

snorkel

M1230E



CE

PARTS & SERVICE MANUAL

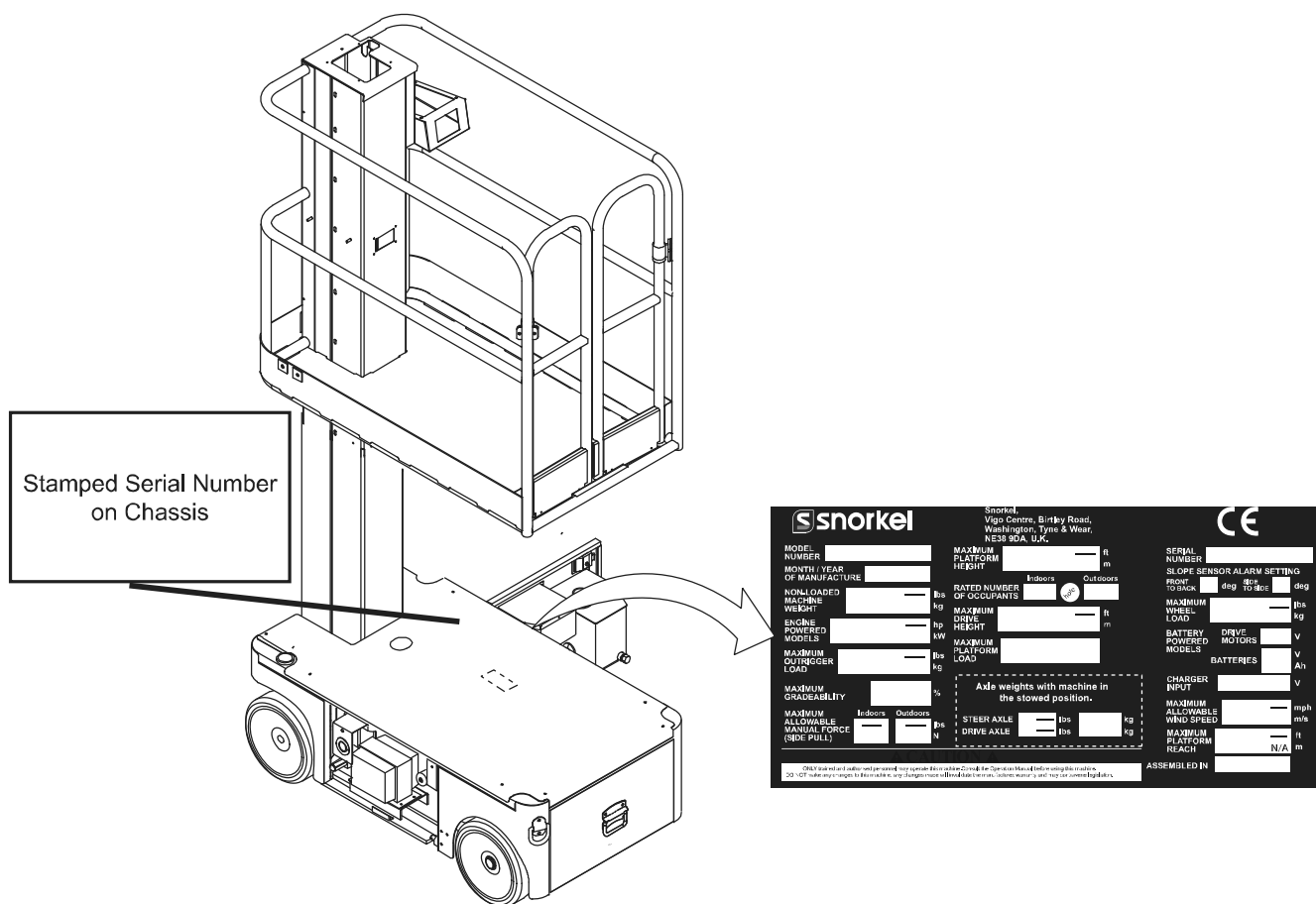
Part Number 512437-200
January 2013

Serial Number 000001 and after

M1230E

ENGLISH

When contacting **SNORKEL** 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.



M1230E SERVICE AND PARTS MANUAL

FOREWORD

HOW TO USE THIS MANUAL

This manual is divided into six sections.

SECTION 1 INTRODUCTION

General description and machine specifications.

SECTION 2 OPERATION AND SPECIFICATIONS

Information on how to operate the work platform and how to prepare it for operation.

SECTION 3 MAINTENANCE

Preventative maintenance and service information.

SECTION 4 TROUBLESHOOTING

Causes and solutions to typical problems.

SECTION 5 SCHEMATICS

Schematics and valve block diagram with description and location of components. Large schematic drawings may be located in the back of the manual.

SECTION 6 ILLUSTRATED PARTS BREAKDOWN

Complete parts lists with illustrations. Large parts drawings may be located in the back of the manual.

SPECIAL INFORMATION

 **D A N G E R** 

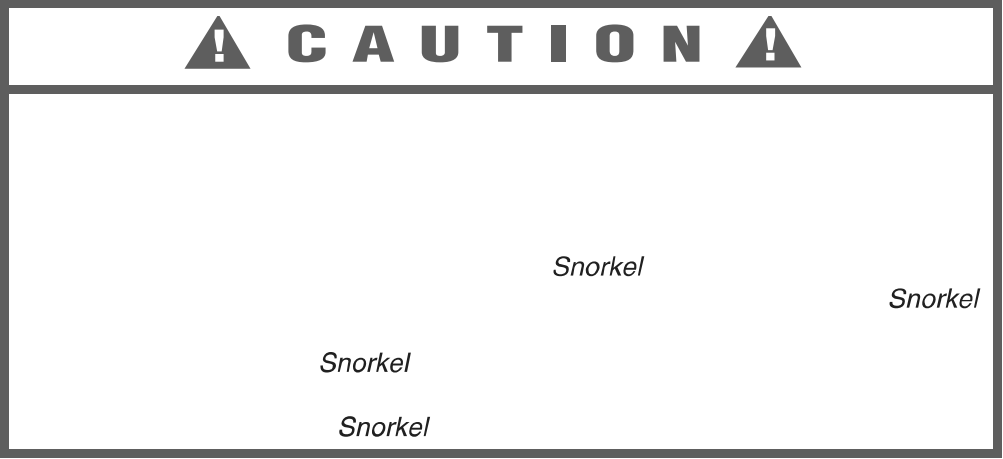
 **W A R N I N G** 

 **C A U T I O N** 

NOTE: Gives helpful information.

WORKSHOP PROCEDURES

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.



INTRODUCTION

1.1 INTRODUCTION

PURPOSE

The purpose of this service and parts manual is to provide instructions and illustrations for the operation and maintenance of the M1230E manufactured by Snorkel

SCOPE

The manual includes procedures for proper operation, maintenance, adjustment, and repair of the M1230E as well as recommended maintenance schedules and troubleshooting.

1.2 GENERAL DESCRIPTION

The M1230E consists of the platform, controller, elevating assembly, power / control module, and chassis.

! WARNING !

M1230E Work Platform

PLATFORM

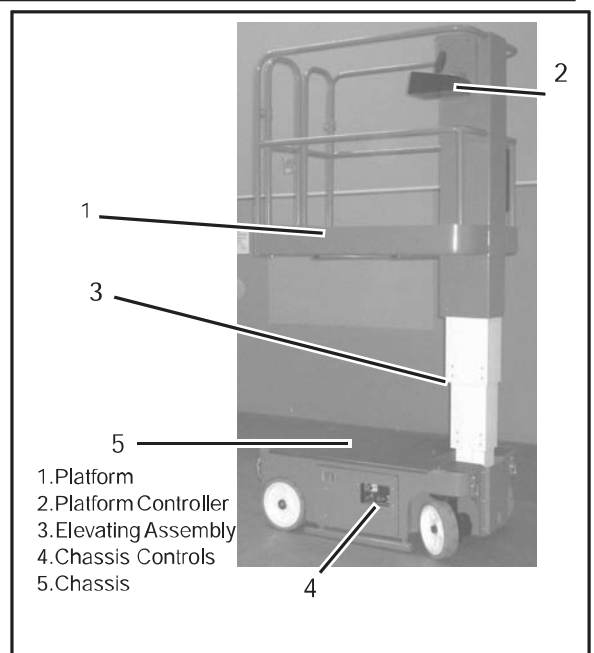
The platform has a reinforced steel floor, 1.11 m (43.75 inch) high guardrails with midrail, 6 inch (152 mm) toeboards, and an entrance gate at the rear of the platform.

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 Section 2.

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 M1230E 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.

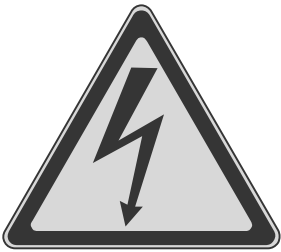
2. OPERATION MANUAL

WARNING

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

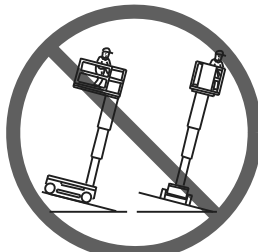
Safety Rules

Electrocution Hazard



THIS MACHINE IS NOT INSULATED!

Tip Over Hazard



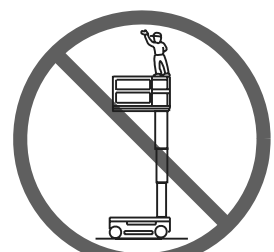
NEVER elevate the platform or drive the machine while elevated unless the machine is on a firm, level surface.

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! DO NOT get closer than the minimum distance recommended by the "National Regulations".

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.

NEVER attach notice boards etc. to the platform, as this will increase wind loading.

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

It is prohibited to keep the entry 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.

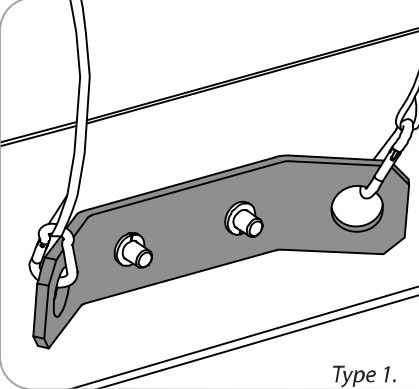
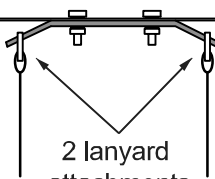
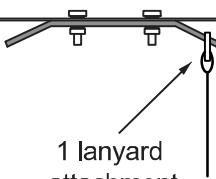
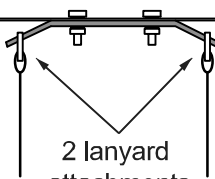
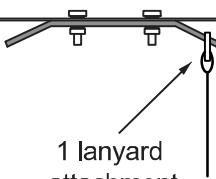
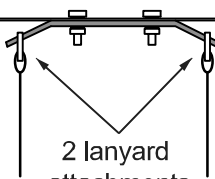
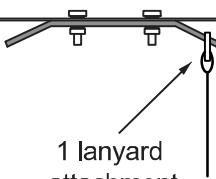
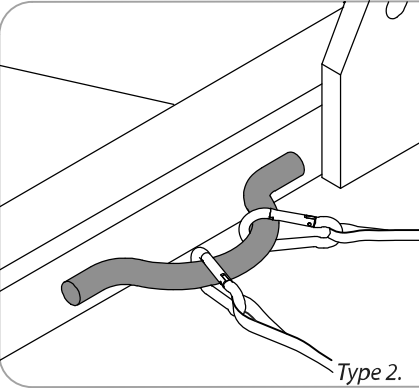
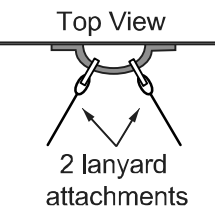
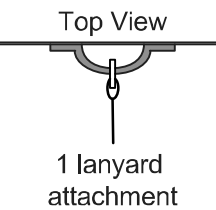
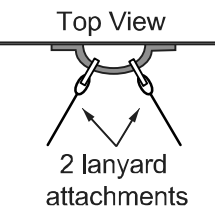
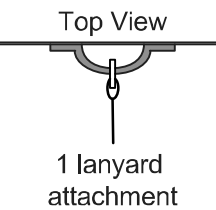
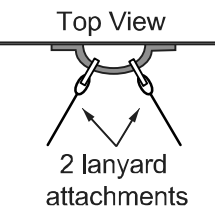
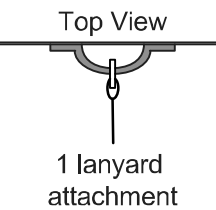
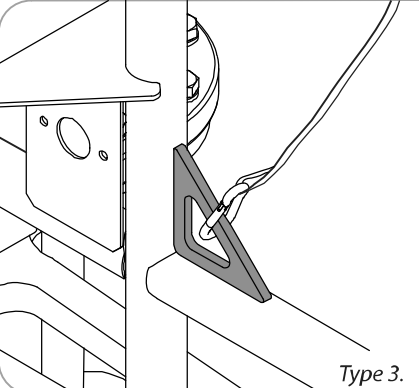
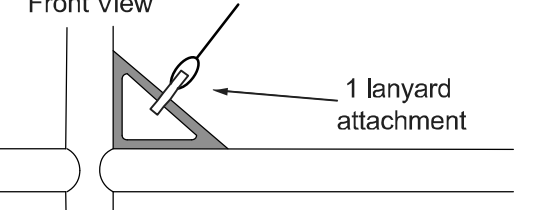
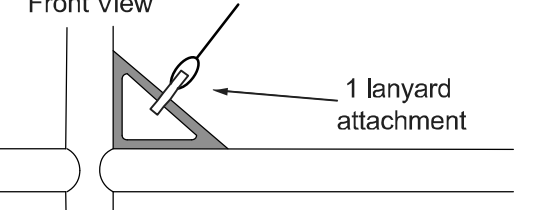
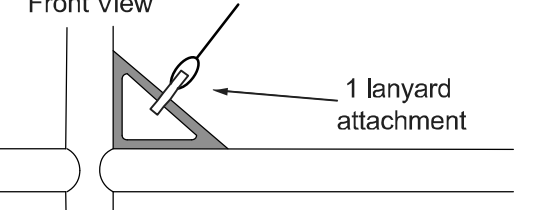
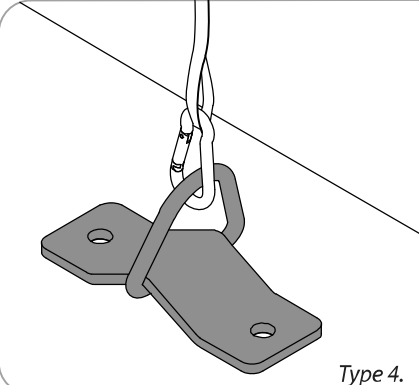
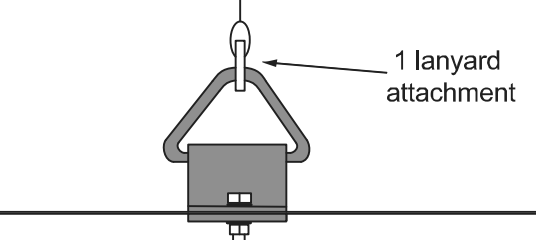
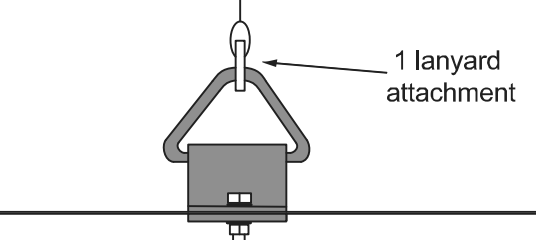
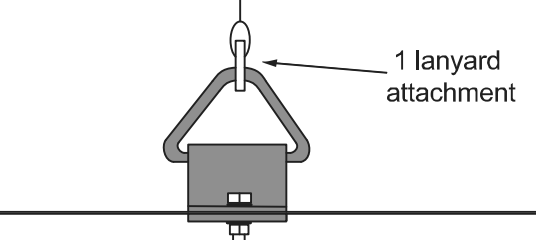
Modifications to the aerial work platform **are prohibited** or permissible only at the approval by Snorkel.

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

Harness attachment points are provided in the platform and the manufacturer recommends the usage of a fall restraint harness, especially where required by national safety regulations.

All harness attachment points on SNORKEL vehicles have been tested with a force of 3,650 lbs (16.3 KN) per person.

See below examples of harness attachment points used on SNORKEL vehicles with their corresponding rating;

 <p>Type 1.</p>	<p>Harness attachment point is rated for one lanyard attachment per loop as shown in the illustrations depending upon platform occupancy rating</p> <table><tr><th>Top View</th><th>Top View</th></tr><tr><td><p>2 lanyard attachments</p></td><td><p>1 lanyard attachment</p></td></tr></table>	Top View	Top View	 <p>2 lanyard attachments</p>	 <p>1 lanyard attachment</p>
Top View	Top View				
 <p>2 lanyard attachments</p>	 <p>1 lanyard attachment</p>				
 <p>Type 2.</p>	<p>Harness attachment point is rated for two lanyard attachments per loop as shown in the illustrations depending upon platform occupancy rating</p> <table><tr><th>Top View</th><th>Top View</th></tr><tr><td><p>2 lanyard attachments</p></td><td><p>1 lanyard attachment</p></td></tr></table>	Top View	Top View	 <p>2 lanyard attachments</p>	 <p>1 lanyard attachment</p>
Top View	Top View				
 <p>2 lanyard attachments</p>	 <p>1 lanyard attachment</p>				
 <p>Type 3.</p>	<p>Harness attachment point is rated for one lanyard attachment per loop as shown in the illustrations depending upon platform occupancy rating</p> <table><tr><th>Front View</th></tr><tr><td><p>1 lanyard attachment</p></td></tr></table>	Front View	 <p>1 lanyard attachment</p>		
Front View					
 <p>1 lanyard attachment</p>					
 <p>Type 4.</p>	<p>Harness attachment point is rated for one lanyard attachment per loop as shown in the illustrations depending upon platform occupancy rating</p> <table><tr><td><p>1 lanyard attachment</p></td></tr></table>	 <p>1 lanyard attachment</p>			
 <p>1 lanyard attachment</p>					

NOTE: There can be more harness attachment points per machine than the maximum number of occupants allowed in a platform. Refer to the platform decal & specifications table listed in the operators manual for the correct occupancy rating before use.

CONTENTS

- Introduction 3**
- General 3**
- Special Limitations 4**
 - Platform Capacity 4
 - Manual Force 4
 - Beaufort Scale 4
- Controls and Indicators 5**
- Pre-Operation Safety Inspection 5**
- System Function Inspection 6**
- Operation 7**
 - Travel With Platform Lowered 7
 - Steering 7
 - Elevating Platform 7
 - Travel With Platform Elevated 7
 - Lowering Platform 7
 - Emergency Lowering 8
 - Parking Brake Release 8
 - After Use Each Day 8
- Transporting the Machine 9**
 - By Crane 9
 - By Forklift 9
 - By Truck 9
- Maintenance 10**
 - Blocking the Elevating Assembly 10
 - Installation 10
 - Removal 10
 - Hydraulic Fluid 10
 - Check Hydraulic Fluid 10
 - Battery Maintenance 11
 - Battery Charging 11
- Inspection and Maintenance Schedule 12**
- Daily Preventative Maintenance Checklist 13**
- Specifications 14**

INTRODUCTION

This manual covers all models of the M1230E Aerial Work Platform. This manual must be stored on the machine at all times.

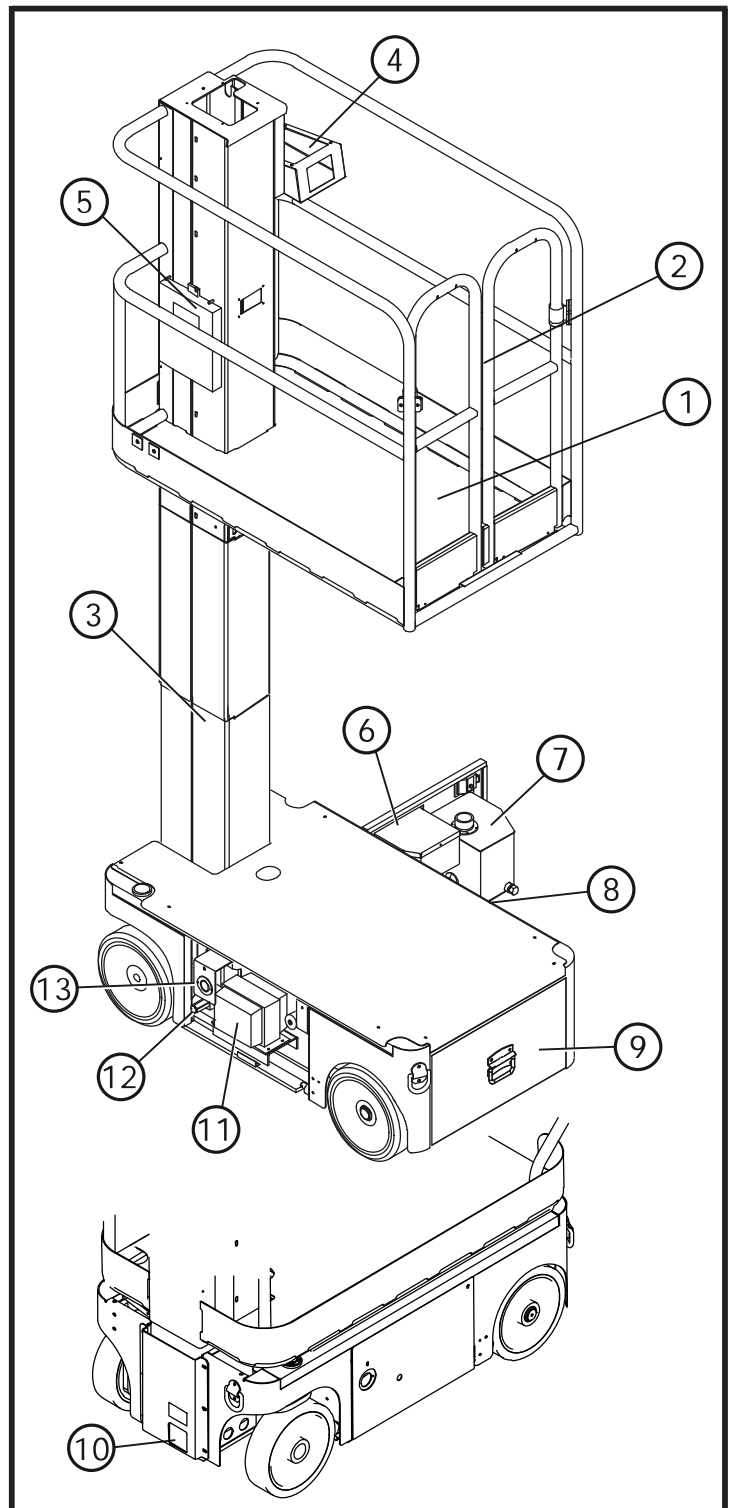
Read, understand and follow all safety rules and operating instructions before attempting to operate the machine.

GENERAL DESCRIPTION

M1230E Series



1. Platform
2. Entry Gates
3. Elevating Mast
4. Platform Controls
5. Manual Case
6. Chassis Controls
7. Hydraulic Reservoir
8. Power / Control Module, Inc level sensor (EZ230)
9. Battery Tray
10. Emergency Lowering Valve
11. Battery Charger
12. Drive Relief Valve
13. Charger Outlet Plug



SPECIAL LIMITATIONS

Travel with the platform raised is limited to creep speed range.
Elevating the platform is limited to firm, level surfaces only.



PLATFORM CAPACITY

The maximum platform capacity for the M1230E is 227 kg (500 lbs). Two people may occupy the platform indoors, while only one may occupy the platform outdoors.



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.



BEAUFORT SCALE

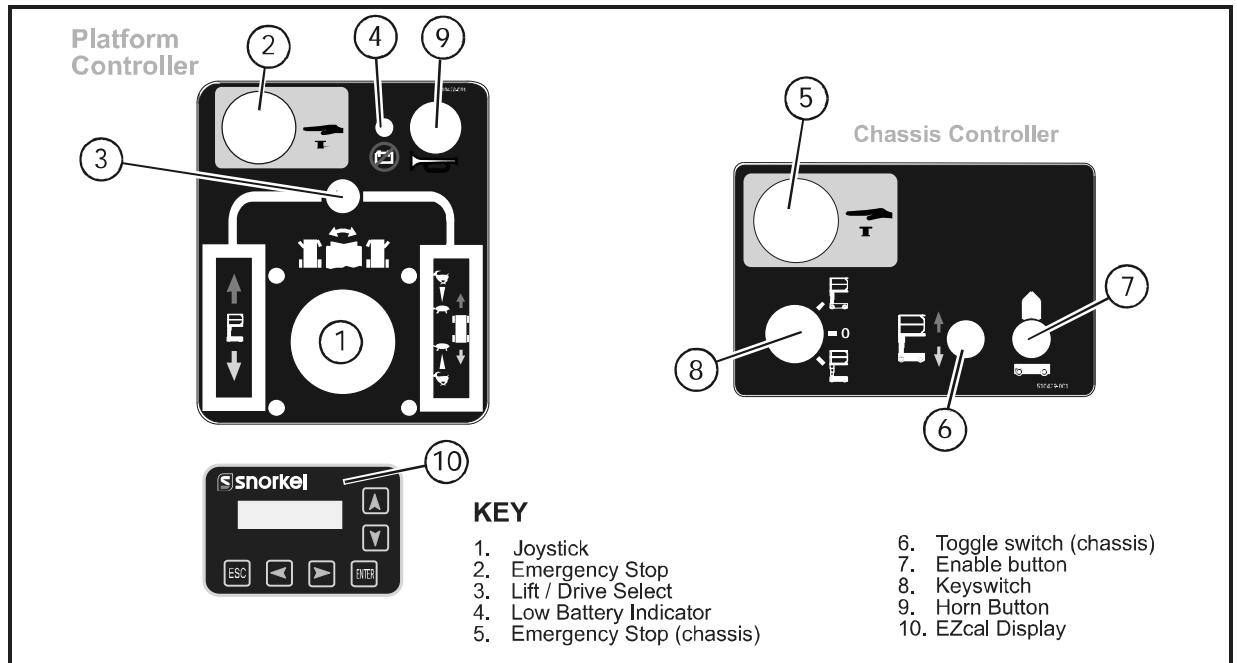
Never operate the machine when wind speeds exceed 12.5m/s (28mph) [Beaufort scale 6].

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.

CONTROLS AND INDICATORS

The operator shall know the location of each control and indicator and have a thorough knowledge of the function and operation of each before attempting to operate the unit.

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 the Chassis Door and inspect for damage, fluid leaks or missing parts.
2. Check the level of the hydraulic fluid with the platform fully lowered. Open the Chassis Door and remove the reservoir cap, fluid should be visible on the dipstick. Add recommended hydraulic fluid if necessary. See "Specifications" on page 14.
3. Check that the fluid level in the batteries is correct. See "Battery Maintenance" on page 11.
4. Verify that the batteries are charged.
5. Check that the A.C. extension cord has been disconnected from the chassis outlet.
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 and loose wire connections.

SYSTEM FUNCTION INSPECTION

Refer to Figure 1 and Figure 2 for the locations of various controls and indicators.

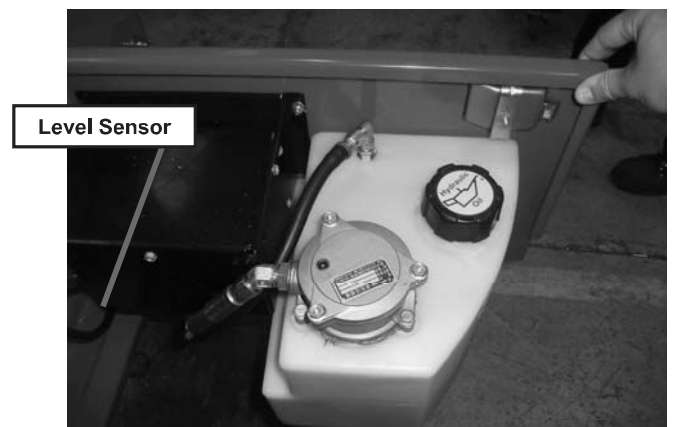


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1. Move the machine, if necessary, to an unobstructed area to allow for full elevation.
 2. Turn the Chassis and Platform Emergency Stop Switches ON by twisting and pulling the buttons out.
 3. Check Level Sensor operation:
 - a. Position the machine off of level by more than 2°.
 - b. Raise the Platform using the Chassis Controls.

- The alarm should sound, and the platform should not lift more than 500mm.

4. Lower the platform by pushing the Chassis Lift Switch to DOWN while holding the enable switch on, and check the operation of the audible lowering alarm.
5. Level the Machine.
6. Push the Chassis Lift Switch to the UP position while holding the enable switch on and fully elevate the platform.
7. Visually inspect the mast assembly for damage or erratic operation. Check for missing or loose parts.
8. Verify that the depression mechanism supports have rotated into position under the machine.
9. Check the Chassis Emergency Lowering Valve for proper operation (see Figure 4):
 - a. Open the valve by pulling the knob out.
 - b. Once the platform is fully lowered, close the valve by releasing the knob.
10. Push the Chassis Emergency Stop Switch down to the OFF position. All machine functions should be disabled. Pull out the Chassis Emergency Stop Switch to resume.
11. Turn the Key Switch to Platform Control and Mount the platform.
12. Check that the route is clear of persons, obstructions, holes and drop-offs, is level and capable of supporting the wheel loads.
13. After mounting platform, lower the bar across the entrance.
14. Select Drive mode.
15. While depressing the Joystick Interlock Switch, slowly position the Joystick to FORWARD then REVERSE to check for speed and directional control. The farther you push or pull the Joystick from center the faster the machine will travel.
16. Push the Steering Switch RIGHT then LEFT to check for steering control.
17. Push the Platform Emergency Stop Switch down to the OFF position. All machine functions should be disabled. Pull out the Platform Emergency Stop Switch to resume.

Level Sensor Location



OPERATION

Before operating the machine, 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.

TRAVEL WITH PLATFORM LOWERED

1. Check that the route is clear of people, obstructions, holes and drop-offs, is level and is capable of supporting wheel loads.
2. Verify that the Chassis Key Switch is turned to Platform Control and the Chassis Emergency Stop Switch is ON, (pull button out).
3. After mounting the platform, Ensure Gates close behind you.
4. Check clearances above, below and to the sides of the machine.
5. Pull the Controller Emergency Stop switch up to the ON position.
6. Select DRIVE mode.
7. While depressing the Joystick Interlock Switch, slowly push or pull the Joystick to FORWARD or REVERSE position to travel in the desired direction. The farther you push or pull the Joystick from center the faster the machine will travel.

STEERING

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

1. Select DRIVE mode.
2. While depressing 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 machine to ensure proper direction.

ELEVATING PLATFORM

1. Select LIFT mode.
2. While depressing the Joystick Interlock Switch, push Joystick forward to UP, the farther you push the Joystick the faster the Platform will elevate.
3. 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 level location before attempting to re-elevate the Platform.

TRAVEL WITH PLATFORM ELEVATED

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

1. Check that the route is clear of persons, obstructions, holes and drop-offs, is level and capable of supporting the wheel loads.
2. Check clearances above, below and to the sides of the platform.
3. With the Machine elevated above 500mm Select DRIVE mode.
4. While depressing the Joystick Interlock Switch, push Joystick to FORWARD or REVERSE for desired direction of travel.
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 level location before attempting to re-elevate the Platform.

LOWERING PLATFORM

1. Select LIFT mode.
 2. While depressing the Joystick Interlock Switch, pull back on the Joystick.
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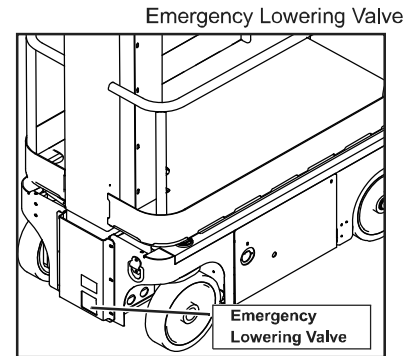
EMERGENCY LOWERING



Ask a person on the ground to open the Emergency Lowering Valve to lower the platform. The Emergency Lowering Valve is located at the front of the chassis.

1. Open the Emergency Lowering Valve by pulling the knob out.
2. To close, release the knob.

NOTE: The platform will not elevate if the Emergency Lowering Valve is open.



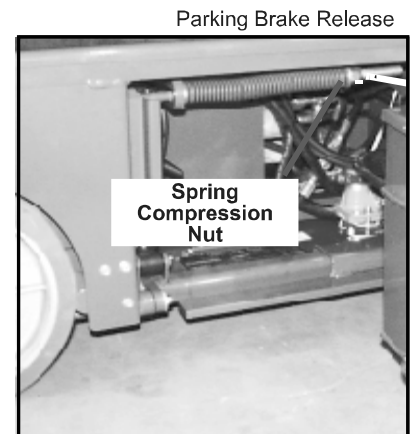
PARKING BRAKE RELEASE

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. Remove the spring compression nut so the spring is loose and the brake bars are away from the tires.
2. Disconnect the Drive Motor Hydraulic Hose from port "D1" on the Hydraulic Manifold and immediately cap the opening to prevent foreign material from entering, open the cap from the Oil Tank and place the end of the hose into the Tank. This will allow the Drive Motors to turn freely and oil from them will be fed back into the Tank.
3. The machine will now roll when pushed or pulled.

After moving the machine and before normal operation:

1. Reconnect the Drive Motor hose to "D1" on the Hydraulic Manifold.
2. Ensure Drive / Steer wheels are clear of the ground.
3. Operate drive (fwd or rev), Assistance will be required to complete this process.
4. Adjust Spring compression nut until spring fully compressed.
5. Restore machine to its original position.



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 MACHINE

BY CRANE

Secure the straps to chassis lifting/tie down points only.

BY FORKLIFT



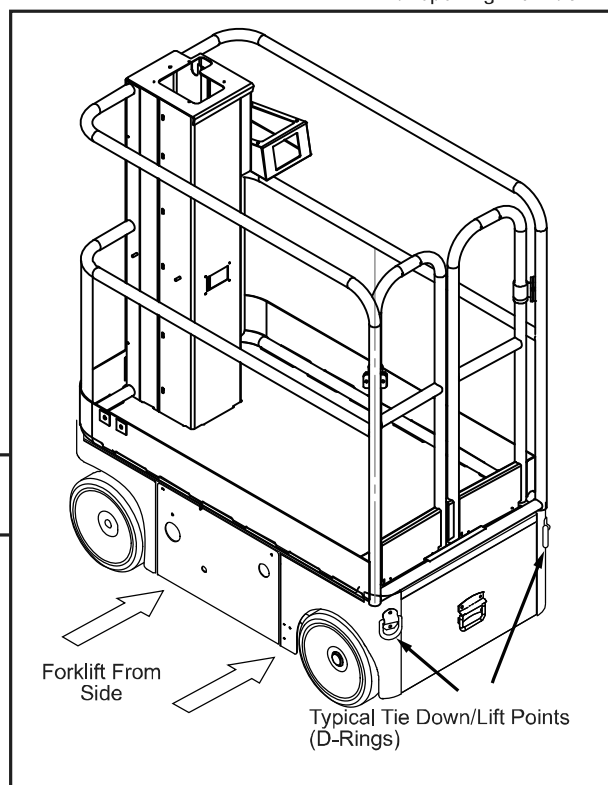
Transporting the Machine

Forklift from the side by lifting under the Chassis.

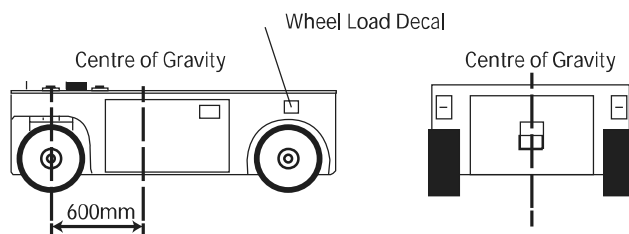
BY TRUCK

1. Maneuver the machine into transport position and chock wheels.
2. Secure the machine to the transport vehicle with chains or straps of adequate load capacity attached to the chassis lifting/tie down points.

CAUTION



CENTRE OF GRAVITY WHEN EMPTY



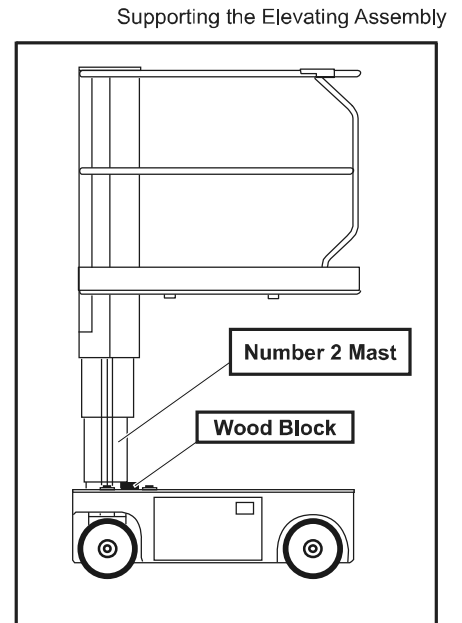
MAINTENANCE



BLOCKING THE ELEVATING ASSEMBLY

INSTALLATION

1. Park the machine on firm level ground.
2. Verify that both Emergency Stop Switches are ON.
3. Turn and hold the Chassis Key Switch to CHASSIS.
4. Position the Chassis Lift Switch to UP and elevate the platform approximately 1,2 m (4 ft.).
5. Place a solid wood block, 51mm x 100mm x 45cm (2"x 4"x18") between the second mast section and Chassis just behind the mast assembly.
6. Push the Chassis Lift Switch to the DOWN position and gradually lower the platform until the second mast section is supported by the block.



REMOVAL

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

HYDRAULIC FLUID

The hydraulic fluid reservoir is located in the chassis door.

Hydraulic Fluid Reservoir and Dipstick

NOTE: Never add fluid if the platform is elevated.

CHECK HYDRAULIC FLUID

1. Make sure that the platform is fully lowered.
2. Open the chassis door.
3. Check the fluid level using the gauge on the tank.
4. To add Hydraulic fluid remove Filler Cap in Fig 8.
5. Add the appropriate fluid to bring the level to the FULL mark. See "Specifications" on page 14



BATTERY MAINTENANCE



Access to Batteries

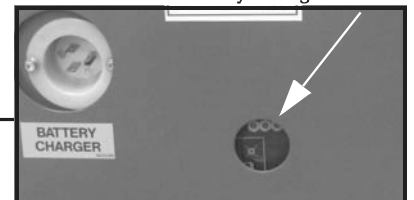


- Check the battery fluid level daily, especially if the machine is being used in a warm, dry climate.
- Keep the terminals and tops of the batteries clean.
- Refer to the Service Manual to extend battery life and for complete service instructions.

BATTERY CHARGING



Battery Charge Indicator



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 extension cord (1,5 mm² [**12 gauge**] minimum conductor diameter; 15 m (**50 ft.**) maximum length) to the charger plug located at the left side of the chassis.
3. The charger turns on automatically after a short delay. Look through the charge indicator cutout to check the state of charge.
 - 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
 - The charger automatically shuts down to low current after charging is complete and all lights turn ON.
 - The charger continues at low current (equalizing charge) for 3-4 hours, then charging current shuts off completely.
4. Lights remain ON until the AC power supply is disconnected.

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 or at intervals to suit the relevant national body whichever is the lesser. Inspection and maintenance shall be performed by personnel who are trained and familiar with mechanical and electrical procedures.



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

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 Hydraulic 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.			
Platform Deck and Rails	Check condition of deck.			
Tires	Check for damage.			

SPECIFICATIONS

ITEM	M1230E
Platform Size	74cm x 96cm (29 in. x 38 in.)
Maximum Platform Capacity	227 kg (500 lbs.)
Maximum Number of Occupants	2 People indoors/1 person outdoors
Height	
Working Height	5,6 m (18 ft.)
Maximum Platform Height	3,63 m (11 ft. 11 in.)
Minimum Platform Height	48,3 cm (19 in.)
Dimensions	
Weight	780 kg (1720 lbs.)
Overall Width	76 cm (30 in.)
Overall Height	165 cm (65 in.)
Overall Length	1,36 m (53.5 in.)
Drive Speed	
Platform Lowered	3,2 km/h (1.99 mph)
Platform Raised	0,65 km/h (0.46 mph)
Energy Source	24V battery pack Four 220 ampere hour, 6 Volt batteries, min. wt. 26,3 kg (58 lbs.) each 4 HP DC electric motor
System Voltage	24 VDC
Battery Charger	20 AMP, 220 V AC 50Hz
Battery Duty Cycle	25% for 8 Hours
Hydraulic Reservoir Capacity	7,2 L (1.9 gal)
Maximum Hydraulic System Pressure	165 bar (2400 psi)
Hydraulic Fluid	
Normal above 32° F [0° C]	ISO #46
Low Temp. below 32° F [0° C]	ISO #32
below 0° F [-17° C]	ISO #15
Lift System	One Single Stage Lift Cylinder
Drive Control	Proportional
Control System	Proportional Control Handle with Interlock, Selector Switch, Red Mushroom Emergency Stop Switches
Horizontal Drive	Dual Front Wheel
Tires	30,5 cm (12 in.) diameter solid rubber, Non-marking
Parking Brakes	Dual, Spring Applied, Hydraulic Release
Turning Radius	37 cm (14.5 in.) Inside
Maximum Gradeability	14° (25%)
Wheel Base	97,8 cm (38.5 in.)
Guardrails	1,10 m (43 in.)
Toeboard	152 mm (6 in.)
Max Chassis Inclination	1,5° Side to Side 2,0° Front to Back
Wheel loading	325kg per wheel / 716.5 lbs per wheel
Vibration of this machine does not exceed	2,5m/sec ²
Sound Pressure Level	68dB (A) at Control Station
Operating Temperature Range	-20° C to +50° C

*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.
This machine meets or exceeds all applicable CE and GS machinery directive requirements.

Section 3

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 Snorkel 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. Owners of this work platform must set up a maintenance programme and have prepared a safety statement in advance as required by the relevant National Body.

! WARNING !

! DANGER !

TABLE OF CONTENTS

3-1 Supporting Elevating Assembly	3-3
Installation	3-3
Removal	3-3
3-2 Preventative Maintenance	3-4
3-3 Preventative Maintenance Check List	3-5
3-4 Parts Location	3-6
3-5 General Lubrication	3-7
3-6 Batteries	3-8
Battery Replacement	3-8
Battery Maintenance	3-8
3-7 Hydraulics	3-9
Hydraulic Oil Tank And Filter	3-9
Hydraulic Pump	3-10
Emergency Down Valve	3-11
Main Hydraulic Manifold	3-12
Setting Hydraulic Manifold Pressures	3-13
3-8 Cylinders	3-15
Depression Cylinder	3-15
Brake Cylinder	3-16
Steering Cylinder	3-17
Lift Cylinder	3-18
3-9 Drive Motors	3-19
Removal	3-19
Installation	3-19

3-10 Elevating Assembly	3-20
Lift Chain Lubrication	3-21
Elevating Assembly Wear Inspection	3-21
Chain Tension Inspection	3-22
Chain Elongation Inspection	3-22
Removal of Elevating Assembly	3-23
Installation of Elevating Assembly	3-23
3-11 Tilt Sensor	3-24
3-12 Controls	3-25
Platform Controls	3-25
Chassis Controls	3-26
4-1 Trouble Shooting	4-1
Introduction	4-1
General Procedure	4-1
4-2 Trouble Shooting	4-2
Special Tools	4-2
Adjustment Procedure	4-2
Diagnostics Using EZcal	4-3
Replacing The EZ230 Control Module	4-4
4-2 Trouble Shooting Guide	4-5
Electric	4-6
Hydraulic	4-7
5-1 Schematics	5-1
Electric	5-2
Hydraulic	5-4
6-1 Illustrated Parts Breakdown	6-1
Contents	6-1

3-1 SUPPORTING ELEVATING ASSEMBLY



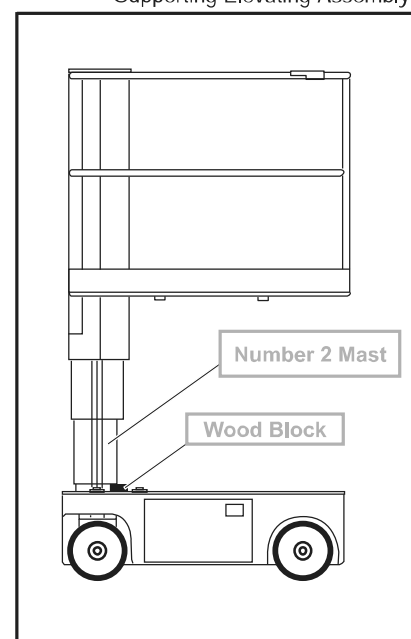
INSTALLATION

1. Park the Work Platform on firm level ground.
2. Verify Platform Emergency Stop Switch is **ON**.
3. Switch the Key switch to chassis.control.
4. Press the Enable button and push Chassis Lift/Lower toggle Switch to **UP** to elevate Platform approximately 1.2m (4 feet).
5. Place a wood block, 5cm x 10cm x 46cm (2 in. x 4 in. x 18 in.) long between the #2 Mast and Chassis just behind the Mast Assembly.
6. Press the Enable button and push Chassis Lift/Lower toggle Switch to **DOWN** position and gradually lower Platform until the #2 Mast is supported by the block.

REMOVAL

1. Press the Enable button and push Chassis Lift/Lower toggle Switch to **UP** to gradually raise Platform until wood block can be removed.
2. Remove block.
3. Press the Enable button and push Chassis Lift/Lower toggle Switch to **DOWN** position and completely lower Platform

Supporting Elevating Assembly



3-2 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.



The preventative maintenance table has been designed for machine service and maintenance repair. Please photocopy the following page and use the table as a checklist when inspecting the machine for service.

3-3 PREVENTATIVE MAINTENANCE CHECK LIST

PREVENTATIVE MAINTENANCE 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: _____

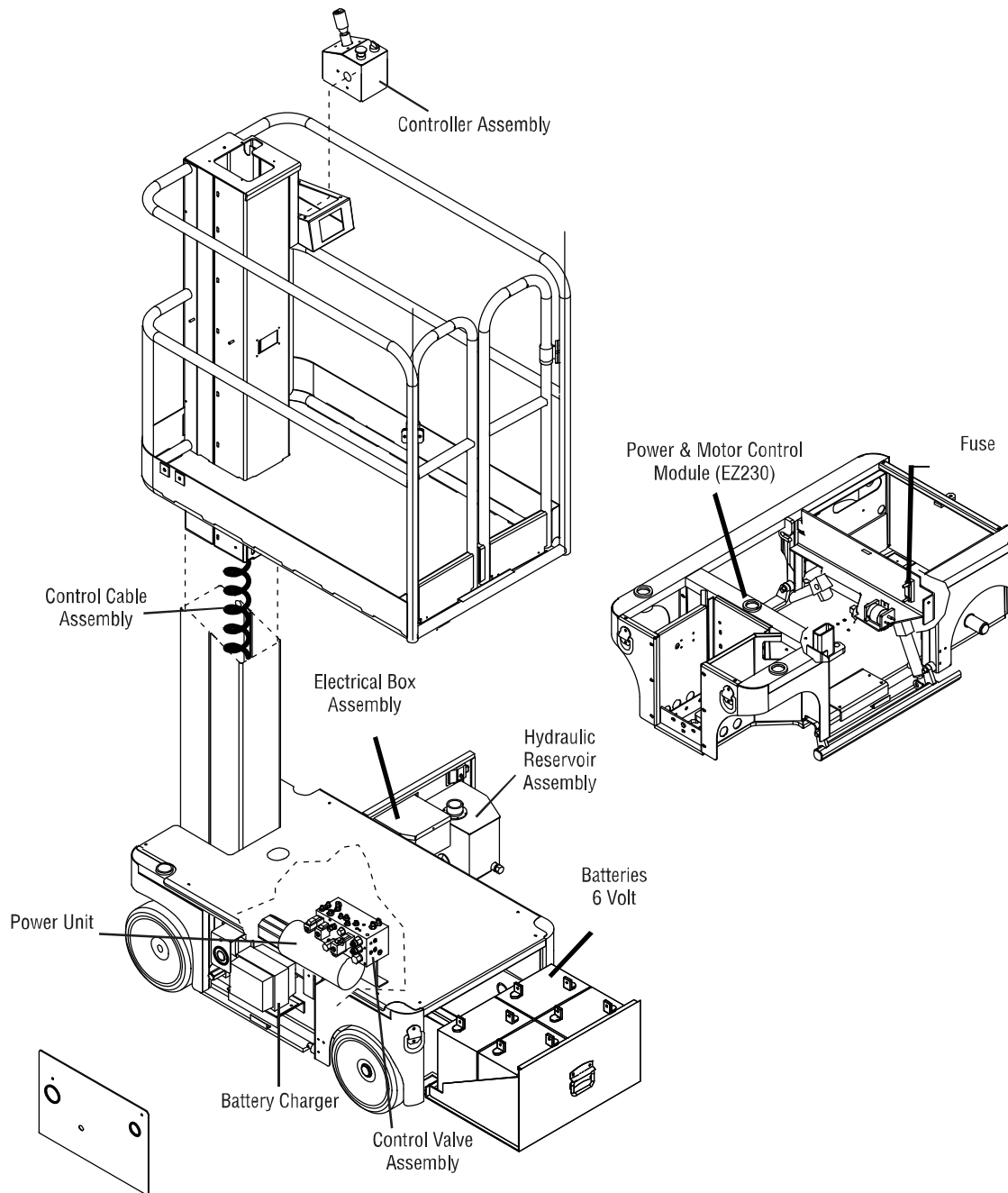
COMPONENT	INSPECTION OR SERVICES	INTERVAL	Y	N	R
Battery System	Check electrolyte level	Daily			
	Check battery cable condition	Daily			
	Charge batteries	Daily			
	Check charger condition & operation	Daily			
	Check specific gravity	6m			
	Clean exterior	6m			
Hydraulic Oil*	Clean terminals	6m			
	Check 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			
Drive Motors	Check for operation and leaks	Daily			
Emergency Down	Check procedure for Emergency Down	Daily			
Hydraulic Pump	Check for fitting leaks	Daily			
	Wipe clean	30d			
	Check for leaks at mating surfaces	30d			
	Check mounting bolts for proper torque	6m			
Controller	Check condition & operation	Daily			
Platform Deck & Rails	Check fasteners for proper torque	Daily			
	Check welds for cracks	Daily			
	Check condition of deck	Daily			
	Check entry way closure	Daily			

COMPONENT	INSPECTION OR SERVICES	INTERVAL	Y	N	R
Elevating Assembly	Inspect for external damage, dents, loose rivets or cracks	Daily			
	Check chains and sheaves for wear	6m			
	Lubricate lift chains	6m			
	Check chain tension	1yr			
	Remove and inspect chains	5yr			
Chassis	Check cables for pinch or rubbing points	Daily			
	Check welds for cracks	Daily			
	Check component mounting for proper torque	6m			
Lift Cylinder	Check for leaks	Daily			
	Check for proper torque	6m			
Mast	Lubricate, see Section 3-5 for application.	3m			
Entire Unit	Perform pre-operation inspection	Daily			
	Check for and repair collision damage	Daily			
	Lubricate	30d			
	Check fasteners for proper torque	6m			
	Check for corrosion; remove and repaint	6m			
Labels	Check for peeling, missing, or unreadable labels & replace	Daily			
Wheels	Check for loose components	Daily			
	Check Bearings for Oil	3m			
Steering System	Oil pivot pins	30d			
	Oil king pins	30d			
	Check steering cylinder for leaks	30d			
	Check hardware & fittings for proper torque	6m			

* NOTE: Use ISO #46 during summer and ISO #32 during winter.

3-4 PARTS LOCATION

Parts Location



3-5 GENERAL LUBRICATION

Mast Lubrication :

Approved Lubricant :
Interflon Fin Lube TF +Teflon

The use of Interflon Fin Lube is recommended as it does NOT have the adhesive properties of other greases and will prevent the trapping of contaminant particles.

The use of other types of 'heavy' grease are therefore not recommended.

Application:

Aerosol, Brush or Mist Application.

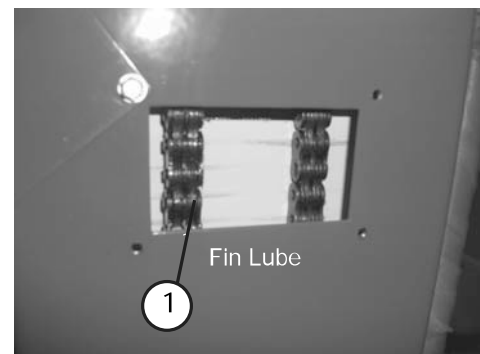
Lubricant should be applied as a extremely thin coating on the corners of the mast assembly sections where the Nylon Pads slide. It is recommended that the mast sections are cleaned and the Fin Lube TF reapplied at three monthly intervals and at each 6 and/or 12 monthly routine Inspection / Service.

Chain Lubrication (Mast) :

Approved Lubricant :
Interflon Fin Lube TF +Teflon

Application:
See section 3-10, Page 3-21.

Chain Lubrication (Fin Lube)



1. Chain

Additional lubrication :

Wheel Bearing.

- Apply one or two drops of motor oil to each bearing in Fig 3-3 item 2, see "Maintenance check list" on Page 3-5 for check frequency.

Bearings.

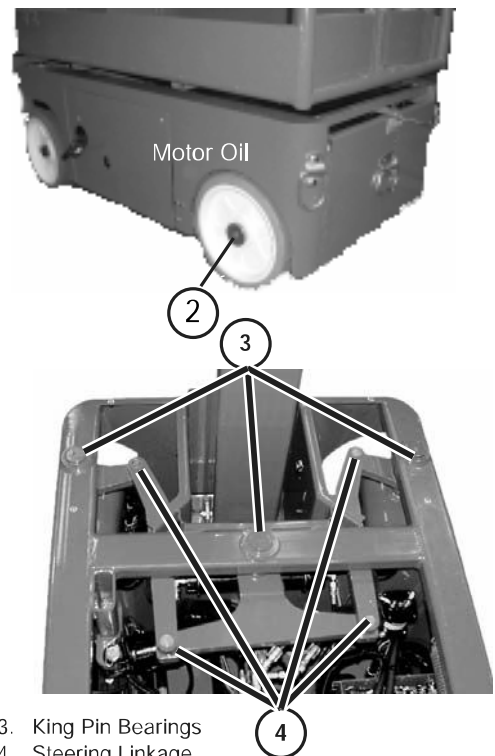
Approved Lubricant : EP.2 Lithium grease

- Apply EP.2 Lithium grease to each fitting identified in Fig 3-3 **item 3**. See "Maintenance Check list" on Page 3-5 for check frequency.

- Linkage.

Apply Fin Lube to linkage pins identified in Fig 3-3 item 4. See "Maintenance Check list" on Page 3-5 for check frequency.

Figure 3-3: Additional Lubrication



3. King Pin Bearings
4. Steering Linkage

3-6 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.

CAUTION

WARNING

BATTERY REPLACEMENT

The batteries are located in a slide-out tray in the rear of the machine. There are four 6 volt batteries wired in series for 24 volts DC. Battery cables must be installed as shown in the Battery Cable Installation Diagram.

BATTERY MAINTENANCE

Refer to [Battery Maintenance](#) for complete battery maintenance instructions.

If Battery Discharge warning Light Illuminates (Fig 3-4), recharge batteries fully.

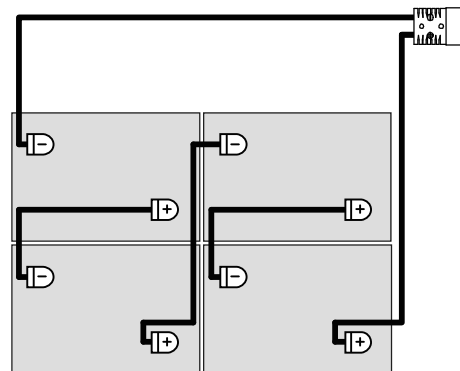
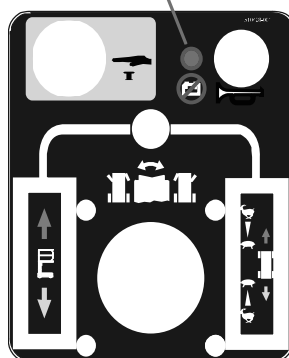
Refer to the [Battery Maintenance](#) included in this Service Manual for specific maintenance and charging instructions.

Battery Cables



Batteries Installed

Battery Discharge warning Light



Battery Cable Installation Diagram

3-7 HYDRAULICS

HYDRAULIC OIL TANK AND FILTER

FLUID LEVEL

With Platform fully lowered, oil should be visible between Max /Min lines on the oil tank, if not, fill the tank.

DO NOT fill above the Max line when the platform is elevated.

OIL AND FILTER REPLACEMENT

1. Operate the work platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.
2. Open module door.
3. Remove Hydraulic oil using a suitable pump. The Hydraulic tank has a 7,2 liter (**1.9 US gal.**) capacity.
4. Extract Filter module by removing the 3 screws shown in fig 2.
5. Remove Spring and replace Old filter
6. Ensure the filter is sitting correctly and refit Spring
7. Apply a thin film of clean hydraulic oil (ISO #46) to the 'O' Ring housed in the Filter Lid.
8. Refit the three screws shown in Fig 2.
9. Fill the hydraulic reservoir with hydraulic oil until the oil comes up just past the Min line .
Hydraulic tank has a 7,2 liter (**1.9 US gallon**) capacity.

Figure 3-5: Hydraulic Oil Tank and Filter

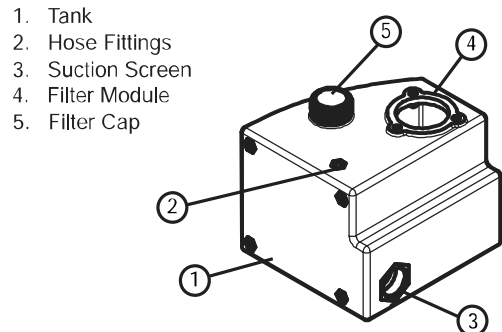


Fig 1

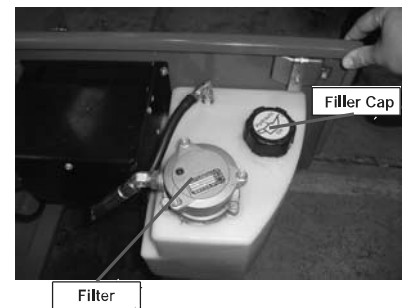
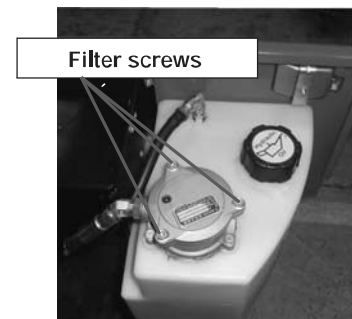


Fig 2



! CAUTION !

HYDRAULIC PUMP

The Hydraulic Pump is located in the Power Module, and is mounted on the rear of the motor.

REMOVAL

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

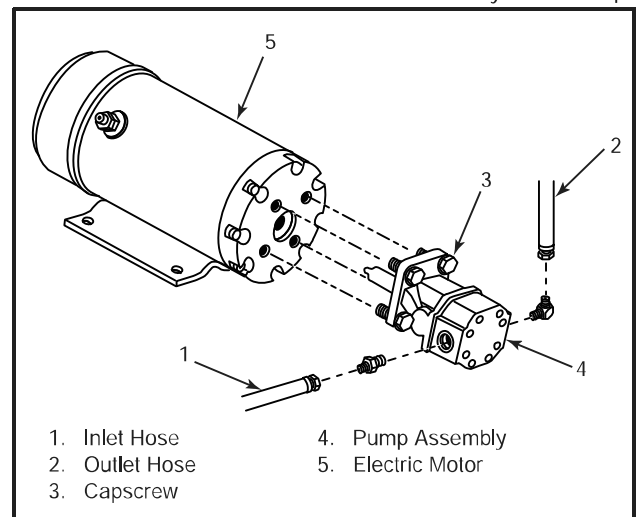
1. Mark, disconnect and plug the hose assemblies.
2. Loosen the capscrews and remove the pump assembly from the motor.

INSTALLATION

1. Lubricate the pump shaft with general purpose grease and attach the pump to the motor with the capscrews.
2. Using a crisscross pattern, torque each cap-screw a little at a time until all capscrews are torqued to 27N-m (20 ft-lbs).
3. Unplug and reconnect the hydraulic hoses.
4. Check the oil level in the hydraulic tank before operating the work platform.

CYLINDER VALVE ASSEMBLY

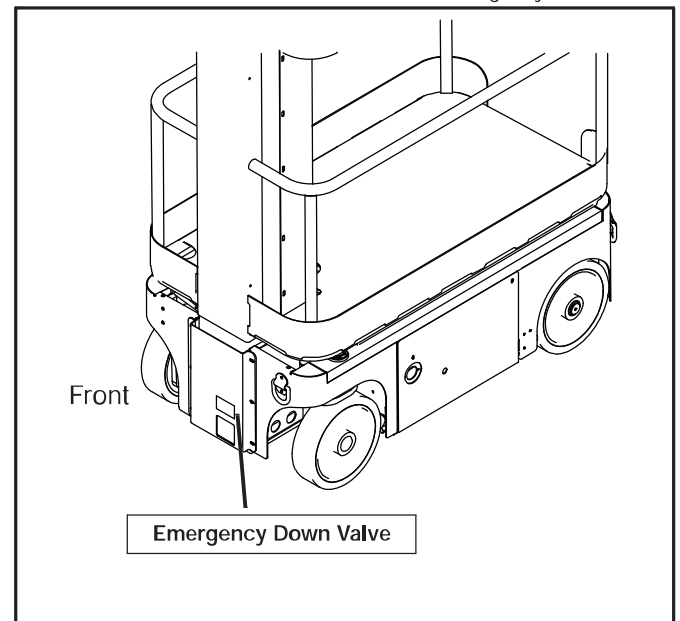
Hydraulic Pump



EMERGENCY DOWN VALVE

The Emergency Down Valve located at the front of the machine. The valve is a 24 Volt DC solenoid mounted on the base of the cylinder.

Pull to activate

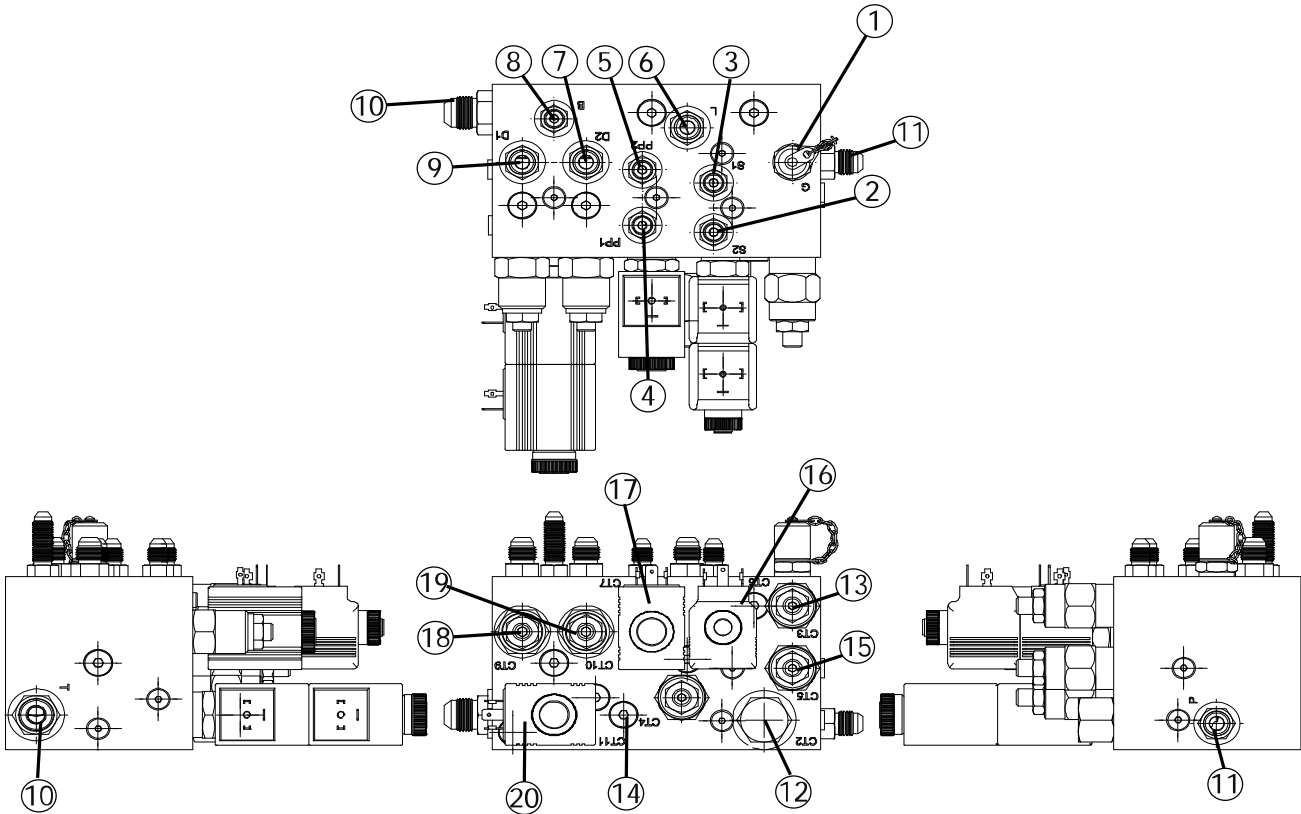


MAIN HYDRAULIC MANIFOLD

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

Hydraulic Manifold, Exploded View

Item	Part	Description	QTY.
1	510652-000	1/4" SAE - TEST POINT	1
2	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
3	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
4	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
5	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
6	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
7	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
8	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC BULKHEAD	1
9	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
10	510655-000	FITTING, 1/2" SAE - 3/4"-16 UNF JIC MALE/MALE	1
11	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
12	502200-002	CT2 CARTRIDGE FLOW REG	1
13	502200-003	CT3 CARTRIDGE RELIEF	1
14	502200-004	CT4 CARTRIDGE RELIEF	1
15	502200-005	CT5 CARTRIDGE RELIEF	1
16	502200-006	CT6 CARTRIDGE SOLENOID	1
17	501526-000	CT7 CARTRIDGE SOLENOID	1
18	502200-007	CT9 CARTRIDGE OVERCENTRE	1
19	502200-007	CT10 CARTRIDGE OVERCENTRE	1
20	501526-000	CT11 CARTRIDGE SOLENOID	1



SETTING HYDRAULIC MANIFOLD PRESSURES

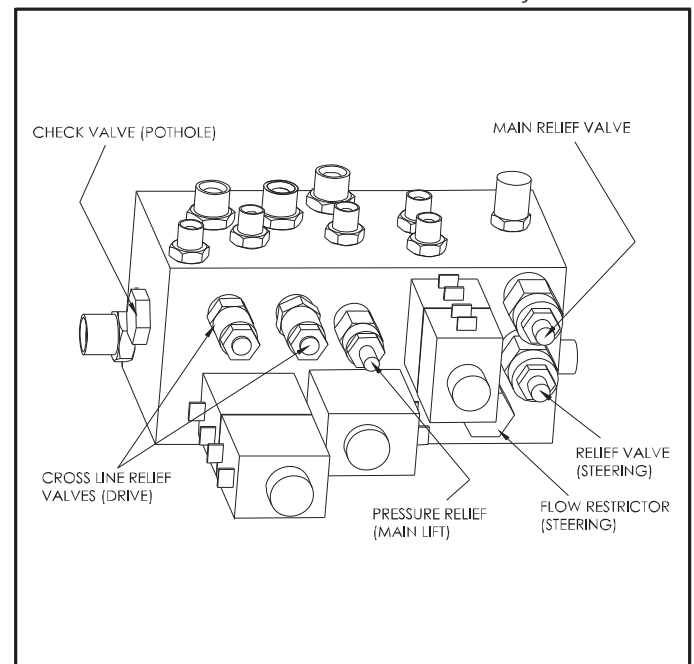
⚠ WARNING ⚠

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

LIFT RELIEF VALVE

1. Operate the hydraulic system 10 to 15 minutes to warm the oil.
2. Remove the cap or loosen the locknut on the Lift Relief Valve.
3. Install a 0-207 bar (0-3000 psi) pressure gauge to the gauge port.
4. Turn the Chassis Keyswitch to CHASSIS and elevate the machine fully.
5. While holding the Chassis Lift Switch to the UP position, adjust the Lift Relief Valve CT4 until the pressure gauge reads 115 bar (1690 psi).
6. Release the Chassis Lift Switch.
7. Replace the cap, or tighten the locknut on the Lift Relief Valve, and torque to 8N-m (6 ft-lbs) and replace the Cap.
8. Lower the platform.

Hydraulic Manifold



COUNTERBALANCE VALVES

1. Operate the work platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.
2. Remove the gauge port cap and install the pressure gauge assembly.
3. Lift work platform and block front wheels off ground.
4. Loosen the locknuts on Counterbalance Valves.
5. With the machine fully powered up depress the **DRIVE** button on the upper control box, 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 25 bar (**362.5 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 25 bar (**362.5 psi**).
9. Check the settings by slowly moving the Control Lever **FORWARD**, then **REVERSE**, checking the gauge to ensure pressures are properly set. Re-adjust as needed.
10. Tighten locknuts on valves to 8N-m (**6 ft-lbs**). Remove blocks and lower work platform to ground.
11. Reconnect the red Control Cable wire to terminal #9.
12. Remove the gauge from the gauge port and re-install cap.
13. Check for proper operation of the drive system and brake.

STEERING RELIEF VALVES

1. Operate the work platform for 10-15 minutes to bring the hydraulic oil up to normal operating temperature.
 2. Install gauge in the gauge port.
 3. Loosen locknut or remove cover on the Steering Relief Valve and turn adjusting screw counter-clockwise 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 100 bar (**1450 psi**).
 5. Tighten locknut or replace Steering Relief Valve cover and torque to 8N-m (**6 ft-lbs**).
 6. Remove gauge and replace cap.
-

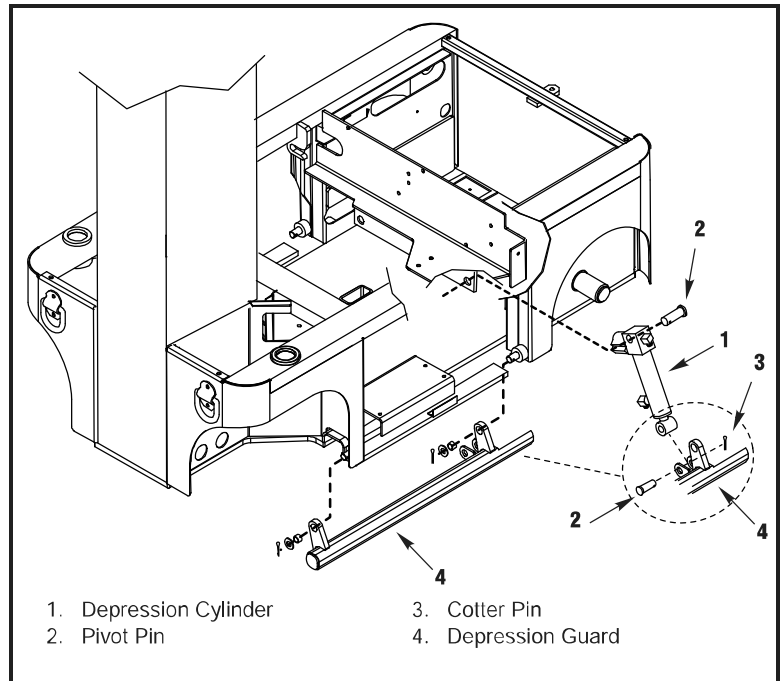
3-8 CYLINDERS

DEPRESSION CYLINDER

Depression Cylinder Remove & Replace

REMOVAL

1. Mark and disconnect the hose assemblies from the cylinder fittings and immediately cap the openings to prevent foreign material from entering.
2. Place a support under the depression guard.
3. Remove the cotter pins from the pivot pins.
4. Remove the pivot pins while supporting the cylinder.
5. Remove the cylinder.



REPAIR

Refer to Cylinder Repair in Section 1 - General Information.

INSTALLATION

Installation is reverse of removal.

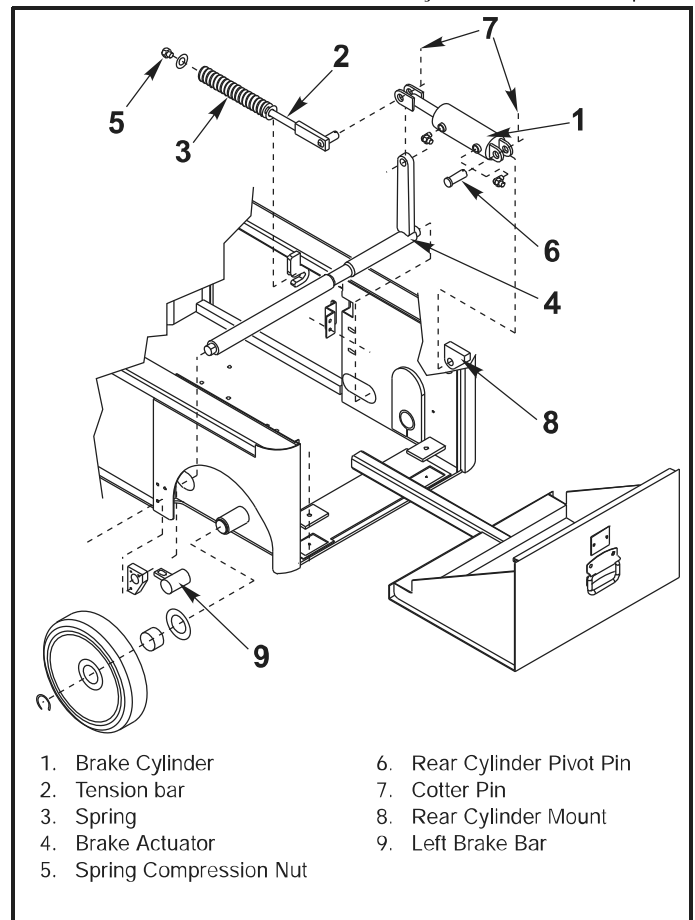
BRAKE CYLINDER

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

Brake Cylinder, Remove & Replace

REMOVAL

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



REPAIR

Refer to Cylinder Repair in Section 1 - General Information.

INSTALLATION

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

STEERING CYLINDER

REMOVAL

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

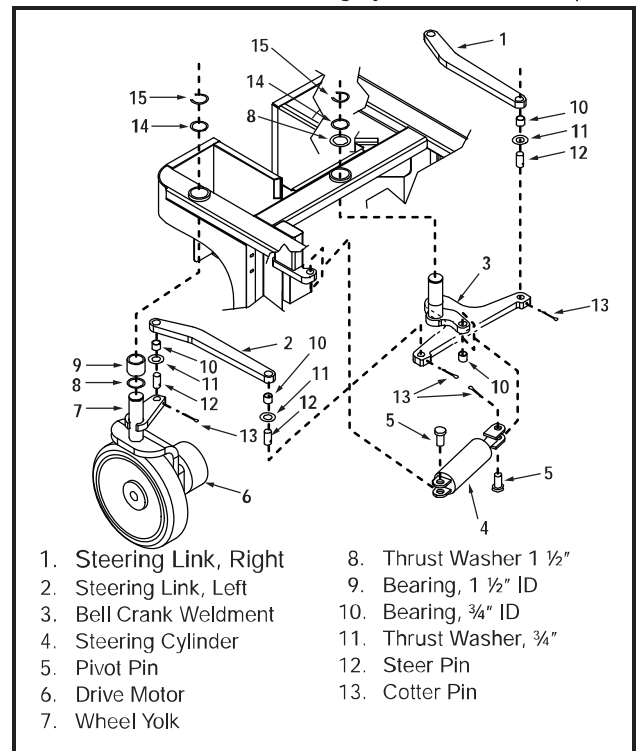
REPAIR

Refer to Cylinder Repair in Section 1 - General Information.

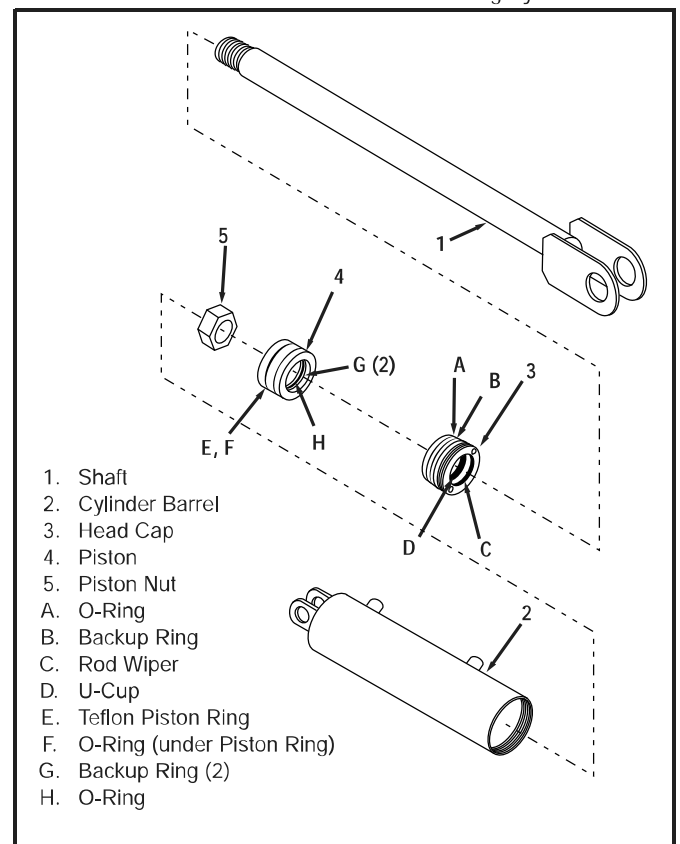
INSTALLATION

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

Steering Cylinder Remove & Replace



Brake and Steering Cylinder Seal Kit



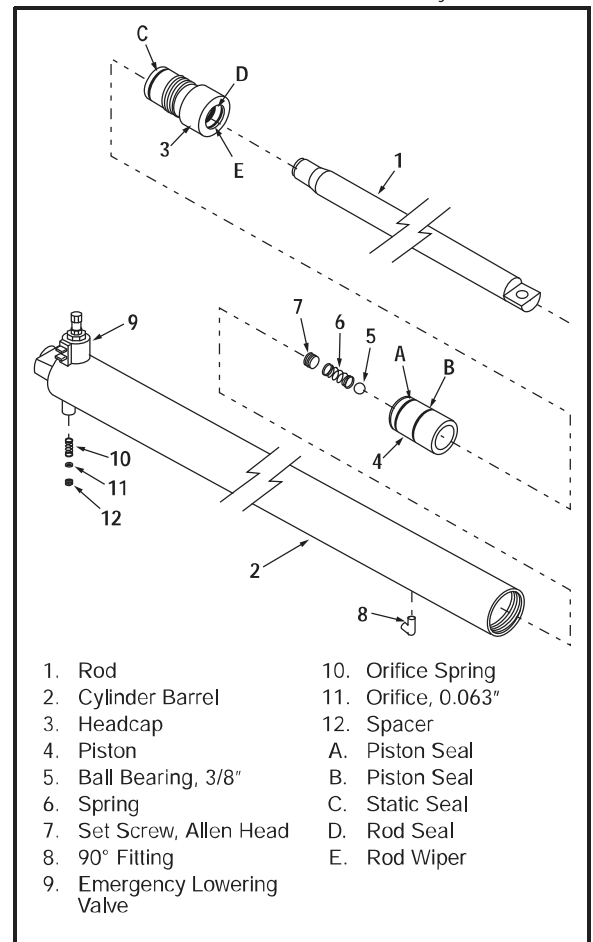
LIFT CYLINDER

REMOVAL

Refer to Figure 3-16: "Elevating Assembly," on page Section 3-20 for details.

Lift Cylinder Seal Kit

1. Fully lower platform.
2. Provide a suitable container to catch the hydraulic fluid, then disconnect the hydraulic hose. Immediately plug hoses to prevent foreign material from entering.
3. Remove the adapter from the base of the cylinder, inside the chassis.
4. Remove the Emergency Lowering Valve Knob from the valve at the base of the cylinder, then remove the Emergency Lowering Valve out the access hole in the bottom of the chassis.
5. Remove the snap ring at the bottom of the cylinder under the chassis.
6. Detach the 6.35mm (0.25 in.) vent line tubing from the top of the hydraulic tank, and cut any plastic ties that secure the tubing. Plug the end of the tubing to prevent contamination.
7. Remove the platform mast cover.
8. Remove the capscrew and locknut securing the cylinder rod to the upper cylinder mount.
9. Attach a suitable hoisting device and sling to the cylinder. Carefully lift the cylinder approximately 0.5 m (18 in.) until you can see the vent line tubing attached near the top of the cylinder barrel. Detach the tubing by depressing the green ring on the fitting at the same time you pull firmly on the tube. Plug the end of the tube and the fitting to prevent contamination.



10. Raise the cylinder the rest of the way through the top of the mast.

REPAIR

Refer to Cylinder Repair in Section 1 - General Information.

INSTALLATION

1. Attach a suitable hoisting device and sling to the cylinder. Carefully lower the cylinder through the top of the mast until you can reattach the vent line tubing. Simply push the tubing into the fitting until it goes no further. Pull firmly to ensure that it is installed correctly.
2. Lower the cylinder the rest of the way, and secure the cylinder to the chassis with the snap ring.
3. Install capscrew, washers and locknut securing cylinder rod to the upper cylinder mount.
4. Install platform mast cover.
5. Install the Emergency Lowering Valve, Knob and adapter to the base of the lift cylinder.
6. Remove the plug from the hydraulic hose and attach it to the adapter.
7. Attach the vent line to the hydraulic tank.
8. Test with weight at rated Platform load to check system operation. Check for leaks

3-9 DRIVE MOTORS

REMOVAL

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

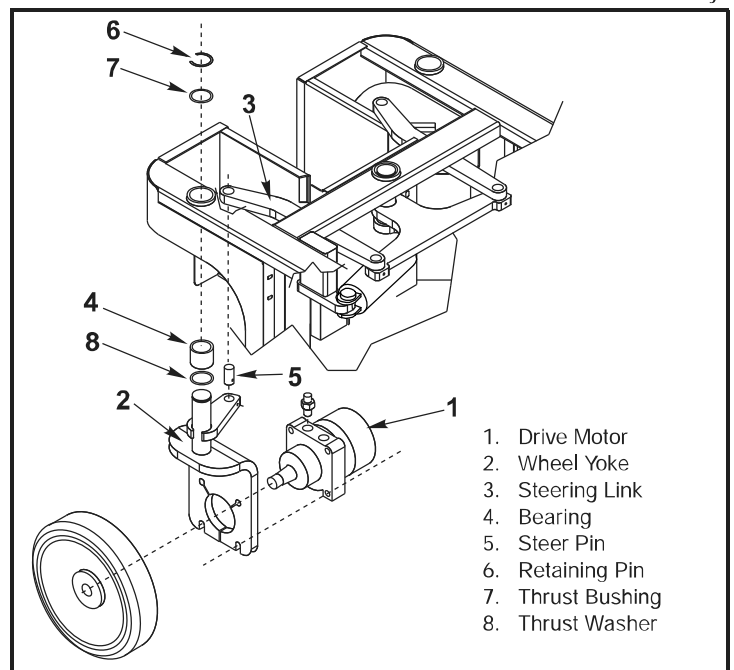
NOTE: Before disconnecting hoses, thoroughly clean off all outside dirt around fittings. (After disconnecting hoses and before removing from vehicle, IMMEDIATELY plug port holes.)

5. Tag, disconnect and plug the hose assemblies to prevent foreign material from entering.
6. Support the drive motor/wheel yoke assembly and remove the retaining ring at the top of the wheel yoke pivot. Remove the drive motor/wheel assembly from the machine.
7. Remove the locknuts, flat washers, capscrews and drive motor from the wheel yoke.

INSTALLATION

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

Drive Motor Assembly



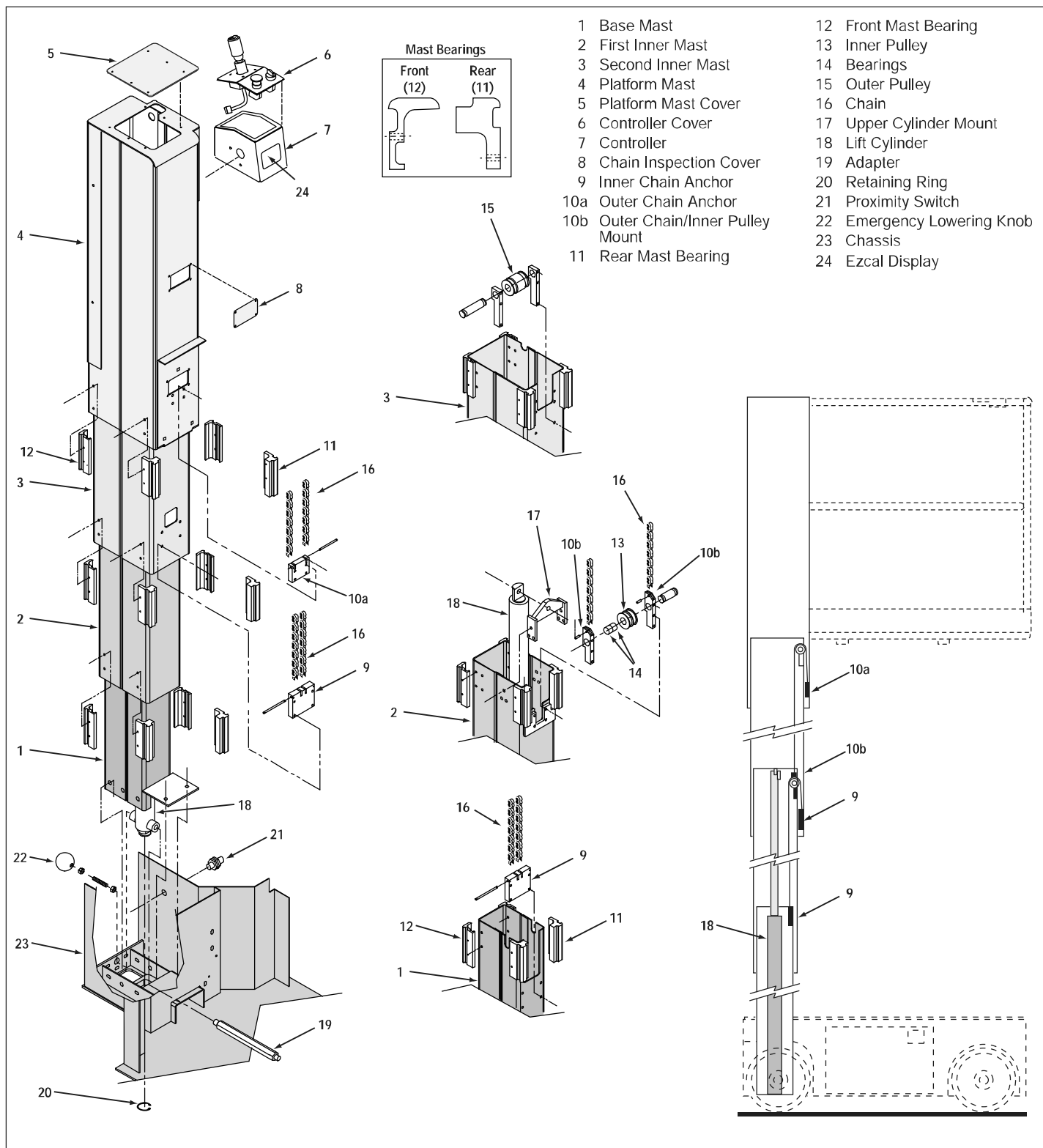
3-10 ELEVATING ASSEMBLY

Maintenance of the elevating assembly consists of four separate tasks and maintenance intervals:

- Chain Lubrication 6 months
- Elevating Assembly Wear Inspection 6 months
- Chain Tension Inspection 1 year
- Chain Elongation Inspection 5 years

All of the tasks except the Elongation Inspection can be done without removing the chains from the assembly.

Elevating Assembly



LIFT CHAIN LUBRICATION

Refer to Figure 0-16: "Elevating Assembly," on page Section 3-20.

With platform in the stowed position;

- remove the (5).
- apply enough aerosol chain lubricant to the exposed portion of all four chains to allow the lubricant to run down the chains.
- replace the cover.
- remove the chain inspection cover (8).
- raise platform approximately 10cm (4 in.), until the inner set of chains are visible through the chain inspection hole.
- apply enough aerosol chain lubricant to the exposed chain to allow the lubricant to run down the chain.
- replace chain inspection cover.

ELEVATING ASSEMBLY WEAR INSPECTION

Refer to Figure 0-16: "Elevating Assembly," on page Section 3-20.

At the same time as the chain lubrication task, inspect all elevating assembly components for wear.

With the platform in the stowed position;

- inspect the system through the (5) to look for worn (13 & 15) or damaged components.
- Inspect the (10a & 10b) and visible portions of lift chain as you lubricate it.
- Look for cracks in the chain links, kinks in any portion of chain, and excessive corrosion.

From the lower controls, raise the platform and block the elevating assembly (see Figure 0-1: "Supporting Elevating Assembly," on page Section 3-3).

- Inspect the (9) and the ends of the chains for damage or worn parts. If damage is present, replace the components.

IMPORTANT: There are two pairs of two chains each, for a total of four chains. If only one chain of either pair is damaged, both chains in the pair must be replaced.

CHAIN TENSION INSPECTION

Refer to Figure 0-16: "Elevating Assembly," on page Section 3-20.

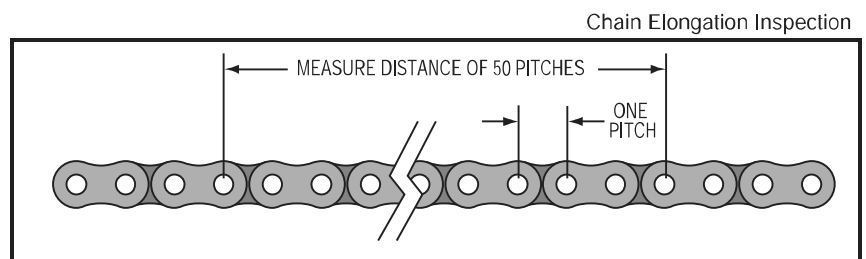
The lifting chains are self-adjusting and should always be close to the same tension. This tension should be checked annually to ensure that there are no problems with this system. To do this task a spring scale will be needed with 20kg (44 lb.) capacity.

1. Place 227kg (500 lbs.) in the platform including the weight of the person testing the chain tension.
2. Remove the _____ (8) and raise the platform approximately 10cm (4 in.) until the outer inspection hole lines up with the inner inspection hole.
3. Attach the spring scale to one of the outer chains and pull until the chain makes contact with the inner surface of the mast section. Note the scale reading.
4. Repeat step 3 on the other outer chain.
5. Compare the scale readings. The readings for each chain in the outer set should be within 20% of each other.
6. Repeat steps 3 - 5 for the inner set of chains. The readings for each chain in the inner set should be within 20% of each other.

IMPORTANT: If the readings are not within 20%, then a problem exists that is causing unequal chain tension. Investigate the problem and repair or replace the worn components.

CHAIN ELONGATION INSPECTION

At five-year intervals, the chains should be removed from the mast and the entire length of the chain inspected for excessive wear and elongation. Follow the procedure below to disassemble the elevating assembly. With the lift chains removed, hang them vertically from something capable of holding 100kg (220 lbs.). Inspect the chains thoroughly, looking for cracks in the chain links, kinks in any portion of chain, and excessive corrosion. Complete the following elongation test:



1. Attach approximately 25kg (55 lbs.) to the lower end of each chain.
2. Measure the distance between 50 pins. This distance should be 63.5cm - 65.5cm (25 in. - 25¾ in.).
3. Remove the weight and measure the same on the other three chains.

If the chains have elongated beyond the indicated range, replace the lift chain sets. Before reinstalling the lift chains, take this opportunity to thoroughly clean and lubricate the entire chain. Reassemble the elevating assembly as described below.

REMOVAL OF ELEVATING ASSEMBLY

Refer to Figure 0-16: "Elevating Assembly," on page Section 3-20.

1. Disconnect the batteries using the battery disconnect in front of the batteries in the battery tray.
2. Remove the (5), and the (6).
3. Detach the control cable inside the (7), remove the cable clamp in the top of the (4), and feed the cable into the section (3).
4. Using a suitable hoisting device, carefully raise the (4) until you can access the (10a).
5. Disconnect the from the , but leave the anchor attached to the chains.
6. Remove the lower mast bearings from the . The front two mast bearings may be removed by drilling out the lower pop rivets that retain the bearings.
7. Raise the straight up and off of the remaining mast sections.
8. Lay the chain that was detached from the over the top of the (17), and place it down inside the section.
9. Repeat steps 4 - 7 on the section (3). The lower mast bearings are removed by unscrewing the two screws on each bearing.
10. The upper chain set may now be removed by detaching the from the section (2). Carefully set the chain set aside on a clean surface.
11. Remove the single bolt that attaches the to the (17).
12. Using a suitable hoisting device, carefully raise the section (2) up several inches.
13. Lay the remaining chain set over the top of the , and place it down inside the inner mast section.
14. Remove the lower mast bearings from the section.
15. Raise the section straight up and off of the remaining section.
16. The inner chain set may now be removed.
17. If it is necessary to remove the section, remove the nine bolts that secure it to the . It may be required to remove the to provide easier access to the bolts (see "Lift Cylinder" on page Section 3-18).

INSTALLATION OF ELEVATING ASSEMBLY

Refer to Figure 0-16: "Elevating Assembly," on page Section 3-20.

Installation of the elevating assembly is the reverse of removal.

- Torque the nine bolts that retain the section to 68N-m (**50 ft-lbs**).
 - For all of the cap screws that attach the chain anchors to the mast sections, apply Loctite #242 to the screw threads and torque to 12N-m (**107 in-lbs**).
 - For all of the screws that attach the mast bearings, apply Loctite Retainer #405 to the screw threads.
 - Check elevating assembly for proper operation.
-

3.11 TILT Sensor

TILT SENSOR SWITCH

The tilt sensor is incorporated in the EZ230 Control Module, the switch is activated if machine is tilted by greater than 2 ° in either direction and the Mast Proximity switch is open, this results in a continuous audible alarm and all movement disabled. The only way to clear this alarm is to return the machine below 2 ° or bring the Mast down to close the Switch.

The settings of this limit is preset at the factory and should on no account be adjusted.

SETTING THE TILT SENSOR TO ZERO

⚠ WARNING ⚠

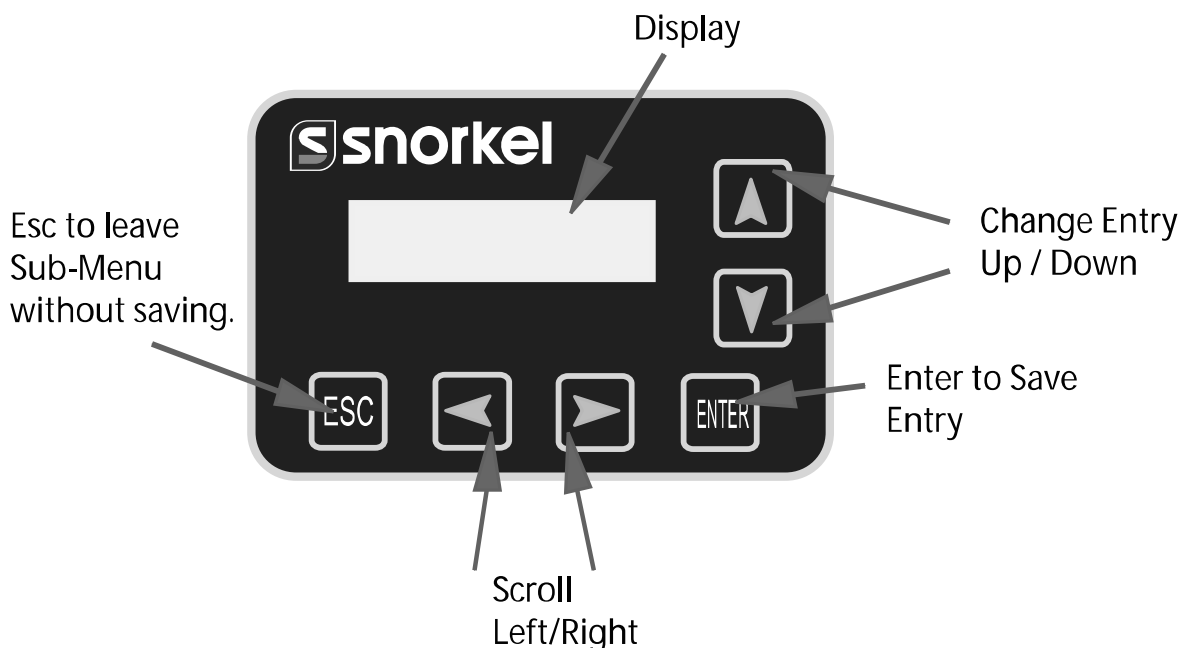
If the EZ230 control module is replaced and/of moved within the machine for any reason the tilt sensor must be reset for zero° using the following procedure. Failure to do so could result in serious injury or death.

To follow this procedure you need to switch the Ezcal display in the Upper Control Box into "Calibration mode".

1. Place the machine on a firm level surface , $\leq 0.25^\circ$
2. Use a Gauge to confirm that the front and rear of the chassis are level to within $\pm 0.25^\circ$ in both directions
3. Switch the machine on, press and hold Esc for 5 seconds until "Ezlift Menu" Appears.
4. Scroll to access level.(Enter)
5. Enter code 2222 for access level 2 .(Enter)
6. Scroll to setups.(Enter)
7. Scroll to tilt setups . (Enter)
8. Calibrate level. (Enter)
9. Enter for yes.

To confirm calibration has worked switch the machine of then back on again.

10. Scroll to Diagnostics. (Enter)
11. System. (Enter)
12. Scroll to tilt, both readings should be below 0.2° if not repeat from 3.

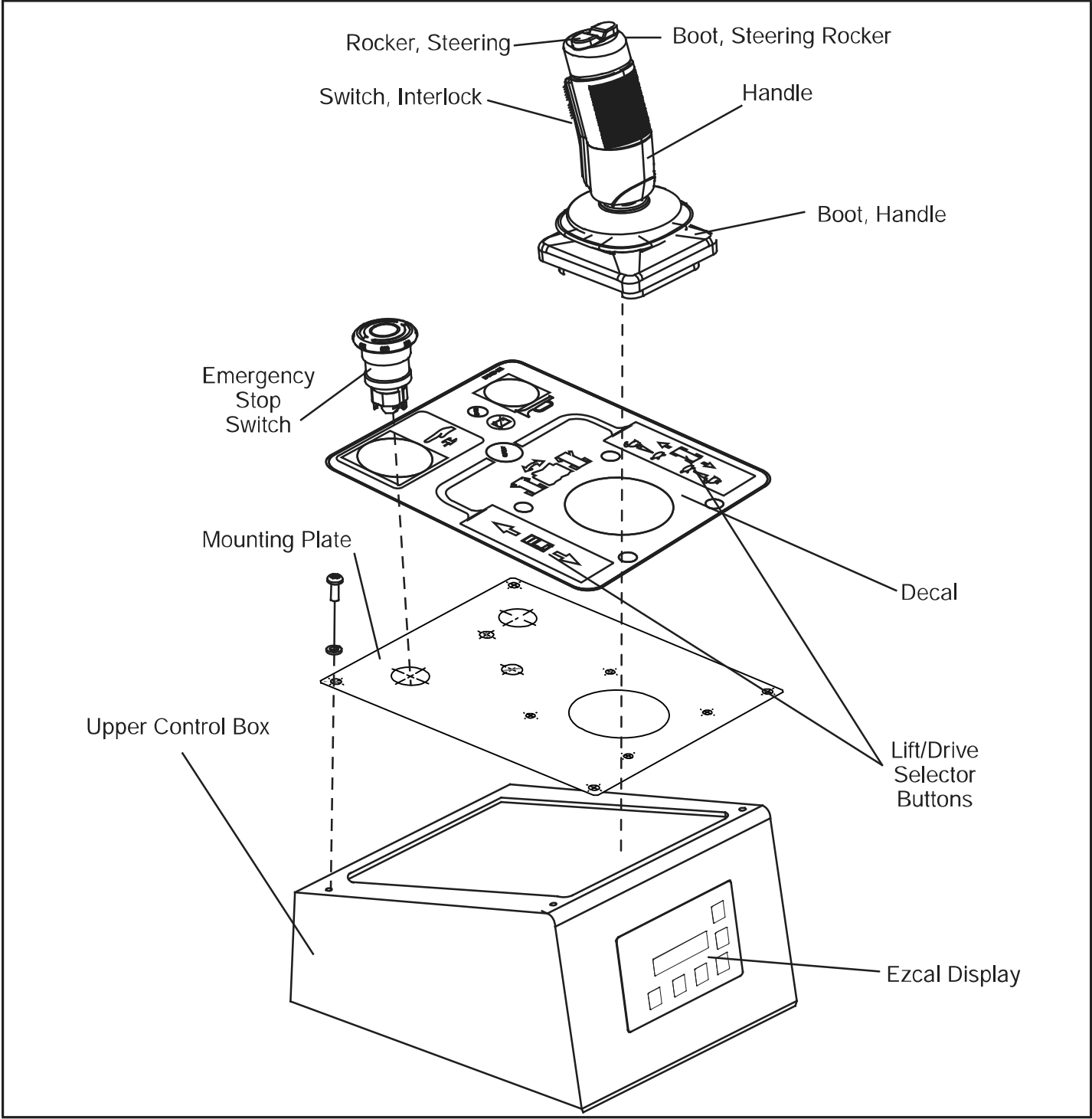


3-12 CONTROLS

PLATFORM CONTROLS

The Proportional Controller can be disassembled to replace defective switches. See the Parts Manual for replacement part numbers.

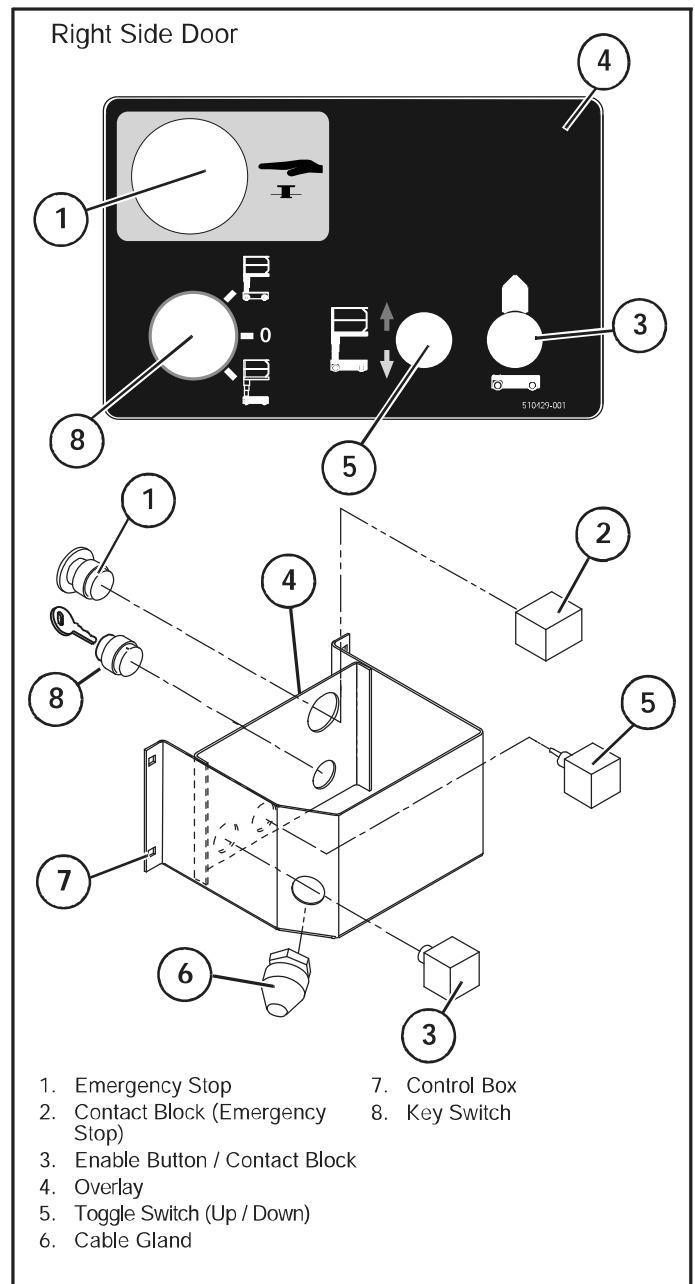
Upper Controls



CHASSIS CONTROLS

The chassis control assembly is mounted on the inside of the chassis door, to the left of the Hydraulic tank.

Chassis Controls



TROUBLESHOOTING

4.1 INTRODUCTION

The following section on troubleshooting provides guidelines on the types of problems users may encounter in the field, helps determine the cause of problems, and suggests proper corrective action.

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 number for service assistance.

Referring to Section 2.0 and 5.0 will aid in understanding the operation and function of the various components and systems and help in diagnosing and repair of the machine.

GENERAL PROCEDURE

Thoroughly study hydraulic and electronic schematics in **Section 5**. Check for loose connections and short circuits. Check/repair/replace each component in the Truth Table that is listed under each machine function that does not operate properly.

Use the charts on the following pages to help determine the cause of a fault.

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

WARNING



4.2 TROUBLESHOOTING

1. Verify your problem.
 - Do a full function test from both the platform 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.
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 any 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 to specified values.

SPECIAL TOOLS

Following is a list of tools which may be required to perform certain maintenance procedures on the M1230E work platforms.

- Flow Meter with Pressure Gauge (P/N 067040-000)
- 0-69 bar (0-1000 psi) Hydraulic Pressure Gauge with Adapter Fittings (P/N 014124-010)
- 0-207 bar (0-3000 psi) Hydraulic Pressure Gauge with Adapter Fittings (P/N 014124-030)
- Adapter Fitting (P/N 063965-002)
- Inclinator (P/N 010119-000)
- Crimping Tool (P/N 028800-009)
- Terminal Removal Tool (P/N 028800-006)

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.

Correct pressure settings are listed in the hydraulic schematic.

CHECKING PUMP PRESSURES

Remove hose from pump port and connect pressure gauge.

DIAGNOSTICS USING EZCAL DISPLAY

The EZcal Display can be switched into calibration mode to become an invaluable tool when troubleshooting on this machine.

Switch the machine on, press and hold Esc for 5 seconds until "Ezlift menu" is displayed then select diagnostics, the following menu's are available:

1. SYSTEM – MODE : Platform or Ground Controls selected.
 SUPPLY : Displays battery voltage, should be above 18v
 when the machine is not running.
 VALVE SUPPLY : ON or OFF
 MOTOR V : Supply voltage to motor (0v when motor
 not running.
 MOTOR I : Supply current to motor (0A when motor
 not running
 TEMPERATURE: Control temperature in °c, should be
 below 60.
 TILT : Displays tilt angle of the machine in X and Y
 direction, both should be below 2°.
 TILTED : YES or NO

The remaining submenu's in SYSTEM are not applicable to this machine.

2. PLATFORM - Checks the function of the switches and joystick
 functions in the platform controller.
3. GROUND - Checks the function of the switches
 in the ground controller.
4. INPUTS - Displays the condition of all inputs to the EZ230, see the
 following table and the circuit diagram on page 5.2 for a list of I/O's.
5. ANALOG - Displays the condition of all analog inputs from the EZ230.
6. OUTPUTS - Displays the condition of all outputs from the EZ230.

I/O PORT	DESCRIPTION
P1-1	5V to Joystick (low current)
P1-3	0V to Joystick (low current)
P1-4	Joystick analog input
P2-7	B+ feed (low current, for switches and sensors only)
P2-8	Lift down valve return (0V=active) CT13
P3-1	EMS Platform (B+ during platform mode)
P3-2	Valve supply (high current B+ during platform mode, supplies all valve outputs) P3-1 P3-2 are connected together
P3-6	Drive select switch (B+=active)
P3-7	Lift select switch (B+=active)
P3-8	Steer right switch (B+=active)
P3-9	Steer left switch (B+=active)
P3-12	Trigger switch (B+=active)
P4-1	EMS Ground (B+ during ground mode)
P4-4	Lift down switch (B+=active in ground mode only)
P4-5	Lift up switch (B+=active in ground mode only)
P4-6	Stack Proximity Switch (B+=lowered, open=elevated)
P4-7	Not used - Connect to P2-7
P5-1	Line contactor output (B+ when active)
P5-2	Forward valve output (B+ when active) CT11A
P5-3	Reverse valve output (B+ when active) CT11B
P5-4	Pothole Retract valve output (B+ when active) CT12
P5-6	Steer left valve output (B+ when active) CT6A
P5-8	Steer right valve output (B+ when active) CT6B
P5-10	Ground Alarm output (B+ when active)
P5-11	Up valve output (B+ when active) CT7
P5-12	Down valve output (B+ when active) CT13

REPLACING THE EZ230 CONTROL MODULE

If for any reason you have to replace the EZ230 control module it is important that you complete the following procedures:

! WARNING !

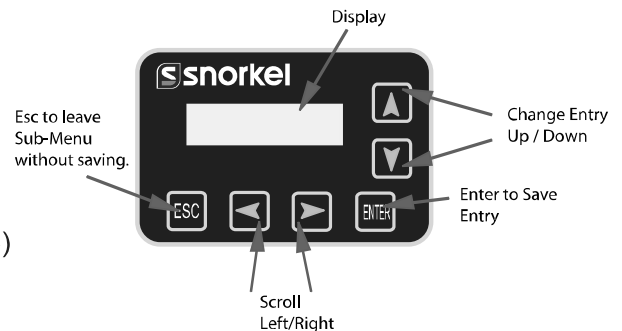
If the EZ230 control module is replaced and/or moved within the machine for any reason the tilt sensor must be reset for zero ° using the following procedure.
Failure to do so could result in serious injury or death.

To follow this procedure you need to switch the Ezcal display in the upper Control box into “calibration mode”.

1. Place the machine on a firm level surface , $\leq 0.25^\circ$
2. Use a Gauge to confirm that the front and rear of the chassis are level to within $\pm 0.25^\circ$ in both directions
3. Switch the machine on and press and hold Esc for 5 Seconds until “Ezlift Menu” is displayed.
4. Scroll to access level.(Enter)
5. Enter code 2222 for access level 2 .(Enter)
6. Scroll to setups.(Enter)
7. Change defaults. (Enter)
8. Select 1= Scissor. (Enter)
9. Scroll to model. (Enter)
10. Select 1 = M1230E (Enter followed by ESC)
11. Scroll to tilt setups . (Enter)
12. Calibrate level. (Enter)
13. Enter for yes.

To confirm calibration has worked switch the machine off then back on again.

14. Scroll to Diagnostics. (Enter)
15. System. (Enter)
16. Scroll to tilt, both readings should be below 0.2° if not repeat from 5.



4.3 TROUBLESHOOTING TABLES

The next step is to refer to the Troubleshooting charts in Tables.

Refer to Hydraulics Section for detailed Troubleshooting information on the Pump/Motor Controller.

Read and understand the Principles of Operation before commencing any troubleshooting.

! WARNING !

RISK of SERIOUS INJURY.

Ensure that the work platform is resting on a firm, level surface.

The elevating assembly must be supported by an overhead hoist when troubleshooting and servicing the electrical/hydraulic system.

4.3 TROUBLESHOOTING GUIDE

TROUBLE	PROBABLE CAUSE	Y D E M E R
All functions inoperable, electric motor does not start.	<ol style="list-style-type: none"> 1. Blown electric motor fuse 2. Faulty battery charger. 3. Faulty battery(ies). 4. Loose or broken battery lead. 5. Emergency Stop switch(es) failed open. 	<p>Check 160 amp electric motor fuse. Replace if blown.</p> <p>Check the voltage output of the battery charger. If less than 24 VDC,</p> <p>After completely charging batteries, test each battery. Replace as</p> <p>Check continuity of all battery and motor leads. Replace if necessary.</p> <p>With emergency stop switch in the ON position, check continuity</p>
All functions inoperable. Electric motor starts when control is actuated.	<ol style="list-style-type: none"> 1. Oil level in hydraulic reservoir is low. 2. Faulty hydraulic pump. 	<p>Check hydraulic fluid level, top off as required.</p> <p>Check pressure and delivery of the hydraulic pump. Replace if</p>
Platform will not elevate or elevates slowly.	<ol style="list-style-type: none"> 1. Emergency Lowering valve open. 2. Platform overloaded. 3. Faulty controller at upper controls. 4. Battery level low. 	<p>Close emergency down valve.</p> <p>Observe maximum load rating. (see Operation section of this manual)</p> <p>Check functionality of controller. Replace if faulty.</p> <p>Check Battery Voltage. Charge if necessary.</p>
Platform drifts down after being elevated	<ol style="list-style-type: none"> 1. Emergency lowering valve open. 2. Leaking piston seals in lift cylinders 	<p>Ensure that emergency lowering valve is completely closed. Replace</p> <p>Check for leakage at cylinder return line, replace seals if necessary.</p>

Electrical Troubleshooting Table

[illegible]

4-7 HYDRAULIC

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									X	X	
Steering Cylinder				X	X						
Lift Cylinder—CYL1	X										
Depression Mechanism Cylinder									X	X	
Brake Cylinder											X
Suction Strainer	X			X	X	X	X	X	X	X	
Return Filter	X			X	X	X	X	X	X	X	
Drive Motors (2)						X	X				
Pump	X			X	X	X	X	X	X	X	
Main Relief Valve	X					X	X	X	X	X	X
Steering Relief Valve				X	X						
Lift Relief Valve	X										
Tank											
Steering Right/Left Valve				X	X						
Lift Valve	X										
Down/Emergency Lowering Valve			X								
Forward/Reverse Valve						X	X				
Counterbalance Valve						X	X	X			X

Notes :

Section 5

SCHEMATICS

5.1 INTRODUCTION

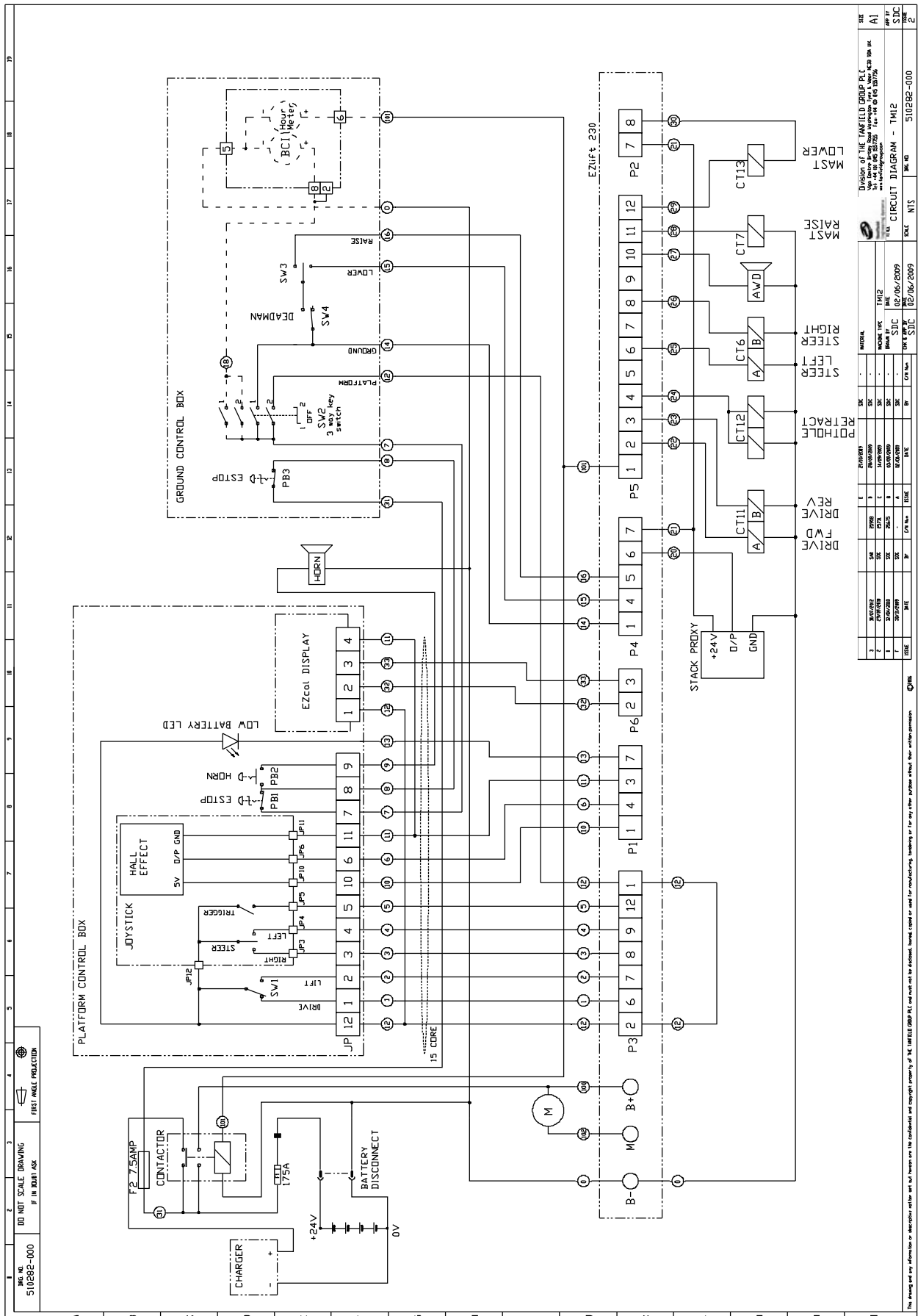
This section contains electrical and hydraulic power schematics and associated information for maintenance purposes.

The diagrams are to be used in conjunction with the information in They allow understanding of the makeup and functions of the systems for checking, tracing, and faultfinding during troubleshooting analysis.

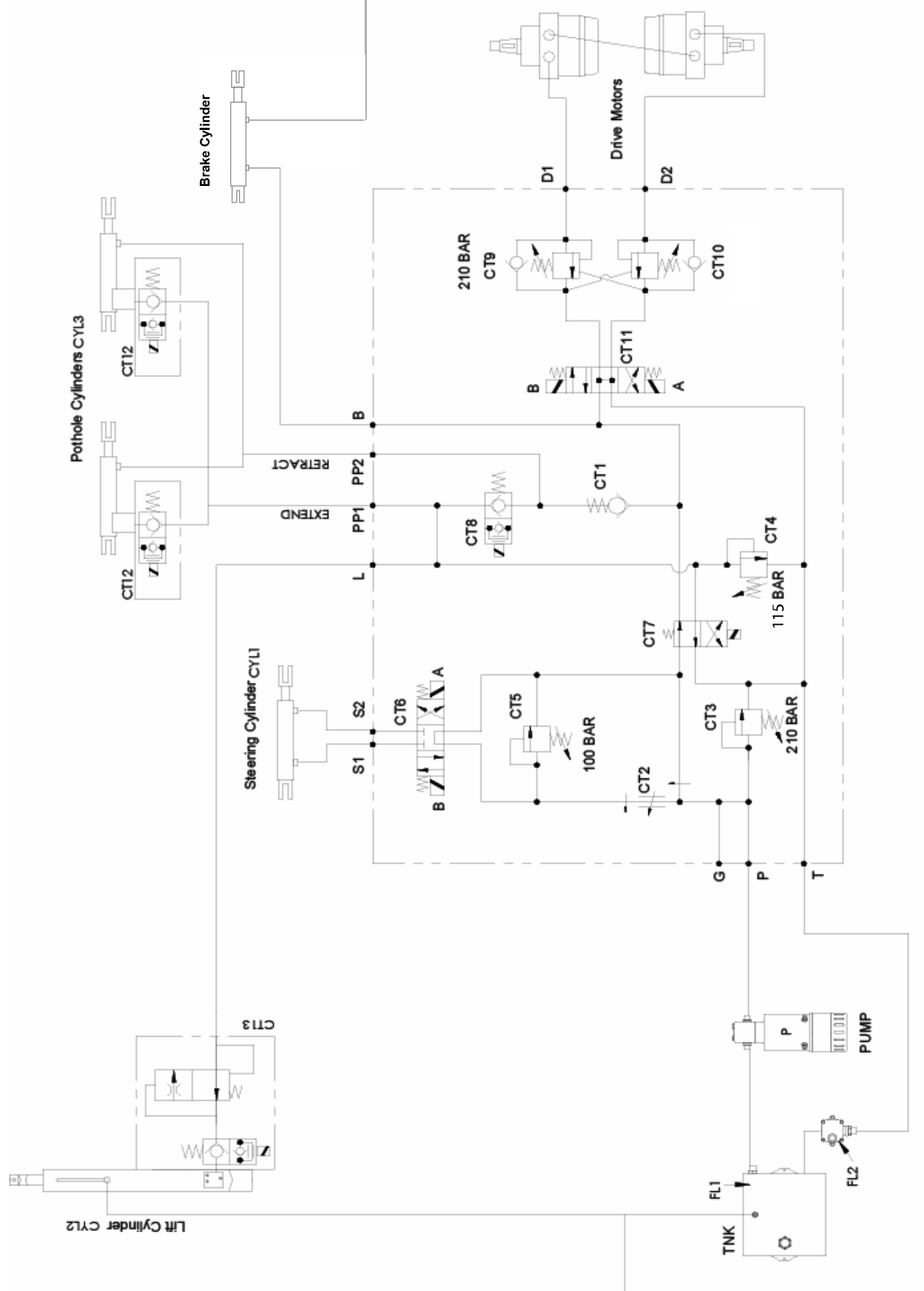
CONTENTS

Electrical Schematic	5-2
Hydraulic Schematic	5-4

5.2 ELECTRIC (Applicable to machines with Serial Range 000001+)



5.4 HYDRAULIC SCHEMATIC



ILLUSTRATED PARTS BREAKDOWN

6.1 INTRODUCTION

This section lists and illustrates the replaceable assemblies and parts of this product, as manufactured by Snorkel.

Each parts list contains the component parts for that assembly.

CONTENTS

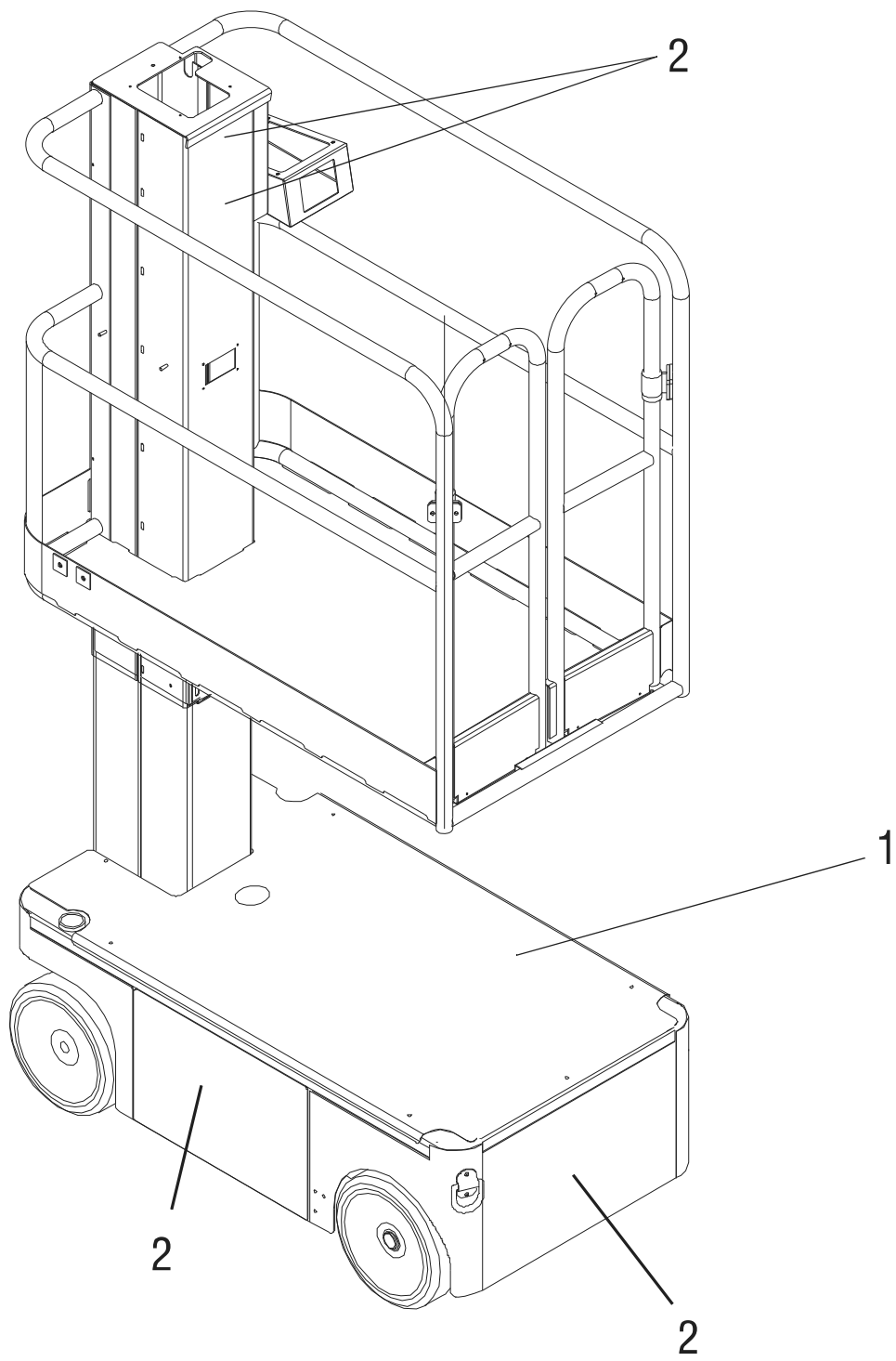
General Assembly.	6 - 2	Hydraulic Assembly.. . . .	6 - 18
Chassis Assembly.	6 - 4	Hydraulic Cylinder Assembly (Lift)	6 - 21
Mast Assembly.	6 - 8	Hydraulic Cylinder Assembly (Steer / Brake)..	6 - 22
Platform Assembly.	6 - 10	Hydraulic Cylinder Assembly (Pothole).	6 - 23
Control Valve Assembly.. . . .	6 - 12	Electrical Assembly	6 - 24
Lower Controls Assembly.. . . .	6 - 14	Decal Kit (English)..	6 - 26
Hydraulic Tank Assembly.. . . .	6 - 15	Decal Kit (German).	6 - 28
Upper Controls Assembly	6 - 16	Decal Kit (French).	6 - 30
		Decal Kit (USA).	6-32

NEVER Replace any components or part with anything other than original Snorkel replacement parts without the Manufacturers consent.

Illustrated Parts Breakdown

General Assembly
505000-000

Item	Part	Description	QTY.
1	505001-000	CHASSIS ASSEMBLY	1
2	535004-000	DECAL ASSEMBLY	1
3	505007-000	HYDRAULIC ASSEMBLY	1

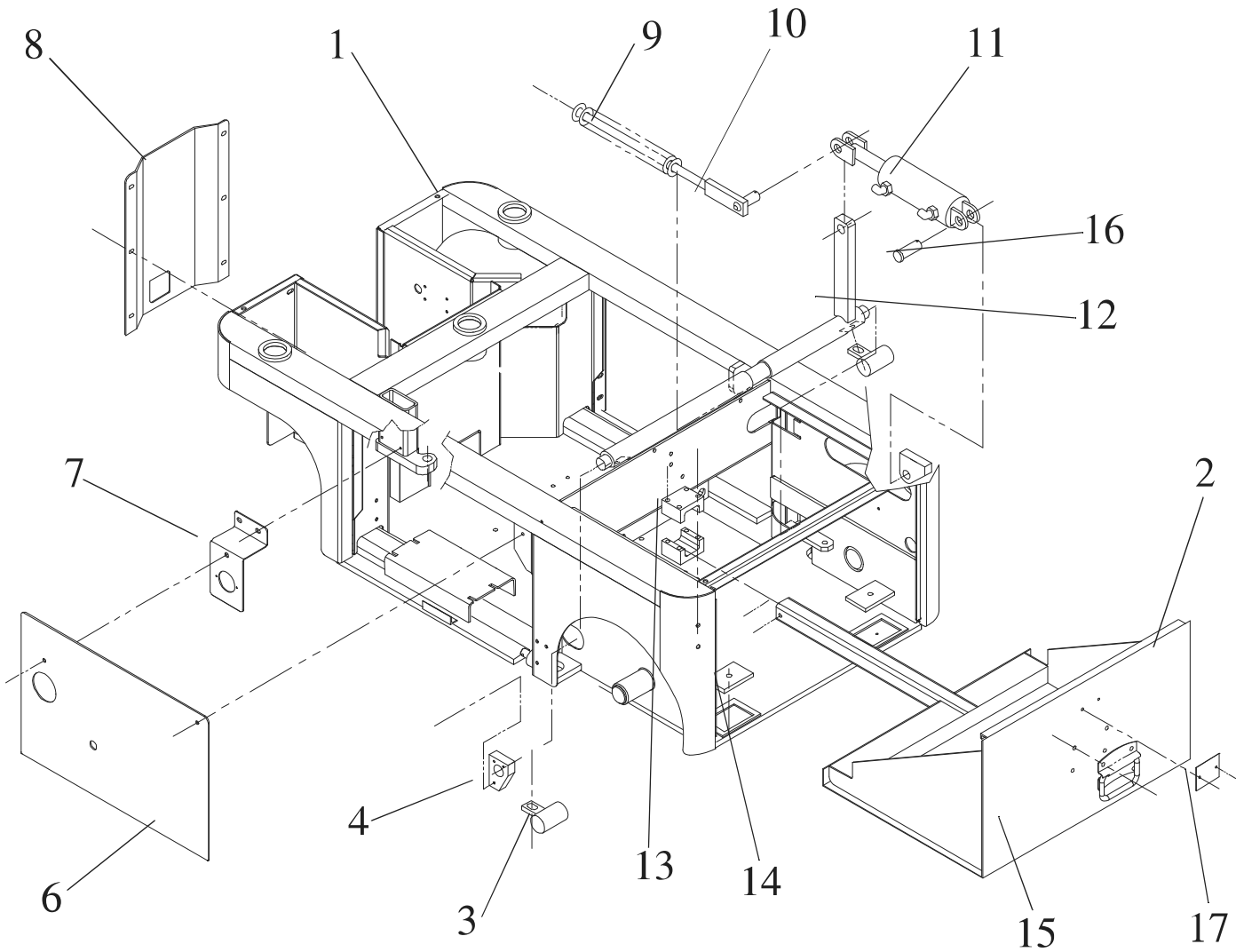


Chassis Assembly 1 of 4

505001-000

ITEM	PART NUMBER	DESCRIPTION	QTY
1	107404-000	CHASSIS WELDMENT M1230E	1
2	065465-000	BATTERY PAN WELDMENT	1
3	065472-000	SHOE PARK BRAKE	2
4	505031-001	BRAKE BEARING (RH) & (LH)	2
5	N/A	N/A	N/A
6	107131-002	CHASSIS ACCESS PANEL	1
7	505033-001	BRACKET, SIDE PANEL SUPPORT	1
8	065532-000	FRONT COVER	1
9	510931-000	SPRING COMPRESSION	1
10	065474-000	TENSION BAR WELDMENT	1

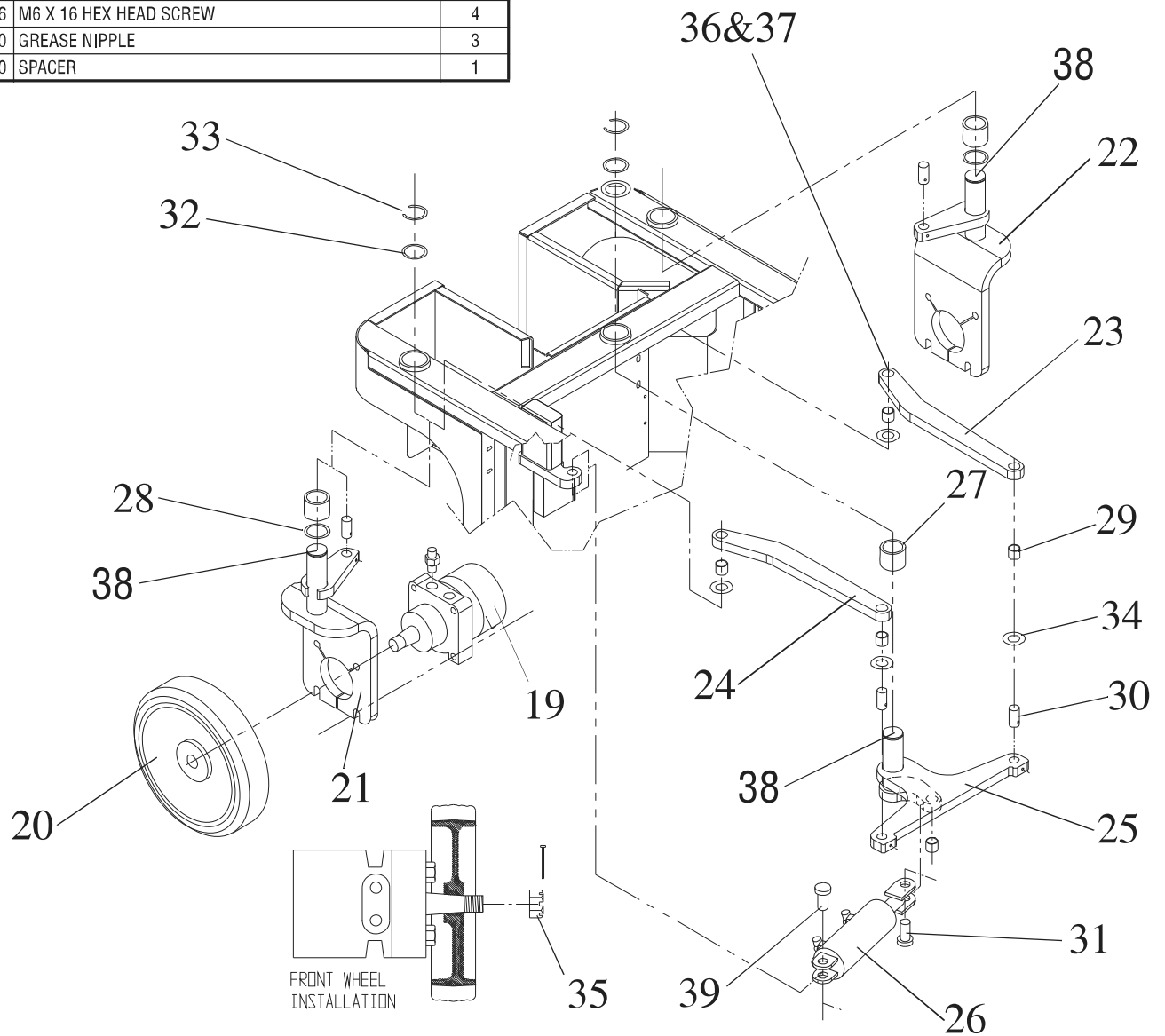
ITEM	PART NUMBER	DESCRIPTION	QTY
11	SEE PAGE 6-22	CYLINDER ASSY (BRAKE)	1
-	SEE PAGE 6-22	SEAL KIT, CYLINDER	
12	065469-000	BRAKE ACTUATOR WELDMENT	1
13	509413-000	GUIDE PAD	2
14	505030-000	SLIDE PAD	2
15	026541-016	HANDLE	1
16	011848-019	PIVOT PIN, BRAKE CYLINDER	1
17	065569-000	SPACER PLATE, BATTERY TRAY SECURING PIN	1
18	065536-000	MAIN CHASSIS COVER	1



Chassis Assembly 2 of 4

505001-000

ITEM	PART NUMBER	DESCRIPTION	QTY
19	101125-001	MOTOR HYDRAULIC	2
*	101125-010	SEAL KIT (MOTOR)	2
20	510815-000	WHEEL, DRIVE	2
21	107186-000	WHEEL YOKE, L.H.	1
22	107185-000	WHEEL YOKE, R.H.	1
23	065517-000	STEER LINK RH	1
24	065518-000	STEER LINK LH	1
25	065445-000	BELL CRANK WELDMT	1
26	SEE PAGE 6-22	CYLINDER ASSY, BRAKE/STEER	1
-	SEE PAGE 6-22	SEAL KIT, BRAKE/STEER CYLINDER	-
27	505043-000	BUSHING, BELL CRANK & STEER YOKE PIVOT	3
28	508108-000	BUSHING (FLAT), BELL CRANK & STEER YOKE PIVOT	3
29	503673-000	BUSHING, STEERING LINK ARMS & BELL CRANK WELD'M	5
30	505034-000	PIVOT PIN, STEERING LINK ARMS	4
31	011848-019	PIVOT PIN, STEERING CYLINDER	2
32	508108-000	BUSHING (FLAT), STEER YOKE PIVOT	2
33	505038-000	CIRCLIP	2
34	505045-000	SPACER (STEERING LINK)	4
35	061817-011	CASTLE NUT, (DRIVE WHEELS)	2
36	505116-000	WASHER (STEERING LINKARMS)	4
37	056058-016	M6 X 16 HEX HEAD SCREW	4
38	058819-000	GREASE NIPPLE	3
39	505075-000	SPACER	1

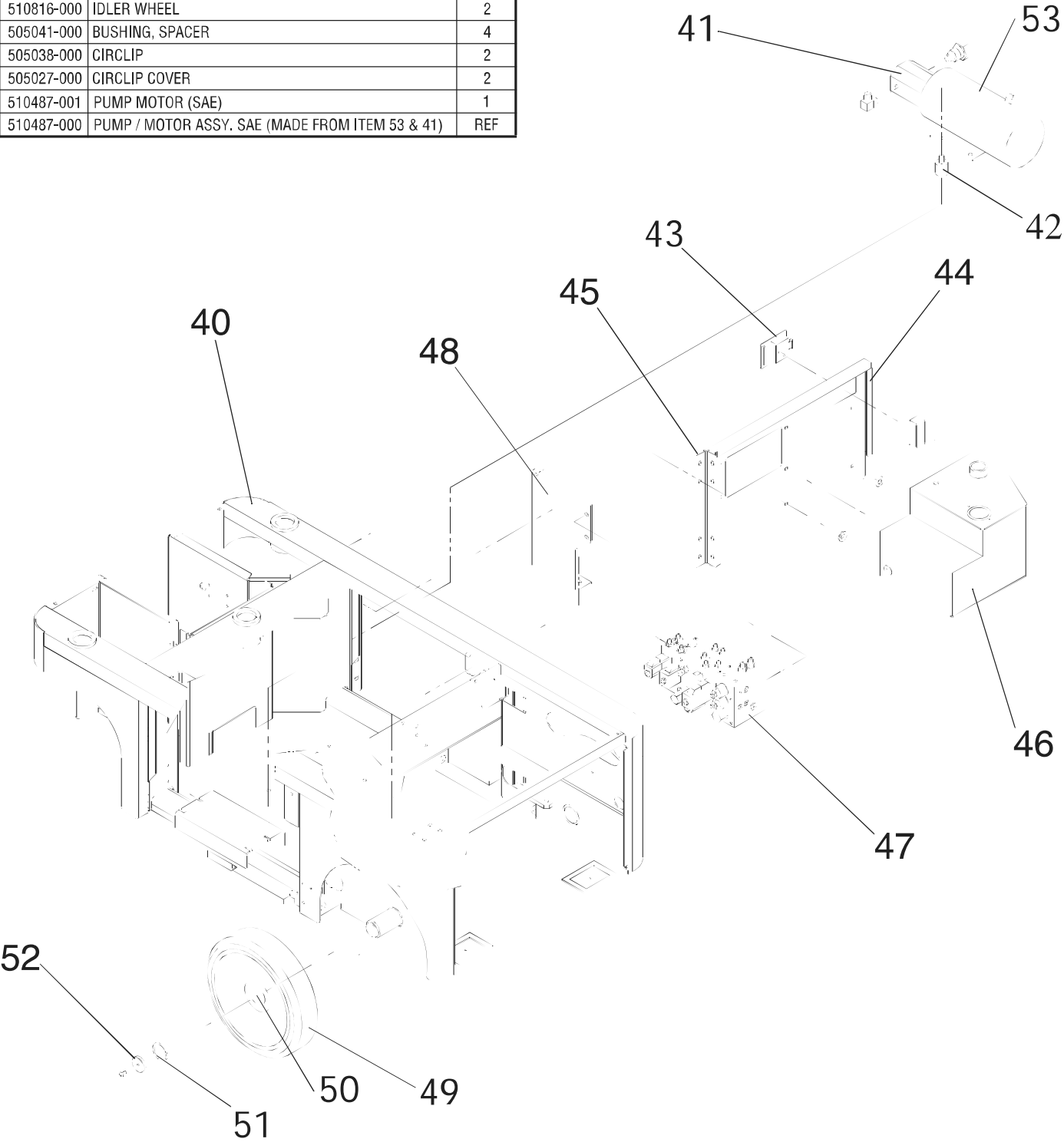


Illustrated Parts Breakdown

Chassis Assembly 3 of 4

505001-000

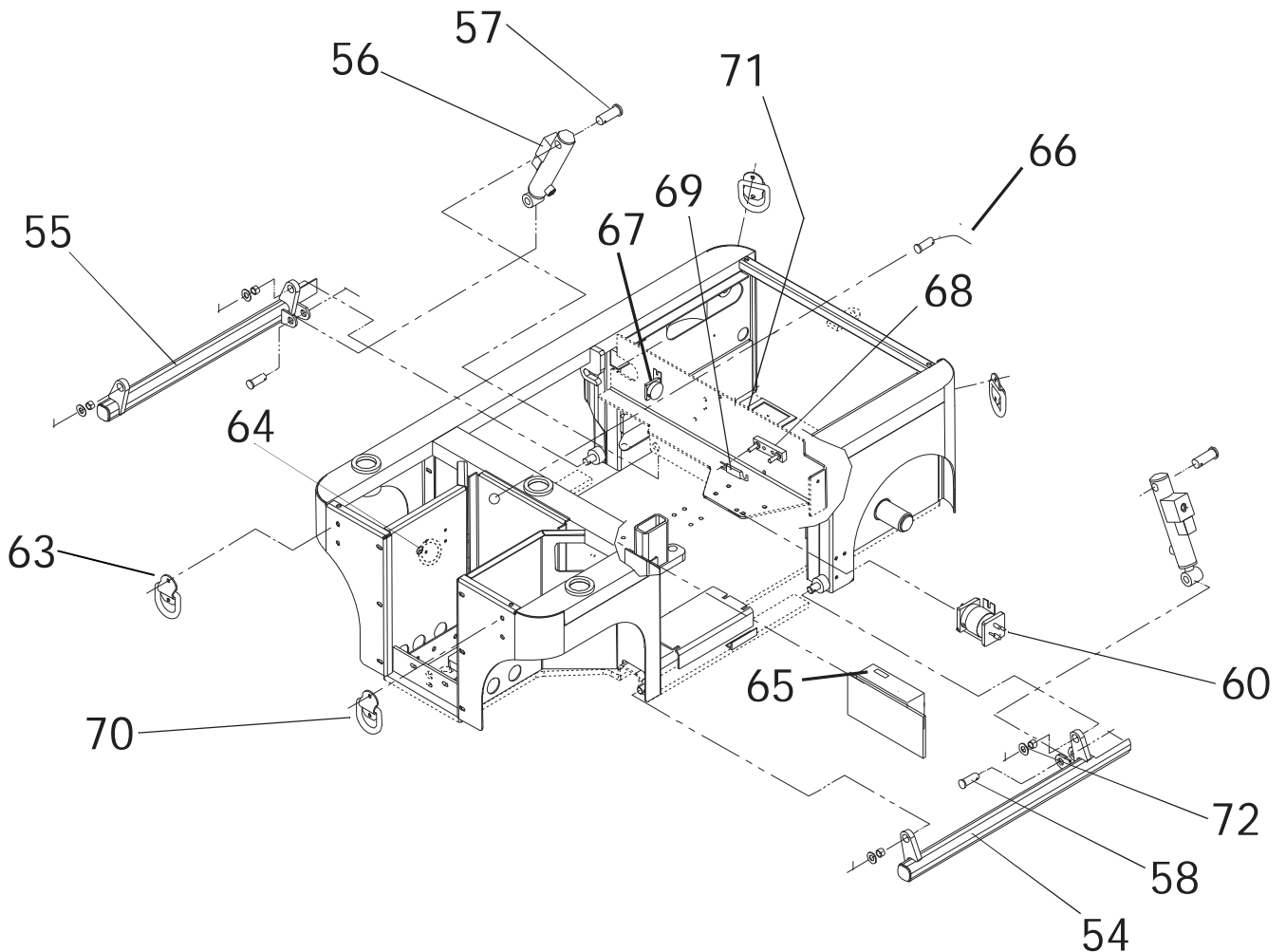
ITEM	PART NUMBER	DESCRIPTION	QTY
40	107404-000	CHASSIS WELDMENT	REF
41	504536-002	PUMP UNIT (SAE)	1
42	501814-000	VIBRATION MOUNT	4
43	505024-000	LATCH (HINGING DOOR)	1
44	107149-010	DOOR (HINGED)	1
45	505025-000	HINGE	1
46	See Pg 6-15	TANK, (HYDRAULIC RESERVOIR)	1
47	503800-002	HYDRAULIC MANIFOLD BLOCK	1
48	107152-000	MOUNTING PLATE, HYDRAULIC MANIFOLD	1
49	510816-000	IDLER WHEEL	2
50	505041-000	BUSHING, SPACER	4
51	505038-000	CIRCLIP	2
52	505027-000	CIRCLIP COVER	2
53	510487-001	PUMP MOTOR (SAE)	1
-	510487-000	PUMP / MOTOR ASSY. SAE (MADE FROM ITEM 53 & 41)	REF



Chassis Assembly 4 of 4

505001-000

ITEM	PART NUMBER	DESCRIPTION	QTY
54	107179-000	POTHOLE WELDMENT-L.H.	1
55	107180-000	POTHOLE WELDMENT-R.H.	1
56	SEE PAGE 6-23	HYDRAULIC CYLINDER, POTHOLE	2
-	SEE PAGE 6-23	SEAL KIT, POTHOLE CYLINDER	-
57	011848-019	PIVOT PIN, POTHOLE CYL - CHASSIS	2
58	011848-036	PIVOT PIN, POTHOLE CYL - POTHOLE WELDMENT	2
*	N/A	N/A	N/A
60	502489-000	LINE CONTACTOR	1
61	N/A	N/A	N/A
*	N/A	N/A	N/A
63	107080-000	M1230E TIE DOWN BRACKET	4
64	501868-000	HORN	1
65	3087800	EZ230 CONTROL MODULE	1
66	505072-000	STACK PROXIMITY SWITCH	1
67	502588-000	ALARM SOUNDER / BUZZER	1
68	501877-000	MOUNTING POST, FUSE	2
69	502494-000	FUSE	1
70	107080-001	TIE DOWN RING (D-RING)	4
71	505091-000	BRACKET, POTHOLE TEE-PIECE MOUNT	1
72	505044-000	BUSHING, POTHOLE WELDMENT - CHASSIS	4



Illustrated Parts Breakdown

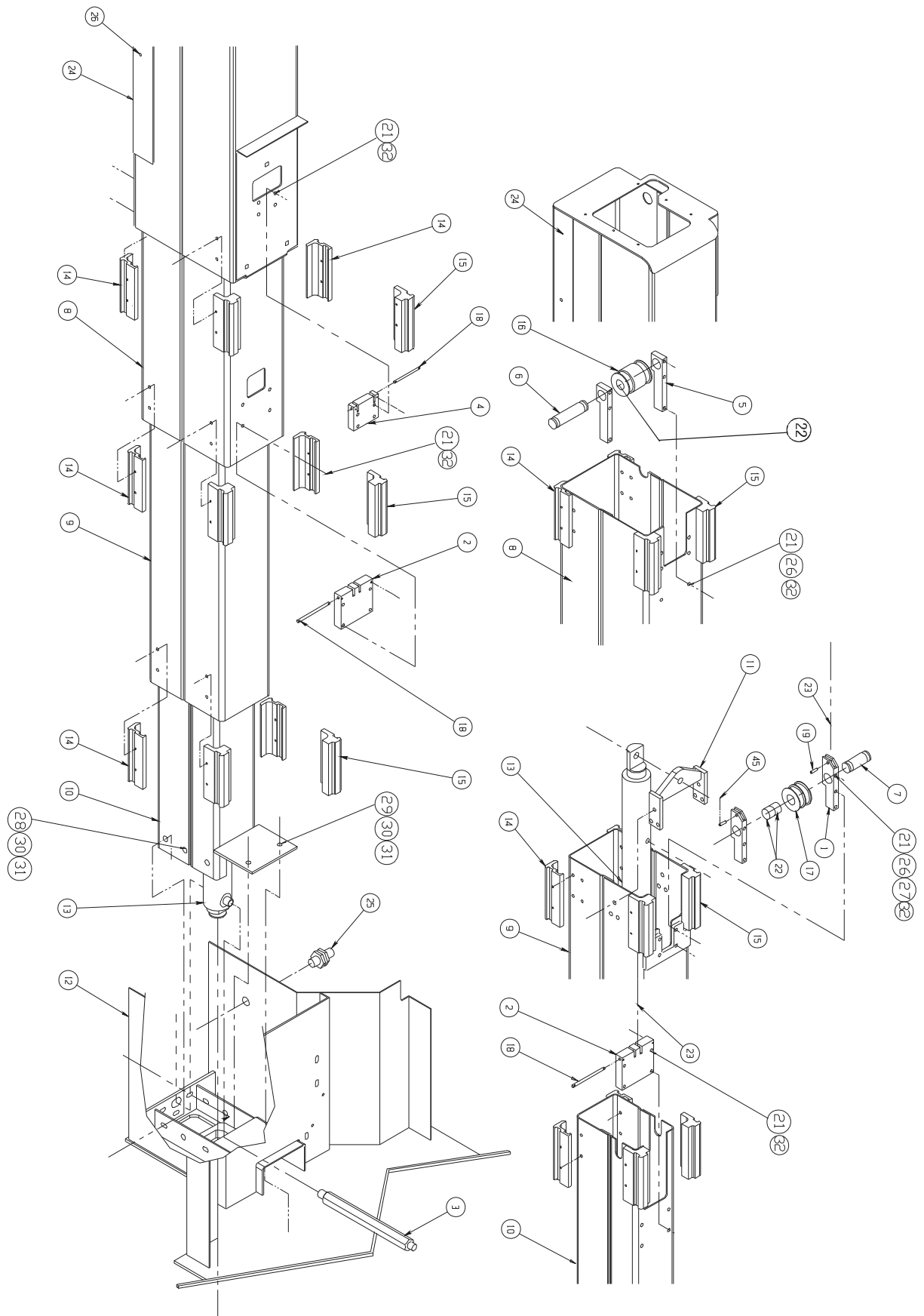
Mast Assembly

505002-000

Item	Part	Description	QTY.
1	505066-000	INNER MOUNT	2
2	505065-000	ANCHOR INNER	2
3	107082-000	STANDPIPE ADAPTER	1
4	505064-000	OUTER ANCHOR	1
5	505063-000	OUTER MOUNT	2
6	505057-000	OUTER AXLE	1
7	505056-000	INNER AXLE	1
8	065491-001	SECOND INNER MAST WEDMENT 4M	1
9	065488-001	LOWER INNER MAST WELDMENT	1
10	065485-004	BASE MAST WELDMENT	1
11	065450-001	CYL. BAR & PAD WELDMENT	1
12	505001-000	CHASSIS ASSY	1
13	SEE PAGE 6-21	LIFT CYLINDER ASSY	1
*	SEE PAGE 6-21	SEAL KIT, LIFT CYLINDER	REF
*	501483-000	EMERGENCY LOWERING VALVE	REF
14	505062-000	FRONT PAD	12
15	505061-000	REAR PAD	12
16	505060-000	PULLEY OUTER	1
17	505059-000	PULLEY INNER	1
18	505054-000	PIN	3
19	505055-000	ANCHOR PIN	2
20	505084-013	HEX HEAD SELF TAPPER (5.5 X 13)	36
21	058502-020	M6 X 20mm SOCKET HEAD CAP SCREW	18
22	505068-000	BEARING, 2220DU	4
23	505067-000	CHAIN LEAF, BL434 (103 LINKS)	4
24	065580-001	PLATFORM WELDMENT	REF
25	505072-000	SWITCH, PROXIMITY ASSY	1
26	058502-035	M6 X 35 SOCKET HEAD CAP SCREW	4
27	500532-030	M6 X 30 SOCKET HEAD COUNTERSUNK SCREW	2
28	510230-030	M12 HEX HEAD 30mm (GRADE 10.9)	2
29	510230-030	M12 HEX HEAD 30mm (GRADE 10.9)	9
30	056064-012	M12 NYLOC NUT (GRADE 10)	11
31	510231-000	M12 FLAT WASHER HARD/TEMPERED (GRADE 10)	22
32	511155-006	M6 HARDENED WASHER, used on machines 54092 and after	18

*NOTE: ITEM **21**, ALL BOLTS SHOULD BE TORQUED TO 17.5NM

Illustrated Parts Breakdown

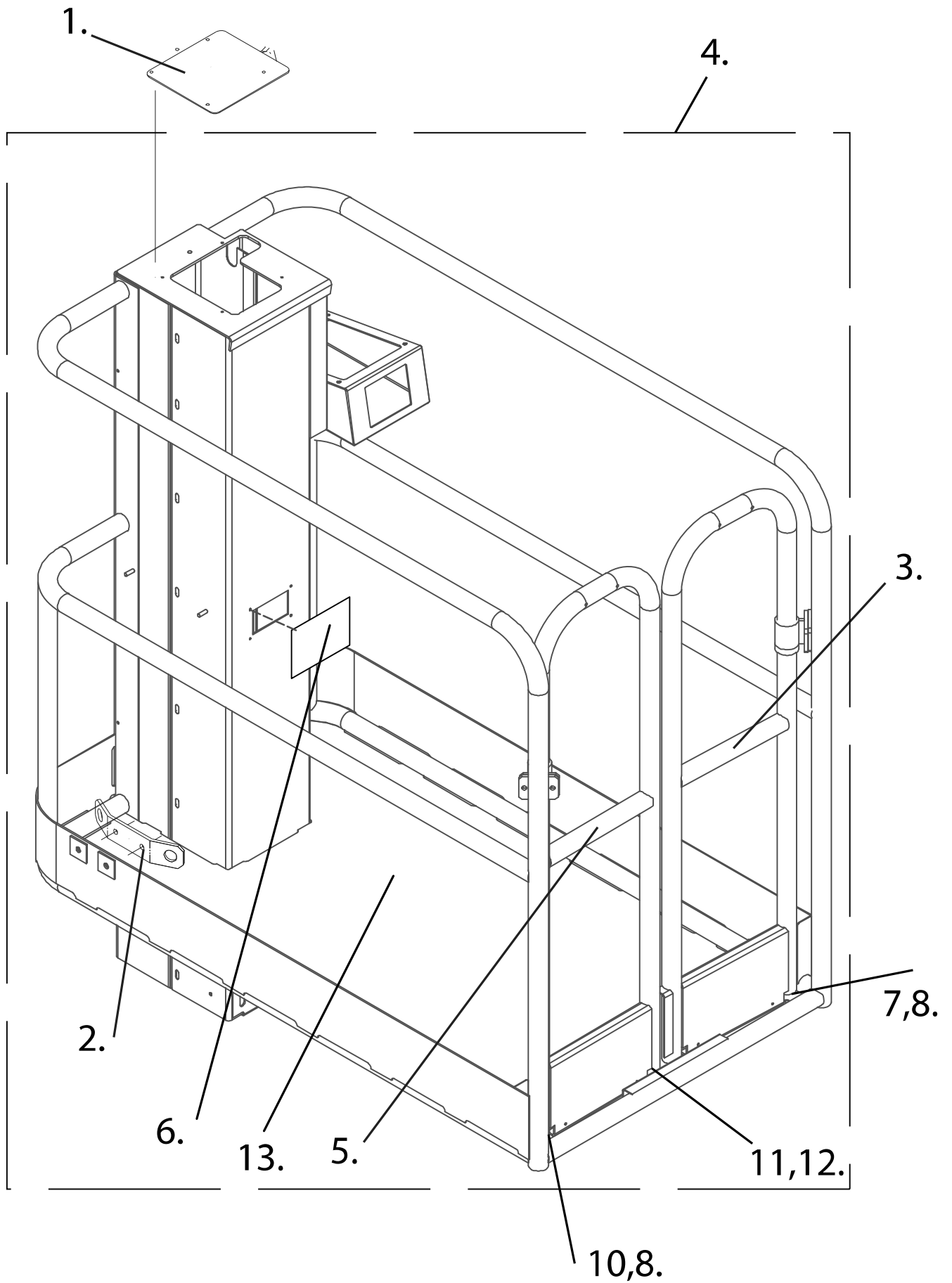


Illustrated Parts Breakdown

Platform Assembly

Item	Part	Description	QTY.
1	065543-000	COVER PLATE (MAST TOP)	1
2	057094-001	HARDPOINT, SAFETY HARNESS	1
3	510917-000	RH DOOR	1
4	510916-000	PLATFORM WELDMENT	1
5	510918-000	LH DOOR	1
6	107197-000	INSPECTION COVER	1
7	502204-000	RH SPRING	1
8	502206-000	DOOR PIVOT	2
10	502204-003	LH SPRING	1
11	511163-000	MAGNETIC CATCH	2
12	511164-000	STRIKE PLATE	2
13	027966-005	SAFTEY WALK 6" X 24"	5

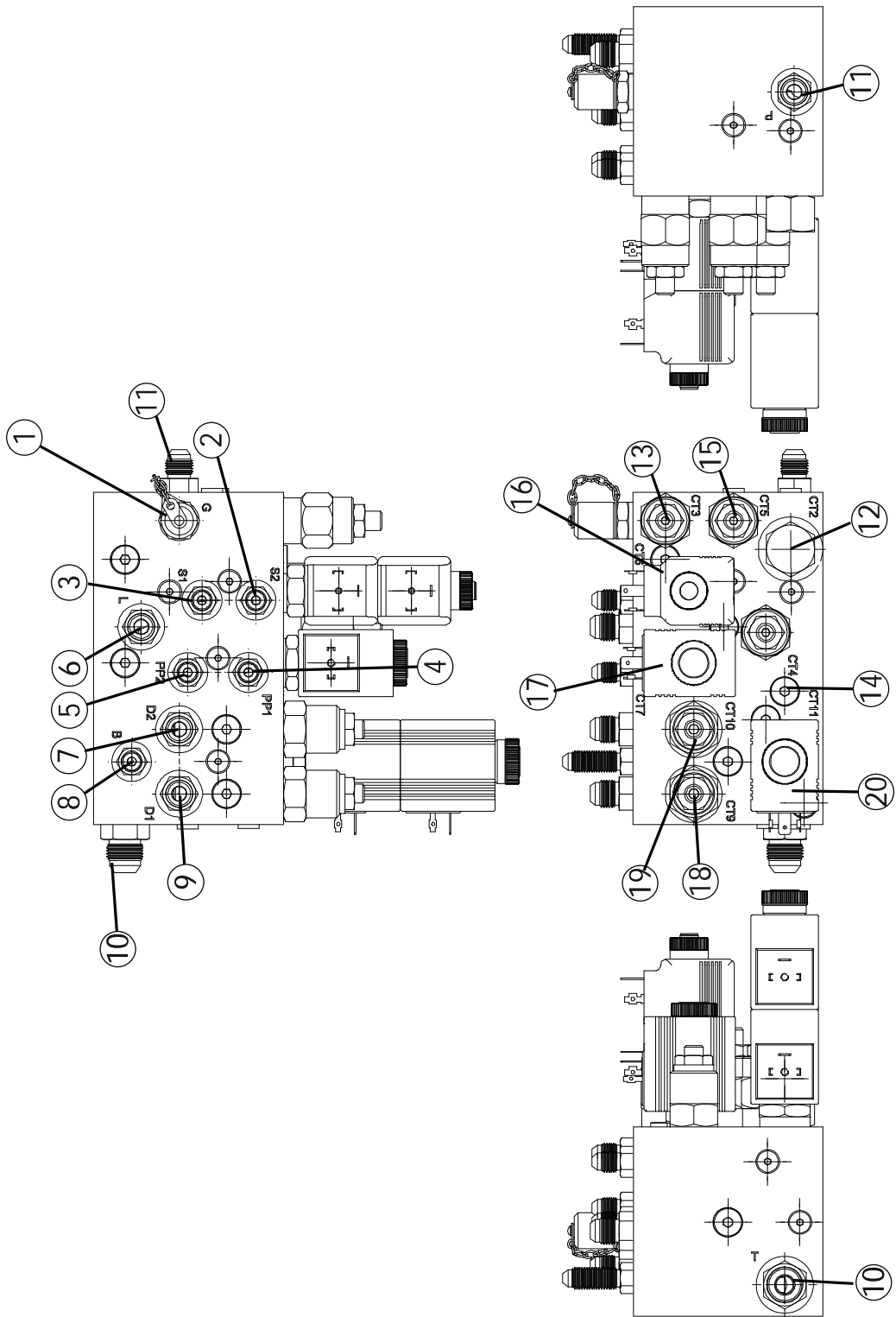
Illustrated Parts Breakdown



Control Valve Assembly

503800-002

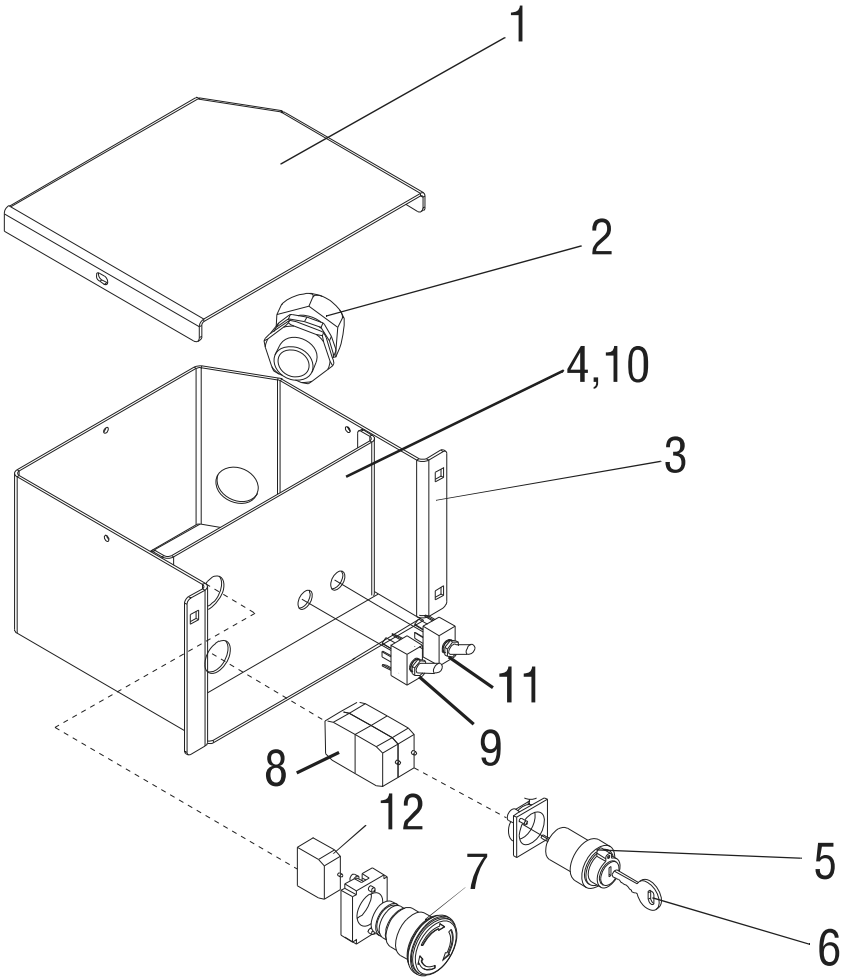
Item	Part	Description	QTY.
1	510652-000	1/4" SAE - TEST POINT	1
2	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
3	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
4	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
5	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC MALE/MALE	1
6	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
7	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
8	510653-000	FITTING, 1/4" SAE 7/16" - 20UNF JIC BULKHEAD	1
9	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
10	510655-000	FITTING, 1/2" SAE - 3/4"-16 UNF JIC MALE/MALE	1
11	510654-000	FITTING, 3/8" SAE - 9/16" - 18UNF JIC MALE/MALE	1
12	502200-002	CT2 CARTRIDGE FLOW REG	1
13	502200-003	CT3 CARTRIDGE RELIEF	1
14	502200-004	CT4 CARTRIDGE RELIEF	1
15	502200-005	CT5 CARTRIDGE RELIEF	1
16	502200-006	CT6 CARTRIDGE SOLENOID	1
17	501526-000	CT7 CARTRIDGE SOLENOID	1
18	502200-007	CT9 CARTRIDGE OVERCENTRE	1
19	502200-007	CT10 CARTRIDGE OVERCENTRE	1
20	501526-000	CT11 CARTRIDGE SOLENOID	1



Illustrated Parts Breakdown

Lower Controls Assembly

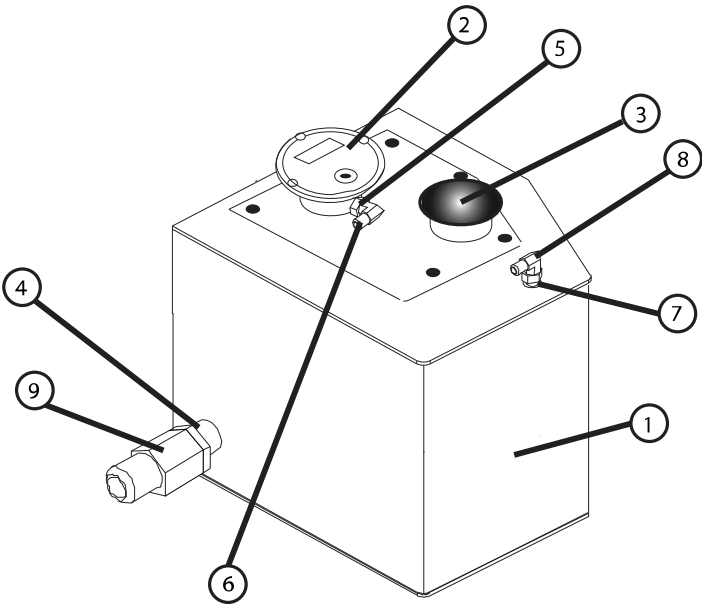
Item	Part	Description	QTY.
1	107148-000	LID, LCB BOX	1
2	505053-000	CABLE GLAND	1
3	107400-000	LCB BOX (WELDMENT)	1
4	510429-003	LCB OVERLAY	1
5	510526-000	KEY SWITCH & MOUNT	1
6	455	KEY	1
7	510524-000	EMERGENCY STOP BUTTON & MOUNT	1
8	510527-000	SWITCH BLOCK (NO)	4
9	502522-000	TOGGLE SWITCH (ON)-OFF-(ON)	1
10	510462-001	FRONT PANEL, LCB BOX	1
11	510521-000	TOGGLE SWITCH ON-(ON)	1
12	510525-000	SWITCH BLOCK (NC)	1
			1



Hydraulic Tank Assembly

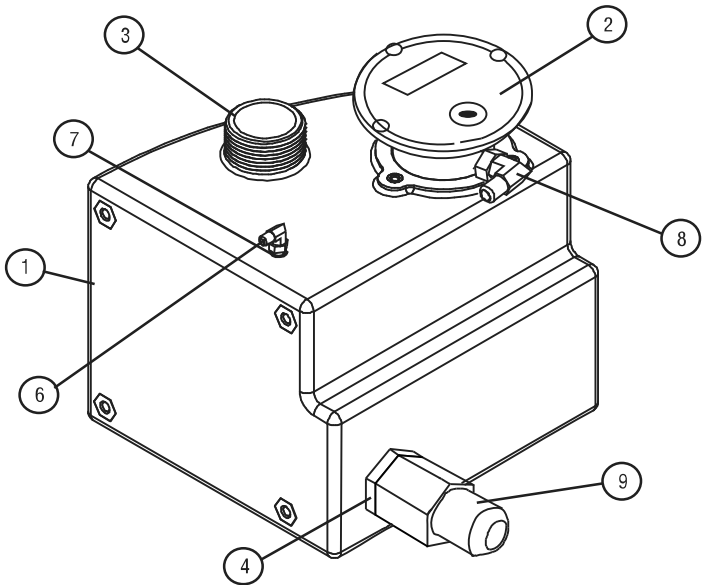
Tank Assembly - SN Range 00000>054179

Item	Part	Description	QTY.
1	510537-000	TANK (STEEL)	1
2	510696-000	RETURN FILTER (ELEMENT 510696-001)	1
3	510697-000	BREATHER CAP	1
4	510698-000	SUCTION STRAINER	1
5	510890-000	STRAIGHT ADAPTOR	1
6	510889-000	ADAPTOR 90°	1
7	510239-000	STRAIGHT ADAPTOR	1
8	011937-001	ADAPTOR 90°	1
9	510343-000	STRAIGHT ADAPTOR	1



Tank Assembly - SN Range 054180 +

Item	Part	Description	QTY.
1	512545-000	TANK (PLASTIC)	1
2	512566-000	RETURN FILTER (ELEMENT 510696-001)	1
3	512565-000	BREATHER CAP	1
4	512575-000	SUCTION STRAINER	1
5	510890-000	STRAIGHT ADAPTOR	1
6	510889-000	ADAPTOR 90°	1
7	510239-000	STRAIGHT ADAPTOR	1
8	011937-001	ADAPTOR 90°	1
9	510343-000	STRAIGHT ADAPTOR	1

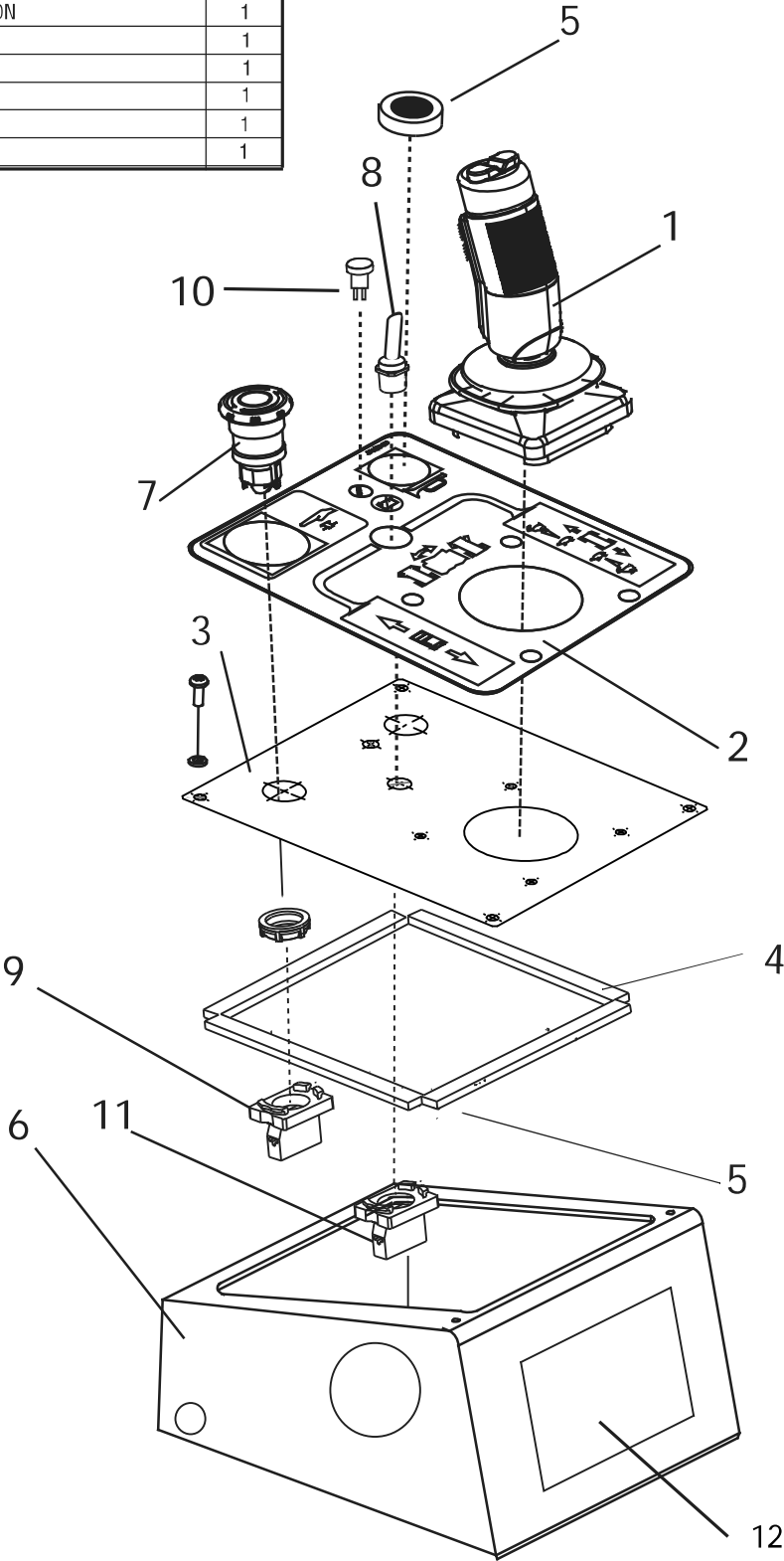


Illustrated Parts Breakdown

Upper Controls Assembly

502541-000

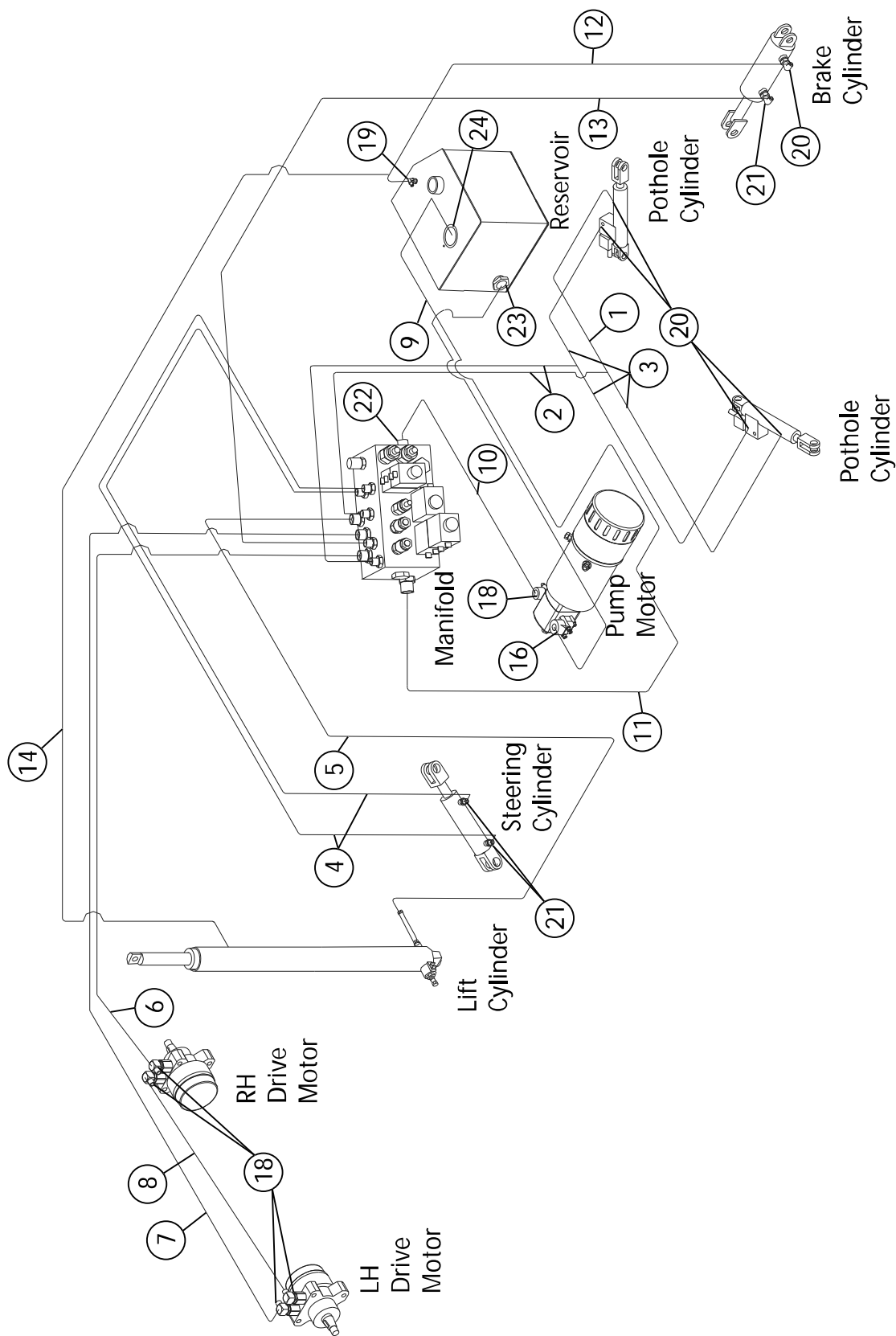
Item	Part	Description	QTY.
1	510471-000	JOYSTICK	1
2	510428-001	OVERLAY	1
3	510461-000	MOUNTING PLATE	1
4	510465-000	SEAL	0,75
5	510542-000	HORN PUSH BUTTON	1
6	511156-000	UPPER CONTROL BOX (BOX ONLY)	1
7	510524-000	EMERGENCY STOP BUTTON	1
8	510541-000	TOGGLE SWITCH	1
9	510525-000	N/C CONTACT BLOCK	1
10	510528-000	RED L.E.D	1
11	510527-000	N/O CONTACT BLOCK	1
12	3087803	EZCAL DISPLAY	1



Notes :

Hose Kit with Fittings 505014-009

[illegible]



Illustrated Parts Breakdown

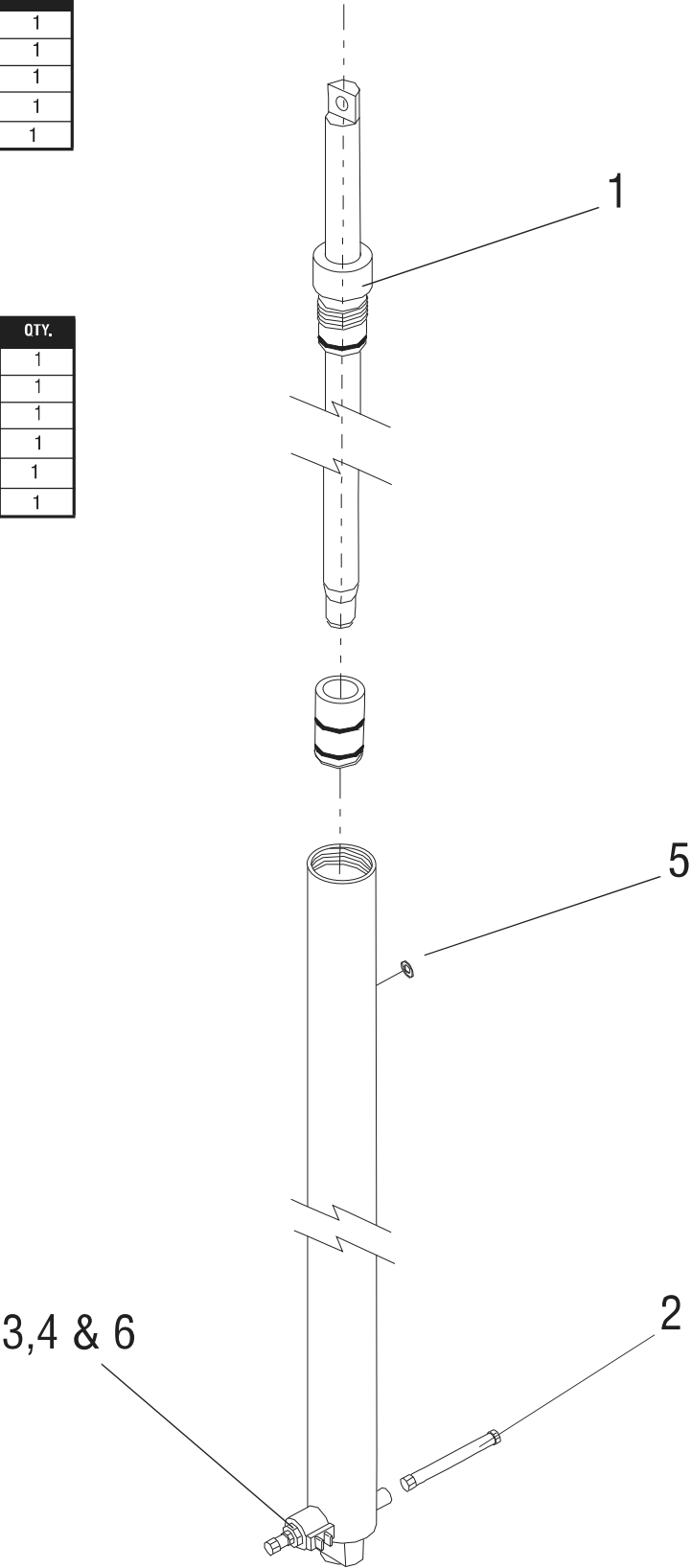
Hydraulic Cylinder Assembly (Lift)

510894-000 Serial Range (000001 > 054179)

Item	Part	Description	QTY.
1	505037-010	LIFT CYLINDER SEAL KIT	1
2	505073-000	STANDPIPE ADDAPTOR	1
3	501483-000	EMERGENCY DOWN VALVE	1
4	501483-001	ADAPTOR (EMERGENCY DOWN VALVE)	1
5	510892-000	FITTING, - 4 ORB, -4 JICM POS 90	1

512636-000 Serial Range (054180 +)

Item	Part	Description	QTY.
1	512793-000	LIFT CYLINDER SEAL KIT	1
2	505073-000	STANDPIPE ADDAPTOR	1
3	512637-000	EMERGENCY DOWN VALVE	1
4	Not Used		1
5	510892-000	FITTING, - 4 ORB, -4 JICM POS 90	1
6	513286-000	T- HANDLE	1

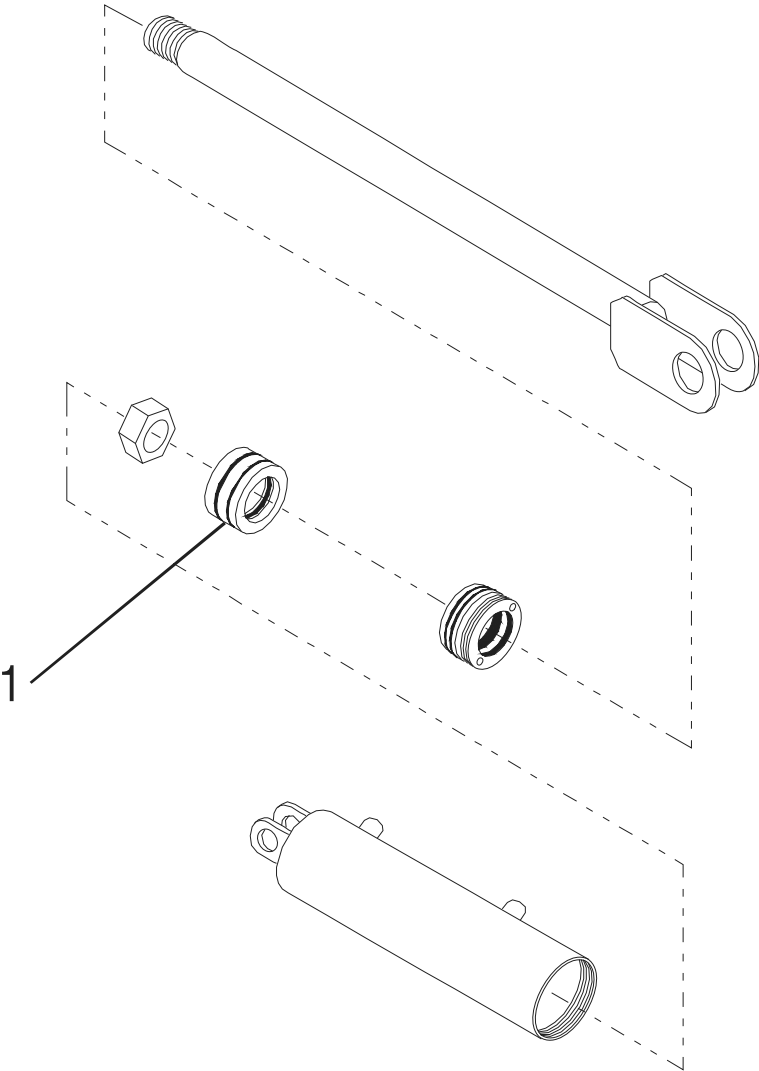
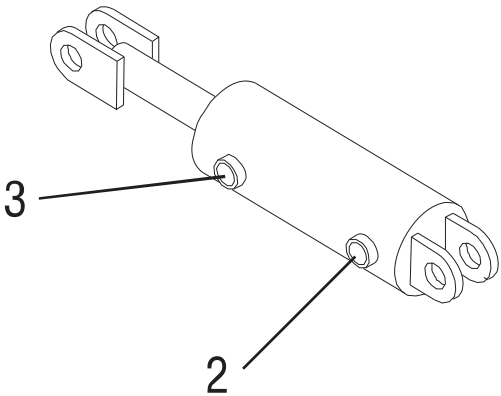


Hydraulic Cylinder Assembly (Steer / Brake)

510895-000

Item	Part	Description	QTY.
1	505035-010	SEAL KIT, BRAKE/STEER CYLINDER (sn < 054179)	1
1	512795-000	SEAL KIT, BRAKE/STEER CYLINDER (sn 054180 +)	1
2	510893-000	FITTING, -6 ORB, -4 JICM, 90 POS	2
3	510893-000	FITTING, -6 ORB, -4 JICM, 90 POS	1

NOTE: FITTINGS SHOWN APPLY TO STEERING CYLINDER, WHEN FITTING HOSES TO THE BRAKE CYLINDER FIT THE 1/8 M/M TO THE FULL BORE END AND THE 1/8 BLOCK 90 WITH 1/8 M/M TO THE ANNULAR END.



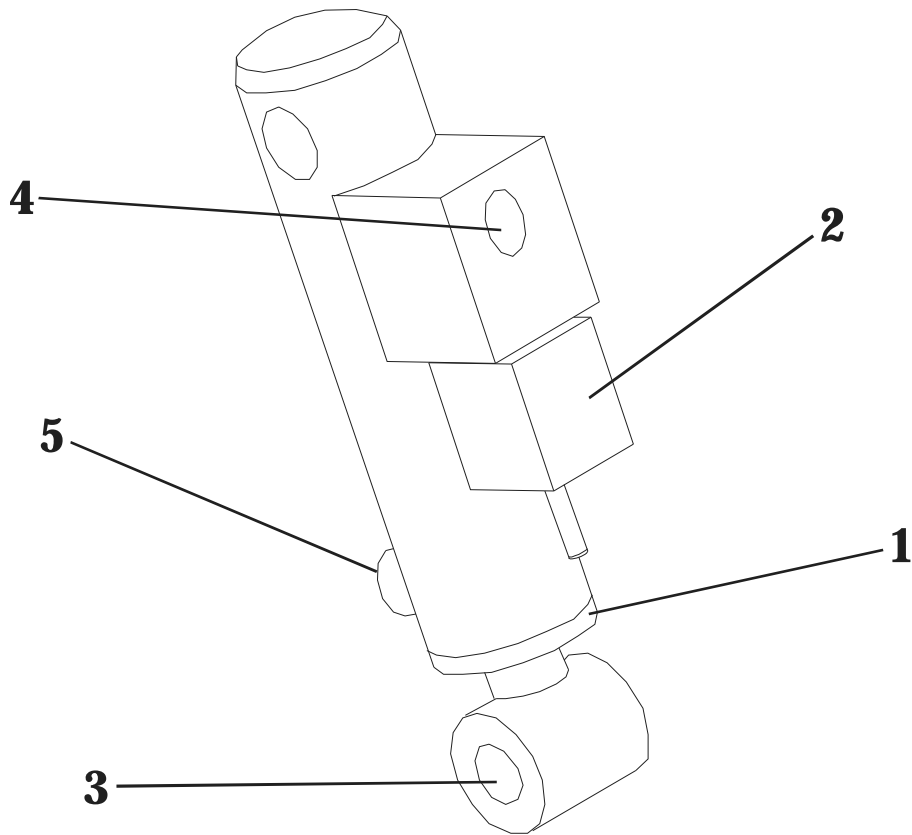
Hydraulic Cylinder Assembly (Pothole)

510896-000 (Serial Range 000001 > 054179)

Item	Part	Description	QTY.
1	505036-010	SEAL KIT, POTHOLE CYLINDER	1
2	501483-000	EMERGENCY RELEASE VALVE	1
*	501483-001	HANDLE (T-PIECE) EMERGENCY REL VALVE	1
3	503760-000	BUSHING	2
4	510892-000	FITTING, -4 ORB, -4JICM, POS 90	1
5	510892-000	FITTING, -4 ORB, -4JICM, POS 90	1

512638-000 (Serial Range 054180 +)

Item	Part	Description	QTY.
1	512794-000	SEAL KIT, POTHOLE CYLINDER	1
2	512639-000	EMERGENCY RELEASE VALVE	1
*	501483-001	HANDLE (T-PIECE) EMERGENCY REL VALVE	1
3	503760-000	BUSHING	2
4	510892-000	FITTING, -4 ORB, -4JICM, POS 90	1
5	510892-000	FITTING, -4 ORB, -4JICM, POS 90	1



Illustrated Parts Breakdown

Electric Kit 510520-000

Item	Part No.	Description	Qty per
	510521-000	Deadman Toggle Switch, on-(on) IP65	1
	510522-000	Toggle Switch SPDT (on)-off-(on), IP65	1
	510541-000	Toggle Switch SPDT on-on, IP65	1
	510524-000	Twist & Release e/stop	2
	510542-000	Black Flush Pushbutton (Horn pushbutton)	1
	510525-000	NC contact block	2
	510526-000	3 posn. Stayput Key Switch	1
	455	Spare key	-
	510527-000	NO contact block	4
	510528-000	Red LED	1
	501868-000	Horn, continuous, 24v(as ITT)	1
	502494-000	Fuse 175Amp(as ITT)	1
	501877-000	Fuse holder	1
	502588-000	Alarm, 80-95dB, 4-28vdc	1
	502489-000	Contactor, 200Amp 24vdc SPDT	1
	510529-000	Battery Cables Kit	1

Harness Kit 510842-000

Item	Part No.	Description	Qty per
	510530-000	Platform Loom	1
	510531-000	Ground Control Loom	1
	510532-000	Valve Cables	1

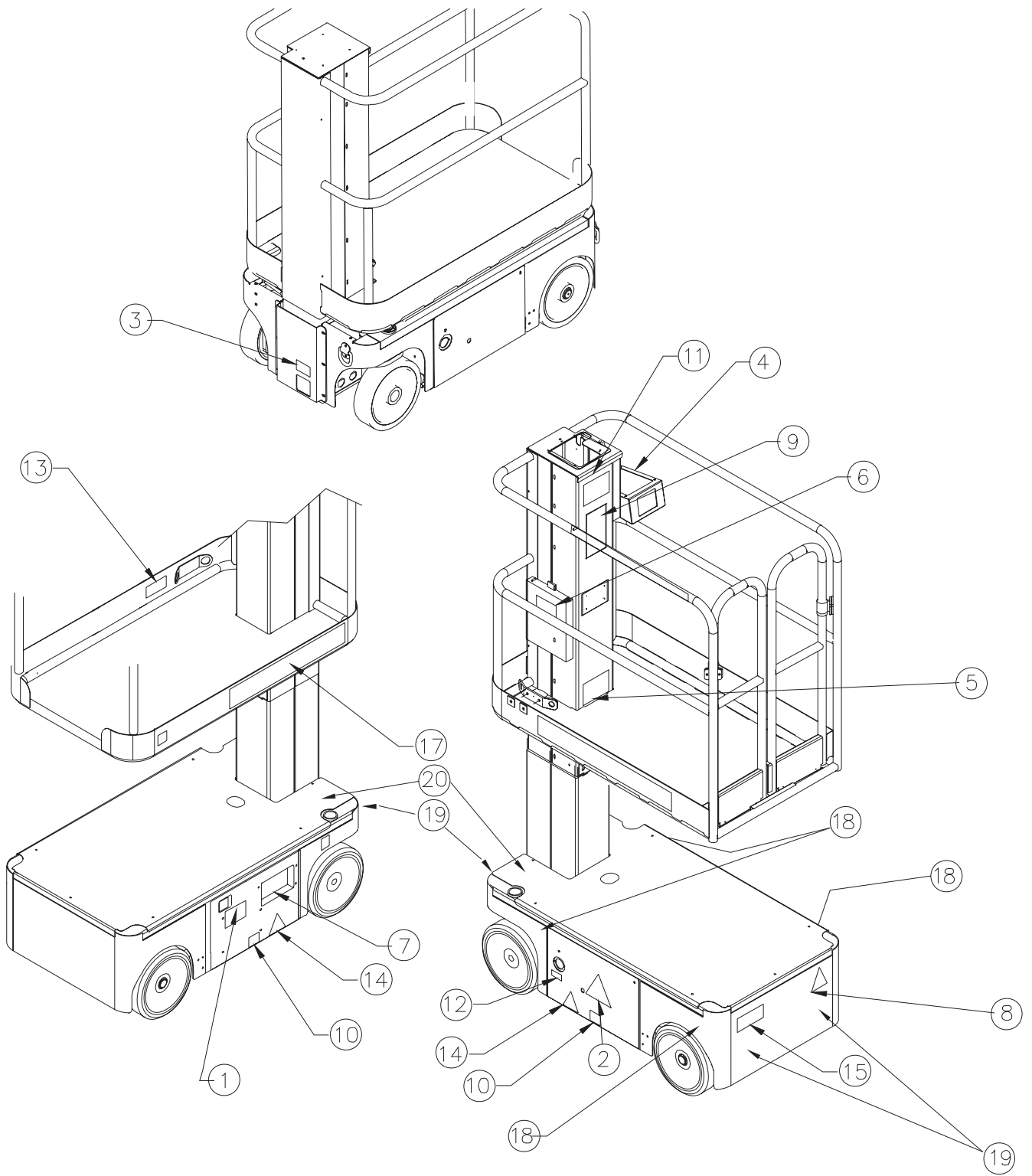
Illustrated Parts Breakdown

Label Kit, European (English)

505004-000

Item	Part	Description	QTY.
1	060197-001	DECAL, HYDRAULIC FLUID	1
2	101210-000	DECAL, HYDROGEN GAS	1
3	510280-000	DECAL, EMERGENCY DOWN (IPAF)	1
4	510428-001	DECAL, UPPER CONTROLS	1
5	107052-001	DECAL, SAFE WORKING LOAD	1
6	010076-901	DECAL, DOCUMENTS ENCLOSED	1
7	510429-001	DECAL, LOWER CONTROLS	1
8	062562-951	DECAL, BATTERIES ARE BALLAST	1
9	505076-000	DECAL, THREE HAZARDS	1
10	014222-903	DECAL, FORKLIFT POINT	2
11	100102-900	DECAL, NOT INSULATED	1
12	066522-900	DECAL, BATTERY SYMBOL	1
13	068635-001	DECAL, HARNESS HARDPOINT	1
14	501453-000	DECAL, WARNING (FOOT CRUSH)	2
15	503723-000	DECAL, BATTERY DISCONNECT	1
17	512435-000	DECAL "SNORKEL M1230E"	2
18	512465-000	DECAL, WHEEL LOAD	4
19	058531-000	DECAL, TIE/LIFT POINT	4
20	512572-000	DECAL, CRUSHING HAZARD	2

Illustrated Parts Breakdown



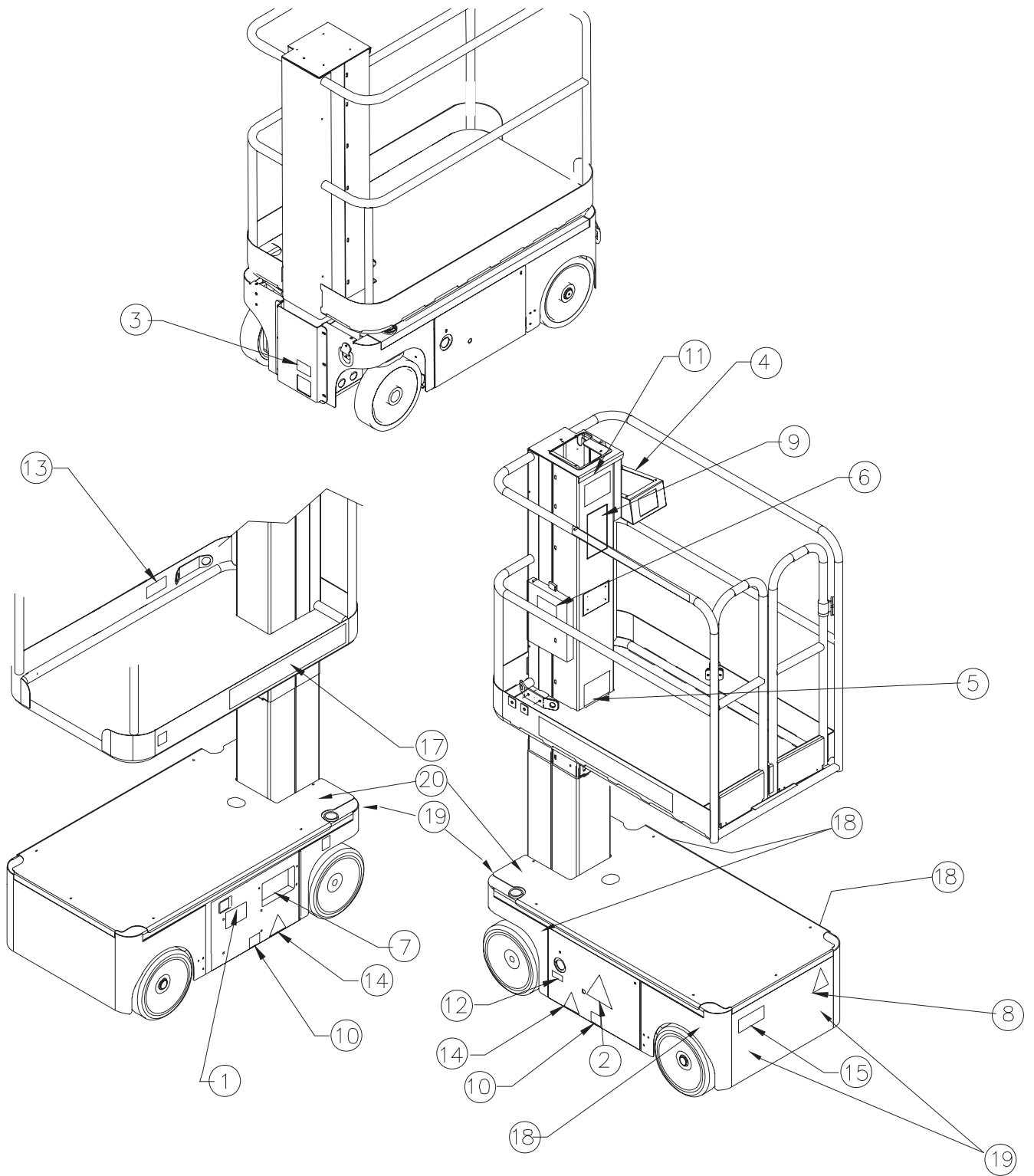
Illustrated Parts Breakdown

Label Kit, German

505604-000

Item	Part	Description	QTY.
1	060197-001	DECAL, HYDRAULIC FLUID	1
2	101210-000	DECAL, HYDROGEN GAS	1
3	510280-000	DECAL, EMERGENCY DOWN	1
4	510428-001	DECAL, UPPER CONTROLS	1
5	107052-001	DECAL, SAFE WORKING LOAD	1
6	010076-901	DECAL, DOCUMENTS ENCLOSED	1
7	510429-001	DECAL, LOWER CONTROLS	1
8	062562-951	DECAL, BATTERIES ARE BALLAST	1
9	505076-200	DECAL, THREE HAZARDS	1
10	014222-903	DECAL, FORKLIFT POINT	2
11	100102-900	DECAL, NOT INSULATED	1
12	066522-900	DECAL, BATTERY SYMBOL	1
13	068635-001	DECAL, HARNESS HARDPOINT	1
14	501453-000	DECAL, WARNING (FOOT CRUSH)	2
15	503723-000	DECAL, BATTERY DISCON NEC	1
17	512435-000	DECAL "SNORKEL M1230E"	2
18	512465-000	DECAL, WHEEL LOAD	4
19	058531-000	DECAL, TIE/LIFT POINT	4
20	512572-000	DECAL, CRUSHING HAZARD	2

Illustrated Parts Breakdown

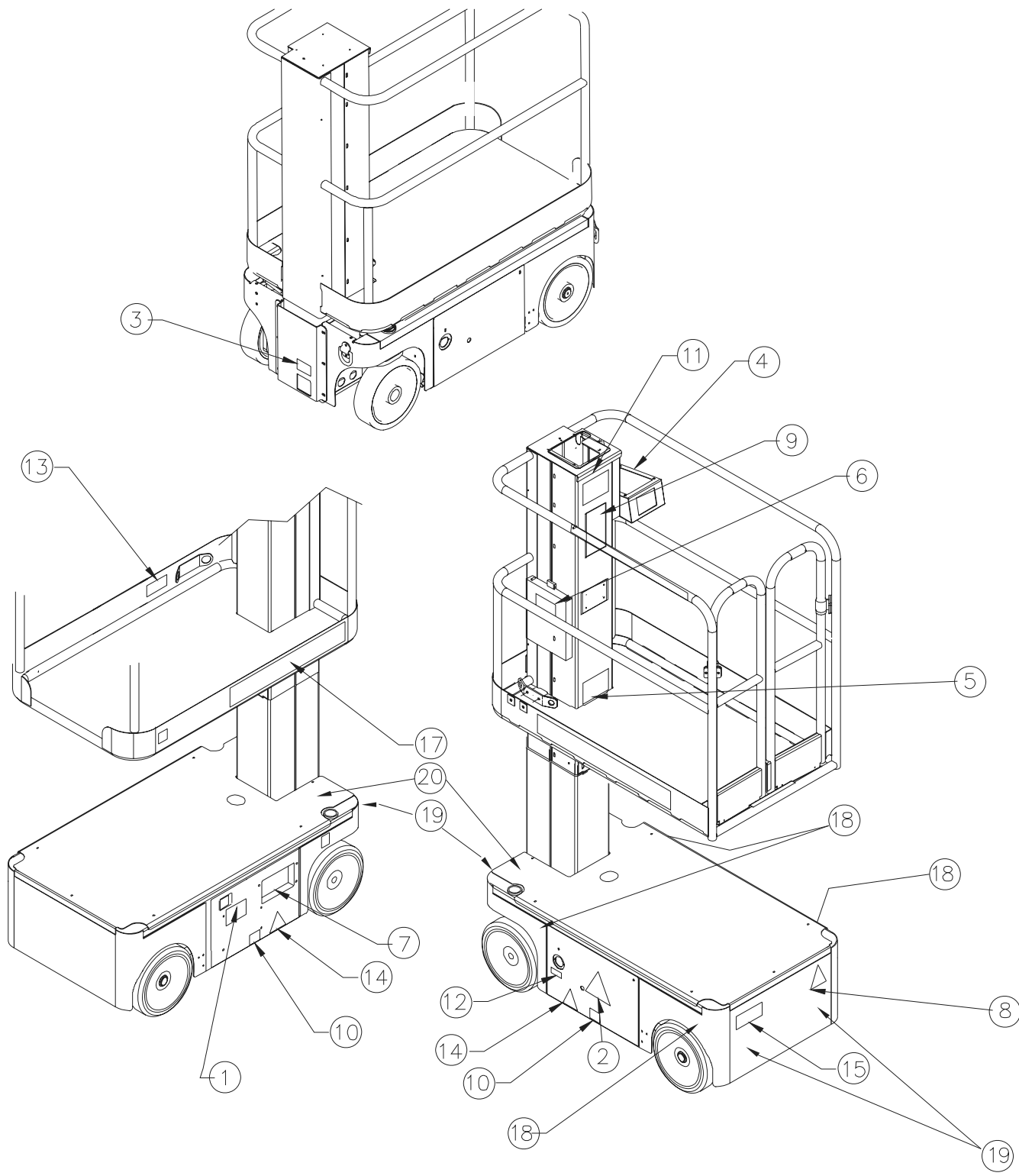


Illustrated Parts Breakdown

Label Kit, French

505601-000

Item	Part	Description	QTY.
1	060197-001	DECAL, HYDRAULIC FLUID	1
2	101210-000	DECAL, HYDROGEN GAS	1
3	510280-000	DECAL, EMERGENCY DOWN	1
4	510428-001	DECAL, UPPER CONTROLS	1
5	107052-001	DECAL, SAFE WORKING LOAD	1
6	010076-901	DECAL, DOCUMENTS ENCLOSED	1
7	510429-001	DECAL, LOWER CONTROLS	1
8	062562-951	DECAL, BATTERIES ARE BALLAST	1
9	505076-300	DECAL, THREE HAZARDS	1
10	014222-903	DECAL, FORKLIFT POINT	2
11	100102-900	DECAL, NOT INSULATED	1
12	066522-900	DECAL, BATTERY SYMBOL	1
13	068635-001	DECAL, HARNESS HARDPOINT	1
14	501453-000	DECAL, WARNING (FOOT CRUSH)	2
15	503723-000	DECAL, BATTERY DISCONNECT	1
17	512435-000	DECAL "SNORKEL M1230E"	2
18	512465-000	DECAL, WHEEL LOAD	4
19	058531-000	DECAL, TIE/LIFT POINT	4
20	512527-000	DECAL, CRUSHING HAZARD	2



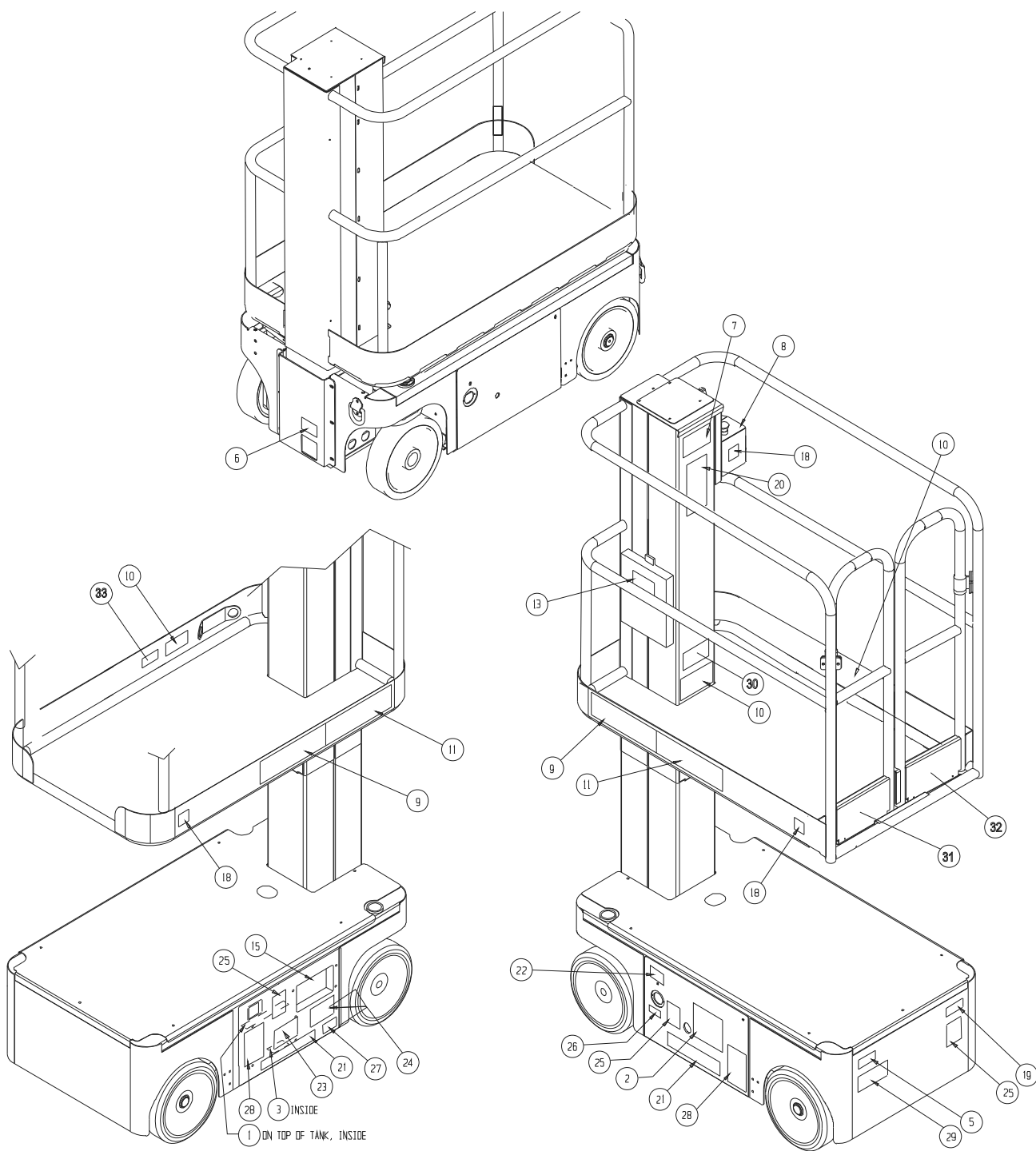
Illustrated Parts Breakdown

Label Kit, USA

107012-010

Item	Part	Description	QTY.
1	0071927	DECAL, HYDRAULIC OIL	1
2	060197-001	DECAL, HYDROGEN GAS	1
3	061205-005	NAME PLATE	1
5	005221-000	DECAL, BATTERY FLUID	1
6	005223-005	DECAL, EMERGENCY DOWN	1
7	066554-000	DECAL, BEFORE OPERATING	1
8	510428-001	DECAL, UPPER CONTROLS	1
9	512435-000	DECAL "SNORKEL M1230E"	2
10	101250-000	DECAL, MAX LOAD 500lbs	3
13	010076-001	DECAL, ATTENTION	1
15	510428-000	DECAL, LOWER CONTROLS	1
18	061220-000	DECAL, ANSI	1
19	058534-000	DECAL, BATTERIES	1
20	066550-001	DECAL, DANGER	1
21	014222-003	DECAL, FORK LIFT	2
23	066555-000	DECAL, RELIEF VALVE	1
24	510429-002	DECAL, LOWER PLATFORM	1
25	066556-000	DECAL, COLLISION HAZARD	3
26	066522-000	DECAL, BATTERY CHARGER	1
27	101252-000	DECAL, MAX WHEEL LOAD (675lbs)	1
28	066556-001	DECAL, WARNING	2
29	107051-000	DECAL, BATTERY DISCONNECT	1
30	300699	DECAL, OPERATORS CHECKLIST	1
31	508771-000	DECAL, DO NOT REMOVE COMPONENTS	1
32	308772-000	DECAL, WARNING RESPONSIBILITIES	1
33	068635-001	DECAL, HARNESS HARD POINT	1

Illustrated Parts Breakdown



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