

# OWNER'S MANUAL

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## LPJ-44 SELF-PROPELLED PALLET LIFT TRUCK



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**<sup>®</sup>

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## WARNING

Do not operate this truck unless you have been authorized and trained to do so, and have read all warnings and instructions in Operator's Manual and on this truck.

Do not operate this truck until you have checked its condition. Give special attention to wheels, horn, battery, controller, lift system, brakes, steering mechanism, guards and safety devices.

Operate truck only from designated operating position. Do not carry passengers. Keep feet clear of truck and wear foot protection.

Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.

Start, stop, travel, steer and brake smoothly. Slow down for turns and on uneven or slippery surfaces that

could cause truck to slide or overturn. Use special care when traveling without load as the risk of overturn may be greater.

Always look in direction of travel. Keep a clear view, and when load interferes with visibility, travel with load trailing.

Use special care when operating on ramps travel slowly, and do not angle or turn. Travel with load downhill.

Do not handle loads which are higher than the chassis unless load is secured so that no part of it could fall backward. Before lifting, be sure load is centered, forks are completely under the chassis backrest.

When leaving truck, neutralize travel control, fully lower lifting mechanism and set brake. When leaving truck unattended, also shut off power.

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**NOTES**

## SECTION 1 DESCRIPTION

### 1-1. INTRODUCTION.

This publication describes the 48 volt LPJ-44 lift truck distributed by Blue Giant. Included are operating instructions, planned maintenance instructions, lubrication procedures, corrective maintenance procedures and a complete parts list with part location illustrations.

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 will receive many years of dependable service from your LPJ-44 lift truck.

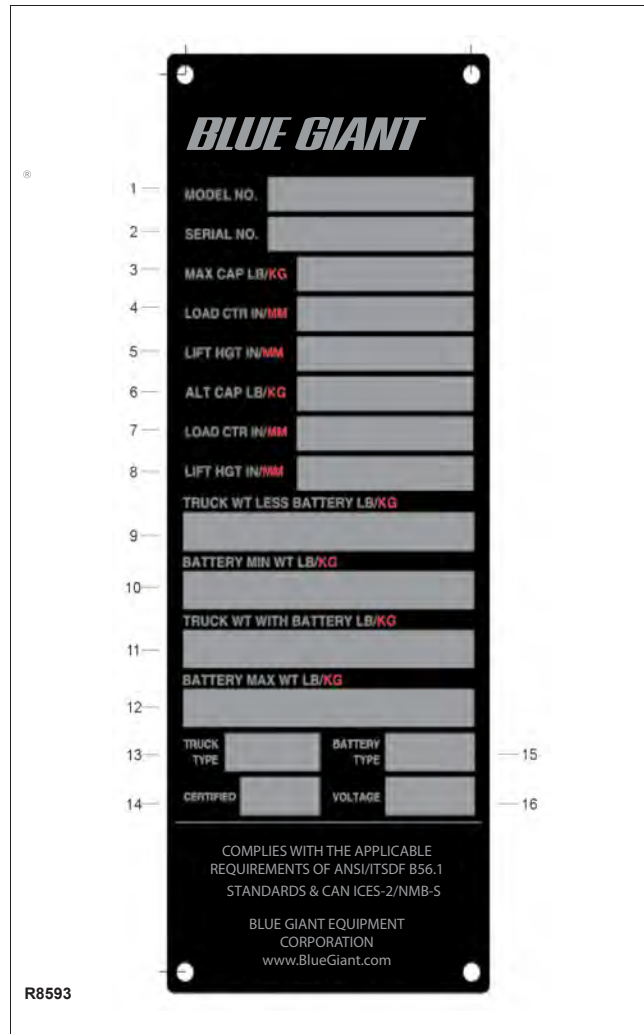
### 1-2. GENERAL DESCRIPTION.

The self-propelled LPJ-44 truck, [Figure 1-2](#), lifts and transports payloads up to 4400 pounds on rigid forks.

The forward and reverse motion is controlled by either of two controller levers mounted on the control head. Stopping and turning is controlled by the steering arm. Lift and Lower is controlled by pushbuttons on the control head. The battery powered lift truck is quiet and without exhaust fumes.

The reversible AC motor propels the lift truck in forward or reverse direction throughout the available speed range. The LPJ-44 lift truck can be driven with forks raised or lowered. The lift truck must be protected from the elements.

The model number will be found on the name plate ([Figure 1-1](#)) along with the serial number, lifting capacity, and load center. [Figure 1-2](#) shows the locations of the truck's main components and controls.

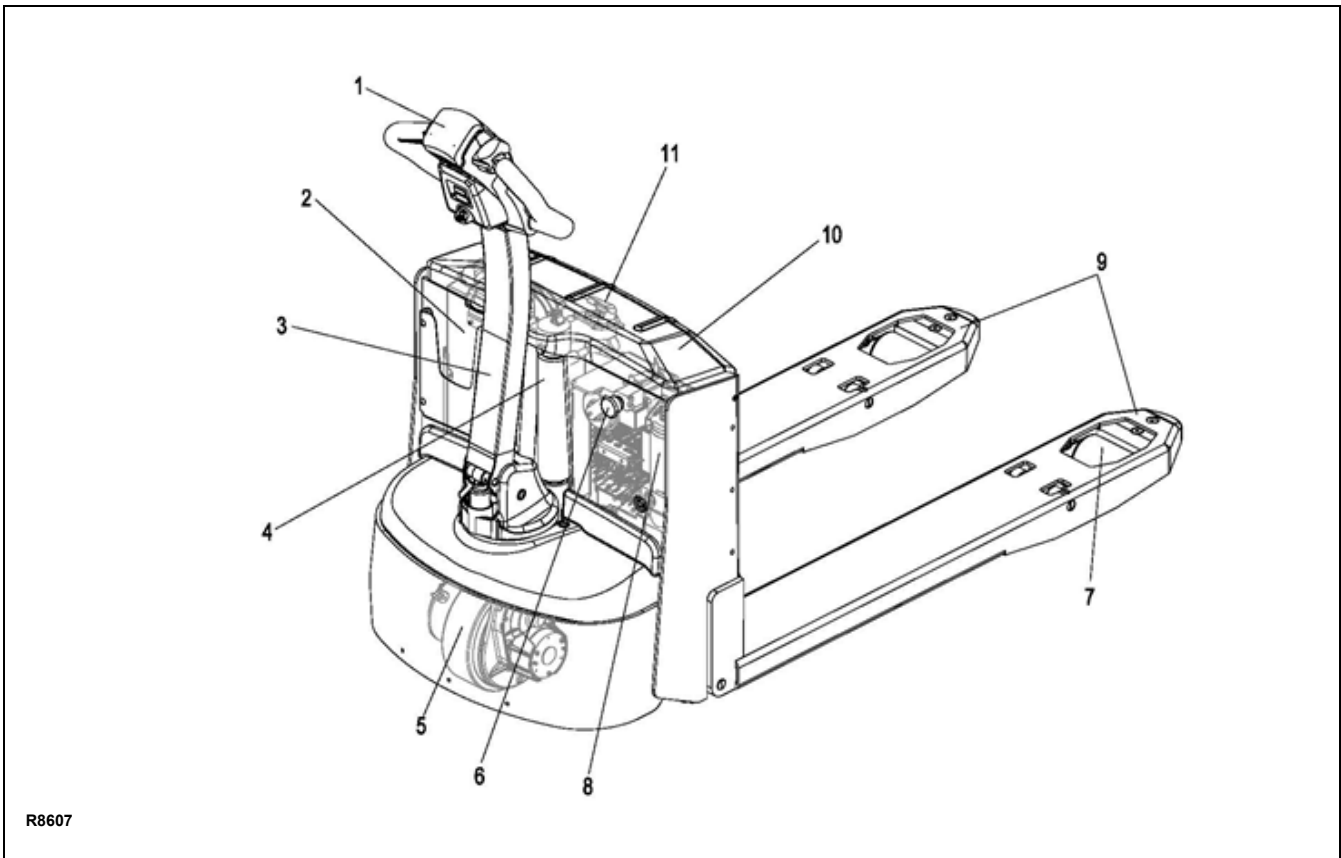


**Figure 1-1 Name Plate**

**Table 1-1 Name Plate Description**

Item	Description	Item	Description
1	Model no.	9	Truck wt less battery (Lbs./kg)
2	Serial no.	10	Battery min wt (Lbs./kg)
3	Max cap (Lbs./kg)	11	Truck wt with battery (Lbs./kg)
4	Load ctr (In./mm)	12	Battery max wt (Lbs./kg)
5	Lift hgt (In./mm))	13	Truck type
6	Alt cap (Lbs./kg)	14	Certified
7	Load ctr (In./mm))	15	Battery type
8	Lift Hgt (In./mm))	16	Voltage

For queries regarding the truck or ordering spare parts please quote the truck serial number(2).



**Figure 1-2 . LPJ-44 Lift Truck**

Item	Component	Item	Component
1	Control head	7	Load wheels
2	Battery	8	Pump & motor assembly
3	Control handle	9	Forks
4	Lift cylinder	10	Cover
5	Drive wheel	11	Charger cable
6	Emergency stop switch		

**1-3. SAFETY FEATURES.**

The LPJ-44 is designed and engineered to provide maximum safety for operator and payload. Some of the safety features incorporated into the design are:

- Dead-man brake to apply the brake and cut off drive power when the steering arm is released.
- Belly-button switch to reverse truck should the operator accidentally pin himself against a wall or obstruction when backing up in slow speed.
- All control functions automatically return to “OFF” when released.

- Emergency Disconnect within operator's reach.
- Readily accessible horn button.
- Handle to provide a firm hand hold for operator.
- 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

**1-2**

## SECTION 2 OPERATION

### 2-1. GENERAL.

This section gives detailed operating instructions for the LPJ-44 lift truck. The instructions are divided into the various phases of operations, such as operating lift, driving, and stopping. Routine precautions are included for safe operation.

### 2-2. OPERATING PRECAUTIONS.

**WARNING:** Improper operation of the lift truck may result in operator injury, or load and/or lift truck damage. Observe the following precautions when operating the LPJ-44 lift truck.

The following safety precautions must be adhered to at all times.

- Do not operate this truck unless you have been trained and authorized to do so and have read all warnings and instructions in this manual and on the truck.
- All warnings and instructions must be read and understood before using the equipment.
- Equipment must be inspected by a qualified person on a regular basis.
- Do not operate this truck until you have checked its condition. Give special attention to Wheels, Horn, Batteries, Controller, Lift System, Brakes, Steering Mechanism, Guards and Safety Devices
- Operate truck only from designated operation position. Wear foot protection. Do not carry passengers.
- Observe applicable traffic regulations. Yield right of way to pedestrians. Slow down and sound horn at cross aisles and wherever vision is obstructed.
- Start, stop, travel, steer and brake smoothly. Slow down for turns and on uneven or slippery surfaces that could cause truck to slide or overturn. Use special care when traveling without load as the risk of overturn may be greater.
- Always look in direction of travel. Keep a clear view, and when load interferes with visibility, travel with load or lifting mechanism trailing.
- Do not overload truck. Check nameplate for load weight and load center information.
- Before lifting, be sure load is centered, forks are completely under load, and load is as far back as possible against the chassis.
- Do not handle loads which are higher than the chassis unless load is secured so that no part of it could fall backward.
- When leaving truck, neutralize travel control. Fully lower lifting mechanism and set brake. When leaving truck unattended, turn off key switch and disconnect switch, and remove key.

### 2-3. BEFORE OPERATION

**Table 2-1** covers important inspection points on the LPJ-44 lift truck which should be checked prior to operation. Depending on use, some trucks may require additional checks.

**Figure 2-1** shows a sample format for an Operator Checklist, which can be modified as necessary to fit your operation.

**WARNING:** Periodic maintenance of this truck by a QUALIFIED TECHNICIAN is required.

**CAUTION:** A QUALIFIED SERVICE TECHNICIAN should check the truck monthly for proper lubrication, proper fluid levels, brake operation, motor maintenance and other areas specified in the **SECTION 3**.

**WARNING:** If the truck is found to be unsafe and in need of repair, or contributes to an unsafe condition, report it immediately to the designated authority. Do not operate it until it has been restored to a safe operating condition. Do not make any unauthorized repairs or adjustments. All service must be performed by a qualified maintenance technician.

**Table 2-1 Operator Checks**

ITEM	PROCEDURE
Transmission and hydraulic systems.	Check for signs of fluid leakage.
Forks	Check for cracks and damage.
Safety signs	Check that warning labels, nameplate, etc., are in good condition and legible.
Horn	Check that horn sounds when operated.
Steering	Check for binding or looseness in steering arm when steering.
Travel controls	Check that speed controls on control head operate in all speed ranges in forward and reverse and that belly button switch functions.

ITEM	PROCEDURE
Wheels	Check drive wheel for cracks or damage. Move truck to check load for freedom of rotation.
Hydraulic controls	Check operation of lift and lower to their maximum positions.
Brake	Check that brake actuates when steering arm is raised to upright position, and when lowered to horizontal position.
Deadman/ Parking brake	Check that steering arm raises to upright position when released and brake applies.
Battery disconnect	Check that battery can be disconnected and reconnected. Check for connector damage.
Battery charge	Check the battery indicator.



**BLUE GIANT®**

**Electric Truck  
Daily Operator Check-Off List**

Date \_\_\_\_\_ Operator \_\_\_\_\_

Truck No. \_\_\_\_\_ Model No. \_\_\_\_\_

Dept. \_\_\_\_\_ Shift \_\_\_\_\_

Hour Meter  
Reading—Drive \_\_\_\_\_ Hoist \_\_\_\_\_

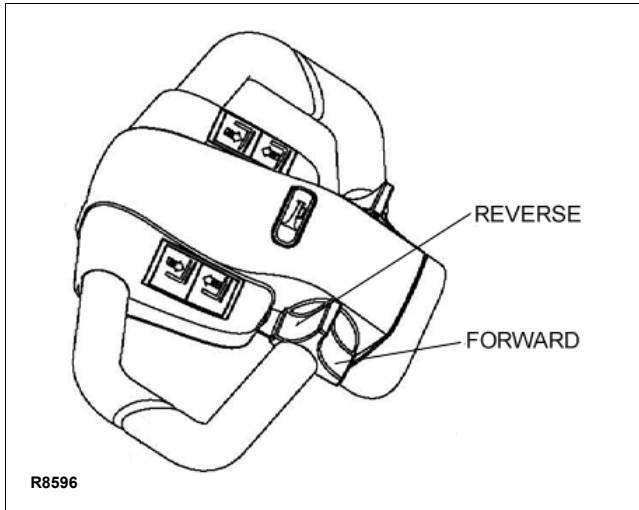
Check	O.K. (✓)	Need Maintenance
Tires		
Load Wheels		
Horn		
Lift—Lower Control		
Attachment Operation		
Forward & Reverse Controls		
Steering		
Brakes		
Hydraulic Leaks, Cylinders, Valves, Hoses, Etc.		

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**Figure 2-1 Sample of Operator Check List**

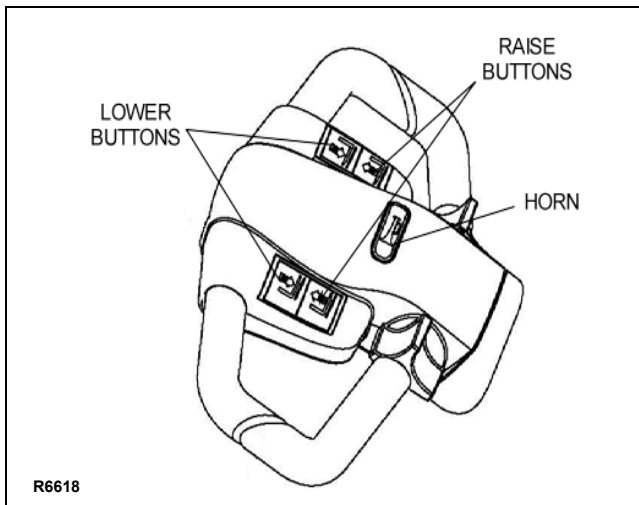
## 2-4. GENERAL CONTROL OPERATION.

The speed control (See [Figure 2-2](#)) located on each side of the control head provides fingertip control for driving the truck. Rotate the control in the direction you want to travel. The farther you rotate the control from the neutral position, the faster the truck will travel.



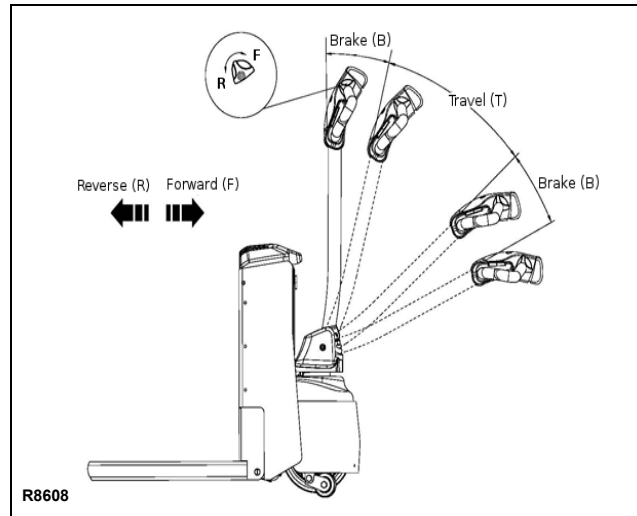
**Figure 2-2 Forward/Reverse Control**

The pushbutton switches (See [Figure 2-3](#)), located on the front of the control head activate the lift-lower controls and the horn.



**Figure 2-3 Pushbutton Switches**

The brake is fully applied by lowering or raising the steering arm. (See [Figure 2-4](#)) All traction control power is shut off when the brake is engaged. When the steering arm is in the upright position, the brake acts as a parking brake. Deadman braking occurs when the handle is released and spring action raises steering arm to the upright position.



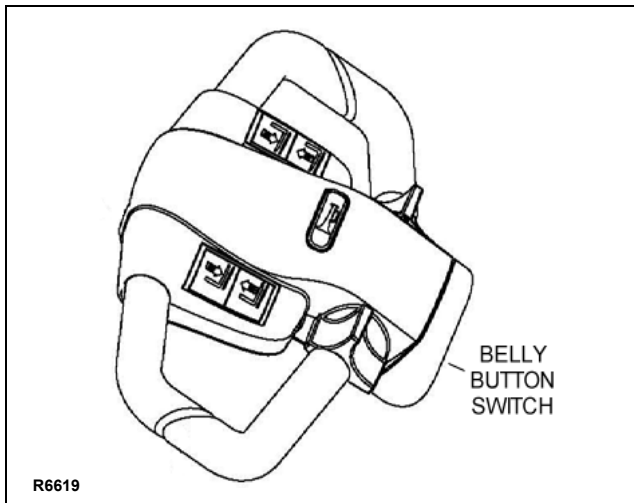
**Figure 2-4 Brake Actuation**

## 2-5. DRIVING AND STOPPING PROCEDURES.

1. Turn on the emergency disconnect and the key switch. Grasp the grips of the steering head so that the speed control can be comfortably operated by either thumb.
2. Lower the steering arm to a comfortable position above horizontal to disengage the brake and to energize the electrical circuits. If the truck is not moved, the electrical circuits will time out and will deenergize. See [Figure 2-4](#).
3. To move forward (with load trailing you), slowly press the speed control towards you. See [Figure 2-2](#). Press the forward speed control farther to increase speed.
4. To slow down or stop, release the speed control and lower or raise the steering arm to the horizontal or vertical position. See [Figure 2-4](#). In those positions, the brake engages, slowing or stopping the truck.
5. Procedures for movement in reverse are the same as in the forward direction except slowly press the speed control in the opposite direction. See [Figure 2-2](#).

## 2-6. BELLY-BUTTON SWITCH.

The belly-button switch ([Figure 2-5](#)) minimizes the possibility of the driver being pinned by the steering arm while driving the lift truck in slow speed. If the switch presses against the operator while the lift truck is being driven toward the operator, the switch changes the direction of the lift truck.



**Figure 2-5 Belly-Button Switch**

### 2-7. STEERING ARM RETURN SPRING.

The steering arm return spring automatically raises the steering arm to the upright position when the steering arm is released. If the steering arm does not return fully, the steering arm return spring might require replacement. Return truck to maintenance for repair.

### 2-8. LIFT AND LOWER CONTROLS.

Lift/Lower Control buttons are located on the steering control head. (Figure 2-3)

To lift forks, push in either LIFT button and hold until forks reach desired height. To lower forks, push in either LOWER button and hold until forks descend to desired height.

### 2-9. LOADING AND UNLOADING.

1. Move truck to location where load is to be picked up.
2. Move the truck into position so forks are within pallet or skid, and the load is centered over the forks and as far back as possible.
3. Raise forks to lift load.
4. Drive to area where load is to be placed.
5. Move truck to align load with its new position.
6. Lower the load until it rests squarely in place and the forks are free.
7. Slowly move the truck out from under the load.

### 2-10. PARKING.

When finished with moving loads, return the truck to its maintenance or storage area. Turn off the emergency Disconnect and the key switch. Charge batteries as necessary. Refer to battery care instructions, [SECTION 3](#).

**NOTES**

## SECTION 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 [SECTION 2](#), 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.

[Table 3-1](#) 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 in excess of forty hours per week, the frequency of inspection and service should be increased accordingly. These procedures must be performed by

a qualified service technician or your Blue Giant Service Representative.

### 3-3. BATTERY CARE.

#### 3-3.1. GENERAL

The LPJ-44 is equipped with a Lithium-Ion battery.

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. Ventilate an enclosed area well when charging.

**Table 3-1 Monthly and Quarterly Inspection and Service Chart**

VISUAL CHECKS	
INTERVAL	INSPECTION OR SERVICE
Monthly	Check electrical brake for proper operation.
Monthly	Check load wheels for wear. A poly load wheel must be replaced if worn to within 1/16 inch of hub. Check for separation from hub.
Monthly	Check drive wheel for wear. A poly drive wheel must be replaced if worn to within 3/4 inch of hub. Check for separation from hub.
Monthly	Inspect wiring for loose connections and damaged insulation.
Monthly	Inspect contactors for proper operation.
Monthly	Check deadman brake switch for proper operation.
Quarterly	Check lift cylinder for leakage.
Quarterly	Check for excessive jerking of steering arm when stopping or starting.

**WARNING:** Do not wash the truck.

#### 3-3.2. SAFETY RULES.

- Do not bring any type of flame, spark, etc., near the battery.
- Do not lay metallic or conductive objects on battery. Arcing will 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 charger if it has been dropped or otherwise damaged.

#### 3-3.3. BATTERY CARE AND CHARGING

**CAUTION:** Never smoke or bring open flame near the battery.

1. Charge the battery only in areas designated for charging.

### 3-3.4. BATTERY CLEANING

### 3-3.5. LITHIUM BATTERIES

The truck is equipped with maintenance free Lithium-Ion battery. This battery is completely sealed and will not require any watering and have a full 80% discharge available.

**CAUTION:** Do not try to open this battery.

Do not connect to an improperly sized charger since severe overcharging or undercharging could happen.

Always use an OEM charger.

### 3-4. CHARGING BATTERIES

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

#### 3-4.1. USING INTERNAL CHARGER

Proceed as follows:

1. Park truck at charging station with forks lowered and turn the key switch off.
2. Check the condition of the AC cord. 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. Pull the charger cord (1) out of the top cover (Figure 3-1) and connect to the appropriate power supply.

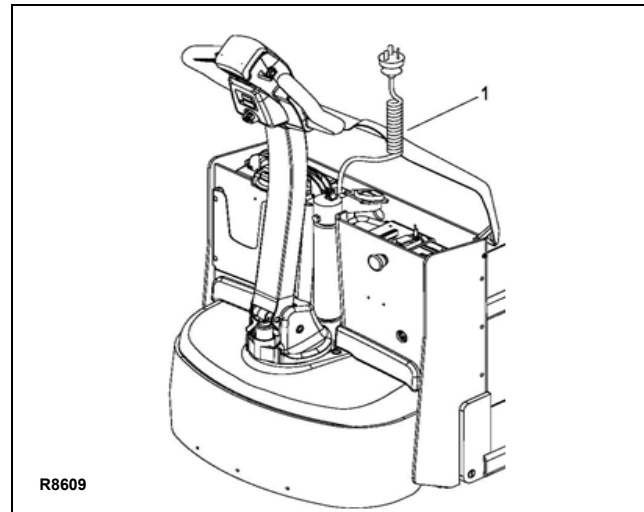


Figure 3-1 Internal Battery Charging

#### 3-4.2. USING EXTERNAL CHARGER

Proceed as follows:

1. Park truck at charging station with forks lowered and turn the key switch off.
2. Unlock the battery lock and with the battery handle slowly pull the battery straight up.
3. Make sure the charger is plugged in and then insert the battery to the charger cradle.
4. The LED lights should light up.

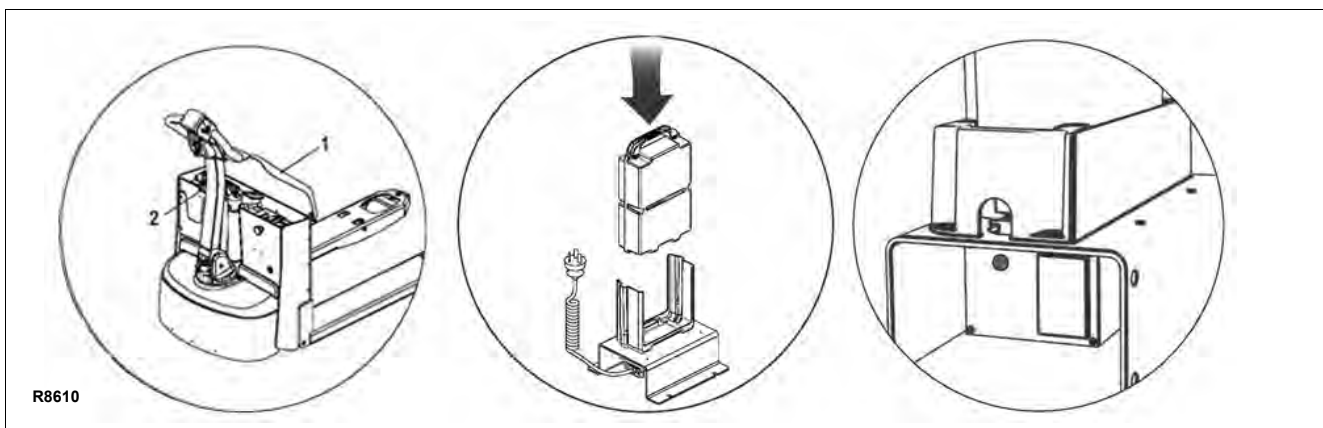








Figure 3-2 External Battery Charging

**Table 3-2 Charger LED Status Indicator**

INDICATOR	COLOR	DESCRIPTION
	Solid Red	Charger Fault - (See display panel for details)
	Flashing Amber	External error condition - Caution (See display panel for details)
	Flashing Green	USB port active
	Solid Green	Safe to remove USB flash drive
	Flashing Green	Low state of charge
	Solid Green	High state of charge
	Flashing Green	High state of charge
	Solid Green	Charge completed
	Solid Blue	AC power available

**3-5. BATTERIES REPLACEMENT**

1. Park truck with forks lowered and turn the key switch off.
2. Unlock the battery lock and with the battery handle slowly pull the battery straight up.
3. Install in the reverse order of remove.

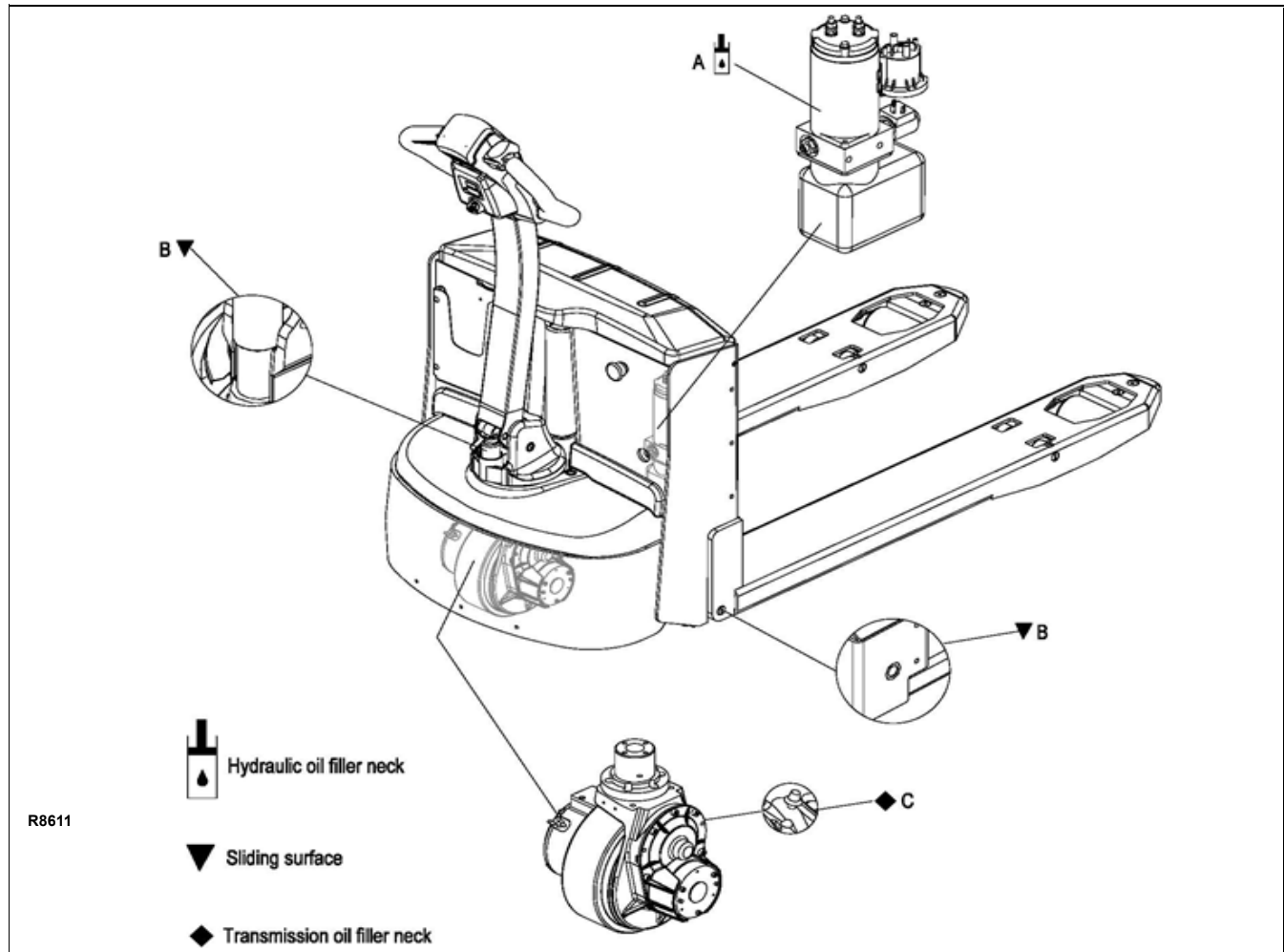


**3-6. LUBRICATION.**

**Table 3-3 (See Table 3-4 for Application)**

A	<b>Ambient:</b> L-HM32#(Cleanliness grade 9,in compliance with NAS1638) <b>Cold Store:</b> L-HV32
B	Grease (Polylube GA352P) Multi-purpose
C	Grease(MoS2)

Refer to [Table 3-3](#) for the recommended types of grease and oil. [Table 3-4](#) in conjunction with [Figure 3-3](#) identifies the items requiring lubrication.



**Figure 3-3 Recommended Lubricants**

**Table 3-4 Lubrication Chart**

FIG 3-3 INDEX NO.	LOCATION	METHOD OF APPLICATION	TYPE (Table 3-3)	APPLICATION OF LUBRICANT
A	Hydraulic Reservoir - <b>Ambient</b>	Can	A (0.5qt./0.48L)	With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening
	Hydraulic Reservoir - <b>Cold Store</b>			
B	Linkage / Moving surfaces	Gun	B	Pressure lubricate.
C	Transmission	Can	C	Fill to level plug opening

\* Raise lift carriage to gain access to grease fittings.

**3-4**



## SECTION 4 TROUBLESHOOTING

### 4-1. GENERAL

Use [Table 4-1](#) and [Figure 4-3](#) as a guide to determine possible causes of trouble. The table is divided into five main categories: Truck and Hydraulic System Will Not Operate:

Truck Does Not Operate Forward or Reverse: Trouble With Braking: Trouble With Lifting Or Lowering, and Miscellaneous malfunctions.

**Table 4-1 Troubleshooting Chart**

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
<p><b>TRUCK AND HYDRAULIC SYSTEM WILL NOT OPERATE</b> Truck will not travel nor will lift system operate.</p>	<p>a. Fuse blown. b. Battery dead or disconnected. c. Keyswitch defective. d. Defective wiring.</p>	<p>Check fuse and replace if necessary. Check battery connections and check battery voltage. Bypass keyswitch to determine if it is malfunctioning. Check for open circuit. Repair as required.</p>
<p><b>TRUCK DOES NOT OPERATE FORWARD OR REVERSE</b> Truck does not travel forward or reverse. All other functions operate normally.</p> <p>Truck travels forward but not in reverse.</p> <p>Truck travels reverse but not in forward.</p> <p>Truck travels forward and in reverse at lower speeds; will not travel at high speed.</p>	<p>a. Check all wiring. A loose connection may be the cause of malfunction. b. Defective deadman switch. c. Defective controller. d. Defective potentiometer.</p> <p>Defective potentiometer in control head.</p> <p>Defective potentiometer in control head.</p> <p>Defective potentiometer in control head.</p>	<p>Tighten all loose connections before further troubleshooting. Check and replace switch if defective. Check for proper operation and replace if necessary. Check and replace potentiometer if defective. Check and replace potentiometer if defective. Check and replace potentiometer if defective.</p>
<p><b>TROUBLE WITH BRAKING</b> Truck does not slow with brake, or brake does not engage.</p> <p>Brake will not release.</p>	<p>a. Defective deadman switch. b. Defective electric brake.</p> <p>a. Brake temperature above 281° F (140° C). b. Open brake circuitry or wiring.</p>	<p>Check deadman switch for continuity. If none found when the control arm is in the brake position, replace switch. Replace brake. Allow to cool. Make voltage checks.</p>

**Table 4-1 Troubleshooting Chart - Continued**

MALFUNCTION	PROBABLE CAUSE	CORRECTIVE ACTION
<p><b>TROUBLE WITH BRAKING - Continued</b></p> <p>Brake drags.</p> <p>Brake grabs.</p> <p>Abnormal noise and chatter when brake is applied.</p>	<p>Defective electric brake.</p> <p>Defective electric brake.</p> <p>Defective electric brake.</p>	<p>Replace.</p> <p>Replace.</p> <p>Replace.</p>
<p><b>TROUBLE WITH LIFTING OR LOWERING</b></p> <p>Oil sprays or flows from the top of the lift cylinder.</p> <p>Squealing sounds when lifting forks.</p> <p>Forks do not lift to top.</p> <p>Weak, slow or uneven action of hydraulic system.</p> <p>Forks do not lift, pump motor does not run.</p>	<p>Defective packing in lift cylinder</p> <p>a. Oil level too low.</p> <p>b. Lift linkage binding.</p> <p>Oil level too low.</p> <p>a. Defective pump or relief valve.</p> <p>b. Worn lift cylinder.</p> <p>c. Load larger than capacity.</p> <p>d. Defective lift motor solenoid.</p> <p>e. Battery charge low.</p> <p>a. Battery is dead or disconnected.</p> <p>b. Defective wiring.</p> <p>c. Defect in electrical system for operating pump motor.</p>	<p>Repair lift cylinder.</p> <p>Identify oil leak.</p> <p>Apply grease.</p> <p>Add oil to reservoir.</p> <p>Check pressure. Adjust as necessary.</p> <p>Replace cylinder.</p> <p>Refer to I.D.plate for capacity.</p> <p>Replace solenoid on electrical panel.</p> <p>Charge battery.</p> <p>Check and recharge if required.</p> <p>Check and repair as required.</p> <p>Check lift switch in control head, as well as the solenoid.</p>
<p>Forks do not lift, motor runs.</p>	<p>Defect in hydraulic system.</p>	<p>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.</p>

**Table 4-1 Troubleshooting Chart - Continued**

<b>MALFUNCTION</b>	<b>PROBABLE CAUSE</b>	<b>CORRECTIVE ACTION</b>
<p><b>TROUBLE WITH LIFTING OR LOWERING - Continued</b></p> <p>Forks lift, but will not go down.</p>	<p>Defect in hydraulic system</p>	<p>Check lowering control switch in control head and lowering solenoid on valve assembly). Replace as required.</p>
<p>Load will not hold</p> <p>Platform does not lift to top. Pump motor runs.</p> <p>Forks creep downward under load when in a raised position.</p>	<p>a. Oil bypassing internally in control valve</p> <p>b. Worn lift cylinder or packing.</p> <p>a. Oil level too low.</p> <p>b. Load larger than capacity.</p> <p>c. Batteries need charging.</p> <p>Leak in hydraulic system, lift cylinder or lowering valve.</p>	<p>Replace valve assembly.</p> <p>Repack cylinder.</p> <p>Add oil to reservoir.</p> <p>Refer to nameplate on side of mast for maximum load capacity.</p> <p>Change batteries.</p> <p>Check for leaking fitting in hydraulic line and repair as required.</p> <p>Repack lift cylinder or replace valve assembly.</p>
<p><b>MISCELLANEOUS</b></p> <p>Steering arm does not return to the upright position.</p> <p>Truck moves forward when arm is pulled down.</p> <p>Steering arm jerks excessively starting or stopping the truck.</p> <p>Drive motor is jerky.</p>	<p>a. Weak return spring.</p> <p>b. Binding.</p> <p>a. Belly-button switch defective.</p> <p>b. Short in control head.</p> <p>Drive wheel worn.</p> <p>Motor internally damaged or worn.</p>	<p>Replace spring.</p> <p>Check and free the binding item. Verify that the cable has not been damaged. Repair or replace as needed.</p> <p>Check for short, and repair or replace as necessary.</p> <p>Check wiring and repair as required.</p> <p>Replace drive wheel if worn to within 3/4 inch of hub.</p> <p>Replace motor.</p>

**4-2. CONTROLLER TROUBLESHOOTING**

**4-2.1. Fault Detection.**

The controller provides diagnostics information to assist technicians in troubleshooting drive system problems. When a fault is detected, the appropriate fault code is signaled via the panel mounted LED.

**4-2.2. Hand Held Programmer (Optional)**

The hand held programmer is available that is designed specifically for use with the controller. The programmer is available through your Blue Giant dealer.

**4-2.3. Fault Recording.**

Fault events are recorded in the controller's memory. However, multiple occurrences of the same fault are recorded as one occurrence.

The fault event list can be loaded into the programmer for readout. The Special Diagnostics mode provides access to the controller's diagnostic history file. The history file contains the entire fault event list created since the diagnostic history file was last cleared. The standard Diagnostics mode provides information about only the currently active faults.

**4-2.4. General Checkout.**

Carefully complete the following checkout procedure. If you find a problem during the checkout, refer to paragraph 4-2.7. for further information.

The checkout can be conducted with or without the hand held programmer (See Paragraph 4-2.2.). However, the checkout procedure is easier with a programmer. To evaluate the system without a programmer, observe the LED and note the flashing pattern and refer to Table 4-3 for the code description.

**CAUTION:** Put the vehicle up on blocks to get the drive wheel off the ground before beginning these tests.

Turn the keyswitch off and make sure the brake is applied, the throttle is in neutral, and the forward/reverse switches are open.

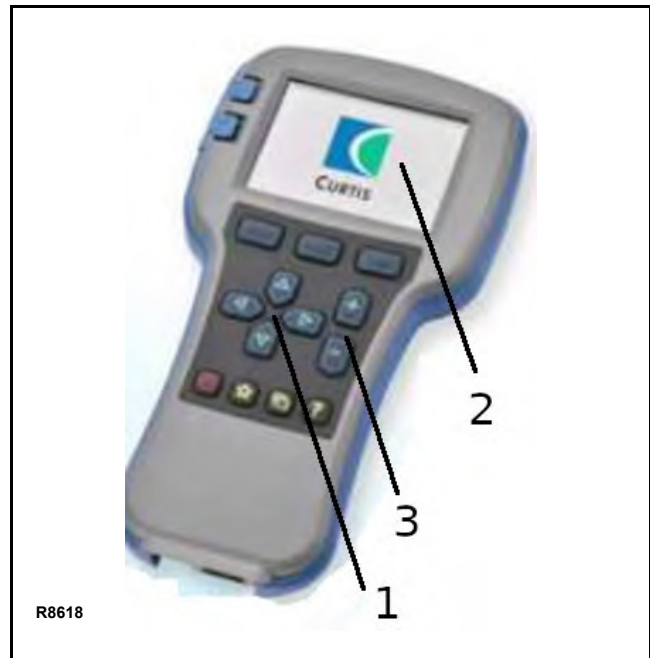
Do not stand, or allow anyone else to stand directly in front of or behind the vehicle during the tests.

1. Disconnect the battery charger and connect the programmer to the 4-pin connector (Figure 4-1) on the controller.



**Figure 4-1. Controller Terminals**

2. Turn the lift truck key switch to the ON position. The programmer should “power up” with an initial display (2, Figure 4-2), and the controller's Status LED should begin steadily blinking a single flash. If neither happens, check for continuity in the key switch circuit and controller ground.



**Figure 4-2. Hand Held Programmer**

3. Put the controller into the diagnostic mode by pressing the “Menu Navigation Key”. Using the Navigation key, select the Faults menu. Display the Faults menu by pressing the Right side of the Navigation key. Press the Right side of the Navigation key again to display the list of System Faults. The display should indicate “No Known Faults.”

Release the brake by pulling down the steering arm into the operating position. The controller's LED should continue blinking a single flash and the programmer should continue to indicate no faults. If there is a problem, the LED will flash a diagnostic code and the programmer will display a diagnostic message. If you are conducting the checkout without a programmer, look up the LED diagnostic code in Table 4-3.

When the problem has been corrected, it may be necessary to cycle the brake in order to clear the fault code.

4. With the brake released, select a direction and operate the throttle. The motor should begin to turn in the selected direction. If it does not, verify the wiring to the forward/reverse switches and motor. The motor should run proportionally faster with increasing throttle. If not, refer to Paragraph 4-2.7.
5. Put the controller into the test mode by using the Navigation key (1) to select the "Monitor" menu. Select the Monitor mode by pressing the "Right"

arrow on the Navigation key. Press the Navigation key "Down" arrow to scroll down to observe the status of the forward, reverse, brake, emergency reverse, and mode switches. Cycle each switch in turn, observing the programmer. Each input should show the correct state on the programmer.

6. Check the controller's fault detection circuitry as described in Paragraph 4-2.5.
7. Take the vehicle off the blocks and drive it in a clear area. It should have smooth acceleration and good top speed.
8. Test the plug braking of the vehicle. The vehicle should smoothly slow to a stop and reverse direction, with the audible plugging tone.
9. Verify that all options, such as high pedal disable (HPD), static return to off (SRO), and anti-tie-down, are as desired.
10. Check to see whether the emergency reverse (belly button) feature is working correctly. Verify that the circuit is operational by momentarily disconnecting one of the emergency reverse wires. The vehicle should be disabled and a fault indicated.

#### 4-2.5. Diagnostic History

The handheld programmer can be used to access the controller's diagnostic history file. When the programmer is connected to the unit, the error log file is automatically uploaded into the handheld programmer.

To see the present status of the unit, use the Menu Navigation Key (1, Figure 4-2) to select:

Faults->System Faults.

To access this log, use the Menu Navigation Key to select:

Faults->Fault History

The faults are shown as a code and descriptive text. If there are multiple faults, you have to scroll through the list using the Up and Down Buttons on the Menu Navigation Key. The faults may be intermittent faults, faults caused by loose wires, or faults caused by operator errors. Faults such as HPD or over-temperature may be caused by operator habits or by overloading.

After a problem has been diagnosed and corrected, clearing the diagnostic history file is recommended. This allows the controller to accumulate a new file of faults. By checking the new diagnostic history file at a later date, you can quickly determine whether the problem has been completely fixed. To clear the diagnostic history file, select:

Faults->Clear Fault History.

You will be asked to confirm your actions. Use the "plus" arrow (+) for yes to clear the menu and the "minus" arrow (-) (3) to cancel your selection and not clear the Fault History.

#### 4-2.6. Test the Fault Detection Circuitry

1. Put the vehicle up on blocks to get the drive wheel off the ground.

1. Turn off the key switch and engage the emergency disconnect.
2. Using an inline fuse holder fitted with a 10 amp fuse and alligator clips, connect the controller's M and B- terminals.
3. Turn on the emergency disconnect (17) the key switch (20). Release the brake and apply the throttle. The motor should not operate.
4. Leave the key switch on and remove the in-line fuse wire. The vehicle status should continue to remain off.
5. Cycle the key switch off and on. Release the brake and apply the throttle. The vehicle should now operate normally.

#### 4-2.7. Diagnostics and Troubleshooting.

The motor controller provides diagnostics information to assist in troubleshooting drive system problems. The diagnostics information can be obtained in two ways:

- Reading the appropriate display on the programmer
- Observing the fault codes issued by the panel mounted Status LED.

##### 4-2.7.1. LED Diagnostics

During normal operation with no faults present, the Status LED is steady on. If the controller detects a fault the Status LED flashes a fault identification code continuously until the fault is corrected.

**NOTE:** The Status LED can only indicate one fault at a time. If multiple faults are detected, the highest priority fault code flashes until it is cleared.

#### 4-2.8. Programmer Diagnostics

With a programmer, diagnostics and troubleshooting is more direct than with the LED alone. The programmer presents complete diagnostic information in plain language - no code to decipher. Faults are displayed in the Diagnostic Menu, and the status of the controller inputs/outputs is displayed in the Test Menu.

The following 4-step process is generally used for diagnosing and troubleshooting an inoperative vehicle using the programmer:

1. Visually inspect the vehicle for obvious problems:
  2. Diagnose the problem:
  3. Test the circuitry with the programmer:
  4. Correct the problem.
- Repeat the last three steps as necessary until the vehicle is operational.

Refer to the Table 4-3 for suggestions covering a wide range of possible faults

**Table 4-2 Programmable Parameter**

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>SPEED</b>			
Max Speed	0%-100%	95%	defines the requested speed at full throttle during forward operation
Min Speed	0%-100%	0%	defines the requested speed at no throttle during forward operation
Rev Max Speed	0%-100%	95%	defines the requested speed at full throttle during reverse operation
Rev Min Speed	0%-100%	0%	defines the requested speed at no throttle during reverse operation
Full Accel Rate HS	0.1s-8.0s	4.0	Sets the rate (in seconds) at which the speed command increases when full throttle is applied at high vehicle speeds. Larger values represent slower response. See Figure 1 for relationship between Full Accel Rate HS, Full Accel Rate LS, and Low Accel Rate
Full Accel Rate LS	0.1s-8.0s	3.0	Sets the rate (in seconds) at which the speed command increases when full throttle is applied at low vehicle speeds.
Low Accel Rate	0.1s-8.0s	3.0	Sets the rate (in seconds) at which the speed command increases when a small amount of throttle is applied. This rate is typically adjusted to affect low speed maneuverability
Neutral Decel Rate HS	0.1s-8.0s	1.5	Sets the rate (in seconds) that is used to slow down the vehicle when the throttle is released to neutral at high vehicle speeds.
Neutral Decel Rate LS	0.1s-8.0s	1.8	Sets the rate (in seconds) that is used to slow down the vehicle when the throttle is released to neutral at slow vehicle speeds.
Full Brake Rate HS	0.1s-8.0s	0.8	Sets the rate (in seconds) at which the vehicle slows down from high speeds when full throttle is applied in the opposite direction. See Figure 2 for relationship between Full Brake Rate HS, Full Brake Rate LS, and Low Brake Rate.
Full Brake Rate LS	0.1s-8.0s	0.8	Sets the rate (in seconds) at which the vehicle slows down from low speeds when full throttle is applied in the opposite direction.
Low Brake Rate	0.1s-8.0s	0.8	Sets the rate (in seconds) at which the vehicle slows down at all speeds when a small of throttle is applied in the opposite direction.
Partial Decel Rate	0.1s-8.0s	1.5	Sets the rate (in seconds) that is used to slow down the vehicle when the throttle is reduced without being released to neutral. Larger values represent slower response.
<b>FINE TUNING</b>			
HS(High Speed)	0%-100%	90%	Sets the percentage of the Typical Max Speed above which the "HS" parameters will be used.
LS(Low Speed)	0%-100%	10%	Sets the percentage of the Typical Max Speed below which the "LS" parameters will be used

Table 4-2 Programmable Parameter - Continued

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>THROTTLE</b>			
Throttle Type	1-7	7	The throttle type parameter can be programmed as follow: 1 = 0-5K 2-wire rheostat 2 = 3-wire potentiometer 3 = 5K-0 2-wire rheostat 4 = wigwag 3-wire potentiometer 5 = 0-5V voltage source 6 = 0-5V wigwag 7 = CAN throttle(CAN version only)
Forward Deadband	0%-100%	10%	Defines the wiper voltage at the throttle deadband threshold. Increasing the throttle deadband setting will increase the neutral range.
Forward Max	0%-100%	90%	Defines the wiper voltage required to produce 100% controller output.
Forward Offset	0%-100%	0%	Defines the initial controller output generated when the throttle is first rotated out of the neutral deadband.
Forward Map	0%-100%	50%	Modifies the vehicle's response to the throttle input. Setting the throttle map at 50% provides a linear output response to throttle position.
Reverse Deadband	0%-100%	10%	The four Throttle Reverse parameters are the same as their Throttle Forward counterparts, and apply when the throttle direction is reversed.
Reverse Max	0%-100%	90%	
Reverse Offset	0%-100%	0%	
Reverse Map	0%-100%	50%	
Throttle Filter	0.5-125Hz	50	Sets the low pass filter cutoff frequency for the throttle pot wiper input.
HPD/SRO Type	0-1	1	0 = HPD/SRO feature is disabled 1 = HPD/SRO enabled for material-handling vehicles. HPD: If throttle input is received before interlock input. SRO: If direction input is received before interlock input. The HPD/SRO check is made when the interlock input changes from Off to On. If the throttle input >25% or a direction input is On, an HPD/Sequencing Fault is set. The HPD/Sequencing Fault is cleared by returning the throttle input to <25% and the direction inputs to Off.
Sequencing Delay	0.1-2.0s	0.5	The sequencing delay feature allows the interlock switch to be cycled within a set time (the programmed sequencing delay), thus preventing inadvertent activation of HPD. This feature is especially useful in applications where the interlock switch may bounce or be momentarily cycled during operation.



**Table 4-2 Programmable Parameter - Continued**

<b>PARAMETER</b>	<b>DISPLAY RANGE</b>	<b>DEFAULT</b>	<b>EXPLANATION</b>
<b>INTERLOCK</b>			
Interlock Type	0-1	1	0 = Interlock turns on with input switch 1 = Interlock turns on with KSI 2 = Interlock controlled by CAN bus (CAN version only)
Interlock Brake Enable	On/Off	On	Determines whether the interlock braking function is active. On = The controller will attempt to bring the vehicle to a stop using regen braking when the interlock signal is removed. Off = The controller will disable the bridge after Sequencing Delay expires and allow the vehicle to roll freely when the interlock signal is removed. This option is typically used only when there is a user controlled mechanical or hydraulic brake system.
Decel Rate	0.1-8.0	0.6	Sets the rate (in seconds) that is used to slow down the vehicle when the interlock is released. Larger values represent slower response.
Interlock Brake Timeout	0-8.0s	2.0	Controls the maximum allowable duration of an interlock braking event. The timer starts as soon as the interlock signal is removed. If the time expires before the vehicle has slowed below the Set Speed Threshold, the EM brake will engage automatically. This timeout allows parallel usage of regen braking and the EM brake to reduce stopping distance. If Interlock Brake Timeout expires and the motor is still moving, regen braking will continue to retard vehicle motion in conjunction with the EM brake.
<b>CURRENT LIMITS</b>			
Drive Current Limit	10-100%	100%	Sets the maximum current the controller will supply to the motor during drive operation; the maximum allowable current is model-dependent
Regen Current Limit	10-100%	60%	Sets the maximum current the controller will supply to the motor during regen operation
EMR Current Limit	10-100%	100%	Sets the maximum current the controller will supply to the motor during emergency reverse
<b>POWER LIMITING MAP</b>			
PL Nominal Speed	100-4000	1000	Sets the base speed that will be used in the drive limiting map and regen limiting map
Delta Speed	50-1000	200	Sets the width of the delta increment that will be used in the drive limiting map and regen limiting map.



Table 4-2 Programmable Parameter - Continued

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>DRIVE LIMITING MAP</b>			
Nominal	0-100%	100%	These parameters define the percentage of drive current limit that will be applied at the speeds defined by the nominal speed and delta speed parameters. The resulting map allows the controller to reduce the drive current as a function of speed. Reducing the power requirements at certain speeds restricts performance. This can be useful for reducing motor heating. It can also be used to keep consistent vehicle power with changing battery state-of-charge.
Plus Delta	0-100%	100%	
Plus 2xDelta	0-100%	100%	
Plus 4xDelta	0-100%	100%	
Plus 8xDelta	0-100%	100%	
<b>REGEN LIMITING MAP</b>			
Nominal	0-100%	100%	These parameters define the percentage of regen current limit that will be applied at the speeds defined by the nominal speed and delta speed parameters. The curve can be shaped to limit the available torque at various speeds.
Plus Delta	0-100%	100%	
Plus 2xDelta	0-100%	100%	
Plus 4xDelta	0-100%	100%	
Plus 8xDelta	0-100%	100%	
<b>MOTOR TEMPERATURE CONTROL</b>			
Sensor Enable	On/Off	Off	When programmed On, the motor temperature cutback and the motor temperature compensation features are enabled. This parameter can be used only if a temperature sensor has been properly configured. The motor temperature cutback feature will linearly cut back the current from 100% to 0% between the Temperature Hot and Temperature Max temperatures. The motor temperature compensation feature will adapt the motor control algorithms to varying motor temperatures, for improved efficiency and more consistent performance.
Sensor Type	1-5	3	Five sensor types are predefined in the software: 1 = KTY83-122 2 = 2× Type 1, in series 3 = KTY84-130 or KTY84-150 4 = 2× Type 3, in series 5 = PT1000. Custom sensor types can be set up easily, if none of the five predefined types is appropriate for your application. Please contact your Curtis distributor or support engineer. Note: The industry standard KTY temperature sensors are silicon temperature sensors with a polarity band; the polarity band of a KTY sensor must be the end connected to I/O Ground
Sensor Temp Offset	-20°C - 20°C	0	Often the sensor is placed in the motor at a location with a known offset to the critical temperature; the offset can be corrected with this parameter. The parameter can also be used to correct a known offset in the sensor itself.

**Table 4-2 Programmable Parameter - Continued**

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>MOTOR TEMPERATURE CONTROL - CONTINUED</b>			
Braking Thermal Cutback Enable	<i>On/Off</i>	<i>Off</i>	When programmed On, drive current and all forms of regen braking current will be cut back based on motor temperature. All forms of regen braking current emergency reverse braking, interlock braking, brake input braking, direction reversal braking, neutral braking, and speed limit braking. When programmed Off, only drive current (and not the regen braking currents) will be cut back based on motor temperature. If the vehicle has mechanical brakes, setting this parameter to On may help reduce motor heating.
Temperature Hot	<i>0-250°C</i>	<i>140</i>	Defines the temperature at which current cutback begins.
Temperature Max	<i>0-250°C</i>	<i>160</i>	Defines the temperature at which current is cut back to zero.
Motor Temp LOS Max Speed	<i>0-100%</i>	<i>50%</i>	When a Motor Temp Sensor Fault is set, a LOS (Limited Operating Strategy) mode is engaged. The maximum speed is reduced to the MotorTemp_LOS_Max_Speed.
<b>MAIN RELAY/ CONTACTOR</b>			
Main Enable(6xxx only)	<i>On/Off</i>	<i>On</i>	On = main contactor controlled by controller Off = main contactor controlled by other controllers
Pull In Voltage	<i>0%-100%</i>	<i>100%</i>	The main relay pull-in voltage parameter allows a high initial voltage when the contactor driver first turns on, to ensure contactor closure. After 1 second, this peak voltage drops to the contactor holding voltage.
Holding Voltage	<i>0%-100%</i>	<i>80%</i>	The main relay holding voltage parameter allows a reduced average voltage to be applied to the relay coil once it has closed. This parameter must be set high enough to hold the relay closed under all shock and vibration conditions the vehicle will be subjected to.
Battery Voltage Compensated	<i>On/Off</i>	<i>On</i>	This parameter determines whether the main relay pull-in and holding voltages are battery voltage compensated. When set On, the pull-in and holding voltages are set relative to the set Nominal Voltage. In other words, the output voltage is adjusted to compensate for swings in battery voltage, so the percentage is relative to the set Nominal Voltage—not to the actual voltage.
Open Delay	<i>0-40</i>	<i>0.5</i>	The Open Delay can be set to allow the main relay to remain closed for a period of time (the delay) after the interlock switch is opened. The delay is useful for preventing unnecessary cycling of the relay and for maintaining power to auxiliary functions that may be used for a short time after the interlock switch has opened.
Precharge Enable(6xxx only)	<i>On/Off</i>	<i>On</i>	Turns the precharge feature on or off. Precharge provides a limited current charge of the controller's internal capacitor bank before the main contactor is closed. This decreases the arcing that would otherwise occur when the contactor is closed with the capacitor bank discharged.

Table 4-2 Programmable Parameter - Continued

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>EM BRAKE</b>			
EM Brake Type	0-2	2	The brake type parameter determines how the EM brake responds to the interlock input, throttle, and vehicle motor speed. 0 = EM brake function disabled. 1 = EM brake controlled by interlock. The controller will command the EM brake to release whenever the interlock is closed (Interlock = On). If interlock braking is enabled and the interlock opens when the vehicle is moving at motor speed less than Set_Speed_Threshold, the EM brake will engage after the Sequencing_Delay has expired. If interlock braking is disabled, the EM brake will engage after the Sequencing_Delay has expired. 2 = EM brake controlled by interlock and neutral. The controller will command the EM brake to set whenever the throttle command is zero and motor speed is less than Set_Speed_Threshold.
Pull In Voltage	0%-100%	100%	Allows a high initial voltage when the EM brake first turns on, to ensure brake release. After 1 second, this peak voltage drops to the holding voltage.
Holding Voltage	0%-100%	80%	Allows a reduced average voltage to be applied to the brake coil once the brake has been released. This parameter must be set high enough to hold the brake released under all shock and vibration conditions the vehicle will be subjected to.
Battery Voltage Compensated	On/Off	On	This parameter determines whether the EM brake pull-in and holding voltages are battery voltage compensated. When set On, the pull-in and holding voltages are set relative to the set Nominal Voltage. In other words, the output voltage is adjusted to compensate for swings in battery voltage, so the percentage is relative to the set Nominal Voltage—not to the actual voltage.
Set Speed Threshold	5-100 rpm	20	Determines the speed below which the EM brake will be commanded to set. Setting this speed too high may cause a jerky stop when the EM brake sets and stops the motor.
Release Delay	40-2000 ms	40	Estimated time for the EM brake to physically release after the pull-in voltage is applied. This is used to ensure the torque buildup is complete before the brake releases. When set too low, the vehicle may experience rollback on EM brake release.
EM Brake Fault Motor Revs	1.0-20.0	100	Defines the allowable number of motor revolutions after the EM brake is set before an EM Brake Failed to Set fault is issued
EM Brake Delay	0-2.0	1.0	Sets the length of delay between when zero speed is commanded and the electromagnetic brake is engaged.

**Table 4-2 Programmable Parameter - Continued**

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>BATTERY</b>			
Nominal Voltage(4101 only)	36V-48V	48V	Must be set to the vehicle's nominal battery voltage.
Kp UV	0-100%	20%	When the battery voltage goes below the undervoltage threshold (as set above), a closed loop PI (Proportional/Integral) controller is enabled in an attempt to keep the battery voltage from drooping. It accomplishes this by cutting back the drive current, thereby reducing the load on the battery. The Kp term is the proportional gain and is set in units of% cutback per volt; for example, a setting of 25 would provide full current cutback with 4 V of droop. The Ki term is the integral gain. Integral gain will accumulate the voltage droop and attempt to bring the battery droop back to 0 V. Higher gains will react more strongly and quickly. Typically, Kp UV and Ki UV are used together to provide the best response. If the linear response of the controllers is preferred, set Ki UV = 0.
Ki UV	0-100%	0%	
User Overvoltage	105%-200%	120%	The value of this parameter is a percentage of the Nominal Voltage setting. The User Overvoltage parameter can be used to adjust the overvoltage threshold, which is the voltage at which the controller will cut back regen braking to prevent damage to the electrical system.
User Undervoltage	0%-95%	80%	The value of this parameter is a percentage of the Nominal Voltage setting. The User Undervoltage parameter can be used to adjust the undervoltage threshold, which is the voltage at which the controller will cut back drive current to prevent damage to the electrical system.
Reset Volts Per Cell	0.90V-3.00V	2.09	The reset voltage level is checked only once, when KSI is first turned on. Note that the BDI Reset Percent parameter also influences the algorithm that determines whether BDI Percentage is reset to 100%. Reset Volts Per Cell should always be set higher than Full Volts Per Cell.
Full Volts Per Cell	0.90V-3.00V	2.04	The full voltage level sets the Keyswitch Voltage that is considered to be 100% state-of-charge; when a loaded battery drops below this voltage, it begins to lose charge.
Empty Volts Per Cell	0.90V-3.00V	1.73	The empty voltage level sets the Keyswitch Voltage that is considered to be 0% state-of-charge.
Discharge Time	0-600 minutes	30	Sets the minimum time for the BDI algorithm to count down the BDI Percentage from 100% to 0%. The BDI algorithm integrates the time the filtered keyswitch voltage is below the state of charge voltage level. When that cumulative time exceeds the Discharge Time / 100, the BDI Percentage is decremented by one percentage point and a new state of charge voltage level is calculated.

**Table 4-2 Programmable Parameter - Continued**

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>BATTERY - CONTINUED</b>			
BDI Reset Percent	0%-100%	75%	When a battery has a high BDI percentage, its float voltage at KSI On can sometimes cause false resets. The BDI Reset Percent parameter addresses this problem by allowing the user to define a BDI Percentage value above which the BDI Percentage variable will not reset. When KSI is first powered on, the BDI Percentage variable will reset to 100% only if ((Keyswitch Voltage > Reset Voltage Level) and (BDI Percentage < BDI Reset Percent)).
Full Charge Voltage	0.90-3.00V	2.35	Voltage, when a charger is connected, above which the battery is considered finished charging
Start Charge Voltage	0.90-3.00V	2.1	Voltage above which the battery is considered to start charging
Charge Time	0-600 minutes	60	Sets the minimum time for the BDI algorithm to count up the BDI Percentage from 0% to 100%. The BDI algorithm integrates the time the filtered keyswitch voltage is above the state of charge voltage level. When that cumulative time exceeds the Charge Time / 100, the BDI Percentage is incremented by one percentage point and a new state of charge voltage level is calculated.
Lift Lockout Threshold	0-%50%	20%	The lift lockout will be active when BDI is less than the parameter setting.
<b>MOTOR</b>			
Pole Pairs	1-24	5	Set the pole pairs of the motor
Swap Encoder Direction	On/Off	On	Changes the motor encoder's effective direction of rotation. The encoder provides data used to calculate motor position and speed. This parameter must be set such that when the motor is turning forward, the controller reports back a positive motor speed
Swap Speed Direction	On/Off	Off	
HALL Status 0 Drive Phase	0-7	0	The controller drives the BLDC motor phases according to the hall sensor status. These parameters describes the relationship between the motor driving phases and hall sensor status For example, when HALL Status 1 Driving Phase = 2, means the controller will drive the motor by step 2 (driving phase U & W) when the HALL sensor feedback value is 001
HALL Status 1 Drive Phase	0-7	3	
HALL Status 2 Drive Phase	0-7	5	
HALL Status 3 Drive Phase	0-7	4	
HALL Status 4 Drive Phase	0-7	1	
HALL Status 5 Drive Phase	0-7	2	
HALL Status 6 Drive Phase	0-7	6	
HALL Status 7 Drive Phase	0-7	0	

**Table 4-2 Programmable Parameter - Continued**

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>EMERGENCY REVERSE</b>			
EMR Input Type	0-2	0	0 = EMR NO input 1 = EMR NC input 2 = EMR NC and EMR NO inputs
EMR Fwd Only	On/Off	On	When programmed On, Emergency Reverse can be activated only when the vehicle is traveling forward. When programmed Off, Emergency Reverse can be activated regardless of vehicle direction.
EMR Dir Interlock	On/Off	On	Determines whether the interlock switch must be turned off after Emergency Reverse before the vehicle can be driven again. On = Interlock and throttle and direction must all be cleared. Off = Only throttle and direction must be cleared.
EMR Time Limit	0-30s	3s	Sets the maximum time the vehicle will operate with the Emergency Reverse inputs active.
EMR Speed	0%-100%	30%	Sets the maximum speed of the vehicle during Emergency Reverse operation, as a percentage of the Speed Scaler.
EMR Accel Rate	0.1-8.0s	0.8s	Sets the rate (in seconds) at which the vehicle accelerates in the opposite direction after it has been brought to a stop in an Emergency Reverse operation.
EMR Decel Rate	0.1-8.0s	0.5s	Sets the rate (in seconds) at which the vehicle brakes to a stop when Emergency Reverse is activated.
<b>DIGITAL / ANALOG INPUTS</b>			
Lift Push Type	0-1	0	0 = Lift 1 = Push(Reserved)
<b>DIGITAL / ANALOG INPUTS 1 / 2</b>			
Type Digital/Analog Input 1: Digital/Analog Input 2:	0-2	0	0 = Disable 1 = Lower valve input 2 = Lift lock input(reserved)
Digital Input Low Level Threshold Digital/Analog Input 1: Digital/Analog Input 2:	0.0-10.0V	3.0V	The digital input is off when the voltage is below the threshold
Digital Input High Level Threshold Digital/Analog Input 1: Digital/Analog Input 2:	0.0-10.0V	5.0V	The digital input is on when the voltage is over the threshold

Table 4-2 Programmable Parameter - Continued

PARAMETER	DISPLAY RANGE	DEFAULT	EXPLANATION
<b>MISC</b>			
EM Brake Driver Checks Enable	<i>On/Off</i>	<i>On</i>	The Checks Enable parameters are used to enable driver and coil fault detection at the 3 individual drivers. When a Checks parameter is enabled, the associated driver, driver wiring, and driver load are checked to verify that the driver correctly drives the load both high and low. The checks will occur regardless of the PWM output of the driver. The checks will detect both open and shorted conditions. When a fault is detected, the controller opens the driver and issues a fault code. If nothing is connected to a driver, its Checks Enable parameter should be set Off. Note: Short circuit protection is always active at these drivers, regardless of how Checks Enable is set.
Pump Contactor Driver Checks Enable	<i>On/Off</i>	<i>Off</i>	
Valve Driver Checks Enable	<i>On/Off</i>	<i>On</i>	
Pump Contactor Driver Compensation	<i>On/Off</i>	<i>On</i>	On = Constant Voltage Mode Off = PWM mode
Valve driver Compensation	<i>On/Off</i>	<i>Off</i>	On = Constant Voltage Mode Off = PWM mode
Pump SRO Enable	<i>On/Off</i>	<i>On</i>	The Pump SRO Enable parameter is used to enable the controller to detect the Pump SRO Fault. If the lift switch is closed before KSI is turned on, the controller will issue a Pump SRO Fault
EMR SRO Enable	<i>On/Off</i>	<i>On</i>	The EMR SRO Enable parameter is used to enable the controller to detect the EMR SRO Fault. If the EMR switch/switches is/are closed before KSI is turned on, the controller will issue a EMR SRO Fault
Valve SRO Enable	<i>On/Off</i>	<i>On</i>	The Valve SRO Enable parameter is used to enable the controller to detect the Valve SRO Fault. If the switch which is defined as lower valve input is closed before KSI is turned on, the controller will issue a Valve SRO Fault If the lift switch is closed before KSI is turned on, the controller will issue a Pump SRO Fault

**Table 4-3 Troubleshooting Chart**

LED	CODE	ALARM	EXPLANATION	TROUBLESHOOTING
1, 2	02A012	SEVERE UNDERVOLTAGE	Capacitor bank voltage dropped below the Severe Undervoltage limit	Reduce current limit
1, 2	02A012	UNDERVOLTAGE CUTBACK	Capacitor bank voltage dropped below the Undervoltage limit with the FET bridge enabled	Reduce the drive current limit
1, 3	02A013	SEVERE OVERVOLTAGE	Capacitor bank voltage exceeded the Severe Overvoltage limit	Disable main contactor, EMBrake, pump contactor and PWM output
1, 3	02A013	OVERVOLTAGE CUTBACK	Capacitor bank voltage exceeded the Overvoltage limit with the FET bridge enabled	Reduced regen current limit
1, 4	02A014	CONTROLLER OVERTEMP CUTBACK	Heatsink temperature over +75C	Reduce the drive current limit and regen current limit
1, 4	02A014	CONTROLLER SEVERE UNDERTEMP	Heatsink temperature below -40C	Disable main contactor, EMBrake, pump contactor and PWM output
1, 4	02A014	CONTROLLER SEVERE OVERTEMP	Heatsink temperature over +85C	Disable main contactor, EMBrake, pump contactor and PWM output
1, 5	02A015	MOTOR TEMP SENSOR	Motor thermistor input is at the voltage rail(0 or 10V)	Max Speed reduced and motor temperature cutback disabled
1, 5	02A015	MOTOR TEMP HOT CUTBACK	Motor temperature is at or above the Temperature Hot parameter setting	Reduce drive current
2, 1	02A021	THROTTLE	Throttle input is out of range	Disable PWM output
2, 1	02A021	HPD SEQUENCING	HPD (High Pedal Disable) or sequencing fault caused by incorrect sequence of KSI, interlock, direction and throttle inputs	Disable PWM output
2, 2	02A022	MAIN CONTACTOR WELDED	Just prior to the main contactor closing, the capacitor bank voltage (B+ connection terminal) was loaded for a short time and the voltage did not discharge	Disable main contactor, EMBrake, pump contactor and PWM output
2, 2	02A022	MAIN CONTACTOR DID NOT CLOSE	With the main contactor commanded closed, the capacitor bank voltage (B+ connection terminal) did not charge to B+	Disable main contactor, EMBrake, pump contactor and PWM output
2, 2	02A022	MAIN DRIVER FAULT	Main Contactor driver is either open or shorted	Disable main contactor, EMBrake, pump contactor and PWM output
2, 2	02A022	PRECHARGE FAILED	Controller failed to precharge	Disable main contactor, EMBrake, pump contactor and PWM output
2, 3	02A023	ENCODER	Motor encoder phase failure detected	Disable EMBrake and PWM output
2, 3	02A023	STALL DETECTED	No motor encoder movement detected	Disable main EMBrake and PWM output



**Table 4-3 Troubleshooting Chart (Drive / Lift Controller) - Continued**

LED	CODE	ALARM	EXPLANATION	TROUBLESHOOTING
2, 4	02A024	MOTOR OPEN	Motor phase U,V or W detected open	Disable main contactor, EMBrake and PWM output
2, 5	02A025	EMBRAKE DRIVER FAULT	Electromagnetic brake driver is either open or shorted	Disable EMBrake and throttle
2, 4	02A024	MOTOR OPEN	Motor phase U,V or W detected open	Disable main contactor, EMBrake and PWM output
2, 5	02A025	EMBRAKE DRIVER FAULT	Electromagnetic brake driver is either open or shorted	Disable EMBrake and throttle
3, 1	02A031	EM BRAKE FAILED TO SET	After the EM Brake was commanded to set and time has elapsed to allow the brake to fully engage, vehicle movement has been sensed	Disable EMBrake and throttle
3, 1	02A031	EMER REV TIMEOUT	Emergency Reverse was activated and ran until the EMR Timeout timer expired	Disable EMBrake and PWM output
3, 2	02A032	EMER REV HPD	At the conclusion of emergency Reverse, the fault was set because various inputs were not returned to neutral	Disable EMBrake and PWM output
3, 2	02A032	EMR SRO	The EMR switches are turned on before KSI	Disable EMBrake and PWM output
3, 3	02A033	PUMP DRIVER FAULT	Pump driver is either open or shorted	Disable Horn driver
3, 4	02A034	PUMP SRO	The lift switch is turned on before KSI	Disable pump driver output
3, 5	02A035	VALVE DRIVER FAULT	Valve driver is either open or shorted	Disable Horn driver
3, 6	02A036	VALVE SRO	The lower valve input switches are turned on before KSI	Disable valve driver output
3, 7	02A037	HYDRAULIC SWITCH	hydraulic switch problem	
4, 1	02A041	FIVE V SUPPLY FAILURE	The voltage of internal +5V supply is upper or lower than the threshold voltage. The Torrance is $\pm 10\%$	None
4, 1	02A041	FIFTEEN V SUPPLY FAILURE	The voltage of internal +15V supply is upper or lower than the threshold voltage. The Torrance is $\pm 10\%$	None
4, 1	02A041	EXTERNAL SUPPLY OUT OF RANGE	The voltage of external +5V or +14V is either greater than the upper voltage threshold or lower than the lower voltage threshold. The Torrance is $\pm 10\%$	Disable main contactor, EMBrake, pump contactor and PWM output
4, 2	02A042	CAN BUS LOADING	Can communication problem	Disable main contactor, EMBrake, pump contactor and PWM output
4, 2	02A042	PDO TIMEOUT	Can communication problem	Disable main contactor, EMBrake, pump contactor and PWM output

**Table 4-3 Troubleshooting Chart (Drive / Lift Controller) - Continued**

LED	CODE	ALARM	EXPLANATION	TROUBLESHOOTING
2, 4	02A024	MOTOR OPEN	Motor phase U,V or W detected open	Disable main contactor, EMBrake and PWM output
2, 5	02A025	EMBRAKE DRIVER FAULT	Electromagnetic brake driver is either open or shorted	Disable EMBrake and throttle
4, 2	02A042	PDO MAPPING ERROR	Can communication problem	Disable main contactor, EMBrake, pump contactor and PWM output
4, 3	02A043	HW FAILSAVE	The hardware is defeated	Disable motor, main contactor, EMBrake, Throttle and drivers
4, 4	02A044	SW FAULT	The CRC code of the application is not right	Disable motor, main contactor, EMBrake, Throttle and drivers
4, 5	02A045	INTERLOCK_SRO	The interlock switch is on before the key switch turned on	Disable throttle
8, 1	02A081	PARAMETER MISMATCH	When the EMR Input Type is set to type 2, the switch 2 input should be set as disable. Otherwise, the Parameter Mismatch fault is reported	Disable main contactor, EMBrake, pump contactor and PWM output
8, 1	02A081	PARAMETER CHANGE	Adjustment of a parameter that requires cycling of KSI	Disable main contactor, EMBrake, pump contactor and PWM output
8, 3	02A083	NV FAILURE	Controller operating system tried to write to EEPROM memory and failed	Disable motor, main contactor, EMBrake, Throttle and drivers
8, 4	02A084	SUPERVISION	Mismatched redundant readings; damaged Supervisor	Disable main contactor, EMBrake, pump contactor and PWM output
8, 7	02A087	TILLER HANDSHAKE FAULT	1. The handshake with Handle failed at start up. 2. The Stuffing Bit check failed while the stuffing bit check is enabled.	Disable throttle
8, 8	02A088	GUAGE HADNSHAKE FAULT	The handshake with display failed at start up.	Motor speed reduced

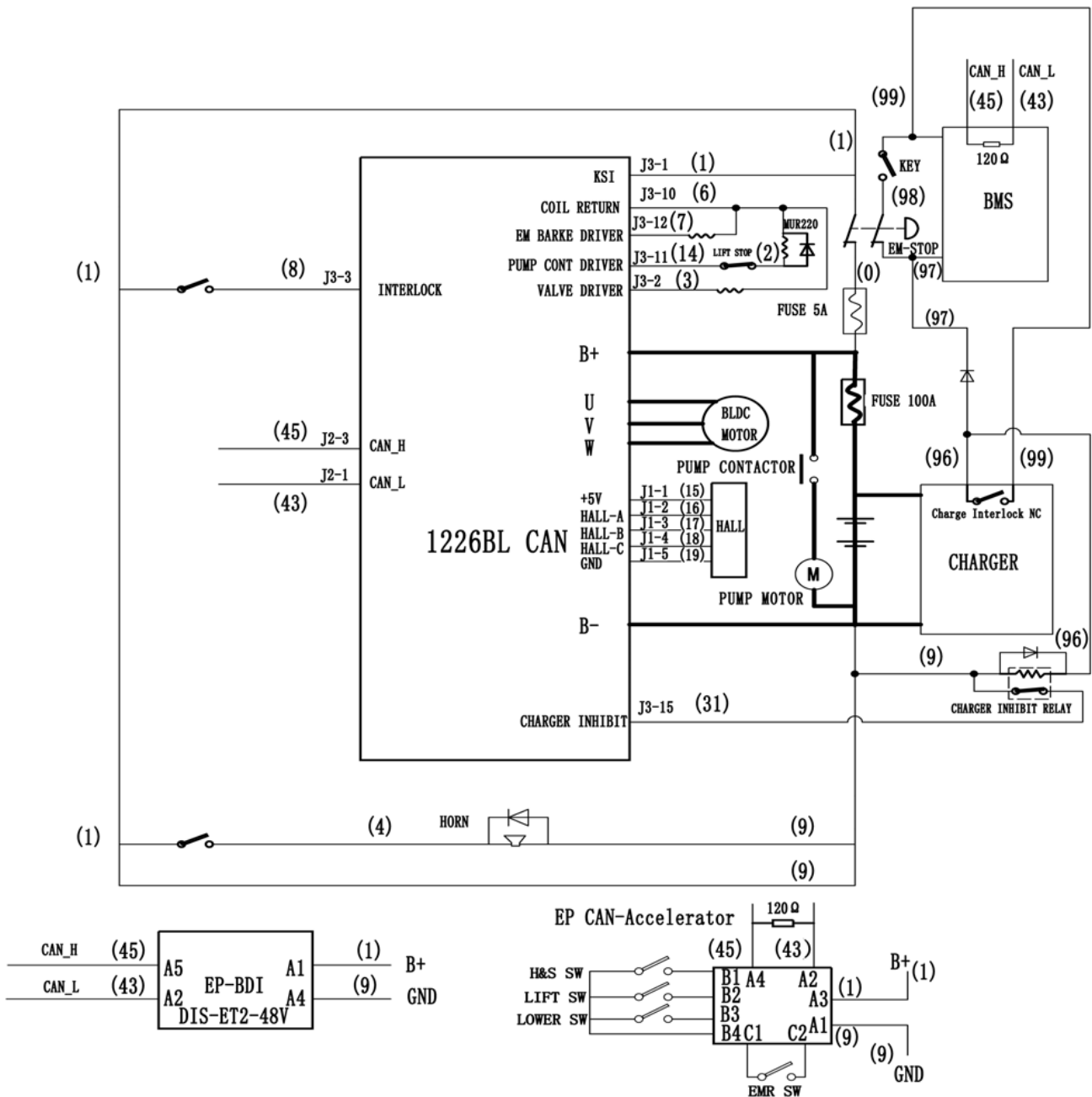


Figure 4-3 Wiring Diagram

**NOTES**

## SECTION 5

### STEERING ARM, CONTROL HEAD AND COMPARTMENT

#### 5-1. CONTROL HEAD

##### 5-1.1. Control Head Removal

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the cap assembly as described in paragraph 5-1.3.
3. Disconnect harness from potentiometer.

4. Disconnect harness from emergency reverse switch.
5. Remove four screws, four washers and four flat washers.

**WARNING:** When removing the control head in the following steps, be sure to hold it in place until the control harness is disconnected.

6. Remove the control head.

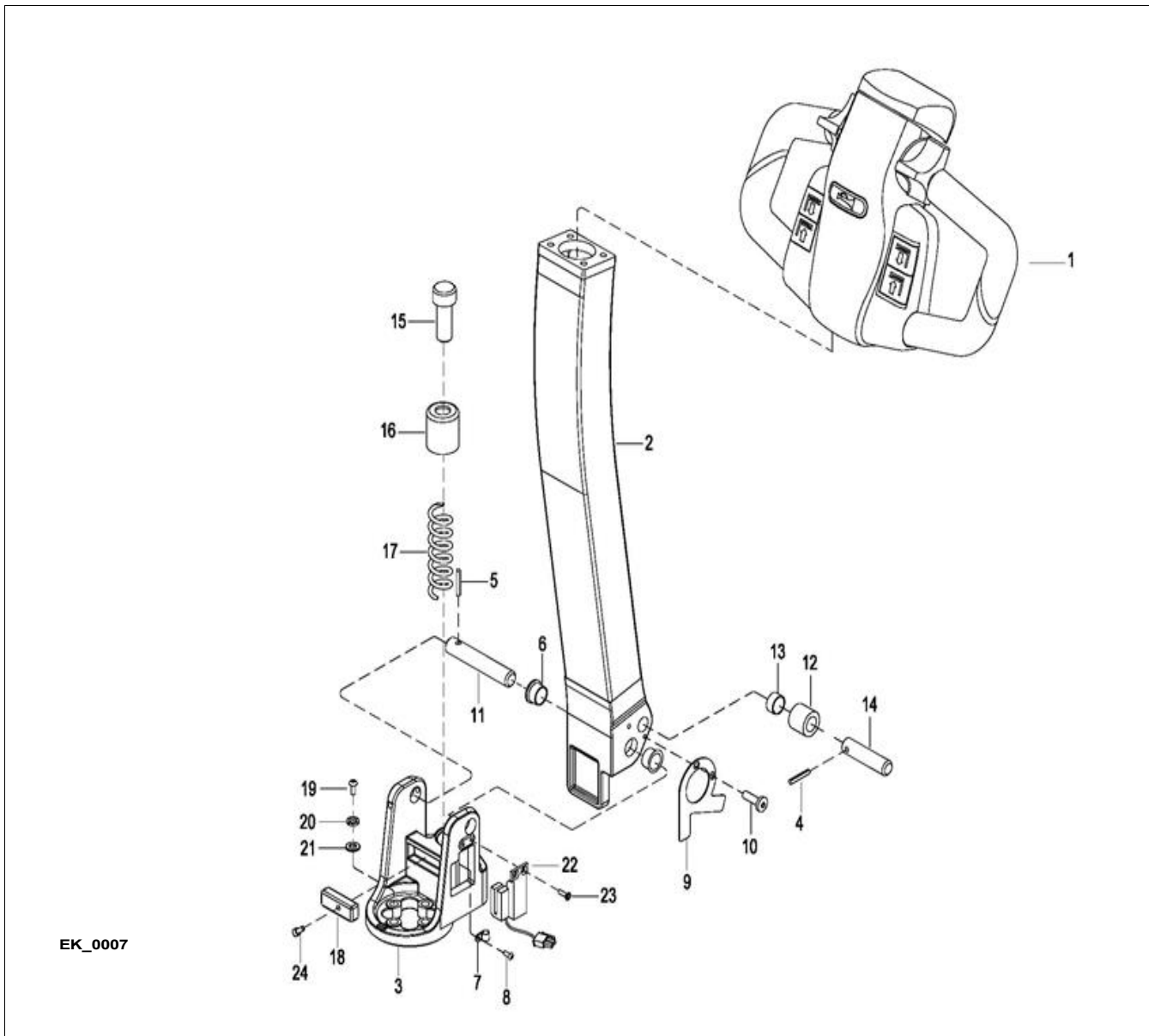
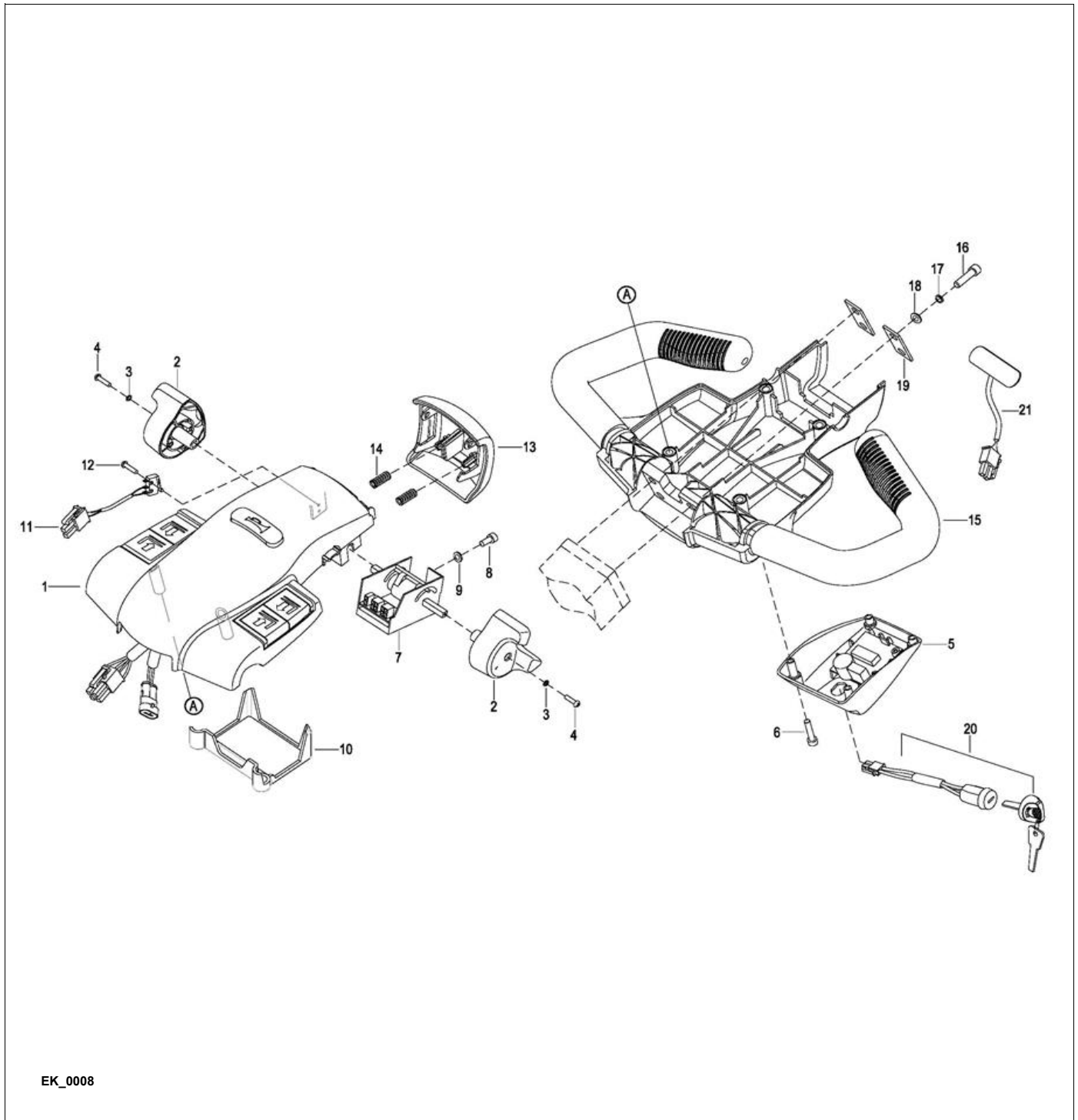


Figure 5-1 Steering Arm



EK\_0008

Figure 5-2 Control Head

**5-1.2. Control Head Installation**

1. Secure control head with four screws, four washers and four flat washers.
2. Reconnect the harness to the emergency reverse switch.
3. Reconnect the harness to the potentiometer.
4. Install the cap assembly as described in paragraph 5-1.4.
5. Turn on the key switch and disengage the emergency disconnect.

**5-1.3. Cap Assembly Removal.**

1. Turn off the key switch and engage the emergency disconnect.
2. Remove four screws and lift up cap assembly.
3. Disconnect the emergency reverse switch from the harness.
4. Disconnect the cap assembly harness from the harness and remove cap assembly (1).

**5-1.4. Cap Assembly Installation.**

1. Hold cap assembly in place and connect the emergency reverse switch to the harness.
2. Connect the cap assembly harness to the harness.
3. Position cap assembly on the control head and secure with four screws.
4. Turn on the key switch and disengage the emergency disconnect.

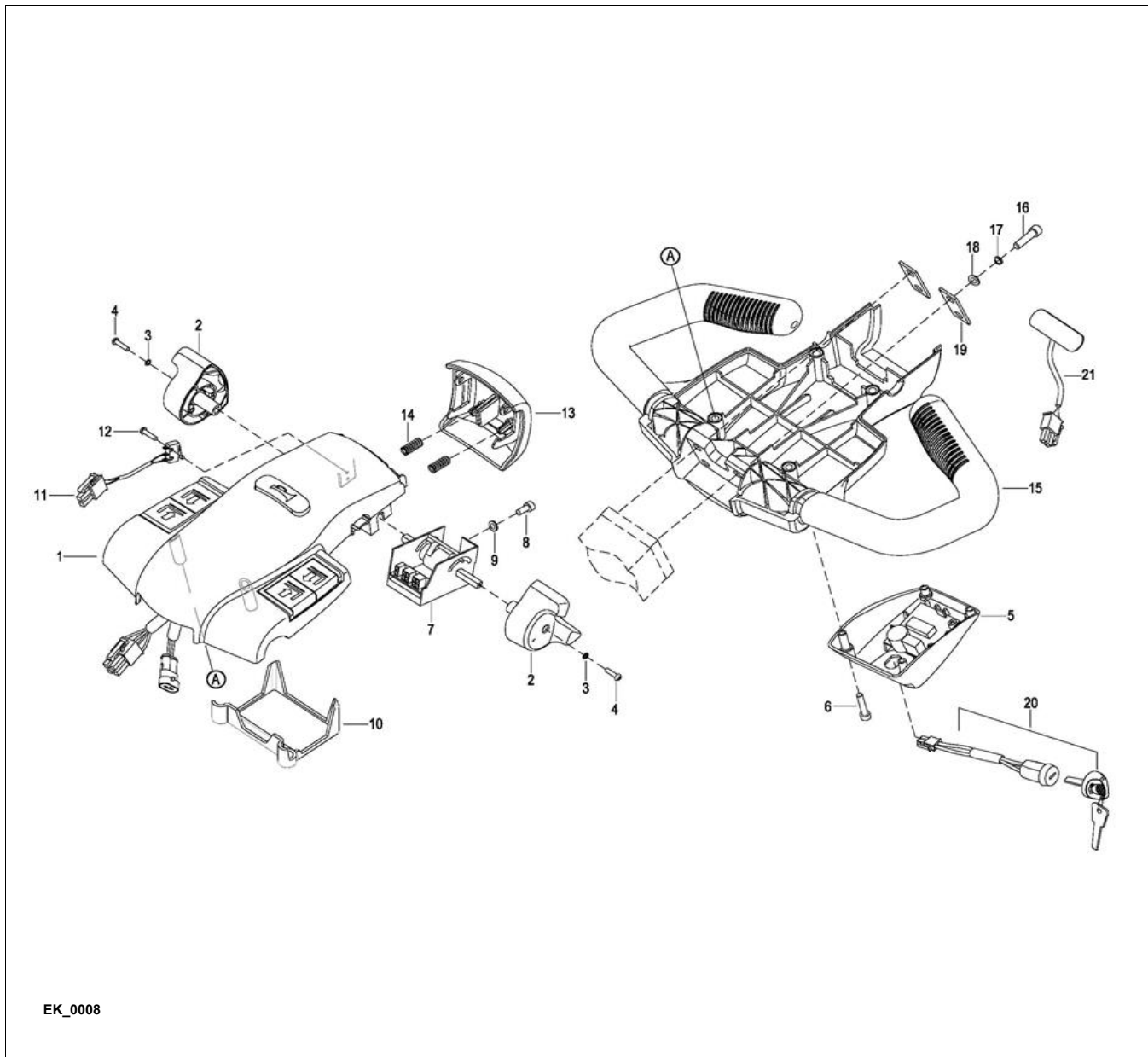
**5-1.5. Speed Potentiometer Replacement.**

1. Remove the cap assembly as described in paragraph 5-1.3.

2. Disconnect harness from potentiometer.
3. Remove screws, washers and control knobs from potentiometer.
4. Remove screw, flat washer and remove potentiometer from cover.
5. Position new potentiometer and secure with screw flat washer.
6. Install control knobs on potentiometer and secure with screws, and washers.
7. Reconnect harness to potentiometer.
8. Install the cap assembly as described in paragraph 5-1.4.

**5-1.6. Belly-Button Switch Replacement.**

1. Remove the cap assembly as described in paragraph 5-1.3.
2. Disconnect harness from reversing switch.
3. Remove screw, lock washer and flat washer.
4. Remove screw, lock washer and flat washer and remove switch assembly from bracket.
5. Remove pin, bracket, and spring from button.
6. Remove two pins and switch assembly from bracket.
7. Position the new switch assembly in bracket and secure with two pins.
8. Position bracket in button and install pin.
9. Position switch assembly from bracket and secure with screw, lock washer and flat washer.
10. Install screw, lock washer and flat washer.
11. Reconnect harness to reversing switch.
12. Install the cap assembly as described in paragraph 5-1.4.

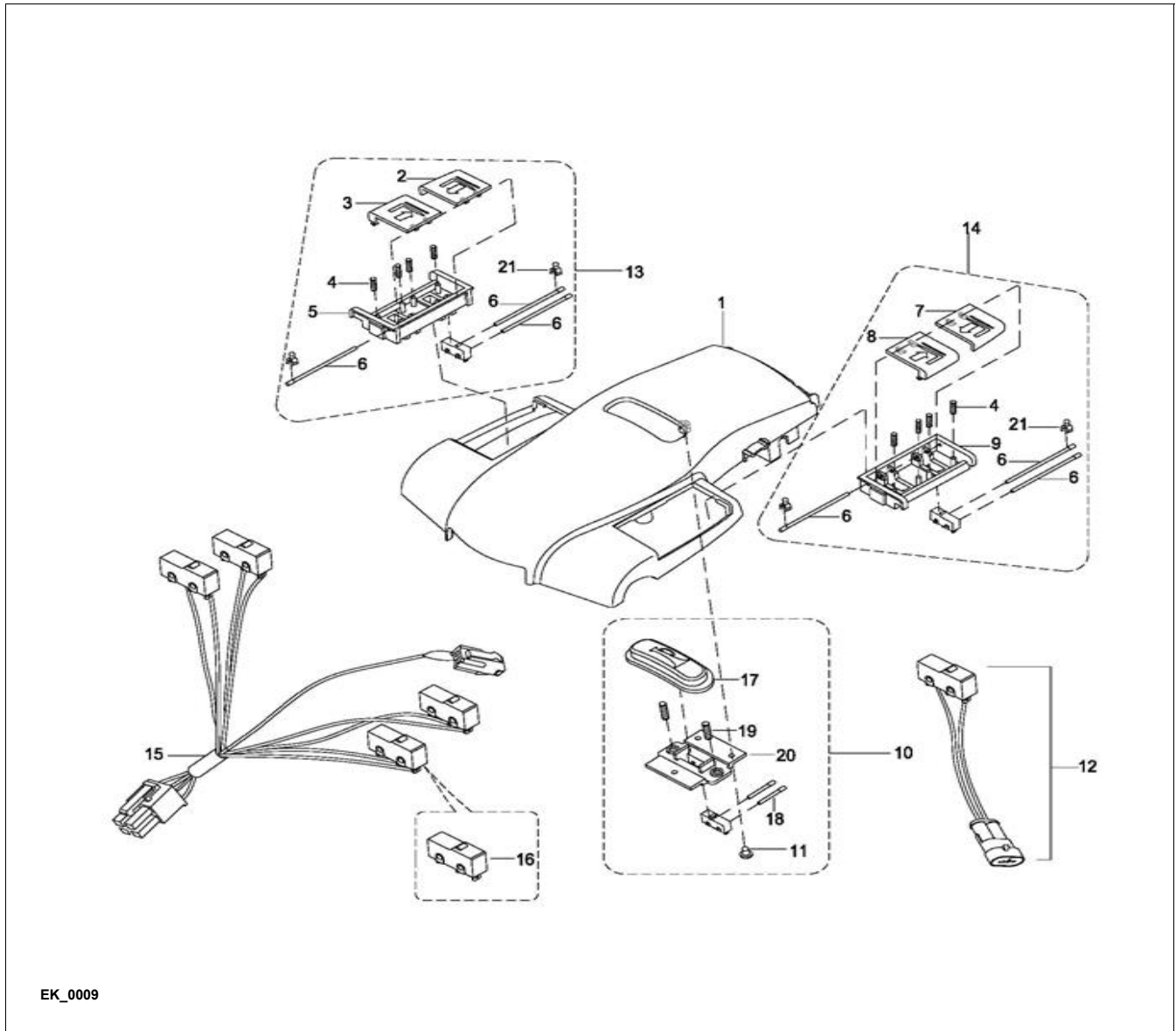


**Figure 5-3 Emergency Reverse Switch Assembly**

**5-1.7. Horn Switch Replacement.**

1. Remove the cap assembly as described in paragraph 5-1.3.
2. Remove three screws, bracket and springs from button.
3. Remove two pins and defective switch from the bracket.
4. Unsolder harness from defective switch and connect it to the new switch.
5. Position the new switch in the bracket and secure with the two pins.
6. Position button in cover and secure with three screws.
7. Install the cap assembly as described in paragraph 5-1.4.





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**Figure 5-4 Cap Assembly**

**5-1.8. Lift and Lower Switch Replacement.**

1. Remove the cap assembly as described in paragraph 5-1.3.
2. Remove switch assembly from cap.
3. Remove pin securing buttons and remove the buttons.
4. Remove two pins, two switches and four springs from bracket.
5. Unsolder harness from defective switch.
6. Solder the harness to new switch.
7. Position the new switches and four springs in bracket and secure with two pins.
8. Position switch assembly in cover and secure with pin.
9. Install the cap assembly as described in paragraph 5-1.4.

## 5-2. UPPER COMPARTMENT COVERS

### 5-2.1. Removal.

1. Turn off the key switch and engage the emergency disconnect.
2. Lift up the top cover and gently push the top cover tabs (one on each side of cover) towards the center of compartment and remove the top cover from the compartment (Figure 5-5).
3. Turn on the key switch and disengage the emergency disconnect.

### 5-2.2. Installation.

1. Turn off the key switch and engage the emergency disconnect.
2. Line up the top cover with the compartment.
3. Gently push the top cover tabs (one on each side of cover) towards the center of compartment and

line up the tabs with the holes in the compartment and let go. (Figure 5-5).

4. Turn on the key switch and disengage the emergency disconnect.

## 5-3. LOWER BAFFLE

### 5-3.1. Removal

1. Block the lower baffle or secure with a hoist so that it doesn't fall off when removing the screws that secures it to the truck.
2. Remove the lower baffle by removing the three screws, lock washer and flat washers on each side of the truck.

### 5-3.2. Installation

1. Install the lower baffle by lifting it in place and securing it with three screws, lock washers and flat washers.

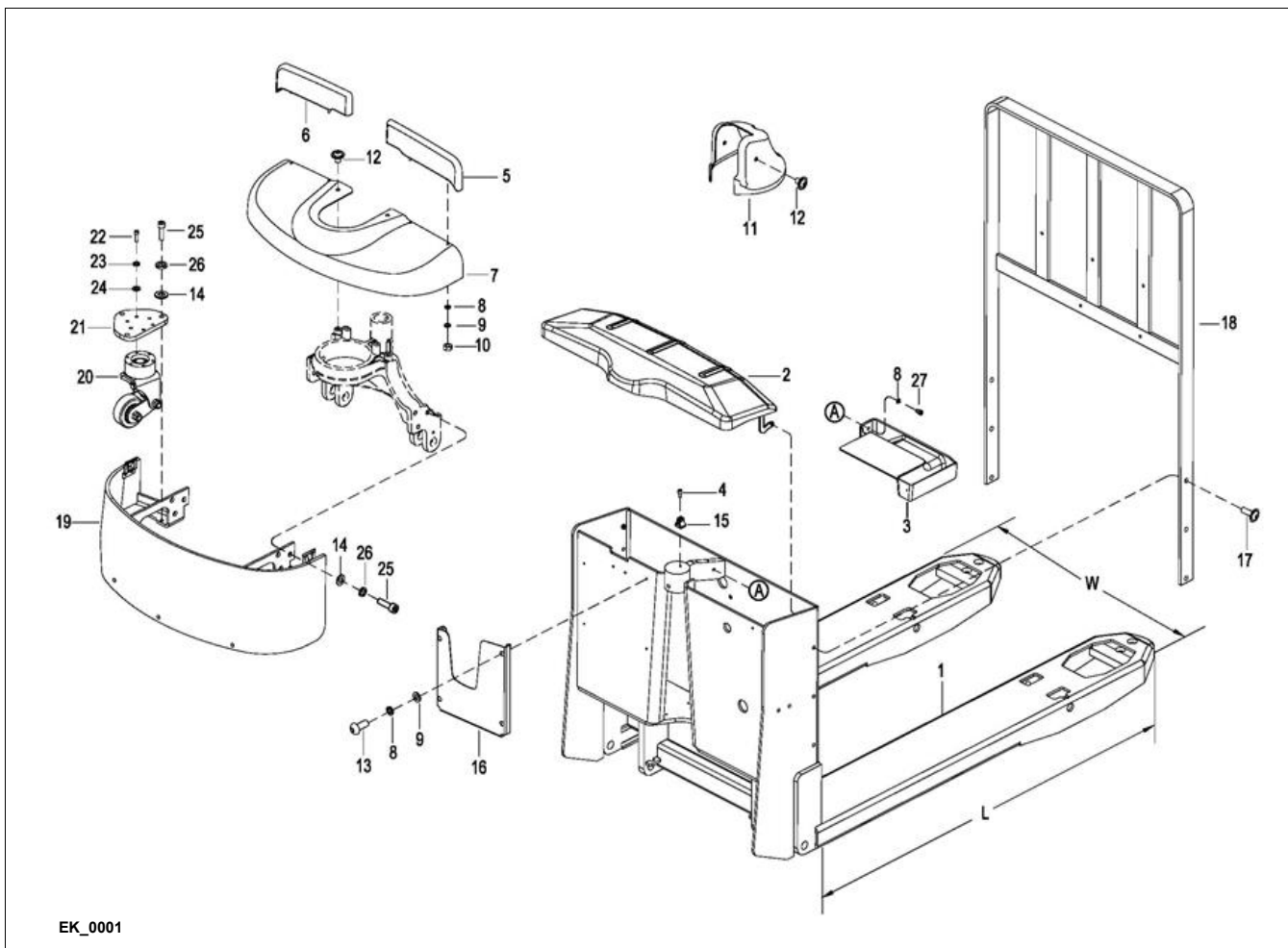


Figure 5-5 Compartment Cover

**5-4. LOWER COMPARTMENT COVERS**

**5-4.1. Removal.**

1. Turn off the key switch and engage the emergency disconnect.
2. Remove two screws and lift the lower cover off the trucks loading bridge.

**5-4.2. Installation.**

1. Position the lower cover on the trucks loading bridge.
2. Secure with two screws.

3. Turn on the key switch and disengage the emergency disconnect.

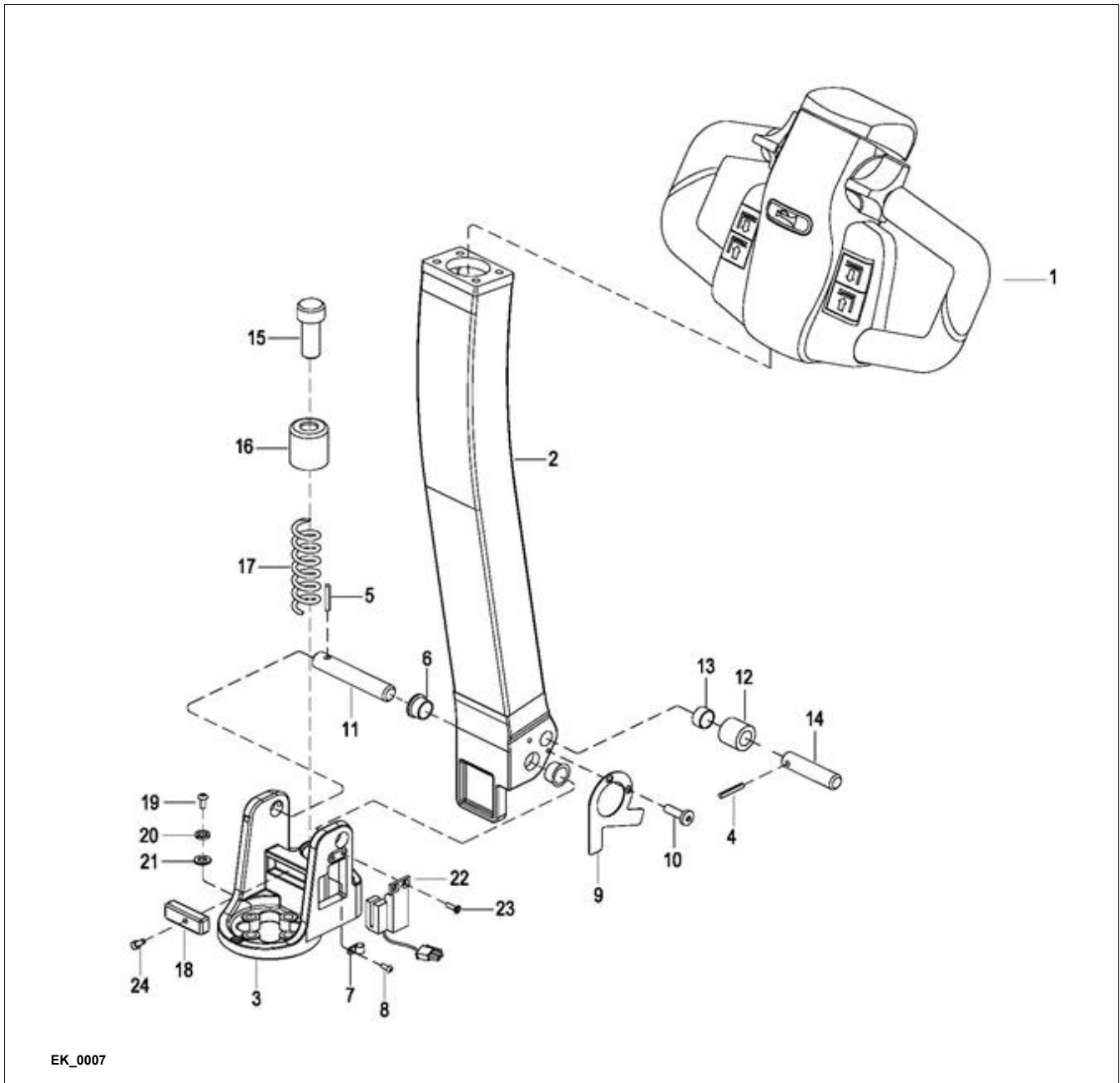
**5-5. MIDDLE COVER**

**5-5.1. Removal**

1. Remove two screws that holds the middle cover to the steering arm.

**5-5.2. Installation**

1. Line up the middle cover on the steering arm and secure with two screws.



EK\_0007

**Figure 5-6 Steering Arm**

## **5-6. STEERING ARM**

### **5-6.1. Return Spring Replacement.**

The steering arm return spring is replaced while the steering arm is in the upright position.

1. Secure the steering arm in the upright position.
2. Remove the roll pin from shaft and remove roller and bushing.
3. Remove the guide column and spring cover.
4. Remove the spring.
5. Install the spring by reversing step 2-4.

### **5-6.2. Steering Arm Removal.**

1. Remove steering arm return spring as described in paragraph [5-6.1](#).
2. Disconnect harness from the master wire harness.
3. Attach a hoist to steering arm.
4. Remove roll pin from steering arm shaft and then remove shaft from steering arm and bracket.
5. Lift out the steering arm.

### **5-6.3. Steering Arm Installation.**

1. Position steering arm over the steering arm bracket and secure with shaft and roll pin.
2. Reconnect the harness to the master wire harness.
3. Install steering arm return spring as described in paragraph [5-6.1](#).

## SECTION 6 BRAKE SERVICING

### 6-1. BRAKES.

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

#### 6-1.1. Brake Assembly Replacement

1. Block load wheels.
2. Remove the lower compartment covers as described in paragraph 5-4.1.
3. Block the lower baffle or secure with a hoist so that it doesn't fall off when removing the screws that secures it to the truck.
4. Remove the lower baffle by removing the three screws, lock washer and flat washers on each side of the truck.
5. Disconnect electric brake from harness.
6. Remove the three mounting screws and then remove the brake.
7. Place the new brake into position and secure with the three mounting screws.
8. Reconnect electric brake to harness.
9. Remove load wheel blocks and check operation.
10. Install the lower baffle by lifting it in place and securing it with three screws, lock washers and flat washers.
11. Install the lower compartment covers as described in paragraph 5-4.2.

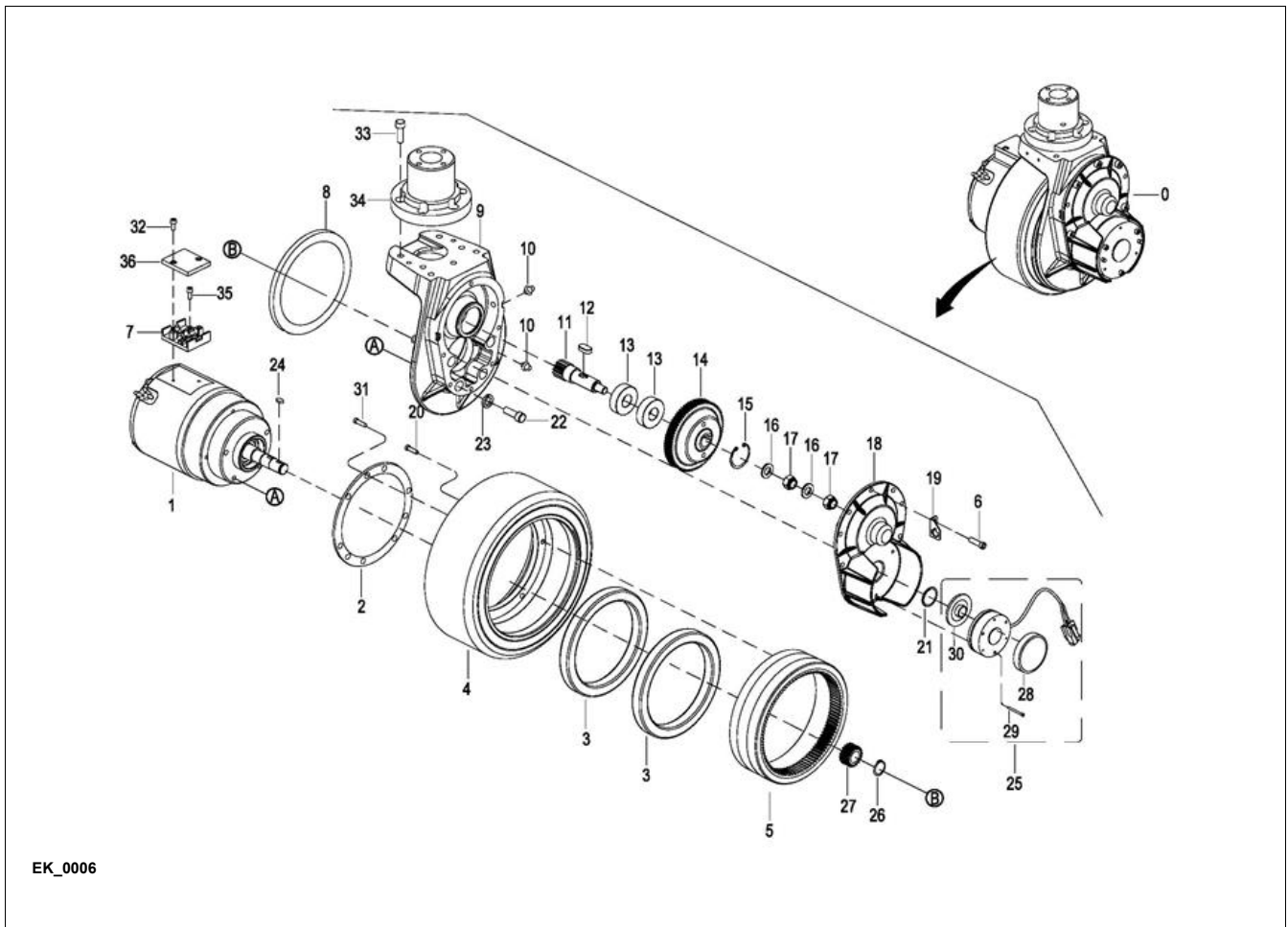
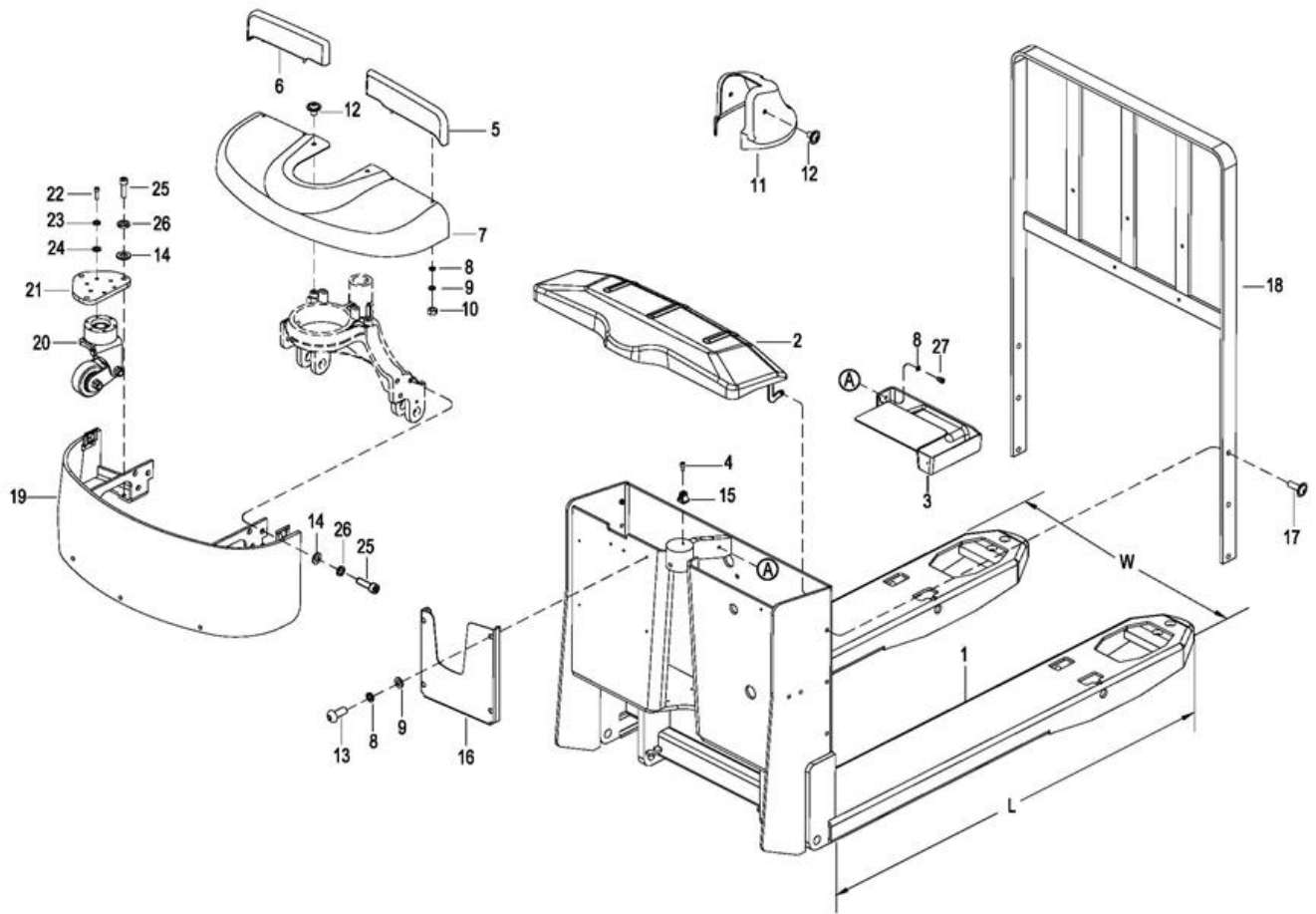


Figure 6-1 Transmission, Motor, Brake Mounting



EK\_0001

Figure 6-2 Frame



## SECTION 7

### TRANSMISSION, DRIVE WHEEL, LOAD WHEEL

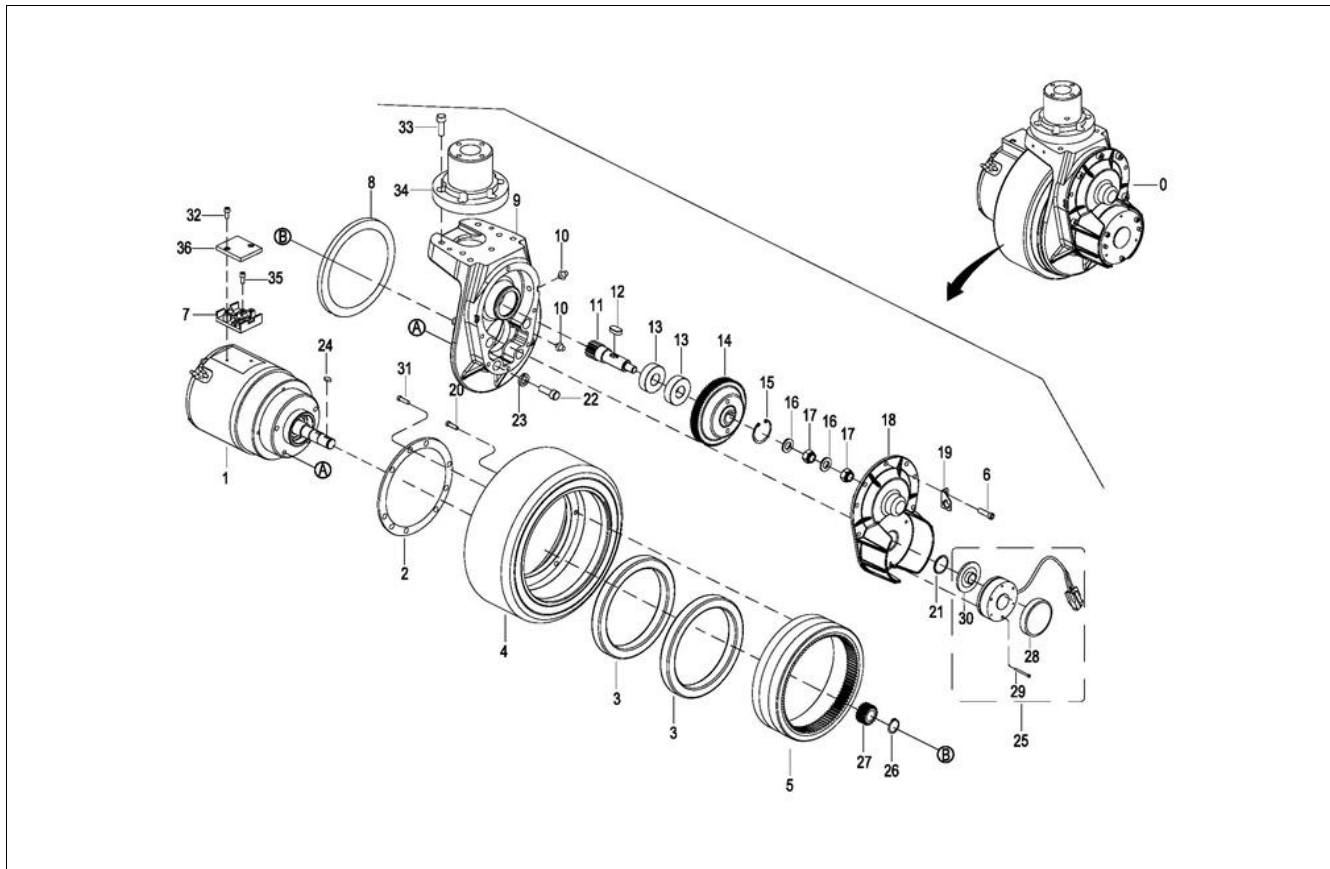
#### 7-1. Drive Wheel.

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the lower compartment covers as described in paragraph 5-4.1.
3. Remove the lower baffle as described in paragraph 5-3.
4. Jack up the truck so the drive wheel is off the ground; then securely block the truck to prevent movement.
5. Disconnect cables from drive motor.
6. Remove four screws, lock washers, and free motor with drive wheel from housing.
7. Remove the six screws and gear.
8. Remove drive wheel from motor.
9. Remove three screws and bearing baffle from drive wheel.
10. Remove bearing from wheel
11. Install new drive wheel in reverse order of removal.

12. Install the lower baffle as described in paragraph 5-3.
13. Install the lower compartment covers as described in paragraph 5-4.2.
14. Turn on the key switch and disengage the emergency disconnect.

#### 7-2. Drive Unit replacement.

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the lower compartment covers as described in paragraph 5-4.1.
3. Remove the lower baffle as described in paragraph 5-3.
4. Block and secure the drive unit so that it doesn't fall.
5. Secure the steering arm assembly so that it doesn't fall and remove the four screws, lock washers and flat washers that secures the steering arm assembly to the drive unit.
6. Install new drive unit by reversing the steps above.



**Figure 7-1 Transmission, Motor, Brake Mounting**

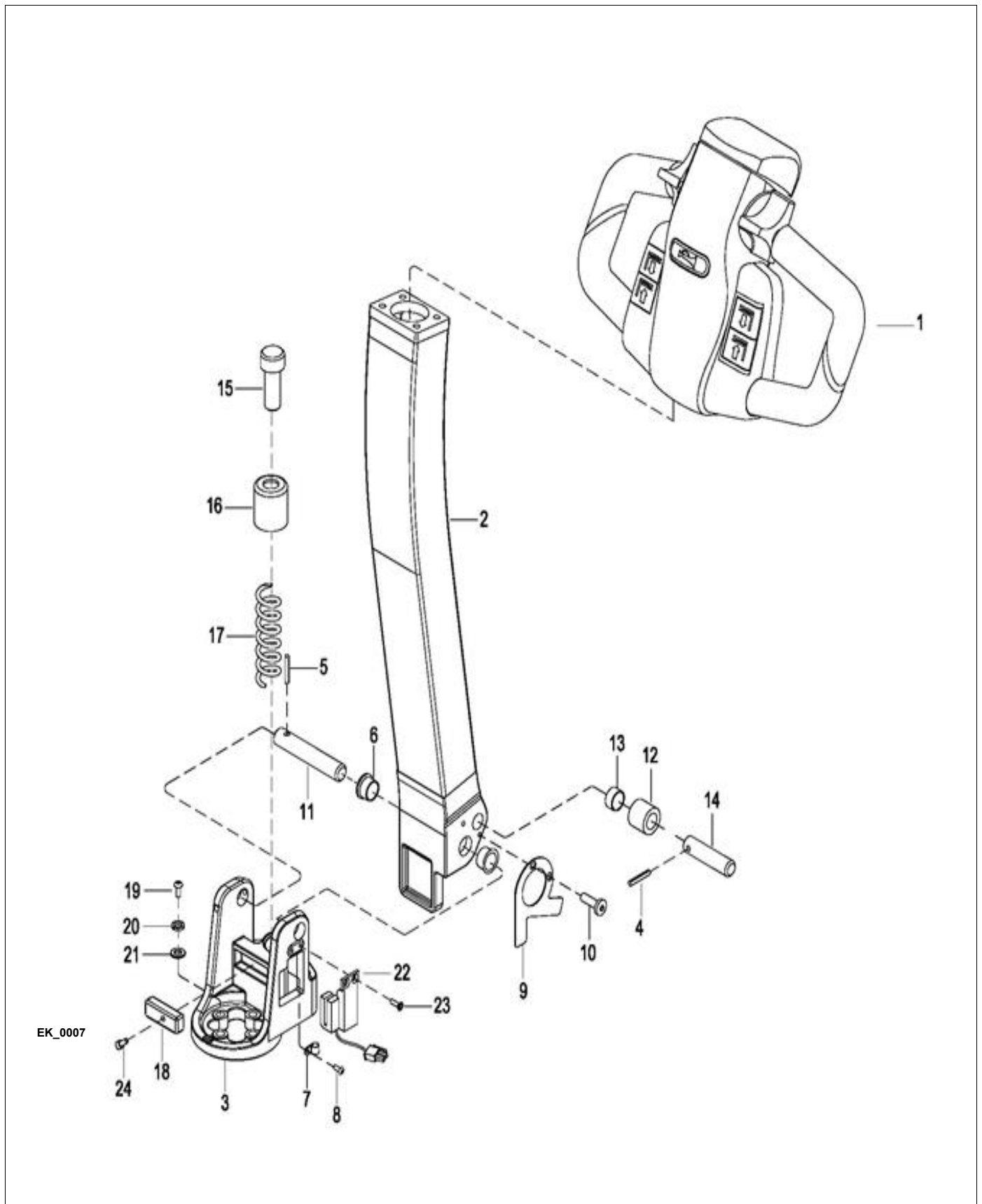


Figure 7-2 Steering Arm



## 7-3. Load Wheel.

### 7-3.1. Removal

1. Raise forks.
2. Turn off the key switch and engage the emergency disconnect.
3. Block the drive wheel to prevent the truck from rolling.
4. Jack up the forks to raise the load wheels off the floor. Securely block the forks in the raised position by positioning supports under both fork tips.

**NOTE:** When the load wheel shaft is removed the load wheel assembly will drop free.

5. Remove roll pin securing load wheel shaft to wheel bracket and remove the shaft and load wheel assembly.

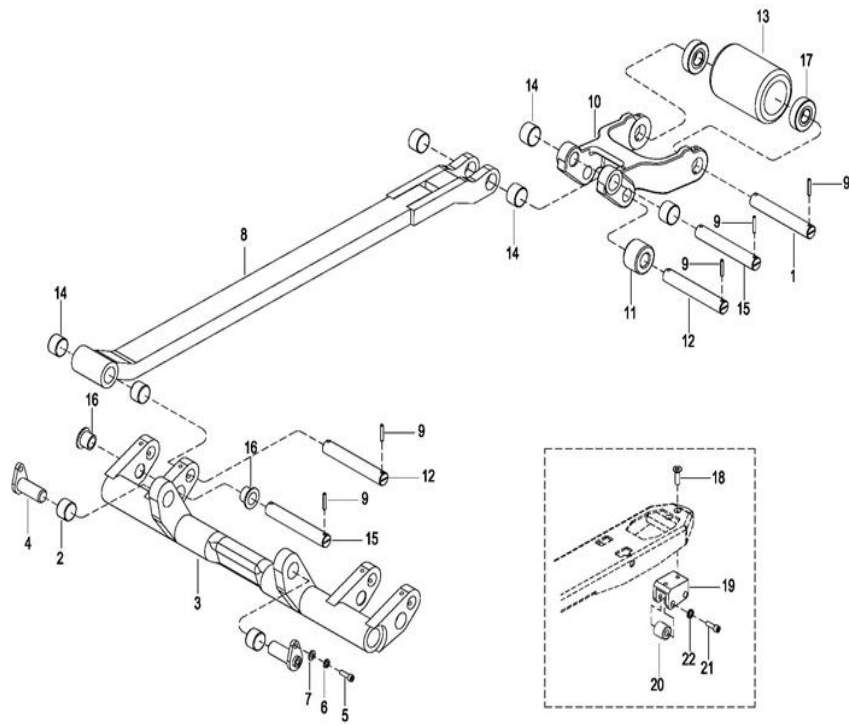
**NOTE:** Inspect the load wheel assembly. If the load wheel is worn within 1/8" of the metal sleeve, or is cracked or damaged, replace the entire load wheel and bearing assembly. Blue Giant recommends that both load wheel assemblies be replaced at the same time. This ensures level and safe operation of the lift truck.

### 7-3.2. Repair

1. Remove bearings from wheels.
2. Inspect bearings and replace if necessary.
3. Reassemble bearings in wheels.

### 7-3.3. Load Wheel Installation

1. Position load wheel assembly in load wheel bracket.
2. Install shaft and secure with roll pin.
3. Remove blocking from under the truck.
4. Lower the forks.
5. Turn on the key switch and disengage the emergency disconnect.



EK\_0002

Figure 7-3 Wheel Assembly

**NOTES**

## SECTION 8

### ELEVATION SYSTEM SERVICING

#### 8-1. LIFT LINKAGE

##### 8-1.1. Removal

1. Lift complete truck to height sufficient to permit access to lift linkage under forks. Provide blocking under frame and at tips of the forks.
2. Turn off the key switch and engage the emergency disconnect.
3. Remove the screws, lock washers and flat washers that secures the shafts for the lower link to the fork frame.
4. Remove the shafts
5. Remove the roll pins that secures the lower shafts on the lower link to the fork frame.
6. Remove the lower shafts.
7. Remove the roll pins that secures the load wheel bracket shafts to the fork frame.
8. Remove load wheel bracket shafts.
9. Lower link assembly to the floor.

##### 8-1.2. Repair

1. Remove roll pins, load wheel shafts and load wheels from wheel brackets.
2. Remove roll pins and load wheel bracket shafts. Free brackets from long link.
3. Remove bushings from brackets if replacement is necessary,
4. Remove roll pins from shaft that secures the long link to the lower link and remove the long link.
5. Remove bushings from the long link and replace if necessary.
6. Install reassemble by reversing the steps above.

##### 8-1.3. Installation

7. Install linkage by reversing step 1-9 in paragraph [8-1.1](#).
8. Remove blocking and lower the truck to the ground.
9. Turn on the key switch and disengage the emergency disconnect.

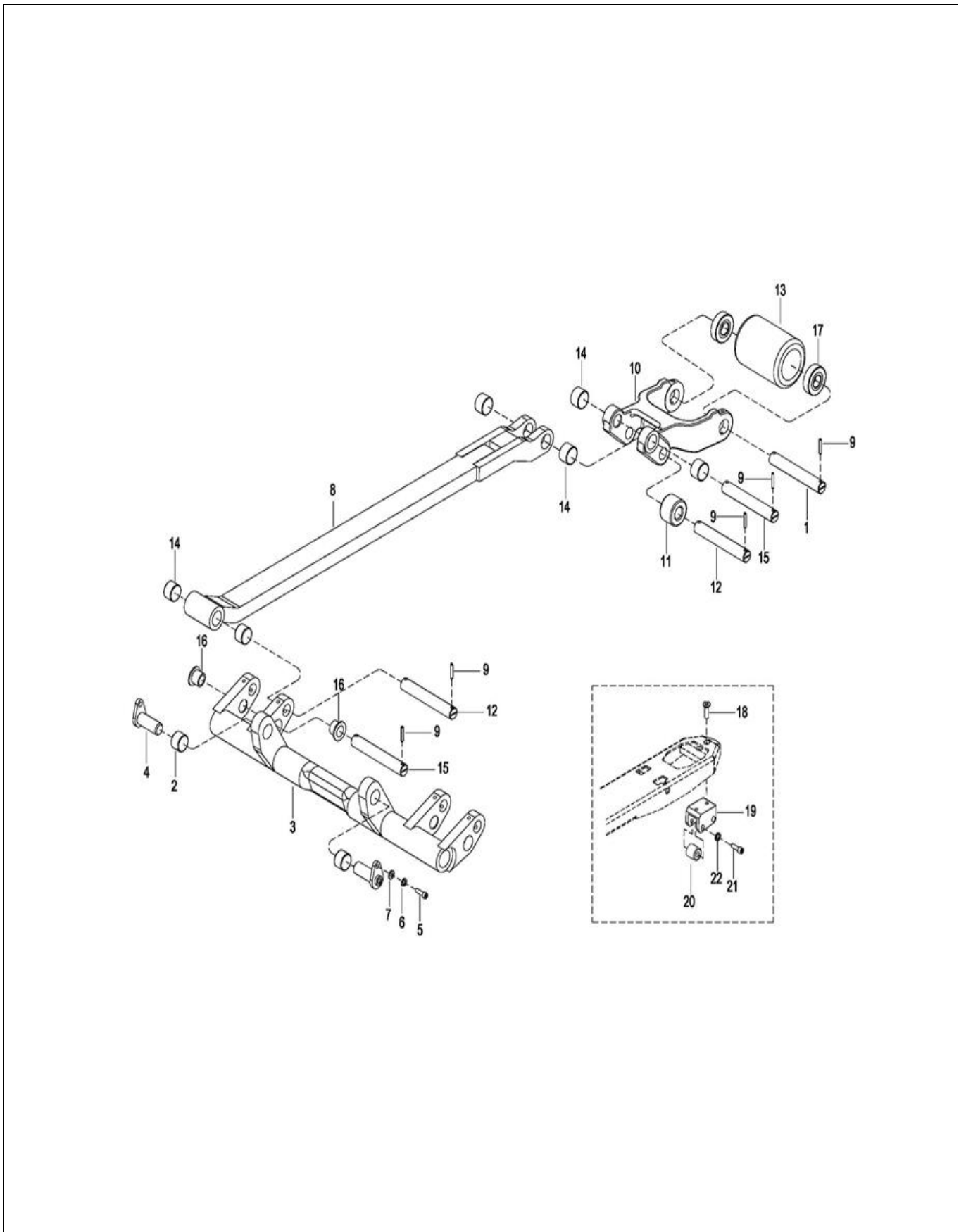


Figure 8-1 Lift Link Assembly - Single Wheel

## SECTION 9 HYDRAULIC SYSTEM SERVICING

### 9-1. LINES AND FITTINGS

**WARNING:** When forks are raised, pressure exists in the hydraulic system lines and fittings. To ensure release of pressure, forks must be fully lowered 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. Turn off the key switch and engage the emergency disconnect.
3. Remove the upper compartment cover as described in paragraph 5-2.1.

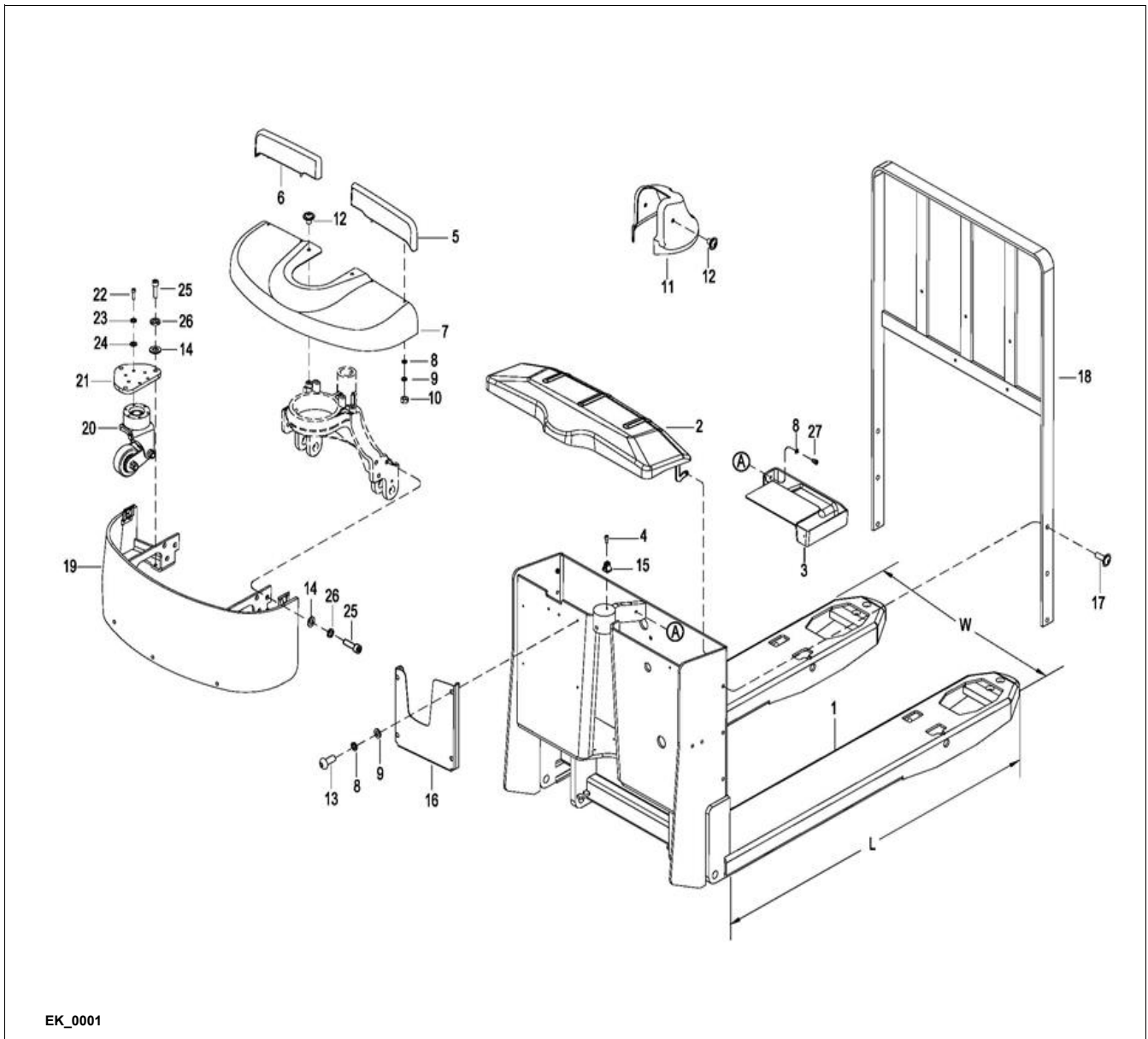


Figure 9-1 Frame

**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 9-2](#) and remove leaking line or fitting and replace it with a new line or fitting. Check level of hydraulic oil. With lift carriage fully lowered, fill reservoir with hydraulic oil to 1 inch below opening. Use hydraulic oil listed in [Table 3-3](#).
5. Turn on the key switch and disengage the emergency disconnect.
6. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
7. Check 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 [Table 3-3](#).
8. Install the upper compartment cover as described in paragraph [5-2.2](#).

## 9-2. HYDRAULIC PUMP, MOTOR, AND RESERVOIR ASSY

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. Turn off the key switch and engage the emergency disconnect.
3. Remove the upper compartment cover as described in paragraph [5-2.1](#).

4. Tag and disconnect electrical leads from solenoid and motor

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

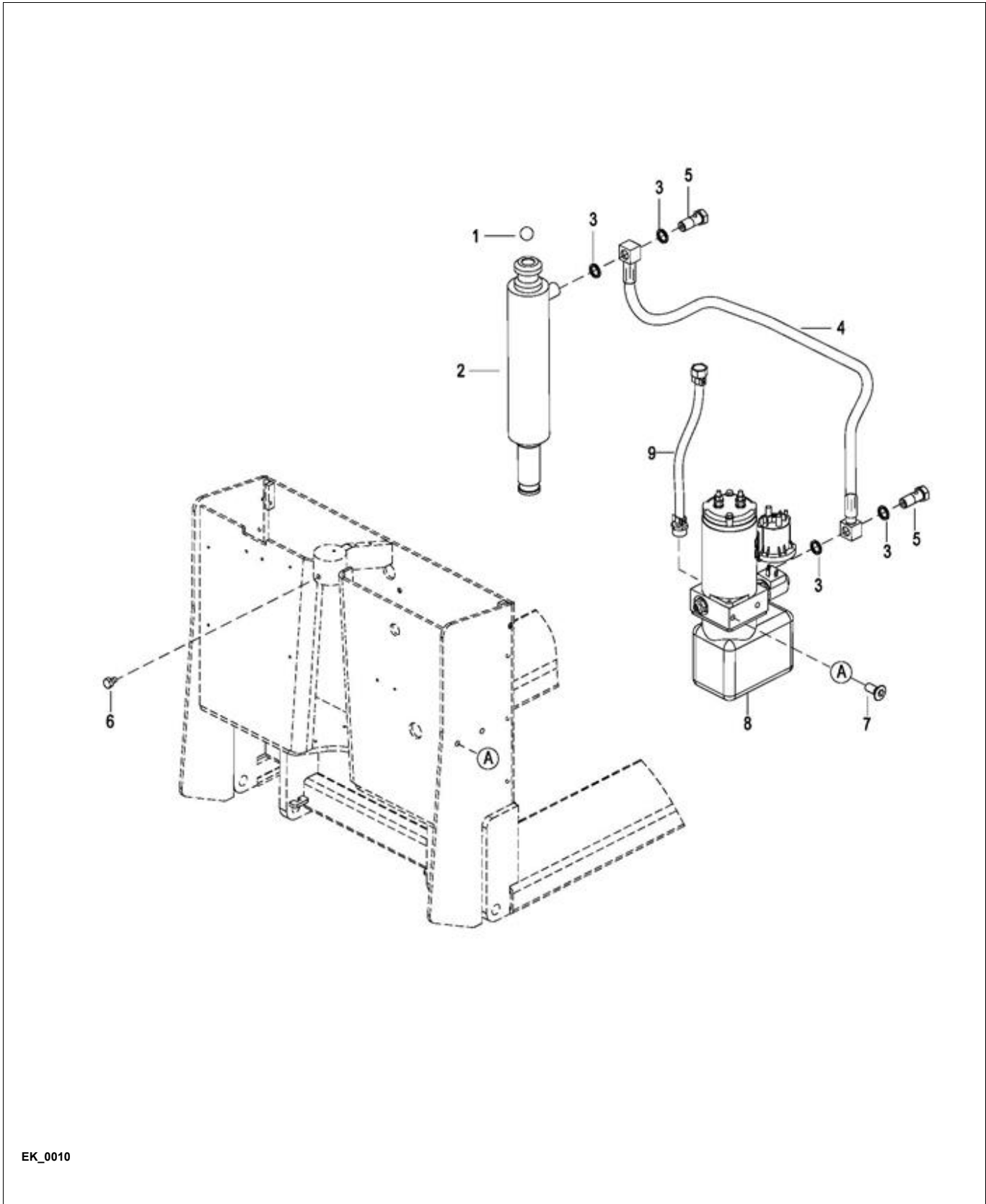
5. Remove bolt and washers and disconnect hose from pump and motor assembly.
6. Remove hose from pump and motor assembly.
7. Remove two screws and move assembly away from frame.

### 9-2.2. Disassembly and Reassembly

1. Remove the hydraulic pump/motor assembly as described in paragraph [9-2.1](#).
2. Refer to [Figure 9-3](#) for disassembly and reassembly.

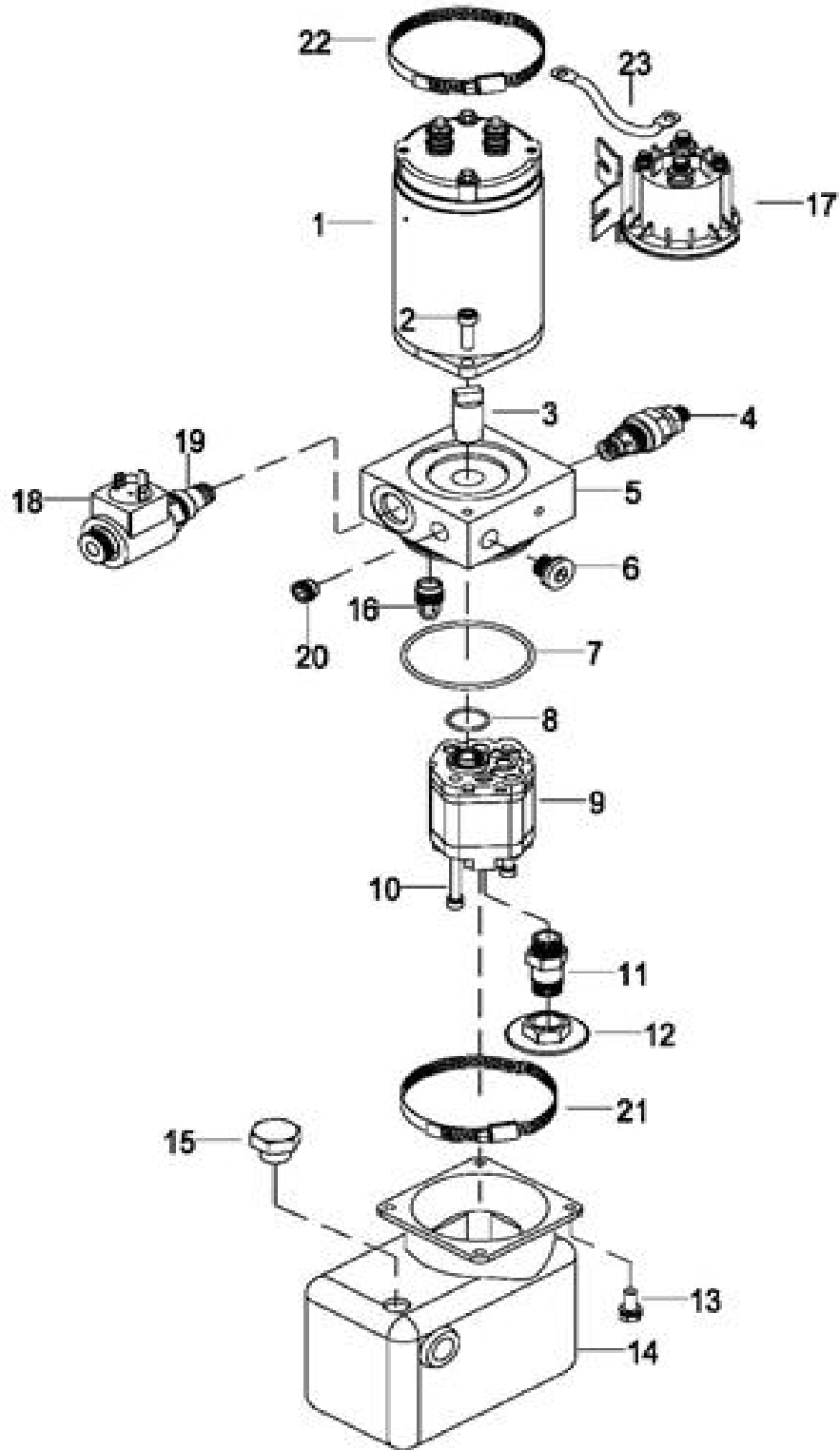
### 9-2.3. Installation

1. Position pump and motor assembly on frame and secure with two screws.
2. Connect electrical leads to motor and solenoid.
3. Reconnect hose to pump and motor assembly with two washers and bolt.
4. Reconnect hose to pump and motor assembly.
5. Fill the hydraulic reservoir. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in [Table 3-3](#).
6. Turn on the key switch and disengage the emergency disconnect.
7. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
8. Check 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 [Table 3-3](#).
9. Install the upper compartment cover as described in paragraph [5-2.2](#).



EK\_0010

Figure 9-2 Hydraulic System



EK\_0012

Figure 9-3 Pump & Motor Assy



## 9-2.4. Lift Cylinder

### 9-2.4.1. Removal

1. Lower forks fully.
2. Turn on the key switch and disengage the emergency disconnect.
3. Remove the upper compartment covers as described in paragraph 5-2.1.
4. Ensure that hydraulic pressure has been relieved from the lift circuit. Disconnect the hydraulic line from the lift cylinder.
5. Remove bolt and washers and disconnect hose from cylinder.
6. Remove screw securing the cylinder to frame.

**WARNING:** Frame is heavy. Use care while securing and lifting in order to prevent injury.

7. With suitable hoist, carefully raise frame slightly so the cylinder can be removed.

### 9-2.4.2. Repair

1. Secure the lift cylinder in a vise with soft jaws, clamping lightly at the base of the cylinder.
2. Unscrew gland nut from body.
3. Remove wiper and O-ring from gland nut.
4. Withdraw the cylinder rod from body.
5. Remove guide ring and seal ring from rod.

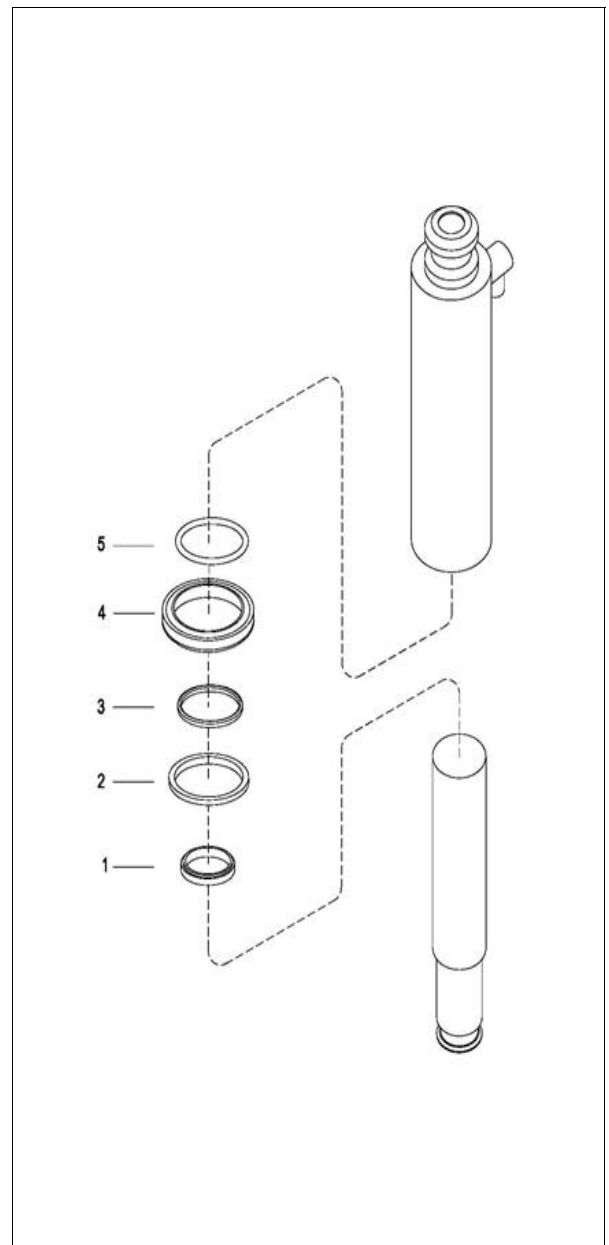
**NOTE:** If the cylinder body or piston rod are damaged, the entire lift cylinder must be replaced

6. Replace guide ring, seal ring, wiper ring and O-ring.
7. Coat all parts with hydraulic oil (Table 3-3).
8. Install new guide ring and seal ring on rod.
9. Insert piston rod into body.
10. Install wiper and O-ring in gland nut.
11. Install gland nut in body.

### 9-2.4.3. Installation

1. Position the cylinder on frame and secure with screw. Then lower the frame onto the cylinder.
2. Reconnect the hose to cylinder with screw and washers.
3. Fill the hydraulic reservoir. Hydraulic oil must be 1 inch below opening. If required, add hydraulic oil to bring to proper level. Use hydraulic oil listed in Table 3-3.

4. Turn on the key switch and disengage the emergency disconnect.
5. Operate the lift and lower buttons to refill the cylinder and lines with hydraulic oil.
6. Check 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 Table 3-3.
7. Install the upper compartment cover as described in paragraph 5-2.2.



**Figure 9-4**

**NOTES**

## SECTION 10 ELECTRICAL COMPONENTS

### 10-1.ELECTRICAL CONTROL PANEL

#### 10-1.1.Maintenance

**NOTE:** Erratic operation of the truck may be caused by defective controller components. Before removing the electrical panel, perform troubleshooting procedures per [SECTION 4](#), 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 pre-programmed unit to assure proper performance settings intended for that particular truck. See [Figure 12-12](#) for the preprogrammed controller number.

It is recommended that the controller exterior be cleaned periodically, and if a Curtis Handset 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 vehicle is serviced.

#### 10-1.2.Cleaning

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the upper compartment covers as described in [paragraph 5-2.1](#).
3. Remove any dirt or corrosion from the bus bar area. The controller should be wiped clean with a moist rag. Allow it to dry before reconnecting the battery.
4. Make sure the connections to the buss bars are tight. Use two well insulated wrenches for this task in order to avoid steering the buss bars.

#### 10-1.3.Controller Removal.

1. Turn off the key switch and engage the emergency disconnect.

2. Remove the upper compartment covers as described in [paragraph 5-2.1](#).
3. Tag and disconnect harness from controller.
4. Remove two screws, two lock washers and two flat washers. Remove controller from bracket.

#### 10-1.4.Controller Installation.

1. Position controller on bracket and secure with two screws, two lock washers and two flat washers.
2. Reconnect harness to controller.
3. Install upper compartment covers as described in [paragraph 5-2.2](#).
4. Turn on the key switch and disengage the emergency disconnect.

#### 10-1.5.Charger Removal.

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the upper compartment covers as described in [paragraph 5-2.1](#).
3. Tag and disconnect harness from charger.
4. Tag and disconnect remaining two charger leads from the pump motor and the fuse. Refer to [Figure 10-3](#).
5. Remove four screws, four lock washers and four flat washers. Remove charger from bracket.

#### 10-1.6.Charger Installation.

1. Position charger on bracket and secure with four screws, four lock washers and four flat washers.
2. Reconnect the two charger leads to the pump motor and the fuse. Refer to [Figure 10-3](#).
3. Reconnect harness to charger.
4. Install upper compartment covers as described in [paragraph 5-2.2](#).
5. Turn on the key switch and disengage the emergency disconnect.

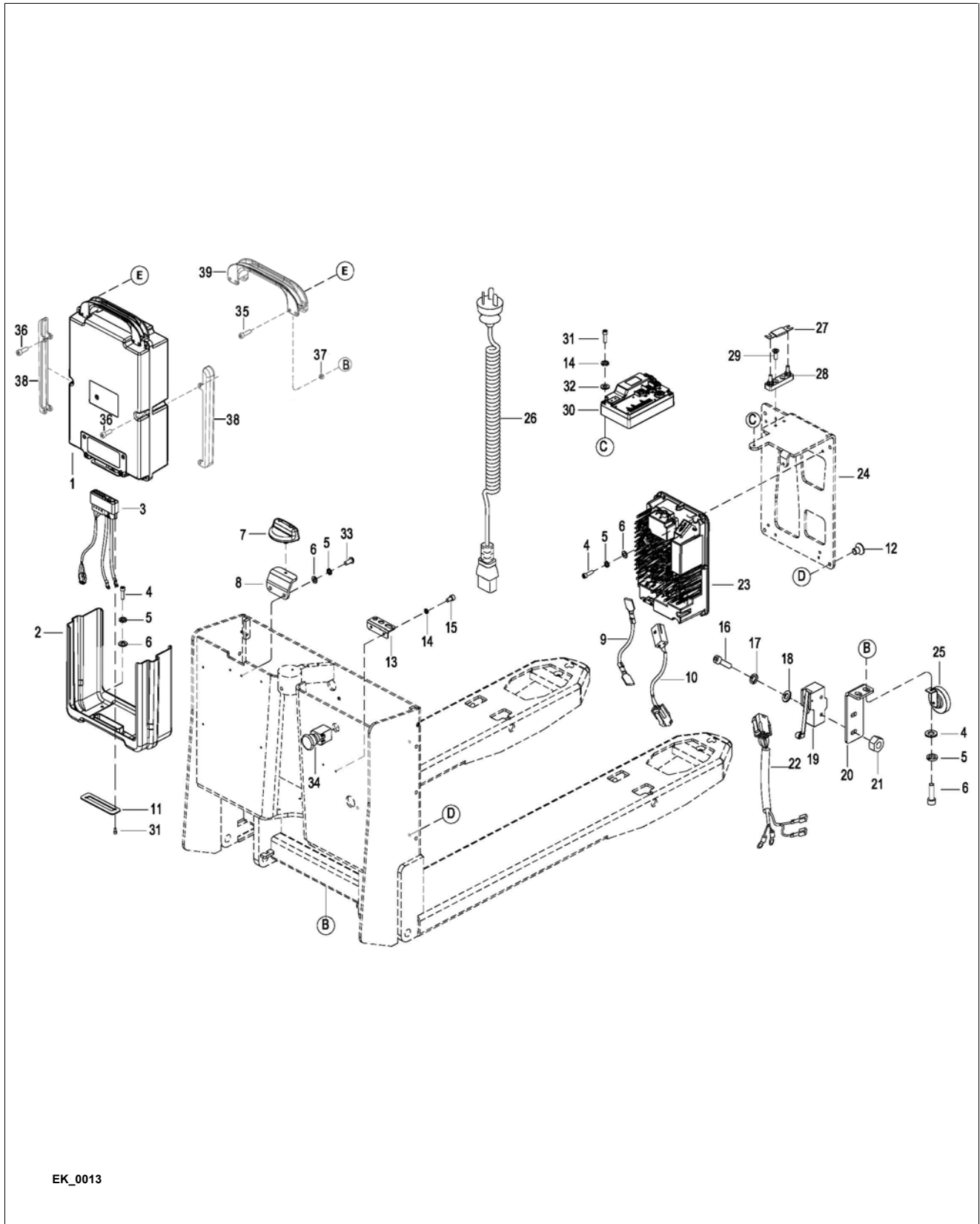


Figure 10-1 Electrical System

**10-1.7. Horn Removal.**

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the upper compartment covers as described in paragraph 5-2.1.
3. Tag and disconnect harness from the horn.
4. Remove screw and horn from bracket.

**10-1.8. Horn Installation.**

1. Position the horn on bracket and secure with screw.
2. Reconnect harness to buzzer.
3. Install upper compartment covers as described in paragraph 5-2.2.
4. Turn on the key switch and disengage the emergency disconnect.

**10-1.9. Key Switch Removal.**

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the four screws that secure the back cover assembly to the control head.
3. Tag and disconnect harness from key switch.

4. Remove mounting nut and key switch from the back cover assembly.

**10-1.10. Key Switch Installation.**

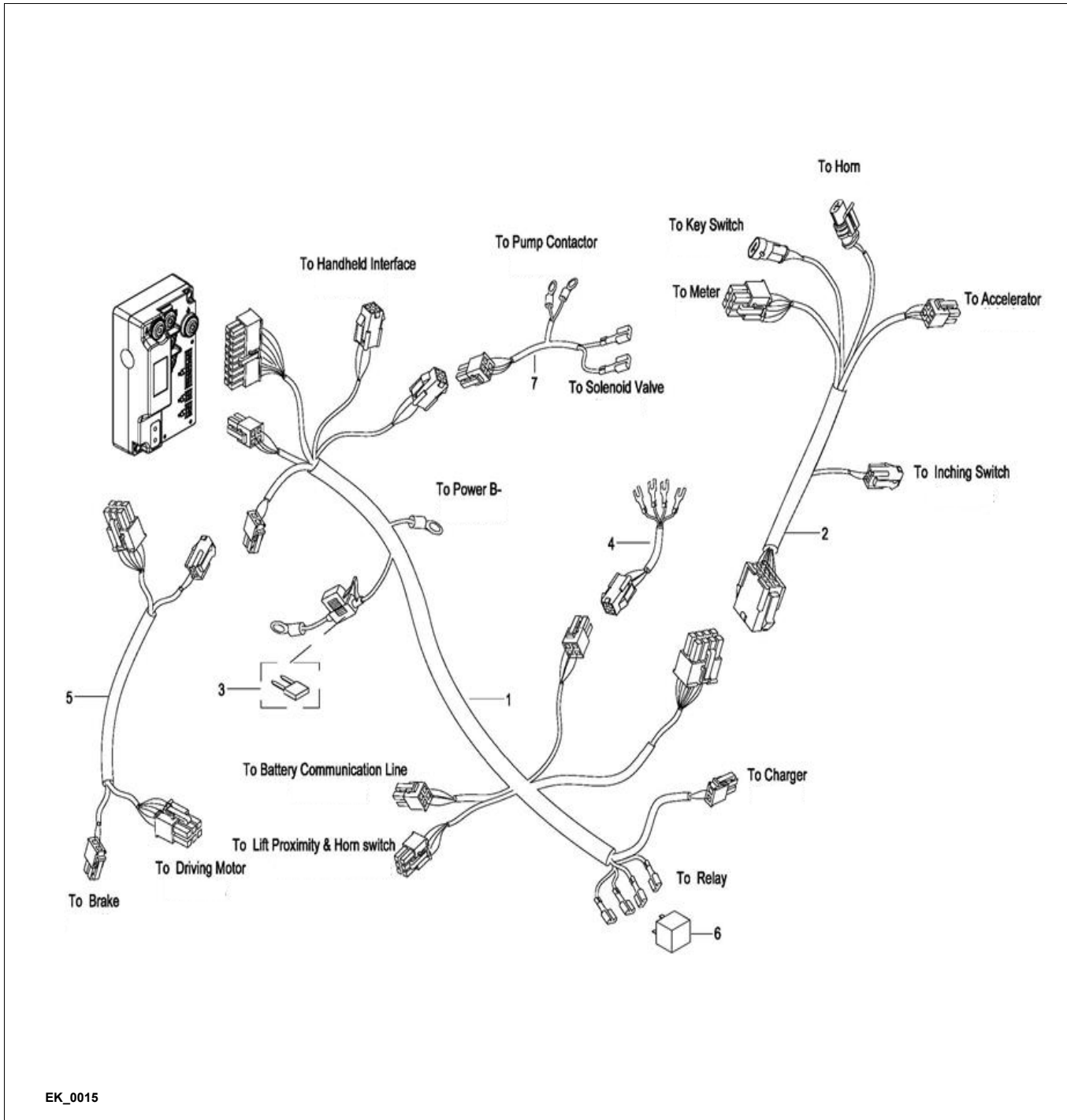
1. Position key switch on the back cover assembly and secure with its mounting nut.
2. Reconnect harness to key switch.
3. Install the four screws that secure the back cover assembly to the control head.
4. Turn on the key switch and disengage the emergency disconnect.

**10-1.11. Emergency Disconnect Removal.**

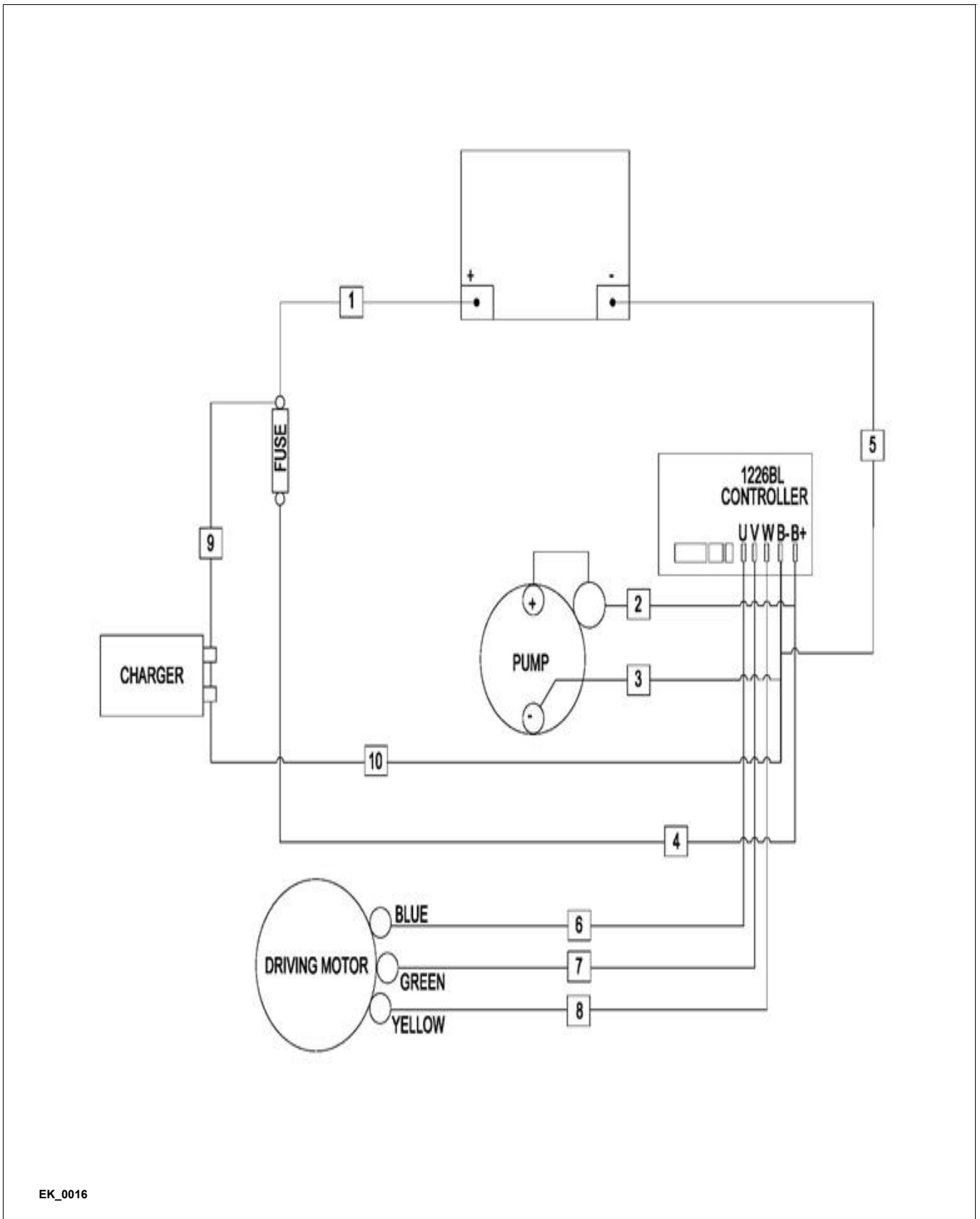
1. Turn off the key switch and engage the emergency disconnect.
2. Remove the upper compartment covers as described in paragraph 5-2.1.
3. Tag and disconnect harness from emergency disconnect.
4. Remove the knob from the emergency disconnect.
5. Remove two screws and remove emergency disconnect from bracket.

**10-1.12. Emergency Disconnect Installation.**

1. Position emergency disconnect on bracket and secure with two screws.
2. Install the knob on the emergency disconnect. Reconnect harness to emergency disconnect.
3. Install upper compartment covers as described in paragraph 5-2.2.
4. Turn on the key switch and disengage the emergency disconnect.



**Figure 10-2 Wiring Harness**



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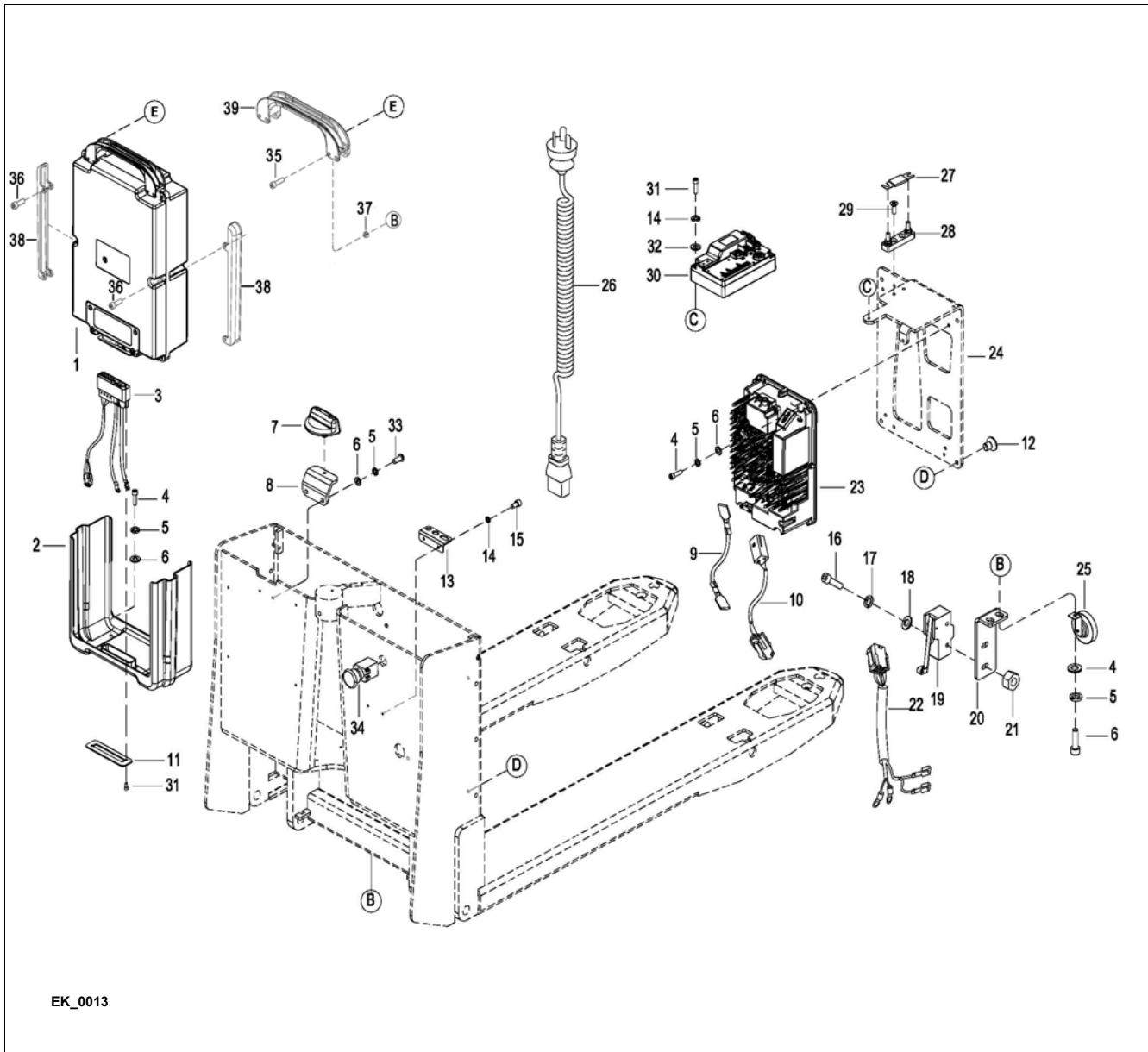
Figure 10-3 Wiring Cables

**10-1.13.Lift Limit Switch Removal.**

1. Lower forks fully.
2. Turn off the key switch and engage the emergency disconnect.
3. Remove the lower compartment covers as described in paragraph 5-4.1.
4. Tag and disconnect harness from limit switch.
5. Remove two screws, lock washers and flat washers and limit switch from bracket.

**10-1.14.Lift Limit Switch Installation.**

1. Position limit switch on bracket and secure with two screws, lock washers and flat washers.
2. Reconnect harness to limit switch.
3. Install upper compartment covers as described in paragraph 5-4.2.
4. Turn on the key switch and disengage the emergency disconnect.



**Figure 10-4 Electrical System**



**10-2.PUMP MOTOR.**

The pump motor is replaceable but not repairable. Refer to paragraph 9-2.

**10-3.DRIVE MOTOR.**

The drive motor exposed surfaces should be cleaned at least once a month to assure proper cooling of motor. Use an air hose to blow dust off of motor surfaces.

The drive motor is replaceable but not repairable. Refer to paragraph 7-2.

**10-4.DEADMAN SWITCH****10-4.1.Replacement**

1. Turn off the key switch and engage the emergency disconnect.
2. Remove the middle compartment covers as described in paragraph 5-5.1.
1. Disconnect wiring from the deadman switch.
2. Remove the two screws that secures the deadman switch to the bracket.
3. Position the new deadman switch on the bracket and secure with the two screws.
4. Install middle compartment cover as described in paragraph 5-5.2.
5. Turn on the key switch and disengage the emergency disconnect.

**NOTES**

**SECTION 11**  
**OPTIONAL EQUIPMENT**

**NOTES**

## **SECTION 12**

### **ILLUSTRATED PARTS BREAKDOWN**

Following is an illustrated breakdown of assemblies and parts associated with the LPJ-44 Lift Truck.

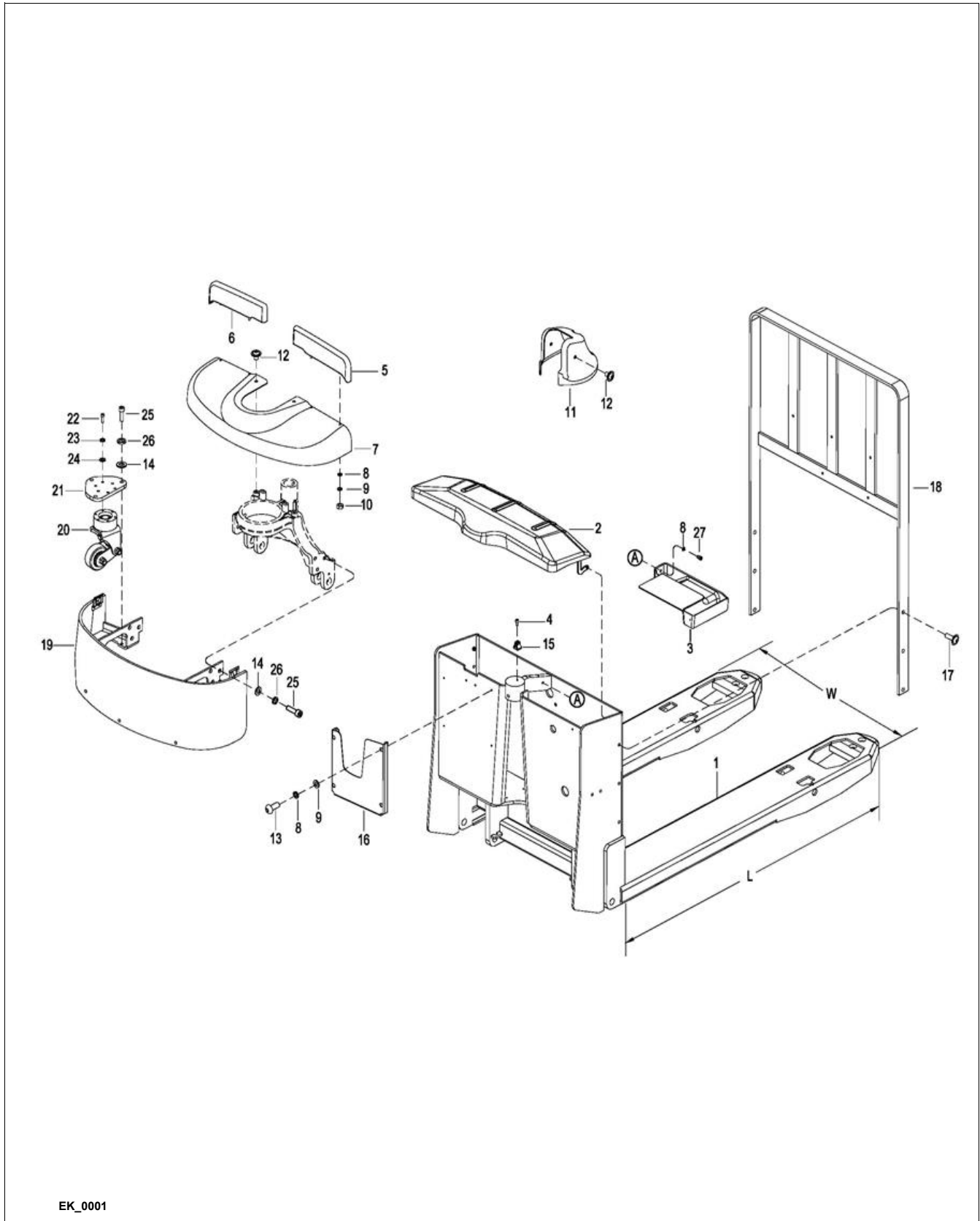
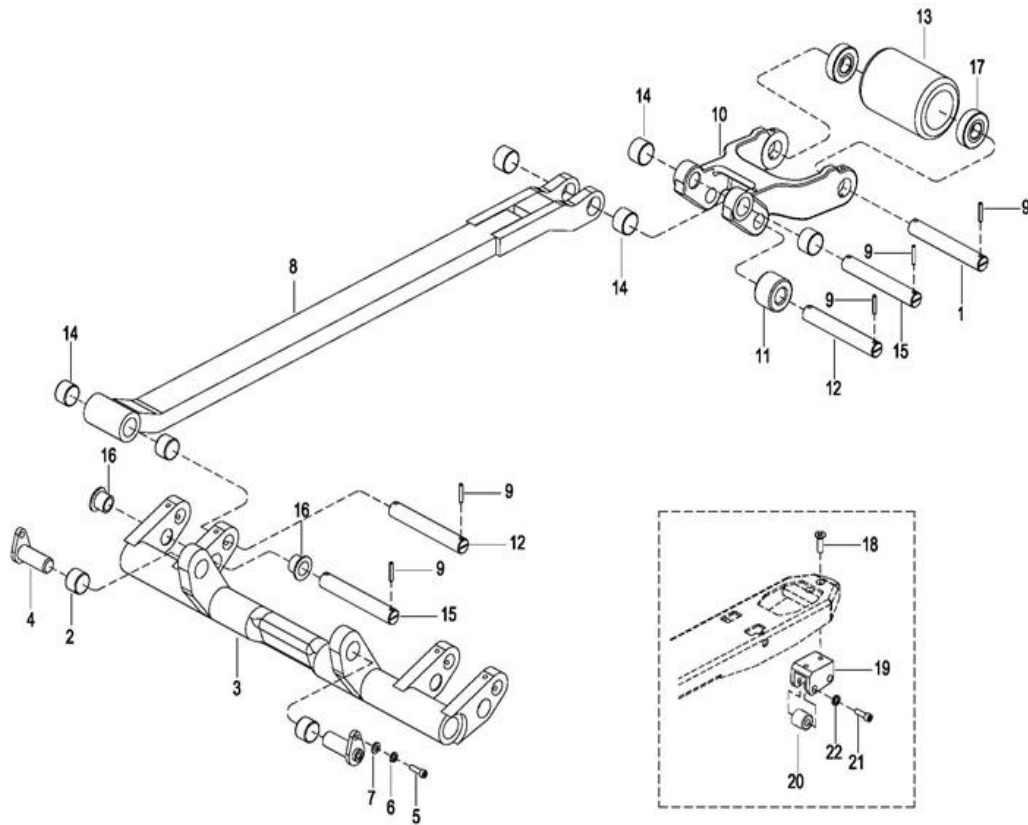


Figure 12-1 Frame

## Frame

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	1124-110000-BJ-03	FRONT FRAME	1	W= 27" (685mm) L=1170mm Single Wheel
2	1124-170000-BJ	COVER	1	
3	1124-100010-BJ	COVER	1	
4	0000-000493-00	SCREW M5×8	1	
5	1124-100006-00-BJ	BAFFLE R	1	BIG JOE yellow
6	1124-100005-00-BJ	BAFFLE L	1	BIG JOE yellow
7	1124-100001-00-BJ	COVER	1	BIG JOE yellow
8	0000-000206-00	LOCK WASHER Ø5	10	
9	0000-000390-00	FLAT WASHER Ø5	8	
10	0000-000546-00	NUT M5	4	
11	1124-100002-00-BJ	REVOLVING COVER	1	BIG JOE yellow
12	1118-100021-10	SCREW M8×12	4	
13	3020-220000-02	SCREW M5×10	4	
14	0000-000007-00	FLAT WASHER Ø10	12	
15	1154-100007-00	CLIP	1	
16	1124-100004-00	FOLDER	1	
17	3020-220000-03	SCREW M10×16	6	
18	1124-160000-BJ-02	SHELVING	1	Optional Height=1219mm
19	1124-140000-00	BAFFLE	1	
20	1155-032000-00	CASTER ASSEMBLY	2	Optional
21	1124-100016-00	PLATE	2	Optional
22	0000-000386-00	SCREW M6×20	6	Optional
23	0000-000056-00	LOCK WASHER Ø6	6	Optional
24	0000-000380-00	FLAT WASHER Ø6	6	Optional
25	0000-000070-00	SCREW M10×25	12	
26	0000-000063-00	LOCK WASHER Ø10	12	
27	0000-000031-00	SCREW M5X8	2	



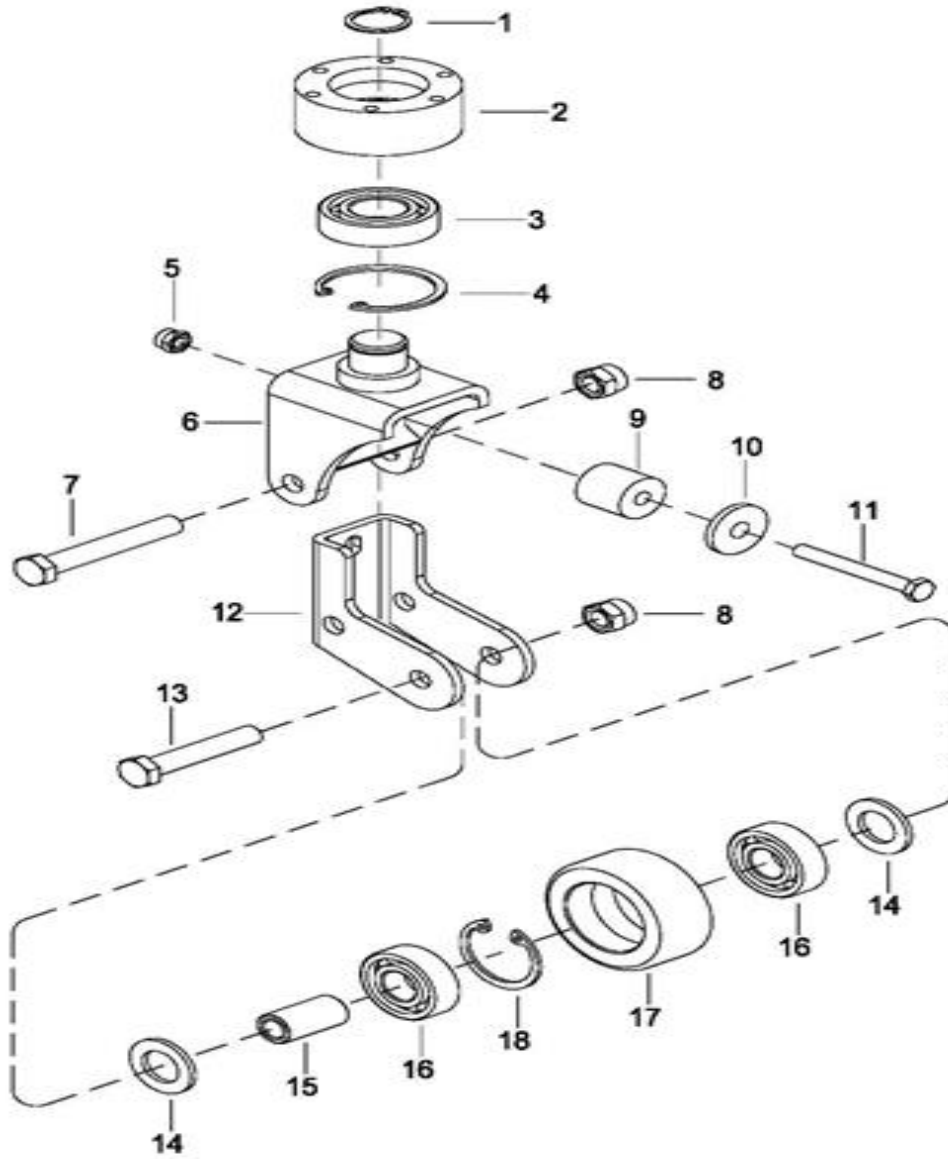
EK 0002

Figure 12-2 Lift Link Assembly - Single Wheel



### Lift Link Assembly - Single Wheel

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	1120-130010-1A	SHAFT	2	
2	1124-130006-00	BUSHING	2	
3	1124-131000-00	LOWER LINK	1	
4	1120-134000-0A	PIN	2	
5	0000-000386-00	SCREW M6×20	2	
6	0000-000056-00	LOCK WASHER Ø6	2	
7	0000-000380-00	FLAT WASHER Ø6	2	
8	1124-132000-00-03	LONG LINK	2	
9	0000-000225-00	PIN Ø6×35	10	
10	1124-130010-00	WHEEL BRACKET	2	
11	1124-130009-00	AUXILIARY WHEEL	2	
12	1221-130003-P0	PIN	4	
13	1124-133003-10	LOAD WHEEL	2	
14	1124-130005-00	BUSHING	12	
15	1221-130002-PA	PIN	4	
16	1124-130004-00	BUSHING	4	
17	0000-000100-00	BEARING	4	
18	3020-000001-09	SCREW M10×25	2	
19	1124-134001-00	MOUNTING BLOCK	2	
20	1124-134002-00	GUIDE WHEEL	4	
21	3020-000002-10	SCREW M12×55	4	
22	0000-000060-00	LOCK WASHER Ø12	4	

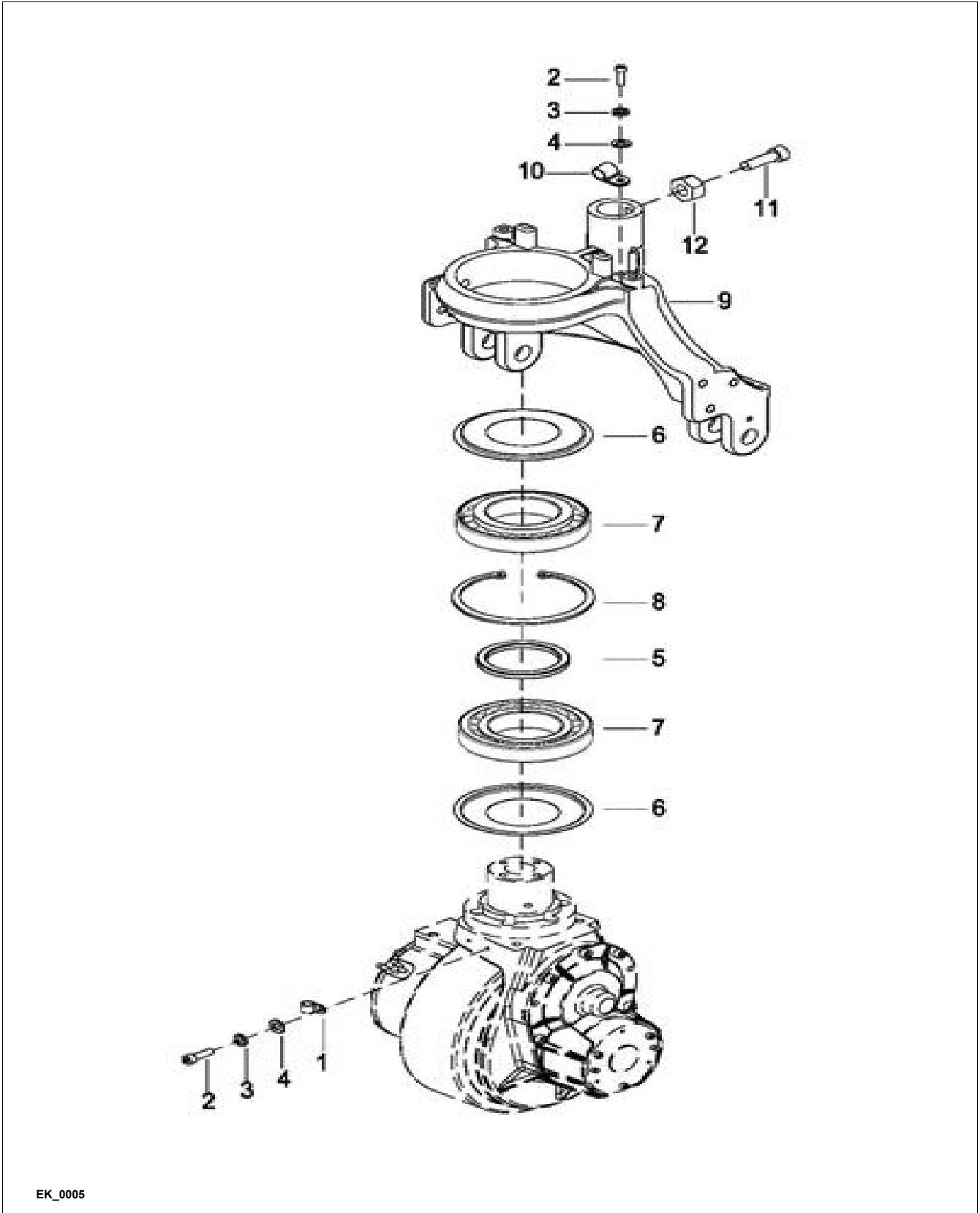


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Figure 12-3 Caster Assembly

## Caster Assembly

Pos. #	Part Number	Description	Qty. Reqd.	Notes
--	1155-032000-00	CASTER ASSEMBLY	1	2 Caster assemblies per truck.
1	0000-000294-00	EXTERNAL CIRCLIP FOR SHAFT Ø25	1	
2	1155-032100-00	CASTER SUPPORT	1	
3	0000-000424-00	BEARING	1	
4	0000-000758-00	INTERNAL CIRCLIP FOR HOLES Ø52	1	
5	0000-000740-00	NUT M8	1	
6	1155-032300-00	SUPPORT	1	
7	0000-001414-00	BOLT M12X80	1	
8	0000-001334-00	NUT M12	2	
9	1115-032002-AB	BUMPER BLOCK	1	
10	0000-000373-00	FLAT WASHER Ø12	1	
11	3010-010000-90	BOLT M8X70	1	
12	1155-032201-00	WHEEL SUPPORT	1	
13	3010-000002-28	BOLT M12X65	1	
14	0000-000435-00	FLAT WASHER Ø20	2	
15	1155-143001-00	SHAFT	1	
16	3090-010000-23	BEARING	2	
17	1155-172101-00	PU WHEEL	1	
18	0000-000849-00	INTERNAL CIRCLIP FOR HOLES Ø47	1	

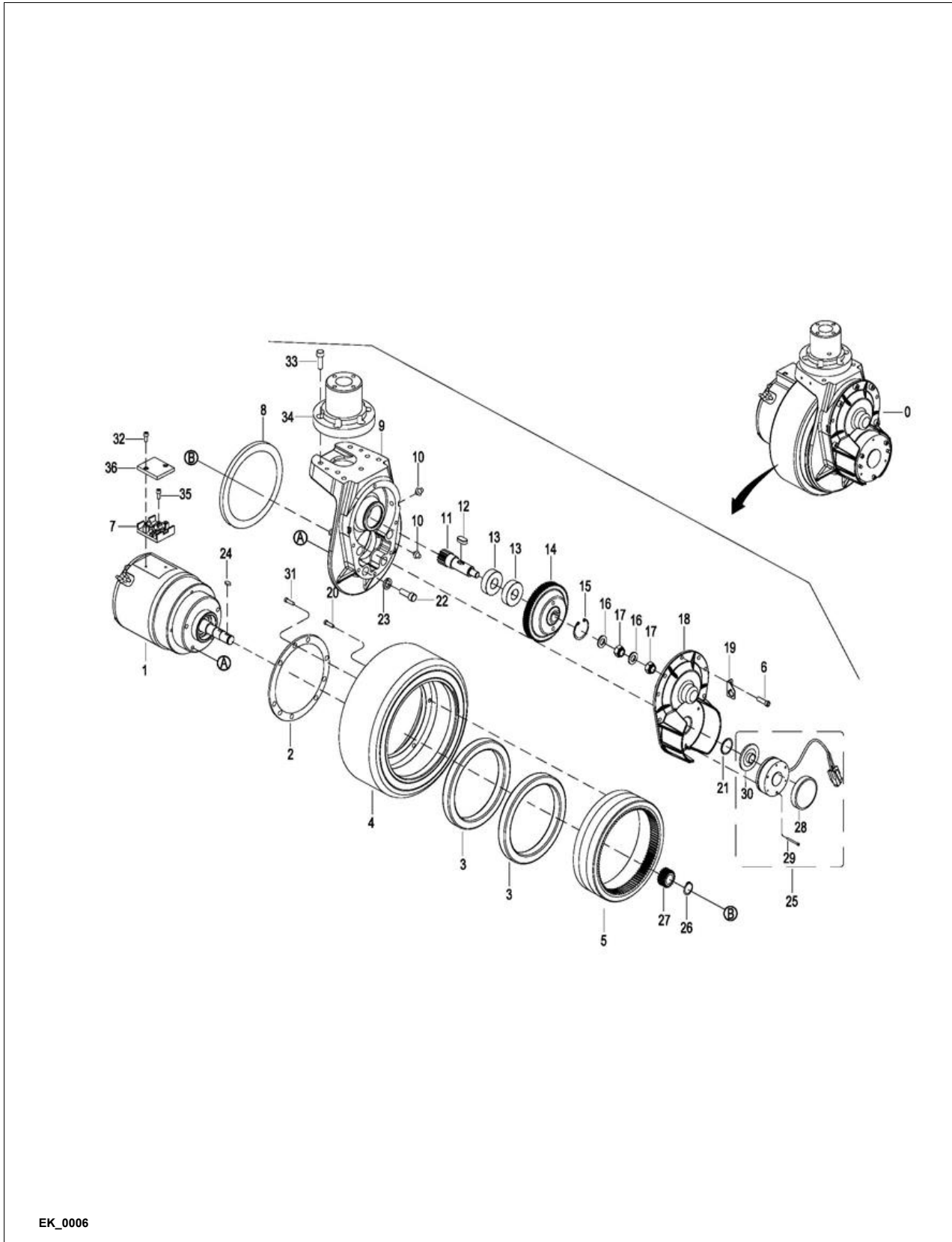


EK\_0005

Figure 12-4 Drive Unit

## Drive Unit

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	0000-001058-00	LINE CLAMP	2	
2	0000-000004-00	SCREW M5×12	3	
3	0000-000206-00	LOCK WASHER Ø5	3	
4	0000-000390-00	FLAT WASHER Ø5	3	
5	1124-200006-00	SPACER	1	
6	1124-200010-00	SCRAPER SEAL	2	
7	3090-020000-32	BEARING	2	
8	3050-020000-24	INTERNAL CIRCLIP FOR HOLES Ø120	1	
9	1124-120000-00	DRIVE AXLE	1	
10	0000-000491-00	LINE CLAMP	1	
11	0000-000030-00	SCREW M10×16	1	
12	0000-000553-00	NUT M10	1	

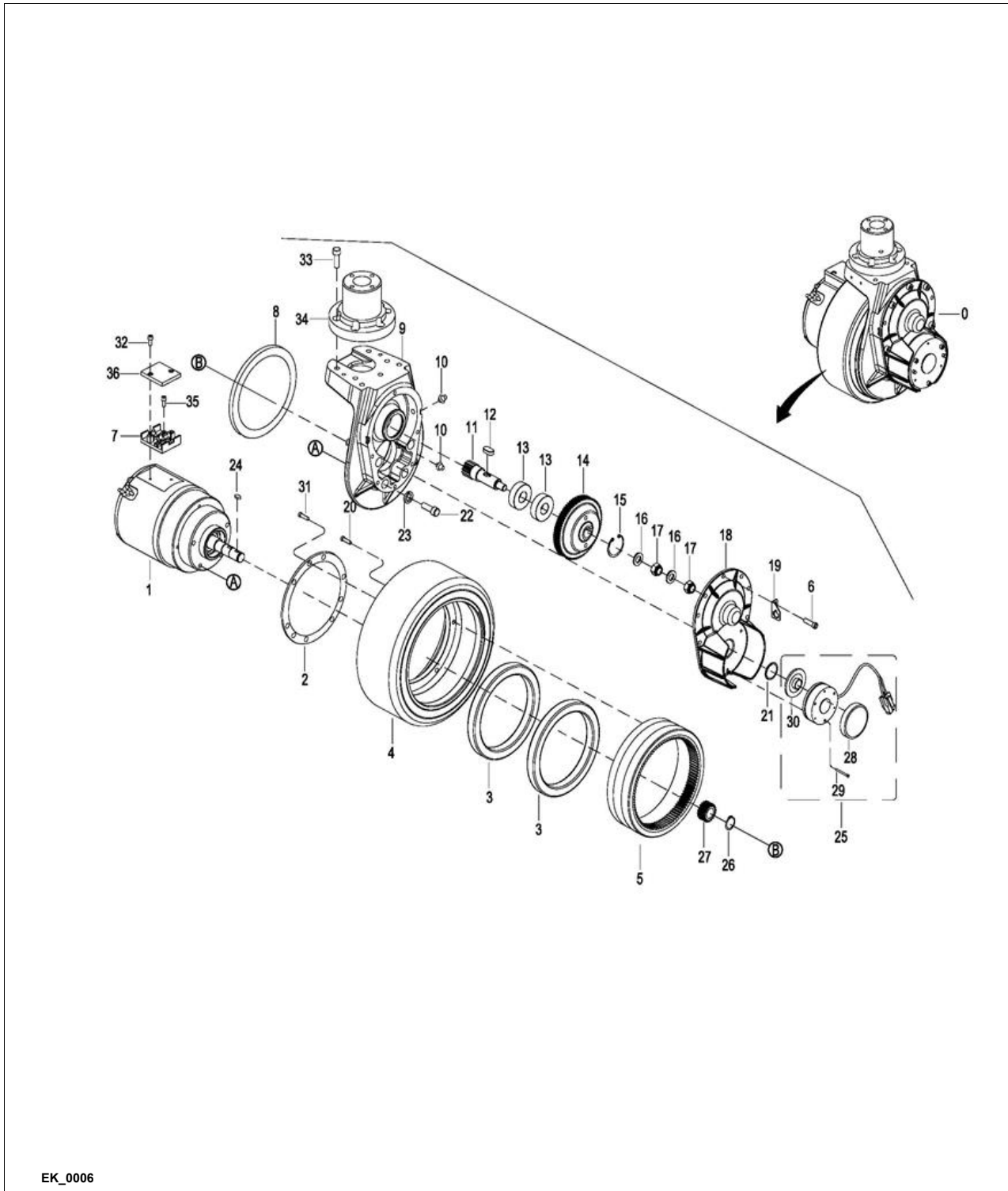


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Figure 12-5 Transmission, Motor and Brake

## Transmission, Motor and Brake

Pos. #	Part Number	Description	Qty. Reqd.	Notes
0	ZL10-200000-F3	DRIVING ASSEMBLY	1	
1	ZL10-220000-30	MOTOR	1	
2	ZL10-200007-00	BEARING BAFFLE	1	
3	3090-010000-11	BEARING	2	
4	ZL10-210000-B0	DRIVE WHEEL	1	
4a	ZL10-210000-D0	DRIVE WHEEL - TRACTION	1	Rubber Traction wheel
5	ZL10-200004-00	INNER GEAR RING	1	Replaced together with item 11
6	0000-000055-00	SCREW M6×16	1	
7	1116-240002-00	COVER	1	
8	0000-000670-00	SEAL RINGØ155×172×10	1	
9	ZL10-200005-F0	GEAR CASE	1	
10	0000-000013-00	GREASE FITTING M8×1×10	2	
11	ZL10-200003-00	SMALL STRAIGHT TEETH	1	Replaced together with item 5
12	0000-001020-00	KEY 5×5×16	1	
13	3090-010000-42	BEARING	2	
14	ZL10-200001-00	LARGE HELICAL TEETH	1	Replaced together with item 27
15	3050-020000-23	INTERNAL CIRCLIP FOR HOLES Ø40	1	
16	0000-000071-00	FLAT WASHER Ø10	2	
17	0000-000425-00	NUT M10	2	
18	ZL10-200006-A0	GEAR COVER	1	
19	1115-200020-00	PLATE	1	
20	1115-200022-D0	SCREW M6×25	6	
21	0000-000671-00	SEAL Ø16×28×7	1	
22	0000-000026-00	SCREW M8×30	4	
23	0000-000159-00	LOCK WASHER Ø8	6	
24	0000-001021-00	KEY 5×5×10	2	
25	ZL10-520012-00	BRAKE ASSEMBLY	1	
26	0000-000659-00	EXTERNAL CIRCLIP FOR SHAFT Ø15	1	
27	ZL10-200002-00	SMALL HELICAL TEETH	1	Replaced together with item 14
28	1115-240002-0A	SCRAPER	1	
29	0000-000665-00	SCREW M4×45	3	
30	1115-240001-00	BRAKE LINING	1	



EK\_0006

Figure 12-5 Transmission, Motor and Brake - Continued



**Transmission, Motor and Brake - Continued**

<b>Pos. #</b>	<b>Part Number</b>	<b>Description</b>	<b>Qty. Reqd.</b>	<b>Notes</b>
31	3020-010000-18	SCREW M6×20	3	
32	0000-000028-00	SCREW M4×10	2	
33	0000-000905-00	SCREW M8×20	5	
34	1124-210011-A0	SPINDLE NOSE	1	
35	0000-000378-00	SCREW M4×16	2	
36	1116-240001-00	COVER	1	

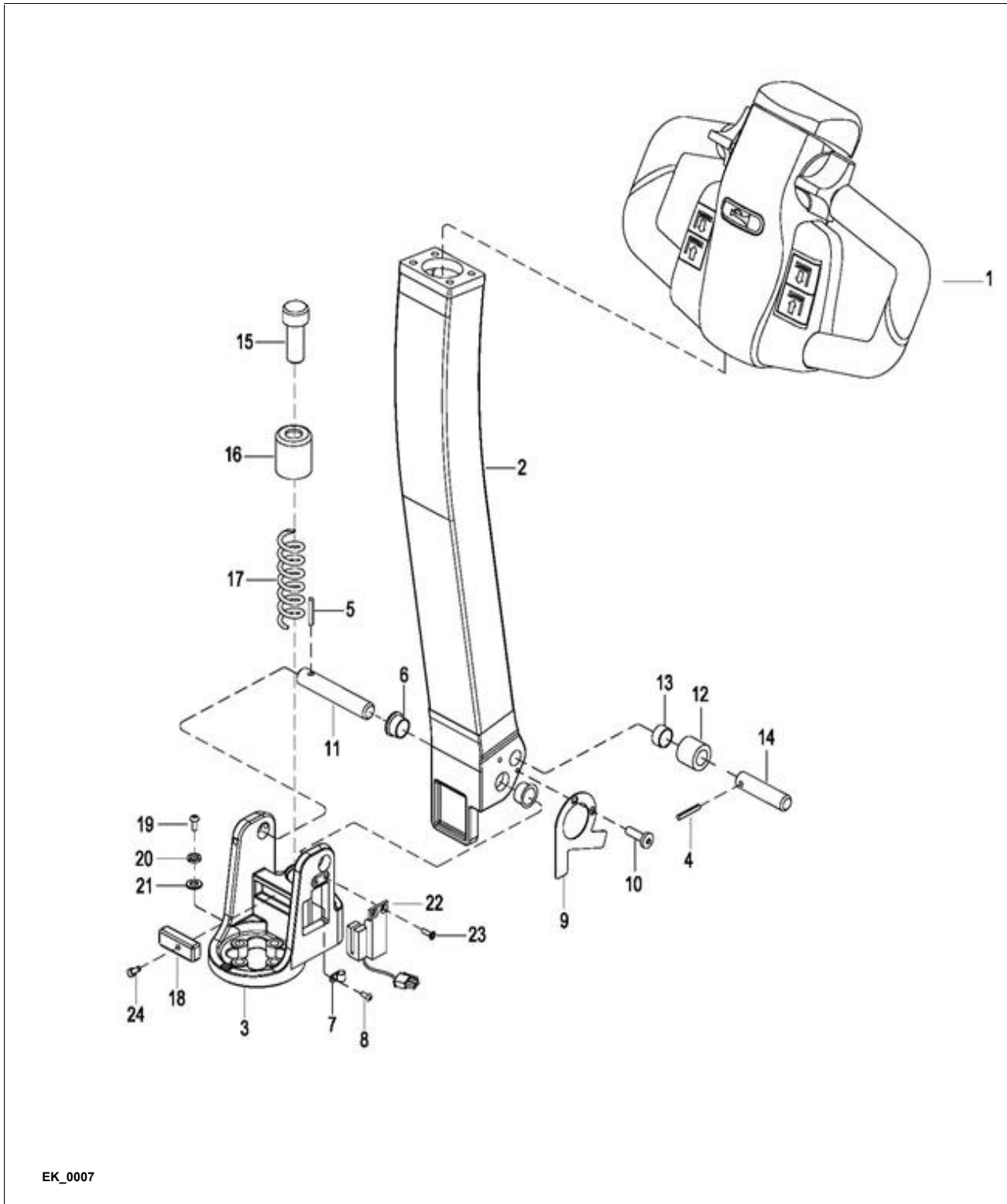
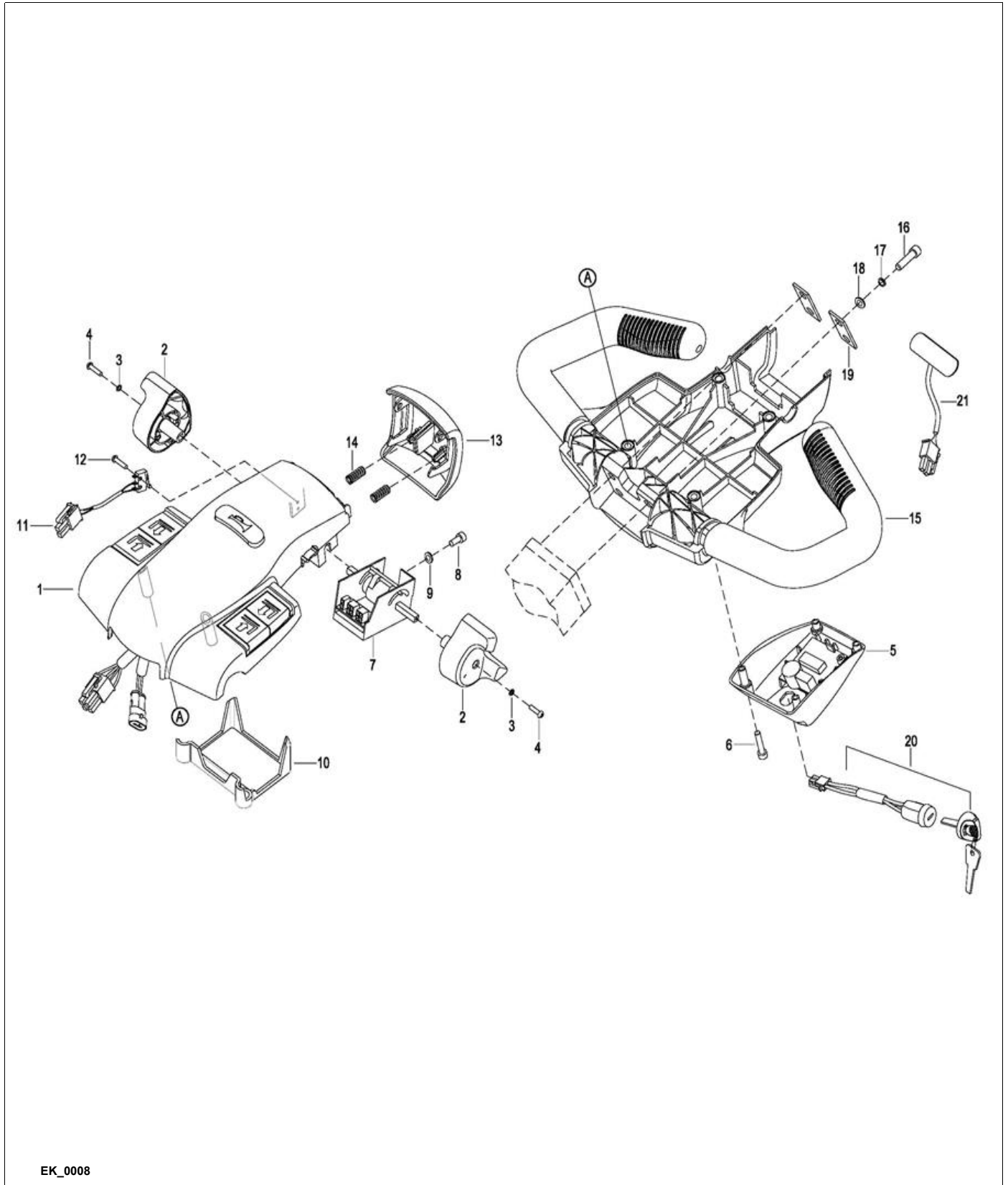


Figure 12-6 Steering Arm

## Steering Arm

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	1115-340000-10-PL	CONTROL POD ASSEMBLY	1	With Wire
2	1124-310000-00	CONTROL HANDLE	1	
3	1124-330000-00	JOINT SEAT	1	
4	3070-030000-04	PIN 5X18	1	
5	3070-000000-76	PIN 5X14	1	
6	0000-000677-00	BUSHING	2	
7	2028-999000-26	LINE CLAMP	1	
8	0000-000518-00	SCREW M5X6	1	
9	1124-300006-00	INDUCTION PLATE	1	
10	1124-300007-00	SCREW M5X8	2	
11	1124-300001-00	SHAFT	1	
12	1113-300006-00	ROLLER	1	
13	2028-019000-08	BUSHING	1	
14	1124-300003-00	SHAFT	1	
15	1124-300004-00	GUIDE COLUMN	1	
16	1124-300005-00	SPRING COVER	1	
17	1124-300002-00	SPRING	1	
18	1127-300002-0A	BUFFER BLOCK	1	
19	0000-001411-00	SCREW M8X30	4	
20	0000-000159-00	LOCK WASHER Ø8	4	
21	0000-000176-00	FLAT WASHER Ø8	4	
22	1124-300011-00	INTERLOCK SWITCH	1	
23	0000-000616-00	SCREW M5X10	2	
24	0000-000004-00	SCREW M5X12	1	

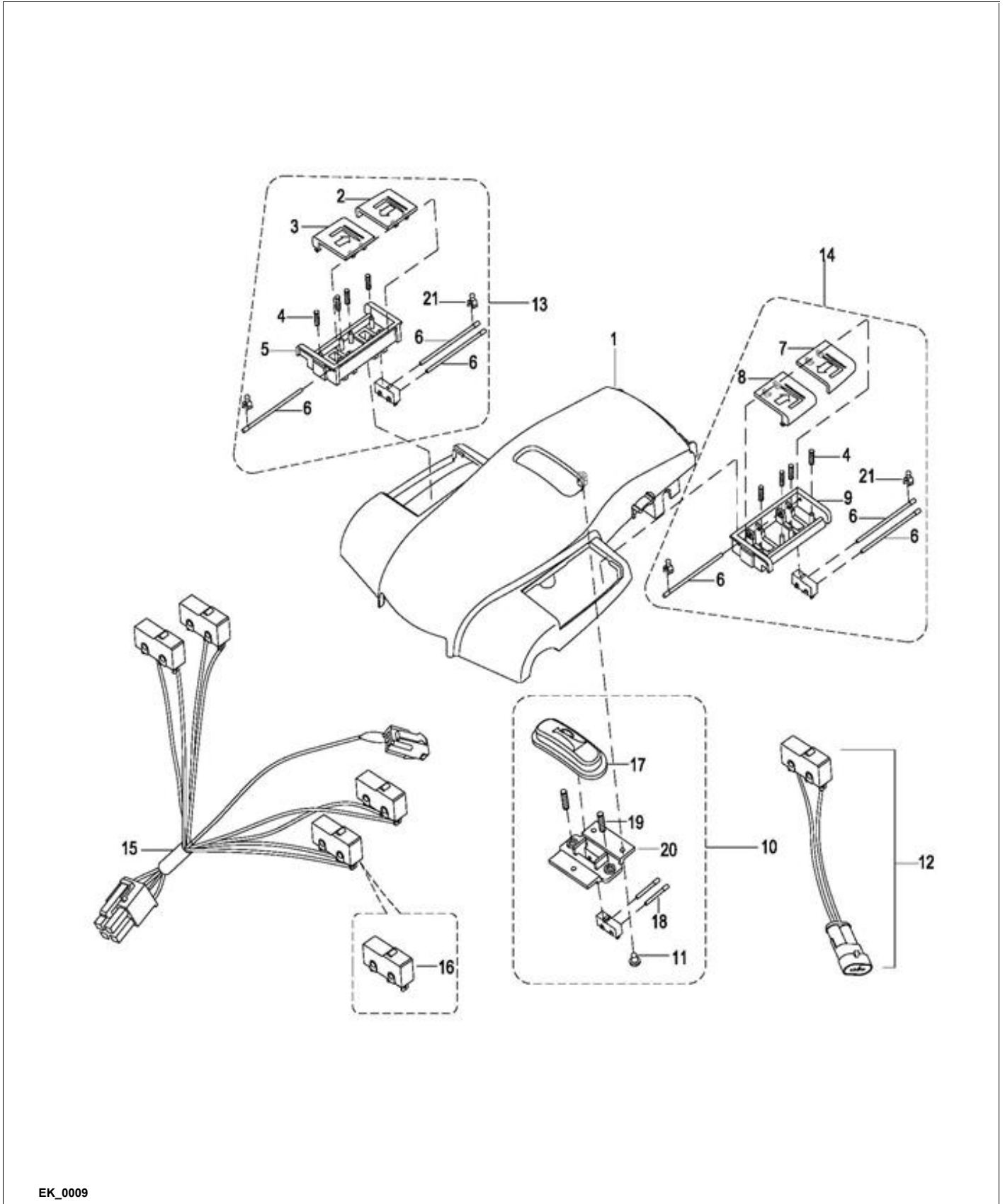


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Figure 12-7 Control Head

## Control Head

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	1115-341000-10-PL	CAP ASSEMBLY	1	With Wire
2	1115-34001X-00	TRAVELING KNOB, SET OF 2	1	Includes one Left and one Right knob
3	0000-000038-00	LOCK WASHER Ø3	2	
4	0000-000037-00	SCREW M3×12	2	
5	2YL0-122250-03	BACK COVER ASSEMBLY	1	
6	0000-001322-00	SCREW M5×50	4	
7	2012-550000-00	DRIVE SWITCH	1	
8	0000-000323-00	SCREW M5×16	1	
9	0000-000390-00	FLAT WASHER Ø5	1	
10	1115-340007-00	WIRE HARNESS COVER	1	
11	1115-520003-0A-CP	REVERSING SWITCH WIRE	1	
12	0000-000989-00	SCREW M2×12	2	
13	1115-340003-00	COVER	1	
14	1121-310004-00	SPRING	2	
15	1115-340002-10	COVER	1	
16	0000-000322-00	SCREW M8×25	4	
17	0000-000159-00	LOCK WASHER Ø8	4	
18	0000-000176-00	FLAT WASHER Ø8	4	
19	1115-340001-00	WASHER	2	
20	1220-520002-0C	2-WAY KEY SWITCH ASSEMBLY	1	
21	2108-520003-0A	TURTLE SPEED UPRIGHT HARNESS	1	



EK\_0009

Figure 12-8 Cap Assembly

## Cap Assembly

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	1115-341001-00	UPPER COVER	1	
2	1120-342203-00	LIFT BUTTON (R)	1	
3	1120-342202-00	LOWERING BUTTON (R)	1	
4	1120-342102-00	SPRING	8	
5	1120-342201-00	BUTTON BRACKET (R)	1	
6	1120-342105-00	PIN	6	
7	1120-342104-00	LIFT BUTTON (L)	1	
8	1120-342103-00	LOWERING BUTTON (L)	1	
9	1120-342101-00	BUTTON BRACKET (L)	1	
10	1120-342300-00	HORN BUTTON ASSEMBLY	1	
11	0000-000039-00	SCREW ST3.5×9.5	6	
12	4230-520004-00	BUTTONS ASSEMBLY	1	
13	1120-342200-00	LIFT AND LOWER BOX ASSEMBLY (R)	1	
14	1120-342100-00	LIFT AND LOWER BOX ASSEMBLY (L)	1	
15	1124-520005-10	BUTTONS ASSEMBLY	1	
16	1220-560002-00	INCHING SWITCH II	5	
17	1120-342002-00	HORN BUTTON	1	
18	1120-342005-00	PIN	2	
19	1120-342003-00	SPRING	2	
20	1120-342004-00	BUTTON BRACKET	1	
21	1120-342005-00-KT	CARD SLEEVE	6	

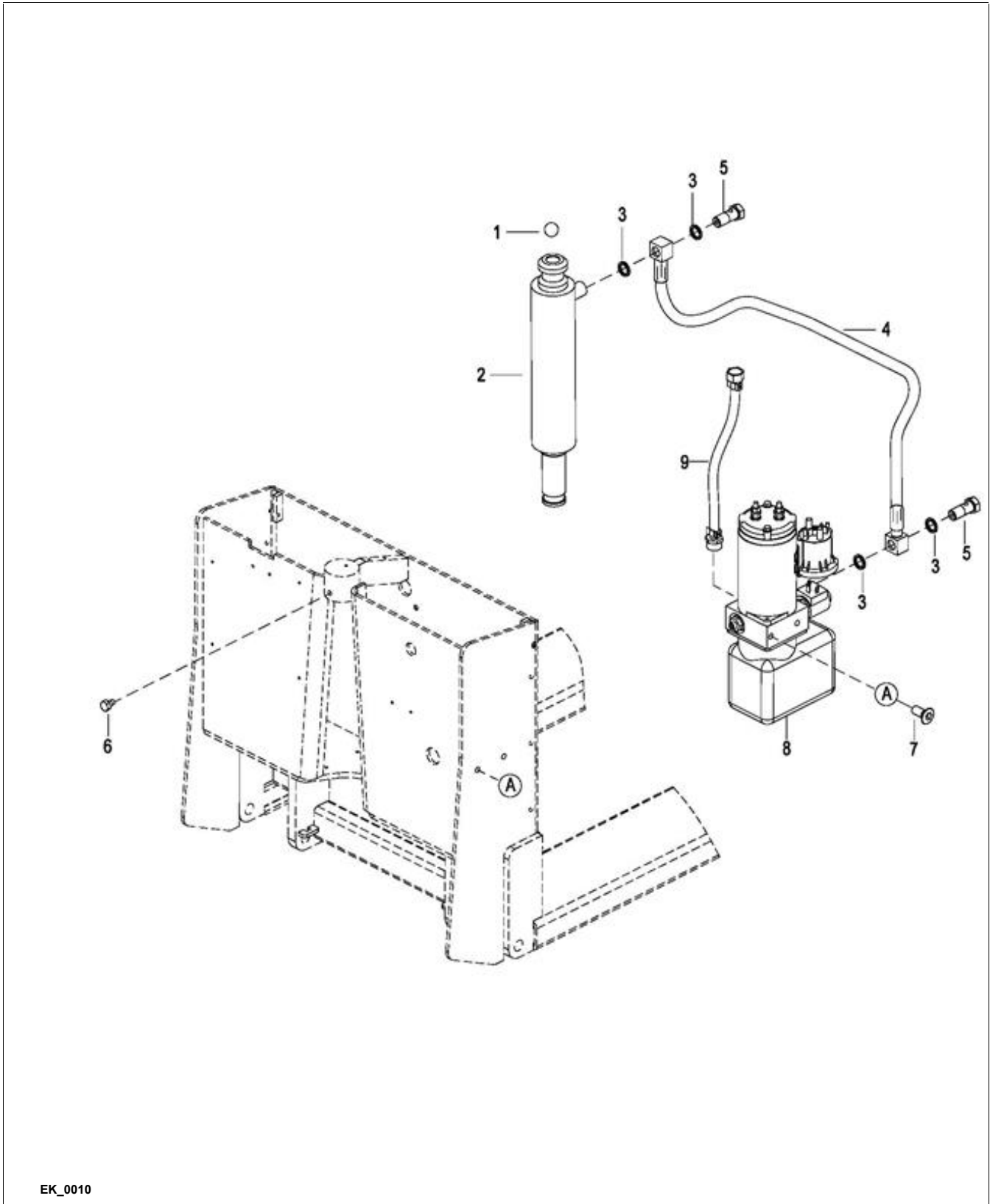
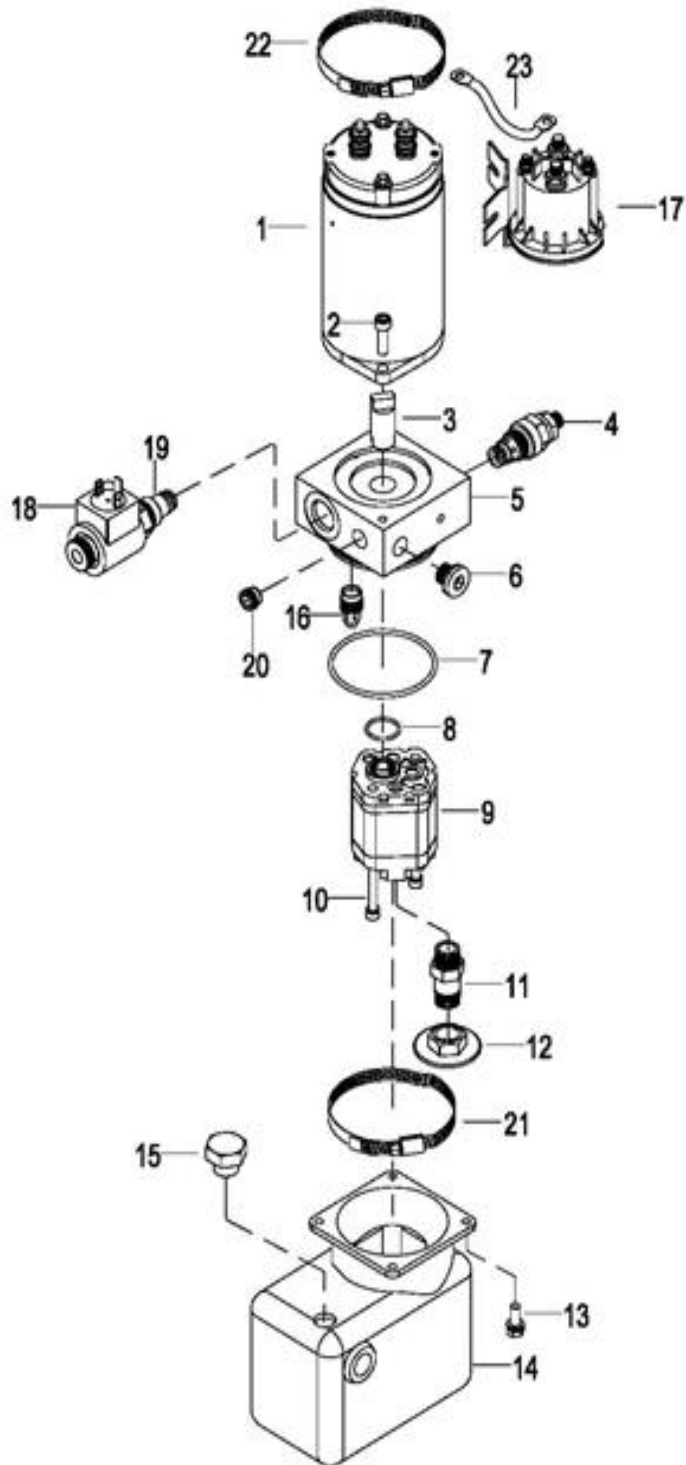


Figure 12-9 Hydraulic System



## Hydraulic System

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	0000-001547-00	BALL 19	1	
2	1124-411000-00	LIFT CYLINDER	1	
3	0000-000044-00	WASHER Ø14	4	
4	1124-431000-BJ	HOSE	1	Includes pos. #5
5	2401-143500-00	SCREW M14×35	1	
6	1220-100006-00	SCREW	1	
7	0000-001572-00	SCREW M8×16	2	
8	1154-420000-00	PUMP & MOTOR ASSEMBLY	1	
9	1124-441000-BJ	PIPE	1	

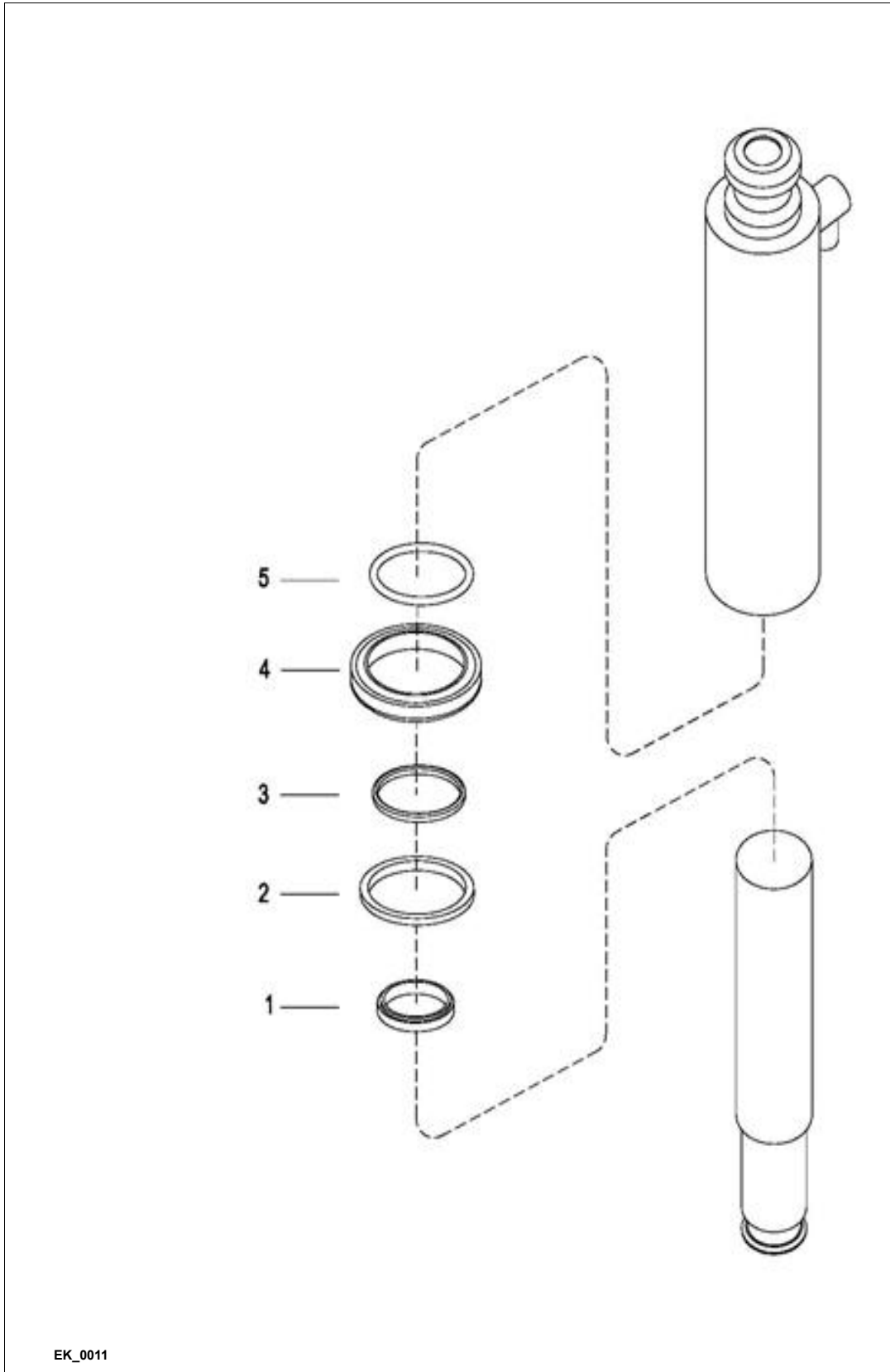


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Figure 12-10 Pump and Motor Assembly

## Pump and Motor Assembly

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	1125-43001X-20	MOTOR	1	
2	1125-43001X-00	SCREW M6×15	2	
3	1114-42003X-B0	COUPLING	1	
4	1114-42008X-B0	RELIEF VALVE	1	
5	1125-43002X-20	ADAPTER	1	
6	1125-43003X-00	IRON PLUG	1	
7	1125-43004X-00	O-RING Ø67.95×2.62	1	
8	1125-43005X-00	O-RING Ø21.2×1.8	1	
9	1154-42001X-00	GEAR PUMPS	1	
10	1125-43006X-00	SCREW M5×65	2	
11	1125-43007X-00	SUCTION PIPE	1	
12	1114-42013X-B0	OIL FILTER	1	
13	1125-43008X-00	SCREW M5×12	4	
14	1125-43009X-00	TANK	1	
15	1125-43010X-00	VENT VALVE M16×1.5	1	
16	1114-42006X-B0	PRESSURIZED VALVE	1	
17	1154-42004X-00	CONTACTOR	1	
18	2012-42117X-00	COIL	1	
19	1114-42015X-B0	SOLENOID VALVE (48V)	1	
20	1125-43012X-00	UNIDIRECTIONAL VALVE	1	
21	1154-42002X-00	CLAMP	1	
22	1125-43003X-20	CLAMP	1	
23	1154-42003X-00	CONNECT LINE	1	

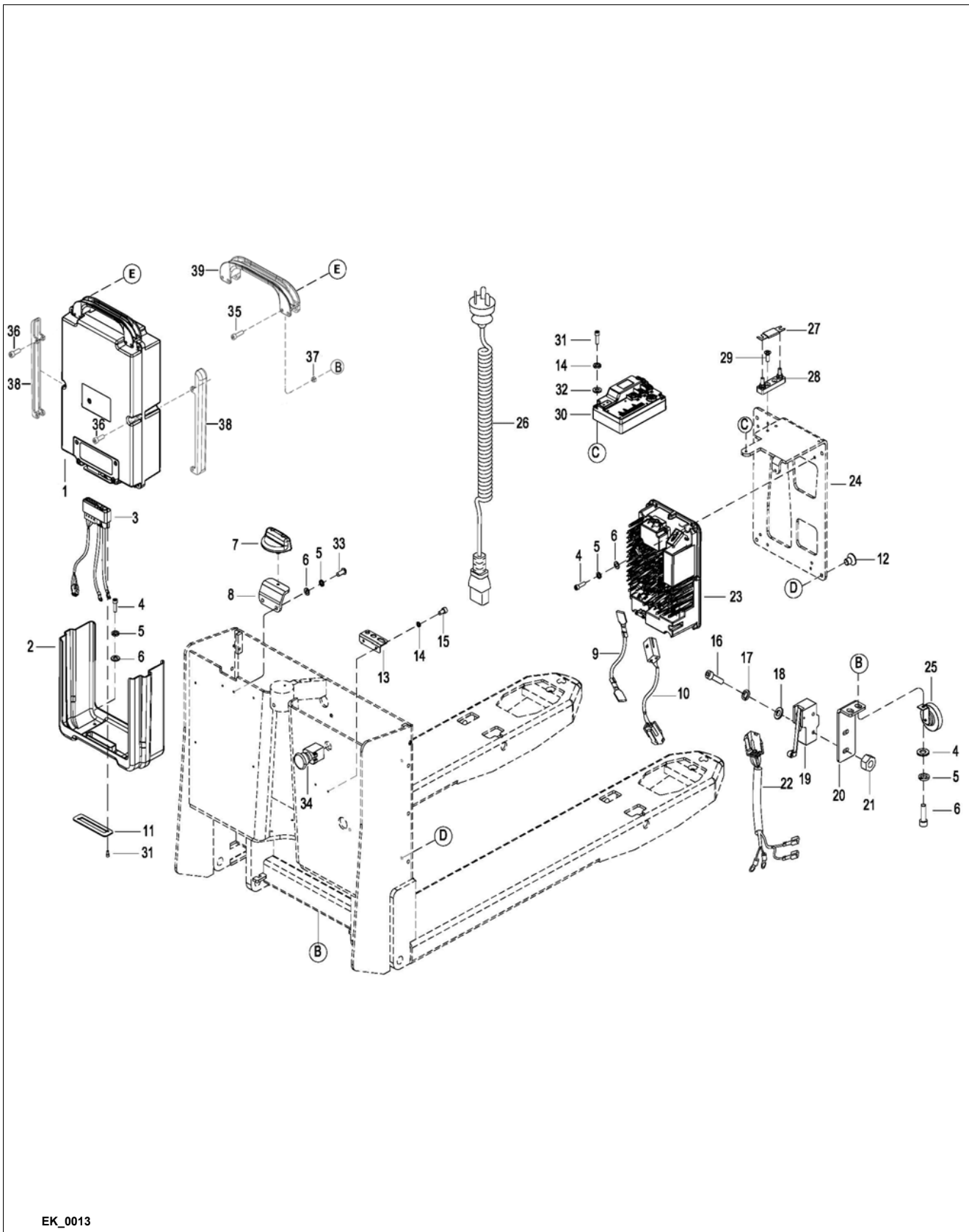


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Figure 12-11 Lift Cylinder

## Lift Cylinder

Pos. #	Part Number	Description	Qty. Reqd.	Notes
--	1124-411000-00	LIFT CYLINDER	1	
--	1124-ZZG-0A	SEAL KIT	1	Includes Pos. # 1, 2, 3, 4 & 5
1	--	WIPER RING Ø40×48×5-6.5	1	
2	--	BACK UP RING 45×40×9.7	1	
3	--	SNAP RING 45×35×2	1	
4	--	ROD PACKING Ø45×35×6	1	
5	--	O-RING Ø50×2.4	1	



EK\_0013

Figure 12-12 Electrical System

**Electrical System**

Pos. #	Part Number	Description	Qty. Reqd.	Notes
1	LB65-00000Z-07	BATTERY	1	
2	1155-100010-00	BATTERY BASE	1	
3	1124-511000-BJ	CONNECTOR ASSEMBLY	1	
4	0000-000055-00	SCREW M6×16	4	
5	0000-000056-00	LOCK WASHER Ø6	12	
6	0000-000380-00	FLAT WASHER Ø6	12	
7	1154-100100-00	BATTERY PLATE	1	
8	1124-100007-BJ	PLATE	1	
9	1124-520009-BJ	CHARGING HARNESS	1	
10	1124-520010-BJ	CHARGING PROHIBITION HARNESS	1	
11	1155-140004-00	BATTERY PLATE	1	
12	0000-000177-00	SCREW M8X12	4	
13	1124-100008-BJ	PLATE	1	
14	0000-000206-00	LOCK WASHER Ø5	2	
15	0000-000031-00	SCREW M5×8	2	
16	0000-000208-00	SCREW M4×25	2	
17	0000-000122-00	LOCK WASHER Ø4	2	
18	0000-000702-00	FLAT WASHER Ø4	2	
19	1120-500006-00	LIFTING LIMIT SWITCH	1	
20	1124-100008-00	BRACKET	1	
21	0000-000139-00	NUT M4	2	
22	1124-520005-BJ	LIFT PROXIMITY WIRING HARNESS	1	
23	1124-520000-BJ	CHARGER	1	
24	1124-580001-BJ	PLATE	1	
25	1116-500008-00	HORN	1	
26	1113-500026-10	CHARGER CABLE	1	
27	1115-510003-00	FUSE 100A	1	
28	1120-540001-00	FUSE STAND	1	
29	0000-000074-00	SCREW M6×20	2	
30	1124-572003-00-40	CONTROLLER	1	
31	3020-010000-49	SCREW M4×8	2	
32	0000-000390-00	FLAT WASHER Ø5	4	
33	0000-000077-00	SCREW M6×12	2	
34	1113-500012-E0	EMERGENCY STOP SWITCH	1	
35	3020-010000-20	SCREW M6X35	4	
36	3020-000002-95	SCREW M6X28	4	
37	0000-000923-00	NUT M6	8	
38	LB00-200246-00	GUIDE GROOVE	2	
39	LB00-200242-00	BATTERY HANDLE	1	

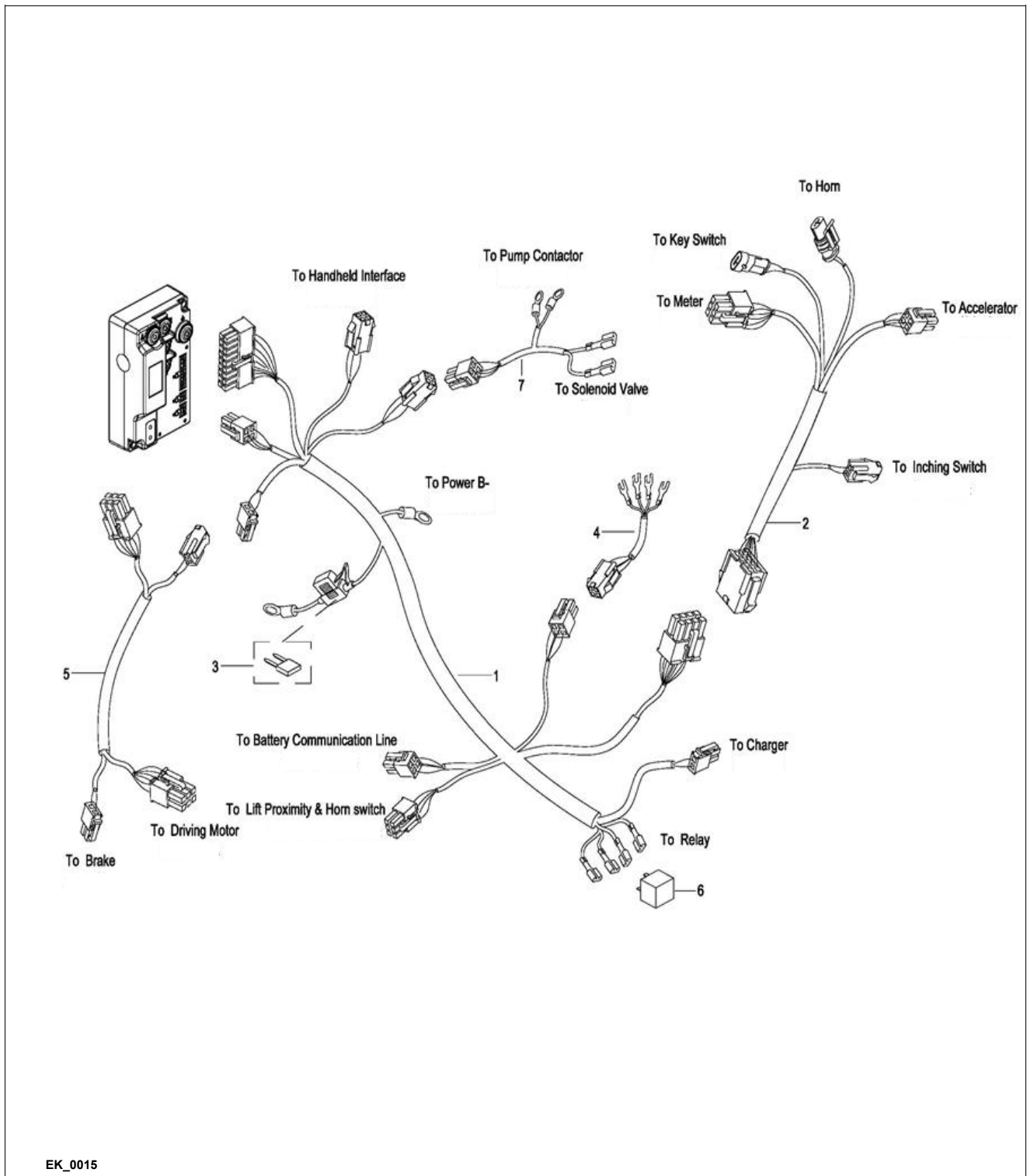
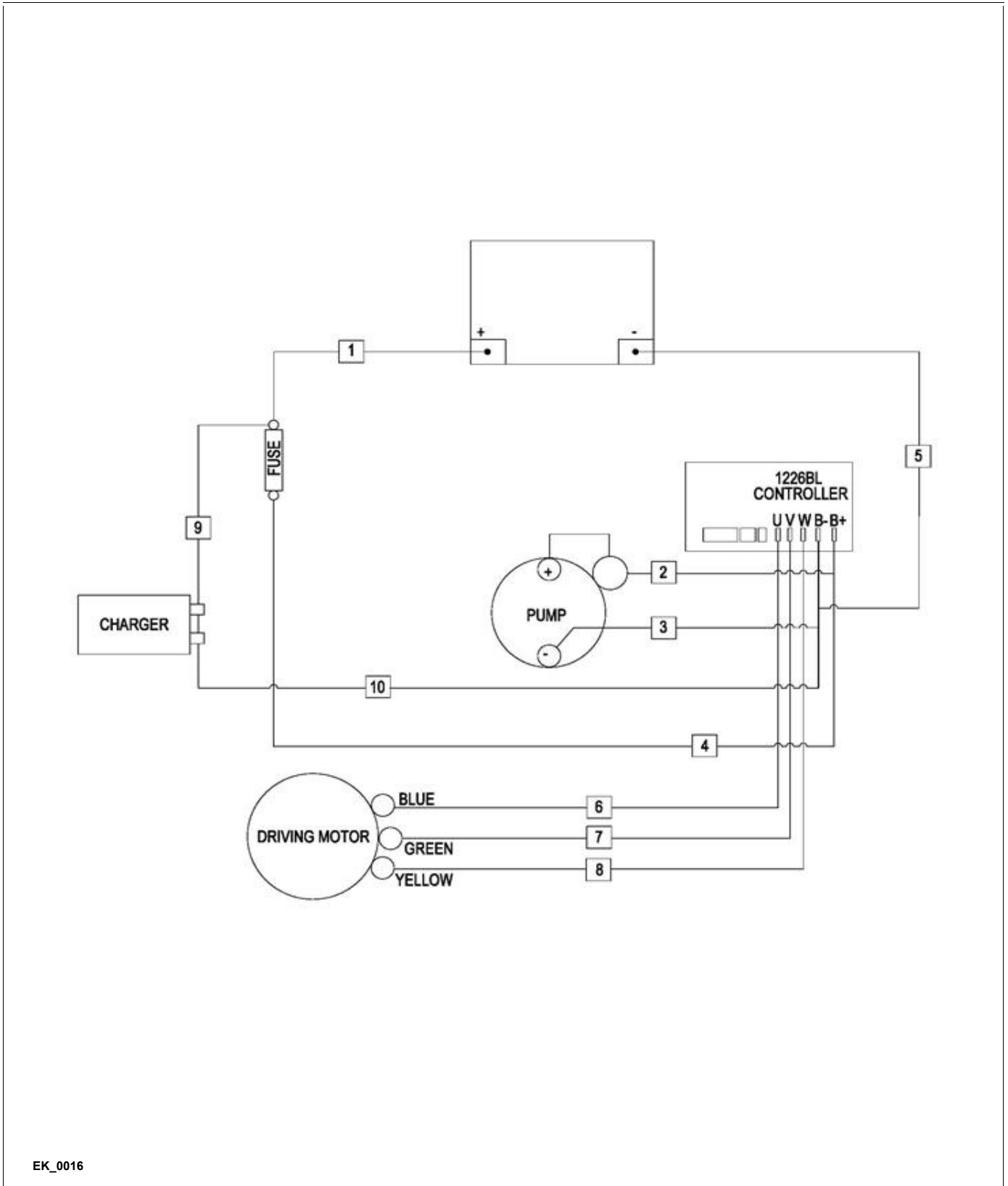


Figure 12-13 Wiring Harness



**Wiring Harness**

<b>Pos. #</b>	<b>Part Number</b>	<b>Description</b>	<b>Qty. Reqd.</b>	<b>Notes</b>
1	1124-520001-BJ	MASTER WIRE HARNESS	1	
2	1124-520008-BJ	BEND WIRE	1	
3	1113-520025-00	FUSE 5A	1	
4	1113-520006-E0	EMERGENCY STOP SWITCH WIRE	1	
5	1124-520007-BJ	DRIVE SIGNAL WIRE	1	
6	3525-683000-00	RELAY	1	
7	1124-520012-BJ	WIRE	1	

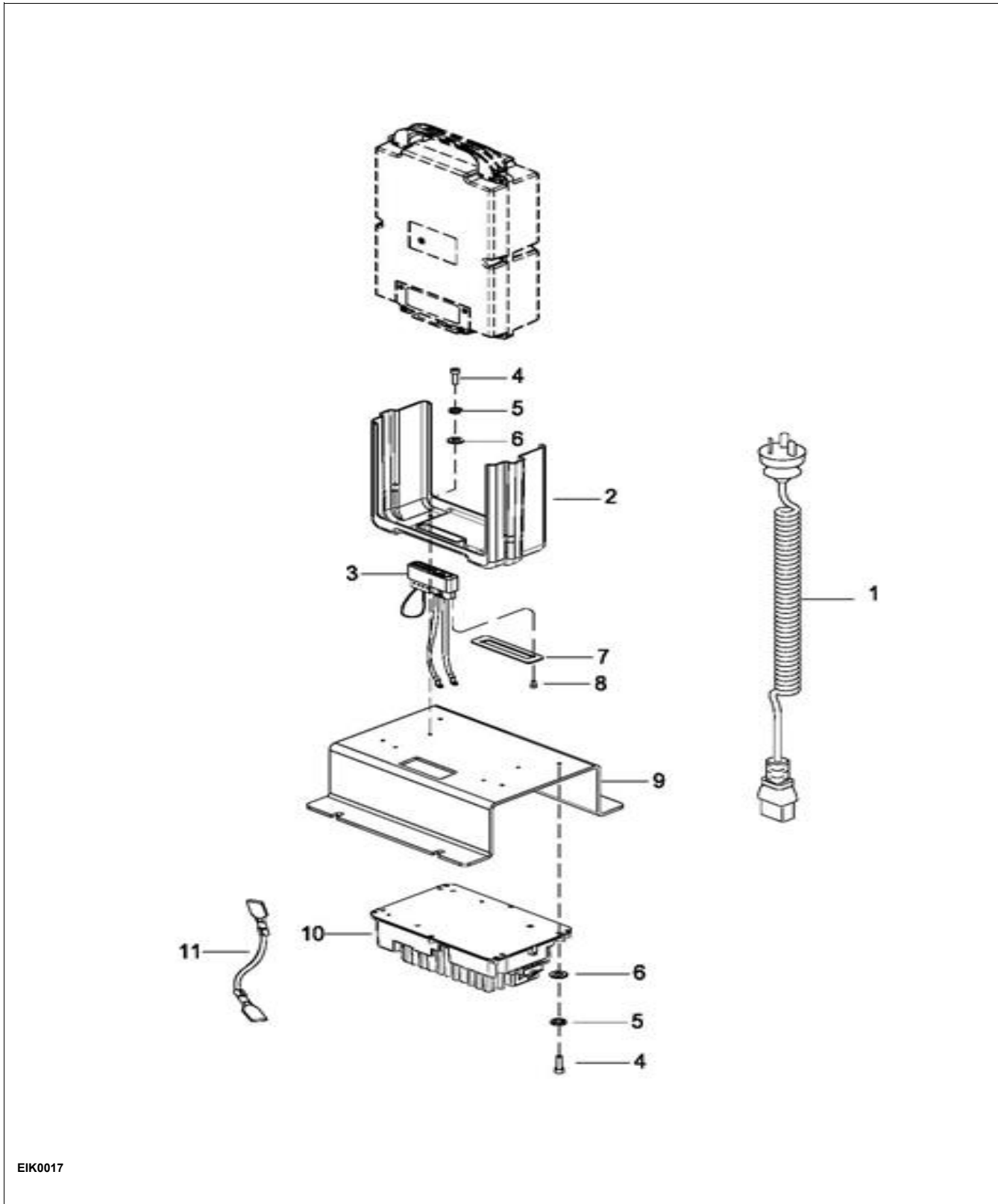


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Figure 12-14 Wiring Cables

**Wiring Cables**

<b>Pos. #</b>	<b>Part Number</b>	<b>Description</b>	<b>Qty. Reqd.</b>	<b>Notes</b>
1	1124-530010-BJ	POWER CABLE+	1	
2	1124-530005-BJ	P+ CABLE	1	
3	1124-530006-BJ	CONTROLLER-	1	
4	1124-530012-BJ	CONTROLLER+	1	
5	1124-530011-BJ	POWER CABLE-	1	
6	1124-530002-BJ	U CABLE	1	
7	1124-530003-BJ	V CABLE	1	
8	1124-530004-BJ	W CABLE	1	
9	1124-530014-BJ	CHARGER+	1	
10	1124-530013-BJ	CHARGER-	1	



EIK0017

Figure 12-15 Charger Assembly

## Charger Assembly

Pos. #	Part Number	Description	Qty. Reqd.	Notes
0	1124-59100Y-XN-10	CHARGER ASSEMBLY	1	
1	1113-500026-10	CHARGER CABLE	1	
2	1155-100010-00	BATTERY BASE	1	
3	1124-591000-BJ	CONNECTOR ASSEMBLY	1	
4	0000-000055-00	SCREW M6×16	8	
5	0000-000056-00	LOCK WASHER Ø6	8	
6	0000-000380-00	FLAT WASHER Ø6	8	
7	1155-140004-00	BATTERY PLATE	1	
8	3020-010000-49	SCREW M4×8	2	
9	1124-590001-BJ	PLATE	1	
10	1124-520000-BJ	CHARGER	1	
11	1124-520009-BJ	WIRE	1	

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BLUE GIANT EQUIPMENT CORPORATION

**Corporate** 410 Admiral Blvd  
Mississauga, ON, Canada L5T 2N6  
t 905.457.3900 f 905.457.2313

**USA** 6350 Burnt Poplar Road  
Greensboro, NC 27409  
[www.bluegiant.com](http://www.bluegiant.com)