

SERVICE & OPERATOR'S MANUAL

BG2 TASK SUPPORT VEHICLE



ACTUAL PRODUCT MAY NOT APPEAR EXACTLY AS SHOWN

WARNING

Do not operate or service this product unless you have read and fully understand the entire contents of this manual. Failure to do so may result in property damage, bodily injury or death.

BLUE GIANT®

WARNING

- ⚠ Do not operate this truck unless you have been authorized and trained to do so and have read all warnings and instructions in this Operator's Manual and on this truck. Read, understand, and comply with the information on the truck's nameplate at all times.
- ⚠ Do not operate this truck until you have performed the daily operation's check list. Inspect tires, horn, battery, controller, lift and hydraulic system, brakes, steering mechanism, and guards. Verify that all emergency controls, personal protection, and safety devices are in place and functioning correctly and ensure the truck is free of fluid leaks and has no loose or missing parts. Report any problems to the designated authority and do not use the truck until they are corrected by a qualified mechanic.
- ⚠ This truck must not be modified without the manufacturer's consent. Components critical to the truck's stability such as batteries shall not be replaced with lighter weight components.
- ⚠ Operate truck only from designated platform operating position. Use this truck indoors on level surfaces only. Never operate on ramps and slopes or uneven floors. This truck is not for use on mezzanines or balcony areas. Before operating, inspect the floor area it will be used on and be certain it will support the truck at full capacity and lift height. Identify and avoid holes, drop-offs, bumps, and obstructions.
- ⚠ Before and during all truck operations ensure that adequate clearance is maintained from overhead obstructions and energized electrical conductors and parts.
- ⚠ Before elevating the platform be sure guardrail access gates are in place and lowered. Always keep feet on platform floor while using truck, never climb onto guard rails or platform shelf. Do not use ladders, planks, or other devices to achieve additional height on platform.
- ⚠ When transferring loads to platform or platform shelf, do not exceed capacity ratings on truck nameplate. Ensure loads are centered and do not contact any obstructions in the truck's vicinity. Do not stabilize the platform by contact with adjacent objects such as racks or shelving. Do not use the platform as a crane.
- ⚠ Take care to prevent electrical cords, hoses, or other equipment from getting entangled in the platform. Ensure the area surrounding the truck is free of personnel and equipment before lowering platform.
- ⚠ Maintain a clear view of the ground while traveling and a safe distance from obstacles in the truck or platform's path. Ensure personnel in the vicinity are aware of the truck's movement. Travel at a safe speed for the conditions the truck is operating in.
- ⚠ Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed. Avoid hazardous locations.
- ⚠ Enter and exit platform only through raised access gates and with the platform fully lowered and truck stopped. When leaving the truck unattended, remove the key to prevent unauthorized use.
- ⚠ If there is a fault code on the BDI/display, do not continue to use. Recycle the key and see if the code displays again. If the code does display, do not operate the truck. Investigate the fault code and check with a service technician.
- ⚠ Rated Life: Please note every vehicle has a finite life. Blue Giant rates the lifespan of these vehicle models to be ~4000 hours and should be removed from service then.

Safety Notices and Text Mark-Ups

Safety instructions and important explanations are indicated by the following graphics:



DANGER

Means that failure to comply can cause risk to life and/or major damage to property.



WARNING

Strictly adhere to safety instructions to avoid personal injury or major damage to equipment.



CAUTION

Pay attention to the safety instructions.



NOTE

Pay attention to the instructions.

PROPOSITION 65



WARNING

in accordance to

California Health & Safety Code Sections 25249.5 et. seq.
this warning is to let you know that this product can expose
you to chemicals known to the state of California to
cause cancer, birth defects and other reproductive harm.
For more information visit: www.p65warnings.ca.gov

TABLE OF CONTENTS

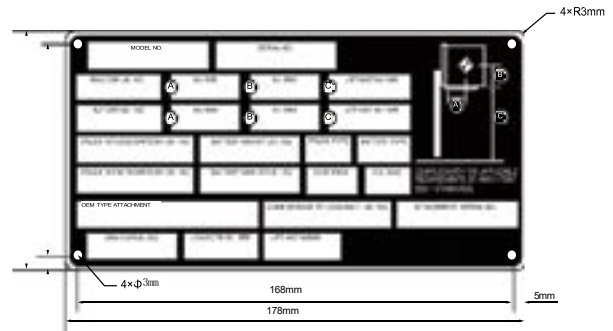
1. INTRODUCTION.....	6
1-2. GENERAL DESCRIPTION	6
1-3. SAFETY FEATURES	6
2. TRUCK COMPONENTS	7
INSTRUMENTS AND CONTROLS	8
INSTRUMENT PANEL	9
3. PLANNED MAINTENANCE.....	11
3-1. GENERAL.....	11
3-2. MONTHLY AND QUARTERLY CHECKS.....	11
3-3. BATTERY CARE	12
3-4. CHARGING BATTERIES.....	13
BATTERY CLEANING	13
3-5. LUBRICATION	14
3-6. LIFT CHAIN MAINTENANCE	14
TROUBLESHOOTING.....	16
CONTROLLER TROUBLESHOOTING	19
ZAPI HANDSET	19
FAULT DETECTION.....	19
LOGBOOK ACCESS	19
TESTING TRUCK OPERATION	19
HOISTING OR LIFTING THE TRUCK.....	42
5. STEERING SYSTEM.....	42
5-1. STEERING CONTROL REMOVAL	42
5-2. COMPARTMENT COVER.....	44
5-3. STEERING MOTOR.....	45
6. BRAKE SERVICING	47
7. DRIVE SYSTEM	48
7-1. DRIVE WHEEL	48
7-2. TRANSMISSION.....	48
7-3. LOAD WHEEL	48
8. ELEVATION SYSTEM SERVICING.....	50
8-1. LIFT CHAIN LENGTH ADJUSTMENT.....	50
8-2. LIFT CHAIN WEAR INSPECTION	51
8-3. LIFT CHAIN REPLACEMENT	51
9. HYDRAULIC SYSTEM.....	54
9-1. LINES AND FITTINGS	54
9-2. HYDRAULIC PUMP, MOTOR AND RESERVOIR ASSEMBLY	54
9-3. LIFT CYLINDER.....	58
9-4 FULL FREE LIFT CYLINDER	59
10. ELECTRICAL COMPONENTS.....	62
10-1. ELECTRICAL CONTROL PANEL	62
10-2. HORN REPLACEMENT	63
10-3. LOWERING BUZZER REPLACEMENT	66
10-4. WARNING LIGHT REPLACEMENT	66

10-5. PLATFORM CABLE REPLACEMENT.....	66
10-6. OPERATOR PRESENCE SWITCH.....	67
LITHIUM-ION BATTERY.....	72
INTRODUCTION*.....	72
GETTING STARTED.....	73
POTENTIAL HAZARDS.....	75
PERFORMANCE DATA.....	76
BATTERY INDICATOR.....	79
TRANSPORTATION.....	81
SERVICE.....	82
TROUBLESHOOTING & RECYCLING.....	84
APPENDIX A: DAILY SPOT CHECK RECORD.....	87
APPENDIX B: BOX STRUCTURE.....	88
OPERATOR'S MANUAL.....	90

1. Introduction

This publication describes the 24-volt lift truck distributed by Blue Giant. Included are planned maintenance instructions, lubrication procedures, and corrective maintenance procedures.

Users shall comply with all requirements indicated in applicable OSHA standards and current edition of A.N.S.I. B56.1 Part II. By following these requirements and the recommendations contained in this manual; you can expect many years of dependable service from your BG2 truck.



1-2. General Description

The BG2 lifts and transports the operator (on the platform portion of the lift carriage) and the payload (on forks or optional payload platform). This permits efficient selection and transport of materials in any area or at any level of the warehouse or storeroom. The design permits one person to perform all operations of selecting stock, driving the truck, and replacing stock at the designated place. The battery-powered truck is quiet and has no exhaust fumes, allowing operation in closed areas without special provisions for ventilation.

The AC motor propels the truck in a forward or reverse direction. The truck can be driven with the platform raised or lowered; however, travel speed is restricted based on lift height.

On demand power steering makes the truck highly maneuverable.

The control arms are used to operate the work truck and provide operator safety.

The operator platform contains the operator presence switch which must be depressed for the truck to operate.

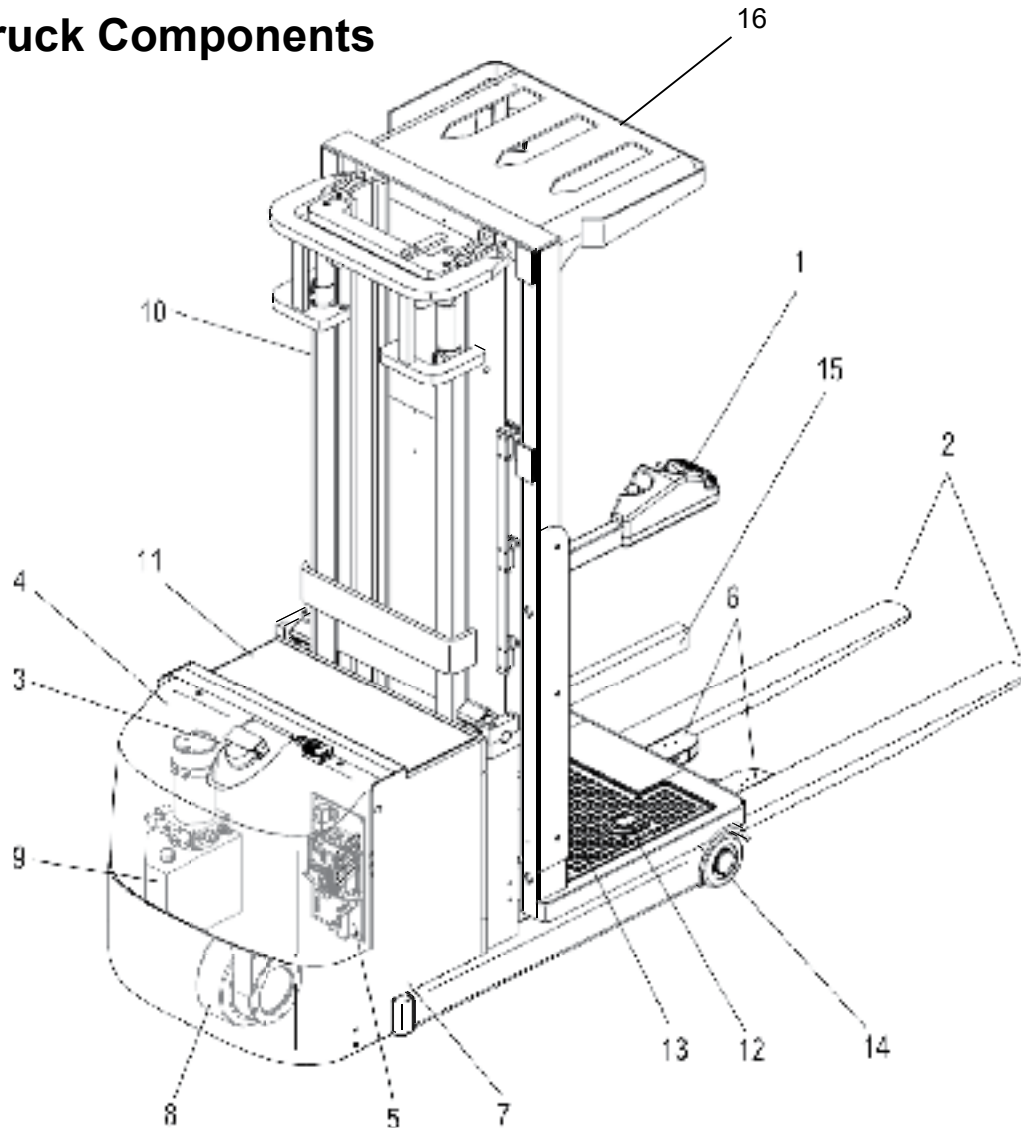
The model number will be found on the name plate along with the serial number, lifting capacity, and load center.

1-3. Safety Features

The BG2 is designed and engineered to provide maximum safety for operator and payload. Some of the safety features incorporated into the design are:

- The operator presence switch applies the brakes and cuts off the drive power when the steering arm is released.
- Key-operated power switch to prevent operation by unauthorized personnel.
- High speed limit switch to restrict speed when the lift carriage is raised above the preset limit.
- All control functions automatically return to "OFF" when released.
- Emergency stop switch.
- Separately fused control circuits and power circuits.
- Readily accessible horn button.
- Drive wheel position indicator.
- Flow control valve regulates maximum lowering speed within prescribed limits.
- Relief valve maintains hydraulic pressure within prescribed limits.
- High visibility color scheme of truck provides visual alert of truck's presence.
- Battery Indicator.
- Casters.

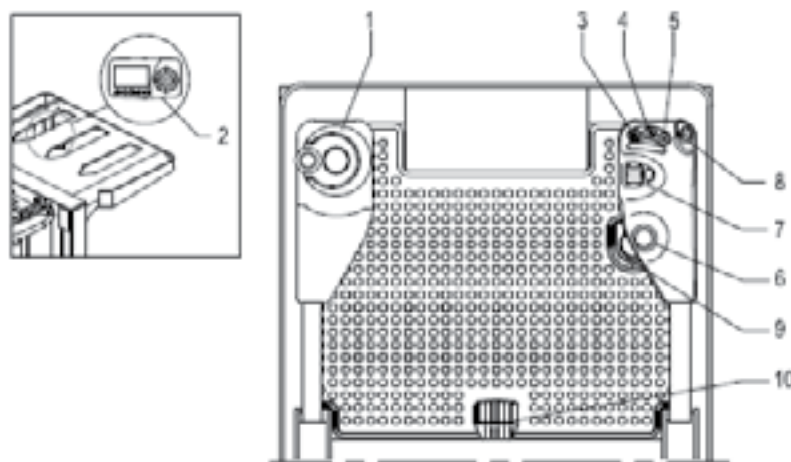
2. Truck Components



ITEM	COMPONENT
1	Control arms
2	Forks
3	Warning light
4	Cover
5	Control panel
6	Pallet grabber
7	Frame
8	Drive wheel

ITEM	COMPONENT
9	Hydraulic pump and reservoir
10	Mast
11	Battery
12	Drive pedal
13	Operator platform
14	Load wheels
15	Side gates
16	Overhead guard

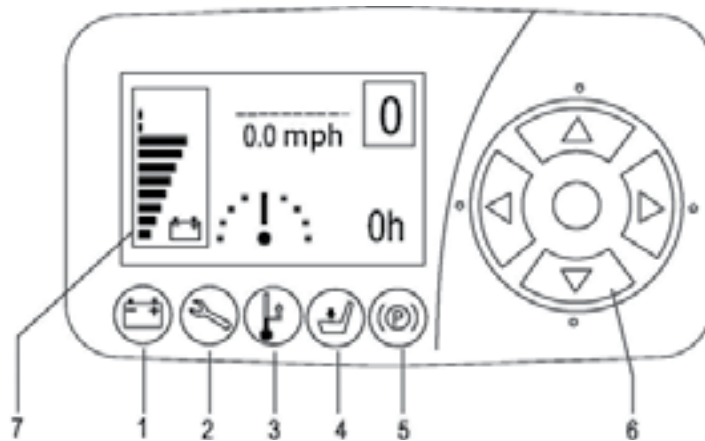
Instruments and Controls



Operator's Controls

- (1) **Steering Wheel:** Used to control the direction of travel.
- (2) **Display Unit:** Operating information and warning message display.
- (3) **Lifting Pushbutton:** Used to lift the operator's platform from the raised position.
- (4) **Lowering Pushbutton:** Used to lower the operator's platform from the raised position.
- (5) **Horn Pushbutton:** Used to sound the horn.
- (6) **Emergency Stop Switch:** Disconnects the supply current, deactivates all electrical functions, causing the truck to brake automatically.
- (7) **Travel Switch:** Used to control the direction and speed of the truck.
- (8) **Key Switch:** Used to prevent unauthorized personnel from operating the lift truck.
- (9) **Operator Presence Footswitch:** Releases the mechanical brake when depressed and engages the brake when released.
- (10) **Pallet Clamp Pedal:** Used to release the mechanical brake when depressed and engage the brake when released.

Instrument Panel



(1) Low Battery Alarm LED

This LED lights when the measured battery voltage is equal or less than 40% normal battery voltage.

(2) Fault Alarm LED

When a fault is detected, this LED will light. The display (7) will display the warning and fault indication. Report alarm to the designated authority and do not use the vehicle until corrected by a qualified mechanic.

(3) Temperature Alarm LED

When the temperature of the drive motor is too high, the LED will illuminate. Temporarily stop operation until the temperature lowers and notify an authorized technician.

(4) Operator Presence Switch Alarm LED

This LED will illuminate when the emergency power disconnect switch on the control arm is actuated.

(5) Brake Alarm

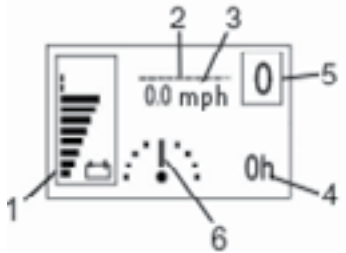
This LED will illuminate when the emergency power disconnect switch on the control arm is actuated.

(6) Function Keys

Use the left arrow button to adjust the speed mode. Use the down arrow button to switch the driving mode.

(7) Display:

The display has the following functions:

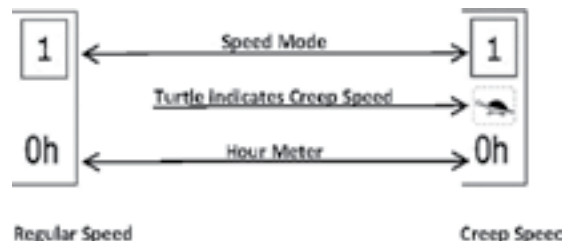


- (1) Battery Indicator:** The state of charge is displayed by ten notches. Each notch represents 10% of the battery charge. For example, the illustration shows the battery has 80% charge.
- (2) Information Display:** Displays the warnings and faults. Report warnings and faults to the designated authority and do not operate the vehicle until corrected by a qualified mechanic.
- (3) Speed Display:** Indicated the truck's speed.
- (4) Hour Meter:** Indicates the number of hours the Key Switch is "ON".
- (5) Speed Mode Display:** (Also see Figure 2-6): There are four performance travel speed ranges available in both high-speed driving mode and the creep speed driving mode. Use the "left function key to select the desired mode. "1" indicates the slowest speed while "4" indicates the highest speed.
- (6) Drive Wheel Directional Indicator:** Indicates the direction of the steer tire.



CAUTION: When the platform rises the truck automatically enters creep speed.

Driving Mode Display: The truck can be operated in two driving modes; regular speed or creep speed. Use the "down" function key to switch the driving mode:



3. Planned Maintenance

3-1. General

Planned maintenance consists of periodic visual and operational checks, parts inspection, lubrication, and scheduled maintenance designed to prevent or discover malfunctions and defective parts. The operator performs the checks in the Operator's manual and refers any required servicing to a qualified maintenance technician who performs the scheduled maintenance and any required servicing.

3-2. Monthly and Quarterly Checks

The table below is a monthly and quarterly inspection and service chart based on normal usage of equipment eight hours per day, five days per week. If the lift truck is used more than forty hours per week, inspection and service should be increased accordingly. These procedures must be performed by a qualified service technician or your Blue Giant Service Representative.

Monthly and Quarterly Inspection and Service Chart (Table 3-1)

VISUAL CHECKS	
INTERVAL	INSPECTION OR SERVICE
Monthly	Check electrical brake for proper operation.
Monthly	Inspect wiring for loose connections and damaged insulation.
Monthly	Check wheels for wear and damage.
Monthly	Check operator presence switch for proper operation.
Monthly	Check lift chain tension, lubrication & operation
Monthly	Check platform and mast assembly for cracks, excessive sway, leaning or binding.
Monthly	Check the frame and welds for cracks.
Quarterly	Check lift cylinder for leakage.
Quarterly	Test electric steering.
Quarterly	Check steering gear for wear and lubricate.
Semi-annually	Inspect for chain wear

3-3. Battery Care

The BG2 may be equipped with maintenance-free or industrial wet cell batteries.

The care and maintenance of the battery is very important to obtain efficient truck operation and maximum battery life.



CAUTION: Gases produced by a battery can be explosive. Do not smoke, use an open flame, create an arc or sparks in the vicinity of the battery. Charge in well-ventilated area.



CAUTION: Some batteries may contain sulfuric acid which may cause severe burns. Avoid contact with eyes, skin, or clothing. In case of contact, flush immediately and thoroughly with clean water. Obtain medical attention when eyes are affected.

Voltage leakage from battery terminals to battery case can cause misleading symptoms with the truck electrical system. Since components of the truck electrical system are insulated from truck frame, leakage voltage will not normally affect truck operation unless a short circuit or breakdown of circuit wire insulation to truck frame occurs.

A voltage check from battery connector terminal to battery case should indicate near zero volts. Typically, however, the sum of the voltages at both terminals will equal battery volts. This leakage voltage will discharge the battery. As battery cleanliness deteriorates, the usable charge of the battery decreases due to this self-discharge. Although a voltage leakage reading of zero volts may not be possible, a cleaner battery will have more usable charge for truck operation and not affect operation of electronic devices on the unit

3-3.2. Battery Safety Rules

- Wear protective clothing, such as rubber apron, gloves, boots, and goggles when performing any maintenance on batteries. Do not allow electrolytes to come in contact with eyes, skin, clothing, or floor. If electrolytes come in contact with eyes, flush immediately and thoroughly with clean water. Obtain medical attention immediately. If electrolytes are spilled on skin, rinse promptly with clean water and wash with soap.
- If truck is equipped with a wet cell battery, keep the vented battery caps twisted firmly in place. Do not allow dirt, cleaning solution or other foreign material to enter cells. Impurities in electrolytes have a neutralizing effect reducing available charge.
- Do not allow any type of flame, spark, etc., near the battery. Gas formed while the battery is charging is highly explosive. This gas remains in the cell long after charging has stopped.
- Do not lay metallic or conductive objects on battery. Arcing may result.
- Do not touch non-insulated parts of DC output connector or battery terminals to avoid possible electrical shock.
- De-energize all AC and DC power connections before servicing battery.
- Do not charge a frozen battery.
- Do not use a charger if it has been dropped or otherwise damaged.

3-3.3. Preparation for Battery Charging

1. Charge the battery only in designated areas.
2. Make certain the charger being used matches the voltage and amperage of the truck battery.
3. Before disconnecting or connecting batteries to a charger, make sure the charger is "OFF". If an attempt is made to do this while the charger is "ON", serious injury to you, the battery and the charger could result.
4. Before connecting the battery cable to the truck's receptacle, make sure the key switch is off. The battery cable must be fully connected before the truck is used. If the plug is not making good contact, heat will weld the two parts of the battery connector together, making it difficult to remove and necessary to replace.
5. Battery terminals should be checked and cleaned of corrosion regularly. Good battery terminal contact is essential not only for operation, but also for proper charging of the battery.

6. The charging requirements will vary depending on the use of the truck.
7. Make certain battery used meets weight and size requirements of truck. NEVER operate the truck with an undersized battery.



CAUTION: Never smoke or bring open flames near the battery. Gas formed during charging is highly explosive and can cause serious injury.

3-4. Charging Batteries

Charging requirements will vary depending on rate of discharge and temperature. Follow safety rules when placing a battery on charge.

Proceed as follows:

1. Park truck at charging station with forks lowered and turn off the key switch.
2. Check the condition of the AC cord and battery cables. If there are any cuts in the cable, any exposed wires, loose plugs, or connectors, DO NOT attempt to charge the batteries. Contact appropriate personnel for repairs to be made.
3. Disconnect the batteries from the truck and connect the batteries to the charger. Make sure connectors are mated properly.
4. Connect the charger to the appropriate power supply.
5. Follow the instructions for the charger being used.

Battery Cleaning

Always keep vent plugs tightly in place when cleaning the battery. When properly watered and charged, the battery will remain clean and dry. All that is necessary is to brush or blow off any dust or dirt that may accumulate. However, if electrolyte is spilled or overflows from a cell, it should be neutralized with a solution of baking soda and water, brushing the soda solution beneath the connectors, and removing grime from the covers. Then rinse the battery with cool water from a low-pressure supply to remove the soda and loosen dirt. If batteries stay wet consistently, they may be either overcharged or over filled. This condition should be investigated and corrected.

3-5. Lubrication

Refer to table below for the recommended types of grease and oil.

Recommended Lubricants

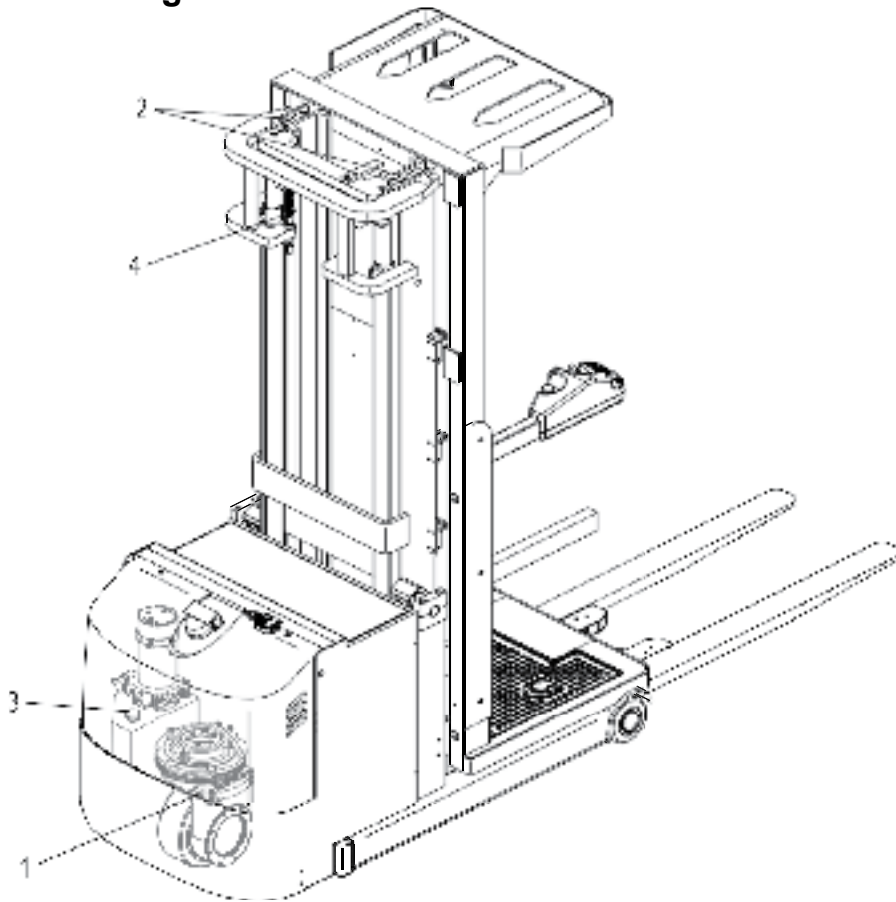
(Table 3-2)

No. 1	GL-80W-90
No. 2	Multi-purpose grease (Polylub GA352P)
No. 3	L-HM32
No. 4	SAE 30 or 40 Engine lubricating oil.

3-6. Lift Chain Maintenance

Fully raise and lower the forks while observing chains as they move over chain sheaves. Ensure the chain is aligned and tracking properly and all links are pivoting freely. With the lift carriage fully lowered, spray or brush on a film of SAE 30 or 40 engine oil.

3-7. Lubrication Diagram



Lubrication Chart (Table 3-3)

ITEM	LOCATION	METHOD OF APPLICATION	APPLICATION OF LUBRICANT
1	Transmission Capacity – 60 fl oz.	Can	Fill to level plug opening.
2	Inner & Outer Mast	Brush	Full length of channel where the rollers operate.
3	Hydraulic Reservoir Lift Height - Capacity: 3.9 gallons	Can	With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening.
4	Lift Chain	Brush or Spray	See Lift Chain Maintenance above.

Troubleshooting

GENERAL

Use Table 4-1 as a guide to determine possible causes of trouble.

Table 4-1 Troubleshooting Chart

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
TRAVEL AND HYDRAULIC SYSTEM WILL NOT OPERATE	a. Battery connections not connected. b. Key switch "OFF" or defective. c. Safety access gate open. d. Emergency power disconnect switch pressed or defective. e. "Deadman" footswitch not pressed or defective. f. Battery charge is too low. g. Faulty fuse.	Check the battery connections and connect if necessary. Turn the key switch "ON" or bypass key switch to determine if it is malfunctioning. Close access gates. Disengage the emergency power disconnect switch or bypass switch to determine if it is malfunctioning. Press "deadman" footswitch or bypass pedal to determine if it is malfunctioning. Check battery charge, charge battery if necessary. Test fuses.
VEHICLE DOES NOT OPERATE FORWARD OR REVERSE - Vehicle does not travel forward or reverse. All other functions operate normally. - Vehicle travels forward but not in reverse. - Vehicle travels reverse but not in forward. - Vehicle travels forward and in reverse at lower speeds; will not travel at high speed.	a. Check all wiring. A loose connection may be the cause of malfunction. c. Defective controller. d. Defective travel switch. Defective travel switch. Defective travel switch in control head. a. Defective travel switch in control head. b. Operator platform raised above 20 inches.	Tighten all loose connections before further troubleshooting. Check for proper operation and replace if necessary. Check and replace switch if defective. Check and replace switch if defective. Check and replace switch if defective. Check and replace switch if defective. Lower operator platform below 20 inches.

Table 4-1 Troubleshooting Chart - Continued

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
TROUBLE WITH LIFTING OR LOWERING		
- Oil sprays or flows from the top of the lift cylinder. - Squealing sounds when lifting Operator's platform.	Defective packing in lift cylinder a. Oil level too low. b. Dry channels in mast. c. Defective mast or Platform rollers	Repair lift cylinder. Identify oil leak and fill reservoir. Apply grease. Replace rollers.
- Platform does not lift to full lift height. - Weak, slow or uneven action of hydraulic system.	a. Oil level too low. b. Load larger than capacity. a. Defective pump or relief valve. b. Worn lift cylinder. c. Load larger than capacity. d. Defective lift motor relay. e. Battery charge low.	Add oil to reservoir. Refer to I.D. plate for capacity. Check pressure. Adjust as necessary. Replace cylinder. Refer to I.D. plate for capacity. Replace relay on pump motor. Charge battery.
Platform does not lift; pump motor does not run.	a. Battery is dead or disconnected. b. Defective wiring. c. Defect in electrical system for operating pump motor.	Check and recharge if required. Check and repair as required. Check lift switch on platform, as well as the relay.
Platform does not lift, motor runs.	Defect in hydraulic system.	Check the oil level in the reservoir and the oil lines to the lift cylinder, and repair as required. If normal, check the hydraulic pump, and relief valve. Repair or adjust.
Platform lifts but will not go down.	Defect in hydraulic system	Check lowering control switch and lowering solenoid. Replace as required.
Load will not hold	a. Oil bypassing internally in control valve b. Worn lift cylinder or packing.	Replace valve assembly. Repack cylinder.
Platform does not lift to top. Pump motor runs.	a. Oil level too low. b. Load larger than capacity. c. Batteries need charging.	Add oil to reservoir. Refer to nameplate on side of mast for maximum load capacity. Charge batteries.
Forks drift down under load when in a raised position.	Leak in hydraulic system, lift cylinder or lowering valve.	Check for leaking fitting in hydraulic line and repair as required. Repack lift cylinder or replace valve assembly.

Table 4-1 Troubleshooting Chart - Continued

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
TROUBLE WITH STEERING	a. Faulty fuse. b. Check all wiring. A loose connection may be the cause of malfunction. c. Defective potentiometer. d. Defective controller. e. Defective STEERING motor.	Test fuses. Tighten all loose connections before further troubleshooting. Check and replace potentiometer if defective. Check for proper operation and replace if necessary. Replace if necessary.

Controller Troubleshooting

Zapi Handset

A Zapi Handset is available that is designed specifically for use with the Zapi controller. It serves multiple functions of reading diagnostic data, testing truck operation, setting options, adjustments, and parameter changes of the controller. The Zapi Handset is available through your Blue Giant dealer. If you require dealer location information, contact Blue Giant.

Fault Detection

The controller provides diagnostics information to assist technicians in troubleshooting problems. When a fault is detected, an alarm is recorded in the logbook. It has a FIFO (First Input First Output) structure, that means the oldest alarm is lost when the database is full, and a new alarm occurs. The logbook is composed of alarms with the following information:

- The alarm codes.
- The number of times that each alarm occurred consecutively.
- The hour meter reading (value) when the latest event of every alarm occurred.
- The invert temperature when the latest event of every alarm occurred.

This function permits a deeper diagnosis of any faults or problems, as the recent history can be revisited.

Logbook Access

To view the alarm logbook, proceed as follows:

1. Connect the Zapi Handset.
2. Press the down arrow (Figure 4-1) to AUTOSCAN CAN and press OK.
3. Press OK again to enter the MAIN MENU.
4. Press the down arrow button to select ALARMS and press OK.
5. Press the down arrow to select the alarm and press OK to view.
6. Press the Esc button to exit the alarms.

Testing Truck Operation

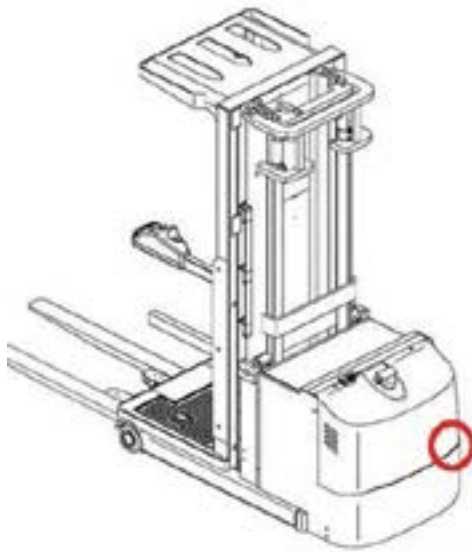
The Zapi Handset can be used to test certain truck operations. Connect the Zapi Handset and follow the steps on the following pages.

ZAPI SMART CONSOLE

Introduction for **BG2**



Location of CAN Connection



Traction VACC

Turn on ZAPI Handset

Push and hold the power button for 3s



The Display will show:

Cons AFG ZF021^

Press  or  button until CAN CONSOLE shows on the display



The Display will show :

Cons AFG ZF021^
CAN CONSOLE

Press OK to go into the CANCONSOLE Menu



The Display will show:

Push  or 
To select Node 2

The Display will show:

Press OK to go into the
Traction controller

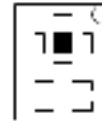
The Display will show:

Press OK to go into the
Main Menu

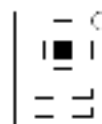
CANCONSOLE
SELECT NODE



SELECT NODE
NODE 2



ACOT2BESK EP0.45
24V 150A 0H



The Display will show:

Press  or  button until
PROGRAM VACC shows on the display

The Display will show:

Press OK to go into the PROGRAM
VACC function

The Display will show the minimum and
maximum throttle voltage values. Both
directions will be shown

Press OK to clear these values.
Display will show 0.0

Main Menu



MAIN MENU
PROGRAM VACC



VACC SETTING
CURRENT VALUE



The display will show:

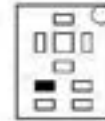
FORWARD x.xV x.xV
BACKWARD x.xV x.xV

Press pedal. Slowly depress the accelerator forward to its maximum value. The new minimum and maximum voltages will be displayed on the Console plus an arrow indicating the direction.



Repeat step for reverse direction

When finished , press ESC



The Display will ask : APPLY CHANGES ?

APPLY CHANGES?
YES= OK NO=ESC

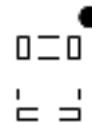
Press OK for yes



When finished, the Console shows :

Main Menu

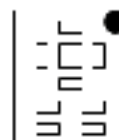
Press and hold power button for 3s to turn off the Console



Steering Calibration

Turn on ZAPI Handset

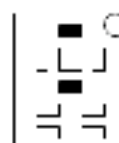
Push and hold the power button for 3s



The Display will show:

Cons AFG ZP021*

Press  or  button until CAN CONSOLE shows on the display



The Display will show :

Cons AFG ZP021*
CAN CONSOLE

Press OK to go into the
CANCONSOLE Menu



The Display will show:

CANCONSOLE
SELECT NODE

Push  or 
To select Node 6



The Display will show:

SELECT NODE
NODE 6

Press OK to go into the
Steer controller



The Display will show:

EPSAC0C2A EP161C
24V 50A 0H

Press OK to go into the
Main Menu



The Display will show:

Press  or  button until
HARDWARE SETTING shows on
the display

The Display will show:

Press OK to go into the HARDWARE
SETTING function

The Display will show:

Press  or  button until
AUTOTEACHING shows on
the display

The Display will show:

Push  or 
To select ON

The Display will show:

When finished , press ESC

The Display will ask : APPLY
CHANGES ?

Press OK for yes

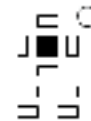
When finished, the Console shows :

Push and hold the power button for
3s to turn off the Console. Rekey
the truck, do not do anything until
autoteach completes (wheel stops
turning), rekey the truck again.

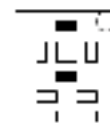
Main Menu



MAIN MENU
HARDWARE SETTING



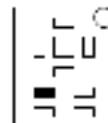
HARDWARE SETTING



HARDWARE SETTING
AUTOTEACHER OFF



HARDWARE SETTING
AUTOTEACHER ON



APPLY CHANGES?
YES= OK NO=ESC



Main Menu



Settings and Adjustments

Set Options

To set options proceed as follows and refer to Table 4-2:

1. Connect the Zapi Handset.
2. Press the ROLL up button and the SET up button (5) at the same time to enter the CONFIG MENU.
3. Press the ROLL DOWN button (1) or the ROLL UP button (2) to find the SET OPTIONS display.
4. Press the ENTER button (3) to view the options
5. Press the ROLL DOWN button (1) or the ROLL UP button (2) to find the option to be changed.
6. Press the SET up button (5) or the SET DOWN button (6) until the desired value setting is reached. The option is now set at the desired value.
7. Press the OUT button (4) to exit the options.

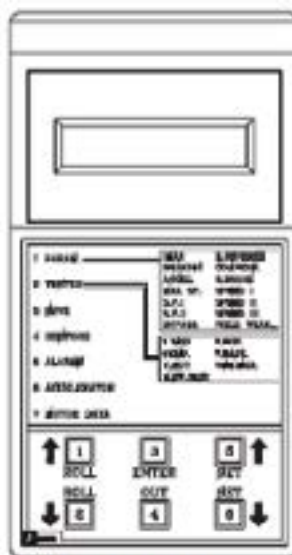


Figure 4-1 Hand Held Programmer

Traction Controller (Table 4-2)

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
99	SLIP PROFILE	This is an error in the choice of the parameters of the slip profile.	Call the Product Support Team at Blue Giant for assistance when this alarm occurs.
80	FORW+BACK	This alarm occurs when both the travel directions (FWD and REV) are active at the same time.	Check the FWD and REV travel demand inputs wiring (use the readings in the TESTER to facilitate the troubleshooting). Check the micro switches for failures. A failure in logic is also possible. If the travel demand switches and wiring is correct, it is necessary to replace the controller.
79	INCORRECT START	This is a warning for an incorrect starting sequence.	The possible reasons for this alarm are (use the readings in the TESTER to facilitate the troubleshooting): • A travel demand was active at key-on. • Presence man sensor was active at key on. • Check the wiring. Check the micro switches. It could be an error sequence made by the operator. A failure in the logic is possible too; so, when all the above are checked and nothing is found, replace the controller.
78	VACC NOT OK	The test is made at key-on and after 20 sec that both the travel demands have been turned off. This alarm occurs if the ACCELERATOR reading in the TESTER menu is 1.0V higher than PROGRAM VACC min acquisition when the accelerator is released.	Check the mechanical calibration and the functionality of the VACC.

Traction Controller (Table 4-2)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
62	TH. PROTECTION	This alarm occurs when the temperature of the base plate is higher than 85°C/185°F as the maximum current decreases proportionally with the temperature increases from 85°C/185°F to 105°C/221°F. At 105°C/221°F the Current is limited to 0 Amps.	Improve the air cooling of the controller. If the alarm is signaled when the controller is cold, the possible reasons are a thermal sensor failure or a failure in the logic card. In this case, it is necessary to replace the controller.
66	BATTERY LOW	This occurs when the battery charge is calculated at less than or equal to 10% of the full charge and the BATTERY CHECK setting is other than 0 (refer to SET OPTION menu).	Charge the battery. If charging does not help, using a voltmeter, measure the battery voltage and compare the reading with the value in the BATTERY VOLTAGE parameter. If they are different, adjust the value of the ADJUST BATTERY function.
71	EEPROM KO	This is due to an HW or SW defect of the non-volatile embedded memory supporting the controller parameters. This alarm does not inhibit the machine operations, but the truck will work with the default values.	Try to execute a CLEAR EEPROM operation (refer to CONSOLE manual). Switch the key off and on to check the result. If the alarm occurs permanently, it is necessary to replace the controller. If the alarm disappears, the previously stored parameters will have been replaced by default parameters with the temperature increases from 85°C/185°F to 105°C/221°F.
65	MOTOR TEMPERATURE	This warning occurs when the temperature sensor is opened (if digital) or has overtaken the threshold of 150°C/302°F (if analog).	Check the thermal sensor inside the motor (use the MOTOR TEMPERATURE reading in the TESTER menu); check the sensor ohmic value and sensor wiring. If the sensor is OK, improve the air cooling of the motor. If the warning is present when the motor is cool, then the problem is inside the controller.
61	THERMIC SENSOR KO	The output of the controller thermal sensor is out of range.	This type of fault is not related to external components; replace the controller.
	CHECK UP NEEDED	This is just a warning to call for the time programmed maintenance.	It is just enough to turn the CHECK UP DONE option to level ON after the maintenance is executed.
	DATA ACQUISITION	Acquisition of the current gains.	The alarm ends when the acquisition is done.

Traction Controller (Table 4-2)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
86	PEDAL WIRE KO	The SW continuously checks for the connection of the two supply ends of the potentiometer in the accelerator. The test consists of reading the voltage drop on a sense diode, connected between NPOT (CNA#30) and GND and cascaded with the potentiometer: if the potentiometer gets disconnected on PPOT (NNA#25) or NPOT, no current flows in the sense diode and the voltage on the NPOT connection collapses down. When the NPOT voltage is less than 0.3V this alarm occurs. This alarm also occurs when the NPOT voltage is higher than 2Vdc (to detect the condition of a broken sense diode).	Check the Voltage on NPOT and the potentiometer connections.
51	TILLER OPEN	Warning: When the tiller is released, after a fixed period of time of standby (30 seconds) the main contactor open.	At the next travel request, the warning will disappear.
92	CURRENT GAIN	The maximum current gain parameters are at the default values, which means the maximum current adjustment procedure has not been carried out yet.	Call for assistance from the Product Support Team at Blue Giant when this alarm occurs.
68	WAITING FOR NODE	The controller receives from the CAN the message that another controller in the net is in fault condition; as a consequence the ACOE controller itself cannot enter an operative status but has to WAIT for the other controller coming out from the fault status.	

Traction Controller (Table 4-2)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
76	VALVE COIL SHORTED	This alarm occurs when there is a short circuit on an on/off valve coil.	• If the fault is present at start up, it is very likely that the HW over current protection circuit is damaged, it is necessary to replace the controller. • If the fault is present when the controller drives the outputs, the problem is in the harness and in the coils.
74	EV1 DRIVER SHORTED	Electro valve EV1 driver is shorted.	Check if there is a short or a low impedance between the negative of one of these coils and -BAT. Otherwise, the drive circuit is damaged, and the controller must be replaced.
74	EV2 DRIVER SHORTED	Electro valve EV2 driver is shorted	Check if there is a short or a low impedance between the negative of this coil and -BAT. This warning also occurs if the external load is not present and the parameter EV2 in the "Set Options" menu is set "PRE- SENT", in this case the warning disappears setting the EV2 parameter "ABSENT". Otherwise, the drive circuit is damaged, and the controller must be replaced.
74	EV3 DRIVER SHORTED	Electro valve EV3 driver is shorted	Check if there is a short or a low impedance between the negative of this coil and -BAT. This warning also occurs if the external load is not present and the parameter EV3 in the "Set Options" menu is set "PRESENT", in this case the warning disappears setting the EV3 parameter "ABSENT". Otherwise, the drive circuit is damaged, and the controller must be replaced.
56	PUMP I NO ZERO	In standby condition (pump motor not driven), the feedback coming from the current sensor in the pump chopper gives a value out of a permitted range.	This type of fault is not related to external components; replace the controller.
52	PUMP I=0 EVER	This test is carried out when the pump motor is running, and it verifies that the current feedback sensor is not constantly stuck to 0.	• Check the motor connection for continuity. If the motor connection is opened, the current cannot flow, so the test fails, and the error code is displayed. • If the motor is okay, the problem could be in the current sensor or in the related circuit.

Traction Controller (Table 4-2)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
75	CONT. DRV. EV1	The EV1 valve driver is not able to drive the load (cannot close).	The device or its driving circuit is damaged, replace the controller.
75	CONT. DRV. EV2	The EV2 valve driver is not able to drive the load (cannot close).	The device or its driving circuit is damaged, replace the controller.
75	CONT. DRV. EV3	The EV3 valve driver is not able to drive the load (cannot close).	The device or its driving circuit is damaged, replace the controller.
89	PUMP VACC NOT OK	The minimum of the lift potentiometer is not correctly set.	It is suggested to repeat a "PROGRAM VACC" procedure.
67	SENS. MOT. TEMP. KO	• The motor temperature sensor is not correctly connected to A22. • The motor temperature sensor is damaged.	• Check the correct connection of the motor temperature sensor. • If the current sensor is correctly connected, replace it. • If the problem persists, replace the controller.
85	VACC OUT RANGE	The voltage on CNC#4 is outside of the parameters' range.	Please re-acquire the VACC parameters with a PROGRAM VACC procedure.
11	STALL ROTOR	The traction rotor is stuck, or the encoder signal is not correctly received by the controller.	Please check if the sign of FREQUENCY and ENCODER on the tester menu are the same and different than zero during a traction request.
48	EVP DRIVER OPEN	The EVP driver is damaged, or the EVP coil impedance is too low.	Please check the EVP coil impedance. If the EVP impedance is OK, the problem is inside the controller.
49	MANY PUMP REQS	More than one pump function was requested at the same time.	Just one pump function at a time can be requested. Please reset all the requests and try again.
79	PUMP INC START	This is a warning for a pump incorrect starting sequence.	The possible reasons for this alarm are: Pump request active at key- on. Pump request active without man presence. Check the wiring. Check the microswitches. It could also be an error sequence made by the operator. A failure logic is possible too. When all the above conditions were checked and nothing was found, replace the controller.

Traction Controller (Table 4-2)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
90	PUMP VACC RANGE	The voltage on CNC#9 is outside of the parameters range.	If the EVP TYPE parameter is set to ANALOG, please acquire again the values of MIN LOWER and MAX LOWER. If the controller is in Combiacx configuration and the PROPORTION. LIFT parameter is set to ON, please acquire again also the values of MIN LIFT and MAX LIFT.
13	PARAM RESTORE	This warning appears when the controller restored the default values.	If a CLEAR EEPROM was mode before the last key-on recycle, this warning just means that the EEPROM was correctly cleared. A travel demand or a pump request cancel the alarm. If this alarm appears at key on without any CLEAR EEPROM request by the operator, there could be a problem inside the controller.

Steering Controller (Table 4-3)

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
6	SERIAL ERR #1	Main uC and slave uC communicate via a local serial interface. This alarm occurs when the slave uC does not receive communication from the main uC through this serial interface.	It is necessary to replace the controller.
13	EEPROM KO	It occurs if a test to write and read one location in EEPROM fails. The SW expects to read the written value. It also occurs when the hour meter gives different values between the three redundant locations in which it is recorded. It also occurs when the busy bit of the EEPROM does not rise within 12 m sec.	It is necessary to replace the controller.
16	LOGIC FAILURE #4	This alarm occurs in the rest state if the output of the voltage amplifier of the phase Vw-Vv have a drift larger than ± 0.25 V.	It is necessary to replace the controller.
17	LOGIC FAILURE #3	This alarm occurs in the rest state if the output of the voltage amplifier of the phase Vu-Vw have a drift larger than ± 0.25 V.	It is necessary to replace the controller.
18	LOGIC FAILURE #2	This alarm occurs when the real voltage between phases W and V of the motor is different from the desired voltage.	It is necessary to replace the controller.
19	LOGIC FAILURE #1	This alarm occurs when the real voltage between phases W and U of the motor is different from the desired voltage.	It is necessary to replace the controller.
32	VMN NOT OK	This alarm occurs in the initial rest state after key-on if the inputs of motor voltage amplifiers are not in the window from 2.2 to 2.8 Vdc.	It is necessary to replace the controller.
48	MAIN CONT. OPEN	This alarm occurs only when the setting CAN BUS is PRESENT. Then the EPS-AC0 waits for a via CAN information that the traction controller has closed the main contactor. If this information lacks more than about 1.5 secs, this alarm occurs.	Find, on the traction controller, the reason for keeping the main contactor open.

Steering Controller (Table 4-3)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
53	STBY I HIGH	This alarm can occur two ways: 1. In the initial rest state after key- on, if the outputs of the current amplifiers are not comprised in the window 2.2 to 2.8 Vdc. 1) After the initial diagnosis this alarm occurs when the outputs of the current amplifiers at rest have a drift larger than $\pm 0.15V$.	It is necessary to replace the controller.
61	HIGH TEMPERATURE	This alarm occurs if the temperature of the controller base plate overtakes 75 degrees.	Improve the cooling of the controller; otherwise, it is necessary to replace the controller.
65	MOTOR TEMPERATURE	This alarm occurs only when DIA MOTOR TEMP is on and the thermal sensor inside the motor measures a temperature higher than 150°C/302°F degrees. It also occurs when trying to acquire the motor resistance with a temperature in the motor higher than 150°C/302°F degree (still with DIAG MOTOR TEMP to ON).	Check that the thermal sensor in the motor is working correctly. If it is, improve the cooling of the motor.
70	HIGH CURRENT	This alarm occurs if the circuit to limit via hardware the current in the motor is either always active at key-on or repeatedly active when the motor is turning.	Check that the motor is suited to work with the EPS-DC0 (not oversized). Otherwise, it is necessary to replace the controller.
71	POWER FAILURE #3	This alarm occurs when the current in the phase V of the motor is zero and the motor is commanded for moving.	Check that the power fuse is OK. Check that the battery positive arrives to the controller. Check the continuity of the wire in phase V of the motor. Otherwise, it is necessary to replace the controller.
72	POWER FAILURE #2	This alarm occurs when the current in the phase U of the motor is zero and the motor is commanded for moving.	Check that the power fuse is OK. Check the battery positive arrives to the controller. Check the continuity of the wire in phase U of the motor. Otherwise, it is necessary to replace the controller.
73	POWER FAILURE #1	This alarm occurs when the current in the phase W of the motor is zero and the motor is commanded for moving.	Check that the power fuse is OK. Check the battery positive arrives to the controller. Check the continuity of the wire in phase W of the motor. Otherwise it is necessary to replace the controller.

Steering Controller (Table 4-3)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
83	BAD ENCODER SIGN	It occurs in applications with toggle switches when the applied frequency (FREQUENCY) and motor speed (ENC SPEED) have opposite sign.	Swap in between two encoder channels (CNB#7 with CNB#8).
84	STEER SENSOR KO	This alarm occurs if the command potentiometer (CPOC1 on CNA#9 or CPOC2 on CNA#8) changes with a jerk larger than MAX SP SLOPE. This alarm is used to catch a discontinuity in the voltages of the command potentiometer.	Change the steer pot.
85	STEER HAZARD	This is just a warning to inform you that the steering controller is limiting the angle in the steering direction. No speed reduction occurs on the traction.	
218	CLOCK PAL NOT OK	The main uC sends an analog signal towards the slave uC to reset the slave uC on demand. When the slave uC detects the analog signal external to a window from 2.2 to 2.8 and not in the range to generate the reset on demand, the slave uC raises this alarm.	It is necessary to replace the controller.
99	INPUT ERROR #1	It occurs when the voltage on CNA#4 (NK1: Lower Potential Terminal of the Safety Contacts) is higher than 12 V before to turn the safety contacts closed.	When the safety contacts are open, the voltage on CNA#4 is expected to be close to 0 Vdc and this is independent from whether the safety contacts are connected to a plus battery or to a minus battery. In the first case (safety contacts connected to a plus battery), when the safety contacts are open, CNA#4 is connected to a minus battery through a load. Only a harness mistake may connect NK1 to a higher than 12 volt- age.
212	MICRO SLAVE #8	It occurs when the encoder counting of the main uC is not matched with the encoder counting the slave uC.	It is necessary to replace the controller.

Steering Controller (Table 4-3)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
219	STEPPER MOTOR MISM	This alarm occurs if the frequency and the amplitude of the voltages from the stepper motor lines are mismatched in between. In normal condition when the amplitude of the stepper motor lines increases, the frequency of the stepper motor lines must increase too.	It is necessary to replace the controller.
220	MOTOR LOCKED	This alarm occurs if the current in the steering motor stays close to the maximum current longer than 1 sec.	Search for a mechanical problem locking the motor. To help in the fault finding, set DEBUG OUTPUT to level 11.
221	MICRO SLAVE #4	It occurs in one or the following conditions: (Open loop application only) If the slave uC detects the stator voltage phasor rotates in the opposite direction with respect to the sign of the stepper motor speed. (Closed loop application only) If the slave uC detects the stator voltage phasor rotates in the opposite direction respect to the commanded position.	It is necessary to replace the controller.
222	FB POT LOCKED	In application with a feedback potentiometer, this alarm occurs if the feed- back potentiometer (CPOT on CNB#6) does not change (or changes in the opposite direction) its value even if commanded to change. In application with toggle switches with ENCODER CONTROL to off, this alarm occurs if the feedback encoder counting does not change its value even if commanded to change.	In application with the feedback potentiometer verify potentiometer is not mechanically loosened. Check that there is not a mechanical block of the steering wheel. Be sure the wiper has not reached its own electrical limit because of too much angle of the steering wheel. Besides, this alarm may occur at the installation when the motor rotates in the wrong direction, turning away from the desired direction.
223	JERKING FB POT	This alarm occurs if the feedback potentiometer (CPOT on CNB#6) changes with a jerk larger than 0.3V in 16 msec. This alarm is used to catch a discontinuity in the voltages of the feedback potentiometer.	Change the feedback potentiometer.

Steering Controller (Table 4-3)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
225	CURRENT GAIN	This alarm occurs when the parameter to compensate for the gain of the current amplifiers (ADJUSTMENT #03 and ADJUSTMENT #04) have the default values.	It is necessary to send the controller back to Blue Giant to perform the maximum current regulation.
226	NO SYNC	Every 16msec, inside the code cycle, the main uC rises and then lowers an input for the slave uC (SYNC). When the slave uC detects no edge for more than 100 msec on this input, this alarm occurs. This is just a watch dog function: When the main uC does not execute the code cycle it does not update the SYNC signal and the slave uC cuts off the steering and traction.	It is necessary to replace the controller.
227	SLAVE COM. ERROR	Main uC and Slave uC communicate via a local serial interface. This alarm occurs when the main uC does not receive the communication from the slave uC through this serial interface.	It is necessary to replace the controller.
237	WAITING DATA	This warning occurs only if CAN BUS is PRESENT. At key-on the EPS-AC0 asks the traction controller to send a list of parameters via CAN BUS. From the request until the parameters are correctly received, this warning occurs. The steering is not activated yet, and the safety relays remain open when this warning is present.	
228	POSITION ERROR	This alarm occurs for an error in the redundant test of the feed- back sensors.	Check the potentiometer connected to CNB#6 is working correctly. If toggle switches are connected to CNA#2 and CNA#3, verify they are working correctly and the setting AUX FUNCTION 11 is correct. Verify that sensor bearing in the motor (encoder) has not slipped (the sensor bearing has two rings: one is connected to the rotor shaft; the other is connected to the motor frame. Check these two rings are securely connected to their structure without slippage.

Steering Controller (Table 4-3)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
238	EPS NOT ALIGNED	This is a real alarm that cuts off traction. It occurs at the initial alignment if the straight-ahead condition is not matched within 6 sec. Throughout the 6 sec delay, steering is not activated, the safety relays are open, and the traction is stopped.	
239	WAITING FOR TRAC	At key-on the EPS-AC0 needs an assent from the traction controller to close the safety contacts and to turn on the operational mode. Until this happens, this warning occurs. The steering is not activated, and the safety relays remain open when this warning is present.	
241	ENCODER ERROR	It occurs when ENCODER CONTROL is set ON and the real frequency does not pursuit the commanded frequency.	This condition is several times due to either a mismatching between the Encoder resolution used in the SW and the real encoder resolution, or a wrong connection between the two encoder channels. In this case, exchange the connections.
242	Q LINE SENSOR KO	This alarm occurs when the mean voltage of the Quadrature line of the stepper motor (connection CNA#8) is not null: the voltage on every stepper motor line is a sine wave with null mean voltage.	Check the continuity of the stepper motor connections. The resistance between CNA#8 and the negative battery (with the stepper motor at rest) is expected to be very low (close to 30 ohms).
243	D LINE SENSOR KO	This alarm occurs when the mean voltage of the Direct line of the step- per motor (connection CNA#9) is not null: the voltage on every stepper motor line is a sine wave with null mean voltage.	Check the continuity of the stepper motor connections. The resistance between CNA#9 and the negative battery (with the stepper motor at rest) is expected to be very low (close to 30 ohms).
245	DATAACQUISITION	This alarm occurs when acquiring the motor resistance or when adjusting the parameters to compensate for the gain of the current amplifiers (maxi- mum current factory adjusted).	Recycle the key.

Steering Controller (Table 4-3)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
244	GAIN EEPROM KO	The parameters to compensate for the gain of the current amplifiers (ADJUSTMENT #03 and ADJUSTMENT #04 are recorded in a not volatile memory (EEPROM)) with redundant handling. In fact, every adjustment is recorded in three EEPROM locations. If the values in these three locations are different, this alarm occurs.	It is necessary to send the controller to Zapi to execute the maximum current regulation.
246	MICRO SLAVE KO	In stepper motor application, this alarm occurs if the main uC is detecting a direction of the stepper motor not matched with the one that the slave uC is detecting. In a closed loop application, this alarm occurs if the main uC is detecting a direction of the steering error not matched with the one that the slave uC is detecting. Furthermore, this alarm occurs if the main uC is detecting no steering limitation meanwhile the slave uC is detecting a steering limitation.	It is necessary to replace the controller.
247	CAN BUS KO	This alarm occurs only when the setting CAN BUS is PRESENT. Then the EPS-AC0 must receive the event messages from the traction controller. If these messages lack more than about 1 sec, this alarm occurs.	Check the CAN Bus communication system and analyze the frames from the traction controller to the steer controllers.
248	S.P OUT OF RANGE	This alarm occurs for a fault on the command potentiometer (CPOC2on CNA#8). When a single command pot is chosen, the alarm occurs if the wiper (CPOC1) exits the range from 0.8 Vdc to 4.2 Vdc. When the twin pot is chosen, the alarm occurs if the sum of the two wiper voltages (CPOC1 + CPOC2) exists the range from 4.5 Vdc to 5.5 Vdc.	Check the connections of the potentiometer. This alarm occurs when one connection of the command potentiometer is broken.

Steering Controller (Table 4-3)- continued

ERROR MESSAGE		POSSIBLE CAUSE	FAULT ELIMINATION
CODE	ERROR TEXT		
249	F.B OUT OF RANGE	This alarm occurs for a fault on the feedback potentiometer (CPOT on CNB#6). This alarm occurs in CPOT exits the range from 0.3 Vdc to 4.7 Vdc.	Check the connections of the feedback potentiometer. This alarm occurs when one connection of the feedback potentiometer is broken.
250	MICRO SLAVE	It occurs when the information on the status bus between the main uC and the slave uC is frozen to the OFF value (the slave uC does not update the status bus configuration).	It is necessary to replace the controller.
251	KM OPEN	This alarm occurs if the slave uC detects the safety contact, of the main uC, open when expecting that it is closed.	It is necessary to replace the controller.
252	KS OPEN	This alarm occurs if the slave uC detects the safety contact, of the main uC, open when expecting that it is closed.	It is necessary to replace the controller.
253	KM CLOSED	This alarm occurs at key-on if the slave uC detects the safety contact, of the main uC, closed prior to being commanded.	This alarm occurs if the connection CNA#5 (K1) is around a volt- age of 12 Vdc when switching on the key. In fact, when the safety contacts are open, K1 is expected to be plus battery volt- age (not 12 V). Search for a harness problem or replace the controller.
254	KS CLOSED	This alarm occurs if the main uC detects the safety contact, of the slave uC, closed prior to being commanded.	This alarm occurs if the connection CNA#4 (NK1) is around a voltage of 12 Vdc when switching on the key. In fact, when the safety contacts are open, NK1 is expected to have a minus battery voltage (not 12 V). Search for a harness problem or replace the controller.



Hoisting or Lifting the Truck

- When an order picker is to be lifted, the lifting gear must only be secured to the points specially provided for this purpose.
- When using a jack to raise the order picker, take appropriate measures to prevent it from slipping or tipping over (e.g. wedges, wooden blocks).



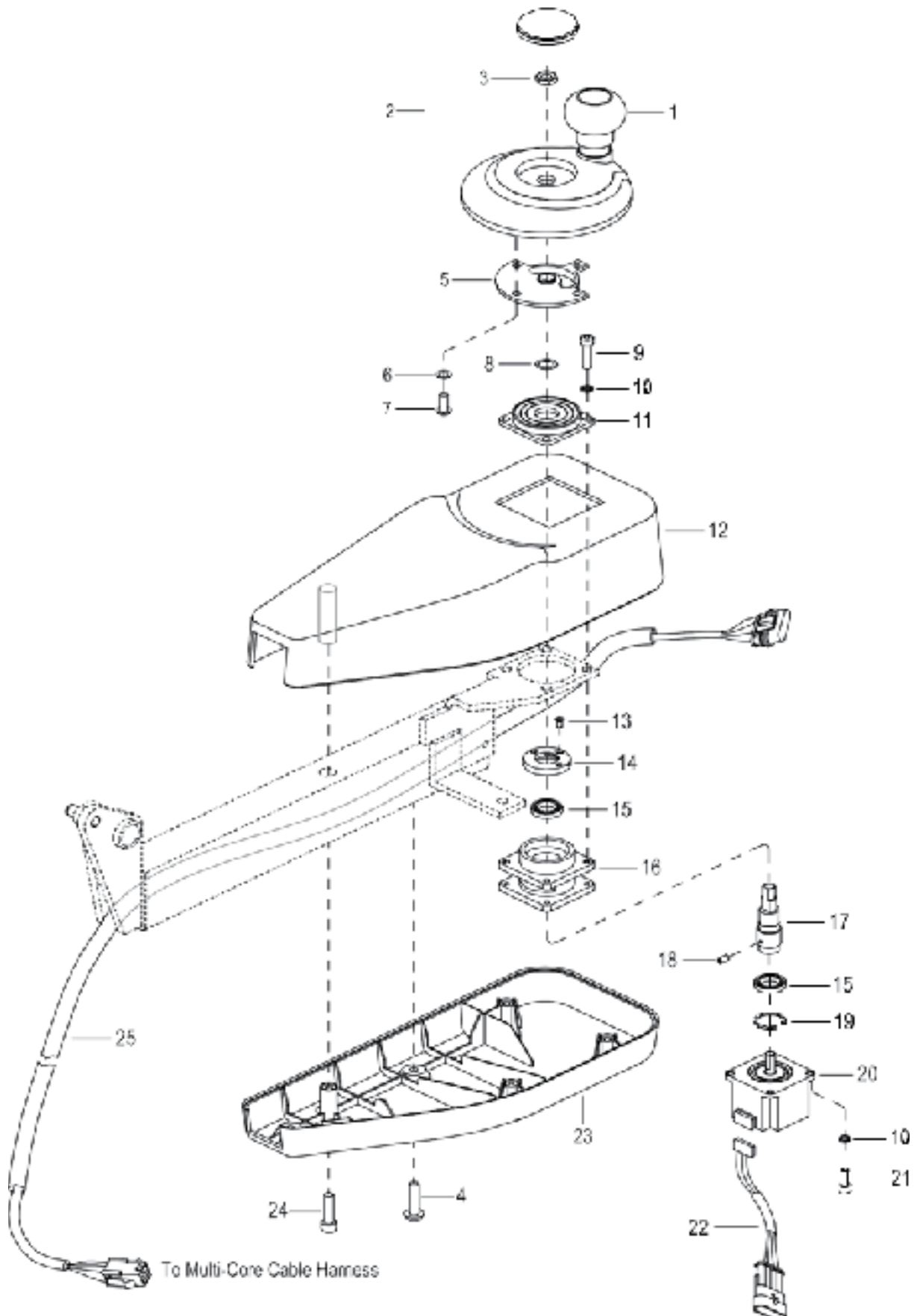
DANGER

- Personnel must not stand below or near the truck when the stacker is being lifted.
- Do not hoist/lift the truck by the control arm.
- Only use lifting gear with sufficient capacity (Weight lifted = net weight + battery weight; see truck nameplate).
- Never walk under or near a forklift when it is being lifted.
- Working under a raised forklift that is not sufficiently supported is risking serious injury or death.

5. Steering System

5-1. Steering Control Removal

1. Engage the emergency stop switch and turn off the key switch.
2. Remove four screws (24, Figure 5-1) and two screws (4). Separate lower cover (23) and upper cover (12).
3. Disconnect harness (22) from harness (25) and potentiometer (20).
4. Remove button plug, nut (3), lock washer, handle (2) and shims (8).
5. Remove four screws (7), four lock washers (6) and bracket (5) from handle (2).
6. Remove four screws (9), four lock washers (10) and damper (11).
7. Remove potentiometer (20) from control arm.
8. Remove screw (13), nut (14) and upper bearing (15).
9. Remove four screws (21), four lock washers (10) and remove potentiometer (20) from bearing block (16).
10. Loosen screw (18) and remove shaft (17) from potentiometer (20).
11. Remove snap ring (19) and lower bearing (15) from shaft (17).



5-1.1. Steering Control Installation

1. Install lower bearing (15, Figure 5-1) and snap ring (19) on shaft (17).
2. Install shaft (17) on potentiometer (20) and secure with screw (18).
3. Position potentiometer (20) on bearing block (16) and secure with four screws (21), and four lock washers (10).
4. Install upper bearing (15), nut (14) and screw (13).
5. Position potentiometer (20) on control arm.
6. Install damper (11) and secure with four screws (9) and four lock washers (10).
7. Install bracket (5) on handle (2) and secure with four screws (7) and four lock washers (6).
8. Install shims (8) and handle (2), engaging bracket (5) with damper (11).
9. Secure handle (2) with nut (3) and lock washer (4) and install the button plug.
10. Reconnect harness (22) to harness (25) and potentiometer (20).
11. Install lower cover (23) and upper cover (12) and secure with four screws (24) and two screws (26).
12. Disengage the emergency stop switch and turn on the key switch.

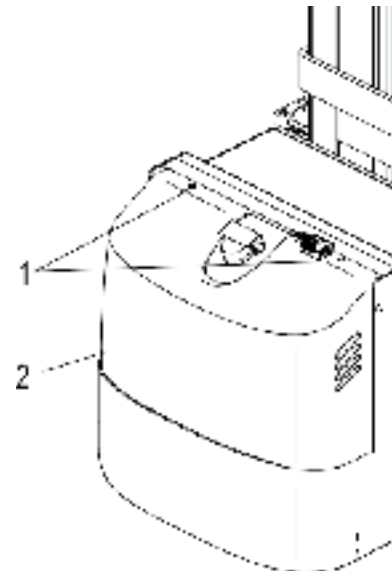
5-2. Compartment Cover

5-2.1. Cover Removal

1. Engage the emergency stop switch and turn off the key switch.
2. Remove two screws (1, Figure 5-2).
3. Carefully lift cover (2) up and off the truck.

5-2.1. Cover Installation

1. Carefully position cover (2, Figure 5-2) on the truck.
2. Install two screws (1).
3. Disengage the emergency stop switch and turn on the key switch.

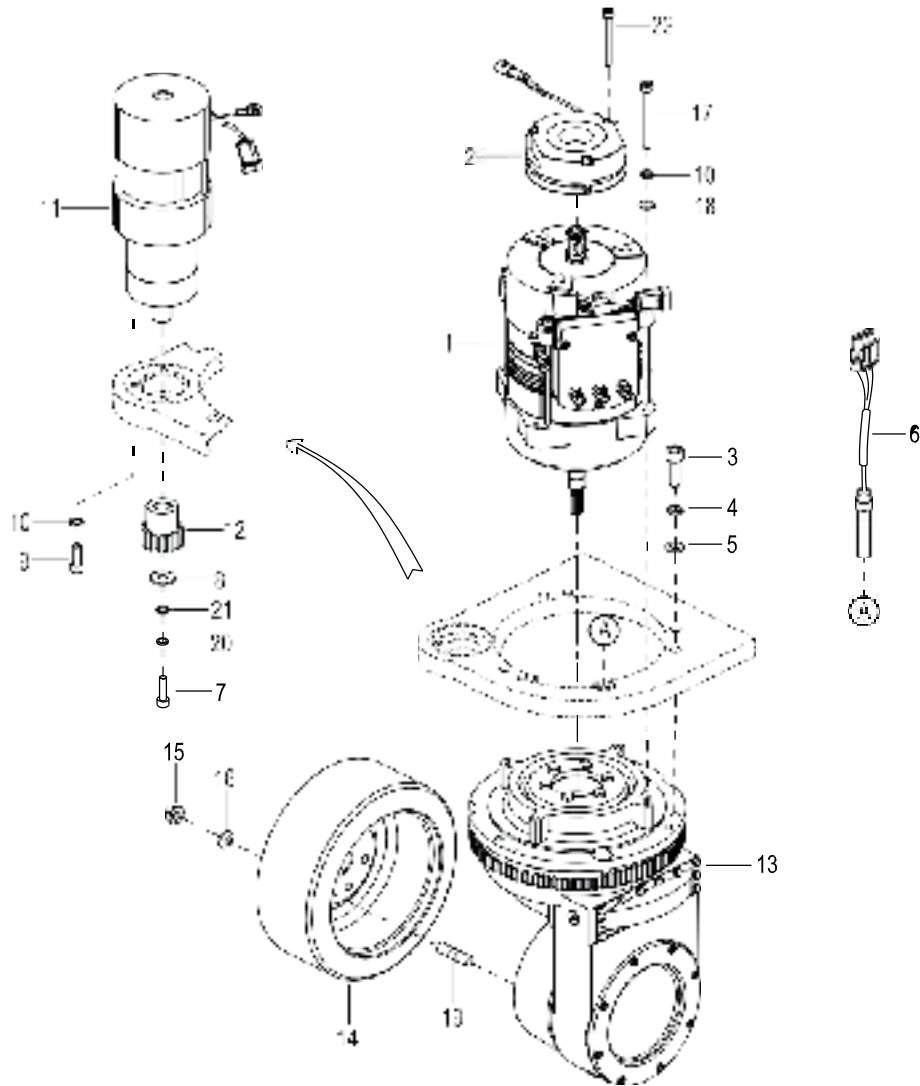


Compartment Cover (Figure 5-2)

5-3. Steering Motor

5.3.1. Motor Removal

1. Engage the emergency stop switch and turn off the key switch.
2. Remove the compartment cover.
3. Disconnect harness (1, Figure 10-3) and cables (6, 7 and 8, Figure 10-4) from the steering motor.
4. Remove the gear on the bottom of the motor first.
5. Remove three screws (9, Figure 5-3) from under the truck.
6. Remove the steering motor from the top of the truck.



Drive System (Figure 5-3)

5-3.2. Motor Installation

1. Position the steering motor (11, Figure 5-3) in the top of the motor compartment.
2. Secure the motor with three screws (9, Figure 5-3) from under the truck.
3. Connect harness (Figure 10-3) and cables (Figure 10-4) from the steering motor.
4. Install the compartment cover.
5. Disengage the emergency stop switch and turn on the key switch.

6. Brake Servicing

The brake system consists of a drive motor mounted brake. This brake is spring applied and electrically released.

6-1.1. Measurement

The "air gap" is the distance between the magnet body and the rotor plate with the brake applied. As the brake pads and rotor wear normally, the air gap will increase and should be replaced when it measures more than 0.25mm.

6-1.2. Stopping Distance Adjustment

The stopping distance of the truck should not require adjustment. However, this distance should be checked during each planned maintenance inspection.

Using an unloaded truck, run truck to its top speed on an even dry concrete surface. Move control handle into the lower braking position. Measure length of braking path from the actuation point of the brakes until the truck has stopped.

6-1.1. Brake Assembly Replacement

1. Engage the emergency stop switch and turn off the key switch.
2. Block the load wheels.
3. Remove the compartment covers.
4. Disconnect electric brake from main harness (1, Figure 10-3).
5. Remove the three mounting screws (22, Figure 5-3) and the brake (2).
6. Place the new brake into position and secure with the three mounting screws.
7. Tighten the three mounting screws to 52 in lb. (6 Nm)
8. Reconnect the brake to main harness.
9. Remove blocks and check operation.
10. Disengage the emergency stop switch and turn on the key switch.

7. Drive System

7-1. Drive Wheel

1. Engage the emergency stop switch and turn off the key switch.
2. Lift the truck to gain access to the drive wheel; then securely block the trucks to prevent movement.
3. Remove five nuts (15, Figure 5-3), five washers (16) and drive wheel (14) from transmission (13).
4. Install new drive wheel in reverse order of removal.
5. Disengage the emergency stop switch (6, Figure 2-3) and turn on key switch (8).

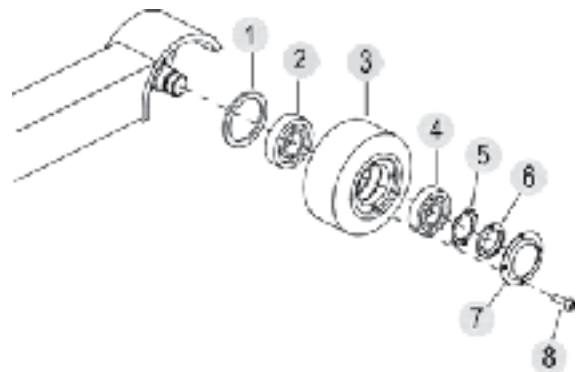
7-2. Transmission

1. Engage the emergency stop switch and turn off the key switch.
2. Remove the compartment covers as described in the cover removal paragraph.
3. Remove the brake (2, Figure 5-3) as described in brake assembly replacement paragraph.
4. Disconnect harness from drive motor (1, Figure 5-3).
5. Remove six screws (3), six lock washers (4), flat washers (5) and motor (1) from transmission (13).
6. Disconnect position switch (36) from harness (1, Figure 10-3).
7. Remove position switch from the frame.
8. Support the transmission (13, Figure 5-3) and remove the six screws (17), six lock washers (18) and six flat washers (10).
9. Slowly lower the transmission out the bottom of the frame.
10. Install new transmission by reversing the steps above.

7-3. Load Wheel

7-3.1. Removal

1. Engage the emergency stop switch (6, Figure 2-3) and turn off the key switch (8).
2. Block the drive wheel to prevent the truck from rolling.
3. Lift the truck to raise the load wheels off the floor. Securely block the truck in the raised position by positioning supports under both fork tips.
4. Remove four screws (8, Figure 7-1) and cover (7).
5. Remove nut (6), washer (5) and load wheel (3).
6. Remove seal (1) from load wheel (3).
7. Remove bearings (2 and 4) from load wheel (3).
8. Inspect bearings (2 and 4) and replace if necessary.



Load Wheel (Figure 7-1)

7-3.2. Load Wheel Installation

1. Pack bearings (2 and 4, Figure 7-1) with grease.
2. Reassemble bearings (2 and 4) in wheel (3).
3. Position load wheel (3) in the axle and install washer (5) and nut (6). Tighten nut (6) until there is a slight drag on load wheel (3). Secure nut (6) with tab on washer (5).
4. Install cover (7) and secure with four screws (8).
5. Remove the blocking from under the truck and lower it to the ground.
6. Disengage the emergency stop switch (6, Figure 2-3) and turn on key switch (8).

8. Elevation System Servicing

The elevation system includes the outer mast, inner mast, lift linkage, lift chains, lift cylinder and ram head.

8-1. Lift Chain Length Adjustment

1. Fully lower the lift carriage.
2. Engage the emergency stop switch and turn off the key switch.



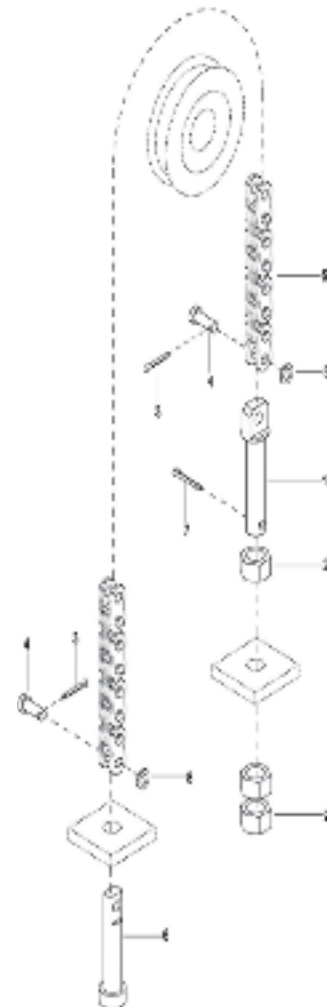
WARNING: Before attempting any adjustment, make certain power is disconnected.

3. Loosen both upper jam nuts (2, Figure 8-1) to allow for adjustment of middle jam nuts (2).
4. Break both lower jam nuts (2) free from the middle jam nuts.
5. Take up slack in both lift chains with middle jam nuts (2). Strive for equal tension on both chains.
6. Align anchor (1) so the clevis pins (4) are parallel to the masts.



CAUTION: At least 3 full threads must be present below lower nut (2) after adjustment.

7. Tighten jam nuts securely while maintaining alignment of clevis pins (4).
8. Disengage the emergency stop switch and turn on the key switch.
9. Test chain by operating carriage. If slack is still apparent, repeat the above procedure.



Lifting Chain Assembly 1 (Figure 8-1)

8-2. Lift Chain Wear Inspection

Both lift chains should be replaced when either chain is worn enough to increase its length by 3% or more. To make this determination proceed as follows.

Using a section of chain that sees the most frequent operation over the chain sheaves, isolate a vertical portion under tension from the weight of carriage and forks.

Measure the distance between pin centers on 20 vertical links. If the section measures 12.88" or more, the chain should be replaced.

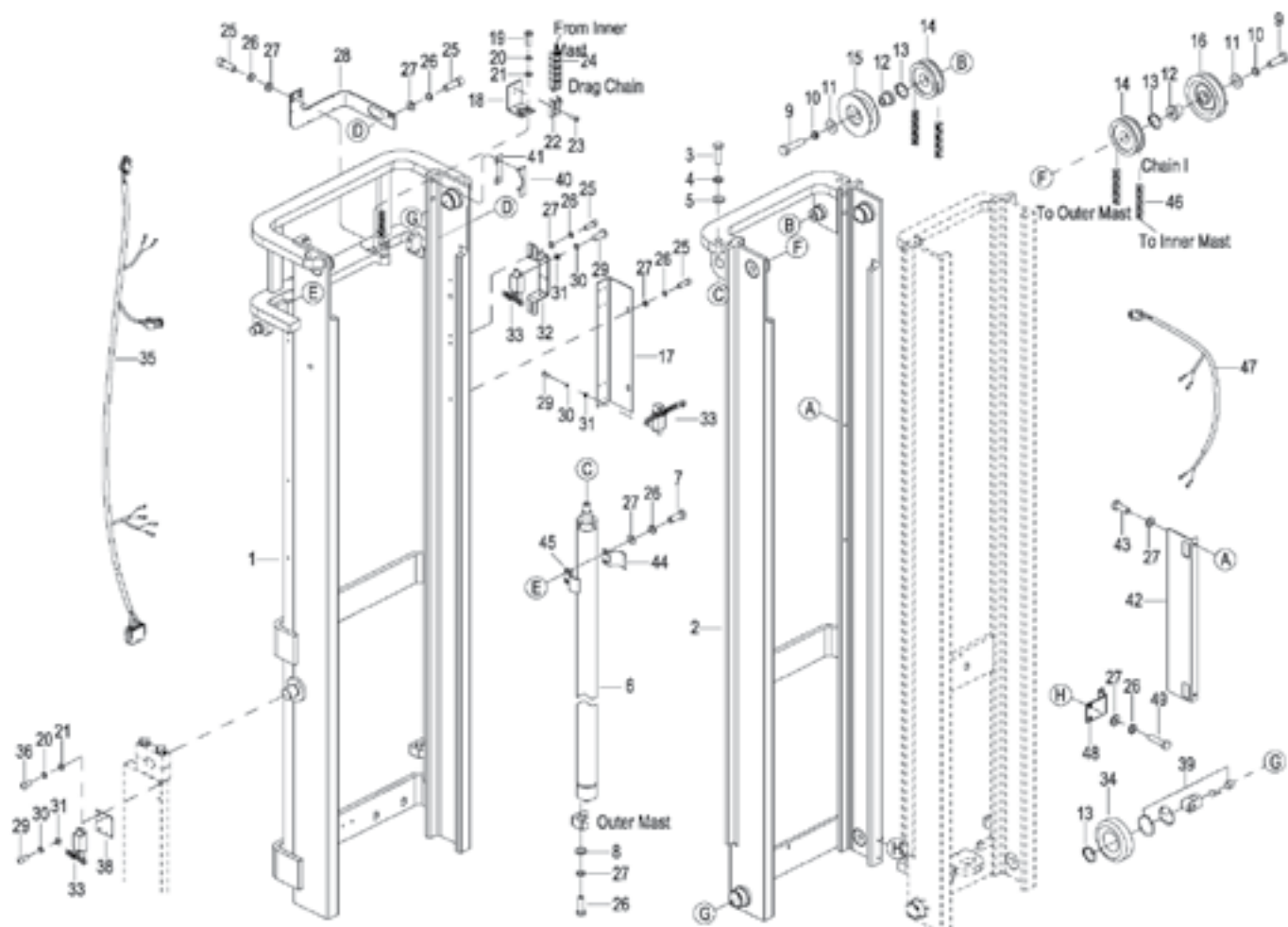
New chain anchor, clevis pins and cotter pins should be installed when chains are replaced. Never replace a partial section of chain and never repair chain.



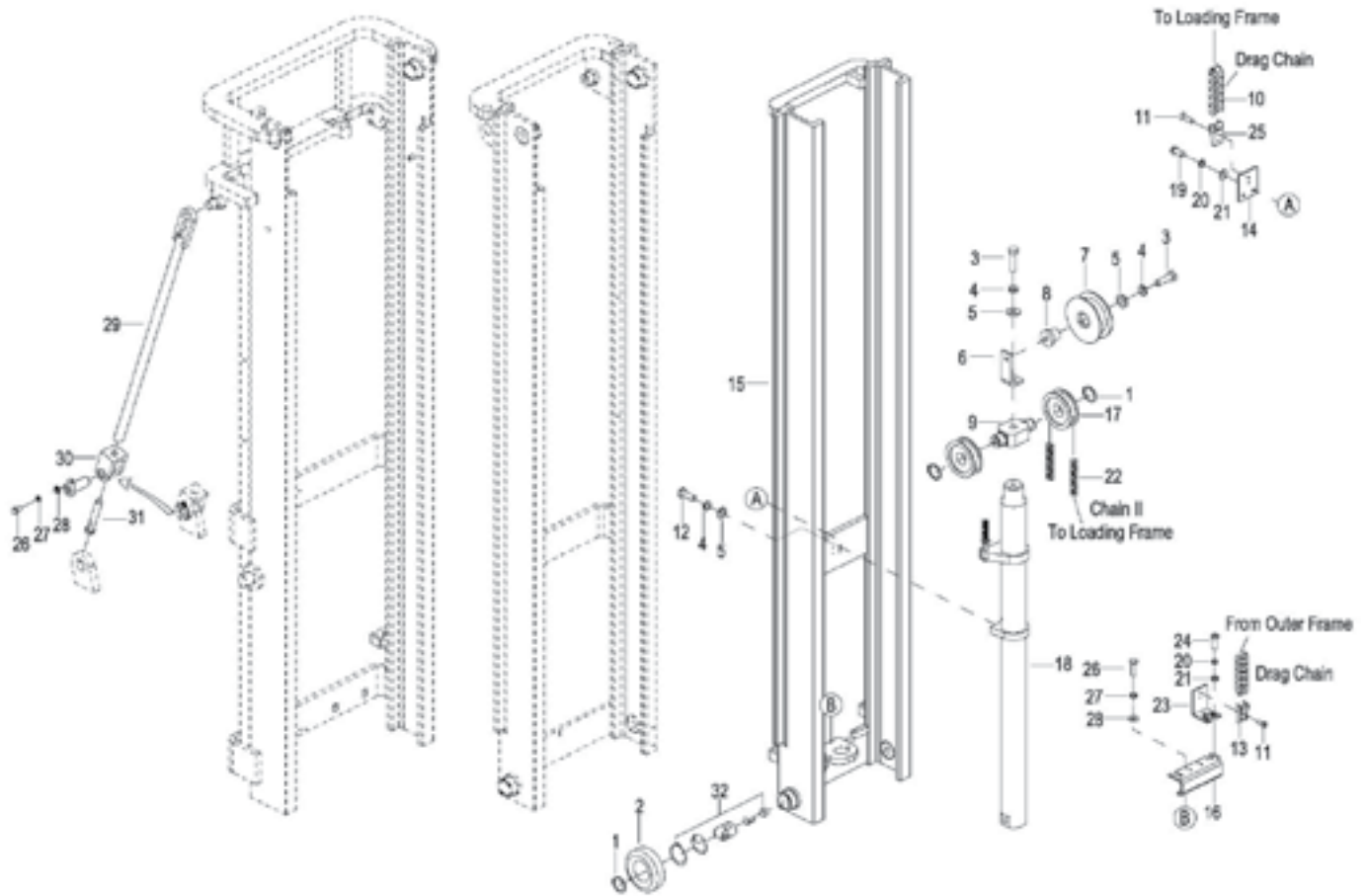
WARNING: Before attempting any adjustment, ensure power is disconnected.

8-3. Lift Chain Replacement

1. With the lift truck wheels secured, raise the platform approximately three feet from floor and position blocks or strong supports under the platform.
2. Lower platform onto the support and check that it is secure before proceeding.
3. Engage the emergency stop switch and turn off the key switch.
4. Remove cotter pin (3, Figure 8-1) and clevis pin (4) connecting chain (5) to chain anchor (6) at the inner mast.
5. Remove cotter pin (3) and clevis pin (4) connecting chain (5) to chain anchor (1) at the outer mast.
6. Remove chain from sheave (14, Figure 8-2).
7. Position new chain on sheave (14).
8. Secure new chain to new chain anchor (1, Figure 8-1) at the outer mast with new clevis pin (4) and new cotter pin (3).
9. Connect the opposite end of the new chain to the new chain anchor (6) at the inner mast with a new clevis pin (4) and new cotter pin (3).
10. Adjust the chains according to paragraph 8-1.
11. Disengage the emergency stop switch and turn on the key switch.



Mast (Platform) (Figure 8-3)



Mast (Platform) (Figure 8-4)

9. Hydraulic System

9-1. Lines and Fittings



WARNING: When platform and forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered, and the batteries disconnected before performing any maintenance on the hydraulic system.



NOTE: Leaking hydraulic fittings may be remedied by simply tightening fittings. If this does not remedy the leak, the fittings or line must be replaced.

1. Lower forks fully.
2. Engage the emergency stop switch and turn off the key switch.
3. Remove the compartment covers as described in paragraph 5-2.



CAUTION: Hydraulic oil can damage parts. Wipe off any oil immediately. Provide a container under the line or fitting before disconnecting.

4. Refer to Figure 9-1 and remove leaking line or fitting and replace it with a new line or fitting.
5. Check the level of hydraulic oil. With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening.
6. Disengage the emergency stop switch and turn on the key switch.
7. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
8. Check the level of hydraulic oil. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in the lubrication section.
9. Install the compartment covers.

9-2. Hydraulic Pump, Motor and Reservoir Assembly

The hydraulic pump/motor assembly can be disassembled and repaired. However, a defective pump, valve or motor requires replacement of that component.



WARNING: When forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered, and the batteries disconnected before performing any maintenance on the hydraulic system.

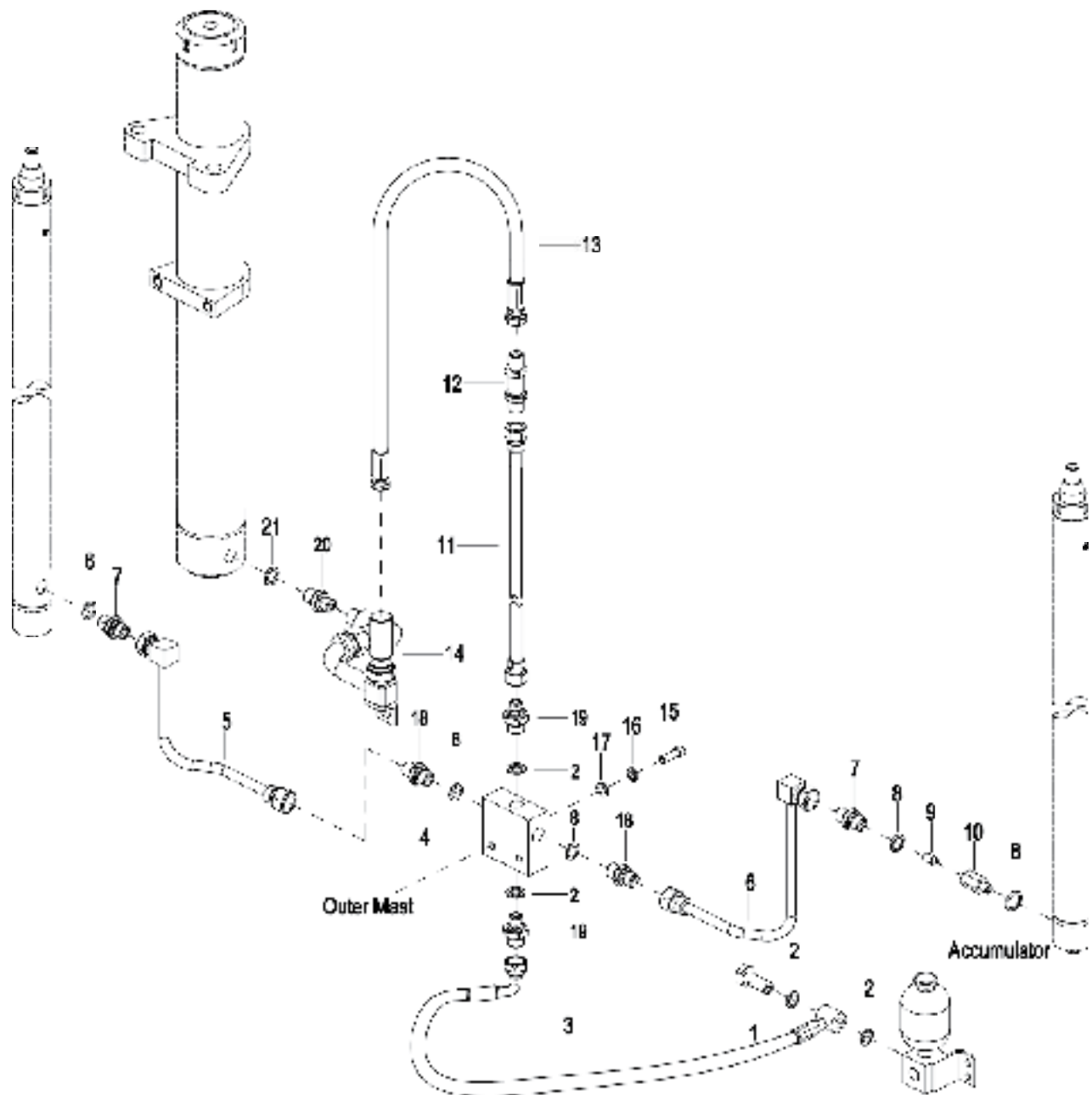
9-2.1. Removal

1. Lower forks fully.
2. Engage the emergency stop switch and turn off key switch.
3. Remove the compartment covers.

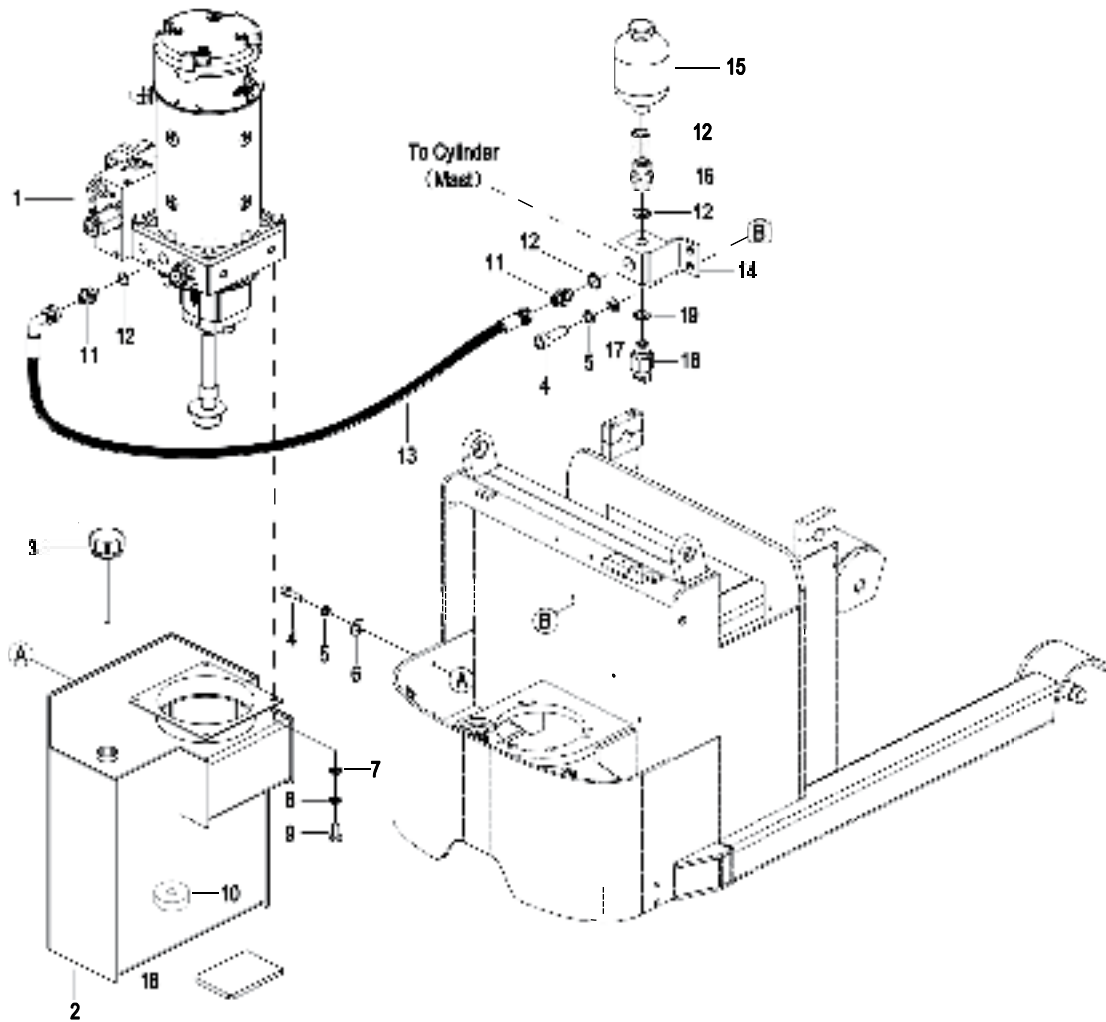


NOTE: The reservoir and hose will be filled with hydraulic oil. Place a container under the pump assembly to catch any hydraulic oil.

4. Label and disconnect electrical leads from motor and solenoid. Refer to Figure 10-3 and Figure 10-4.
5. Disconnect the hose (13, Figure 9-2) from pump and motor assembly.
6. While supporting the pump and motor assembly (1, Figure 9-2), remove four bolts (9), four lock washers (8) and four flat washers (7).
7. Remove the pump and motor assembly (1).
8. Unscrew screw (4) lock washers (5) and four flat washers (6) and remove the reservoir (2).



Hydraulic System (Tubes) (Figure 9-1)



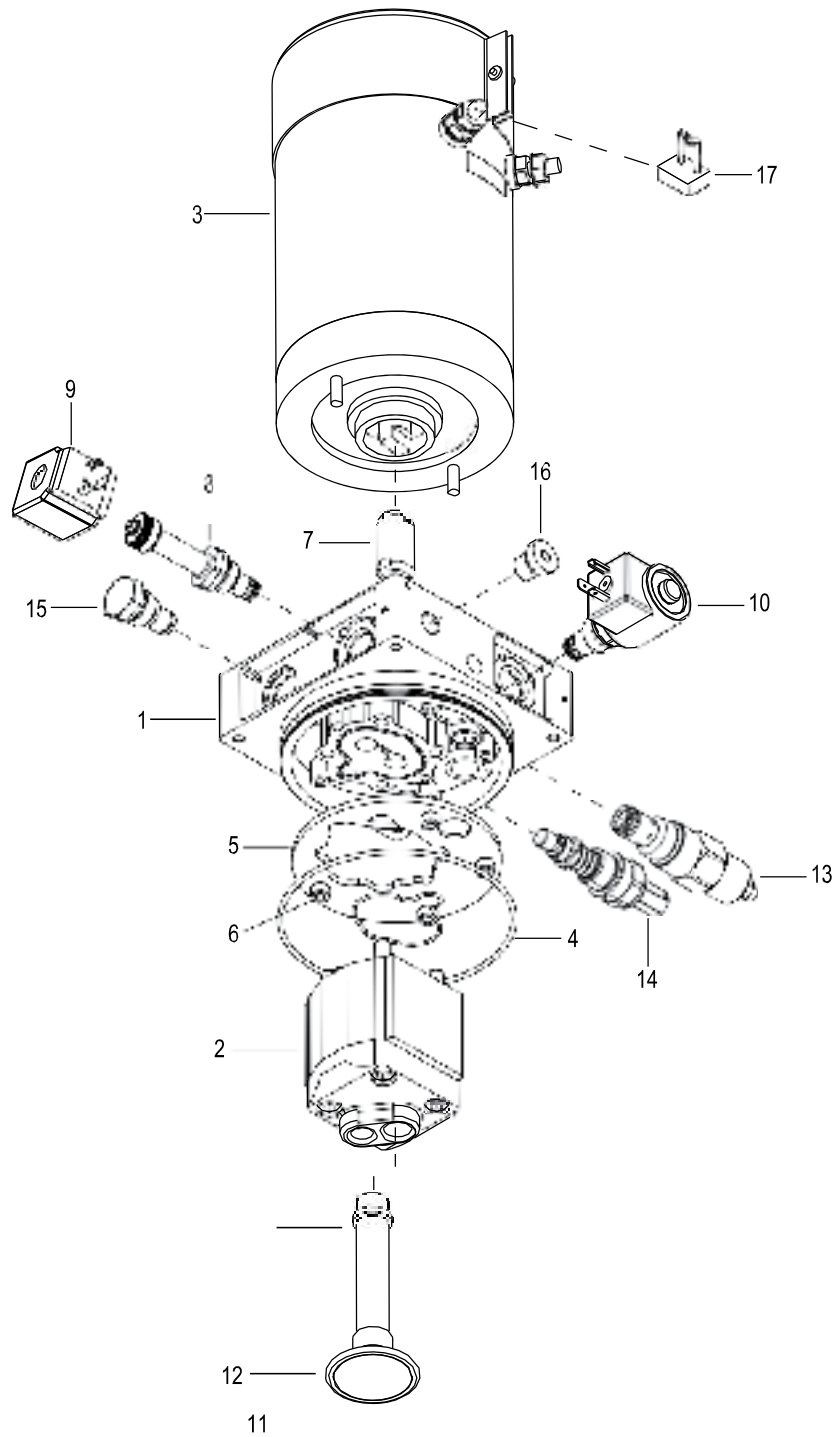
Hydraulic System (Figure 9-2)

9-2.2. Disassembly and Reassembly

Remove the hydraulic pump and motor assembly as described in paragraph 9-2.1, refer to Figure 9-3.

9-2.3. Installation

1. Install the reservoir to frame and fix with the screw (4), washers(8) and flat washers (6).
2. While supporting the pump and motor assembly (1, Figure 9-2), secure with four bolts (9), four lock washers (8) and four flat washers (7).
3. Reconnect hoses (13, Figure 9-2) to pump & motor assembly.
4. Connect electrical leads to motor and solenoid. Refer to Figure 10-3 and Figure 10-4.
5. Fill the hydraulic reservoir. Use hydraulic oil listed in Table 3-2.
6. Disengage the emergency stop switch and turn on the key switch.
7. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
8. Check the level of hydraulic oil. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in Table 3-2.
9. Install the compartment cover.



Pump and Motor Assembly (Figure 9-3)

9-3. Lift Cylinder

9-3.1. Removal

1. With the wheels securely blocked, raise the platform approximately three feet from the floor and position blocks or strong supports under the platform.
2. Lower platform onto the support. Check that the arrangement is secure before proceeding.
3. Engage the emergency stop switch and turn off the key switch.

WARNING: Before attempting any replacement, make certain power is disconnected.



CAUTION: Hydraulic oil can damage parts. Wipe off any oil immediately. Provide a container under the line or fitting before disconnecting.

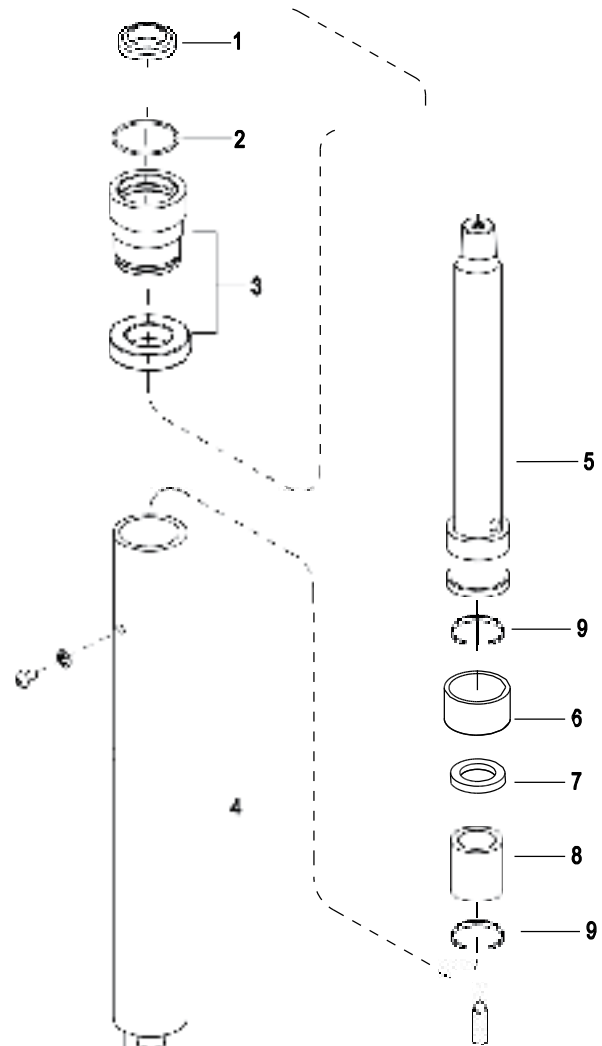


4. Loosen the tube connector (10, 18 Figure 9-1) at the bottom of lift cylinder, disconnect the tube from the bottom of lift cylinder.
5. Unscrew the mounting bolt (26, Figure 8-3), lock washer (27) and flat washer (8) from the bottom of the cylinder.
6. Unscrew the bolt (3), lock washer (4) and flat washer (5) from the top of lift cylinder.

WARNING: Support lift cylinder before performing the following steps to prevent cylinder from falling.



7. Support cylinder (6, Figure 8-3) and remove two bolts (7), two lock washers (26), two flat washers (27) and hoops (44 & 45).
8. Tilt lift cylinder (6) forward from their position in the lift truck.
9. Raise lift cylinder assembly up and out of truck.



Lift Cylinder (Figure 9-4)

9-3.2. Repair

CAUTION: To prevent damage, use proper pipe clamp vise. The cylinder will be distorted if the vise is tightened too much.



1. Secure the lift cylinder in a vise, clamping lightly at the base of the cylinder.
2. Remove gland nut (3, Figure 9-4).
3. Remove the dust ring (1) and O-ring (2) from gland nut (3).
4. Pull out piston rod (5) from the cylinder tube (4).
5. Remove guide ring (6), seal (7), cushion collar (8) and baffle ring (9) from piston rod (5).
6. Coat all parts with hydraulic oil (Table 3-2).
7. Install guide ring (6), new seal (7), cushion collar (8) and baffle ring (9) on piston rod (1).
8. Insert piston rod (5) in cylinder tube (4).
9. Install new dust ring (1) and new O-ring (2) on gland nut (3).
10. Install gland nut (3) in cylinder tube (4).

9-3.3. Installation

1. Position the cylinder on the frame and secure with two screws, two lock washers and two flat washers.
2. Reconnect the tube to the bottom of the cylinder.
3. Position ram head on cylinder and secure with bracket, screw, lock washer and flat washer.
4. Lift the lift chains and position them on sheaves.
5. Adjust the chains according to paragraph 8-2.
6. Disengage the emergency stop switch (6, Figure 2-3) and turn on the key switch (8).
7. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
8. Check the level of hydraulic oil. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in Table 3-2.
9. Install the compartment covers.

9-4 Full Free Lift Cylinder

9-4.1. Removal

1. With the lift truck wheels securely blocked, raise the platform approximately three feet from floor and position blocks or strong supports under the platform.
2. Lower platform onto the support. Check that the arrangement is secure before proceeding.
3. Engage the emergency stop switch and turn off the key switch.



WARNING: Before attempting any replacement, ensure power is disconnected.



CAUTION: Hydraulic oil can damage parts. Wipe off any oil immediately. Provide a container under the line or fitting before disconnecting.

4. Loosen the tube connector (20 Figure 9-1) at the bottom of lift cylinder, Disconnect the tube (13) from the bottom of lift cylinder.
5. Unscrew the mounting bolt (3, Figure 8-3), lock washer (4) and flat washer (5) from the top of the cylinder, remove the Fixed Angle (6) with roller (7).
6. Unscrew the bolt (3), lock washer (4) and flat washer (5) from the top of lift cylinder.
7. Remove the full free cylinder chain (22) according to [Section 8-5](#).



WARNING: Support lift cylinder before performing the following steps to prevent cylinder from falling.

8. Knock out the circlip (1), roller (17) and roller bracket (9).
9. Support cylinder (18, Figure 8-3) and remove two bolts (12), two lock washers (4), two flat, two washers (5).
10. Raise lift cylinder assembly up and out of truck.

9-4.2. Repair



CAUTION: To prevent damage, use proper pipe clamp vise. The cylinder will be distorted if the vise is tightened too much.

1. Secure the lift cylinder in a vise, clamping lightly at the base of the cylinder.
2. Remove gland nut (3, Figure 9-5).
3. Remove the dust ring (1) and O-ring (2) from gland nut (3).
4. Pull out piston rod (5) from the cylinder tube (4).
5. Remove the piston (8) from the piston rod (5).
6. Remove guide ring (6), seal (7), and baffle ring (9) from piston rod (5).
7. Coat all parts with hydraulic oil (Table 3-2).
8. Install guide ring (6), new seal (7), piston (8) and baffle ring (9) on piston rod (1).
9. Insert piston rod (5) in cylinder tube (4).
10. Install new dust ring (1) and new O-ring (2) on gland nut (3).
11. Install gland nut (3) in cylinder tube (4).

9-4.3. Installation

1. Install the lift cylinder according to the reverse order of removal.
3. Adjust the chains according to paragraph 8-1.
4. Disengage the emergency stop switch and turn on the key switch.
5. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
6. Check the level of hydraulic oil. If required, add hydraulic oil to bring to proper level.
7. Install the compartment covers.

10. Electrical Components

10-1. Electrical Control Panel

10-1.1. Electrical Control Panel Maintenance

i **NOTE:** Erratic operation of the truck may be caused by defective controller components. Before removing the electrical panel, perform troubleshooting procedures, to determine corrective action to be taken.

There are no user-serviceable parts inside the controller. No attempt should be made to open the controller. Opening the controller may damage it and will void the warranty.

The controller is programmed at the factory specifically for the truck model on which it is equipped. It is important to replace the controller with the correct preprogrammed unit to ensure proper performance settings intended for that truck. See Figure 10-2 for the preprogrammed controller number.

It is recommended that the controller exterior be cleaned periodically, and if a handheld programmer is available, this periodic cleaning provides a good opportunity to check the controller's diagnostic history file. It is also recommended that the controller's fault detection circuitry be checked whenever the truck is serviced.

10-1.2. Cleaning

1. Engage the emergency stop switch and turn off key switch.
2. Remove the compartment covers.
3. Remove any dirt or corrosion from the bus bar area. The controller should be wiped clean. Allow it to dry before reconnecting the battery.
4. Make sure the connections to the bus bars are tight. Use two well insulated wrenches for this task to avoid steering the buss bars.

10-1.3. Panel Removal

1. Engage the emergency stop switch and turn off the key switch.
2. Remove the compartment covers.
3. Tag and disconnect all electrical cables which connect to the control panel (4, Figure 10-1).
4. Remove four screws (1), four lock washers (2), four flat washers (3) and control panel (4).

10-1.4. Panel Disassembly

Refer to Figure 10-2 for location and identity of the major replacement components mounted on the panel and remove defective parts.

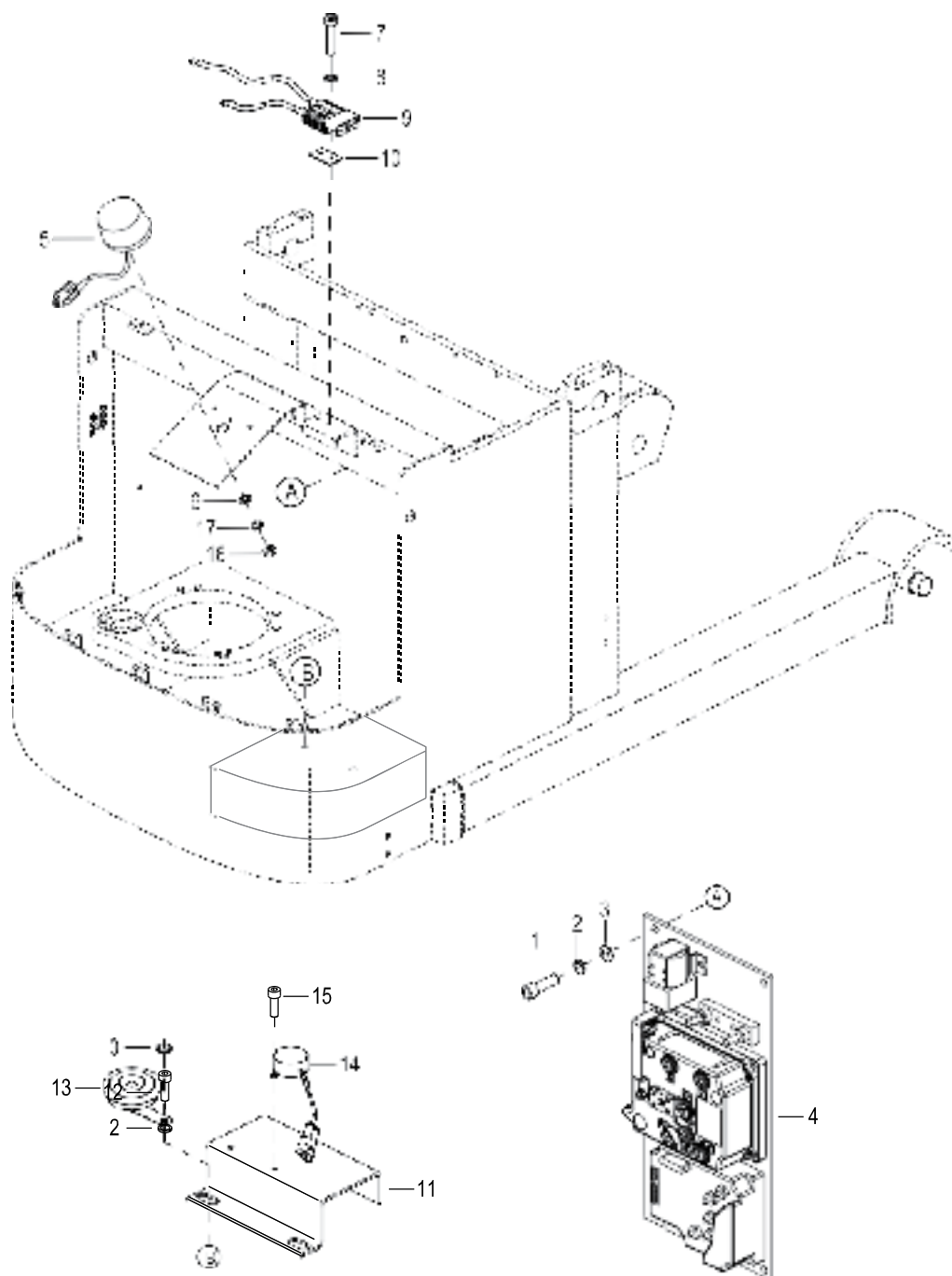
i **NOTE:** Contactor (2 or 4) is not repairable and must be replaced if defective.

10-1.5. Panel Installation

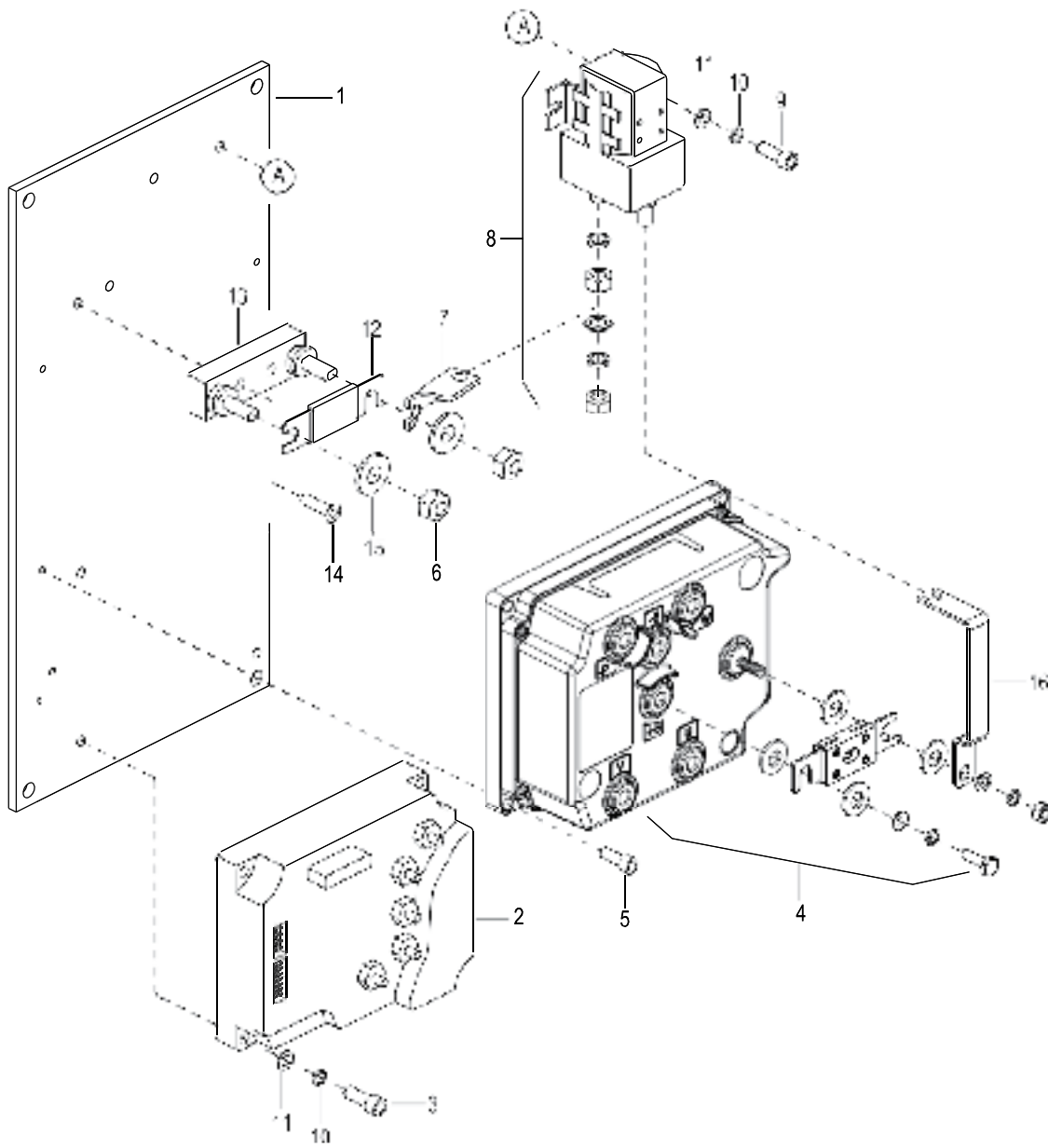
1. Install the control panel (4, Figure 10-1) and secure it with four screws (1), four lock washers (2) and four flat washers (3).
2. Refer to Figure 10-3 and Figure 10-4 and connect all electrical cables to the control panel as noted during removal.
3. Install the compartment covers.
4. Disengage the emergency stop switch and turn on the key switch.

10-2. Horn Replacement

1. Engage the emergency stop switch and turn off the key switch.
2. Remove the compartment covers.
3. Tag and disconnect all electrical connections from horn (13, Figure 10-1).
4. Remove screw (12), lock washer (2), flat washer (3) and horn (13).
5. Install new horn (13) and secure with screw (12), lock washer (2), flat washer (3).
6. Install the compartment covers.
7. Disengage the emergency stop switch and turn on the key switch.



Electrical System (Figure 10-1)



Electrical Panel (Figure 10-2)

10-3. Lowering Buzzer Replacement

1. Engage the emergency stop switch and turn off the key switch.
2. Remove the compartment covers.
3. Tag and disconnect all electrical connections from buzzer (14, Figure 10-1).
4. Remove screw (15) and buzzer (14).
5. Install new buzzer (14) and secure with screw (15).
6. Reconnect harness (1, Figure 10-3) to buzzer (14, Figure 10-1).
7. Install the compartment covers as described in paragraph 5-2.
8. Disengage the emergency stop switch and turn on the key switch.

10-4. Warning Light Replacement

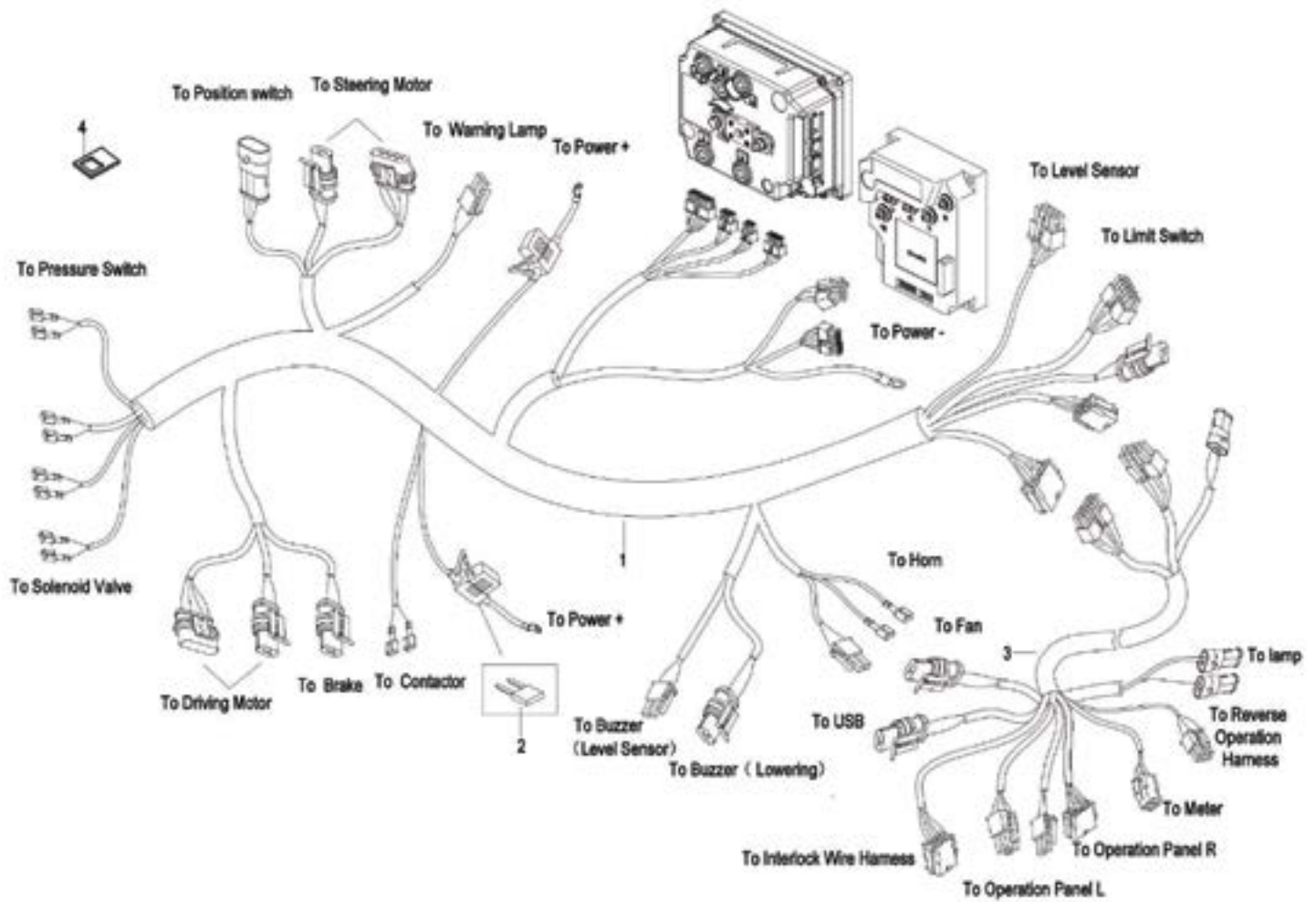
1. Engage the emergency stop switch and turn off the key switch.
2. Remove the compartment covers.
3. Tag and disconnect all electrical connections from light (5, Figure 10-1).
4. Remove two screws (6) and light (5).
5. Install new light (5) and secure with two screws (6). Reconnect harness (1, Figure 10-3) to light (5, Figure 10-1).
6. Install the compartment covers.
7. Disengage the emergency stop switch and turn on the key switch.

10-5. Platform Cable Replacement

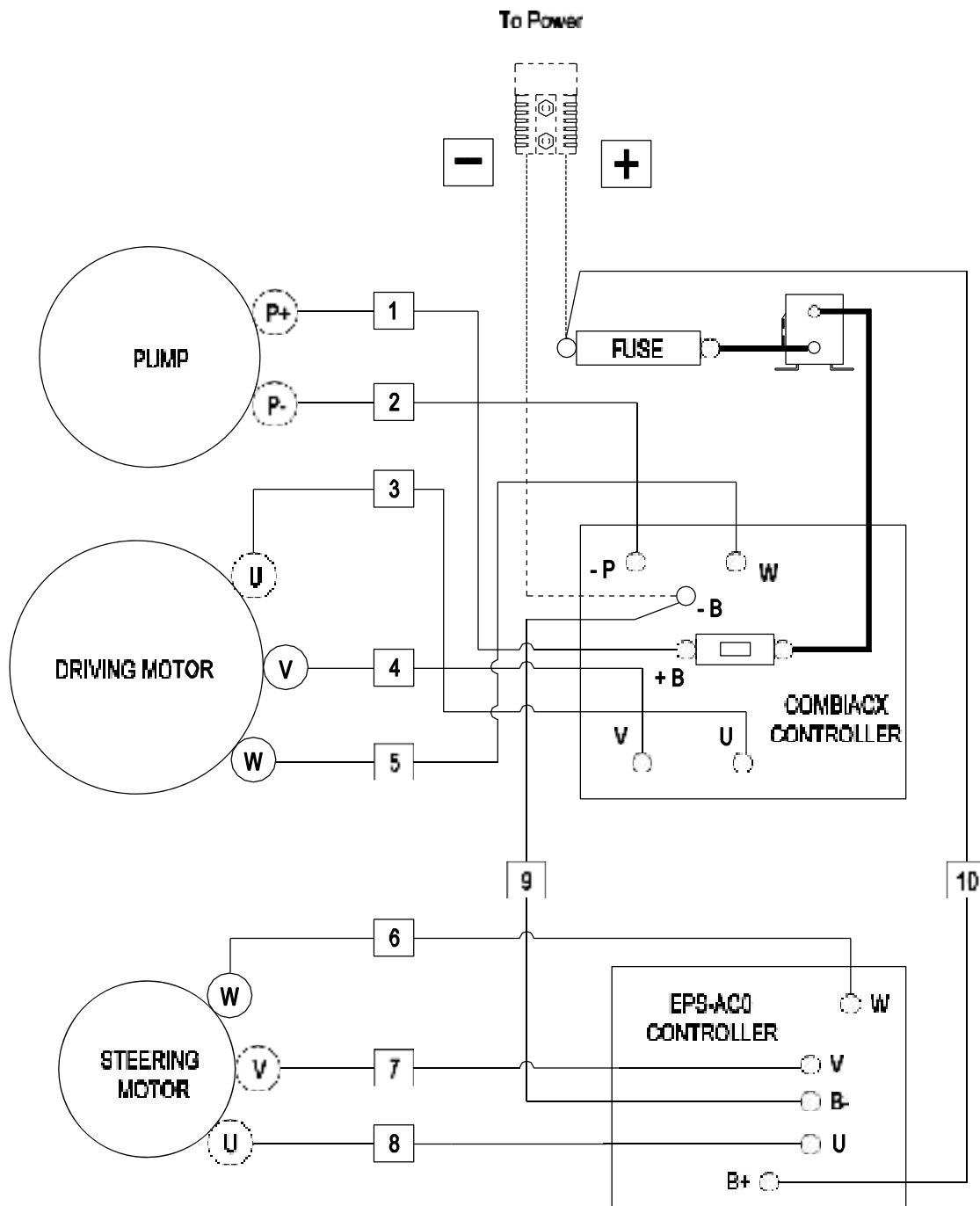
1. With the lift truck's wheels securely blocked, raise the platform approximately three feet and position blocks or strong supports under platform.
2. Lower platform onto the support and check that it is secure before proceeding.
3. Engage the emergency stop switch and turn off the key switch.
4. Remove the compartment covers.
5. Disconnect cable harness (3, Figure 10-3) from harness (1).
6. Disconnect cable harness (3, Figure 10-3) from switch wire harness (20, Figure 10-5).
7. Remove two screws (18, Figure 10-6) and disconnect mount (19) from bracket (20).
8. Disconnect protective chain from mount (19).
9. Remove two screws (23, Figure 8-2) and disconnect mount (22) from bracket (25).
10. Remove screw, lock washer, flat washer, and clamp.
11. Lift harness with protective chain (24) from sheave (15).
12. Remove harness from the protective chain.
13. Install new harness by reversing the steps above.

10-6. Operator Presence Switch

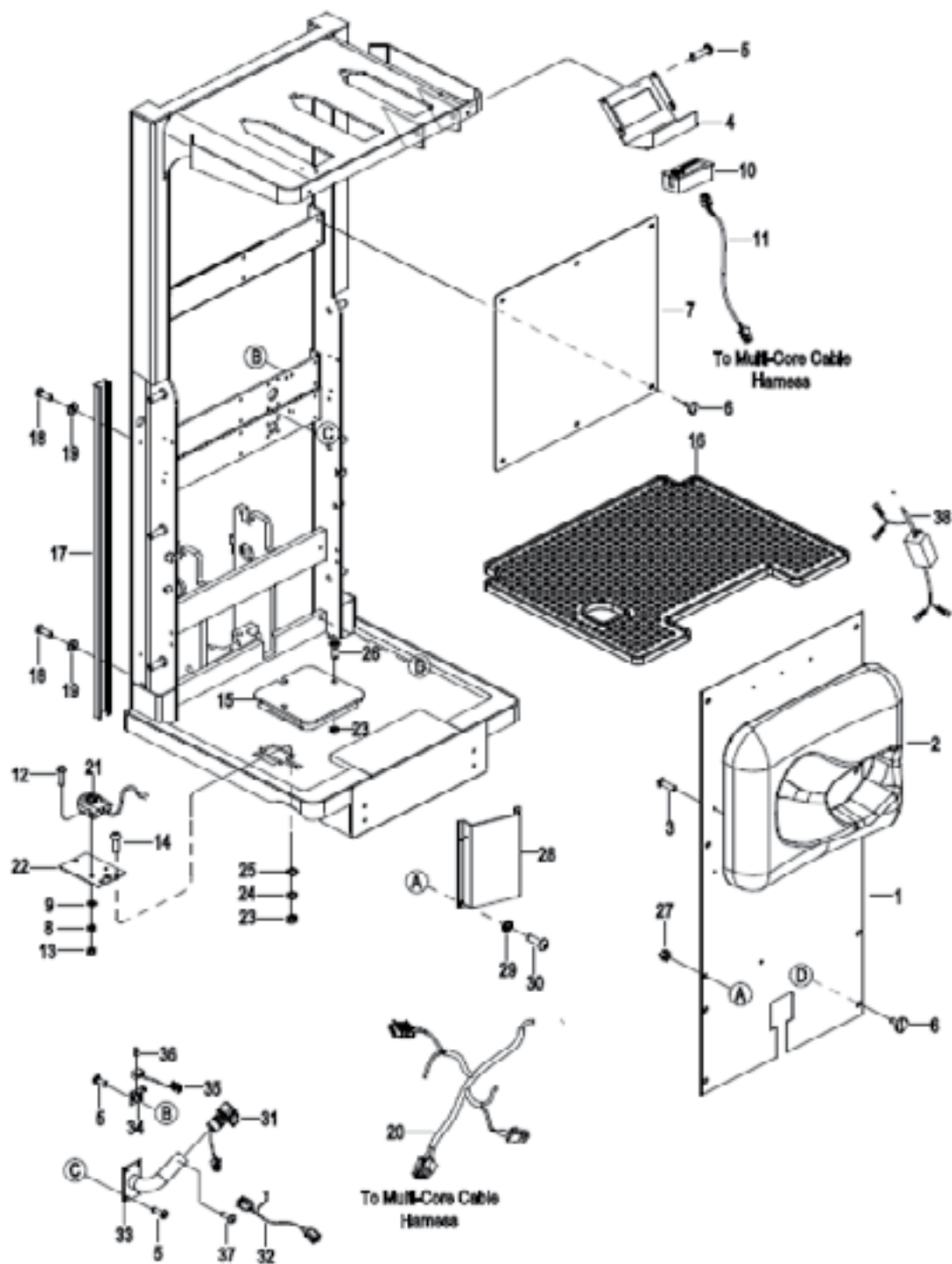
1. With the lift truck wheels securely blocked, raise the platform approximately three feet from floor and position blocks or strong supports under the platform.
2. Lower platform onto the support. Check that the arrangement is secure before proceeding.
3. Engage the emergency stop switch
and turn off the key switch.
4. Remove the plate (15, Figure 10-5) and disconnect switch wire harness (20, Figure 10-5) from the operator presence switch (21).
5. Remove three screws (14), three nuts (23), three lock washers (24), three flat washers (25) and bracket (22).
6. Remove two screws (12), two nuts (13), two lock washers (8), two flat washers (9) and the operators presence switch (21) from bracket (22).
7. Position the new operator presence switch (21) by reversing the steps above.



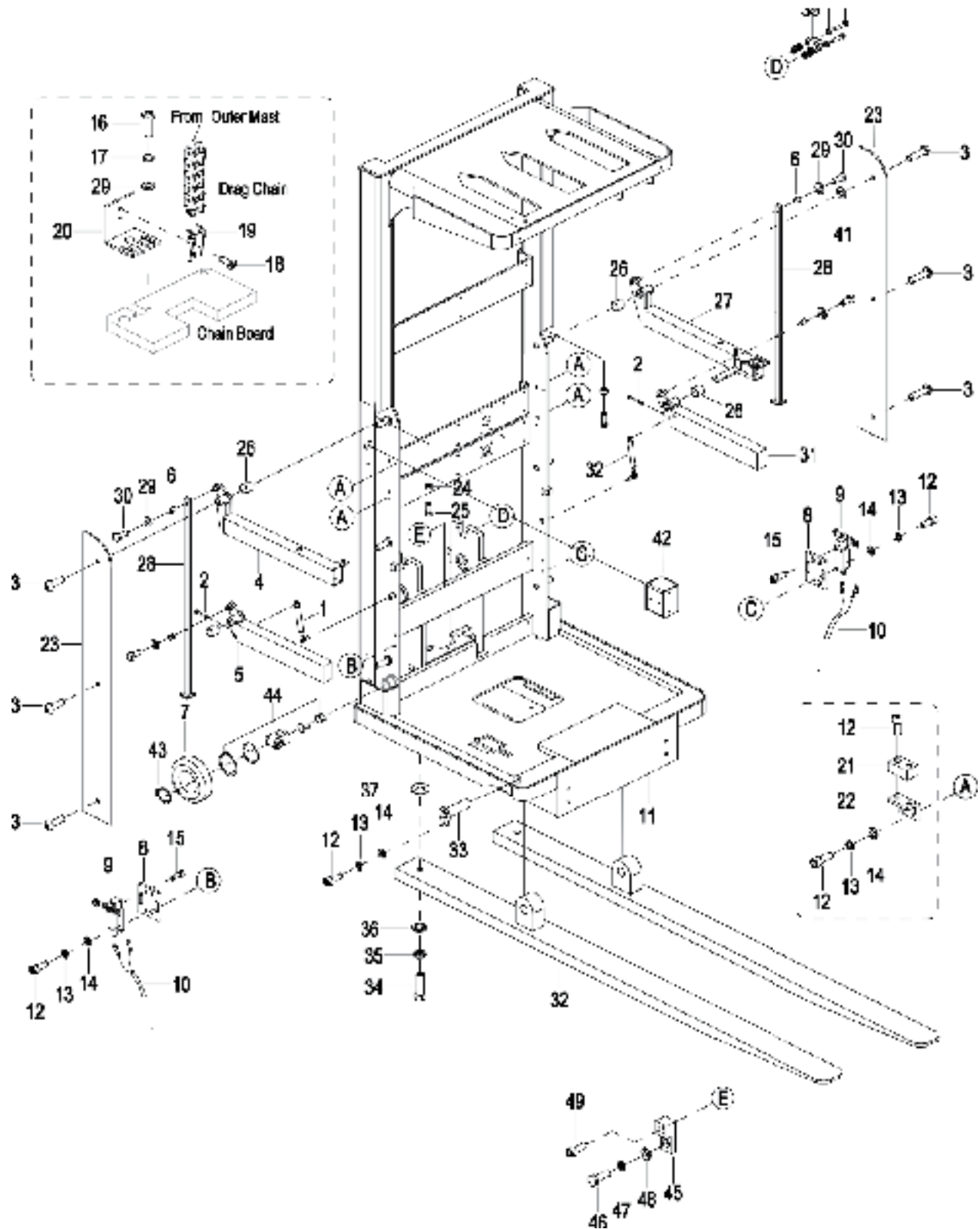
Wiring Harness (Figure 10-3)



Wiring Cables (Figure 10-4)



Platform Assembly (Figure10-5)



Platform Installation (Figure 10-6)

Introduction*

This manual is intended to provide information on correctly using the Li-ion battery and maximizing its productivity and longevity through preventive maintenance and safe operation. Operators should read through the manual before using the battery.

All the information, specifications, and illustrations in the manual are effective at time of print. The company maintains the right to modify the specification(s) or design(s) of the products at any time without prior notification.

Overview

Lithium-ion (Li-ion) batteries have many advantages over traditional lead acid and other types of batteries. Blue Giant's Li-ion batteries are classified as LFP 'Lithium Iron Phosphate' or LiFePO_4 . When stored, handled, and used properly, they also have a longer service life, a higher power density, don't need a cooling down period, and can be opportunity charged.

Blue Giant's priority is safety, and establishing the following safety procedures for storing, handling and use of these batteries will help prevent fires and explosions.

Companies training employees to recognize the hazards of Li-ion and other types of batteries as well as how to handle, store and manage them properly will help to avoid damage to the batteries resulting in possible fires and explosions.

This battery should not be used at a very low SOC (state of charge) status. To ensure the battery life, the operator should avoid the discharge depth of more than 80% of the rated capacity of the battery. Whether it is partially discharged or fully discharged, the battery should be immediately charged.

Lithium batteries have a special charger and may not be charged with other types of battery chargers.

NOTE: A new battery from the factory should be fully charged before its initial use.

*** Temperatures referenced in this manual are for standard trucks. For trucks equipped with the cold storage option, follow the temperature rating instructions specifically for those.**

Getting Started

The lithium-ion battery unit is composed of battery cells in series or in parallel. It is equipped with battery management system (BMS) for monitoring and protecting the lithium-ion battery. The truck's key switch can control power supply of the battery. The circular meter shows various data including SOC (State of Charge), error code, total voltage, and temperature.

Safety & Warnings

- Always wear personal protective equipment (PPE) (e.g., safety goggles and safety gloves) when working on cells and batteries.
- Abide by the operation manual.
- Check the battery for leakage and mechanical damage before use and charging.
 - **NOTE: STOP** using the battery if leaking or damaged and follow the recycling instructions found in section 8.3 in this manual. We recommend the battery be recycled within 3 days.
- Inspect easy exchange batteries daily. See Appendix A for detailed daily inspection instructions for the pallet truck easy exchange batteries. If new or replacement visual inspection reminder decals are needed, they can be ordered via PN 056747.



- Check charger connectors and bracket for contamination daily, clean the bracket with a dry cloth if needed.
- All operations related to the battery must be implemented under the instruction of professionals.
- Do NOT smoke near the battery because it may cause fire.
- Do NOT place the battery near open flame, sparks, or energized wires as fire or explosion may occur.
- Avoid short-circuiting the battery, as fire or explosion is likely to occur.
- Keep the battery away from all fire sources, heat sources, and flammable or explosive materials.
- Don't knock over the battery, drop the battery, or expose it to abusive vibration applications.
- Use lifting and delivery devices as specified. Prevent the battery cell, interface, and connection cable from being damaged by the lifting hook.
- If the internal battery components start to leak out, do not inhale the fumes. Always wear PPE when in close contact with the battery.
- Wash hands after working on a battery.
- Use only insulated tools.
- Make sure the truck is turned off before connecting the battery.

- The metal part of the battery cell is electrified, don't place any external object or tool on the battery cell.
- Do NOT place the battery on top of conductive objects.
- Do NOT trample on the battery to prevent it from fierce shaking.
- Protect the battery from solar or other forms of heat radiation.
- Do NOT physically alter the battery, strike, crush, compress, notch, dent or modify it in any way.
- Do NOT open the battery without Blue Giant's official authorization.
- Do NOT spray wash the battery with water.

Intended Use*

- Discharge/Operational application temperatures: 32° F - 104° F.
- Charging application temperatures: 41° F - 104° F.
- Humidity < 80%.
- The battery's maximum operation altitude is up to 6500ft (2000m).

CAUTION:

- A high-rate recharging operation below 0°C may lead to battery damage, so the recommended charging temperature range is 41° F - 104° F.
- The discharging temperature range can be used in more extreme temperature conditions as follows -4° F - 131° F however, this isn't the recommended range for optimal life which is identified above. Also, the truck may not be rated for those extreme conditions or extended durations in a cold operating environment as that is truck and option dependent.
 - If used at low temperatures -4° F - 32° F, battery discharge capacity will be smaller compared with one in normal temperature conditions.
 - A battery used between 104° F - 131° F will accelerate the aging of the internal material which may shorten the service life of the battery, so is not recommended.

Battery Management System

The battery is permanently monitored by the Battery Management System (BMS). This provides communication with the truck.

The BMS continually monitors items such as the cell temperature, voltage, and charge status of the cells. It also functions as a safety cut-off device in case of overcharging, overcurrent, or overheating.

*** Temperatures referenced in this manual are for standard trucks. For trucks equipped with the cold storage option, follow the temperature rating instructions specifically for those.**

Potential Hazards

Hazards are not anticipated if the equipment is used correctly. Do not use the equipment for anything other than its intended purpose.

The following hazards can arise in the event of improper use:

Physical Damage:

-

This can occur if a battery falls or is deformed through pressure or high impact (e.g., truck forks penetrate the battery housing).

Physical damage includes cracks, breakage, splinters, or holes in the battery housing. This type of damage may be caused by a short circuit inside the battery, which may result in harmful materials leaking, fire or battery explosion.

- Some physical damage may not show on the battery enclosure, but there may be damage to the internal cell pack, which could cause electrolyte leaking and short circuit. Always check for leakage before use and charging.

-

Short Circuits:

-

These may be caused by inadvertently creating a connection between the two battery terminals (e.g., battery immersed in water, battery leakage, contamination on the charger connector or battery connector).

Temperature Effects:

-

High temperatures caused by sunlight or being stored in warm locations (e.g., near ovens) can result in harmful material leakage and fire.

To avoid fire and leakage of harmful materials, a safe place for storing batteries must satisfy the following criteria:

- Do not store in places often frequented by personnel.
- Do not store in places where valuable objects (e.g., cars) are stored.
- Fire extinguishers must be available to put out any fires.
- Caution should be taken with fire or smoke detectors in the vicinity to ensure that an automatic fire detection system is only activated in the event of actual danger (e.g., naked flames).
- Small amounts of discharge from a single battery are not critical to the environment. Above-average natural ventilation is required in this case.
- No ventilation intake pipes should be in the vicinity, as discharged content could spread within a building.

-

Examples of where to store a non-functional battery:

- Covered area outdoors.

- Ventilated metal container.
- Covered box with pressure and smoke discharge option.

Fire Hazard

Physical damage, thermal effects, or incorrect storage in the event of a defect can result in fire. Please note that the battery materials can be flammable.

WARNING: Contact with combustion products can be hazardous. Fires produce combustion products. Combustion is a chemical process by which a flammable material combines with oxygen under heat and light (fire). The resulting combustion products can occur in the form of smoke, leaking fluids, escaping gases, debris, as well as decomposition products of certain chemicals. These combustion products are substances that enter the body through the respiratory tract and/or the skin and can cause serious health issues.

Avoid contact with combustion products and use personal protective equipment (PPE).

- Hydrogen fluoride (HF) Hydrofluoric acid = extremely corrosive
- Risk of toxic substances produced by pyrolysis
- Risk of highly flammable gas mixtures
- Other combustion products: Carbon monoxide & -dioxide, manganese, nickel, and cobalt oxides.

WARNING: If a lithium battery fire occurs, use a CO₂ (Class BC) or dry chemical (Class ABC) fire extinguisher. Lithium batteries do not have actual lithium metal so **DO NOT** use a Class D fire extinguisher.

Touch Voltage Hazard

Hazardous contact voltages only arise in the event of a technical or physical defect. The batteries are normally charged. There is still some residual voltage in a discharged battery. This must be considered a hazardous contact voltage.

Battery Storage*

Proper storage prevents damage to batteries and prolongs their life expectancy. Follow these battery storage tips:

- Store in dry, well-ventilated areas
- Store in temperatures between 32° F and 104°F
- Store away from direct sunlight and heat sources
- Keep terminals covered when the battery is not in use
- Prevent terminals from touching each other
- Store separately from other types of batteries
- Keep the battery charged and do not store it for an extended period with a low state of charge (SOC) < 20%. It is recommended to maintain a charge level of 50% or greater.
- For long-term storage, the Li battery must be recharged every 2-3 months regardless of the SOC level. If a battery is stored longer than six months without charging, the cell may be damaged due to over-discharge. This can cause the cell to bulge and break the battery enclosure.

IMPORTANT: Monitor battery condition daily when in use and storage.

*** Temperatures referenced in this manual are for standard trucks. For trucks equipped with the cold storage option, follow the temperature rating instructions specifically for those.**

Battery Handling

Improper handling can cause damage to batteries, which may lead to overheating, fires, or explosions. Here are some tips for proper Li-ion battery handling:

- Remove batteries from devices that will not be used for an extended time.
- Keep batteries away from electromagnetic sources.
- Keep batteries intact.
- Keep batteries and charger in a clean location, do not expose battery or charger to water or other type of contaminations.
- Clean charger bracket and connector/pin with dry cloth if needed, since foreign material and contamination may accumulate in the bracket.
- DO NOT use batteries that show any signs of damage, they must be isolated.
- DO NOT modify the battery in any way.

WARNING: Damaged Li-ion batteries have the potential to leak electrolytes, so it's important to wear proper personal protective equipment (PPE) (goggles, gloves, apron, etc.) during handling.

Performance Data

Battery Nominal Data

Battery Cell

1	Cell material	LFP
---	---------------	-----

Battery System

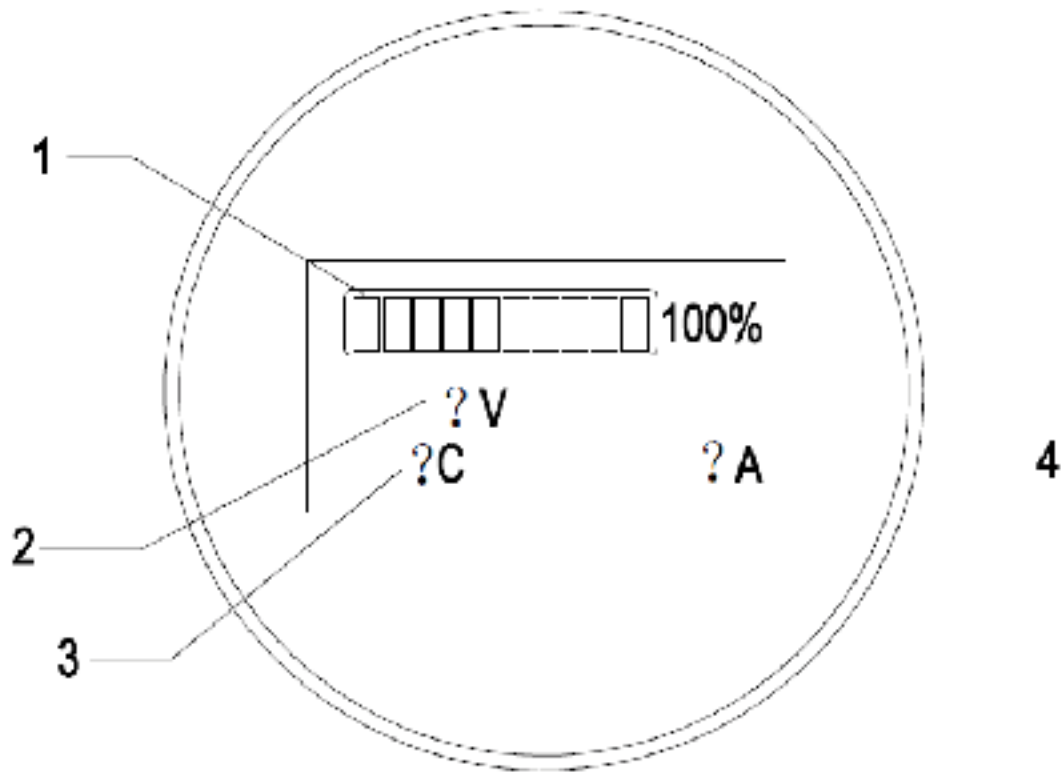
2	Burst mode	Parallel Circuit or Series Circuit
3	Ambient relative humidity	≤80%RH
4	Operational application temperature	32-104°F

BMS Nominal Data

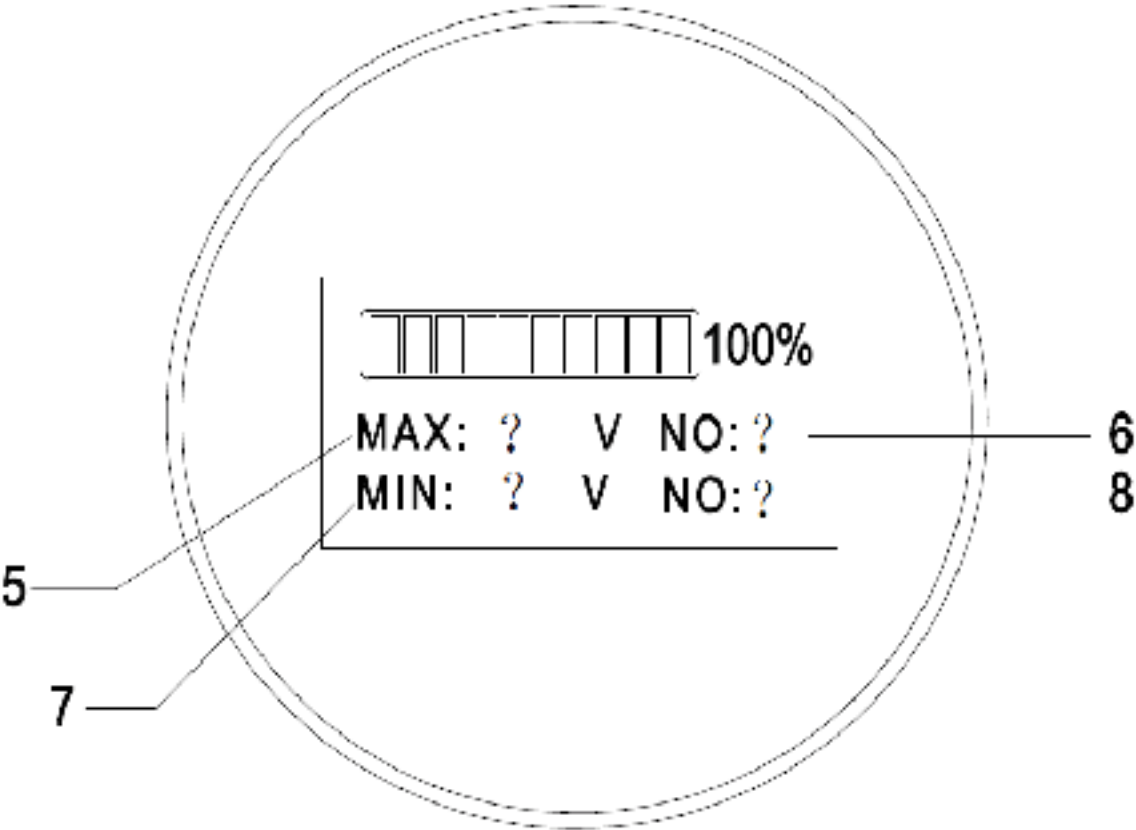
Battery Management System Function

No	Item	Function	Description
1	Inspection / Estimates	Monomer voltage detection	Accurate acquisition of all cell voltage data
2		Total voltage detection	Accurate acquisition of total voltage data
3		Temperature collecting	Accurate detection of battery temperature
4		Current inspection	Accurate detection of charge-discharge currents
5		SOC Estimate	Hall sensor is used to obtain the input and output current of the battery, and the SOC estimation of the battery is carried out by the method of ampere time integration
6	Communication Function	CAN communication	Communication and debugging
7	Protection Function	Short-circuit protection	Power circuit short circuit, contactor disconnect
8		Over current protection	Over-current occurs, contactor disconnect
9		Overcharging protection	Overcharge occurs, contactor disconnect
10		Over discharging protection	Over discharge occurs, contactor disconnect
11		Over temperature protection	Over temperature occurs, contactor disconnect
12	Sleep Wake	Sleep awakening function	Charge communication wake-up, Battery switch button wake-up

Battery Indicator



No	Name	Description
1	Energy Display	When the first cell and the second flash alternately, battery is low and must be charged. The battery remaining charge is displayed; “100%” indicates that the battery is fully charged.
2	Total Voltage	The sum of the total voltages of the lithium battery series
3	Temperature	Battery temperature
4	Charging Current	Current value when charging the lithium battery



No	Name	Description
5	Maximum Cell Voltage	Maximum value of cell voltage
6	Number of Cell	Identification number of the cell with maximum voltage
7	Minimum Cell Voltage	Minimum value of cell voltage
8	Cell Number of Minimum Cell Voltage	Identification number of the cell with minimum voltage

Transportation

Before transporting any lithium-ion battery, check the current regulations on the transport of dangerous goods. Comply with these when preparing the packaging and transport. Train authorized staff to dispatch lithium-ion batteries.

NOTE:

It is recommended that the original packaging is kept for any subsequent dispatch.

A lithium-ion battery is a special product.

Special precautions should be taken when:

- Transporting a truck equipped with a lithium-ion battery
- Transporting only the lithium battery

A class 9 danger label must be affixed to the packaging for transport.

Handling differs if the battery is transported on its own or in a truck. An example of a label appears in this supplement (see figure below). Refer to the latest current regulations before dispatch as the information might have changed since this manual was written.

Special documents must be sent with the battery. Refer to the applicable standards or regulations.

For UN3480	Lithium-ion Batteries	
For UN3481	Lithium-ion Batteries packed with Equipment or Lithium batteries built into Equipment	

Service

Lithium-ion batteries typically require no maintenance. If needed, only a certified technician should perform any service or maintenance.

Blue Giant recommends following the maintenance schedule below. Record all battery service, maintenance, and inspections to maximize the service life of your battery and lift truck.

No.	Maintenance Content	Method of Operation	Notes	Frequency
1	Check if battery capacity is too low	Check instrumentation SOC display	Make sure the battery is not stored without charge for a long period. If the battery system needs to be put on hold for a long period, keep the battery at a half power state and charge the battery every 3 months to ensure that the battery system remains in a half power state.	Everyday
2	The battery pack charge and discharge current	Check instrumentation display	Make sure battery pack charge and discharge current meet the operation manual requirements.	Everyday
3	Check connector pins at the bottom of the battery (if present)	Perform a visual inspection	If any ablation or deformation is found, replace the battery connector pins.	Everyday
4	Check if appearance is deformed, whether surface is oxidized, paint is peeling, the mounting position is offset or if cabinet is damaged	Perform a visual inspection	If deformed/damaged follow battery recycling procedure.	Everyday
5	Check the entire battery as well as the surface beneath it for signs of fluid leakage	Perform a visual inspection	If leaking, follow battery recycling procedure.	Everyday

No.	Maintenance Content	Method of Operation	Notes	Frequency
6	Check if battery and charger are clean	Perform a visual inspection Wear insulated gloves before performing cleaning	Clean the lithium battery and charger with a dry cloth or compressed air	Weekly

7	Check if external wiring harness has worn spots, imprints, creases, or exposed wire	Perform a visual inspection	Replace the wiring harness if damaged	Weekly
8	Check the surface of lithium-ion battery for cleanliness	No dust, water, corrosion, oxidation, rust, etc.	Clean the surface if dust, corrosion, oxidation, or rust is found. Use a dustless cloth or air compressor. Using water is strictly prohibited.	Weekly
9	Ensure outside battery screws are tight	Tighten screws if necessary		Weekly
10	Check for water or foreign material in the plug and socket. Check for rust or charring (if necessary)	Perform a visual inspection		Monthly
11	Check the cable for damages or loose joints (if necessary)	Perform a visual inspection		Monthly
12	Check the battery case for abnormalities such as cracks, deformation, and bulging	Perform a visual inspection	Stop using the battery if abnormalities are found	Monthly

NOTE: The manufacturer recommends using compressed air at less than 30psi (207kPa).

Troubleshooting & Recycling

During the use and maintenance of the lithium-ion battery, the battery or battery system may have one or more of the following abnormal conditions.

Only trained technicians are allowed to perform the necessary processing according to the instructions in this manual.

If there are any questions about the status or solutions, please contact Blue Giant dealers or after-sales service department of the company to obtain professional technical support.

- If the battery is found to have abnormal mechanical characteristics such as swelling, cracked casing, melted casing or distortion of the casing before and during installation, stop using the battery immediately, place it in open and well-ventilated space, and contact the after-sales service.
- If abnormalities such as looseness, cracks, cracks in the insulation layer, burn marks, etc. of the battery's pole pressing bolts, conductive strips, main circuit wires, and connectors are found before and during the installation, STOP using the battery immediately.
- If the polarity of the positive and negative terminals of the battery is found incorrect, STOP using the battery immediately and contact the after-sales service department to replace the battery or obtain other solutions.
- If the battery emits smoke; immediately STOP using the battery, use fire sand and an explosion-proof box for burial and isolation, wearing a respirator and fireproof gloves move the battery to a safe area, and notify the after-sales service department of the company for record and obtain technical support.

Damaged / Leaking Battery Handling

- Put on personal protective equipment (PPE), such as gloves, goggles/safety glasses, and a lab coat.
- Isolate and ventilate the area.
- Keep an appropriate fire extinguisher within reach.
- If batteries are showing evidence of overheating, use extreme care. Gases can be toxic and flammable.
- Disconnect the battery (if possible).
- Remove the battery from the equipment/device (if possible).
- Use inert, non-cellulose absorbents to clean up the spilled electrolyte.
- Place used absorbents and PPE in a sealed bag and contact your environmental or shipping container for proper disposal of the battery and absorbents.
- **DO NOT** place damaged batteries in regular trash or recycling containers.
- For safe storage while awaiting proper disposal, place the battery in a container of sand or another chemically inert cushioning material like vermiculite. There are damaged Li-ion battery kits commercially available for isolating a battery in a metal pail along with fire-proof media (such as sand, and vermiculite) to cover the battery with.

Damaged, Defective Battery Container Kits: Metal Storage container kit with vermiculite

3rd Party Options (Not associated with Blue Giant)

- <https://www.cirbasolutions.com/product-category/damaged-battery-kit/>
- <https://cellblockfcs.com/cellsafe-drums>
- <https://www.call2recycle.org/product/large-damaged-defective-or-recalled-lithium-ion-battery-recycling-pail/>

Blue Giant Options:

Without prepaid shipping and without prepaid recycling

- For 24V – 20Ah battery DDR Kit part # 26275

With prepaid shipping and prepaid recycling

- For 48V - 30Ah battery Kit = Part # 25827
- For 24V – 20Ah battery Kit = Part # 25826
- If the electrolyte is leaking out, place the battery in a bucket of water for 7 days to effectively discharge the internal cells. This is the only time the battery should be exposed to water.
- Place the battery container away from combustibles.
- Contact the local fire department and ask for advice on how to proceed.

Charging

Note: Some Lithium-Ion batteries disconnect the charger from the batteries when the batteries reach full charge. In these situations, the “Charge Complete” LED will NOT be illuminated green despite the fact that the charge cycle has completed. Please refer to the State of Charge (SOC) display on the batteries to confirm a full charge.

Designate a specific area for the purpose of charging lithium-ion batteries. When charging, make sure the battery charger is turned OFF before connecting the battery charging cables. Lithium-ion batteries allow for fast charging, if the battery does not charge completely in a normal period or if the battery management system (BMS) indicates a fault, then remove the battery from service. Blue Giant recommends the opportunity charge lithium-ion batteries. This is when the battery is recharged for short intervals during a shift period. It reduces or eliminates the need for long charging periods, changing batteries during a shift, and extending shift periods.

Please follow the guidelines below:

- Battery must be charged when the remaining charge is lower than 20%, avoid over-charging or over-discharging.
- Remaining charge should be higher than 60% during a short period of storage.
- Running the truck is prohibited in the case of a short circuit, low voltage, or high temperature.
- Perform charging, discharging test, and battery status inspection at least once per month, including total voltage, unit voltage, voltage difference, temperature, temperature difference, the value of insulation resistance, remaining charge, etc.
- Handle battery gently. DO NOT throw, roll, or allow to collide with other objects.

Recycling

Lithium-ion batteries must be disposed of according to the relevant environmental protection regulations. Blue Giant recommends researching battery recycling companies and choosing what is best for your situation. We have included two companies here with some information about each. This information is not guaranteed to be current, please contact the company for the most up-to-date information.

Note: The companies are not affiliated with Blue Giant and are considered third party.

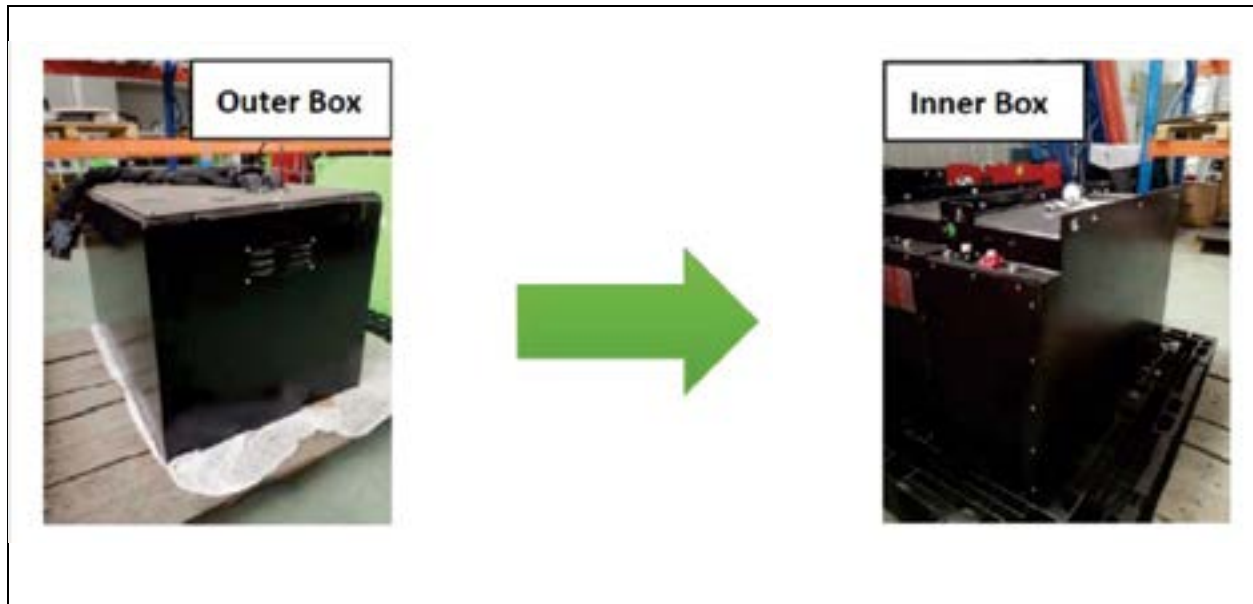
Company:	Battery Recyclers of America	Li-Cycle
HQ:	Dallas TX	Toronto Canada
Years in Business: (as of 2023)	13 years	7 years
Recycling Process:	Smelting	Submerged
EPA Certified:	Yes	Yes
Refurb/Recycle:	Both	Recycle
Packaging Requirements:	Per DoT	Per DoT
Palletize Service:	Yes	No
Pickup:	Yes	Ship only
Logistics Support:	Yes	No
Min. Pickup Weight:	50 lbs.	N/A
Accept Mix of Lead and Li:	Yes	No

Appendix A: Daily Spot Check Record

Daily Spot Check Record of Lithium Batteries (Easy Exchange)					
Routine Check Items	Leakage	Leakage	Box Damaged	Battery Bulge	Terminal Damage
Diagram of Routine Inspection Items					
Explanation	There is liquid leakage causing corrosion at the charging and discharging terminals on the bottom of the battery	There are traces of liquid leakage at the bottom of the battery, which caused stains around the positive and negative terminal ports	The box body is cracked and has pieces missing	The battery expands causing it to bulge	The terminal is deformed, discolored, blackened or there are traces of high temperature burning
Processing Method	Stop using, soak in water for 7 days to discharge and recycle according to local regulations	Stop using, soak in water for 7 days to discharge and recycle according to local regulations	Stop using and recycle according to local regulations	Stop using and recycle according to local regulations	Replace the terminal
Inspection Frequency	Daily	Daily	Daily	Daily	Daily
Inspection Method	Visual inspection	Visual inspection	Visual inspection	Visual inspection	Visual inspection
Date					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
Note: All spot inspectors shall conduct a visual inspection prior to work every day. Mark "v" if they meet the requirements. If they do not meet the requirements, Mark "x" and report it to the proper personnel.					
Place of use:					
Person in charge of spot inspection:					

Appendix B: Box Structure

Big Battery Box Structure – If equipped, only the inner box needs to be shipped with battery cells and BMS plate for repair/return.



SECTION 12

ILLUSTRATED PARTS BREAKDOWN

For updated parts information, please contact Blue Giant Technical Support
Or visit www.bluegiant.com/support

Correct Use and Application

The truck described in this operator manual is designed for lifting and transporting material loads. It must be used, operated, and serviced as specified in the following instructions. Any other type of use is beyond the scope of application and can result in damage to personnel, the truck or property. Avoid overloading the truck with loads which are too heavy or placed on one side. The data plate attached to the truck, or the load diagram are binding for the maximum load capacity. All nameplates and safety signs on the truck should be cleaned regularly to maintain visibility.

Proprietor Responsibilities

For the purposes of the present operator manual, the “proprietor” is defined as any person who either uses the truck themselves, or on whose behalf it is used. In special cases (e.g., leasing or renting) the proprietor is considered the person who, in accordance with existing contractual agreements between the owner and user of the truck, is charged with operational duties.

The proprietor must ensure that the truck is used only for the purpose it is intended for and that danger to life and limb of the user and third parties are excluded.

Furthermore, accident prevention regulations, safety regulations and operating, servicing and repair guidelines must be followed. The proprietor must ensure that all truck users have read and understood this operator manual. The owner must also read and understand the safety guidelines/requirements as called out in the applicable ANSI/ITSDF B56 series of standards.

Failure to comply with the operator manual shall invalidate the warranty. The same applies if improper work is carried out on the truck by the customer or third parties without the permission of the manufacturer's customer service department.

Modifications

The mounting or installation of additional equipment which affects or enhances the performance of the truck requires the written permission of the manufacturer. Local authority approval may also need to be obtained. Local authority approval does not constitute the manufacturer's approval. If approval has been granted for capacity change, the nameplate and safety signs on the truck must also be changed.



WARNING

This truck can ONLY be used indoors on smooth, flat, level surfaces. NO INCLINES/SLOPES.



WARNING

No passengers. Only one person is permitted in the truck at one time.

Truck Description

The BG2 is an electric order picker. This truck is designed to transport and lift goods on level surfaces. Loads can be transported over long distances. Loads should be transported with the forks and operator's platform lowered for enhanced stability. The capacity can be obtained from the data plate.

Safety Mechanisms: Pressing the emergency disconnect switch interrupts all electrical functions except steering in hazardous situations. Gates on either side of the cab interrupt all truck operations as soon as they are opened. Wear the safety harness and connect the tether to the truck. When you start the truck, the drive pedal must be pressed for movement to begin. Please use all safety equipment provided.

Drive: The entire drive unit is enclosed in the truck chassis. The electronic traction controller ensures the smooth rotation of the drive motor, resulting in smooth driving and powerful acceleration.

Brake System: The operator can pull back the travel switch on the control arm to slow it down prior to braking. The electromagnetic brake applies braking via spring pressure applied to friction discs that act on the drive motor and serves as both a parking and handbrake.

Steering System: Steering is achieved via an independent steer motor. The steer wheel is integrated in the control panel. The position of the steer drive wheel is shown in the control panel display unit. The maximum steer angle is $\pm 90^\circ$.

Controls and Displays: The functions are activated via ergonomic finger movements for ease of operation. The dual controls allow the operator to drive with forks forward or forks trailing. The truck utilizes travel and hydraulic movements to position the goods. The driver's display unit shows all important driver information such as steer wheel position, overall lift, truck status reports (e.g., faults), battery capacity and time etc.

Hydraulic System: All hydraulic operations are controlled by a DC motor with a gear pump. Hydraulic control oil is distributed via electromagnetic valves.

Electrical System: The truck has a standard electronic drive, lift and steering control system. The electronic drive control enables plugging when changing direction.

Safety Equipment

BG2 series standard safety equipment:

- Rear flashing lights
- Horn
- Guard rails
- Tether and safety harness (all except BG2-72)
- Pallet clamp (all except BG2-72)
- Plexiglass mast guard
- Emergency stop switch
- Operator presence switch

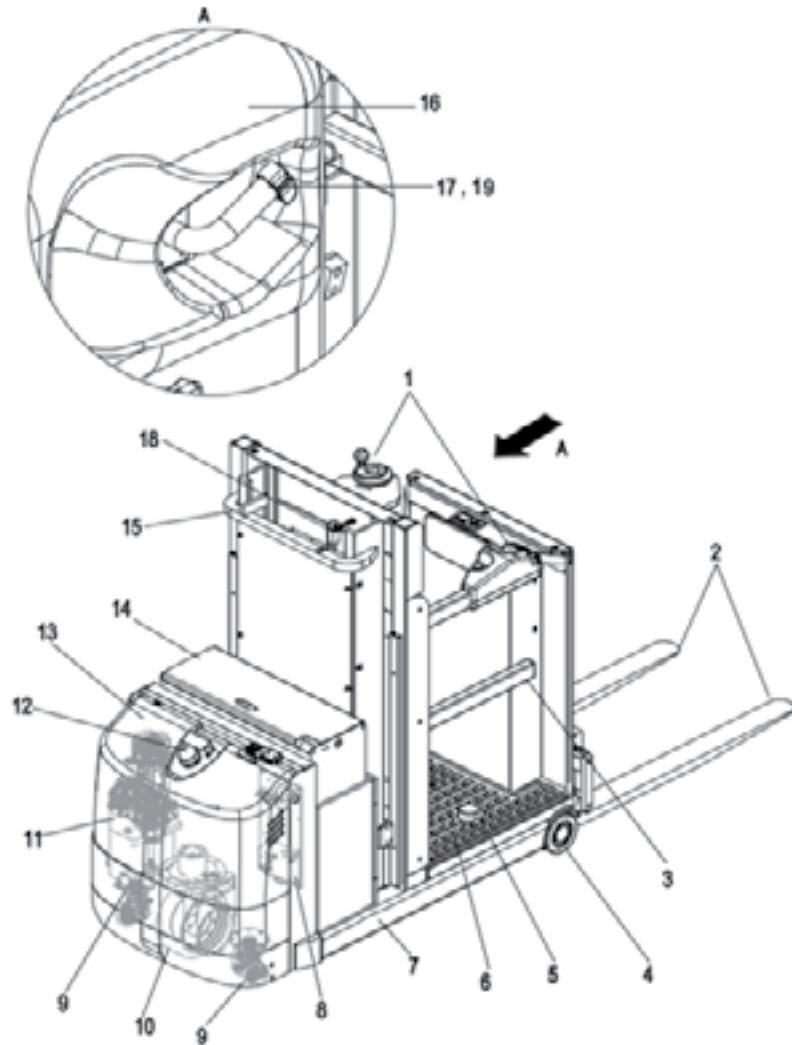
Truck Data Plate

MODEL NO.		SERIAL NO.			
MAX CAP LB / KG	A IN / MM	B IN / MM	C LIFT HGT IN / MM		
ALT CAP LB / KG	A IN / MM	B IN / MM	C LIFT HGT IN / MM		
TRUCK WT LESS BATTERY LB / KG	BATTERY MIN WT LB / KG		TRUCK TYPE		
TRUCK WT WITH BATTERY LB / KG	BATTERY MAX WT LB / KG		CERTIFIED	VOLTAGE	COMPLIES WITH THE APPLICABLE REQUIREMENTS OF ANSI / ITSDF B56.1 STANDARDS.
DEM TYPE ATTACHMENT		COMB SERVICE WT LESS BATT LB / KG		ATTACHMENT SERIAL NO.	
MAX CAP LB / KG	LOAD CTR IN / MM	LIFT HGT IN / MM			

Data plates are required on the truck. If lost, stolen, or damaged they must be replaced per OSHA standards.

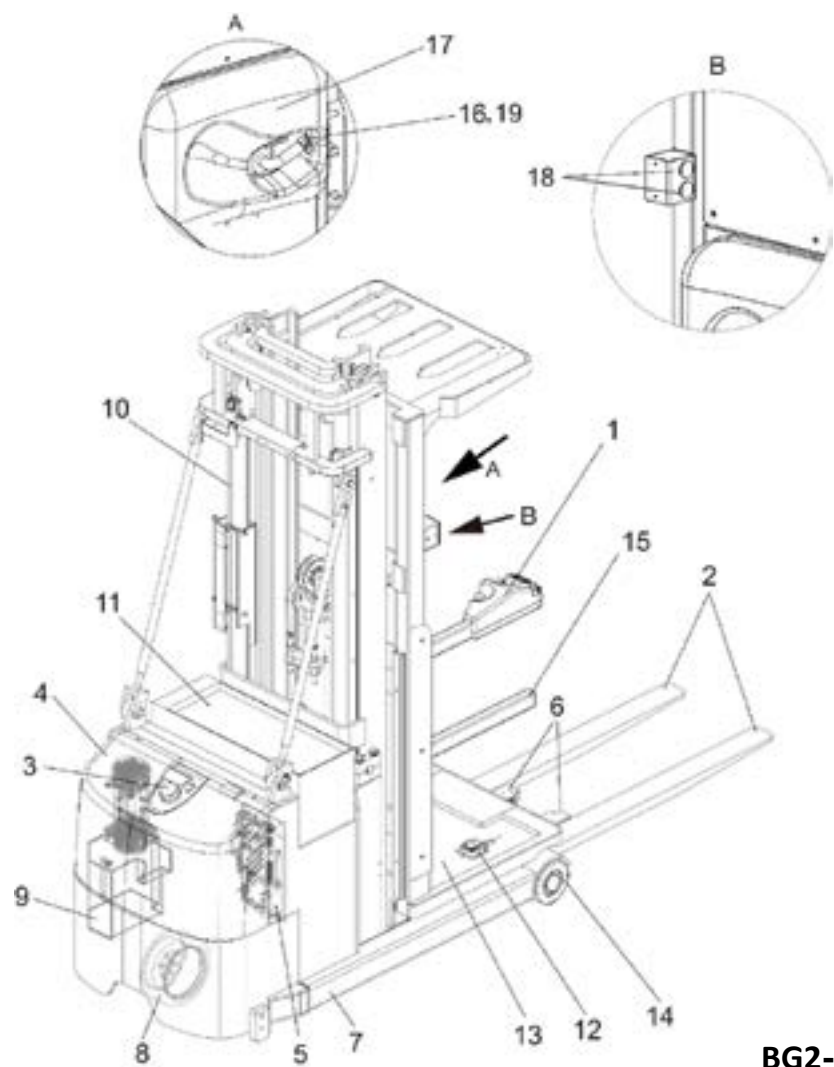
For queries regarding the truck or ordering spare parts, always provide the serial number.

Truck Components



BG2-72

Item	Component	Item	Component
1	Control arms	11	Hydraulic pump and reservoir
2	Forks	12	Warning light
3	Side gates	13	Cover
4	Load wheels	14	Battery
5	Drive pedal/Operator presence switch	15	Mast
6	Operator platform	16	Cushion
7	Frame	17	Travel switch
8	Control panel	18	Lifting limit switch
9	Casters	19	Secondary horn
10	Drive wheel		

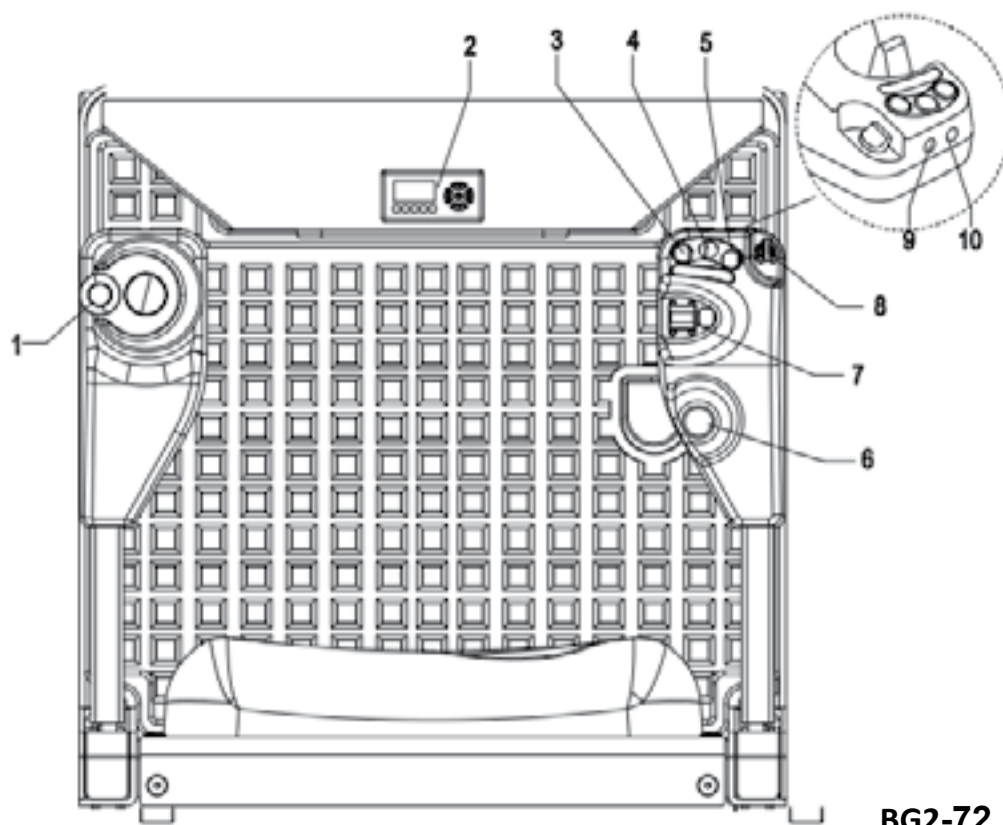


BG2-126/144/192

Item	Component	Item	Component
1	Control arms	11	Battery
2	Fork	12	Drive pedal/Operator presence switch
3	Warning lamp	13	Height-adjustable operator platform
4	Cover	14	Load wheel
5	Controller	15	Gates
6	Pallet clamp	16	Travel switch / Horn
7	Frame	17	Cushion
8	Drive wheel	18	12V socket
9	Hydraulic pump	19	Secondary horn
10	Mast		

Controls and Displays

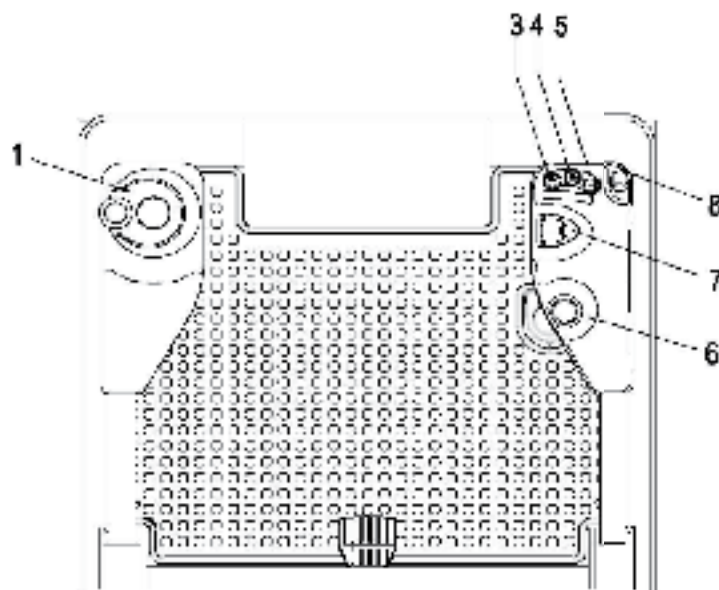
Control Panel (Aerial View)



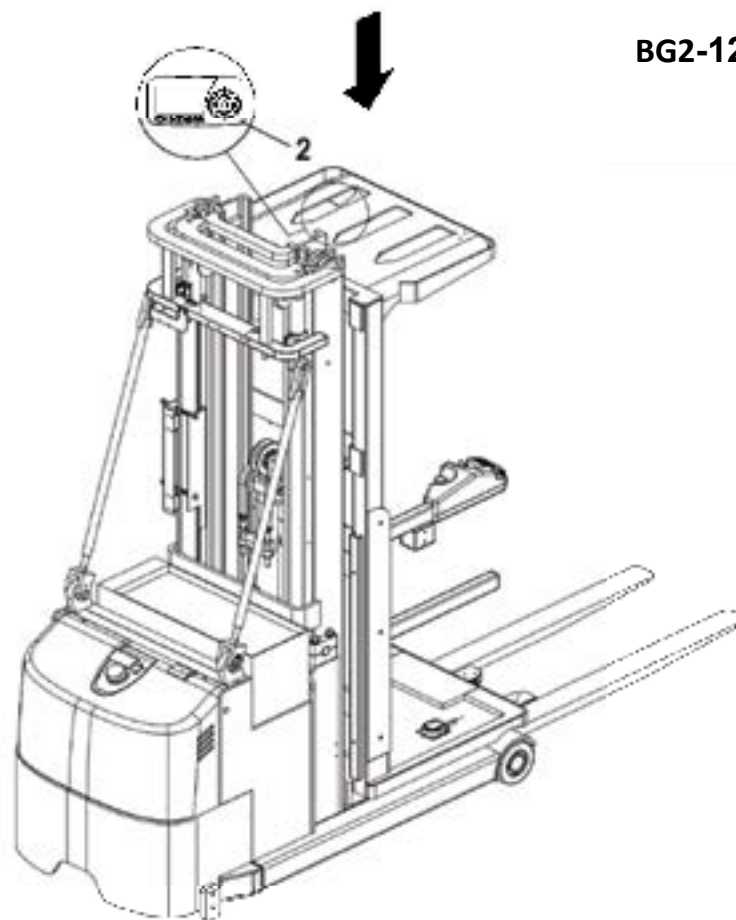
BG2-72

Instruments and Controls

- (1) **Steering Controls:** Controls the direction of travel.
- (2) **Display unit:** Operating information and warning message display.
- (3) **Lifting Pushbutton:** Lifts the operator's platform from the raised position.
- (4) **Lowering Pushbutton:** Lowers the operator's platform from the raised position.
- (5) **Horn Pushbutton:** Sounds the horn.
- (6) **Emergency Stop Switch:** Disconnects the supply current, deactivates all electrical functions, causing the truck to automatically brake and stop.
- (7) **Travel Switch:** Controls the direction and speed of the truck.
- (8) **Key Switch:** Prevents unauthorized personnel from operating the lift truck.
- (9) **Lowering Pushbutton:** Lowers the forks from the raised position.
- (10) **Lifting Pushbutton:** Lifts the forks from the raised position.



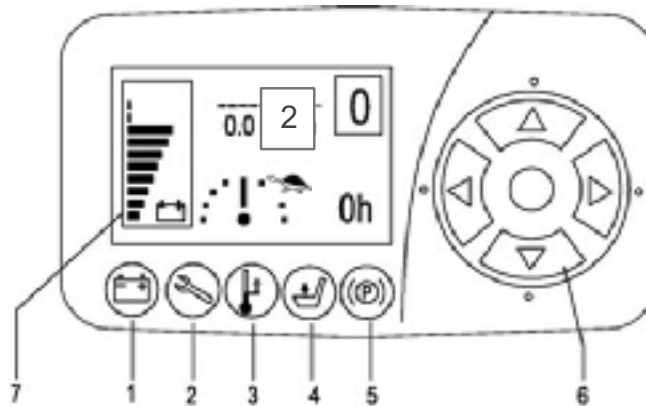
BG2-126/144/192



Instruments and Controls

- (1) **Steering Controls:** Controls the direction of travel.
- (2) **Display Unit:** Operating information and warning message display.
- (3) **Lifting Pushbutton:** Lifts the operator's platform from the raised position.
- (4) **Lowering Pushbutton:** Lowers the operator's platform from the raised position.
- (5) **Horn Pushbutton:** Sounds the horn.
- (6) **Emergency Stop Switch:** Disconnects the supply current, deactivates all electrical functions, causing the truck to automatically brake and stop.
- (7) **Travel Switch:** Controls the direction and speed of the truck.
- (8) **Key Switch:** Prevents unauthorized personnel from operating the lift truck.

Display Unit



(1) Low Battery Alarm LED

The battery LED illuminates when the measured battery voltage is equal to or less than 40% normal battery voltage.



(2) Fault Alarm LED

The wrench LED illuminates when a fault is detected. The display (7) will show the warning and fault indication. Report alarm to the designated authority and do not use the vehicle until corrected by a qualified mechanic.



(3) Temperature Alarm LED

The temperature LED illuminates when the temperature of the motor controller exceeds allowable range (too high or too low). If the temperature is too high, stop operation until the temperature drops and notify an authorized technician.



(4) Operator Presence Switch Alarm LED

When the operator presence pedal is released, this LED will illuminate.



(5) Brake LED

The parking brake LED illuminates when the brake is applied.



(6) Function Keys

Use the left arrow button to adjust the speed mode. Use the down arrow button to switch the driving mode. Use the center button to code in new values.

(7) LCD Display



Battery Indicator

The state of charge is displayed by ten cells. Each cell represents 10% of the batteries charge. For example, the illustration shows 80% charge.

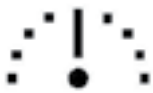
Information Display

Displays the warnings and faults. Stop using the truck until corrected by a qualified mechanic.

0.0 mph

Speed Display

Displays vehicle speed. Unit: mph.



Steering Display Area

One of nine notches will indicate the steering angle of the drive wheel.



Driving Mode Display

The vehicle can be operated in two driving modes, high speed or crawl speed. Use the 'down' function key to switch the driving mode. The crawl speed will automatically come on when the operator platform reaches approximately 12" of lift height. When you are in crawl speed, a 'turtle' will appear on the display.

0h

Hour Meter

Displays the number of hours that the vehicle has been operated.



Speed Mode Display

There are four speed ranges available in both high and crawl speed driving modes. Use the left function key to select the desired mode. '1' Indicates slowest speed while '4' indicates highest speed.

Low Voltage Protection

The truck has a low-voltage protection function. When battery state of charge is below 10% the truck drive speed will slow and prevent the ability to lift the platform. The battery will need to be charged.

Workplace Inspection

Before the aerial platform is used and during use, the operator shall check the area in which the aerial platform is to be used for possible hazards such as, but not limited to:

1. Drop-offs or holes, including those that might be concealed or difficult to see. This vehicle is only rated for both smooth and level surfaces indoors.
2. Slope(s).
3. Bumps and floor obstructions. Examples of floor defects that shall be avoided include any height deviations greater than 3mm (0.1in):
4. Large bumps (ex. transition strips between buildings, out-of-level cement pads)
5. Bumpy surfaces (ex. old pitted concrete surfaces)
6. Unpaved uneven surfaces
7. Potholes
8. Unrepaired cracks
9. Debris or obstacles
10. Overhead obstructions and high voltage conductors.
11. Hazardous locations and atmospheres (reference ANSI/NFPA 505-current addition)
12. Inadequate surface and support to withstand all load forces imposed by the aerial platform in all operating configurations.
13. Wind and weather conditions.
14. Presence of unauthorized persons.
15. Other possible unsafe conditions.

Daily Operator Checklist

Date _____
 Serial Number _____
 Truck Model _____
 Operator _____
 Hr Meter _____

Item	Procedure	Ok (Yes/No)	Remark
Transmission and Hydraulic Systems	Check for signs of fluid leakage.		
Chains, Cables, and Hoses	Check that they are in place, secured correctly, functioning properly and free of binding or damage.		
Guards	Check that side guard rails are in place, properly secured and not damaged.		
Safety Decals	Check that warning labels, nameplate, etc., are in good condition and legible.		
Horn and lights	Check that horn sounds when operated and the lights are operational		
Steering	Check for binding or looseness in steering arm when steering.		
Travel Controls	Check that travel speed functions forward and reverse		
Wheels	Check the drive wheels, casters, loads wheels for cracks or damage		
Hydraulic Controls	Check operation of lift and lower to their maximum positions		
Brakes	Check that brakes actuate when in the stop position and when reversing travel directions		
Operator Presence Switch	Check whether the truck starts when operator presence switch is released.		
Emergency Stop Switch	Check that emergency stop switch can be disengaged and reengaged.		
Battery	Check battery charge and condition.		
Limit Switches	Allow for enough space to operate truck and ensure the travel speed reduces each time a limit switch is engaged while raising the mast. 126", 144", and 192" masts have (3) speed reduction limit switch and a final top height limit switch. 72" Mast has (1) limit switch and a final top height limit switch.		
Platform and Mast Assembly	Check for proper roller adjustment so there is not excessive play, mast deflection, leaning, or binding in the operator platform.		
Hardware	Check that all hardware (nuts/bolts) are secure and free of damage.		
Frame	Ensure there are no structural cracks or cracked welds in the frame or mast assembly		
Anchor Tether and Harness (If supplied with the model)	Check for structural integrity of the mount and any wear, fraying, or binding in the tether and harness.		
Forks (If Supplied)	Check for cracks and damage and that they are properly secured.		

NOTE: This is a minimum of daily inspections for operators. Items can be added to meet specific requirements.

Safety Regulations for the Operation of Trucks

Driver Authorization: The truck may only be used by trained personnel who have demonstrated that they can drive, handle loads, and are authorized to operate the truck.

Driver's Rights, Obligations and Responsibilities: The driver must be informed of their duties and responsibilities and be instructed in the operation of the truck and shall be familiar with the operator's manual.

Unauthorized Use of Truck: The driver is responsible for the truck during the time it is in use. They should prevent unauthorized persons from driving or operating the truck. Do not carry passengers or lift personnel.

Damage and Faults: The supervisor must be immediately informed of any damage or faults to the truck. If the truck is not safe for operation (e.g., wheel or brake problems) it must not be used until it has been repaired.

Repairs: The driver must not make any repairs or alterations to the truck. Repairs must only be made by an authorized, trained technician. The driver must never disable or adjust safety mechanisms or switches.

Hazardous Area: A hazardous area is defined as the area in which a person is at risk due to truck movement, lifting operations, the load handler (e.g., forks or attachments) or the load itself. This also includes areas which can be reached by falling loads or lowering operating equipment.

- Unauthorized persons must be kept away from the hazardous area.
- When there is danger to personnel, a warning (horn) must be sounded with sufficient notice.
- If unauthorized personnel are still within the hazardous area the truck shall be brought to a halt immediately.
- This unit is intended to be driven in clean, dry, flat surfaces in non-freezer or refrigerated environments.

Safety Devices and Warning Signs: Safety devices, warning signs, and warning instructions shall be strictly observed.

Travel routes and work areas: Only use lanes and routes specifically designated for truck traffic. Unauthorized parties must stay away from work areas. Loads must only be stored in places specially designated for this purpose.

Driving conduct: The driver must adapt the travel speed to workplace conditions. The truck must be driven at slow speed when negotiating bends or narrow passageways, when passing through swing doors and at blind spots. The driver must always observe an adequate braking distance in front of the forklift truck. The driver must be in control of the truck at all times. Abrupt stopping (except in emergencies), rapid U turns and passing at blind spots are not permitted. It is forbidden to lean out of the truck or reach beyond the working and operating area.

Nature of loads to be carried: The operator must make sure that the load is in a satisfactory condition. Only carry loads that are positioned safely and securely. Use suitable precautions to prevent parts of the load from tipping.

Truck Operation



WARNING

Before operation ensure that no one is within the proximity of the truck.

Before Using the Truck for the First Time

Only operate the truck with battery power.

Preparing the truck for operation after delivery or transport:

- Ensure a post-delivery inspection of the entire truck is performed by qualified personnel.
- Check the hydraulic oil level.
- Install the battery, if necessary (where required), do not damage the battery cable.
- Fully charge the battery.
- Check platform mast assembly for proper roller adjustment so that there isn't excessive play, mast deflection, leaning, or binding in the operator platform. Consult with manufacturer for training.
- When the truck is parked the surface of the tires will flatten. The flattening will disappear after a short period of operation.

Break-In Period

Operate the machine under light load conditions for the first stage of operation to get the most from it. The requirements below should be observed while the machine is in the first 100 hours of operation (break-in period).

- Prevent the new battery from over-discharging. Do not allow it to go below 20% state of charge.
- Perform specified preventive maintenance services carefully and completely.
- Avoid sudden stops, starts, or turns.
- Limit load to 70~80% of the rated load.



CAUTION

Only operate on level, flat surfaces indoors.

Preparing the Truck for Daily Operation

- Close the safety gates.
- Insert the key in the key switch and turn it to the 'ON' position.
- Turn the emergency disconnect switch ¼ turn clockwise until it pops up to activate.
- Test the horn.
- Check brake operation.

Driving

- Close the safety gates.
- Wear the safety harness and connect the tether to the truck. (All models but BG2-72).
- Insert the key switch (5) and turn it to the “ON” position.
- Turn emergency brake switch counterclockwise until pops up (3).
- Step on the operator presence switch (2).
- Use the dual control travel switches (4) & (6) to operate
- Forward facing/fork facing direction = FWD

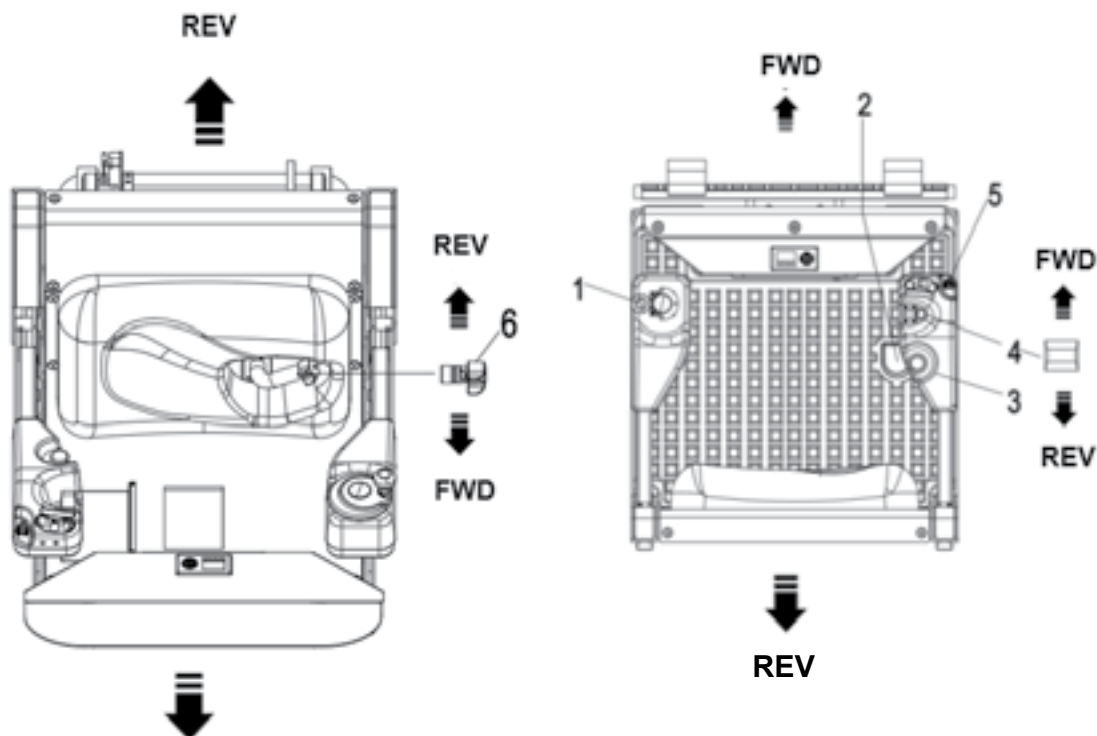
OR

- Reverse facing/ fork trailing direction = REV.
- The travel speed is governed by the speed mode.
- Use steering controls (1) to steer the truck in the required direction.



WARNING

When the power is switched on, the truck will run a self-test. Make sure the lamps on the display unit stop flashing before operation.



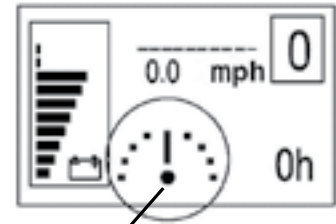
Dual Controls

When the driver changes their orientation and grabs the dual control handle, a sensor will detect their hand, automatically allowing the truck to travel in either direction (e.g., forks forward or forks trailing).

Steering

Use steering controls (1) to steer the truck in the required direction.

The drive wheel position is indicated in the driver's display.



Drive Wheel Position

Braking Methods

The truck can brake in three different ways:

• Reverse Braking Method

To stop faster, slowly move the travel switch to the opposite direction, this is also referred to as 'plugging'.

• Coast Braking Method

Release the drive pedal and allow the truck to coast to a stop.

• Emergency Braking Method

To stop rapidly when an emergency exists, press the emergency power disconnect switch.



WARNING

The emergency brake switch (3) must only be used in an emergency.

WARNING



- Do not climb out of the operation platform while elevated and never walk on the forks or pallet.
- The lift mast cannot be safely climbed.
- An elevated operator position has a high center of gravity and can be tipped easily.
- Standing on or leaning out from the outside of a platform rail may cause the lift truck to tip over.
- Tipping the lift truck over can cause severe injury or death and equipment damage.
- Do not rock, shake, or induce any other external lateral load on to the truck by pushing/pulling a rack from the operator platform position.

Lifting - Lowering

Ensure there are no people standing underneath the raised load or the operator's platform. Instruct other people to move out of the hazardous area.

Lifting

Press the "Lifting" button (1) until you reach the desired height.

Lowering

Press the "Lowering" button (2) until you reach the desired level.



NOTE

When lowering, the vehicle sounds an intermittent alarm.



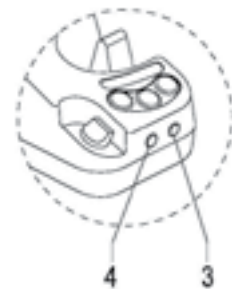
Fork Position (BG2-72)

Lifting

Press the "Lifting" button (3) until you reach the desired height.

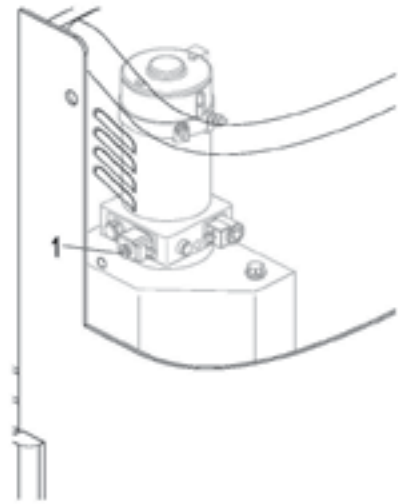
Lowering

Press the "Lowering" button (4) until you reach the desired level.



Emergency Lowering Procedures

If you lose power while elevated in the cage, instruct someone on ground to press the emergency lowering valve (1), which lowers the platform.

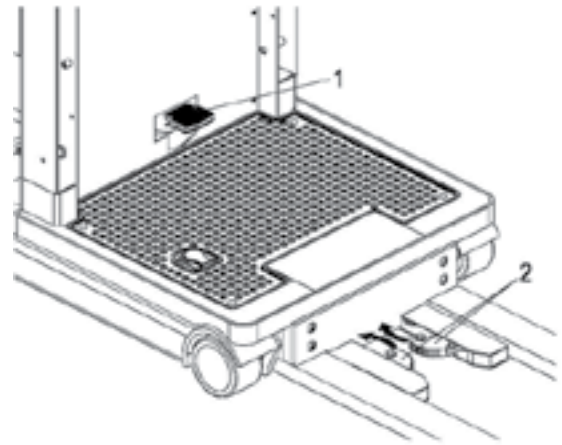


Loading/Unloading a Pallet With Pallet Clamp (BG2-126/144/192)

Models BG2-126/144/192 have a pallet clamp that secures the pallet.

Loading a Pallet

When loading a pallet, press on pedal (1), and then the pallet clamp jaws (2) will release allowing pallet to be secured. Releasing the pedal switch (1) after picking will secure the pallet in place.



Unloading a Pallet

When unloading a pallet, ensure the forks are fully lowered then press pedal (1), and then the pallet clamp jaws (2) open. When the jaws are in an open state, the pallet can be detached. Release the pedal (1) after unloading pallet.



CAUTION

Pallet clamp must attach to pallet before transporting.

Parking Securely

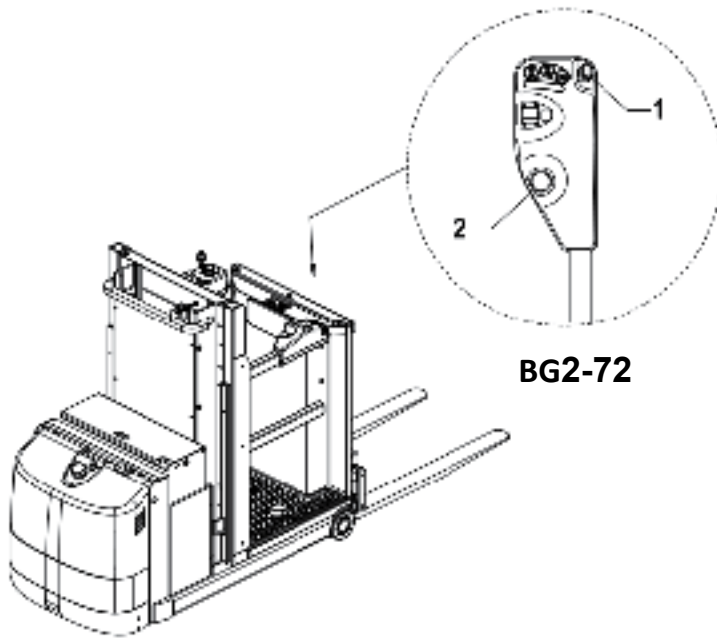
When you leave the truck, it must be securely parked even if you only leave it for a short time.

- Lower the platform completely and position it horizontally.
- Depress the emergency disconnect switch (2).
- Turn off the key switch and remove the key (1).

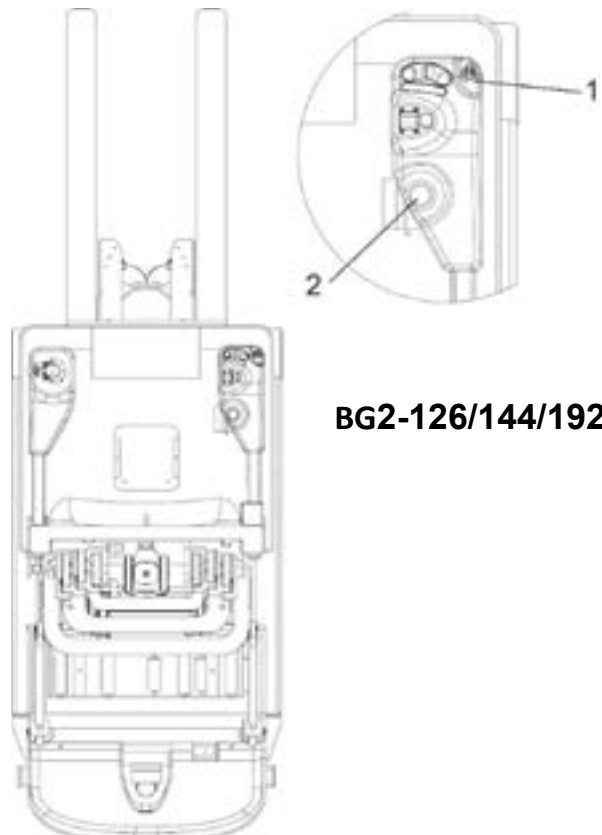


WARNING

Do not park the truck on a slope. The load must always be lowered to the ground.



BG2-72



BG2-126/144/192

Battery Safety and Maintenance



CAUTION

Only qualified and experienced personnel should perform maintenance and repair on batteries.



WARNING

- Wear protective clothing, such as, rubber apron, gloves, boots, and goggles when performing any maintenance on batteries.
- Gases produced by a battery can be explosive. Do not smoke, use an open flame, create an arc or sparks in the vicinity of the battery. Ventilate area well when servicing and when charging.
- Batteries contain sulfuric acid which may cause severe burns.
- Avoid contact with eyes, skin, or clothing.

In case of contact, flush immediately and thoroughly with large amounts of clean water.

Remove contaminated clothing. Obtain medical attention. In case of spills, dilute spill cautiously with five to six volumes of water and gradually neutralize with lime, soda ash or baking soda. For waste disposal consult Federal, State and Local Regulations.

Battery Safety Rules

- Wear protective clothing, such as, rubber apron, gloves, boots and goggles when performing any maintenance on batteries.
- Do not allow electrolyte to come in contact with eyes, skin, clothing, or floor. If electrolyte comes in contact with eyes, or skin flush thoroughly with large amounts of clean water, remove contaminated clothing and obtain medical help immediately.
- Keep vent plugs firmly in place at all times except when adding water or taking hydrometer readings.
- Do not bring any type of flame, spark, etc., near the battery. Gas formed while the battery is charging is highly explosive. This gas remains in the cells long after charging has stopped.
- Do not lay metallic or conductive objects on battery. Arcing may result.
- Do not allow dirt, cleaning solution, or other foreign material to enter cells. Impurities in electrolytes have a neutralizing effect reducing available charge.

Battery Type

The battery (or batteries) in your lift truck fit into two basic categories, flooded cell and maintenance free.

- Flooded cell batteries have vent plugs for access to the electrolyte inside the battery.
- Maintenance free batteries do not have removable vent caps and should never be opened, or the battery will be permanently damaged or destroyed.

Cleaning the Battery

Always keep vent plugs tightly in place when cleaning the battery. When the water level and charge are correct, the battery will remain clean and dry. All that is necessary is to brush or blow off any dust or dirt which may accumulate on the battery.

However, if electrolyte is spilled or overflows from the cell, dilute spill cautiously with five to six volumes of water and gradually neutralize with lime, soda ash or baking soda. To do this, remove battery from truck and clean with the solution of soda and water, brushing the soda solution to get the solution beneath the connectors and removing grime from the covers. Then rinse the battery with cool water from a low-pressure supply to remove the soda and the loosened dirt. If batteries stay wet consistently, they may be either overcharged or overfilled. This condition should be investigated and corrected.

Checking Electrolyte Level (flooded cell only)

Battery electrolyte level should be checked before each charge of the battery. If the plates are exposed, only add enough water to cover the plates before charging. The level should be maintained at one-half inch above plates or just below the lower lip of the filler hole after the battery is fully charged. If low, add distilled water or approved local supply (at the end of a charge cycle). (Do not overfill).

Checking Specific Gravity (flooded cell only)

For maximum battery life, specific gravity readings should be taken weekly on a pilot cell and recorded. A different pilot cell should be selected monthly with readings taken on all cells at semi-annual intervals. Do not take specific gravity readings immediately after adding water. Water and electrolyte must be thoroughly mixed by charging before a reliable reading can be taken. Normal full charge specific gravity should be taken. Normal full charge specific gravity should be between 1.265 and 1.285 corrected to 80°F (26.7°C).

Some variances exist between manufacturers. Consult battery manufacturers guide to confirm the level for your specific battery.

Do not assume a battery will not take a charge because you have been charging it for a while and the hydrometer float will not rise. The battery may have been fully discharged and will require considerable charging before reaching the minimum specific gravity of the hydrometer float. The lower the float sinks in the electrolyte, the lower its specific gravity.

Temperature Correction (flooded cell only)

Hydrometer floats are calibrated to give a true reading at one fixed temperature only. A correction factor must be applied for any specific gravity reading made when the electrolyte temperature is different from the hydrometer float calibration.

A correction factor of 4 "points of gravity" (0.004 specific gravity) is used for each 10°F (5.5°C) change in temperature. 4 "points of gravity" (0.004) are added to the indicated reading for each 10°F (5.5°C) increment above hydrometer calibration. 4 "points of gravity" are subtracted for each 10°F (5.5°C) increment below hydrometer calibration.

Charging the Battery

Before charging, check all cables and plug connections for visible signs of damage.

It is essential to follow the safety regulations of the battery and charger.

- 1.) Park the vehicle at the charging station with platform lowered and the key switch 'OFF'.
- 3.) Disconnect plug from the vehicle and connect to the charger's plug.
- 4.) Connect cord and charge the battery.

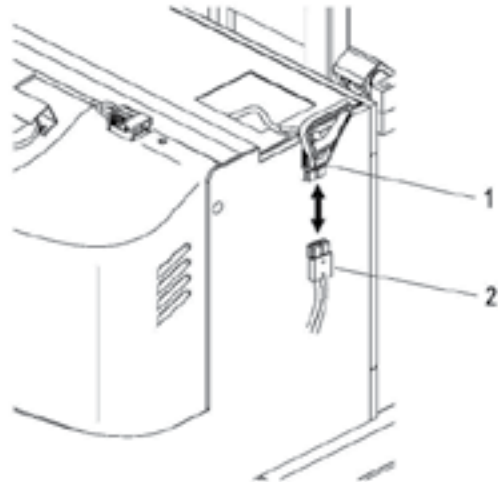


WARNING

Use factory supplied charger or recommended charger from battery supplier only.

Use factory supplied battery or recommended battery from the factory only.

Follow the information above to prevent equipment damage and accidental risks such as fire.



Do not overuse battery:

When the low battery LED illuminates it is time to charge the battery.

Removing Battery From the Charger

1. When working with flooded cell batteries, put on protective clothing such as rubber apron, gloves, boots, and goggles. Remove vent cap and add water as needed.
2. Some fully automatic chargers may stay charging until battery is disconnected. When ammeter reads near 0, charger cycle is complete. The ammeter needle may cycle momentarily to a higher reading and fall back to near 0. The red charger light stays on until the charger is unplugged from AC outlet. If your charger is equipped with a timer, be sure timer is turned OFF.
3. If your trucks battery is equipped with a connector, unplug connector using both hands with a straight pulling motion.
4. Disconnect AC plug, wind up or hang up (as needed) the AC plug and charger cables to prevent any damage.

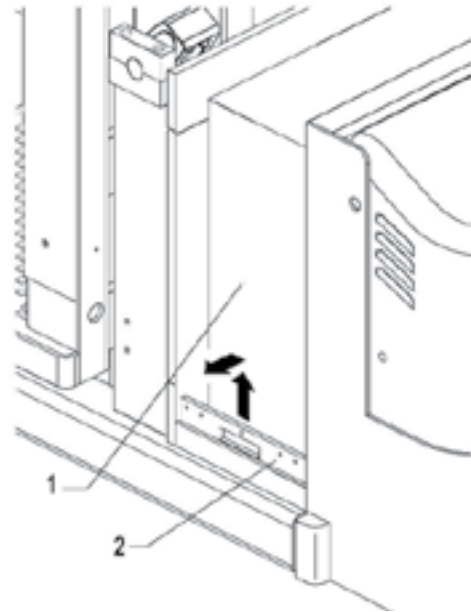
Battery Removal and Installation

- Park the truck securely.
- Place the battery plug or the battery cable where it will not get caught on the truck when the battery (1) is removed.
- Remove battery baffle (2). Pull the battery out from the side.
- Install in the reverse order.



CAUTION!

The truck must be parked on level ground. When transporting batteries using a crane, ensure that the crane is of adequate capacity. The lifting gear must exert a vertical pull so that the battery container is not compressed.



Lithium-Ion Battery Information



NOTE: For comprehensive information on the Lithium-Ion Battery, reference the corresponding service manual.



WARNING: Damaged Li-ion batteries have the potential to leak electrolyte, so it's important to wear proper personal protective equipment (PPE) (goggles, gloves, apron, etc.) during handling.



WARNING: If a lithium-ion battery fire occurs, use a carbon dioxide (CO₂) (Class BC) or dry chemical (Class ABC) fire extinguisher. Lithium-ion batteries have very little actual lithium metal in the battery; thus, a Class D fire extinguisher is not required.

Intended Use:

- Discharge/Operational application temperatures: 32° F - 104° F
- Charging application temperatures: 41° F - 104° F.
- Humidity < 80%.
- The battery's maximum operation altitude is up to 6500ft (2000m).



NOTE:

- A high-rate recharging operation below 0°C may lead to battery damage, so the recommended charging temperature range is 41° F - 104° F.
- The discharging temperature range can be used in more extreme temperature conditions as follows -4° F - 131° F however, this isn't the recommended range for optimal life which is identified above. Also, the truck may not be rated for those extreme conditions or extended durations in a cold operating environment as that is truck and option dependent.
 - If used at low temperatures -4° F - 32° F, battery discharge capacity will be smaller compared with one in normal temperature conditions.
 - A battery used between 104° F - 131° F will accelerate the aging of the internal material which may shorten the service life of the battery, so is not recommended.

Battery Handling:

Improper handling can cause damage to batteries, which may lead to overheating, fires, or explosions. Here are some tips for proper Li-ion battery handling:

- Remove batteries from devices that will not be used for an extended time.
- Keep batteries away from electromagnetic sources.
- Keep batteries intact.
- Do not use batteries that show any signs of damage, they must be isolated.
- Do not modify the battery in any way.

Li-Ion Battery Storage

Proper storage prevents damage to batteries and prolongs their life expectancy. Follow these battery storage tips:

- Store in dry, well-ventilated areas
- Store in temperatures between 32° F and 104°F
- Store away from direct sunlight and heat sources
- Keep terminals covered when the battery is not in use
- Prevent terminals from touching each other
- Store separately from other types of batteries
- Keep the battery charged and do not store it for an extended period with a low state of charge (SOC) < 20%. It is recommended to maintain a charge level of 50% or greater.
- For long-term storage, the Li battery must be recharged every 2-3 months regardless of the SOC level. If a battery is stored longer than six months without charging, the cell may be damaged due to over-discharge. This can cause the cell to bulge and break the battery enclosure.

IMPORTANT: Monitor battery condition when in use and storage.

Damaged/Leaking Battery Handling/Clean-Up

1. Put on personal protective equipment, such as gloves, goggles/safety glasses and lab coat.
2. Isolate and ventilate the area.
3. Keep an appropriate fire extinguisher within reach.
4. If batteries are showing evidence of overheating, use extreme care. Gases can be toxic and flammable.
5. Disconnect the battery (if possible).
6. Remove the battery from the equipment/device (if possible).
7. Use inert, non-cellulose absorbents to clean up spilled electrolyte.
8. **DO NOT** use water to clean electrolyte leakage.
9. Place used absorbents and PPE in a sealed bag and contact your environmental/recycling or shipping company for proper disposal of the battery and absorbents.
10. **DO NOT** place damaged batteries in the regular trash or recycling containers.
11. For safe storage while awaiting proper disposal, place the battery in a container of sand or another chemically inert cushioning material like vermiculite.
12. Place the battery container away from combustibles.
13. Contact the local fire department and ask for advice on how to proceed.

Maintenance

- Trucks must only be serviced and maintained by trained personnel.
- Regular maintenance is important to ensure stable and reliable operation of the truck. Neglecting regular maintenance could easily lead to truck malfunction and failure, which could lead to potential threats to staff and operational safety. There must be adequate maintenance equipment and personnel with a comprehensive maintenance plan in place.
- Regular checks and maintenance should be conducted to braking, steering, mast assembly, control, warning, and safety devices to keep them in good condition.
- Any modification to the truck's safety mechanisms is prohibited. The operational speeds of the truck must not be changed under any circumstances.
- To ensure safe and reliable operation of the truck, use only the manufacturer's spare parts.
- Used parts, oils and fuels must be disposed of in accordance with the relevant environmental protection regulations. For oil changes refer to the Service Manual.

Cleaning

- Do not use liquids to clean the truck.
- Prior to cleaning, all safety measures must be observed to prevent sparking (e.g., through short circuits). For battery-operated trucks, the battery connector must be removed.
- Only light suction, compressed air, or non-conductive antistatic brushes may be used for cleaning electric or electronic assemblies.
- Do not clean with pressurized water.

Electrical System

Only suitably trained personnel may perform maintenance on the truck's electrical system. Refer to the Service Manual for additional information.

Retirement/Disposal

Proper disposal of the truck must be performed in accordance with the regulations of the country of application. Regulations governing the disposal of batteries, fuels and electronic and electrical systems must be observed.

Troubleshooting

Use this guide to identify and resolve basic faults. For further assistance refer to a qualified service technician.

Fault	Possible cause	Action
Truck does not start.	• Battery is not connected. • Key switch in 'OFF' position • Safety gates are open • Emergency disconnect switch is pressed • Foot switch not pressed • Battery charge too low • Faulty fuse • Truck is in charge mode	• Check the battery connector and connect if necessary. • Set key switch to 'ON' • Close the safety gates • Unlatch emergency disconnect switch • Press foot switch • Check battery charge and charge if necessary • Test fuses • Interrupt charging
Load cannot be lifted	• Hydraulic oil level too low • Excessive load • Fuse blown	• Check the hydraulic oil level • Note maximum capacity (see data plate) • Check fuses

To provide targeted and rapid response to faults, provide the following details to your local dealer:

- Truck serial number
- Display unit error number (if present)
- Error description
- Current location of truck

Obtaining a Service Manual and Parts List

A service manual and complete parts list covering this vehicle are available from Blue Giant. To order, obtain the serial number of your vehicle and contact your Blue Giant Authorized Dealer.

You may also visit <https://www.bluegiant.com/en/contact-us/>

Rated Life: Please note every vehicle has a finite life.

Blue Giant advises the lifespan of these vehicle models to be ~4000 hrs.



Corporate 410 Admiral Blvd
Mississauga, ON, Canada L5T 2N6
t 905.457.3900

USA 6350 Burnt Poplar Road
Greensboro, NC 27409
www.bluegiant.com