

Service Manual

MX15 and MX19 Work Platform European Specifications

Serial Numbers 20000 - Current

Publication Number: 060569-026

UpRight

MX 15/19

Serial Numbers 20000 – Current

ENGLISH

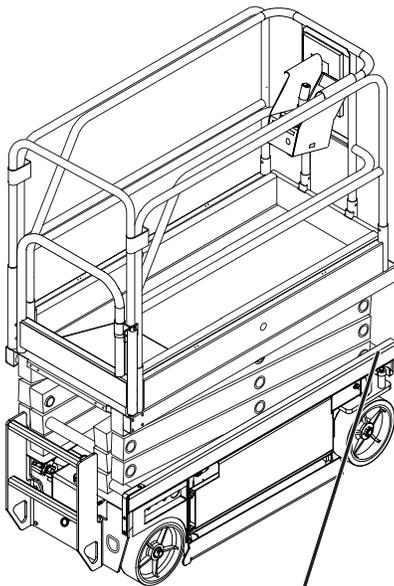
When contacting UpRight for service or parts information, be sure to include the MODEL and SERIAL NUMBERS from the equipment nameplate. Should the nameplate be missing, the SERIAL NUMBER is also stamped on top of the chassis above the front axle pivot.

FRANÇAIS

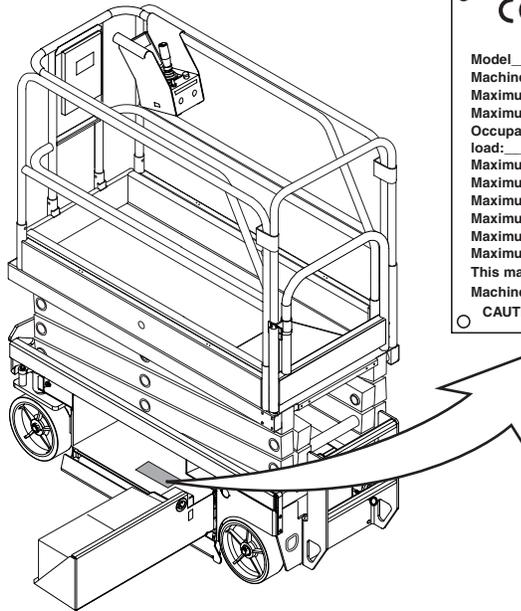
Lors des communications avec UpRight pour des informations au sujet de l'entretien ou des pièces, ne pas oublier d'inclure les NUMÉROS DE MODÈLE et de SÉRIE inscrits sur la plaque signalétique. Si la plaque signalétique manque, le NUMÉRO DE SÉRIE est également estampé sur le dessus du châssis, au-dessus de l'axe pivot avant.

DEUTSCH

Stellen Sie sicher, dass Sie die MODELL- und SERIENNUMMERN auf dem Gerätetypenschild angeben, wenn Sie sich mit UpRight bezüglich Wartungs- oder Ersatzteilm Informationen in Verbindung setzen. Sollte das Typenschild fehlen, finden Sie



Stamped Serial Number
Estampille de numéro de série
Eingestanzte Seriennummer



CE		UpRight Inc.	
1775 PARK ST. SELMA CALIFORNIA 93662 USA			
Model	Serial number:		
Machine weight	kg	Mfg. date:	
Maximum wheel load:			
Maximum allowable incline of machine when elevated:	deg.		
Occupants and equipment must not exceed the rated maximum load: kg Maximum platform occupants: N			
Maximum allowable side force on platform:	N		
Maximum platform height:	m		
Maximum platform reach:	m		
Maximum allowable wind speed:	m/s=Beaufort scale		
Maximum hydraulic system pressure:	bar		
Maximum system voltage:	Vdc		
This machine is manufactured to comply with Machinery directive 89-392/CEE			
CAUTION: CONSULT OPERATOR'S MANUAL BEFORE USE.			
091205-003			

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UpRight

EC Declaration of Conformity of Machinery
EC-Konformitätserklärung für Maschinen
Declaration De Conformite CE pour les Machines
Declaracion De Conformidad CE Para Maquinaria
Dichiarazione Di Conformità CE Per Le Macchine
CE Conformiteitsverklaring voor Machinery
EU Deklaration Avseende Överensstämelse För Maskinutrustning
EF-Samavarskerklæring For Maskiner
EU Vaatimustenmukaisuuskäytäntö
EF-Overensstemmelseserklæring for Maskiner
EU Vaatimustenmukaisuuskäytäntö

Modello
Verticaal model
Malli

MX 15/19

Serial number
Maticola
Sarajanumero

Seriennummer
Numero de serie
Maticola

20000 +

Notified body
Notifizierte Stelle
Organisme notifie
Organismo notificado
Aangemelde instantie
Myndighet
Avende harmoniserate standarder
Udpeget organ
Asiasta on tehty ilmoitus seuraaville taholle
Ente Notificatore

Technische
Dienstbier & Pix
Hundert Beete 13
D-91334 Hemhofen
DEUTSCHLAND

ID Number CE 0533

EC Type Examination Certificate number
EC-Typenprüfung Zertifikat-Nr
Examen type CE Numero de Certificat
Inspeccion tipo CE Numero de certificado
Attestato di certificazione CE nr
Onderzoek van het type EC Certificateaantalnummer
EU typpikontroll Certifieringsnummer
EF-typeproving Sertifikatnummer
EF-typegodkendelse Nummer pa typeattest
EU-tyyppitarkastuksen nr.

0533 78 01

January, 2002

Quality Assurance Manager
Leiter Qualitätssicherung
Directeur de l'Assurance Qualite
Gerente de Garantia de Calidad
Responsabile Garanzia di Qualita
Kvaliteitscontrole Manager
Kvaliteitskontroll Chef
Kvalitetssikringschef
Kvalitetssikringschef
Laadunvalvoja

Date
Datum
Fecha
Data
Dato
Päiväamaara

Manufacturer
Hersteller
Fabricant
Fabricante
Fabbriicante

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Valtuutettu edustaja

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Description..... Aerial Work Platform
Bezeichnung..... Arbeitsbühne
Description..... Plate-forme elevatrice de personnel
Descripcion..... Plataforma aerea de trabajo con motor
Descrizione..... Piattaforma di sollevamento motorizzata
Beschrijving..... Mechanisch aangedreven werkplatform
Beskrivning..... Hög-och sänkbar arbetsplattform
Beskrivelse..... Selvgående arbetsplattform
Beskrivelse..... Motordrevet lofteplattform
Kuvaus..... Konevoimalla toimiva nostolava
Selvgående personarbetslift

Original document
do not discard

CE 00

SUOMI

Yllämainittu laite täyttää seuraavat vaatimukset:
Direktiivi Muutettuna direktiivillä Hvzäksytyt yhdenmukaiset standardit
 98/37/EC EN60204-1:1997 Koneurvallisuus

89/336/EEC 93/68/EEC
 EN50081-1:1992 Sähkömagneettinen
 EN50082-1:1992 yhteensopivuus

SVENSKA

Maskinen som specificeras ovan överensstämmer med följande bestämmelser:
 Med ändringar
Direktiv enligt direktiven Harmoniserade standarder som har tillämpats:
 98/37/EC EN60204-1:1997 Säkerhet hos maskinutrustning

89/336/EEC 93/68/EEC
 EN50081-1:1992 Elektromagnetisk
 EN50082-1:1992 kompatibilitet

DANSK

Den anførte maskine er i overensstemmelse med følgende bestemmelser:

Som ændret ved
Direktiv Rådets direktiver Anvendte harmoniserede standarder:
 98/37/EC EN60204-1:1997 Maskinsikkerhed

89/336/EEC 93/68/EEC
 EN50081-1:1992 EMC
 EN50082-1:1992

NORSK

Den ovenfor angitte maskinen samsvarer med følgende bestemmelser:

Med endringer i
Direktiv Rådets direktiv Anvendte harmoniserte standarder:
 98/37/EC EN60204-1:1997 Maskinsikkerhet

89/336/EEC 93/68/EEC
 EN50081-1:1992 Elektromagnetisk
 EN50082-1:1992 kompatibilitet

ESPAÑOL

La máquina especificada arriba de estas líneas cumple con las disposiciones indicadas a continuación:

Según las enmiendas
Directiva de las Directivas Estándares armonizados adoptados:
 98/37/EC EN60204-1:1997 Seguridad de la maquinaria

89/336/EEC 93/68/EEC
 EN50081-1:1992 Compatibilidad
 EN50082-1:1992 electromagnética

ENGLISH

The Machine specified herein complies with the following provisions:
Directive As amended by Directive Harmonized Standards
 98/37/EC EN60204-1:1997 Safety of Machinery

89/336/EEC 93/68/EEC
 EN50081-1:1992 Electromagnetic
 EN50082-1:1992 compatibility

DEUTSCH

Die obengenannte Maschine entspricht den folgenden Bestimmungen:

Richtlinie Geändert durch Richtlinien Harmonisierte Normen:
 98/37/EC EN60204-1:1997 Maschinensicherheit –
 Elektrische
 Maschinenausrüstung

89/336/EEC 93/68/EEC
 EN 50081-1:1992 Elektromagnetische
 EN 50082-1:1992 Kompatibilität

NEDERLANDS

De bovenvermelde machine voldoet aan de volgende voorwaarden:

Zoals gewijzigd
Richtlijn door richtlijnen Aanvaarde geharmoniseerde normen:
 98/37/EC EN60204-1:1997 Veiligheid van machinerie

89/336/EEC 93/68/EEC
 EN50081-1:1992 Elektromagnetische
 EN50082-1:1992 compatibiliteit

FRANCAIS

La machine décrite ci-dessus est conforme aux normes ci-dessous:

Directive Amendée par la directive Normes harmonisées adoptées
 98/37/EC EN60204-1:1997 Sécurité des machines

89/336/EEC 93/68/EEC
 EN50081-1:1992 Compatibilité
 EN50082-1:1992 électromagnétique

ITALIANO

La macchina sopra specificata è conforme alle seguenti disposizioni:

Directiva Modificata dalle Direttive Norme armonizzate adottate
 98/37/EC EN60204-1:1997 Sicurezza del macchinario

89/336/EEC 93/68/EEC
 EN50081-1:1992 Compatibilità
 EN50082-1:1992 elettromagnetica

FOREWORD

This manual contains instructions for the maintenance of the machine. Referring to the Operator Manual will aid in understanding the operation and function of the various components and systems of the machine, and help in diagnosing and repair of the machine.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at any time without notice. No part of this publication may be reproduced, stored in retrieval system, or transmitted, in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. This includes text, figures and tables.

This manual consists of five (5) parts.

OPERATOR MANUAL

A copy of the Operator Manual that is stored on every UpRight Aerial Work Platform.

SECTION 1 - GENERAL INFORMATION

Contains generic information relevant to all UpRight Aerial Work Platforms.

SECTION 2 - SERVICE AND REPAIR

Detailed information specific to this UpRight Aerial Work Platform.

SECTION 3 - TROUBLESHOOTING

Causes and solutions to typical problems.

SECTION 4 - SCHEMATICS

Electric and Hydraulic schematics.

NOTES:

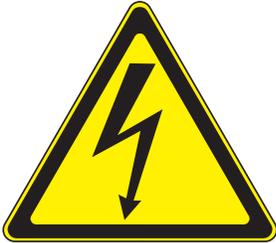
OPERATION MANUAL

WARNING

All personnel shall carefully read, understand and follow all safety rules and operating instructions before operating or performing maintenance on any UpRight aerial work platform.

Safety Rules

Electrocution Hazard



THIS MACHINE IS NOT INSULATED!

Tip Over Hazard



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

Collision Hazard



NEVER position the platform without first checking for overhead obstructions or other hazards.

Fall Hazard



NEVER climb, stand, or sit on platform guardrails or midrail.

USE OF THE AERIAL WORK PLATFORM: This aerial work platform is intended to lift persons and his tools as well as the material used for the job. It is designed for repair and assembly jobs and assignments at overhead workplaces (ceilings, cranes, roof structures, buildings etc.). All other uses of the aerial work platform are prohibited!

THIS AERIAL WORK PLATFORM IS NOT INSULATED! For this reason it is imperative to keep a safe distance from live parts of electrical equipment!

Exceeding the specified permissible maximum load **is prohibited!** See "Platform Capacity" on page 4 for details.

The use and operation of the aerial work platform as a lifting tool or a crane **is prohibited!**

NEVER exceed the manual force allowed for this machine. See "Manual Force" on page 4 for details.

DISTRIBUTE all platform loads evenly on the platform.

NEVER operate the machine without first surveying the work area for surface hazards such as holes, drop-offs, bumps, curbs, or debris; and avoiding them.

OPERATE machine only on surfaces capable of supporting wheel loads.

NEVER operate the machine when wind speeds exceed this machine's wind rating. See "Beaufort Scale" on page 4 for details.

IN CASE OF EMERGENCY push EMERGENCY STOP switch to deactivate all powered functions.

IF ALARM SOUNDS while platform is elevated, STOP, carefully lower platform. Move machine to a firm, level surface.

Climbing up the railing of the platform, standing on or stepping from the platform onto buildings, steel or prefab concrete structures, etc., **is prohibited!**

Dismantling the swing gate or other railing components **is prohibited!** Always make certain that the swing gate is closed and securely locked!

It is prohibited to keep the swing gate in an open position when the platform is raised!

To extend the height or the range by placing of ladders, scaffolds or similar devices on the platform **is prohibited!**

NEVER perform service on machine while platform is elevated without blocking elevating assembly.

INSPECT the machine thoroughly for cracked welds, loose or missing hardware, hydraulic leaks, loose wire connections, and damaged cables or hoses before using.

VERIFY that all labels are in place and legible before using.

NEVER use a machine that is damaged, not functioning properly, or has damaged or missing labels.

To bypass any safety equipment **is prohibited** and presents a danger for the persons on the aerial work platform and in its working range.

NEVER charge batteries near sparks or open flame. Charging batteries emit explosive hydrogen gas.

Modifications to the aerial work platform **are prohibited** or permissible only at the approval by UpRight.

AFTER USE, secure the work platform from unauthorized use by turning both keyswitches off and removing key.

CONTENTS

Introduction	3
General Description	3
Special Limitations	4
Platform Capacity	4
Manual Force	4
Beaufort Scale	4
Lift Overload Alarm	4
Controls and Indicators	5
Pre-Operation Safety Inspection	6
System Function Inspection	7
Operation	8
Platform Extension	8
Travel With the Platform Lowered	8
Steering	8
Elevating the Platform	9
Travel With the Platform Elevated	9
Lowering the Platform	9
Emergency Lowering	10
Parking Brake Release	10
After Use Each Day	10
Transporting the Work Platform	11
By Crane	11
By Forklift	11
By Truck	11
Maintenance	12
Blocking The Elevating Assembly	12
Scissor Brace Installation	12
Scissor Brace Stowage	12
Hydraulic Fluid	12
Battery Maintenance	13
Battery Charging	13
Inspection and Maintenance Schedule	14
Daily Preventative Maintenance Checklist	15
Interval	15
Labels	16
Specifications	18

INTRODUCTION

This manual covers the application of the MX Series Self-Propelled Work Platforms. **This manual must be stored on the machine at all times.**

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

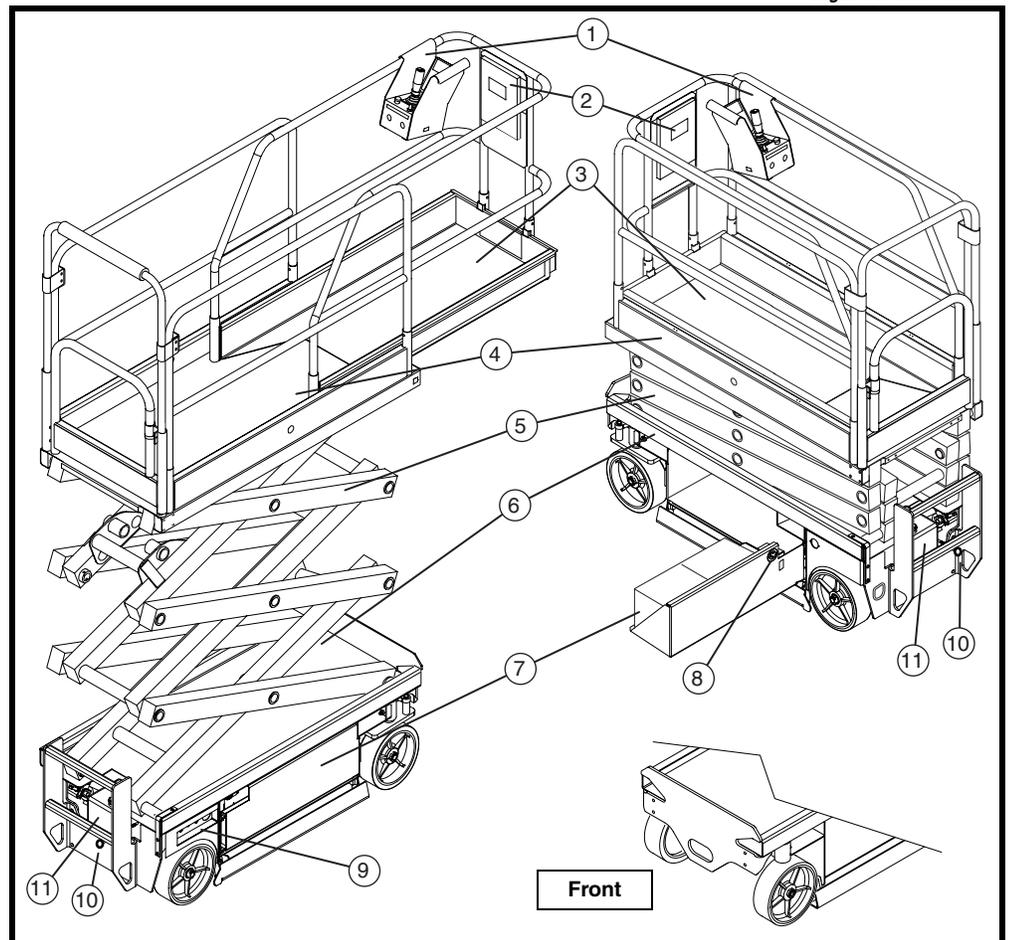
GENERAL DESCRIPTION

⚠ WARNING ⚠

DO NOT use the maintenance platform without guardrails properly assembled and in place.

Figure 1: MX Series

1. Platform Controls
2. Manual Case
3. Deck Extension
4. Platform
5. Elevating Assembly
6. Chassis
7. Batteries
8. Charger Outlet Plug
9. Chassis Controls
10. Emergency Lowering Valve Knob
11. Hydraulic Fluid Reservoir



SPECIAL LIMITATIONS

Travel with the platform raised is limited to creep speed range.

Elevating the platform is limited to firm, level surfaces only.



*The elevating function shall ONLY be used when the work platform is level and on a firm surface.
The work platform is NOT intended to be driven over uneven, rough, or soft terrain.*

PLATFORM CAPACITY

The maximum platform capacity for the MX 15 is 250 kg (550 lbs). Two people may occupy the platform indoors, while only one may occupy the platform outdoors.

The maximum platform capacity for the MX 19 is 227 kg (500 lbs). Two people may occupy the platform indoors, while only one may occupy the platform outdoors.



DO NOT exceed the maximum platform capacity or the platform occupancy limits for this machine.

MANUAL FORCE

Manual force is the force applied by the occupants to objects such as walls or other structures outside the work platform.

The maximum allowable manual force is limited to 200 N (45 lbs.) of force per occupant, with a maximum of 400 N (90 lbs.) for two occupants.



DO NOT exceed the maximum amount of manual force for this machine.

BEAUFORT SCALE

Never operate the machine when wind speeds exceed 25 km/h (15 mph) [Beaufort scale 4].

BEAUFORT RATING	WIND SPEED				GROUND CONDITIONS
	m/s	km/h	ft/s	mph	
3	3,4-5,4	12,25-19,4	11.5-17.75	7.5-12.0	Papers and thin branches move, flags wave.
4	5,4-8,0	19,4-28,8	17.75-26.25	12.0-18	Dust is raised, paper whirls up, and small branches sway.
5	8,0-10,8	28,8-38,9	26.25-35.5	18-24.25	Shrubs with leaves start swaying. Wave crests are apparent in ponds or swamps.
6	10,8-13,9	38,9-50,0	35.5-45.5	24.5-31	Tree branches move. Power lines whistle. It is difficult to open an umbrella.
7	13,9-17,2	50,0-61,9	45.5-56.5	31.-38.5	Whole trees sway. It is difficult to walk against the wind.

LIFT OVERLOAD ALARM

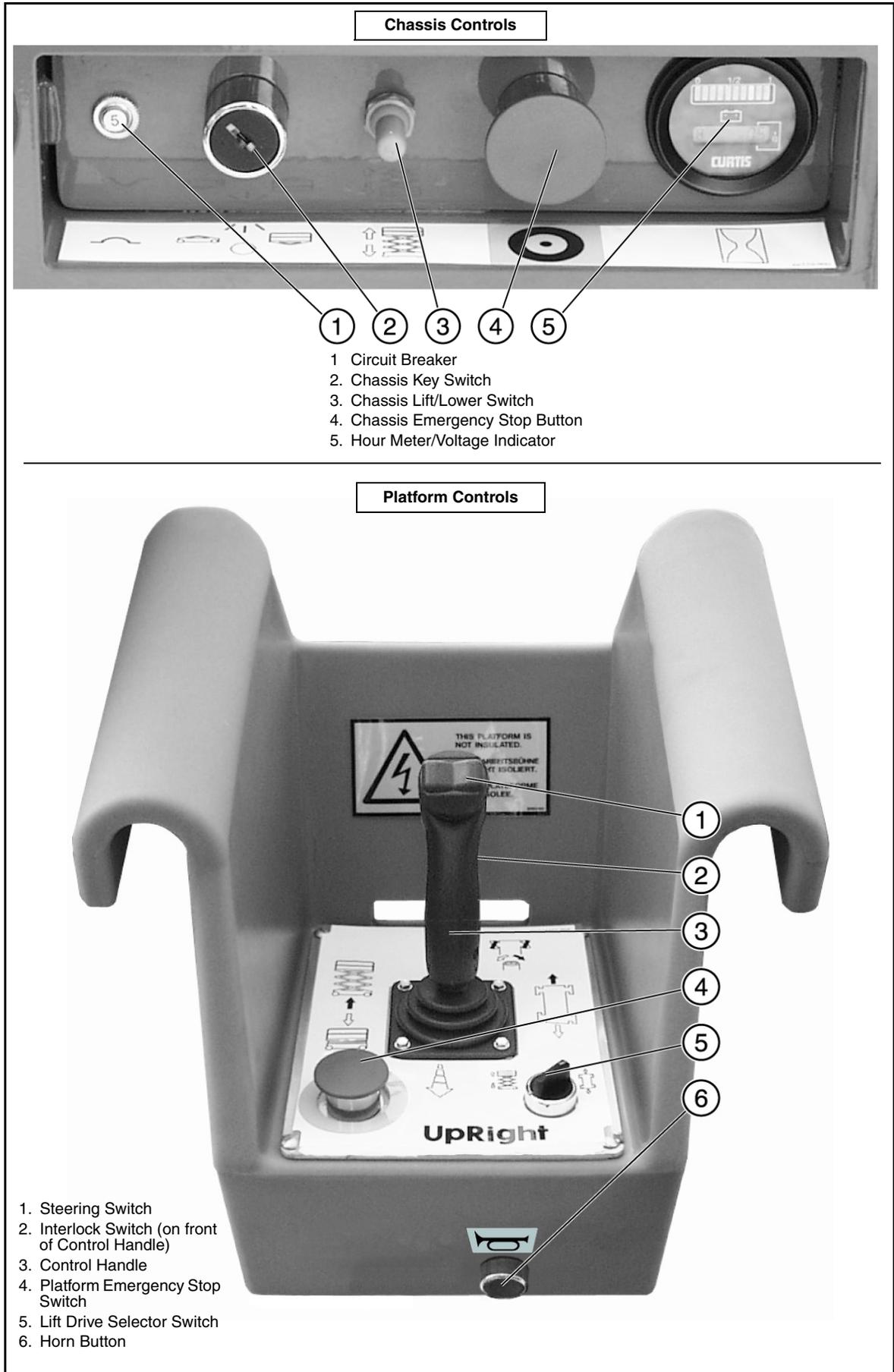
All models include a feature that alerts the operator when the platform load is exceeded. If the alarm sounds during the lift function, lower the platform and reduce the platform load.



Never operate the machine with a platform load greater than the rated capacity.

CONTROLS AND INDICATORS

Figure 2: Controls and Indicators



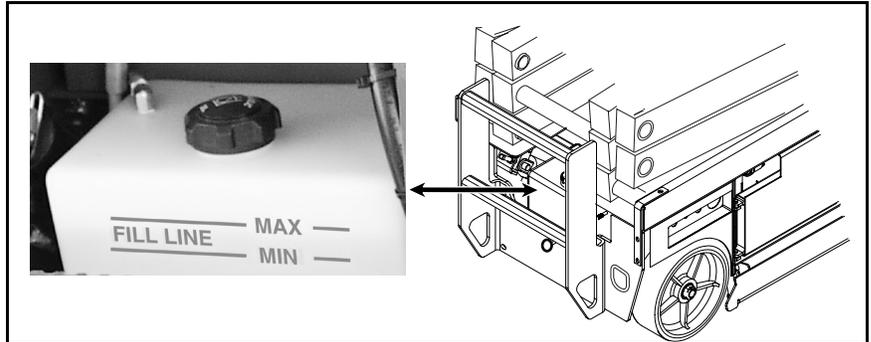
PRE-OPERATION SAFETY INSPECTION

NOTE: Carefully read, understand and follow all safety rules, operating instructions, labels and National Safety Instructions/Requirements. Perform the following steps each day before use.

1. Open modules and inspect for damage, fluid leaks or missing parts.

Figure 3: Hydraulic Reservoir

2. Check the level of the hydraulic fluid with the platform fully lowered. The hydraulic reservoir is located at the rear of the machine. The fluid level should be visible through the side of the reservoir, and must be between the MIN and MAX lines (see Figure 3). Add hydraulic fluid if necessary.



3. Check that fluid level in the batteries is correct (See “Battery Maintenance” on page 13).
4. Verify that batteries are charged.
5. Check that A.C. extension cord has been disconnected from the plug in the left Chassis Module, and that the module doors are closed and locked.
6. Check that all guardrails are in place and all fasteners are properly tightened.
7. Inspect the machine thoroughly for cracked welds and structural damage, loose or missing hardware, hydraulic leaks, damaged control cable, loose wire connections and wheel bolts.

SYSTEM FUNCTION INSPECTION

Refer to Figure 2 for the locations of various controls and indicators.

⚠ WARNING ⚠

STAND CLEAR of the work platform while performing the following checks.

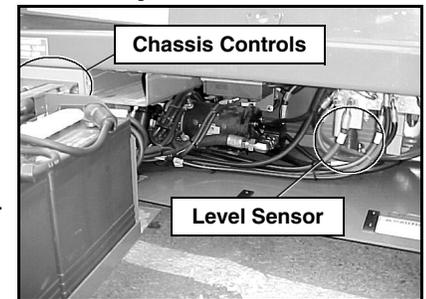
Before operating the work platform, survey the work area for surface hazards such as holes, drop-offs, bumps and debris.

Check in **ALL** directions, including above the work platform, for obstructions and electrical conductors.

Protect the control console cable from possible damage while performing checks.

1. Move the machine, if necessary, to an unobstructed area to allow for full elevation.
2. Pull Chassis Emergency Stop Switch to the ON position.
3. Pull Platform Emergency Stop Switch to the ON position.
4. Check Level Sensor operation:
 - a. Open the door.
 - b. Push and hold the sensor off of level.
 - c. Turn and hold the Chassis Key Switch to CHASSIS. Push the Chassis Lift Switch to the UP position.
 - The alarm should sound, and the platform should not lift.
 - d. Close and latch the door.
5. Turn and hold the Chassis Key Switch to CHASSIS. Push the Chassis Lift/Lower Switch to the UP position and raise the platform approximately 2,1 m (7 feet). **BLOCK THE ELEVATING ASSEMBLY AS DESCRIBED ON page 12.**
6. Visually inspect the elevating assembly, lift cylinder, cables, and hoses for cracked welds and structural damage, loose hardware, hydraulic leaks, loose wire connections, and erratic operation. Check for missing or loose parts.
7. Verify that the Depression Mechanism Supports have rotated into position under the machine. **REMOVE THE SCISSOR BRACE AS DESCRIBED ON page 12.**
8. Turn and hold the Chassis Key Switch to CHASSIS. Push the Chassis Lift/Lower Switch to the UP position and fully elevate the platform. Partially lower the platform by pushing Chassis Lift/Lower Switch to LOWER, and check for proper operation of the audible lowering alarm.
9. Open the Emergency Lowering Valve (see Figure 3) by pulling the knob out to check for proper operation. When the platform is lowered, release the knob.
10. Push the Chassis Emergency Stop Switch to check for proper operation. All machine functions should be disabled. Pull out the Chassis Emergency Stop Switch to resume.
11. Turn the Chassis Key Switch to DECK.
12. Check that route is clear of obstacles (persons, obstructions, holes, and drop-offs, bumps and debris), is level, and is capable of supporting the wheel loads.
13. Mount the platform and properly close the entrance.
14. Turn the Drive/Lift Switch to DRIVE. While engaging the Interlock Switch, move the Control Handle to FORWARD, then REVERSE, to check for speed control.
15. Push the Steering Switch RIGHT, then LEFT, to check for steering control.
16. Turn the Drive/Lift Switch to LIFT. Grasp the Control Handle, engaging the Interlock Switch, and push it forward to check platform lift controls. Raise the platform to full elevation.
17. Pull back on the Control Handle. The platform should descend and the audible lowering alarm should sound.
18. Push the Platform Emergency Stop Switch to check for proper operation. All machine functions should be disabled. Pull out the Platform Emergency Stop Switch to resume.

Figure 4: Level Sensor Location



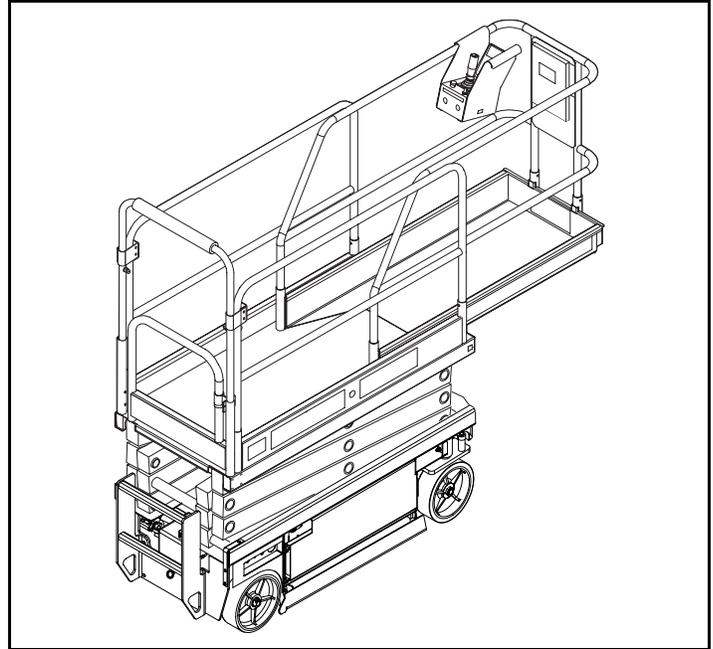
OPERATION

Before operating the work platform, ensure that the Pre-Operation Safety Inspection has been completed and that any deficiencies have been corrected. **Never operate a damaged or malfunctioning machine.** The operator must be thoroughly trained on this machine.

PLATFORM EXTENSION

1. Mount the platform and properly close the entrance.
2. Depress the foot lever located at the rear of the platform extension. Push the platform extension forward until the pin engages the front stop.
3. To retract the platform extension, depress the foot lever and pull the platform extension toward the rear of the machine until the pin engages the rear stop.

Figure 5: Platform Extension



TRAVEL WITH THE PLATFORM LOWERED

1. Check that the route is clear of obstacles (persons, obstructions, holes, drop-offs, bumps, and debris), is level, and is capable of supporting the wheel loads.
2. Verify that the Chassis Key Switch is turned to DECK and Chassis Emergency Stop Switch is ON (pulled out).
3. Mount the platform and properly close the entrance.
4. Check clearances above, below, and to the sides of platform.
5. Pull the Platform Emergency Stop Switch out to the ON position.
6. Turn the Drive/Lift Switch to DRIVE.
7. Engage the Interlock Switch and move the Control Handle to FORWARD or REVERSE to travel in the desired direction. The speed of the machine will vary depending on how far from center the Control Handle is moved.

STEERING

1. Turn the Drive/Lift Switch to DRIVE.
2. While engaging the Interlock Switch, push the Steering Switch to RIGHT or LEFT to turn the 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 the straight ahead position by operating the Steering Switch.

ELEVATING THE PLATFORM

1. Select a firm, level surface.
2. Turn the Drive/Lift Switch to LIFT.
3. While engaging the Interlock Switch, push the Control Handle forward.
4. If the machine is not level the tilt alarm will sound and the machine will not lift or drive. **If the tilt alarm sounds the platform must be lowered and the machine moved to a firm level surface before attempting to re-elevate the platform.**

NOTE: Depression Mechanism supports will deploy automatically as the platform elevates and will retract after the platform has been lowered completely and has been driven.

TRAVEL WITH THE PLATFORM ELEVATED

NOTE: The machine will travel at reduced speed when the platform is elevated.

1. Check that the route is clear of obstacles (persons, obstructions, holes, drop-offs, bumps, and debris), is level, and is capable of supporting the wheel loads.
2. Check clearances above, below, and to the sides of platform.
3. Turn the Drive/Lift Switch to DRIVE.
4. Engage the Interlock Switch and move the Control Handle to FORWARD or REVERSE to travel in the desired direction. The speed of the machine will vary depending on how far from center the Control Handle is moved.
5. If the machine is not level the tilt alarm will sound and the machine will not lift or drive. **If the tilt alarm sounds the platform must be lowered and the machine moved to a firm, level surface before attempting to re-elevate the platform.**

LOWERING THE PLATFORM

1. Turn the Drive/Lift Switch to LIFT.
2. Check around the base of the platform to ensure that no one is in contact with the machine. Engage the Interlock Switch and pull back on the Control Handle to lower the platform.
3. The platform will stop when it reaches the PPE cutout height. Inspect around the machine to ensure no one is in contact with the machine. After a four-second time delay, lower the platform as in step 2.

EMERGENCY LOWERING

⚠ WARNING ⚠

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

Stand clear of the elevating assembly while operating the Emergency Lowering Valve Knob.

The Emergency Lowering Valve Knob is located beside the ladder at the rear of the machine.

1. Open the Emergency Lowering Valve by pulling and holding the knob.
2. To close, release the knob. The platform will not elevate if the Emergency Lowering Valve is open.

PARKING BRAKE RELEASE

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

1. To release the brakes, loosen the jam nut and bolt until the brakes disengage the tires (Figure 7). The machine will now roll when pushed or pulled.
2. To re-engage the brakes, tighten the bolt until the brakes have fully engaged the tires. Secure the bolt with the lock-nut. Verify that the brakes have fully engaged the rear tires before operating the machine by testing their ability to hold the machine on a 29% (16°) grade.

Figure 6: Emergency Lowering

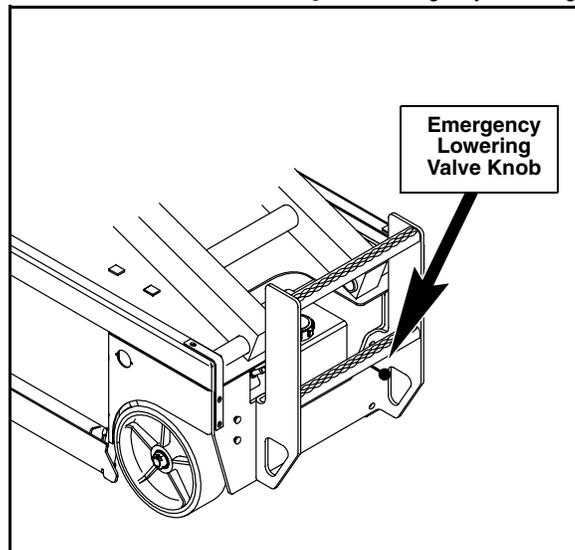


Figure 7: Parking Brake Release



⚠ WARNING ⚠

Never tow faster than 0,3 m/sec. (1 ft./sec.).

Never operate the work platform with the parking brakes released. Serious injury or damage could result.

AFTER USE EACH DAY

1. Ensure that the platform is fully lowered.
2. Park the machine on a firm level surface, preferably under cover, secure against vandals, children and unauthorized operation.
3. Turn the Chassis Key Switch to OFF and remove the key to prevent unauthorized operation.

TRANSPORTING THE WORK PLATFORM

BY CRANE

Secure the straps to Tie Down/Lift Points only.

BY FORKLIFT

! DANGER !

Forklifting is for transport only.

See specifications for weight of work platform and be certain that forklift is of adequate capacity to lift the work platform.

Both the MX15 and MX19 may be forklifted from the rear end of the machine between the wheels. They may also be forklifted from the side using the forklift pockets shown in the diagram.

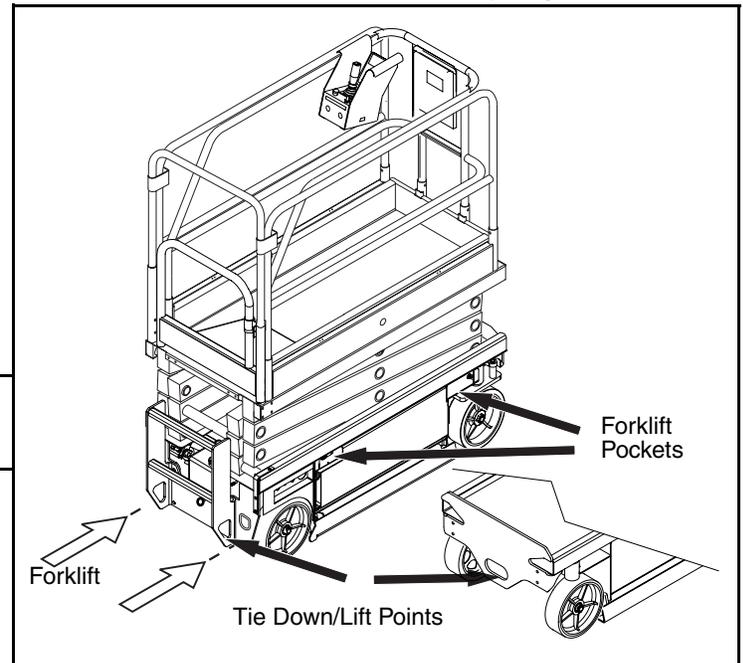
BY TRUCK

Maneuver the work platform into transport position and chock the wheels. Secure the work platform to the transport vehicle by attaching chains or straps of adequate load capacity to the Tie Down/Lift Points.

CAUTION

Overtightening of the chains or straps attached to the Tie Down/Lift Points may result in damage to work platform.

Figure 8: Transporting the Work Platform



MAINTENANCE

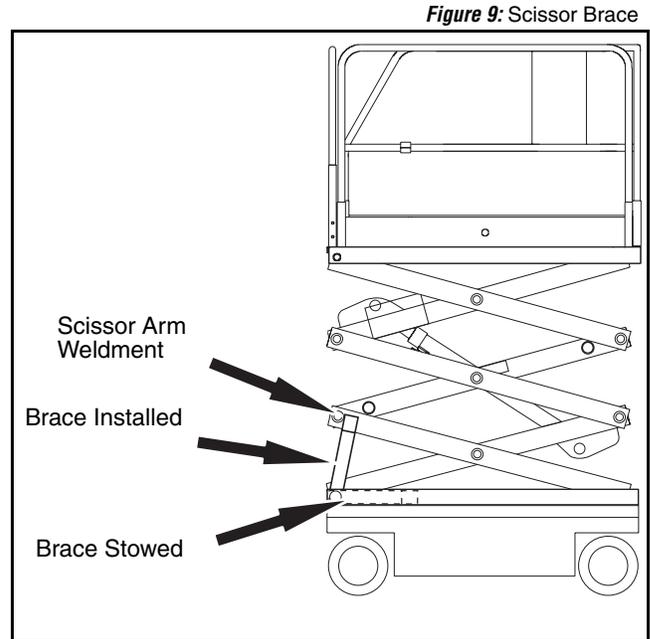
⚠ WARNING ⚠

Never perform service while the platform is elevated without first blocking the elevating assembly.
DO NOT stand in the elevating assembly area while deploying or storing the brace.

BLOCKING THE ELEVATING ASSEMBLY

SCISSOR BRACE INSTALLATION

1. Park the work platform on a firm, level surface. Completely unload the platform before installing the Scissor Brace.
2. Verify that the Chassis and Platform Emergency Stop Switches are ON by pulling each button out.
3. Turn and hold the Chassis Key Switch to CHASSIS. Push the Chassis Lift/Lower Switch to UP and elevate the platform approximately 2,1 m (7 ft.).
4. Rotate the Scissor Brace to a vertical position.
5. Carefully lower the platform until the end of the Scissor Arm Weldment rests on the Brace.



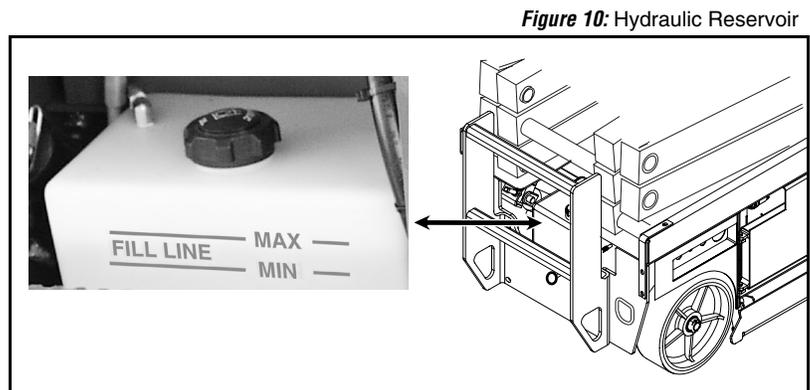
SCISSOR BRACE STORAGE

1. While holding the Brace, slowly raise the platform using the Chassis Controls until the end of the Scissor Arm Weldment clears the Scissor Brace.
2. Rotate the Scissor Brace forward to rest on the Chassis.
3. Push the Chassis Lift/Lower Switch to LOWER and completely lower the platform.

HYDRAULIC FLUID

NOTE: Never add fluid if the platform is elevated.

Check the level of the hydraulic fluid with the platform fully lowered. The hydraulic reservoir is located at the rear of the machine. The fluid level should be visible through the side of the reservoir, and must be between the MIN and MAX lines (see Figure 10). Add hydraulic fluid if necessary.



BATTERY MAINTENANCE

⚠ WARNING ⚠

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

Always wear safety glasses when working near batteries.

Battery fluid is highly corrosive. Thoroughly rinse away any spilled fluid with clean water.

Always replace batteries with UpRight batteries or manufacturer approved replacements weighing 26,3 kg (58 lbs.) each.

- Check the battery fluid level daily, especially if the work platform is being used in a warm, dry climate.
- If electrolyte level is lower than 10 mm ($\frac{3}{8}$ in.) above the plates add distilled water only. DO NOT use tap water with high mineral content, as it will shorten battery life.
- Keep the terminals and tops of the batteries clean.
- Refer to the Service Manual to extend battery life and for complete service instructions.

BATTERY CHARGING

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

⚠ WARNING ⚠

Charge the batteries in a well ventilated area.

Do not charge the batteries when the work platform is near a source of sparks or flames.

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

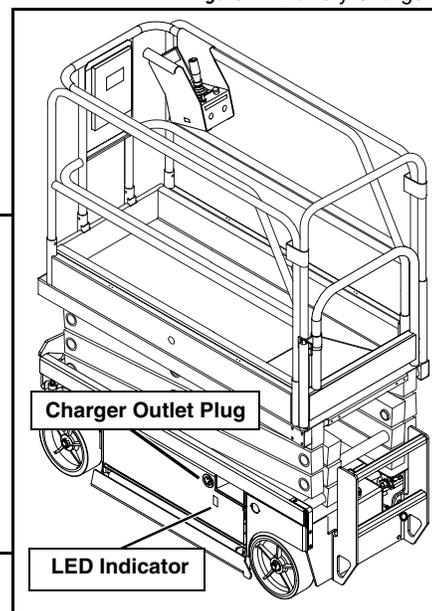
Never leave the battery charger operating for more than two days.

Never disconnect the cables from the batteries when the charger is operating.

Keep the charger dry.

1. Check the battery fluid level. If the battery fluid level is lower than 10 mm ($\frac{3}{8}$ in.) above the plates add distilled water only.
2. Connect an appropriate extension cord to charger outlet plug in Left Module Door. Plug the extension cord into a properly grounded outlet of proper voltage and frequency.
3. The charger turns on automatically after a short delay. There are three LED's to indicate the state of charge cycle.
 - The first LED will blink until the batteries reach 50% state of charge, and then it will stop blinking and stay ON.
 - The second LED will blink until the batteries reach 75% state of charge, and then it will stop blinking and stay ON.
 - The third LED will blink until the batteries reach 100% state of charge, and then it will stop blinking and stay ON.
 - When the batteries are fully charged, all three LED's will stay ON. The battery charger will automatically turn off a short time after the batteries reach full charge.

Figure 11: Battery Charger



NOTE: The battery charger circuit must be used with a GFI (Ground Fault Interrupt) outlet.

NOTE: DO NOT operate the machine while the charger is plugged in.

INSPECTION AND MAINTENANCE SCHEDULE

The Complete Inspection consists of periodic visual and operational checks, along with periodic minor adjustments that assure proper performance. Daily inspection will prevent abnormal wear and prolong the life of all systems. The inspection and maintenance schedule should be performed at the specified intervals. Inspection and maintenance shall be performed by personnel who are trained and familiar with mechanical and electrical procedures.

⚠ WARNING ⚠

Before performing preventative maintenance, familiarize yourself with the operation of the machine.

Always block the elevating assembly whenever it is necessary to perform maintenance while the platform is elevated.

The daily preventative maintenance checklist has been designed for machine service and maintenance. Please photocopy the Daily Preventative Maintenance Checklist and use the checklist when inspecting the machine.

DAILY PREVENTATIVE MAINTENANCE CHECKLIST

MAINTENANCE TABLE KEY

INTERVAL

Y = Yes/Acceptable

N = No/Not Acceptable

R = Repaired/Acceptable

PREVENTATIVE MAINTENANCE REPORT

Date: _____

Owner: _____

Model No: _____

Serial No: _____

Serviced By: _____

COMPONENT	INSPECTION OR SERVICES	Y	N	R
Battery	Check electrolyte level.			
	Check battery cable condition.			
Chassis	Check hoses for pinch or rubbing points.			
	Check welds for cracks.			
Control Cable	Check the exterior of the cable for pinching, binding or wear.			
Controller	Check switch operation.			
Drive Motors	Check for operation and leaks.			
Elevating Assembly	Inspect for structural cracks.			
Emergency Lowering System	Operate the emergency lowering valve and check for serviceability.			

COMPONENT	INSPECTION OR SERVICES	Y	N	R
Entire Unit	Check for and repair collision damage.			
Hydraulic Fluid	Check fluid level.			
Hydraulic Pump	Check for hose fitting leaks.			
Hydraulic System	Check for leaks.			
Labels	Check for peeling, missing, or unreadable labels & replace.			
Platform Deck and Rails	Check welds for cracks.			
	Check condition of deck.			
Tires	Check for damage.			

LABELS

These labels shall be present and in good condition before operating the work platform. Be sure to read, understand and follow these labels when operating the work platform.

USE OF THE AERIAL WORK PLATFORM: This aerial work platform is intended to lift persons and his tools as well as the material used for the job. It is designed for repair and assembly jobs and assignments at overhead workplaces (ceilings, cranes, roof structures, buildings etc.). All other uses of the aerial work platform are prohibited!
THIS AERIAL WORK PLATFORM IS NOT INSULATED! For this reason it is imperative to keep a safe distance from live parts of electrical equipment!
 Exceeding the specified permissible maximum load **IS PROHIBITED!** Read operator's manual for more details.
 The use and operation of the aerial work platform as a lifting tool or a crane **IS PROHIBITED!**
NEVER exceed the manual force allowed for this machine. Read operator's manual for more details.
DISTRIBUTE all platform loads evenly on the platform.
NEVER operate the machine without first surveying the work area for surface hazards such as holes, drop-offs, bumps, curbs, or debris, and avoiding them.
OPERATE machine only on surfaces capable of supporting wheel loads.
NEVER operate the machine when wind speeds exceed this machine's wind rating. Read operator's manual for more details.
IN CASE OF EMERGENCY push emergency stop switch to deactivate all powered functions.
IF ALARM SOUNDS while platform is elevated, **STOP**, carefully lower platform. Move machine to a firm, level surface.
 Climbing up the railing of the platform, standing on or stepping from the platform onto buildings or other structures, **IS PROHIBITED!**
 Disengaging the swing gate or other railing components **IS PROHIBITED!** Always make certain that the swing gate is closed and securely locked!
IT IS PROHIBITED to keep the swing gate or throttle bar in an open position when the platform is raised!
 To extend the height or the range by climbing of ladders, scaffolds or similar devices on the platform **IS PROHIBITED!**
NEVER perform service on machine while platform is elevated without blocking elevating assembly.
INSPECT the machine thoroughly for cracked welds, loose or missing hardware, hydraulic leaks, loose wire connections, and damaged cables or hoses before using.
VERIFY that all labels are in place and legible before using.
NEVER use a machine that is damaged, not functioning properly, or has damaged or missing labels.
 To bypass any safety equipment **IS PROHIBITED** and presents a danger for the persons on the aerial work platform and in its working range.
NEVER charge batteries near sparks or open flame. Charging batteries emit explosive hydrogen gas.
 Modifications to the aerial work platform are prohibited or permissible only at the approval by UpRight.
AFTER USE: secure the work platform from unauthorized use by turning the keyswitch off and removing key.

4 067195-001

INSIDE
INNSEITIG
L'INTERIEUR

16 107051-900



17 066556-900

THIS PLATFORM IS NOT INSULATED
DIESE ARBEITSBÜHNE IST NICHT ISOLIERT
CETTE PLATEFORME N'EST ISOLEE

5 100102-900



11 066559-900

MAX = 250 kg = 1 person + 1 battery
MAX = 250 kg = 1 person + 1 battery

18 MX15 066557-952

MAX = 113 kg = 1 person + 1 battery

12 066551-950

MAX = 227 kg = 1 person + 1 battery
MAX = 227 kg = 1 person + 1 battery

18 MX19 066557-951



13 101210-000

19 005223-906



14 101208-000

UpRight

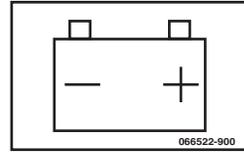
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15 030768-001



21 064936-099

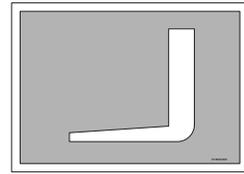


22 066522-900

CE UpRight Inc.
1775 PARK ST. SELMA CALIFORNIA 93662 USA

Model: _____ Serial number: _____
 Machine weight: _____ kg Mfg. date: _____
 Maximum wheel load: _____
 Maximum allowable incline of machine when elevated: _____ deg.
 Occupants and equipment must not exceed the rated maximum load: _____ kg Maximum platform occupants: _____
 Maximum allowable side force on platform: _____ N
 Maximum platform height: _____ m
 Maximum platform reach: _____ m
 Maximum allowable wind speed: _____ m/s=Beaufort scale _____
 Maximum hydraulic system pressure: _____ bar
 Maximum system voltage: _____ Vdc
 This machine is manufactured to comply with Machinery directive 89-392/CEE
CAUTION: CONSULT OPERATOR'S MANUAL BEFORE USE.

29 061205-003



23 014222-903



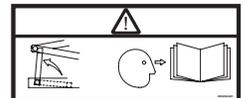
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24 101208-001



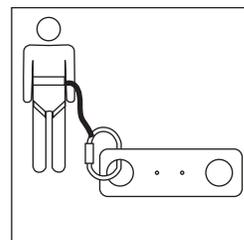
36 107053-000



25 063255-901

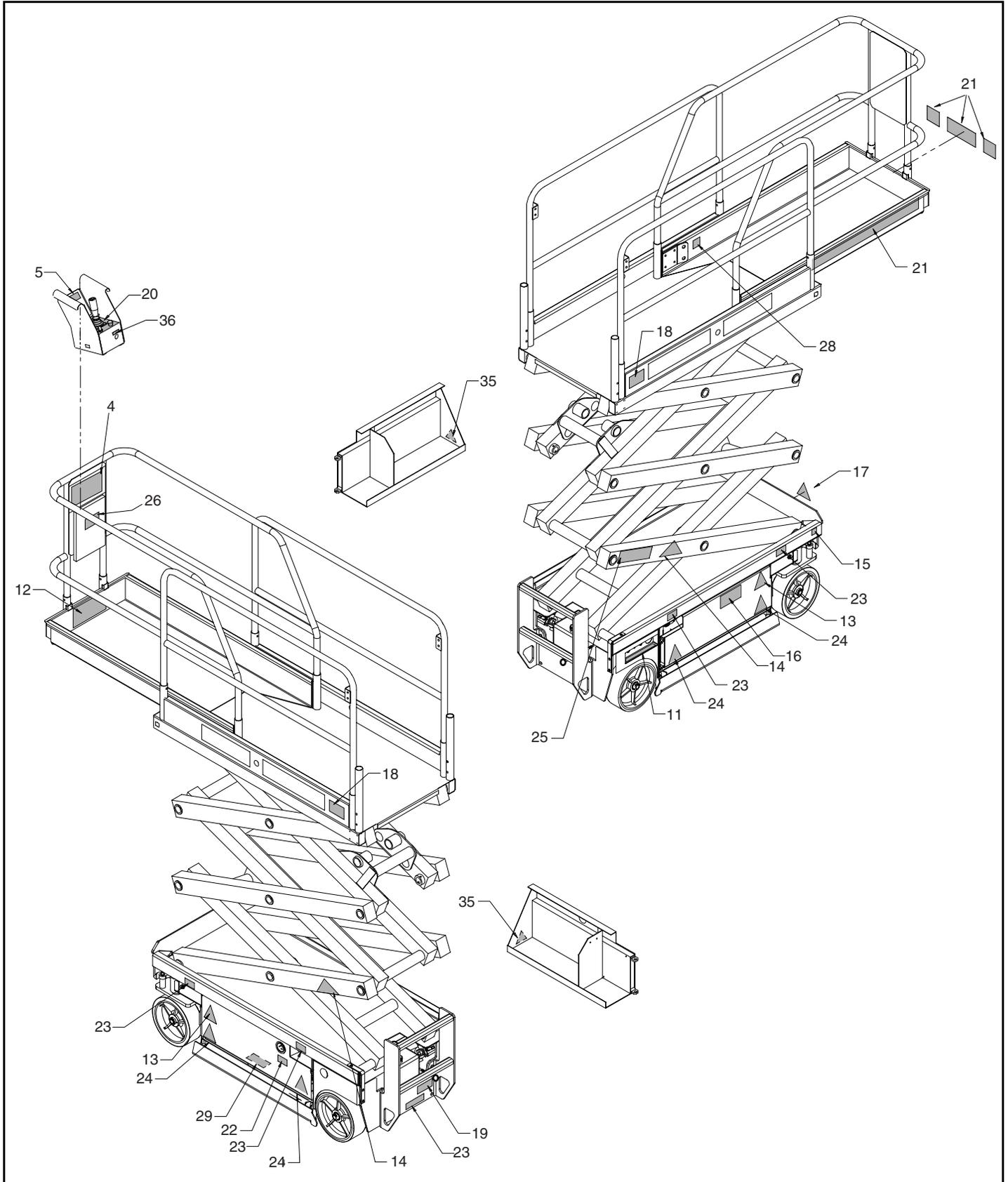


26 010076-901



28 068635-001

Figure 12: Safety Labels Locations



SPECIFICATIONS

ITEM	MX15	MX19
Platform Size (Inside minimum) Standard w/Deck	0,72 m x 2,5 m (28.5 in. x 100 in.)	0,72 m x 2,5 m (28.5 in. x 100 in.)
Maximum Platform Capacity Standard w/Deck Extension	250 kg (550 lbs.)	227 kg (500 lbs.)
Maximum Number of Occupants Standard w/Deck Extension on Extension	2 People indoors/1 person outdoors 1 Person	2 People indoors/1 person outdoors 1 Person
Height		
Working Height	6,57 m (21 ft. 7 in.)	7,8 m (25 ft. 6 in.)
Maximum Platform Height	4,57 m (15 ft.)	5,8 m (19 ft.)
Maximum Drivable Height	4,57 m (15 ft.)	5,8 m (19 ft.)
Dimensions		
Weight	1284 kg (2830 lbs.)	1406 kg (3100 lbs.)
Overall Width	760 mm (30 in.)	760 mm (30 in.)
Overall Height (Lowered)	1,89 m (74.5 in.)	2,01 m (79.25 in.)
Overall Length (Deck in)	1,75 m (68.75 in.)	1,75 m (68.75 in.)
Drive Speed		
Platform Lowered	3,7 km/h (2.3 mph)	3,7 km/h (2.3 mph)
Platform Raised	1,0 km/h (0.62 mph)	1,0 km/h (0.62 mph)
Energy Source	24 V battery pack (4-220 A hour, 6 V batteries, min. wt. 26,3 kg [58 lbs.] each), 4 HP DC electric motor	24 V battery pack (4-220 A hour, 6 V batteries, min. wt. 26,3 kg [58 lbs.] each), 4 HP DC electric motor
System Voltage	24 V DC	24 V DC
Battery Charger	20 A, 110/220 VAC	20 A, 110/220 VAC
Hydraulic Reservoir Capacity	12,9 L (3.4 US gal.)	12,9 L (3.4 US gal.)
Maximum Hydraulic System Pressure	207 bar (3000 psi)	207 bar (3000 psi)
Hydraulic Fluid		
Normal above 0° C [32° F]	ISO #46	ISO #46
Low Temp. below 0° C [32° F]	ISO #32	ISO #32
below -17° C [0° F]	ISO #15	ISO #15
Lift System	One Single Stage Lift Cylinder	One Single Stage Lift Cylinder
Drive Control	Motor Control	Motor Control
Control System	Control Handle with Interlock Switch, Rotary Drive/Lift Switch, and Red Mushroom Emergency Stop Switch	Control Handle with Interlock Switch, Rotary Drive/Lift Switch, and Red Mushroom Emergency Stop Switch
Drive System	Dual Front Wheel Hydraulic Motors	Dual Front Wheel Hydraulic Motors
Tires	30,5 cm (12 in.) diameter solid rubber, Non-marking	30,5 cm (12 in.) diameter solid rubber, Non-marking
Parking Brake	Dual, Spring Applied, Hydraulic Release	Dual, Spring Applied, Hydraulic Release
Turning Radius (inside)	150 mm (6 in.) Inside	150 mm (6 in.) Inside
Maximum Gradeability	29% (16°)	29% (16°)
Wheel Base	1,23 m (48.5 in.)	1,23 m (48.5 in.)
Guardrails	1,10 m (43 in.)	1,10 m (43 in.)
Toeboard	150 mm (6 in.)	150 mm (6 in.)
Noise Level		

*Specifications are subject to change without notice. Hot weather or heavy use may affect performance.

Refer to the Service Manual for complete parts and service information.

The MX15/19 meets or exceeds all applicable CE machinery directive requirements.

GENERAL INFORMATION

This section contains generic instructions for the repair and maintenance of UpRight Aerial Work Platforms. Referring to the Operator Manual will aid in understanding the operation and function of the various components and systems of the machine, and help in diagnosing and repair of the machine.

TABLE OF CONTENTS

1-1	Hazard Indicators	1-2
1-2	Workshop Procedures	1-2
1-3	Torque Specifications	1-3
1-4	Date Code Identification on Hoses	1-5
1-5	Special Tools	1-5
1-6	UpRight Connectors	1-6
1-7	Hydraulic Manifold Repair	1-8
1-8	Cylinder Repair	1-9
1-9	Electric Motors	1-10
1-10	Battery Maintenance	1-12
1-11	Floor Loading	1-16
1-12	Hydraulic Fluid	1-17
1-13	Long Term Storage	1-18

LIST OF FIGURES

Figure 1-1:	UpRight Connector Kits	1-6
Figure 1-2:	UpRight Male Connector	1-6
Figure 1-3:	UpRight Female Connector	1-6
Figure 1-4:	Locking Finger, UpRight Connector	1-7
Figure 1-5:	Heavy Duty UpRight Connector	1-7
Figure 1-6:	Electric Motor Service	1-10
Figure 1-7:	Electric Motor Brushes	1-11
Figure 1-8:	Contact Area	1-16
Figure 1-9:	Occupied Surface Area	1-16

LIST OF TABLES

Table 1-1:	Torque Specifications for Hydraulic Components	1-3
Table 1-2:	Torque Specifications for SAE Fasteners	1-3
Table 1-3:	Torque Specifications for Metric Fasteners, U.S. Customary Units	1-4
Table 1-4:	Torque Specifications for Metric Fasteners, SI Units	1-4
Table 1-5:	Specific Gravity and Battery Voltage	1-13
Table 1-6:	Battery Charging, UpRight Electric and BiEnergy Machines	1-14
Table 1-7:	Battery Charger Troubleshooting	1-15

1-1 HAZARD INDICATORS



Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

CAUTION

Indicates a potentially hazardous situation which, if not avoided, may result in damage to the machine.

1-2 WORKSHOP PROCEDURES

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.



Be sure to read, understand and follow all safety rules, operating instructions, and the Scaffold Industry Association's MANUAL OF RESPONSIBILITIES of ANSI A92.6-1999 before performing maintenance on or operating any UpRight Aerial Work Platform.



Never perform service on the machine in the elevating assembly area while platform is elevated without first blocking the elevating assembly.
DO NOT stand in elevating assembly area while deploying or storing brace.
Refer to the Operator Manual for elevating assembly blocking instructions.

1-3 TORQUE SPECIFICATIONS

HYDRAULIC COMPONENTS

NOTE: Always lubricate threads with clean hydraulic fluid prior to installation

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

Table 1-1: Torque Specifications for Hydraulic Components

Type: SAE Port 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	107-119
#16	130-140	176-190	130-140	176-190	1300-1368	147-155

FASTENERS

This standard applies to the preloading of fasteners measured by installation torque.

NOTE: For other preloading methods or fasteners consult UpRight Engineering Department.

This general standard applies to all SAE and Metric fasteners unless otherwise specified.

THREAD CONDITION

- For lubricated or zinc plated fasteners use $K = .15$
- For dry unplated fasteners use $K = .20$

TORQUE TABLES

Table 1-2: Torque Specifications for SAE Fasteners

	Nominal Thread Size	 SAE J429 Grade 5			 SAE J429 Grade 8		
		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
			K=,15	K=,20		K=,15	K=,20
		lbs.	in-lbs.	in-lbs.	lbs.	in-lbs.	in-lbs.
Unified Coarse Thread Series	1/4 -20	2,000	75	100	2850	107	143
	5/16 - 18	3,350	157	210	4700	220	305
		lbs.	ft-lbs.	ft-lbs.	lbs.	ft-lbs.	ft-lbs.
	3/8-16	4,950	23	31	6950	32.5	44
	7/16-14	6,800	37	50	9600	53	70
	1/2-13	9,050	57	75	12800	80	107
	9/16-12	11,600	82	109	16400	115	154
	5/8-11	14,500	113	151	20300	159	211
	3/4-10	21,300	200	266	30100	282	376
	7/8-9	29,435	321	430	41550	454	606
1-8	38,600	483	640	54540	680	900	
Unified Fine Thread Series	1/4 -28	2,300	85	115	3250	120	163
	5/16-24	3,700	173	230	5200	245	325
		lbs.	ft-lbs.	ft-lbs.	lbs.	ft-lbs.	ft-lbs.
	3/8-24	5,600	26	35	7900	37	50
	7/16-20	7,550	42	55	10700	59	78
	1/2-20	10,200	64	85	14400	90	120
	9/16-18	13,000	92	122	18300	129	172
	5/8-18	16,300	128	170	23000	180	240
	3/4-16	23,800	223	298	33600	315	420
	7/8-14	32,480	355	473	45855	500	668
1-12	42,270	528	704	59670	745	995	

Table 1-3: Torque Specifications for Metric Fasteners, U.S. Customary Units

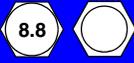
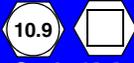
Nominal Thread Size	 Grade 8.8			 Grade 10.9			 Grade 12.9		
	Clamp Load	Tightening Torque		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
		K =,15	K =,20		K =,15	K =,20		K =,15	K =,20
mm	lbs.	in-lbs.	in-lbs.	lbs.	in-lbs.	in-lbs.	lbs.	in-lbs.	in-lbs.
3	-	-	-	-	-	-	823	14.6	19.5
3.5	-	-	-	-	-	-	1,109	22.9	30.5
4	-	-	-	-	-	-	1,436	33.9	45.2
5	1,389	41.0	54.7	1,987	58.7	78.2	2,322	68.6	91.2
6	1,966	69.7	92.9	2,813	100.0	132.8	3,287	116.8	155.8
7	2,826	116.8	155.8	4,044	167.3	223.0	4,727	195.6	260.2
		ft-lbs.	ft-lbs.		ft-lbs.	ft-lbs.		ft-lbs.	ft-lbs.
8	3,579	14.1	18.8	5,122	20.1	26.9	5,986	23.6	31.4
10	11,742	27.9	37.2	8,117	39.9	53.3	9,486	46.7	62.3
12	8,244	48.7	64.9	11,797	69.7	92.2	13,787	81.1	108.4
14	11,246	77.4	103.3	16,093	110.6	147.5	18,808	129.1	172.6
16	15,883	125.4	166.7	21,971	173.3	230.9	25,677	202.1	269.2
18	19,424	171.9	229.4	26,869	238.2	317.2	31,401	278.1	371.0
20	2,304	243.4	325.3	34,286	337.8	449.9	40,070	394.6	525.9
22	30,653	331.9	442.5	42,403	458.8	612.2	49,556	536.2	715.4
24	35,711	420.4	562.0	49,400	583.4	778.1	57,733	682.2	909.4
27	46,435	617.3	84.8	64,235	853.4	1138.1	75,069	997.2	1329.8
30	56,753	837.9	1117.4	78,509	1159.4	1545.2	91,751	1354.9	1807.0
33	70,208	1140.3	1520.1	97,121	1576.9	2102.8	113,503	1843.9	2457.5
36	82,651	1464.1	1952.3	114,334	2025.3	2700.9	133,620	2367.6	3156.0

Table 1-4: Torque Specifications for Metric Fasteners, SI Units

Nominal Thread Size	 Grade 8.8			 Grade 10.9			 Grade 12.9		
	Clamp Load	Tightening Torque		Clamp Load	Tightening Torque		Clamp Load	Tightening Torque	
		K =,15	K =,20		K =,15	K =,20		K =,15	K =,20
mm	N	N-m	N-m	N	N-m	N-m	N	N-m	N-m
3	-	-	-	-	-	-	3660	1.65	2.2
3.5	-	-	-	-	-	-	4932	2.59	3.45
4	-	-	-	-	-	-	6387	3.83	5.11
5	6177	4.63	6.18	8840	6.63	8.84	10330	7.75	10.3
6	8743	7.87	10.5	12512	11.3	15	14623	13.2	17.6
7	12570	13.2	17.6	17990	18.9	25.2	21025	22.1	29.4
8	15921	19.1	25.5	22784	27.3	36.5	26626	32	42.6
10	52230	37.8	50.5	36105	54.1	72.2	42195	63.3	84.4
12	36670	66	88	52475	94.5	125	61328	110	147
14	50025	105	140	71587	150	200	83663	175	234
16	70650	170	226	97732	235	313	114218	274	365
18	86400	233	311	119520	323	430	139680	377	503
20	10250	330	441	152513	458	610	178238	535	713
22	136350	450	600	188618	622	830	220433	727	970
24	158850	570	762	219743	791	1055	256808	925	1233
27	206550	837	115	285728	1157	1543	333923	1352	1803
30	252450	1136	1515	349223	1572	2095	408128	1837	2450
33	312300	1546	2061	432015	2138	2851	504885	2500	3332
36	367650	1985	2647	508582	2746	3662	594368	3210	4279

1-4 DATE CODE IDENTIFICATION ON HOSES

GATES uses an eight digit code: Plant, Month, Day, Year.
i.e.: XX 01 07 01 - means Plant XX January 07 2001.

PARKER uses a 4 digit code indicating Quarter and Year.
i.e.: 2Q01 - means Second Quarter of 2001.

DAYCO stamps month, day and year on each hose.

1-5 SPECIAL TOOLS

The following is a list of special tools which may be required to perform certain maintenance procedures on the machine.

- 0-100 bar (**0-1000 psi**) Hydraulic Pressure Gauge with Adapter Fittings
- 0-200 bar (**0-3000 psi**) Hydraulic Pressure Gauge with Adapter Fittings
- 0-500 bar (**0-6000 psi**) Hydraulic Pressure Gauge with Adapter Fittings
- Small UpRight Connector Field Kit (UpRight P/N 030899-000)
- Large UpRight Connector Field Kit (UpRight P/N 030898-000)
- Inclinometer (UpRight P/N 010199-000-00)
- MOS90 Calibrator (UpRight P/N 057128-000)
- Optimizer with adapter (UpRight P/N 100329-000)
- Flow Meter Kit (UpRight P/N 067040-000)
- Quadrageauge with fitting (UpRight P/N 063971-000)
- 0-25 kg (**0-50 Lbs.**) Chain Tension Scale (UpRight P/N 107078-000)

UPRIGHT LIFT TOOL LIST

- Gland Nut Wrench (UpRight P/N 062521-000)
- Strap Wrench (UpRight P/N 062482-000)
- Tierod Tensioner (2 required) (UpRight P/N 062738-000)
- Tensioner Bracket (2 required) (UpRight P/N 062739-000)

1-6 UPRIGHT CONNECTORS

UpRight connectors are designed so that connector parts, contacts or electrical cables may be replaced without replacing the entire connector.

Figure 1-1: UpRight Connector Kits



Small Kit

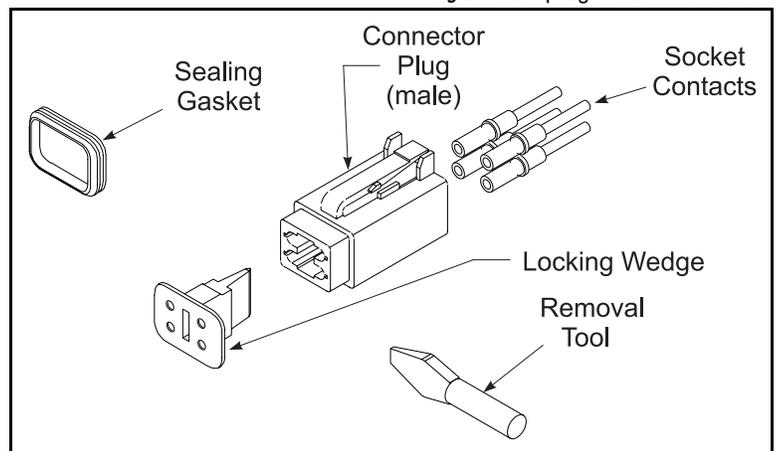


Large Kit

MALE CONNECTOR (PLUG)

Figure 1-2: UpRight Male Connector

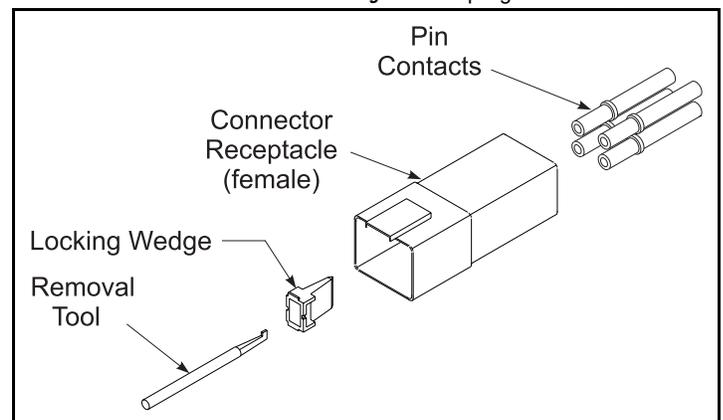
1. Disconnect the male connector (plug) from the female connector (receptacle).
2. Using the flat end of the Removal Tool (or flat blade screwdriver), pry the Locking Wedge from the Male Connector. Care should be taken that the Sealing Gasket is not damaged during this procedure.
3. Check all parts for damage. Replace all parts which are damaged or worn.
4. Replace or re-crimp the wires and contacts. Refer to "Crimping" procedure.



FEMALE CONNECTOR (RECEPTACLE)

Figure 1-3: UpRight Female Connector

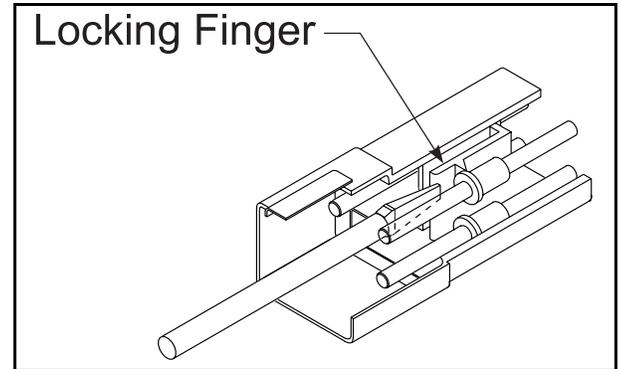
1. Disconnect the male connector (plug) from the female connector (receptacle).
2. Using the notched end of the Removal Tool (or a wire hook), pull the Locking Wedge from the Female Connector.
3. Check all parts for damage. Replace all parts which are damaged or worn.
4. Replace or re-crimp the wires and contacts. Refer to "Crimping" procedure.



RELEASING LOCKING FINGERS

1. The Locking Fingers can be released following the removal of the Locking Wedge of either the male or female connector.
2. Use the removal tool (or flat bladed screwdriver) to push the Locking Fingers aside. This will release the grip on the contact.
3. Pull the wire and contact out of the connector.

Figure 1-4: Locking Finger, UpRight Connector



CRIMPING

1. Strip 6 mm (¼ in.) from the wire.

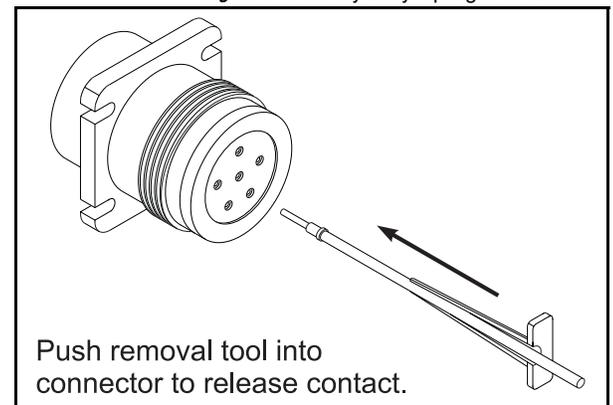
NOTE: Complete crimping instructions are included in each Field Kit.

2. Insert the contact into the crimping tool.
3. Insert the stripped wire into the contact. Copper strands should be visible in the bleed hole of the contact and no copper strands should be loose (outside) of the contact barrel.
4. Completely close the handles of the crimping tool. Release the handles of the crimping tool and remove the crimped contact.
5. Inspect the crimped contact to ensure that all strands are secure in the crimp barrel.

REMOVING CONTACT FROM HEAVY DUTY PLUG

1. Slip the removal tool along the wire to be replaced.
2. Push the removal tool into the connector until the contact is released.
3. Pull the wire and contact out of the plug.

Figure 1-5: Heavy Duty UpRight Connector



1-7 HYDRAULIC MANIFOLD REPAIR

REMOVAL

Refer to the *Service and Repair* section for model specific information.

1. Disconnect the battery.
2. Tag and disconnect the solenoid valve leads.
3. Tag, disconnect, and plug hydraulic hoses.
4. Remove the bolts that hold the manifold to the mounting bracket.
5. Remove the manifold block.

DISASSEMBLY

NOTE: Mark all components as they are removed so as not to confuse their location during assembly.

1. Remove coils from solenoid valves.
2. Remove valves.
3. Remove fittings, plugs, springs, balls, and orifices.

CLEANING AND INSPECTION

1. Wash the manifold in cleaning solvent to remove built-up contaminants, 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

Refer to the *Service and Repair* section for assembly drawings, and the *Parts Manual* for illustrated parts breakdowns.

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 punch.

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

INSTALLATION

Refer to the *Service and Repair* section for model specific information.

1. Attach manifold assembly to mounting plate with bolts.
2. Connect solenoid leads (as previously tagged).
3. Connect hydraulic hoses. Be certain to tighten hoses to manifold.
4. Reconnect the battery.
5. Operate each hydraulic function and check for proper operation and leaks.
6. Adjust valve pressures according to the *Service and Repair* section.

1-8 CYLINDER REPAIR



Cylinders may be very heavy. Support heavy cylinders before removing pins which secure the cylinder to the machine.

REMOVAL

NOTE: Refer to the *Service and Repair* section for the location of cylinders, and the *Parts Manual* for a list of parts which secure the cylinders.

1. Mark and disconnect hoses and IMMEDIATELY cap the openings to prevent contamination.
2. Remove the cylinder from the machine as described in the *Service and Repair* section.

DISASSEMBLY

1. Remove the head from the cylinder body.
2. Carefully slide the rod assembly out of the cylinder.
3. Remove the seal kit components (wipers, rod seals, o-rings and backup rings) from the head and piston.
4. Inspect parts for scratches, pits or polishing. Check seal grooves and sealing surfaces. Scratches or pits deep enough to catch the fingernail are unacceptable; replace the cylinder. Polishing is a sign of uneven loading. When this occurs, the surface should be checked for roundness. Cylinders not round within 0,18 mm (.007 in.) should be replaced.

ASSEMBLY

Refer to the *Service and Repair* section for seal-kit assembly drawings, and the *Parts Manual* for illustrated parts breakdowns.

NOTE:

- To avoid cutting the seals, do not use sharp edged tools during seal replacement. After installing seals allow at least one hour for the seals to elastically restore to their original shape before assembling the cylinder.
- Torque all hardware to torques according to Table 1-1, "Torque Specifications for Hydraulic Components," on Page 1-3 unless otherwise specified.

1. Lubricate all components with clean hydraulic fluid.
2. Install new seal kit components.
3. Lubricate the rod wiper and seal with hydraulic fluid and slide the head onto the rod.
4. Lubricate the seals on the piston and head.
5. Carefully slide the rod assembly into the cylinder.
6. Secure the head into the cylinder.

INSTALLATION

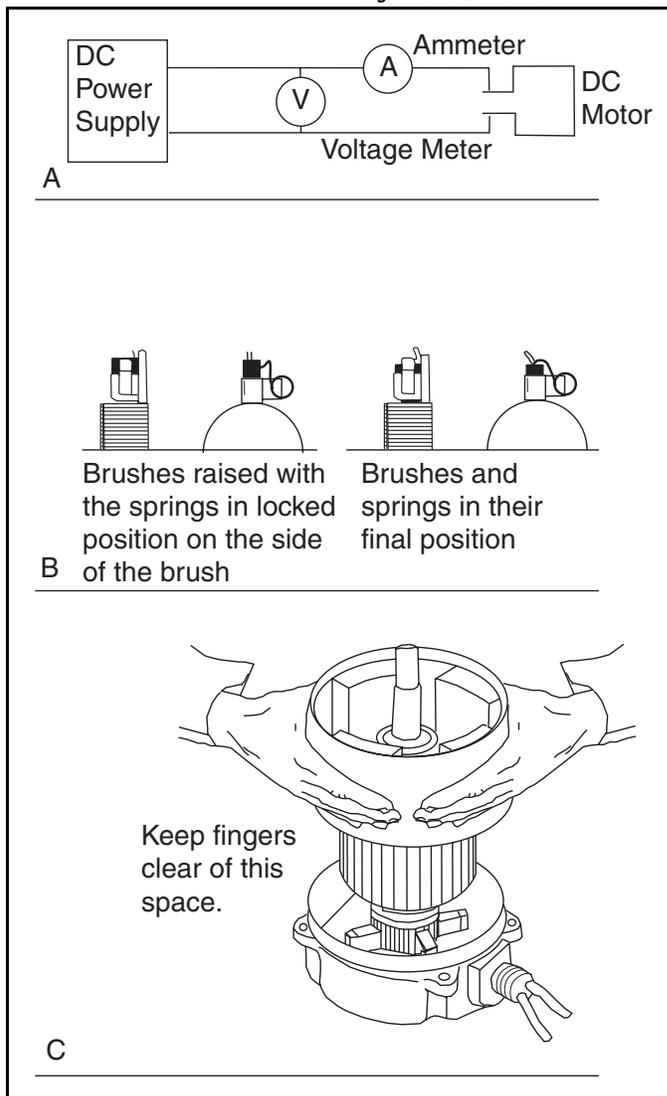
1. Installation is reverse of removal.
2. Carefully remove the elevating assembly support.
3. Slowly cycle the cylinder several times to remove air from the hydraulic system.
4. Check for proper cylinder operation. Check hydraulic connections for leaks.

1-9 ELECTRIC MOTORS

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 A.
 - A. The shaft could be tight for a number of reasons, this check is to determine if the tightness is of a temporary nature only.
 - a. Obtain power to produce the nameplate voltage. **Do not Make a Permanent Connection.**
 - b. First touch the motor leads quickly to the power supply just long enough to observe if the shaft turns.
 - c. 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..
 - d. 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 1-6A. 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 that the original problem is external to the motor.

Figure 1-6: Electric Motor Service



DISASSEMBLY

1. Remove the through bolts.
2. Remove the pulley end cover.
3. Pull the armature out of the assembly in one swift motion.
4. Remove the 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. The armature should be checked for grounds and shorted turns. Re-finish the commutator surface if it is pitted or excessively worn. (This procedure should be performed by a qualified electric motor shop.)
3. Brushes should be checked for wear and to ensure that they are free in the brush holders.

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

- a. Remove the brush spring clip from its mounting on the brush assembly.
 - b. Lift the brush assembly from the brush holder.
 - c. Disconnect the brush assembly lead.
 - d. Install the new brush assembly by reversing the above procedure.
4. Inspect the wire harness and all connections for signs of damage due to overheating.
 5. Check the stator to see if it is securely mounted.

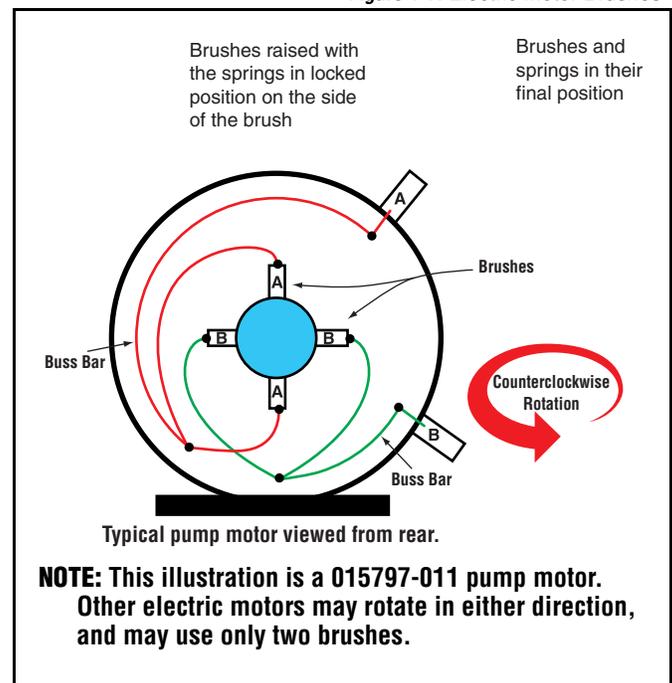
REASSEMBLY

1. Install new brushes and be sure they are free in the holder. Install the brush with the lead wires positioned as when received. Raise all brushes to the locked position. (See Figure 1-7 and **Inspection** Step 3.).
2. Place the commutator cover on a work bench with the brush assembly facing upward.
3. Place the bearing spring into the bearing bore.
4. Take a complete armature assembly, including bearings, and insert the commutator end bearing into the bearing bore.

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

5. Set the brushes into their final position as shown in Figure 1-7.
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 the 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 the rated voltage, observe the no-load current. It should be less than 20% of the name-plate full load current. Anything higher indicates:
 - Brushes are not on neutral setting (check match-marks for exact alignment).
 - Faulty armature.

Figure 1-7: Electric Motor Brushes



1-10 BATTERY MAINTENANCE

CAUTION

If battery water level is not maintained, batteries will not fully charge, creating a low discharge rate.

⚠ 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. Thoroughly rinse away any spilled fluid with clean water.

Always replace batteries with UpRight batteries or manufacturer approved replacements.

Before disconnecting the battery negative (-) lead, make sure all switches are OFF. If ON, a spark will occur at the ground terminal which could cause an explosion if hydrogen gas or fuel vapors are present.

- Check battery fluid level daily.
- If electrolyte level is lower than 10 mm (**3/8 in.**) above plates, add distilled water only. DO NOT use tap water with high mineral content. It will shorten battery life. DO NOT overfill. Battery acid expands during charging and can overflow.
- Keep terminals and tops of batteries clean.
- The battery and cables should be inspected regularly for signs of cracks in the case, electrolyte leakage and corrosion of the terminals. Inspect the cables for worn spots or breaks in the insulation and for broken cable terminals.
- Clean batteries whenever there are signs of corrosion at the terminals, or when electrolyte has overflowed during charging. Use a baking soda solution to clean batteries, taking care not to get the solution inside the cells. Rinse thoroughly with clean water.
- Clean battery and cable contact surfaces to a bright metal finish whenever a cable is removed.

BATTERY CHECK

Electric UpRight Aerial Work Platforms use deep cycle batteries. If poor service life is experienced, batteries should be checked for bad cells. Fully charge batteries for 14 hours minimum, ensuring that the charger has completed its cycle (see 'Battery Charging' on page 1-14).

Deep cycle batteries do not have their full potential until they have been through 50 charge/discharge cycles. Normal 5-day weeks, charging batteries every day, equals 50 cycles in ten weeks.

If bad cells are found in any battery in a battery pack more than two years old, all batteries in the pack should be replaced for balance.

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' on page 1-14. After this initial charge, recheck the electrolyte level in all cells and add distilled water as necessary. Then, turn on the charger for an additional eight hours.

SPECIFIC GRAVITY

Check the specific gravity of all cells with a hydrometer. The temperature corrected specific gravity of a fully charged battery 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 complete a discharge/charge cycle before checking.

Table 1-5: Specific Gravity and Battery Voltage

	SPECIFIC GRAVITY		VOLTS DC			
	Each Cell	Per Cell	6V Battery	12V Battery	24V Battery Pack	48V Battery Pack
Fully Charged	1.270	2.10	6.30	12.60	25.20	50.40
Fully Discharged	1.130	1.75	5.25	10.50	21	42

LOAD TESTING BATTERY PACKS

1. Fully charge the battery pack.
2. With the battery pack at rest and under full load, perform steps 3 and 4.
 - a. To put the battery pack under full load,
 - Activate the steering switch to turn the wheels fully in either direction.
 - Continue to hold the steering switch while performing steps 3 and 4.
3. Measure the potential across each battery.
4. Measure the potential across the entire battery pack.
5. Compare the measured results

Any battery that measures 10% lower voltage than the others has a bad cell and should be replaced.

BATTERY CHARGING

CAUTION

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

WARNING

Charge batteries only in a well ventilated area.

DO NOT charge batteries when sparks or open flames are present.

Never leave the connected charger unattended for more than two days.

Never disconnect the cables from the battery when the charger is operating.

Keep the charger dry.

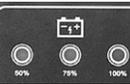
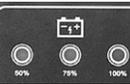
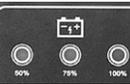
- Charge batteries at the end of each work shift or sooner if the batteries have been discharged.
- Discharging a deep cycle battery to less than 1.75 Volts per cell can cause permanent damage.

NOTE: Do not operate the machine when the battery charger is plugged in.

When night temperatures fall below 65°F (18°C), batteries charged in unheated areas should be charged as soon after use as possible. Under such conditions a four hour charge cycle once a week in the early afternoon will improve the state of charge and battery life.

1. Check the battery fluid level. If electrolyte level is lower than 10 mm (3/8 in.) above plates, add distilled water only.
2. Check the charger to determine the AC charging current. If equipped, set the AC voltage selector switch to match the AC power source.
3. Connect an extension cord that meets or exceeds the charger AC current onto the charger plug.
4. Connect the other end of the extension cord to a grounded AC outlet of proper current, voltage and frequency rating.
5. The charger turns on automatically after a short delay. Table 1-6 illustrates charging indicators.

Table 1-6: Battery Charging, UpRight Electric and BiEnergy Machines

Charger Display	AC Charging Current		Charging Indicator	Charger Shutdown											
	068574-000	8 Amp - 115 VAC	Ammeter • Charging current is displayed on ammeter. • Current drops off as batteries charge.	• Charger shuts off automatically. • Ammeter shows "0" current.											
	069112-000	4 Amp - 230 VAC				063944-001	7 Amp - 115 VAC	Green Light • ON during charging cycle. • Blinking at charge completion.	• Charger automatically shuts down to 1 amp trickle charge. • Green Light continues to blink.	063948-003	4 Amp - 230 VAC		069199-000 & 069199-001	8 Amp - 115 VAC 4 Amp - 230 VAC	Three Lights • 0 - 50% charge: First Light -Blinking- Second and Third Light -OFF- • 50% - 75% Charge: First Light -ON- Second Light -Blinking- Third Light -OFF- • 75% - 100% Charge: First and Second Light -ON- Third Light - Blinking- • Charge Complete All Lights -ON-
	063944-001	7 Amp - 115 VAC	Green Light • ON during charging cycle. • Blinking at charge completion.	• Charger automatically shuts down to 1 amp trickle charge. • Green Light continues to blink.											
	063948-003	4 Amp - 230 VAC				069199-000 & 069199-001	8 Amp - 115 VAC 4 Amp - 230 VAC	Three Lights • 0 - 50% charge: First Light -Blinking- Second and Third Light -OFF- • 50% - 75% Charge: First Light -ON- Second Light -Blinking- Third Light -OFF- • 75% - 100% Charge: First and Second Light -ON- Third Light - Blinking- • Charge Complete All Lights -ON-	• Charger automatically shuts down to low current after charging is complete and all Lights turn ON. • Charger continues at low current (equalizing charge) for 3-4 hours, then charging current shuts off completely. • Lights remain ON until the AC power supply is disconnected.	Dual Voltage					
	069199-000 & 069199-001	8 Amp - 115 VAC 4 Amp - 230 VAC	Three Lights • 0 - 50% charge: First Light -Blinking- Second and Third Light -OFF- • 50% - 75% Charge: First Light -ON- Second Light -Blinking- Third Light -OFF- • 75% - 100% Charge: First and Second Light -ON- Third Light - Blinking- • Charge Complete All Lights -ON-	• Charger automatically shuts down to low current after charging is complete and all Lights turn ON. • Charger continues at low current (equalizing charge) for 3-4 hours, then charging current shuts off completely. • Lights remain ON until the AC power supply is disconnected.											
	Dual Voltage														

BATTERY CHARGER TROUBLESHOOTING

CAUTION

Ensure that battery chargers with voltage selector switches are set on the correct AC line voltage before placing chargers in service to avoid charger failure.

Connect battery leads in correct polarity to avoid charger damage.

WARNING

Remove all power before working on electrical parts to avoid shock.

Shock hazard can exist if AC plugs are wired incorrectly.

The battery charger troubleshooting procedure is outlined in Table 1-7. The table shows various conditions for each charger type with the problem to be investigated. Follow the table from the top down when troubleshooting. If the problem is not resolved after going through the entire table, the charger should be replaced.

NOTE: The majority of chargers returned to UpRight as “failed” test good. Please follow the troubleshooting procedures carefully.

Table 1-7: Battery Charger Troubleshooting

				
Problem	068574-000 (115V) 069112-000 (110/230V)	063944-001 (115V) 063948-003 (110/230V)	069199-000 & 069199-001 (115/230V auto)	Solution
Battery voltage is below 18 Volts (too low to allow the charger to turn on).	<ul style="list-style-type: none"> • Ammeter does not move. • No hum from charger. 	<ul style="list-style-type: none"> • No green Light. • No hum from charger. 	<ul style="list-style-type: none"> • Not Applicable. • Charger turns on even with very low battery voltage. 	Charge batteries to at least 24 Volts with an external charger, then disconnect the external charger and plug in the internal charger.
The charger has been plugged into an AC outlet with different voltage than the AC switch setting on the charger.	<ul style="list-style-type: none"> • Ammeter does not move. • No hum from charger. 	<ul style="list-style-type: none"> • No green Light. • No hum from charger. 	<ul style="list-style-type: none"> • Not Applicable. • Charger automatically adjusts to the incoming AC current. 	063944-001 ONLY <ul style="list-style-type: none"> • Check the fuse inside the switch box - replace if bad. • If the fuse is good, the charger has failed. All Others <ul style="list-style-type: none"> • Check the AC main circuit breaker and reset if necessary. • Set the voltage selector switch to the proper voltage.
Fuse visible on front of charger has failed.	<ul style="list-style-type: none"> • Ammeter does not move. • No hum from charger. 	<ul style="list-style-type: none"> • Not Applicable. 	<ul style="list-style-type: none"> • Not Applicable. 	Check for DC output short circuit and replace the fuse.
AC power problem.	<ul style="list-style-type: none"> • Ammeter does not move. • No hum from charger. 	<ul style="list-style-type: none"> • No green Light. • No hum from charger. 	<ul style="list-style-type: none"> • No Lights ON. • No Lights blinking. 	<ul style="list-style-type: none"> • AC outlet is bad. • Extension cord is bad • Plug is bad or wired wrong. • AC wire is broken. Check and repair as necessary.
DC connection to batteries.	<ul style="list-style-type: none"> • Ammeter does not move. • No hum from charger. 	<ul style="list-style-type: none"> • No green Light. • No hum from charger. 	<ul style="list-style-type: none"> • All three Lights blink once. 	Connection to battery; <ul style="list-style-type: none"> • missing. • corroded. • wrong polarity. • DC wire broken. Check and repair as necessary, and check Fuse.
One or more batteries is bad.	<ul style="list-style-type: none"> • Ammeter never shuts off, even after 14 hours of charging. 	<ul style="list-style-type: none"> • Green Light ON but never starts blinking, even after 14 hours of charging. 	<ul style="list-style-type: none"> • Lights one and two are ON or blinking, but all three Lights ON never occurs, even after 14 hours of charging. 	<ul style="list-style-type: none"> • Check water level. • Check for shorted cells. • Replace bad batteries.
AC input voltage too high.	<ul style="list-style-type: none"> • Not Applicable. 	<ul style="list-style-type: none"> • Not Applicable. 	<ul style="list-style-type: none"> • All three Lights blink two times. 	Check and correct AC source.
Overheated charger.	<ul style="list-style-type: none"> • Not Applicable. 	<ul style="list-style-type: none"> • Not Applicable. 	<ul style="list-style-type: none"> • All three Lights blink three times. 	Move the machine to a cooler area. Allow the machine to cool before connecting to AC source.
High current in DC charging output.	<ul style="list-style-type: none"> • Not Applicable. 	<ul style="list-style-type: none"> • Not Applicable. 	<ul style="list-style-type: none"> • All three Lights blink four times. 	<ul style="list-style-type: none"> • Check for shorted DC output wires. • Check for bad batteries.

1-11 FLOOR LOADING

Floor Loading is defined as pressure imposed onto load-bearing surfaces, and can be measured as **Localized Pressure** or **Occupied Pressure**. To calculate Floor Loading, find the Total Weight of the machine.

TOTAL WEIGHT = MACHINE WEIGHT + MAXIMUM PLATFORM CAPACITY.

Refer to the machine specifications or contact UpRight or your UpRight dealer.

LOCALIZED PRESSURE

KG/CM² OR PSI

Localized Pressure is measured in *kilograms per square centimeter (pounds per square inch)*. It is the pressure exerted onto a small area (contact area). Each tire and/or outrigger imposes Localized Pressure which can cause damage to the load-bearing surface.

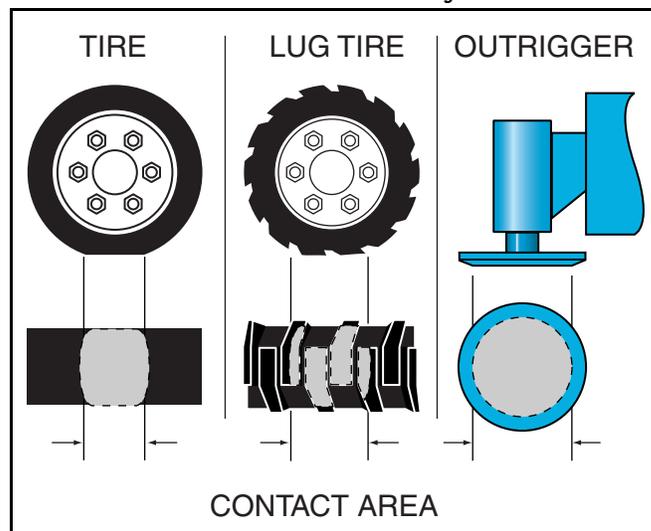
NOTE: The formulas shown here are for vertical lift machines. Applying these formulas to machines with extending platforms will yield average pressures for machines in stowed position. Extending a platform causes increased localized pressure in the direction of extension, and decreased localized pressure at the opposite end.

MEASURE THE CONTACT AREA

Measure the contact area of the contacting surface (tire or outrigger).

The tire contact area can be determined by placing the loaded tire on a clean surface. The tire will leave an imprint from which an area can be determined.

Figure 1-8: Contact Area



CALCULATE THE LOCALIZED PRESSURE

Find the pressure exerted at each contacting surface.

NOTE: The wheel load can usually be found on a label on the machine, or on the serial plate.

If you know the wheel load, use this formula:

LOCALIZED PRESSURE = WHEEL LOAD ÷ CONTACT AREA

If you do not know the wheel load, use this formula:

LOCALIZED PRESSURE = (TOTAL WEIGHT ÷ 4) ÷ CONTACT AREA

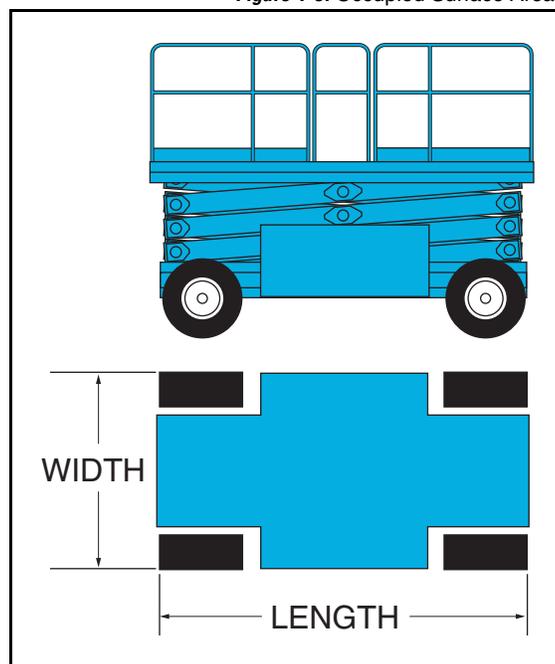
OCCUPIED PRESSURE

KPA OR PSF

Occupied Pressure is measured in *kilopascals or pounds per square foot*. It is the total pressure imposed onto the work surface over the area of the machine (occupied surface area). This is especially important when the work surface is supported by beams. The Occupied Pressure *must not exceed* the maximum load that the surface can support.

OCCUPIED PRESSURE = TOTAL WEIGHT ÷ (LENGTH X WIDTH)

Figure 1-9: Occupied Surface Area



1-12 HYDRAULIC FLUID

FLUID LEVEL

With the platform fully lowered, check the hydraulic fluid level. If the fluid is NOT in operating range, add hydraulic fluid until the fluid level is in operating range.

- DO NOT fill above operating range.
- DO NOT add fluid when the platform is elevated.

RECOMMENDED HYDRAULIC FLUID

CAUTION

Unless recommended by UpRight, do not mix hydraulic fluids of different brands or types. The required additives and fluid viscosities may vary.

If the use of hydraulic fluids other than listed below is desired please contact UpRight Product Support.

MOBILFLUID 424

- Viscosity Grade: ISO 46 High V.I. (similar to SAE 10W-30).
- Viscosity index: 152.
- Operating Range: -10° C to +96° C (+15° F to +205° F) Reservoir Temperature.
- Ambient Conditions*: Above -10° C (+15° F).

MOBIL DTE 13 M

- Viscosity Grade: ISO 32 High V.I. (similar to SAE 5W-20).
- Viscosity index: 140.
- Operating Range: -18° C to +80° C (-4° F to +176° F) Reservoir Temperature.
- Ambient Conditions*: -18° C to +30° C (-4° F to +86° F).

MOBIL DTE 11 M

- Viscosity Grade: ISO 15.
- Viscosity index: 140.
- Operating Range: -35° C to +45° C (-30° F to +115° F) Reservoir Temperature.
- Ambient Conditions*: -35° C to +20° C (-30° F to +70° F).

MOBIL EAL ENVIROSYN 46 H

For use where a *biodegradable non-toxic hydraulic fluid is required.*

- Viscosity Grade: ISO 46 High V.I. (similar to SAE 10W-20).
- Viscosity Index: 153.
- Operating Range: -14° C to +90° C (+6° F to +195° F) Reservoir Temperature.
- Ambient Conditions*: -14° C to +41° C (+6° F to +105° F).
- Synthetic Ester Base.

The anti-wear quality of hydraulic fluid must meet or exceed API Service Classification GL-3. The chemical stability of the hydraulic fluid must be sufficient for mobile hydraulic system service.

*Ambient Conditions are for reference only and may vary by model. Refer to operating temperature for final determination of correct fluid.

1-13 LONG TERM STORAGE

NOTE: Do not drain the hydraulic system prior to long term storage.

If the machine is to be placed in long term storage, follow these recommended preservation procedures.

PRESERVATION

1. Clean painted surfaces. If paint is damaged, repaint.
2. Fill the hydraulic reservoir to operating level.

IMPORTANT: Do not fill the hydraulic reservoir while the platform is elevated.

3. Coat exposed portions of cylinder rods with a preservative such as multipurpose grease and wrap with a barrier material.
4. Coat all exposed unpainted metal surfaces with preservative.
5. **Internal Combustion Models:** Service the engine according to the manufacturers recommendations.
6. **Electric And BiEnergy Models:** Remove the batteries and place them in alternative service.

SERVICE AND REPAIR

This section contains instructions for the maintenance of the Work Platform. Refer to the General Information section for information relevant to all UpRight work platforms. Referring to the Operator Manual will aid in understanding the operation and function of the various components and systems of the work platform, and help in diagnosing and repair of the machine.

⚠ WARNING ⚠

Be sure to read, understand and follow all information in the Operation Section of this manual before attempting to operate or perform service on any Work Platform.

⚠ DANGER ⚠

Never perform service on the work platform in the elevating assembly area while platform is elevated without first blocking the elevating assembly.

DO NOT stand in elevating assembly area while deploying or storing brace.

TABLE OF CONTENTS

2-1 General Description	2-3
Platform	2-3
Platform Controller	2-3
Elevating Assembly	2-3
Chassis	2-3
Purpose of Equipment	2-3
2-2 Blocking the Elevating Assembly	2-4
Installing the Brace	2-4
Removing the Brace	2-4
2-3 Preventative Maintenance	2-4
Preventative Maintenance Check List	2-5
2-4 Batteries	2-6
Battery Replacement	2-6
Battery Maintenance	2-6
2-5 Switch Adjustments	2-7
Level Sensor	2-7
Introduction	2-7
Adjustment	2-7
Test	2-7
Down Limit Switch	2-7
PQ Control Handle	2-8
Motor Controller and I/O Board Dip Switch Settings	2-8
2-6 Hydraulic Fluid Reservoir and Filter	2-9
Fluid Level	2-9
Fluid and Filter Replacement	2-9

2-7 Hydraulic Pressure Settings	2-10
Main Relief Valve	2-10
Lift Relief Valve	2-10
Steering Relief Valve	2-10
Counterbalance Valves	2-11
2-8 Hydraulic Manifold	2-12
Removal, Repair and Installation	2-12
2-9 Hydraulic Pump	2-13
Removal	2-13
Installation	2-13
2-10 Hydraulic Drive Motors and Hubs	2-13
Removal	2-13
Installation	2-13
2-11 Brake Cylinder	2-14
Removal	2-14
Repair	2-14
Installation	2-14
2-12 Steering Cylinder	2-15
Removal	2-15
Repair	2-15
Installation	2-15
2-13 Depression Mechanism Cylinder	2-16
Removal	2-16
Repair	2-16
Installation	2-16
2-14 Lift Cylinder	2-17
Removal	2-17
Repair	2-17
Installation	2-17

LIST OF FIGURES

Figure 2-1: MX15/19 Work Platform	2-3
Figure 2-2: Blocking the Elevating Assembly	2-4
Figure 2-3: Battery Cables	2-6
Figure 2-4: Level Sensor	2-7
Figure 2-5: Down Limit Switch	2-7
Figure 2-6: Control Handle	2-8
Figure 2-7: Hydraulic Fluid Reservoir	2-9
Figure 2-8: Hydraulic fluid Filter from left side	2-9
Figure 2-9: Hydraulic Manifold Test Ports, from right side	2-11
Figure 2-10: Hydraulic Manifold	2-12
Figure 2-11: Hydraulic Pump	2-13
Figure 2-12: Drive Motor Installation	2-13
Figure 2-13: Brake Cylinder Installation	2-14
Figure 2-14: Brake Cylinder Assembly	2-14
Figure 2-15: Steering Cylinder Installation	2-15
Figure 2-16: Steering Cylinder Assembly	2-15
Figure 2-17: Depression Mechanism Cylinder	2-16
Figure 2-18: Depression Mechanism Cylinder	2-16
Figure 2-19: Lift Cylinder Assembly	2-17
Figure 2-20: Lift Cylinder Location	2-18

2-1 GENERAL DESCRIPTION

The MX15/19 consists of the platform, controller, elevating assembly, and chassis.

⚠ WARNING ⚠

DO NOT use the work platform without guardrails properly assembled and in place.

PLATFORM

The platform has a reinforced steel floor, guardrails with midrail, toeboards, and an entry-way at the rear of the platform.

PLATFORM CONTROLLER

The platform controller contains the controls to operate the machine. It is located at the front of the platform. A complete explanation of control functions can be found in the *Operation Manual*.

ELEVATING ASSEMBLY

The platform is raised and lowered by the elevating assembly. The hydraulic pump, driven by an electric motor, powers the cylinder. Solenoid operated valves control raising and lowering.

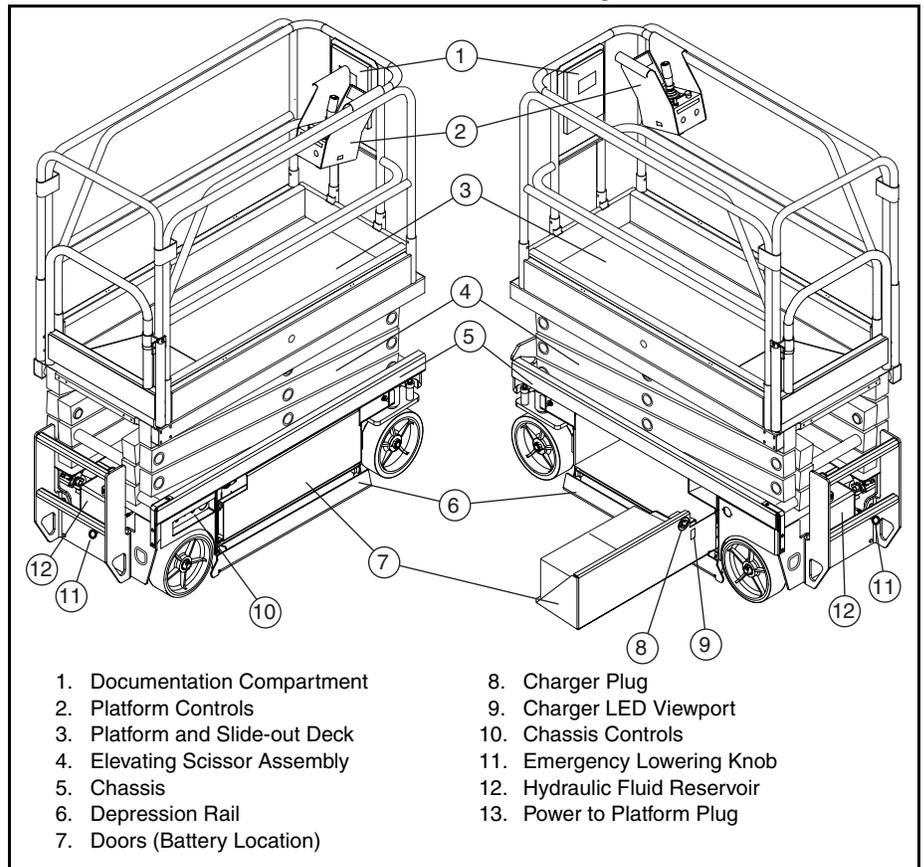
CHASSIS

The chassis is a structural frame that supports all the components of the MX15/19 work platform. The platform is raised and lowered using a scissors mechanism. Lift is achieved using a single stage cylinder.

PURPOSE OF EQUIPMENT

The objective of the work platform is to provide a quickly deployable, self-propelled, variable height work platform to elevate personnel and materials to overhead work areas.

Figure 2-1: MX15/19 Work Platform



2-2 BLOCKING THE ELEVATING ASSEMBLY

⚠ WARNING ⚠

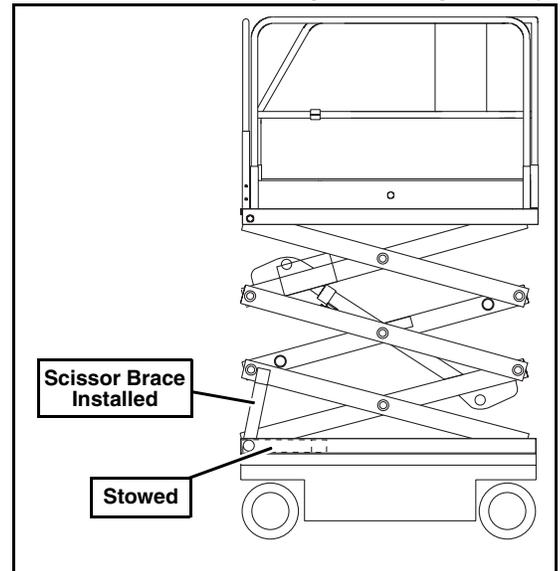
Never perform service on the work platform in the elevating assembly area while platform is elevated without first blocking the elevating assembly.

DO NOT stand in elevating assembly area while deploying or storing brace.

INSTALLING THE BRACE

1. Park the work platform on a firm, level surface.
2. Verify that Chassis and Platform Emergency Stop Switches are ON.
3. Turn and hold the Chassis Key Switch to CHASSIS.
4. Push the Chassis Lift Switch to UP and elevate the platform:
 - MX15 - approximately 2,1 m (7 feet).
 - MX19 - approximately 2,7 m (9 feet).
5. Rotate the Scissor Brace towards the rear, holding it perpendicular to the scissor tube.
6. Push the Chassis Lift Switch to the DOWN position and gradually lower the platform until the scissor tube rests on the brace.

Figure 2-2: Blocking the Elevating Assembly



REMOVING THE BRACE

1. Turn and hold the Chassis Key Switch to CHASSIS. Push the Chassis Lift Switch to the UP position and gradually raise the platform until the scissor brace clears the scissor tube.
2. Rotate the scissor brace towards the front so that it rests on the chassis.
3. Push the Chassis Lift Switch to the DOWN position, and completely lower the platform.
4. Turn the Chassis Key Switch to DECK.

2-3 PREVENTATIVE MAINTENANCE

The complete inspection consists of periodic visual and operational checks, along with periodic minor 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.

⚠ WARNING ⚠

Before performing preventative maintenance, familiarize yourself with the operation of the machine.

Always block the elevating assembly whenever it is necessary to enter the scissor assembly to perform maintenance while the platform is elevated.

The preventative maintenance table has been designed for machine service and maintenance repair. Please photocopy the **Preventative Maintenance Check List** and use the table when inspecting the machine for service.

PREVENTATIVE MAINTENANCE CHECK LIST

MAINTENANCE TABLE KEY

Interval

- Daily=each shift or every day
- 50h/30d=every 50 hours or 30 days
- 250h/6m=every 250 hours or 6 months
- 1000h/2y=every 1000 hours or 2 years
- Y=Yes/Acceptable
- N=No/Not Acceptable
- R=Repaired/Acceptable

PREVENTATIVE MAINTENANCE REPORT

Date: _____

Owner: _____

Model No: _____

Serial No: _____

Serviced By: _____

Service Interval: _____

COMPONENT	INSPECTION OR SERVICES	INTERVAL	Y	N	R
Battery	Check electrolyte level	Daily			
	Check specific gravity	6m			
	Clean exterior	6m			
	Check battery cable condition	Daily			
	Clean terminals	6m			
Hydraulic Oil	Check oil level	Daily			
	Change filter	6m			
	Drain and replace oil	2y			
Hydraulic System	Check for leaks	Daily			
	Check hose connections	30d			
	Check hoses for exterior wear	30d			
Emergency Hydraulic System	Operate 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	6m			
	Check welds for cracks	Daily			
	Check condition of deck	Daily			
Tires	Check for damage	Daily			
	Check lug nuts (torque to 108 Nm [80 ft. lbs.])	6m			
Hydraulic Pump	Wipe clean	30d			
	Check for leaks at mating surfaces	30d			
	Check for hose fitting leaks	Daily			
	Check mounting bolts for proper torque	6m			
Drive Motors	Check for operation and leaks	Daily			

COMPONENT	INSPECTION OR SERVICES	INTERVAL	Y	N	R
Steering System	Check hardware & fittings for proper torque	6m			
	Grease pivot pins	30d			
	Oil king pins	30d			
	Check steering cylinder for leaks	30d			
Elevating Assembly	Inspect for structural cracks	Daily			
	Check pivot points for wear	6m			
	Check mounting pin pivot bolts for proper torque	6m			
Chassis	Check elevating arms for bending	6m			
	Check hoses for pinch or rubbing points	Daily			
Lift Cylinder	Check component mounting for proper torque	6m			
	Check welds for cracks	Daily			
Entire Unit	Check the cylinder rod for wear	30d			
	Check mounting pin pivot bolts for proper torque	6m			
	Check seals for leaks	30d			
	Inspect pivot points for wear	6m			
Labels	Check fittings for proper torque	6m			
	Check for and repair collision damage	Daily			
	Check fasteners for proper torque	6m			
	Check for corrosion-remove and repaint	6m			
Entire Unit	Lubricate	30d			
	Check for peeling, missing, or unreadable labels & replace	Daily			

2-4 BATTERIES

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.

NOTE: If system voltage drops below 17 volts (on a 24 volt system), the charger will not recharge the batteries. If this extreme voltage drop occurs, disconnect and recharge each battery separately using a 6 volt charger to bring the voltage in each up to at least 4 1/2 volts.

CAUTION

If battery water level is not maintained, batteries will not fully charge, creating a low discharge rate.

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. Thoroughly rinse away any spilled fluid with clean water.

Always replace batteries with UpRight batteries or manufacturer approved replacements.

Before disconnecting the battery negative (-) lead, make sure all switches are OFF. If ON, a spark will occur at the ground terminal which could cause an explosion if hydrogen gas or fuel vapors are present.

BATTERY REPLACEMENT

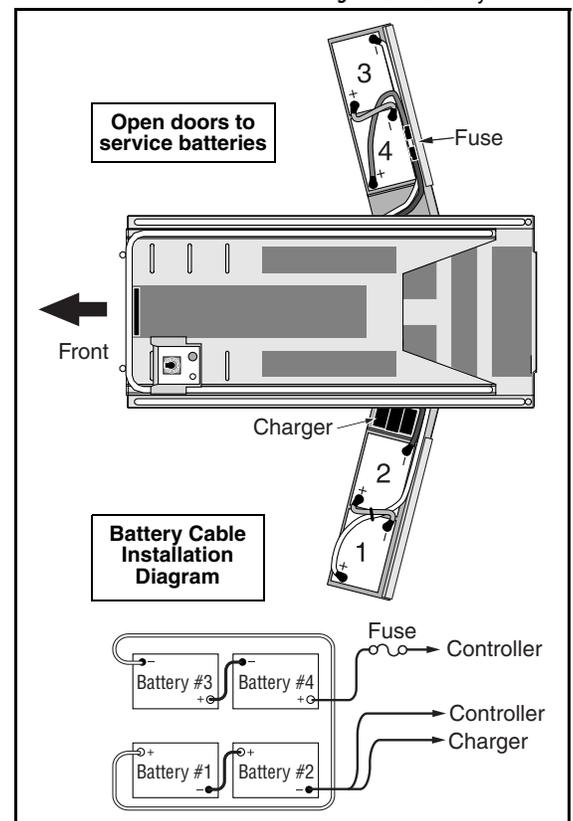
There are two batteries located in each door. The four 6 volt batteries are wired in series for 24 volts DC. Battery cables must be installed as shown in the Battery Cable Installation Diagram.

BATTERY MAINTENANCE

Refer to *Section 1: General Information* for complete battery maintenance instructions.

Refer to the *Operation Manual* included in this Service Manual for specific maintenance and charging instructions.

Figure 2-3: Battery Cables



2-5 SWITCH ADJUSTMENTS

⚠ WARNING ⚠

Always use the elevating assembly brace whenever it is necessary to enter the elevating assembly when the platform is elevated.

LEVEL SENSOR

INTRODUCTION

The Level Sensor has three wires: red-power (24V in), black-ground, white-output (24V out). To verify that the sensor is working properly, there is one LED under the sensor that indicates the sensor is off level.

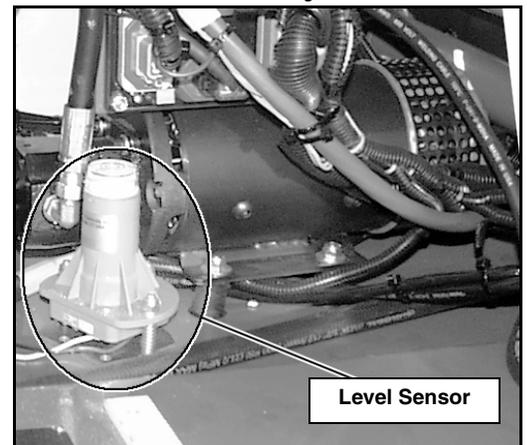
ADJUSTMENT

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

TEST

1. Open the door.
2. Push and hold the sensor off of level.
3. Push the Chassis Lift Switch to the UP position.
 - The alarm should sound, and the platform should not lift.
4. Close and latch the door.

Figure 2-4: Level Sensor



DOWN LIMIT SWITCH

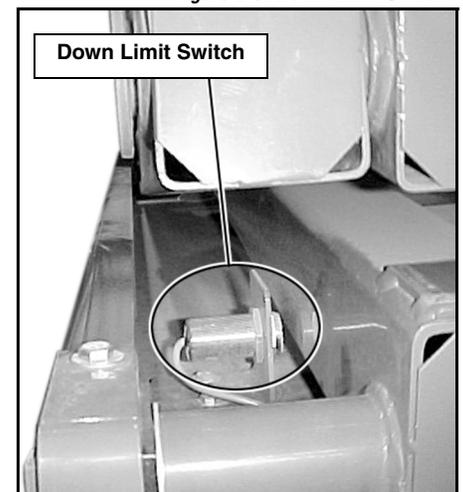
The Down Limit Switch cuts power to the High Speed Circuit and supplies power to the Level Sensor Circuit when the platform is elevated. The switch is located on the left side of the chassis at the rear of the machine.

The down limit adjustment is;

- MX15 - 89 cm (35 inches).
- MX19 - 114 cm (45 inches).

No adjustment of the switch should be necessary.

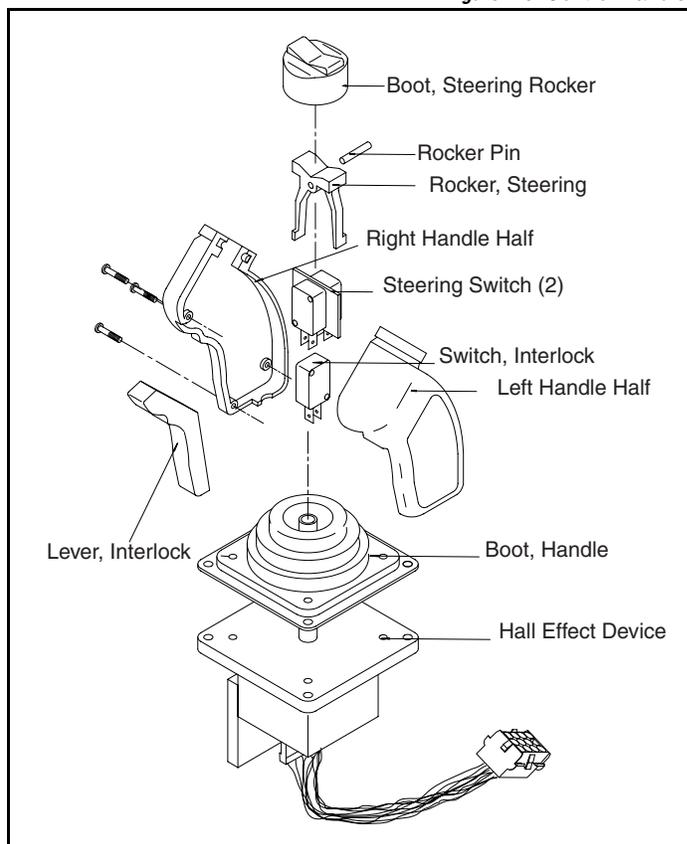
Figure 2-5: Down Limit Switch



PQ CONTROL HANDLE

1. Remove the handle if necessary from Platform Control box.
2. Remove and replace parts as needed. Refer to the *Parts Manual* for repair parts numbers.

Figure 2-6: Control Handle



MOTOR CONTROLLER AND I/O BOARD DIP SWITCH SETTINGS

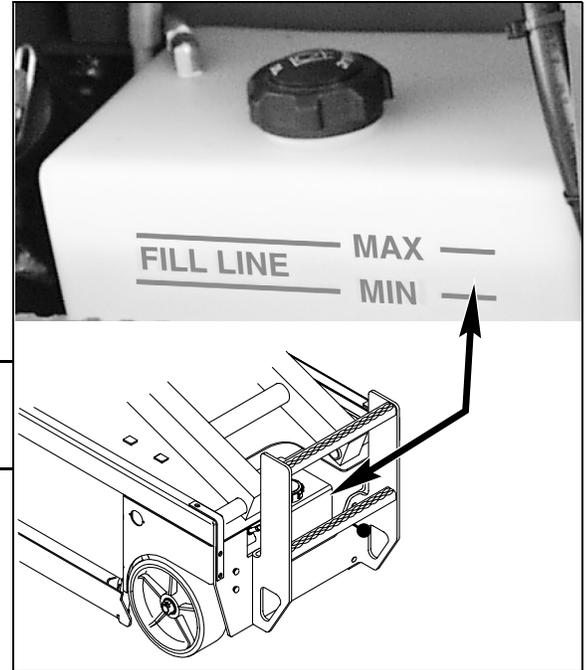
Refer to the *Section 3: Troubleshooting* for dip switch settings.

2-6 HYDRAULIC FLUID RESERVOIR AND FILTER

FLUID LEVEL

With the platform **fully lowered**, check the fluid level through the side of the reservoir. The level should be between the “max” and “min” lines.

Figure 2-7: Hydraulic Fluid Reservoir



FLUID AND FILTER REPLACEMENT

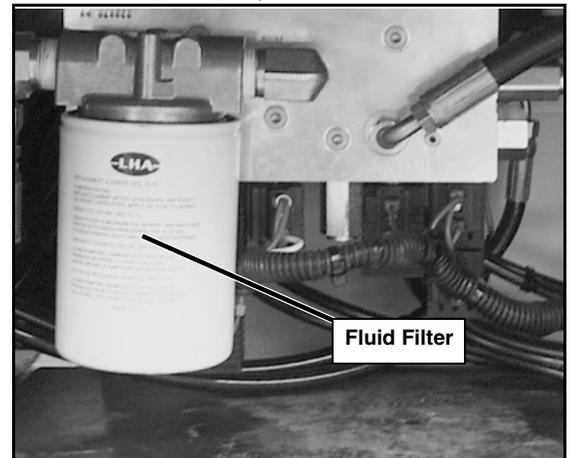
1. Operate the work platform for 10-15 minutes to bring the hydraulic fluid up to normal operating temperature.

CAUTION

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

2. Provide a suitable container to catch the drained fluid. Hydraulic reservoir has a 12,9 liter (**3.4 US gal**) capacity.
3. Remove the drain plug and allow all fluid to drain. Dispose of hydraulic fluid properly - contact your local recycler.
4. Clean magnet on drain plug and reinstall.
5. Unscrew the filter (located beside valve block, easily accessed through the left module) from the filter assembly.
6. Apply a thin film of clean hydraulic fluid to the gasket of the replacement filter.
7. Screw the replacement filter onto the filter head until the gasket makes contact, then rotate the filter $\frac{3}{4}$ of a turn further.
8. Fill the hydraulic reservoir with hydraulic fluid until the fluid level is between the minimum and maximum lines on the reservoir. Do not fill above the maximum line on the reservoir. Hydraulic reservoir has a 12.9 liter (**3.4 US gal**) capacity.
9. Operate all machine functions and recheck the fluid level. Add fluid if necessary.

Figure 2-8: Hydraulic fluid Filter from left side



2-7 HYDRAULIC PRESSURE SETTINGS

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

⚠ WARNING ⚠

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

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

MAIN RELIEF VALVE

1. Operate the hydraulic system 10-15 minutes to warm the fluid.
2. Slowly drive the machine to within 8 cm (**3 inches**) of a solid, immovable brick wall. Ease the machine forward until the front of the chassis is in solid contact with the wall.
3. Insert a 344 bar (**5000 psi**) pressure gauge into the test port.
4. Loosen the locknut or remove the cover on the Main Relief Valve and turn the adjusting screw counterclockwise two full turns.
5. Unhook the Platform Controls from the guardrail so that the machine may be operated from the ground. Slowly push the control lever in the direction of the wall.
6. Slowly turn the Main Relief Valve adjusting screw clockwise to increase the pressure until the gauge reads 207 bar (**3000 psi**).
7. Tighten locknut or replace Main Relief Valve cover and torque to 8 Nm (**6 ft/lbs**).

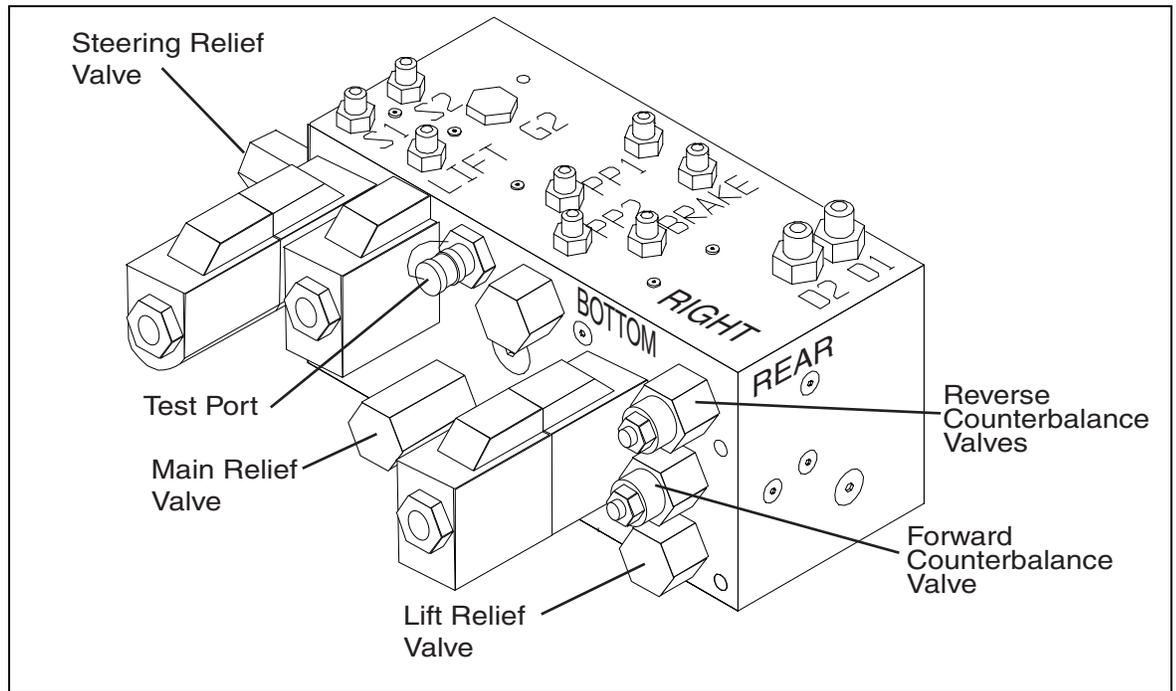
LIFT RELIEF VALVE

1. Operate the hydraulic system 10-15 minutes to warm the fluid.
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 the Specifications Table in the *Operation Manual*) on the platform.
4. Turn and hold the Chassis Key Switch to CHASSIS. Push 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 rise.
6. Release the Chassis Lift Switch. Tighten locknut or replace Lift Relief Valve cover and torque to 8 Nm (**6 ft/lbs**).

STEERING RELIEF VALVE

1. Operate the work platform for 10-15 minutes to bring the hydraulic fluid up to normal operating temperature.
2. Connect a 207 bar (**3000 psi**) pressure gauge into the test 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 82,7 bar (**1200 psi**).
5. Tighten locknut or replace Steering Relief Valve cover and torque to 8 Nm (**6 ft/lbs**).
6. Remove gauge and replace cap.

Figure 2-9: Hydraulic Manifold Test Ports, from right side



COUNTERBALANCE VALVES

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

2-8 HYDRAULIC MANIFOLD

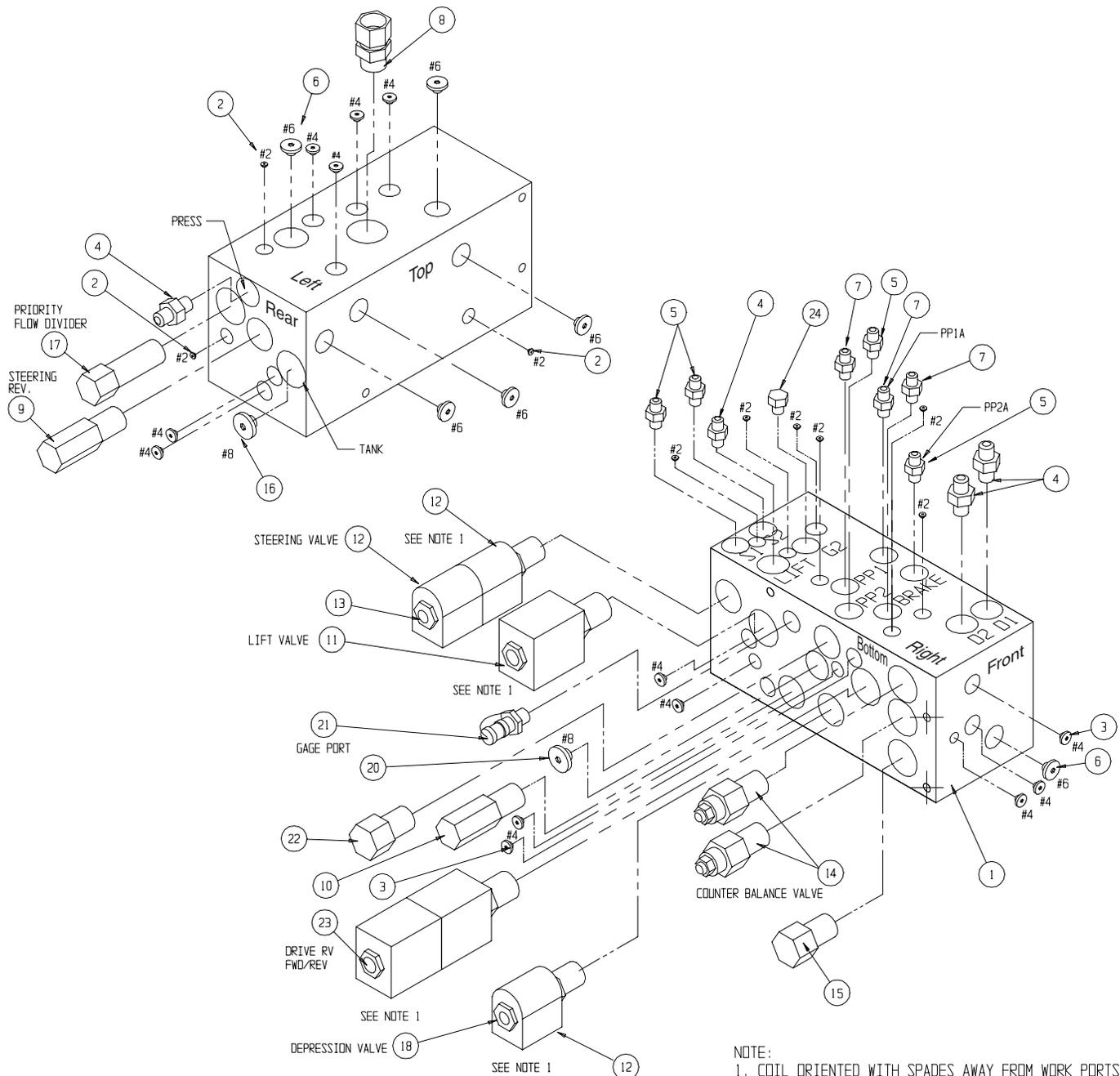
It is not necessary to remove the manifold to perform all maintenance procedures. Decide beforehand as to whether or not the manifold should be removed before maintenance procedures begin.

REMOVAL, REPAIR AND INSTALLATION

Refer to *Section 1 - General Information* for removal, repair and installation instructions.

Figure 2-10: Hydraulic Manifold

- | | | |
|--|--|--|
| 1. CONTROL VALVE BLOCK | 10. RELIEF VALVE, MAIN | 18. DEPRESSION MECHANISM VALVE
2 POS POPPET VALVE W/ COIL |
| 2. FITTING #2 PLUG | 11. LIFT SOLENIOD
2 POS - 4 WAY SOLENOID W/ COIL | 19. COIL |
| 3. FITTING #4 PLUG | 12. COIL | 20. FITTING, #8 PLUG |
| 4. FITTING STRAIGHT 6MB - 6MJ | 13. STEERING SOLENOID
3 POS - 4 WAY SOLENOID W/ COILS | 21. FITTING GAUGE |
| 5. FITTING STR 4MBH - 4MJ | 14. COUNTERBALANCE VALVE | 22. CHECK VALVE |
| 6. FITTING PLUG #6 | 15. RELIEF VALVE | 23. DRIVE SOLENOID
3 POS - 4 WAY SOLENOID W/ COILS |
| 7. FITTING STRAIGHT
4MB - 4MJ W/ .031 ORIFICE | 16. FITTING PLUG #8 | 24. FITTING, HEX PLUG #4 |
| 8. FITTING 8MB-8FJX | 17. FLOW DIVIDER VALVE | |
| 9. RELIEF VALVE, STEERING | | |



2-9 HYDRAULIC PUMP

REMOVAL

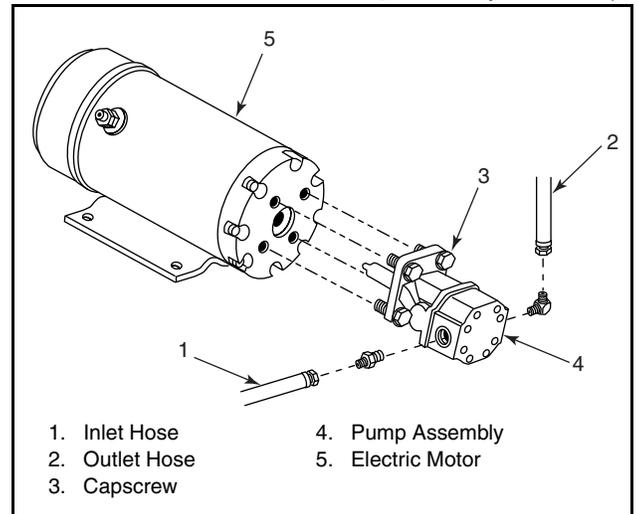
NOTE: If the hydraulic reservoir has not been drained, plug the hoses to prevent excessive fluid loss.

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 cap-screw a little at a time until all capscrews are torqued to 27 Nm (20 ft/lbs).
3. Unplug and reconnect the hydraulic hoses.
4. Check the fluid level in the hydraulic reservoir before operating the work platform.

Figure 2-11: Hydraulic Pump



2-10 HYDRAULIC DRIVE MOTORS AND HUBS

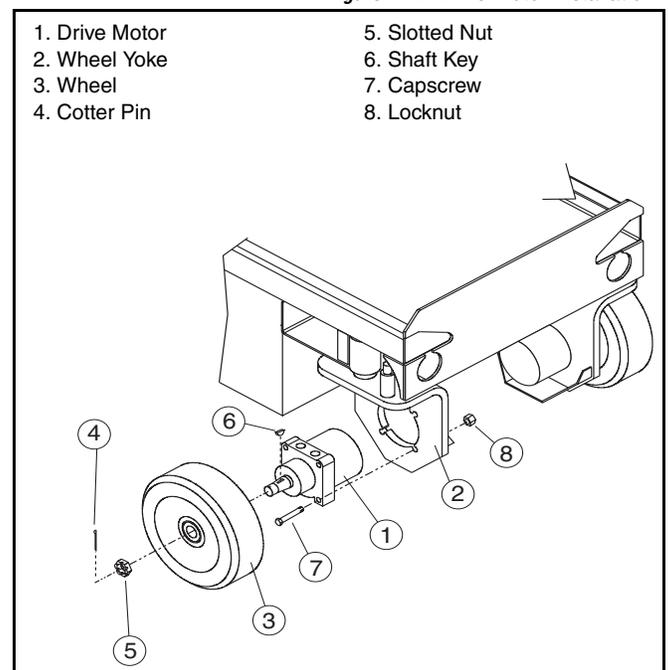
REMOVAL

1. Block the rear wheels to prevent the machine from rolling.
2. Use a 1000 kg (1 ton) capacity jack to raise the front of the machine. Place two 1000 kg (1 ton) jack stands under the machine. Remove jack.
3. Remove the cotter pin, slotted nut, wheel, and shaft key.

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

4. Tag, disconnect, and plug the hose assemblies to prevent foreign material from entering.
5. Remove the locknuts, capscrews, and drive motor.

Figure 2-12: Drive Motor Installation



INSTALLATION

1. Position the drive motor in the wheel yoke and secure with capscrews and locknuts.
2. Install the shaft key, wheel, and slotted nut. Torque the slotted nut to 102 Nm (75 ft/lbs). Install a new cotter pin. Do not back-off the nut to install the cotter pin.
3. Remove the plugs from the hose assemblies and connect to the drive motor.
4. Lift the platform with the jack and remove jack stands, then lower the jack and remove. Operate the drive system and check for leaks.

2-11 BRAKE CYLINDER

The brake cylinder is located between the rear wheels at the rear of the chassis.

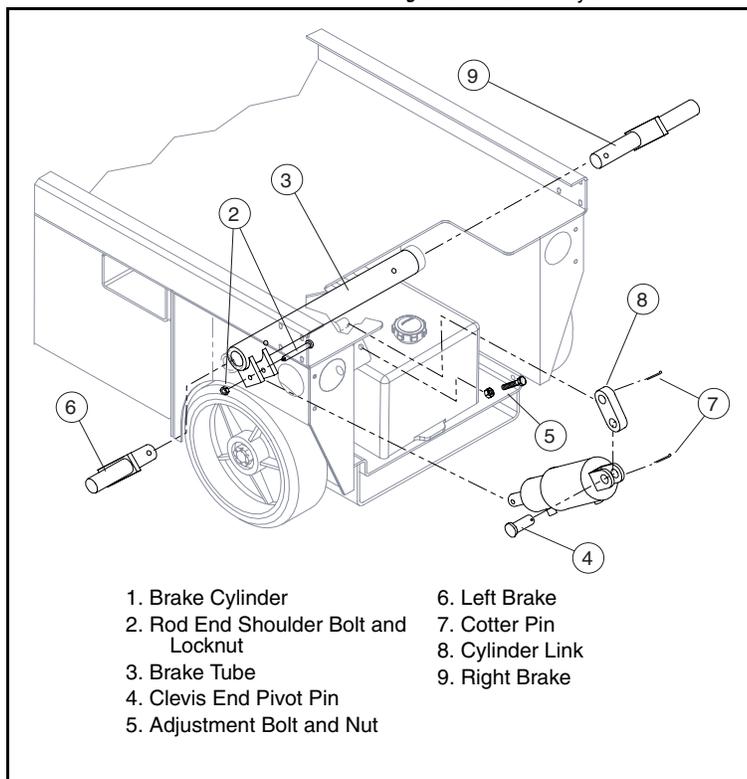
REMOVAL

1. Block the wheels to prevent the work platform from rolling when the brake is removed.
2. Remove the adjustment nut and bolt.
3. Tag and disconnect the hose assemblies and cap the openings to prevent foreign material from entering.
4. Remove the shoulder bolt and locknut that mount the cylinder rod to the brake tube.
5. Remove the cotter pin and pivot pin from the rear cylinder mount. Remove the cylinder.

REPAIR

Refer to *Section 1 - General Information* for disassembly, cleaning and inspection, and assembly instructions.

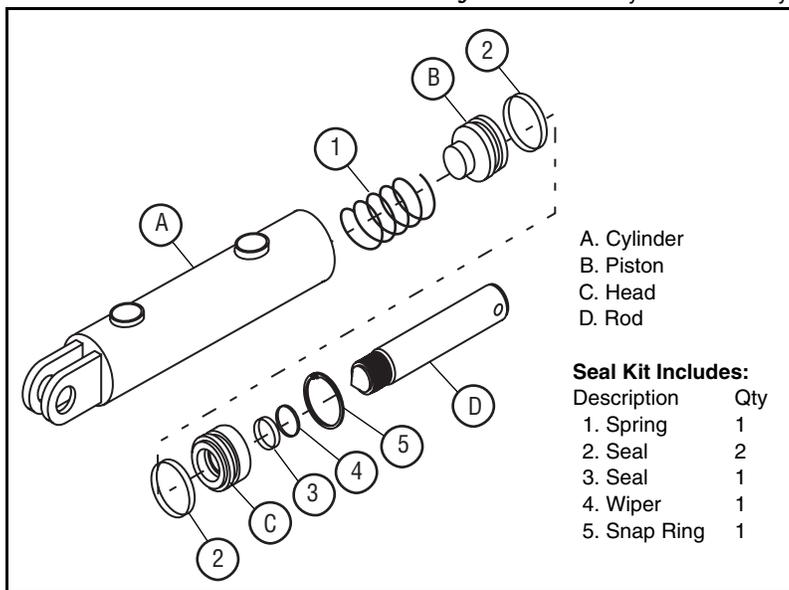
Figure 2-13: Brake Cylinder Installation



INSTALLATION

1. Install the clevis end pivot pin through the cylinder clevis and cylinder link and secure with a new cotter pin.
2. Install the rod end shoulder bolt through the cylinder rod and brake tube mounting tabs, and secure with the locknut.
3. Install the hydraulic hoses.
4. Install the adjustment bolt and locknut. Tighten the bolt until the brakes have fully engaged the tires. Secure the bolt with the locknut.
5. Lower the machine and operate the drive circuit to check that the brakes retract and clear the tires when driving and fully engage the tires when stopped. Verify that the brakes fully engage the rear tires by testing their ability to hold the machine on its rated grade. If they do not, tighten the adjustment bolt until they do. Secure the bolt with the locknut.
6. Check for leaks.

Figure 2-14: Brake Cylinder Assembly



2-12 STEERING CYLINDER

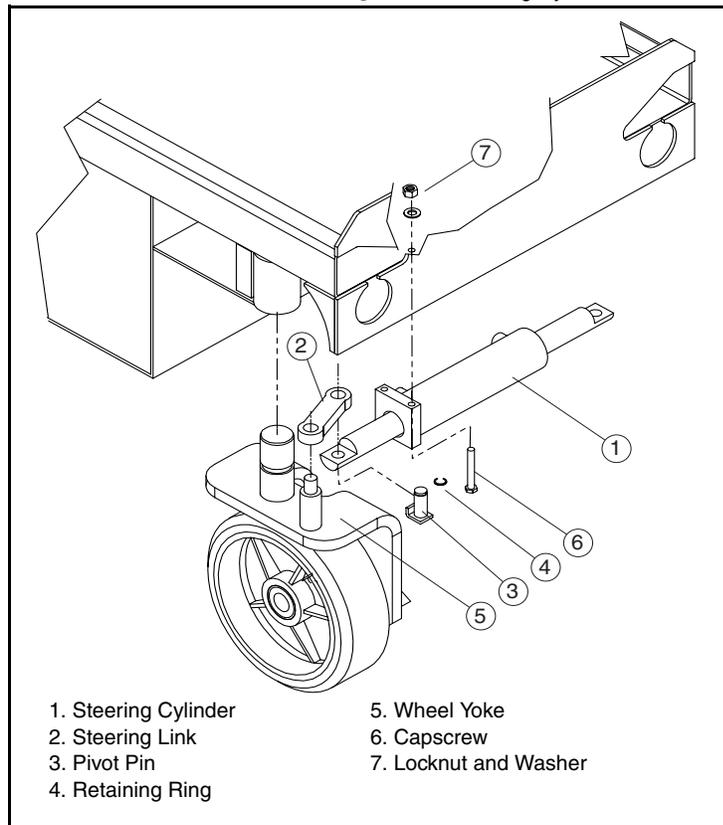
REMOVAL

1. Turn the wheels to the straight position.
2. Elevate the platform and block the elevating assembly with the brace (see "Blocking the Elevating Assembly" on page 2-4).
3. Tag and disconnect the hose assemblies from the cylinder fittings and immediately cap the openings to prevent foreign material from entering.
4. Remove the retaining rings from the pivot pins.
5. While supporting the cylinder, remove the locknuts, washers, and capscrews. Remove the cylinder.

REPAIR

Refer to *Section 1 - General Information* for disassembly, cleaning and inspection, and assembly instructions.

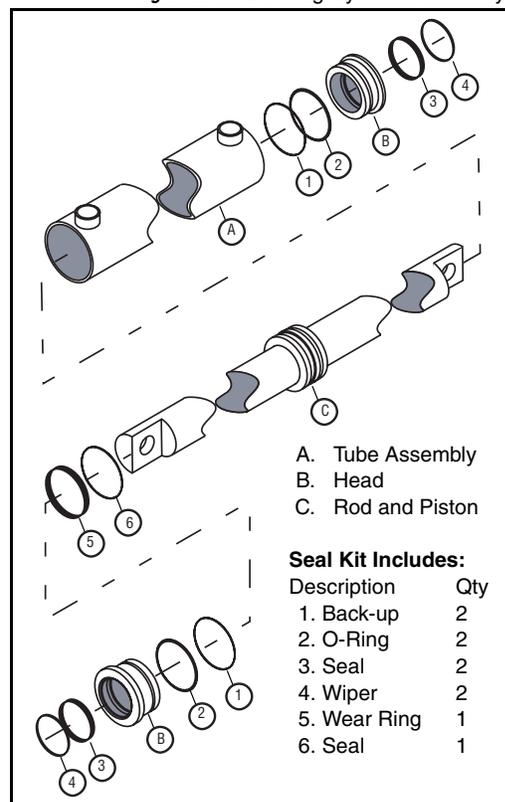
Figure 2-15: Steering Cylinder Installation



INSTALLATION

1. Position the cylinder assembly in the chassis and secure with capscrews, washers, and locknuts.
2. Insert pivot pins and secure with retaining rings.
3. Connect the hose assemblies to the fittings.
4. Operate the steering circuit several times throughout its entire range of travel to expel trapped air, then check for leaks.

Figure 2-16: Steering Cylinder Assembly



2-13 DEPRESSION MECHANISM CYLINDER

REMOVAL

1. Open the module door to access the cylinder.
2. Tag and disconnect the hose assemblies from the cylinder fittings and immediately cap the openings to prevent foreign material from entering.
3. Remove the cotter pins from the pivot pins.
4. While supporting the cylinder, remove pivot pins. Remove the cylinder.

REPAIR

Refer to *Section 1 - General Information* for disassembly, cleaning and inspection, and assembly instructions.

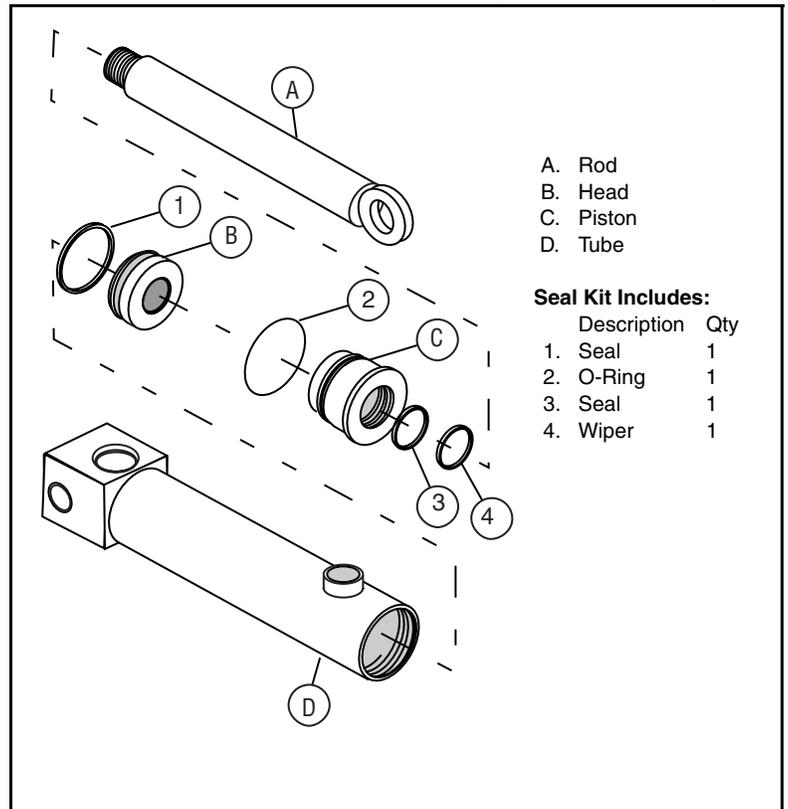
INSTALLATION

1. Position the cylinder assembly in the chassis. Insert the 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, then check for leaks.

Figure 2-17: Depression Mechanism Cylinder



Figure 2-18: Depression Mechanism Cylinder



2-14 LIFT CYLINDER

REMOVAL

Refer to Figure 2-20: "Lift Cylinder Location," on page 2-18.

1. Elevate the platform and install the scissor brace (see "Blocking the Elevating Assembly" on page 2-4).
2. Provide a suitable container to catch the hydraulic fluid, then disconnect the hydraulic hoses. Immediately plug hoses to prevent foreign material from entering.
3. Remove emergency lowering valve cable and down valve wires from the emergency lowering/down valve.
4. Remove the cable bracket from the lift cylinder.
5. Remove capscrews and locknuts securing lift cylinder pivot pins.
6. Remove lower pivot pin and lower cylinder to rest on chassis.
7. Attach a suitable hoisting device and sling to the cylinder, and remove upper pivot pin.
8. Carefully remove cylinder.

REPAIR

Refer to *Section 1 - General Information* for disassembly, cleaning and inspection, and assembly instructions.

INSTALLATION

1. Coat both pivot pins with anti-seize compound.
2. Attach a suitable hoisting device and sling to the cylinder. Carefully position cylinder in the elevating assembly, and install the upper pivot pin.
3. Install the capscrew and locknut.
4. Carefully lift the cylinder and align the lower mount, and install the pivot pin. Install the capscrew and locknut securing the pivot pin.
5. Install the cable bracket. Connect the emergency lowering valve cable and down valve wires.
6. Unplug hydraulic hoses and attach to the cylinder.
7. Replace hydraulic fluid removed from lift cylinder.
8. Test with weight at rated platform load to check system operation. Check for leaks and level of fluid.

Figure 2-19: Lift Cylinder Assembly

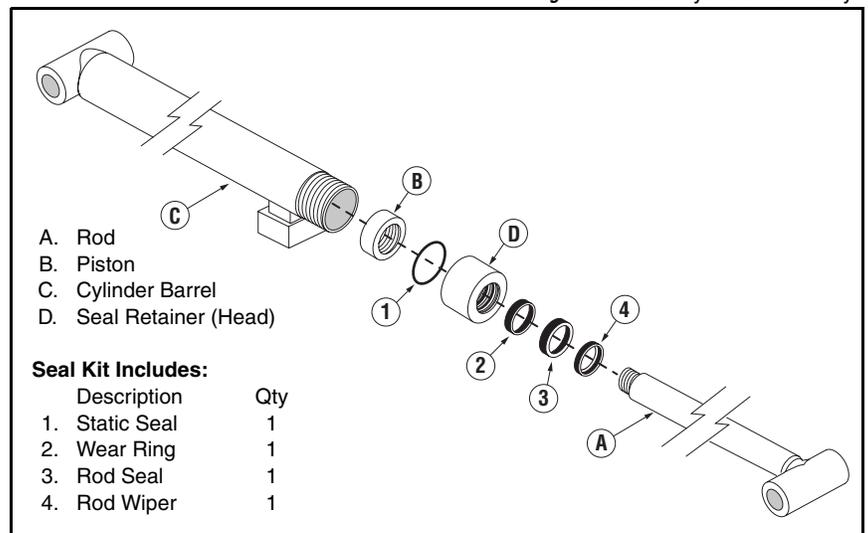
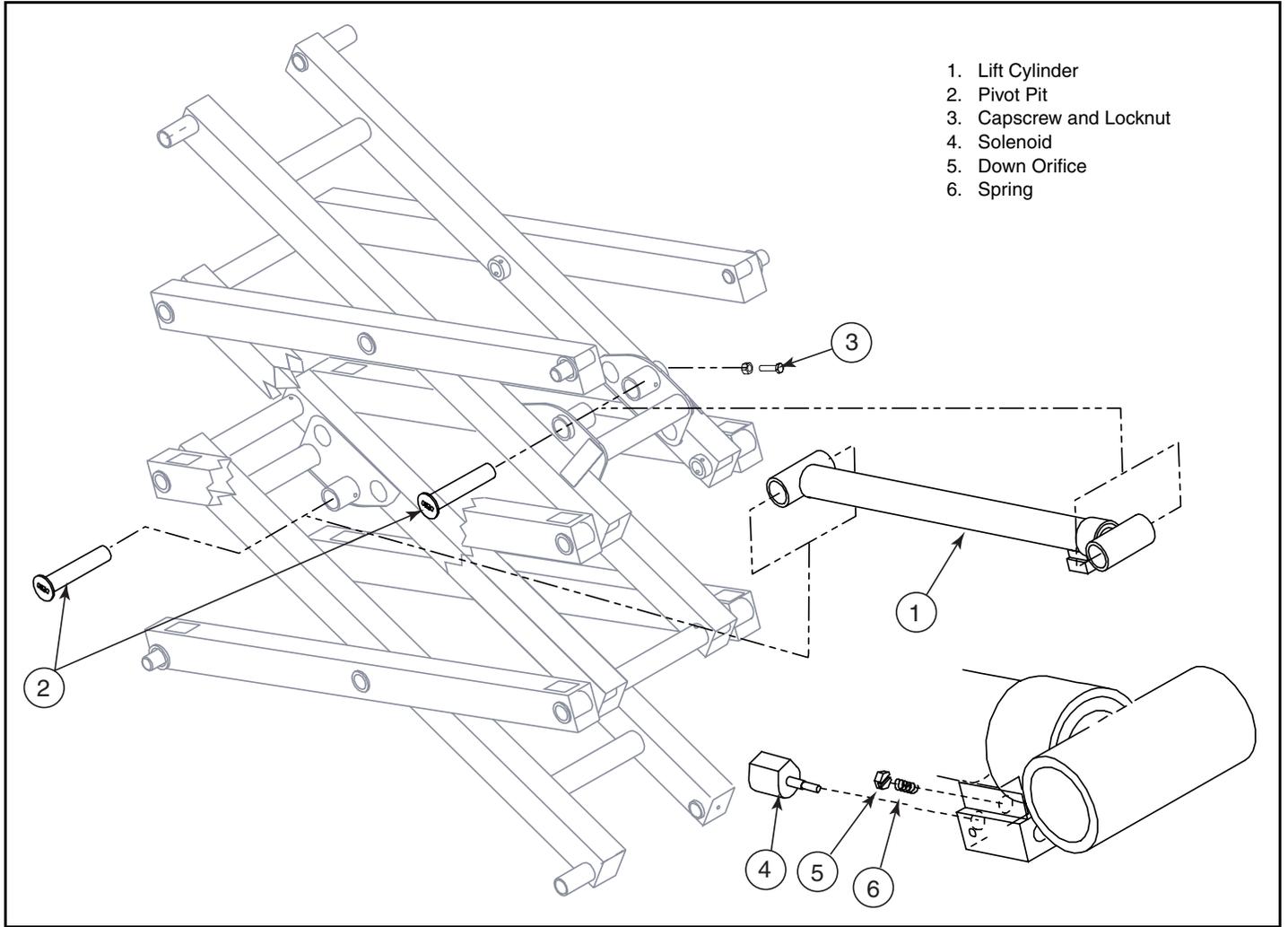


Figure 2-20: Lift Cylinder Location



TROUBLESHOOTING

This section contains troubleshooting Truth Tables.

Careful inspection and accurate analysis of the symptoms listed in the Troubleshooting Guide will localize the trouble more quickly than any other method. This manual cannot cover all possible problems that may occur. If a specific problem is not covered in this manual, call our toll free number for service assistance.

Referring to the Operator Manual and the Schematics section will aid in understanding the operation and function of the various components and systems of the Work Platform and help in diagnosing and repair of the machine.

⚠ WARNING ⚠

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

When performing any service which requires the platform to be raised, the Elevating Assembly must be blocked.

Disconnect the battery when replacing or testing the continuity of any electrical component.

TABLE OF CONTENTS

3-1 Technical Support	2-3
3-2 General Procedure	2-3
3-3 Troubleshooting Procedures	2-3
Adjustment Procedures	2-3
Checking Pump Pressures	2-3
3-4 Motor Controller Dip Switch Settings	2-4
Default Dip Switch Settings	2-4
Adjusted Dip Switch Settings	2-4
3-5 I/O Board Dip Switch Settings	2-5
Default Settings	2-5
Optional Settings	2-5
3-6 LED Fault Codes	2-6
3-7 LEDs at I/O Board	2-7
3-8 I/O Board Inputs and Outputs	2-8
3-9 Electric	2-11
3-10 Hydraulic	2-12

LIST OF FIGURES

Figure 3-1: Hydraulic Test Port	2-3
Figure 3-2: Controller	2-4
Figure 3-3: I/O Board	2-5
Figure 3-4: Motor Controller	2-6
Figure 3-5: I/O Board	2-7

LIST OF TABLES

Table 3-1: LED Fault Codes	2-6
Table 3-2: Connector J1	2-8
Table 3-3: Connector J2	2-9
Table 3-4: Connector J3	2-9
Table 3-5: Connector J4	2-10
Table 3-6: Connector J5	2-10
Table 3-7: Electrical Troubleshooting Table	2-11
Table 3-8: Hydraulic Troubleshooting Table	2-12

3-1 TECHNICAL SUPPORT

Technical Support is available by telephone or FAX.

**UPRIGHT
USA** 1-800-926-5438
FAX: 1-559-662-4785

**UPRIGHT
EUROPE** Tel: +353 1 620 9300
FAX: +353 1 620 9301

3-2 GENERAL PROCEDURE

Thoroughly study hydraulic and electronic schematics in **the Schematics section**. Check for loose connections and short circuits. Check/repair/replace each component in the Truth Table which is listed under each machine function which does not operate properly.

Determine whether the problem is mechanical (interference), electrical or hydraulic. Some functions require power at more than one solenoid.

Use the charts on the following pages to help determine the cause of a fault in your UpRight work platform

NOTE: Spike protection diodes at components have been left out of the charts to eliminate confusion.

3-3 TROUBLESHOOTING PROCEDURES

1. *Verify your problem.* Do a full function test from both platform controls and chassis controls and note all functions that are not operating correctly.
2. *Narrow the possible causes of the malfunction.* Use the troubleshooting guide to determine which components are common to all circuits that are not functioning correctly. To aid in troubleshooting, the letters following the component on the table are the same as the component's designation on the schematics.
3. *Identify the problem component.* Test components that are common to all circuits that are not functioning correctly. Remember to check wires and terminals between suspect components. Be sure to check connections to battery negative.
4. *Repair or replace component found to be faulty.*
5. *Verify that repair is complete.* Do a full function test from both the platform and chassis controls to verify that all functions are operating correctly and that the machine is performing according to specifications.

ADJUSTMENT PROCEDURES

Hydraulic settings must be checked whenever a component is repaired or replaced.

Remove counterbalance valves and "bench test" them if they are suspect.

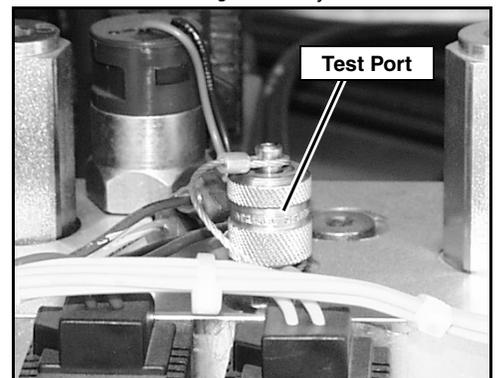
Connect a pressure gauge of appropriate range to the test port located on the hydraulic manifold.

NOTE: Correct pressure settings are listed in the hydraulic schematic.

CHECKING PUMP PRESSURES

Remove hose from pump port and connect pressure tester.

Figure 3-1: Hydraulic Test Port



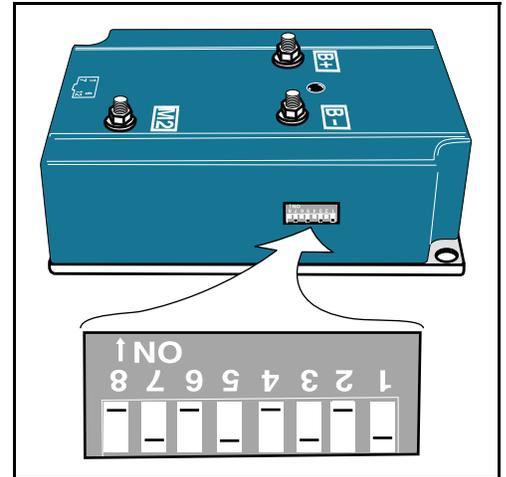
3-4 MOTOR CONTROLLER DIP SWITCH SETTINGS

Figure 3-2: Controller

DEFAULT DIP SWITCH SETTINGS

The table shows the default dip switch settings on the controller box when the machine leaves the factory.

	1	2	3	4	5	6	7	8
MX15/19	OFF	ON	OFF	ON	OFF	ON	OFF	ON
SL20	ON	OFF	OFF	ON	OFF	ON	OFF	ON
TM12	OFF	OFF	OFF	ON	OFF	ON	OFF	ON
X20N	ON	OFF	OFF	ON	OFF	ON	OFF	ON
X20W	ON	OFF	OFF	ON	OFF	ON	OFF	ON
X26/32	ON	ON	OFF	ON	OFF	OFF	OFF	ON



ADJUSTED DIP SWITCH SETTINGS

The following adjustments may be made to the dip switch settings.

CREEP SPEED

Switches 3 & 4 determine the elevated “creep” speed. If the machine does not operate at the specified speed at the default settings, use the following table to adjust the dip switch settings.

	3	4
1 (slowest)	OFF	OFF
2	ON	OFF
3 (default)	OFF	ON
4 (fastest)	ON	ON

DECELERATION TIME

Switches 5 & 6 determine the deceleration time. Switch 5 is for the deceleration rate while the platform is lowered. Switch 6 is for the elevated rate.

DECEL	5	6
0.24 sec.	OFF	OFF
1.27 sec.	ON	ON

3-5 I/O BOARD DIP SWITCH SETTINGS

Figure 3-3: I/O Board

DEFAULT SETTINGS

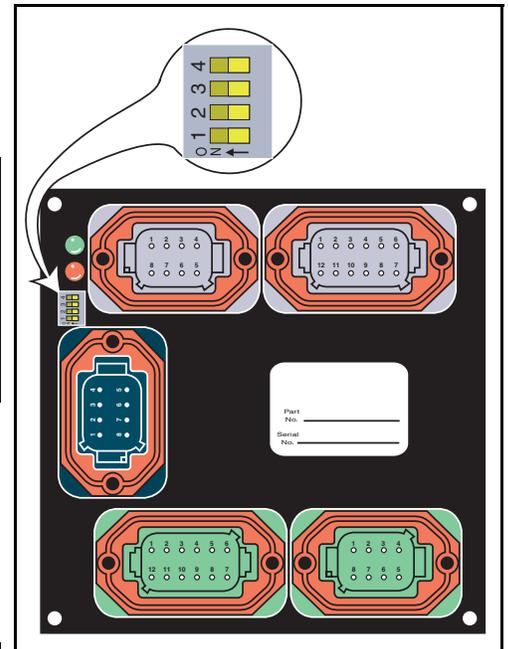
The table shows the default dip switch settings on the I/O board when the machine leaves the factory.

	1	2	3	4
MX15/19	OFF	OFF	OFF	OFF
SL20	OFF	OFF	OFF	OFF
TM12	OFF	OFF	OFF	OFF
X20N	OFF	OFF	OFF	OFF
X20W	OFF	OFF	OFF	OFF
X26/32	OFF	OFF	OFF	OFF

OPTIONAL SETTINGS

Switches 3 & 4 work together to determine the optional alarm settings.

1	2	3	4	RESULT
ON				Two Speed Mode (not used)
OFF				Proportional Control
	ON			not used
	OFF			Depression Mechanism extends when platform is raised
		OFF	OFF	Down alarm only
		ON	OFF	Down and Reverse alarm
		OFF	ON	Drive and Down alarm
		ON	ON	All Motion alarm

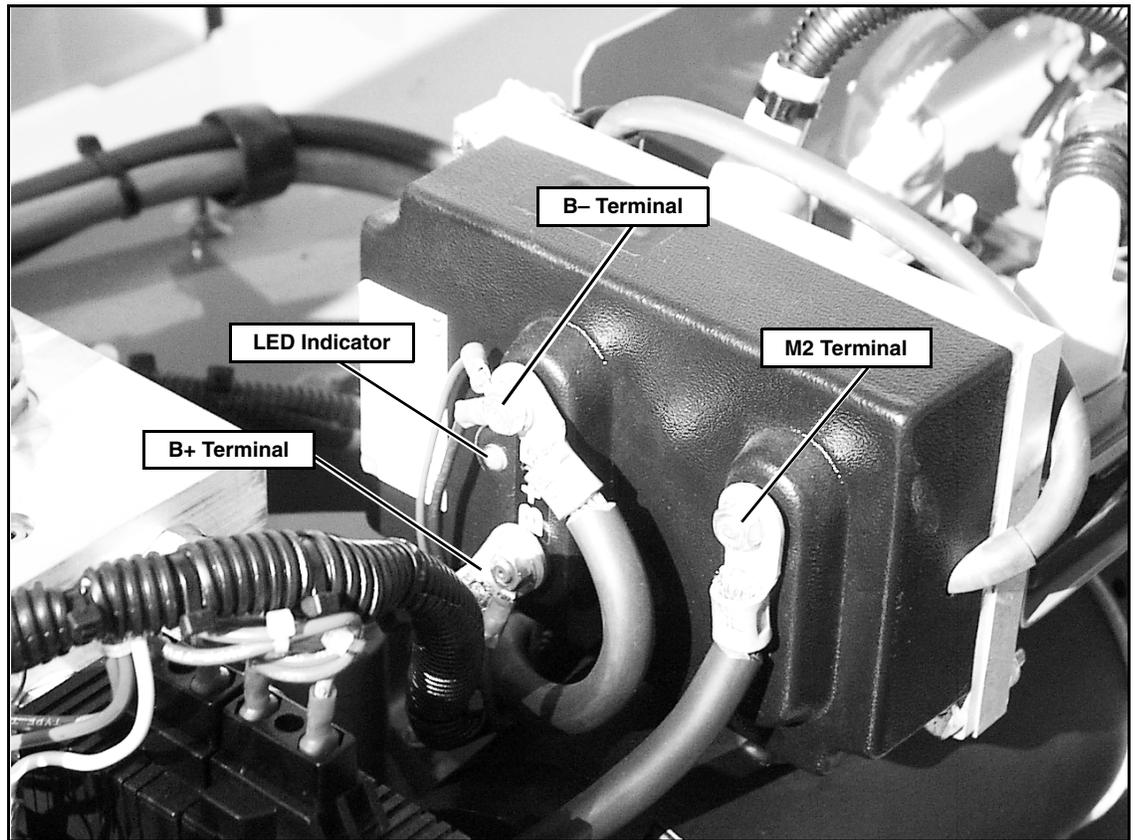


3-6 LED FAULT CODES

Batteries must be fully charged before troubleshooting.

Check/Repair all connections before replacing any components

Figure 3-4: Motor Controller



NOTE: Before dip switch settings will take effect, power must be disconnected or Emergency Stop switches must be depressed.

Table 3-1: LED Fault Codes

Flash Code	Meaning	Status	Corrective Action
LED on	Power to the controller and the controller is operational.	System is functional	None.
LED off	No power to the controller, or internal fault in the controller.	Battery cables not connected properly; Failed controller	Check battery cable connections. Replace the controller.
2 Flash	Procedural fault.	Lift, drive, or steer switch is engaged at start-up; Drive/Lift switch rotated while operating	Cycle the Control Handle through neutral to clear fault.
3 Flash	Controller senses B- at the M2 terminal.	Short circuit at the motor; M2 cable in contact with B- cable; Short circuit within controller	Check cable routing and connections. Test terminals for source of B-. Replace the controller
4 Flash	Controller senses B+ at the M2 terminal before engaging the Motor Start relay.	B+ cable routed incorrectly; M2 cable making contact with B+ cable; Motor Start relay contacts welded closed.	Check cable routing and connections. Test terminals for source of B+. Replace the Motor Start relay.
5 Flash	Controller senses open circuit at M2 after engaging the Motor Start terminal.	Cables loose or not connected; Faulty Motor Start relay	Check the cable routing and connections. Check the signal from Motor Controller to relay. Check/replace the Motor Start relay.
6 Flash	Faulty signal from Control Handle or I/O board.	Faulty Control Handle; Wiring error	If Platform Controls are affected, check/replace the Control Handle. If Chassis Controls are affected, check/replace the I/O board.
7 Flash	Battery voltage below 12V or above 45V.	Dead batteries; Bad cable connections	Check batteries and cable connections.
8 Flash	Thermal cut-off.	Controller is overheated due to overuse or other failure	Allow system to cool. Locate and repair other source of overheat.

3-7 LEDs AT I/O BOARD

GREEN LED ON

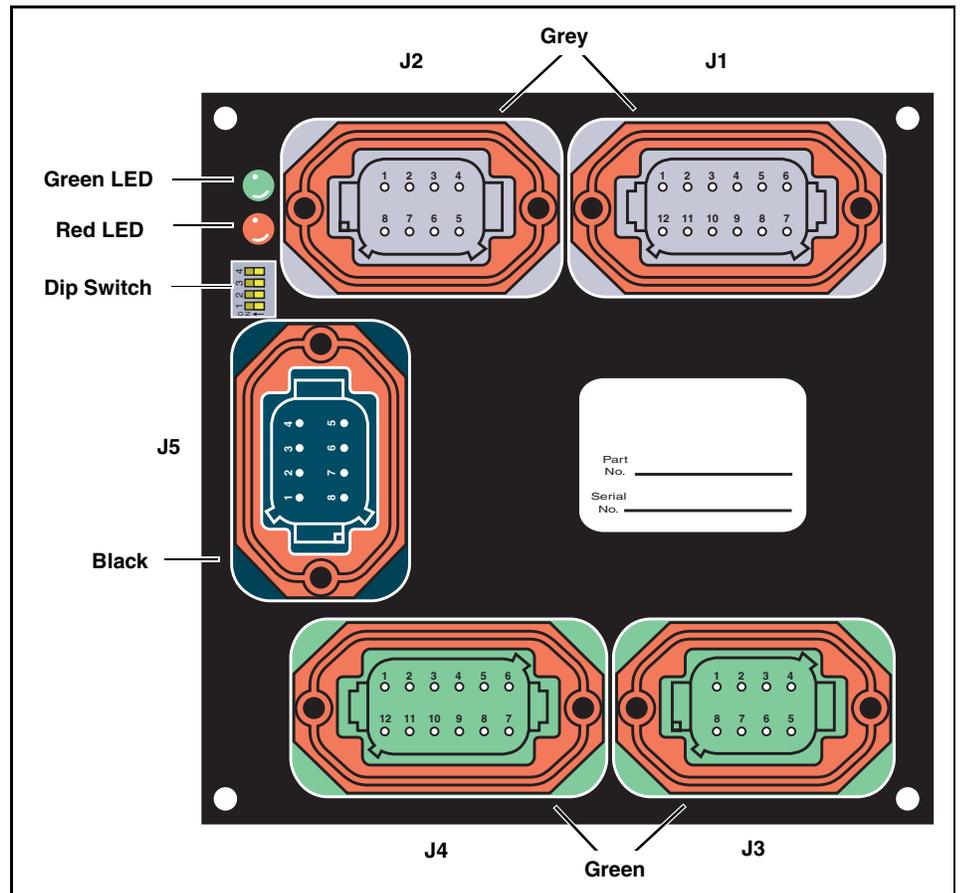
The Green LED indicates that power is present at the board.

RED LED ON

The Red LED indicates a short in the system. To locate the problem;

1. Push both E-Stop switches to the OFF position.
2. Turn the Keyswitch to the OFF position, then to either Platform or Chassis.
3. Pull both E-Stop switches to the ON position.
 - The Green LED should be ON.
 - The Red LED should be OFF.
4. Perform all machine functions until the Red LED is ON. Determine which function activated the Red LED and check all components that are active for that function.

Figure 3-5: I/O Board



3-8 I/O BOARD INPUTS AND OUTPUTS

Refer to Figure Figure 3-5: "I/O Board," on page 3-7.

PERFORM TESTS WITH FULLY CHARGED BATTERIES

Battery state of charge will affect readings.

BV = BATTERY VOLTAGE

Readings within a few volts of current battery state of charge will be called BV.

0V

0V is generally 0 up to 1 volt.

VOLTAGE READINGS FOR ELECTRONICS ARE RARELY EXACT

Many factors can affect readings, such as state of charge, voltage drops through switches (mechanical or electrical), and wires.

Be sure that both the Platform and Chassis Emergency Stop Switches are pulled out to the ON position.

All voltages are measured between the component and the B- terminal on the Motor Controller.

NOTE: For the I/O board to be powered up (Green LED illuminated), both E-Stops must be closed and either Platform Controls or Chassis Controls selected by the Keyswitch.

Table 3-2: Connector J1

PIN	PIN DESCRIPTION	CONDITION	VOLTAGE	CONTINUOUS TO PIN
J1-1	Lift input from Lift/Drive selector switch	Lift selected	BV	—
		Lift not selected	0V	
J1-2	Not Used	—	—	—
J1-3	Drive input from Lift/Drive selector switch	Drive selected	BV	—
		Drive not selected	0V	
J1-4	Lower E-Stop activation (output from I/O board when lower E-Stop is closed)	Lower E-Stop closed	BV	J4-9
		Lower E-Stop open	0V	
J1-5	Upper E-Stop activation (output to I/O board when upper E-Stop is closed)	Upper E-Stop closed	BV	J4-2
		Upper E-Stop open	0V	
J1-6	Power to Platform Controls when selected by Keyswitch	Platform Controls selected	BV	J4-10
		Platform Controls not selected	0V	
J1-7	Not Used	—	—	—
J1-8	Controller direction "A" (up/forward)	Control Handle pushed forward	20-22V	—
J1-9	Controller direction "B" (down/reverse)	Control Handle pushed forward	20-22V	—
J1-10	Speed signal from Control Handle	Signal starts high and drops proportionally as Control Handle is moved in either direction	4.3V dropping to 0.2V	—
J1-11	Steer Left input from Steering switch	Steer Left selected	23V	—
		Steer Left not selected	0V	
J1-12	Steer Right input from Steering switch	Steer Right selected	23V	—
		Steer Right not selected	0V	

Table 3-3: Connector J2

PIN	PIN DESCRIPTION	CONDITION	VOLTAGE	CONTINUOUS TO PIN
J2-1	Depression mechanism activation (extend)	Lift Up requested	0V	—
		Lift Up not requested	BV	
J2-2	Not Used	—	—	—
J2-3	24 Volt supply for solenoids	Upper & Lower E-Stops closed	BV	J4-5 & J3-3
		Upper or Lower E-Stop open	0V	
J2-4	Forward solenoid activation	Forward requested	0V	—
		Forward not requested	BV	
J2-5	Reverse solenoid activation	Reverse requested	0V	—
		Reverse not requested	BV	
J2-6	Up solenoid activation	Up requested	0V	—
		Up not requested	BV	
J2-7	Steer Left solenoid activation	Steer Left requested	0V	—
		Steer Left not requested	BV	
J2-8	Steer Right solenoid activation	Steer Right requested	0V	—
		Steer Right not requested	BV	

Table 3-4: Connector J3

PIN	PIN DESCRIPTION	CONDITION	VOLTAGE	CONTINUOUS TO PIN
J3-1	Alarm activation	Alarm sounding (out of level unit lowering, etc.)	†	—
† If the alarm is sounding because the unit is out of level, BV will drop to 0V as long as the alarm is sounding. If the alarm is sounding because the unit is lowering, there will be alternating high and low voltages (the voltages will vary).				
J3-2	Tilt Sensor output signal	Unit within Level Sensor angle	BV	—
		Unit outside Level Sensor angle	0V	
J3-3	24 Volt supply for Alarm, Tilt Sensor and solenoids,	Upper & Lower E-Stops closed	BV	J2-3 & J4-5
		Upper or Lower E-Stop open	0V	
J3-4	Input from platform down Proximity Switch	Above Proximity switch	0V	—
		Below Proximity switch	BV	
J3-5	Down solenoid activation	Down requested	0V	—
		Down not requested	BV	
J3-6	Depression mechanism activation (retract)	Drive requested	0V	—
		Drive not requested	BV	
J3-7	Not Used	—	—	—
J3-8	Battery negative supply for Tilt sensor and Proximity switch	—	B-	J4-11

Table 3-5: Connector J4

PIN	PIN DESCRIPTION	CONDITION	VOLTAGE	CONTINUOUS TO PIN
J4-1	Motor Start relay and Hourmeter activation	Drive, Lift or Steer requested	0V	—
		Drive, Lift or Steer not requested	BV	
J4-2	24 Volt supply to Keyswitch	Upper & Lower E-Stops closed	BV	—
		Upper or Lower E-Stop open	0V	
J4-3	Chassis Controls selected from Keyswitch	Chassis Controls selected	BV	—
		Chassis Controls not selected	0V	
J4-4	24 Volt supply to chassis Up/Down switch	—	‡	—
‡ Keyswitch must be held to Chassis Controls position to measure BV				
J4-5	24 Volt supply to Keyswitch	Upper & Lower E-Stops closed	BV	J2-3 & J3-3
		Upper or Lower E-Stop open	0V	
J4-6	Not Used	—	—	—
J4-7	Up signal from Chassis Controls	Up requested from Chassis Controls	BV	—
		Up not requested from Chassis Controls	0V	
J4-8	Down signal from Chassis Controls	Down requested from Chassis Controls	BV	—
		Down not requested from Chassis Controls	0V	
J4-9	Lower E-Stop activation (input to I/O board when E-Stop is closed)	Lower E-Stop closed	BV	J1-4
		Lower E-Stop open	0V	
J4-10	Power output to Platform Controls	Platform selected at Keyswitch	BV	J1-6
		Platform not selected at Keyswitch	0V	
J4-11	Battery negative supply to I/O Board	—	B-	—
J4-12	24 Volt supply to Hourmeter and Line Contactor coil	Upper & Lower E-Stops closed and Platform Controls or Chassis Controls selected	BV	—

Table 3-6: Connector J5

PIN	PIN DESCRIPTION	CONDITION	VOLTAGE	CONTINUOUS TO PIN
J5-1	24 Volt supply to EMC motor controller	Upper & Lower E-Stops closed and Platform Controls or Chassis Controls selected	BV	—
J5-2	Drive signal to EMC motor controller	Forward/Reverse requested	15V	—
		Forward/Reverse not requested	0V	
J5-3	Steer signal to EMC motor controller	Steer Right/Steer Left requested	15V	—
		Steer Right/Steer Left not requested	0V	
J5-4	Up signal to EMC motor controller	Up requested	15V	—
		Up not requested	0V	
J5-5	Speed Reduction signal to EMC motor controller	Below Proximity switch	15V - 17V	—
		Above Proximity switch	0V	
J5-6	Line Contactor activation signal	Drive, Lift or Steer requested	0V	—
		Drive, Lift or Steer not requested	BV	
J5-7	Direction enable	Forward/Reverse requested	0V	—
		Forward/Reverse not requested	4.0V - 4.3V	
J5-8	Speed signal to EMC motor controller	Signal starts high and drops proportionally as Control Handle is moved in either direction	4.3V dropping to 0.2V	—

3-9 ELECTRIC**Table 3-7:** Electrical Troubleshooting Table

Component	Function	Lower Controls	Upper Controls	Drive Forward	Drive Reverse	High Speed/Creep	Raise Platform	Lower Platform	Steer Left	Steer Right	Depression Mechanism Extend	Depression Mechanism Retract	Brakes	Tilt Alarm	Down Alarm	Battery Charge
Alarm--ALM																
Batteries--BAT		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Battery Charger--CHG																X
5 AMP Circuit Breaker--F1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
175 AMP Fuse--F2		X	X	X	X	X	X	X	X	X	X	X	X			
Hour Meter/Low Voltage indicator--HM																
I/O Board--I/O		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Motor Control--MC		X	X	X	X	X	X	X	X	X	X	X	X			
Motor--MOT				X	X	X	X	X	X	X	X	X	X			
Motor Relay--R1				X	X	X	X	X	X	X	X	X	X			
Chassis Emergency Stop Switch--S1		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Chassis Lift Switch--S2							X	X								
Chassis Key Switch--S3		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Lift/Drive Selector Switch--S4			X	X	X		X	X								
Platform Down Switch--S5						X										
Platform Emergency Stop Switch--S6		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Interlock Switch--S7			X	X	X	X	X	X	X	X						
PQ Control Handle--S8			X	X	X		X	X								
Height Limit Switch--S9							X									
Platform Steering Switch--S10									X	X						
Tilt Sensor--SNSR		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Steering Solenoid (right)--SOL1A										X						
Steering Solenoid (left)--SOL1B									X							
Platform Lift Solenoid--SOL2A							X									
Down Solenoid--SOL2B								X								
Depression Mechanism Extension Solenoid--SOL3A											X					
Depression Mechanism Retraction Solenoid--SOL3B												X				
Reverse Solenoid--SOL4A					X											
Forward Solenoid--SOL4B				X												

3-10 HYDRAULIC

Table 3-8: Hydraulic Troubleshooting Table

Component	Function	Lift Platform	Lower Platform	Steer Right	Steer Left	Drive Forward	Drive Reverse	Creep	Depression Mechanism Extend	Depression Mechanism Retract	Brakes
Check Valve--CV									X	X	
Steering Cylinder--CYL2				X	X						
Lift Cylinder--CYL1		X									
Depression Mechanism Cylinder--CYL3									X	X	
Brake Cylinder--CYL5											X
Priority Flow Divider--DVDR		X		X	X	X	X	X	X	X	X
Suction Strainer--FL1		X		X	X	X	X	X	X	X	
Return Filter--FL2		X		X	X	X	X	X	X	X	
Drive Motors (2)--MOT						X	X				
Pump--PMP		X		X	X	X	X	X	X	X	
Main Relief Valve--RV3		X				X	X	X	X	X	X
Steering Relief Valve--RV1				X	X						
Lift Relief Valve--RV2		X									
Orifice--OR		X	X								
Reservoir--RES											
Steering Right/Left Valve--V1				X	X						
Lift Valve--V2A		X									
Down/Emergency Lowering Valve--V2B			X								
Depression Mechanism Retract Valve--V3B										X	
Depression Mechanism Extend Valve--V3A									X		
Forward/Reverse Valve--V4						X	X				
Counterbalance Valve--V5						X	X	X			X

SCHEMATICS

This section contains electrical and hydraulic power schematics and associated information for maintenance purposes.

The diagrams are to be used in conjunction with the *Troubleshooting Truth Tables* in **Section 3**. 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.

TABLE OF CONTENTS

4-1 Electric	4-2
4-2 Hydraulic	4-8

LIST OF FIGURES

Figure 4-1: Electrical Schematic	4-3
Figure 4-2: Electrical Wire Routing	4-4
Figure 4-3: Lower Controls Components	4-5
Figure 4-4: Upper Controls Components	4-6
Figure 4-5: Upper Controls Wiring	4-7
Figure 4-6: Hydraulic Schematic	4-9
Figure 4-7: Valve Diagram	4-10
Figure 4-8: Plug Diagram	4-11
Figure 4-9: Hose Routing	4-12

4-1 ELECTRIC

Legend: Electrical Schematic 065616-025

Reference Number	Name	Function	Location
ALM	Alarm	Provides warning sound for platform lowering and tilt alarm	Right Door
BAT	Batteries	Powers work platform	Swing-out Modules on each side of the Chassis
CHG	Battery Charger	Charges battery	Left Battery Module
F1	5 AMP Circuit Breaker	Electrical overload protection	Chassis Controls
F2	175 AMP Fuse	Overload protection for electric motor	Right Door
HM	Hour Meter/Low Voltage indicator	Indicates hours of machine use and level of battery voltage	Chassis Controls
I/O	I/O Board	Connection point for machine function wiring	Chassis
MC	Motor Control	Controls the speed of electric motor	Chassis
MOT	Motor	Provides power to hydraulic pump	Chassis
R1	Motor Relay	Starts and stops motor circuit	Right Door
R2	Time Delay Relay	Interrupts platform lowering for PPE system	Platform Controls
R3	Relay	Interrupts platform lowering for PPE system	Platform Controls
S1	Chassis Emergency Stop Switch	Shuts down all machine functions	Chassis Controls
S2	Chassis Lift Switch	Elevates and lowers platform	Chassis Controls
S3	Chassis Key Switch	Allows some machine functions to be initiated from ground level	Chassis Controls
S4	Lift/Drive Selector Switch	Activates lift or drive functions	Platform Controls

Reference Number	Name	Function	Location
S5	Platform Down Switch	Cuts out high speed drive when platform is elevated	Top of chassis
S6	Platform Emergency Stop Switch	Shuts down all machine functions	Platform Controls
S7	Interlock Switch	Safety mechanism for joystick	Platform Controls
S8	Control Handle	Proportionally controls the drive and lift functions	Platform Controls
S10	Steering Switch	Controls left and right steering solenoids	Platform control handle
SNSR	Tilt Sensor	Activates tilt alarm and disables all machine functions except platform lower when the machine is more than 2° out of level	Chassis between Battery Modules
SOL1A	Steering Solenoid (right)	Shifts steering valve to the left	Hydraulic Manifold
SOL1B	Steering Solenoid (left)	Shifts steering valve to the right	Hydraulic Manifold
SOL2A	Platform Lift Solenoid	Raises platform	Hydraulic Manifold
SOL2B	Down Solenoid	Lowers platform	Lift Cylinder
SOL3A	Depression Mechanism Extend Solenoid	Extends depression mechanism bars	Hydraulic Manifold
SOL3B	Depression Mechanism Retract Solenoid (2)	Retracts depression mechanism bars	Depression Mechanism cylinder
SOL4A	Reverse Solenoid	Shifts forward/reverse valve to reverse	Hydraulic Manifold
SOL4B	Forward Solenoid	Shifts forward/reverse valve to forward	Hydraulic Manifold

Figure 4-2: Electrical Wire Routing

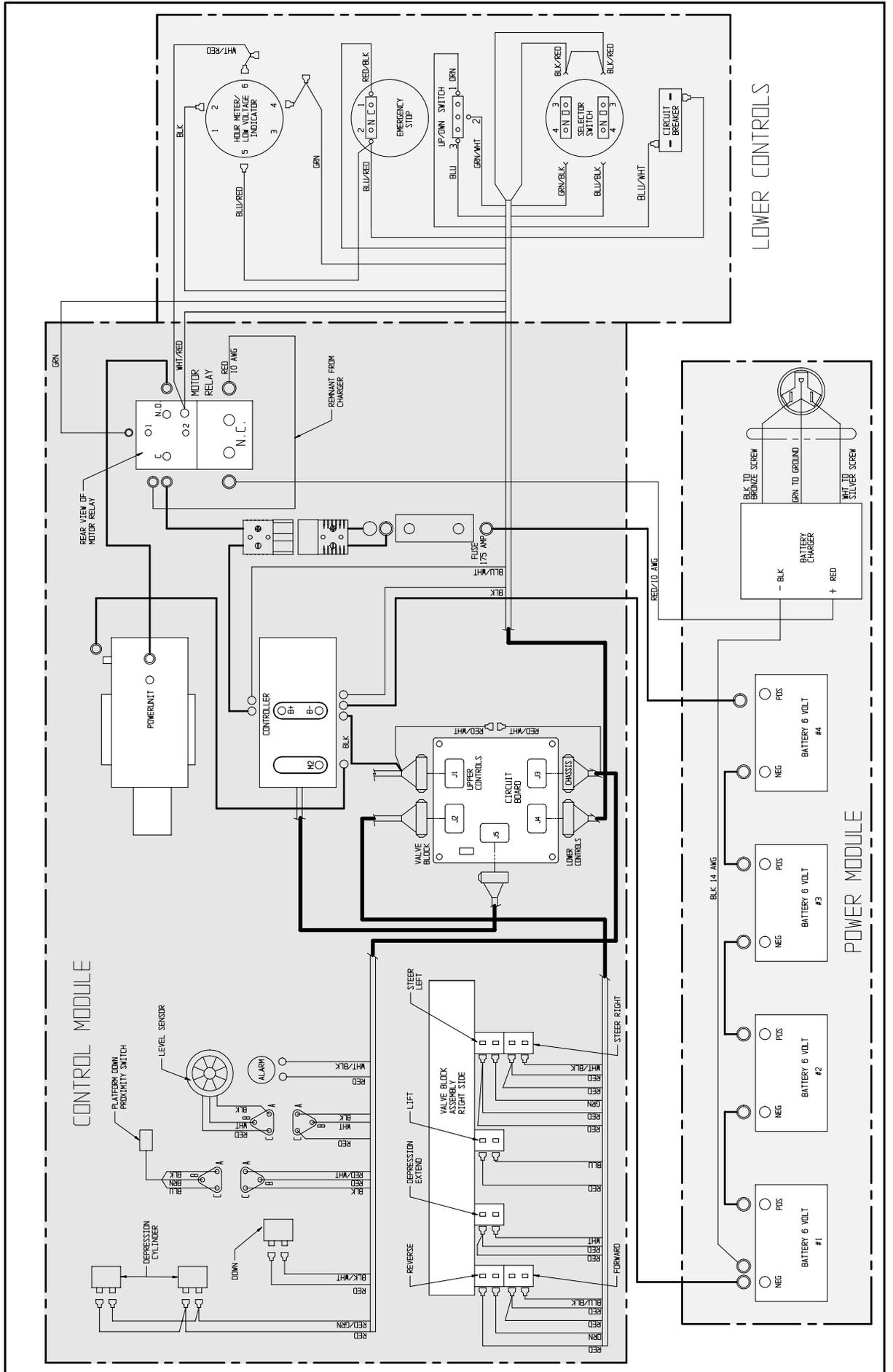


Figure 4-3: Lower Controls Components

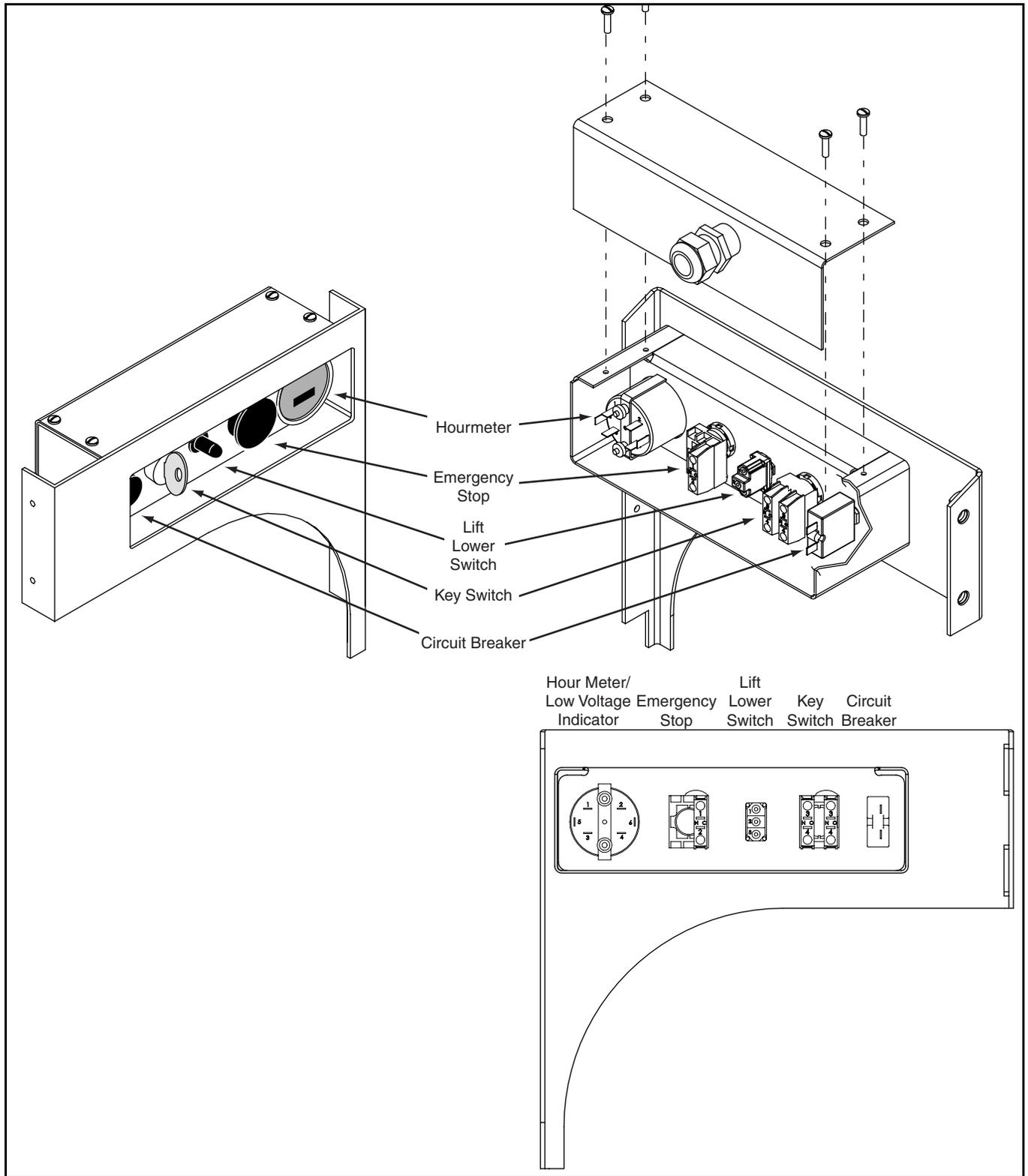


Figure 4-4: Upper Controls Components

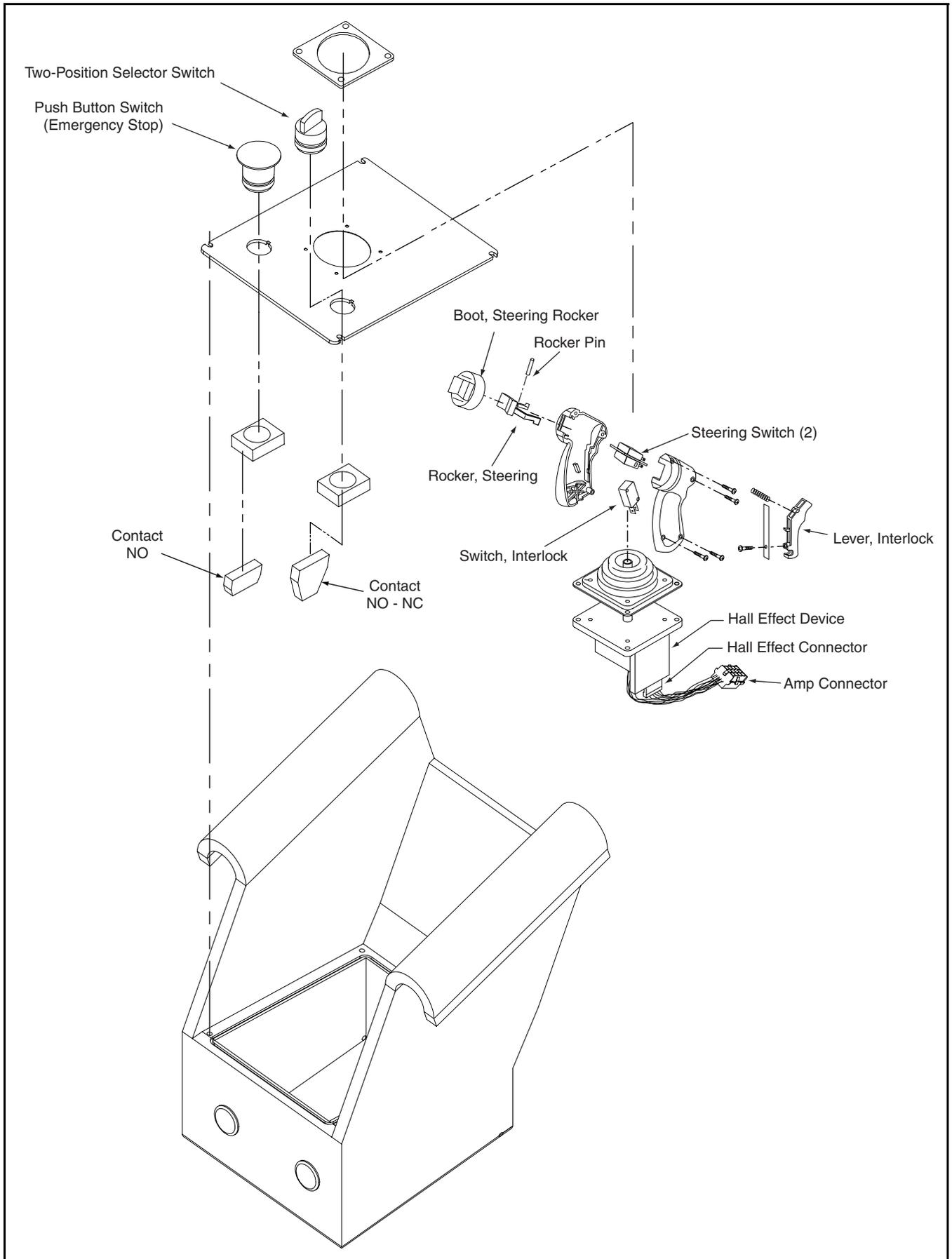
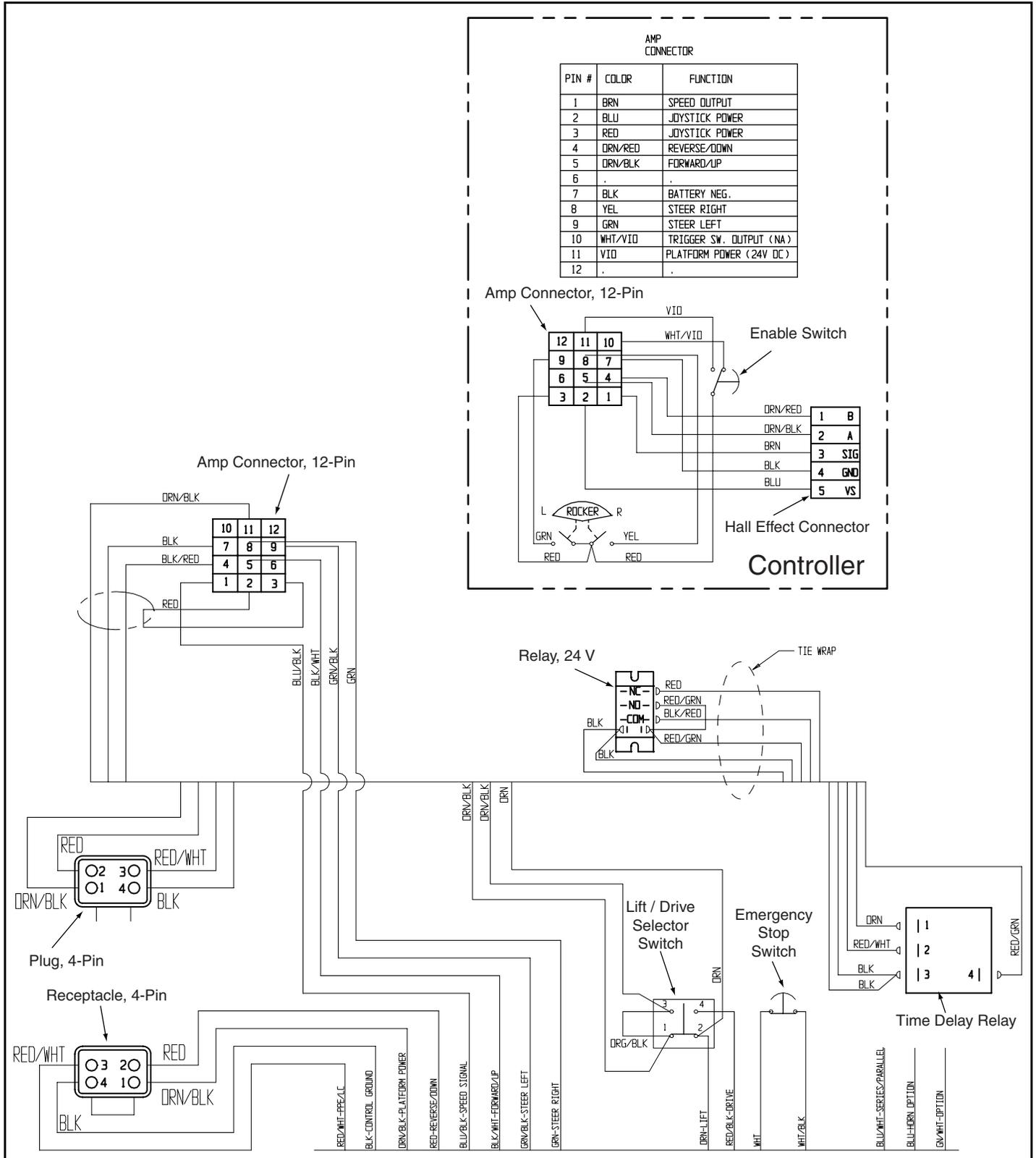


Figure 4-5: Upper Controls Wiring



4-2 HYDRAULIC

Legend: Hydraulic Schematic 065615-023

Reference number	Name	Function	Location
CV	Check Valve	Allows Depression Mechanism to retract in drive mode	Hydraulic Manifold
CYL1	Steering Cylinder	Provides force to turn front wheels	Front of Chassis above drive motors
CYL2	Lift Cylinder	Provides force to lift platform	Elevating Assembly
CYL3	Depression Mechanism Cylinder (2)	Extends or retracts DM bar	Front of hydraulic reservoir
CYL4	Brake Cylinder	Stops machine from moving while parked	Rear End of Chassis
DVDR	Priority Flow Divider	Provides priority oil flow to steering	Hydraulic Manifold
FL1	Suction Strainer	Traps particles in hydraulic reservoir	Inside hydraulic reservoir at outlet
FL2	Return Filter	Filters oil returning to reservoir	Back of hydraulic reservoir
MOT	Drive Motors (2)	Provides tractive effort to move platform	Front motor mounts
OR1	Orifice	Controls the oil flow rate of the lift cylinder	Lift Cylinder
OR2	Orifice	Controls the oil flow rate of the DM cylinders	Hydraulic Manifold
OR3	Orifice	Controls the oil flow rate of the brake cylinder	Hydraulic Manifold

Reference number	Name	Function	Location
PMP	Pump	Provides hydraulic pressure for all functions	On Electric Motor between Battery Modules
RV1	Steering Relief	Provides pressure protection to pump and steering components when steering	Hydraulic Manifold
RV2	Lift Relief Valve	Provides pressure protection to lift system	Hydraulic Manifold
RV3	Main Relief Valve	Provides pressure protection to hydraulic system	Hydraulic Manifold
RES	Reservoir	Holds hydraulic oil	Rear end of Chassis
V1	Steering Right/Left Valve	Provides directional control for steering	Hydraulic Manifold
V2A	Lift Valve	Provides oil control for drive or lift functions	Hydraulic Manifold
V2B	Down/Emergency Lowering Valve	Allows oil to return to reservoir; manually operated for emergency lowering	Lift Cylinder
V3A	Depression Mechanism Extend Valve	Provides oil control for DM bar	Hydraulic Manifold
V3B	Depression Mechanism Retract Valve (2)	Provides oil control for DM bar	Depression Mechanism Cylinder
V4	Forward/Reverse Valve	Provides oil control for drive or lift functions	Hydraulic Manifold
V5	Counterbalance Valve (2)	Provides dynamic braking	Hydraulic Manifold

Figure 4-6: Hydraulic Schematic

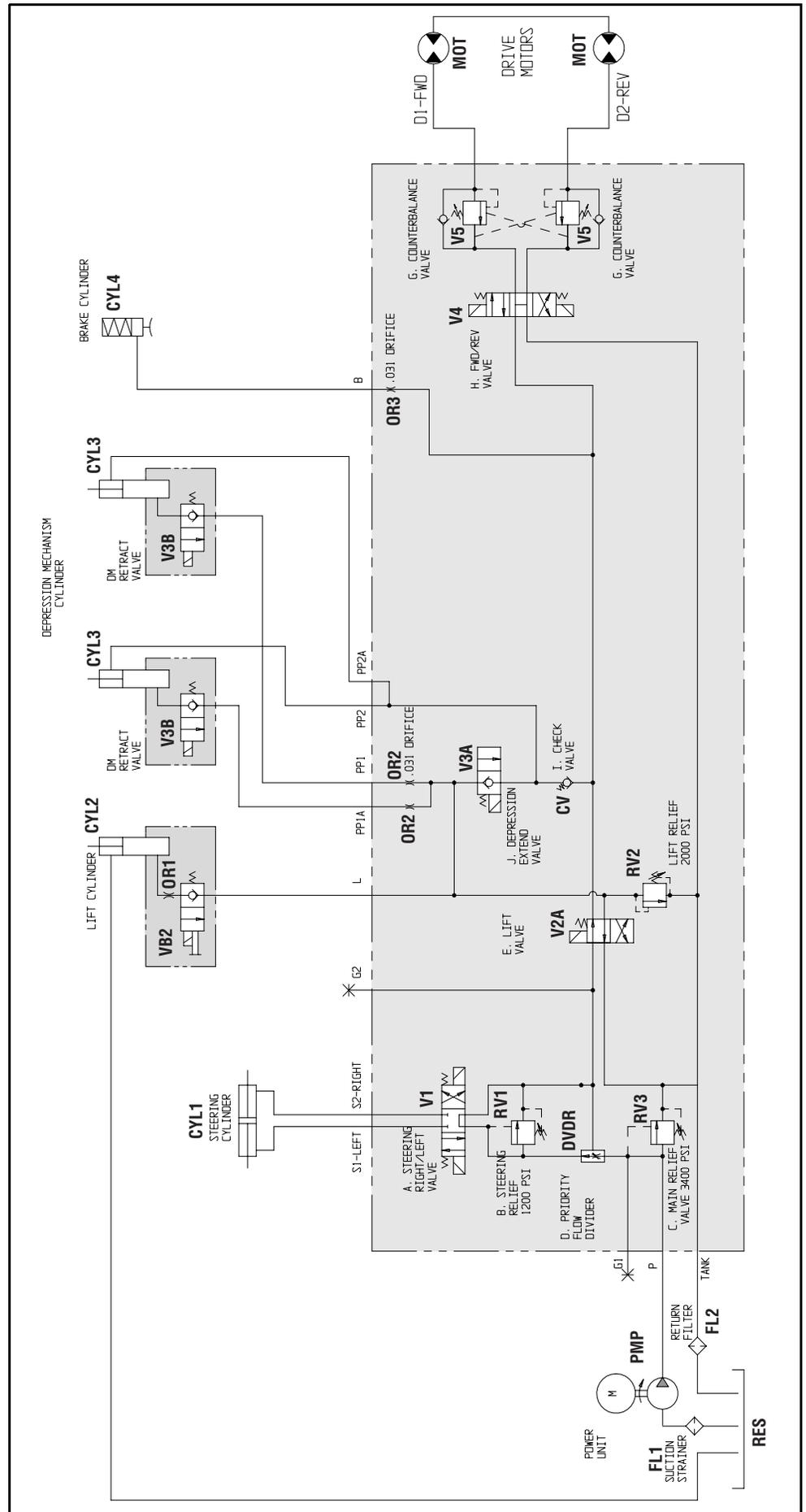


Figure 4-7: Valve Diagram

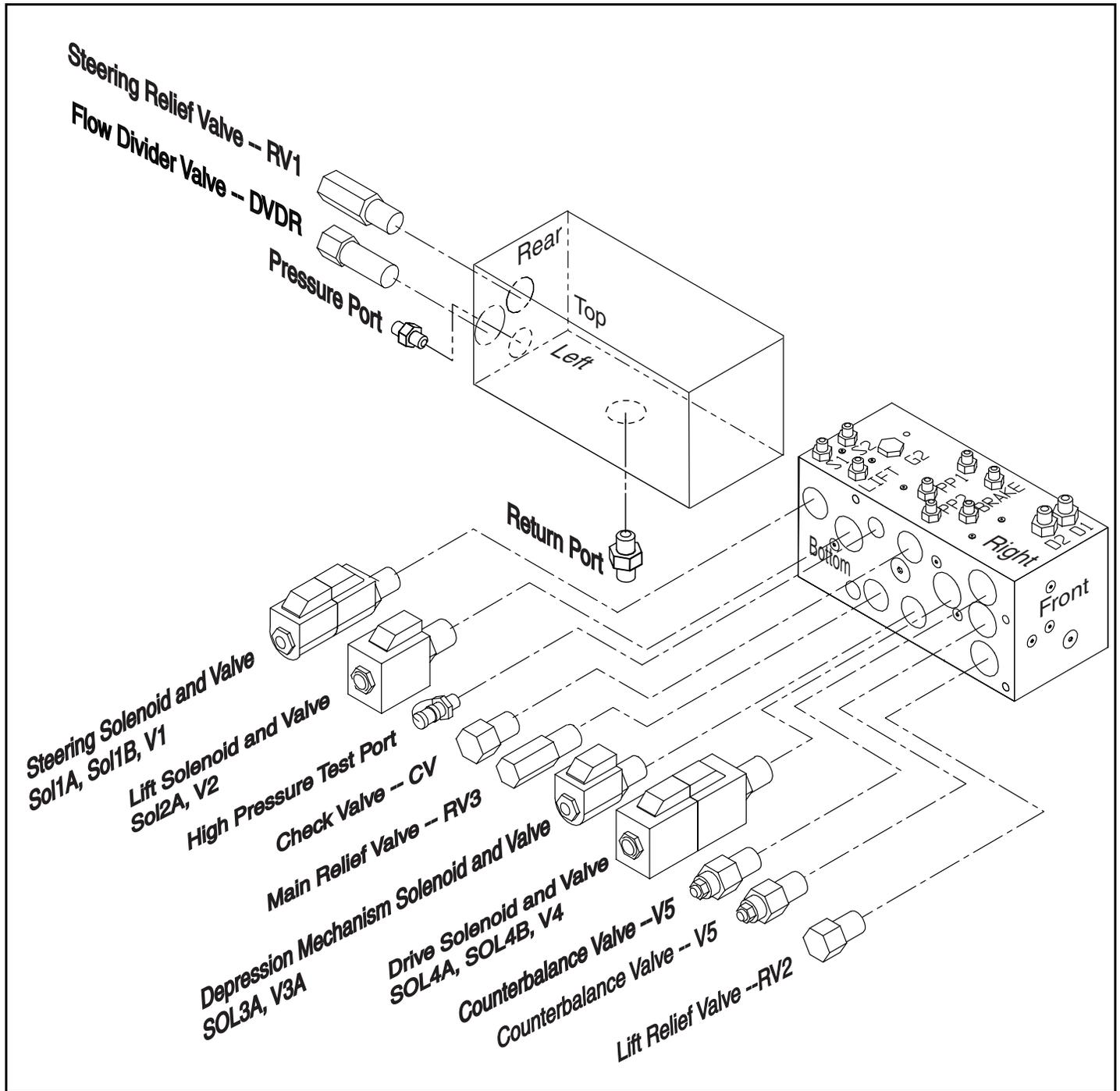


Figure 4-8: Plug Diagram

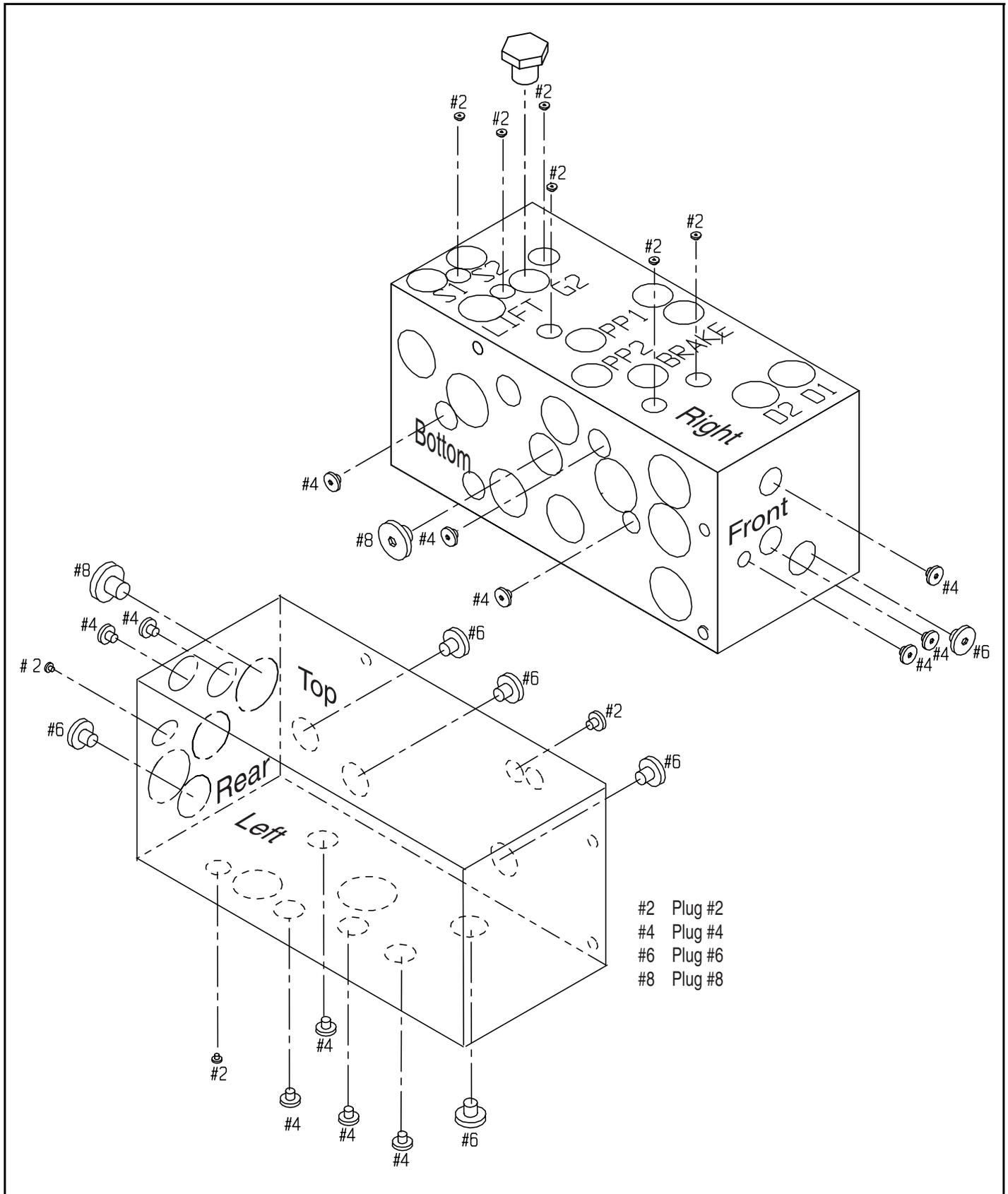
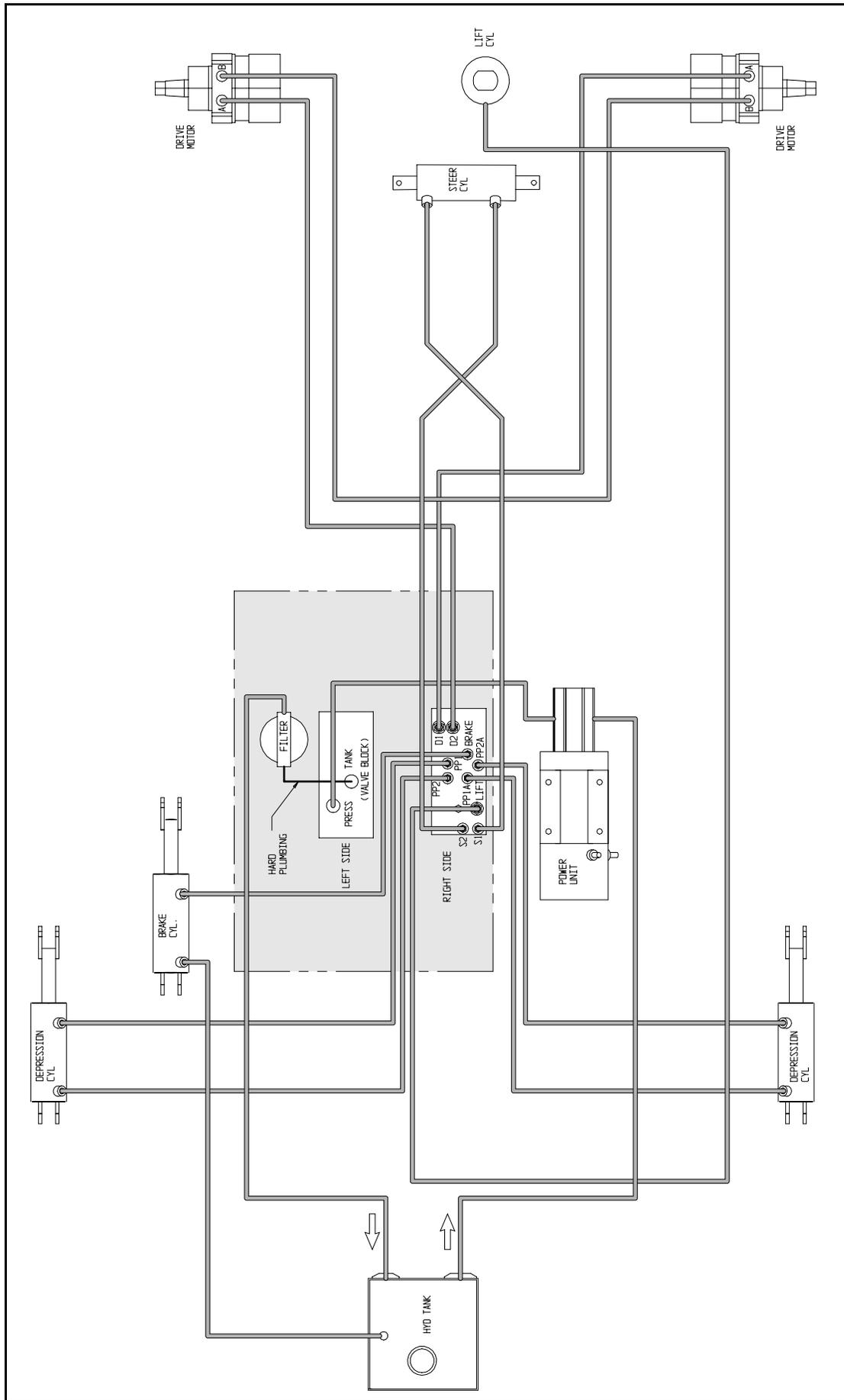


Figure 4-9: Hose Routing



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