

# UpRight



## TM12

### SERIES

### Work Platforms

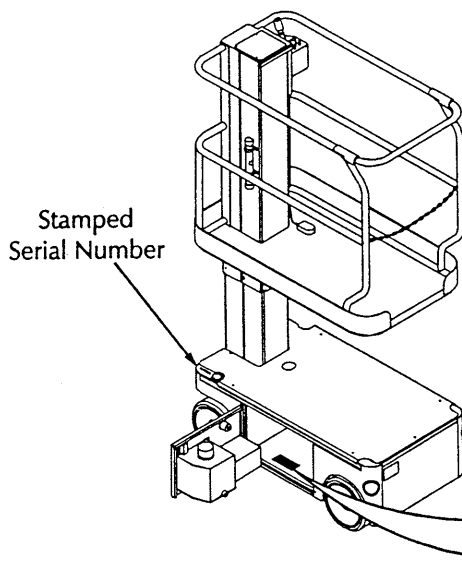
# Service & Parts Manual

# SERVICE & PARTS MANUAL

## TM12

### Aerial Work Platform

#### Serial Numbers 1141 to Current



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 left front corner of the chassis in front of the steering pivot.

<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"/>	
CAUTION: CONSULT OPERATOR'S MANUAL BEFORE USE. THIS PLATFORM IS NOT ELECTRICALLY INSULATED	
<small>P/N 61205 000 00</small>	

# UpRight

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## Introduction

### HOW TO USE THIS MANUAL

This manual is divided into 7 sections. The first page of each section is marked with a black tab that lines up with one of the thumb index tabs on the right side of this page. You can quickly find the first page of each section without looking through the table of contents which follows this page. 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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# 2.0

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# 3.0

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## Maintenance

# 4.0

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## Troubleshooting

# 5.0

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## Illustrated Parts Breakdown

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## 1.0 Introduction

### PURPOSE

This manual provides illustrations and instructions for the operation and maintenance of the TM12 Work Platform manufactured by UpRight, Inc. Selma, California. (See Figure 1-1).

### SCOPE

This manual includes both operation and maintenance responsibilities concerning the TM12 Work Platform's readiness. The Maintenance Section covers scheduled maintenance, troubleshooting, repair, adjustment and replacement.

## 1.1 General Information

### DESCRIPTION

The TM12 Work Platform is a self-propelled aerial work platform designed to be used as a means of elevating personnel and equipment and to provide a mobile work platform. They are designed to provide mobility with the platform in a raised or lowered position. Travel with the platform elevated is automatically limited to the low speed range.

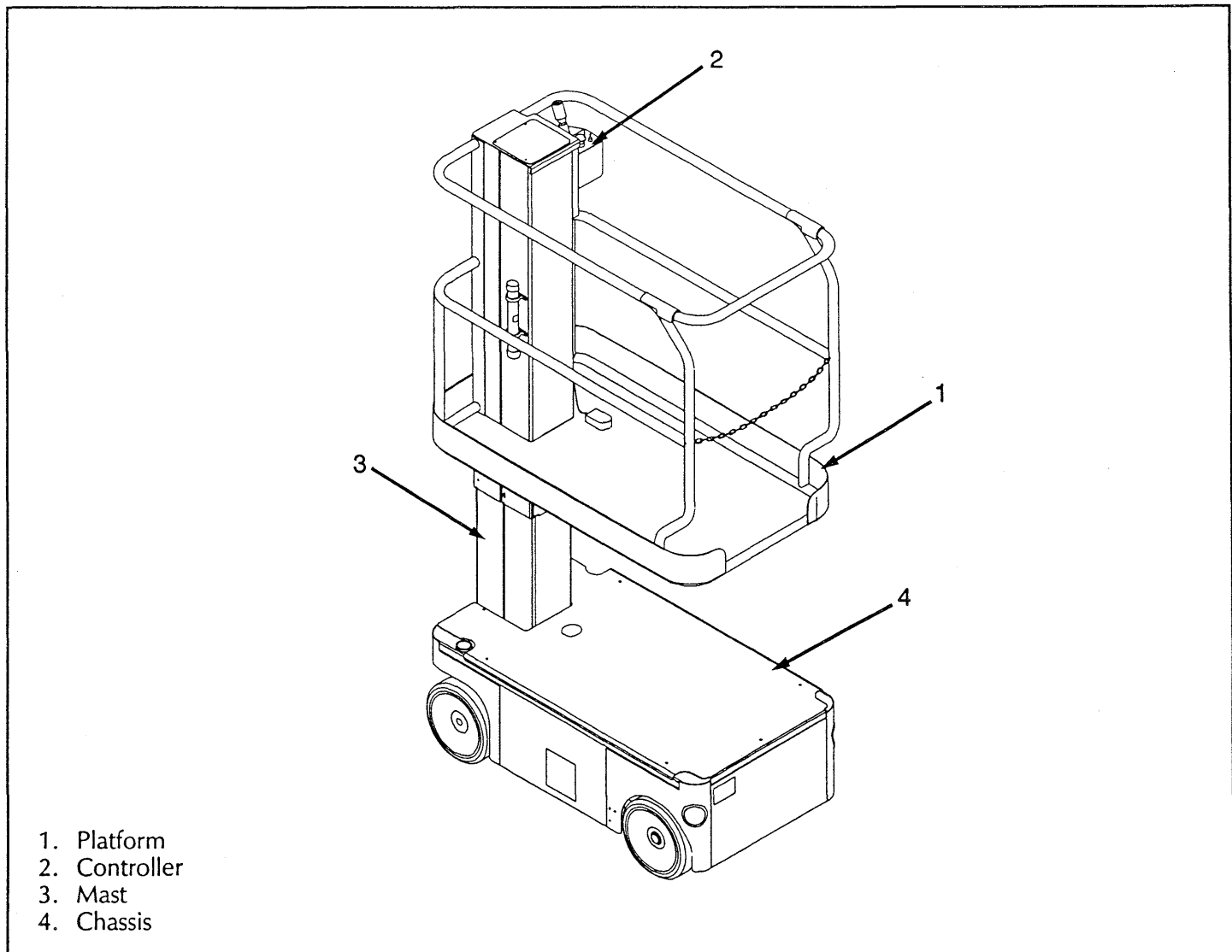


Figure 1-1: TM12 Series Work Platform

## PURPOSE AND LIMITATIONS

The objective of the TM12 Work Platform is to provide a quickly deployable, self-propelled, variable height work platform. The elevating function shall only be used when the work platform is on a firm level work area. The work platform is intended to be self-propelled when in relatively close proximity to the work area.

## 1.2 Specifications\*

Refer to Table 1-1.

**Table 1-1: Specifications**

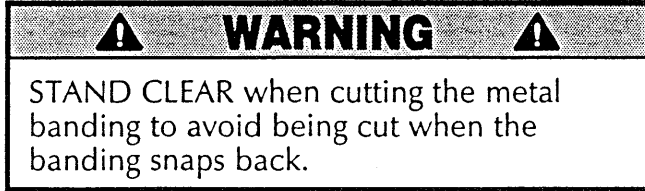
ITEM	TM12
Platform Size (inside Toeboards)	29 in. x 41 in. (74 cm x 1.04 m)
Maximum Platform Capacities	500 lbs. (200 kg.) or two people
Height	
Working Height	19 ft. (5.79 m)
Max. Platform Height	12 ft. 7 in. (3.83 m)
Min. Platform Height	19 in. (48 cm)
Weight	1,390 lbs. (630 kg)
Dimensions	
Overall Width	29.25 in. (74 cm)
Overall Height	64.75 in. (1.64 m)
Overall Length	53.5 in. (1.36 m)
Driveable Height	12 ft. 7 in. (3.83 m)
Surface Speed	
Platform Lowered	2.27 mph (3.65 km/h)
Platform Raised	.54 mph (.87 km/h)
Lift Speed - Raise/Lower	20 sec./23 sec.
Energy Source	24V battery pack (4-220 ampere hour, 6 Volt batteries, min. wt. 62 lbs. (28.12 kg)), 4 HP DC electric motor
System Voltage	24 VDC
Battery Charger	25 AMP, 110 VAC, 60 Hz
Battery Duty Cycle	25% for 8 Hours
Hydraulic Tank Capacity	1.8 gal. (7 l)
Hydraulic System Pressure, Max.	2200 psi (152 bar)
Hydraulic Fluid	
Normal use (>32 °F [0 °C])	ISO #46
Low Temp. Use (-10 to 32 °F [-23 to 0 °C])	5W-20 Motor Oil
Lift System	One Single Stage Lift Cylinder
Drive Control	Proportional
Control System	Proportional Joystick Controller with Toggle Selector Switch, Red Mushroom Emergency Stop and Foot-Operated Interlock Switch
Horizontal Drive	Dual Front Wheel
Tires	12 in. (30.5 cm) diameter Solid Rubber, Non-marking
Parking Brakes	Dual, Spring Applied, Hydraulic Release
Turning Radius (Inside)	14.5 in. (37 cm)
Gradeability	25% (14°)
Wheel Base	38.5 in. (97.8 cm)
Guardrails	38 in. (97 cm)
Toeboard	6 in. (152 mm)

\*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



1. Remove the metal banding from the machine.
2. Lift the front of the machine and remove banding and blocks from front wheels.
3. Lower machine.
4. Close the Emergency Lowering Valve (Figure 2-1) by pushing in and turning clockwise until the detent engages.
5. Connect the negative battery lead terminal (Figure 2-2).

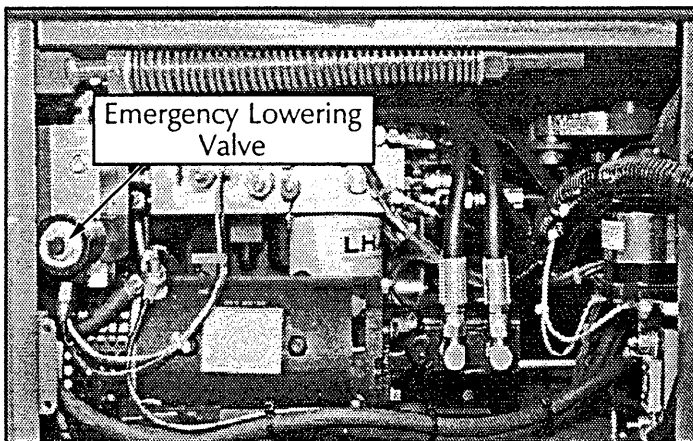


Figure 2-1: Chassis Module, Right Side

## 2.2 Preparation For Shipment

1. Grease all grease fittings per lubrication instructions in Section 4.0, Maintenance.
2. Fully lower the platform.
3. Disconnect the battery negative (-) lead from the battery terminal (Figure 2-2).
4. Band the Platform Assembly to the Chassis.

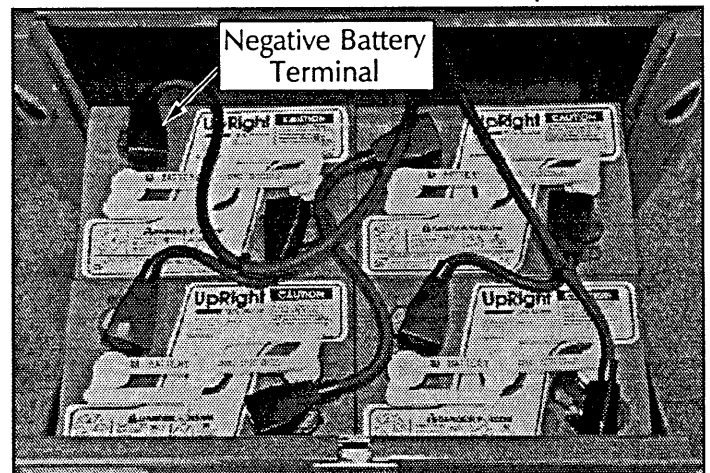




Figure 2-2: Battery Compartment

## 2.3 Forklifting Of Work Platform



NOTE: Forklifting is for transporting only.

 <b>CAUTION</b> 
<p>See specifications for weight of work platform and be certain that forklift is of adequate capacity to lift platform.</p>

Forklift from the side by lifting under the Chassis (Figure 2-3).

## 2.4 Lifting Work Platform

Secure straps to chassis tie down/lift points **only** (Figure 2-3).

 <b>CAUTION</b> 
<p>When attaching straps or chains to the right rear tie down/lift point be careful not to damage the Brake Cylinder or hose.</p>

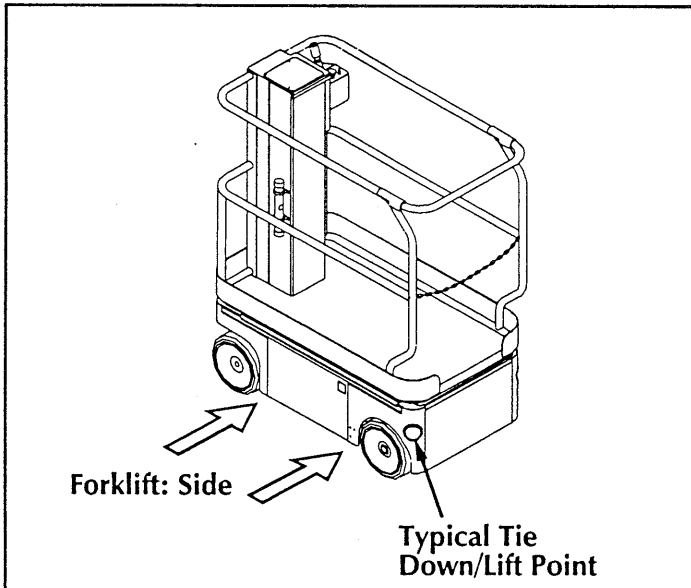




Figure 2-3: Transporting machine

## 2.5 Transport

1. Maneuver the work platform into transport position and chock wheels.
2. Secure the work platform to the transport vehicle with chains or straps of adequate load capacity attached to the chassis tie down points (Figure 2-3).

 <b>CAUTION</b> 
<p>When attaching straps or chains to the right rear tie down/lift point be careful not to damage the Brake Cylinder or hose. Over-tightening of chains or straps attached to tie down lugs may result in damage to work platform.</p>

3. Open Emergency Lowering Valve by pushing in and turning fully counterclockwise.

## 2.6 Storage

No preparation is required for normal storage. Regular maintenance per Table 4-1 should be performed. If the work platform 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. Fill the hydraulic tank to operating level with the Platform fully lowered, fluid should be visible on the dipstick.
3. Coat all exposed unpainted metal surfaces with preservative.

### BATTERIES

1. Disconnect the battery ground cable terminal and secure to the chassis.
2. Disconnect the remaining battery leads and secure to the chassis.
3. Remove the batteries and place in alternate service.

## 3.0 Introduction

### GENERAL FUNCTIONING

Refer to the Hydraulic and Electrical Schematics, Section 6.

The battery powered electric motor directly drives a two section hydraulic pump. The low section supplies oil under pressure to operate steering and joins the high section flow to provide oil to the other work platform functions. The oil flow is directed to the different functions by electrically activated solenoid valves.

#### *Driving*

With both Emergency Stop Switches ON (pull up) the Key Switch on PLATFORM, the Foot Switch depressed and the Drive/Lift Switch in DRIVE the machine will drive at a speed proportional to the angle of the Control Lever from center and steer in the direction you wish to travel. Driving forward will energize the Drive Coil, the Proportional High Speed Coil and the Motor Start Relay, through CR2 NC contacts and CR4 NO contacts with the Platform down, to start the Electric Motor. Oil will now flow through the Proportional Valve. The greater the angle (from center) of the Control Lever the more the Proportional Valve closes. As the Proportional Valve closes more oil is allowed to flow to the Drive/Lift Valve, the Brake Cylinder and through the Forward/Reverse Valve to the Drive Cushion Valve, Hydraulic Motors and back through the Forward/Reverse Valve to tank. Driving reverse is the same except the Forward/Reverse Valve is energized reversing the flow of oil the the Hydraulic Motors.

Driving with the platform elevated is the same, except the proportional controller is in the midrange or creep speed (CR4 is no longer energized by the Proximity Switch), thus limiting the machine to a lower speed. And the Motor Start Relay is energized through CR2 NC contacts, CR4 NC and CR5 NO contacts as long as the machine is level.

#### *Steering*

Steering left or right will energize the Steering Coils and the Motor Relay. This allows oil to flow through the Steering Valve to the Steering Cylinder.

#### *Raising and Lowering The Platform*

With both Emergency Stop Switches ON (pull up), the Key Switch on PLATFORM, the Foot Switch depressed and the Drive/Lift Switch in LIFT, the platform will raise at a speed proportional to the angle of the Control Lever. Actuating the Control Lever energizes the Proportional Coil, the UP Coil and Motor Relay, through CR2 NC contacts, CR4 NC contacts and CR5 NO contacts as long as the machine is level, to start the Electric Motor. The greater the angle (from center) of the Control Lever the more the Proportional Valve closes. As the Proportional Valve closes more oil is allowed to flow through the Drive/Lift Valve increasing lift speed. Oil will now flow through the Drive/Lift Valve, Flow Control Valve and Down Valve to the Lift Cylinder in proportion to the angle of the Control Lever. Lowering the platform electrically energizes the Down Coil, CR2 (closing CR2 NO contacts) and the 60 Hz Down Alarm. This allows the oil to flow out of the Lift Cylinder through the Down Valve, Flow Control Valve and both Down orifices, which controls the rate of descent, then back to the tank. During the last inch (25 mm) of platform lowering, the oil flows through the Lift Cylinder Internal Cushion Oifice to slow the platform even further (Cushion Speed). Lowering the platform manually with the Emergency Down Valve allows the oil to flow out of the Lift Cylinder in the same manner but there is no Down Alarm.

## DESIGN FEATURES

The TM12 Work Platform has the following features:

- The drive speed is limited to Creep Speed when operating the work platform while the platform is elevated.
- The platform descent rate is controlled by an orifice (Fixed Speed). In the last 25 mm of platform lowering the oil flows through the cushion orifice only slowing the platform descent even further (Cushion Speed). The lift cylinder is equipped with a velocity fuse to prevent descent should a hose rupture.
- Parking brakes are automatically engaged when the Drive Switch is released and the machine comes to a full stop or if power is lost.
- The Chassis Controls and Controller are equipped with an Emergency Stop Switch for stopping all powered functions.
- The Foot Switch must be depressed for the Controller to function.
- An alarm (60 Hz) is provided to signal when the Platform is lowering.
- A Lift Switch is located in the Chassis Control Panel on the right side of the Chassis for lifting and lowering the Platform from ground level.
- The Tilt Alarm (600 Hz) is activated on slopes of 2 degrees side to side and fore and aft when the machine is elevated.
- An Emergency Lowering Valve is provided in the Chassis Module to lower the Platform in the event electrical power is lost.

## *3.1 Safety Rules and Precautions*

### **Before using the TM12 Work Platform:**

**NEVER** operate the machine within 3 meters of power lines. **THIS MACHINE IS NOT INSULATED.**

**NEVER** elevate the platform or drive the machine while elevated unless the machine is on a firm level surface.

**NEVER** sit, stand or climb on guardrail.

**NEVER** operate the machine without first surveying the work area for surface hazards such as holes, drop-offs, bumps and debris.

**NEVER** operate the machine unless all guardrails are properly in place.

**SECURE** chain across entrance after mounting platform.

**NEVER** use ladders or scaffolding on the platform.

**NEVER** attach overhanging loads or increase platform size.

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

**DISTRIBUTE** all loads evenly on the platform. See Table 1-1 for maximum platform load.

**NEVER** use damaged equipment. (Contact UpRight, Inc. for instructions.)

**NEVER** change or modify operating or safety systems.

**INSPECT** the machine thoroughly for cracked welds, loose hardware, hydraulic leaks, damaged control cable, loose wire connections and wheel bolts.

**NEVER** climb down mast assembly with platform elevated.

**NEVER** enter the area between the platform and chassis while the platform is elevated without first blocking the mast assembly.

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

**SECURE** the work platform against unauthorized use by turning key switch off and removing key from key switch.

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

## 3.2 Controls and Indicators

The controls and indicators for operation of the TM12 Work Platform are shown in Figure 3-1. The names and functions of the controls and indicators are listed in Table 3-1. The index numbers in the figure correspond to the index numbers in the table. **The operator should know the location of each control and indicator and have a thorough knowledge of the function and operation of each before attempting to operate the unit.**

Table 3-1: Controls and Indicators

### Platform/Controller

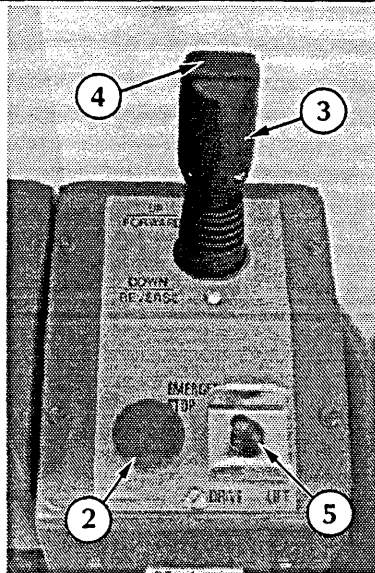
INDEX NO.	NAME	FUNCTION
1	Foot Switch	Provides power to the Controller only when depressed, preventing accidental activation of the Controller.
2	Emergency Stop Switch	Push red button to cut off power to all functions (OFF). Turn clockwise to provide power (ON).
3	Control Lever (Joystick)	Move joystick forward or backward to proportionally control Drive Valves or Lift and Down Valves depending on position of Drive/Lift Switch.
4	(Steering Switch)	Push switch right or left to control steering. <b>Steering is not self-centering. Wheels must be returned to straight ahead position by operating Steering Switch.</b>
5	Drive/Lift Switch	Selecting <b>DRIVE</b> allows the machine to move forward or reverse. Selecting <b>LIFT</b> allows the Platform to raise or lower.

Table 3-1: Controls and Indicators (cont'd.)

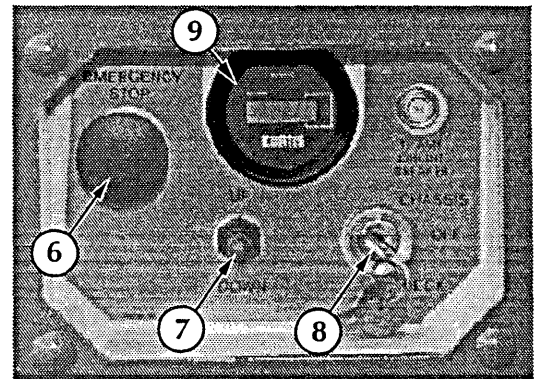
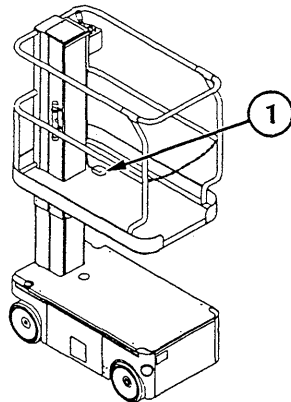
### Chassis

INDEX NO.	NAME	FUNCTION
6	Emergency Stop Switch	Push red button to cut off power to all functions (OFF). Pull out to provide power (ON).
7	Chassis Lift Switch	Toggle switch to <b>UP</b> to lift the Platform and toggle switch to <b>DOWN</b> to lower the Platform.
8	Chassis Key Switch	Turn switch to <b>PLATFORM</b> to provide power to Controller and to <b>CHASSIS</b> to provide power to Chassis Controls.
9	Volt/Hour Meter	Indicates state of battery charge and hours machine has been operated.
10	Emergency Lowering Valve	Push in and turn knob counterclockwise to lower the Platform. To close, push in and turn clockwise until detent engages. <b>The Platform cannot be raised until this valve is closed.</b>
11	Brake Release	Remove nut to relieve tension on the spring, disengaging brakes. Replace nut and tighten until spring length measures 9.75 - 10 in. (248 - 254 mm) and brake bars fully engage tires. <b>DO NOT operate the machine with the Brakes disengaged.</b>
12	Charge Indicator	LED illuminates when batteries are charging. When batteries are fully charged the LED will blink.
13*	Down Alarm (60 Hz)	Sounds an audible signal anytime the Platform is lowering during normal operation. If the Emergency Lowering Valve is used the alarm <b>does not</b> sound.
14*	Tilt Alarm (600 Hz)	Sounds an audible signal when the platform is elevated and on a slope of 2° side to side or 2° fore and aft.

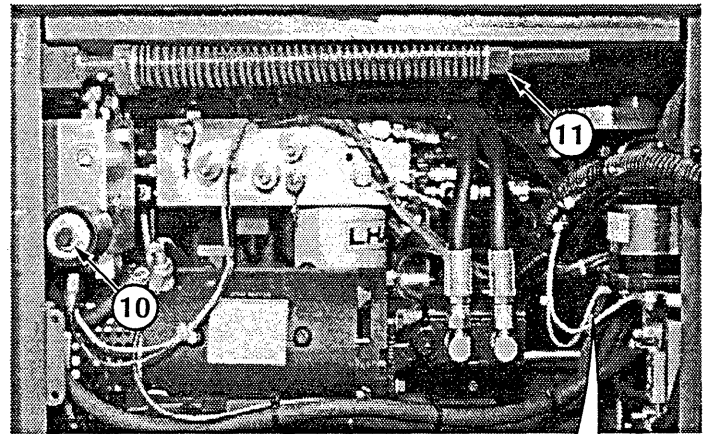
\* Not Shown



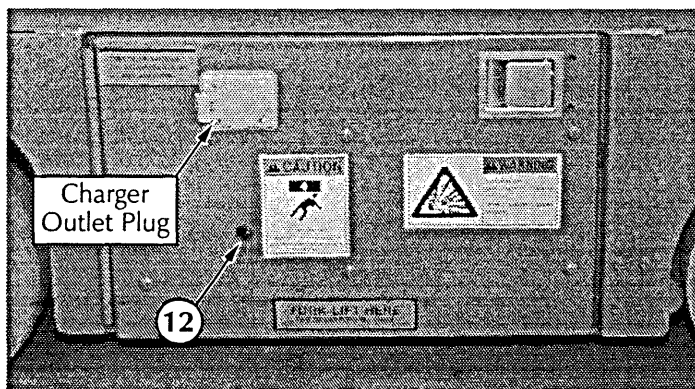
Controller



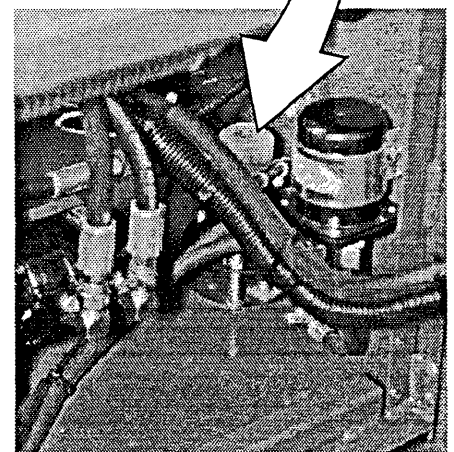
Chassis Control Panel



Chassis Module, Right Side



Chassis Module, Left Side



Tilt Sensor

\* Items 13 & 14 are mounted in the electrical box mounted inside the right Chassis Door.

Figure 3-1: Controls and Indicators

### 3.3 Pre-Operation Inspection

**NOTE:** Carefully read, understand and follow all safety rules, operating instructions, labels and the Scaffold Industry Association's **MANUAL OF RESPONSIBILITIES**. Perform the following steps each day before use.



#### WARNING



**DO NOT** perform service on or in the Mast Assembly with the Platform elevated unless the Platform is properly blocked.

1. Open module doors.
2. Check the level of the hydraulic oil with the platform fully lowered. Oil should be visible on the dipstick. Add hydraulic oil if necessary (see Sections 1.2 and 4.4).
3. Check that fluid level in the batteries is correct (see Battery Maintenance, Section 4.3).
4. Verify that batteries are charged.
5. Check that AC extension cord has been disconnected from the chassis outlet.
6. Carefully inspect the entire work platform for damage such as cracked welds or structural members, loose or missing parts, oil leaks, damaged cables or hoses, loose connections and tire damage.
7. Move machine, if necessary, to unobstructed area to allow for full elevation.
8. Turn Chassis and Platform Emergency Stop Switches ON (Figure 3-1) by pulling up.
9. Turn the Chassis Key Switch (Figure 3-1) to **CHASSIS**.
10. Push Chassis Lift Switch (Figure 3-1) to **UP** position and fully elevate Platform.
11. Visually inspect the Mast Assembly for damage or erratic operation. Check for missing or loose parts.
12. Check Level Sensor (Figure 3-1) operation by pushing the sensor off of level while pushing the Chassis Lift Switch to **UP** position, the alarm should sound.
13. Partially lower the Platform by pushing Chassis Lift Switch to **DOWN** and check the operation of the audible lowering alarm.
14. Open the Emergency Lowering Valve (Figure 3-1) to check for proper operation by pushing in on the knob and turning  $\frac{1}{4}$  turn counterclockwise. Once the Platform is fully lowered, close the valve by pushing in on the knob and turning  $\frac{1}{4}$  turn clockwise until the detent engages.
15. Turn the Chassis Key Switch to **PLATFORM**.
16. Close and latch module doors.
17. Check that route is clear of persons, obstructions, holes and drop-offs, is level and capable of supporting the wheel loads.
18. After mounting platform secure chain across entrance.
19. Position Drive/Lift Switch to **DRIVE**.
20. While depressing Foot Switch, slowly position the Control Lever to **FORWARD** then **REVERSE** to check for speed and directional control. The farther the Control Lever is pushed or pulled from center the faster the machine will travel.
21. Push the Steering Switch, on the top of the Control Lever, **RIGHT** then **LEFT** to check for steering control.
22. Push the Emergency Stop Switch Button.



## 3.4 Operation

**Note:** Before operating work platform ensure that the pre-operation and safety inspection has been completed, any deficiencies have been corrected and the operator has been thoroughly trained on this machine.

### TRAVEL WITH PLATFORM LOWERED

1. Check that route is clear of people, obstructions, holes and drop-offs, is level and capable of supporting wheel loads.
2. Verify Chassis Key Switch is on **PLATFORM** and Chassis Emergency Stop Switch is **ON**, pull up.
3. After mounting Platform secure chain across entrance.
4. Check clearances above, below and to the sides of the machine.
5. Turn Controller Emergency Stop Switch **ON** by pulling up. When the button is pushed down Emergency Stop Switch will automatically go to **OFF** position.
6. Position Drive/Lift Switch to **DRIVE**.
7. While depressing Foot Switch, slowly push or pull the Control Lever to **FORWARD** or **REVERSE** position to travel in the desired direction. The farther the Control Lever is pushed or pulled from center the faster the machine will travel.

### STEERING

1. Position Drive/Lift Switch to **DRIVE**.
2. While depressing the Foot Switch, push the Steering Switch, on the end of the Control Lever, to **RIGHT** or **LEFT** to turn wheels in the desired direction. Observe the tires while maneuvering the work platform to ensure proper direction.

**NOTE:** Steering is not self-centering. Wheels must be returned to straight ahead position by operating Steering Switch.

### ELEVATING PLATFORM



#### WARNING



**LOOK** up and around for obstructions before performing the lift function.  
**DO NOT** elevate the Platform unless the work platform is on a firm and level surface.  
**DO NOT** operate the work platform within 10 ft. (3 m) of any electrical lines. **THIS WORK PLATFORM IS NOT INSULATED.**  
**NEVER** enter the space between the Chassis and Platform while the Platform is elevated.

1. Position Drive/Lift Switch to **LIFT**.
2. While depressing Foot Switch, push Control Lever to **UP**.

### TRAVEL WITH PLATFORM ELEVATED



#### WARNING



Travel with Platform elevated **ONLY** on firm and level surfaces.

**NOTE:** Work platform will travel at reduced speed when Platform is elevated.

1. Check that route is clear of people, obstructions, holes and drop-offs, is level and capable of supporting the wheel loads.
2. Check clearances above, below and to the sides of work platform.
3. Position Drive/Lift Switch to **DRIVE**.
4. While depressing Foot Switch, slowly push or pull the Control Lever to **FORWARD** or **REVERSE** position to travel in the desired direction.

### LOWERING PLATFORM

1. Position Drive/Lift Switch to **LIFT**.
2. While depressing Foot Switch, pull Control Lever to **DOWN**.

## EMERGENCY LOWERING

The Emergency Lowering Valve is located just inside the right door of the Chassis Module (see Figure 3-1).

1. Open the Emergency Lowering Valve by pushing in on the knob and turning  $\frac{1}{4}$  turn counterclockwise.

**Note:** the Down Alarm will not sound when using the Emergency Lowering Valve.

2. 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 has not been closed.
3. To close the Emergency Lowering Valve, push in on the knob and turn  $\frac{1}{4}$  turn clockwise until the detent engages.

## AFTER USE EACH DAY

1. Ensure that the Platform is fully lowered.
2. Park the machine on level ground, preferably under cover. Secure against vandals, children or unauthorized operation.
3. Turn the Key Switch to **OFF** (center position) and remove the key to prevent unauthorized operation.

## PARKING BRAKE RELEASE (Figure 3-2)

Perform the following only when the machine will not operate under its own power and it is necessary to move the machine or when towing the machine up a grade or winching onto a trailer to transport.

1. Remove the spring compression nut so the spring is loose and the Brake Bars are away from the tires.
2. The machine will now roll when pushed or pulled.

After moving the machine and before normal operation:

1. Replace the spring compression nut and tighten until the spring measures  $9\frac{3}{4}$  - 10 in. (248 - 254 mm) in length. Verify that the Brake Bars have fully engaged the tires before the machine is operated.

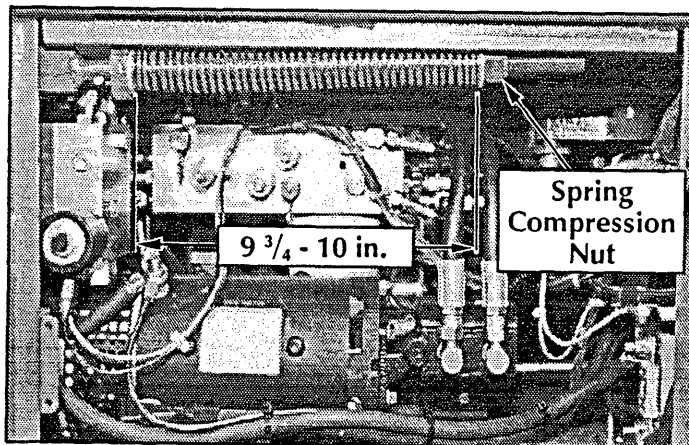
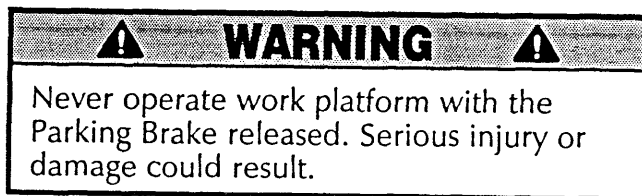


Figure 3-2: Brake Release

## 4.0 Introduction

This section contains instructions for the maintenance of the TM12 Work Platform. Procedures for the operational checkout 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 TM12 Work Platform 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.

<b>Description</b>	<b>Part Number</b>
Inclinometer	10119-000-00
Gauge, 0-3000 psi	14124-030-00
Fitting, Quick Disconnect	63965-002-00

## 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>	
Before performing preventative maintenance familiarize yourself with the operation of the machine.	
Always block the Platform whenever it is necessary to enter the area between the Chassis and Platform when the Platform is elevated.	

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 (every day) or every eight hours

30d=every month (30 days) or every 50 hours

3m=every 3 months or 125 hours

6m=every 6 months or 250 hours

1y=every year or 500 hours

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	Check electrolyte level	Daily			
	Check battery cable condition	Daily			
	Charge batteries	Daily			
	Check specific gravity	30d			
	Clean terminals	3m			
	Clean exterior	6m			
Hydraulic Oil	Check oil level	Daily			
	Change filter	6m			
	Drain and replace oil (ISO #46)	2y			
Hydraulic System	Check for leaks	Daily			
	Check hose connections	30d			
	Check for exterior wear	30d			
Emergency Hydraulic System	Open the Emergency Lowering Valve and check for serviceability	Daily			
Controller	Check switch 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			
Tires	Check for damage	Daily			
Hydraulic Pump	Check for hose fitting leaks	Daily			
	Check for leaks at mating surfaces	30d			
	Wipe clean	30d			
	Check mounting bolts for proper torque	30d			
Drive Motors	Check for operation and leaks	Daily			
Steering System	Oil pivot pins	3m			
	Oil king pins	3m			
	Check steering cylinder for leaks	30d			
	Check hardware & fittings for proper torque	6m			
Elevating Assembly	Inspect for structural cracks	Daily			
	Check mast bearings for wear	30d			
	Check that mast bearing mounting screws are tight	30d			
	Check Elevating Assembly for bending and dents	6m			
Chassis	Check hoses for pinch or rubbing points	Daily			
	Check welds for cracks	Daily			
	Check component mounting for proper torque	6m			
Lift Cylinder	Check seals for leaks	30d			
	Check fittings for proper torque	30d			
Entire Unit	Check for and repair collision damage	Daily			
	Lubricate	30d			
	Check fasteners for proper torque	3m			
	Check for corrosion; remove and repaint	6m			
Labels	Check for peeling or missing labels & replace	Daily			

## 4.2 Blocking Elevating Assembly (Figure 4-1)

**⚠ WARNING ⚠**

**BEFORE** entering area between Chassis and Platform ensure that Platform is properly blocked.

### INSTALLATION

1. Park the work platform on firm level ground.
2. Verify Platform Emergency Stop Switch is ON.
3. Turn Chassis Key Switch to **CHASSIS**.
4. Position Chassis Lift/Lower Switch to **UP** and elevate Platform approximately four feet (1.2 m).
5. Place a wood block, 2 in. x 4 in. x 18 in. long (5 cm x 10 cm x 46 cm long) between the #2 Mast and Chassis just behind the Mast Assembly.
6. Push Chassis Lift Switch to **DOWN** position and gradually lower Platform until the #2 Mast is supported by the block, see Figure 4-1.

### REMOVAL

1. Push Chassis Lift Switch to **UP** position and gradually raise Platform until wood block can be removed.
2. Remove block.
3. Push Chassis Lift Switch to **DOWN** position and completely lower Platform.

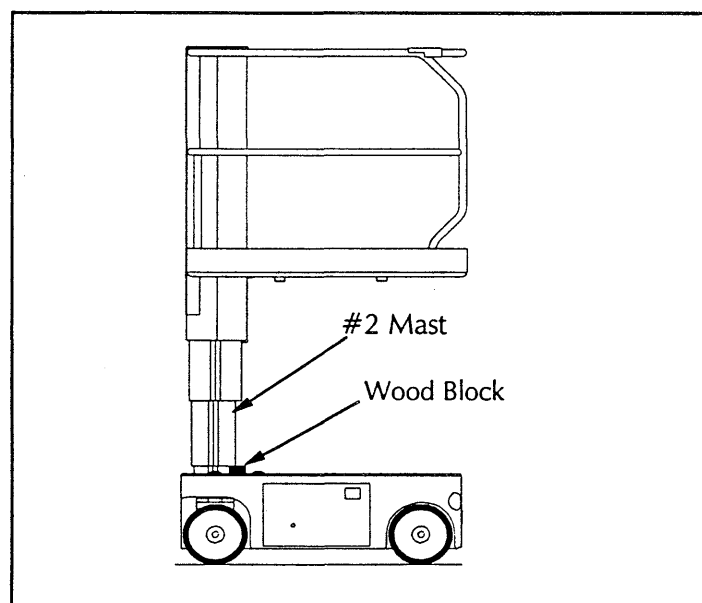


Figure 4-1: Blocking the Elevating Assembly

## 4.3 Battery Maintenance

Electrical energy for the motor is supplied by four 6 volt batteries wired in series for 24 volts DC. Proper care and maintenance of the batteries and motor will ensure maximum performance from the work platform.

**⚠ 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.

**⚠ CAUTION ⚠**

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

Batteries 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 batteries that show signs of corrosion at the terminals or onto which electrolyte has overflowed during charging. Use a baking soda solution to clean the batteries, 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**

(See Figure 4-2)

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

**CAUTION**

Charge batteries in a well-ventilated area.

Do not charge batteries when the work platform is in an area containing sparks or flames.

Permanent damage to batteries will result if batteries are not immediately recharged after discharging.

Never leave charger operating unattended for more than two days.

Never disconnect cables from batteries when charger is operating.

Keep charger dry.

When night air temperatures fall below 18°C batteries charged in unheated areas 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. The outlet plug for the battery charger is located in the left chassis door. Connect extension cord (12 gauge conductor minimum and 50 ft. (15 m) in length maximum) to the charger outlet plug. Connect other end of extension cord to properly grounded outlet of proper voltage and frequency.
3. Charger turns on automatically after a short delay, the LED charge indicator will illuminate.
4. Charger turns off automatically when batteries are fully charged, the LED charge indicator will blink.

**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 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 batteries containing such cells 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.

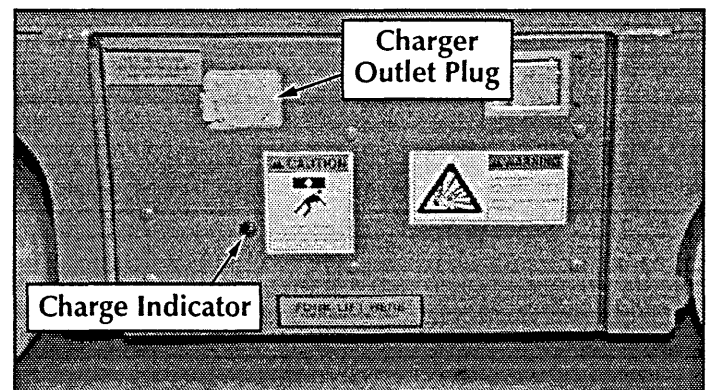
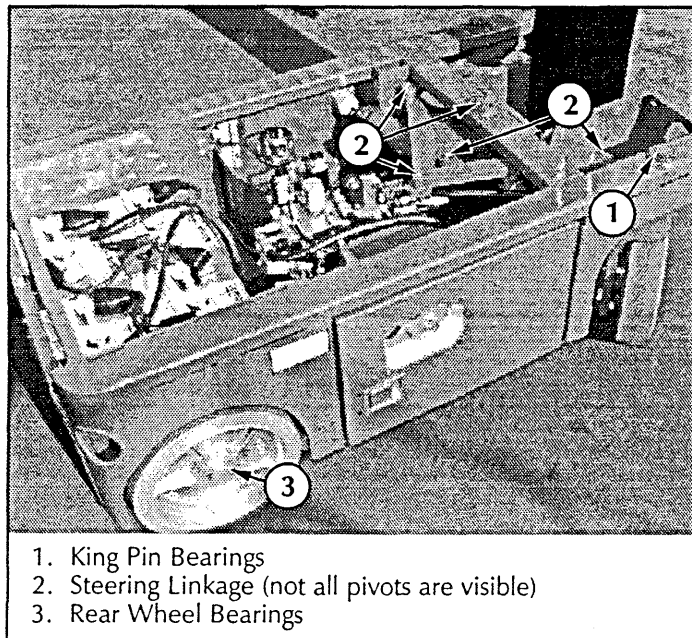


Figure 4-2: Battery Charger

## 4.4 Lubrication

Refer to Figure 4-3 for location of items that require lubrication service. Refer to the appropriate sections for lubrication information on the Hydraulic Oil Tank and Filter.



1. King Pin Bearings
2. Steering Linkage (not all pivots are visible)
3. Rear Wheel Bearings

Figure 4-3: Lubrication Points

Apply one or two drops of motor oil to each bearing.

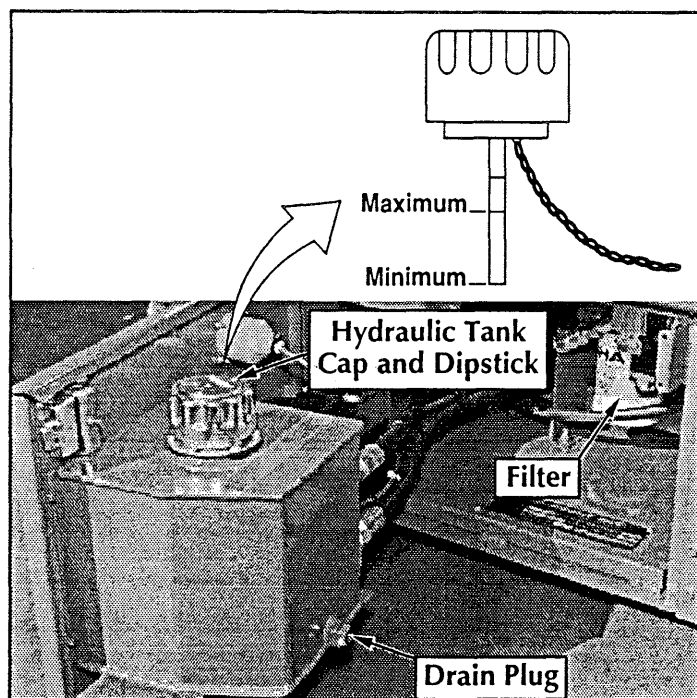


Figure 4-4: Hydraulic Oil Tank and Filter

## HYDRAULIC OIL TANK AND FILTER (Figure 4-4)

### Fluid Level

With Platform fully lowered, oil should be visible on the dipstick, if not fill the tank until oil registers on the dipstick. **DO NOT** fill above the lower line on the dipstick or when the Platform is elevated.

### Oil and Filter Replacement

1. Operate the work platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.

### ⚠ CAUTION ⚠

The hydraulic oil may be of sufficient temperature to cause burns. Wear safety gloves and safety glasses when handling hot oil.

2. Provide a suitable container to catch the drained oil. Hydraulic tank has a 1.8 gal. (7 l) capacity.
3. Open left module door.
4. Remove the drain plug and allow all oil to drain.
5. Reinstall the drain plug.
6. Unthread the filter from the Control Valve Block.
7. Apply a thin film of clean hydraulic oil (ISO #46) to the gasket of the replacement filter.
8. Thread the replacement filter onto the filter head until the gasket makes contact then rotate the filter 3/4 of a turn further.
9. Fill the hydraulic reservoir with hydraulic oil (see Section 1.2) until the oil comes up just past the end of the dipstick, Figure 4-4. Hydraulic tank has a 1.8 gal. (7 l) capacity.

## 4.5 Setting Hydraulic Pressures (Figure 4-5)

Check the hydraulic pressures whenever the pump, manifold or relief valves have been serviced or replaced.

### ⚠ WARNING ⚠

The hydraulic oil may be of sufficient temperature to cause burns. Wear safety gloves and safety glasses when handling hot oil.

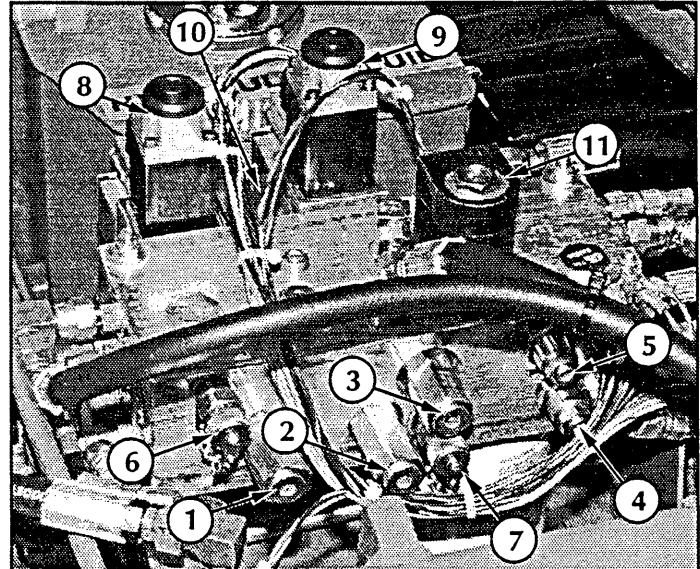
The oil in the hydraulic system is under very high pressure which can easily cause severe cuts. **Obtain medical assistance immediately if cut by hydraulic oil.**

### LIFT RELIEF VALVE (Figure 4-5)

1. Operate the hydraulic system 10-15 minutes to warm the oil.
2. Loosen locknut or remove cover on the Lift Relief Valve and turn adjusting screw counterclockwise two full turns.
3. Place the maximum rated load, see Table 1-1, on the Platform.
4. Turn the Chassis Key Switch to **CHASSIS**. Position the Chassis Lift Switch to **UP** position and hold it there.
5. Slowly turn the Lift Relief Valve adjusting screw clockwise to increase the pressure until the Platform just begins to raise.
6. Release the Chassis Lift Switch. Tighten locknut or replace Lift Relief Valve cover and torque to 6 Ft/Lbs (8 Nm).

### LOW DRIVE RELIEF VALVE (Figure 4-5)

1. Operate the work platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.
2. Move machine so the front is against a wall or other unmovable object.
3. Install gauge in lower gauge port.
4. Loosen locknut or remove cover on the Drive Relief Valve and turn adjusting screw counterclockwise two full turns.



- |                         |                           |
|-------------------------|---------------------------|
| 1. Lift Relief          | 7. Lower Gauge Port       |
| 2. Low Drive Relief     | 8. Steering Valve         |
| 3. Steering Relief      | 9. Drive/Lift Valve       |
| 4. Fwd. C-Balance Valve | 10. Proportional Valve    |
| 5. Rev. C-Balance Valve | 11. Forward/Reverse Valve |
| 6. Upper Gauge Port     |                           |

Figure 4-5: Hydraulic Manifold

5. While one person drives the machine forward against the wall slowly turn the Drive Relief Valve adjusting screw clockwise to increase the pressure until the gauge reads 1750 psi (121 bar).
6. Tighten locknut or replace Lift Relief Valve cover and torque to 6 Ft/Lbs (8 Nm).
7. Remove gauge and replace cap.

### STEERING RELIEF VALVE

1. Operate the work platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.
2. Install gauge in lower gauge port.
3. Loosen locknut or remove cover on the Steering Relief Valve and turn adjusting screw counterclockwise two full turns.
4. While one person holds the Steering Switch to steer right or left, slowly turn the Steering Relief Valve adjusting screw clockwise to increase the pressure until the gauge reads 750 psi (52 bar).
5. Tighten locknut or replace Steering Relief Valve cover and torque to 6 Ft/Lbs (8 Nm).
6. Remove gauge and replace cap.



## COUNTERBALANCE VALVES

(Figure 4-5)

1. Operate the work platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.
2. Remove lower gauge port cap and install the pressure gauge assembly.
3. Remove the red Control Cable wire from terminal #9.
4. Lift work platform and block front wheels off ground.
5. Loosen the locknuts on Counterbalance Valves.
6. With the Chassis Key Switch on **DECK** and the Drive/Lift Switch in **DRIVE**, depress the Foot Switch and slowly pull the Control Lever to **REVERSE** to drive the wheels.
7. Adjust the Forward Counterbalance Valve by turning the adjustment screw until the pressure gauge indicates 800 psi (55 bar).
8. Slowly push the Control Lever to **FORWARD** to drive the wheels.
9. Adjust the Reverse Counterbalance Valve by turning the adjustment screw until the pressure gauge indicates 800 psi (55 bar).
10. Check the settings by slowly moving the Control Lever **FORWARD**, then **REVERSE** checking the gauge to ensure pressures are properly set. Readjust as needed.
11. Tighten locknuts on valves to 8 Nm. Remove blocks and lower work platform to ground.
12. Reconnect the red Control Cable wire to terminal #9.
13. Remove the gauge from the gauge port and reinstall cap.
14. Check for proper operation of the drive system and brake.

## 4.6 Switch Adjustments

### TILT SENSOR

#### Introduction

The Tilt Sensor has three wires; red-power (24 v in), black-ground, white-output (24 v out). To verify the sensor is working properly there are two LED's under the sensor; green indicates the sensor is on (has power), red indicates the sensor is level and the white wire is 'hot' (24 v out).

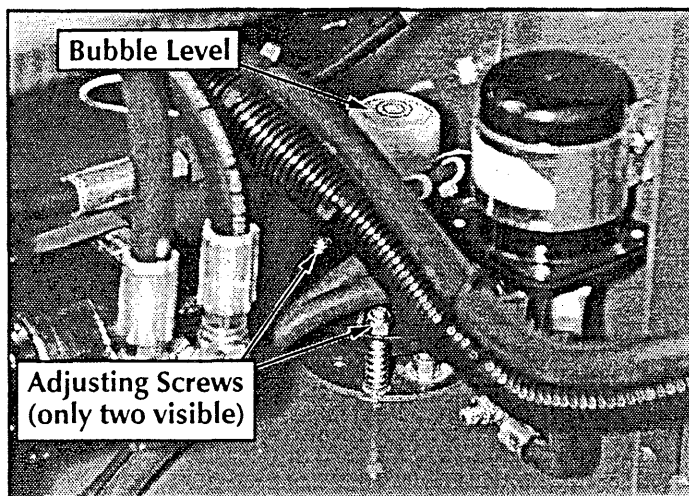


Figure 4-6: Tilt Sensor Adjustment

#### Adjustment (Figure 4-6)

1. Place machine on firm level surface  $\pm 1/4^\circ$ .
3. Use the Inclinator (P/N: 10119-000-00) to ensure front and rear of Chassis is level  $\pm 1/4^\circ$ .
4. Adjust the three leveling screws until the bubble is centered in the circle on the attached bubble level.

### PROPORTIONAL CONTROLLER

To perform the adjustment the Controller (Control Box) must be opened by removing the two screws at the top corners of the Controller and rotating the top forward to expose the proportional controller.

1. Push Control Lever just far enough to illuminate the **PWM LED** indicator.
2. Set the 'Lo' pot so the motor turns on when the LED lights up but the machine does not move.
3. Select **LIFT** with Drive/Lift Switch and elevate Platform 6 in. (152 mm).
4. Select **DRIVE** with Drive/Lift Switch.
5. Push Control Lever fully to **FORWARD** or **REVERSE** and check that machine speed is 20 ft. (6.1 m) in 18-22 seconds.
6. Adjust 'Mid' trim pot if required, turning clockwise increases speed.
7. Lower platform fully.
8. Push Control Lever fully to **FORWARD** or **REVERSE** and check that machine speed is 20 ft. (6.1 m) in 5-7 seconds.
9. Adjust 'Hi' trim pot if required.

## 4.7 Hydraulic Manifold (Figure 4-7)

Though it is not necessary to remove the manifold to perform all maintenance procedures, a determination should be made as to whether or not the manifold should be removed before maintenance procedures begin.

### REMOVAL

1. Remove the battery ground cable.
2. Tag and disconnect the solenoid valve leads from the terminal strip.
3. Tag, disconnect and plug hydraulic hoses.
4. Remove the filter.
5. Remove the locknuts, jam nut and bolts that hold the manifold to the mounting bracket.
6. Remove manifold block.

### DISASSEMBLY

**NOTE: Mark all components as they are removed so as not to confuse their location during assembly. Refer to Figure 4-7 often to aid in disassembly and assembly.**

1. Remove coils from solenoid valves.
2. Remove spool valve covers and spool valves.
3. Remove solenoid valves, relief valves and counterbalance valves.
4. Remove fittings, plugs, springs, balls and orifices.

### CLEANING AND INSPECTION

1. Wash the manifold in cleaning solvent to remove built up contaminants and then blow out all passages with clean compressed air.
2. Inspect the manifold for cracks, thread damage and scoring where O-rings seal against internal and external surfaces.
3. Wash and dry each component and check for thread damage, torn or cracked O-rings and proper operation.
4. Replace parts and O-rings found unserviceable.

### ASSEMBLY

**Note: Lubricate all O-rings before installation to prevent damage to O-rings. Seat all balls in manifold block by lightly tapping on the ball with a brass drift.**

1. Install fittings, plugs, springs, balls and orifices. Use one drop of Loctite #242 on each screw-in orifice.
2. Install counterbalance valves, relief valves, solenoid valves and spool valves.

**Note: Refer to Table 4-2 for the proper torque values when installing any hydraulic component.**

3. Install coils on solenoid valves.

### INSTALLATION

**Note: refer to Table 4-2 for hydraulic component torque specifications.**

1. Attach manifold assembly to mounting brackets with bolts, washers and locknuts.
2. Connect solenoid leads to terminal strip (as previously tagged).
3. Connect hydraulic hoses. Be certain to tighten hoses to manifold.
4. Install oil filter.
5. Operate each hydraulic function and check for proper function and leaks.
6. Adjust all hydraulic pressures according to instructions in Section 4.5.

1. Valve Block
2. Front Bracket
3. Rear Bracket
4. Filter Adapter
5. Proportional Valve Block
- 6.
7. Proportional Valve
8. Drive Plug, 9mm
9. Steering Valve
10. Forward/Reverse Valve
11. Plug
12. Ball, 7/16 (11 mm)
13. Steering Relief Cartridge
14. Relief Cartridge
15. Counterbalance Valve
16. Gauge Connector
17. Drive Plug, 10mm
18. Spring
19. Drive/Lift Valve
20. Spring
21. Plug, #6
22. Plug, #4
23. Plug, Soc. Hd.
24. Fitting
- 25.
26. Fitting
27. 90° Elbow Fitting
28. 90° Elbow Fitting
29. 90° Elbow Fitting
30. 90° Elbow Fitting
- 31.
32. Tee Fitting
33. Filter
34. Ball, 5/16 (8 mm)
- 35.
36. O-ring
37. Washer, 1/4 Flat
38. Locknut, 1/4
39. Screw, 1/4 x 4
40. Brake Orifice
41. Tee Fitting
42. Fitting
43. 90° Elbow Fitting
44. Fitting
45. Screw, 1/4 x 3 3/4
46. Screw, 10-24 x 2

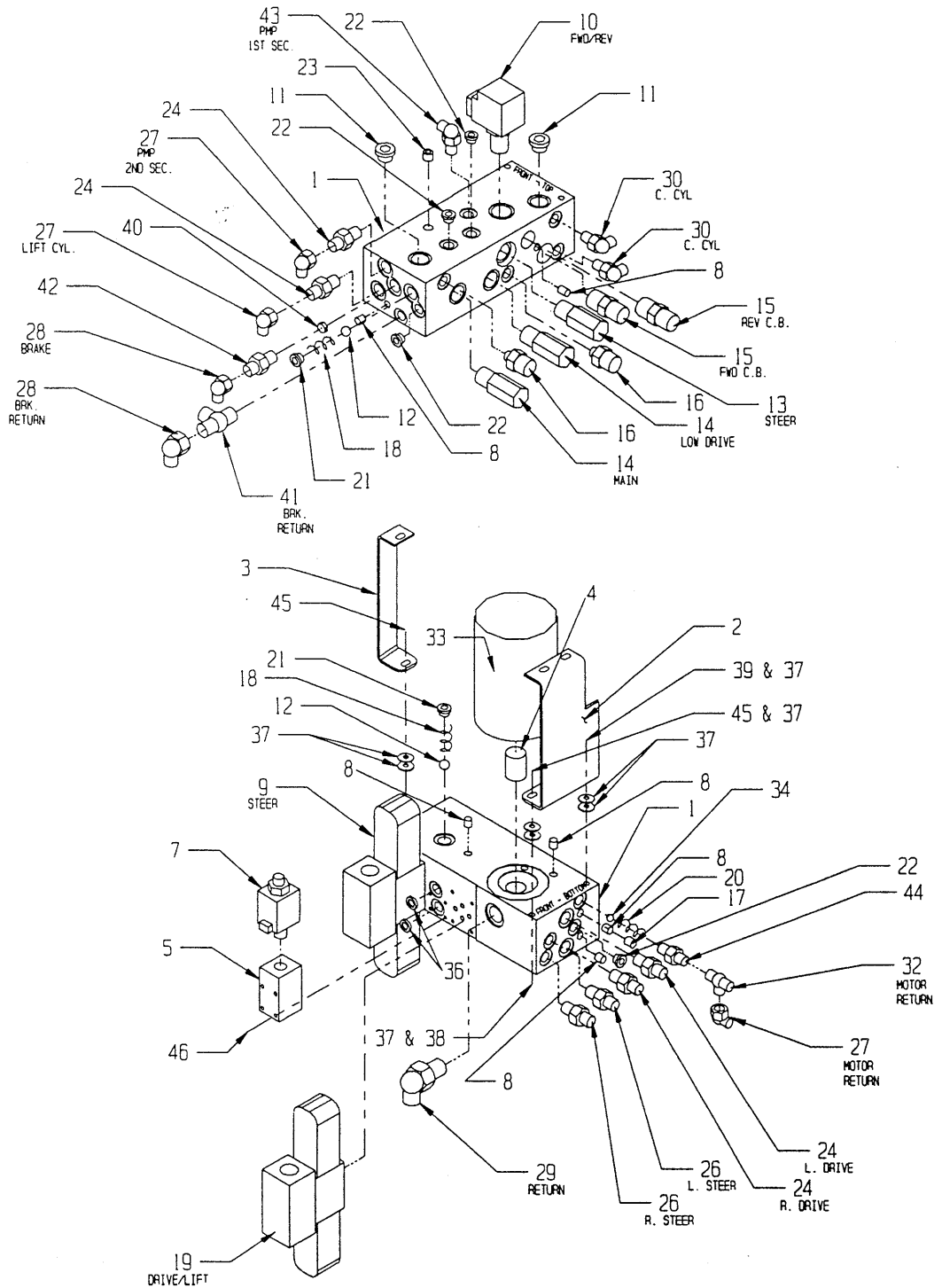


Figure 4-7: Hydraulic Manifold, Exploded View

## 4.8 Hydraulic Pump (Figure 4-8)

### REMOVAL

**NOTE:** If the hydraulic tank has not been drained, suitable means for plugging the hoses should be provided to prevent excessive fluid loss.

1. Mark, disconnect and plug the hose assemblies.
2. Loosen the capscrews and remove the pump assembly from the motor.

### INSTALLATION

1. Lubricate the pump shaft with general purpose grease and attach the pump to the motor with the capscrews.
2. Using a crisscross pattern torque each capscrew a little at a time until all capscrews are torqued to 20 Ft/Lbs (27 Nm).
3. Unplug and reconnect the hydraulic hoses.
4. Check the oil level in the hydraulic tank before operating the work platform.

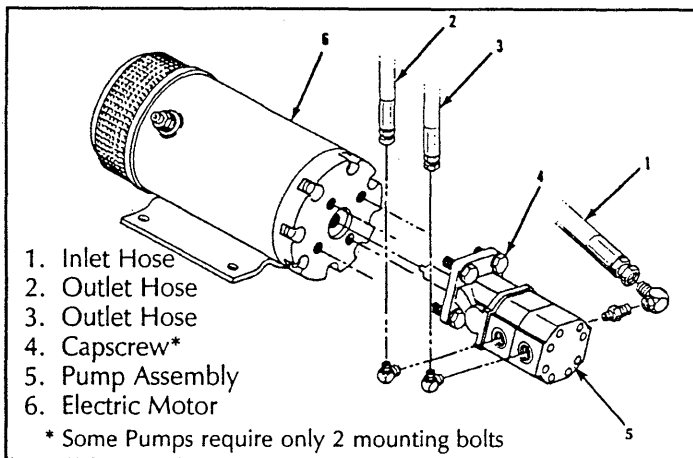


Figure 4-8: Hydraulic Pump

## 4.9 Hydraulic Drive Motors and Hubs (Figure 4-9)

### REMOVAL

1. Use a one ton (1000 Kg) capacity jack to raise the front of the machine. Position blocks under the machine to prevent the work platform from falling if the jack fails.
2. Block the rear wheels to prevent the machine from rolling.
3. Remove the cotter pin, nut and washer.
4. Remove the wheel.

**NOTE:** Before disconnecting hoses, thoroughly clean off all outside dirt around fittings. (After disconnecting hoses and before removing from vehicle, IMMEDIATELY plug port holes.)

5. Tag, disconnect and plug the hose assemblies to prevent foreign material from entering.
6. Remove the roll pin, securing the pivot pin to the steering arm on the wheel yoke, by driving it through the steering arm with a punch.
7. Support the drive motor/wheel yoke assembly and remove the retaining ring at the top of the wheel yoke pivot. Remove the drive motor/wheel yoke assembly from the machine.
8. Remove the locknuts, flat washers, capscrews and drive motor from the wheel yoke.

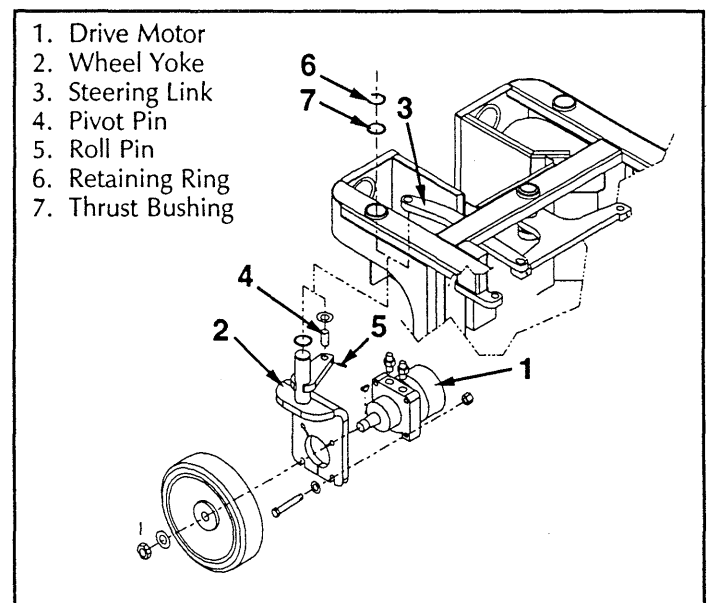


Figure 4-9: Drive Motor Installation

## INSTALLATION

1. Position the drive motor in the wheel yoke and secure with capscrews, flat washers and locknuts.
2. Install the drive motor/wheel yoke assembly into the pivot bearing along with the lower thrust washer, thrust bushing, and retaining ring.
3. Install the pivot pin in the wheel yoke steering arm and steering link and secure with a new roll pin.
4. Remove the plugs from the hose assemblies and connect to the drive motor.
5. Install the shaft key, wheel, washer and slotted nut. Torque the locknut to 75 Ft/Lbs (102 Nm). Install a new cotter pin, **DO NOT** back-off the nut to install the cotter pin.
6. Remove blocks, lower the jack and remove. Operate the drive system and check for leaks.

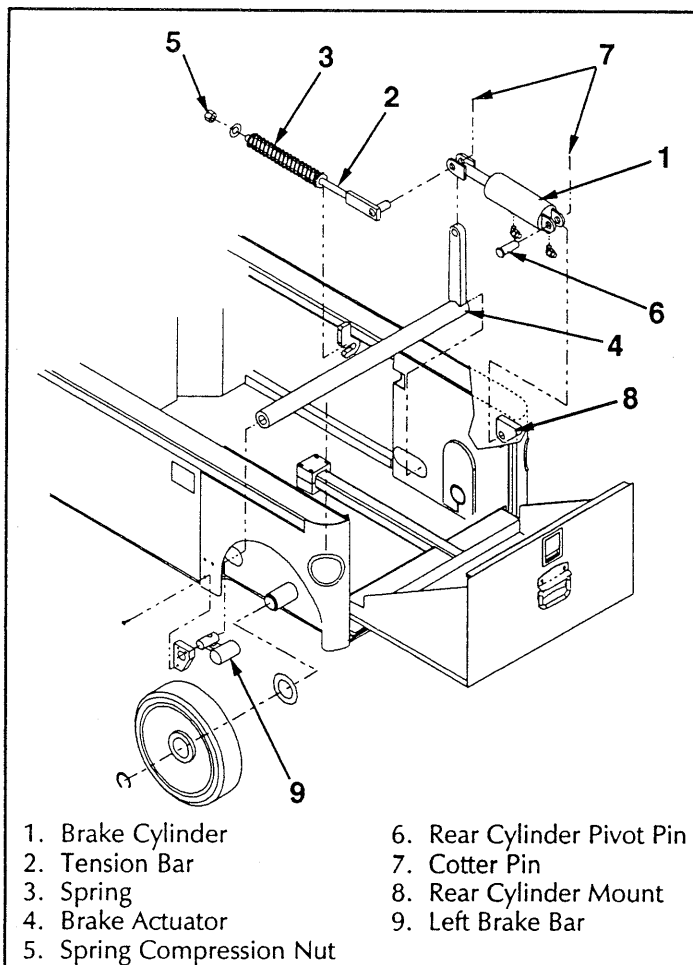


Figure 4-10: Brake Cylinder Installation

## 4.10 Brake Cylinder (Figure 4-10 & 11)

The Brake Cylinder and the Steering Cylinder are the same unit. Refer to the Steering Cylinder section for rebuilding information.

The brake cylinder is located inside the right rear chassis wall above the wheel.

## REMOVAL

1. Block the wheels to prevent the work platform from rolling when the brake is removed.
2. Use a one ton (1000 Kg) capacity jack to raise the rear of the machine. Position blocks under the chassis to prevent the work platform from falling if the jack fails.
3. Block the front wheels to prevent the machine from rolling.
4. Remove the spring compression nut and flat washer from the tension bar.
5. Remove the retaining ring and right rear wheel.
6. Remove the cotter pin and pivot pin from the rear cylinder mount.
7. Remove the cotter pin from the tension bar pivot allowing the cylinder to be lowered.
8. Disconnect the hose assemblies and cap the openings to prevent foreign material from entering.
9. Remove the cylinder from the chassis.

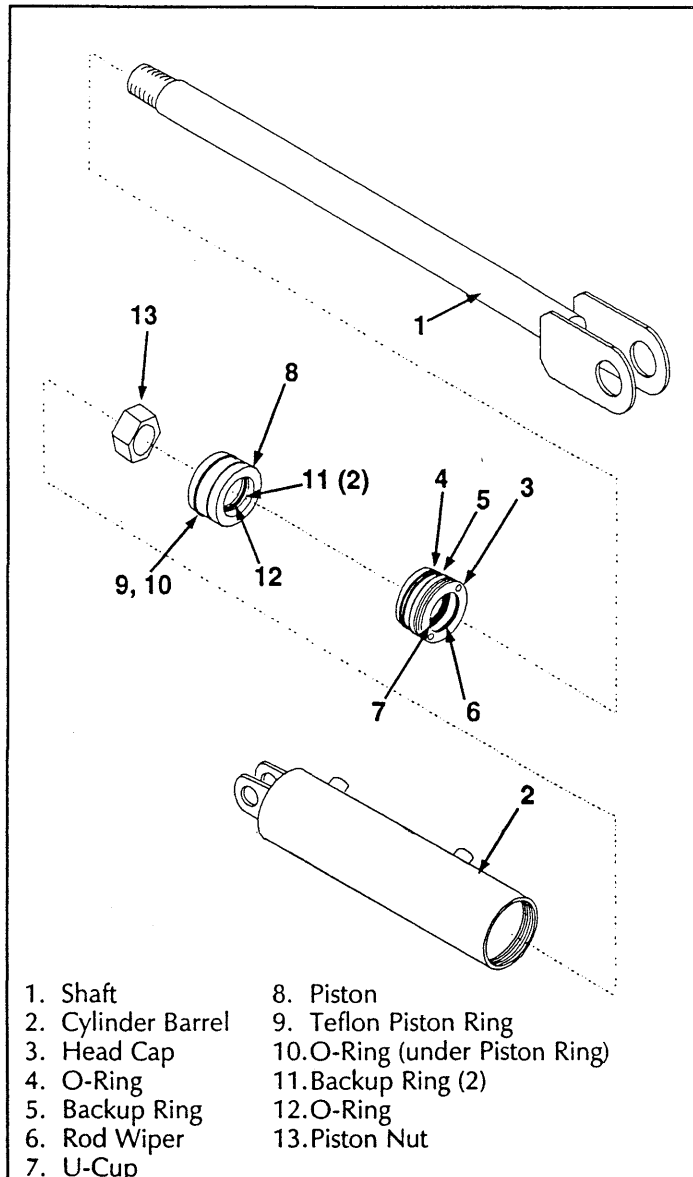
## INSTALLATION

1. Connect the hose assemblies.
2. Install the tension bar pivot through the cylinder clevis and brake actuator and secure with a new cotter pin.
3. Install the pivot pin through the cylinder mounting tabs and rear cylinder mount and secure with a new cotter pin.
4. Install the wheel and retaining ring.
5. Install the flat washer and spring compression nut on the tension bar. Tighten the nut until at least flush with the tension bar shaft or until the brake bar has full engagement with the tire.
6. Lower the machine and operate the drive circuit and check that the brake bars retract and clear the tires when driving and fully engage the tires when stopped. Check for leaks.

## 4.11 Steering Cylinder (Figure 4-11)

### REMOVAL

1. Mark and disconnect the hose assemblies from the cylinder fittings and immediately cap the openings to prevent foreign material from entering.
2. Remove the cotter pins from the pivot pins.
3. Remove the pivot pins while supporting the cylinder. Remove the cylinder.



- |                    |                                |
|--------------------|--------------------------------|
| 1. Shaft           | 8. Piston                      |
| 2. Cylinder Barrel | 9. Teflon Piston Ring          |
| 3. Head Cap        | 10. O-Ring (under Piston Ring) |
| 4. O-Ring          | 11. Backup Ring (2)            |
| 5. Backup Ring     | 12. O-Ring                     |
| 6. Rod Wiper       | 13. Piston Nut                 |
| 7. U-Cup           |                                |

Figure 4-11: Brake and Steering Cylinder

### DISASSEMBLY

1. Unscrew the headcap from the barrel tube.
2. Withdraw the piston and shaft assembly from the barrel tube.
3. Remove the piston nut, piston and headcap.
4. Remove the rod wiper, U-cup, O-ring and backup ring from the headcap and discard the seals.
5. Remove the internal backup rings and O-ring, piston seal and piston rod seal from the piston and discard.

### CLEANING AND INSPECTION

1. Wash all the metal parts in cleaning solvent and blow dry with filtered compressed air.
2. Inspect all the threaded components for stripped or damaged threads.
3. Check the inside surface of the cylinder barrel for scoring or excessive wear.
4. Check the piston and headcap for scoring or excessive wear.
5. Inspect the surface of the shaft for scoring or excessive wear.

### ASSEMBLY

1. Lubricate and install new rod wiper, U-cup, O-ring and backup ring on the headcap.
2. Install the headcap onto the shaft.
3. Install the new internal backup rings and O-ring, piston seal and piston rod seal on the piston.
4. Install the piston on the shaft and secure with the piston nut, torque to 250 Ft/Lbs (339 Nm).
5. Lubricate the piston seal with clean hydraulic fluid and install the shaft assembly in the cylinder barrel.
6. Screw headcap into cylinder barrel hand tight then turn 1/4 turn further.

### INSTALLATION

1. Position the cylinder assembly in the chassis and insert pivot pins and secure with new cotter pins.
2. Connect the hose assemblies to the fittings.
3. Operate the steering circuit several times throughout its entire range of travel to expel trapped air and check for leaks.

## 4.12 Lift Cylinder (Figure 4-12 & 4-13)

### REMOVAL (Figure 4-13)

1. Fully lower Platform.
2. Provide a suitable container to catch the hydraulic fluid, then disconnect the hydraulic hose. Immediately plug hoses to prevent foreign material from entering.
3. Remove velocity fuse, adapter and fitting from the base of the lift cylinder.
4. Remove retaining ring securing cylinder to the Chassis.
5. Remove top mast cover.
6. Remove capscrew, washers and locknut securing cylinder rod to the upper cylinder mount.
7. Attach a suitable hoisting device and sling to the cylinder. Carefully remove cylinder by lifting up through the top of the Mast.

### DISASSEMBLY (Figure 4-12)

1. Unscrew the headcap and withdraw the rod and piston assembly from the barrel tube.
2. Separate and remove the two part piston and then headcap from the cylinder rod.

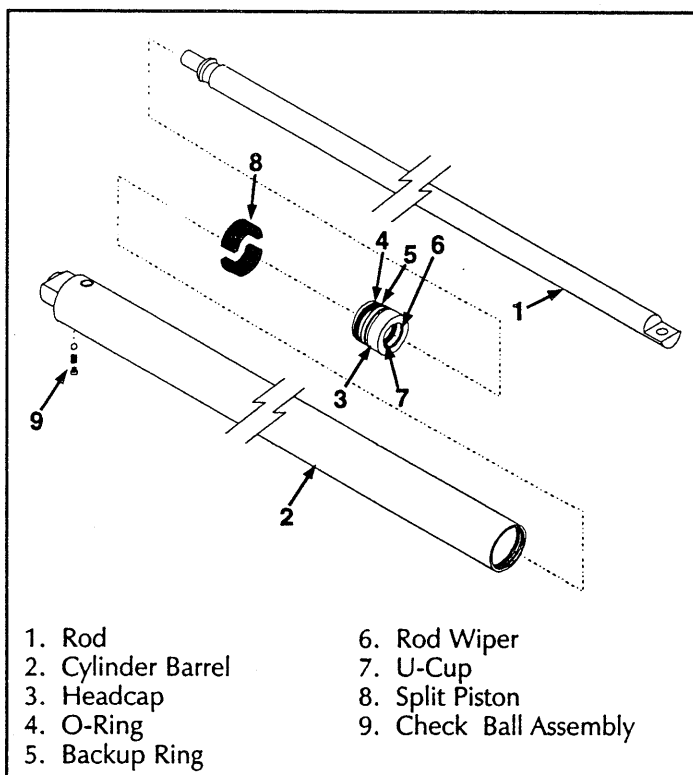


Figure 4-12: Lift Cylinder

3. Remove the O-ring, backup ring, U-cup and rod wiper from the head cap.
4. Remove the check ball assembly from the cylinder barrel. Do not remove the plug unless it has been leaking.

### CLEANING AND INSPECTION

1. Clean all metal parts in solvent and blow dry with filtered compressed air.
2. Check all threaded parts for stripped or damaged threads.
3. Check the bearing surfaces inside of the headcap, outer edge surface of the piston, inside of the cylinder barrel and the shaft for signs of scoring or excessive wear.
4. Replace all seals and O-rings.

### REASSEMBLY (Figure 4-13)

1. Lubricate and install new O-ring, backup ring, U-cup and rod wiper on the head cap.

### NOTE: Multipurpose lubricant should be used.

2. Install the headcap on the cylinder rod from the piston end.
3. Install the split piston on the rod.
4. Lubricate the piston and install the piston and rod assembly in the barrel tube, making sure the flat in the cylinder rod points in the same direction as the fitting port.
5. Thread the headcap into the barrel tube and hand tighten, then turn  $\frac{1}{4}$  turn further.
6. Install the check ball assembly, seating the ball with a brass drift before installing the spring and plug.

### INSTALLATION (Figure 4-13)

1. Attach a suitable hoisting device and sling to the cylinder. Carefully lower cylinder through the top of the Mast. The flat in the cylinder rod and fitting port at the base of the cylinder face to the rear of the machine.
2. Secure the base of the cylinder to the Chassis with the retaining ring.
3. Install capscrew, washers and locknut securing cylinder rod to the upper cylinder mount.
4. Install top mast cover.
5. Install velocity fuse, adapter and fitting into the base of the lift cylinder.
6. Unplug hydraulic hose and attach to the velocity fuse.
7. Test with weight at rated Platform load to check system operation. Check for leaks.

## 4.13 Mast Assembly (Figure 4-13)

### REMOVAL

1. Raise the Platform approximately 30 in. (76 cm) and block the Mast Assembly, see Section 4.2.
2. Attach a suitable hoisting device and sling to the Platform and support the Platform.
3. Tag and disconnect the control cable wires in the Controller and remove the top mast cover.

4. Remove the cable clamp securing the control cable to the Platform and feed the cable into the inner can.
5. Remove Platform chain mounts and lower Platform mast bearings.
6. Pull out chains up and feed into inner can.
7. Remove the Platform using the hoist by pulling straight up off of the Mast Assembly.
8. Support the next can with the sling and hoisting device.

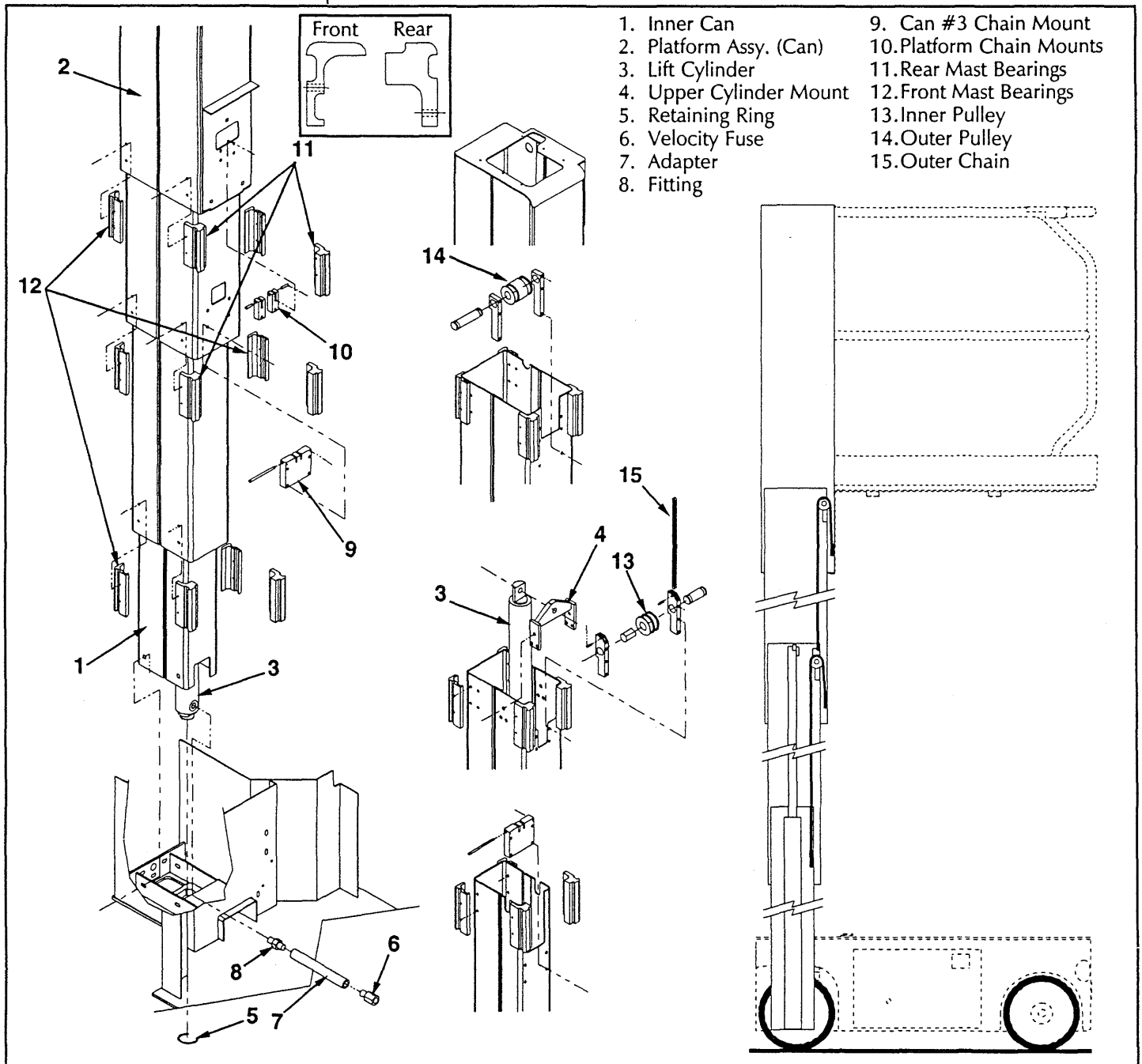


Figure 4-13: Mast Assembly



9. Remove the chain mounts and lower mast bearings.
10. Remove the can with the hoisting device.
11. Support the next can with the sling and hoisting device.
12. Remove capscrew, washers and locknut securing cylinder rod to the upper cylinder mount.
13. Remove the lower mast bearings.
14. Remove the can with the hoisting device.
15. Support the inner can with the sling and hoisting device.
16. Remove locknuts, washers and carriage bolts securing the can to the Chassis.
17. Remove the can with the hoisting device.

## INSTALLATION

1. Using the hoisting device and sling lower the inner can over the lift cylinder (if installed).
2. Secure inner can to the Chassis with the locknuts, washers and carriage bolts.
3. Using the hoisting device and sling partially lower the next can over the first. Support the can with the sling along with the blocking device used to support the Mast Assembly, see Section 4.2.
4. Install the lower mast bearings, refer to Figure 4-15 to help determine front and rear bearings.

**Note: Always use Loctite Primer #770 and Retainer #405 on the capscrews that secure the mast bearings to the masts.**

5. Install capscrew, washers and locknut securing cylinder rod to the upper cylinder mount.
6. Pull the inner chains attached to the inner can up and over the inner pulley.
7. Using the hoisting device and sling carefully lower the third can over the first two.
8. Install the lower mast bearings and chain mount.
9. Using the hoisting device and sling carefully lower the Platform Assembly over the three cans.
10. Install the lower mast bearings.
11. Move the outer chains attached to the top of the second can up and over the outer pulley.
12. Install the outer chain mounts.
13. Install the cable clamp securing the control cable to the Platform and pull the cable through the hole in the platform can.
14. Connect the control cable wires to the Controller.
15. Remove the blocking device from the Mast Assembly.
16. Raise and lower the Platform checking for proper operation and leaks.
17. Install the top mast cover.

## 4.14 Electric Motor (Figure 4-14)

### TROUBLESHOOTING

1. Read the nameplate to become familiar with the motor, especially the rated voltage.
2. Try to turn the shaft by hand. Keep motor leads separated while doing this. If the shaft turns freely go to step 3. If the shaft won't turn, proceed to step 2A.
- 2A. The shaft could be tight for a number of reasons, this check is to determine if the tightness is of a temporary nature only. Obtain power to produce the nameplate voltage. **Do Not Make A Permanent Connection.** First touch the motor leads quickly to the power supply just long enough to observe if the shaft runs. If it does turn, then hold the motor leads on the power supply for a longer time. If the motor sounds normal, go to step 3. If the motor sounds noisy, it should be taken apart as described in the disassembly section.
3. If the motor turned freely, connect an ammeter in the circuit as shown in Figure 4-14A. With rated voltage applied and the shaft running free, the ammeter should read less than 20% of the nameplate full load current. If the motor meets the above conditions then it can be assumed the original problem is external to the motor.

### DISASSEMBLY

1. Remove thru bolts.
2. Remove pulley end cover.
3. Pull the armature out of the assembly in one swift motion.
4. Remove commutator end cover.

**NOTE: Do not place the stator ring in any mechanical holding device during the disassembly or assembly operation. Permanent distortion or other damage will result.**

### INSPECTION

Once the motor has been disassembled, go through the following check list steps to determine where the problem lies.

1. Bearings should spin smoothly and easily and have ample lubrication and be free of corrosion.
2. Armature should be checked for grounds and shorted turns. Refinish commutator surface if pitted or excessively worn.
3. Brushes should be checked for wear and to ensure that they are free in the brush holders.

**NOTE:** Observe how brushes are assembled in brush holders and position of brush lead. New brushes must be installed in same manner. Brushes should be removed as follows:

- Remove brush spring clip from its mounting on brush assembly.
  - Lift brush assembly from brush holder.
  - Disconnect brush assembly lead.
  - New brush assembly to be installed by reversing above procedure.
4. Inspect wire harness and all connections for signs of damage due to overheating.
  5. Check stator to see it is securely mounted.

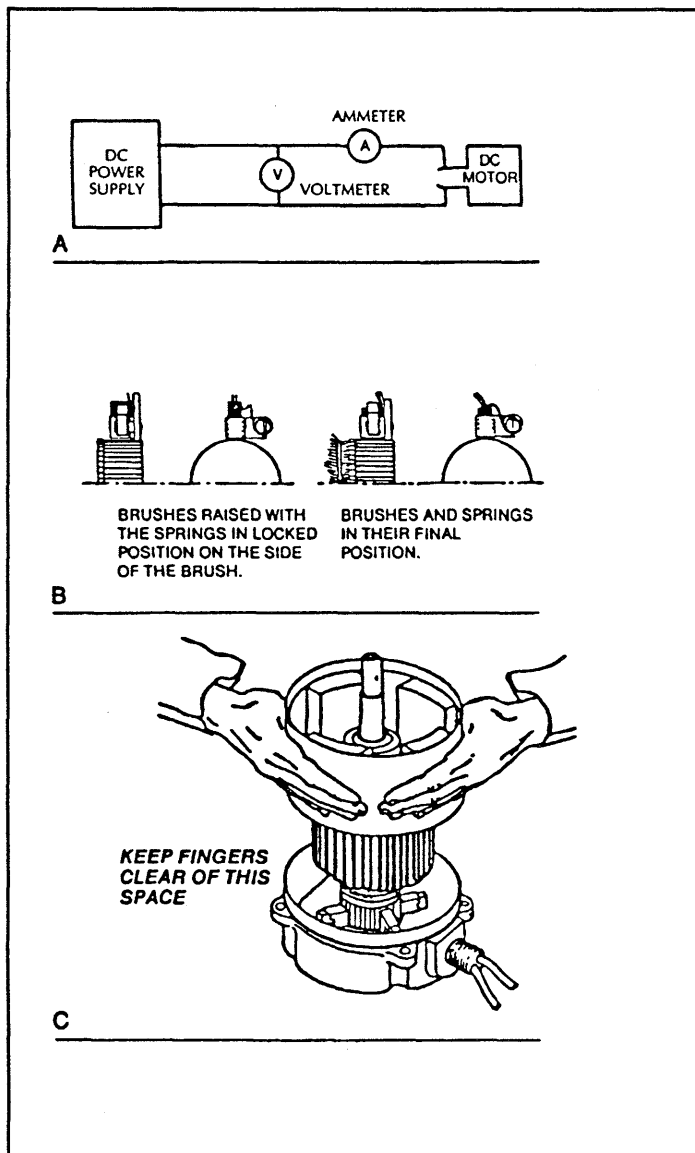


Figure 4-14: Electric Motor Service

## REASSEMBLY

1. Install new brushes and be sure they are free in the holder. Install brush with the lead wires positioned as when received. Raise all brushes to the locked position. (See Figure 4-14B and step 3 in the Inspection section).
2. Place commutator cover on a work bench with brush assembly facing upward.
3. Place the bearing spring into the bearing bore.
4. Take a complete armature assembly, including bearings, and insert commutator end bearing into the bearing bore.

**Note:** Do not reuse bearings which have been removed from armature shaft. Keep assembly in a vertical position. Use extreme care not to damage armature with bearing pullers. New bearings should be installed by pressing inner race of bearing onto proper position on armature shaft.

5. Set the brushes to final position as shown in Figure 4-14B.
6. Place the complete stator down over the vertical armature, and into position on the commutator cover.
7. The stator assembly must be placed in a definite relationship with the commutator covers in order to obtain a neutral brush setting. There is a match-mark on both items. **These two marks must line up exactly. Rotate until they do.**
8. Assemble the pulley end cover in the proper relationship. Insert mounting bolts and tighten alternately to ensure a good mechanical alignment.
9. Spin the shaft by hand to see if it is free. Be sure motor leads (if used) are not touching together. If the leads are touching, a generator action will give the effect of friction in the motor. A no-load test can now be performed. At rated voltage, observe the no-load current. It should be less than 20% of the nameplate full load current. Anything higher indicates:
  - Brushes are not on neutral setting (check match-marks for exact alignment).
  - Faulty armature.

## 4.15 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

Spool Valve and Subplate (DO1 & DO4) fasteners:  
50 In/Lbs (7 Nm).

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

NOTES

## 5.0 Introduction

Table 5-1 provides a logical sequence of tests that are designed to isolate problems with TM12 machines. This table includes a list of probable causes and remedies.

 <b>WARNING</b> 
When troubleshooting, ensure that the work platform is resting on a firm, level surface.
When performing any service on or in the Elevating Assembly area, which requires the Platform to be raised, the Elevating Assembly must be blocked.
Disconnect the batteries ground cable 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.

# Troubleshooting

**Table 5-1: Troubleshooting**

TROUBLE	PROBABLE CAUSE	REMEDY
All functions inoperable, Electric Motor does not start.	<ol style="list-style-type: none"> <li>1. Open control circuit Circuit Breaker (CB).</li> <li>2. Blown Electric Motor Fuse (FU).</li> <li>3. Faulty Battery Charger.</li> <li>4. Faulty Battery(ies) (BAT).</li> <li>5. Faulty Electric Motor (MOT).</li> <li>6. Faulty Motor Relay (CR1).</li> <li>7. Emergency Stop Switch (SW1, SW3) failed open.</li> </ol>	<p>Check control circuit Circuit Breaker. Reset if open.</p> <p>Check 175 amp Electric Motor Fuse. Replace if blown.</p> <p>Check the voltage output of the Battery Charger. If less than 24 VDC, repair or replace.</p> <p>After completely charging Batteries, test each Battery. Replace as required.</p> <p>While operating the steering function, check voltage across the Electric Motor terminals. If 24 VDC is present, replace the Motor.</p> <p>While operating the steering, check voltage across the coil terminals of Motor Relay. If no voltage is present, proceed with step 7. If 20 VDC or more, check continuity across the contact terminals of Motor Relay while still operating the steering function. If there is no continuity, replace the defective Motor Relay.</p> <p>With the Emergency Stop Switch in the ON position, check continuity across the contacts. If none, replace.</p>
All functions inoperable. Electric Motor starts when control is actuated.	<ol style="list-style-type: none"> <li>1. Hydraulic Reservoir low.</li> <li>2. Faulty Hydraulic Pump (PMP).</li> <li>3. Faulty Controller (CONT).</li> <li>4. Proportional Valve (V6).</li> </ol>	<p>Check hydraulic fluid level, top off as required.</p> <p>Check pressure and delivery of the Hydraulic Pump. Replace if required.</p> <p>Check operation. Replace switch if required.</p> <p>Check operation. Replace if required.</p>
Electric Motor continues to run after controls are returned to the OFF position.	Motor Relay (CR1) contacts fused together.	Check operation, replace if required. With 0 voltage at the coil terminals of the Motor Relay (CR1) check continuity across the contact terminals. If there is continuity, replace the Motor Relay.
Steering inoperable or functions sluggishly.	<ol style="list-style-type: none"> <li>1. Faulty Steering Switch (CONT).</li> <li>2. Mechanical damage.</li> <li>3. Steering Valve (V1) stuck.</li> <li>4. Steering Cylinder (CYL1) piston seal leaking.</li> <li>5. Steering Relief (RV3).</li> </ol>	<p>Test Steering Switch for continuity. Replace if defective.</p> <p>Inspect all steering components. Replace damaged parts.</p> <p>Inspect Steering Valve. If spool is sticking, replace.</p> <p>Check Steering Cylinder for leakage from one port to another. Repair as required.</p> <p>Adjust the relief valve, if not adjustable, replace.</p>
Work platform will not steer right.	<ol style="list-style-type: none"> <li>1. Faulty Steering Switch (CONT).</li> <li>2. Faulty Diode (DIO1).</li> <li>3. Faulty Steer Right Solenoid (SOL1).</li> </ol>	<p>Test Controller Switch for continuity. Replace if defective.</p> <p>Test Diode. Replace if defective.</p> <p>Test Steer Right Solenoid. If the proper voltage is present and the coil is not magnetized, replace.</p>
Work platform will not steer left.	<ol style="list-style-type: none"> <li>1. Faulty Steering Switch (CONT).</li> <li>2. Faulty Diode (DIO2).</li> <li>3. Faulty Steer Left Solenoid (SOL2).</li> </ol>	<p>Test Steering Switch for continuity. Replace if defective.</p> <p>Test Diode. Replace if defective.</p> <p>Test Steer Left Solenoid. If the proper voltage is present and the coil is not magnetized, replace.</p>

TROUBLE	PROBABLE CAUSE	REMEDY
Work platform will not drive forward or reverse. Lift function operable.	<ol style="list-style-type: none"> <li>1. Faulty Drive/Lift Selector Switch (SW5).</li> <li>2. Faulty Drive/Lift Valve (V4, SOL3).</li> <li>3. Mechanical failure.</li> <li>4. Worn Drive Motors (MOT1, MOT2).</li> </ol>	<p>Check continuity of Drive/Lift Switch. Replace if defective.</p> <p>Check the Drive/Lift Valve. If the spool is not shifting, replace the valve. Inspect Drive Motor shafts, hubs, and keys.</p> <p>Check hydraulic pressure being delivered to the Drive Motors. If sufficient, replace Drive Motors.</p>
No high speed drive.	<ol style="list-style-type: none"> <li>1. Faulty Relay (CR4).</li> <li>2. Faulty Down Limit Switch (LSW).</li> <li>3. Faulty Proportional Coil/Valve (SOL7/V6).</li> </ol>	<p>Test Relay (CR4). Replace if faulty. Check Switch for continuity. Replace if faulty.</p> <p>Test coil and valve. If defective, replace.</p>
No drive forward but drives in reverse. Lift function operable.	<ol style="list-style-type: none"> <li>1. Faulty Drive/Lift Selector Switch (SW5).</li> <li>2. Faulty Counterbalance Valves (V2, V3).</li> </ol>	<p>Test Drive/Lift Switch for continuity. Replace if faulty.</p> <p>Check pressure of Counterbalance Valves. Replace or reset valves as required.</p>
No drive forward but drives in reverse. No lift function.	<ol style="list-style-type: none"> <li>1. Faulty Drive/Lift Selector Switch (SW5).</li> <li>2. Faulty Controller (CONT).</li> <li>3. Faulty Up/Fwd Relay (CR6).</li> </ol>	<p>Test Drive/Lift Switch for continuity. Replace if faulty.</p> <p>Check operation of Controller switch. Replace if required.</p> <p>Test relay, replace if faulty.</p>
No drive reverse but drives in forward. Lift function operable.	<ol style="list-style-type: none"> <li>1. Faulty Drive/Lift Selector Switch (SW5).</li> <li>2. Faulty Diode (DIO3).</li> <li>3. Faulty Reverse Coil (SOL4).</li> <li>4. Faulty Counterbalance Valves (V2, V3).</li> </ol>	<p>Test Drive/Lift Switch for continuity. Replace if faulty.</p> <p>Test Diode. Replace if faulty.</p> <p>Test Reverse Coil, if proper voltage is present and coil is not magnetized, replace.</p> <p>Check pressure of Counterbalance Valves. Replace or reset valves as required.</p>
No drive reverse but drives in forward. No lift function.	<ol style="list-style-type: none"> <li>1. Faulty Drive/Lift Selector Switch (SW5).</li> <li>2. Faulty Controller (CONT).</li> <li>3. Faulty Down/Reverse Relay (CR7).</li> </ol>	<p>Test Drive/Lift Switch for continuity. Replace if faulty.</p> <p>Check operation of Controller switch. Replace if required.</p> <p>Test relay, replace if faulty.</p>
Platform will not elevate or elevates slowly.	<ol style="list-style-type: none"> <li>1. Emergency Down Valve (V8) open.</li> <li>2. Platform overloaded.</li> <li>3. Faulty Diode (DIO5).</li> <li>4. Faulty Lift Valve Coil (SOL5).</li> <li>5. Faulty Drive/Lift Selector Switch (SW5).</li> <li>6. Lift Relief Valve (RV1) out of adjustment or faulty.</li> <li>7. Drive/Lift Valve (V4) sticking.</li> <li>8. Faulty Up/Fwd Relay (CR6).</li> <li>9. Faulty Controller (CONT).</li> <li>10. Faulty Lift Flow Control (FC).</li> </ol>	<p>Close Emergency Down Valve.</p> <p>Observe maximum load rating (See Table 1-1).</p> <p>Test Diode, replace if faulty.</p> <p>Test Lift Valve Coil. If proper voltage is present and coil is not magnetized, replace.</p> <p>Test Drive/Lift Switch for continuity. Replace if defective.</p> <p>Adjust the Lift Relief Valve. If not adjustable, replace.</p> <p>Replace the Lift Valve.</p> <p>Test relay, replace if faulty.</p> <p>Check operation of Controller. Replace if required.</p> <p>Replace Flow Control.</p>

Table 5-1: Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Platform drifts down after being elevated.	1. Emergency Lowering/Down Valve (V8) partly open or faulty.	Ensure that the Emergency Lowering Valve is completely closed. Replace the valve.
Platform will not lower. Drive function operable.	1. Faulty Down Valve Coil (SOL6). 2. Faulty Drive/Lift Selector Switch (SW5). 3. Down Valve (V8) stuck. 5. Plugged Down Orifice (ORF2, ORF3). 6. Velocity Fuse Valve (V7) sticking or frozen.	Test Down Valve Coil. If proper voltage is present and coil is not magnetized, replace. With the Drive/Lift Switch in the <b>LIFT</b> position, check continuity. Replace if defective. Replace the Down Valve. Remove and Clean Orifice. Repeat lifting and lowering platform to warm oil, if possible move machine out of cold environment, replace the Velocity Fuse Valve.
Motion Alarm does not sound.	1. Faulty Down Alarm (ALM1). 2. Faulty Relay (CR2).	Check voltage to Down Alarm . If proper voltage is present, replace the Alarm. Test Relay. Replace if faulty.
Brake will not release.	1. Brake Orifice (ORF1) plugged. 2. Faulty Brake Cylinder (CYL2). 3. Brake out of adjustment.	Remove and Clean Orifice. Check and replace seals in Brake Cylinder. Adjust nut to disengage brakes from tires when driving <b>only</b> .
Brake will not lock wheel.	1. Brake Orifice (ORF1) plugged. 2. Faulty Brake Cylinder (CYL2). 3. Brake out of adjustment.	Remove and Clean Orifice. Check and replace seals in Brake Cylinder. Adjust nut so brakes fully engage tires when not driving .

## 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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6-3: Hydraulic Manifold and Cylinder Valve Assy. ...	6-5

## 6.1 Electrical Schematic

**Table 6-1: Electrical Schematic Legend**

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
ALM1	Alarm, Down	Provides warning sound (60 Hz) when the Platform is lowering.	Inside electrical box on right door. Red wire for 60 Hz.
ALM2	Alarm, Tilt	Provides warning sound (600 Hz) when Platform is on elevated on slopes of 2° side to side and 2° fore and aft.	Inside electrical box on right door. White wire for 600 Hz.
BAT	Batteries (4), 6 volts each	To store energy.	Slide out tray at rear of Chassis.
CB	Circuit Breaker	Overload protection for the control circuit.	Chassis Control Panel.
CONT	Controller, Proportional & Switch, Steering	Supplies power to; Motor Start Relay circuit at T2 & T9, Up/Forward & Down /Reverse Relays, and Proportional Coil. Supplies power to either Right or Left Steer Valve Solenoids.	Platform Controller right center.  Top of Controller Joystick.
CR1	Relay, Motor Start	Connects Batteries to Motor.	Inside right Chassis Door. Mounted on front bulkhead.
CR2	Relay, Down Alarm	Energized with Down Coil, relay provides power to Down Alarm from down circuit and prevents Motor Start Relay from closing.	Middle relay in Electrical Box.
CR3	Relay, Tilt Sensor Power	Supplies power to Tilt Sensor.	Relay closest to center of machine in Electrical Box.
CR4	Relay, Platform Down	Energized when Platform is down, cuts power to Tilt Sensor circuit and provides power to Motor Start Relay.	Relay closest to rear of machine in Electrical Box.
CR5	Relay, Tilt Alarm	Energized by Tilt Sensor when level, provides power to Motor Start Relay when elevated. When machine is not within 2° of level Motor Start Relay circuit opens and power is provided to Tilt alarm.	Relay closest to outside of machine in Electrical Box.
CR6	Relay, Up/Forward	When energized by Controller provides power to Drive Lift Switch.	Controller.
CR7	Relay, Down/Reverse	When energized by Controller provides power to Drive Lift Switch.	Controller.
DIO1	Diode	Supplies power to Motor Start Circuit, from Steer Right Circuit.	On Fanning Strip between terminals T1 and T2.

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
DIO2	Diode	Supplies power to Motor Start Circuit, from Steer Left Circuit.	On Fanning Strip between terminals T3 and T2.
DIO3	Diode	Provides power to Drive Coil from Reverse Circuit.	On Fanning Strip between terminals T6 and T4.
DIO4	Diode	Provides power to Motor Start Circuit from Lift Circuit	On Fanning Strip between terminals T7 and T2.
DIO5	Diode	Provides power to Controller for high speed Lift.	On Fanning Strip between terminals T7 and T9.
DIO6,7 & 8	Diode(s)	Protects diodes 1,2 & 5 from voltage spikes.	On Fanning Strip.
FU	Fuse, 175 AMP	Overload protection for the electric motor.	Inside right chassis door under Motor Start Relay.
LSW	Switch, Down Limit	Provides power to Platform Down Relay when Platform is down.	Behind Mast Assembly on Chassis.
MOT	Motor, Electric	Provides power to Drive Hydraulic Pump.	Center right of Chassis Module.
MTR**	Meter, Low Voltage/Hour	Shows state of charge of Batteries and hours machine has operated.	Chassis Control Panel.
SNSR	Sensor, Tilt	Cuts power to Tilt Alarm Relay (CR5) when Platform is on slopes of 2° side to side and 2° fore and aft to activate Tilt Alarm.	Right front of Chassis Module.
SOL1*	Solenoid, Right Steer (coil)	Shifts Steer Valve to <b>RIGHT</b> turn position.	Top* end of Spool Valve mounted towards front of machine.
SOL2*	Solenoid, Left Steer (coil)	Shifts Steer Valve to <b>LEFT</b> turn position.	Bottom* end of Spool Valve mounted towards front of machine.
SOL3*	Solenoid, Drive (coil)	Shifts Drive/Lift Valve to Drive position.	Bottom* end of Spool Valve mounted towards rear of machine.
SOL4	Solenoid, Reverse (coil)	Opens Reverse Valve.	Top of Manifold Block towards front of machine.
SOL5*	Solenoid, Lift (coil)	Shifts Drive/Lift Valve to Lift position.	Top* end of Spool Valve mounted towards rear of machine.
SOL6	Solenoid, Down (coil)	Opens Down Valve.	Inside right chassis door towards rear of machine.
SOL7	Solenoid, Proportional (coil)	Opens Proportional Valve.	Left side of Manifold Block. between Drive/Lift and Steering Valves.

\* When Delta spool valves are used the coils are on the opposite ends.

\*\* Optional Volt/Hour Meter is shown.

# Schematics

Table 6-1: (cont'd.)

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
SW1	Switch, Chassis Emergency Stop Button.	Control Circuit shut off.	Chassis Control Panel.
SW2	Switch, Chassis Selector	Provides power to either the Chassis Controls or the Controller.	Chassis Control Panel.
SW3	Switch, Controller Emergency Stop Button	Control Circuit shut off.	Platform Controller bottom left.
SW4	Switch, Foot	Supplies power to Controller.	Platform deck.
SW5	Switch, Drive/Lift Selector	Supplies power to Drive and Reverse or Up and Down Valve coils.	Controller bottom right.
SW6	Switch, Chassis Lift	Provides power to either UP or Down circuits.	Chassis Control Panel.

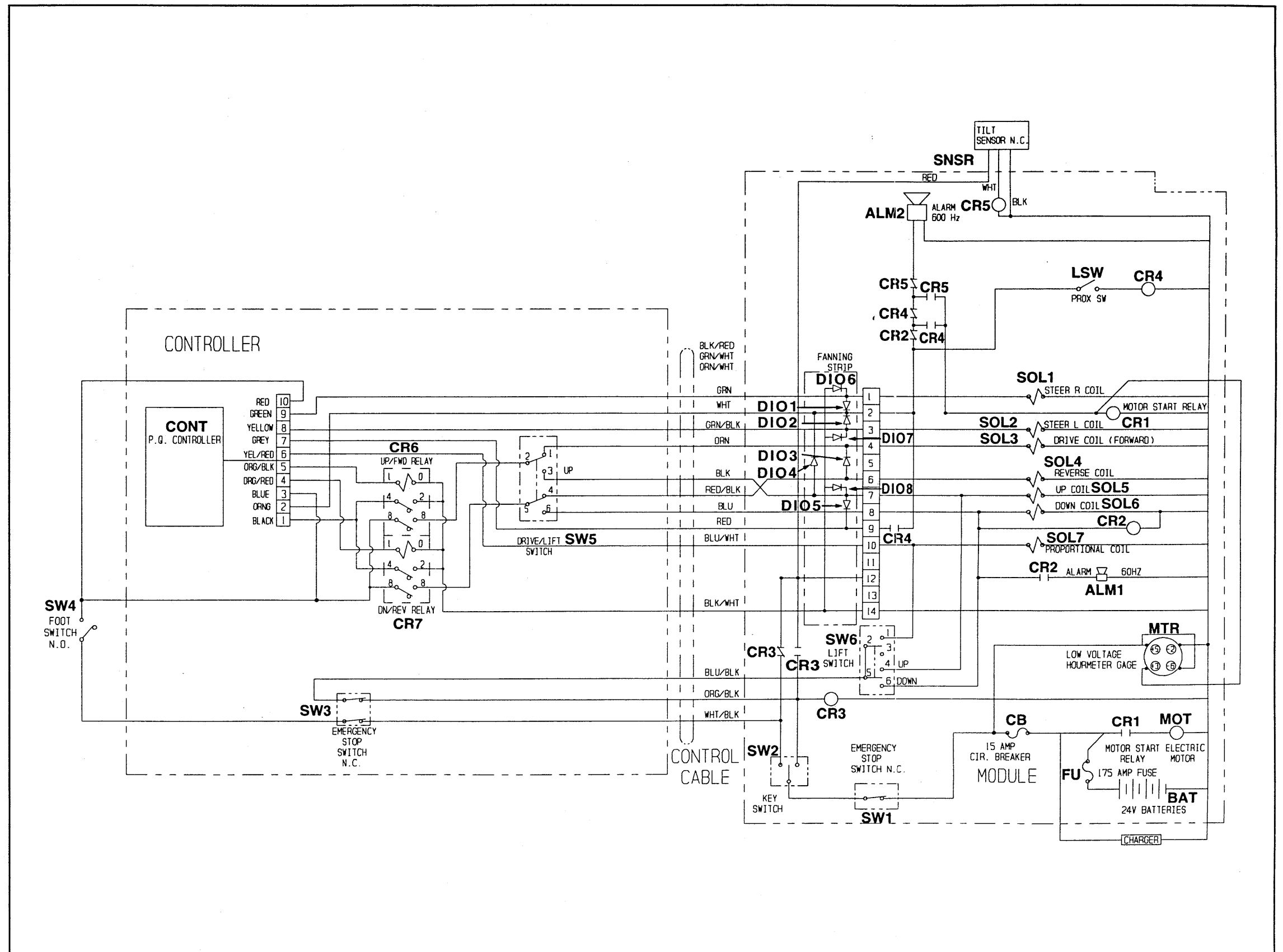


Figure 6-1: Electrical Schematic

## 6.2 Hydraulic Schematic

Table 6-2: Hydraulic Schematic Legend

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
CV1	Check Valve, Low Drive	Prevents oil from second side of pump from entering first side circuit.	Under plug at upper right corner on rear of Manifold Block.
CV2	Check Valve, High Drive	Prevents oil from first side of pump from entering second side circuit.	Under plug on bottom of Manifold Block.
CV3	Check Valve, Drive Make-up	Supplies extra oil, when required by Drive Motors, during steering.	Under fitting at lower right corner on front of Manifold Block.
CYL1	Cylinder, Steering	Provides force to turn front wheels.	Inside Chassis Module through left door.
CYL2	Cylinder, Brake	Stops machine from moving while parked.	Right rear wheel well.
CYL3	Cylinder, Lift	Provides force to lift Platform.	Inside the Mast Assembly.
CYL4	Cylinder, Cushion	Provides smooth starting and stopping when driving.	Front center of Chassis Module on bulkhead.
FC	Flow Control, Lift	Controls elevation rate of Platform.	Bottom of Cylinder Valve Assembly.
FL1	Filter	Filters oil returning to Tank.	Bottom of Manifold Block.
FL2	Suction Screen	Traps particles in Hydraulic Tank.	Inside Hydraulic Tank at outlet.
MOT1	Drive Motor	Provides tractive effort for work	On left front Steering Spindle.
MOT2	Drive Motor	Provides tractive effort for work	On right front Steering Spindle.
ORF1	Orifice, Brake	Delays the engagement of the Brake Cylinder.	Under center fitting on rear of Manifold Block.
ORF2	Orifice, Down	Controls the Platform rate of descent.	Under top left fitting on Cylinder Valve Assembly.
ORF3	Orifice, Down	Controls the Platform rate of descent.	Under top middle fitting on Cylinder Valve Assembly.
ORF4,5	Orifice, Cushion Cylinder	Controls drive cushion rate.	Inside each end of Drive Cushion Cylinder.
PMP	Duplex Pump	Supplies hydraulic oil flow for all functions.	On Electric Motor at center right of Chassis Module.

REFERENCE DESIGNATION	NAME	FUNCTION	LOCATION
RV1	Valve, Lift Relief	Provides over pressure protection to second side of Pump and limits Platform lifting capacity.	Right side of Manifold Block, upper left corner.
RV2	Valve, Low Drive Relief	Provides over pressure protection to first side of Pump when driving.	Right side of Manifold Block, lower center.
RV3	Valve, Steering Relief	Provides over pressure protection to first side of Pump and steering components when steering.	Right side of Manifold Block, upper center.
V1*	Valve, Steering	Provides directional control for Steering Cylinder.	Left side of Manifold Block towards front.
V2	Valve, Forward Counterbalance	Prevents machine from running away on slopes and cushions stops.	Right side of Manifold Block, near lower right corner.
V3	Valve, Reverse Counterbalance	Prevents machine from running away on slopes and cushions stops.	Right side of Manifold Block, near upper right corner.
V4 *	Valve, Drive /Lift	Provides control of oil for Drive or Lift functions.	Left side of Manifold Block towards rear.
V5	Valve, Forward/Reverse	Provides control of oil for Forward or Reverse drive.	Top of Manifold Block, towards front.
V6	Valve, Proportional	Controls oil flow into Drive and Lift circuits by proportionally dumping oil back to tank.	Left side of Manifold Block between Steering and Drive/Lift Valves.
V7	Valve, Velocity Fuse	Locks Lift Cylinder if line breaks.	On long adapter at base of Lift Cylinder .
V8	Valve, Down and Emergency Lowering	Allows oil to flow out of Lift Cylinder to Tank, manually operated for Emergency Lowering.	Right side of Cylinder Valve Assembly.

\* When Delta spool valves are used the coils are on the opposite ends.

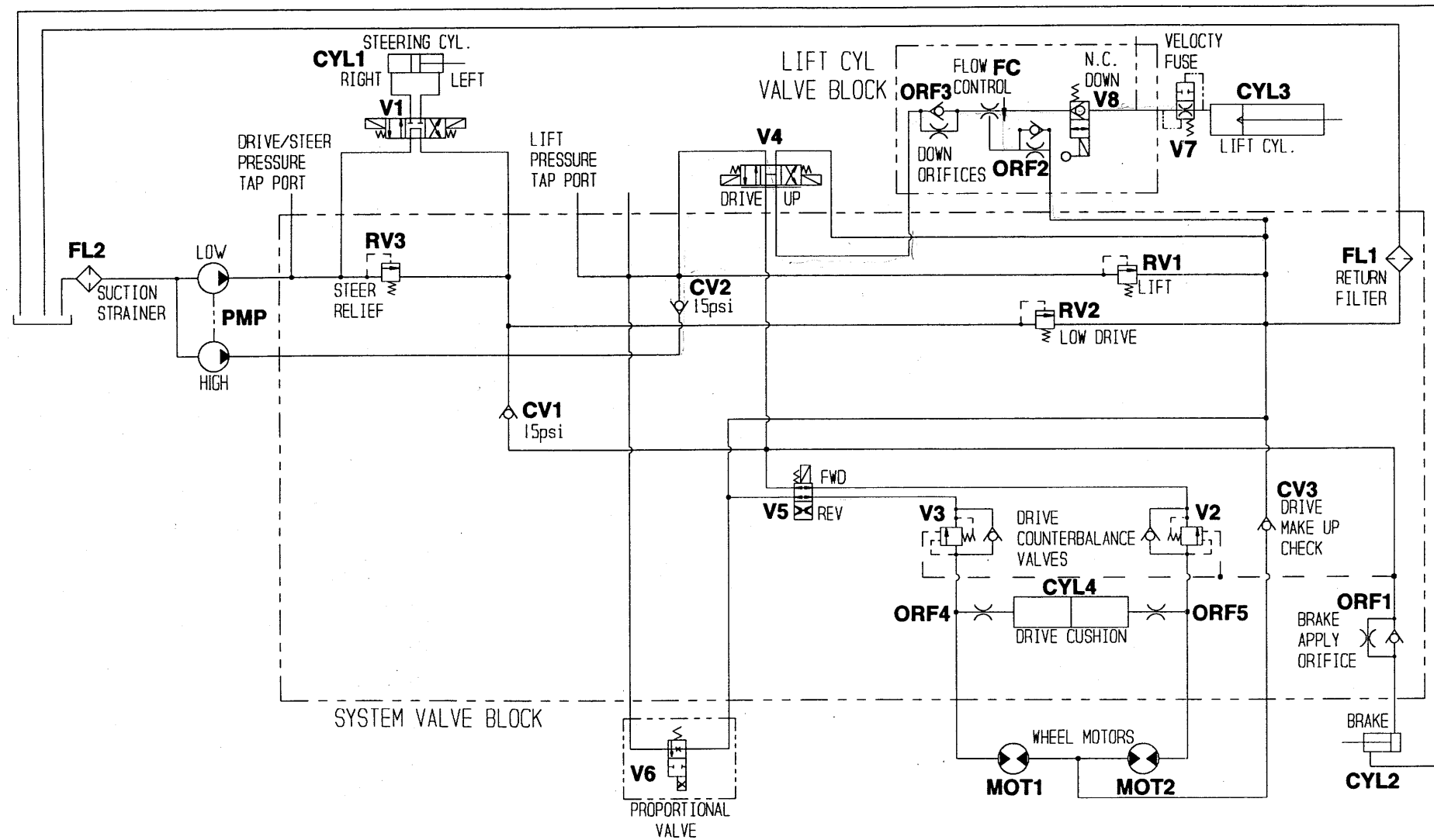


Figure 6-2: Hydraulic Schematic

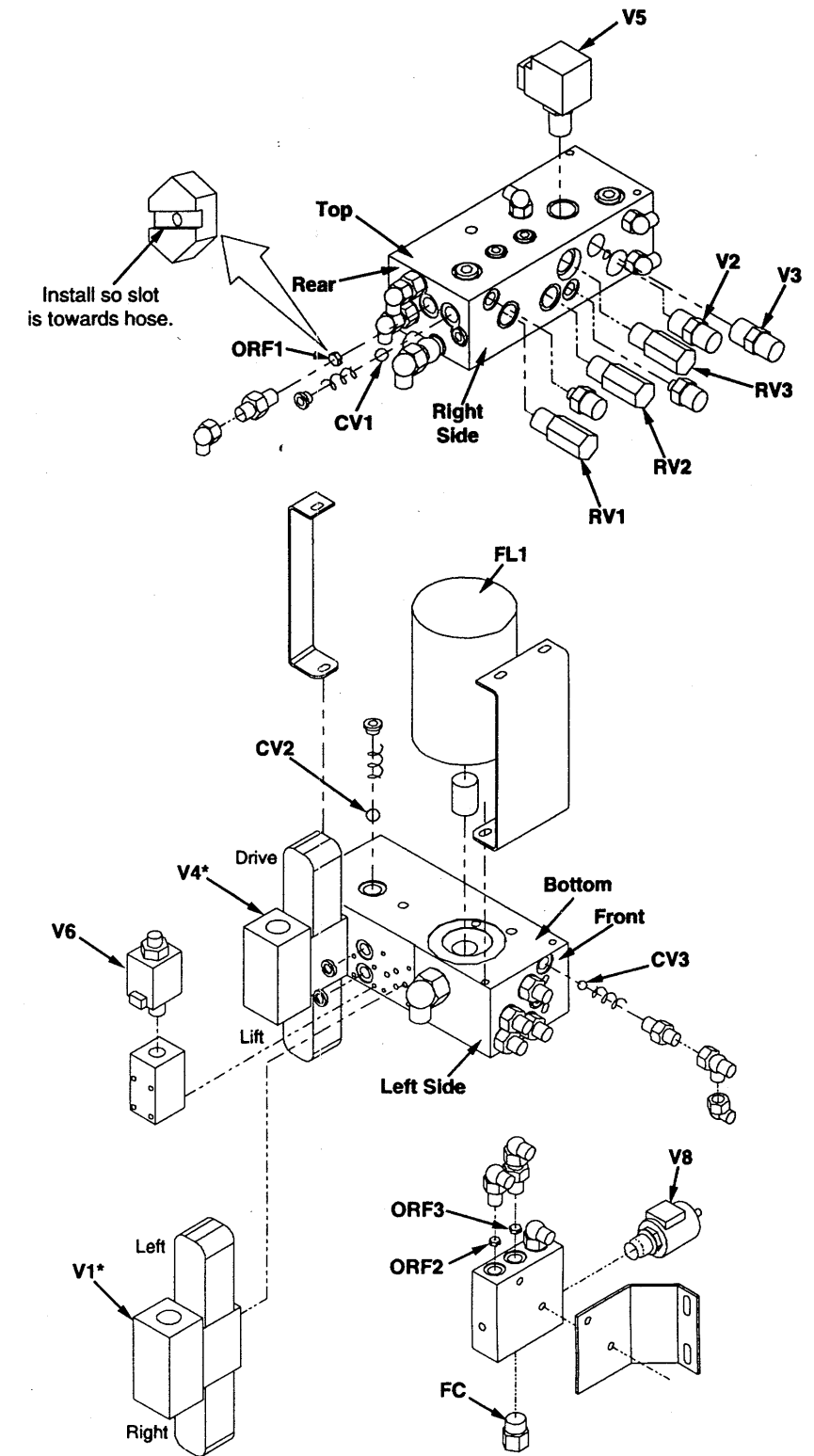


Figure 6-3: Hydraulic Manifold and Cylinder Valve Assembly

**NOTES**

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## 7.0 Introduction

This section lists and illustrates the replaceable assemblies and parts of the TM12 Work Platform, as manufactured by UpRight, Inc. Each parts list contains the component parts for that assembly indented to show relationship where applicable.

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## 7.2 Illustrated Parts

NEXT PAGE.

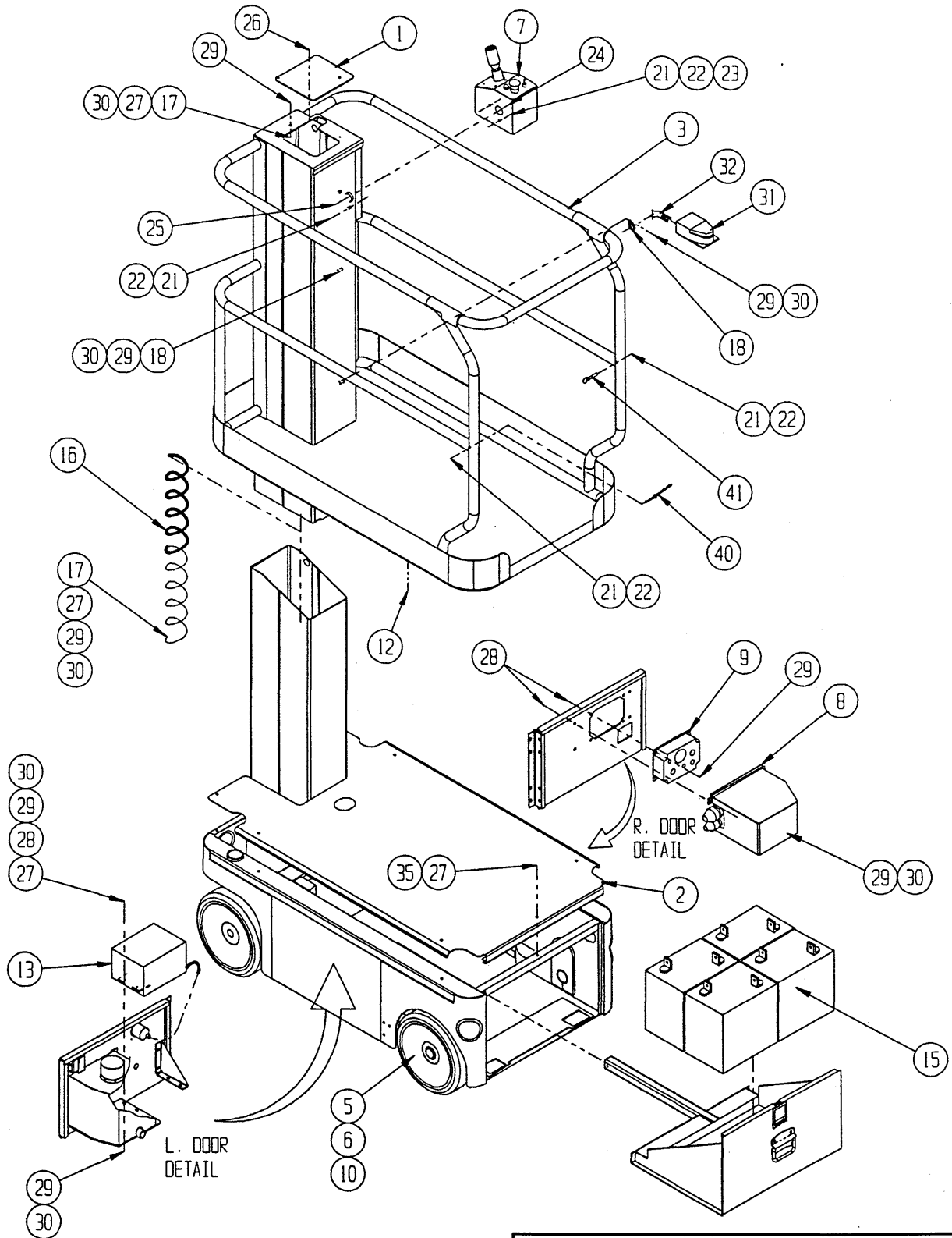
FINAL ASSEMBLY, MAST LIFT  
 TM12 DOMESTIC, DRAWING 1 OF 4  
 65400-001

ITEM	PART	DESCRIPTION	QTY.
1	65543-000	Cover, Mast Top	1
2	65536-000	Cover, Chassis	1
3	65580-000	Platform Weldment	1
5	65412-001	Label Kit Installation	1
6	65411-001	Hose Kit	1
7	65410-001	Controller Assy.	1
8	65408-000	Electrical Box Assy.	1
9	65403-001	Electrical Panel Assy.	1
10	65401-001	Basic Assy.	1
12	10080-006	T-Clip	4
13	63944-001	Battery Charger	1
15	15796-000	Battery, 6V	4
16	65409-001	Control Cable Assy.	1
17	13919-018	Clamp	2
18	13919-016	Clamp	2
21	11240-005	Washer, 5/16 Std Flat	6
22	11248-005	Locknut, 5/16-18 UNC Hex	4
23	11253-006	Screw, 5/16-18 UNC HHC x 3/4	2
24	26616-008	Nipple, 1"	1
25	29939-004	Locknut, 1 NPT	1
26	13923-004	Screw, #10 SLFTP x 1/2	4
27	11252-006	Screw, 1/4-20 UNC HHC x 3/4	13
28	11829-006	Carriage Bolt, 1/4-20 UNC x 3/4	8
29	11248-004	Locknut, 1/4-20 UNC Hex	16
30	11240-004	Washer, 1/4 Dia Std Flat	16
31	63906-000	Foot Switch	1
32	29490-099	Wire, 16 AWG 2 Conn	5 Ft
35	14252-004	Nut-Sert, 1/4-20 UNC	7
38*	65375-000	Cyl. Tube Assy. (Not Shown, see Hose Kit Assy.)	1
39*	65369-001	Hose Guard x 18 (Not Shown, see Hose Kit Assy.)	2
40	63133-002	Guard, Chain Assy.	1
41	14940-005	Eyebolt, 5/16-18 UNC x 2 1/4	1

\*Not Shown



# Illustrated Parts Breakdown

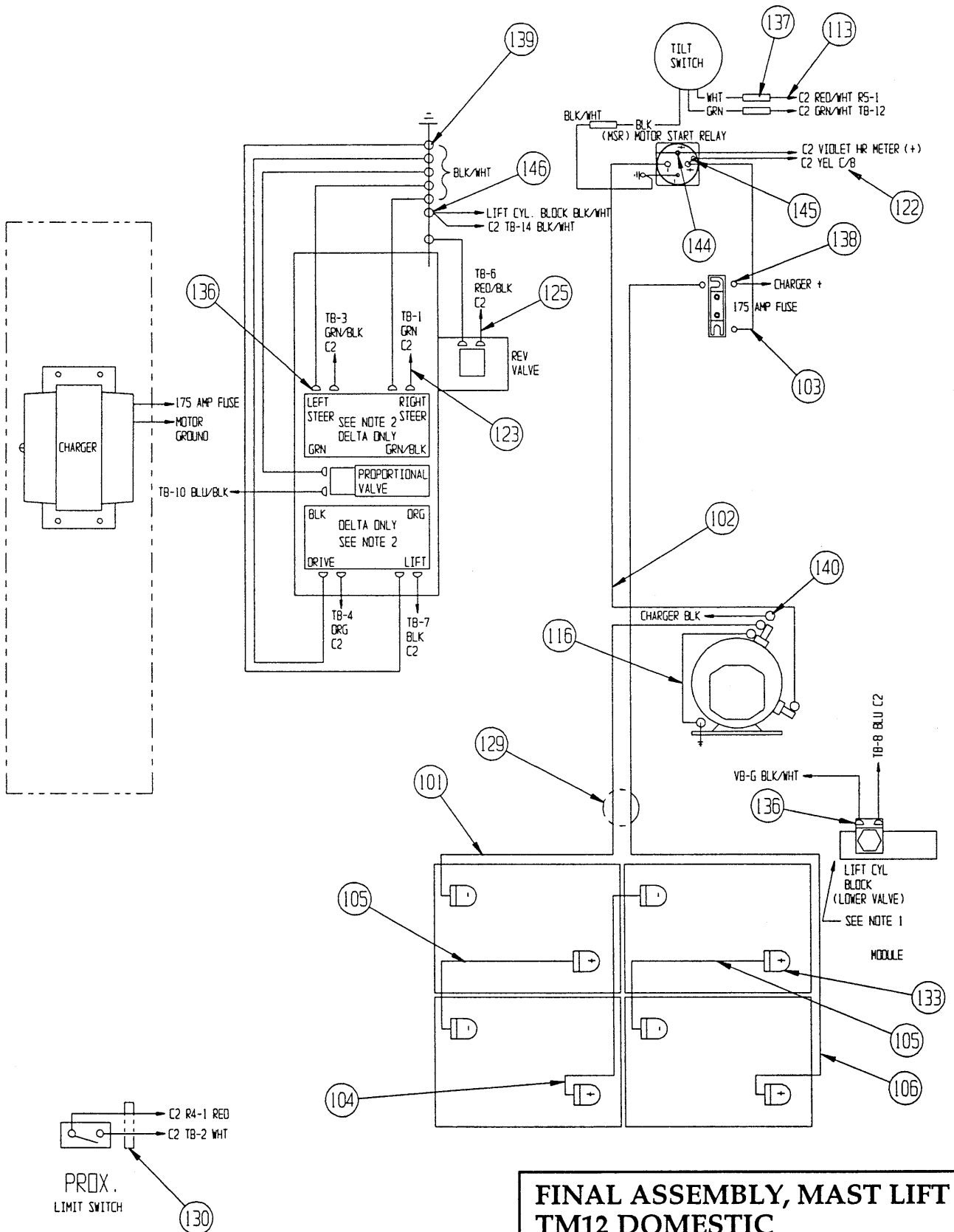


**FINAL ASSEMBLY, MAST LIFT  
TM12 DOMESTIC  
DRAWING 1 OF 4**

FINAL ASSEMBLY, MAST LIFT  
 TM12 DOMESTIC, DRAWING 2&3 OF 4  
 65400-001

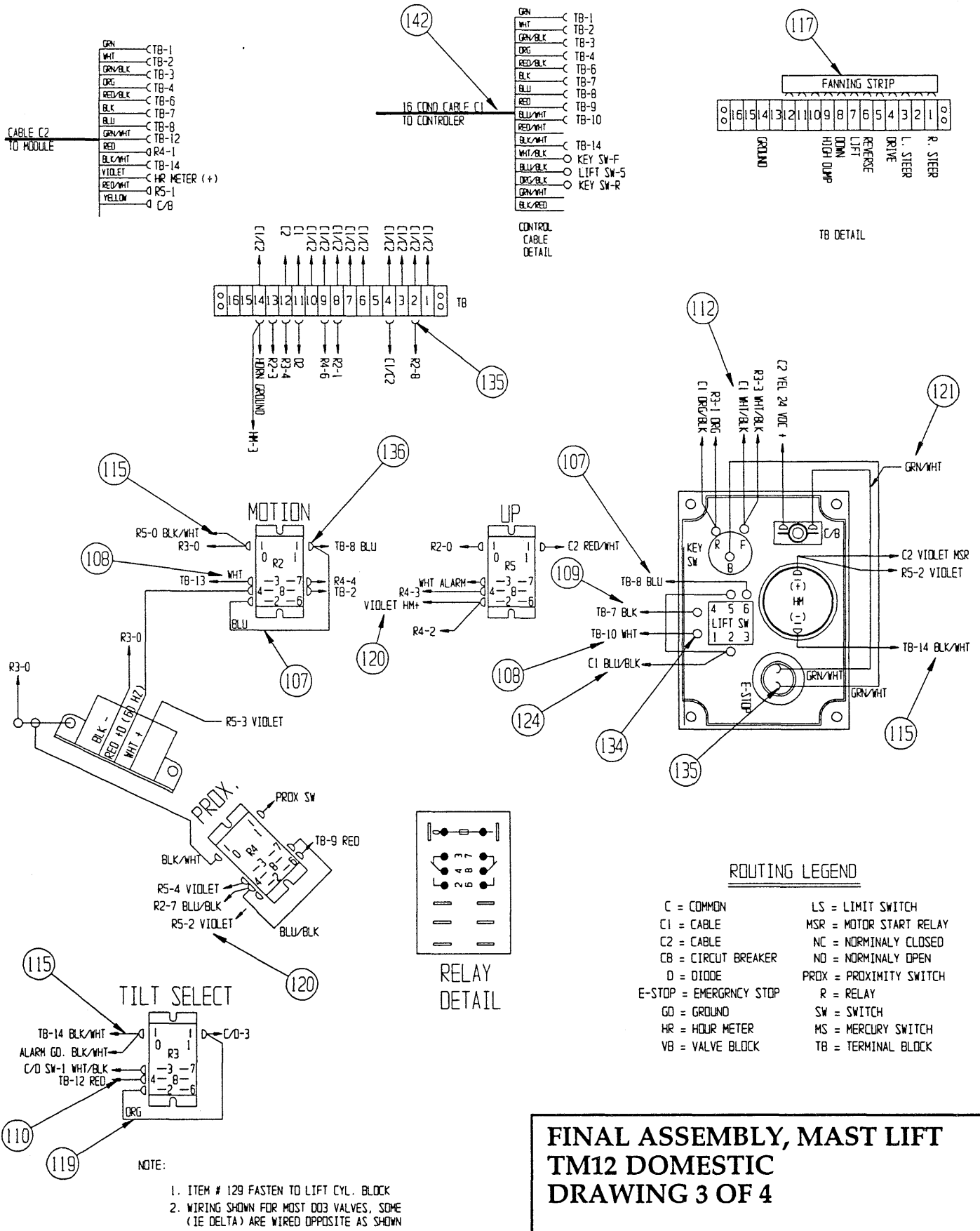
ITEM	PART	DESCRIPTION	QTY.
101	62125-048	Battery Cable Assy., 5/16 - 3/8 x 50	1
102	62125-021	Battery Cable Assy., 5/16 - 3/8 x 21	1
103	64195-006	Battery Cable Assy., 5/16 - 5/16 x 6	1
104	64195-014	Battery Cable Assy., 5/16 - 5/16 x 14	1
105	64195-008	Battery Cable Assy., 5/16 - 5/16 x 8	2
106	64195-057	Battery Cable Assy., 5/16 - 5/16 x 57	1
107	29450-099	Wire, 16 AWG Blu	6.9Ft
108	29451-099	Wire, 16 AWG Wht	8.9Ft
109	29452-099	Wire, 16 AWG Blk	5.5Ft
110	29454-099	Wire, 16 AWG Red	4.4Ft
111	29455-099	Wire, 16 AWG Brn	7.8Ft
112	29479-099	Wire, 16 AWG Wht/Blk	1 Ft
113	29483-099	Wire, 16 AWG Red/Wht	4.7Ft
115	63574-099	Wire, 16 AWG Blk/Wht	7.8Ft
116	62125-007	Battery Cable Assy., 5/16 - 3/8 x 10	1
117	64056-010	Fanning Strip Assy.	1
119	29453-099	Wire, 16 AWG Org	4.8Ft
120	05487-099	Wire, 16 AWG Violet	6.6Ft
121	29482-099	Wire, 16 AWG Grn/Wht	3.7Ft
122	29456-099	Wire, 16 AWG Yel	2.8Ft
123	29457-099	Wire, 16 AWG Grn	3.8Ft
124	29475-099	Wire, 16 AWG Blu/Blk	3.7Ft
125	29478-099	Wire, 16 AWG Red/Blk	5.8Ft
129	13919-010	Clamp	1
130	11868-021	Bushing, Snap	2
133	10154-000	Cover, Battery Term.	8
134	29601-013	Conn., Ring, #10 16-14	10
135	29610-001	Conn., Fork, #6 22-18	30
136	29931-003	Conn., FM Push, .25 16-14	34
137	29620-002	Conn., Butt, 16-14	7
138	29601-039	Conn., Ring, 5/16 12-10	1
139	29601-014	Conn., Ring, 1/4 16-14	8
140	29601-021	Conn., Ring, 3/8 12-10	8
142	65409-001	Control Cable Assy.	REF
144	29601-019	Conn., Ring, 12-10 x #10	1
145	29601-040	Conn., Ring, 16-14 x 5/16	1
146	29601-020	Conn., Ring, 12-10 x 1/4	1

# Illustrated Parts Breakdown



**FINAL ASSEMBLY, MAST LIFT  
TM12 DOMESTIC  
DRAWING 2 OF 4**

# Illustrated Parts Breakdown



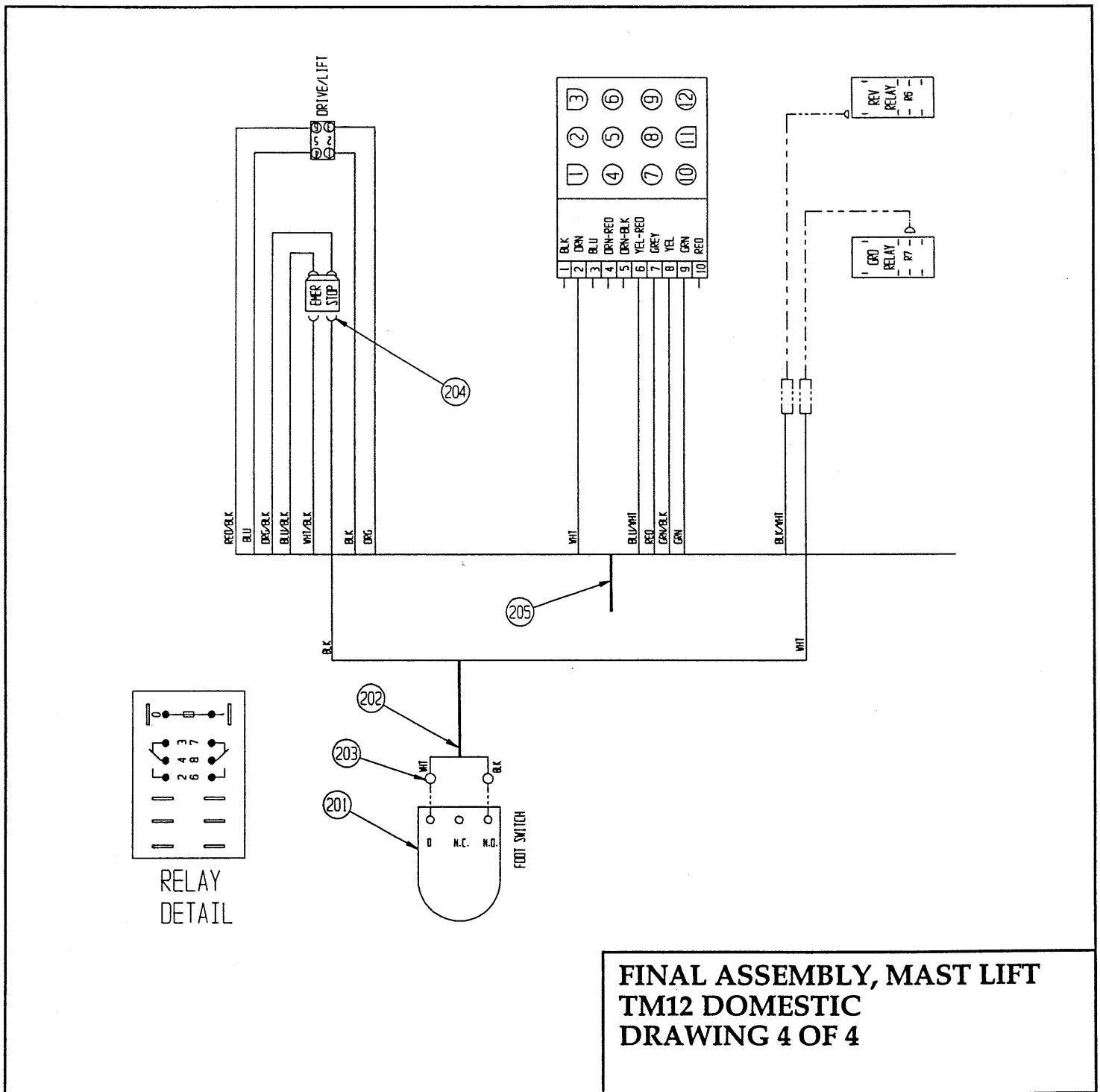
**FINAL ASSEMBLY, MAST LIFT  
TM12 DOMESTIC  
DRAWING 3 OF 4**

# Illustrated Parts Breakdown

Section  
7.2

FINAL ASSEMBLY, MAST LIFT  
TM12 DOMESTIC, DRAWING 4 OF 4  
65400-001

ITEM	PART	DESCRIPTION	QTY.
201	63906-000	Foot Switch	REF
202	29490-099	Wire, 16 AWG 2 Cond.	REF
203	29601-013	Conn., Ring, 16-14 x #10	2
204	29610-006	Conn., Fork, 16-14 x #6	1
205	65409-001	Control Cable Assy.	REF

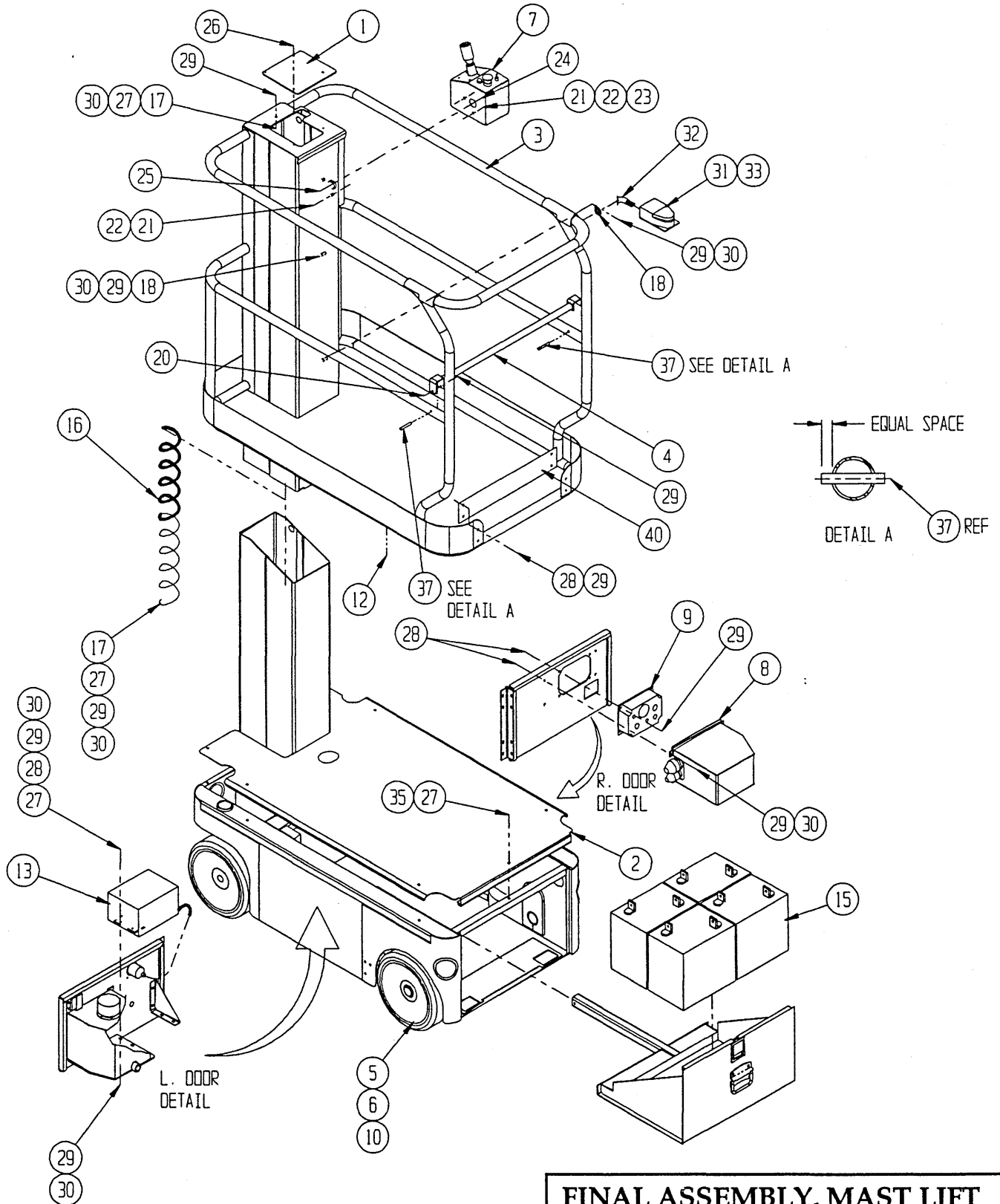


FINAL ASSEMBLY, MAST LIFT  
TM12 DOMESTIC  
DRAWING 4 OF 4

FINAL ASSEMBLY, MAST LIFT  
 TM12 EUROPEAN, DRAWING 1 OF 4  
 65400-002

ITEM	PART	DESCRIPTION	QTY.
1	65543-000	Cover, Mast Top	1
2	65536-000	Cover, Chassis	1
3	65580-000	Platform Weldment	1
4	65593-000	Gate Weldment	1
5	65412-001	Label Kit Installation	1
6	65411-001	Hose Kit	1
7	65410-001	Controller Assy.	1
8	65408-000	Electrical Box Assy.	1
9	65403-002	Electrical Panel Assy.	1
10	65401-001	Basic Assy.	1
12	10080-006	T-Clip	4
13	63948-002	Battery Charger	1
15	15796-000	Battery, 6V	4
16	65409-001	Control Cable Assy.	1
17	13919-018	Clamp	2
18	13919-016	Clamp	2
20	11252-018	Screw, 1/4-20 UNC HHC x 2 1/4	1
21	11240-005	Washer, 5/16 Std Flat	6
22	11248-005	Locknut, 5/16-18 UNC Hex	2
23	11253-006	Screw, 5/16-18 UNC HHC x 3/4	2
24	26616-008	Nipple, 1" Chase	1
25	29939-004	Locknut, 1" NPT	1
26	13923-004	Screw, #10 SLFTP x 1/2	4
27	11252-006	Screw, 1/4-20 UNC HHC x 3/4	9
28	11829-006	Bolt, 1/4-20 UNC Carriage x 3/4	16
29	11248-004	Locknut, 1/4-20 UNC Hex	20
30	11240-004	Washer, 1/4 Dia Std Flat	14
31	63906-000	Foot Switch	1
32	29490-099	Wire, 16 AWG 2 Conn	5FT
33	64479-000	Foot Switch Guard	1
35	14252-004	Nut-Sert, 1/4-20 UNC	7
37	11738-016	Rollpin, 5/16 x 2	2
38*	65375-000	Cyl. Tube Assy. (Not Shown, see Hose Kit Assy.)	1
39*	65369-001	Hose Guard x 18 (Not Shown, see Hose Kit Assy.)	2
40	65589-000	Toeboard	1

# Illustrated Parts Breakdown



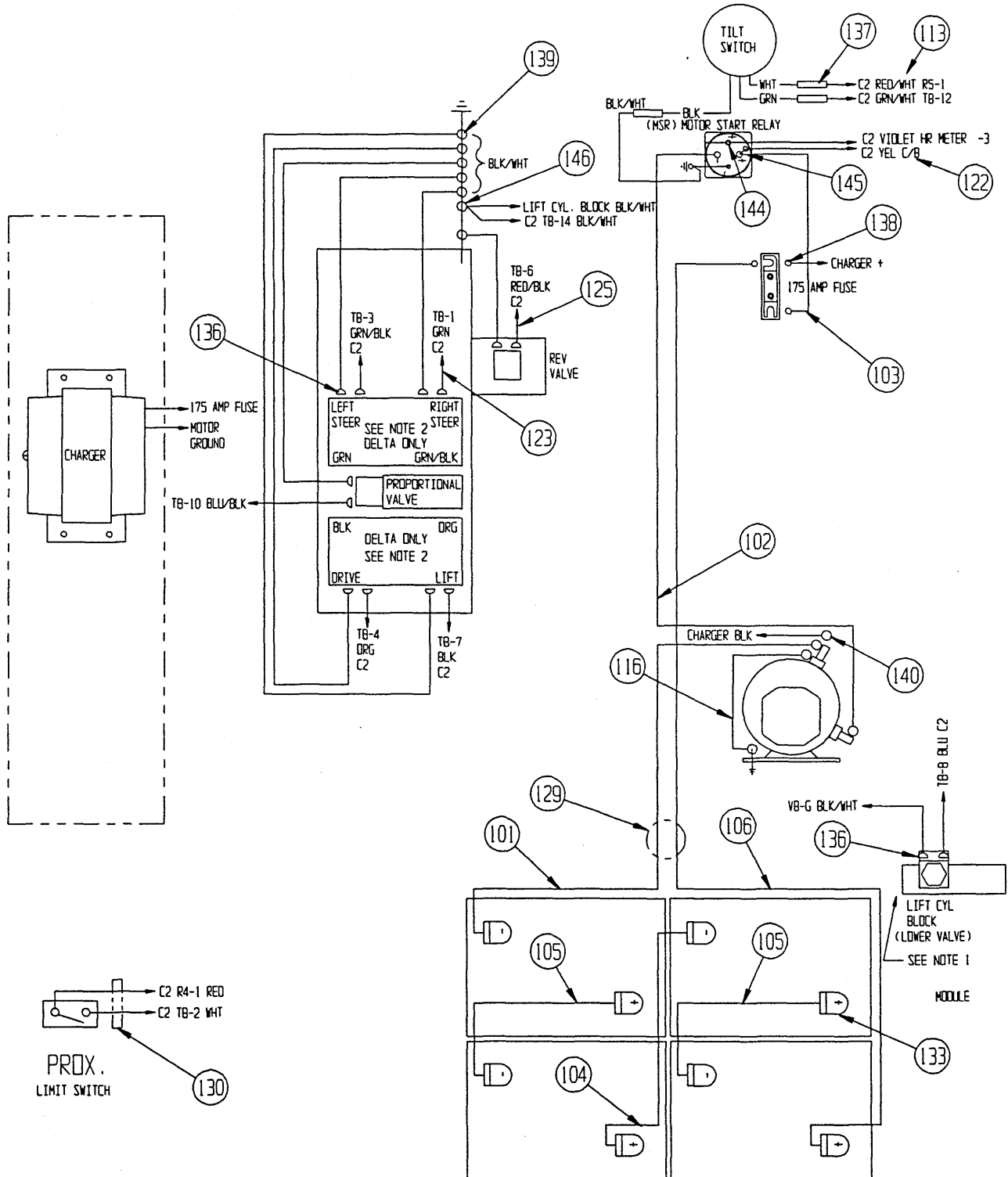
**FINAL ASSEMBLY, MAST LIFT  
TM12 EUROPEAN  
DRAWING 1 OF 4**

FINAL ASSEMBLY, MAST LIFT  
 TM12 EUROPEAN, DRAWING 2&3 OF 4  
 65400-002

ITEM	PART	DESCRIPTION	QTY.
101	62125-048	Battery Cable Assy., 5/16 - 3/8 x 50	1
102	62125-021	Battery Cable Assy., 5/16 - 3/8 x 21	1
103	64195-006	Battery Cable Assy., 5/16 - 5/16 x 6	1
104	64195-014	Battery Cable Assy., 5/16 - 5/16 x 14	1
105	64195-008	Battery Cable Assy., 5/16 - 5/16 x 8	2
106	64195-057	Battery Cable Assy., 5/16 - 5/16 x 57	1
107	29450-099	Wire, 16 AWG Blu	6.9Ft
108	29451-099	Wire, 16 AWG Wht	8.9Ft
109	29452-099	Wire, 16 AWG Blk	5.5Ft
110	29454-099	Wire, 16 AWG Red	4.4Ft
111	29455-099	Wire, 16 AWG Brn	7.8Ft
112	29479-099	Wire, 16 AWG Wht/Blk	1Ft
113	29483-099	Wire, 16 AWG Red/Wht	4.7Ft
115	62125-007	Wire, 16 AWG Blk/Wht	7.8Ft
116	62125-007	Battery Cable Assy., 5/16 - 3/8 x 10	1
117	64056-010	Fanning Strip Assy.	1
119	29453-099	Wire, 16 AWG Org	4.8Ft
120	05487-099	Wire, 16 AWG Violet	6.6Ft
121	29482-099	Wire, 16 AWG Grn/Wht	3.7Ft
122	29456-099	Wire, 16 AWG Yel	2.8Ft
123	29457-099	Wire, 16 AWG Grn	3.8Ft
124	29475-099	Wire, 16 AWG Blu/Blk	3.7Ft
125	29478-099	Wire, 16 AWG Red/Blk	5.8Ft
129	13919-010	Clamp	1
130	11868-021	Bushing, Snap	2
133	10154-000	Cover, Battery Term.	8
134	29601-013	Conn., Ring, #10 16-14	10
135	29610-001	Conn., Fork, #6 22-18	30
136	29931-003	Conn., FM Push, .25 16-14	34
137	29620-002	Conn., Butt, 16-14	7
138	29601-039	Conn., Ring, 5/16 12-10	1
139	29601-014	Conn., Ring, 1/4 16-14	8
140	29601-021	Conn., Ring, 3/8 12-10	8
142	65409-001	Control Cable Assy.	REF
144	29601-019	Conn., Ring, 12-10 x #10	1
145	29601-040	Conn., Ring, 16-14 x 5/16	1
146	29601-020	Conn., Ring, 12-10 x 1/4	1



# Illustrated Parts Breakdown



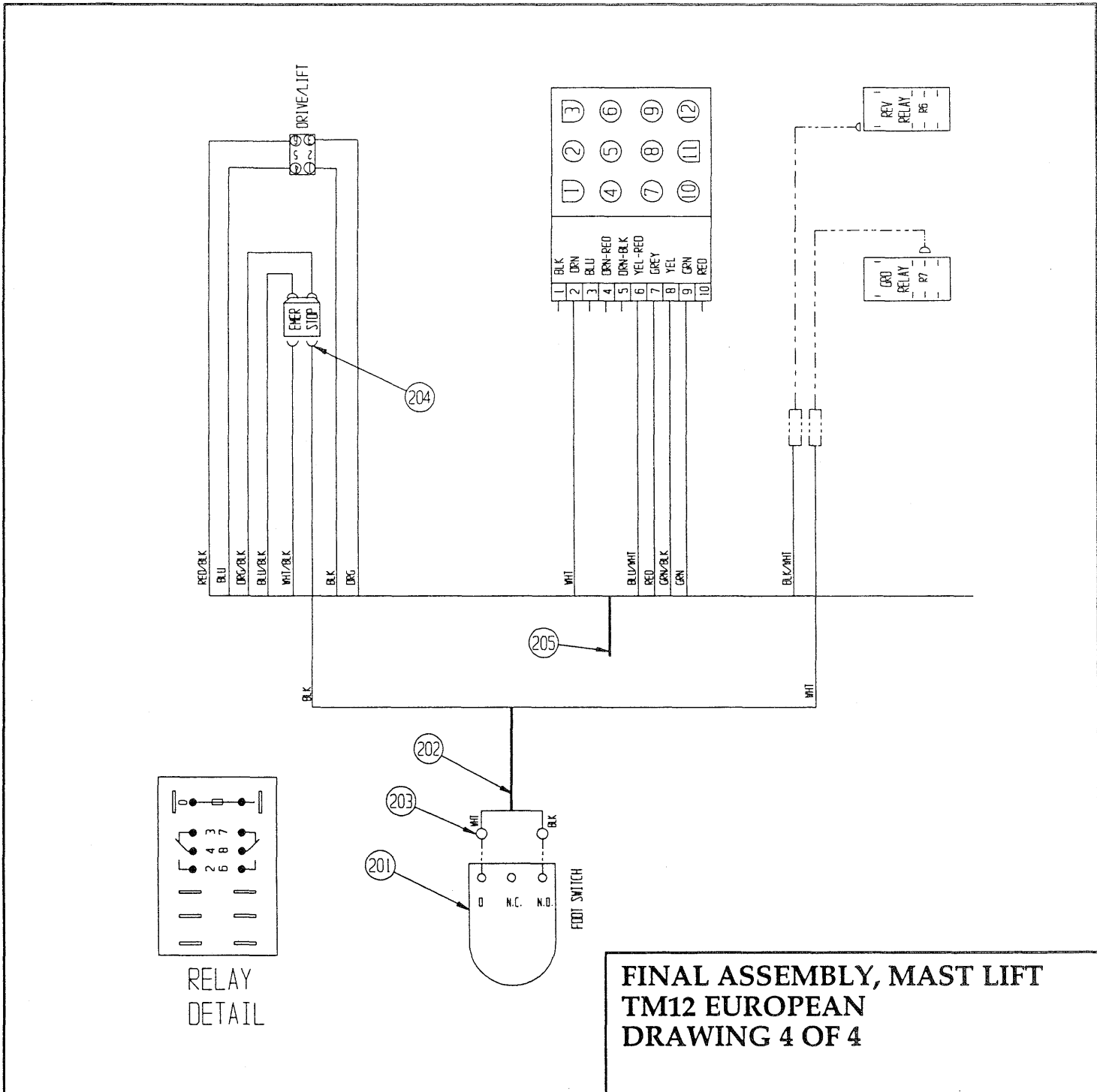
**FINAL ASSEMBLY, MAST LIFT  
TM12 EUROPEAN  
DRAWING 2 OF 4**



# Illustrated Parts Breakdown

FINAL ASSEMBLY, MAST LIFT  
 TM12 EUROPEAN, DRAWING 4 OF 4  
 65400-002

ITEM	PART	DESCRIPTION	QTY.
201	63906-000	Foot Switch	Ref
202	29490-099	Wire, 16 AWG 2 Cond.	Ref
203	29601-013	Conn., Ring, 16-14 x #10	2
204	29610-006	Conn., Fork, 16-14 x #6	1
205	65409-001	Control Cable Assy.	Ref

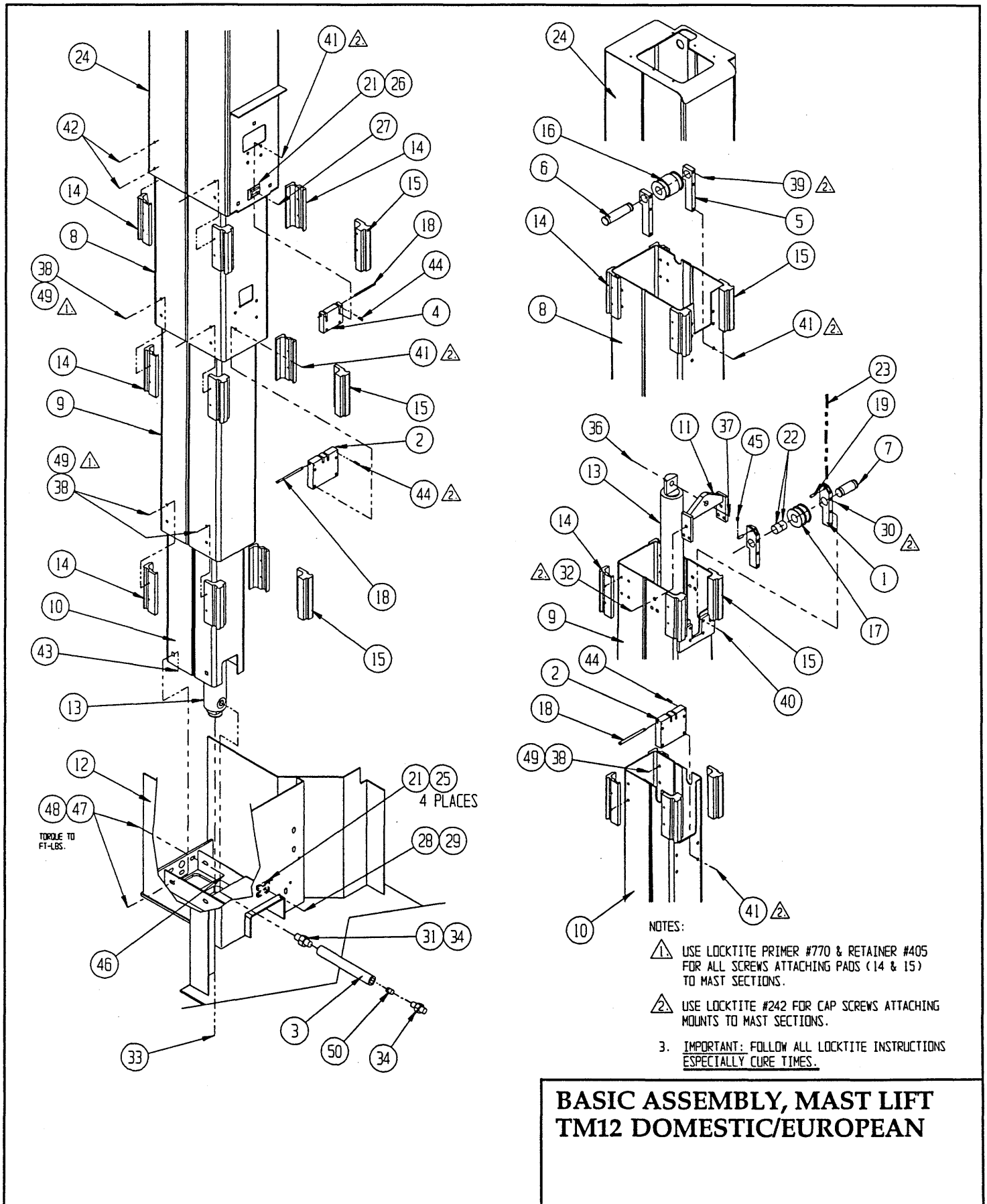


**BASIC ASSEMBLY, MAST LIFT**  
**TM12 DOMESTIC/EUROPEAN**  
 65401-001

ITEM	PART	DESCRIPTION	QTY.
1	65562-001	Inner Mount	2
2	65561-001	Anchor Inner	2
3	65552-000	Adapter	1
4	65542-001	Outer Anchor	1
5	65540-000	Outer Mount	2
6	65539-001	Outer Axle	1
7	65538-001	Inner Axle	1
8	65491-001	Second Inner Mast Weldment	1
9	65488-001	Lower Inner Mast Weldment	1
10	65485-001	Base Mast Weldment	1
11	65450-001	Cyl. Bar & Pad Weldment	1
12	65402-001	Chassis Assy.	1
13	65398-000	Lift Cylinder	1
14	65389-000	Front Pad	12
15	65388-000	Rear Pad	12
16	65387-001	Pulley, Outer	1
17	65386-001	Pulley, Inner	1
18	65383-001	Pin	3
19	65382-001	Anchor Pin	2
21	65519-000	Switch Pad	5
22	62642-019	Bearing, 7/8 ID x 3/4 LG	2
23	62167-103	Chain, Leaf	4
24	65580-000	Platform Weldment	Ref
25	65373-001	Switch Sensor	1
26	65373-002	Switch Actuator	1

ITEM	PART	DESCRIPTION	QTY.
27	26551-005	Pop Rivet, 1/8 x 1/4 Grip	2
28	11721-006	Screw, #4-40 UNC Rd Hd x 3/4	2
29	11248-049	Locknut, #4-40 UNC Hex	2
30	12553-012	Screw, 1/4-20 UNC Soc Hd x 1 1/2	2
31	11979-006	O-Ring	1
32	11253-004	Screw, 5/16-18 UNC HHC x 1/2	6
33	13315-009	Ring, Retaining	1
34	11941-009	Fitting, Str	2
36	11248-008	Locknut, 1/2-13 UNC Hex	1
37	11256-016	Screw, 1/2-13 UNC HHC x 2	1
38	13923-004	Screw, #10-ABHWH x 1/2	44
39	12553-010	Screw, 1/4-20 UNC Soc Hd x 1 1/4	2
40	12553-008	Screw, 1/4-20 UNC Soc Hd x 1	4
41	12553-006	Screw, 1/4-20 UNC Soc Hd x 3/4	18
42	26553-001	Pop Rivet, 3/16 x 1/8 Grip	4
43	11830-006	Carriage Bolt, 5/16-18 UNC x 3/4	4
44	11735-006	Roll Pin, 1/8 x 3/4	6
45	11751-006	Cotter Pin, 1/16 x 3/4	4
46	11830-008	Carriage Bolt, 5/16-18 x 1	3
47	11248-005	Locknut, 5/16-18 UNC	7
48	11240-005	Washer, 5/16 Std Flat	7
49	13949-003	Washer, #10 Ext. Star	44
50	63096-010	Fuse, Velocity	1

# Illustrated Parts Breakdown



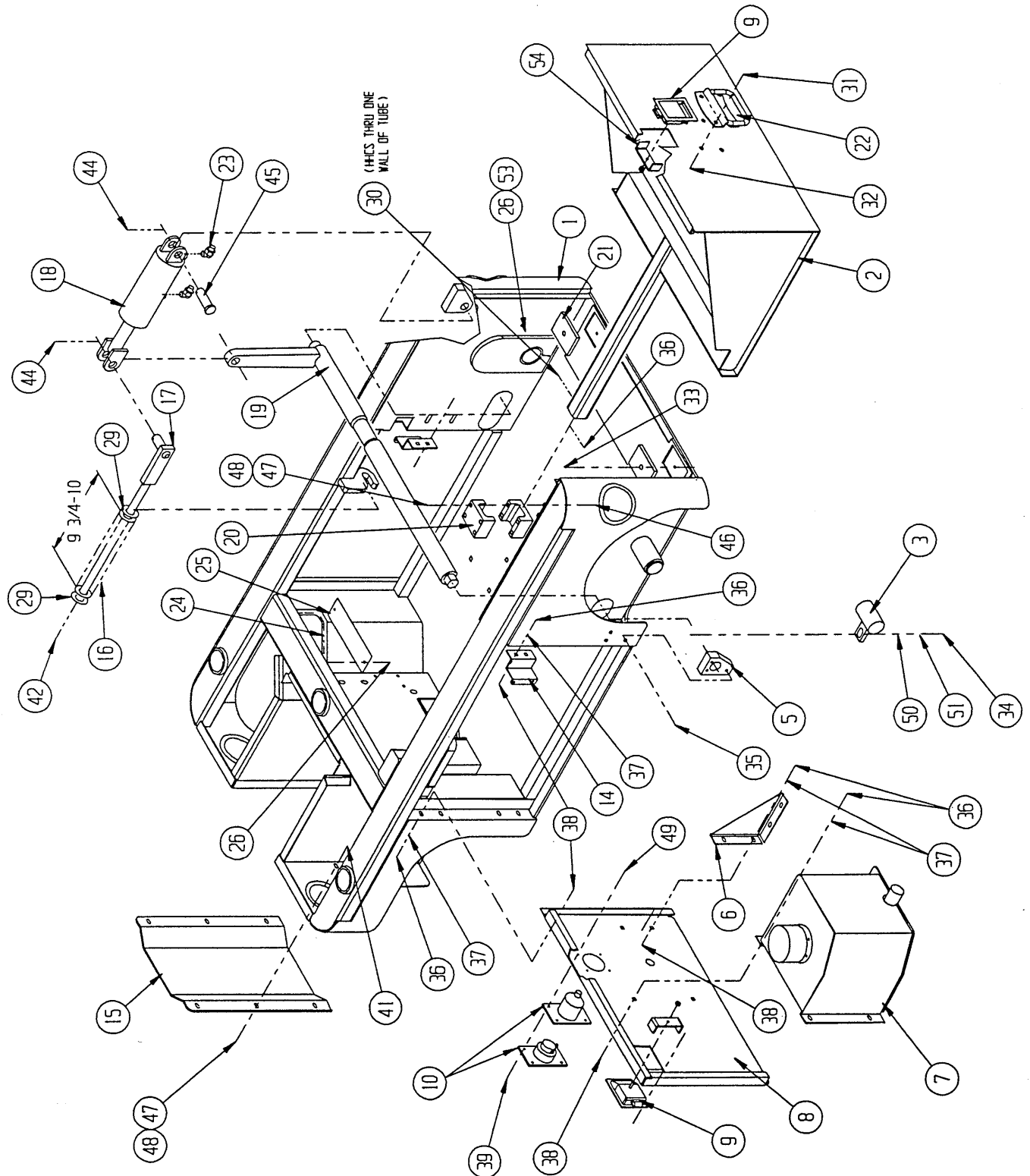
**BASIC ASSEMBLY, MAST LIFT  
TM12 DOMESTIC/EUROPEAN**

CHASSIS ASSEMBLY  
 TM12 DOM/EURO, DRAWING 1 OF 3  
 65402-001

ITEM	PART	DESCRIPTION	QTY.
1	65420-001	Chassis Weldment	1
2	65465-000	Battery Pan Weldment	1
3	65472-000	Pressure Mount Weldment	2
5	65384-000	Brake Bearing	2
6	65531-000	Charger Mount	1
7	65407-000	Hydraulic Tank Assy.	1
8	65480-001	Door Panel Weldment, L.H.	1
9	65395-000	Latch, Door	2
10	08942-002	Plug w/Rubber Boot	1
14	65537-000	Catch	2
15	65532-000	Front Cover	1
16	10121-010	Spring, Compression	1
17	65474-000	Tension Bar Weldment	1
18	65397-000	Cylinder, Steer/Brake	1
*	65397-010	Seal Kit, Steer/Brake Cylinder	1
19	65469-000	Brake Actuator Weldment	1
20	65385-000	Guide Pad	2
21	65380-000	Slide Pad	2
22	26541-016	Handle	1
23	11932-001	Fitting, 45°	2
24	61796-099	Grommet (Edging)	1.33
25	65656-000	Wear Pad	2
26	26553-002	Rivet, 3/16 x .120-.250 Grip	5
29	14996-010	Washer, 5/8 SAE	2
30	11252-006	Screw, HHC 1/4-20 UNC x 3/4	1
31	64397-003	Nut, Acorn 10-24 NC	4
32	11709-004	Screw, Mach Rd Hd 10-24 UNC x 1/2	4
33	26553-006	Rivet, 3/16 .376-.500	2
34	11256-012	Screw, HHC 1/2-13 UNC x 1 1/2	2
35	14066-006	Screw, 1/4 AB x 3/4	6
36	11248-004	Nut, Hex 1/4-20 UNC	15
37	11240-004	Washer, Flat, Std 1/4	14
38	11829-006	Carriage Bolt, 1/4-20 UNC x 3/4	14
39	11715-006	Screw, Mach Rd Hd 6-32 UNC x 3/4	4
41	11830-006	Carriage Bolt, 5/16-18 x 3/4	6
42	11248-010	Nut, Hex 5/8-11 UNC	1
44	11753-010	Cotter Pin	2
45	11848-041	Pin, 3/4 Pivot	1
46	11830-026	Carriage Bolt, 5/16-18 x 3 1/4	4
47	11248-005	Nut, Hex 5/16-18 UNC	10
48	11240-005	Washer, Flat, Std 5/16	10
49	11248-047	Nut, Hex 6-32 UNC	4
50	11240-008	Washer, 1/2 Std Flat	2
51	11238-008	Washer, 1/2 Split Lock	2
53	29918-010	Tie Wrap	1
54	65352-000	Latch, Battery Channel	1

\*Not Shown

# Illustrated Parts Breakdown



**CHASSIS ASSEMBLY  
DRAWING 1 OF 3**

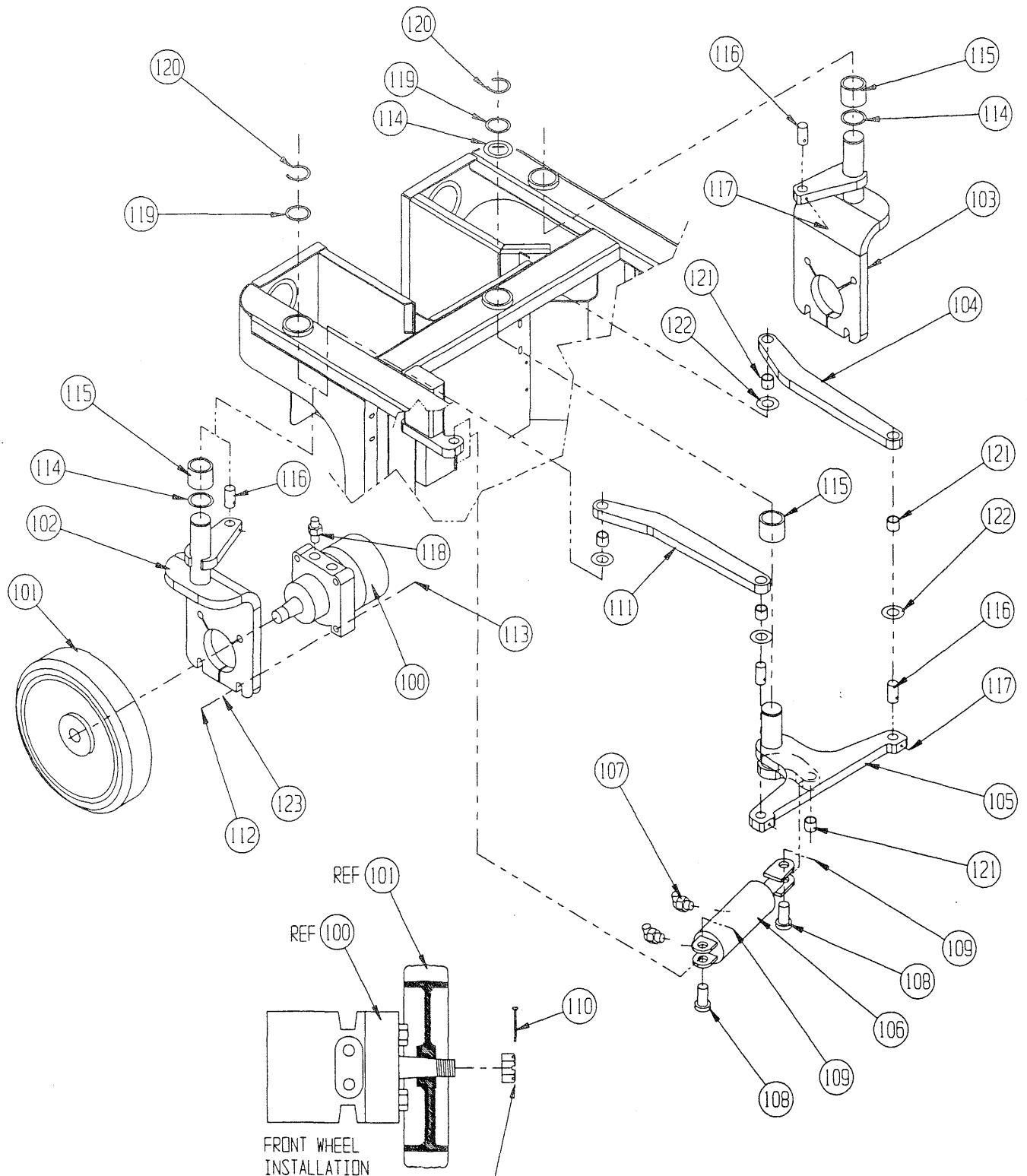
CHASSIS ASSEMBLY  
 TM12 DOM/EURO, DRAWING 2 OF 3  
 65402-001

ITEM	PART	DESCRIPTION	QTY.
100	61817-002	Motor, Hydraulic	2
*	61817-010	Seal Kit, Hydraulic Motor	1
*	61817-011	Nut, Slotted	1
*	61817-015	Key, Shaft	1
101	65393-002	Wheel, Drive	2
102	65454-000	Wheel Yoke, L.H.	1
103	65453-000	Wheel Yoke, R.H.	1
104	65517-000	Steer Link, R.H.	1
105	65445-000	Bell Crank Weldment	1
106	65397-000	Cylinder, Steering/Brake	1
*	65397-010	Seal Kit, Steering/Brake Cyl.	1
107	11934-001	Fitting, 90°	2
108	11848-041	Pin, 3/4 Pivot	2
109	11753-010	Pin, Cotter, 1/8 x 1 1/4	2
110	11753-012	Pin, Cotter, 1/8 x 1 1/2	2
111	65518-000	Steer Link, L.H.	1
112	11256-026	Screw, HHC GR5 1/2-13 UNC x 3 1/4	8
113	11248-008	Nut, Hex 1/2-13 UNC	8
114	10092-011	Washer, Thrust 1 1/2	3
115	27931-068	Bearing, 1 1/2	3
116	65534-000	Steer Pin	4
117	11736-012	Roll Pin, 3/16 Dia. x 1 1/2	4
118	11941-013	Fitting, Straight	4
119	11786-007	Bushing, Machine 1 1/2 I.D.	3
120	13315-009	Retaining Ring	3
121	27931-022	Bearing, 3/4 I.D.	5
122	10092-005	Washer, Thrust 3/4 I.D.	4
123	11240-008	Washer, Flat Std 1/2	8

\*Not Shown



# Illustrated Parts Breakdown



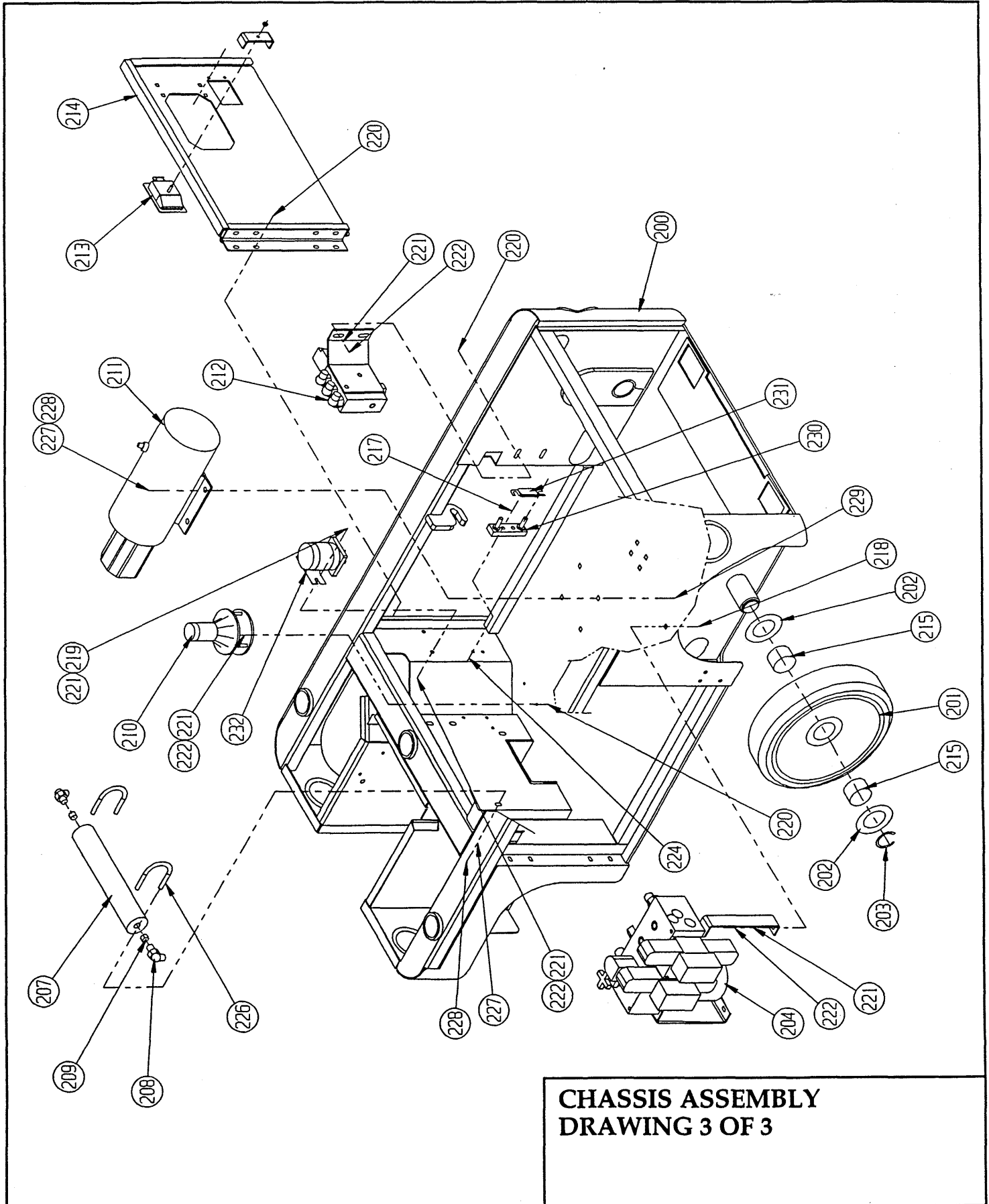
CLEAN MOTOR SHAFT AND HUB BORE.  
LUBRICATE NUT FACE AND THREADS.  
TORQUE SLOTTED NUT TO 75 ±5 FT LBS  
BOTH WHEELS.

**CHASSIS ASSEMBLY  
DRAWING 2 OF 3**

CHASSIS ASSEMBLY  
 TM12 DOM/EURO, DRAWING 3 OF 3  
 65402-001

ITEM	PART	DESCRIPTION	QTY.
200	65420-001	Chassis Weldment	Ref
201	65392-002	Wheel, Idler	2
202	11786-014	Bushing, Machine 1 3/4 I.D..	4
203	13315-009	Retaining Ring, 1 1/2	2
204	65404-001	Control Valve Assembly	1
207	65396-000	Cylinder, Cushion	1
208	11934-003	Fitting, 90°	2
209	65556-000	Orifice	2
210	29945-011	Level Sensor	1
211	15797-000	Power Unit	1
-	15797-010	Pump	1
-	15797-011	Motor	1
*	10145-001	Brushes (8), Motor	1
212	65405-002	Cylinder Valve Assembly	1
213	65395-000	Latch	1
214	65483-000	Door Panel Weldment, R.H.	1
215	27931-069	Bearing, 1 3/4	4
217	11709-008	Screw, 10-24 x 1	2
218	11829-008	Carriage Bolt, 1/4-24 x 1	5
219	11252-006	Screw, HHC 1/4-20 x 3/4	2
220	11829-006	Carriage Bolt, 1/4-20 x 3/4	14
221	11240-004	Washer, Flat Std 1/4	22
222	11248-004	Nut, Hex 1/4-20 UNC	22
224	11248-003	Nut, Hex 10-24 UNC	2
226	14924-007	U-Bolt	2
227	11240-005	Washer, Flat 5/16	6
228	11248-005	Nut, Hex 5/16-18	6
229	11830-008	Carriage Bolt, 5/16-18 x 1	4
230	10149-000	Fuse Block	1
231	10148-001	Fuse	1
232	10122-000	Relay	1

# Illustrated Parts Breakdown



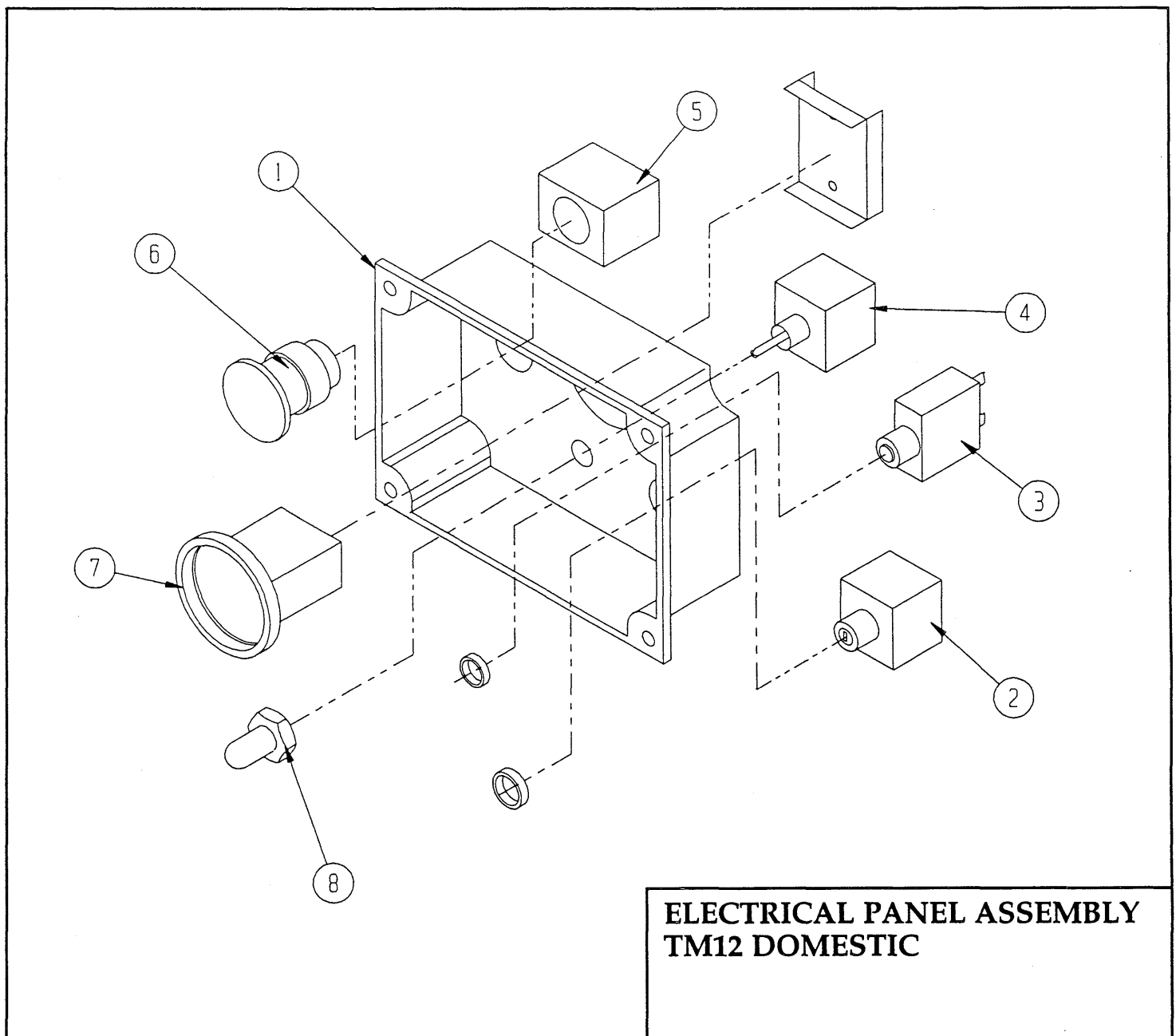
**CHASSIS ASSEMBLY  
DRAWING 3 OF 3**

# Illustrated Parts Breakdown

**ELECTRICAL PANEL ASSEMBLY  
TM12 DOMESTIC  
65403-001**

ITEM	PART	DESCRIPTION	QTY.
1	65550-001	Switch Box	1
2	10155-000	Switch, Key Selector	1
*	10155-001	Key	1
3	29868-007	Circuit Breaker	1
4	12798-001	Switch, Toggle SPDT	1
5	63667-002	Switch Contact Block	1
6	63667-001	Switch Head, Mushroom	1
7	15752-000	Hour Meter	1
8	29872-000	Boot, Switch Cover	1

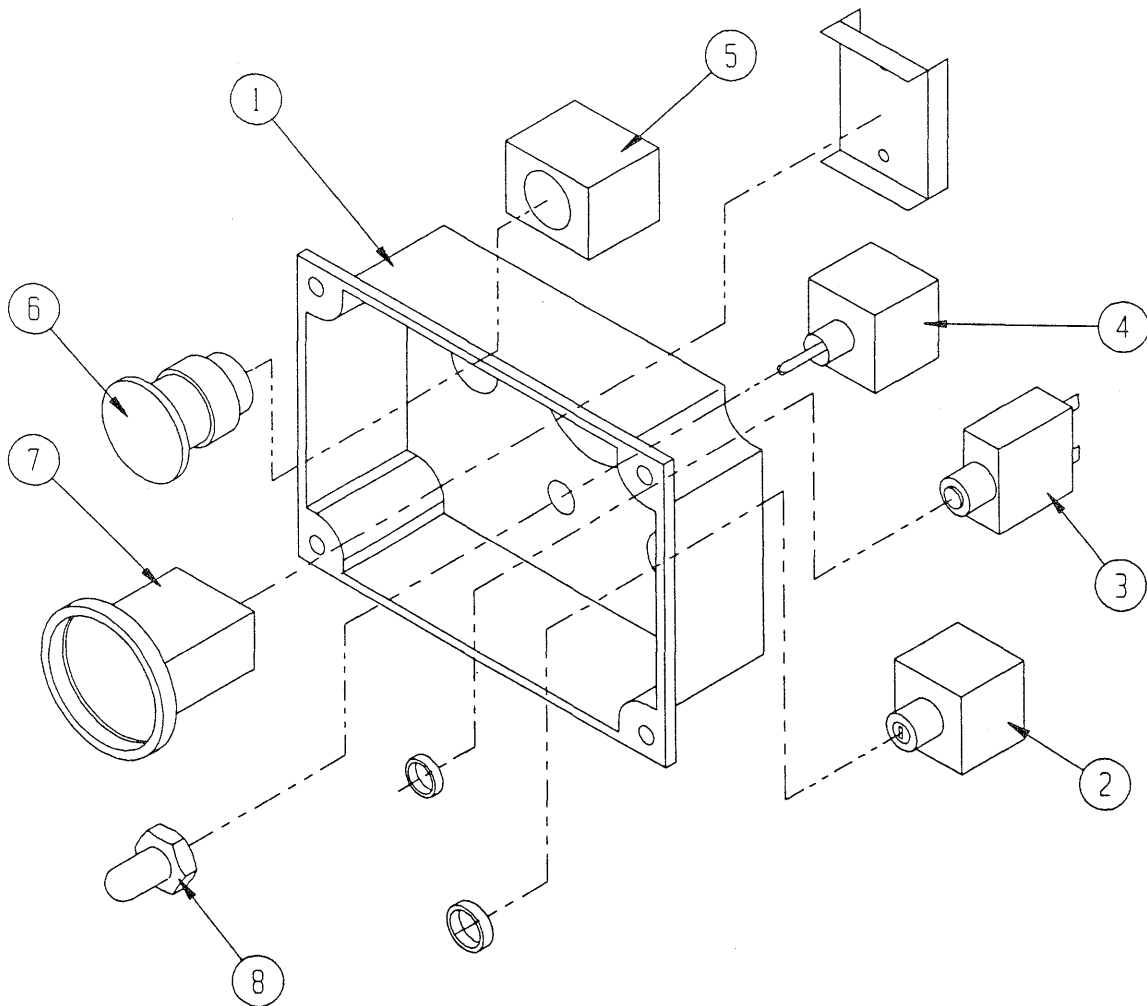
\*Not Shown



# Illustrated Parts Breakdown

## ELECTRICAL PANEL ASSEMBLY TM12 EUROPEAN 65403-002

ITEM	PART	DESCRIPTION	QTY.
1	65550-001	Switch Box	1
2	10155-000	Switch, Key Selector	1
-	10155-001	Key	1
3	29868-007	Circuit Breaker	1
4	12798-001	Switch, Toggle SPDT	1
5	63667-002	Switch Contact Block	1
6	63667-001	Switch Head, Mushroom	1
7	29959-000	Hour Meter / Low Voltage Indicator	1
8	29872-000	Boot, Switch Cover	1



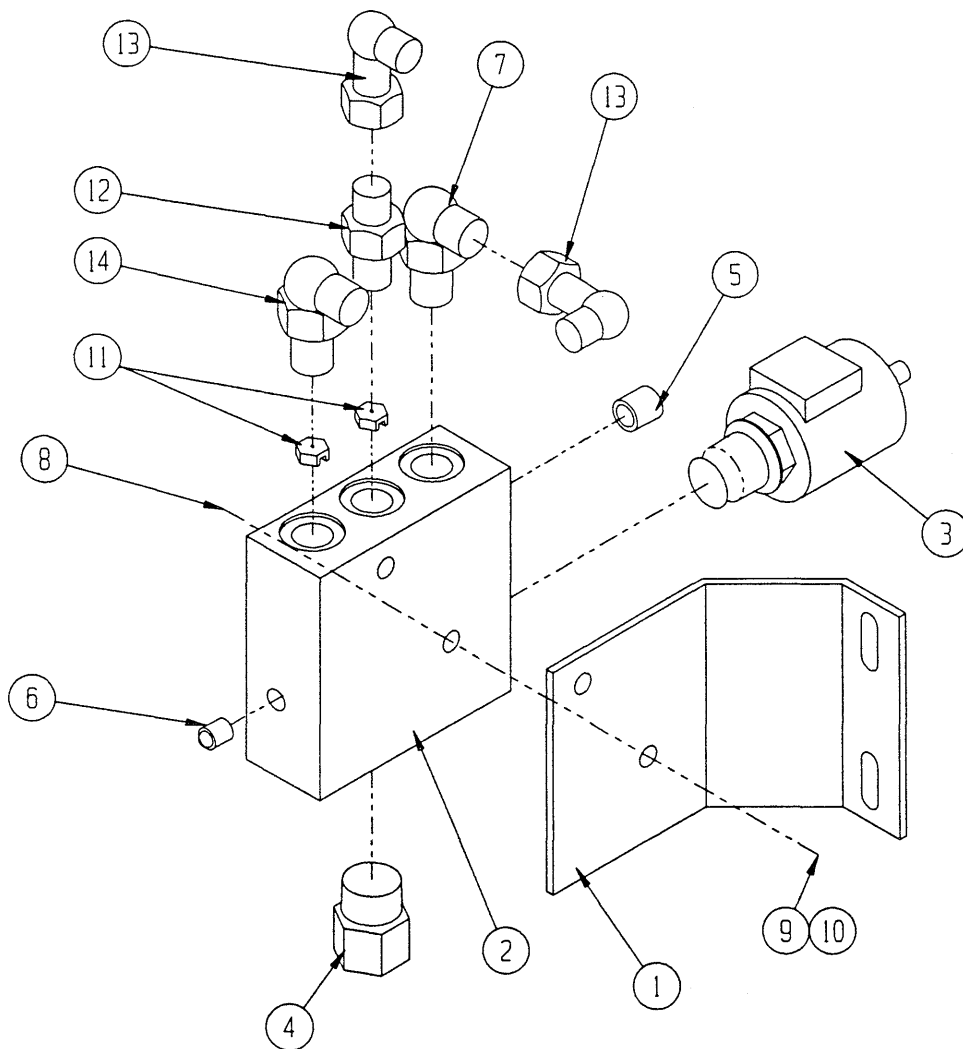
**ELECTRICAL PANEL ASSEMBLY  
TM12 EUROPEAN**

# Illustrated Parts Breakdown

## CYLINDER VALVE ASSEMBLY TM12 DOMESTIC/EUROPEAN 65405-002

ITEM	PART	DESCRIPTION	QTY.
1	65546-000	Down Valve Bracket	1
2	65545-000	Valve Block	1
3	63925-002	Valve Sol, 24 VDC	1
4	63924-005	Valve, Flow Control, 1 GPM	1
5	11920-002	Plug, Soc. Hd. 1/4-18 NPTF	1
6	63977-001	Plug, 9mm	1
7	11934-004	Fitting, 90°	1
8	11253-018	Screw, 5/16-18 HHC x 2 1/4	2

ITEM	PART	DESCRIPTION	QTY.
9	11240-005	Washer, Flat Std 5/16	2
10	11248-005	Nut, Hex 5/16-18	2
11	15919-000	Orifice	2
12	11941-005	Fitting, Str	1
13	11937-003	Fitting, 90°	2
14	11934-003	Fitting, 90°	1

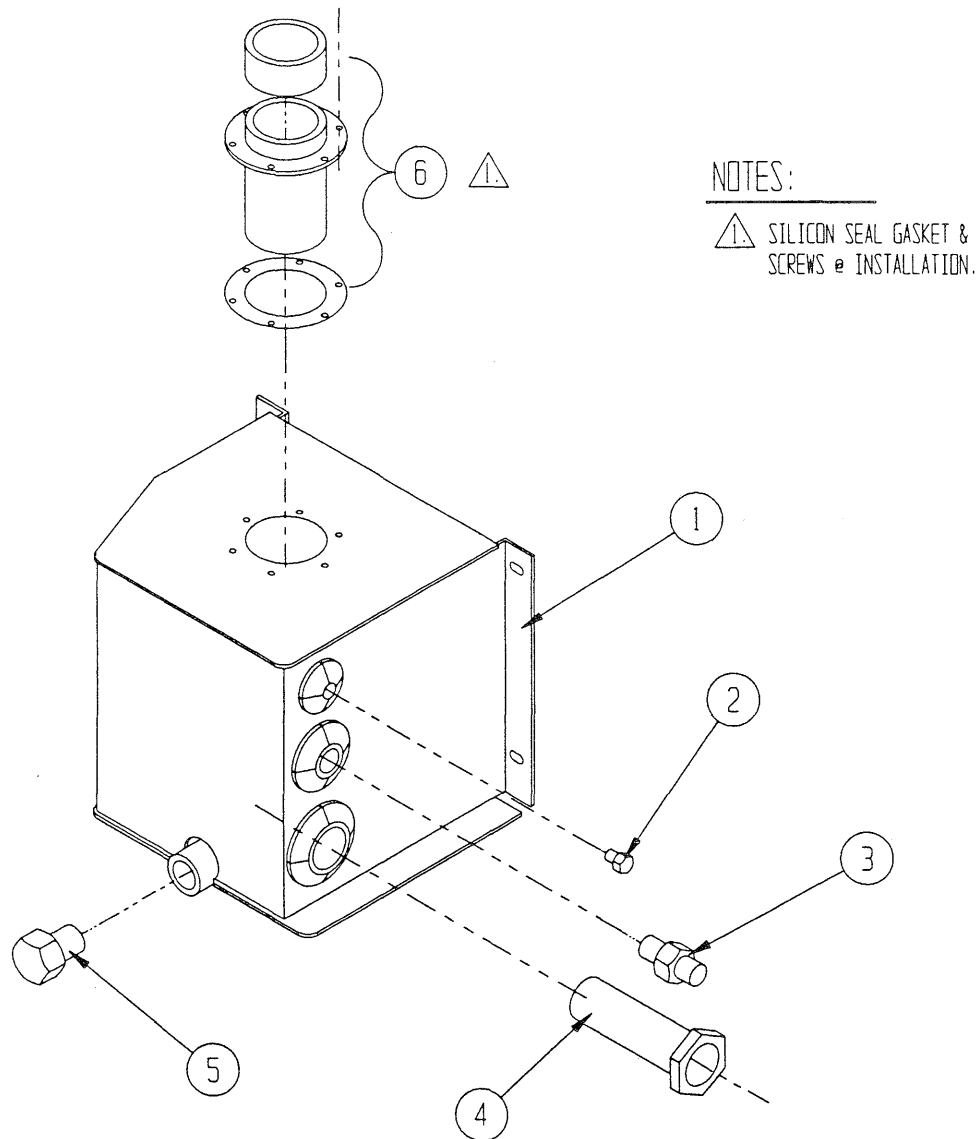


**CYLINDER VALVE ASSEMBLY  
TM12 DOMESTIC/EUROPEAN**

# Illustrated Parts Breakdown

## HYDRAULIC TANK ASSEMBLY TM12 DOMESTIC/EUROPEAN 65407-000

ITEM	PART	DESCRIPTION	QTY.
1	65476-000	Tank Weldment	1
2	11920-002	Plug, Pipe, Soc Hd 1/4-18 NPTF	1
3	11939-015	Fitting	1
4	61818-000	Suction Screen/Fitting	1
5	21305-006	Plug, Magnetic	1
6	05963-001	Filler/Breather	1



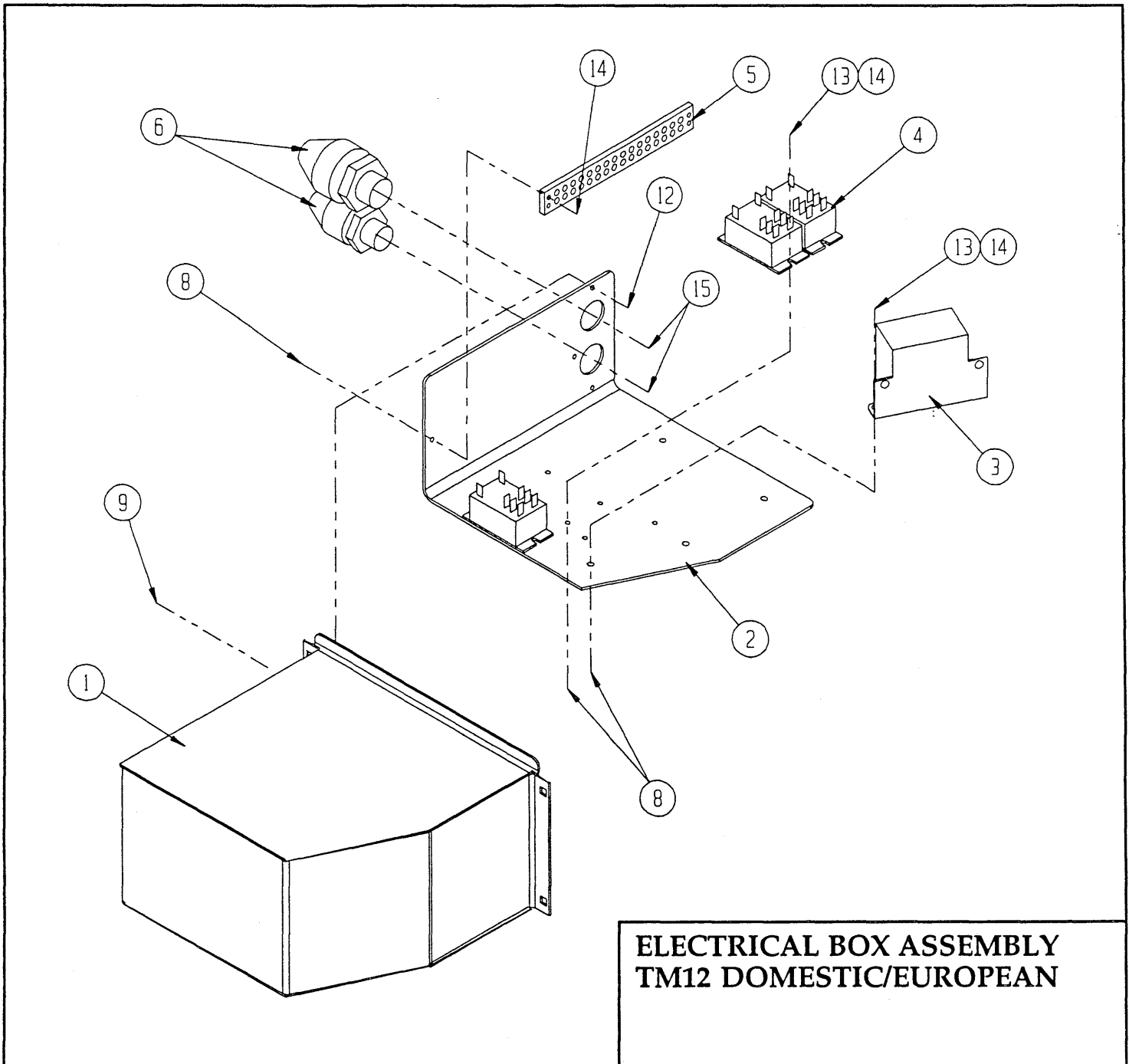
**HYDRAULIC TANK ASSEMBLY  
TM12 DOMESTIC/EUROPEAN**

# Illustrated Parts Breakdown

## ELECTRICAL BOX ASSEMBLY TM12 DOMESTIC/EUROPEAN 65408-000

ITEM	PART	DESCRIPTION	QTY.
1	65457-000	Box, Electrical, Weldment	1
2	65551-000	Plate, Electrical Box	1
3	63778-000	Alarm, 12-24 VDC	1
4	29863-009	Relay, 24 VDC	3
5	29928-006	Terminal Block	1
6	29925-001	Connector, Cable 9/16	2
8	62734-006	Screw, FLTHD 6-32 x 3/4	10
9	11709-003	Screw, RD HD 10-24 x 3/8	2

ITEM	PART	DESCRIPTION	QTY.
12	11250-003	Nut, #10-24	2
13	11240-001	Washer, Flat #6 STD	8
14	11248-047	Nut, #6-32	10
15	29939-003	Locknut, Conduit 3/4	2





# Illustrated Parts Breakdown

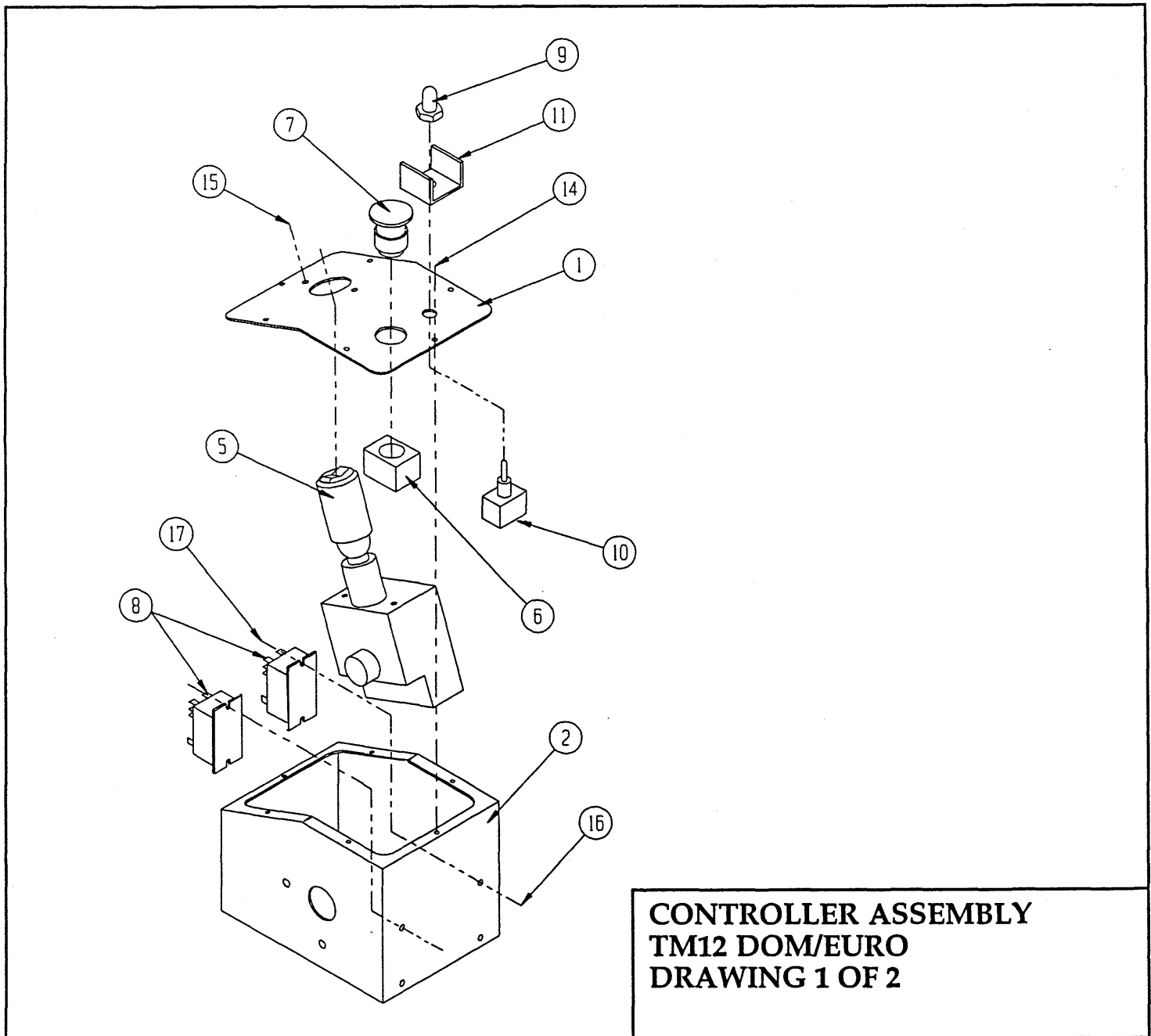
Section  
7.2

## CONTROLLER ASSEMBLY TM12 DOM/EURO, DRAWING 1 OF 2 65410-001

ITEM	PART	DESCRIPTION	QTY.
1	65597-001	Control Cover	1
2	65594-000	Controller Weldment	1
5	63975-000	Controller, Joystick	1
*	08686-003	Switch, Steering	2
*	63953-001	Boot, Steering Switch	1
*	63953-002	Boot, Controller Shaft	1
*	63975-003	Circuit Board, Controller	1
*	63975-004	Gear/Pot Assy., Controller	1
6	63667-003	Contact Block	1

ITEM	PART	DESCRIPTION	QTY.
7	63667-001	Push Button	1
8	29863-009	Relay	2
9	29872-000	Boot	1
10	15941-001	Switch, Toggle	1
11	08271-000	Switch, Guard	1
14	11826-004	Screw, 10-32 SLFTP x 1/2	6
15	11811-006	Screw, 10-32 SLFTP x 3/4	2
16	11715-004	Screw, 6-32 Mach Rd Hd x 1/2	4
17	11248-047	Locknut, 6-32 Hex	4

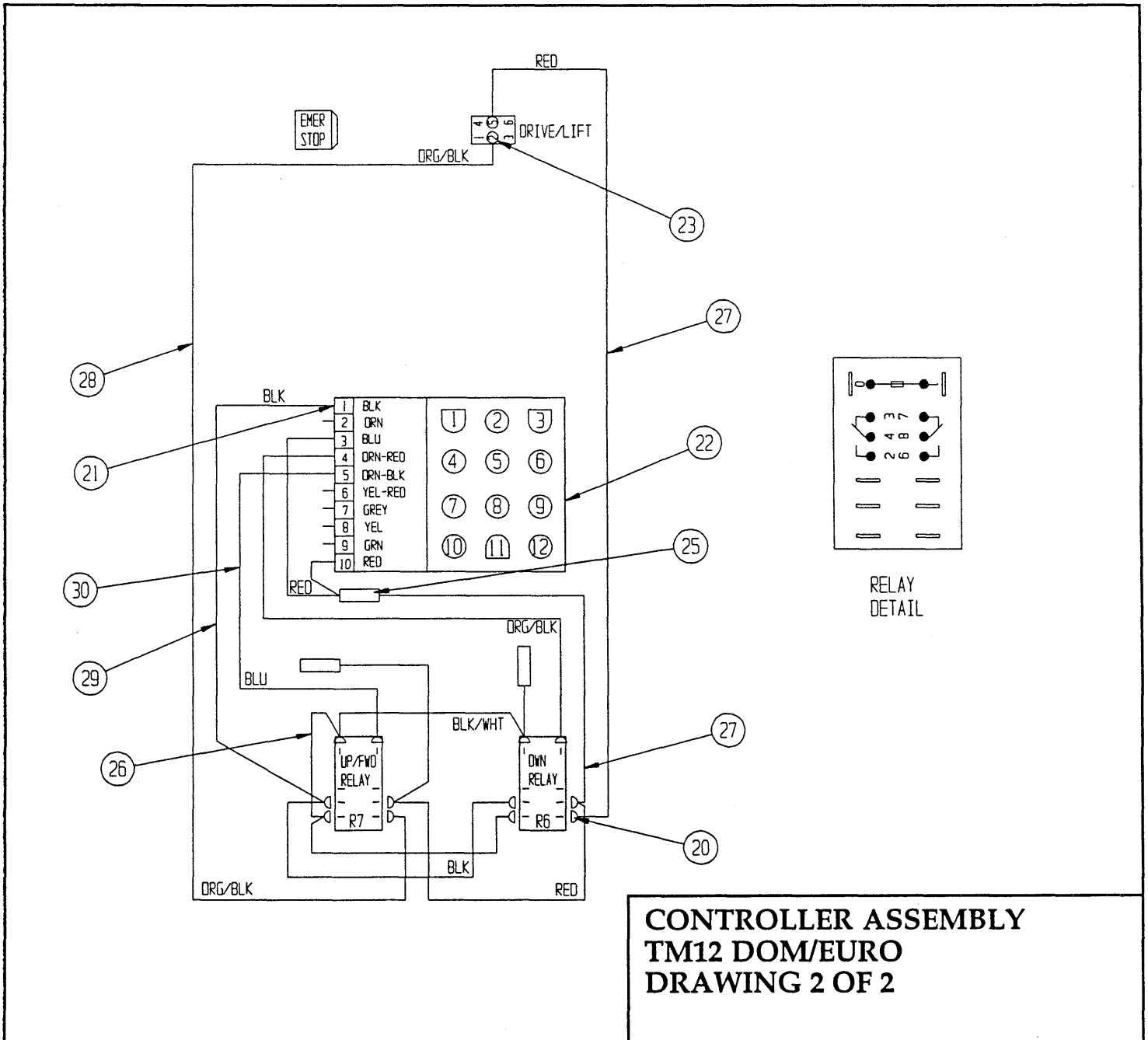
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# Illustrated Parts Breakdown

## CONTROLLER ASSEMBLY TM12 DOM/EURO, DRAWING 2 OF 2 65408-000

ITEM	PART	DESCRIPTION	QTY.
20	29931-003	Conn, FM Push 16-14 x .25	12
21	63956-002	Pin	5
22	63956-003	Plug Conn.	1
23	29601-013	Conn., Ring 16-14 x #10	2
25	29620-003	Conn., Butt 16-14	3
26	63574-099	Wire, 16 AWG Blk/Wht	2Ft
27	29454-099	Wire, 16 AWG Red	1.5Ft
28	29477-099	Wire, 16 AWG Org/Blk	.5Ft
29	29452-099	Wire, 16 AWG Blk	2Ft
30	29450-099	Wire, 16 AWG Blu	1Ft



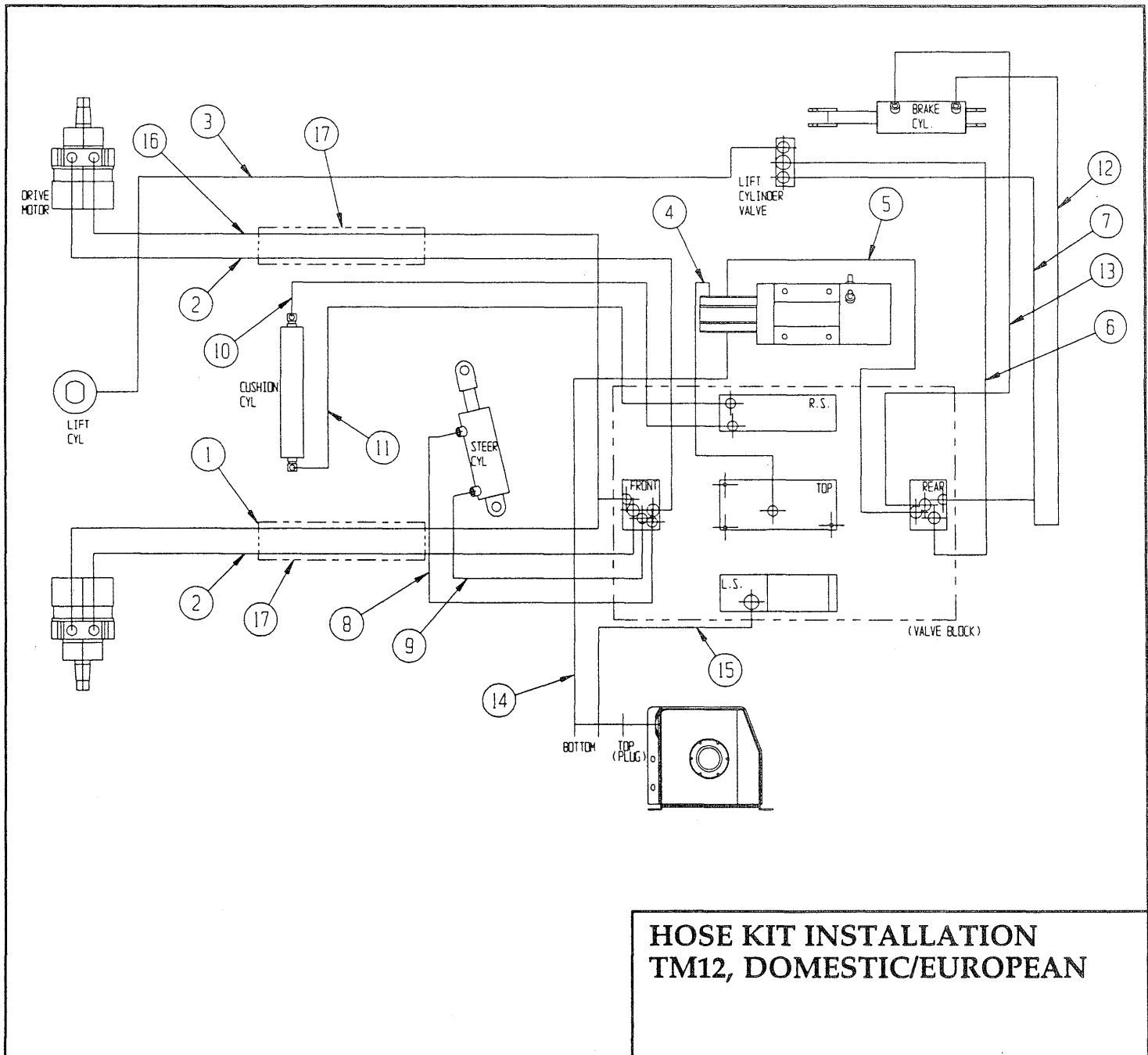
# Illustrated Parts Breakdown

Section  
7.2

## HOSE KIT INSTALLATION TM12 DOMESTIC/EUROPEAN 65411-001

ITEM	PART	DESCRIPTION	QTY.
1	65419-029	Hose Assy., 1/4 X 29	1
2	65419-027	Hose Assy., 1/4 X 27	2
3	65375-000	Cylinder Tube Assy., (Steel) 3/8 Dia.	Ref
4	60861-018	Hose Assy., 3/8 X 18	1
5	60861-063	Hose Assy., 3/8 X 25	1
6	60861-021	Hose Assy., 3/8 X 12	1
7	61351-042	Hose Assy., 1/8 X 10	1
8	61351-043	Hose Assy., 1/8 X 11	1
9	61351-044	Hose Assy., 1/8 X 12	1

ITEM	PART	DESCRIPTION	QTY.
10	61351-045	Hose Assy., 1/8 X 13	1
11	61351-046	Hose Assy., 1/8 X 17	1
12	61351-022	Hose Assy., 1/8 X 30	1
13	61351-047	Hose Assy., 1/8 X 34	1
14	61789-028	Hose Assy., 3/4 X 28	1
15	64156-038	Hose Assy., 1/2 X 25	1
16	65419-023	Hose Assy., 1/4 x 23	1
17	65369-099	Hose Guard, Nylon x 18"	Ref

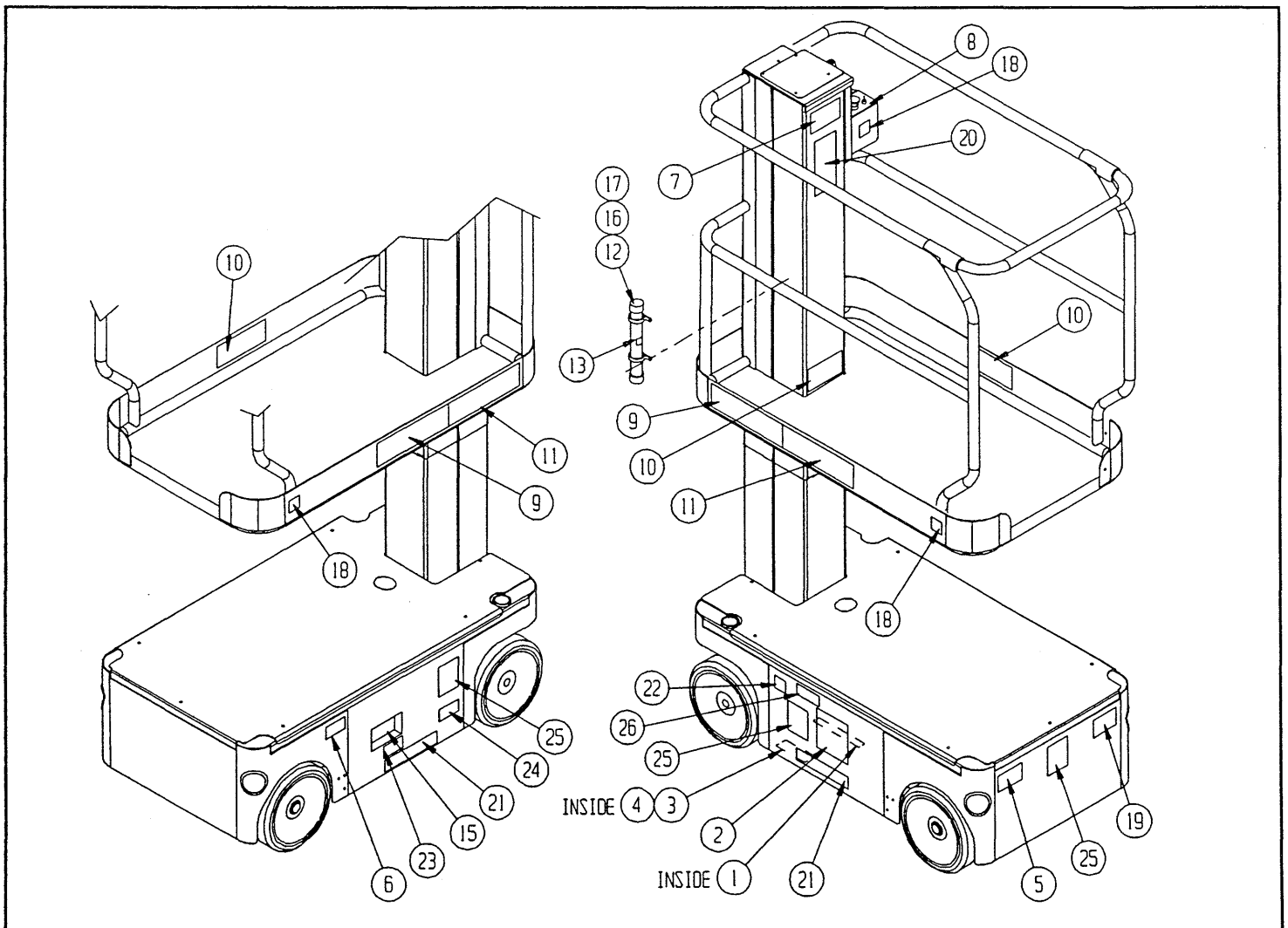


# Illustrated Parts Breakdown

## LABEL KIT TM12, DOMESTIC/EUROPEAN 65412-001

ITEM	PART	DESCRIPTION	QTY.
1	60197-000	Label, Hydraulic Oil	1
2	61214-000	Label, Hydrogen Gas	1
3	61205-000	Name Plate	1
4	65368-000	Tack	4
5	05221-000	Label, Battery Fluid	1
6	05223-000	Label, Emergency Down	1
7	61831-000	Label, Before Operating	1
8	65567-000	Label, Controller	1
9	61683-003	Label, UpRight	2
10	08442-005	Label, Max. Load 500 lbs.	3
11	61684-014	Label, TM12	2
12	65099-000	Instruction Manual Tube Assy.	1

ITEM	PART	DESCRIPTION	QTY.
13	03610-000	Label, Instruction Manual Tube	1
15	65568-000	Label, Controls	1
16	60574-000	User Manual	1
17	60577-000	ANSI Manual	1
18	64444-000	Label, USA	3
19	62562-000	Label, Batteries	1
20	61218-001	Label, Danger	1
21	14222-003-99	Label, Fork Lift	2
22	61220-001	Label, ANSI	1
23	62561-000	Label, Relief Valve	1
24	27993-000	Label, Lower Platform	1
25	66556-000	Label, Collision Hazard	3
26	66522-000	Label, Battery Charger	1



NOTE:  
1. FOR EUROPEAN UNITS INSTALL LOGO DECALS ONLY  
SHIP ALL OTHER DECALS WITH UNIT

**LABEL KIT  
TM12, DOMESTIC/EUROPEAN**

# UpRight

Call Toll Free in U.S.A.

**1-800-926-LIFT**

**UpRight, Inc.**  
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Selma, California 93662  
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FAX: 209/896-9012  
PARTSFAX: 209/896-9244

**UpRight, Europe**  
(Europe, Africa & Middle East)  
Pottery Road  
Dun Laoire, Ireland  
TEL: 353/1/285-3333  
FAX: 353/1/284-0015

**P/N 60573-000**

12/94 K