VOLVO

Construction Equipment

Service Information

Document Title: **Description**	Function Group: **600**	Information Type: **Service Information**	Date: **2014/5/21**
Profile:			

Description

The L70B/L70C is provided with hydrostatic articulated frame steering consisting of two variable displacement hydraulic pumps connected in parallel, central valve, steering valve (ORBITROL) and two cylinders. The outlet ports of the steering valve are connected to the steering cylinder piston and piston rod ends respectively.

The two variable hydraulic pumps are mounted in tandem, connected in parallel and supply oil to the brake system, steering system, servo system and working hydraulics. Pump 1, which is fitted nearest to the transmission, gives priority to the steering system.
The oil is drawn from the hydraulic oil tank.

The purpose of the central valve is to distribute oil and pressure out to the brakes, steering, servo and working hydraulics.

For description of the central valve, see Section 9.

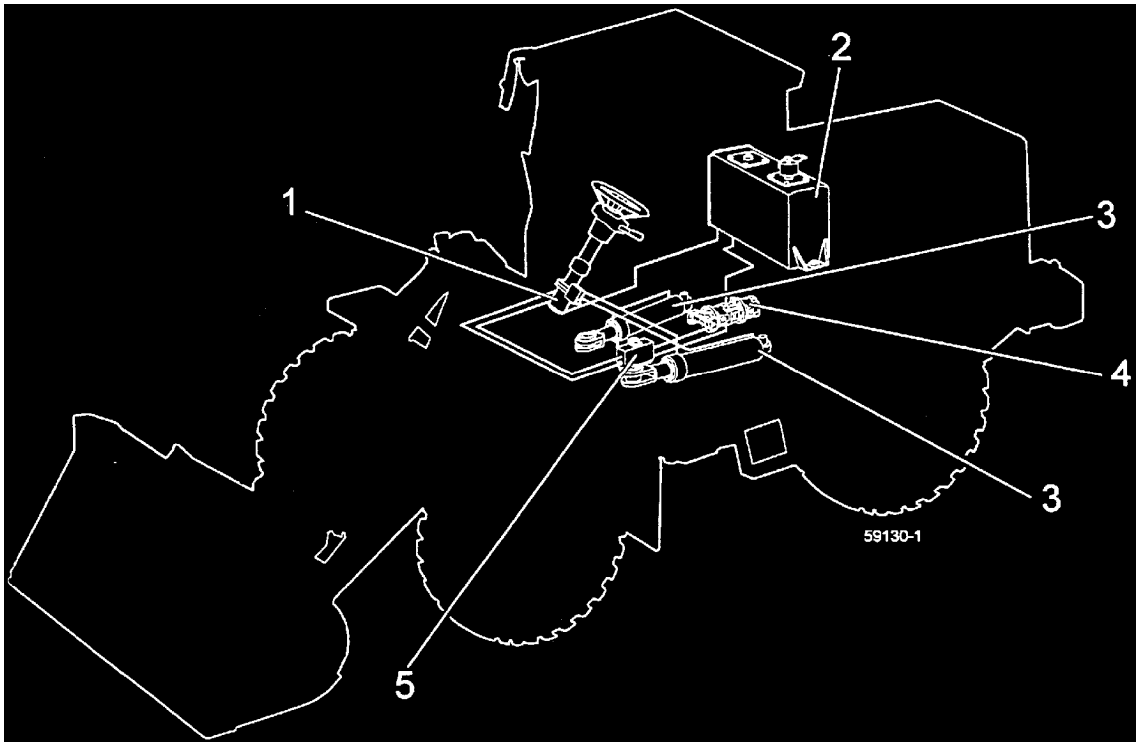

Figure 1
Steering system

1. Steering valve
2. Hydraulic oil tank
3. Steering cylinders
4. Hydraulic oil pump
5. Central valve

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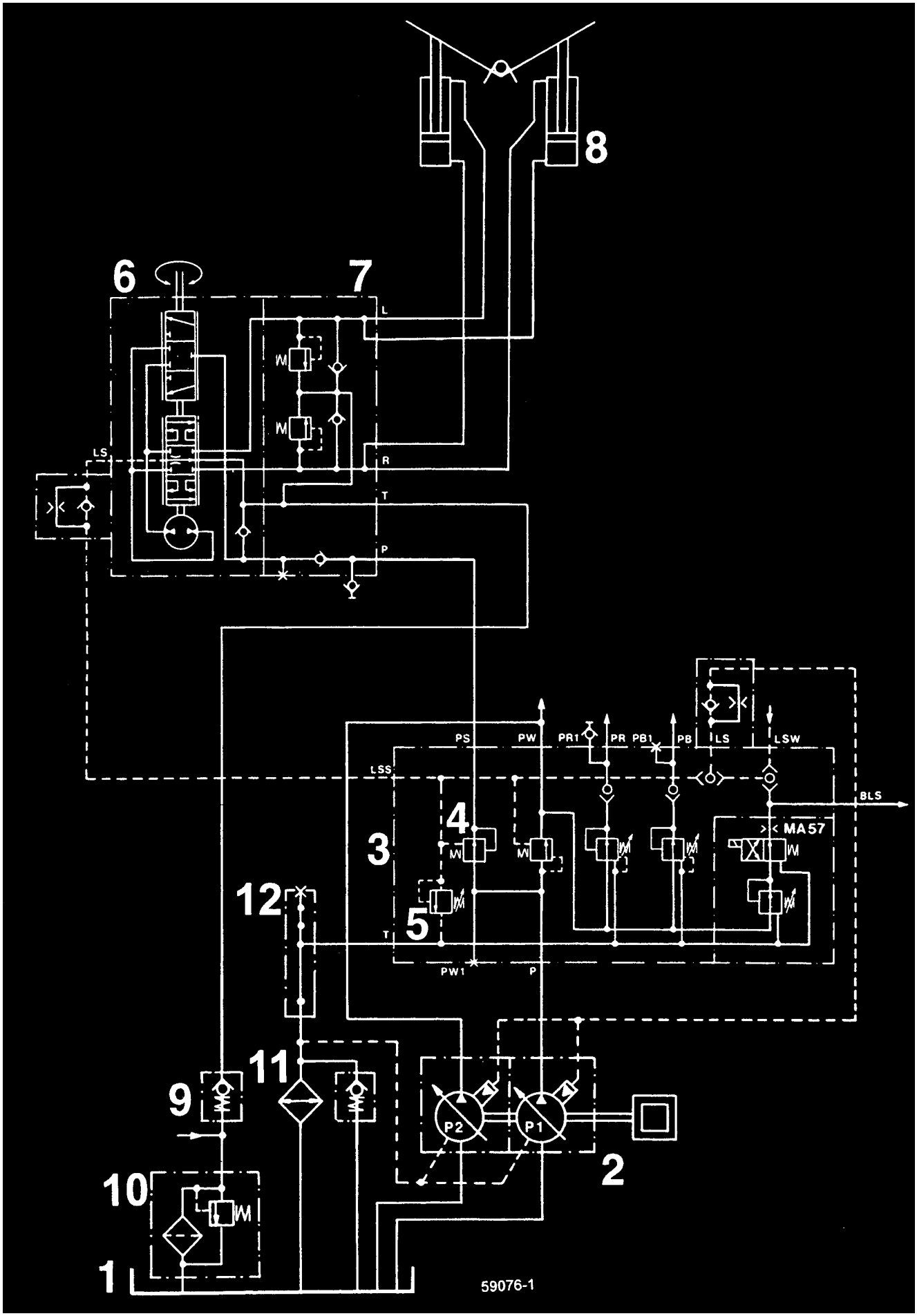
Document Title:	Function Group:	Information Type:	Date:
Hydraulic diagram, stering system	**640**	**Service Information**	**2014/5/21**
Profile:			

Hydraulic diagram, stering system


8
6
7
L
LS
R
T
P
PS
PW
PR1
PR
PB1
PB
LS
LSW
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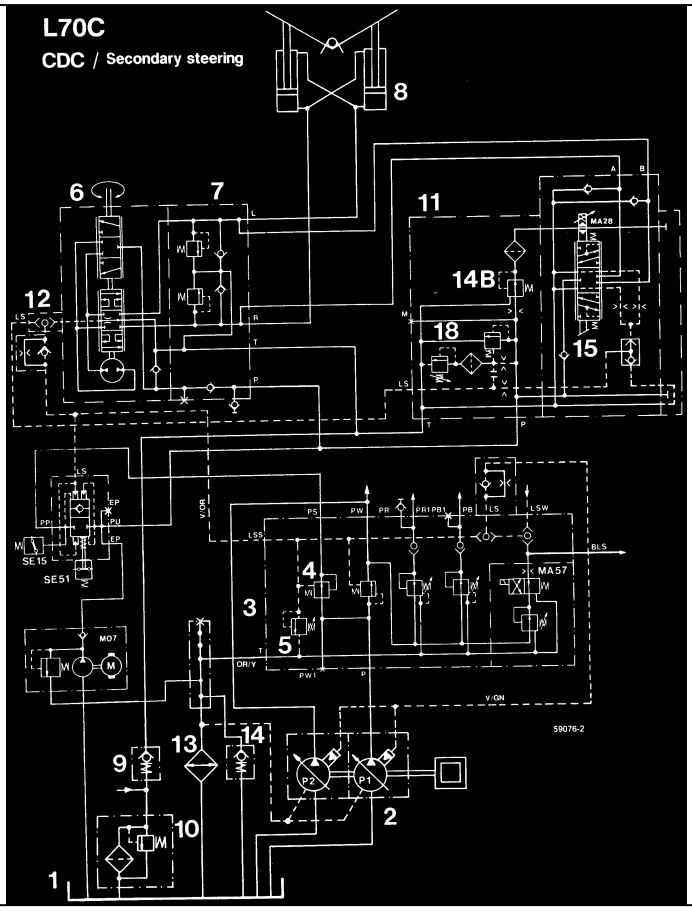
BLS
MA57
4
3
12
5
T
PW1
P
11
9
P2
P1
2
10
1
59076-1

Figure 1
Hydraulic diagram, steering system

basic machine

1. Hydraulic oil tank
2. Hydraulic oil pump 2 pcs
3. Central valve
4. Pilot-controlled pressure-reducing spool
5. Pilot valve for max. steering pressure, 21 MPa (3046 psi)
6. Steering valve (ORBITROL)
7. Valve block with shock and anti-cavitation valves, 28 ± 0.5 MPa (4061 ± 73 psi)
8. Steering cylinders
9. Back-up valve for return pressure, 0.6 MPa (87 psi) (positioned by hydraulic oil tank)
10. Return oil filter
11. Hydraulic oil cooler with by-pass valve
12. Return block (positioned under the cab)


L70C
CDC / Secondary steering
8
6
7
11
14B
12
18
15
MA28
MA57
SE15
SE51
MO7
3
4
5
9
13
14
10
2
1
59076-2

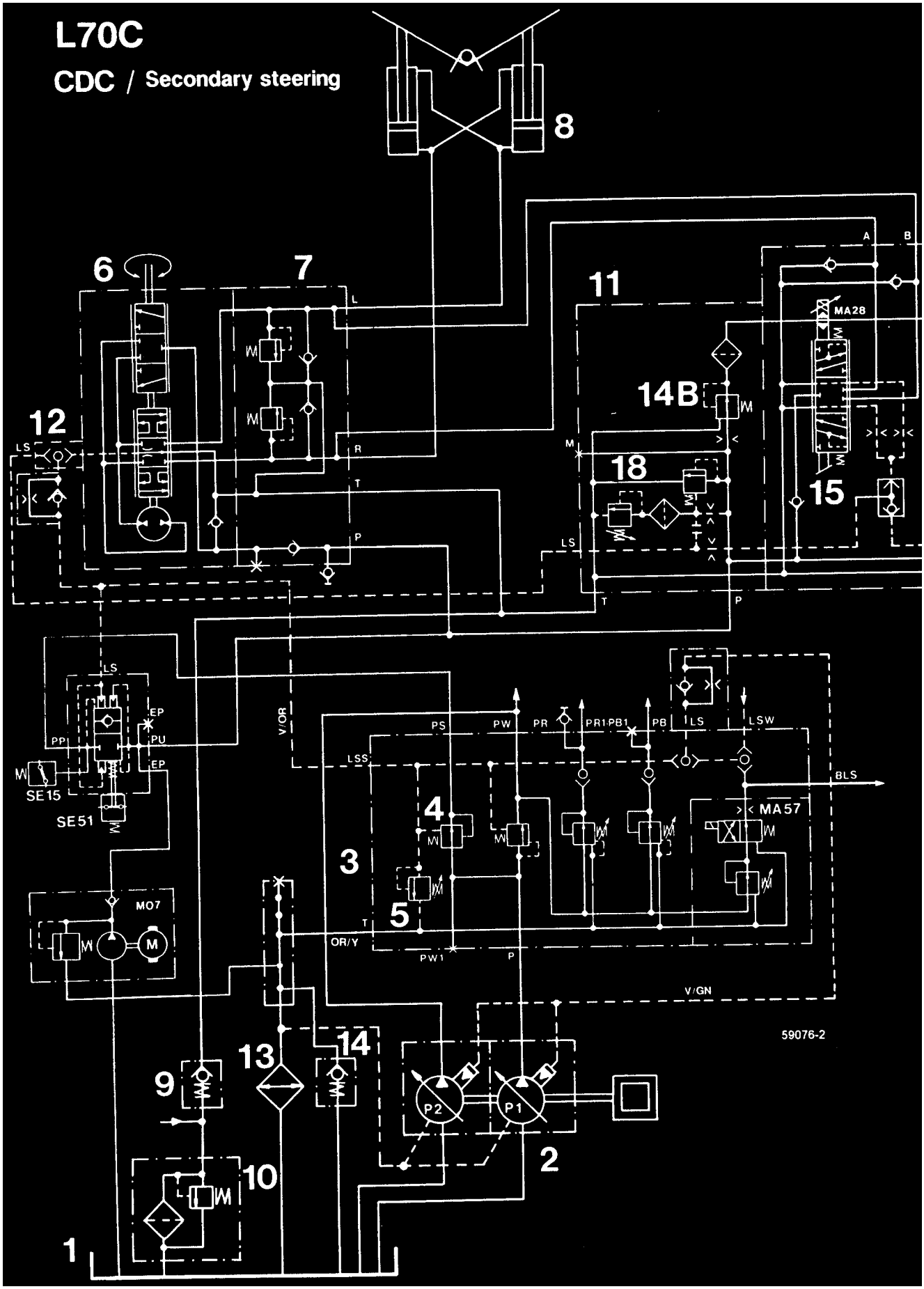


Figure 2
Hydraulic diagram, steering system

Basic machine	
Lever steering (CDC *)	
Secondary steering	
1	Hydraulic oil tank
2	Hydraulic oil pumps, 2 pcs
3	Central valve
4	Pilot-controlled pressure-reducing spool
5	Pilot valve for max. steering pressure, 21 MPa (3046 psi)
6	Steering valve (ORBITROL)
7	Valve block with shock and anti-cavitation valves 28 ±0.5 MPa (4061 ±73 psi)
8	Steering cylinders
9	Back-up valve for return pressure 0.6 MPa (87 psi) (positioned by hydraulic oil tank)
10	Return oil filter
11	Steering valve, lever steering (CDC *)
12	Shuttle valve *
13	Hydraulic oil cooler
14	By-pass valve for hydraulic oil cooler
14B	Pressure-reducing valve
15	Valve spool
18	Pressure-limiting valves (are not used)
MO7	Secondary steering motor/pump
SE15	Steering pressure, secondary steering
SE51	Differential pressure, secondary steering
*) Optional equipment	

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Document Title: **Control valve**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/5/21**
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Control valve

Description

When the steering lever is actuated, an electrical signal is passed via ramp generators CU20 or CU22 to control unit 25 on the control valve (11 volts or lower for steering to the left, 13 volts or higher for steering to the right), see also Fig.

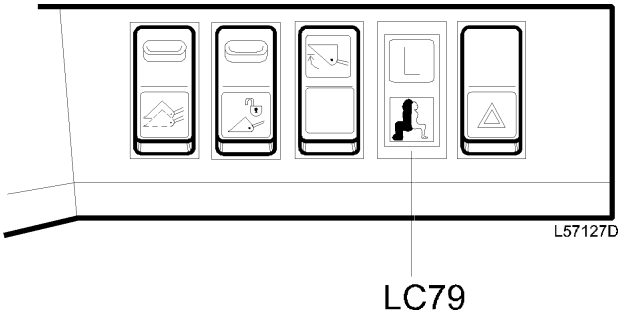

Figure 1

LC79	Control lamp, CDC

Two of solenoid valves 21 - 22 or 23 - 24 in the control unit become activated which means that oil is admitted at one or the other end of control spool 15, which is displaced and opens for a controlled oil flow to one of the steering cylinders. The position sensor 27 sends signals back to the control unit and indicates the position of the spool. Oil is admitted until control spool 15 has been displaced in proportion to the lever deflection and thereby the desired steering speed has been reached.

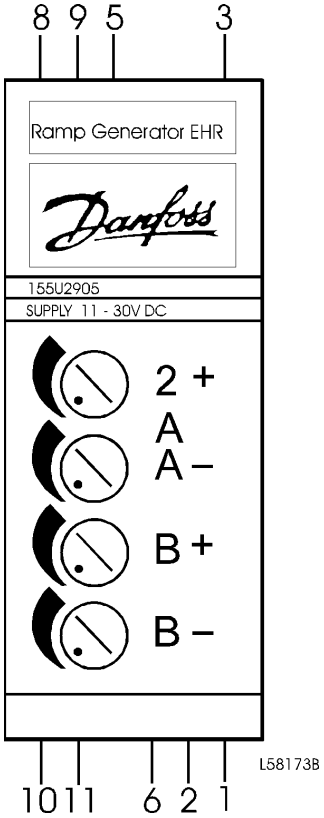

Figure 2
Ramp generator CU20/CU22 circuit board

When the spool has taken up the position which corresponds to the signal to the control unit, the control unit interrupts the feed to solenoid valves 21 or 23 depending on the steering direction.

On the control unit of the control valve there is a light-emitting diode 28 which gives off a green light when steering. Should the control spool become stuck in an actuated position, when the steering lever is returned to neutral, the diode changes colour to red. Should such a fault arise, the machine continues to steer even though the steering lever is not actuated.

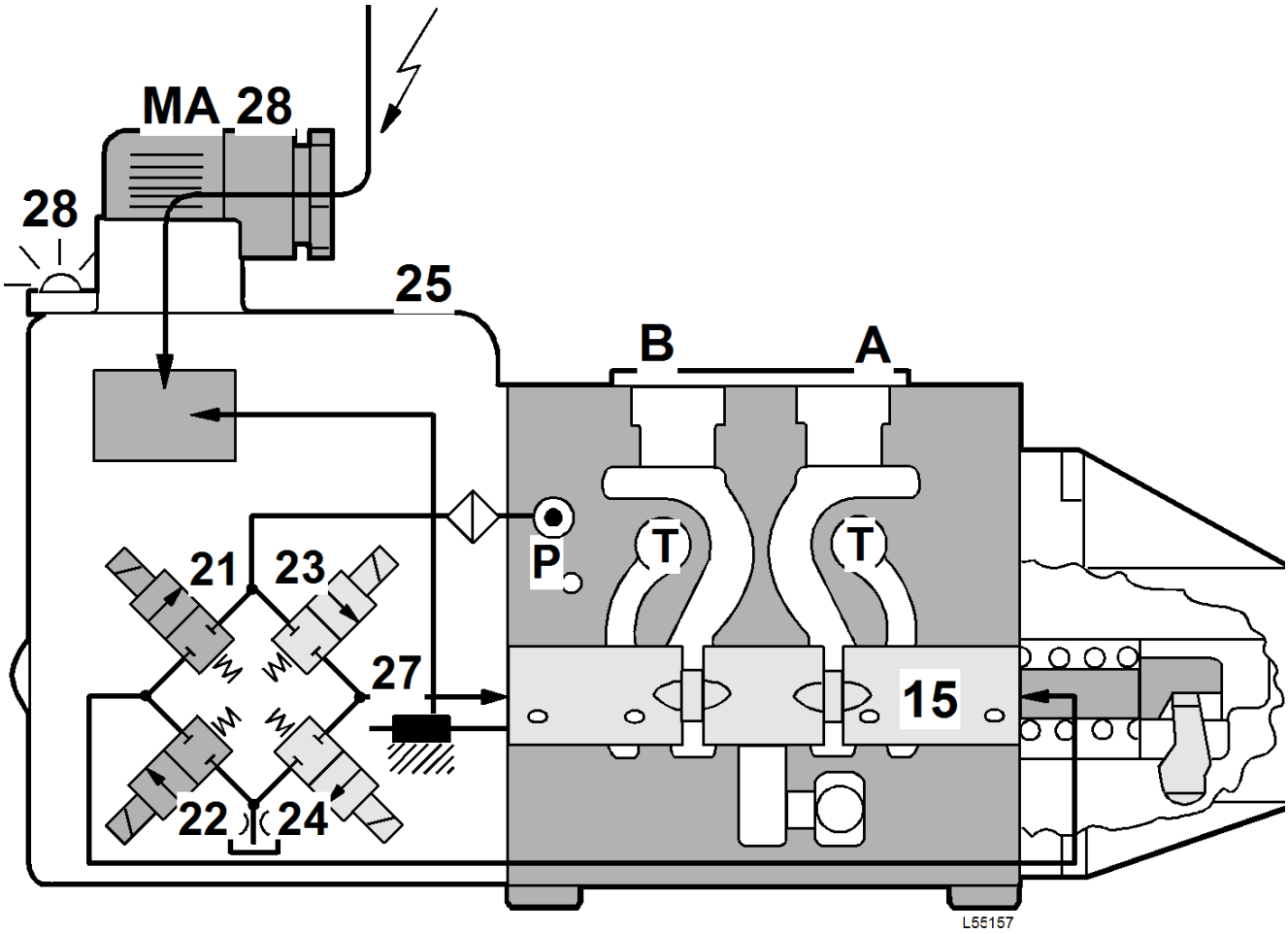

Figure 3
Control valve with control unit

15	Control spool
21-24	Solenoid valve
25	Control unit CU3
27	Position sensor
28	Light-emitting diode

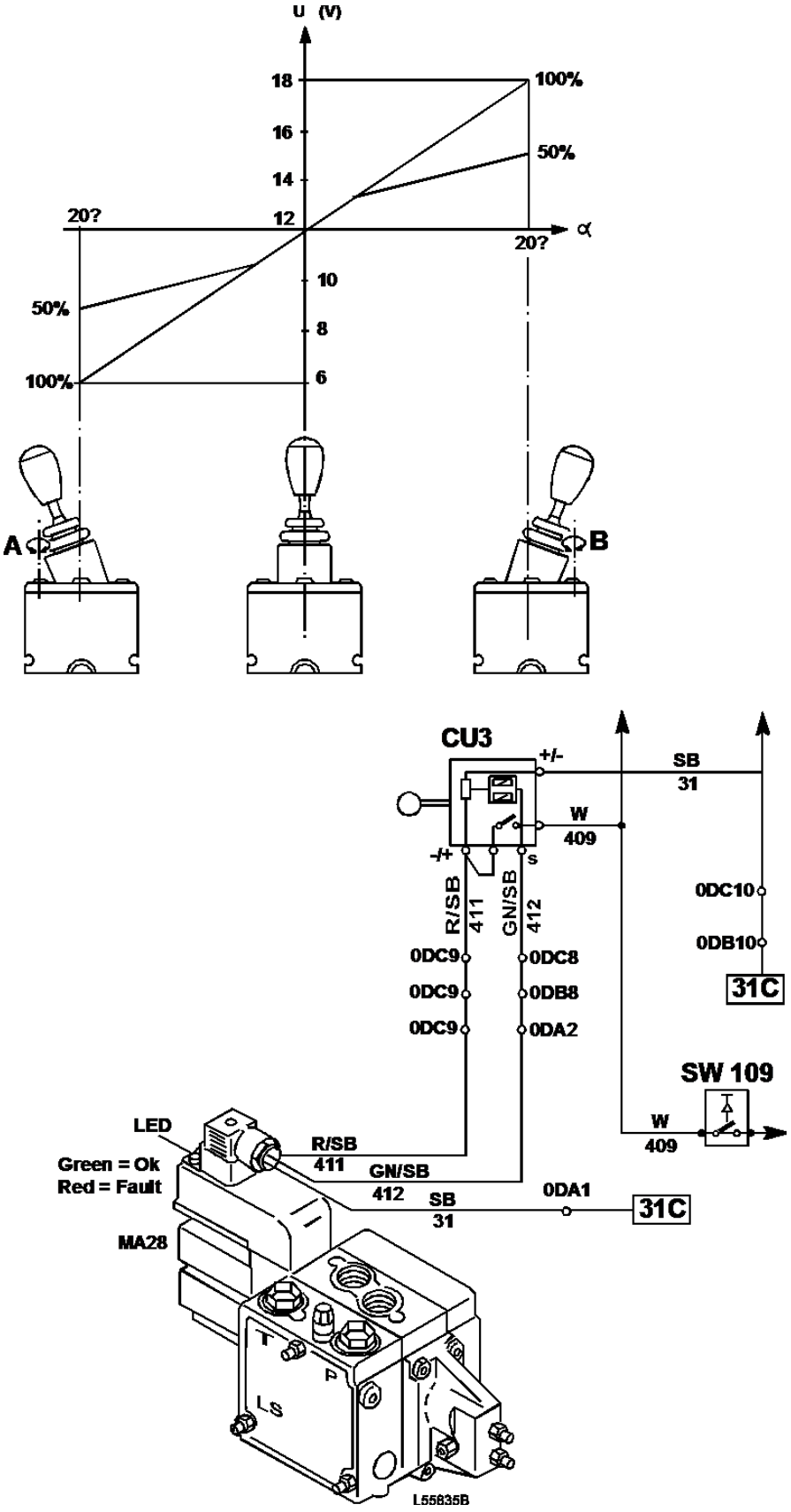

Figure 4
Adjusting screws for steering speed

A. Steering to the left
B. Steering to the right

Basic setting of steering speed at 1500 rpm 3.5 - 4.0 secondsbetween full steering locks.

Clockwise adjustment will increase the speed

Counter-clockwise adjustment will reduced the speed

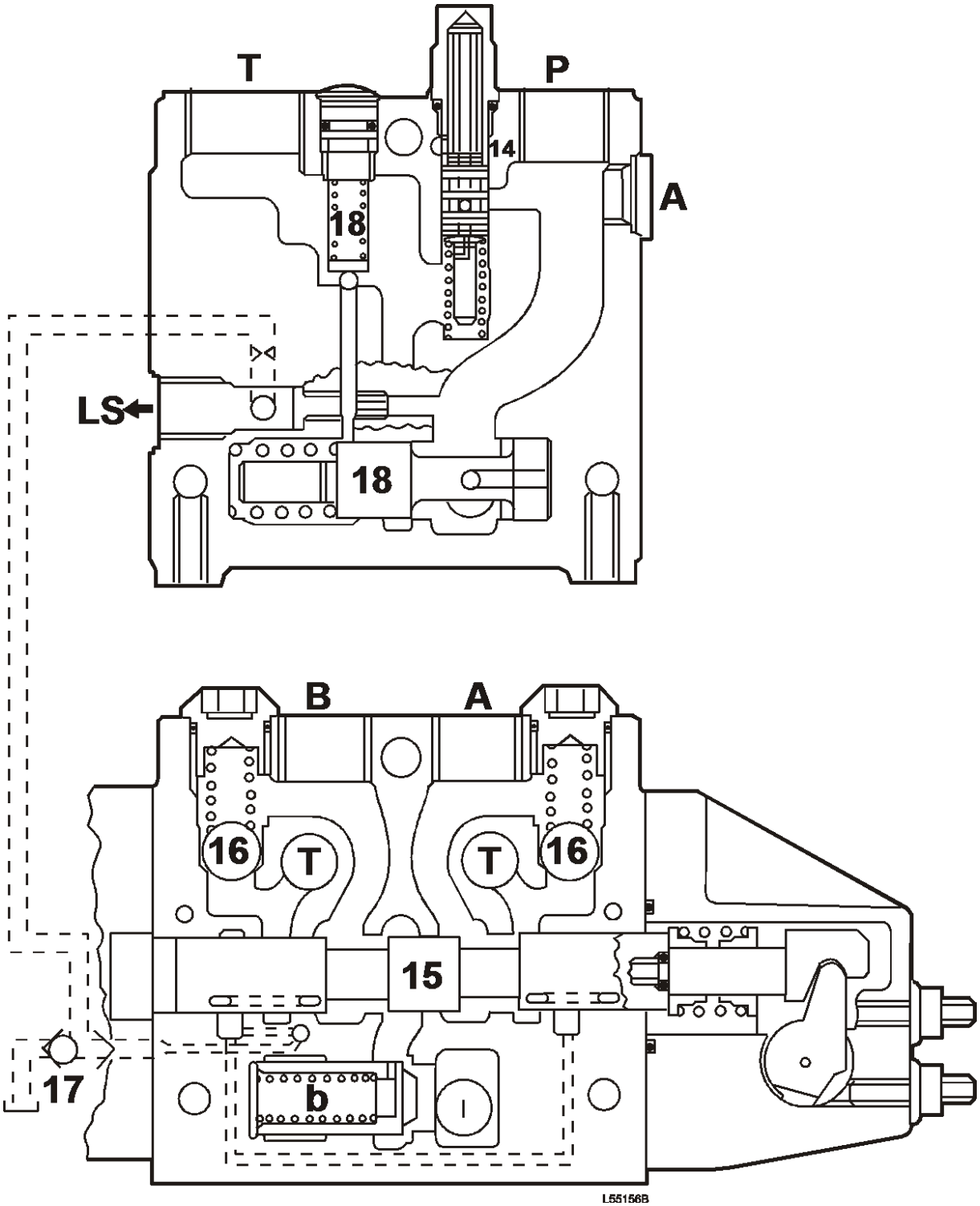

Figure 5

Control valve, lever steering	
14	Pressure-reducing valve
15	Control spool

16	Anti-cavitation valves
18	Pressure-limiting valves, blocked
b	Non-return valve

Document Title: **Hydraulic pump**	Function Group: **645**	Information Type: **Service Information**	Date: **2014/5/21**
Profile:			

Hydraulic pump

see fig Figure 1, Figure 2and Figure 3

The pump is a nine-cylinder axial piston pump with variable flow. The principle for such a pump is shown in Fig.Figure 1
Drive shaft 9 turns taking with it cylinder block 6, pistons 7 and swash plate 8. The stroke of the pistons is dependent on the angle of yoke 10. The angle is determined by the difference between the pressure from control piston 8 and spring 7, Fig. Figure 2.
When the piston has turned in its innermost position and is on its way outward, it passes a bow-shaped groove 4 in distribution plate 5, Fig.
The oil is sucked (or more correctly forced by the atmospheric pressure) from inlet port 3 via inlet groove 4 into the cylinder. When the piston has passed its outermost position and is on its way into the cylinder, the oil is forced out through outlet groove 2 and further on to outlet port 1.

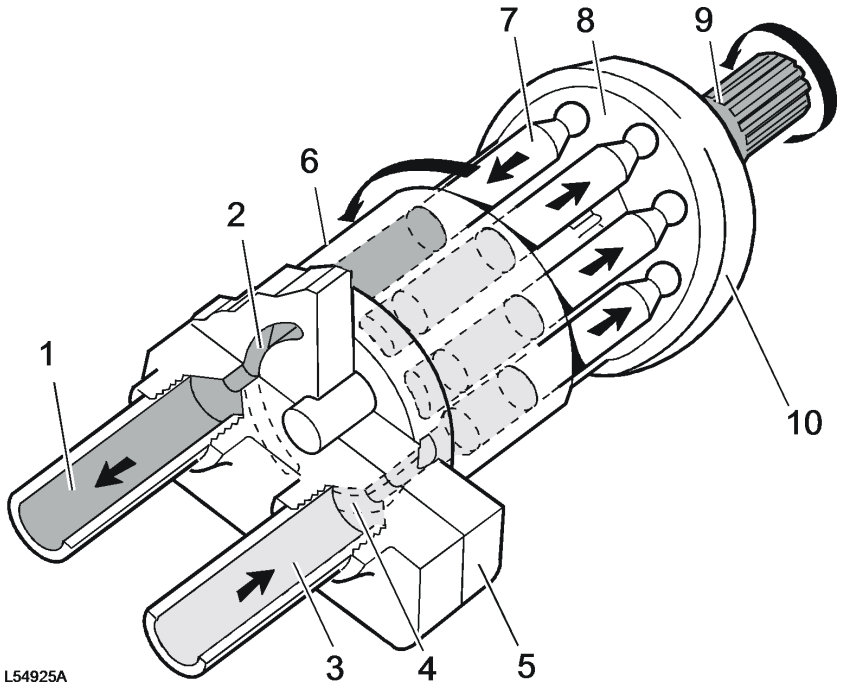

Figure 1
Hydraulic pump

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 axle
10. Yoke

Pressure / flow compensator

see Fig Figure 2

The purpose of the flow compensator is always to control the pump via control piston 8 and spring 7, Fig, so that the pump supplies an oil flow, the pressure drop of which in the system corresponds to a set pressure difference between the pump outlet and the load-sensing port on the compensator.

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

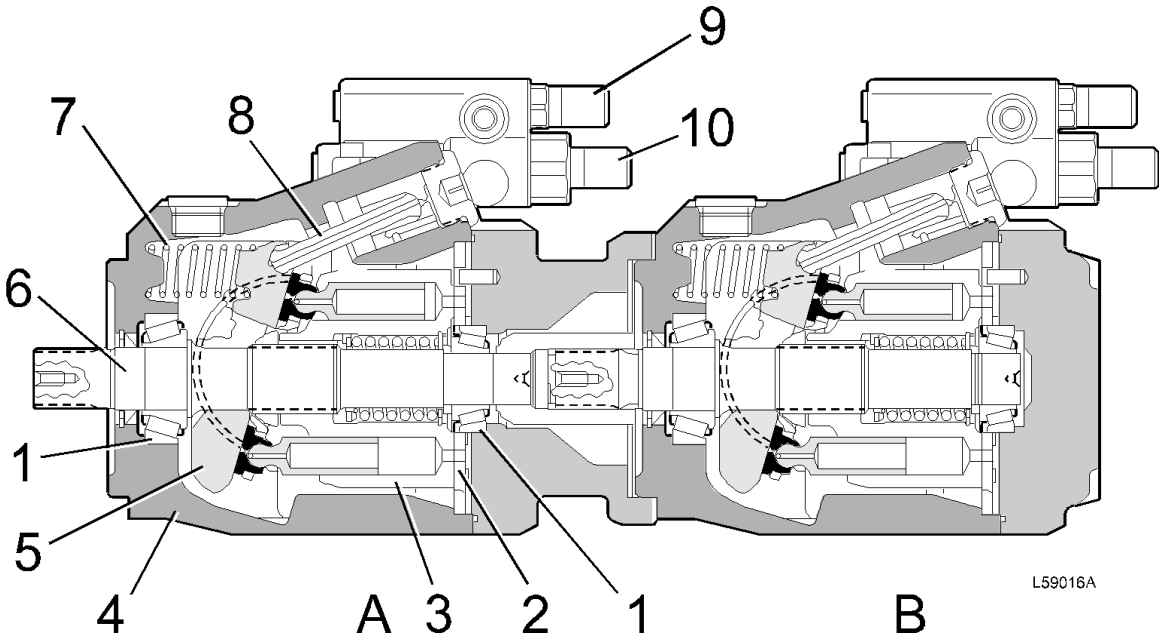

Figure 2
Hydraulic pumps 1 and 2

A	Pump 1
B	Pump 2
1	Bearing
2	Distribution plate
3	Pump unit (with cylinder block and piston)
4	Housing
5	Yoke
6	Drive axle
7	Spring
8	Control piston
9	Flow compensator (stand-by pressure)
10	Pressure compensator (main pressure)

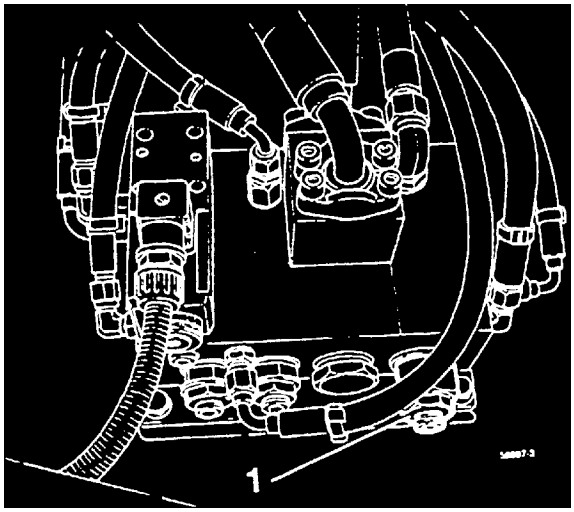

Figure 3
Central valve

1. Adjusting, steering pressure

Document Title:	Function Group:	Information Type:	Date:
Lever steering	**645**	**Service Information**	**2014/5/21**
Profile:			

Lever steering

Hydraulic system, description, see diagram

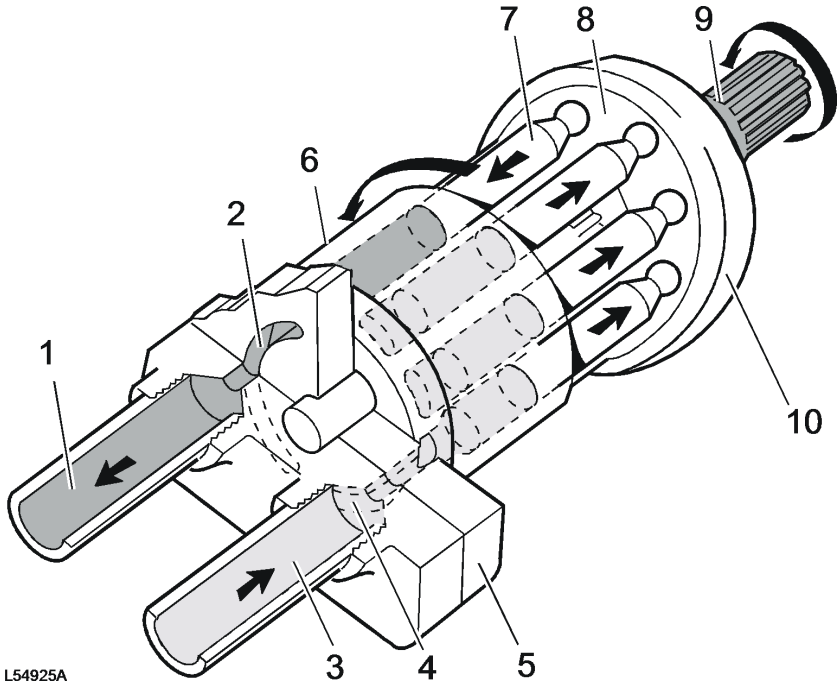

Figure 1
Hydraulic pump

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 axle
10. Yoke

Pump pressure builds up at steering valve 6 and control valve 11. The pressure to valve spool 15 is reduced by pressure-reducing valve 14b to approx. 2 MPa (290 psi).

Pressure-limiting valves 18 are blocked in the closed position and therefore have no function in the system.

When stand-by pressure has been built up, the pumps angle down to "0 flow". When the steering lever is actuated, an electrical signal is passed via ramp generator CU20 or CU22 to control unit MA28 on the control valve. Oil is admitted onto valve spool 15 which is moved and opens for a controlled oil flow to the steering cylinders.

The position sensor sends back signals to the control unit and indicates the position of the spool. Oil is admitted until the valve spool has been moved a distance corresponding to the lever deflection.

The flow compensators of the pump are actuated by the LS-pressure and adapts the pump flow and pressure to the existing need.

VOLVO

Construction Equipment

Service Information

Document Title:	Function Group:	Information Type:	Date:
Lever steering, CDC	**645**	**Service Information**	**2014/5/21**
Profile:			

Lever steering, CDC

Description of function

The equipment is connected to the circuit board through connector OD.

With ignition key in position 1 and the arm rest folded down current is obtained at switch SW30 via fuse FU29, sensor SE62 and relay RE30 (30 - 87A).

When switch SW30 is actuated, the coil in relay RE31 obtains current. Relay RE31 is activated and then obtains holding current via terminals 30 - 87 (RE31).

Relay 31 (30 - 87) also feeds current to switch SW43 for forward/reverse selection, control lamp LC79, ECU connection EB13 (whereby engagement of 4th gear is blocked), switch SE109 (kick-down) and control lever CU3 for the steering. When CU3 is actuated in either direction, solenoid valve MA28 obtains current and the steering function is engaged (the machine is steered).

If the arm rest is folded up, sensor SE62 interrupts the current to the coil in relay RE31. Relay RE31 is activated and the current to CU3 is interrupted and the lever steering is disconnected.

If the ordinary selector control SW2A is moved to either forward or reverse drive position, the coil in relay RE30 obtains current. Relay RE30 is activated and the lever steering is disconnected.

Exempel: Selector control SW2A is moved to position F (forward). The coil in relay RE30 obtains current via fuse FU29, switch SW2A (GA1 - F) and diode DI2:13. Relay RE30 is activated and then obtains holding current via terminals 30 - 87 (RE30) and switch SW30. When relay RE30 is activated, the current to the coil in relay RE31 is interrupted and the lever steering is disconnected.

The lever steering must be connected again with switch SW30, with the arm rest folded down and the selector control in neutral position. When switch SW30 is actuated the current is interrupted to the coil in relay RE30 which is activated. The coil in relay RE31 now obtains current which means that the lever steering is connected as described earlier.

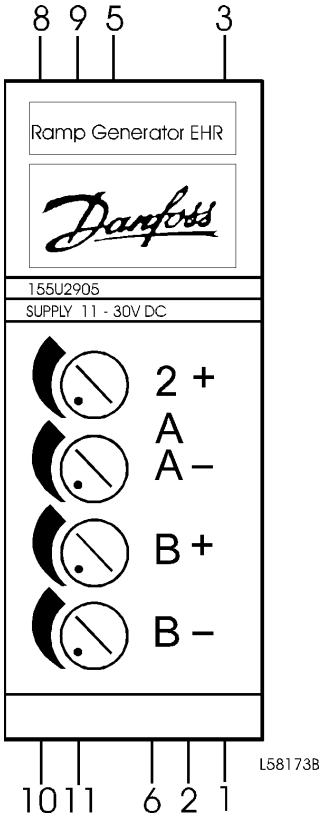

Figure 1
Ramp generator CU20 / CU22

A +	Start damping left
A -	Stop damping left
B +	Start damping right
B -	Stop damping right

Ramp generator CU20 / CU22

With the aid of the ramp generator a more comfortable steering is obtained in that the signal to MA28 is dampened both at the beginning and the stop of the steering movement. The the ramp -the damping) is adjustable from 0 - 0.7 second.

NOTE!
CU22 has a fixed ramp (damping) adjusted to approx. 0.2 second.

⚠ CAUTION

On machines manufactured w.e.fr. 96.01.01 the ramp generator was replaced by a circuit board. The ramp is not adjustable see Fig.

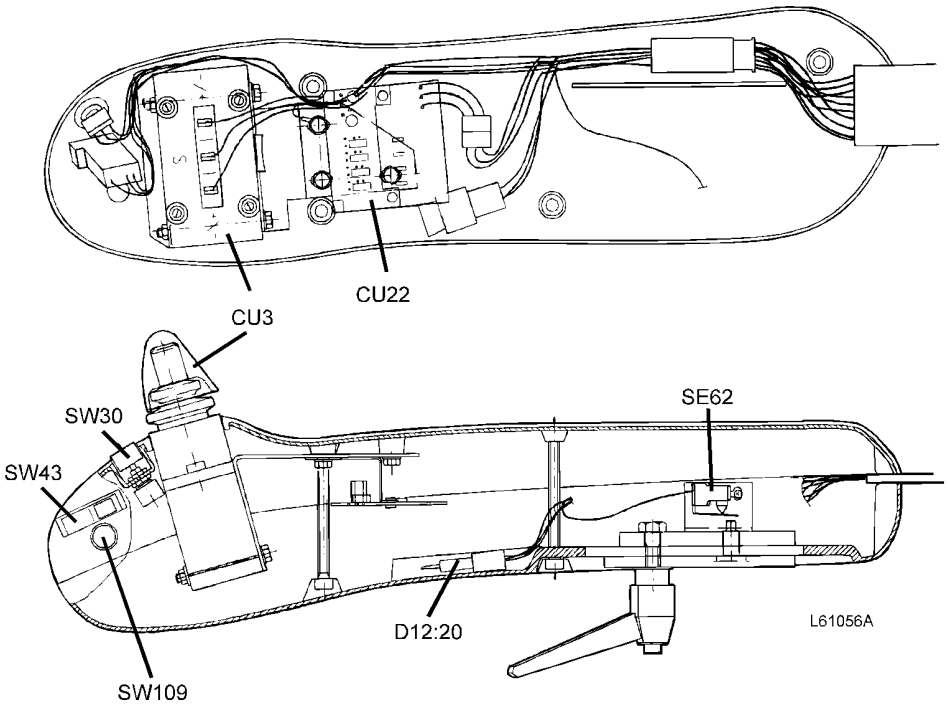

Figure 2
Arm rest (CDC)

CU3	Steering lever
SW30	Connection of CDC
SW43	Selection, forward/reverse
SW109	Kick-down
SE62	Connection of CDC in arm rest
CU20	Ramp generator, not adjustable
DI2: 20	Blocking diode, CDC

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