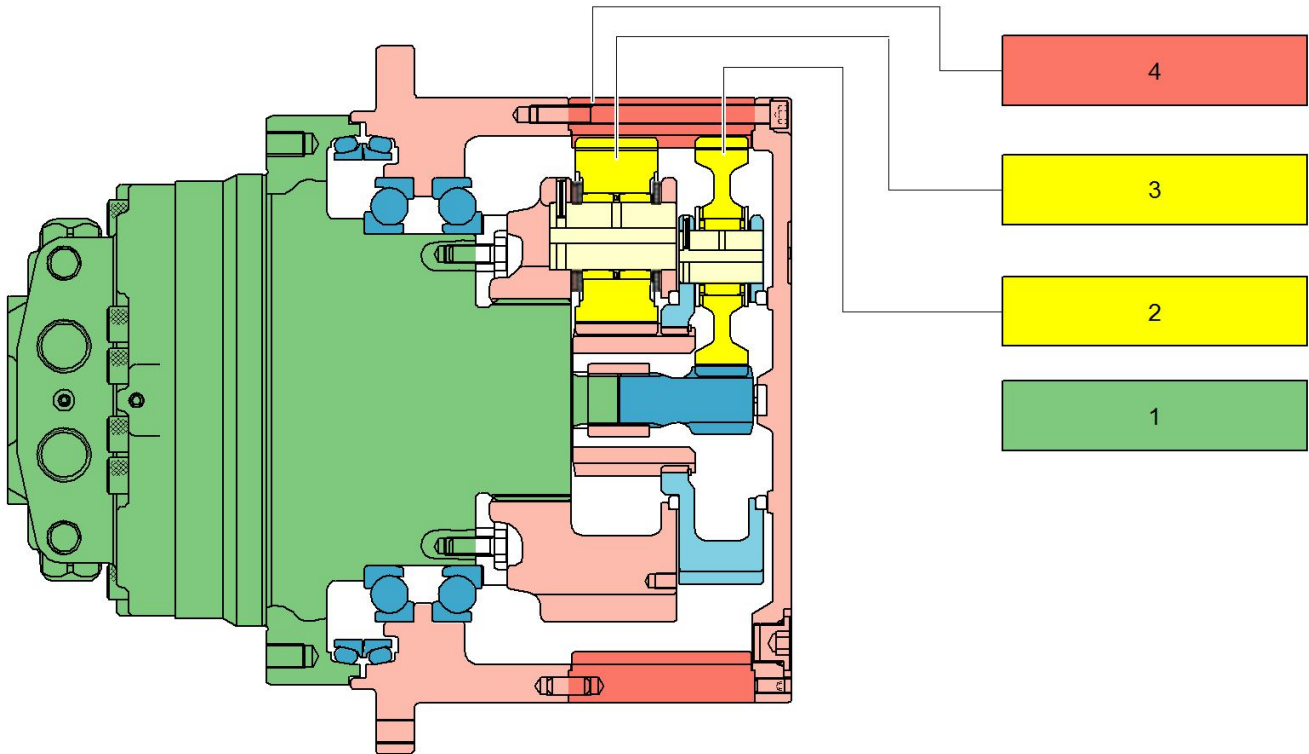


Document Title: Track gearbox, description	Function Group:	Information Type: Service Information	Date: 2015/5/20
Profile: EXC, EC160B NLC [GB]			

Track gearbox, description

Track gearbox consists of a two stage planetary mechanism that converts the high speed rotation of the hydraulic motor, into low speed, high torque rotating force at the sprocket hub.



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Figure 1
Track gearbox, structure

1. Track motor
2. No.1 planetary gear assembly
3. No.2 planetary gear assembly
4. Ring gear

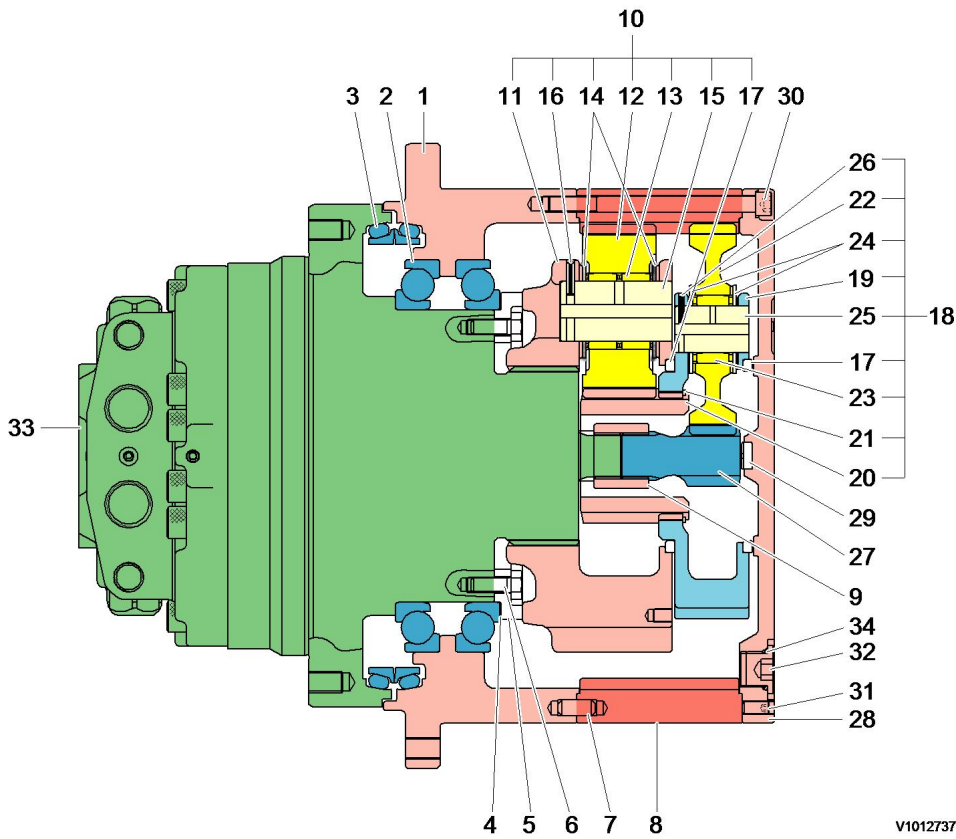
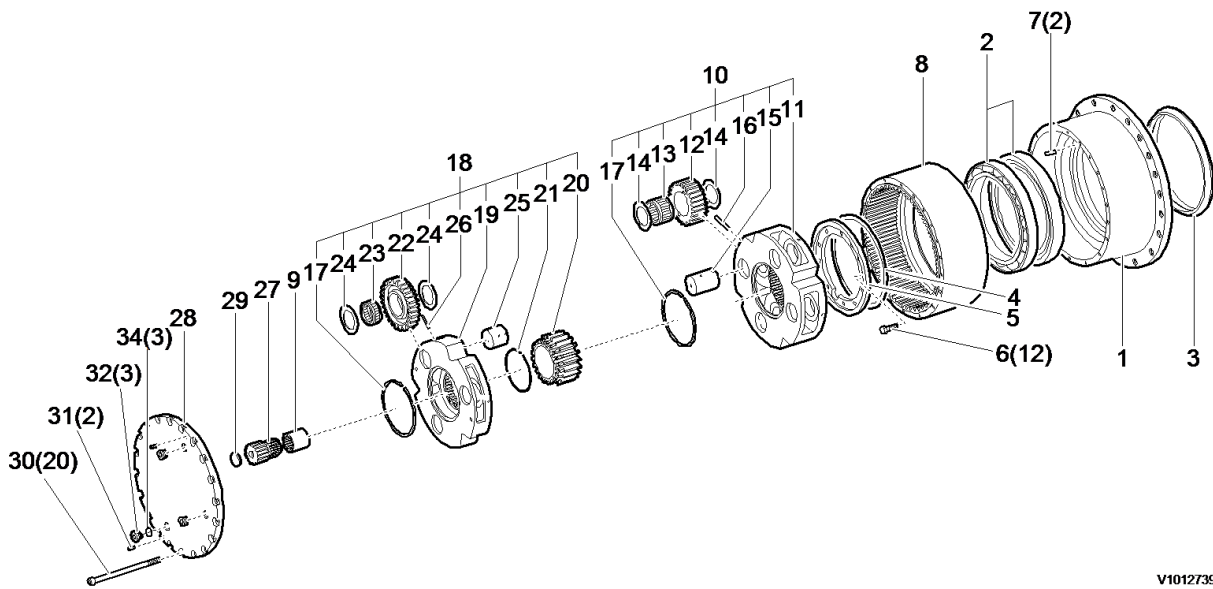


Figure 2
Track gearbox, sectional view

1	Housing	13	No.2 needle bearing	25	No.1 pin
2	Angular bearing	14	Thrust washer	26	Spring pin
3	Seal	15	No.2 pin	27	No.1 sun gear
4	Shim	16	Spring pin	28	Cover
5	Retainer	17	Thrust ring	29	Pad (thrust)
6	Screw	18	No.1 planetary gear assembly	30	Screw
7	Parallel pin	19	No.1 carrier	31	Screw
8	Ring gear	20	No.2 sun gear	32	Plug
9	Coupling	21	Retaining ring gear	33	Name plate
10	No.2 planetary gear assembly	22	No.1 planetary gear	34	O-ring
11	No.2 carrier	23	No.1 needle bearing		
12	No.2 planetary gear	24	Thrust washer		

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Figure 3
Track gearbox, exploded view

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Track gearbox, precautions for operation

Installation

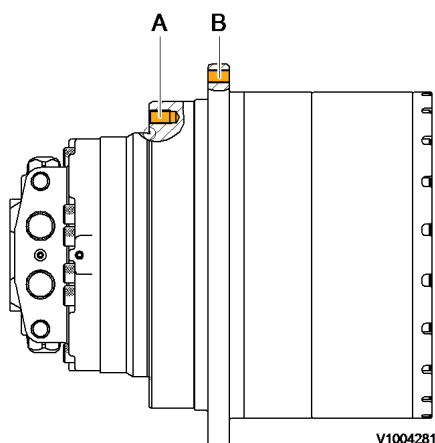


Figure 1
Mounting location

- A. Main body mounted area
- B. Sprocket mounted area

- Check that the mating mount surfaces are clean.
- Check that the motor is positioned correctly in the frame.
- If the gearbox to frame fit is tight, draw the assembly into the frame evenly with the mounting screws.
- Tighten the screws in a crisscross pattern in several stages to the specified torque.
- Apply these same precautions when mounting the sprocket.

Tightening torque

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

	Quantity	Thread	Tightening torque
Gearbox screw (A)	30	M16 (P2.0)	27 ± 3 (195 ± 22)
Sprocket screw (B)	22	M16 (P2.0)	27 ± 3 (195 ± 22)

NOTE!

The screws must be 10.9 KS strength classification or above.

Lubricating oil

NOTE!

Prior to operating the travel function, fill the gearbox with the specified oil to the correct level.

NOTE!

Gear specification

Use a gear oil equivalent to API classification GL4 / GL5 with EP (Extreme Pressure) additives

Gear oil replacement period

- First (initial) oil replacement: 500 operating hours
- Subsequent oil replacement: 2000 operating hours
- After maintenance (initial): 250 operating hours

NOTE!

Regardless of the operating hours the gear oil must be replaced at least once per year.

NOTE!

Do not mix different types, classifications or brands of oil.

NOTE!

Drain the gear oil while it is still warm to flush out any contaminants.

Gear oil replacement procedure

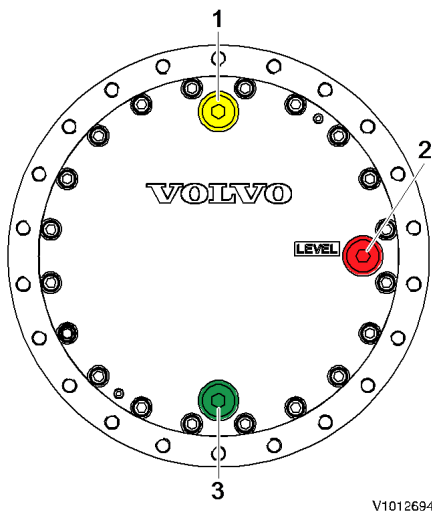


Figure 2

Oil replacement location

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

- Rotate the gearbox until the drain plug and the fill plug are on the vertical axis.
- Remove the 3 plugs in the end cover and drain the oil into a suitable container.
- Ensure that the drain plug O-ring is not damaged, then install the plug and torque to specification.
- Refill the gearbox through the fill port until oil exits from the level check port.
- Ensure that the O-ring on each plug is not damaged, then install the plugs and torque to specification.

NOTE!

Oil capacity: 5.8 Liter (1.5 gal)

Operating checks

- Check the oil level prior to operating the travel function.
- Check for oil leakage on the gearbox assembly.
- Check for loose mounting screws.
- Check for abnormal sound or vibration while rotating.
- Check for any abnormal temperature increase after operating for a short time.



The temperature of the case is high just after running. Do not touch directly by hand to prevent a burn injury. Check

the temperature with a surface thermometer.

NOTE!

The temperature of the case must be lower than 90 °C (194 °F), during continuous operation.

Document Title: Track gearbox, principle of operation	Function Group:	Information Type: Service Information	Date: 2015/5/20
Profile: EXC, EC160B NLC [GB]			

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Track gearbox, principle of operation

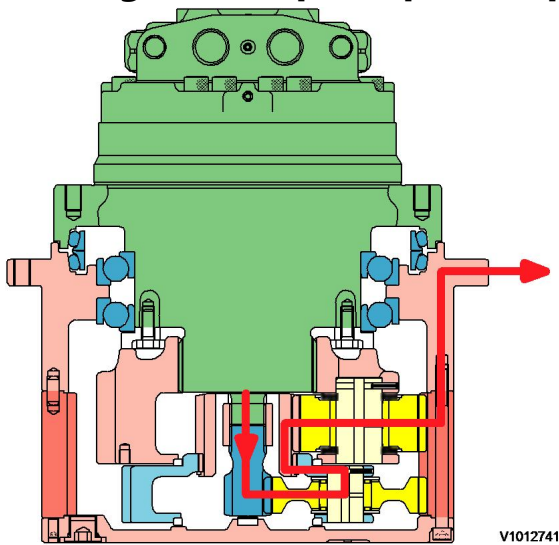


Figure 1
Track gearbox, torque flow

The power transmitted from the hydraulic motor output shaft is transmitted to the 1st stage sun gear (27) → spline of 1st carrier (19) → 2nd sun gear (20) → 2nd planetary gear (12) → ring gear (8).
At this time, the reduction ratio of reduction gear is as follows:

(1) 1st reduction ratio

$$i_1 = ((Z_{s1} + Z_r) \cdot (Z_{s2} + Z_r)) / (Z_{s1} \cdot Z_{s2}) - 1$$

- Z_{s1} = No. of tooth of 1st sun gear
- Z_{s2} = No. of tooth of 2nd sun gear
- Z_r = No. of tooth of ring gear

Document Title: Track gearbox, troubleshooting	Function Group:	Information Type: Service Information	Date: 2015/5/20
Profile: EXC, EC160B NLC [GB]			

Track gearbox, troubleshooting

Track gearbox troubleshooting

Gearbox does not rotate.	Motor overloaded.	Reduce the load.
	Gearbox is damaged.	Replace the gearbox.
Oil leakage from mating joint surfaces.	Liquid gasket improperly applied.	Disassembly and re-apply.
	Mating surface damaged.	Repair or replace.
	Loosen screws.	Tighten to specified torque.
	Loosen plug.	Tighten to specified torque.
Casing leakage.	Cracks or pin holes.	Replace the housing.
	Cover damaged.	Replace the cover.
Floating seal leakage.	Sliding surface worn.	Replace the floating seal assembly.
	O-ring distorted.	
Abnormal operating temperature.	Insufficient gear oil.	Refill to specified level.
	Gear or bearing damaged.	Replace the gearbox.

Document Title: Track gearbox, removal	Function Group:	Information Type: Service Information	Date: 2015/5/20
Profile: EXC, EC160B NLC [GB]			

Track gearbox, removal

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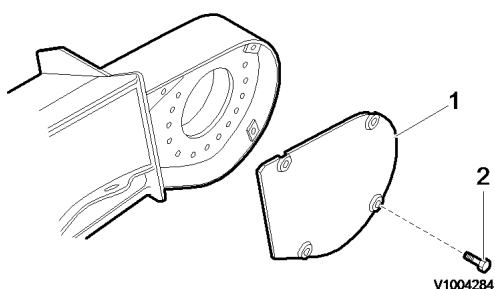


Figure 1
Removal, cover

1. Remove cover screw (2), and remove cover (1).
2. Remove the track.
3. Place a wooden block on the track, and place the lower roller on the block to raise the sprocket off the track.
4. Disconnect the hydraulic hoses at the track motor. Plug the pipe ends and ports to prevent the outflow of oil and the entry of contamination.
5. Remove the track motor mounting screws from the undercarriage.

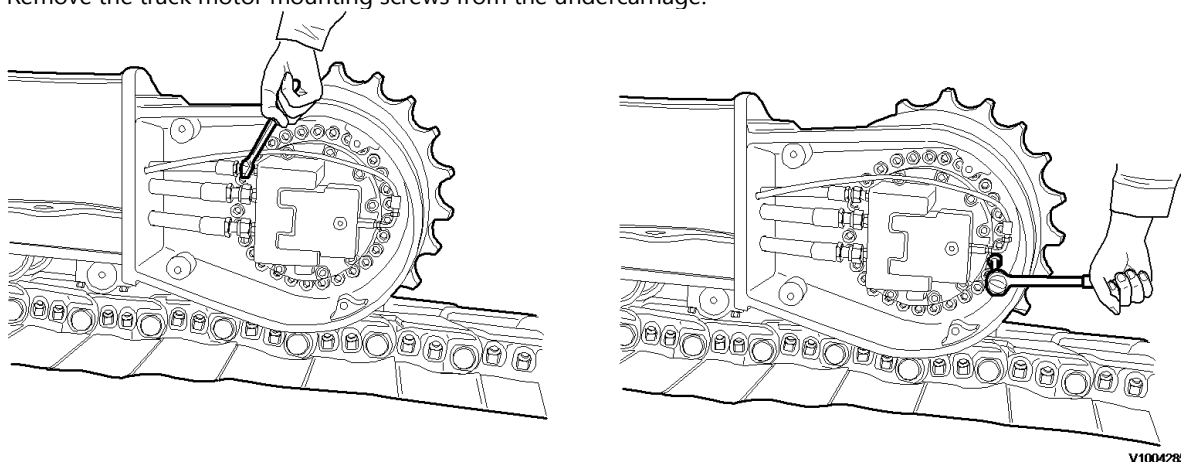


Figure 2
Removal, hydraulic hoses and screws

6. Pass a wire rope around the gearbox, and lift it. Remove the track motor as an assembly. Then, using screws in the threaded holes of the undercarriage, force out the gearbox.

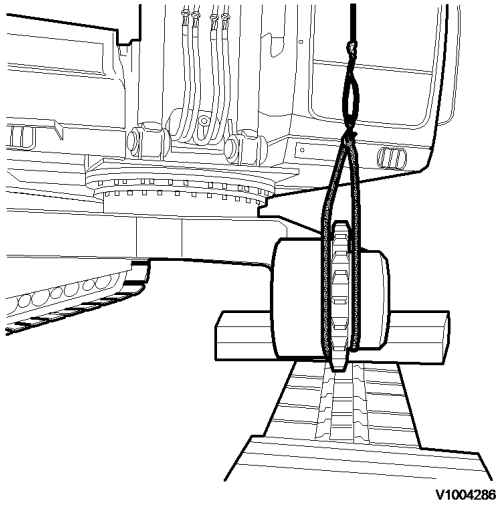


Figure 3
Removal, track gearbox

NOTE!

Lift the gearbox as close to the sprocket as possible to maintain balance.

NOTE!

The gearbox mounting screws may be used in the threaded frame holes.

NOTE!

Putting match-marks on the track frame and track gearbox will facilitate reassembly.

Document Title: Track gearbox, installation	Function Group:	Information Type: Service Information	Date: 2015/5/20
Profile: EXC, EC160B NLC [GB]			

Track gearbox, installation

Op nbr 00000

NOTE!

Carefully check the mating surface of the undercarriage and the gearbox for burrs, dirt and rust scale.

1. Pass a wire rope around the gearbox, lift and install the gearbox to the undercarriage.

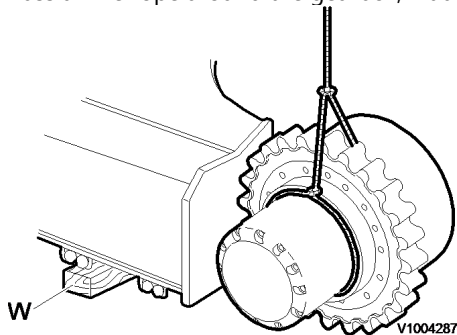


Figure 1
Installation, track gearbox

2. Apply loctite # 277 to the gearbox mounting screws, and tighten them to the specified torque.

○ Tightening torque: 27 ± 3 kgf·m (195 ± 22 lbf·ft)

3. Connect the hydraulic hoses at the track motor.
4. Install the gearbox cover.

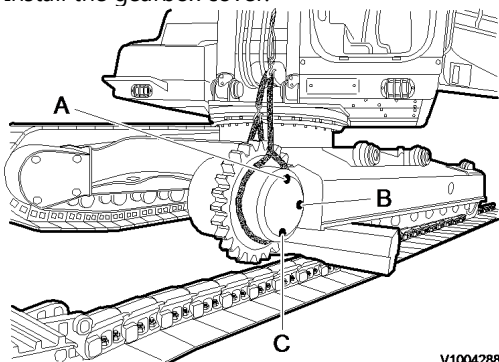


Figure 2
Checking, oil level

- A. Fill port
- B. Level check port
- C. Drain port

5. Check the gear oil level of gearbox. If necessary, replace or refill the oil.

Document Title: Track gearbox, maintenance standard	Function Group:	Information Type: Service Information	Date: 2015/5/20
Profile: EXC, EC160B NLC [GB]			

Track gearbox, maintenance standard

The parts are precision finished and must be handled carefully.

Keep the parts of the planetary carrier (s) together, do not mix the bearings, gears, pins and thrust washers.

Seals

Replace the seals, oil seal and O-ring, although they appear not damaged.

Part replacement criteria

Replace all parts that appear damaged or are not within the allowable value.

Replace some parts in sets, i.e. gears, bearings, pins and thrust washers.

Part replacement criteria

Item No.	Part	Condition	Allowable value
8 12 20 22 27	Ring gear No.2 planetary gear No.2 sun gear No.1 planetary gear No.1 sun gear	The tooth surface is pitted or non uniformly worn. The gear is cracked.	Area rate: within 5%
23 13 2	Needle bearing Needle bearing Angular bearing	Fitting/flaking of the balls, rollers or races. Does not rotate smoothly by hand.	
3	Seal	Rust or damage on sliding face. O-ring distorted or damaged.	
15 25	No.2 pin No.1 pin	The pin is cracked, galled or pitted.	
24 14	Thrust washer	Excessively worn on the face area.	

Remove air in the track motor before operating.

1. Check that the gearbox axis is horizontal. Rotate the gearbox housing until the drain plug is on the bottom of the vertical axis of the end cover.

The gearbox is supplied with oil plugs (draining, filling and level) equipped with an hole that allows the air to bleed.

NOTE!

Remove the oil plugs with care. When the gearbox is warm, the air inside can be pressurized and this can cause their strongly expulsion towards the worker.

2. Loose with caution the plugs (2~3 rounds) counterclockwise.
3. Clean the plug to be sure that the air bleed hole is not obstructed.
4. Wait a few seconds to allow the pressurized air to bleed from the gearbox.
5. Remove the plugs and let the oil flow in a large enough container; in order to facilitate the draining must be oil still warm.
6. Wait a few minutes until all the oil is drained and then proceed to screw on the plugs.
7. Proceed with the oil fill-up following the procedures given.

NOTE!

Never mix mineral oils with synthetic oils and vice versa.

Do not dispose of the oil in the natural environment but be careful to eliminate it in compliance with the relative rules and regulations that govern locally.

Tightening torque plug. See track gearbox, description.

General tools

General tools

No.	Description	Size	Quantity
1	Socket wrench	19 mm	1
2	L wrench	5 mm 10 mm 12 mm	1
3	Torque wrench	400 ~ 1800 kgf cm	1
4	Eye bolt	PF 3/4 M10 M12	2
5	Plastic hammer	Approximately L = 300 ~ 500 mm	1
6	Screwdriver	Approximately L = 200 mm	1
7	Depth gauge (Vernier calliper)	Range approximately 300 mm Min. scale 0.01 mm	1

Special tools

Special tools

No.	Description	Size	Quantity
1	Bearing shim adjust fixture	8932-00290 Measuring plate	1

Document Title: Track gearbox, disassembly	Function Group:	Information Type: Service Information	Date: 2015/5/20
Profile: EXC, EC160B NLC [GB]			

Track gearbox, disassembly

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Precautions

- Thoroughly clean the gearbox assembly prior to disassembly.
- Select a clean work area.
- Match mark attached components to indicate proper positioning during reassembly.
- Take care not to mix parts of sub assemblies i.e. planetary bearings, gears and thrust washers.
- Thoroughly clean all parts and the inside of the casings.
- Inspect and analyse all failures. – Determine the root cause!

1. Place the oil fill port and the oil drain port on the vertical axis. Remove plug (32) and drain the gear oil.

- Tools: L wrench 12 mm (PF 3/4), 8 liter pan

NOTE!

Drain oil into a clean container and check thoroughly for contamination.

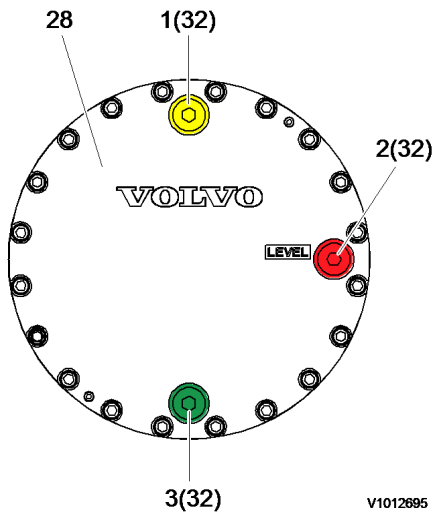


Figure 1
Removal, plug

1. Fill port
 2. Level check port
 3. Drain port
2. Remove screws (30) and remove cover (28).

- Tools: L wrench 10 mm, 5 mm



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NOTE!

Install a screw (31) and carefully lift the cover off.

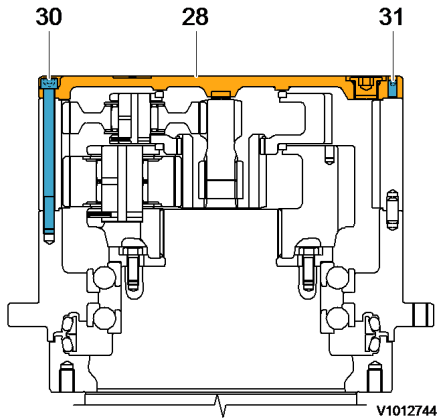


Figure 2

Removal, screw and cover



The parts are heavy. Take appropriate safety precautions.

3. Remove No.1 planetary gear assembly (18) from No.2 planetary gear assembly (10).

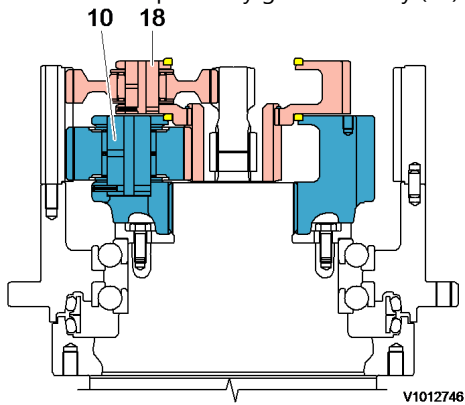


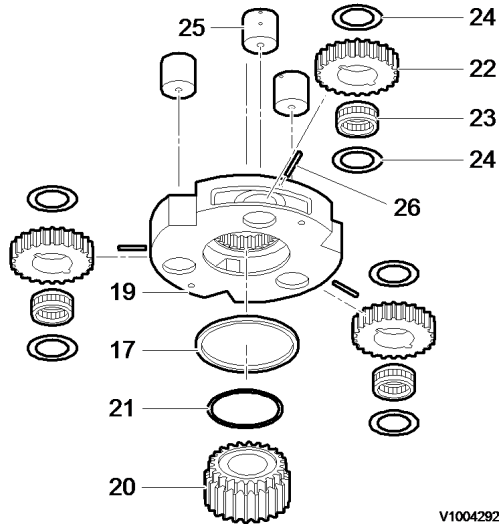
Figure 3

Removal, No.1 planetary gear assembly

Disassemble No.1 planetary gear assembly.

- Tap spring pin (26) into No.1 pin (25).
- Remove thrust washer (24), No.1 planetary gear (22) and needle bearing (23) from No.1 carrier (19).
- Remove thrust ring (17).
- Remove retaining ring (21), then No.2 sun gear (20).
- Remove thrust ring (17).

- Tools: Eye bolt (M10), plastic hammer



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Figure 5
Removal, spring pins

NOTE!

Match mark gears (22), pins (25) and carrier (19).

NOTE!

Do not mix the gears, bearings, thrust washers, and pin assemblies.

NOTE!

Do not reuse spring pins (26).

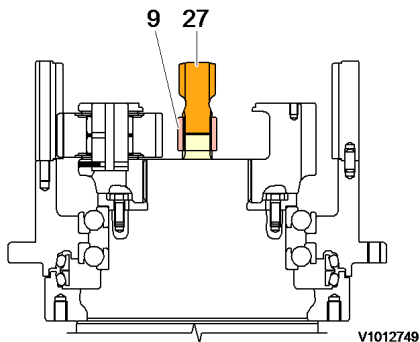
NOTE!

If there are any flakes at the surface of No.1 pin, replace No.1 pin, No.1 carrier (28), No.1 planetary gear (33) and needle bearing (34) simultaneously.

- Remove No.1 sun gear (27) and coupling (9).

NOTE!

Remove No.1 carrier (19) and then remove No.2, No.1 sun gear (20, 27).



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Figure 6
Removal, No.1 sun gear and coupling



The parts are heavy. Take appropriate safety precautions.

- Remove No.2 planetary gear assembly (10) from spindle (302).

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