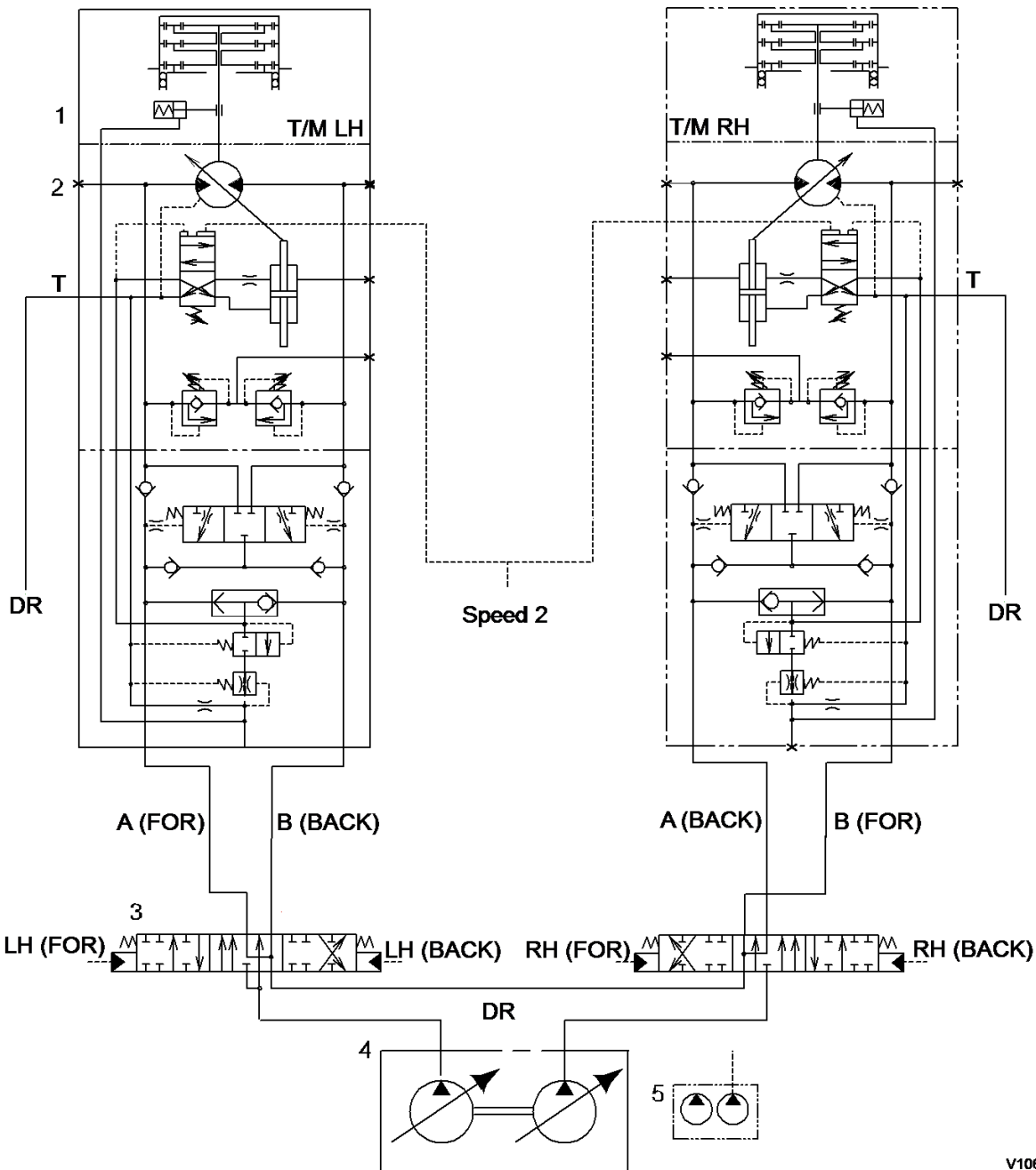


Document Title: Function description	Function Group:	Information Type: Service Information	Date: 2015/9/2 0
Profile: EXC, EC460B LR [GB]			

Function description

The track unit is operated by hydraulic power from the main pump and servo pump. The engine power transmitted via the pump coupling is converted from mechanical power to hydraulic power. When the engine is running, the travel system is ready to be operated; the remote control valve pedal controls the main control valve travel spool via servo hydraulic power to change track motor rotational direction.



V106288C

Figure 1
Track unit, diagram

1	Track gearbox	3	Main Control Valve	5	Servo pump
2	Track motor	4	Main pump		

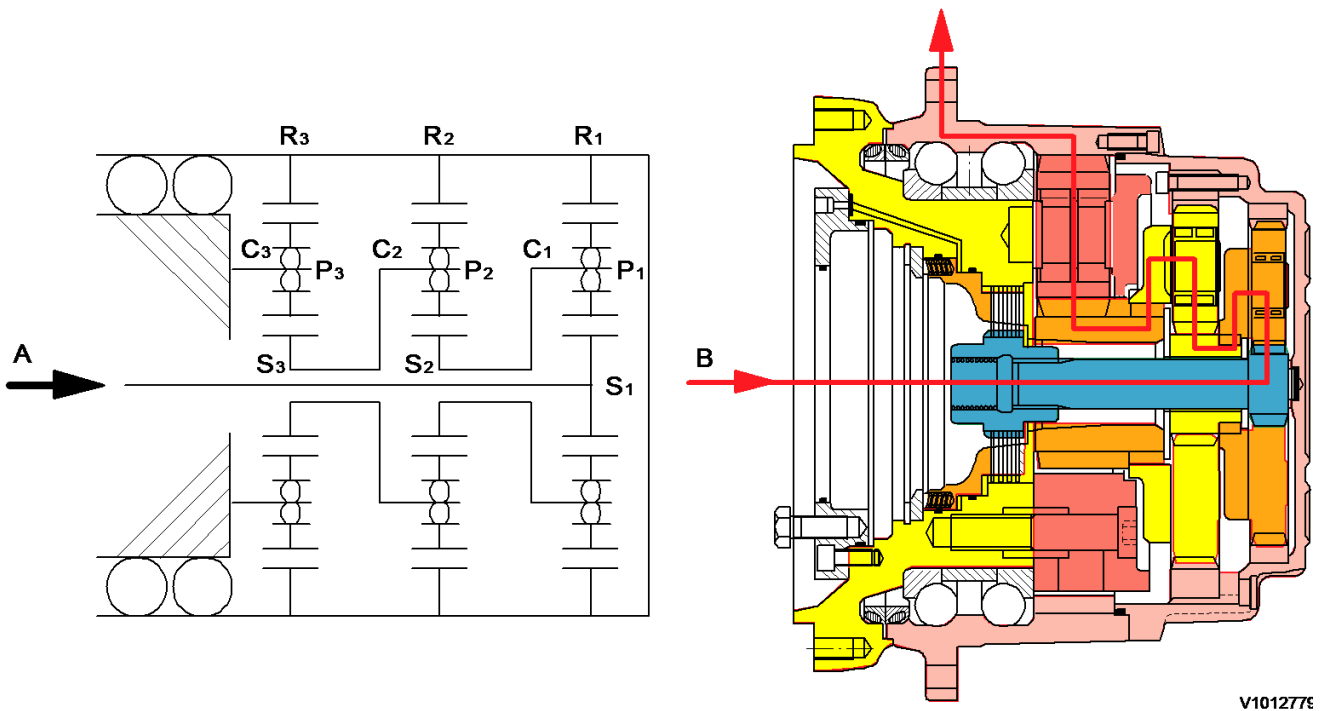
Function track unit (Forward)

- The pedal remote control valve is pushed forward.
- The swash plate angle increases and the main control valve travel spool is moved from left to right by the servo hydraulic circuit.
- Then the hydraulic motor is operated by main hydraulic power and the motor shaft transmits power through the reduction gears.
- The reduction gears of the planetary mechanism convert the high speed rotation of the hydraulic motor shaft into low speed high torque rotation at the track unit for forward travel.

Function track unit (Reverse)

- The pedal remote control valve is pushed backward.
- The swash plate angle increases and the main control valve travel spool is moved from right to left by the servo hydraulic circuit.
- Then the hydraulic motor is operated by main hydraulic power and the motor shaft transmits power through the reduction gears.
- The reduction gears of the planetary mechanism convert the high speed rotation of the hydraulic motor shaft into low speed high torque rotation at the track unit for reverse travel.

Gearbox, torque flow



V101277E

Figure 2
Gearbox, torque flow

A	Input (Hydraulic motor output)
B	Torque flow

The input rotation of the hydraulic motor is transmitted to No. 1 sun gear (S1) and this drives No.1 planetary gears (P1). The No. 1 planetary gears (P1) drive No. 1 ring gears (R1) with the same force as the meshing tangential force with No. 1 sun gear (S1), and also No. 1 carrier (C1) with the same force as the meshing reaction force. In other words, No. 1 planetary gears (P1) revolve rotating. This rotation of No. 1 carrier (C1) becomes the output of the 1st stage, and is transmitted directly to No. 2 sun gear (S2). (No. 1 carrier is spline-coupled with No. 2 sun gear.) Similarly the revolution of No.2 planetary gears (P2) are transmitted through No. 2 carrier (C2) to No.3 sun gear (S3). Since

No. 3 carrier (C3) supporting No.3 planetary gears (P3) are fixed, No. 3 planetary gears (P3) do not revolve, but rotates to drive No. 3 ring gears (R3).

Therefore, the rotating case is driven by the overall driving torque of No. 1, 2 and 3 ring gears. This reduction ratio is expressed as shown below:

$$i = \frac{(Z_{S1} + Z_{R1})(Z_{S2} + Z_{R2})(Z_{S3} + Z_{R3})}{Z_{S1} \cdot Z_{S2} \cdot Z_{S3}} - 1$$

V1012776

where, Z: =Number of teeth of each gear

The direction of rotation is reverse to that of the input shaft

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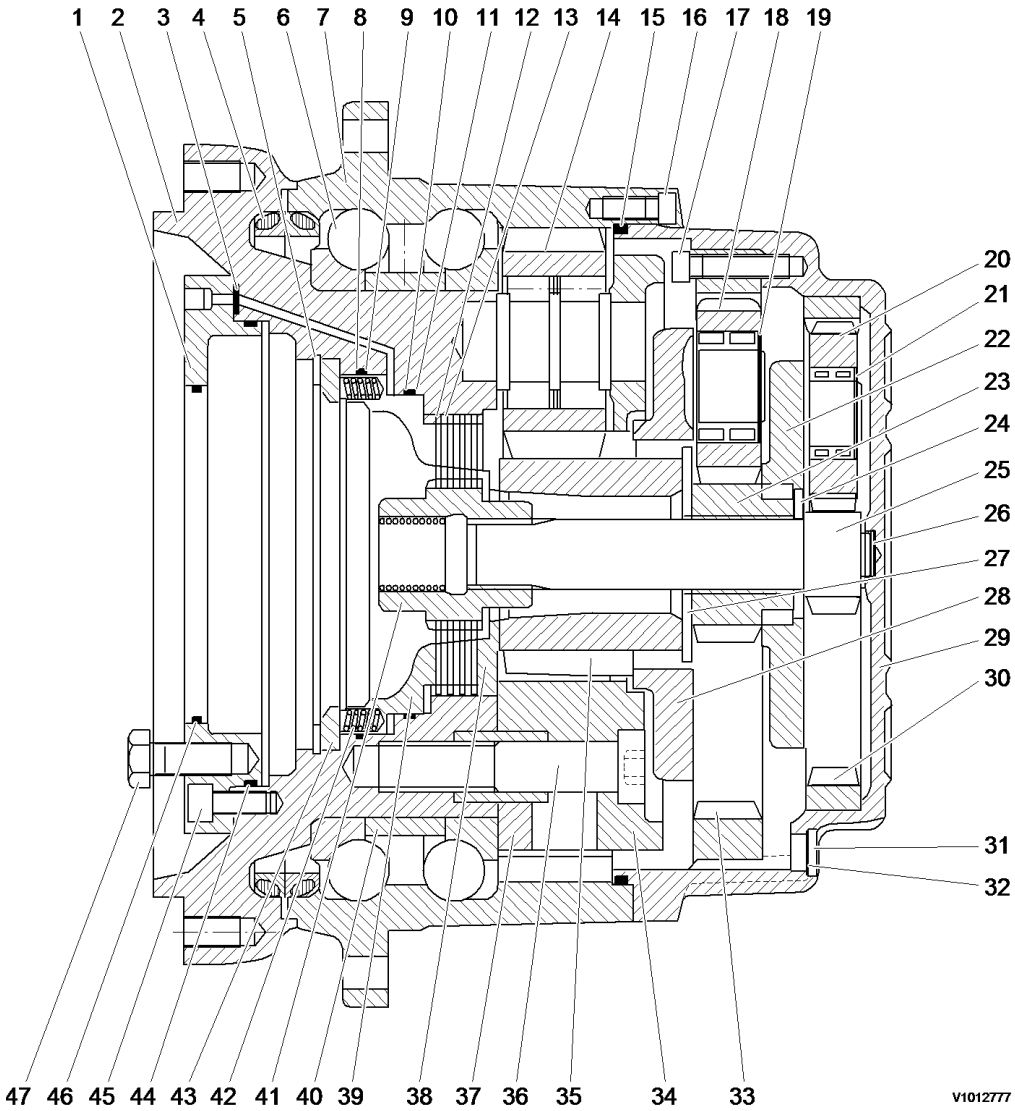
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Document Title: Track gearbox, description	Function Group:	Information Type: Service Information	Date: 2015/9/20
Profile: EXC, EC460B LR [GB]			

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Track gearbox, description

Track gearbox, sectional view



V1012777

Figure 1
Track gearbox, sectional view

1	Flange	17	Screw	33	Gear
2	Hub	18	Planetary gear	34	Carrier-3rd stage reduction
3	O-ring	19	Circlip	35	Sun gear
4	Seal	20	Planetary gear	36	Screw
5	Circlip	21	Circlip	37	Bushing
6	Bearing	22	Carrier-1st stage reduction	38	Spacer

7	Housing	23	Sun gear	39	Piston
8	Ring	24	Center ring	40	Spacer
9	O-ring	25	Sun gear	41	Shaft
10	O-ring	26	Pad	42	Spring
11	Ring	27	Center ring	43	Spacer
12	Disc	28	Carrier-2nd stage reduction	44	O-ring
13	Steel ring	29	Cover	45	Screw
14	Planetary gear	30	Gear	46	O-ring
15	O-ring	31	Plug	47	Screw
16	Screw	32	Washer		

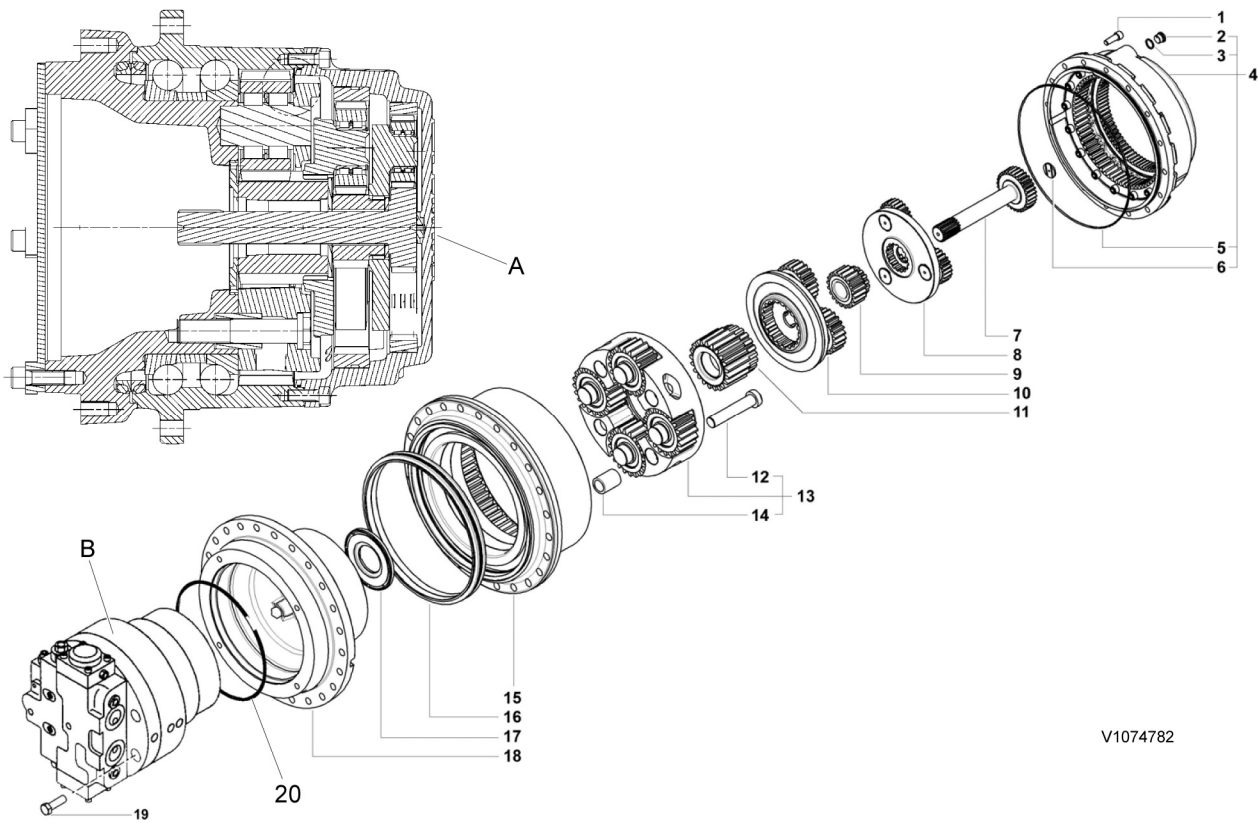
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Track gearbox, description

The unit includes planetary gearbox, 3 stages, rotating housing type.
An important piece of advice given is "to perfectly" design the main hydraulic system.
The illustrations show the parts and the main functions of the gearbox.

Track gearbox illustrations show



V1074782

Figure 1
Track gearbox

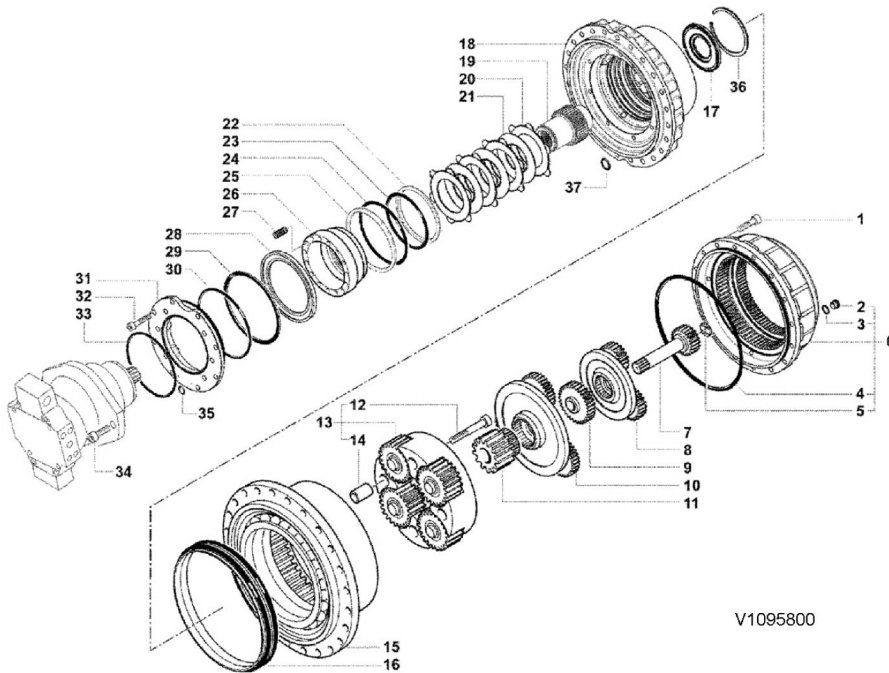
A	Track gearbox	B	Track motor		
1	Screws Tightening torque: 190 Nm (141 lbf ft) (19.4 kg m)	8	1st Red assembly	15	Bush + Bearing
2	Oil breather plug Tightening torque: 60 ~ 80 Nm (44.4 ~ 59.2 lbf ft) (6.1 ~ 8.2 kg m)	9	Sun gear	16	Lifetime seal
3	Washers	10	2nd Red assembly	17	Discs retainer
4	Cover assembly	11	Sun gear	18	Hub
5	O-ring	12	Screws, Apply Loctite #277 or equivalent locking fluid Tightening torque: 2000 Nm (1480 lbf ft) (204 kgf m)		

6	Pad	13	3nd Red assembly	19	Screws
7	Sun gear	14	Bush	20	O-ring seal

Document Title: Track gearbox, description	Function Group:	Information Type: Service Information	Date: 2015/9/2 0
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Track gearbox, description



V1095800

Figure 1
Track gearbox

1	Screw Tightening torque: 190 Nm (141 lbf ft) (19.4 kg m)	25	Spiral ring
2	Oil breather plug Tightening torque: 60~80 Nm (14.4~59.2 lbf ft) (6.1~8.2 kg m)	26	Brake piston
3	Washers	14	Bush
4	O-ring	15	Housing + bearing
5	Pad	16	Lifetime seal
6	Cover assembly	17	Discs retainer
7	Sun gear	18	Hub
8	1st red assembly	19	Brake shaft
9	Sun gear	20	Sintered disc
10	2nd red assembly	21	Steel disc
11	Sun gear	22	Backup ring
12	Screws Tightening torque: 2000 Nm (1480 lbf ft) (204 kg m)	27	Spring
13	3rd red assembly	28	Spring retainer
		29	Circlip
		30	O-ring
		31	Motor adaptor
		32	Screws
		33	O-ring seal
		34	Screws
		35	O-ring
		36	Circlip
		37	O-ring
		24	O-ring

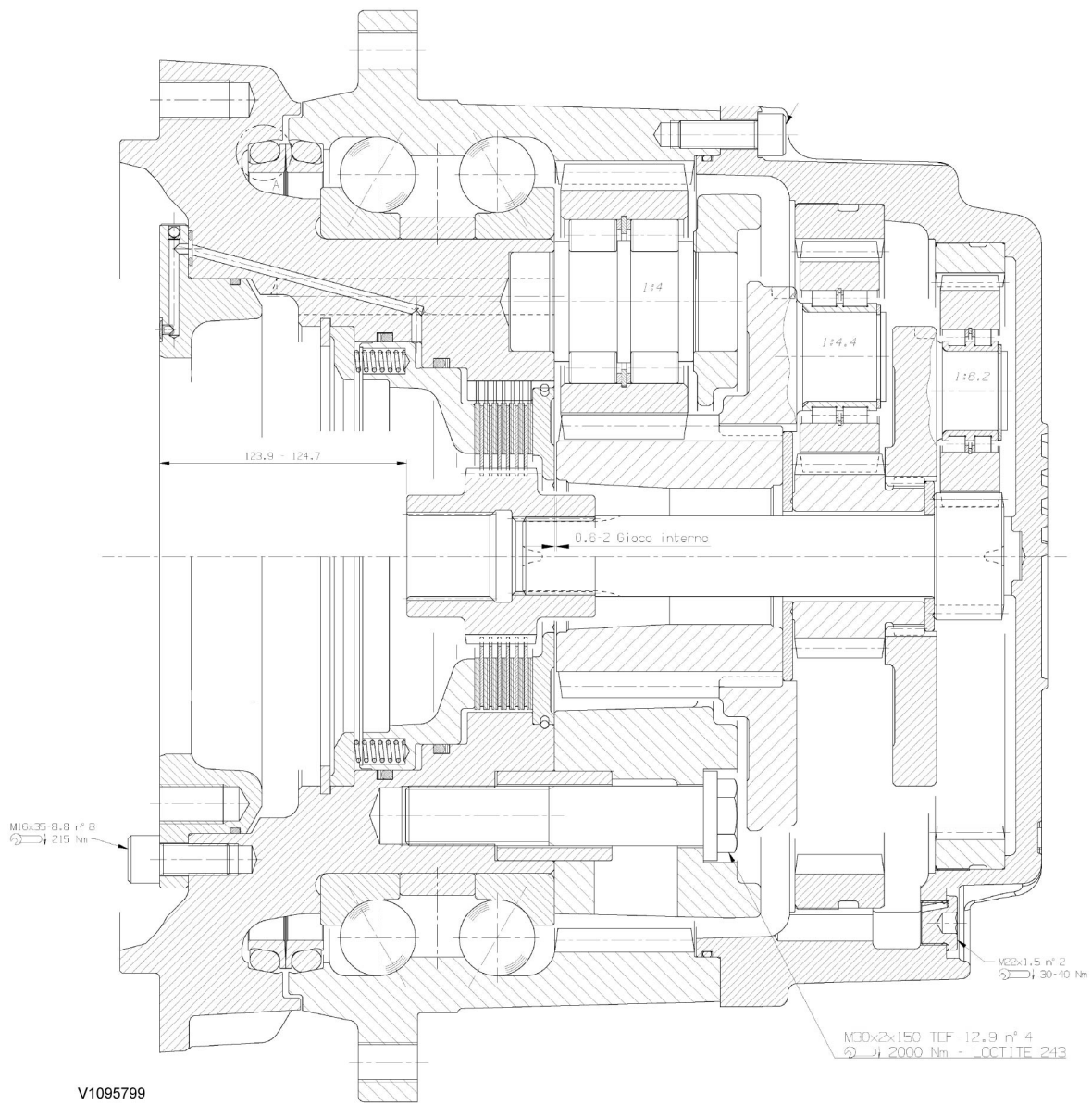


Figure 2
Track gearbox, sectional view

Document Title: Track gearbox, removal	Function Group:	Information Type: Service Information	Date: 2015/9/2 0
Profile: EXC, EC460B LR [GB]			

Track gearbox, removal

Op nbr 43112

1. Remove the track.
2. Place a wooden block on the track, and place the lower roller on the block to raise the sprocket off the track.

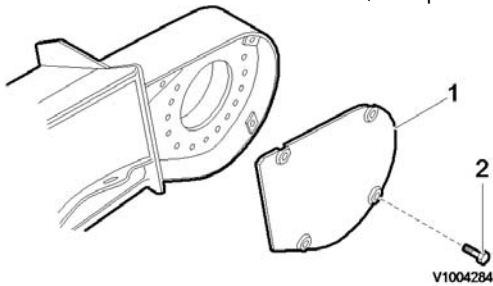


Figure 1
Removal, cover

3. Remove cover screw (2) of track frame, and remove cover (1).
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.

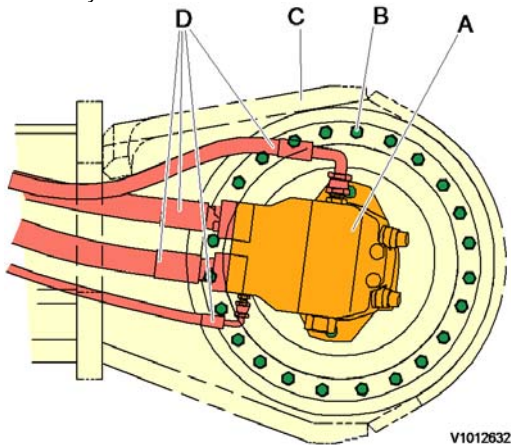


Figure 2
Removal, hydraulic hoses and screws

A	Track motor	C	Undercarriage frame
B	Screw	D	Hoses

5. Remove the track gearbox mounting screws from the undercarriage.
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.

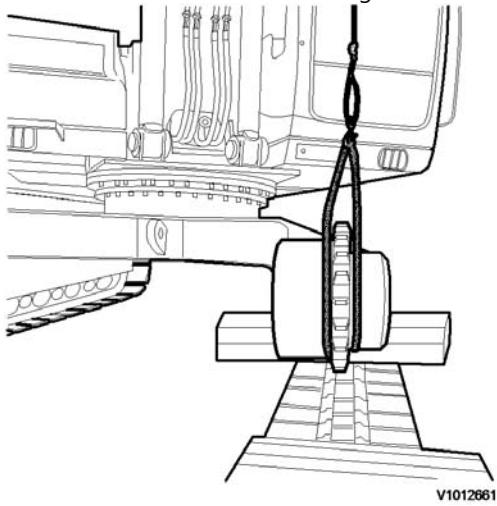


Figure 3
Removal, track gearbox

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.

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Track gearbox, installation

Op nbr 43113

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.
2. Apply loctite #277 to the gearbox mounting screws, and tighten them to the specified torque.
Tightening torque : 52.2 ± 5.2 kgf·m (377 ± 38 lbf·ft)
3. Connect the hydraulic hoses at the track motor.

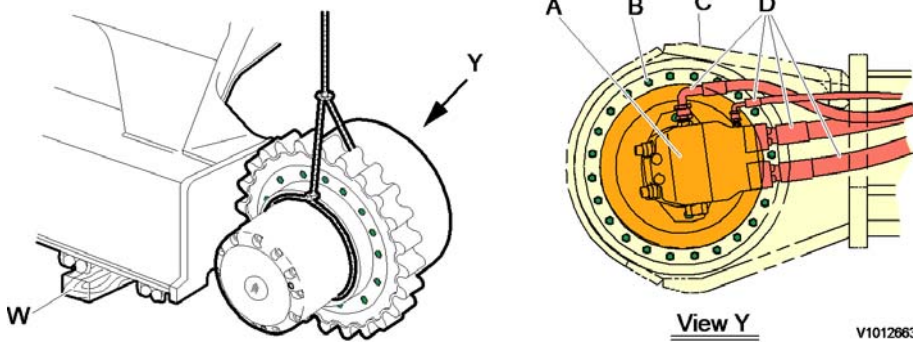


Figure 1
Install, track gearbox

A	Track motor	B	Screw	C	Undercarriage frame	D	Hoses
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4. Install the gearbox cover.

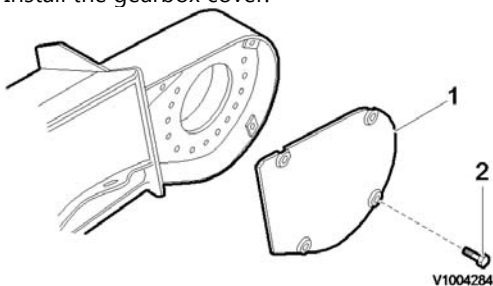
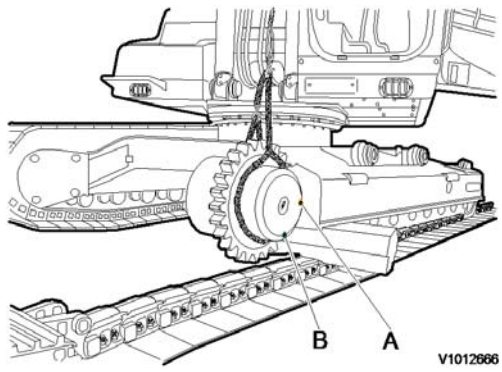


Figure 2
Install, track gearbox cover

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



V1012666

Figure 3
Checking, oil level

- A. Level port, Filling port
- B. Drain port

Document Title: Track gearbox, maintenance standard	Function Group:	Information Type: Service Information	Date: 2015/9/2 0
Profile: EXC, EC460B LR [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 and o-ring, although they appear not damaged.

Part replacement criteria

1. Replace all parts that appear damaged or are not within the allowable value.
2. Replace some parts in sets, i.e. gears, bearings, pins and thrust washers.

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.

Tightening torques for gearbox, unit : kgf-m (lbf-ft)

Position	Thread size	Tightening torque	Tool (allen wrench)
16	M12 × 35K (Grade)=12.9	14.8 (107)	10
17	M12 × 65K (Grade)=12.9	14.8 (107)	10
36	M30 × 2K (Grade)=8.8	153 (1105)	22
45	M16 × 35K (Grade)=8.8	21 (151)	14
47	M20 × 50K (Grade)=8.8	41 (295)	17



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Profile: EXC, EC460B LR [GB]			

Track gearbox, precautions for operation

Installation

Op nbr 00000

1. Check that the mating mount surfaces are clean.

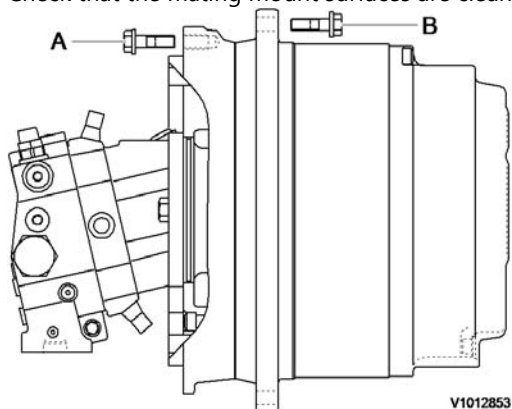


Figure 1
Installation, track gearbox

2. Check that the motor is positioned correctly in the frame.
3. If the gearbox to frame fit is tight, draw the assembly into the frame evenly with the mounting screws.
4. Tighten the screws in a crisscross pattern in several stages to the specified torque.
5. Apply these same precautions when mounting the sprocket.

(A) ... Main body mounted area

(B) ... Sprocket mounted area.

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

	Quantity	Thread size	Tightening torque
Reduction screw (A)	24	M20 (P2.5)	52.2 ± 5.2 (377 ± 38)
Sprocket screw (B)	24	M20 (P2.5)	44 ~ 49 (318 ± 354)

NOTE!

The screws must be 10.9 strength classification or above.

Lubrication oil

The gearbox is lubricated by oil splash in oil bath, the suggested oil type is SAE 80W/90 corresponding to : MIL-L-2105C API GL5

During the running the oil must not always exceed the temperature of 90 ~ 95 °C (195 ~ 205 °F) (intermittent)

Gear oil replacement

- 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

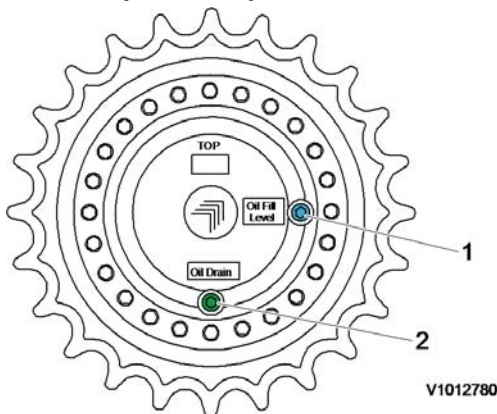


Figure 2

Position, gear oil replacement

1. Fill and Level port (plug)
 2. Drain port (plug)
- Rotate the gearbox until the drain plug and the fill plug are on the vertical axis.
 - Remove the 2 plugs in the end cover and drain the oil into a suitable container.
 - Ensure that the o-ring on each plug is not damaged, then install the plugs and torque to specification.
 - Refill the gearbox through the fill port until oil exits from the level check port.
Oil capacity : 5.5 Liter (1.45 gal)

Operating checks

- Check the oil level prior to operating the track 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. Use a thermometer to measure. Do not touch directly by hand to prevent a burn injury.

NOTE!

The temperature of the case must be lower than 80 °C, during continuous operation.

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