snorkel

A38E

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PARTS & SERVICE MANUAL

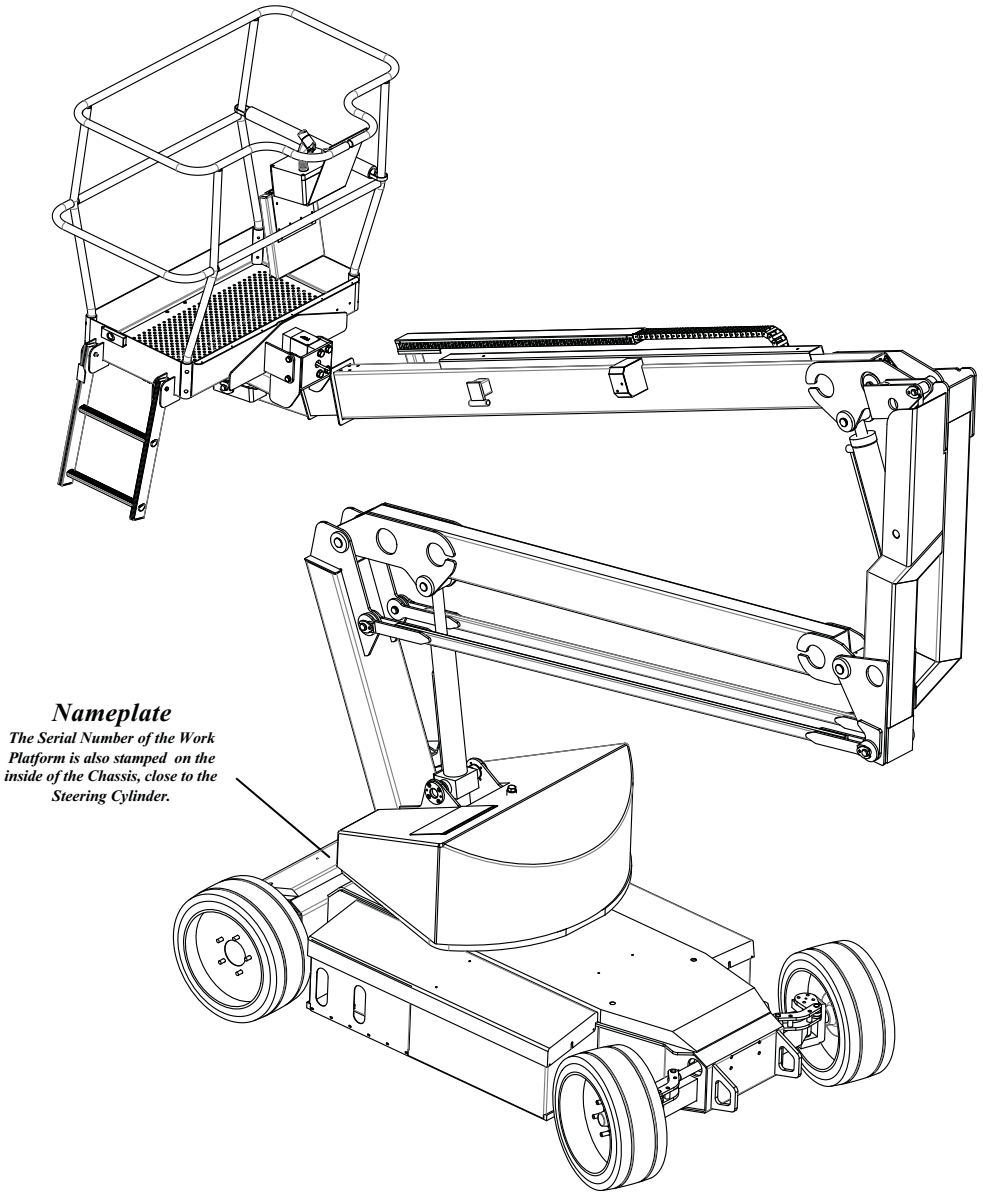
Part Number 511115-200
JULY 2013

Serial Number 004500 and after

SERVICE & PARTS MANUAL

A38E

Aerial Work Platform



Nameplate

The Serial Number of the Work Platform is also stamped on the inside of the Chassis, close to the Steering Cylinder.

NOTES:

Foreword

Introduction

HOW TO USE THIS MANUAL

This manual is divided into 7 Sections,
The right hand pages of each Section is marked with a black section number printed at the top corner of each page which can be used as a quick guide.

SPECIAL INFORMATION

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.

WORKSHOP PROCEDURES

CAUTION

Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual does contain warnings and cautions against some specific service methods which could cause personal injury, or could damage a machine and make it unsafe. Please understand that these warnings cannot cover all conceivable ways in which service, whether or not recommended by Snorkel, can be done, or the possible hazardous consequences of each conceivable way, nor could Snorkel investigate all 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 jeopardised.

Notes: Give helpful information.

Foreword

NOTES:

Contents

Table of Contents

Contents

Table of Contents

Contents

List of Illustrations

List of Tables

Contents

NOTES:

1.0 Introduction

PURPOSE

The purpose of this Service & Parts Manual is to provide instructions and illustrations for the operation and maintenance of the A38E Work Platform manufactured by ***Snorkel***. (See Figure 1-1).

SCOPE

The manual includes the procedures and responsibilities which must be strictly adhered to for proper operation, maintenance, adjustment, and repair of this product. The Maintenance Section further covers preventative maintenance and trouble shooting.

1.1 General Information

The A38E is a quickly deployable self propelled aerial work platform, designed to raise two operators with hand tools to a work height of up to 13.45 m (44.12 ft.) i.e. a platform floor height of 11.45 m (37.56 ft.). It is designed to provide mobility with the Platform in the raised or lowered position, although travel with the Platform raised is limited to a low speed. The boom assembly and telescope functions are operated by a hydraulic pump driven by a DC electric motor. Two DC electric traction motors coupled to two braked gearboxes regulate the drive function.

PLATFORM

The platform is large enough for two operators and has a free-draining perforated floor with 150 mm (5.9 inches) toeboards. Hand rails are constructed from steel tubing and a safety drop-bar is provided at the entrance. Safety harness anchor points are also fitted in the floor of the platform. The primary Control Box is fitted permanently within this platform.

⚠ WARNING ⚠

DO NOT begin using the machine until the platform entrance drop bar is in the fully lowered position.

CONTROL BOX

The control box is permanently fitted at the front centre of the platform. It features a Joystick which will provide proportional control for raising or lowering either of the two booms, extending or retracting the Telescopic Boom, rotating (slewing) the entire Booms & Posts Assembly or driving. A safety feature which is incorporated into the Joystick's operation is the Interlock Switch. This must be activated at all times while operation is required. This allows for one-handed operation. A complete explanation of control functions can be found in Section 3.

ELEVATING ASSEMBLY

The platform is raised and lowered by a combination of two steel lift booms and one telescopic boom, each of which is operated by a hydraulic cylinder which in turn is actuated by hydraulic power from the motor driven pump. Solenoid operated valves control to which cylinder the hydraulic oil is directed. Each cylinder features an integral holding valve to prevent uncontrolled descent in the case of a hose burst.

ROTATION GEAR

The Booms & Posts Assembly can be rotated to provide up to 5.6 m (18.4 ft.) of side outreach, measured from the centreline of rotation to the front of the Platform. This is done by means of an integral hydraulic motor driving a Worm Drive Unit, around a large diameter Slew Gear.

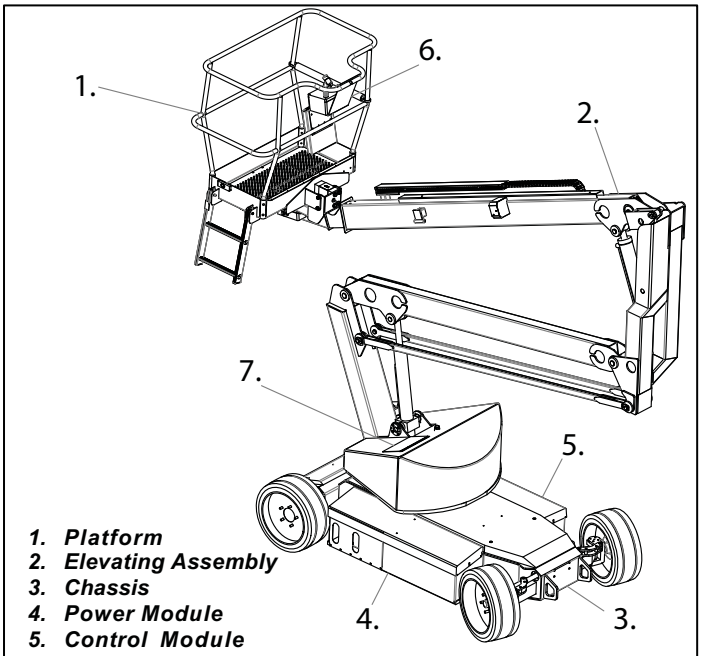


Figure 1-1: A38E Work Platform

DRIVE & STEER SYSTEMS

The A38E Work Platform is restricted to low speed drive when the Platform is raised above the Boom Rest Limit Switch. The Traction controller controls the application of drive from the Joystick by means of two Traction Motors, which are assembled to the drive wheels via a Drive Reduction Gearbox.

Steering of the A38E Work Platform is controlled by the ECU, which controls the signals activating a double acting cylinder. An Operator can Steer left or right by depressing the Rocker Switches on top of the Joystick, while activating the Interlock Switch.

POWER SYSTEM

The power system incorporates eight 6V batteries driving the drive traction motors, or the 4kW (5.4HP) electric motor which in turn drives the hydraulic pump. The application of this hydraulic pressure is performed by the Control System.

CONTROL SYSTEM

The machine is provided with fully proportional controls by means of the interaction between an ECU, electronic motor controller and a proportional joystick. The ECU and motor controller regulate the drive motor/pump speed and hence the flow of oil reaching the cylinders, the Worm Drive Unit or the Drive Reduction Gearbox. It regulates the direction of flow of the hydraulic oil via the solenoid valves located on the manifold block, and it also monitors the operation of all switches on the machine via the machine harness system.
The motor control units are located, in the left hand chassis module. The manifold block is located on the hydraulic tank. This is accessible by removing the main cover.

CHASSIS

The chassis is a structural frame designed to support all the components of the A38E Work Platform.

A38E PURPOSE & LIMITATIONS

The purpose of the A38E work platform is to provide a quickly deployable variable height work platform. It is capable of lifting two people with work tools up to an upper limit of 215 kg (ANSI 475 lbs) in total. The unit will provide the ability to reach over obstacles but must be used on firm level ground. See Specification table on page 1-3.

The platform must **only** be used on firm level or slightly uneven ground capable of supporting the maximum load generated under the four wheels. **Do not** use on soft or severely sloping ground.

⚠ DANGER ⚠

NOTE: It should be recognised that if the tilt switch senses a degree of slope greater than 3º the elevating circuits will lockout and sound a warning alarm. The Emergency Override should then be used, to lower the Elevating Assembly.

1.2 Specifications

Table 1-1: Specifications

ITEM	METRIC	IMPERIAL (ANSI)
Duty Cycle	45% of 8 hour shift	45% of 8 hour shift
Platform Size	0.58m x 1.3 m (inside gaurdrails)	1.77 ft x 4.3 ft (inside gaurdrails)
Max. Platform Capacity	215 kg	475 lbs
Indoors	2 People	2 People
Outdoors	1 People	2 People
Min. Platform Floor Height	13.45 m 11.45 m 0.65 m	44.12 ft 37.56 ft 2.13ft
	6.10 m	20.00 ft
Platform Height At Maximum Outreach	5.40 m	17.72 ft
Stowed Dimensions Length Width Height	 4.04 m 1.50 m 2.00 m	 13.25 ft 4.92 ft 6.56 ft
Ground Clearance	0.12 m	0.39 ft
Wheel Base x Gauge	2.00 m x 1.27 m	6.56 ft x 4.16 ft
Rotation	362 degrees non-continuous	362 degrees non-continuous
Unloaded Weight	3,770 kg	7,826 lbs
With Load/ Max Weight	3,970 kg	8,840 lbs
Drive Speed Stowed	0 - 4 km/h	0 - 2.49 mph
Drive Speed Elevated	0 - 0.72 km/h	0 - 0.45 mph
Maximum Gradeability	36%	36%
Inside Turning Radius	0.40 m	1.31 ft
Outside Turning Radius	2.40 m	7.87 ft
Power Source	48V DC 4kW, 8 X 6V 210Ah Batteries	48V DC 5.4HP, 8 X 6V 210Ah Batteries
System Voltage Control	12V	12V
Battery Charger	Auto Dual AC input 100-240V ~ 50/60Hz 18A Output 48V, 25A	Auto Dual AC input 100-240V ~ 50/60Hz 18A Output 48V, 25A
Hydraulic Oil Tank Capacity	25 Litres	6.5 Gallons US
Max. Hydraulic Pressure	145 bar	2105 psi
Hydraulic Oil Grade	ISO #46	ISO #46
Cylinder Types	2 Double Acting Lift Cylinders With Lock Valves And Manual Emergency Lowering Facility. 1 Double ActingTelescopic Cylinder	2 Double Acting Lift Cylinders With Lock Valves And Manual Emergency Lowering Facility. 1 Double ActingTelescopic Cylinder
	Refer to Section 5 of the Service & Parts Manual	Refer to Section 5 of the Service & Parts Manual
Control System	One handed Proportional Joystick Operating Energy Efficient Motor Control System	One handed Proportional Joystick Operating Energy Efficient Motor Control System
Wheels/Tyres	400 mm Diameter Steel Disc Wheel With Solid All Surface Tyres	15.75 inch Diameter Steel Disc Wheel With Solid All Surface Tyres
Braking	Automatic Spring Applied Hydraulic Release	Automatic Spring Applied Hydraulic Release
Max Noise Level	69.5 dB(A)	69.5 dB(A)

NOTES:

2.1 Preparation for use

CAUTION

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

2.2 Preparation for Shipment

1. Lubricate machine per lubrication instructions in Section 4.4, Maintenance.
2. Fully lower the platform and make sure the machine is stowed securely.
3. Check that the hydraulic oil level is adequate and that it is not over filled.

Check that the batteries are charged and disconnect the batteries using the Battery Disconnect Plug. This prevents excessive power drain prior to next using the machine.

2.3 Forklifting the Work Platform

CAUTION

The A38E is not designed to be consistently forklifted. This operation can be used for very short distances only.

Forklift from the side by lifting under the chassis modules as per Figure 2-1. When lifting the A38E with a forklift, great care should be taken not to damage the right or left hand modules as these contain sensitive equipment.

2.4 Lifting the Work Platform

CAUTION

See specifications (Section 1.2) for the weight of the work platform and be certain that lifting apparatus is of adequate capacity to lift the platform.

The A38E may be lifted by an overhead hoist/crane in the following manner:
Four lifting straps capable of safely supporting the total weight of the A38E ((3,770 Kg /7,430 lbs CE

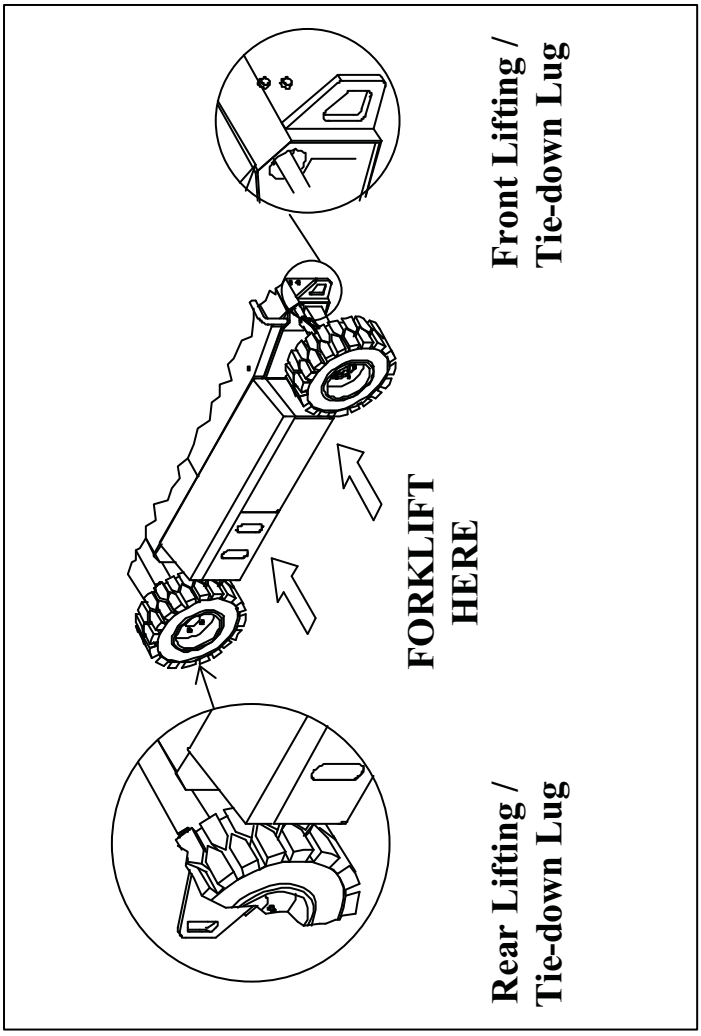


Figure 2-1: Forklifting & Lifting the A38E

Version & 4,010 Kg /8,840 lbs ANSI Version) and at least 250 cm (8 ft.) long are required. This minimum length is important to ensure the correct lifting angle. The straps should be positioned at the Lifting/Tie Down Lugs as shown in Figure 2-1. Great care must be taken to avoid damage to any of the components of the machine.

2.5 Transport by Truck

The A38E is normally carried upon a suitably rated transportation vehicle. Because of the high gradeability of the A38E it will be capable of driving directly on to most vehicles. If however the loading slope is greater than the gradeability or the batteries have been depleted sufficiently a winch should be used. The procedure when using a winch is to disengage the gearbox from the drive wheels using the Allen key release, and then winch the machine on to the vehicle in its freewheel state.

Refer to Section 2.6 which follows.

When the A38E is on the Truck it should then be made secure.

1. Chock the wheels of the A38E.
2. Secure the work platform to the transport vehicle with chains or straps of adequate load capacity attached to the lifting lugs on the chassis.
3. Secure the top boom at the closest point to the platform to the transport using straps.

⚠ CAUTION ⚠

Overtightening of the chains or straps through tie down lugs may result in damage to the Work Platform.

2.6 Manual Brake Release

⚠ CAUTION ⚠

Preform this operation only when the machine will not operate under its own power and it is necessary to move the machine, or for winching onto a trailer for transportation.
Ensure the machine is on level ground before commencing this operation and use wheel chocks as appropriate to prevent the machine from rolling inadvertently.
Do not exceed 3 mph. Faster speeds will damage drive components and void warranty.

1. Ensure that the Platform is fully lowered and that the Elevating Assembly is slewed (rotated) such that the platform is stowed above the drive wheels. Turn the Upper Control Box to the **OFF** position and remove the key.
2. Attach a chain/cable of sufficient capacity for towing the machine to the front or rear lifting/tie down lugs. Take up the slack in the chain/cable.
3. Locate the Allen head socket screws located in the centre of the two drive (rear) wheels and using a 6 mm Allen key, turn each one clockwise to its full extent. The machine is now in freewheel mode.

⚠ WARNING ⚠

DO NOT leave the machine unattended or attempt to operate the A38E Work Platform until the Brake Release Screws have been re-engaged.

4. When towing is completed, turn both Allen head socket screws in a counter clockwise direction until they rest firmly against the locking circlip.

Figure 2-2 : Manual Brake Release

2.7 Storage

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

PRESERVATION

1. Clean painted surfaces. If the painted surface is damaged, repaint.
2. Fill the hydraulic tank to operating level **with the platform fully lowered.** Fluid should be visible on the Dip Stick. It is not recommended that the hydraulic fluid be drained.
3. Coat exposed portions of cylinder rods with a preservative such as multipurpose grease and wrap with barrier material.
4. Coat all exposed unpainted metal surfaces with preservative.

BATTERIES

1. Disconnect the batteries.
2. Disconnect the battery leads and secure to the chassis.

⚠ WARNING ⚠

Care should be taken, while disconnecting the battery leads, that a short circuit does not occur. i.e. grounding to the chassis with a spanner.

3. Remove the batteries and place in alternate service. Battery efficiencies are best realised when used consistently.

NOTES:

NOTES:

3.0 Introduction

GENERAL FUNCTIONING

WARNING

To understand the properties of the A38E Work Platform it is recommended that you refer to the Hydraulic and Electrical Schematics in Section 6. All the information within this Service & Parts Manual should be read thoroughly and fully understood. Before beginning to operate the machine it is also a mandatory requirement to read, fully understand and follow the Operators Manual.

The A38E Lift and Steer functions are operated by utilising a battery powered electric motor which drives a hydraulic pump. The pump supplies oil under pressure to the various platform functions. The oil flow is directed to the different functions by electrically activated solenoid valves. The control of which solenoid valves activate and the rate at which the hydraulic fluid flows is carried by the application of the electrical circuit, and its components, to an ECU.

The Drive function is operated by utilising two drive motors which are controlled by a Electronic Traction Motor Controller.

NOTE:

An Interlock Trigger Switch is an integral part of the Joystick. This must be depressed for the functions to operate. This will energise the Line Contactor and enable electrical control. (This safety feature prevents inadvertent activation of all powered functions, in the case of accidental movement of the Joystick.)

DRIVING

Platform controls provide variable speeds for the drive function through the use of a Joystick. This is achieved using a motor control unit which varies the speed of the two DC electric traction motors. To drive the A38E there are a number of steps which need be taken. First the operator should ensure that neither of the Emergency Stop Buttons are pressed, then the Keyswitch on the ground control panel should be turned to the 'PLATFORM CONTROL' position. Momentarily operate the drive function switch and the A38E will be able to drive.
The machine will then drive at a speed proportional to the angle of the Joy- stick from the neutral (centre) position, while the Joystick Interlock Switch is depressed. The speed range within which the machine will drive is determined by whether or not the booms are raised. If a boom is raised off the Boom Rest Limit Switch the current to the drive motors will be reduced leading to a significantly slower drive speed. This is a safety feature.
The drive wheels are driven by two DC electric traction motors coupled to two braked gearboxes. When the Joystick is in the neutral position the brake chamber is free of oil and the internal spring within the gearbox maintains the braking pressure. Upon moving the Joystick the brake chambers will receive a flow of pressurised oil which will release the brakes.

STEERING

Platform controls also provide a steering function through the use of 'Rocker' activated Steering Switches in the Joystick. This is achieved by using the ECU which varies the hydraulic flow by altering the voltage to the pump. To steer the A38E there are a number of steps which need be taken.
First the operator should ensure that neither of the Emergency Stop Buttons are pressed, then the Keyswitch on the ground control Panel should be turned to the 'PLATFORM CONTROL' position.
Momentarily operate the drive function switch to drive and the A38E will also be able to steer. To steer the machine the Rocker should be pushed to the left or the right, while the Joystick Interlock Switch is depressed. Steering left or right will energise the steering coils and allow oil to enter the full bore side or annular side of the steering cylinder, thereby turning the wheels in the chosen direction.

NOTE:

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

OPERATING THE BOOMS

Boom functions, including the telescopic and slewing functions, can be operated either from the Platform Controls or the Chassis Controls.
The Platform controls provide variable speeds for the boom functions through the use of a Joystick. This is achieved using an ECU unit which varies the speed of the motor/pump unit and increases or decreases the flow of oil to the different functions. This control unit receives a control signal from the Joystick on the upper controls, the speed of the motor will increase as the Joystick is pushed further away from the neutral (centre) position.

It will be noticed that on the Upper Control Box a set of switches are used to alternate functions. Each function will have it's corresponding graphicand lamp. This selector switch indicates to the Controller which function is required and by using the Joystick the speed of this selected function can be adjusted.

The boom functions on the chassis controls provide proportional control for each function by way of an analog rocker switch, the desired function can be activated by holding on one of four switches on the controls and and operating the analog rocker, the the four switchs act as both selector & enable switches.

The use of these functions is further explained throughout this Section.

DESIGN FEATURES

The A38E Series Work Platform has the following features:

- The drive speed is limited to a 'creep speed' when operating the Work Platform while the machine is elevated.
- The energy-efficient motor control units provides long battery life and smooth proportional control of the boom and drive functions.
- All cylinders are fitted with hydraulic hose-burst protection interlocks.
- The on-board charger is fully automatic and charges the batteries efficiently and economically.
- If the work platform starts to become unstable and the Tilt Sensor is activated an alarm will sound in the upper control box. In this situation power is partially cut to the upper controls to prevent any boom movements (i.e. UP, TELE OUT) that might increase instability. An emergency override switch is fitted to allow the booms to be lowered at a controlled speed to bring the machine back to a stable position.
- In the event of a power loss the two Boom Lift Cylinders are fitted with emergency lowering valves which allow the booms to be lowered at a controlled speed by an operator on the ground.
- A Master Cylinder/Slave Cylinder levelling system ensures that the Platform remains level throughout the entire working cycle of the machine.
- A manual rotation facility is fitted to allow rotation of the Elevating Assembly in the event of power loss.

HOUR METER & BATTERY CHARGE INDICATOR.

The A38E Series Work Platform is equiped with a display in the chassis control panel which displays total hours run & an Indication of remaining battery charge.

LOAD SENSI NG

The A38E is fitted with a load sensing system designed to comply with the requirements of :
BS EN 280 : 2001

If a load equivelent to 90% of safe working load is lifted an overload lamp will illuminate on the platform control box.
If a load which is greater than the safe working load is present in thebasket all machine functions will cease to operate and an acoustic warning will sound.
In order to return to normal operation a load equal to or less than the safe working load must be present in the basket and the power must be re-cycled, power can be re-cycled by pushing the emergency stop button and releasing it again.

3.1 Safety Rules and Precautions

⚠ WARNING ⚠

Before using the A38E Work Platform it is imperative to read, understand and follow the following Safety Rules and Precautions.

NEVER operate the machine unless you have been fully trained in its safe use, are medically fit and have read and fully understood these instructions.

NEVER leave the A38E unattended with the Platform in the raised position.

ALWAYS position the machine on firm level ground with a minimum bearing capacity of 550 kN/m^2 (80 psi).

CHECK that no overhead obstructions exist within the machines range of movement.

DO NOT work within 3 metres (10 feet) of live overhead cables. Set up warning tape barrier at the safe distance.
(THIS MACHINE IS NOT INSULATED).

DO NOT exceed the safe working load of 215 kg, (ANSI 475 lbs)
CE=max. 1 persons Outdoor + Tools 55Kg
2 person Indoor + Tools 135Kg
(ANSI=max. 2 person Indoor/Outdoor)
See specification table on page 1-3 .

NEVER sit, stand or climb on guard rail or midrail of the platform.

NEVER use ladders or scaffolding on the platform.

DO NOT use the machine as a crane or for any other application involving additional loads or forces. The maximum side force **must not exceed 200N Outdoors / 400N Indoors, (ANSI = 90 ft. lbs).**

DO NOT increase wind loadings by fitting items such as sign boards, flags etc. to the cage or boom.

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

NEVER use damaged equipment. (Contact Snorkel Ltd. for instructions).

NEVER attach overhanging loads or increase the size of the working platform.

DO NOT use in winds exceeding 12.5 m/s (28 mph - Beaufort Force 6)

NEVER change or modify operating or safety systems.

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

NEVER climb down an elevating assembly with platform elevated.

NEVER perform service on or in the elevating assembly while the platform is elevated without first blocking the elevating assembly.

NEVER recharge batteries near sparks or open flame; batteries under charge emit highly explosive hydrogen gas.

SECURE the work platform against unauthorised use by turning Keyswitch off and removing key from switch.

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

NEVER leave the machine unattended while the Gearbox Drive is disengaged.

3.2 Controls and Indicators

The controls and indicators for operation of the A38E Work Platform are shown in Figures 3-1 & 3-2. The name and function of each control and indicator are listed in Tables 3-1. The index numbers in the figure correspond to the index numbers in the table. **The operator should know the location of each control and indicator and have a thorough knowledge of the function and operation of each before attempting to operate the unit.**

Table 3-1: Controls and Indicators

*Platform Controller**

INDEX NO.	NAME	FUNCTION
1	Emergency Stop	Cuts all Platform control functions when pushed, twist to release.
2	Platform Level	Operate switch and hold while using joystick to level the platform.
3	Upper Boom	Operate switch to engage Upper Boom lift functions (Up & Down)
4	Lower Boom	Operate switch to engage Lower Boom lift functions (Up & Down)
5	Drive	Operate switch to engage Drive functions (Forward & Reverse)
6	Horn	Operate switch and hold to sound the horn.
7	Slew (Rotate)	Operate switch to engage Slew functions (Clockwise & Counter Clockwise)
9	Telescope	Operate switch to engage Telescope functions (Extend & Retract)
10	Joystick	Depress deadman switch and select joystick forward or reverse to enable a selected function.

Chassis Control

INDEX NO.	NAME	FUNCTION
1	Emergency Stop	Cuts all machine functions
2	Upper Boom	Operate switch and hold to engage and enable Upper Boom lift functions (up & down)
3	Lower Boom	Operate switch and hold to engage and enable Lower Boom lift functions (up & down)
4	Slew (Rotate)	Operate switch and hold to engage and enable Slew functions (clockwise & counter clockwise)
5	Telescope	Operate switch and hold to engage and enable Telescope functions (extend & retract)
6	Key Switch	Turns the machine OFF/ON and selects Platform or Chassis controls
7	Rocker Switch	Use with “enable” switches to activate the selected function
8	Display	In normal operation displays battery life and hour run. Can also be used to display diagnstics.

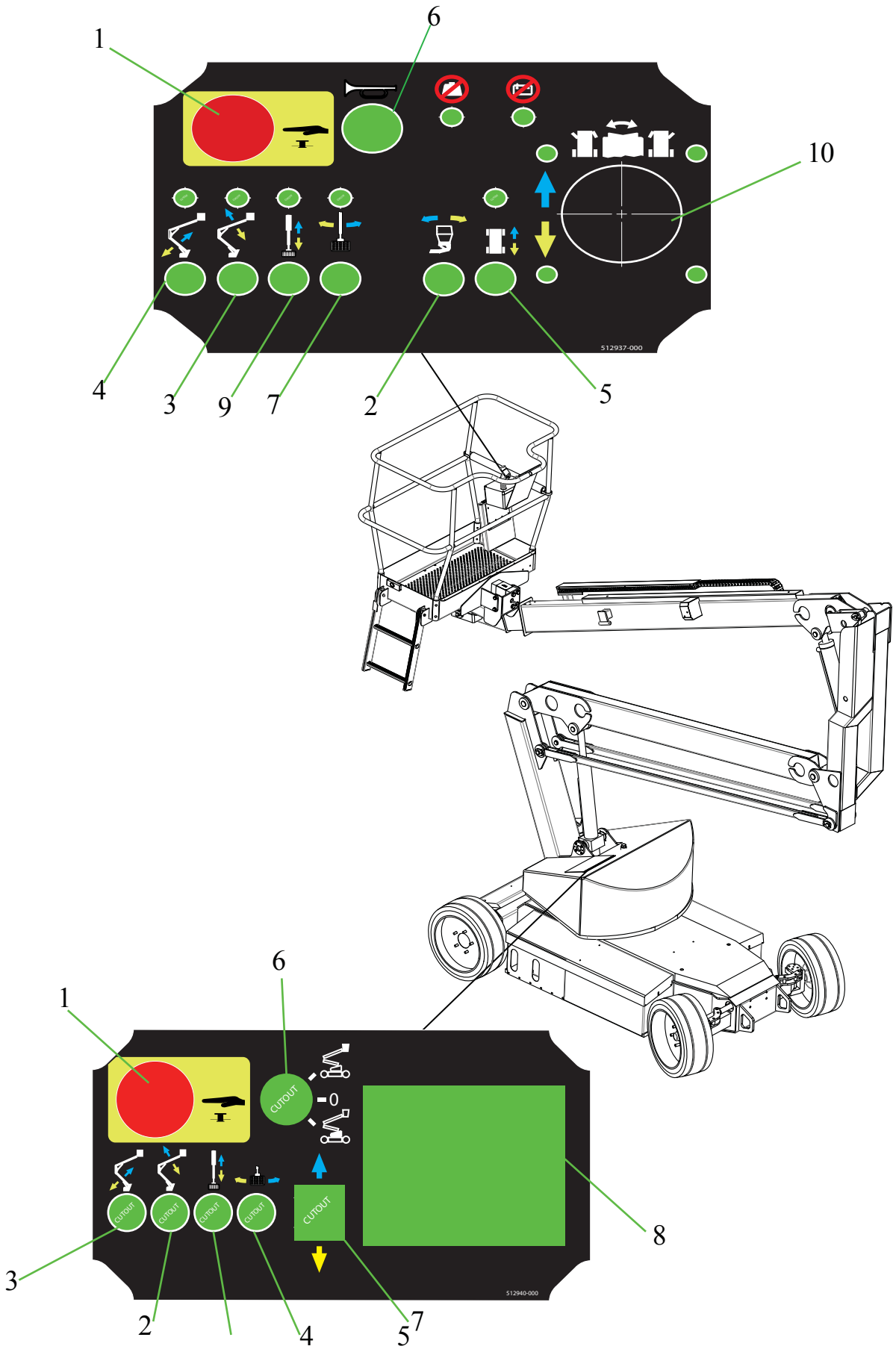


Figure 3-1: Controls & Indicators

3.3 Pre-Operation Inspection

WARNING

Carefully read, understand and follow all safety rules and operating instructions. Perform the following steps each day before use. DO NOT perform service on Work Platform with the platform elevated unless the elevating assembly is properly supported.

1. Remove module covers and inspect for damage, oil leaks or missing parts.
2. Check the level of the hydraulic oil with the platform fully lowered and the Telescopic Boom fully retracted. Oil should be visible on the filler cap dip stick. If necessary top-up using ISO No. 46 hydraulic oil.
3. Check that the electrolyte level in the batteries is correct. (Battery Maintenance, Section 4.3)
4. Verify batteries are charged.
5. Check that the A.C. extension cord has been disconnected from charger.
6. Carefully inspect the entire machine for damage such as cracked welds or structural members, loose or missing parts, oil leaks, damaged cables or hoses, loose connections and tyre damage.
7. Move machine, if necessary, to unobstructed area where machine can be fully elevated.
8. Visually inspect the cylinders, hoses and cables for damage. Check for missing or loose parts.

SYSTEM FUNCTION INSPECTION

9. Turn both Chassis and Platform Emergency Stop switches **ON** (rotate clockwise).
10. Turn Keyswitch on the Lower Control box to the **'UPPER CONTROL SELECTION'.**
11. Using the chassis control switches, fully **ELEVATE** Booms no. 1 & 2 and **EXTEND** the Telescope.
12. **SLEW** the Elevating Assembly through 180 degrees in both directions.
13. Visually inspect the elevating assembly and cage mounting/structure, lift cylinders, cables and hoses for leaks, damage or erratic operation. Check for missing or loose parts such as nuts, bolts and circlips.
14. Test that the Emergency Lowering Valves on each of the Lift Cylinders is operating correctly as detailed in *Section 3.4*. **PUSH** the Emergency Stop Button to identify that functions will indeed cease when depressed.
15. Operate the manual telescopic retraction system using the Handpump to test that it will work. (Not required on ANSI machines).
16. **LOWER** each boom until the Elevating Assembly is fully stowed. Turn Keyswitch on the Lower Control box to the 'UPPER CONTROL SELECTION'. Climb into the Platform and check that the Platform. is level.
    If not adjust as shown in the Platform Levelling Section of this manual. Repeat all the above tests from the Platform Controls. Push the Emergency Stop Button to identify that functions will indeed cease when depressed. Bring the machine back to the stowed position and retract the Telescopic Cylinder.
17. **PRESS** the Service Horn to see that it is operational. Select the **DRIVE** function. While pressing the Joystick Interlock Switch slowly **PUSH** the Joystick to **DRIVE FORWARD**, and then **PULL** to **DRIVE REVERSE**, to check for speed and proportional control. The farther you push or pull the Joystick the faster the machine will travel.
18. **PUSH** the Steering Switch **RIGHT** and then **LEFT** to check for steering control.
19. **RAISE** the Elevating Assembly until the Boom Rest Limit Switch is no longer activated and then repeat the Drive Function test. Only low speed ('**CREEP SPEED**') should be available.

The System Function Inspection is then complete.

WARNING

If there are any concerns about the safe use or operation of the A38E following this Pre-Operation Inspection **DO NOT USE THE A38E WORK PLATFORM**. Contact your supplier or Snorkel's Product Support Department.

3.4 Operation

NOTE: Before operating the A38E Work Platform it is imperative that the Pre-Operation Inspection (Section 3.3) has been completed and any deficiencies have been corrected. The operator must also understand the functions of all the controls before operating the machine.

ELEVATING & LOWERING THE A38E WORK PLATFORM

Before beginning any operation involving the Elevating Assembly the following checks should be carried out. When the A38E has been thoroughly inspected the elevating assembly can then be used.

⚠ WARNING ⚠

LOOK up and around for obstructions before performing the lift function.
ENSURE that the Elevating Assembly is clear of the Chassis before engaging the Slew operation.
DO NOT overload the platform
DO NOT operate within 3 metres (10 feet) of any electrical power cables. THIS WORK PLATFORM IS NOT INSULATED.
Cordon off the area within the platform's working area to keep passers-by clear of the booms.

NOTE: Chassis controls are for service use only.

1. Ensure the **'CONTROL SELECTION KEYSWITCH'** is selected to **'UPPER CONTROL'** and both emergency stop buttons are released (twisted clock-wise).
2. Enter Platform through the entrance at the side of the A38E and ensure that the drop bar is in the lowered position. Lock the Entry Step in the raised position.
3. Before using the machine all local Safety Regulations involving helmets and restraining devices should be observed. Safety harness lanyards, not exceeding 1 m (3 ft.) in length, should be attached to anchor points in cage floor.
4. Select " **LOWER BOOM** " on function selector switch. Check for overhead obstructions and when when satisfied squeeze the Joystick Interlock control on.
   Slowly move the Joystick forward to **ELEVATE** the lower boom.
   The further the joystick is moved, the faster. the boom will move. Pressure must be applied to the Interlock at all times while operation is required.
5. Select "**UPPER BOOM**", "**TELESCOPE**" or "**ROTATE**" as required using the 'Function Selector Switches' and operate as described above. For boom functions the controls will again be forward for **UP** and backward for **DOWN**.
6. To rotate (**SLEW**) **RIGHT** the Controller Joystick should be moved forward. Conversely to rotate (**SLEW**) **LEFT** move the Controller Joystick backward.
7. To "**TELESCOPE**" **IN** the Controller Joystick should be moved forward. Conversely to "**TELESCOPE**" **OUT** move the Controller Joystick backward.
8. Before lowering, check beneath the cage floor for obstructions, operate as described above, moving the Joystick back to lower the Booms.

TRAVEL WITH WORK PLATFORM LOWERED

1. Verify that the chassis Emergency Stop Button is in the 'ON' position (turn clockwise) and that the Keyswitch is turned to the **'UPPER CONTROL'** position.
2. Climb into the Platform and check that the Platform Emergency Stop Button is in the '**ON**' position, and that the Drive function button is depressed. Ensure that the drop bar is in the lowered position.
3. 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.
4. Grasp the Joystick so that the Interlock Switch is depressed (releasing this Interlock Switch will cut power to the Joystick). Slowly push or pull the Joystick to **FORWARD** or **REVERSE** to travel in the desired direction. The farther you push or pull the Joystick from the centre the faster the machine will travel.

5. To "**STEER**" the A38E activate the Interlock Switch while pushing the Steering Switch **LEFT** or **RIGHT** to turn the wheels. Observe the tyres while manoeuvring to ensure proper 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

WARNING

Travel with platform elevated **ONLY** on firm and level surfaces. Platform motion is exaggerated while travelling on uneven surfaces.

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. Depress the Drive function button.
3. Grasp the Joystick so that the Interlock Switch is depressed (releasing this Interlock Switch will cut power to the Joystick). Slowly push or pull the Joystick to **FORWARD** or **REVERSE** to travel in the desired direction. The farther you push or pull the Joystick from the center the faster the machine will travel.

CAUTION

If the machine comes to a halt and the Tilt Alarm sounds, immediately lower the Platform and move the machine to a level location before re-elevating the Platform.

PLATFORM LEVELLING

NOTE:
The Levelling function will only work when the Boom Rest Limit Switch has been activated i.e. when the Booms are stowed.

The platform can be levelled from the Upper controls using the levelling function, depress and hold the levelling button on the upper control box (see fig3-1) while moving the joystick forward or back to level the platform. The switch should be operated in short bursts to level the platform **slowly.**

EMERGENCY SITUATIONS & EMERGENCY OVERRIDE

In any emergency situation, the first action to be taken should be to hit the red "Emergency Stop" button for instant cutout of all functions. It will then be required to twist the button clockwise, this releases the cutout and the machine can be operated again.
If the audible Tilt warning alarm sounds, normal control functions will cease to operate. This will be due to the following problem ;

- the machine is out of level i.e. Tilt Sensor has been activated.

In this situation the only machine functions that will operate are descent functions, descend to the ground in a controlled manner and cycle the power (push and release the emergency stop) to restore all functions, move the machine to a level surface and continue with normal operation.
Note that during emergency operation, controls will operate at a fixed, slow speed and will not allow the raising or extending of the Booms. The Booms can be lowered or retracted.

Emergency Lowering

CAUTION

When operating this function, extreme care must be taken to ensure that the person carrying out the task does not become trapped by the structure. **DO NOT** climb down the Elevating Assembly to operate these valves.

Should the machine become inoperable when elevated, request a person on the ground to lower the platform using the emergency lowering valves. These are red knobs (push type) mounted at the base of the 2 Main Hydraulic Lift Cylinders (See Figure 3-2).
Operate the lower boom first by pushing slowly. The boom will descend slowly. The speed of descent is controlled by retaining pressure on the valve -

ensure a slow controlled rate of descent at all times. Descent can be halted at any time by removing pressure from the red knob.
Repeat the operation if necessary for the upper boom when cylinder is in reach of the ground.
With both main booms lowered fully it should then be possible to leave the platform safely.

Before operating the Emergency Lowering Valves the surrounding area should first be cleared of any potential obstructions. It is also important that when the valve is pushed, it is initially done slowly. This is so that sudden movement will not occur in the Elevating Assembly, leading to a potentially unstable machine.

Figure 3-2: Emergency Lowering

CONTROL FROM GROUND LEVEL

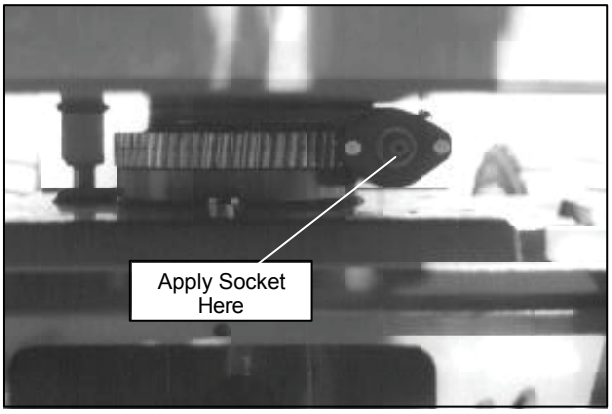
1. Chassis Controls are fitted at the base of the Elevating Assembly. These should be used when no operator is in the platform (for maintenance/ service or inspection purposes), or if the operator has become incapacitated. For further information see Table 3-1.
2. Use the appropriate switch to raise or lower Boom 1, Boom 2, Telescope or rotate as required.

AFTER USE EACH DAY

1. Ensure that the platform is fully lowered.
2. Park the machine on level ground, preferably undercover, secure against vandals, children or unauthorised operation.
3. Turn key switch to **OFF** and remove key to prevent unauthorised operation.
4. Recharge batteries in accordance with the instructions in section 4.2.

MANUAL ROTATION

1. Ensure booms are lowered as far as possible using the emergency lowering valves, and that the Emergency Stop Button is pressed to prevent any accidental powered operation.
2. Apply a 7/8” socket wrench to shaft and turn to rotate elevating assembly.
3. Remove wrench.



To rotate the Elevating Assembly first apply a 7/8” socket wrench to the shaft and turn to rotate the Elevating Assembly. When finished remove the wrench.

Figure 3-3: Manual Rotation

MANUAL TELESCOPIC RETRACTION (SEE FIGURE 3-4)

In the event of loss of electrical power the Telescopic Cylinder can be retracted as follows:

1. Remove the cover from the chassis body.
2. The Handpump is attached to the Main Manifold Block. Remove the Handpump Handle from the clips on the side of the Chassis and insert into the Handpump Valve as shown in Figure 3-4.
3. Operate handpump to retract the tele cylinder.
4. After use replace the Handpump Handle in the clips provided.
5. Reposition the cover on Chassis.

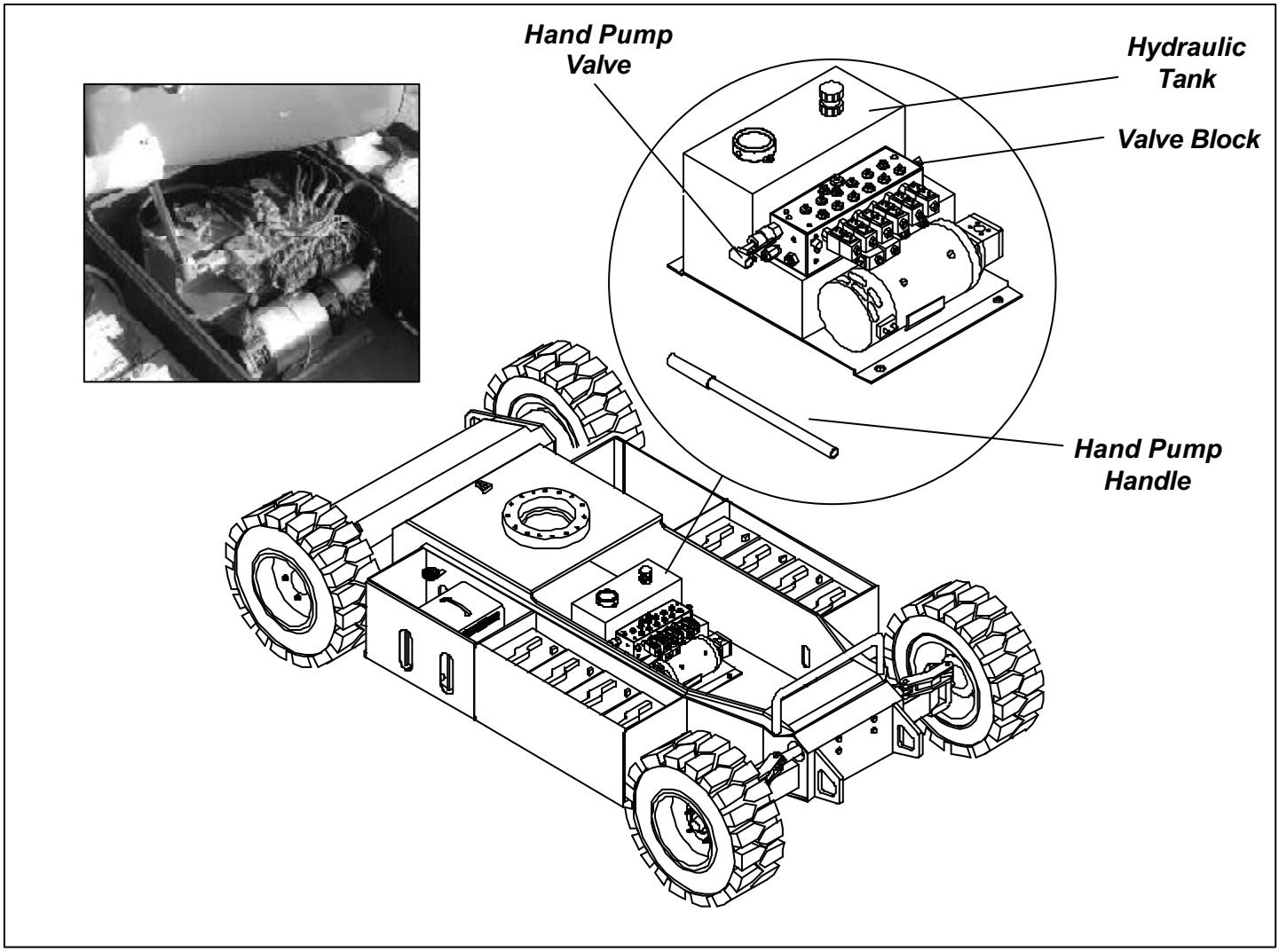


Figure 3-4: Manual Telescopic Retraction

NOTES:

NOTES:

4.0 Introduction

WARNING

Be sure to read, understand and follow all information in the ***Operation Section*** of this manual before attempting to operate or perform service on any A38E Work Platform.

This section contains instructions for the maintenance of the A38E Series Work Platform. Procedures for scheduled maintenance and repair/ removal are included.

Referring to *Section 3.0 and Section 6.0* will aid in understanding the operation and function of the various components and systems of the A38E Work Platform and help in diagnosing and repair of the machine.

Refer to Table 4-1, the Preventative Maintenance Checklist for the recommended Maintenance intervals.

TOOLS REQUIRED

The following is a list of items which may be required to perform certain maintenance & repair procedures on the A38E Work Platform.

1 x Multi-meter capable of reading Voltage, Ohms and Amps.

1 x Hydraulic Pressure Gauge
- Range (0 - 3000 PSI)

1 x Calibrator EZcal (Snorkel Part No: 504560-001)

4.1 Preventative Maintenance (Table 4-1)

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

WARNING

Before performing preventative maintenance familiarise yourself with the operation of the machine.
Ensure that the machine is fully secured and supported when carrying out maintenance procedures in the elevated position.

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

Please copy the following page and use this table as a checklist when inspecting a machine for service.

Maintenance

Preventative Maintenance Table Key

Interval

Daily	**=**	each shift or every day
10h/7d	**=**	every 10 hours or 7 days
50h/30d	**=**	every 50 hours or 30 days
250h/6m	**=**	every 250 hours or 6 months
500h/1y	**=**	every 500 hours or 1 year
1000h/2y	**=**	every 1000 hours or 2 years

Y=Yes/Acceptable
N=No/Not Acceptable
R=Repaired/Acceptable

Preventative Maintenance Report

Date : _____
Owner : _____
Model No : _____
V.I.N No : _____
Serial No :_____
Serviced By :_____
Service Interval :_____

COMPONENT	INSPECTION OR SERVICES	INTERVAL	Y	N	R
Battery System	Check electrolyte level.	Daily			
	Check battery cable condition.	Daily			
	Charge batteries.	Daily			
	Check Charger condition & operation.	Daily			
	Check specific gravity.	50h/30d			
	Clean exterior.	250h/6m			
	Clean terminals.	250h/6m			
Hydraulic Oil	Check oil level.	Daily			
	Drain and replace oil. (ISO #46).	500h/1y			
Hydraulic Pump	Wipe clean	50h/30d			
	Check for hose fitting leaks.	50h/30d			
	Check for leaks at mating surfaces.	50h/30d			
	Check mounting bolts for proper torque.	50h/30d			
Hydraulic System	Check for leaks.	Daily			
	Check hose connections.	50h/30d			
	Check for exterior wear.	50h/30d			
	Change filter.	250h/6m			
Emer. Hydraulic System	Open the emergency lowering valves and check for proper operation.	Daily			
Control Cable	Check switch operation. Check the exterior of cable for pinching, binding or cable wear.	Daily Daily			
Tyres / Wheels	Check for damage.	Daily			
	Check/torque nuts - Front: 200 Nm (150 ft. lbs) Rear: 130 Nm (95 ft. lbs)	50h/30d			
Overload System	Check/torque nuts - 220 Nm (162 ft. lbs)	50h/30d			
	Calibrate system	500h/1y			
Steering Assembly	Check Steering Cylinder for leaks.	50h/30d			
	Lubricate all pivot pins.	250h/6m			
	Check Links and Hubs.	250h/6m			
Drive Motors	Check for operation.	Daily			
	Check for any foreign bodies.	Daily			
	Check for wear of brushes.	500h/1y			
	Check that commutator or springs are undamaged.	500h/1y			
	Check bearings for operation.	1000h/2y			
	Change oil in drive reduction gearbox.*(ref: sec 4.12)*	500h/1y			
Platform Deck and Guardrails	Check welds for cracks.	Daily			
	Check condition of floor.	Daily			
	Check that securing bolts are tightened.	Daily			
	Check drop bar on cage entrance.	Daily			
Slew System	Grease slew gear.	10h/7d			
	Check slew motor for leaks and mounting bolts for proper torque.	50h/30d			
	Check hardware and fittings for proper torque.	250h/6m			
Slew System/ First Post	Check torque on all bolts, 15 outer ring and 20 inner ring. Retorque to 220 Nm (160 ft. lbs).	50h/30d			
Elevating Assembly	Inspect for structural cracks.	Daily			
	Check hoses for pinch or rubbing points.	Daily			
	Check pivot pins for damage.	50h/30d			
	Check pivot pin retaining rings.	50h/30d			
	Check elevating assembly for bending.	250h/6m			
	Check component mounting for proper torque.	250h/6m			
	Check fasteners for proper torque.	250h/6m			
Lift Cylinders	Check cylinder rod for wear.	50h/30d			
	Check pivot pin retaining rings.	50h/30d			
	Grease all fittings as section 4.4.	50h/30d			
Chassis Assembly	Inspect for structural cracks.	Daily			
	Check hoses for pinch or rubbing points.	Daily			
Entire Unit	Function check Emergency stop switches at control boxes.	Daily			
	Perform pre-operation inspection.	Daily			
	Check for and repair collision damage.	Daily			
	Check for peeling, missing or unreadable decals. Replace.	Daily			
	Lubricate.	50h/30d			
	Grease all fittings.	50h/30d			
	Check for corrosion - Remove and repaint.	250h/6m			

NOTE:
Recommend Bolt Torques are shown in Table 4-3, ***Section 4.13***.

Signature of Service Engineer

_____

4.2 Battery Maintenance

Electrical energy for the motor is supplied by eight 6 volt batteries wired in series to give a 48 volts DC supply. Each of these batteries consist of three cells which can supply a maximum voltage of 2.1V ea =>6.3V per battery =>50.4V per battery pack. Proper care and maintenance of the batteries and motor will ensure maximum performance from the work platform.

⚠ WARNING ⚠

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

BATTERY INSPECTION AND CLEANING

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

⚠ WARNING ⚠

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

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

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

Basic Rule for maximum duty cycle of deep cycle traction batteries

- Use the machine until it shows signs of weak / slow performance.
- Allow the charger to charge the batteries until it automatically shuts off.

BATTERY CHARGING

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.

⚠ WARNING ⚠

DO charge batteries in a well-ventilated area.
DO NOT charge batteries in the vicinity of sparks or flames.
NEVER leave charger operating unattended for more than two days.
NEVER disconnect cables from batteries when charger is operating.
Permanent damage to batteries will result if they are not immediately recharged after discharging.
Keep charger dry.

To ensure a proper charge several items must first be checked.

1. Correct voltage and current are available to the charger.
2. Extension cord in good condition, is no longer than 8 m (26 ft.) and is 1.5 mm (12g a) or larger.
3. Charger will have an adequate time to allow a full charge i.e. ensure that power supply will not be switched off overnight.

All ***Snorkel*** battery operated Work Platforms, including the A38E can operate at ambient temperatures to a value of -20ºC (-4ºF). However for this there are two provisions which must be met.

- The ISO#46 grade of hydraulic oil normally used in Snorkel Work Platforms must be replaced with a grade suitable for these low temperature conditions.
- When ambient temperatures fall below 18ºC (65ºF) batteries cannot deliver 210 Ampere hours and so should be placed on charge as soon after use as possible. Under such conditions a 4 hour equalize charge once a week in the early afternoon will improve state of charge and battery life.

Charging

1. Check battery fluid level. If electrolyte level is lower than 10 mm (3/8 in) above plates add distilled water only.
2. Connect battery charger lead to properly earthed outlet of correct voltage and frequency.
3. The Charger will turn on automatically after going through a self test sequence. LED's will indicate the status of charging.
4. The Charger indicates that the charge is complete when the batteries are fully charged.

BATTERY CELL EQUALIZATION

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. The specific gravity of the electrolyte in the battery cells should be equalized monthly, or weekly when used in low temperature conditions. To do this, charge batteries as described above. After this initial charge, check the electrolyte level in all cells and add distilled water as necessary, and turn the charger on until a full charge is again indicated. During this time, the charging current will be low (four Amps) as cells are equalizing.

After equalization, the specific gravity of each cell should be checked with a hydrometer. The **temperature corrected** specific gravity in this state should be **1.28**. If any corrected readings are below **1.23**, the batteries contain bad cells and therefore the battery should be replaced.

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

4.3 Temperature correction for Electrolyte readings

SPECIFIC GRAVITY CONVERSION CHART

Electrolyte Temperature		Temperature Corrected Specific Gravity, Fully Charged	
Fahrenheit	**Celsius**	**USA**	**Euro**
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

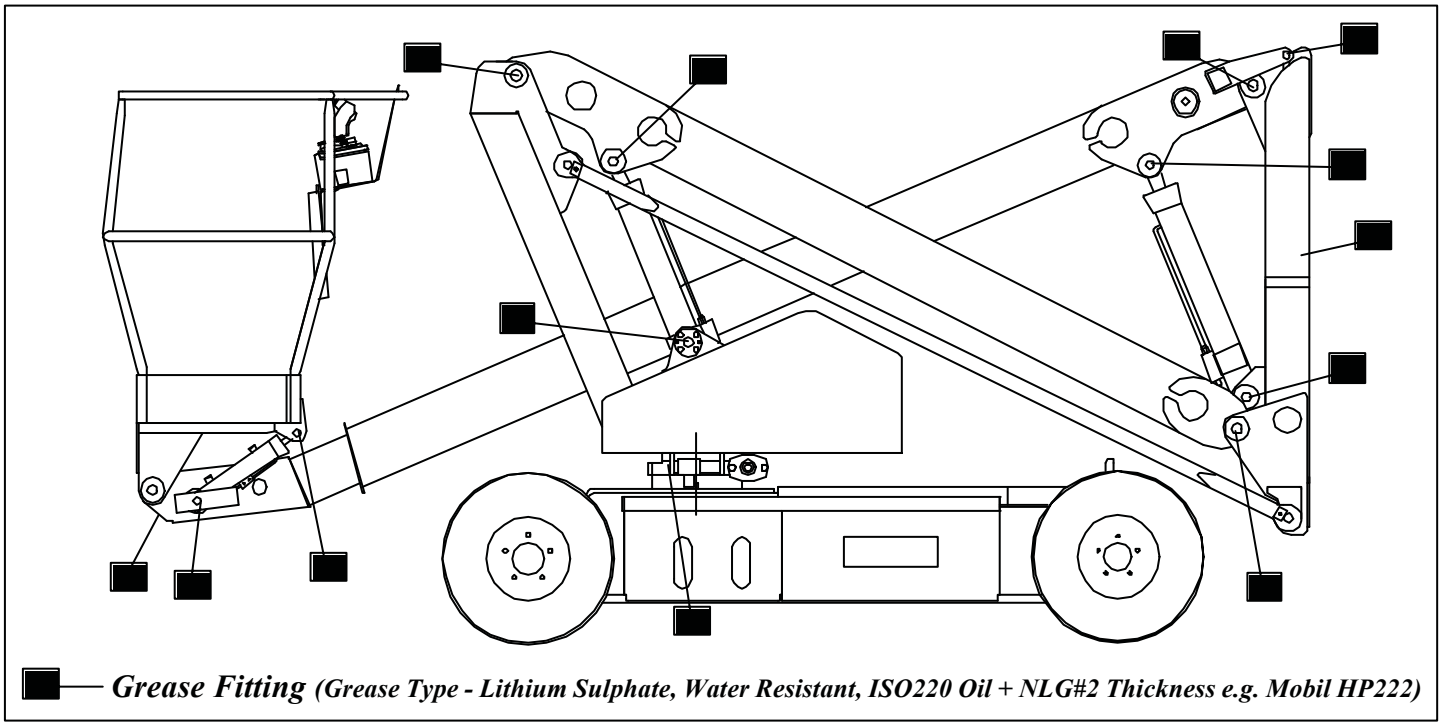
Table 4-2: Specific Gravity Conversion Chart

4.4 Lubrication

Refer to Table 4-1 and Figure 4-1 for location and lubrication intervals required for the items that necessitate lubrication service. Refer to the appropriate sections for lubrication information on the Hydraulic Oil Tank and Filter.

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.



■ — ***Grease Fitting*** ***(Grease Type - Lithium Sulphate, Water Resistant, ISO220 Oil + NLG#2 Thickness e.g. Mobil HP222)***

Figure 4-1: Lubrication Points

GREASE FITTINGS

Wipe each grease fitting before and after greasing. Using multipurpose grease in a grease gun, pump the grease into the fitting until grease just begins to appear at the edges of the pivot, then wipe of any excess grease.

Grease Fitting Locations

Lower Boom	2
Upper Boom	1
Telescopic Boom	1
Lower Cylinder (including Trunnions)	3
Upper Cylinder	2
Telescopic Cylinder	1
Master Cylinder	2
Slave Cylinder	2
Steering Cylinder	2
Torque Arms	4
Pinion Gearbox & Slew Bearing Assembly	3
Total	***23***

SLEW RING

Grease Slew Ring evenly and sparingly every 10 hours or 7 days as per the intervals in Table 4-1. **DO NOT** subject this area to powerwashing.

HYDRAULIC OIL TANK AND FILTER *(Figure 4-2)*

Fluid Level

With platform fully lowered i.e. stowed, oil should be visible on the dipstick. If the oil is NOT visible, fill the tank until oil (ISO#46) 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.

Oil and Filter Replacement

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

⚠ CAUTION ⚠

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.

2. Provide a suitable container to catch the drained oil. Hydraulic tank has a capacity of 25 Litres (6.5 Gallons US).
3. Remove the drain plug on the lower side and allow all oil to drain.
4. Clean the magnetic drain plug and reinstall.
5. Disconnect the return hose and hose fitting from inlet port of the hydraulic return filter. Loosen and remove the filter cover retaining bolts. Remove filter (10 micron) assembly. Replace with a new filter.
6. Fill the hydraulic reservoir with hydraulic oil (see Section 1-2) checking level with dipstick.
7. Recycle used oil as per local environmental regulations.

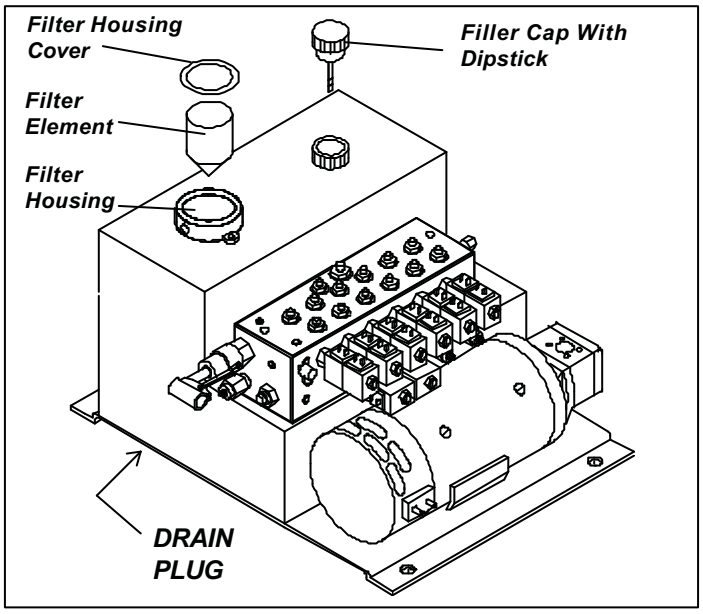


Figure 4-2: Oil and Filter Replacement

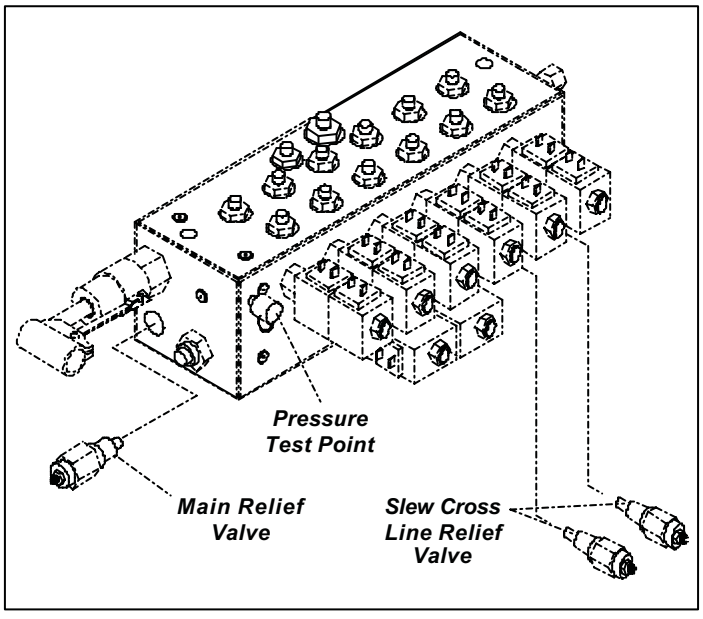


Figure 4-3: Manifold Block

4.5 Setting Hydraulic Pressures (Figure 4-3)

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

WARNING

The hydraulic oil may be of sufficient temperature to cause burns. Wear safety gloves and safety glasses when handling hot oil. The oil in the hydraulic system is under very high pressure which can easily cause severe cuts. Obtain medical assistance immediately if cut by hydraulic oil.

MAIN RELIEF VALVE *(Figure 4-3,4)*

1. Operate the hydraulic system for 10-15 minutes to warm the oil.
2. Remove the cover from the Chassis body.
3. Insert pressure gauge into the high pressure gauge port (TP) on the Manifold Block.
4. Loosen locknut on main relief valve and turn adjusting screw anticlockwise two full turns using a 4 mm Allen key.
5. Operate the Telescope RETRACT function switch from lower controls and keep it activated.
6. Slowly turn the main relief valve adjusting screw clockwise until the pressure gauge reads 175 Bar (2538 p.s.i.) pressure.
7. Release the Telescope RETRACT switch.
8. Tighten locknut on main relief valve while holding the adjusting screw in position.

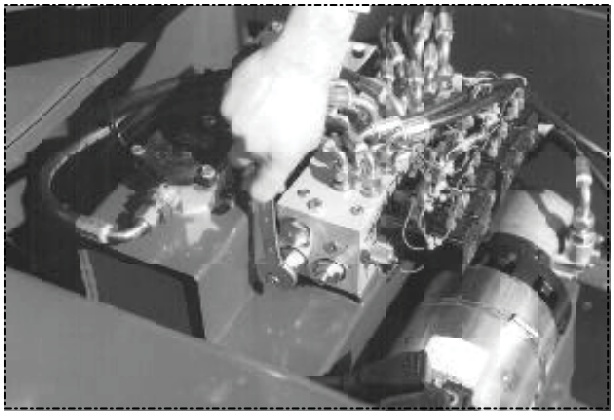


Figure 4-4: Setting Main Relief Pressures

SLEW CROSS-LINE RELIEF VALVES

1. Repeat steps 1-3 as outlined above
2. Loosen Locknuts on both cross-line relief valves and turn adjusting screws anticlockwise two full turns.
3. Operate slew function from lower controls and rotate the Elevating Assembly until the slew stop prevents further rotation.
4. Slowly turn the cross-line relief valve adjusting screw clockwise using a 4 mm Allen key until the pressure gauge reads 50 Bar (725 p.s.i.) pressure.
5. Now operate the slew function in the opposite direction through approximately 360º until the Slew Stop prevents further rotation.
6. Slowly turn the remaining cross-line relief valve adjusting screw clockwise until the pressure gauge reads 50 Bar (725 p.s.i.) pressure.
7. Tighten the locknuts on both cross-line relief valves while holding the adjusting screws in position.

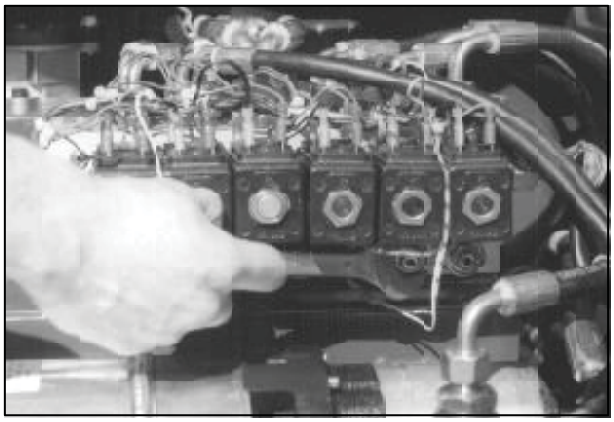


Figure 4-5: Setting Cross-Line Relief Pressures

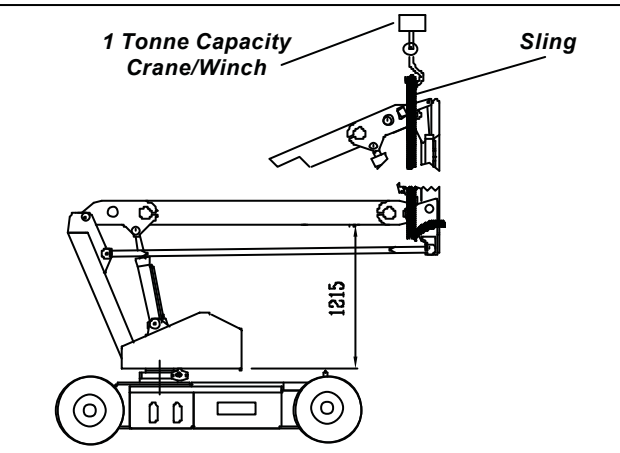


Figure 4-6: Supporting Elevating Assy.

4.6 Maintenance on Elevating Assembly (Figure 4-6)

The only time the Elevating Assembly needs to be elevated is to allow service work to be carried out on the lower parts of the Elevating Assembly, the Lower Lift Cylinder or the Slewing mechanisms.
All other work (Bearings, Cylinders, Booms & Tension Bars) can and must be performed with the Elevating Assembly in the stowed position.

⚠ WARNING ⚠

BEFORE entering Elevating Assembly, to perform maintenance on the Work Platform while elevated, ensure that Elevating Assembly is properly supported by suitable cranage of adequate capacity.
(Recommended 1 tonne capacity crane and sling.)

INSTALLATION OF ELEVATING ASSEMBLY SUPPORT

1. Park the work platform on firm level ground.
2. Verify Platform Emergency Stop Switch is ON.
3. Hold the Chassis/Platform Selector Switch on the Lower Control Box to the 'Chassis' position.
4. Select Lower Control Boom 1 Switch and elevate until the lower boom is slightly above horizontal.
5. Place a sling of 1 Tonne load capacity at the end of the lower boom and second post. Ensure sling is secured so that it will not slip up along the boom.
6. Gradually lower the platform until Lower Boom is supported by the sling.

REMOVAL OF ELEVATING ASSEMBLY SUPPORT

1. Select Lower Control Boom 1 Switch and gradually raise the platform until the sling can be removed.
2. Remove the sling.
3. Completely lower platform.
4. Turn Key Switch to "OFF"

4.7 Switch Adjustments (Figure 4-7 & 4-8)

TILT SENSOR

The Tilt Sensor is incorporated in the GP400 control module.

Function: This limit switch is activated when the internal sensor in the 'Tilt Sensor' is tilted 3° or more (factory set at this value). When the Tilt Sensor activates the elevating and telescope extend functions will be locked out and an audible warning alarm will sound. It will activate if the Chassis tilts 3° in any direction.

SETTING THE TILT SENSOR TO ZERO

! WARNING !

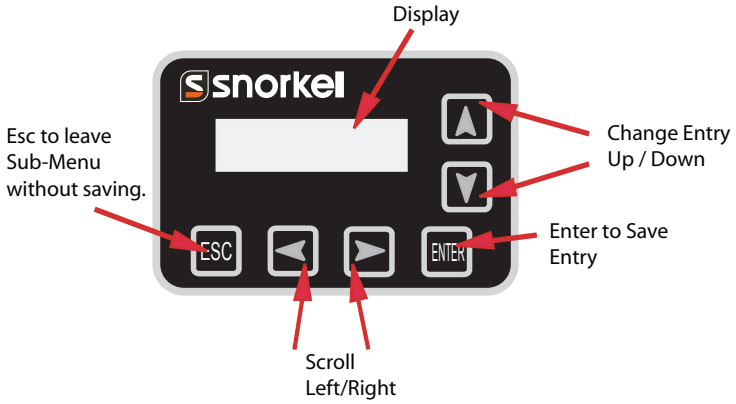
If the EZ230 control modual is replaced and/of moved within the machine for any reason the tilt sensor must be reset for zero° using the following procedure. Failure to do so could result in serious injury or death.

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.



BOOM REST LIMIT SWITCH

Function: This limit switch is activated when the Elevating Assembly is fully stowed and the upper boom is sitting in the boom rest. The Boom Rest is located on the side of the First Post on the A38E Work Platform. 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.

Location: The switch is located on the side of the First Post on the Boom Rest Weldment. (see fig 4-8)

Adjustment: The switch should be activated when the boom sits in the boom rest. The lever is adjustable and should be adjusted so that the switch's activation/deactivation point occurs just as Boom 2 leaves the Boom Rest. To adjust the switch loosen the lever clamping nut and rotate the lever. Tighten the lever clamping nut. The switch should periodically be checked for freedom of movement and be kept clean from dirt and other contaminants that might affect its free movement.

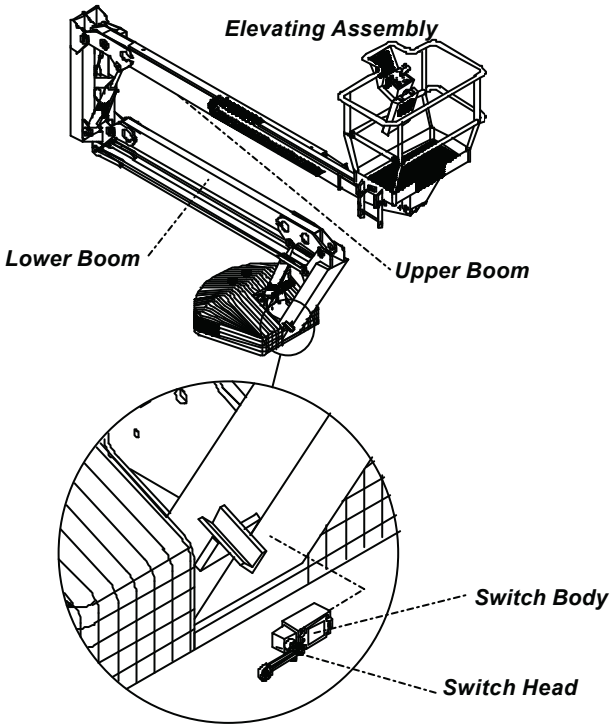


Figure 4-8: Boom Rest Limit Switch

4.8 Hydraulic Manifold (Figure 4-9)

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

REMOVAL

1. Disconnect the Battery Disconnect Plug.
2. Remove the cover from the Chassis body.
3. Tag and disconnect the solenoid valve leads from the solenoids.
4. Tag, disconnect and plug hydraulic hoses.
5. Remove securing bolts that hold manifold block to hydraulic resevoir.
6. Remove the manifold block.

DISASSEMBLY

⚠ CAUTION ⚠

NOTE: Mark all components as they are removed so as not to confuse their location during assembly. Refer to Figure 4-9 often to aid in disassembly and assembly.

1. Remove coils from solenoid valves.
2. Remove solenoid valves and the relief valves.
3. Remove fittings and bonded washers.

CLEANING AND INSPECTION

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

ASSEMBLY

⚠ CAUTION ⚠

Note: Lubricate all O-rings before installation to prevent damage to O-rings.

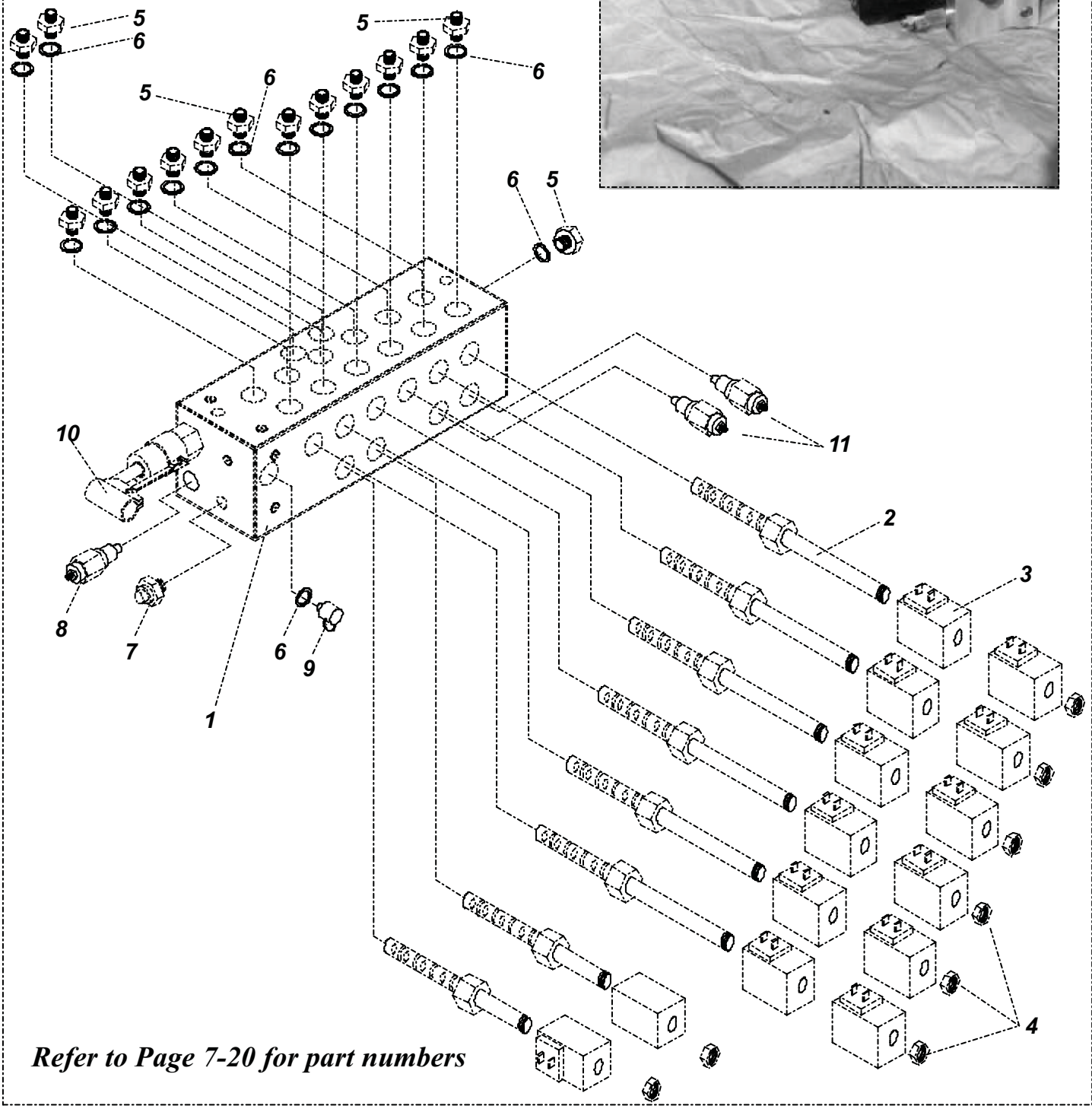
1. Install fittings, plugs and bonded seals.
2. Install the solenoid valves and tighten the coils on to the valves.
3. Install the Main Relief Valve and the Slew Cross- Line Relief Valves .

Note: Torque relief valves to 45 Nm (33 ft. lbs).
Torque solenoid spool cartridges to 20 Nm (14.75 ft. lbs)
Torque coil retaining nuts to 1.5 Nm (1.01 ft. lbs)

INSTALLATION

1. Attach manifold assembly to the Hydraulic Tank with bolts and washers.
2. Connect hydraulic hoses to their destinations on the manifold block.
3. Connect solenoid leads to their correct coils.
4. Operate each hydraulic function and check for proper function and leaks.
5. Re-secure cover to Chassis body.

1. Valve Block
2. Solenoid Valve
3. Coil
4. Locking Nut
5. Fitting, straight
6. Bonded Washer
7. Pressure Reduction Valve
8. Main Relief Valve
9. Pressure Test Point
10. Telescopic Retraction Valve
11. Cross Line Relief Valves



Refer to Page 7-20 for part numbers

Figure 4-9: Manifold Block Components

4.9 Hydraulic Pump (Figure 4-10)

CAUTION

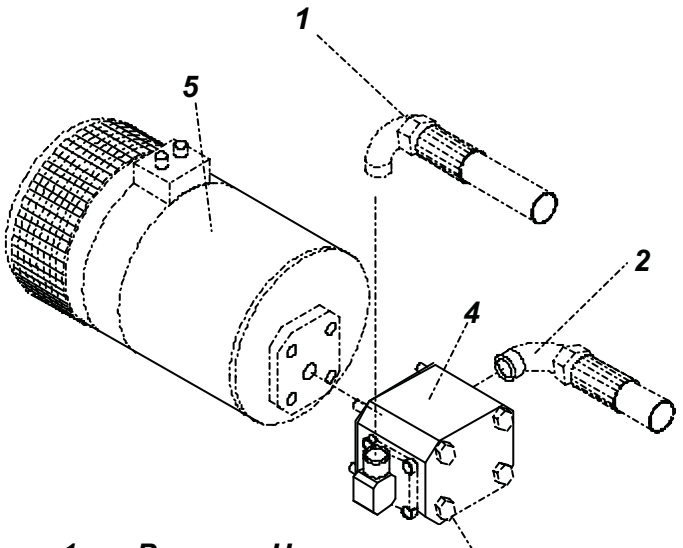
If the hydraulic reservoir has not been drained, suitable means for plugging the hoses should be provided to prevent excessive fluid loss.

REMOVAL

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

INSTALLATION

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



1. *Pressure Hose*
2. *Suction Hose*
3. *Capscrew*
4. *Pump Assembly*
5. *Electric Motor*

Figure 4-10: Hydraulic Pump

4.10 Traction Motor Maintenance (Figure 4-11)

CAUTION

Before carrying out any maintenance procedures on the Drive Motors ensure that the electric circuit is disconnected i.e. disconnect the batteries and unplug the charger. It is also important that when dealing with batteries the proper safety precautions are adhered to. There is always a hazard of sparks or explosive gas.

INSPECTING THE DRIVE MOTORS

Remove the inspection covers (Item 6) from the rear section of the motor and examine the brushes for excessive wear.
If required the brushes may need to be changed as follows:

1. Lift the spring (Item 3)
2. Release the brushes and unscrew the bolts (Item 2) from the brush box (Item 5)
3. Remove the brushes by pulling the electric leads.

WARNING

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

4. After thoroughly cleaning the brush boxes, insert the new brushes and check that they slide correctly inside the seat (Item 5).
5. Tighten and lock the bolts (Item 2).
6. Push the springs back in place. Check the constant pressure on all the brushes, and the correct contact with the commutator.
7. Replace the inspection/ventilation covers.

Every **500** working hours, or annually

Brushes - Check the wear, the correct seating, and the regularity of the working surface.

Springs - They should not be burned or damaged, and they must apply a constant and equal pressure on the brushes.

Commutator - The surface must be clean and regular without grooving or burning.

General - Check that foreign bodies or dirt have not entered the motor.
Check that the ventilation holes are clean and not obstructed.

Every **1000** working hours, or every two years

Bearings- All the bearings are fitted with a double shield and lubricated with high temperature grease.
Check for leaks, vibration and noise.
If necessary replace with bearings of identical type.

Screws - Check that all nuts, particularly the cable nuts and screws are tight.

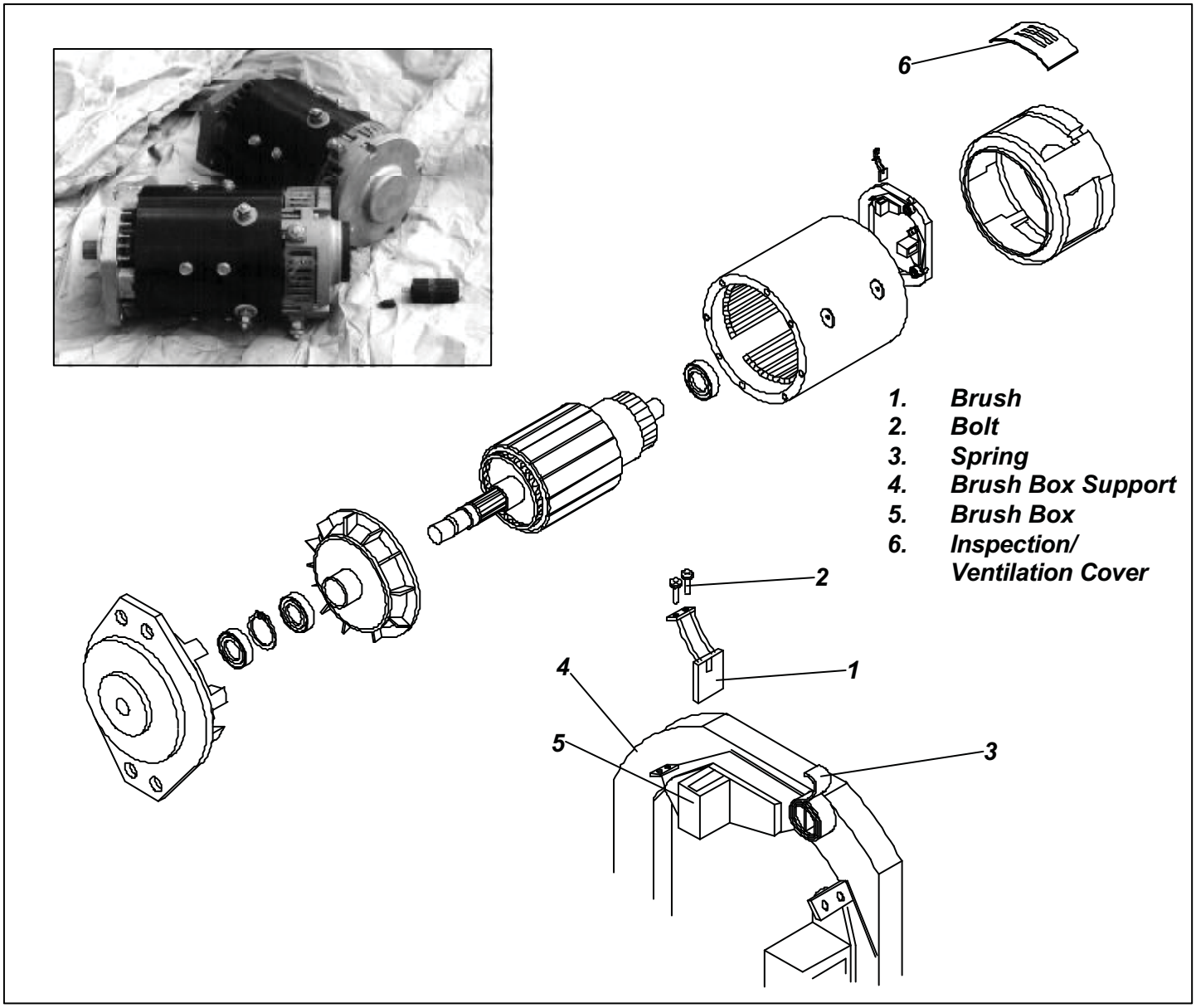


Figure 4-11: Traction Motor Maintenance

4.11 Electric Pump Motor (Figure 4-13)

⚠ WARNING ⚠

Before carrying out any maintenance procedures on the electric motor ensure that the electric circuit is disconnected i.e. disconnect the batteries and unplug the charger. It is also important that when dealing with batteries the proper safety precautions are adhered to. There is always a hazard of sparks or explosive gas.

TROUBLESHOOTING

1. Read the nameplate to become familiar with the motor, especially the rated voltage.
2. Try to turn the shaft by hand. Keep motor leads separated while doing this. **If the shaft turns freely go to step 3. If the shaft won't turn, proceed to step 2A.**

2A. The shaft could be tight for a number of reasons , this check is to determine if the tightness is of a temporary nature only. Obtain power to produce the nameplate voltage. Do not make a permanent connection.
First touch the motor leads quickly to the power supply just long enough to observe if the shaft runs. If it does turn, then hold the motor leads on the power supply for a longer time. If the motor sounds normal , go to step 3.
If the motor is noisy it should be taken apart as described in the **DISASSEMBLY** section.

3. If the motor turned freely, connect an ammeter in the circuit as shown in Figure 4-12. With rated voltage applied and the shaft running free, the ammeter should read less than 20% of the nameplate full load current. If the motor meets the above conditions then it can be assumed that the original problem is external to the motor.

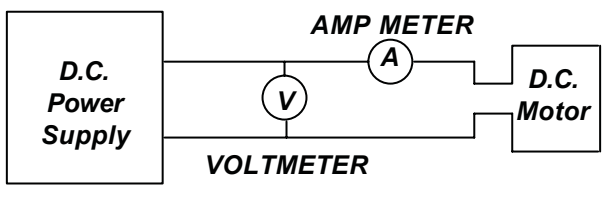


Figure 4-12: Electrical Test Circuit

DISASSEMBLY

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

⚠ CAUTION ⚠

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

INSPECTION

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

1. Bearings should spin smoothly and easily and have ample lubrication and be free of corrosion.
2. Armature should be checked for grounds and shorted Windings. Refinish commutator surface if pitted or excessively worn.
3. Brushes should be checked for wear and to ensure that they are free in the brush holders. **NOTE:** Observe how the brushes are assembled in brush holders and position of brush lead. New brushes must be installed in same manner. Brushes should be removed as follows:
   - Remove brush spring clip from its mounting on brush assembly.
   - Lift brush assembly from the brush holder
   - Disconnect brush assembly lead.
   - New brush assembly to be installed by reversing the above procedure.
4. Inspect wire harness and all connections for signs of damage due to overheating.
5. Check stator to see if it is securely mounted.

REASSEMBLY

1. Install new brushes and be sure they are free in the holder. Install brush with the lead wires positioned as when received.
2. Place commutator cover on a work bench with brush assembly facing upward.

3. Place the bearing spring into the bearing bore.
4. Take a complete armature assembly, including bearings, and insert commutator end bearing into the bearing bore.
   Note: Do not reuse bearings which have been removed from armature shaft. Keep assembly in a vertical position. Use extreme care not to damage armature with bearing pullers. New bearings should be installed by pressing inner race of bearing onto proper position on armature shaft.
5. Set the brushes to final position and lock with springs.
6. Place the complete stator down over the vertical armature, and into position on the commutator cover.
7. The stator assembly must be placed in a definite relationship with the commutator covers in order to obtain a neutral brush setting. There is a match-mark on both items. These two marks must line up exactly.
   Rotate until they do.
8. Assemble the pulley end cover in the proper relationship. Insert mounting bolts and tighten alternately to ensure a good mechanical alignment.
9. Spin the shaft by hand to see if it is free. Be sure motor leads (if used) are not touching together. If the leads are touching, a generator action will give the effect of friction in the motor. A no-load test can now be performed. At rated voltage, observe the no-load current. It should be less than 20% of the nameplate full load current. Anything higher will indicate:
   - Brushes are not on neutral setting (check matchmarks for exact alignment)
   - Faulty armature.

NOTE: Following assembly, the electric motor may turn in the wrong direction. The cause of this will be that the brush holder assembly has been connected the wrong way. To solve this disassemble and reconnect in the proper way. Reversing the polarity will not solve this problem as this is a series wound motor.

MAINTENANCE INTERVALS & PROCEDURES

Every **500** working hours, or annually

Brushes - Check the wear, the correct seating, and the regularity of the working surface.

Springs - They should not be burned or damaged, and they must apply a constant and equal pressure on the brushes.

Commutator - The surface must be clean and regular without grooving or burning.

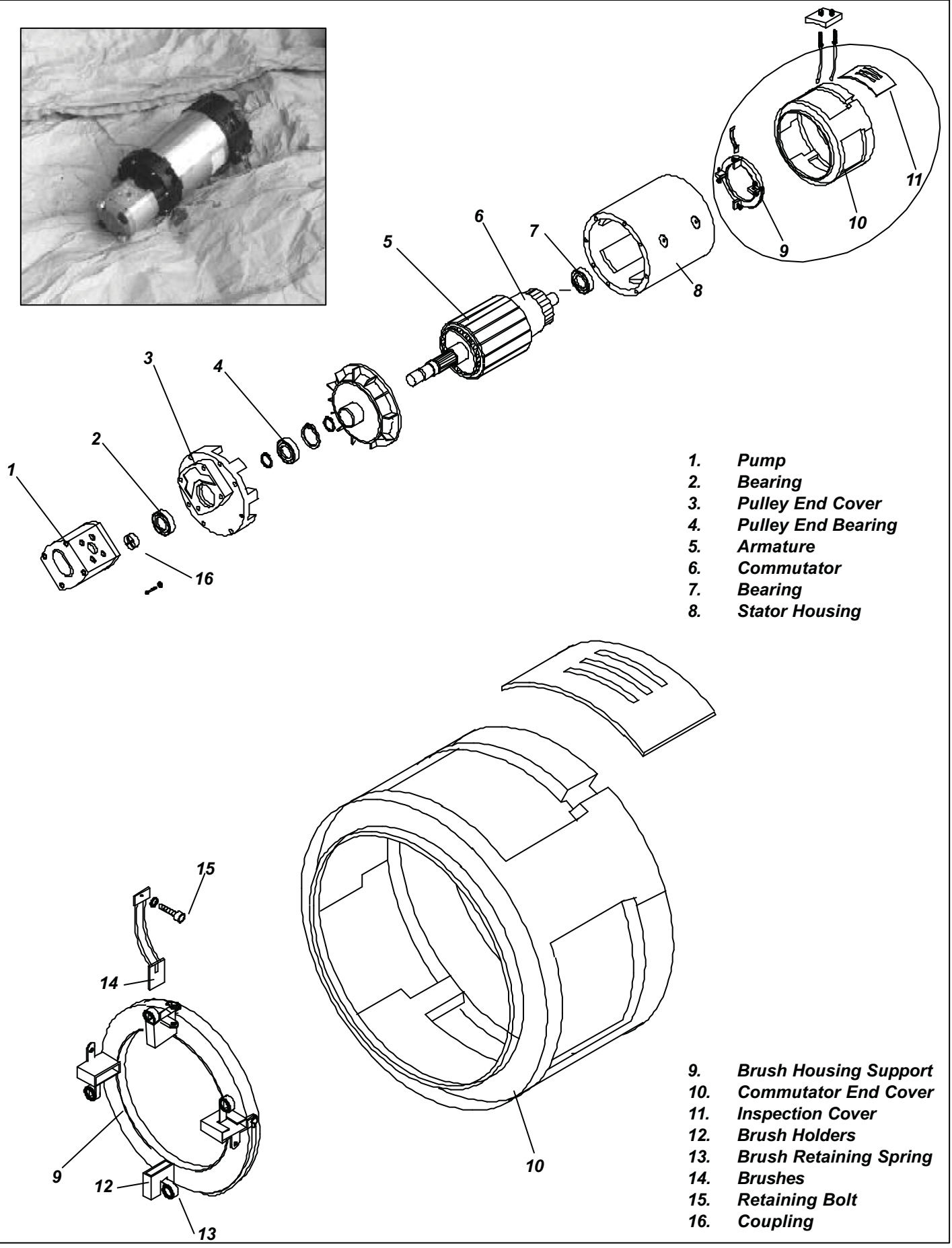
General - Check that foreign bodies or dirt have not entered the motor.
Check that the ventilation holes are clean and not obstructed.

Every **1000** working hours, every two years

Bearings- All the bearings are fitted with a double shield and lubricated with high temperature grease.
Check for leaks, vibration and noise.
If necessary replace with bearings of Identical type.

Seals - Check that hydraulic seals are in perfect condition.

Screws - Check that all nuts, particularly the cable nuts and screws are tight.



1. Pump
2. Bearing
3. Pulley End Cover
4. Pulley End Bearing
5. Armature
6. Commutator
7. Bearing
8. Stator Housing
9. Brush Housing Support
10. Commutator End Cover
11. Inspection Cover
12. Brush Holders
13. Brush Retaining Spring
14. Brushes
15. Retaining Bolt
16. Coupling

Figure 4-13: Electric Motor Assembly

4.12 Drive Reduction Gearbox (Figure 4-14)

As with most gearboxes oil changes must be carried out at regular intervals. Initially this should be done after the first 50/100 working hours and then subsequently every 500 working hours or at least every 12 months.

For this gearbox the **minimum** recommended viscosity index is 95. Depending on the ambient temperature of the work place the viscosity index should vary as follows:

Ambient Temperature	Viscosity Index (ISO 3448)
-20°C (-4°F) / 5°C (41°F)	VG 100
5°C (41°F) / 30°C (86°F)	VG 150
30°C (86°F) / 50°C (122°F)	VG 320

During oil change, we recommend that the inside of the Gearcase is flushed out with flushing fluid recommended by the lubricant manufacturer.
Oil should be changed when hot to prevent a build up of sludge deposit. It is advisable to check the oil level at least once per month. If more than 10% of total oil capacity has to be added, check for oil leaks.
Do not mix oils of different types even of the same make.
Never mix mineral and synthetic oils.

⚠ CAUTION ⚠

Service Engineers must be aware of the dangers during an oil change involving hot oil i.e. scalding. The Service Engineer must also be responsible when disposing of the discarded oil. This should be done in accordance with local environmental regulations.

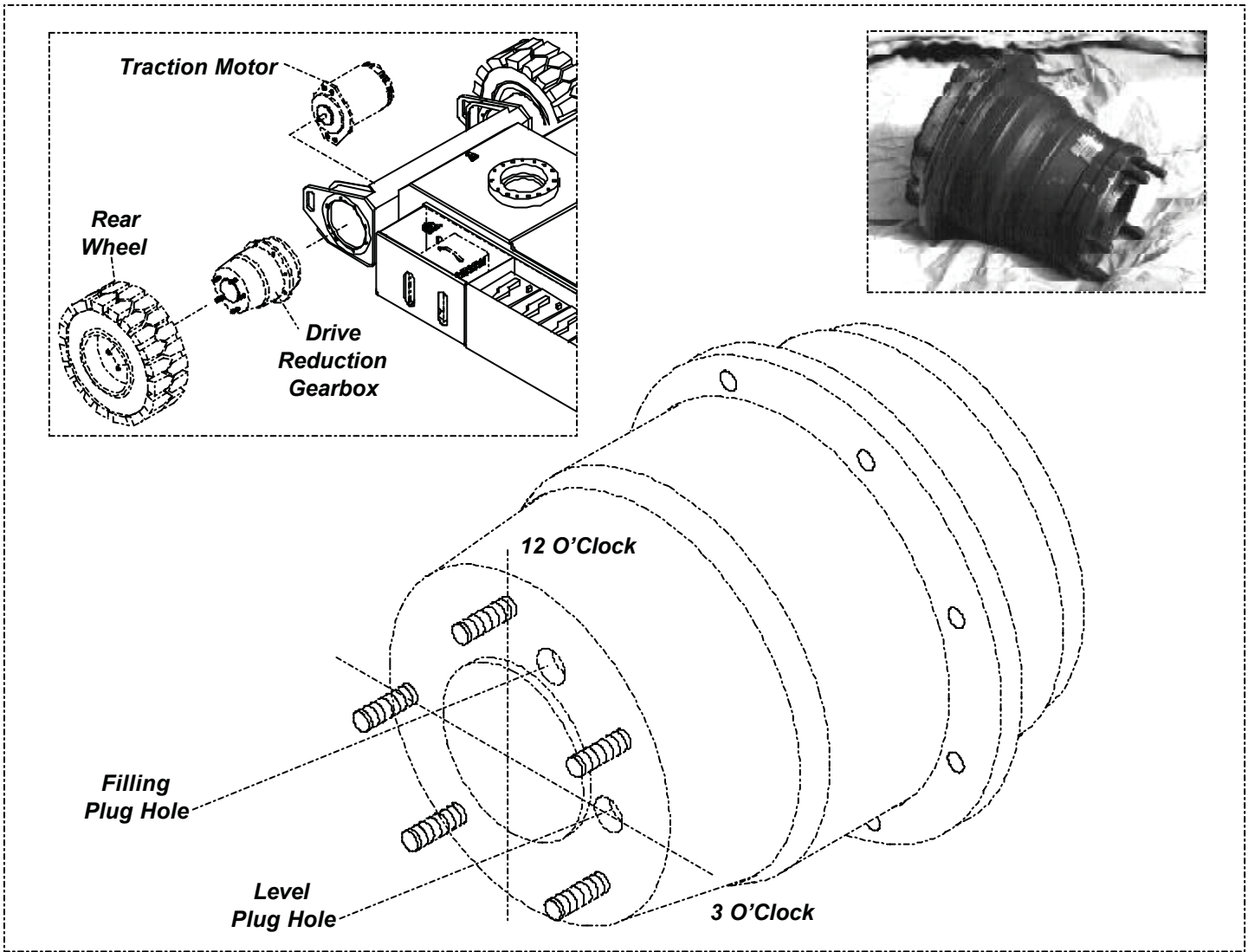


Figure 4-14: Drive Reduction Gearbox

CHANGING THE OIL

Unless an oil suction system can be used, it is necessary to remove the gearbox to fully drain the oil.

1. The A38E should be driven for five minutes in order to bring the oil up to working temperature.
2. The Electric Traction Motor must be disconnected from the Gearbox.

⚠ WARNING ⚠

Disconnect the batteries when working near the traction motors.

3. Unscrew the four bolts that hold the traction motor to the Gearbox and pull the Motor away from the rear face of the Gearbox.
4. Disconnect the brake hose from the brake port on the Gearbox and plug to avoid excessive oil spillage and contamination.
5. Loosen the five wheel nuts securing the Wheel Assembly to the Gearbox studs.
6. Jack up the rear of the A38E and chock the front wheels to prevent the machine from moving during the service.
7. Remove the Wheel Assembly by unscrewing the five wheel nuts
8. Unscrew the eight securing bolts that hold the Gearbox to the Chassis, and remove the Gearbox, noting its orientation on the chassis before removal.
9. Remove the oil filler and drain plugs from the front (stud) face of the Gearbox.
10. Stand the Gearbox vertically (studs facing down) in a suitable oil disposal container and allow the oil to drain fully.
11. The Gearbox needs to be half filled which requires approximately 0.9 Litres (0.23 Gallons US) of oil. To check this level, rotate the Gearbox into the horizontal position with one of the filler/drain plug holes in the 3 O' Clock position and the other plug hole above it (See fig 4-14). When the Gearbox is half full oil will just start to trickle out the plug hole in the 3 O'Clock position.
12. Insert and tighten both plugs and clean the surfaces of the gearbox.
13. Reattach the Gearbox to the Chassis in its original position with the eight securing bolts.

⚠ CAUTION ⚠

The Gearbox Securing Bolts must be torqued to 130 Nm (96 ft. lbs).

14. Reattach the brake hose to the brake port.
15. Reattach the Wheel Assembly to the Gearbox using the five M14 nuts.

⚠ CAUTION ⚠

The Wheel Assembly Nuts must be torqued as per values given in Table 4-1.

16. Reattach the Electric Traction Motor to the Gearbox.

⚠ CAUTION ⚠

The Electric Traction Motor Bolts must be torqued to 74 Nm (55 ft. lbs).

Repeat this procedure for the other Drive Gearbox.

4.13 Torque Specifications

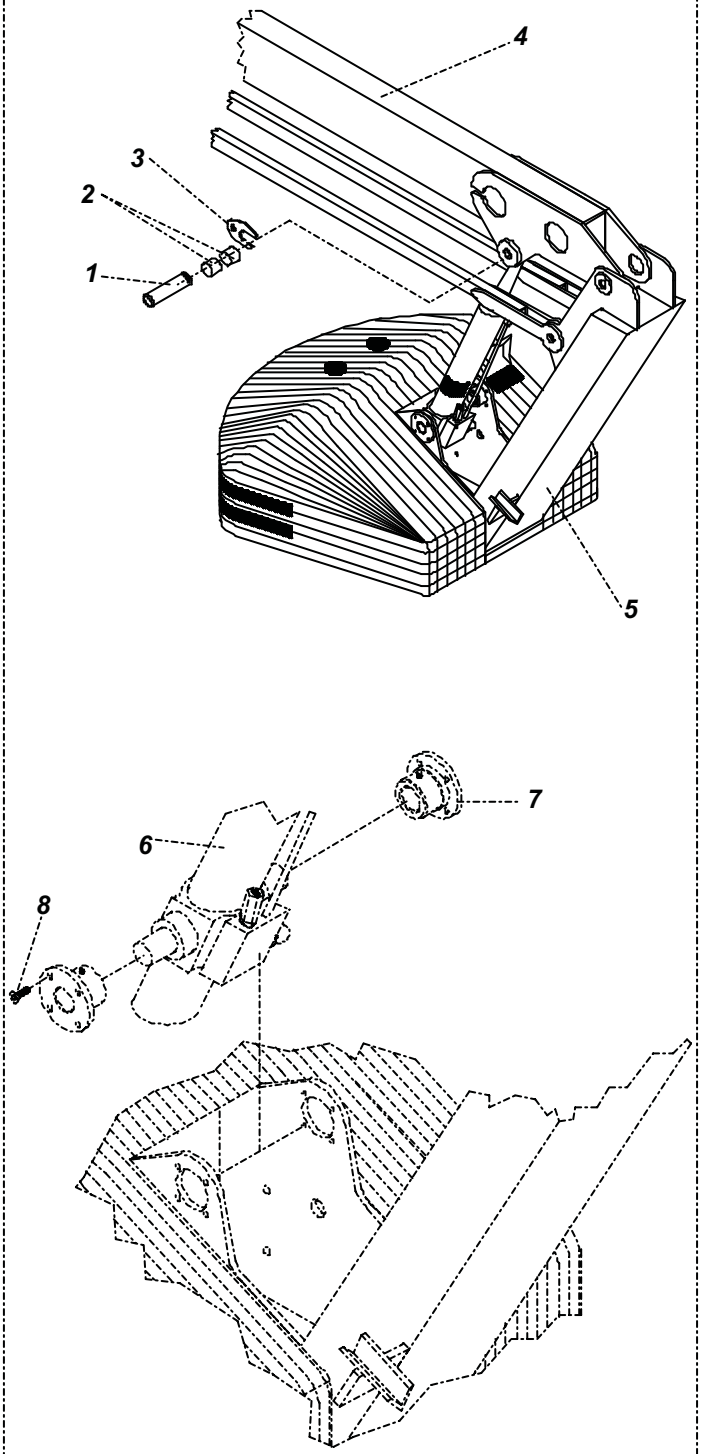
RETAINING BOLTS

Use the following values to torque bolts used on ***Snorkel*** A38E Work Platform unless a specific torque value is called out for the part being installed.

Thread Size	Location	Torque	
		Metric	Imperial
M4	SPIRIT LEVEL	3 Nm	2 Ft/Lbs
M6	VARIOUS	10 Nm	7 Ft/Lbs
M8	TRUNNION	25 Nm	18 Ft/Lbs
M10	PIN LOCK PLATES	45 Nm	33 Ft/Lbs
M12	TORQUE ARMS	90 Nm	67 Ft/Lbs
5/8" -11 UNC x 3 1/2" (ISO 10.9) (US Grade 8)	SLEW BEARING	220 Nm	165 Ft/Lbs

Table 4-3: Bolt Torques

NOTE: All Bolts are ISO Grade 8.8 unless otherwise stated



1.	*Rod End Pivot Pin*	*5.*	*First Post*
2.	*Bushings*	*6.*	*Lower Lift Cylinder*
3.	*Pin Lock Plate*	*7.*	*Trunnion*
4.	*Lower Boom*	*8.*	*Trunnion Screw*

Figure 4-15: Lower Lift Cylinder

4.14 Lower Lift Cylinder (Figure 4-15)

REMOVAL

CAUTION

The Lower Lift Cylinder is heavy, so utilise appropriate lifting equipment to support the unit before removing pins.

1. Ensure that the A38E 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. Provide a suitable container to collect the hydraulic fluid, then disconnect the hydraulic hoses. Immediately plug hoses to prevent foreign material from entering.
3. Remove securing bolts and pin lock plates from the cylinder pins.
4. Support rod end of cylinder and remove rod end pivot pin. Move cylinder backwards to rest against the first post.
5. Support the cylinder so that the Trunnion Pivot bushings can be removed. This is done by releasing the eight M8 Allen head bolts. Remove the cylinder from the machine.
6. 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.

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.
6. Care should be taken to save the O-ring and all other seals for reassembly, if they have been deemed serviceable following the cleaning and inspection phase of maintenance.

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 any parts or seals found to be unserviceable.

REASSEMBLY/SEAL REPLACEMENT

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

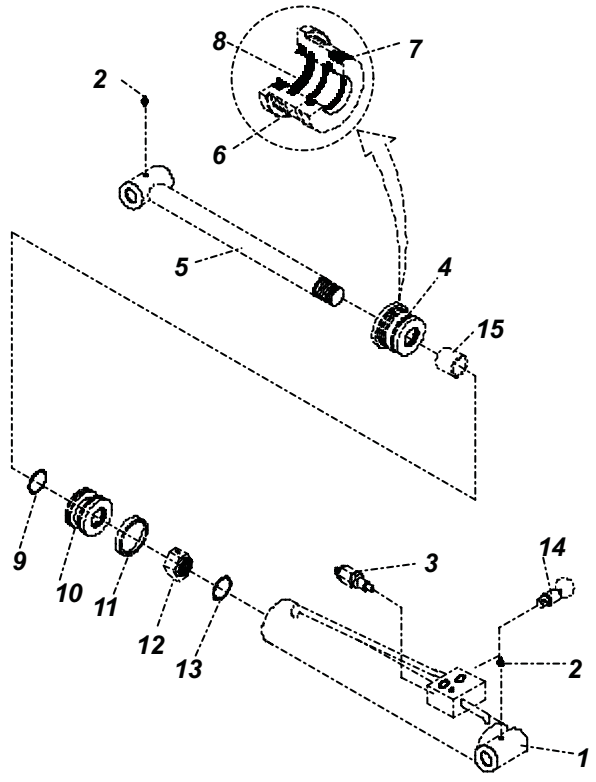
1. Lubricate and install new rod seal, rod wiper and static seal on the headcap.
   NOTE: Multi-purpose lubricant should be used.
2. Install a new piston seal on the piston.
3. Install the headcap on the cylinder from the piston end.
4. Install the piston, piston nut and a new piston static O-ring on 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 1/4 turn further.
7. Install the lower cylinder Overcentre Valve.

INSTALLATION

NOTE: Before installing Lift Cylinder check cylinder pins, bearings and Trunnion Pivot for wear and replace if necessary.

1. Locate the Trunnion Pivot on the cylinder and place the lift cylinder against the first post.
2. Maintaining the Trunnion Pivot in place put the first Allen Bolt in one turn. Repeat for all of the bolts. When all bolts are in place tighten fully.
   NOTE: Take care in aligning the holes so that the bolts can be made turn by hand. If holes are not properly aligned the Trunnion Pivot will be positioned incorrectly.
3. Install rod end bearings (if removed).
4. Lift rod end of cylinder into place and insert pin. Install pin lock plate. Fix pin lock plate with bolt.
5. Test with weight at rated platform load to check system operation.

Note: Diagram below shows a sample cylinder breakdown for the Upper Lift Cylinder. Component Breakdowns of the other cylinders are shown in the Illustrated Parts Breakdown.



1.	*Cylinder Body*	*9.*	*Piston O-Ring*
2.	*Grease Nipple*	*10.*	*Piston Head*
3.	*Overcentre Cartridge*	*11.*	*Piston Seal*
4.	*End Cap*	*12.*	*Piston Locknut*
5.	*Rod And Pivot*	*13.*	*Washer*
6.	*Rod Seal*	*14.*	*Emergency Lowering Valve*
7.	*O-Ring*		
8.	*Wiper*	*15.*	*Spacer*

Figure 4-16: Hydraulic Cylinder Component Breakdown

4.15 Upper Lift Cylinder (Figure 4-17)

REMOVAL

⚠ CAUTION ⚠

The Upper Lift Cylinder is heavy, so utilise appropriate lifting equipment to support the unit before removing pins.

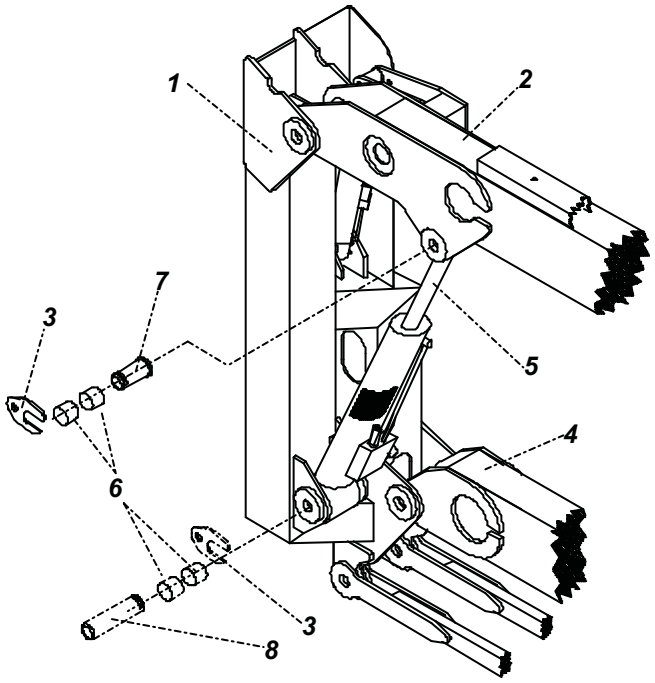
1. Ensure that the A38E is on firm level ground, the Elevating Assembly is completely stowed, the Keyswitch is to the 'OFF' position and the Emergency Stop Button is pressed.
2. Provide a suitable container to collect the hydraulic fluid, then disconnect the hydraulic hoses. Immediately plug hoses to prevent foreign material from entering.
3. Remove securing bolts and the pin lock plates from the cylinder pins.
4. Support rod end of cylinder and remove rod end pivot pin. Let cylinder down to hang freely.
5. Support the cylinder so that the barrel end cylinder pin can be removed, then remove the cylinder from the machine.
6. 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 highly sensitive to contamination.

DISASSEMBLY (Refer to Figure 4-16)

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.
6. Care should be taken to save the O-ring and all other seals for reassembly, if they have been deemed serviceable following the cleaning and inspection phase of maintenance.

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 any parts or seals found to be unserviceable.



1.	*Second Post*	*5.*	*Upper Lift Cylinder*
2.	*Upper Boom*	*6.*	*Bushings*
3.	*Pin Lock Plate*	*7.*	*Rod End Pivot Pin*
4.	*Lower Boom*	*8.*	*Barrel End Pivot Pin*

Figure 4-17: Upper Lift Cylinder

REASSEMBLY/SEAL REPLACEMENT

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

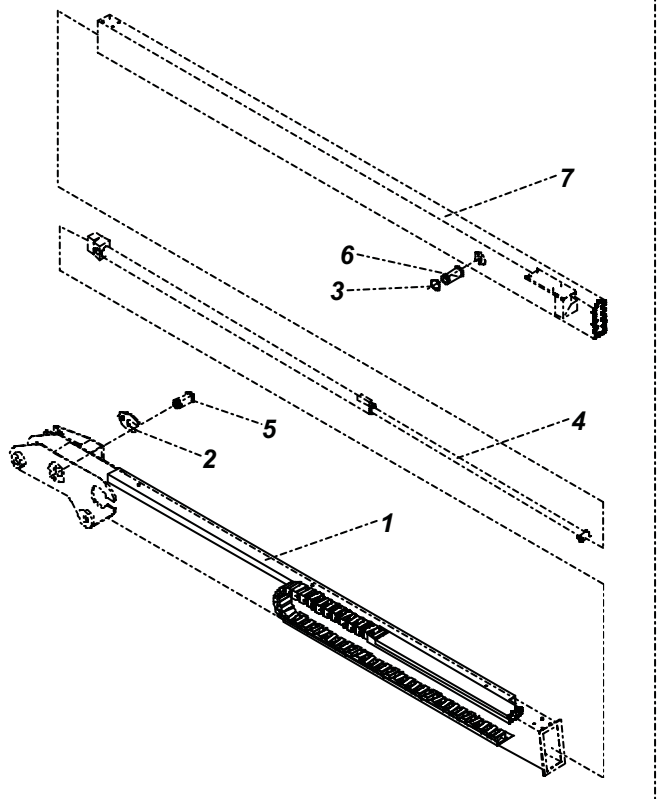
1. Lubricate and install new rod seal, rod wiper and static seal on the headcap.
   NOTE: Multi-purpose lubricant should be used.
2. Install a new piston seal on the piston.
3. Install the headcap on the cylinder from the piston end.
4. Install the piston, piston nut and a new piston static O-ring on 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 1/4 turn further.
7. Install the upper cylinder Overcentre valve.

INSTALLATION

NOTE: Before installing Lift Cylinder check cylinder pins and bearings for wear and replace if necessary.
1. Install barrel end bearing (if removed)
2. Lift the barrel end of the cylinder into place and push the cylinder pin in.

NOTE: Take care in aligning the holes so that the pin can be pushed in by hand. Bearings will be damaged if holes are not properly aligned and the pin is forced.
3. Align pin lock plate on cylinder pin with hole in the mast and push the cylinder pin completely in. Fix pin lock plate with bolt.
4. Install rod end bearings (if removed).
5. Lift rod end of cylinder into place and insert pin. Install pin lock plate. Fix pin lock plate with bolt.
6. Test with weight at rated platform load to check system operation.



1. Upper Boom
2. Pin Lock Plate
3. Circlip
4. Telescopic Cylinder
5. Barrel End Pivot Pin
6. Rod End Pivot Pin
7. Telescopic Boom

Figure 4-18: Telescopic Cylinder

4.16 Telescopic Cylinder (Figure 4-18)

REMOVAL

1. Ensure that the A38E 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. From Chassis Controls extend the Telescope until the Rod End Pin is just visible. This will leave a small amount of clearance between the ground and the Telescopic Boom.
3. Support the Telescopic Boom & Platform Assembly to avoid any damage while removing the Telescopic Cylinder.
4. Provide a suitable container to collect the hydraulic fluid, then disconnect the hydraulic hoses. Immediately plug hoses to prevent foreign material from entering.
5. Remove securing bolts and pin lock plates from the barrel end cylinder pin.
6. Remove the Telescopic Cylinder rod end circlip and then push the rod end pin out.
7. Support the cylinder so that the barrel end cylinder pin can be removed, then remove the cylinder from the machine. This is done by pulling the cylinder forward through the gap provided in Boom 2 at the 2nd post end.
8. Move the cylinder to a prepared work area. It is important that clean assembly practices are observed. Seals and other cylinder components are highly sensitive to contamination.

DISASSEMBLY (Refer to Figure 4-16)

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.
6. Care should be taken to save the O-ring and all other seals for reassembly, if they have been deemed serviceable following the cleaning and inspection phase of maintenance.

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 any parts or seals found to be unserviceable.

REASSEMBLY/SEAL REPLACEMENT

Note: During seal replacement do not use sharp edged tools to avoid cutting 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 1/4 turn further.
7. Install the telescopic cylinder's Overcentre and Check Valves.

INSTALLATION

NOTE: Before installing Telescopic Cylinder check cylinder pins and bearings for wear and replace if necessary.

1. Lift the Telescopic Cylinder so that it will be able to slide down Boom 2.
2. While maintaining a positive hold on the cylinder position the barrel end of the cylinder into place. Push the cylinder pin in.
   NOTE: Take care in aligning the holes so that the pin can be pushed in by hand. If holes are not properly aligned and the pin is forced in, the bearings will be damaged.
3. Align pin lock plate on cylinder pin with hole in Boom 2 and push the cylinder pin completely in and fix pin lock plate with bolt.
4. Position the rod end of cylinder into place and insert the pin until the circlip groove is exposed. Replace the circlip.
5. From the Chassis Controls retract the Telescopic Cylinder fully.
7. Test with weight at rated platform load to check system operation.

4.17 Steering Cylinder (Figure 4-19)

REMOVAL

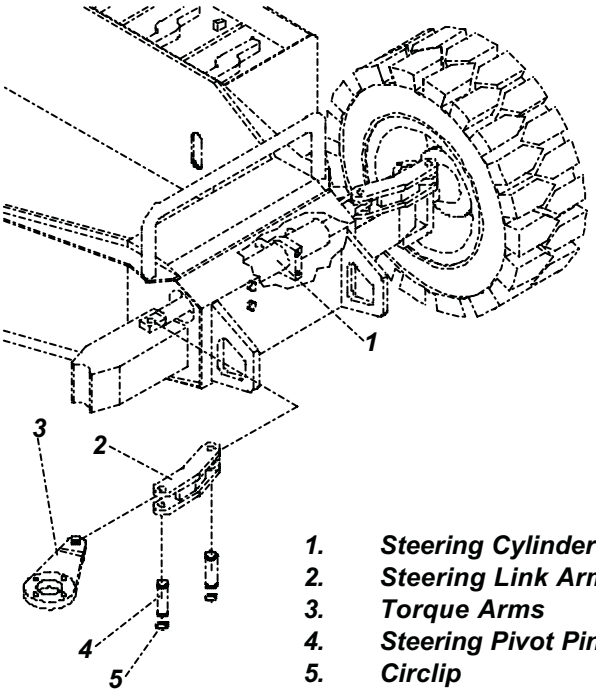
1. Ensure that the A38E is on firm level ground, the Elevating Assembly is completely stowed but slewed away from centre, the Keyswitch is to the 'OFF' position and the Emergency Stop Button is pressed.
2. Straighten the drive wheels.
3. Provide a suitable container to collect the hydraulic fluid, then disconnect the hydraulic hoses. Immediately plug hoses to prevent foreign material from entering.
4. Remove the circlips from each steering pivot pin. Push the steering pivot pins out and rotate the steering link arm away from the rod.
5. While supporting the cylinder remove the four bolts from the front panel of the A38E's chassis.
6. 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 highly sensitive to contamination.

DISASSEMBLY (Refer to Figure 4-16)

1. Unscrew both of the headcaps and withdraw the rod piston assembly (this is one unit) from the barrel tube.
2. Remove the piston static O-ring from the cylinder rod.
3. Remove the piston seal from the piston.
4. Remove the rod seal, rod wiper and static seal from the headcap.
5. Care should be taken to save the O-ring and all other seals for reassembly, if they have been deemed serviceable following the cleaning and inspection phase of maintenance.

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 rod & piston assembly or 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 any parts or seals found to be unserviceable.



1. *Steering Cylinder*
2. *Steering Link Arm*
3. *Torque Arms*
4. *Steering Pivot Pins*
5. *Circlip*

Figure 4-19: Steer Cylinder

REASSEMBLY/SEAL REPLACEMENT

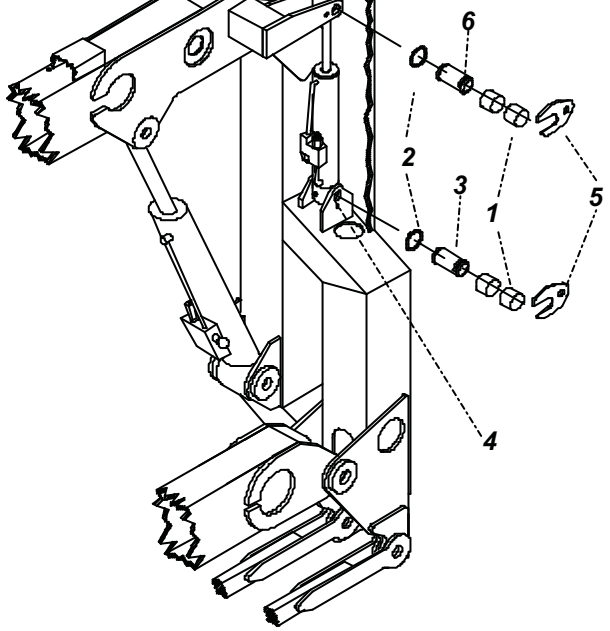
Note: During seal replacement do not use sharp edged tools to avoid cutting the seals, and allow at least one hour for the seals to elastically restore to their original shape before assembly.

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 one end of the cylinder barrel.
4. Lubricate the piston seal and install the rod & piston assembly in the barrel tube.
6. Thread the headcap onto the free end of the barrel tube and hand tighten, then turn 1/4 turn further.

INSTALLATION

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

1. While supporting the cylinder replace the four washers and bolts at the front panel of the A38E's chassis.
2. Move the steering arm so that the holes for positioning the pins are correct. Install each of the steering pivot pins and ensure that the circlips are attached properly.
   NOTE: Take care in aligning the holes so that the pin can be pushed in by hand. If holes are not properly aligned and the pin is forced in, the bearings will be damaged.
   Torque these four bolts to 90 Nm (66 ft. lbs).
3. Reconnect the hydraulic hoses.
4. Test system operation by carrying out a 'figure of eight' driving pattern for 5 cycles. This should be sufficient to prove proper function.



1. *Bushings*
2. *Circlip*
3. *Barrel End Pivot Pin*
4. *Master Levelling Cylinder*
5. *Pin Lock Plate*
6. *Rod End Pivot Pin*

Figure 4-20: Master Levelling Cylinder

4.18 Master Levelling Cylinder (Figure 4-20)

REMOVAL

1. Ensure that the A38E 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. Provide a suitable container to collect the hydraulic fluid, then disconnect the hydraulic hoses. Immediately plug hoses to prevent foreign material from entering.
3. Remove securing bolts and pin lock plates from the rod end cylinder pin. Remove the circlip from the barrel end of the cylinder
4. Support barrel end of cylinder and remove rod end pivot pin. Move cylinder backwards and allow to hang freely.
5. Support the cylinder so that the barrel end cylinder pin can be removed, then remove the cylinder from the machine.
6. 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 highly sensitive to contamination.

DISASSEMBLY (Refer to Figure 4-16)

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.
6. Care should be taken to save the O-ring and all other seals for reassembly, if they have been deemed serviceable following the cleaning and inspection phase of maintenance.

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 any parts or seals found to be unserviceable.

REASSEMBLY/SEAL REPLACEMENT

Note: During seal replacement do not use sharp edged tools to avoid cutting 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 1/4 turn further.
7. Install the Master Cylinders Overcentre Valves.

INSTALLATION

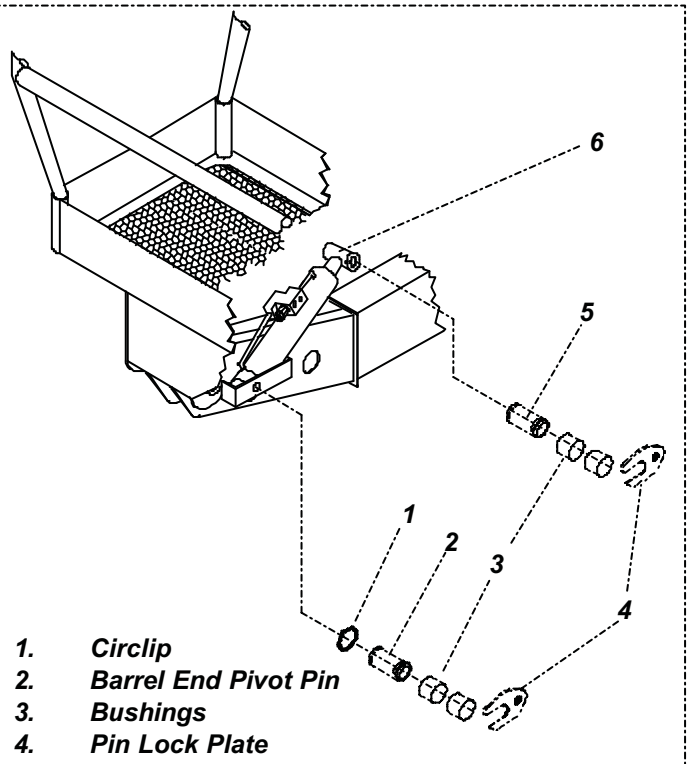
NOTE: Before installing the Master Cylinder check cylinder pins and bearings for wear and replace if necessary.

1. Install barrel end bearing (if removed).
2. Lift the barrel end of the cylinder into place and push the barrel end pivot pin in until the circlip grooves are exposed, then attach the circlip.
   NOTE: Take care in aligning the holes so that the pin can be pushed in by hand. If holes are not properly aligned and the pin is forced in, the bearings will be damaged.
3. Align pin lock plate on cylinder pin with hole in the 2nd Post and push the cylinder pin completely in and fix pin lock plate with bolt.
4. Install rod end bearings (if removed).
5. Lift rod end of cylinder into place and insert the rod end pivot pin until the circlip grooves are exposed, then attach the circlip. Install the pin lock plate.
6. Fix pin lock plate with bolt.
7. Test with weight at rated platform load to check system operation.

4.19 Slave Levelling Cylinder (Figure 4-21)

REMOVAL

1. Ensure that the A38E 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. Provide a suitable container to collect the hydraulic fluid, then disconnect the hydraulic hoses. Immediately plug hoses to prevent foreign material from entering. Support the Platform
3. Remove securing bolts and pin lock plates from the cylinder pins.
4. Support barrel end of cylinder and remove rod end pivot pin. Move cylinder backwards allowing it to hang freely. Rotate the cylinder backwards.
5. Support the cylinder so that the barrel end cylinder pin can be removed, then remove the cylinder from the machine.
6. 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 highly sensitive to contamination.



1. *Circlip*
2. *Barrel End Pivot Pin*
3. *Bushings*
4. *Pin Lock Plate*
5. *Rod End Pivot Pin*
6. *Slave Levelling Cylinder*

Figure 4-21: Slave Levelling Cylinder

DISASSEMBLY (Refer to Figure 4-16)

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.
6. Care should be taken to save the O-ring and all other seals for reassembly, if they have been deemed serviceable following the cleaning and inspection phase of maintenance.

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 any parts or seals found to be unserviceable.

REASSEMBLY/SEAL REPLACEMENT

Note: During seal replacement do not use sharp edged tools to avoid cutting 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 1/4 turn further.
7. Install the upper cylinder valve block. Check O-rings.

INSTALLATION

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

1. Install barrel end bearing (if removed)
2. Lift the barrel end of the cylinder into place.
   NOTE: Take care in aligning the holes so that the barrel end pivot pin can be pushed in by hand. If holes are not properly aligned and the pin is forced in, the bearings will be damaged.
3. Align pin lock plate on cylinder pin with hole in the bracket, push the cylinder pin completely in and fix pin lock plate with bolt. Attach the circlip inside the Telescopic Boom.
4. Install rod end bearings (if removed).
5. Lift rod end of cylinder into place and insert rod end pivot pin. Install pin lock plate.
6. Fix pin lock plate with bolt.
7. Test with weight at rated platform load to check system operation.

BLEEDING THE MASTER/SLAVE LEVELLING CIRCUIT

When air enters the Master/Slave Levelling circuit the Slave Levelling Cylinder is prevented from following the master cylinder precisely. If it seems there may be air in the system the following procedures should be followed.

1. While outside the Platform activate the Levelling Switch function and level the cage in the forward direction. Continue this until, and for 30 seconds after, the Platform comes to a stop.
2. Activate the Levelling function in the backward direction. Continue this until, and for 30 seconds after, the Platform comes to a stop. Care must be taken that the Platform Cage does not impact on the ground. Repeat this procedure until the cage becomes level when elevated.

The above two procedures have the effect of 'Priming' the Levelling Circuit. Test to see if the Slave Cylinder is operating correctly. If not follow the procedures below.

3. Ensure the Elevating Assembly is fully stowed and the booms are in their rest position.
4. Remove securing bolts and pin lock plates from the rod end cylinder pin of the Master Cylinder.
5. Remove the rod end pivot pin. Move cylinder backwards and allow to hang freely.
6. Loosen, but do not fully disconnect, the hose fitting at 'B'. Prepare to activate the Levelling Switch while a colleague holds a cloth at the fitting 'B'. Air will be expelled through this fitting.
7. Activate the Switch slowly in both directions until all air is expelled and hydraulic fluid begins to appear.
8. Repeat the above procedure for fitting 'A'. Lift the rod end of the cylinder into place and insert the pin until the circlip grooves are exposed, then attach the circlip. Install the pin lock plate.
9. Fix the pin lock plate with the bolt.
10. Support the Platform before removing the securing bolts and pin lock plates from the Slave Cylinders rod end pivot pin.
11. Remove the rod end pivot pin. Move the cylinder backwards allowing it to hang freely. Rotate the cylinder backwards.
12. Repeat the procedures outlined in Items 6, 7 & 8 for the Slave Cylinder.
13. Lift rod end of cylinder into place and insert pin. Install pin lock plate.
14. Fix pin lock plate with bolt.

4.20 Adjustment of Overcentre Valves on A38E Lift Cylinders (Figure 4-22)

The valve supplier delivers the Overcentre valve preset to specification and **SHOULD NOT** be adjusted by the user.
In the event of the valve having been tampered with the advisable course of action is to fit a replacement cartridge.

A **short term** solution is to temporarily adjust the valve as follows :-

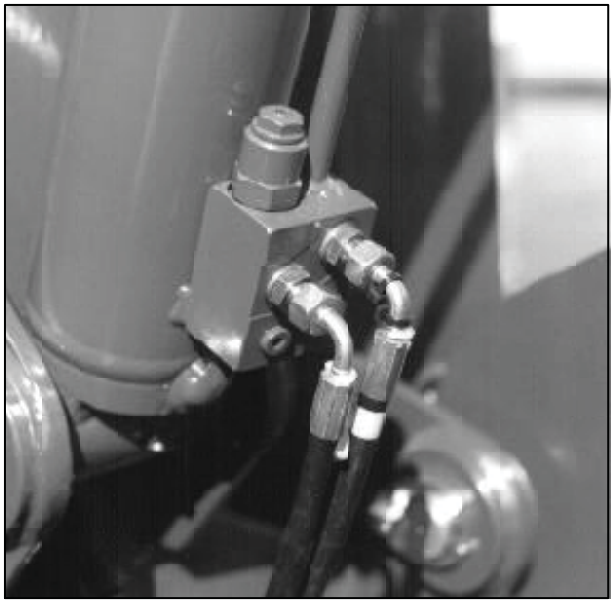
a) Place the max. SWL (Safe Working Load), evenly distributed, in the cage.
b) Raise the boom to 50 mm stroke on the cylinder.
c) First loosen the Locknut, then using an Allen Key adjust the spring setting screw on the valve cartridge. Turning the screw clockwise increases the pressure setting. Turning the screw anticlockwise reduces the setting and allows the boom to creep downwards. Adjust the spring setting until the boom just begins to creep downwards.
d) Screw the adjuster **1 (one)** further turn **clockwise** and secure Locknut.

This operation should only be carried out by suitably qualified and/or experienced personnel.

⚠ CAUTION ⚠

An incorrectly adjusted valve may cause one of the following:-

- Cylinder drifts down under load less than the SWL (Safe Working Load).
- Jerky motion in cylinder & boom when lowering.
- Pump under high load when lowering.
- Valve does not hold load if hose connections are loosened or broken.
- Damaged seals in cylinders due to high ambient temperature rise.
- High pitched sound from hydraulic system when lowering.



The Overcentre Valves are located towards the Rod End of the Lower Lift and Upper Lift Cylinders.

Figure 4-22: Overcentre Valve

4.21 START UP / 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.

NOTES:

5.0 Introduction

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

Careful inspection and accurate analysis of the symptoms listed in the *Troubleshooting Guide 5.1* will help localise the trouble quickly than.
This manual cannot cover all possible problems that may occur. If a Service Engineer finds a specific problem that is not covered in this manual, they should contact their local distributor and if warranted the ***Snorkel*** **Product Support** at:

EUROPE, MIDDLE EAST
AFRICA & ASIA
PHONE: +44 (0) 845 1550 058
FAX: +44 (0) 845 1557 756

NORTH & SOUTH AMERICA
PHONE: +1 785 989 3000
TOLL FREE: +1 800 225 0317
FAX: +1 785 989 3070

AUSTRALIA
PHONE: +611300 700 450
FAX: +61 2 9609 3057

NEW ZEALAND
PHONE: +64 6 3689 168
FAX: +64 6 3689 164

Referring to *Section 3.0* and *Section 6.0* will aid in understanding the operation and function of the various components and systems of the *A38E Work Platform* and help in diagnosing and repair of the machine.

⚠ WARNING ⚠

When troubleshooting, ensure that the work platform is resting on a firm, level surface. Disconnect the batteries when replacing or testing the continuity of any electrical component.
When performing any service on or in the elevating assembly area, which requires the platform to be raised, the elevating assembly must be securely supported by overhead cranes, or equivalent, of suitable capacity.

GENERAL PROCEDURE

As all problems which require troubleshooting will to some extent be unique, the Service Engineer will need to evaluate the steps to follow for each individual case. Troubleshooting, however, should be carried out in a logical thoughtful manner.
The procedure which ***Snorkel*** recommend is as follows:

1. The Service Engineer must be familiar with the machine and its functions. i.e.
   - which functions are supposed to work?
   - when are they supposed to work?
2. Know the symptoms, and write them down. If possible talk to the person, operator, who initially experienced the problem.
3. Thoroughly study both the hydraulic and electric schematics for possible causes.
4. Test all functions to determine what works and what does not. Although the operators information is valuable it may be inaccurate.
5. Re-evaluate the schematics and check all suspect components electrically, hydraulically and mechanically to determine if they are at fault. Check to see if there is a 'Flash Fault', and if necessary refer to Section 5.2.
6. Correct the problem.
7. Test, Test, & Test the machine again to see that the problem does not recur. Recreate the original problem to see if the same symptoms will repeat. Recorrect the problem and again test the machine for a prolonged period of time.

Troubleshooting

PROBLEM	PROBABLE CAUSE	REMEDY
All functions inoperable. Electric motor does not start.	1. Blown Electric Fuse.	Check fuses, Replace if blown.
	2. Faulty Battery Charger.	Check the voltage output of battery charger. If less than 24 VDC, repair or replace.
	3. Faulty Battery or Batteries.	After completely charging batteries test each battery. Replace as required.
	4. Loose or broken Battery Lead.	Check continuity of all battery and motor leads. Replace if necessary.
	5. Emergency Stop Switch(es) upper & lower failed open.	With emergency stop switch in the ON position, check continuity across contacts. If none, replace.
	6. Connecting Plug at Upper Control Box loose.	Check connection and retry.
	7. Battery Line Disconnect plug loose.	Check for security of connection and retry.
All functions inoperable. Electric motor starts when control is actuated.	1. Oil level in Hydraulic Reservoir is low.	Check hydraulic fluid level, as required.
	2. Faulty Hydraulic Pump.	Check pressure and delivery of the hydraulic pump. Replace if required.
	3. Faulty Controller.	Check operation. Replace if required.
Electric motor continues to run after functions have ceased.	1. Line Contactor (LC1) contacts fused together.	Replace Line Contactor.
Platform will not elevate or elevates slowly.	1. Emergency Lowering valve leaking.	Remove and inspect the valve. Replace if necessary.
	2. Platform Overloaded.	Observe maximum load rating. (See Table 1-1).
	3. Faulty Lift Valve Solenoid. (Fault code : 51 or 53)	Test Lift Solenoid, if proper voltage is present and coil unmagnetized - Replace the Solenoid.
	4. Faulty Controller at upper controls.	Check functionality of controller. Replace the Controller if faulty.
	5. Battery Voltage.	Check Battery Voltage. Charge if necessary. Voltage must be greater than 14V.
Booms drift down after being elevated.	1. Emergency Lowering Valve is leaking.	Remove and inspect the valve. Replace if necessary.
	2. Leaking piston seals in Lift Cylinders (CYL1, CYL2 & Telescope).	Check for leakage at cylinder return line, replace the seal kit if necessary.
	3. Overcentre Valve leaking internally or needs adjusting.	Check for contamination and clean. Check that O-Rings are intact. Adjust or replace.
	4. Platform Overloaded.	Remove excess weight.
Machine will not slew when Booms are elevated.	1. The Elevating Assembly is not clear of the wheels.	Raise the Elevating Assembly.
	2. Faulty Controller	Test Controller for continuity during Slew function. Replace if defective.
	3. Faulty Slew Solenoid. (Fault code : 57 or 58)	Test Slew Solenoid, if proper voltage is present and coil is not magnetized - Replace
	4. Mechanical Damage.	Inspect all slewing components. Replace damaged parts.
	5. Slew Valve stuck.	Inspect slew valve. If spool is sticking - Replace.
	6. Faulty function select Switch.	Replace switch.
Platform will not lower.	1. Faulty Down Valve Coil (Fault code : 52 or 54)	Test Down Valve Coil. If proper voltage is present and coil is not magnetised - Replace
	2. Faulty function Selector Switch.	Replace switch.
	3. Faulty Controller	Replace if required.
	4. Down Valve stuck.	Check and see if spool is stuck. - Replace if necessary.
Telescopic cylinder will not extend.	1. Faulty Tele-Out Valve Coil. (Fault code : 55 or 56)	Test Tele-out Valve Coil. If proper voltage is present and coil is not magnetised - Replace.
	2. Faulty function Selector Switch.	Replace switch.
	3. Faulty Controller.	Replace if required.
	4. Tele-Out Valve stuck.	Check and see if spool is stuck. - Replace if necessary.
	5. Platform is overloaded.	Reduce the load
Machine will not drive.	1. Fuses blown.	Check fuses and replace if necessary
	2. Loose electrical connection on drive motor or motor control units.	Check all electrical connections relating to the drive system for security.
	3. Brakes engaged Brake solenoid V2 (CT12) has become de-energised or the spool is stuck in the open position.	Check that coil of V2 is energised when drive is selected. Remove cartridge and check for contamination and freedom of movement of the spool. Replace if necessary.
	4. Brakes engaged Brake solenoid V1 (CT11) is not energising to	Check that the coil of V1 is energised for approximately 4 seconds, by a delay module, when

PROBLEM	PROBABLE CAUSE	REMEDY
	prime the brake lines.	drive is selected. If no current is being fed to this coil then replace the cable feeding the coil or replace the P.C.B.
	5. Drive Reduction Gearbox has seized due to lack of oil.	Replace gearbox and ensure proper oil level is maintained.
	6. Brake Valves out of adjustment.	Adjust Brake Pressure Reduction Valve to 100 Bar.
	7. Joystick damaged or faulty.	Check for voltage signal on pin 8 or 11 on the traction motor control unit when forward or reverse is selected using the joystick.
Cage levelling is erratic or irregular throughout the lift cycle.	1. Air in cage levelling closed circuit.	Reprime or bleed as required. See Section 4.19.
	2. Cage damaged, hole centres are out of position.	Replace.
	3. Damaged Overcentre valves on master /slave cylinders.	Remove and inspect O-Rings and seals. Replace if necessary.
Machine will not steer.	1. Faulty Steering Switch on Joystick.	Replace if necessary.
	2. Loose connection on steer solenoid valve V5.	Reconnect if necessary.
	3. Faulty steering valve coil. (Fault code : 59 or 61)	Test steering valve coil. If proper voltage is present and coil is not magnetised -Replace.
	4. Steering valve V5 stuck.	Replace valve.
	5. Mechanical Damage.	Replace damaged parts.
Machine drives in reverse but not forward.	1. Faulty drive switch.	Test and replace if necessary.
	2. Loose connection or continuity lost to reverse contactor coil.	Check continuity and cable connections. Repair or replace as necessary.
	3. Reverse contactor coil faulty.	Check that coil is receiving 48v. If it is and contacts are not closing then replace the contactor.
	4. Tacho faulty.	Repair or replace.
Machine drives forward but not in reverse.	1. Faulty drive switch.	Test and replace if necessary.
	2. Loose connection or continuity lost to forward contactor coil.	Check continuity and cable connections. Repair or replace as necessary.
	3. Forward contactor coil faulty.	Check that coil is receiving 48V. If it is and contacts are not closing then replace the contactor.
	4. Tacho faulty.	Repair or replace.
Machine will not drive in high speed.	1. The A38E is not in the stowed position.	Lower the Elevating Assembly.
	2. Faulty boom rest switch.	Test and replace switch if necessary.
	3. Loss of continuity along boom rest switch cable.	Check continuity and repair if necessary.
	4. Machine is not level.	Drive to level ground.
	5. Tilt Sensor is faulty.	Adjust Tilt Sensor or replace.
Machine will not drive while elevated.	1. Machine is not level.	Lower the Platform and drive to level ground.
	2. Tilt Sensor is faulty.	Adjust Tilt Sensor or replace.

5.2 Fault Codes.

The A38E is equipped with a fault detection system, if you have a faulty component, bad electrical connection or start up error a fault code will be displayed on the read out located on the upper control box.

For fault codes 01 - 39 the following procedure should be followed.

Ensure that no selector buttons are depressed.

Ensure that the deadman switch on the joystick is not held.

Ensure that the joystick is in neutral.

Ensure that the steer rocker is not activated.

Ensure that analog rocker is in neutral.

Then re-cycle power, do this by pushing and releasing the emergency stop button. If the fault code is still displayed you may have a faulty upper or lower control box, consult the error code list to identify the problem component and replace if necessary.

For fault codes 51 - 69 the following procedure should be followed.

1. Check the fault code list to identify the problem component.

2. Ensure that the wiring harness is connected, secure, in good condition and fully intact.

3. Ensure that the problem component is receiving electrical signal, consult the schematics in section 6 of this manual to identify the ECU output and harness test points.

4. If no ECU output is present replace the ECU.

5. If ECU output is present but no signal is reaching the component replace the wiring harness.

6. If signal is reaching the component but the component is not functioning replace the component (refer to section 7 of this manual for part number information).

CODE	FAULT
01	SYSTEM INITIALIZATION ERROR
02	SYSTEM COMMUNICATION ERROR
22	Platform STEER left switch ON at power-up (rocker switch on top of joystick)
23	Platform STEER right switch ON at power-up (rocker switch on top of joystick)
24	Platform SLEW switch ON at power-up (rotate function)
25	Platform DRIVE switch ON at power-up
26	Platform TELESCOPE switch ON at power-up
27	Platform LOWER BOOM switch ON at power-up
28	Platform UPPER BOOM switch ON at power-up
29	Platform Joystick Enable ON at power-up
31	Platform Joystick not in neutral at power-up
32	Lower Control Analog Rocker not in neutral at power-up
34	Lower Control Slew Switch ON at power-up
36	Lower Control Telescope Switch ON at power-up
37	Lower Control Lower Boom Switch ON at power-up
38	Lower Control Upper Boom Switch ON at power-up
39	Lower Control Enable Switch ON at power-up
51	Lower Boom, Up Coil fault
52	Lower Boom, Down Coil fault
53	Upper Boom, Up Coil fault
54	Upper Boom, Down Coil fault
55	Telescope Boom, Extend Coil fault
56	Telescope Boom, Retract Coil fault
57	Slew Clockwise Coil fault
58	Slew Counter Clockwise Coil fault
59	Steer Right, Coil fault
61	Steer Left, Coil fault
62	Level Platform Up, Coil fault
63	Level Platform Down, Coil fault
64	Brake Chamber Fill, Coil fault
65	Brake Chamber Empty, Coil fault
66	Forward Contactor, Coil Fault
67	Reverse Contactor, Coil fault
68	Low Battery fault
69	Pump Contactor, Coil fault

NOTES:

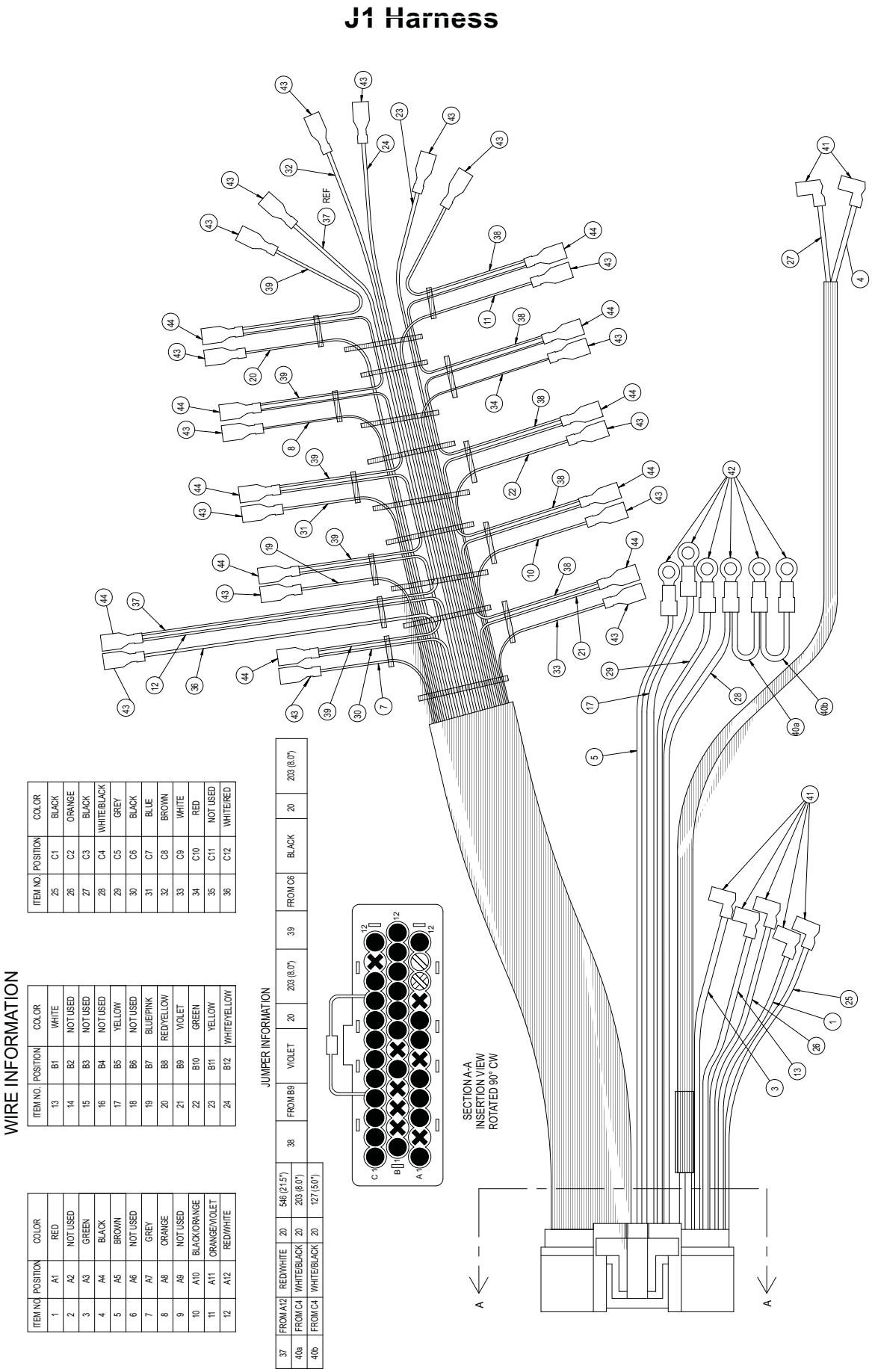
6.0 Introduction

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

INDEX

NOTES:

6.1. Electrical Schematics



ITEM NO.	POSITION	COLOR
1	A1	RED
2	A2	NOT USED
3	A3	GREEN
4	A4	BLACK
5	A5	BROWN
6	A6	NOT USED
7	A7	GREY
8	A8	ORANGE
9	A9	NOT USED
10	A10	BLACK/ORANGE
11	A11	ORANGE/VIOLET
12	A12	RED/WHITE

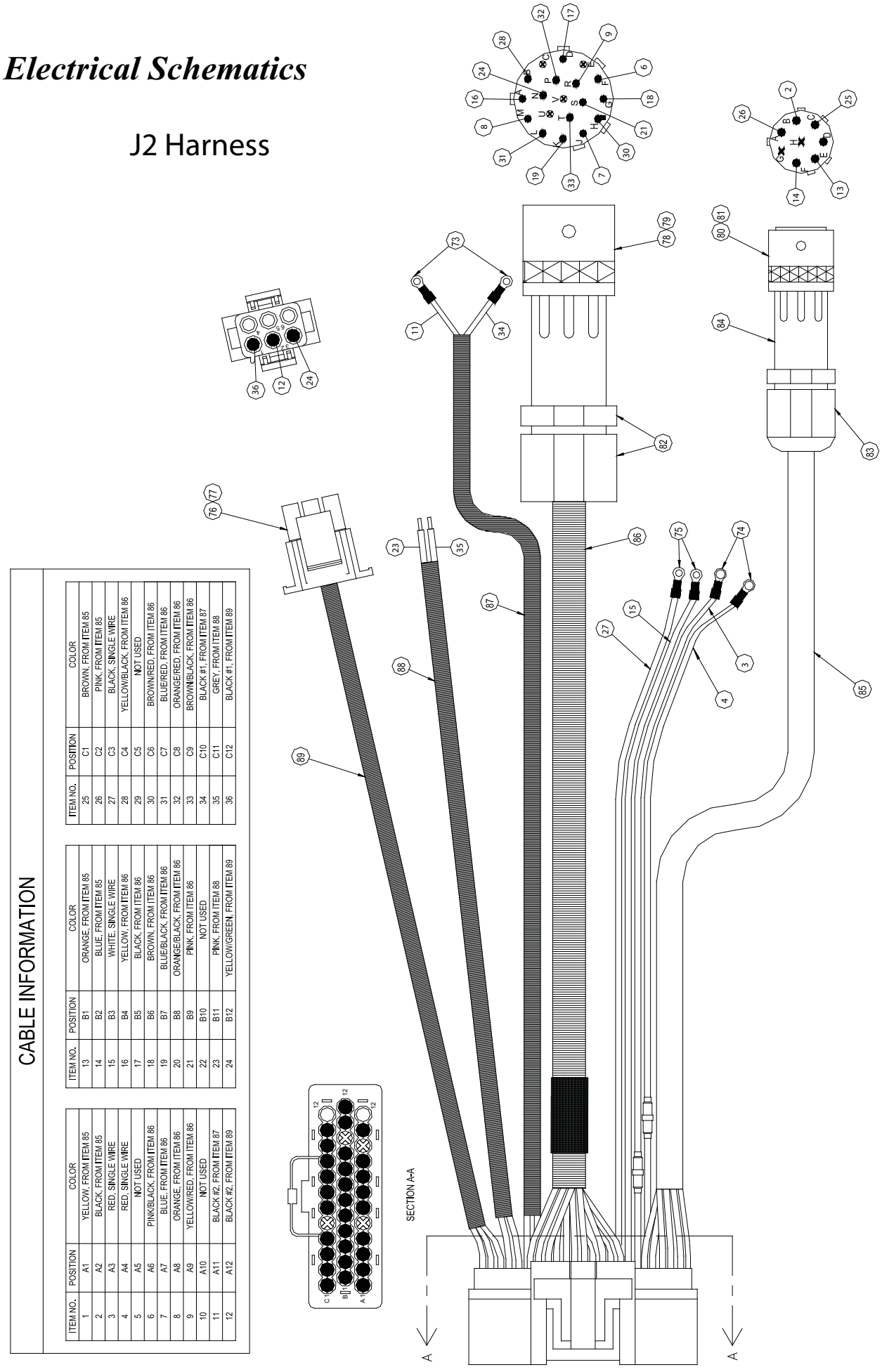
ITEM NO.	POSITION	COLOR
13	B1	WHITE
14	B2	NOT USED
15	B3	NOT USED
16	B4	NOT USED
17	B5	YELLOW
18	B6	NOT USED
19	B7	BLUE/PINK
20	B8	RED/YELLOW
21	B9	VIOLET
22	B10	GREEN
23	B11	YELLOW
24	B12	WHITE/YELLOW

ITEM NO.	POSITION	COLOR
25	C1	BLACK
26	C2	ORANGE
27	C3	BLACK
28	C4	WHITE/BLACK
29	C5	GREY
30	C6	BLACK
31	C7	BLUE
32	C8	BROWN
33	C9	WHITE
34	C10	RED
35	C11	NOT USED
36	C12	WHITE/RED

37	FROM A12	RED/WHITE	20	546 (21.5")	38	FROM B9	VIOLET	20	203 (8.0")	39	FROM C6	BLACK	20	203 (8.0")
40a	FROM C4	WHITE/BLACK	20	203 (8.0")										
40b	FROM C4	WHITE/BLACK	20	127 (5.0")										

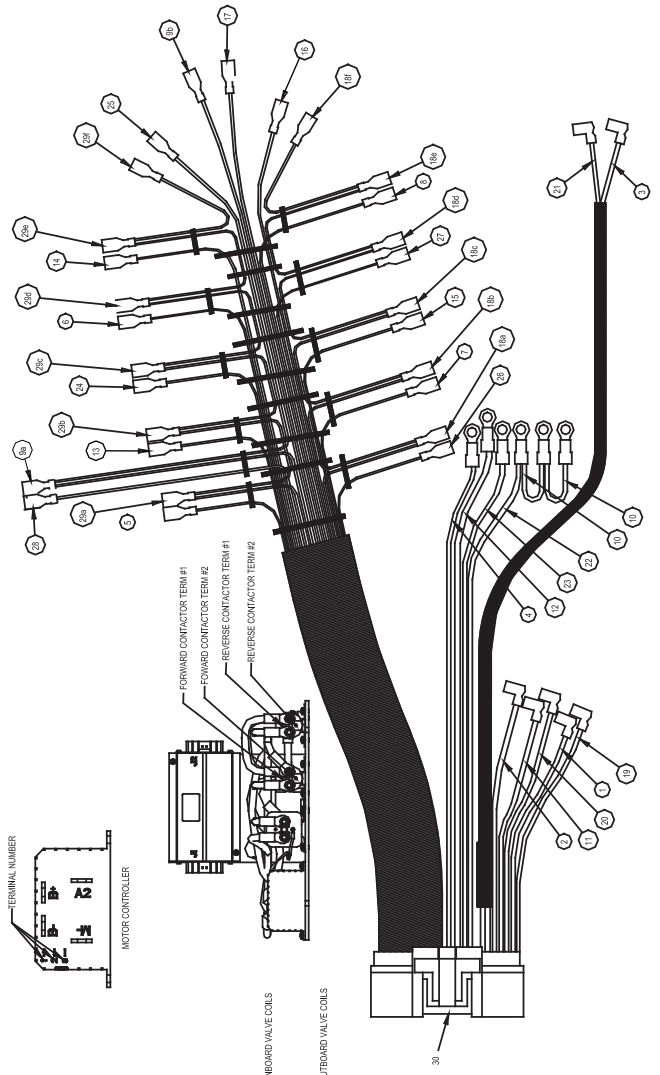
6.1. Electrical Schematics

J2 Harness



6.1. Electrical Schematics

J1 Harness & Connections



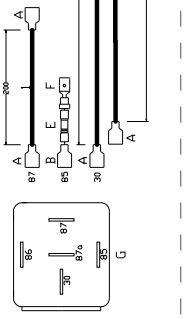
TERMINATION POINTS

ITEM	COLOR	DESCRIPTION	ITEM	COLOR	DESCRIPTION	ITEM	COLOR	DESCRIPTION
1	RED	MOTOR CONTROLLER, TERM 2	11	WHITE	MOTOR CONTROLLER, TERM 3	21	BLACK #1	TO HORN HARNESS 513370-000 PIN 85 ON RELAY (NEGITIVE)
2	GREEN	TO ALARM (NEGATIVE)	12	YELLOW	REVERSE CONTACTOR, TERM 1	22	WHITE/BLACK	PUMP CONTACTOR, TERM 2 SEE SHEET 2 FOR IDENTIFICATION
3	BLACK #2	TO HORN HARNESS 513370-000 PIN 85 ON RELAY (NEGITIVE)	13	BLUE/PINK	V8, OUTBOARD, POSITIVE	23	GREY	PUMP CONTACTOR, TERM 1 SEE SHEET 2 FOR IDENTIFICATION
4	BROWN	FORWARD CONTACTOR, TERM 1	14	RED/YELLOW	V5, INBOARD, POSITIVE	24	BLUE	V7, OUTBOARD, POSITIVE
5	GREY	V4, OUTBOARD, POSITIVE	15	GREEN	V7, INBOARD, POSITIVE	25	BROWN	V9, OUTBOARD, POSITIVE
6	ORANGE	V6, OUTBOARD, POSITIVE	16	YELLOW	V9, INBOARD, POSITIVE	26	WHITE	V4,OUTBOARD, POSITIVE
7	BLACK/ORANGE	V8, INBOARD, POSITIVE	17	WHITE/YELLOW	V1, POSITIVE	27	RED	V6, INBOARD, POSITIVE
8	ORANGE/VIOLET	V5, OUTBOARD , POSITIVE	18	VIOLET	(10b - V4, INBOARD, NEG) (18b - V8, INBOARD, NEG) (18c - V7, INBOARD, NEG) (18d - V6, INBOARD, NEG) (18e - V5, INBOARD, NEG) (18f - V9, INBOARD, NEG)	28	WHITE/RED	V2, POSITIVE
9	RED/WHITE	9a, V2 NEGATIVE 9b, V1 NEGATIVE	19	BLACK	MTR CONTROLLER, TERM 1	29	BLACK	(29a - V4, OUTBOARD, NEG) (29b - V8, OUTBOARD, NEG) (29c - V7, OUTBOARD, NEG) (29d - V6, OUTBOARD, NEG) (29e - V5, OUTBOARD, NEG) (29f - V9, OUTBOARD, NEG)
10	WHITE/BLACK	FWD & REV CONTACTORS, TERM 2	20	ORANGE	ALARM (POSITIVE)	30	AMP TERMINAL	PLUGS INTO LEFT SIDE (J1 SIDE) OF ECU

HYDRAULIC VALVE FUNCTIONS

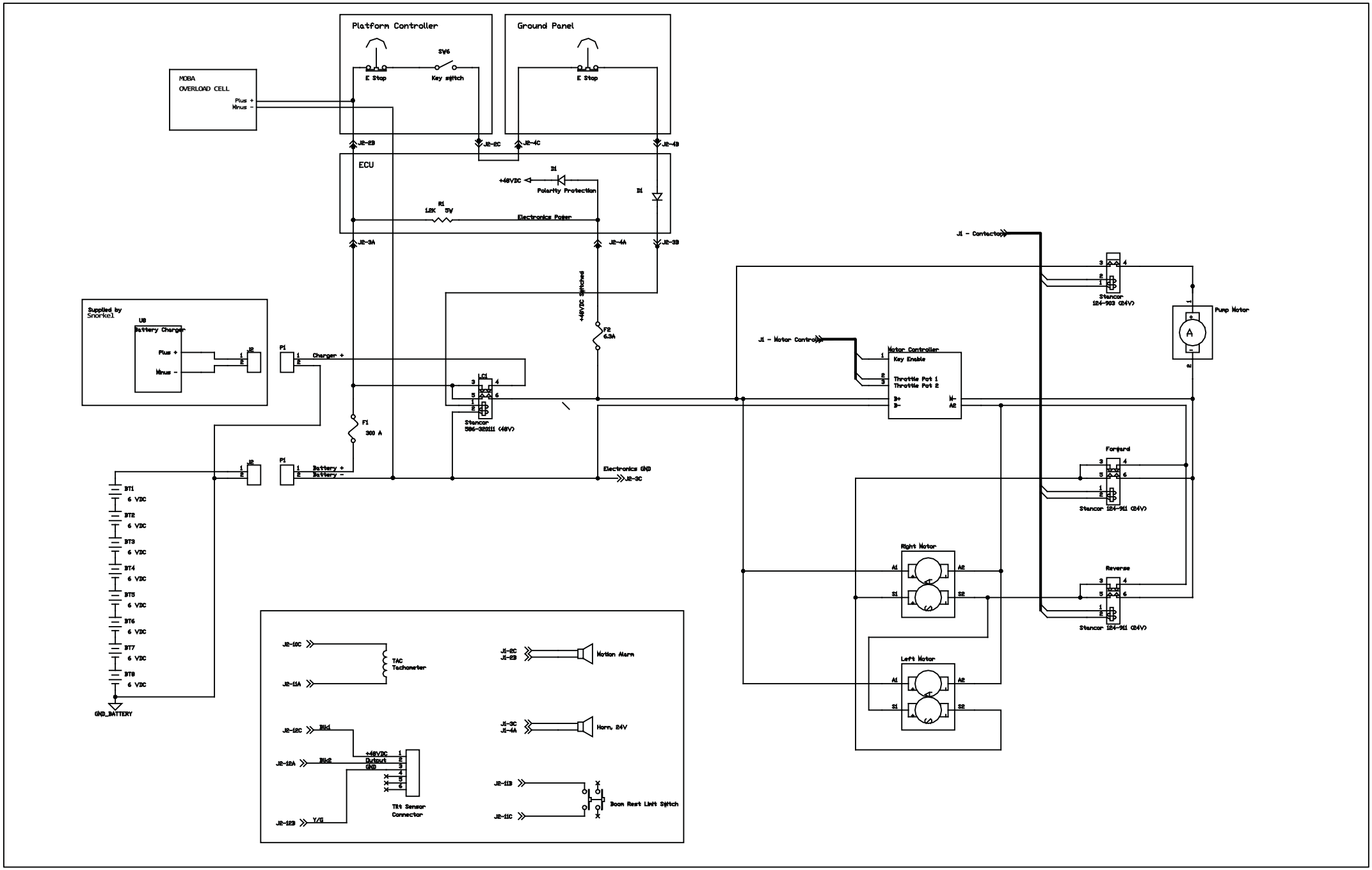
REFERENCE	NAME	FUNCTION	LOCATION
V1	BRAKE OIL SUPPLY VALVE	ALLOWS OIL INTO BRAKE RELEASE CHAMBER	ON MAIN MANIFOLD BLOCK
V2	BRAKE VALVE	VENTS OIL BACK TO TANK WHEN DE-ENERGIZED	ON MAIN MANIFOLD BLOCK
V3	PRESSURE REDUCTION VALVE	PREVENTS PRESSURES OVER 100 BAR ENTERING BRAKE CHAMBER	ON MAIN MANIFOLD BLOCK
V4	SLEW DIRECTIONAL CONTROL VALVE	OIL SENT TO LEFT OR RIGHT SLEW MOTOR	ON MAIN MANIFOLD BLOCK
V5	STEER DIRECTIONAL CONTROL VALVE	OIL SENT TO STEERING	ON MAIN MANIFOLD BLOCK
V6	TELE DIRECTIONAL CONTROL VALVE	OIL SENT TO TELESCOPIC CYLINDER	ON MAIN MANIFOLD BLOCK
V7	BOOM 2 DIRECTIONAL CONTROL VALVE	OIL SENT TO BOOM 1 CYLINDER	ON MAIN MANIFOLD BLOCK
V8	BOOM 1 DIRECTIONAL CONTROL VALVE	OIL SENT TO BOOM 1 CYLINDER	ON MAIN MANIFOLD BLOCK
V9	LEVELING DIRECTIONAL CONTROL VALVE	OIL SENT TO LEVELING CYLINDERS	ON MAIN MANIFOLD BLOCK

Horn Relay Assembly 513370-000



Ref	Name	Part Number	Cable	Colour/Wire Length	Size
A	Insulated Spade Blue	501140-000	1	Red/200mm	3.5mm
B	Insulated Spade Red	510130-000	2	Red/925mm	3.5mm
C	M5 Ring Blue	513113-000	3	Black/1040mm	3.5mm
D	M8 Ring Blue	510170-000			
E	8 Ohm Resistor	513346-000			
F	Red Spade Male	510142-000			
G	24V Relay	510086-000			

NOTES:

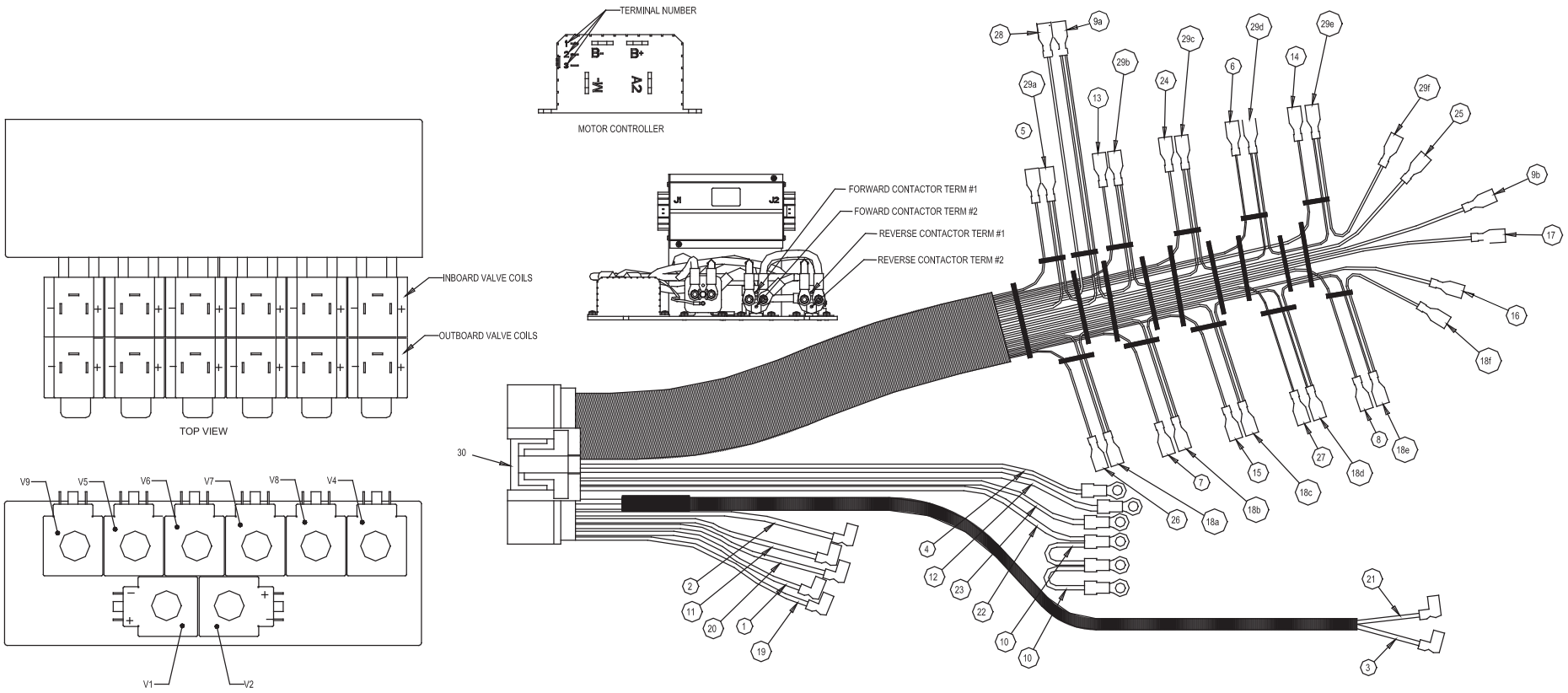

Platform Controller
Ground Panel
SW6
E Stop
Key switch
E Stop
MOBA
OVERLOAD CELL
Plus +
Minus -
J2-2B
J2-2C
J2-4C
J2-4B
ECU
D1
+48VDC
Polarity Protection
D1
R1
1.2K 5W
Electronics Power
J2-3A
J2-4A
J2-3B
+48VDC Switched
F2
6.3A
J1 - Contactor
J1 - Motor Control
Motor Controller
Key Enable
Throttle Pot 1
Throttle Pot 2
B+
B-
M-
A2
Stancor
124-903 (24V)
Pump Motor
Supplied by
Snorkel
U8
Battery Charger
Plus +
Minus -
J2
P1
Charger +
LC1
Stancor
586-320111 (48V)
F1
300 A
P1
Battery +
Battery -
Electronics GND
J2-3C
BT1
6 VDC
BT2
6 VDC
BT3
6 VDC
BT4
6 VDC
BT5
6 VDC
BT6
6 VDC
BT7
6 VDC
BT8
6 VDC
GND_BATTERY
Forward
Stancor 124-911 (24V)
Right Motor
A1
A2
S1
S2
Reverse
Stancor 124-911 (24V)
Left Motor
A1
A2
S1
S2
J2-10C
TAC
Tachometer
J2-11A
J1-2C
J1-2B
Motion Alarm
J2-12C
BRK1
J2-12A
BRK2
+48VDC
Output
GND
Tilt Sensor
Connector
J1-3C
J1-4A
Horn, 24V
J2-11B
J2-11C
Boom Rest Limit Switch
J2-12B
Y/G

HYDRAULIC VALVE FUNCTIONS

REFERENCE	NAME	FUNCTION	LOCATION
V1	BRAKE OIL SUPPLY VALVE	ALLOWS OIL INTO BRAKE RELEASE CHAMBER	ON MAIN MANIFOLD BLOCK
V2	BRAKE VALVE	VENTS OIL BACK TO TANK WHEN DE-ENERGIZED	ON MAIN MANIFOLD BLOCK
V3	PRESSURE REDUCTION VALVE	PREVENTS PRESSURES OVER 100 BAR ENTERING BRAKE CHAMBER	ON MAIN MANIFOLD BLOCK
V4	SLEW DIRECTIONAL CONTROL VALVE	OIL SENT TO LEFT OR RIGHT SLEW MOTOR	ON MAIN MANIFOLD BLOCK
V5	STEER DIRECTIONAL CONTROL VALVE	OIL SENT TO STEERING	ON MAIN MANIFOLD BLOCK
V6	TELE DIRECTIONAL CONTROL VALVE	OIL SENT TO TELESCOPIC CYLINDER	ON MAIN MANIFOLD BLOCK
V7	BOOM 2 DIRECTIONAL CONTROL VALVE	OIL SENT TO BOOM 1 CYLINDER	ON MAIN MANIFOLD BLOCK
V8	BOOM 1 DIRECTIONAL CONTROL VALVE	OIL SENT TO BOOM 1 CYLINDER	ON MAIN MANIFOLD BLOCK
V9	LEVELING DIRECTIONAL CONTROL VALVE	OIL SENT TO LEVELING CYLINDERS	ON MAIN MANIFOLD BLOCK

TERMINATION POINTS

ITEM	COLOR	DESCRIPTION	ITEM	COLOR	DESCRIPTION	ITEM	COLOR	DESCRIPTION
1	RED	MOTOR CONTROLLER, TERM 2	11	WHITE	MOTOR CONTROLLER, TERM 3	21	BLACK #1	TO HORN (POSITIVE)
2	GREEN	TO ALARM (NEGATIVE)	12	YELLOW	REVERSE CONTACTOR, TERM 1	22	WHITE/BLACK	PUMP CONTACTOR, TERM 2 SEE SHEET 2 FOR IDENTIFICATION
3	BLACK #2	TO HORN (NEGATIVE)	13	BLUE/PINK	V8, OUTBOARD, POSITIVE	23	GREY	PUMP CONTACTOR, TERM 1 SEE SHEET 2 FOR IDENTIFICATION
4	BROWN	FORWARD CONTACTOR, TERM 1	14	RED/YELLOW	V5, INBOARD, POSITIVE	24	BLUE	V7, OUTBOARD, POSITIVE
5	GREY	V4, OUTBOARD, POSITIVE	15	GREEN	V7, INBOARD, POSITVE	25	BROWN	V9, OUTBOARD, POSITIVE
6	ORANGE	V6, OUTBOARD, POSITIVE	16	YELLOW	V9, INBOARD, POSITIVE	26	WHITE	V4,OUTBOARD POSITIVE
7	BLACK/ORANGE	V8, INBOARD, POSITIVE	17	WHITE/YELLOW	V1, POSITIVE	27	RED	V6, INBOARD, POSITIVE
8	ORANGE/VIOLET	V5, OUTBOARD , POSITIVE	18	VIOLET	(18a - V4, INBOARD, NEG) (18b - V8, INBOARD, NEG) (18c - V7, INBOARD, NEG) (18d - V6, INBOARD, NEG) (18e - V5, INBOARD, NEG) (18f - V9, INBOARD, NEG)	28	WHITE/RED	V2, POSITIVE
9	RED/WHITE	9a, V2 NEGATIVE 9b, V1 NEGATIVE	19	BLACK	MTR CONTROLLER, TERM 1	29	BLACK	(29a - V4, OUTBOARD, NEG) (29b - V8, OUTBOARD, NEG) (29c - V7, OUTBOARD, NEG) (29d - V6, OUTBOARD, NEG) (29e - V5, OUTBOARD, NEG) (29f - V9, OUTBOARD, NEG)
10	WHITE/BLACK	FWD & REV CONTACTORS, TERM 2	20	ORANGE	ALARM (POSITIVE)	30	AMP TERMINAL	PLUGS INTO LEFT SIDE (J1 SIDE) OF ECU



6.2. Hydraulic Schematics

Table 6-2: Hydraulic Schematic Legend

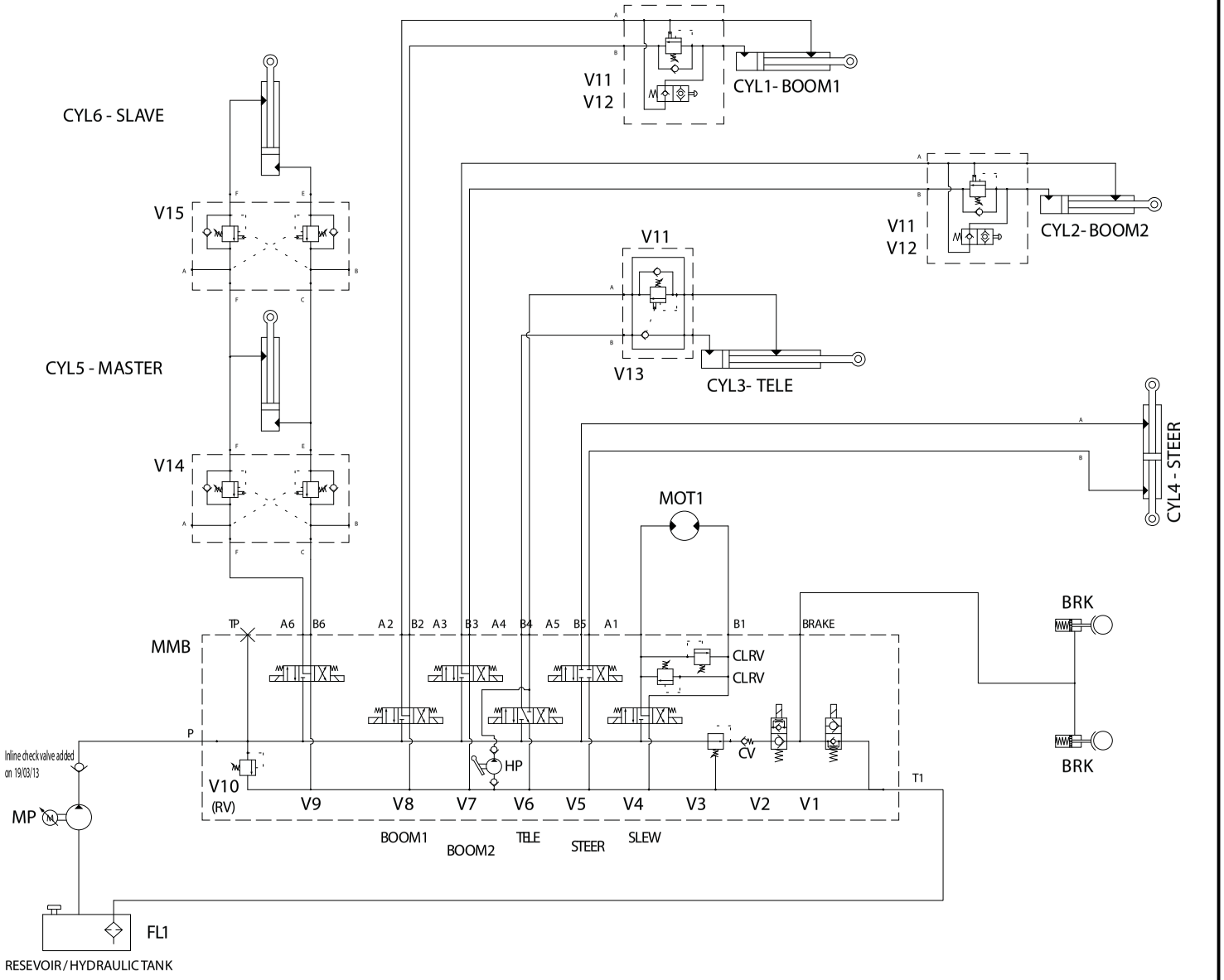
REFERENCE	NAME	FUNCTION	LOCATION
BRK	Brake.	Spring applied - hydraulically released brakes to stop rotation of drive wheels. (Set at 100 Bar).	On front end of wheel drive motors on chassis.
CLRV	Cross-line relief valve.	To limit the max. operating pressure of the slew motor. (Set at 50 Bar).	On main manifold block.
CV	Check Valve.	To prevent oil pressure in the brake line from being lost through the main pressure line.	On main manifold block.
CYL1	Lower boom lift cylinder.	Provides the force to lift the lower boom - Boom1.	Foward of first post
CYL2	Upper boom lift cylinder.	Provide the force to lift the upper boom - Boom2.	Behind second post
CYL3	Tlelscopic cylinder.	Provides the force to push/pull the tele-boom - Boom3.	Inside Boom2 & Tele boom.
CYL4	Steering cylinder.	Provides the force to push/pull the steering torque arms.	Inside front of chassis.
CYL5	Master levelling cylinder.	Provides the pressure to the slave cylinder for cage levelling.	Behind the second post
CYL6	Slave levelling cylinder.	Provides the force to level the cage up/down.	Close to cage pivot at inner Tele boom.
FL1	Return line filter. (10 Micron)	Continuously filters hydraulic return oil.	On top of the hydraulic reservoir.
HP	Handpump.	Used for retraction of tele boom in the case of power failure. Delivers 15cc/stroke.	On side of manifold block.
MMB	Main manifold block.	Contains the directional control valves and relief valves that distribute oil to the various functions and control the operating pressures.	On hydraulic reservoir in chassis.
MOT1	Slew Motor.	Drives slew bearings drive pinion.	Connected to drive pinion.
MP	Motor/Pump set.	Gear pump close coupled to D.C electric motor. Provides pressurised oil flow for all hydraulic functions.	On chassis.
V1	Brake oil supply valve.	This valve is energised to allow oil into the brake release chamber.	On main manifold block
V2	Brake valve.	When energised this valve prevents the pressurised brake oil from venting back to tank. When the machine is stationary this valve de-energises and the brake oil vents to tank and the brake springs apply themselves and keep the machine stationary.	On main manifold block.
V3	Pressure reduction valve.	Prevents pressures in excess of 100 Bar entering the brake chambers.	On main manifold block.
V4	Slew Directional Control Valve.	Send oil to the left or right side of the slew motor.	On main manifold block.
V5	Steer Directional Control Valve.	Send oil to the annular or full-bore side of the steering cylinder.	On main manifold block.
V6	Tele Directional Control Valve.	Send oil to the annular or full-bore side of the telescopic cylinder.	On main manifold block.
V7	Boom2 Directional Control Valve.	Send oil to the annular or full-bore side of the Boom2 cylinder.	On main manifold block.
V8	Boom1 Directional Control Valve.	Send oil to the annular or full-bore side of the Boom1 cylinder.	On main manifold block.
V9	Levelling Directional Control Valve.	Send oil to the annular or full-bore side of the levelling cylinders.	On main manifold block.
V10 (RV)	Main relief valve.	Sets max system pressure to 175 Bar	On main manifold block.
V11	Single Overcentre valve.	Prevents back flow and provides a hydraulic lock on the cylinder.	On base of upper, lower & tele cylinders.
V12	Emergency lowering valve.	Allows upper and lower boom to be manually lowered.	On base of upper and lower cylinders.
V13	Pilot operated check valve.	Holds tele cylinder in position after controls are released	On base of tele cylinder.
V14	Dual Overcentre valve.	Holds pressure in master/slave closed circuit and provides hose burst protection. (Set 160 Bar).	On base of master cylinder.
V15	Dual Overcentre valve.	Holds pressure in slave cylinder and provides host burst protection. (Set 120 Bar).	On base of slave cylinder.

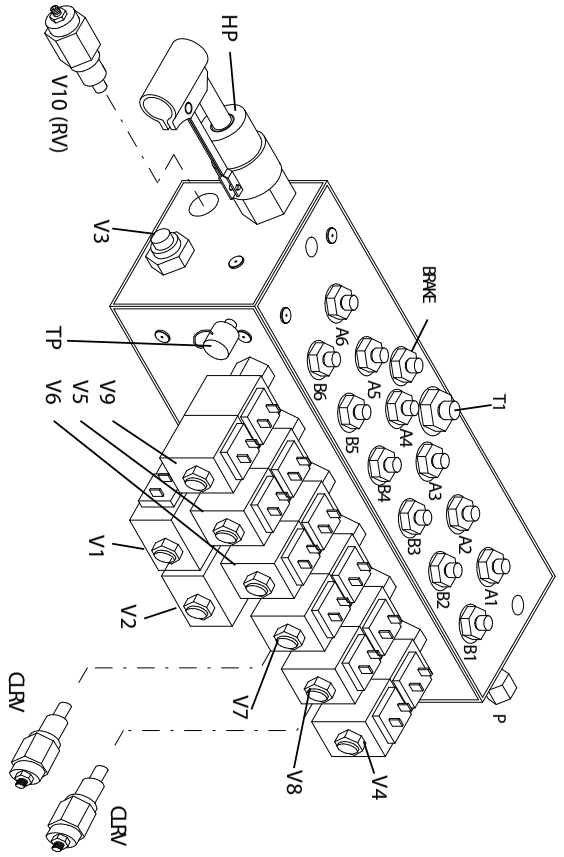
Notes:

1. All of the Overcentre Valves represented within this schematic have a 5:1 Pilot Ratio.
2. The P/O Check Valve represented has a 3:1 Pilot Ratio.
3. The maximum flow rate of the Pump/Motor Unit is limited to 15 L/min @ 100% speed. Although it should be noted that the actual flow rate will depend on the applied load and the D.C. Motor speed.
4. The maximum 'Return' flow rates for each of the functions are restricted to the following values;

- Slew... 4 L/min
- Boom1... 8 L/min
- Boom2... 5 L/min
- Tele... 5 L/min
- Steering... 6 L/min.

NOTES:





MMB - Main Manifold Block

NOTES:

7.0 Introduction

This section lists and illustrates the replaceable assemblies and parts of the A38E Work Platform as manufactured by ***Snorkel UK.***

Each parts list contains the component parts for that assembly indented to show relationship where applicable.

NOTE: Any part or assembly that is not represented by a ***Snorkel*** part number within the Illustrated Parts Breakdown is subsequently not supported by ***Snorkel***. For further advice please contact ***Snorkel Product Support*** at:

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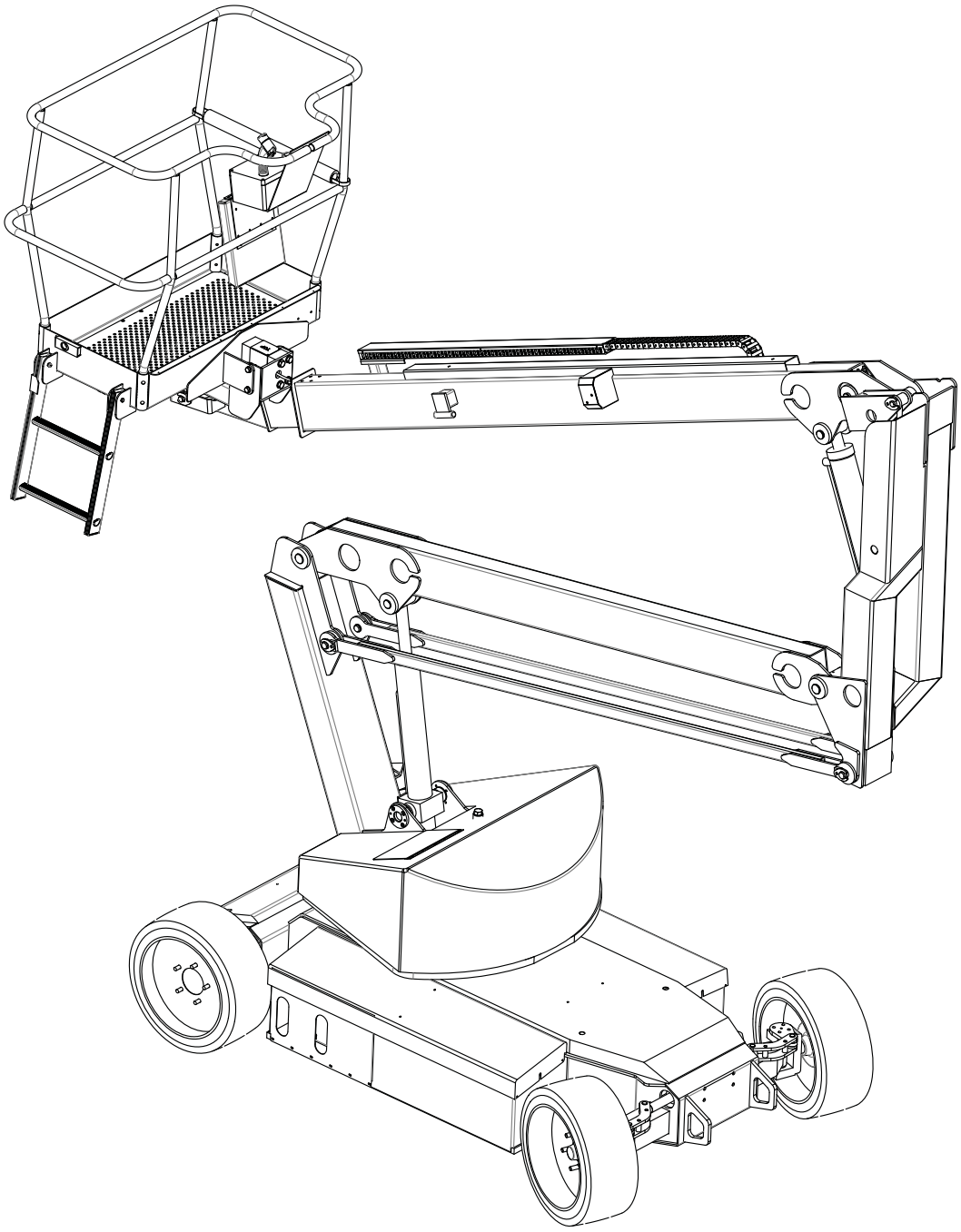
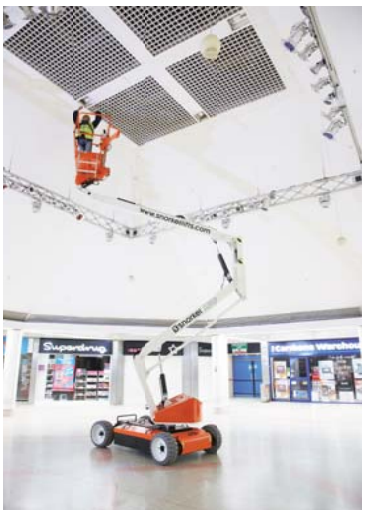
7.1 Index

FINAL ASSEMBLY A38E -

500200-001 (ANSI Version)
500200-000 (CE Version)

ITEM	PART NO.	DESCRIPTION	QTY.
-	500202-000	Chassis Assembly	-
-	500201-000	Booms and Posts Assembly	-
-	057603-000	Cage and Cradle Assembly	-
-	057580-000	Drive Reduction Gearbox Assembly	-
-	057568-000	Traction Motor Assembly - Right Hand	-
	058834-000	Traction Motor Assembly - Left Hand	-
-	057530-000	Motor / Pump Assembly	-
	057667-001	Rear Wheel Assembly	
-	057667-003	Front Wheel Assembly	-
-	500284-001	Pinion Gearbox & Slew Bearing Assy.	-
-	500261-000	Manifold Block Assembly	-
-	504504-000	Lower Lift Cylinder Assembly	-
-	504505-000	Upper Lift Cylinder Assembly	-
-	058461-000	Telescopic Cylinder Assembly	-
-	058463-000	Steering Cylinder Assembly	-
-	058734-000	Master Cylinder Assembly	-
	058735-000	Slave Cylinder Assembly	-
-	500483-000	Pump Motor Control Unit Assembly	-
-	500490-000	Lower Control Box Assembly	-
-	500491-000	Upper Control Box Assembly	-
-	500482-000	Circuit Board Box & Harnesses	-
-	-	Cables & Electrical Components	-
-	500360-000	Hose Assembly	-
-	-	Decal Kit	-

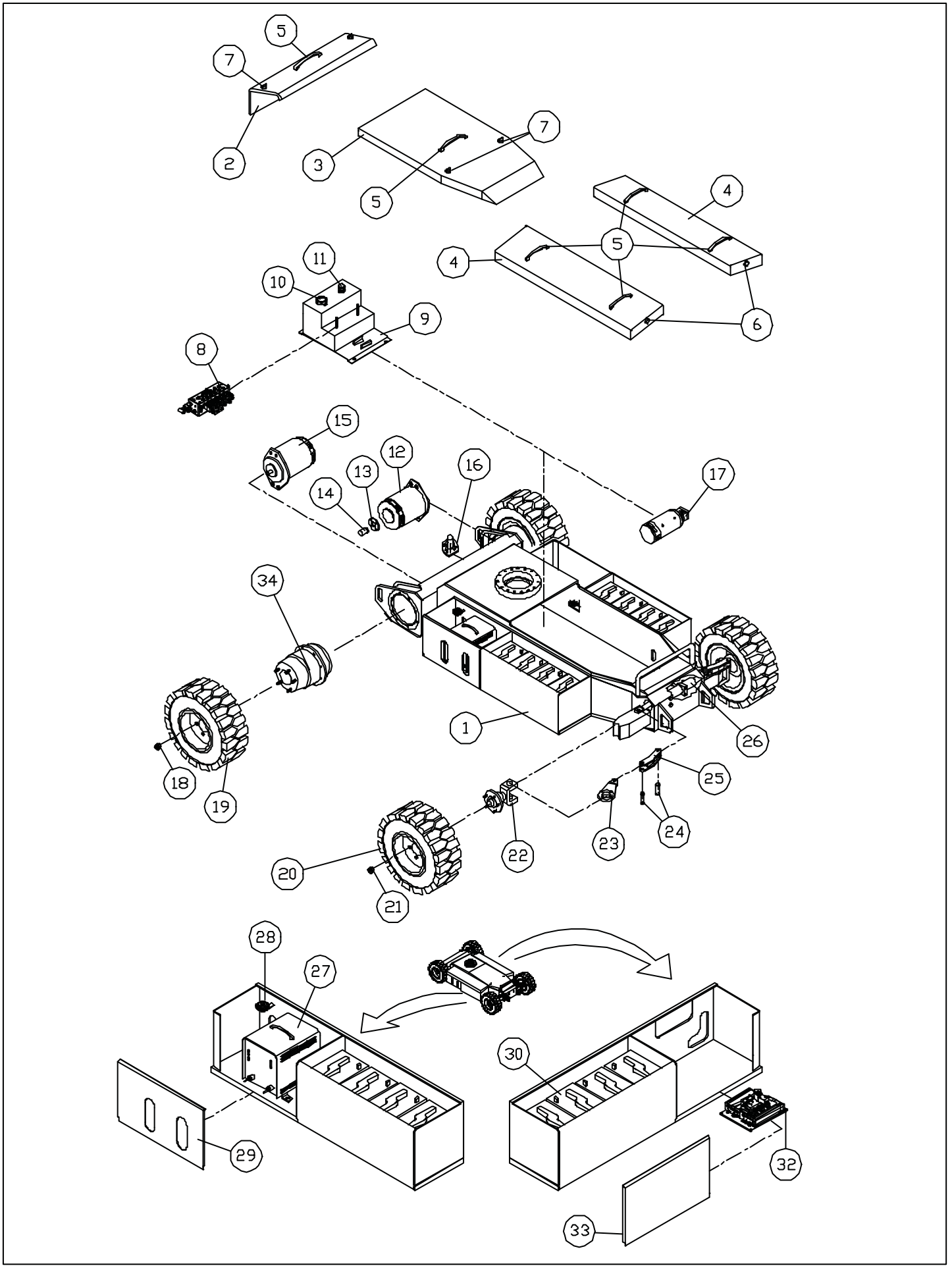




CHASSIS ASSEMBLY A38E -

500202-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	500210-000	A38E CHASSIS WELDMENT	1
2	500232-000	A38E DRIVE MOTOR COVER	1
3	500233-000	A38E CHASSIS BODY COVER	1
4	500231-000	A38E MODULE COVER	2
5	500052-000	GRAB HANDLE	6
6	057727-000	TWIST SCREW FASTENER	4
7	500259-000	A38E COVER GRIP LATCH	4
8	500261-000	A38E MANIFOLD BLOCK	1
9	500260-000	A38E HYDRAULIC RESERVOIR ASSY.	1
10	057532-000	RESERVOIR RETURN LINE FILTER	1
11	058074-000	FILTER ELEMENT ASSEMBLY	1
12	058834-000	DRIVE MOTOR, LEFT HAND SIDE	1
13	057569-001	TACHOMETER ADAPTOR KIT	1
14	057569-000	TACHOMETER	1
*	057570-000	TACHO COUPLING	1
15	505566-000	DRIVE MOTOR, RIGHT HAND SIDE	1
16	057281-000	TILT SENSOR	1
17	057530-000	MOTOR/PUMP ASSEMBLY	1
18	057578-000	REAR WHEEL NUT - M14	10
19	057668-001	REAR WHEEL TYRE & RIM ASSY.	2
20	057667-003	FRONT WHEEL TYRE & RIM ASSY.	2
21	057666-000	FRONT WHEEL NUT - M16	10
22	057669-000	STEERING STUB AXLE ASSY.	2
23	058427-000	A38E TORQUE ARMS	2
24	500253-001	A38E STEERING LINKAGE PIN	4
*	500252-000	CIRCLIP 16 mm	4
*	500408-000	BUSHINGS	2
25	500250-000	A38E STEERING LINK ARM	2
26	058463-000	A38E STEERING CYLINDER	1
*	058494-035	MOUNTING BOLTS M12	4
*	056021-012	SPRING WASHER	4
27	0260021	CHARGER 240/100VAC 50/60Hz	1
28	057586-000	HORN	1
29	500234-002	A38E CHASSIS SIDE DROP PANEL - WITH SLOTS	1
30	501074-000	BATTERY 6V 220AH	8
*	010154-000	TERMINAL COVERS	18
31	-	-	-
32	501862-000	MOTOR CONTROLLER ASSEMBLY	1
33	500234-001	A38E CHASSIS SIDE DROP PANEL - WITHOUT SLOTS	1
34	057580-000	DRIVE GEARBOX	1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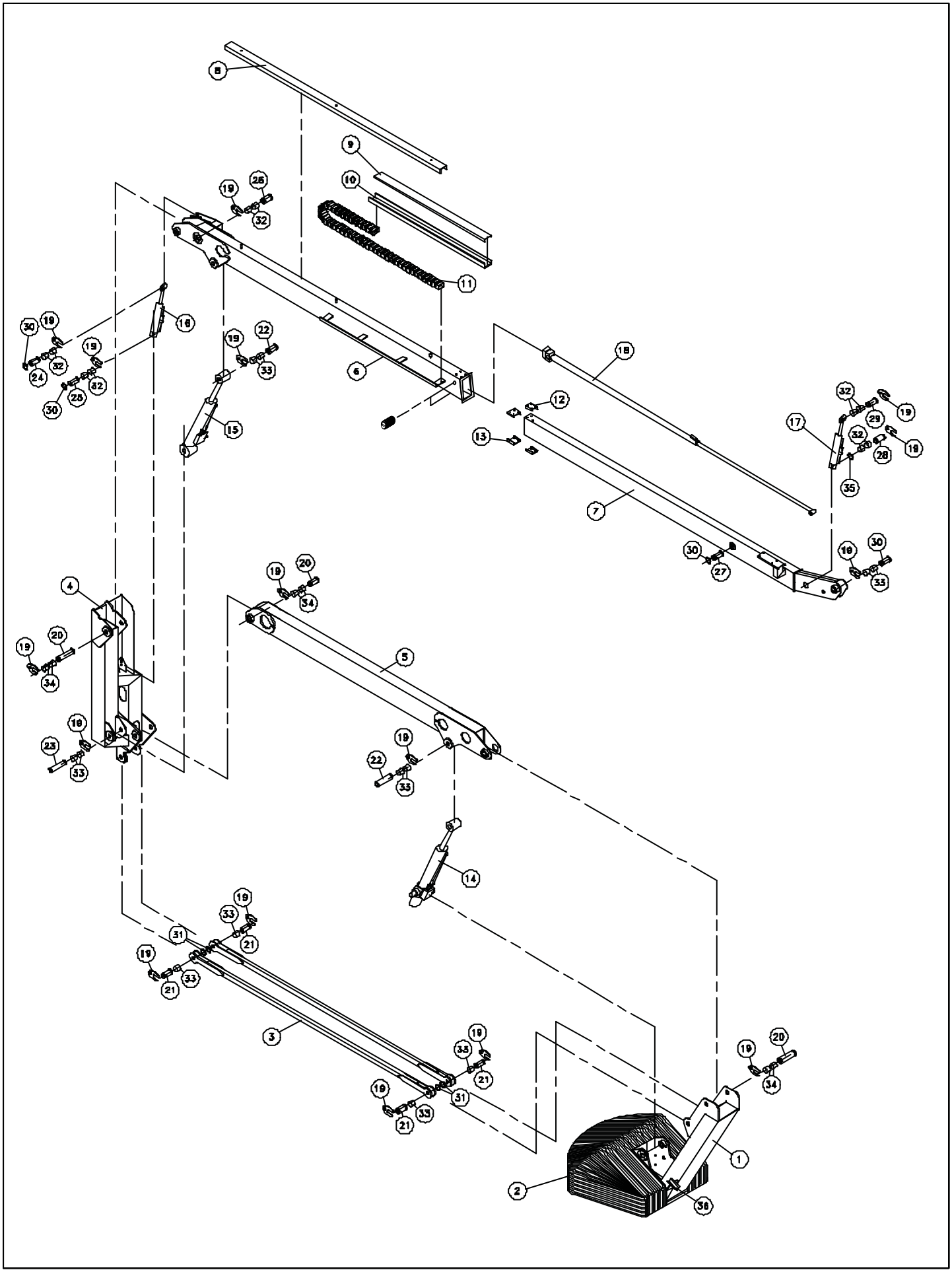
BOOMS & POSTS ASSEMBLY

500201-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	058412-000	A38E FIRST POST WELDMENT	1
2	512614-000	BALLAST ASSEMBLY CE	1
	512614-001	BALLAST ASSEMBLY ANSI	1
3	058417-000	A38E TENSION BAR WELDMENT	2
4	058416-000	A38E SECOND POST WELDMENT	1
5	058413-000	A38E LOWER BOOM WELDMENT	1
6	058414-001	OUTER TELE BOOM WELDMENT	1
*	0260297	WEAR PAD 1-3 /4" - 4 ACME THREAD	2
7	058415-001	INNER TELESCOPIC BOOM WELDMENT	1
8	500245-000	A38E HOSE & CABLE COVER	1
9	500265-000	COVER FOR ENERGY CHAIN CHANNEL	1
*	057727-000	TWIST SCREW FASTENER	2
10	500266-000	ENERGY CHAIN SUPPORT CHANNEL	1
11	500468-000	ENERGY CHAIN - COMPLETE	1
	500468-002	ENERGY CHAIN (1 UNIT OF 24)	24
	500468-001	MOUNTING ELEMENTS	1
12	057975-000	INNER TELESCOPIC BOOM WEAR PAD	2
	058510-016	M8 x 16 CSK	6
	058510-025	M8 x 25 CSK	2
13	500275-001	OUTER TELESCOPIC BOOM WEAR PAD	2
	056058-010	M6 x 10 HEX	8
	500519-006	1/4" T4 WASHER	8
	057975-300	6mm INSERTS	8
14	504504-000	A38E LOWER LIFT CYLINDER	1
15	504505-000	A38E UPPER LIFT CYLINDER	1
16	058734-000	A38E MASTER LEVELLING CYLINDER	1
17	058735-000	A38E SLAVE LEVELLING CYLINDER	1
18	058461-000	A38E TELESCOPIC CYLINDER	1
19	058056-000	PIN LOCK PLATE	16
*	056060-016	BOLT M10 x 16 mm	16
*	056021-010	SPRING WASHER 10 mm	16
20	058055-006	PIN - LOWER & UPPER BOOM TO FIRST & SECOND POST	3
21	058054-001	PIN - TENSION BARS	4
22	058066-001	PIN - LIFT CYLINDERS ROD END	2
23	058066-007	PIN - UPPER LIFT CYLINDER BODY END	1
24	058053-004	PIN - MASTER CYLINDER ROD END	1
25	058053-005	PIN - MASTER CYLINDER BODY END	1
26	058065-006	PIN - TELE CYLINDER BODY END	1
27	500254-000	PIN - TELE CYLINDER ROD END	1
28	058053-001	PIN - SLAVE CYLINDER BODY END	1
29	058065-005	PIN - SLAVE CYLINDER ROD END	1
30	058066-001	PIN - TELESCOPIC BOOM TO CAGE	1
31	057033-000	CIRCLIP 30 mm	4
32	057047-000	BUSHING STRAIGHT 25 mm	12
33	057054-000	BUSHING FLANGED 30 mm	12
34	057046-000	BUSHING FLANGED 35 mm	6
35	057034-000	CIRCLIP 25 mm	4
36	501085-000	BOOM REST (BOLT ON)	1

Serial Break
2890 - 3144 : Part No: 058460-000
3145 - Current : Part No: 504504-000

Serial Break
2890 - 3144 : Part No: 058462-000
3145 - Current : Part No: 504505-000

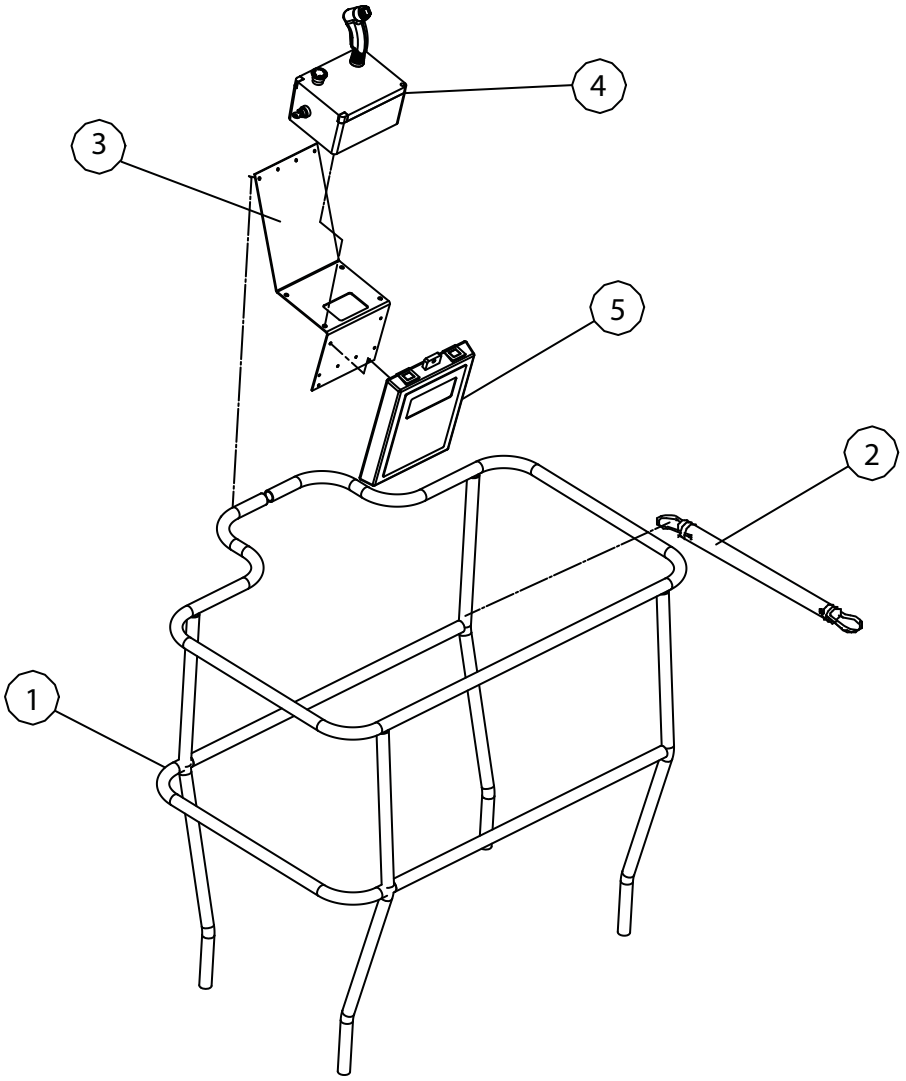


CAGE & CRADLE ASSEMBLY(STANDARD)

057603-000 (501864-000 is not included as part of this assembly)
(ANSI is Without Overload)

ITEM	PART NO.	DESCRIPTION	QTY.
1	057521-003	CAGE RAIL ASSY.	1
2	508931-000	DROP BAR ASSY.	1
3	057523-000	CONTROL BOX MOUNTING PLATE	1
4	501864-000	A38E UPPER CONTROL BOX	1
5	010076-000	MANUAL HOLDER	1
6	501970-000	A38E CAGE FLOOR WELDMENT	1
7	058251-000	LADDER LOCKING LATCH	1
8	057347-001	LADDER	1
9	501886-000	OVERLOAD UNIT(Ansi 509791-000)	1
10	056066-012	M12 NYLOCK NUT	2
11	056069-016	M16 WASHER	8
12	503101-045	M16 X 45 HEX HEAD SCREW	8
13	056069-012	M12 WASHER	4
14	058494-040	M12 X 40 HEX HEAD SCREW	2
15	501971-000	CAGE CRADLE WELDMENT	1

Note : Ensure that items 10 and 14 (M12 screw and drilled nut with pin) remain loose, these are safety bolts.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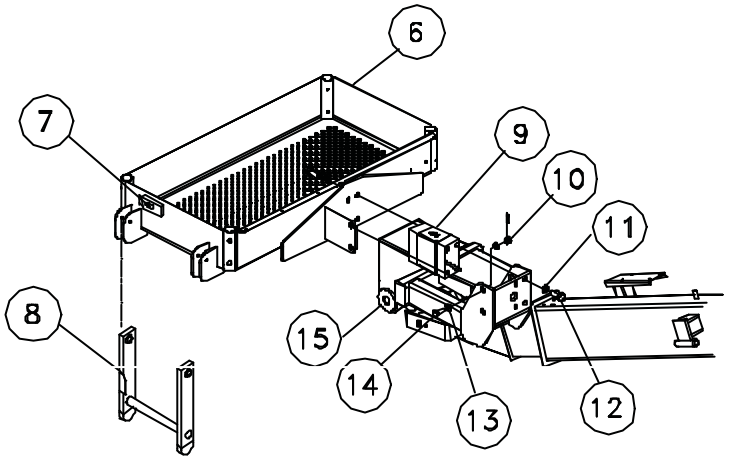
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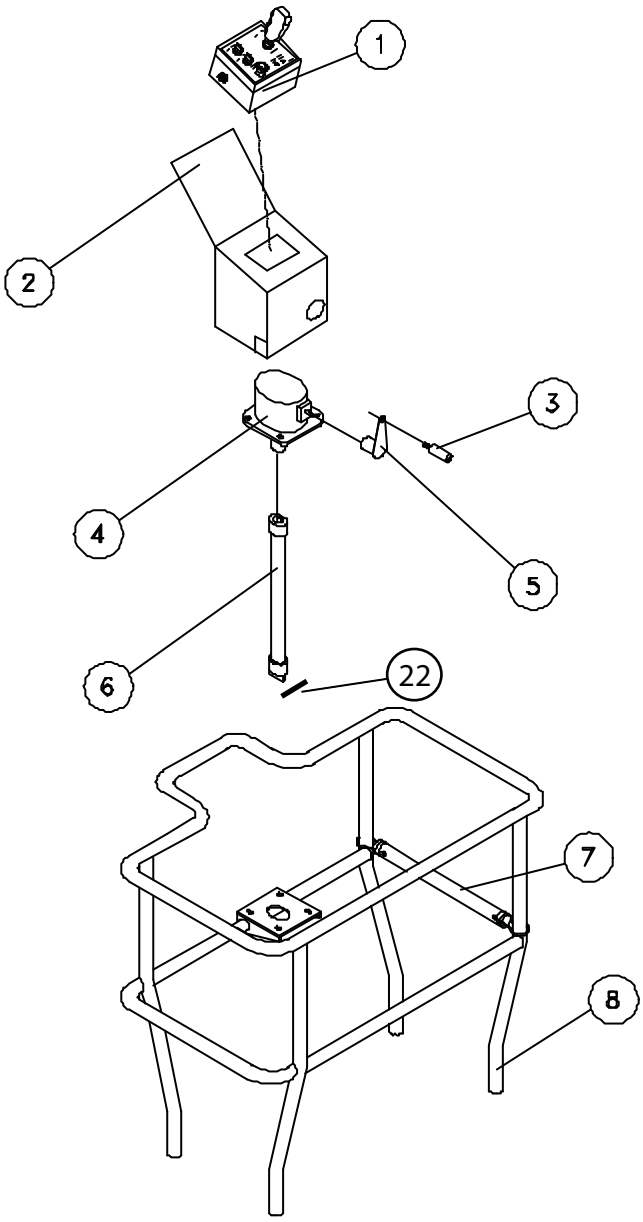
CAGE ROTATOR ASSEMBLY(OPTION)

500905-000 (501864-000 is not included as part of this assembly)
(ANSI is Without Overload)

ITEM	PART NO.	DESCRIPTION	QTY.
1	501864-000	UPPER CONTROL BOX.	1
2	500973-000	MOUNTING PLATE.	1
3	500985-000	ROTATING HANDLE	1
4	500922-000	GEARBOX	1
5	500905-034	HANDLE	1
6	500905-030	DRIVE SHAFT	1
7	508931-001	DROP BAR ASSY	1
8	057521-001	CAGE RAIL ASSY	1
9	501970-000	WELDMENT, CAGE BASE	1
10	501886-000	OVERLOAD UNIT (Ansi 509791-000)	1
11	058494-040	M12 X 40 HEX HEAD SCREW	2
12	056069-016	M16 WASHER	8
13	503101-040	M16 X 40 HEX HEAD SCREW	8
14	512321-000	DISC, FRICTION	2
15	501971-001	CAGE CRADLE WELDMENT	1
16	500993-000	45mm BUSHING X 30mm LONG	2
17	501972-000	WELDMENT, CAGE LINK	1
18	058066-012	M12 NYLOCK NUT	2
19	057347-001	LADDER	1
20	058251-000	LOCKING CATCH	1
21	057405-000	LADDER BUSHING	2
22	512782-000	ROLL PIN ROTATE LINK	1
23	500905-018	CAGE PIVOT PIN	1
24	504189-001	STEEL FLAT WASHER, M48 x 4mm	1
25	056067-545	HEX JAM NUT, M45	2

Note : Ensure that items 11 and 18 (M12 screw and drilled nut with pin) remain loose, these are safety bolts.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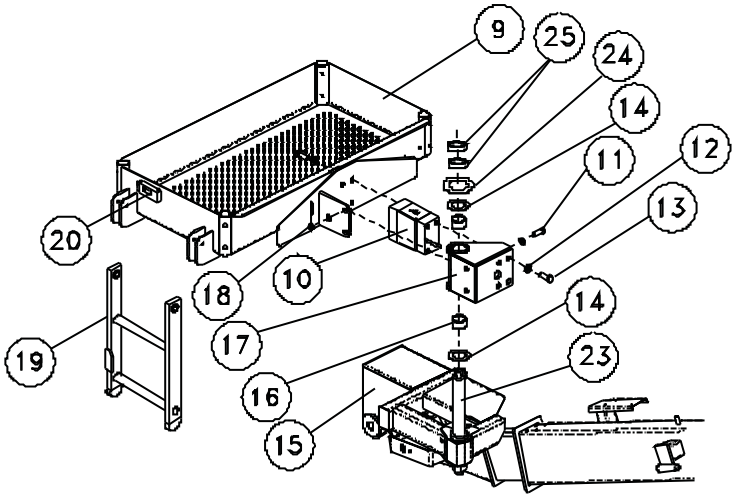
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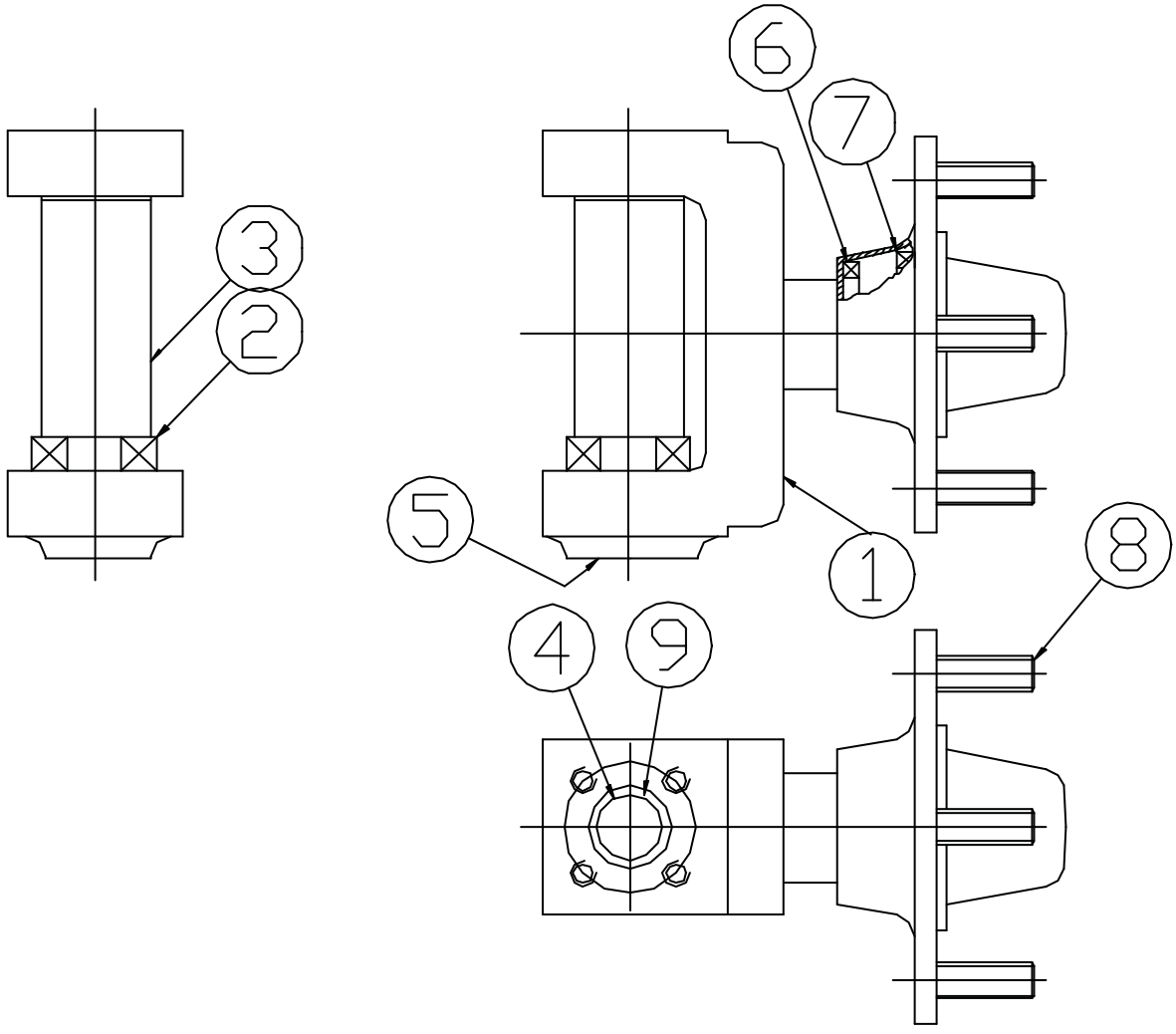
WHEEL HUB ASSEMBLY

057669-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	057665-000	WHEEL HUB HINGE	1
2	057664-000	THRUST BEARING	1
3	057662-000	PIVOT BOSS	1
4	057663-000	PIVOT PIN	1
5	057585-000	COVER PLATE	1
6	057584-000	OUTER HUB BEARING	1
7	057583-000	INNER HUB BEARING	1
8	057582-000	STUD	1
9	057669-002	PLASTIC BUSHING	1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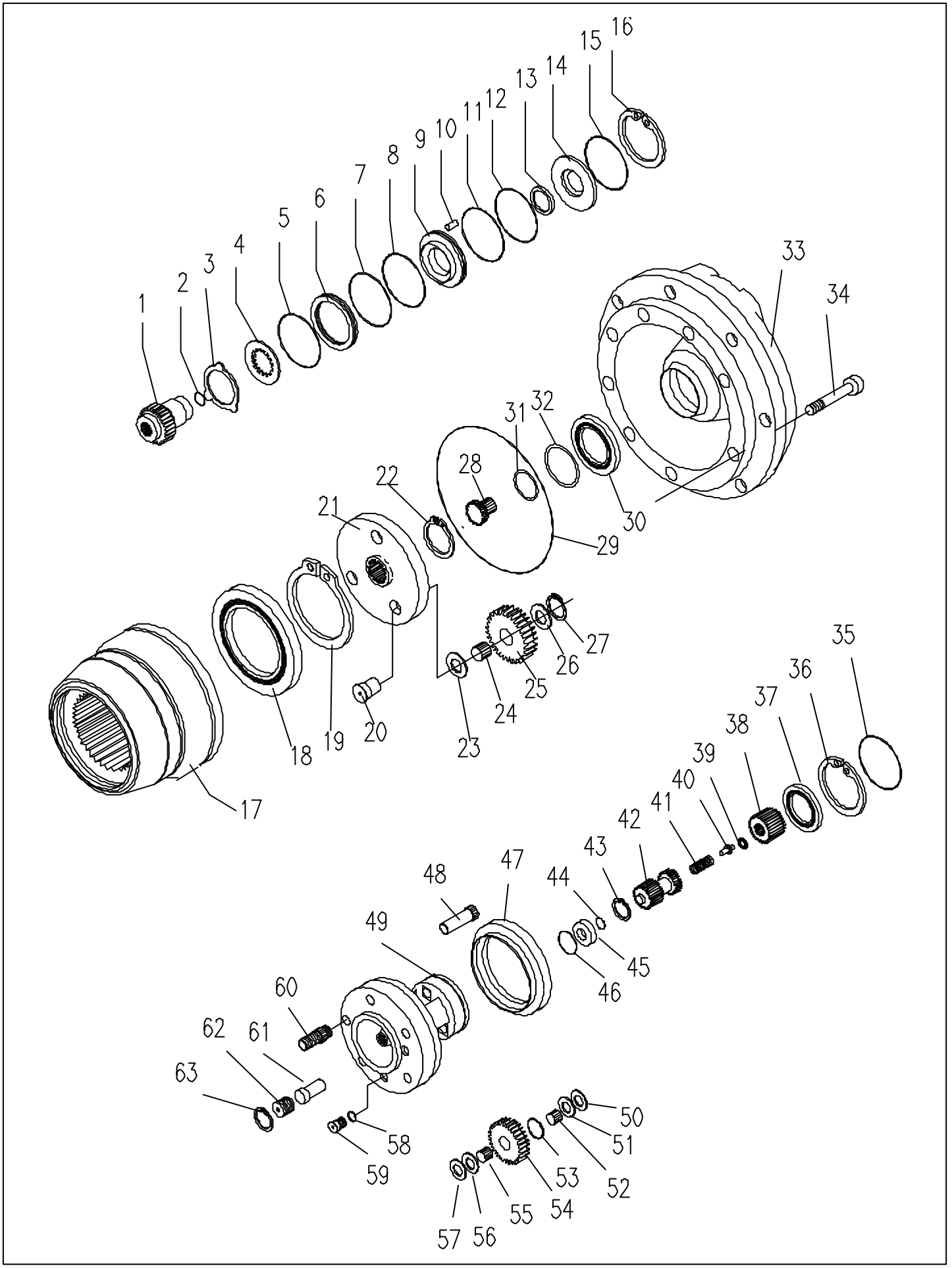
DRIVE REDUCTION GEARBOX ASSEMBLY

057580-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	COUPLING	1
2	-	EXPANSION PLUG	1
3	-	STEEL DISC	1
4	-	BRONZE DISC	1
5	-	O-RING	1
6	-	SPACER	1
7	-	O-RING	1
8	-	ANTI-EXTRUS. RING	1
9	-	PISTON	1
10	-	SPRING	12
11	-	O-RING	1
12	-	ANTI-EXTRUS. RING	1
13	-	OIL SEAL	1
14	-	END PLATE	1
15	-	O-RING	1
16	-	CIRCLIP	1
17	-	HUB	1
18	-	BEARING	1
19	-	CIRCLIP	1
20	-	PLANET SHAFT	1
21	-	PLANET CARRIER	1
22	-	CIRCLIP	1
23	-	THRUST WASHER	3
24	-	NEEDLE ROLLER	84
25	-	PLANET GEAR	3
26	-	THRUST WASHER	3
27	-	CIRCLIP	3
28	-	SUN PINION	1
29	-	O-RING	1
30	-	BEARING	1
31	-	RETAINING RING	1
32	-	RETAINING RING	1

ITEM	PART NO.	DESCRIPTION	QTY.
33	-	INPUT FLANGE	1
34	-	SCREW	8
35	-	SPACER	1
36	-	CIRCLIP	1
37	-	BEARING	1
38	-	COUPLING	1
39	-	BEARING	1
40	-	PIN	1
41	-	SPRING	1
42	-	SUN PINION	1
43	-	CIRCLIP	1
44	-	O-RING	1
45	-	THRUST WASHER	1
46	-	O-RING	1
47	-	RING + BEARING	1
48	-	PLANET SHAFT	3
49	-	SPINDLE	1
50	-	THRUST WASHER	3
51	-	THRUST WASHER	3
52	-	NEEDLE ROLLER	75
53	-	SPACER	3
54	-	PLANET GEAR	3
55	-	NEEDLE ROLLER	75
56	-	THRUST WASHER	3
57	-	THRUST WASHER	3
58	-	WASHER	2
59	-	PLUG	2
60	057580-002	STUD M15 X 1.5	5
61	-	PIN	1
62	-	SCREW	1
63	-	CIRCLIP	1

NOTE: ITEMS 5,7,8,11,12,13,15,29,44 & 46 FORM THE SEAL KIT FOR THE DRIVE REDUCTION GEARBOX ASSEMBLY. THE PART NUMBER FOR THE COMPLETE SEAL KIT IS ***057580-010***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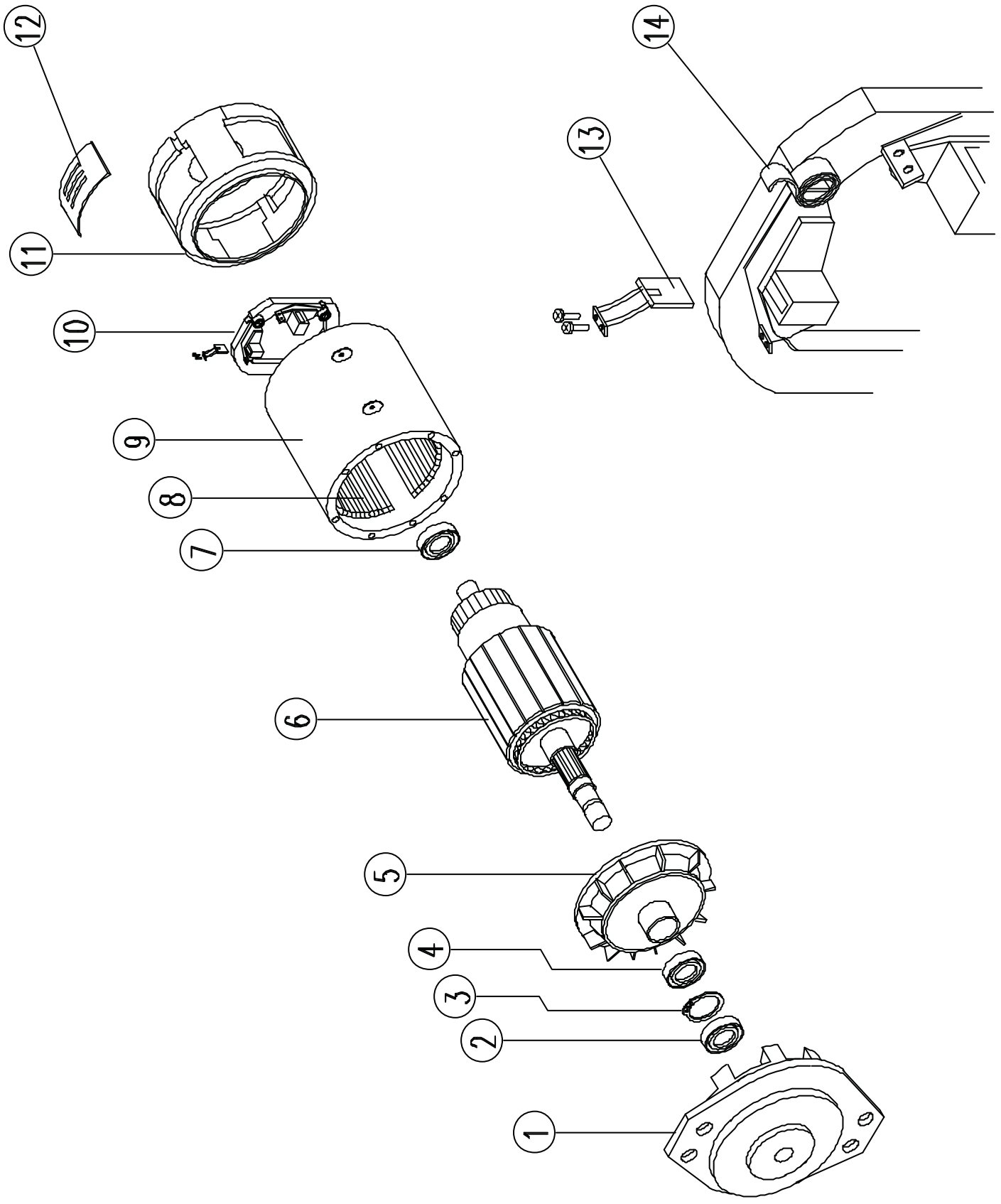
TRACTION MOTOR ASSEMBLY

057568-000 : RIGHT HAND MOTOR
058834-000 : LEFT HAND MOTOR

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	MOTOR MOUNTING FACE	1
2	-	SEAL	1
3	-	CIRCLIP	1
4	-	BEARING	1
5	-	COOLING FAN	1
6	-	COMMUTATOR	1
7	-	BEARING	1
8	-	FIELD WINDINGS	1
9	-	COMMUTATOR COVER	1
10	-	BRUSH BOXES SUPPORT	1
11	-	END FACE	1
12	-	VENT / INSPECTION CAP	4
13	057698-000	BRUSH	4
14	057699-000	BRUSH SPRINGS	4
15	057569-001	TACHO ADAPTOR KIT	1
16	057569-000	TACHO	1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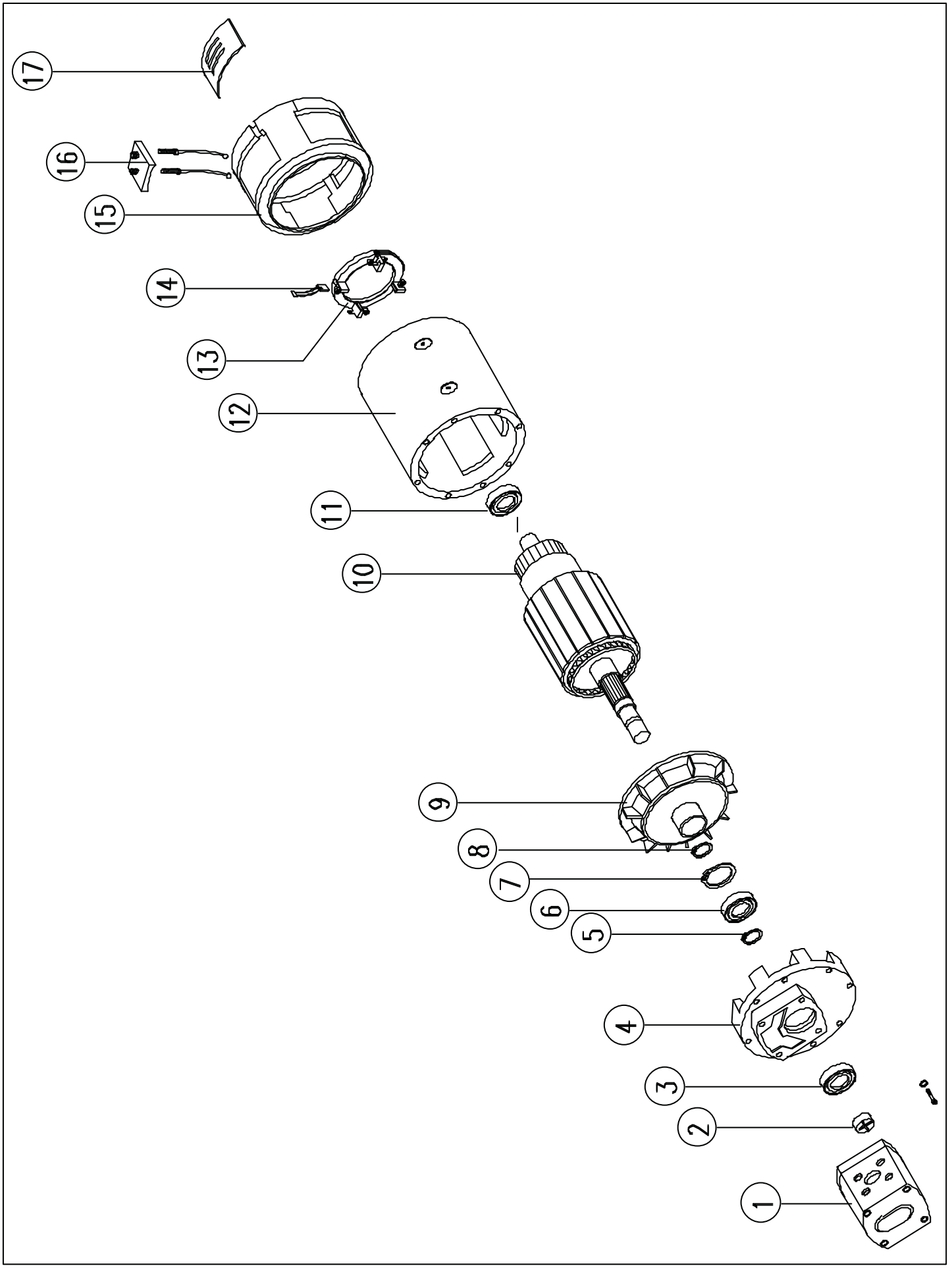
MOTOR/PUMP ASSEMBLY

057530-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	058862-000	HYDRAULIC PUMP	1
*	058862-001	SEAL KIT	1
2	058847-000	COUPLING	1
3	-	OIL SEAL	1
4	-	PUMP MOUNTING FACE	1
5	-	CIRCLIP	1
6	-	BEARING	1
7	-	CIRCLIP	1
8	-	CIRCLIP	1
9	-	COOLING FAN	1
10	-	COMMUTATOR	1
11	-	BEARING	1
12	-	COMMUTATOR COVER	1
13	-	BRUSH HOUSING SUPPORT	1
14	058863-000	BRUSH	4
15	-	END HOUSING	1
16	-	TERMINAL BLOCK	1
17	-	VENT / INSPECTION CAP	4

NOTE: THE PART NUMBER FOR THE MOTOR ASSEMBLY (ALL ITEMS FROM 2 TO 17) IS ***058861-000***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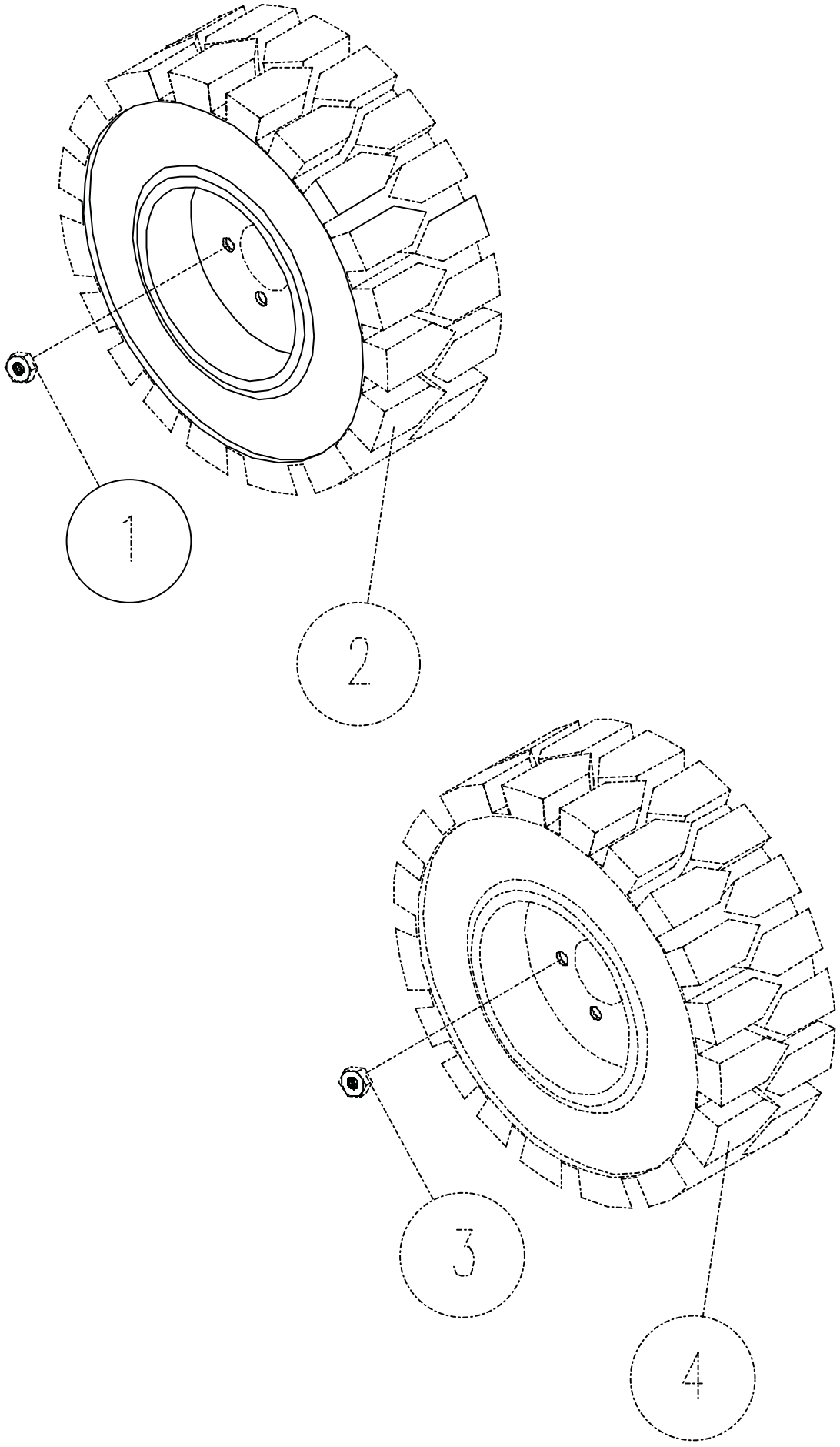
REAR & FRONT WHEEL KIT (NON MARKING) SERIAL 1297 TO 004942 500494-000

ITEM	PART NO.	DESCRIPTION	QTY
1	057578-000	WHEEL NUT - M14	10
2	057668-001	REAR WHEEL TYRE & RIM ASSY.	2
3	057666-000	WHEEL NUT - M16	10
4	057667-003	FRONT WHEEL TYRE & RIM ASSY.	2

REAR & FRONT WHEEL KIT (NON MARKING) SERIAL 004940-004943 TO CURRENT

ITEM	PART NO.	DESCRIPTION	QTY
1	057578-000	WHEEL NUT - M14	10
2	513429-000	REAR WHEEL TYRE & RIM ASSY.(MAGNUM)	2
3	057666-000	WHEEL NUT - M16	10
4	513430-000	FRONT WHEEL TYRE & RIM ASSY. (MAGNUM)	2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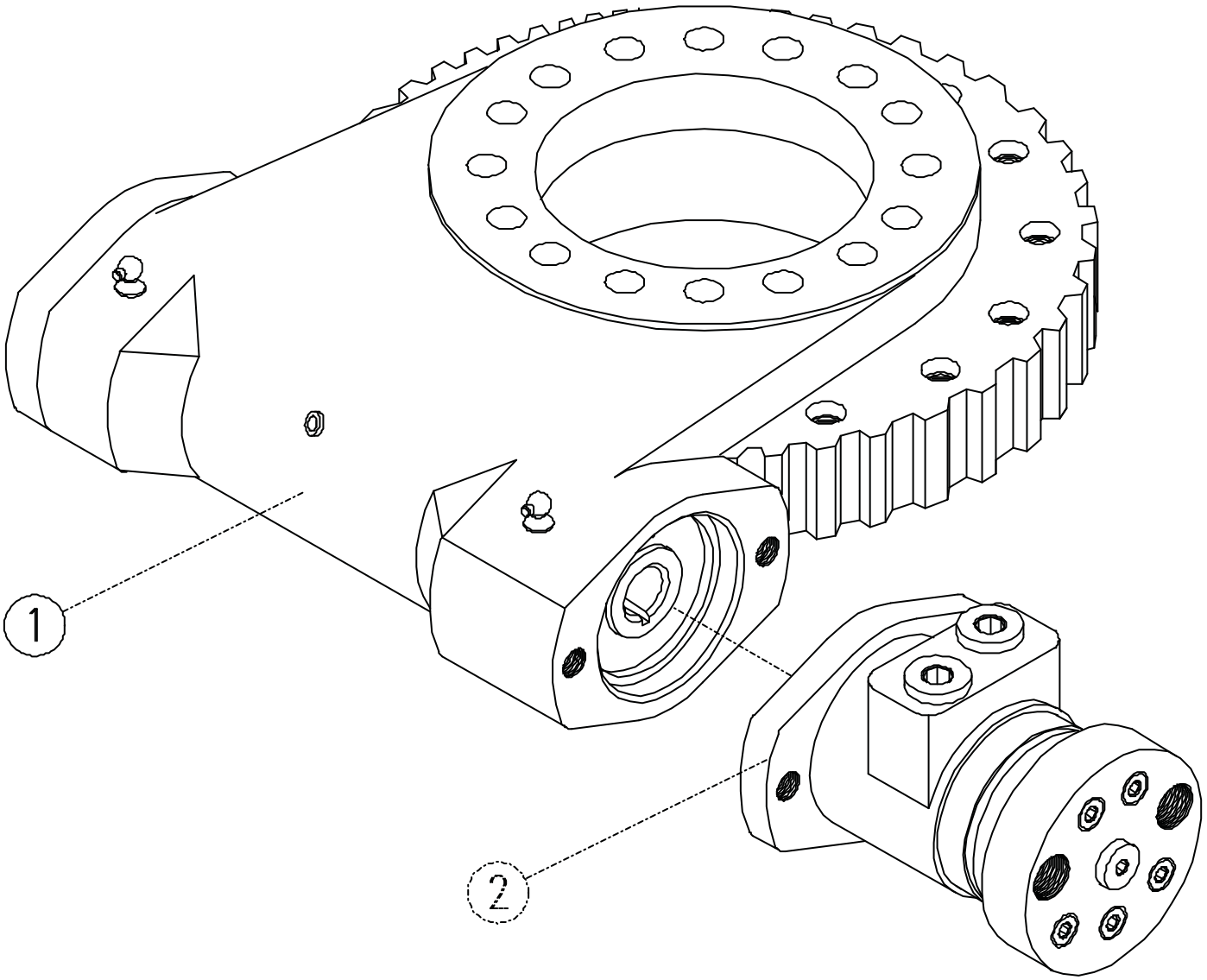
SLEW MOTOR, WORM DRIVE UNIT & SLEW BEARING ASSEMBLY 500284-001

ITEM	PART NO.	DESCRIPTION	QTY.
1	500284-000	A38E WORM DRIVE UNIT & SLEW BEARING ASSEMBLY	1
*	500280-000	BOLT 5/8" -11 UNC x 3 1/2"	16
*	500281-000	WASHER M16 HARDENED	16
2	500285-000	A38E SLEW MOTOR	1
*	500285-001	SEAL KIT	1
*	500282-000	BOLT 1/2" -13 UNC x 1"	2
*	056021-012	WASHER M12 SPRING	2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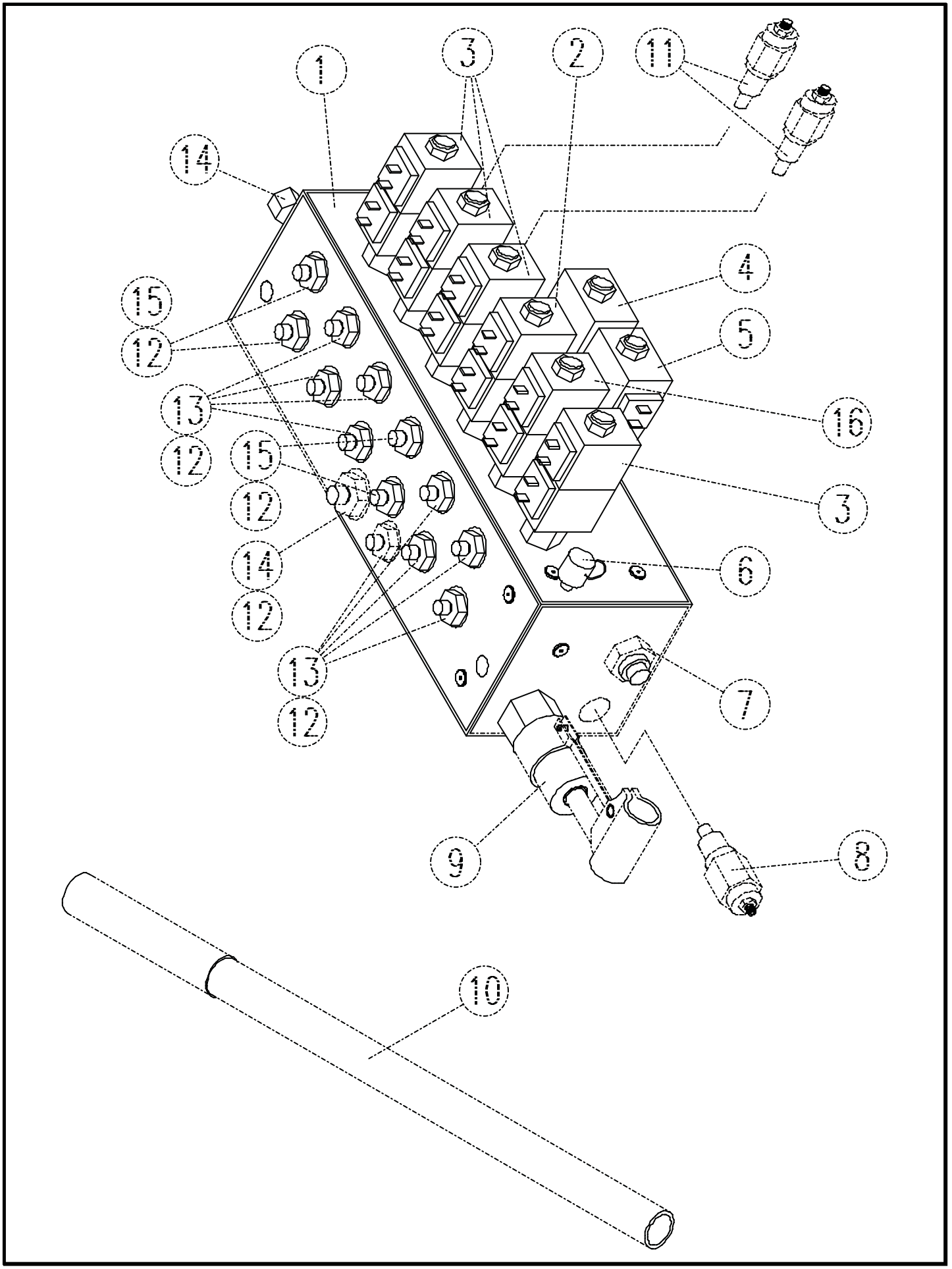
MANIFOLD BLOCK ASSEMBLY

500261-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	MAIN MANIFOLD BLOCK ONLY	1
2	501960-000	SOLENOID VALVE & COILS	1
3	501961-000	SOLENOID VALVE & COILS	5
4	501962-000	SOLENOID VALVE & COILS	1
5	501963-000	SOLENOID VALVE & COILS	1
6	057106-000	PRESSURE TEST POINT FITTING	1
7	057540-000	PRESSURE REDUCING VALVE	1
8	057536-000	MAIN RELIEF VALVE	1
9	500261-002	MANUAL TELE RETRACTION VALVE	1
10	500261-004	TELE RETRACTION VALVE LEVER	1
11	057539-000	CROSS LINE RELIEF VALVE	2
12	-	BONDED SEAL, VARIOUS	12
13	057358-000	ADAPTOR 1/4” x 1/4”	9
14	057122-000	ADAPTOR 3/8” x 3/8”	2
15	057121-000	ADAPTOR 1/4” x 3/8”	4
16	501964-000	SOLENOID VALVE & COILS (STEER)	1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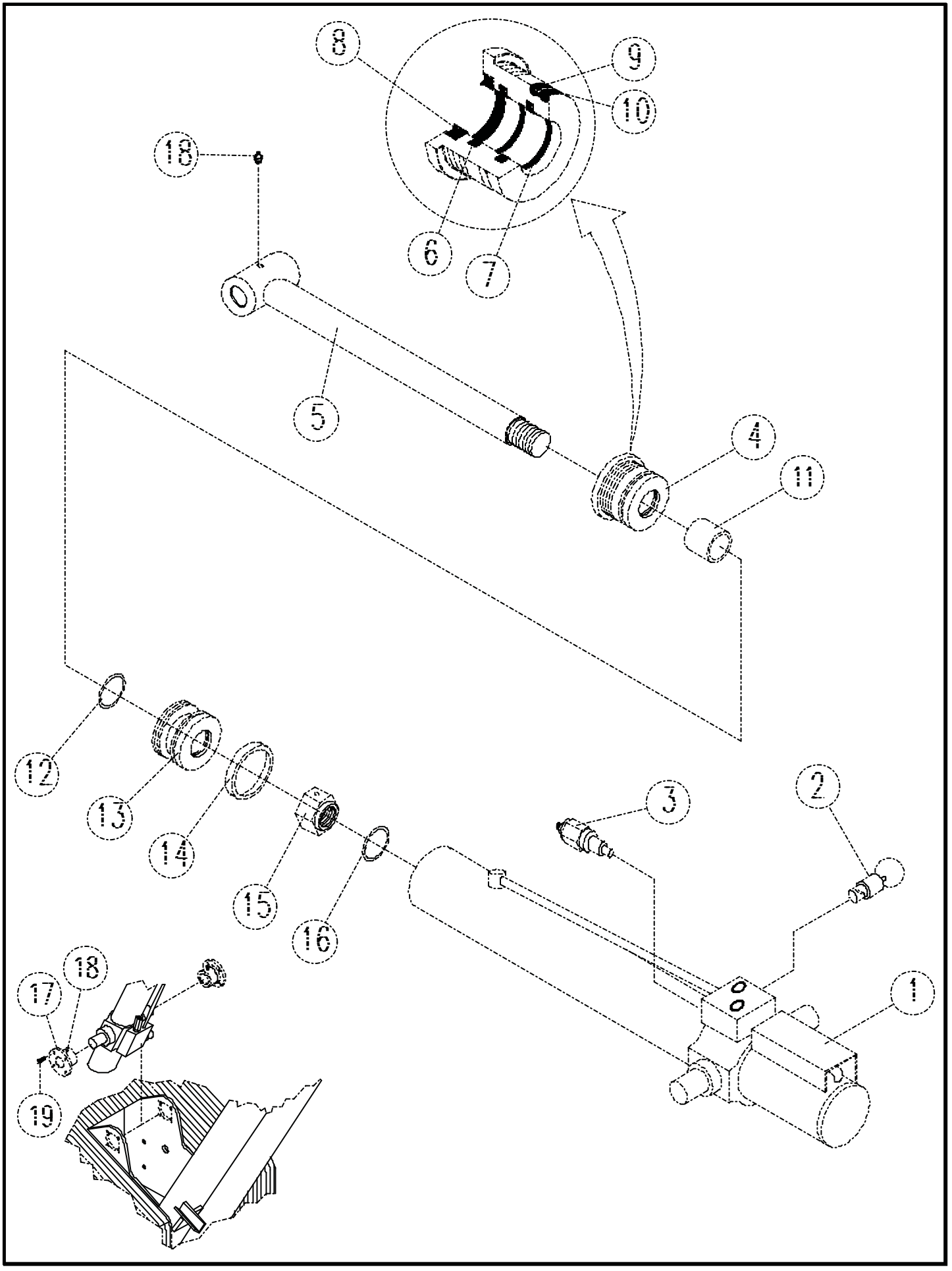
LOWER LIFT CYLINDER ASSEMBLY

504504-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	CYLINDER BODY	1
2	500397-000	EMERGENCY LOWERING VALVE	1
3	058728-000	SINGLE OVERCENTRE VALVE	1
4	-	END CAP	1
5	-	ROD AND END PIVOT	1
6	SEE NOTE	U-RING ROD SEAL	1
7	SEE NOTE	ROD SEAL	1
8	SEE NOTE	WIPER	1
9	SEE NOTE	BACK UP 0-RING	1
10	SEE NOTE	O-RING	1
11	-	SPACER	1
12	SEE NOTE	PISTON O-RING	1
13	-	PISTON HEAD	1
14	SEE NOTE	PISTON SEAL	1
15	-	PISTON LOCKNUT	1
16	-	WASHER	1
17	058447-000	A38E LOWER LIFT CYLINDER BOSS	2
18	057048-000	GREASE NIPPLE	3
19	058516-000	A38E BOSS CAPHEAD SCREW M8	8

NOTE: ITEMS 6 TO 10 INCLUSIVE, 12 & 14 FORM THE SEAL KIT FOR THE A38E LOWER LIFT CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS ***500457-000***

NOTE: ITEMS 17, 18 & 19 ARE NOT INCLUDED AS PART OF THE CYLINDER ASSEMBLY.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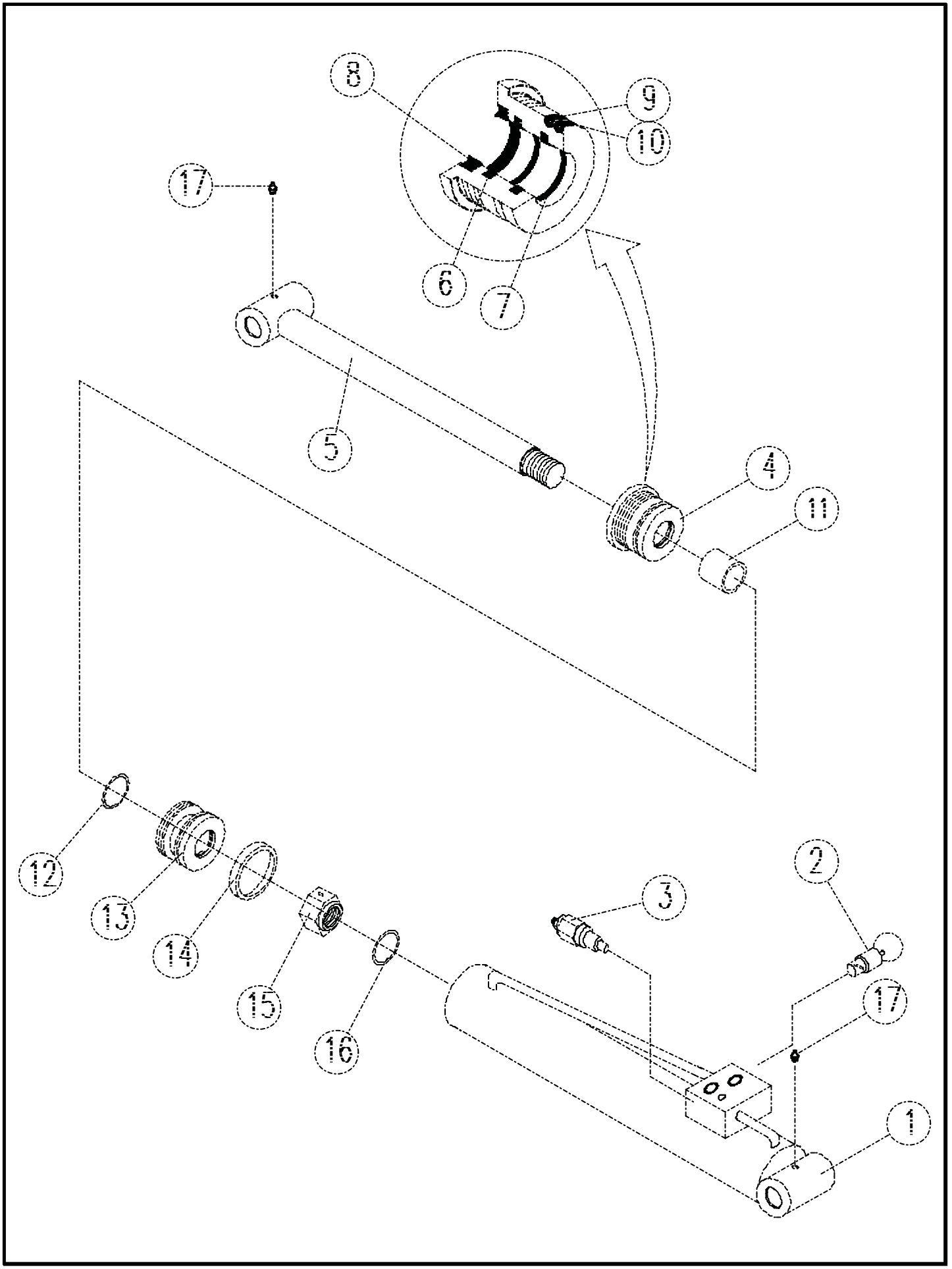
UPPER LIFT CYLINDER ASSEMBLY

504505-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	CYLINDER BODY	1
2	500397-000	EMERGENCY LOWERING VALVE	1
3	058728-000	SINGLE OVERCENTRE VALVE	1
4	-	END CAP	1
5	-	ROD AND END PIVOT	1
6	SEE NOTE	U-RING ROD SEAL	1
7	SEE NOTE	ROD SEAL	1
8	SEE NOTE	WIPER	1
9	SEE NOTE	BACK UP 0-RING	1
10	SEE NOTE	O-RING	1
11	-	SPACER	1
12	SEE NOTE	PISTON O-RING	1
13	-	PISTON HEAD	1
14	SEE NOTE	PISTON SEAL	1
15	-	PISTON LOCKNUT	1
16	-	WASHER	1
17	057048-000	GREASE NIPPLE	2

NOTE: ITEMS 6 TO 10 INCLUSIVE, 12 & 14 FORM THE SEAL KIT FOR THE A38E UPPER LIFT CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS ***500458-000***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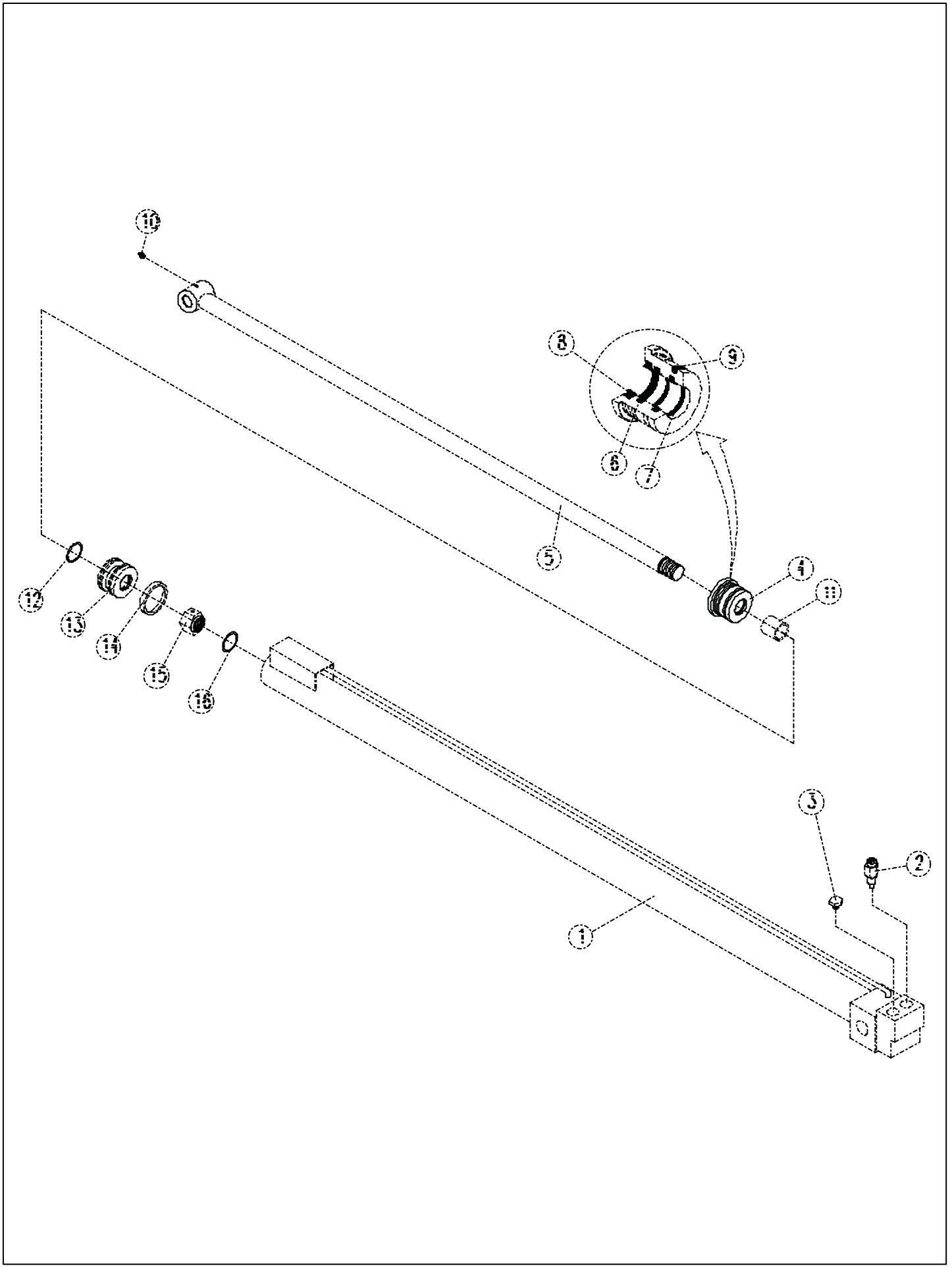
TELESCOPIC CYLINDER ASSEMBLY

058461-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	CYLINDER BODY	1
2	058728-000	SINGLE OVERCENTRE VALVE	1
3	058714-000	SINGLE P.O. CHECK VALVE	1
4	-	END CAP	1
5	-	ROD AND END PIVOT	1
6	SEE NOTE	U-RING ROD SEAL	1
7	SEE NOTE	ROD SEAL	1
8	SEE NOTE	WIPER	1
9	SEE NOTE	0-RING	1
10	057048-000	GREASE NIPPLE	1
11	-	SPACER	1
12	SEE NOTE	PISTON O-RING	1
13	-	PISTON HEAD	1
14	SEE NOTE	PISTON SEAL	1
15	-	PISTON LOCKNUT	1
16	-	WASHER	1

NOTE: ITEMS 6 TO 9 INCLUSIVE, 12 & 14 FORM THE SEAL KIT FOR THE A38E TELESCOPIC CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS ***500459-000***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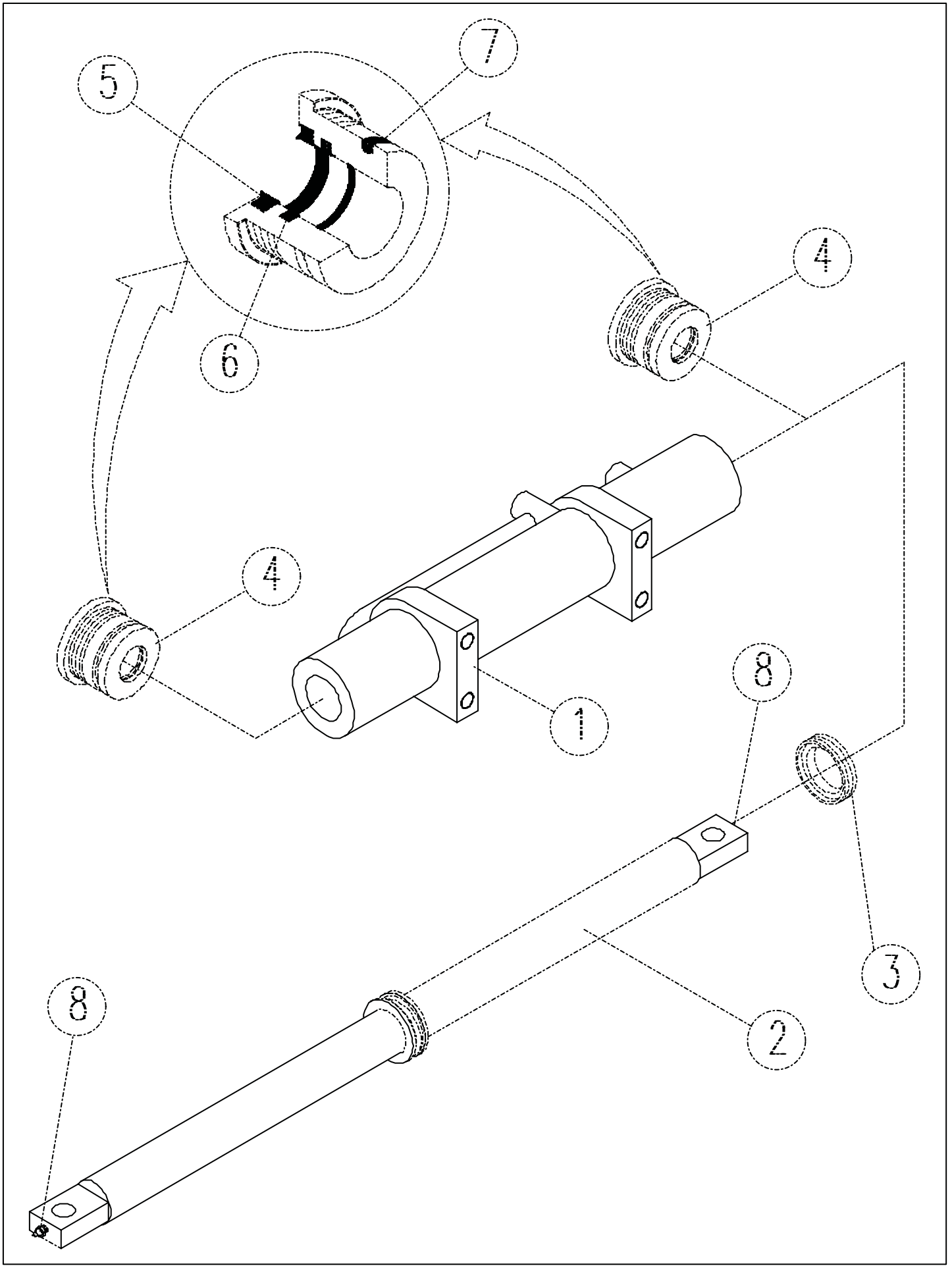
STEERING CYLINDER ASSEMBLY

058463-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	CYLINDER BODY	1
2	-	CYLINDER ROD	1
3	SEE NOTE	PISTON SEAL	1
4	-	END CAP	1
5	SEE NOTE	WIPER	1
6	SEE NOTE	ROD SEAL	1
7	SEE NOTE	O-RING	1
8	057048-000	GREASE NIPPLE	2

NOTE:ITEMS 3, 5, 6 & 7 FORM THE SEAL KIT
FOR THE A38E STEERING CYLINDER.
THE PART NUMBER FOR THIS SEAL
KIT IS ***500460-000***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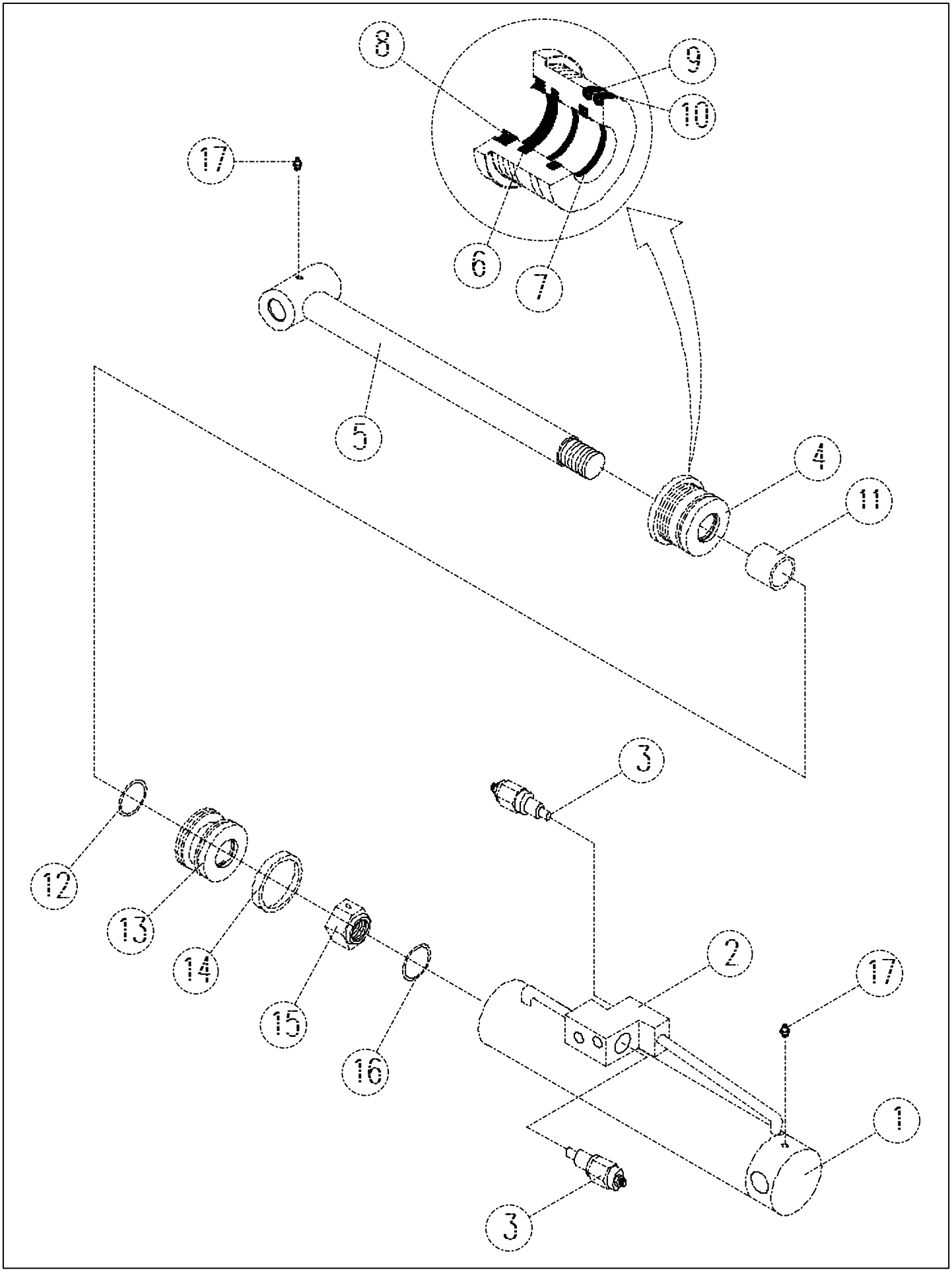
MASTER/SLAVE CYLINDER ASSEMBLY

MASTER CYLINDER 058734-000
SLAVE CYLINDER 058735-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	CYLINDER BODY	1
2	-	VALVE BLOCK BODY	1
3	058728-000	SINGLE OVERCENTRE VALVE	1
4	-	END CAP	1
5	-	ROD AND END PIVOT	1
6	SEE NOTE	U-RING ROD SEAL	1
7	SEE NOTE	ROD SEAL	1
8	SEE NOTE	WIPER	1
9	SEE NOTE	BACK UP 0-RING	1
10	SEE NOTE	0-RING	1
11	-	SPACER	1
12	SEE NOTE	PISTON O-RING	1
13	-	PISTON HEAD	1
14	SEE NOTE	PISTON SEAL	1
15	-	PISTON LOCKNUT	1
16	-	WASHER	1
17	057048-000	GREASE NIPPLE	2

NOTE: ITEMS 6 TO 10 INCLUSIVE, 12 & 14 FORM THE SEAL KIT FOR THE A38E MASTER OR SLAVE CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS ***058750-000***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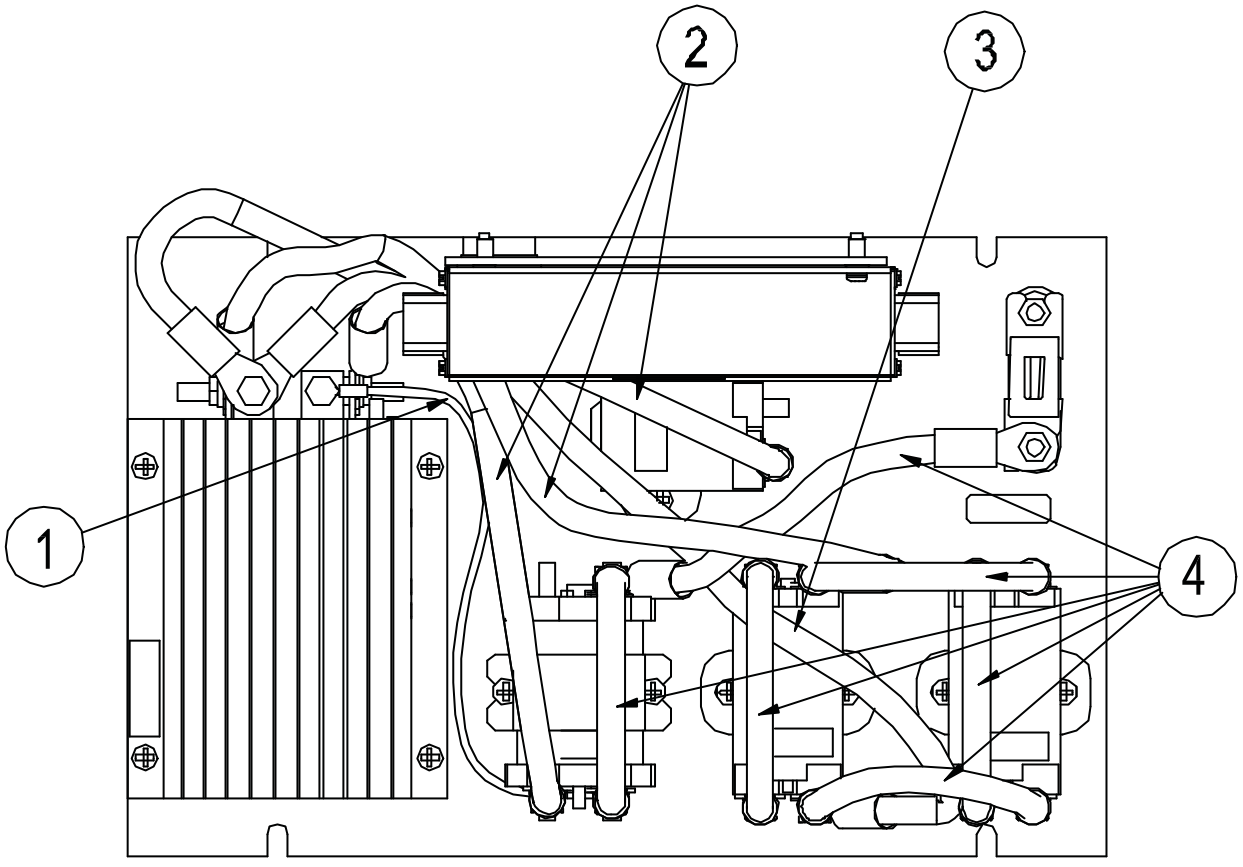
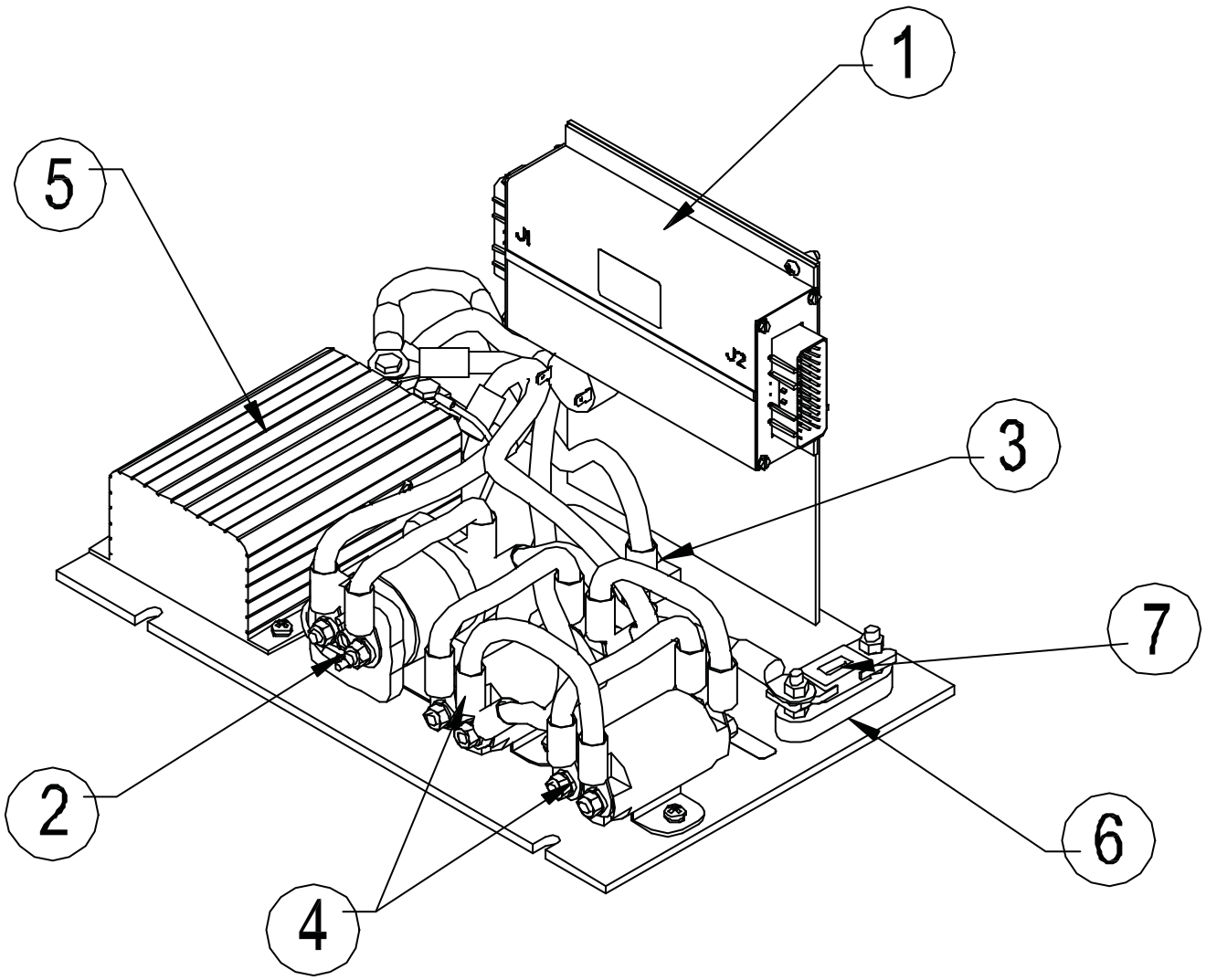
PUMP & TRACTION MOTOR CONTROL UNIT ASSEMBLY
501862-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	501863-001	ECU BOX WITH PC BOARD	1
2	501873-000	LINE CONTACTOR	1
3	501874-000	PUMP CONTACTOR	1
4	501875-000	MOTOR CONTACTOR FWD & REV	1
5	501876-000	MOTOR CONTROLLER	1
6	501877-000	FUSE BLOCK	1
7	501878-000	FUSE	1

HARNESSES

ITEM	PART NO.	DESCRIPTION	QTY.
1	501894-000	HARNESS, LC2 TO MTR CNTRL B-	1
2	501895-000	HARNESS, FWD 3 TO FWD 5	1
3	501895-000	HARNESS, REV 3 TO REV 5	1
4	501895-000	HARNESS, LC 3 TO LC 5	1
5	501895-000	HARNESS, FWD 4 TO REV 4	1
6	501895-000	HARNESS, FWD 6 TO REV 6	1
7	501895-000	HARNESS, LC 3 TO FUSE	1
8	501896-000	HARNESS, MTR CNTRL A2 TO FWD 4	1
9	501897-000	HARNESS, MTR CNTRL B+ TO LC 6	1
10	501897-000	HARNESS,MTR CNTRL M- TO FWD 6	1
11	501897-000	HARNESS,MTR CNTRL B+ TO PC 3	1

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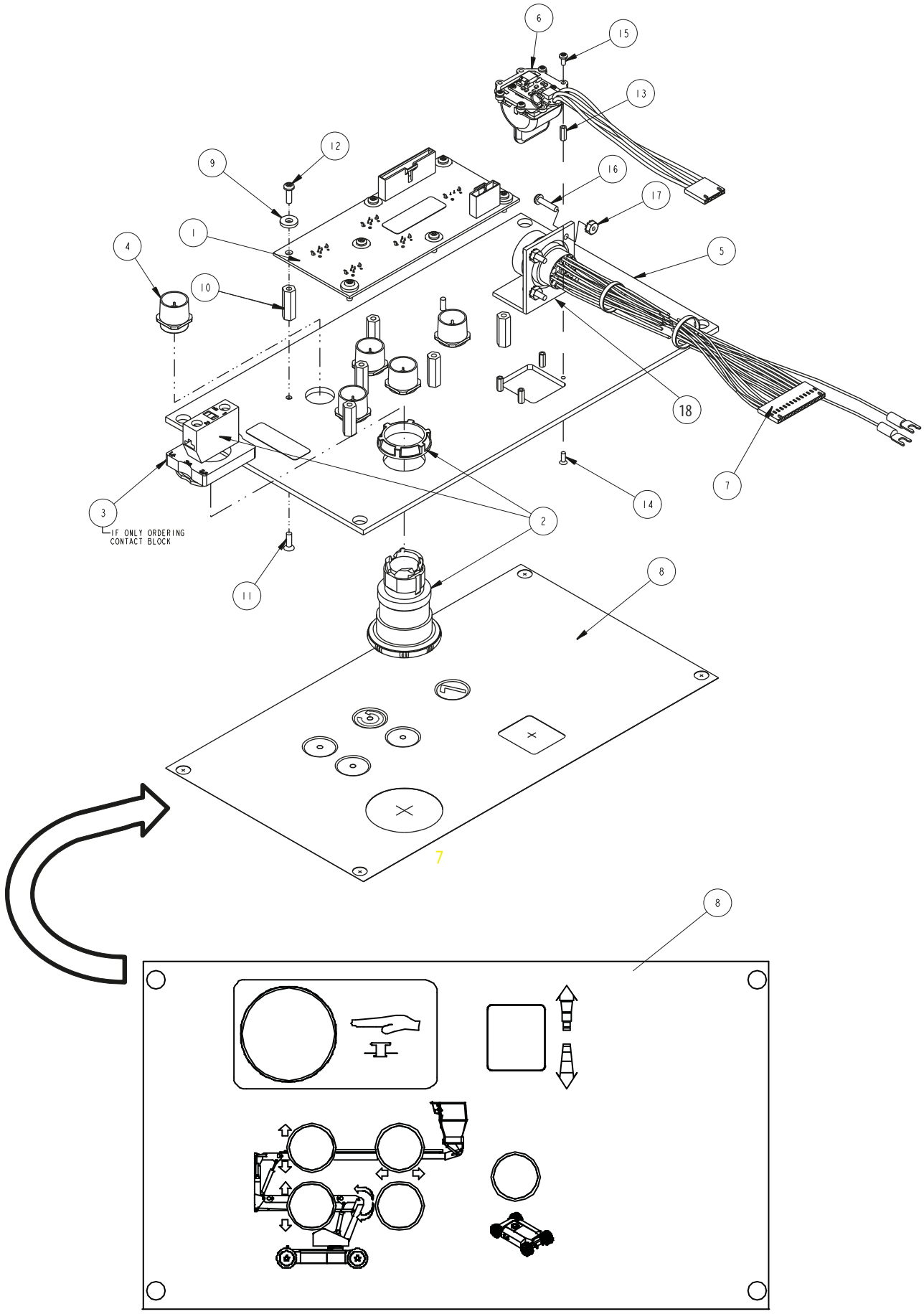
A38E LOWER CONTROL BOX ASSEMBLY

500490-000 (Harnesses are not part of this assembly)

ITEM	PART NO.	DESCRIPTION	QTY
1	501871-000	PCB ASSY, GROUND CONTROL	1
2	501867-000	E-STOP SWITCH C/W CONTACT BLOCK	1
3	508033-000	CONTACT BLOCK N.C.	1
4	SEE NOTE	K12 SWITCH ACTUATOR	5
5	SEE NOTE	PLATE, GROUND CONTROL PANEL	1
6	501872-000	ANALOG ROCKER	1
7	SEE NOTE	WIRE HARNESS	1
8	501867-000	OVERLAY (DECAL)	1
9	502453-003	NYLON WASHER	7
10	502453-004	STANDOFF, #4-40 X .730LG	7
11	502453-002	SCREW FH, #4-40 X .375LG	7
12	SEE NOTE	SCREW PH, #4-40 X .375LG	7
13	SEE NOTE	SCREW PH, #4-40 X .375LG	4
14	SEE NOTE	STANDOFF, #2-56 X .312LG	4
15	SEE NOTE	SCREW FH, #2-56 X .250LG	4
16	SEE NOTE	SCREW PH, #2-56 X .187LG	4
17	SEE NOTE	SCREW PH, #4-40 X .500LG	4
-	3020080	MOMENTARY SWITCH (ANSI ONLY)	1
18	513583-000	LCB CONNECTOR BRACKET	1

NOTE: PARTS 4, 5, 7, 12, 13, 14, 15, 16 & 17 ARE PART OF ASSEMBLY 500490-000 AND CANNOT BE SOLD SEPARATELY.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IF ONLY ORDERING CONTACT BLOCK
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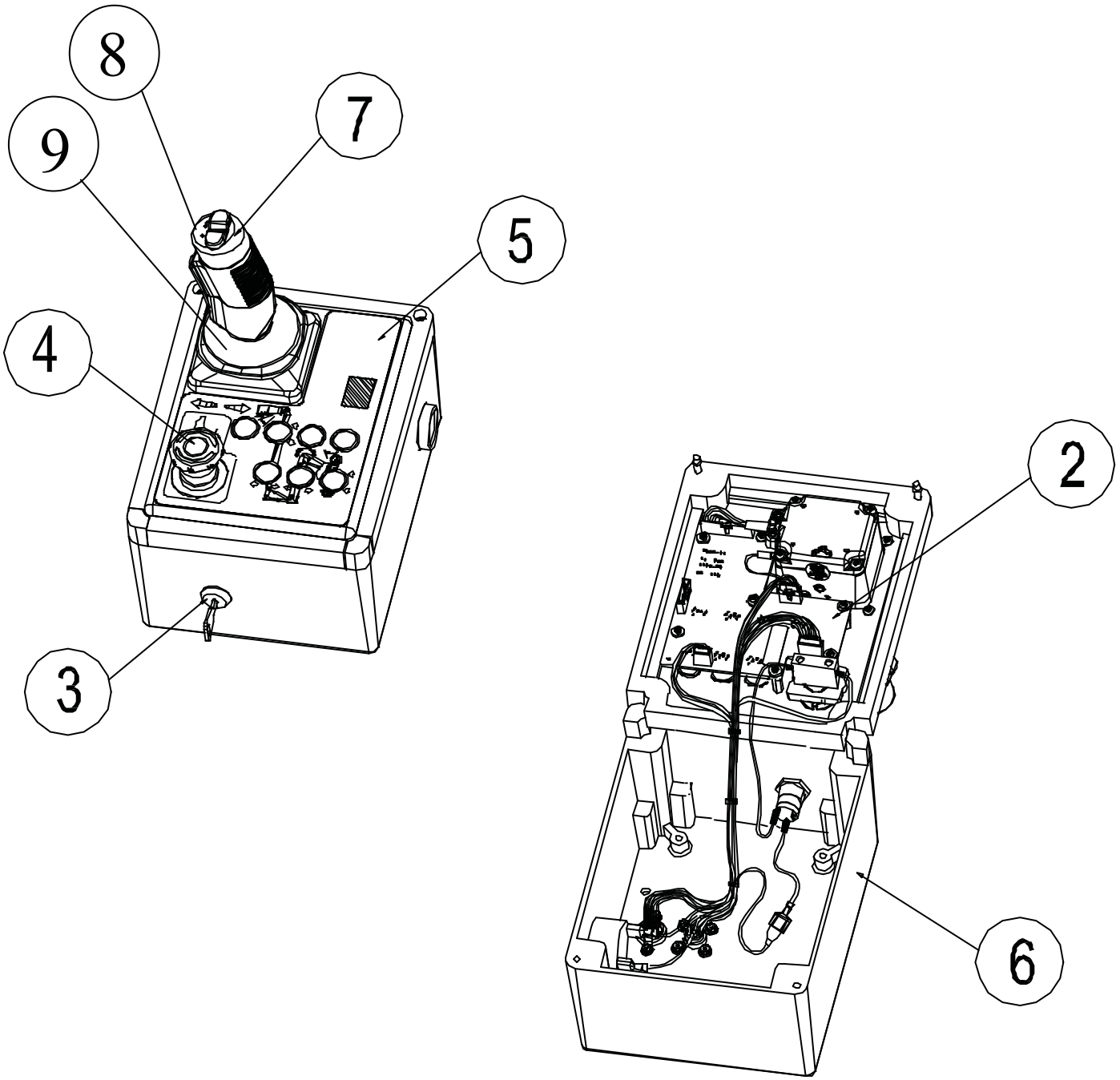
UPPER CONTROL BOX ASSEMBLY

501864-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	501864-001	PLATFORM CONTROLLER	1
2	502453-000	PC BOARD ASSY	1
3	501866-000	KEY SWITCH 2WAY Before SN 04310 AND ANSI SPEC MACHINES	1
3	510366-000	KEY SWITCH 3WAY After SN 04310	1
4	501867-000	E-STOP SWITCH C/W CONTACT BLOCK	1
5	501869-000	OVERLAY (DECAL)	1
6	501881-000	UPPER CONTROL BOX (BOX ONLY)	1
7	501882-000	JOYSTICK	1
8	501882-001	JOYSTICK, RUBBER STEERING BOOT	1
9	501882-002	JOYSTICK, RUBBER BOOT	1
-	513005-000	BLACK PLUG (ANSI ONLY)	1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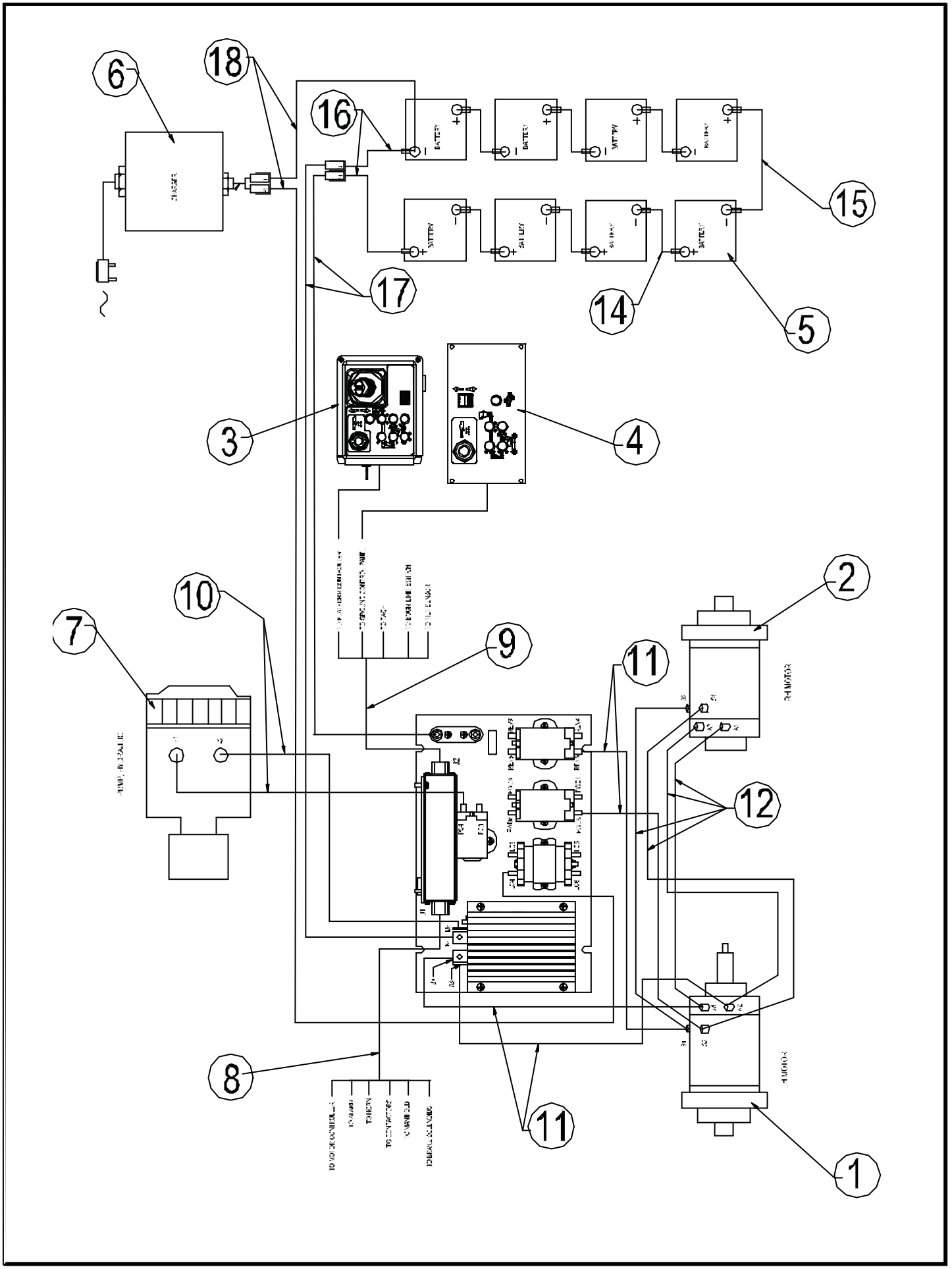
CABLES & ELECTRICAL COMPONENT LEGEND

ITEM	PART NO.	DESCRIPTION	QTY.
1	058834-000	DRIVE MOTOR, LH	1
2	057568-000	DRIVE MOTOR, RH	1
3	501864-000	UPPER CONTROL BOX ASSY.	1
4	502597-000	LOWER CONTROL PANEL	1
5	501074-000	BATTERY	8
6	0260021	CHARGER	1
7	057530-000	PUMP MOTOR	1
8	501879-000	HARNESS - J1	
9	501880-000	HARNESS - J2	1
10	502588-000	HARNESS - PUMP - LINE CONTACTOR	
*		HARNESS - PUMP - MOTOR CONTROLLER	
11	502589-000	HARNESS - LH MOTOR - MOTOR CONTROLLER B+	1
*		HARNESS - LH MOTOR - REVERSE CONTACTOR	1
*		HARNESS - LH MOTOR - MOTOR CONTROLLER A2	1
*		HARNESS - LH MOTOR - FORWARD CONTACTOR	1
12	502590-000	HARNESS - LH MOTOR A1 - RH MOTOR A1	1
*		HARNESS - LH MOTOR S1 - RH MOTOR S2	1
*		HARNESS - LH MOTOR A2 - RH MOTOR A2	1
*		HARNESS - LH MOTOR S2 - RH MOTOR S1	1
13			
14	502592-000	HARNESS - BATTERY - BATTERY (SHORT)	6
15	502593-000	HARNESS - BATTERY - BATTERY (LONG)	1
16	502594-000	HARNESS - BATTERY DISCONNECT - BATTERY	1
*		POSITIVE AND NEGATIVE.	
17	502595-000	HARNESS - BATTERY DISCONNECT - FUSE AND	1
*		MOTOR CONTROLLER B-	
18	502596-000	HARNESS - BATGTERY CHARGER - LINE	1
*		CONTACTOR AND BETTERY NEG	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HOSE ASSEMBLY

500360-000

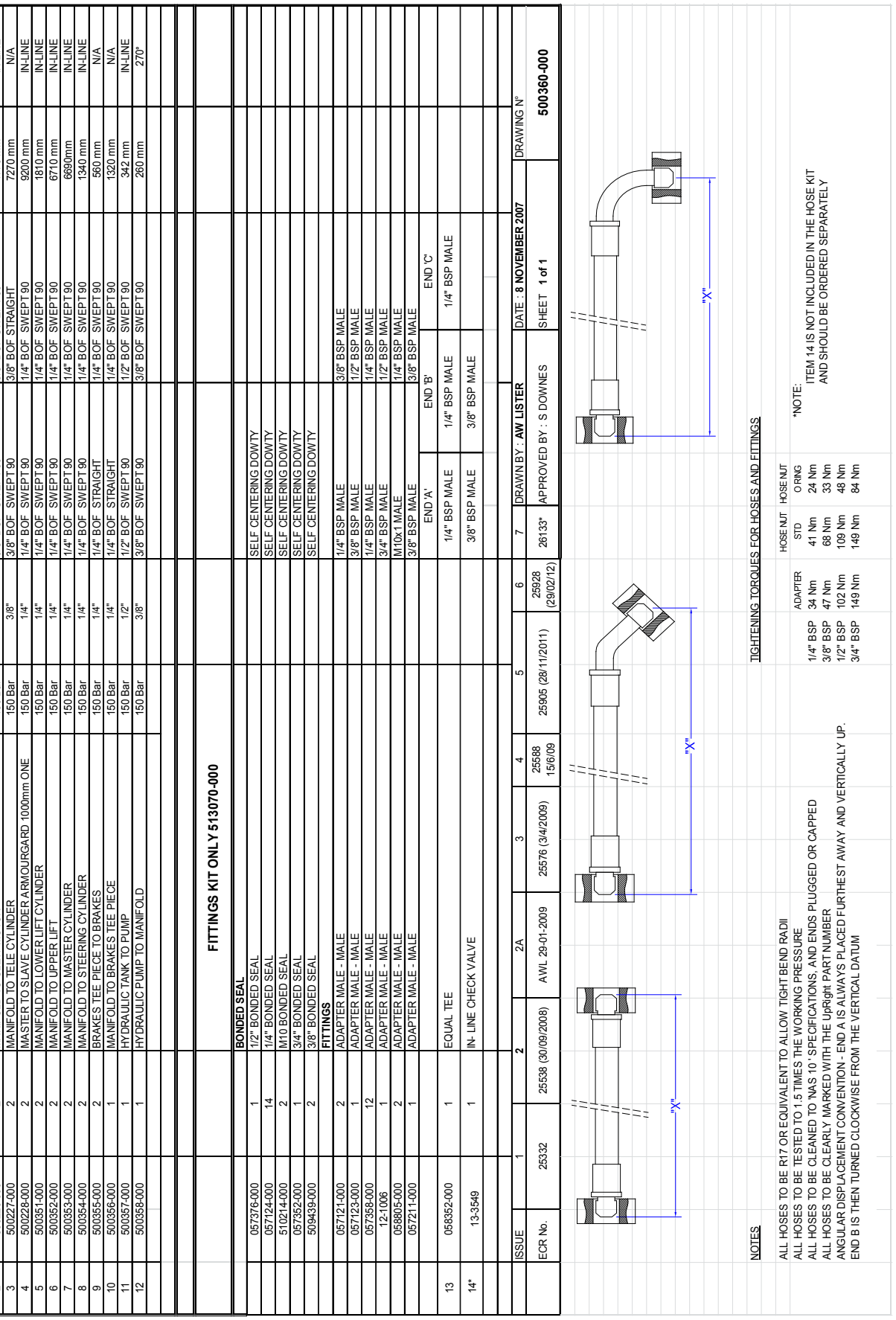
HYDRAULIC KIT

UpRight POWERED ACCESS, VIGO CENTRE, BIRTLEY ROAD, WASHINGTON, TYNE & WEAR, NE38 9DA

MACHINE DESCRIPTION : AB 38

ITEM	PART NUMBER	QUANTITY OFF	ITEM DESCRIPTION	WORKING PRESSURE	HOSE SIZE	END FITTINGS END 'A'	END FITTINGS END 'B'	TOTAL HOSE LENGTH (incl. fittings)	ANG. DISP.
			HOSE KIT ONLY 513069-000					*Dimension "X"*	
1	500225-000	1	**HOSE & LOCATION ON MACHINE** HYDRAULIC MANIFOLD TO TANK	150 Bar	3/8"	3/8" BOF SWEPT 90	3/8" BOF SWEPT 90	520mm	270°
2	500226-000	2	MANIFOLD TO SLEW MOTOR	150 Bar	3/8"	3/8" BOF SWEPT 90	3/8" BOF SWEPT 90	1770 mm	IN-LINE
3	500227-000	2	MANIFOLD TO TELE CYLINDER	150 Bar	3/8"	3/8" BOF SWEPT 90	3/8" BOF STRAIGHT	7270 mm	N/A
4	500228-000	2	MASTER TO SLAVE CYLINDER ARMOURGARD 1000mm ONE	150 Bar	1/4"	1/4" BOF SWEPT 90	1/4" BOF SWEPT 90	9200 mm	IN-LINE
5	500351-000	2	MANIFOLD TO LOWER LIFT CYLINDER	150 Bar	1/4"	1/4" BOF SWEPT 90	1/4" BOF SWEPT 90	1810 mm	IN-LINE
6	500352-000	2	MANIFOLD TO UPPER LIFT	150 Bar	1/4"	1/4" BOF SWEPT 90	1/4" BOF SWEPT 90	6710 mm	IN-LINE
7	500353-000	2	MANIFOLD TO MASTER CYLINDER	150 Bar	1/4"	1/4" BOF SWEPT 90	1/4" BOF SWEPT 90	6690mm	IN-LINE
8	500354-000	2	MANIFOLD TO STEERING CYLINDER	150 Bar	1/4"	1/4" BOF SWEPT 90	1/4" BOF SWEPT 90	1340 mm	IN-LINE
9	500355-000	2	BRAKES TEE PIECE TO BRAKES	150 Bar	1/4"	1/4" BOF STRAIGHT	1/4" BOF SWEPT 90	560 mm	N/A
10	500356-000	1	MANIFOLD TO BRAKES TEE PIECE	150 Bar	1/4"	1/4" BOF STRAIGHT	1/4" BOF SWEPT 90	1320 mm	N/A
11	500357-000	1	HYDRAULIC TANK TO PUMP	150 Bar	1/2"	1/2" BOF SWEPT 90	1/2" BOF SWEPT 90	342 mm	IN-LINE
12	500358-000	1	HYDRAULIC PUMP TO MANIFOLD	150 Bar	3/8"	3/8" BOF SWEPT 90	3/8" BOF SWEPT 90	260 mm	270°
			FITTINGS KIT ONLY 513070-000						
			BONDED SEAL						
	057376-000	1	1/2" BONDED SEAL			SELF CENTERING DOWTY			
	057124-000	14	1/4" BONDED SEAL			SELF CENTERING DOWTY			
	510214-000	2	M10 BONDED SEAL			SELF CENTERING DOWTY			
	057352-000	1	3/4" BONDED SEAL			SELF CENTERING DOWTY			
	509439-000	2	3/8" BONDED SEAL			SELF CENTERING DOWTY			
			FITTINGS						
	057121-000	2	ADAPTER MALE - MALE			1/4" BSP MALE	3/8" BSP MALE		
	057123-000	1	ADAPTER MALE - MALE			3/8" BSP MALE	1/2" BSP MALE		
	057358-000	12	ADAPTER MALE - MALE			1/4" BSP MALE	1/4" BSP MALE		
	12-1006	1	ADAPTER MALE - MALE			3/4" BSP MALE	1/2" BSP MALE		
	058805-000	2	ADAPTER MALE - MALE			M10x1 MALE	1/4" BSP MALE		
	057211-000	1	ADAPTER MALE - MALE			3/8" BSP MALE	3/8" BSP MALE		
						END 'A'	END 'B' END 'C'		
13	058352-000	1	EQUAL TEE			1/4" BSP MALE	1/4" BSP MALE 1/4" BSP MALE		
14*	13-3549	1	IN- LINE CHECK VALVE			3/8" BSP MALE	3/8" BSP MALE		

ISSUE	1	2	2A	3	4	5	6	7	DRAWN BY : **AW LISTER**	DATE : **8 NOVEMBER 2007**	DRAWING N°
ECR No.	25332	25538 (30/09/2008)	AWL 29-01-2009	25576 (3/4/2009)	25588 15/6/09	25905 (28/11/2011)	25928 (29/02/12)	26133*	APPROVED BY : S DOWNES	SHEET **1 of 1**	**500360-000**



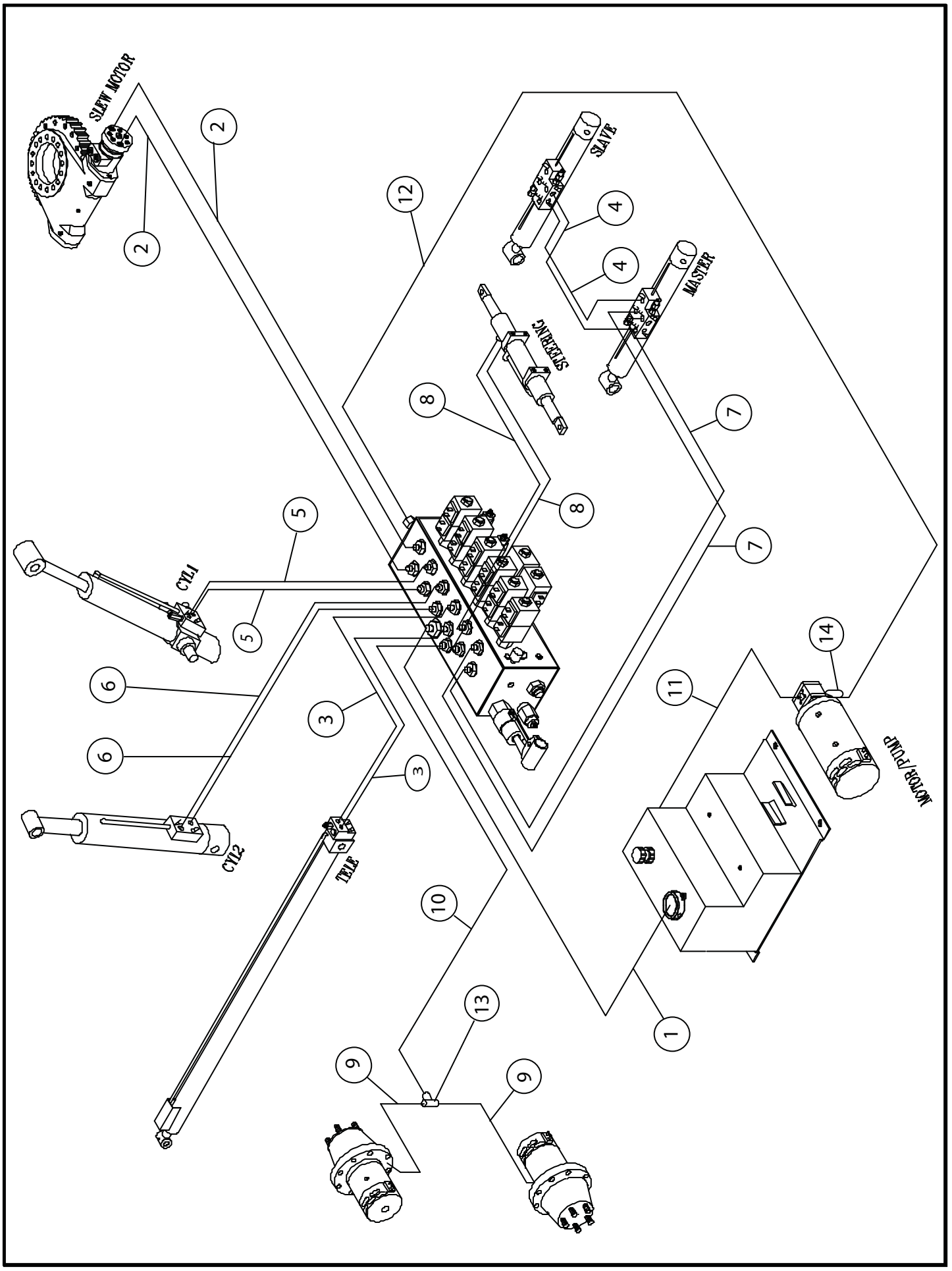
NOTES

TIGHTENING TORQUES FOR HOSES AND FITTINGS

	HOSE NUT STD	HOSE NUT O RING
ADAPTER		
1/4" BSP	34 Nm	41 Nm 24 Nm
3/8" BSP	47 Nm	68 Nm 33 Nm
1/2" BSP	102 Nm	109 Nm 48 Nm
3/4" BSP	149 Nm	149 Nm 84 Nm

ALL HOSES TO BE R17 OR EQUIVALENT TO ALLOW TIGHT BEND RADII
ALL HOSES TO BE TESTED TO 1.5 TIMES THE WORKING PRESSURE
ALL HOSES TO BE CLEANED TO 'NAS 10' SPECIFICATIONS, AND ENDS PLUGGED OR CAPPED
ALL HOSES TO BE CLEARLY MARKED WITH THE UpRight PART NUMBER
ANGULAR DISPLACEMENT CONVENTION - END A IS ALWAYS PLACED FURTHEST AWAY AND VERTICALLY UP. END B IS THEN TURNED CLOCKWISE FROM THE VERTICAL DATUM

*NOTE:
ITEM 14 IS NOT INCLUDED IN THE HOSE KIT AND SHOULD BE ORDERED SEPARATELY


SLEW MOTOR
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SLAVE
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MASTER
STEERING
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MOTOR/PUMP
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CYL2
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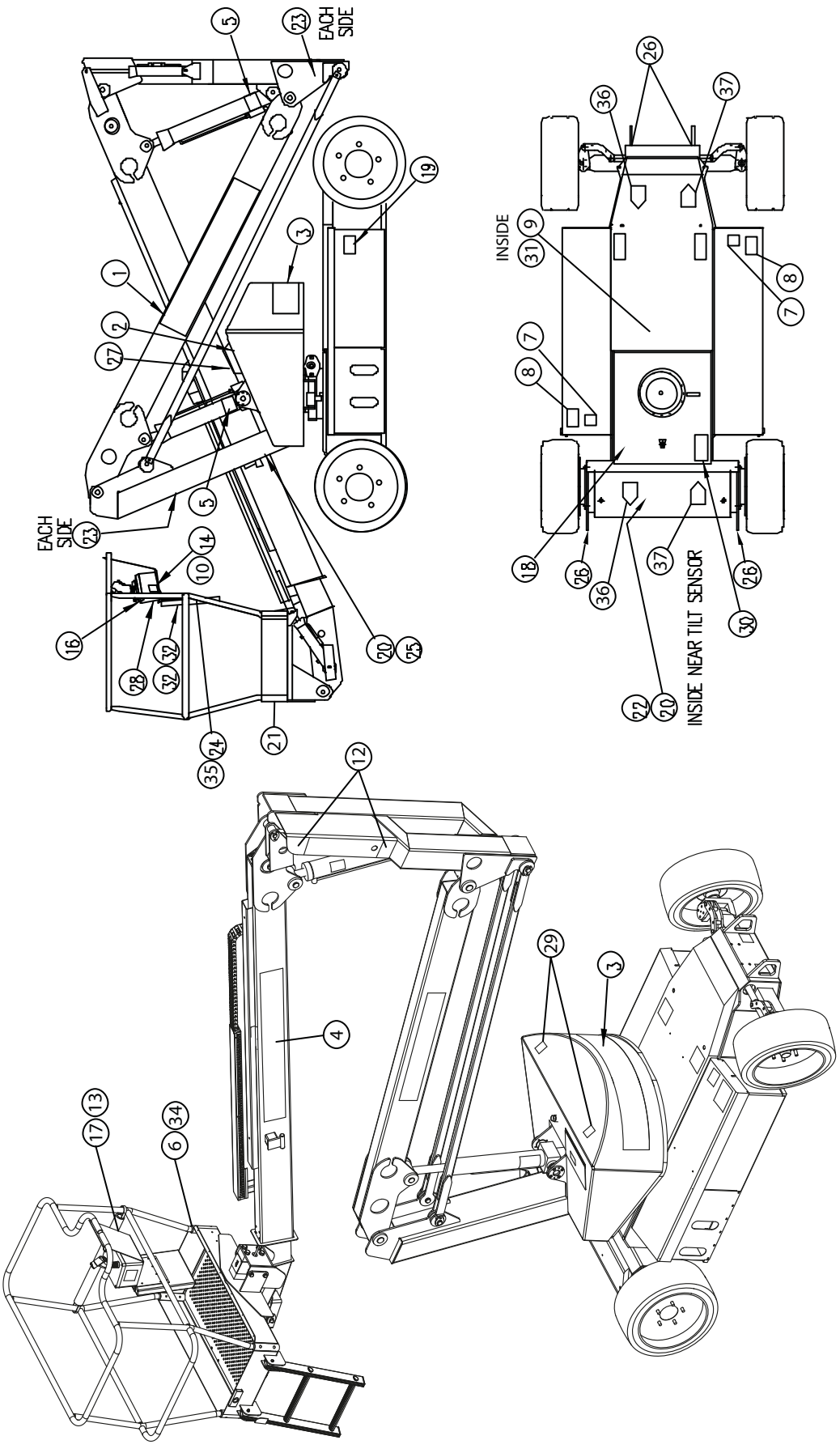
DECAL KIT
American English (ANSI)
500206-001

ITEM	PART NO.	DESCRIPTION	QTY.
1	511069-000	DECAL - '***Snorkel*** A38E' BOOM	2
2	501870-000	DECAL - LOWER CONTROL BOX	1
3	512224-000	DECAL - Snorkel LOGO 75mm	1
4	511067-000	DECAL - WEB ADDRESS LOGO	1
5	510280-000	DECAL - EMERGENCY LOWERING	2
6	511099-000	DECAL - '***Snorkel*** ' LOGO 100mm	1
7	057429-000	DECAL - BATTERY FLUID LEVEL	2
8	057430-002	DECAL - EXPLOSION HAZARD	2
9	500467-000	DECAL - HANDPUMP	1
10	508498-000	DECAL - LWA 107dB	1
11	508771-000	DECAL - DO NOT REMOVE	1
12	058881-001	DECAL - HAZARD TAPE	2
13	058080-000	DECAL - CAGE LEVELLING	1
14	058186-000	DECAL - ON/OFF UPPER CONTROL, before sn 04310	1
14	510982-000	DECAL - ON/OFF UPPER CONTROL, After sn 04310	1
15	508772-000	DECAL - WARNING RESPONSIBILITIES	1
16	501869-000	DECAL - UPPER CONTROL BOX	1
17	058538-000	DECAL - DANGER/HAZARDS/INSTR.	1
18	058530-000	DECAL - MEETS ANSI REQUIREMENTS	1
19	058534-000	DECAL - BATTERIES ARE COUNTERWEIGHT	2
20	058533-000	DECAL - DO NOT ADJUST SWITCHES	2
21	058761-000	DECAL - S.W.L. LARGE ANSI	1
22	057434-001	DECAL - GENUINE REPLACEMENTS	2
23	057424-001	DECAL - CRUSH HAZARD	4
24	300699	DECAL - OPERATORS CHECKLIST	1
25	058181-003	DECAL - 3 POINTS	1
26	058531-000	DECAL - TIE DOWN / LIFT POINT	4
27	500438-000	DECAL - LOWER CONTROL BOX	1
28	057382-000	DECAL - EM LOWERING	2
29	058537-000	DECAL - PINCH POINT	2
30	058471-001	NAME PLATE - ANSI	1
31	060197-001	DECAL - HYDRAULIC FLUID	1
32	511114-000	ANSI OPERATORS MANUAL	1
33	511115-200	SERVICE & PARTS MANUAL	1
34	068635-001	DECAL - IHARNESS HARD POINT	1
35	010076-001	DECAL - INSTRUCTIONS INSIDE	1
36	0070540	DECAL - YELLOW ARROW	2
37	513792-000	DECAL - RED ARROW	2


EACH SIDE
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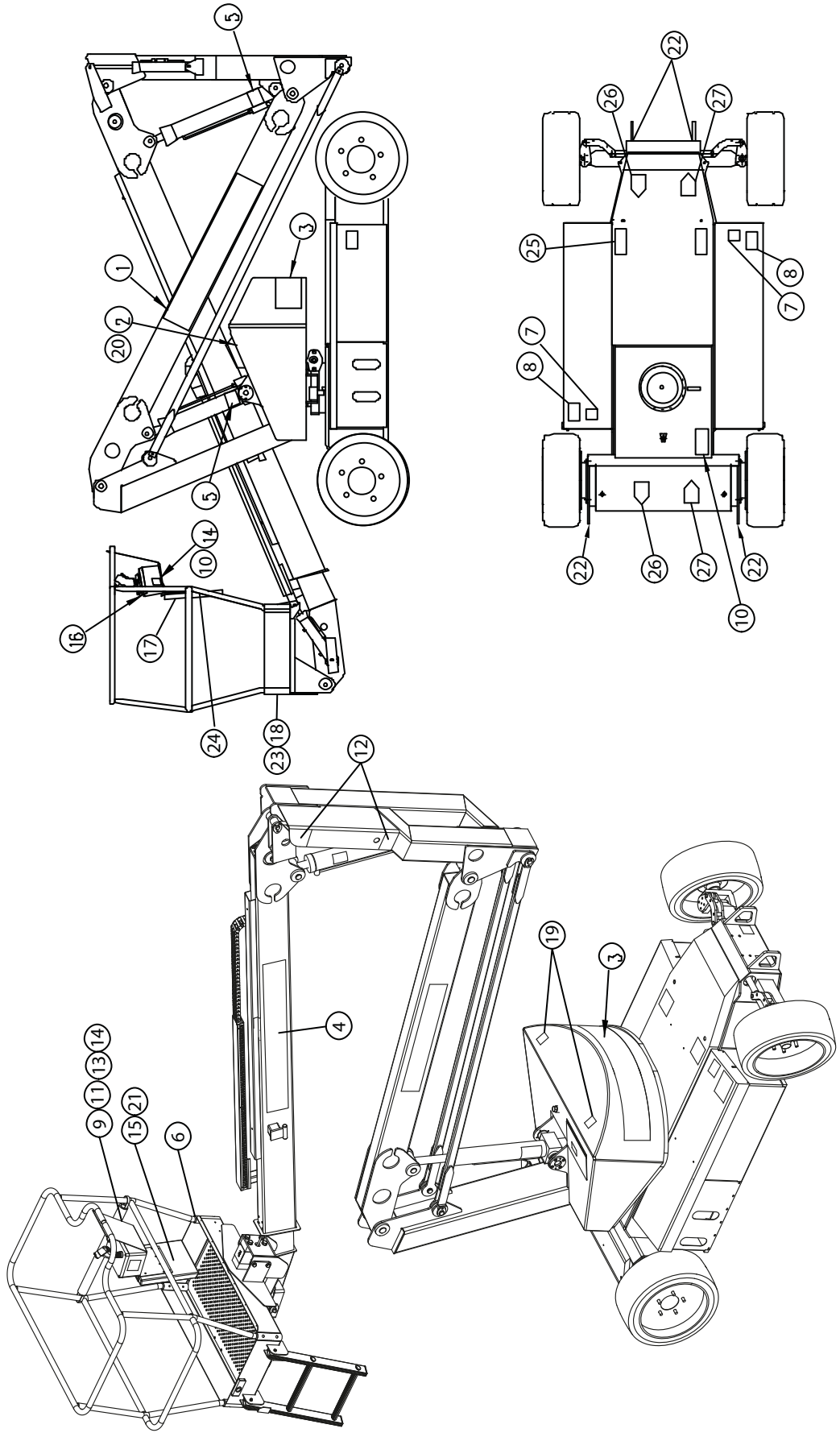
INSIDE NEAR TILT SENSOR

DECAL KIT
International (CE)

ITEM	DUTCH CE 510207-000	ITALIAN CE 512231-000	SPANISH CE 510016-000	FRENCH CE 509722-000	GERMAN CE 500206-002	ENGLISH CE 500206-000	DESCRIPTION	QTY.
1	511069-000	511069-000	511069-000	511069-000	511069-000	511069-000	DECAL - '***Snorkel*** A38E' BOOM	2
2	501870-000	501870-000	501870-000	501870-000	501870-000	501870-000	DECAL - LOWER CONTROL BOX	1
3	512224-000	512224-000	512224-000	512224-000	512224-000	512224-000	DECAL - 75mm Snorkel LOGO	1
4	511067-000	511067-000	511067-000	511067-000	511067-000	511067-000	DECAL - WEB ADDRESS	1
5	510280-000	510280-000	510280-000	510280-000	510280-000	510280-000	DECAL - EMERGENCY LOWERING	2
6	511099-000	511099-000	511099-000	511099-000	511099-000	511099-000	DECAL - '***100mmSnorkel***' LOGO	2
7	510215-000	510848-000	509944-000	508834-000	057507-024	057429-000	DECAL - BATTERY FLUID LEVEL	2
8	057430-002	057430-002	057430-002	057430-002	057430-002	057430-002	DECAL - EXPLOSION HAZARD	2
9	510220-001	512236-000	510014-001	508852-001	057507-025	057692-004	DECAL - IMPORTANT BEFORE USING	1
10	511027-000	511027-000	511027-000	511027-000	511027-000	511027-000	NAMEPLATE, CE	1
11	510218-000	512234-000	510012-000	508850-000	500467-002	500467-000	DECAL - HANDPUMP	1
12	058881-001	058881-001	058881-001	058881-001	058881-001	058881-001	DECAL - HAZARD TAPE	2
13	510216-000	512232-000	510011-000	508848-000	057507-030	058080-000	DECAL - CAGE LEVELLING	1
14	058186-000	058186-000	058186-000	058186-000	058186-000	058186-000	DECAL, ON/OFF Up CRL Before sn 04310	1
14	510982-000	510982-000	510982-000	510982-000	510982-000	510982-000	DECAL, ON/OFF Up CRL After sn 04310	1
15	511114-000-NL	511114-000-IT	511114-000-ES	511114-000-FR	511114-000-DE	511114-000-EN	OPERATORS MANUAL CE	1
16	501869-000	501869-000	501869-000	501869-000	501869-000	501869-000	DECAL - UPPER CONTROL BOX	1
17	510221-000	512237-000	510015-000	508853-000	058181-002	058181-003	DECAL - 3 POINT	1
18	504199-005	504199-005	504199-005	504199-005	504199-005	504199-005	DECAL - S.W.L. LARGE	1
19	058860-000	058860-000	058860-000	058860-000	058860-000	058860-000	DECAL - PINCH POINT	2
20	510217-000	512233-000	510017-000	508849-000	500438-002	500438-000	DECAL - LOWER CONTROL COVER	1
21	511115-200	511115-200	511115-200	511115-200	511115-200	511115-200	SERVICE & PARTS MANUAL	1
22	058531-200	058531-200	058531-200	058531-200	058531-200	058531-200	DECAL - TIE DOWN/LIFT POINT	4
23	058531-200	058531-200	058531-200	058531-200	058531-200	058531-200	DECAL - HARNESS HARD POINT	1
24	010076-901	010076-901	010076-901	010076-901	010076-901	010076-901	DECAL - DOCUMENT BOX	1
25	060197-001	060197-001	060197-001	060197-001	060197-001	060197-001	DECAL - HYDRAULIC FLUID	1
26	0070540	0070540	0070540	0070540	0070540	0070540	DECAL - YELLOW ARROW	2
27	513792-000	513792-000	513792-000	513792-000	513792-000	513792-000	DECAL - RED ARROW	2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OPTION LIST

ITEM	PART NO.	DESCRIPTION
1	058191-000	A38E OPTION, POWER TO PLATFORM 110V
2	058191-001	A38E OPTION, POWER TO PLATFORM 220V
3	058275-000	A38E OPTION, FLASHING BEACON
4	058284-000	A38E OPTION, SPOTLIGHT IN PLATFORM

The options outlined opposite are available from Snorkel when ordering a new machine or as a spare part to be retrofitted to an existing machine. However, because the Options are not considered a normal spare part, the standard parts delivery policy may not always apply.

When required as a Spare Part please contact Snorkel Product Support for more information.

When required with new machine please contact Snorkel Sales & Marketing prior to placing machine order.

NOTES:

Local Distributor / Lokaler Vertiebshändler / Distributeur local
El Distribuidor local / Il Distributore locale

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