snorkel

MB26J
MB20J

CE

PARTS & SERVICE MANUAL

Serial Number 001200 and after

Part Number 511110-200
January 2013

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MB20J

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MANUAL

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⚠ WARNING ⚠

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

Safety Rules

Electrocution Hazard

THIS MACHINE IS NOT INSULATED!

Tip Over Hazard

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

Collision Hazard

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

Fall Hazard

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

USE OF THE 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 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 "Specifications - Platform Capacity" 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 2 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 1 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 to or from the platform onto buildings, steel or prefabricated 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 **UpRight Powered Access**.

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

The driving of MEWP’s on the public highway is subject to Regulations made under the Road Traffic Acts.

ENVIRONMENTAL TEMPERTURE LIMITATION, The machine is primarily for use in normal ambient tempertures and conditions ranging between 50c to -20c.

1. Introduction

1.1 INTRODUCTION

PURPOSE & LIMITATIONS

This Service & Parts Manual is designed to provide instructions and illustrations for the safe operation and maintenance of the MB20J & MB26J Work Platform manufactured by Snorkel. The purpose of this machine is to provide fast and safe access to difficult to reach areas. The machine may only safely operated on firm level ground. Refer to the Specification section for the machines access limitations.

DO NOT use on soft ground or on slopes greater than 2 degrees.

DO NOT use the lifting mechanism to raise or lower goods or persons except within the cage and subject to the weight limitations.

DO NOT enter the platform from a structure, rack or other platform.

ENVIRONMENTAL TEMPERATURE LIMITATION, The machine is primarily for use in normal ambient temperatures and conditions ranging between 50c to -20c.

SCOPE

This manual includes the procedures and responsibilities for the inspection, transportation, safe operation, maintenance, and repair of this product. The Maintenance Section within the Parts & Service Manual also covers preventative maintenance and troubleshooting.

SPECIAL INFORMATION

Throughout this manual the users attention is drawn to these special warning boxes:

DANGER

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

WARNING

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

CAUTION

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

1.2 GENERAL DESCRIPTION

The MB20/26J are self propelled, fast acting aerial work platforms, designed to raise two operators with hand tools to a platform floor height of 6.00 m and 7.76 m respectively. The accessible height is approximately 2.00 m above these figures. It is designed to travel with safe working load and work tools up to an upper limit, See table on page 2-18 / 2-19.

The unit offers the ability to reach over obstacles but must be used on firm and level ground at all times.

PLATFORM

The MB20/26J platform is large enough for two operators indoors, one outdoors and has a free-draining perforated floor with 150 mm toeboards. Hand-rails are constructed from Steel tubing and a safety drop-bar is provided at the entrance. Safety restraint harness anchor points are also fitted in the floor of the platform. These must be used at all times. The main controls are fitted to this platform.

WARNING

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

PLATFORM CONTROLLER

The primary (Upper) control box is permanently fitted to the front of the platform. It features a joystick which provides proportional control for raising or lowering the mast, raising or lowering the jib or rotating the complete mast assembly. The same joystick is also used to drive and steer the machine.

A safety Interlock Switch or 'deadman button' is incorporated into the Joystick. It must be activated at all times in order to operate any function. This feature allows for one-handed operation. A comprehensive explanation of control functions is given in the Operators Manual - a copy of which shall be located in the platform document wallet located just beneath the upper control station in the platform.

The secondary (Lower) control box is fitted to the mast cover at arm level. It features a 'deadman' enable button and selector buttons to provide pre-programmed speeds for all functions except drive and steering. This control station is used primarily for service-type operations including pre-operation inspection. It should never be used to position a manned or unmanned platform. It may be used in the event of emergency, however, to lower the manned platform.

WARNING

NEVER operate the machine from the upper controls until the platform entrance drop-bar is in the fully lowered position and the safety harness is fitted.

ELEVATING ASSEMBLY

The platform is raised and lowered by a combination of a steel jib and a series of telescoping mast sections. The main hydraulic cylinder, mounted within the masts, lifts the 2nd mast directly. The other masts are connected by a system of heavy duty plate chains and pulleys to ensure sequential lifting.

A parallel system of heavy duty straps ensures that the masts descend in the proper sequence and also ensure that a mast cannot be held in suspension by an obstacle during descent.

The jib cylinder provides a lifting arc to the jib and cage assembly. All hydraulic functions are carried out using solenoid operated control valves. Each cylinder features an integral holding valve to prevent uncontrolled descent in the case of a hose bursting.

ROTATION GEAR

The complete mast, jib and cage assembly can be rotated to provide a maximum outreach of 2.6m in the case of the MB20J and 2.96m in the case of the MB26J machine. This dimension is measured from the centreline of rotation and is carried out by means of an integral hydraulic motor driving a Worm Drive Unit, around a Slew Gear.

DRIVE & STEER SYSTEM

An electronic controller, mounted in the chassis, is pre-programmed to adjust the upper speed limit of each individual function. The controller limits the rotational speed of the electronic motor and oil pump, thereby limiting the maximum oil flow rate.

The following functions are controlled and driven by the electro-hydraulic system:

- Traction Drives (Fwd & Rev) mast stowed/mast raised.
- Steering and Jib elevation.
- Mast elevation, descent and rotation.
- The Jib descent function is gravity operated and is determined by built in flow regulators.

POWER SYSTEM

The Power System (Prime Mover) incorporates four 6V batteries driving a 4KW electro-hydraulic pump. The pump drives all hydraulic cylinders and the traction drive motors. A single multi-valve control block diverts the oil pressure to the individual actuators. The oil flow rate is limited by the pre-programmed speed setting on the motor but is determined by the position of the joystick in the Upper Control Box.

1.3 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.

CAUTION

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Note that this manual does contain warnings and cautions against some specific service methods that could cause personal injury, or could damage a machine or make it unsafe.

Please understand that these warnings cannot cover all conceivable ways in which service, whether or not recommended by Snorkel, might be done, or of the possible hazardous consequences of each conceivable way, nor could Snorkel investigate all such ways.

Anyone using service procedures or tools, whether or not recommended by Snorkel must satisfy themselves thoroughly that neither personal safety nor machine safety will be jeopardized. When in doubt, contact your local distributor or Snorkel.

2. Operation & Specifications

2.1 INTRODUCTION

SPECIAL LIMITATIONS

The purpose of this machine is to provide fast and safe access to difficult to reach areas.

Refer to the Specification section for the machines access limitations.

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

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.

⚠ DANGER ⚠

DO NOT exceed the maximum manual force.

NEVER exceed the platform capacity.

PLATFORM CAPACITY

The Platform is designed to travel with safe working load **(SWL)** including work tools to an upper limit of **215 kg (425 lbs for ANSI MB20J)**

BEAUFORT SCALE

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

BEAUFORT RATING	WIND SPEED				GROUND CONDITIONS
	M/S	KM/H	FT./S	M.P.H.	
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.

⚠ DANGER ⚠

DO NOT use on soft ground or on slopes greater than 2 degrees.

The work platform is **NOT** intended for use on uneven or rough terrain.

ONLY operate this machine on **FIRM** and **LEVEL** ground.

2.2 GENERAL DESCRIPTION

The MB20/26J are self propelled, fast acting aerial work platforms, designed to raise two operators with hand tools to a platform floor height of 6.00m and 7.76m respectively. The accessible height is approximately 2.00m above these figures.

The unit offers the ability to reach over obstacles but **must** be used on firm and level ground at all times.

DANGER

DO NOT use the lifting mechanism to raise or lower goods or persons except within the cage and subject to the specified weight limitations.

DANGER

DO NOT enter the platform from any structure, rack or other platform.

Figure 3: Work Platform

WARNING

DO NOT use the work platform without safety drop-bar in place and with the safety harness fitted.

2.3 SAFETY INSPECTION

This Safety Inspection shall be carried out by the owner immediately prior to transporting this machine.

This Safety Inspection shall also be carried out by the user **prior to use each day**.

The procedure is to carry out the following 14 checks in order as follows.

1. Remove the rear chassis covers by means of the two top twist-locks and the two lift-and-turn catches at the sides. The cover is removed by sliding it backwards and upwards. Use the central handle provided.
2. Ensure that the mast and jib are fully lowered. Remove the hydraulic oil filler cap and check that the hydraulic oil level is correct. Oil should be visible on the dip stick. Top up as necessary using hydraulic oil Viscosity Grade ISO 46.
3. Inspect the chassis area for oil leaks, loose parts, frayed cables and hoses and structural damage etc. Check that all cable connections to the solenoid valves are intact.
4. Open the Inspection hatches on both sides of the upper mast cover. Check that the AC mains cable is disconnected from the battery charger. Check the electrolyte level in each battery cell. Top up as necessary with distilled water only.
5. Use the automated battery top-up system fill the batteries to the correct electrolyte level. This is done by opening the shut off valve and pressing the green fill button for approximately 10 seconds, then re-closing the shut-off valve.

   Batteries should be examined for cracks, acid leakage and terminal corrosion. Take corrective action immediately if either check fails.

Figure 3: Battery Fill Button & Valve

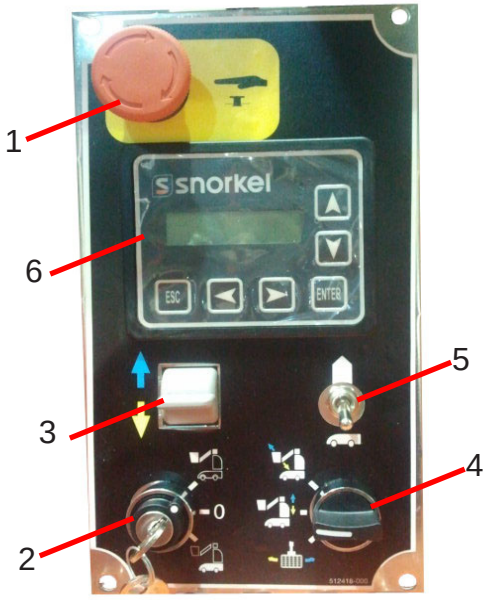
CAUTION

Vehicles fitted with the automated battery top-up system **with** shut off valve, top up the battery cells with distilled water using the electrolyte fill button, ensuring that the shut-off valve is open during the fill and closed after use.

This is the **only** time this valve should be opened.

Figure 4: Lower Control Panel

1. Emergency Stop
2. KeySwitch - Platform Controls
   - OFF
   - Lower Controls
3. Analogue Rocker
4. Selector Switch - Jib
   - Mast
   - Mast Rotate
5. Enable Switch
6. Ez 230 Display



6. Prior to operating the functions, check that the upper and lower emergency stop buttons on each control station are retracted; turn clockwise if necessary. Carry out the following function from the Lower Control Station.

NOTE: DO NOT enter the platform at this stage.

7. Check jib operation by extending the jib to its fully elevated position. Check for correct routing of the hoses and cables. Check the Emergency Lowering feature of the jib. Ensure that when the Emergency Lowering lever/button is disengaged, the jib no longer descends. Return the jib to its rest position using the normal Lower Control Station.
8. Check mast chains by elevating the masts approximately 30cm above the rest position. Check for correct routing of the energy chain. Raise the masts to full height and check for correct adjustment of each lifting chain as follows. Each chain in the pair should bear load. Use a hand held spring balance or tensiometer apply a nominal load (approximately 10kgf.) to either chain in the pair. Apply the load about half way up the chain. Record the approximate deflection i.e. the offset distance from the mast. Repeat the measurement on the adjacent chain at the same location. Chains bearing equal load will deflect equal amounts. Carefully adjust the slack chain until the deflections are approximately equal. Torque up the locknuts to 70 Nm.

NOTE: Apply a thin layer of grease to the lifting chains with a small paintbrush.

CAUTION

Over-tensioning of either lifting chain will result in unnecessary lifting of the mast.

This will lead to a subsequent increase in machine stowed height.

The function of the mast straps is to ensure that masts descend in the correct order and more importantly, that masts cannot continue to descend if the jib or platform meets an external obstacle. Raise the masts about 30cm. Check the external mast clamp screws for tightness. Pull on the short length of each strap and check that they are secure. Refer to the maintenance manual for instructions on more stringent periodic checks on these straps.

Check the Emergency Lowering feature of the mast. The lever is located in the upper mast over. Open the left hand battery inspection hatch and locate the 'Emergency Lowering' decal label. Check the wear pads for damage or heavy scoring. Replace as necessary.

9. Elevate the jib fully. Using the Lower Control Station, turn the mast assembly through about 90 degrees. Check the correct routing of the hoses and cables and the correct smooth operation of the energy chain in its chassis base slide. Continue rotating through 180 degrees in both directions. Confirm that the rotation stops are intact.
10. STANDARD PLATFORM CONTROLS Repeat the mast, jib and rotate functions from the Upper Control Station in the platform. Check that pressing the emergency stop button prevents subsequent operation of the joystick.
11. TILT SENSOR FUNCTION CHECK. The tilt sensor is incorporated in the EZ230 control module. To check it's operation while in platrom drive the machine onto a suitable ramp to raise it's tilt angle above 2 degrees, lift the Jib until the jib limit switch just separates, a continuous audible alarm should sound and all functions on the machine become disabled. Lower the jib using the emergency manual release valve located between the jib structure, the alarm should silence and normal operation becomes enabled.

CAUTION

During manual lowering extreme care must be taken to ensure hands are not trapped in the jib structure.

Figure 5: Joystick

12. MACHINE TRAVEL - UNELEVATED Travel functions are possible only from the platform Upper Control Station. As with all such controls, the deadman handgrip switch must be depressed before any function can operate.

    Select Drive on the upper control panel. Pushing back and forward on the joystick moves the machine backwards and forwards respectively.

    The pothole protection will begin to retract immediately. However, full demand speed will not be realised until the bars are fully raised. This takes about 3 seconds. Check that the motion alarm DOES sound during travel. Check that the thumb operated switches on the top of the joystick operates the front wheel steering.
13. MACHINE TRAVEL-ELEVATED While the masts are raised, it is possible to drive and steer the machine at a much reduced speed. Also note that while the masts are raised, the pothole protection bars should be fully extended and should remain extended during slow speed motion of the machine.

WARNING

The issue of reduced speed while elevated and deployment of the pothole protection bars is crucial to the safe operation of this machine.
The machine may not be released or operated unless these functions operate properly.

14. FINAL PREPARATION Configure the masts and jib to the stowed position. Replace all machine covers and secure.

NOTE: The machine is now ready for Operation or Transportation.

2.4 OPERATION OF THE PLATFORM CONTROLS

The primary (Upper) control box is permanently fitted to the front of the platform. It features a multi-use joystick which provides proportional control for all the machines functions. That includes, raising or lowering the mast, raising or lowering the jib, rotating the mast assembly, and also to drive and steer the machine.

A safety Interlock Switch or 'deadman button' is incorporated into the Joystick. It must be activated at all times in order to operate any function. This feature allows for one-handed operation.

The secondary (Lower) control box is fitted to the mast cover at arm level. It features an enable button and selector buttons to provide pre-programmed speeds for all functions except drive and steering. This control station is used primarily for service-type operations including pre-operation inspection. It should **never** be used to position a manned or un-maned platform.

NOTE: It may be used in the event of emergency to lower the manned platform.

WARNING

NEVER operate the machine from the upper controls until the platform entrance drop-bar is in the fully lowered position and the safety harness is fitted.

TO TURN THE MACHINE ON

Turn the key switch on the lower controls panel to platform controls or lower controls as required, the overload warning lamp on the platform control box will flash for 2 seconds and the buzzer will sound twice confirming that the overload sensor has booted up.

CONTROLS AND INDICATORS

The pre-operation safety checks should be carried out prior to operation. These checks are detailed in the previous section. Operators who follow these guidelines will become familiar with the controls and indicators on the machine.

This section summarises the controls and indicators in tabular form and provides more detailed information.

WARNING

DO NOT operate the machine from the upper controls until the platform entrance drop-bar is in the fully lowered position and your safety harness has been fitted and attached.

UPPER CONTROL PANEL

Figure 3: Upper Control Panel

CONTROL FUNCTIONS

Table 1: Platform Controls and Indicators

ITEMS	NAMES	FUNCTION
1	Joystick	Refer to the decal logic diagrams for correct direction of motion. e.g. If Drive is preselected - pushing forward moves machine forward.
2	Deadman Grip	The 'Deadman' grip switch on the joystick must be grasped for any function to operate.
3	Emergency Stop	Push this red button at any time to isolate power. Turn clockwise to reset.

ITEMS	NAMES	FUNCTION
4	Steering Switch	Turns the wheels left or right.
5	Selector Switch	Pre selects Jib, Mast or Mast Rotate function.
6	Drive / Lift Selector	Pre selects either drive or lift function.
7	Low / High Torque Selector	In drive function pre-selects low torque high speed drive or high torque low speed drive, only functions when mast and jib are down.
8	Horn Button	Use to warn bystanders or to attract attention.
9	Low battery warning lamp	Illuminates when battery charge is low and machine automatically switches into limp mode.
10	Overload warning lamp	Illuminates when load in basket exceeds SWL

Table 2: Lower controls and Indicators

LOWER CONTROL PANEL

ITEMS	NAMES	FUNCTION
1	Emergency Stop	Push this red button at any time to isolate power. Turn clockwise to reset.
2	Key Switch	Selects Platform controls, OFF, or lower controls.
3	Rocker Switch	Activates the Pre-Selected operation, in either direction.
4	Selector Switch	Pre-selects Jib, Mast or Mast Rotate function.
5	Enable Switch	This Switch Enables the rocker switch and must be held up during operation.
6	Hour Meter / BCI	Displays total run time of the machine and an indication of remaining battery capacity.

Figure 4: Lower Control Panel

1. Emergency Stop
2. KeySwitch - Platform Controls
   - OFF
   - Lower Controls
3. Analogue Rocker
4. Selector Switch - Jib
   - Mast
   - Mast Rotate
5. Enable Switch
6. Ez 230 Display

TYPICAL OPERATION

Raising the mast.

- The Keyswitch must be turned to lower controls (2).
- Select Mast using the selector switch (4)
- Press up and hold the switch (5),
- Activate the Rocker Switch (2) in the direction required.

ELEVATING & LOWERING THE WORK PLATFORM

Before operating the MB20/26J Work Platform it is imperative that the pre-operation Safety Inspection has been completed and any deficiencies have been corrected. The operator must also be fully trained in the use of this machine.

Before beginning any operation, the following checks should be carried out.

WARNING

ENSURE that no other persons are within 1 metre of the machine. Be aware of the pothole protection bar hazard on both sides of the machine.

LOOK up and around for obstructions before performing the lift or drive functions.

DO NOT overload the platform.

DO NOT operate near electrical power cables, keep within national safety limits.

THIS WORK PLATFORM IS NOT ELECTRICALLY INSULATED.

NOTE: Chassis controls are for service use only.

1. Ensure that the Key Switch on the Lower Control Box is turned to the Platform Controls position and both emergency stop buttons are off (twist clockwise if necessary).
2. Check the Display B.C.I. is illuminated. If not, the battery may need recharging.
3. Enter the Platform through the entrance at the rear of the MB20/26J and ensure that the drop bar is in position. Raise and lock the entry step.
4. Before using the machine all local Safety Regulations involving helmets and restraining devices should be observed. Safety harness lanyards, not exceeding 1 metre in length, should be attached to anchor points in cage floor.
5. Check if the audible alarm sounds due to un-level ground. None of the functions can work if the machine is not level.

TRAVEL WITH WORK PLATFORM LOWERED

Refer to Tables 1 & 2 for controls and indicators.

1. Verify that both Lower and Upper Control Console Emergency Stop Button is in the 'ON' position (turn clockwise to reset).
2. Turn the key switch on the lower control panel to the platform controls position.
3. Climb into the Platform and select drive using the drive / lift selector toggle switch. Ensure that the drop bar is in position.
4. Check that the route is clear of persons, obstructions, pot holes or ledges and is capable of supporting the wheel loads. Also, check that the clearances above, below, and to the side of the Work Platform are sufficient.
5. To steer the MB20/26J, activate the Deadman Switch while pushing the Steering Thumb-switch, on top of the Joystick, LEFT or RIGHT to turn the wheels. Observe the tyres while manoeuvring to ensure correct direction.

NOTE: Steering is not self-centring. The wheels must be returned to the straight ahead position by operating the Steering Switch.

TRAVEL WITH WORK PLATFORM ELEVATED

CAUTION

If the machine stops driving and the Tilt Alarm sounds, lower the Platform **immediately**.

Using the Emergency Override functions, move the machine to a level location before re-elevating the platform.

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

Refer to Tables 1 & 2 for controls and indicators.

NOTE: The Work Platform will travel at reduced speed when in the elevated position.

1. Check that the route is clear of persons, obstructions, pot holes or ledges and is capable of supporting the wheel loads. Also, check that the clearances above, below and to the side of the Work Platform are sufficient.
2. Ensure that the pothole guards remain in the extended (down) position during elevated travel.

EMERGENCY SITUATIONS

In any emergency situation, the immediate action is to push the red “Emergency Stop” button. This will instantly cut of all electrical power to the controls. The button must be twisted in a clockwise direction in order to recommence control.

However, the switch should be reset only when it is safe to do so.

If the Continuous Audible warning alarm sounds, normal control functions will cease to operate. This will be due to the following problem;

• The Tilt Sensor has been activated

EMERGENCY LOWERING (BY HAND)

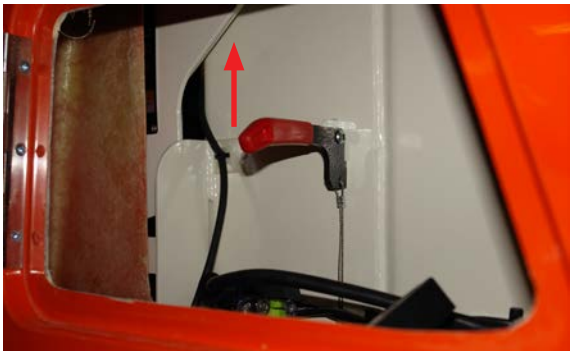
CAUTION

During manual emergency lowering, **extreme care** must be taken to ensure that the person carrying out the task is not struck by the jib or platform structure.

Should the machine become inoperable when elevated request a person on the ground to lower the platform using the emergency lowering valves. Lower the mast structure before lowering the jib/platform structure.
NOTE: **Lower the masts fully before lowering the jib structure.**

Figure 8: Emergency Lowering - Mast Valve Figure

Locate the red lever behind the mast cover inspection door on the left hand side of the machine. By pushing the lever up, the mast will descend fully under gravity. Releasing the spring-loaded lever will cease this operation immediately if required.



9: Emergency Lowering - Jib Valve

The Jib may be manually lowered by operating the manual release valve located between the Jib Structure.

MANUAL ROTATION

1. Lower the masts and jib fully before manually slewing the assembly. Press the Emergency Stop Button to prevent inadvertent powered motion.
2. Locate the opening behind the front right drive wheel. Apply a 23 mm socket wrench with extension bar to the shaft and turn to rotate the elevating assembly. (Turning the front wheel fully to one side will facilitate this operation).

2.5 TRANSPORTATION

MACHINE WEIGHTS

Before transporting or lifting the MB20/26J machine be aware of its weight. It is very important to realise that the centre of gravity of the stowed machine is approximately 80 cm above ground and in the plane of the energy chain which is located on the back of the mast.

MB20J CE Version	=	2590 kg	
MB20J US Version	=	3012 kg	(6640 lbs)
MB26J CE Version	=	2660 kg	
MB26J US Version	=	3175 kg	(7000 lbs)

In cases of particular difficulties with lifting or shipping it is possible to remove the single block ballast from the machine. Remove the 13 screws connecting the ballast cover to the mast. Undo the 4 bolts connecting the ballast to the mast and use a forklift to remove the ballast block. The ballast block weighs 600 kg on MB20J, 460 kg on MB26J (CE version) and 1300kg on the US (ANSI) version.

WARNING

This work must not be carried out without the prior written permission of Snorkel.

LIFTING BY FORK-LIFT

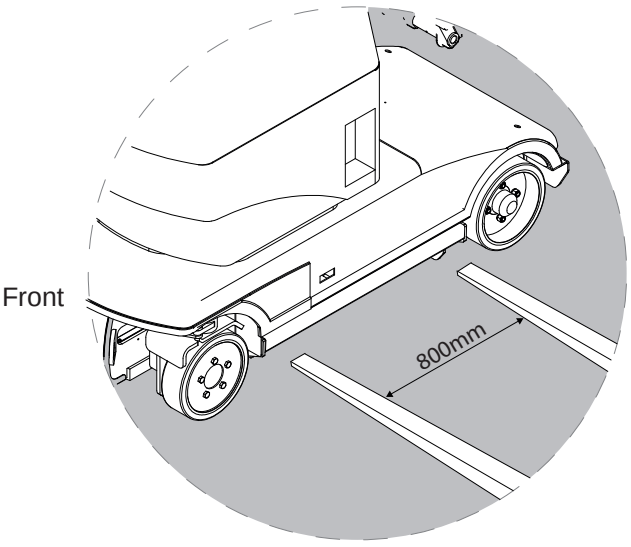
DANGER

Forklifting is for transport only. **See machine weights** and ensure that the forklift is of adequate capacity.

Figure 3: Lifting by Forklift

Adjust the forks so that the minimum clearance between them is 800mm as shown.

Approach the machine from either side but place the fork as close as possible to the front wheel as shown.



1. Never approach the MB20J from the front or rear while fork lifting.
2. Use maximum forklift tilt as soon as possible when raising the MB20/26J.
3. If travelling over sloped or uneven ground it is strongly recommended to temporarily tie the MB20J jib mount structure to the forklift mast as a safety precaution.
4. The MB20/26J may be lifted by forklift subject to the following strict procedure.
5. Ensure that the mast and jib are fully stowed and that the pothole bars are fully retracted (raised).

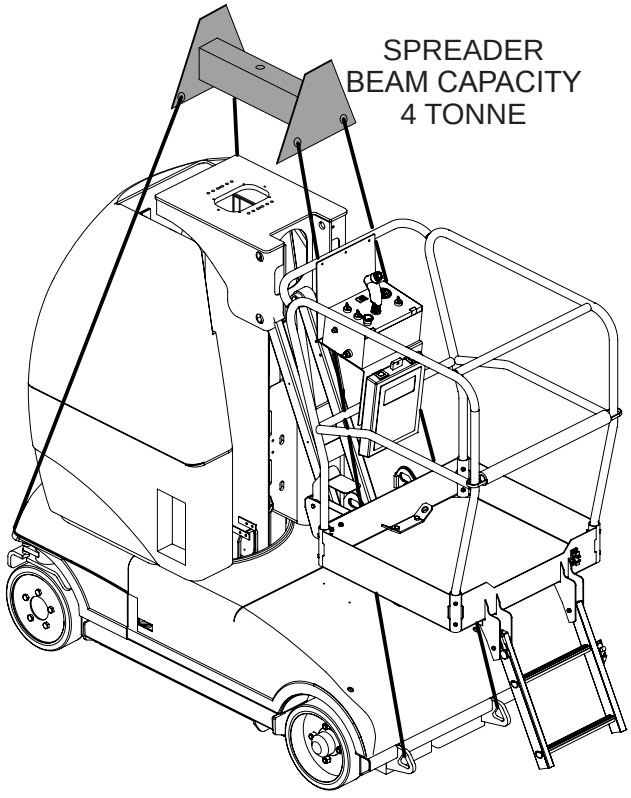
LIFTING BY CRANE

The MB20/26J may be lifted by an overhead hoist/crane subject to the following strict procedure.
Raise the jib to clear the lifting straps as shown.

Use 4 separate lifting straps connected to a spreader beam. DO NOT use a lesser number of threaded straps as these could slip and lead to instability. The recommended minimum capacity of EACH of the 4 straps is 2 tonne and the minimum length of each strap is 2 metres. Damage to the covers and/or cage rails can occur if a spreader beam is not deployed during a crane lift.

Figure 4: Lifting by Crane

Apply the straps via 2 tonne shackles to each of the 4 lifting lugs on the chassis.



CAUTION

DO NOT apply lifting straps to any other part of the machine.

TRANSPORT BY TRUCK

The MB20/26J can be carried on a suitably rated transportation vehicle or trailer. Because of its high gradeability, the machine can be driven under its own power on to a standard loading ramp (Up to 14 degrees).

It is recommended to reverse the machine up on to the truck thus forward travelling down the ramp at the delivery point. Winch-assisted loading is allowable for larger slopes, however, operate the trucks assist winch at minimum speed to avoid over-pressurising the hydraulic system in the machine.

When the MB20/26J is on the truck or trailer it should then be made secure by:-

1. Chocking the wheels.
2. Securing with adequate chains or straps to the lifting lugs on the chassis.

CAUTION

DO NOT loop straps through the cage, ladder or jib as this could cause permanent structural damage during transportation.

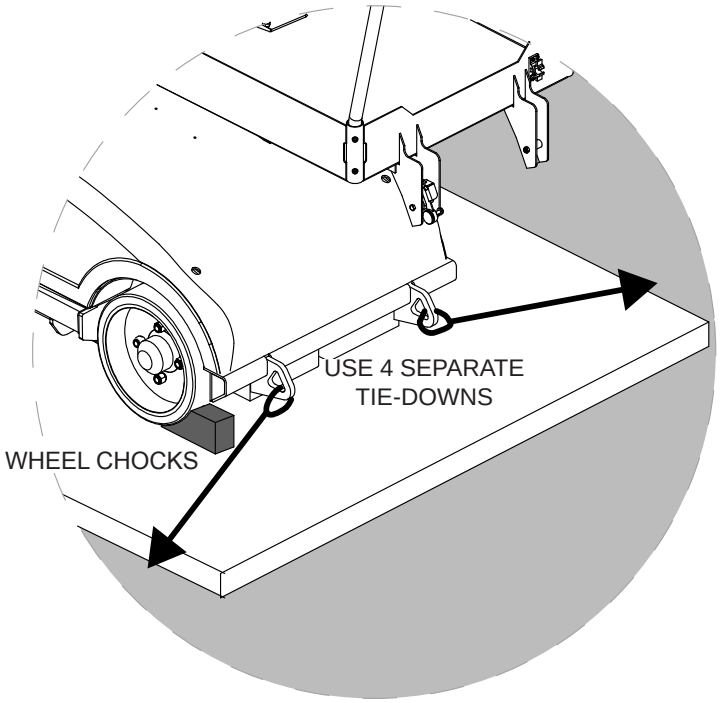


Figure 5: Securing the Platform

TOWING & WINCHING VALVES

The fail-safe brakes are automatically applied when the machine comes to a stop or in the event of total power loss due to low battery or malfunction of the hydraulic drive system.

To tow the vehicle or to winch it on to a truck it is necessary to hydraulically bypass the control valves and release these brakes.

Make sure the Jib is tied down securely during transport, DO NOT over tighten straps. Straps should have adequate slack so no downward force is applied to the Jib.

Proceed as follows:- (Refer to the valve block drawing Figure 6.)

1. Fully lower the jib boom and the mast sections. Rotate the mast into the stowed position.
2. Turn the Upper Control Box Keyswitch to the OFF position and remove the key.
3. Remove the rear GRP cover from the chassis and locate the hydraulic control valve block.
4. The hand valve marked ‘A’ should be turned fully clockwise to close. The hand valve marked ‘B’ should be turned fully anti-clockwise to open.
5. Operate the red handpump a number of times to develop sufficient pressure to ‘separate’ the internal brake disks. These brakes are integral with the hydraulic drive motors.

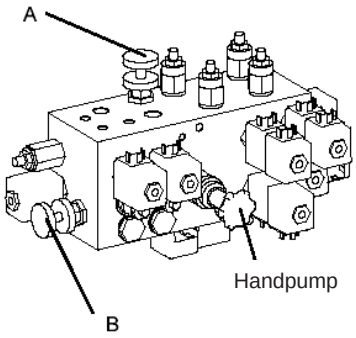
NOTE: The machine can now be safely towed or winched.

6. On completion of towing/winching, reverse the position of the rotary hand valves ‘A’ and ‘B’. The handpump becomes inoperative when the valves are returned to their normal position.

Figure 6: Valve Block-Towing Valves

WARNING

RISK OF SERIOUS INJURY. Releasing the brakes will cause the machine to move uncontrollably on a slope. Damaging momentum can be developed due to the large mass of a slow moving machine



2.6 AFTER USE & STORAGE

AFTER USE EACH DAY

1. Ensure that the platform (masts and jib) are fully lowered.
2. Park the machine on firm and level ground, never on a grass surface.
3. Turn the key switch to the OFF position and remove.
4. Put the batteries on charge.

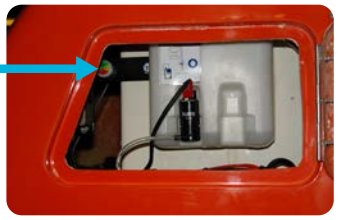
BATTERY CHARGING

Before charging check that:-

1. The correct mains voltage and current is available to the charger.

   The MB machine is fitted with a high output charging assembly. this consists of two 24V 30A 900W Chargers. The chargers can be linked together if the supply voltage and current are high enough to meet the power demand. If the power supply is not good enough, a single charger can be used. If this option is taken, it is important that charger ‘A’ is used, as it is the one linked to the remote display for battery charge level.

LED Remote Charge Indicator.



‘A’

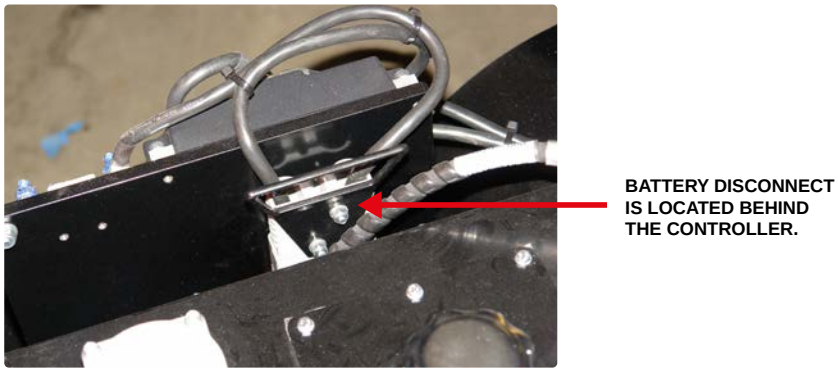
2. Check that the extension cord(s) is in good condition and is no longer than 8M (26fT). 1.5mm Sq (12 AWG) or larger cable is required. Ensure that the plug(s) is of the correct rating and is compatible with the electrical installation into which it will be plugged.
3. The charger(s) will turn on automatically after going through a self test sequence. the remote LED on the control Panel will indicate the status of charging.

LONG-TERM STORAGE

PRESERVATION

1. Clean and touch up damaged paint surfaces.
2. Fill the hydraulic tank to operating level with the platform fully lowered. Fluid should be visible on the tank dip stick.
3. Coat exposed portions of cylinder rods with a preservative such as multipurpose grease and wrap with barrier material.
4. Coat all exposed un-painted metal surfaces with a light oil or other preservative.
5. Cover the machine with tarpaulin if possible. If this is not available it is advisable to cover the mast and jib mount area as a minimum. This will prevent moisture from entering the mast, battery and chassis areas.

Figure 3: Battery Disconnect



BATTERIES

1. Disconnect the batteries at the quick connect plug and socket. This is located in the chassis between the controller and the hydraulic tank.
2. Disconnect the battery leads and tape up the lead terminals to ensure insulation.

   Better battery life and efficiency is achieved if the batteries are used consistently. It is therefore recommended that the batteries are used elsewhere if the machine is to be unused for an extended period (2 weeks or more).

W A R N I N G

RISK OF SERIOUS INJURY. Take particular care when handling batteries. Acid spills can cause severe burns or blindness.

DO NOT store batteries close to naked flames or close to steel fabrication areas.

DAILY PREVENTATIVE MAINTENANCE CHECKLIST

Daily preventative maintenance will prevent abnormal wear and prolong the life of all systems. The inspection & maintenance schedule should be performed at the specified intervals.

Inspection and maintenance shall be performed by personnel who are trained and familiar with mechanical and electrical procedures.

WARNING

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

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

This Daily checklist has been designed for machine service and maintenance. Please photocopy this page and use the checklist when inspecting the machine.

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 SERVICE	Y	N	R
BATTERY	Check electrolyte level.			
	Check battery cable condition.			
CHASSIS	Check hoses for pinch or rubbing points.			
	Check welds for cracks.			
CONTROL CABLE	Check the exterior of the cable for pinching, binding or wear.			
CONTROLLER	Check switch operation.			
DRIVE MOTORS	Check for operation and leaks.			
ELEVATING ASSEMBLY	Inspect for structural cracks.			
EMERGENCY LOWERING SYSTEM	Operate the emergency lowering valve & check for serviceability.			
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.			
TYRES AND WHEELS	Check for damage.			

Table 1: Daily Maintenance Checklist

SPECIFICATIONS

MB20J

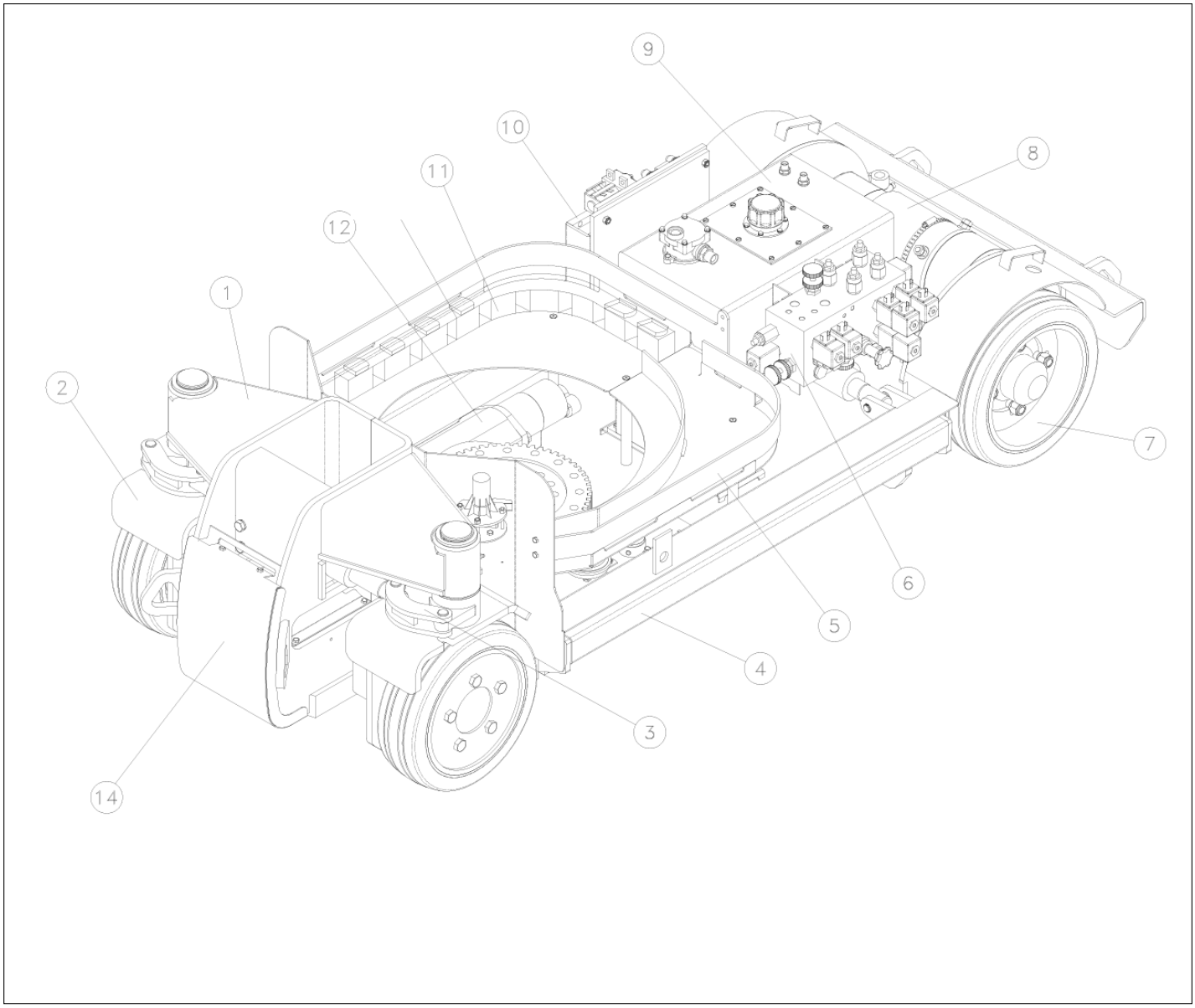
PARAMETER	MB20J EU VERSION	MB20J US VERSION
Duty Cycle	45%over 8 hour cycle	35%over 8 hour cycle
Platform Size	770mm x 730mm	30.5in. x 28.5in.
Maximum Platform Capacity	215kg.	425lbs.
Indoors	2 People	2 People
Outdoors	1 Person	2 People
Max Wind Speed	12.5 m/s	26.8 mph
Max Manual Force Per Person	200N	45lbs
Maximum Chassis Inclination	2°	2°
Heights:		
Maximum Platform Height	6.10m	20.00ft.
Maximum Working Height	8.10m	26.50ft.
Platform Height at Maximum Outreach	5.04m	16.54ft.
Maximum Working Outreach	2.64m	8.66ft
Stowed Dimensions:		
Length	2.430m	7.97ft.
Width	0.810m	32in.
Height	2.013m	6.60ft
Chassis Ground Clearance	90mm	3.54in.
Wheelbase x Wheel Gauge	1465mm x 708mm	4.81ft. x 2.32ft.
Rotation	360deg non-continuous	360 deg non-continuous
Gross Vehicle Weight	2590kg.	6640lbs.
Maximum Drive Speed - Stowed	3.30 km/h	2.05mph.
Maximum Drive Speed - Elevated	0.60km/h	0.37mph
Maximum Gradeability	25%	25%
Outside Turning Radius	1.90m	6.23ft.
Electrical:		
Power Source	4 x 6V @ 375Ah Battery	4 x 6V @ 375Ah Battery
System Voltage	24 Volt DC	24 Volt DC
Battery Charger (2 Per Machine)	24V x 30A, Output Auto Select AC input 100-240v -50/60Hz 12-6A	24V x 30A, Output Auto Select AC input 100-240v -50/60Hz 12-6A
Control System	Single Joystick, Function Selector, DC Motor Controller	Single Joystick, Function Selector, DC Motor Controller
Hydraulic System:		
System Relief Setting	220bar	3190psi
Hydraulic Oil Type	ISO VG46	ISO VG46
Hydraulic Tank Capacity	20 litres	5.3 gallons (U.S.)
Brakes	Spring applied hydraulically released	Spring applied hydraulically released
Wheel & Tyres	13.5in. x 4.0 solid, Non-Marking	13.5in. x 4.0 solid, Non-Marking
Wheel loading	1300kg per wheel	3466lbs per wheel
Vibration of this machine does not exceed	2.5m/sec x^2	2.5m/sec x^2
Noise Pressure Level	68dB (A) at Control Station	68dB (A) at Control Station

SPECIFICATIONS

MB26J

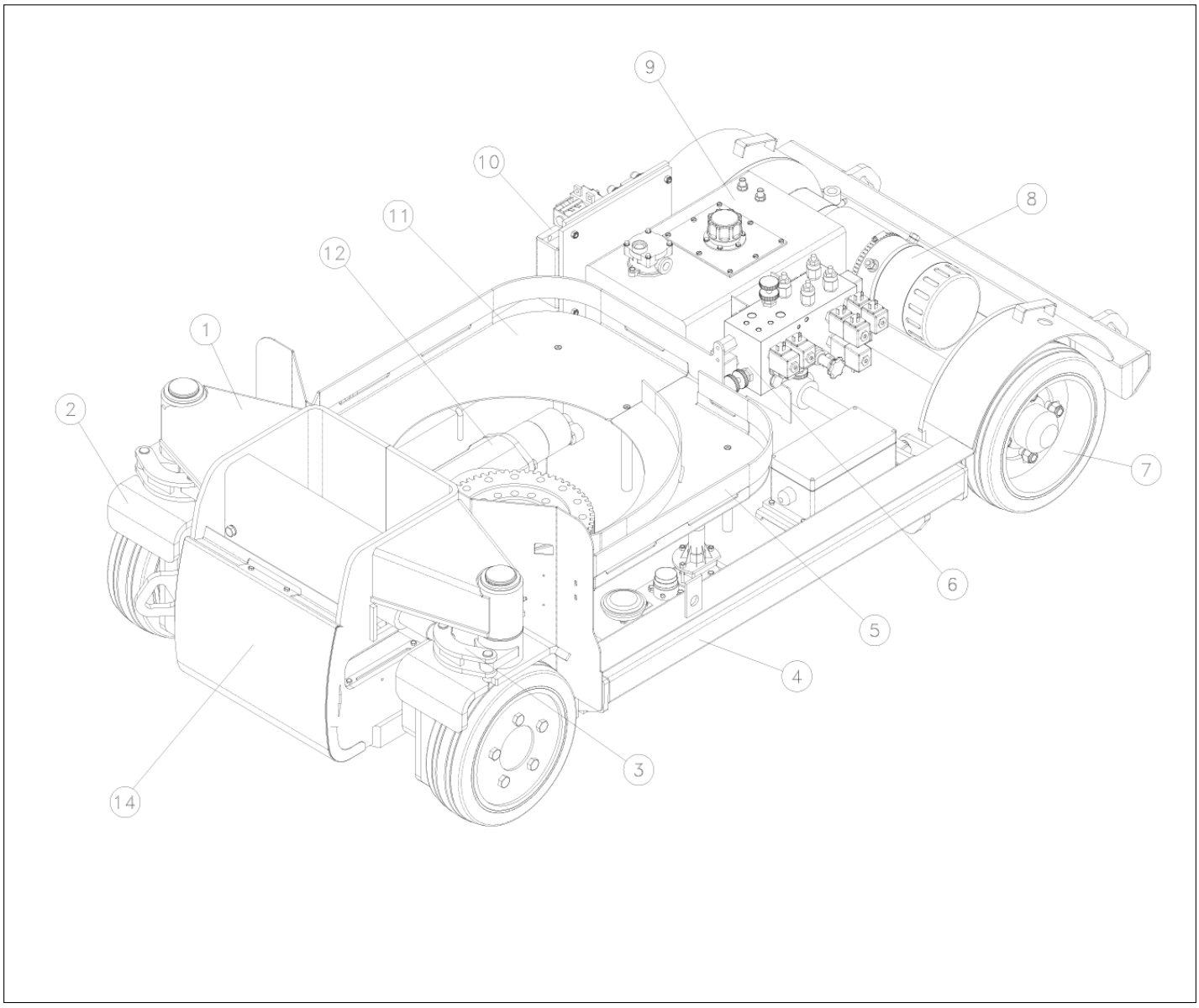
PARAMETER	MB26J EU VERSION	MB26J US VERSION
Duty Cycle	45%over 8 hour cycle	35%over 8 hour cycle
Platform Size	770mm x 730mm	30.5in. x 28.5in.
Maximum Platform Capacity	215kg.	475lbs.
Indoors	2 People	2 People
Outdoors	1 Person	2 People
Max Wind Speed	12.5 m/s	26.8 mph
Max Manual Force Per Person	200N	45lbs
Maximum Chassis Inclination	2°	2°
Heights:		
Maximum Platform Height	7.75m	25.45ft.
Maximum Working Height	9.75m	32.00ft.
Platform Height at Maximum Outreach	6.51m	21.36ft.
Maximum Working Outreach	3m	10ft.
Stowed Dimensions:		
Length	2.800m	9.2ft.
Width	1.010m	40in.
Height	2.010m	6.59ft.
Chassis Ground Clearance	90mm	3.54in.
Wheelbase x Wheel Gauge	1465mm x 890mm	4.81ft. x 2.93ft.
Rotation	360deg non-continuous	360 deg non-continuous
Gross Vehicle Weight	2660kg.	7000lbs.
Maximum Drive Speed - Stowed	3.13 km/h	1.94mph.
Maximum Drive Speed - Elevated	0.60km/h	0.37mph
Maximum Gradeability	25%	25%
Outside Turning Radius	1.93m	6.33ft.
Electrical:		
Power Source	4 x 6V @ 375Ah Battery	4 x 6V @ 375Ah Battery
System Voltage	24 Volt DC	24 Volt DC
Battery Charger (2 Per Machine)	24V x 30A, Output Auto Select AC input 100-240v -50/60Hz 12-6A	24V x 30A, Output Auto Select AC input 100-240v -50/60Hz 12-6A
Control System	Single Joystick, Function Selector, DC Motor Controller	Single Joystick, Function Selector, DC Motor Controller
Hydraulic System:		
System Relief Setting	220bar	3190psi
Hydraulic Oil Type	ISO VG46	ISO VG46
Hydraulic Tank Capacity	18 litres	4.7 gallons (U.S.)
Brakes	Spring applied hydraulically released	Spring applied hydraulically released
Wheels & Tyres	13.5in x 4.0 solid, Non-Marking	13.5in x 4.0 solid, Non-Marking
Wheel loading	1300kg per wheel	3566lbs per wheel
Vibration of this machine does not exceed	2.5m/sec x2	2.5m/sec x2
Noise Pressure Level	68dB (A) at Control Station	68dB (A) at Control Station

REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
1	500715-000	Chassis Weldment	1	EA
2	REF	Front Wheel Assembly	1	EA
3	REF	Steering Assembly	1	EA
4	REF	Pothole Assembly	1	EA
5	500840-002	Chain Side Plate - LH	1	EA
6	REF	Hydraulic Assembly	1	EA
7	REF	Rear Wheel Assembly	1	EA
8	501599-000	Pump/Motor Unit (Not in Hose Kit)	1	EA
9	501234-000	Hydraulic Tank (Not in Hose Kit)	1	EA
10	REF	Electrical Assembly	1	EA
11	500840-001	Chain Side Plate - RH	1	EA
12	REF	Slew Bearing Assembly	1	EA
13	501212-000	Chassis Energy Chain	1	EA
14	501290-000	Nose Cover	1	EA

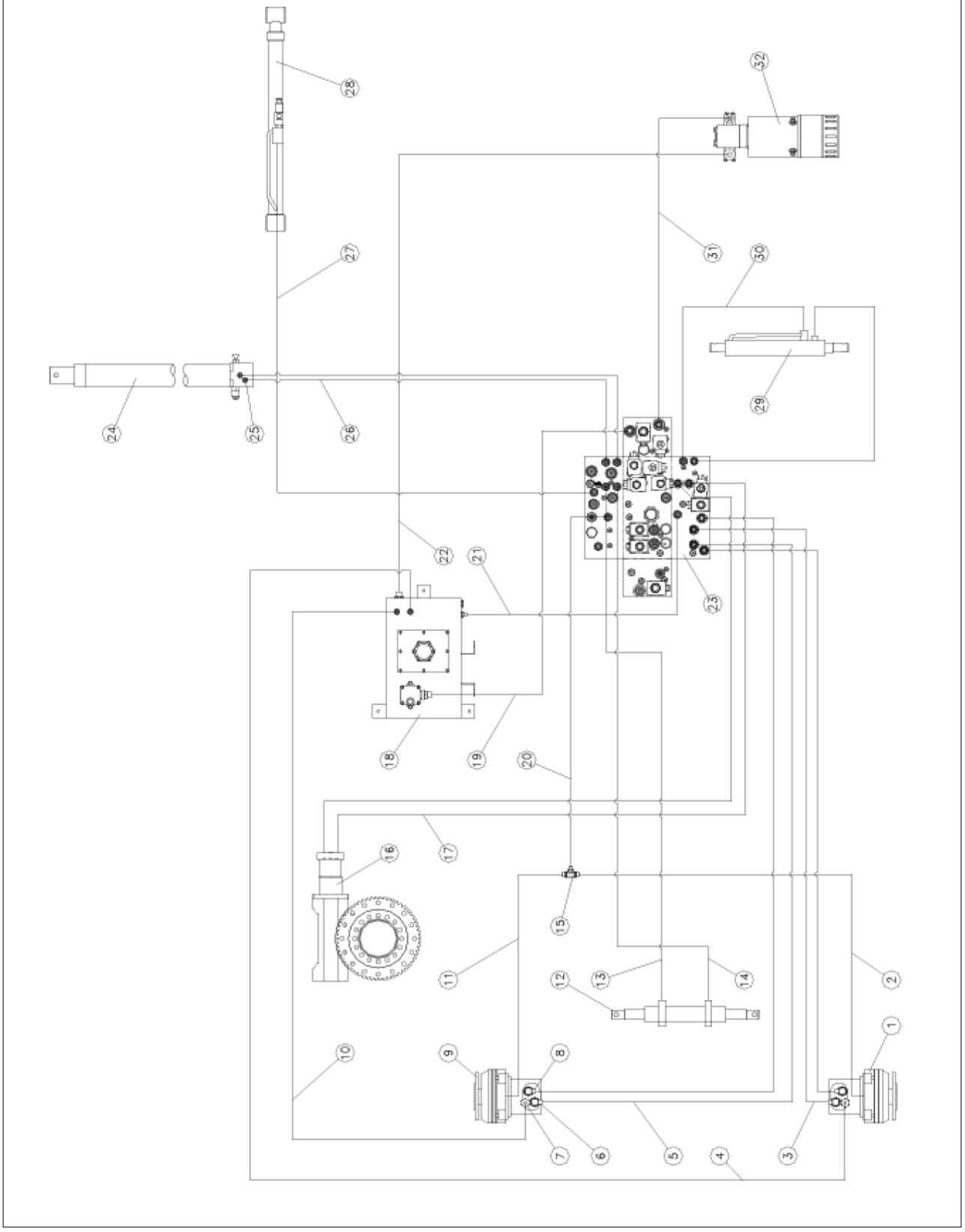
REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
1	500715-001	Chassis Weldment	1	EA
2	REF	Front Wheel Assembly	1	EA
3	REF	Steering Assembly	1	EA
4	REF	Pothole Assembly	1	EA
5	500840-002	Chain Side Plate - LH	1	EA
6	REF	Hydraulic Assembly	1	EA
7	REF	Rear Wheel Assembly	1	EA
8	501599-000	Pump/Motor Unit (Not in Hose Kit)	1	EA
9	501234-000	Hydraulic Tank (Not in Hose Kit)	1	EA
10	REF	Electrical Assembly	1	EA
11	500840-001	Chain Side Plate - RH	1	EA
12	REF	Slew Bearing Assembly	1	EA
13	501212-000	Chassis Energy Chain	1	EA
14	501290-001	Nose Cover	1	EA

REPAIR PARTS

HYDRAULIC COMPONENT ASSEMBLY

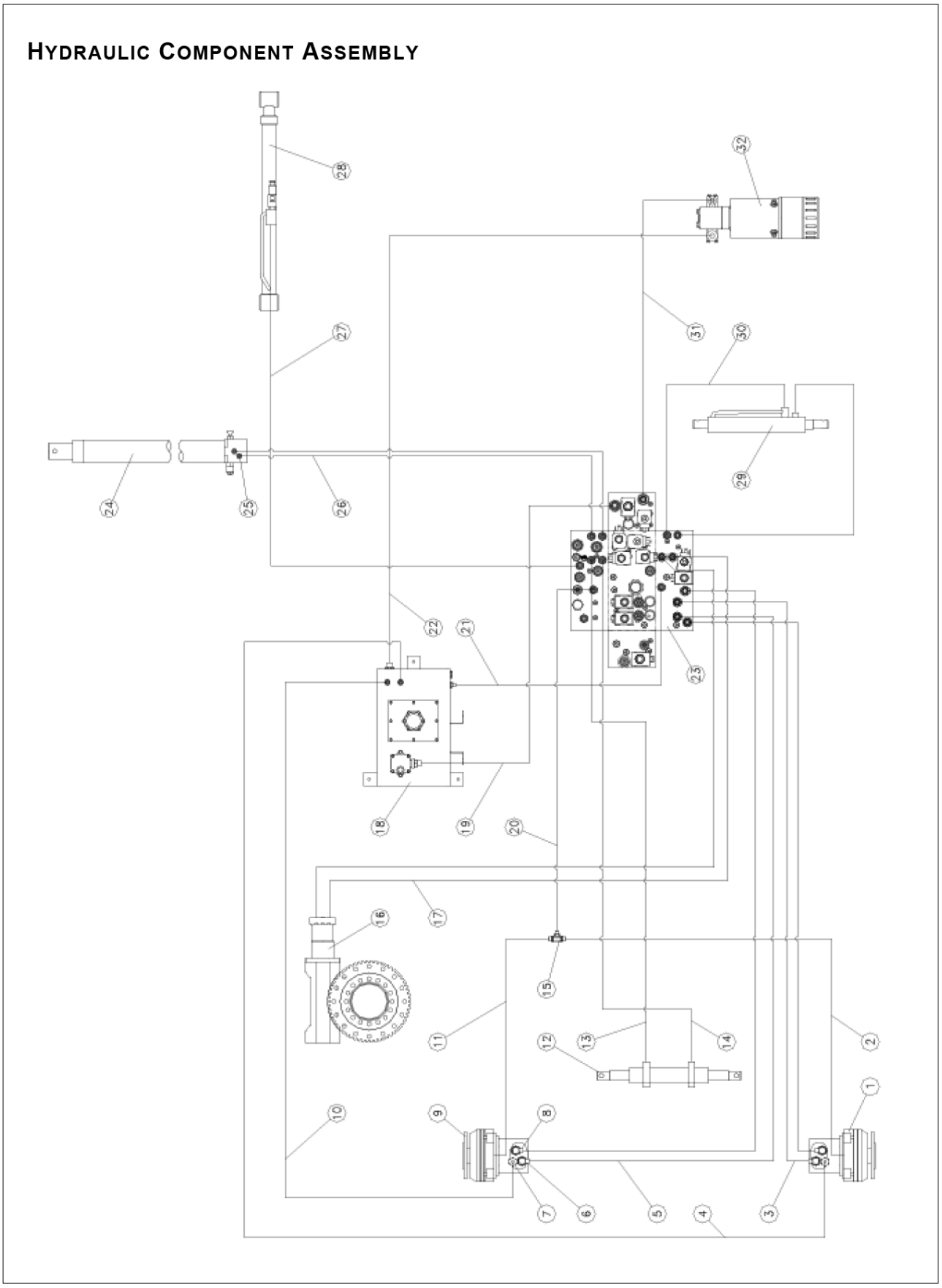


アイテム	部品番号	名前	数量	UOM
Not Shown	501236-000	MB20J Hydraulic Assembly		EA
1	501233-000	Wheel Motor R/H (Not in Hose Kit)	1	EA
2	501367-000	Hydraulic Hose	1	EA
3	501368-000	Hydraulic Hose	2	EA
4	501369-001	Hydraulic Hose	1	EA
5	501368-001	Hydraulic Hose	2	EA
6	501268-000	Swivel Fitting (Not in Hose Kit)	2	EA
7	501430-000	Swivel Fitting (Not in Hose Kit)	2	EA
8	501268-001	Swivel Fitting (Not in Hose Kit)	2	EA
9	501233-000	Wheel Motor R/H (Not in Hose Kit)	1	EA
10	501369-000	Hydraulic Hose	1	EA
11	501367-001	Hydraulic Hose	1	EA
12	500782-000	Steering Cylinder (Not in Hose Kit)	1	EA
13	501370-001	Hydraulic Hose	1	EA
14	501370-000	Hydraulic Hose	1	EA
15	058352-000	1/4" Tee	1	EA
16	500285-000	SLEW MOTOR	1	EA
17	501359-000	Hydraulic Hose	2	EA
18	501234-000	Hydraulic Tank (Not in Hose Kit)	1	EA
19	501364-000	Hydraulic Hose	1	EA
20	501336-000	Hydraulic Hose	1	EA
21	501363-000	Hydraulic Hose	1	EA
22	501361-000	Hydraulic Hose	1	EA
23	501471-000	Manifold Block (Not in Hose Kit)	1	EA
24	500780-000	Main Lift Cylinder (Not in Hose Kit)	1	EA
25	500784-000	Standpipe Adaptor (Not in Hose Kit)	2	EA

アイテム	部品番号	名前	数量	UOM
26	501365-000	Hydraulic Hose	2	EA
27	501366-000	Hydraulic Hose	1	EA
28	501480-000	Jib Cylinder (Not in Hose Kit)	1	EA
29	500783-000	Pothole Cylinder (Not in Hose Kit)	1	EA
30	501360-000	Hydraulic Hose	2	EA
31	501362-000	Hydraulic Hose	1	EA
32	501599-000	Pump/Motor Unit (Not in Hose Kit)	1	EA
Not Shown	057358-000	ADAPTOR 1/4" x 1/4"	8	EA
Not Shown	057124-000	Dowty Washer	8	EA
Not Shown	057352-000	BONDED SEAL 3/4 in SC	4	EA
Not Shown	057123-000	Adaptor (Pump Pressure)	1	EA
Not Shown	057376-000	Dowty Washer	1	EA
Not Shown	12-1006	Adaptor (Pump Suction)	1	EA
Not Shown	058590-000	Adaptor (Jib Cylinder)	1	EA

REPAIR PARTS

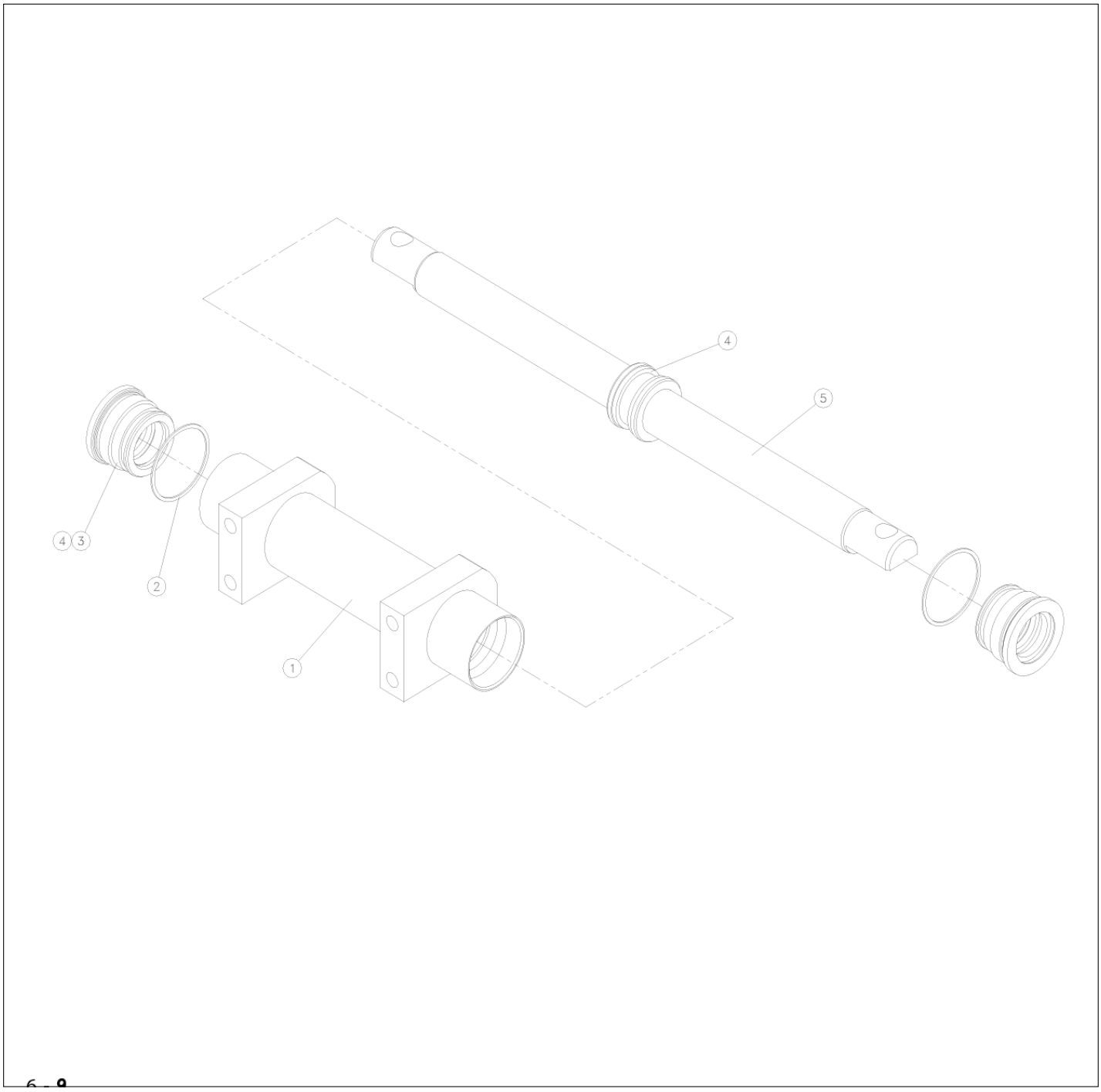
HYDRAULIC COMPONENT ASSEMBLY



アイテム	部品番号	名前	数量	UOM
Not Shown	501236-001	MB26J Hydraulic Assembly		EA
1	501233-000	Wheel Motor R/H (Not in Hose Kit)	1	EA
2	501371-000	Hydraulic Hose	1	EA
3	501372-000	Hydraulic Hose	2	EA
4	501373-001	Hydraulic Hose	1	EA
5	501372-001	Hydraulic Hose	2	EA
6	501268-000	Swivel Fitting (Not in Hose Kit)	2	EA
7	501430-000	Swivel Fitting (Not in Hose Kit)	2	EA
8	501268-001	Swivel Fitting (Not in Hose Kit)	2	EA
9	501233-001	Wheel Motor R/H (Not in Hose Kit)	1	EA
10	501373-000	Hydraulic Hose	1	EA
11	501371-001	Hydraulic Hose	1	EA
12	500782-001	Steering Cylinder (Not in Hose Kit)	1	EA
13	501374-001	Hydraulic Hose	1	EA
14	501374-000	Hydraulic Hose	1	EA
15	058352-000	1/4" Tee	1	EA
16	500285-000	SLEW MOTOR	1	EA
17	501359-000	Hydraulic Hose	2	EA
18	501234-000	Hydraulic Tank (Not in Hose Kit)	1	EA
19	501364-000	Hydraulic Hose	1	EA
20	501336-000	Hydraulic Hose	1	EA
21	501363-000	Hydraulic Hose	1	EA
22	501361-000	Hydraulic Hose	1	EA
23	501471-000	Manifold Block (Not in Hose Kit)	1	EA
24	500780-001	Main Lift Cylinder (Not in Hose Kit)	1	EA
25	500784-000	Standpipe Adaptor (Not in Hose Kit)	2	EA

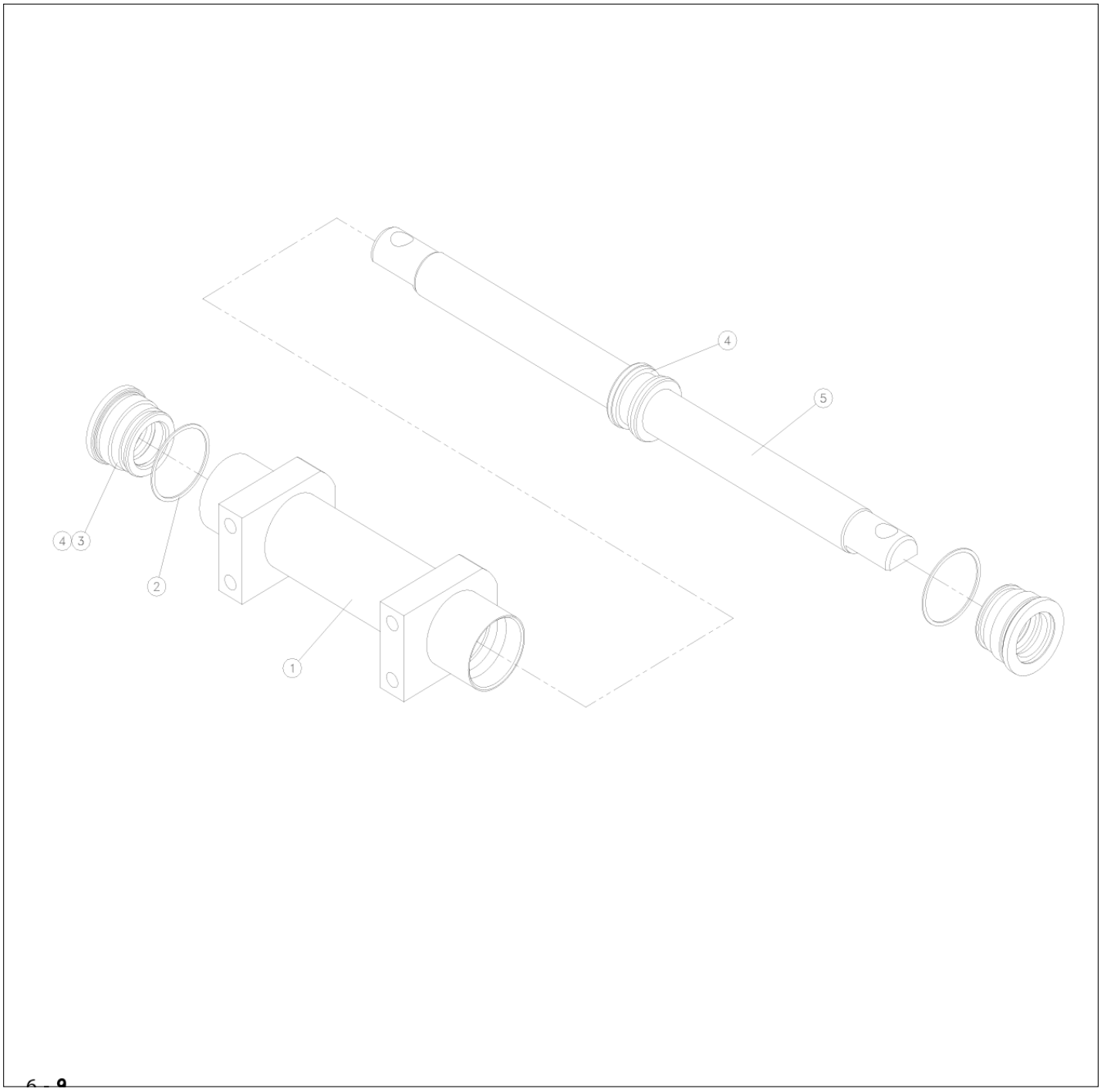
アイテム	部品番号	名前	数量	UOM
26	501365-000	Hydraulic Hose	2	EA
27	501366-001	Hydraulic Hose	1	EA
28	501480-001	Jib Cylinder (Not in Hose Kit)	1	EA
29	500783-001	Pothole Cylinder (Not in Hose Kit)	1	EA
30	501360-000	Hydraulic Hose	2	EA
31	501362-000	Hydraulic Hose	1	EA
32	501599-000	Pump/Motor Unit (Not in Hose Kit)	1	EA
Not Shown	057358-000	ADAPTOR 1/4" x 1/4"	8	EA
Not Shown	057124-000	Dowty Washer	10	EA
Not Shown	057352-000	BONDED SEAL 3/4 in SC	4	EA
Not Shown	057123-000	Adaptor (Pump Pressure)	1	EA
Not Shown	057376-000	Dowty Washer	1	EA
Not Shown	12-1006	Adaptor (Pump Suction)	1	EA
Not Shown	058590-000	Adaptor (Jib Cylinder)	1	EA

REPAIR PARTS



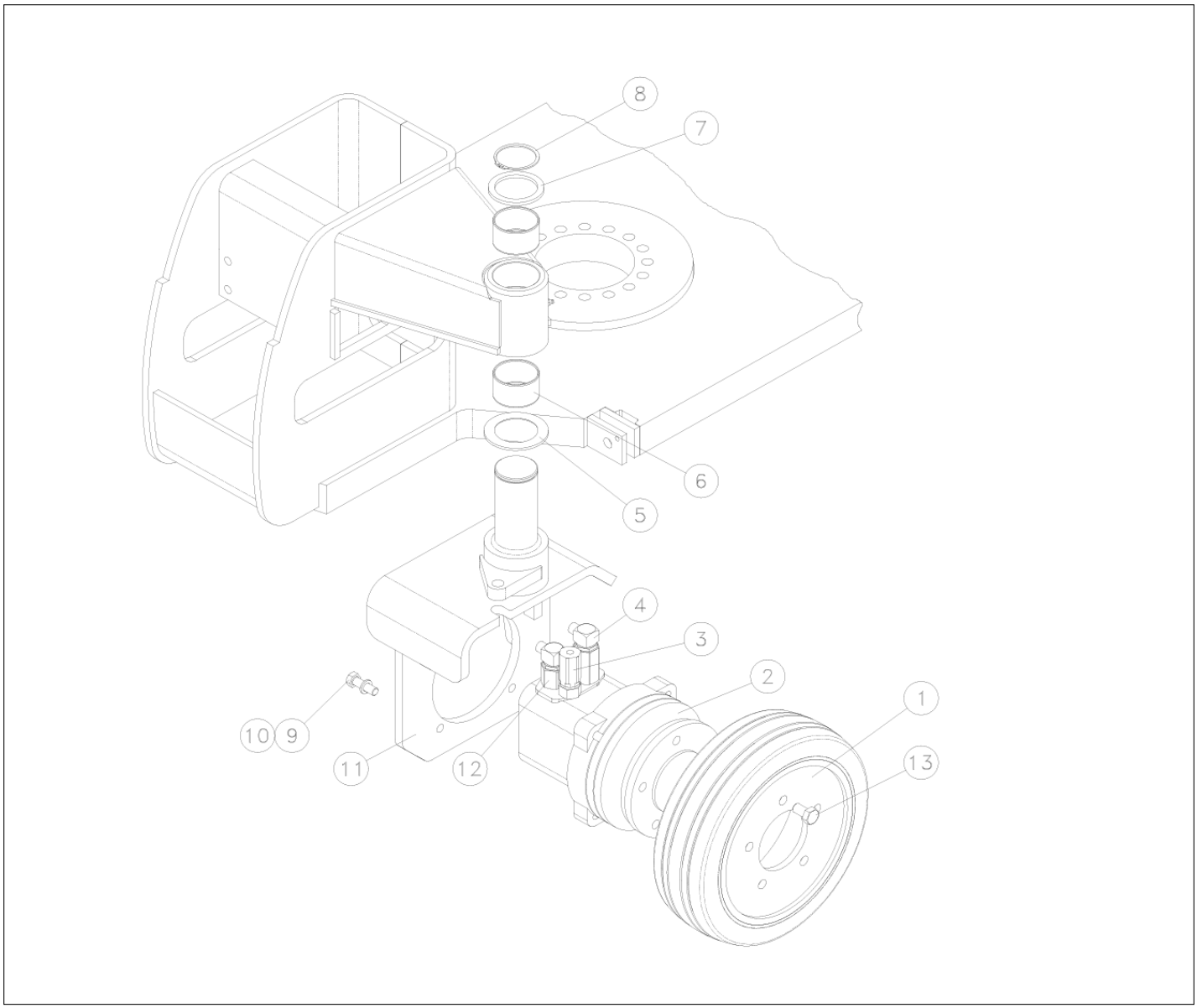
アイテム	部品番号	名前	数量	UOM
Not Shown	500782-000	Steering Cylinder (Not in Hose Kit)		EA
1	REF	CYLINDER BODY	1	EA
2	REF	Wa sher Tab	2	EA
3	REF	Body E nd C ap	2	EA
4	500460-000	SEAL KIT (CONTAINS 3, 5, 6 AND 7)	1	EA
5	REF	CYLINDER ROD	1	EA

REPAIR PARTS



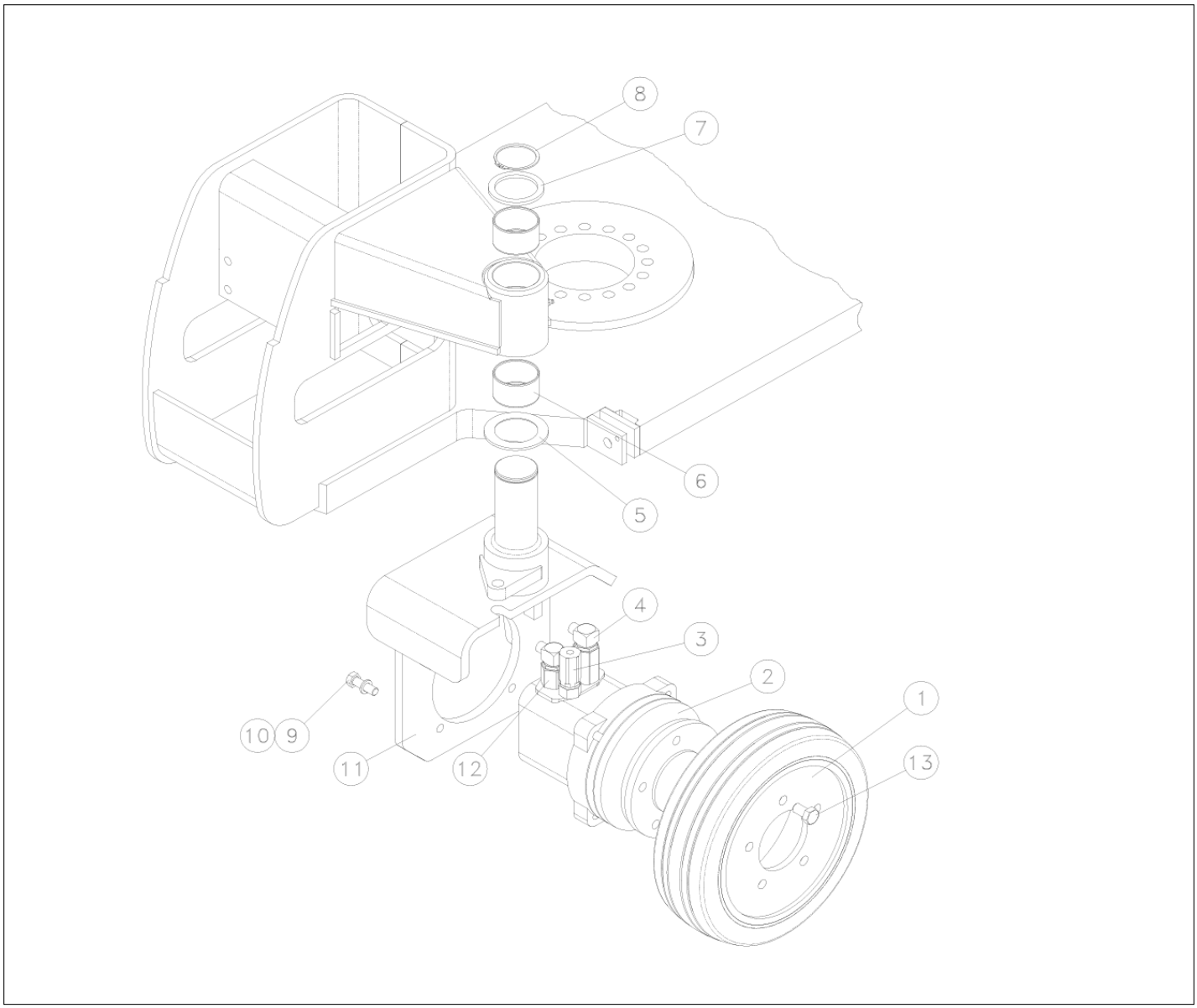
アイテム	部品番号	名前	数量	UOM
Not Shown	500782-001	Steering Cylinder (Not in Hose Kit)		EA
1	REF	CYLINDER BODY	1	EA
2	REF	Wa sher Tab	2	EA
3	REF	Body E nd C ap	2	EA
4	500460-000	SEAL KIT (CONTAINS 3, 5, 6 AND 7)	1	EA
5	REF	CYLINDER ROD	1	EA

REPAIR PARTS



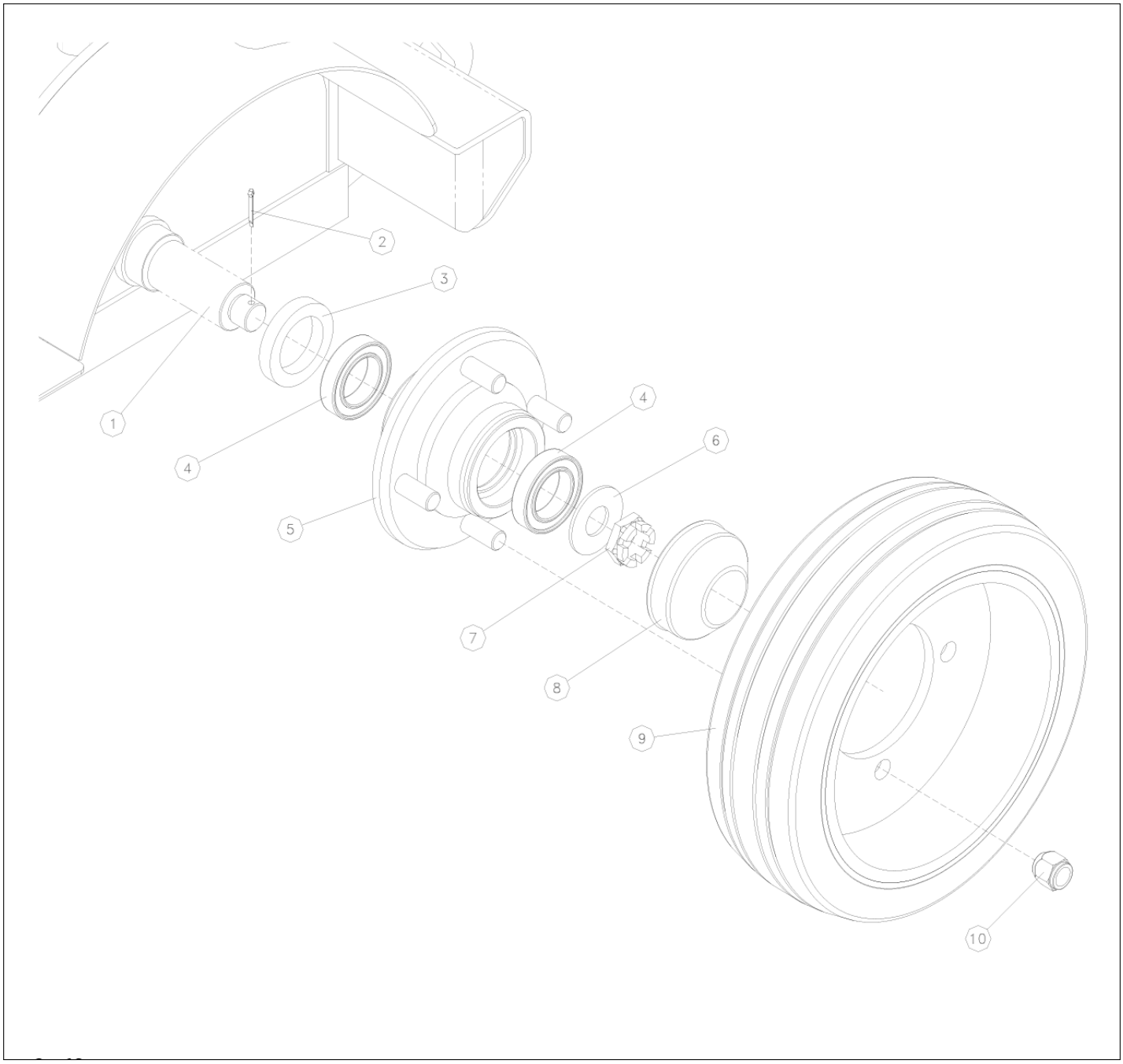
アイテム	部品番号	名前	数量	UOM
1	501625-000	Front Wheel	1	EA
2	501233-000	Wheel Motor R/H (Not in Hose Kit)	1	EA
3	501430-000	Swivel Fitting (Not in Hose Kit)	1	EA
4	501268-001	Swivel Fitting (Not in Hose Kit)	1	EA
5	501066-000	Thrust Washer	1	EA
6	501068-000	King Pin Bush	2	EA
7	500775-000	Steering Retaining Washer	1	EA
8	501055-000	Circlip	1	EA
9	058494-040	HHCS M12 x 1.75 x 40 G8.8 DIN 933	4	EA
10	056021-012	Washer, SpringWasher DIN127B M	4	EA
11	500730-000	Motor Mount Weldment	1	EA
12	501268-000	Swivel Fitting (Not in Hose Kit)	1	EA
13	501248-025	BOLT, HEXSETSCREW DIN961 M14 X 1.5 X 25MM 8.8 ZINCPLATED	5	EA

REPAIR PARTS



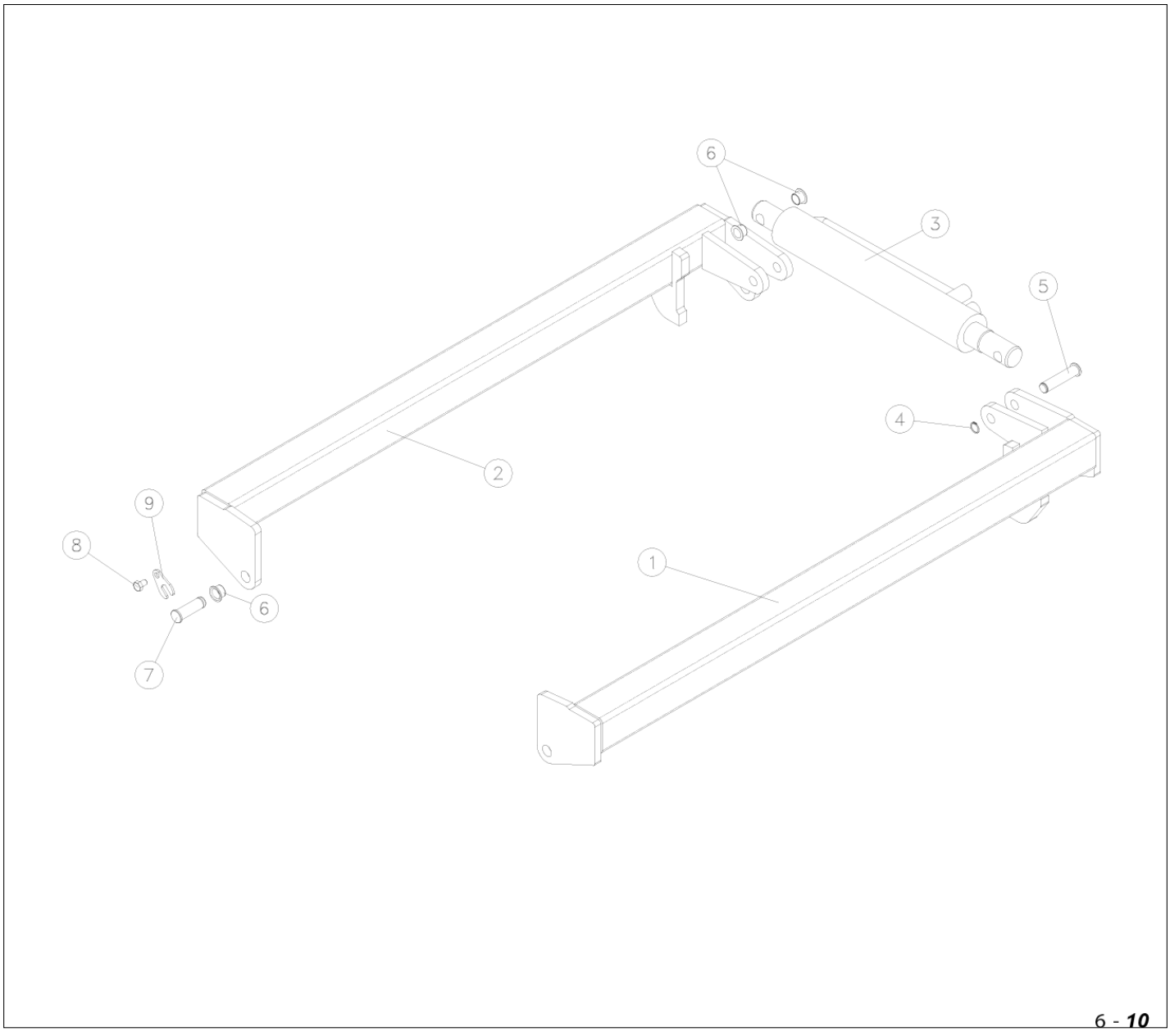
アイテム	部品番号	名前	数量	UOM
1	501625-000	Front Wheel	1	EA
2	501233-001	Wheel Motor R/H (Not in Hose Kit)	1	EA
3	501430-000	Swivel Fitting (Not in Hose Kit)	1	EA
4	501268-001	Swivel Fitting (Not in Hose Kit)	1	EA
5	501066-000	Thrust Washer	1	EA
6	501068-000	King Pin Bush	2	EA
7	500775-000	Steering Retaining Washer	1	EA
8	501055-000	Circlip	1	EA
9	058494-040	HHCS M12 x 1.75 x 40 G8.8 DIN 933	4	EA
10	056021-012	Washer, SpringWasher DIN127B M	4	EA
11	500730-001	Motor Mount Weldment	1	EA
12	501268-000	Swivel Fitting (Not in Hose Kit)	1	EA
13	501248-025	BOLT, HEXSETSCREW DIN961 M14 X 1.5 X 25MM 8.8 ZINCPLATED	5	EA

REPAIR PARTS



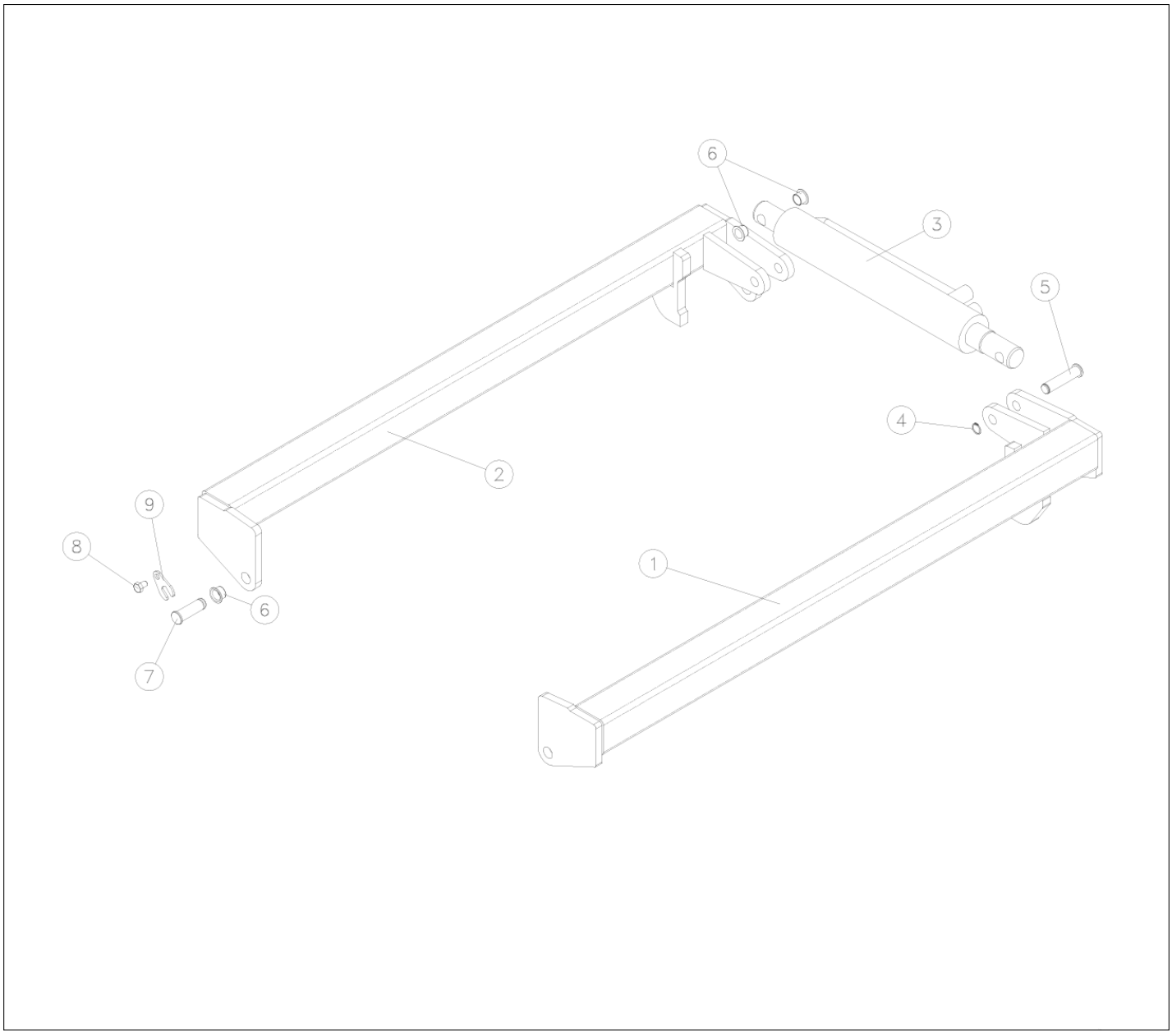
アイテム	部品番号	名前	数量	UOM
1	PNNA	Not a Serviceable Part		EA
2	501527-050	Split Pin	2	EA
3	501657-000	Oil Seal	2	EA
4	501668-000	Bearing	2	EA
5	501669-000	Wheel Hub	2	EA
6	056069-030	Washer	2	EA
7	508241-000	Castle Nut	2	EA
8	501658-000	Hub Cap	2	EA
9	501625-001	Rear Wheel	2	EA
10	500790-002	Wheel Nut	8	EA

REPAIR PARTS



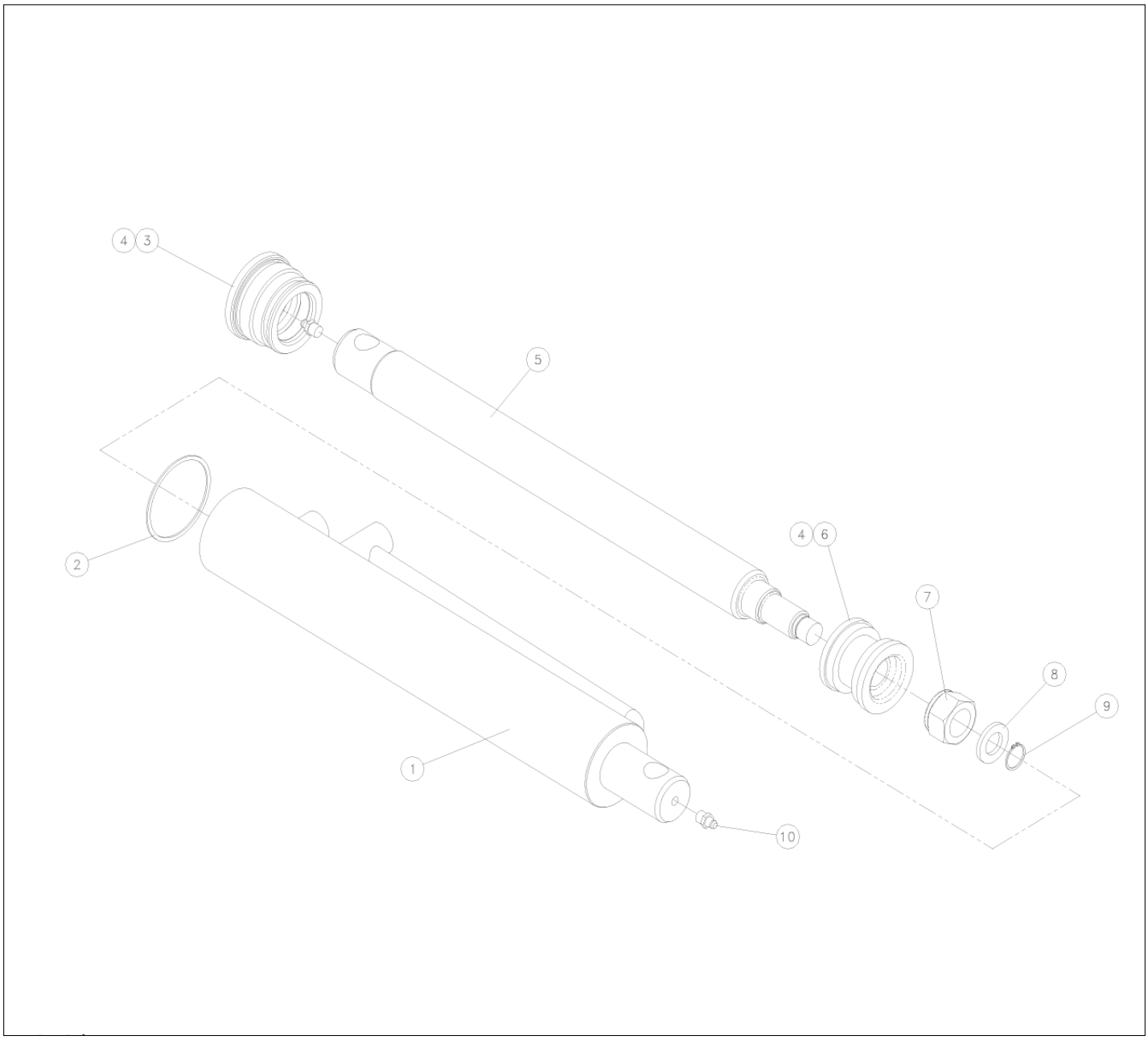
アイテム	部品番号	名前	数量	UOM
1	500726-002	Pothole Weldment - LH	1	EA
2	500726-003	Pothole Weldment - RH	1	EA
3	500783-000	Pothole Cylinder (Not in Hose Kit)	1	EA
4	501056-000	dia.15 EXTERNAL CIRCLIP	2	EA
5	501226-001	Pivot Pin	2	EA
6	501067-000	Flanged Bush (FMB 1512 DU)	8	EA
7	501570-000	Pivot Pin	4	EA
8	058492-012	Bolt HexSetScrew DIN933 M8 x 1	4	EA
9	500776-000	Retaining Plate	4	EA

REPAIR PARTS



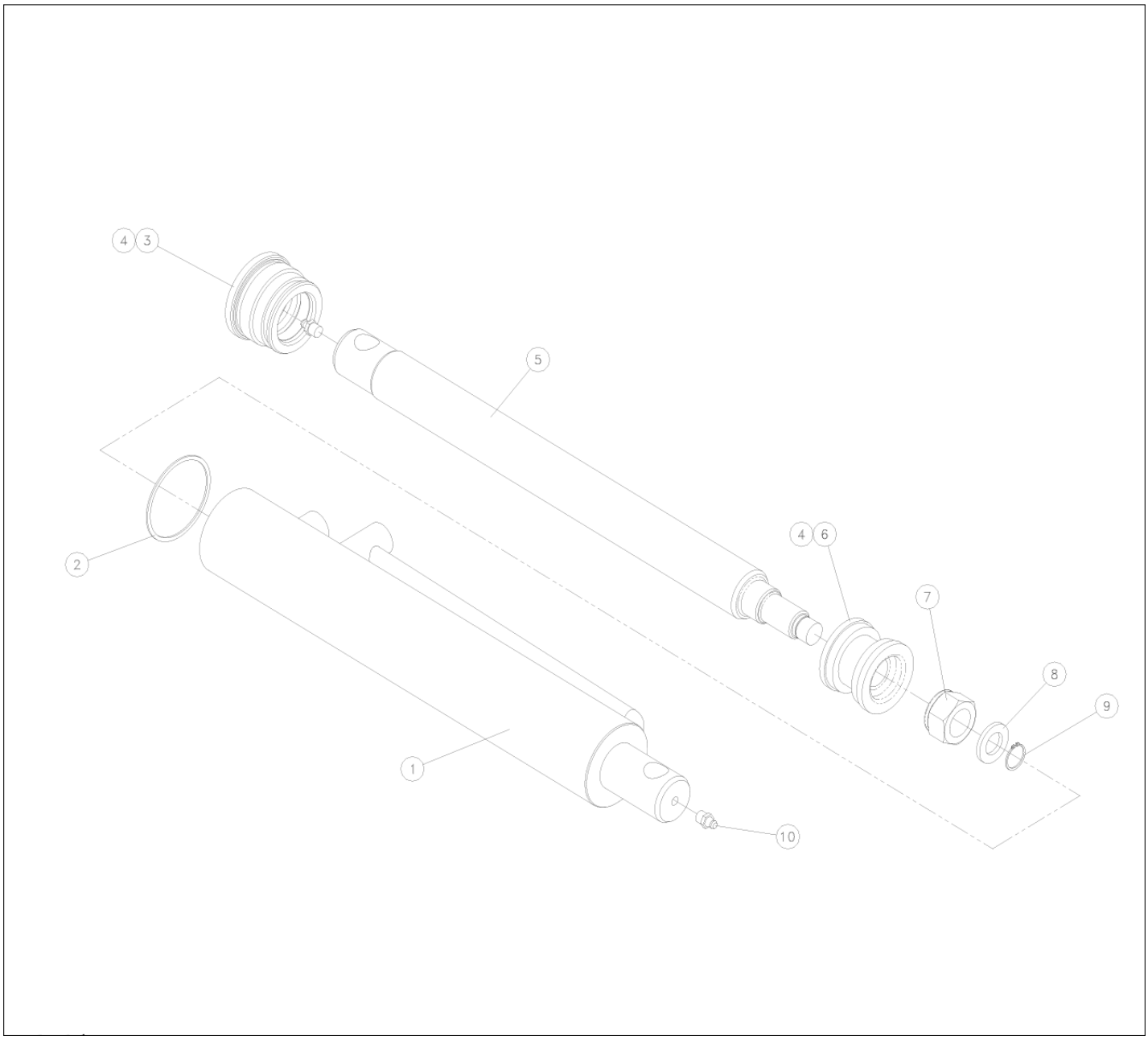
アイテム	部品番号	名前	数量	UOM
1	500726-002	Pothole Weldment - LH	1	EA
2	500726-003	Pothole Weldment - RH	1	EA
3	500783-001	Pothole Cylinder (Not in Hose Kit)	1	EA
4	501056-000	dia.15 EXTERNAL CIRCLIP	2	EA
5	501226-001	Pivot Pin	2	EA
6	501067-000	Flanged Bush (FMB 1512 DU)	8	EA
7	501570-000	Pivot Pin	4	EA
8	058492-012	Bolt HexSetScrew DIN933 M8 x 1	4	EA
9	500776-000	Retaining Plate	4	EA

REPAIR PARTS



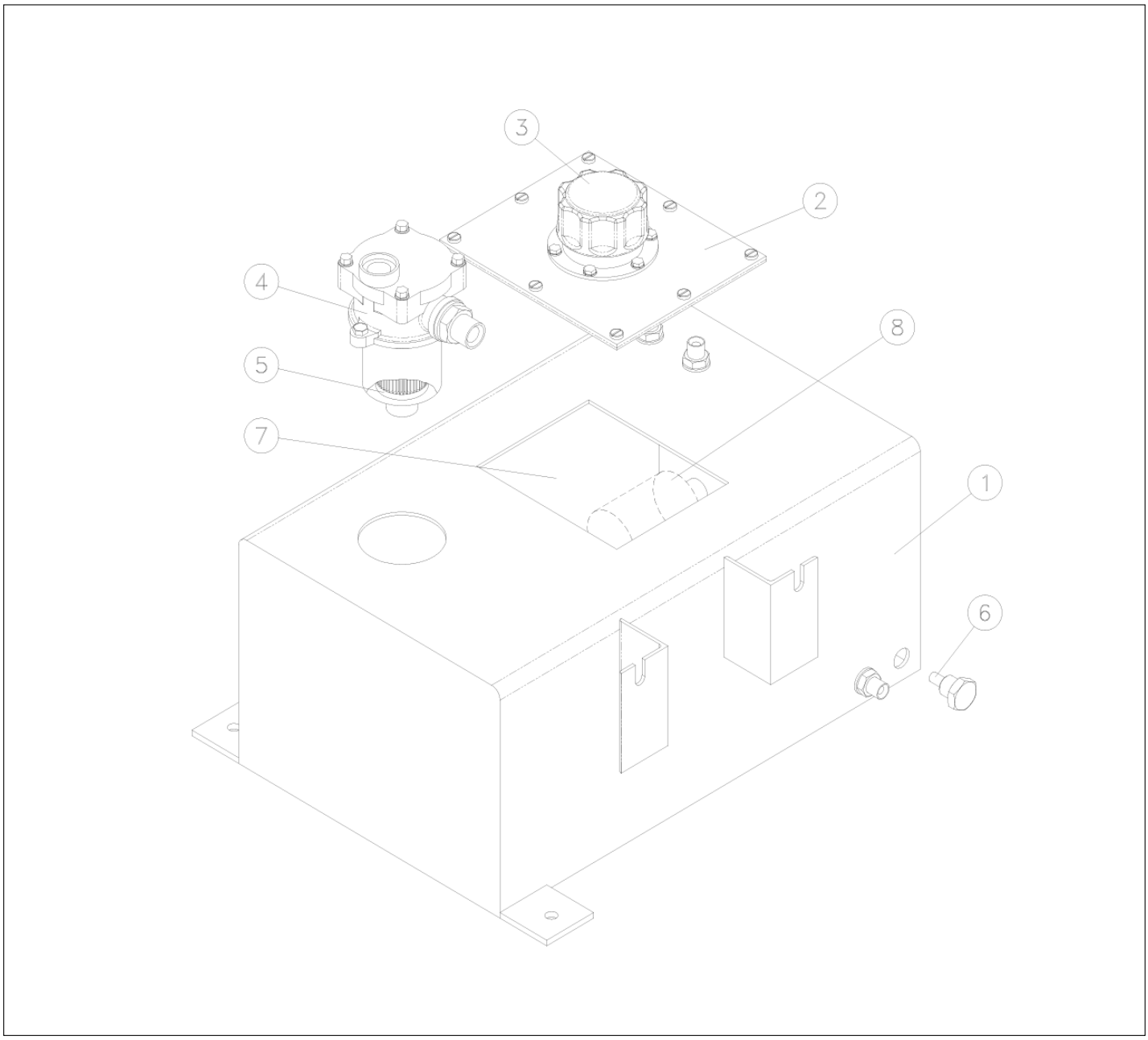
アイテム	部品番号	名前	数量	UOM
Not Shown	500783-001	Pothole Cylinder (Not in Hose Kit)		EA
1	REF	CYLINDER BODY	1	EA
2	REF	Wa sher Tab	1	EA
3	REF	Body End C ap	1	EA
4	500459-000	SEAL KIT (6 THRU 9, INCLUDING 12 AND 14)	1	EA
5	REF	CYLINDER ROD	1	EA
6	REF	PISTON HEAD	1	EA
7	REF	Locknut	1	EA
8	REF	Wa sher	1	EA
9	REF	CIRCLIP	1	EA
10	057048-000	GREASE NIPPLE	2	EA

REPAIR PARTS



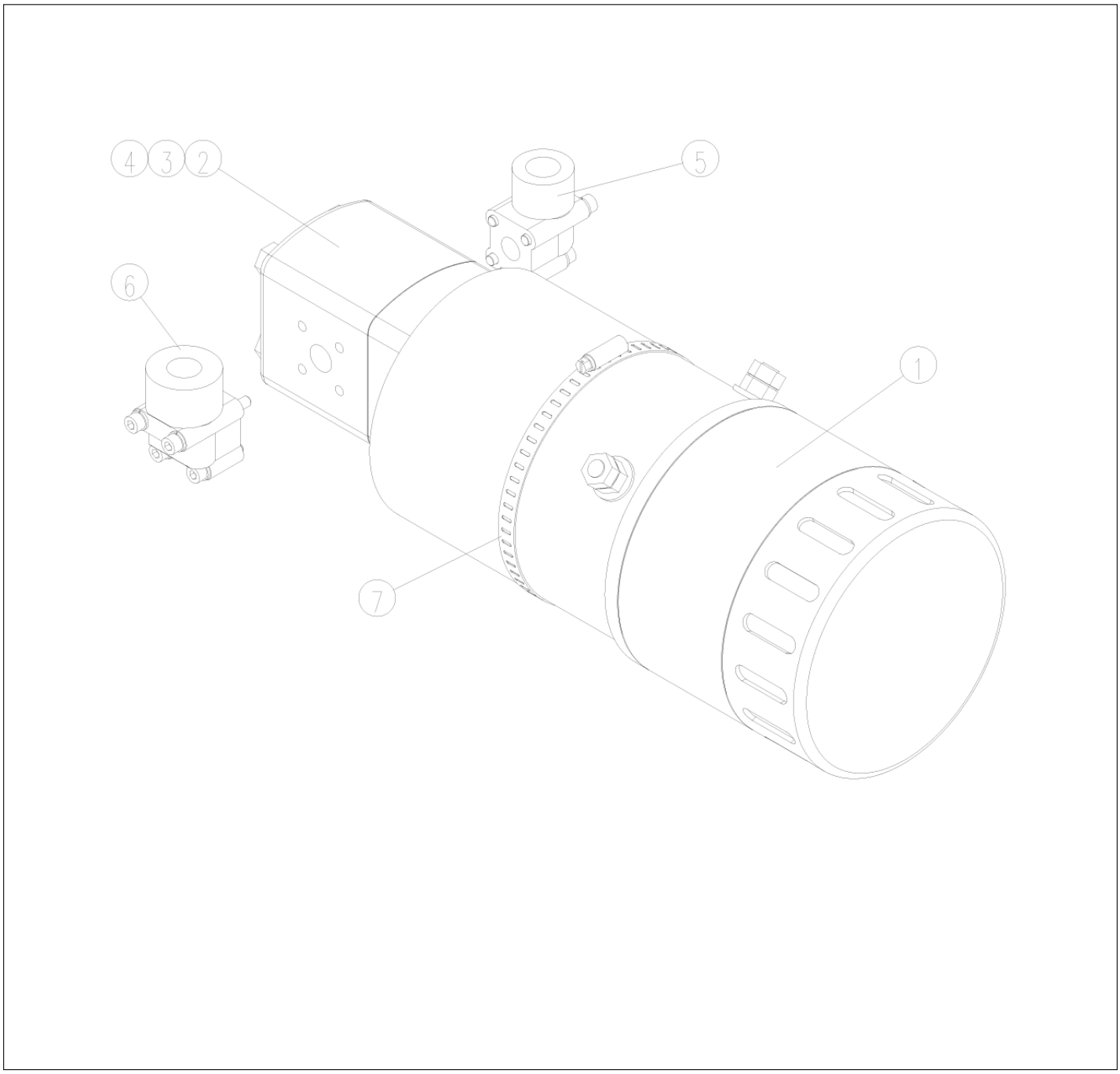
アイテム	部品番号	名前	数量	UOM
Not Shown	500783-000	Pothole Cylinder (Not in Hose Kit)		EA
1	REF	CYLINDER BODY	1	EA
2	REF	Wa sher Tab	1	EA
3	REF	Body End C ap	1	EA
4	500459-000	SEAL KIT (6 THRU 9, INCLUDING 12 AND 14)	1	EA
5	REF	CYLINDER ROD	1	EA
6	REF	PISTON HEAD	1	EA
7	REF	Locknut	1	EA
8	REF	Wa sher	1	EA
9	REF	CIRCLIP	1	EA
10	057048-000	GREASE NIPPLE	2	EA

REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
Not Shown	501234-000	Hydraulic Tank (Not in Hose Kit)		EA
1	500728-000	Tank Weldment	1	EA
2	500728-001	Inspection Lid & Gasket	1	EA
3	057534-000	FILLER / BREATHER CAP	1	EA
4	057532-000	RESERVOIR RETURN LINE FILTER ASSEMBLY(Inc Filter)	1	EA
5	058074-000	FILTER / WASHER / SPRING ASSEMBLY (Part of item 10)	1	EA
6	057108-000	Drain Plug	1	EA
7	057533-000	Hydraulic Oil ISO VG46	20 l.	EA
8	058359-000	Suction Filter	1	EA

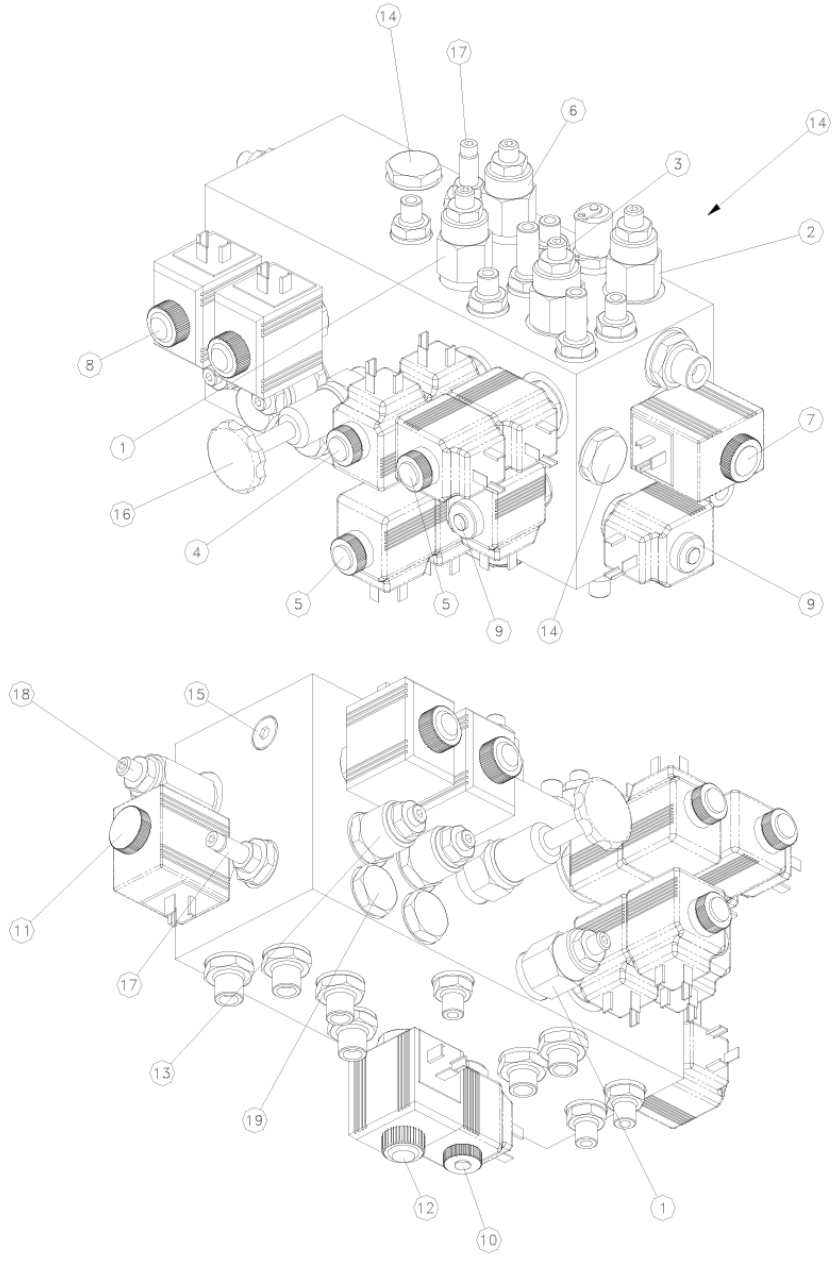
REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
Not Shown	501599-000	Pump/Motor Unit (Not in Hose Kit)		EA
1	501599-001	Electric Motor	1	EA
2	058862-000	HYDRAULIC PUMP	1	EA
3	058862-001	OIL SEAL	1	EA
4	058847-000	COUPLING	1	EA
5	501232-002	Pressure Port Adaptor Kit	1	EA
6	501232-003	Suction Port Adaptor Kit	1	EA
7	058114-000	Fixing Clip (Hose Clip)	1	EA
Not Shown	501757-000	Brushes (not shown)	1	EA

REPAIR PARTS

HYDRAULIC VALVE MANIFOLD 501471-000

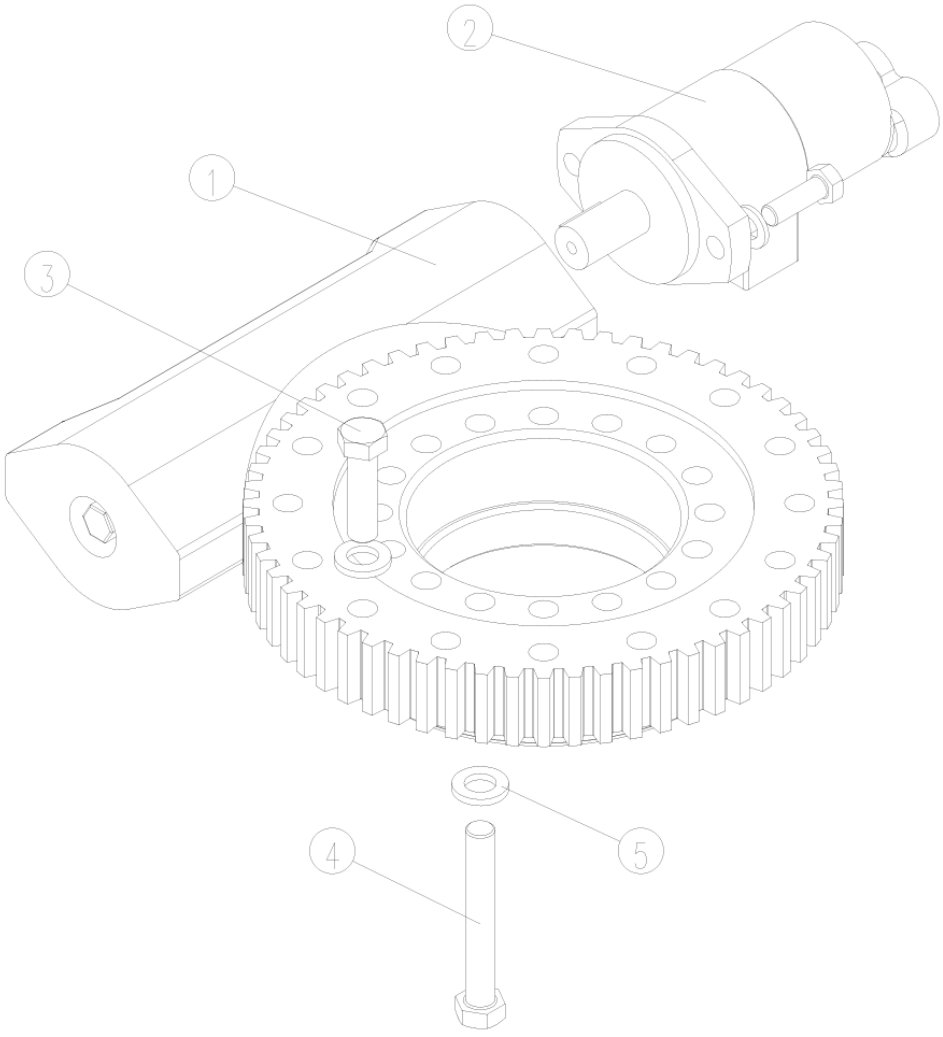


アイテム	部品番号	名前	数量	UOM
Not Shown	501471-000	Manifold Block (Not in Hose Kit)		EA
1	058722-001	Relief Cartridge CT12-13	2	EA
2	058722-002	Relief Cartridge CT10	1	EA
3	058722-003	Relief Cartridge CT11	1	EA
4	058723-000	Solenoid Cartridge CT1	1	EA
5	058726-002	Solenoid Cartridge CT2-6	2	EA
6	501486-000	Relief Cartridge CT25	1	EA
7	501526-000	Solenoid Cartridge CT3	1	EA
8	501527-000	Check Caartridge CT4-15	2	EA
9	501528-000	Solenoid Cartridge CT7-15	2	EA
10	501479-000	Solenoid Cartridge CT14	1	EA
11	501530-000	Solenoid Cartridge CT23	1	EA
12	501531-000	Solenoid Cartridge CT24	1	EA
13	6029632	#10 HAND PUMP, 1.36CC, BLACK	2	EA
14	501484-000	Check Cartridge CT16-26-30	3	EA
15	501534-000	Shuttle Cartridge CT17	1	EA
16	501535-000	Hand Pump CT19	1	EA
17	501485-000	Needle Cartridge CT20-21	2	EA
18	501537-000	Pressure Reducer CT22	1	EA
19	501539-000	P.O Check Cartridge CT27-28	2	EA
Not Shown	057377-000	Adaptors 1/2" x 1/2"	1	EA
Not Shown	057122-000	PISTON SEAL	7	EA
Not Shown	057358-000	ADAPTOR 1/4" x 1/4"	10	EA

REPAIR PARTS

Item 3 secures slewing ring to the mast assembly

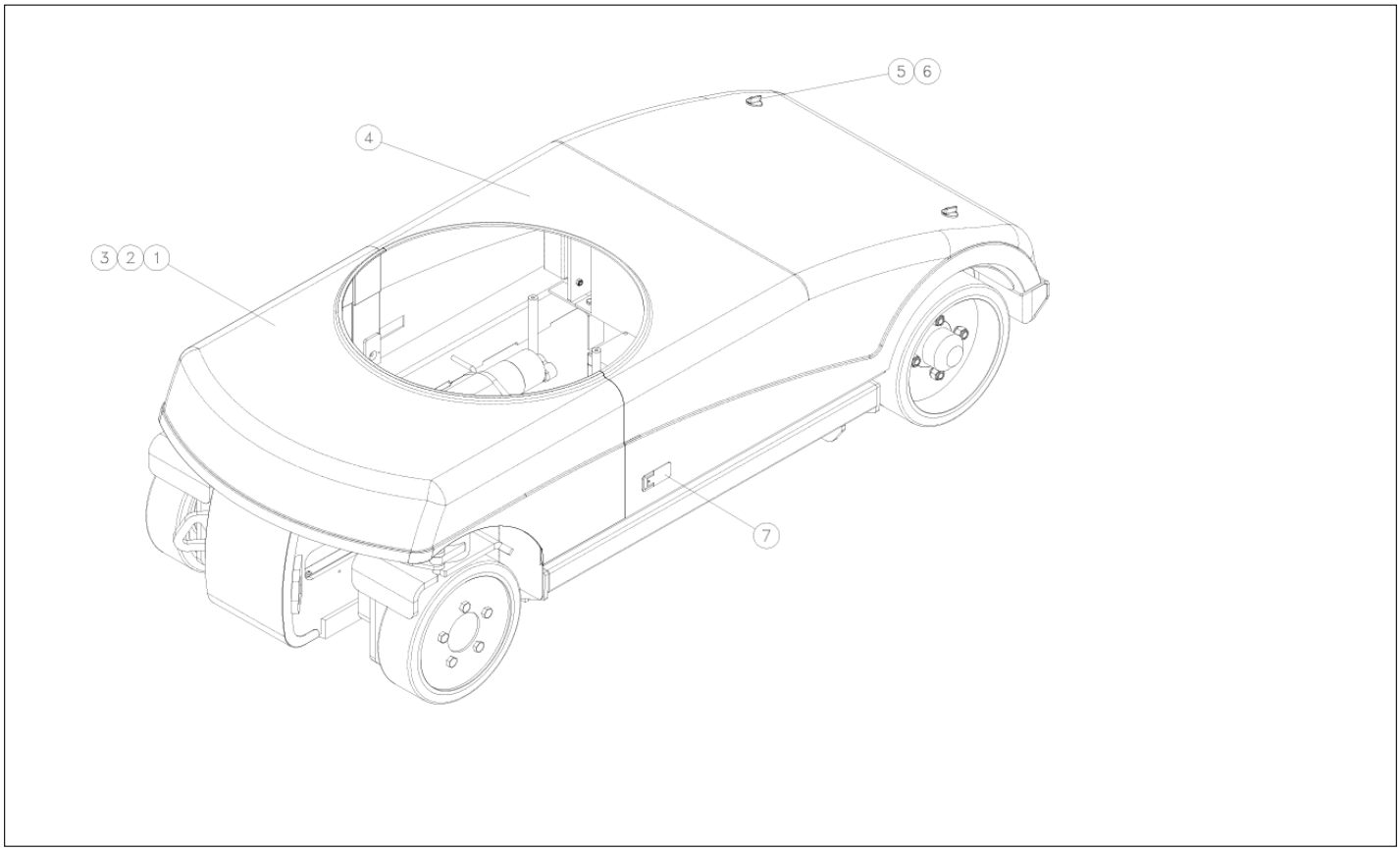
Item 4 secures slewing ring to the chassis



6 - 7

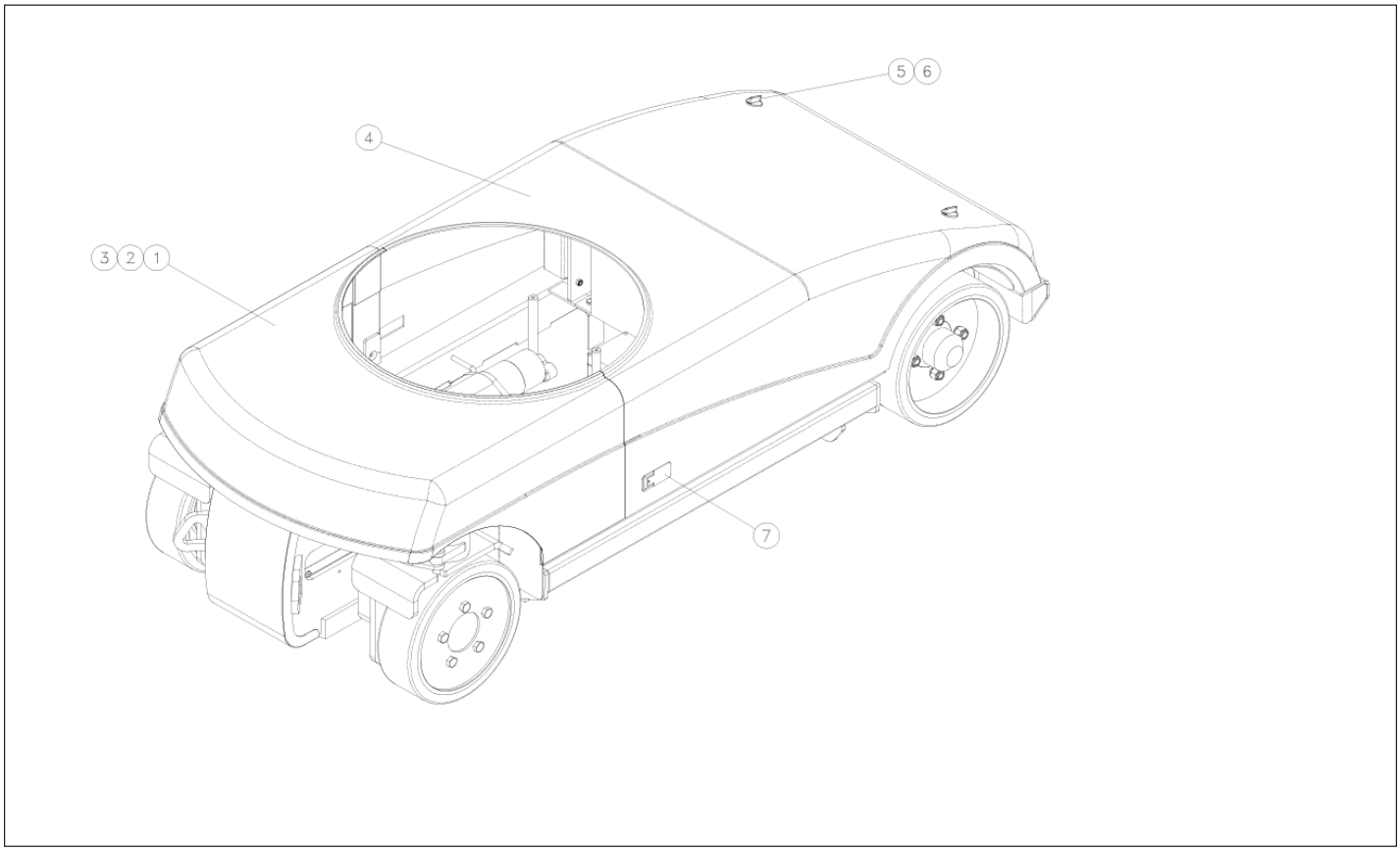
アイテム	部品番号	名前	数量	UOM
1	500284-000	SLEW DRIVE	1	EA
2	500285-000	SLEW MOTOR	1	EA
3	058480-060	Bolt, M16 x 60mm	16	EA
4	058480-110	Hex Hd Bolt	16	EA
5	500281-000	WSHR M16 HARDEND STL DIN 6016 PLTD	32	EA

REPAIR PARTS



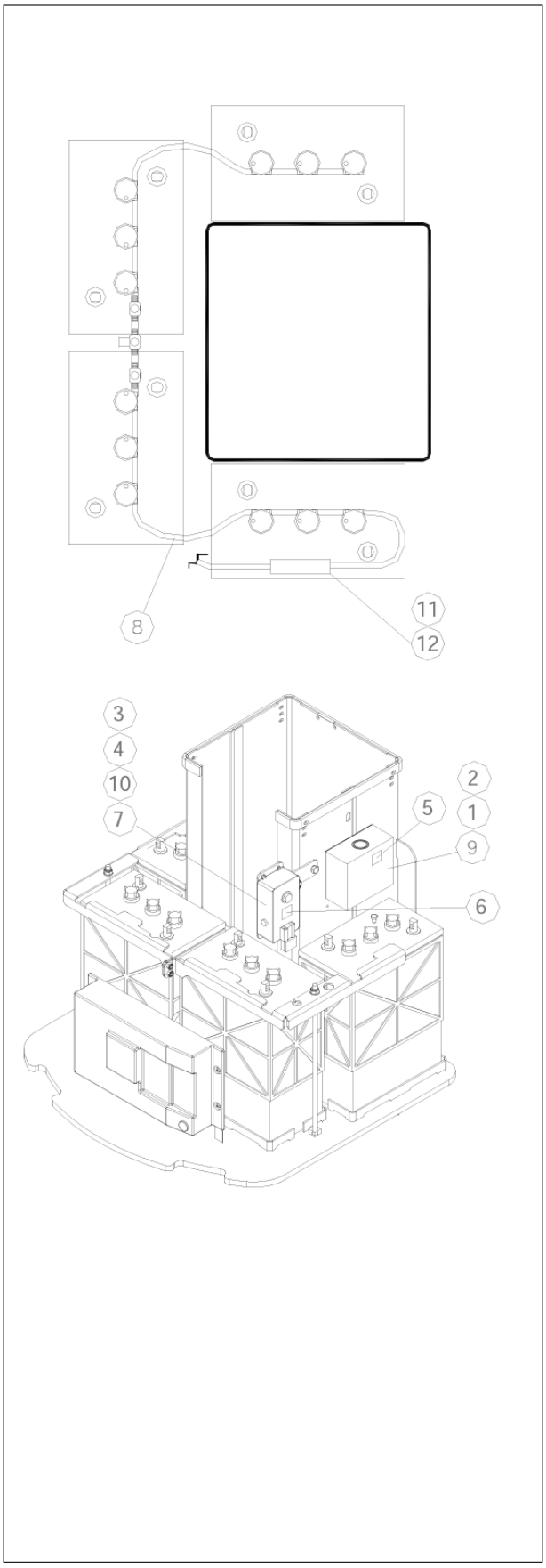
アイテム	部品番号	名前	数量	UOM
1	510836-000	Front Chassis Cover	1	EA
2	512667-000	Captive Screw	2	EA
3	500409-003	Captive Screw Recepticle	2	EA
4	510835-000	Rear Chassis Cover	1	EA
5	500465-001	Compression Latch	2	EA
6	500259-001	Spur Washer	2	EA
7	501348-000	Lift & Turn Latch	2	EA

REPAIR PARTS



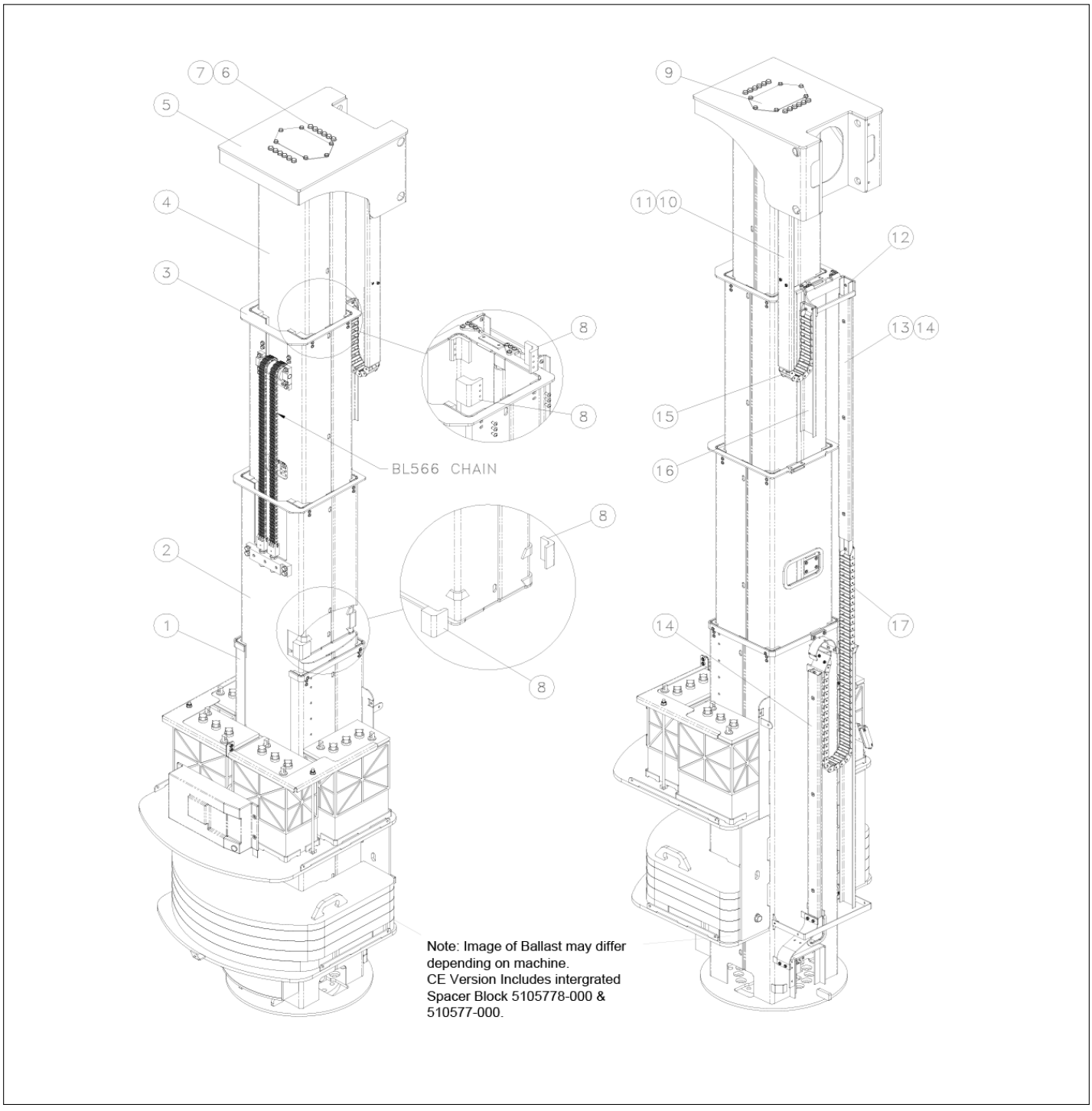
アイテム	部品番号	名前	数量	UOM
1	510838-000	Front Chassis Cover	1	EA
2	512667-000	Captive Screw	2	EA
3	500409-003	Captive Screw Recepticle	2	EA
4	510837-000	Rear Chassis Cover	1	EA
5	500465-001	Compression Latch	2	EA
6	500259-001	Spur Washer	2	EA
7	501348-000	Lift & Turn Latch	2	EA

REPAIR PARTS



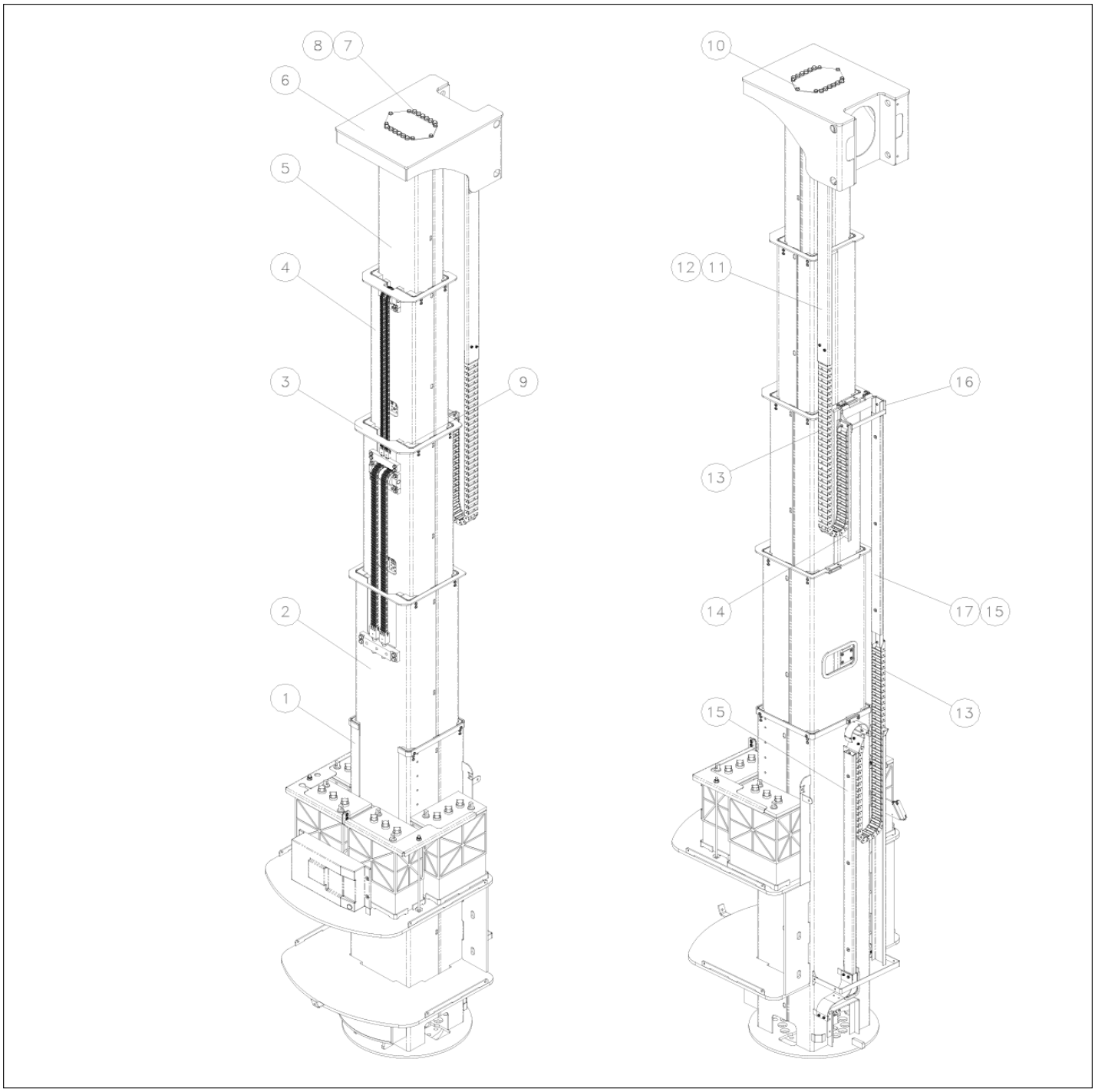
アイテム	部品番号	名前	数量	UOM
Not Shown	501652-000	WATER FILL SYSTEM		EA
1	501253-012	M6 x 12 Button HD. screw - 12.9	2	EA
2	056069-006	WSHR STEELFLATWSHE M6 DIN125A	2	EA
3	058500-016	M4 x 16 SOCKET HD CAP SCREW - 12.9	4	EA
4	056066-004	NUT NYLOCK DIN985 M4 8.0 ZP	4	EA
5	501643-000	System Operating Decal	1	EA
6	508503-000	Decal, Caution Batfill Battery	1	EA
7	501649-000	Indicator Mounting Plate	1	EA
8	501891-010	Battery Float Cap Kit	1	EA
9	501890-000	Topping Bottle	1	EA
10	501892-000	Control Box Assenbly	1	EA
11	510005-000	1/4 BSPP Equal Female Mini Ball Valve	1	EA
12	510006-000	1/4 OD x 1/4 BSPT 6mm OD Male Push in Fitting	2	EA

REPAIR PARTS



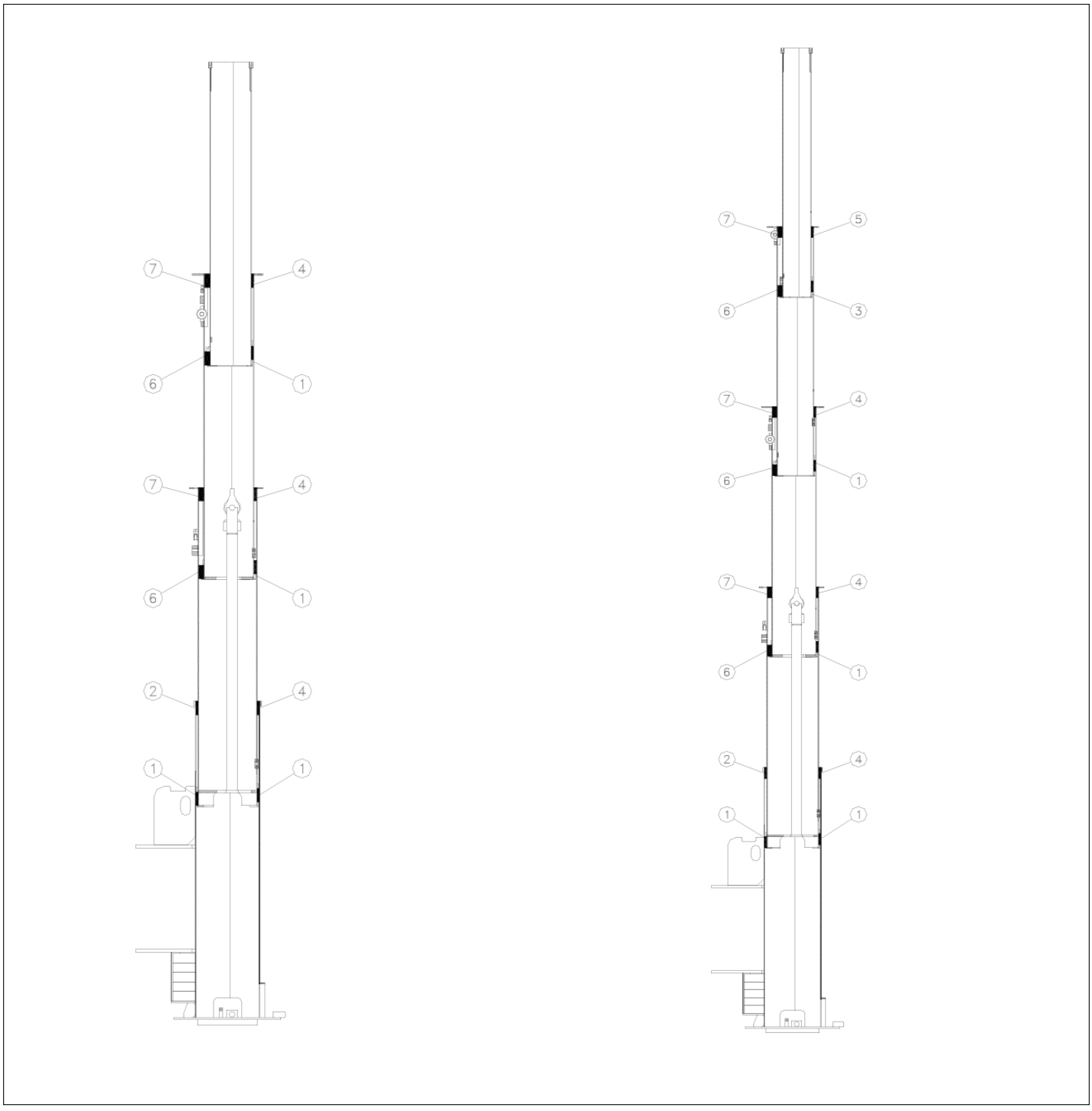
アイテム	部品番号	名前	数量	UOM
1	500717-000	Mast #1 Weldment	1	EA
2	500718-000	Mast #2 Weldment	1	EA
3	500719-000	Mast #3 Weldment	1	EA
4	500720-000	Mast #4 Weldment	1	EA
5	500721-000	Jib Mount Weldment	1	EA
6	056060-050	Bolt, HexBolt DIN931 M10 x 50m	12	EA
7	056069-010	Washer, SteelFlatWasher DIN125A M10 ZincPlated	12	EA
8	501659-000	Wear Pad Kit	1	EA
9	500861-000	Jib Mount Cover Plate	1	EA
10	500871-001	Slide Channel	1	EA
11	500882-000	Slide Channel Cover	1	EA
12	501550-000	Energy Chain Weldment	1	EA
13	500875-000	Lower Guide Trunking	1	EA
14	501274-000	Trunking Cover	2	EA
15	501211-001	Mast Energy Chain (27 L)	1	EA
16	500871-002	Slide Channel	1	EA
17	501211-000	Mast Energy Chain (50 L)	1	EA

REPAIR PARTS



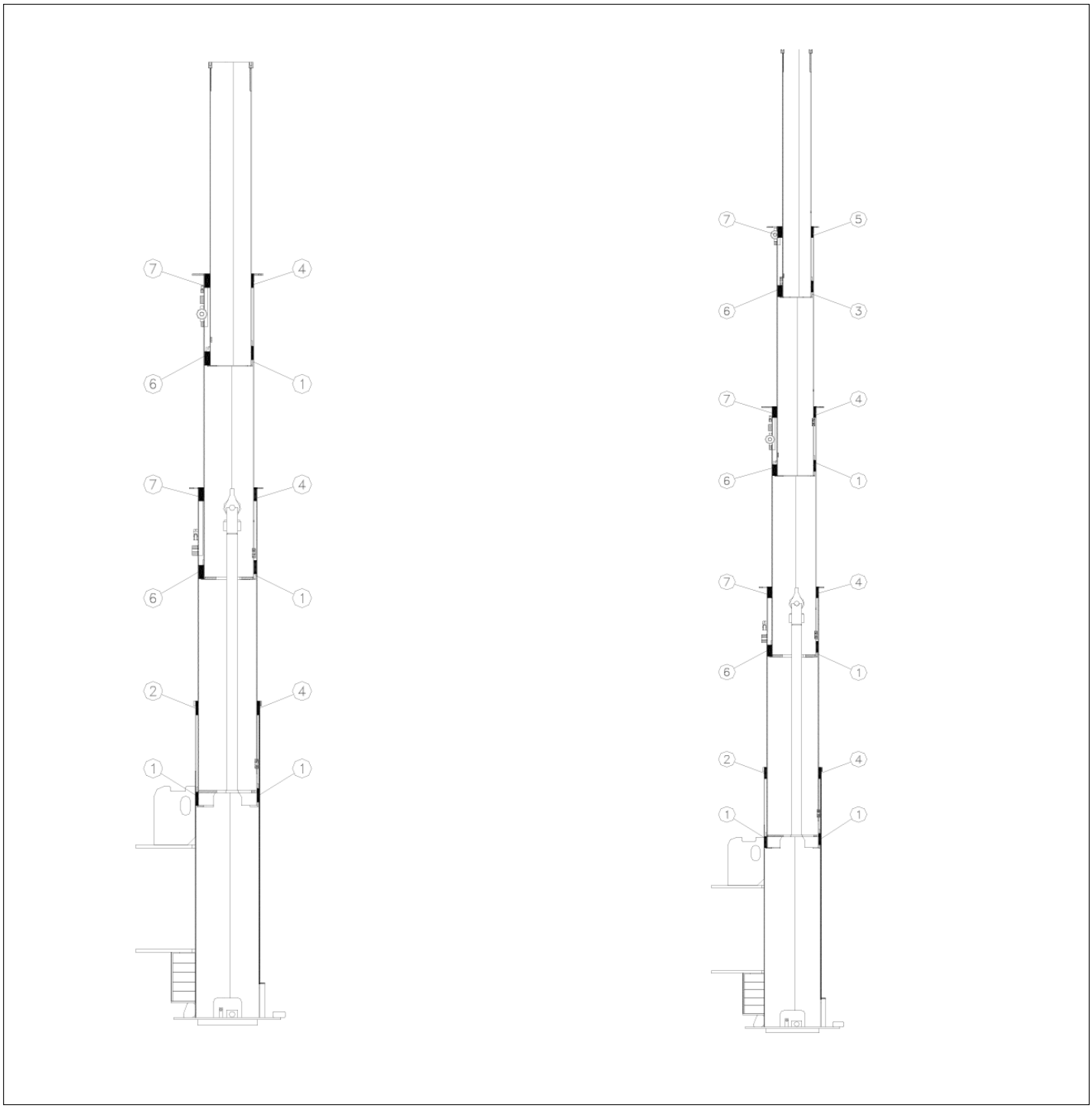
アイテム	部品番号	名前	数量	UOM
1	500717-000	Mast #1 Weldment	1	EA
2	500718-000	Mast #2 Weldment	1	EA
3	500719-000	Mast #3 Weldment	1	EA
4	500720-001	Mast #4 Weldment	1	EA
5	500863-000	Mast #5 Weldment	1	EA
6	500721-001	Jib Mount Weldment	12	EA
7	056060-050	Bolt, HexBolt DIN931 M10 x 50m	12	EA
8	056069-010	Washer, SteelFlatWasher DIN125A M10 ZincPlated	1	EA
9	501659-001	Wear Pad Kit	1	EA
10	50 0861-000	Jib Mount Cover Plate	1	EA
11	50 0871-003	Slide C hannel	1	EA
12	50 0882-001	Slide C hannel C over	1	EA
13	50 1211-000	Mast Energy Chain (50 L)	2	EA
14	50 0871-002	Slide Channel	1	EA
15	50 1274-000	Trunking Cover	2	EA
16	50 1550-000	Energy Chain Weldment	1	EA
17	50 0875-000	Lower Guide Trunking	1	EA

REPAIR PARTS



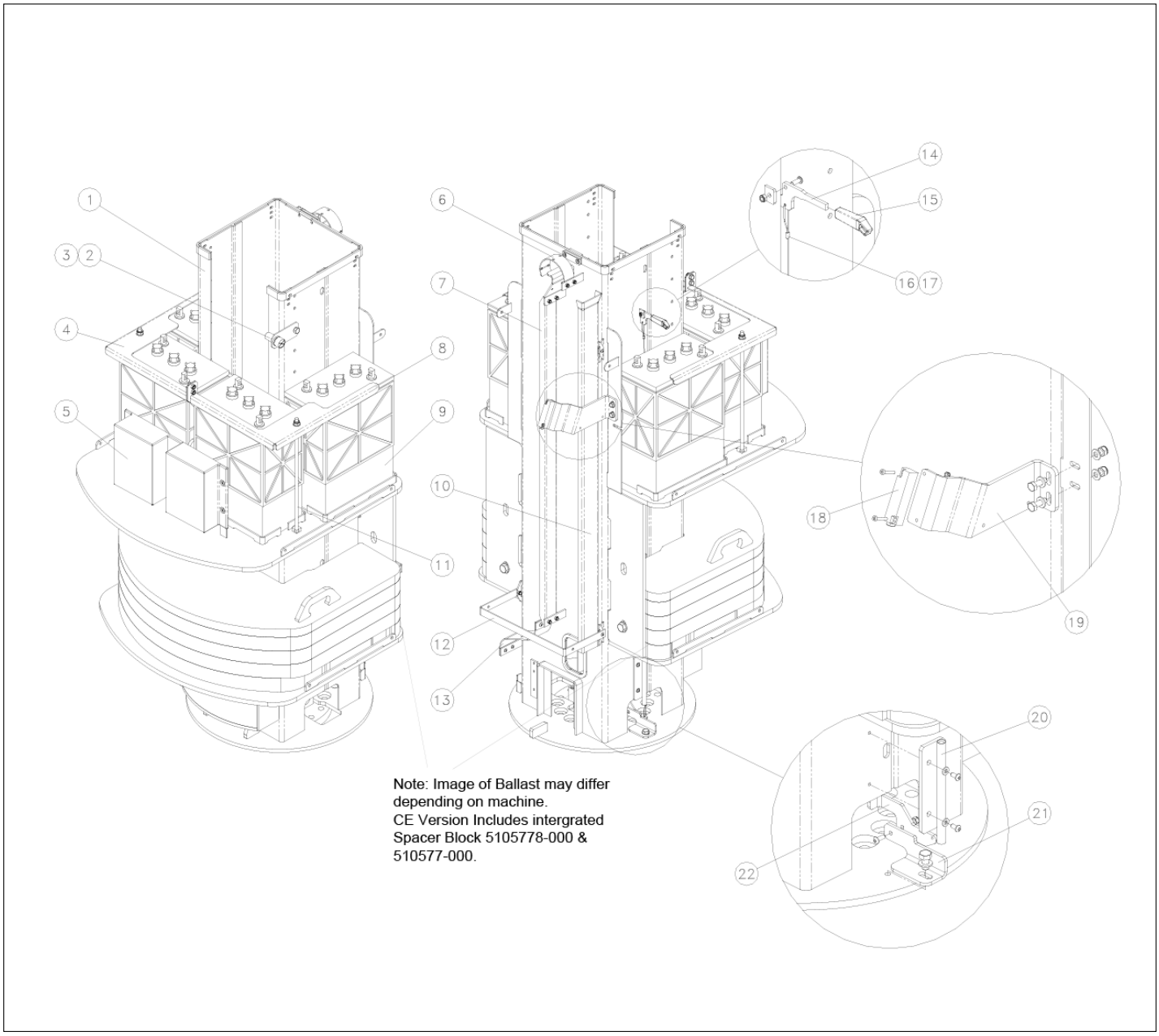
アイテム	部品番号	名前	数量	UOM
Not Shown	501659-000	Wear Pad Kit		EA
1	500820-000	Lower Slide 10mm	8	EA
2	500820-001	Upper Slide 10mm	2	EA
3	500820-003	Upper Slide 11mm	6	EA
4	501299-000	Lower Slide 26mm	4	EA
5	501299-002	Upper Slide 27mm	4	EA
6	501253-016	M6 x 16 BUTTON HD. SCREW - 12.9	4	EA
7	501253-012	M6 x 12 Button HD. screw - 12.9	32	EA

REPAIR PARTS



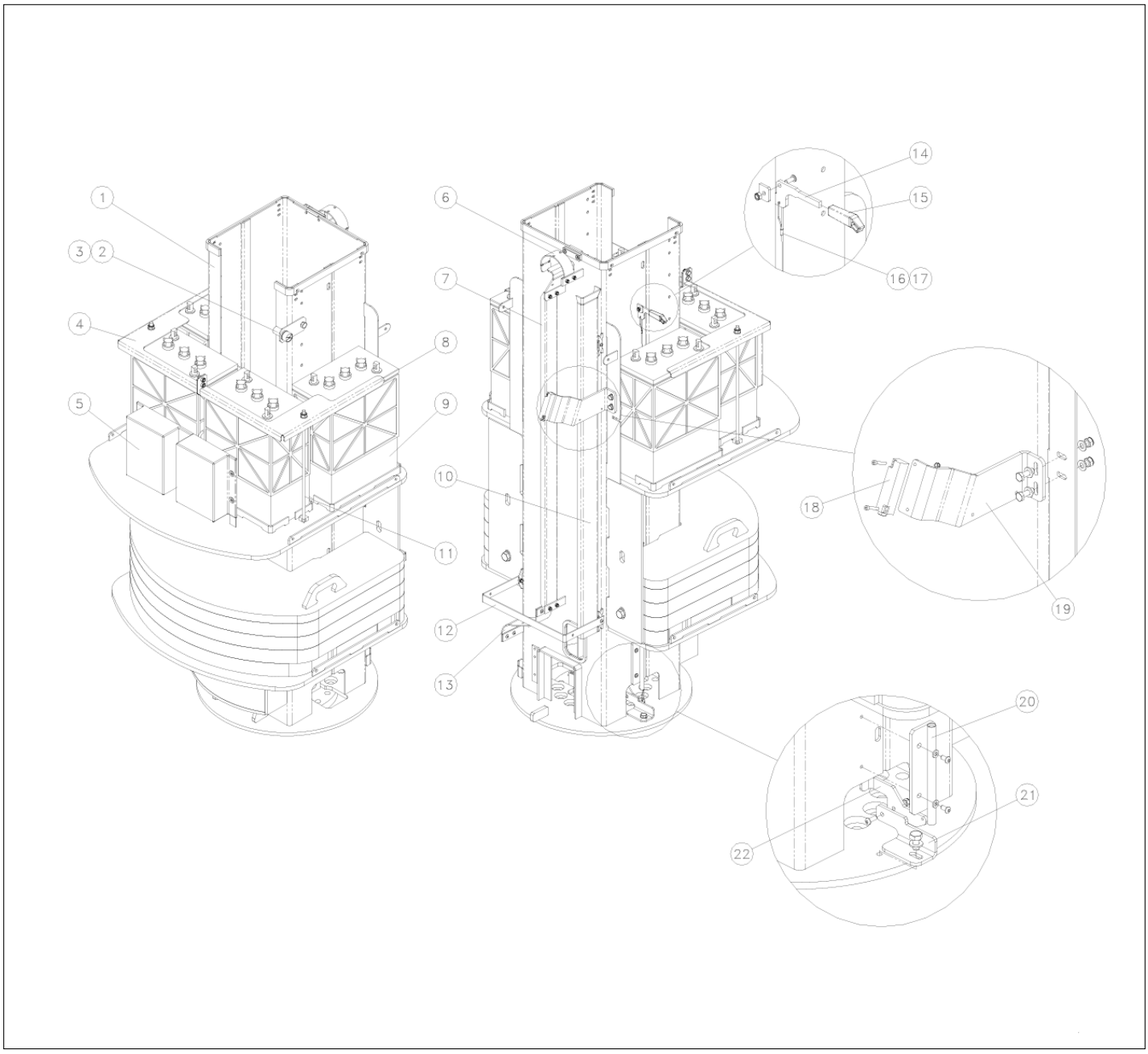
アイテム	部品番号	名前	数量	UOM
Not Shown	501659-001	Wear Pad Kit		EA
1	500820-000	Lower Slide 10mm	8	EA
2	500820-001	Upper Slide 10mm	2	EA
3	500820-002	Lower Slide 10mm	2	EA
4	500820-003	Upper Slide 11mm	6	EA
5	500820-004	Upper Slide 11mm	2	EA
6	501299-002	Upper Slide 27mm	6	EA
7	501299-000	Lower Slide 26mm	6	EA
8	501253-016	M6 x 16 BUTTON HD. SCREW - 12.9	4	EA
9	501253-012	M6 x 12 Button HD. screw - 12.9	44	EA

REPAIR PARTS



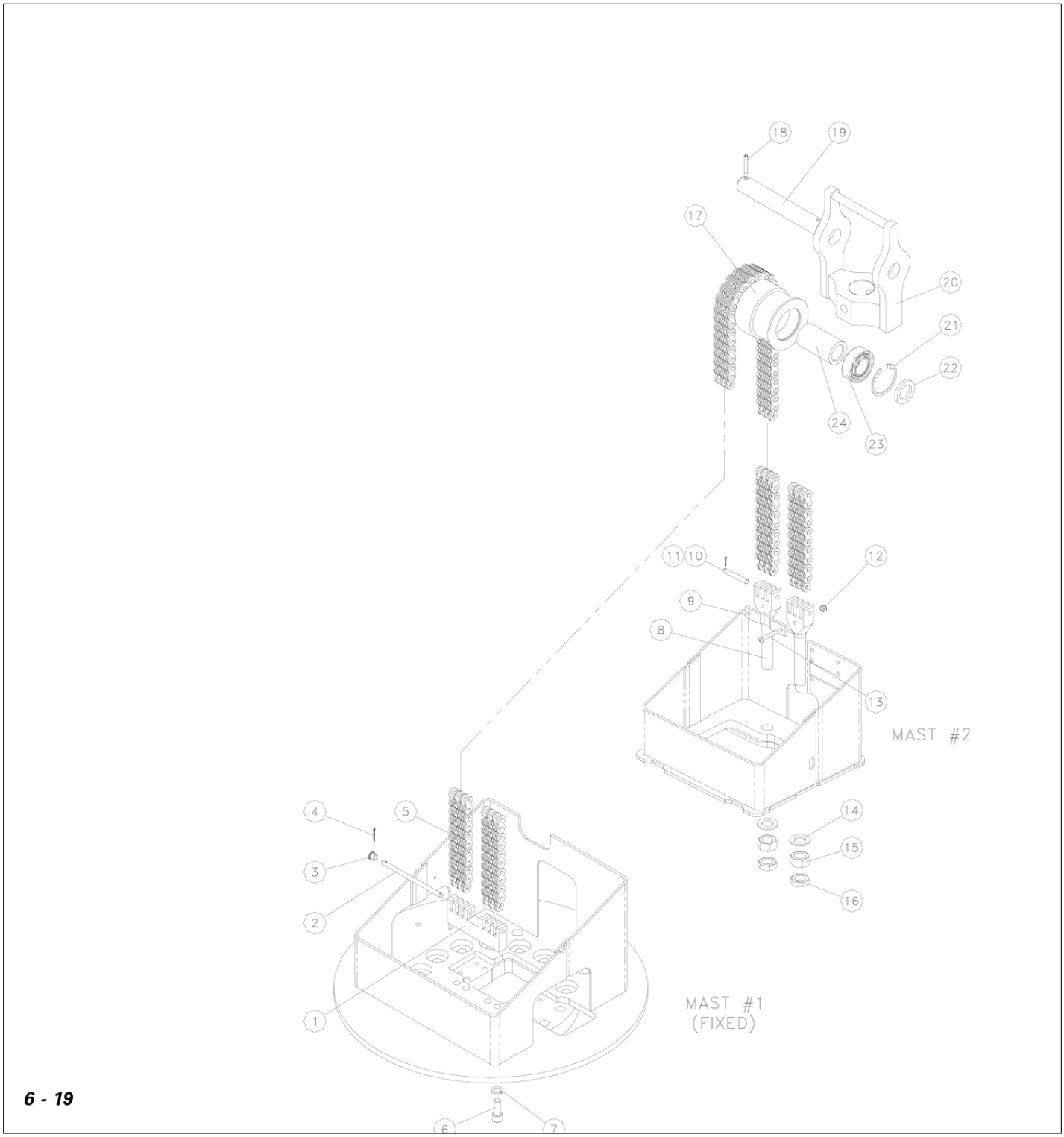
アイテム	部品番号	名前	数量	UOM
1	500717-000	Mast #1 Weldment	1	EA
2	501575-000	BATTERY CHARGER INDICATOR	1	EA
3	501649-0 0 0	Indicator Mounting Plate	1	EA
4	501422-000	Tie-Down Plate LH	1	EA
5	513755-000	BATTERY CHARGER	2	EA
6	500819-000	Top Hose Guide	1	EA
7	500875-001	Mast #1 Trunking	1	EA
8	501422-001	Tie-Down Plate RH	1	EA
9	501237-001	Battery 6V	4	EA
10	500890-000	Slide Channel Weldment	1	EA
11	501423-000	Tie-Down Bar	2	EA
12	501388-000	Mast Cover Bracket	1	EA
13	500885-000	Bottom Hose Guide	1	EA
14	501381-000	Lever Hand Actuator	1	EA
15	501451-000	Lever Actuator Cover	1	EA
16	53192	Pin Lock Retainer	1	EA
17	53195-02	Lever Cable Crimp	2	EA
18	501425-000	Magnetic Limit Switch	1	EA
19	501393-000	Switch Mounting Bracket	1	EA
20	501383-000	Guide Weldment	1	EA
21	501380-000	Lever Pivot Bracket	1	EA
22	501382-000	Lever Actuator Bracket	1	EA

REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
1	500717-000	Mast #1 Weldment	1	EA
2	501575-000	BATTERY CHARGER INDICATOR	1	EA
3	501649-000	Indicator Mounting Plate	1	EA
4	501422-000	Tie-Down Plate LH	1	EA
5	513755-000	BATTERY CHARGER	2	EA
6	500819-000	Top Hose Guide	1	EA
7	500875-001	Mast #1 Trunking	1	EA
8	501422-001	Tie-Down Plate RH	1	EA
9	501237-001	Battery 6V	4	EA
10	500890-000	Slide Channel Weldment	1	EA
11	501423-000	Tie-Down Bar	2	EA
12	501388-000	Mast Cover Bracket	1	EA
13	500885-000	Bottom Hose Guide	1	EA
14	501381-000	Lever Hand Actuator	1	EA
15	501451-000	Lever Actuator Cover	1	EA
16	53192	Pin Lock Retainer	1	EA
17	53195-02	Lever Cable Crimp	2	EA
18	501425-000	Magnetic Limit Switch	1	EA
19	501393-001	Switch Mounting Bracket	1	EA
20	501383-000	Guide Weldment	1	EA
21	501380-000	Lever Pivot Bracket	1	EA
22	501382-000	Lever Actuator Bracket	1	EA

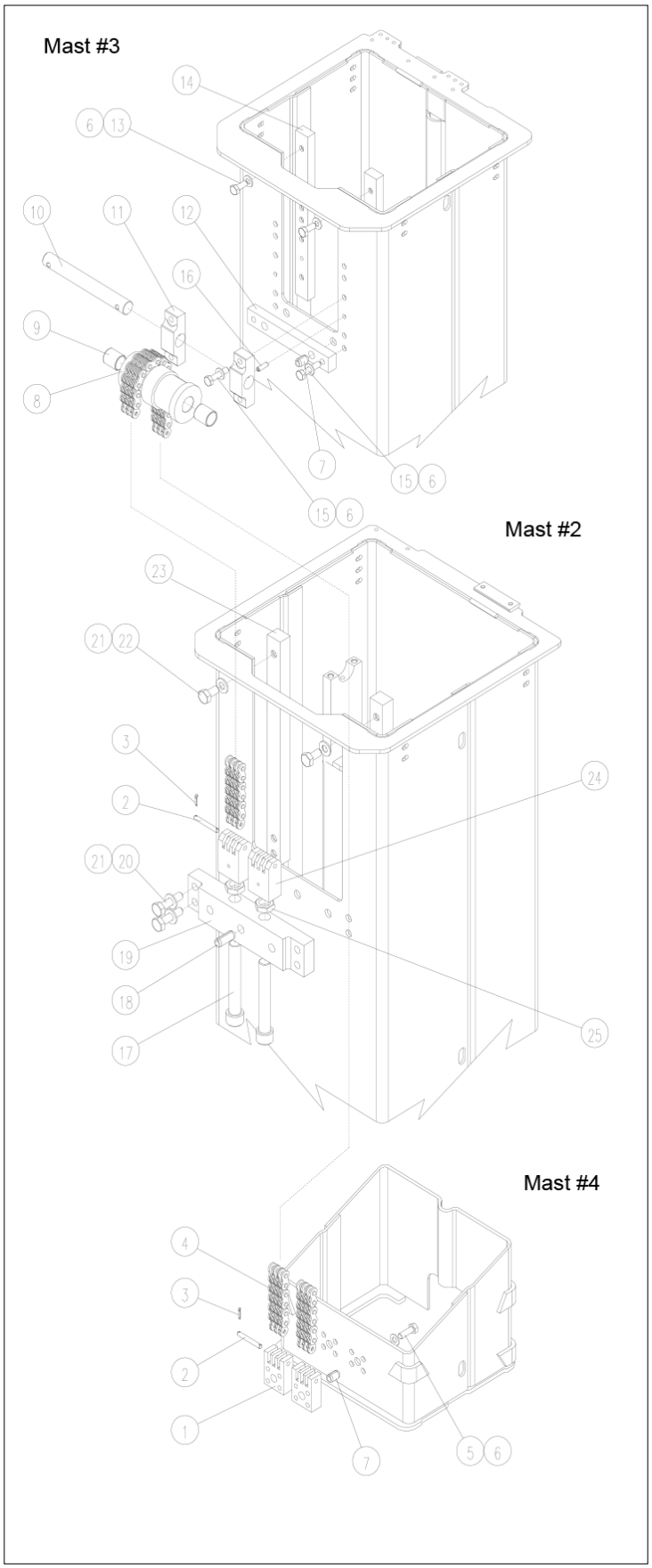
REPAIR PARTS



6 - 19

アイテム	部品番号	名前	数量	UOM
Not Shown	(BL666)	LOWER CHAIN GROUP		EA
1	501307-000	Chain Anchor Block	1	EA
2	501301-000	Anchor Pin	1	EA
3	500858-000	Knob	1	EA
4	501563-025	Split Pin	2	EA
5	501209-000	BL666 Chain (Complete)	1	EA
6	501247-030	Socket Head Screw	1	EA
7	056021-012	Washer, SpringWasher DIN127B M	1	EA
8	501310-000	Tensioner Fork	2	EA
9	501323-001	BL666 Brace	1	EA
10	501302-000	Tensioner Pin	2	EA
11	501244-012	Split Pin	4	EA
12	056066-006	Nut NylockNut DIN985 M6 8.0 Zi	2	EA
13	501253-035	Button Head Screw M6	2	EA
14	056069-020	(CE/AU ONLY) washer steel flat m20 din125a zp	2	EA
15	056067-020	NUT, HEXNUT DIN934 M20 8.0 ZINCPLATED	2	EA
16	056067-520	Locknut M20	2	EA
17	501313-000	BL666 Dual Pulley	1	EA
18	501057-020	Roll Pin	2	EA
19	500853-000	BL666 Pulley Axle	1	EA
20	500722-001	Cylinder Mount Weldment	1	EA
21	501432-000	Internal Circlip	2	EA
22	501291-000	Bearing Washer	2	EA
23	501342-000	Roller Bearing	2	EA
24	501378-000	Pulley Sleeve	1	EA

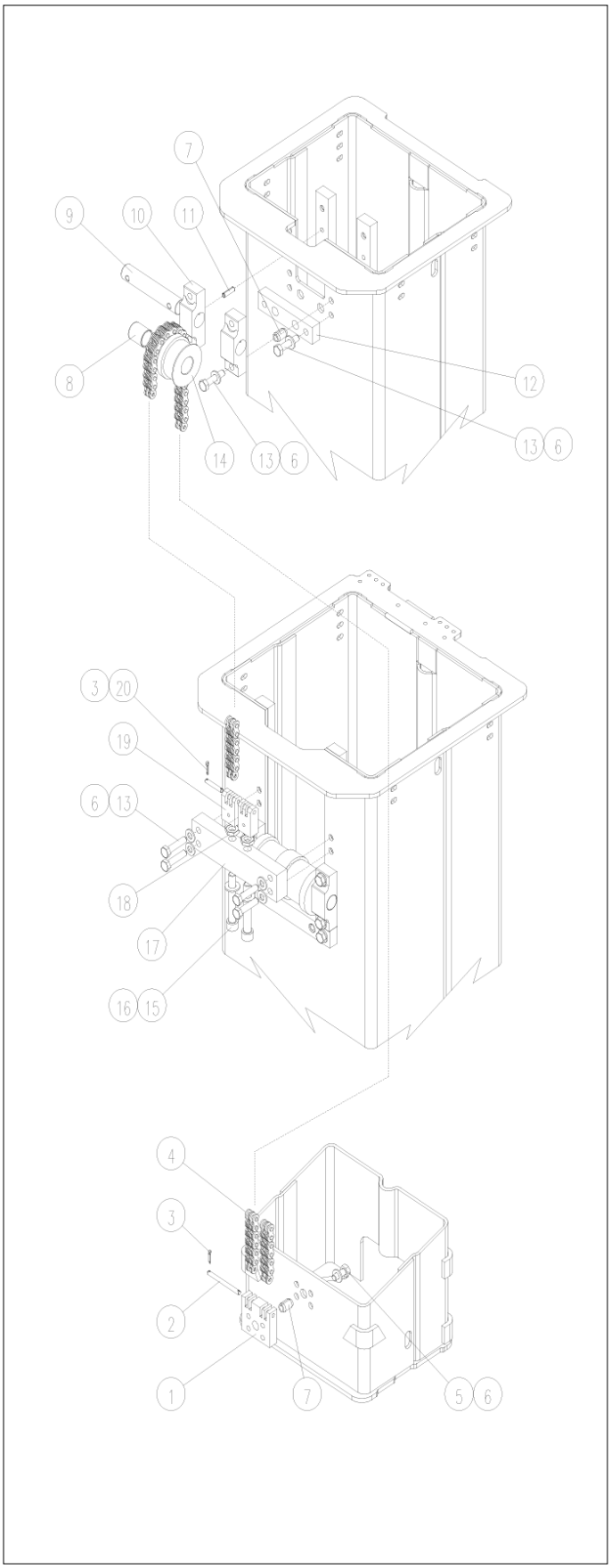
REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
Not Shown	(BL566)	INTERMEDIATE CHAIN GROUP		EA
1	501311-000	Anchor Block	2	EA
2	501304-000	End Pin	4	EA
3	501244-012	Split Pin	8	EA
4	501208-000	BL566 Chain (Complete)	2	EA
5	058492-025	BOLT HEXSETSCREW DIN933 M8 X 25MM 8.8 ZP	8	EA
6	056069-008	WASHER, STEELFLATWASHER DIN12M8 FLAT WASHER DIN 125	20	EA
7	500860-016	Roll Pin	4	EA
8	501314-000	BL666 Dual Pulley	1	EA
9	501064-000	Bushing	2	EA
10	501303-000	Pulley Axle	1	EA
11	501321-000	Pulley Mount	2	EA
12	501317-000	Base Mount	1	EA
13	058492-020	Bolt HexSetScrew DIN933 M8 x 2	6	EA
14	501316-000	Back Mount	2	EA
15	058492-035	BLT HEXHD M8 X 35MM DIN933 GR8.8 ZP (CE/AU ONLY)	6	EA
16	501057-020	Roll Pin	3	EA
17	501431-100	Socket Hd Screw M16	2	EA
18	500860-020	Roll Pin	3	EA
19	500854-000	Tensioner Mount	1	EA
20	056069-010	Washer, SteelFlatWasher DIN125A M10 ZincPlated	4	EA
21	058493-020	BOLT HEXSETSCREW DIN933 M10 X 20MM 8.8 ZP	6	EA
22	501320-000	Hex Hd Screw M10	2	EA
23	501308-000	Back Mount	2	EA

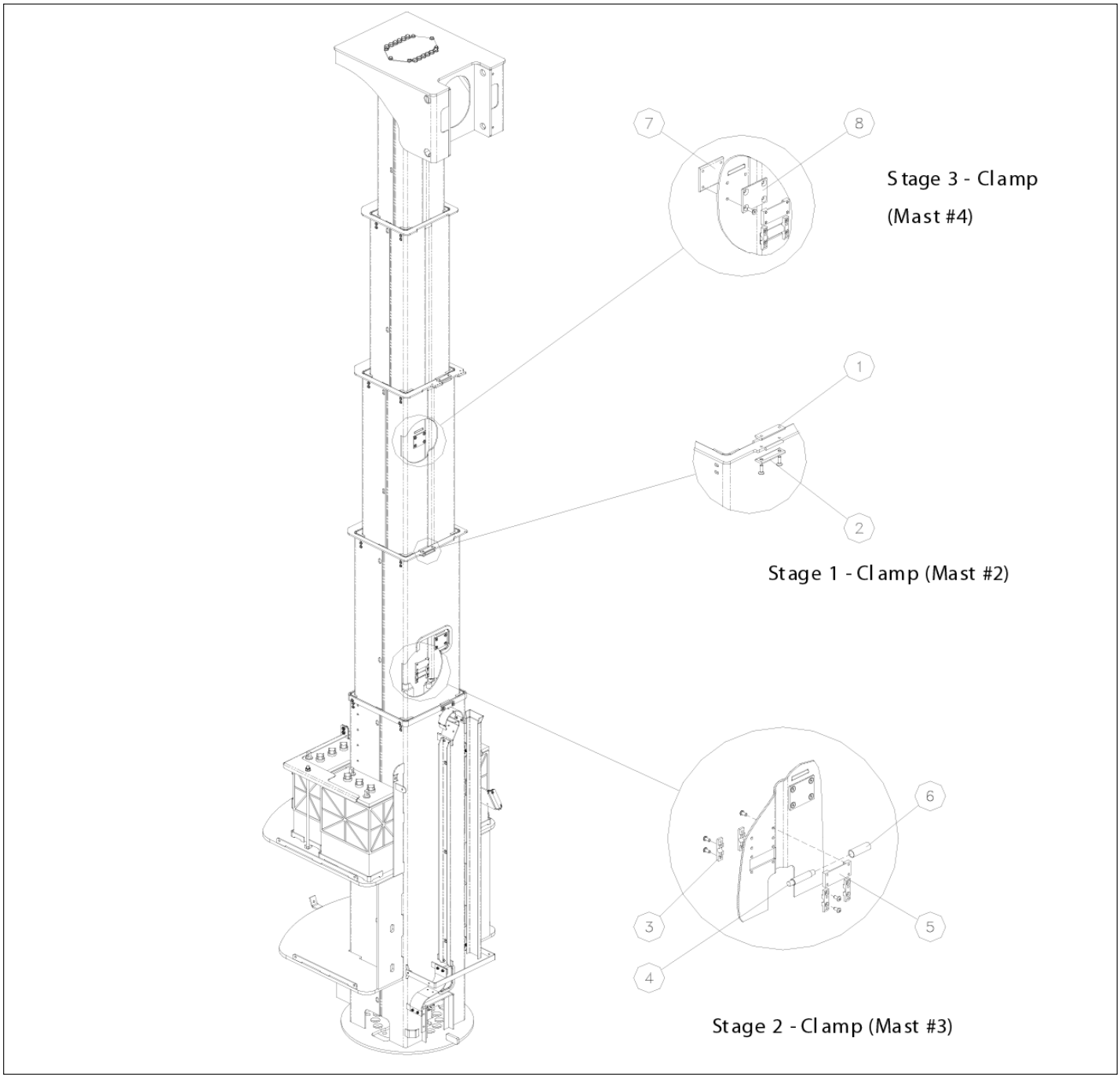
アイテム	部品番号	名前	数量	UOM
24	056067-516	NUT HEX, THIN M16 X 2.0 DIN 936	2	EA
25	058493-040	BLT HEXHD M10 X 40MM DIN933 GR8.8 ZP	2	EA

REPAIR PARTS



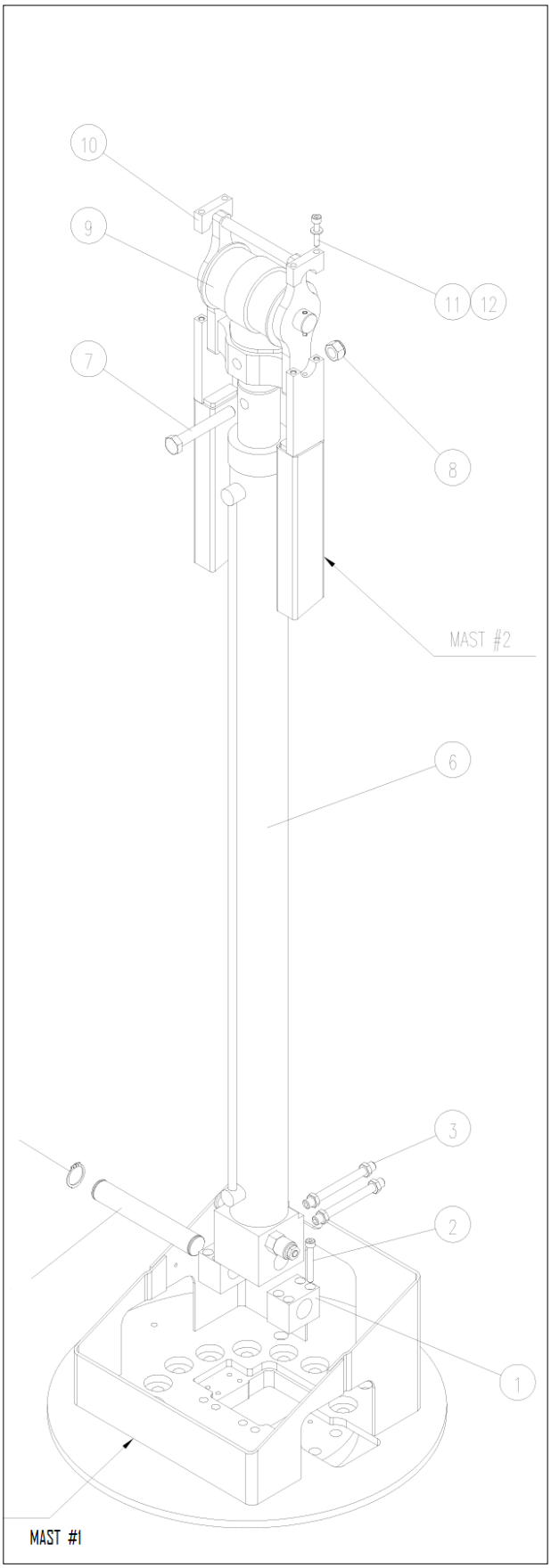
アイテム	部品番号	名前	数量	UOM
Not Shown	BL444	TOP CHAIN GROUP MB26J		EA
1	501312-000	Anchor Block	1	EA
2	501305-000	Anchor Pin	2	EA
3	501244-012	Split Pin	6	EA
4	501207-000	BL444 Chain (Complete)	2	EA
5	058492-020	Bolt HexSetScrew DIN933 M8 x 2	4	EA
6	056069-008	WASHER, STEELFLATWASHER DIN12M8 FLAT WASHER DIN 125	14	EA
7	500860-016	Roll Pin	3	EA
8	501064-000	Bushing	2	EA
9	501303-001	Pulley Axle	1	EA
10	501321-000	Pulley Mount	1	EA
11	501057-020	Roll Pin	2	EA
12	501319-000	Base Mount	1	EA
13	058492-035	BLT HEXHD M8 X 35MM DIN933 GR8.8 ZP (CE/AU ONLY)	10	EA
14	501315-000	BL666 Dual Pulley	1	EA
15	056060-070	Bolt, HexBolt DIN931 M10 x 70m	2	EA
16	056069-010	Washer, SteelFlatWasher DIN125A M10 ZincPlated	2	EA
17	501325-000	Tensioner Mount	1	EA
18	056067-510	Lock Nut M10	2	EA
19	501309-000	Tensioner	2	EA
20	501305-001	Tensioner Pin	2	EA

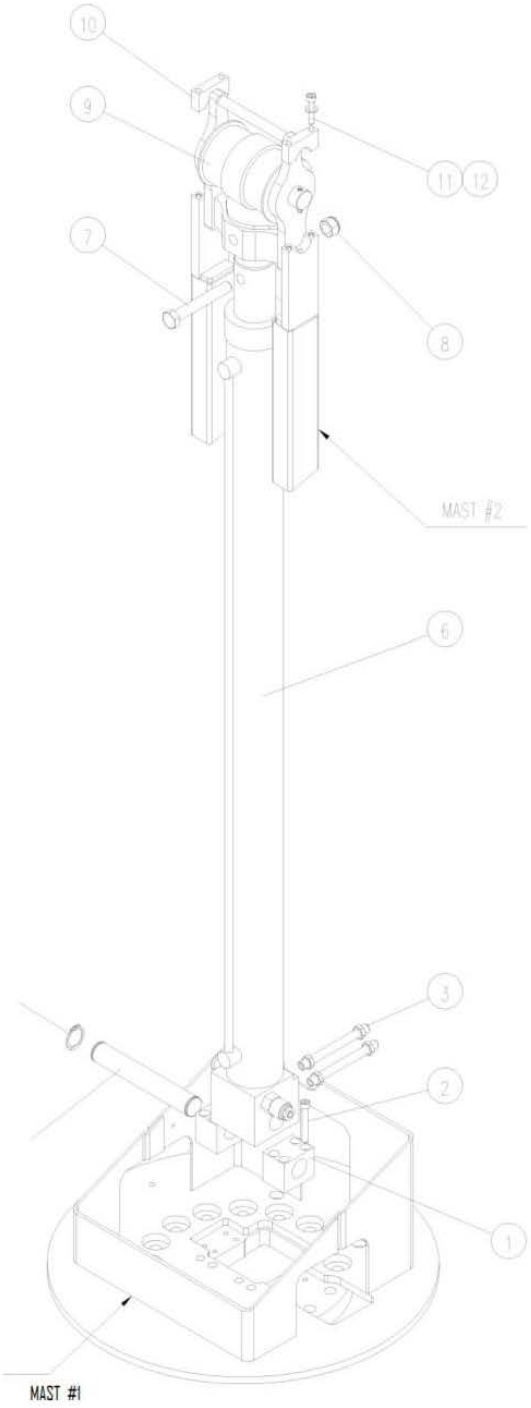
REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
1	500851-000	Strap Clip Upper	2	EA
2	500850-000	Strap Clip Lower	2	EA
3	501287-000	Roller Support Block	8	EA
4	500852-000	Strap Clip Shaft	2	EA
5	500873-000	Strap Guide	2	EA
6	500849-000	Strap Bushing	2	EA
7	501270-001	Clamp Plate - Threaded	2	EA
8	501270-000	Clamp Plate - Outer	2	EA
9	501210-001	Sequence Strap	2	EA

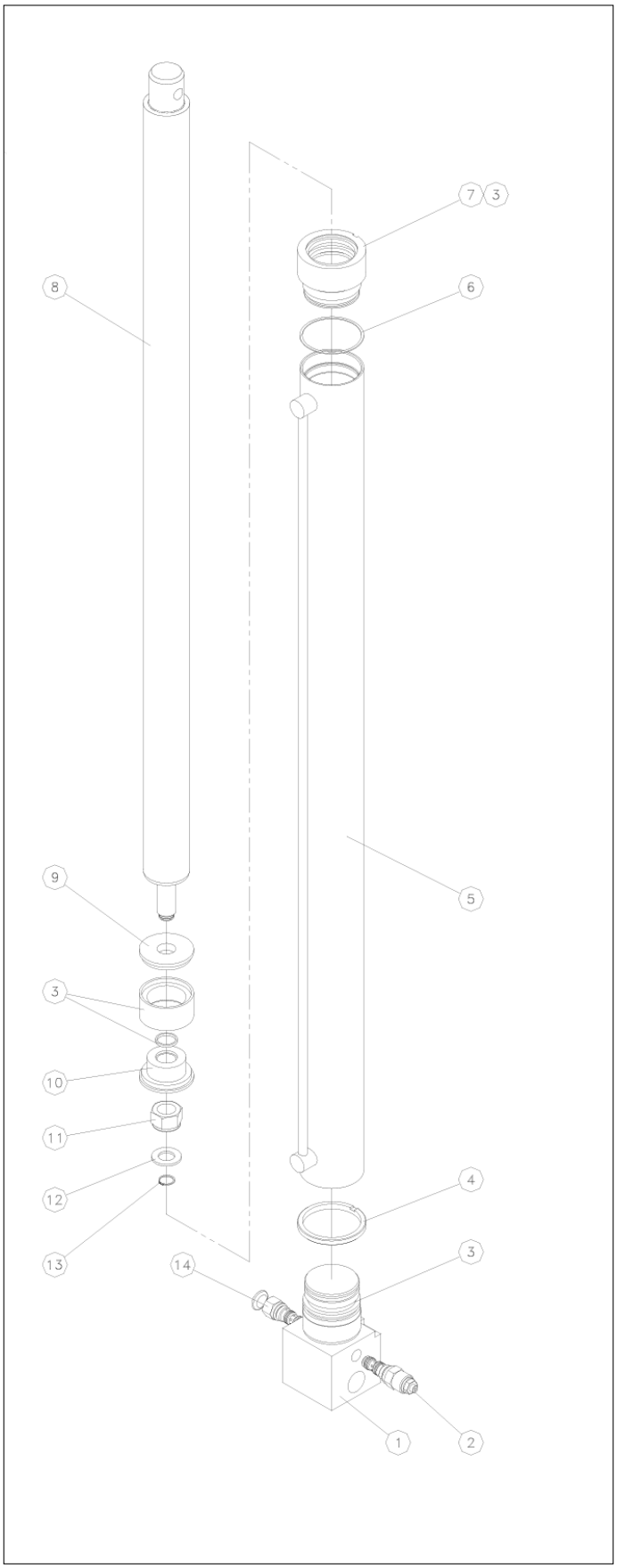
REPAIR PARTS




10
9
11
12
7
8
MAST #2
6
3
2
1
MAST #1

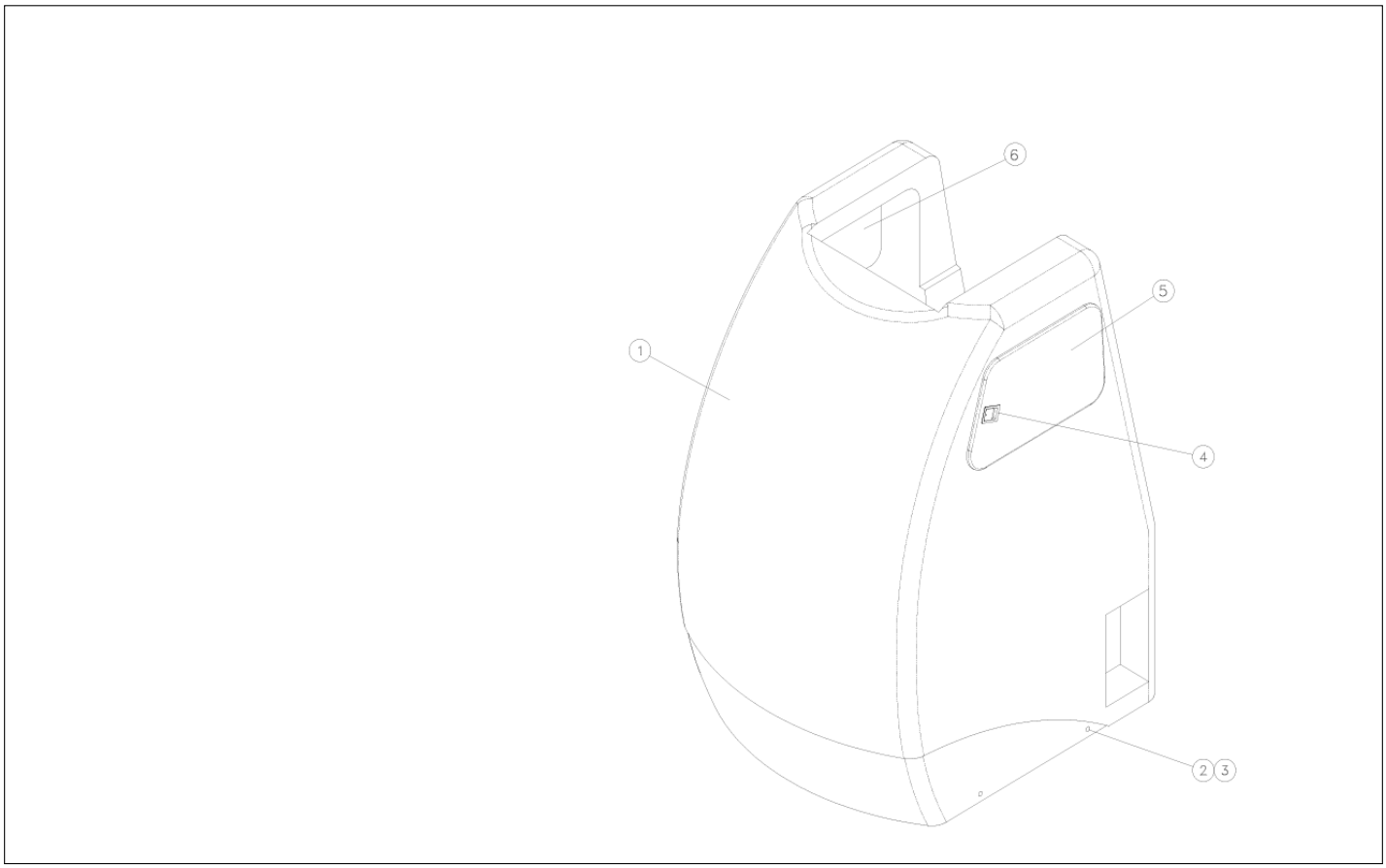
アイテム	部品番号	名前	数量	UOM
1	500838-000	Anchor Block	2	EA
2	058503-060	Socket Hd Screw M8	8	EA
3	500784-000	Standpipe Adaptor (Not in Hose Kit)	2	EA
4	057033-000	CIRCLIP 30mm	2	EA
5	501324-000	Anchor Pin	1	EA
6	REF	Lift Cylinder Assembly	1	EA
7	058480-110	Hex Hd Bolt	1	EA
8	056064-016	NUT NYLOCKNUT DIN985 M16 10.0	1	EA
9	501445-001	Cylinder Mount Assembly	1	EA
10	500864-000	Shaft Cap	2	EA
11	058503-045	SHCS M8 X 1.25 X 45 G8.8 ISO 4762 BLACK OXIDE	4	EA
12	056069-008	WASHER, STEELFLATWASHER DIN12M8 FLAT WASHER DIN 125	4	EA

REPAIR PARTS



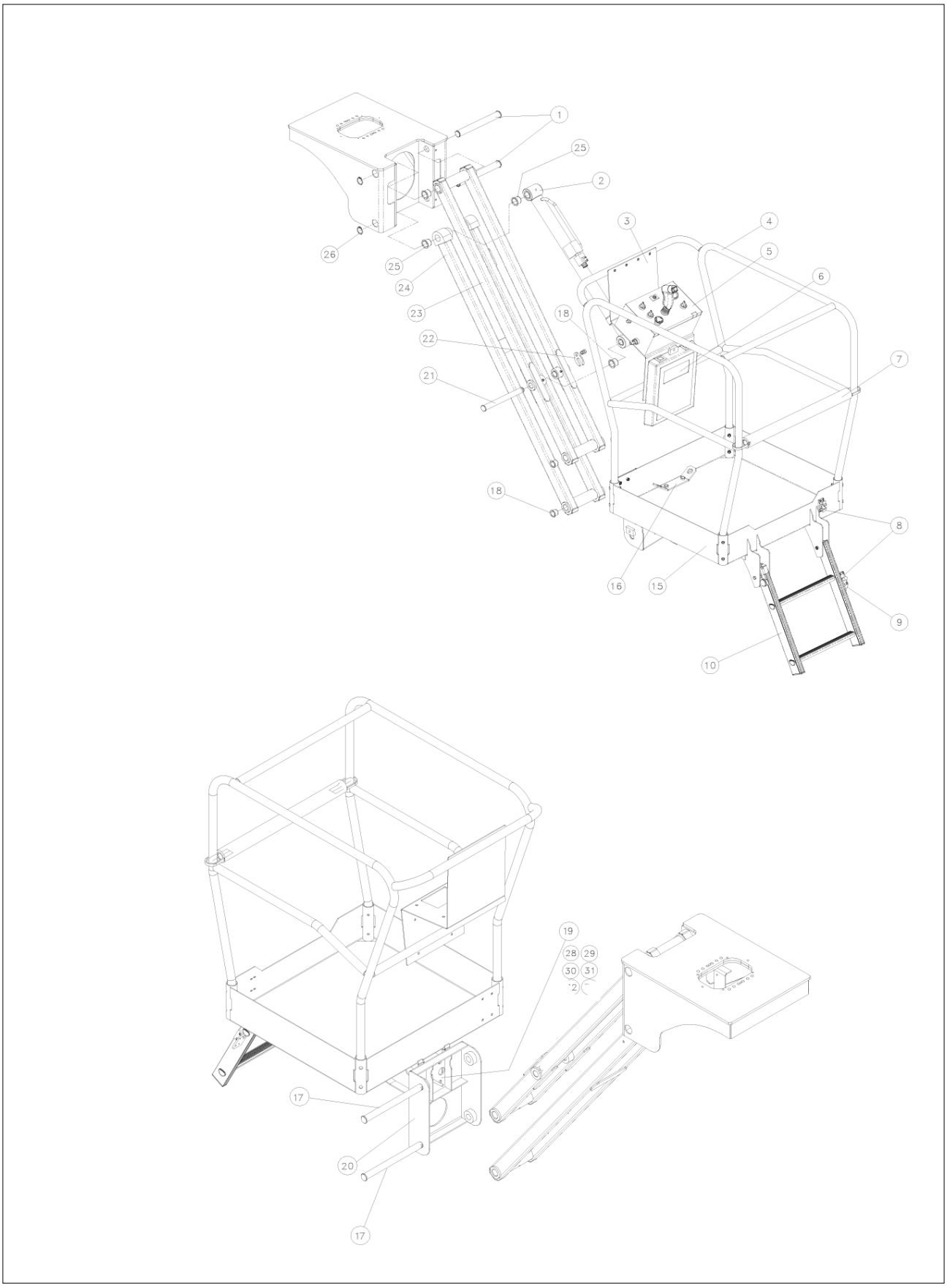
アイテム	部品番号	名前	数量	UOM
Not Shown	500780-000	Main Lift Cylinder (Not in Hose Kit)		EA
Not Shown	500780-001	Main Lift Cylinder (Not in Hose Kit)		EA
1	REF	Body End Block	1	EA
2	058728-000	SINGLE OVERCENTRE VALVE	1	EA
3	501664-000	Seal Kit	1	EA
4	REF	Collar Locking Washer	1	EA
5	REF	CYLINDER BODY	1	EA
6	REF	Washer Tab	1	EA
7	REF	Rod End Cap	1	EA
8	REF	CYLINDER ROD	1	EA
9	REF	Piston Head Cap	1	EA
10	REF	PISTON HEAD	1	EA
11	REF	Nylock Nut	1	EA
12	REF	WASHER	1	EA
13	REF	CIRCLIP	1	EA
14	500397-000	EMERGENCY LOWERING VALUE	1	EA

REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
1	509716-000	Mast Cover	1	EA
2	505050-006	M6 x 20mm Socket Button Screw	4	EA
3	501253-020	Bolt, SktButCapScrew DIN9427 M	4	EA
4	503181-000	Slam Action Paddle Latch	2	EA
5	509719-000	Door L/H	1	EA
6	509720-000	Door R/H	1	EA

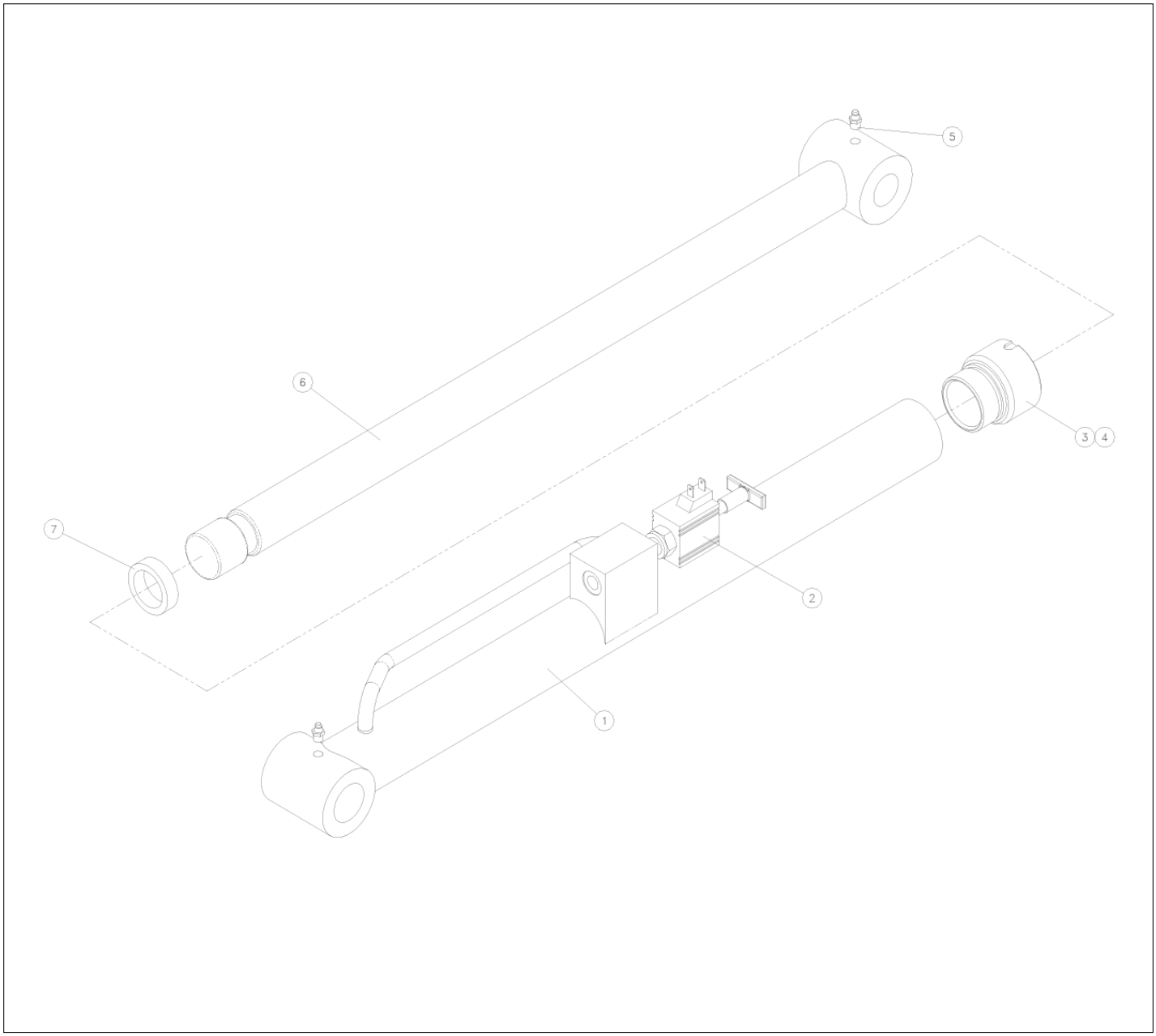
REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
1	501231-000	Pivot Pin (Jib Mount)	2	EA
2	REF	Jib Cylinder Assembly	1	EA
3	500761-000	Upper Control Box Mounting Plate	1	EA
4	501450-000	Cage Rail Weldment	1	EA
5	510544-000	Upper Control Box Assembly	1	EA
6	562386	Literature Compartment	1	EA
7	508930-000	Drop Bar Assembly	1	EA
8	501352-000	Ladder Catch	1	EA
9	501351-000	Ladder Catch Bracket	1	EA
10	501350-000	Ladder	1	EA
15	501955-000	Cage Base Weldment	1	EA
16	057094-000	Harness Anchor	1	EA
17	501230-000	Pivot Pin Cage Connect	2	EA
18	500078-000	Flanged Bush	8	EA
19	501886-000	Overload Block (Ansi 509791-000)	1	EA
20	501956-001	Cage Link Weldment	1	EA
21	501269-000	Pivot Pin - Jib Cylinder Rod	1	EA
22	058056-000	Pin Keeper, Square	2	EA
23	500723-000	Jib Tie Weldment	1	EA
24	500724-000	Jib Strut Weldment	1	EA
25	057054-000	BUSH	8	EA
26	057033-000	CIRCLIP 30mm	2	EA
28	503101-040	M16 x 40 HEX. HD. SCREW x1.5 P	8	EA
29	056069-016	WASHER STEELFLATWASHER M16 DIN	8	EA
30	058493-035	M10 x 35 Bolt	4	EA
31	056069-010	Washer, SteelFlatWasher DIN125A M10 ZincPlated	8	EA

アイテム	部品番号	名前	数量	UOM
32	056064-010	Nut NylockNut DIN985 M10 10.0	4	EA

REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
Not Shown	501480-000	Jib Cylinder (Not in Hose Kit)		EA
Not Shown	501480-001	Jib Cylinder (Not in Hose Kit)		EA
1	REF	CYLINDER BODY	1	EA
2	501483-000	Hydraulic Valve	1	EA
3	REF	Rod End Cap	1	EA
4	501662-000	Seal Kit	1	EA
5	058819-001	Grease Nipple M8	2	EA
6	REF	CYLINDER ROD	1	EA
7	REF	Bearing Ring	1	EA

REPAIR PARTS

CONTROLS BREAKDOWN

Part No.	Description	Qty per
510540-000	Control kit	1
510543-000	Ground Control Panel Assy	
510521-000	Deadman Toggle Switch, on-(on) IP65	1
510523-000	Hour run/BCI Meter	1
510353-000	Ground Control Panel	1
510524-000	Twist & Release e/stop	1
510525-000	NC contact block	1
510526-000	3 posn. Stayput Key Switch	1
-510351-000	Spare key, (same as Trailers, existing number)	-
510545-000	3 Pos Stayput selector switch	1
510527-000	NO contact block	6
510470-000	Analogue Rocker	1
510346-001	Ground Control Panel Overlay	1
510544-000	**Platform Control Box Assy**	
510521-000	Deadman Toggle Switch, on-(on) IP65	2
510542-000	Black Flush Pushbutton (Horn pushbutton)	1
510524-000	Twist & Release e/stop	1
510525-000	NC contact block	1
510545-000	3 Pos Stayput selector switch	1
510527-000	NO contact block	3
510546-000	Enclosure	1
510546-001	Cut-out details for enclosure	1
510471-000	Joystick	1
510472-000	Matrix board	1
510528-000	Red LED	1
502588-000	Alarm, 80-95dB, 4-28vdc	1
510339-001	Platform Control Box Overlay	1
	External Components	
510549-000	Platform cable assy	1
510550-000	Ground Panel Cable assy	1
510551-000	Valve cable loom	1
510552-000	Battery cables	1
510552-001	Battery cable, B to Motor	1
510552-002	Battery cable, Battery Link 550mm	1
510552-003	Battery cable, Battery Link 370mm	1
510552-004	Battery cable, Battery Link 200mm	2
510552-005	Battery cable, B+ to Contactor	1
510552-006	Battery cable, Contactor Link	1
510552-007	Battery cable, Fuse to Contactor	1
510552-008	Battery cable, Battery to Dissconnect	1
510552-009	Battery cable, Fuse to Dissconnect	1
501868-000	Horn, continuous, 24v(as ITT)	1
502494-000	Fuse 175Amp(as ITT)	1
501877-000	Fuse holder	1
502489-000	Contactor, 200Amp 24vdc SPDT	1

REPAIR PARTS

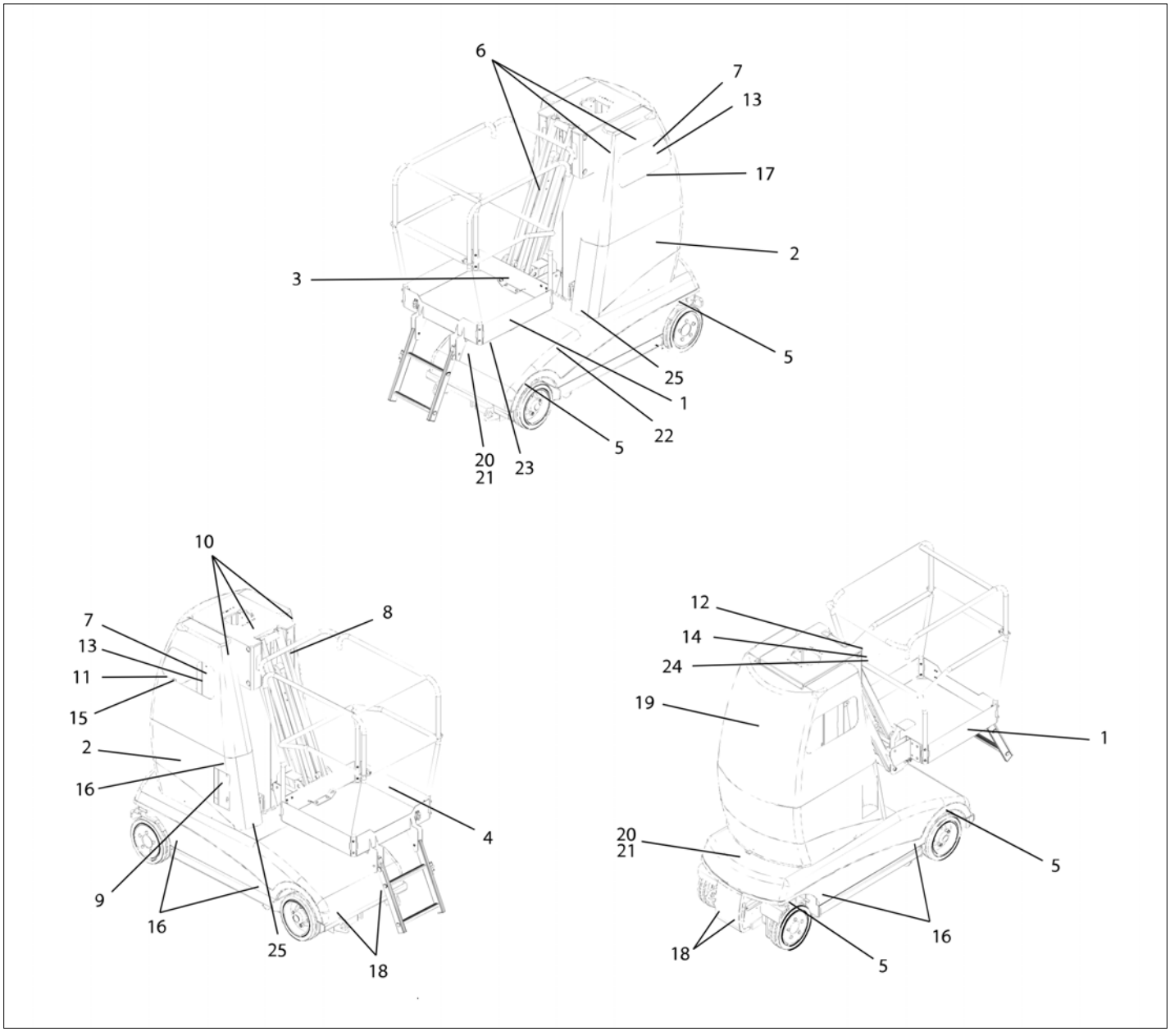
CONTROLS PANEL
FROM MB20J SERIAL NO 1200 & MB26J SERIAL NO 1000 ONWARDS

Part No.	Description	Qty per
510540-000	**Ifcom Kit**	1
510543-000	**Ground Control Panel Assy**	
510521-000	Deadman Toggle Switch, on-(on) IP65	1
3087803	Ezcal Display	1
512369-000	Ground Control Panel	1
510524-000	Twist & Release e/stop	1
510525-000	Contact base with 1 NC contact block	1
510526-000	3 posn. Stayput Key Switch	1
(510351-000)	Spare key	-
510545-000	3 Pos Stayput selector switch	1
512535-000	Contact base with 2 NO contact block	1
512536-000	NO Contact Block	2
510470-000	Analogue Rocker	1
512418-000	Ground Control Panel Overlay CE	1
512360-000	19-Way Metalock	1
510548-000	Contact Socket Crimp	19
512362-000	Backshell	1
512366-000	4-way Panel Plug	1
510145-000	Mate-N-Lock Socket Contact	4
510671-000	Cable 1.0mm CSA	4m
512665-006	M3 x 6 CSK Slotted Screw (R.S. 553-841)	4
512666-003	M3 x 8 Hex Spacer (R.S. 222-389)	4
500430-006	M3 x 6 Pan Head Slotted Screw (560-754)	4

Part No.	Description	Qty per
510544-000	**Platform Control Box Assy**	
510541-000	Toggle Switch, on-on IP65	2
510542-000	Black Flush Pushbutton (Horn pushbutton)	1
510524-000	Twist & Release e/stop	1
510525-000	Contact base with 1 NC contact block	1
510545-000	3 Pos Stayput selector switch	1
510527-000	Contact base with 1 NO contact block	1
512535-000	Contact base with 2 NO contact block	1
510546-000	Enclosure (CUT-OUT)	1
-510546-001	ENCLOSURE	1
510471-000	Joystick	1
510472-000	Matrix board	1
510528-000	Red LED	2
502588-000	Alarm, 80-95dB, 4-28vdc	1
510339-001	Platform Control Box Overlay	1
510547-000	8-way Metalock Chassis Socket	1
510548-000	Contact Socket Crimp	7
512367-000	6Pin +E Straight Chassis Socket	1
510154-000	6-way Panel Plug	1
510156-000	9-way Panel Plug	1
510157-000	12-way Panel Plug	2
510145-000	Mate-N-Lock Socket Contact	19
512368-000	DIN Rail, 35mm perforated steel.	170mm
510671-000	Cable 1.0mm CSA	4m
	Cable 3-core 0.75mm	470mm

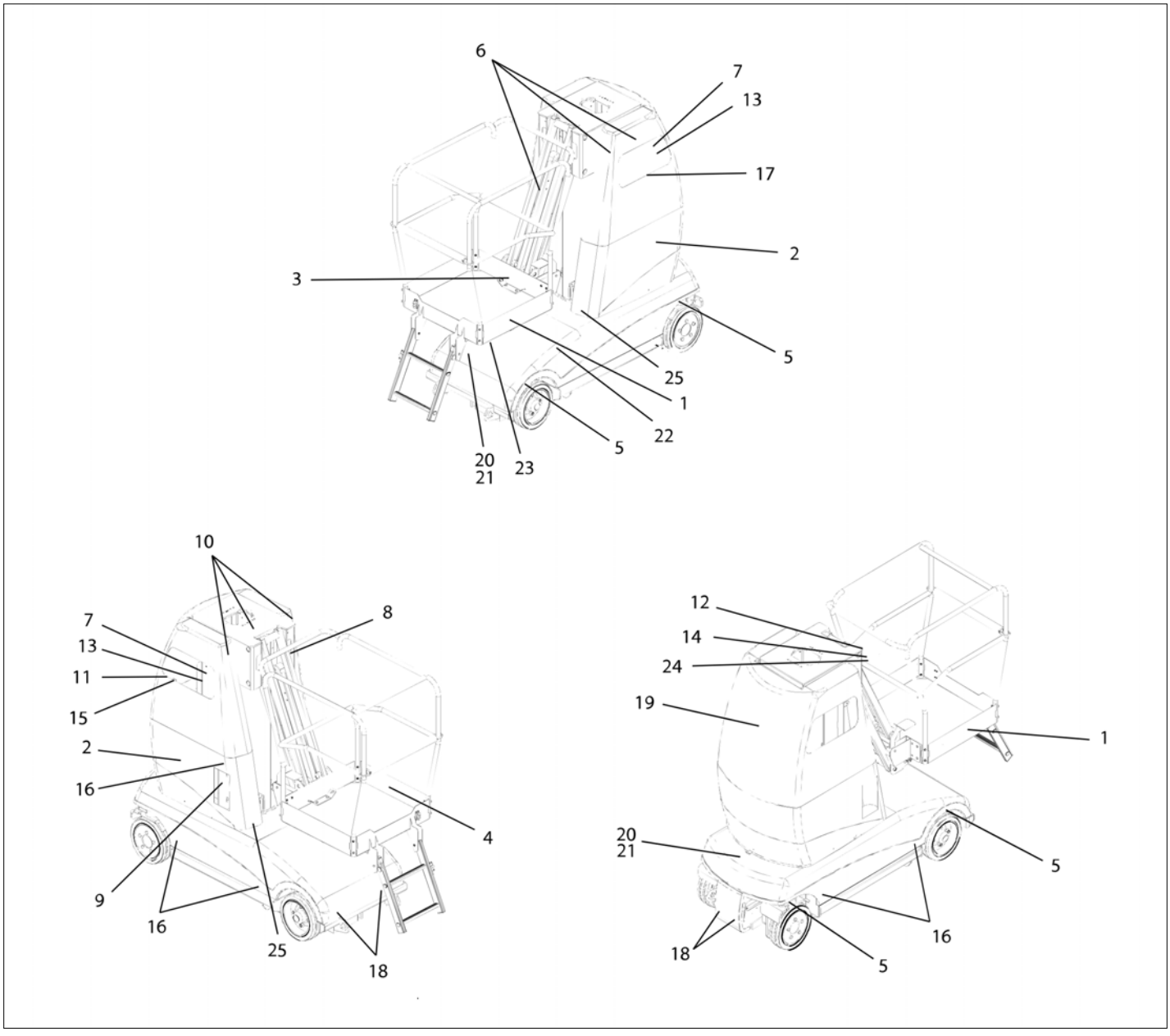
Part No.	Description	Qty per
	External Components	
512357-000	Wiring Harness	1
(512357-001)	Platform Control Loom	1
(512357-002)	Ground Panel Cable assy	1
(512357-003)	Valve cables loom	1
510552-000	Battery cables	1
(510552-001)	Battery cable, B+ to Motor	1
(510552-002)	Battery cable, M to Motor	1
(510552-003)	Battery cable, Battery Link 370mm	1
(510552-004)	Battery cable, Battery Link 300mm	1
(510552-005)	Battery cable, Battery Link 200mm	2
(510552-006)	Battery cable, B+ to Contactor	1
(510552-007)	Battery cable, Contactor Link	1
(510552-008)	Battery cable, B- to Earth	1
(510552-009)	Battery cable, Fuse to Contactor	1
(510552-010)	Battery cable, Fuse to Dissconnect	
(510552-011)	Battery cable, Battery to Dissconnect	1
501868-000	Horn, continuous, 24v(as ITT)	1
502494-000	Fuse 175Amp(as ITT)	1
501877-000	Fuse holder	1
502489-000	Contactor, 200Amp 24vdc SPDT	1

REPAIR PARTS



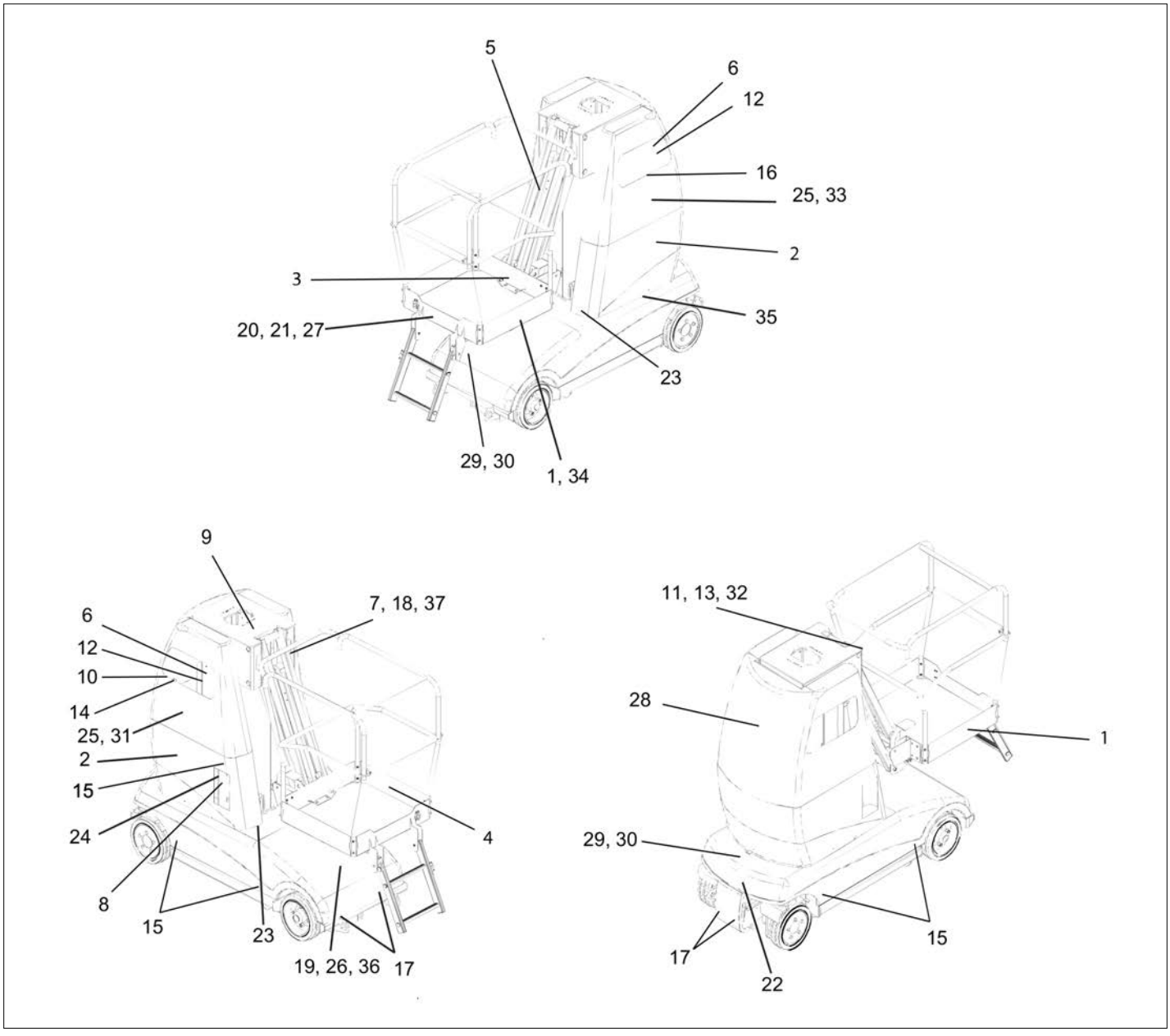
アイテム	部品番号	名前	数量	UOM
Not Shown	505612-000	Decal Kit CE	1	EA
1	511099-000	Decal, Snorkel	2	EA
2	512261-000	DECAL, Snorkel MB26J cover	2	EA
3	068635-001	Harness anchor point	1	EA
4	504199-008	DECAL-SWL LARGE 215k	1	EA
5	510674-000	DECAL-Wheel Loading 1300Kg	4	EA
6	510280-100	DECAL - EMERGENCY LOWERING 2	3	EA
7	057429-000	DECAL - BATTERY FLUID LEVEL	2	EA
8	057692-004	DECAL-MAIN INSTRS (S	1	EA
9	501573-000	MB LOWER CONTROL BOX	1	EA
10	058660-000	DECAL HAND PINCH POINT	3	EA
11	501643-001	DECAL,SYSTEM OPERATING	1	EA
12	058181-003	DECAL - 3 POINTS	1	EA
13	057430-002	DECAL - EXPLOSION HAZARD	2	EA
14	010076-901	DECAL SNORKEL LOGO, 183MM CAP	1	EA
15	508503-000	Decal, Caution Batfill Battery	1	EA
16	501453-000	Decal, Foot Crush Hazard	5	EA
17	508526-000	DECAL - EMERCENCY RE	1	EA
18	058531-000	Lift/tie down point	4	EA
19	511099-000	Decal, Snorkel	1	EA
20	0070540	DECAL, YELLOW ARROW	2	EA
21	0070541	DECAL, BLUE ARROW	2	EA
22	514360-000	Decal, Hand Trap	1	EA
23	515843-000	DECAL OIL TYPE	1	EA
24	515335-100	Decal, QR Barcode, English	1	EA
25	066556-900	Risk from above	2	EA

REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
Not Shown	505608-000	Decal Kit CE	1	EA
1	511099-000	Decal, Snorkel	2	EA
2	512260-000	DECAL, Snorkel MB20J cover	2	EA
3	068635-001	Harness anchor point	1	EA
4	504199-008	DECAL-SWL LARGE 215k	1	EA
5	510674-000	DECAL-Wheel Loading 1300Kg	4	EA
6	510280-100	DECAL - EMERGENCY LOWERING 2	3	EA
7	057429-000	DECAL - BATTERY FLUID LEVEL	2	EA
8	057692-004	DECAL-MAIN INSTRS (S	1	EA
9	501573-000	MB LOWER CONTROL BOX	1	EA
10	058660-000	DECAL HAND PINCH POINT	3	EA
11	501643-001	DECAL,SYSTEM OPERATING	1	EA
12	058181-003	DECAL - 3 POINTS	1	EA
13	057430-002	DECAL - EXPLOSION HAZARD	2	EA
14	010076-901	DECAL SNORKEL LOGO, 183MM CAP	1	EA
15	508503-000	Decal, Caution Batfill Battery	1	EA
16	501453-000	Decal, Foot Crush Hazard	5	EA
17	508526-000	DECAL - EMERCENCY RE	1	EA
18	058531-000	Lift/tie down point	4	EA
19	511099-000	Decal, Snorkel	1	EA
20	0070540	DECAL, YELLOW ARROW	2	EA
21	0070541	DECAL, BLUE ARROW	2	EA
22	514360-000	Decal, Hand Trap	1	EA
23	515843-000	DECAL OIL TYPE	1	EA
24	515335-100	Decal, QR Barcode, English	1	EA
25	066556-900	Risk from above	2	EA

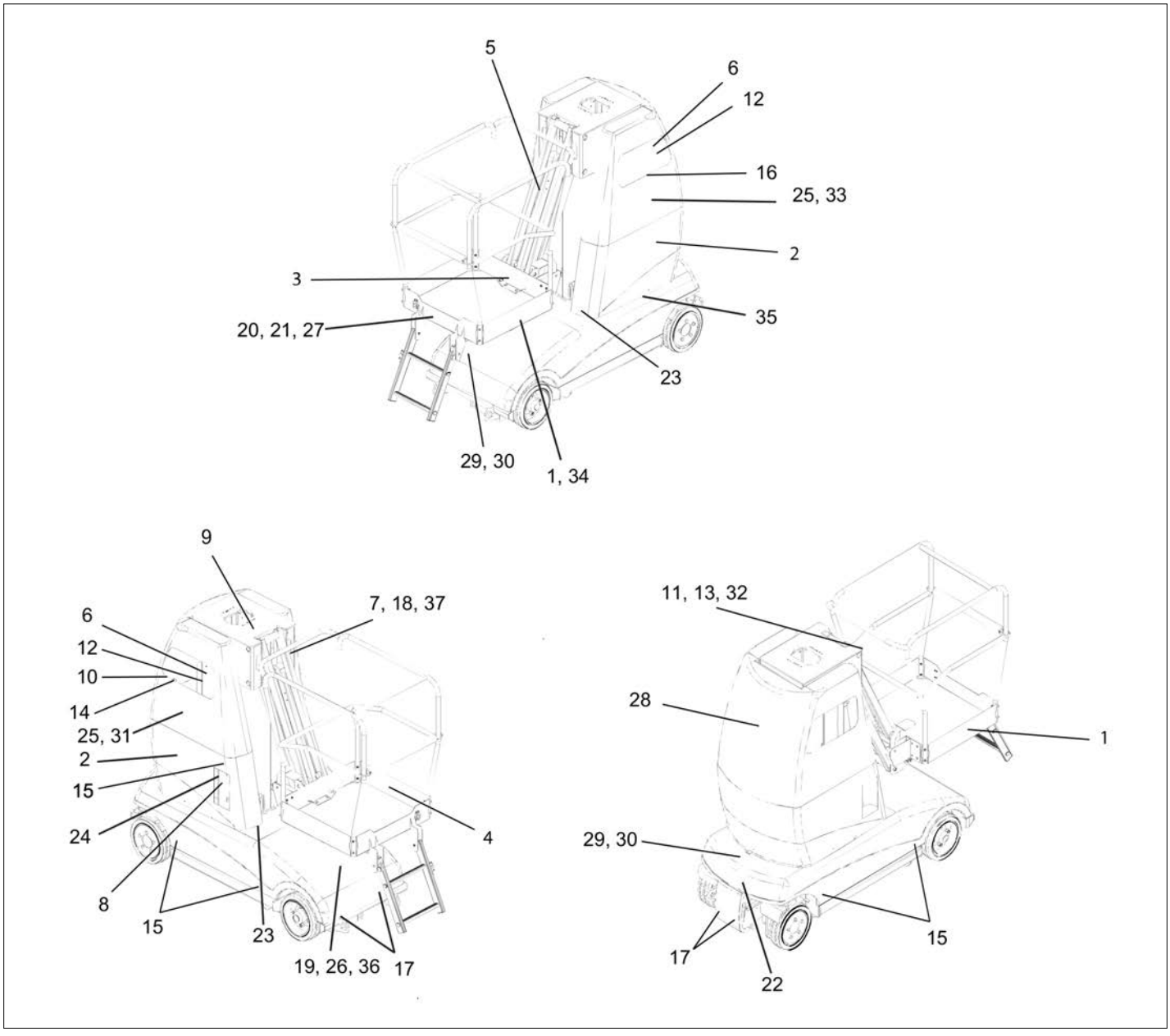
REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
Not Shown	505611-001	DECALS MB26 ANSI		EA
1	511099-000	Decal, Snorkel	2	EA
2	512261-000	DECAL, Snorkel MB26J cover	2	EA
3	068635-001	Harness anchor point	1	EA
4	058761-000	DECAL - S.W.L. LARGE ANSI	1	EA
5	510280-100	DECAL - EMERGENCY LOWERING 2	1	EA
6	057429-000	DECAL - BATTERY FLUID LEVEL	2	EA
7	058539-002	DECAL- SAFETY STEPS	1	EA
8	501573-000	MB LOWER CONTROL BOX	1	EA
9	058537-000	DECAL-PINCH POINT	1	EA
10	501643-001	DECAL,SYSTEM OPERATING	1	EA
11	058181-003	DECAL - 3 POINTS	1	EA
12	066552-000	DECAL- EXPLOSION HAZARD	2	EA
13	010076-901	DECAL SNORKEL LOGO, 183MM CAP	1	EA
14	508503-000	Decal, Caution Batfill Battery	1	EA
15	066556-001	DECAL, CRUSHING HAZARD	5	EA
16	508526-000	DECAL - EMERCENCY RE	1	EA
17	058531-000	Lift/tie down point	4	EA
18	058538-001	DECAL- SAFETY HAZARDS	1	EA
19	060197-001	DECAL,HYDRAULIC FLUID	1	EA
20	058530-000	DECAL- ANSI A92.5 199	1	EA
21	300699	Decal, Operators Checklist	1	EA
22	057434-001	DECAL - GENUINE REPLACEMENTS	1	EA
23	057424-001	DECAL - CRUSH HAZARD	2	EA
24	066555-000	DECAL, RELIEF VALVE	1	EA
25	058534-000	DECAL, BATTERIES	2	EA
26	508771-000	DECAL, DO NOT REMOVE COMPONENTS	1	EA

アイテム	部品番号	名前	数量	UOM
27	508772-000	DECAL, WARNING RESPONSIBILITIES	1	EA
28	511099-000	Decal, Snorkel	1	EA
29	0070540	DECAL, YELLOW ARROW	2	EA
30	0070541	DECAL, BLUE ARROW	2	EA
31	416836	DECAL BATTEY CHARGER PLUG	1	EA
32	0073224	DECAL, NOTICE MANUAL REORDER	1	EA
33	0070921	Decal, 125 Volts (USA Only)	1	EA
34	0150606	Decal, 125 Volts Power To Platform (USA Only)	1	EA
35	514360-000	Decal, Hand Trap	1	EA
36	515843-000	DECAL OIL TYPE	1	EA
37	515335-100	Decal, QR Barcode, English	1	EA

REPAIR PARTS



アイテム	部品番号	名前	数量	UOM
Not Shown	505607-002	MB20 ANSI DECAL KIT		EA
1	511099-000	Decal, Snorkel	2	EA
2	512260-000	DECAL, Snorkel MB20J cover	2	EA
3	068635-001	Harness anchor point	1	EA
4	058761-000	DECAL - S.W.L. LARGE ANSI	1	EA
5	510280-100	DECAL - EMERGENCY LOWERING 2	1	EA
6	057429-000	DECAL - BATTERY FLUID LEVEL	2	EA
7	058539-002	DECAL- SAFETY STEPS	1	EA
8	501573-000	MB LOWER CONTROL BOX	1	EA
9	058537-000	DECAL-PINCH POINT	1	EA
10	501643-001	DECAL,SYSTEM OPERATING	1	EA
11	058181-003	DECAL - 3 POINTS	1	EA
12	066552-000	DECAL- EXPLOSION HAZARD	2	EA
13	010076-901	DECAL SNORKEL LOGO, 183MM CAP	1	EA
14	508503-000	Decal, Caution Batfill Battery	1	EA
15	066556-001	DECAL, CRUSHING HAZARD	5	EA
16	508526-000	DECAL - EMERCENCY RE	1	EA
17	058531-000	Lift/tie down point	4	EA
18	058538-001	DECAL- SAFETY HAZARDS	1	EA
19	060197-001	DECAL,HYDRAULIC FLUID	1	EA
20	058530-000	DECAL- ANSI A92.5 199	1	EA
21	300699	Decal, Operators Checklist	1	EA
22	057434-001	DECAL - GENUINE REPLACEMENTS	1	EA
23	057424-001	DECAL - CRUSH HAZARD	2	EA
24	066555-000	DECAL, RELIEF VALVE	1	EA
25	058534-000	DECAL, BATTERIES	2	EA
26	508771-000	DECAL, DO NOT REMOVE COMPONENTS	1	EA

アイテム	部品番号	名前	数量	UOM
27	508772-000	DECAL, WARNING RESPONSIBILITIES	1	EA
28	511099-000	Decal, Snorkel	1	EA
29	0070540	DECAL, YELLOW ARROW	2	EA
30	0070541	DECAL, BLUE ARROW	2	EA
31	416836	DECAL BATTEY CHARGER PLUG	1	EA
32	0073224	DECAL, NOTICE MANUAL REORDER	1	EA
33	0070921	Decal, 125 Volts (USA Only)	1	EA
34	0150606	Decal, 125 Volts Power To Platform (USA Only)	1	EA
35	514360-000	Decal, Hand Trap	1	EA
36	515843-000	DECAL OIL TYPE	1	EA
37	515335-100	Decal, QR Barcode, English	1	EA

Maintenance

Every person who maintains, inspects, tests or repairs the aerial platform must be qualified to do so. Maintenance functions must be performed by maintenance personnel who are qualified to work on the aerial platform.

⚠Caution

Welding current can be very intense. Damage to electronic components can result. Connect the ground clamp as close as possible to the area being welded. Disconnect the battery cables and any microprocessors and engine control modules before welding on the machine.

If it becomes necessary to weld aerial platform components as a method of repair, take all precautions to prevent damage to electronic circuitry and devices on the machine. This includes, but may not be limited to, disconnecting battery cables and electronic devices.

Do not modify this aerial platform without prior written consent of the Snorkel Engineering Department. Modification may void the warranty, adversely affect stability or affect the operational characteristics of the aerial platform.

Maintenance Schedules

Snorkel has established a preventative maintenance schedule to detect any defective, damaged or improperly secured parts and provide information regarding lubrication and other minor maintenance items.

This schedule includes the following:

- Daily Prestart Inspection
- Frequent Inspection and Maintenance every 90 Days or 150 Hours
- Annual Maintenance – Every 500 Hours

The Daily Prestart Inspection must be performed by a trained operation. All other maintenance and inspection must be performed by a trained service technician only. Retain a copy of these forms for your records.

Note : frequency and extent of periodic examinations may depend on National Regulations.

All placards and decals on the machine must be in place and legible. Use the Placards and Decals parts page in the Repair Parts section of this manual to check these placards and decals.

Snorkel recommends that you make additional copies of the preventative inspection and maintenance checklists for your use in performing these inspections.

⚠Warning

The potential for accident increases when operating an aerial platform that is damaged or malfunctioning. Death or serious injury can result from such accidents. Do not operate the aerial platform if it is damaged or malfunctioning.

Repair all defects before returning the machine to service.

General Information

The parts drawings located in the Repair Parts section are designed for use as a guide for proper disassembly of the machine and components, as well as, for parts replacement.

⚠Danger

Hydraulic fluid escaping under pressure can have enough force to inject fluid into the flesh. Serious infection or reaction will result if medical treatment is not given immediately. In case of injury by escaping hydraulic fluid, seek medical attention at once.

Always refer to the hydraulic system installation drawings and the electrical wiring diagram before removing or disassembling associated parts.

When disassembling or reassembling components, complete the procedural step in sequence. Do not partially disassemble or assemble one part, then start on another. Always check your work to assure that nothing has been overlooked.

Keep the following in mind when disassembling or assembling the machine.

- Always be conscious of weight.
- Never attempt to lift heavy objects without the aid of a mechanical device.
- Do not allow heavy object to rest in an unstable condition.
- Always make sure the work platform is in the stowed position, blocked or the weight removed by a suitable lifting device before removing any components from the machine.
- When raising a portion of the machine, be sure that adequate blocking is properly positioned. Do not depend solely on the lifting device to hold and secure weight.
- If a part resists removal, check to see if all fasteners, electrical wiring, hydraulic lines, etc., have been removed or that other parts are not interfering.

Parts should be thoroughly inspected before restoring to service at the time of reassembly. Burrs, nicks or scratches may be removed from machines surfaces by

honing or polishing with a #600 crocus cloth, followed by a thorough cleaning with an approved cleaning solvent, and blown dry with compressed air. Do not alter the contour of any part. If this operation does not restore the part to a serviceable condition, replace the part.

Replace all o-rings, seals and gaskets at reassembly. Use new roll pins or cotter pins. Dip all packing rings and seals in hydraulic oil before reassembling in cylinder and manifolds. Replace any part having imperfect threads. In general, machines that have been disassembled can be reassembled by reversing the order of disassembly.

The service life of a machine can be increased by keeping dirt and foreign materials out of the vital components. Shields, covers, seals and filters help to keep air and oil supplies clean. However, these items must be maintained on a scheduled basis in order to function properly.

Clean surrounding areas, as well as the opening and fittings before disconnecting air or oil lines. As soon as a line or component is disconnected, cap or cover all openings to prevent the entry of dirt or foreign materials.

New parts should remain in their container until they are ready to be used.

Clearly mark or tag hydraulic lines and electrical wiring connections when disconnecting or removing them from the machine. This will assure that they are correctly reinstalled.

Proper assembly is critical to the successful rebuilding of any machine. Carefully, inspect any parts which are to be reused. If in doubt, replace.

“Safety First” is a good slogan.

Replace any guards and protective devices that have been removed to carry out maintenance and repair work.

Daily Prestart Inspection

Item	Inspect For	Ok
Operator's Manual	In place, all pages readable and intact	
Electrical System		
Battery	Condition and charged for proper operation	
Battery fluid level and terminals	Proper level/clean, connectors tight	
Cables and wiring harness	No wear,pinching or physical damage	
Hydraulic System		
Fluid level	Between full and add marks	
Hose, tubes and fittings	No leaks, pinching or rubbing points	
Emergency Hydraulic System	Operate the emergency lowering valve and check for serviceability	
Drive Motor/Gear Box	Check operation and leaks	
Tires	Good condition	
Wheels	All wheel lug nuts present and properly torqued	
Lower Control Station		
Operating controls	Proper operation	
Emergency stop	Shuts off lower controls/proper operation	
Level Sensor	Sounds tilt alarm	
Flashing Light	Proper operation (Optional)	
All Motion Alarm	Sounds when machine is lifting and/or driven (Optional)	
Motion Alarm	Sounds when machine is lifting	
Structures		
Weldments – Chassis, turntable, Mast, platform, etc.	Welds intact, no damage,cracks or deformation	
Slide pads	In place, no damage or deformation	
Fasteners	In place and tight	
Entire unit	Check for and repair collision damage	
Upper Control Station		
Guardrail system and lanyard anchors	Welds intact, no damage or deformation	
Operating controls – Boom functions, drive, brakes, etc.	Proper operation	
Emergency stop	Shuts off upper controls/proper operation	
Horn	Sounds when activated	
Placards and Decals	In place and readable	

Performed by: _____ Date: _____

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	OK
Chassis			
Structural	Check for damage and cracked welds		
Steering cylinder snap rings	Verify that all fasteners are in place and are tight		
Steering linkage	Check for proper operation		
Steering cylinder	Check for leaks, wear, damage, and for proper operation		
Tires	Check for wear and damage		
Hydraulic tubes and hoses	Check for leaks, wear, and damage		
Drive motor brake	Check for proper operation		
Hydraulic Pump	Check for leaks at mating surfaces		
Torque drive and steer wheel lug nuts.	Torque lug bolts/nuts to proper value	Front: 130 Nm (96 lb ft) Rear: 130 Nm (96 lb ft)	
Right drive motors	Check for leaks		
Left drive motors	Check for leaks		
System pressure - Main Relief	Check maximum system pressure	MB26 -220 Bar (3190 p.s.i.) MB20 -220 Bar (3190 p.s.i.)	
System pressure - Lift Relief	Check maximum system pressure	MB26 -180 Bar (2610 p.s.i.) MB20 -155 Bar (2250 p.s.i.)	
System pressure - Slew Cross Line	Check maximum system pressure	MB26 -50 Bar (725 p.s.i.) MB20 -50 Bar (725 p.s.i.)	
Batteries (Fully charged)	Check specific gravity	1.28(US 1275)at 32.2° C(90°F)	
Tie-down and lifting lugs	Check for damage and cracked welds		
Decals and placards	Check for damage and readability Order replacements as necessary		
Tuntable (Slew)			
Structural	Check for damage and cracked welds		
Torque turntable top bolts	Torque to proper value (20 Bolts)	220 Nm (162 lb ft)	
Torque turntable bottom bolts	Torque to proper value (15 Bolts)	220 Nm (162 lb ft)	
Hydraulic tubes and hoses	Check for leaks, wear and damage		
First Mast	Check for wear, and damage		
First Mast mounting bolts	Verify that all fasteners are in place and are tight		
Chain adjusting anchors	Verify that all fasteners are in place and are tight		
Pully shaft bearing block bolts	Verify that all fasteners are in place and are tight		
Lift cylinder and valve end block	Check for leaks, wear, damage, and for proper operation		
Emergency Lowering Mast valve	Check for proper operation		
Emergency Jib Mast valve	Check for proper operation		
Cowling	Check for wear/damage and that fasteners are in place and are tight		
Wire harness	Check for wear/damage and that fasteners are in place and are tight		
Rotation backlash	Check for wear and damage		
Operator’s Manual	Proper manual in document holder		
Decals and placards	Check for damage and readability Order replacements as necessary		

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	OK
Lower Controls			
Control switch in the lower controls position	Check for proper operation	With selector in the lower controls position, upper controls do not work	
Station selector switch in the upper controls position	Check for proper operation	With selector in the upper controls position, lower controls do not work	
Turntable CW – CCW	Check for proper operation		
Jib elevation Up – Down	Check for proper operation		
Platform level Up – Down	Check for proper operation		
Emergency stop	Check for proper operation		
Mast / Jib			
Structural	Check for damage and cracked welds		
Jib cylinder pin caps	Verify that all fasteners are in place and are tight.		
Jib cylinder and Lowering valve	Check for leaks, wear, damage, and for proper operation		
Jib cylinder	Check for rod wear,damage and for proper operation. Check retaining rings.		
Hydraulic tubes and hoses	Check for leaks, wear, and damage		
Electrical wires	Check for wear and damage		
Check pivot pins and retaining rings	Check for wear and damage, lubricate.		
Wear Pads	Check for wear and damage, lubricate.	Two upper-rear pads should be replaced every two years	
Limit Switch	Check for switch damage, check for damage to 2-core cable.	Max 10mm gap between magnetic faces	
Decals and placards	Check for damage and readability Order replacements as necessary		
Platform			
Structural	Check for damage and cracked welds		
Entry Bar	Check for proper operation		
Hydraulic tubes and hoses	Check for leaks, wear, and damage		
Cage Rails	Fixed in position, Bolts tight	20Nm	
Decals and placards	Check for damage and readability Order replacements as necessary		
Upper Control Station			
Turntable (Slew) CW – CCW	Check for proper operation		
Jib elevation Up – Down	Check for proper operation		
Jib Extend – Retract	Check for proper operation		
Platform level Up – Down	Check for proper operation		
Platform rotation CW – CCW	Check for proper operation		
Drive speed	Elevated / Stowed	0.37 mph / 2.05 mph	
Platform controller	Check smooth operation/speeds		
Emergency stop	Check for proper operation		
Horn	Check for proper operation		
Gradual start to stop lift/swing/ drive controls	Check for proper operation		
Tilt alarm	Check for proper operation	2° Front/Back-2° Side/Side	
110 volt AC power to platform	Check for proper operation (Optional)		

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	OK
Chains			
Inspect Anchor Block and Anchor Block Cross-Pin	Inspect for wear and damage.		
Inspect Clamping Bolts and central locating pin	Inspect for wear and damage.		
Chain Inspection	Inspect for wear and damage and excessive slackness.	check for slamming of the chain during acceleration and deceleration.	
Battery fluid level and terminals	Check	Clean terminals, check electrolyte levels and cable connections	
Hydraulic Oil Resevoir			
Filler/breather cap and tank	Check for wear/securely fasten		
Hydraulic fluid level	Check for proper level	Q8 (Check fluid ID label on tank)	
Hydraulic filter	Replace after the first 50 hours, every 90 days or 150 hours thereafter Inspect filter for foreign matter that could indicate component wear		
Hydraulic System			
Check hose connections			
Check for exterior wear			
Main Hydraulic Valve	Leaks		
Parking Brakes	Leaks		
Hydraulic Drive Motors	Leaks		
Overload System			
Check Overload is working correctly		Check Overload warning light Illuminates when load in basket exceeds SWL by 20%	
Decals			
Placards and decals inspection	Inspect using drawing and parts listing in Section of Repair Parts	Replace any missing or unreadable decals/ placards	
Options			
Drive motion alarm	Check for proper operation		
Flashing light	Check for proper operation		
Driving lights	Check for proper operation		
Platform work lights	Check for proper operation		
Platform control cover	Check condition and for proper operation		
Airline to platform	Check for proper operation		

Frequent Inspection and Maintenance – Every 90 Days or 150 Hours

Item	Procedure	Information	OK
Lubrication			
Daily Preventitive maintenance Checklist	Perform maintenance as per schedule, complete form	Retain copy of checklist	
Hinges and latches	Lubricate	Spray lubricant Interflon EP+	
Rotation Slew bearing	Lubricate	EP.2 Lithium Grease	
Slew Motor	Lubricate (3 positions)	EP.2 Lithium Grease	
Rotation Slew bearing teeth and pinion	Lubricate	EP.2 Lithium Grease	
Pothole Mechanism	Lubricate (2 positions)	EP.2 Lithium Grease	
Chains	Lubricate, apply light caoting	Light coating Interflon Fin Lube TF +Teflon	
Jib Arms	Lubricate (8 positions)	EP.2 Lithium Grease	
Wear Pads / Mast	Lubricate	Interflon LS 1/2	
Steering Yoke	Lubricate(2 positions)	EP.2 Lithium Grease	

Performed by: _____ Date: _____

Annual Maintenance – Every 500 Hours

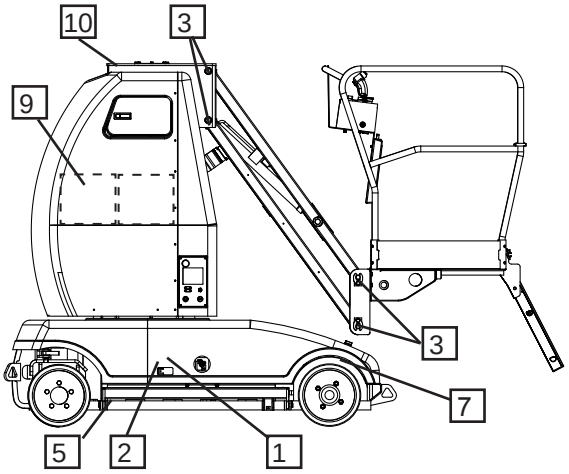
Item	Procedure	Information	OK
90 day or 150 hour maintenance	Perform maintenance per schedule	Retain copy of checklist	
Hydraulic fluid condition	Drain, flush, and clean hydraulic system. Refill with new fluid.	Q8 (Check fluid ID label on tank for specific fluid grade)	
Overload			
Calibrate System	See Maintenance Process	Moba Overload Cell	
Wear Pads			
Inspect the wear on the pads, two upper rear Wear Pads should be replaced every two years or after 1500 hours work.	See Maintenance Process section		
Chain Tension Adjustment			
Check adjust chain tension	See Maintenance Process section		

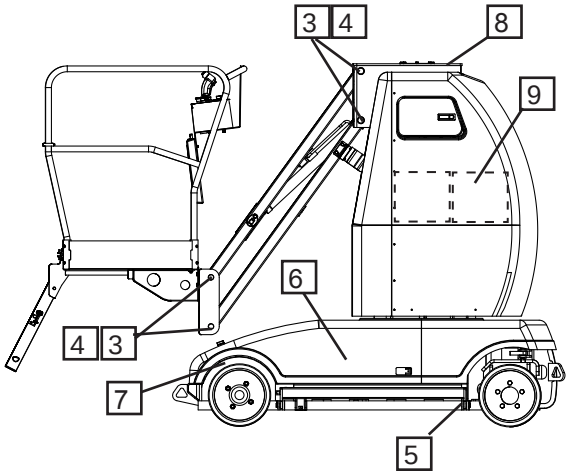
Performed by:_____ Date:_____

Major Repairs

Date	Part Number	Part Description	Repair Performed

Lubrication Points





Lubrication
Specific lubricants as recommended by Snorkel, should be used in maintaining the unit. If in doubt regarding the use of lubricants other than those listed, contact Snorkel Customer Service Department for evaluation and recommendation.

Refer to the above lubrication illustration to locate component item numbers.

Service all fittings as indicated on the Frequent Maintenance schedule and lubrication illustration. Wipe away all excess lubricant from exposed surfaces. Over lubrication can collect dirt and foreign matter which acts as an abrasive. Lubrication of accessory equipment should be in accordance with the manufacturer's recommendations.

Slew Ring
Slew Ring (remove covers)– Item 1. Pressure gun lubricate bearing at recommended interval using lubricant as outlined in the maintenance schedule. The lubrication fittings (Qty 3) are located on the turntable motor below the ballast.

Rotation Gear Teeth and Pinion
Rotation gear teeth and pinion – Item 2. Gear teeth and gear box pinion should be lubricated with EP.2 Lithium Grease. Grease Slew Ring evenly and sparingly every 50 hours or 50 days.
DO NOT subject this area to powerwashing.

Pivot Pins
Pivot Pins – Item 3 Apply grease liberally to the Pivot Pin and Pin Lock Plate locations using a brush or cloth. Force as much Interflon LS1/2 grease as possible between the Pins & Pin Lock Plates and the Weldments. Wipe away all excess grease.

Jib Pivot Pins
Jib – Item 4. Use pressure gun to lubricate pins (8 fitting locations) at recommended interval using lubricant as outlined in the maintenance schedule. Lubrication fittings are located between Jib arm weldments.

Pothole Mechanism
Pothole – Item 5. Use pressure gun to lubricate Pothole Mechanism at recommended interval using lubricant as outlined in the maintenance schedule. Lubrication fittings (Qty 2) are located on each side of the machine. Potholes must be in the lowered position to access fitting, switch machine off before proceeding.

Hydraulic Oil Reservoir(Tank)
Hydraulic oil reservoir – Item 6. With platform and Jib fully lowered i.e. stowed, oil should be visible on the dipstick. If the oil is NOT visible, fill the tank until oil is then visible on the dipstick. DO NOT fill above the upper line on the dipstick or when the platform is elevated.

Note: oil grades may vary depending on machine specification. Contact Snorkel Product Support for further advice.

The interior of the reservoir should be wiped out and cleaned each time the hydraulic oil is changed. The reservoir filler/breather cap and the filter housing should be removed and cleaned with Kerosene, fuel oil, or other solvent at this time.

It is absolutely necessary that only new, clean hydraulic oil is added.

Note
If it becomes necessary to add or use an oil other than the recommended fluid, it is important that it be compatible and equivalent to the factory fill. Local oil suppliers can generally furnish this information.

If questions still remain, contact Snorkel Customer Service Department for further information.

Hydraulic Oil Return Filter
Return filter – Item 6. The hydraulic oil return filter is mounted inside of the hydraulic oil reservoir(Tank).

The filter element is a throw-away type filter and should be changed after the initial break-in period (approximately 50 hours operation time).

The filter condition should be checked at the 90 day or 150 hour Preventive Inspection Maintenance interval or more frequently under extreme working conditions.

⚠Warning

Wear safety gloves and safety glasses when handling hot oil (hydraulic oil can be a skin irritant). The hydraulic oil may be of sufficient temperature to cause burns.

When changing the filter element, the oil inside of the filter element, should be examined for deposits of metal cuttings, which is present, could indicate excessive wear in some of the system components.

Yoke Pins
Yoke Pin – Item 7. Use pressure gun to lubricate pins (2 fitting locations) at recommended interval using lubricant as outlined in the maintenance schedule. Lubrication fittings are located on the Yoke weldments.

Slide Pads
Slide pads – Item 8. Check slide pads for excessive wear and replace as required or as outlined in the maintenance schedule. Slide pads require lubrication.

Lift Chains
Chains - Item 9. Raise the masts to full height. Apply grease liberally to the external lift chains using a small paint brush. The main internal chain may be lubricated by removing the top cover from the jib mount structure. With the jib fully lowered, apply grease to the chain from the platform.
The masts may be raised or lowered to expose the links. This operation should be carried out at intervals outlined in the maintenance schedule.

Batteries
Batteries – Item 10. Batteries will have longer life if the water level is maintained and they are kept charged. In cold weather the battery should be maintained at full charge to keep from freezing. An extremely low or dead battery can freeze in cold weather. Make sure connections are clean and tight.

Make sure charging equipment is operating properly.

⚠Danger

Lead-acid batteries produce flammable and explosive gases. Never allow smoking, flames or sparks around batteries. Lead-acid batteries contain sulfuric acid which will damage eyes or skin on contact. When working around batteries, always wear a face shield to avoid acid in eyes.

If acid contacts eyes, flush immediately with clear water and get medical attention. Wear rubber gloves and protective clothing to keep acid off skin, if acid contacts skin, wash off immediately with clear water.

Battery Care and Maintenance
The following information about battery care and maintenance was supplied by Interstate Batteries and is reprinted here with their permission.

1. New batteries need to be cycled several times before reaching full capacity (20-50 cycles, depending on type). Usage should be limited during this period.

2. Always recharge batteries fully, immediately after use. Batteries perform best when they are fully charged. More capacity and longer life will result from this practice.

3. The deeper the discharge, the fewer number of cycles a lead-acid battery will deliver. Deep discharges deteriorate the battery quicker than lighter shallow cycles.

4. Battery cables should be intact and connectors kept tight at all times. Systematic inspection is recommended.

5. Batteries should be kept clean – free of dirt and corrosion – at all times. Always keep the top of batteries clean. A film on top of the battery can cause the current to migrate between the posts, accelerating self discharge.

6. A fully charged battery will give you the best and longest service. Be sure the batteries are fully charged before testing or using. A fully charged battery, without a drain or load, after the surface charge has dissipated, is 6.35 volts for a 6 volt battery.

7. Batteries should not be discharged below 20% of capacity (approximately 1.8 volts per cell under normal operating load; 1.98 volts open circuit; 1.145 specific gravity). Proper battery sizing will help avoid excessive discharge.

8. Battery chargers should be sized to fully charge batteries in an eight hour period. Chargers should be kept in proper operating condition.

9. Do not use a mismatched charger of any type; i.e., a 12 volt charger on a 24 volt pack or a 24 volt charger on a 12 volt pack. An undersized charger will never get the job done, no matter how long it tries. An oversized charger will cause excess gassing and heat that could possibly result in a battery meltdown and/or explosion.

10. Never charge a lead-acid battery with a sealed (gel cell) battery charger. The lead-acid battery needs higher voltage to finish its charge. Without it the battery will never come back to 100% and sulfation can occur.

11. Always allow batteries to cool off after charging. The cooling time is very important because heat is generated during the recharge and discharge cycles. Without the cooling time the heat grows, accelerating grid corrosion which is one of the major causes of battery failure. Charging practice should

should be equalized once per week. Manually timed chargers should have the charge time extended approximately 3 hours. Automatically controlled chargers should be unplugged and reconnected after completing a charge cycle.

13. In situations where multiple batteries are connected in series, parallel or series-parallel, a replacement battery's should be of the same size, age and usage level as the companion batteries. Do not put a new battery in a pack that has 50 or more cycles. Either replace all the batteries with new batteries or install a good used battery's in place of the bad. New batteries should be given a full charge before use.

14. Periodic battery testing is an important preventative maintenance procedure. Hydrometer readings of each cell (fully charged) give an indication of balance and true charge level. Imbalance could mean the need for equalizing and is often a sign of improper charging or a bad cell. Voltage checks (open circuit, charged and discharged) can locate a bad cell or weak battery. Load testing will pick out a bad cell when other methods fail. The point is to look for the abnormal. A weak cell or battery will cause premature failure of companion cells or batteries respectively.

15. As batteries age, their maintenance requirements change, Generally their specific gravity is higher and gassing voltage goes up. This means longer charging time and/or higher finish rate (higher amperage at the end of charge). Usually, older batteries need to be watered more often and their capacity decreases.

16. “Opportunity charging”, a short partial charge during an extended duty cycle, is a controversial subject. Generally, the practice is a “crutch” to make up for undersized batteries. The correct approach is to install adequate battery capacity. If this is impossible because of lack of space in the battery compartment or extreme operating conditions (24 hour intermittent use, as an example), “opportunity charging” is better than excessive battery discharging. However, the practice can cause batteries to overheat, require more watering and usually will shorten battery life. “Opportunity charging” is a trade off; something to avoid if possible. One charging cycle per day is preferable.

17. Extreme temperatures can substantially affect battery performance and charging. Cold reduces battery capacity and retards charging. Heat increases water usage and can result in overcharging. Very high temperature can cause “thermal run away” which may lead to an explosion or fire. If extreme temperature is an unavoidable part of an application, consult a battery/charger specialist about ways to deal with the problem.

18. An overly discharged battery might need to be cycled a few times before it can recover fully. If a battery begins to heat before coming up to a full charge, it might be necessary to discharge the battery and recharge it a few times. The charge and discharge cycle might help the current acceptance of the battery and facilitate its recovery to a usable condition.

19. Inactivity can be harmful to deep cycle batteries. If they sit for several months, a “boost” charge should be given – more frequently in warm climate (about once a month) than in cold (every 2-3 months).

20. Never store a battery in a discharged state. The sulfate that forms during discharge can make the battery impossible to recharge fully.

Fastener Torque Chart

Bolt Grade	SAE Grade 1 or 2	SAE Grade 5	SAE Grade 6	SAE Grade 8
Marking				
Definition	Indeterminate Quality	Minimum Commercial Quality	Medium Commercial Quality	Best Commercial Quality
Material	Low Carbon Steel	Medium Carbon Steel Tempered	Medium Carbon Steel Quenched and Tempered	Medium Carbon Alloy Steel Quenched and Tempered
Minimum Tensile Strength	64,000 psi.	105,000 psi	133,000 psi.	150,000 psi
Bolt Size	Recommended Torque Value (ft lbs)			
1/4	5	7	10	10.5
5/16	9	14	19	22
3/8	15	25	34	37
7/16	24	40	55	60
1/2	37	60	85	92
9/16	53	88	120	132
5/8	74	120	167	180
3/4	120	200	280	296
7/8	190	302	440	473
1	282	466	660	714

Torque chart information:

- Consult manufacturers' specific recommendations, when available.
- The chart may be used with both coarse and fine thread fasteners lightly lubricated.
- Increase torque by 20% when multiple tapered tooth (shake proof) lock washers are used.
- The torque values are given in foot-pounds.
- Inch/pound equivalent may be obtained by multiplying by 12.

Fastener Torque Chart – Metric System

Capscrew	Grade 8.8					Grade 10.9				
Size	In-LBS Dry	In-LBS Lubed	FT-LBS Dry	FT-LBS Lubed	Clamp Load (lb)	In-LBS Dry	In-LBS Lubed	FT-LBS Dry	FT-LBS Lubed	Clamp Load (lb)
M4 - 0.7	27	20			861	36	24			1,173
M5 - 0.8	55	41			1,394	72	60			1,895
M6 - 1.0	93	70			1,971	132	96			2,686
M8 - 1.25	228	168	19	14	3,591	312	228			4,889
M8 - 1.0	240	180	20	15	3,844	336	252			5,232
M10 - 1.5			37	28	5,693			51	38	7,744
M10 - 1.25			39	30	6,008			54	41	8,171
M12 - 1.75			65	49	8,273			89	66	11,257
M12 - 1.25			71	53	9,037			96	72	12,297
M14 - 2.0			103	77	11,285			140	107	15,354
M14 - 1.5			114	85	12,263			155	114	16,691
M16 - 2.0			162	122	15,404			221	166	20,963
M16 - 1.5			173	129	16,388			236	177	22,311
M18 - 2.5			222	167	19,423			235	176	
M18 - 1.5										
M20 - 2.5			317	236	24,042			428	321	32,720
M20 - 1.5			350	262	26,695			479	358	36,316
M22 - 2.5			428	321	30,651			452	339	
M22 - 1.5										
M24 - 3.0			546	409	34,642			745	557	47,141
M24 - 2.0			594	446	37,676			811	605	51,277
M27 - 3.0			796	597	45,039			1,084	811	61,292
M27 - 2.0			863	645	58,785			1,173	848	66,226
M30 - 3.5			1084	811	55,054			1,475	1106	74,915
M30 - 3.0			1121	841	56,908			1,527	1143	77,444
M30 - 2.0			1202	900	60,932			1,630	1224	82,917

Rev D

Torque chart information:

- Consult manufacturers' specific recommendations, when available.
- The chart may be used with both coarse and fine thread fasteners lightly lubricated.
- Increase torque by 20% when multiple tapered tooth (shake proof) lock washers are used.
- Foot/pound equivalent may be obtained by dividing by 12.
- Inch/pound equivalent may be obtained by multiplying by 12.
- Newton/meter equivalent may be obtained by multiplying inch/pound by 0.1130.
- Newton/meter equivalent may be obtained by multiplying foot/pound by 1.3558.

3. Maintenance Process

3.1 Introduction

This section contains safety precautions which must be observed during the maintenance and servicing of the MB20/26J work platforms.

Failure to adhere strictly to these instructions will result in personal injury to yourself or others and damage to the machine or the local environment.

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 ⚠

RISK of SERIOUS INJURY.

DO NOT undertake any mechanical, electrical or structural modifications to the design of this machine. Any departure from the normal use of the machine must be certified in writing from Snorkel Powered Access Ltd. or other responsible authority.

Failure to abide by this instruction is a Safety Violation and a Warranty Violation.

3.2 Maintenance Safety

The specific procedures and precautions for maintenance are detailed in Section 3.0 of this Manual. In general, the maintenance procedures and methods used are similar to those for heavy engineering machines which incorporate hydraulic, electrical and structural components.

Be aware that your safey and that of others is of the utmost importance when carrying out maintenanc. The following basic principles should be applied:-

1. Never lift heavy weights without the aid of a mechanical device.
2. Do not allow objects to rest in unstable equilibrium even for short periods.
3. Always place supports under structural members.
4. Always presume that any action, no matter how insignificant, could result in the sudden and uncontolled motion of machine parts under gravity.

⚠ WARNING ⚠

Neither the manufacturer, Snorkel Powered Access Ltd. nor its distributor has direct control over the field inspection, maintenance and safety of this macine.

This is the responsibility of the owner or operator.

Hydraulic System Safety

The operating pressures within the hydraulic circuit are very high. Be aware that personal injury can occur if this pressure is released uncontrollably. Always presume that there is residual high pressure in a hose, pipe cylinder or valve body.

Take steps to eliminate this residual pressure by operating the booms and masts into their rest positions before carrying out any maintenance.

The MB machine should be maintained while on level ground only. This will ensure that the mast rotating mechanism and the running gear are stable.

The greatest risk to safety when maintaining the work platform is the sudden motion under gravity when a hose connection or built-in valve is loosened. The motion control valve is designed to prevent motion under gravity of cylinders in the event of a hose burst. However, loosening or partial removal of the hose burst valve will cause instant motion of the cylinder and the associated structural components.

NOTE: Oil spillages should be cleared up immediately. Avoid the temptation to do it later.

Electrical System Safety

Take note that there is a facility to charge the batteries using an on-board charger. During this operation the machine is therefore connected to a potentially dangerous AC supply. Be conscious that ingress of water and or climatic conditions could result in circuit faults and the machine becoming 'live'.

There is a risk of burns caused by dead shorting of battery terminal.

The severe dangers associated with spilt battery acid and gaseous product are well documented.

Personnel must be fully aware of all these dangers before embarking on work platform maintenance.

Safety Checklist

⚠ WARNING ⚠

Failure to comply with the following safety precautions may result in death or injury of personnel

or machine damage and is a safety violation.

- Ensure that lifting equipment including chains and straps are in good condition. Check the certification of all lifting gear.
- Provide independent supports for all booms, masts, jibs etc. before working underneath. Preferably, these support should be made up of a strong stable structure. Overhead slings or chains may be used only if the slings, chains and the supporting device such as crane, jib or hoist is certified for use as such.
- Use non-flamable cleaning solvents.
- Keep oil, grease and water wiped from floor surfaces and hand hold areas.
- Do not wear loose fitting clothing or neckties. These items and long hair may become entangled in rotating or moving machinery.
- Smoking is strictly forbidden. DO NOT weld or grind in the vicinity of the machine until the batteries are disconnected and removed.
- Remove rings watches and other jewelry when performing maintenance.
- Shut off all power sources and switches before embarking on maintenance.

WORKSHOP PROCEDURES

⚠ CAUTION ⚠

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included.

Please note that this manual contains warnings and cautions concerning some specific service methods which could cause personal injury, or could damage the machine and make it unsafe.

Other service methods may be deployed to carry out a specific task, however, these methods may not be recommended by Snorkel.

Snorkel cannot investigate all possible methods nor can they warn against all possible dangers

Service personnel must be fully satisfied that neither personal safety nor machine safety is compromised.

⚠ WARNING ⚠

Where an abnormal situation is noted - for example damage to a part etc.

It is imperative that advice is sought from Snorkel Techncal advisors or from a suitably qualified person before continuing with maintenance.

It is very important to be aware of the potential dangers associated with maintaining these machines. Think carefully about the possible consequences of all actions before carrying them out.

Take particular precautions against dropping structures when working on the support components such as:-

- Cylinders
- Hydraulic hoses
- Hydraulic valves
- Pivot pins
- Chains
- Sequence Straps
- Chain Anchor Blocks
- Bolts & Screws etc.

Never attempt to repair the mast, jib or platform components while the assembly is partially elevated. In the event of failure of the assembly to descend by normal means use the emergency lowering valves as described in the Operators Manual.

If this fails then support the structure by means of an approved overhead lifting equipment or an approved adjustable support jack prior to loosening or removing any parts.

! DANGER !

Failure to carry out this instruction could lead to **serious injury or death**.

! WARNING !

Where an abnormal situation is noted - for example damage to a part etc. - it is imperative that advice is sought from **Snorkel Techncal advisors** or from a suitably qualified person before continuing with maintenance.

TOOLS

The following special tools will assist in speedy repair and maintenance of the MB20N/26 machines:-

- Multi-meter capable of reading DC Volts, Ohms and Amps.
- 1/4" standard quick -connect hydraulic pressure gauge - Range (0 - 300 bar)
- Calibrator Pt. No. 504560-001 - A test and analysis instrument for the D.C. motor controller.

THREAD SIZE	LOCATION	TIGHTENING TORQUE METRIC	IMPERIAL
M4		3Nm	2.2lbs-ft
M6		10Nm	7lbs-ft
M8		25Nm	18lbs-ft
M10	Pin Lock Plates	40Nm	30lbs-ft
M10	Jib Mount Structure	50Nm	37lbs-ft
M12		80Nm	59lbs-ft
5/8-11unc	Slew Bearing	220Nm	165lbs=ft

Table 1: Torque Settings

! WARNING !

RISK of SERIOUS INJURY.

Take particular care when handling batteries. Acid spills can cause severe burns or blindness.

DO NOT store batteries close to naked flames or close to steel fabrication areas.

3.3 GENERAL MAINTENANCE

This section contains information necessary to perform maintenance on the MB20J & MB26J work platforms. Procedures and techniues are designed to provide the safest and most efficient methods for scheduled maintenance and repair of the machine.

3.4 PREVENTIVE MAINTENANCE CHART

Preventive maintenance and inspection checks can be located at the front of the Mainenance section.
The table lists the components to be checked and the period between checks.
Items for inspection on the table are generally in order, starting at the ground and progressing upwards along the machine. For example, wheel bearings appear near the start of the list while the cage components appear towards the end.

It is a condition of warranty that machines are properly maintained according to this schedule.

3.5 Lubrication

Grease Points

Clean each fitting before applying grease. Using multipurpose grease (EP.2 Lithium), pump the grease into the fitting using a gun until grease just begins to appear at the edges of the pivot pin. Wipe away excess grease.

Figure 3-1: Grease Points

Pivot Pins

Apply grease liberally to the Pivot Pin and Pin Lock Plate locations using a brush or cloth. Force as much grease as possible between the Pins & Pin Lock Plates and the Weldments. Wipe away all excess grease.

Lift Chains

Raise the masts to full height. Apply grease liberally to the external lift chains using a small paint brush. The main internal chain may be lubricated by removing the top cover from the jib mount structure. With the jib fully lowered, apply grease to the chain from the platform. The masts may be raised or lowered to expose the links. This operation should be carried out at intervals outlined in the maintenance schedule.

Slew Ring

Using a brush, apply grease evenly and sparingly to the slew ring gear teeth. Do not subject this area to powerwashing.

3.6 Removal of Covers

Chaissis Covers

Refer to the photo below for a description of the covers.

Figure 3-2: Chassis Covers

The rear chassis cover must be removed in order to access the majority of hydraulic and electrical components on the MB machines.

No tools are required to remove this cover and it is possible to remove and refit with the jib and cage in the stowed position.

Figure 3-3: Bonnet Catch

To remove the cover, loosen the 2 bonnet catches by twisting half a turn in the anticlockwise direction.

Undo the 2 side catches by pressing on the black tab lock, flipping out the tab and twisting 1/4 turn in the clockwise direction.

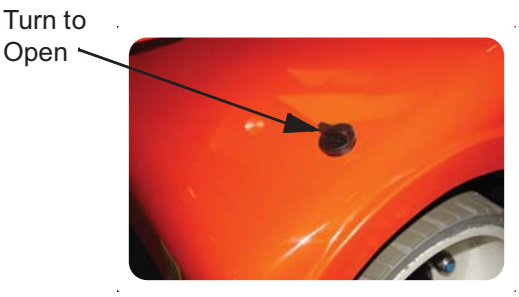


Figure 3-4: Side Catch

When all 4 catches have been loosened it is then possible to remove the rear cover clear of the chassis.

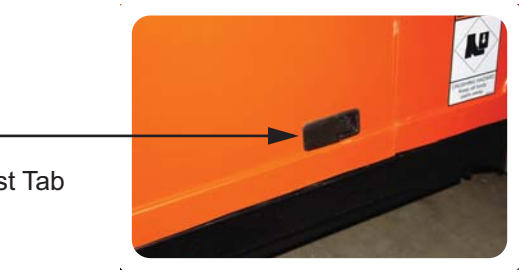


Figure 3-5: Central Handle

Use the central handle to lift the cover upwards and rearward in order to clear the chassis. Take care not to snag the electrical wiring when removing this cover.

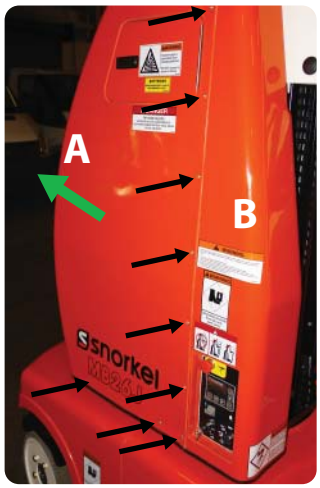
It is not necessary to remove the small front cover on the MB range of machines except for replacement. To remove this cover undo the quick action captive screws which become visible after the rear cover has been removed.

Mast Cover

The mast cover must be removed to replace a battery or battery charger. Servicing of the batteries, however,does not require removal of this cover.

Before removing the cover, raise the mast assembly until the cage is about 2 metres clear of the ground.

Figure 3-7: Mast Cover Removal



1. To remove the Mast Cover, undo all 18 screws from both sides of the Cover (fig 3-7) allowing the cover to seperate.

2. When all 18 screws have been removed completely, Cover “A” should release and slide off in the direction indicated by the Green Arrow (fig 3-7).

Figure 3-8: Mast Cover Removal

3. To remove Cover “B” undo screws shown in fig 3-8

4. Locate the Lower Control box cable within the left wing and undo the cable connector by turning anticlockwise.

5. Store the cable end safely in the chassis.

6. Refitting of the covers is in reverse order.

⚠ WARNING ⚠

Risk of Serious Injury

DO NOT remove ballast material from this machine. Stability is critically dependent on the weight of ballast as supplied from the factory.

3.7 Jib & Platform Assembly

Regular inspection checks should be carried out on the jib and platform assembly. Pay particular attention to the following areas:-

1. Platform ladder mounting bolts and pivots
2. Platform drop bar
3. Cage rail bolts
4. Jib to platform pivot pins & lock bolts
5. Jib to mast pivot pins & lock bolts
6. Jib cylinder hydraulic hose routing & fitting
7. Jib cylinder emergency lowering mechanism
8. Jib cylinder end pivots

Ladder

The machine should not be operated with a damaged ladder. Failure to replace a damaged ladder could result in injury. Do not repair a damaged or broken ladder. Use only plated bolts and nylok nuts when renewing the ladder pivots.

Drop-Bar

Replace damaged, missing or jammed drop-bars on the cage rails. It is not permitted to enter the platform unless it is fitted with an operational drop-bar.

⚠ WARNING ⚠

BEFORE commencing any work on the jib cylinder, jib cylinder valve, jib cylinder hose or jib cylinder emergency lowering mechanism, it is vitally important to either lower the jib completely or to support the assembly externally.

Failure to do this could result in sudden dropping of the jib during dissasembly and consequential serious injury.

Figure 3-9: External Support

Overhead support load =125kg

Use certified crane straps only.
Always lift on a strong point.

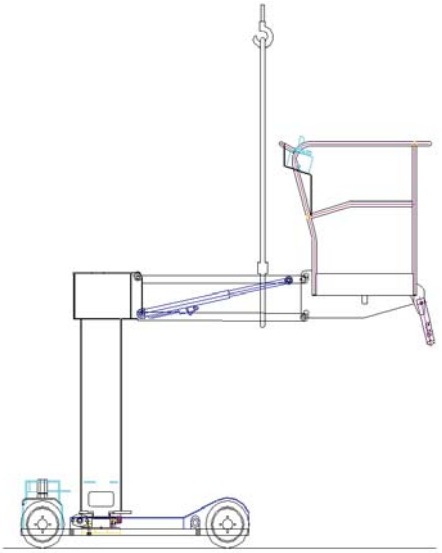


Figure 3-10: Boom Limit Switch

Before commencing work on the Mast Assembly ensure that the jib is fully lowered and approaching the reed switch as shown.

⚠ WARNING ⚠

Failure to do this could result in sudden dropping of the jib during dissasembly and consequential serious injury.

Cage Rails

The cage rails are fixed in position by means of 8 No. M8 ISO grade 8.8 bolts. Regularly inspect these bolts for damage and replace as necessary. The bolts should be tightened to a torque of 20.0 Nm.

The cage rails are manufactured from painted Mild Steel. It is very important to thoroughly inspect the whole Jib & Platform assembly when broken or damaged rails are encountered.

Platform & Jib Removal

The platform assembly (steel base, rails, ladder sub-assembly and Upper Control Station) may be removed as a single unit. The total weight of this assembly is approximately 70 kg. Remove the rear chassis cover and proceed as follows:-

1. Disconnect the Upper Control Station cable from the underside of the box. Turn the plastic socket locknut anticlockwise and withdraw the pin connector. Take note of the socket orientation and the locating tabs to facilitate refitting later.

2. Remove the cable ties on the cage rail and platform base and secure the connector end against damage.

3. Remove the two M10 screws from the lock-plate retainers and slide the lock plates from the pin slots.

Figure 3-11: Retaining bolts

4. Remove the circlip, and using an punch and hammer, tap out the upper jib-mount lower pin taking care to prevent the platform from swinging backwards uncontrollably.

5. Lower the platform backwards and downwards until it rests on the ground or on some temporary support on the chassis. In the case of the MB20J machine, a common long pin is used to connect the jib cylinder and the jib strut to the jib-mount structure.

NOTE: Take precautions to prevent the cylinder from

⚠ WARNING ⚠

The platform and cylinder MUST be supported before removing the Jib Pins.

Failure to do this could result in sudden dropping of the jib during dissasembly and consequential serious injury.

6. Remove the lower pin in the same way.

Figure 3-12: Jib Pin Removal

7. Inspect the cylinder boss and the jib ends for bushing wear and replace as necessary.

8. When replacing the bushings it is important to first remove burrs and lightly oil the steel bosses. Use a small mallet and drift to fit the bearings. Take care not to score the ptfe/bronze coatings as this will greatly reduce the useful life of the bearing.

9. Assembly is in the reverse order of dissassembly.

10. When replacing the pins, coat them in a grease and align the steel bosses and bearings before tapping in the pin. Difficulties with pin fitting are normally caused by misalignment of the parts. Careful attention to alignment of the bosses before driving the pin saves time and minimises the risk of bearing damage. This applies to such assemblies throughout the machine.

11. Removal of the jib members follows in the same manner. The jib upper pins may be accessed by first removing the plastic caps from the sides of the jib-mount structure.

12. Disconnect the jib cylinder hose, solenoid cables and emergency lowering mechanism. Remove the remaining control cable ties from the jib members.

NOTE: Make a note of cables and hose routing in the area of the jib mount access hole. Incorrect re-assembly may result in cable pinching or shearing of either and considerable expense later.

13. Before removing the pins it is necessary to first remove the retaining circlips. Take care when removing the pin to support the jib cylinder which will become free before the jib member.

14. Use new circlip retainers and cable ties when re-assembling the jib members and jib cylinder.

15. Reinstate the cables and hose as per the original routing. Fix the control cable to the jib and platform rails by means of new ties.

16. Test the jib operation from the Lower Control Station initially. Inspect the cable and hose routing. Lower the jib by means of the emergency lowering lever. Test the operation of the jib, mast and slew etc. from the Upper Control Station. Malfunction at this point is most likely caused by an incorrectly fitted control cable connector at the base of the control station. Remove and refit taking care to correctly locate the plastic tabs within the connector.

3.8 Switch Adjustments

Jib Rest Limit Switch

Function (Drive/Lift)

This limit switch is activated when the Elevating Assembly is fully lowered into the stowed position.

The limit switch is a magnetic reed type and is mounted on a bracket between the jib strut and the fixed mast. The high speed drive can only be operated when this switch is activated. When the boom leaves the boom rest the Normally Open contacts of the limit switch open and power is cut to the high speed drive function.

Adjustment

The switch itself is not adjustable and is not serviceable.

Check regularly for damage to the 2-core cable and clear the faces of contaminants.

The switch mounting brackets should be adjusted to give a maximum gap of 10mm between the magnetic faces of the switch.

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 ⚠

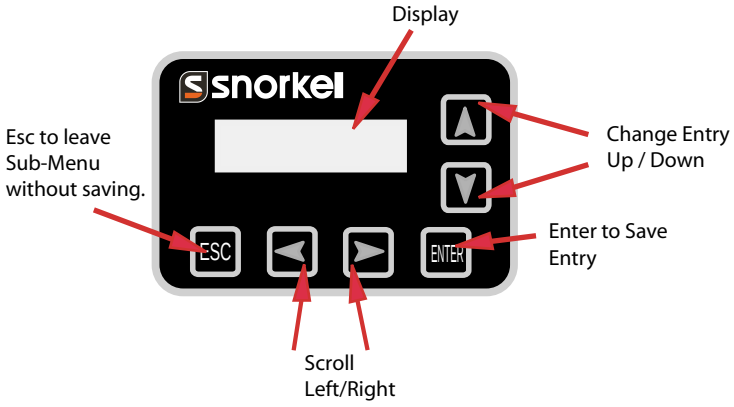
If the EZ230 control module is replaced and/of moved within the machine for any reason the tilt sensor must be reset for zero° using the following procedure. Failure to do so could result in serious injury or death.

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 , ≤ 0.25 °
2. Use a Gauge to confirm that the front and rear of the chassis are level to within +/- 0.25 ° 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.

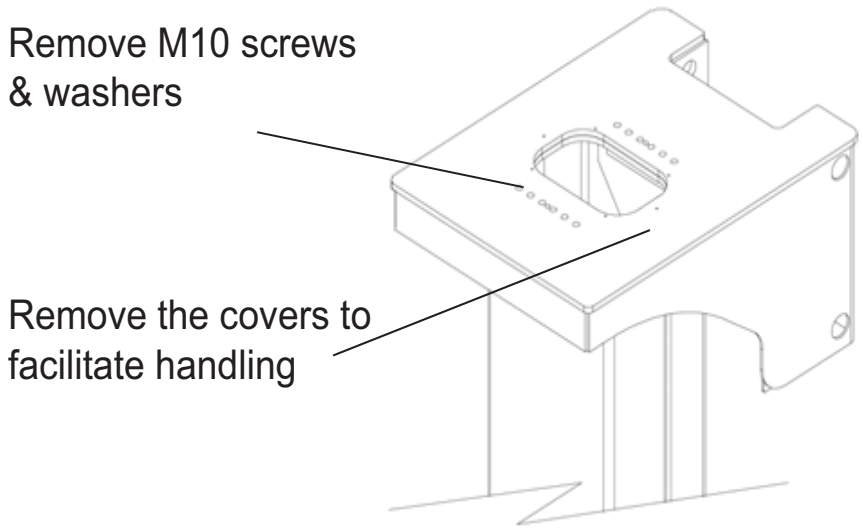


3.9 Mast Assemblies

Jib-Mount Structure

Figure 3-15: Jib Mount Removal

Disassembly and re-assembly of the MB20/26J masts is a specialised task requiring special tools, jigs and fixtures. Structural damage to any of the masts requires a total replacement of the complete mast assembly by Snorkel Powered Access.



The jib-mount structure may be replaced as follows:-

1. Remove the platform and jib assembly.

2. Carefully route the hoses and cables through the openings in the back of the jib-mount weldment. Take note of the positions of hoses and cables to facilitate refitting.

3. Remove the cover plate at the top of the jib-mount to reveal the chain and pulley assembly.

4. Remove and discard the 12 No. M10 screws holding the jib-mount to the upper mast.

5. Remove the jib-mount from the top mast by lifting vertically upwards with a hoist. The jib-mount structure weighs 44kg.

⚠ WARNING ⚠

DO NOT attempt to repair this crucially important structural component.

6. Thoroughly inspect and clean the internal treads on the mast flange plate before re-fitting the jib-mount. DO NOT fit the jib-mount to the mast if any thread is damaged or blocked.

7. Do not lubricate the screw threads. Do not lubricate the internal threads . Use NEW replacement screws M10 x 50, ISO Grade 8.8 or better.

8. Tighten each screw using a short spanner. Gradually increase the torque in a cross-pattern, tightening each screw using a calibrated torque wrench to a maximum value of 65Nm.

9. Refit the dust cover.

10. Reassemble the platform and jib assembly as per the instructions in Section 2.5.

11. It is recommended to check the torque on the 12 screws after a number of working cycles of the machine.

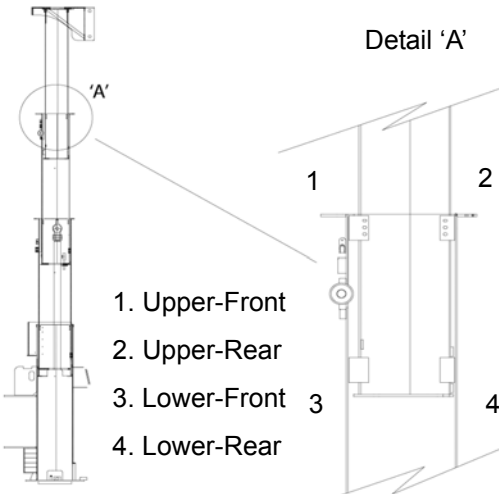
Wear Pads

Correct lubrication, replacement and adjustment of the mast wear pads is critical to the safety of the machine and to the comfort of the operator.

The two Upper-Rear pads being the most heavily loaded, should be replaced every two years or after 1500 hours work.

The Upper-Front pads will have a much longer life. The lower wear pads can be replaced during a major mast overhaul only.

Figure 3-16: Wear Pad Location



Replacement of Wear Pads

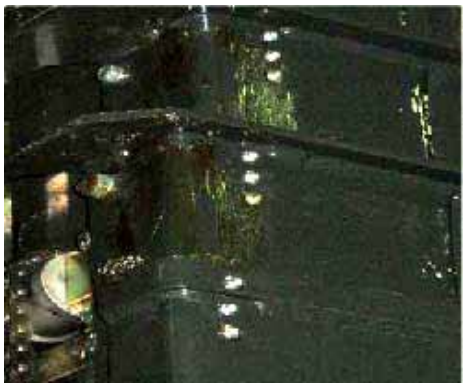
1. Fully lower the Platform assembly into the stowed position.

2. Raise the top mast section approximately 30cm. Wear pad replacement is facilitated if the platform is supported either by using an adjustable jack or an overhead hoist.

3. By means of a retainer (flat steel or bent wire) support the wear pad and prevent it from dropping into the mast.

Figure 3-17: Wear Pad Retaining Screw

4. Using a 4mm Allen key remove the 3 No. M6 button head screws and washers from the mast as shown in Figure 3-7.



5. Replace the worn pad with a new part. Retain and reuse the shim(s) if required. Replacement shims may be used provided they are of stainless stell or plated steel material. Use 1mm and 2mm thick shim material only. It is advisable to remove pads from one side (front face or back face) at a time. Do not fit shims beyond a total of 3mm as this will lead to excessive power consumption in the mast motion until the pads bed in.

Lubrication of Wear Pads

The lubrication of the internal wear pads is very important. Use a Molybdenum based grease. Fully raise the mast sections and apply grease with a brush on to the rear face of the mast in the way of the wear pads.

The front wear pads may be more conveniently lubricated using a heavy grade oil. It is desirable to lubricate the area beneath these wear pads as the loaded pads are at the base of the mast in each case.

3.10 Chains & Straps

Chains

Disassembly and replacement of the lifting chains on the MB20J & MB26J machines is a specialised task requiring special tools, jigs and fixtures. Damage to the chains requires a re-assembly of the mast sections.

Servicing of the lifting chains can be broken into 3 separate functions:-

- Chain Lubrication
- Chain Anchor Inspection
- Chain Tension Adjustment
- Refer to the maintenance table for chain lubrication periods. A light coating of grease should be visible on the chains at all times.

CHAIN ANCHOR INSPECTION & ADJUSTMENT

The chain anchors on the MB20J & MB26J machines can be inspected by adjusting the height of the masts until the anchor points come into view through the inspection opening.

Figure 3-18: Top Chain Ends,Mast-3

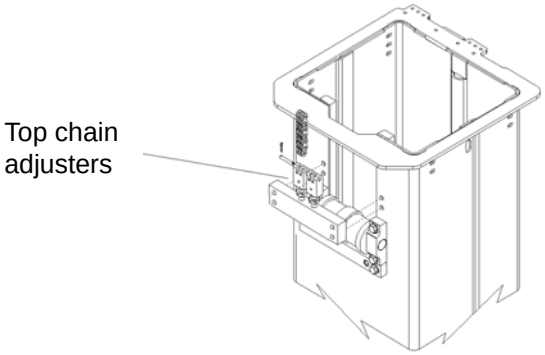


Figure 3-19: Top Chain Ends, Mast-5

Inspect the wear on the anchor block and anchor block cross-pin. Replace the pin and block if there is any visible signs of wear.

Also inspect the clamping bolts and central locating pin. Tighten

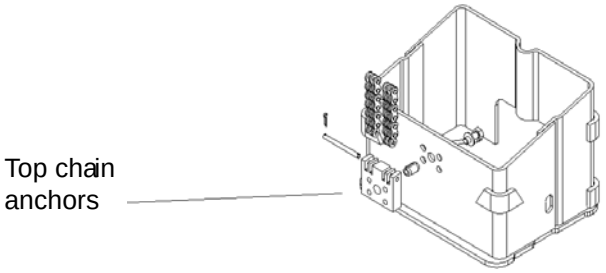
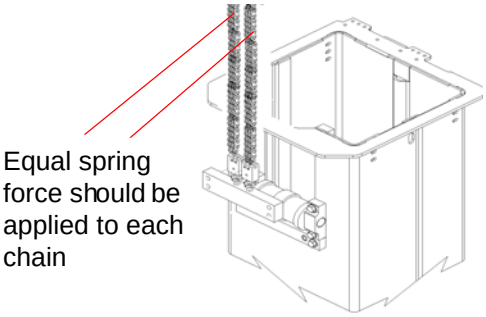


Figure 3-20: Chain Adjustment

The chains are selected to give adequate safety factors against breaking even if only one chain bears load.

However, it is absolutely imperative that each chain in the pair is loaded as evenly as possible throughout its life.



To adjust the balancing of chain tension proceed as follows:-

1. Extend the unladen masts to full height

2. Using a pair of identical compression springs,position each spring betwen the mid point of the external chain and the mast plating. The spring stiffness is not critical but a spring having the following approximate dimension will suffice.

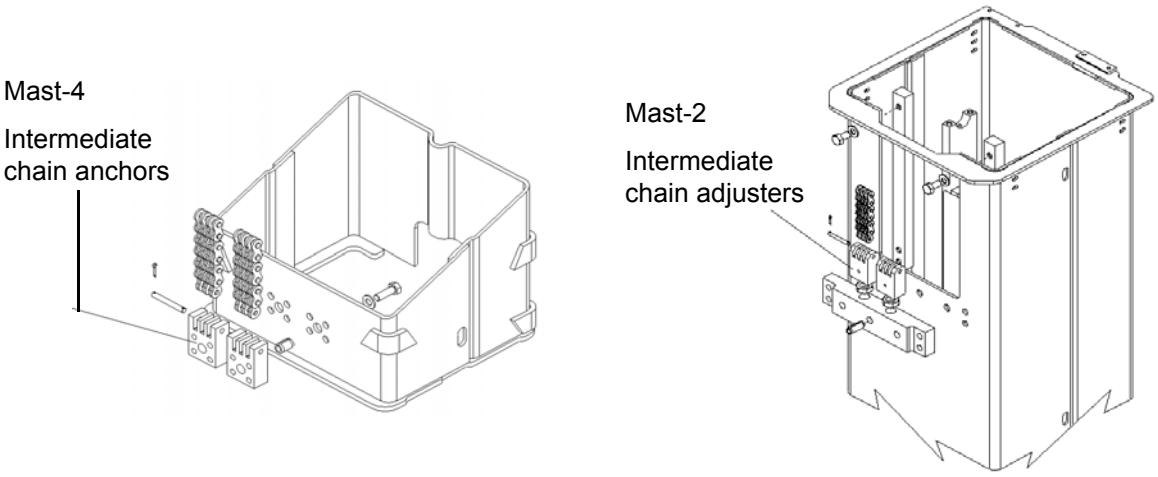
- Wire diameter - 2 to 3mm
- Ouside diameter - 40 to 50mm
- Free length - 90 to 100mm
- Measure the difference in outward deflection of each of the two chains in the pair.

3. If the differential dimension is greater than 6mm. then it is neccessary to tighten the loose adjuster.

4. Return the masts to the fully lowered position and check the overall height of the mast assembly from the ground. Check that the nominal dimension is 1995 mm.

5. If this dimension has been exceeded during chain balancing, then it is likely that one of the chain pairs the chains has been overtightened, causing the masts to rise above the normal position. If this is the case then return to point 3. and balance the chains by slackening off the tightest adjuster.

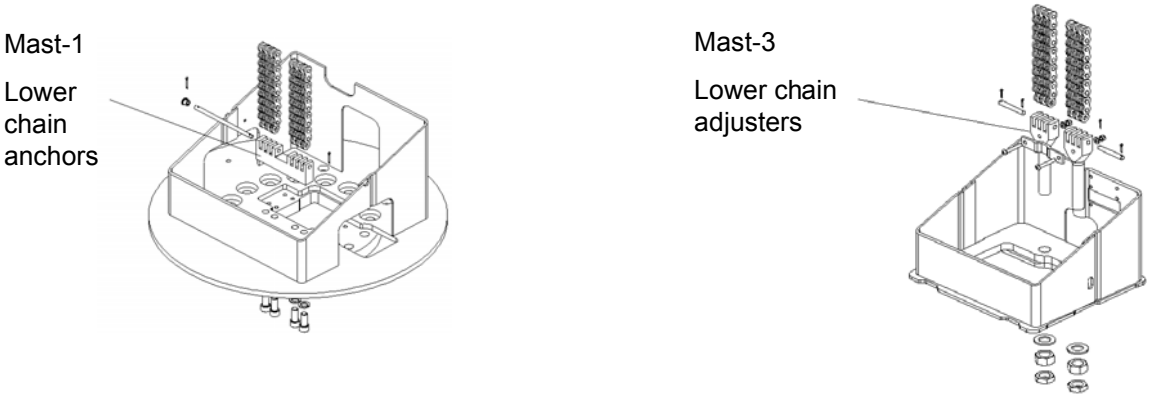
Figure 3-21: Intermediate Chain Ends



LOWER CHAIN ADJUSTMENT

The lower chain adjustment and inspection requires special consideration. Excessive slackness of the lower chain causes slamming of the chain during acceleration and deceleration of the machine during travel. To adjust the chain tension it is necessary to fully lower the mast assembly. Remove the chassis covers and locate the inspection cutout at the base of the fixed mast.

Figure 3-22: Lower Chain Ends



Check that the anchor pins are secured by means of the split pin as shown in Figure 2-22 Using a 22mm spanner adjust the nut at the base of the main chain adjusting end until the chain slackness ie reduced to a minimum. There is no advantage to be gained in continued tightening of the chain. This will lead to raising of Mast-3 and loss of stowed height clearance. Balance the chain tensions by inspecting each chain from the top mast inspection hatch. Tighten the locknuts at the base of each chain tensioner.

3.11 WHEELS & STEERING

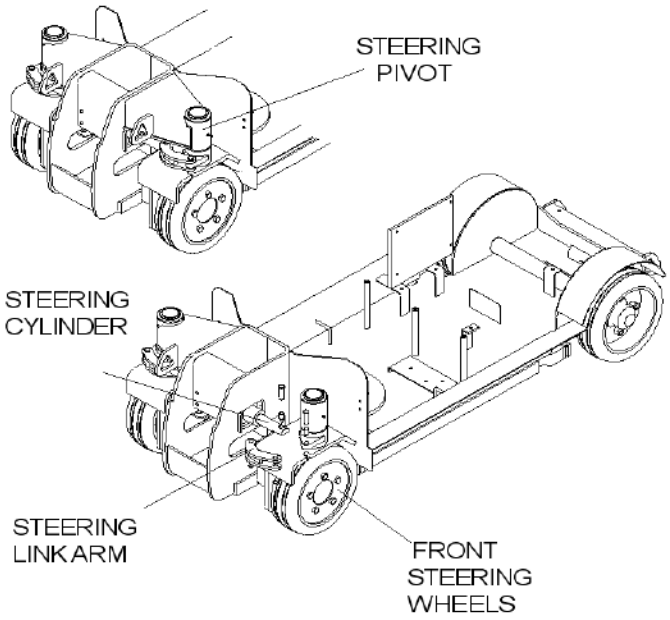
STEERING ASSEMBLY

Steering on the MB20J & MB26J machines is via an hydraulic cylinder mounted on the front of the chassis.

Figure 3-23: Front Steering Wheels

Two steering link arms provide extra tight turning ability and ensure correct geometry during a tight turn.

Each front wheel assembly (consisting of; mounting frame, motor, wheel & tyre) can be **removed as a unit.**



To remove a wheel assembly proceed as follows:-

1. Using suitable lifting equipment to raise the Machine. (refer to the Operators Manual for guidelines to the safe handling of the complete machine) Support the machine chassis on 4 individual supports with a capacity of 1 tonne each. In order to allow the wheel assembly to be removed it is necessary to chock the chassis about 150mm above floor level.

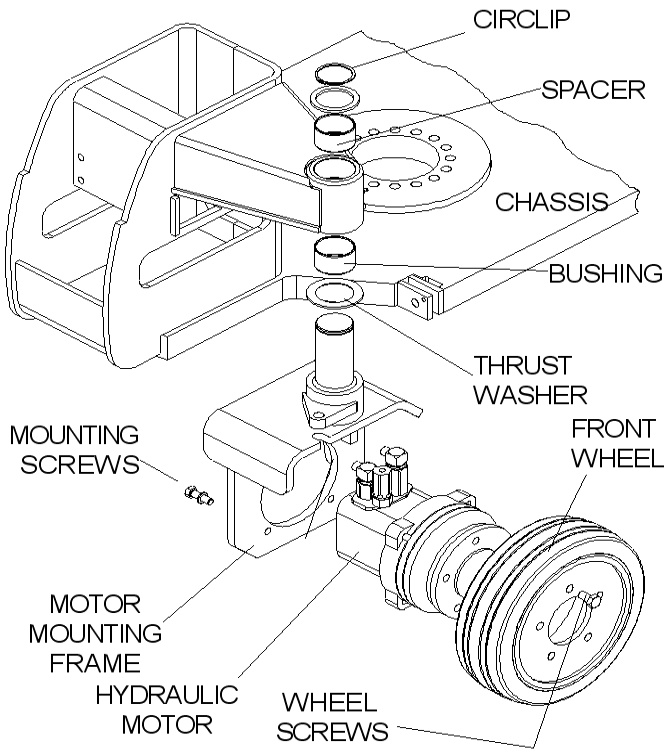
2. Turn the wheel fully to expose the hose connector swivel fittings. Remove the 3 hose connections and plug all hose ends and motor fittings.

3. Remove the steering link link arm by disconnecting the circlips and tapping upwards on the two-pins.

4. Take the weight of the wheel assembly by supporting the wheel from below by suitable means . This facilitates removal of the circlip. The unit weighs approximately 70kg.

5. Remove the circlip from the pivot shaft and lower the assembly to the floor. The wheel, tyre and hydraulic motor may now be replaced as necessary.

Figure 3-24: Front Wheel Assembly



6. Before re-assembling the unit, check that the grease nipple is free from dirt. Lubricate the pivot shaft and chassis pivot tube with grease. Lift the assembly into the pivot preferably using a forklift. The unit weighs approximately 70kg. Fit the spacer washer and a new circlip.

Tightening Torques:-

- Motor mounting screws - 80 N-m
- Wheel mounting screws - 45 N-m

3.12 Hydraulic Tank, Oil & Filter

Fluid Level Check - every 50 hours

Figure 3-25: Hydraulic Tank Dip Stick

Check the oil level in the tank with the platform and jib fully lowered. Oil should be visible on the dipstick. If required, top up using hydraulic oil ISO Grade 46.

Topping up with the jib or mast raised could result in oil overflow during subsequent operation.

Do not remove filter gauze when filling

Filter Replacement - every 500 hours

It is strongly recommended to change the filter element in any case after each 150 hours work. To replace the filter element undo the 4 screws at the top of the filter body. Refer to Figure 3-26. The element is retained by means of the o-ring seal. Do not remove the replacement element wrapping until required - invisible contamination can cause damage to hydraulic components.

Oil Replacement - 500 hours

Breakdown of lubricating capability of hydraulic oil may occur with time. It is recommended to completely change the oil after 500 hours work.

When ingress of contamination such as dirt or water occurs the oil should be changed immediately according to the following instructions.

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

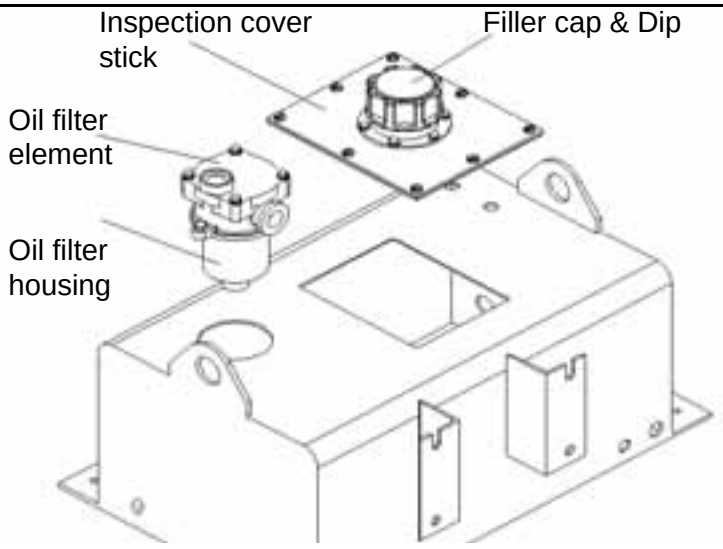
2. Remove the inspection cover as shown in Figure 3-26. Use a barrel pump or similar device to remove the oil from the tank. Alternatively the tank may be removed from the machine and the drain plug used to empty the oil.

⚠ WARNING ⚠

ALWAYS recycle the used oil as per local environmental regulations.

3. The hydraulic tank has a capacity of 20 litres (5.3 US Gallons).
4. Clean the magnetic drain plug and re-install.
5. Disconnect the return hose and hose fitting from inlet port of the hydraulic return filter. Remove and replace the filter element as described above.
6. Fill the hydraulic reservoir with hydraulic oil (Q8 or similar, Check tank label for fluid grade or contact Snorkel) checking level with dipstick.
7. Check the hydraulic pressures whenever the pump, manifold or relief valve have been serviced or replaced.

Figure 3-26: Hydraulic Tank



⚠ CAUTION ⚠

Wear safety gloves and safety glasses when handling hydraulic oil.

Oil can cause irritation of the skin. The oil remains hot long after use.

3.13 Hydraulic Valves

Operating Principles

Control Valves

This machine is fitted with 3-way, 2-position and 4-way, 3-position cartridge type directional control valves. When the circuit is activiated and the solenoid activated, the spool shifts and allows oil to flow through the port and on to the desired actuator (cylinder or motor). The spool is designed to allow oil to return from the actuator to the tank at the same time.

A built-in spring returns the spool to the neutral position as soon as the solenoid is de-energised. Each directional control valve consists of a cavity in the block, the valve body, a sliding spool and one or two solenoids.

Relief Valves

The primary function of a relief valve is to protect equipment from excessive pressures. The valve provides an alternative path back to tank for the oil if the actuator reaches its limit or if blockage problem arises in the circuit. The relief pressures are normally set about 20 to 30% higher than the load induced pressures to prevent loss of pressure energy and unnecessary heating of the oil.

Poppet Valves

These valves are similar in operation to the directional control valves except that they have a single solenoid.

They are used to block or allow oilflow depending on the required logic. The functionality of these valves must be studied in conjunction with the Hydraulic Schematic.

Pressure Settings

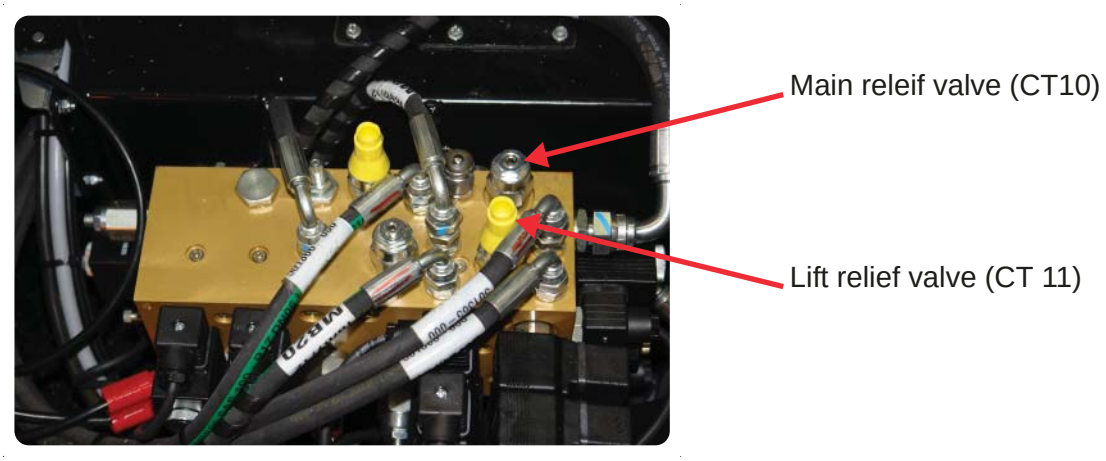
It is important to note some special features of the MB hydraulic circuits before embarking on pressure setting adjustments.

- The circuits are fitted with 2 system relief valves. The primary or Main Relief Valve protects the pump from over-pressure while the secondary or Lift System Relief Valve is used to limit the lifting capacity of the platform.
- A Cross-Line Relief Valve is fitted on the ‘service’ side of the slew control valve. This valve serves an important purpose. It limits the slewing pressure to that required for slewing only so that the jib cannot apply a large force to an external structure. This limit in turn prevents dangerous reaction torques on the structure which could cause tipping of the machine.
- Motion Control Valves are fitted to the drive circuit. These valves (CT 8 & CT 9) prevent over running of the drive and also prevent creeping of the machine while parked (assuming that the failsafe brakes are inoperable or have been previously dissengaged). These valves are factory set and may not be adjusted under any circumstances.
- The function of the Drive Motor Relief Valve is to protect the circuit from excessive pressure build up during steering and driving of the machine. This relief valve (CT 25) is isolated during ‘high traction’ drive and serves no purpose. During ‘standard drive’ the motors are connected in series. Sharp steering combined with travel speed causes a build up of pressure between the hydraulic motors. The valve prevents excessive pressure build up between the lines. This valve is factory set and may not be adjusted under any circumstances.

Main Relief Valve Adjustment

1. Operate the hydraulic system for 10-15 minutes to warm the oil.
2. Remove the rear chassis cover.
3. Insert a (zero-to-300 bar) pressure gauge into the high pressure gauge port on the Manifold Block.
4. Loosen the locknut on the Main relief valve (CT 10) and insert a 4 mm allen key into the hex head adjusting screw. Turn the key anti-clockwise about 2 full turns.
5. Carefully bring the machine to a halt against a solid obstruction and place a block of timber between the obstruction and the chassis.
6. Get a colleague to continuously drive the machine against the obstruction while the allen key is turned clockwise.
7. Continue turning the key until the pressure reads as follows.
   - MB 20J : 220 bar (3190 psi)
   - MB 26J : 220 bar (3190 psi)
8. Tighten locknut on main relief valve while holding the adjusting screw in position.

Figure 3-27: Main Relief Valves



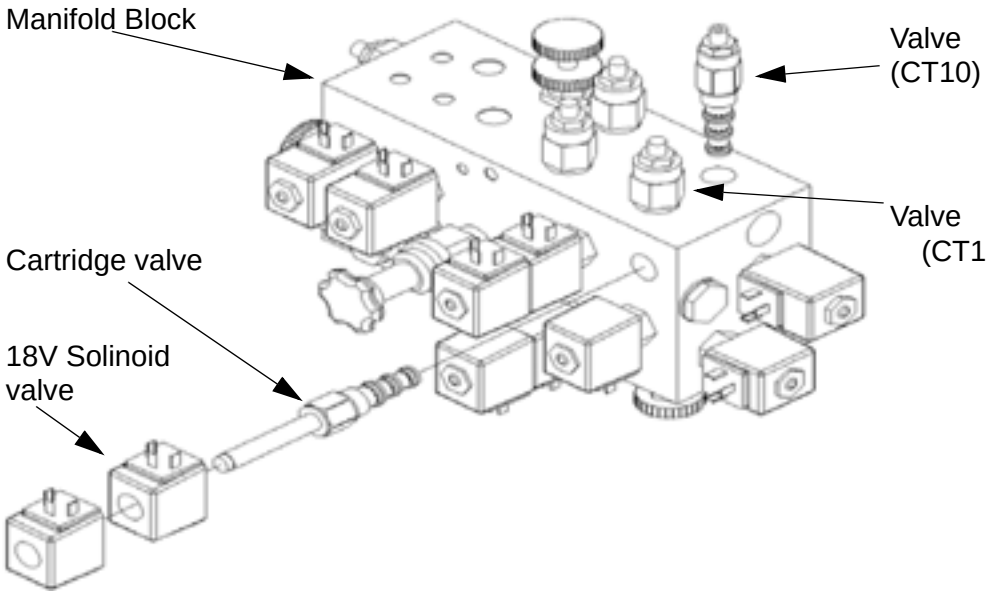
Lift Relief Valve Adjustment

1. Operate the hydraulic system for 10-15 minutes to warm the oil.
2. Remove the rear chassis cover.
3. Insert a (zero-to-300 bar) pressure gauge into the high pressure gauge port on the Manifold Block.
4. Loosen the locknut on the Lift relief valve (CT 11) and insert a 4 mm allen key into the hex head adjusting screw. Turn the key anti-clockwise about 2 full turns.
5. Operate the Mast Down function until the mast is fully bottomed out.
6. Get a colleague to continuously operate the mast down function while the allen key is turned clockwise.
7. Continue turning the key until the pressure reads as follows :-
   - MB 20J : 155 bar (2250 psi)
   - MB 26J : 180 bar (2610 psi)
8. Tighten locknut on lift relief valve while holding the adjusting screw in position.

Slew Cross-Line Relief Valve Adjustment

1. Operate the hydraulic system for 10-15 minutes to warm the oil.
2. Remove the rear chassis cover.
3. Connect a (zero-to-100 bar) pressure gauge into the high pressure gauge port on the Manifold Block.
4. Loosen the locknuts on both relief valve (CT 12 & CT 13) and insert a 4 mm allen key into the hex head adjusting screw. Turn the key anti-clockwise about 1 full turn.
5. Operate the Slew function until the mast strikes the mechanical slew stop.
6. Get a colleague to continuously operate the Slew function while the allen key is turned clockwise.
7. Continue turning the key until the pressure reads as follows :-
   - MB 20J : 50 bar (725 psi)
   - MB 26J : 50 bar (725 psi)
8. Tighten locknut on both relief valves while holding the adjusting screws in position.

Figure 3-28: Drawing of Valve Block



3.14 Manifold Block

The manifold block is suspended in position by means of two bolts on the tank bracket. Complete removal of the block is only necessary during a major overhaul of the hydraulic hoses or replacement of the block itself.

Most hydraulic problems can be solved with the block in situ, however, access to or replacement of some of the cartridges may be facilitated by dislocating the block temporarily. To do this, simply pull upwards on the block and rotate in position.

Use the Troubleshooting guides to ascertain the faulty cartridge and refer to the Hydaulic Function Legend for the designation and location of the suspect valve cartridge.

⚠ CAUTION ⚠

To avoid the risk of component damage the hydraulic hose ends should be tagged prior to disassembly.

Refer to the Hydraulic Schematic Diagram

Manifold Block Removal

1. Remove the rear chassis cover.
2. Disconnect the Battery Disconnect Plug.
3. Tag and disconnect the solenoid valve leads.
4. Tag and disconnect the hydraulic hoses from the top face of the block.
5. Lift the manifold block from the two studs onthe tank. Rotate the block to give access to the underside hose end fittings. Tag and remove hoses.
6. Plug all hose end fittings as a precaution against ingress of dirt or moisture.
7. Remove the manifold block to a clean bench.

Disassembly

1. Remove coils from solenoid valves.
2. Remove solenoid valves, relief valve cartridges, handwheel valves and screw in plugs from the aluminium block.
3. Remove the adaptor fittings and bonded washers.

⚠ CAUTION ⚠

To avoid the risk of component damage the Valve Cartridges should be tagged before removal. Each cartridge contains a spool design appropriate to the specific function.

Refer to the Hydraulic Schematic Diagram.

Cleaning and Inspection

Where an overhaul is required on the hydraulic system - for example as a result of major contamination of the system, it is necessary to thoroughly clean and inspect the valve block.

Wash the manifold block in parafin, kerosene or similar cleaning solvent and leave to drain. Blow out all ports with compressed air.

⚠ CAUTION ⚠

Take precautions against airborn debris when carrying out this task.

ALWAYS Wear Safety Glasses.

Inspect the block for crack damage and check all ports for thread damage. Check the o-ring seal seats for score marks.

Check the spade connectors on the solenoid coils. Replace the coil if either of the outer connectors are broken (the central ‘earth’ spade connector is not used) As a precaution against damage to the coil spade connectors it is advisable to defer fitting the coils until the block has been secured and hosed up completely

Assembly

1. Install the cartridge valves, relief valves, over-centre valve, handwheel valves and screw-in plugs to their original positions.
2. Inspect each o-ring seal prior to fitting and replace as necessary. Do not fit the cartridge unless the o-ring seal is in good condition.
3. Install all port adaptors having checked all threads and inspected each bonded washer.

Apply the following torques to all components:-

- Cartridge Valves 20 Nm
- Relief Valves 45 Nm
- Overcentre Valves 45 Nm
- Coil Retainers 4 Nm

Block Installation

1. Refer to the exploded view of the block before connecting the hoses to the male adaptors on the underside.
2. Check the hose routing on the chassis floor before tightening the hose fittings.
3. Locate the two screws on the back of the block into the slots in the tank bracket. Tighten or loosen off these screws until a snug fit is made between the block and the tank bracket. It is not necessary to adjust these screws after the block is properly suspended.
4. Connect the hoses to their correct destinations on the top and sides of the block.
5. Replace the solenoids and secure lightly using the narrow nuts and spacers where relevant.
6. Connect the solenoid leads to the spade connectors. If necessary, refer to the Electrical Schematic section for the correct colour coding of these cables.
7. Check each function (Up/Down, Fwd/Rev and Left/Right) before proceeding.
8. Secure the chassis cover to the chassis.

3.15 Pump/Motor Unit

Removal

1. Remove the chassis rear cover and, if possible, elevate the platform and jib and rotate through 90 degrees. This is recommended to give more working space.
2. Drain or siphon off the hydraulic oil from the reservoir. The pump motor unit is located on the base of the chassis at the rear end.

! CAUTION !

Isolate the battery power by disconnecting the battery supply at the 'battery disconnect' plug & socket. This is located in the chassis behind the aluminium controller base-plate.

Failure to do this could result in electrical arcing at the motor terminals and damage to components.

3. Mark the hose ends and the motor cable terminals before removing the two hose connectors and the two electric terminals. Plug the hose ends to prevent ingress of contamination and oil loss..

! WARNING !

During these operations take care that screws, washers or other materials do not fall into the motor casing.

4. Using a large screwdriver, undo the pipe clamp clip (jubilee clip) holding the motor to the chassis. Remove the motor and service as required.
5. The pump is close-coupled to the motor and may be withdrawn by removing the four cap-screws. Match mark the pump and motor casing to ensure correct re-assembly.

INSTALLATION

1. Lubricate the pump shaft with a Molybdenum based grease and attach to the motor. Take care to orientate the pump ports correctly relative to the motor terminals. Tighten the 4 capscrews to 27Nm.
2. Refit the hoses.
3. Check the tightness of the port adaptor flange screws.

⚠ WARNING ⚠

Be aware of the cavitation-induced damage caused to the pump if oil is not delivered to the suction port immediately..

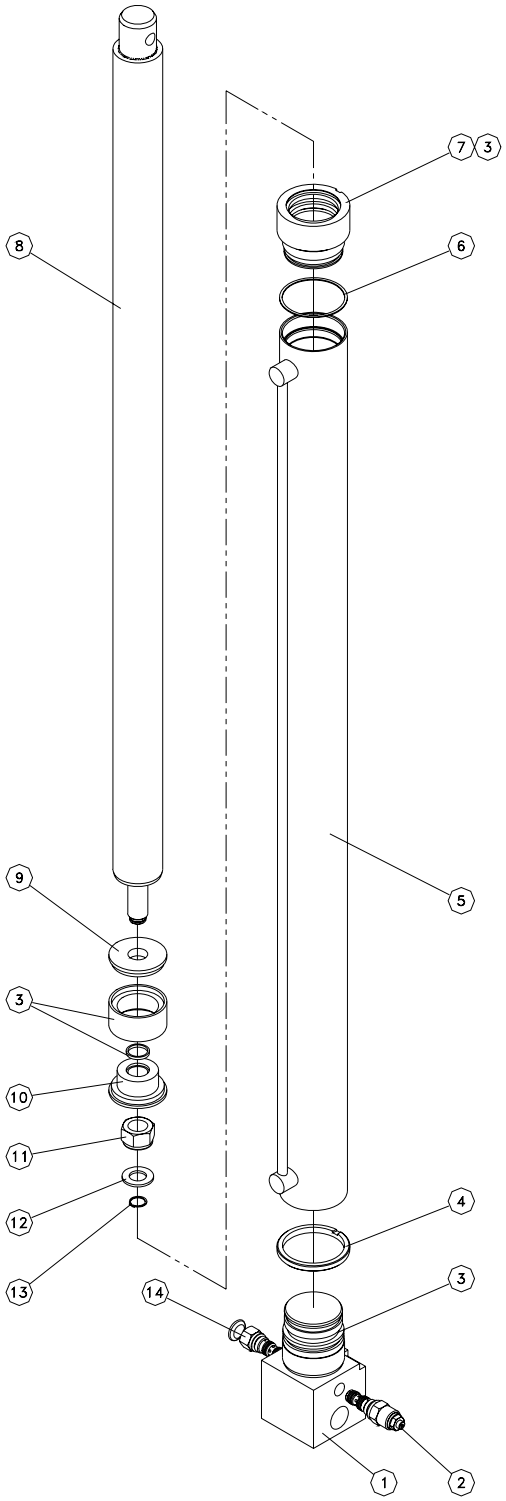
4. Refill the reservoir. Check all operating functions and allow time for entrapped air to make its way to the reservoir return lines.
5. Fit the large diameter pipe clamp and rotate the pump motor unit until the terminals and pump hose adaptors are correctly orientated. Tighten the pipe clamp and fit the chassis cover(s).

3.16 LIFT CYLINDER

REMOVAL

1. Ensure that the machine is on firm level ground, the Elevating Assembly is completely stowed, the Keyswitch is to the 'OFF' position and the Emergency Stop Button is pressed.
2. Remove the chassis covers from the machine.
3. Disconnect the manual emergency lowering cable and mechanism from the base of the fixed mast.
4. Using a 30mm open spanner, slacken off the chain adjusting anchors at the base of the mast.
5. Remove the 8mm dia. x 150mm long chain anchor pin. Use a punch and a hammer to drive out this pin. Leave the punch in position until ready to undo the chain from the top pulley.
6. Remove the jib-mount top cover plate to expose the main chain pulley assembly.
7. Remove the four M8 x 50 long cap head screws from the pulley shaft bearing blocks.
8. The pulley and shaft assembly may now be withdrawn from its seat. Take care to first remove the temporary punch pin from the bottom end and to fold the chain out over the mast sections. It is not necessary to remove the main chain adjusting anchors.
9. Move the cylinder to a prepared work area. It is important that clean assembly practices are observed, as seals and other hydraulic cylinder components are sensitive to contamination.

Figure 3-29: Main Lift Cylinder Component Breakdown



Note: The diagram shoes a sample cylinder breakdown for the Upper Lift Cylinder.

Component Breakdowns of the other cylinders are shown in the Illustrated Parts Breakdown.

1 Body End Block
2 Overcentre Valve
3 Seals
4 Collor Locking Washer
5 Cylinder Body
6 Washer Tab
7 Rod End Cap
8 Cylinder Rod
9 Piston Head Cap
10 Piston Head
11 Lock Nut
12 Washer
13 Circlip
14 Emergeny Lowering Valve

⚠ CAUTION ⚠

The Main Lift Cylinder weighs 55kg, utilise appropriate lifting equipment to support the unit before removing pins.

DISASSEMBLY

1. Unscrew the headcap and withdraw the rod and piston assembly from the barrel tube.
2. Unscrew the piston nut and remove piston and headcap from the cylinder rod.
3. Remove the piston static O-ring from the cylinder rod.
4. Remove the piston seal from the piston.
5. Remove the rod seal, rod wiper and static seal from the headcap.

CLEANING AND INSPECTION

1. Clean all metal parts in solvent and blow dry with filtered compressed air.
2. Check all threaded parts for stripped or damaged threads.
3. Check the bearing surfaces inside of the headcap, outer edge surface of the piston, inside of the cylinder barrel and the shaft for signs of scoring, pits, excessive wear or polishing. Scratches or pits deep enough to catch a fingernail are unacceptable. Polishing is a sign of uneven loading and if sufficiently polished the affected parts should be replaced.
4. Replace all seals and any parts found to be unserviceable.

INSTALLATION

NOTE: Before installing the Lift Cylinder check the pivot pins and bearings for wear and replace if necessary.

REASSEMBLY AND SEAL REPLACMENT

NOTE: During seal replacement do not use sharp edged tools. Take care not to cut the seals, and allow at least one hour for the seals to elastically restore to their original shape before assembly.

1. Lubricate and install new rod seal, rod wiper and static seal on the headcap.

NOTE: Multi-purpose lubricant should be used.

2. Install a new piston seal on the piston.
3. Install the headcap on the cylinder from the piston end.
4. Install the piston, piston nut and a new piston static O-ring on the cylinder rod. Screw nut to end of thread and secure with circlip.
5. Lubricate the piston seal and install the piston and rod assembly in the barrel tube.
6. Thread headcap onto barrel tube and hand tighten, then turn an additional 1/4 turn.

Install the lower cylinder Overcentre Valve.

3.17 BATTERIES

PRINCIPLES OF OPERATION

Electrical energy for the motor is supplied by four 6- Volt batteries wired in series to give a 24 volts DC supply. Each of these batteries consist of three cells supplying a maximum voltage of 2.2V each, i.e.6.6V at each battery or 26.4V for the full battery pack.

Proper care and maintenance of the batteries will ensure maximum performance from the work platform.

BATTERY POTENTIAL

Batteries do not reach full potential until they have been through 50 charge/discharge cycles (however the rate at which the potential increases is exponential, and the batteries will normally have 95% potential after 15 charge/discharge cycles). Hence do not use a new battery in a battery pack that already has more than 15 cycles. Charge batteries at the end of each work shift or sooner if batteries have been discharged. A battery is considered to have a faulty cell if it has less than 80% of the potential of the other batteries in the pack while measured under load.

When ambient temperatures fall below 18ºC (65ºF) batteries cannot deliver their rated Ampere hours and so should be placed on charge as soon after use as possible.

BATTERY CELL EQUALISATION

Specific Gravity is a measurement of the strength of the electrolyte in a battery and is measured using a hydrometer. For a fully charged battery the temperature corrected reading should be about 1.28.

Battery cells with specific gravity below 1.23 (after charging) are considered to be faulty and should be removed from the pack.

As the specific gravity is dependent on ambient temperature, the hydrometer reading must be temperature corrected using the following Correction Chart.

ELECTROLYTE TEMPERATURE		TEMPERATURE CORRECTED SPECIFIC GRAVITY, FULLY CHARGED	
FAHRENHEIT	CELSIUS	USA	EUROPE
120	48.9	1291	1.29
110	43.3	1287	1.29
100	37.8	1283	1.28
90	32.2	1275	1.28
80	26.7	1275	1.28
70	21.1	1275	1.28
60	15.6	1267	1.27
50	10.0	1263	1.26
40	4.4	1259	1.26
30	-1.1	1255	1.26
20	-6.7	1251	1.25
10	-12.2	1247	1.25
5	-15.0	1245	1.25
0	-17.8	1243	1.24
-5	-20.6	1241	1.24
-10	-23.3	1239	1.24
-15	-26.1	1237	1.24
-20	-28.9	1235	1.24
-25	-31.7	1233	1.23
-30	-34.4	1231	1.23

Table 2: Specific Gravity Correction Chart

3.18 Battery Maintenance

Battery Inspection and Cleaning

Check battery fluid level every day, especially if the work platform is being used in a warm, dry climate. Top up using distilled water only.

Tap water contains a high mineral content and will shorten the battery life.

⚠ WARNING ⚠

Danger of explosive gas mixture.

Keep sparks, flames and smoking materials away from batteries. Always wear safety glasses when working with or handling batteries. Battery fluid is highly corrosive. Rinse away any spilled fluid thoroughly with clean water.

Batteries should be inspected periodically for signs of cracked cases, electrolyte leakage and corrosion of the terminals. Inspect cables for abrasion or breaks in the insulation and for broken cable terminals. Take corrective action immediately if check fails.

Thoroughly clean batteries using a ‘baking soda’ solution where corrosion is visible or where electrolyte has overflowed during charging.

Take care to avoid the solution entering the cells. Rinse thoroughly with clean, warm water. Clean battery and cable contact surfaces to a bright metal finish whenever a cable is removed.

⚠ CAUTION ⚠

If battery water level is not maintained the batteries will not recharge fully. This will result in a low discharge rate and damage to the windings on the Motor/Pump unit and **Warranty violation**.

There are 3 basic rules to achieve the maximum life cycle using deep-cycle traction batteries:-

1. Use the machine until it shows signs of weak/slow performance.
2. Allow the charger to charge the batteries until it automatically shuts off.
3. Avoid intermittent charging as the batteries can develop a memory effect similar to NiCad batteries.

Battery Charging

Before charging check that:-

1. The correct mains voltage and current is available to the charger.
   The MB machine is fitted with a high output charging assembly. this consists of two 24V 30A 900W Chargers. The chargers can be linked together if the supply voltage and current are high enough to meet the power demand. If the power supply is not good enough, a single charger can be used. If this option is taken, it is important that charger ‘A’ is used, as it is the one linked to the remote display for battery charge level.

2. Check that the extension cord(s) is in good condition and is no longer than 8M (26fT). 1.5mm Sq (12 AWG) or larger cable is required. Ensure that the plug(s) is of the correct rating and is compatible with the electrical installation into which it will be plugged.
3. The charger(s) will turn on automatically after going through a self test sequence. the remote LED on the control Panel will indicate the status of charging.

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⚠ WARNING ⚠

DO charge batteries in a well-ventilated area.

DO NOT charge batteries in the vicinity of sparks or flames.

NEVER leave the charger operating unattended for more than two days.

NEVER disconnect cables from batteries when the charger is operating.

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

Keep the charger dry.

Figure 3-30: Upper Control Panel with Battery Indicator

⚠ CAUTION ⚠

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

⚠ CAUTION ⚠

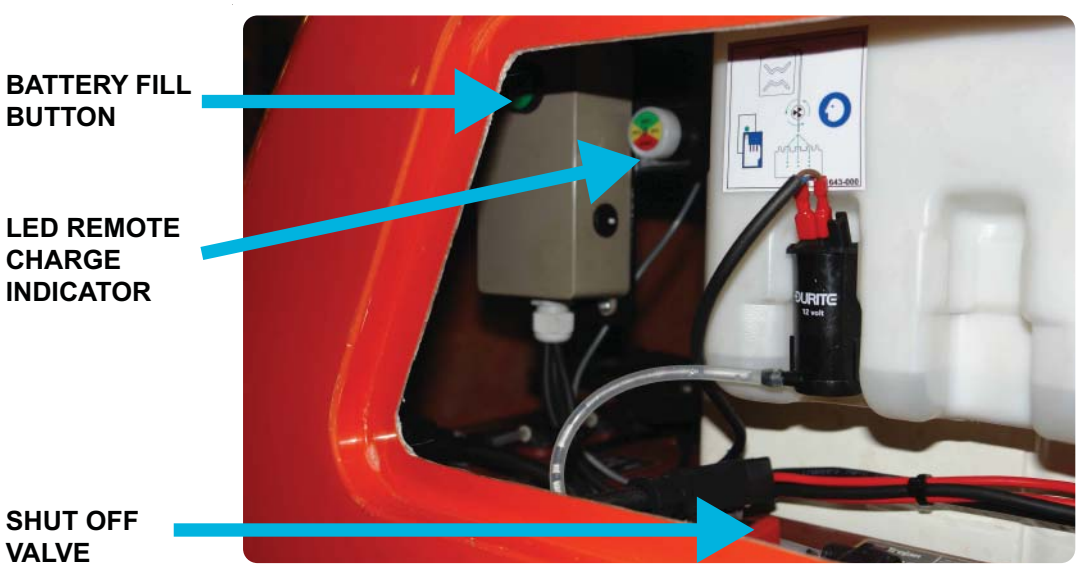
Incorrect voltage selection will result in permanent damage tothe charger unit.

This is a Warranty violation.

Battery Fluid Level

1. Open the Inspection hatches on both sides of the upper mast cover. Check that the AC mains cable is disconnected from the battery charger.
2. Check the electrolyte level in each battery cell. If electrolyte level is less than 10 mm above the top edge of the plates then distilled water must be added.
3. Use the automated battery top-up system fill the batteries to the correct electrolyte level.
   - This is done by opening the shut off valve and pressing the green fill button for approximately 10 seconds, then re-closing the shut-off valve.

Figure 3-31: Battery Fill Button & Valve



⚠ CAUTION ⚠

Vehicles fitted with the automated battery top-up system **with** shut off valve, top up the battery cells with distilled water using the electrolyte fill button, ensuring that the shut-off valve is open during the fill and closed after use.

This is the **only** time this valve should be opened.

STARTUP / CALIBRATION OF THE MOBA OVERLOAD CELL.

START UP

Storage of the dead load (tare) and the limit value (alarm)

1. MRW LIMIT has been mounted and the control cable is connected.
2. The supply voltage has been applied and the system is switched on.
3. The platform is unloaded and it has been ensured that the platform has no base contact.
4. Remove the program connector's dust protection cap.
5. Connect the Teach in Handset.
6. After a check-up the " T" in the label of the Teach in Handset flashes with a frequency of 5Hz.

- *If the "T" at the label of the Teach in Handset does not flash but light up constantly, this may indicate an error that does not allow teaching.*
  1. *System alarm The right red LED at the MRW LIMIT lights up! (check system)*
  2. *Motion The determined weight fluc tuates too much! (check platform)*

7. After the key labeled with "4" is pressed for 4 seconds, the "T" of the Teach in Handset lights up constantly. In older versions (before 2010), the "T" in the label of the Teach in Handset subsequently starts flashing with a low frequency of approx.1Hz.
8. The platform has to be loaded with an alarm weight (100%) and it has to be ensured that the platform has no base contact. The Handset stays connected! The "T" in the label of theTeach in Handset starts flashing with a low frequency of approx.1Hz.

- *The load has to be at least 10kg above the tare weight, otherwise the "T" in the label of theTeach in Handset will not start flashing!*

9. The key labeled with "4" is pressed again for 4 seconds until the "T" of the Teach inHandset lights up contstantly.
10. Disconnect the Teach in Handset.
11. The alarm is activated.
12. Slightly release and after 4 seconds reload the platform again to check up the switch point.
13. After the alarm weight has been unloaded, the orange LED at the MRW has to be activated (+/- 15kg dead load control).
14. Close the program connector with the dust protection cap.
15. Stick label stored and test r with the dust protection cap.
16. The programming process is completed.

CALIBRATION

1. MRW LIMIT has been mounted and the control cable is connected.
2. The supply voltage has been applied and the system has been switched on.
3. The platform is unloaded and it has been ensured that the platform has no base contact.

- *If the orange LED (zero/tare) at the MRW is activated, a calibration is not necessary, but if the LED is not activated, please continue with point 4.*

4. Remove the program connector's dust protection cap.
5. Connect the Teach in Handset.
6. After the check-up the "T" in the Teach in Handset's label flashes with a frequency of 5Hz.

- *If the "T" at the label of the Teach in Handset does not flash but light up constantly this may indicate an error that does not allow teaching.*
  1. *System alarm The right red LED at the MRW LIMIT lights up! (check system)*
  2. *Motion The determined weight fluctuates much! (check platform)*

7. The key labeled with "4" is activated for 4 seconds, the "T" of the Teach in Handset lights up constantly. In older versions (before 2010) after lighting up constantly, the "T" in the label of the Teach in Handset starts flashing with a low frequency of approx.1Hz.
8. Disconnect the Teach in Handset.
9. Now the orange LED [zero/tare] at the MRW has to be activated (+/- 15kg dead load control).
10. If the orange LED (zero/tare) at the MRW is not activated, please repeat point 5. – 9.
11. Close the program connector with the dust protection cap.
12. Stick label „stored and tested" over the program connector (included in delivery).
13. The programming process is completed.

4. Troubleshooting

INTRODUCTION

The following section provides troubleshooting guidelines to be used to locate and correct most of the operation problems which may occur. Problems which arise and which are not solved by the following corrective actions should be referred to a technically qualified person, as there is no substitute for a thorough knowledge of and practical experience in the servicing and repair of related equipment and machines.

For further assistance contact the local distributor and if warranted the Snorkel Powered Access Product Support at:

Snorkel U.K. _____ Tel: +44(0)845 1550 058

_____ Fax:+44(0)195 2985 228

Snorkel Inc. U.S.A. _____Tel:+1(559) 443 6600

_____ Fax:+1(559) 268 2433

Refer to the Operators Manual and to Sections 2 & 3 of this manual before proceeding.

⚠ WARNING ⚠

Always ensure that the work platform is on a firm, level surface.

For any service that requires the platform to be raised, ensure that the platform and booms are supported by a suitable crane.

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

GENERAL APPROACH

Each malfunction is followed by a listing of probable causes which will enable determination of the remedial action. The probable causes and remedial action should be followed in the order in which they are listed in the following tables.

Note that the majority of problems will be related to the electrical and hydraulic systems. For this reason much attention has been paid to these areas in the troubleshooting charts. The lists are not guaranteed to include all possible causes and remedies. The immediately obvious causes and remedies are not necessarily listed.

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 MB20J and MB26J work platforms.

- Flow Meter with Pressure Gauge (**Snorkel** P/N 067040-000)
- 0-69 bar (0-1000 psi) Hydraulic Pressure Gauge with Adapter Fittings (**Snorkel** P/N 014124-010)
- 0-207 bar (0-3000 psi) Hydraulic Pressure Gauge with Adapter Fittings (**Snorkel** P/N 014124-030)
- Adapter Fitting (**Snorkel** P/N 063965-002)
- Inclinometer (**Snorkel** P/N 010119-000)
- Crimping Tool (**Snorkel** P/N 028800-009)
- Terminal Removal Tool (**Snorkel** P/N 028800-006)
- Calibrator EZcal (**Snorkel PN:** 504560-001)

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/0'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
P1-5	CAN H
P1-6	CAN L
P1-7	Slew left (0V=active) CT1A
P1-8	Slew Right (0V=active) CT1B
P1-9	Jib UP (0V=active) CT14
P2-1	5V (low current, for sensors only)
P2-3	0V (low current, for sensors only)
P2-6	Ground control FingerJoystick
P2-7	B+ feed (low current, for switches and sensors only)
P2-8	Lift down valve return (0V=active) CT6B
P2-9	Jib Down (0V=active) Cylinder valve
P3-1	EMS Platform (B+ during platform mode)
P3-2	Valve supply (high current B+ during platform & Ground mode, supplies all valve outputs)
P4-1	EMS Ground (B+ during ground mode)
P4-2	Enable sw. (Momentary sw.) need to be hold closed to allow any GND function
P4-6	Elevation switch (B+=lowered, open=elevated)
P4-7	Not used - Connect to P2-7
P4-8	Jib function selected (direction & speed control by ground control joystick)
P4-9	Slew function selected (direction & speed control by ground control joystick)
P5-1	Line contactor output (B+ when active)
P5-2	Forward valve output (B+ when active) CT4
P5-3	Reverse valve output (B+ when active) CT5
P5-4	Retract valve output (B+ when active) CT7 always ON when driving
P5-5	Cavitation smooth out (B+ when active) CT24 always ON when driving unless steering
P5-6	Steer left valve output (B+ when active) CT1A
P5-7	Extend valve output (B+ when active) CT15 any time Slew, Jib or Lift is activated and Elevation sw open (elevated)
P5-8	Steer right valve output (B+ when active) CT1B
P5-9	High speed valve output (B+ when active) CT23 activated when high speed sw. closed
P5-10	Lift/Drive valve (B+ when active) CT3 any time Lift, Slew or Jib is activated
P5-11	Up valve output (B+ when active) CT6A
P5-12	Down valve output (B+ when active) CT6B & Cylinder valve

4.1 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 trouble shooting.

⚠ 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.

4.2 General Troubleshooting

Problem	Cause	Action
All functions inoperable. Electric motor does not start.	1. Blown main fuse	Check the 175A fuse and replace if necessary
	2. Faulty Battery Charger	Connect charger to batteries and check the output voltage. If less than 24v, repair or replace. Check input voltage to charger. Check the internal charger protection fuse.
	3. Faulty Battery	Charge batteries overnight. Check individual cell voltage. Replace as necessary.
	4. Loose or broken battery leads	Check resistance and continuity of each individual lead. Replace as required.
	5. Emergency Stop buttons contacts failed	Check resistance and continuity of each individual lead. Replace as required.
	7. Loose Upper Control Box Terminal	Unscrew connector, align locating tabs and reconnect
	8. Battery Disconnect plug loose	Check and reconnect. Check the internal steel points for pitting or damage
Electric motor starts but all functions are inoperable	1. Low hydraulic oil	Check and top up using ISO VG 46 hydraulic oil.
	2. Faulty hydraulic pump	Insert a pressure gauge in the G1 port of the valve block. Operate a function to the limit of stroke. Check that relief valve pressure develops. Repair or replace.
	3. Faulty controller	Check the 10mm cable terminals for tightness.
Electric motor continues to run when action has ceased	1. Line contactor malfunction	Check the contact faces. Fusing or arcing due to contamination destroys the contacts. Replace the unit.
Pl.atform elevates very slowly or not at all	1. Leaking emergency lowering valves	Check the operating levers and cables. Check closure of the control knob at the base of the control valve block. Remove and replace the cylinder-mounted valves as necessary.
	2. Faulty lift valve solenoids	Test the voltage to the mast and jib solenoids. Swap around solenoids to isolate the problem. Solenoids are not serviceable.
	3. Platform overloaded	Remove excessive load. Check the pressure setting of the hydraulic 'lift limit' relief valve (CT11) on the block. This may only be reset at 215 kg payload in the platform.
	4. Incorrect controller speed settings	Check the programmed speed settings using the calibrator. This may be carried out by trained service personnel only.
	5. Low Battery level	Check the battery cell voltages after recharging. Total battery pack voltage should exceed 18v. Charge the batteries or replace faulty battery unit.
Platform drifts down uncontrollably	1. Leaking emergency lowering / hose burst valves	Check the operating levers and cables. Check contamination within the valve. Check closure of the control knob (CT14) at the base of the control valve block. Remove and replace the cylinder-mounted valves as necessary.
	2. Cylinder piston seal internal leakage	Switch off all power functions. Disconnect the hose from the annular side of the cylinder and check for small oil flow. Oil flow indicates a faulty cylinder piston seal. Remove and repair the cylinder.
	3. Platform is overloaded	Remove excessive weight. The Safe Working Load is 215 kg for MB20N & MB26.

PROBLEM	CAUSE	ACTION
Platform assembly will not slew	1. Faulty controller	Check the I/O's Using EZcal diagnostics
	2. Faulty slew solenoid	Check voltage at the solenoid electrical connections. Use a screw driver or similar component to check the magnetic effect of solenoid.
	3. Incorrect cross-line relief setting	Insert a pressure gauge in the G1 port of the valve block. Operate a slew function and measure the pressure. Provided the main relief pressure has been preset properly, the gauge should register 20-50 bar. Reset or replace CT12 & CT13 thus preventing bypassing of oil.
	4. Faulty slew select switch	Replace the complete switch assembly.
Platform assembly will not descend	1. Faulty controller	Check the I/O's using EZcal diagnostics. Check the programmed jib and mast speed settings. Check the continuity of jib & mast speed enabling cables to the controller. Repair as necessary.
	2. Faulty mast or jib solenoids	Check the voltage to the solenoid CT 6 for the mast functions and CT 14 for the jib function. Swap solenoids to confirm fault and replace if necessary.
	3. Mechanical blockage in masts	Check the mast overlap sections and lift chain pulleys for foreign bodies. Inspect the mast wear pads for damage and excessive wear, replace and lubricate as required. Remove the jib-mount dust plate and inspect the main internal lift chain for dislocation, looseness or damage.
Pothole bar does not retract during Drive	1. Mechanical blockage due to damage to pivots or pins	Remove and repair the pivot plates or replace the weldment if this is bent.
	2. Faulty pothole solenoid	Check the voltage to the solenoid CT 7. Check the cables feeding the solenoids. Swap solenoids to confirm fault and replace if necessary.
	3. Pothole cylinder malfunction	Check the hose connections to the cylinder. Check the cylinder rod-end pins and the cylinder mounting screws.
Pothole bar does not extend during Lift	1. Mechanical blockage due to damage to pivots or pins	Remove - repair the pivot plates or replace the weldment if damaged.
	2. Faulty pothole solenoid	Check the voltage to the solenoid CT 15. Check the cables feeding the solenoids. Swap solenoids to confirm fault and replace if necessary. Check the correct function of the check valve CT 16.
	3. Pothole cylinder malfunction	Check the hose connections to the cylinder. Check the cylinder rod-end pins and the cylinder mounting screws.
Pothole bar does not remain extended during elevated Drive	1. Pothole cylinder malfunction	Check the cylinder pivot pins.
	2. Faulty pothole solenoid	Check that solenoids at CT 7 & CT 15 are energised simultaneously while the drive function is selected and the platform is elevated. Check the cables feeding these solenoids. Replace the solenoids if necessary. Check the valve cartridges for contamination.
Pothole bar drifts down when the machine is idle	1. Malfunction of check valve	Remove and service the check valve CT 16. Replace cartridge if in doubt.

PROBLEM	CAUSE	ACTION
Machine will not steer	1. Malfunction of joystick toggle switch	Check I/O's using EZcal diagnostics. Remove and service the switch &/or joystick.
	2. Faulty steering solenoid & valve	Check that the solenoids at CT 1 are energised while the steering function is selected. Check the cables feeding these solenoids. Replace the solenoids if necessary. Check the valve cartridges for contamination.
	3. Faulty controller	Check I/O's using EZcal diagnostics. Check the continuity of the steer speed enabling cable to the controller. Repair or replace as necessary.
	4. Steer cylinder malfunction	Check the hose connections to the cylinder. Check the cylinder rod-end pins and the cylinder mounting bolts.
	5. Seized wheel mounting frame pivot(s)	Refer to the maintenance section for assembly and repair of the pivot and associated parts.
	6. Damaged steering link plates	Replace the steering link plates, associated pins and lock plates.
Machine will not drive	1. Temp	Reset system and allow the system to cool down.
	2. Towing valve open	Locate the towing valve CT 21 on the valve block. Ensure that it is fully closed by turning clockwise.
	3. Hydraulic selector valve cartridge jammed	Locate the cartridge valve CT 3 on the valve block. Ensure that the internal spool is not contaminated and stuck in the 'Lift' position.
	4. Incorrect hose connections	Refer to the hydraulic diagram for correct connections of valve ports M1, M2, M3 & M4 to the motor ports. Incorrect connection may result in locking of wheels.
	5. Fail-safe brake-circuit malfunction	Blocked brake line to either motor. Clear blockage and/or replace hoses and fittings. Incorrect setting of cartridge valve CT 20 on the valve block. Open this valve fully for normal drive operation. Check the correct function of the check valves CT 30 and CT 17 on the valve block. These valve should open to allow brake chamber evacuation.
	6. Faulty Drive solenoid	Check that solenoids at CT 4 & CT 5 are energised while the drive function is selected. Check the cables feeding these solenoids. Replace the solenoids if necessary. Check the valve cartridges for contamination.
	7. Malfunction of the over-centre valve	Check the valve cartridges CT 8 7 CT 9 for contamination or mal-adjustment. Too low a setting on the adjusters will prevent motion of the drives. Too high a setting will cause over-running after attempting to halt the machine.
Machine travels in fast i.e. 'standard drive' mode only	1. Series-Parallel valve malfunction	Check that the cartridge valves CT 23 & CT 24 are not jammed in the energised position. Remove contamination and/or replace the cartridges.
Machine travels in slow i.e. 'high traction' mode only	1. Series-Parallel valve malfunction	Check that the solenoid on cartridge valves CT 23 & CT 24 are both energised simultaneously when 'high traction' is selected. Check wiring and connectors. Repair connections and replace solenoids as required.
Motor shaft seal extrudes	1. motor case pressure build-up	Check that the cartridge valve CT 24 is not jammed in the energised position while the circuit is in series ('standard drive') mode. Check that relief valve CT 25 is not set incorrectly. (50 bar). Prolonged tight turning of the machines during malfunction of CT 24 & CT 25 will cause build up of case pressure and subsequent shaft seal extrusion. Remove motor as per maintenance Section instructions and replace the shaft seal. this work may only be carried out by experienced hydraulic service personnel.

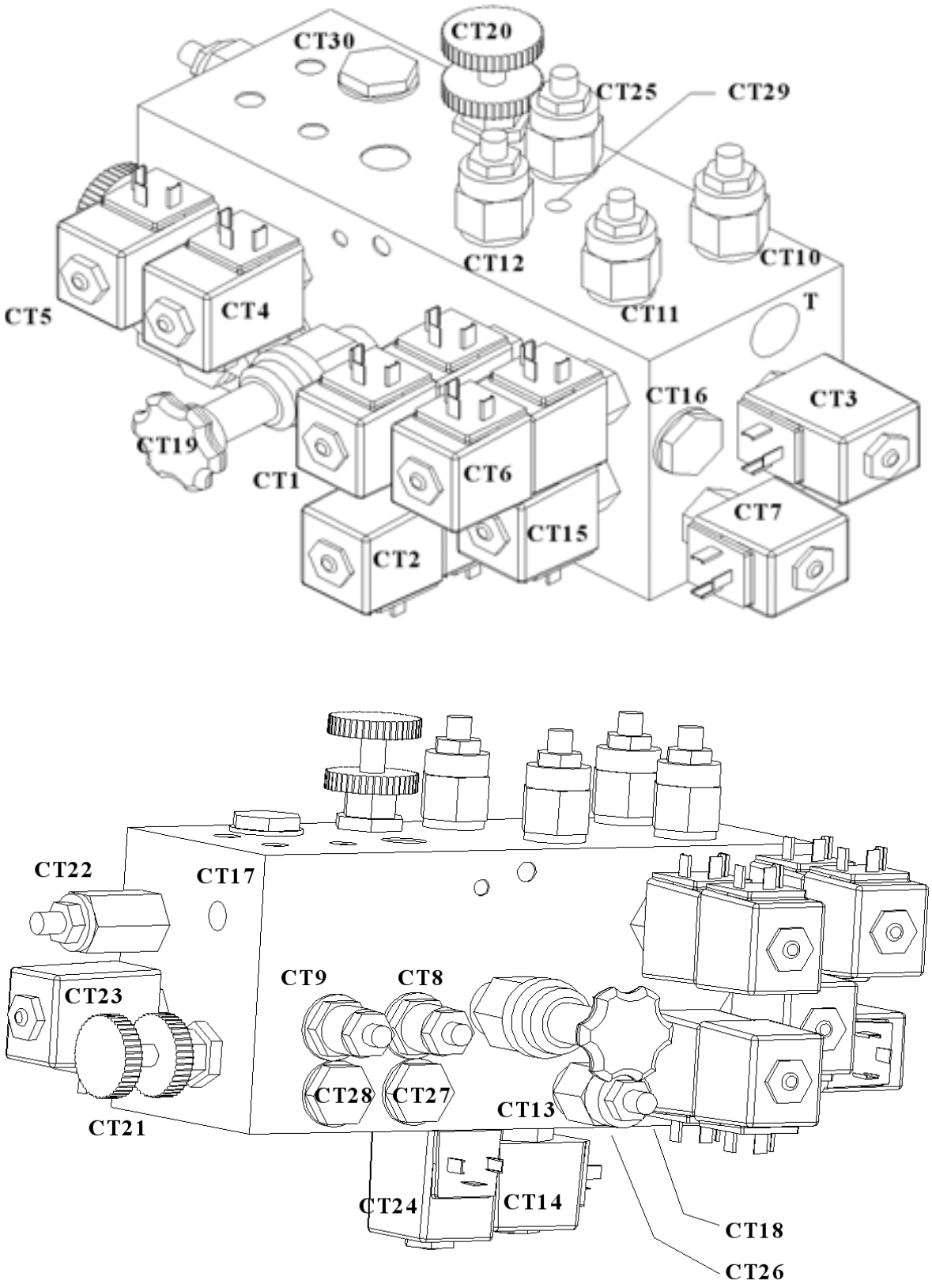
4.3 Hydraulic System

Hydraulic Function Table

Ref	Name	Function	Location
CT1	Directional control valve - Steering	Moves steering rod to left or right	Front face of block (double solenoid)
CT2	Directional control valve - Slew	Turns mast assembly left or right	Front face of block (double solenoid)
CT3	Selector valve - Drive/Lift	Diverts oil to either the drive or lift part of the circuit	Right hand face of the block (single solenoid)
CT4	Drive valve - Forward	Diverts oil to the drive motors	Front face of the block (single solenoid)
CT5	Drive valve - Reverse	Diverts oil to the drive motors	Front face of the block (single solenoid)
CT6	Directional control valve - Main lift	Raises or lowers the mast lift cylinder	Front face of block (double solenoid)
CT7	Poppet valve - Pothole bars	Extends the pothole cylinder	Right hand face of the block (single solenoid)
CT8	Over-centre valve - Drive motors	Prevents over-run of the drive motors. Piloted to CT9	Front face of the block (hex head)
CT9	Over-centre valve - Drive motors	Prevents over-run of the drive motors. Piloted to CT8	Front face of the block (hex head)
CT10	Pressure relief valve - Main system	Protects the pump from excessive pressure	Top face of the block (hex head)
CT11	Pressure relief valve - Lift system	Limits the jib lift to Safe Working Load	Top face of the block (hex head)
CT12	Cross-line relief valve - Slew	Limits the slew motor pressure to 50 bar. Diverts excess oil to tank	Top face of the block (hex head)
CT13	Cross-line relief valve - Slew	Limits the slew motor pressure to 50 bar. Diverts excess oil to tank	Top face of the block (hex head)
CT14	Directional control valve - Jib	Raises or lowers the jib lift cylinder	Bottom face of the block (single solenoid)
CT15	Poppet valve - Pothole bars	Retracts the pothole cylinder	Front face of block (single solenoid)
CT16	Check valve - Pothole circuit	Traps oil in pothole circuit	Right hand face of block (screw-in hex head valve)
CT17	Shuttle valve - Brake circuit	Provide high pressure to the braking circuit regardless of the drive direction	Left hand face of block (screw-in hex head valve)
CT18	Throttle Valve - Jib	Controls the rate of descent of the jib	Bottom face of block (screw-in hex head valve)
CT19	Plunger pump - Brakes	Provides manual means of disengaging brakes during an emergency	Front face of block (Red knob)
CT20	Brake over-ride valve	Closing this, normally open valve, allows plunger pump pressure to the brake chambers prior to emergency towing	Top face of block (Black knob)
CT21	Towing valve	Opening this, normally closed valve, allows bypassing of motor oil during emergency towing	Left hand face of block (Black knob)

REF	NAME	FUNCTION	LOCATION
CT22	Pressure reducing valve	Automatically limits the pressure in the brake chamber to 25 bar regardless of the operating pressures	Left hand face of block (Hex head)
CT23	Series/Parallel poppet valve	Switches between series and parallel connection of the motors	Left hand face of block (Single Solenoid)
CT24	Series/Parallel poppet valve	Prevents oil entering the anti-peak relief valve (CT25) during parallel connection of the drive motors	Bottom face of block (Single Solenoid)
CT25	Relief valve - series connection	Prevents damaging build up of pressures during a series- connected turn	Top face of block (Hex head)
CT26	Check valve	Allows low pressure oil to bypass CT25 during anti-cavitation function	Bottom face of block (Hex head)
CT27	Anti-cavitation valve	Allows low pressure oil to fill the possible vacuum formed during a series-connected left turn	Front face of block (Hex head)
CT28	Anti-cavitation valve	Allows low pressure oil to fill the possible vacuum formed during a series-connected right turn	Front face of block (Hex head)
CT29	Throttle valve - Steering	Controls the speed of operation of the steering cylinder	Top face of block (Hex head)
CT30	Check valve - Brakes	Allows oil to bypass the pressure reducing valve during normal operation	Top face of block (Hex head)
CYL1	Main lift cylinder	Raises/lowers the mast sections	Within the mast sections
CYL2	Jib lift cylinder	Raises or lowers the Jib and Platform assembly	Between the jib structural members
CYL3	Steering cylinder	Turns the front wheels left or right	Front chassis extremity
CYL4	Pothole cylinder	Automatically raises or lowers the pothole protection bars	Under the hydraulic tank
BRK1 BRK2	Failsafe brakes	Spring applied, hydraulically released brakes	Within the drive motor housings
MB	Manafold block	Houses all the hydraulic valves	Connected to the hydraulic tank
FL1	Return-line filter	Filters the returning oil continuously to 25 microns	Flange-mounted to the hydraulic tank
FL2	Suction strainer/filter	Filters the suction oil continuously to 40 microns	Screwed to inside of hydraulic tank (3/4”)
MOT1 MOT2	Hydraulic motor	Drives the machine forward and backwards at various travel speed	Front end of chassis.
MOT3	Hydraulic motor	Drives the mast assembly through 360deg. (Slew)	Base of chassis. Coupled to the slew bearing assembly.
MP	Motor pump unit	Provides hydraulic pressure to the circuit	Chassis mounted towards the rear of the machine

Figure 4-1: Manafold Block with Valve Location



4.4 Electrical Troubleshooting Table

COMPONENT	LOWER CONTROLS	UPPER CONTROLS	DRIVE FORWARD	DRIVE REVERSE	HIGH SPEED/CREEP	RAISE MAST	LOWER MAST	RAISE JIB	LOWER JIB	SLEW	STEER	LOWER POTHOLES	RAISE POTHOLES	TILT ALARM	MOTION ALARM	BATTERY CHARGE	HORN
ALARM														X	X		
BATTERIES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
BATTERY CHARGER																X	
175AMP FUSE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
EZ230 CONTROLLER	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
MOTOR			X	X	X	X	X	X		X	X	X	X				
JIB LIMIT SWITCH					X							X	X	X			
GROUND CONTROLS																	
EMERGENCY STOP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
KEY SWITCH	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
ANALOGUE ROCKER	X					X	X	X	X	X							
SELECTOR SWITCH						X	X	X	X	X							
ENABLE SWITCH						X	X	X	X	X							
PLATFORM CONTROLS																	
EMERGENCY STOP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X		
HORN BUTTON																	X
SELECTOR SWITCH						X	X	X	X	X							
DRIVE/LIFT SELECTOR			X	X	X	X	X	X	X	X	X	X	X				
LOW/HIGH TORQUE SELECTOR					X												
JOYSTICK			X	X		X	X	X	X	X							
TURN SWITCH											X						
ENABLE SWITCH			X	X		X	X	X	X	X	X						
SOLENOIDS																	
STEER SOLENOID CT1											X						
SLEW SOLENOID CT2										X							
DRIVE/LIFT SOLENOID CT3			X	X		X	X	X	X	X	X						
FORWARD SOLENOID CT4			X	X													
REVERSE SOLENOID CT5			X	X													
LIFT SOLENOID CT6						X	X										
POTHOLE RETRACT SOLENOID CT7												X	X				
POTHOLE EXTEND SOLENOID CT15												X	X				
JIB RAISE SOLENOID CT14								X	X								
JIB LOWER SOLENOID								X	X								
DRIVE TORQUE SOLENOID CT23					X												

REPLACING THE EZ230 CONTROL MODULE

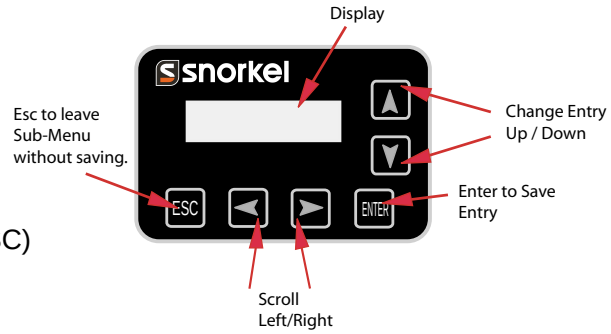
If for any reason you have to replace the EZ230 control module it is important that you complete the following procedures:

⚠ 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 , ≤ 0.25 °
2. Use a Gauge to confirm that the front and rear of the chassis are level to within +/- 0.25 ° 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 = MB20/26J (Enter followed by ESC)
11. Scroll to tilt setups . (Enter)
12. Calibrate level. (Enter)
13. Enter for yes.

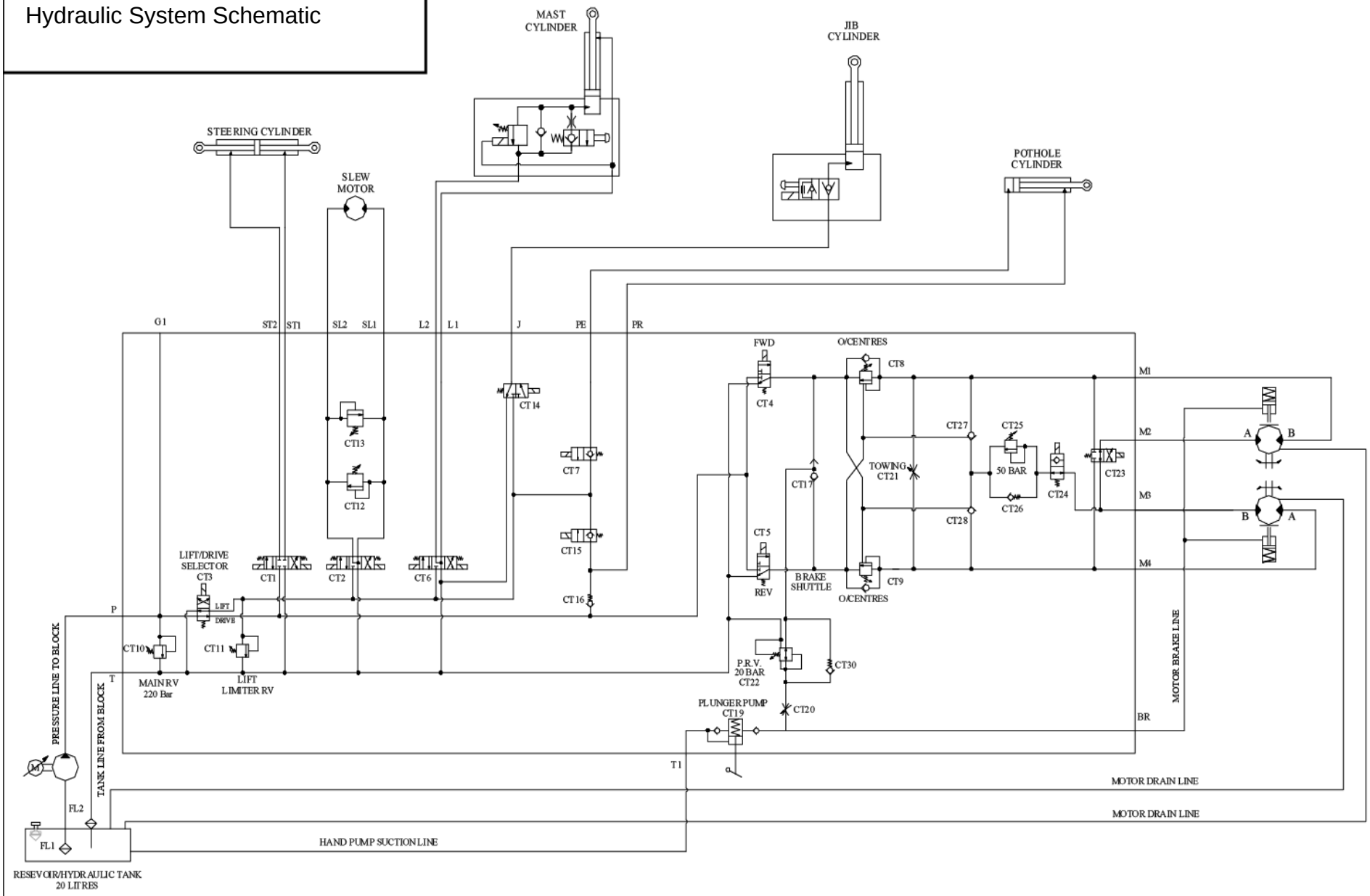


To confirm calibration has worked switch the machine of then back on again.

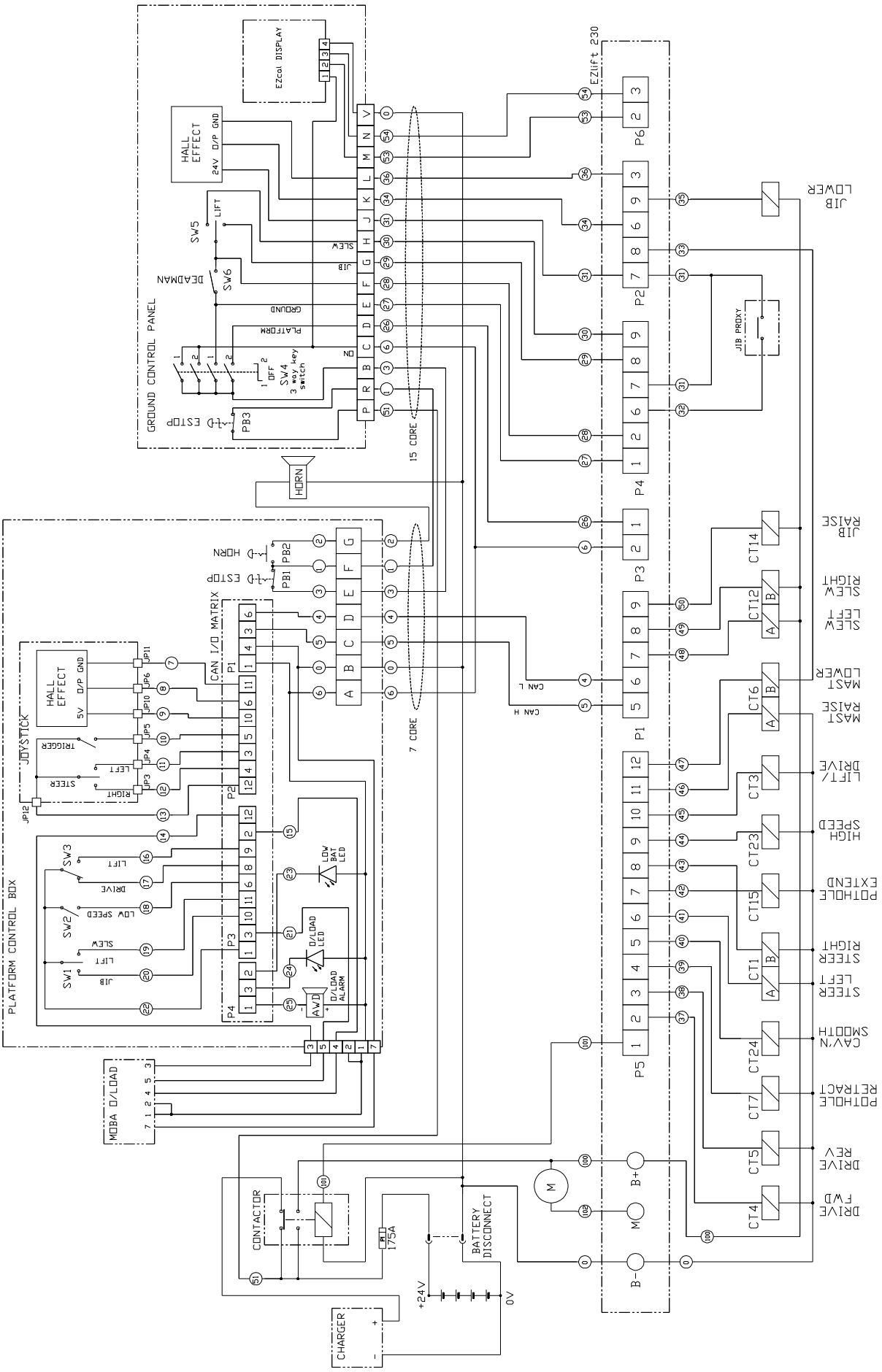
14. Scroll to Diagnostics. (Enter)
15. System. (Enter)
16. Scroll to tilt, both readings should be below 0.2 ° if not repeat from 5.

PN	DESCRIPTION
501244-012	1.6 x 20mm SteelCotterPin DIN94 Zinc Plated
058490-025	M5 x 25mm HexSet DIN933 8.8 Zinc Plated
058491-012	M6 x 12mm HexSet DIN933 8.8 Zinc Plated
058491-016	M6 x 16mm HexSet DIN933 8.8 Zinc Plated
058491-020	M6 x 20mm HexSet DIN933 8.8 Zinc Plated
058492-010	M8 x 10mm HexSet DIN933 8.8 Zinc Plated
058492-012	M8 x 12mm HexSet DIN933 8.8 Zinc Plated
058492-015	M8 x 15mm HexSet DIN933 8.8 Zinc Plated
058492-016	M8 x 16mm HexSet DIN933 8.8 Zinc Plated
058492-020	M8 x 20mm HexSet DIN933 8.8 Zinc Plated
058492-020	M8 x 20mm HexSet DIN933 8.8 Zinc Plated
058492-030	M8 x 30mm HexSet DIN933 8.8 Zinc Plated
058492-035	M8 x 35mm HexSet DIN933 8.8 Zinc Plated
058493-020	M10 x 20mm HexSet DIN933 8.8 Zinc Plated
058493-035	M10 x 35mm HexSet DIN933 8.8 Zinc Plated
058493-040	M10 x 40mm HexSet DIN933 8.8 Zinc Plated
058494-025	M12 x 25mm HexSet DIN933 8.8 Zinc Plated
058494-040	M12 x 40mm HexSet DIN933 8.8 Zinc Plated
503101-040	M16 x 1.5 x 40 HexSet DIN961 8.8 Zinc Plated
056059-055	M8 x 55mm HexBolt DIN931 8.8 Zinc Plated
056060-055	M10 x 55mm HexBolt DIN931 8.8 Zinc Plated
058480-110	M16 x 110mm HexBolt DIN931 10.9 Dacromet
057021-045	M8 x 45mm HexSet DIN933 8.8 Zinc Plated
056069-004	M4 SteelFlatWasher DIN125A Zinc Plated
056069-005	M5 SteelFlatWasher DIN125A Zinc Plated
056069-006	M6 SteelFlatWasher DIN125A Zinc Plated
056069-008	M8 SteelFlatWasher DIN125A Zinc Plated
056069-010	M10 SteelFlatWasher DIN125A Zinc Plated
056069-016	M16 SteelFlatWasher DIN125A Zinc Plated
056021-012	M12 Spring Washer DIN127B Zinc Plated
056066-004	M4 NylockNut DIN985 8.0 Zinc Plated
056066-008	M8 NylockNut DIN985 8.0 Zinc Plated
056064-010	M10 NylockNut DIN985 10.0 Zinc Plated
501253-040	M6 x 40mm SocketButtonCapScrew DIN9427 10.9 ZincPlated
058500-025	M4 x 25mm SocketCapScrew DIN912 12.9 Zinc Plated
058501-040	M5 x 40mm SocketCapScrew DIN912 12.9 Zinc Plated
500532-012	M6 x 12mm SocketCountersunkScrew DIN7991 10.9 Zinc Plated
501253-015	M6 x 15mm SocketButtonCapScrew DIN9427 10.9 ZincPlated
500532-016	M6 x 16mm SocketCountersunkScrew DIN7991 10.9 Zinc Plated
058502-016	M6 x 16mm SocketCapScrew DIN912 12.9 Zinc Plated
501253-040	M6 x 40mm SocketButtonCapScrew DIN9427 10.9 ZincPlated
058510-025	M8 x 25mm SocketCountersunkScrew DIN7991 10.9 Zinc Plated
058503-040	M8 x 40mm SocketCapScrew DIN912 12.9 Zinc Plated
058503-050	M8 x 50mm SocketCapScrew DIN912 12.9 Zinc Plated
501247-030	M12 x 30mm SocketCapScrew DIN912 12.9 Zinc Plated

MB20/26J
Hydraulic System Schematic



Electrical System Schematic



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