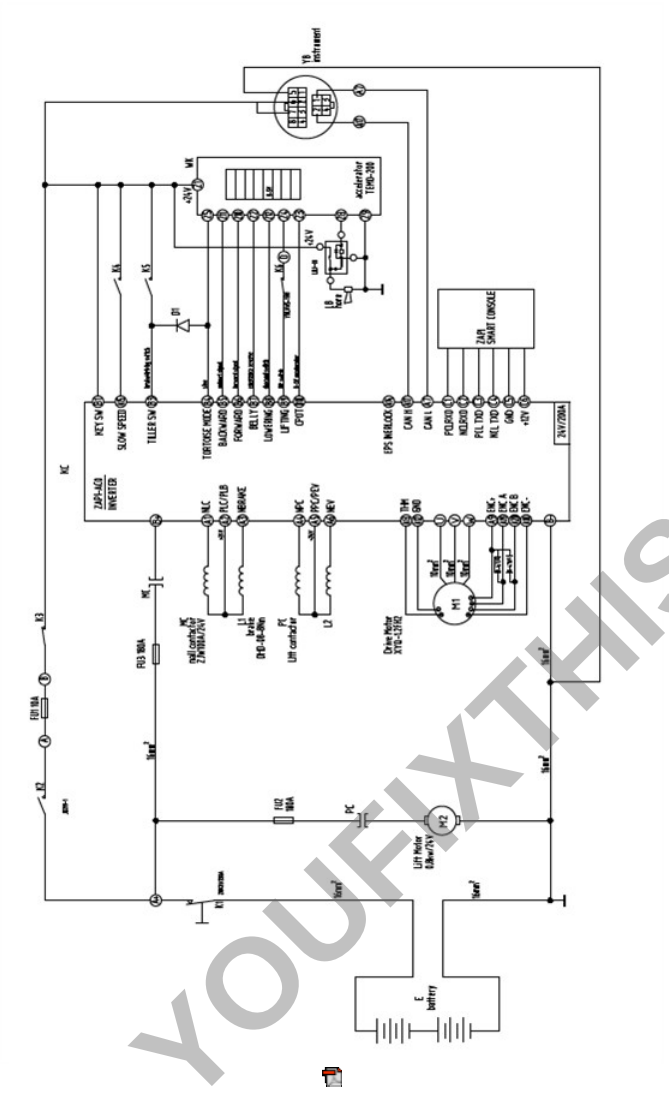


Figure 21. Wiring Diagram

Ref	Description
KC	Traction controller
WK	Tiller board
M1	Traction motor 1.2 Kw
M2	Pump motor 0.8 Kw
K1	Emergency Switch
K2	Key Switch
K4	Speed limitation sensor
K5	Tiler sensor
K6	Lift Switch
L	Electromagnetic brake
L1	Lowering solenoid valve
MC	Main contactor
PC	Pump contactor

Electrical Schematics by Controller and Battery Type

For details about electrical schematics by controller and battery type, see Electrical Schematics by Controller and Battery Type P2.0UT (P40UT) [A3B0] .

TRUCK FUNCTION
FORWARD/REVERSE TRACTION

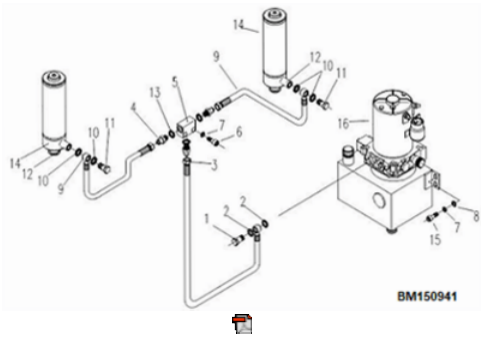
ACTUATION CONTROLS

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2	RELIEF VALVE	5	OIL FILTER	8	ONE-WAY VALVE
3	OIL PUMP (1.0CC/R)	6	SPEED LIMIT VALVE	9	SOLENOID VALVE

Figure 37. Hydraulic Schematic Diagram



1	CONNECTOR	6	SCREW	12	CONNECTOR
2	COMPOUND GASKET	7	WASHER	13	COMPOUND WASHER
3	HIGH PRESSURE HOSE	8	WASHER	14	CYLINDER ASSEMBLY
4	CONNECTOR	9	HIGH PRESSURE HOSE	15	SCREW
5	CONNECTOR SEAT	10	COMPOUND WASHER	16	HYDRAULIC STATION ASSEMBLY
		11	CONNECTOR		

Figure 38. Hydraulic System

HYDRAULIC SYSTEM SPECIFICATION

Voltage	System Pressure		Current		Lift Pressure and Current		Lift Time		Lower Time	
	No Load	Heavy Load	No Load	Heavy Load	Maximum pressure	Current	No Load	Full Load	No Load	Full Load
24V	2.5Mpa	13.5Mpa	28A	74A	17Mpa	90A	4s	4.8s	4s	3.5s

Lowering A Load

A load is lowered by depressing the lower button. When the lower button is depressed, electric current is sent to the normally closed solenoid lowering valve, which causes it to change position and open a path for the trapped hydraulic oil to flow from the cylinder back to the reservoir.

Hydraulic Lines

All hydraulic lines must be thoroughly cleaned before installation.

When making repairs, use the least number of fittings and connections to minimize flow resistance and the possibility of leakage.

Hydraulic Oil

The hydraulic oil in the system performs the dual function of the power transmission and lubrication. Using the correct fluid is essential to proper system operation.

Check the reservoir level when troubleshooting lifting problems. Low oil levels will make it appear that a problem exists with the battery or hydraulic system.

Recommended specifications:

- **Hydraulic oil**: L-HV 32 type conforming GB/T11118.1, DIN 51524 (II) standards
- **Gear oil**: Hypoid gear oil 85 W / 90 (GL-5) (about 1.7 L)
- **Grease**: No. 3 lithium grease

CAUTION

All waste liquids, such as hydraulic oil, gear oil and grease, will pollute the environment. Please recycle replaced working media or dispose them according to local regulations.

Clean

Adhere to the following precautionary steps to ensure that the hydraulic system remains clean.

1. Flush the entire system when a failure is encountered to make sure all paint, metal chips, welding shot, and debris are removed.
2. Filter each change of oil to prevent the introduction of contaminants into the system.
3. Provide continuous protection from airborne contamination by keeping the breather clean and serviceable.

Sound Level

Hydraulic system noise is caused by both improperly selected oil and loose or damaged system components.

- Hydraulic oil with high or moderately high viscosities - At startup, temperatures can cause pump noises due to cavitation and also impedes the release of trapped air. Air does not have sufficient time to purge itself from the fluid while in the reservoir before recycling through the system.
- Aerated Hydraulic Oil - Results in system noise that is similar to cavitation. Aerated oil is caused by the ingestion of air through the pipe joints of the inlet lines and high velocity discharge lines, as well as cylinder rod packing. Aeration can also be caused by oil discharging above the fluid level.

OIL SUPPLY TO THE HYDRAULIC CIRCUIT
FIXED DISPLACEMENT PUMPS

With fixed displacement pumps, the oil flow is constant, providing the rotation speed of the motor shaft remains unchanged.

A reduction in the shaft rpm will reduce the pump capacity. If the rpm is reduced so is the flow rate and vice versa. The pressure remains constant, providing the load is unchanged.

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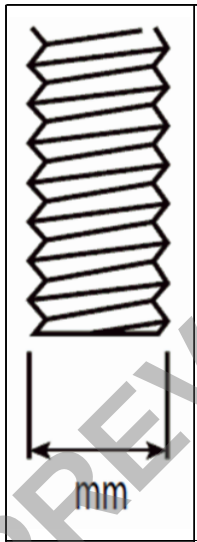
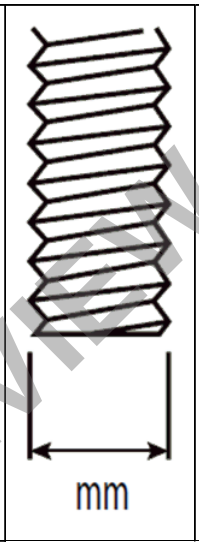
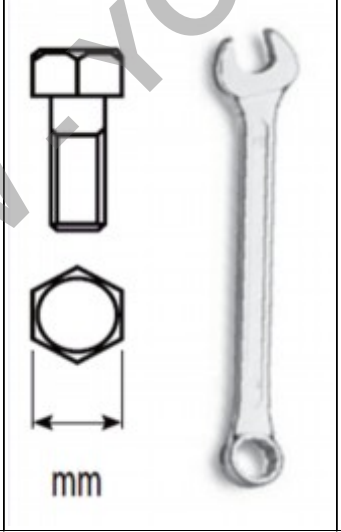
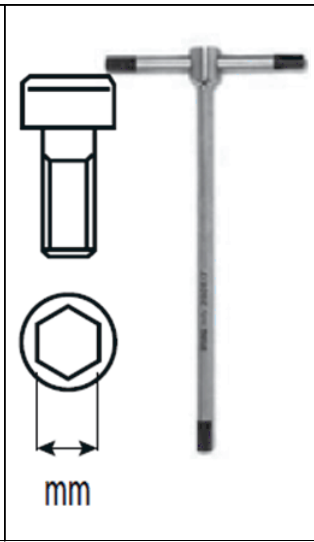
NOTE: The working load capacity is calculated with an angle at the centre of 90 °

Torque settings for screws nuts and fittings

NOTE: Before disassembling the various parts and nuts and bolts, read the following carefully.

To make the threaded matings secure, thread lock solution is used for tightening the screws. If it is not possible to unscrew the bolts because this product has been used, avoid applying extensions to the tools, instead slightly heat the area (at most 50°C) so as to eliminate the thread lock solution effect. In the cases described, reapply thread lock solution during installation in a moderate quantity (30% of the mating surface). The torque setting used for tightening the threaded couplings is extremely important to make the coupling secure and the machine safe. The tables on this page give the classes of bolts normally used with the relevant torque settings.

Nominal diameter	NUT TORQUE SETTING Nm	
	Class 8	Class 10
M3	4 (2.95 lbf ft)	5.2 (3.83 lbf ft)
M4	7 (5.16 lbf ft)	9.15 (6.74 lbf ft)
M5	12.14 (8.95 lbf ft)	14.8 (10.91 lbf ft)
M6	17.2 (12.68 lbf ft)	20.9 (15.41 lbf ft)
M8	31.8 (23.45 lbf ft)	38.1 (28.10 lbf ft)
M10	50.5 (37.24 lbf ft)	60.3 (44.47 lbf ft)
M12	74.2 (54.72 lbf ft)	88.5 (65.27 lbf ft)
M14	101.2 (74.64 lbf ft)	120.8 (89.09 lbf ft)
M16	138.2 (101.93 lbf ft)	164.9 (121.62 lbf ft)
M18	176.6 (130.25 lbf ft)	203.5 (150.09 lbf ft)
M20	225.4 (166.25 lbf ft)	259.7 (191.54 lbf ft)
M22	278.8 (205.63 lbf ft)	321.2 (236.9 lbf ft)
M24	324.8 (239.56 lbf ft)	374.2 (276 lbf ft)
M27	422.3 (311.47 lbf ft)	486.5 (358.82 lbf ft)
M30	516.1 (380.66 lbf ft)	594.7 (438.63 lbf ft)

				Pre-load N	SCREW TORQU		
					Class 5.8		Class
						with lubr.	
M4	0.7	7	3	2400	1.92 (1.41 lbf ft)	1.44 (1.06 lbf ft)	3.07 (2.26 lbf ft)
M5	0.8	8	4	3880	3.88 (2.86 lbf ft)	2.91 (2.14 lbf ft)	6.2 (4.57 lbf ft)
M6	1	10	5	5490	6.58 (4.85 lbf ft)	4.94 (3.64 lbf ft)	10.5 (7.74 lbf ft)
M8	1.25	13	6	9990	16 (11.80 lbf ft)	12 (8.85 lbf ft)	25.6 (18.88 lbf ft)
M8	1	13	6	10700	17.1 (12.61 lbf ft)	12.8 (9.44 lbf ft)	27.4 (20.20 lbf ft)
M10	1.5	16	8	15825	31.7 (23.38	23.8 (17.55	51 (37.61

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Table 6. LED Error Codes

Conditions	LED 1	LED 2	LED 3	LED 14	LED 5
Battery Voltage High	Off	Off	Off	Off	Flash
Battery Pack Unbalanced	Off	Off	Flash	Off	Off
Excessive Charging Time	Off	Off	Flash	Flash	Flash
Battery Testing - 1	Off	Flash	Off	Off	Flash
Battery Testing - 2	Off	Flash	Off	Flash	Off
Inhibit Control Defective	Off	Flash	Off	Flash	Flash
Internal Over Temperature	Off	Flash	Flash	Off	Flash
Mode Selected Not Valid	Flash	Off	Off	Flash	Off
Database Save Error	Flash	Off	Off	Flash	Flash
Discharge Error	Flash	Flash	Off	Off	Off
Severe Discharge Error	Flash	Flash	Flash	Off	Off
Battery Storage Error	Flash	Off	Flash	Off	Flash
Critical Battery Error	On	On	Off	Off	Off

LEDs Frozen (no activity) or Charger seems inoperable: Battery may have been subjected to an Over-Discharge condition. Using a voltmeter check if battery voltage is well under its 100% depth of discharge level defined as 1.75V per cell for lead acid batteries. For example, if a 24V lead acid battery measures well under 21V, then this condition may have occurred as a result of batteries left in lengthy storage without a trickle charge applied to it. Try removing the output leads from the battery pack (while A.C. Power is disconnected from the charger) and reconnecting the output leads.

Battery Voltage High: Charger's DC cord set possibly connected to a battery pack with voltage higher than the output rating of the charger.

Battery Pack Unbalanced: Caused by unbalanced battery condition and or excessive battery plate sulphation. Example: some batteries are at a much higher state of charge than others. This may require replacement of the batteries. Refer to the Equipment's Operators manual for instructions on servicing the battery pack.

Excessive Charging Time: Occurs when charging took too long. Possible causes include: use of a battery load that is draining energy from the battery while the charger is trying to charge that same battery, aged or unbalanced battery cell conditions, etc.

Battery Testing: This error is only generated by one of two conditions found during the Pre- Qualification Test Stage. Condition 1: A severely discharged battery pack did not charge up to 1.75Vdc per cell (21Vdc for 24V-battery), within 4 hrs. Condition 2: A heavy load applied prevents charger from charging battery pack above 1.75Vdc per cell.

Inhibit Lockout Control Defective: If an Equipment Lockout Cable (Inhibit) is installed and supposed to be active, but it is not. Check Inhibit vehicle wiring. If correct, internal inhibit switch may have been overload. Contact factory.

Internal Over Temperature: Charger shut down due to an internal over temperature condition. Check fan operation and remove blockages, if any.

Mode Selected Empty: The selected Charge Algorithm, set via the dip switches, is empty and not a valid setting for charging batteries. Reset the mode select switches to a valid value.

Database Write Error: While disconnecting the charger output leads from a battery pack, if the charger was in the process of saving information back into memory, this error may be produced. Contact the factory to have a reset programming cable sent to you to field reset the charger.

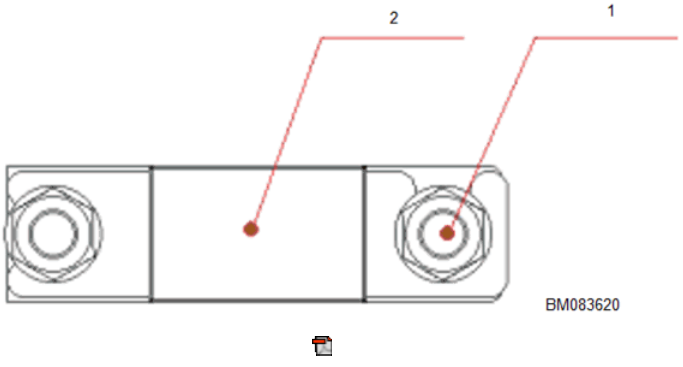
Discharge Error: Based on 1.75V/cell, this error is produced when cell voltage falls below this value (example: 21Vdc for 24V Battery Pack). A.C. Power should be connected to charger and charging initiated immediately.

Severe Discharge Error: Based on 1.417V/cell, this error is produced when cell voltage falls below this value (example: 17Vdc for 24V Battery Pack). A.C. Power should be connected to charger and charging initiated immediately. Damage to battery pack, resulting in reduced capacity, may have occurred and may be permanent. Check battery with Load Tester after re-charge complete.

Battery Storage Error: Battery has sat in storage for greater than 30 days and requires charging. Connect A.C. Power and Charge Battery.

Critical Battery Error: Battery has drained to a critically low level possibly resulting from many months of storage, parasitic drains including equipment key left in 'ON' position. Disconnect the charger's positive battery lead, wait a few seconds and then reconnect the lead.

BOLT FUSE



1 NUT 2 BOLT TYPE FUSE

Figure 28. Bolt Fuse

Remove

1. Position lift truck on level surface. Turn the key switch to the **OFF** position and disconnect the battery.
2. Remove drive unit compartment cover.
3.

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- Minimum/maximum battery weight
- Persons on board
- Rated power
- Battery voltage

INSTALLATION

INSTALLING THE BATTERY

ALERT

Before starting work, ensure that you are wearing suitable protective clothing. Move the truck to a safe place, away from areas of transit of other vehicles and all pedestians.



1. Remove the lateral door of the battery compartment.

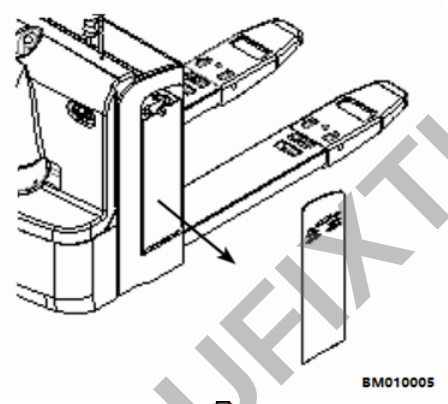
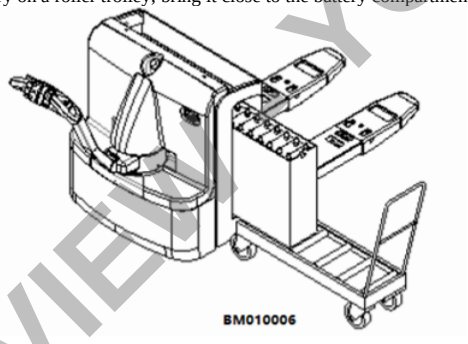
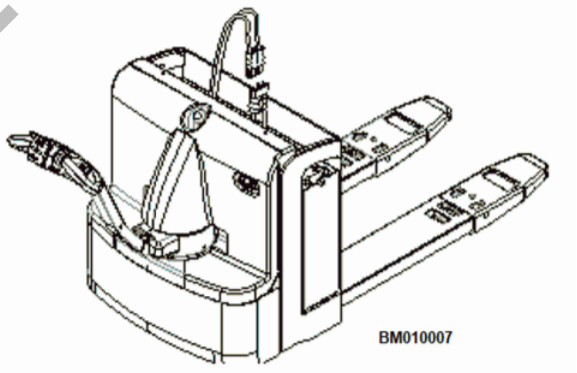


Figure 2. Door Removal

2. Place the battery on a roller trolley, bring it close to the battery compartment, and then push the battery inside the battery compartment.



3. Connect the battery to the battery connector, and then replace the side door of the battery compartment.



FRAME

HOW TO REMOVE COVERS

1. To remove the baffle, first remove two screws (item 1) and another two screws (item 2), and then remove the baffle (item 3).

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MAINTENANCE

OILS AND LUBRICANTS

Application	Standard storage	Storage in cold room	Type
Oil for lubrication Hydraulic circuit	•		Shell Tellus S3 V 46
		•	Shell Tellus S3 V 32
Oil for lubrication of the reduction unit	•	•	Double curve gear oil 85W-90 (GL-5)
Oil for lubrication of the gears	•	•	Shell Advance Teflon Chain
Grease for lubrication of the pins	•		Shell Albida Grease EP2
		•	Aeroshell Grease 6

CLEANING PRODUCTS

CLEANING OF CASINGS, PLASTIC COVERS, PLATES, DECALS AND PAINTED PARTS

Use only dry air, cloths moistened with water, or cleaning products.

Do not use jets of water or steam, solvent or explosive, oxidizing, flammable, toxic, corrosive and harmful/irritant products, which can damage the truck, plates, decals or that can be dangerous for the operator.

CLEANING OF ENGINES, BRAKING SYSTEM AND ELECTRIC SYSTEM

Use only dry air at low pressure and a dry clean brush.

Do not use wet rags, water jets, vapour, solvents or flammable products that may damage the truck or that may be dangerous for the operator.

CLEANING OF HYDRAULIC SYSTEM, REDUCTION GEAR AND BEARING SLIDING GUIDES

Use degreasing products.

Do not use water jets, vapours, solvents or flammable products that may damage the truck or that can be dangerous for the operator.

NOTE: To clean the battery, follow the directions in the battery manual.

SCHEDULED MAINTENANCE

●= check and maintenance ■= operator check x = replacement		Maintenance			
	Operation description	**every 50 hours 1 week**	**every 200 hours 1 month**	**every 600 hrs 3 months**	**every 1200 hours 6 months**
Braking System	Pull the tiller to make it pass between zones A and B. The brake makes noise.	■			
	Remove dirt residues and oil from the steering wheel.	■			
	Keep the brake clearance between 0.2 mm and 0.8 mm.	■	●	●	●
Frame	Check the general conditions and the presence of anomalies.		●		
	Check the correct operation of the horn.		●		
	Frame, operation, cracks, lubrication status, loose fasteners		■		
	Connecting rod and transport wheel, operation, cracks, bends, deformations, lubrication status		■		
	Replace the load wheels and bearings depending on their wear.				x
Steering Wheel	Pull the rudder to make it pass between zones A and B. The brake makes an absorption sound.		■		
	Tiller seat and flexibility		■		
Hydraulic System	Oil leaks in the pipes		■		
	Correct dosing of hydraulic oil		■		
	Oil leaks in the lifting cylinder		■		
	Filter cleaning		■		●
	Replace hydraulic oil, check for leaks in the lifting cylinder and replace gaskets if necessary				x
Electrical System	Plug operation and faults		■		
	Key switch operation		■		
	Contactor performance and operation		■		
	Microswitch operation		●		
	Control operation		●		
	Traction motor wear		●		
	Lifting motor, carbon brush and commutator wear		●		
	Steering motor, carbon brush and switch wear		●		
	Fuse, complete or not complete		●		
	Wiring and terminals, loose or faulty		●		
	Polish the irregular contacts with abrasive paper			●	●
	Replace in case of malfunctions			x	x
	Carbon brush and commutator wear			●	
	Electrolyte capacity, liquid level check, distilled water	■	■		
	Electrolyte density, after recharging the test should give a value of	■	■		

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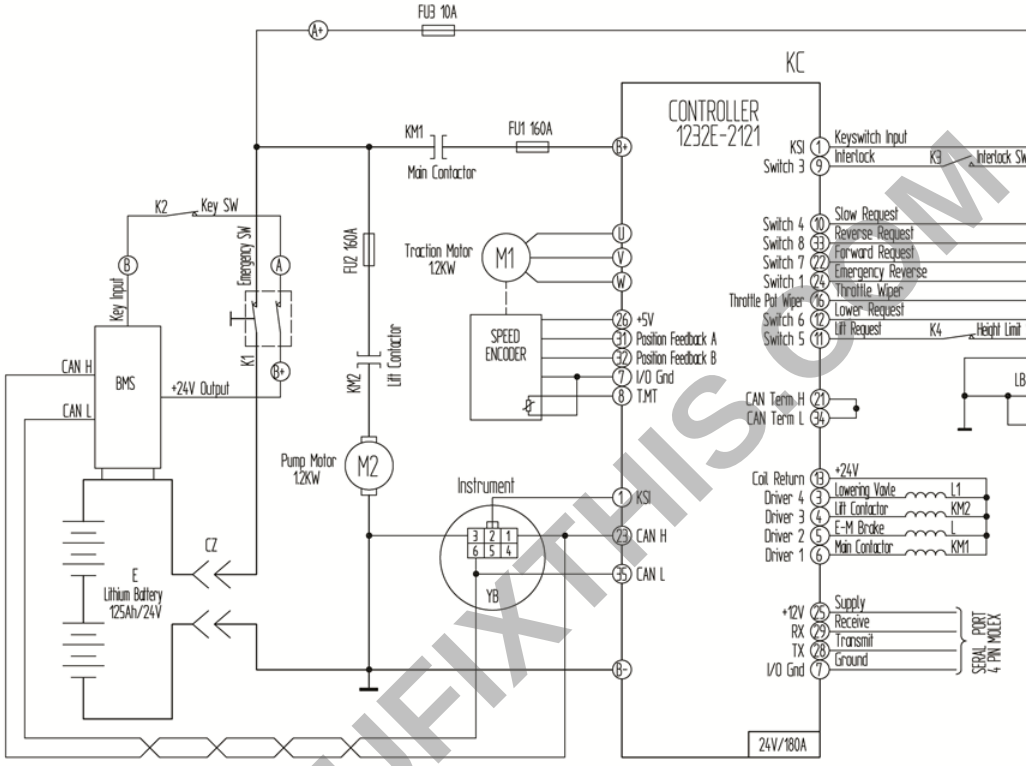
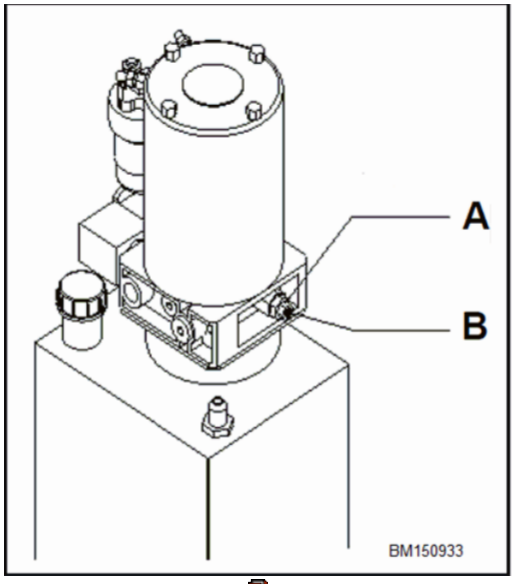


Figure 58. Electrical Schematic - 1230 Controller with Lead-Acid Battery

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A LOCK NUT B ADJUSTMENT SCREW

Figure 39. Pressure Relief Valve

Once the adjustment has been made, tighten the nut again.

DIRECTIONAL CONTROL VALVES
ONE-WAY VALVES AND CHECK VALVES

The function of one-way or non-return valves is to allow the oil to flow in one direction only, while preventing the flow in the opposite direction.

They are essentially comprised of a fixed part connected to the end of the pipe that in the appropriate inner housing runs the moving element, which might be a bearing or a conical plug.

Check valves instead have an opposing spring. In the direction of free flow, the oil pressure must exceed the force exerted by the spring.

LIFT CYLINDER

WARNING

Put blocks under each fork. Position blocks on both sides of the drive wheel. The blocks must prevent the lift truck from falling and causing personal injury or damage.

Remove

To remove lift cylinder, do the following steps.

1. Raise the forks of the lift truck to maximum height.
2. Place blocks under the forks and block the drive tire.
3. Lower the forks onto the blocks.
4. Remove the drive unit compartment cover from the lift truck.
5. Remove the top center and main center covers covering the hydraulic cylinder.
6. Unscrew the screw (item 1) and spacer (item 2) of the upper pivot point of the oil cylinder.
7. Unscrew the screw (item 4) and spacer (item 3) of the lower pivot point of the oil cylinder.
8. Raise the front frame slightly to remove the oil cylinder (item 5), each on left and right side.

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