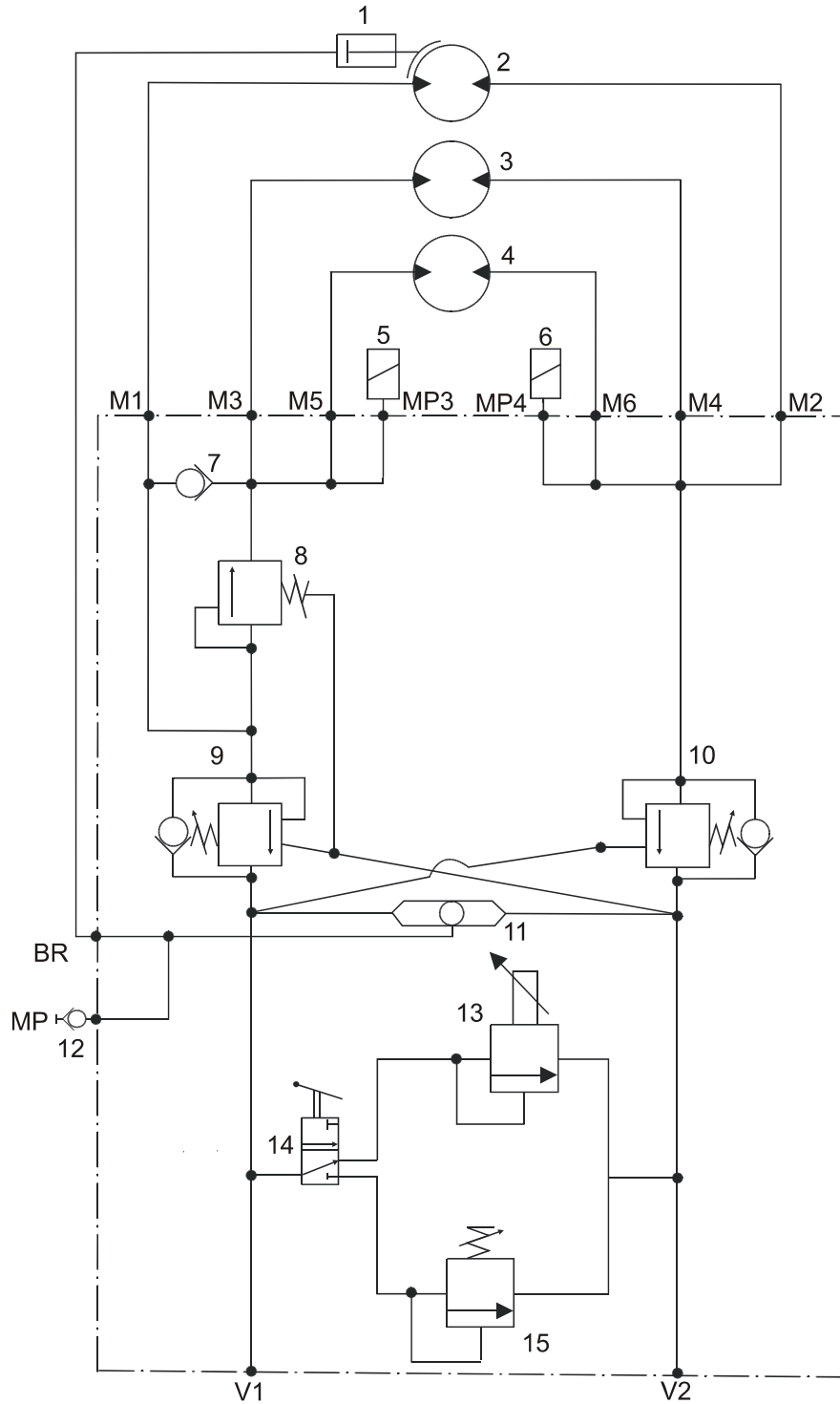


- (4) Inspect the condition of the bores in the clutch gear wheel and ensure that the disengagement pin engages smoothly and to its correct depth i.e., when engaged, no more than 7 mm of the pin head should be visible above the cylinder end cap.
- b. Inspect all hydraulic components and lines for oil leaks.
- c. Inspect that all wiring and connectors between the winch hydraulic block, PLC and display unit are in good condition and secure.
- d. Inspect the winch rope for serviceability in accordance with EMEI Vehicle D 108.
- e. Ensure that the hydraulic oil is clean and at the correct level.

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Item	Description	Item	Description	Item	Description
1.	Hydraulic brake	6.	Pressure sensor PG2	11.	Shuttle valve
2.	OMH 250 motor	7.	Check valve	12.	Test point
3.	OMT 200 motor	8.	Sequence valve	13.	Electrically controlled pressure reducing valve
4.	OMH 200 motor	9.	Double overcentre valve (winching out)	14.	Ball valve (manual)
5.	Pressure sensor PG1	10.	Double overcentre valve (winching in)	15.	Pilot controlled pressure reducing valve

Figure 35 Winch Hydraulic Circuit

- f. Inspect the drag brake pads for wear and test the operation. Replace the pads if necessary (refer to Para 169).

WARNING

TO PREVENT PERSONAL INJURY WHICH MAY BE CAUSED DUE TO INCORRECT HOOK UP OR EQUIPMENT OPERATION, WINCH SET-UP AND CONSTANT PULL SYSTEM CHECK PROCEDURES REQUIRING LIVE HOOKUPS MUST BE CONTROLLED BY A QUALIFIED RECOVERY TRADESPERSON IN A SAFE LEVEL AREA USING AN ANCHOR POINT CAPABLE OF HOLDING 13.00 TONNES.

166. Functional Testing. To ensure the winch is operating correctly conduct a system check in accordance with the monthly functional checks for the Recovery System detailed in the HRV User Handbook, Servicing Instructions, Section 3, Chapter 1.

WINCH ROPE

167. Fitting and handling of winch ropes is to be conducted in accordance with the Technical Manual User Handbook.

NOTE

It is not necessary to carry out Winch Set-up and Constant Pull System Check (refer to EMEI Vehicle D 324-1) when replacing ropes unless the integrity of the system is in question.

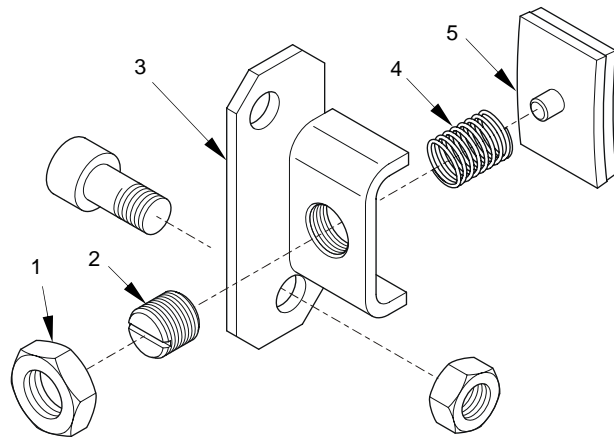
DRUM BRAKE (DRAG BRAKE)

168. Adjustment. To adjust the drum brake, proceed as follows (refer to Figure 36):

- a. Loosen the lock nut.
- b. To increase the braking effect, turn the brake nipple ¼ turn clockwise or, to decrease the braking effect, turn the brake nipple ¼ turn anti-clockwise.
- c. Tighten the lock nut.
- d. To check that the brake has been adjusted correctly, ensure that the winch rope can be pulled out at walking pace by one operator, and that the drum stops when the operator is directed to stop.

169. Replacement. To replace the drum brake, proceed as follows:

- a. Loosen the adjusting nut and back off the brake nipple to relieve spring tension.



Item	Description
1.	Lock nut
2.	Brake nipple
3.	Mounting bracket
4.	Spring
5.	Brake pad

Figure 36 Drum Brake

- b. Undo the bolts securing the brake assembly to the winch frame and remove the brake assembly.
- c. Replace the brake pad and assemble the drum brake in reverse order.
- d. Adjust the brake in accordance with Para 168.

PROGRAMMABLE LOGIC CONTROLLER (PLC)

170. Figure 37 shows the circuit board and the locations of fuses, LED and test points within the PLC box.

171. Fuse Replacement. To replace the PLC fuses, proceed as follows:

- a. Turn off the power to the PLC at the PLC isolation switch.
- b. Remove the PLC cover, test and replace fuses as necessary.

WINCH ASSEMBLY

SECONDARY DRIVE MOTOR (OMH 200)

172. Removal. To remove the OMH 200 motor, proceed as follows (refer to Figure 38):

- a. Clean and dry the exterior of the secondary drive assembly prior to removing the motor to prevent the ingress of contaminants into any open components.
- b. Tag and remove the hydraulic pipes from the motor then cap the ports and pipe ends.

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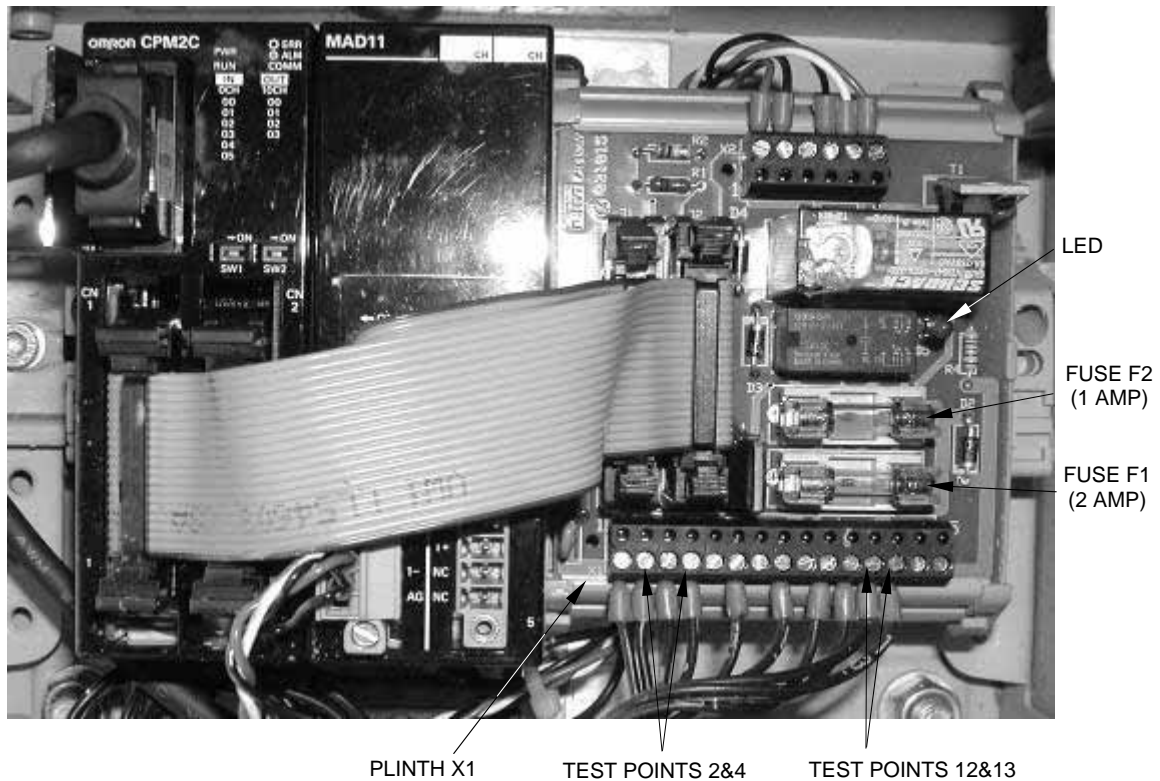


Figure 37 PLC

- c. Remove the four cap screws securing the motor to the mounting bracket and withdraw the motor. Cover the opening to the drive unit.

173. Installation. To install the OMH 200 motor, proceed as follows (refer to Figure 38):

- a. Align the splines of the drive shaft with the internal splines of the locking shaft and slide the motor into position. Fit the four cap screws and tighten in accordance with Table 10.
- b. Re-connect the pipes to the hydraulic motor and tighten the fittings.
- c. Bleed and test the winch in accordance with Paras 128 and 166.

Secondary Drive A Gear Assembly

174. Removal. To remove the secondary drive A gear assembly, proceed as follows:

- a. Remove the OMH 200 motor in accordance with Para 172.
- b. Remove the motor mounting bracket followed by the gear housing and shaft, from the gearbox end plate.
- c. If necessary, remove and disassemble the gear shaft assembly from the gear housing in accordance with Figure 38.

175. Cleaning and Inspection. To clean and inspect the secondary drive gear assembly A, proceed as follows:

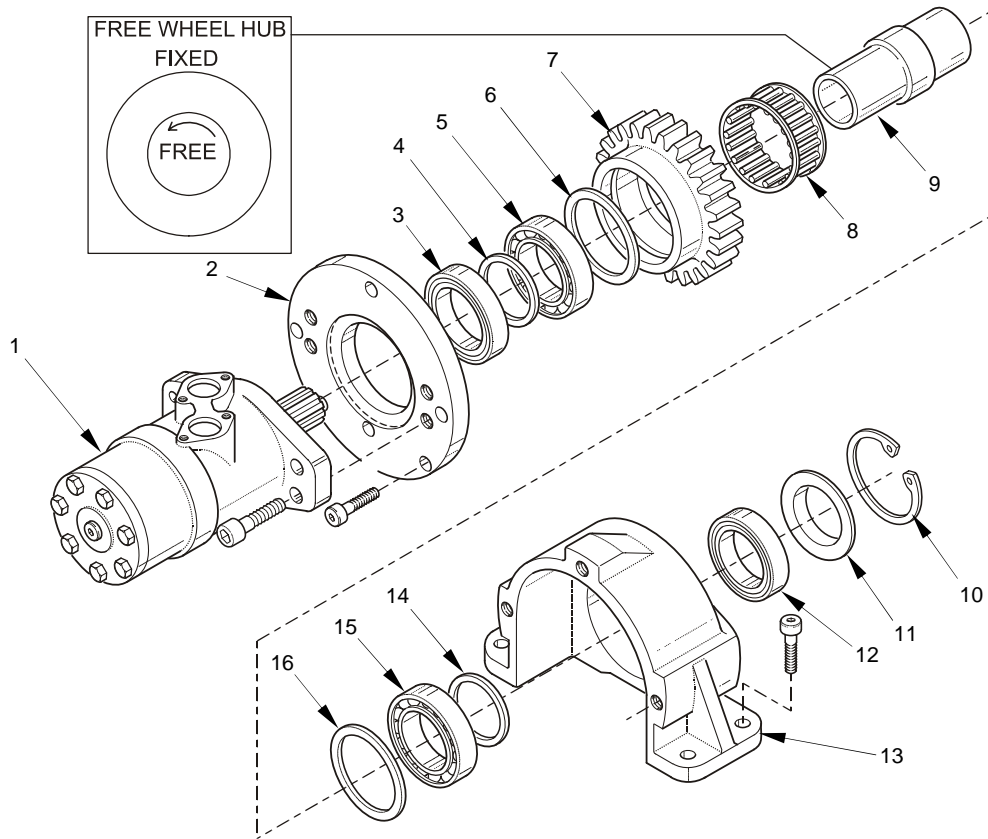
- a. Clean the motor mounting plate and drive components in clean solvent and dry thoroughly. Ensure all sealing compound has been removed from mating surfaces and that they are free of nicks and burrs.
- b. Inspect the condition of all drive components, paying particular attention to the gear teeth, bearings and free wheeling hub. Replace unserviceable components as necessary.

176. Installation. To install the secondary drive gear assembly A, proceed as follows (refer to Figure 38):

NOTE

Where it is indicated to apply sealant, use Sabesto silicone sealant or equivalent.

- a. Refit the bearings and gear shaft into the gear housing. Ensure that the free wheeling hub is fitted the correct way, allowing the motor to remain stationary during winching in. Apply sealant to the mating surfaces of the bearing cover, install and secure with the circlip.
- b. Apply sealant to the mating surfaces of the gear housing and gearbox end plate. Fit the gear housing assembly and tighten the capscrews in accordance with Table 10.



Item	Description	Item	Description	Item	Description
1.	OMH 200 motor	7.	Drive gear	13.	Gear housing
2.	Motor mounting bracket	8.	Free wheel hub	14.	Spacer
3.	Bearing	9.	Locking shaft	15.	Bearing
4.	Spacer	10.	Circlip	16.	Spacer
5.	Bearing	11.	Bearing cover		
6.	Spacer	12.	Bearing		

Figure 38 Secondary Drive Assembly A

- c. Apply sealant to the mating surfaces of the gear housing and motor mounting bracket. Refit the motor mounting bracket and tighten the capscrews in accordance with Table 10.
- d. Install the OMH 200 motor in accordance with Para 173.
- e. Bleed and test the winch in accordance with Paras 128 and 166.

Hydraulic Valve Block

177. **Removal.** To remove the hydraulic valve block, proceed as follows:

- a. Remove the protective cover plate from the top of the valve block.
- b. Tag and remove all wiring and piping and supply hoses from the valve block. Note; wiring plugs are fastened with a screw.

- c. Remove the four cap screws securing the valve block to the motor and remove the valve block.

178. **Installation.** To install the hydraulic valve block, proceed as follows:

- a. Install the valve block in reverse order to disassembly. Ensure new 'O' rings are installed between the valve block and motor.
- b. Torque mounting cap screws in accordance with Table 10.
- c. Bleed and test the winch in accordance with Paras 128 and 166.

Secondary Drive Motor B (OMT 200)

179. **Removal.** To remove the OMT 200 motor, proceed as follows:

- a. Remove the hydraulic valve block in accordance with Para 177.

- b. Remove the four cap screws securing the motor to the motor mounting bracket and remove the motor.
- c. Cover the opening to the drive gear housing and cap the motor ports.

180. Installation. To install the OMT 200 motor, proceed as follows:

- a. Install the OMT 200 motor in reverse order to removal and tighten the cap screws in accordance with Table 10.
- b. Install the hydraulic valve block in accordance with Para 178.
- c. Bleed and test the winch in accordance with Paras 128 and 166.

Secondary Drive B Gear Assembly

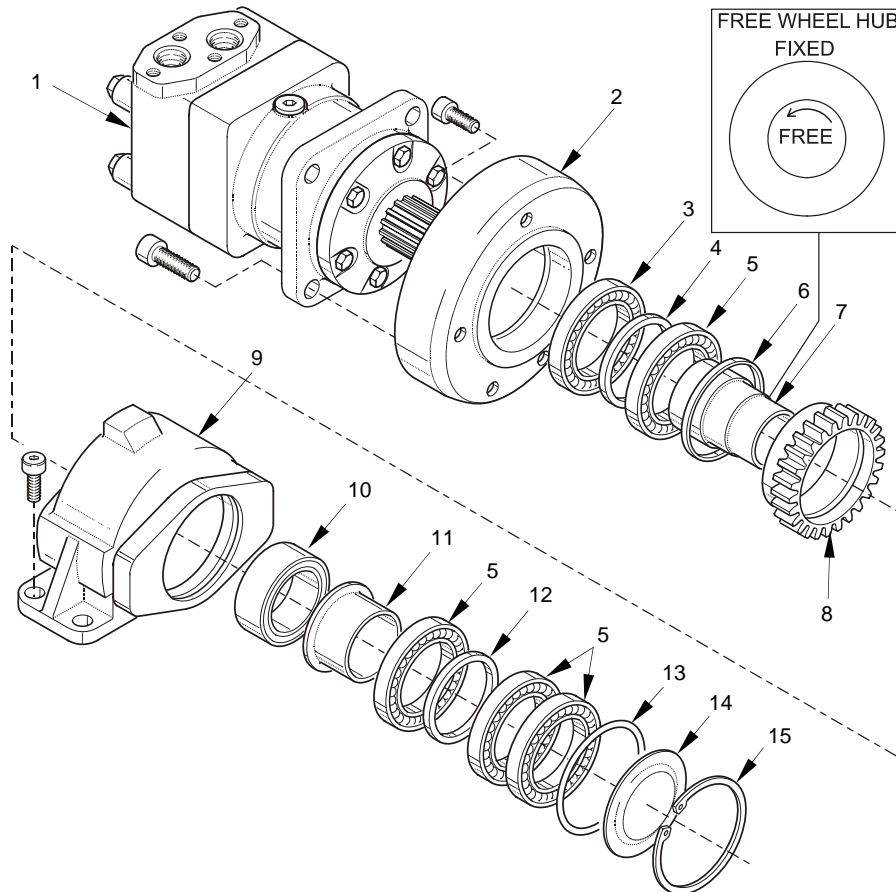
181. Removal. To remove the secondary drive B gear assembly, proceed as follows:

- a. Remove the hydraulic valve block and OMT 200 motor in accordance with Paras 177 and 179.
- b. Remove the motor mounting bracket followed by the gear housing and shaft, from the gearbox end plate.



ENSURE THAT THE ONE WAY CLUTCH IS INSTALLED AROUND THE RIGHT WAY (REFER TO FIGURE 39).

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Item	Description	Item	Description	Item	Description
1.	OMT 200 motor	6.	Spacer	11.	Spacer
2.	Motor mounting bracket	7.	Locking shaft	12.	Spacer
3.	Bearing	8.	Drive gear	13.	'O' ring
4.	Spacer	9.	Gear housing	14.	Cover
5.	Bearing	10.	Free wheel hub	15.	Circlip

Figure 39 Secondary Drive Assembly B

- c. If necessary, remove and disassemble the gear shaft assembly from the gear housing in accordance with Figure 39.

182. Cleaning and Inspection. To clean and inspect the secondary drive gear assembly B, proceed as follows:

- a. Clean the motor mounting plate and drive components in clean solvent and dry thoroughly. Ensure all sealing compound has been removed from mating surfaces and that they are free of nicks and burrs.
- b. Inspect the condition of all drive components, paying particular attention to the gear teeth, bearings and free wheeling hub. Replace unserviceable components as necessary.

183. Installation. To install the secondary drive gear assembly B, proceed as follows (refer to Figure 39):

- a. Refit the bearings and gear shaft into the gear housing. Ensure that the free wheeling hub is fitted the correct way, allowing the motor to remain stationary during winching in. Apply sealant to the mating surfaces of the bearing cover, install and secure with the circlip then refit the gasket and cover plate.
- b. Apply sealant to the mating surfaces of the gear housing and gearbox end plate. Fit the gear housing assembly and tighten the capscrews in accordance with Table 10.
- c. Apply sealant to the mating surfaces of the gear housing and motor mounting bracket. Refit the motor mounting bracket and tighten the capscrews in accordance with Table 10.
- d. Install the OMT 200 motor and hydraulic valve block in accordance with Para 180.
- e. Bleed and test the winch in accordance with Paras 128 and 166.

PNEUMATIC DISENGAGEMENT CYLINDER

184. Removal. To remove and disassemble the pneumatic disengagement cylinder, proceed as follows:

- a. Disconnect the air line from the cylinder.
- b. Bend down the locking tab on the locking washer.
- c. Loosen the locking ring with a C spanner and remove the cylinder assembly from the mounting bracket.
- d. Remove the mounting bracket from the winch end plate.

185. Disassembly. To disassemble the pneumatic disengagement cylinder, proceed as follows:

- a. Secure the cylinder in a vice and disassemble in accordance with Figure 40.
- b. Remove and discard all 'O' rings from the piston and cylinder cap.

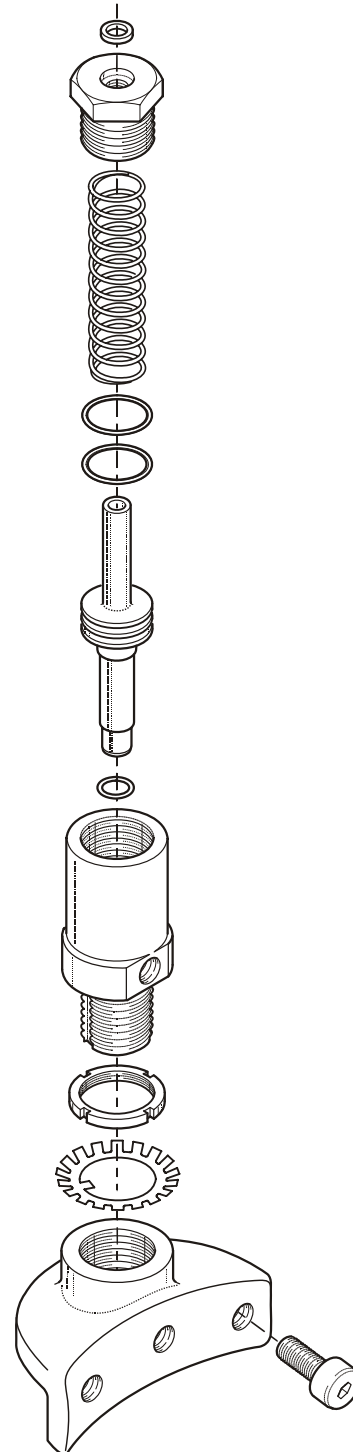


Figure 40 Pneumatic Disengagement Cylinder

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186. Cleaning and Inspection. To clean and inspect the pneumatic disengagement cylinder, proceed as follows:

WARNING

IT IS CRITICAL TO THE SAFE OPERATION OF THE WINCH THAT THE PIN CAN ENGAGE FULLY AND SMOOTHLY INTO THE BORE IN THE CLUTCH GEAR WHEEL. PARTIAL ENGAGEMENT WILL RESULT IN UNACCEPTABLE BORE WEAR. IF THE PIN DISENGAGES DURING OPERATION THE WINCH WILL INSTANTLY FREE SPOOL.

- a. Clean the cylinder components in clean solvent and dry with low pressure compressed air or lint free cloth.
- b. Inspect the locking pin, piston and cylinder surfaces for wear and scoring. Repair or replace components as necessary.
- c. Clean and inspect the condition of the bore in the clutch gear wheel. Remove any burrs or scores from the bore or bore rim. Replace the wheel if excessive wear is evident.
- d. Check the condition of the tab lock washer, replace if necessary.

187. Assembly. To assemble the pneumatic disengagement cylinder, proceed as follows:

- a. Grease and fit the new 'O' rings to the piston using Omega 58 or Dow Corning 111 silicone compound.
- b. Lightly grease the piston, cylinder and the clutch gear wheel bore with Omega 58 or Dow Corning 111 silicone compound.
- c. Assemble the cylinder in reverse order to disassembly.

188. Installation. To install the pneumatic disengagement cylinder, proceed as follows:

- a. Refit the mounting bracket to the winch end plate and torque the cap screws in accordance with Table 10.
- b. Screw the cylinder into the mounting bracket leaving a clearance of 1 to 2 mm between the base of the threaded section of the cylinder and the surface of the clutch gear ring.
- c. Tighten the lock ring, re-check the clearance then lock the ring with the tab lock washer.

- d. Reconnect the air line and check for correct operation. Correct pin engagement is checked by measuring the distance the pin protrudes from the top of the cylinder cap. This distance should be between 4 and 7 mm (refer to Figure 41) and must not exceed 7 mm.

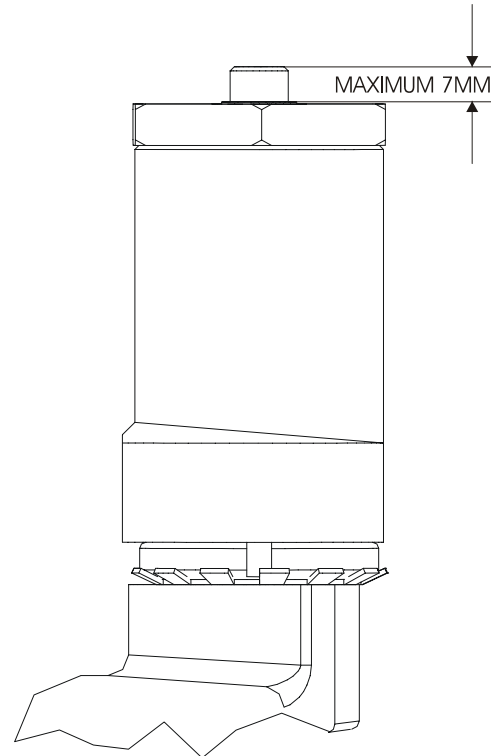


Figure 41 Pin Engagement Measurement

FAULT FINDING

189. Table 11 provides fault finding and problem solving procedures for the winches. The following circuit diagrams may be referenced during fault finding:

- a. Figure 35 Winch Hydraulic Circuit,
- b. Figure 51 Recovery System Pneumatic Circuit,
- c. Figure 52 Recovery System Hydraulic Circuit,
- d. Figure 54 Recovery System Electrical Circuit Diagram, and
- e. Figure 55 Recovery System Remote Control Circuit Diagram.

Table 10 Winch Fault Finding

Symptom		Probable Cause	Action
1.	Winch will not operate	<ul style="list-style-type: none"> a. PTO has not been engaged b. PLC isolation switch is turned off (Auto Mode) c. Emergency stop button is pressed d. AUTOMATIC/MANUAL selector valve incorrectly set e. No oil flow to winch f. Electric defect g. Defective hydraulic motors h. Defective hydraulic pump 	<p>Engage the recovery PTO.</p> <p>Set PLC isolation switch to ON position.</p> <p>Reset emergency stop on the remote pendant.</p> <p>Ensure the lever on the hydraulic valve block is in either the AUTOMATIC or MANUAL position. Move the lever in the required direction until it stops.</p> <p>Ensure the recovery PTO is engaged, and that it and the tandem pump are operating correctly.</p> <p>Check hydraulic oil level.</p> <p>Ensure the hydraulic isolation valves under the tank are all open.</p> <p>Check that the spool valve is moving when the levers or buttons on the remote pendant are actuated.</p> <p>Check all hydraulic lines, fittings and components for leaks.</p> <p>Inspect and repair electrical system.</p> <p>Inspect and repair drive motors. Refer to EMEI Vehicle D 324-1.</p> <p>Inspect and repair hydraulic pump. Refer to EMEI Vehicle D 324-1.</p>
2.	Winch drum does not turn	<ul style="list-style-type: none"> a. The pin of the disengaging cylinder is disengaged from the clutch gear wheel 	<p>Ensure the ALL winch ENGAGE/DISENGAGE switches are in the ENGAGE position and check that the pin locks into the clutch gear wheel.</p> <p>Check the electrical circuit and solenoid bank for correct operation (refer to Figure 54).</p> <p>Ensure that the disengaging device is correctly adjusted (refer to Para 188).</p>
3.	Winch drum does not disengage	<ul style="list-style-type: none"> a. The pin of the disengaging cylinder will not disengage from the clutch gear wheel b. Disengaging cylinder piston return spring broken or collapsed.x c. Disengaging cylinder piston jammed in cylinder.x 	<p>Check the air supply to the lower port of the disengaging cylinder.</p> <p>Check for restrictions in the breather tube from the upper port.</p> <p>Check the electrical circuit and solenoid bank for correct operation (refer to Figure 54).</p> <p>Inspect and repair IAW Para 184.</p> <p>Inspect and repair IAW Para 184.</p>
4.	Winch display will not operate (Auto Mode)	<ul style="list-style-type: none"> a. No power to PLC b. Broken connection between PLC and display box 	<p>Ensure that the PLC isolation switch is in the ON (down) position.</p> <p>Check the power supply and main recovery circuit breaker.</p> <p>Check the fuses in the PLC (refer to Para 171).</p> <p>Check all wiring and connections between the PLC and Display.</p>
5.	Winch will not achieve required force (Auto Mode)	<ul style="list-style-type: none"> a. Selector valve in manual position 	<p>Place the lever on the hydraulic valve block in the AUTOMATIC position.</p>

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Table 10 Winch Fault Finding (Cont.)

Symptom		Probable Cause	Action
		<p>b. Fault with inductive sensor on the hydraulic valve block. (not sensing that the lever is in the AUTOMATIC position)</p> <p>c. Low hydraulic pressure</p> <p>d. Electrically controlled pressure reducing valve malfunction</p> <p>e. Winch constant pull system out of adjustment</p> <p>f. Problem with mechanical flag adjustment, seized, damaged or worn pressure plate or linkages.</p> <p>g. Defective free wheel hub/s on secondary drive motors. Hydraulic pressure does not increase as load exceeds 3 tonnes (both clutches defective). Load above 3 tonnes, pressure increases and stabilises again without achieving maximum line pull (one defective clutch).</p>	<p>Check that the sensor is in place, is in good condition and that the wiring between the sensor and the PLC is in good condition.</p> <p>Check the hydraulic pressure at the gauge on the control panel. A minimum of 100 bar is required to overcome the sequence valve and engage the secondary motors.</p> <p>Check the electrical connection between the valve and PLC box.</p> <p>Check for current supply to the coil of the valve (the red LED on the PLC circuit board will be illuminated if the PLC is generating an output signal to the valve). If not inspect the fuse marked F2 in the PLC box (refer to Figure 37).</p> <p>The input signal to the valve can be checked using a multimeter to measure the current at connection points 12 and 13 on Plinth X1 (refer to Figure 37). The signal should be between 0 and -800 mA.</p> <p>If the power supply to the valve has been cut the pressure indicated at the gauge on the control panel should be less than 20 bar. If a current of 800 mA is supplied to the valve the pressure should increase to 210 bar. If the pressure does not increase, replace the valve.</p> <p>Conduct Winch Set-up and Constant Pull Check/Adjustment in accordance with EMEI Vehicle D 324-1.</p> <p>Inspect the condition of all distance sensor components and repair as necessary. Check that the mechanical flag is adjusted correctly and that values displayed at Menus 7 and 8 are correct (refer to EMEI Vehicle D 324-1).</p> <p>Inspect and replace defective free wheel hub/s (refer to Paras 174 and/or 181).</p>
6.	Winch will not achieve required force (Manual Mode)	<p>a. Low hydraulic pressure</p> <p>b. Defective free wheel hub/s on secondary drive motors. Hydraulic pressure does not increase as load exceeds 3 tonnes (both clutches defective). Load above 3 tonnes, pressure increases and stabilises again without achieving maximum line pull (one defective clutch).</p>	<p>Check the hydraulic pressure at the gauge on the control panel. A minimum of 100 bar is required to overcome the sequence valve and engage the secondary motors.</p> <p>Inspect and replace defective free wheel hub/s (refer to Paras 174 and/or 181).</p>
7.	Winch creeps under load with spool in neutral	a. Hydraulic brake clutch pack worn and or reduced spring tension	Replace the hydraulic brake assembly (refer to EMEI Vehicle D 324-1).
8.	Display showing Menu 15 (Alarm, Sensor Fault) (Auto Mode)	a. Poor electrical connection between distance sensor and PLC	Inspect the wiring and connections between the sensor and the PLC.

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Table 10 Winch Fault Finding (Cont.)

Symptom		Probable Cause	Action
		b. Sensor fault	Test the output from the sensor at connection points 2 and 4 at Plinth X1 on the PLC circuit card (refer to Figure 37). Output signal should be between 4 and 20 mA depending on the position of the mechanical flag. The further the flag is moved away from the sensor, the higher the output signal. Note: An indication of sensor operation can be obtained by placing a metallic object between the mechanical flag and the sensor, the insertion and vertical movement of the item should register on the display. This test will not determine the accuracy of the sensor.
9.	Display showing Menu 16-17 (Alarm, Pressure guard 1 or 2) (Auto Mode)	a. Poor electrical connection between pressure guard and PLC	Inspect the wiring and connections between the pressure guard and the PLC
10.	Winch jerks or is noisy during operation	a. Defective hydraulic pump b. Defective hydraulic motors c. Low hydraulic oil flow	Inspect and repair hydraulic pump. Refer to EMEI Vehicle D 324-1. Inspect and repair motors. Refer to EMEI Vehicle D 324-1. Increase the engine rpm.
11.	Winch will not achieve required rope speed	a. Engine rpm to low b. Hydraulic oil filters are dirty c. Hydraulic oil too hot d. Control valve defect e. Defective hydraulic pump f. Defective hydraulic motors	Adjust engine rpm. Replace filters. Refer to serial 12. Inspect and repair hydraulic pump. Refer to EMEI Vehicle D 324-1. Inspect and repair hydraulic pump. Refer to EMEI Vehicle D 324-1. Inspect and repair motors. Refer to EMEI Vehicle D 324-1.
12.	Hydraulic oil too hot (>70 C)	a. Control valve defect	Inspect and repair hydraulic pump. Refer to EMEI Vehicle D 324-1.
13.	The display shows level 3 even though the winch has 4 rope layers spool on the drum	a. Problem with mechanical flag adjustment seized, damaged or worn pressure plate or linkages b. Sensor fault	Inspect the condition of all distance sensor components and repair as necessary. Check that the mechanical flag is adjusted correctly if not increase the distance between the sensor and the mechanical flag. Test the output from the sensor at connection points 2 and 4 at Plinth X1 on the PLC circuit card (refer to EMEI Vehicle D 324-1). Output signal should be between 4 and 20mA depending on the position of the mechanical flag. The further the flag is moved away from sensor, the higher the output signal. Make sure that the distance is at least 44 mm. Measured output signal should then be at least 18,5 mA. If not, change the distance sensor in accordance with EMEI Vehicle D 324-1.

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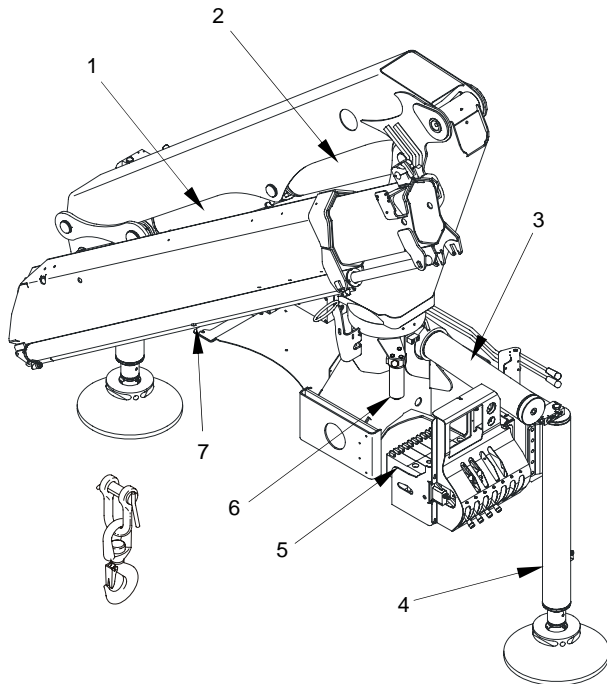
PALFINGER CRANE PK-9501

WARNING

DO NOT OPERATE THE CRANE WITHIN 6 METRES OF ANY POWER LINES WHEN FULLY EXTENDED, OR WHEN THUNDERSTORMS ARE IMMINENT.

WARNING

THE CRANE SERIAL NUMBER MUST BE SUPPLIED WHEN ORDERING ANY CRANE COMPONENTS TO ENSURE COMPATIBILITY AND SAFE CRANE OPERATION.



Item	Description
1.	Outer boom cylinder
2.	Inner boom cylinder
3.	Slew cylinder (1 of 2)
4.	Stabiliser leg (1 of 2)
5.	Control valve assembly
6.	High pressure filter
7.	Boom extension cylinder

Figure 42 Basic Crane Components

CAUTION

DO NOT ATTEMPT TO USE THE REMOTE CONTROL CONSOLE IF IT HAS, OR IS, THOUGHT TO HAVE SUFFERED WATER INGRESS. THE UNIT MUST BE RETURNED TO A HEAVY REPAIR FACILITY.

190. Figure 42 illustrates the location of the basic components of the crane.

191. Table 12 provides torque settings for fasteners used on the crane.

Table 11 Crane Fastener Torque Settings

Thread Diameter	Property Class	
	8.8	10.9
M8	23 N.m	34 N.m
M10	46 N.m	68 N.m
M12	79 N.m	117 N.m
M14	125 N.m	185 N.m
M16	195 N.m	280 N.m
M18	280 N.m	390 N.m
M20	390 N.m	560 N.m
Mounting Shackle Bolts		
Thread Size	Thread Material 42 Cr Mo 4v	
M24 x 1.5	600 N.m	

HYDRAULICS

WARNING

PRIOR TO COMMENCING REPAIRS TO THE HYDRAULIC SYSTEM RELIEVE HYDRAULIC PRESSURE BY SHUTTING DOWN THE ENGINE, VENTING THE RESERVOIR AND CYCLING ALL CONTROL VALVES. ENSURE HYDRAULIC FLUID HAS REACHED A SAFE HANDLING TEMPERATURE.

CAUTION

CLEAN AROUND ALL HYDRAULIC FITTINGS AND COMPONENTS PRIOR TO REMOVAL TO PREVENT SYSTEM CONTAMINATION.

192. Hydraulic circuit diagrams for the crane are shown at Figure 56 and Figure 57.

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Hydraulic Pipes and Hoses

WARNING

THIS OPERATION IS TO BE CARRIED OUT WITH THE CRANE IN THE STOWED POSITION. IF THIS IS NOT POSSIBLE, SUITABLY SUPPORT THE CRANE WITH CHOCKS TO PREVENT THE BOOMS MOVING DUE TO THE LOSS OF FLUID (PRESSURE). ENSURE THAT THE CONTROL OR OPERATING LEVER IS IN THE NEUTRAL POSITION AND A WARNING NOT TO OPERATE THE CRANE IS PLACED ON OR NEAR THE VEHICLE CONTROLS.

193. Removal. To remove hydraulic pipes and hoses, proceed as follows:

- a. Disengage the PTO and shut down the engine. Place a suitable container under the pipe or hose to be replaced to catch any spillage.
- b. Remove any clamps or zip ties securing the pipe or hose then crack one fitting loose and allow any residual line pressure to bleed out.
- c. Disconnect the fittings and remove the line. Plug all ports and fittings to prevent contamination of the hydraulic system.

194. WEO Plug-In Fittings. This new type of plug-in fitting has been used on the crane to alleviate hose stress in certain applications. To connect and disconnect the fittings, proceed as follows (refer to Figure 43):

CAUTION

RED PLASTIC TAB MUST BE IN PLACE ON ALL FITTINGS WHEN CONNECTED AND MUST BE FITTED PRIOR TO RECONNECTION OF COUPLING TO ENSURE CORRECT LOCKING.

- a. To disconnect the fitting, remove the plastic locking tab, push the male hose end in towards the female fitting to disengage the locking mechanism, then pull out.
- b. To connect, refit the plastic tab to the male hose end, then push the hose end into the female fitting until it locks.



Figure 43 WEO Plug-In Fitting

High Pressure Filter

195. Replacement. To replace the high pressure filter, proceed as follows:

- a. Unscrew the filter housing from the filter head. Take care not to spill the oil in the housing.
- b. Drain the oil into a suitable container then remove the filter element.
- c. Inspect the filter and base of the housing for contamination, indicating possible component failure.
- d. Clean out the filter housing and inspect the 'O' ring and back-up, replace if necessary.
- e. Install a new filter element and apply anti-seize compound to the threads of the filter housing. Screw the housing back into the filter head and tighten to 20 N.m.
- f. Bleed the system in accordance with Para 127.

Stabiliser Leg Cylinder

196. Removal. To remove the stabiliser leg cylinder, proceed as follows:

WARNING

AT NO TIME IS THE STABILISER LEG TO BE REMOVED WHEN IT IS BEING USED TO STABILISE THE VEHICLE. EITHER STOW THE CRANE OR IF THAT IS NOT POSSIBLE, ALTERNATE ARRANGEMENTS ARE TO BE MADE TO STABILISE THE VEHICLE.

- a. This operation is best carried out with the crane in the stowed position and the stabiliser leg fully retracted to minimise oil loss.

- b. Crack loose the two flexible hose connections at the load holding valve at the top of the cylinder and disconnect the fittings. Use a suitable container to catch any oil spillage. Tag the hoses to ensure correct connection during installation.
- c. Suitably support the cylinder prior to the removal of the mounting bolts.
- d. Remove the ten mounting screws securing the cylinder to the crane base and carefully remove the cylinder clear of the crane.

197. Installation. To install the stabiliser leg cylinder, proceed as follows:

- a. Position the stabiliser cylinder in place and secure the cylinder using the mounting screws. Tighten in accordance with Table 12.
- b. Remove the plastic plugs and connect the two flexible hoses to the load holding valve. Tighten securely.
- c. Start the engine, engage the crane PTO and operate the crane to check the operation of the cylinder and to bleed the air from the system (refer to Para 127). Check for leaks and rectify as necessary.

Stabiliser Control Valve

NOTE

Ensure that the stabilisers are lightly resting on the ground, not supporting vehicle prior to removal of valve.

198. Removal. To remove the stabiliser control valve, proceed as follows (refer to Figure 44):

- a. Remove the cable ties securing the panel light wiring to the valve.
- b. Tag and disconnect the hydraulic lines from the valve.
- c. Remove the clevis pins from the control rods disconnecting them from the spool assemblies.
- d. Unbolt and remove the valve from its mounting.

199. Installation. To install the stabiliser control valve, proceed as follows:

- a. Refit the valve to the mounting bracket.
- b. Reconnect the control rods and hydraulic lines.
- c. Start the engine, and bleed the crane in accordance with Para 127. Check that the crane operates smoothly and correctly and rectify any leaks as necessary.

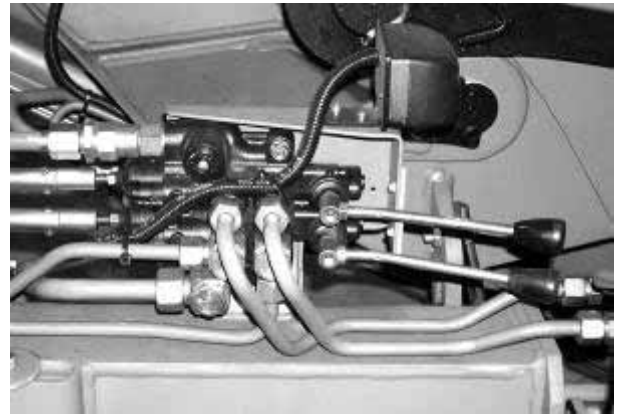


Figure 44 Stabiliser Control Valve

CRANE ELECTRONICS

General

WARNING

THE CRANE SERIAL NUMBER MUST BE SUPPLIED WHEN ORDERING REPAIR PARTS FOR THE CRANE TO ENSURE COMPATIBILITY AND SAFE CRANE OPERATION.

200. Figure 58 provides an overview of the cranes electrical circuit including the vehicle mounted remote control units.

201. All circuit boards used within the cranes electronic system are non-repairable and must be replaced with factory pre-programmed units upon failure. Therefore no repair or replacement of Paltronic electronic or remote control boxes should occur at light repair level.

Paltronic 50 System Fault Finding

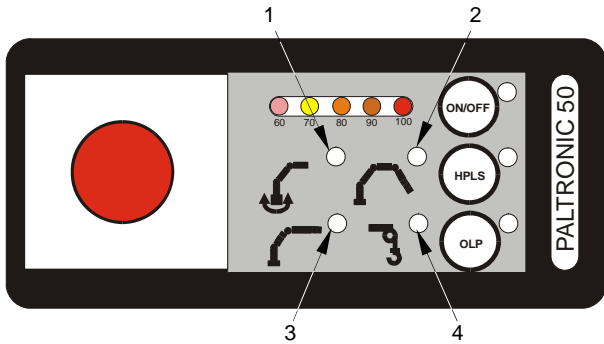
202. Electronic system fault codes and crane condition codes are displayed either on the Paltronic display unit (Figure 45) or the LCD screen located on the cover of the Paltronic 50 basic unit (Figure 47). Refer to Para 207 for an explanation of the various system codes.

203. In addition to the system codes, LEDs have been fitted to the circuit boards of the spool position sensor, Paltronic 50 main circuit board and the display unit. These LEDs may be used to further assist in system diagnosis.

204. Paltronic Display Unit. Figure 45 and Figure 46 illustrate the LED functions and connections in the Paltronic display unit.

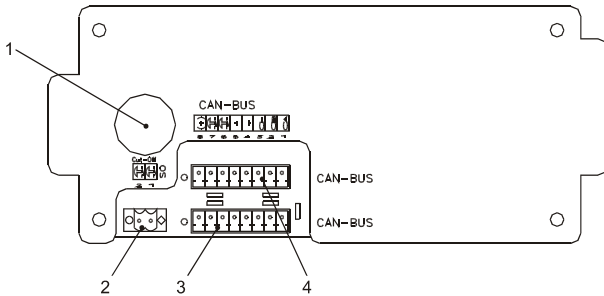
NOTE

Crane overload is only sensed on the inner boom cylinder on this crane, therefore only the crane overload LED is used.



Item	Function
1.	Derated area (SHB) – not used
2.	Fly-jib – not used
3.	Crane
4.	Rope winch – not used
Note	HPLS button is not used on this crane

Figure 45 Paltronic 50 Display Unit



Item	Function
1.	Emergency cut-off button
2.	Connection for emergency cut-off button (included in emergency loop)
3.	CAN bus plug with a green LED for emergency cut-off loop okay
4.	CAN bus plug with a green LED for emergency cut-off loop okay

Figure 46 Paltronic Display 50 Unit Connections

NOTE

The emergency stop button must be connected to the plug (2) or the cut-off loop is interrupted and the system will not function.

205. **Control Valve Unit.** The control valve circuit board is mounted on top of the main circuit board within the Paltronic 50 basic unit. The control valve circuit board indicates the spool positions of the hydraulic control valve and sends them to the Paltronic 50 basic unit via the CAN bus. Refer to Figure 48 and Table 13 for identification and function of connections and LEDs.

NOTE

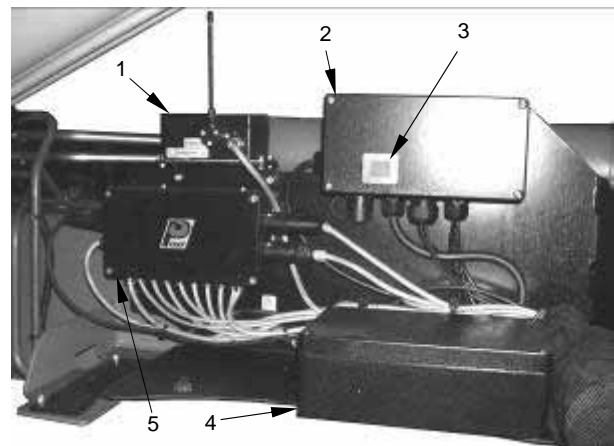
The crane function LEDs should only illuminate while the relevant control is in the neutral position.

206. **Paltronic 50 Basic Unit.** Refer to Figure 48 and Table 13 for the locations of the various connections, digital inputs, outputs and fuse on the main electronic module within the Paltronic 50 basic unit.

Paltronic 50 Codes

207. Two types of codes may be displayed on the LCD display of the Paltronic 50 basic unit (Figure 47) as follows:

- a. **Standard Codes (non-flashing).** Standard codes are indicated by a steadily displayed two digit number eg; **03** (refer to Table 14).
- b. **Flashing Codes.** Flashing codes are displayed in conjunction with following additional information code (refer to Table 16). The main code is displayed with a dot after the number (eg; **63.**) while the additional code is displayed without a dot (eg; **07**) (refer to Table 15).



Item	Description
1.	Remote control antenna box
2.	Paltronic 50 basic unit
3.	Status display
4.	Paltronic 50 connection box
5.	Remote control receiver

Figure 47 Crane Electronic and Remote Control Boxes

208. The system further distinguishes between status codes and error codes as follows:

- a. **Status Codes.** Status codes are information for the operator which appear during normal crane operation. By following correct operating procedures a displayed status code will automatically change back to the normal operating code (**00**). Eg; if the code

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03 is displayed indicating an overload situation, it will revert back to **00** when the

lifting moment is reduced.

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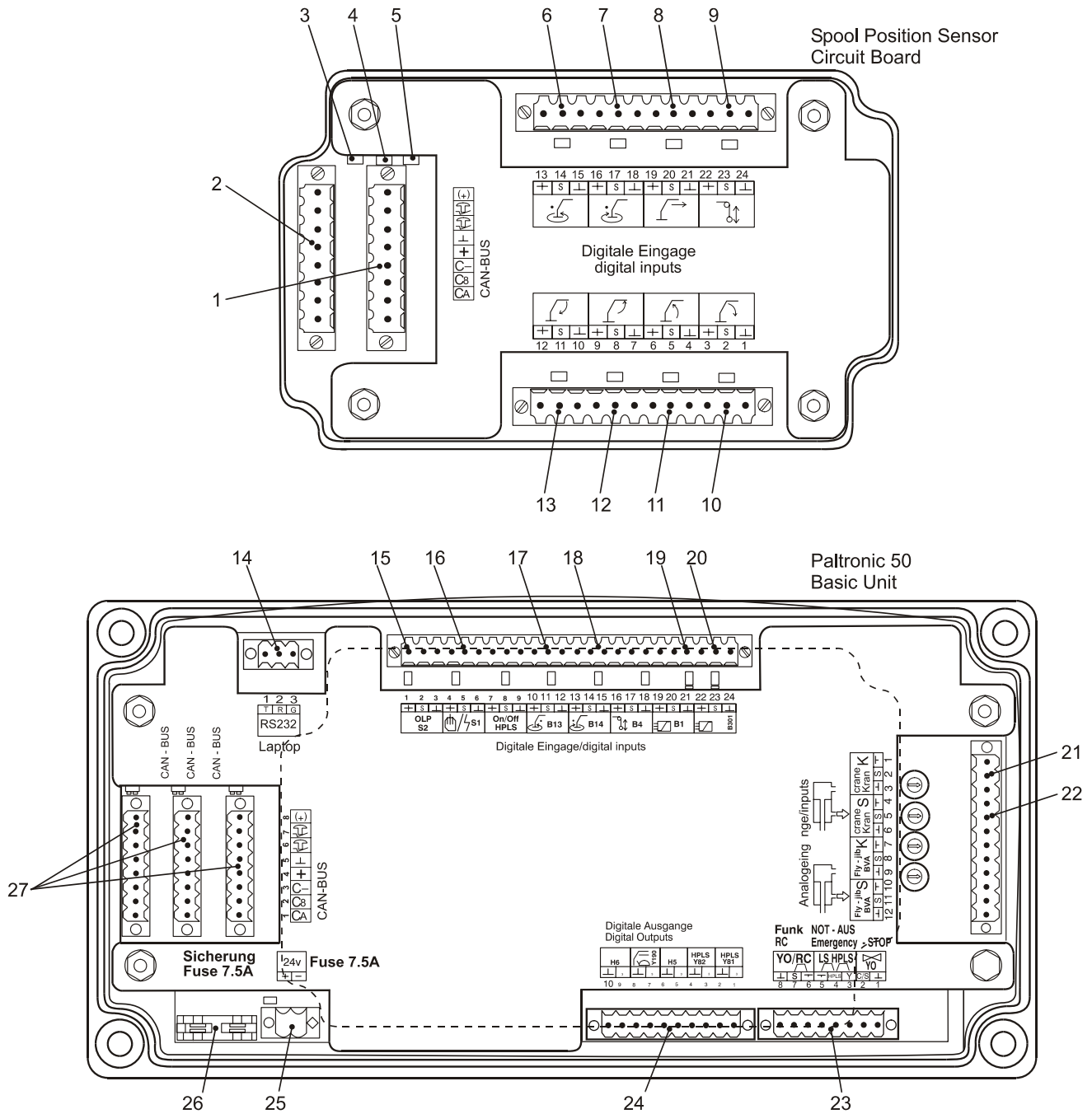


Figure 48 Paltronic 50 Basic Unit and Control Valve Circuit Boards

Table 12 Legend to Paltronic 50 Basic Unit and Control Valve Circuit Boards

Item	Description
1.	CAN bus plug
2.	CAN bus plug
3.	Control LED green for cut off loop on CAN plug (1) okay. Illuminated when emergency stop is inactive.
4.	Control LED green for cut off loop on CAN plug (2) okay. Illuminated when emergency stop is inactive.
5.	Control LED green for power supply control valve box okay
6.	Connection to control function SLEWING RIGHT
7.	Connection to control function, spool position sensing SLEWING LEFT
8.	Connection to control function, spool position sensing EXTENSION BOOM EXTENDING
9.	Connection to control function, spool position sensing ROPE WINCH LIFTING (not fitted)
10.	Connection to control function, spool position sensing MAIN BOOM LOWERING
11.	Connection to control function, spool position sensing MAIN BOOM LIFTING
12.	Connection to control function, spool position sensing OUTER BOOM LIFTING
13.	Connection to control function, spool position sensing OUTER BOOM LOWERING
Note.	Below the cover plate of the control valve is a green LED for internal power supply 5 V okay.
14.	Computer connection for PALDIAG (system diagnosis software)
15.	Peak pressure button of overload protection system (S2). The red LED is on if the button is pressed (also possible from the remote transmitter).
16.	Switch MANUAL/AUTOMATIC (Signal input). The red LED is on if the crane is in the automatic mode.
17.	Not used (not fitted)
18.	Not used (not fitted)
19.	Inductive switch for crane outer boom position (level indicator), (B1). The green LED is on if the cable is not broken. The red LED is on if the switch is closed.
20.	Not used (not fitted)
21.	Pressure transducer U230, crane piston (inner boom lifting)
22.	Pressure transducer U231, crane piston rod (inner boom lowering)
23.	Emergency cut-off connections
24.	Digital outputs (warning horn signal)
25.	Power supply with LED indicating 24 V supply is okay
26.	7.5 amp mini blade fuse
27.	CAN bus plugs with LEDs for emergency loop closed

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Table 13 Paltronic 50 Standard Codes

Code	Description	Reason	Solution	LED	Locked Functions
00.	System in normal operating mode	N/A	N/A	Nil	None
01. **	Check sum EEPROM not okay	Internal system check not possible. Chip error.	Change chip or main unit.	Crane flashing	All
02. **	Check sum EEPROM not okay	Internal system check not possible. Chip error.	Change chip or main unit.	Crane flashing	All
03.	Actual limit on main boom cylinder reached	Crane overload	Reduce load on crane (refer to user handbook).	Crane	OVL crane
10. **	Emergency Cut-off error. Crane ready but overload protection system not active.	24 V supply to emergency cut off but no signal from Paltronic, (valve eventually overridden by feed power)	Check magnetic valve (short cut). Remove any external power supply. Check output signal from Paltronic (must be 0 V in overload situation when a lever is actuated).	Crane flashing	All
11. **	Broken connection to pressure transducer on main boom piston side (signal less than 1.25 mA)	Broken connection to pressure transducer. Faulty connection on pressure transducer U230.	Check wiring and connections to (U230). Interchange the plug from U230 with U231 then reset the system by pressing OLP. If code 11. remains – broken wire. If code 12. appears, change the pressure transducer U230.	Crane	OVL crane
12. **	Broken connection to pressure transducer on main boom piston rod side (signal less than 1.25 mA)	Broken connection to transducer. Faulty connection on transducer U230.	Check wiring and connections to (U231). Interchange the plug from U231 with U230 then reset the system by pressing OLP. If code 12. remains – broken wire. If code 11. appears, change the pressure transducer U231.	Crane	OVL crane
15. **	Broken connection to the level indicator on the outer boom	Broken connection to the level indicator or system activated in the software but not mounted on the crane. Eventually wrong switch used.	Check wiring to the level indicator on the outer boom. System is not currently used (version 2.6). If activated but not used, deactivate system via computer. If necessary change the switch to the standard Palfinger switch. Repair by OEM.	Crane	OVL crane
20. **	Illogical high signal value from pressure transducer main boom piston side (U230)	Signal from transducer U230 above 19.7 mA. Short in the circuit or defective transducer.	Interchange plug of the transducer U230 with U231, reset the system by pressing OLP. If error 21 appears – replace transducer U230.	Crane	OVL crane
21. **	Illogical high signal value from pressure transducer main boom piston rod side (U231)	Signal from transducer U231 above 19.7 mA. Short in the circuit or defective transducer.	Interchange plug of the transducer U231 with U230, reset the system. If error 20 appears – replace transducer U231.	Crane	OVL crane
41. **	CAN – reading buffer writing error	Internal CAN error	Restart the system. If error remains, check all bus connections. If necessary change main unit.	Crane flashing	All

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Table 13 Paltronic 50 Standard Codes

Code	Description	Reason	Solution	LED	Locked Functions
44. **	Global CAN – Kingdom error	CAN – configuration incorrect CAN – addressing wrong Fault may also occur if bus cables are faulty (no answer from CAN member)	Check configuration of system in PALDIAG, if necessary change and reset the configuration. Check address switches of all CAN members (refer to addressing of the system). Check wiring. Change CAN members one by one. Restart the system.	Crane flashing	All
46. **	CAN – transmission error	It is not possible to transmit a data diagram due to a broken cable, loose connection or incorrect wiring of the CAN – bus system	Check wiring and connections of the CAN – bus system. Restart the system.	Crane flashing	All
47. **	CAN – unknown identifier received	The received data diagram has an invalid format. This usually occurs if the system has very short power supply interruptions.	Check wiring and connections of the CAN – bus system. Check the power supply line. Restart the system.	Crane flashing	OVL Fly Jib
93.	Lever not in neutral after overload situation	Hand lever still actuated after overload situation	Ensure all levers are in the neutral position. If code remains, restart the system.	Crane	All lifting function locked additionally
95.	Power supply failure (low voltage)	Supply has dropped below 10 V	Check supply circuit and fuse.	Crane	Lifting
96.	System switched off manually	Paltronic switched off with ON/OFF button	Start system with ON/OFF button. Also possible via RRC feed back system.	Nil	None
98.	Programmed delay after overload.	Programmed delay after overload or load limit overridden via the PALDIAG software	Automatically shifts back to normal mode after the programmed delay time is over or the setting via computer is completed.	Nil	None
99.	CAN – unknown identifier received	The received data diagram has an invalid format. This usually occurs if the system has very short power supply interruptions.	Check wiring and connections of the CAN – bus system. Check the power supply line. Restart the system.	Nil	All previously locked functions

b. **Error Codes.** Error codes indicate a system fault and are denoted by ** under the code numeral in Table 14. Error codes must be reset by pressing the **OLP** button

or restarting the system upon the completion of repairs.

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Table 14 Paltronic 50 Flashing Codes

Code 1	Code 2 Refer to Table 16	Description	Reason	Solution	LED	Locked Functions
03.	AA	Actual load limit on crane overridden. Load moment increasing movements blocked.	Crane in overload	Reduce load on crane (refer to user handbook).	Crane	OVL crane
42. **	AA	CAN error interrupt, bus off	CAN – bus error	Check all CAN bus connections, restart system.	Crane flashing	All
44. **	BB CC	CAN – bus error	CAN – members have the same or similar addresses	Check and reset all address switches of CAN – bus members (refer to 'addressing of the system'). Change CAN – bus members one by one, restarting system after each change.	Crane flashing	All
45. **	DD	CAN warning status	CAN – bus error, warning status	Check all bus connections, restart the system.	Crane flashing	All
50. **	BB CC	Initialisation error of CAN – bus members	CAN – member received a non programmed restart. This may occur due to bad connections, defective cables or plugs.	Check all bus connections and replace cable if necessary. Restart system. If error remains, change the CAN member indicated by the flashing address code.	Crane flashing	All
60. **	EE	Comparison of actual desired position of control valve spools not okay	Too fast change of operating direction on a single function (A to B), very cold oil or incorrectly programmed delay time.	Restart system. Allow engine to idle with PTO engaged to warm up oil. If error continues, check RC signal and Danfoss module.	Crane flashing	All
61. **	BB	Error document from the main spool position box to the main unit	The spool position box found an error	Restart system. If error remains, change the spool position box. The additional information (BB) shows the address of the defective unit.	Crane flashing	All
62. **	BB	10 times no telegram (100 ms) from spool position	Spool position box gives no answer	Check wiring and restart system. If error remains, change the spool position box. The additional information (BB) shows the address of the defective unit.	Crane flashing	All

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Table 14 Paltronic 50 Flashing Codes

Code 1	Code 2 Refer to Table 16	Description	Reason	Solution	LED	Locked Functions
63. **	EE	Lever not in neutral position during start up	<p>The spool of a certain function is acted while starting the system</p> <p>The cable to the spool position switch is defective</p> <p>Connection of the switch or in the spool position box is loose</p> <p>Spool position sensor is damaged</p> <p>The LED in the spool position box has to be on in the neutral position of the spool</p>	<p>Check the wiring and connections to the shown function.</p> <p>To find out if the switch or cable is damaged interchange two different spool position connections in the box. If the code remains the same after restarting the system, the cable is defective. If the code changes, the switch is defective.</p>	Crane flashing	All
64. **	FF	Lever acted in both directions (no signal from a spool position sensor at all)	<p>Cable from the spool position box to the switch is broken</p> <p>No power to the switch</p> <p>Check: In neutral position, the LEDs in the spool position box must be on</p>	<p>Check the wiring connections.</p> <p>To find out if the switch or cable are defective, interchange two different spool position connections in the box. If the code remains the same after restarting the system, the cable is defective. If the code changes, the switch is defective. If necessary, change wiring or switch (Danfoss module).</p>	Crane flashing	All
65. **	BB	Error initialisation of spool position box	It is impossible to initialise a spool position box. The box has probably been removed.	Check wiring and restart system. If the unit has been removed, the configuration in the software must be corrected (PALDIAG software).	Crane flashing	All
66. **	CC	Error message from the display unit to the main unit	A display unit found an internal error.	Restart the system. If error remains, change the defective display unit. The additional information (CC) shows the address of the defective unit.	Nil	Nothing
67. **	CC	10 times no telegram (100 ms) from display unit	A display unit gives no answer	Check wiring and restart system. If error remains, change the defective display unit. The additional information (CC) shows the address of the defective unit.	Crane flashing	None
68. **	CC	Error initialisation of display unit	It is impossible to initialise a display unit. The unit has probably been removed.	Check wiring and restart system. If the unit has been removed, the configuration in the software must be corrected (PALDIAG software).	Nil	Nothing

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Table 14 Paltronic 50 Flashing Codes

Code 1	Code 2 Refer to Table 16	Description	Reason	Solution	LED	Locked Functions
70. **	CC	Error document from RRC-receiver unit	Radio remote control receiver found an internal error	Restart system, if error remains, change the receiver box.	Crane flashing	All
71. **	CC	Error document from RRC-receiver unit (digital function). 100 ms no telegram	No answer from RRC-receiver box	Check EX3 cable, restart the system. If error remains, change the receiver box.	Crane flashing	All
72. **	CC	Error document from RRC-receiver unit (proportional function)	No answer from RRC-receiver box	Check EX3 cable, restart the system. If error remains, change the receiver box.	Crane flashing	All
73. **	CC	Initialisation error of RRC-receiver box	System switches off due to overheating or receiver actually disconnected	Check EX3 cable, restart the system. If error remains, change the receiver box. Check CAN – bus configuration in the software to be sure to have correct setting, in case of code 77.99.	Crane flashing	All

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Table 15 Paltronic 50 Additional Information Codes

Code 2	Code 3	Description	Reason	Solution	LED	Locked Functions
AA	02	Overload crane nominal load	Crane overload	Reduce load on crane.	Crane	OVL crane
BB	51-5F	Address of defective CAN member	Also see codes 61. to 65. and 66. to 68.			
CC	61-6F					
BB	51, 52, 99	Address of defective CAN member. In this case only spool position boxes can be the reason. Address with 'O' not allowed. Address switch to '1' causes address 51. Address switch to '2' causes address 52. and so on... Not known address gives code 99	Code 51 is the crane spool position box, 52 is the fly jib spool position box Address 99 means that a box is activated in the software by mistake	Check connections and addressing. Replace cables and connectors, reset the address using PALDIAG software.		
CC	61, 62, 63, 64, 99	Address of defective CAN member. In this case only spool position boxes can be the reason. Address with 'O' not allowed. Address switch to '1' causes address 6. Address switch to '2' causes address 6. and so on... Not known address gives code 99	All addresses of this kind are display units, there is no defined rule how to order them The address of a RRC display is usually 61. Address 99 means that a display unit is activated in the software by mistake.	Check connections and addressing. Replace cables and connectors, reset the address using PALDIAG software.		
DD	00 01 02 03 04 05 06 07	No specification Stuff error Form error Acknowledge error Bit 1 error Bit 0 error CRC error Unused		If the code still remains after checking all cables and connections the CAN – participants have to be changed one by one. Always reset the system to test the new parts.		
EE	01 02	Main boom lowering Main boom lifting				
	03 04 05 06 07	Outer boom lifting Outer boom lowering Slewing left Slewing right Extending extension boom				
FF	01 03 05	Main boom lifting and lowering Main boom lifting and lowering Rotation left and right	Normal function			

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Fault Finding – Crane

209. Table 17 provides fault finding information and procedures for the crane hydraulic system.

Table 16 Fault Finding – Crane Hydraulic System

Symptom		Probable Cause	Action
1.	External leakage	a. Leakage at hydraulic connections or hoses b. Leakage on the cylinder nuts	Inspect all fittings, connections and hoses, ensure all connections serviceable and tight. Inspect seal condition. Extend piston rod and inspect for scoring, nicks or burrs. Inspect for cracks in the cylinder indicated by leakage while under pressure. Ensure the cylinder nut is tight.
2.	Hydraulic cylinders are hard to or will not extend or retract	a. Low hydraulic oil level b. No oil flow to cylinder c. Mechanical system seized d. Bent or damaged piston rod and or cylinder e. Load holding valve fault f. Internal cylinder leak	Inspect and top up hydraulic reservoir with all hydraulic cylinders retracted if possible. Ensure hydraulic supply valve at the bottom of the reservoir is open. Inspect control valve operation. Clean and grease components. Replace cylinder assembly. Inspect double acting load holding valve. Remove, disassemble, inspect and correct cylinder.

Radio Control System



DO NOT ATTEMPT TO USE THE REMOTE CONTROL CONSOLE IF IT HAS, OR IS, THOUGHT TO HAVE SUFFERED WATER INGRESS. THE UNIT MUST BE RETURNED TO A HEAVY REPAIR FACILITY.

210. *Initial Fault Finding Procedures.* This paragraph lists the initial procedure to be performed when fault finding the remote control system:

- a. Ensure there is 24 V ± 20%, max 5% V peak to peak. This is to be measured at the crane emergency stop in both the loaded and unloaded condition.
- b. Check the fuse located in the remote control receiver (Figure 47 item 5). The fuse is a 10 amp standard blade type.
- c. Test the system with the cable control.
- d. Set the power supply switch to test the crane in that mode.
- e. Return the switch to the REMOTE position.

- f. Unscrew and disconnect the EX cable from the electronic box.
- g. Remove the valve contact DV from the dump valve.
- h. Remove and inspect valve contacts Nos 1 to 4 (grey plugs on Danfoss control modules fitted to the control valve).
- i. Record which LEDs are illuminated on the remote control receiver (see Figure 49 and refer to Table 18).

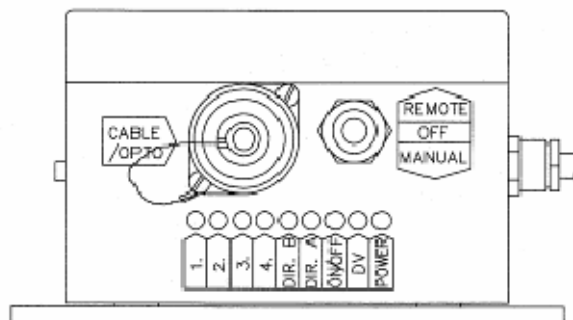


Figure 49 Remote Control Receiver

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211. Error Messages. Error messages can be read using LEDs. 1 to 4 on the remote control receiver box (see Figure 49). LED No 1 always flashes once first, followed by a combination of 2, 3 and 4 to indicate the actual fault. Refer to Table 18 for fault code indications.

Testing of Radio Transmitter

212. To test the control levers and buttons on the radio transmitter, proceed as follows:

- a. To enter the test mode press and release the emergency stop button on the transmitter, then press the start button ten times in rapid succession.
- b. Test the proportional levers by operating them one by one. The transmitter will give acoustical signals according to the angle of the lever.

c. Test the digital functions (buttons and switches) by operating them one by one. A beep will be heard each time a function is operated.

d. If there is a fault with a particular function no beeping will be heard. Replace the unit.

NOTE

The crane can be used in manual mode if the radio transmitter is unserviceable.

- e. To exit the test mode, press the emergency stop button.

**ELECTRICAL AND MECHANICAL
ENGINEERING INSTRUCTIONS**

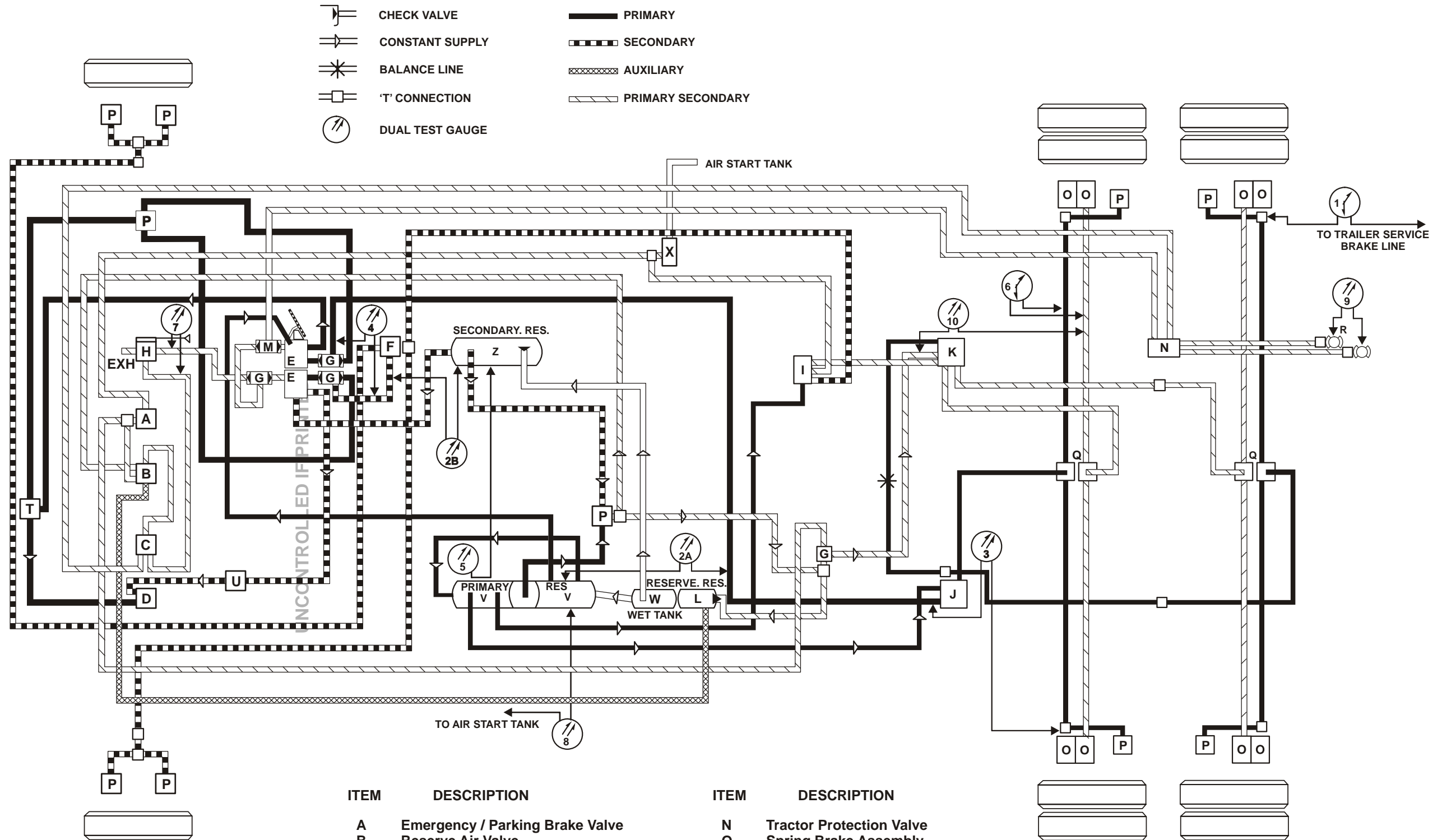
Table 17 Fault Finding – Remote Control Receiver

Fault Code		Probable Cause	Action
1.	LED 1, Pause, then LED 2	Overload on ON/OFF function (function draws more than 1.2 A)	<p>Disconnect EX-plug and EX-2 plug.</p> <p>If error remains, one of the EX cables has an internal short. Replace the cable.</p> <p>If error disappears, connect one of the EX cables. If the error shows up again, one of the functions on this cable has a short. Disconnect each function connected to the EX cable one by one to find the one causing the error. Repair or replace the faulty unit. A relay may be necessary on the defective function to lower the power consumption. Consult Palfinger.</p>
2.	LED 1, Pause, then LEDs 2 and 4	Overload on dump valve connection (DV) (function draws more than 2 A)	<p>Disconnect the DV function from terminal 15, or if not there, terminal 16 in the Paltronic 50 connection box.</p> <p>If the error remains, one of the cables has an internal short. Replace the cable.</p> <p>If the error disappears, check the Paltronic DV input and output for shorts. A relay may be necessary to reduce the power consumption of the DV system. Consult Palfinger.</p>
3.	LED 1, Pause, then LEDs 2 and 3	Short in Danfoss control module	<p>Disconnect the Danfoss modules one by one until the error disappears.</p> <p>If the error remains, one of the cables has an internal short. Replace the remote control receiver.</p> <p>If the error disappears, replace the defective control module.</p>
4.	LED 1, Pause, then LEDs 3 and 4	Danfoss control signal incorrect	<p>Disconnect the Danfoss modules one by one until the error disappears.</p> <p>If the error remains, one of the cables has an internal short. Replace the remote control receiver.</p> <p>If the error disappears, inspect the Danfoss module for possible condensation. Dry the module and recheck. It may be necessary to replace the module.</p>
5.	LED 1, Pause, then LEDs 2, 3 and 4	Error in the dump valve cable during system start up	<p>Disconnect the dump valve plug.</p> <p>If the error remains, the cable has an internal short. Replace cable.</p> <p>If the error disappears, replace the dump valve and check for shorts in external cables.</p>
6.	LED 1, Pause, then LED 4	Check sum error during programming with WIN-SCI	System requires resetting, contact Palfinger.

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ITEM	DESCRIPTION	ITEM	DESCRIPTION
A	Emergency / Parking Brake Valve	N	Tractor Protection Valve
B	Reserve Air Valve	O	Spring Brake Assembly
C	Tractor Protection Switch	P	Service Brake Assembly
D	Pressure Gauge	Q	Air Line Tee Piece
E	Foot Brake Treadle Valve	R	Trailer Emergency Line Coupling
F	Quick Release Valve	S	Trailer Service Line Coupling
G	Double Check Valve	T	Primary Manifold
H	Trailer Brake Hand Control Valve	U	Coupling
I	Spring Brake Control Valve	V	Primary Air Reservoir
J	Service Brake Relay Valve	W	Wet Tank
K	Spring Brake Relay Valve	X	Inversion Valve
L	Reserve Air Reservoir	Y	Work Brake Control
M	Double Check Valve	Z	Secondary Air Reservoir

Figure 50 Brake System Circuit Diagram

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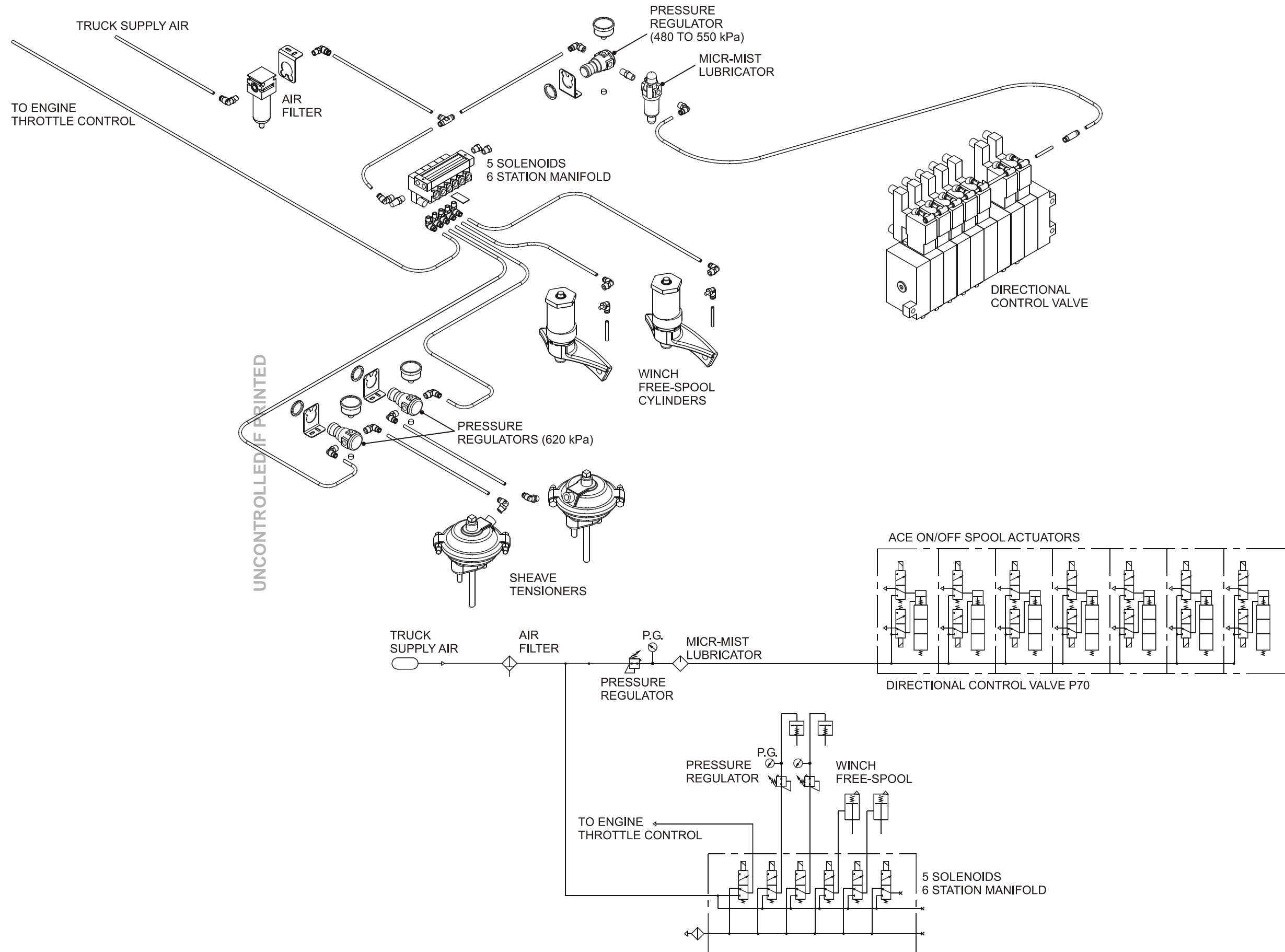


Figure 51 Recovery System Pneumatic Circuit

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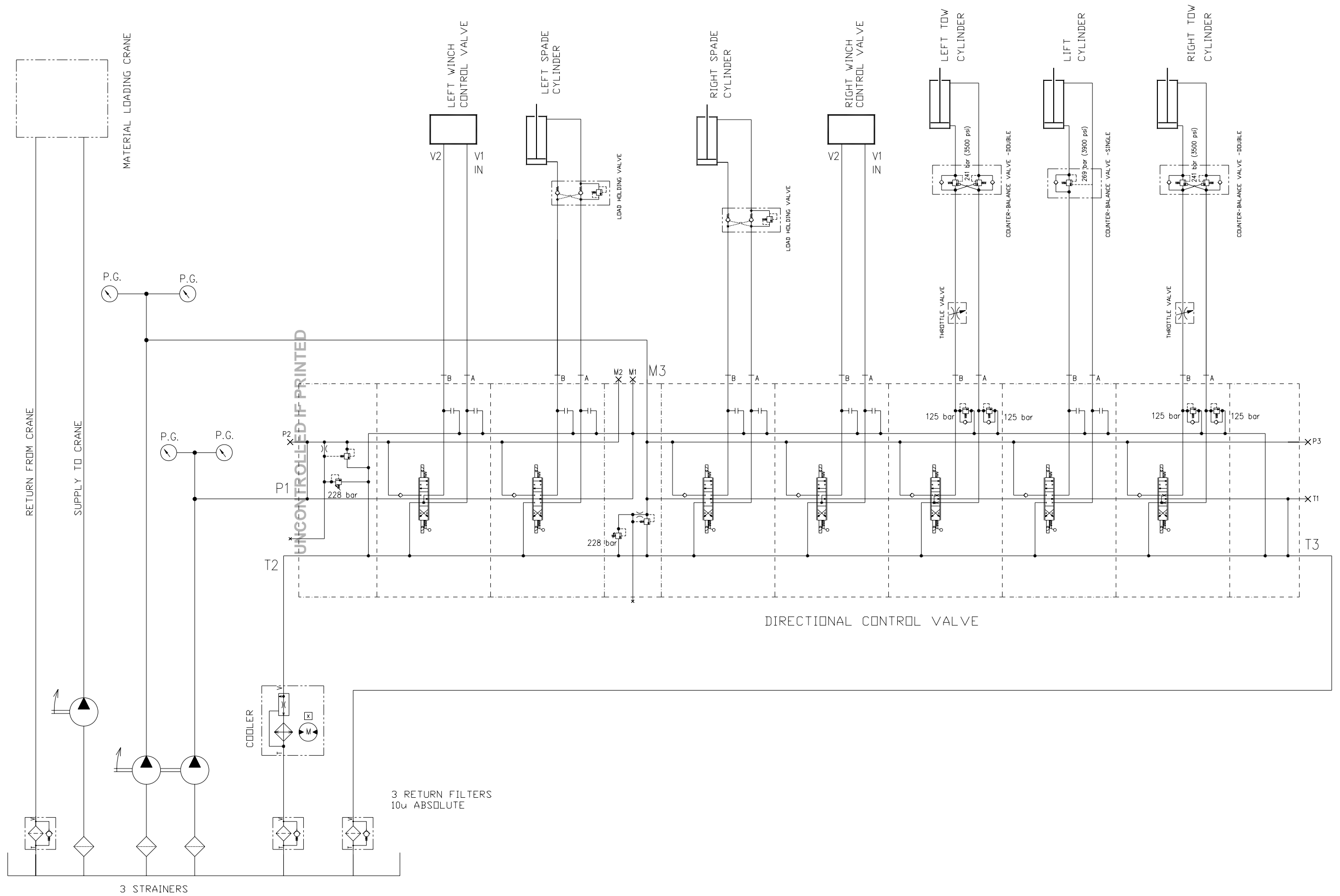


Figure 52 Recovery System Hydraulic Circuit

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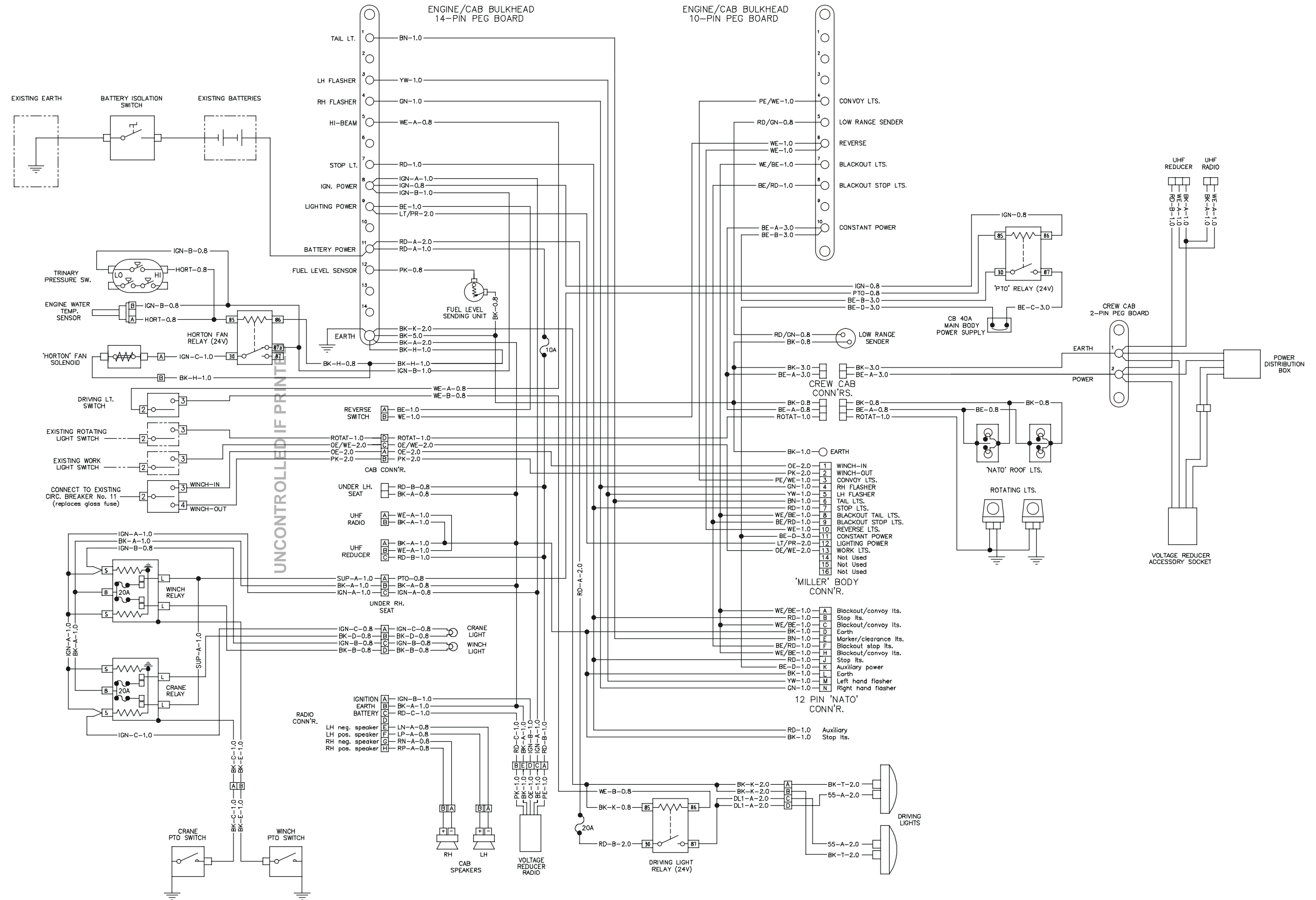


Figure 53 HRV Specific Cab/Chassis Electrical Circuit Diagram

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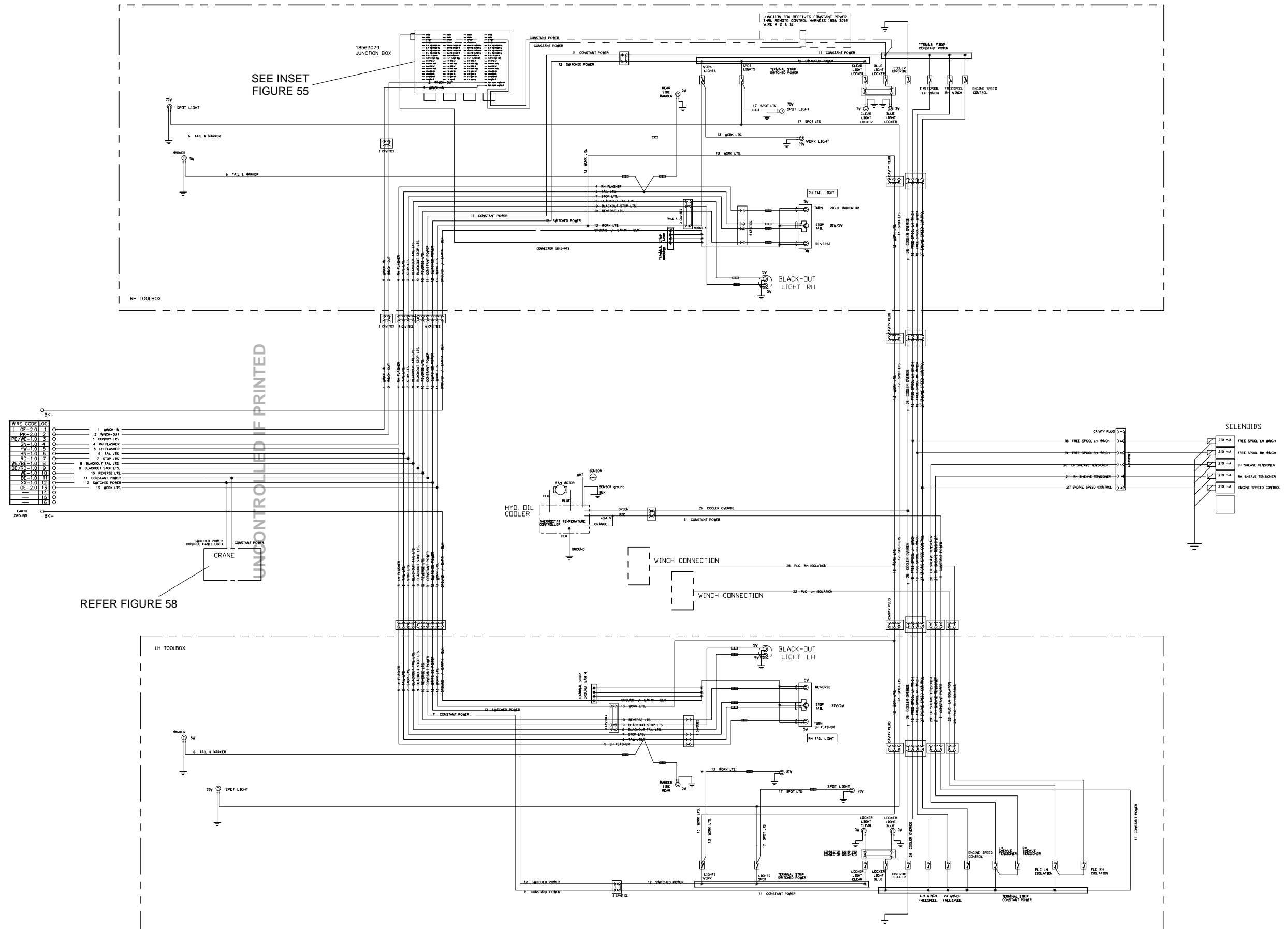


Figure 54 Recovery System Electrical Circuit Diagram

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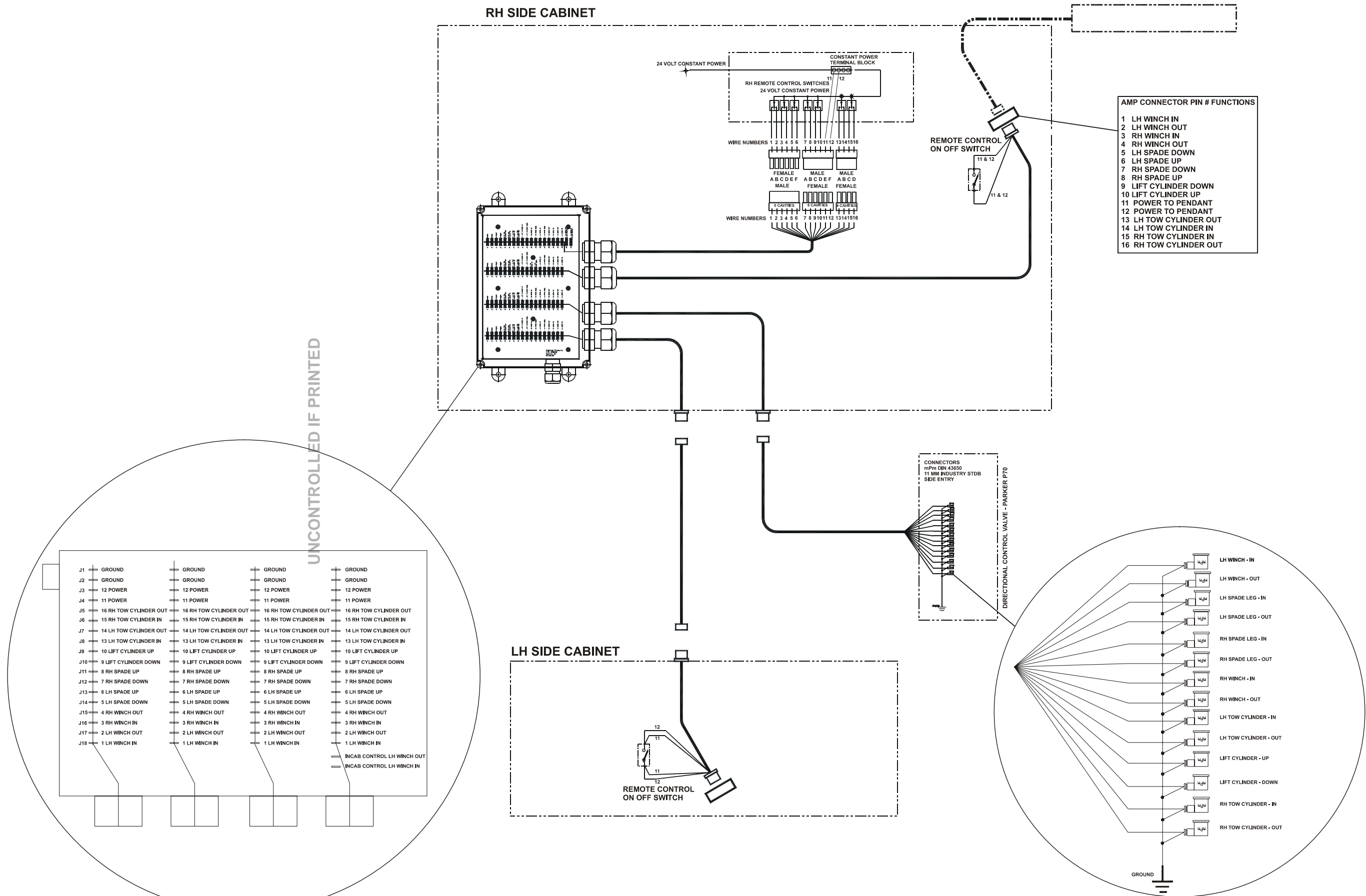


Figure 55 Recovery System Remote Control Circuit Diagram

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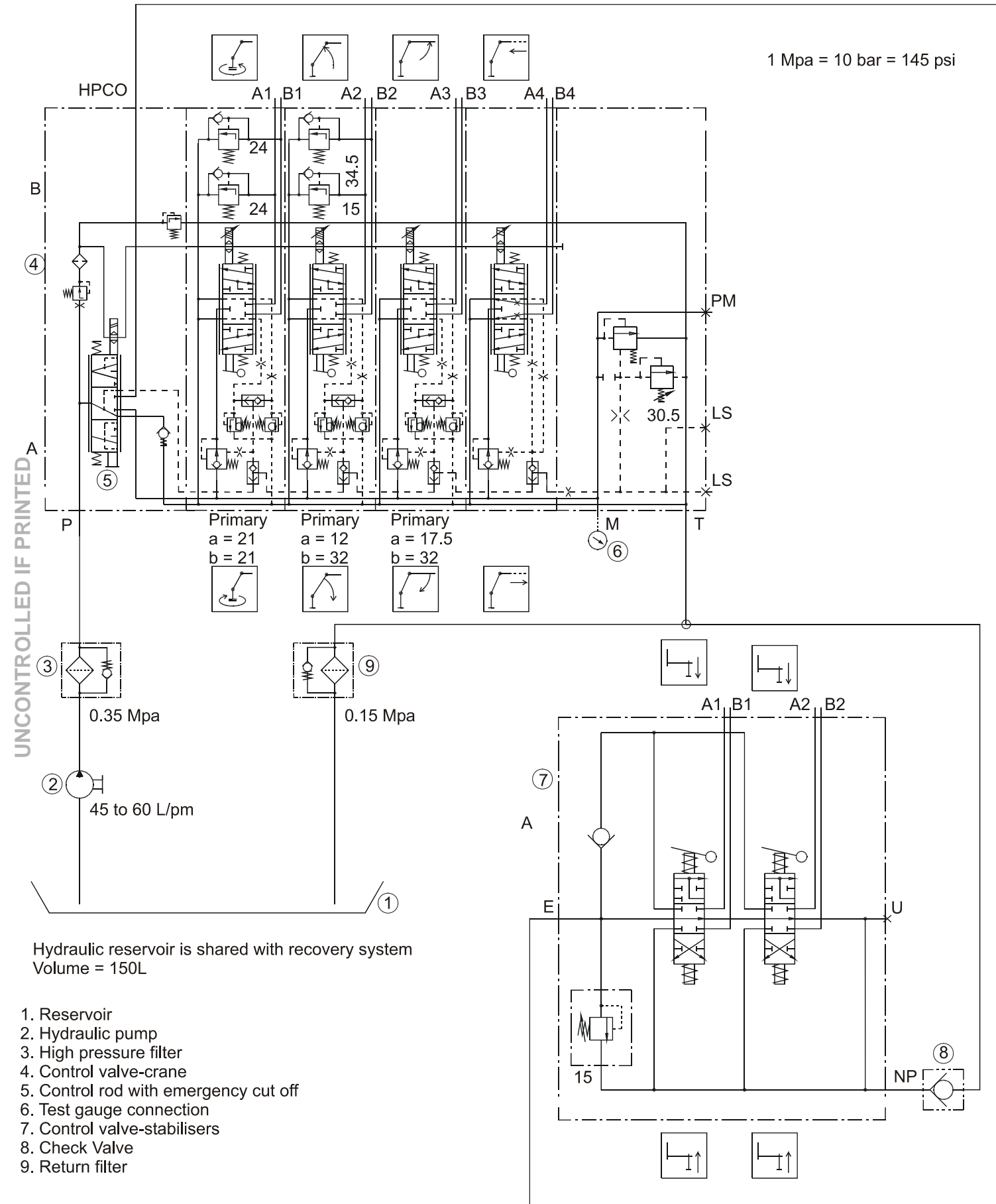


Figure 56 Crane Spool Valve Hydraulic Circuits

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1 Mpa = 10 bar = 145 psi

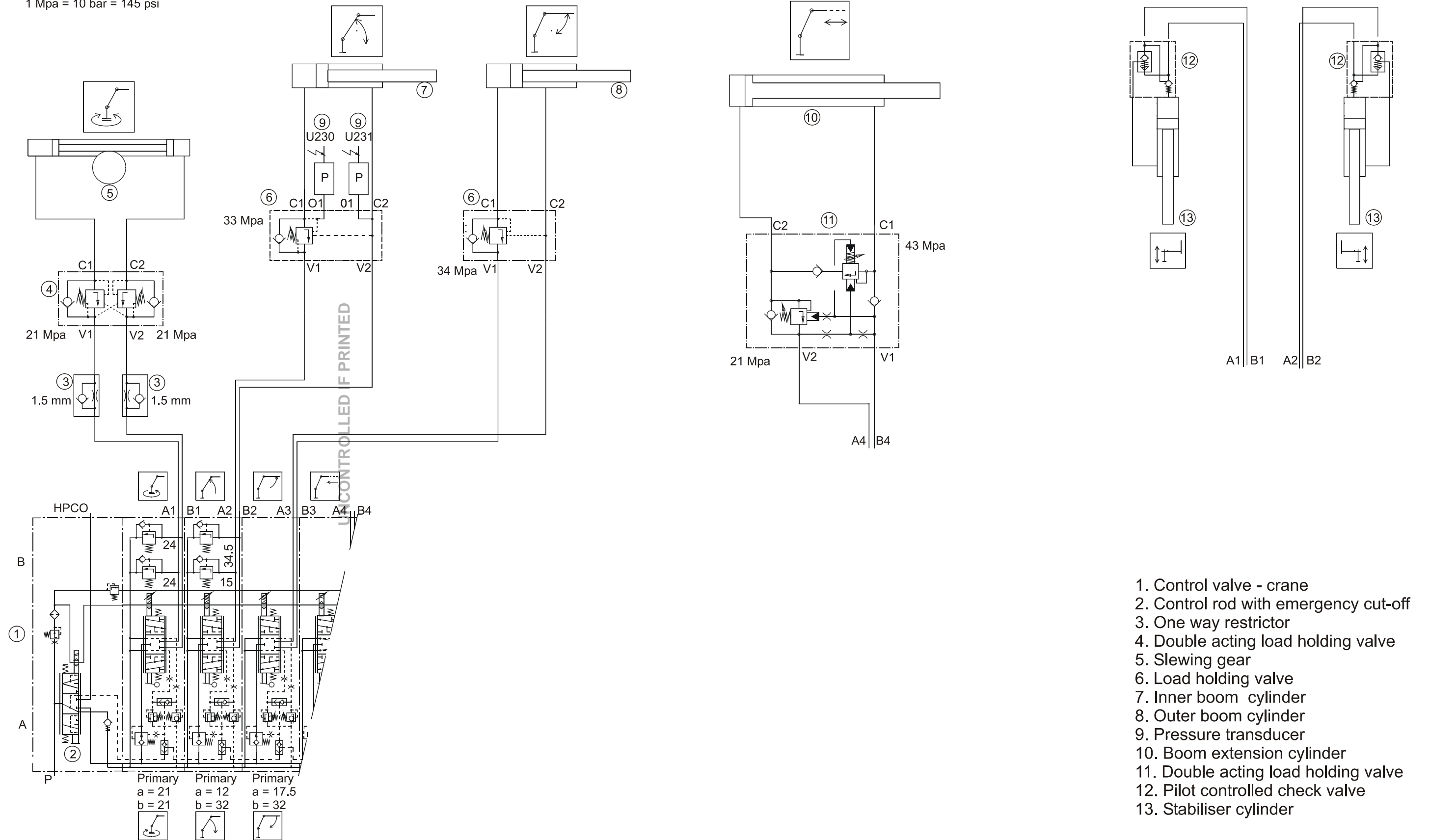


Figure 57 Crane Actuator Hydraulic Circuits

UNCONTROLLED IF PRINTED

INTENTIONALLY LEFT BLANK

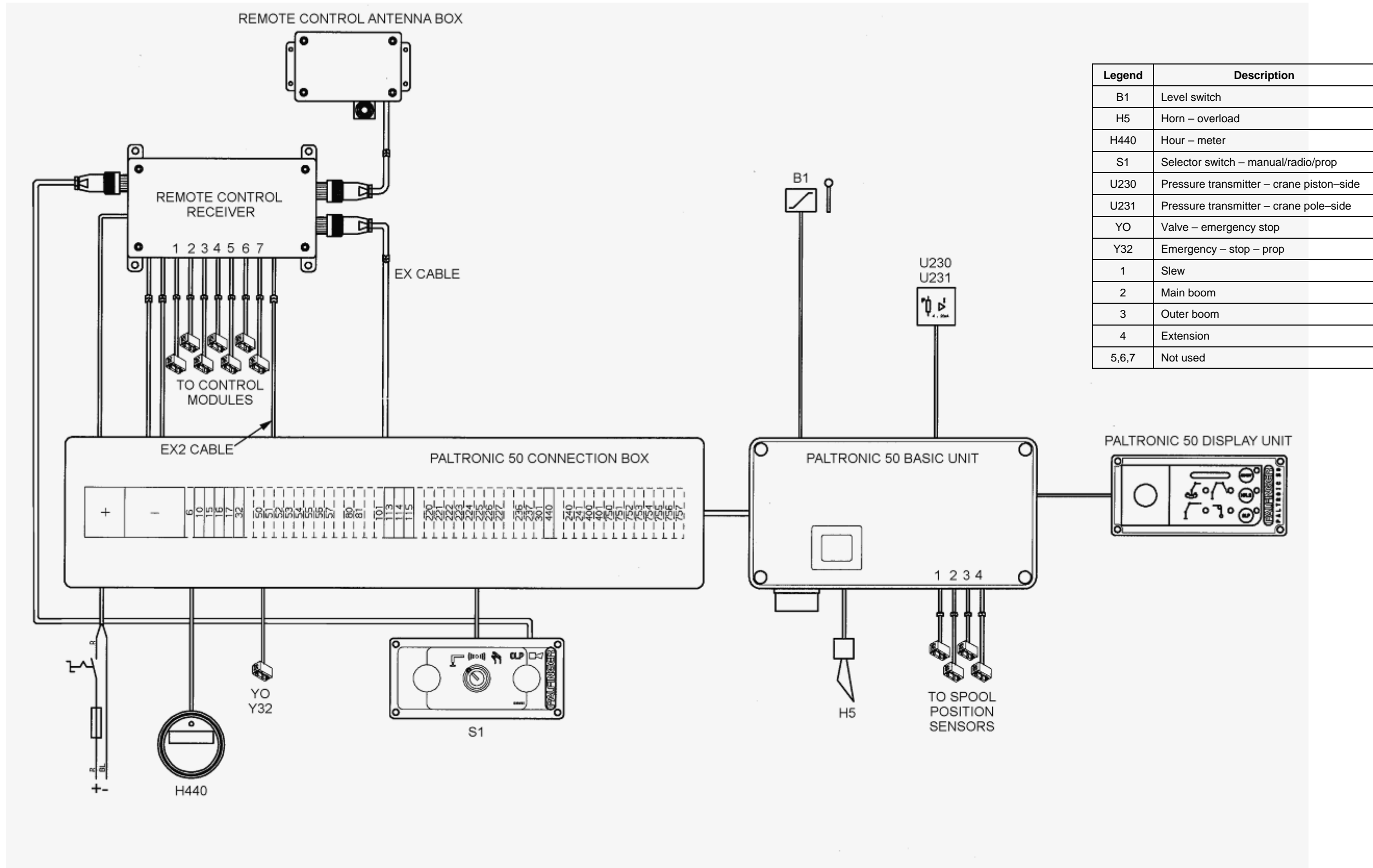


Figure 58 Crane Electrical Circuit Overview

END
Distribution List: **VEH D 30.0 – Code 2** (Maint Level)
(Sponsor: LV SPO, Hvy B Veh Sect)