

CROWN



Service Manual



WF3000 Series

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M5 – BRAKE	PAGE	SER-NO. CUT	REV.
Brake	107		
Function	107		
Disassembly	107		
Assembly	109		
Air gap setting	109		
Brake moment setting	110		
Brake test	110		
Definition of run-in/new rotor	110		
General Notes	110		
M6 – STEERING	PAGE	SER-NO. CUT	REV.
Steering	115		
Live ring bearing	115		
Disassembly	115		
Installation	115		
Control handle return springs	116		
Adjustment	116		
Disassembly	116		
Installation	116		
Steering Chain	117		
Permissible Elongation	117		
Chain Tension Adjustment	117		
Tiller Handle	119		
Main Components	119		
Tiller Handle Component Removal / Installation	120		
Tiller Handle Shells	120		
Removing the Upper and Lower Shells	120		
Fitting the Upper and Lower Shells	121		
Switch Unit	122		
Removal	122		
Switch Unit Installation	122		
"Fast/Slow" Toggle Switch	123		
Removal	123		
Installation	123		
Hydraulic Board	123		
Removal	123		
Installation	123		
Potentiometer	124		
Removal	124		
Installation	124		
Safety Reverse Switch	125		
Removal	125		
Installation	125		
Horn Switch	126		
Removal	126		
Installation	126		
Handle	127		
Removal	127		
Installation	127		

General

The present manual is designed for Customer Service engineers who wish to familiarise themselves with the maintenance work required for the various truck components.

It also contains troubleshooting sections which can be used to identify and remedy truck faults.

INFORMATION



This book is not an operating manual. It is designed solely for specialist personnel who have been trained and authorised to carry out the work described in the manual.

This manual therefore contains fewer and less detailed warnings than the Operator's Manual, as the latter is aimed at persons who have very little or no prior experience at all.

Operating Instructions

This manual contains no operating instructions. An operating instructions manual is supplied with the vehicle. Additional copies can be ordered as required.

With the help of this manual you and your personnel will be able to ensure the long service life, operational safety and error free functioning of your CROWN vehicle.

Service Training

CROWN offers the appropriate vehicle related training for service personnel. Details on this training can be obtained from CROWN on request.

Ordering Spare Parts

The maintenance manual does not cover spare parts. These are listed in a separate manual.

Spare parts can be ordered by quoting:

- The truck specification number
- The truck model number
- The truck serial number

This information can be found on the truck's data plate. Only if this information is provided can the order be processed quickly, correctly and reliably.

Please refer to the Technical Specifications Sheet for the utilisable loads, technical data and dimensions for this series. Brochures can be obtained from your CROWN dealer or from the following address:

CROWN Gabelstapler GmbH & Co.KG
Moosacher Str. 52
80809 Munich
GERMANY
Tel.: +49 (0)89 / 93 002 -0
Fax: +49 (0)89 / 93 002 -175 or133

Using the Manual

The manual is divided into sections. The following table shows how the manual is structured.

Section	Description
IDX	Table of Content
MA	Safety
ITD	Introduction
M1	Lubrication and Adjustment
M2	Hydraulics
M3	Drive Unit
M4	Electrical
M5	Brake
M6	Steering
M7	Mast / Lifting Mechanism
M8	Cylinder
DIA	Electrical Diagrams
HYD	Hydraulic Schematic

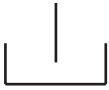





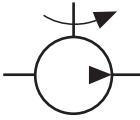

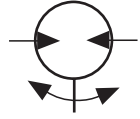

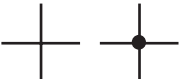





A01M-gb

Lubricant Table

Grease (multi purpose)	Aralube HLP2 LM-Grease Regulus A2 Beacon EP2 EP2 Mobiluxe EP2 Retinax LX LGWMI	Aral Castrol Century Esso Maxol Mobil Shell SKF	053002-001	B
Low temperature grease	Aralube SKL2 Unirex Lotemp EP	Aral Mobil	053002-005	BB
Hydraulic oil	Vitam GF 32 Hyspin AWS-32 Nuto H32 DTE 24 Tellus 32 Hydran LZ 32 B110	Aral Castrol Esso Mobil Shell Finol Fuchs Mineralölwerke GmbH	053001-003	D
Low temperature hydraulic oil	Deutz Oel HVI 32	Klockner	053001-009	DD
Transmission oil	Hyp 85W90 GX - D 85W90 Mobilube HD85/90 Spirax MB90	Aral Esso Mobil Shell	053002-004	A
Low temperature transmission oil	Mobil SHC 624	Mobil	053002-009	AA
Lubrication oil	Kowal 40 Essolube HDX + 40 Delvac 1240	Aral Esso Mobil	053002-007	G
Low temperature lubrication oil	SHC 626	Mobil	053002-008	GG
Rubber and vinyl dressing	---	---	---	H

L01_Lubricants_WF-GB

Hydraulic Symbols

	Vented reservoir with lines above the fluid level		Electric motor with unidirectional turn and speed
	Vented reservoir with lines below the fluid level		Electric motor with unidirectional turn and variable speed
	Filter or strainer		
	Hydraulic line with full flow (tubing or hose)		Hydraulic pump with fixed displacement and single direction of turn
	Pilot or drain line or drainage with limited flow		Hydraulic motor, bi-directional
	Lines crossing; not connected		
	Lines crossing and connected		Pressure gauge
	Plugged port (test port)		Thermometer
	Flow meter		Accumulator gas charged diaphragm type

M3559

Replacing the relief valve

- Remove the locking mechanism (4) and unscrew the relief valve (3),
- Remove the O ring and the strainer from the valve seat if they are still in there.
- Apply a thin coat of hydraulic oil to the new O ring and place it in the valve seat with the strainer.
- Apply hydraulic oil to the relief valve, insert it into the valve seat and tighten. Tap in the new locking mechanism.
- Refit the hydraulic unit and adjust the relief valve.

- Repeat the test. Repeat the setting until the relief valve opens within the tolerance range.

Relief valve test and setting

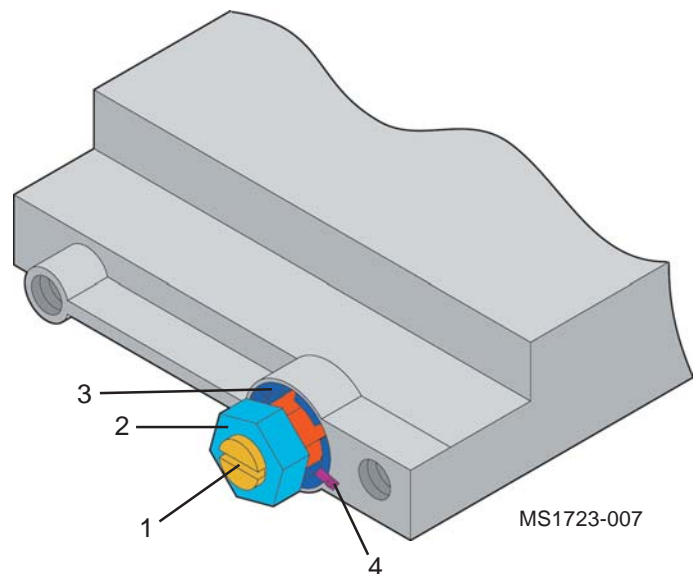
The relief valve protects the hydraulic system and the lifting mechanism from overloading.

WARNING



Do not let the pump unit run unless it is fixed to the chassis.

The amount of torque will twist the unit. This can result in short circuits and damage.



WF3000-1.0	1,0 t	1,100 kg	1,200 kg
WF3000-1.2	1,2 t	1,320 kg	1,420 kg

H01_GB

- With the truck at operating temperature, raise a test load on the forks that corresponds to 110% of rated capacity (= minimum load). It should be easy to raise the load.
- Now raise a test load that corresponds to 110% of rated capacity + 100 kg (=maximum load). It should not be possible to raise this load. (relief valve opens).

If necessary, adjust the relief valve so that it opens within the above mentioned tolerance range.

- Hold onto the setscrew (1) and loosen the jam nut (2): Turn the setscrew clockwise to increase the limit until the valve opens, turn it anti-clockwise to reduce the limit
- Counter-fix the setscrew (1) again with the nut (2).

Gear unit disassembly

NOTE



All item numbers in the following sections refer to Figure MS-1723-0027-A on the following page unless another figure number is indicated.

- Remove the retaining ring (61, Fig. MS1723-027A) and the supporting ring (62).
- Using a suitable extractor pull off the wheel (2).
- Remove the retaining ring (45) and the two shims (48, 49).
- Press off the driven shaft (7) in the direction of the drive wheel. **This will inevitably damage the bearing (23).**
- Remove the retaining ring (44) and extract the bearing (23). **The bearing can no longer be used.**
- Remove the retaining ring (43) and extract the bearing (24) via the outer ring.
- Now press out the shaft seal (31).
- Remove the retaining ring (42) and the sealing cover (30).
- Press off the pinion shaft (3) in the direction of the gear unit cover (6). Both bearings (21 and 22) will remain on the pinion shaft.
- Remove the two bearings (21 and 22) from the pinion shaft (3).

NOTE



The output gear is part of the motor. The procedure for removing the pinion and the bearings is described in the Drive Motor section on the previous pages.

Gear unit assembly

Replace all bearings and seals. Used bearings and seals will result in premature failure of the unit.

- Press the bearing (21) into the housing via the outer ring.
- Press the inner ring of the roller bearing (24) onto the drive shaft (7).

- Press the shaft seal (31) from the outside into the seat on the gear unit housing.
- Fit the outer ring of the roller bearing (24) and insert the retaining ring (43).
- Place the bushing (9) onto the rollers of the bearing (24) and press the bearing (23) into the gear unit housing and insert the retaining ring (44).
- Place the wheel (4) in position and guide the drive shaft carefully into the shaft seal. Align the bushing in the process.
- Align the wheel (4) with the tooth shaft profile of the drive shaft (7).
- Support the wheel (4) with suitable bushing and press the drive shaft (7) into the wheel (4).
- Using an appropriate number of shims (49), distance the drive shaft (7) between the two shims (48) so that there is no slack and insert the retaining ring (45).
- Press the bearing (22) onto the pinion shaft (3).
- Hold against the inner ring of the bearing (21) and fit the pinion shaft (3). Press in the retaining ring (42).
- The contact surfaces of the cover and gear unit housing must be clean and oil-free. If necessary, clean the surfaces as described in the Gear Unit Cover Removal section.
- Apply a layer of Dirko® sealant (part no. see chapter one, lubricants) all around the contact surfaces of the gear unit cover.
- Insert the feather key (51) into the pinion shaft (3).
- Hold against the inner ring of the bearing (21) and fit the wheel (2) onto the pinion shaft (3).
- Thread the supporting ring (62) onto the pinion shaft (3) and insert the retaining ring (61).
- Press the sealing cover (30) into the housing.

Electrical Symbols

EUROPE	USA	DESCRIPTION	EUROPE	USA	DESCRIPTION
		Wires joining			Hand operated maintained contact
		Wires crossing			Solenoid valve
		Wire connection			Inductor
		Plug / socket			Resistor
		Wire strap			Capacitor
		Terminal board			Potentiometer
		Fuse			Varistor
		Assembled unit			Thermal protector
		Contact, normally open			Lamp
		Contact, normally closed			Horn
		Contact double throw			Battery
		Operating device			Diode
		Operating devices, slow releasing			Breakdown diode
		Operating device, slow operating			LED
		Hand operated push button			Transistor
		Mechanically actuated			MOSFET
		Hydraulically actuated			Thyristor
		Emergency disconnect			Comparator
		Motor armature			

M0056-gb

Replacing the SEM0 Traction Controller

WARNING



Make sure you are operating the truck with the correct controller.

The use of SEM0 traction controllers with different part numbers can change the characteristics and result in accidents.

When fitting a new SEM0 traction controller in a truck you must select the right truck model through the appropriate selection in the configuration menu.

If you have changed and stored the standard configuration with the programmer, the stored parameters will be loaded the next time the controller is started.

- Prepare to remove the traction controller as previously described in the **Maintenance** section.
- Remove the 4 mounting screws and remove the traction controller.
- Check the contact pattern left behind by the controller back plate on the heat dissipation sheet. The controller must lie fully flat on the heat dissipation sheet. If there are large areas with no contact to the controller, replace the heat dissipation sheet to avoid thermal problems.
- Clean the contact surface of the traction controller on the truck chassis with a lint-free cloth and use an industry-standard silicon removal agent to remove the residue of the heat conducting paste.
- Apply a **thin and even** layer of Dow Corning® 340 heat conducting paste, part no. 053051-008 to the floorboard (= contact surface of the traction controller on the truck chassis).
- Secure the traction controller again with the 4 screws.
- If necessary clean the contact surfaces and refit the power cable (**you must follow the instructions in the Maintenance section on the previous page**) and refit the connectors for 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 to the controller.

Important: After replacing the controller check and adjust the settings. You can adjust the settings to suit the customer's requirements. Follow the order described as follows.

Parameter Setting after Replacing the Traction Controller

Preparatory Measures

- **Power down the truck and jack it up so that the drive wheel is free (see Chapter 1).**
- When the truck is *powered down* connect the programmer to the traction controller.
- Power up the truck.

Adjustment

1. If required, change the options for the safety reverse switch and the internal service hourmeter of the controller. The standard setting is contained in Table 11-GB. If you have made changes, switch the truck off and on again. This will activate the changes.
2. Measure the battery voltage directly at the battery and adjust the reading measured and displayed by the traction controller (see CONFIG MENU section).
3. Using the TEST menu check the wiring and operation of the switches (see TEST menu section).
4. Re-calibrate the traction potentiometer (see "Traction pod – calibrate potentiometer, PROGRAM VACC menu).
5. Test the traction pod starting point at creep speed. The drive wheel should start when the travel switch closes. If necessary increase the value accordingly. Repeat the test for both travel directions (see PARAMETER CHANGE menu section).
6. **Jack down the truck and bring it to a secure area where you can perform test runs without endangering other people.**

Menu item	Setting range	Recommended setting	Description
ACC DELAY	1.15 - 3.00 sec	0	Acceleration delay: The time taken for the traction controller to increase the output supply to the traction motors from 0 to 100%. (When travel switch suddenly set to limit).
DEC DELAY	9 - 0	0	Time taken to reach the new set value when the set value on the travel switch is changed. Corresponds to the braking intensity when the transmitter is returned.
RELEASE BRAKING	0 - 9	1	Release braking. Activated when the travel switch is released. Time taken for the motor current to fall to zero.
INVERSION BRAKING	0 - 9	9	Inversion braking. Activated when travel switch is set to the opposite direction.
AUX TIME DELAY	0 - 9	3	A lower value reduces the time taken for inversion braking to activate when changing from one direction to the opposite direction.
CUTBACK SPEED 1	30 - 100% ACC	5	Maximum current (=speed) for the low speed range selected by the fast / slow speed switch (HSS) (in % of max. current ACC for fast speed (=normal)). Again, the entire mechanical control range of the transmitter is available. Enables more sensitive travel at reduced speed.
CUTBACK SPEED 2	30 - 100% ACC	3	Max. travel current (= speed) available when you change to the low speed range with mast switch LMS (in % of max. travel current ACC for fast (=normal)). Again, the entire mechanical control range of the transmitter is available. Enables more sensitive travel at reduced speed.

E06-03-GB

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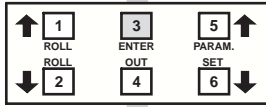
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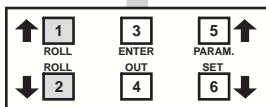
Config. Menu

In this menu the operation of the hour meter and the safety reverse switch (SAS) can be set.

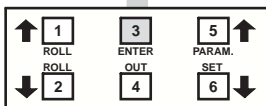
**MAIN MENU
CONFIG MENU**



**CONFIG MENU
SET MODEL**

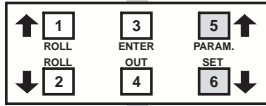


**CONFIG MENU
SET OPTIONS**

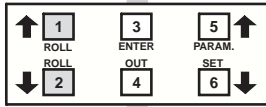


Press "Enter" to display first option.

**HOUR METER
RUNNING**

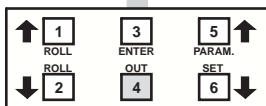


Press "parameter set up" or "parameter set down" to change option setting.



Use "roll up" or "roll down" keys to select next option.

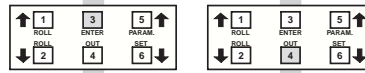
Quick Inversion



When finished, press "out" to exit menu.

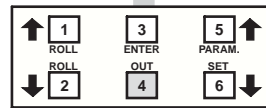
Config. Menu (continued)

**ARE YOU SURE?
YES = ENTER NO = OUT**



Press "Enter" to accept changes
– or –
Press "out" not to accept changes.

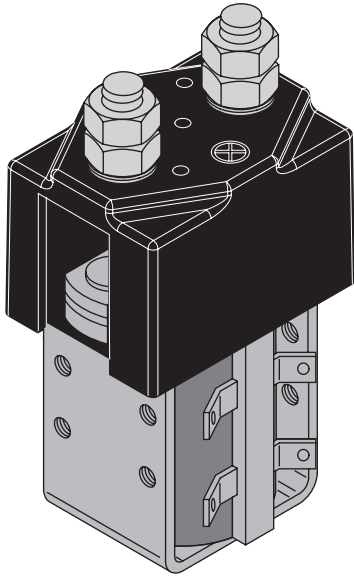
**CONFIG MENU
SET OPTIONS**



Press "out" to exit menu.

**MAIN MENU
PARAMETER CHANGE**

Contactors



M1480

DANGER



Disconnect the battery before working on the contactors.

Important: Only use original Crown contactors as replacements, or Crown spare parts for repairs. The contactors are specially made for the truck.

Do not change the place or the angle where they are positioned, and do not change the wiring.

If dismantling a contactor for inspection or repairs, you must mark out the position of the contacts with respect to each other. It is important that contacts that are already been worked into each other are reassembled together. Otherwise, excessive wear and premature failure will result.

Inspection

Contactors

The contacts can blacken, swell and roughen during normal operation. This is normal, and there is no need to file or polish them. On the contrary: physically re-worked contacts burn out very rapidly.

Under certain conditions the contact silver coating can wander from one contact to another, where it can build up. This is quite harmless. The contacts must only be replaced if the silver coating has flaked off to such an extent that the supporting metal is visible.

Coils

The coil cannot be repaired. In the event of a defect, replace any coils if no resistance can be measured between the connections using an ohmmeter.

Springs

Replace any springs showing signs of corrosion, or fading through overheating.

Brake

Function

The drive motor contains the drive wheel brake which is designed as a disk brake.

Its design is shown in Figure 8051-01.

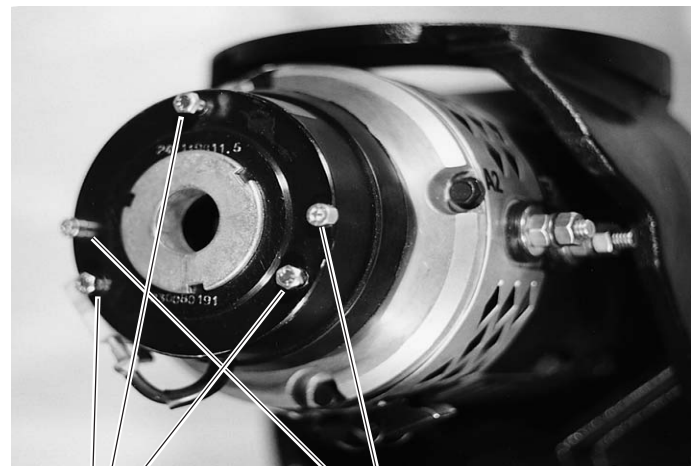
The brake interlocks with the motor shaft. The brake is applied when de-energised. If the truck needs to be moved in this case, the brake can be mechanically released by turning the two cheese head screws. Afterwards, always remember to undo this! Before starting up the truck again, make sure that it cannot move.

The brake is electro-magnetically released. The axial force generated by the compression springs acts on the moving armature disk. The rotor with friction lining on either side also moves axially. The force acting on the armature disk pulls the rotor between the armature disk and the friction plate. When a DC voltage is produced at the coil, a magnetic force acts on the armature disk. The armature disk is pulled against the compression springs. The rotor and hence the brake are released.

Disassembly

The item numbers in brackets refer to Figure MP8051-01 on the following page.

- Disconnect the battery (=EMERGENCY DISCONNECT).
- Jack up the truck.
- Remove the front panel.
- Pull the rubber covering ring (8) out of the groove in the magnetic body.
- Remove the abrasion dust.
- Undo the electric connectors from the magnetic body (3).
- Unscrew the three mounting screws (see Fig. M1462).



Mounting screws (hex. head) Screws for mechanical brake release (cheese head screws)

M1462

- Remove the magnetic body (3) from the motor (including everything connected to it).
- Remove the rotor (7) from the hub (5). Take care not to damage the toothing.
- Measure the thickness of the rotor. Replace the rotor if it is less than 5.5mm thick.
- Remove the friction plate (9).
- Unscrew the cheese head screws (see Fig. M1462) from their respective nuts.
- Unscrew the hollow screws (2) from the magnetic body (3 off).
- Remove the armature disk (6).
- Thoroughly clean all components.

CAUTION



Do not allow friction surfaces to come into contact with oil or grease.

Steering Chain

DANGER



Your hands could be trapped by the steering chain.

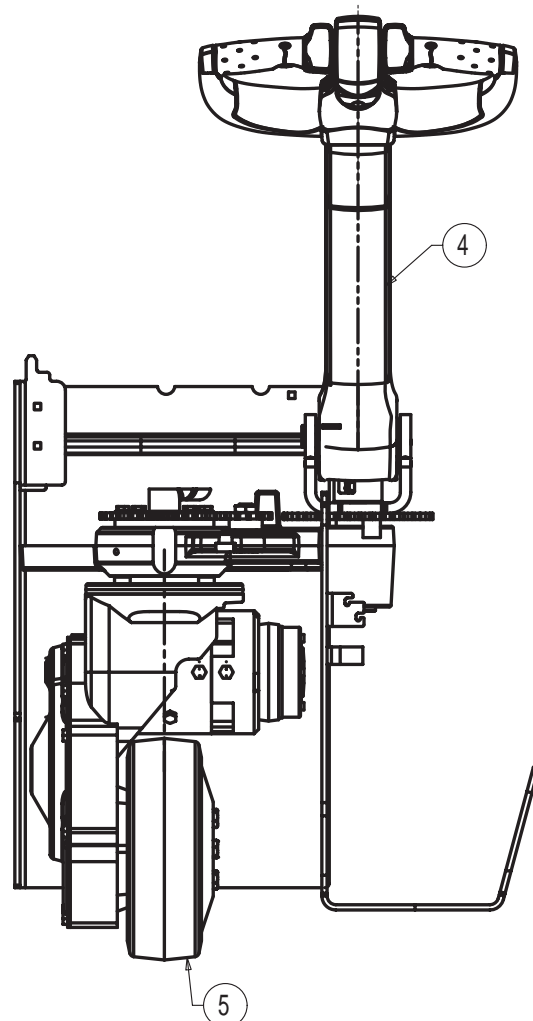
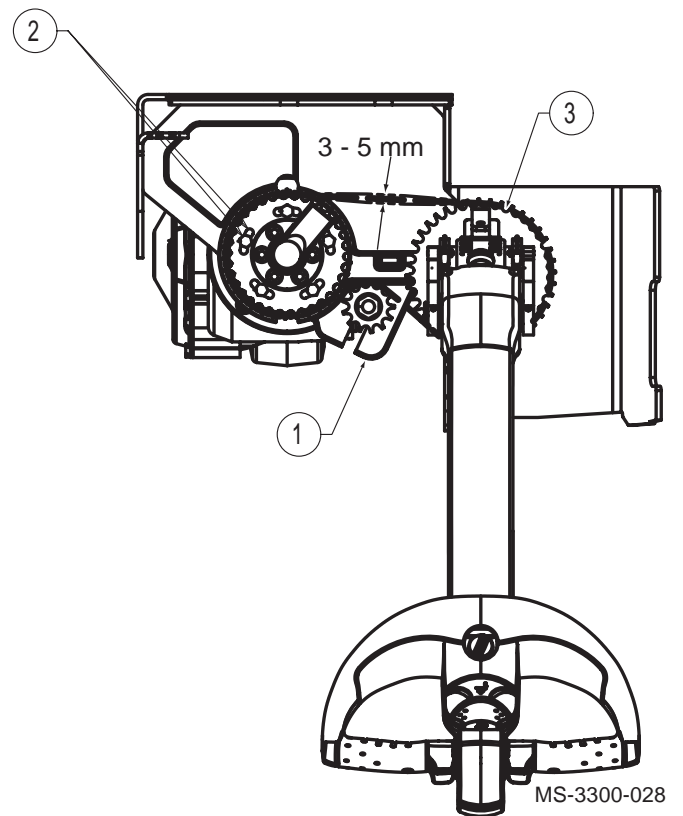
Prevent the truck from being switched on again. The safest way to do this is to disconnect the battery.

Permissible Elongation

New steering chains are 901.7 mm long (71 links with 1/2" x 5/16"). The chain must be replaced if there is a 2% elongation. The chain is connected to a chain lock and half a chain link.

Chain Tension Adjustment

- Switch off the truck and remove the key. Prevent the truck from being switched on again.
- Jack up the truck and prevent it from accidentally lowering if the steering chain can only be reached from below. See chapter 1.
- Remove any chain covers, if applicable. The steering chain is correctly tensioned if, when you apply pressure with both thumbs on the opposite side of the chain tensioner, the chain yields approx. 3 – 5 mm.
- To adjust the chain tension loosen the nut of the chain tensioner and push the chain tensioner (1, Fig. MS-3300-028) in the slotted hole in the corresponding direction. Now tighten the nut again and check the chain tension. If necessary, repeat the adjustment.
- Test forward travel. If this produces a deviation in angle from the control handle (4) to the drive wheel (5), loosen the mounting screws (2) connecting the steering shaft to the chain pinion. Turn the control handle to the forward position. Tighten the screws (2) again and test forward travel once again. Repeat the adjustment if necessary.
- To facilitate future service work, note the position of the chain pinion in relation to the steering shaft using a water-proof pen.



MS-3300-027

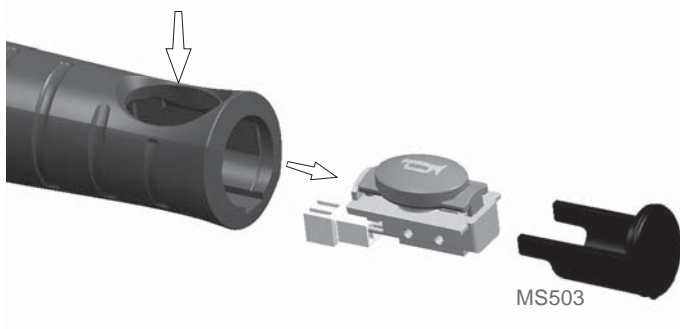
Handle

Removal

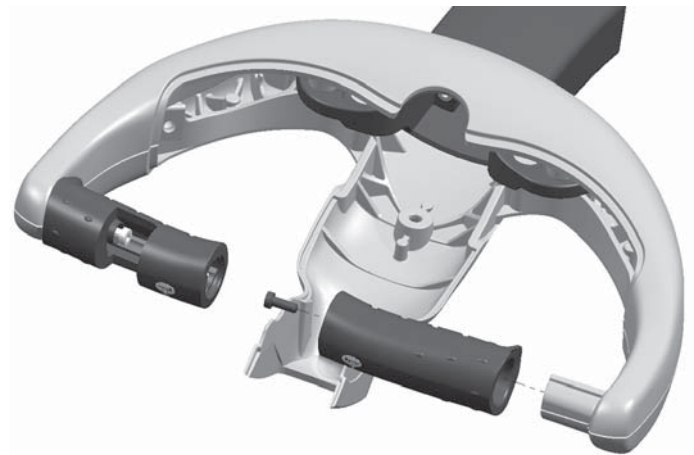
- Remove the switch unit (see *SWITCH UNIT* section in this chapter).



- Using a small flat screwdriver lever out the handle protective cap (see Fig. MS502)



- Simply press the horn switch inward and pull it out of the handle (see Fig. MS503). Disconnect the plug connector from the switch (see Fig. MS503).



- Unscrew the internal M5 Torx® screw (see Fig. MS501) and pull off the handle.

Installation

Note: The switches for the left and right handles are different. If you fit the switch on the wrong side the horn symbol will be upside down!

Fit the horn switch in the reverse order of removal.

- Re-install the switch unit (see *SWITCH UNIT* section in this chapter) and carry out a functional test.

DANGER

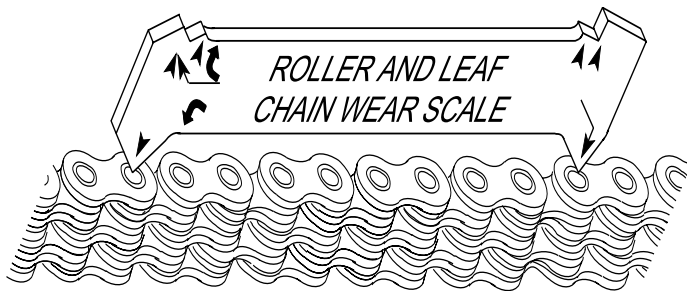


When checking for chain wear be sure to measure a part of the chain which passes over the guide pulleys. Never repair chains by cutting out the worn section and replacing it with a new section. If a chain is worn, always replace both lift chains.

Chain wear can be measured with a wear gauge (Crown No. 106440) or a steel tape measure (see Fig. 2271).

Before testing the chain elongation it is important to tension the lift chain if necessary. For non-detachable lift chains the weight of the fork carriage or mast is sufficient. If the lift chain is detached it must be kept taut during measurement.

The chain slack test must cover at least ten links, over at least three different points in a section of the chain which always passes over a pulley during operation.



2271

Chain Dimensions (Dimension C in Fig. 2271).

New: 10 links = 158.75 mm

Wear limit: 10 links = 163.5 mm

Detachable chain anchors, tie bolts and lift chains must be replaced in the event of 3% chain elongation.

DANGER



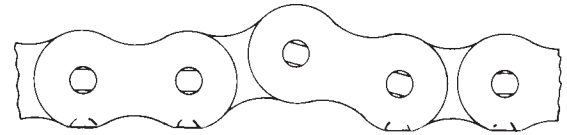
If just one of the faults mentioned in this chapter is detected, both chains together with their chain anchors or bolts must be immediately replaced.

Never repair damaged chains!

This can result in fatal accidents!

Freedom of Movement of Chain Links

Each individual chain link must flex freely. Tight joints (Fig. 2775si) increase friction and the chain tension during lifting. Excessive chain tension in turn accelerates material wear.



2775si

Possible causes of stiff joints are as follows:

- Bent pins or plates
- Rusty joints.
- Peened plate edges.

Plate edge distortion is caused by:

- Ruptured chain pinion.
- Constant overloading of the chain.
- Chain striking the mast components.

Immediately replace any chains with stiff joints.

Chain Tension

When installed, both lift chains should have the same chain tension to ensure even distribution of the load over the two chains when lifting.

When replacing the forks make sure that both forks lie evenly on the surface. If they are not even, compensate the chain length via the chain anchor so that both chains have the same chain tension.

After adjusting, tighten the counternuts of the chain anchor again (for correct torques see Chapter 1, Torque table).

Cylinders

General

Safety when working on hydraulic systems

WARNING



Risk of serious injury from pressurized hydraulic oil.

Pressurized hydraulic oil can penetrate the skin. This is a serious medical emergency which requires immediate medical attention.

The skin will not show any obvious initial damage and the physical effects will not be manifested immediately. Seek medical assistance if your skin has been affected by pressurized hydraulic oil.

For your personal protection:

Depressurise the hydraulic system before starting assembly work on the hydraulic system.

After carrying out assembly work carefully check to see that all ports are tightened before re-pressurising the system.

Wear protective clothing, safety glasses and safety gloves when tracing leaks or bleeding the system.

Use a piece of absorbent paper to trace leaks, never use your hands.

Follow the hydraulic oil manufacturer's safety instructions when handling these oils.

General Instructions for Repairing Hydraulic Components

Hydraulic systems are sensitive to dirt.

- Thoroughly clean any hydraulic components you have removed before dismantling them and placing them on a workbench.
- Always repair hydraulic components in a clean working environment.
- Immediately protect cleaned and de-greased components with a thin coating of hydraulic oil. Use the same type as is used in the truck.
- Protect all components from re-contaminating until they are installed again.
- Immediately seal any open hydraulic ports on repaired assemblies with filler plugs. This also applies to the open ports and lines on the truck when you remove any hydraulic components.
- Do not refinish any cylinder surfaces! Replace any damaged components.
- **When carrying out repairs always replace all the seals in the assembly.** Never recycle seals which have already been used.

- Install new wiper, seal, guide, backing and o-ring in cap. Use care when installing to avoid nicking the components.
- Install new seal on bleed screw. Then install bleed screw in cap and tighten securely.
- Install cap on cylinder tube and tighten securely. Use care when installing cap to prevent sharp edges from damaging the new seals.

Installing Free Lift Cylinder

- Install free lift cylinder and secure it to inner mast using screws and shims previously removed. Tighten screws securely. For correct shimming see „Free Lift Cylinder Shims“.
- Install yoke assembly on ram and secure it with retaining ring previously removed.
- Insert lifting chain through yoke assembly and connect chain to tensioner in fork carriage. Make certain chain is not twisted.
- Connect hydraulic supply line to free lift cylinder and tighten connections securely.
- Using lifting device, raise fork carriage and remove blocks from under carriage. Then lower carriage completely and remove lifting device.
- Install forks.
- Remove chocks.
- Connect battery and remove warning tag from the control handle.
- Air that may have entered the system must be bled from the system. Follow the appropriate procedure outlined under “Cylinder Bleeding and Flushing”.
- Carry out a drift test. See “Drift Test”.

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.

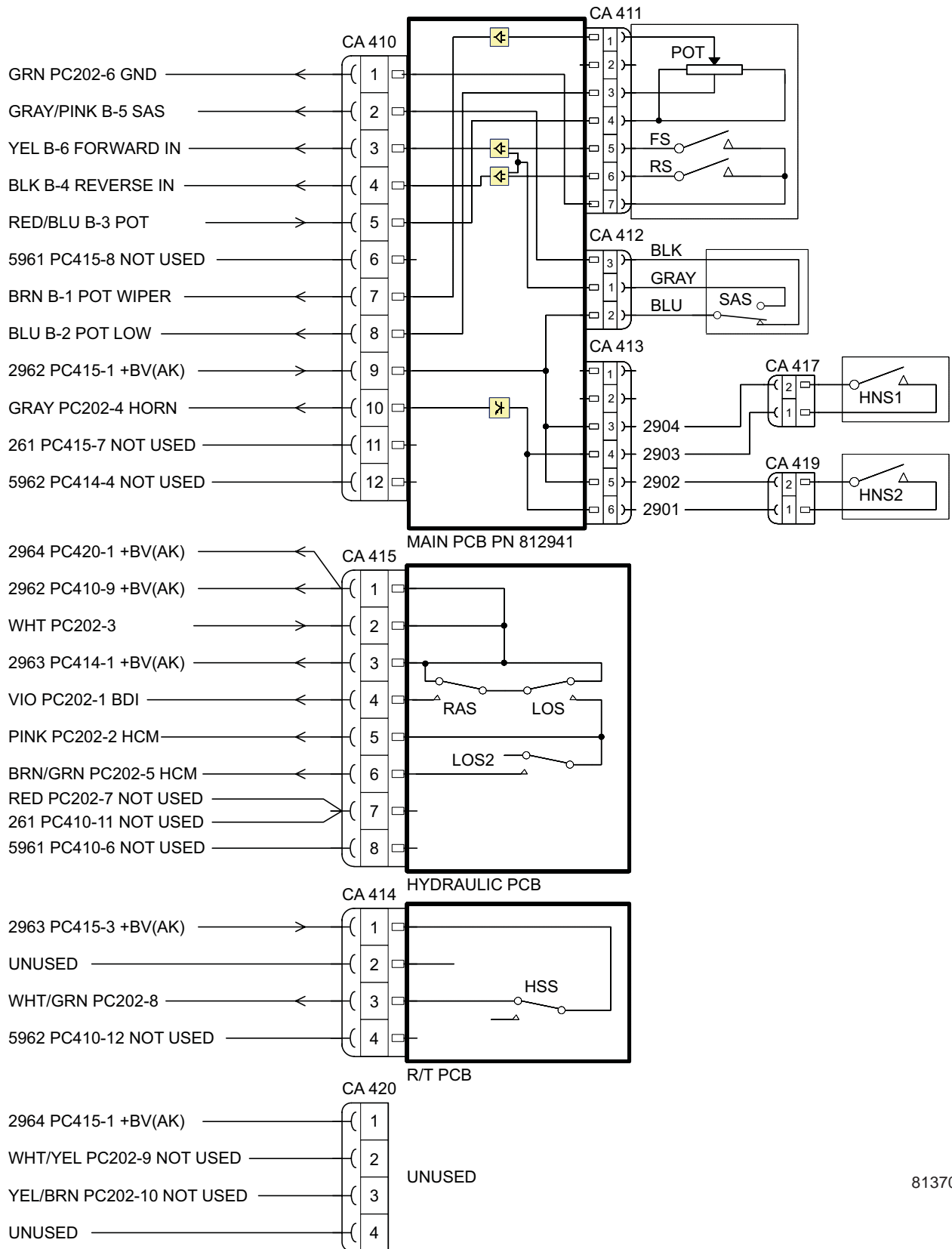
Bleeding — Mast Lift Cylinders

- Slowly raise forks to approximately 1220 mm (4 ft.).
- Slowly open R.H. mast lift 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.
- Repeat steps 1 and 2 on the L.H. mast lift cylinder.
- Flush cylinders following procedure outlined below.

Bleeding — Free Lift Cylinder (if applicable)

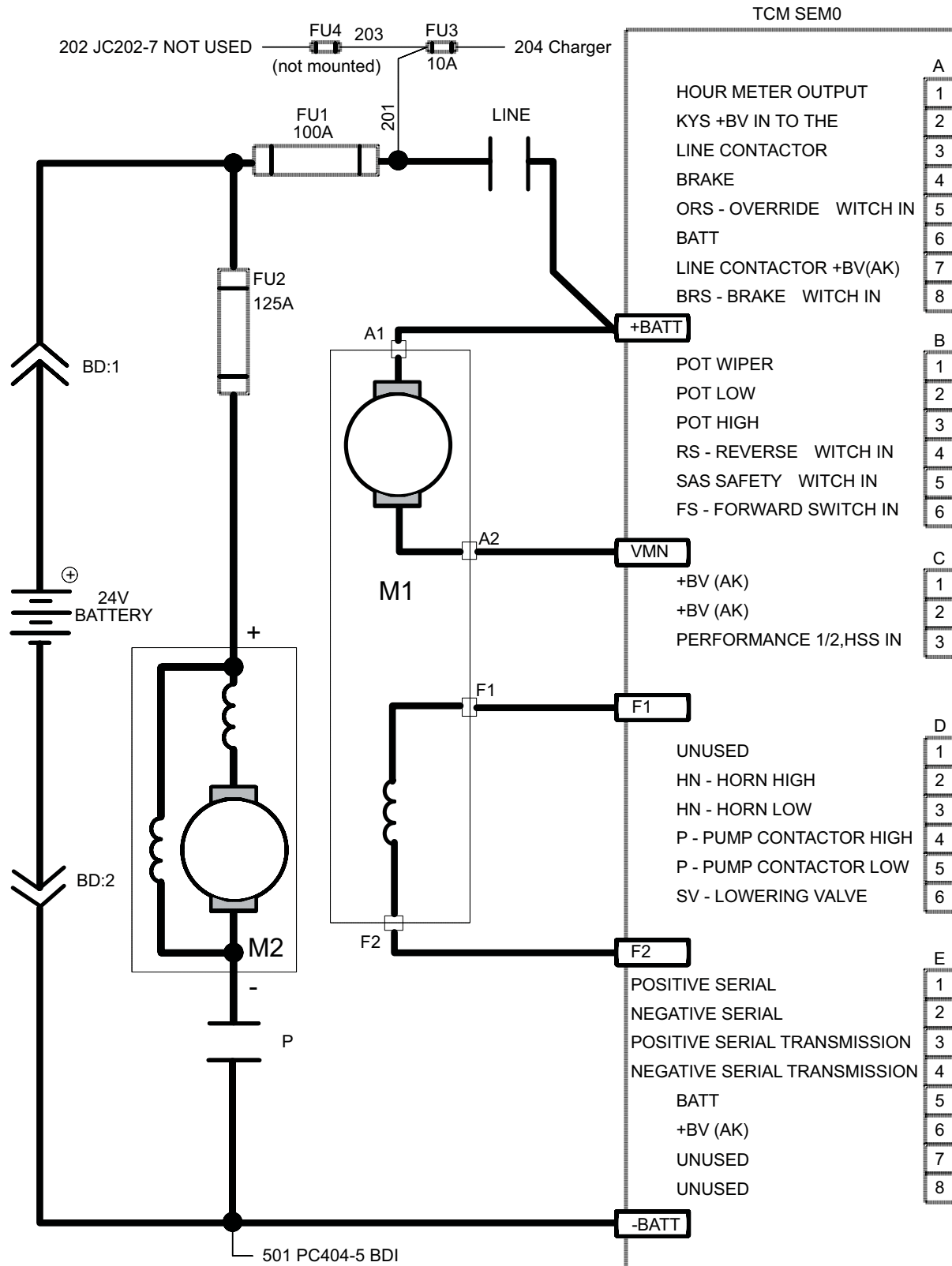
- Slowly elevate carriage in free lift to approximately 1220 mm (4 ft.).
- Slowly open fork carriage cylinder bleed screw and bleed air from cylinder until a solid stream of hydraulic fluid flows out of bleed screw hole.
- Tighten bleed screw securely.
- Flush cylinder following procedure outlined below.

WF3000-10 Standard, Control Handle - Control Circuit



813706-5-2B

WF3000-12 Standard, Traction Controller - SEM0 Power Circuit



Note:
 1) Voltage between B1 & B2:
 10V = Max. speed
 0V = No drive command

814374-3-2B

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