

# **Service Manual**

## **ULII - 25/32/40 Portable Personnel Lifts**

**Serial Number 21691 - Current**

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**P/N 068018-002**

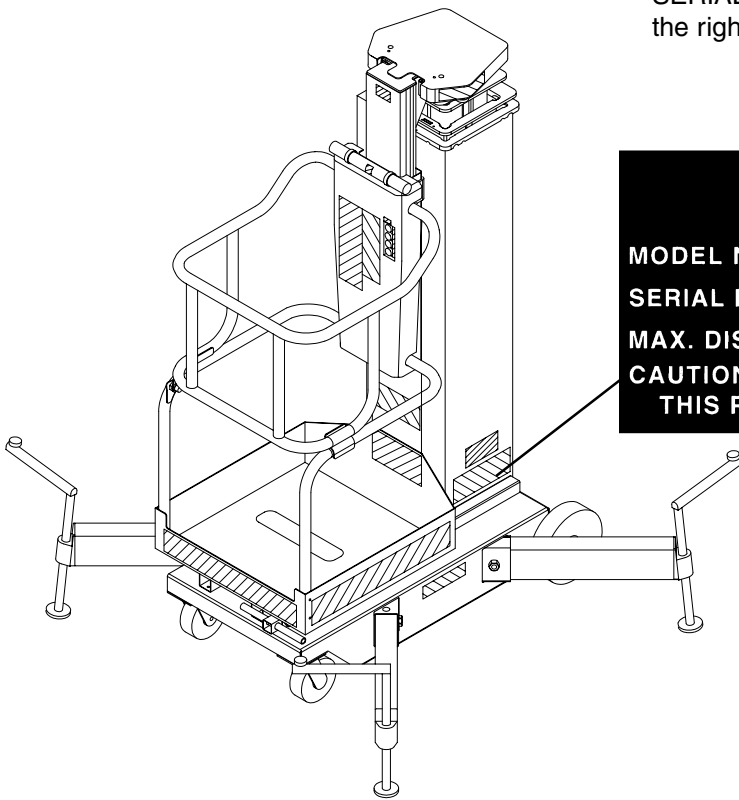
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**UpRight**

# ULII - 25/32/40

## Portable Personnel Lifts

When contacting UpRight for service or parts information, be sure to include the MODEL and SERIAL NUMBERS from the equipment nameplate. Should the nameplate be missing, the SERIAL NUMBER is also stamped on the chassis tube on the right side of the mast.



<b>UpRight, Inc.</b>	
1775 PARK ST. SELMA, CA 93662 USA	
MODEL NO. <input type="text"/>	MAX. PLATFORM HEIGHT <input type="text"/>
SERIAL NO. <input type="text"/>	BATTERY VOLTAGE <input type="text"/>
MAX. DISTRIBUTED LOAD <input type="text"/>	<input type="text"/>
CAUTION: CONSULT OPERATOR'S MANUAL BEFORE USE.	
THIS PLATFORM IS NOT ELECTRICALLY INSULATED	
<small>P/N 61205-000-00</small>	

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Madera, California 93637  
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# Foreword

## Introduction

### HOW TO USE THIS MANUAL

This manual is divided into 6 sections. The section number printed at the top corner of each page can also be used as a quick reference guide.

### SPECIAL INFORMATION



#### **DANGER**



Indicates the hazard or unsafe practice *will* result in severe injury or death.



#### **WARNING**



Indicates the hazard or unsafe practice *could* result in severe injury or death.



#### **CAUTION**



Indicates the hazard or unsafe practice could result in *minor* injury or property damage.

NOTES: Give helpful information.

### WORKSHOP PROCEDURES

**CAUTION:** Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual does contain warnings and cautions against some specific service methods which could cause personal injury, or could damage a machine or make it unsafe. Please understand that these warnings cannot cover all conceivable ways in which service, whether or not recommended by UpRight, Inc., might be done, or of the possible hazardous consequences of each conceivable way, nor could UpRight Inc. investigate all such ways. Anyone using service procedures or tools, whether or not recommended by UpRight Inc., must satisfy themselves thoroughly that neither personal safety nor machine safety will be jeopardized.

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## Introduction & Specifications

General description and machine specifications.

# 1.0

## Machine Preparation

Information on preparation for use & shipment, forklifting, transporting and storage.

# 2.0

## Operation

Operating instructions and safety rules.

# 3.0

## Maintenance

Preventative maintenance and service information.

# 4.0

## Troubleshooting

Causes and solutions to typical problems.

# 5.0

## Schematics

Schematics and valve block diagram with description and location of components.

# 6.0

# Foreword

## ***NOTES***

## 1.0 Introduction

### **PURPOSE OF EQUIPMENT**

The UpRight Personnel Lift is a portable lift designed to elevate personnel and light equipment to work above the ground.

### **GENERAL DESCRIPTION**

There are three basic UpRight Personnel Lift models: the UL-25, UL-32 and the UL-40.

All models consist of a Platform, Mast and Chassis.

The UL-32 and UL-40 are equipped with a tilt back mechanism to facilitate passage through a standard 80 inch doorway. This tilt back mechanism is optionally available in a configuration adapted to fit the UL-25.

### **Platform**

The platform is an aluminum structure supported by a steel cage support attached to the mast. It has 43.5-inch high "clamshell" upper and lower guardrail assembly with gas spring assist for opening and closing, six (6) inch toeboards and integrated midrail.

### **Mast**

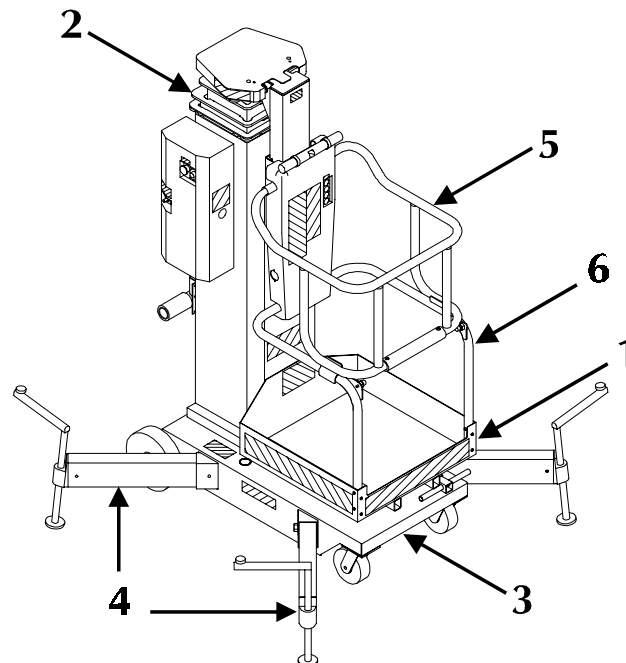
The platform is raised and lowered by a seven stage mast assembly that is driven by a single stage hydraulic lift cylinder and a series of leaf chains. An AC or DC electric motor powers a hydraulic pump which in turn energizes the cylinder. Solenoid operated valves control the raising and lowering of the Platform.

### **Chassis**

The Chassis is a steel structure that consists of the first stage of the Mast Assembly, control box, battery charger (for DC Models), and AC or DC Motor, hydraulic pump and reservoir, 12v battery (for DC Models), a tilt back assembly (standard on 32', and 40' machines, optional on 25' machines), and four Outriggers. The chassis is equipped with outrigger status lights which indicate that outrigger interlock switches are closed

### **Operator Controls**

Controls consist of a Lower Emergency Stop Switch, Upper Emergency Stop Switch, Key Switch and three (3) push button controls: Power On, Up, Down. The Power On button must be pushed along with the Up or Down button to operate the machine. An Emergency Lowering Valve is located on the power unit at the base of the machine.



1. Platform
2. Mast
3. Chassis
4. Outriggers
5. Upper Guardrail (Gate)
6. Lower Guardrail

**Figure 1-1: UL Portable Personnel Lift**

# Introduction & Specifications

**Table 1-1: Specifications**

ITEM	UL25	UL32	UL40
<b>Platform Height</b>			
Maximum	25 ft. (7.62 m)	32 ft. (9.75 m)	40 ft. (12.19 m)
Minimum	15 in. (38 cm)	15 in. (38 cm)	15 in. (38 cm)
<b>Platform Capacity</b>	350 lbs. (159 kg)	300 lbs. (136 kg)	300 lbs. (136 kg)
<b>Stored Dimensions</b>			
Vertical Height	78 in. (1.98 m)	99.5 in. (2.53 m)	114 in. (2.90 m)
Width	29 in. (.74 m)	29 in. (.74 m)	29 in. (.74 m)
Depth	49.5 in. (1.26 m)	52.5 in. (1.32 m)	52.5 in. (1.32 m)
Diagonal Storage Height	-	78 in. (1.98 m)	78 in. (1.98 m)
Diagonal Storage Length	-	99.5 in. (2.53 m)	114 in. (2.9 m)
<b>Footprint</b> (outriggers extended)			
Width	59 in. (1.5 m)	81 in. (2.06 m)	92 in. (2.34 m)
Length	56 in. (1.42 m)	78 in. (1.98 m)	89 in. (2.26 m)
<b>Weight-overall AC:</b>	770 lbs. (349 kg)	920 lbs. (417 kg)	990 lbs. (449 kg)
<b>Weight-overall DC:</b>	810 lbs. (367 kg)	960 lbs. (435 kg)	1,030 lbs. (467 kg)
Set of Outriggers & Screwjacks	46 lbs. (21 kg)	54 lbs. (25 kg)	66 lbs. (30 kg)
Guardrail Height	43.5 in. (1.11m)	43.5 in. (1.11m)	43.5 in. (1.11m)
Toe Board Height	6 in. (152 mm)	6 in. (152 mm)	6 in. (152 mm)
<b>Max. System Voltage</b>	120 VAC 60 Hz or 220 VAC 50/60 Hz		
AC Electric Motor	1-12 Volt Battery, Grp. 27		
DC Electric Power Source	105 Amp/Hrs., Min. Wt. 52 lbs. (23.6 kg)		
<b>Battery Charger</b>	Automatic, 120 VAC 60 Hz or 220 VAC 50 Hz		
	Output: 10 Amps, 12 Volts D.C.		
<b>Maximum Hydraulic System Pressure</b>	2400 PSI (165 bar)		

**\*Specifications subject to change without notice.**



**Read, understand and follow all safety rules and operating instructions before attempting to operate the machine.**

## 2.1 Preparation for Use

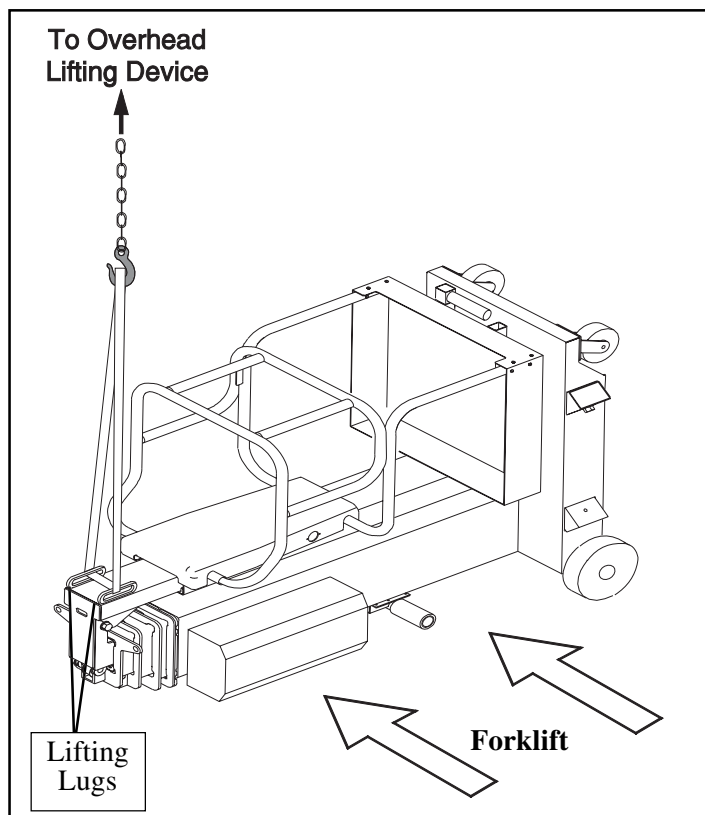


### **WARNING**



**STAND CLEAR** when cutting the metal banding to avoid being cut when the banding snaps back.

1. Remove the metal banding securing the battery box (DC machines only) and the machine to the crate.
2. Remove the battery box from the crate (DC machines only).
3. Disassemble the crate.
4. Remove any other banding or straps from the machine.
5. Using a forklift, raise the machine up far enough to remove the base of the crate (Figure 2-1). Lower the machine.
6. Place a lifting strap through the lifting lugs on the cage support assembly and to a suitable lifting device. With the lifting device, raise the machine to its vertical position.



**Figure 2-1: Lifting UL Lifts**

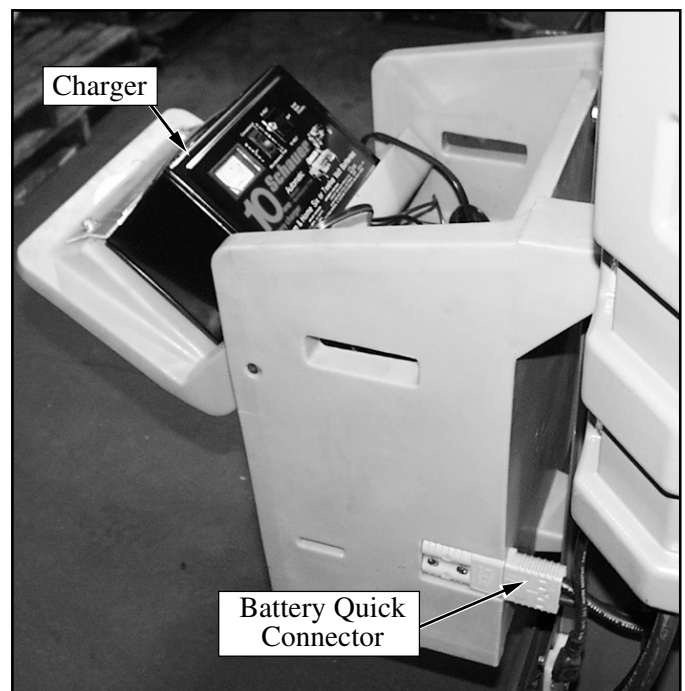
7. For DC machines, hang the battery box on the pegs provided on the back of the mast and connect the battery quick connector. If necessary plug the Battery Charger cord into a grounded AC outlet of proper voltage and frequency to charge the battery.

## 2.2 Preparation For Shipment

The following instructions are for shipping the machine by a freight carrier.

For instructions on transporting UL Lifts short distances by pick-up or small flat bed truck see *Section 3.5*.

1. Fully lower the Platform.
2. Disconnect the battery quick connector and remove the battery box from the rear of the mast assembly (Figure 2-3).
3. Band the Platform Assembly to the Chassis.
4. Place a lifting strap through the lifting lugs located on the cage support assembly and to a suitable lifting device (Figure 2-1). Lower the machine with the lifting device to the horizontal position.
5. Using a forklift, raise the machine up far enough to place the base of the crate under the machine. Lower the machine onto the base of the crate.
6. Band the machine and the battery box to the base of the crate.
7. Assemble the rest of the crate around the machine and band together.



**Figure 2-2: Battery Box**

### 2.3 Storage

No preparation is required for normal storage. Regular maintenance per *Table 4-1* should be performed. If the Lift is to be placed in long term storage (dead storage) use the following preservation procedure.

#### **PRESERVATION**

1. Clean painted surfaces. If the paint surface is damaged, repaint.
2. Check the level of the hydraulic oil with the cage fully lowered. Unscrew the reservoir cap/dipstick; oil should be visible on the dipstick. Add ISO #46 hydraulic oil if necessary.

#### **BATTERY**

Remove the battery and place in alternate service.

## 3.0 Introduction

### GENERAL FUNCTIONING

The AC or DC electric motor directly drives a hydraulic pump and is energized only when all four outriggers are set, closing the outrigger limit switches, and powering the outrigger relays.

The oil flow is normally allowed to return to the reservoir through the lift valve until it is energized by depressing the lift button and the power button simultaneously with the keyswitch on and both emergency stop buttons pulled out. Oil is then diverted to the lift cylinder until the lift function is stopped by the operator or until pressure in the system reaches the relief setting and is bypassed to the reservoir through the relief valve.

When lowering, oil is allowed to flow out of the lift cylinder through an orifice located in its base (limiting the decent speed) and through the down valve when it is energized by depressing the down button and the power button simultaneously with the keyswitch on and both emergency stop switches pulled out. In case of powered function failure, the unit may be lowered by turning the manual release on the down valve or by the platform Emergency Down (Optional).

### DESIGN FEATURES

The UL - Series Lifts have the following features to ensure safe operation:

- Interlocks are provided on each outrigger socket that prevent Platform elevation if the Outriggers are improperly installed.
- The Power and UP or Down buttons must be depressed for the controls to operate, preventing inadvertent actuation of the controls.
- The Chassis and Platform Controls are equipped with an Emergency Stop Button for stopping all powered functions.
- An Emergency Lowering Valve is provided to lower the Platform in the event electrical power is lost.
- Dual chain lift system for added safety.
- An Orbit Level is provided on the Chassis Base so the machine can be properly leveled.
- Optional Emergency Down from the platform is available in the event electrical power is lost.

## 3.1 Safety Rules and Precautions



### WARNING



All personnel shall carefully read, understand and follow all safety rules, operating instructions and the Scaffold Industry Association's **MANUAL OF RESPONSIBILITIES** before performing maintenance on or operating any UpRight Aerial Work Platform.

#### Before using the UL-Series Lift:

**NEVER** elevate Platform unless all four (4) Outriggers have been properly installed. All outrigger screwjack pads must be in solid contact with a firm surface before the Platform is elevated.

**NEVER** attempt to move the UpRight Lift with people or materials on the Platform or with the Platform elevated.

**NEVER** operate the machine within ten feet of power lines. **THIS MACHINE IS NOT INSULATED.**

**NEVER** sit, climb, or stand on the Platform guardrails or midrail.

**NEVER** elevate Platform without first leveling the base.

**NEVER** use ladders, planks or other devices to increase the height of the Platform.

**NEVER** attach overhanging loads to the Platform or increase the Platform size.

**NEVER** elevate the Platform if it contains more than one person or more than the rated load (see to table 1-1)

**LOOK** up, down and around for overhead obstructions and electrical conductors.

**NEVER** change operating or safety systems.

**NEVER** use Outriggers from one model on another model.

**CLOSE** and secure the gate after entering Platform. Verify that the locking pin is fully engaged.

**INSPECT** the machine thoroughly for cracked welds, loose or missing hardware, hydraulic leaks, damaged control or power cables and loose wire connections.

**NEVER** use the UpRight Lift as a freight or personnel elevator.

**NEVER** recharge batteries near sparks or open flame; batteries that are being charged emit highly explosive hydrogen gas.

**AFTER USE** secure the work Platform against unauthorized use by turning key switch off and removing key.

**NEVER** replace any component or part with anything other than original UpRight replacement parts without the manufacturer's consent.

## 3.2 Outrigger Installation

1. Remove the outriggers from storage locations on sides of mast.
2. Insert into outrigger socket in base (Figure 1).
3. Push in until locking pin engages hole in end of outrigger. Pull outward on outrigger to ensure engagement.
4. Repeat the above steps for all other outriggers. Make sure all four (4) locking pins are engaged.
5. Level the base, centering the bubble in the orbit level on the base by adjusting the screwjacks at the end of each outrigger (Figure 1). DO NOT release the tension on an outrigger, by turning counterclockwise, to level base.
6. **All four (4) screwjack pads must be in solid contact with a firm surface and each outrigger indicator light must be lit before the platform is elevated.**

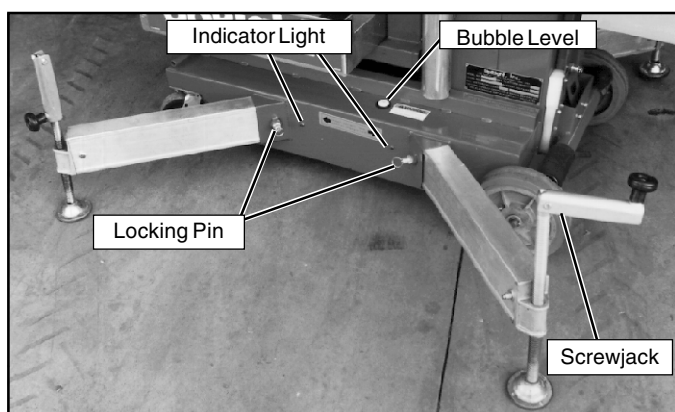


Figure 1: Installing outriggers

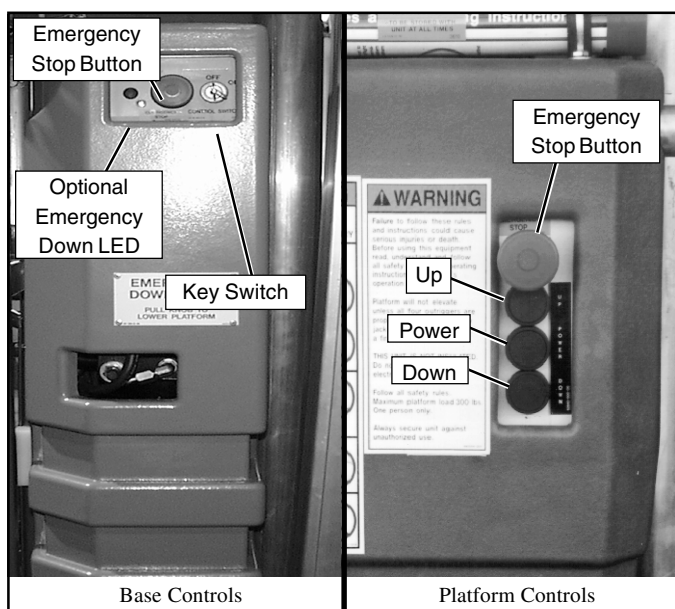


Figure 2: Controls

## 3.3 Operation

Before operating UL Lift insure that: the operator has been thoroughly trained on this machine, the operator has read, fully understands and follows this Operator Manual and the Scaffold Industry Association's MANUAL OF RESPONSIBILITIES, the unit has been properly set up with all four (4) outriggers properly installed and the base leveled, and the machine has passed the Safety Interlock Test.

**Note: Platform will not elevate unless all four outriggers are properly installed with screwjack pads firmly in contact with floor and each outrigger indicator lamp lit.**

1. Check for external damage to the mast.
2. For AC units connect power unit plug to extension cord (12 ga. (1.5 mm<sup>2</sup>) conductor minimum and 50 ft. (15 m) in length maximum). Connect extension cord to properly grounded outlet of proper voltage and frequency.
3. Turn Key to **ON**, Key Switch is located on the left side of the mast (Figure 2).
4. Pull out on Lower Emergency Stop Button, located on the left side of the mast (Figure 2), to turn switch ON. In the event of an emergency push the button in to cut power to all controls.
5. Enter the platform by pulling out on the locking pin and lifting up on the upper half of the cage.
6. Lower upper half of the cage after entering platform making sure locking pin is engaged.
7. Check that the area above the platform is clear before elevating the platform.
8. Pull out on Emergency Stop Button, located on platform control panel (Figure 2). In the event of an emergency push the button in to cut power to all controls.
9. Push both the middle and top buttons (POWER and UP), on the Control Box (Figure 2), at the same time to elevate the platform. Release the buttons to stop.
10. Check that the area below the platform is clear before lowering the platform.
11. Push both the middle and bottom buttons (POWER and DOWN) at the same time to lower the platform. Release the buttons to stop.
12. After use, secure unit from unauthorized use by turning Key Switch to **OFF** and remove key.

## 3.4 EMERGENCY LOWERING



### WARNING



If the platform should fail to lower, **NEVER** climb down the mast.

Ask a person on the ground to open the Emergency Lowering Valve to lower the platform.

#### **Serial Number 15001 - 21690**

This valve is located through a cutout in the power unit cover on the left side of the mast (Figure 3).

1. Pull the knob out and turn  $\frac{1}{4}$  turn to open the Emergency Lowering Valve.
2. To close the Emergency Lowering Valve, turn the knob until it snaps back in.

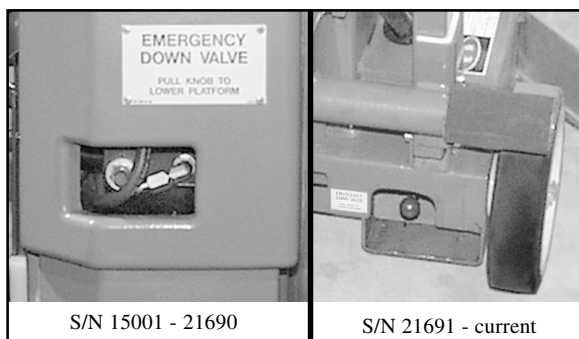
#### **Serial Number 21691 - Current**

The Emergency Control Valve Knob is located at the rear of the machine. (Figure 3).

1. Open the valve by pulling and holding the knob.
2. To close the Emergency Lowering Valve, release the knob.

Once the platform is fully lowered, be certain that the Emergency Lowering Valve is closed again. The platform will not elevate if the Emergency Lowering Valve is open.

**NOTE: Optional auxiliary platform lowering circuit allows operator to lower platform when power source is interrupted. A warning light on chassis controls shines when batteries for auxiliary platform lowering circuit are low (Figure 3). Batteries for warning light are located inside chassis control box.**



**Figure 3: Emergency Lowering**  
**AFTER USE EACH DAY**

1. Ensure that the platform is fully lowered.
2. Park the machine on level ground, preferably under cover.
3. Secure against vandals, children or unauthorized operation by turning the Key Switch to **OFF** and remove the key.

## 3.5 Safety Interlock Test



### DANGER



**NEVER** perform this test from the platform.

1. Properly install all four (4) outriggers and level base.
2. Release the tension on one (1) outrigger by turning the screwjack counterclockwise, until the indicator lamp is no longer lit.
3. While standing on the ground activate the control panel to elevate the platform. **Platform should not elevate.**
4. Re-level the base with all four (4) outriggers then repeat step 2 with another outrigger.
5. Repeat steps 2, 3 & 4 until all four (4) outriggers have been tested.

**DO NOT** use a machine that elevates when the tension has been released on an outrigger. **Machine must be repaired before using.**

## 3.6 Battery Maintenance



### WARNING



Hazard of explosive gas mixture. Keep sparks, flame and smoking materials away from battery.

Always wear safety glasses when working with batteries.

Battery fluid is highly corrosive. Rinse away any spilled fluid thoroughly with clean water.

Always replace battery with UpRight battery or manufacturer approved replacement weighing at least 52 lbs. (23.6 kg) each.

Check battery fluid level daily, especially if work platform is being used in a warm, dry climate.



If electrolyte level is less than  $\frac{3}{8}$  in. (10 mm) above plates add distilled water only. **DO NOT** use tap water with high mineral content, it will shorten battery life.

Keep terminals and tops of batteries clean.

Refer to the Service Manual to extend battery life and for complete service instructions.

## BATTERY CHARGING (FIGURE 4)

Charge batteries at end of each work shift or sooner if batteries have been discharged.

 <b>WARNING</b> 
<p>Charge battery in a well ventilated area.</p> <p>Do not charge battery when the work platform is in an area containing sparks or flames.</p> <p>Permanent damage to battery will result if not immediately recharged after discharging.</p> <p>Never leave charger operating unattended for more than two days.</p> <p>Never disconnect cables from battery when charger is operating.</p> <p>Keep charger dry.</p>

1. Check battery fluid level. If electrolyte level is lower than 3/8 in. (10 mm) above plates add distilled water only.
2. Verify charger voltage switch is set to 12 volts.
3. Connect extension cord (12 ga. (1.5 mm<sup>2</sup>) conductor minimum and 50 ft. (15 m) in length maximum) to charger plug.  
Connect extension cord to properly grounded outlet of proper voltage and frequency.
4. Set charger control to "conventional" setting. Ammeter should indicate charge rate.
5. When battery is fully charged, charger automatically turns itself off. Disconnect extension cord.

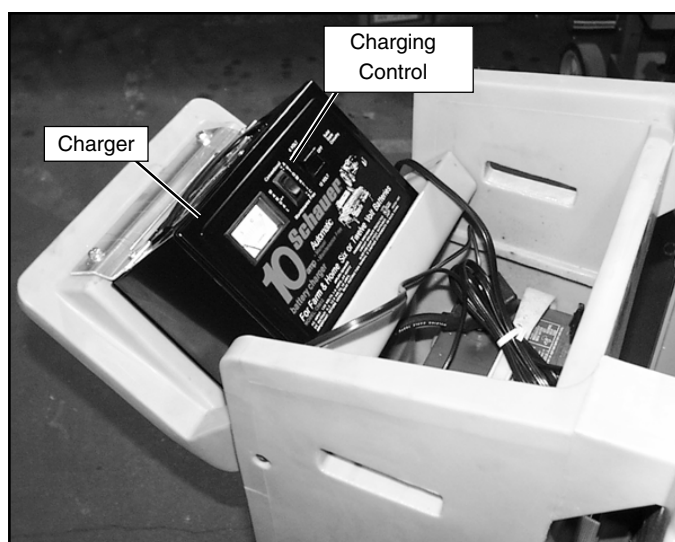




Figure 4: Battery Box (DC Models only)

## 3.7 Loaders

### DC MODELS

Disconnect the plug from the battery box and remove the battery box from the rear of the machine (Figure 4).

 <b>CAUTION</b> 
<p>The battery box is heavy, 52 lbs. (23.6 kg), lift properly (or have someone help you) to prevent back injury.</p>

 <b>WARNING</b> 
<p>Make sure loader fully engages tailgate or vehicle bed.</p>

### LOADING

1. Raise the loader support bracket and engage the retaining pin in the top hole of the loader channel (Figure 5).
2. Secure the loader to the loader support bracket with the gravity hook (Figure 5).
3. Position the unit so the back of the machine comes in contact with the vehicle bed or tailgate.
4. Release the gravity hook and slide the loader down until it comes into contact with the vehicle bed or tailgate (Figure 5). Then reposition the loader support bracket so the retaining pin is in the **first** available hole above the loader.
5. Release the locking pin and pull the T-handle out until the locking pin engages the hole in the end of the T-handle (Figure 6).
6. Lift up on the T-handle, using the loader as a pivot, until the unit rotates to a horizontal position in the vehicle bed (Figure 7).
7. Push the base of the unit towards the front of the vehicle bed. The machine will slide on the loader until the rear wheels are on the bed. The unit may then be rolled on the rear wheels and upper casters.

8. Return the T-handle to the stored position, making sure the locking pin engages the T-handle.
9. Secure the unit with suitable strength rope or tie straps using the forklift pockets located under the base of the unit and either the upper caster axle on UL25 models or the tilt back frame on UL32 and UL40 models.



## CAUTION



To prevent damage to the mast assembly, do not place rope or tie straps across the mast assembly when securing the unit for transportation.

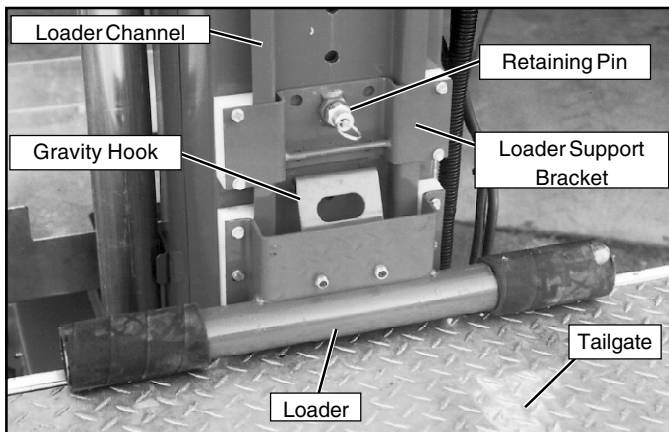
**DO NOT** overtighten the rope or tie straps, damage to the machine will result.

## UNLOADING

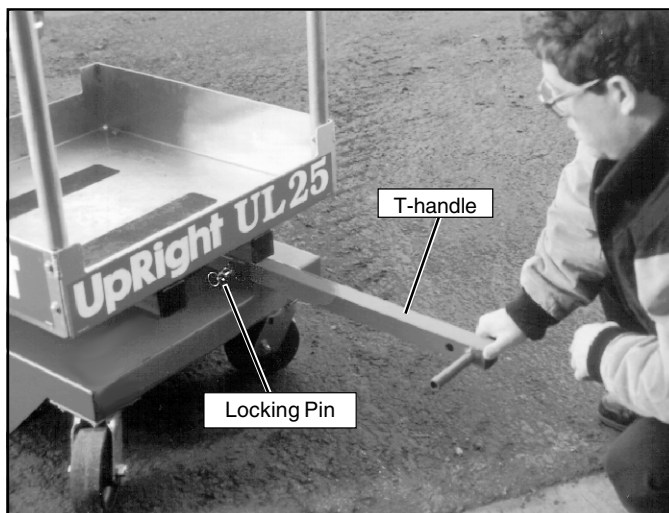
1. Unsecure the unit.
2. Release the locking pin and pull the T-handle out until the locking pin engages the hole in the end of the T-handle.
3. Roll the unit back until the rear wheels are off the edge of the tailgate or vehicle bed.
4. Pull downward on the T-handle, allowing the unit to slide on the loader. As the unit stops sliding on the loader, it will pivot on the loader to an upright position. Gradually counterbalance the unit's weight by applying an upward force on the T-handle. This allows the unit to settle gently on the wheels, avoiding undue impact on the unit.
5. Return the T-handle to the stored position, making sure the locking pin engages the T-handle.

## DC Models

Replace the battery and reconnect the battery box plug making certain it is fully engaged.



**Figure 5: Loader in load position**



**Figure 6: T-handle positioning**



**Figure 7: Tilting machine onto or off of a vehicle**



## 3.8 Passage Through A Doorway

The UL32 and UL40 are equipped with a castered rear Tilt Back assembly. When the unit is tilted back onto this support frame, the overall height is reduced to allow the unit to pass through a standard doorway.

### LOWERING



### CAUTION



Before tilting the machine onto the rear Tilt Back assembly be sure the retaining pin is fully inserted with the hair pin retainer installed and the cylinder assembly is fully extended.

**DO NOT** drop Tilt Back frame.

Keep out from under Tilt Back frame and machine when tilting.

1. Be sure area is clear of personnel and obstructions.
2. While holding Tilt Back frame, remove the hair pin retainer and the retaining pin (Figure 8).
3. Lower the Tilt Back frame until the hole in the cylinder assembly aligns with the upper mounting bracket pin hole. Secure the cylinder assembly to the upper mounting bracket using retaining pin and hair pin retainer (Figure 8).
4. Extend Tilt Back Handle to the tilt/lift position by releasing locking pin and pulling handle out of the Tilt Back assembly until the locking pin engages (Figure 9).
5. Push down on the Tilt Back Handle until the unit comes to rest on the Tilt Back frame. As the mast tilts back, counterbalance the machine's weight by increasing upward force on end of Tilt Back Handle (Figure 9). This allows machine to gently come to rest on Tilt Back casters.

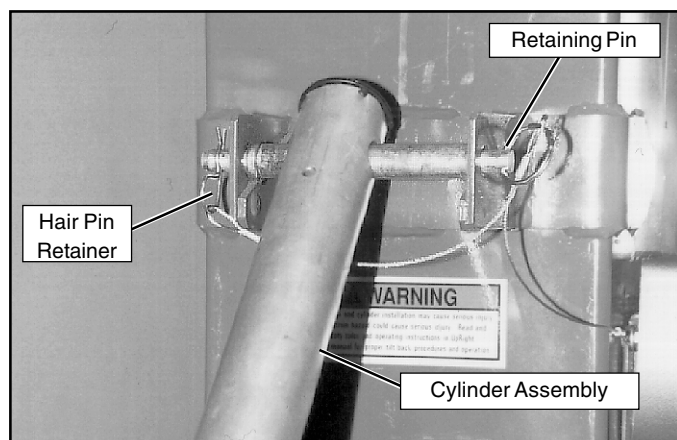


Figure 8: Cylinder secured with retaining pin

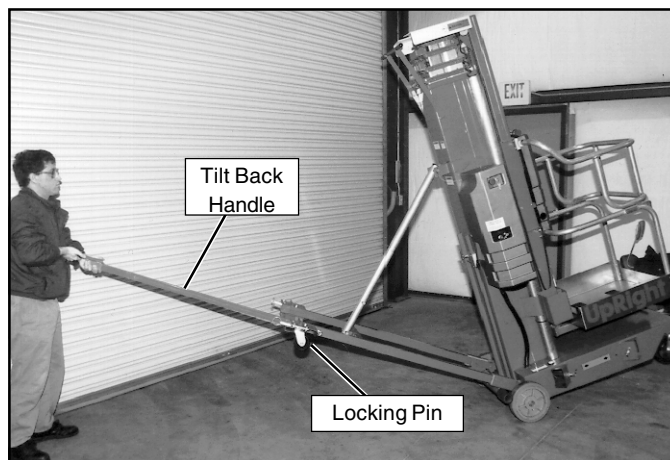


Figure 9: Lowering and raising with Tilt Back Handle

6. Pull down on the handle on the back of the mast to compress the cylinder assembly (Figure 10).
7. Return Tilt Back Handle to storage position making sure locking pin engages handle.

### RAISING

1. Lift up on mast handle to extend cylinder assembly.
2. Fully extend the Tilt Back Handle until the locking pin engages.
3. Lift up on the Tilt Back Handle. As the mast approaches vertical, counterbalance machine's weight by increasing the downward force on end of Tilt Back Handle (Figure 9). This allows machine to settle gently on the front casters.
4. Return Tilt Back Handle to storage position making sure locking pin engages handle.
5. While holding Tilt Back frame, remove retaining pin and raise Tilt Back assembly to the stowed position. Secure with the retaining pin, making sure pin is fully inserted and hair pin retainer installed.



Figure 10: Compressing cylinder assembly



## Section 3.8

[illegible]

**3-7**

## 3.9 Specifications\*

ITEM	UL25	UL32	UL40
<b>Platform Height</b>			
Maximum	25 ft. (7.62 m)	32 ft. (9.75 m)	40 ft. (12.19 m)
Minimum	15 in. (38 cm)	15 in. (38 cm)	15 in. (38 cm)
<b>Platform Capacity</b>	350 lbs. (159 kg)	300 lbs. (136 kg)	300 lbs. (136 kg)
<b>Stored Dimensions</b>			
Vertical Height	78 in. (1.98 m)	99.5 in. (2.53 m)	114 in. (2.90 m)
Width	29 in. (74 cm)	29 in. (74 cm)	29 in. (74 cm)
Depth	49.5 in. (1.24 m)	52.5 in. (1.32 m)	52.5 in. (1.32 m)
Diagonal Storage Height	-	78 in. (1.98 m)	78 in. (1.98 m)
Diagonal Storage Length	-	99.5 in. (2.53 m)	114 in. (2.9 m)
<b>Footprint</b> (outriggers extended)			
Width	59 in. (1.5 m)	81 in. (2.06 m)	92 in. (2.34 m)
Length	56 in. (1.42 m)	78 in. (1.98 m)	89 in. (2.26 m)
<b>Weight-overall</b>	770 lbs. (349 kg)	920 lbs. (417 kg)	990 lbs. (449 kg)
w/o Outriggers & Screwjacks	810 lbs. (367 kg)	960 lbs. (435 kg)	1030 lbs. (467 kg)
Set of Outriggers & Screwjacks	46 lbs. (21 kg)	54 lbs. (25 kg)	66 lbs. (30 kg)
Add'l Weight for D.C. Option	64 lbs. (29 kg)	64 lbs. (29 kg)	64 lbs. (29 kg)
Guardrail Height	43.5 in. (1.1 m)	43.5 in. (1.1 m)	43.5 in. (1.1 m)
Toe Board Height	6 in. (152 mm)	6 in. (152 mm)	6 in. (152 mm)
<b>Max. System Voltage</b>	120 VAC 60 Hz or 220 VAC 50/60 Hz		
AC Electric Motor	1-12 Volt Battery, Grp. 27		
DC Electric Power Source	105 Amp/Hrs., Min. Wt. 52 lbs. (23.6 kg)		
<b>Battery Charger</b>	Automatic, 120 VAC 60 Hz or 220 VAC 50 Hz		
	Output: 10 Amps, 12 Volts D.C.		
<b>Maximum Hydraulic System Pressure</b>	2400 PSI (165 bar)		

\*Specifications subject to change without notice.

Meets or exceeds all applicable requirements of OSHA and ANSI A92.3-1990.

## 3.10 Routine Service

Use the following table as a guide for routine maintenance, refer to Service Manual for complete service instructions.

SERVICE OPERATION	INTERVAL			
	DAILY	MONTHLY OR 50 HRS.	3 MONTHS OR 125 HRS.	YEARLY OR 500 HRS.
Check bubble level accuracy	X			
Check operation of outrigger interlocks	X			
Check battery fluid level and charge battery (D.C. models only)	X			
Check for peeling, faded or missing labels & replace	X			
Check condition of control cable	X			
Inspect mast assembly for bends, cracks or loose rivets	X			
Check chassis and platform emergency stop switch operation	X			
Check emergency lowering valve operation	X			
Check casters for damage	X			
Check hydraulic fluid level		X		
Check cage and cage support fasteners for proper torque		X		
Inspect and adjust sequence straps slack		X		
Lubricate lift chains and sheaves			X	
Change hydraulic fluid (ISO #46)				X

## 4.0 Introduction

This section contains instructions for the maintenance of the UL-Series Lifts. Procedures for the operational check-out adjustment, scheduled maintenance, and repair/removal are included.

Referring to *Section 3.0* will aid in understanding the operation and function of the various components and systems of the UL-Series Lifts and help in diagnosing and repair of the machine.



### **SPECIAL TOOLS**

The following is a list of special tools that are required to perform certain maintenance procedures. These tools may be purchased from your dealer.

Description	Part Number
Spanner Wrench For UL25,32,40	062521-010
Strap Wrench	062482-000
Tie Rod Tensioner (2 req'd.)	062738-000
Tensioner Bracket (2 req'd.)	062739-000

## 4.1 Preventative Maintenance (Table 4-1)

The complete inspection consists of periodic visual and operational checks, together with all necessary adjustments to assure proper performance. Daily inspection will prevent abnormal wear and prolong the life of all systems. The inspection and maintenance schedule is to be performed at regular intervals. Inspection and maintenance shall be performed by personnel who are trained and familiar with mechanical and electrical procedures. Complete descriptions of the procedures are in the text following the table.

	<b>WARNING</b>	
<p>Before performing preventative maintenance, familiarize yourself with the operation of the machine.</p> <p>Never enter the area below the Platform when the Platform is elevated.</p>		

The Preventative Maintenance Table has been designed to be used for machine service and maintenance repair.

**Please copy the following page and use the Preventative Maintenance Table as a checklist when inspecting a machine for service.**

## Preventative Maintenance Table Key

### Interval

Daily=each shift or every day

30d=every month or 30 days

3m=every 3 months

1y=every year

**Y**=Yes/Acceptable

**N**=No/Not Acceptable

**R**=Repaired/Acceptable

## Preventative Maintenance Report

Date: \_\_\_\_\_

Owner: \_\_\_\_\_

Model No: \_\_\_\_\_ Serial No: \_\_\_\_\_

Serviced By: \_\_\_\_\_

Service Interval: \_\_\_\_\_

**Table 4-1: Preventative Maintenance**

COMPONENT	INSPECTION OR SERVICES	INTERVAL	Y	N	R
Battery System (DC Units only)	Check electrolyte level	Daily			
	Check battery cable condition	Daily			
	Charge batteries	Daily			
	Check charger condition & operation	Daily			
	Check specific gravity	30d			
	Clean exterior	3m			
Hydraulic Oil	Clean terminals	3m			
	Check oil level	Daily			
Hydraulic System	Drain and replace oil (ISO #46)	1y			
	Check for leaks	Daily			
	Check line connections	30d			
Emergency Hydraulic System	Check for exterior wear	30d			
	Open the emergency lowering valve and check for serviceability	Daily			
Emergency Down	Check procedure for Emergency Down batteries	3m			
Hydraulic Pump	Check for fitting leaks	Daily			
	Wipe clean	30d			
	Check for leaks at mating surfaces	30d			
	Check mounting bolts for proper torque	30d			
Controls	Check condition & operation	Daily			
Control Cable	Check the exterior of the cable for pinching, binding or wear	Daily			
Platform Deck and Rails	Check fasteners for proper torque	Daily			
	Check welds for cracks	Daily			
	Check condition of deck	Daily			
	Check entry way closure	Daily			
Elevating Assembly	Inspect for external damage, dents, loose rivets or cracks	Daily			
	Check chains and sheaves for wear	3m			
	Inspect and adjust sequence straps	30d			
Chassis	Check cables for pinch or rubbing points	Daily			
	Check welds for cracks	Daily			
	Check casters for damage	Daily			
	Check component mounting for proper torque	3m			
Lift Cylinder	Check for leaks	Daily			
	Check fitting for proper torque	30d			
Entire Unit	Perform pre-operation inspection	Daily			
	Check for and repair collision damage	Daily			
	Lubricate	3m			
	Check fasteners for proper torque	3m			
	Check for corrosion; remove and repaint	3m			
Labels	Check for peeling, missing, or unreadable labels & replace	Daily			

## 4.2 Lubrication

Refer to Figure 4-1 for location of items that require lubrication service. Use an aerosol chain lubricant for all components to be lubricated that require oil.

### CASTERS

Using a grease gun, apply 1 or 2 shots of multi-purpose bearing grease to each zerk fitting. Swivel casters have two zerk fittings, one at the wheel bearing and one at the swivel.

### CHAINS

1. Ensure that Platform is fully lowered.
2. Apply enough aerosol chain lubricant to exposed section of chain to allow lubricant to run down chain.

### SCREW JACKS

Apply a moderate amount of aerosol chain lubricant to each screwjack assembly.

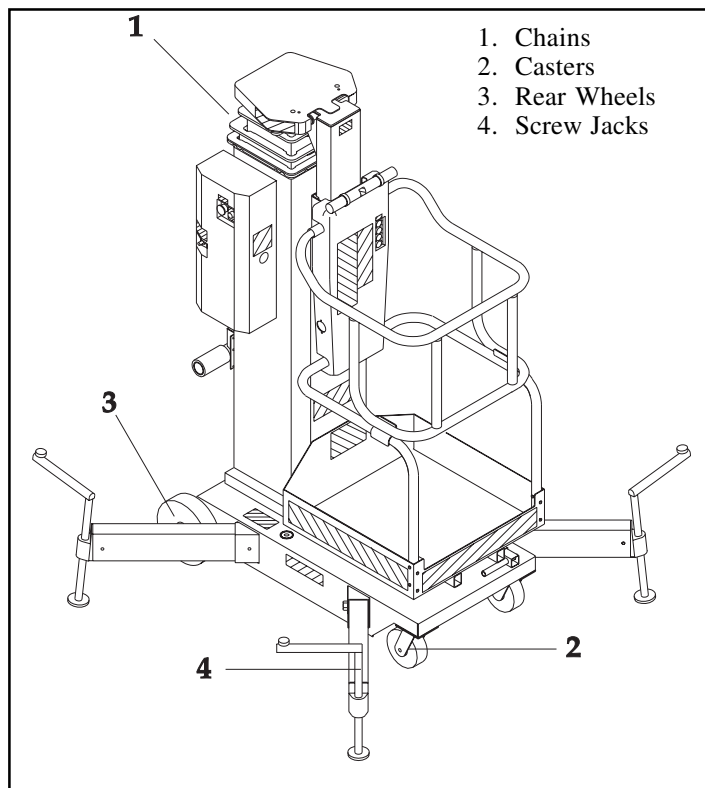


Figure 4-1: Lubrication

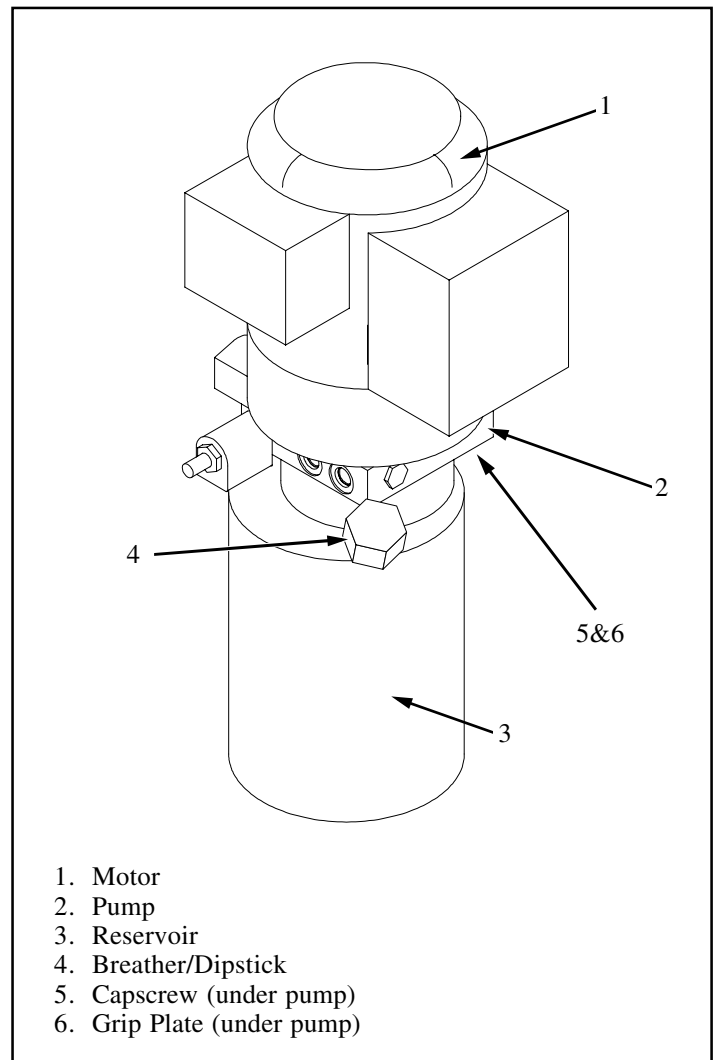


Figure 4-2: Hydraulic Power Unit

### HYDRAULIC OIL RESERVOIR (Figure 4-2)

Verify that Platform is fully lowered.

1. Remove hydraulic reservoir from pump by removing four screws and four grip plates.
2. Provide a suitable container (reservoir has a 1.5 gallon (5.7 l) capacity) and dispose of hydraulic fluid properly; contact your local oil recycler.

**Note: Ensure o-ring is in place on pump when installing hydraulic reservoir.**

3. Reinstall hydraulic reservoir to pump assembly with grip plates and screws.
4. Fill hydraulic reservoir through the dipstick hole with ISO #46 hydraulic fluid. Hydraulic reservoir has a 1.5 gallon (5.7 l) capacity.

### 4.3 Battery Maintenance (DC units only)

Electrical energy for the motor is supplied by a 12-volt battery. Proper care and maintenance of the battery and motor will ensure maximum performance from the lift.



#### WARNING



Hazard of explosive gas mixture. Keep sparks, flame and smoking materials away from batteries.

Always wear safety glasses when working with batteries.

Battery fluid is highly corrosive. Rinse away any spilled fluid thoroughly with clear water.

### BATTERY INSPECTION AND CLEANING

Check battery fluid level daily, especially if work platform is being used in a warm, dry climate. If required, add distilled water only; use of tap water with high mineral content will shorten battery life.



#### WARNING



If battery water level is not maintained, battery will not fully charge, creating a low discharge rate which will damage Motor/ Pump unit and void warranty.

Battery should be inspected periodically for signs of cracks in the cases, electrolyte leakage and corrosion of the terminals. Inspect cables for worn spots or breaks in the insulation and for broken cable terminals.

Clean battery that shows signs of corrosion at the terminals or onto which electrolyte has overflowed during charging. Use a baking soda solution to clean the battery, taking care not to get the solution inside the cells. Rinse thoroughly with clear water. Clean battery and cable contact surfaces to a bright metal finish whenever a cable is removed.

### BATTERY CHARGING (Figure 4-3)

Charge battery at end of each work shift or sooner if battery has been discharged.



#### CAUTION



Charge battery in a well-ventilated area.

Do not charge battery when the lift is in an area containing sparks or flames.

Permanent damage to battery will result if battery is not immediately recharged after discharging.

Never leave charger operating unattended for more than two days.

Never disconnect cables from battery when charger is operating.

Keep charger dry.

When night air temperatures fall below 65°F (18°C) a battery charged in an unheated area should be placed on charger as soon after use as possible. Under such conditions a 4 hour equalize charge once a week in the early afternoon will improve state of charge and battery life.

1. Check battery fluid level. If electrolyte level is lower than  $\frac{3}{8}$  in. (10 mm) above plates add distilled water only.
2. Verify charger voltage switch is set to 12 volts.
3. The battery charger is located at the rear of the mast. Connect extension cord (12 gauge conductor minimum and 50 ft. (15 m) in length maximum) to the charger plug. Connect other end of extension cord to properly grounded outlet of proper voltage and frequency.
4. Set charger control to "conventional" setting. Charger ammeter should indicate charge rate.
5. When battery is fully charged, charger automatically turns itself off. Disconnect extension cord.

## BATTERY CELL EQUALIZATION

The specific gravity of the electrolyte in the battery cells should be equalized monthly. To do this, charge batteries as outlined in Battery Charging. After this initial charge, check the electrolyte level in all cells and add distilled water as necessary. Then, turn the charger on for an additional eight hours. During this time, the charging current will be low (four amps) as cells are equalizing.

After equalization, the specific gravity of all cells should be checked with a hydrometer. The temperature corrected specific gravity in this state should be 1.260. If any corrected readings are below 1.230, the battery should be replaced.

Do not check the specific gravity in a cell to which water has just been added. If there is not enough electrolyte in a fully charged cell to obtain a sample for the hydrometer, add water and continue charging for one to two hours to adequately mix the water and electrolyte.

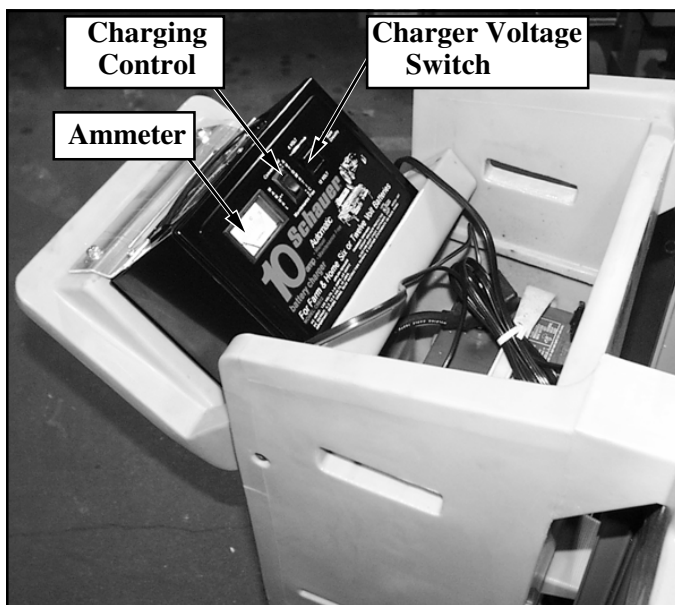


Figure 4-3: Battery Charger

## 4.4 Setting System Relief Valve (Figure 4-4)

**Check the hydraulic system pressure whenever the pump or relief valve has been serviced or replaced.**

<b>⚠</b>	<b>WARNING</b>	<b>⚠</b>
<p>The hydraulic oil may be of sufficient temperature to cause burns. Wear safety gloves and safety glasses when handling hot oil.</p>		

1. Install outriggers and level unit as normal, (see section 3 for operating instructions), and operate the hydraulic system for 5-10 minutes to warm the hydraulic oil.
2. Remove Cover from Power Unit Assembly
3. Place rated load on the platform (see table 1-1 for specifications). **Do Not** use live weight for this procedure.
4. Install pressure gauge on gauge port.
5. Remove the cap from the System Relief Valve (fig. 4-4), and turn the adjustment screw counterclockwise two full turns.
6. Operate controls to elevate machine. (Machine will not raise until Relief Valve is properly adjusted.)
7. Turn the System Relief Valve Clockwise (fig. 4-4) until the machine begins to rise.
8. Elevate the platform fully and verify that the pressure does not exceed 2400 PSI (165 bar) at any time during the lift cycle.
9. Replace cap on System Relief Valve, reassemble Cover.

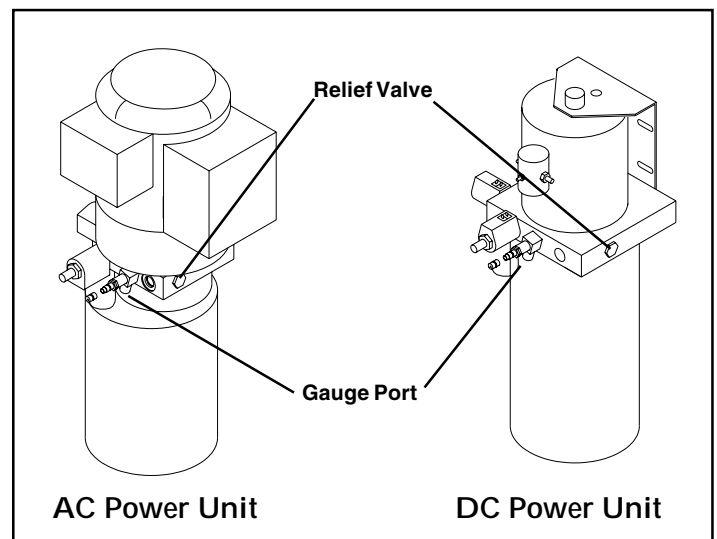


Figure 4-4: System Relief Valve

## 4.5 Mast Assembly (Figure 4-6,4-7) Disassembly

Using a suitable lifting device, lower the work platform into a horizontal position (Figure 4-5). If possible, place the machine onto a sturdy work table using a forklift.



### WARNING



Never attempt to lower lift into a horizontal position without the use of a suitable lifting device; bodily injury or damage to the machine may result.

**NOTE:** Mark all components as they are removed so they can be reinstalled in the correct sequence and location.

## Platform Assembly Removal (Figure 4-6)

1. Extend elevating assembly far enough to expose the eight screws attaching the cage support assembly to stage 6 by opening the emergency lowering valve and pulling on the cage guardrail.
2. Remove cover from front of platform assembly.

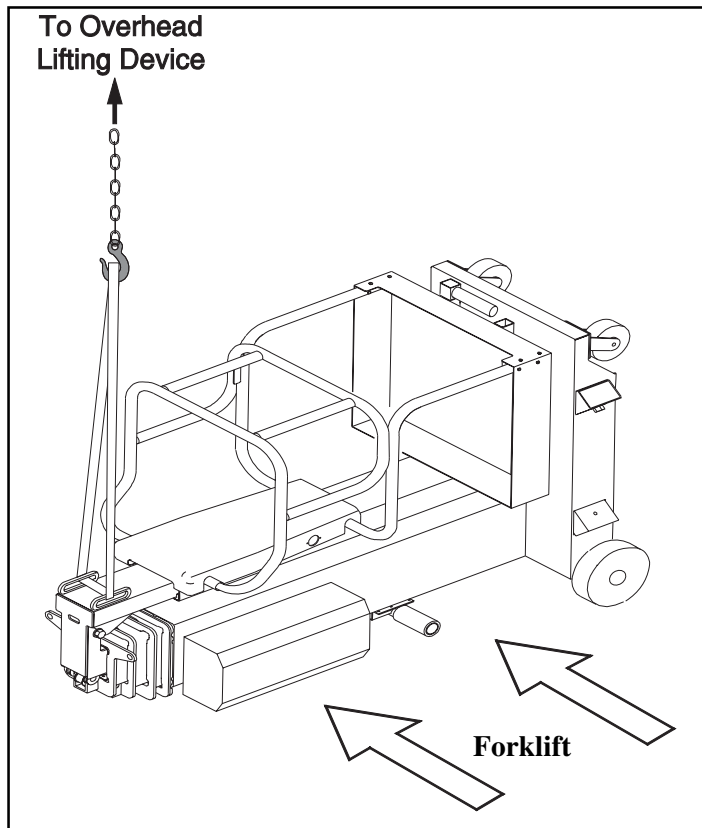


Figure 4-5: Lifting/Lowering UL Lift

3. Remove cotter pins, and drive out chain retaining pins from the top front of stage 5.
4. Loosen screws from strap retainer on stage 5 top casting. Pull strap free of retainer.
5. Remove cage support screws, slide the cage support out of the sixth stage mast and set aside. It should not be necessary to remove the pinch shield. Be careful not to damage the control cable.

**Note:** to remove the platform assembly from the cage support assembly, follow steps 6-10 below.

6. Remove cable sheaves from cage support weldment, and strain reliefs from stage 5 top casting.
7. Loosen screws from strap retainer on platform assembly weldment and free strap from retainer.
8. Remove two screws and washers holding stop bracket located at top of platform assembly weldment. Remove the stop bracket.
9. Slide the cage support weldment out of the top of the platform assembly weldment.
10. Slide bearings in platform assembly may now be inspected / replaced if necessary.

## #6 Mast

1. Remove sequence strap retainer on the top of #4 mast.
2. Remove the Allen head screws holding the top mast bearings between the #5 and #6 mast. Remove the top mast bearings.
3. Slide #6 mast out of #5 mast. As mast is removed, the bottom four mast bearings will fall out; note their orientation for re-assembly.
4. Disconnect chain from top of #4 mast.

## #5 Mast

1. Remove sequence strap retainer on the top of #3 mast.
2. Remove the Allen head screws holding the top mast bearings between the #4 and #5 mast. Remove the top mast bearings.
3. Slide #5 mast out of #4 mast. As mast is removed, the bottom four mast bearings will fall out; note their orientation for re-assembly.
4. Disconnect chain from top of #3 mast.

## #4 Mast

1. Remove sequence strap retainer on the top of #2 mast.
2. Remove the Allen head screws holding the top mast bearings between the #3 and #4 mast. Remove the top mast bearings.
3. Slide #4 mast out of #3 mast. As mast is removed, the bottom four mast bearings will fall out; note their orientation for re-assembly.



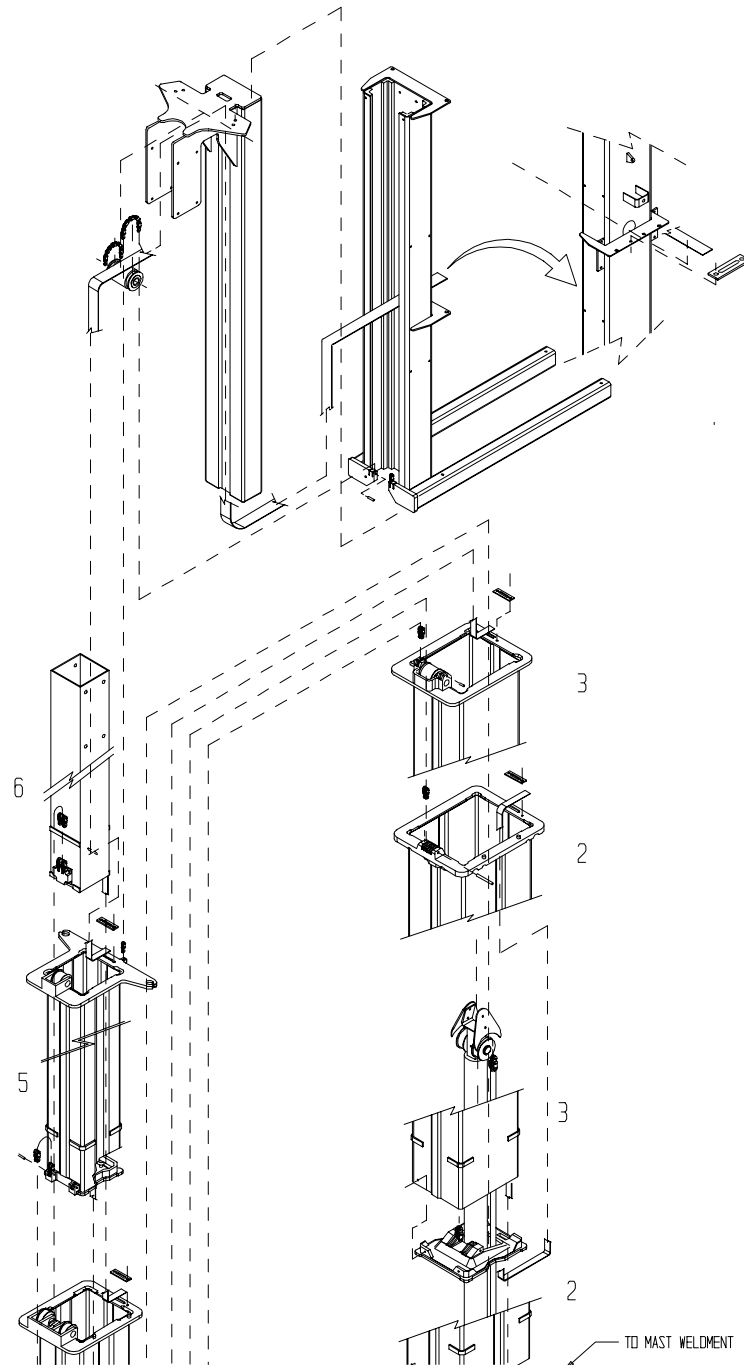


Figure 4-6: Mast Assembly, Strap and Chain Detail

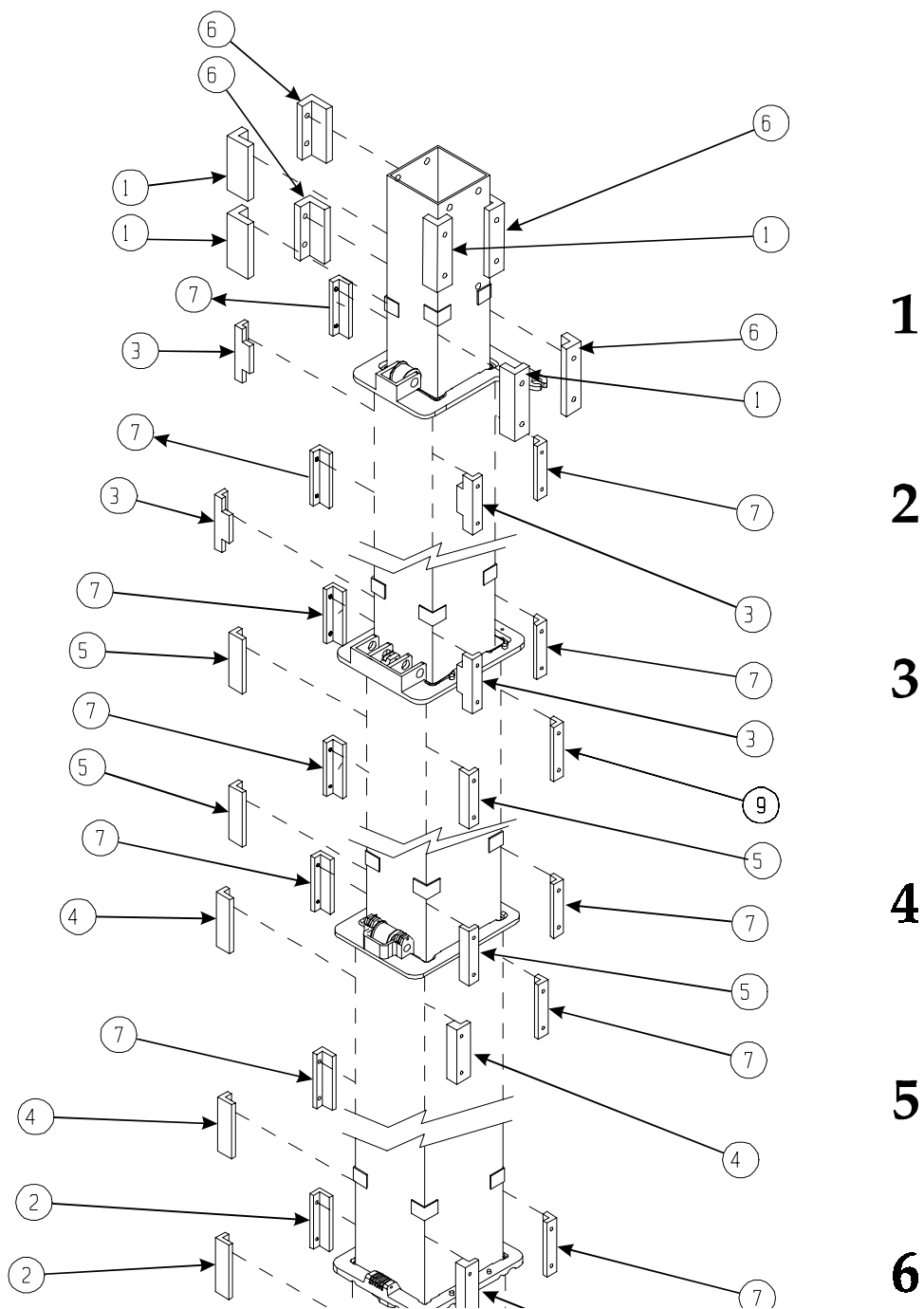


Figure 4-7: Mast Assembly, Bearing Detail

## 4.5 Mast Assembly (Cont.)

4. Disconnect chain from top of #2 mast.
5. Remove cylinder by following instructions in *Section 4.7*.

### #3 Mast

1. Remove sequence strap retainer on the top of #1 mast.
2. Remove the Allen head screws holding the top mast bearings between the #2 and #3 mast. Remove the top mast bearings.
3. Slide #3 mast out of #2 mast. As mast is removed, the bottom four mast bearings will fall out; note their orientation for re-assembly.

### #2 Mast

1. Remove the Allen head screws holding the top mast bearings between the #1 and #2 mast. Remove the top mast bearings.
2. Slide #2 mast out of #1 mast. As mast is removed, the bottom four mast bearings will fall out; note their orientation for re-assembly.

## ASSEMBLY (Figure 4-7)

**Note:** Use WD-40 lubricant as necessary to aid in reassembly.

### #2 Mast

1. Set #2 mast in place.
2. Install bottom lower bearings.
3. Install bottom upper bearings.
4. Slide #2 mast in all the way except 12-15" (30 -38 cm).
5. Install top bearings and secure with retaining screws using Loctite® 242 or equivalent on the threads.
6. Slide #2 mast in completely.

### #3 Mast

1. Set #3 mast in place with the sequencing strap inside.
2. Install bottom lower bearings.
3. Install bottom upper bearings.
4. Slide #3 mast in all the way except 12-15" (30 -38 cm).
5. Install top bearings and secure with retaining screws using Loctite® 242 or equivalent on the threads.
6. Place a 10" (25 cm) long wood block between #3 and #2 masts, slide #3 mast down tight against block. Pull sequencing strap completely out of the bottom of assembly.
7. Install cylinder assembly by following instructions in section 4.6.

### #4 Mast

1. Set #4 mast in place with the sequencing strap inside and the chains on the bottom.
2. Install bottom lower bearings.
3. Install bottom upper bearings.
4. Slide mast #4 in, make sure chains are not twisted.
5. Install top bearings and secure with retaining screws using Loctite® 242 or equivalent on the threads.
6. Install chains around #3 sheave and down through #3 casting, secure to #2 casting with new roll pins.
7. Use a center punch to dimple pin hole after roll pins are installed.

### #5 Mast

1. Set #5 mast in place with the sequencing strap inside.
2. Install bottom lower bearings.
3. Install bottom upper bearings.
4. Slide #5 mast in, make sure chains are not twisted.
5. Install top bearings and secure with retaining screws using Loctite® 242 or equivalent on the threads.
6. Install chains around #4 sheaves and down through #4 casting, secure to #3 casting with new roll pins.
7. Use a center punch to dimple pin holes after all roll pins are installed.
8. Slide mast in, leaving 10" (25 cm) exposed.

### #6 Mast

1. Set #6 mast in place with the sequencing strap inside.
2. Run the remaining sequencing strap (from platform assembly) through the slot in the bottom of stage #6 and up through the inside. Leave just enough slack on the outside to reach the attachment point at the top of stage #5.
3. Install bottom lower bearings.
4. Install bottom upper bearings.
5. Slide #6 mast in, make sure chains are not twisted.
6. Install top bearings and secure with retaining screws using Loctite® 242 or equivalent on the threads.
7. Install #6 chain around #5 sheave and through casting, secure to #4 casting with new roll pins.
8. Use a center punch to dimple pin holes after all roll pins are installed.
9. Pull the sequencing strap attached to the bottom of mast #6 out through the bottom of the mast assembly. Be sure not to pull the strap that is attached to the top of mast #5.

## 4.5 Mast Assembly (Cont.)

### Platform Support Assembly

1. Slide cage support weldment into the top of the platform assembly weldment.
2. Install stop bracket and retaining screws / washers.
3. Feed chains over sheave.
4. Install cable sheaves with cables to the top of cage support weldment.
5. Feed sequencing strap from inside mast #6 over sheave and out through the slot in the top of the cage support weldment.
6. Install cage support weldment to mast #6 using eight screws, tighten.
7. Attach chains to #5 casting front using new cotter pins.

### Sequencing Strap Installation

**When installing straps, make sure they are not twisted.**

1. Feed fish tape up through the bottom slot in cage support weldment and out through the top slot.
2. Attach strap to fish tape and pull out through bottom slot.
3. Feed fish tape down through the opening in the front of the platform support weldment and out through the bottom of the platform support weldment.
4. Attach strap to fish tape and pull out through opening. Attach strap to platform support weldment, pull tightly and secure with strap clamp and screws using Loctite® 242 or equivalent on the threads.
5. Fish #6 strap up through mast between fourth and fifth stages with fish tape.
6. Fish #5 strap up through mast between third and fourth stages with fish tape.
7. Fish #4 strap up through mast between third and second stages with fish tape.
8. Fish #3 strap up through mast between first and second stages with fish tape.
9. Install strap #6 to #4 top casting.
10. Install strap #5 to #3 top casting.
11. Install strap #4 to #2 top casting.
12. Install strap #3 to top of #1 mast weldment.
13. Install the strap clamps and retaining screws using Loctite® 242 or equivalent on the threads. Pull straps tight while tightening retaining screws.

## 4.6 Cylinder Assembly

### SEAL REPLACEMENT (Figure 4-8)

**Note: The Lift Cylinder Seal can be accessed from the bottom of the Lift without removing the Cylinder Assembly.**

Using a suitable lifting device, lower the work platform into a horizontal position (Figure 4-5). If possible, place the machine onto a sturdy work table using a forklift.



### WARNING



Never attempt to lower lift into a horizontal position without the use of a suitable lifting device; bodily injury or damage to the machine may result.

1. Remove cylinder mounting plate fasteners and retaining ring.
2. Remove tie rod nuts, count the number of turns required to bring the nut flush with the tie rod end and record for reference during installation. The tension on the tie rods maintains the left / right positioning of the cylinder within the mast assembly, reinstalling the nuts with the proper tension will speed up adjustment later.
3. Remove the cylinder mounting plate. Be careful not to allow the tie rods to suck back inside of the mast assembly, replace the nuts on the tie rod ends temporarily to prevent this.
4. Remove hydraulic line from the cylinder fitting and cap the cylinder fitting to prevent contaminants from entering the cylinder.



### CAUTION



Marring the surface of the cylinder rod will damage cylinder seals and cause leakage. Use a strap wrench to prevent rod damage.

5. Extend cylinder rod at least twelve inches by hand. Apply heat to rod near end cap to loosen Loc-tite®.



### WARNING



Wear safety glasses and heat resistant gloves when operating torch. Do not touch hot surfaces without proper protection.

6. Using a Strap Wrench, 062482-000, to secure the cylinder rod, unscrew the cylinder rod end. If necessary, thread a 9/16 x 18 bolt into end cap port to use as a lever. Remove rod end cap and orifice / bleeder tube assembly.

7. Remove the seal retainer, using the spanner wrench, 062521-010 (UL25,32,40).
8. Clean all sealing surfaces with solvent. Inspect cylinder rod for excessive wear, replace if necessary.
9. Remove all seals from seal retainer, rod end cap and discard.

**Note: Apply clean hydraulic fluid to new cylinder seal, threads and all sliding surfaces prior to assembly. If necessary, soften new seals with warm water (180°F [82°C]) to aid in installation.**

10. Twist the pressure seal into a 'C' shape and snap into seal groove in seal retainer, making sure the lip of the seal is facing inward.
11. Using the same method, install the rod wiper into the seal retainer outer groove, making sure that the blade of the seal is facing outward from the seal retainer.
12. Replace static seals in rod end cap and seal retainer by stretching them into place. Be careful not to cut the seal during installation.
13. Install the seal retainer onto rod using a sharp blow from a hard rubber mallet to overcome seal squeeze. Slide seal retainer into place and tighten using the spanner wrench.

14. Rod and rod end threads must be absolutely clean. Spray threads with Loctite® primer #7471, allow to dry for five minutes. Coat threads liberally with Loctite® #242. Thread rod end cap onto rod, tighten using strap wrench to hold rod.
15. Push rod back into cylinder for reassembly.
16. Reconnect hydraulic line.
17. Remove nuts from tie rod ends and set the cylinder mounting plate into place. Secure mounting plate with fasteners.
18. Install tie rod nuts flush with tie rod ends, torque each nut the exact number of turns used to remove it.
19. Reinstall retaining ring.
20. Using a suitable lifting device, raise the lift to its normal vertical position.
22. Bleed air from cylinder by cycling the mast to full extension several times. The cylinder is self bleeding; air will be forced out of the cylinder during the lowering cycle.
23. If necessary, remove pinch shield and check alignment of cylinder within mast assembly by peering down the mast with a flashlight. The cylinder may be moved left or right by tightening one or the other of the tie rod nuts.

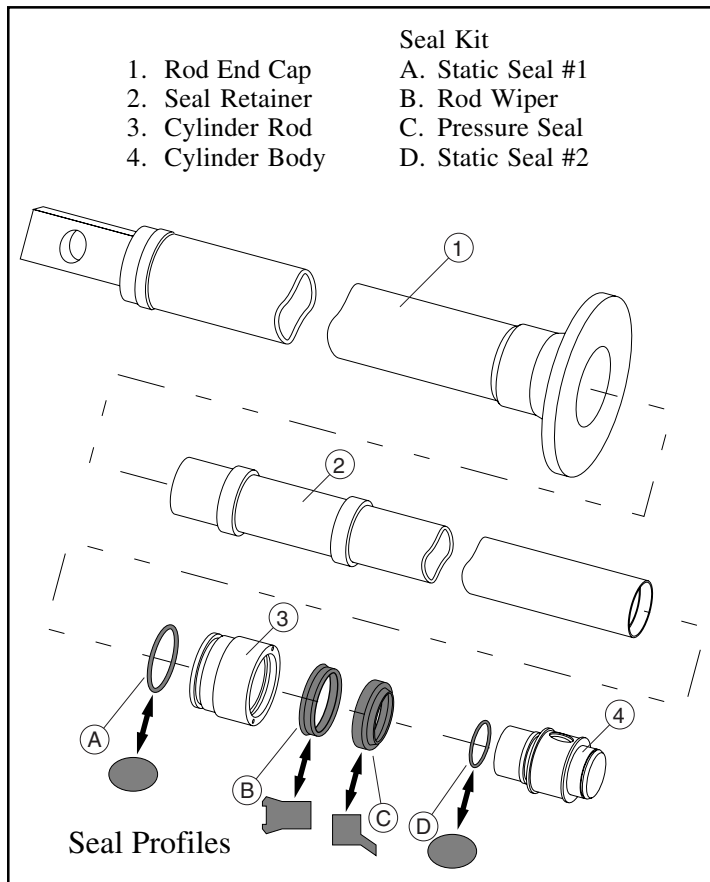


Figure 4-8: lift Cylinder



## CAUTION



If cylinder is not centered, mast may "hang" when lowering.



## WARNING



Keep hands clear of the mast assembly when the pinch shield is removed for inspection purposes; pinching injury to hands may result.

Never operate a machine with the pinch shield removed, except for inspection.

## 4.6 Cylinder Assembly (Cont.)

### ORIFICE VALVE CLEANING

Using a suitable lifting device, lower the work platform into a horizontal position (Figure 4-5). If possible, place the machine onto a sturdy work table using a forklift.



#### WARNING



Never attempt to lower lift into a horizontal position without the use of a suitable lifting device; bodily injury or damage to the machine may result.

1. Remove cylinder mounting plate fasteners and retaining ring.
2. Remove tie rod nuts, count the number of turns required to bring the nut flush with the tie rod end and record for reference during installation. The tension on the tie rods maintains the left / right positioning of the cylinder within the mast assembly, reinstalling the nuts with the proper tension will speed up adjustment later.
3. Remove the cylinder mounting plate. Be careful not to allow the tie rods to suck back inside of the mast assembly, replace the nuts on the tie rod ends temporarily to prevent this.
4. Remove hydraulic line from the cylinder fitting and cap the cylinder fitting to prevent contaminants from entering the cylinder.



#### CAUTION



Marring the surface of the cylinder rod will damage cylinder seals and cause leakage. Use a strap wrench to prevent rod damage.

5. Extend cylinder rod at least twelve inches by hand. Apply heat to rod near end cap to loosen Loc-tite®.



#### WARNING



Wear safety glasses and heat resistant gloves when operating torch. Do not touch hot surfaces without proper protection.

6. Using a Strap Wrench, 062482-000, to secure the cylinder rod, unscrew the cylinder rod end. If necessary, thread a 9/16 x 18 bolt into end cap port to use as a lever. Remove rod end cap and orifice / bleeder tube assembly.
7. Remove snap ring to release orifice / bleeder tube from rod end cap.

8. Clean orifice valve hole with a straight pin. Flush with solvent to remove any contamination that may remain in bleeder tube.
9. Reinstall orifice / bleeder tube into rod end cap and secure with snap ring.
10. Replace static seal on red end. Existing seal may have been damaged by heating rod.
11. Rod and rod end threads must be absolutely clean. Spray threads with Loctite® primer #7471, allow to dry for five minutes. Coat threads liberally with Loctite® #242. Thread rod end cap onto rod, tighten using strap wrench to hold rod.
12. Push rod back into cylinder for reassembly.
13. Reconnect hydraulic line.
14. Remove nuts from tie rod ends and set the cylinder mounting plate into place. Secure mounting plate with fasteners.
15. Install tie rod nuts flush with tie rod ends, torque each nut the exact number of turns used to remove it.
16. Reinstall retaining ring.
17. Using a suitable lifting device, raise the lift to its normal vertical position.
18. Bleed air from cylinder by cycling the mast to full extension several times. The cylinder is self bleeding; air will be forced out of the cylinder during the lowering cycle.
19. If necessary, remove pinch shield and check alignment of cylinder within mast assembly by peering down the mast with a flashlight. The cylinder guide bearings must not be touching the inside surface of #6 mast. The cylinder may be moved left or right by tightening the left or right tie rod nuts respectively.



#### CAUTION



If cylinder is not centered, mast may "hang" when lowering.

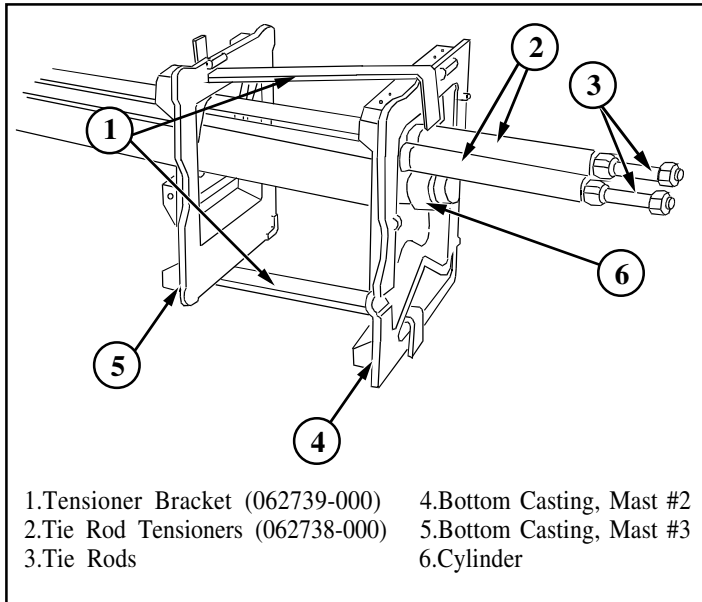


#### WARNING



Keep hands clear of the mast assembly when the pinch shield is removed for inspection purposes; pinching injury to hands may result .

Never operate a machine with the pinch shield removed, except for inspection.



**Figure 4-9: Cylinder Assembly Installation**

## CYLINDER REMOVAL (Figure 4-9)

Using a suitable lifting device, lower the work platform into a horizontal position (Figure 4-5). If possible, place the machine onto a sturdy work table using a forklift.



### WARNING



Never attempt to lower lift into a horizontal position without the use of a suitable lifting device; bodily injury or damage to the machine may result.

1. Remove cylinder mounting plate fasteners and retaining ring.
2. Remove tie rod nuts, count the number of turns required to bring the nut flush with the tie rod end and record for reference during installation. The tension on the tie rods maintains the left / right positioning of the cylinder within the mast assembly, reinstalling the nuts with the proper tension will speed up adjustment later.
3. Remove the cylinder mounting plate. Be careful not to allow the tie rods to suck back inside of the mast assembly, replace the nuts on the tie rod ends temporarily to prevent this.
4. Remove hydraulic line from the cylinder fitting and cap the cylinder fitting to prevent contaminants from entering the cylinder.
5. Remove sequence strap retainers on the top of #3 and #2 masts.
6. Remove front and rear mast access plates from the bottom of the #1 mast.

7. Remove the screws and washers, attaching the #2 and #3 bottom castings to the #2 and #3 mast assemblies.
8. While keeping tension on the tie rods, slide the cylinder and #2 and #3 bottom castings out the bottom of the UL Lift far enough to expose both castings.
9. Install cylinder Tensioner Brackets, 062739-000 on #2 and #3 bottom castings. Remove tie rod nuts and install the Tie Rod Tensioners, 062738-000. Remove all slack from the chains with the Tie Rod Tensioners.
10. Remove cylinder assembly from mast assembly.

## INSTALLATION

**NOTE: Cylinder assembly must have Tension Brackets, Tensioner Spacer and Tie Rod Tensioners installed to remove slack from chain.**

1. Slide cylinder assembly into mast assembly until #3 bottom casting is at the bottom of the mast assembly.
2. Install the screws and washers attaching the #3 bottom casting to the #3 mast assembly.
3. Remove cylinder Tensioner Brackets from #2 and #3 bottom castings and Tie Rod Tensioners from tie rods. Install tie rod nuts finger tight.
4. While maintaining tension on the tie rods to keep slack out of the chains, slide cylinder assembly completely into the mast assembly.
5. Install the screws and washers attaching the #2 bottom casting to the #2 mast assembly.
6. Install front and rear mast cover plates on the bottom of #1 mast.
7. Fish #4 strap between #3 and #2 mast with fish tape.
8. Slide #4 strap through #2 casting.
9. Fish #3 strap between #2 and #1 mast with fish tape.
10. Install strap #4 to #2 top casting.
11. Install strap #3 to #1 top casting.
12. While maintaining tension on the sequencing straps, install strap retainers using Loctite® 242 or equivalent on the threads of the retainer screws.
13. Reconnect hydraulic line.
14. Remove nuts from tie rod ends and set the cylinder mounting plate into place. Secure mounting plate with fasteners.
15. Install tie rod nuts flush with tie rod ends, torque each nut the exact number of turns used to remove it.
16. Reinstall retaining ring.

## 4.6 Cylinder Assembly (Cont.)

### INSTALLATION (CONT.)

17. Using a suitable lifting device, raise the lift to its normal vertical position.
18. Bleed air from cylinder by cycling the mast to full extension several times. The cylinder is self bleeding; air will be forced out of the cylinder during the lowering cycle.
19. If necessary, remove pinch shield and check alignment of cylinder within mast assembly by peering down the mast with a flashlight. The cylinder guide bearings must not be touching the inside surface of #6 mast. The cylinder may be moved left or right by tightening the left or right tie rod nuts respectively.



### WARNING



Keep hands clear of the mast assembly when the pinch shield is removed for inspection purposes; pinching injury to hands may result.

Never operate a machine with the pinch shield removed, except for inspection.

## 4.7 Torque Specifications

### HYDRAULIC COMPONENTS

Use the following values to torque hydraulic components used on UpRight Work Platforms.

**Note: Always lubricate threads with clean hydraulic oil prior to installation.**

**Table 4-2: Hydraulic Component Torque**

TYPE: SAE PART SERIES	CARTRIDGE POPPET		FITTINGS		HOSES	
	(Ft/Lbs)	(Nm)	(Ft/Lbs)	(Nm)	(In/Lbs)	(Nm)
#4	N/A	N/A	N/A	N/A	135-145	15-16
#6	N/A	N/A	10-20	14-27	215-245	24-28
#8	25-30	34-41	25-30	34-41	430-470	49-53
#10	35-40	47-54	35-40	47-54	680-750	77-85
#12	85-90	115-122	85-90	115-122	950-1050	107-131
#16	130-140	176-190	130-140	176-190	1300-1368	147-155

Coil nuts: 30 In/Lbs (3 Nm)

### FASTENERS

Use the following values to torque fasteners used on UpRight Work Platforms unless a specific torque value is called out for the part being installed.

**Table 4-3: Bolt Torque**

THREAD SIZE <small>American National Standard-UNF (fine)</small>	WIDTH ACROSS FLATS	TORQUE VALUE			
		ENGLISH		METRIC	
1/4	7/16	110	In/Lbs	12	Nm
5/16	1/2	190	In/Lbs	22	Nm
3/8	9/16	30	Ft/Lbs	41	Nm
7/16	5/8	50	Ft/Lbs	68	Nm
1/2	3/4	75	Ft/Lbs	102	Nm
5/8	15/16	150	Ft/Lbs	203	Nm
3/4	1 1/8	250	Ft/Lbs	339	Nm
7/8	1 5/16	400	Ft/Lbs	542	Nm
1	1 1/2	600	Ft/Lbs	813	Nm



## 5.0 Introduction

Table 5-1 provides a logical sequence of tests that are designed to isolate problems with the UpRight Lift. This table includes a list of probable causes and remedies.



### **WARNING**



When troubleshooting, ensure that the work platform is resting on a firm, level surface.

When performing any service which requires the Platform to be raised, ensure that all four (4) outriggers are properly installed.

Unplug the machine or disconnect the battery when replacing or testing the continuity of any electrical component.

## **GENERAL PROCEDURE**

Troubleshooting should be carried out in two steps. First, thoroughly study both hydraulic and electric schematics to determine possible causes. Loose terminal connections and short circuits are always a potential cause when troubleshooting. Second, check suspect components electrically, hydraulically and mechanically to determine if they are at fault. Refer to Tables 6-1 and

6-2 for Reference Designations used in Table 5-1.

**Table 5-1: Troubleshooting**

TROUBLE	PROBABLE CAUSE	REMEDY
Lift Function inoperable, electric motor does not start.	<ol style="list-style-type: none"> <li>1. Extension cord too long or insufficient capacity.</li> <li>2. Not plugged in or faulty connection (AC only).</li> <li>3. No power at wall outlet (AC only).</li> <li>4. Faulty Battery Charger (DC only).</li> <li>5. Faulty Battery (BAT).</li> <li>6. Key Switch (S2), Emergency Stop Switch (S1, S3) or Push-button Switch (S4, S5) failed open.</li> <li>7. Outrigger Interlock Switch (S7,S8, 9,S10).</li> <li>8. Open circuit in cable to motor control box.</li> <li>9. Faulty Electric Motor (M1).</li> </ol>	<p>Use minimum 12 ga. cord of 50 feet (16m) or less in length.</p> <p>Check all AC plugs and cords used.</p> <p>Check power output at wall outlet.</p> <p>Check the voltage output of the Battery Charger. If less than 12 VDC, repair or replace.</p> <p>After completely charging Battery, test Battery. Replace as required.</p> <p>With the switch in the ON position, check continuity across the contacts. If none, replace.</p> <p>Make sure all four outriggers are in firm contact with floor. Check continuity of interlock switches.</p> <p>Test for continuity through cable assembly and repair or replace.</p> <p>While operating the Lift function, check the voltage to the Electric Motor. If voltage is present (12VDC or 120/240VAC), replace the motor. In case of low AC voltage, see #1.</p>
Lift turns on and off repeatedly.	<ol style="list-style-type: none"> <li>1. Low line voltage or battery charge.</li> </ol>	<p>Use minimum 12 ga. cord of 50 feet (16m) or less in length.</p>
One or more, but not all indicator lights fail to operate	<ol style="list-style-type: none"> <li>1. Indicator light damaged or faulty.</li> <li>2. Outrigger limit switch damaged or faulty.</li> <li>3. Chassis harness damaged or improperly connected.</li> </ol>	<p>Replace indicator light.</p> <p>Replace switch.</p> <p>Repair damage, insure proper connection.</p>
Lift function inoperable, Electric Motor starts when control is activated.	<ol style="list-style-type: none"> <li>1. Emergency Lowering Valve (V2) open.</li> <li>2. Hydraulic Reservoir Low.</li> <li>3. Down Valve (V2) stuck.</li> <li>4. Relief Valve (RV) out of adjustment or faulty.</li> <li>5. Lift Valve (V1) faulty.</li> <li>6. Faulty Hydraulic Pump (P).</li> </ol>	<p>Close valve.</p> <p>Check hydraulic fluid level, top off as required.</p> <p>Check or replace Down Valve (V2).</p> <p>Adjust the Relief Valve (RV). If not adjustable, replace.</p> <p>Check or replace Lift Valve (V1).</p> <p>Check pressure and delivery of the Hydraulic Pump. Replace if required.</p>

TROUBLE	PROBABLE CAUSE	REMEDY
Platform does not lower using electrical switches. (Will lower using emergency lowering valve.)	<ol style="list-style-type: none"> <li>1. Down Valve Solenoid (SOL1) faulty.</li> <li>2. Electrical malfunction.</li> </ol>	<p>Test for continuity across Solenoid. Repair or replace.</p> <p>Check all AC plugs and cords used (AC only). Check power output at wall outlet (AC only).</p> <p>With each switch (S1,S2,S3,S4,S6) in the ON position, check continuity across the contacts. If none, replace.</p>
Platform does not lower or lowers very slowly.	<ol style="list-style-type: none"> <li>1. Down Orifice (ORF) plugged.</li> <li>2. Down Valve (V2) blocked or stuck closed.</li> <li>2. Mechanical interference.</li> </ol>	<p>Remove and clean Down Orifice check valve.</p> <p>Check function / clear blockage of Down Valve.</p> <p>Inspect Mast Assembly, correct interference.</p>
Platform continues to lower when controls are released.	<ol style="list-style-type: none"> <li>1. Down Valve (V1) stuck open</li> </ol>	<p>Clean or replace Down Valve.</p>

**Table 5-1: Troubleshooting (cont'd)**

## LIFT DOES NOT TURN ON - AC

All voltages are referenced to Chassis ground. Using a voltmeter, place the negative probe directly to a clean ground source on the AC motor. If equipped with battery back up, remove back up battery before proceeding. Disconnect both chassis connector and coil cord connector. Set voltmeter for DC voltage. Plug lift into outlet.

**1) Check for voltage at the power terminals of the circuit board. Turn off key switch and E-Stop switch. Power terminal is S28 and ground terminal is GND. See drawing.**

1a) DC voltage at S28 is less than 11 VDC.	a) Extension harness excessive in length. b) Low line voltage. c) Damaged or faulty circuit board.
1b) Voltage is found at the ground terminal.	a) Damaged or faulty motor harness. b) Damaged or faulty circuit board.
1c) Between 11 VDC and 26 VDC found at S28. Zero volts found at GND.	a) Continue to #2.

**2) Check for voltage at the terminals of the key switch. Turn the key switch on and the E-Stop switch off.**

2a) No voltage is found on either terminal.	a) Circuit board is damaged.
2b) Voltage is found only on one of the two key switch terminals.	a) Ignition key switch is faulty.
2c) Voltage is found at both sides of the key switch.	a) Continue to step 3.

**3) Check voltages at the chassis harness. Turn on the ignition key and turn off the E-Stop. Disconnect the chassis harness. Check voltage of pin 6 and pin 1 of chassis connector on the circuit board.**

3a) Voltage at pin 6 does not exist or is less than 11 volts DC.	a) Circuit board is damaged.
3b) Voltage at ground pin 1 is not zero.	a) Circuit board is damaged. b) Ground on motor harness damaged or connected improperly.
3c) Voltage at pin 6 is between 10 and 12 VDC, voltage at pin 1 is zero.	a) Continue to step 4.

**4) Plug in Chassis harness. Turn on ignition key, turn off E-Stop switch. Check voltages at pin 1 and 6 of the chassis harness. This may require the use of a sharp probe to pierce the insulation of the corresponding wires.**

4a) Pin 6 is not between 10 and 12 VDC.	a) Damaged or shorted chassis harness.
4b) Voltage found at pin 1.	a) Circuit board is damaged. b) Ground on motor harness damaged or connected improperly.

## LIFT DOES NOT RAISE - AC

**1) Plug lift into outlet. Make sure all outriggers are extended and raised. Turn off the E-Stop switch and turn on the ignition key. Wait five seconds for machine to turn on and outrigger lights to light.**

1a) Outrigger lights do not turn on.	a) See section LIFT DOES NOT TURN ON
1b) Outrigger lights turn on immediately and no five second delay is present.	b) Circuit board is damaged. Replace circuit board.
1c) Fewer than four indicator lights will operate.	a) Indicator light is damaged. b) Chassis harness damaged or incorrectly connected. c) Outrigger limit switch defective or improperly connected.
1d) All four indicator lights turn on five seconds after ignition key is turned on.	a) Continue to step 2.

**2) Pull out both E-Stop switches. Activate the common and up switch on the upper control box.**

2a) Motor does not run.	a) Continue to step 3.
2b) Motor runs but will not raise.	a) Hydraulic system failure. b) Damaged or improperly connected motor harness. c) Damaged pump solenoid.
2c) Motor attempts to start but machine turns off and then restarts in five seconds.	a) Improperly connected or damaged motor harness. b) Improperly connected or damaged coil cord or upper control box. c) Damaged pump solenoid. d) Extension harness excessive in length. e) Low line voltage. f) Damaged pump motor.

**3) Open the lid on the lower control box. Check for voltage at the E-Stop switch. Ignition key is turned on E-Stop is pulled out on both the upper and lower box.**

3a) No voltage is present at either of the terminals on the E-Stop.	a) Circuit board is damaged. Replace circuit board.
3b) Voltage is present on both terminals of the E-Stop switch.	a) Check for correct operation of upper E-Stop switch. Continue to step 4.
3c) Voltage is only present at one side of the E-Stop switch.	a) Replace E-Stop switch in whole or in part.

**4) Check Circuit board lift circuit. Place voltmeter probe at lift terminal S26 at the upper right hand side of the circuit board. See drawing(Page 5-5). Activate the common and up switch on the upper control box.**

4a) When up button is pressed, 10-12 VDC is not present at pin S26.	a) Improperly connected or damaged coil cord or upper control control box. b) Improperly connected or damaged chassis harness. c) Damaged circuit board.
4b) When up button is pressed, 10-12 VDC is present at pin S26.	a) Continue to step 5.

**5) Set voltmeter for AC voltage. Place one probe of the voltmeter on -120 and the other probe on motor. See drawing(Page 5-5). Plug the lift into an outlet. Set outriggers, turn on ignition key, and pull out both E-Stops. Press the common and up switches on the upper control box.**

5a) Line voltage is found between -120 and motor.	a) Damaged or improperly connected motor harness. b) Damaged motor.
5b) Line voltage is not found between -120 and motor.	a) Circuit board damaged.

## LIFT DOES NOT LOWER - AC

**1) Lift will raise but will not lower. Turn on key switch, pull out both upper and lower E-Stops. Press the common and down push buttons on the upper control box.**

1a) Lift turns off and restarts in five seconds.	a) Low line voltage. b) Extension harness excessive in length. c) Improperly connected or damaged motor harness. d) Improperly connected or damaged coil cord or upper control box. e) Damaged down solenoid.
1b) Outrigger lights turn on immediately and no five second delay is present.	a) Continue to step 2.

Table 5-1: Troubleshooting (cont'd)

2) Check circuit board for correct output. Open the lid on the lower control box. Using a voltmeter, check the voltage terminal S27 found on the upper right hand side of the circuit board. See drawing. Turn on ignition key and pull out both E-Stop switches. Depress the common and down switches on the upper control box.

2a) Motor does not run.	Continue to step 3.
2b) Motor runs but will not raise.	a) Hydraulic system failure. b) Damaged or improperly connected motor harness. c) Damaged pump solenoid.
2c) Motor attempts to start but machine turns off and then restarts in five seconds.	a) Improperly connected or damaged motor harness. b) Improperly connected or damaged coil cord or upper control box. c) Damaged pump solenoid. d) Extension harness excessive in length. e) Low line voltage. f) Damaged pump motor.

## LIFT DOES NOT TURN ON - DC

All voltages are referenced to Battery ground. Using a voltmeter, place the negative probe directly to the negative pole of the battery. If equipped with battery back up, remove back up battery before proceeding. Disconnect both chassis connector and coil cord connector from the control box.

1) Turn off key switch and E-Stop switch. Check power connections on circuit board S28 and GND found on the lower right hand side of the circuit board. See drawing (Page 5-5).

1a) S28 is less than battery voltage.	a) Improperly connected or damaged motor harness. b) Poor battery connections.
1b) GND is not zero volts.	a) Improperly connected or damaged motor harness.
1c) Battery voltage is found at S28 and zero volts is found on GND.	a) Battery power is present at PCB. Continue to step 2.

2) Check for voltage at the terminals of the key switch. Turn the key switch on and the E-Stop switch off.

2a) No voltage is found on either terminal.	a) Circuit board is damaged. Replace circuit board.
2b) Voltage is found only on one of the two key switch terminals.	a) Ignition key switch is faulty. Replace ignition key switch.
2c) Voltage is found at both sides of the key switch.	a) Key switch is working properly. Continue to step 3.

3) Check for voltage at the terminals of the key switch. Turn the key switch on and the E-Stop switch off.

3a) Voltage at pin 6 does not exist or is less than 11 volts DC.	a) Circuit board is damaged.
3b) Voltage at ground pin 1 is not zero.	a) Circuit board is damaged. b) Ground on motor harness damaged or connected improperly.
3c) Voltage at pin 6 is between 10 and 12 VDC, voltage at pin 1 is zero.	Continue to step 4.

4) Plug in Chassis harness. Turn on ignition key, turn off E-Stop switch. Check voltages at pin 1 and pin 6 of the chassis harness. This may require the use of a sharp probe to pierce the insulation of the corresponding wires.

4a) Pin 6 is not between 10 and 12 VDC.	a) Damaged or shorted chassis harness.
4b) Voltage at ground pin 1 is not zero.	a) Circuit board is damaged. b) Ground on motor harness damaged or connected improperly.

## LIFT DOES NOT RAISE - DC

1) Does the lift turn on? Make sure all outriggers are extended and raised. Turn off the E-Stop switch and turn on the ignition key. Wait five seconds for machine to turn on and outrigger lifts to light.

1a) Outrigger lights do not turn on.	a) See section LIFT DOES NOT TURN ON.
1b) Outrigger lights turn on immediately and five second delay is not present.	b) Circuit board is damaged. Replace circuit board.
1c) Fewer than four indicator lights operate.	a) Indicator light is damaged. b) Chassis harness damaged or incorrectly connected. c) Outrigger limit switch defective or improperly connected.
1d) All four indicator lights turn on five seconds after ignition key is turned on.	a) Continue to step 2.

2) Pull out both E-Stop switches. Activate the common and up switch on the upper control box.

2a) Motor does not run.	a) Continue to step 3.
2b) Motor runs but will not raise.	a) Hydraulic system failure. b) Coil cord is damaged c) Damaged or improperly connected pump solenoids.
2c) Lift turns off and restarts in five seconds.	a) Improperly connected or damaged motor harness. b) Improperly connected or damaged coil cord or upper control box. c) Damaged pump solenoid or motor solenoid. d) Battery charge is low.

3) Open the lid on the lower control box. Check for voltage at the E-Stop switch. Ignition key is turned on E-Stop is pulled out on both the upper box and lower box.

3a) No voltage is present at either of the terminals on the E-Stop switch.	a) Circuit board is damaged. Replace circuit board.
3b) Voltage is present on both terminals of the E-Stop switch.	a) Check for correct operation of upper E-Stop switch. Continue to step 4.
3c) Voltage is only present at one side of the E-Stop switch.	a) Replace E-Stop switch in whole or in part.

4) Click circuit board lift circuit. Place voltmeter probe at terminal S26 at the upper right hand side of the circuit board. See drawing (Page 5-5). Activate the common and up switch on the upper control box.

4a) When button is pressed, 10-12 VDC is not present at pin S26.	a) Improperly connected or damaged coil cord or upper control box. b) Damaged circuit board.
4b) When up button is pressed, 10-12 VDC is present at pin S26.	a) Damaged or improperly wired motor harness. b) Damaged motor starter relay.

Table 5-1: Troubleshooting (cont'd)

## LIFT DOES NOT LOWER - DC

1) Lift will raise but will not lower. Turn on key switch, pull out both upper and lower E-Stops. Press the common and down push buttons on the upper control box.

1a) Lift turns off and restarts in five seconds.	a) Improperly connected or damaged motor harness. b) Improperly connected or damaged coil cord or upper control box. c) Damaged down solenoid.
1b) Lift will not lower.	a) Continue to step 2.

2) Check circuit board for correct output. Open lid on the lower box. Using a voltmeter, check the voltage on terminal S27 found on the upper right hand side of the circuit board. See drawing. Turn on ignition key and pull out both E-Stop switches. Depress the common and down switches on the upper control box.

2a) Lift turns off and restarts in five seconds.	a) Improperly connected or damaged motor harness. b) Improperly connected or damaged coil cord or upper control box. c) Damaged down solenoid.
2b) Lift will not lower.	a) Continue to step 2.

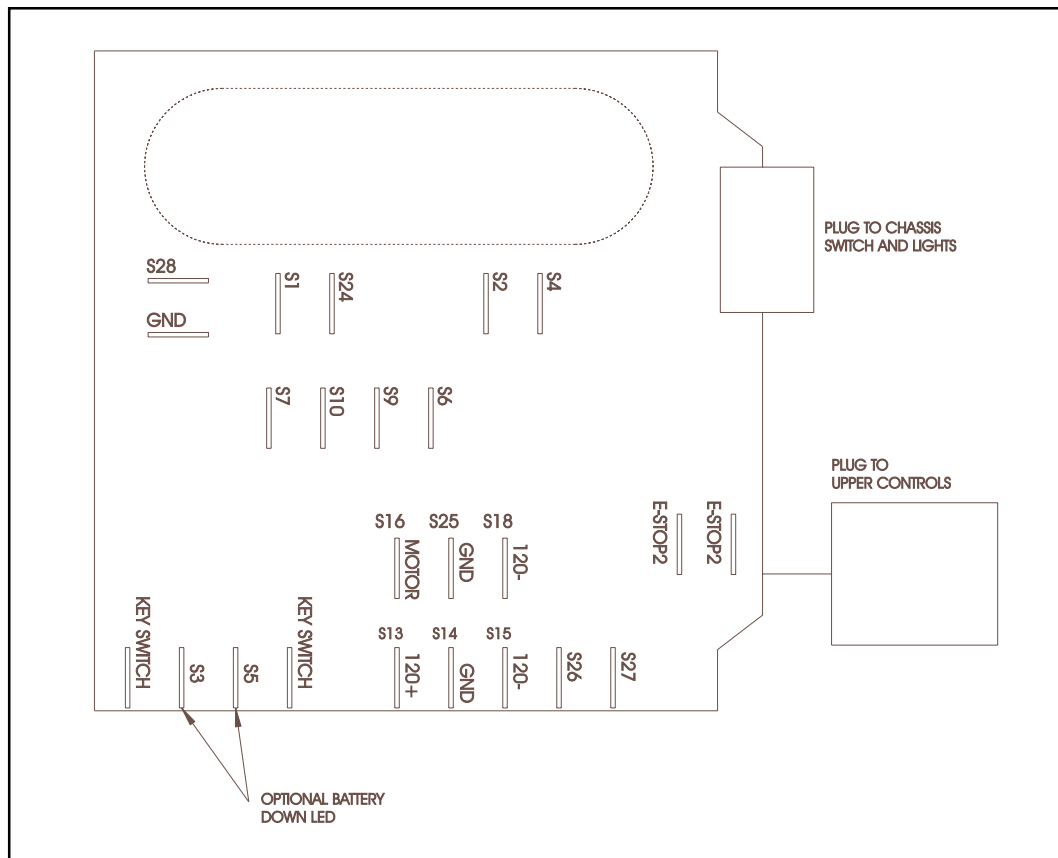


Figure 5-1: Circuit Board

*NOTES:*

6.0 Introduction

This section contains electrical and hydraulic power schematics and associated information for maintenance purposes. The diagrams are to be used in conjunction with *Table 5-1: Troubleshooting Guide*. They allow understanding of the makeup and functions of the systems for checking, tracing, and faultfinding during troubleshooting analysis.

The components that comprise the electrical and hydraulic systems are given a reference designation and are explained as to function and location in the following tables.

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## 6.1 Electrical Schematics

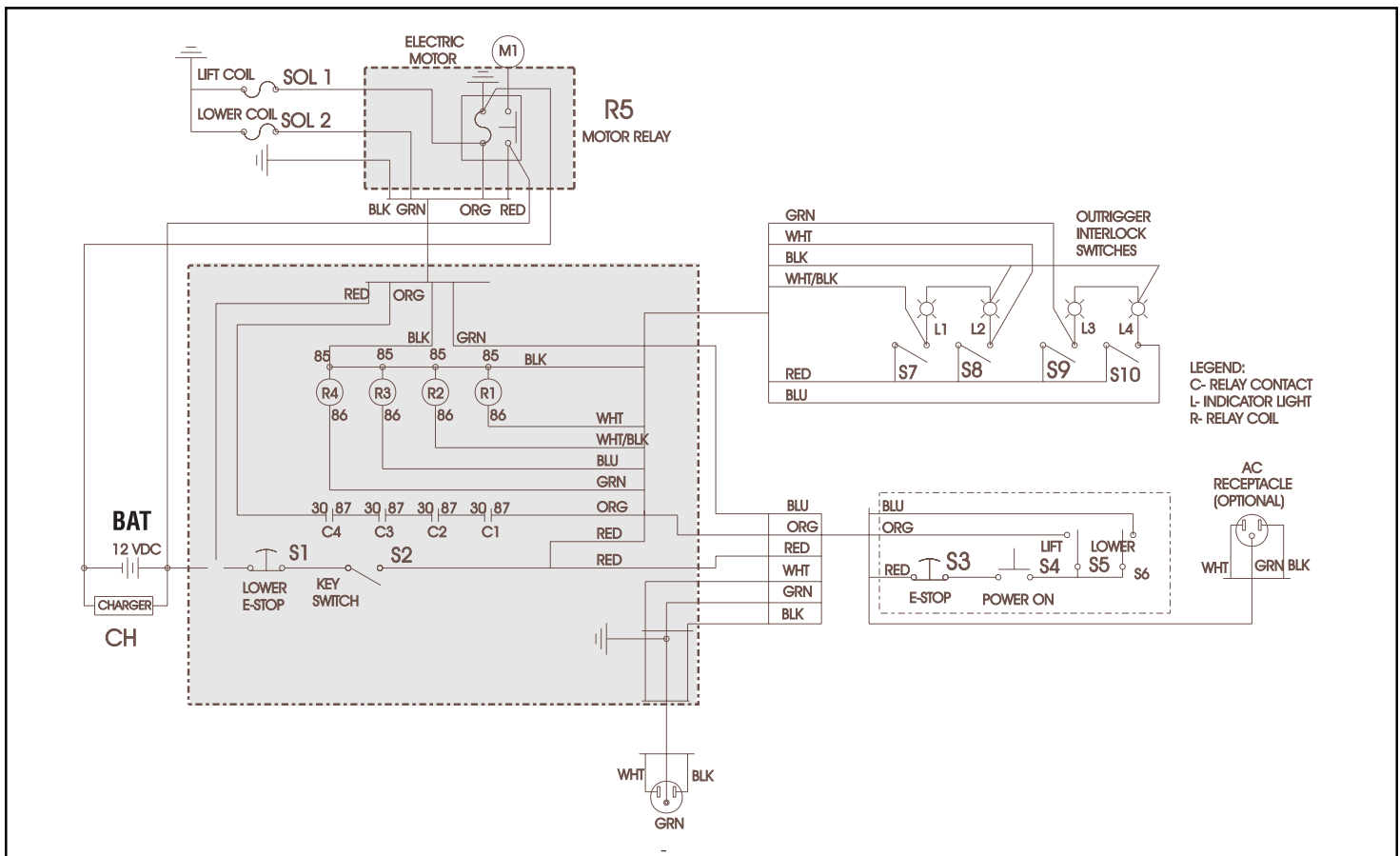
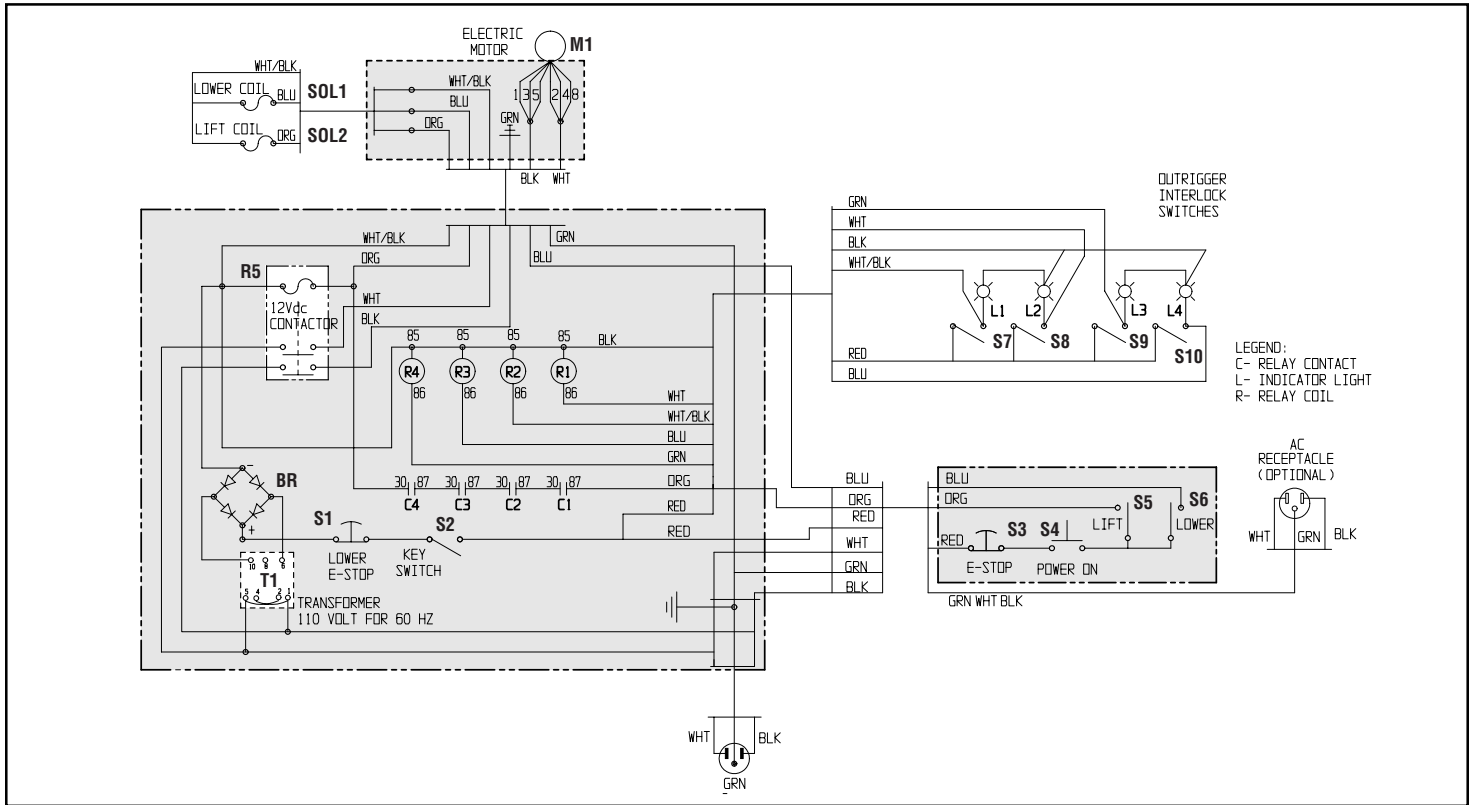
Table 6-1: Electrical Schematic Legend AC

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
BR	Bridge Rectifier	Converts AC to DC for control circuit.	In Control Box.
C1-4	Relay Contacts Norm. Open for R1-4.	Completes ground circuit to motor and Lift Valve when R1-4 are energized.	In Control Box.
L1-4	Indicator Light	Lights when Outrigger Interlock Switches are closed.	On chassis next to Outrigger socket.
M1	Electric Motor	Supplies power to drive hydraulic pump.	Upper portion of Power Unit.
R1-4	Relay Coil	When energized closes relay contacts 1-4.	In Control Box.
R5	Motor Contactor	Switches power to Electric Motor.	In Control Box.
S1	Switch, Chassis Emergency Stop	Control circuit shut off.	In Control Box.
S2	Switch, Key	Provides power to upper controls.	In Control Box.
S3	Switch, Platform Emergency Stop	Control Circuit shut off.	In Control Box.
S4	Switch. Power On	Supplies power to either Up or Down Switch.	Center button of platform controls.
S5	Switch, Lift	Supplies power to up circuit.	Upper button of platform controls.
S6	Switch, Lower	Supplies power to down circuit.	Lower button of platform controls.
S7-10	Switch, Outrigger Interlock	Supplies power to L1-L4 and R1-R4.	In Outrigger Sockets.
SOL1	Solenoid, Lower (coil)	Opens down valve.	Power Unit front.
SOL2	Solenoid, Lift (coil)	Opens Up Valve.	Power Unit left hand side.
T1	Transformer	Steps down AC voltage.	Inside electrical Control Box.

Table 6-2: Electrical Schematic Legend DC

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
BAT	Battery	Supplies current to circuit.	In Power Module.
CH	Charger	Maintains Charge level in Battery.	In Power Module.
C1-4	Relay Contacts Norm. Open for R1-4.	Completes ground circuit to motor and Lift Valve when R1-4 are energized.	In Control Box.
L1-4	Indicator Light	Lights when Outrigger Interlock Switches are closed.	On chassis next to Outrigger socket.
M1	Electric Motor	Supplies power to drive hydraulic pump.	Upper portion of Power Unit.
R1-4	Relay Coil	When energized closes relay contacts 1-4.	In Control Box.
R5	Relay, Motor	Supplies power to Motor.	Lower Power Module.
S1	Switch, Chassis Emergency Stop	Control circuit shut off.	In Control Box.
S2	Switch, Key	Provides power to upper controls.	In Control Box.
S3	Switch, Platform Emergency Stop	Control Circuit shut off.	In Control Box.
S4	Switch. Power On	Supplies power to either Up or Down Switch.	Center button of platform controls.
S5	Switch, Lift	Supplies power to up circuit.	Upper button of platform controls.
S6	Switch, Lower	Supplies power to down circuit.	Lower button of platform controls.
S7-10	Switch, Outrigger Interlock	Supplies power to L1-L4 and R1-R4.	In Outrigger Sockets.
SOL1	Solenoid, Lower (coil)	Opens down valve.	Power Unit front.
SOL2	Solenoid, Lift (coil)	Opens Up Valve.	Power Unit left hand side.



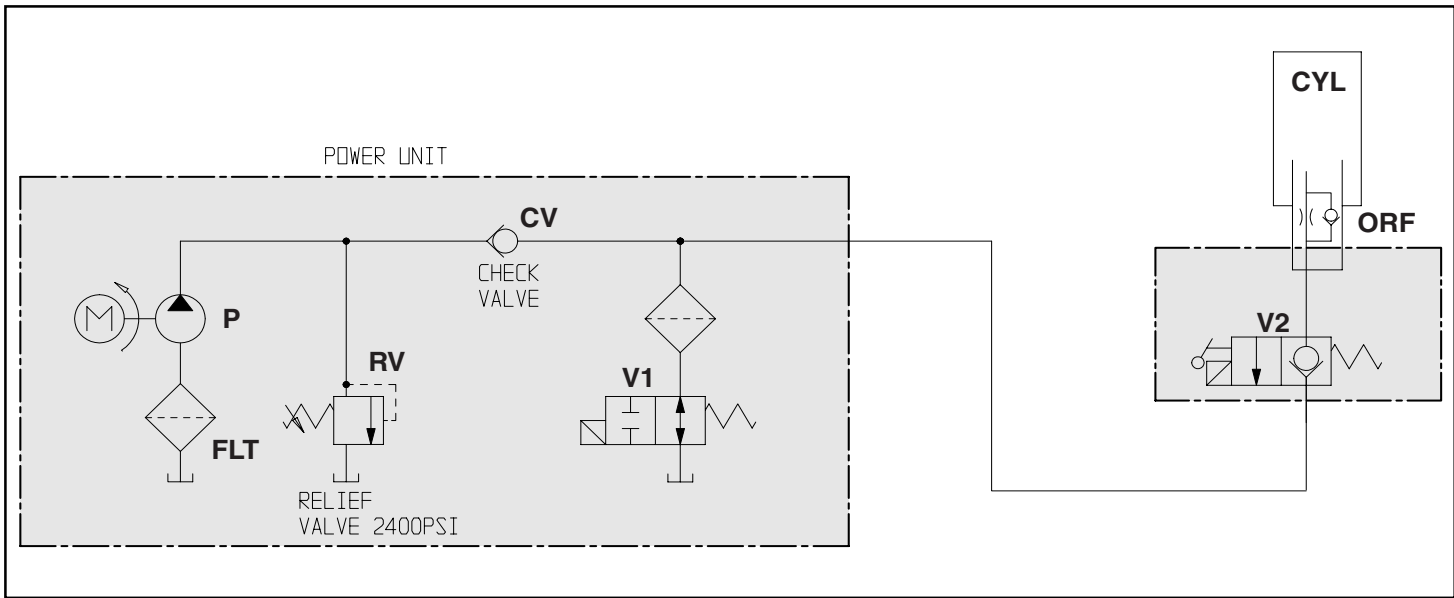


**Figure 6-2: Electrical Schematic, DC Models**

## 6.2 Hydraulic Schematic

**Table 6-3: Hydraulic Scematic Legend**

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
CV	Valve, Check	Allows flow in one direction.	Valve Block Assembly
CYL	Cylinder	Operates Lift	On lift assembly.
FLT	Filter	Seperates matter held in suspension from fluid.	Inline with Pump.
ORF	Orifice	Controls flow out of CYL.	Inline with CYL.
P	Pump	Supplies hydraulic pressure to system.	Lower Power Module.
RV	Relief Valve	Limits maximum pressure by releasing oil.	Valve Assembly Lower Power Module.
V1	Valve, Two-Way Norm. Open	Stops flow when energized.	Valve Block Assembly.
V2	Valve, Two-Way Norm. Closed	Allows flow when energized.	Lift Cylinder Assembly.



**Figure 6-3: Hydraulic Schematic**

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