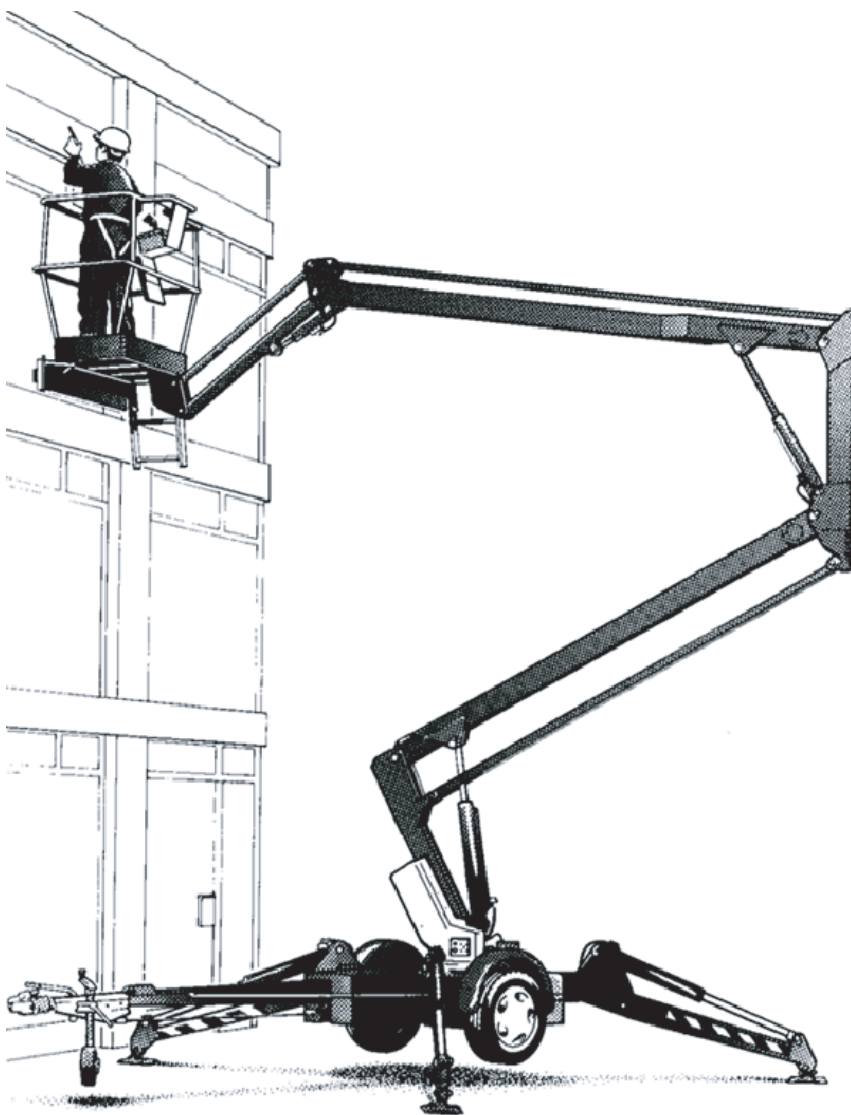


UpRight

POWERED ACCESS



TL38
WORK PLATFORM

SERVICE & PARTS MANUAL

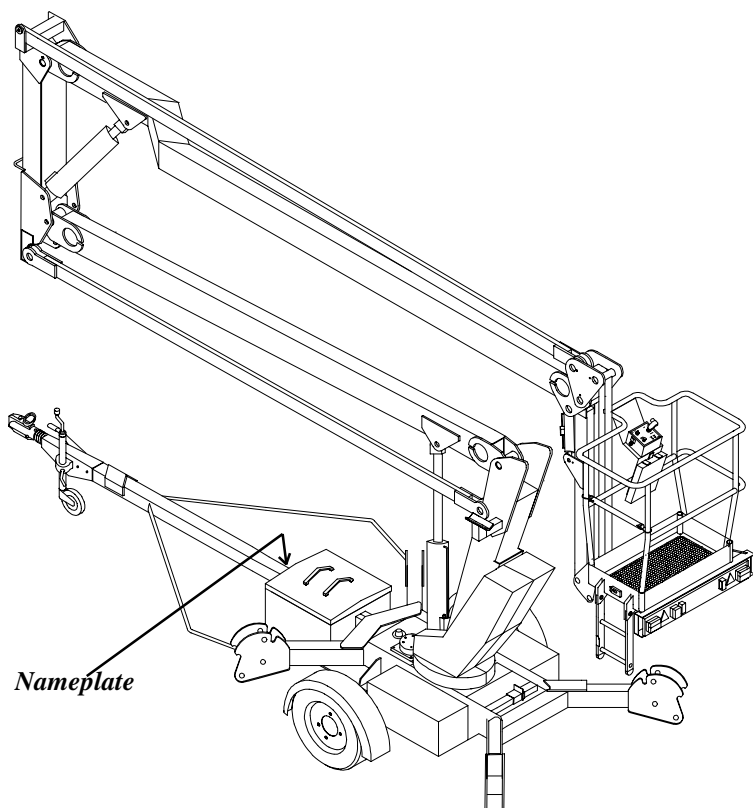
SERVICE & PARTS MANUAL

TL38

UpRight Work Platform Manual & Hydraulic Models

Serial Numbers 1754 to current

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). Should the name plate be missing the SERIAL NUMBER is also stamped on the axle mounting plate on the right hand side of the machine. The TL38 Work Platform meets and exceeds the requirements of both *prEN280* and *ANSI 292.2(1990)*.



| | | | |
|--|-----------------------------------|--|----------|
| UpRight | | Vigo Centre Birtley Road, Washington, Tyne & Wear, U.K. | CE |
| MODEL | TL38 | SERIAL NO. | 199 |
| MAX PLATFORM HEIGHT | 11.5m | UNLADEN WEIGHT | kg |
| MAX. PLATFORM LOAD | 215kg 2 Persons + 55kg. Equipment | | |
| MAX. LATERAL FORCE | 400N | MAX. WIND SPEED | 12.5m/s |
| MAX. CHASSIS INCLINATION | 0° | BATTERY VOLTAGE | 24V |
| NOMINAL POWER | 3kW | CHARGER INPUT VOLTAGE | 220/240V |
| CAUTION: ONLY TRAINED & AUTHORISED PERSONNEL MAY USE THIS MACHINE - CONSULT OPERATORS MANUAL BEFORE USE. THIS PLATFORM IS NOT ELECTRICALLY INSULATED | | | |
| PIN 58838-000 | | | |

| | | | |
|--|---------------------------------------|--|----------|
| UpRight | | Vigo Centre Birtley Road, Washington, Tyne & Wear, U.K. | |
| MODEL | TL38 | SERIAL NO. | 199 |
| MAX PLATFORM HEIGHT | 37ft 8" | UNLADEN WEIGHT | lbs |
| MAX. PLATFORM LOAD | 475lbs 2 Persons + 140 lbs. Equipment | | |
| MAX. LATERAL FORCE | 90lbf | MAX.WIND SPEED | 28mph |
| MAX. CHASSIS INCLINATION | 2° | BATTERY VOLTAGE | 24V |
| NOMINAL POWER | 4 hp | CHARGER INPUT VOLTAGE | 100/120V |
| VEHICLE IDENTIFICATION NUMBER | *UN973800--A001--- | | |
| CAUTION: ONLY TRAINED & AUTHORISED PERSONNEL MAY USE THIS MACHINE - CONSULT OPERATORS MANUAL BEFORE USE. THIS PLATFORM IS NOT ELECTRICALLY INSULATED | | | |
| P/N 58839-000 | | | |

500314-001

07/07



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: **TL38**

Serial Numbers: **1001-1200**

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



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

TL38 Work Platform

Foreword

Introduction

HOW TO USE THIS MANUAL

This manual is divided into 7 Sections. The right hand pages of each Section are marked with a black tab that lines 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 reference 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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| Machine Preparation | 2.0 |
| Information on the preparation for use, shipment, forklifting, transporting and storage. | |
| Operation | 3.0 |
| Operating Instructions & Safety Rules. | |
| Maintenance | 4.0 |
| Preventative Maintenance & Service Intervals. | |
| Troubleshooting | 5.0 |
| Causes and Solutions to typical problems. | |
| Schematics | 6.0 |
| Schematics and Valve Block Diagram with description and location of components. | |
| Illustrated Parts Breakdown | 7.0 |
| Complete parts lists with illustrations. | |

Foreword

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1.0 Introduction

PURPOSE

This purpose of this Service & Parts Manual is to provide instructions and illustrations for the operation and maintenance of the TL38 Work Platform manufactured by Upright Ireland Ltd, Dun Laoire, Ireland. (See Figure 1-1).

SCOPE

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

1.1 General Information

The TL38 is a three-stage articulating boom lift platform, designed to raise two operators with hand tools to a maximum working height of up to 13.5m (44ft) i.e. a platform floor height of 11.5m (38ft). It is mounted on a trailer suitable for towing on public roads at speeds of up to 50 mph / 83Km/h (subject to local regulations). The boom assembly is operated by a hydraulic pump driven by a DC electric motor. The Chassis Assembly is fitted with either hydraulic or manually operated stabilising Outriggers.

PLATFORM

The platform is large enough for two operators and has a free-draining perforated floor with 150mm (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 fixed at the front centre of the platform. It features a Joystick which will provide proportional control for raising or lowering one of the three booms, or rotating (slewing) the entire

Booms & Posts Assembly.

A safety feature which is incorporated into the Joystick's operation is the 'Deadman's' 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 Chapter 3.

ELEVATING ASSEMBLY

The platform is raised and lowered by a combination of three booms, each of which is operated by a hydraulic cylinder which in turn is driven by hydraulic power from the motor driven pump. Solenoid operated valves control which cylinder the hydraulic oil is directed to. Each cylinder includes 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 5.5m (18ft) of actual side outreach (working outreach will be 6m (19.7ft)). This is done by means of a hydraulic motor driving a pinion gear around a large diameter Slew Gear via a gearbox.

POWER SYSTEM

The power system incorporates four 6V batteries driving a 4HP electric motor which in turn drives the hydraulic pump. The application of this hydraulic pressure is performed by the Control System.

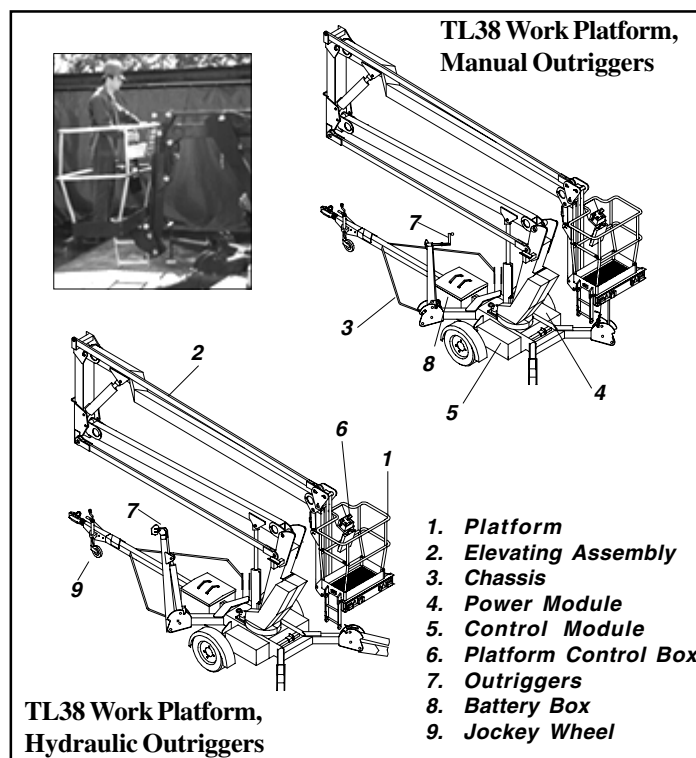


Figure 1-1: TL38 Work Platform

CONTROL SYSTEM

The machine is provided with fully proportional controls by means of the interaction between an electronic motor controller (MOS 90) and a proportional joystick. The MOS90 unit regulates the drive motor/pump speed and hence the flow of oil reaching the cylinders and slew motor. It regulates 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 unit is located below the Printed Circuit Board Box in the right hand chassis module. The manifold block is located under the first post cover.

CHASSIS

The chassis is a structural frame designed to support all the components of the TL38 Work Platform and for towing on public roads. It is fitted with suspension and full sized road wheels. Also fitted is a 50mm (2 inch) ball tow hitch, jockey wheel and overrun braking system with handbrake. The hydraulic tank is integral within the chassis members, and a bubble level is for levelling the chassis before use.

OUTRIGGERS

There are two different means of stabilising the TL38, depending on which option has been purchased.

Manual: Four 'Quick set' fold down outriggers with screw jacks for level adjustment are provided. Interlocks prevent operation of the booms until all four outriggers are deployed.

Hydraulic: Four Outriggers are independently actuated by hydraulic cylinders operated by Toggle Switches mounted on the Lower Control Box. Limit Switches ensure correct deployment of the Outriggers before allowing operation of the lift functions. An isolator valve ensures complete safety by isolating the deployed outrigger valves from the rest of the hydraulic system.

TL 38 PURPOSE & LIMITATIONS

The purpose of the TL38 work platform is to provide a quickly deployable, trailer mounted, variable height work platform. It is capable of lifting two people with work tools up to an upper limit of 215kg in total. The unit will provide the ability to reach over obstacles and may be used on uneven firm surface provided the chassis is correctly and carefully levelled using the Outriggers.

The platform must **only** be used on firm level or slightly uneven ground capable of supporting the maximum load generated under the outriggers. All outriggers **must** be correctly deployed and the chassis levelled before use. **Do not** use on soft or severely sloping ground.



DANGER



For operation of the hydraulic version of the TL38 it should be recognised that if the tilt switch senses a degree of slope greater than 2° the elevating circuits will lockout and sound a warning alarm. The Emergency Over-Ride should then be used to lower the Platform.

1.2 Specifications

Table 1-1: Specifications

| ITEM | MANUAL OUTRIGGERS | HYDRAULIC OUTRIGGERS |
|--|--|---|
| Duty Cycle | 30% of 8 hour cycle | 30% of 8 hour cycle |
| Platform Size | 0.7m x 1.3m [2.3ft x 4.3ft] (inside guardrails) | 0.7m x 1.3m [2.3ft x 4.3ft] (inside guardrails) |
| Max. Platform Capacity | 215kg [473lbs] | 215kg [473lbs] |
| Max. # of Occupants | 2 People | 2 People |
| Height Maximum Working Height Maximum Platform Height Min. Platform Height | 13.45m [44.1ft] 11.45m [38ft] 0.65m [2.1ft] | 13.49m [44.3ft] 11.49m [38ft] 0.65m [2.1ft] |
| Max. Working Outreach | 6m [19.7ft] | 6m [19.7ft] |
| Travelling Dimensions: Length Width Height | 6.08m [19.9ft] 1.53m [5.0ft] 2.00m [6.6ft] | 6.08m [19.9ft] 1.53m [5.0ft] 2.00m [6.6ft] |
| Outrigger Spread Max. Clearance Min. Effective Clearance | (front-rear x side-side) 3.40m x 3.42m [11.2ft x 11.2ft] 3.25m x 3.27m [10.7ft x 10.7ft] | (front-rear x side-side) 3.39m x 3.45m [11.1ft x 11.3ft] * 3.46m x 3.56m [11.4ft x 11.7ft]** 3.16m x 3.22m [10.4ft x 10.6ft]* 3.24m x 3.33m [10.6ft x 10.9ft]** |
| Rotation | 370 degrees non-continuous | 370 degrees non-continuous |
| Gross Weight | 1468kg [3,237lbs] | 1468kg [3,237lbs] |
| Maximum Towable Speed | 83km/h [50mph]*** | 83km/h [50mph]*** |
| Power Source | 24V DC 4HP, 4 X 6V 220Ah Batteries | 24V DC 4HP, 4 X 6V 220Ah Batteries |
| System Voltage | 24V DC | 24V DC |
| Battery Charger | 24V 25A 220/110VAC 50/60 Hz | 24V 25A 220/110VAC 50/60 Hz |
| Hydraulic Tank Capacity | 15 Litres [3.9 Gallons US] | 15 Litres [3.9 Gallons US] |
| Max. Hydraulic Pressure | 155 Bar [2,250psi] | 155 Bar [2,250psi] |
| Hydraulic Oil | ISO #46 | ISO #46 |
| Lift System | 2 Double Acting Lift Cylinders With Lock Valves And Manual Emergency Lowering Facility. 1 Double Acting Lift (Jib) Cylinder | 2 Double Acting Lift Cylinders With Lock Valves And Manual Emergency Lowering Facility. 1 Double Acting Lift (Jib) Cylinder |
| Control System | One handed Proportional Joystick Operating Energy Efficient Motor Control System | One handed Proportional Joystick Operating Energy Efficient Motor Control System |
| Tyres | 185 R13 6PLY | 185 R13 6PLY |
| Brake System | Automatic Reverse & Overrun Brakes Handbrake | Automatic Reverse & Overrun Brakes Handbrake |
| Maximum Continuous Sound Pressure Level At Operation Stations | 74.6 dB(A) | 74.6 dB(A) |

* Outriggers deployed to full height of 395mm => minimum footprint.

** Outriggers deployed to min. height of 160mm => maximum footprint.

*** Subject to Local Regulations

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. Stow all four Outriggers.
4. Check that the hydraulic oil level is adequate and that it is not over filled.

Check that the batteries are charged and disconnect the negative (-) battery cable from the battery terminal. This is so that an excessive power drain will not have occurred before the machine is next used.

2.3 Forklifting the Work Platform



CAUTION



The TL38 is not designed to be forklifted, and does not have provision on the chassis to allow this method of lifting. UpRight recommends the procedure below for handling the machine.

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 TL38 may be lifted by an overhead hoist/crane in the following manner:

Two lifting straps capable of safely supporting the total weight of the TL38 (1468Kg (3,237lbs)), and at least 220cm long are required. This minimum length is important to ensure the correct lifting angle. The straps should be positioned as shown in Figure2-1.

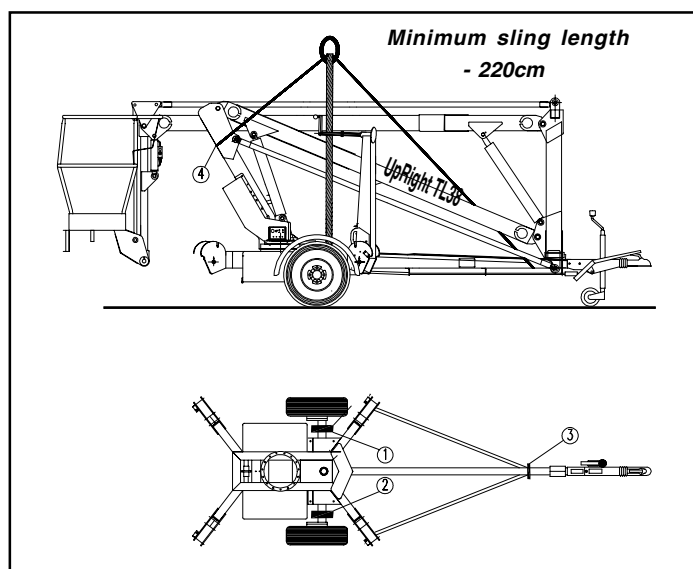


Figure 2-1: Lifting the TL38

The two lifting straps (Positions 1 & 2) should be positioned either side of the TL38's axle assembly at the points indicated. Care must be taken to ensure the straps do not interfere with any of the other part of the TL38.

Two securing lines (Positions 3 & 4) should also be used when lifting the TL38 Work Platform. These are used to maintain the balance of the TL38 but are **NOT to be considered as lifting points**. Position 3 shows the securing line around the Tow Bar where the Cycle Guard Frames meet. Position 4 shows the securing line around the First Post. This line should be secured below the Boom Rest, however care should be taken not to damage the Boom Rest Limit Switch or its cable on a TL38 with hydraulic outriggers.

2.5 Transport



CAUTION



It is important that before commencing transport to ensure the vehicle used is of capable of towing 1468Kg (3,263lbs).

The TL38 is a road approved vehicle and therefore may be transported behind a motor vehicle of suitable towing capacity. It is recommended that the vehicle used should have a tow bar where the top of the ball is at a height of between 435mm (1.42ft) and 500mm (1.64ft) above surface level. This is for the following reasons;

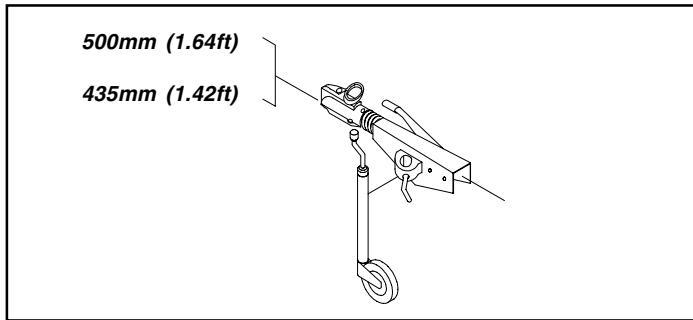


Figure 2-2: Allowable Tow Hitch Height

- the bottom of the cage may be in danger of hitting the surface while driving if the tow hitch is above the upper limit.
- the towing vehicle will support too much weight if the tow hitch is too low.

Care should always be taken while towing the TL38 on an uneven or sloped surface. It is recommended that the set of procedures on the following page be incorporated into a normal working practice for towing the TL38 Work Platform. The Procedures which should be followed when transporting the TL38 are:

1. The platform is to be fully lowered and slewed in the correct position.
2. The platform is to be securely stowed by inserting the boom lock down pin in its place.
3. The Jockey Wheel that is fitted to the Tow Hitch is to be extended until the Receiver is close to the height of the vehicle's tow bar.
4. The Hand Brake is pulled to engage the brakes (important if the machine is not on a level surface).
5. The Outriggers are to be fully retracted and secured in position.
6. The key is turned to the off position.
7. Move the vehicle as close as possible to the Receiver.
8. Lift the tow hitch on to the tow bar and make sure the Receiver is properly secured.
9. Release the Hand Brake and retract the Jockey Wheel.



CAUTION



It is important that the Jockey Wheel is retracted as fully as possible so that the wheel will not slew, turn, while being transported. Failure to do so could result in damage to the Jockey Wheel.

10. The tailboard harness is connected to the vehicle's braking system by means of a 7 Pin Plug.
11. Attach the Breakaway Safety Cable to the Towing Vehicle.

The TL38 may then be towed.

If the TL38 is to be transported by other means then it must be securely tied down to the transporting unit at several points.

Recommended securing points are the four outrigger support members on the chassis and the towbar. Further securing points should be used if the terrain on which the unit is travelling is rough or uneven. Care should be taken when using tie downs that sensitive parts of the TL38 (i.e. hosing, cabling etc.) are not affected.

ALWAYS ensure that the Hand Brake is fully applied and that all the booms are FULLY stowed.

2.6 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 just 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 battery negative (-) cable and secure to the chassis.
1. Disconnect the remaining battery leads and secure to the chassis.
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 TL38 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 battery powered electric motor directly 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 out by the application of the electrical circuit, and its components, to an Electronic Motor Controller (MOS90).

SETTING UP THE MACHINE FOR USE

The TL38 must be set up on a firm level surface. Careful Outrigger setup is very important for stability of the unit when elevated. An intermittent alarm will sound while deploying the Outriggers. This alarm will cease when the Outriggers Switches are taking load. The activation of each individual switch will be indicated on the Lower Controls by a green LED and once all four are illuminated i.e. all switches activated, it will be possible to operate the other machine functions. Should an Outrigger become unloaded or a switch is not activated during operation of the booms an alarm sounds and further operation is impossible except by means of an emergency override switch on the cage control box, allowing the operator to descend and/or slew to remedy the cause.

Manual Outriggers (See Figure 3-2)

The Manual Outriggers are secured in the travel position by a spring activated Locking Pin. To lower an Outrigger pull the Locking Handle up and rotate the Outrigger down until the Locking Pin locks the leg into the down position. This is done by means of another retaining slot at the bottom of the 'quadrant' plate. The

screw jack at the end of the Outrigger 'leg' is then lowered until in contact with the surface. Further adjustment off the appropriate screw jack(s) are then made to level the machine using the bubble level on the chassis as a guide. Manual Outriggers are fitted with electrical interlock limit switches which prevent operation of any functions until all outriggers are secured in the lowered position and the outrigger feet are taking the machines weight. This will result in four illuminated green LEDs on the Lower Control Box.

Hydraulic Outriggers (See Figure 3-3)

The Hydraulic Outriggers are secured in the travel position by means of the hydraulic pressure exerted on the retracted cylinder. The hydraulic pressure will also maintain the cylinder in the extended position when lowered. To set up the machine for operation all four Outriggers should be lowered until they just touch the ground. Then each Outrigger should be further lowered in small increments to raise the chassis until the wheels are clear of the surface. Fine adjustment should then be made, using the chassis Bubble Level as a guide, to level the machine. In order to negate the possibility of the hydraulic oil within the Outrigger Cylinder 'Settling' (the tiny movement of the cylinder ram caused by the small compressibility of the hydraulic oil) the final movement of each Outrigger should always be an extension i.e. down. The Hydraulic Outriggers on the TL38 are fitted with four Outrigger Limit Switches which are wired in series. Once the four Outriggers are taking load the Outrigger Limit Switches should be tripped.

OPERATING THE BOOMS

Only when the TL38 is set up correctly according to the above procedures can raising and lowering of the booms commence.

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.

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 allow for electrical control. (This safety feature prevents inadvertent activation of the booms in the case of accidental movement of the Joystick.)

It will be noticed that on the Upper Control Box a Function Selector Switch is used to select the appropriate function. Each function will have its 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 Outrigger Controls for the Hydraulic Outrigger Version are also operated from this position.

DESIGN FEATURES

The TL38 Series Work Platform has the following features:

- The interlock system on the manual outriggers ensure that the machine must be set up properly before use.
- The Tilt Sensor on the hydraulic version will limit functions to down only when activated.
- The isolator valve on the hydraulic version ensures that the Outriggers can not begin to retract unintentionally.
- The slew cutout interlock ensures that the Elevating Assembly is clear of the Chassis before slewing can be activated.
- The energy-efficient motor control unit provides long battery life and smooth proportional control of the boom functions.
- All cylinders are fitted with hydraulic hose-burst protection interlocks.
- The on-board charger is fully automatic and charges the batteries.
- If the work platform starts to become unstable and one of the outrigger switches becomes deactivated 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, 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. This will also apply on the hydraulic version where a Tilt Sensor will stop functions.
- 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 mechanical basket levelling system will ensure that the platform remains level throughout the entire working cycle of the machine.
- A manual rotation facility is fitted to allow rotation of the booms in the event of power loss.

3.1 Safety Rules and Precautions



WARNING



Before using the TL38 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 TL38 unattended with the Platform in the raised position.

ALWAYS position the machine on a firm level surface with a minimum bearing capacity of 550 kN/m² (11,500 lbf/ft²).

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 operate unless all four outriggers are fully lowered and are secured at a level position.

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 lbf)**.

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

DO NOT use in winds exceeding 12.5m/s (27mph - 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 supporting the elevating assembly.

NEVER recharge batteries near sparks or open flame; batteries that are being charged 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 replacement parts without manufacturer's consent.

NEVER leave the machine unattended with the Hand Brake not engaged

3.2 Controls and Indicators

The controls and indicators for operation of the TL38 Work Platform are shown in Figures 3-1 & 3-2. The name and function of each control and indicator are listed in Tables 3-1. The index numbers in the figure correspond to the index numbers in the table. **The operator should know the location of each control and indicator and have a thorough knowledge of the function and operation of each before attempting to operate the unit.**

Table 3-1: Controls and Indicators

Platform Controller *

| INDEX NO. | NAME | FUNCTION |
|-----------|---|---|
| 1 | 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 BOOM 3 (Jib) 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 BOOM1 UP, BOOM2 UP, BOOM3 DOWN or ROTATE RIGHT functions the controller should be pushed forward. To activate the BOOM1 DOWN, BOOM2 DOWN, BOOM3 UP or ROTATE LEFT functions the controller should be pulled back. The speed that each function operates is related to how far the Joystick is moved forward. |
| 5 | SYSTEM OK INDICATOR | Illuminates to indicate that the Outrigger Switches are activated, i.e. the Outriggers have been properly deployed and 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 5-6 |

NOTES :

* On the Hydraulic Outrigger version and where the Manual Outrigger version is fitted with the optional tilt sensor, an alarm is located in the Upper Control Box. This will sound when Tilt Sensor is activated, and while this alarm is on only the Emergency Override controls can be used. This alarm will also sound on Manual Outrigger versions which do not have a Tilt Sensor when an Outrigger Limit Switch opens.

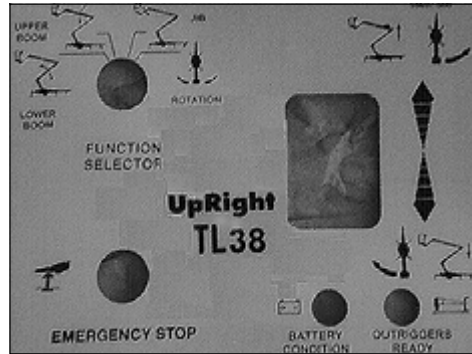
** To activate these functions on Lower Controls the Spring Return Switch must be used in conjunction.

*** For the TL38 with manual Outriggers only the L.E.D.'s will be present. They will indicate when an Outrigger has been correctly deployed and the Outrigger Limit Switch has been activated.

Chassis Control

| INDEX NO. | NAME | FUNCTION |
|-----------|--|---|
| 7 | 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. |
| 8 | EMERGENCY STOP SWITCH | Push red button to cut off power to all functions (OFF). Turn clockwise to release and restore power. |
| 9 | SLEW TOGGLE SWITCH ** | The elevating assembly can be slewed LEFT by holding toggle switch LEFT and RIGHT by holding switch RIGHT. |
| 10 | BOOM 1 TOGGLE SWITCH ** | Boom 1 can be raised by holding toggle switch UP, and it can be lowered by holding toggle switch DOWN. |
| 11 | BOOM 2 TOGGLE SWITCH ** | Boom 2 can be raised by holding toggle switch UP, and it can be lowered by holding toggle switch DOWN. |
| 12 | BOOM 3 TOGGLE SWITCH ** | Boom 3 (Jib) can be raised by holding toggle switch UP, and it can be lowered by holding toggle switch DOWN. |
| 13 | OUTRIGGER TOGGLE SWITCHES AND INDICATORS See Notes ** & *** | For each of the four Outrigger Toggle Switches there is a corresponding L.E.D. Indicator. This L.E.D. indicates that the Outrigger Switch has been activated and the Outrigger has been safely deployed. To EXTEND an Outrigger the operator needs to hold the Toggle Switch DOWN, to RETRACT the Outriggers hold the Toggle Switch UP. |

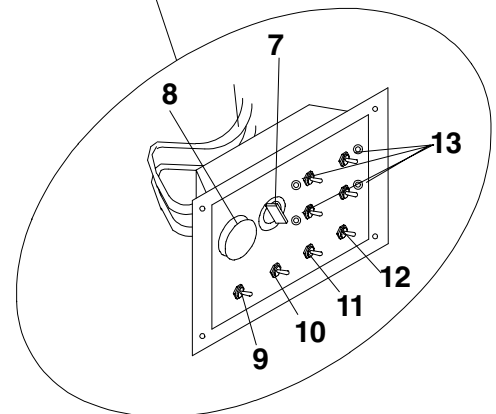
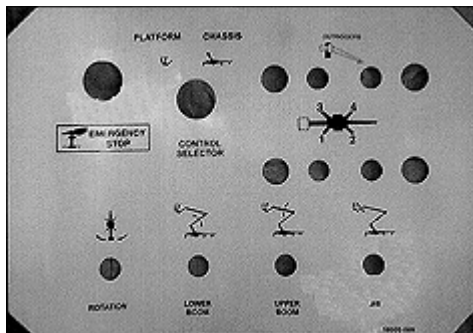
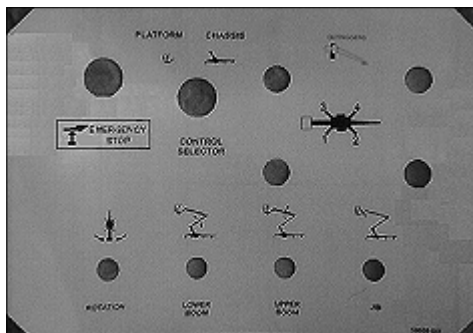
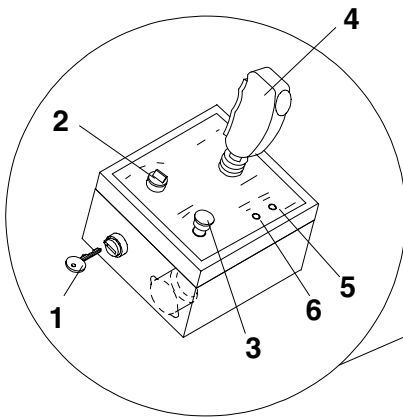
Upper Control Box Operation & Decal



BOOM 3 (JIB)

BOOM 2

BOOM 1



Lower Control Box Operation & Decals

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 in the case of a Hydraulic version the Outriggers fully stowed. 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 4.2)
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. Check that the ground is capable of supporting the outrigger loads, and is generally level. Apply handbrake.
9. For the **Manual Outrigger** version the following pre-operation inspection should be carried out. Check that all four limit switches are undamaged and then taking each outrigger in turn, pull the locking pin release lever out while simultaneously lowering the outrigger leg. Ensure the locking pin snaps into position in the lower slot. (See Figure 3-2). Lower all screw jacks until the load is just removed from the road wheels. Level the machine as necessary using the bubble level on the chassis to check in both longitudinal and lateral directions. Retract the jockey wheel until it is clear of the ground. For a more detailed description of this procedure the instructions in **Section 3.4** should be followed.
10. For the **Hydraulic Outrigger** version the following pre-operation inspection should be carried out and should be applied to each Outrigger. Ensure that no leaks are present on

the hydraulic hoses to the Outrigger cylinder and that they are properly secured. Check that there is no physical damage to the cylinder body or ram. **IF THERE IS ANY DAMAGE DO NOT PROCEED IN USING THE MACHINE.** To extend the Hydraulic Outriggers turn and hold the Chassis/Platform Selector Switch to the chassis position and deploy the Outriggers using the Toggle Switches until the Outrigger Foot Pads come into contact with the ground. Care should be exercised that the Foot Pads are orientated correctly. When all four Outriggers are in contact with the ground the chassis can then be elevated. This should be done by extending each Outrigger one at a time in small increments until both of the Road Wheels have just cleared the ground. The chassis must then be levelled using the Bubble Level on the rear of the chassis as a reference. When carrying out these minor adjustments the last operation on the Outriggers must be an extension so as to avoid the possibility of minor settling in the Hydraulic Fluid.

SYSTEM FUNCTION INSPECTION

11. Turn both Chassis and Platform Emergency Stop switches ON (rotate clockwise).
12. Turn Keyswitch on the Upper Control box to the ON position (anticlockwise position).
13. Using the chassis control switches, fully elevate Booms 1 and 2 and Boom 3 (Jib). 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.
14. 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.
15. Check rotation (slew) left and right function. Again it must be remembered to use the Spring Return Switch.
16. Return the machine to an elevated position just above the Boom Rest (300mm(1ft)). To confirm that Outriggers and Outrigger Limit Switches will operate correctly while the machine is elevated, **it is then vital that each Outrigger Limit Switch is individually tested.** On the **Manual** version raise the Rear Left Screw Jack until the switch is no longer activated (will simulate Outrigger out of

deployment). At this point the TL38 should have the following characteristics;

the alarm will sound, the LED on Lower Control Box for the Rear Left Outrigger is not illuminated and only the DOWN Boom & Jib functions will be operable from the Lower Controls.

These above characteristics should also be displayed on the **Hydraulic** version when an Outrigger is retracted until the Outrigger Limit Switch is no longer activated. The above test should also be repeated for the three other Outriggers.

17. Lower each boom until Elevating Assembly is fully stowed. Repeat all the above tests from the Platform Controls.
18. While testing the platform controls it is also necessary to test that the Emergency Override functions will work. While elevated in the platform 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 Emergency Override functions should also only give the Down functions when an Outrigger Limit Switch is deactivated. Carry out these tests as outlined in Item No.16 in this section.

The System Function Inspection is then complete.

PRE-TRANSPORT INSPECTION

19. Lower jockey wheel until it is in contact with the ground.
20. Retract the Outriggers fully, making sure that they will rest in the vertical position. This should be done using the Lower Control Box for **Hydraulic** versions. For the **Manual** outrigger version raise the Screw Jack until the Locking Pin is released from the lower slot on the Quadrant Plate.
21. Return the Platform Keyswitch to the OFF position. Check tyre pressures and thread depth.



WARNING



If there are any concerns about the safe use or operation of the TL38 following this Pre-Operation Inspection **DO NOT USE THE TL38 WORK PLATFORM.** Contact your supplier or UpRight's Product Support Department.

3.4 Operation

NOTE: Before operating the TL38 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.



WARNING



Before Towing, ensure that the Elevating Assembly is properly stowed and secured and that the Outriggers are raised, retracted and locked into position. Ensure tyres are free from damage, inflated to correct pressure and have sufficient thread depth. Ensure breakaway cable is properly attached to towing vehicle before driving away.

TOWING

Adjust Jockey wheel using screw handle until tow hitch is just above height of tow ball on towing vehicle. Position tow vehicle and fit breakaway cable to a suitable attachment point on the towing vehicle (not the tow ball stem or towing pin).

While pushing the release button on the Towhitch lower the Receiver onto the Tow Bar using the screw handle on the Jockey Wheel, until the catch snaps into position. Then when the receiver is secure and the Tow Bar is taking some of the machines weight retract the Jockey Wheel to its full extent, at which point the Jockey Wheel will be in its locked position. Retighten the clamp. This will negate the possibility of the wheel moving and so the possibility of the Jockey Wheel screwing down during transport. Connect the breakaway cable and the electrical lead to the tow vehicles socket. Check all lights for correct operation before transporting the machine.

NOTE:

Exercise caution during brake "Running In" period (First 850Km or 500 miles). When parking on slopes fully tension the Hand Brake. When moving the TL38 in reverse ensure that the Hand Brake spring is fully compressed. Check that the TL38 is moving in reverse. When not in use it is advisable to chock wheels to prevent movement.

DEPLOYING THE OUTRIGGERS

Position machine on firm, level ground. Apply the handbrake and then lower the Jockey Wheel until it comes into contact with the ground and retighten the clamp. As the Jockey Wheel is further lowered release the locking mechanism on the Tow Hitch Receiver. When clear of the tow bar move the towing vehicle a small distance away from the TL38. Next ensure that the machine is switched to the 'ON' position using the Keyswitch on the Upper Control Box and that the Emergency Stop Switches are also 'OFF' (turned clockwise to release).



DANGER



It is important that all outriggers are correctly deployed on a firm surface capable of withstanding the loads imposed. The chassis **MUST** be correctly levelled before elevating the platform.



WARNING



DO NOT use the TL38 Work Platform unless all Outrigger LEDs are illuminated.

Manual Outriggers (See Figure 3-2)

1. Pull out the locking handle and lower outrigger until the Locking Pin locks into position in the lower slot. Ensure pin is completely seated in this slot.
2. Repeat for the remaining three outriggers
3. When all four Outriggers are seated in the lower slot on the Quadrant Plate the operator can then proceed to begin the process of levelling the chassis.
4. Screw down all four jacks until they come into contact with the firm surface.
5. Begin to adjust each of the Screw Jacks individually in small increments until the Outriggers alone are taking the machines weight. The Road Wheels should be relieved of the machine's load but they should still just remain in contact with the ground.
6. Ensure that the machine is level using the Bubble Level located at rear of chassis.
7. Raise the Jockey Wheel on the Tow Hitch until it is well clear of the ground.

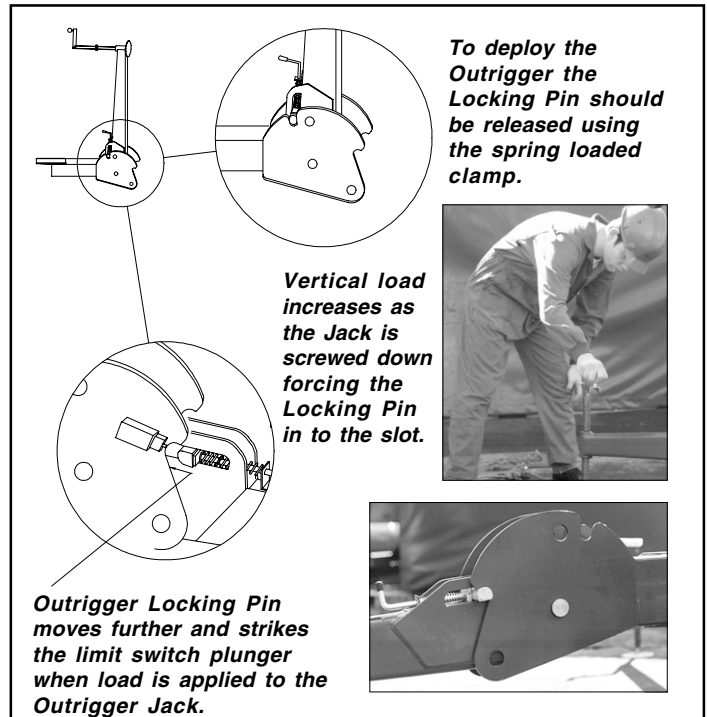


Figure 3-2: Deploying Manual Outriggers

The last operation to be carried out before entering the platform should be to check each of the Outriggers individually for their stability and that in each instance the Outrigger Limit Switch is activated. When the Keyswitch is in the 'ON' position and the Outriggers are properly deployed there should be no warning alarm and all four LEDs on the Chassis Controls should be illuminated.

Hydraulic Outriggers (See Figure 3-3)

1. Before deploying the Hydraulic Outriggers it is necessary that the area be cleared of any objects or personnel that may infringe on the Outriggers deployment radius.
2. Turn and hold the Chassis/Platform Selector Switch on the Lower Control Box to the 'Chassis' position and deploy the Outriggers using the Toggle Switches until the Outrigger Foot Pads come into contact with the ground. Care should be exercised that the Foot Pads are orientated correctly.
3. When all four Outriggers are in contact with the ground the chassis can then be elevated. This should be done by extending each Outrigger one at a time in small increments until both of the Road Wheels have just cleared the ground.
4. The chassis must then be levelled using the Bubble Level on the rear of the chassis as a reference.

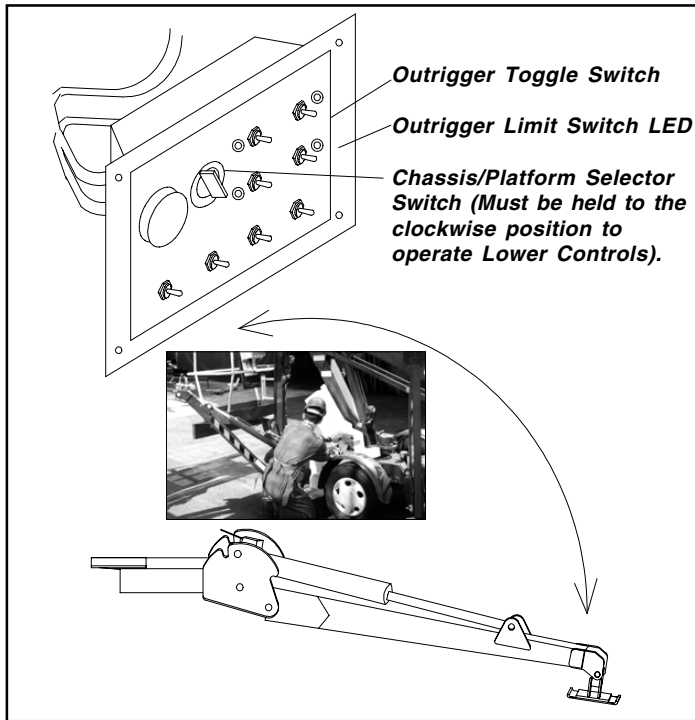


Figure 3-3: Deploying Hydraulic Outriggers

! DANGER !

When carrying out final adjustments in the levelling of the chassis it is important that the last operation on each Outrigger be an extension. This is to avoid creating a reduced hydraulic pressure within the Outriggers and hence negate the possibility of minor settling.

As with the Manual Outrigger version the last operation to be carried out before entering the platform should be to check each of the Outriggers individually for their stability i.e. that they are deployed correctly, and that in each instance that the Outrigger Limit Switch is activated, all four LEDs are illuminated and that no alarm is sounding.

ELEVATING & LOWERING THE TL38 WORK PLATFORM

When the TL38 has been thoroughly inspected, and has been set up in accordance with the correct Outrigger Deployment procedures, the elevating assembly can then be used.



WARNING



LOOK up and around for obstructions before performing the lift function.

ENSURE that the Elevating Assembly is clear of the Chassis before engaging the Slew operation.

DO NOT overload the platform

DO NOT operate within 3 metres (10 feet) of any electrical power cables. THIS WORK PLATFORM IS NOT INSULATED.

Cordon off the area within the platform's working area to keep passers-by clear of the booms.

NOTE: Chassis controls are for service use only.

1. Enter Platform through the entrance at the side of the TL38 and ensure that the Drop Bar is in 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 1m 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 off (twisted clockwise).
4. Check the green "System OK" L.E.D. is illuminated. If not, and/or an audible alarm sounds, check that the outriggers are correctly deployed and that the machine is level. None of the three boom 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", "Boom 3 (Jib)" or "Rotate" as required using the 'Function Selector Switch' and operate as described above. For boom one or two functions the controls will be forward for UP and backward for DOWN. "Boom 3 (Jib)" controls will be forward for DOWN and backward for UP. To rotate (Slew) RIGHT the Controller Joystick should be moved forward. To rotate (Slew) LEFT move the Controller Joystick backward.
7. Before lowering, check beneath the cage floor for obstructions, operate as described above, moving the Joystick back to lower the Booms.

EMERGENCY SITUATIONS & EMERGENCY OVERRIDE

In any emergency situation, the first action to be taken should be to hit the red "Emergency Stop" button. This will give instant cutout of all functions. It will then be required to twist the button clockwise to release before the machine can be operated again. If the Audible warning alarm sounds, normal control functions will cease to operate. This will be due to one of the following problems ;

- deactivation of an Outrigger Limit Switch where Manual Outriggers are fitted.
- the activation of the tilt sensor on the Hydraulic Outrigger version and where the Tilt Sensor is fitted as an option for the Manual Outrigger version

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. After leaving the cage, check all outriggers and adjust to ensure each is correctly deployed. **Note that during emergency operation, controls will operate only at a fixed, slow speed and will not allow the raising of the Booms. The Booms can only be lowered.**

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 Elevating Assembly.

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 3-4).

Operate the lower boom first by pushing slowly until the boom starts to descend. The speed of descent is controlled by the amount the valve is pushed - ensure that the rate of descent is kept slow and under control. 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.



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

Figure 3-4: Emergency Lowering

CONTROL FROM GROUND LEVEL

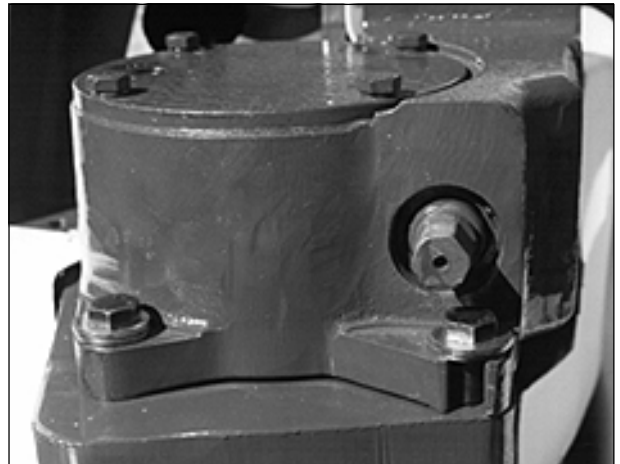
1. Chassis Controls are fitted at the base of the Elevating Assembly. These should only be used when no operator is in the platform (for maintenance/ service or inspection purposes), or if the operator has become incapacitated. For further information see Table 3-1.
2. It should be noted that in order 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, Boom 3 (Jib) 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. Apply handbrake.
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 emergency lowering valves, and that the Emergency Stop Button is pressed any accidental powered operation.
2. Apply a 17 mm socket wrench to shaft and turn to rotate elevating assembly.
3. Remove wrench.



To rotate the Elevating Assembly first apply a 17 mm socket wrench to the shaft and turn to rotate the Elevating Assembly. When finished remove the wrench.

Figure 3-5: Manual Rotation

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 preform service on any TL38 Work Platform.

This section contains instructions for the maintenance of the TL38 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 TL38 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 TL38 Work Platform.

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

An optional item also recommended by **UpRight** is the 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
50h/30d = every 50 hours or 30days
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 specific gravity. | 50h/30d | | | |
| | Clean exterior. | 250h/6m | | | |
| | Clean terminals. | 250h/6m | | | |
| Hydraulic Oil | Check oil level. | Daily | | | |
| | Drain and replace oil. (ISO No.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 tyre press. 3.75bar (55psi) | Daily | | | |
| | Check for damage. | Daily | | | |
| | Check thread depth. | Daily | | | |
| | Check/torque nuts 100 Nm-74 ft lbs | Daily | | | |
| 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 | | | |

| COMPONENT | INSPECTION OR SERVICES | INTERVAL | Y | N | R |
|-------------------------|---|-----------|---|---|---|
| Slew System | Grease slew gear. | 50h/30d | | | |
| | Check slew motor for leaks and mounting bolts for proper torque. | 50h/30d | | | |
| | Check hardware and fittings for proper torque. | 250h/6m | | | |
| Slew System/ First Post | Check torque on all bolts, 15 outer ring and 20 inner ring. Retorque to 120 Nm (88 ft lbs). | 50h/30d | | | |
| Elevating Assembly | Inspect for structural cracks. | Daily | | | |
| | Check hoses for pinch or rubbing points. | Daily | | | |
| | Check pivot pins for damage. | 50h/30d | | | |
| | Check pivot pin retaining rings. | 50h/30d | | | |
| | Check elevating assembly for bending. | 250h/6m | | | |
| | Check component mounting for proper torque. | 250h/6m | | | |
| Lift Cylinders | Check fasteners for proper torque. | 250h/6m | | | |
| | Check cylinder rod for wear. | 50h/30d | | | |
| | Check pivot pin retaining rings. | 50h/30d | | | |
| Chassis Assembly | Grease all fittings as section 4.4. | 50h/30d | | | |
| | 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 | | | |
| | Lubricate. | 50h/30d | | | |
| | Grease all fittings. | 50h/30d | | | |
| | Check for corrosion - Remove and repaint. | 250h/6m | | | |
| Outriggers | Check screw jacks or outrigger cylinders for damage. | Daily | | | |
| | Check interlock switch function. | Daily | | | |
| | Lubricate. | 50h/30d | | | |
| | Grease all fittings. | 50h/30d | | | |
| Tow Hitch | Check coupling for function and wear. | Daily | | | |
| | Inspect breakaway cable for proper attachment. | Daily | | | |
| | Grease all fittings as section 4.4 | 50h/30d | | | |
| Road Lights | Check all trailer lights and connecting plug | Daily | | | |
| Brake | Apply handbrake and check function. | Daily | | | |
| | Check brake shoes for wear. | 50h/30d | | | |
| | Test auto reverse function. | 50h/30d | | | |
| | Adjust brake shoes. | 50h/30d | | | |
| | Check handbrake and adjust. | 250h/6m | | | |
| Axle/ Hubs | Repack wheel bearings | 1000h/ 2y | | | |

Signature of Service Engineer

4.2 Battery Maintenance

Electrical energy for the motor is supplied by four 6 volt batteries wired in series to give a 24 volts DC supply. Each of these batteries consist of three cells which can supply a maximum voltage of 2.1V ea =>6.3V per battery =>25.2V 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 have their full potential until they have been through 50 charge/discharge cycles. Hence do not use a new battery in a battery pack that already has more than 50 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



Charge batteries in a well-ventilated area.

Do not charge batteries in the vicinity of sparks or flames.

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

Never leave charger operating unattended for more than two days.

Never disconnect cables from batteries when charger is operating.

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 8m (26ft) and is 1.5mm (12ga) 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), if fitted, is in the correct position.

All UpRight battery operated Work Platforms, including the TL38, are suitable for use in freezer and low temperature conditions (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 10mm(3/8in.) 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 a short delay. The ammeter will indicate the rate of charging.
4. Charger turns off automatically when 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 for an additional eight hours. 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 containing such cells should be replaced.

Do not check the specific gravity in a cell to which water has just been added. If there is not enough electrolyte in a fully charged cell to obtain a sample for the hydrometer, add water and 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 **Figure 4-1** for location of items requiring lubrication and to **Table 4-1** for recommended lubrication intervals. Refer below 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.

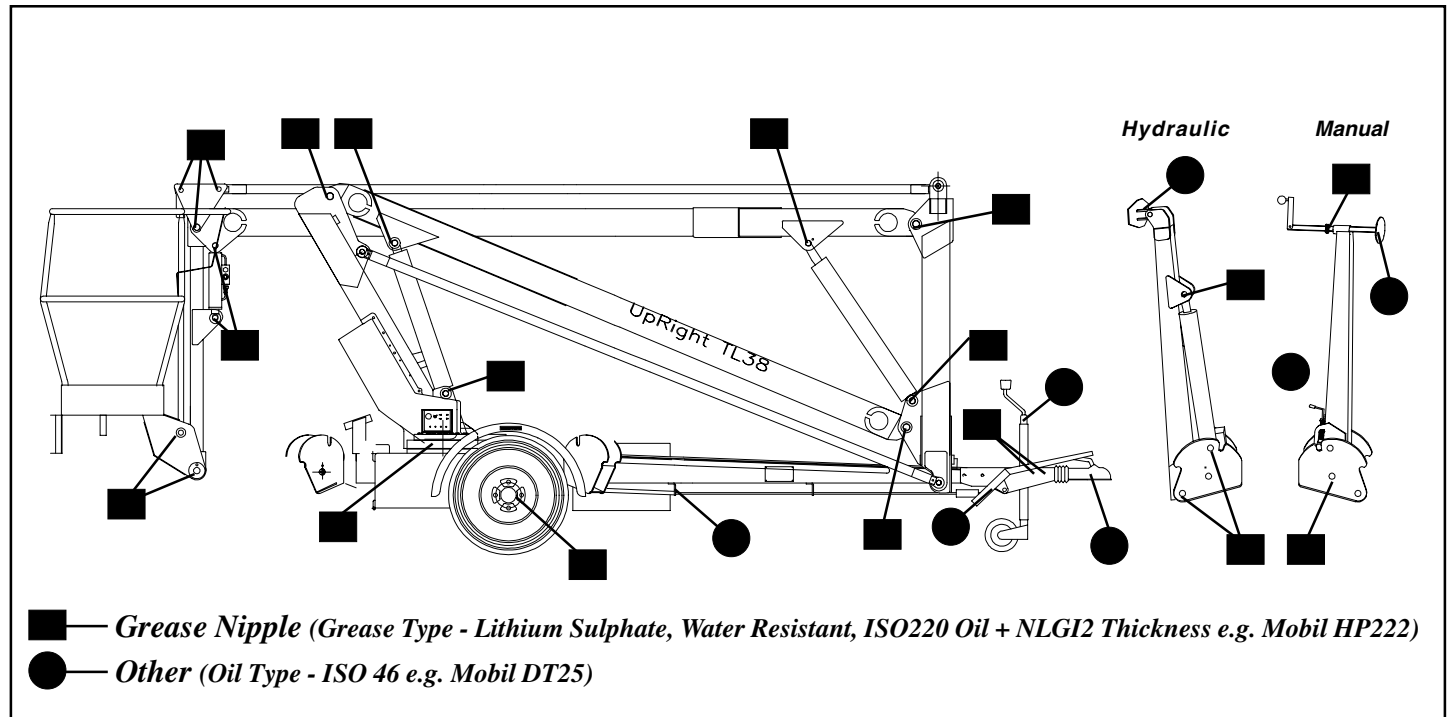


Figure 4-1: Lubrication Points

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 off any excess grease.

| Grease Nipple Locations | Manual Outriggers | Hydraulic Outriggers |
|--------------------------------|----------------------|-------------------------|
| Outrigger | 8 | 12 |
| Lower Boom | 2 | 2 |
| Upper Boom | 2 | 2 |
| Jib Weldment | 2 | 2 |
| Jib Tie Bar | 2 | 2 |
| Tow Hitch | 2 | 2 |
| Lower Cylinder | 2 | 2 |
| Upper Cylinder | 2 | 2 |
| Jib Cylinder | 2 | 2 |
| Slew Ring Grease Wells | 2 | 2 |
| Total | 26 | 30 |

SLEW RING

Grease Slew Ring evenly and sparingly every 50 hours or 30 days as per the intervals in Table 4-1.

HYDRAULIC OIL TANK AND FILTER (Figure 4-2)

Fluid Level

With platform fully lowered and Hydraulic Outriggers fully stowed, oil should be visible on the dipstick. If the oil is NOT visible, fill the tank until oil is then visible on the dipstick. **DO NOT** fill above the upper line on the dipstick or when the platform is elevated.

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 15 Litres (3.9 Gallons US).
3. Remove the drain plug under the tank and allow all oil to drain into a suitable container.
4. Clean the magnetic drain plug and reinstall.
5. Unthread the filter from the filter head.
6. Apply a thin film of clean hydraulic oil (ISO No. 46) to the gasket of the replacement filter.
7. Thread the replacement filter onto the filter head until the gasket makes contact then rotate the filter a further 3/4 of a turn.
8. Fill the hydraulic reservoir with hydraulic oil (see Section 1-2) checking level with dipstick.
9. Recycle used oil as per local environmental regulations.

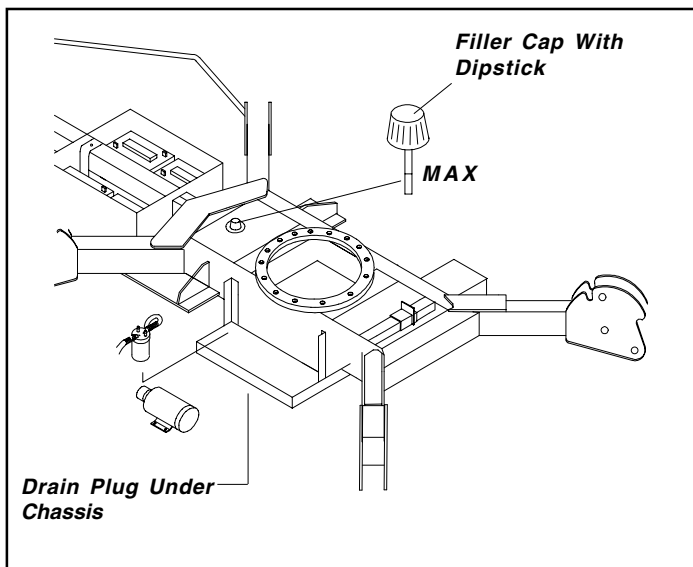


Figure 4-2: Oil and Filter Replacement

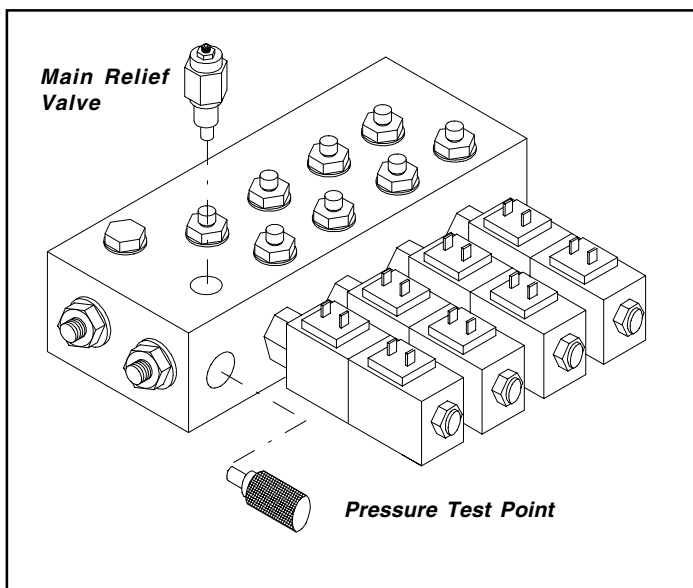


Figure 4-3: Main Manifold Block

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

1. Operate the hydraulic system for 10-15 minutes to warm the oil.
2. Remove the cover from the 1st post.
3. Insert pressure gauge into pressure gauge port below solenoids on right side face of Main Manifold Block.
4. Loosen locknut on main relief valve and turn adjusting screw counter clockwise two full turns.
5. Evenly distribute the Save Working Load (SWL), as shown in Table 1-1, in the Platform.
6. Operate lower boom down function switch at lower controls and keep it activated.
6. Slowly turn the main relief valve adjusting screw clockwise until the pressure gauge reads 155 Bar (2250 p.s.i.) pressure.
7. Release the boom down switch.
8. Tighten locknut on main relief valve while holding the adjusting screw in position.

For information on how to adjust the Overcentre Valves on the TL38's Lift Cylinders refer to **Page 4-23**

4.6 Maintenance on Elevating Assembly (Figure 4-4)

The only time the Elevating Assembly needs to be elevated is to allow service work to be carried out when working on the Slew Limit Switch.

All other work (Bearings, Cylinders, Booms & Tension Bars) can and must be performed with the Elevating Assembly in the stowed position.

When working on the Slew Limit Switch follow the procedure detailed below.



WARNING



BEFORE entering Elevating Assembly while performing maintenance on 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. Turn 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 1600mm (63inches) above the tow bar.
5. Place a sling of a 1 Tonne load capacity at the end of the lower boom and first 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 the 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"

TL38 Work Platform

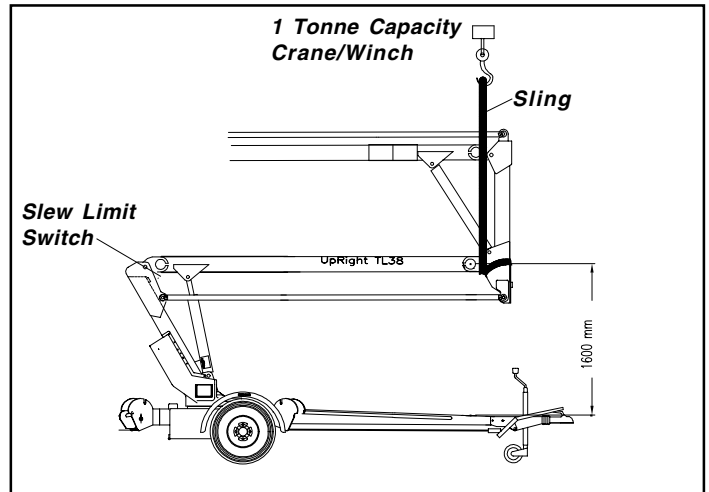


Figure 4-4: Supporting Elevating Assembly

4.7 Switch Adjustments (Figure 4-5, 4-6, 4-7 & 4-8)

TILT SENSOR

The Tilt Sensor is always fitted to Hydraulic versions of the TL38 and is an optional extra on the Manual version. It is factory set at 2° in all instances. The Tilt Sensor has three wires; red-power (24V in), black-ground, white-output (24V out).

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 the white wire is 'hot' (24V out).

1. Set Outriggers correctly.
2. Place machine on firm level surface $\pm 0.25^\circ$.
3. Use Inclinator to ensure that the front and rear of the Chassis are level within $\pm 0.25^\circ$.
4. Using a bubble level adjust the three levelling locknuts on the Tilt Sensor.
5. Elevate the platform until the Boom Rest Switch opens and push the tilt sensor base to test the alarm circuit. The Alarm should sound.

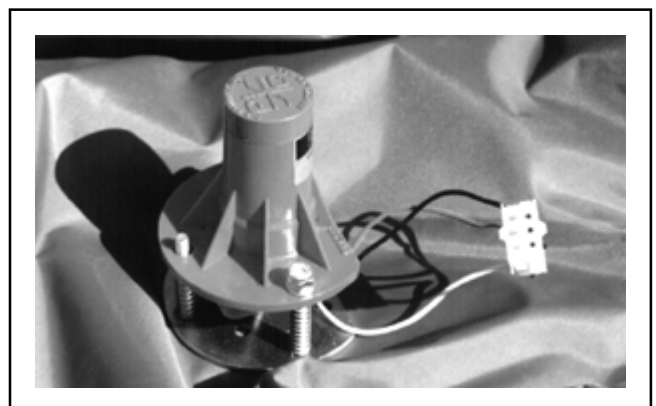


Figure 4-5: Tilt Sensor

SLEW CUTOUT LIMIT SWITCH

Function: The purpose of this limit switch is to prevent the operator from slewing while the Elevating Assembly is near the Chassis, thus preventing accidental damage to it. It does this by breaking the slew signal from the upper controls while the second post is less than approximately 0.5m (1.64ft) above the towbar.

Location: The switch is located between the first post and the underside of Boom 1.

Adjustment: To adjust the switch loosen the lever clamping nut and rotate the lever. Tighten the lever clamping nut. The lever is actuated by the lower boom as it descends. The Normally Closed contacts of the switch should open when the lower boom descends to an angle such that the bottom of the second post is approx. 0.5 m above the towbar.

OUTRIGGER LIMIT SWITCHES

Function: These four limit switches are wired in series. When the four outriggers are deployed these switches are activated and allow the booms functions to be operated. In addition, the switches also provide warning if one of the outriggers becomes 'light' or lifts off the ground. In this case power is cut to the elevating functions and the alarm is activated.

Location: On the Outrigger Quadrant Plates.

Adjustment: *There* are two different types of Outrigger Limit Switches used on the TL38 Work Platform. They have different part numbers and are activated by distinct mechanical means.

Manual Version: The limit switch head is nonadjustable and should be depressed by the outrigger locking pin when the outriggers are deployed and taking load. It should be checked for freedom of movement and kept clean from dirt or other contaminants. Ensure all moving parts on locking mechanism (springs, etc.) are in good working order and lubricated regularly.

Hydraulic Version: This limit switch uses a 'lever' head similar to the Slew Cutout Switch but on a smaller scale. It can be adjusted by loosening the lever clamping nut and rotating the lever so that it will be activated by the Outrigger Cylinder. Following this tighten the lever clamping nut.

BOOM REST LIMIT SWITCH

(Standard On Hydraulic Outrigger Version, Option On Manual Outrigger Version)

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 TL38 Work Platform. The Hydraulic Outriggers 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 Hydraulic Outrigger function switches.

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 is on the boom rest. The lever is adjustable, in the same manner as the Slew Cutout Switch, 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 kept clean from dirt and other contaminants that might affect its free movement.

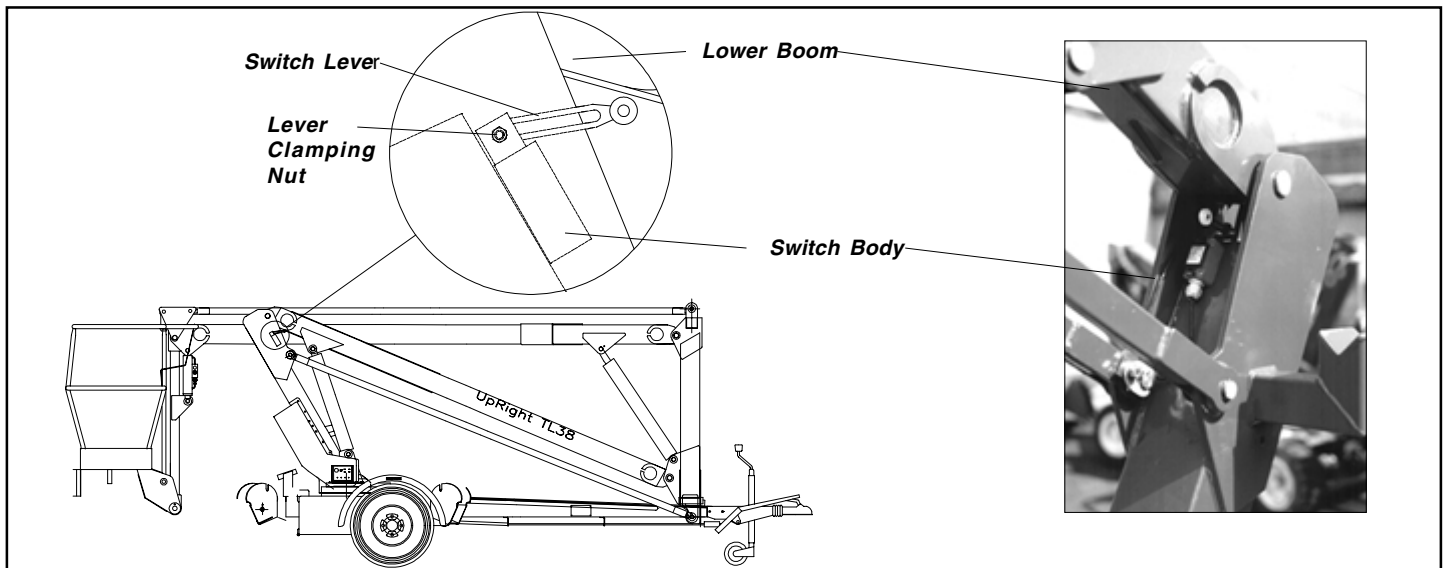


Figure 4-6: Slew Cut Out Limit Switch

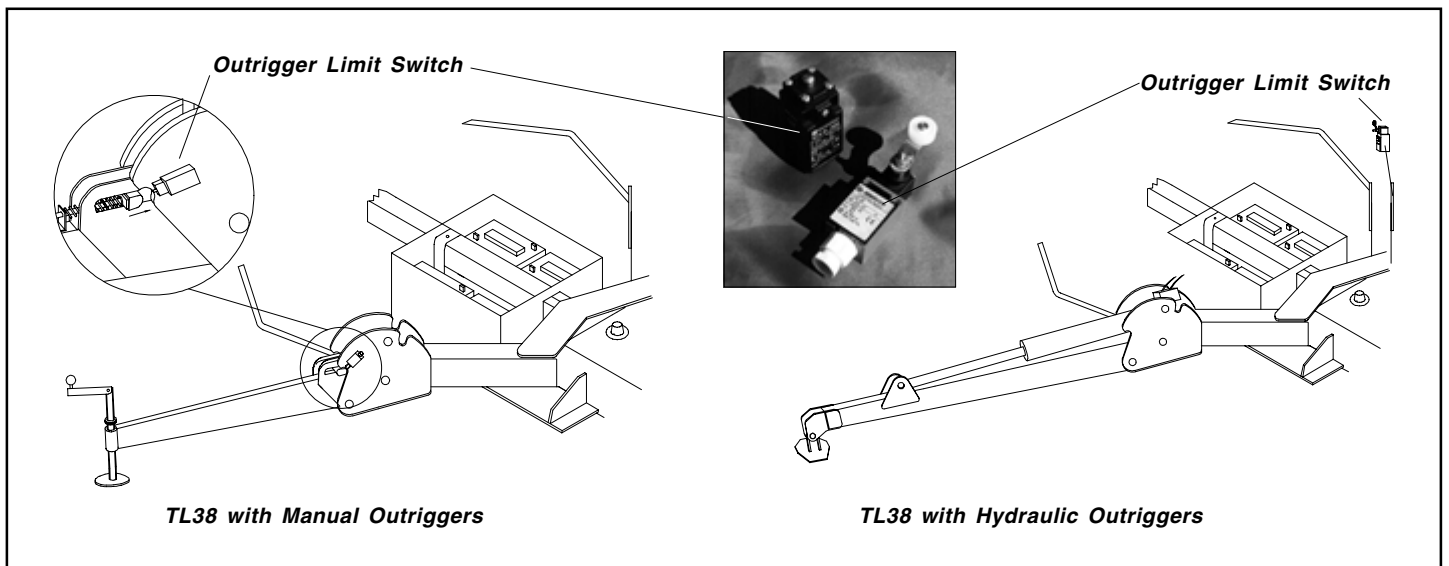


Figure 4-7: Outrigger Limit Switches

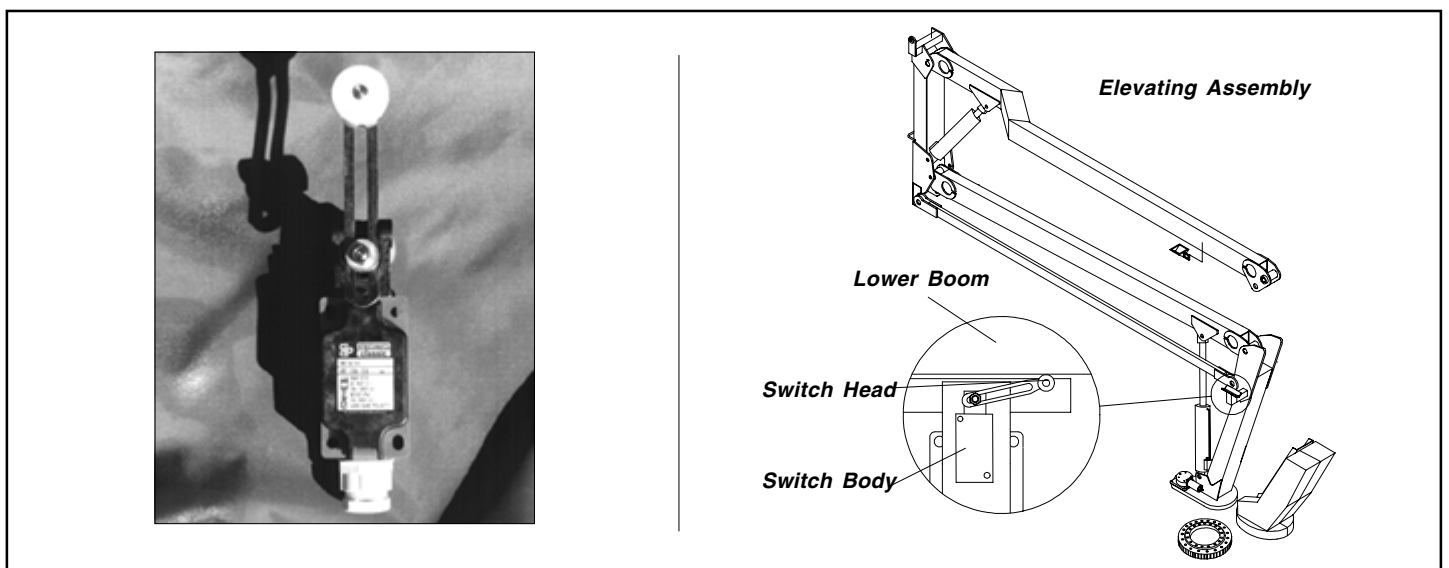


Figure 4-8: Boom Rest Limit Switch

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. Remove battery ground cable.
2. Remove fibreglass cover from first post.
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 first post.
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 valve.
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.

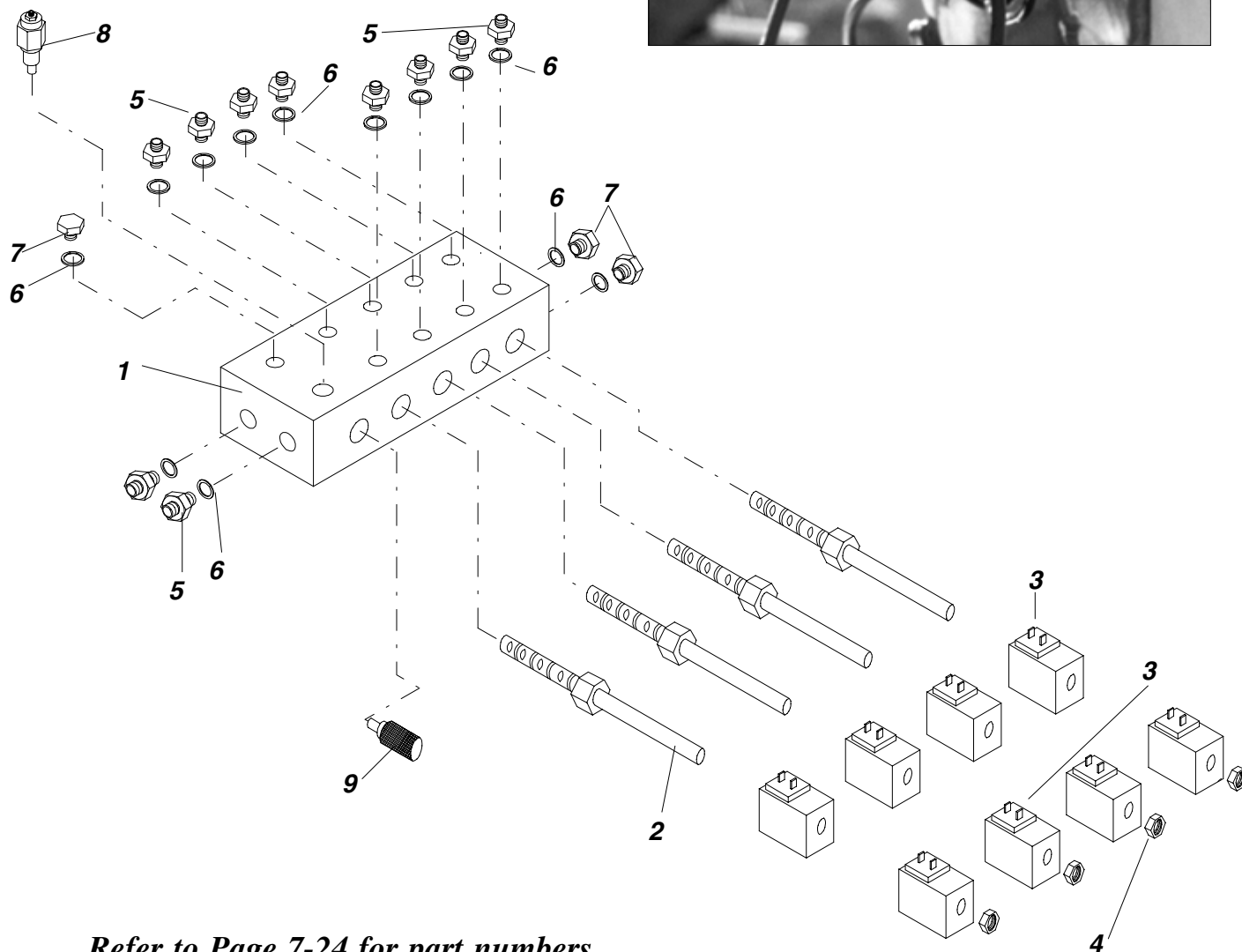
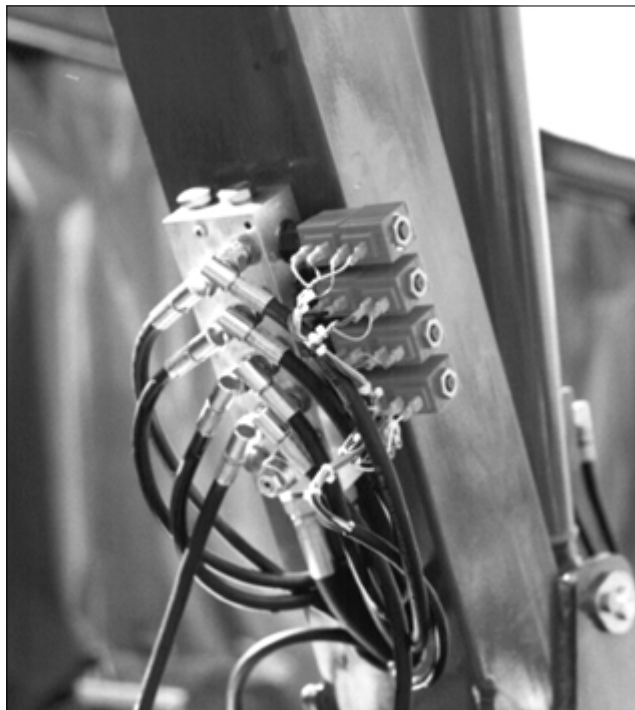
1. Install fittings, plugs and bonded seals.
2. Install the solenoid valves and tighten the coils on to the valves.
3. Install the Main Relief Valve.

Note: Torque cartridge relief valve 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 first post with bolts and washers.
2. Connect hydraulic hoses to their positions 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 fibreglass cover to first post.

1. **Valve Block**
2. **Solenoid Valve**
3. **Coil**
4. **Locking Nut**
5. **Fitting, straight**
6. **Bonded Washer**
7. **Plug**
8. **Main Relief Valve**
9. **Pressure Test Point.**



Refer to Page 7-24 for part numbers

Figure 4-9: Main Manifold Block Components

4.9 Hydraulic Outrigger Manifold (Figure 4-10)

As with the Main Manifold it is not necessary to remove the outrigger 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. Remove battery ground cable.
2. Remove fibreglass cover from the left hand chassis module.
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 the module tray.
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 4-10 often to aid in disassembly and assembly.

1. Remove coils from solenoid valves.
2. Remove solenoid 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.

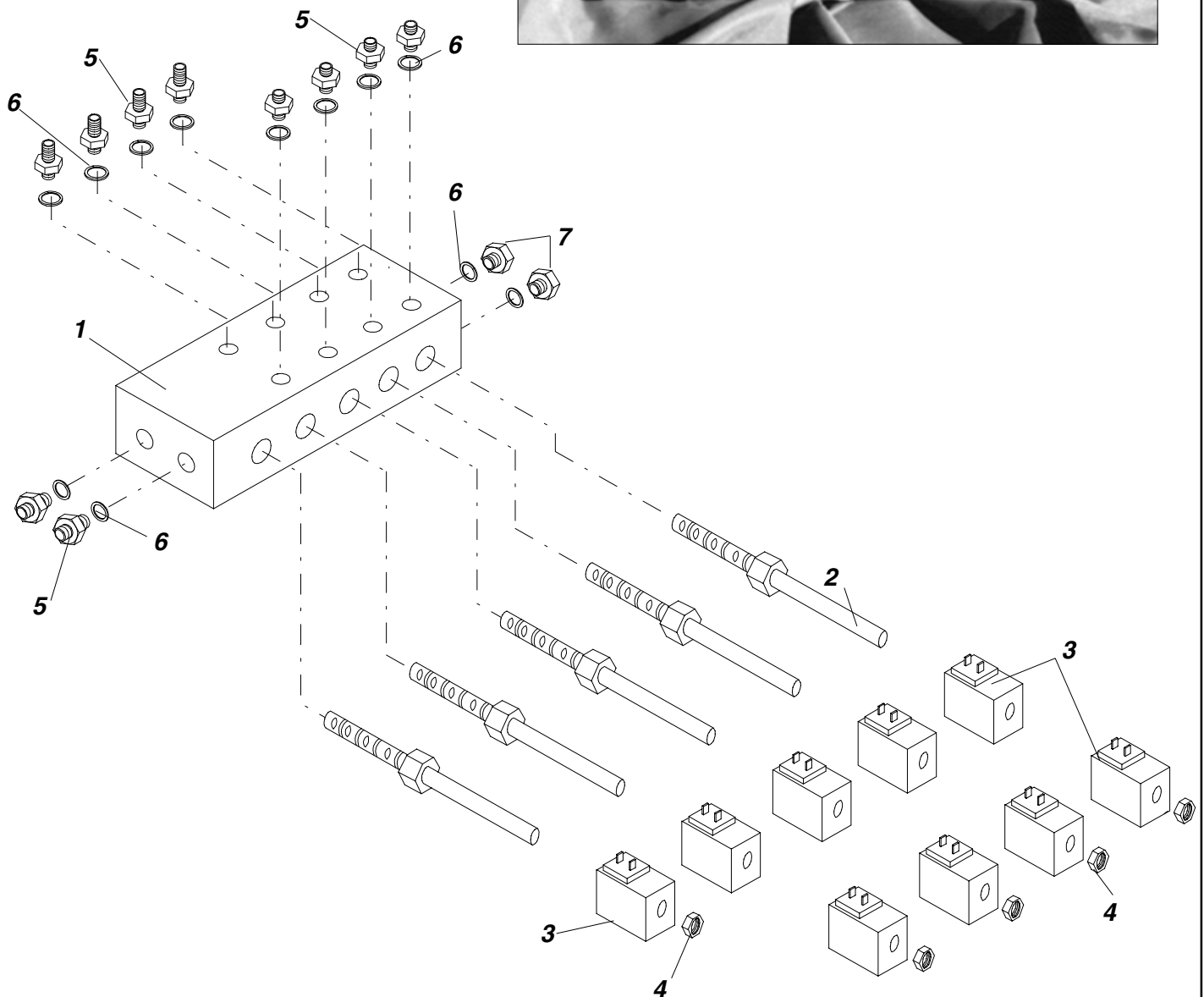
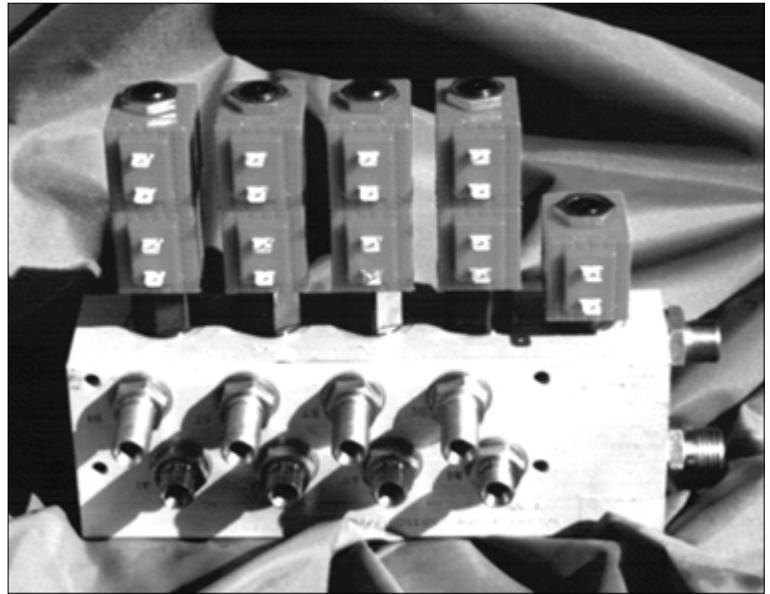
Note: Torque solenoid spool cartridges to 20 Nm (14.75 ft lbs)

Torque coil retaining nuts to 3.4 Nm (2.5 ft lbs)

INSTALLATION

1. Attach manifold assembly to module tray with bolts and washers.
2. Connect hydraulic hoses to their positions 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 fibreglass cover to the chassis module.

1. **Valve Block**
2. **Solenoid Valves**
3. **Coil**
4. **Locking Nut**
5. **Fitting, straight**
6. **Bonded Washer**
7. **Plug**



Refer to Page 7-26 for part numbers

Figure 4-10: Outrigger Manifold Block Components

4.10 Hydraulic Pump (Figure 4-11)



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.

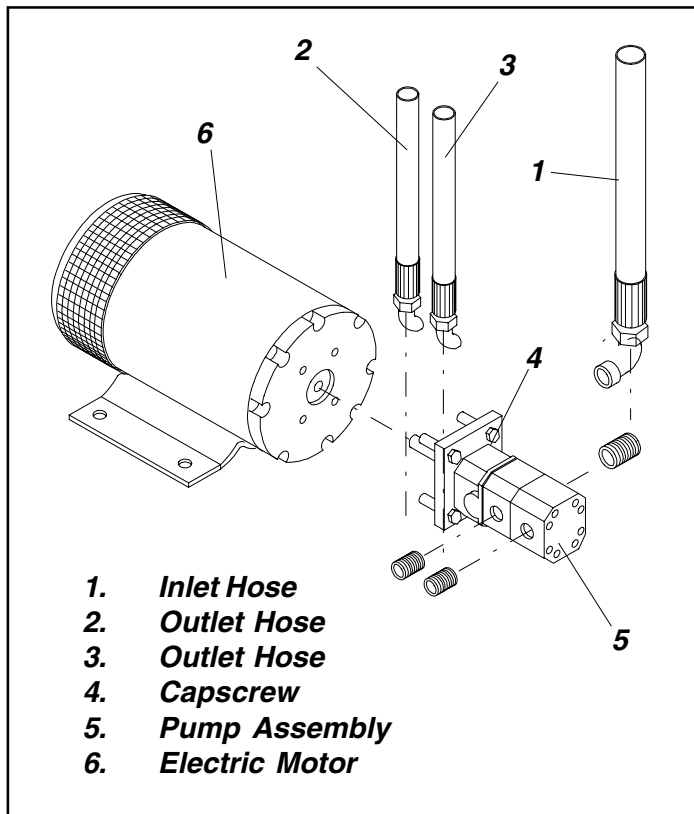


Figure 4-11: Hydraulic Pump

4.11 Wheel Hubs/Bearings (Figure 4-12)

MAINTENANCE & ADJUSTMENT

1. On level ground, jack up the TL38 Work Platform with the outriggers so that the wheels are clear of the ground. Release the Handbrake fully.
2. Slacken the brakes by turning the hexagon adjusting nut (Figure 4-13 Item 1) anticlockwise. Take note of this adjusting nuts approximate position.
3. If movement can be detected between the brake drum and brake backplate, adjust as follows:
 - a) With a screwdriver blade inserted between the flange of the grease cap and the hub, remove the cap. (See Figure 4-12.1).
 - b) Straighten and remove the split pin from the axle nut. (See Figure 4-12.2).
 - c) Tighten the axle nut clockwise until resistance is felt when rotating the hub by hand.
 - d) Slacken the nut one slot (30°) anticlockwise, and refit new split pin. Replace new grease cap.
 - e) Adjust brakes. (See Section 4-12)

REPLACING WORN BEARINGS/ HUB OIL SEAL

1. Remove hubs following procedure from 1 to 3.b above.
2. Remove oil seal and bearing cone (with rollers), remove bearing cup by using a 'drift' or bar through the hub bore, and tapping the cup and oil seal out with a hammer. (See Figure 4-12.3)
3. Clean hub center thoroughly with a cleaning fluid.
4. Using a suitable soft plug/jig, tap bearing into hub recess. Ensure that the tapered side of the bearing is facing outwards (See Figure 4-12.4) and bearing is fully located against shoulder in hub.
5. Pack bearings with good quality wheel bearing grease. Half fill hub cavity with grease.
6. Locate back bearing in hub with rollers facing inwards, tap oil seal into position.
7. Assemble hub and adjust as described in paragraphs 3c - 3e above.

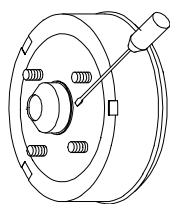


Figure 4.12.1

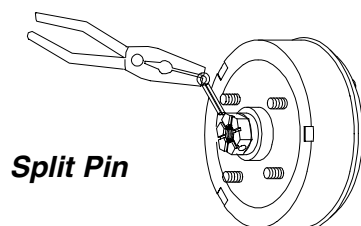


Figure 4.12.2

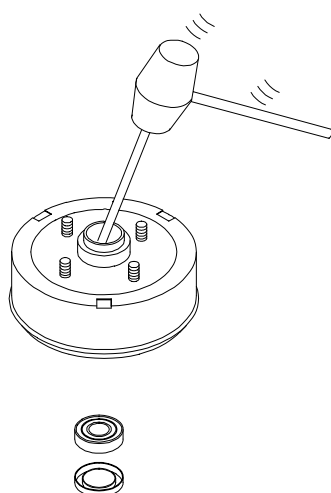


Figure 4.12.3

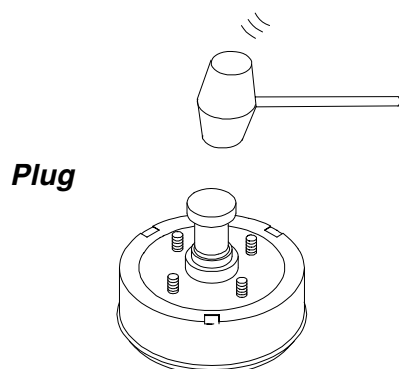


Figure 4.12.4



- | | |
|-------------------|---------------|
| 1. Brake Assembly | 6. Wheel Stud |
| 2. Grease seal | 7. Wheel Nut |
| 3. Inner Bearing | 8. Drum |
| 4. Outer Bearing | 9. Axle Nut |
| 5. Split Pin | 10. Hub Cap |

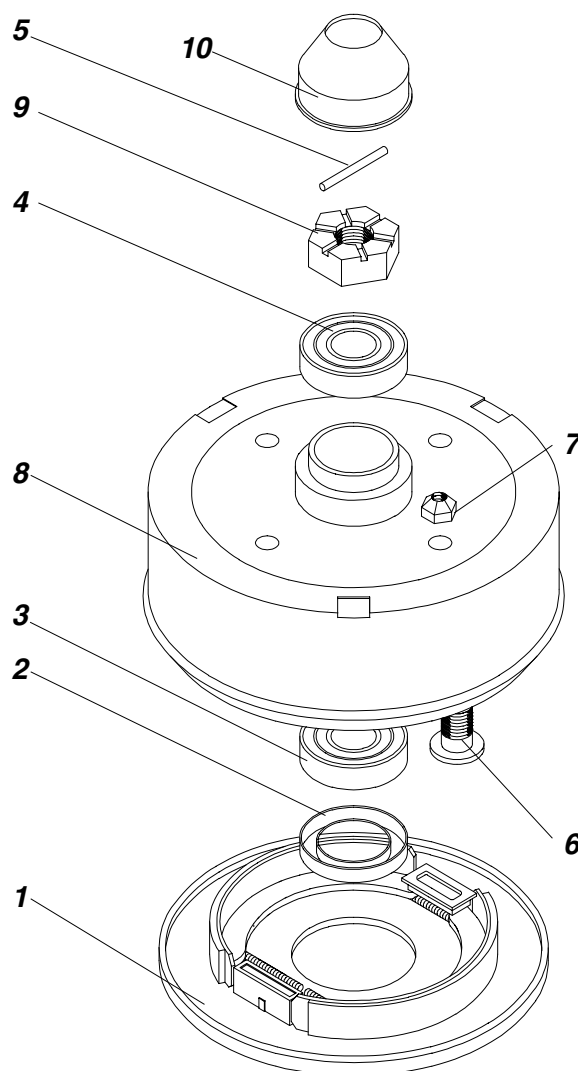


Figure 4.12.5 Wheel Hub Assembly

Figure 4-12.1-5: Maintaining Wheel Hubs & Bearings

4.12 Braking System

PRINCIPLES OF OPERATION

The Auto Reversing arrangement is fitted to each wheel brake. One 'Shoe' in each brake is fitted with a device that allows the shoe to slide down on cams or rollers when the brake drum is rotated in reverse, thus reducing the overall brake diameter and resistance to movement. In forward motion, the brake shoe is drawn back to its normal operating position for forward braking.

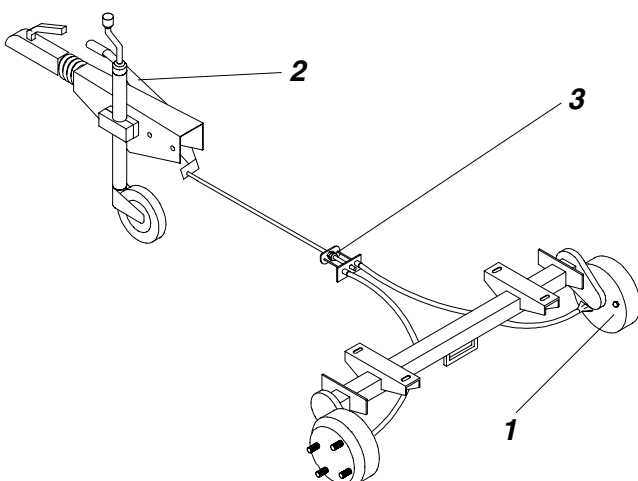
To overcome the tendency for the auto-reverse function to disengage the brakes when parked facing up-hill, an 'energy-store' in the form of a spring in the handbrake lever mechanism is fitted. This maintains sufficient pressure on the brakes in the reverse mode, preventing the TL38 from moving backwards.



CAUTION



NOTE: The handbrake must be applied sufficiently to ensure that the spring energy store is fully compressed. Prior to the brakes being 'bedded in' (850 km or 500 miles from new or from brake shoe change) care must be taken during normal braking, and when using the handbrake for parking it is advisable to chock the wheels for safety.



1. **Brake Shoe Adjustment**
2. **Handbrake**
3. **Equalizer Plate**

Figure 4-13: Braking Arrangement

ADJUSTMENT OF WHEEL BRAKES



CAUTION



Take care not to inhale brake dust when working on brakes. Wear a filter mask.

Position the machine on level ground and ensure that the handbrake is in the fully OFF position. Then follow the instructions below.

1. Jack wheels clear of the ground.
2. Ensure that handbrake cables are slack.
3. Rotate wheels in the forward direction (clockwise on the right hand side of trailer, anti clockwise on the left hand side) and tighten adjustment nut (Fig. 4-13 item 1) in a clockwise direction until hubs will no longer rotate.
4. Slacken the adjustment nut until very slight resistance is felt between the brakes and brake drum.
5. When adjusting the brakes, ensure that the shoes only just touch the inside of the brake drums. In order for the system to work correctly in the reverse mode, the brake drums must rotate in reverse sufficiently to disconnect and collapse the auto reverse shoe. The moving tube inside the coupling must continue to stroke fully and rest on a "stop" without reapplying the brakes. If the brakes are adjusted too tightly to the drums then the coupling will again apply the brakes and prevent further reverse movement.
6. Readjust cables & test function.

CHANGING WORN OR DAMAGED BRAKE CABLES

1. Check brake cable where it enters brake. If it ends in a collar that fits over the cable entry tube then the cables are of the detachable type.
2. To change the cable, slacken and drop cable end from the Equalizer plate (Fig. 4-13 item 3) and detach cables from drum as shown in Figure 4-14 (a) .
3. To refit, reverse the procedure.

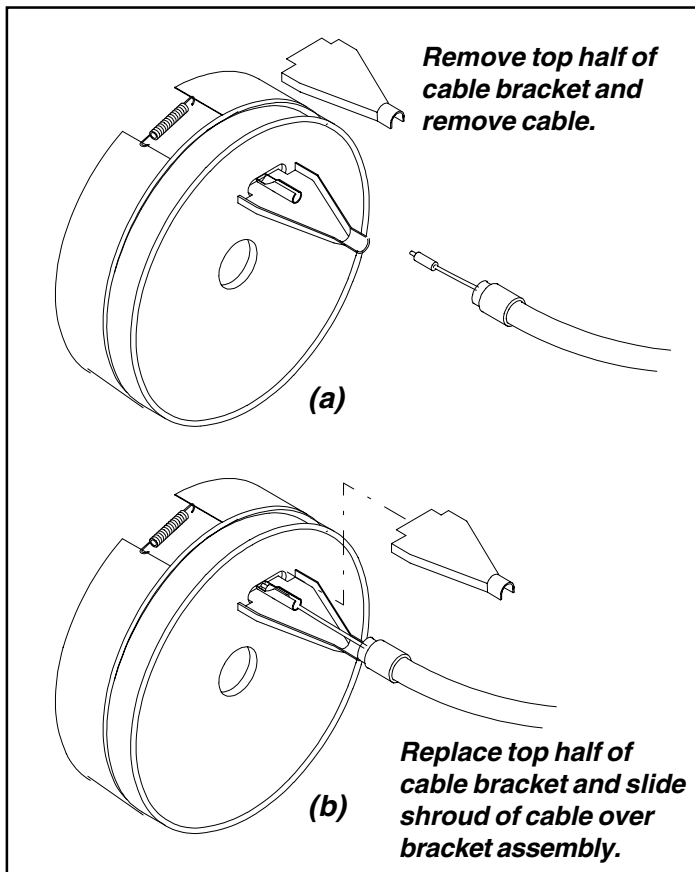


Figure 4-14: Replacing Brake Cable

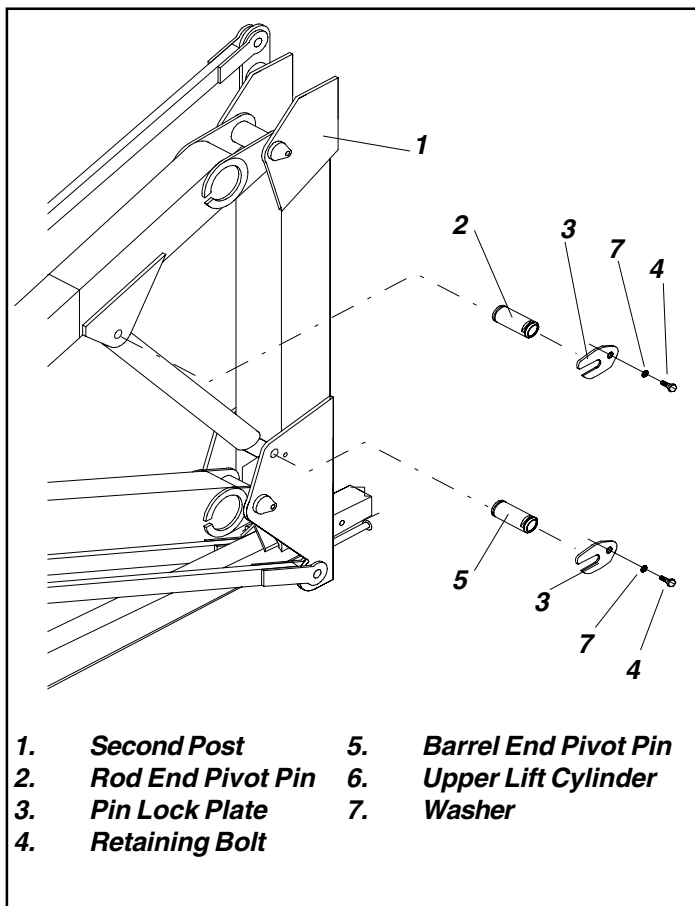


Figure 4-15: Upper Lift Cylinder

4.13 Upper Lift Cylinder (Figure 4-15)

REMOVAL



CAUTION



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

1. Ensure 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 rest on the lower boom.
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 a new piston static O-ring, the piston and piston nut 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. Place the lift cylinder on the lower boom.
3. 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.

4. Align pin lock plate on cylinder pin with hole in the mast. Fix pin lock plate with bolt.
5. Install rod end bearings (if removed).
6. Lift rod end of cylinder into place and insert pin. Install pin lock plate.
7. Fix pin lock plate and bolt, using a thread lock.
8. Test with weight at rated platform load to check system operation.

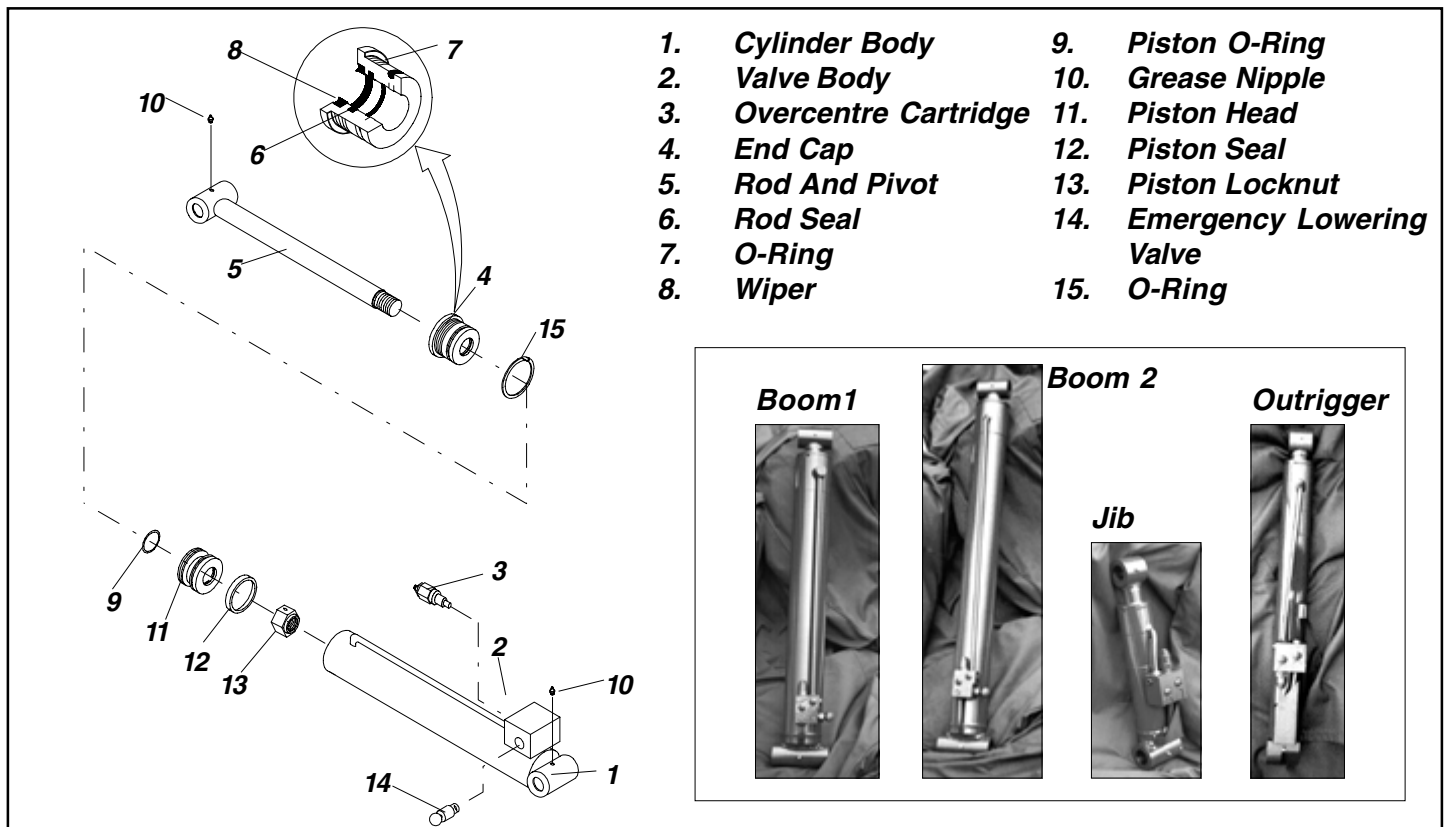


Figure 4-16: Hydraulic Cylinder Component Breakdown

4.14 Lower Lift Cylinder (Figure 4-17)

REMOVAL



CAUTION



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

1. Ensure Elevating Assembly is fully stowed and the booms are in their rest position.
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 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.

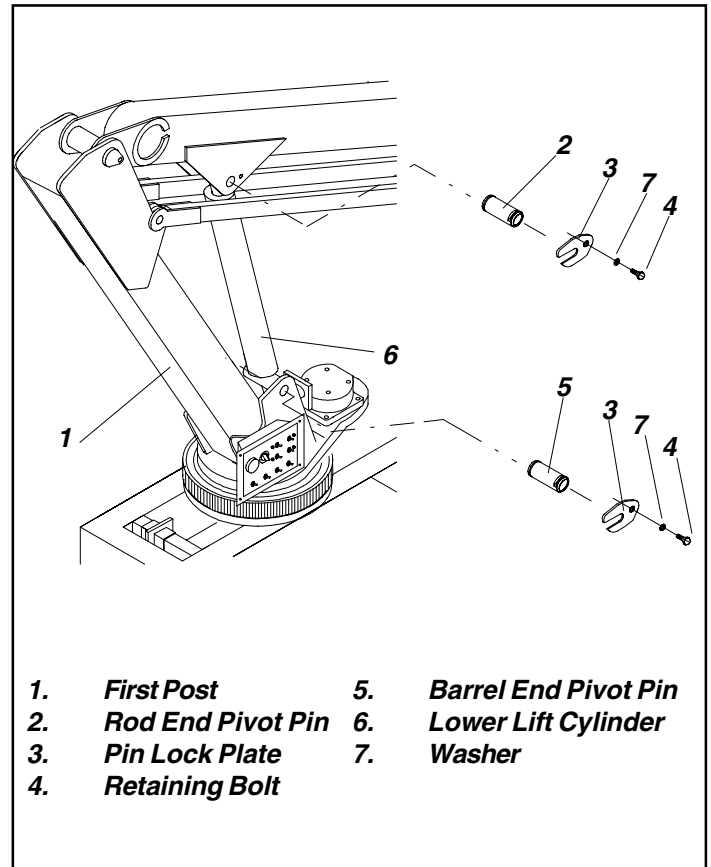


Figure 4-17: Lower Lift Cylinder

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 a new piston static O-ring, the piston and piston nut 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 and bearings for wear and replace if necessary.

1. Install barrel end bearing (if removed)
2. Place the lift cylinder against the first post.
3. 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. If holes are not properly aligned and the pin is forced in, the bearings will be damaged.
4. Align pin lock plate on cylinder pin with hole in the mast. Fix pin lock plate with bolt.
5. Install rod end bearings (if removed).
6. Lift rod end of cylinder into place and insert pin. Install pin lock plate.
7. Fix pin lock plate and bolt, using a thread lock.
8. Test with weight at rated platform load to check system operation.

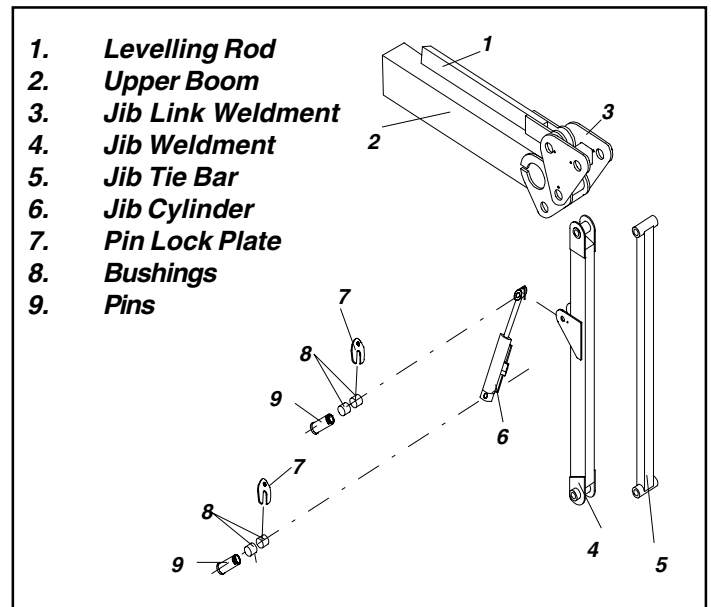


Figure 4-18: Jib Cylinder

4.15 Jib Cylinder (Figure 4-18)

REMOVAL

1. Ensure Elevating Assembly is fully stowed and the booms are in their rest position.
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 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 a new piston static O-ring, the piston and piston nut on the cylinder rod. Screw nut to end of thread and secure with set screw.
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 Jib 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. 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 Boom and 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.
6. Fix pin lock plate with bolt.
7. Test with weight at rated platform load to check system operation

4.16 Outrigger Cylinder (Figure 4-19)

REMOVAL



CAUTION



Note: The Outrigger Cylinder is heavy, so utilise appropriate lifting equipment to support the unit before removing pins.

1. With the booms in the stowed position, retract all 4 outriggers completely.
2. Disconnect the hoses from the cylinder and plug to avoid excessive oil spillage. Note which hoses go to which port.
3. Remove securing bolts and pin lock plates from the cylinder pins.
4. Support the cylinder so that the barrel end cylinder pin can be removed.
5. Lower the outrigger and cylinder to the ground and knock out the rod end pin.
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 a new piston static O-ring, the piston and piston nut on the cylinder rod. Screw nut to end of thread and secure with set screw.
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 Outrigger Cylinder Overcentre Valve on the 'annulus' side and the Check Valve on

the 'full bore' side of the Outrigger Cylinder valve block.

INSTALLATION

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

1. Place the Outrigger Cylinder against the quadrant plate.
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. 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 quadrant plate. 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.
6. Fix pin lock plate and bolt, using a thread lock.
7. Bleed the Outrigger Cylinder as outlined on the following page.
8. Test with weight at rated platform load to check system operation

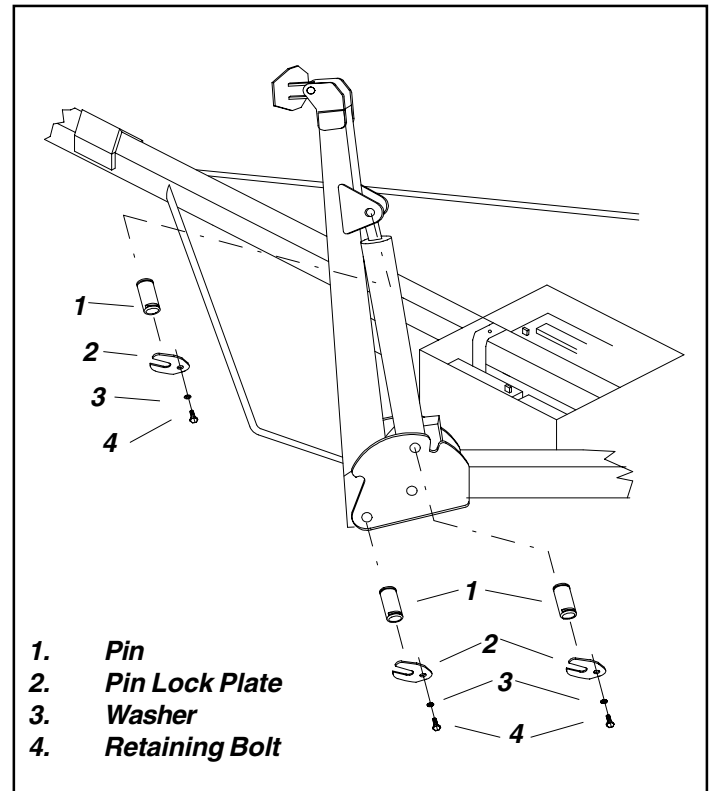


Figure 4-19: Outrigger Cylinder

BLEEDING OF OUTRIGGER CYLINDERS

1. Retract all three booms until they are fully stowed.
2. Locate the two plugs G1 & G2 situated on the side of the valve block affixed to the Outrigger Cylinder.
3. With the Outrigger fully extended, unplug G2 and connect a drain hose (3/16 fitting will be required) to collect the waste hydraulic fluid into a suitable container.
4. Retract the Cylinder completely and the fluid will collect in the container. A whitish colour will be an indication of air in the oil. Disconnect the hose and re-plug G2.
5. Unplug G1 and connect the drain hose. This time extend the Outrigger Cylinder and collect the waste oil. Disconnect the hose and plug G1.
6. Unplug G2 again and reconnect the drain hose. Retract the Cylinder completely once more. Although the waste oil should now be almost completely clean, lacking the whitish colour, it is very important that the Cylinder is fully retracted. This is because at the very end of the stroke air or aerated oil can still be expelled.
7. Disconnect the hose and again plug G2. Make certain that the plugs in G1 & G2 are fully tightened. With the Outriggers retracted top up the oil level in the tank before proceeding.
8. Test the cylinder for correct operation.
9. Carry out the above procedure (Steps 2 to 8) again for each of the Outrigger Cylinders and test each for correct operation.
10. Test the TL38 with the rated platform load to check system operation.
11. Refill the hydraulic tank as required.

NOTE:

1. Do not reuse the waste aerated oil to refill the hydraulic tank. It must be disposed of in accordance with the local regulations governing the disposal of such substances.
2. Take care not to aerate the hydraulic fluid when refilling the tank.
3. Do not disconnect the hydraulic hoses at any stage in the bleeding process.

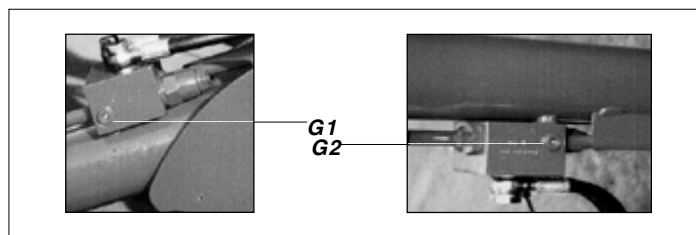


Figure 4-20: Bleed Points

4.17 Adjustment of Overcentre Valves on TL38 Lift Cylinders

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 about 50mm stroke on the cylinder.
- c) First loosen the locknut, then using an Allen Key adjust the spring setting screw on the valve cartridge. Turning the screw clockwise increases the pressure setting. Turning the screw anticlockwise reduces the setting and allows the boom to creep downwards. Adjust the spring setting until the boom just begins to creep downwards.
- d) Screw the adjuster **1 (one)** further turn **clockwise** and secure locknut.

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



CAUTION



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

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

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



Overcentre Valve

Figure 4-21: Overcentre Valve

4.18 Electric Motor (Figure 4-23)



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 4-22. 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.

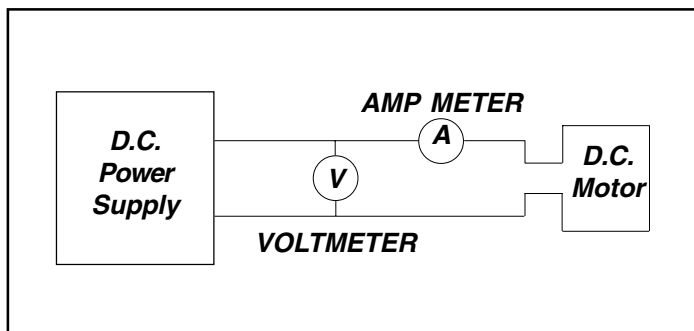


Figure 4-22: Electrical Test Circuit

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 shortened turns. 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 harnesses 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. |

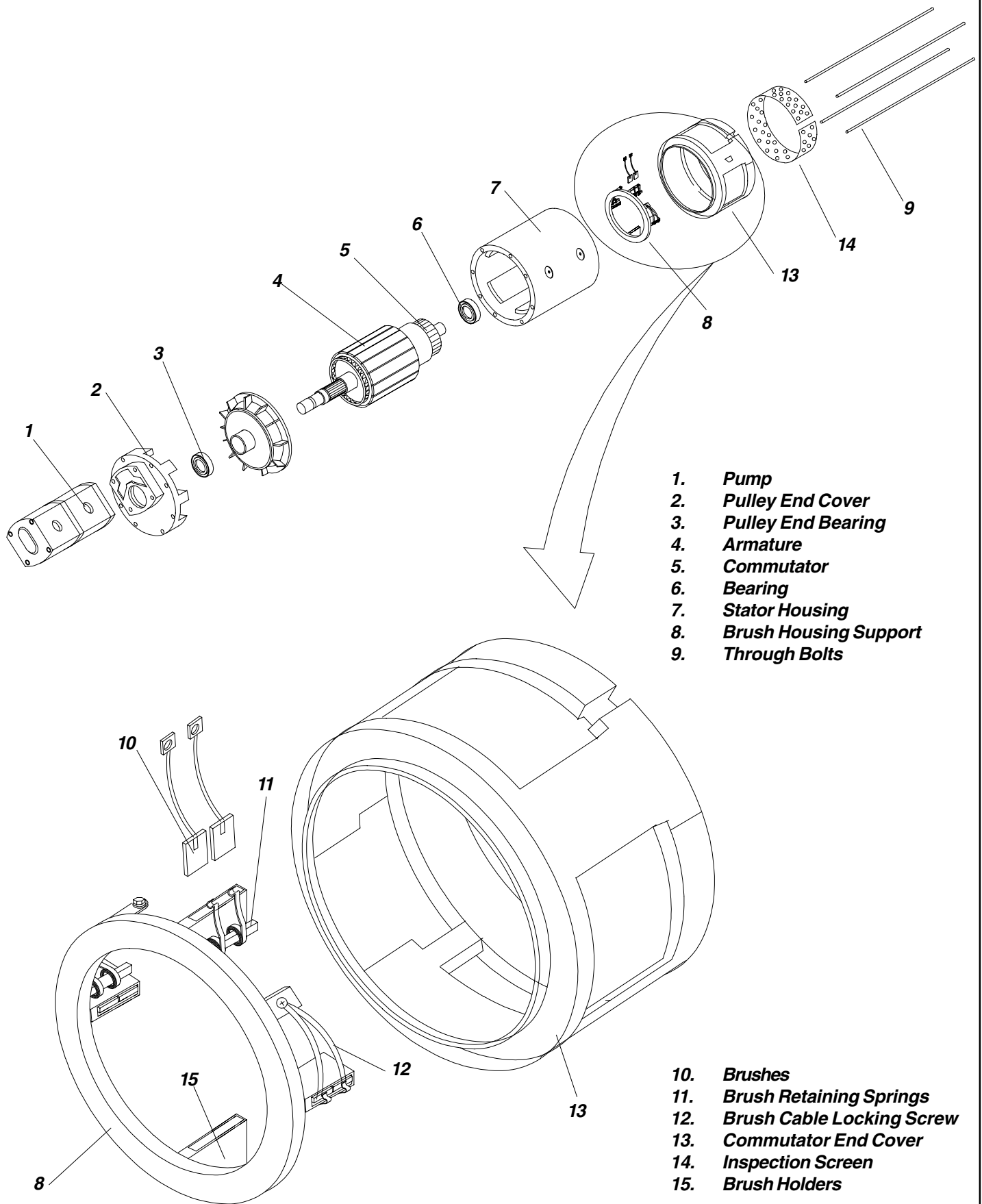


Figure 4-23: Electric Motor Assembly

4.19 Torque Specifications

RETAINING BOLTS

Use the following values to torque bolts used on UpRight's TL38 Work Platform unless a specific torque value is called out for the part being installed.

| Thread Size | Location | Torque | |
|-------------------|-----------------|--------|-----------|
| | | Metric | Imperial |
| M4 | - | 3 Nm | 2 Ft/Lbs |
| M6 | - | 10 Nm | 7 Ft/Lbs |
| M8 | - | 25 Nm | 18 Ft/Lbs |
| M10 | - | 45 Nm | 33 Ft/Lbs |
| M10 (ISO 10.9) | GEARBOX | 80 Nm | 59 Ft/Lbs |
| M12 | - | 85 Nm | 63 Ft/Lbs |
| M12 (ISO 10.9) | ROAD WHEELS | 80 Nm | 59 Ft/Lbs |
| | SLEW BEARING | 120 Nm | 88 Ft/Lbs |
| M16 | TOW HITCH | 100 Nm | 74 Ft/Lbs |

Table 4-3: Bolt Torques

NOTE: All Bolts are ISO Grade 8.8 unless otherwise stated

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 localise the trouble more quickly than any other method. 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 *TL38 Work Platform* and help in diagnosing and repair of the machine.



WARNING



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

When performing any service 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.

Disconnect the batteries ground cable when replacing or testing the continuity of any electrical component.

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. This is because 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 the easy ones first.
6. Correct the problem.
7. Test, Test, & Test the machine again to see that the problem does not reoccur. 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 160 amp 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. Check LED on control unit 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. |
| | 7. Blown control Fuse FU1. | Check 7A circuit control fuse. Replace if blown. |
| 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. |
| Platform will not elevate or elevates slowly. | 1. Emergency Lowering valve leaking. | Remove and inspect the valve. Replace if necessary. |
| | 2. Platform Overloaded. | Observe maximum load rating. (See Table 1-1). |
| | 3. Faulty Controller at upper controls | Check functionality of controller. Replace the Controller if faulty. |
| | 4. Blown control Fuse FU1. | Check 7A circuit control fuse. Replace if blown. |
| | 5. Battery Voltage Check LED on control unit 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. |
| | 6. Check LED on control unit for 8 flash fault. | Allow unit to cool down, to clear flashing. LED will flash 8 times due to thermal cutback. |
| | 7. Outrigger Limit Switches LS1, LS2, LS3, LS4 not activated. | Ensure all four outriggers are deployed and the limit switch contacts are closed. Replace the faulty switch. |
| | 8. Faulty Lift Valve Solenoid. | Test Lift Solenoid, if proper voltage is present and coil unmagnetized - Replace |

| PROBLEM | PROBABLE CAUSE | REMEDY |
|--|--|---|
| 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 & Jib) | 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 Overcentre Valve. |
| | 4. Platform Overloaded | Remove excess weight. |
| Machine will not slew when booms are elevated. | 1. Faulty Slew Cut-Out Limit Switch. | Check that Normally Closed contacts of limit switch are closed when the second post is approximately elevated 1.6m above ground. Adjust switch lever arm or replace switch. |
| | 2. Faulty Slew Switch or Controller | Test switch for continuity. 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 Valves stuck. | Inspect slew valves. If spool is sticking - Replace. |
| | 6. Key on Slew Motor sheared off. | Remove motor from gearbox and replace key if sheared. |
| | 7. Oil seals in Slew Motor are damaged. | Check and replace if necessary. |
| | 8. 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. |
| Brakes Overheat. | 1. Brake shoes too tight, wheels difficult to rotate. | Reset brakes according to reset procedure. |
| Trailer fails to Auto-Reverse. | 1. Hitch incorrectly adjusted. | Follow adjustment procedure as per Section 4-12 in maintenance section. Reverse. |
| Handbrake not working | 1. Brake shoes worn. | Remove hubs, clean brakes and drums, replace brake shoes. |
| | 2. Handbrake out of adjustment. | Adjust handbrake as per Section 4-12 in maintenance section. |

| PROBLEM | PROBABLE CAUSE | REMEDY |
|---|---|---|
| Brakes snatching. | 1. Damper failure in coupling. | Replace coupling. |
| Brakes remaining on after handbrake release. | 1. Cable linkage incorrectly adjusted or sticking. | Remove linkages, cables and rods. Clean and refit. Readjust linkage system. |
| Trailer failing to tow easily. Encounters resistance. | Brake shoes adjusted too tight, wheels difficult to rotate. | Reset brakes according to reset procedure in Section 4. |
| Trailer swaying when towing i.e. hard to tow. | Wrong Tow Hitch height or towing speed greater than 70km/h (45mph). | Obtain a more suitable tow vehicle or slow down. |

5.2 General Information.

The TL38 uses a single **DC Motor Control Unit** to control the speed of the hydraulic pump electric drive motor. The DC motor control unit 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 this DC motor controller, the most common are **Quadrapower** or **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 TL38 control circuit operates at 24V. 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.

BENEFITS & PROPERTIES

Some of the benefits of this type of control are:

- Energy efficient - preserves battery power.
- Smooth and Precise - allows safe and easy precision control.
- Quiet operation - the motor only "hums", no high pitch noise.
- Compact - no bulky equipment.

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. 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).

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

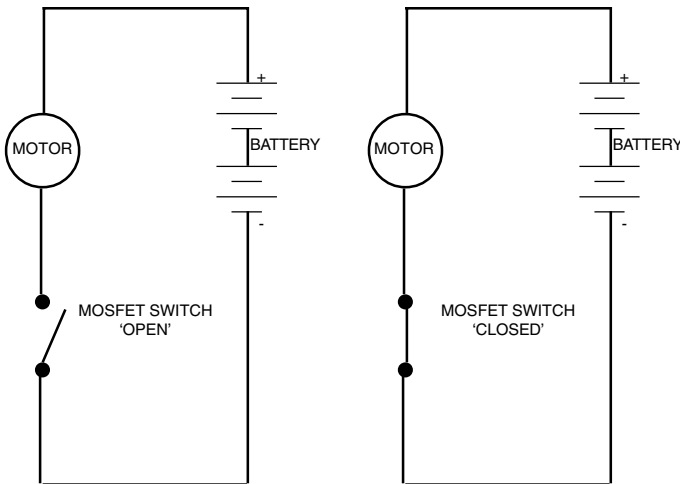
The reference points used on the electrical schematics e.g. JP1 (Junction Point #1) and Pin 1 (connection pin #1) have the following meanings:

- 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.

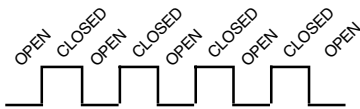
The software of the MOS90 is related to the various functions as follows:

- 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

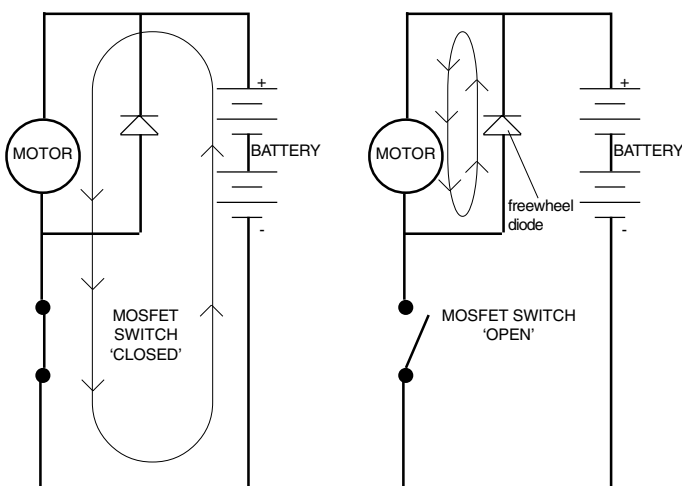


The resultant pulses of voltage through the MOTOR will then look like this, and the number of pulses per second will determine the average motor voltage.



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.



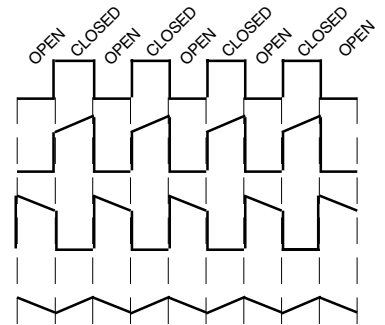
(Equal pulses of open & close as follows relates to a MOS90 Controller outputting to the motor to give half speed.

'PULSES OF VOLTAGE'

'BATTERY CURRENT'

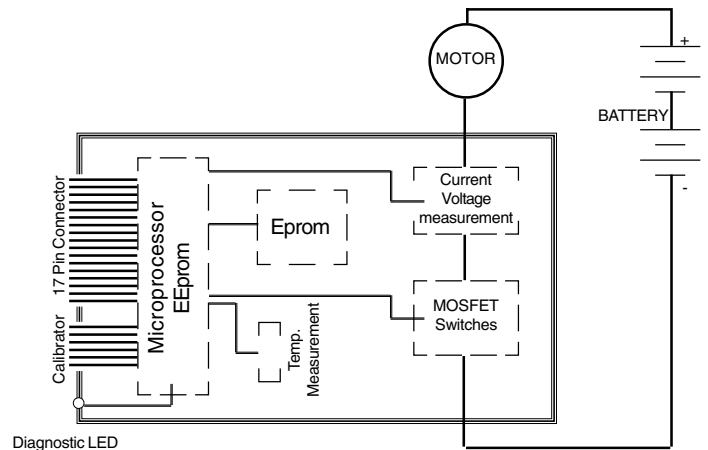
'FREEWHEEL CURRENT'

'MOTOR CURRENT'

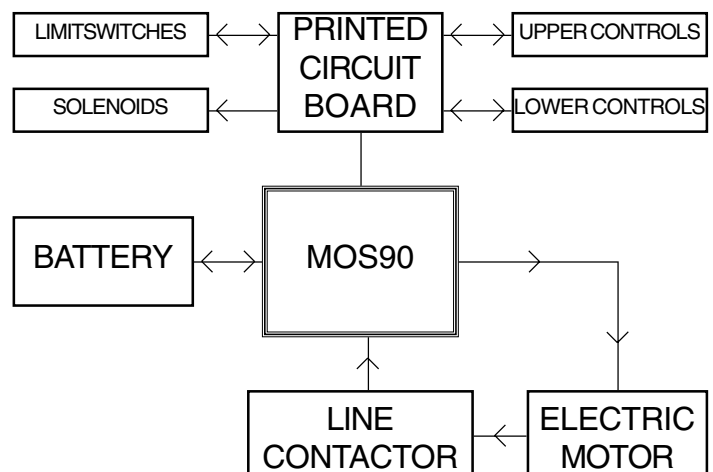


At low speed the MOSFET is mostly open and most of the current is from 'freewheel'.

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 MOS90 controls the DC motor, and below the basic principle (block diagram) of how the MOS90 relates 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 (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 degrees Celsius and the MOS90 will shut down at 90 degrees Celsius. 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 < 2.4 V |
| 7 Flash | Battery voltage <14.0V | Batteries low - need charging |
| 8 Flash | Thermal cutback | The MOS90 temp. is too high |

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 TL38 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 MOS90 is first powered up, the recorded minutes of run time is displayed. This time displayed indicates the total time the MOS90 is engaged in operation.

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.

Pump controllers on the three machines do 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 5-3: Calibrator Face

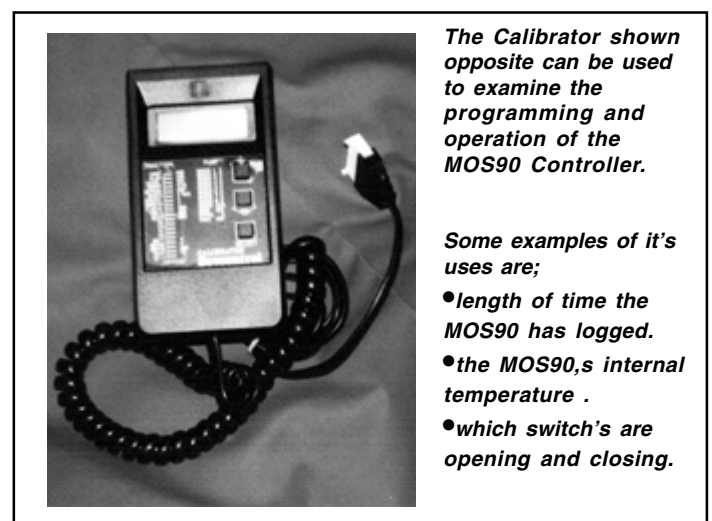


Figure 5-1: MOS90 Calibrator

5.6 Calibrator Settings

| Cal. Text | Function | Unit | Setting | Signal | Comments |
|------------------|-----------------------------------|-------------|----------------|---------------|--|
| SPEED1 | Upper Controls, Boom 1. | % | 75 | Input/Prop. | |
| SPEED2 | Upper Controls, Slew & Jib. | % | 40 | Input/Prop. | |
| SPEED3 | Upper Controls, Boom 2. | % | 50 | Input/Prop. | |
| SPEED4 | Lower Controls, Boom 1 & 2. | % | 45 | Input/Fixed | |
| SPEED5 | Lower Controls, Slew & Jib. | % | 13 | Input/Fixed | |
| SPEED6 | Lower Controls, Outriggers. | % | 30 | Input/Fixed | |
| SPEED7 | Not Used | | | | |
| SPEED8 | Not Used | | | | |
| CREEP | Not Used | | | | |
| RAMP | Activation Delay ("Soft Start") | Seconds | 1 | | |
| 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. | Open | Closed | 8 | Green |
| Switch 2 | Upper Controls, Slew & Jib. | Open | Closed | 13 | Turquoise |
| Switch 3 | Upper Controls, Boom 2. | Open | Closed | 12 | Brown |
| Switch 4 | Lower Controls, Boom 1 & 2. | Open | Closed | 4 | White |
| Switch 5 | Lower Controls, Slew & Jib. | Open | Closed | 7 | Orange |
| Switch 6 | Lower Controls, Outriggers. | Open | Closed | 16 | Grey |
| Switch 7 | Not Used | Open | | | |
| Switch 8 | Not Used | Open | | | |
| Switch 9 | Not Used | Open | | | |
| Switch 10 | Not Used | Open | | | |

Table 5-4: Calibrator Settings & Switches

NOTES:

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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NOTES:

6.1. Electrical Schematics - Manual Outriggers

Table 6-1: Electrical Schematic Legend

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|------------------------------|---|----------------------|
| ALM1 | Alarm | Provides warning sound until outriggers are deployed and the contacts on LS1, LS2, LS3 and LS4 are closed. If one of the switches opens during the operation of the machine then the alarm sounds and power is cut to the upper controls. This will also sound on TL38s fitted with a Tilt Sensor if the machine tilts more than 2 degrees. | Upper Control Box. |
| BAT | Batteries x 4. 6 Volts each. | Power supply. | Chassis Battery Box. |
| BC1 | 24V Battery Charger | This charges the 4 x 6V batteries when switched on and the line contactor is energised. | Chassis Subframe |
| D1 | Diode | Feeds power to Jib Up solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D2 | Diode | Feeds power to Jib Up solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D3 | Diode | Feeds a signal to pin 12 on the controller when Jib Up function is selected and prevents backfeed to the Jib solenoid when Jib Down is selected. | On Lower P.C.B. |
| D4 | Diode | Feeds a signal to pin 12 on the controller when Jib Down function is selected and prevents backfeed to the Jib solenoid when Jib Up is selected. | On Lower P.C.B. |
| D5 | Diode | Feeds power to Jib Down solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D6 | Diode | Feeds power to Jib Down solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D7 | Diode | Feeds a signal from Boom 1 Up solenoid to pin 4 on the controller and prevents backfeed to the solenoid when other functions are selected. | On Lower P.C.B. |
| D8 | Diode | Feeds a signal from Jib Up solenoid to pin 4 on the controller and prevents backfeed to the Jib Up solenoid when other functions are selected. | On Lower P.C.B. |
| D9 | Diode | Feeds a signal from Boom 2 Up solenoid to pin 4 on the controller and prevents backfeed to the lift solenoid when other functions are selected. | On Lower P.C.B. |
| D10 | Diode | Feeds +24V to pin 6 on the controller from upper controls. | On Lower P.C.B. |
| D11 | Diode | Feeds +24V to pin 6 on the controller when Momentary Switch SW8 is used to select lower controls. | On Lower P.C.B. |
| D12 | Diode | Feeds a signal from Jib | On Lower |

| REFERENCE | NAME | FUNCTION | LOCATION |
|---------------|-------|--|-----------------|
| D12 contd.... | | Down solenoid to pin 4 on the controller and prevents backfeed to the Jib Down solenoid when other functions are selected. | P.C.B. |
| D13 | Diode | Feeds a signal from Boom 1 Down solenoid to pin 4 on the controller and prevents backfeed to the Boom 1 Down solenoid when other functions are selected. | On Lower P.C.B. |
| D14 | Diode | Feeds a signal from Boom 2 Down solenoid to pin 4 on the controller and prevents backfeed to the Boom 2 Down solenoid when other functions are selected. | On Lower P.C.B. |
| D15 | Diode | Feeds +24V to Relay K7 from upper controls. | On Lower P.C.B. |
| D16 | Diode | Feeds +24V to Relay K7 when Momentary Switch SW8 is used to select lower controls. | On Lower P.C.B. |
| D17 | Diode | Suppression diode for relay K7. | On Lower P.C.B. |
| D18 | Diode | Feeds a signal to pin 13 on the controller via the Slew Cut-Out limit switch (LS6) when the slew function is selected at the upper controls. | On Lower P.C.B. |
| D19 | Diode | Feeds a signal to pin 13 on the controller via the Slew Cut-Out limit switch (LS6) when the slew function is selected at the upper controls. | On Lower P.C.B. |
| D20 | 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. |
| D21 | Diode | Feeds power to Slew Left solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D22 | Diode | Feeds power to Boom 1 Up solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D23 | Diode | Feeds power to Boom 1 Up solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D24 | Diode | Feeds power to Boom 2 Up solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D25 | Diode | Feeds power to Boom 2 Up solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D26 | Diode | Feeds power to Slew Right solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D27 | Diode | Feeds power to Slew Right solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |

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

| REFERENCE | NAME | FUNCTION | LOCATION | REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|-------|--|-----------------|---|-------|---|--------------------|
| D28 | Diode | Feeds power to Boom 1 Down solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. | D40 | Diode | It prevents backfeed to the outrigger control switches when the alarm is activated from upper controls. | On Lower P.C.B. |
| D29 | Diode | Feeds power to Boom 1 Down solenoid from lower controls and prevents feed-back to the lower controls from the upper controls. | On Lower P.C.B. | D41 | Diode | Suppression diode for relay K8. Prevents backfeed reaching SOL13. | On Lower P.C.B. |
| D30 | Diode | Feeds power to Boom 2 Down solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. | D42 | Diode | Feed to alarm. Prevents backfeed to coil of K9. | On Lower P.C.B. |
| D31 | Diode | Feeds power to Boom 2 Down solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. | D43 | | Suppression diode for relay K9. Prevents backfeed from reaching SOL13. | On Lower P.C.B. |
| D32 | Diode | Feeds power signal from joystick trigger to pin 7 on controller when emergency override is activated. | On Lower P.C.B. | D44 | Diode | Feeds a signal to tilt alarm relay K9 when Momentary Switch SW8 on lower controls is closed. Keyswitch SW2 on upper controls is to the 'ON' position and all four outrigger limit switches are activated. It prevents backfeed to the coil of K8 through the SW2. | On Lower P.C.B. |
| D33 | Diode | Feeds a signal to pin 7 on the controller when slew is energised by lower controls and prevents backfeed to the slew solenoids when a signal is fed through D29 to pin7 on the controller. | On Lower P.C.B. | D45 | Diode | Feeds a signal to tilt alarm relay K9 when Momentary Switch SW8 (Lower Controls) is closed. Keyswitch SW2 on upper controls is to the 'ON' position and all four outrigger limit switches are activated. It prevents back-feed to coil K8 through SW2. | On Lower P.C.B. |
| D34 | Diode | Feeds a signal to pin 7 on the controller when slew is energised by lower controls and prevents backfeed to the slew solenoids when a signal is fed through D32 to pin7 on the controller. | On Lower P.C.B. | D46, D48, D50, D52, D54, D56 D58, D60. | Diode | Feeds a signal to the line contactor each time an outrigger toggle switch is operated. They also prevent the outrigger solenoids from being energised by backfeed from the line contactor signal line when it is energised by other functions | On Lower P.C.B. |
| D35 | Diode | Feeds the signal which comes from the Keyswitch in the UCB and from the Chassis/Platform Selector Switch set at 'Platform' on the LCB to a contact on the alarm relay K8 and prevents power getting to upper controls when the alarm is activated from the lower controls. | On Lower P.C.B. | D47, D49, D51, D53, D55, D57, D59, D61. | Diode | Feeds +24V supply to the outrigger solenoids (up & down) when the outrigger toggle switches are activated. | On Lower P.C.B. |
| D35 | Diode | Feeds the signal which comes from the Keyswitch in the UCB and from the Chassis/Platform Selector Switch held to 'Chassis' on the LCB to a contact on the alarm relay K8 and prevents power getting to upper controls when the alarm is activated from the lower controls. | On Lower P.C.B. | D62 - D78 | Diode | Suppression diodes for the coils of the function control solenoids SOL 1 - 17 | On Lower P.C.B. |
| D37 | Diode | Feeds the signal from the outrigger diodes to the line contactor and prevents backfeed from other signals to pin 16 on the controller. | On Lower P.C.B. | D79 | Diode | Suppression diode for the coil of Upper Control Box direction relay K4. | Upper Control Box. |
| D38 | Diode | Prevents backfeed to lower control contact of the Momentary Switch SW8 when the line contactor is energised. | On Lower P.C.B. | D80 | Diode | Suppression diode for the coil of Upper Control Box direction relay K5. | Upper Control Box. |
| D39 | Diode | Feeds a signal to the line contactor when the joystick trigger is depressed. It prevents backfeed to the upper controls when the line contactor is energised by lower controls. | On Lower P.C.B. | D81 | Diode | Feeds power to Relay K5 from Relay K6. It also prevents backfeed to K6 when K5 is energised. | Upper Control Box. |
| | | | | D82 | Diode | Feeds power to handle supply of Joystick from Relay K6. It also prevents backfeed to K6 when the handle supply on the Joystick is energised. | Upper Control Box. |
| | | | | D83 | Diode | Suppression diode for the coil of Upper Control Box direction relay K6. | Upper Control Box. |
| | | | | D84 | Diode | Suppression diode for the coil of Upper Control Box direction relay K3. | Upper Control Box. |
| | | | | D85 | Diode | Prevents backfeed between the contacts on Relay K3. | Upper Control Box. |
| | | | | D86 | Diode | Suppression diode for the coil of Upper Control Box direction relay K1. | Upper Control Box. |
| | | | | D87 | Diode | Suppression diode for the coil of Upper Control Box direction relay K2. | Upper Control Box. |

6.1. Electrical Schematics - Manual Outriggers

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

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|--------------------|--|-------------------------------------|
| D88, 90 | Diode | Prevents backfeed from reaching Boom2 function on SW1 when K6 is energised. | Upper Control Box. |
| D89, 91 | Diode | Prevents backfeed from reaching Boom1 function on SW1 when K4 is energised. | Upper Control Box. |
| D92, 93 | Diode | Prevents backfeed from reaching Jib functions on SW1 when K4 is energised. | Upper Control Box. |
| D94 | Diode | Prevents backfeed from reaching the Battery Indicator LED1 when K6 is energised. | Upper Control Box. |
| D95 | Diode | Prevents backfeed from reaching Boom 2 functions on SW1 when K6 is energised. | Upper Control Box. |
| D96 | Diode | Suppression diode for coil of Line Contactor LC1. | Upper Control Box. |
| D97, 98 | Diode | Prevents feedback to alarm ALM1 when relays K8 and K9 are energised. | Upper Control Box. |
| FU1 | Fuse 7Amps. | Overload protection for control circuit. | On MCU |
| FU2 | Fuse 160Amps. | Overload protection for Electric Motor. | On MCU |
| K 1 - 6 | Main Power Relays. | These six Relays are all directly affected by the Four Position Selector Switch SW1, the ON/OFF/ Em.Override Keyswitch SW 2 and the Joystick. When a function is selected or the Keyswitch is activated the relevant relays to those positions will be energised. These Relays will then activate the required functions. | In the Upper Control Box. |
| K7 | Main Power Relay | This relay is energised when the Emergency Stop is activated. It will cut the 24V supply to the controller and Lower Controls when the emergency stop is pressed. | On Lower Printed Circuit Board. |
| K8 | Alarm Relay. | This relay is energised when the four Outrigger Limit Switches are activated. The Normally Closed contacts which feed power to the alarm are opened and the alarm switches off. If an Outrigger Limit Switch opens during operation of the booms the relay loses power and the alarm sounds. | On Lower Printed Circuit Board. |
| K9 | 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 Selector Switch is turned to Upper Controls. When the machine is in a tilt position power will be cut to all but the Emergency Override functions on Upper Controls. | On Lower Printed Circuit Board. |
| LC1 | Line Contactor. | In the unenergised 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. |

| REFERENCE | NAME | FUNCTION | LOCATION |
|-------------------|----------------------------|--|--|
| 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 | Outrigger LED (Green). | This LED is illuminated when the outriggers are deployed and taking load. If an Outrigger becomes "light" and comes off the ground this LED will go off and the alarm will sound. | Upper Control Box. |
| LED 3 - 6 | Outrigger LED (Green). | These four LED's are individually linked to the 4 Outrigger Limit Switches and indicate on the Lower Control Box when each of the switches has activated. | Lower Control Box. |
| LK1-7 | Insulated Links | These links bridge points on the Printed Circuit Boards to give characteristics required for the particular machine. | Upper & Lower Control Box P.C.B. |
| LS1,LS2,LS3 & LS4 | Outrigger Limit Switch | Activated when the outriggers are deployed and are taking load. A +24V supply from the batteries is routed through these four limit switches, which are wired in series, to the Keyswitch and provides power to the upper and lower control boxes for operation of the boom functions. | On Outrigger Quadrant Plate. |
| LS6 | Slew Cut-Out Limit Switch. | This prevents slewing until the second post is clear of the tow bar. The normally closed contact is open and the slew signal to pin 4 (W) on the controller is broken until the second post is clear of the towbar. | On First Post beneath Boom1 |
| MCU | Motor Control Unit. | This controls the speed of the electric motor. Using the Upper Controls the motor speed varies the position of the 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. |
| MOT | 24V 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 above MCU. |
| SOL1 | Solenoid <i>JIB Up</i> | Solenoid used for activating hydraulic valve to raise the JIB Boom. | On Main Manifold Block |
| SOL2 | Solenoid <i>JIB Down</i> | Solenoid used for activating hydraulic valve to lower the JIB Boom. | On Main Manifold Block |
| SOL3 | Solenoid <i>SLEW Left</i> | Solenoid used for activating hydraulic valve to slew in the left direction. | On Main Manifold Block |
| SOL4 | Solenoid <i>BOOM 1 Up</i> | Solenoid used for activating hydraulic valve to raise Boom 1. | On Main Manifold Block |
| SOL5 | Solenoid <i>BOOM 2 Up</i> | Solenoid used for activating hydraulic valve to raise Boom 2. | On Main Manifold Block |

6.1. Electrical Schematics - Manual Outriggers

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

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|---|---|------------------------|
| SOL6 | Solenoid <i>SLEW Right</i> | Solenoid used for activating hydraulic valve to slew in the right direction. | On Main Manifold Block |
| SOL7 | Solenoid <i>BOOM 1 Down</i> | Solenoid used for activating hydraulic valve to lower Boom 1. | On Main Manifold Block |
| SOL8 | Solenoid <i>BOOM 2 Down</i> | Solenoid used for activating hydraulic valve to lower Boom 2. | On Main Manifold Block |
| SW1 | Function switch <i>4 Position</i> | Sends power to the selected solenoid valve . (Boom 1, Boom 2, Jib, Slew) Only one function can be selected at any one time. | Upper Control Box. |
| SW2 | Keyswitch, <i>ON/OFF/ Em.Override.</i> | Allows +24V supply to feed to Upper Controls when turned to the ON position. This will then allow signals from SW1 and the Joystick Trigger to pass down to the MCU. 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 an Outrigger Limit Switch deactivating or Tilt Alarm operating. | Upper Control Box. |
| SW3 | Emergency Stop Button. | Control circuit shut off. In series with SW13. | Upper Control Box. |
| SW8 | 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. |
| SW 9 | 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. |
| SW10 | 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. |
| SW11 | Toggle switch <i>Jib</i> | Sends power to the Jib lift cylinder solenoid which diverts oil to full bore or annular side of Jib lift cylinder. | Lower Control Box. |
| SW12 | 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. |
| SW13 | Emergency Stop Button. | Control circuit shut off. In series with SW3. | Lower Control Box. |
| TS1 | Tilt Sensor. <i>Optional On TL38 With Manual Outriggers</i> | This is a tilt activated switch fitted on the TL38 which will deactivate all but emergency functions if the machine chassis tilts more than 2 degrees. This is an option on the Manual version | Chassis. |
| TSW1 | Transistor Switch | This switching mechanism, which is controlled by a combination of a transistor and resistors, activates the alarm when the Tilt Sensor is activated. | On Lower P.C.B. |
| TSW2 | Transistor Switch | This switching mechanism, which is controlled by a combination of a transistor and resistors, deactivates the Lower Control functions when the Tilt Sensor is activated. | On Lower P.C.B. |

MOTOR CONTROL UNIT (PIN LEGEND)

| PIN NO. | DESCRIPTION |
|---------|---|
| 1 | Battery Discharge Indicator (B.D.I.) output |
| 2 | sw8 - Not used, Connected to 24V supply from Pin 6 |
| 3 | Not used - 10V supply |
| 4 | sw4 - Switch 4 (Speed 4: Boom 1 & 2 speed from lower controls - Factory set at 45%) |
| 5 | Not used - Not connected. |
| 6 | 24V supply (Must be greater than 14V) |
| 7 | sw5 - Switch 5 (Speed 5: Slew & Jib speed from Lower Controls- Factory set at 13%) |
| 8 | sw1 - Switch 1 (speed 1: Max. variable speed for Boom 1 from upper controls - Factory set at 75%) |
| 9 | Not used - Not connected. |
| 10 | Not used - Not connected. |
| 11 | Not used - Not connected. |
| 12 | sw3 - Switch 3 (Speed 3: Max. variable speed for Boom 2 from upper controls - Factory set at 50%) |
| 13 | sw2 - Switch 2 (Speed 2: Max. variable speed for Slew & Jib from upper controls - Factory set at 40%) |
| 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: Outrigger speed from lower controls - Factory set at 30%) - Not Used On TL38 With Manual Outriggers. |
| 17 | Not used - Not connected. |

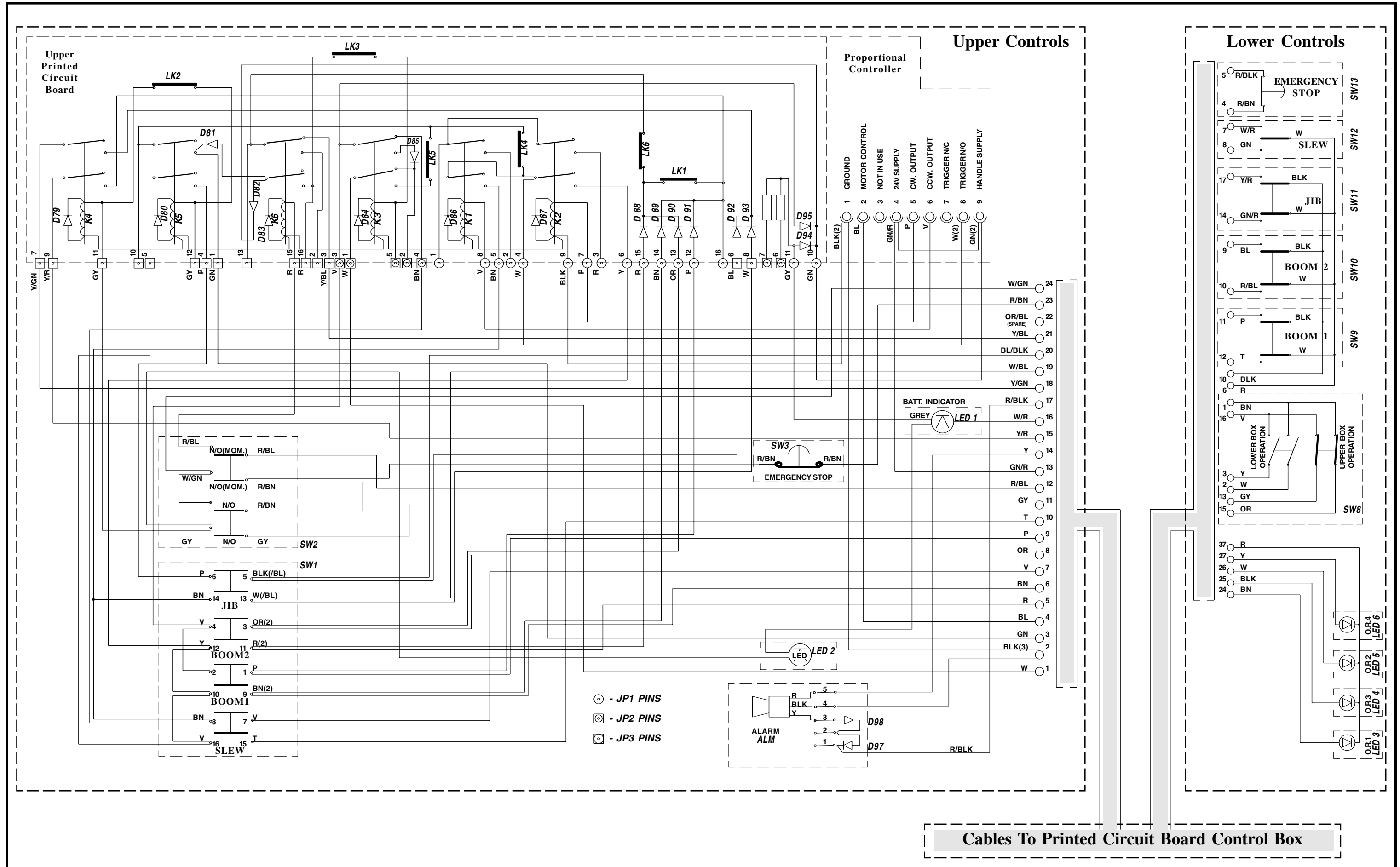


Figure 6-1a : Electrical Schematic (Manual Outriggers - Upper & Lower Control Boxes)

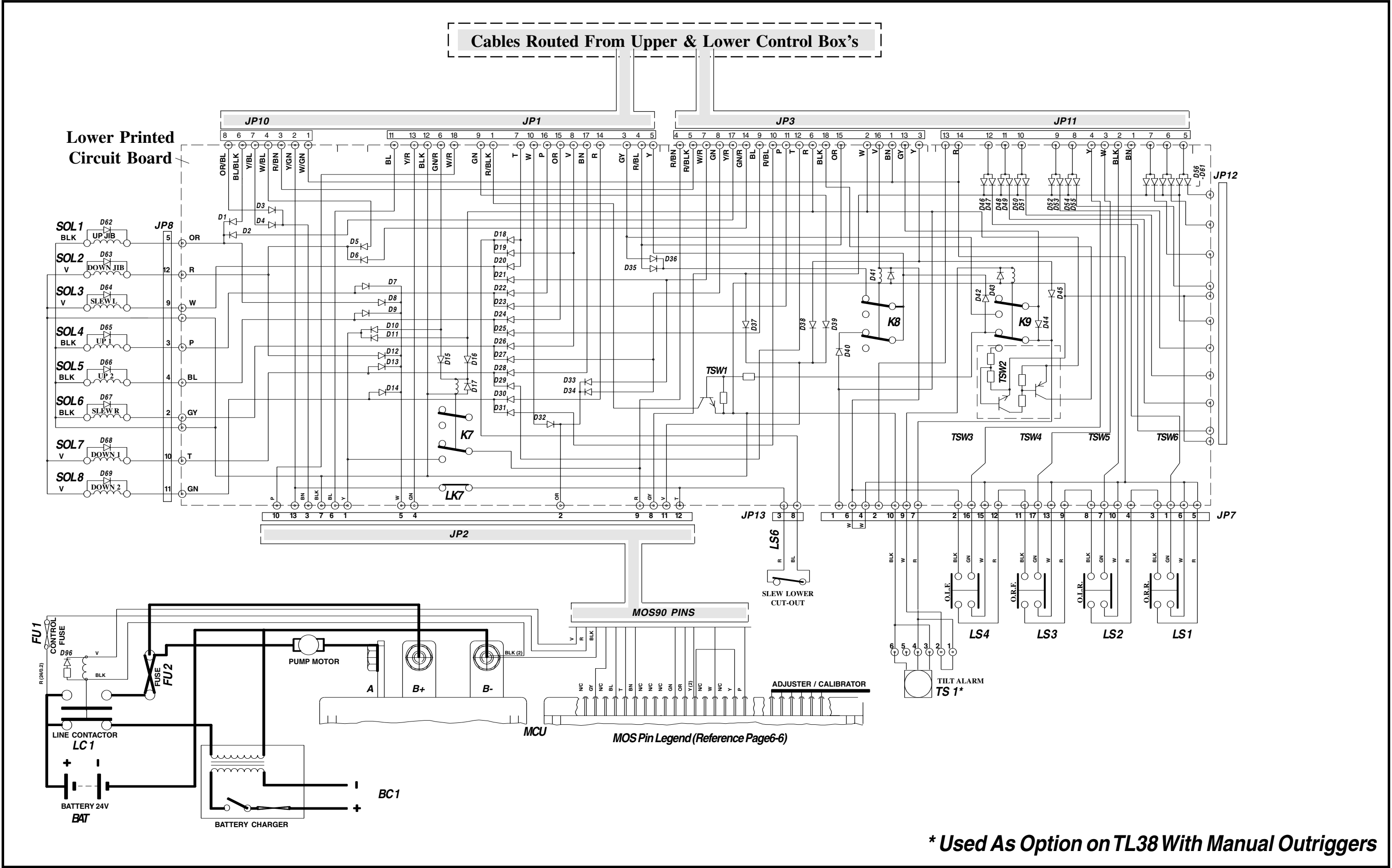


Figure 6-1b : Electrical Schematic (Manual Outriggers, Controller & Printed Circuit Board Assembly)

6.1. Electrical Schematics - Hydraulic Outriggers

Table 6-2: Electrical Schematic Legend

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|------------------------------|---|----------------------|
| ALM1 | Alarm | Provides warning sound until outriggers are deployed and the contacts on LS1, LS2, LS3 and LS4 are closed. If one of the switches opens during the operation of the machine then the alarm sounds and power is cut to the upper controls. This will also sound on TL38s fitted with a Tilt Sensor if the machine tilts more than 2 degrees. | Upper Control Box. |
| BAT | Batteries x 4. 6 Volts each. | Power supply. | Chassis Battery Box. |
| BC1 | 24V Battery Charger | This charges the 4 x 6V batteries when switched on and the line contactor is energised. | Chassis Subframe |
| D1 | Diode | Feeds power to Jib Up solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D2 | Diode | Feeds power to Jib Up solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D3 | Diode | Feeds a signal to pin 12 on the controller when Jib Up function is selected and prevents backfeed to the Jib solenoid when Jib Down is selected. | On Lower P.C.B. |
| D4 | Diode | Feeds a signal to pin 12 on the controller when Jib Down function is selected and prevents backfeed to the Jib solenoid when Jib Up is selected. | On Lower P.C.B. |
| D5 | Diode | Feeds power to Jib Down solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D6 | Diode | Feeds power to Jib Down solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D7 | Diode | Feeds a signal from Boom 1 Up solenoid to pin 4 on the controller and prevents backfeed to the solenoid when other functions are selected. | On Lower P.C.B. |
| D8 | Diode | Feeds a signal from Jib Up solenoid to pin 4 on the controller and prevents backfeed to the Jib Up solenoid when other functions are selected. | On Lower P.C.B. |
| D9 | Diode | Feeds a signal from Boom 2 Up solenoid to pin 4 on the controller and prevents backfeed to the lift solenoid when other functions are selected. | On Lower P.C.B. |
| D10 | Diode | Feeds +24V to pin 6 on the controller from upper controls. | On Lower P.C.B. |
| D11 | Diode | Feeds +24V to pin 6 on the controller when Momentary Switch SW8 is used to select lower controls. | On Lower P.C.B. |
| D12 | Diode | Feeds a signal from Jib | On Lower |

| REFERENCE | NAME | FUNCTION | LOCATION |
|---------------|-------|--|-----------------|
| D12 contd.... | | Down solenoid to pin 4 on the controller and prevents backfeed to the Jib Down solenoid when other functions are selected. | P.C.B. |
| D13 | Diode | Feeds a signal from Boom 1 Down solenoid to pin 4 on the controller and prevents backfeed to the Boom 1 Down solenoid when other functions are selected. | On Lower P.C.B. |
| D14 | Diode | Feeds a signal from Boom 2 Down solenoid to pin 4 on the controller and prevents backfeed to the Boom 2 Down solenoid when other functions are selected. | On Lower P.C.B. |
| D15 | Diode | Feeds +24V to Relay K7 from upper controls. | On Lower P.C.B. |
| D16 | Diode | Feeds +24V to Relay K7 when Momentary Switch SW8 is used to select lower controls. | On Lower P.C.B. |
| D17 | Diode | Suppression diode for relay K7. | On Lower P.C.B. |
| D18 | Diode | Feeds a signal to pin 13 on the controller via the Slew Cut-Out limit switch (LS6) when the slew function is selected at the upper controls. | On Lower P.C.B. |
| D19 | Diode | Feeds a signal to pin 13 on the controller via the Slew Cut-Out limit switch (LS6) when the slew function is selected at the upper controls. | On Lower P.C.B. |
| D20 | 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. |
| D21 | Diode | Feeds power to Slew Left solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D22 | Diode | Feeds power to Boom 1 Up solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D23 | Diode | Feeds power to Boom 1 Up solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D24 | Diode | Feeds power to Boom 2 Up solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D25 | Diode | Feeds power to Boom 2 Up solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D26 | Diode | Feeds power to Slew Right solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D27 | Diode | Feeds power to Slew Right solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |

6.1. Electrical Schematics - Hydraulic Outriggers**Table 6-2: Electrical Schematic Legend (Contd....)**

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|-------|--|-----------------|
| D28 | Diode | Feeds power to Boom 1 Down solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D29 | Diode | Feeds power to Boom 1 Down solenoid from lower controls and prevents feedback to the lower controls from the upper controls. | On Lower P.C.B. |
| D30 | Diode | Feeds power to Boom 2 Down solenoid from upper controls and prevents feedback to upper controls from lower controls. | On Lower P.C.B. |
| D31 | Diode | Feeds power to Boom 2 Down solenoid from lower controls and prevents feedback to lower controls from upper controls. | On Lower P.C.B. |
| D32 | Diode | Feeds power signal from joystick trigger to pin 7 on controller when emergency override is activated. | On Lower P.C.B. |
| D33 | Diode | Feeds a signal to pin 7 on the controller when slew is energised by lower controls and prevents backfeed to the slew solenoids when a signal is fed through D29 to pin7 on the controller. | On Lower P.C.B. |
| D34 | Diode | Feeds a signal to pin 7 on the controller when slew is energised by lower controls and prevents backfeed to the slew solenoids when a signal is fed through D32 to pin7 on the controller. | On Lower P.C.B. |
| D35 | Diode | Feeds the signal which comes from the Keyswitch in the UCB and from the Chassis/Platform Selector Switch set at 'Platform' on the LCB to a contact on the alarm relay K8 and prevents power getting to upper controls when the alarm is activated from the lower controls. | On Lower P.C.B. |
| D35 | Diode | Feeds the signal which comes from the Keyswitch in the UCB and from the Chassis/Platform Selector Switch held to 'Chassis' on the LCB to a contact on the alarm relay K8 and prevents power getting to upper controls when the alarm is activated from the lower controls. | On Lower P.C.B. |
| D37 | Diode | Feeds the signal from the outrigger diodes to the line contactor and prevents backfeed from other signals to pin 16 on the controller. | On Lower P.C.B. |
| D38 | Diode | Prevents backfeed to lower control contact of the Momentary Switch SW8 when the line contactor is energised. | On Lower P.C.B. |
| D39 | Diode | Feeds a signal to the line contactor when the joystick trigger is depressed. It prevents backfeed to the upper controls when the line contactor is energised by lower controls. | On Lower P.C.B. |

| REFERENCE | NAME | FUNCTION | LOCATION |
|---|-------|---|--------------------|
| D40 | Diode | It prevents backfeed to the outrigger control switches when the alarm is activated from upper controls. | On Lower P.C.B. |
| D41 | Diode | Suppression diode for relay K8. Prevents backfeed reaching SOL13. | On Lower P.C.B. |
| D42 | Diode | Feed to alarm. Prevents backfeed to coil of K9. | On Lower P.C.B. |
| D43 | | Suppression diode for relay K9. Prevents backfeed from reaching SOL13. | On Lower P.C.B. |
| D44 | Diode | Feeds a signal to tilt alarm relay K9 when Momentary Switch SW8 on lower controls is closed. Keyswitch SW2 on upper controls is to the 'ON' position and all four outrigger limit switches are activated. It prevents backfeed to the coil of K8 through the SW2. | On Lower P.C.B. |
| D45 | Diode | Feeds a signal to tilt alarm relay K9 when Momentary Switch SW8 (Lower Controls) is closed. Keyswitch SW2 on upper controls is to the 'ON' position and all four outrigger limit switches are activated. It prevents backfeed to coil K8 through SW2. | On Lower P.C.B. |
| D46, D48, D50, D52, D54, D56 D58, D60. | Diode | Feeds a signal to the line contactor each time an outrigger toggle switch is operated. They also prevent the outrigger solenoids from being energised by backfeed from the line contactor signal line when it is energised by other functions | On Lower P.C.B. |
| D47, D49, D51, D53, D55, D57, D59, D61. | Diode | Feeds +24V supply to the outrigger solenoids (up & down) when the outrigger toggle switches are activated. | On Lower P.C.B. |
| D62 - D78 | Diode | Suppression diodes for the coils of the function control solenoids SOL 1 - 17 | On Lower P.C.B. |
| D79 | Diode | Suppression diode for the coil of Upper Control Box direction relay K4. | Upper Control Box. |
| D80 | Diode | Suppression diode for the coil of Upper Control Box direction relay K5. | Upper Control Box. |
| D81 | Diode | Feeds power to Relay K5 from Relay K6. It also prevents backfeed to K6 when K5 is energised. | Upper Control Box. |
| D82 | Diode | Feeds power to handle supply of Joystick from Relay K6. It also prevents backfeed to K6 when the handle supply on the Joystick is energised. | Upper Control Box. |
| D83 | Diode | Suppression diode for the coil of Upper Control Box direction relay K6. | Upper Control Box. |
| D84 | Diode | Suppression diode for the coil of Upper Control Box direction relay K3. | Upper Control Box. |
| D85 | Diode | Prevents backfeed between the contacts on Relay K3. | Upper Control Box. |
| D86 | Diode | Suppression diode for the coil of Upper Control Box direction relay K1. | Upper Control Box. |
| D87 | Diode | Suppression diode for the coil of Upper Control Box direction relay K2. | Upper Control Box. |

6.1. Electrical Schematics - Hydraulic Outriggers

Table 6-2: Electrical Schematic Legend (Contd....)

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|--------------------|--|-------------------------------------|
| D88, 90 | Diode | Prevents backfeed from reaching Boom2 function on SW1 when K6 is energised. | Upper Control Box. |
| D89, 91 | Diode | Prevents backfeed from reaching Boom1 function on SW1 when K4 is energised. | Upper Control Box. |
| D92, 93 | Diode | Prevents backfeed from reaching Jib functions on SW1 when K4 is energised. | Upper Control Box. |
| D94 | Diode | Prevents backfeed from reaching the Battery Indicator LED1 when K6 is energised. | Upper Control Box. |
| D95 | Diode | Prevents backfeed from reaching Boom 2 functions on SW1 when K6 is energised. | Upper Control Box. |
| D96 | Diode | Suppression diode for coil of Line Contactor LC1. | Upper Control Box. |
| D97, 98 | Diode | Prevents feedback to alarm ALM1 when relays K8 and K9 are energised. | Upper Control Box. |
| FU1 | Fuse 7Amps. | Overload protection for control circuit. | On MCU |
| FU2 | Fuse 160Amps. | Overload protection for Electric Motor. | On MCU |
| K 1 - 6 | Main Power Relays. | These six Relays are all directly affected by the Four Position Selector Switch SW1, the ON/OFF/ Em.Override Keyswitch SW 2 and the Joystick. When a function is selected or the Keyswitch is activated the relevant relays to those positions will be energised. These Relays will then activate the required functions. | In the Upper Control Box. |
| K7 | Main Power Relay | This relay is energised when the Emergency Stop is activated. It will cut the 24V supply to the controller and Lower Controls when the emergency stop is pressed. | On Lower Printed Circuit Board. |
| K8 | Alarm Relay. | This relay is energised when the four Outrigger Limit Switches are activated. The Normally Closed contacts which feed power to the alarm are opened and the alarm switches off. If an Outrigger Limit Switch opens during operation of the booms the relay loses power and the alarm sounds. | On Lower Printed Circuit Board. |
| K9 | 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 Selector Switch is turned to Upper Controls. When the machine is in a tilt position power will be cut to all but the Emergency Override functions on Upper Controls. | On Lower Printed Circuit Board. |
| LC1 | Line Contactor. | In the unenergised 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. |

| REFERENCE | NAME | FUNCTION | LOCATION |
|-------------------|----------------------------|---|--|
| 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 | Outrigger LED (Green). | This LED is illuminated when the outriggers are deployed and taking load. If an Outrigger becomes "light" and comes off the ground this LED will go off and the alarm will sound. | Upper Control Box. |
| LED 3 - 6 | Outrigger LED (Green). | These four LED's are individually linked to the 4 Outrigger Limit Switches and indicate on the Lower Control Box when each of the switches has activated. | Lower Control Box. |
| LK1-7 | Insulated Links | These links bridge points on the Printed Circuit Boards to give characteristics required for the particular machine. | Upper & Lower Control Box P.C.B. |
| LS1,LS2,LS3 & LS4 | Outrigger Limit Switch | Activated when the outriggers are deployed and are taking load. A +24V supply from the batteries is routed through these four limit switches, which are wired in series, to the Keyswitch and provides power to the upper and lower control boxes for operation of the boom functions. | On Outrigger Quadrant Plate. |
| LS5 | Boom Rest Limitswitch. | Activated when Boom 2 is in the stowed position. When Boom 2 leaves the rest the Normally Open contact of the switch opens and cuts power to the the Outrigger function switches. This prevents the Outriggers from being operated or adjusted whilst the booms are elevated. The power from the Outrigger Switches is then diverted through the Normally Closed contact of the Boom Rest Limit Switch. | On Side of First Post. |
| LS6 | Slew Cut-Out Limit Switch. | This prevents slewing until the second post is clear of the tow bar. The normally closed contact is open and the slew signal to pin 4 (W) on the controller is broken until the second post is clear of the towbar. | On First Post beneath Boom1 |
| MCU | Motor Control Unit. | This controls the speed of the electric motor. Using the Upper Controls the motor speed varies the position of the 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. |
| MOT | 24V 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 above MCU. |

6.1. Electrical Schematics - Hydraulic Outriggers

Table 6-2: Electrical Schematic Legend (Contd....)

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|---|---|-----------------------------|
| SOL1 | Solenoid <i>JIB Up</i> | Solenoid used for activating hydraulic valve to raise the JIB Boom. | On Main Manifold Block |
| SOL2 | Solenoid <i>JIB Down</i> | Solenoid used for activating hydraulic valve to lower the JIB Boom. | On Main Manifold Block |
| SOL3 | Solenoid <i>SLEW Left</i> | Solenoid used for activating hydraulic valve to slew in the left direction. | On Main Manifold Block |
| SOL4 | Solenoid <i>BOOM 1 Up</i> | Solenoid used for activating hydraulic valve to raise Boom 1. | On Main Manifold Block |
| SOL5 | Solenoid <i>BOOM 2 Up</i> | Solenoid used for activating hydraulic valve to raise Boom 2. | On Main Manifold Block |
| SOL6 | Solenoid <i>SLEW Right</i> | Solenoid used for activating hydraulic valve to slew in the right direction. | On Main Manifold Block |
| SOL7 | Solenoid <i>BOOM 1 Down</i> | Solenoid used for activating hydraulic valve to lower Boom 1. | On Main Manifold Block |
| SOL8 | Solenoid <i>BOOM 2 Down</i> | Solenoid used for activating hydraulic valve to lower Boom 2. | On Main Manifold Block |
| SOL9 | Solenoid <i>O.R. Right Rear Up</i> | Solenoid used for activating hydraulic valve to raise the Right Rear Outrigger. | On Outrigger Manifold Block |
| SOL10 | Solenoid <i>O.R. Right Rear Down</i> | Solenoid used for activating hydraulic valve to lower the Right Rear Outrigger. | On Outrigger Manifold Block |
| SOL11 | Solenoid <i>O.R. Left Rear Up</i> | Solenoid used for activating hydraulic valve to raise the Left Rear Outrigger. | On Outrigger Manifold Block |
| SOL12 | Solenoid <i>O.R. Left Rear Down</i> | Solenoid used for activating hydraulic valve to lower the Left Rear Outrigger. | On Outrigger Manifold Block |
| SOL13 | Solenoid <i>Outrigger Isolate</i> | Solenoid used for activating hydraulic valve to isolate all Outriggers from the rest of the hydraulic circuit. | On Outrigger Manifold Block |
| SOL14 | Solenoid <i>O.R. Right Front Up</i> | Solenoid used for activating hydraulic valve to raise the Right Front Outrigger. | On Outrigger Manifold Block |
| SOL15 | Solenoid <i>O.R. Right Front Down</i> | Solenoid used for activating hydraulic valve to lower the Right Front Outrigger. | On Outrigger Manifold Block |
| SOL16 | Solenoid <i>O.R. Left Front Up</i> | Solenoid used for activating hydraulic valve to raise the Left Front Outrigger. | On Outrigger Manifold Block |
| SOL17 | Solenoid <i>O.R. Left Front Down</i> | Solenoid used for activating hydraulic valve to lower the Left Front Outrigger. | On Outrigger Manifold Block |
| SW1 | Function switch <i>4 Position</i> | Sends power to the selected solenoid valve . (Boom 1, Boom 2, Jib, Slew) Only one function can be selected at any one time. | Upper Control Box. |
| SW2 | Keyswitch, <i>ON/OFF/ Em.Override.</i> | Allows +24V supply to feed to Upper Controls when turned to the ON position. This will then allow signals from SW1 and the Joystick Trigger to pass down to the MCU. 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 an Outrigger Limit Switch deactivating or Tilt Alarm operating. | Upper Control Box. |
| SW3 | Emergency Stop Button. | Control circuit shut off. In series with SW13. | Upper Control Box. |
| SW4 | Toggle switch <i>Outrigger R.R.</i> | Sends power to the Outrigger cylinder solenoid which diverts oil to full bore or | Lower Control Box. |

| REFERENCE | NAME | FUNCTION | LOCATION |
|--------------|--|--|--------------------|
| SW4 contd... | | annular side of Right Rear Outrigger Cylinder. | |
| SW5 | Toggle switch <i>Outrigger L.R.</i> | Sends power to the Outrigger cylinder solenoid which diverts oil to full bore or annular side of Left Rear Outrigger Cylinder. | Lower Control Box. |
| SW6 | Toggle switch <i>Outrigger R.F.</i> | Sends power to the Outrigger cylinder solenoid which diverts oil to full bore or annular side of Right Front Outrigger Cylinder. | Lower Control Box. |
| SW7 | Toggle switch <i>Outrigger L.F.</i> | Sends power to the Outrigger cylinder solenoid which diverts oil to full bore or annular side of Left Front Outrigger Cylinder. | Lower Control Box. |
| SW8 | 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. |
| SW 9 | 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. |
| SW10 | 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. |
| SW11 | Toggle switch <i>Jib</i> | Sends power to the Jib lift cylinder solenoid which diverts oil to full bore or annular side of Jib lift cylinder. | Lower Control Box. |
| SW12 | 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. |
| SW13 | Emergency Stop Button. | Control circuit shut off. In series with SW3. | Lower Control Box. |
| TS1 | Tilt Sensor. | This is a tilt activated switch fitted on the TL38 which will deactivate all but emergency functions if the machine chassis tilts more than 2 degrees. | Chassis. |
| TSW1 | Transistor Switch | This switching mechanism, which is controlled by a combination of a transistor and resistors, activates the alarm when the Tilt Sensor is activated. | On Lower P.C.B. |
| TSW2 | Transistor Switch | This switching mechanism, which is controlled by a combination of a transistor and resistors, deactivates the Lower Control functions when the Tilt Sensor is activated. | On Lower P.C.B. |

6.1. Electrical Schematics - Hydraulic Outriggers

Table 6-2: Electrical Schematic Legend (Contd....)

MOTOR CONTROL UNIT (PIN LEGEND)

| PIN NO. | DESCRIPTION |
|---------|---|
| 1 | Battery Discharge Indicator (B.D.I.) output |
| 2 | sw8 - Not used, Connected to 24V supply from Pin 6 |
| 3 | Not used - 10V supply |
| 4 | sw4 - Switch 4 (Speed 4: Boom 1 & 2 speed from lower controls - Factory set at 45%) |
| 5 | Not used - Not connected. |
| 6 | 24V supply (Must be greater than 14V) |
| 7 | sw5 - Switch 5 (Speed 5: Slew & Jib speed from Lower Controls- Factory set at 13%) |
| 8 | sw1 - Switch 1 (speed 1: Max. variable speed for Boom 1 from upper controls - Factory set at 75%) |
| 9 | Not used - Not connected. |
| 10 | Not used - Not connected. |
| 11 | Not used - Not connected. |
| 12 | sw3 - Switch 3 (Speed 3: Max. variable speed for Boom 2 from upper controls - Factory set at 50%) |
| 13 | sw2 - Switch 2 (Speed 2: Max. variable speed for Slew & Jib from upper controls - Factory set at 40%) |
| 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: Outrigger speed from lower controls - Factory set at 30%) |
| 17 | Not used - Not connected. |

NOTES:



Schematics - Hydraulic Outriggers

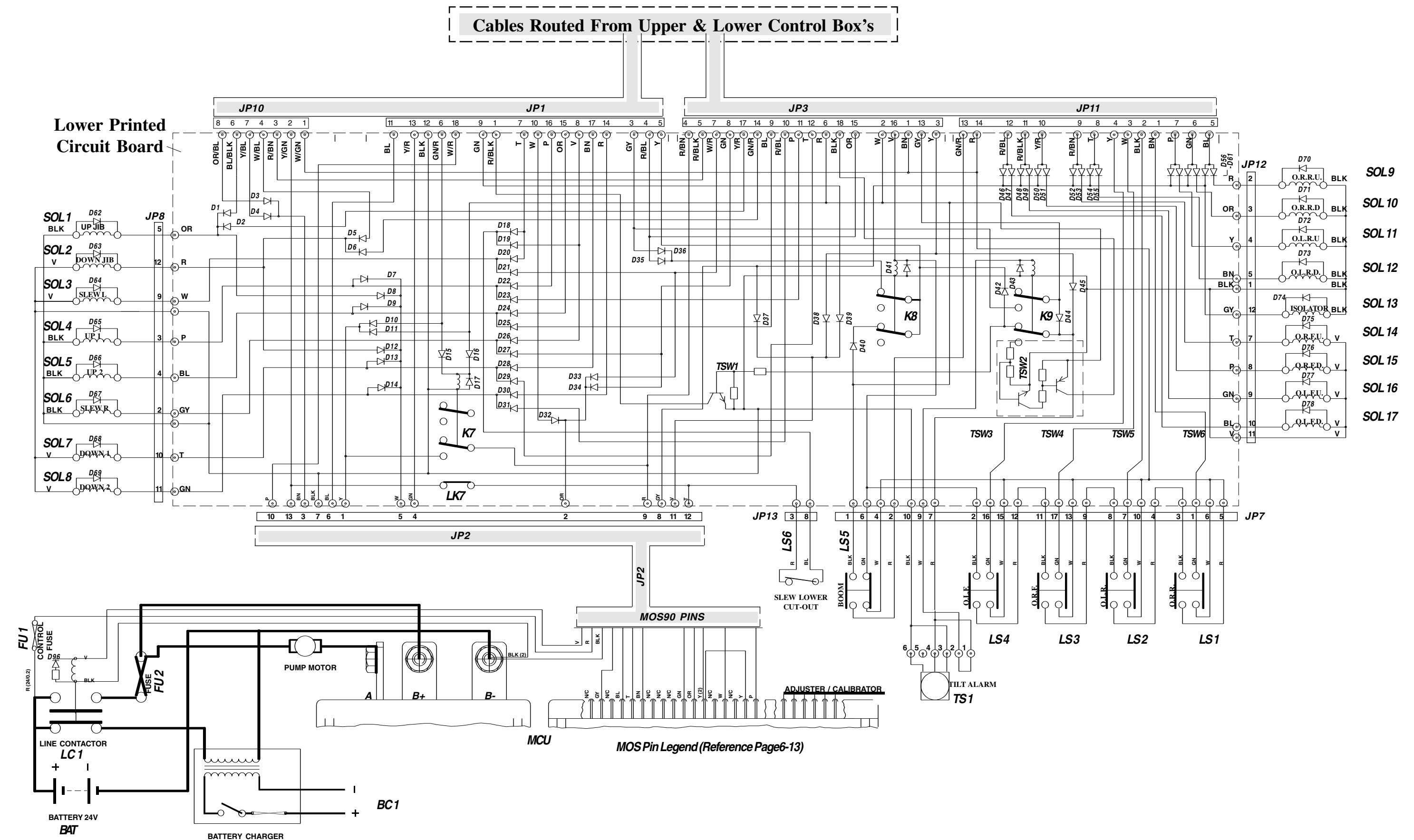


Figure 6-1b : Electrical Schematic (Hydraulic Outriggers, Controller & Printed Circuit Board Assembly)

6.2. Hydraulic Schematics

Table 6-3: Hydraulic Schematic Legend

| REFERENCE | NAME | FUNCTION | LOCATION |
|------------|---|---|--|
| CYL1 | Lower Boom Lift Cylinder. | Provides the force to lift lower boom. | Forward of first post. |
| CYL2 | Upper Boom Lift Cylinder. | Provide the force to lift upper boom. | Behind second post. |
| CYL3 (Jib) | Jib Lift Cylinder. | Provides the force to lift the Jib and Platform Assembly. | Between Boom 2 and the Jib. |
| CYL4-7* | Outrigger Cylinders | Provides the force to extend and retract the Outriggers. | Outrigger/ Chassis |
| FL1 | Return Line Filter. (10 Micron). | Continuously filters hydraulic return oil. Contains integral bypass which operates when return line oil pressure exceeds 1.7 Bar. | Under left module cover of the TL38 chassis. |
| 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 the rear of the First Post, under a glass reinforced plastic cover. |
| OMB* | Outrigger Manifold Block. | Contains the directional control valves that distribute oil to the required Outrigger Cylinders. | Under left module cover of the TL38 chassis |
| MOT1 | Slew Motor. | Coupled to a gearbox it drives the slew bearing via a pinion gear. | Forward of first post on base plate |
| MP | Motor/Pump Set. | Gear pump close coupled to D.C electric motor. Provides pressurised oil flow for all hydraulic functions, this will provide approx. 13 L/min at 100% motor speed. | Under left module cover of the TL38 chassis. |
| RV1 | Main Relief Valve. | Sets max system pressure to 155 Bar. | On main manifold block. |
| V1 | Single Overcentre Valve. | Prevents back flow and provides hydraulic lock on cylinders. This Overcentre Valve has a 210 bar Setting. | On base of the upper and lower cylinders. |
| V2 | Emergency Lowering Valve. | Allows upper and lower boom to be lowered by manual means. | On base of upper and lower cylinders. |
| V3 | Directional Control Valve. Slew Motor. | Allows oil to flow to the Slew Motor, and can be energised LEFT or RIGHT. | On the Main Manifold Block. |
| V4 | Directional Control Valve. Jib Cylinder. | Allows oil to flow to the Jib Cylinder, and can be energised UP or DOWN. | On the Main Manifold Block. |
| V5 | Directional Control Valve. CYL 2. | Allows oil to flow to BOOM 2 Cylinder, and can be energised UP or DOWN. | On the Main Manifold Block. |
| V6 | Directional Control Valve. CYL 1. | Allows oil to flow to BOOM 1 Cylinder, and can be energised UP or DOWN. | On the Main Manifold Block. |
| V7* | Isolator Valve. | Isolates the Outrigger Manifold Block when not in use. Prevents unwanted pressure from affecting the Outrigger Valves. | On Outrigger Manifold Block. |
| V8* | Directional Control Valve. R.F.Outrigger. | Allows oil to flow to R.F. Outrigger Cylinder, and can be energised to EXTEND or RETRACT. | On Outrigger Manifold Block. |
| V9* | Directional Control Valve. L.F.Outrigger. | Allows oil to flow to L.F. Outrigger Cylinder, and can be energised to EXTEND or RETRACT. | On Outrigger Manifold Block. |
| V10* | Directional Control Valve. R.R.Outrigger. | Allows oil to flow to R.R. Outrigger Cylinder, and can be energised to EXTEND or RETRACT. | On Outrigger Manifold Block. |
| V11* | Directional Control Valve. L.R.Outrigger. | Allows oil to flow to L.R. Outrigger Cylinder, and can be energised to EXTEND or RETRACT. | On Outrigger Manifold Block. |

| REFERENCE | NAME | FUNCTION | LOCATION |
|-----------|------------------------------------|--|-------------------------------------|
| V12* | Single Overcentre Check Valve. | Prevents back flow and provides hydraulic lock on Outrigger Cylinders. | On base of the Outrigger Cylinders. |
| V13* | Single Pilot Operated Check Valve. | Provides an hydraulic lock on the annular side of the Outrigger Cylinders. | On base of the Outrigger Cylinders. |
| V14 | Single Overcentre Check Valve. | Prevents back flow and provides hydraulic lock on the Jib Cylinder. | On base of the Jib Cylinder. |
| V15 | Single Pilot Operated Check Valve. | Provides an hydraulic lock on the annular side of the Jib Cylinder. | On base of the Jib Cylinder. |

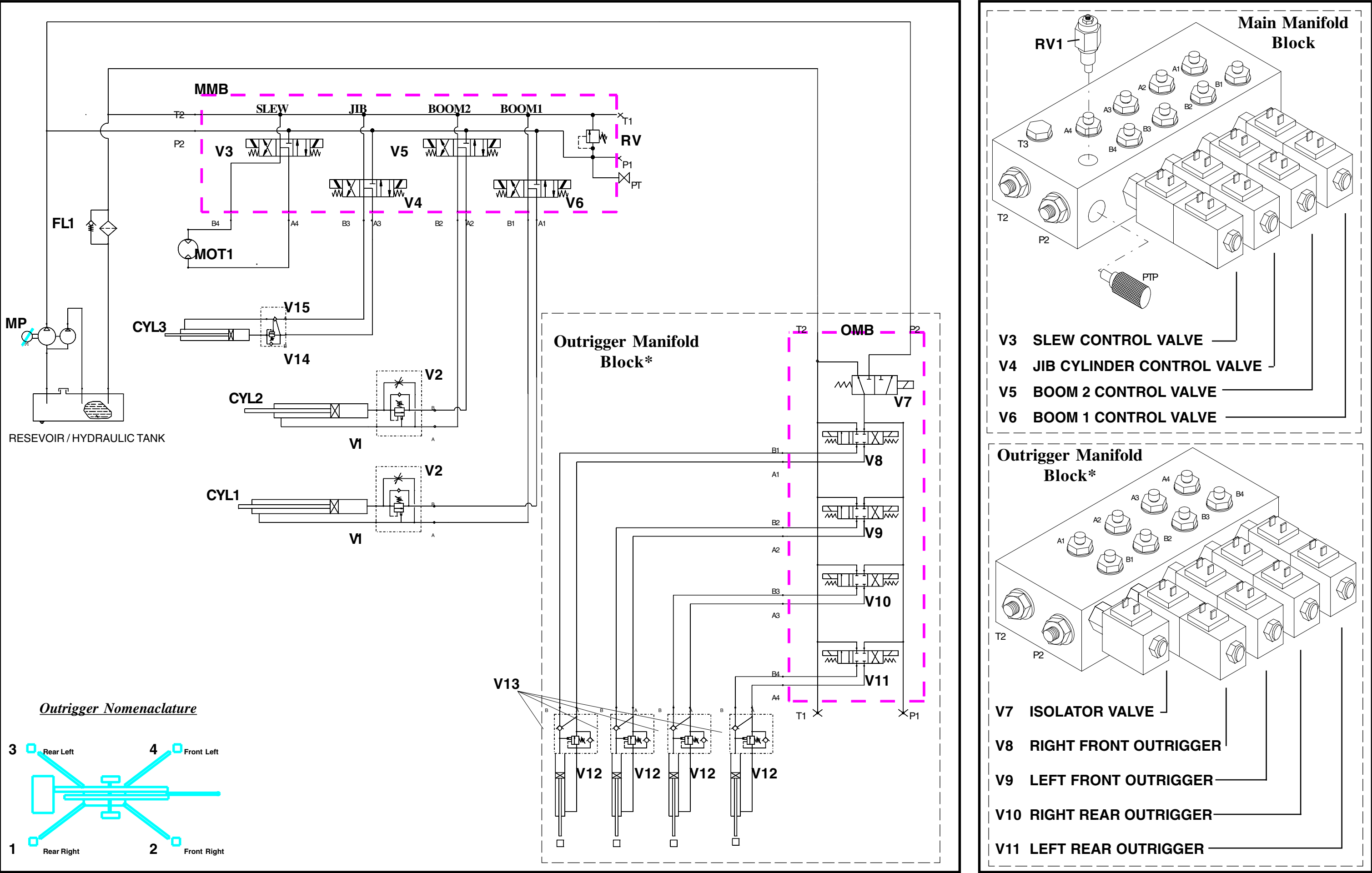
*** Components marked with an Asterisk are those which are only required where the Hydraulic Outrigger version has been specified. Where the Manual Outrigger version is used only the basic Hydraulic Assembly and Schematics need apply. It will, however be possible to upgrade this to a Hydraulic version using the basic Manual Assemblies components as a basis. See Page 7-56 for more information.**

Notes:

- All of the Overcentre Valves represented within this schematic have a 5:1 Pilot Ratio.
- All of the P/O Check Valves represented have a 3:1 Pilot Ratio.
- The maximum flow rate of the Pump/Motor Unit is limited to 12 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... | 8 L/min |
| - Jib... | 11 L/min |
| - Boom2... | 12 L/min |
| - Boom1... | 9.5 L/min |
| - Outriggers... | 5 L/min |

NOTES:



NOTES:

7.0 Introduction

This section lists and illustrates the replaceable assemblies and parts of the TL38 Work Platform as manufactured by UpRight Ireland Ltd.

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

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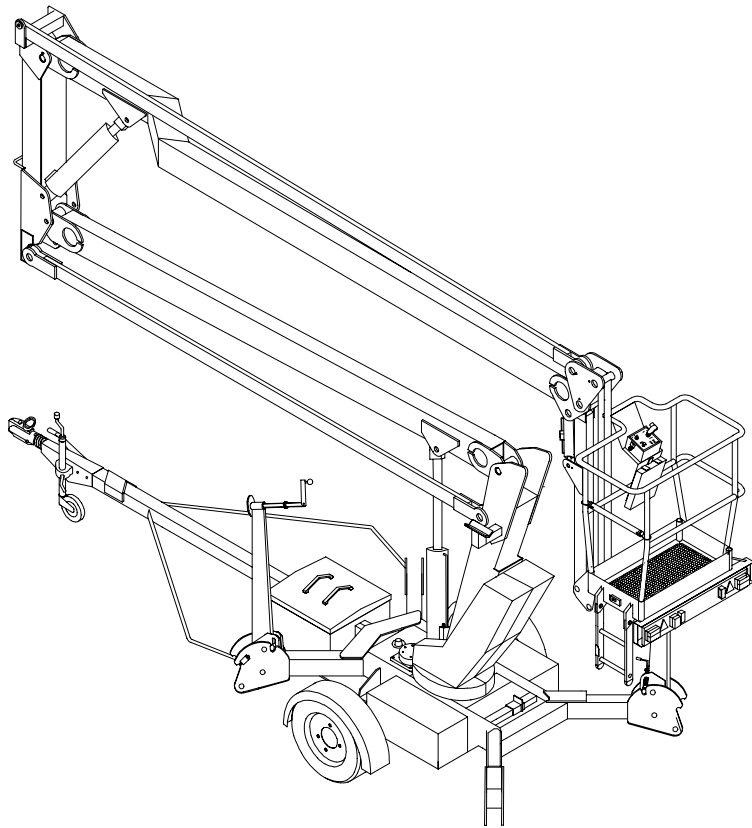
Illustrated Parts Breakdown

FINAL ASSEMBLY TL38 - Manual Outrigger Version 058575-000 (CE Version) 058575-001 (ANSI Version)

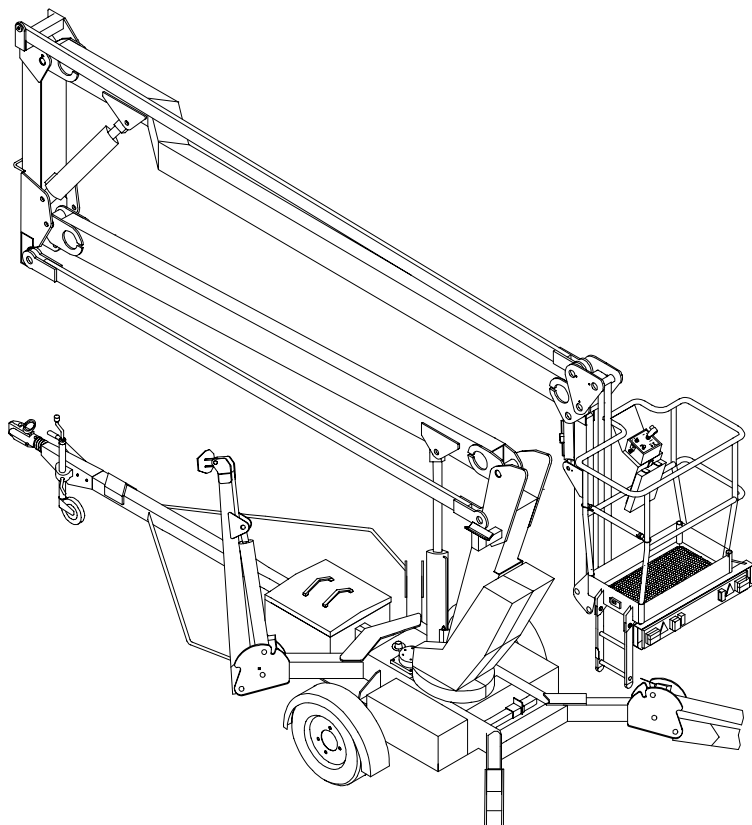
| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|--------------|----------------------------------|------|
| - | 500001-000 | Chassis Assembly- Manual | - |
| - | 500002-000 | Booms and Posts Assembly | - |
| - | 500003-000 | Cage and Cradle Assembly | - |
| - | 500050-000 | Axle and Brake Hub Assembly | - |
| - | 500050-001 | Hub Assembly | - |
| - | 500050-003/4 | Brake Assembly | - |
| - | 057190-000/1 | Tailboard Assembly | - |
| - | 058241-000 | Towhitch Assembly | - |
| - | 058266-000 | Slew Gear Box Assembly | - |
| - | 500055-000 | Main Manifold Block Assembly | - |
| - | 057104-000 | Lower Lift Cylinder Assembly | - |
| - | 500056-000 | Upper Lift Cylinder Assembly | - |
| - | 500059-000 | Jib Lift Cylinder Assembly | - |
| - | 500084-000 | Pump Motor Control Unit Assembly | - |
| - | 500086-000 | Lower Control Box Assembly | - |
| - | 500087-000 | Upper Control Box Assembly | - |
| - | 500085-000 | Circuit Board Box & Harnesses | - |
| - | - | Cables & Electrical Components | - |
| - | 500103-000 | Hose Assembly | - |
| - | - | Decal Kit- Manual | - |

FINAL ASSEMBLY TL38 - Hydraulic Outrigger Version 058576-000 (CE Version) 058576-001 (ANSI Version)

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|--------------|-----------------------------------|------|
| - | 500001-001 | Chassis Assembly- Manual | - |
| - | 500002-000 | Booms and Posts Assembly | - |
| - | 500003-000 | Cage and Cradle Assembly | - |
| - | 500050-000 | Axle and Brake Hub Assembly | - |
| - | 500050-001 | Hub Assembly | - |
| - | 500050-003/4 | Brake Assembly | - |
| - | 057190-000/1 | Tailboard Assembly | - |
| - | 058241-000 | Towhitch Assembly | - |
| - | 058266-000 | Slew Gear Box Assembly | - |
| - | 500055-000 | Main Manifold Block Assembly | - |
| - | 500058-000 | Outrigger Manifold Block Assembly | - |
| - | 057104-000 | Lower Lift Cylinder Assembly | - |
| - | 500056-000 | Upper Lift Cylinder Assembly | - |
| - | 500059-000 | Jib Lift Cylinder Assembly | - |
| - | 500058-000 | Outrigger Cylinder Assembly | - |
| - | 500084-000 | Pump Motor Control Unit Assembly | - |
| - | 500086-001 | Lower Control Box Assembly | - |
| - | 500087-000 | Upper Control Box Assembly | - |
| - | 500085-015 | Circuit Board Box & Harnesses | - |
| - | - | Cables & Electrical Components | - |
| - | 500113-000 | Hose Assembly | - |
| - | - | Decal Kit- Hydraulic | - |



Manual Outrigger Version
058575-000 (CE Version)
058575-001 (ANSI Version)

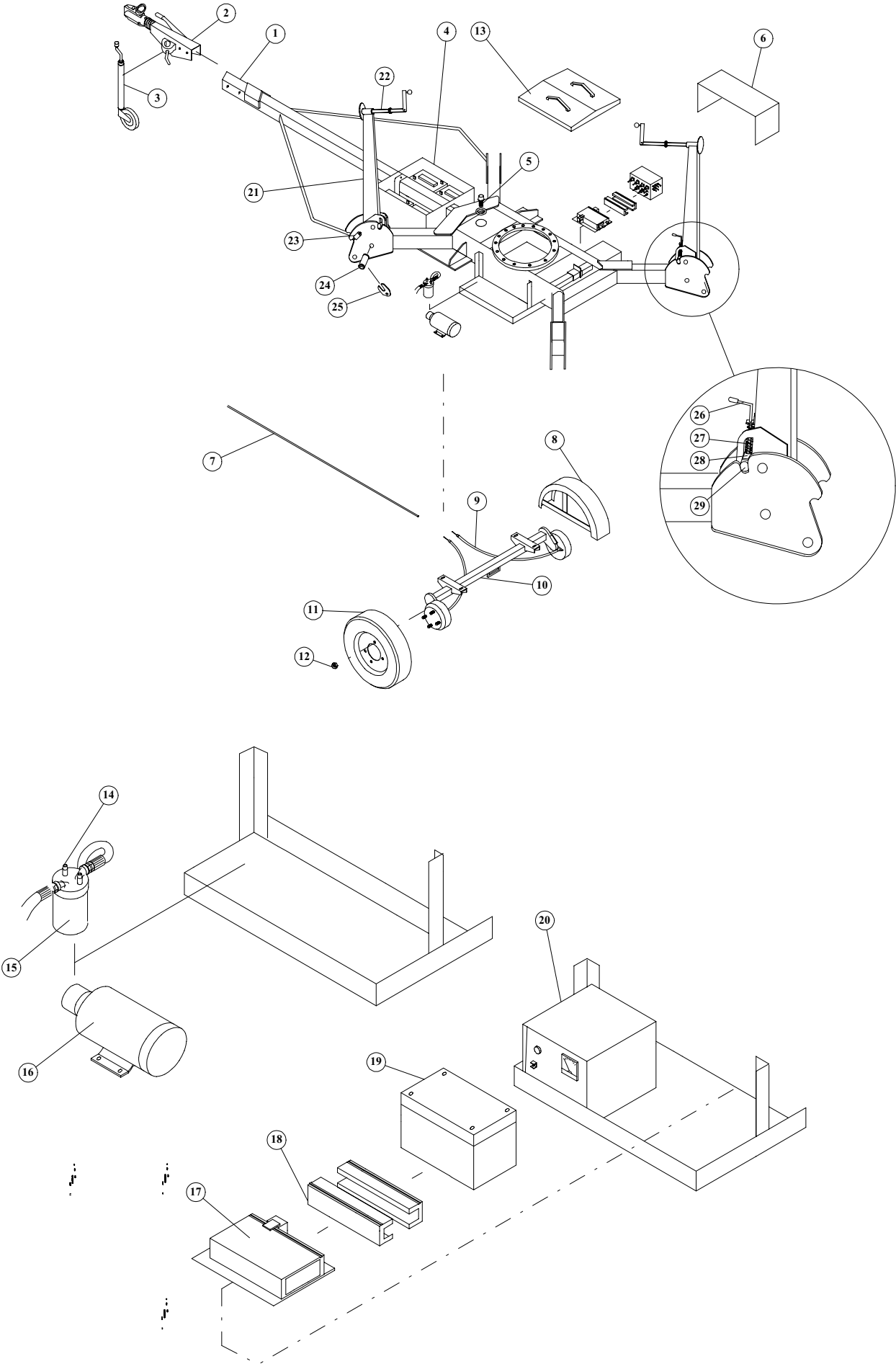


Hydraulic Outrigger Version
058576-000 (CE Version)
058576-001 (ANSI Version)

CHASSIS ASSEMBLY TL38 - Manual Outrigger Version Only 500001-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 500029-000 | TL38 CHASSIS WELDMENT | 1 |
| 2 | 058241-000 | TOW HITCH ASSEMBLY | 1 |
| 3 | 058242-000 | JOCKEY WHEEL ASSEMBLY | 1 |
| 4 | 500030-000 | TL38 BATTERY BOX WELDMENT | 1 |
| * | 500132-000 | BATTERY CLAMP | 1 |
| * | 500052-000 | BATTERY BOX GRAB HANDLE | 2 |
| * | 500081-000 | BATTERY BOX OVERCENTRE CATCH | 2 |
| 5 | 057109-000 | FILLER / BREATHER ASSEMBLY | 1 |
| | 057379-000 | GASKET FOR FILLER / BREATHER | 1 |
| 6 | 057025-003 | COVER RIGHT SIDE | 1 |
| * | 057025-002 | COVER LEFT SIDE | 1 |
| * | 057727-000 | COVER KNOB SCREW | 4 |
| 7 | 058116-000 | BRAKE ROD | 1 |
| 8 | 057099-000 | MUDGUARD | 2 |
| 9 | 057077-000 | BRAKE CABLE ASSEMBLY | 2 |
| 10 | 500050-000 | TL38 AXLE & BRAKE HUB ASSEMBLY | 1 |
| 11 | 500051-000 | TL38 WHEEL ASSEMBLY | 2 |
| * | 500312-000 | TYRE ONLY | 2 |
| * | 500313-000 | WHEEL ONLY | 2 |
| 12 | 057474-000 | WHEEL NUT - M12 | 8 |
| 13 | 500031-000 | TL38 BATTERY BOX COVER | 1 |
| 14 | 057107-000 | FILTER ASSEMBLY & HOUSING | 1 |
| 15 | 057375-000 | FILTER | 1 |
| 16 | 015797-000 | MOTOR / PUMP SET ASSEMBLY | 1 |
| * | 015797-010 | HYDRAULIC PUMP | 1 |
| * | 015797-011 | ELECTRIC MOTOR | 1 |
| * | 010145-001 | BRUSH SET | 2 |

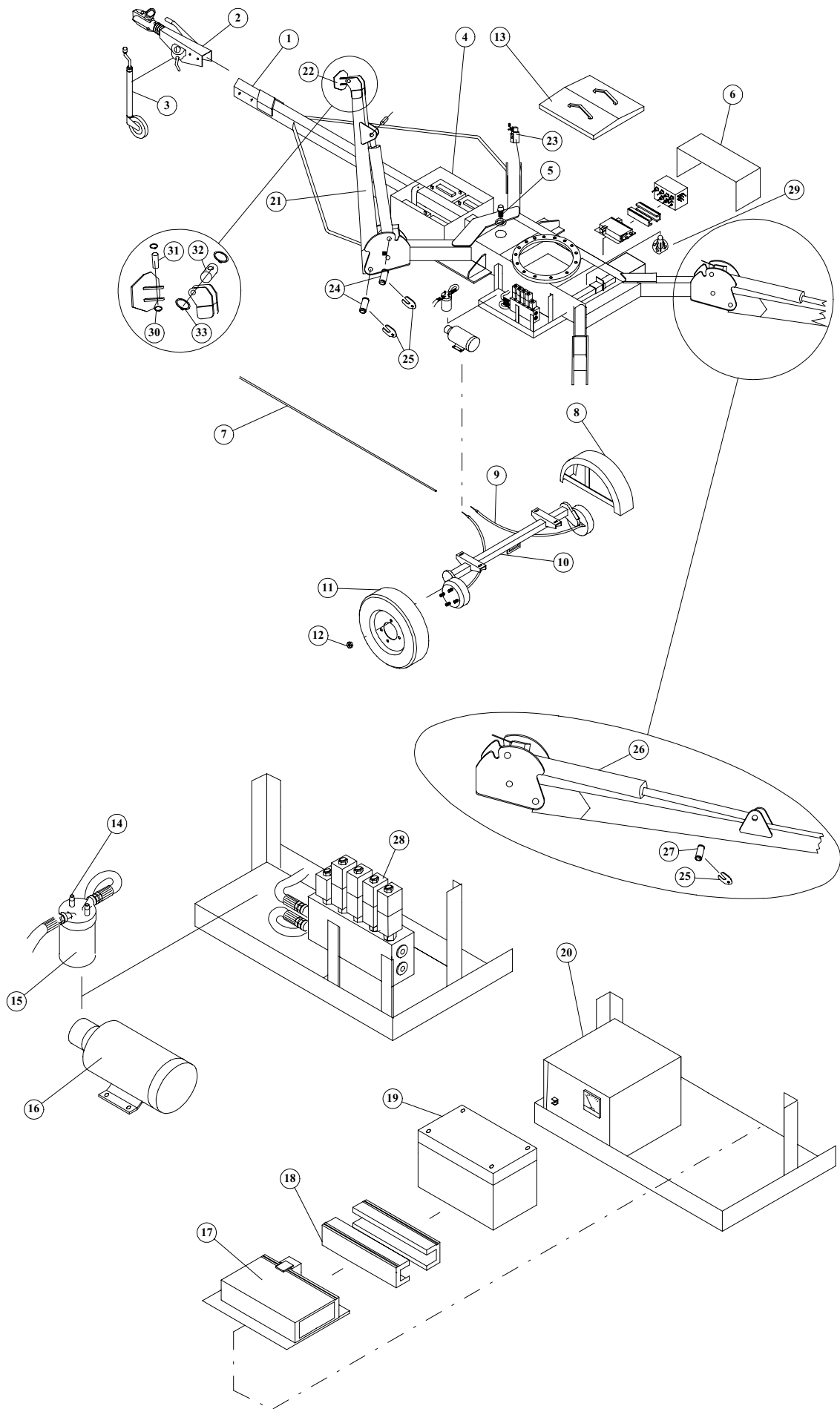
| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|---------------------------------|------|
| 17 | 500084-000 | PUMP MOTOR CONTROLLER ASSY. | 1 |
| 18 | 500091-000 | MOS90 MOUNTING BRACKET | 2 |
| 19 | 500092-000 | PRINTED CIRCUIT BOARD BOX ONLY | 1 |
| 20 | 063948-011 | CHARGER E.U. 220/110VAC 50/60Hz | 1 |
| * | 063944-011 | CHARGER U.S.A. 110VAC 60Hz | |
| * | 063983-002 | CHARGER JAPAN 100VAC 60Hz | |
| 21 | 500034-000 | OUTRIGGER WELDMENT | 4 |
| 22 | 500019-000 | OUTRIGGER JACK ASSEMBLY | 4 |
| * | 057062-001 | JACK HANDLE, NUT & BOLT ONLY | 4 |
| * | 057062-002 | JACK SCREW & PIVOT PLATE ONLY | 4 |
| 23 | 057182-000 | OUTRIGGER LIMIT SWITCH | 4 |
| 24 | 057199-000 | OUTRIGGER PIVOT PIN | 4 |
| 25 | 058056-000 | PIN LOCK PLATE | 4 |
| 26 | 057063-000 | LOCKING HANDLE | 4 |
| 27 | 057065-000 | SPRING | 4 |
| 28 | 057066-000 | GUIDE BLOCK | 4 |
| 29 | 057067-000 | OUTRIGGER LOCKING PIN | 4 |



CHASSIS ASSEMBLY TL38 - Hydraulic Outrigger Version Only 500001-001

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 500029-000 | TL38 CHASSIS WELDMENT | 1 |
| 2 | 058241-000 | TOW HITCH ASSEMBLY | 1 |
| 3 | 058242-000 | JOCKEY WHEEL ASSEMBLY | 1 |
| 4 | 500030-000 | TL38 BATTERY BOX WELDMENT | 1 |
| * | 500132-000 | BATTERY CLAMP | 1 |
| * | 500052-000 | BATTERY BOX GRAB HANDLE | 2 |
| * | 500081-000 | BATTERY BOX OVERCENTRE CATCH | 2 |
| 5 | 057109-000 | FILLER / BREATHER ASSEMBLY | 1 |
| | 057379-000 | GASKET FOR FILLER / BREATHER | 1 |
| 6 | 057025-003 | COVER RIGHT SIDE | 1 |
| * | 057025-002 | COVER LEFT SIDE | 1 |
| * | 057727-000 | COVER KNOB SCREW | 4 |
| 7 | 058116-000 | BRAKE ROD | 1 |
| 8 | 057099-000 | MUDGUARD | 2 |
| 9 | 057077-000 | BRAKE CABLE ASSEMBLY | 2 |
| 10 | 500050-000 | TL38 AXLE & BRAKE HUB ASSEMBLY | 1 |
| 11 | 500051-000 | TL38 WHEEL ASSEMBLY | 2 |
| * | 500312-000 | TYRE ONLY | 2 |
| * | 500313-000 | WHEEL ONLY | 2 |
| 12 | 057474-000 | WHEEL NUT - M12 | 8 |
| 13 | 500031-000 | TL38 BATTERY BOX COVER | 1 |
| 14 | 057107-000 | FILTER ASSEMBLY & HOUSING | 1 |
| 15 | 057375-000 | FILTER | 1 |
| 16 | 015797-000 | MOTOR / PUMP SET ASSEMBLY | 1 |
| * | 015797-010 | HYDRAULIC PUMP | 1 |
| * | 015797-011 | ELECTRIC MOTOR | 1 |
| * | 010145-001 | BRUSH SET | 2 |

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|----------------------------------|------|
| 17 | 500084-000 | PUMP MOTOR CONTROLLER ASSY. | 1 |
| 18 | 500091-000 | MOS90 MOUNTING BRACKET | 2 |
| 19 | 500092-000 | PRINTED CIRCUIT BOARD BOX ONLY | 1 |
| 20 | 063948-011 | CHARGER E.U. 220/110VAC 50/60Hz | 1 |
| * | 063944-011 | CHARGER U.S.A. 110VAC 60Hz | |
| * | 063983-002 | CHARGER JAPAN 100VAC 60Hz | |
| 21 | 500032-000 | OUTRIGGER WELDMENT | 4 |
| 22 | 500033-000 | OUTRIGGER FOOT PAD | 4 |
| 23 | 500361-000 | OUTRIGGER LIMIT SWITCH | 4 |
| 24 | 057199-000 | OUTRIGGER PIVOT PIN | 8 |
| 25 | 058056-000 | PIN LOCK PLATE | 8 |
| 26 | 500058-000 | OUTRIGGER CYLINDER | 4 |
| 27 | 058055-002 | OUTRIGGER CYLINDER PIN (ROD END) | 4 |
| 28 | 058180-010 | OUTRIGGER VALVE BLOCK ASSY. | 1 |
| 29 | 058912-000 | TILT SENSOR | 1 |
| 30 | 057577-000 | CIRCLIP 20mm | 2 |
| 31 | 500061-000 | FOOT PAD PIVOT PIN SMALL | 1 |
| 32 | 500060-000 | FOOT PAD PIVOT PIN LARGE | 1 |
| 33 | 057032-000 | CIRCLIP 35mm | 2 |



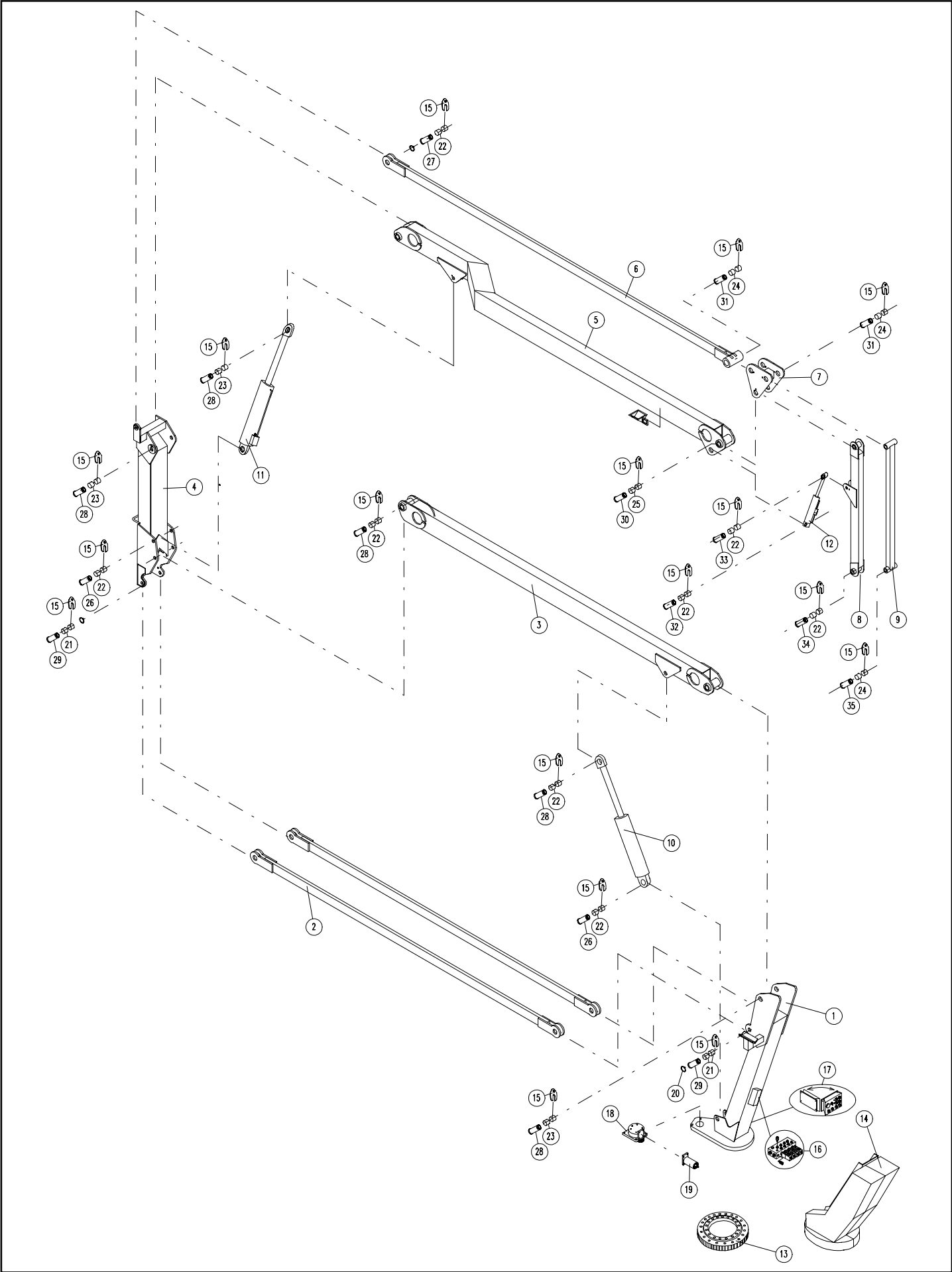
BOOMS & POSTS ASSEMBLY

Manual & Hydraulic Outrigger Versions

500002-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|------------------------------|------|
| 1 | 500028-000 | FIRST POST WELDMENT | 1 |
| 2 | 057039-000 | LOWER TENSION BAR WELDMENT | 2 |
| 3 | 057037-000 | LOWER BOOM WELDMENT | 1 |
| 4 | 500027-000 | SECOND POST WELDMENT | 1 |
| 5 | 500025-000 | UPPER BOOM WELDMENT | 1 |
| 6 | 500026-000 | UPPER TENSION BAR WELDMENT | 1 |
| 7 | 500024-000 | JIB LINK WELDMENT | 1 |
| 8 | 500022-000 | JIB WELDMENT | 1 |
| 9 | 500023-000 | JIB TIE BAR | 1 |
| 10 | 057104-000 | LOWER LIFT CYLINDER | 1 |
| 11 | 500056-000 | UPPER LIFT CYLINDER | 1 |
| 12 | 500059-000 | JIB LIFT CYLINDER | 1 |
| 13 | 057043-000 | SLEW RING BEARING | 1 |
| 14 | 500076-000 | FIRST POST COVER | 1 |
| 15 | 058056-000 | PIN LOCK PLATE | 19 |
| * | 056060-020 | BOLT M10x20mm | 19 |
| * | 056021-010 | WASHER 10mm | 19 |
| 16 | 500055-000 | MAIN MANIFOLD BLOCK ASSEMBLY | 1 |

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|-----------------------------|------|
| 17 | 500086-000 | LOWER CONTROL BOX ASSEMBLY | 1 |
| 18 | 058266-000 | SLEW GEAR BOX | 1 |
| 19 | 058268-000 | SLEW MOTOR | 1 |
| 20 | 057034-000 | CIRCLIP | 5 |
| 21 | 057047-000 | BUSHING STRAIGHT 25mm | 8 |
| 22 | 057054-000 | BUSHING FLANGED 30mm | 16 |
| 23 | 057046-000 | BUSHING FLANGED 35mm | 6 |
| 24 | 500078-000 | BUSHING FLANGED 25mm | 6 |
| 25 | 500079-000 | BUSHING FLANGED 35mm x 16mm | 2 |
| 26 | 057196-000 | PIN | 2 |
| 27 | 057197-000 | PIN | 1 |
| 28 | 057198-000 | PIN | 5 |
| 29 | 057176-000 | PIN | 4 |
| 30 | 500074-000 | PIN | 1 |
| 31 | 500073-000 | PIN | 2 |
| 32 | 500072-000 | PIN | 1 |
| 33 | 500071-000 | PIN | 1 |
| 34 | 500070-000 | PIN | 1 |
| 35 | 500069-000 | PIN | 1 |
| * | 058486-000 | TRANSIT LOCK PIN | 1 |



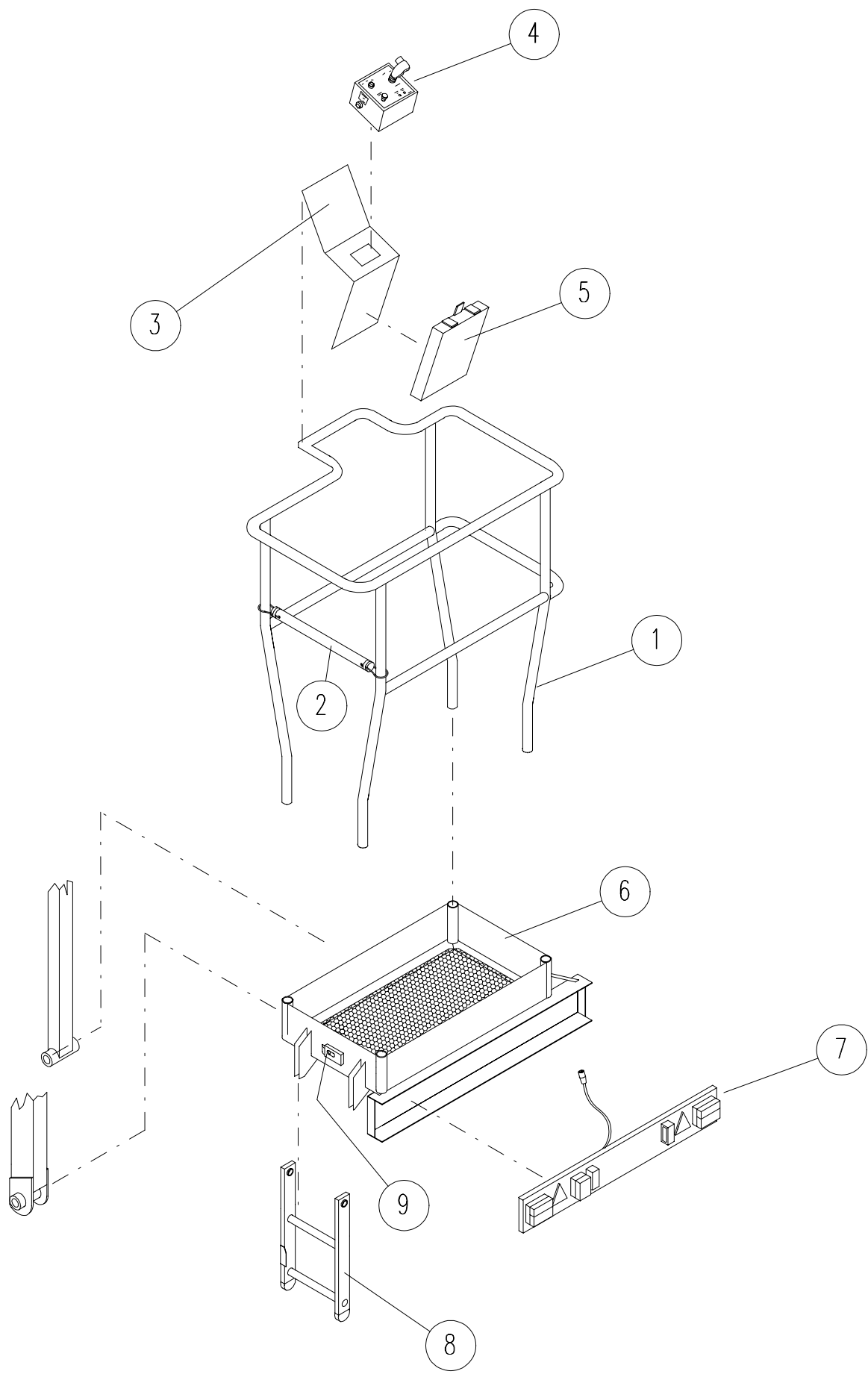
TL38 Work Platform

CAGE & CRADLE ASSEMBLY

Manual & Hydraulic Outrigger Versions

500003-000 (500087-000 is not included as part of this assembly)

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 500020-000 | CAGE RAIL ASSY. | 1 |
| 2 | 057525-000 | DROP BAR ASSY. | 1 |
| 3 | 057523-000 | CONTROL BOX MOUNTING PLATE | 1 |
| 4 | 500087-000 | TL38 UPPER CONTROL BOX | 1 |
| 5 | 010076-000 | MANUAL HOLDER | 1 |
| 6 | 500021-000 | TL38 CAGE FLOOR WELDMENT | 1 |
| 7 | 057190-000 | TAILBOARD ASSY. (CE Version) | 1 |
| * | 057190-001 | TAILBOARD ASSY. (ANSI Version) | |
| 8 | 057347-000 | LADDER | 1 |
| 9 | 058251-000 | LADDER LOCKING LATCH | 1 |

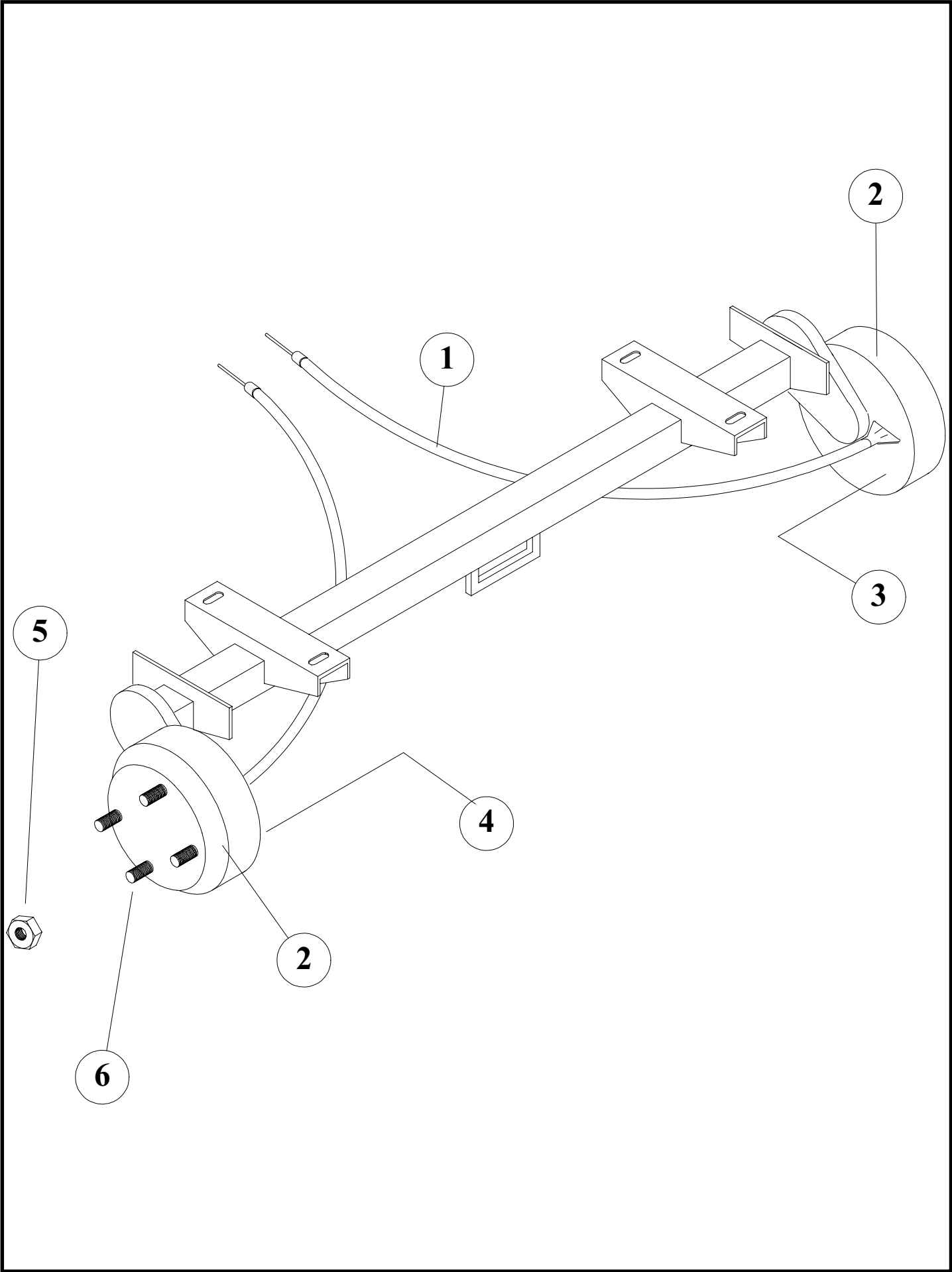


AXLE & BRAKE HUB ASSEMBLY

Manual & Hydraulic Outrigger Versions

500050-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|----------------------------|------|
| 1 | 057077-000 | BRAKE CABLE ASSEMBLY | 2 |
| 2 | 500050-001 | WHEEL HUB ASSEMBLY | 2 |
| 3 | 500050-004 | BRAKE ASSEMBLY, RIGHT HAND | 1 |
| 4 | 500050-003 | BRAKE ASSEMBLY, LEFT HAND | 1 |
| 5 | 057474-000 | WHEEL NUT M12 | 8 |
| 6 | 057471-000 | WHEEL STUD M12 | 8 |

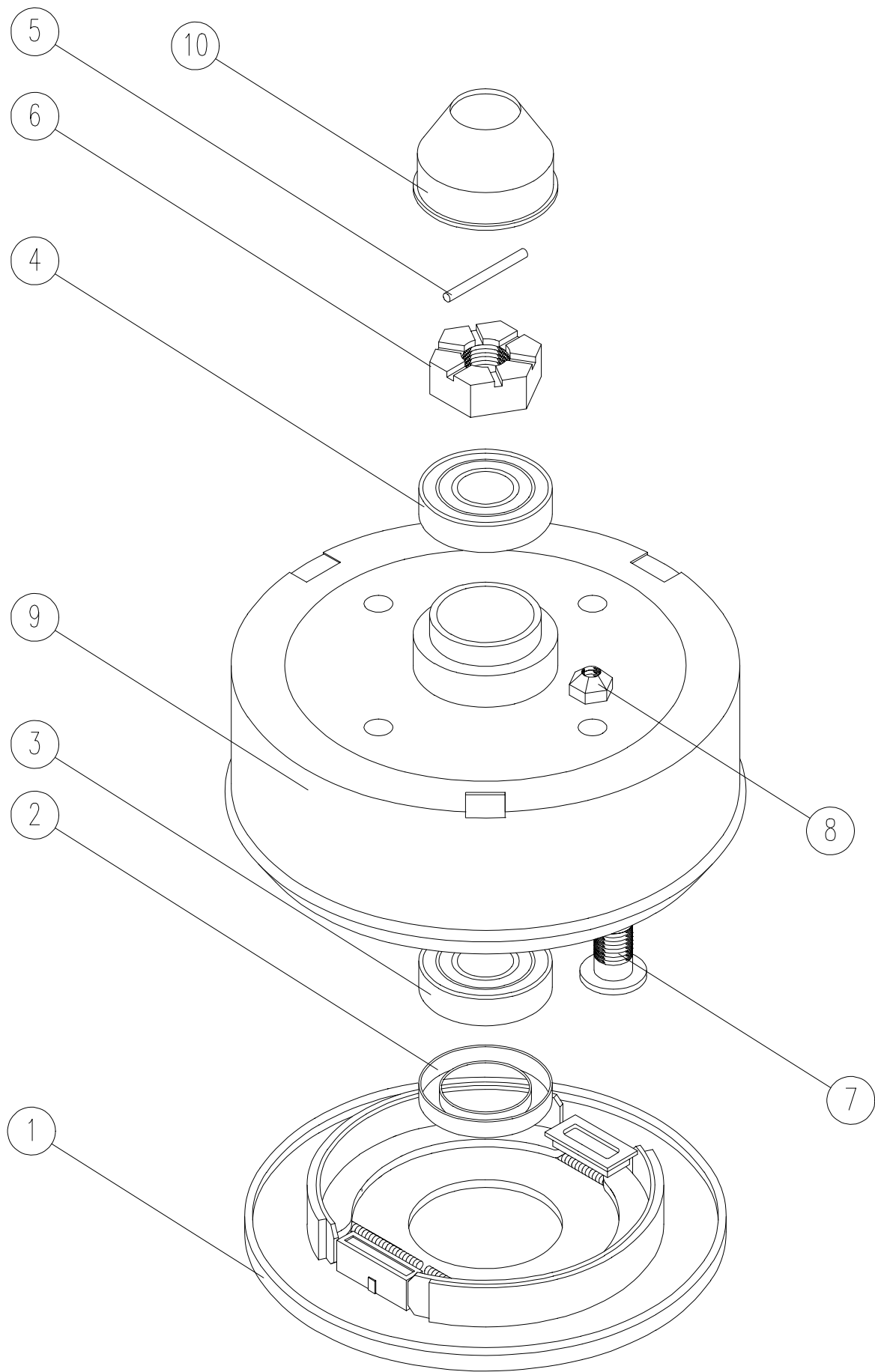


HUB ASSEMBLY

Manual & Hydraulic Outrigger Versions

500050-001

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|---------------------------|------|
| 1 | 500050-003 | LEFT HAND BRAKE ASSEMBLY | 1 |
| * | 500050-004 | RIGHT HAND BRAKE ASSEMBLY | |
| 2 | 058871-000 | GREASE SEAL | 1 |
| 3 | 057083-000 | INNER BEARING | 1 |
| 4 | 057084-000 | OUTER BEARING | 1 |
| 5 | - | SPLIT PIN | 1 |
| 6 | - | AXLE NUT | 1 |
| 7 | 057471-000 | WHEEL STUD M12 | 4 |
| 8 | 057474-000 | WHEEL NUT M12 | 4 |
| 9 | 500050-002 | DRUM | 1 |
| 10 | 057089-000 | HUB CAP | 1 |

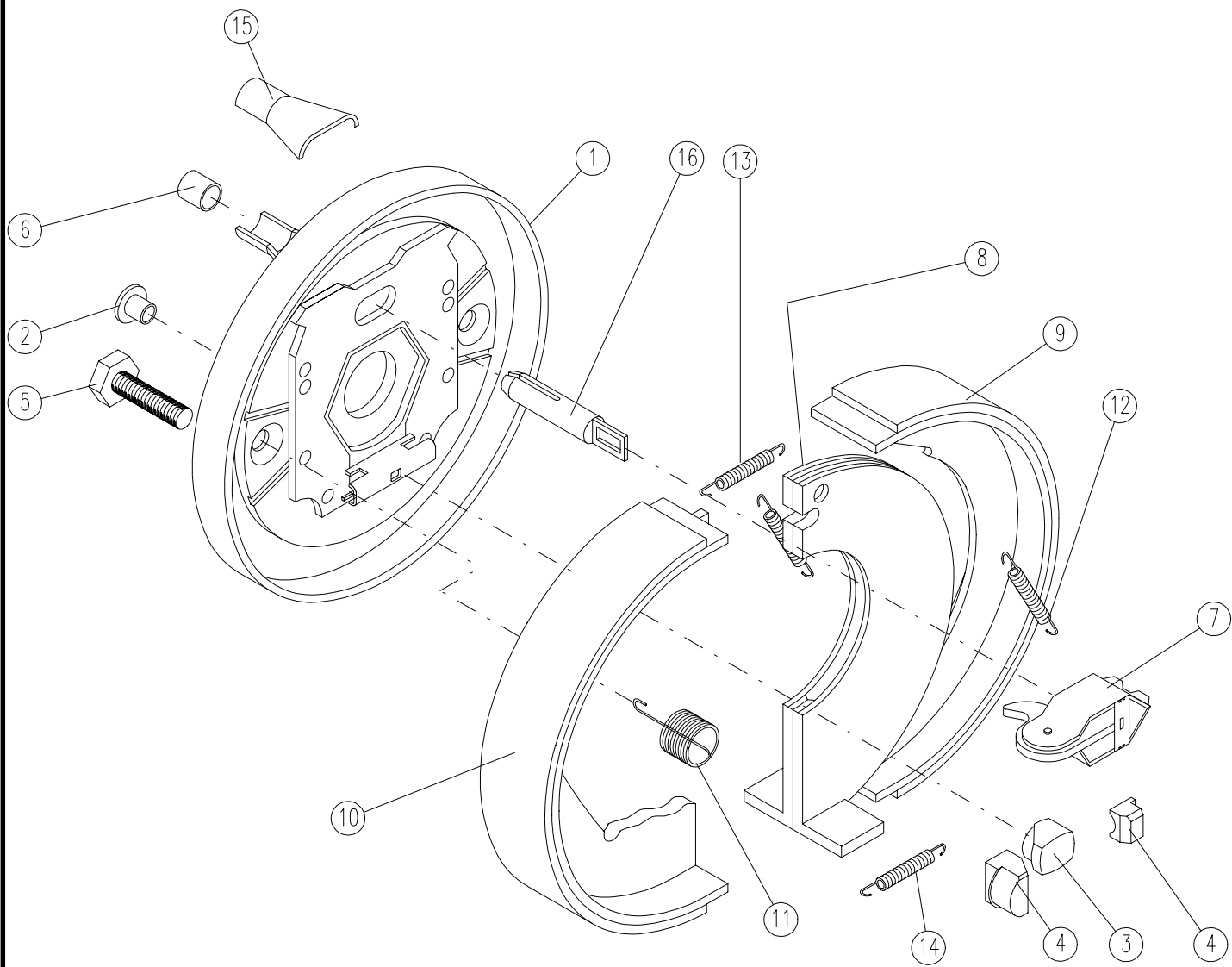


BRAKE ASSEMBLY

Manual & Hydraulic Outrigger Versions

500050-003-000 (L.H.) 500050-004 (R.H.)

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|------------------------|------|
| 1 | - | BACK PLATE | 1 |
| 2 | - | BLANKING PLUG | 2 |
| 3 | - | ADJUSTING WEDGE | 1 |
| 4 | - | SIDE WEDGE | 2 |
| 5 | - | BOLT | 1 |
| 6 | - | RETAINING CAP | 1 |
| 7 | - | EXPANDER ASSY. | 1 |
| 8 | - | SHOE CARRIER | 1 |
| 9 | 500050-005 | REVERSING SHOE | 1 |
| 10 | 500050-006 | STANDARD SHOE | 1 |
| 11 | - | RETAINING SPRING | 1 |
| 12 | - | REVERSING SHOE SPRING | 2 |
| 13 | - | TOP SPRING | 1 |
| 14 | - | BOTTOM SPRING | 1 |
| 15 | - | CABLE BRACKET TOP HALF | 1 |
| 16 | - | EYELET | 1 |
| 17 | - | BACK PLATE RIGHT HAND | 1 |



Illustrated Parts Breakdown

TAILBOARD ASSEMBLY

Manual & Hydraulic Outrigger Versions

057190-000 (CE Version)

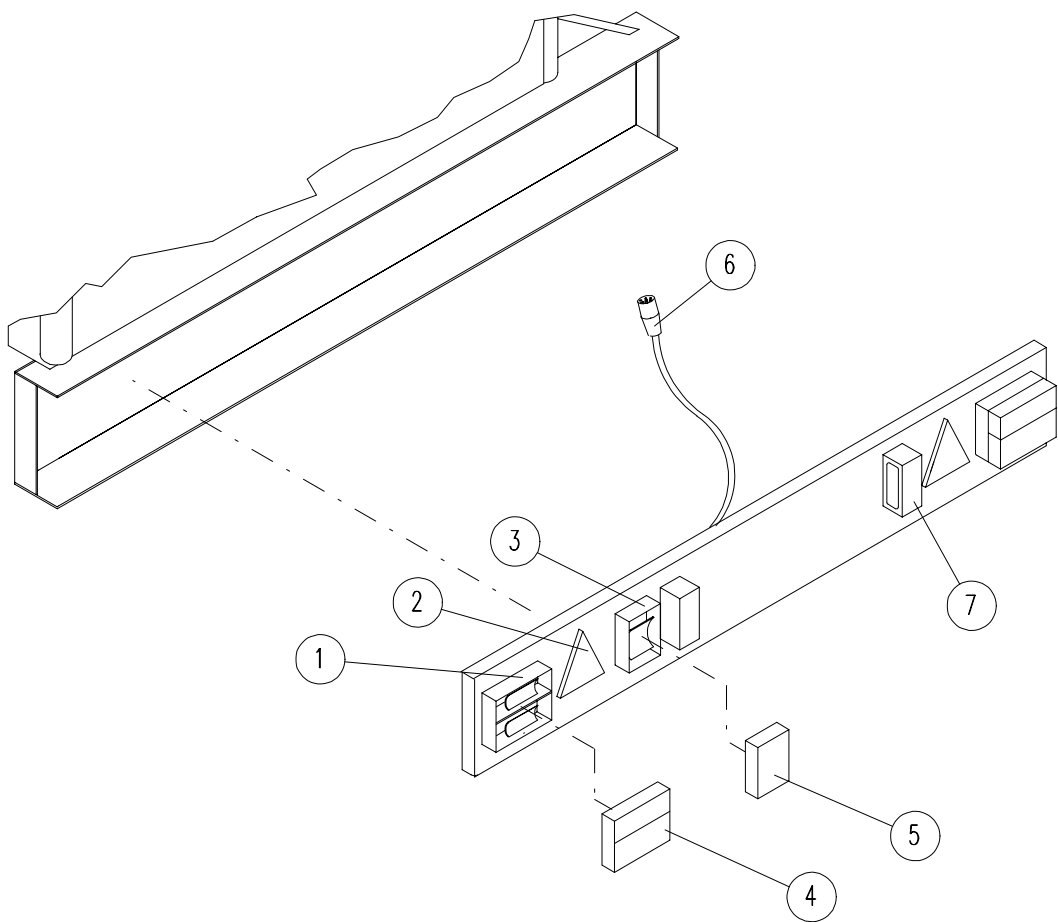
| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 058260-000 | BRAKE/INDICATOR ASSY. COMPLETE | 2 |
| 2 | 058739-000 | REFLECTOR | 2 |
| 3 | 058738-000 | FOG LIGHT ASSEMBLY COMPLETE | 1 |
| 4 | 058261-000 | BRAKE/INDICATOR LENS | 2 |
| 5 | 057327-000 | FOG LIGHT LENS | 1 |
| 6 | 057334-000 | 7 PIN PLUG | 1 |
| * | 057335-000 | 7 PIN SOCKET | 1 |
| 7 | 058262-000 | NUMBER PLATE LIGHT ASSY. | 2 |








TAILBOARD ASSEMBLY








Manual & Hydraulic Outrigger Versions

057190-001 (ANSI Version)

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 058260-000 | BRAKE/INDICATOR ASSY. COMPLETE | 2 |
| 2 | 058739-000 | REFLECTOR | 2 |
| 3 | - | - | - |
| 4 | 058261-000 | BRAKE/INDICATOR LENS | 2 |
| 5 | - | - | - |
| 6 | 057334-000 | 7 PIN PLUG | 1 |
| * | 057335-000 | 7 PIN SOCKET | 1 |
| 7 | 058262-000 | NUMBER PLATE LIGHT ASSY. | 2 |



| | | |
|--|---|------------|
| R.H. FLASHER |  | Y |
| FOG LIGHT |  | BL |
| EARTH |  | W |
| L.H. FLASHER |  | GN |
| L.H. TAIL LIGHT |  | BN |
| STOP LIGHTS |  | R |
| L.H. TAIL LIGHTS & NUMBER PLATE |  | BLK |

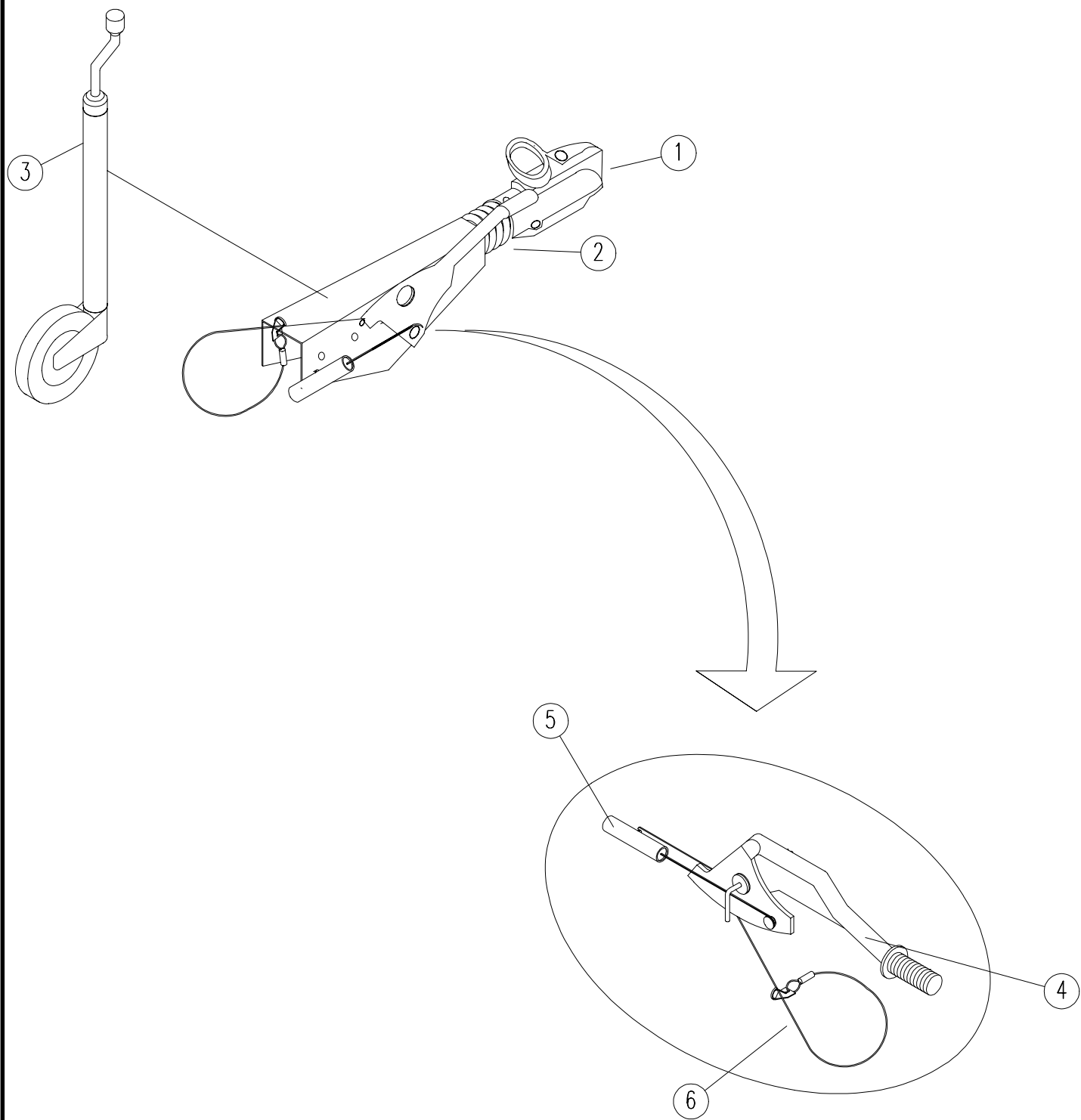
| | | |
|------------|---|--|
| Y |  | L.H. FLASHER |
| BL |  | FOG LIGHT |
| W |  | EARTH |
| GN |  | R.H. FLASHER |
| BN |  | R.H. TAIL LIGHT |
| R |  | STOP LIGHTS |
| BLK |  | L.H. TAIL LIGHTS & NUMBER PLATE |

TOWHITCH ASSEMBLY

Manual & Hydraulic Outrigger Versions

058241-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|---|------|
| 1 | 058348-000 | COUPLING HEAD EUROPE | 1 |
| * | 058349-000 | COUPLING HEAD USA | |
| 2 | 058790-000 | GAITER | 1 |
| 3 | 058242-000 | JOCKEY WHEEL Note: Not part of Towhitch Assembly | 1 |
| 4 | 058787-000 | HANDBRAKE LEVER ASSY. | 1 |
| 5 | 058794-000 | SPRING PACK ASSY. | 1 |
| 6 | 058746-000 | BREAKAWAY SAFETY CABLE | 1 |

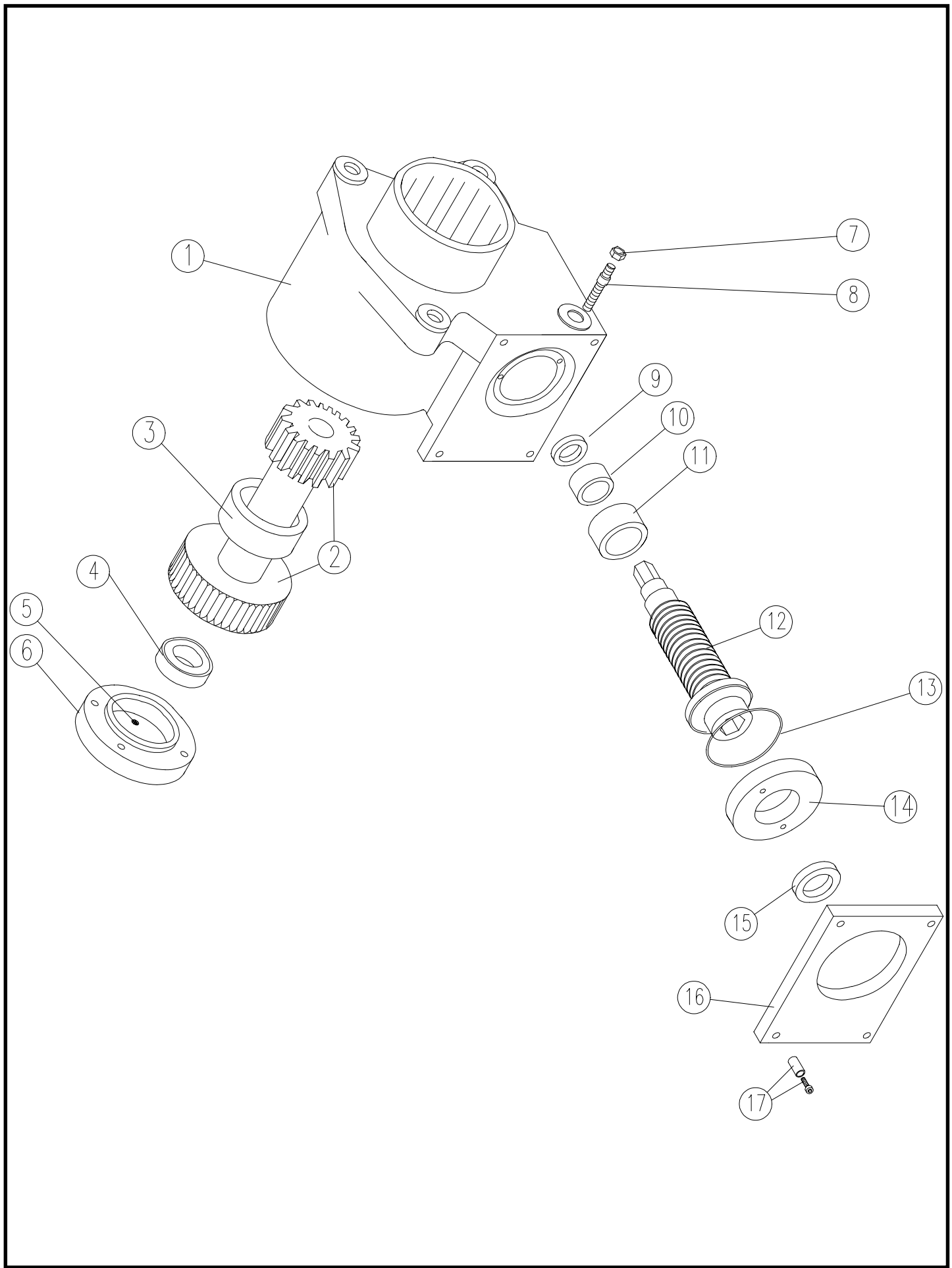


SLEW GEARBOX ASSEMBLY

Manual & Hydraulic Outrigger Versions

058266-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|----------|---|------|
| 1 | - | GEARBOX HOUSING | 1 |
| 2 | - | BEVEL GEAR & SLEW PINION ASSY. | 1 |
| 3 | - | BEARING | 1 |
| 4 | - | BEARING | 1 |
| 5 | - | TOP CAP BREATHER | 1 |
| 6 | - | TOP CAP | 1 |
| 7 | - | SELF LOCKING NUT | 1 |
| 8 | - | STUD | 1 |
| 9 | - | SEAL | 1 |
| 10 | - | BEARING | 1 |
| 11 | - | BEARING | 1 |
| 12 | - | WORM GEAR ASSY. | 1 |
| * | - | THRUST BEARING ON EITHER SIDE OF FLANGE ON WORM GEAR ASSY. | |
| 13 | - | O RING | 1 |
| 14 | - | END CAP | 1 |
| 15 | - | SEAL | 1 |
| 16 | - | MOTOR PLATE | 1 |
| 17 | - | ALLEN BOLT & BUSH | 4 |

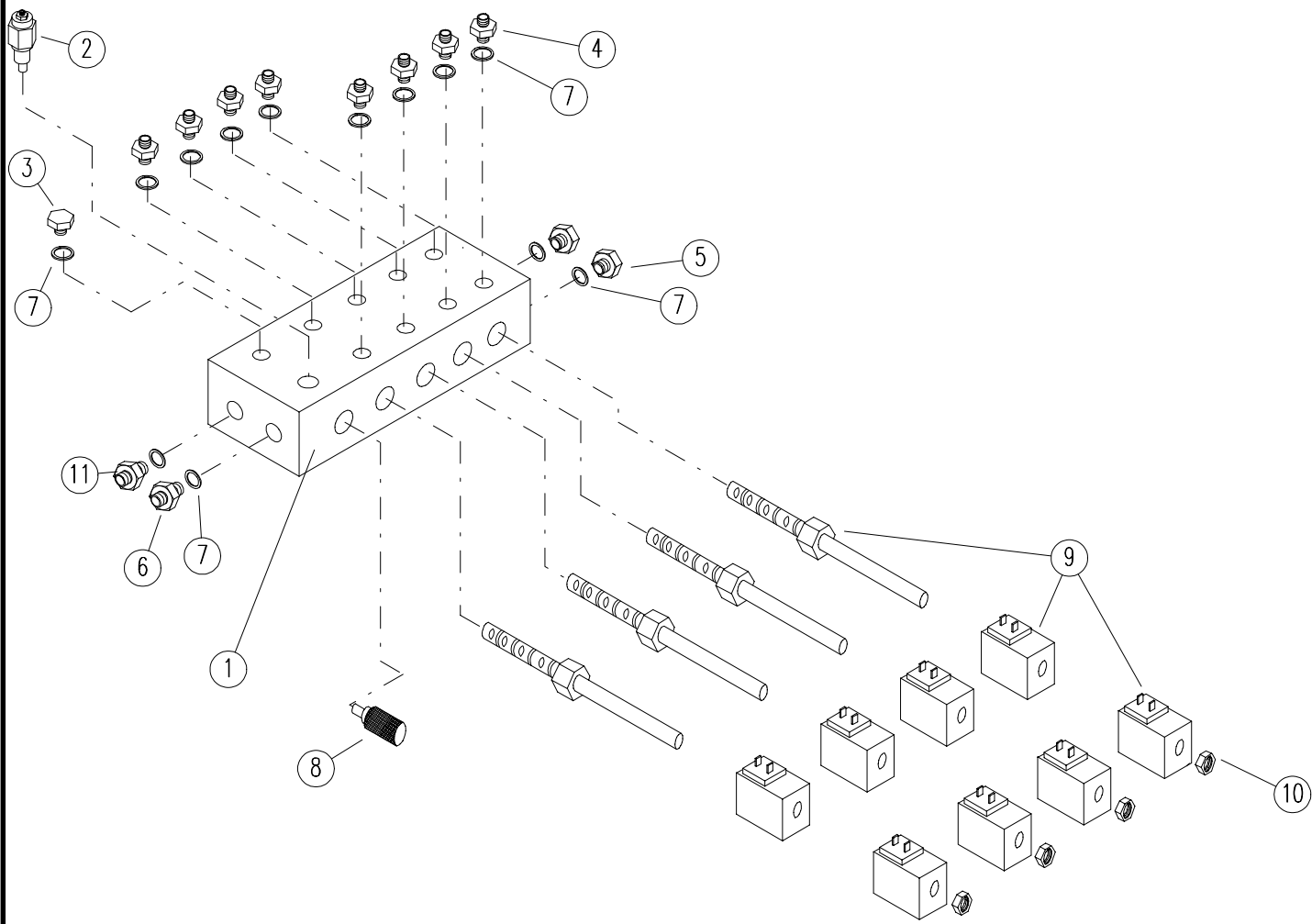


MAIN MANIFOLD BLOCK ASSEMBLY

Manual & Hydraulic Outrigger Versions

500055-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|-----------------------------|------|
| 1 | - | MAIN MANIFOLD BLOCK ONLY | 1 |
| 2 | 057536-000 | MAIN RELIEF VALVE | 1 |
| 3 | 500055-001 | PLUG 1/4" | |
| 4 | 057358-000 | ADAPTOR 3/8" - | 8 |
| 5 | 500055-002 | PLUG 3/8" - | 2 |
| 6 | 057123-000 | ADAPTOR 1/2" OUT | 1 |
| 7 | - | BONDED SEAL, VARIOUS | 12 |
| 8 | 057106-000 | PRESSURE TEST POINT FITTING | 1 |
| 9 | 058726-000 | SOLENOID VALVE & COILS | 4 |
| 10 | 058255-000 | LOCKNUT | 4 |
| 11 | 057122-000 | ADAPTOR 3/8" IN | 1 |



OUTRIGGER MANIFOLD BLOCK ASSEMBLY

Hydraulic Outtrigger Versionn Only

058180-010

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------|------|
| 1 | - | OUTRIGGER MANIFOLD BLOCK | 1 |
| 2 | 058723-000 | SOLENOID VALVE & COILS | 4 |
| 3 | 058180-001 | SOLENOID VALVE & COIL | 1 |
| 4 | 057358-000 | ADAPTOR 3/8" - | 10 |
| 5 | 500055-002 | PLUG 3/8" - | 2 |
| 6 | 057123-000 | ADAPTOR 3/8" | 2 |
| 7 | - | BONDED SEAL, VARIOUS | 14 |
| 8 | 058255-000 | LOCKNUT | 5 |
| 9 | 057122-000 | ADAPTOR 3/8" IN | 1 |

Section 7.2



LOWER LIFT CYLINDER ASSEMBLY

Manual & Hydraulic Outrigger Versions

057104-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------|------|
| 1 | - | CYLINDER BODY | 1 |
| 2 | 058887-000 | EMERGENCY LOWERING VALVE | 1 |
| 3 | 058728-000 | SINGLE OVERCENTRE VALVE | 1 |
| 4 | - | END CAP | 1 |
| 5 | - | ROD AND END PIVOT | 1 |
| 6 | SEE NOTE | ROD SEAL | 2 |
| 7 | SEE NOTE | O-RING | 1 |
| 8 | SEE NOTE | WIPER | 1 |
| 9 | SEE NOTE | PISTON O-RING | 1 |
| 10 | SEE NOTE | PISTON SEAL | 1 |
| 11 | - | PISTON HEAD | 1 |
| 12 | - | PISTON LOCKNUT | 1 |
| 13 | - | TAB WASHER | 1 |
| 14 | 058819-000 | GREASE NIPPLE | 2 |

NOTE: ITEMS 6 TO 10 INCLUSIVE FORM THE SEAL KIT FOR THE TL38 LOWER LIFT CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS **057360-000**

Section 7.2



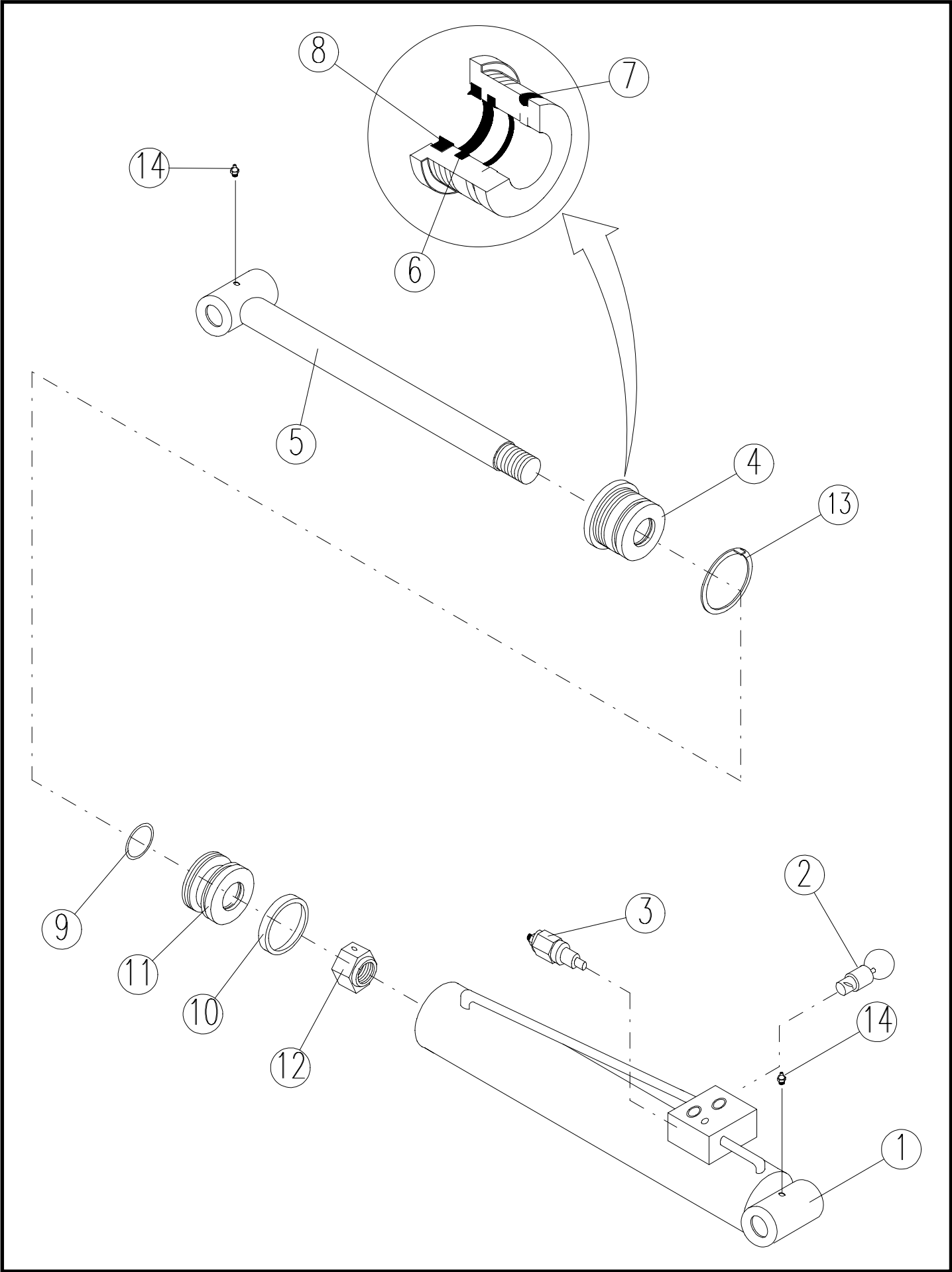
UPPER LIFT CYLINDER ASSEMBLY

Manual & Hydraulic Outrigger Versions

500056-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------|------|
| 1 | - | CYLINDER BODY | 1 |
| 2 | 058887-000 | EMERGENCY LOWERING VALVE | 1 |
| 3 | 058728-000 | SINGLE OVERCENTRE VALVE | 1 |
| 4 | - | END CAP | 1 |
| 5 | - | ROD AND END PIVOT | 1 |
| 6 | SEE NOTE | ROD SEAL | 2 |
| 7 | SEE NOTE | O-RING | 1 |
| 8 | SEE NOTE | WIPER | 1 |
| 9 | SEE NOTE | PISTON O-RING | 1 |
| 10 | SEE NOTE | PISTON SEAL | 1 |
| 11 | - | PISTON HEAD | 1 |
| 12 | - | PISTON LOCKNUT | 1 |
| 13 | - | TAB WASHER | 1 |
| 14 | 058819-000 | GREASE NIPPLE | 2 |

NOTE: ITEMS 6 TO 10 INCLUSIVE FORM THE SEAL KIT FOR THE TL38 UPPER LIFT CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS **500056-001**



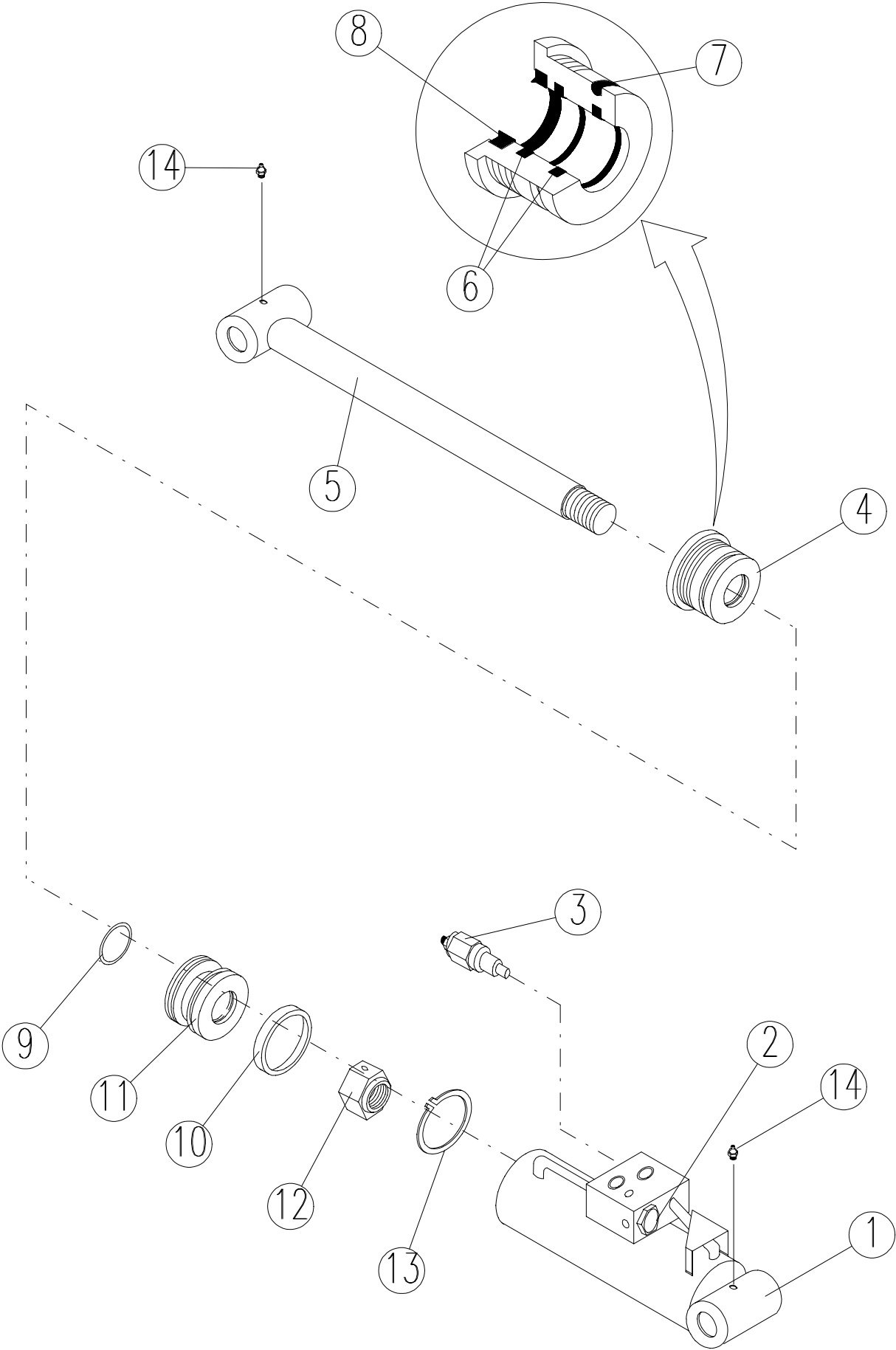
JIB LIFT CYLINDER ASSEMBLY

Manual & Hydraulic Outrigger Versions

500059-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|-------------------------|------|
| 1 | - | CYLINDER BODY | 1 |
| 2 | 058925-000 | SINGLE P.O. CHECK VALVE | 1 |
| 3 | 058728-000 | SINGLE OVERCENTRE VALVE | 1 |
| 4 | - | END CAP | 1 |
| 5 | - | ROD AND END PIVOT | 1 |
| 6 | SEE NOTE | ROD SEAL | 2 |
| 7 | SEE NOTE | O-RING | 1 |
| 8 | SEE NOTE | WIPER | 1 |
| 9 | SEE NOTE | PISTON O-RING | 1 |
| 10 | SEE NOTE | PISTON SEAL | 1 |
| 11 | - | PISTON HEAD | 1 |
| 12 | - | PISTON LOCKNUT | 1 |
| 13 | - | CIRCLIP | 1 |
| 14 | 058819-000 | GREASE NIPPLE | 2 |

NOTE: ITEMS 6 TO 10 INCLUSIVE FORM THE SEAL KIT FOR THE TL38 JIB CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS **500059-001**



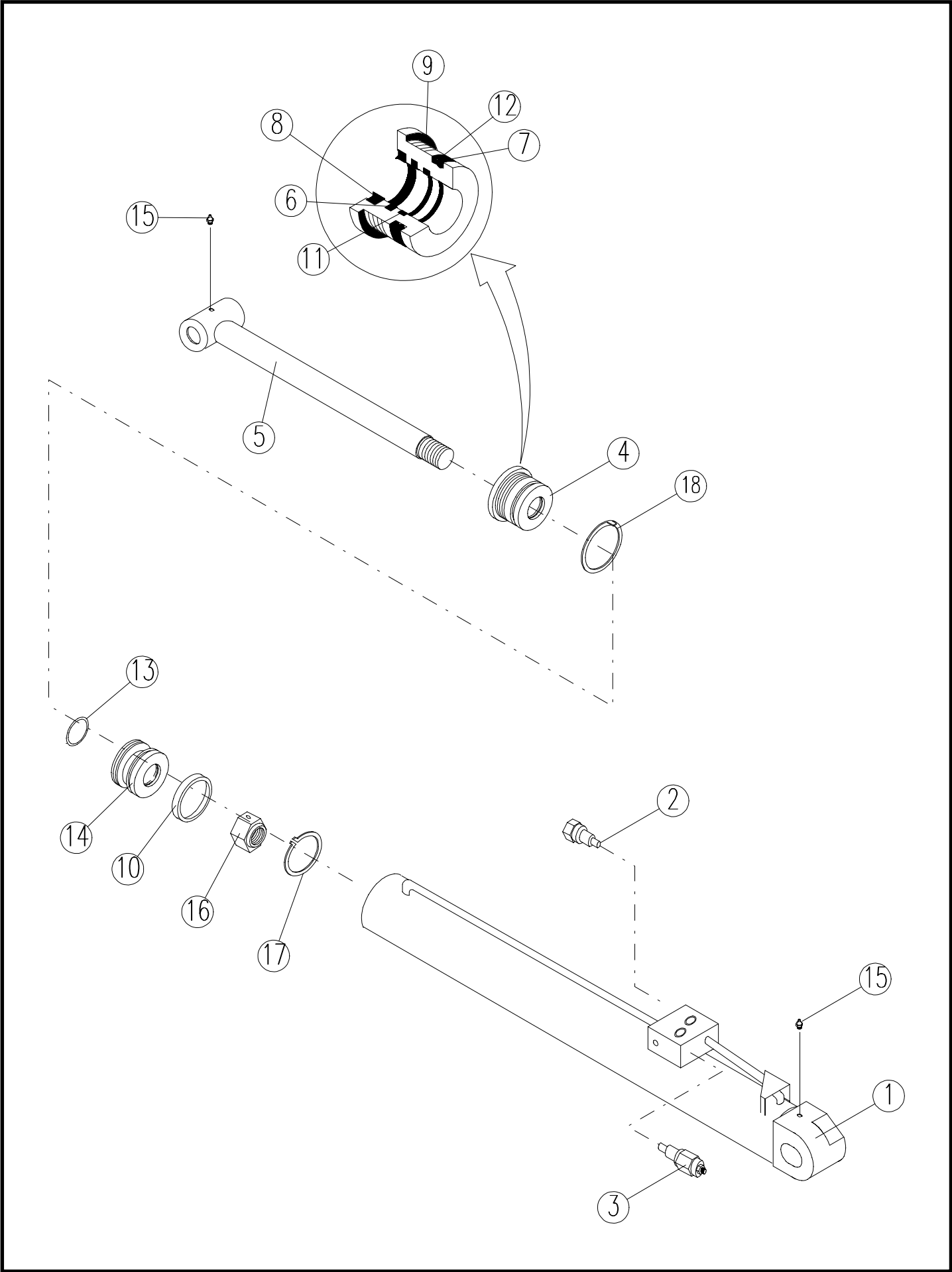
OUTRIGGER CYLINDER ASSEMBLY

Hydraulic Outrigger Version Only

500058-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|-------------------------|------|
| 1 | - | OUTRIGGER CYLINDER BODY | 1 |
| 2 | 058925-000 | SINGLE P.O. CHECK VALVE | 1 |
| 3 | 058728-000 | SINGLE OVERCENTRE VALVE | 1 |
| 4 | - | END CAP | 1 |
| 5 | - | ROD AND END PIVOT | 1 |
| 6 | SEE NOTE | ROD SEAL | 1 |
| 7 | SEE NOTE | O-RING | 1 |
| 8 | SEE NOTE | WIPER | 1 |
| 9 | SEE NOTE | END CAP GLAND | 1 |
| 10 | SEE NOTE | PISTON SEAL | 1 |
| 11 | SEE NOTE | ROD SEAL | 1 |
| 12 | SEE NOTE | PTFE SEAL | 1 |
| 13 | SEE NOTE | PISTON O-RING | 1 |
| 14 | - | PISTON HEAD | 1 |
| 15 | 058819-000 | GREASE NIPPLE | 2 |
| 16 | - | PISTON LOCKNUT | 1 |
| 17 | - | CIRCLIP | 1 |
| 18 | - | TAB WASHER | 1 |

NOTE: ITEMS 6 TO 13 INCLUSIVE FORM THE SEAL KIT FOR THE TL38 OUTRIGGER CYLINDER. THE PART NUMBER FOR THIS SEAL KIT IS **500058-001**

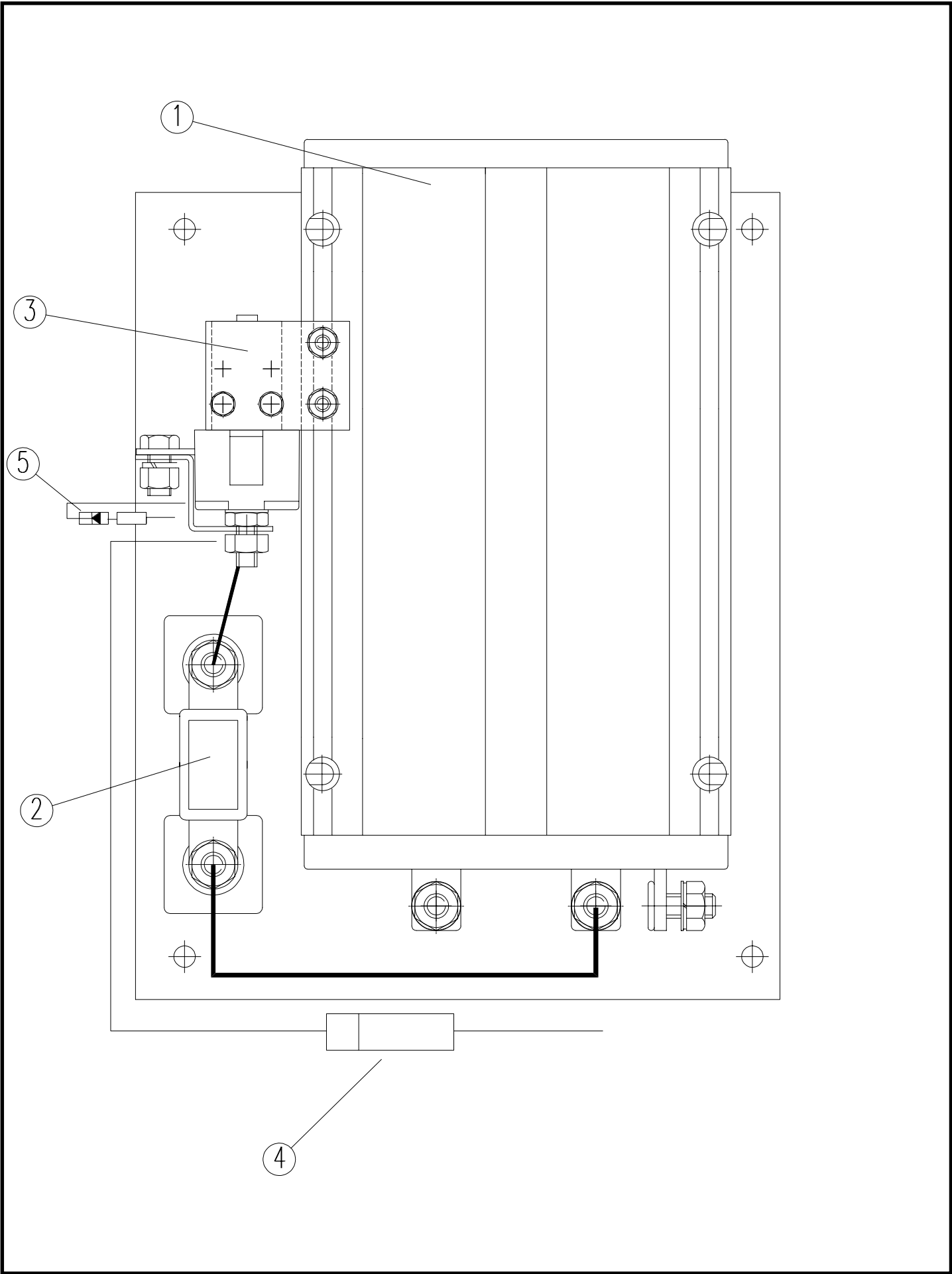


PUMP MOTOR CONTROL UNIT ASSEMBLY

Manual & Hydraulic Outrigger Versions

500084-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|---|------|
| 1 | 500094-000 | TL38 CONTROLLER UNIT, MOS90 | 1 |
| 2 | 057304-000 | FUSE, 160A MAIN | 1 |
| 3 | 057485-000 | LINE CONTACTOR | 1 |
| 4 | 057470-000 | FUSE 7A | 1 |
| 5 | 058932-000 | SUPPRESSION DIODE ASSY. | 1 |
| * | 057128-000 | MOS90 CALIBRATOR (NOT SHOWN) TEST/PROGRAMMING INSTRUMENT | 1 |



LOWER CONTROL BOX ASSEMBLY Manual Outrigger Version Only

500086-000 (Harnesses are not part of this assembly)

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--|------|
| 1 | 500095-000 | CONTROL BOX ENCLOSURE ONLY | 1 |
| 2 | 057311-000 | TOGGLE SWITCH | 4 |
| 3 | 500096-000 | CHASSIS/PLATF. SELECTOR SWITCH | 1 |
| 4 | 057309-000 | EMERGENCY STOP SWITCH | 1 |
| 5 | 500085-002 | HARNESS ASSY. - PRINTED CIRCUIT BOARD BOX | 1 |
| 6 | - | - | - |
| 7 | 057329-000 | GREEN LED | 4 |
| 8 | 058608-001 | LOWER CONTROL BOX DECAL | 1 |

NOTE: THE PART NUMBER FOR THE
CABLE-BOX CONNECTOR IS
057477-000

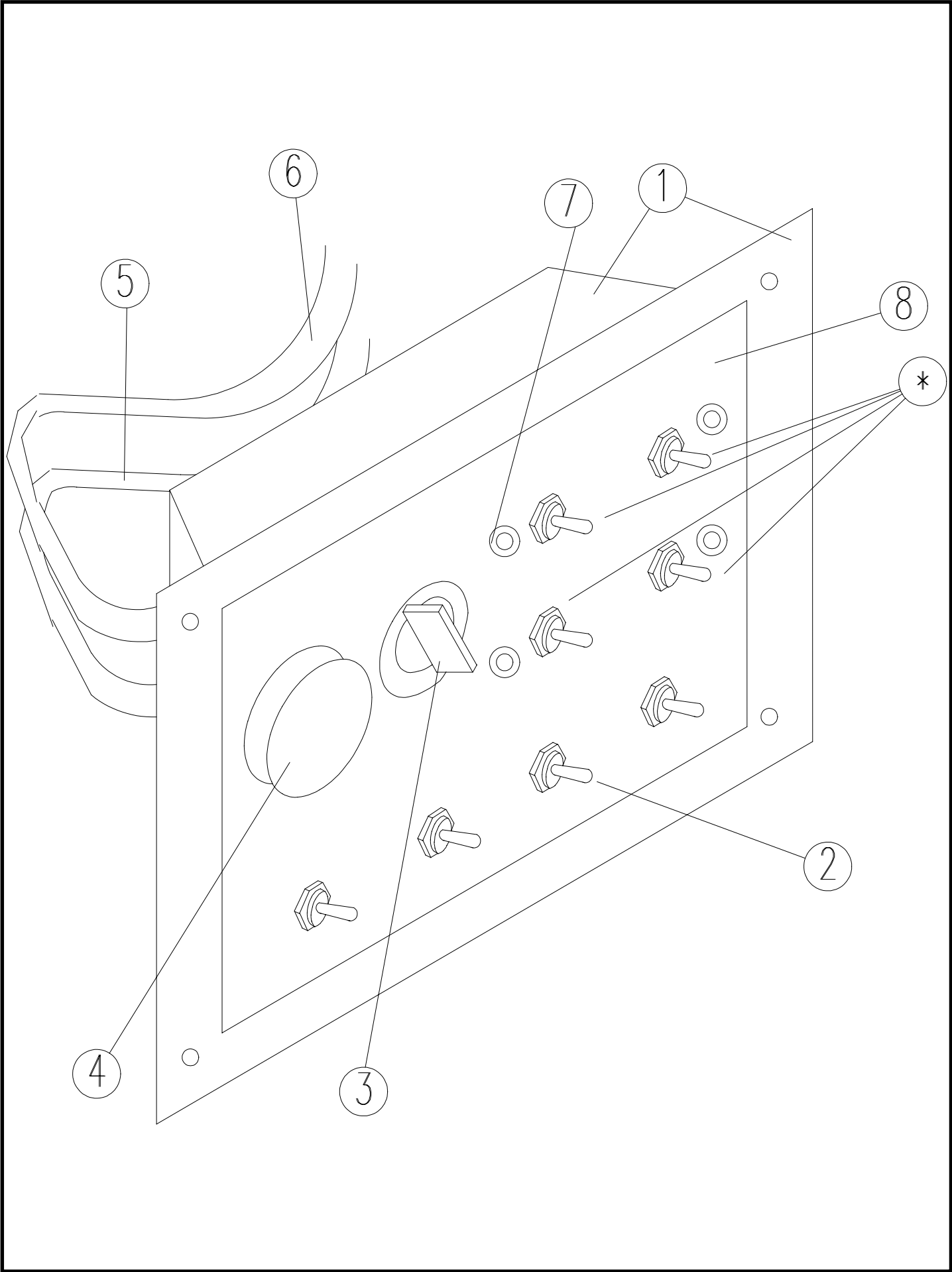
NOTE: * - THESE TOGGLE SWITCHES ARE
PRESENT ON HYDRAULIC
OUTRIGGER VERSIONS OF THE
TL38 ONLY.

LOWER CONTROL BOX ASSEMBLY Hydraulic Outrigger Version Only

500086-001 (Harnesses are not part of this assembly)

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--|------|
| 1 | 500095-000 | CONTROL BOX ENCLOSURE ONLY | 1 |
| 2 | 057311-000 | TOGGLE SWITCH | 8 |
| 3 | 500096-000 | CHASSIS/PLATF. SELECTOR SWITCH | 1 |
| 4 | 057309-000 | EMERGENCY STOP SWITCH | 1 |
| 5 | - | - | - |
| 6 | 500085-005 | HARNESS ASSY. - PRINTED CIRCUIT BOARD BOX | 1 |
| 7 | 057329-000 | GREEN LED | 4 |
| 8 | 058608-000 | LOWER CONTROL BOX DECAL | 1 |

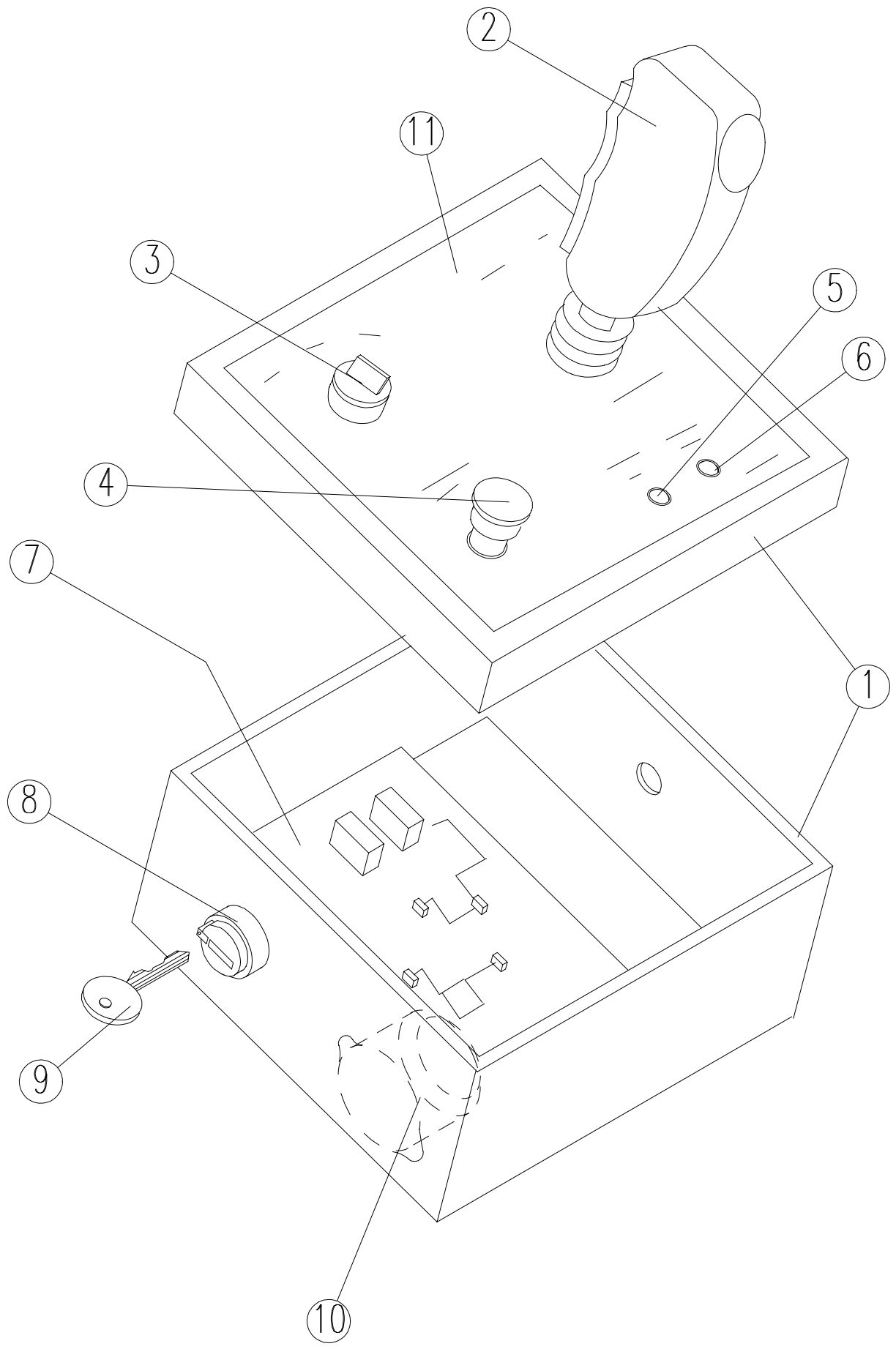
NOTE: THE PART NUMBER FOR THE
CABLE-BOX CONNECTOR IS
500122-000



UPPER CONTROL BOX ASSEMBLY
Manual & Hydraulic Outrigger Versions
500087-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|------------------------------|------|
| 1 | 058150-000 | CONTROL BOX ENCLOSURE ONLY | 1 |
| 2 | 057325-000 | JOYSTICK | 1 |
| * | 063975-004 | POT ASSEMBLY | 1 |
| * | 058984-000 | RUBBER BOOT | 1 |
| * | 058985-000 | INTERNAL MICRO SWITCH | 1 |
| 3 | 058152-000 | 4 POSITION SELECTOR SWITCH | 1 |
| 4 | 057309-000 | EMERGENCY STOP SWITCH | 1 |
| 5 | 057330-000 | RED LED | 1 |
| 6 | 057329-000 | GREEN LED | 1 |
| 7 | 500087-001 | PRINTED CIRCUIT BOARD, UPPER | 1 |
| 8 | 057310-000 | KEYSWITCH, WITH KEY | 1 |
| * | 058946-000 | CONTACT BLOCK N/O | 4 |
| 9 | 057238-000 | KEY | 1 |
| 10 | 057328-000 | ALARM | 1 |
| 11 | 058607-000 | UPPER CONTROL BOX DECAL | 1 |

NOTE: THE PART NUMBER FOR THE CABLE-
BOX CONNECTOR IS **057477-000**



CIRCUIT BOARD BOX & HARNESSES

Manual Outrigger Version Only

500085-000

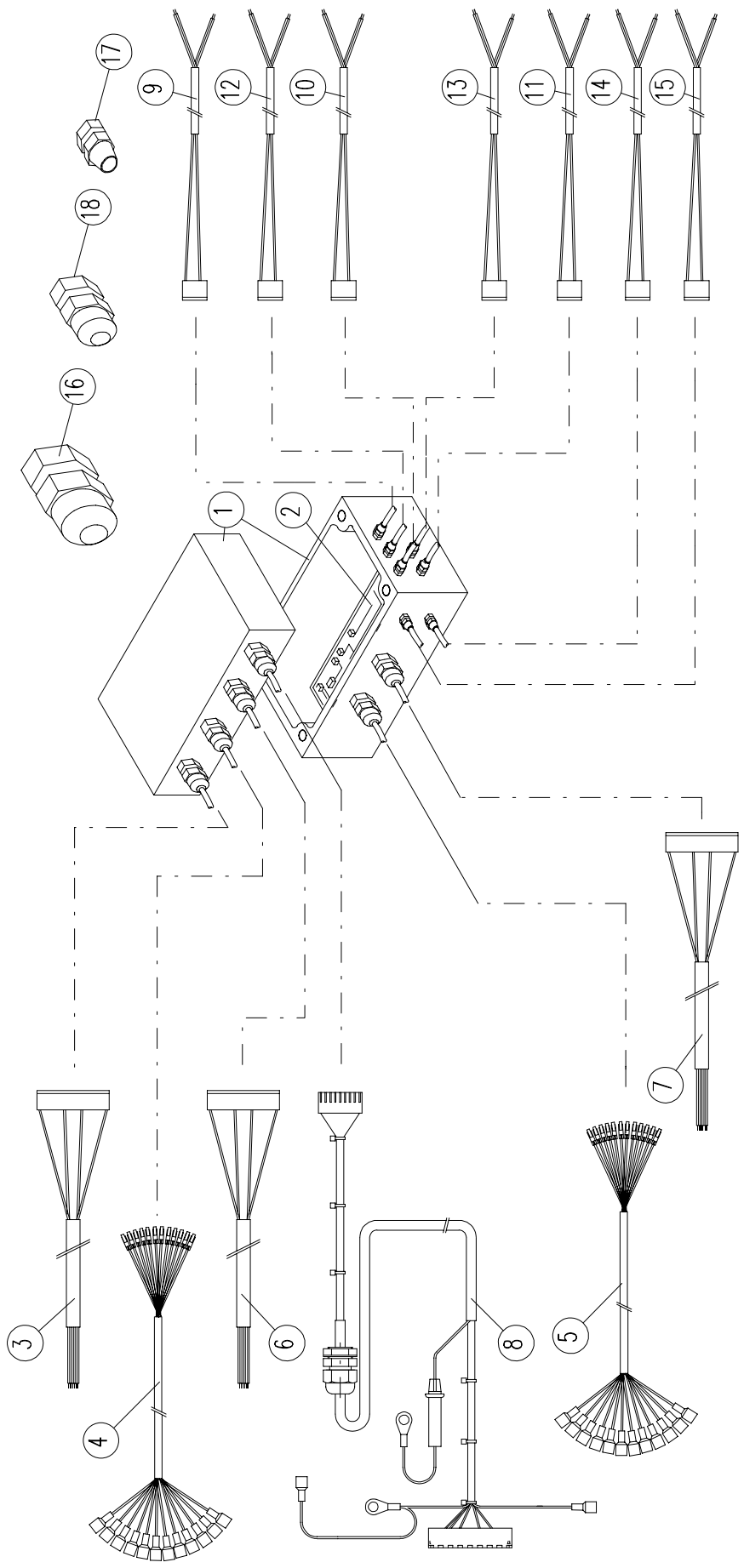
| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--|------|
| 1 | 500092-000 | CIRCUIT BOARD BOX ONLY | 1 |
| 2 | 500085-001 | PRINTED CIRCUIT BOARD - SERIAL NUMBERS #1001 -1015 | 1 |
| | 500085-020 | PRINTED CIRCUIT BOARD - SEIAL NUMBERS #1016 - CURRENT | |
| 3 | 500085-002 | HARNESS ASSY. - TO LOWER CONTROL BOX | 1 |
| 4 | 500085-003 | HARNESS ASSY. - TO MAIN MANIFOLD SOLENOIDS | 1 |
| 5 | - | - | - |
| 6 | - | - | - |
| 7 | 500085-006 | HARNESS ASSY. - TO UPPER CONTROL BOX | 1 |
| 8 | 500085-007 | HARNESS ASSY. - TO MOTOR CONTROL UNIT | 1 |
| 9 | 500085-008 | HARNESS ASSY. - TO TILT SENSOR (Option or ANSI Standard) | 1 |
| 10 | 500085-009 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH F.R. | 1 |
| 11 | 500085-010 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH R.R. | 1 |
| 12 | 500085-011 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH F.L. | 1 |
| 13 | 500085-012 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH R.L. | 1 |
| 14 | 500085-013 | HARNESS ASSY. - TO SLEW CUT OUT LIMIT SWITCH | 1 |
| 15 | - | - | - |
| 16 | 057332-001 | GLAND NUT, LARGE | 1 |
| 17 | 057308-000 | GLAND NUT, SMALL | 3 |
| 18 | 057332-000 | GLAND NUT, MEDIUM | 4 |

CIRCUIT BOARD BOX & HARNESSES

Hydraulic Outrigger Version Only

500085-015

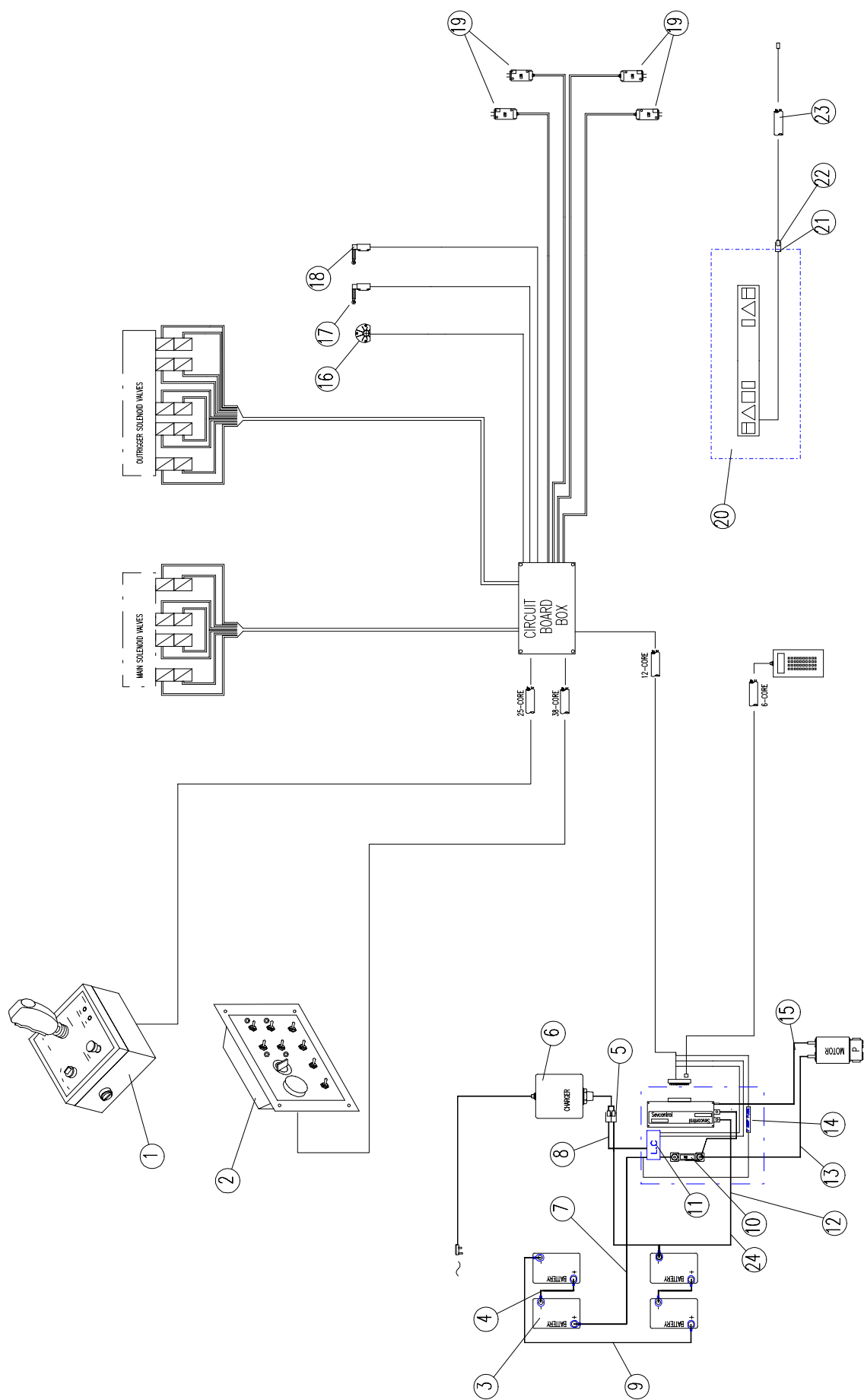
| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--|------|
| 1 | 500092-000 | CIRCUIT BOARD BOX ONLY | 1 |
| 2 | 500085-001 | PRINTED CIRCUIT BOARD - SERIAL NUMBERS #1001 -1015 | 1 |
| | 500085-020 | PRINTED CIRCUIT BOARD - SERIAL NUMBERS #1016 - CURRENT | |
| 3 | - | HARNESS ASSY. - TO LOWER CONTROL BOX (SEE ITEM 6 (500085-005)) | - |
| 4 | 500085-003 | HARNESS ASSY. - TO MAIN MANIFOLD SOLENOIDS | 1 |
| 5 | 500085-004 | HARNESS ASSY. - TO OUTRIGGER SOLENOIDS | 1 |
| 6 | 500085-005 | HARNESS ASSY. - TO LOWER CONTROL BOX (MERGEING OF 2 HARNESSES FROM PRINTED CIRCUIT BOARD BOX) | 1 |
| 7 | 500085-006 | HARNESS ASSY. - TO UPPER CONTROL BOX | 1 |
| 8 | 500085-007 | HARNESS ASSY. - TO MOTOR CONTROL UNIT | 1 |
| 9 | 500085-008 | HARNESS ASSY. - TO TILT SENSOR | 1 |
| 10 | 500085-016 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH F.R. | 1 |
| 11 | 500085-017 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH R.R. | 1 |
| 12 | 500085-018 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH F.L. | 1 |
| 13 | 500085-019 | HARNESS ASSY. - TO OUTRIGGER LIMIT SWITCH R.L. | 1 |
| 14 | 500085-013 | HARNESS ASSY. - TO SLEW CUT OUT LIMIT SWITCH | 1 |
| 15 | 500085-014 | HARNESS ASSY. - TO BOOM REST LIMIT SWITCH | 1 |
| 16 | 057332-001 | GLAND NUT, LARGE | 2 |
| 17 | 057308-000 | GLAND NUT, SMALL | 7 |
| 18 | 057332-000 | GLAND NUT, MEDIUM | 6 |



CABLES & ELECTRICAL COMPONENT LEGEND

Manual & Hydraulic

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|---|------|
| 1 | 500087-000 | UPPER CONTROL BOX ASSY. | 1 |
| 2 | 500086-001 | LOWER CONTROL BOX ASSY. -HYD. | 1 |
| * | 500086-000 | LOWER CONTROL BOX ASSY. -MAN. | |
| 3 | 015796-001 | BATTERY 6V 220AH | 4 |
| 4 | 057185-000 | CABLE ASSY. BATTERY TO BATTERY | 2 |
| 5 | 058783-000 | CHARGER DISCONNECT PLUG | 2 |
| 6 | 063948-011 | CHARGER E.U. 220/110VAC 50/60Hz | 1 |
| * | 063944-011 | CHARGER U.S.A. 110VAC 60Hz | |
| * | 063983-002 | CHARGER JAPAN 100VAC 60Hz | |
| 7 | 500097-000 | CABLE ASSY. BATTERY TO LINE CONTACTOR | 1 |
| 8 | 500098-000 | CABLE ASSY. CHARGER TO LINE CONTACTOR | 1 |
| 9 | 500099-000 | CABLE ASSY. BATTERY TO BATTERY | 1 |
| 10 | 057304-000 | FUSE, 160A MAIN | 1 |
| 11 | 057485-000 | LINE CONTACTOR | 1 |
| 12 | 500100-000 | CABLE ASSY. MOS90 TO CHARGER DISCONNECT | 1 |
| 13 | 500101-000 | CABLE ASSY. FUSE TO D.C. MOTOR | 1 |
| 14 | 057470-000 | FUSE, 7A | 1 |
| 15 | 500102-000 | CABLE ASSY. MOS90 TO D.C. MOTOR | 1 |
| 16 | 058912-000 | TILT SENSOR -Standard on Hydraulic and optional on Manual version of TL38 | 1 |
| 17 | 057183-000 | SLEW CUT OUT LIMIT SWITCH | 1 |
| 18 | 058889-000 | BOOM REST LIMIT SWITCH -Hydraulic versions of TL38 only | 1 |
| 19 | 057182-000 | OUTRIGGER LIMIT SWITCH -Manual versions of TL38 only | 4 |
| * | 500361-000 | OUTRIGGER LIMIT SWITCH -Hydraulic versions of TL38 only | 4 |
| 20 | 057190-000 | TAILBOARD ASSY. (CE VERSION) | 1 |
| * | 057190-001 | TAILBOARD ASSY. (ANSI VERSION) | 1 |
| 21 | 057335-000 | 7 PIN TRAILER SOCKET | 1 |
| 22 | 057334-000 | 7 PIN PLUG | 1 |
| 23 | 057191-000 | CABLE ASSY. -TAILBOARD TO TOWHITCH | 1 |
| 24 | 500120-000 | CABLE ASSY. BATTERY TO MOS90 | 1 |
| 25 | 057128-000 | CALIBRATOR (OPTIONAL) | 1 |



HOSE ASSEMBLY

Manual

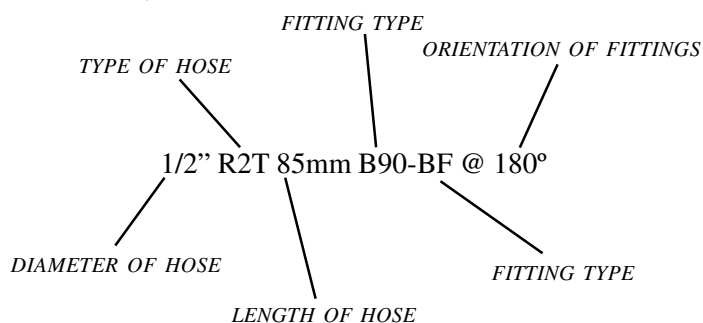
500103-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|---|------|
| 1 | 500122-000 | HOSE ASSY, 3/8" M1T 1400mm BF-B90 PUMP TO MAIN MANIFOLD | 1 |
| 2 | 500114-000 | HOSE ASSY, 1/2" M1T 85mm BK-BK @ 180° RETURN LINE TO FILTER | 1 |
| 3 | 500106-000 | HOSE ASSY, 3/4" R2T 210mm BF-B90 HYDRAULIC TANK TO PUMP | 1 |
| 4 | 500107-000 | HOSE ASSY, 1/2" M1T 580mm B90-B90 @ 270° RETURN LINE FROM PUMP TO TANK | 1 |
| 5 | 500108-000 | HOSE ASSY, 1/2" M1T 520mm B90-B90 @ 90° RETURN LINE FROM FILTER TO TANK | 1 |
| 6 | 500109-000 | HOSE ASSY, 1/4" M1T 750mm B90-BF MAIN MANIFOLD TO SLEW MOTOR | 2 |
| 7 | 500110-000 | HOSE ASSY, 1/4" M1T 11350mm B90- BANJO MAIN MANIFOLD TO JIB CYLINDER | 2 |
| 8 | 500111-000 | HOSE ASSY, 1/4" M1T 5350mm B90- B90 MAIN MANIFOLD TO BOOM 2 | 2 |
| 9 | 500112-000 | HOSE ASSY, 1/4" M1T 900mm B90- B90 MAIN MANIFOLD TO BOOM 1 | 2 |
| 10 | 500121-000 | HOSE ASSY, 1/4" M1T 1040mm B90- 1/8"BF SLEW MOTOR DRAIN TO TANK | 1 |

EXPLANATION OF HYDRAULIC TERMINOLOGY

| | |
|-------|---------------------------------|
| R2T | DOUBLE WIRE BRAIDED RUBBER HOSE |
| BF | STRAIGHT FEMALE FITTING |
| B90 | SWEPT 90° FITTING |
| BK90 | BLOCK 90° FITTING |
| M1T | MEGAFLEX HOSE |
| BANJO | DIRECT MOUNT FITTING |

EXAMPLE:

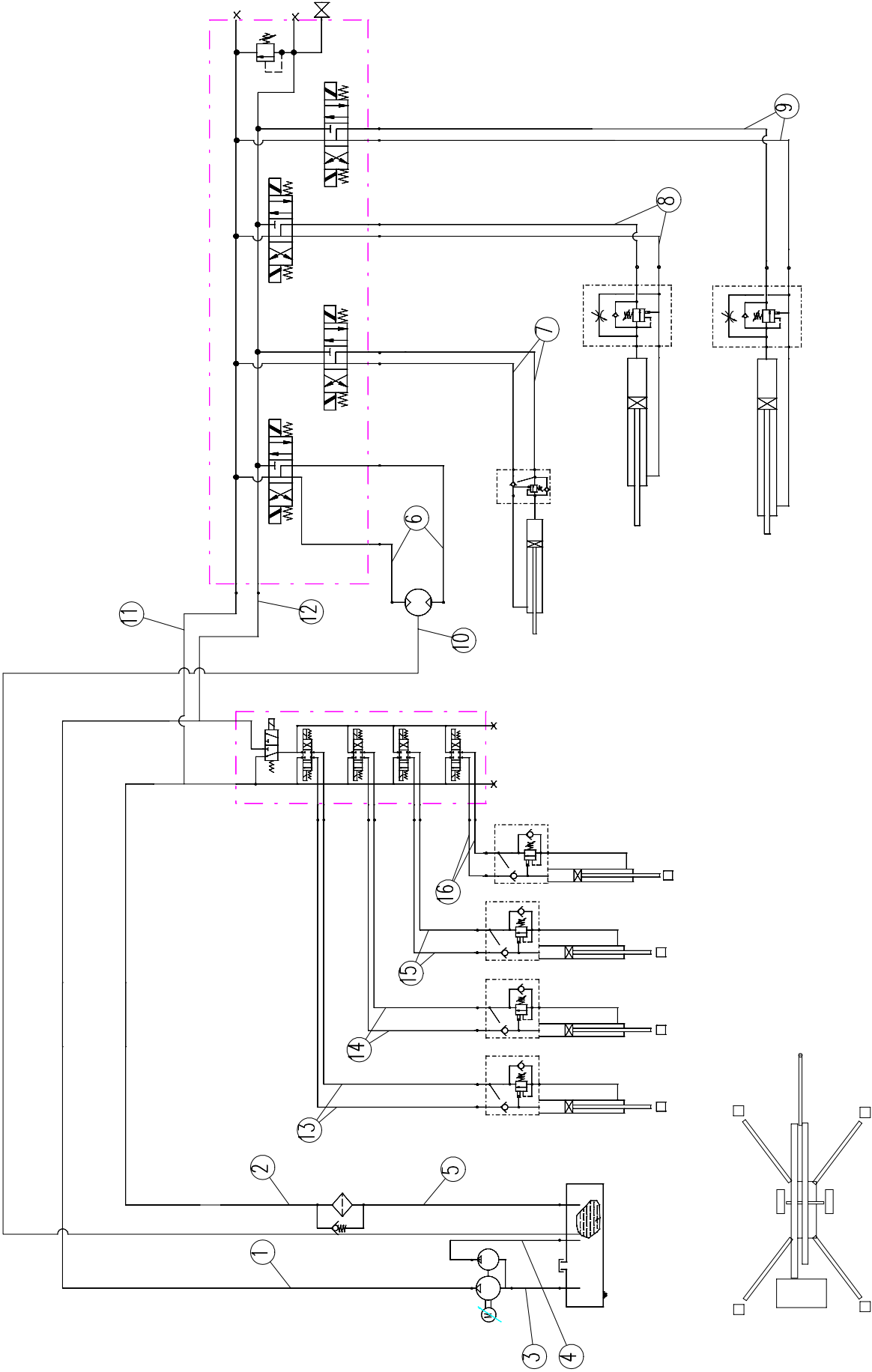


HOSE ASSEMBLY

Hydraulic

500113-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|---|------|
| 1 | 500104-000 | HOSE ASSY, 3/8" M1T 400mm B90- B90 @ 90° PUMP TO T JUNCTION | 1 |
| 2 | 500105-000 | HOSE ASSY, 1/2" M1T 85mm B90-B90 @ 180° T JUNCTION TO FILTER | 1 |
| 3 | 500106-000 | HOSE ASSY, 3/4" M1T 210mm BF-B90 HYDRAULIC TANK TO PUMP | 1 |
| 4 | 500107-000 | HOSE ASSY, 1/2" M1T 580mm B90- B90 @ 270° RETURN LINE FROM PUMP TO TANK | 1 |
| 5 | 500108-000 | HOSE ASSY, 1/2" M1T 520mm B90- B90 @ 90° RETURN LINE FROM FILTER TO TANK | 1 |
| 6 | 500109-000 | HOSE ASSY, 1/4" M1T 750mm B90-BF MAIN MANIFOLD TO SLEW MOTOR | 2 |
| 7 | 500110-000 | HOSE ASSY, 1/4" M1T 11350mm B90- BANJO MAIN MANIFOLD TO JIB CYLINDER | 2 |
| 8 | 500111-000 | HOSE ASSY, 1/4" M1T 5350mm B90- B90 MAIN MANIFOLD TO BOOM 2 | 2 |
| 9 | 500112-000 | HOSE ASSY, 1/4" M1T 900mm B90- B90 MAIN MANIFOLD TO BOOM 1 | 2 |
| 10 | 500121-000 | HOSE ASSY, 1/4" M1T 1040mm B90- 1/8"BF SLEW MOTOR DRAIN TO TANK | 1 |
| 11 | 500114-000 | HOSE ASSY, 1/2" M1T 1200mm BF-BF RETURN LINE FROM MAIN MANIFOLD TO T JUNCTION | 1 |
| 12 | 500115-000 | HOSE ASSY, 3/8" M1T 1100mm BF-BF PUMP-T JUNCTION-MAIN MANIFOLD | 1 |
| 13 | 500116-000 | HOSE ASSY, 1/4" M1T 2080mm BF- BANJO OUTRIGGER MANIFOLD TO O.R. F.R. | 2 |
| 14 | 500117-000 | HOSE ASSY, 1/4" M1T 1530mm BF- BANJO OUTRIGGER MANIFOLD TO O.R. F.L. | 2 |
| 15 | 500118-000 | HOSE ASSY, 1/4" M1T 2080mm BF- BANJO OUTRIGGER MANIFOLD TO O.R. R.R. | 2 |
| 16 | 500119-000 | HOSE ASSY, 1/4" M1T 1480mm BF- BANJO OUTRIGGER MANIFOLD TO O.R. R.L. | 2 |



Illustrated Parts Breakdown

DECAL KIT

Manual, American English (ANSI)

500390-000

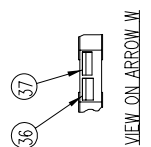
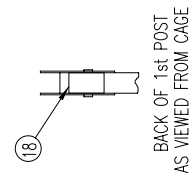
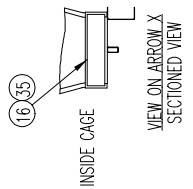
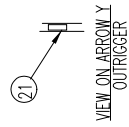
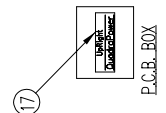
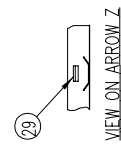
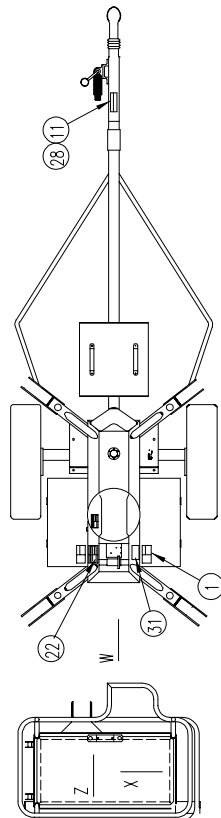
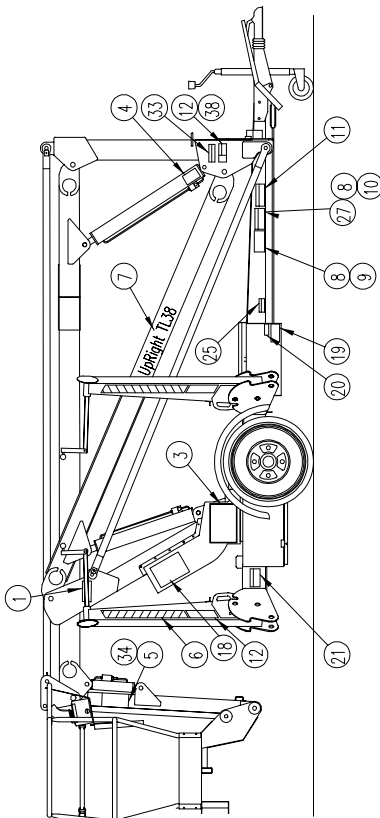
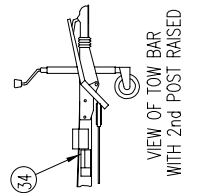
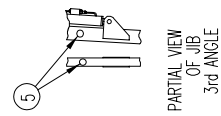
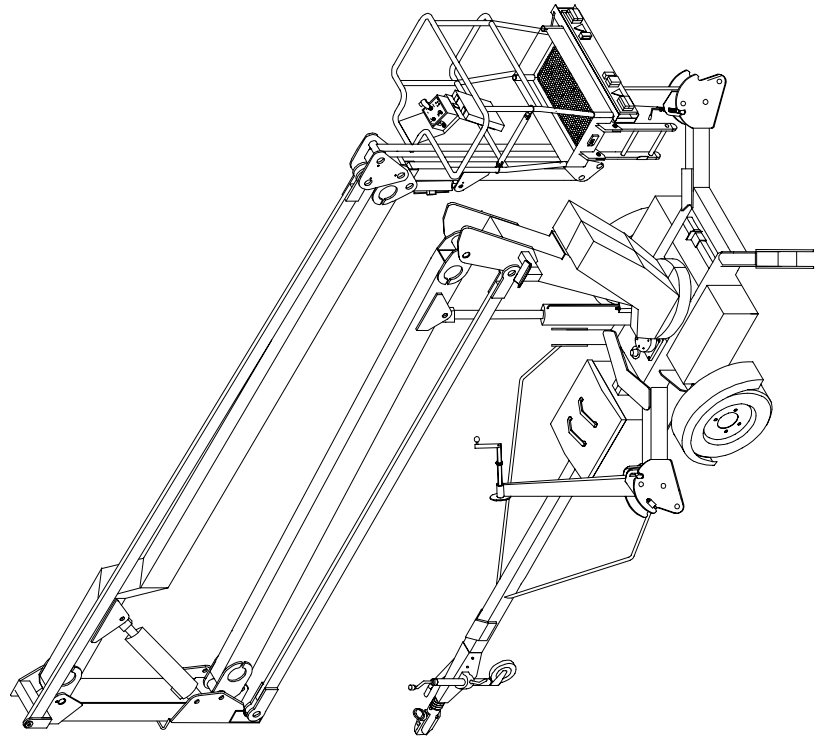
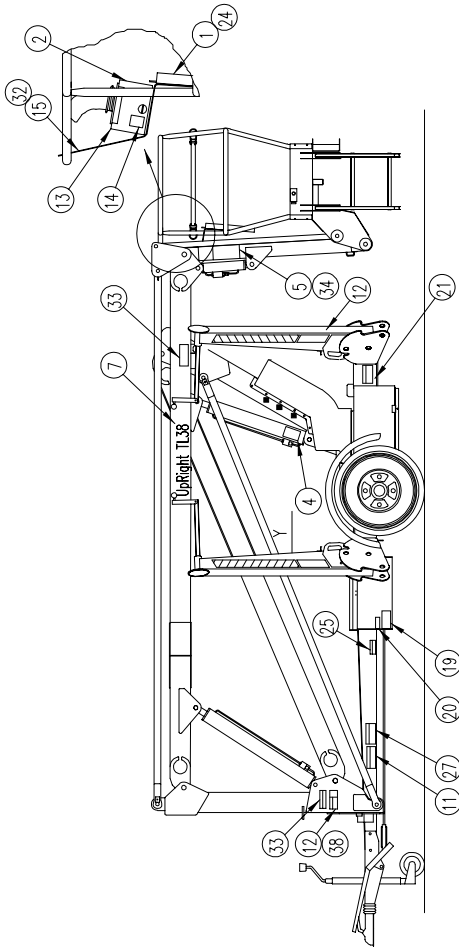
| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 057421-000 | DECAL - ELECTROCUTION HAZARD | 2 |
| 2 | 057420-000 | DECAL - TIP OVER HAZARD | 1 |
| 3 | 058608-001 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | 057382-000 | DECAL - EMERGENCY LOWERING | 2 |
| 5 | - | - | - |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT' LOGO | 2 |
| 8 | 057339-001 | PLASTIC PUSH RIVET | 1 |
| 9 | - | - | - |
| 10 | - | - | - |
| 11 | 057416-000 | DECAL - BEFORE TOWING | 2 |
| 12 | 057418-000 | DECAL - LOCK OUTRIGGER TOWING | 4 |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | 058186-000 | DECAL - ON/OFF UPPER CONTROL | 1 |
| 15 | - | - | - |
| 16 | - | - | - |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | 058760-000 | DECAL - MAIN INSTRUCTIONS | 2 |
| 19 | 057430-000 | DECAL - EXPLOSION HAZARD | 2 |
| 20 | 057429-000 | DECAL - BATTERY FLUID LEVEL | 2 |
| 21 | 057417-000 | DECAL - TIP OVER HAZARD | 4 |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | 058992-000 | DECAL - BOOM LOCK PIN | 1 |
| 24 | 057425-001 | DECAL - SAFETY INSTR. ENCLOSED | 1 |
| 25 | 057433-000 | DECAL - FORKLIFT DAMAGE | 2 |
| 26 | 057463-000 | U.S. NAME PLATE | 1 |
| 27 | 057427-000 | DECAL - LOSS OF CONTROL | 2 |
| 28 | 057431-000 | DECAL - PERSONAL INJURY | 1 |
| 29 | 057426-000 | DECAL - SAFETY HARNESS | 1 |
| 30 | - | - | - |
| 31 | 057428-000 | DECAL - ANSI A92.2-1990 | 1 |
| 32 | 058538-001 | DECAL - U.S. SAFETY HAZARD | 1 |
| 33 | 057432-000 | DECAL - STRUCTURAL DAMAGE | 2 |
| 34 | 057424-000 | DECAL - CRUSH HAZARD | 4 |
| 35 | 058761-000 | DECAL - S.W.L. LARGE ANSI | 1 |
| 36 | 057434-000 | DECAL - GENUINE REPLACEMENTS | 1 |
| 37 | 057435-000 | DECAL - FALL HAZARD | 1 |
| 38 | 057422-000 | DECAL - COLLISION HAZARD-BOOM | 2 |

DECAL KIT

Manual, English (CE)

500390-003

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 057421-000 | DECAL - ELECTROCUTION HAZARD | 2 |
| 2 | 057420-000 | DECAL - TIP OVER HAZARD | 1 |
| 3 | 058608-001 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | 057382-000 | DECAL - EMERGENCY LOWERING | 2 |
| 5 | 058860-000 | DECAL - HAND HAZARD | 3 |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT' LOGO | 2 |
| 8 | 057339-001 | PLASTIC PUSH RIVET | 2 |
| 9 | 058838-000 | E.U. NAME PLATE | 1 |
| 10 | 058836-000 | V.I.N. PLATE | 1 |
| 11 | 057416-000 | DECAL - BEFORE TOWING | 1 |
| 12 | 057418-000 | DECAL - LOCK OUTRIGGER TOWING | 2 |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | 058186-000 | DECAL - ON/OFF UPPER CONTROL | 1 |
| 15 | 058016-000 | DECAL - MACHINE GENERAL INSTR. | 1 |
| 16 | 057392-000 | DECAL - S.W.L. LARGE CE | 1 |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | - | - | - |
| 19 | 057430-000 | DECAL - EXPLOSION HAZARD | 2 |
| 20 | 057429-000 | DECAL - BATTERY FLUID LEVEL | 2 |
| 21 | 057417-000 | DECAL - TIP OVER HAZARD | 4 |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | 058992-000 | DECAL - BOOM LOCK PIN | 1 |



DECAL KIT**Manual, French (CE)**

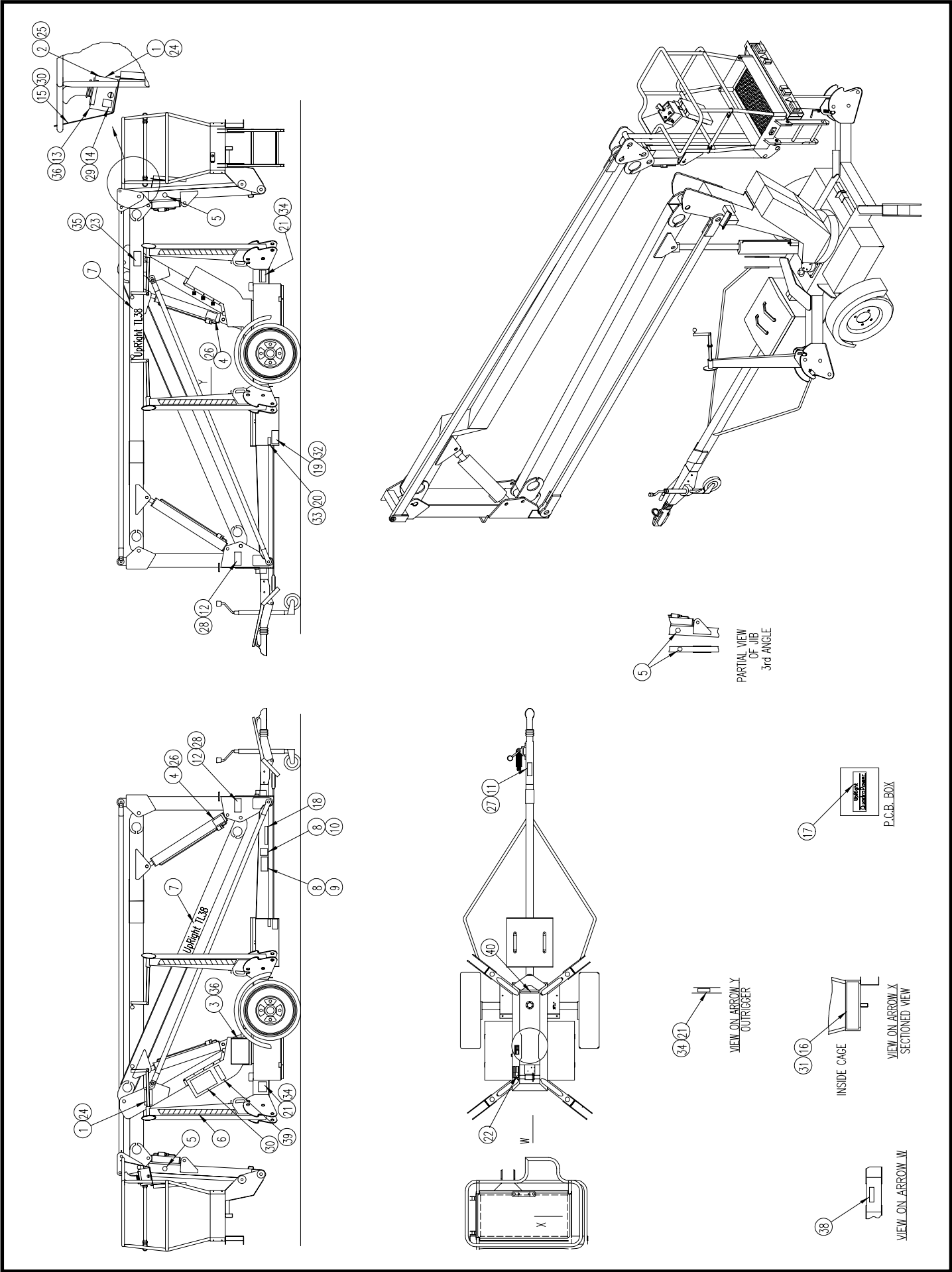
500390-001

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 057507-016 | DECAL - MACHINE NOT INSULATED | 2 |
| 2 | 057507-018 | DECAL - ACTION ON ALARM | 2 |
| 3 | 058608-001 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | 057382-001 | DECAL - EMERGENCY LOWERING | 2 |
| 5 | 058860-000 | DECAL - HAND HAZARD | 3 |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT LOGO' | 2 |
| 8 | 057339-001 | DECAL - PLASTIC PUSH RIVET | 2 |
| 9 | 058838-000 | E.U. NAMEPLATE | 1 |
| 10 | 058836-000 | V.I.N. PLATE | 1 |
| 11 | 057507-017 | DECAL - BEFORE TOWING | 1 |
| 12 | 057507-020 | DECAL - LOCK OUTRIGGER | 2 |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | 058186-001 | DECAL - ON/OFF UPPER CONTROLS | 1 |
| 15 | 058016-001 | DECAL - MACHINE GENERAL INSTR. | 1 |
| 16 | 057392-001 | DECAL - S.W.L. LARGE | 1 |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | - | - | - |
| 19 | 057430-001 | DECAL - EXPLOSION HAZARD | 2 |
| 20 | 057429-001 | DECAL - BATTERY FLUID LEVEL | 2 |
| 21 | 058017-001 | DECAL - LOWERING OUTRIGGER | 4 |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | 058992-001 | DECAL - BOOM LOCK PIN | 1 |

DECAL KIT**Manual, German (CE)**

500390-002

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | - | - | - |
| 2 | - | - | - |
| 3 | 058608-001 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | - | - | - |
| 5 | 058860-000 | DECAL - HAND HAZARD | 3 |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT LOGO' | 2 |
| 8 | 057339-001 | DECAL - PLASTIC PUSH RIVET | 2 |
| 9 | 058838-000 | E.U. NAMEPLATE | 1 |
| 10 | 058836-000 | V.I.N. PLATE | 1 |
| 11 | - | - | - |
| 12 | - | - | - |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | - | - | - |
| 15 | - | - | - |
| 16 | - | - | - |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | 057507-005 | DECAL - UNIT WEIGHT 1500kg | 1 |
| 19 | - | - | - |
| 20 | - | - | - |
| 21 | - | - | - |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | - | - | - |
| 24 | 057507-027 | DECAL - MACHINE NOT INSULATED | 2 |
| 25 | 057420-002 | DECAL - ACTION ON ALARM | 2 |
| 26 | 057507-002 | DECAL - EMERGENCY LOWERING | 2 |
| 27 | 057416-002 | DECAL - BEFORE TOWING | 1 |
| 28 | 057418-002 | DECAL - STOW OUTRIGGERS | 2 |
| 29 | 058186-002 | DECAL - ON/OFF UPPER CONTROLS | 1 |
| 30 | 057507-025 | DECAL - MACHINE GENERAL INSTR. | 2 |
| 31 | 057507-031 | DECAL - S.W.L. LARGE | 1 |
| 32 | 057507-026 | DECAL - EXPLOSION HAZARD | 2 |
| 33 | 057507-024 | DECAL - BATTERY FLUID LEVEL | 2 |
| 34 | 057417-012 | DECAL - OUTRIGGER LOWERED | 4 |
| 35 | 058992-002 | DECAL - BOOM LOCK PIN | 1 |
| 36 | 057507-001 | DECAL - EMERGENCY STOP | 2 |
| 37 | 057507-007 | DECAL - MAX SIDE LOAD | 1 |
| 38 | 057507-021 | DECAL - BUBBLE LEVEL | 1 |
| 39 | 057507-022 | DECAL - BEFORE MAINTENANCE | 1 |
| 40 | 057507-023 | DECAL - HYDRAULIC OIL | 1 |



Illustrated Parts Breakdown

DECAL KIT

Hydraulic, American English (ANSI)

500391-000

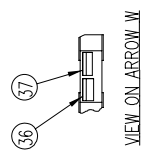
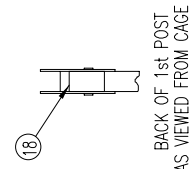
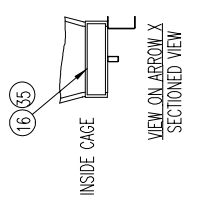
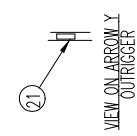
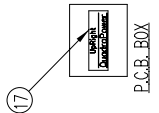
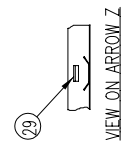
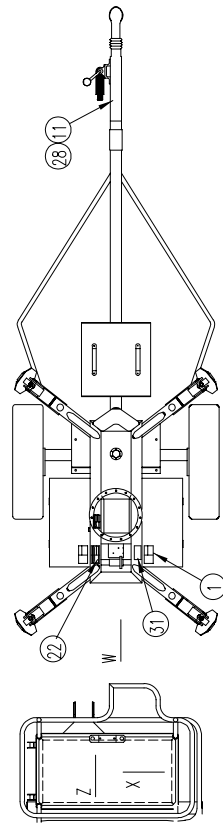
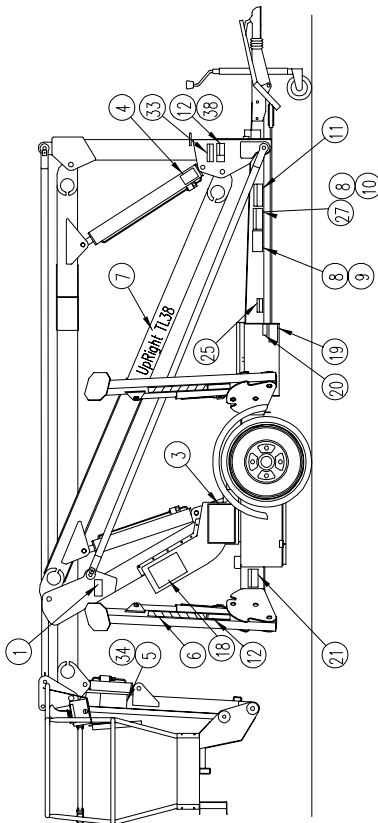
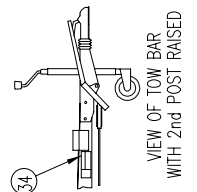
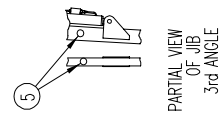
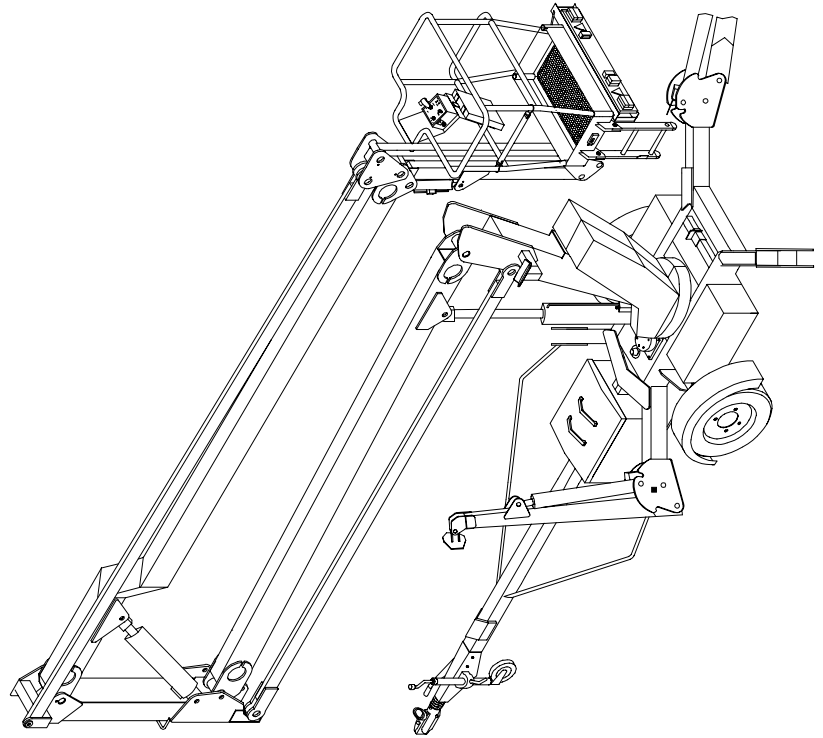
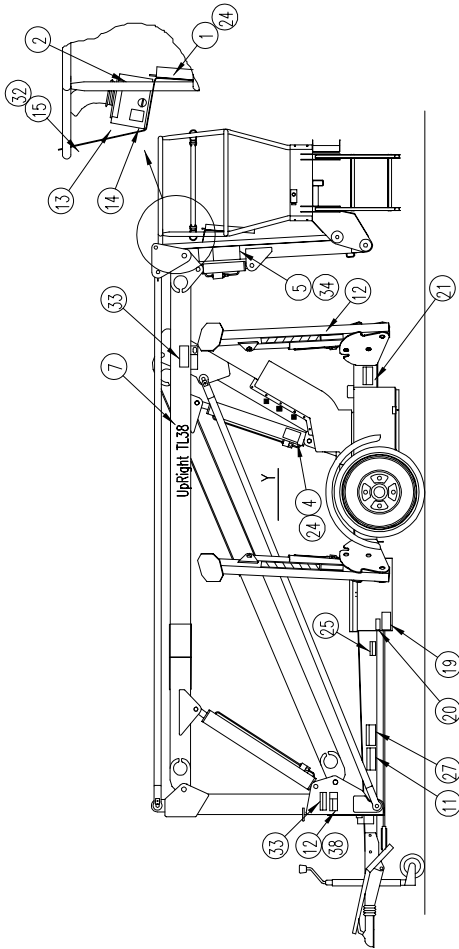
| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 057421-000 | DECAL - ELECTROCUTION HAZARD | 2 |
| 2 | 057420-000 | DECAL - TIP OVER HAZARD | 1 |
| 3 | 058608-000 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | 057382-000 | DECAL - EMERGENCY LOWERING | 2 |
| 5 | - | - | - |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT' LOGO | 2 |
| 8 | 057339-001 | PLASTIC PUSH RIVET | 1 |
| 9 | - | - | - |
| 10 | - | - | - |
| 11 | 057416-000 | DECAL - BEFORE TOWING | 2 |
| 12 | 057418-000 | DECAL - LOCK OUTRIGGER TOWING | 4 |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | 058186-000 | DECAL - ON/OFF UPPER CONTROL | 1 |
| 15 | - | - | - |
| 16 | - | - | - |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | 058760-000 | DECAL - MAIN INSTRUCTIONS | 2 |
| 19 | 057430-000 | DECAL - EXPLOSION HAZARD | 2 |
| 20 | 057429-000 | DECAL - BATTERY FLUID LEVEL | 2 |
| 21 | 057417-000 | DECAL - TIP OVER HAZARD | 4 |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | 058992-000 | DECAL - BOOM LOCK PIN | 1 |
| 24 | 057425-001 | DECAL - SAFETY INSTR. ENCLOSED | 1 |
| 25 | 057433-000 | DECAL - FORKLIFT DAMAGE | 2 |
| 26 | 057463-000 | U.S. NAME PLATE | 1 |
| 27 | 057427-000 | DECAL - LOSS OF CONTROL | 2 |
| 28 | 057431-000 | DECAL - PERSONAL INJURY | 1 |
| 29 | 057426-000 | DECAL - SAFETY HARNESS | 1 |
| 30 | - | - | - |
| 31 | 057428-000 | DECAL - ANSI A92.2-1990 | 1 |
| 32 | 058538-001 | DECAL - U.S. SAFETY HAZARD | 1 |
| 33 | 057432-000 | DECAL - STRUCTURAL DAMAGE | 2 |
| 34 | 057424-000 | DECAL - CRUSH HAZARD | 4 |
| 35 | 058761-000 | DECAL - S.W.L. LARGE ANSI | 1 |
| 36 | 057434-000 | DECAL - GENUINE REPLACEMENTS | 1 |
| 37 | 057435-000 | DECAL - FALL HAZARD | 1 |
| 38 | 057422-000 | DECAL - COLLISION HAZARD-BOOM | 2 |

DECAL KIT

Hydraulic, English (CE)

500391-003

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 057421-000 | DECAL - ELECTROCUTION HAZARD | 2 |
| 2 | 057420-000 | DECAL - TIP OVER HAZARD | 1 |
| 3 | 058608-000 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | 057382-000 | DECAL - EMERGENCY LOWERING | 2 |
| 5 | 058860-000 | DECAL - HAND HAZARD | 3 |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT' LOGO | 2 |
| 8 | 057339-001 | PLASTIC PUSH RIVET | 2 |
| 9 | 058838-000 | E.U. NAME PLATE | 1 |
| 10 | 058836-000 | V.I.N. PLATE | 1 |
| 11 | 057416-000 | DECAL - BEFORE TOWING | 1 |
| 12 | 057418-000 | DECAL - LOCK OUTRIGGER TOWING | 2 |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | 058186-000 | DECAL - ON/OFF UPPER CONTROL | 1 |
| 15 | 058016-000 | DECAL - MACHINE GENERAL INSTR. | 1 |
| 16 | 057392-000 | DECAL - S.W.L. LARGE CE | 1 |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | - | - | - |
| 19 | 057430-000 | DECAL - EXPLOSION HAZARD | 2 |
| 20 | 057429-000 | DECAL - BATTERY FLUID LEVEL | 2 |
| 21 | 057417-000 | DECAL - TIP OVER HAZARD | 4 |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | 058992-000 | DECAL - BOOM LOCK PIN | 1 |



DECAL KIT**Hydraulic, French (CE)**

500391-001

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | 057507-016 | DECAL - MACHINE NOT INSULATED | 2 |
| 2 | 057507-018 | DECAL - ACTION ON ALARM | 2 |
| 3 | 058608-000 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | 057382-001 | DECAL - EMERGENCY LOWERING | 2 |
| 5 | 058860-000 | DECAL - HAND HAZARD | 3 |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT LOGO' | 2 |
| 8 | 057339-001 | DECAL - PLASTIC PUSH RIVET | 2 |
| 9 | 058838-000 | E.U. NAMEPLATE | 1 |
| 10 | 058836-000 | V.I.N. PLATE | 1 |
| 11 | 057507-017 | DECAL - BEFORE TOWING | 1 |
| 12 | 057507-020 | DECAL - LOCK OUTRIGGER | 2 |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | 058186-001 | DECAL - ON/OFF UPPER CONTROLS | 1 |
| 15 | 058016-001 | DECAL - MACHINE GENERAL INSTR. | 1 |
| 16 | 057392-001 | DECAL - S.W.L. LARGE | 1 |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | - | - | - |
| 19 | 057430-001 | DECAL - EXPLOSION HAZARD | 2 |
| 20 | 057429-001 | DECAL - BATTERY FLUID LEVEL | 2 |
| 21 | 058017-001 | DECAL - LOWERING OUTRIGGER | 4 |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | 058992-001 | DECAL - BOOM LOCK PIN | 1 |

DECAL KIT**Hydraulic, German (CE)**

500391-002

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--------------------------------|------|
| 1 | - | - | - |
| 2 | - | - | - |
| 3 | 058608-000 | DECAL - LOWER CONTROL BOX | 1 |
| 4 | - | - | - |
| 5 | 058860-000 | DECAL - HAND HAZARD | 3 |
| 6 | 057385-000 | HAZARD TAPE (900mm LONG) | 8 |
| 7 | 058609-000 | DECAL - 'UPRIGHT LOGO' | 2 |
| 8 | 057339-001 | DECAL - PLASTIC PUSH RIVET | 2 |
| 9 | 058838-000 | E.U. NAMEPLATE | 1 |
| 10 | 058836-000 | V.I.N. PLATE | 1 |
| 11 | - | - | - |
| 12 | - | - | - |
| 13 | 058607-000 | DECAL - UPPER CONTROL BOX | 1 |
| 14 | - | - | - |
| 15 | - | - | - |
| 16 | - | - | - |
| 17 | 057387-000 | DECAL - UPPER QUADRAPOWER | 1 |
| 18 | 057507-005 | DECAL - UNIT WEIGHT 1500kg | 1 |
| 19 | - | - | - |
| 20 | - | - | - |
| 21 | - | - | - |
| 22 | 057507-010 | DECAL - ARROW | 2 |
| 23 | - | - | - |
| 24 | 057507-027 | DECAL - MACHINE NOT INSULATED | 2 |
| 25 | 057420-002 | DECAL - ACTION ON ALARM | 2 |
| 26 | 057507-002 | DECAL - EMERGENCY LOWERING | 2 |
| 27 | 057416-002 | DECAL - BEFORE TOWING | 1 |
| 28 | 057418-002 | DECAL - STOW OUTRIGGERS | 2 |
| 29 | 058186-002 | DECAL - ON/OFF UPPER CONTROLS | 1 |
| 30 | 057507-025 | DECAL - MACHINE GENERAL INSTR. | 2 |
| 31 | 057507-031 | DECAL - S.W.L. LARGE | 1 |
| 32 | 057507-026 | DECAL - EXPLOSION HAZARD | 2 |
| 33 | 057507-024 | DECAL - BATTERY FLUID LEVEL | 2 |
| 34 | 057417-012 | DECAL - OUTRIGGER LOWERED | 4 |
| 35 | 058992-002 | DECAL - BOOM LOCK PIN | 1 |
| 36 | 057507-001 | DECAL - EMERGENCY STOP | 2 |
| 37 | 057507-007 | DECAL - MAX SIDE LOAD | 1 |
| 38 | 057507-021 | DECAL - BUBBLE LEVEL | 1 |
| 39 | 057507-022 | DECAL - BEFORE MAINTENANCE | 1 |
| 40 | 057507-023 | DECAL - HYDRAULIC OIL | 1 |

Section 7.2



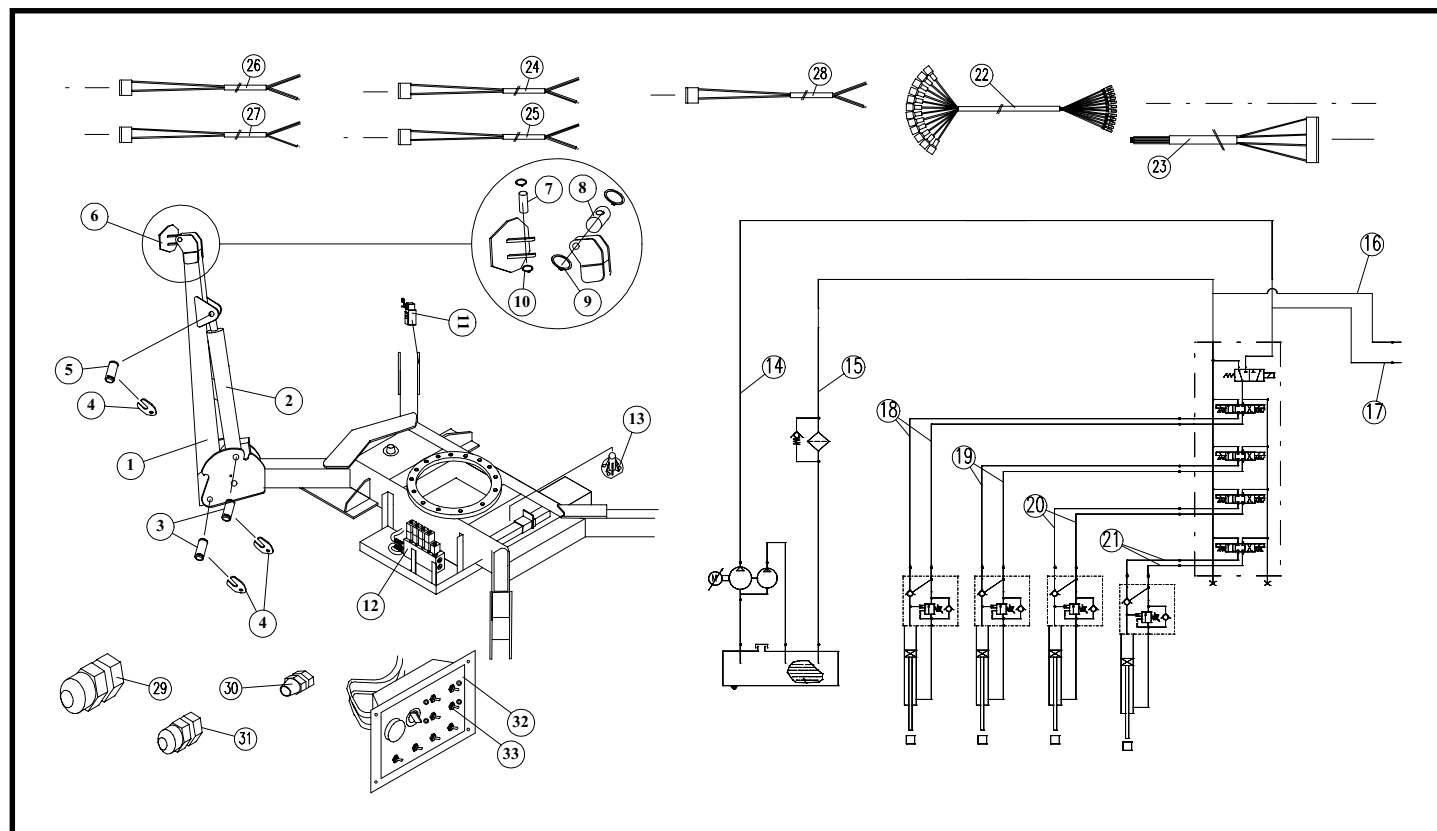
CONVERSION TO HYDRAULIC OUTRIGGERS - OPTION

Manual Outriggers Only

500124-000

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|--|------|
| 1 | 500032-000 | OUTRIGGER WELDMENT | 4 |
| 2 | 500058-000 | OUTRIGGER CYLINDER | 4 |
| 3 | 057199-000 | OUTRIGGER PIVOT PIN | 8 |
| 4 | 058056-000 | PIN LOCK PLATE | 12 |
| * | 056060-020 | BOLT M10X20mm | 12 |
| * | 056021-010 | WASHER 10mm | 12 |
| 5 | 058055-002 | OUTRIGGER CYLINDER PIN (ROD END) | 4 |
| 6 | 500033-000 | OUTRIGGER FOOT PAD | 4 |
| 7 | 500061-000 | FOOT PAD PIVOT PIN SMALL | 4 |
| 8 | 500060-000 | FOOT PAD PIVOT PIN LARGE | 4 |
| 9 | 057032-000 | CIRCLIP 35mm | 8 |
| 10 | 057577-000 | CIRCLIP 20mm | 8 |
| 11 | 058269-000 | OUTRIGGER LIMIT SWITCH | 4 |
| * | 057022-025 | M4x25mm SOCKET HEAD BOLT | 8 |
| 12 | 058180-010 | OUTRIGGER MANIFOLD BLOCK ASSY. | 1 |
| 13 | 058912-000 | TILT SENSOR | 1 |
| 14 | 500104-000 | HOSE ASSY, 3/8" M1T 400mm BK-BK @ 90° | 1 |
| | | PUMP TO T JUNCTION | |
| 15 | 500105-000 | HOSE ASSY, 1/2" M1T 85mm B90-B90 @ 180° | 1 |
| | | T JUNCTION TO FILTER | |
| 16 | 500114-000 | HOSE ASSY, 1/2" M1T 1200mm BF-BF | 1 |
| | | RETURN LINE FROM MAIN MANIFOLD TO T JUNCTION | |
| 17 | 500115-000 | HOSE ASSY, 3/8" M1T 1100mm BF-BF | 1 |
| | | PUMP-T JUNCTION-MAIN MANIFOLD | |
| 18 | 500116-000 | HOSE ASSY, 1/4" M1T 2080mm BF-BANJO | 2 |
| | | OUTRIGGER MANIFOLD TO O.R. F.R. | |

| ITEM | PART NO. | DESCRIPTION | QTY. |
|------|------------|-------------------------------------|------|
| 19 | 500117-000 | HOSE ASSY, 1/4" M1T 1530mm BF-BANJO | 2 |
| | | OUTRIGGER MANIFOLD TO O.R. F.L. | |
| 20 | 500118-000 | HOSE ASSY, 1/4" M1T 2080mm BF-BANJO | 2 |
| | | OUTRIGGER MANIFOLD TO O.R. R.R. | |
| 21 | 500119-000 | HOSE ASSY, 1/4" M1T 1480mm BF-BANJO | 2 |
| | | OUTRIGGER MANIFOLD TO O.R. R.L. | |
| 22 | 500085-004 | HARNESS ASSY. | 1 |
| | | - TO OUTRIGGER SOLENOIDS | |
| 23 | 500085-005 | HARNESS ASSY. | 1 |
| | | - TO LOWER CONTROL BOX | |
| 24 | 500085-016 | HARNESS ASSY. | 1 |
| | | - TO OUTRIGGER LIMIT SWITCH F.R. | |
| 25 | 500085-017 | HARNESS ASSY. | 1 |
| | | - TO OUTRIGGER LIMIT SWITCH R.R. | |
| 26 | 500085-018 | HARNESS ASSY. | 1 |
| | | - TO OUTRIGGER LIMIT SWITCH F.L. | |
| 27 | 500085-019 | HARNESS ASSY. | 1 |
| | | - TO OUTRIGGER LIMIT SWITCH R.L. | |
| 28 | 500085-014 | HARNESS ASSY. | 1 |
| | | - TO BOOM REST LIMIT SWITCH | |
| 29 | 057332-001 | GLAND NUT, LARGE | 1 |
| 30 | 057308-000 | GLAND NUT, SMALL | 4 |
| 31 | 057332-000 | GLAND NUT, MEDIUM | 2 |
| 32 | 058608-000 | DECAL - LOWER CONTROL BOX | 1 |
| 33 | 057311-000 | TOGGLE SWITCH | 4 |



OPTION LIST

Manual & Hydraulic Outrigger Versions

| ITEM | PART NO. | DESCRIPTION |
|------|------------|---|
| 1 | 500125-000 | TL38 OPTION, POWER TO PLATFORM 110V |
| 2 | 500125-001 | TL38 OPTION, POWER TO PLATFORM 220V |
| 3 | 500126-000 | TL38 OPTION, SPARE WHEEL |
| 4 | 058256-000 | TL38 OPTION, AMBER FLASHING BEACON |
| 5 | 500127-000 | TL38 OPTION, SPOTLIGHT IN CAGE |
| 6 | 058280-000 | TL38 OPTION, HOURMETER |
| 7 | 500128-000 | TL38 OPTION, CRASHBARS (FRANCE) |
| 8 | 500129-000 | TL38 OPTION, CRASHBARS (HOLLAND) |
| 9 | 057341-000 | TL38 OPTION, TILT ALARM FOR MANUAL MACHINES |
| 10 | 057343-000 | TL38 OPTION, TOWHITCH CABLE KIT |
| 11 | 500130-000 | TL38 OPTION, HEAVY DUTY TOWHITCH & JOCKEY WHEEL |

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.

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