Document Title:	Function Group:	Information Type:	Date:
Description	**600**	**Service Information**	**2014/4/8 0**
Profile:			

Description

The L70D features hydrostatic articulated frame steering consisting of one of the two variable displacement hydraulic pumps connected in parallel, central valve, steering valve and two cylinders. The outlet ports of the steering valve are connected to the plus and minus sides of the steering cylinders.

Two variable hydraulic pumps (P1 and P2) are connected in parallel and common to the brake system, servo system and working hydraulics. Pump 1, located closest to the transmission, also supplies the steering system with fluid and gives it priority over the brake system, servo system, and working hydraulics.
The fluid is drawn from the hydraulic fluid tank.

The purpose of the central valve is to distribute hydraulic fluid to the working hydraulics and the brake, steering and servo systems.

For a description of the central valve, see [Invalid linktarget] .

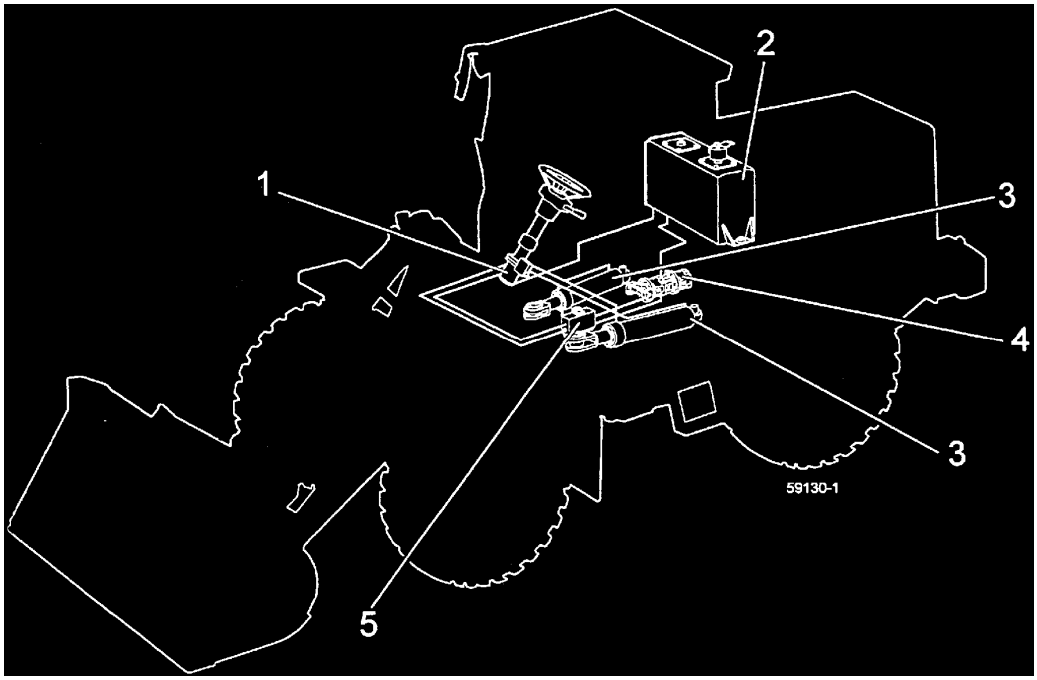

Figure 1
Steering system

1. Steering valve
2. Hydraulic oil tank
3. Steering cylinders
4. Hydraulic fluid pumps P1 and P2.
5. Central valve

VOLVO
Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Hydraulic diagram, steering	**640**	**Service Information**	**2014/4/8 0**
Profile:			

Hydraulic diagram, steering

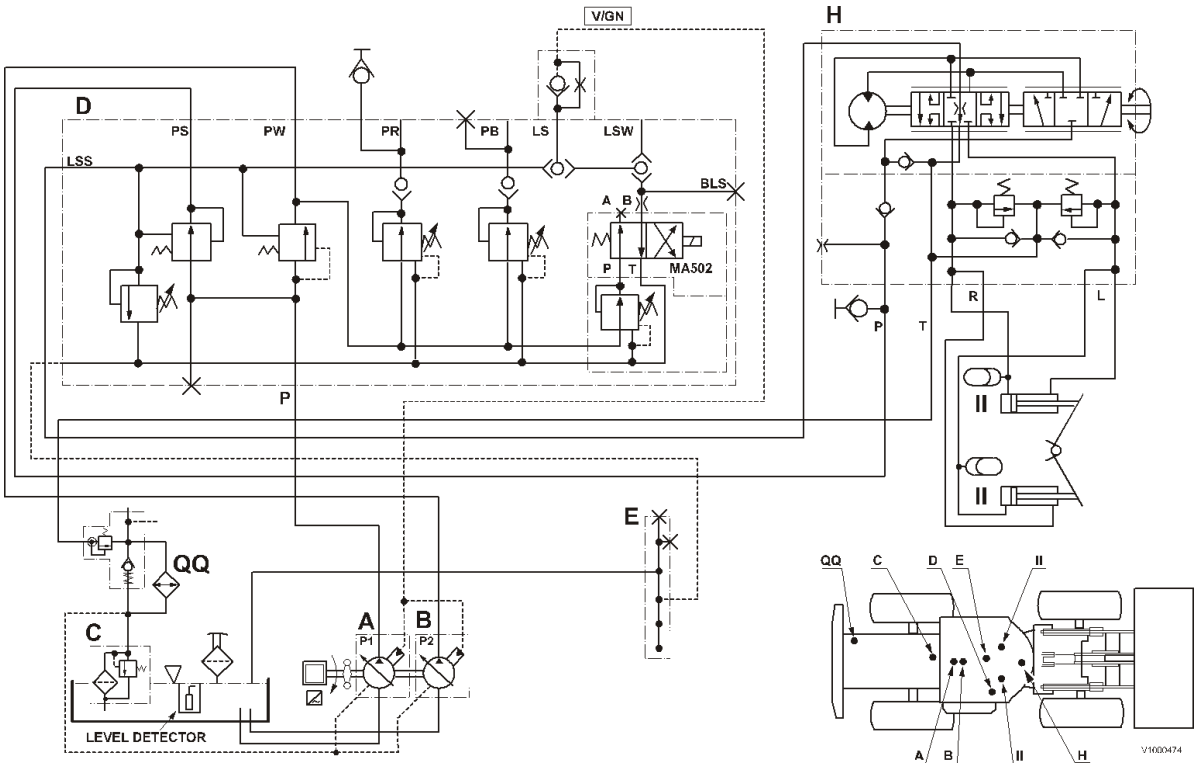

Figure 1
Hydraulic diagram, steering system

A	Hydraulic oil pump
B	Hydraulic fluid pump, cooling fan motor/brakes
C	Hydraulic oil tank
D	Central valve
E	Return fluid block
H	Steering valve
II	Steering cylinders
J	Secondary steering
K	CDC valve
QQ	Return oil filter

Document Title: **Hydraulic pump, description**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/4/8 0**
Profile:			

Hydraulic pump, description

The pump is a nine-cylinder axial piston pump with variable flow.
As the drive shaft (9) rotates, the cylinder block (6), pistons (7) and swash plate (8) also rotate with it.
The stroke of the pistons is then dependent on the angle of the swash plate (10).
The angle is determined by the difference between the pressure from the control piston and the spring.
When the piston is in its innermost position and on its way out it passes a bow-shaped groove (4) in the distribution plate (5). The fluid is sucked (or more accurately, forced by atmospheric pressure) from the inlet port (3) via the inlet groove (4) into the cylinder.
When the piston has passed its outermost position and is on its way back into the cylinder, the fluid is forced out through the outlet groove (2) and on to the outlet port (1).

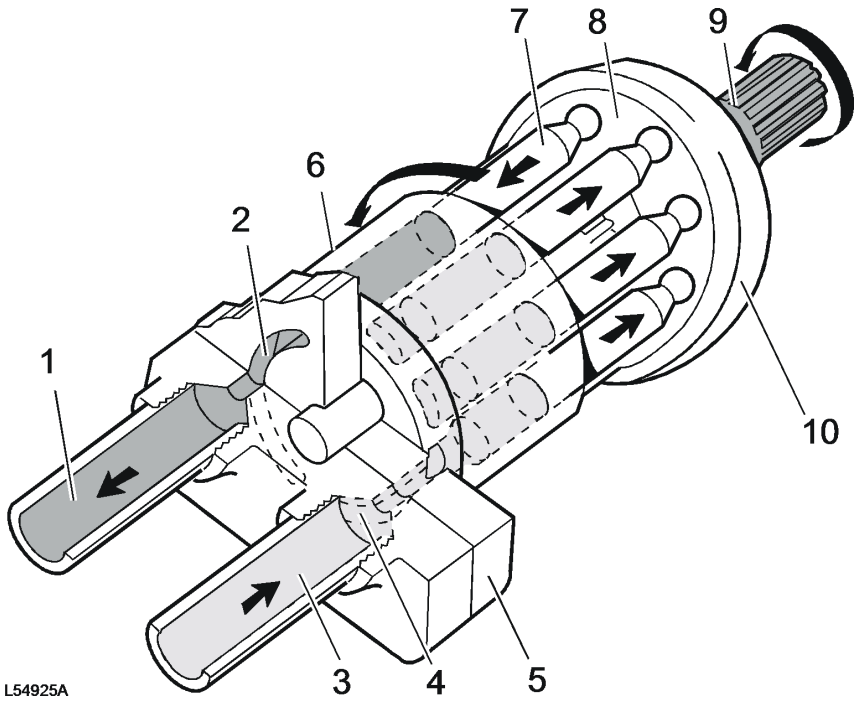

Figure 1
Hydraulic pump

1. Outlet port
2. Outlet groove in distribution plate
3. Inlet port
4. Inlet groove in distribution plate
5. Distribution plate
6. Cylinder block
7. Piston
8. Swash plate
9. Drive shaft
10. Yoke

Pressure/flow compensator

The purpose of the flow compensator is to control the pump via the control piston (8) and spring (7) at all times so that it

will always supply a flow of fluid, the pressure drop of which in the system corresponds to a preset pressure difference between the pump outlet and the load-sensing port on the governor.

The purpose of the pressure compensator is to control the pump via the control piston (8) and spring (7) so that the maximum pressure for the working hydraulics is limited.

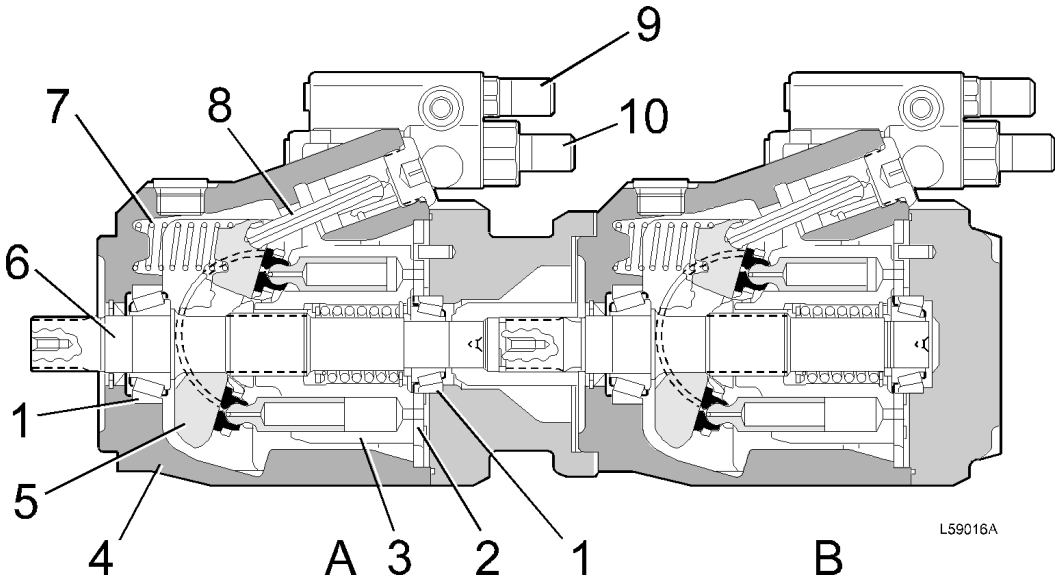

Figure 2
Hydraulic pumps 1 and 2

A	Pump 1		
B	Pump 2		
1	Bearing	6	Drive shaft
2	Distribution plate	7	Spring
3	Pump unit (With cylinder block and piston)	8	Control piston
4	Housing	9	Flow compensator (hold/standby pressure)
5	Yoke	10	Pressure compensator (Main pressure)

Document Title: **Steering cylinder, cutaway view**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/4/8 0**
Profile:			

Steering cylinder, cutaway view

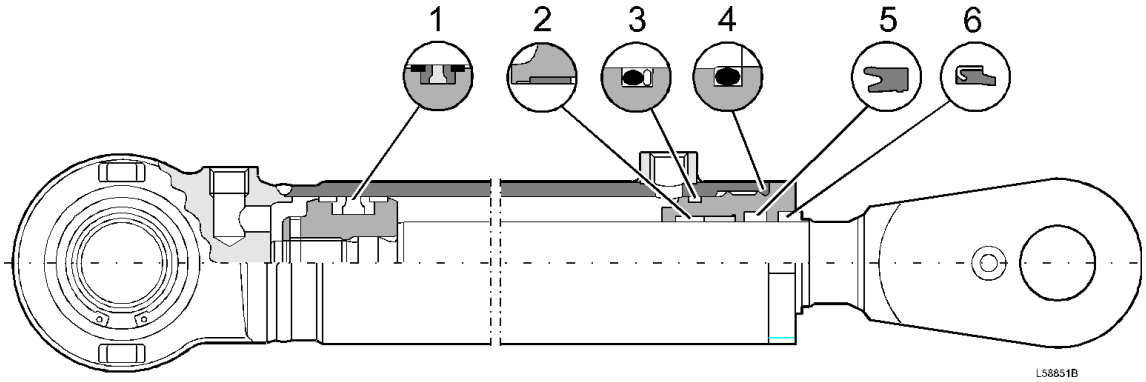

Figure 1
Steering cylinder

1. Piston seal
2. Bakelite bushings
3. O-ring with back-up ring
4. O-ring
5. Seal
6. Scraper seal

Document Title: **Steering cylinder, reconditioning**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/4/8 0**
Profile:			

Steering cylinder, reconditioning

Op nbr 64506

999 3725 Draw bolt
999 3722 Support
999 3712 Socket
999 3714 Draw bolt
999 3717 Speed nut
999 3686 Plate
11 667 060 Plate
11 667 050 Plate

Hook spanner diam. 76 mm (2.99 in)

Removing

1. Steer the machine at full lock from the side on which the steering cylinder is to be reconditioned.
   Remove the cover plate between the cab and frame.
   NOTE!
   Use a long 12 mm (0.47 in) socket with max. 17 mm (0.67 in) outside diameter on the rear steering cylinder pin.

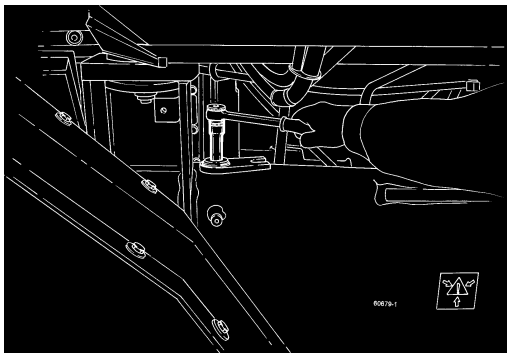

Figure 1
Removing the rear pin

2. Remove the retaining ring from the front steering cylinder pin.
   Thoroughly clean that part of the pin protruding from the piston rod fork.
   Remove the pin using 999 3725 draw bolt and 999 3722 support.

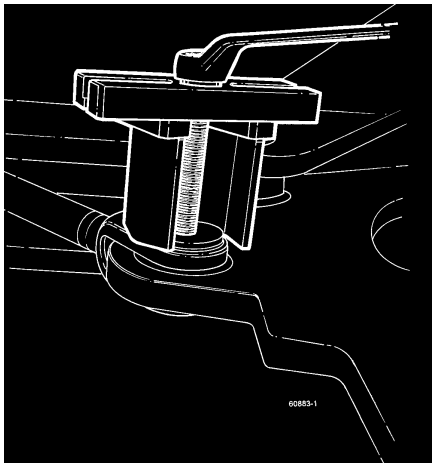

Figure 2
Removing the front pin

3. Remove the steering cylinder hose connections.
   Compress the steering cylinder. Drain the fluid into a suitable receptacle.
   Plug all connections.

4. Remove the retaining ring from the rear steering cylinder pin. Withdraw the pin, using 999 3725 draw bolt and 999 3722 support. Twist the steering cylinder and lift it out of the frame.

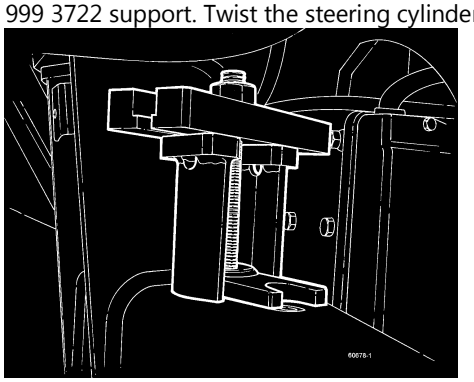

Figure 3
Removing the rear pin

5. Clamp the steering cylinder in a vice. Use soft protective jaws to avoid deforming the cylinder.

6. Remove the piston rod guide using a hook spanner diam. 76 mm and withdraw the piston rod from the cylinder. Collect the oil that runs out of the cylinder in a suitable receptacle.

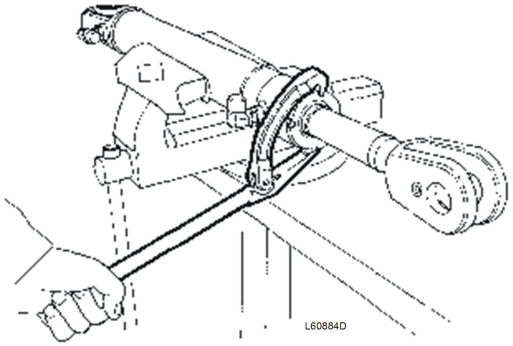

Figure 4
Removing the piston rod guide

7. Clamp the piston rod in a vice, drive out the lock pin and undo the nut.

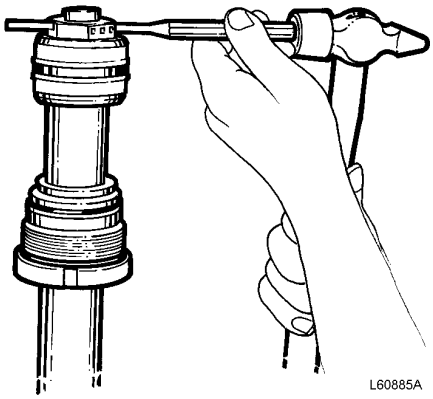

Figure 5
Driving out the lock pin

8. Remove piston and piston rod guide. Clean and inspect for damage and wear. Change seals.

9. Remove the retaining rings and withdraw the link bearing with socket 999 3712, draw bolt 999 3714, nut 999 3717 and drift plate 11 667 060.

Assembling

10. Fit the link bearing and retaining rings, using socket 999 3712, draw bolt 999 3714, nut 999 3717 and drift plate 11 667 060.

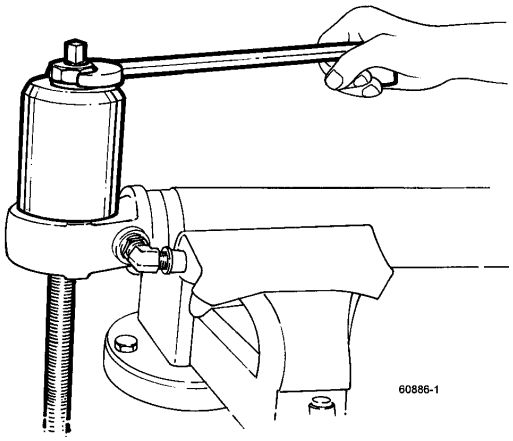

Figure 6
Fitting link bearing and retaining rings

11. Fit the piston rod guide on the piston rod and fit the piston.
    Tighten the nut.
    Tightening torque: **200 ±25 Nm (148 ±18 lbf ft)**
    Secure the piston with spring pins.
    NOTE!
    If the existing piston - piston rod hole does not fall within the prescribed torque, the piston must not be turned back. A new hole should be drilled for securing the piston with spring pins.

12. Fit the piston rod in the cylinder and tighten the piston rod guide.
    Tightening torque: **200 ±25 Nm (148 ±18 lbf ft)**

Changing the steering piston rod link bearing in the front frame

13. Withdraw the link bearing, using draw bolt 999 3714, socket 999 3712, drift plate 11 667 050 and speed nut 999 3717.

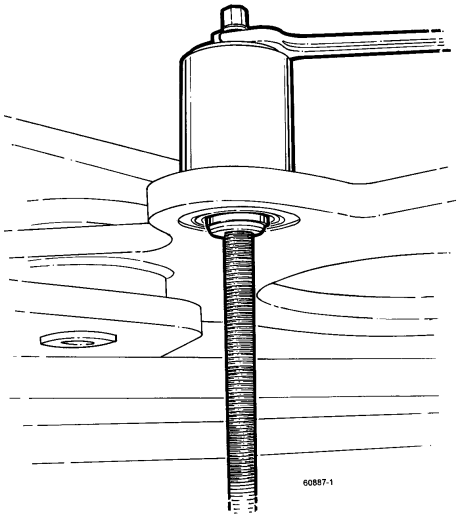

Figure 7
Changing the link bearing

14. Pull in the new link bearing using the same tools as when withdrawing the old one.
    NOTE!
    The bearing must be centred in the frame.

Installing

15. Lift the steering cylinder into the frame, fit the link bearing seals and line up the cylinder with the hole in the frame.

16. Fit the pin. Use plate 999 3686 and draw bolts 999 3714, 999 3725.

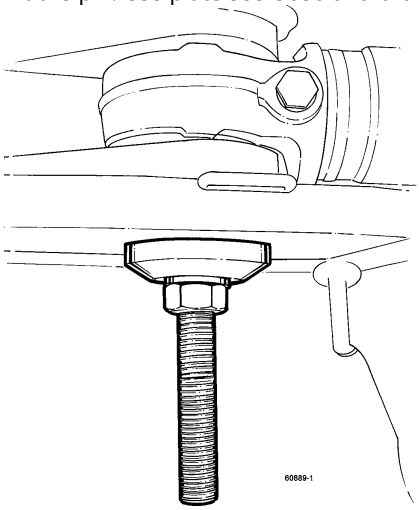

Figure 8
Fitting the rear pin

17. Pull out the piston rod and line it up with the hole in the frame. Fit the shims.

18. Insert the locating screw in the fork and fit the pin in place.
    NOTE!
    Fitting will be easier if the pin is chilled.

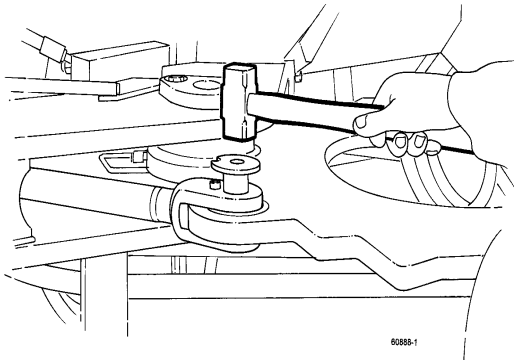

Figure 9
Fitting the front pin

19. Fit the grease nipple in the pin.

20. Attach the hydraulic hoses to the steering cylinder. Attach the lubrication pipe to the rear steering cylinder pin. Lubricate the pins.

21. Start the engine and drive the machine back and forth a few times, steering at full left and full right lock in order to bleed the steering cylinder.

22. Check that no leakage occurs and refit the cover plate.

Document Title: **Steering pressure and holding pressure, checking and adjusting**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/4/8 0**
Profile:			

Steering pressure and holding pressure, checking and adjusting

Op nbr 64515

11 666 020 Pressure gauge 0 –25 MPa (0–3625 psi)
11 666 037 Hose

The following applies when checking:	
Temperature:	**Normal operating temperature.**[T1]
Engine speed:	**Low idle speed**
Steering pressure:	**21.0 ±0.5 MPa (3045 ±72.5 psi)**
Holding (stand-by) pressure:	**2.8 ±0.4 MPa (406 ±58 psi)**

[T1]Achieved in about 15 minutes on a haulage run.

WARNING

Do not work under the machine when the engine is running.

Checking the steering pressure

1. Connect the frame joint lock.

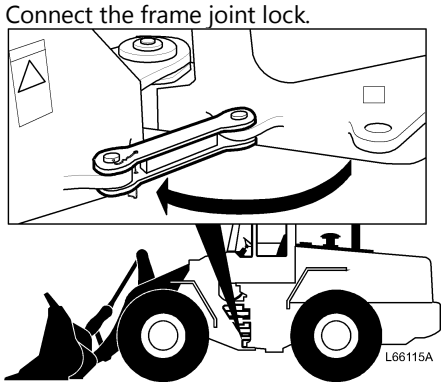

Figure 1

2. Connect a pressure gauge to the pressure outlet on the steering valve.

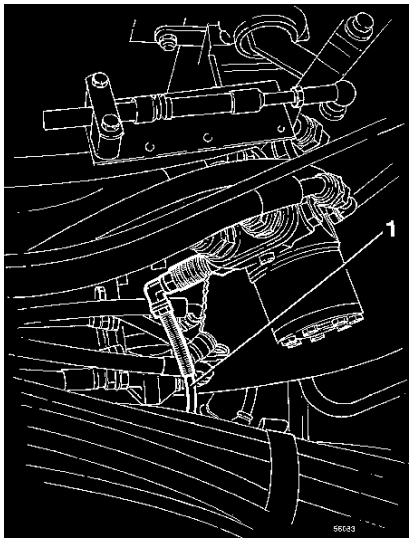

Figure 2
Checking the steering pressure

1. Hose 11 666 037 with pressure gauge 11 666 020

3. Start the engine and let it run at low idle.

4. Steer to frame joint locking and check the maximum steering pressure.

Adjusting

5. Any necessary adjustment should be carried out on the central valve.

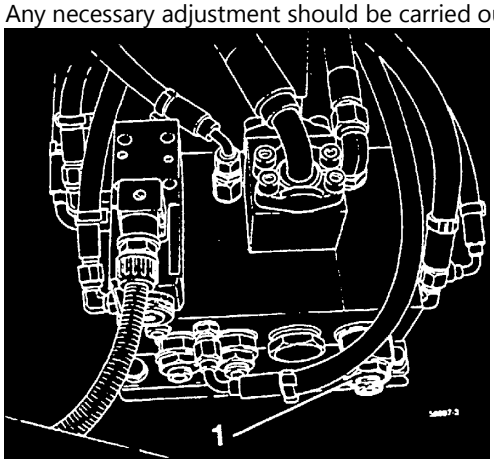

Figure 3
Central valve

1. Adjusting steering pressure

Checking holding pressure

6. Connect a pressure gauge to the pressure outlet on the control valve.

7. Start the engine and let it run at low idle.

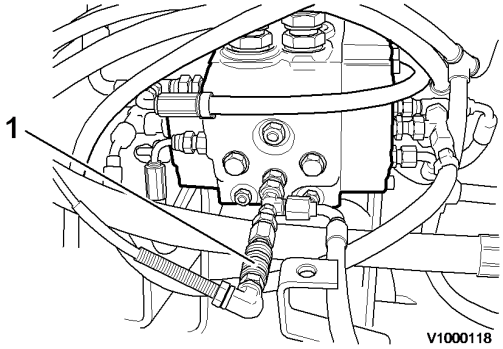

Figure 4
Checking hold (stand-by) pressure

1. Hose 11 666 037 with pressure gauge 11 666 020

8. Read off the holding pressure.
   NOTE!
   Use pressure gauge 0-25 MPa (0-3625 ps). If the brake system starts charging, the pressure in the outlet will rise to approx. 16.5 MPa (2392.5 psi). Wait then while the pressure in the brake system builds up, following which the holding pressure can be checked (see Section 5 for further information).

Adjusting

9. Carry out adjustment with the adjusting screws on the relevant pump's flow compensator, as follows.

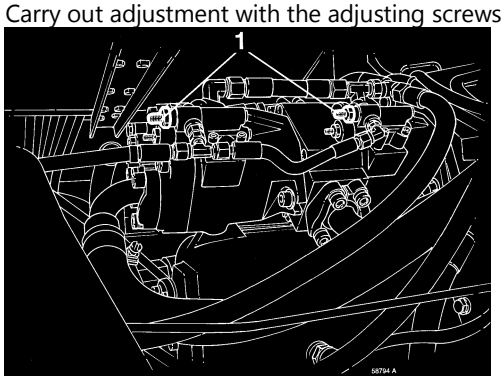

Figure 5
Hydraulic pump

1. Adjusting holding pressure

10. Unscrew the protective caps from the adjusting screws. Slacken the lock nuts and back off both adjusting screws about one turn so that a lower pressure than the specified holding pressure is obtained.

11. Observe the pressure gauge and adjust to the correct pressure on the first pump. Lock the adjusting screw.
    Adjust the other pump until the pressure starts to increase. Then adjust it further so that the pressure drops to that attained by the first pump. Lock the adjusting screw.

Document Title: **Steering valve, description**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/4/8 0**
Profile:			

Steering valve, description

The steering valve is of non-reaction type with closed centre. "400" in the designation indicate that it delivers 400 cm3 (24.4 in3) of oil per steering wheel turn. The steering valve has a load-sensing outlet (LS) from which a steering pressure is obtained for the central valve's LSS connection. This steering pressure goes from the central valve LS connection to the flow compensator on pumps 1 and 2.

Function

When the steering wheel is held stationary, the steering valve is in the neutral position and holding pressure (stand-by pressure) is obtained from pump P1 by means of the flow compensator. P1 is angled down and supplies no fluid to the steering system. P2 is also angled down and supplies no fluid to the brake and servo systems nor to the working hydraulics. P2 also maintains holding pressure which is as high as P1.

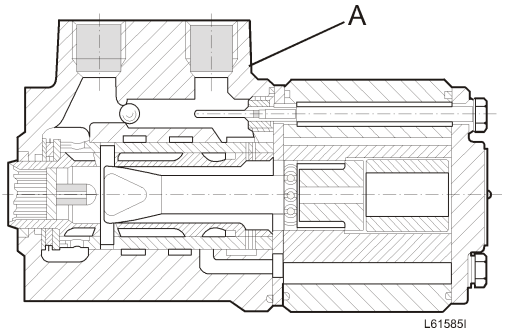

Figure 1
Steering valve

A. Punched marking, week/year, e.g. 416 (week 41 year 1996)

When the steering wheel is turned in any direction, it causes turning of the inner and outer spools. When this turning amounts to 1.5°, the ducts to the metering unit (rotor and rotor ring) and the load-sensing port (LS) begin to open.

At 6° turning the channels to the metering unit and load-sensing port are fully open. Turning of the inner and outer spools is limited to ± 8–9°.

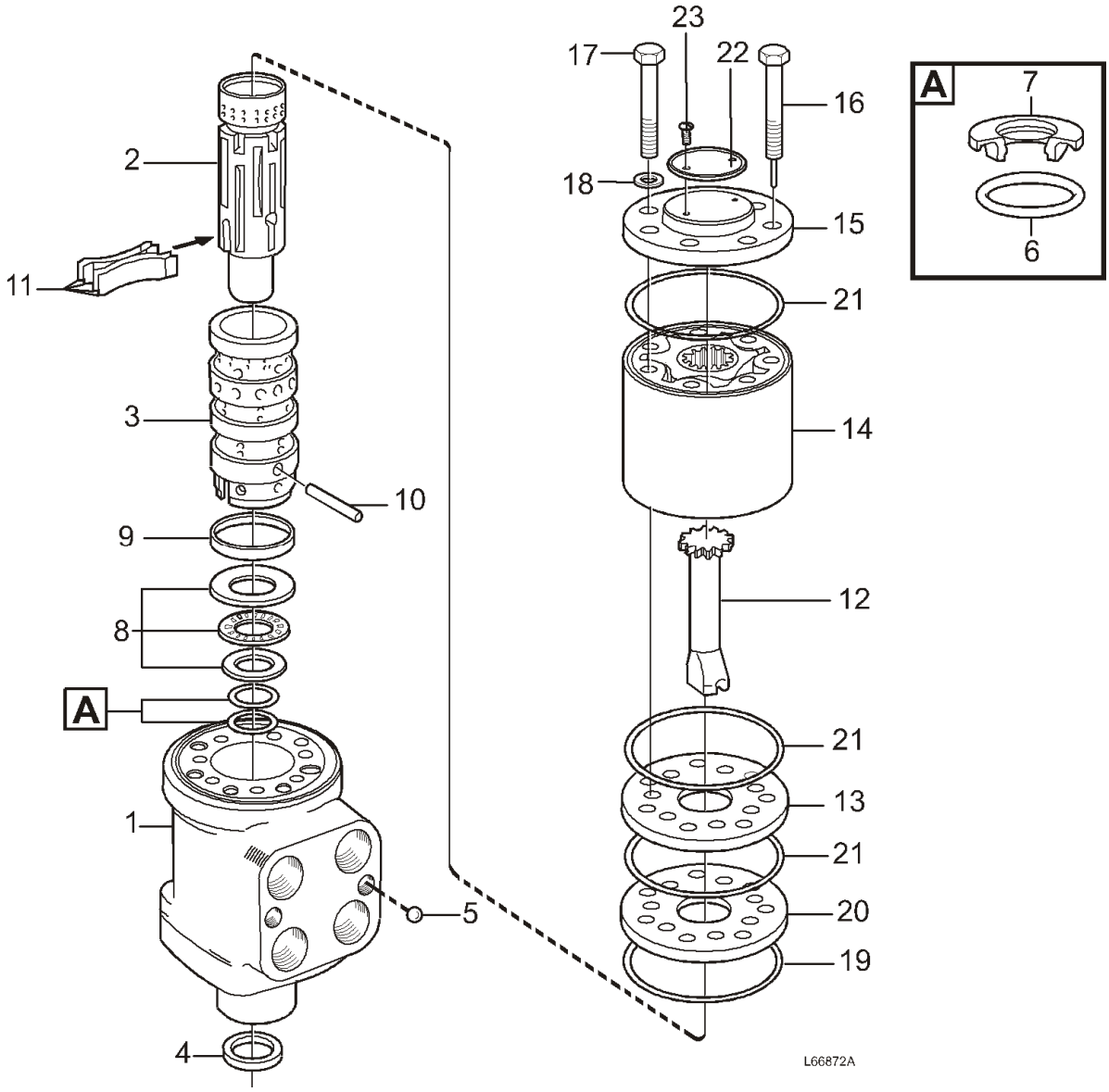

Figure 2
Steering valve

1	Valve housing	13	Distribution plate
2	Inner valve spool	14	Rotor and rotor ring
3	Outer valve spool	15	Cover
4	Seal	16	Screw with guide pin
5	Ball (non-return valve)	17	Screw
6	O-ring	18	Washer
7	Sealing ring	19	O-ring
8	Thrust bearing	20	Distribution plate
9	Ring (retainer)	21	O-ring
10	Cross-pin	22	Type plate
11	Leaf springs	23	Blind rivet
12	Rotor shaft	A	Seal

Steering

Neutral position

The steering valve (7) is in the neutral position. The LS-line (8) then has only increased tank pressure. Pressure builds up in

the outlet line (10) and pressure line (11). The pressure goes past the pressure reducing spool (5). Approx. 0.3 MPa (43.5 psi) is required to overcome the spring force and the spool closes. Owing to the permitted internal leakage across the slide (5), the pressure arriving at the steering valve (7) will be much higher, although not the same as holding pressure.

NOTE!

The holding pressure cannot be measured on the steering valve's pressure check connection, see [Invalid linktarget] .

The pressure compensator (2) for working hydraulics is held in its lower position by the spring (13). The spring (15) balances the flow compensator valve spool (14) so that fluid can flow out to the control piston (16), which reduces the angle of the swash plate. The spring (17) acts on the swash plate in the opposite direction to the control piston but with less force. The pressure from the pump is regulated to a pressure which is dependent on the force of the spring (15) plus the pressure in the LS-line (8), which in neutral is equal to the increased pressure in the tank (0.6 MPa (87 psi)). A pressure difference is thus created between the lines (8 and 10) which is the same as the holding pressure. Adjustment of the holding pressure is performed on the adjusting screw (18).

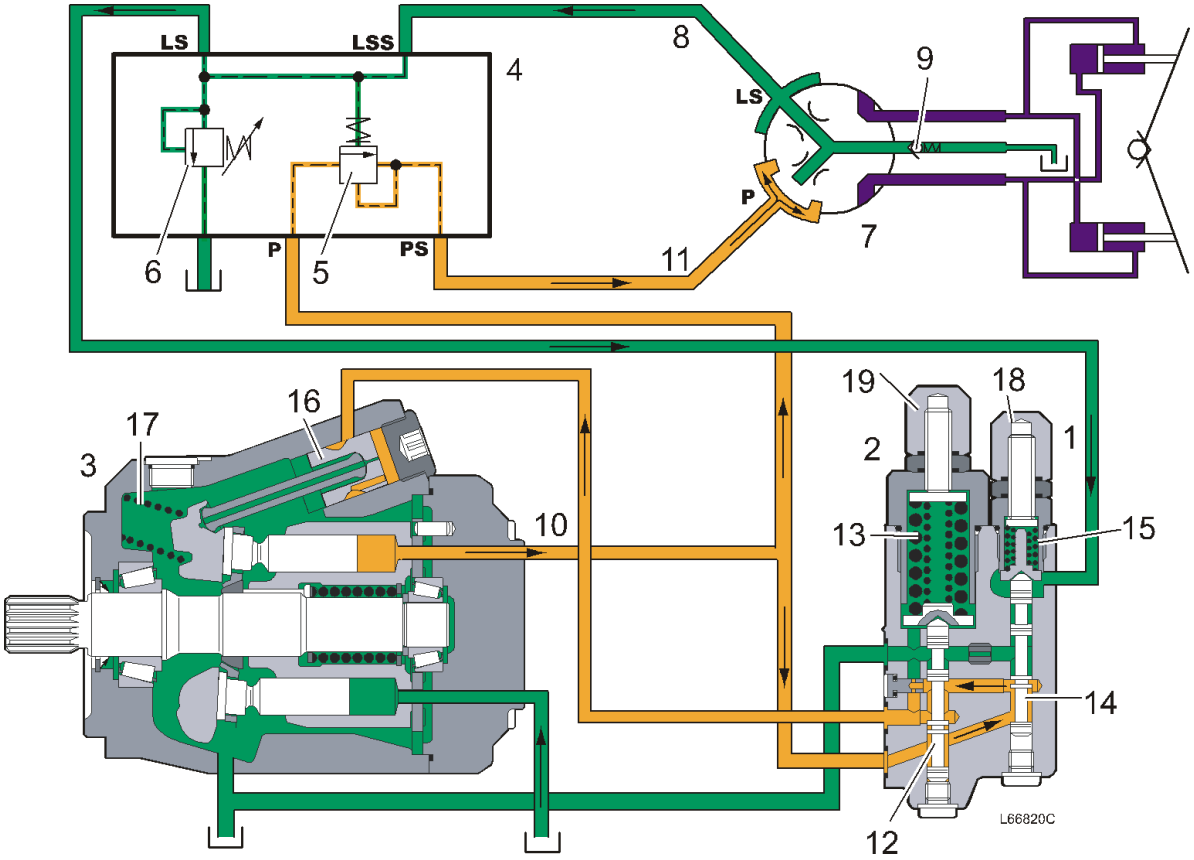

Figure 3
Steering system

1	Flow compensator	11	Pressure line
2	Pressure compensator, working hydraulics	12	Pressure compensator spool
3	Pump 1	13	Spring
4	Central valve, simplified	14	Flow compensator spool
5	Pilot-controlled pressure reducing spool	15	Spring (2)
6	Pressure-reducing valve for max. steering pressure	16	Control piston
7	Steering valve	17	Spring
8	Load-sensing line LS	18	Adjusting screw, holding pressure
9	Pressure back-up valve	19	Adjusting screw, max. working hydraulics pressure
10	Outlet line		

Green	Return, no pressure
Violet	Trapped fluid

Orange	Hold (stand-by) pressure

Steering

The LS line obtains communication with one of the motor ports (the pressure port) on the steering valve (7). The LS pressure goes in at the rear of the priority valve and, together with the spring force, presses the spool down and redirects the fluid to the steering system. The steering system thus takes priority over the brake, servo and working hydraulics systems.
Simultaneously, the LS pressure goes in at the rear of the pressure-reducing spool (5) and, together with the spring force, presses it down and opens the connection to the steering valve.
The LS pressure then continues to the top of the flow compensator spool (14) and, together with the spring force, presses it to a balanced position against the pressure in the outlet line (10). By draining the fluid to the control piston (16), the flow compensator spool controls the angle of the pump's swash plate so that the pump delivers a volume of fluid that is proportional to steering movement and steering speed.
The increase in fluid flow is balanced via the balancer piston and spring (17), which act on the swash plate in the opposite direction to the control piston.

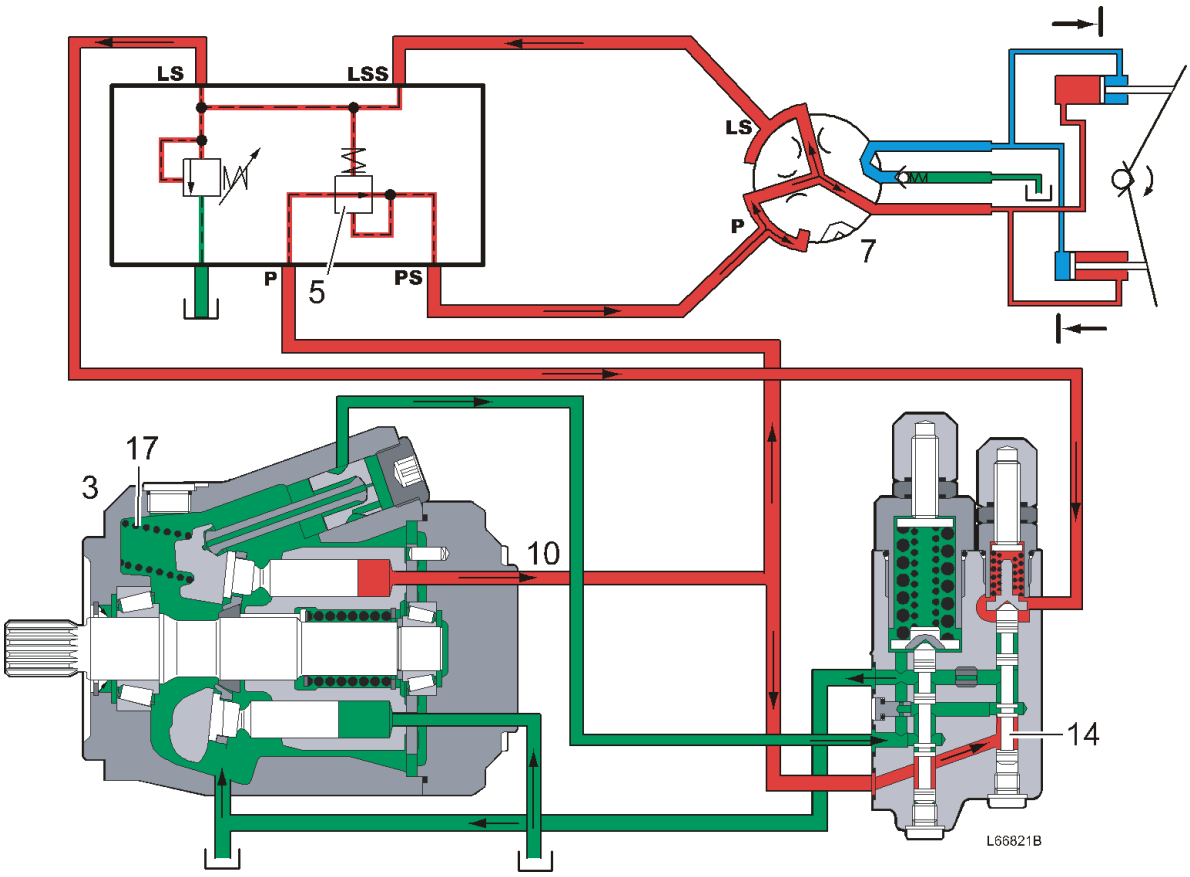

Figure 4
Steering, normal

3	Pump 1	Red	Pressurized fluid
5	Pilot-controlled pressure reducing spool	Blue	Increased return pressure
7	Steering valve	Green	Return, no pressure
10	Outlet line		
14	Flow compensator spool		
17	Spring		

Steering against lock (end) position

When the pressure in the LS line rises to maximum steering pressure, the pressure-limiting valve (6) opens. When this happens the pressure-reducing spool (5) closes and cuts off the flow up to the steering valve (7). The pump pressure opens the priority valve.
The LS pressure also goes in to the top of the flow compensator spool (14). The output pump pressure acts on the underside of the spool (14) and overcomes the LS pressure plus spring force owing to the difference in pressure between the output

pump pressure and the LS pressure. The fluid is directed to the control piston (16). The angle of the swash plate is reduced and with it the flow, but maximum steering pressure is retained.
Adjustment of maximum steering pressure is carried out on the pressure- limiting valve (6).

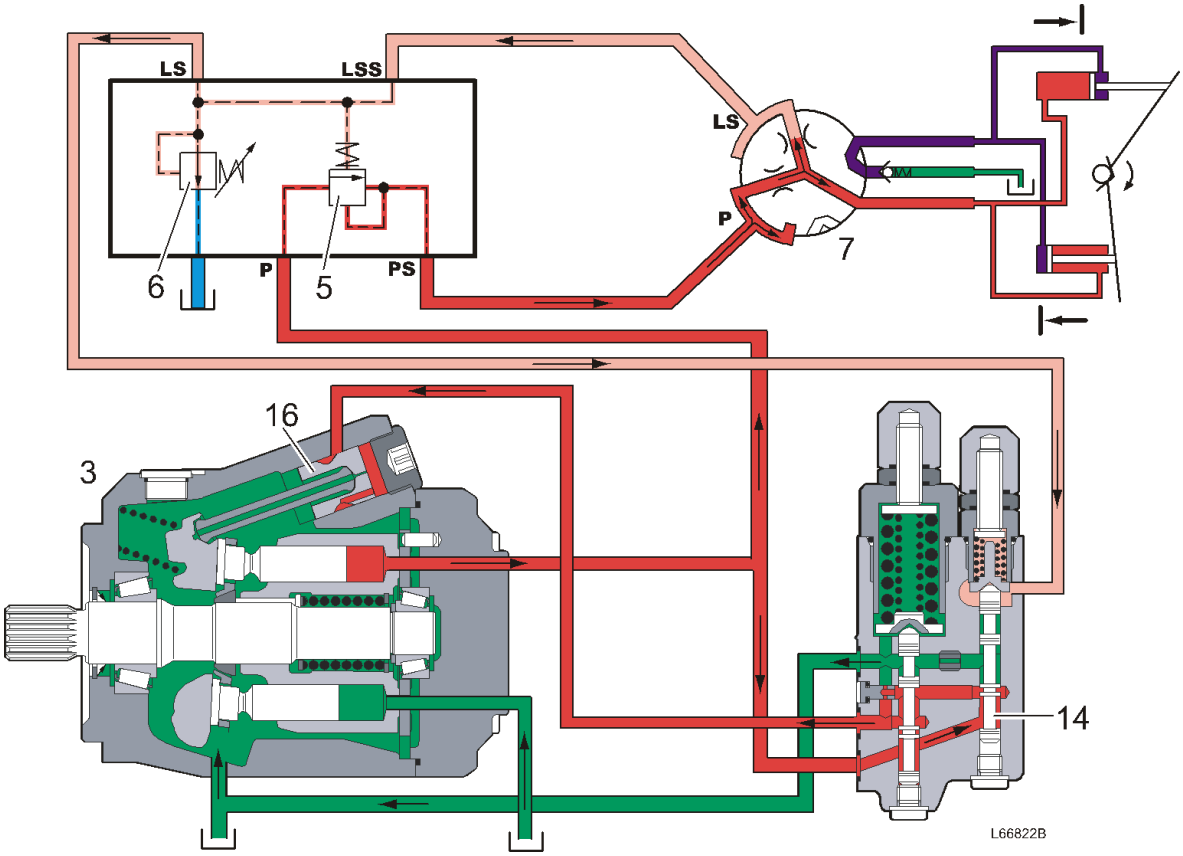

Figure 5
Steering against lock (end) position

3	Pump 1	Red	Pressurized fluid
5	Pilot-controlled pressure reducing spool	Pink	LS pressure
6	Pressure-reducing valve for max. steering pressure	Blue	Increased return pressure
7	Steering valve	Green	Return, no pressure
14	Flow compensator spool		
16	Control piston		

Document Title: **Steering valve, reconditioning**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/4/8 0**
Profile:			

Steering valve, reconditioning

Op nbr 64581

6999 007 Handle
6999 025 Plate
6999 034 Plate

Dismantling

1. Mark the steering valve parts in relation to each other in order to facilitate assembling.
   Secure the steering valve in a vice. Use soft protective jaws.
   Remove the cover.

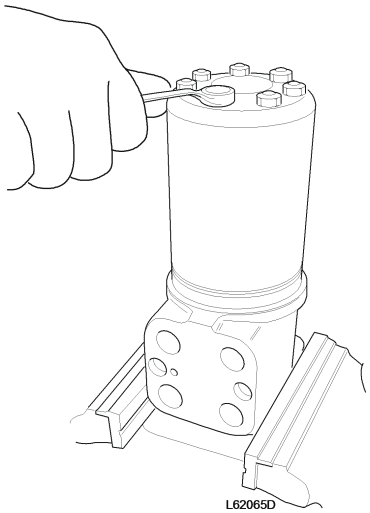

Figure 1

2. Remove the metering unit, rotor shaft and distribution plate.
   Remove the O-ring.

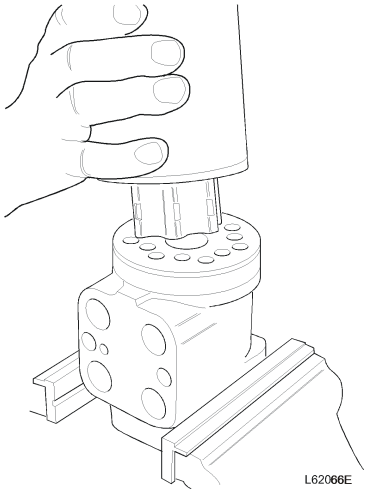

Figure 2

3. Remove the steering valve from the vice and remove the ball.

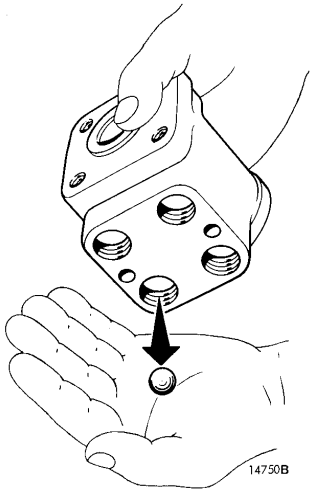

Figure 3
Removing ball

4. Remove the inner and outer spools.

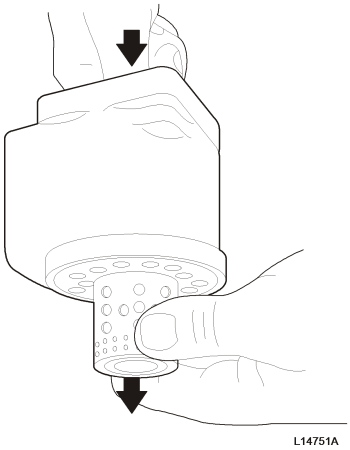

Figure 4

5. Remove the axial disc, needle bearing, bearing race and the ring.

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