

AB38 WORK PLATFORMS



The AB38N Machine has been re-assessed to ensure compliance to the Machinery Directive (2006/42/EC).

The Machine rating has been changed from:

2 People Indoors and Outdoors.

To

2 People Indoors and 1 Person Outdoors.

Please attach to the front cover of
your manual

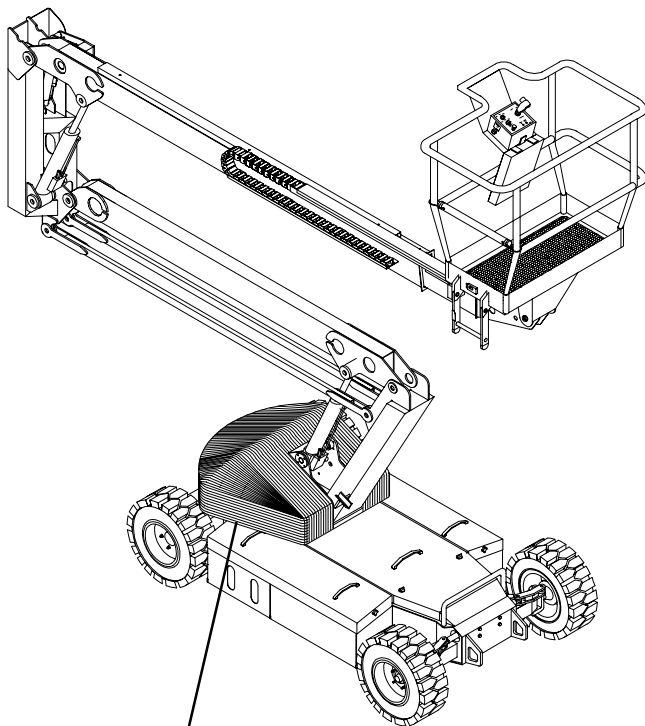
SERVICE & PARTS MANUAL

AB38

Aerial Work Platform

Serial Numbers 1500 to 1800

When contacting UpRight for service or parts information, be sure to include the MODEL and SERIAL NUMBERS from the equipment nameplate (nameplate types shown below). The AB38 Work Platform meets and exceeds the requirements of both *prEN280* and *ANSI A92.5 (1992)*.



Nameplate

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

UpRight		POTTERY ROAD, DUN LAOIRE, IRELAND.	CE
MODEL	AB38	SERIAL NO.	199
MAX PLATFORM HEIGHT	11.5 m	UNLADEN WEIGHT	3550 kg
MAX. PLATFORM LOAD	215 kg 2 Persons + 55 kg Equipment		
MAX. LATERAL FORCE	400 N	MAX. WIND SPEED	12.5 m/s
MAX. CHASSIS INCLINATION	0°	BATTERY VOLTAGE	48V
MAX. GRADEABILITY	36%	CHARGER INPUT VOLTAGE	240V
MAX. FORWARD SPEED	1.1 m/s	NOMINAL POWER	4 kW
CAUTION: ONLY TRAINED & AUTHORISED PERSONNEL MAY USE THIS MACHINE - CONSULT OPERATORS MANUAL BEFORE USE. THIS PLATFORM IS NOT ELECTRICALLY INSULATED			

UpRight		POTTERY ROAD, DUN LAOIRE, IRELAND.	CE
MODEL	AB38N	SERIAL NO.	199
MAX. PLATFORM LOAD	475 lbs (2 Persons + 120 lbs)		
MAX. PLATFORM HEIGHT	38 ft.	UNLADEN WEIGHT	7,825 lbs
MAX. PLATFORM REACH	18 ft. 4 in		
MAX. LATERAL FORCE	90 lbs	MAX. WIND SPEED	28 mph
MAX. CHASSIS INCLINATION	0°	MAX. GRADEABILITY	36%
MAX. HYDRAULIC PRESSURE	2700 psi		
BATTERY VOLTAGE	48V dc	CHARGER INPUT VOLTAGE	110/220V
MAX. FORWARD SPEED	2.5 mph	NOMINAL POWER	5.4 hp
THIS MACHINE IS MANUFACTURED TO COMPLY WITH ANSI A92.5 - 1992			
CAUTION: ONLY TRAINED & AUTHORISED PERSONNEL MAY USE THIS MACHINE - CONSULT OPERATORS MANUAL BEFORE USE. THIS PLATFORM IS NOT ELECTRICALLY INSULATED			

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04/98

UpRight

EC DECLARATION OF CONFORMITY RELATING TO ELECTROMAGNETIC COMPATIBILITY

Manufacturer:
UpRight International
Pottery Road, Dun Laoire
Co. Dublin, Ireland

Machinery:

Powered Aerial Work Platform known as:

UpRight: **AB38**

Serial Numbers: **1500-1800**

The machines specified above comply with the following provisions:

European Directive 89/336/EEC
(as amended by Directive 92/31/EEC)

Harmonized Standards adopted:

EN 50081-1 : 1992

&

EN 50082-1 : 1992

Electromagnetic Compatibility -
Generic Emission and Immunity Standards

Part 1 : Residential, Commercial
and Light Industry

Signed for UpRight International



A handwritten signature in black ink, reading 'Conor Balfe', written over a dotted line.

Conor Balfe BE M.Eng.Sc MIEI
Project Engineer (Machines)

Foreword

Introduction

HOW TO USE THIS MANUAL

This manual is divided into 7 Sections, one of which is in a loose leaf format. The right hand pages of each Section is marked with a black tab that line up with one of the thumb index tabs on the right side of this page. You can quickly find each Section without looking up the Table of Contents which follows this page. The section number printed at the top corner of each page can also be used as a quick guide.

SPECIAL INFORMATION



DANGER



Indicates the hazard or unsafe practice **will** result in severe injury or death.



WARNING



Indicates the hazard or unsafe practice **could** result in severe injury or death.



CAUTION



Indicates the hazard or unsafe practice could result in **minor** injury or property damage.

Notes: Give helpful information.

WORKSHOP PROCEDURES

CAUTION: Detailed descriptions of standard workshop procedures, safety principles and service operations are not included. Please note that this manual does contain warnings and cautions against some specific service methods which could cause personal injury, or could damage a machine and make it unsafe. Please understand that these warnings cannot cover all conceivable ways in which service, whether or not recommended by UpRight Ireland Ltd., might be done, or of the possible hazardous consequences of each conceivable way, nor could UpRight Ireland Ltd. investigate all such ways. Anyone using service procedures or tools, whether or not recommended by UpRight Ireland Ltd., must satisfy themselves thoroughly that neither personal safety nor machine safety will be jeopardised.

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

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3.0

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5.0

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1.0 Introduction

PURPOSE

The purpose of this Service & Parts Manual is to provide instructions and illustrations for the operation and maintenance of the AB38 Work Platform manufactured by Upright Ireland Ltd, Dun Laoire, Ireland. (See Figure 1-1).

For US Domestic Machines this Work Platform is more correctly referred to as the AB38N Work Platform. There is however little difference between these machines, as regards electrical or hydraulic operation, and from herein the Work Platform will be simply referred to as the AB38 Work Platform.

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 AB38 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 aluminium 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.

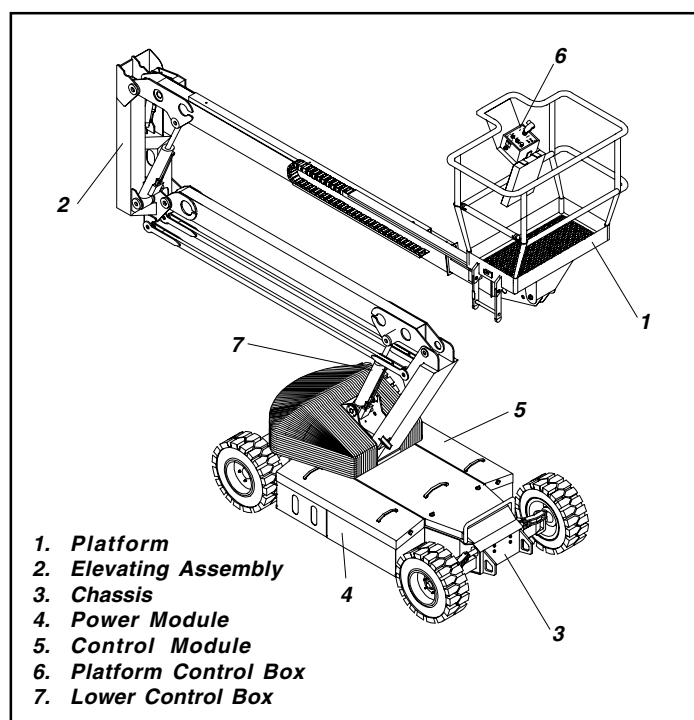


Figure 1-1: AB38 Work Platform

DRIVE & STEER SYSTEMS

The AB38 Work Platform is restricted to low speed drive when the Platform is raised above the Boom Rest Limit Switch. The Traction MOS90 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 AB38 Work Platform is controlled by the Pump MOS90, 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 two electronic motor controllers (MOS90's) and a proportional joystick. The MOS90's 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, beside the Printed Circuit Box, 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 AB38 Work Platform.

AB38 PURPOSE & LIMITATIONS

The purpose of the AB38 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 (475 lbs) in total. The unit will provide the ability to reach over obstacles but must be used on firm level ground.

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 3° 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
Duty Cycle	45% of 8 hour shift	45% of 8 hour shift
Platform Size	0.7 m x 1.3 m (inside gaurdrails)	2.3 ft x 4.3 ft (inside gaurdrails)
Max. Platform Capacity	215 kg	475 lbs
Max. No. of Occupants	2 People	2 People
Height		
Maximum Working Height	13.45 m	44.12 ft
Maximum Platform Height	11.45 m	37.56 ft
Min. Platform Floor Height	0.65 m	2.13ft
Max. Working Outreach	6.10 m	20.00 ft
Platform Height At Maximum Outreach	5.40 m	17.72 ft
Stowed Dimensions		
Length	4.04 m	13.25 ft
Width	1.50 m	4.92 ft
Height	2.00 m	6.56 ft
Ground Clearance	0.13 m	0.43 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
Gross Weight -CE Version	3,550 kg	7,826 lbs
Gross Weight -ANSI Version	4,010 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 220Ah Batteries	48V DC 5.4HP, 8 X 6V 220Ah Batteries
System Voltage	48V	48V
Battery Charger	48V 25A 220/110VAC 50/60 Hz	48V 25A 220/110VAC 50/60 Hz
Hydraulic Tank Capacity	25 Litres	6.5 Gallons US
Max. Hydraulic Pressure	145 bar	2105 psi
Hydraulic Oil	ISO #46	ISO #46
Lift System	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
Lift Speed	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 (MOS90)	One handed Proportional Joystick Operating Energy Efficient Motor Control System (MOS90)
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
Maximum Continuous Sound Pressure Level At Operation Stations	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 AB38 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 AB38 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 AB38 may be lifted by an overhead hoist/crane in the following manner:

Four lifting straps capable of safely supporting the total weight of the AB38 (3,550 Kg / 7,826 lbs CE

AB38 Work Platform

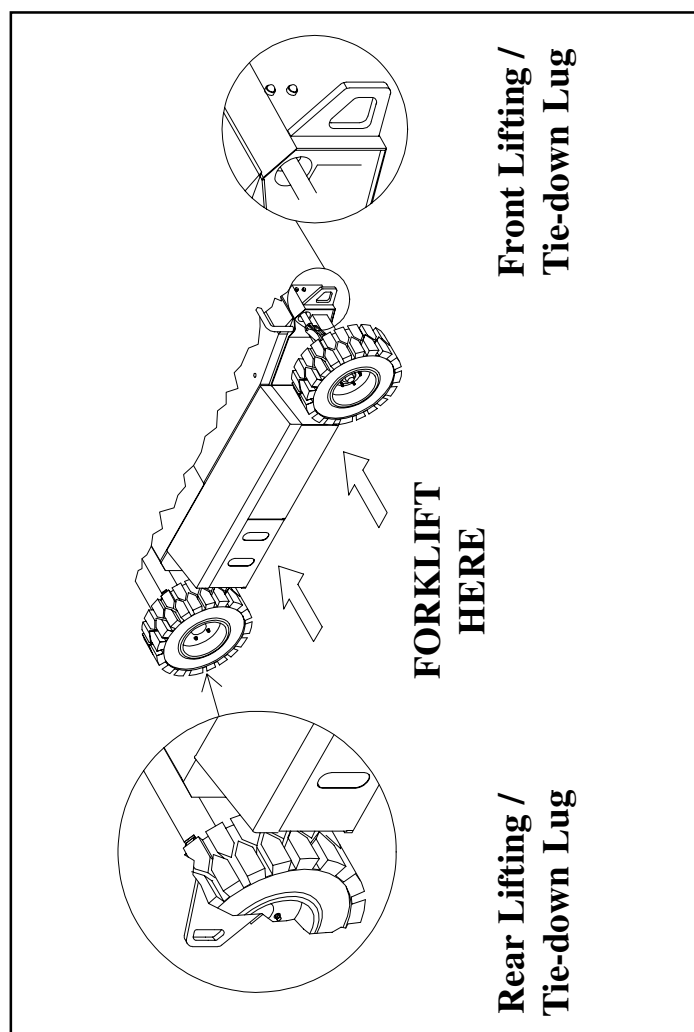


Figure 2-1: Forklifting & Lifting the AB38

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 AB38 is normally carried upon a suitably rated transportation vehicle. Because of the high gradeability of the AB38 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 AB38 is on the Truck it should then be made secure.

1. Chock the wheels of the AB38.
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.



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



Perform 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 AB38 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 AB38 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 AB38 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 a Pump Electronic Motor Controller (MOS90).

The Drive function is operated by utilising two drive motors which are controlled by a Electronic Traction Motor Controller (MOS90).

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 (MOS90 Traction) which varies the speed of the two DC electric traction motors. To drive the AB38 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 while in the platform the Keyswitch should be turned to the 'ON' position. Switch the Drive/Lift Selector Switch to drive and the AB38 will be able to drive. The machine will then drive at a

speed proportional to the angle of the Joystick 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, again, is achieved using a motor control unit (in this instance a Pump MOS90) which varies the hydraulic flow by altering the voltage to the pump. To steer the AB38 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 while in the platform the Keyswitch should be turned to the 'ON' position. Switch the Drive/Lift Selector Switch to drive and the AB38 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 a motor control unit (MOS90) 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 Function Selector Switch is used to alternate functions. Each function will have it's corresponding graphic. 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 a fixed speed for each of the boom functions using four separate toggle switches. These must be used in conjunction with the 'Chassis/Platform Selector Switch'.

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

DESIGN FEATURES

The AB38 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. This is carried out by using a Boom Rest Limit Switch.
- 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.

3.1 Safety Rules and Precautions



WARNING



Before using the AB38 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 AB38 unattended with the Platform in the raised position.

ALWAYS position the machine on firm level ground with a minimum bearing capacity of 550 kN/m² (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 (475 lbs), (max. 2 persons plus 55 kg (120 lbs) equipment)

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 400 N (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 UpRight Ireland 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 UpRight replacement parts without the UpRight'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 AB38 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.**

NOTES :

* An alarm is fitted in the Upper Control Box. This will sound when the Tilt Sensor is activated, and while this alarm is on only the Emergency Override controls can be used.

** To activate these functions on Lower Controls the Spring Return Switch must be used in conjunction i.e. it must be held to the Chassis position.

*** To activate the levelling function the machine must be in the stowed position.

Table 3-1: Controls and Indicators

Platform Controller*

INDEX NO.	NAME	FUNCTION
1	KEY SWITCH : ON/OFF/ EMERGENCY OVERRIDE	Turn anticlockwise for power 'ON', in centre position for power 'OFF' and clockwise for 'EMERGENCY OVERRIDE'. (Must be held against spring pressure in this position)
2	SELECTOR SWITCH	Select function to be operated. Left Hand position for BOOM 1, the next position for BOOM 2 and the next position for the Telescopic operation. The Slew function is the Right Hand position. Only one function can be selected at any one time.
3	EMERGENCY STOP SWITCH	Push red button to cut off power to all functions (OFF). Turn clockwise to release and restore power.
4	JOYSTICK CONTROL LEVER	Squeeze the Interlock Switch, coloured red. This will activate the controller. To activate the DRIVE FORWARD, LIFT, ROTATE RIGHT or TELESCOPE IN functions the controller should be pushed forward. To activate the DRIVE REVERSE, DOWN, ROTATE LEFT or TELESCOPE OUT functions the controller should be pulled back. The speed, at which each function operates, is related to the Joystick displacement.
5	SYSTEM OK INDICATOR	Illuminates to indicate that power is now available to the Upper Control Box.
6	BATTERY CONDITION INDICATOR	This red L.E.D. indicates the condition of the batteries. It is constantly illuminated when the batteries are more than 80% discharged. It flashes repeatedly when the batteries are 70% discharged. It is not illuminated when the batteries are fully charged. See Page 5--7

Chassis Control

INDEX NO.	NAME	FUNCTION
7	DRIVE/LIFT SELECTOR SWITCH :	This 2 position switch will activate either the drive or lift functions. Selecting DRIVE will enable forward, reverse and steer. Selecting LIFT will enable BOOM1, BOOM2, TELESCOPE & SLEW.
8	LEVEL SWITCH ***	This toggle switch will allow the Platform to have its level adjusted forwards or backwards. The Emergency Override Switch must be held in position for this function to work.
9	CHASSIS/ PLATFORM SELECTOR SWITCH :	This switch activates all the controls on the chassis control box . It must be turned and held to the clockwise position when the functions on the Lower Control Box are to be operated.
10	EMERGENCY STOP SWITCH	Push red button to cut off power to all functions (OFF). Turn clockwise to release and restore power.
11	SLEW TOGGLE SWITCH **	The elevating assembly can be slewed LEFT by holding toggle switch LEFT and RIGHT by holding switch RIGHT.
12	BOOM 1 TOGGLE SWITCH **	Boom 1 can be raised by holding toggle switch UP, and it can be lowered by holding toggle switch DOWN.
13	BOOM 2 TOGGLE SWITCH **	Boom 2 can be raised by holding toggle switch UP, and it can be lowered by holding toggle switch DOWN.
14	TELESCOPE TOGGLE SWITCH **	Telescope can be extended by holding toggle switch UP, and it can be retracted by holding toggle switch DOWN.

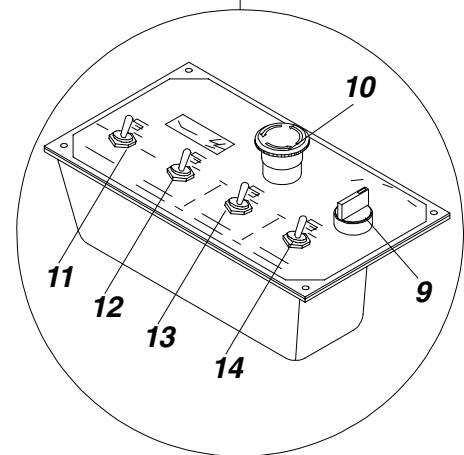
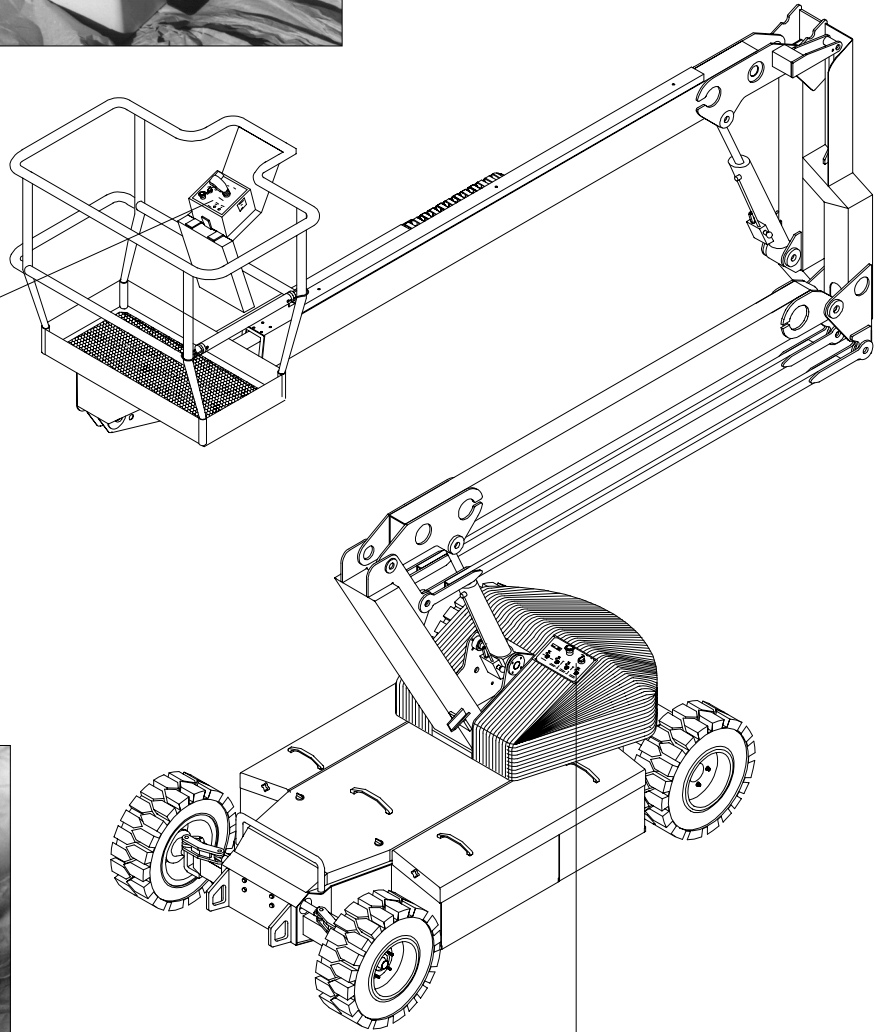
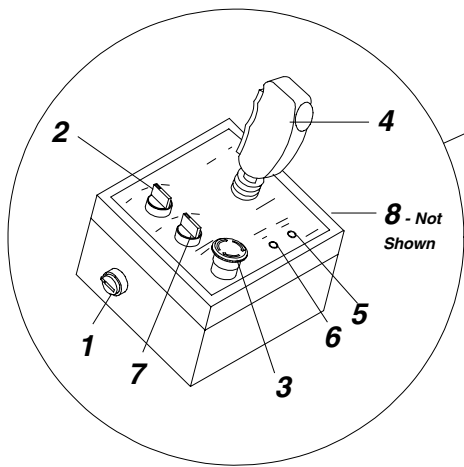


Figure 3-1: Controls & Indicators

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 Upper Control box to the **ON** position (anticlockwise position).
11. Using the chassis control switches, fully **ELEVATE** Booms no. 1 & 2 and **EXTEND** the Telescope. It should be noted that in order to operate any of these functions the lower controls must first be activated. This is done by simultaneously holding the Chassis/Platform Selector Switch to the clockwise position.
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. 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. Position the Lift/Drive Selector Switch to the **DRIVE** position. 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.
20. While testing the Platform Controls it is also necessary to test the Emergency Override functions.

While elevated in the platform drive to a location of 3 degrees slope to activate the Tilt Sensor (If this is not possible request a colleague to activate the Tilt Sensor). The alarm should sound and normal controls should cease. By turning the Keyswitch to the **Emergency Override position the DOWN functions and SLEW functions only** will be activated.

The System Function Inspection is then complete.



WARNING





If there are any concerns about the safe use or operation of the AB38 following this Pre-Operation Inspection **DO NOT USE THE AB38 WORK PLATFORM**. Contact your supplier or UpRight's Product Support Department.

3.4 Operation

NOTE: Before operating the AB38 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 AB38 WORK PLATFORM

Before beginning any operation involving the Elevating Assembly the following checks should be carried out. When the AB38 has been thoroughly inspected the elevating assembly can then be used.

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

NOTE: Chassis controls are for service use only.

1. Enter Platform through the entrance at the side of the AB38 and ensure that the drop bar is in the lowered position. Lock the Entry Step in the raised position.
2. 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.
3. Ensure the 'ON/OFF/OVERRIDE' switch on the Upper Control Box switch is turned to the "ON" position and both emergency stop buttons are released (twisted clockwise).
4. Check the green "System OK" L.E.D. is illuminated. If not, and/or audible alarm sounds, check that the machine is level. None of the

three boom functions, nor the drive functions will operate if this is not correct.

5. Select "**BOOM 1**" on function selector switch. Check for overhead obstructions and when satisfied squeeze the red Interlock control on the Joystick. Slowly move the Joystick forward to **ELEVATE** Boom 1. 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.
6. Select "**BOOM 2**", "**TELESCOPE**" or "**ROTATE**" as required using the 'Function Selector Switch' and operate as described above. For boom functions the controls will again be forward for **UP** and backward for **DOWN**.
7. To rotate (**SLEW**) **RIGHT** the Controller Joystick should be moved forward. Conversely to rotate (**SLEW**) **LEFT** move the Controller Joystick backward.
8. To "**TELESCOPE**" **IN** the Controller Joystick should be moved forward. Conversely to "**TELESCOPE**" **OUT** move the Controller Joystick backward.
9. 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).
2. Climb into the Platform and check that the Platform Emergency Stop Button is in the 'ON' position, that the Keyswitch is turned to the 'ON' position and that the "**Drive/Lift Selector**" switch is positioned at **DRIVE**. 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.

- To **"STEER"** the AB38 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.

- 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.
- Position the **"Drive/Lift Switch"** to the **DRIVE** position.
- 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 switch, while the Keyswitch is held in the Emergency Override position (See Figure 3-1). This switch is for fine adjustment of the slave levelling cylinder. Care should be taken when performing this operation. The switch should be operated in short bursts to level the cage **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 procedure is to turn the Platform **"ON/OFF/OVERRIDE"** Keyswitch to the **'EMERGENCY OVERRIDE'** position, and hold it in this position while using the boom controls as normal to descend in a controlled manner to ground level. Do not begin to rotate until close to the ground.

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. A small step ladder can be used if necessary.



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. It should be noted that in order to activate any of the Lower Control Toggle Switches the Chassis/Platform Selector Switch, also located on the Lower Controls, must be turned and held in a clockwise position.
3. 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.

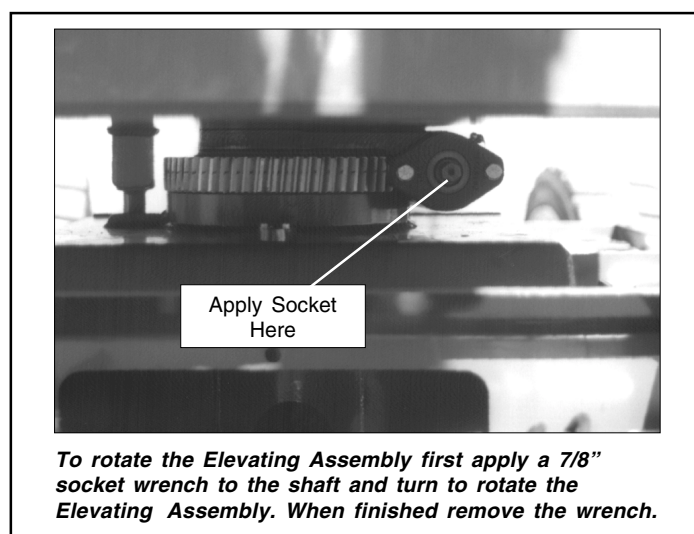


Figure 3-3: Manual Rotation

MANUAL TELESCOPIC RETRACTION (SEE FIGURE 3-4)

NOTE:

Manual Tele Retraction is not required, and hence is not provided for ANSI machines.

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.

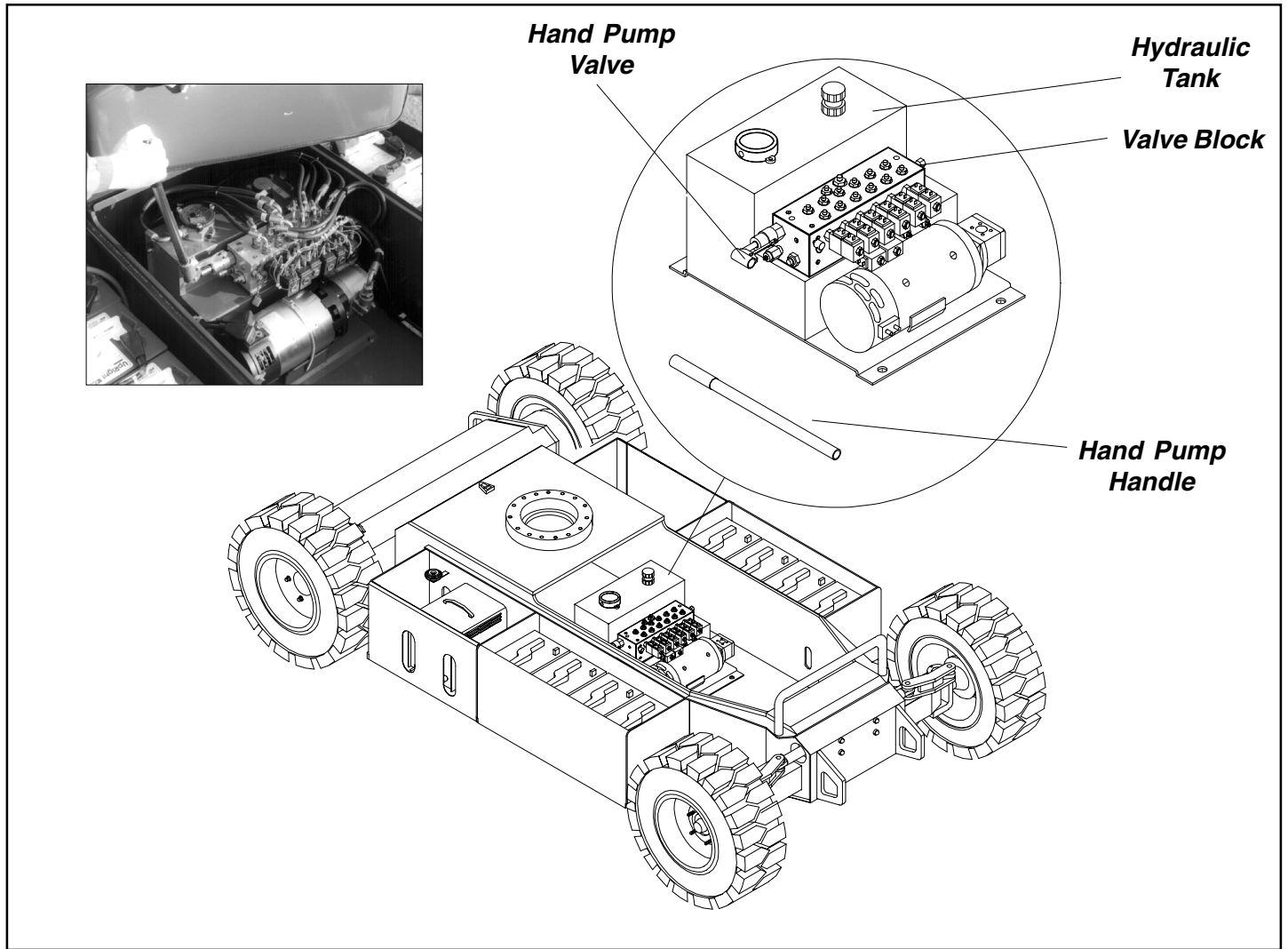


Figure 3-4: Manual Telescopic Retraction

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 AB38 Work Platform.

This section contains instructions for the maintenance of the AB38 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 AB38 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 AB38 Work Platform.

- 1 x Multi-meter capable of reading Voltage, Ohms and Amps.
- 1 x Hydraulic Pressure Gauge
- Range (0 - 3000 PSI)

An optional item also recommended by **UpRight** is the MOS90 Calibrator.

- 1 x 57128-000 Calibrator - A test and analysis instrument for the D.C. motor Control Unit.

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.
Never perform maintenance on a machine when it is 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.

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.	Daily			
	Check the exterior of cable for pinching, binding or cable wear.	Daily			
Tyres / Wheels	Check for damage.	Daily			
	Check/torque nuts - Front: 200 Nm (150 ft. lbs) Rear: 130 Nm (95 ft. lbs)	50h/30d			

COMPONENT	INSPECTION OR SERVICES	INTERVAL	Y	N	R
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			
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.	50h/30d			
	Retorque to 220 Nm (160 ft. lbs).				
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.
- Avoid intermittent charging as the batteries develop a memory effect similar to Nicad batteries.

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.
4. AC Voltage Selector Switch (110/220V) is in the correct position.

All UpRight battery operated Work Platforms, including the AB38 can operate at ambient temperatures to a value of -20°C (-4°F). However for this there are two provisions which must be met.

- The ISO#46 grade of hydraulic oil normally used in UpRight Work Platforms must be replaced with a grade suitable for these low temperature conditions.
- When ambient temperatures fall below 18°C (65°F) batteries cannot deliver 220 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.

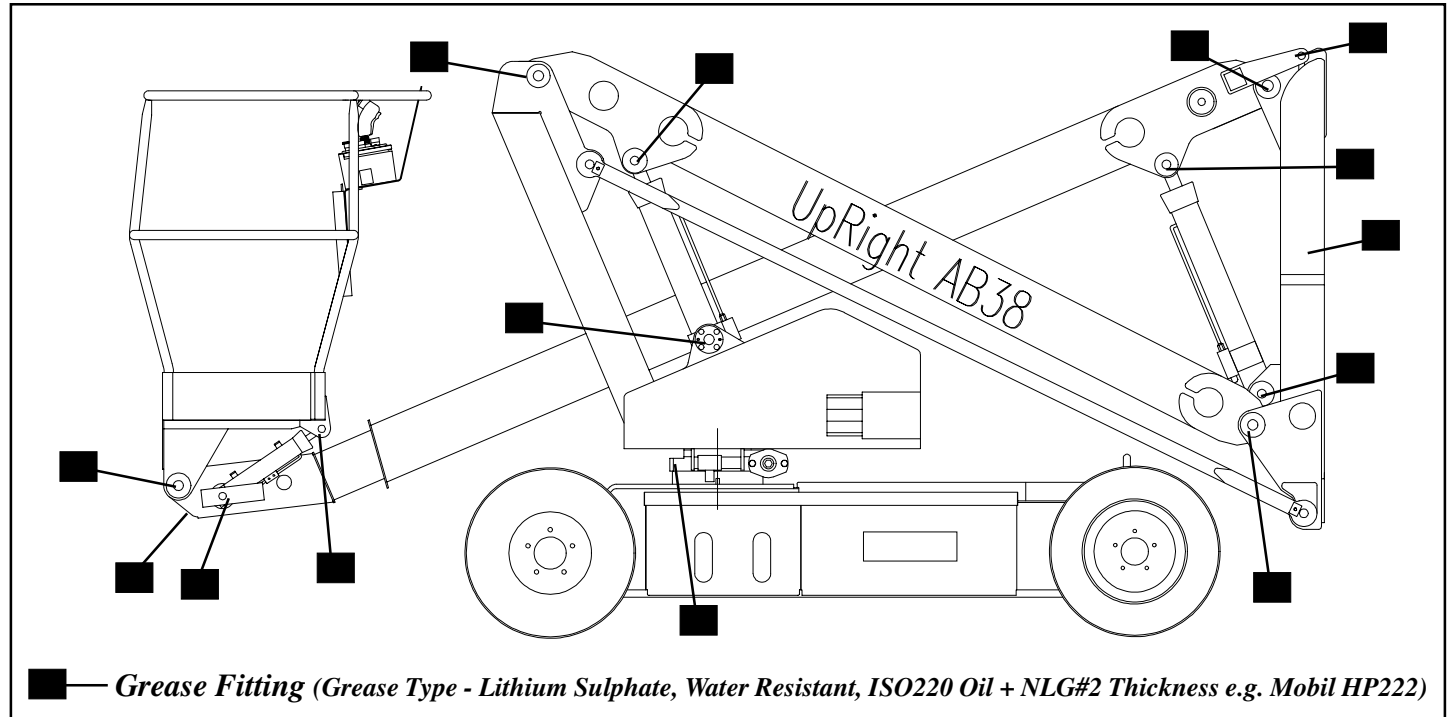


Figure 4-1: Lubrication Points

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	2
Total	22

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.

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.

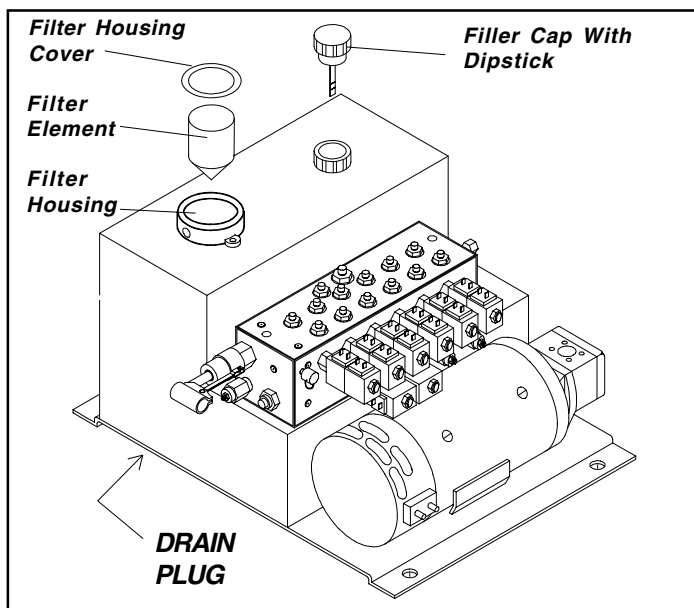


Figure 4-2: Oil and Filter Replacement

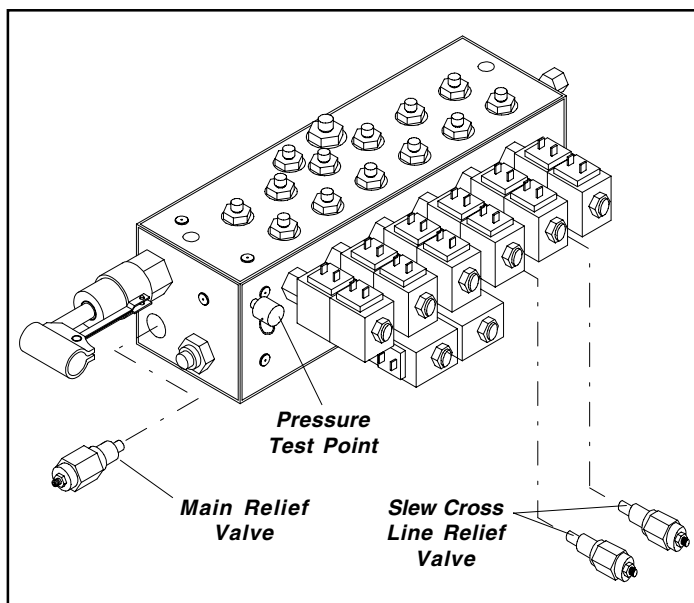


Figure 4-3: Manifold Block

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 145 Bar (2105 p.s.i.) pressure.
7. Release the Telescope RETRACT switch.
8. Tighten locknut on main relief valve while holding the adjusting screw in position.

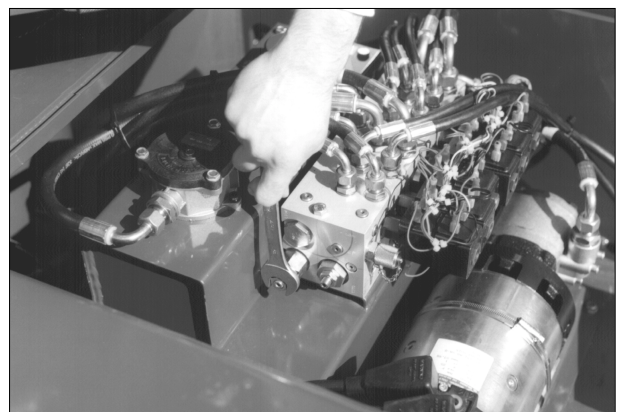


Figure 4-4: Setting Main Relief Pressures

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 360° 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.

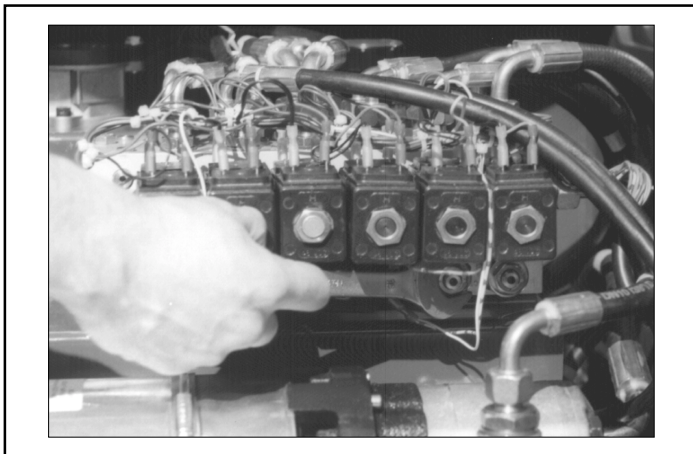


Figure 4-5: Setting Cross-Line Relief Pressures

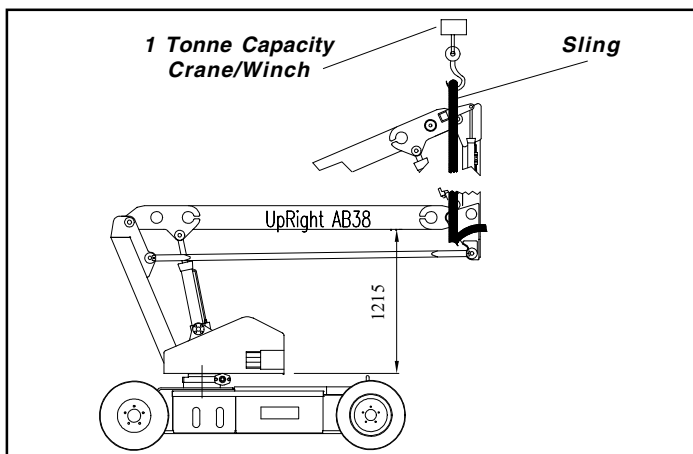


Figure 4-6: Supporting Elevating Assy.

AB38 Work Platform

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 crange 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. Position Lower Control Boom 1 Switch to "UP" 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. Push Lower Control Boom 1 Switch to "DOWN" and gradually lower the platform until Lower Boom is supported by the sling.

REMOVAL OF ELEVATING ASSEMBLY SUPPORT

1. Push Lower Control Boom 1 Switch to "UP" position and gradually raise the platform until the sling can be removed.
2. Remove the sling.
3. Push Lower Control Boom 1 Switch to "DOWN" and completely lower platform.
4. Turn Key Switch to "OFF"

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

TILT SENSOR

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. The Tilt Sensor has three wires; red-power (48V in), black-ground and white-output (48V out).

Location: The Tilt Sensor is fitted in the rear Chassis alcove and is a vital part of the electrical equipment.

Adjustment: To verify the sensor is working properly there are two LED's under the sensor; green indicates the sensor is on (has power), red indicates the sensor is level and that the white wire is 'hot' (48V out).

To adjust the mechanism of the Tilt Sensor, (but not the value of tilt allowed), the following procedure can be followed:

1. Place the machine on firm level surface $\pm 0.25^\circ$.
2. Use Inclinator to ensure that the front and rear of the Chassis are level to within $\pm 0.25^\circ$.
3. Using a bubble level adjust the three levelling locknuts on the Tilt Sensor, until the bubble is centred.
4. Elevate the platform until the Boom Rest Switch opens and depress the Interlock Switch on the Joystick. Ask a colleague to push the tilt sensor base to test the alarm circuit. The alarm should sound. If the alarm does not sound readjust the Tilt Sensor until the alarm does sound.

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 AB38 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.

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.

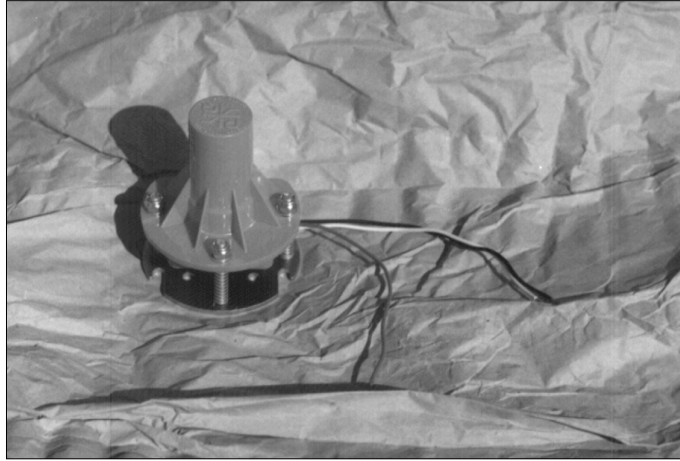


Figure 4-7: Tilt Sensor

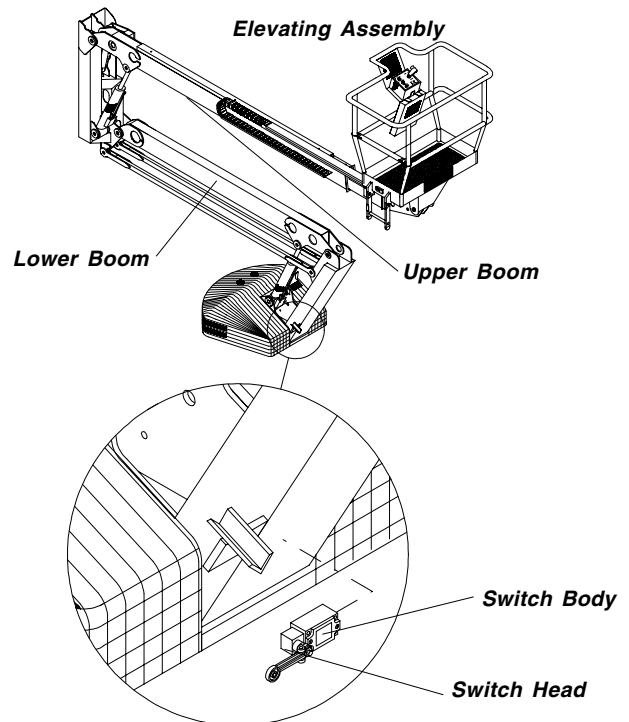


Figure 4-8: Boom Rest Limit Switch

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 reservoir.
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.

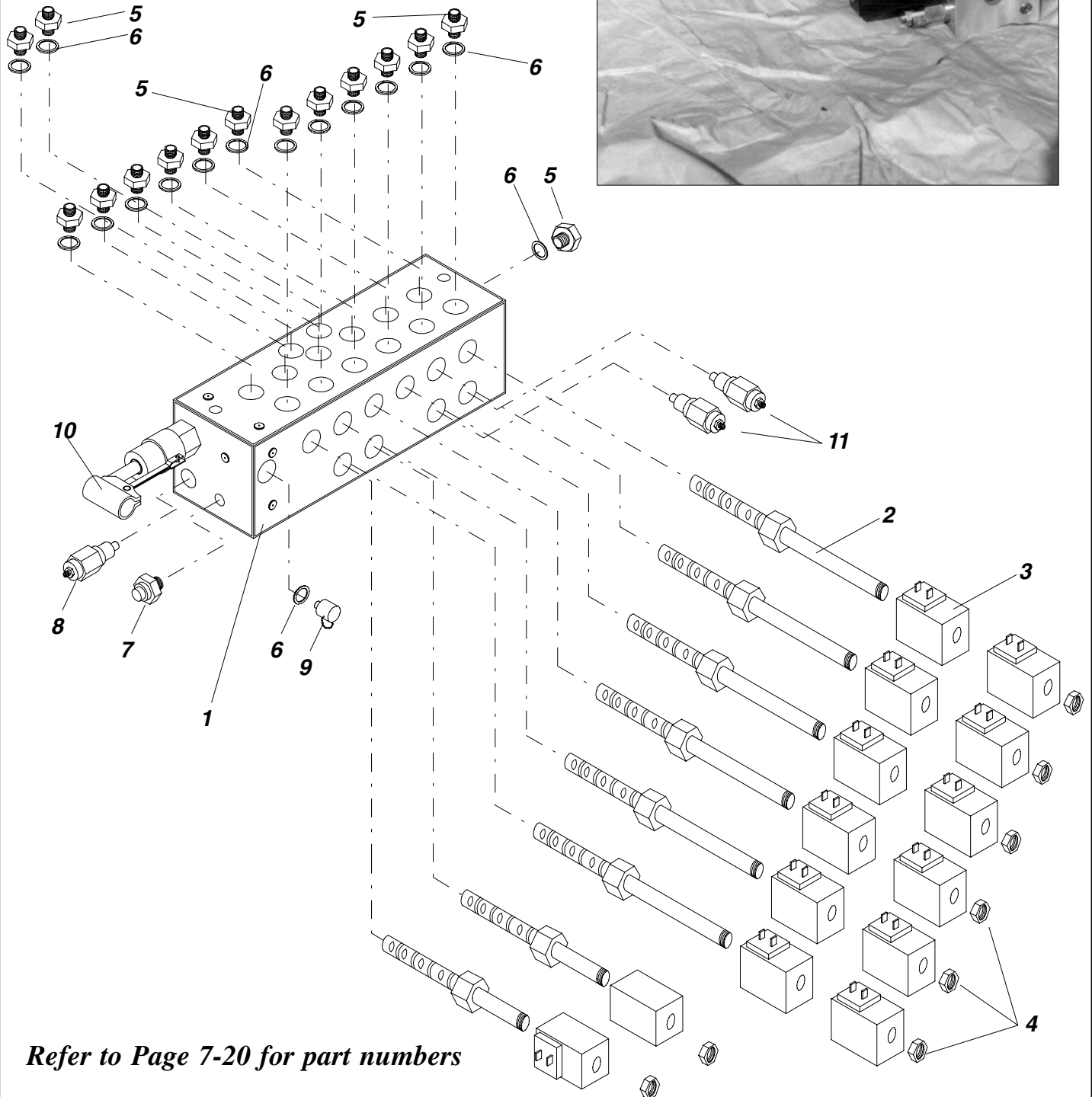
1. Install fittings, plugs and bonded seals.
2. Install the solenoid valves and tighten the coils on to the valves.
3. Install the Main Relief Valve and the Slew Cross- Line Relief Valves .

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 3.4 Nm (2.5 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.

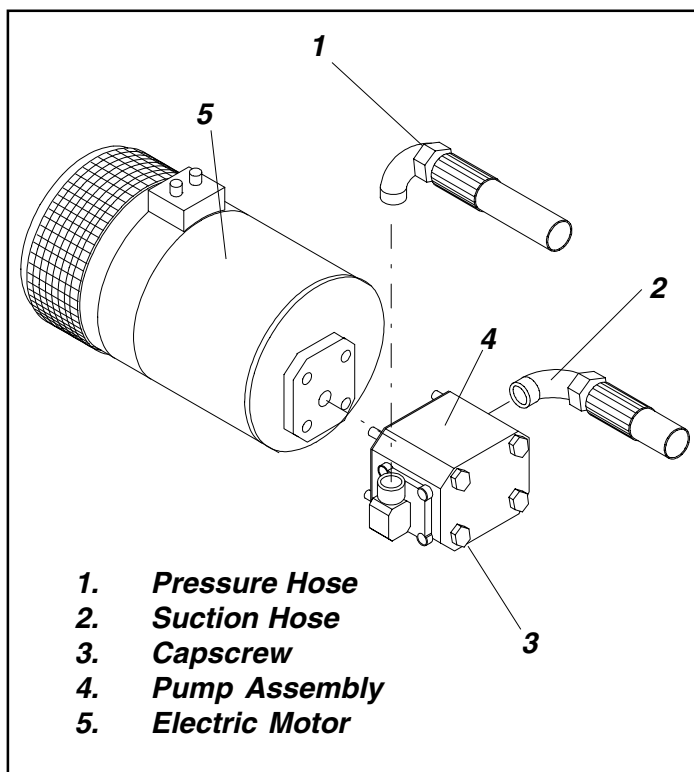


Figure 4-10: Hydraulic Pump

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.

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

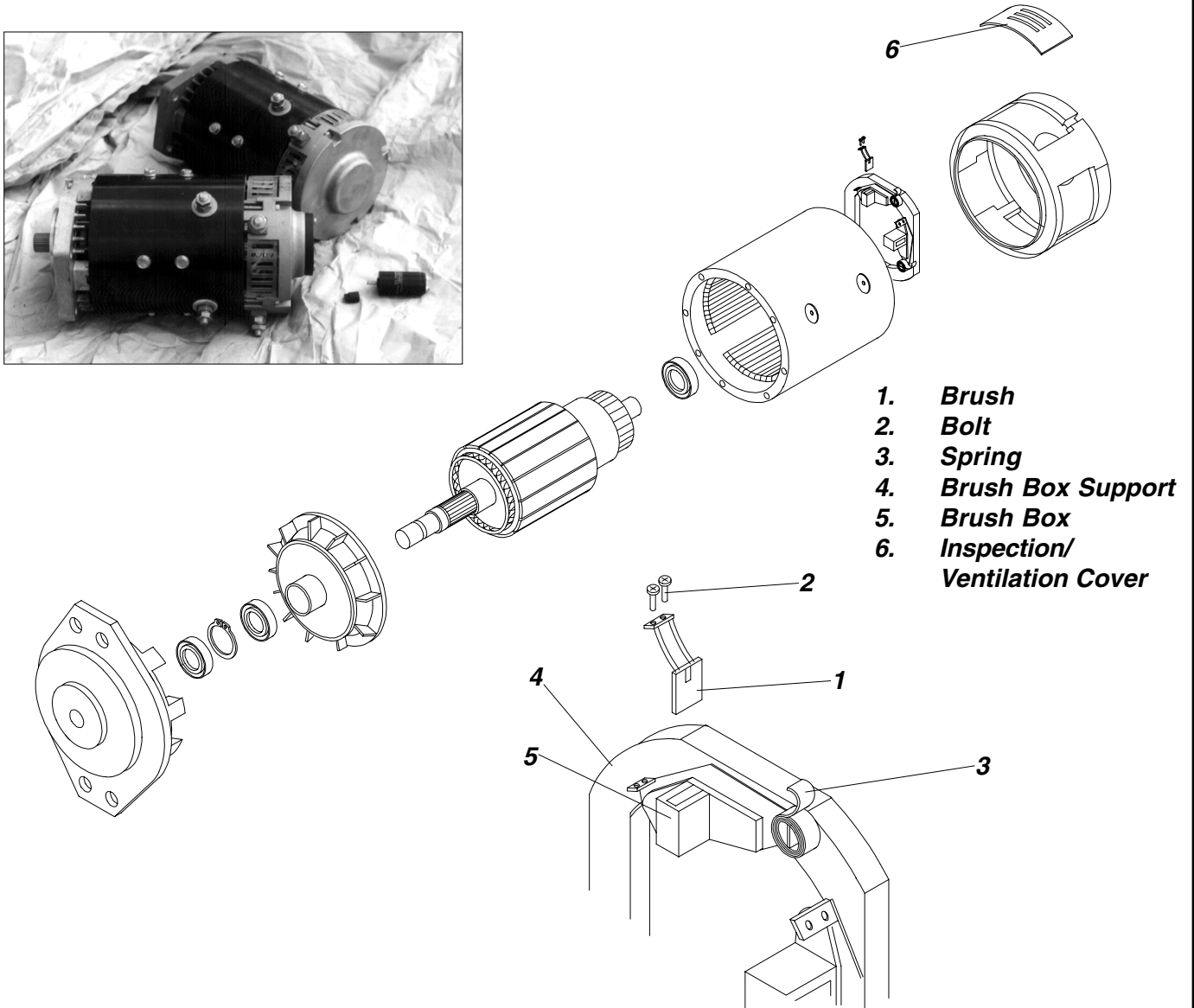


Figure 4-11: Traction Motor Maintenance

4.11 Electric 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.

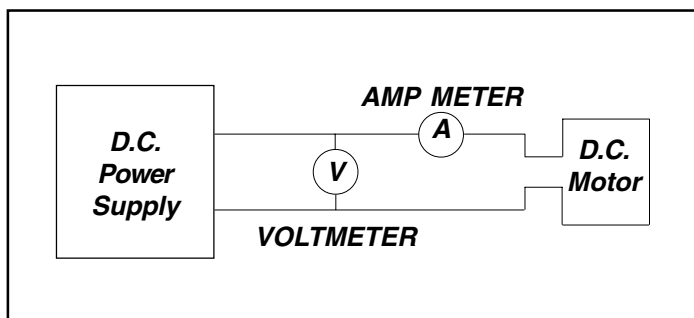


Figure 4-12: Electrical Test Circuit

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. |

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

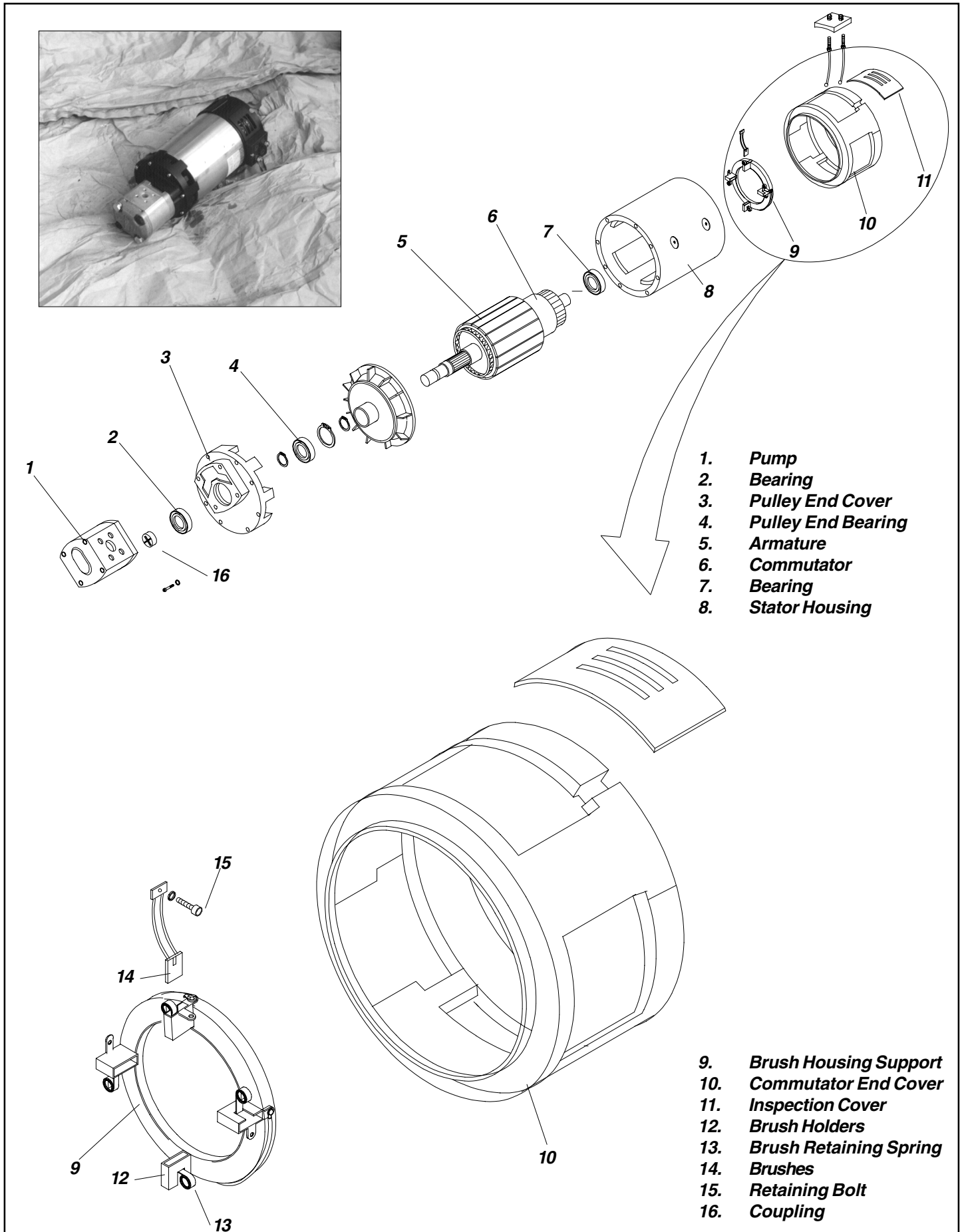


Figure 4-13: Electric Motor Assembly

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 2500 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 regulations.

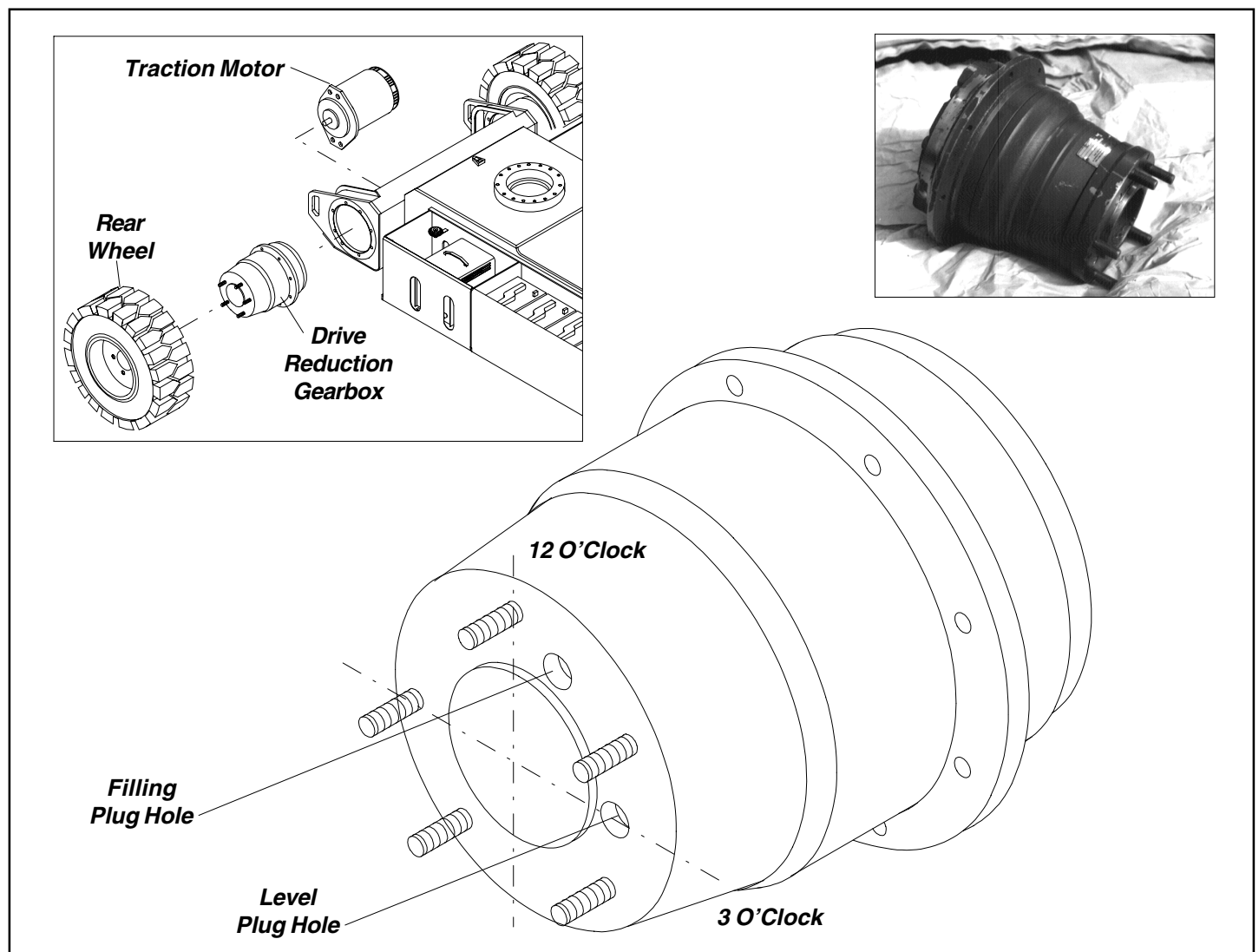


Figure 4-14: Drive Reduction Gearbox

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 AB38 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.
5. Loosen the five wheel nuts securing the Wheel Assembly to the Gearbox studs.
6. Jack up the rear of the AB38 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.

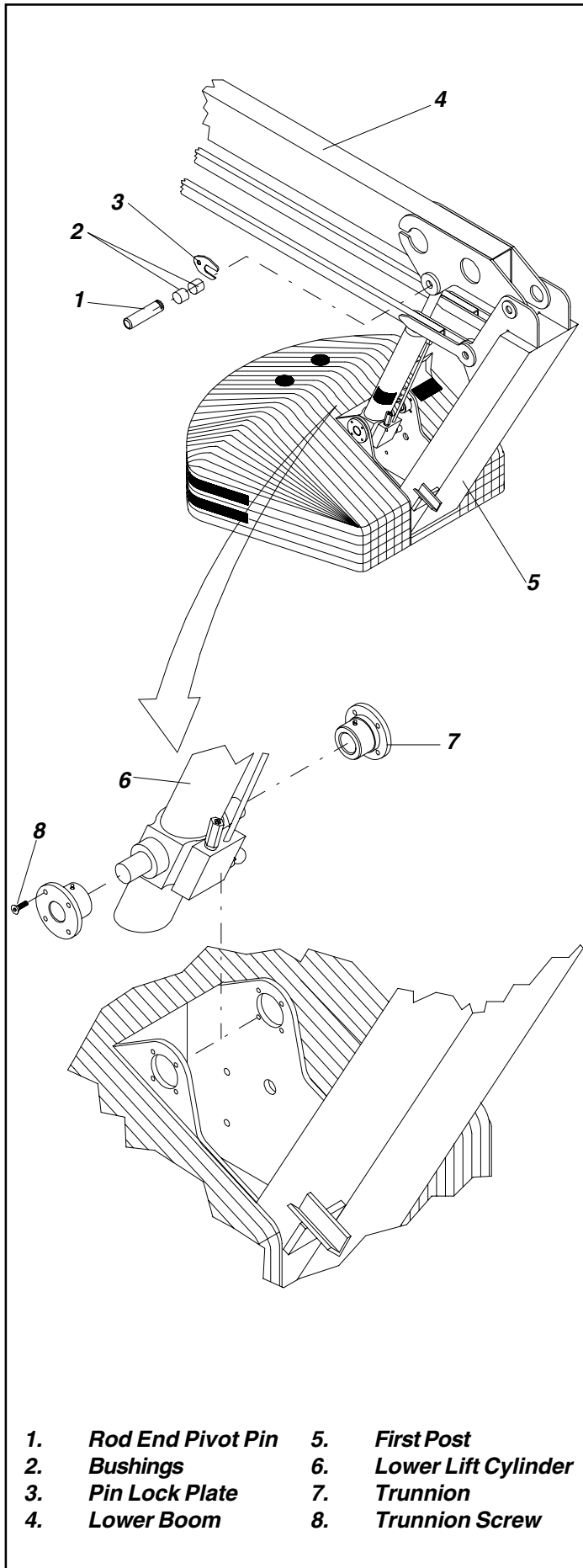
4.13 Torque Specifications**RETAINING BOLTS**

Use the following values to torque bolts used on UpRight's AB38 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 |

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 AB38 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 8 mm 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

Figure 4-15: Lower Lift Cylinder

- 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 shoes a sample cylinder breakdown for the Upper Lift Cylinder. Component Breakdowns of the other cylinders are shown in the Illustrated Parts Breakdown.

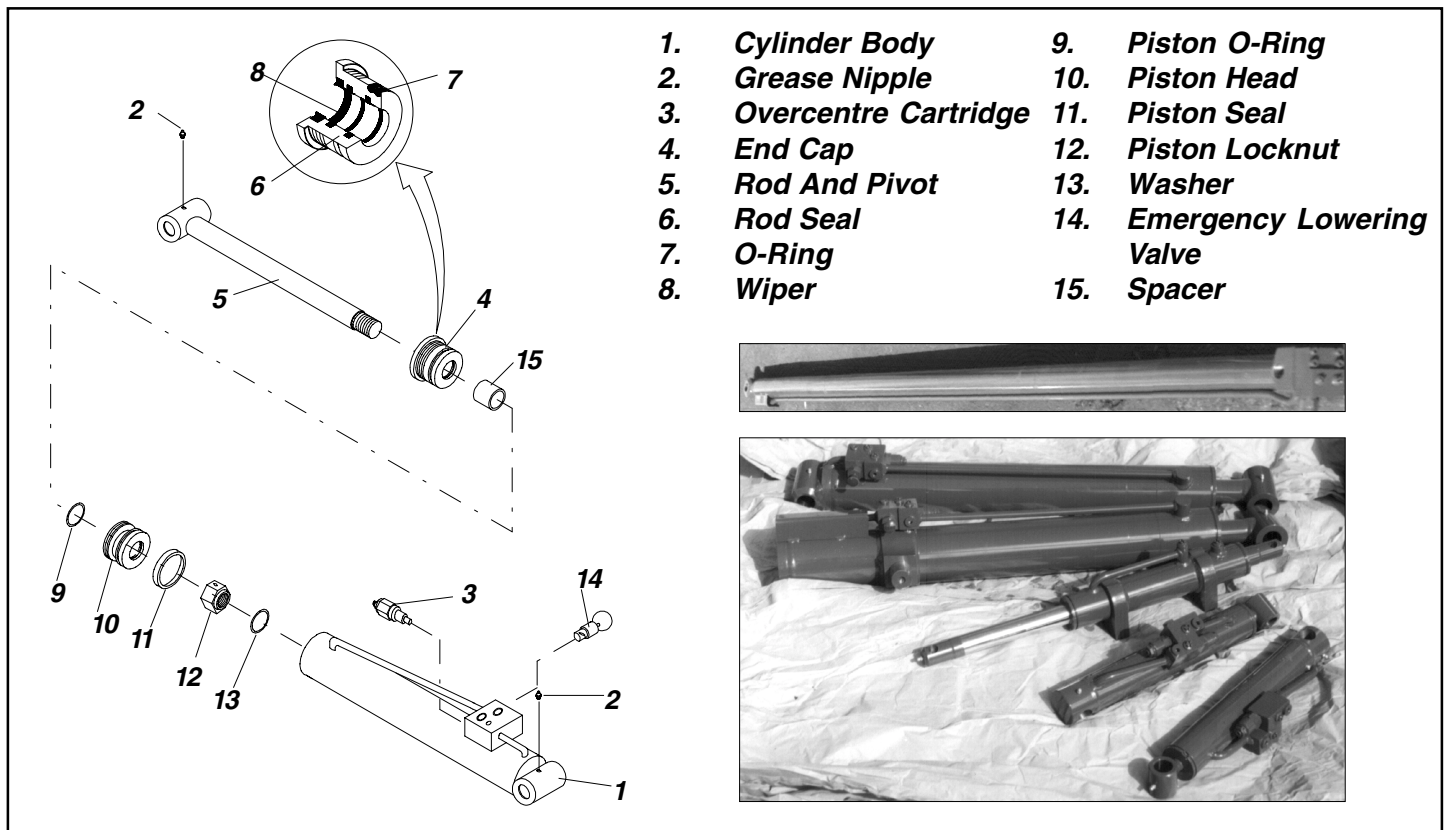


Figure 4-16: Hydraulic Cylinder Component Breakdown

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 AB38 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

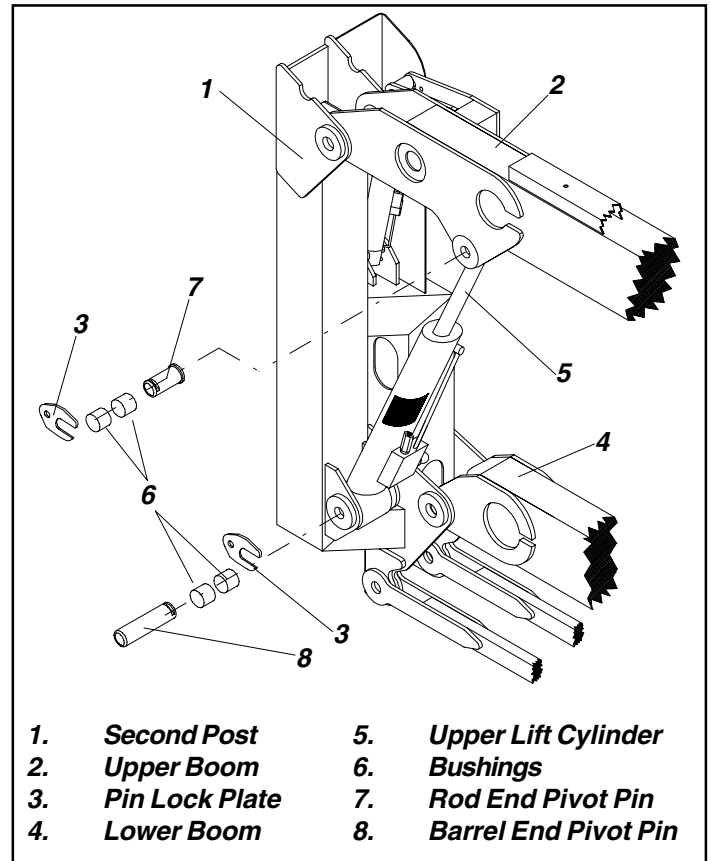


Figure 4-17: Upper Lift Cylinder

- 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 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.

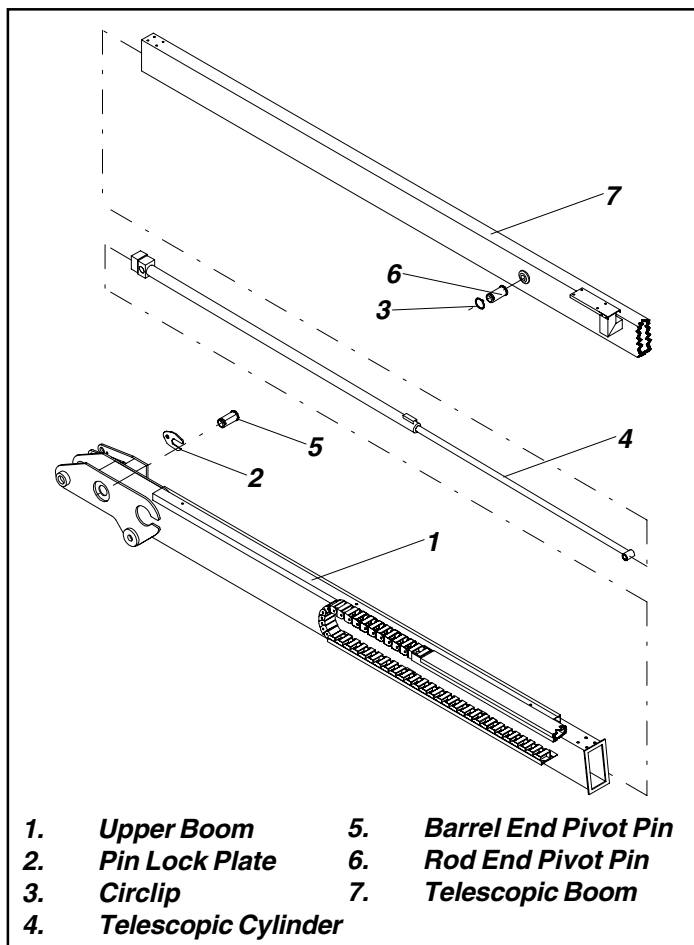


Figure 4-18: Telescopic Cylinder

4.16 Telescopic Cylinder (Figure 4-18)

REMOVAL

1. Ensure that the AB38 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 AB38 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 AB38'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.

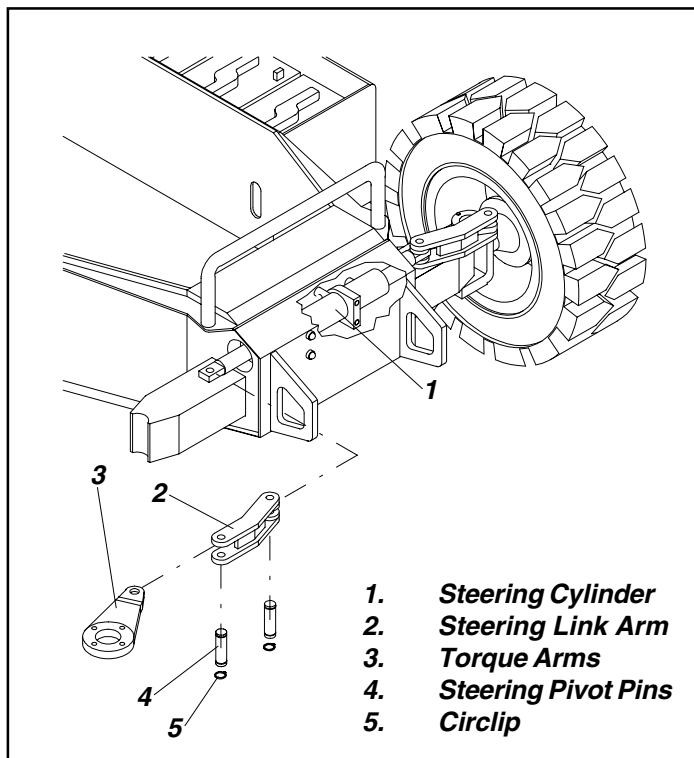


Figure 4-19: Steer Cylinder

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 AB38'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 70 Nm (52 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.

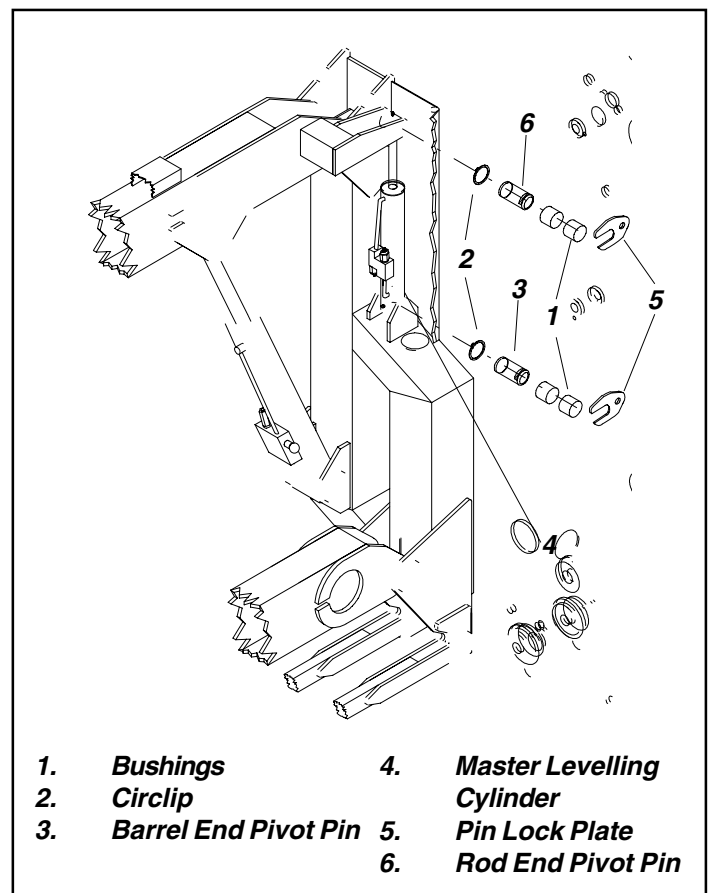


Figure 4-20: Master Levelling Cylinder

4.18 Master Levelling Cylinder (Figure 4-20)

REMOVAL

1. Ensure that the AB38 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 AB38 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.

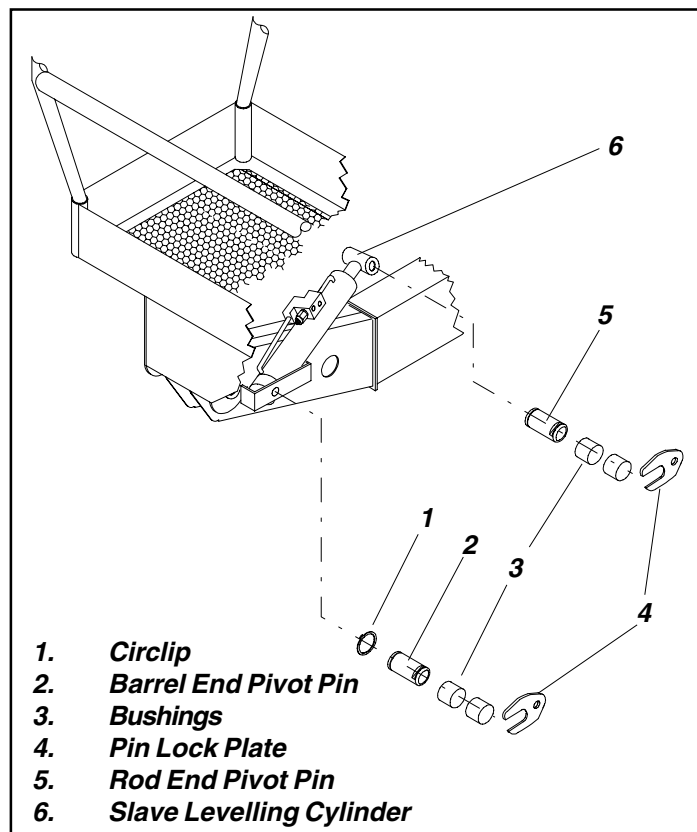


Figure 4-21: Slave Levelling Cylinder

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 (the Keyswitch must be held to the Emergency Override position) in the forward direction. Continue this until, and for 30 seconds after, the Platform comes to a stop.
2. Activate the Levelling Switch 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.

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 AB38 Lift Cylinders (Figure 4-22)

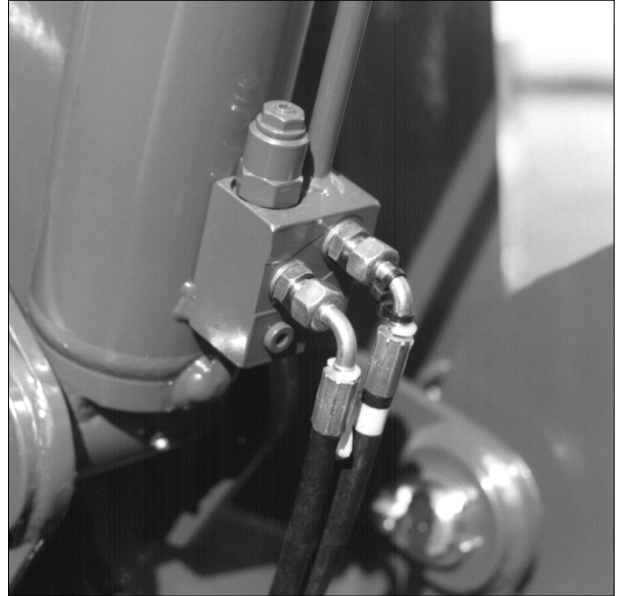
The valve supplier delivers the Overcentre valve preset to specification and **SHOULD NOT** be adjusted by the user.

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.



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

Figure 4-22: Overcentre Valve



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.

NOTES:

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 **UpRight Product Support** at:

UpRight Ireland	@	Tel: +353-1-202-4100
		Fax: +353-1-202-4105
UpRight Inc. U.S.A.	@	Tel: +1-209-891-5200
		Fax: +1-209-896-9244

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 *AB38 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 UpRight 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, including the Emergency Override 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 5.4.
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.

PROBLEM	PROBABLE CAUSE	REMEDY
All functions inoperable. Electric motor does not start.	1. Blown Electric Motor Fuse FU2.	Check 325A electric motor fuse. 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. Blown control Fuse FU3.	Check 7A circuit control fuse. Replace if blown.
	7. Connecting Plug at Upper Control Box loose.	Check connection and retry.
	8. 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. Check LED on Pump MOS90 for 5 flash fault (LED flash 5 times) due to Line Contactor not closing when selecting a function.	Check Line Contactor for mechanical operation and coil is functioning. Repair or replace if necessary.
	4. Check LED on Pump MOS90 for 8 flash fault.	Allow unit to cool down, to clear flashing. LED will flash 8 times due to thermal cutback.
	5. Faulty Lift Valve Solenoid.	Test Lift Solenoid, if proper voltage is present and coil unmagnetized - Replace the Solenoid.
	6. Faulty Controller at upper controls.	Check functionality of controller. Replace the Controller if faulty.

PROBLEM	PROBABLE CAUSE	REMEDY
	7. Battery Voltage. Check LED on Pump MOS90 for 7 flash fault.	Check Battery Voltage. Charge if necessary. Voltage must be greater than 14V. LED will flash 7 times due to battery voltage being too low.
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.	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	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.	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 FU1 and/ or FU3 blown.	Check fuses and replace if necessary

PROBLEM	PROBABLE CAUSE	REMEDY
	2. Check LED on Traction MOS90 for 8 flash fault. LED will flash 8 times due to thermal cutback.	Allow unit to cool down, to clear flashing.
	3. Check LED on Traction MOS90 for 11 flash fault. LED will flash 11 times because tachometer is disconnected or leads on the wrong way.	Check tachometer leads for secure connection or reverse the leads.
	4. Check LED on Traction MOS90 for 4 flash fault. LED will flash 4 times due to direction contactor welded.	Check direction contactor tips and free or replace if welded.
	5. Loose electrical connection on drive motor or motor control units.	Check all electrical connections relating to the drive system for security.
	6. 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.
	7. Brakes engaged Brake solenoid V1 (CT11) is not energising to prime the brake lines.	Check that the coil of V1 is energised for approximately 4 seconds, by a delay module, when 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.
	8. Drive Reduction Gearbox has seized due to lack of oil.	Replace gearbox and ensure proper oil level is maintained.
	9. Brake Valves out of adjustment.	Adjust Brake Pressure Reduction Valve to 100 Bar.
	10. Defective Drive/Lift Switch.	Check switch for function, continuity. Replace as required.
	11. 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.

PROBLEM	PROBABLE CAUSE	REMEDY
	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.	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 AB38 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 General Information.

The AB38 uses two (2) **DC Motor Control Unit's**. The **Pump Motor Control Unit** controls the operation of the hydraulic pumps electric drive motor while the **Traction Motor Control Unit** controls the speed of operation for the two (2) electric traction motors.

These motor control units will power the electric motor at a speed that depends on;

1. The signal from the lower or upper controls.
2. The preprogrammed software inside the MCU.

Many names are also commonly used for these DC motor controllers, the most common are **Quadrapower** or **MOS90**.

To distinguish between the two types used on the AB38 we call them the **Pump MOS90** and the **Traction MOS90**.

The name Quadrapower was a supplier reference originally emblazoned on the unit while the name MOS90 relates to the technology behind this system of providing variable, multidirectional, control of a DC motor. The basic principle of this system is to deal with a high current (resulting in a high temperature) in a compact and energy efficient manner. The main component in a MOS90 is a MOSFET transistor (metal oxide semiconductor field effect transistor). The MOSFET can deal with very high currents, quickly rid itself of high temperatures and all in a very efficient manner (up to 95%). All this despite its small physical size.

The AB38 control circuit operates at 48V. The circuit is limited to 7A by the control fuse. The components used are relays, diodes, selector/limit switches, motor contactors, the joystick, alarm and tilt sensor. Between the components UpRight generally use a 0.75 mm² (AWG 20) cable and P.C.B's (Printed Circuit Boards). The P.C.B. connectors are of the MOLEX type.

5.3 D.C. Motor Control - Information

DESCRIPTION

DC motor control is one way to achieve smooth proportional control of an electrically powered work platform. It can be regarded as the opposite of the more familiar "constant rpm electric motor" turning a hydraulic pump at a constant speed. In that instance the speed of the function is controlled by the proportional valve, allowing more or less hydraulic fluid to the e.g. lift cylinder depending on the angle of the joystick.

With DC motor control we are doing the opposite, but still achieving the same objective. By controlling the r.p.m. of the electric motor we are controlling the amount of hydraulic fluid the pump will deliver, or the speed at which the elevating assembly will e.g. lift.

OPERATIONAL THEORY

The basic DC motor controller has three connections: Positive (B+), Battery Negative (B-) and Motor Field Negative (A). This is used on the AB38 as the 'Pump Controller'. So how does this work?

The electric motor has continuous battery positive (B+) over the main fuse. Inside the DC motor controller we have high current MOSFET transistors & capacitors and the low current control circuitry, made up of integrated circuits (IC's). By controlling the amount of time when Battery Negative (B-) and Motor Field Negative (A) is "connected" - the electric motor will turn at an r.p.m. equal to the same. Or simply:

- If (B-) and (A) are connected all the time - then the motor will turn at 100%
- If (B) and (A) are not connected - then the motor will turn at 0%
- Anything in between will turn the motor at any speed between 0 to 100%.

i.e. the Controller acts as a Switch.

TERMINOLOGY

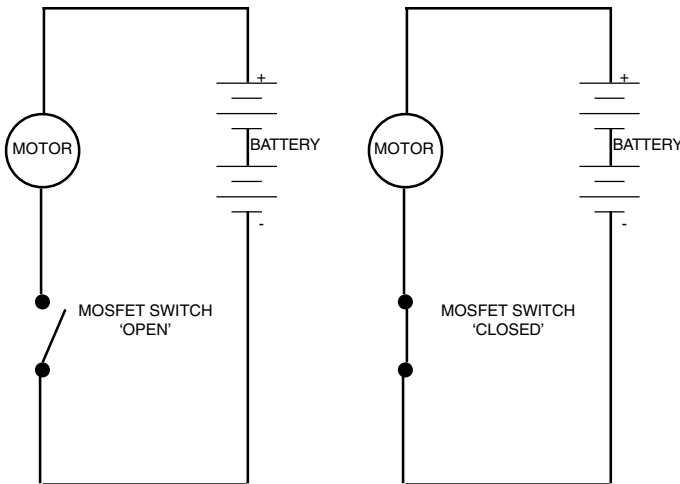
The reference points used on the electrical schematics e.g. JP1 (Junction Point #1) and Pin 1 (connection pin #1) have the following meanings:

- JP is a cable harness connector, e.g. between P.C.B. and multi-connector
- PIN is the pin number of the P.C.B. or on the MOS90.

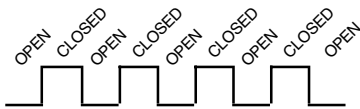
The software of the MOS90 is related to the various functions as follows:

- e.g. Speed 5 is the #5 internal speed setting of the Pump MOS90.
- e.g. Switch 5 (sw5) is the logical switch in the software enabling Speed 5.

This Switch has the ability to open and close '**PULSE**' very rapidly

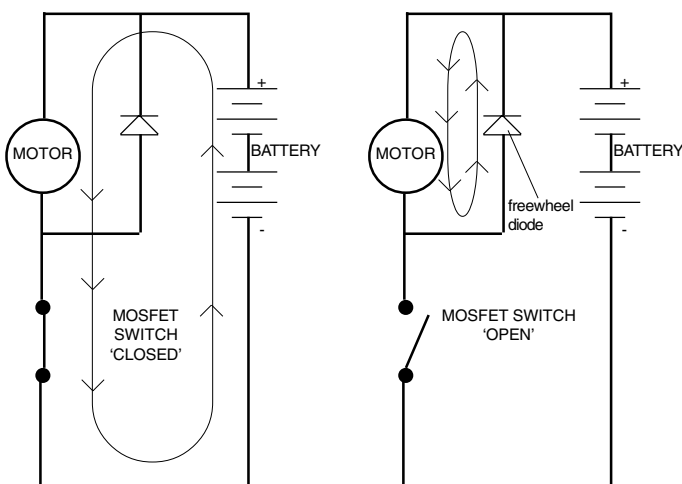


The resultant pulses of voltage through the MOTOR will then look like this, and the number of pulses per second will determine the average motor voltage.



However, because of inherent efficiency problems with this type of circuit alone, the circuit more resembles the one below with the addition of the freewheel diode. This is explained as follows;

When the MOSFET switches open, the motor current passed to battery negative is reduced. And because the circuit is no longer complete the load on the motor will slow the armature of rotation. During this slowing the energy previously used is lost and so to counteract this the properties of a diode are used. This 'freewheel diode' dissipates and reuses the 'energy' back through the motor.



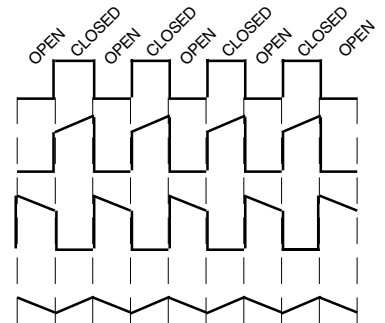
(Equal pulses of open & close as follows relates to a MOS90 Controller outputting to the motor to give half speed.

'PULSES OF VOLTAGE'

'BATTERY CURRENT'

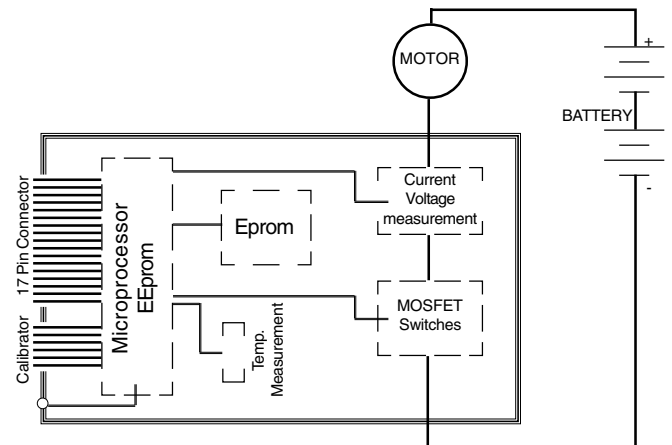
'FREEWHEEL CURRENT'

'MOTOR CURRENT'



At low speed the MOSFET is mostly open and most of the current is from 'freewheel'.

At high speed the MOSFET is mostly closed and most of the current is from the battery.

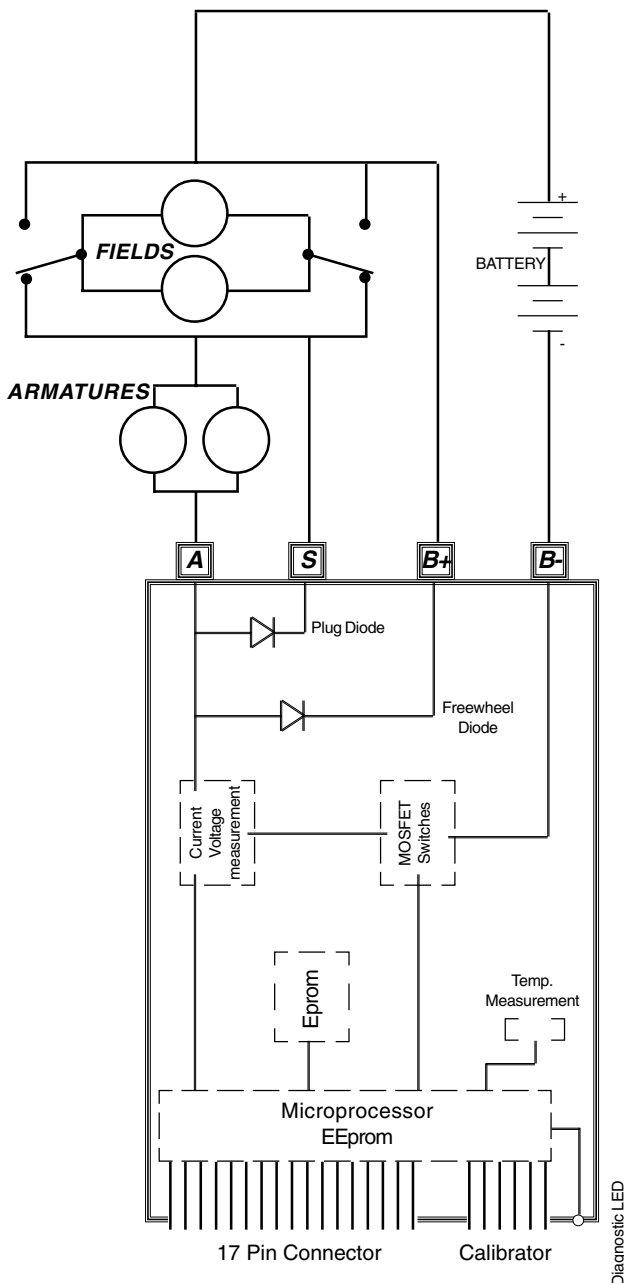


The above picture shows the principle of how the Pump MOS90 then controls the DC Electric Motor, which in turn provides the power to the pump. Hence, this is why UpRight refer to this type as a 'Pump MOS90'.

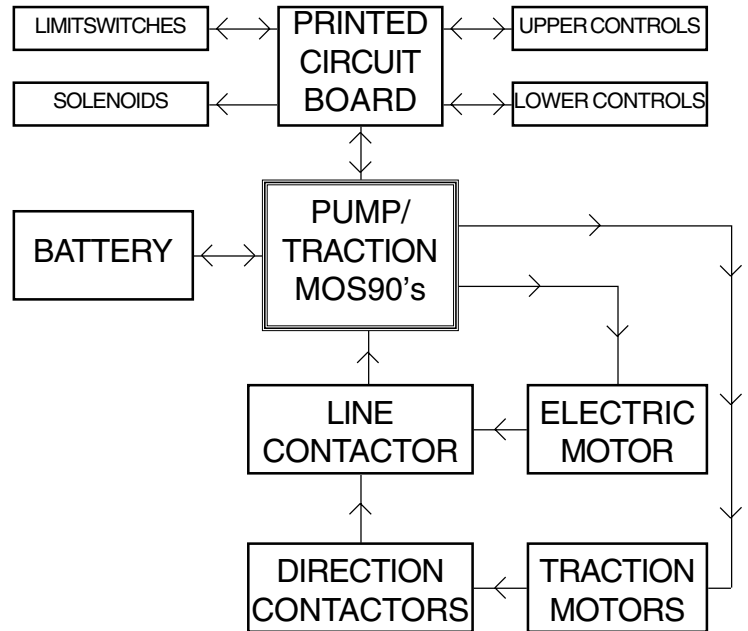
But there are two MOS90 Controllers used on the AB38, the 'Pump MOS90' and the 'Traction MOS90'. The power frame and the operation of a Traction MOS90 is much the same as previously described for the Pump MOS90. The differences are that the Traction MOS90 has four terminals (**A**, **S**, **B+** & **B-**), which are connected to two Traction Motors wired in parallel. A Traction Motor, as represented on the following page, embodies (in an electric sense) a 'Traction Motor Armature' and a 'Traction Motor Field' connected in series. This allows the machine to drive in both directions.

This is achieved by using a pair of changeover contactors (Direction Contactor **DC1**) which can change the direction of the current in the traction motor field, and hence the direction in which the machine will travel.

The primary visual difference between the two Controllers is that the Traction MOS90 has an extra terminal (**S**). The function of this terminal is to connect the 'Traction Motor Armature' (A1 and A2 on the Traction Motors) to the cathode of a diode inside the Traction MOS90. This diode, the plugging diode, is then used to give a signal to the processor within the Traction MOS90 indicating when the machine is stopping and that the Brake must be applied. A diagram of how the Traction MOS90 differs is shown below. (Machine at Rest).



Below the basic principle (block diagram) of how the MOS90's relate to the rest of the electrical system. The Electrical Schematic in **Section 6** explains the functions and positions of all components in more detail.



5.4 Trouble shooting the motor control unit (The MOS90)

Important basics applicable to the motor control unit:

- The MOS90 has a green diagnostics L.E.D. in the front panel.
- The green L.E.D. will turn on and shine continuously when the MOS90 is powered up and working correctly.
- The green L.E.D. will be off if no power is being supplied to the MOS90.
- The green L.E.D. will flash a sequence of flashes if the MOS90 is damaged or is receiving an improper signal from the machine circuit. An explanation of the flash sequences or “flash faults” is shown in the table below.
- The MOS90 is **high temperature protected**, called “**thermal cutback**”. The high temperature cutback starts at 80°C (175°F) and the MOS90 will shut down at 90°C (195°F). This is a gradual feature and the symptom is: powered functions will gradually operate slower and slower. Continuing operation at high temperature will damage the MOS.

- The MOS90 is **low voltage protected**, called “**low voltage cutout**”. The low voltage cutout shuts the MOS90 down as soon as the input voltage is below 14.0VDC. This is an instant feature and the symptom is: powered functions suddenly stop. As soon as the input voltage goes above 14.0 VDC it will resume normal functions.
- The PUMP MOS90 has a B.D.I. system (Battery Discharge Indicator System), connected to the red L.E.D. on the upper control box. The B.D.I. system monitors the input voltage and will inform the operator when the batteries are discharged.

Normal operation: The red L.E.D. is off.

70% Discharge: The red L.E.D. will flash.

80% Discharge: The red L.E.D. will be continuously on.

- The B.D.I. will not show how much battery power is left, it only shows how much the batteries have been discharged from the starting time.

Table 5-2 Pump MOS90 Flash Faults

L.E.D. Status	Manufacturers Technical Reason	Possible cause
No L.E.D	MOS90 did not turn on.	MOS90 did not receive an input voltage on PIN # 6 (power input pin) or received less than 14V.
1 Flash	EEPROM corruption.	The MOS90 has been damaged by a voltage spike.
2 Flash	not applicable.	not applicable
3 Flash	(a) Internal short circuit (b) Motor circuit open	(a) Line contactor not activated (b) Motor burned / bad contact
4 Flash	not applicable	not applicable
5 Flash	not applicable	not applicable
6 Flash	(a) Accelerator input wrong (b) Accelerator input wrong	(a) Bad connection on PIN #14 (b) PIN #14 input >4.5V or < 2.4V
7 Flash	Battery voltage <14.0V	Batteries low - need charging
8 Flash	Thermal cutback	The MOS90 temp. is too high

Table 5-3 Traction MOS90 Flash Faults

L.E.D. Status	Manufacturers Technical Reason	Possible cause
No L.E.D	MOS90 did not turn on.	MOS90 did not receive an input voltage on PIN # 6 (power input pin) or received less than 14V.
1 Flash	EEPROM corruption.	The MOS90 has been damaged by a voltage spike.
2 Flash Driving	Incorrect start sequence	DRIVE selected at power up
2 Flash Idle	Both forward and reverse have been selected	Forward/Reverse contactor or Joystick defective
3 Flash Driving	Contactor coil short circuit	Battery line contactor defective
3 Flash Idle	(a) Internal short circuit (b) Motor circuit open	(a) Line contactor not activated (b) Motor burned / bad contact
4 Flash	Forward/Reverse contactor damage	Forward/Reverse Contactor stuck ON
5 Flash	Forward/Reverse contactor open	Forward/Reverse Contactor stuck OFF
6 Flash	(a) Accelerator input wrong (b) Accelerator input wrong	(a) Joystick defective (b) PIN #14 input >4.5V or < 2.4V
7 Flash	Battery voltage <14.0V	Batteries low - need charging
8 Flash	Thermal cutback	The MOS90 temp. is too high
9 Flash	not applicable	not applicable
10 Flash Driving	Tacho Error	Bad connection/no output
11 Flash Driving	Tacho Error	PCB Tacho Circuit defective

General guide lines when a flash error occurs

Step 1

Disconnect the 17 pin multi-connector from the MOS90. Wait 5 seconds and plug it back in again. If the flash error stays go to Step 2. If the green L.E.D. lights up and stays on continuously - test all functions, try to recreate the problem.

Step 2

Disconnect the 17 pin multi-connector from the MOS90. Connect pin #6 to fused battery supply (min. 14VDC) and observe the green L.E.D. If flash error stays - replace MOS90. If the green L.E.D. lights up and remains on continuously - check wiring.

NOTE: Troubleshoot the flash error as per “possible cause” before replacing the MOS90, e.g. 8 flash fault will cure itself with time (as the MOS90 cools down).

5.5 Using The Calibrator

The calibrator is not just an extension to the MOS90 for looking at and adjusting the personalities, it is also a useful diagnostic tool. A MOS90 Calibrator can be used on Traction or Pump Controllers. The screen of the calibrator that UpRight use has 20 LED segments and they are marked as listed opposite (a picture of the calibrator is also shown). The values which should be expected when checking the AB38 Work Platform are shown on the following page.

There are three buttons on the calibrator :

increment, marked with a +
decrement, marked with a -
select

When select is pressed, each LED segments will light in turn, stopping when the select button is released. Each personality can then be incremented or decremented using the + or - buttons when the LED adjacent to that personality is lit.

When the '**TEST**' LED is lit, the operator can view the state of the MOS90 inputs. The first input displayed is the accelerator and can vary from 0 - 100%. When the + button is pressed once the switch Input 1 is displayed. This will be seen as '**1OP**' until the switch 1 Input voltage changes, '**1CL**' will then be displayed. This is repeated for all the switch inputs.

BATTV, **MOTORV**, **MOTORA** and **TEMPC** show what the MOS90 interprets these fields to be. When **BATTV** is selected and the + button is held in, the highest voltage that the MOS90 has recorded will be displayed. When **TEMP C** is selected and the + button is held in the highest temperature that the MOS90 has recorded will be displayed. The - button will record the lowest values.

When the Calibrator is first connected up, the recorded minutes of run time is displayed. This time displayed indicates the total time the MOS90 is engaged in operation (minutes).

If the + button is held in, the thousands of hours are displayed. If the - button is held in, hours are displayed in hundreds. When the MOS90 Controller is pulsing (i.e. being used), the point in the minutes display will flash to indicate that the run time is being incremented and stored in memory. This can not be reset or changed.

The Pump MOS90 on the AB38 does not have the creep speed (**F.WEAK**) set. The segment marked

TIMER on the calibrator is the pump acceleration delay. This is the time it takes from 0 to 100% acceleration. The segment marked **X2** on the Calibrator is **IMAX** on the pump controllers. The segment marked **X3** on the Calibrator is not used. The segment marked **X4** on the Calibrator is the voltage of a fully charged cell on the machines battery. The segment marked **X5** on the calibrator is the voltage of the allowed discharged state of a cell on the machine's battery.

TRACTION			PUMP		
IMAX	■	AMP	SPEED1	1 %	
PLUG	■	AMP	SPEED2	2 %	
ACCEL	■	SEC	SPEED3	3 %	
CREEP	■	%VB	SPEED4	4 %	
BYPASS	■	AMP	SPEED5	5 %	
SPEED	■	%MAX	SPEED6	6 %	
SPEED1	■	%	SPEED7	7 %	
SPEED2	■	%	SPEED8	8 %	
F.WEAK	■	AMP	CREEP	%VB	
TIMER	■	SEC	RAMP	SEC	
SEAT	■	SEC	EXTRA	%	
X2	■		IMAX	AMP	
X3	■				
X4	■				
X5	■				
BATT	■	V			
MOTOR	■	V			
MOTOR	■	AMP			
TEMP	■	C			
TEST	■				

Table 5-4: Calibrator Face

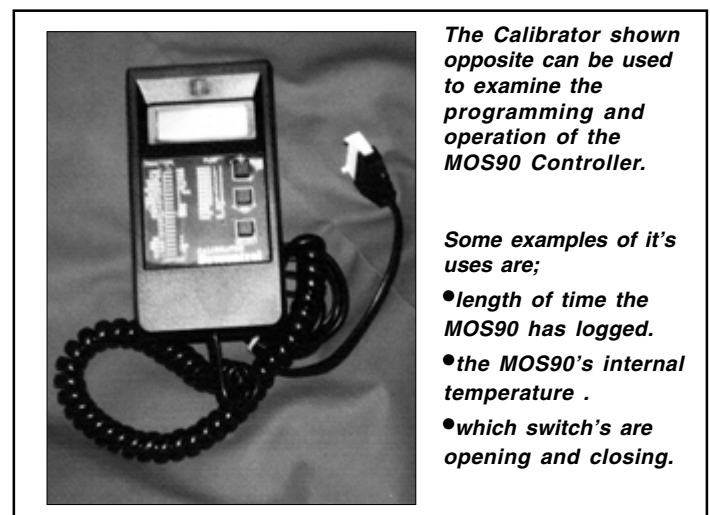


Figure 5-1: MOS90 Calibrator

5.6 Calibrator Settings - Pump & Traction Motor Control Units

Pump MOS90

Cal. Text	Function	Unit	Setting	Signal	Comments
SPEED1	Upper Controls, Boom 1 & 2.	%	75	Input/Prop.	
SPEED2	Upper Controls, Slew.	%	25	Input/Prop.	
SPEED3	Upper Controls, Tele.	%	100	Input/Prop.	
SPEED4	Lower Controls, Boom 1, 2 & Tele.	%	30	Input/Fixed	Speed4 also controls the brake release function.
SPEED5	Lower Controls, Slew.	%	13	Input/Fixed	
SPEED6	Upper Controls, Steering.	%	30	Input/Prop.	
SPEED7	Upper Controls, Cage Levelling.	%	15	Input/Prop.	
SPEED8	Not Used				
CREEP	Not Used				
RAMP	Activation Delay ("Soft Start")	Seconds	1.00		
EXTRA	Not Used				
IMAX	MOS90 Maximum Amp. Capacity	Amps	270		
X3	Not Used				
X4	Battery Reset Value	Volt	2.09		Upper Box Red L.E.D.: Flashes At 70% Discharge
X5	Battery Discharge Value	Volt	1.78		Upper Box Red L.E.D.: Lit At 80% Discharge
BATT.	Battery Voltage At Pin#6 On MOS90	Volt	Real Time		
MOTOR	Voltage Across Motor Contacts	Volt	Real Time		
MOTOR	Amperage Across Motor Contacts	Amp	Real Time		
TEMP	Internal Temp. Of The Controller	Celsius	Real Time		
TEST	Switch Activation And Status	OP/CL			Open=Un-Activated Closed=Activated

To activate the test: Red indicator at TEST, then press "+" or "-" to select the switch you want to view

Switch No.	Indicates Status Of:	Un-Activated	Activated	Input, Pin#	Comments
Switch 1	Upper Controls, Boom 1 & 2.	Open	Closed	8	Green
Switch 2	Upper Controls, Slew.	Open	Closed	13	Red
Switch 3	Upper Controls, Tele.	Open	Closed	12	Violet
Switch 4	Lower Controls, Boom 1, 2 & Tele.	Open	Closed	4	White
Switch 5	Lower Controls, Slew.	Open	Closed	7	Orange
Switch 6	Upper Controls, Steering.	Open	Closed	16	Grey
Switch 7	Upper Controls, Cage Levelling.	Open	Closed	11	Brown
Switch 8	Not Used	Open			
Switch 9	Not Used	Open			
Switch 10	Not Used	Open			

Table 5-5: Pump MOS90 Calibrator Settings & Switches

Traction Motor Control Unit

Cal. Text	Function	Unit	Setting	Signal	Comments
IMAX	MOS90 Maximum Amp. Capacity.	Amps	400		
PLUG	Acceleration Delay.	Seconds	2.0		
ACCEL	Deceleration Delay.	Seconds	0.1		
CREEP	Not Used.	%	0		
BYPASS	Stowed Max. Drive Speed, Level	%	80		
SPEED	Elevated Drive Speed, Level	%	12		Elevated Drive Speed Off-Level => Alarm On, No Drive.
SPEED1	Stowed Max. Drive Speed, Off-Level	%	40		Drive Speed reduced ,alarm sounds when Off-Level while stowed.
SPEED2	Not Used	Seconds			
F.WEAK	Not Used	%			
TIMER	Not Used	Seconds			
SEAT	Not Used	Seconds			
X3	Not Used				
X4	Not Used				
X5	Not Used				
BATT.	Battery Voltage At Pin#6 On MOS90	Volt	Real Time		
MOTOR	Voltage Across Motor Contacts	Volt	Real Time		
MOTOR	Amperage Across Motor Contacts	Amp	Real Time		
TEMP	Internal Temp. Of The Controller	Celsius	Real Time		
TEST	Switch Activation And Status	OP/CL/%			Open=Un-Activated Closed=Activated %=Percentage

To activate the test: Red indicator at TEST, then press “+” or “-” to select the switch you want to view

Switch No.	Indicates Status Of:	Unactivated	Activated	Input, Pin#	Comments
Switch 1	Drive Forward.	Open	Closed	8	CL=Drive Forward
Switch 2	Drive Reverse.	Open	Closed	11	CL=Drive Reverse
Switch 3	Tacho Output to MOS90.	from 0%	to 60%	12	Varies from 0%-60% depending on Drive Speed (3.00-3.60)
Switch 4	Elevated Position - LS1	Open	Closed	4	CL=Stowed Position
Switch 5	Level or Off-Level - Tilt Sensor.	Open	Closed	7	CL=Level
Switch 6	Not Used	Open			
Switch 7	Tacho Direction.	Open	Closed	2	CL=Reverse Drive
Switch 8	Not Used	Open			
Switch 9	Not Used	Open			
Switch 10	Not Used	Open			

Table 5-6: Traction MOS90 Calibrator Settings & Switches

NOTES:

6.0 Introduction

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

The diagrams are to be used in conjunction with Table 5-1: *Troubleshooting Guide*. They allow understanding of the make-up and functions of the systems for checking, tracing, and fault-finding during troubleshooting analysis.

The components that comprise the electrical and hydraulic systems are given a reference designation as per the following tables. Their names, functions and locations are also explained in detail in the tables. An understanding of basic electrical and hydraulic circuitry will be required to follow this information.

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Electrical Schematic	6-1	6.7
Hydraulic Schematic	6-2	6.11
Hydraulic Manifolds	6-3	6.11

NOTES:

6.1. Electrical Schematics

Table 6-1: Electrical Schematic Legend

REFERENCE	NAME	FUNCTION	LOCATION
ALM1	Alarm	Provides warning sound when Tilt Sensor is activated i.e. tilts more than 3 degrees.	Upper Control Box.
ALM2	Movement Alarm	Provides intermittent sound when machine is driving.	On Motor Control Unit.
BAT	Batteries x 8. 6 Volts each.	Power supply. - 48V System.	Chassis Subframe.
BC1	48V Battery Charger	This charges the 8 x 6V batteries when switched on and the line contactor is energised.	Chassis Subframe.
D1 - D14	Diode	Suppression diodes for the coils of the function control solenoids SOL 1 - 14	On Lower P.C.B.
D15	Diode	Feeds power to pin 11 on the Pump Controller when level up is selected and prevents feedback to the level down solenoid when level up is selected.	On Lower P.C.B.
D16	Diode	Feeds power to pin 11 on the Pump Controller when level down is selected and prevents feedback to the level up solenoid when level down is selected.	On Lower P.C.B.
D17	Diode	Feeds a signal from Boom 1 Up solenoid to pin 4 on the controller and prevents feedback to the solenoid when other functions are selected.	On Lower P.C.B.
D18	Diode	Feeds a signal from Boom 2 Up solenoid to pin 4 on the controller and prevents feedback to the solenoid when other functions are selected.	On Lower P.C.B.
D19	Diode	Feeds a signal from Tele Extend solenoid to pin 4 on the controller and prevents feedback to the solenoid when other functions are selected.	On Lower P.C.B.
D20	Diode	Feeds a signal from Boom 1 Down solenoid to pin 4 on the controller and prevents feedback to the solenoid when other functions are selected.	On Lower P.C.B.
D21	Diode	Feeds a signal from Boom 2 Down solenoid to pin 4 on the controller and prevents feedback to the solenoid when other functions are selected.	On Lower P.C.B.
D22	Diode	Feeds a signal from Tele Retract solenoid to pin 4 on the controller and prevents feedback to the solenoid when other functions are selected.	On Lower P.C.B.
D23	Diode	Feeds a signal from Steer Left solenoid to pin 16 on the controller and prevents feedback to the solenoid when Steer Right is selected.	On Lower P.C.B.
D24	Diode	Feeds a signal from Steer Right solenoid to pin 16 on the controller and prevents feedback to the solenoid when Steer Left is selected.	On Lower P.C.B.
D25	Diode	Prevents feedback to the reverse contactor when SOL 14 (Brake Valve) is activated by the forward contactor.	On Lower P.C.B.

REFERENCE	NAME	FUNCTION	LOCATION
D26	Diode	Prevents feedback to the forward contactor when SOL14 (Brake Valve) is activated by reverse contactor.	On Lower P.C.B.
D27	Diode	Feeds power to Boom 1 Up solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D28	Diode	Feeds power to Boom 1 Up solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.
D29	Diode	Feeds power to Boom 2 Up solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D30	Diode	Feeds power to Boom 2 Up solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.
D31	Diode	Feeds power to Tele Extend solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D32	Diode	Feeds power to Tele Extend solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.
D33	Diode	Feeds power to Boom 1 Down solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D34	Diode	Feeds power to Boom 1 Down solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.
D35	Diode	Feeds power to Boom 2 Down solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D36	Diode	Feeds power to Boom 2 Down solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.
D37	Diode	Feeds power to Tele Retract solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D38	Diode	Feeds power to Tele Retract solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.
D39	Diode	Feeds power to Slew Right solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D40	Diode	Feeds power to Slew Right solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.

6.1. Electrical Schematics**Table 6-1: Electrical Schematic Legend (Contd....)**

REFERENCE	NAME	FUNCTION	LOCATION
D41	Diode	Feeds power to Slew Left solenoid from upper controls and prevents feedback to upper controls from the lower controls.	On Lower P.C.B.
D42	Diode	Feeds power to Slew Left solenoid from lower controls and prevents feedback to lower controls from the upper controls.	On Lower P.C.B.
D43, D44	Diode	Feeds power to pin 13 on the Pump Controller when the slew function is selected at upper controls. Prevents feedback to upper controls or slew solenoids from K2.	On Lower P.C.B.
D45	Diode	Feeds power to pin 12 on the Pump Controller when the Tele Retract function is selected at upper controls and prevents feedback to the Tele Retract Solenoid.	On Lower P.C.B.
D46	Diode	Feeds power to pin 12 on the Pump Controller when the Tele Extend function is selected at upper controls and prevents feedback to the Tele Extend Solenoid.	On Lower P.C.B.
D47	Diode	Prevents feedback from the suppression/tacho circuitry to the upper control circuitry.	On Lower P.C.B.
D48	Diode	Prevents feedback from reaching the suppression /tacho circuitry.	On Lower P.C.B.
D49	Diode	Feeds +48V supply to pin 6 on the Pump Controller from upper controls.	On Lower P.C.B.
D50	Diode	Feeds +48V supply to pin 6 on the Pump Controller from lower controls.	On Lower P.C.B.
D51	Diode	Feeds power to the movement alarm and the delay module circuitry when forward drive is selected.	On Lower P.C.B.
D52	Diode	Feeds power to the movement alarm and the delay module circuitry when reverse drive is selected.	On Lower P.C.B.
D53	Diode	Feeds power to pin 7 on the Pump Controller when the Slew function is selected at lower controls and prevents feedback to the Slew Solenoids.	On Lower P.C.B.
D54	Diode	Feeds power to pin 7 on the Pump Controller when the Slew function is selected at lower controls and prevents feedback to the Slew Solenoids.	On Lower P.C.B.
D55	Diode	Prevents feedback from the solenoids to the upper box when K3 is energised.	On Lower P.C.B.
D56	Diode	Suppression diode for coil of Relay K3.	On Lower P.C.B.
D57	Diode	Suppression diode for coil of Relay K2.	On Lower P.C.B.
D58	Diode	Feeds power from Interlock Switch on the Joystick at upper controls to the line contactor. Protects K1 from feedback from the line contactor.	On Lower P.C.B.
D59	Diode	Feeds power from lower controls to the line contactor. Protects TS1 from feedback from the line contactor.	On Lower P.C.B.

REFERENCE	NAME	FUNCTION	LOCATION
D60	Diode	Suppression diode for coil of Relay K1.	On Lower P.C.B.
D61	Diode	Feeds power to the Tilt Sensor from upper controls and prevents feedback to the upper controls from the lower controls.	On Lower P.C.B.
D62	Diode	Feeds power to the Tilt Sensor from lower controls and prevents feedback to the lower controls from the upper controls.	On Lower P.C.B.
D63	Diode	Prevents feedback to normal upper controls through the level switch during Emergency Override i.e. when machine is tilted.	Upper Control Box.
D64	Diode	Prevents feedback to emergency functions from normal functions during Emergency Override i.e. when machine is tilted.	Upper Control Box.
D65	Diode	Suppression diode for the coil of Upper Control Box direction relay K4.	Upper Control Box.
D66	Diode	Feeds power to pin 8 on the Pump Controller when the Boom2 Down function is selected at upper controls and prevents feedback to the Boom2 Down Solenoid when the Boom1 Down Solenoid is energised.	Upper Control Box.
D67	Diode	Feeds power to pin 8 on the Pump Controller when the Boom1 Down function is selected at upper controls and prevents feedback to the Boom1 Down Solenoid when the Boom2 Down Solenoid is energised.	Upper Control Box.
D68	Diode	Feeds power to pin 8 on the Pump Controller when the Boom2 Up function is selected at upper controls and prevents feedback to the Boom2 Up Solenoid when the Boom1 Up Solenoid is energised.	Upper Control Box.
D69	Diode	Feeds power to pin 8 on the Pump Controller when the Boom1 Up function is selected at upper controls and prevents feedback to the Boom1 Up Solenoid when the Boom2 Up Solenoid is energised.	Upper Control Box.
D70	Diode	Suppression diode for the coil of Upper Control Box direction relay K5.	Upper Control Box.
D71	Diode	Suppression diode for the coil of Upper Control Box direction relay K6.	Upper Control Box.
D72	Diode	Suppression diode for the coil in the Line Contactor.	Line Contactor
D73	Diode	Prevents feedback from the Horn affecting the rest of the lower P.C.B. circuitry.	On Lower P.C.B.
DC1	Direction Contactor	Provides the means to reverse the direction of current through the traction motor field (TMF) windings and hence reverse the direction of the electromagnetic field.	On MCU
FU1	Fuse (425 Amps)	Overload protection for drive electric motors.	On MCU

6.1. Electrical Schematics

Table 6-1: Electrical Schematic Legend (Contd....)

REFERENCE	NAME	FUNCTION	LOCATION
FU2	Fuse (325 Amps)	Overload protection for pump electric motor.	On MCU
FU3	Fuse (7 Amps)	Overload protection for control circuitry.	On MCU
HRN	Horn	Provides audible warning when the Horn Switch on the upper control box is pressed.	Chassis Subframe.
K1	Tilt Relay	This relay is constantly energised through the tilt alarm TS1. The Normally Open contacts remain closed in this state and feed the Upper Controls with power when the Keyswitch is turned to ON. When the machine is in a tilt position power will be cut to all but the Emergency Override functions on the Upper Controls.	On Lower Printed Circuit Board.
K2	Tilt/Override Relay	Energised when machine is tilted more than 3°. It breaks the upper control tele speed signal and changes upper slew speed to lower slew speed.	On Lower Printed Circuit Board.
K3	Relay	Timed relay to switch in the pump controller during timed section (4 seconds approx.)	On Lower Printed Circuit Board.
K4	Tilt/Override	Energised when machine is tilted more than 3°. It disables cage levelling and sends power to the pump contact of SW13.	On Upper Printed Circuit Board.
K5	Joystick Direction Relay	This relay is energised when the joystick is pulled backwards. The contacts close and feed +48V to the opposite set of contacts in the selector switch as K6 does. This then energises the opposite solenoid for each function and provides motion in the opposite direction when the joystick is pulled back.	On Upper Printed Circuit Board.
K6	Joystick Direction Relay	This relay is energised when the joystick is pushed forward. The contacts close allowing +48V to be fed into only one half of the contacts on the selector switch. This then allows only one of the two solenoids on each function spool to be energised thus allowing only one direction of motion when the joystick is pushed forward.	On Upper Printed Circuit Board.
LC1	Line Contactor.	In the unenergized state the Normally Closed contacts allow the charger +ve to the batteries. In the energised state the Normally Open contacts close and route the battery +ve to the pump motor.	On the MCU on the Chassis Subframe.
LED 1	Battery Indicator (Red).	The LED remains off when the batteries are fully charged. The LED flashes when the batteries are discharged 70% of their value. The LED will remain on when the batteries are 80% discharged.	Upper Control Box.
LED2	System OK LED (Green).	This LED is illuminated when there is power at the upper	Upper Control Box.

REFERENCE	NAME	FUNCTION	LOCATION
LED2 contd...		controls and the machine is ready to function from the Platform.	
LS1	Boom Rest Limitswitch.	Activated when Boom 2 is in the stowed position, it sends a signal to pin 4 of the Traction Controller. When Boom 2 leaves the rest the Normally Open contact of the switch opens and cuts power to the to the high speed drive. The cage levelling function is operable only when the machine is stowed. i.e. the boom rest limit switch is activated.	On Side of First Post.
MCU1	Traction Motor Control Unit.	This controls the speed of the electric drive motors. Using the Upper Controls the motor speed varies with the position of the control joystick. The change in speed of the motors is caused by the varying output of current from the Motor Control Unit into the motors armature and field.	On Chassis Subframe beneath the Printed Circuit Board Box.
MCU2	Pump Motor Control Unit.	This controls the speed of the pump electric motor. Using the Upper Controls the motor speed varies with the position of the control joystick. Using the Lower Controls the motor has different fixed speeds for the various functions which are programmed into the MCU using a specialist Calibrator.	On Chassis Subframe beneath the Printed Circuit Board Box.
MOT1	48V D.C. Electric Motor.	This motor is coupled to the Hydraulic Pump which provides the oil flow and pressure to operate the various machine functions.	Chassis Subframe.
SOL1	Solenoid <i>Level Up</i>	Solenoid used for activating hydraulic valve to level the Cage Up.	On Main Manifold Block
SOL2	Solenoid <i>Level Down</i>	Solenoid used for activating hydraulic valve to level the Cage Down.	On Main Manifold Block
SOL3	Solenoid <i>BOOM 1 Up</i>	Solenoid used for activating hydraulic valve to raise Boom 1.	On Main Manifold Block
SOL4	Solenoid <i>BOOM 2 Up</i>	Solenoid used for activating hydraulic valve to raise Boom 2.	On Main Manifold Block
SOL5	Solenoid <i>Tele Extend</i>	Solenoid used for activating hydraulic valve to extend the Telescopic cylinder.	On Main Manifold Block
SOL6	Solenoid <i>BOOM 1 Down</i>	Solenoid used for activating hydraulic valve to lower Boom 1.	On Main Manifold Block
SOL7	Solenoid <i>BOOM 2 Down</i>	Solenoid used for activating hydraulic valve to lower Boom 2.	On Main Manifold Block
SOL8	Solenoid <i>Tele Retract</i>	Solenoid used for activating hydraulic valve to retract the Telescopic cylinder.	On Main Manifold Block
SOL9	Solenoid <i>SLEW Right</i>	Solenoid used for activating hydraulic valve to slew in the right direction.	On Main Manifold Block
SOL10	Solenoid <i>SLEW Left</i>	Solenoid used for activating hydraulic valve to slew in the left direction.	On Main Manifold Block
SOL11	Solenoid <i>Steer Left</i>	Solenoid used for activating hydraulic valve to steer in the left direction.	On Main Manifold Block

6.1. Electrical Schematics

Table 6-1: Electrical Schematic Legend (Contd....)

REFERENCE	NAME	FUNCTION	LOCATION
SOL12	Solenoid <i>Steer Right</i>	Solenoid used for activating hydraulic valve to steer in the right direction.	On Main Manifold Block
SOL13	Solenoid <i>Brake - V1</i>	This solenoid is energised to allow oil into the brake release chamber.	On Main Manifold Block
SOL14	Solenoid <i>Brake - V2</i>	When this valve energises brake oil is prevented from venting back to tank.	On Main Manifold Block
SW1	Toggle switch <i>Slew</i>	Sends power to the slew motor control solenoid which diverts oil to the left or right side of the slew motor.	Lower Control Box.
SW2	Toggle switch <i>Boom 1</i>	Sends power to the lower lift cylinder solenoid which diverts oil to full bore or annular side of lower lift cylinder.	Lower Control Box.
SW3	Toggle switch <i>Boom 2</i>	Sends power to the upper lift cylinder solenoid which diverts oil to full bore or annular side of upper lift cylinder.	Lower Control Box.
SW4	Toggle switch <i>Tele</i>	Sends power to telescopic cylinder solenoid which diverts oil to full bore or annular side of the telescopic cylinder.	Lower Control Box.
SW5	Function switch <i>Momentary</i>	This switch activates all other switches in the Lower Control Box. This must be held in a clockwise position to activate these controls.	Lower Control Box.
SW6	Emergency Stop Button.	Control circuit shut off. In series with SW8.	Lower Control Box.
SW7	Horn Switch	Activates the horn located on the chassis.	Upper Control Box.
SW8	Emergency Stop Button.	Control circuit shut off. In series with SW13.	Upper Control Box.
SW9	Cage Levelling Switch	Sends power to cage levelling solenoid which diverts oil to full bore or annular side of the cage levelling cylinder.	Upper Control Box.
SW10	Drive/Lift Selector Switch	Switches from drive or boom lift function. It engages the traction MOS90 when Drive is selected. The Pump MOS90 is engaged in either instance.	Upper Control Box.
SW11	Keyswitch, <i>ON/OFF/Em.Override.</i>	Allows +48V supply to feed to Upper Controls when turned to the ON position. This will then allows signals from SW1 and the Joystick Trigger to pass down to the Motor Control Units. When turned to Emergency Override it will allow the emergency power functions only. This should be used when power has been cut to the upper controls due to the tilt sensor activating.	Upper Control Box.
SW12	Function switch <i>4 Position</i>	Sends power to the selected solenoid valve . (Boom 1, Boom 2, Tele or Slew). Only one function can be selected at any one time.	Upper Control Box.
TMA	Traction Motor Armature	High resistance commutator part of electric traction motor.	Traction Motor
TMF	Traction Motor Field	Lower resistance housing and windings of the electric traction motor.	Traction Motor

REFERENCE	NAME	FUNCTION	LOCATION
TS1	Tilt Sensor.	This is a tilt activated switch fitted on the AB38 which will deactivate all but emergency functions if the machine chassis tilts more than 3 degrees.	Chassis Subframe.

Shown opposite are the Pump & Traction Motor Control Unit Pin Legends. Within these two tables the function of each pin is shown. i.e. contactor supply, switch number (the functions which it controls and the setting), B.D.I., supply voltage etc.

* Where a function setting is given the corresponding time duration normally expected to carry out that function is also given. The times given equate to when the AB38 is tested with its batteries fully charged, an empty platform when operated from Lower Controls or one person in the platform when operated from Upper Controls and under ambient temperatures of 15°.

The durations given are from the cylinders position when the machine is fully stowed to the cylinders full extension (for level forward or back the duration given is for 100mm of stroke). The duration includes any cushion down phase of the cylinders stroke. For the Telescopic functions the values correspond to when Boom2 is horizontal).

The values shown opposite have been recorded under optimum charging conditions, and so are a representation of the values which could be expected. The corresponding values for machines 'in the field' may differ somewhat.

PUMP MOTOR CONTROL UNIT (PIN LEGEND)

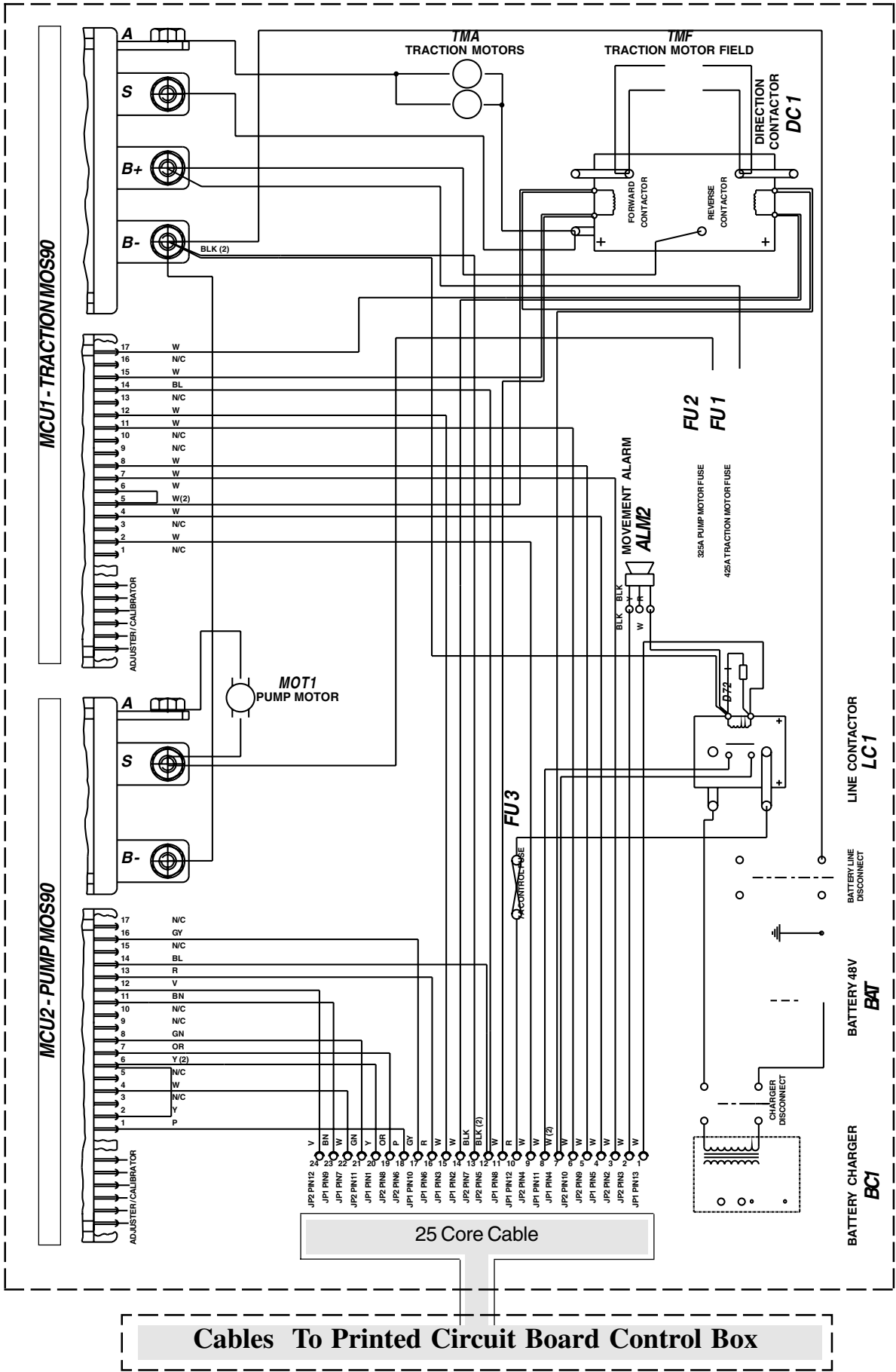
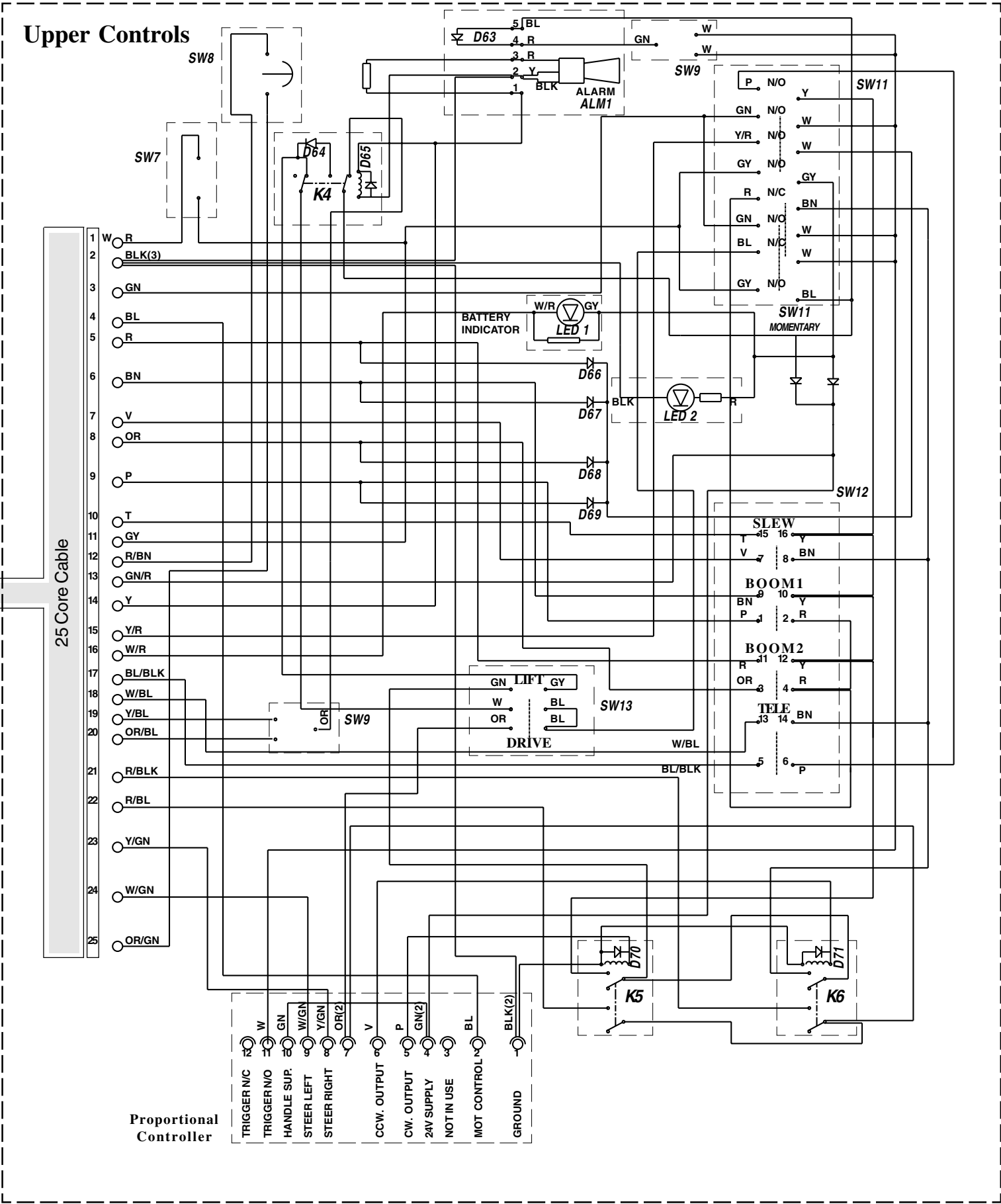
PIN NO.	DESCRIPTION
1	Battery Discharge Indicator (B.D.I.) output
2	sw8 - Not used, Connected to 48V supply from Pin 6
3	Not used - 10V supply
4	sw4 - Switch 4 (Speed 4: Boom 1, 2 & Tele speed from lower controls - Factory set at 30%) <ul style="list-style-type: none"> * Lower Controls Boom 1 Up - 61 Seconds * Lower Controls Boom 1 Down - 39 Seconds * Lower Controls Boom 2 Up - 54 Seconds * Lower Controls Boom 2 Down - 45 Seconds * Lower Controls Tele Extend - 64 Seconds * Lower Controls Tele Retract - 36 Seconds * Upper Controls Brake Release Speed - 1 Seconds
5	Not used - Not connected.
6	48V supply (Must be greater than 14V)
7	sw5 - Switch 5 (Speed 5: Slew speed from Lower Controls - Factory set at 13%) <ul style="list-style-type: none"> * Lower Controls Slew Left & Right -80 Seconds (180°)
8	sw1 - Switch 1 (speed 1: Max. variable speed for Boom 1& 2 from upper controls - Factory set at 75%) <ul style="list-style-type: none"> * Upper Controls Boom 1 Up - 23 Seconds * Upper Controls Boom 1 Down - 18 Seconds * Upper Controls Boom 2 Up - 23 Seconds * Upper Controls Boom 2 Down - 20 Seconds
9	Not used - Not connected.
10	Not used - Not connected.
11	sw7 - Switch 7 (speed 7: Cage levelling speed from upper controls - Factory set at 15%) <ul style="list-style-type: none"> * Upper Controls Levelling Foreward - 19 Seconds * Upper Controls Levelling Back - 19 Seconds
12	sw3 - Switch 3 (Speed 3: Max. variable speed for Tele from upper controls - Factory set at 100%) <ul style="list-style-type: none"> * Upper Controls Tele Extend - 21 Seconds * Upper Controls Tele Retract - 15 Seconds
13	sw2 - Switch 2 (Speed 2: Max. variable speed for Slew from upper controls - Factory set at 25%) <ul style="list-style-type: none"> * Upper Controls Slew Left & Right -34 Seconds (180°)
14	Accelerator (3.5V - 0V) - Input from joystick to vary motor speed from upper controls.
15	Not used - Not connected.
16	sw6 - Switch 6 (Speed 6: Steering from upper controls - Factory set at 30%) <ul style="list-style-type: none"> * Upper Controls Steering Left & Right -5 Seconds (Lock Left to Lock Right, Lock Right to Lock Left))
17	Not used - Not connected.

TRACTION MOTOR CONTROL UNIT (PIN LEGEND)

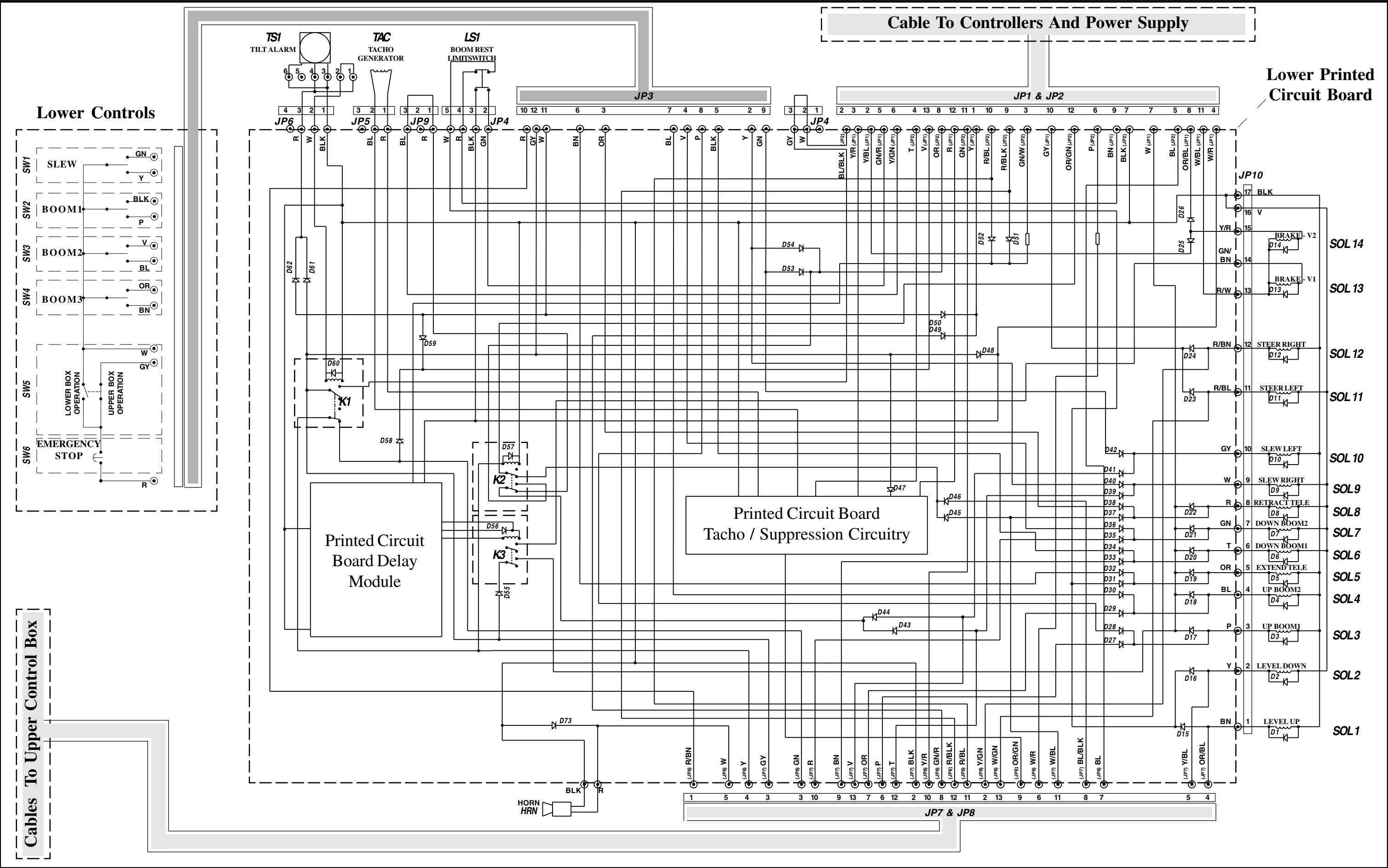
PIN NO.	DESCRIPTION
1	Not used - Not connected.
2	sw7 - Switch 7 (direction signal from tacho generator)
3	Not used - 10V supply
4	sw4 - Switch 4 (boom elevated signal)
5	48V supply (Must be greater than 14V)(Contactor Suppression)
6	48V supply (Must be greater than 14V)(Key Switch Input)
7	sw5 - Switch 5 (tilt switch (off-level) signal)
8	sw1 - Switch 1 (forward direction signal from upper controls)
9	Not used - Not connected.
10	Not used - Not connected.
11	sw2 - Switch 2 (reverse direction signal from upper controls)
12	sw3 - Switch 3 (speed signal from tacho circuitry)
13	Not used - Not connected.
14	Accelerator (3.5V - 0V) - Input from joystick to vary motor speed from upper controls.
15	Signal to forward contactor.
16	Not used - Not connected.
17	Signal to reverse contactor.

NOTES:

Cables To Printed Circuit Board Control Box



Cables To Printed Circuit Board Control Box



6.2. Hydraulic Schematics

Table 6-2: Hydraulic Schematic Legend

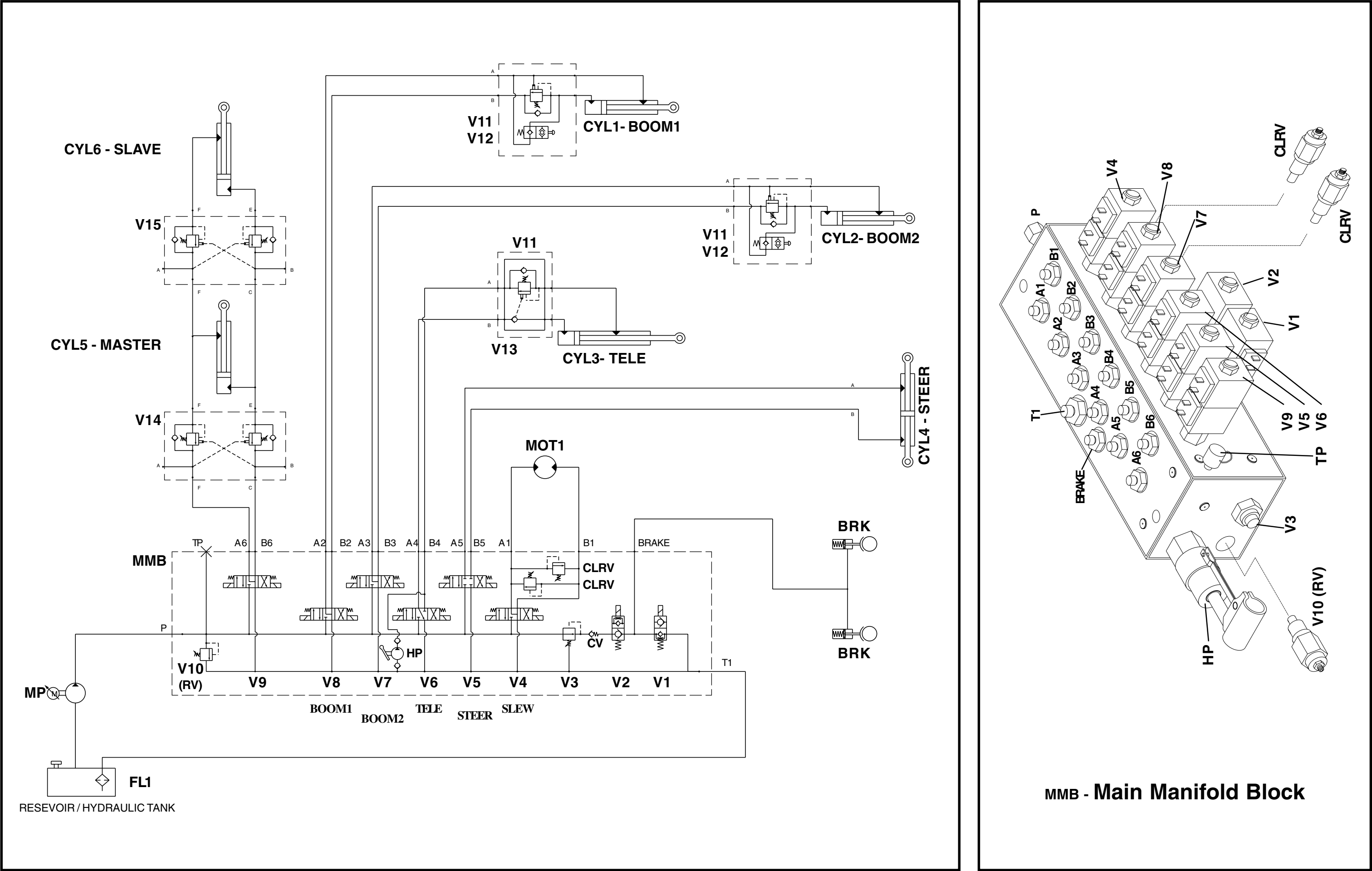
REFERENCE	NAME	FUNCTION	LOCATION
BRK	Brake.	Spring applied - hydraulically released brakes to stop rotation of drive wheels. (Set at 100 Bar).	On front end of wheel drive motors on chassis.
CLRV	Cross-line relief valve.	To limit the max. operating pressure of the slew motor. (Set at 50 Bar).	On main 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.	Forward of first post
CYL2	Upper boom lift cylinder.	Provide the force to lift the upper boom - Boom2.	Behind second post
CYL3	Telescopic 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.

REFERENCE	NAME	FUNCTION	LOCATION
V10 (RV)	Main relief valve.	Sets max system pressure to 145 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 host 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:

- All of the Overcentre Valves represented within this schematic have a 5:1 Pilot Ratio.
- The P/O Check Valve represented has a 3:1 Pilot Ratio.
- 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.
- 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:



NOTES:

7.0 Introduction

This section lists and illustrates the replaceable assemblies and parts of the AB38 Work Platform as manufactured by UpRight Ireland Ltd.

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

7.1 Index

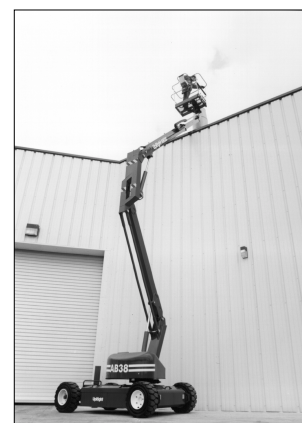
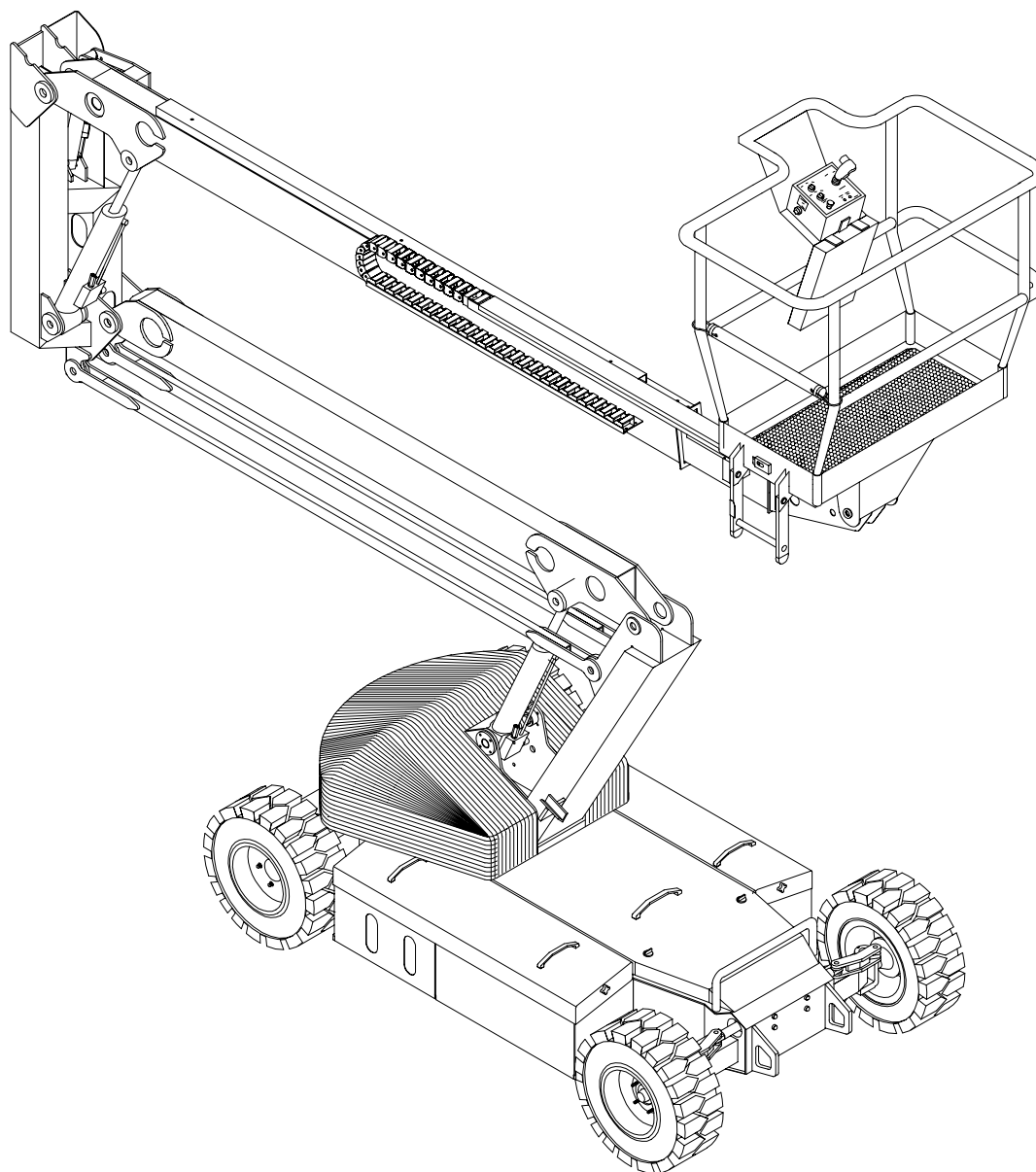
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FINAL ASSEMBLY AB38 -

500200-001 (ANSI Version)

500200-000 (CE Version)

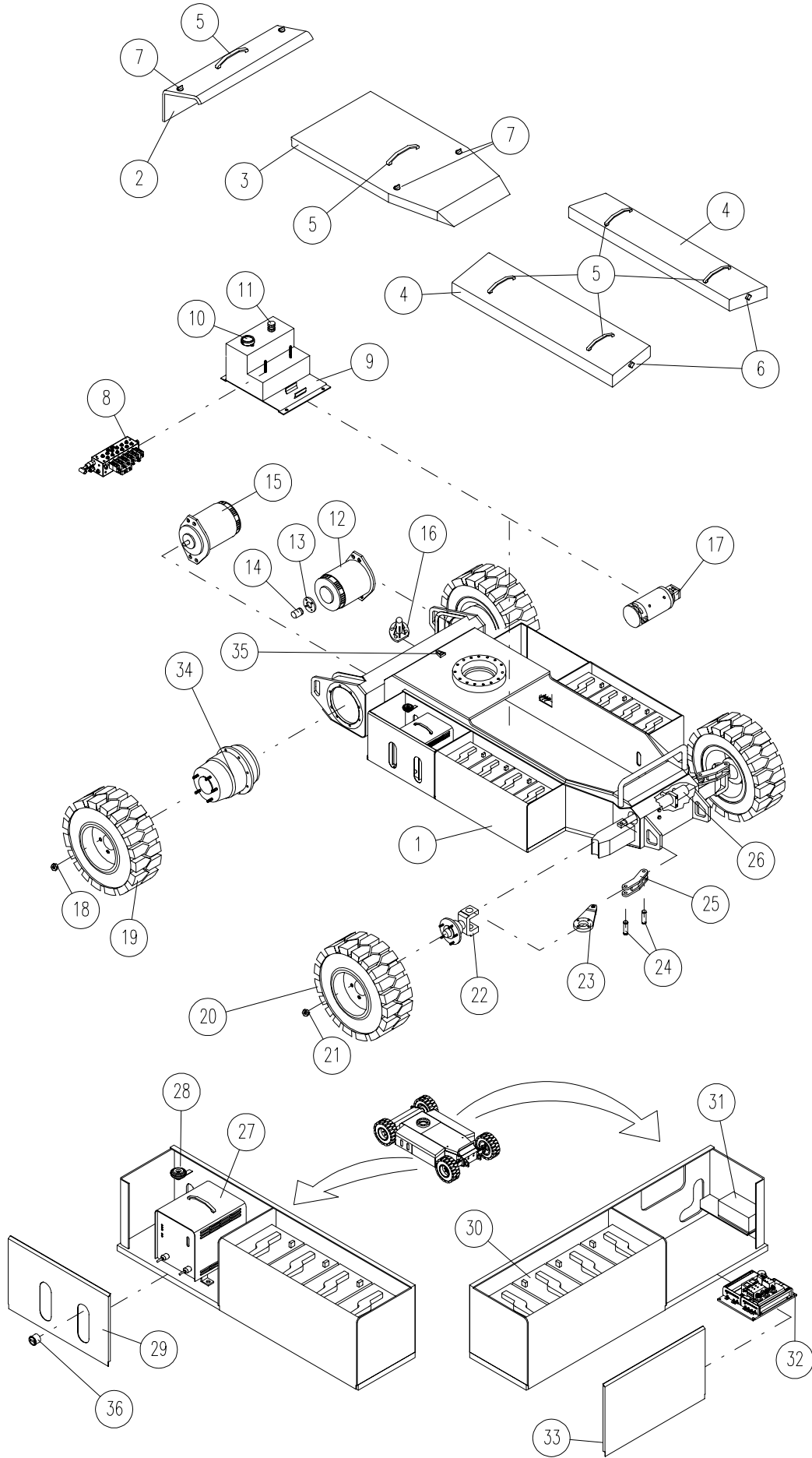
ITEM	PART NO.	DESCRIPTION	QTY.
-	500202-000	Chassis Assembly	-
-	500201-000	Booms and Posts Assembly	-
-	057603-000	Cage and Cradle Assembly	-
-	057580-000	Drive Reduction Gearbox Assembly	-
-	057568-000	Traction Motor Assembly - Right Hand	-
-	058834-000	Traction Motor Assembly - Left Hand	-
-	057530-000	Motor / Pump Assembly	-
-	500494-000	Rear & Front Wheel Assembly	-
-	500284-001	Pinion Gearbox & Slew Bearing Assy.	-
-	500261-000	Manifold Block Assembly	-
-	058460-000	Lower Lift Cylinder Assembly	-
-	058462-000	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	-
-	500262-000	Hose Assembly	-
-	-	Decal Kit	-



CHASSIS ASSEMBLY AB38 -

500202-000

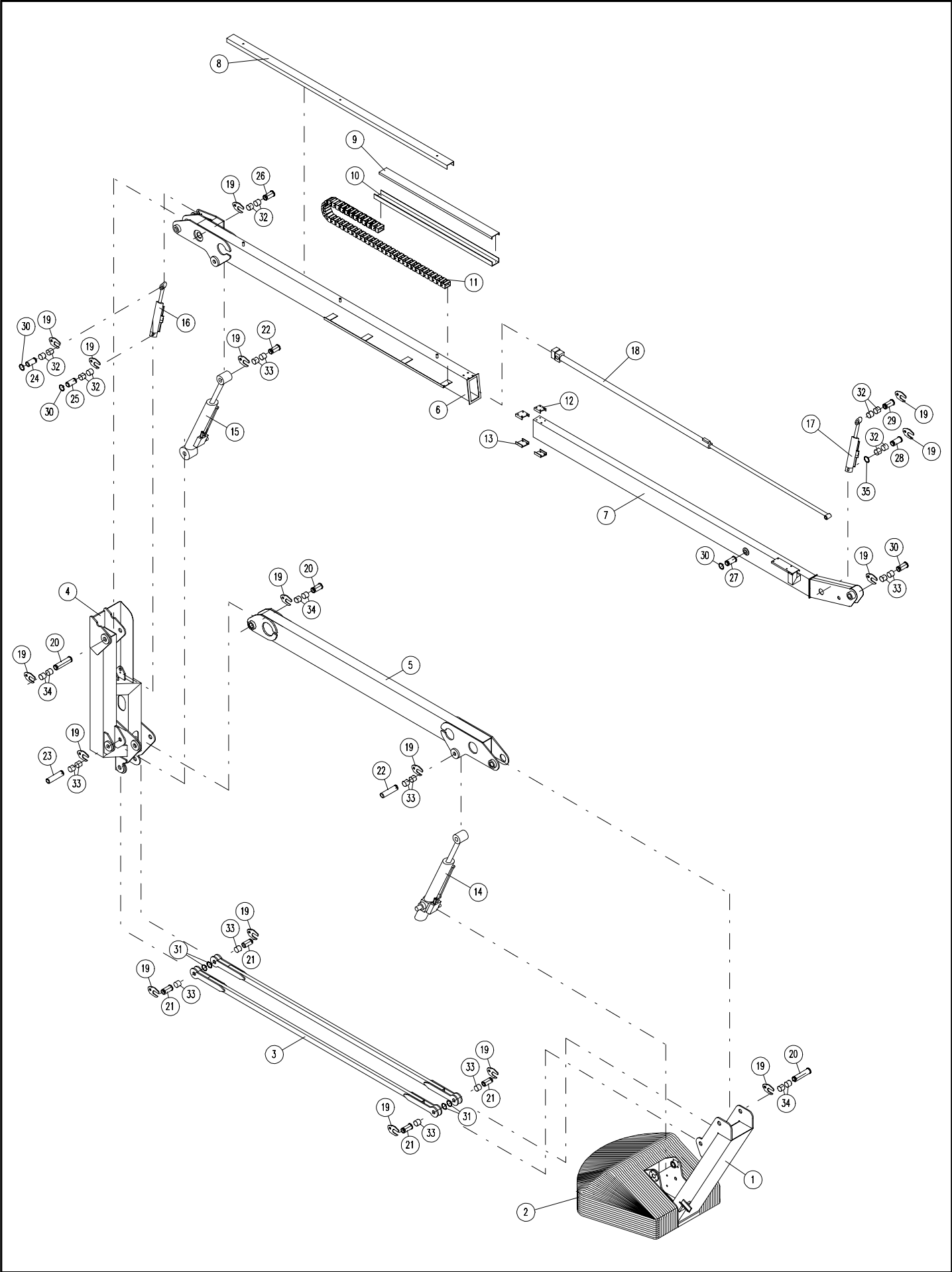
ITEM	PART NO.	DESCRIPTION	QTY.
1	500210-000	AB38 CHASSIS WELDMENT	1
2	500232-000	AB38 DRIVE MOTOR COVER	1
3	500233-000	AB38 CHASSIS BODY COVER	1
4	500231-000	AB38 MODULE COVER	2
5	500052-000	GRAB HANDLE	6
6	057727-000	TWIST SCREW FASTENER	4
7	500259-000	AB38 COVER GRIP LATCH	4
8	500261-000	AB38 MANIFOLD BLOCK	1
9	500260-000	AB38 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	057568-000	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	057668-000	REAR WHEEL TYRE & RIM ASSY.	2
20	057667-001	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	AB38 TORQUE ARMS	2
24	500253-001	AB38 STEERING LINKAGE PIN	4
*	500252-000	CIRCLIP 16 mm	4
*	500408-000	BUSHINGS	2
25	500250-000	AB38 STEERING LINK ARM	2
26	058463-000	AB38 STEERING CYLINDER	1
*	056065-035	MOUNTING BOLTS M12	4
*	056021-012	SPRING WASHER	4
27	057573-000	CHARGER 220/110VAC 50/60Hz	1
28	057586-000	HORN	1
29	500234-002	AB38 CHASSIS SIDE DROP PANEL - WITH SLOTS	1
*	500410-001	DROP PANEL LOCK (CHASSIS)	1
*	500410-002	DROP PANEL KEEPER (PANEL)	1
30	015796-001	BATTERY 6V 220AH	8
*	010154-000	TERMINAL COVERS	18
31	500482-000	AB38 PRINTED CIRCUIT BOARD BOX ASSEMBLY	1
32	500483-000	MOTOR CONTROLLER ASSEMBLY	1
33	500234-001	AB38 CHASSIS SIDE DROP PANEL - WITHOUT SLOTS	1
*	500410-001	DROP PANEL LOCK (CHASSIS)	1
*	500410-002	DROP PANEL KEEPER (PANEL)	1
34	057580-000	DRIVE GEARBOX	1
35	057045-000	SPIRIT LEVEL	1
36	058281-000	HOURMETER - OPTION CE MACHINES	1
*	058288-000	HOURMETER MOUNTING PLATE	1



BOOMS & POSTS ASSEMBLY

500201-000

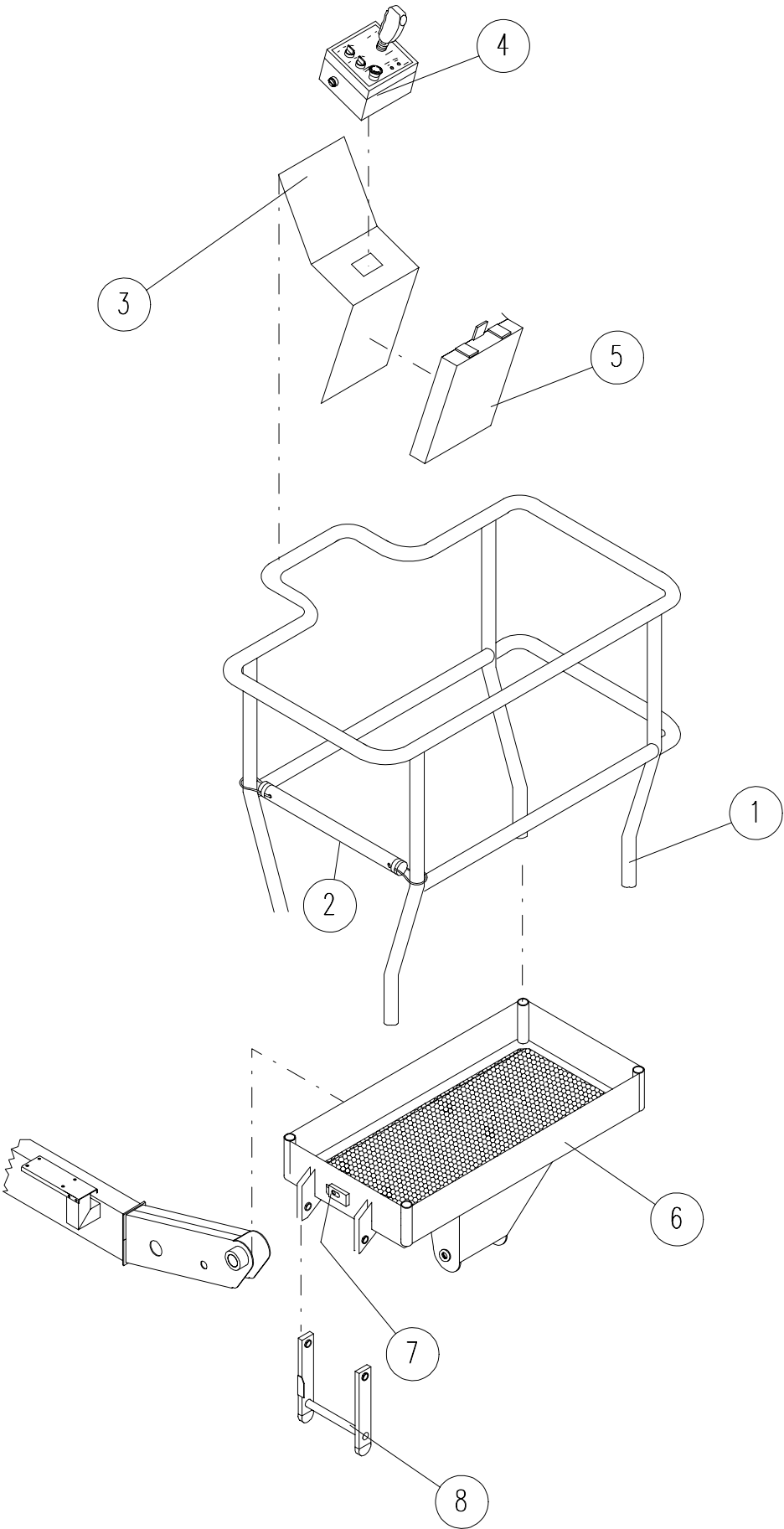
ITEM	PART NO.	DESCRIPTION	QTY.
1	058412-000	AB38 FIRST POST WELDMENT	1
2	058431-000	AB38 BALLAST COVER	1
3	058417-000	AB38 TENSION BAR WELDMENT	2
4	058416-000	AB38 SECOND POST WELDMENT	1
5	058413-000	AB38 LOWER BOOM WELDMENT	1
6	058414-000	OUTER TELE BOOM WELDMENT	1
7	058415-000	INNER TELESCOPIC BOOM WELDMENT	1
8	058457-000	AB38 HOSE & CABLE COVER	1
9	500265-000	COVER FOR ENERGY CHAIN SUPPORT CHANNEL	1
10	500266-000	ENERGY CHAIN SUPPORT CHANNEL	1
11	057679-000	ENERGY CHAIN - COMPLETE	1
	058821-000	ENERGY CHAIN (1 UNIT OF 24)	24
	058822-000	MOUNTING ELEMENTS	2
		SERIAL NUMBERS#1501-1565	
	500468-000	ENERGY CHAIN - COMPLETE	1
	500468-002	ENERGY CHAIN (1 UNIT OF 24)	24
	500468-001	MOUNTING ELEMENTS	2
		SERIAL NUMBERS#1566-CURRENT	
12	057976-000	INNER TELESCOPIC BOOM WEAR PAD	2
*	058510-010	BOLT M8 x 10 mm	8
13	500275-001	OUTER TELESCOPIC BOOM WEAR PAD	2
*	056058-015	BOLT M6 x 15 mm	8
*	056069-006	WASHER M6	8
*	056069-008	WASHER M8	8
14	058460-000	AB38 LOWER LIFT CYLINDER	1
15	058462-000	AB38 UPPER LIFT CYLINDER	1
16	058734-000	AB38 MASTER LEVELLING CYLINDER	1
17	058735-000	AB38 SLAVE LEVELLING CYLINDER	1
18	058461-000	AB38 TELESCOPIC CYLINDER	1
19	058056-000	PIN LOCK PLATE	14
*	056060-020	BOLT M10 x 20 mm	14
*	056021-010	SPRING WASHER 10 mm	14
20	058055-006	PIN - LOWER & UPPER BOOM TO FIRST & SECOND POST	3
21	058054-002	PIN - TENSION BARS	4
22	058066-005	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



CAGE & CRADLE ASSEMBLY

057603-000 (500491-000 is not included as part of this assembly)

ITEM	PART NO.	DESCRIPTION	QTY.
1	057521-000	CAGE RAIL ASSY.	1
2	057524-000	DROP BAR ASSY.	1
3	057523-000	CONTROL BOX MOUNTING PLATE	1
4	500491-000	AB38 UPPER CONTROL BOX	1
5	010076-000	MANUAL HOLDER	1
6	057346-000	AB38 CAGE FLOOR WELDMENT	1
7	058251-000	LADDER LOCKING LATCH	1
8	057348-000	LADDER	1



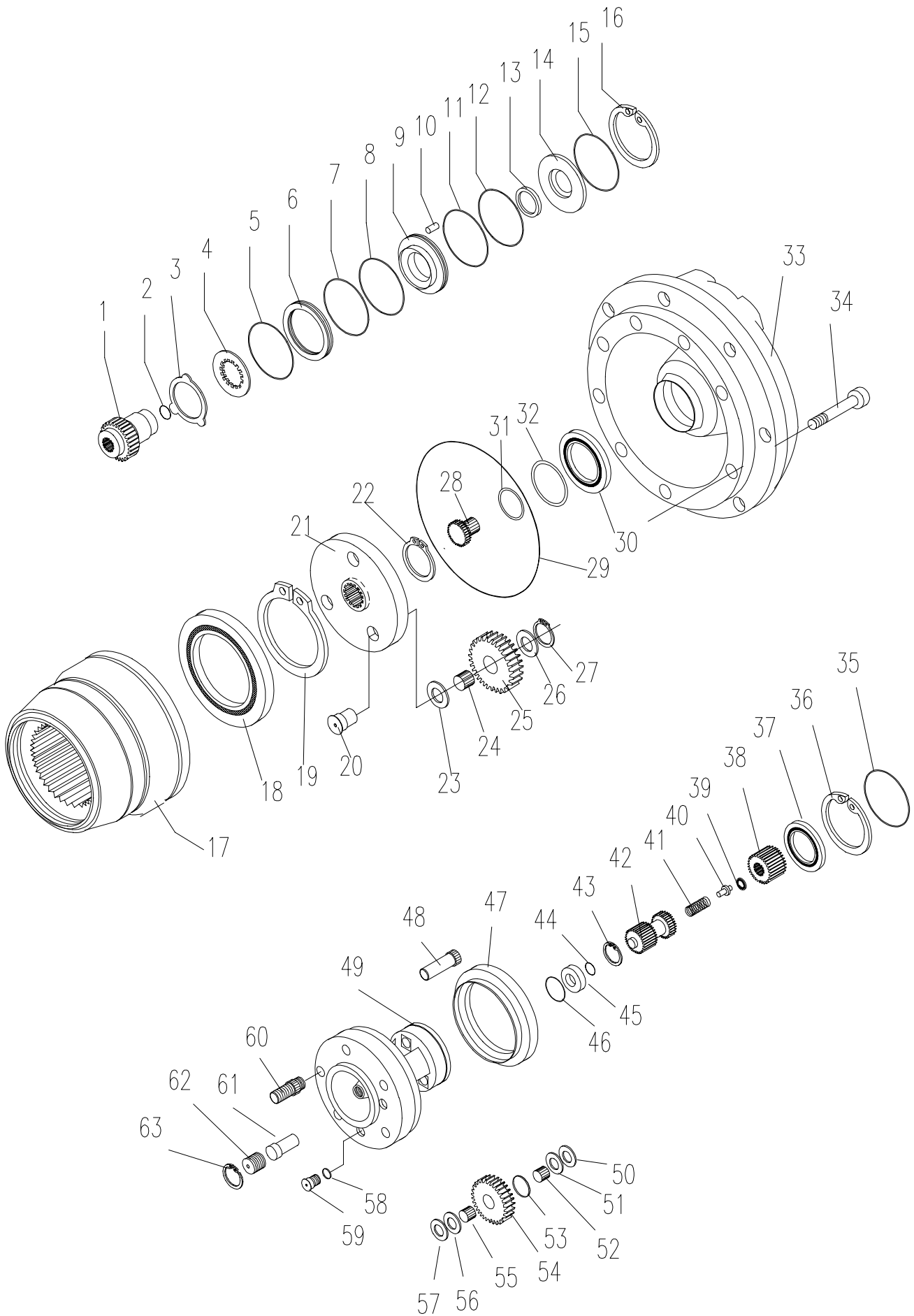
DRIVE REDUCTION GEARBOX ASSEMBLY

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	-	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 **058799-000**

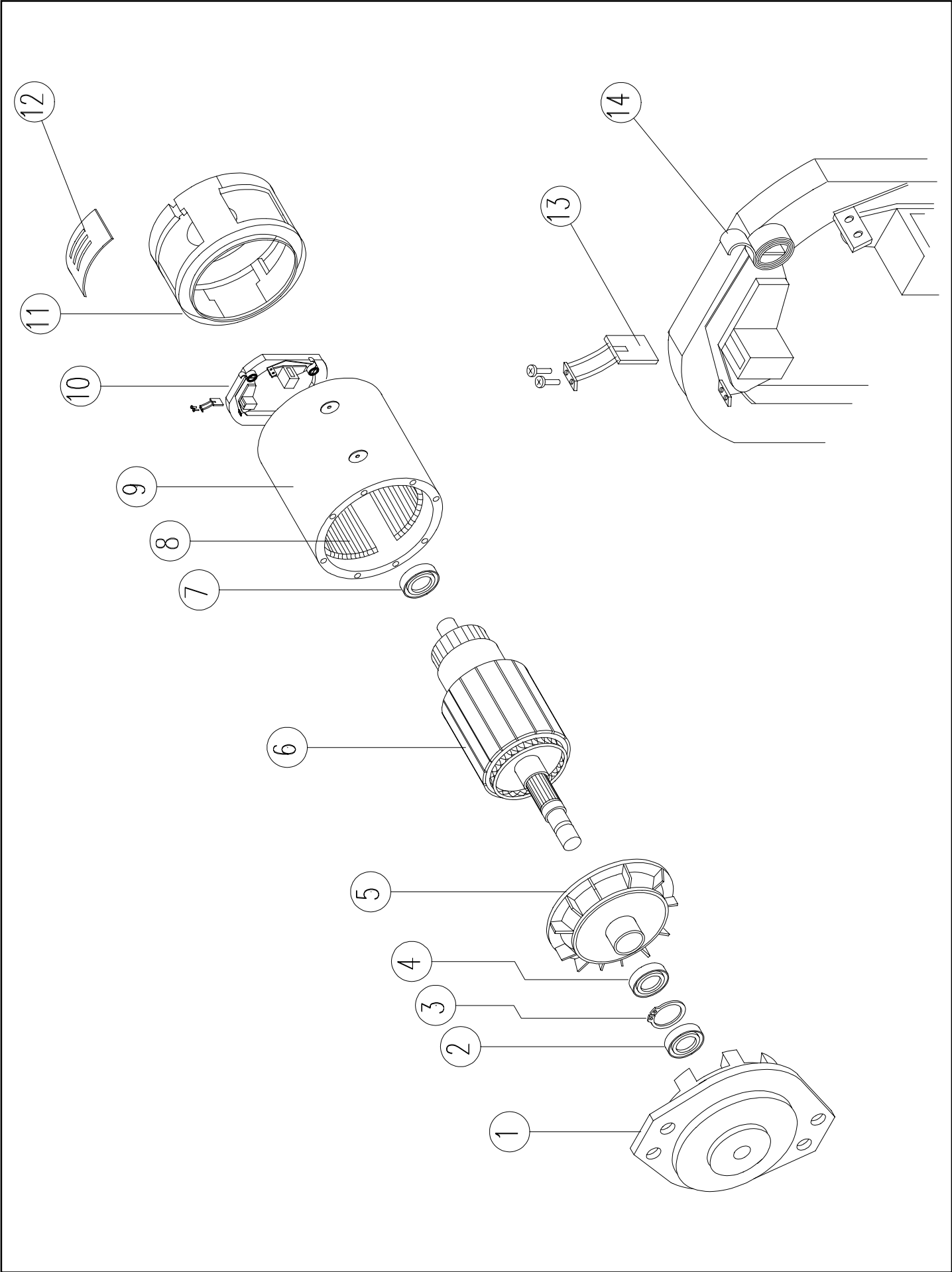


TRACTION MOTOR ASSEMBLY

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

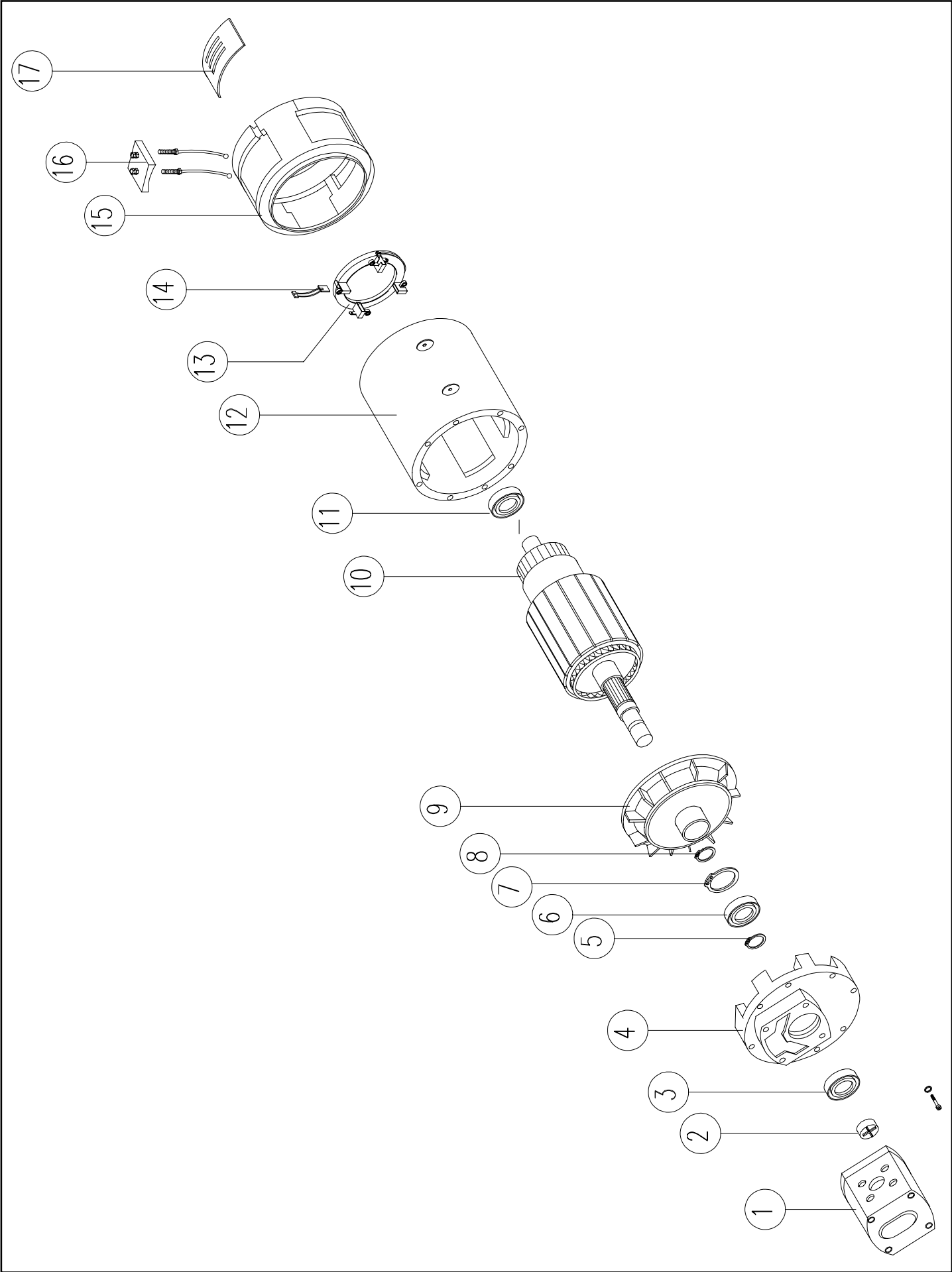


MOTOR/PUMP ASSEMBLY

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

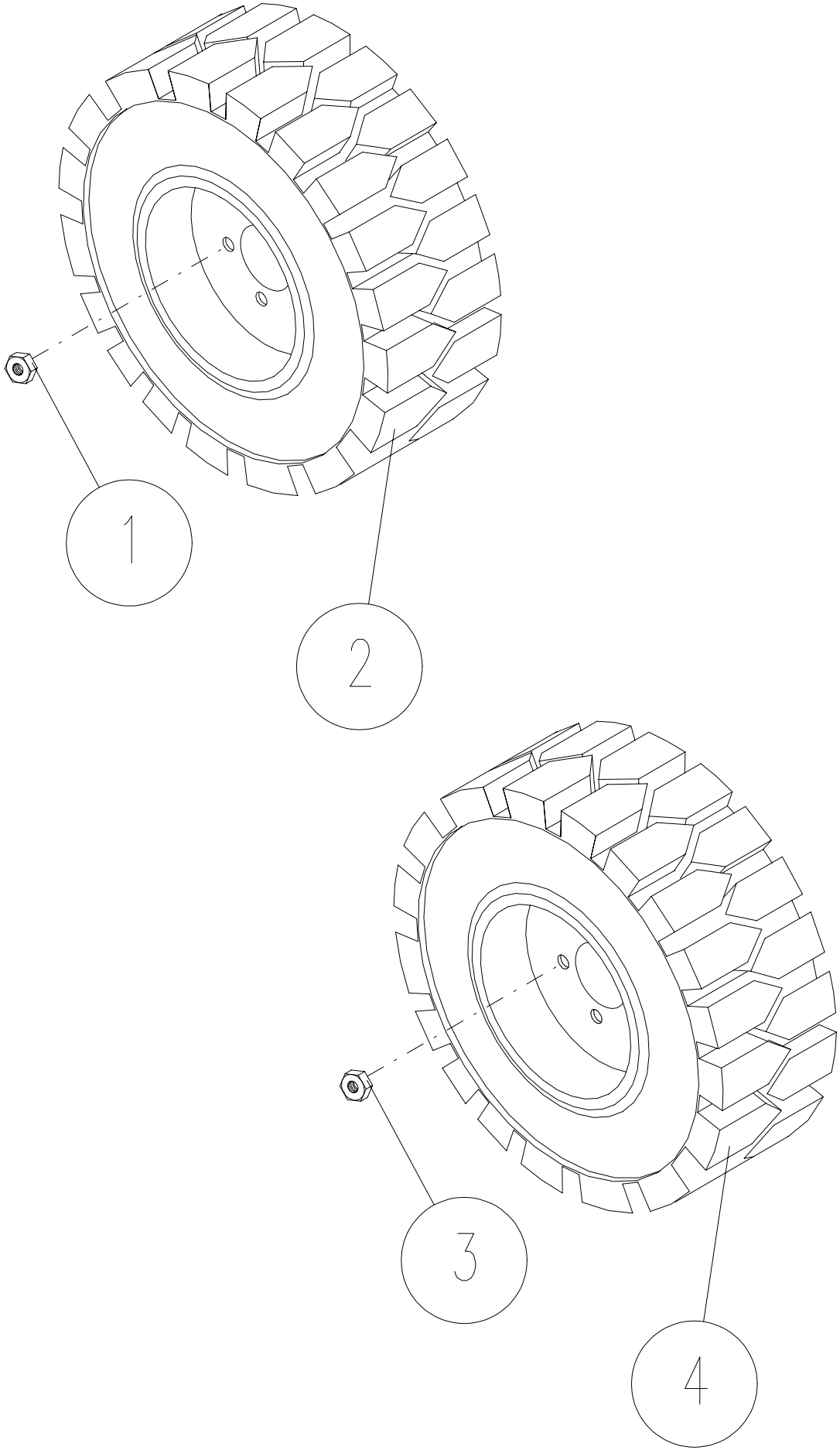
NOTE: THE PART NUMBER FOR THE
MOTOR ASSEMBLY (ALL ITEMS FROM
2 TO 17) IS **058861-000**



REAR & FRONT WHEEL KIT (BLACK) 500494-000

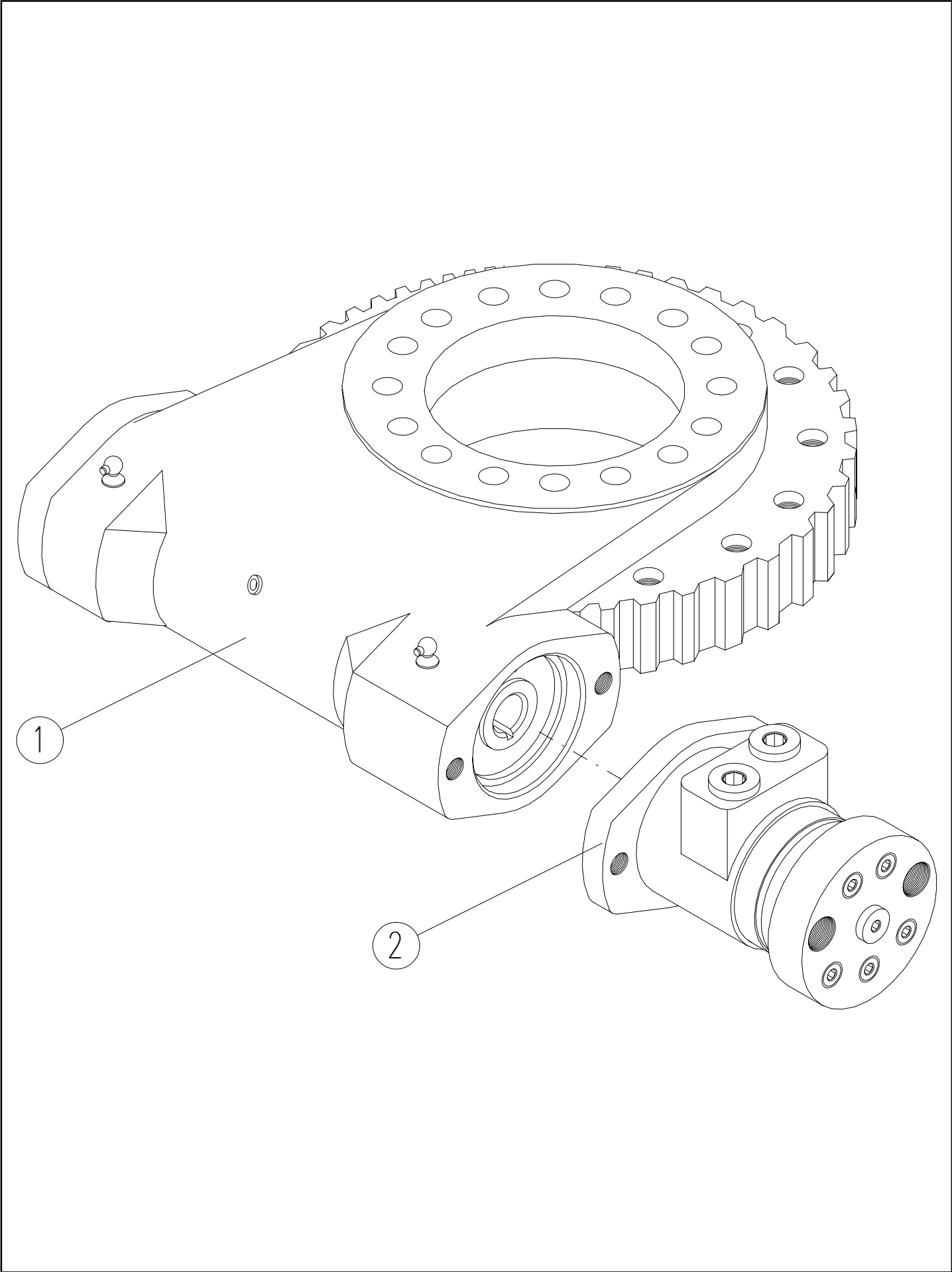
ITEM	PART NO.	DESCRIPTION	QTY.
1	057578-000	WHEEL NUT - M14	10
2	057668-000	REAR WHEEL TYRE & RIM ASSY.	2
3	057666-000	WHEEL NUT - M16	10
4	057667-001	FRONT WHEEL TYRE & RIM ASSY.	2

NOTE: SEE OPTIONS LIST FOR PART
NUMBERS OF THE NON MARKING
WHEEL WHITE TYRE



SLEW MOTOR, WORM DRIVE UNIT & SLEW BEARING ASSEMBLY 500284-001

ITEM	PART NO.	DESCRIPTION	QTY.
1	500284-000	AB38 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	AB38 SLEW MOTOR	1
*	500285-001	SEAL KIT	1
*	500282-000	BOLT 1/2" -13 UNC x 1 1/2"	2
*	056021-012	WASHER M12 SPRING	2



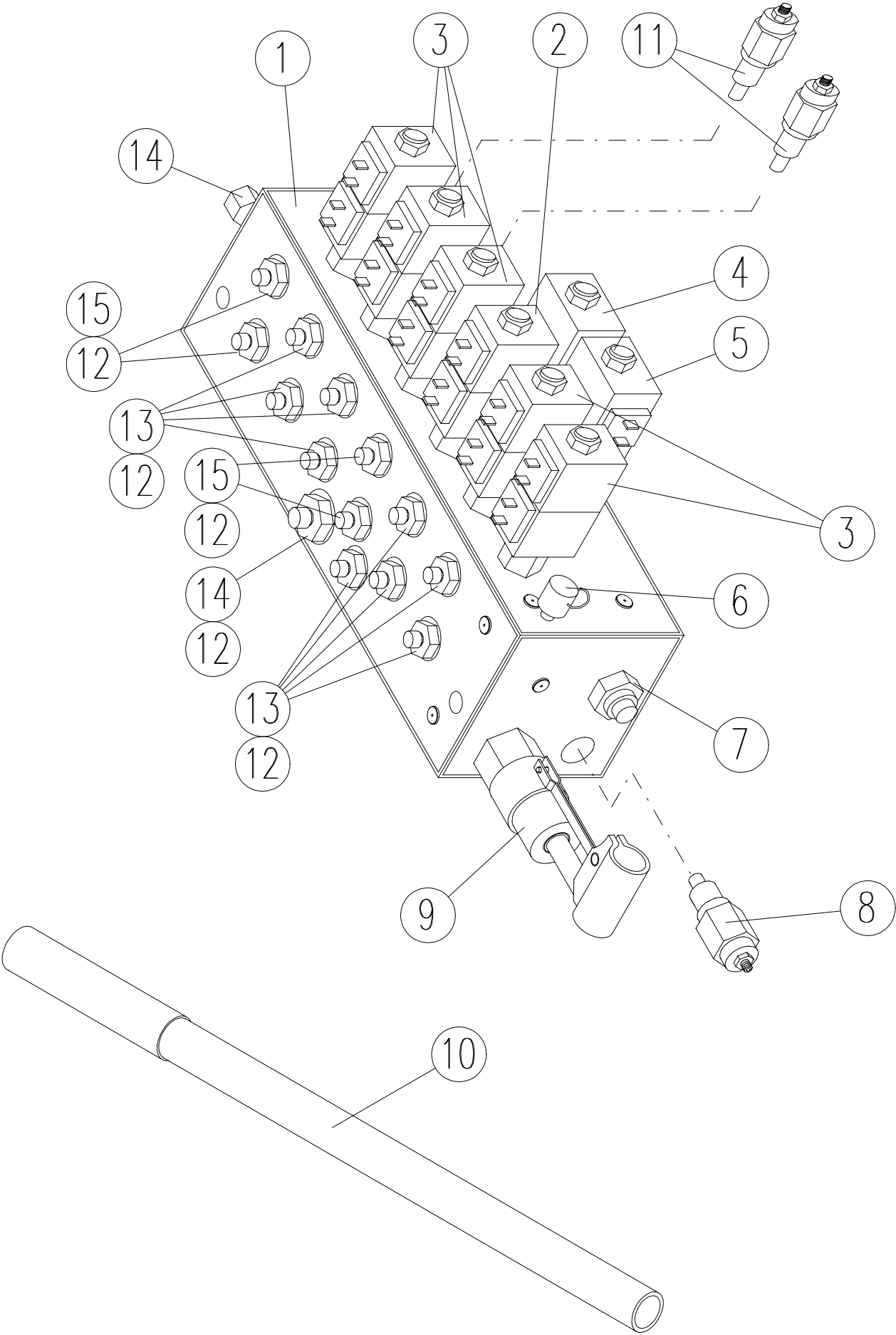
MANIFOLD BLOCK ASSEMBLY

500261-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	MAIN MANIFOLD BLOCK ONLY	1
2	500461-000	SOLENOID VALVE & COILS	1
3	057537-000	SOLENOID VALVE & COILS	5
4	057541-000	SOLENOID VALVE & COILS	1
5	057542-000	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

NOTE: ITEMS NUMBER 9 (MANUAL TELE RETRACTION VALVE) OR 10 (TELE RETRACTION VALVE LEVER) ARE NOT REQUIRED FOR MACHINES MANUFACTURED TO COMPLY WITH THE ANSI STANDARD.

THEREFORE THE PORT INDICATED BY ITEM 9 ON THE HYDRAULIC MANIFOLD IS BLANKED. THE PART NUMBER FOR THIS BLANK IS **500261-003**



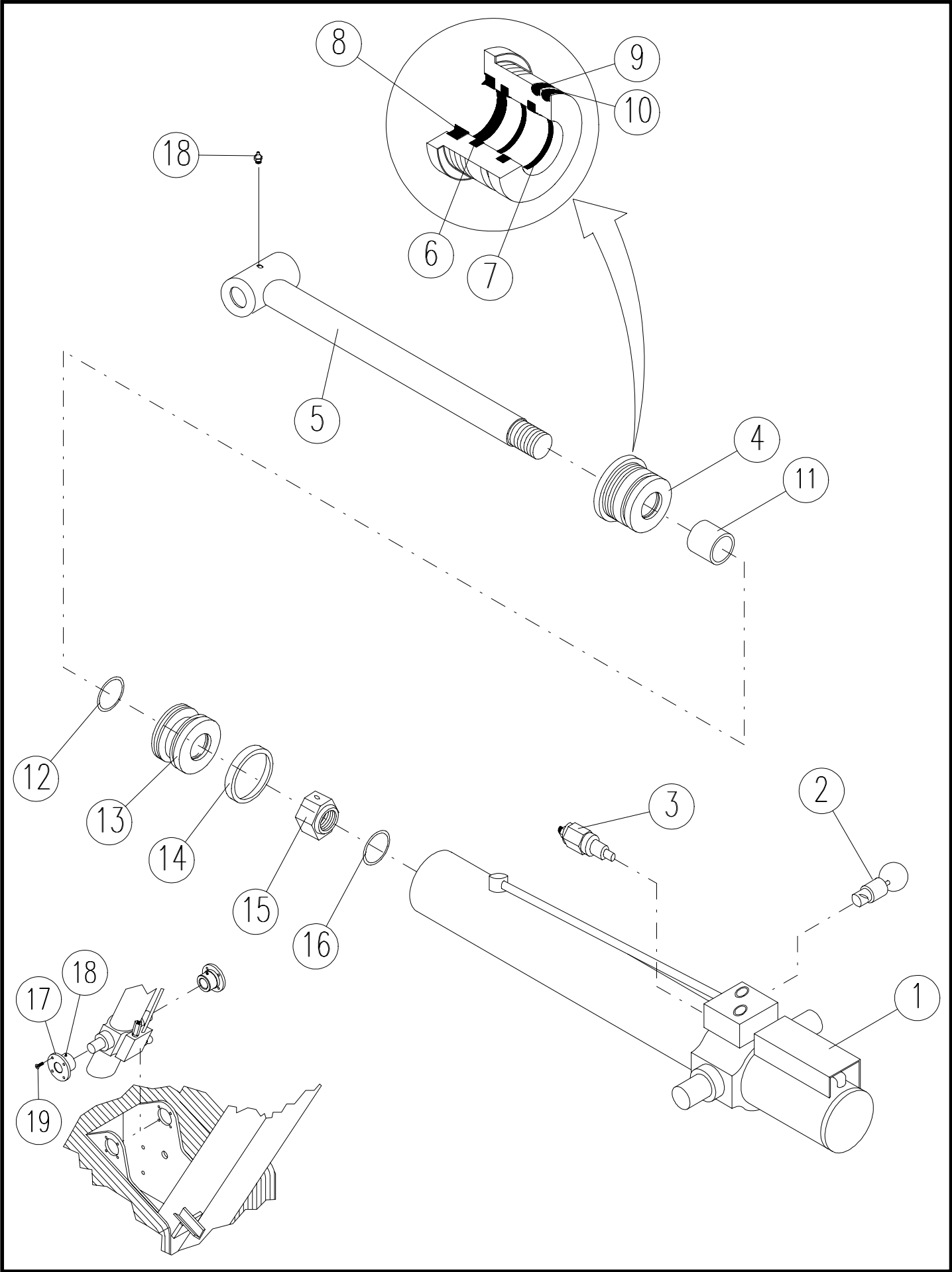
LOWER LIFT CYLINDER ASSEMBLY

058460-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	CYLINDER BODY	1
2	058887-000	EMERGENCY LOWERING VALVE SERIAL NUMBERS #1501-1522	1
	500397-000	EMERGENCY LOWERING VALVE SERIAL NUMBERS #1523-CURRENT	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 O-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	AB38 LOWER LIFT CYLINDER BOSS	2
18	057048-000	GREASE NIPPLE	3
19	058516-000	AB38 BOSS CAPHEAD SCREW M8	8

NOTE: ITEMS 6 TO 10 INCLUSIVE, 12 & 14
FORM THE SEAL KIT FOR THE AB38
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.



UPPER LIFT CYLINDER ASSEMBLY

058462-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	-	CYLINDER BODY	1
2	058887-000	EMERGENCY LOWERING VALVE SERIAL NUMBERS #1501-1522	1
	500397-000	EMERGENCY LOWERING VALVE SERIAL NUMBERS #1523-CURRENT	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 O-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 AB38
UPPER LIFT CYLINDER. THE PART
NUMBER FOR THIS SEAL KIT IS
500498-000

Section 7.2

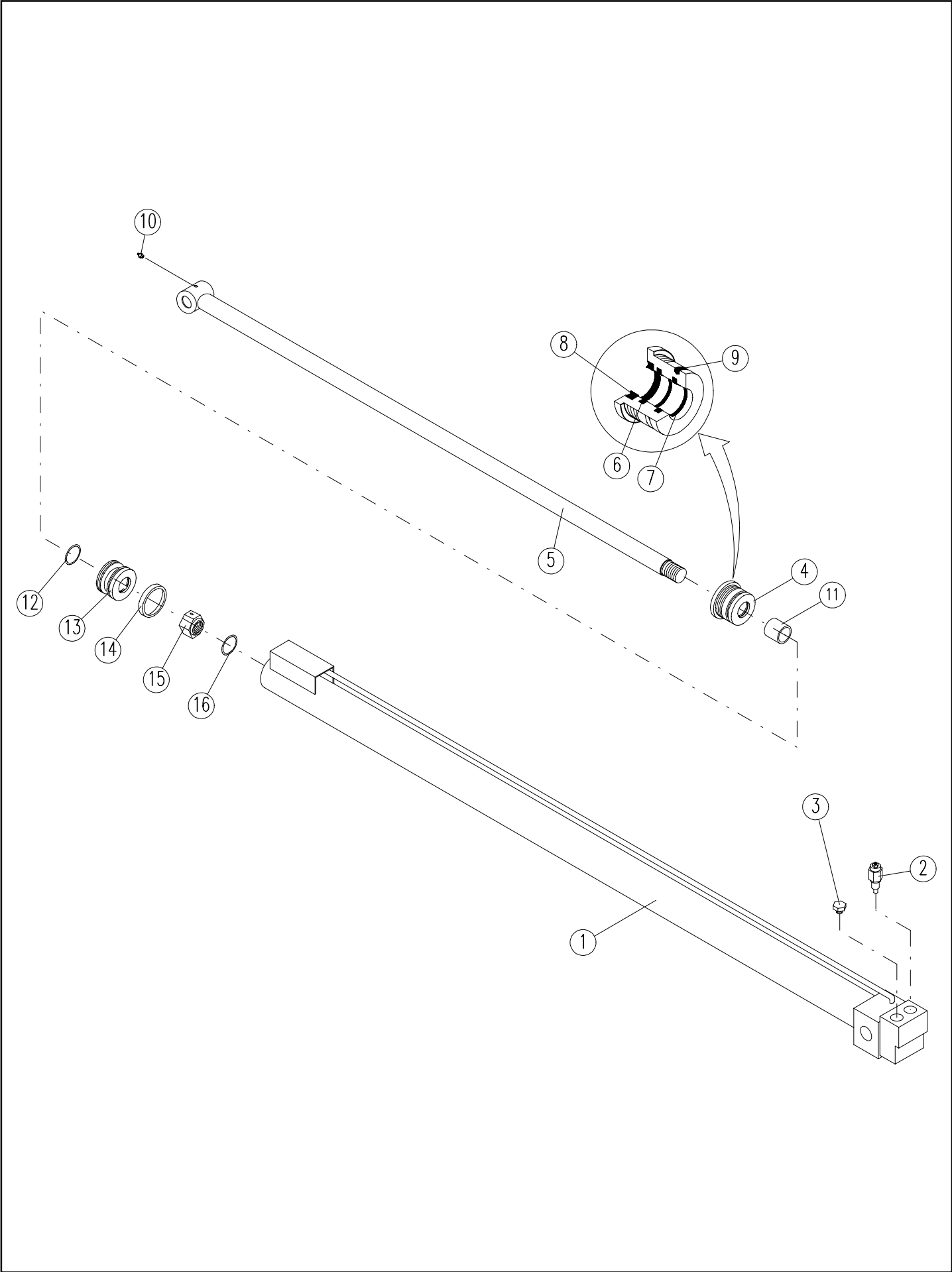


TELESCOPIC CYLINDER ASSEMBLY

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	O-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 AB38
TELESCOPIC CYLINDER. THE PART
NUMBER FOR THIS SEAL KIT IS
500459-000

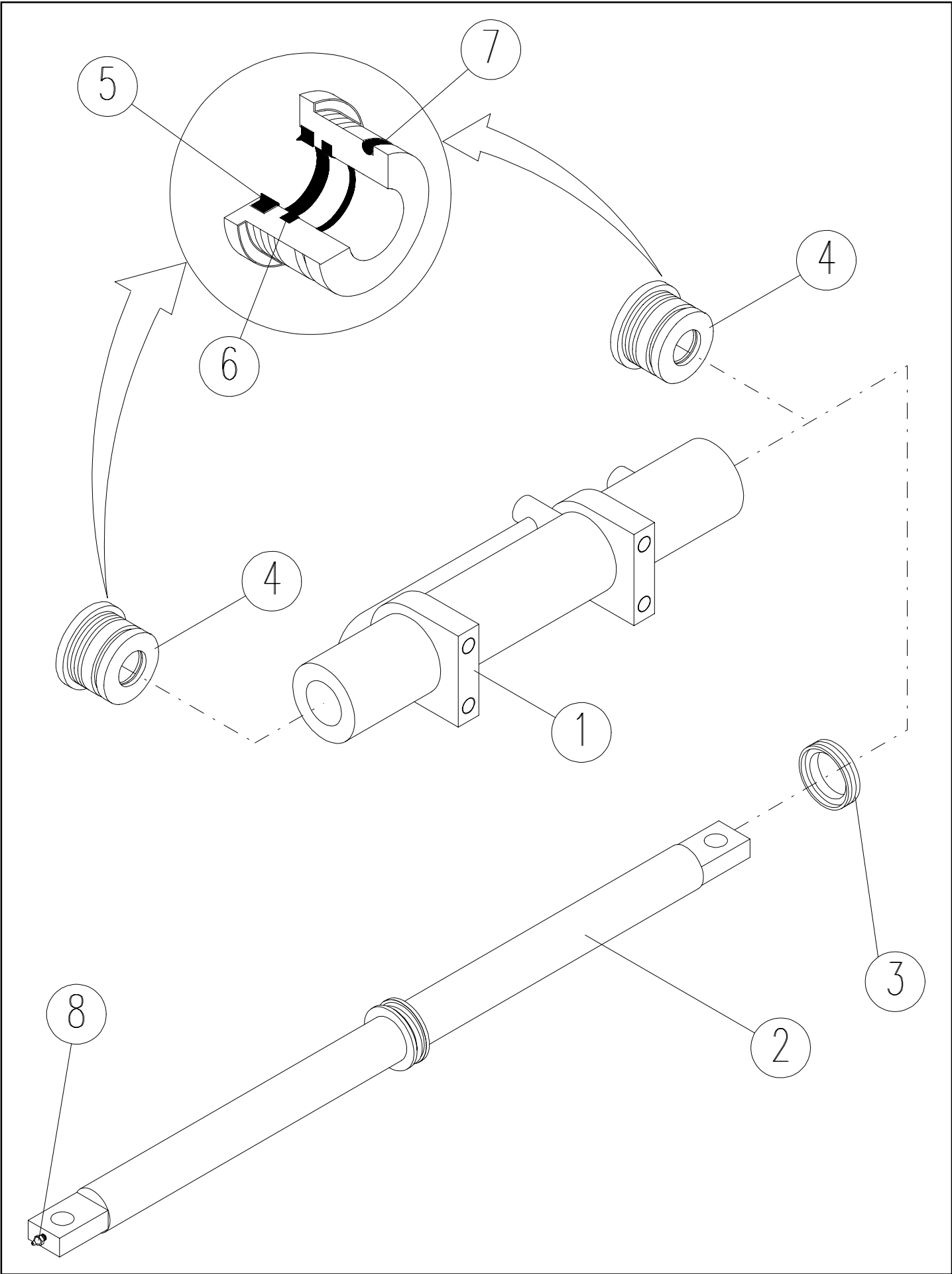


STEERING CYLINDER ASSEMBLY

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 AB38 STEERING CYLINDER.
THE PART NUMBER FOR THIS SEAL
KIT IS **500460-000**



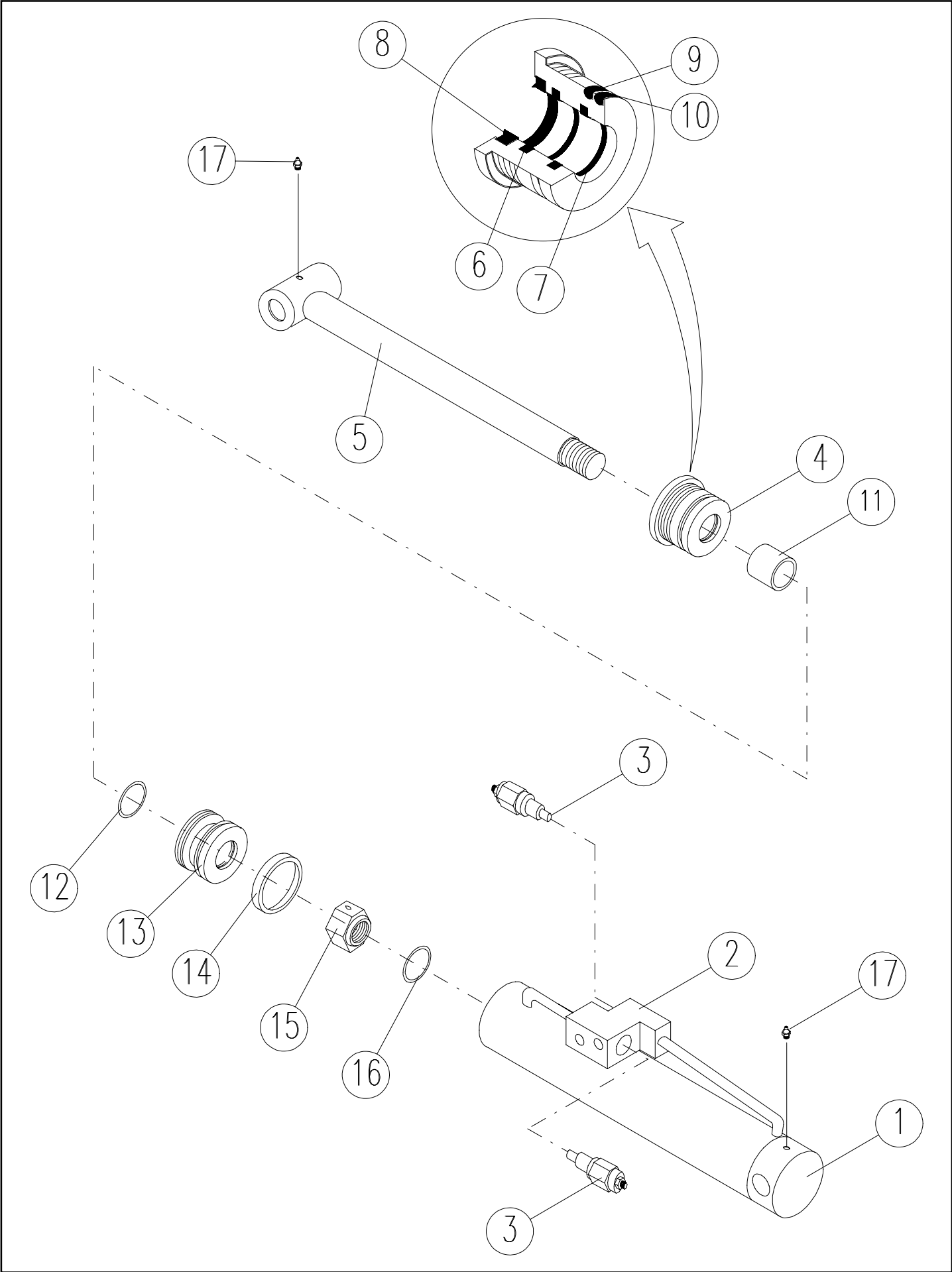
MASTER/SLAVE CYLINDER ASSEMBLY

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 O-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

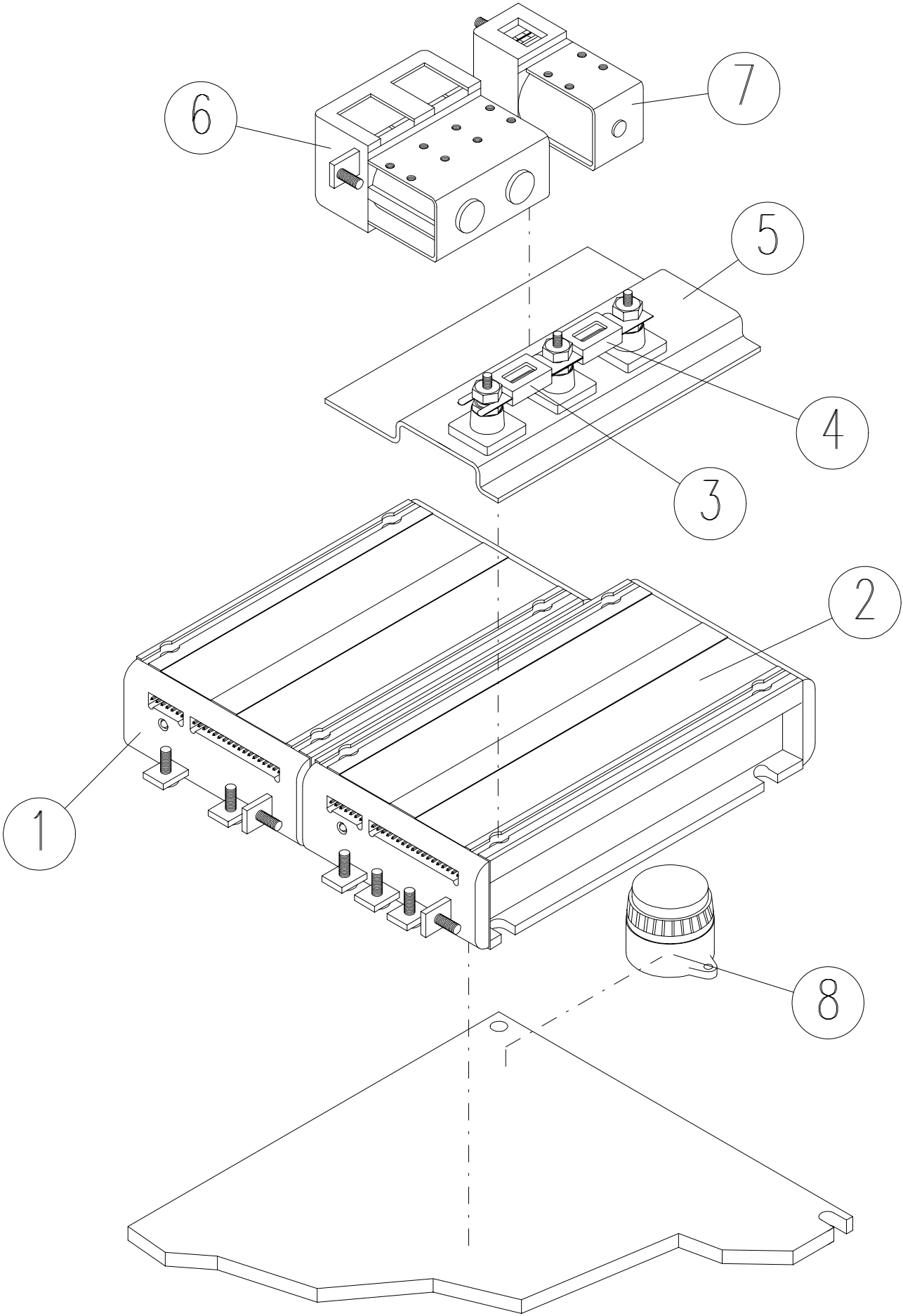
NOTE: ITEMS 6 TO 10 INCLUSIVE, 12 & 14
FORM THE SEAL KIT FOR THE AB38
MASTER OR SLAVE CYLINDER. THE
PART NUMBER FOR THIS SEAL KIT IS
058750-000



PUMP & TRACTION MOTOR CONTROL UNIT ASSEMBLY

500483-000 (Harnesses are not part of this assembly)

ITEM	PART NO.	DESCRIPTION	QTY.
1	500456-000	PUMP CONTROL UNIT, MOS90	1
2	500455-000	TRACTION CONTROL UNIT, MOS90	1
3	058920-000	TRACTION FUSE, 425A	1
4	058921-000	PUMP FUSE, 325A	1
5	500495-000	FUSE MOUNTING BOARD	1
6	500463-000	FORWARD/REVERSE CONTACTOR	1
7	500462-000	LINE CONTACTOR	1
8	057328-000	ALARM	1
*	057128-000	MOS90 CALIBRATOR (NOT SHOWN) TEST/PROGRAMMING INSTRUMENT	1

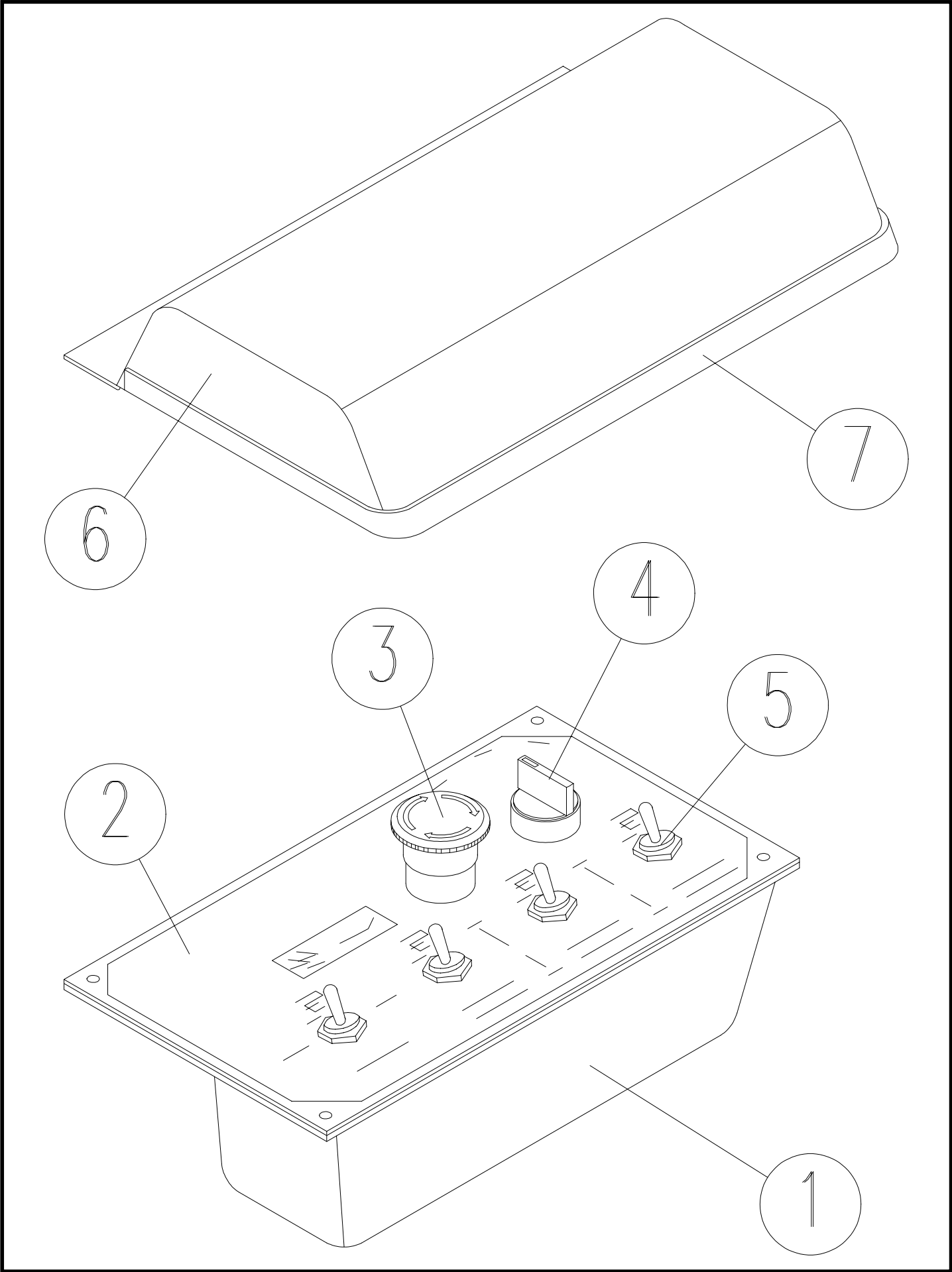


AB38 LOWER CONTROL BOX ASSEMBLY

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

ITEM	PART NO.	DESCRIPTION	QTY.
1	500490-001	CONTROL BOX ENCLOSURE ONLY	1
2	500306-000	LOWER CONTROL BOX DECAL	1
3	057309-000	EMERGENCY STOP SWITCH	1
4	500096-000	CHASSIS/PLATF. SELECTOR SWITCH	1
5	057311-000	TOGGLE SWITCH	4
6	500418-000	LOWER CONTROL BOX COVER - INCLUDING HINGE	1
7	500490-002	COVER PROTECTIVE LINING	1

NOTE: THE PART NUMBER FOR THE
CABLE-BOX CONNECTOR IS
500496-000

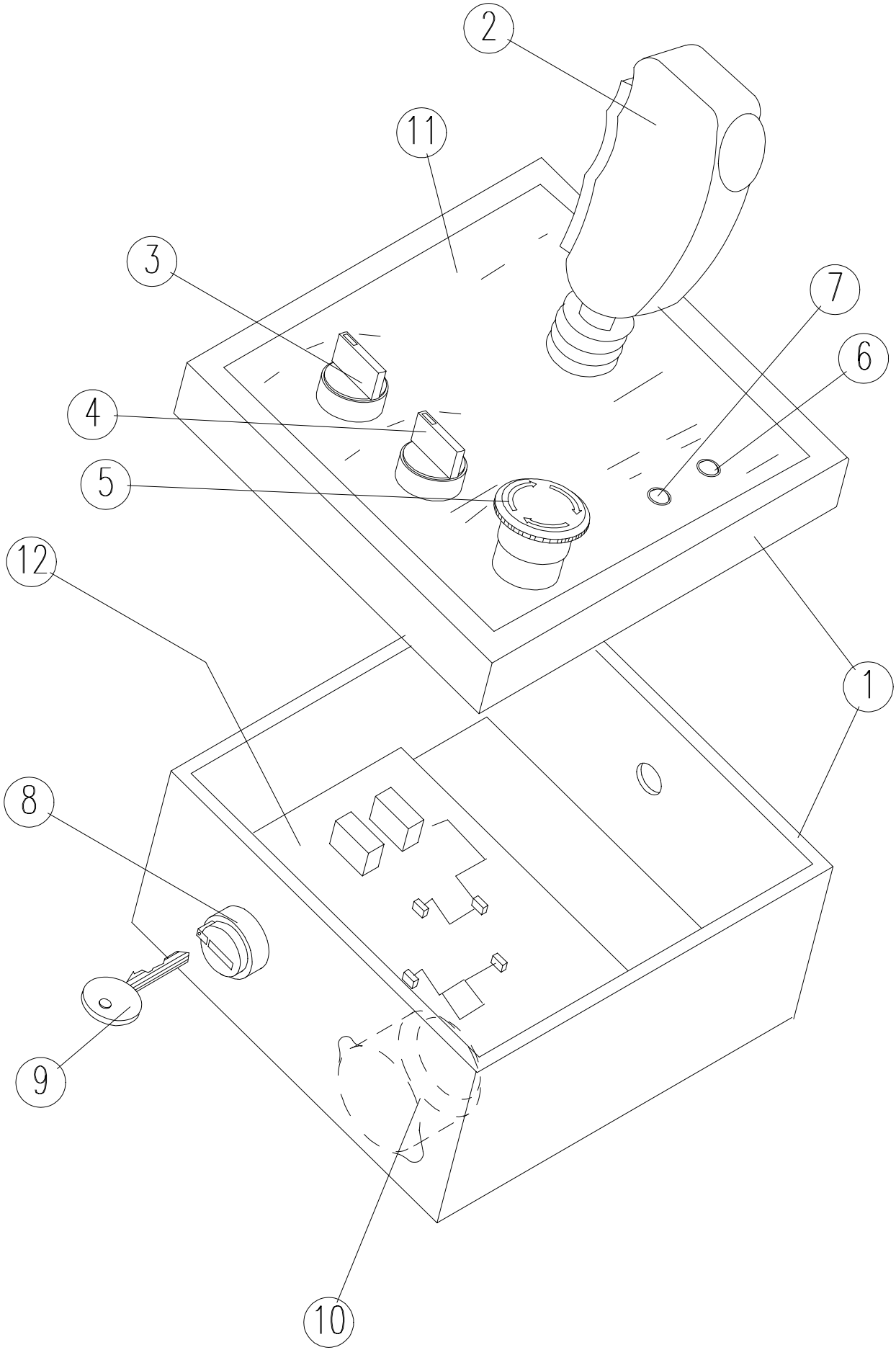


UPPER CONTROL BOX ASSEMBLY

500491-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	058150-000	CONTROL BOX ENCLOSURE ONLY	1
2	058804-000	JOYSTICK	1
*	063975-004	POT ASSEMBLY	1
*	058984-000	RUBBER BOOT	1
*	058985-000	INTERNAL MICRO SWITCH	1
*	058809-000	STEER ROCKER SWITCH	2
3	058152-000	4 POSITION SELECTOR SWITCH	1
4	058807-000	2 POSITION DRIVE/LIFT SWITCH	1
5	057309-000	EMERGENCY STOP SWITCH	1
6	057329-000	GREEN LED	1
7	057330-000	RED LED	1
8	057310-001	KEYSWITCH, WITH KEY	1
*	058946-000	CONTACT BLOCK N/O	4
9	057238-000	KEY	1
10	057328-000	ALARM	1
11	500305-000	UPPER CONTROL BOX DECAL	1
12	500454-000	UPPER CONTROL BOX PRINTED CIRCUIT BOARD	1

NOTE: THE PART NUMBER FOR THE CABLE-
BOX CONNECTOR IS **500122-000**

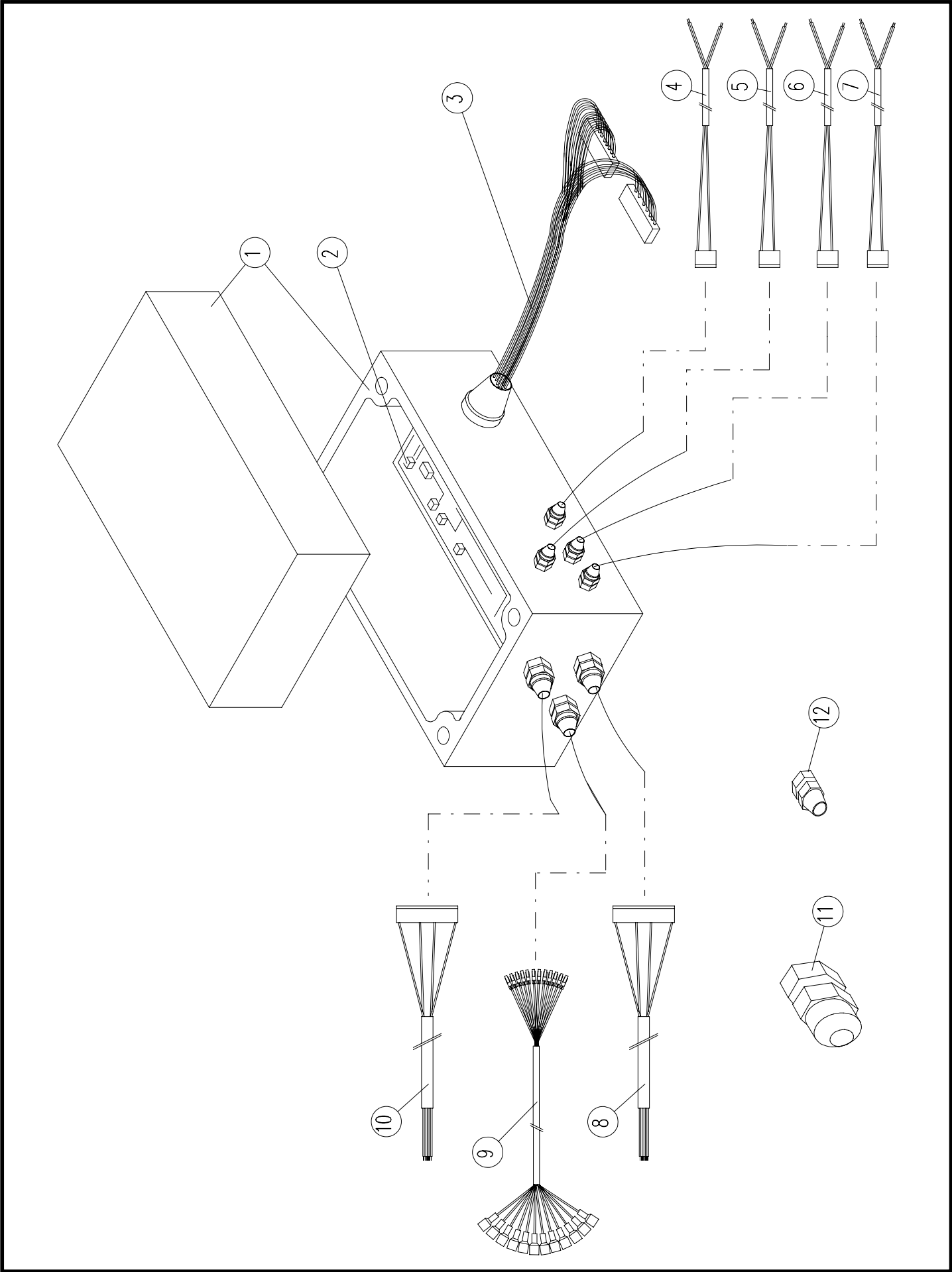


CIRCUIT BOARD BOX & HARNESES

500482-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	500482-001	CIRCUIT BOARD BOX ONLY	1
2	500448-000	PRINTED CIRCUIT BOARD	1
3	500482-002	HARNESS ASSEMBLY - TO MOTOR CONTROL UNIT ASSY.	1
4	500482-003	HARNESS ASSEMBLY - HORN	1
5	500482-004	HARNESS ASSEMBLY - BOOM REST LIMIT SWITCH	1
6	500482-005	HARNESS ASSEMBLY - TO TACHOMETER	1
7	500482-006	HARNESS ASSEMBLY - TO TILT SENSOR	1
8	500482-007	HARNESS ASSEMBLY - TO LOWER CONTROL BOX	1
9	500449-000	HARNESS ASSEMBLY - TO UPPER CONTROL BOX	1
10	500482-008	HARNESS ASSEMBLY - TO MANIFOLD SOLENOIDS	1
11	057332-000	GLAND NUT, MEDIUM	3
12	057308-000	GLAND NUT, SMALL	4

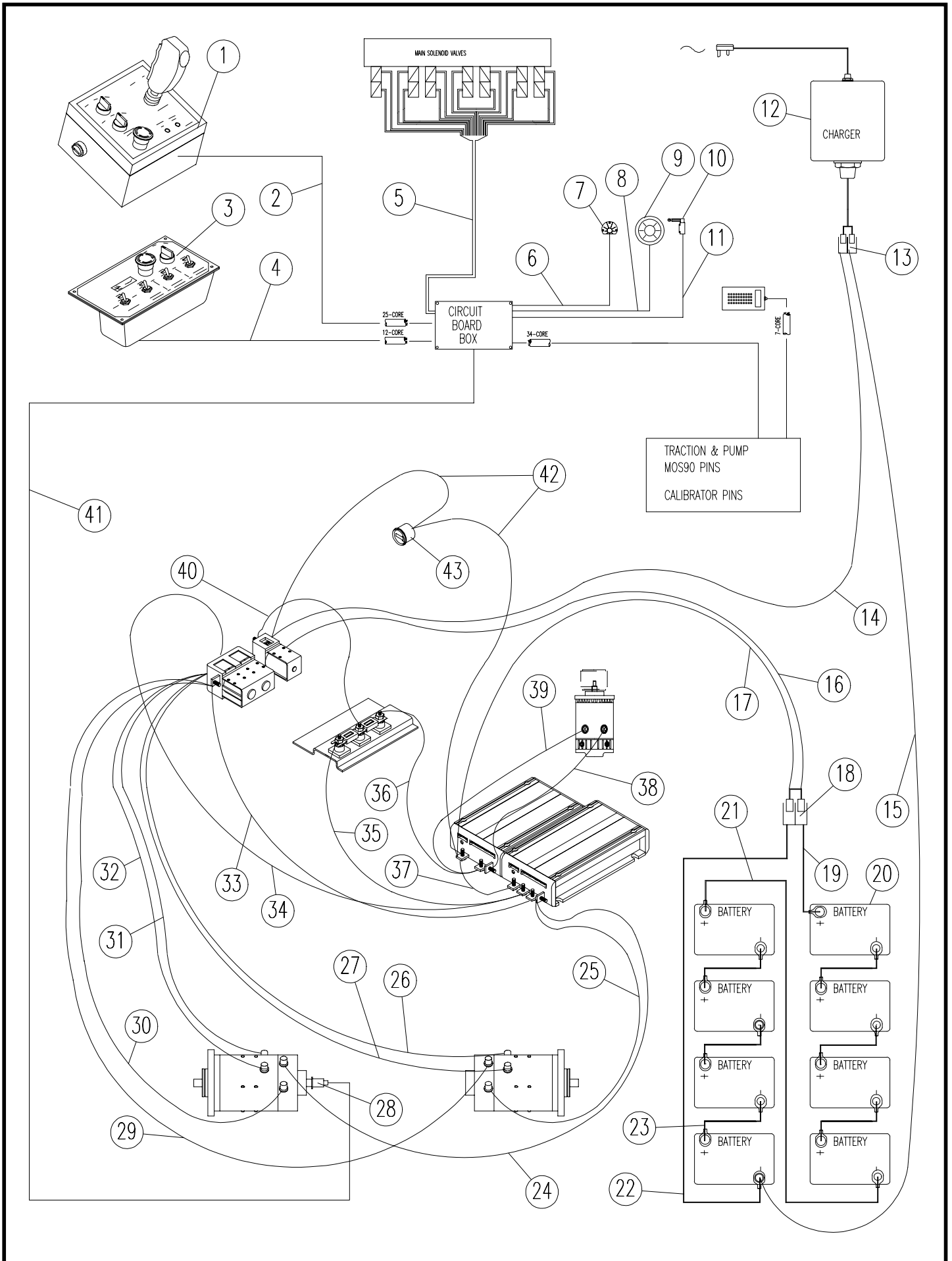
NOTE: THE MOTOR CONTROL UNIT ASSEMBLY HARNESS IS CONNECTED TO THE CIRCUIT BOARD BOX USING A CABLE-BOX CONNECTOR. THE PART NUMBER FOR THIS IS **500497-000**



CABLES & ELECTRICAL COMPONENT LEGEND

ITEM	PART NO.	DESCRIPTION	QTY.
1	500491-000	UPPER CONTROL BOX ASSY.	1
2	500449-000	HARNESS - UPPER CONTROL BOX TO CIRCUIT BOARD BOX	1
3	500490-000	LOWER CONTROL BOX ASSY.	1
4	500482-007	HARNESS - LOWER CONTROL BOX TO CIRCUIT BOARD BOX	1
5	500482-008	HARNESS - SOLENOID VALVES TO CIRCUIT BOARD BOX	1
6	500482-006	HARNESS - TILT SENSOR TO CIRCUIT BOARD BOX	1
7	057281-000	TILT SENSOR	
8	500482-003	HARNESS - HORN TO CIRCUIT BOARD BOX	1
9	057586-000	HORN	1
10	058864-000	BOOM REST LIMIT SWITCH	1
11	500482-004	HARNESS - BOOM REST LIMIT SWITCH TO CIRCUIT BOARD BOX	1
12	057573-000	CHARGER	1
13	058783-000	CHARGER DISCONNECT PLUG	2
14	500401-001	CABLE ASSEMBLY CHARGER TO LINE CONTACTOR	1
15	500401-002	CABLE ASSEMBLY CHARGER TO BATTERY NEGATIVE	1
16	500401-003	CABLE ASSEMBLY BATTERY DISCONNECT TO LINE CONTACTOR	1
17	500401-004	CABLE ASSEMBLY BATTERY DISCONNECT TO PUMP MOTOR CONTROL UNIT	1
18	058937-000	BATTERY DISCONNECT PLUG	2
19	500401-005	CABLE ASSEMBLY BATTERY DISCONNECT TO BATTERY POSITIVE	1
20	015796-001	BATTERY 6V 220AH	8
*	010154-001	BATTERY TERMINAL	16
21	500401-007	CABLE ASSEMBLY BATTERY TO BATTERY LONG	1
22	500401-006	CABLE ASSEMBLY BATTERY DISCONNECT TO BATTERY NEGATIVE	1
23	500401-008	CABLE ASSEMBLY BATTERY TO BATTERY SHORT	1
24	500401-009	CABLE ASSEMBLY TRACTION MOS (A) TO L.H. TRACTION MOTOR (A1)	1
25	500401-009	CABLE ASSEMBLY TRACTION MOS (A) TO R.H. TRACTION MOTOR (A1)	1

ITEM	PART NO.	DESCRIPTION	QTY.
26	500401-009	CABLE ASSEMBLY DIRECTION CONTACTOR TO R.H. TRACTION MOTOR (S2)	1
27	500401-009	CABLE ASSEMBLY DIRECTION CONTACTOR TO R.H. TRACTION MOTOR (S1)	1
28	057569-000	TACHOMETER	1
29	500401-009	CABLE ASSEMBLY DIRECTION CONTACTOR TO R.H. TRACTION MOTOR (A2)	1
30	500401-009	CABLE ASSEMBLY DIRECTION CONTACTOR TO L.H. TRACTION MOTOR (A2)	1
31	500401-009	CABLE ASSEMBLY DIRECTION CONTACTOR TO L.H. TRACTION MOTOR (S1)	1
32	500401-009	CABLE ASSEMBLY DIRECTION CONTACTOR TO L.H. TRACTION MOTOR (S2)	1
33	500401-010	CABLE ASSEMBLY DIRECTION CONTACTOR TO TRACTION MOS (S)	1
34	500401-011	CABLE ASSEMBLY DIRECTION CONTACTOR TO TRACTION MOS (B+)	1
35	500401-012	CABLE ASSEMBLY 425A FUSE TO TRACTION MOS (B+)	1
36	500401-013	CABLE ASSEMBLY 325A FUSE TO PUMP MOS (S)	1
37	500401-014	CABLE ASSEMBLY PUMP MOS (B-) TO TRACTION MOS (B-)	1
38	500401-015	CABLE ASSEMBLY PUMP MOS (A) TO PUMP MOTOR	1
39	500401-015	CABLE ASSEMBLY PUMP MOS (S) TO PUMP MOTOR	1
40	500401-016	CABLE ASSEMBLY LINE CONTACTOR TO PUMP & TRACTION FUSE	1
41	500482-005	HARNESS - TACHOMETER TO CIRCUIT BOARD BOX	1
42	058281-000	HARNESS - HOURMETER CABLE	1
43	058689-000	HOURMETER	1



HOSE ASSEMBLY

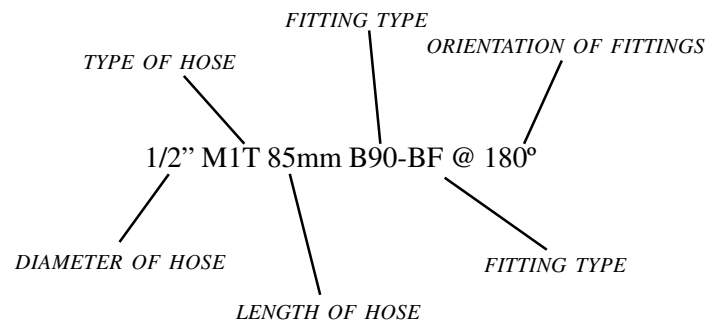
500262-000

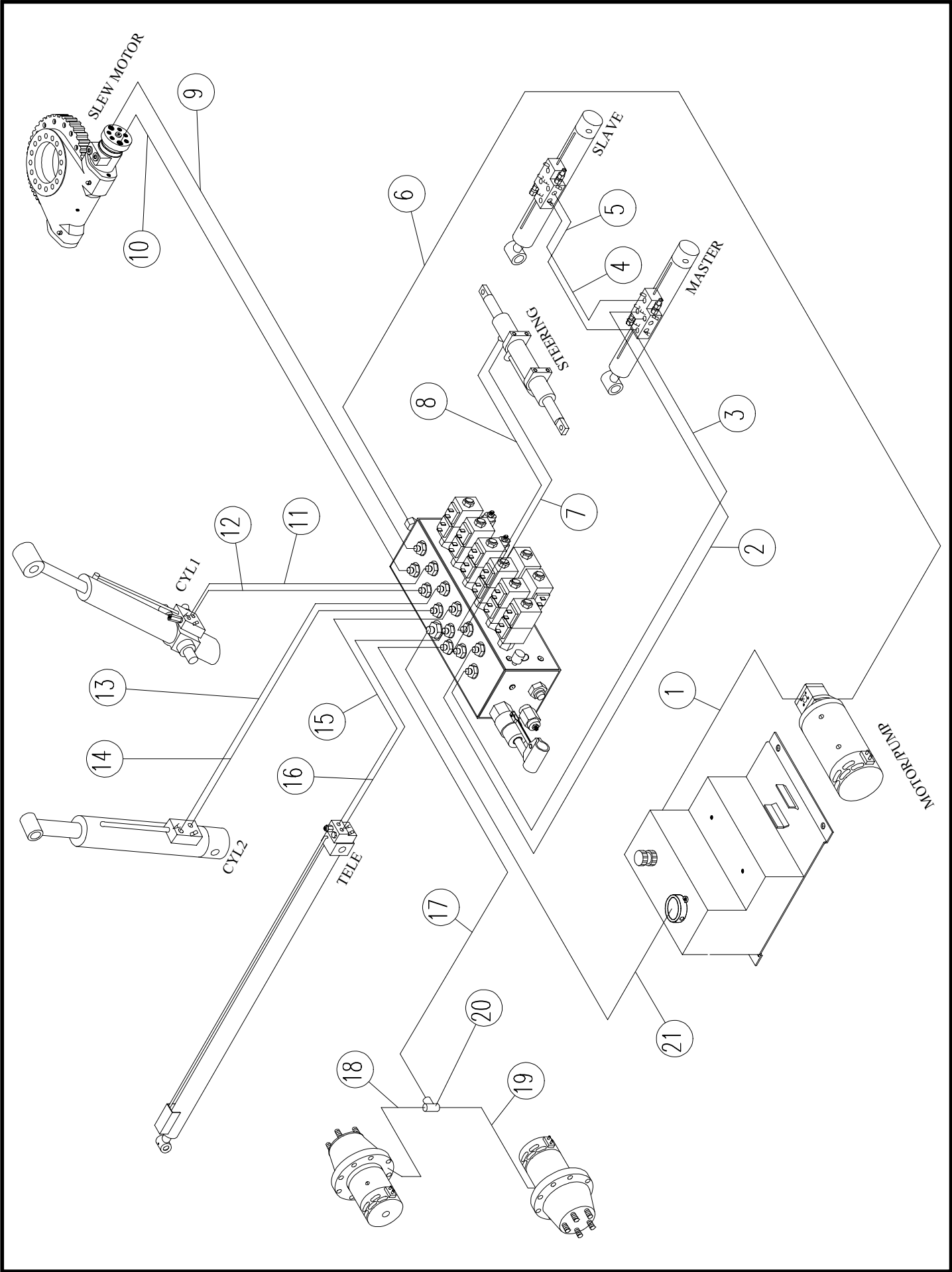
ITEM	PART NO.	DESCRIPTION	QTY.
1	500357-000	HOSE ASSY, 1/2" M1T 267 mm B90-B90 PUMP TO MANIFOLD	1
2	500353-000	HOSE ASSY, 1/4" M1T 6630 mm B90-B90 MANIFOLD TO MASTER CYLINDER	1
3	500353-000	HOSE ASSY, 1/4" M1T 6630 mm B90-B90 MANIFOLD TO MASTER CYLINDER	1
4	500228-000	HOSE ASSY, 1/4" M1T 8900 mm B90-B90 MASTER TO SLAVE CYLINDER	1
5	500228-000	HOSE ASSY, 1/4" M1T 8900 mm B90-B90 MASTER TO SLAVE CYLINDER	1
6	500358-000	HOSE ASSY, 3/8" M1T 190 mm B90-B90 PUMP TO MANIFOLD	1
7	500354-000	HOSE ASSY, 1/4" M1T 1280 mm B90-B90 MANIFOLD TO STEERING CYLINDER	1
8	500354-000	HOSE ASSY, 1/4" M1T 1280 mm B90-B90 MANIFOLD TO STEERING CYLINDER	1
9	500226-000	HOSE ASSY, 3/8" M1T 1700 mm B90-B90 MANIFOLD TO SLEW MOTOR	1
10	500226-000	HOSE ASSY, 3/8" M1T 1700 mm B90-B90 MANIFOLD TO SLEW MOTOR	1
11	500351-000	HOSE ASSY, 1/4" M1T 1750 mm B90-B90 MANIFOLD TO LOWER LIFT CYLINDER	1
12	500351-000	HOSE ASSY, 1/4" M1T 1750 mm B90-B90 MANIFOLD TO LOWER LIFT CYLINDER	1
13	500352-000	HOSE ASSY, 1/4" M1T 6650 mm B90-B90 MANIFOLD TO UPPER LIFT CYLINDER	1
14	500352-000	HOSE ASSY, 1/4" M1T 6650 mm B90-B90 MANIFOLD TO UPPER LIFT CYLINDER	1
15	500227-000	HOSE ASSY, 3/8" M1T 7200 mm B90-BF MANIFOLD TO TELESCOPIC CYLINDER	1
16	500227-000	HOSE ASSY, 3/8" M1T 7200 mm B90-BF MANIFOLD TO TELESCOPIC CYLINDER	1
17	500356-000	HOSE ASSY, 1/4" M1T 1270 mm BF-B90 MANIFOLD TO BRAKE T PIECE	1
18	500355-000	HOSE ASSY, 1/4" M1T 430 mm BF-B90 T PIECE TO BRAKE	1
19	500355-000	HOSE ASSY, 1/4" M1T 430 mm BF-B90 T PIECE TO BRAKE	1
20	058352-000	TPIECE	1

EXPLANATION OF HYDRAULIC TERMINOLOGY

BF STRAIGHT FEMALE FITTING
 B90 SWEPT 90° FITTING
 M1T MEGAFLEX HOSE

EXAMPLE:

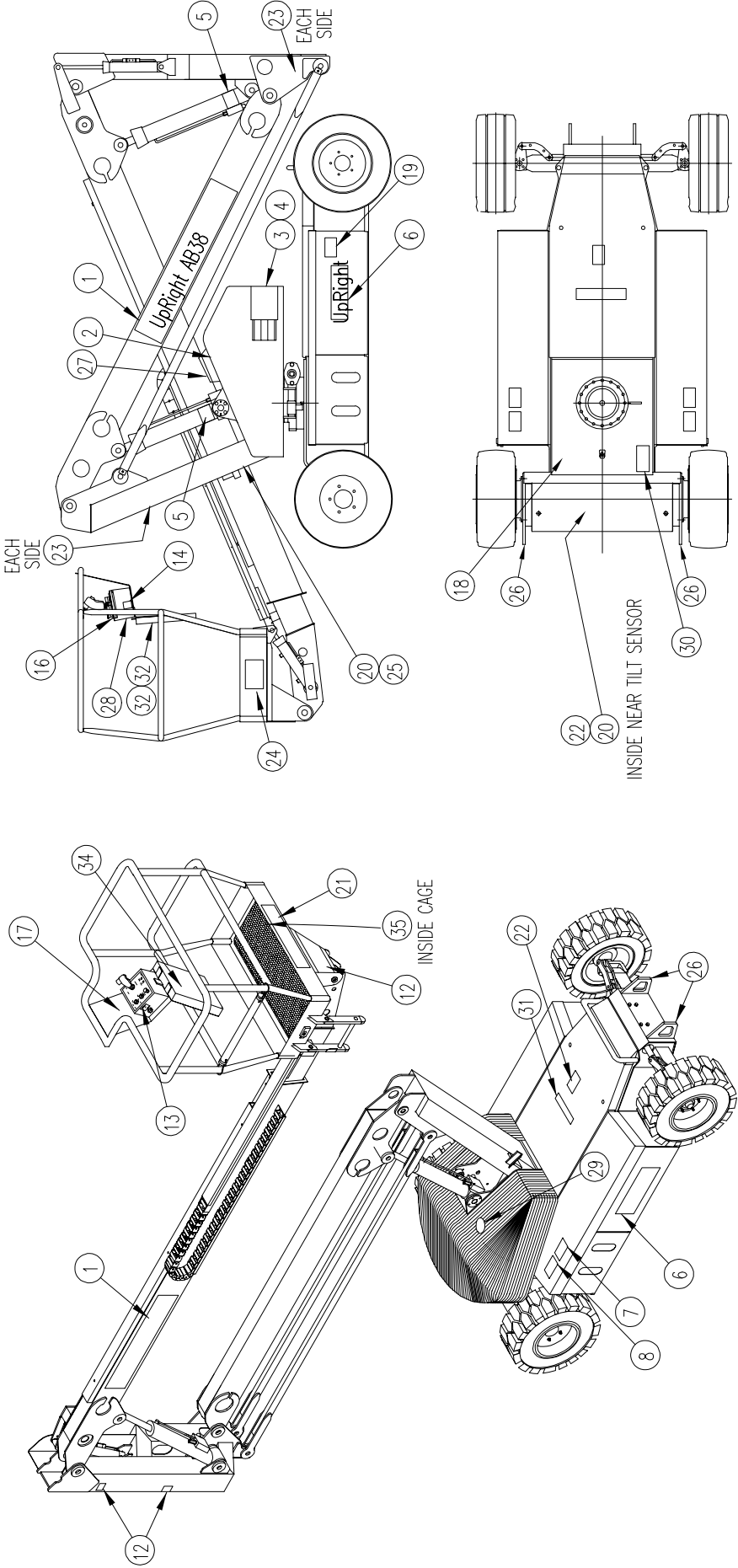




DECAL KIT**American English (ANSI)**

500206-001

ITEM	PART NO.	DESCRIPTION	QTY.
1	500264-001	DECAL - 'UpRight AB38N' BOOM	2
2	500306-000	DECAL - LOWER CONTROL BOX	1
3	500257-001	DECAL - AB38N LOGO	1
4	057695-000	DECAL - BALLAST STRIP	1
5	057382-000	DECAL - EMERGENCY LOWERING	2
6	057696-000	DECAL - 'UpRight' LOGO	2
7	057429-000	DECAL - BATTERY FLUID LEVEL	2
8	057430-000	DECAL - EXPLOSION HAZARD	2
9	-	-	-
10	-	-	-
11	-	-	-
12	058881-001	DECAL - HAZARD TAPE	2
13	058080-000	DECAL - CAGE LEVELLING	1
14	058186-000	DECAL - ON/OFF UPPER CONTROL	1
15	-	-	-
16	500305-000	DECAL - UPPER CONTROL BOX LEGEND	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	057434-000	DECAL - GENUINE REPLACEMENTS	2
23	057424-001	DECAL - CRUSH HAZARD	4
24	058535-000	DECAL - CAUTION BEFORE OPERATING	1
25	058536-000	DECAL - IMPACT FROM DESCENDING	1
26	058531-000	DECAL - TIE DOWN / LIFT POINT	4
27	500438-000	DECAL - LOWER CONTROL BOX	1
28	058539-000	DECAL - ALL PERSONNEL SHALL BE	1
29	058537-000	DECAL - PINCH POINT	2
30	058471-001	NAME PLATE - ANSI	1
31	058532-000	DECAL - HYDRAULIC FLUID	1
32	500424-000	ANSI OPERATORS MANUAL	1
33	500422-000	SERVICE & PARTS MANUAL	1
34	057425-001	DECAL - INSTRUCTIONS INSIDE	1
34	057425-001	DECAL - INSTRUCTIONS INSIDE	1

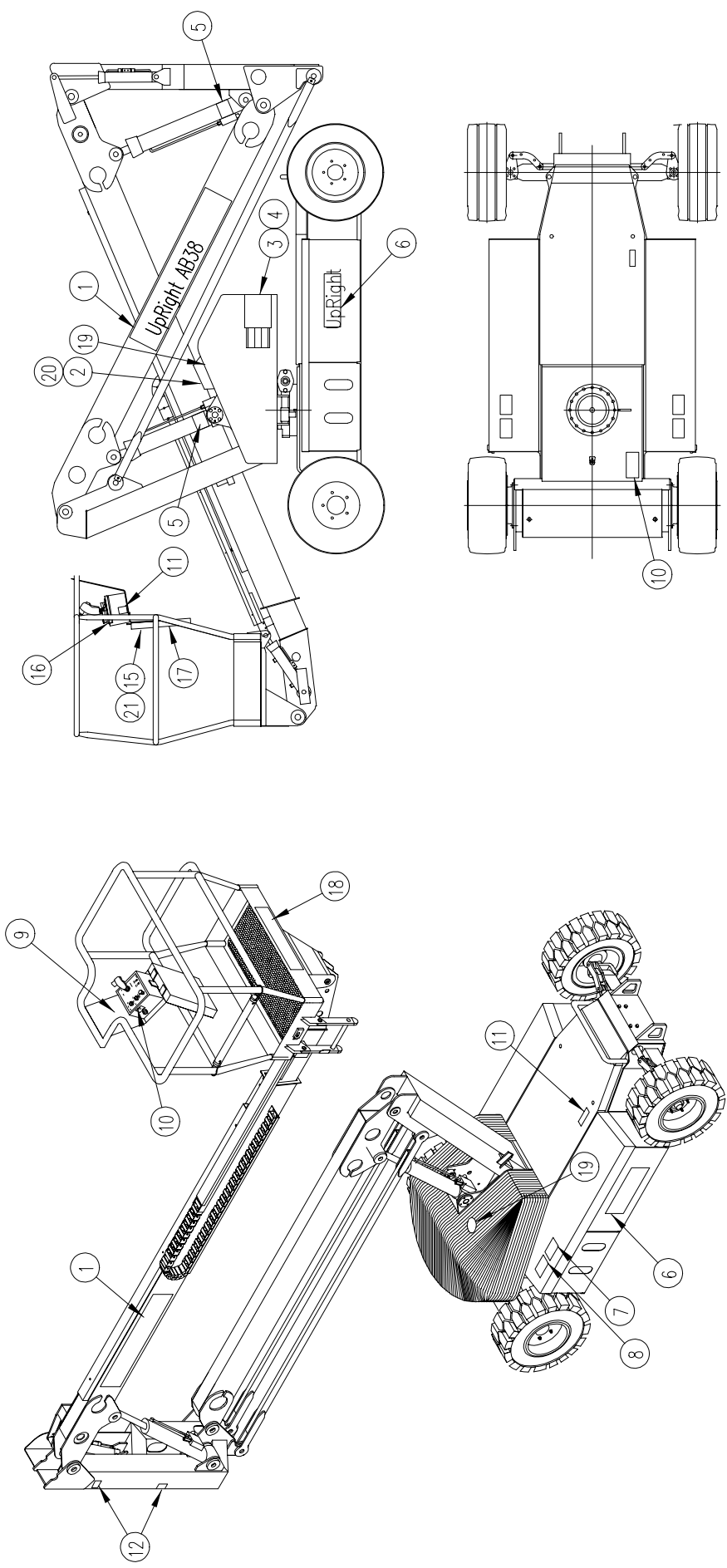


DECAL KIT

International English (CE)

500206-000

ITEM	PART NO.	DESCRIPTION	QTY.
1	500264-000	DECAL - 'UpRight AB38' BOOM	2
2	500306-000	DECAL - LOWER CONTROL BOX	1
3	500257-000	DECAL - AB38 LOGO	1
4	057695-000	DECAL - BALLAST STRIP	1
5	057382-000	DECAL - EMERGENCY LOWERING	2
6	057696-000	DECAL - 'UpRight' LOGO	2
7	057429-000	DECAL - BATTERY FLUID LEVEL	2
8	057430-000	DECAL - EXPLOSION HAZARD	2
9	057692-000	DECAL - IMPORTANT BEFORE USING	1
10	058472-000	NAMEPLATE	1
11	500467-000	DECAL - HANDPUMP	1
12	058881-001	DECAL - HAZARD TAPE	2
13	058080-000	DECAL - CAGE LEVELLING	1
14	058186-000	DECAL - ON/OFF UPPER CONTROL	1
15	500423-000	INSTRUCTION MANUAL CE	1
16	500305-000	DECAL - UPPER CONTROL BOX LEGEND	1
17	058181-000	DECAL - 3 POINT	1
18	057392-000	DECAL - S.W.L. LARGE	1
19	058860-000	DECAL - PINCH POINT	2
20	500438-000	DECAL - LOWER CONTROL COVER	1
21	500422-000	SERVICE & PARTS MANUAL	1



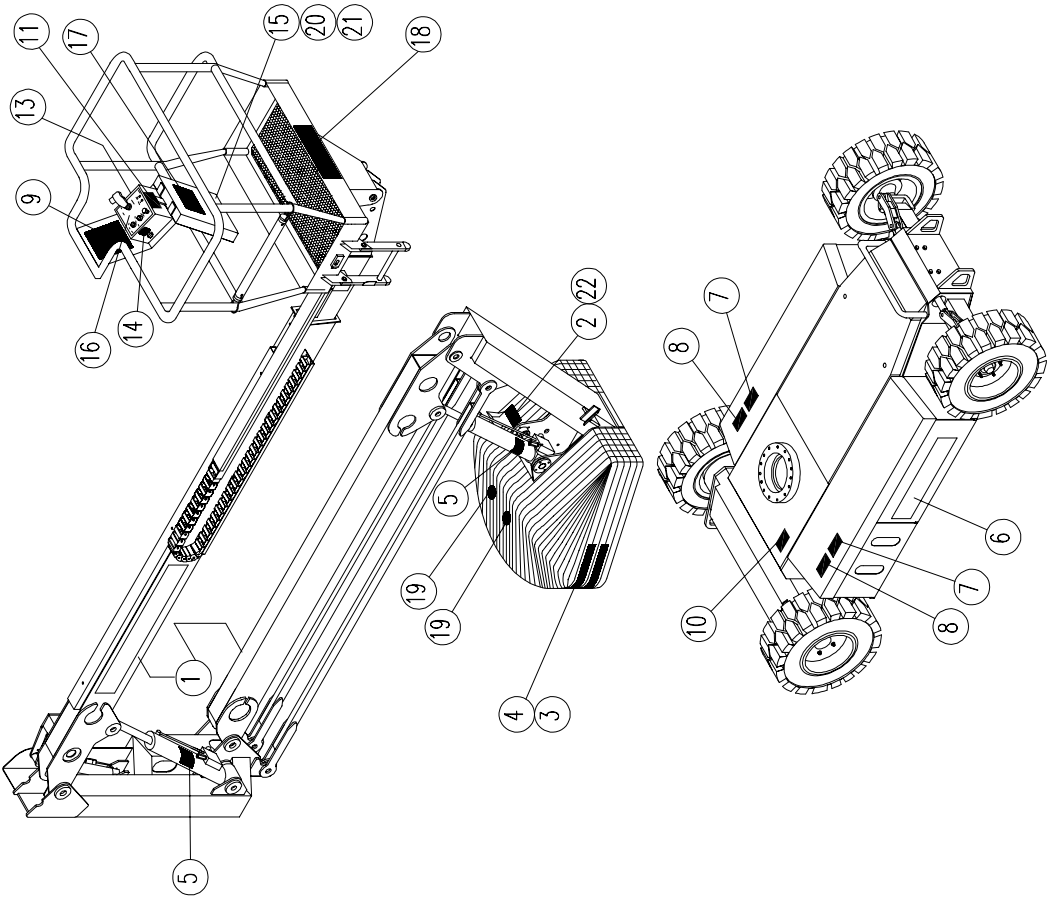
DECAL KIT
French (CE)
 500206-003

ITEM	PART NO.	DESCRIPTION	QTY.
1	500264-000	DECAL - 'UpRight AB38' BOOM	2
2	500306-000	DECAL - LOWER CONTROL BOX	1
3	500257-000	DECAL - AB38 LOGO	1
4	057695-000	DECAL - BALLAST STRIP	1
5	057382-001	DECAL - EMERGENCY LOWERING	2
6	057696-000	DECAL - 'UpRight' LOGO	2
7	057429-001	DECAL - BATTERY FLUID LEVEL	2
8	057430-001	DECAL - EXPLOSION HAZARD	2
9	057692-001	DECAL - IMPORTANT BEFORE USING	1
10	058472-000	NAMEPLATE	1
11	500467-001	DECAL - HANDPUMP	1
12	058881-001	DECAL - HAZARD TAPE	2
13	058080-000	DECAL - CAGE LEVELLING	1
14	058186-001	DECAL - ON/OFF UPPER CONTROL	1
15	500423-000	INSTRUCTION MANUAL CE	1
16	500305-000	DECAL - UPPER CONTROL BOX LEGEND	1
17	058181-001	DECAL - 3 POINT	1
18	057392-000	DECAL - S.W.L. LARGE	1
19	058860-000	DECAL - PINCH POINT	2
20	500438-001	DECAL - LOWER CONTROL COVER	1
21	500422-000	SERVICE & PARTS MANUAL	1

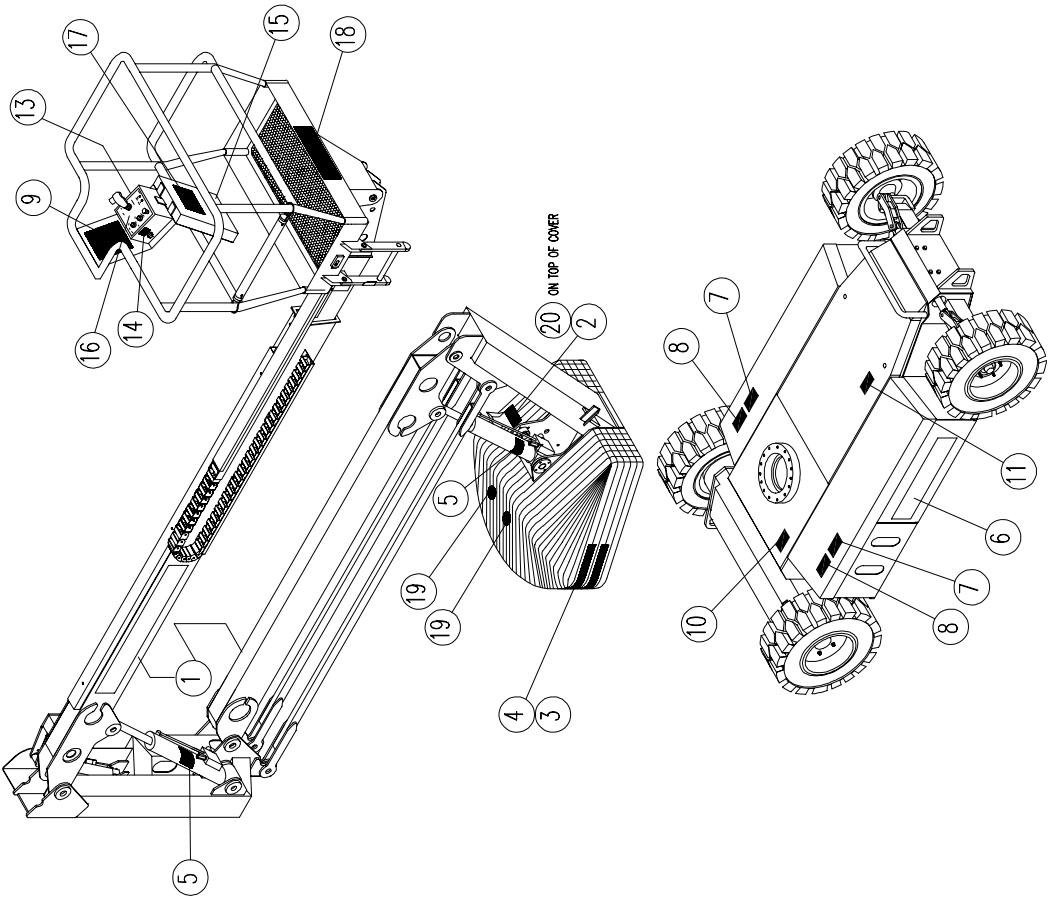
DECAL KIT
German (CE)
 500206-002

ITEM	PART NO.	DESCRIPTION	QTY.
1	500264-000	DECAL - 'UpRight AB38' BOOM	2
2	500306-000	DECAL - LOWER CONTROL BOX	1
3	500257-000	DECAL - AB38 LOGO	1
4	057695-000	DECAL - BALLAST STRIP	1
5	057507-002	DECAL - EMERGENCY LOWERING	2
6	057696-000	DECAL - 'UpRight' LOGO	2
7	057507-024	DECAL - BATTERY FLUID LEVEL	2
8	057507-026	DECAL - EXPLOSION HAZARD	2
9	057507-025	DECAL - MACHINE GENERAL INSTR.	1
10	058472-000	NAMEPLATE	1
11	057507-027	DECAL - THIS MACHINE IS NOT INSULATED	1
12	058881-001	DECAL - HAZARD TAPE	2
13	057507-030	DECAL - CAGE LEVELLING	1
14	058186-002	DECAL - ON/OFF UPPER CONTROL	1
15	058990-000	INSTRUCTION MANUAL CE	1
16	500305-000	DECAL - UPPER CONTROL BOX LEGEND	1
17	058181-002	DECAL - 3 POINT	1
18	057507-031	DECAL - S.W.L. LARGE	1
19	058860-000	DECAL - PINCH POINT	2
20	500422-000	SERVICE & PARTS MANUAL	1
21	058013-000	DECAL - BEFORE DRIVING	1
22	500438-002	DECAL - LOWER CONTROL COVER	1

DECAL KIT
German (CE)
500206-002



DECAL KIT
French (CE)
500206-003



OPTION LIST

ITEM	PART NO.	DESCRIPTION
1	058191-000	AB38 OPTION, POWER TO PLATFORM 110V
2	058191-001	AB38 OPTION, POWER TO PLATFORM 220V
3	500123-000	AB38 OPTION, DESCENT ALARM
4	058286-001	AB38 OPTION, HOURMETER
5	058275-000	AB38 OPTION, FLASHING BEACON
6	058284-000	AB38 OPTION, SPOTLIGHT IN PLATFORM
7	058259-003	AB38 OPTION, GENERATOR - PETROL
7	058259-004	AB38 OPTION, GENERATOR - DIESEL
8	500494-001	AB38 OPTION, NON MARKING WHEELS (WHITE TYRES)

The options outlined opposite are available from UpRight Ireland 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 UpRight Product Support for more information.

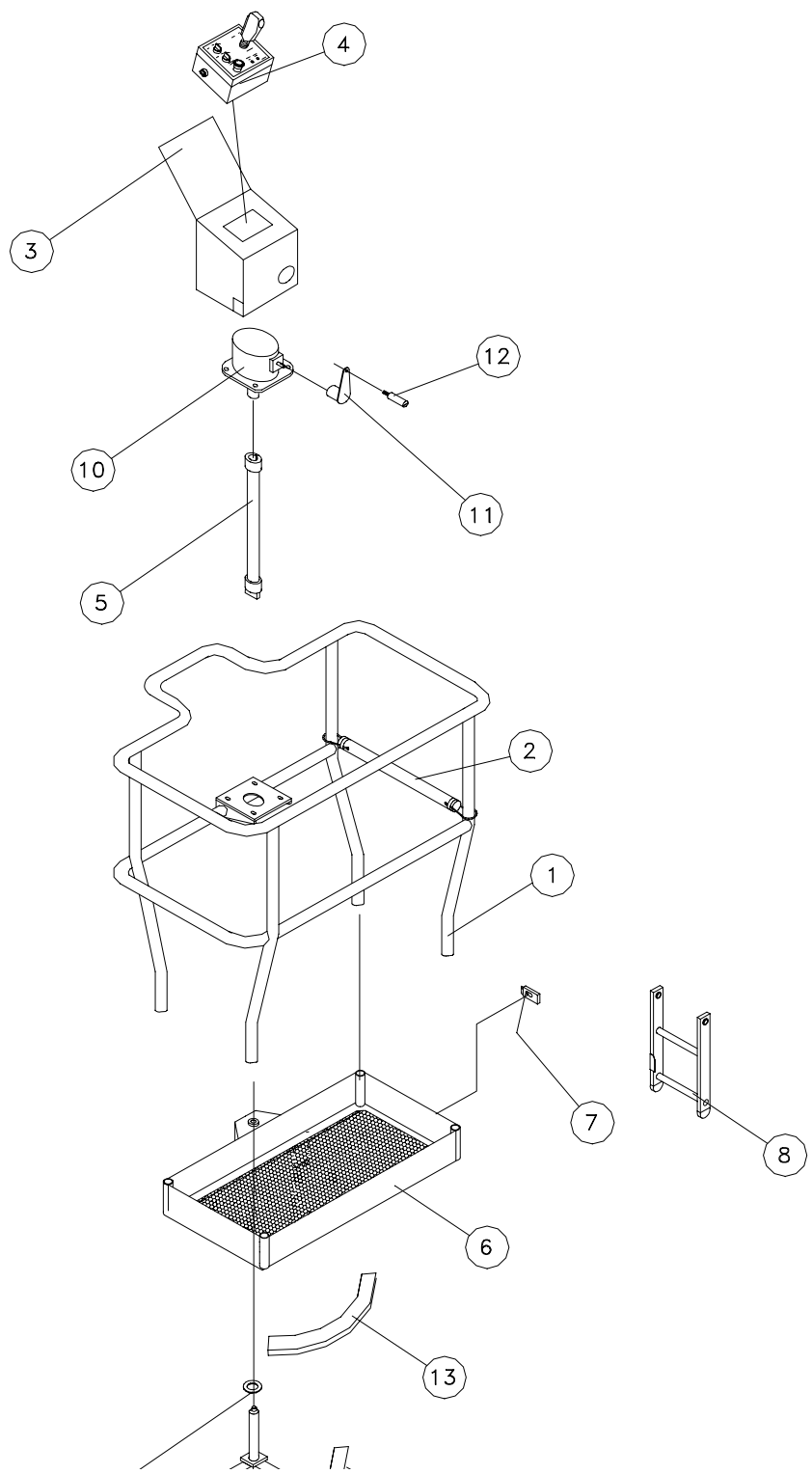
When required with new machine please contact UpRight Sales & Marketing prior to placing machine order.

NOTES:

CAGE ROTATOR ASSEMBLY

500905-000 (500491-000 is not included as part of this assembly)

ITEM	PART NO.	DESCRIPTION	QTY.
1	057521-001	ROTATOR CAGE RAIL ASSY.	1
2	057524-000	DROP BAR ASSY.	1
3	500973-000	CONTROL BOX MOUNTING PLATE	1
4	500491-000	AB38 UPPER CONTROL BOX	1
5	500905-030	DRIVE SHAFT	1
6	500948-000	ROTATOR FLOOR WELDMENT	1
7	058251-000	LADDER LOCKING LATCH	1
8	057347-001	LADDER	1
9	500947-000	ROTATOR CRADLE WELDMENT	1
10	500922-000	GEARBOX	1
11	500905-034	HANDLE	1
12	500985-000	ROTATING HANDLE	1
13	500905-012	WEAR PAD	1
14	500924-000	THRUST WASHER	1



NOTES:

Numerical Index

Part No.	Description	Page No.	Part No.	Description	Page No.
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056021-010	SPRING WASHER 10 mm	7-6	057569-000	TACHOMETER	7-4,40
056021-012	WASHER M12 SPRING	7-4,18	057569-001	TACHOMETER ADAPTOR KIT	7-4
056058-015	BOLT M6 x 15 mm	7-6	057570-000	TACHO COUPLING	7-4
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056065-035	MOUNTING BOLTS M12	7-4	057578-000	REAR WHEEL NUT - M14	7-4,16
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057033-000	CIRCLIP 30 mm	7-6	057603-000	CAGE AND CRADLE ASSEMBLY	7-2,8
057034-000	CIRCLIP 25 mm	7-6	057666-000	FRONT WHEEL NUT - M16	7-4,16
057045-000	SPIRIT LEVEL	7-4	057667-001	FRONT WHEEL TYRE & RIM ASSY.	7-4,16
057046-000	BUSHING FLANGED 35 mm	7-6	057668-000	REAR WHEEL TYRE & RIM ASSY.	7-4,16
057047-000	BUSHING STRAIGHT 25 mm	7-6	057669-000	STEERING STUB AXLE ASSY.	7-4
057048-000	GREASE NIPPLE	7-22,24,26,28,30	057679-000	ENERGY CHAIN - COMPLETE	7-6
057054-000	BUSHING FLANGED 30 mm	7-6	057692-000	DECAL - IMPORTANT BEFORE USING	7-46
057106-000	PRESSURE TEST POINT FITTING	7-20	057692-001	DECAL - IMPORTANT BEFORE USING	7-48
057121-000	ADAPTOR 1/4" x 3/8"	7-20	057695-000	DECAL - BALLAST STRIP	7-44,46,48
057122-000	ADAPTOR 3/8" x 3/8"	7-20	057696-000	DECAL - 'UpRight' LOGO	7-44,46,48
057128-000	MOS90 CALIBRATOR	7-32	057698-000	BRUSH	7-12
057238-000	KEY	7-36	057699-000	BRUSH SPRINGS	7-12
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