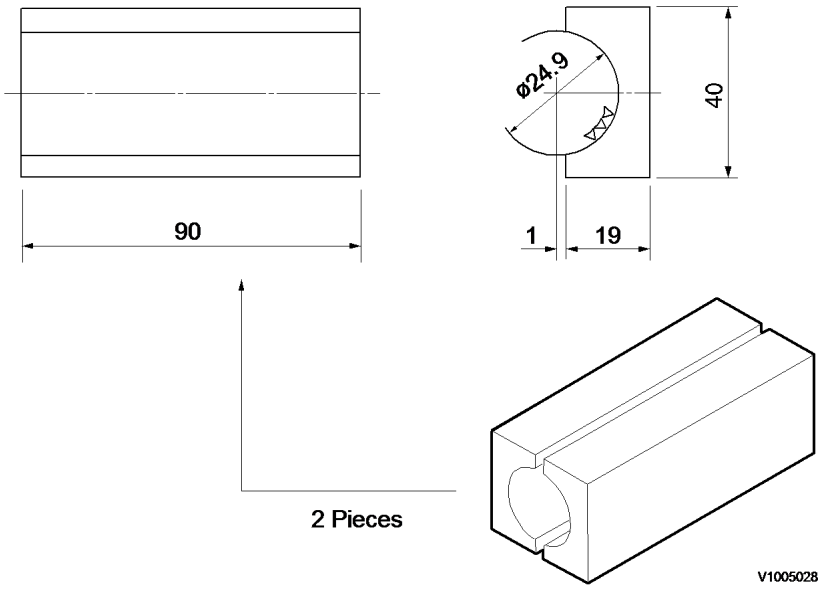


Figure 1
Adjustable valve holder

NOTE!
Material: Brass

NOTE!
For assembly, reverse the disassembly procedures.

NOTE!
When disassembling, mark each part to indicate original location and position during assembly.

Disassembly, main spool

1. Remove screw (1), and remove cover (2).
   NOTE!
   When reassembling, make sure that the o-ring is installed before assembling the cover.

   - Allen wrench 8 mm
   - Tightening torque: 5 kgf·m (36 lbf·ft)

holding pressurized hydraulic oil of rear side of boom holding valve (C) flows to tank return port by connection with cylinder piston side port at spool of adjustable boom valve (36). Therefore, hydraulic oil from main pump (1) opens boom holding valve through spool of adjustable boom valve (36) and flows to cylinder rod side. Hydraulic oil of cylinder piston side returns to tank through spool of adjustable boom valve (36).

Figure 1
Dozer blade, servo hydraulic piping

1	Dozer blade control valve	13	T2: from dozer blade control lever "T"
2	b-1: from dozer blade control lever "1"	14	P2: to dozer blade control lever "P"
3	b-2: to servo hydraulic selector valve "Pi"	15	Servo hydraulic selector valve
4	b-3: from dozer blade control lever "2"	16	A: to main control valve "Px1"
5	Main control valve	17	P: from accumulator block "S2"
6	b: from servo hydraulic selector valve "Pi"	18	T: to drain pipe "Tr7"
7	Dozer blade control lever	19	Pi: from dozer blade control valve "b-2"
8	T: to block (1) "T2"	20	Pi: to main control valve "b"
9	P: from block (1) "P2"	21	Pi: from adjustable boom valve "c"
10	1: to dozer blade control valve "b-1"	22	Pi: to main control valve "a"
11	2: to dozer blade control valve "b-3"	23	b: from solenoid valve (2) "A2"
12	Block (1)		

VOLVO

Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Digging unit, maintenance	**970**	**Service Information**	**2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Digging unit, maintenance

Clearance between pins and bushing

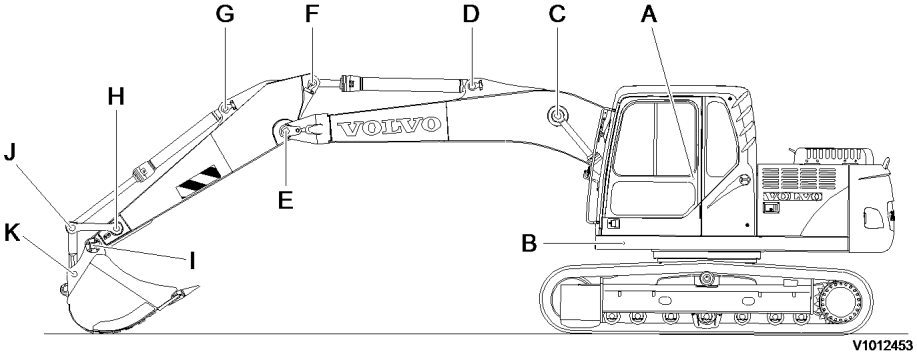


Figure 1
Position, clearance checking

Wear limits (unit: mm)

Check item		Standard	Pin diameter		Bushing bore		Remedy
			Recommended service limit	Limit of use	Recommended service limit	Limit of use	
A	Boom mounting	80	79	78.5	81	81.5	Replace
B	Boom cylinder mounting pin	70	69	68.5	71	71.5	Replace
C	Boom cylinder rod end pin	70	69	68.5	71	71.5	Replace
D	Arm cylinder mounting pin	70	69	68.5	71	71.5	Replace
E	Boom–arm coupling pin	70	69	68.5	71	71.5	Replace
F	Arm cylinder rod end pin	70	69	68.5	71	71.5	Replace
G	Bucket cylinder mounting pin	70	69	68.5	71	71.5	Replace
H	Arm–link coupling pin	65	64	63.5	66	66.5	Replace
I	Bucket–arm coupling pin	65	64	63.5	66	66.5	Replace
J	Bucket cylinder rod end pin	65	64	63.5	66	66.5	Replace
K	Bucket–link coupling pin	65	64	63.5	66	66.5	Replace

Greasing

Lubricating point

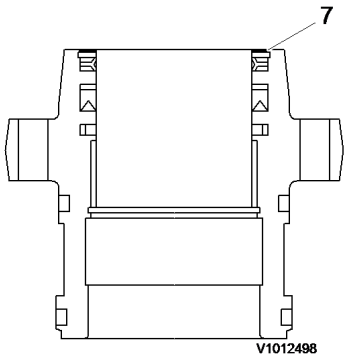


Figure 22
Assembly, retaining ring

13. Install o-rings (9) and back-up rings (6, 8).
NOTE!
Take care to the position of back-up ring.

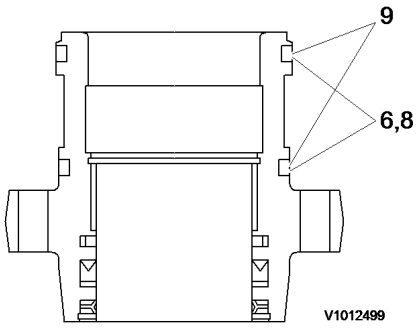


Figure 23
Assembly, o-ring and back-up ring

6,8	Back-up ring
9	O-ring

Assembly of piston unit

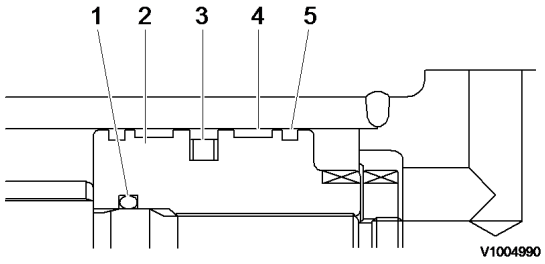


Figure 24
Assembly, piston unit

1	Back-up ring	4	Wear ring
2	Piston	5	Contami seal
3	Piston packing		

14. Check for sharp edges at piston ring groove. If any, remove sharp edge with an oilstone.

Document Title: **Boom lifting cylinder, disassembly and assembly**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Boom lifting cylinder, disassembly and assembly

Precautions

See 970 Cylinder, disassembly and assembly.

General tools

See 970 Cylinder, disassembly and assembly.

Special tools

See 970 Cylinder, disassembly and assembly.

Tightening torque

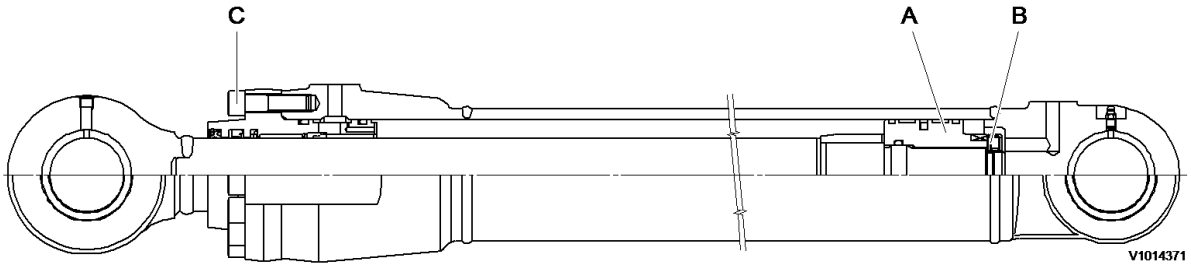


Figure 1
Tightening torque

Tightening torque, unit: kgf·m (lbf·ft)

Cylinder	A	B	C
	Piston nut, to tighten turn clockwise	Lock nut, to tighten turn counterclockwise	Screw
Boom	M 64 35 ± 5 (253 ± 36)	M 60 35 ± 5 (253 ± 36)	M 16 26.7 ± 2.7 (193 ± 19)

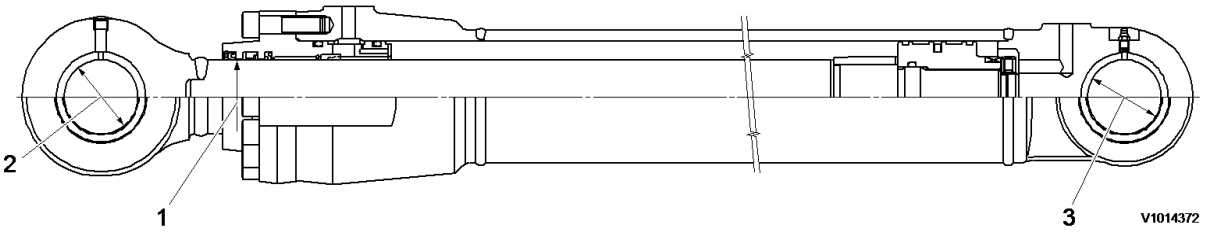
NOTE!
Apply "Threebond 1360K" or "Loctite # 242" to the rod and screw thread before tightening.

Volume of oil leakage

Oil leakage

Cylinder	**Volume of internal oil leakage**
Boom	5.6 cc (0.34 cu·in) or less / 10 min.

Maintenance standards



Document Title: **Bucket cylinder, description**	Function Group:	Information Type: **Service Information**	Date: **2015/3/4 0**
Profile: **EXC, EC140B LCM [GB]**			

Bucket cylinder, description

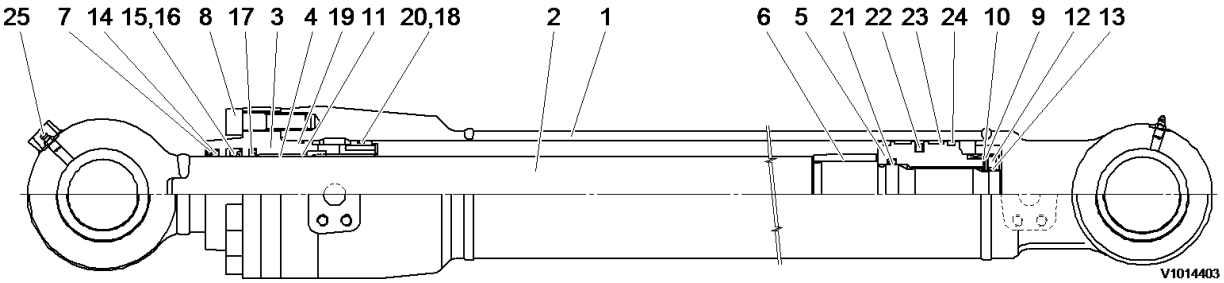


Figure 1
Bucket cylinder (sectional view)

1	Tube	8	Screw	15	Rod packing	22	Piston packing
2	Rod	9	Lock nut	16	Back-up ring	23	Wear ring
3	Head cover	10	Lock washer	17	Buffer ring	24	Contami seal
4	Bushing	11	Retaining ring	18	O-ring	25	Grease nipple
5	Piston	12	Set screw	19	Back-up ring		
6	Cushion ring	13	Pellet pad	20	Back-up ring		
7	Retaining ring	14	Wiper seal	21	O-ring		

NOTE!
Coat the screws of the gland with "Threebond 1360K" or equivalent.

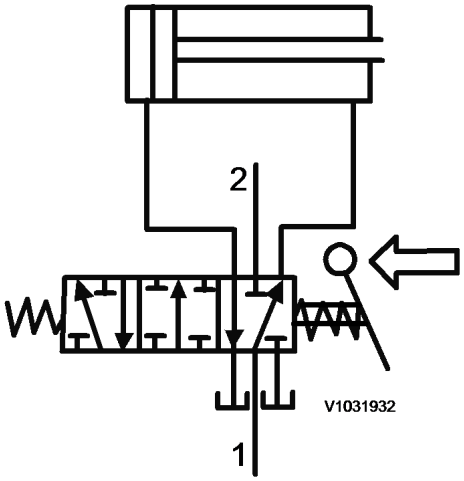


Figure 7
The piston rod is pressed in

1. Inlet
2. Outlet

The spool is actuated with the lever so that the minus side of the cylinder is connected to the inlet at the same time as the plus side is connected to the tank.

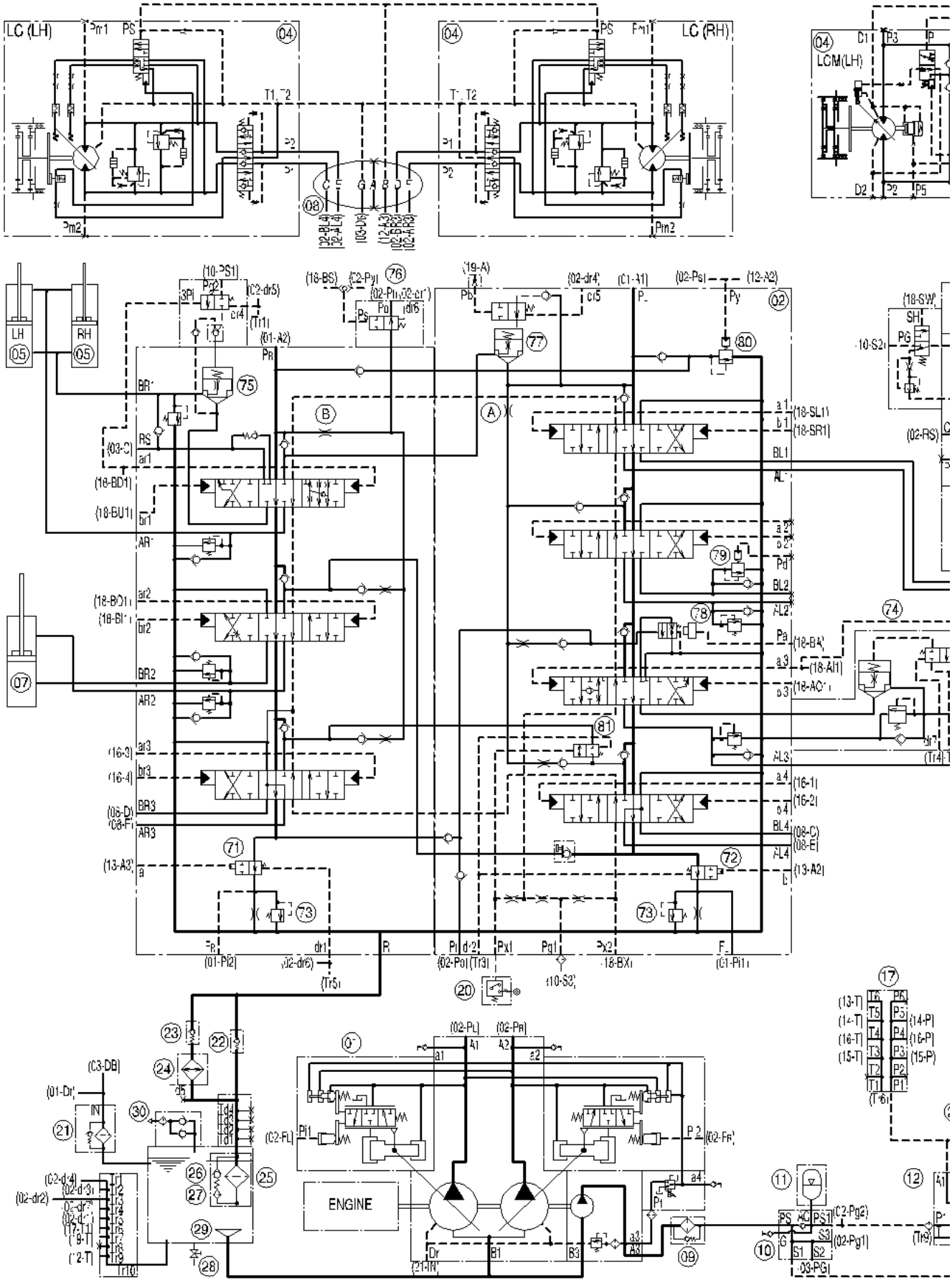


Figure 1
Hydraulic circuit, standard