MAINTENANCE MANUAL

WD2300S SERIES

Order Number: 812560-006
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SAFETY

Printed in Germany

LUBRICATION & ADJUSTMENT

Printed in Germany

Inspection and Maintenance Schedule

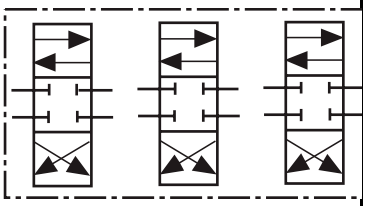
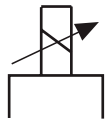
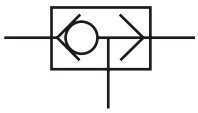
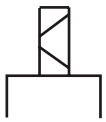
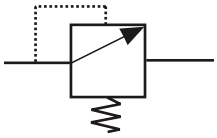
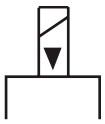
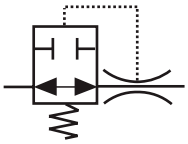
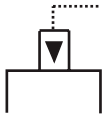
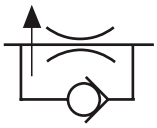
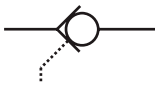
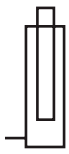
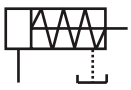
The following inspection and maintenance schedule assumes single-shift operation under normal conditions. The frequency of maintenance intervals must however be constantly adapted to the prevailing operating conditions. In dusty or otherwise extreme operating conditions including cold store application, the maintenance intervals specified must be reduced. Exact details should be discussed with a Crown service engineer.

When carrying out maintenance routinely check for wear, corrosion, damage, component operation and safety. If in doubt, replace components.

Daily Operator's Inspection		
Item	**Location**	**Action**
I01	**Battery**	**Check battery connector (Emergency Disconnect) and wires for damage, check contacts for burning. Check battery compartment for spilled acid. Battery safety clip and battery terminal support fitted? Screws tight? Catch down? Check/charge battery in accordance with manufacturer's instructions if necessary.**
I02	**Gear unit**	**Check for leaks: Brown oil at the bottom near the drive wheel? If leakage is found, take the truck out of service.**
I03	**Hydraulics**	**Check for leaks: Traces of light oil on the ground beneath the truck? If leakage is found, take the truck out of service.**
I04	**Steering**	**Check operation, ensure there is zero backlash.**
I05	**Platform**	**Test freedom of movement, automatic return and check for damage.**
I06	**Side restraint**	**Test freedom of movement and check for any damage.**
I07	**Forks, outriggers**	**Check for possible damage, cracks and excessive wear.**
I08	**if applicable: Load backrest**	**Ensure it is securely fitted and check for damage.**
I09	**Lift chains, chain anchor**	**Check for possible corrosion, cracks and any other damage.**
I10	**Wheels, load wheels**	**Check tyres for wear and foreign bodies. Remove any foreign bodies.**
I11	**Safety shield**	**Securely attached, not cracked and still visible?**
I12	**Labels, decals**	**Check that they are all present, clean and legible.**
I13	**Key switch**	**Switch on and test battery discharge indicator operation.**
I14	**Outriggers**	**Raise and lower outriggers. Check operation.**

Lubrication Points

Item	Component	Type	Quantity	100	250	500	1000	2000
L1	Check hydraulic reservoir, top up if necessary	D	A/R	Initial inspection	x			
L2	Replace hydraulic oil	D	A/R	First change after 500 service hours				x
L3	Battery cover hinges	B	A/R		x			
L4	Control handle return springs	B	A/R			x		
L5	Tie rod pintails and all lift mechanism joints.	B	A/R		x			
L6	Lift cylinder attachment	B	A/R			x		
L7	Piston rod attachment	B	A/R			x		
L8	Change transmission oil	A	A/R	First change after 250 service hours				x
L9	Mast sections	B	AR		x			
L10	Mast & fork carriage rollers	B	AR		x			
L11	Lift chains	G	AR		x			

Symbol	Meaning	Symbol	Meaning
	Valve block with 3 operating units		Proportional solenoid
	Shuttle valve		Dual solenoid
	Relief valve, fixed setting		Solenoid valve, pilot operated
	Velocity fuse		Hydraulic pilot operated
	Pressure-compensated flow control with reverseflow bypass; fixed.		Manual actuator
	Pressure-compensated flow control with reverseflow bypass; fixed.		Single-acting cylinder, with cushion
	Pilot check valve(pilot to open)		Single-acting cylinder ram type
	Manual lever actuator		Single-acting cylinder with spring returned (rod end vented)

Bleeding the Hydraulic System

Whenever work has been performed on hydraulic components, the hydraulic system must be flushed and bled. The procedure for doing this can be found in Chapter 8 under “Cylinder Bleeding and Flushing”.

Drift Test

Whenever work has been performed on hydraulic components a drift test must be carried out to ensure that certain system components are working correctly. The procedure for doing this can be found in Chapter 8 under “Drift Test".

Proportional function:

Whenever maintenance work has been performed on the hydraulic system.

Ensure that the load can start smoothly when the lift motor is switched on and that the load can also brake smoothly when lowering is switched off (subjective test).

The HCM (hydraulic control module) may have to be calibrated (see Electrics chapter).

Disassembly

Warning

De-pressurise all components before carrying out maintenance work on the hydraulic system. High pressure hydraulic oil can cause serious injuries.

Whenever a high pressure fluid enters the skin it must be treated as an emergency, even if the skin initially shows no reaction. Physical effects may take time to set in.

Tighten all ports before re-applying system pressure. Keep hands and body away from all ports as high pressure hydraulic oil can emerge.

Use absorbent paper to trace leaks, never use your hands!

- Fully lower the forks. Retract the mast fully.
- Fully lower the initial lift.
- Turn the key switch OFF. Remove the key. Disconnect the battery.

Gear Unit

Preparatory Measures

Raise the truck approx. 500 mm to remove the gear unit.

Tools required:

- Forklift truck with sufficient capacity, lift height and fork length for the truck to be raised.
- Safety mechanism for the forks of the lifting truck, required to hold the raised truck.
- Sufficient number of wooden blocks (surface area of at least 250 x 250 mm) or suitable supports to secure the raised truck.
- Device to carry the gear unit onto a jack or pallet truck.

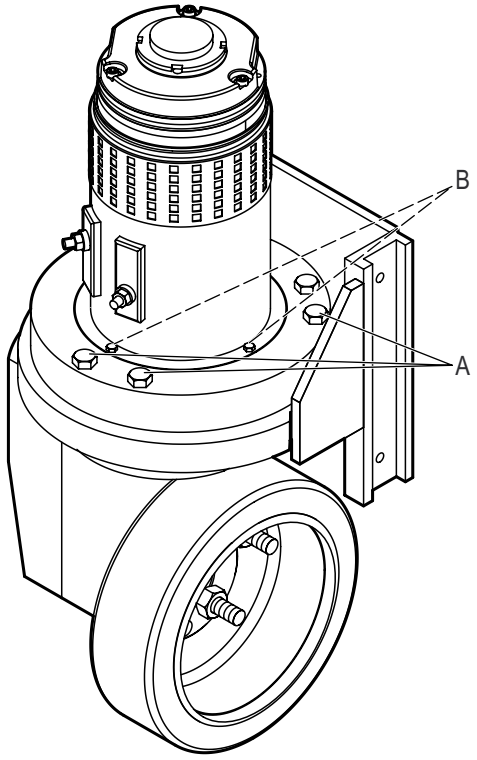
Disassembly

- Disconnect the battery and remove the key.
- Secure the truck to prevent it from being switched on again.
- Secure the truck with a second forklift and prevent it from sliding away.

Danger

Never work underneath a suspended load.
Fatal injuries could result if the truck is suddenly lowered.

- Raise the truck until you can push a jack / pallet truck underneath the truck to support it.
- Raise the truck again by approx. 50 mm in order to be able to loosen the gear unit from the toothing at a later time.
- Lower the truck onto the wooden blocks/supports.
- Raise the device on the jack/pallet truck until it contacts the gear unit.
- Remove the electrical connections from the motor.
- Undo the six gear unit mounting screws (A) and the three motor mounting screws (B) in Fig. M1564.



M1564

A Gear unit mounting screw

B Motor mounting screw

- Lower the device together with the gear unit and pull it out from under the truck.

Wire Colour Code

The wires used in the truck are colour-coded and numbered according to their function. The first digit or the first two digits indicate the wire colour while the last two digits are counter numbers.

Abbreviation	Colour	Number[a]	Function
BLK	Black	0**	Digital signal
BRN	Brown	1**	Analog signal
RED	Red	2**	Positive not allowed
ORG	Orange	3**	+12 volt DC converter
YEL	Yellow	4**	Third DC converter
GRN	Green	5**	Negative not allowed
BLU	Blue	6**	Insulated negative
VIO	Violet	7**	+5 volt DC converter
GREY	Grey	8**	Fourth DC converter
WHT	White	9**	Various
RED/WHT	Red/White	29**	Positive connected
GRN/WHT	Green/White	59**	Negative connected

a. ** Numbers 01 to 99

Battery

General

The condition of the battery will affect the performance and driving characteristics of the truck. Optimal maintenance is key to maintaining the performance and useful life of the battery.

Warning

The battery must be serviced solely in accordance with the battery manufacturer's instructions.

Incorrect or inadequate maintenance will initially reduce the performance of the truck and ultimately result in premature failure of the battery.

It is essential to adjust the battery discharge indicator (BDI) correctly to ensure on the one hand that the battery is not fully discharged and on the other that there is maximum battery capacity available for the task in hand.

Replacing the Battery

Warning

Only use batteries of the permitted size, weight and specifications for this truck.

An incorrect battery type can cause damage to the truck.

Incorrect weight and dimensions alter the truck centre of gravity. This can result in fatal accidents.

There are several different battery compartment models. **Refer to the truck operator manual to battery replacement instructions.**

The operator manual contains the latest safety instructions and information.

Maintenance

Maintenance of the SEM1 traction controller is restricted to external cleaning and checking the torques of the nuts securing the power cable connecting bolts.

You should also take this opportunity to check the errors listed with the help of the programmer.

Warning

The SEM1 traction controller operates at high currents. Particular safety measures are therefore required when handling the controller.

Only use specially trained personnel.

Use non-fatigue goggles.

Do not wear loose clothing.

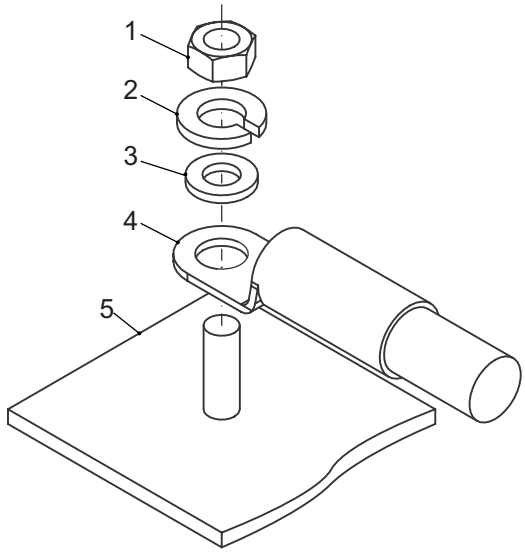
Do not wear jewelry.

Only use insulated tools.

- Disconnect the battery (=EMERGENCY DISCONNECT).
- Jack up the truck.
- Discharge the traction controller capacitors by connecting the BATT- and BATT+ connections over a resistance of approx. 10 Ohm, 5 5 W.
- Remove the power cable: Tag out the cable if necessary. Loosen the bottom nut (1, Fig. MS-1723-100).
- Remove any dirt and corrosion from the contact surfaces.
- Wipe down the traction controller with a clean, damp cloth.
- When everything is dry, reconnect the power cable as illustrated in Fig. MS-1723-100.
- **Torque the locknut (1, Fig. MS-1723-100) to 5.5 - 8 Nm.**

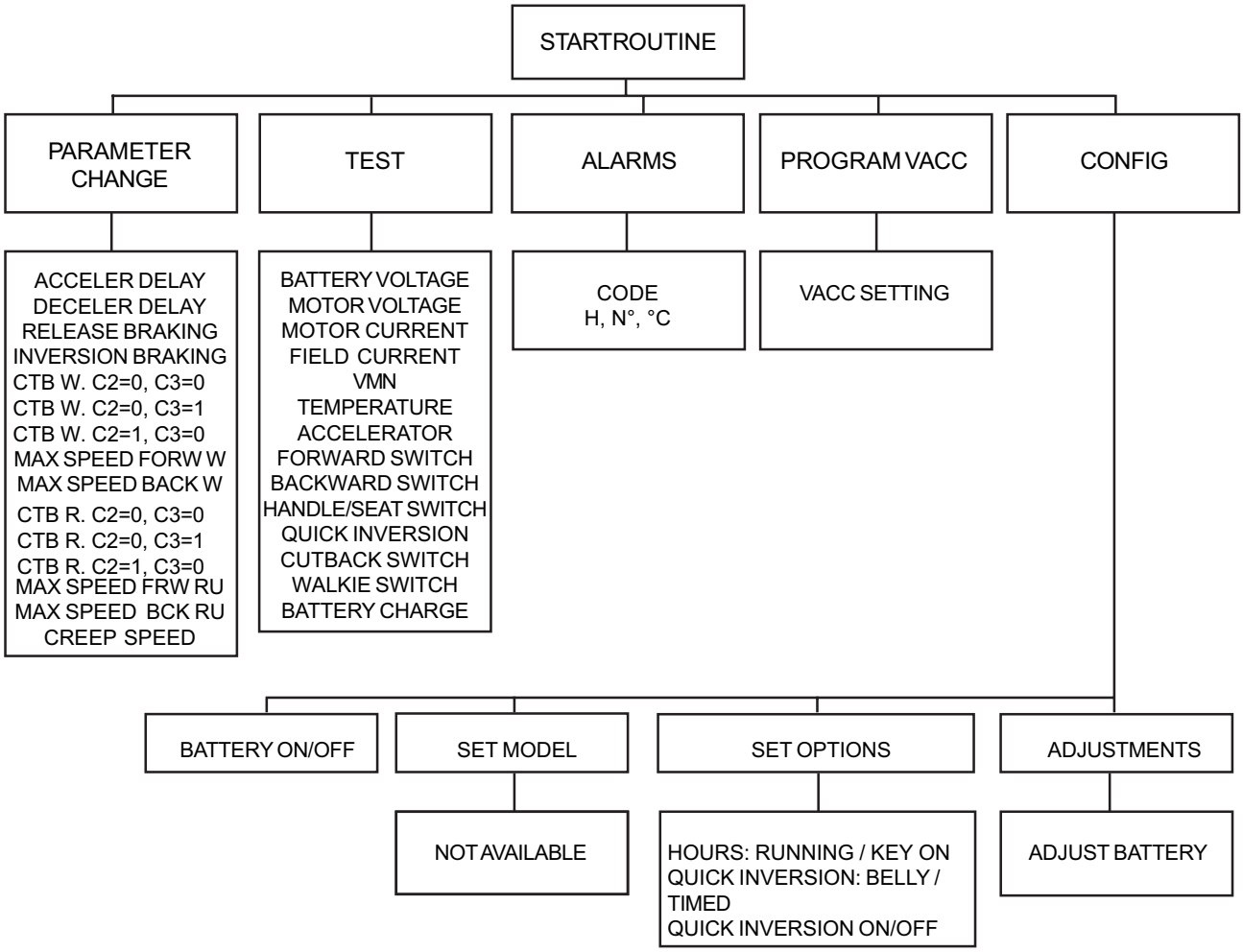
Important: An incorrect torque can damage the circuit board and the housing of the controller.

- Refit the control lines.
- **For cold store versions:** Apply a coat of Dow Corning® 4 Compound, part no. 053051-006, to the control line connectors. Apply a layer of acid-resistant clearseal paint, part no. 805236-003, to the controller.



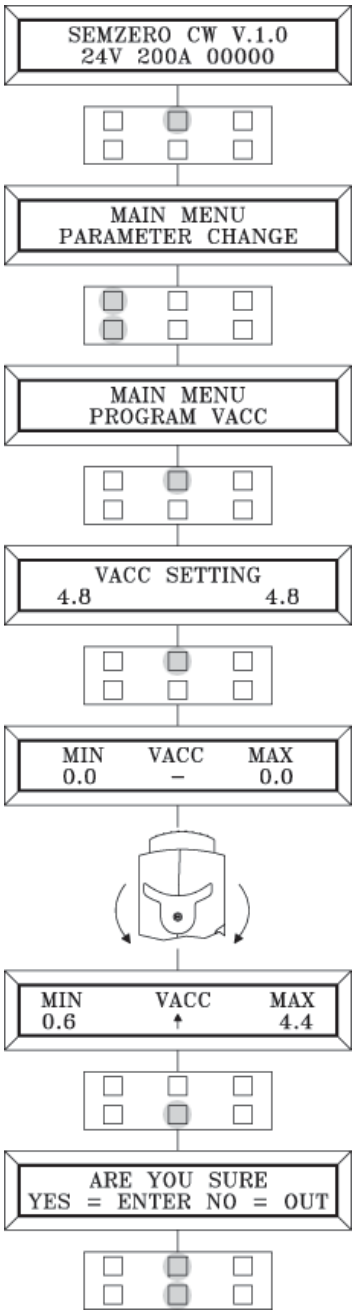
MS-1723-100

Menu Structure for Folding Platform



MS-4.4-1723

- Press OUT to quit the VACC menu.



M1610

Calibrating the HCM

The system must be re-calibrated every time the wiring of the HCM module, the proportional valve or the hydraulic wiring is disconnected. Apply the following procedure:

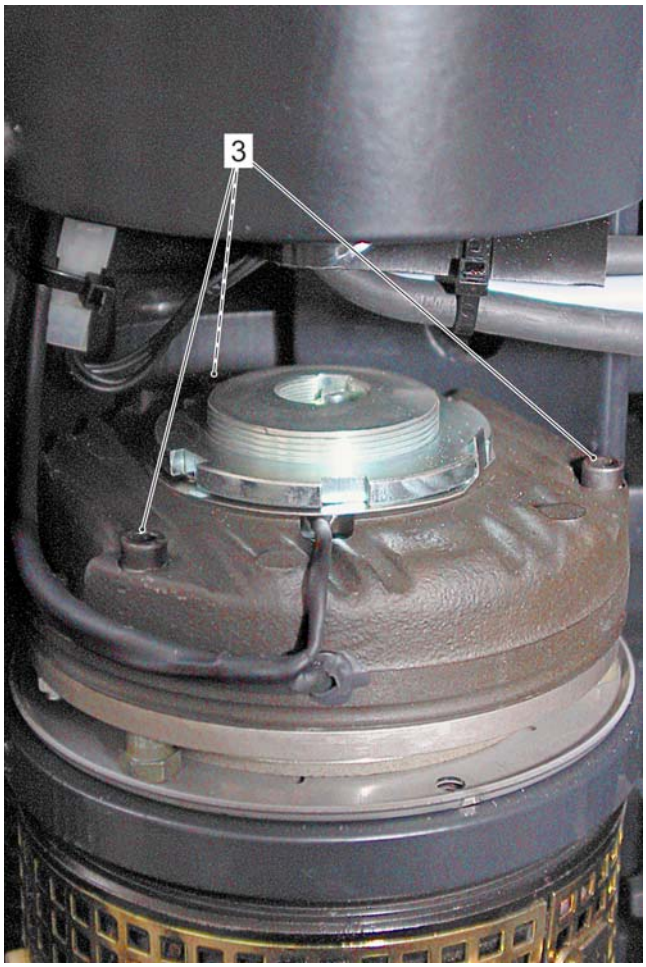
- Connect the battery if it is not already connected.
- Turn the key switch ON (lifting and lowering must be ready for operation).
- Raise the forks to a height of approx. 1 m.
- Disconnect the battery.
- Depress and hold down the “Lower” switch.
- Connect the battery.
- Depress and hold down the “Lower” switch for 5 seconds. The forks should not lower during this period.
- Release the lowering functions.
- Switch the truck off and on again.
- The procedure is complete. Check all operations in accordance with the truck’s specifications.

Assembly

Warning

Do not allow brake components to come into contact with oil or grease.

- Re-insert any pressure items (11) and springs (12) that may have fallen out of the magnetic body (7). First the springs (12), then the pressure items (11).
- Insert the spring (10) and bushing (13) in the magnetic body (7).
- Place the tie plate (14) in the correct position on the magnetic body (7), while noting the hole pattern.
- Screw the hollow screws (17) into the magnetic body (7) as far as the stop, using a medium strength sealant.
- Insert the screws (8) into the tie plate (14) just so far that a uniform gap of 1 mm remains between the tie plate (14) and the magnetic body (7).
- Screw the friction plate (18) onto the motor.
- Push the rotor (16) onto the hub (15). Avoid damaging the toothing.



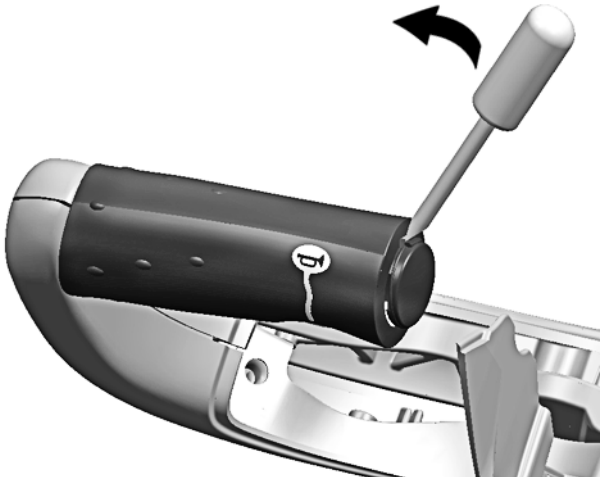
M1535

3 Hex. socket screw

- Attach the pre-assembled magnetic body (7) with the hex. socket screws (3) to the motor.
- Refit the electric plug connection (20).

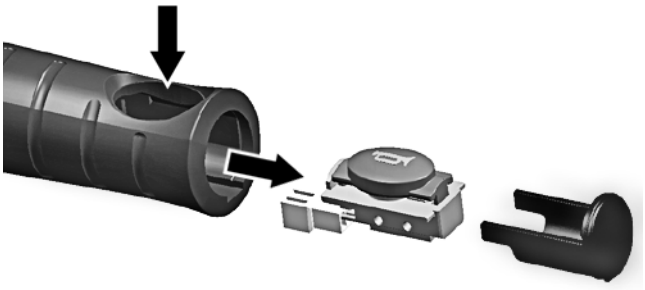
Caution

After assembling, it is important to set the air gap correctly, test the braking distance (see following page) and set the braking torque if necessary.



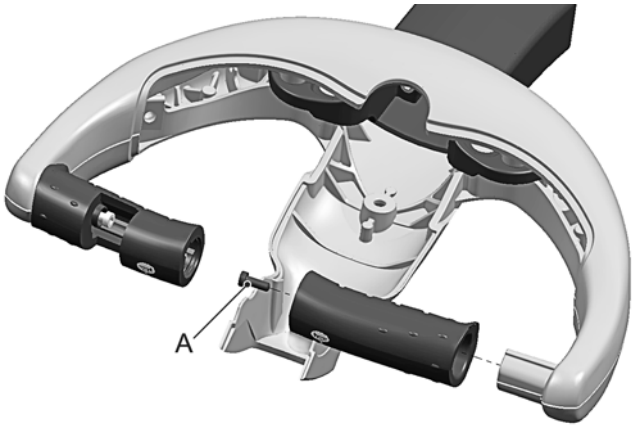
MS502

- Using a small flat bladed screwdriver lever off the cover on each hand grip (see arrow, Fig. MS502).



MS503

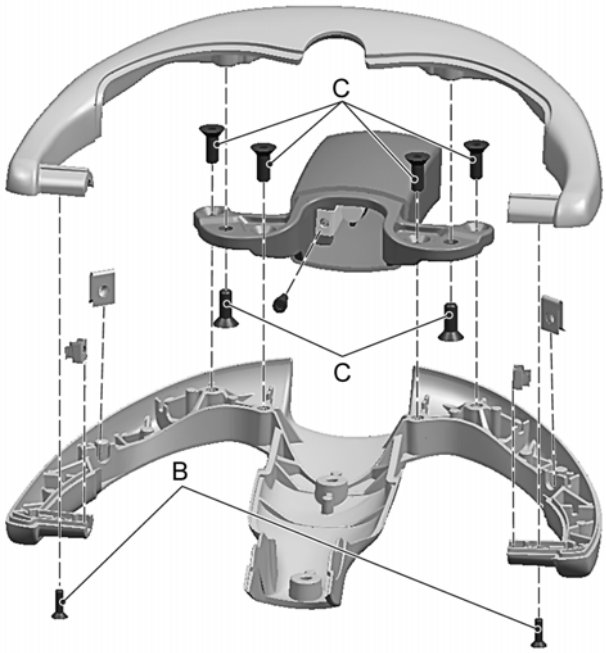
- Gently press in the horn switch and pull it out of the grip (see arrow, Fig. MS503). Disconnect the plug connection from the switch.



MS501

A Torx screw

- Remove the inner Torx® screws (A) shown in Fig. MS501 and pull off the grips.



MS517

B Torx screw

C Torx screw

Disassembly

- Remove the switch unit (see Switch Unit section in this chapter).
- Remove the two screws connecting the clip (1) to the shell.
- Remove the screw (2, not visible in the drawing) connecting the switch to the clip. Lift out the switch block.
- Remove the two screws (3) to remove the microswitch.

Installation

- Assemble the auxiliary switch in the reverse order ofdisassembly.

Make sure the gap between the switch cap (4) and the shell (5) is even throughout its circumference. The switch cap must not jam when applied.

- Refit the switch unit (see Switch Unit section in this chapter) and test the operation.

Fork Carriage Removal

Warning

Wear appropriate safety clothing such as safety glasses and shoes, whenever performing maintenance work. To avoid injury, do not place fingers, hands, arms or feet through mast and keep them away from pinch points.

1. Turn the key switch OFF. Remove the key and disconnect the battery.
2. Attach warning tag to control handle to advise others that the truck is being serviced.
3. Chock drive tire and outrigger load wheels.
4. Using a lifting device, raise fork carriage until lift chains are slack.
5. Disconnect lift chain(s) from chain anchors or tensioner on fork carriage. Then lower fork carriage completely.
6. Attach lifting device to top of inner mast. Then raise inner mast and remove fork carriage. Make certain rollers and shims remain in place on fork carriage.
7. Lower mast to collapsed height.

Fork Carriage Installation

1. Chock drive tire and outrigger load wheels.
2. Make certain rollers are in good condition and installed on fork carriage. Replace a worn or damaged roller.
3. Using a lifting device, raise inner mast, install the fork carriage, and lower inner mast to collapsed height.
4. Attach lifting device to fork carriage and raise carriage enough to allow chains and hydraulic supply lines, if applicable, to be connected.
5. Connect lift chain(s) to chain anchors or tensioner on fork carriage.
6. Remove any pipe plugs or caps that were previously used to seal connections. Then connect all hydraulic lines that were previously disconnected.
7. Lower fork carriage and remove lifting device.
8. Check lift chain tension and adjust if necessary.
9. Remove chocks.
10. Connect battery and remove warning tag from the control handle.

Lift Chains

General

Lift chains are a major component of a fork lift truck. The chain system on this mast is designed to transmit the lift force from the hydraulic cylinder to the fork reliably and efficiently. Safe, uninterrupted truck operation depends on careful servicing and maintenance of the lift chains.

Most complaints about the chain performance are due to lack of maintenance. Highly stressed precision chains require regular maintenance to ensure a long useful life.

Inspection

The chain must be inspected every 100 hours for any signs of faults or damage. If used in a corrosive or dusty environment, this interval must be reduced to 50 hours. If this cannot be performed on the truck, the lift chains must be removed.

Irrespective of the result of the inspection, the lift chains, detachable chain anchors and anchor bolts must be replaced every three years.

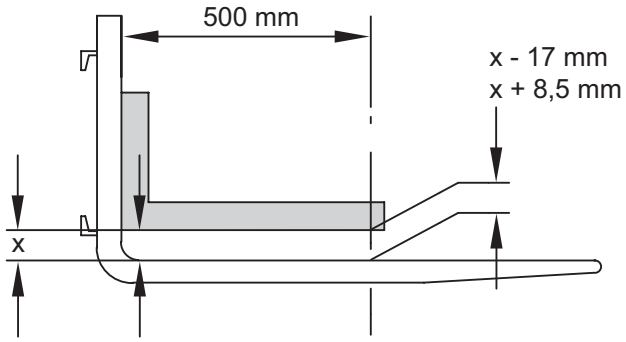
The inspection should include the following:

- Chain wear and elongation.
- Pitting due to rust or corrosion, in particular on the outer surfaces of the connection plates.
- Pins turning in or extruding from the outside plates.
- Loss of freedom of movement.
- Damage to the anchor bolt attachment
- Wear and corrosion to the anchor bolt and anchor.
- Wear between the bolts and the connection plates.

The following sections cover the above items in detail.

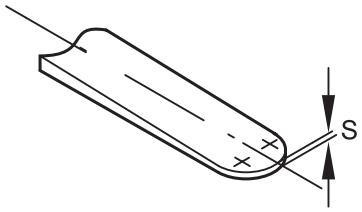
Fork Blade Warping

Measure the angle deflection between the top of the fork blade and the front of the fork shank (Fig. M0353). If dimension x is outside the tolerance range, the fork must be aligned by a specialist and re-checked.



M0353

Measuring the Fork Tip Width



M0355

If the fork tip width S is less than a/6 mm (a = fork back width) do not use the fork (Fig. 0355).

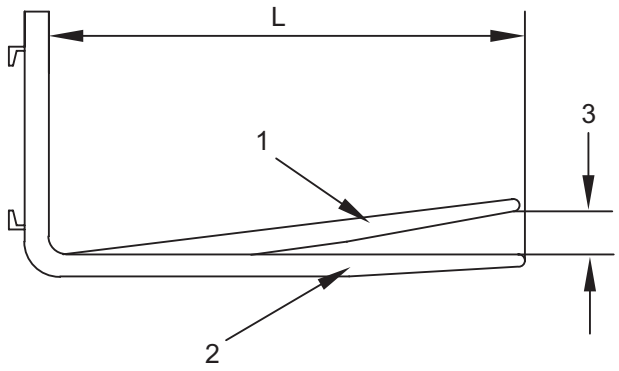
Fork Tine Height Difference

Check the height of the fork tines in relation to each other (Fig. M0354) if the fork is fixed to the fork carriage. If the difference is greater than 3% of the fork blade length the fork tines must be correctly aligned.

Example: If the length of the fork blade is 1150mm the maximum permissable deviation is approx. 35mm.

However, this would prevent the fork from working. In practice, forks must be aligned if the deviation is max. 10 mm.

Fork Stop



M0354

1 1. Fork
2 2. Fork
3 3% of L

Check the stop mechanism (Fig. M0356) on both fork tines. The mechanism should lock securely, otherwise the fork must be de-commissioned.

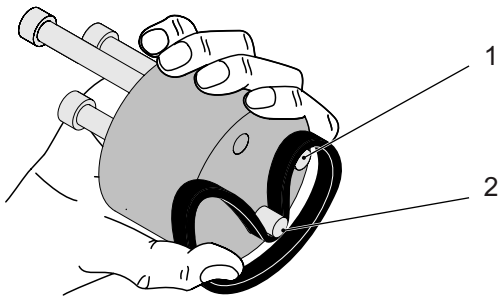
Large Rod Seal Assembly

Tools required:

- Tool body (outer diameter must fit the internal diameter of the cylinder cap).
- Three pins (1, 2 and 3). Pin (1) is fixed; pins (2) and (3) are moveable.

Assembly:

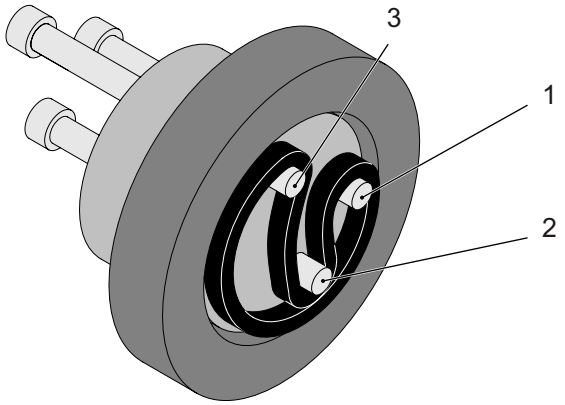
- Apply a thin coating of hydraulic oil to the rod seal and the seal seat in the cylinder cap.
- Place the rod seal over the fixed pin (1).
- Bend the rod seal under pin (2) (see Fig. MS-3400-085).



MS-2232-019

1 Pin
2 Pin

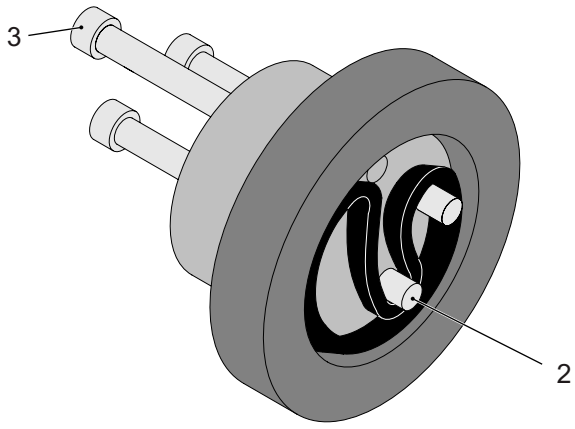
- Bend the loop created in this way so far up that pin (3) can be pushed into the loop.
- Now push the tool body into the cylinder cap until the rod seal is aligned with the seal seat (see Fig. MS-3400-086).



MS-3400-086

1 Pin
2 Pin
3 Pin

- Pull back pin (3). A section of the rod seal jumps into the seal seat (Fig. MS-3400-087).



MS-3400-087

2 Pin
3 Pin

Cylinder Bleeding and Flushing

Hydraulic circuits need to be flushed after repair of lift cylinders and bled of all air. Before bleeding and flushing, all hydraulic ports must be checked for leaks. In addition you must ensure that all filters, where applicable, are fitted and that there is sufficient hydraulic fluid in the reservoir for flushing and bleeding. Hydraulic system must be pressurized during the flushing and bleeding procedures.

Free lift cylinder bleeding

Danger!

Always stay away from the operatingarea of the fork carriage while bleeding is taking place.

The fork carriage can automatically lower and result in fatal injuries.

- Slowly extend the fork carriage to free lift. The free lift is approx. 1220 mm.
- Slowly open fork carriage cylinder bleed screw and bleed air from cylinder until a solid stream of hydraulic fluid flows out of bleed screw hole.
- Tighten bleed screw securely.
- Flush cylinder following procedure outlined below.

Flushing – Mast Lift Cylinders and Free Lift Cylinders

- Actuate control valve to raise carriage through free and stage lift and stop to hold in position.
- When the fork carriage is raised visually inspect for leaks.
- Actuate control valve to lower carriage through stage and free lift while visually checking operation and staging.
- Raise and lower carriage rapidly for a minimum of 10 cycles to flush system.

Drift Test

Danger!

Never stand or work under a suspended load

If a raised load drops, fatal injuries can result.

All drift tests should be conducted with a capacity load (refer to capacity plate for the rated capacity of your truck). The material used for the test load must be evenly distributed within a 1.2 m x 0.8 m pallet and must be attached to the fork carriage. Fully extend the mast with maximum rated load. The load may not drift down more than 50 mm within 5 minutes. Occasionally internal leaks in the cylinder may cause the fork assembly to lower slowly. However, this may also be due to leaks in the check valves, pilot valves etc. In this case flush the system by raising and lowering the fork carriage several times to remove any foreign bodies from the valve seats. Now repeat the drift test.

ELECTRICAL WIRING DIAGRAMS

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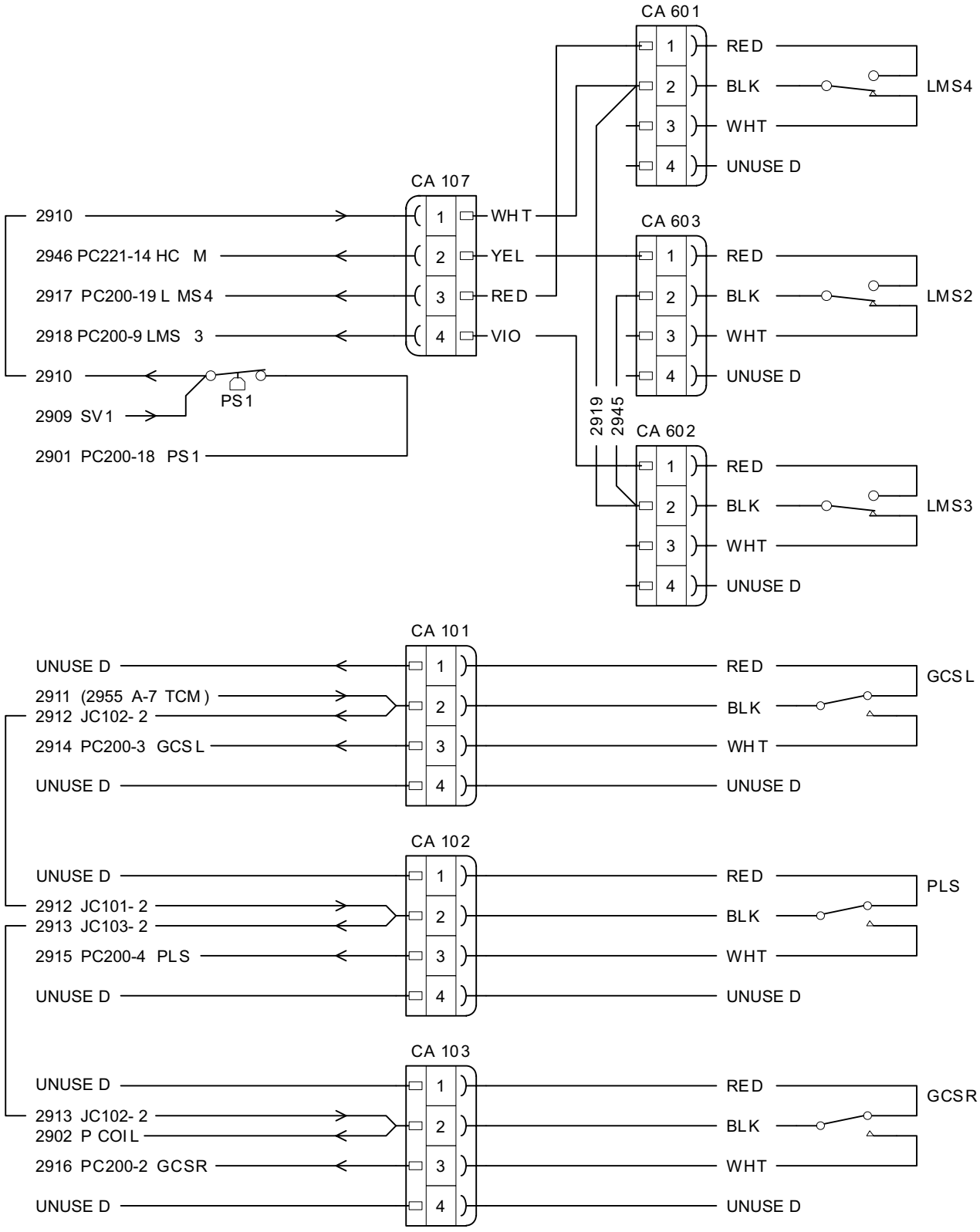
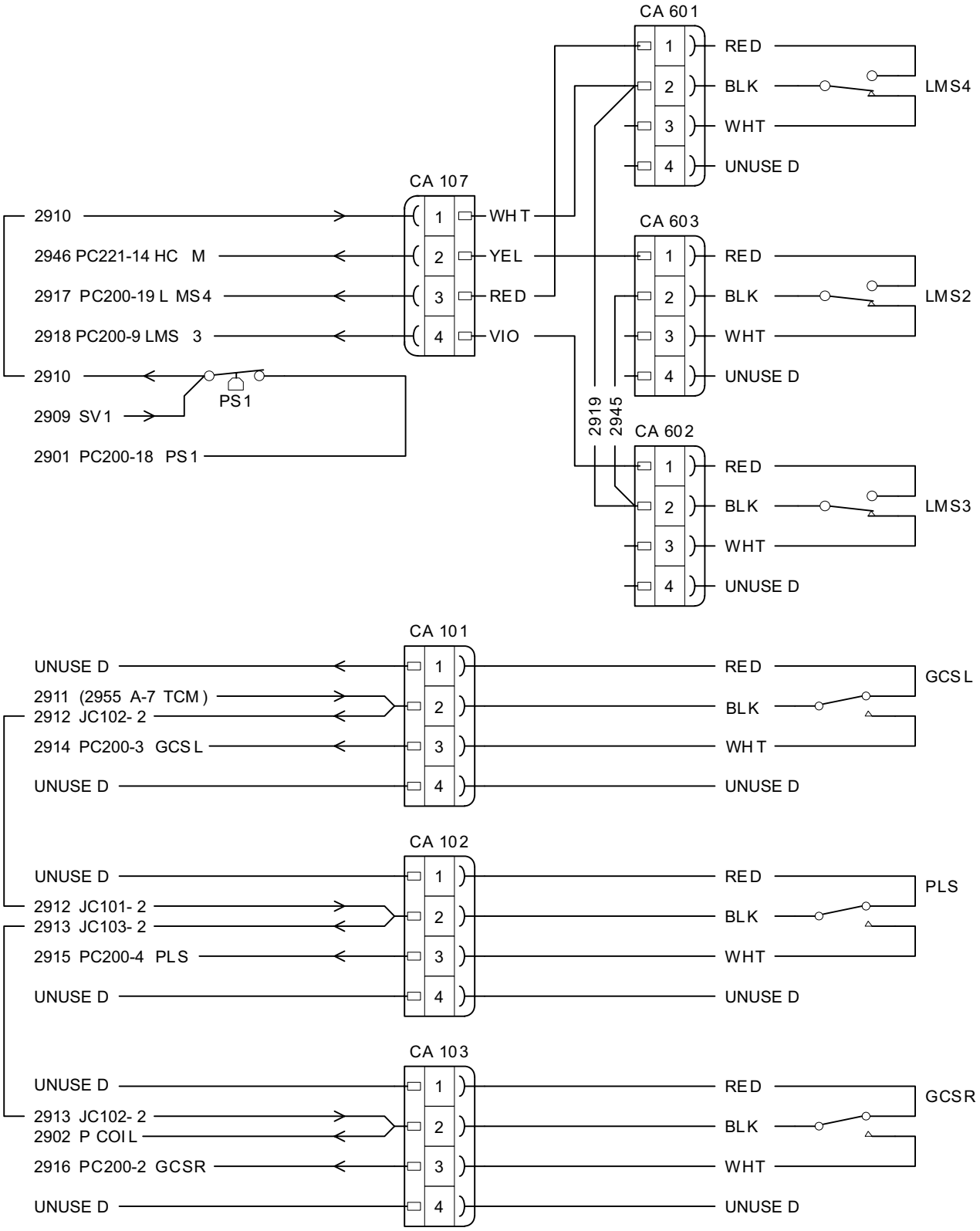
Platform & Mast Control Circle



EDO WD2330S_7

Platform & Mast Traffic circle



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