snorkel

TL49J

CE

PARTS & SERVICES

MANUAL

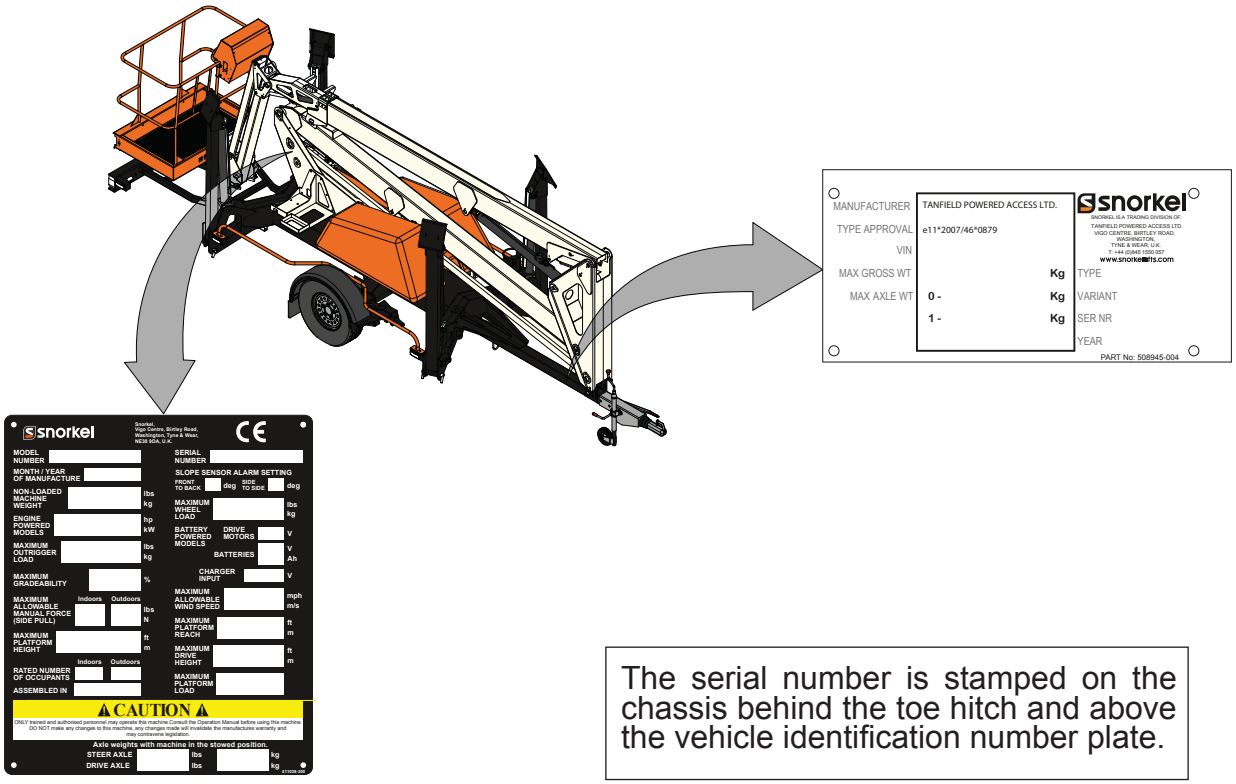
Part Number 513868-200
June 2016

Serial Number TL49-01-008562 and after

TL49J

ENGLISH

When contacting Snorkel for service or parts information, be sure to include the model and serial numbers from the equipment name plate. Should the name plate be missing, the serial number is also stamped on top of the chassis above the front axle pivot.



The serial number is stamped on the chassis behind the toe hitch and above the vehicle identification number plate.

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TL49J SERVICE AND PARTS MANUAL

FOREWORD

This manual is divided into six sections namely;

SECTION 1: INTRODUCTION

General description and machine specifications.

SECTION 2: OPERATION AND SPECIFICATION

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

SECTION 3: SERVICE AND REPAIR

Preventative maintenance and service information.

SECTION 4: TROUBLESHOOTING

Causes and solutions to typical problems.

SECTION 5: SCHEMATICS

Schematics and valve block diagrams with description and location of components.

SECTION 6: ILLUSTRATED PARTS BREAKDOWN

Complete parts list with illustrations.

SPECIAL INFORMATION

NOTE: **Provides helpful information.**

WORKSHOP PROCEDURES

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at any time without notice.

CAUTION

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

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

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

Anyone using service procedures or tools whether or not recommended by Snorkel must satisfy themselves thoroughly that neither personal saftey nor machine safety will be jeopardized.

INTRODUCTION

PURPOSE

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

SCOPE

The manual includes procedures for proper operation, specifications, service and repair of this product as well as recommended maintenance schedules, troubleshooting, schematics and illustrated parts breakdown.

GENERAL DESCRIPTION

The work platform consists of the platform, upper and lower controls, elevating assembly, outriggers and a chassis.

WARNING

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

Features of the TL49J is shown in Figure 1-1.

1. Platform
2. Upper controls
3. Elevating assembly
4. Lower controls
5. Outriggers
6. Chassis

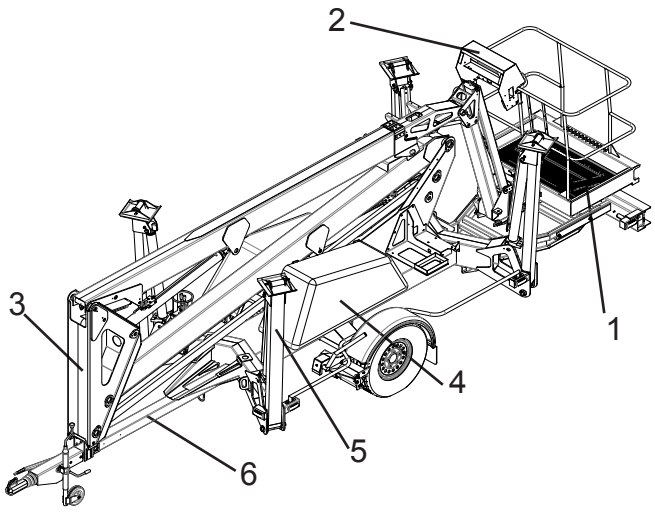


Figure 1-1: Work platform

INTRODUCTION

PLATFORM

The platform consists of guardrails which prevents personnel from falling of the platform. The guardrail system consists of the top rail, mid rail, lock rail strap and toeboards around the sides of the platform.

UPPER & LOWER CONTROLS

These are controls located on the chassis and platform and used to operate the machine. A complete explanation of control functions can be found in section 2.

ELEVATING ASSEMBLY

The platform is raised and lowered by the elevating assembly. The hydraulic pump driven by the engine, powers the 3 - stage lift cylinders.

CHASSIS

The chassis is a structural frame that supports all the components of the TL49J work platform.

PURPOSE OF EQUIPMENT

The objective of the work platform is to provide a quickly deployable, variable height work platform to elevate personnel and materials to overhead work areas.

SPECIAL LIMITATIONS

Elevating of the work platform is limited to firm, even surfaces only.

DANGER

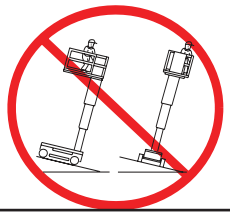
*The elevating function shall **ONLY** be used when the work platform is level and on a a firm surface.*

OPERATION AND SPECIFICATION

SAFETY RULES

WARNING

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

ELECTROCUTION HAZARD	TIP OVER HAZARD	COLLISION HAZARD	FALL HAZARD	TRAPPING/CRUSHING HAZARD
				
THIS MACHINE IS NOT INSULATED	NEVER ELEVATE THE PLATFORM OR DRIVE THE MACHINE WHILE ELEVATED UNLESS THE MACHINE IS ON A FIRM LEVEL SURFACE	NEVER POSITION THE PLATFORM WITHOUT FIRST CHECKING FOR OVERHEAD OBSTRUCTIONS OR OTHER HAZARDS	NEVER CLIMB, STAND OR SIT ON PLATFORM GUARDRAILS OR MID RAIL	BEWARE OF CRUSHING HAZARD WHEN HOLDING HANDRAILS WHILE THE PLATFORM IS MOVING IN CLOSE PROXIMITY TO OTHER OBJECTS

- **USE OF THE AERIAL WORK PLATFORM**: This aerial work platform is intended to lift a person or persons and their tools including material needed for a job. The work platform is designed to be used for repair and assembly jobs **ONLY** at overhead work places (ceilings, cranes, roof structures, buildings, etc.).

  The use and operation of the aerial work platform as a lifting tool or a crane is **prohibited!**

  Climbing up the railing of the platform, standing on or stepping from the platform unto buildings, steel or prefab concrete structures etc is **prohibited!**

  NEVER use the machine if damaged, not functioning properly, has damaged or missing decals.

  NEVER attach notice boards etc. to the platform as this will increase the wind loading.
- **INSULATION**: The aerial work platform is not insulated. It is imperative to keep a safe distance from live parts or electrical equipment. **DO NOT** get closer than the minimum distance recommended by the “National Regulations”.
- **PLATFORM CAPACITY**: Exceeding the specified permissible maximum load is **prohibited!** Refer to platform capacity on page 24 for details.
- **MANUAL FORCE**: **NEVER** exceed the manual force allowed for this machine. Refer to special limitations on page 9 for details.
- **LOAD DISTRIBUTION**: Ensure that all loads are distributed evenly on the platform.
- **SURVEILLANCE**: **NEVER** operate the machine without first surveying the work area for surface hazards such as holes, drop-offs, bumps, curbs or debris and avoiding them.
- **WHEEL LOAD: OPERATE** the machine only on surfaces capable of supporting wheel load.
- **WIND SPEED**: **NEVER** operate the machine when the wind speed exceeds the machine’s wind speed rating. Refer to the Beaufort scale for details.
- **EMERGENCY STOP**: In case of an emergency, push the **EMERGENCY STOP** switch to de-activate all powered functions.
- **ALARM**: If the alarm sounds while the platform is elevated, **STOP** operation immediately and carefully lower the platform. Move the machine to a firm, level surface.
- **SWING GATE**: Dismantling the entry gate or other railing components is **prohibited!** Always make certain that the entry gate is closed and securely locked.

  It is **prohibited** to keep the entry gate in an open position when the platform is raised.

  Extending the height of the platform by placing ladders, scaffolds or similar devices on the platform is **prohibited!**
- **SERVICING: NEVER** perform service on machine while platform is elevated without blocking the elevating assembly. Refer to “maintenance” for details.
- **INSPECT**: the machine thoroughly for cracked welds, loose or missing hardware, hydraulic leaks, loose wire connections and damaged cables or hoses before usage.
- **DECALS: VERIFY** that all labels are in place and legible before using the machine.
- **BATTERIES**: **NEVER** charge batteries near sparks or open flame. Charging batteries emit explosive hydrogen gas.
- **STORAGE**: **AFTER USE**, secure the work platform from unauthorised use by turning the key switch off and removing the key.
- **HARNESS**: Harness attachment points are provided on the platform and the manufacturer recommends the usage of a fall restraint harness especially where required by national safety regulations.

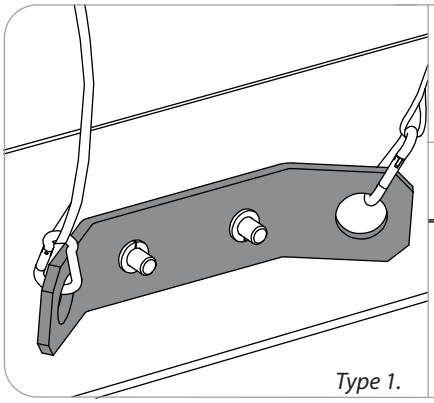
  Modifications to the aerial work platform are prohibited or permissible only at the approval of the manufacturer.

SAFETY NOTICE

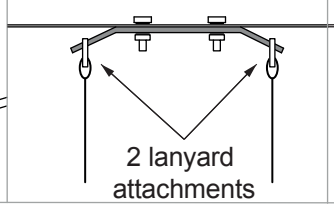
Harness attachment points are provided in the platform and the manufacturer recommends the usage of a fall restraint harness, especially where required by national safety regulations.

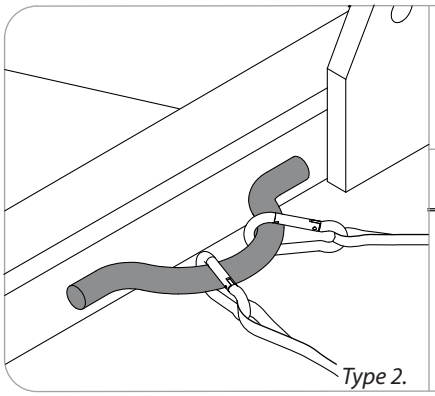
All harness attachment points on SNORKEL vehicles have been tested with a force of 3,650 lbs (16.3 KN) per person.

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

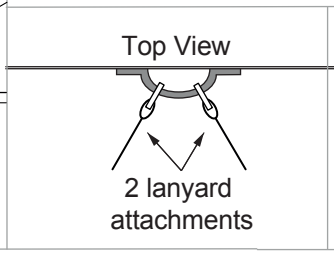


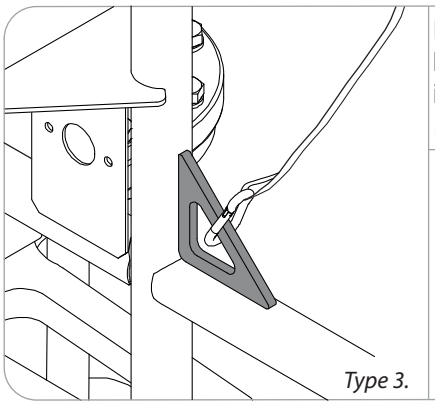
Harness attachment point ***Type 1.*** is rated for one lanyard attachment per loop as shown in the illustrations depending upon platform occupancy rating *(see operators manual & decals).*



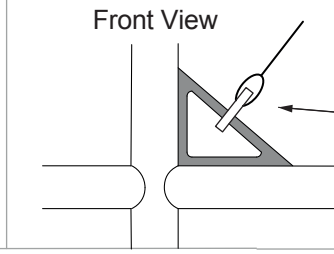


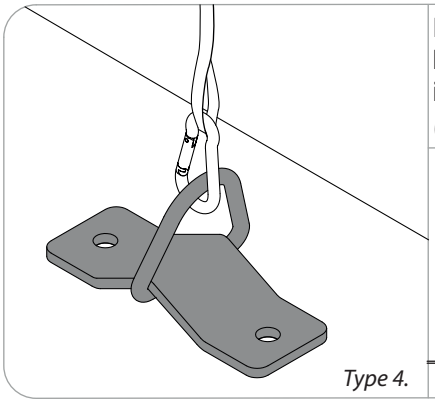
Harness attachment point ***Type 2.*** is rated for two lanyard attachments per loop as shown in the illustrations depending upon platform occupancy rating *(see operators manual & decals).*



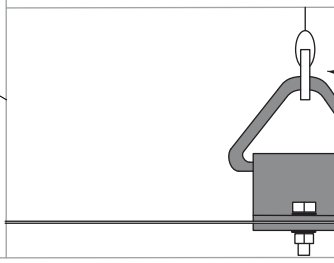


Harness attachment point ***Type 3.*** is rated for one lanyard attachment per loop as shown in the illustrations depending upon platform occupancy rating *(see operators manual & decals).*





Harness attachment point ***Type 4.*** is rated for one lanyard attachment per loop as shown in the illustrations depending upon platform occupancy rating *(see operators manual & decals).*



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

SAFETY NOTICE

NOTE:

1. To bypass any safety equipment is **prohibited** and presents a danger for the person/persons on the aerial work platform and in its working range.
2. Modification to the aerial work platform is **prohibited** or permissible only at the approval of Snorkel.
3. The driving of MEWP'S on the public highway is subject to national traffic regulations.
4. It is important to ensure that the machine meets the requirements of stability during use, transportation, assembly, dismantling when out of service, testing or foreseeable breakdowns.
5. Never use a machine that is damaged or not functioning properly. Verify that all labels are in place and legible before using.

Model
Modello
Modell
Verticaal model
Modele
Malli
Modelo

TL49J

Serial number
Serienummer
Matricola
Numero de serie
Sarajanumero
Matricola

TL49J-01-008577

EC Declaration of Conformity of Machinery 2006/42/EC
EC-Konformitätserklärung für Maschinen 2006/42/EC
Declaration De Conformite CE pour les Machines 2006/42/EC
Declaracion De Conformidad CE Para Maquinaria 2006/42/EC
Dichiarazione Di Conformità CE Per Le Macchine 2006/42/EC
CE Conformiteitsverklaring voor Machinerie 2006/42/EC
EU Deklaration Avseende Överensstammelse För Maskinutrustning 2006/42/EC
EF-Samsvarserklaering For Maskiner 2006/42/EC
EF-Overensstemmelseserklaering for Maskiner 2006/42/EC
EU Vaatimustenmukaisuusvakuutus 2006/42/EC

Manufacturer
Hersteller
Fabrikant
Produsent
Tillverkare
Valmistaja
Fabbricante
Fabricante
Fabricant

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Holder of Technical File
Inhaber des technischen Dossiers
Titulaire du dossier technique
Titular del expediente técnico
Houder van een technisch dossier
Innehavaren av technichal fil
Voer tekst in om hier te vertalen
Haltija technichal tiedosto
Titolare del fascicolo technichal
Innehaveren av technichal fil

Snorkel
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NE38 9DA
England

Authorized Representative
Autorisierte Vertretung
Representant autorise
Representante autorizado
Mandatario
Erkend vertegenwoordiger
Auktoriserad representant
Autorisert representant
Represenentant
Valtuutettu edustaja

Stuart Campbell (Design Manager)
Vigo Centre, Washington
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FAX: +44 (0) 845 1557 756

Signed for Snorkel

Manufacturing Quality Manager

Jan-16

Date
Datum
Fecha
Data
Dato
Paivamaara

Description .....Aerial Work Platform
Bezeichnung .....Arbeitsbühne
Description.....Plate-forme elevatrice de personnel
Descripcion .....Platforma aerea de trabajo con motor
Descrizione .....Piattaforma di sollevamento motorizzata
Beschrijving .....Mechanisch aangedreven werkplatform
Beskrivning .....Höj-och sänkbar arbetsplattform
Beskrivelse .....Selvgående arbetsplattform
Beskrivelse .....Motordrevet lofteplatform
Kuvaus.....Konevoimalla toimiva nostolava
Selvgående personarbetslift

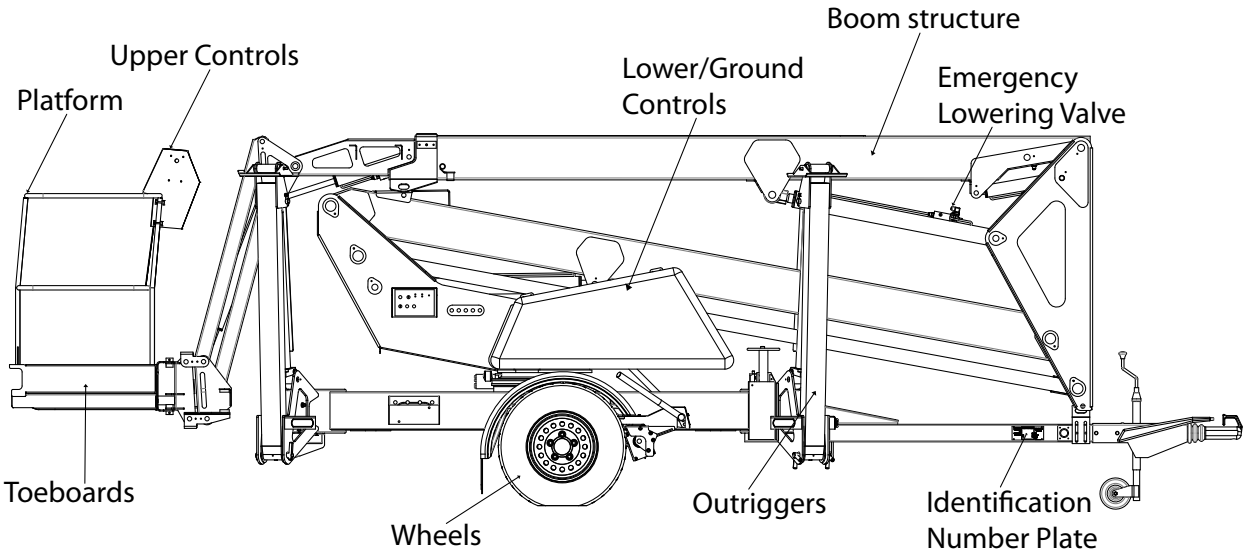
CE

CONTENTS

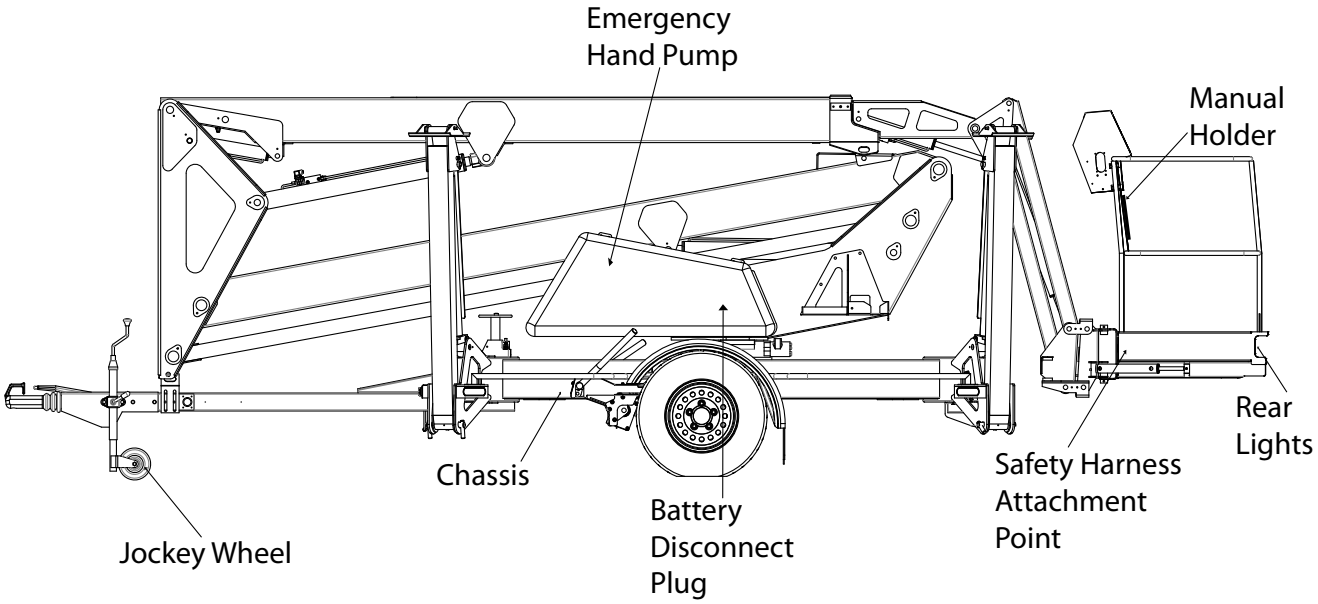
INTRODUCTION

This manual covers the operation of the TL49J work platform. This manual must be stored on the machine at all times.

GENERAL DESCRIPTION



Right Side



Left Side

Figure 2-1: Work platform

SPECIAL LIMITATIONS

Elevating the work platform is limited to firm surfaces only. The aerial platform can tip over if it becomes unstable.

DANGER

*The elevating function shall **ONLY** be used when the work platform is levelled and on a firm surface.*

PLATFORM CAPACITY

The platform capacity for the machine including occupants is determined by model and options. This is listed under “specifications” on page 2-32.

DANGER

***DO NOT** exceed the maximum platform capacity or the platform occupancy limits for this machine.*

MANUAL FORCE

Manual force is the force applied by the occupants to objects such as walls or other structures outside the work platform.The maximum allowable manual force is limited to 200N (45 lbs.) of force per occupant with a maximum of 400N (90 lbs.) for two or more occupants.

DANGER

***DO NOT** exceed the maximum amount of manual force for this machine.*

BEAUFORT SCALE

Beaufort Scale	m/Sec	Ground Conditions
3	3.5-5	*Leaves and small twigs in constant motion; wind extends light flag.*
4	6-8	*Raises dust and loose paper; small branches are moved*
5	9-10	*Small trees in leaf begin to sway; crested wavelets on inland waterways.*
6	11-13	*Large branches in motion; umbrellas used with difficulty.*
7	14-17	*Whole trees in motion; inconvenience felt when walking against wind.*
8	18-21	*Breaks twigs off trees; generally impedes progress.*
9	22-24	*Slight structural damage occurs (chimney pots and slates removed)*

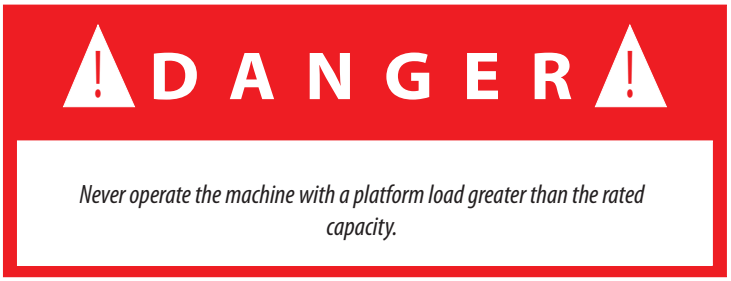
Table 2-1: Beaufort scale

Never operate the machine when wind speed exceeds 12.5 m/s (28 mph) as indicated on the Beaufort scale 6.

PLATFORM OVERLOAD ALARM

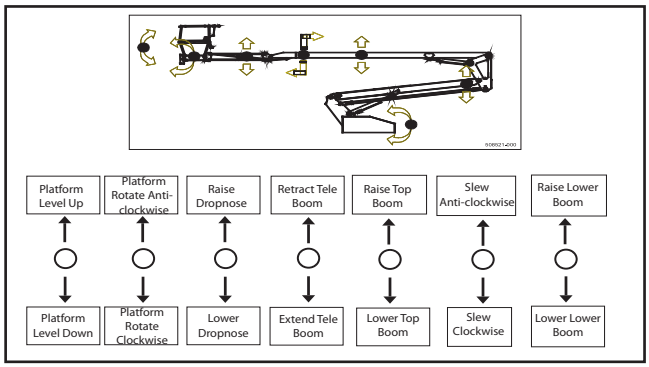
If a load greater than 100% of safe working load is lifted, the overload alarm on the platform will sound. All machine functions will cease to operate.

To operate the machine, a load equal to or less than the safe working load must be placed on the platform. To re-start the machine functions, the excess load must be first removed to stop the alarm from sounding.



PLATFORM CONTROLS AND INDICATORS

1. Emergency lowering switch
2. Platform raise/lower button
3. Platform raise/lower lever
4. Emergency stop button



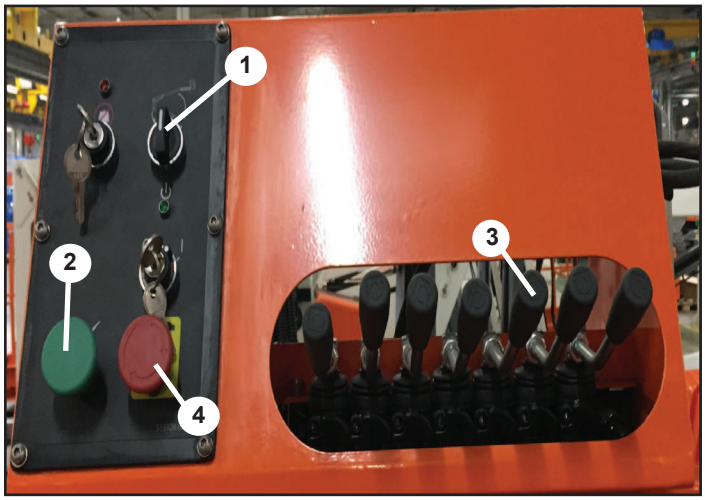
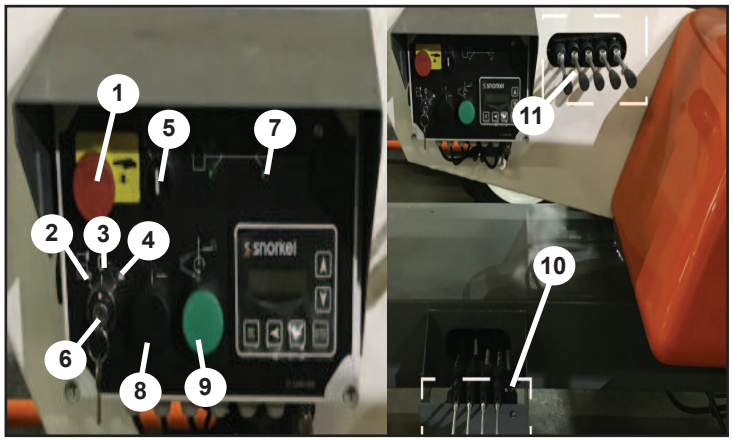


Figure 2-2: Platform controls and indicator locations

CHASSIS CONTROLS AND INDICATORS

1. Emergency stop button
2. Upper controls
3. OFF position
4. Lower controls
5. Emergency lowering switch
6. Control select/Ground operation switch
7. Outrigger LED display
8. Outrigger raise/lower enable button
9. Platform raise/lower enable button
10. Outrigger raise/lower levers
11. Platform raise/lower levers



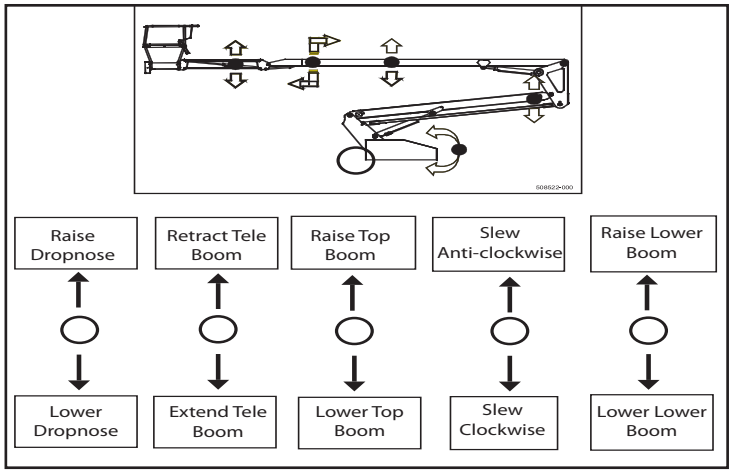


Figure 2-3: Chassis controls and indicator locations

PRE-OPERATION SAFETY INSPECTION

Perform a pre start inspection at the beginning of each shift before using the aerial platform on the job. The inspection site must have a smooth and level surface.

WARNING

DO NOT *operate the aerial platform if it is damaged or malfunctioning*

OPERATOR'S MANUAL

The manual holder is located underneath the platform controls on the platform (refer to Figure 2-4).

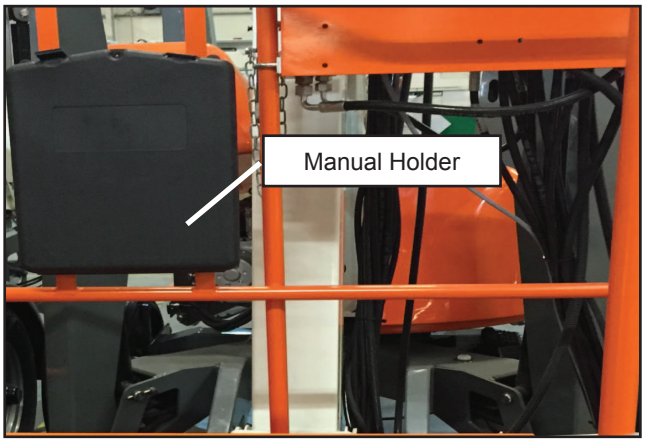


Figure 2-4 – Operator's Manual Holder

To inspect the operator's manual and manual holder:

1. Make certain the Operator's Manual holder is securely fastened in place.
2. Check to see that the proper Operator's Manual is in the holder.
3. Check to see that the manual is complete with all pages intact and in readable condition.

ELECTRICAL SYSTEM

Electrical power is supplied from four, 6 volt batteries. The batteries supply 24 volt DC electrical power to operate the aerial platform control system. The battery tray is located on the left side of the aerial platform.

WARNING

DO NOT *not smoke or permit open flames or sparks when checking the batteries.*

CAUTION

Electric shock or component damage may result from contact with energised conductors. Use caution when working with any electrical device.

For optimal battery performance, the battery fluid level must be maintained and the battery connections must be kept clean.

BATTERY TERMINALS

To inspect the battery terminals:

1. Check the top of the battery, the terminals and cable ends (refer to Figure 2-5). They should be clean and free of corrosion.
2. If necessary, clean the top of the battery. Clean the terminals and cable ends with a wire brush or terminal cleaning tool.
3. Make sure all cable ends are securely fastened to the terminals.

BATTERY FLUID LEVEL

To inspect the battery fluid level:

1. Remove the caps from the batteries (refer to Figure 2-5).

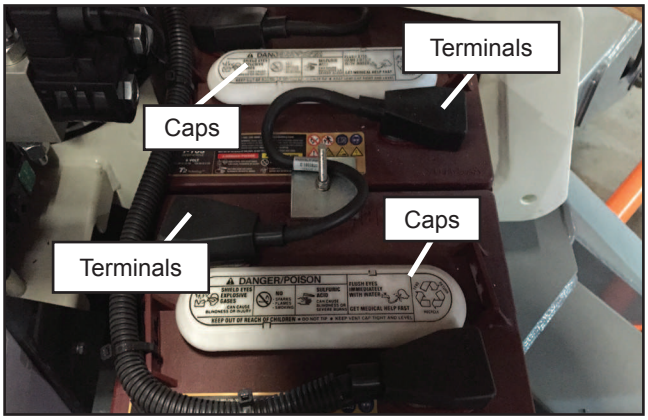


Figure 2-5 – Battery tray

2. Visually check the battery fluid level making sure the level is ¼″ (6 mm) above the plates.
3. If necessary, add distilled water.

Note
Use only distilled water when refilling the battery. Tap water may contain metallic solids such as iron which can reduce the life of the battery.

4. Replace the caps on the battery. The caps must be in place and tight during machine operation and battery charging.

SAFETY SWITCHES

To inspect the safety switches:

1. Visually check that the platform overload switch is free from damage.
2. Check all limit switch arms are fee from damage and move easily.
3. Check to make sure the platform does not extend when outriggers are raised.

4. Check to make sure outrigger controls do not work when the outriggers are deployed under load and the top or bottom boom is raised approximately 2” (50 mm).

BATTERY CHARGER

Inspect the battery charger (refer to Figure 2-6) to ensure that it is operating properly.

1. Plug the charger into a source of power.
2. Observe the LED’s on the charger to determine the charger status. If necessary, refer to the charger decal or to the battery charge indicator in chapter 5 to determine when the batteries are fully charged.

Figure 2-6 – LED Charge Indicator

3. Unplug the charger

DAMAGED OR LOOSE FITTINGS

Visually inspect the machine for signs of wear and tear, damage, loose or missing parts.

WHEELS

Check tyres are at the correct pressure of 76 psi(5.25 bar) and that the wheel nuts are tightened using the correct torque settings 147.5 ft lbs(200 Nm).

CABLES AND WIRING HARNESS

To inspect the cables and wiring harness:

1. Visually inspect all cables and wiring for wear and/or physical damage such as loose connections, broken wires, and frayed insulation.
2. Check the wiring in areas where a change in routing direction may cause them to become pinched.
3. Make sure the cables and wires are properly routed to avoid sharp edges, pinching, and scuffing.

HYDRAULIC SYSTEM

Hydraulic power is supplied from three stage hydraulic pumps.

DANGER

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

The hydraulic reservoir, pump, and filter are located in the hydraulic tray on the left side of the chassis. Open the cover to inspect the hydraulic components.

FLUID LEVEL

To inspect the fluid level:

1. Make sure the aerial platform is fully stowed on a level surface. Open the hydraulic tray cover and visually check the fluid level using the hydraulic level indicator attached to the hydraulic tank (refer to Figure 2-7). Some machines may have a fill cap with a dipstick. The fluid must be visible on the dipstick.

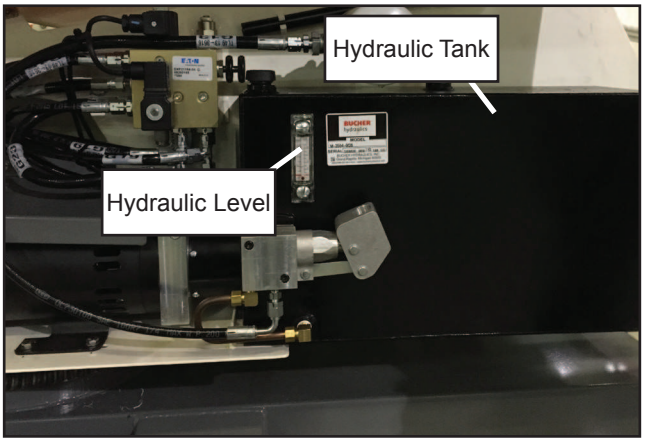


Figure 2-7 – Hydraulic Tank

CAUTION

Not all hydraulic fluid is suitable to use in the hydraulic system. Some have poor lubricating characteristics and may increase component wear. Only use hydraulic fluid as recommended.

2. If necessary, add fluid of the proper type.

Note
Refer to specifications on page 2-32 for the proper type and grade of hydraulic fluid to use. The need to regularly add fluid indicates a leak that should be corrected.

3. Replace the cap making sure it is secured in place.

HOSES, TUBES AND FITTINGS
To inspect the hoses, tubes and fittings:

1. Inspect all hydraulic hoses, tubes, and fittings for wear, leakage, or damage.
2. Make sure the hoses are properly routed to avoid sharp edges, kinking, and scuffing.
3. Inspect the tubes for dents or other damage that may restrict fluid flow.
4. Make sure all hoses and tubes are held firmly in their support brackets.
5. Check under the chassis for fluid that has leaked. Hydraulic fluid leaks are easily visible on the ground.

LOWER CONTROL STATION
With no personnel or materials on the platform, test the operation of each control from the lower controls (refer to Figure 2-8)

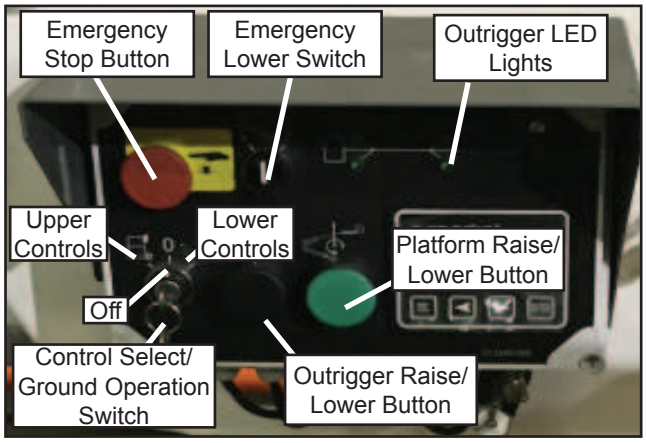


Figure 2-8 – Lower Control Station

OPERATING CONTROLS
Use the following procedure to operate and test the machine from the lower controls:

1. Plug the battery disconnect (refer to Figure 2-9).
2. At the lower controls, twist and pull the emergency stop switch outwards to the ON position.
3. Turn the control select switch to lower controls (turn to the right).

Figure 2-9 – Battery Disconnect

WARNING

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

1. Pressing down on the platform raise/lower button, test the operation of the platform raise/lower levers in both directions.
2. Unplug the battery disconnect. The platform should not raise or lower with the disconnect in this position.

EMERGENCY SLEW
Use the following procedure to test the emergency lowering.

With the top and bottom booms each raised approximately 20”(500 mm) and the unit switched off, check:

- The emergency slew can be operated using a 17mm socket or spanner together with a lever.

EMERGENCY LOWERING VALVES
Use the following procedure to test the emergency lowering.

With the top and bottom booms each raised approximately 20”(500 mm) and the unit switched off, check:

- The emergency lowering valves located on the lift cylinders lower the boom when pushed in a slow and controlled manner and the boom movement is stopped on releasing the valve.

EMERGENCY STOP
To test the emergency stop button from the lower controls:

1. Push the emergency stop button inward to turn off electrical power.
2. Test the lower control functions to make sure they do not operate with the emergency stop in this position.

EMERGENCY LOWERING SWITCH
To test the Emergency Lowering Switch from the lower controls:

Note
The emergency lowering switch relies on the electrical system. The switch will not function if the electrical system is faulty.

- Turn the switch clockwise to lower the top boom.
- Turn the switch anti-clockwise to lower the lower boom.
- Check that the Emergency Lowering Switch does not work with the battery disconnect plug unplugged.

EMERGENCY HAND PUMP
With the outriggers down, under load, the machine level with the wheels clear of the ground, turn the control select switch to the lower controls (turn switch to the right).

- Insert the hand pump lever into the pump shaft.

- Move the platform raise/lower levers to the required direction of movement and operate the hand pump.

- Continue pressing down on the platform raise/lower lever when the machine starts to lower.

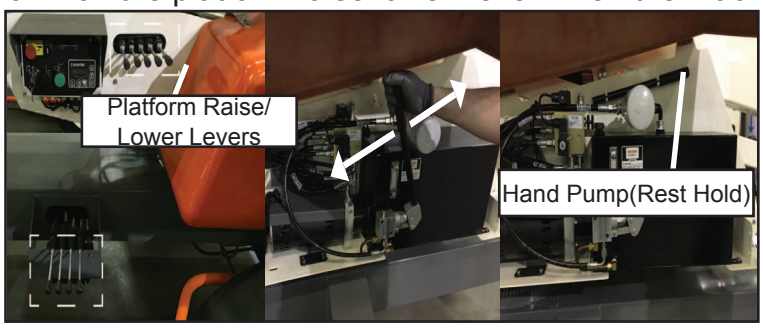


Figure 2-10 – Emergency hand pump operation

STRUCTURES

Visually inspect all weldments and related components. It is important to inspect the fasteners that connect the components.

WELDMENTS

To inspect weldments:

1. Visually inspect all weldments for abnormal wear, abrasion or deformation that could cause interference between moving parts.

2. Inspect the welds on the structural components. The area to be inspected should be clean and free of dirt and grease.

3. Look for visible cracks in the welds and at the weld to parent material joints. A bright light may be used to provide adequate visibility of the inspection area.

4. Pay close attention to welds in areas where changes in cross section takes place near the attachment points of highly loaded components.

FASTENERS

To inspect the fasteners:

1. Visually inspect all fasteners to see that none are missing or loose.

2. Inspect all of the bolts, nuts, rollpins, collars, and snap rings. They should all be present, tight, and not damaged in any way.

UPPER CONTROL STATION

Inspect the platform and upper controls only if all functions operated properly from the lower controls.

GUARDRAIL SYSTEM

The guardrail system includes (refer to Figure 2-11):

- A top rail
- A mid rail
- Drop bar
- Toeboards around the sides of the platform

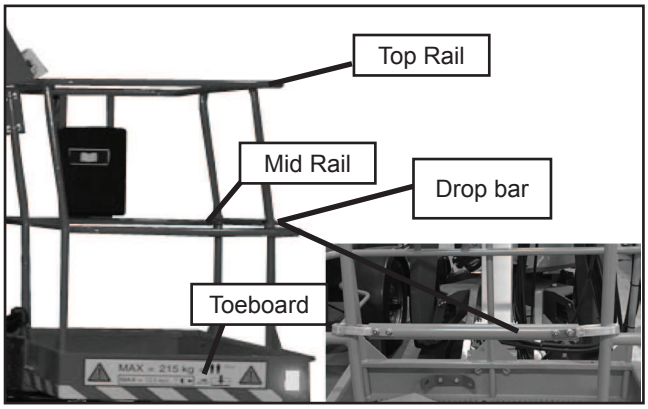


Figure 2-11 – Guardrail System

The lock rail allows for access to the platform. The lock rail must be securely closed except when personnel are entering or leaving the platform.

To inspect the guardrail system:

1. Visually inspect all components of the guardrail system. Make sure the rails and toeboards are all in place and free of any damage or deformation.
2. Visually check the rail and toeboard welds for cracks.
3. Visually check all bolts and nuts fastening the platform and guardrails are in place. They must be present and not show any signs of looseness.
4. Inspect the entry doors to see that they swing freely and are not deformed in any way. Make sure the doors are secure when they are closed.

EMERGENCY LOWERING SWITCH
To test the Emergency Lowering Switch from the Upper controls:

Note
The emergency lowering switch relies on the electrical system. The switch will not function if the electrical system is faulty.

- Turn the switch clockwise to lower the top boom.
- Turn the switch anti-clockwise to lower the lower boom.
- Check that the Emergency Lowering Switch does not work with the battery disconnect plug unplugged.

EMERGENCY STOP
To test the emergency stop button from the upper controls:

1. Push the emergency stop button inward to turn off electrical power.
2. Test the upper control functions to make sure they do not operate with the emergency stop in this position.

The aerial platform may be operated from either the lower or upper controls.

The platform rated work load is the total weight of the personnel and equipment that may be lifted in the platform. The work loads are stated on the platform rating placard at the entrance to the platform.

DANGER

The aerial platform can tip over if it becomes unstable. Death or serious injury will result from a tip over accident. Do not exceed the capacity values indicated on the platform rating placard.

Capacity values indicate the rated lifting capacity but do not indicate aerial platform stability.

The operator bears ultimate responsibility for ensuring that the aerial platform is properly set up for the particular conditions encountered.

PREPARING FOR OPERATION

Use the following procedure to prepare the aerial platform for operation:

1. Perform a prestart inspection.
2. Connect the battery disconnect plug.
3. Close and latch the swing-out tray cover.

LOWER CONTROLS

The lower controls may be used for initial set up of the aerial platform and for testing and inspection. The lower controls can also be used to raise and lower both the outriggers and platform.

Use the following procedure to raise or lower the platform using the lower controls.

1. Twist and pull the emergency stop button outward (refer to Figure 2-12).

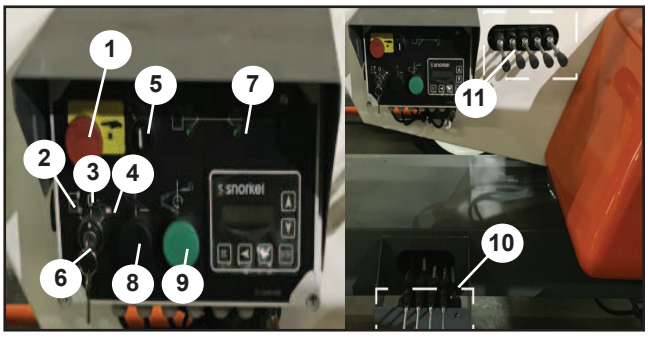


Figure 2-12 – Lower Control Station

1	**Emergency Stop Button**	**7**	**Outrigger LED Display**
2	**Upper Controls**	**8**	**Outrigger Raise/Lower Button**
3	**Off Position**	**9**	**Platform Raise/Lower Button**
4	**Lower Controls**	**10**	**Outrigger Raise/Lower Levers**
5	**Emergency Lowering Switch**	**11**	**Platform Raise/Lower Levers**
6	**Control Select/ Ground Operation Switch**		

2. Hold down on the platform raise/lower button.
3. Still holding the platform raise/lower button down, use the platform raise/lower control levers to raise/lower the platform.
4. Release either button to stop movement.

Use the following procedure to raise or lower the outriggers using the lower controls.

1. Hold down on the outrigger raise/lower button (refer to Figure 2-12).
2. Still holding the outrigger raise/lower button down, use the outrigger raise/lower levers to raise/lower the outriggers.
3. An alarm sounds as the outriggers lower or raise.

UPPER CONTROLS

The upper controls may be used for driving and positioning the aerial platform while on the job.

Before operating the upper controls, properly set up the aerial platform as described under Pre - operation.

Use the following procedure to operate the aerial platform from the upper controls:

1. From the lower controls, twist and pull the emergency stop button outward (refer to Figure 2-12).
2. Switch the control select/ground operation switch to the upper controls position.

Note
The upper controls will not operate while the control selector is in the lower position.

3. Enter the platform and secure the lock rail.
4. From the upper controls, twist and pull the emergency stop button outward (refer to Figure 2-13).

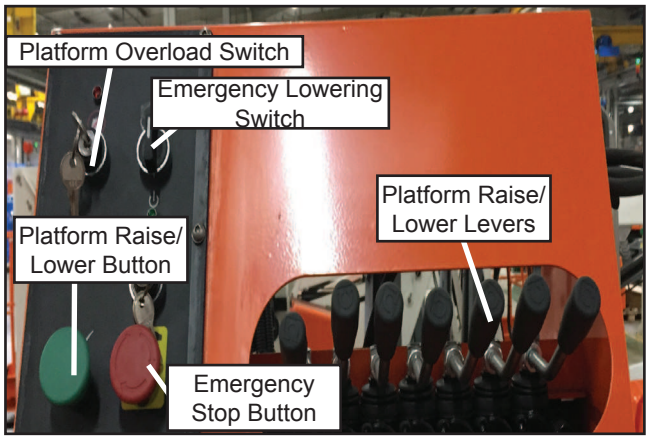


Figure 2-13 – Upper Controls

5. The aerial platform may be driven and the platform may be raised and lowered from the upper controls.
6. Hold down on the platform raise lower button.
7. Still holding the platform raise/lower button down, use the platform raise/lower levers to raise/lower the platform.
8. Release either the button or levers to stop movement.

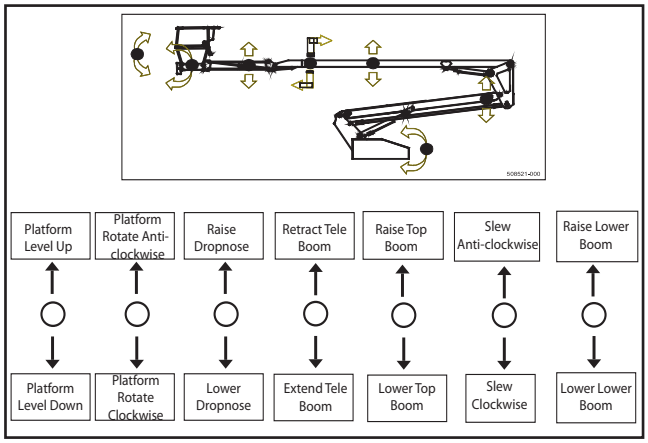


Figure 2-14 – Upper Controls Raise/Lower Levers

PLATFORM

Use care when entering and exiting the platform to avoid slipping and/or falling. Securely close the lock rail when the platform is occupied.

SIDE TRAY COVERS

Batteries and hydraulic components are enclosed in trays covered by a swing out cover (refer to Figure 2-15) on each side of the chassis.

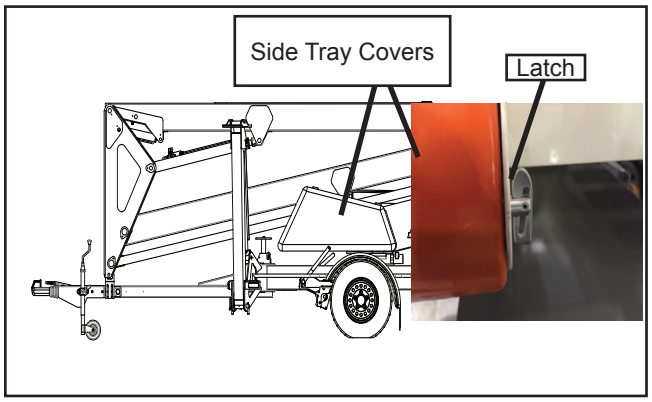


Figure 2-15 – Side Tray cover

- The battery tray is on the left side and contains four batteries.
- The right side of the chassis contains the battery charge indicator. The diagnostic center LCD display is also on this tray.
- The hydraulic tray on the right side of the chassis contains the hydraulic pump, reservoir and fluid filter.
- To open the tray, pull upward on the latch (step 1) and open the cover (step 2)(refer to Figure 15).
- The latched tray cover must be opened first to enable access to the battery tray.
- When closing the tray cover, reverse the process to lock it in place.

EMERGENCY PROCEDURE

The aerial platform may be lowered using the emergency lowering slew, hand pump or switch.

Use the following procedure to operate the emergency lowering system.

1. Immediately push the emergency stop button inward to disable the control system in the event of an emergency.
2. Locate the emergency lowering control.
3. Make sure there is nothing in the way to obstruct the platform when it lowers.
4. Stand clear of the boom structure.

EMERGENCY SLEW

A 17 mm socket together with a lever or spanner may be used to move the platform if there is a malfunction in the hydraulic or electrical system.

In the event of a failure, the machine can be manually slewed by moving the slew platform clockwise or anticlockwise by inserting the slew lever and rotating the gearbox by moving upwards and downwards.

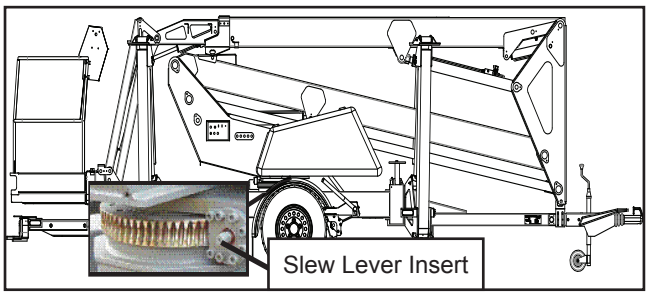


Figure 2-16 – Slew Lever Insert

EMERGENCY LOWERING VALVES

In the event of a power failure, the emergency lower valve on the ram can be used to lower the booms.

This process involves assistance from the ground.

- Operate the lower ram valve first because it is closer to the ground
- Press on the lowering valve button to initiate lowering and facilitate access to the top ram valve.

Note
Each emergency ram valve will automatically close when the button is released.

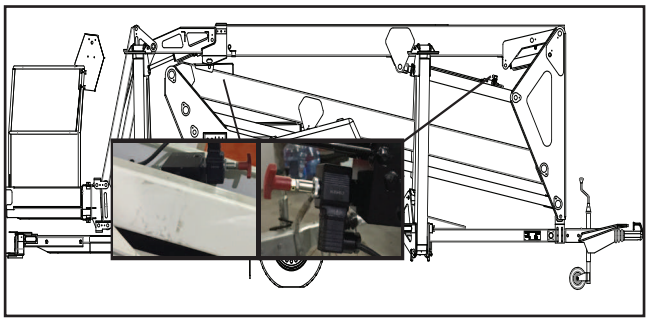


Figure 2-17 – Emergency Valve Location

DANGER

If the emergency lower is used due to a machine defect, do not use the machine. Contact your local Snorkel representative.

WARNING

If the emergency lower is used, the top and bottom booms must be fully extended then fully lowered before work can continue.
After emergency lowering, any further powered lowering could cause an airlock in the hydraulic system. This could cause the hydraulic operation to fail.
All booms must be fully extended/raised, then lowered before work can recommence.

EMERGENCY LOWERING HAND PUMP

The emergency hand pump lowering procedure is available from the lower control station. In the event of a power failure, the hand pump procedure to use is as follows:

- Insert the hand pump lever into the pump shaft (refer to Figure 2-18).
- Move the platform raise/lower lever to the required direction of movement and operate the hand pump.
- Continue pressing down on the platform raise/lower lever when the machine starts to lower.

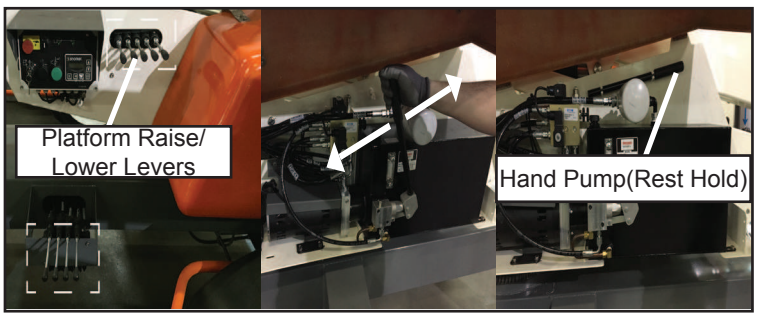


Figure 18 – Hand Pump Emergency Lowering Procedure

EMERGENCY LOWERING SWITCH

The Emergency lowering switch can be used to lower the platform from the lower controls in situations where the boom levers malfunction (refer to Figure 2-19).

Note
The emergency lowering switch relies on the electrical system. The switch will not function if the electrical system is faulty.

- Turn the switch clockwise to lower the top boom.
- Turn the switch anti-clockwise to lower the lower boom.

- Releasing the switch will stop the lowering procedure.

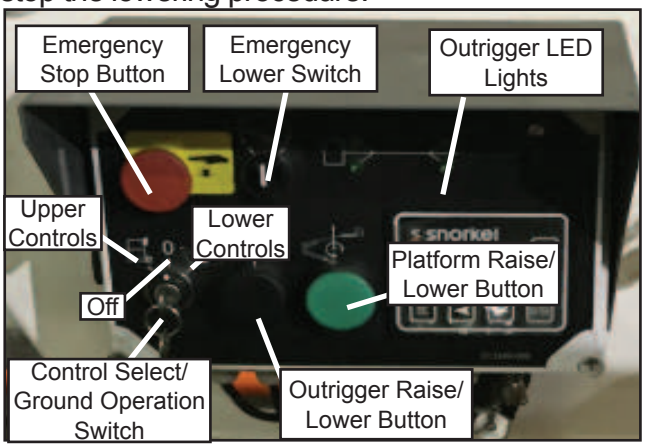


Figure 2-19 – Lower Control Station

PLATFORM OVERLOAD

In the event of the platform being overloaded, an audible alarm will sound and the platform controls will stop working.

To re-start the machine, the excess load must first be removed to stop the alarm from sounding. In a situation where the excess load cannot be removed immediately then the platform overload switch (refer to Figure 2-13) can be used to move the platform to a safe position so that the excess load can be removed safely.

To prevent unauthorized use and damage, properly stow the aerial platform at the end of each work day. It must also be properly stowed while transporting.

STOWING

Use the following procedure to properly stow the aerial platform.

1. Fully lower all the booms.
2. Engage the Transit Pins and lock in place using an 'R' clip (refer to Figure 2-20).

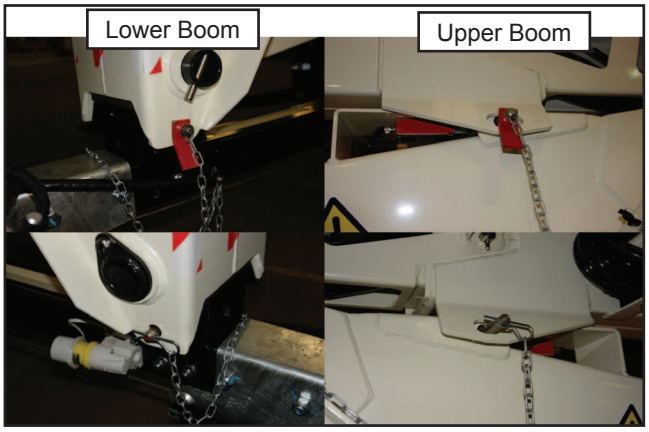


Figure 2-20 - Transport Pin Locations.

3. Set the platform keyswitch to 'Ground'.
4. Raise the outriggers by simultaneously pressing down on the 'Outrigger raise/lower button' and using the appropriate control levers, two at a time until the road wheels are in contact with the ground (refer to Figure 2-21).

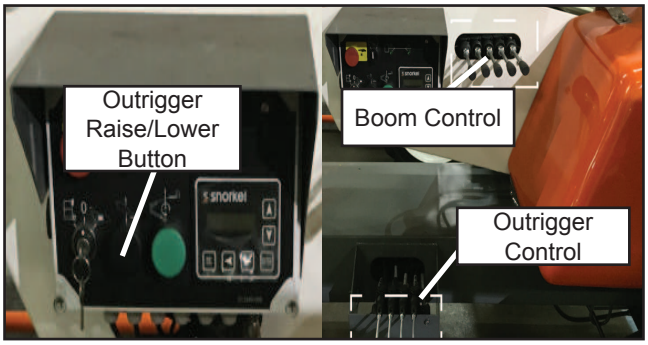


Figure 2-21 – Outrigger Operation

5. Only when the road wheels are in contact with the ground should the unit be lowered further until the jockey wheel makes contact with the supporting surface.
6. Fully raise the outriggers until they are in the stowed position.
7. Switch off the platform and ensure all loose items/covers are secure.

TRANSPORTATION

The aerial platform may be moved on a transport vehicle or towed. Depending on the particular situation, the aerial platform may be lifted with a forklift, driven, winched, or hoisted onto a vehicle such as a truck.

The equipment used to load, unload, and transport the aerial platform must have adequate capacity. The empty vehicle weight is listed in Chapter 2 and is stamped on the serial number placard. The user assumes all responsibility for:

- Choosing the proper method of transportation.
- Choosing the proper selection and use of transportation and tie-down devices.

- Making sure the equipment used is capable of supporting the weight of the aerial platform.
- Making sure all manufacturer's instructions and warnings, regulations and safety rules of their employer and federal law are followed.

SECURING FOR TRANSPORT

Use the following procedure to secure the aerial platform on the transport vehicle.

1. Chock the wheels.
2. Remove all personell, tools, materials or other loose objects from the platform.
3. Properly stow the aerial platform.
4. Place the lower controls emergency stop switch in the off position.
5. Unplug the battery disconnect.

CAUTION

Ratchets, winches and come-alongs can produce enough force to damage machine components. Do not over tighten the straps or chains when securing the aerial platform to the transport vehicle.

6. Use chains or straps to securely fasten the aerial platform to the transport vehicle using the front and rear tie-down lugs (refer to Figure 22) as attachment points. Proper tie-down and hauling is the responsibility of the carrier.

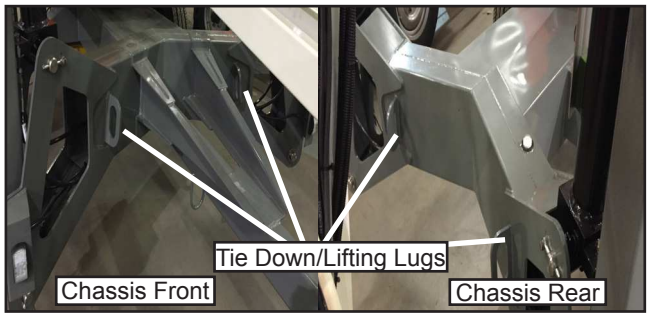


Figure 2-22 – Tie Down Lug Locations

HOISTING

Use a four point sling arrangement attached to the lifting lugs when hoisting the aerial platform. Machine damage can occur if the sling is attached anywhere else.

WARNING

The potential for an accident increases when the aerial platform is lifted using improper equipment and/or lifting techniques. Death or serious injury could result from such accidents. Use proper equipment and lifting techniques when lifting the aerial platform.

Know the weight of the aerial platform and the capacity of the lifting devices before hoisting.

- Lifting devices include the hoist or crane, chains, straps, cables, hooks, sheaves, shackles, slings, and other hardware used to support the machine.

- The empty vehicle weight is stamped on the serial number placard and is listed in specifications.

The user assumes all responsibility for:

- Making sure the equipment used is capable of supporting the weight of the aerial platform.
- Making sure all manufacturer's instructions and warnings, regulations and safety rules of their employer and/or any state or federal law are followed.

Use the following procedure to hoist the aerial platform onto the transport vehicle:

1. Properly stow the aerial platform.
2. Inspect the front and the rear lifting lugs (refer to Figure 2-22) to make sure they are free of cracks and are in good condition. There are two lugs on the front and rear of the chassis. Have any damage repaired by a qualified service technician before attempting to hoist the machine.
3. Remove all personnel, tools, materials, or other loose objects from the platform.
4. Connect the chains or straps to the lifting lugs using bolted shackles. Hooks that fit properly in the lugs and that have latching mechanisms to prevent them from falling out under a slack line condition may also be used.

   Do not run the sling cable through the lifting lugs.

   - Cable damage and/or failure can result from the cable contacting the sharp corners of the lug.
   - There is no effective way of putting a corner protector in the hole of the lug.
5. Use spreader bars of sufficient length to keep the chains, straps, or cables from contacting the structure or platform.
   - When using cables, use rigid corner protectors at any point where the cable contacts on sharp corners to prevent damaging the cable.
   - Careful rigging of the spreaders is required to prevent machine damage.
6. Adjust the length of each chain or strap so the aerial platform remains level when raised off the ground.
7. Use the hoist or crane to carefully raise and position the aerial platform onto the transport vehicle.

TOWING

Trailer mounted machines may be safely towed behind a vehicle at a speed set by state traffic regulation or up to 50 mph (80 km/h), whichever is the lowest.

1. Before towing, check the capacity of the vehicle being used. Machine weight will increase if optional extras are fitted.
2. Ensure that the road tyres and brakes are in good serviceable condition.
3. Ensure that all booms are fully lowered and both the transit pins are fitted through the loops and secured with the "R" clip on the end of the chain.
4. Ensure that all outriggers are fully raised.
5. Use the jockey wheel to raise or lower the tow bar coupling to position the machine above the 50 mm ball hitch on the towing vehicle (refer to Figure 2-23).

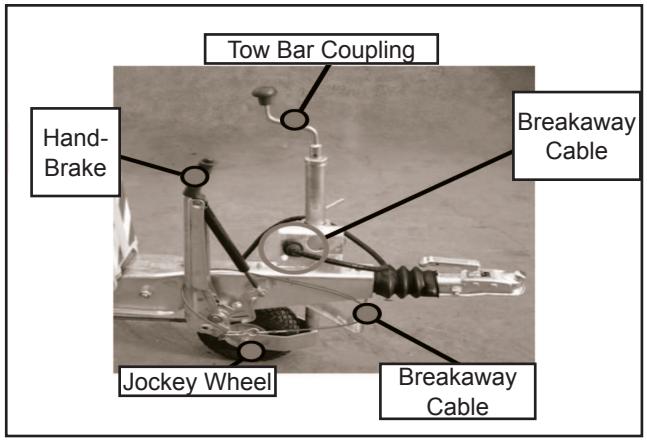


Figure 2-23 - Illustration Of A Jockey Wheel.

1. Apply the handbrake.
2. Lower the tow bar coupling down onto the ball hitch using the jockey wheel.
3. Secure the breakaway cable, (Ensure correct engagement of 50 mm ball).
4. Fully raise the jockey wheel and lock in position.
5. Release the handbrake.
6. Plug in the trailer lights (13 pin) plug and check that both vehicle and trailer lights operate correctly.

FRICTION DRIVE ASSIST PACKAGE

The friction drive assist package is an option to have attached to the aerial platform. It allows for the aerial platform to be moved over short distances with ease.

Use the following procedure to operate the friction drive:

1. Ensure that the booms are fully lowered and all outriggers are fully raised.
2. Push down on the friction drive hand lever to engage the drive cylinders against the tyres until they lock over centre (refer to Figure 2-24).

Figure 2-24 – Friction Drive Hand Lever

3. Turn the Control select/ground operation switch to lower controls.
4. Disengage the handbrake and ensure that the locking pin stopping the tow bar coupling from rotation is removed to enable the jockey wheel to be lowered.

Figure 2-25 – Locking Pin Disengaged

5. Using the 2 hydraulic cylinders on the right side of the chassis (refer to Figure 26);

- Push both levers forward to move the aerial platform in a straight direction.
- Push both levers backwards to reverse the aerial platform in a straight direction.
- Push the left lever only forwards or backwards to turn the machine to the right.
- Push the right lever only forwards or backwards to turn the machine to the left.

Figure 2-26 – Hydraulic Levers

6. Ensure the hand brake is engaged when the machine is in position

INSPECTION AND MAINTENANCE

The complete inspection consists of periodic visual and operational checks along with periodic minor adjustments that assure proper performance. Daily inspection will prevent abnormal wear and prolong the life of all systems. The inspection and maintenance schedule should be performed by personnel who are trained and familiar with mechanical and electrical procedures.

WARNING

Before performing preventative maintenance, familiarize yourself with the operation of the machine. Always block the elevating assembly whenever it is nessecary to perform maintenance while the platform is elevated.

The daily preventative maintenance checklist has been designed for machine service and maintenance. Photocopy the checklist page and use the checklist when inspecting the machine.

DAILY PREVENTATIVE MAINTENANCE SCHEDULE

MAINTENANCE TABLE KEY

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

PREVENTATIVE MAINTENANCE REPORT

Date: _____
Owner: _____
Model #: _____
Serial #: _____
Serviced by: _____

COMPONENT	INSPECTION OR SERVICES	Y	N	R
Operator's Manual	Check that the operators manual is in the manual holder and all pages are intact and readable			
Labels & Decals	Check that labels and decals are in place, intact and readable			
Entire Unit	Perform pre-operation inspection			
	Check for and repair any damage			
Electrical system	Check cables and wiring harness condition (No wear or physical damage)			
Battery System	Check electrolyte level			
	Check battery cable condition			
	Check terminals are clean and connectors are tight			
	Check charger condition and operation			
	Charge batteries			
Hydraulic fluid (*)	Check oil level			
Hydraulic system	Check all fittings are tight and there are no leaks			
Hydraulic pump	Check fittings are secure and there are no leaks			
Emergency lowering	Check emergency lowering correctly (See emergency lowering procedure)			
Controller	Check condition and operation			
Platform deck and rails	Check fasteners are in place, correctly tightened and not damaged			
	Check the structure and welds for damage, deformation, corrosion and cracks			
	Check condition of deck (no damage, deformation, corrosion or cracks			
	Check entry gate closure functions correcly			

COMPONENT	INSPECTION OR SERVICES	Y	N	R
Elevating assembly	Inspect for external damage, dents, loose rivets or cracks.			
	Check the structure and welds for damage, deformation, corrosion and cracks			
Chassis	Check cables for pinch or rubbing points			
	Check the structure and welds for damage, deformation, corrosion and cracks			
Lift Cylinders	Check for leaks			
Wheels	Check for loose components			
	Check for damage to tyres			
Harness anchor point	Check fasteners are secure			
	Check for damage, deformation, corrosion and cracks			
System function inspection	Conduct system function inspection (see pre-start operation pocedure)			
Emergency stops	Check that the emergency stop button on the basket panels opertates correctly			
	Check that the emergency stop button on the ground control panel operates correctly			
Brakes	Check that the brakes operate correctly			
Controller and Sensors	Check that the level sensor and controller functions correctly.			

*** NOTE: Use ISO #22 hydraulic fluid.**

Table 2-2: Daily preventative maintenance checklist

SPECIFICATIONS

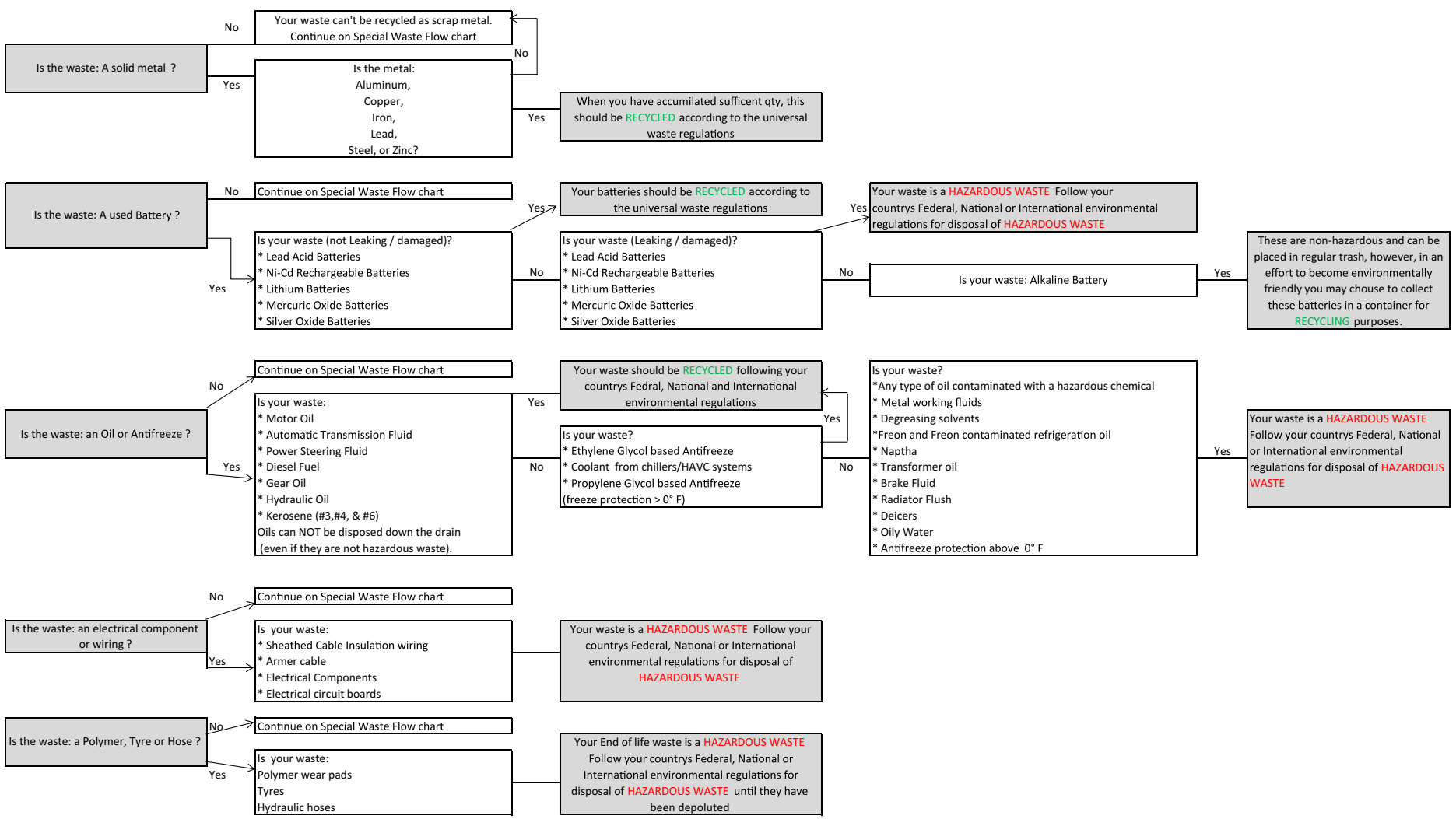
ITEM	TL49J
Operating Dimensions	
Maximum platform height	48' (14.7 m)
Guardrail height	3.61' (1.10 m)
Maximum working height	54.8' (16.7 m)
Platform length	47" (1.2 m)
Platform width	31.5" (0.8 m)
Platform height	6.3" (0.16 m)
Maximum outreach (from center of rotation)	27' (8.23 m)
Travel Dimensions	
Towing length	23.3' (7.10 m)
Towing width	5.6' (1.72 m)
Stowed height	7.1' (2.16 m)
Weight	
Weight (battery model) UN-LADEN	5027 lb (2280 kg)
Weight (battery model +friction drive) UN-LADEN	5291 lb (2400 kg)
Weight (bi-fuel model)	5159 lb (2340 kg)
Operating parameters	
Safe working load	441 lb (200 kg)
Maximum horizontal pull	89.9 lbs (400 N)
Maximum wind speed	28 mph (12.5 m/s)
Rotation	680°
Control system	Hydraulic proportional
Outrigger raise	112 s
Outrigger lower	84 s
Platform raise	136 s
Platform lower	101 s
Maximum ground slope	5°
Stabilizer feet to accommodate ground uneveness of at least 10°	+/-5°
Tyres	205/75R16
Brakes	Hand brake)spring release)
Hydraulic system	
Hydraulic reservoir capacity	3.96 US gal (15 L)
Maximum hydraulic system pressure	3045.79 psi (210 bar)
Hydraulic fluid temperature normal above 32° F (0°C)	ISO #22
Electrical system	
Energy source	24 V battery x 6 V 195 Ampere hour/230 V mains power
System voltage	24 DC/230 V AC
Battery duty cycle	89.6% in 192.2 minutes

Battery charger	Auto selectable dual input: AC input 100 - 240 V 50 - 60 Hz 8 A output: 24 V - 18 A
Maximum wind speed	28 mph (12.5 m/s)

Table 2-3: TL49J Specification

NOTE: Specifications are subject to change without notice. Hot weather or heavy use may affect performance. Refer to the service manual for complete parts and service information. This machine meets or exceeds all applicable OSHA and ANSI A92.6 - 1999.

End of Life Waste Advice Chart :



SERVICE AND REPAIR

CONTENTS

INTRODUCTION

The Snorkel TL49J is a versatile means of gaining access in difficult locations.

The access platform is safe in operation providing that basic rules are observed in the setting up of the machine. This manual focuses on the maintenance and repair of the machine. Please read the operators manual available from Snorkel or from your local distributor prior to operating the machine.

All operator's and service personnel should have read and understood the operator's manual and received full training in the safe use of the machine before attempting to use it or carrying out repairs.

Always quote your machine serial number and date of manufacture when ordering spare parts.

The part number for this manual is found on the front cover.

CONSTRUCTION STANDARDS

The TL49J machine complies fully with the requirements of European standard EN280:2013.

TECHNICAL CHARACTERISTICS

TRAILER/ STRUCTURE/OUTRIGGERS

This consists of a variety of welded and folded fabrications which where necessary, contain bushed stainless steel pivots with grease nipples. The main components are shot blasted and then powder coated. The cylinders are wet painted. The machine also includes a fully automatic running gear with auto reverse and an integrated trailer lighting. At the towing end of the machine, there is a heavy duty coupling head as well as a pneumatic jockey wheel. The maximum allowable load on the outriggers is 10.3 kN and the allowable sideway inclination is 5 degrees.

EQUIPMENT	INFORMATION
Bottom ram	Double acting: Bore Ø 60.0 mm Rod Ø 40.0 mm
Top ram	Double acting: Bore Ø 60.0 mm Rod Ø 40.0 mm
Dropnose ram	Double acting: Bore Ø 60.0 mm Rod Ø 40.0 mm
Stabilizer ram	Double acting: Bore Ø 70.0 mm Rod Ø 40.0 mm
Basket levelling ram	Double acting: Bore Ø 40.0 mm Rod Ø 20.0 mm
Bottom & Top ram lock valves	Pilot operated over centre valves
Control valve (Platform)	Monoblock unit consisting of five double acting spools
Control valve (Ground)	Monoblock unit consisting of four double acting spools
Control valve (Stabilizer)	Monoblock unit consisting of four double acting spools
Bushes	Acetol resin polymer with sintered bronze base (DX)
Pivot pins	Stainless steel bright bar to grade BS970 303 S31 CW
Tyres	205/75R16

Table 3-1: A list of equipment on the trailer and its associated features.

POWER PACK - BATTERY POWER OR MAINS POWER

This is a fully integrated power pack consisting of a motor, pump, relief valve, non-return check valve and a return filter with a dip stick for checking oil level. The pump is fitted with an internal suction strainer. The return filter is fitted with a breather and is used for topping up oil if required. The tank is fitted with a drain plug on the bottom face. A quick release coupling for checking oil pressure is also fitted on top of the pressure port.

POWER PACK - ENGINE

The engine is fitted with a separate pump which is fitted with a return filter and dipstick. The return filter is fitted with a breather and is used for topping up oil if required. The tank is fitted with a drain plug on the bottom face. The relief valve is mounted independently in close proximity to the pump together with a quick release coupling for checking hydraulic pressure.

The engine is fitted with an electric starter with its own independent starter battery. The engine can be started from the engine's start/stop key switch and from the remote start/stop push button from the platform.

SAFETY SYSTEMS

This is a full fail-safe hydraulic and electric system as required by EN280 and the machinery directive.

Emergency Stop Buttons

Emergency stop buttons are fitted on the machine to stop operation in an emergency. There are two emergency stop buttons; one on the upper control panel and the other on the lower control panel

Note

The lower controls override the upper controls. If the upper control emergency stop button is engaged, the lower controls can still be used to operate the aerial platform.

Emergency Lowering Switch

The Emergency lowering switch can be used to lower the platform in situations where the boom levers malfunction.

Note
The emergency lowering switch relies on the electrical system. The switch will not function if the electrical system is faulty.

Outrigger Indicators

The LED lights at the lower control station are indicators for outrigger stability. The outriggers are pressure sensitive to prevent operating of the booms until the outriggers are in full contact with the ground. It is not possible to raise the outriggers when the booms are extended.

Emergency Slew

A 17 mm socket together with a lever or spanner may be used to move the platform if there is a malfunction in the hydraulic or electrical system.

In the event of a failure, the machine can be manually slewed by moving the slew platform clockwise or anticlockwise by inserting the slew lever and rotating the gearbox by moving upwards and downwards.

Emergency Lowering Valves

In the event of a power failure, the emergency lowering valve on the ram can be used to lower the booms.

Emergency Lowering Hand Pump

The emergency hand pump lowering procedure is available from the lower control station.

Guardrails

The guardrails help protect personnel from falling off the platform.

OPERATING SPEEDS AND NOISE LEVEL

Due to oil viscosity and the fluctuating supply of power on a machine fitted with batteries and/or an engine as its power source, the following nominal operating speeds reached are indicated on table 3-2. All speeds have been taken with fully charged batteries and at an ambient temperature of +10 degrees. Significant speed differences will be experienced if operating in cold climates with batteries in a semi discharged state or if the engine is poorly maintained. All speeds have been taken from the platform with 1 person on board.

Note

Mains power powered machines have different speeds.

FUNCTION	SPEED TIME/SECONDS	TOLERANCE/SECONDS
Bottom boom - up	32	+/- 5
Bottom boom - down	17	+/- 5
Top boom - up	41	+/-5
Top boom - down	26	+/- 5
Dropnose boom - up	14	+/-1
Dropnose boom - down	8	+/-1
Slew - clockwise 180 degrees	73	+/-10
Slew - counter clockwise 180 degrees	73	+/-10
Platform rotation	8	+/- 2
Emergency decent - top boom	87	+/- 2

Table 3-2: A list of functions and their associated speed times.

DUTY CYCLES

The mains power pack and the engine are both continuously rated. The engine speed is fixed and must not be altered.

BATTERY

With well maintained batteries, you will be able to get the following operations from one full charge in a simulated working environment. For one cycle, lifting to full elevation and lowering can take place 10 times with a 5 minutes break. The cycle also includes lifting and lowering the outrigger at ground level once. A total of four cycles can be achieved from one full charge.

This will provide the operator under normal circumstances, a full days work. The charger can also be connected to the mains supply if re-charging is needed. The machine cannot be run directly from

the charger as the current drawn from the motor is higher than the output from the charger. It is important to cool the machine for 5 minutes to prevent the motor from being overloaded.

MAINTENANCE SCHEDULE

GENERAL

A well maintained machine will provide years of trouble free operation. It is important to carry out set out checks of the machine's structure and component prior to use or when set up for transportation.

Note
All machines operated in the UK must have a thorough inspection carried out every 6 months in accordance with LOLER regulations 1998 and a Certificate of Thorough Inspection produced by a competent person. Contact Snorkel for further details.

OPERATOR'S RESPONSIBILITY

It is the responsibility of the operator to ensure that the machine is safe to use. To do so, all the daily checks provided should be performed prior to operating the machine. The weekly and 6 monthly period checks should be performed for maintenance purposes.

The information on the maintenance schedule are set to cover most eventualities. If further advice is needed, contact Snorkel or its local representative.

Note
If this manual was not issued with the machine, check for updates and revisions from Snorkel or its local representative. Failure to maintain the machine as specified will invalidate the warranty.

WARNING

Always ensure the machine is in good, sound and undamaged condition. When carrying out maintenance and repairs. Always clean the machine thoroughly. Take care not to steam the batteries or the electrical components.

DAILY CHECKS	ACTION	NOTES
Hydraulic system	Ensure the machine is on level ground.	Use SHF22 oil or equivalent. Change oil and filter every 6 months.
	Top up the oil using the return line filter on top of the tank. Oil must be at the bottom mark on the dipstick.	
	Check out for oil leaks.	
Engine	Check oil, filter and fuel.	Refer to OEM manual for more information.
	Check for leaks.	
	Check battery.	
	Top up with distilled water only 6 mm above plates	
Level gauge	Check that the level gauge is present and secure	
Physical damage	Check for physical damage to the booms, tie bars, basket, slew and the chassis.	Do not use a damaged machine.
	Check that all warning labels are legible and in place.	
Nuts, bolts & fittings	Check for missing and loose nut and bolts.	Replace immediately
Locking pegs	Check that all locking pegs are present.	Broken peg = seized shaft.
	Check that no shafts are seized.	
Transport locks & lifting points	Check that all transport lock pins are present.	Do not transport machine without locking pin.
	Check for damaged lifting points.	
Battery & Charging	If fitted, check the operation of the charger.	
	Record specific gravity of each cell.	
	Clean top of the battery.	
	Clean and check terminals.	
Emergency stop	Check that all emergency stop switches are working.	Turn to release.
Electrical system	Check for correct operation of the complete electrical system.	
Electrical safety system	Check that the booms cannot be operated until the outriggers are down and in contact with the ground.	
	Check that the outriggers cannot be raised with the top or bottom boom elevated.	
Hydraulic safety system	Check that all emergency lowering valves work.	
	Check emergency slew	
	Check emergency hand pump.	

Wheels	Check tyres for damage.	55 PSI 3.8 Bar
	Check wheel nuts and tyre pressures	
Running gear	Check parking brake.	
	Check overrun device.	
	Check for damage.	
Trailer lights	Check for correct operation if towing.	

Table 3-3: Daily checklist.

WEEKLY CHECKS	ACTION	NOTES
Lubrication	All grease nipples. Depending on machine use and operating condition, different intervals may be acceptable.	
Slew gear	Check slew gear for excessive wear. Grease, if needed.	

Table 3-4: Weekly checklist.

MONTHLY CHECKS	ACTION	NOTES
DC motor	Check and replace motor brushes if the machine is used very frequently.	If 2/3 worn out, replace
Wheel bearings	Check for wear - Perform checks after every 3000 miles	

Table 3-5: Monthly checklist.

6 MONTHLY CHECKS	ACTION	NOTES
Thorough Inspection	Contact Snorkel or its local representative.	Change oil and filter.

Table 3-6: 6 Monthly checklist.

MAINTENANCE PROCEDURE

POWER PACK

The power pack consists of a fully integrated pump, tank, preset relief valve and a return filter. The biggest cause of hydraulic problems is due to contaminated oil and filter. The oil and filter needs changing at least every 6 months even though the hydraulic system is a closed system. The only access for external dirt is through the filter breather. Contamination will occur due to seal kit wear (black sludge in the bottom of the tank, mechanical wear from the gear pump, valve block and cartridges in addition to water contamination due to tank condensation). Refer to the power pack section for more details.

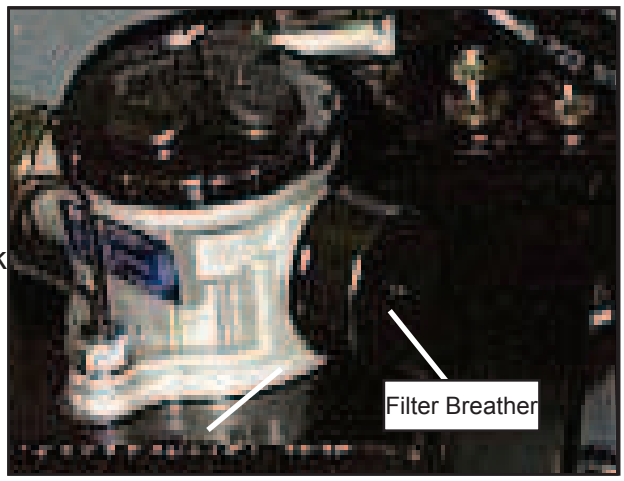


Figure 3-1: Filter breather location.

The hydraulic system is fully self contained. Oil tank capacity is 15 litres. When operating above 0°C, ISO22 grade hydraulic mineral oil (refer to health & safety guidelines supplied with the oil prior to handling) is recommended.

The main cause of hydraulic issues, sticking valves and leaking cylinders is due to contaminated oil. There is no need to replace the oil in the hose. Replace the oil in the tank and filter every 6 months.

Oil is not discharged from the system and as a result, if oil is required, this would indicate an oil leak which must be investigated prior to using the machine.

CORRECT OIL LEVEL

It is critical that the correct oil level is maintained. Too little oil will cause cavitation and failure of the pump. Too much oil will lead to oil leak through the return filter breather or a massive oil leak when using the emergency lower valves on the top and bottom boom. When using the emergency lower valves, enough space is required in the tank to accommodate oil which normally would be pumped into the annular side of the cylinder. If this should happen, clean up the oil spillage. Fully extend all rams and then close up all the rams to check for the amount of free space in the tank using the dip stick. The correct level expected is that at the bottom mark of the dipstick.

DC MOTOR & PUMP

The hydraulic pump is submerged in the tank. Oil is drawn in through a suction strainer protecting the pump. The DC motor is directly coupled to the pump shaft. On the AC motor, a small adaptor coupling is used between the motor and pump shaft. To replace the pump;

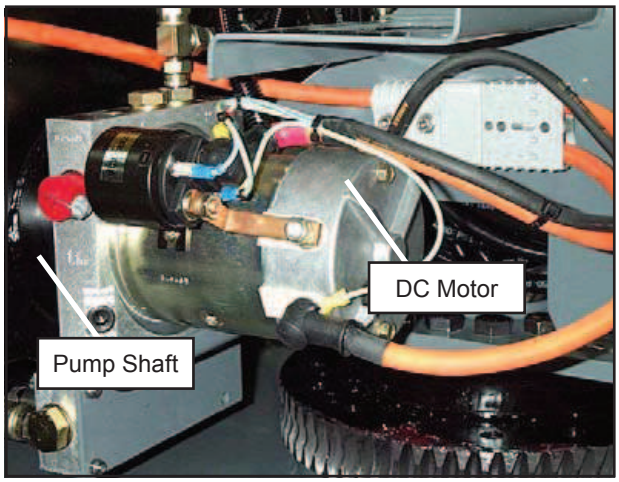


Figure 3-2: DC motor coupled to the pump shaft.

1. Remove the tank by removing the 4 bolts securing it in place.
2. Remove the power pack from the machine.
3. Remove the 4 fixing bolts securing the pump to the aluminium block.
4. With the pump removed, inspect the gears for wear.
5. If the gears are worn out or broken, replace the complete pump. The replacement pump is a unit consisting of the gears but without the strainer.
6. Torque the 4-5/16 hex fixing bolts evenly to 17.63 Nm (13 ft/lbs) to ensure correct operation of the pump. Do not overtighten.
7. Before re-fitting, thoroughly clean the tank and the magnet found inside.
8. De-grease and replace the large “O” ring and apply a small amount of silicone around the circumference of the de-greased tank neck.
9. Place the tank back on and secure with the 4 bolts removed earlier.

Note
The relief valve is factory set to 210 bar.

The DC motor can be removed without worrying about oil spillage.

1. Remove the 2 bolts shown in Figure 3-3 at the end of the motor.
2. Withdraw the motor taking care not to strain the wires.
3. For optimum performance of the DC motor, replace the motor brushes when they are 2/3 worn out. If the machine is used extensively, changes must be made at least every 6 months.
4. Fully remove the motor from the power pack to be able to replace the brushes.
5. Blow out dust on the brushes using compressed air before re-assembling the motor.
6. Check the motor shaft bearing and replace if worn out. Replacing the contactor is recommended at the same time as replacing the brushes. The unit is fully sealed and contains no serviceable parts.
7. Press on the platform raise/lower button. If the motor carries on running and there's no power at the contactor coil, the contactor needs replacing. To stop the motor in this situation, use the battery disconnect plug or lightly tap the contactor on its end with the handle of a large screw driver to free the internal contact points.

Note
The main relief valve is factory set to 210 bar and should not need adjusting. Breaking the seal during the warranty period will invalidate the warranty.

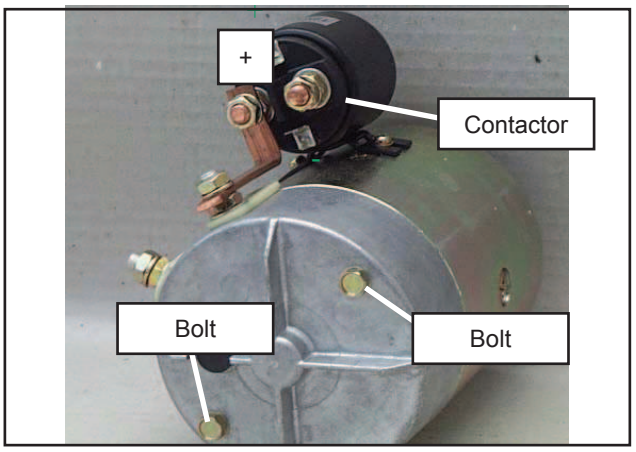


Figure 3-3: DC motor showing contactor and bolt location.

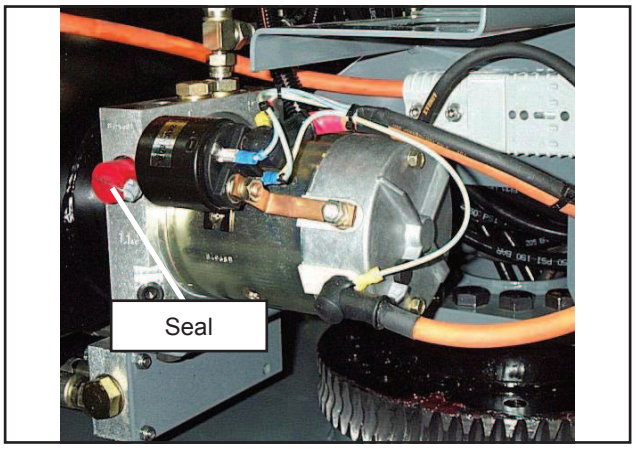


Figure 3-4: A view of the seal location.

SOL 1

The SOL 1 valve diverts oil from the outrigger control valve firstly to the ground control valve and then to the platform control valve. Never operate the coil unless it is on the valve cartridge. This risks burning out the coil.

GROUND CONTROL VALVE

The ground control valve provides full control over all functions apart from the platform slew. The adjustable relief valve is preset at the factory to approximately 190 bar. This setting is put in place to ensure only the safe working load (SWL) is lifted. The centre position is closed to prevent oil back feeding into the tank when operating the platform controls.

PLATFORM CONTROLS

The platform controls is identical to the ground controls apart from the extra valve blank needed to control the slewing platform ram. The orifice in the platform slew fitting is there to prevent the platform from turning too quickly.

HAND PUMP

The hand pump enables lowering and operates the slew in case of an emergency. The pump is fed from the general return line. It is theoretically possible to extend the cylinder with the hand pump but the force required is excessive and the fixing bracket for the hand pump is not designed to take such a load. If no resistance is felt when operating the hand pump, try to operate the platform slew or the drop nose to prime the pump.

PLATFORM SLEW

The cylinder has no lock valve. It relies on the closed centre of the spool to prevent it from moving.

ALL OTHER BOOM CYLINDERS

Lock valves are fitted to prevent uncontrolled movement in case of hose failure.

STABILIZER CONTROL VALVE

In the centre position, this block has the B port connected to the tank. This is to ensure that the outrigger cylinder check valve closes quickly when setting up the machine. The 4 restrictors are there to prevent cylinder juddering caused by the check valves fitted to the outrigger cylinders.

The TL49J can be fitted with a variety of power options. The battery powered machine has only one solenoid valve fitted (SOL 1). Both the engine and the mains powered version have a separate dump valve fitted (SOL 2). This is because oil is in circulation all the time and not just when a cylinder movement is required as on the battery version. Having oil circulating through the different valve blocks may lead to uncontrolled movements should the controls be accidentally operated. By fitting the dump valve, the oil will always flow to tank unless the dump valve is activated.

Refer to the relevant circuit diagram under schematics or contact Snorkel or its local representative for further information if required.

TOP & BOTTOM RAM

Each ram is fitted with a manual release to enable lowering of the boom in case of an emergency. Press down on the red button as shown in Figure 3-5 and hold. When released, the red button will spring out and the movement should stop.

If the cylinder is operating erratically (jamming at odd intervals with the motor running), check that the little restrictor disc fitted at the nose of the cartridge is not loose. The disc is held in place with a small circlip. Replace cartridge.

The O/C valve enables the oil to flow freely into the cylinder but will not let any oil flow out until a pilot signal is received when pumping oil into the annular side of the ram. The O/C valve will then open up and let oil flow out in a controlled manner.

The O/C valve is also fitted with an adjustable relief valve which must be set to 1.25 times the maximum pressure inside the cylinder. If the cartridge is marked with CBBA, the adjusting screw is turned CCW to increase pressure.
If screwed fully CW, the cartridge is now fully open and does not hold any load. The O/C valve must be set correctly to ensure safe operation.

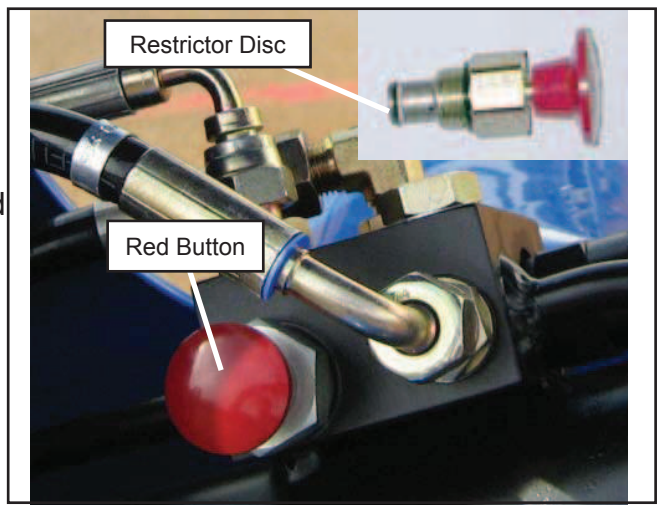


Figure 3-5: A view of the manual release valve and restrictor disc.

RAM NOT HOLDING UNDER LOAD

Releasing the controls must stop the cylinder movements.

- It is not advisable to leave an extended machine unattended to for a lengthy period of time.
- It is normal to expect slight creep over time however during normal operating conditions, the ram should hold the load and not move once the lock valve cartridge has closed. This may take between 1-2 seconds after the directional valve has been returned to the centre position. The pilot pressure holding the valve open must be allowed to drain back into the tank to allow the lock valve to seat fully.

When a cylinder is not holding the load in place, it is critical to know which part from the following list has failed.

- Cylinder piston seal.
- O/C valve (check valve)
- Emergency lowering cartridge (if fitted)

The efficient way of establishing where the failure is, is by removing all the hoses to determine where oil is leaking out from.

- If leakage is from the emergency lowering cartridge, clean or replace (#3).
- If leakage is from the O/C valve, clean and adjust the relief valve or replace (Check valves are non adjustable and can only be cleaned or replaced) (#1).
- If the leakage is from the piston seal kit, replace. The leakage is possibly through annular port which has no lock valve (#2).

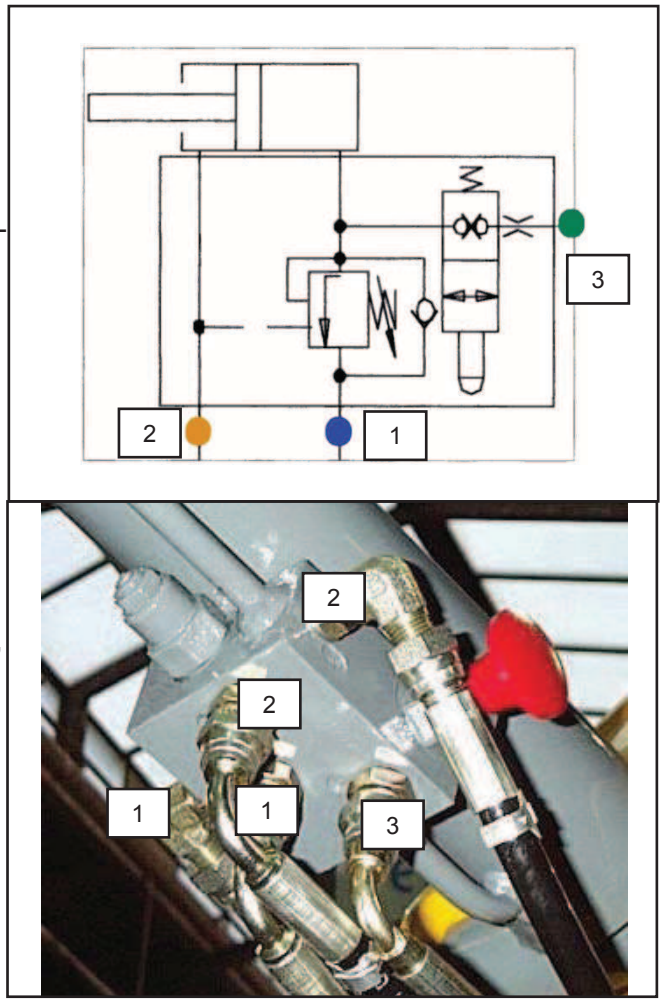


Figure 3-6: For clarity, the drawing shows only one hose to each service. In reality, there are two hoses. One for the platform controls and one for the ground controls. Only the emergency lower has one hose.

DROPNOSE RAM

The dropnose ram is fitted with two O/C valves. There are two ways to determine which component has failed.

1. Remove all hoses to determine where the oil is escaping from.
2. If the oil is escaping from the full bore side, the full bore O/C valve must be faulty.
3. Slowly open the adjusting screw for the O/C relief valve on the annular side.
4. The piston seals have failed if oil starts to flow out from the annular side and the cylinder is starting to close up at an increased speed. Replace the piston seals.

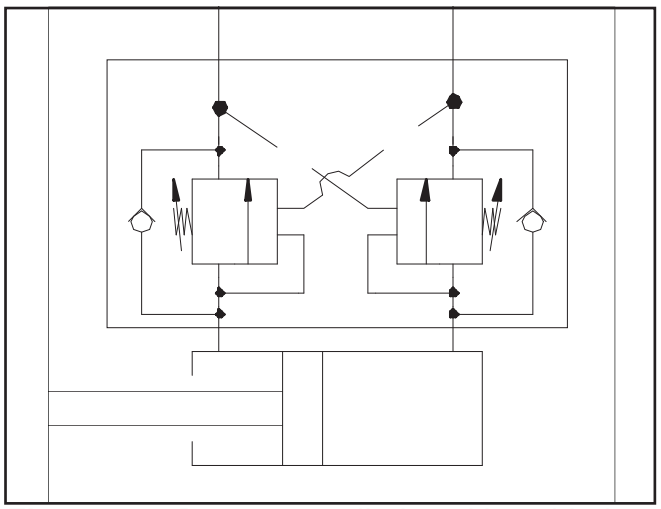


Figure 3-7: Dropnose cylinder with welded on block containing 2 adjustable O/C valves.

OUTRIGGER RAM

The outrigger ram is fitted with two check valves. They require no adjustment. If the outrigger is not holding under load, it is most likely that the check valve for the full bore side is leaking. The check valves are difficult to get to as the block is tucked away on the underside of the ram.

- With the outrigger retracted, remove the rod pin.
- Swing down the outrigger to remove the cylinder.
- Both check valves are identical. Swap them over to determine if the cylinder stops moving.

The full bore check is performed to ensure that the outriggers stay down when the booms have been lifted (#2).

The annular side checks are performed to enure that the outrigger remains vertical when towing the machine (#1).

The restrictor is critical to prevent the outrigger from juddering when raising the outrigger to the transport position. Do not replace with a non restricted hose adapter (#3).

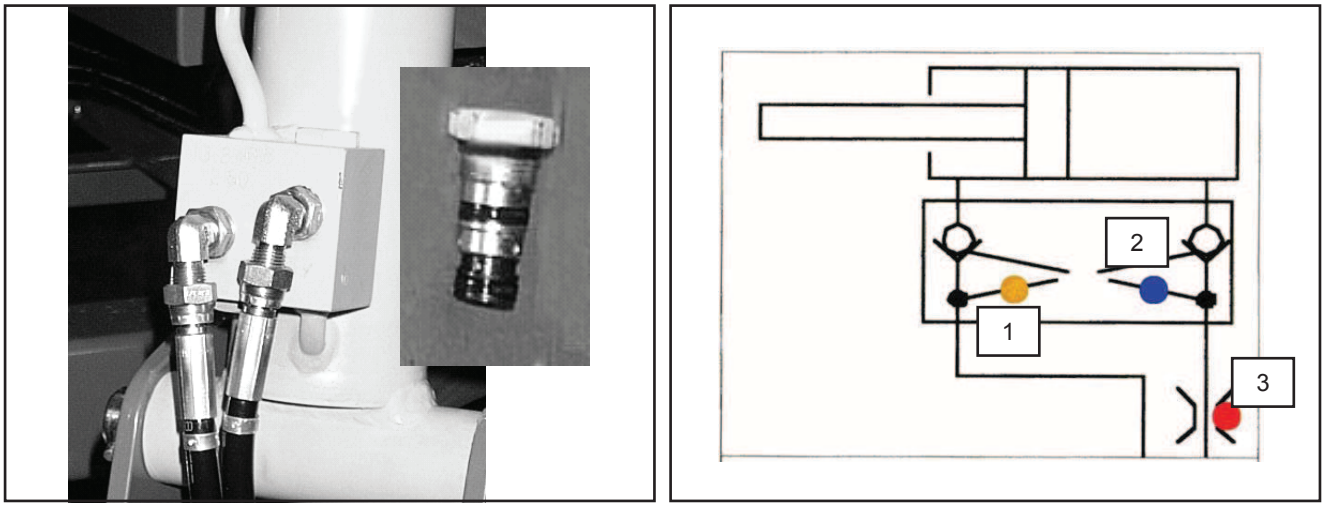


Figure 3-8: Outrigger cylinder with welded on block containing the two check valves. The restrictor shown is the hose adaptor fitted in the outrigger control valve.

PLATFORM CONTROL VALVE

The in-line check valve is found below the manual hand pump. The valve prevents the oil from flowing back down the pressure line when operating the hand pump. The relief valve is set at 190 bar and should be adjusted in accordance with the set up procedure.

To adjust the pressure, remove the cap of the relief valve and screw the adjusting screw inwards to increase pressure and outwards to decrease pressure. Place the cap back after adjusting.

The spools are all the same and are closed centred in the neutral position. It is critical that the valve block does not leak internally when in the neutral position. Note that there are two valve blocks with each connected together at the lift cylinders. If the ground valve is not leak free with the spool in the neutral position when operating the platform valve, the oil will not flow into the cylinder but leak out through the ground valve. The same scenario applies for operating the ground controls when the platform valve is leaking internally. This can also occur if the spool is not properly centralised by the spring at the end of the spool.

In a situation where the ground controls function well but the operation of the boom from the platform controls does not work, then the valve responsible for making the booms lift/lower is the faulty valve.

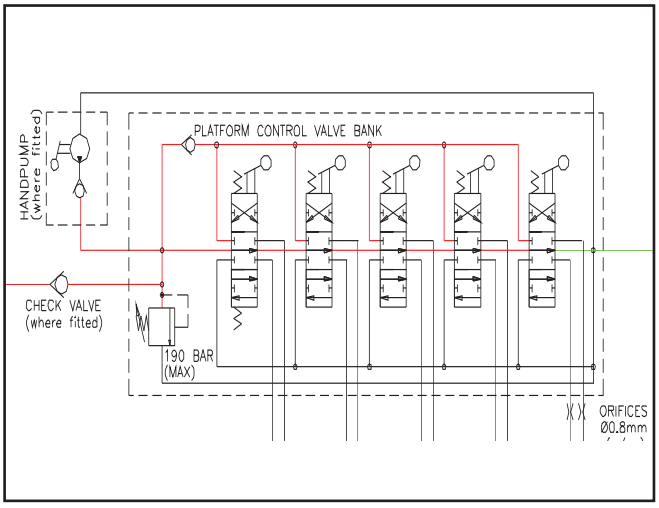


Figure 3-9: A view of the platform controls and check valve location.

GROUND CONTROL VALVE

This valve is identical to the platform control valve except

- It is not possible to operate the platform slew from the ground controls. On the ground control valve schematic shown in Figure 3-10, the last spool is that of the platform slew.
- A high pressure carry over plug has been fitted to the ground control valve to allow oil under full system pressure to pass through it. Without the internal plug, it is impossible to operate the platform valve as all the oil will flow directly back to the tank.

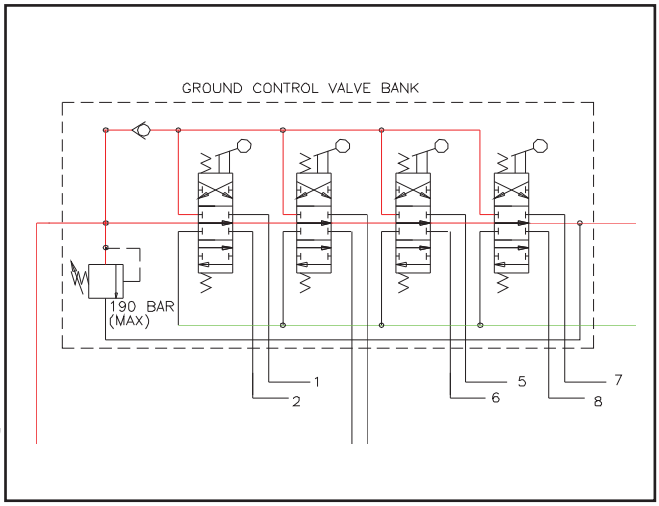


Figure 3-10: Ground control valve.

If it is necessary to operate the ground control valve, make sure the carry over plug is fitted. The plug is found inside the valve under the fitting for the return line. Shine a light down the port to make the Allen head grub screw visible. If not in place, use the head grub screw fitted to the replacement valve.

Incase of an oil leak from the valve block, it is most likely to be from the end cap. This refers to either the end where the lever is or at the opposite end where the return spring is. Never fully withdraw the spool. Push it out opposite to where the leak is coming from with sufficient space to clear the “O” ring which can now be observed with a small screw driver. Apply plenty of grease and keep well lubricated when pushing the spool back in. If the spool is not centring, check that the return spring and the end cap is well secured.

DIVERTER VALVE

When the diverter valve is not activated (no power on the coil), the oil will flow to the outrigger control valve. When activated, the oil flows to the ground control valve. Incase of a reduced flow and a high pressure drop over the valve, the valve could be sticking. Remove the cartridge from the aluminium body and clean. Also look for contamination in the valve or valve cavity.

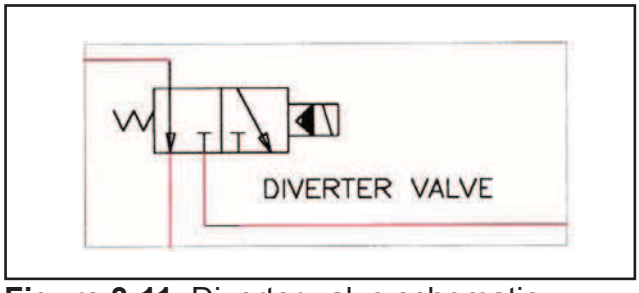


Figure 3-11: Diverter valve schematic.

To check that power is reaching the coil, hold a screw driver against the end of the coil. When the

coil is activated, a strong magnetic force is felt pulling the screwdriver towards the nut securing the coil to the cartridge.

Do not use great force when securing the coil to the cartridge as the casing can easily crack due to thermal expansion when heated up during use. The coil will fail if water gets through the crack.

OUTRIGGER CONTROL VALVE

This valve is not interchangeable with the ground control valve even tough it is a 4 bank valve block with a relief valve and looks identical to the ground controls.

When the spool is in the neutral position, the annular side of the ram is attached to the tank line. This is done to ensure that the pilot pressure holding the check valve on the full bore open is drained of quickly to tank so that the check valve closes quickly.

If the valve block is replaced, make sure that the piping is done exactly as shown. Rely on the closed port as back up for the check on the full bore side.

Note that earlier versions might not have this type of spool. This type can easily be identified as it has a “DIN - Oil” stamped on the end cap. This type used a standard closed centre valve block. The leakage rate across the closed centre spool is high enough to ensure that the deck would close.

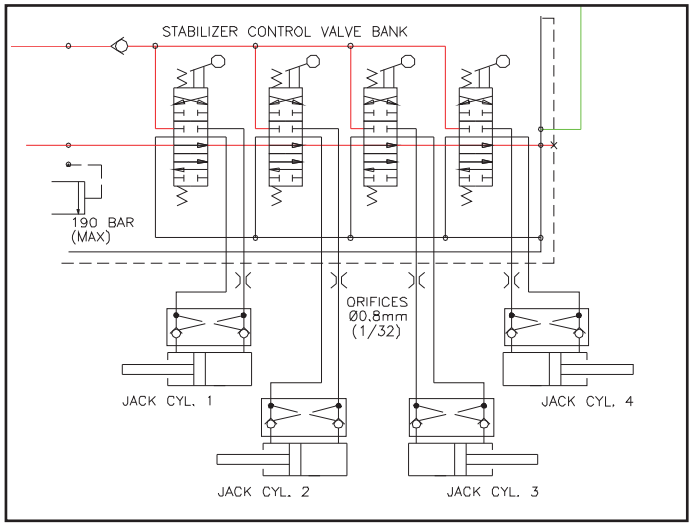


Figure 3-12: Schematic view of outrigger control valve.

Each A port has a restrictive hose adaptor fitted in the valve block. If the restrictor gets blocked, the cylinder will not operate correctly.

When looking for a fault relating to cylinders and valve blocks, swapping hose connections can easily provide a good pointer to where the fault is. If the fault position doesn’t change, then the fault is in the valve block. If the fault position moves, then the fault is in the cylinder.

Do not overtighten the hose fittings. Overtightening can lead to leakages due to deformation of the adaptor cone.

RESTRICTORS

All valve blocks have restrictors fitted at different locations. The current versions (2002) of the TL49J uses a hose adapter with a drilled hole. Other types which have been in use (and currently are on other machines) are a simple copper washer with a sized hole. The copper washer is squashed between the hose fitting and the adapter screwed into the valve block.

It is easy to observe that a copper washer type restrictor has been used as it looks like the hose fitting is not screwed fully down onto the adapter in comparism to the hose fitting next to it. A large force is needed when tightening the hose fitting to prevent leaks.

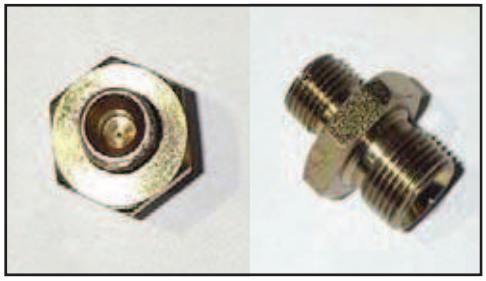


Figure 3-13: Hose adaptor shown here with drilled hole. If cylinder movement is erratic, check for contamination.

Figure 3-14: Copper restrictor fitted loose in the hose adaptor. Hose end requires more torque to prevent oil leak when securing hose.

SLEW MOTOR

The slew motor is a high torque low speed hydraulic motor. The slew motor is bolted directly on the slew gear. Apart from greasing and checking for oil leaks, no maintenance is required.

The motor can be unbolted from the slew drive to check for leakage. A full seal kit is available with overhaul instructions. Location 3 and 4 on figure 3-15 indicates the hoses going to the platform controls.

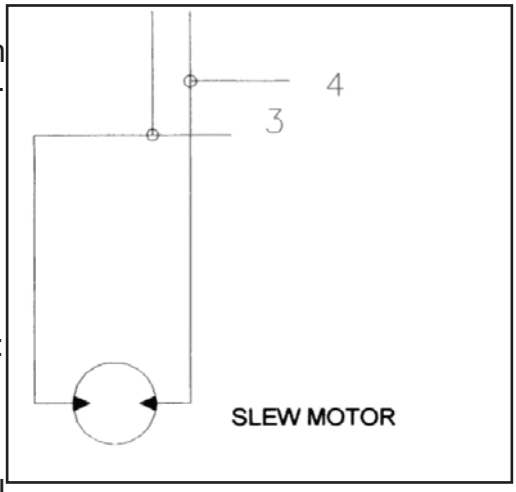


Figure 3-15: Hose connections to the platform controls.

GENERAL TESTS OF LOAD HOLDING VALVES

All critical movements rely on 2 components for safety namely:

- The lock valve on the cylinder
- The closed centre on the valve block

The valve blocks used have very low leakage rate. This is ideal for the slewing platform ram which has no lock valve.

To determine which load holding valve is in use be it the valve block or cylinder lock valve, perform the procedure below.

- With the pump not running, operate the valve blocks which leads to closing the ram up.
- If there is cylinder movement, then there is a leaking load holding valve on the cylinder.
- Do not use a machine with a failed load holding valve.

SLEWING PLATFORM RAM

Do not operate the slewing platform ram valve lever without the pump turning. If operated, the valve lever can push the platform from side to side. This allows air to enter the system and the platform will not stay put during transportation.

If this occurs, move the valve lever with the pump running. Moving the platform from side to side will fill the cylinder with oil and the platform will lock in place when the lever is released.

BLEEDING

The hydraulic system needs no special bleeding. If a cylinder is stripped down or hoses for repair removed, operate the cylinder fully in and fully out for the system to be operational.

Note

- *Replace filter and oil regularly.*
- *Make sure the oil in the tank is clean.*
- *Never use dirty cans when filling up the tank with oil.*
- *In situations where oil replacement is needed, the system must be leaking.*
- *Use the right oil for the right temperature:*
  - *Below 0° C - use low viscosity oil.*
  - Above *0° C - use regular grade oil.*
- *Keep a log of relief valve settings to monitor pump performance.*

HYDRAULIC PUMP

The engine drives a hydraulic pump via a spider type coupling.

If there is a loss of oil pressure experienced and the motor is running correctly, use the check procedures stated below.

- First check that the hydraulic system is working correctly by checking that the dump valve is activated. If the dump valve is working and there is still no oil flow, the issue is most likely to be a failed pump or that the coupling is spinning on the motor or pump shaft.
- Remove the bell housing to check that each coupling half is secured on the shaft. Then remove the pump and check the internal gears.

- The stop/run/start key switch is located on the right hand side of the engine. Also available is a separate start/stop push button on the platform controls.

Some engines are equipped with an automatic electrical choke (Figure 3-16) to facilitate remote cold start. For the engine to start remotely, the key switch on the engine must be in the run position. If not, the engine will turn over on the starter but will fail to ignite.

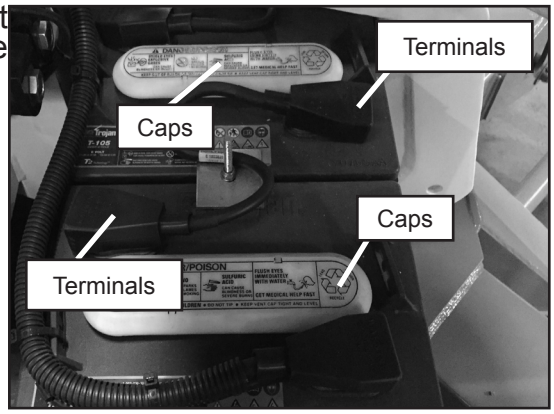


Figure 3-16: Check battery weekly and top up with distilled water if required.

The platform's control circuit is powered by the engine's start battery. The built in heavy duty 10 A alternator will re-charge the battery during use. If the engine is not turning over when trying to start, the most likely cause is a discharged battery. Jump start using another 12 V battery or use the manual recoil fitted on all engines.

Always switch the keyswitch on the engine position when not in use to isolate the circuit. Should the engine turnover without starting, check the fuel level first and then look at the electrical circuits for faults.

Note
Always let the engine reach operating temperature before loading the hydraulic circuit.

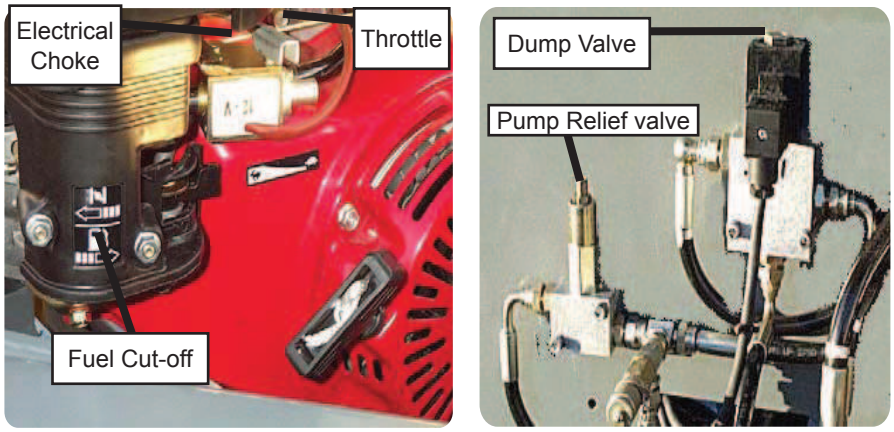
Some engines are fitted with a low oil level safety cut out which will stop the engine and prevents starting if the oil level is low.

Note
The engine Stop/Run/Start key switch must be in the run position even when starting the engine manually.

Check the battery level weekly and top up with distilled water if required.

ENGINE SETTINGS

The throttle is locked and must not be tampered with. If the boom speeds are not in accordance with the time test sheet, the engine speed may have to be adjusted. Set the engine speed by adjusting the throttle to give required pump flow which in turn governs boom speed. Then set the throttle end stop and secure the throttle from turning using a lock nut on the throttle spindle. Use fuel cut-off when moving the machine over long distances.



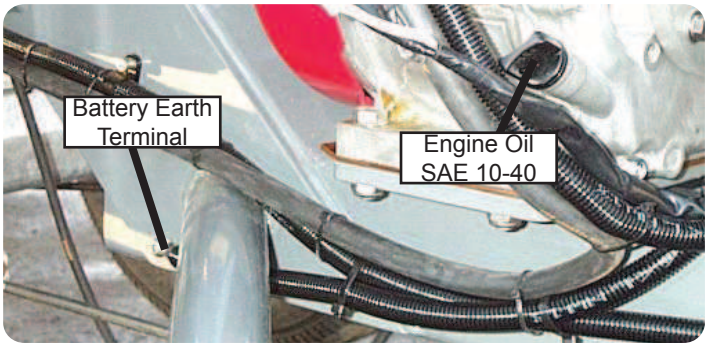


Figure 3-17: Engine settings.

ELECTRICAL START/STOP

The full engine electrical diagram shown below is not integrated in the main electrical diagram for the machine. The engine is stopped by letting the signal to the ignition coil go to earth.

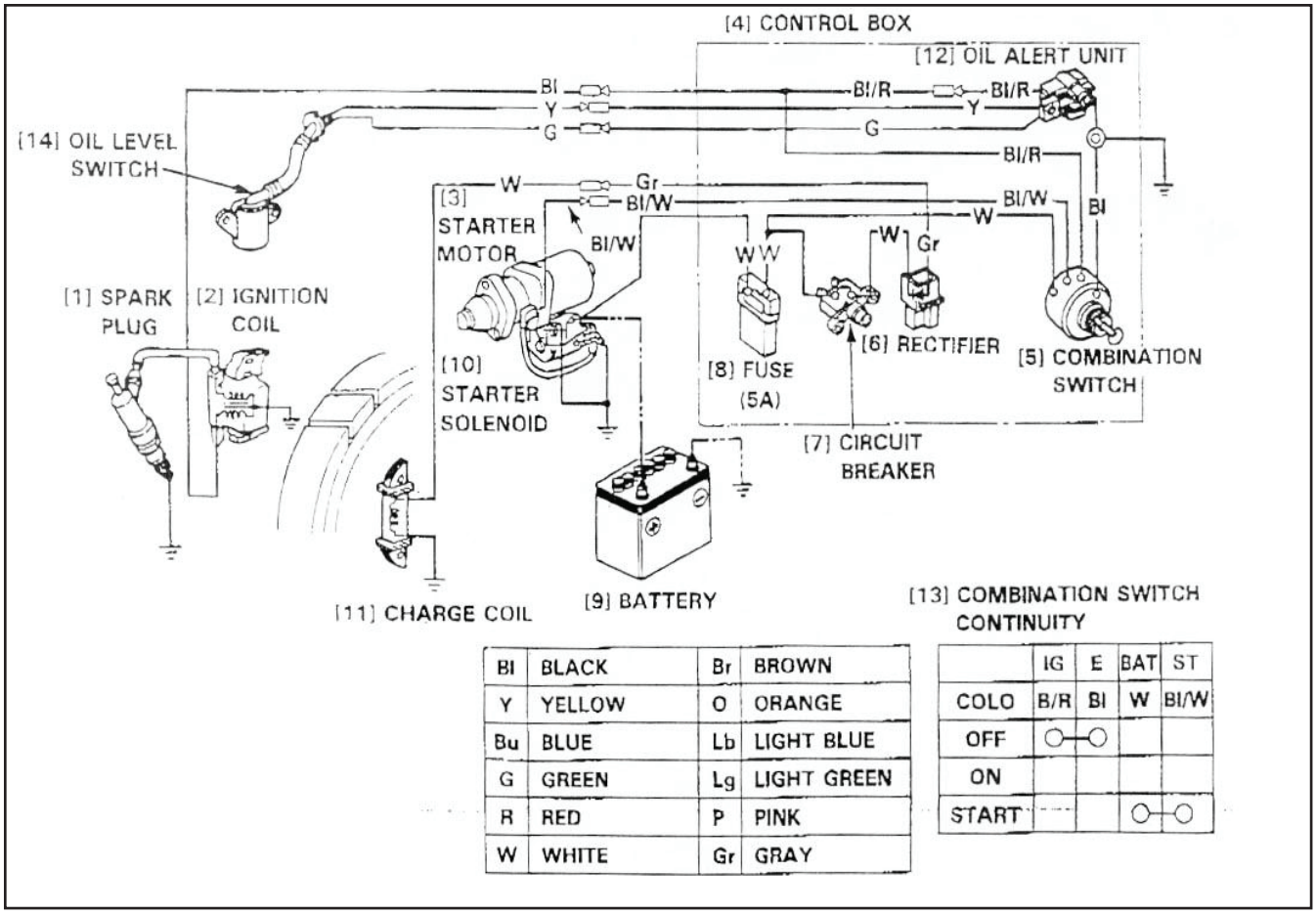


Figure 3-18: Engine engine schematics.

LEVEL GAUGE

The level gauge used for setting up the machine is located next to the outrigger control valve block. If the level is damaged or has been removed, do not use the machine until a new level has been fitted.

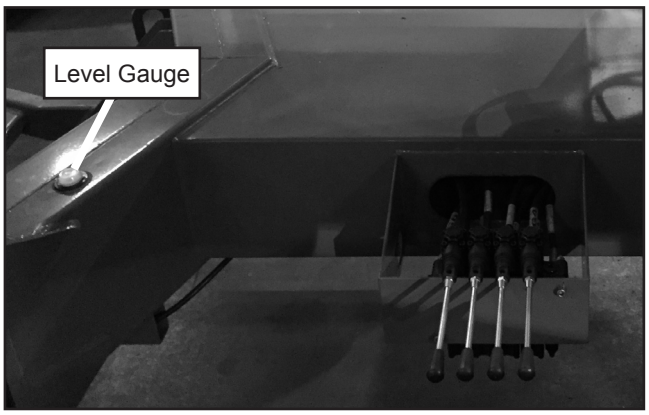


Figure 3-19: Level gauge location.

PHYSICAL DAMAGE

When looking for physical damage, it is important that the machine is clean. Large dents in the boom from operators hitting obstacles are generally easy to see. Crack in welds or corrosion damage can be harder to spot. The biggest wear and tear is due to the constant vibration from towing the machine. Curbs and speed bumps passed at high speed can also cause severe damage to the tow bar or the axle.

On machines fitted with the optional sliding axle, inspect the underside of the axle carrier and the sliding box suspension.

On machines fitted with the fixed axle, check the fixing bolts and the main chassis member.

Check the area just behind the coupling where the vertical boom is secured to the tow bar. Incase the vertical boom is not secured to the tow bar and the machine is towed over a long distance on poor roads, damage may have occurred due to the constant banging of the vertical boom against the towbar. Also check the top boom rest. The top boom must be locked in place during transport.

Note
Forgetting to lower the boom leads to damage occurring to the underside of the top boom due to movement in its rest position during transportation. Fitting the top boom lock would greatly reduce the need for top boom repairs or possible replacement.

Another area prone to damage is the drop nose. When reversing, the basket may hit a low wall or a post. The impact may not be easy to spot on an already battered basket however may bend the bottom of the drop nose. Check the straightness of the top tie bar. A slight dip is acceptable but a kink or sideways bend is unacceptable. Check both booms for creases in the steel next to the main bosses which is next to the slew post and the vertical boom. Hoses and cables are prone to damage, wear and tear. If the outer sheathing on the hydraulic hose is a slightly frayed fitting, a temporary outer sleeve may be adequate depending on the size of the damage.

Note
If in doubt, replace or ask Snorkel or its local representative for advice.

NUTS & BOLTS

Replace any missing bolts immediately. The main pivot shafts and pivot pins are secured with one or two locking pegs. The locking peg not only secures the shafts from falling out but also stops them from turning.

Most nuts used are nyloc nuts which are superior to the normal full nut and spring washer. Never use plain nuts and spring washers unless originally fitted. Always torque fixings.

THREAD SIZE	MAXIMUM TIGHTENING TORQUES			
	UNPLATED		PLATED	
	Nm	Lbf.in.	Nm	Lbf.in.
M4	4.6	40.7	3.5	31
M5	9.5	84.1	7.1	62.8
M6	16.0	142.0	12.0	106.0
M8	39.0	345.0	29.0	257.0
M10	77.0	682.0	58.0	513.0
M12	135.0	1200.0	101.0	894.0
M14	215.0	1900.0	161.0	1420.0
M16	330.0	2920.0	248.0	2190.0
M20	650.0	5750.0	488.0	4320.0

Table 3-7: Torque table for nuts & bolts.

LOCKING PEG

Each shaft is secured with a locking peg. If a peg is broken or the bolt and peg is missing then this could be down to a seized shaft as a result of no lubrication. If a seized shaft is suspected, check that the x-drilling for the locking peg lines up with the bolt for the locking peg. Fit a new peg. Carefully operate the boom to determine if the shaft is trying to turn.

If a grease nipple is fitted, apply grease. If the shaft has seized, it is recommended to drive the shaft 1/2 way out. Clean and apply new grease. If the shaft is badly worn or scoured, replace both shaft and the bush. Depending on which shaft is causing the problem, the structure might need support to prevent jamming when extracting the shaft.

Figure 3-20: Locking peg.

LOCKING PINS

It is important that the boom locking pins are used when the machine is transported. Never transport a machine if the pin is missing. The fixing clips fitted on machines have been provided to prevent paint damage by the pin hitting the structure during use.

When towing, insert the pin and lock in place with the “R” clip provided. During inspection, look for indication of the machine being moved without the pin. Signs of damage include dents in the top boom and crack lines below the vertical boom. Contact Snorkel or its local representative for repairs.

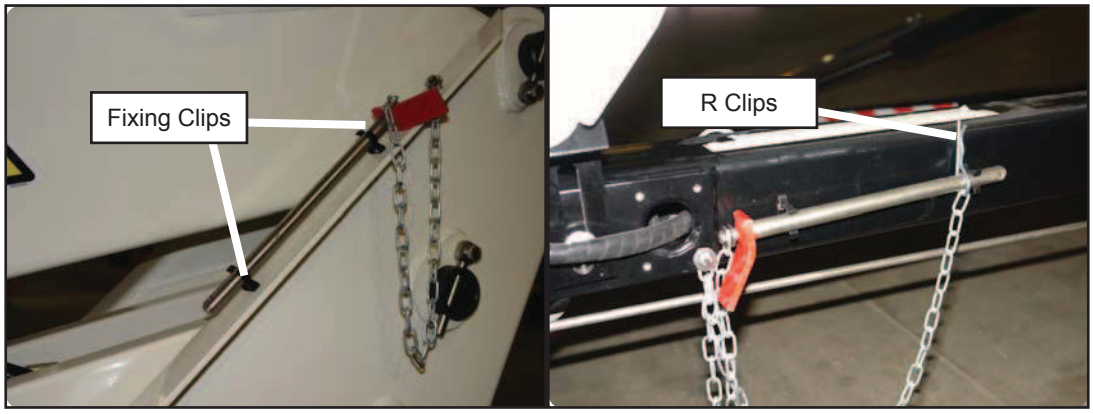


Figure 3-21: Level gauge location.

TIE DOWN LUGS

Check for wear and tear. Also check for damage. There are two lugs on each side attached to the tow-bar and two other lugs on each side of the rear outriggers. Current machines have a single box towbar. Earlier models had an “A” frame towbar with one individual lug welded to each side of the towbar.

Note
The lugs are used to secure the platform when being stowed or transported. They are not designed for lifting the access platform.

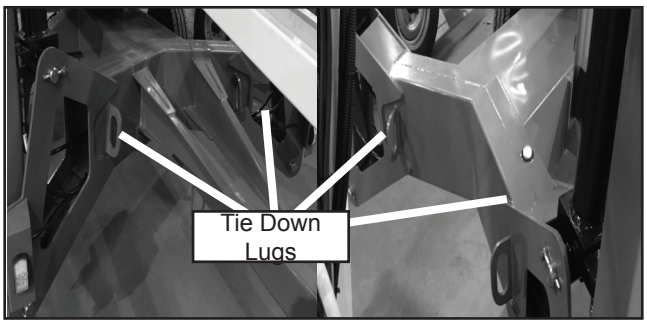


Figure 3-22: Tie down lugs location.

BATTERY & CHARGING

If the machine is fitted with a fully automatic charger, refer to the information provided here. If the machine is fitted with a different type of charger, refer to documentation included with the unit.

The fully automatic charger is

- Waterproof.
- Capable of charging batteries when the motor is running.
- Dual voltage with auto select and indicator light to show voltage selected.
- Short circuit protection.
- Designed to withstand heavy vibration.
- Modular design. The black box will control 12 V, 24 V and 48 V at 30 A outputs with the appropriate transformer.
- Auto-boost to enable batteries to be kept in optimum condition when machine is in storage with the charger connected.

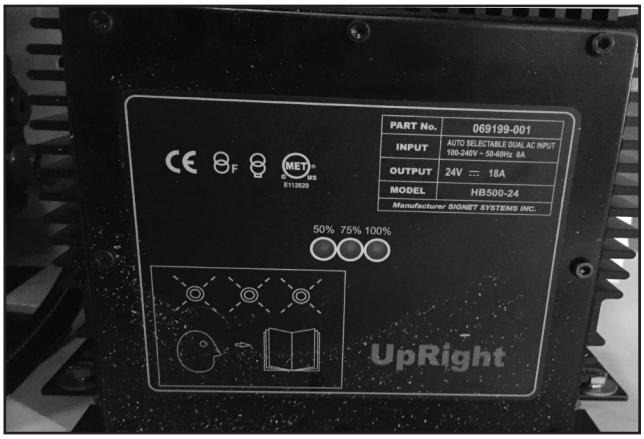


Figure 3-23: The charger (black box) shown has a 110 V plug. To operate on 240 V, replace plug.

OPERATION

The LED’s are visible on the battery charger.

- 50% green LED blinking – indicates that the batteries are 0% to 50% charged.
- 50% solid green LED light and 75% green LED blinking – indicates that the batteries are 50% to 75% charged.
- 50% solid green LED light, 75% solid green LED light and green LED blinking – indicates that the batteries are 75% to 100% charged.
- 50% solid green LED light, 75% solid green LED light and a 100% solid green LED light – indicates that the charge cycle is complete.

The fuse used is a 24 V (15 A) fuse.

ERROR CODES

If the display panel on the box is flickering between -1 and 2, then there is a fault in the transformer or the black box. Check the two output fuses under the terminal cover. The black box or the transformer contains no user replaceable parts. Opening the black box apart from the terminal cover shown will invalidate the warranty.

If the “time out light” comes on, there is a possibility of a faulty battery. Check each cell with a hydrometer. The “time out light” will come on and the charger will switch off if gassing level has not been reached in 24 hours. The “reverse polarity light” will light if the output cables to the battery are reversed. The red cable must go to the positive terminal and the black cable goes to the negative terminal.

CHARGING TIMES

The charger will recharge 2/3’s of discharged batteries in 8 to 10 hours. In reality, batteries are often discharged more than 2/3’s when used on an access platform. The operator tends to use the machine until the motor stops (This causes arcing of the motor contactor and severe heat rise in the motor; both of which shortens the components life considerably.). After which it is easy to forget to put the machine back on charge after using it. This results in the battery being as much as 95% discharged before the charger is connected (this causes severe reduction in battery life).

If the battery cell voltage is below 1 V, the charger may not start. In this case, hold down the low voltage start button for several seconds. This will bypass the charger safety system and cause it to start irrespective of battery voltage. After the voltage has increased sufficiently for the controller to take over, the button can be let go off.

If gassing level is not reached in 24 hours, the charger will switch off and the “time out light” will come on. Disconnecting the input lead will automatically re-set the timer. Take care not to disconnect the charger during a charging cycle. Always let the charger reach “Charge complete” or “Time out” to prevent overcharging.

PRACTICAL APPLICATIONS

The machine will not work if the batteries are run down fully. This is still the case even if the charger is connected. The electric motor requires as much as 3 times the charger output. The charger will float on 30 A maximum and the motor will not turn (This results in damage to the motor and contactor). If the user has a very hectic work schedule, it is easy to run out of battery power before work is completed. In this case, the charger can be connected to the mains supply before the batteries are 50% discharged. This will provide enough time for the charger to keep topping up the batteries and extend the duty cycle of the machine considerably. The battery life may be slightly reduced as the optimum charging cycle for any battery is “fully charged - 2/3’s discharged and then fully charged.

To check if a charger works, connect the voltmeter to the same battery terminals as the charger. Take a note of the reading. The next step is to connect the charger to a mains voltage. There should be a marked increase in voltage. Check the display on the charger. An in-line anmeter (or use a clamp on type) can also be connected to check that the charger output display matches the current going into the batteries.

BATTERY & CHARGING CHECKLIST

- Check that the fuses are secured in the fuse holder.
- Check that all wires are secure on the terminal block and on the battery terminal.
- Check that the multi pin plug is secure on the pcb.
- Check for damage to cables and wiring.

BATTERY SAFETY PRECAUTION

When charging the battery, explosive hydrogen gas will be given off. Keep away from open flames. Always wear appropriate personal safety equipment such as eye goggles and rubber gloves to prevent injury incase of spillage. Keep the top of the batteries clean and free from dirt. It is very easy for the battery to be contaminated when topping up with distilled water. Regular topping up with distilled water will be required from time to time.

BATTERY CHARGING USING A GENERATOR

The charger can only be connected to a generator fitted with a full AVR (Automatic voltage regulator) and spike filtering system. Large voltage fluctuations and spikes will damage the electronic components in the charger. It has been noted that the Honda generator set offers the best and most reliable voltage supply. This applies only to the fully integrated Honda generator sets and not the cheaper options using a Honda engine fitted with a non-Honda generator unit.

EMERGENCY STOP

Two emergency stops are fitted; one at the lower controls and the other at the upper controls. When pressed down on, they must stop all movements immediately. To release, pull up the emergency stop. The switch head is not physically attached to the switch mechanism behind the head. If the head is released and the machine will not start, check that the switch has not seized in the off position.

ELECTRICAL SYSTEM

The electrical system is quite simple and requires minimal maintenance. The biggest problem is loose connections which is caused by vibration during towing and secondly moisture or condensation caused by high humidity and temperature fluctuations.

Erratic running of the motor when pressing down on the platform raise/lower button and moving the booms can be caused by an intermittent internal cable failure. The failure can be hard to locate. The best way is to lower the relevant boom. If the motor has stopped permanently, use the emergency lower system. Try raising the boom again to determine if the fault occurs roughly in the same place. If it does, it is highly likely there is an internal cable failure and the complete cable should be replaced.

On mains powered machines, the control circuit is almost identical apart from voltage variants and the use of an isolation transformer on the control circuit. The bolt on motor contactor used on the DC pack is replaced by a combined thermal overload and motor contactor mounted inside its own junction box. On engine powered machines, the boom circuit is the same as for the DC powered machines apart from the electrical start/stop circuit needed for the engine.

OUTRIGGER SAFETY & MAINTENANCE

- It should not be possible to raise the outriggers with the booms up in the air. If this occurs, immediately check the boom limit switch and the diverter valve. If it is not possible to lift up the outriggers after lowering the booms, check the same components.
- It should not be possible to lift the booms up in the air unless the outriggers are all down and in full contact with the ground. If this occurs, adjust the outrigger limit switch immediately. If lifting is performed without having the outrigger correctly set, the operator will fall over. In any case of instability, the machine will stop and the audible alarm mounted on the underside of the platform control box will sound. The hand pump must be used for dropping down and re-setting the outriggers. Check that the LED on the ground control panel is working correctly. Each LED should only come on when the outrigger is in contact with the ground.
- Check that the audible alarm is working. It should sound when the outriggers are unstable.

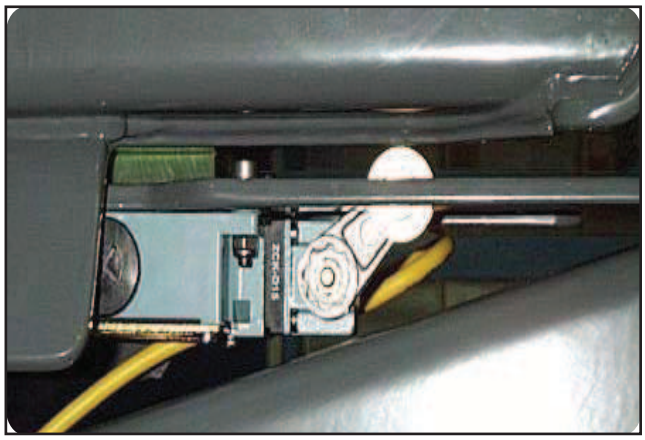


Figure 3-24: Boom limit switch.

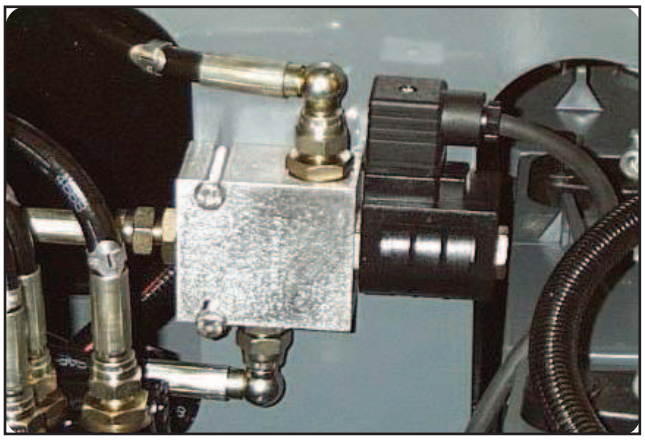


Figure 3-25: Diverter valve.

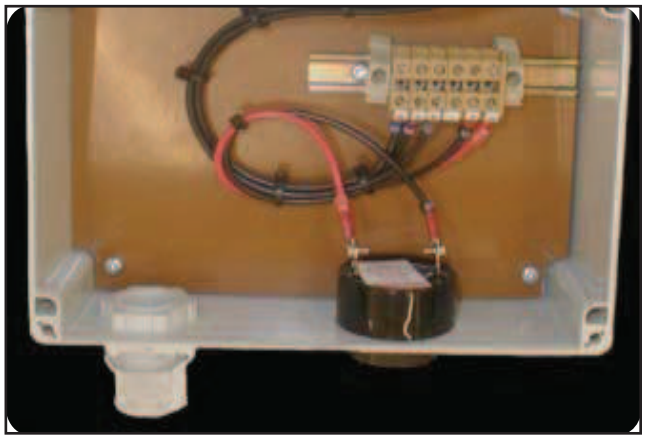


Figure 3-26: Audible alarm.

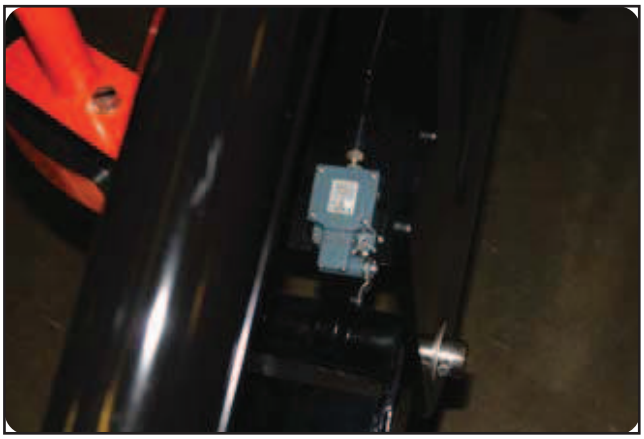


Figure 3-27: Outrigger limit switch.

EMERGENCY LOWERING SAFETY & MAINTENANCE

- When using the emergency lowering valve on the top or bottom ram, it is important to fully extend the cylinder to fill the ram up with oil. There is a delay if it is the first time powering the cylinder down because it has to fill up with oil. If the oil tank is overflowing, clean up the oil spillage immediately. The spillage is due to the tank being overfilled.
- The emergency slew handle and the slew valve handle must be operated at the same time to allow oil to circulate. When the hydraulic motor is turned, it becomes a pump leading to the oil being moved elsewhere.

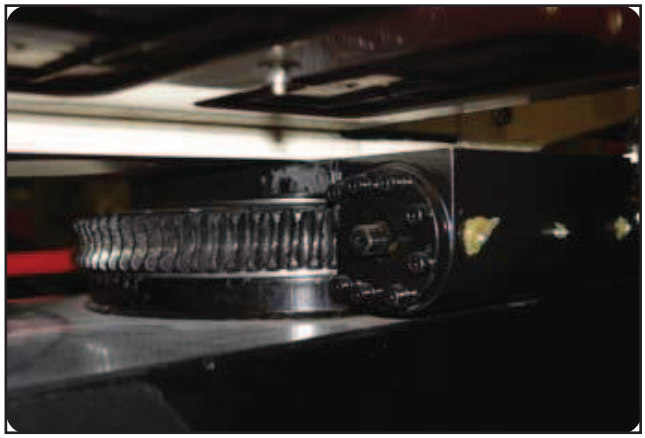


Figure 3-28: Emergency slew.

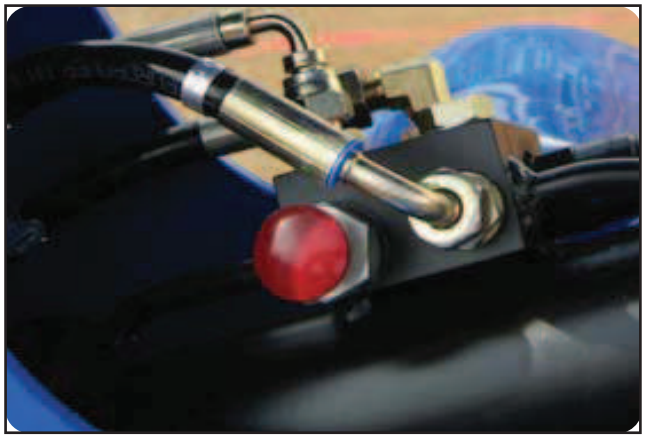


Figure 3-29: Emergency lowering valve.

WHEELS

Check for damage to the tyre/tyres. Replace if tread pattern is worn below 3 mm. On machines with sliding axle, increased wear will be noticed on the inside part of the tyre/tyres compared to the outside part. It is important that correct tyre pressure is maintained at all times. The correct pressure is 3.8 bar (55 PSI) and not what may be indicated on the tyre. Refer to the tyre pressure sticker fitted on the top of the mudguard. Tyre size is 205/75R16.

Note
For full service and maintenance information on the running gear, contact Snorkel to request a copy of the running gear OEM service handbook.

BRAKES

Check Bowden cable for damage - Replace if inner steel core is visible. Sticking brakes can be down to seized cables. The inner steel wire must run freely inside the cable.

Adjust the brakes with the wheels removed. Remove the plastic bung in the back of the brake plate.

Use a screw driver to adjust the star wheel until resistance is felt when turning the brake drum in the direction of travel. Then, slack back until the brake drum turns freely.

Check for correct movement of the Bowden cable. The cable should move 5 to 8 mm. Check for uniform response when braking. All adjustments must be done at the wheel brake and not on the brake linkage.

When removing the drum for cleaning the brake shoes, always ensure that a new flanged nut is used. Tighten the flange nut to between 280 - 300 Nm. When re-fitting the wheel, tighten wheel nuts in the N.S.W.E. sequence and to a torque of 88 Nm.

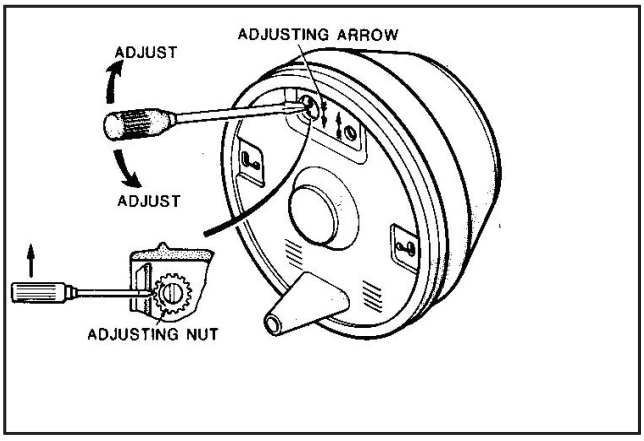


Figure 3-30: Nut adjusting direction.

Note

If the handbrake is not fully applied, there is a risk that the trailer could move backwards. The brake rod must not be under tension or bowed when the handbrake is disengaged.

AXLE

The axle is fully maintenance free. Check the fixing bolts. If ordering replacement axle, quote all reference numbers on the oval serial number plate riveted to the axle beam.

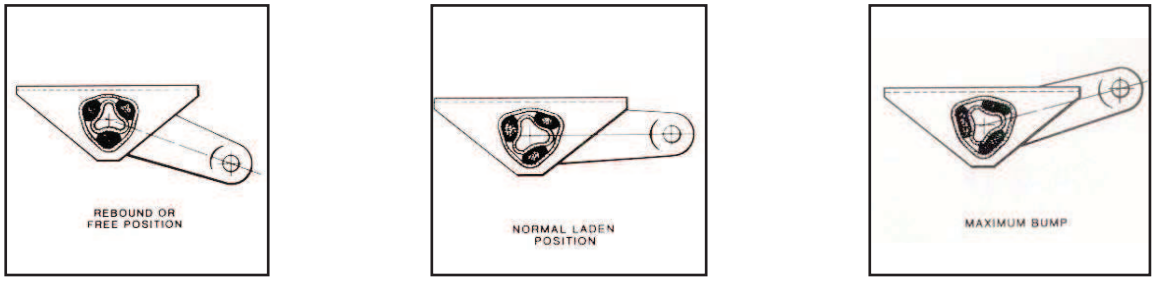


Figure 3-31: View of the different axle positions.

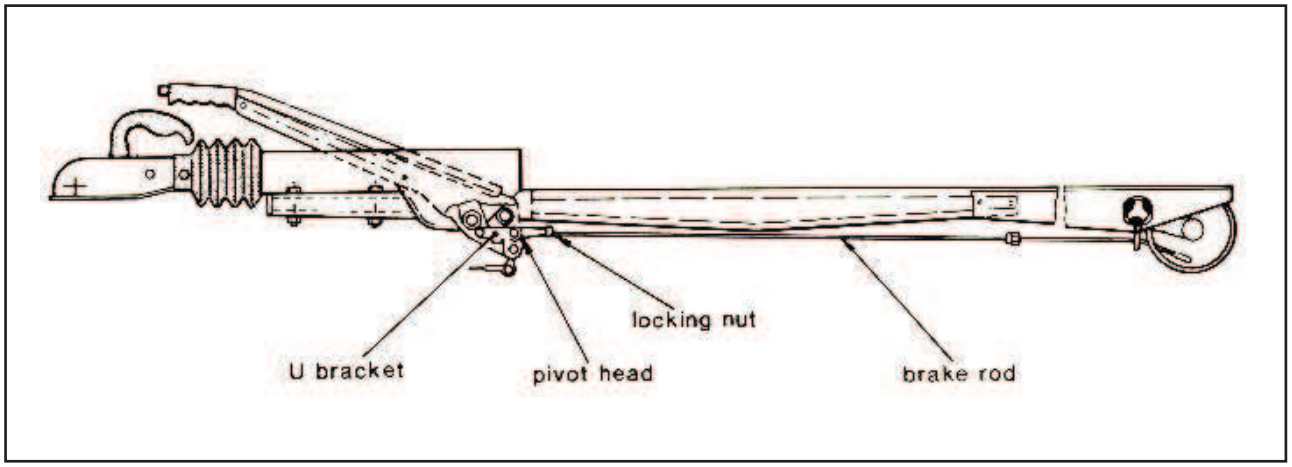


Figure 3-32: Coupling/Overrun device.

En- sure that the draw bar is fully extended. Screw the brake rod into the pivot head and secure with an M10 nut. Using the M10 ball nut, connect the brake rod to the Bowden cable via the compensating bracket. Fit and hand tighten the hex securing nut. Tighten the M10 ball nut on the brake rod until there is no further play on the pivot head against the draw bar (the draw bar must be fully extended).
The compensating bracket must be square on the brake rod. The current type of Bowden cables are

non adjustable. Hook the cable on to the compressor bracket. Adjust to ensure even braking on the brake, not on the compensator.

Check that both wheels run freely in the forward direction. Apply the handbrake; the brakes should start to hold on at the second click. The gas strut will ensure that the handbrake is fully applied. If the trailer is moving backwards, the handbrake will move further up. It is imperative that the gas strut is working correctly. Without the gas strut, the brakes will not hold the trailer on a slope.

Adjust brakes if required and check that all nuts are secured. Grease the coupling head (Multipurpose grease to DIN 51825 KTA 3K), clean and oil all other moving parts.

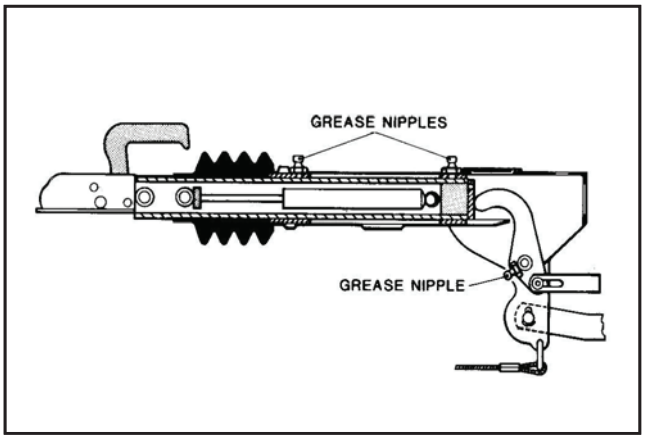


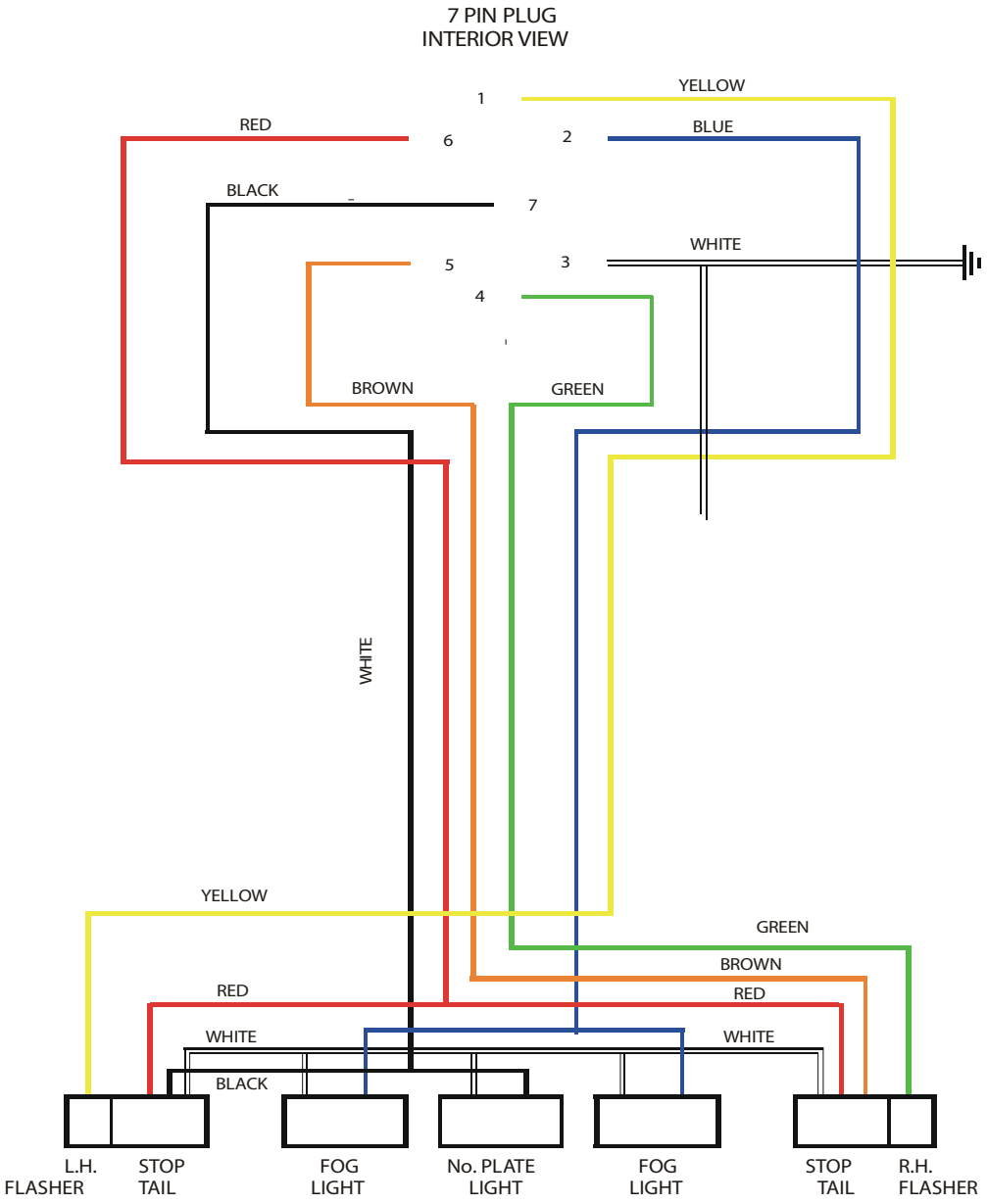
Figure 3-33: View of the grease nipple locations.

WHEEL BEARINGS

The wheel bearings are sealed permanently and require no maintenance or grease. The service life for a set of bearings is in the region of 20000 to 30000 miles depending on running conditions. It is vital that the brakes have not been overheated as this will cause the grease in the sealed ball bearings to evaporate and the bearings will fail. Never re-use the flanged nut when re-fitting the brake drum as the wheel may come off when towing.

When purchasing a brake drum, the bearings are normally included fitted to the brake drum. If replacing the bearings only, contact Snorkel or its local representative for further information. Always use a new flanged nut and torque to between 280 - 300 Nm when re-fitting the drum.

TL49 REAR LIGHTS



NUMBER	REFERENCE	COLOUR	FUNCTION
1	L	YELLOW	L.H. INDICATOR
2	54G	BLUE	REAR FOG LAMP(S)
3	31	WHITE	EARTH
4	R	GREEN	R.H. INDICATOR

NUMBER	REFERENCE	COLOUR	FUNCTION
5	58R	BROWN	R.H.TAIL
6	54	RED	STOP LIGHTS
7	58L	BLACK	L.H. TAIL & NUMBER PLATE

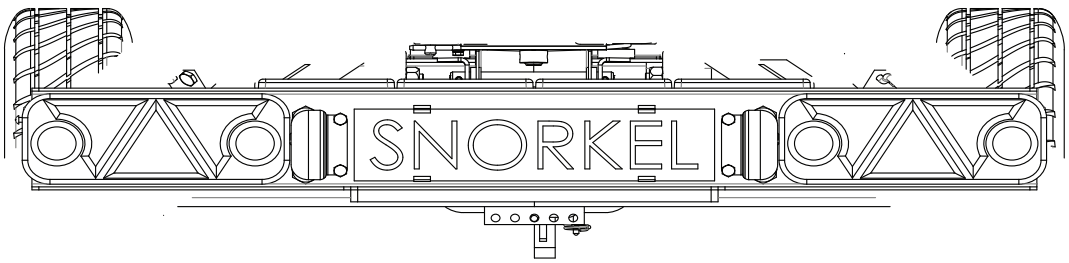


Figure 3-34: Colour and function table for rear lights.

GENERAL GREASE POINTS

Regular greasing greatly improves the service life of the bushes and also removes any moisture which may cause internal corrosion on the wall of the bosses making it difficult to remove the pivot shafts for inspection.

Figure 3-35: General grease point locations.

LUBRICATION SPECIFICATIONS

It is recommended that only premium quality grease is used. Lithium based grease offer very good performance. For the slew ring, the “RENOLIT ARMNA G4789” from Fuchs offers extremely good lubrication and anti corrosion properties especially at very low temperatures (-30°C).

SLEW DRIVE

To grease the slew ring, the machine needs to be set up and slew around to gain access to the reassessed grease nipple fitted to the top face of the slew ring.

When greasing the worm housing, take care not to push out the oil seal on the end face. If you do, remove excess grease from the end and drive the seal back in. Refer to the slew drive section for more details.

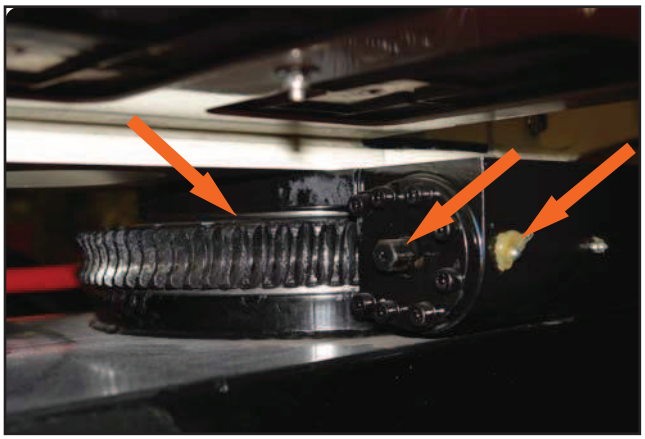


Figure 3-36: Location of the slew drive and grease locations.

SLEW DRIVE GEARS

The slew drive gear is designed to be largely maintenance free. However, it is recommended that the gear teeth be greased on a weekly/monthly basis with a high pressure grease depending on operation conditions. Always clean the gear firstly to remove any road dirt and grime. In very dusty or sandy conditions, take care to prevent a build up of grit/sand mixed with grease which may cause pre-mature wear on the gear.

Additionally, the ring gear and gear box should be greased on a six monthly basis. The grease nipple

for the ring gear is on the top face of the slew gear set between the fixing bolts. It can be accessed by lifting one of the side covers and slewing the structure appropriately.

The ring gear should be inspected on a six monthly basis for excessive wear. It is unlikely there will be any wear if the machine is maintained correctly.

To check the gear, place a payload of approximately 80 Kg on the platform. Elevate the lower boom to approximately half way. Then, gently elevate the top boom whilst observing the ring gear. Excessive wear will be observed by noticing more than 0.5 mm movement between the inner and outer bearing rings. If excessive wear is present, the gear ring should be replaced.

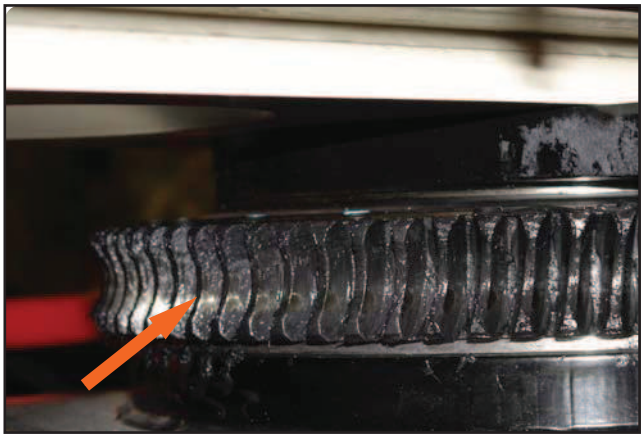


Figure 3-37: Location of the slew drive gears.

SLEW STOP

The slew stop mechanism is fully lubricated and should normally not require any further lubrication. Should more lubrication be needed, this can be done in two ways;

1. When greasing the slew bearing, some grease will drop into the centre part of the slew. Keep on greasing the slew bearing until grease escaping becomes visible from the outside sealing lip on the slew gear. Keep on greasing as the grease will now be pushed out through the outer and inner sealing ring of the slew bearing. Grease escaping from the inner seal will drop unto the slew stop ring.
2. LPS-3 lubrication can also be sprayed between the slew tube and the chassis plate.

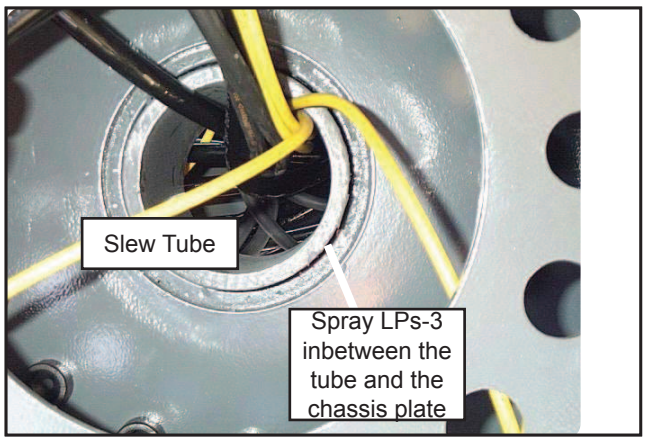


Figure 3-38: Different procedures of lubrication.

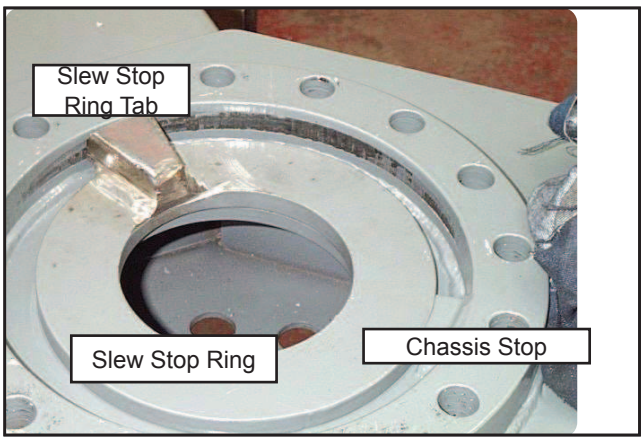


Figure 3-39: Critical parts of the slew stop.

The slew stop mechanism is very simple and prevents the cables and hoses getting tangled up by continuous rotation. The slew stop ring will allow the operator to turn almost 360° in each direction from the stowed position.

The critical parts of the slew stops are as follows:

- Chassis stop
- Slew stop ring
- Slew stop ring tab
- Slew tube stop

When slewing (rotating), the slew tube stop will pick up on the slew stop ring tab and drag it around until the slew stop ring tab hits the chassis stop. It is possible to slew almost two turns in the opposite direction until the slew stop ring tab hits the chassis stop again. This provides almost two turns (lock to lock). From the parking position, this equates to one left turn or one right turn.

The mechanism is very simple and has proven reliable in the field. However, if the slew does not stop, check that one of the 3 steel stop blocks has broken loose. If this is not rectified, the platform can slew continually and will rip out the hoses and cables. To solve such a problem, split the machine and re-weld the slew stop.

Check hydraulic pressure. Apply plenty of lubrication to ensure that the slew stop ring has not got jammed. Again, if the problem does not disappear contact Snorkel or its local representative for further assistance.

Note

All machines being operated in the UK must have a thorough inspection carried out every 6 months in accordance with LOLER regulations 1998 and a certificate of Thorough Inspection produced by a competent person.

When the machine has passed its test, a sticker will be issued showing the certificate number and the date of the next Examination. A copy of the certificate is available upon request.

TROUBLESHOOTING

CONTENTS

TROUBLESHOOTING

FAULT FINDING

It is recommended that fault finding is only carried out by technically competent personnel. Whilst every effort has been made to ensure these procedures are as comprehensive as possible, they do not cover all eventualities.

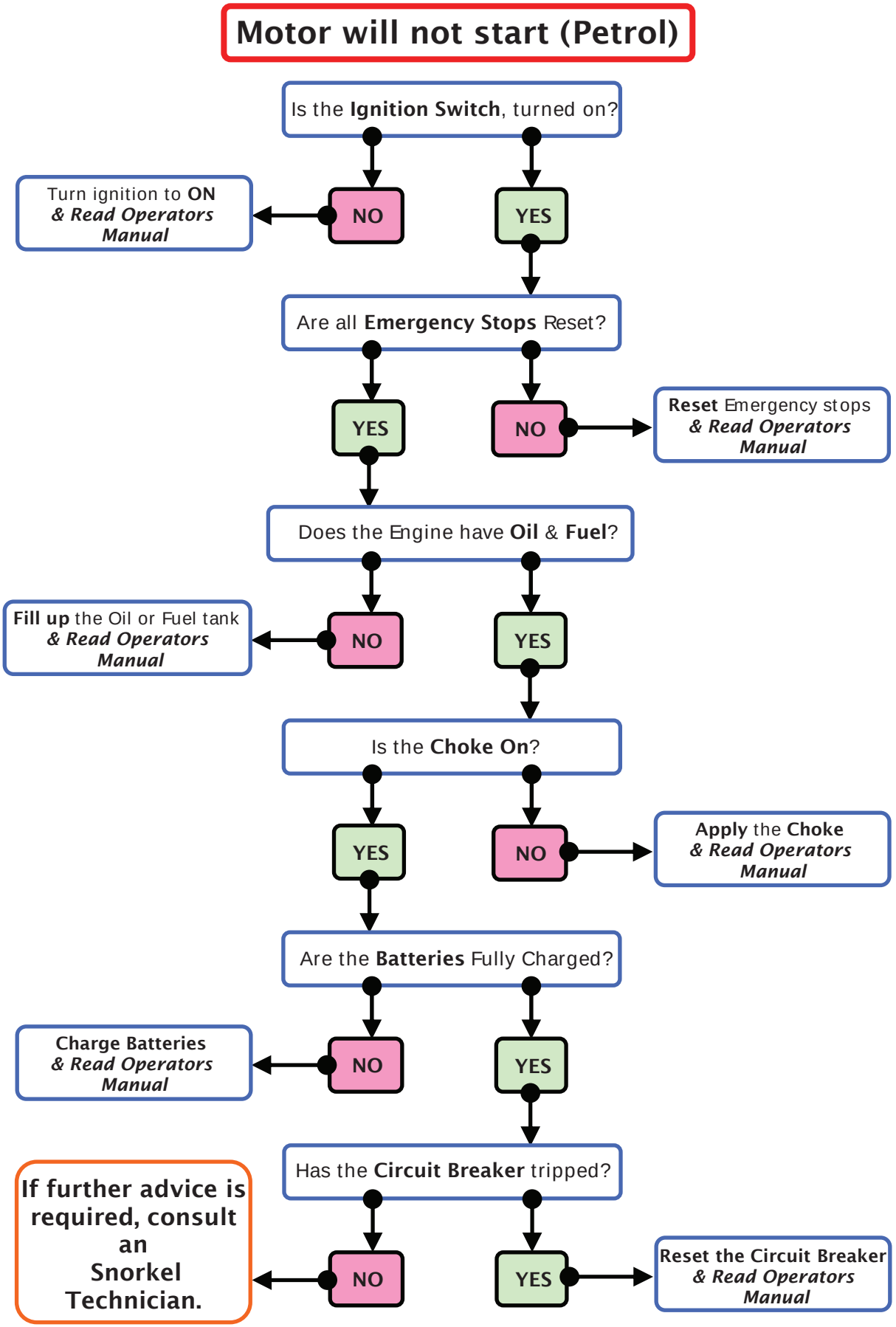
If difficulty is experienced in identifying a fault, contact Snorkel for assistance. A list of troubleshooting notes are also listed below to help with solutions to faults identified.

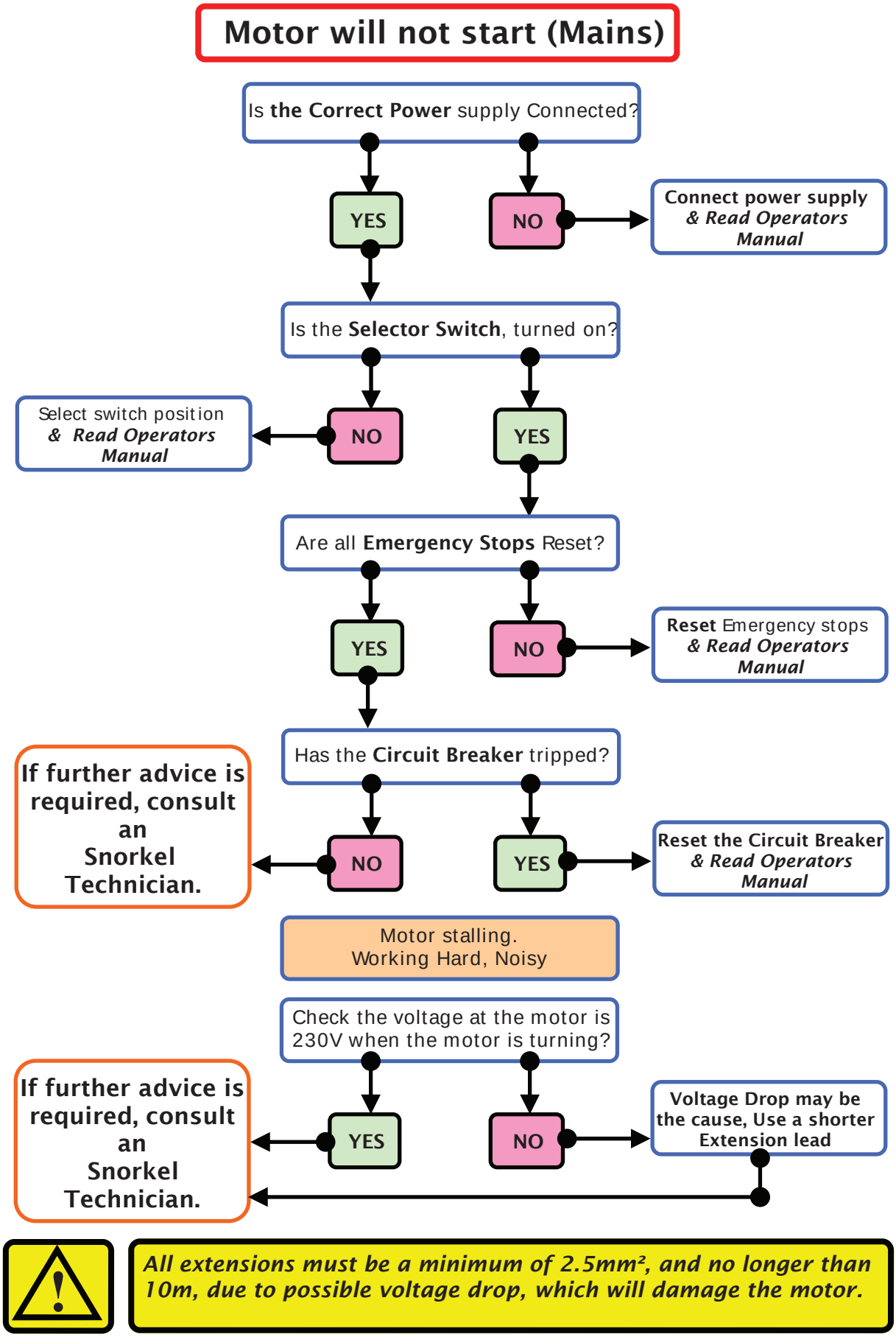
ISSUE	REMEDY
Engine will not start - if fitted.	Ensure there is enough fuel in the tank.
	Switch off emergency stops.
	Turn on the engine ignition.
	Ensure the batteries are fully charged.
	If the engine is cold, apply the choke manually.
	Check engine blade fuse.
DC motor not turning when trying to lower the outriggers.	Ensure the ground control select is turned to ground controls.
	Check the battery level. The battery should be 2/3 charged.
	Check the motor contactor.
	Check the motor brushes.
	Check the motor fuse.
	Ensure the emergency stop button is not engaged.
DC motor turning but not able to operate outriggers.	Ensure the top boom is lowered and the boom switch is activated.
	Check that the limit switch arm is secure on the boom switch.
	Ensure the diverter valve is de-activated. Refer to the hydraulic circuit.
	Check the hydraulic pressure. If there's no pressure, check the pump.
DC motor not turning after outriggers have been lowered.	Check that the key selector switch is not in the off position.
	Ensure the emergency stop buttons are not engaged.
	If the overload alarm still sounds, check the outrigger switches.
Boom will not raise/lower when the control lever is operated and DC motor running.	Ensure the right control select is in use.
	Check the oil level.
	Ensure that the diverter valve is activated.
	Check that the other control valve has all spools in centre position.
	Check the hydraulic pressure. If there's no pressure, check the pump.
	Check that the emergency lowering valve is not opened on the cylinder.
	Check for obstructions.

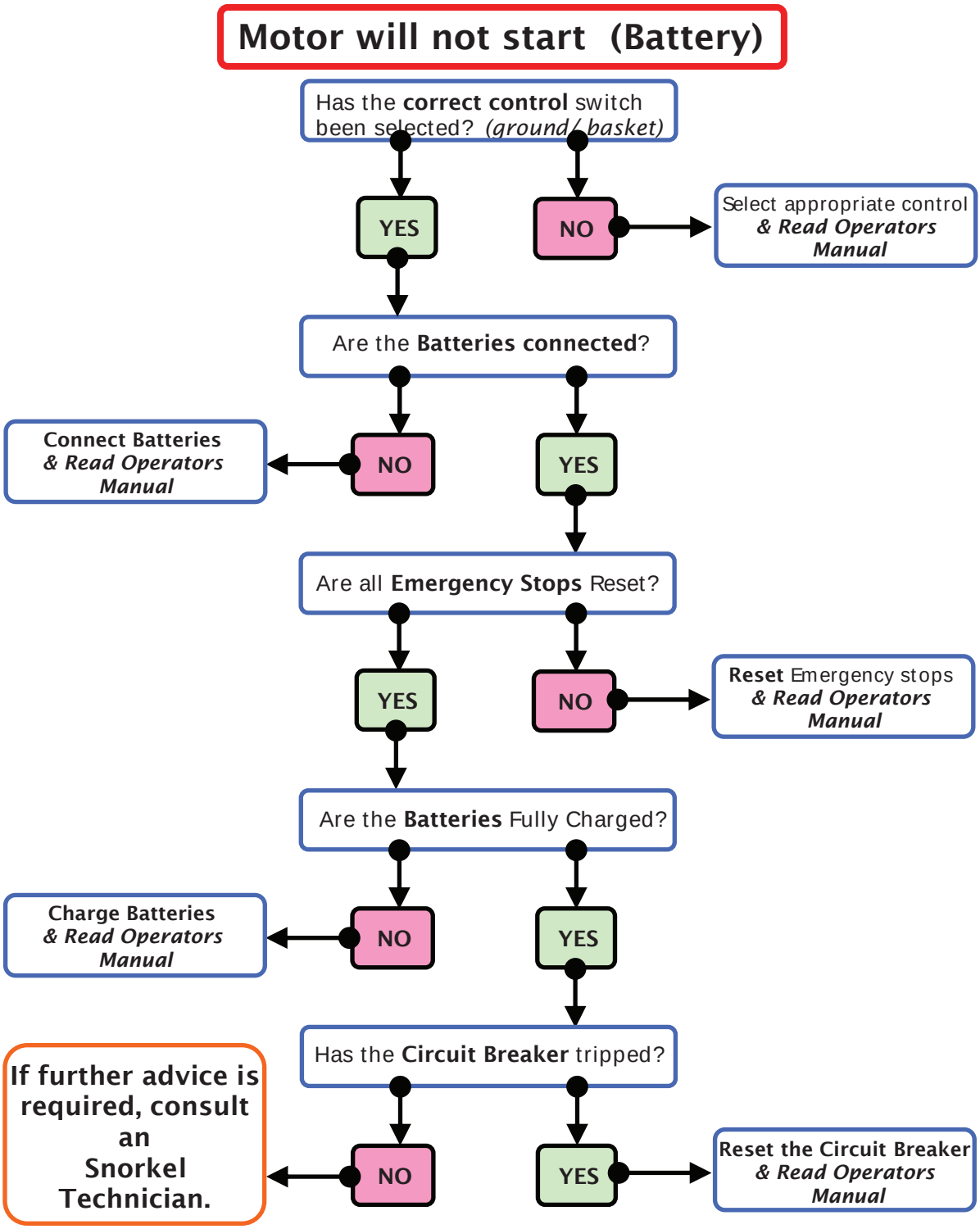
Audible alarm activated when outriggers are not moving	Check the level and limit switches on the outriggers
Slew will not operate in either direction with DC motor running	Check that the machine is on level ground. Slew will not operate if the machine is out of level.
	Check for obstructions.
	Ensure the slew has not reached the slew stop. 2002 machine specification will only slew +/- 355 degrees from the stowed position. Earlier machines would slew +/- 450 degrees from the stowed position.
Loss of movements on the mains/engine powered machines.	Check the dump valve. To enable movement, the dump valve must pull in to stop oil going to the tank.
	Check the oil pressure.
	Check the pump and coupling.
Mains motor/engine stalls when trying to operate the machine	Check relief valve setting.
Mains motor stalls when operating the machine	Check for voltage drop.
	Use shorter extension lead.
	If the voltage reading on the motor terminals is below 10% of the motor rating when it is running under load, the motor will fail. Do not run the machine.
RCD on mains powered machines keeps tripping	Check for water ingress on terminal boxes.
	Check motor start and run capacitors.
0.5A fuse on control circuit keeps popping (Mains powered machines)	Check coil on selector valve and dump valve for cracks/signs of water damage.
Burnt out mains isolating transformer (Mains powered machines)	Check fuse.
	Check coil on selector valve and dump valve for cracks/signs of water damage.

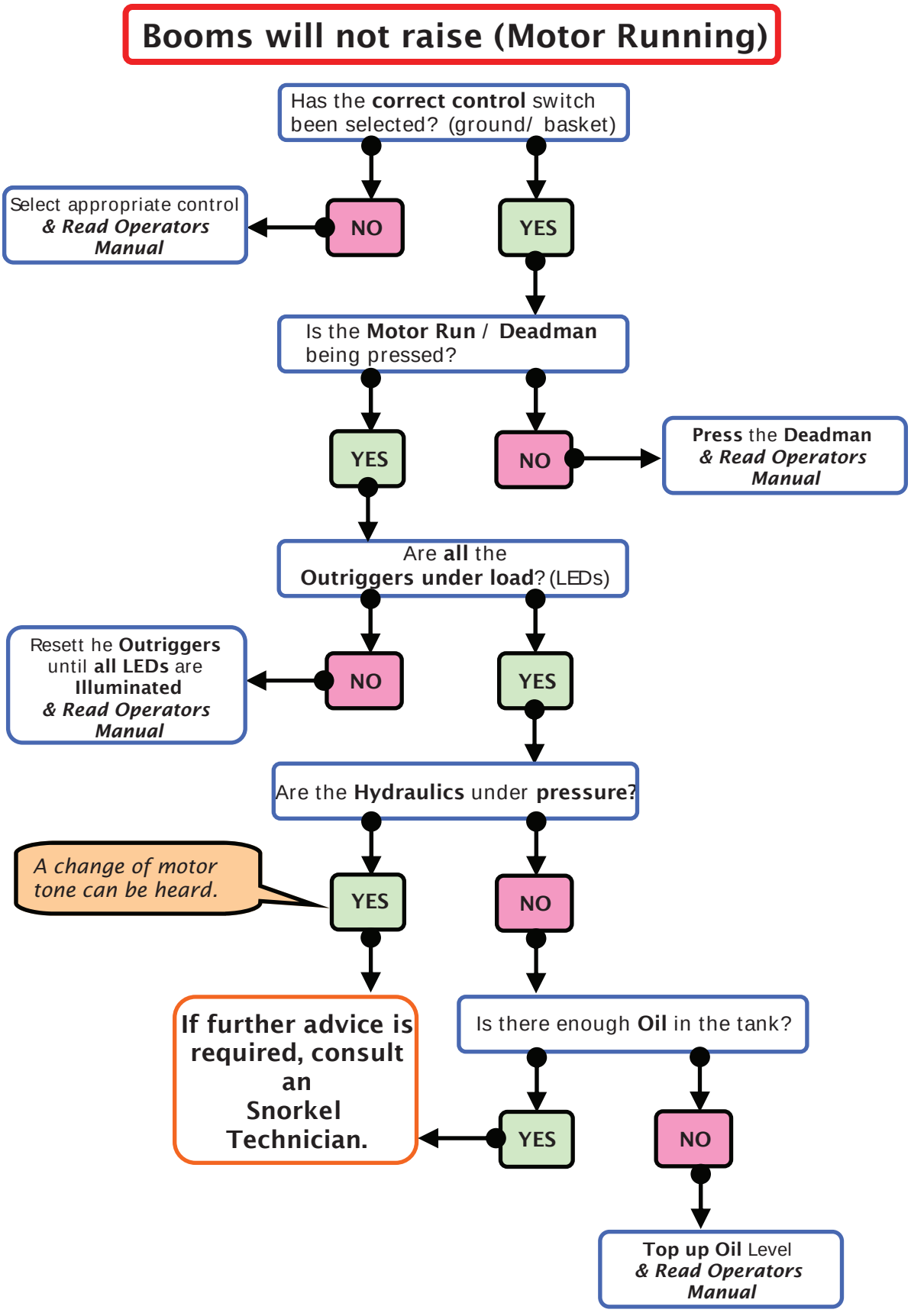
Table 3-3: Fault finding list and possible solutions.

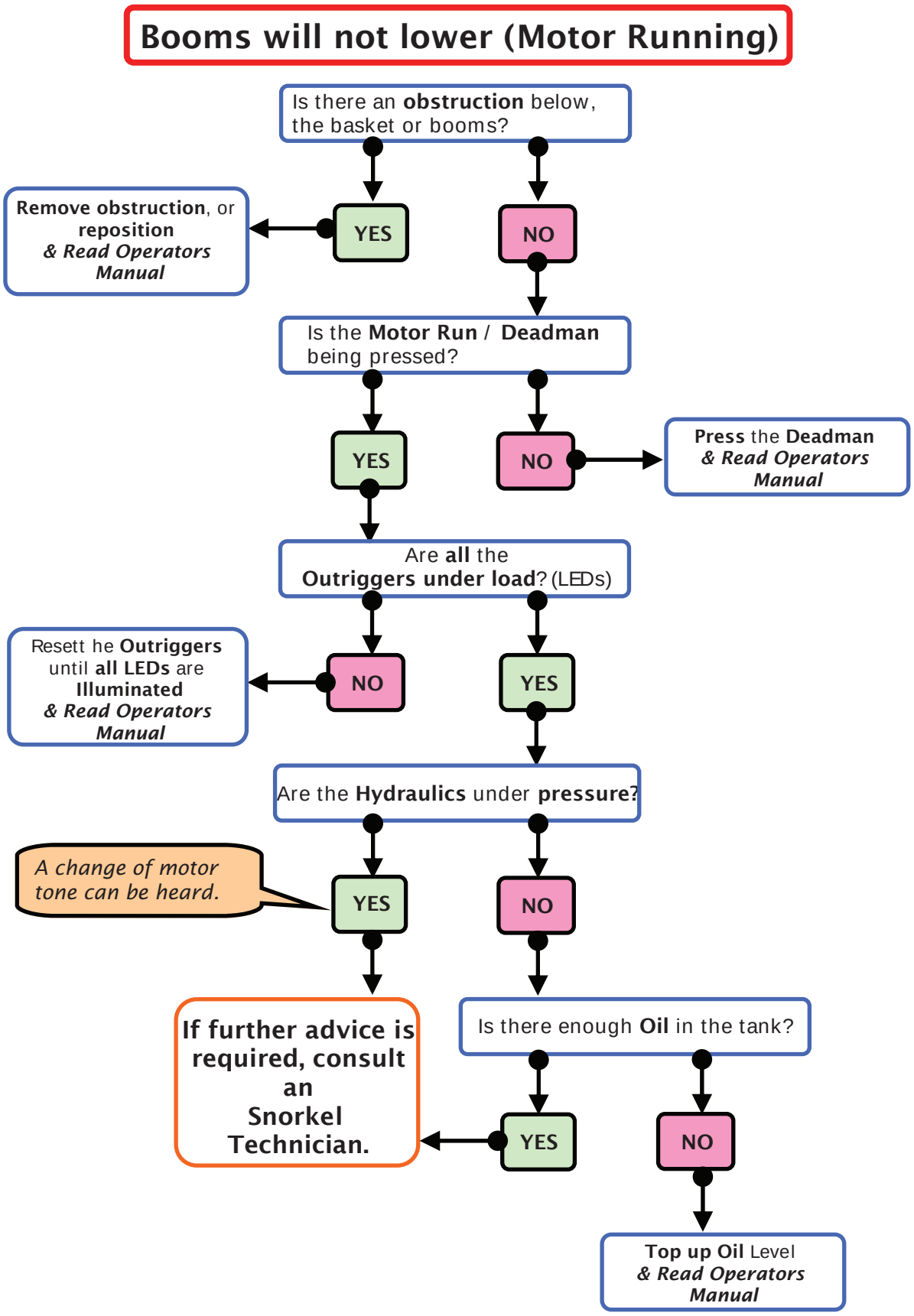
FAULT FINDING MATRIX

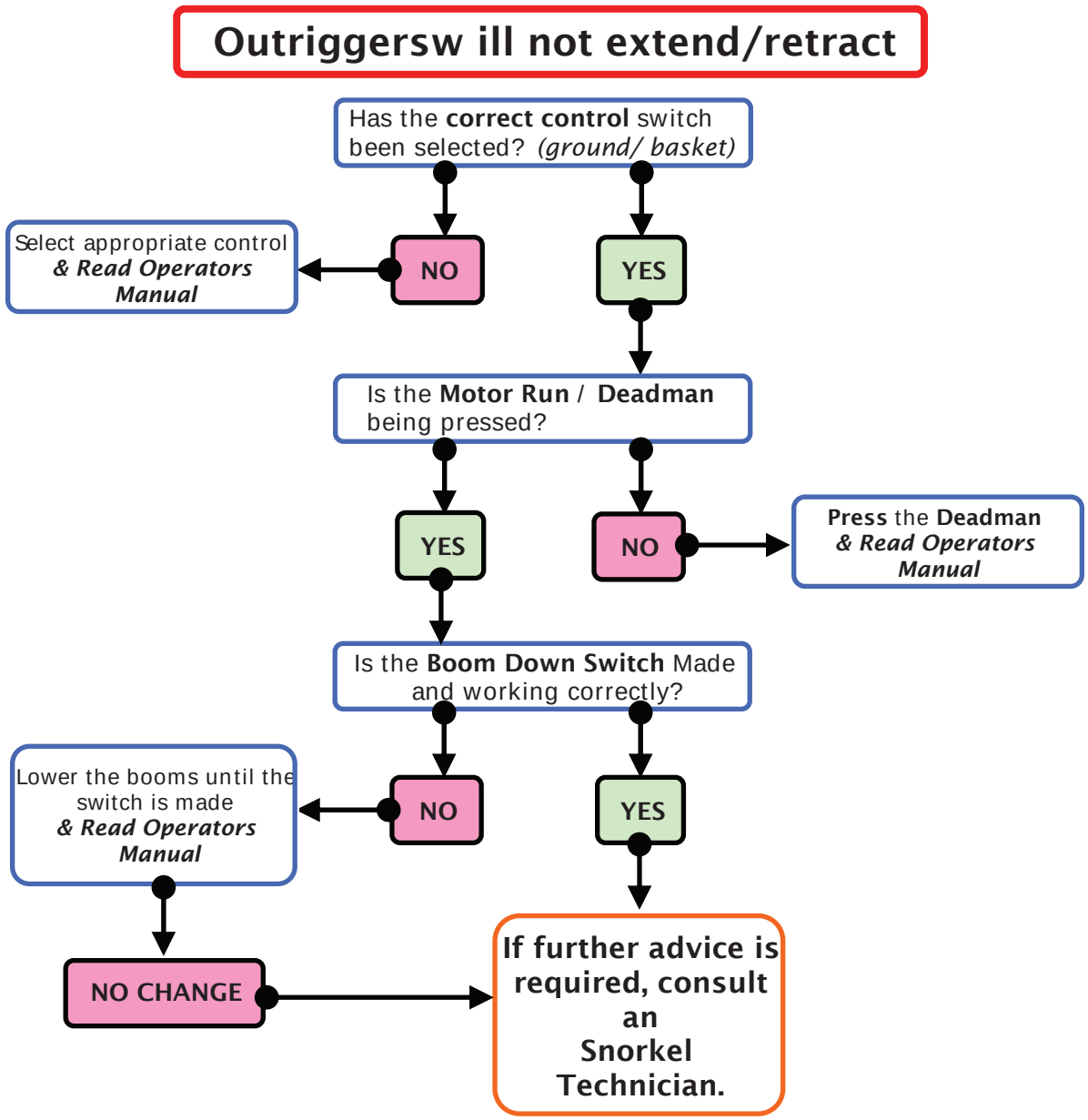


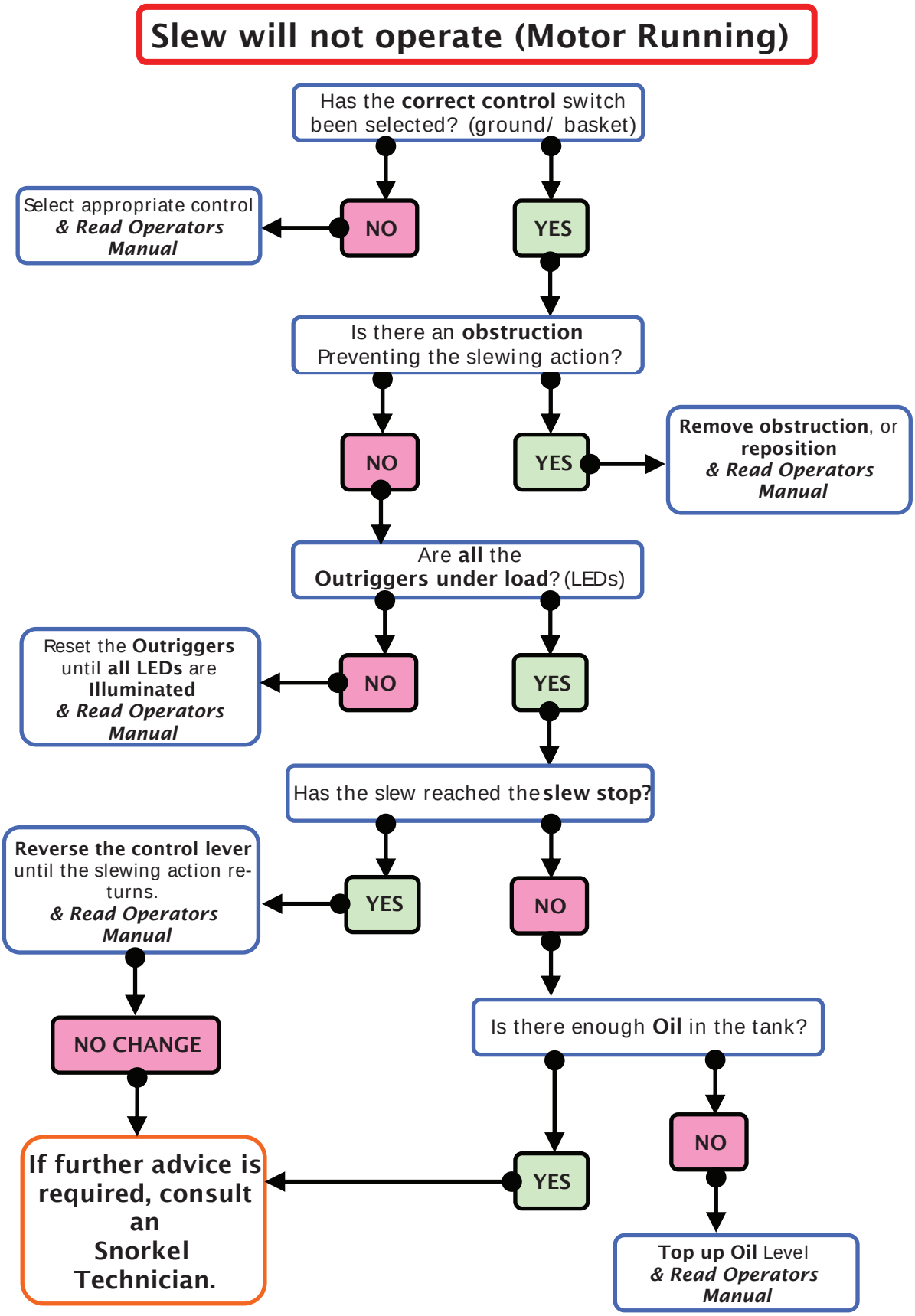












SCHEMATICS

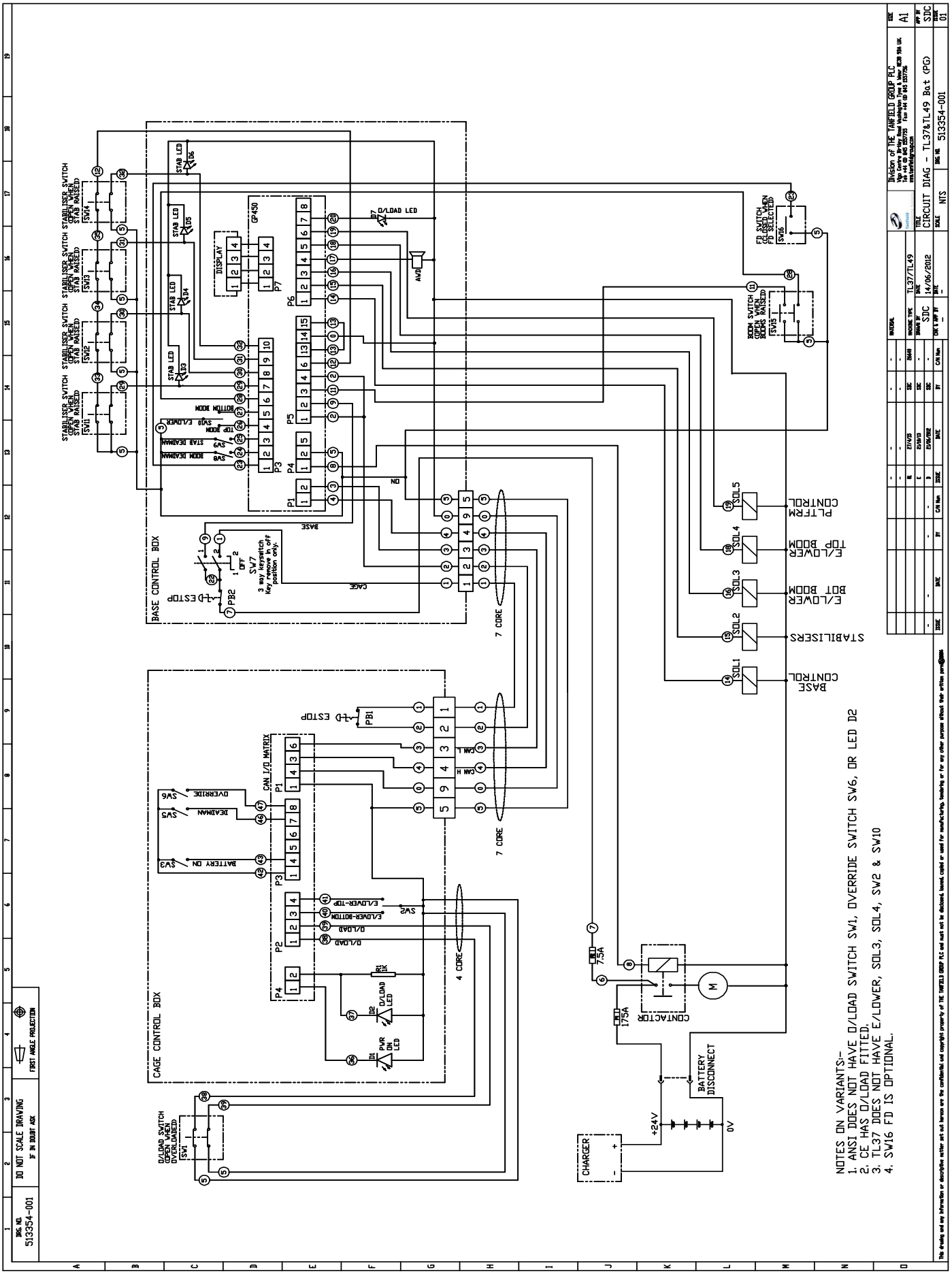
INTRODUCTION

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

The diagrams are to be used in conjunction with the information in section 4. The schematics provide an understanding to the makeup and functions of the systems for checking, tracing and fault-finding during troubleshooting analysis.

CONTENTS

TL49 BATTERY PG ELECTRIC SCHEMATIC - 513354-001



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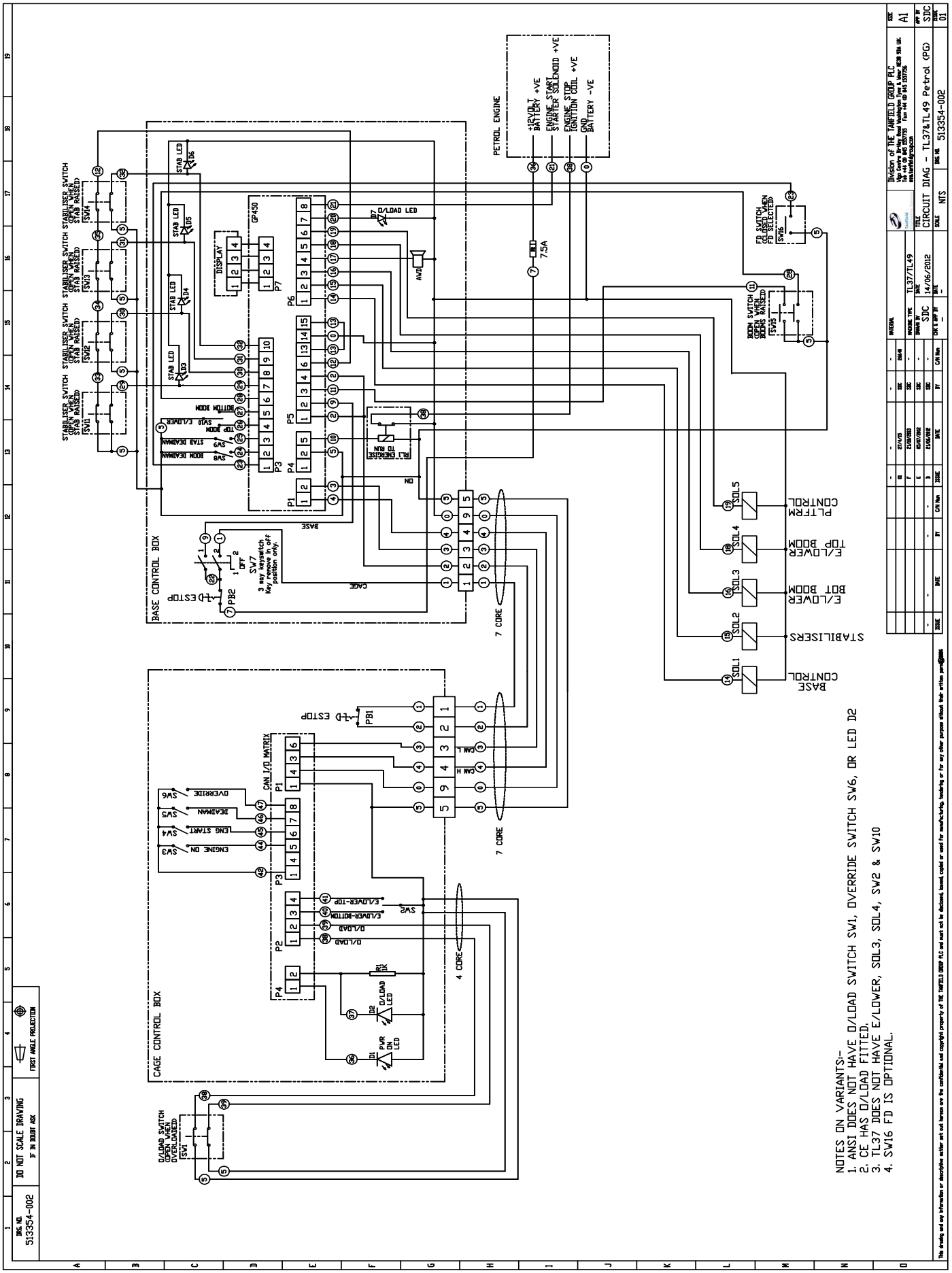

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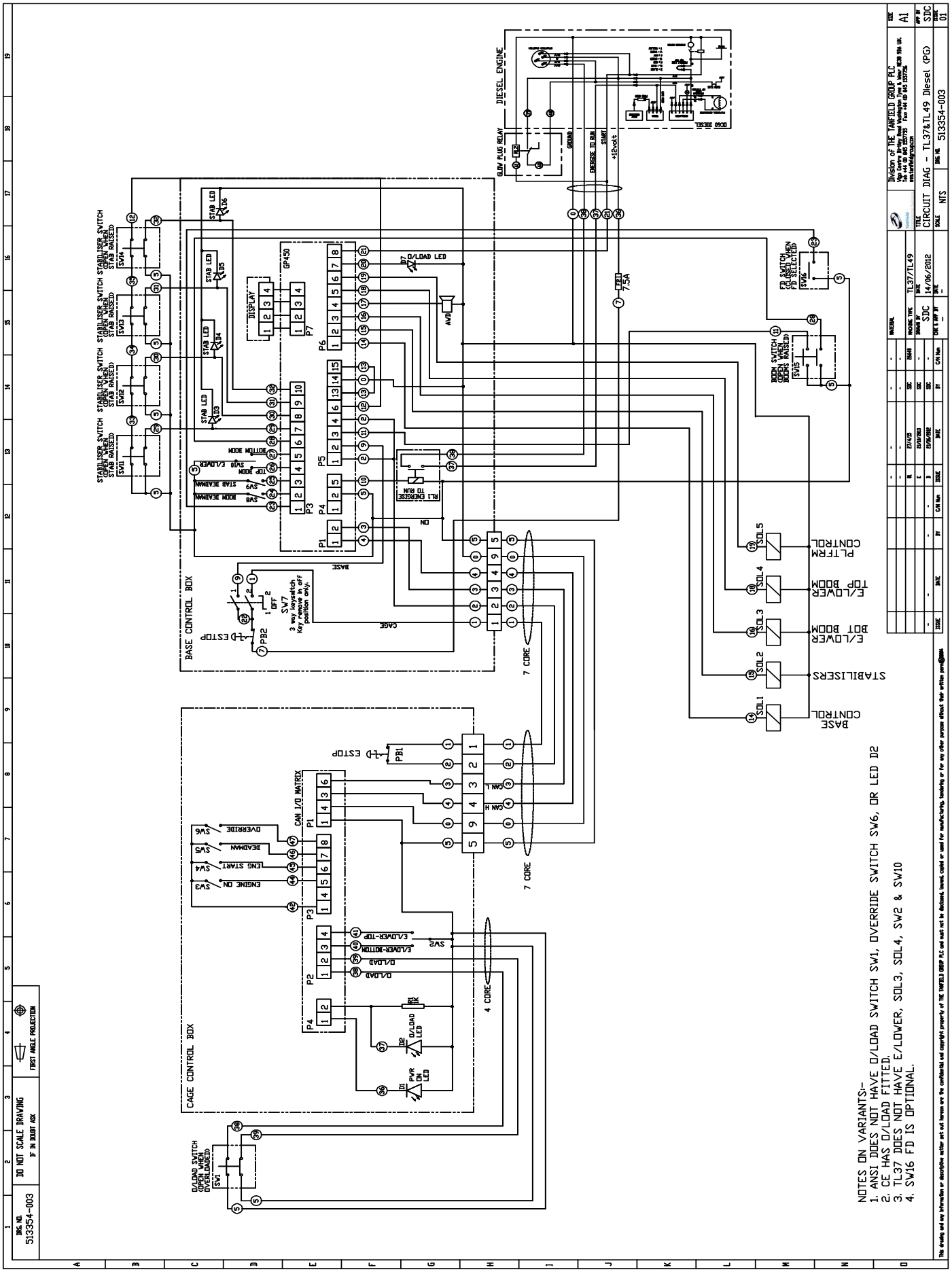

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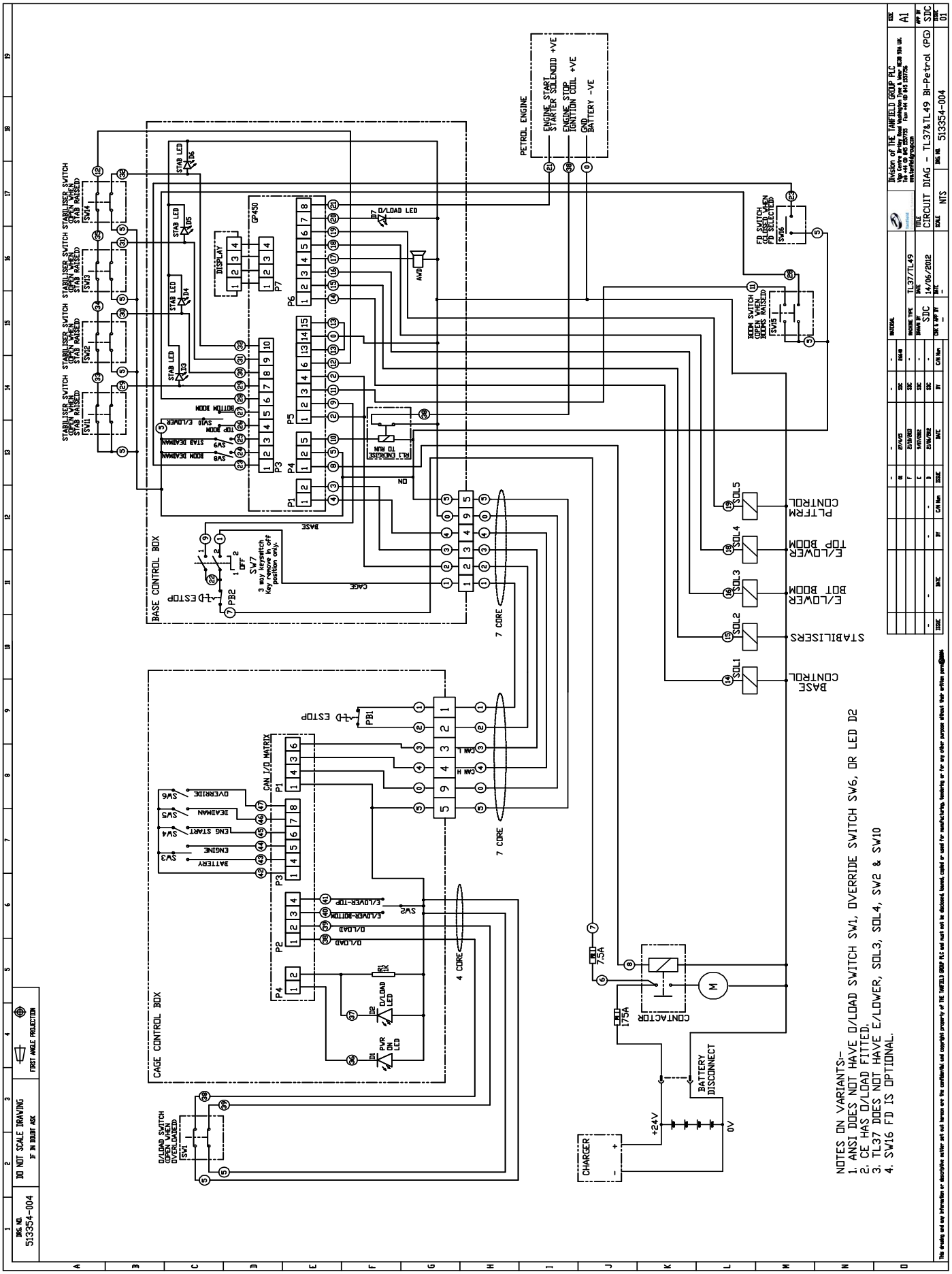

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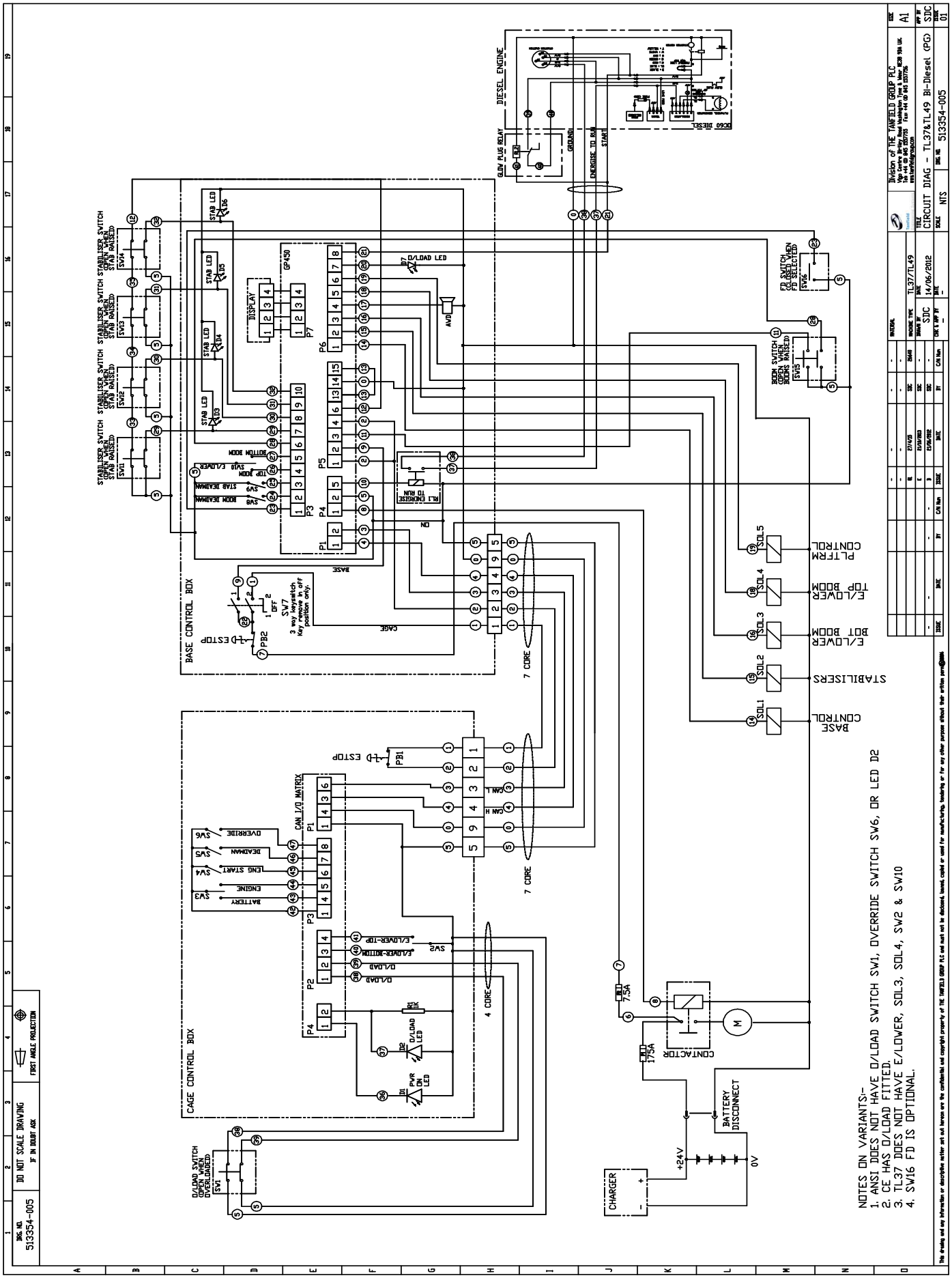

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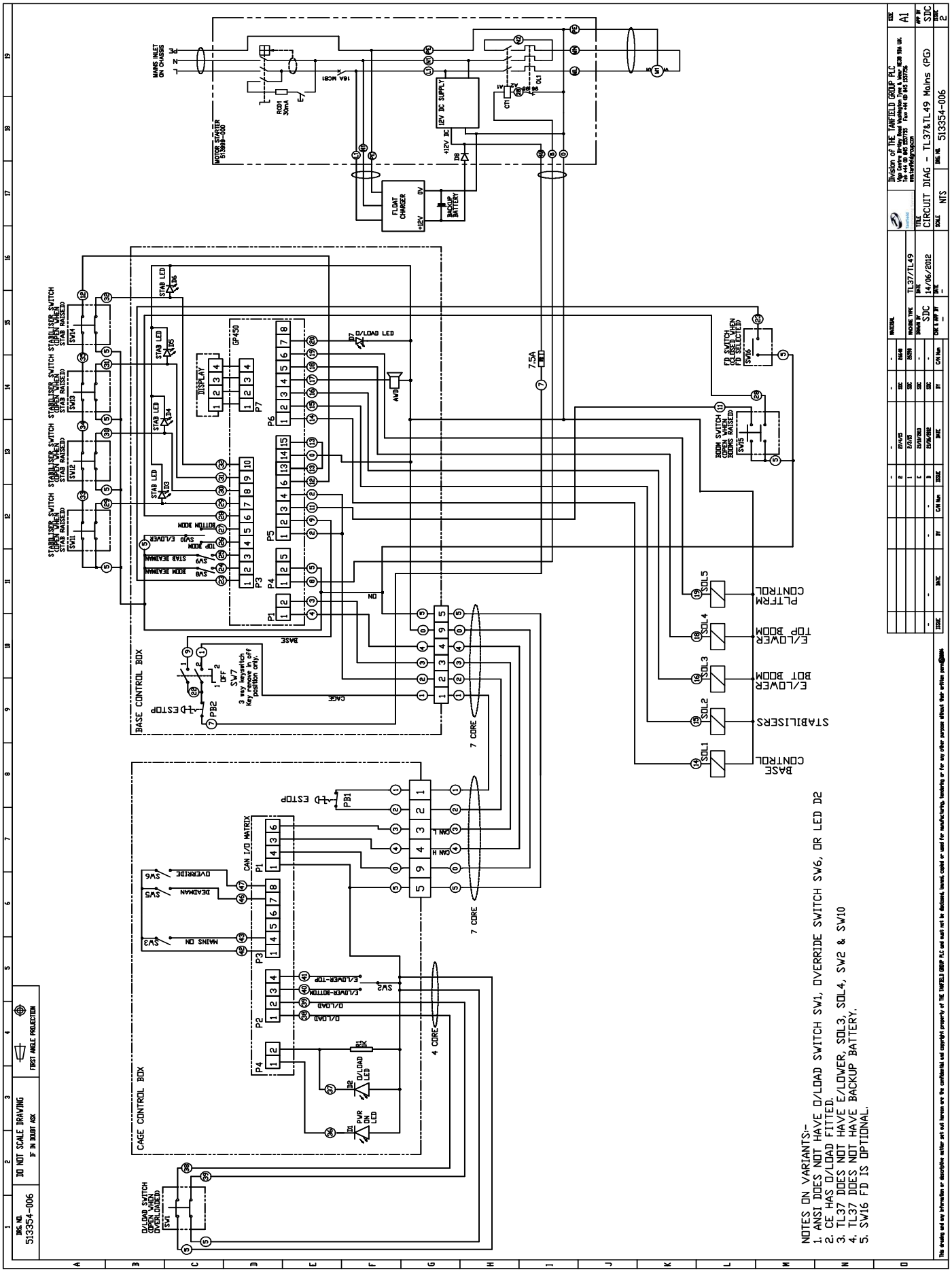
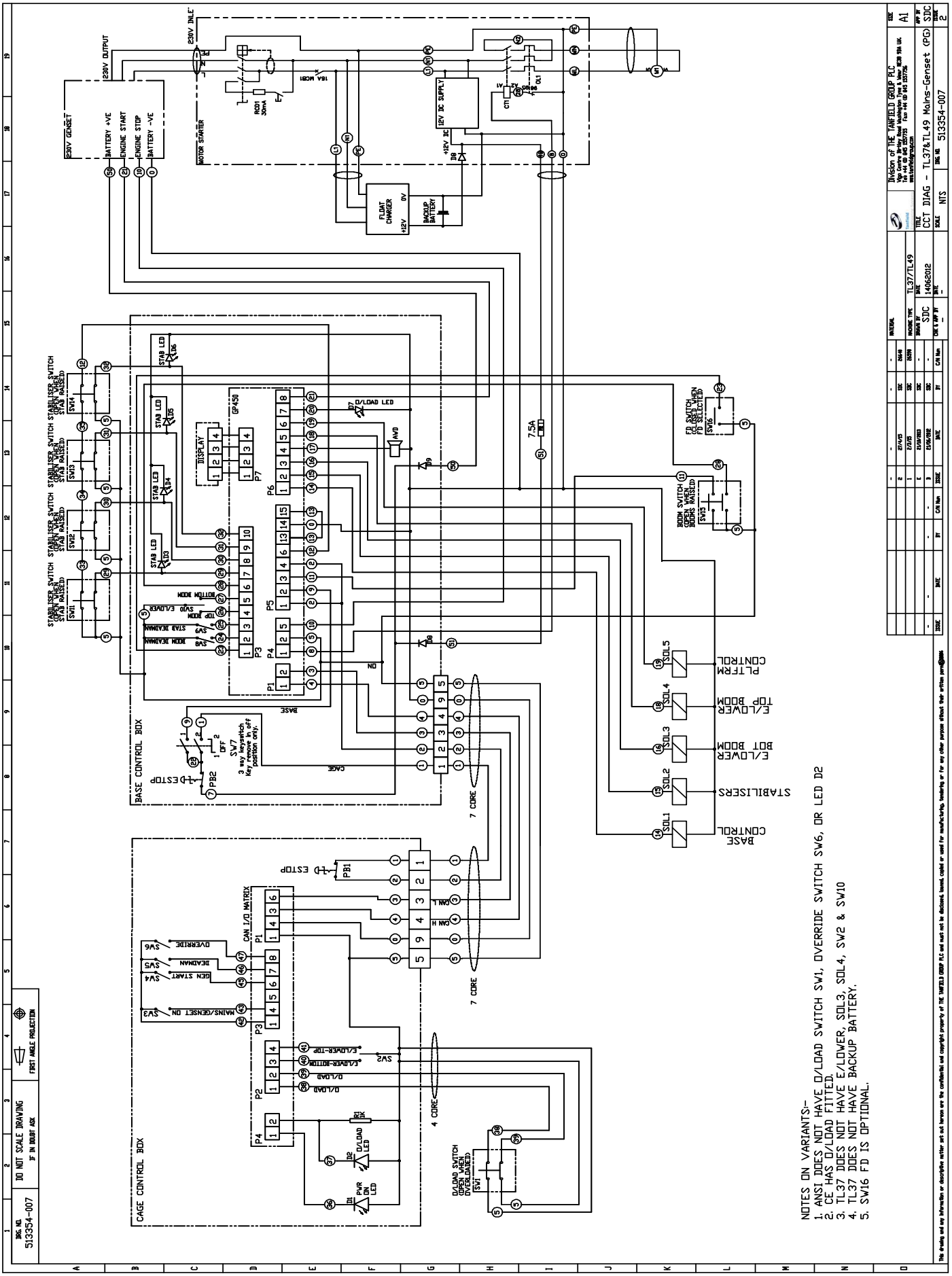
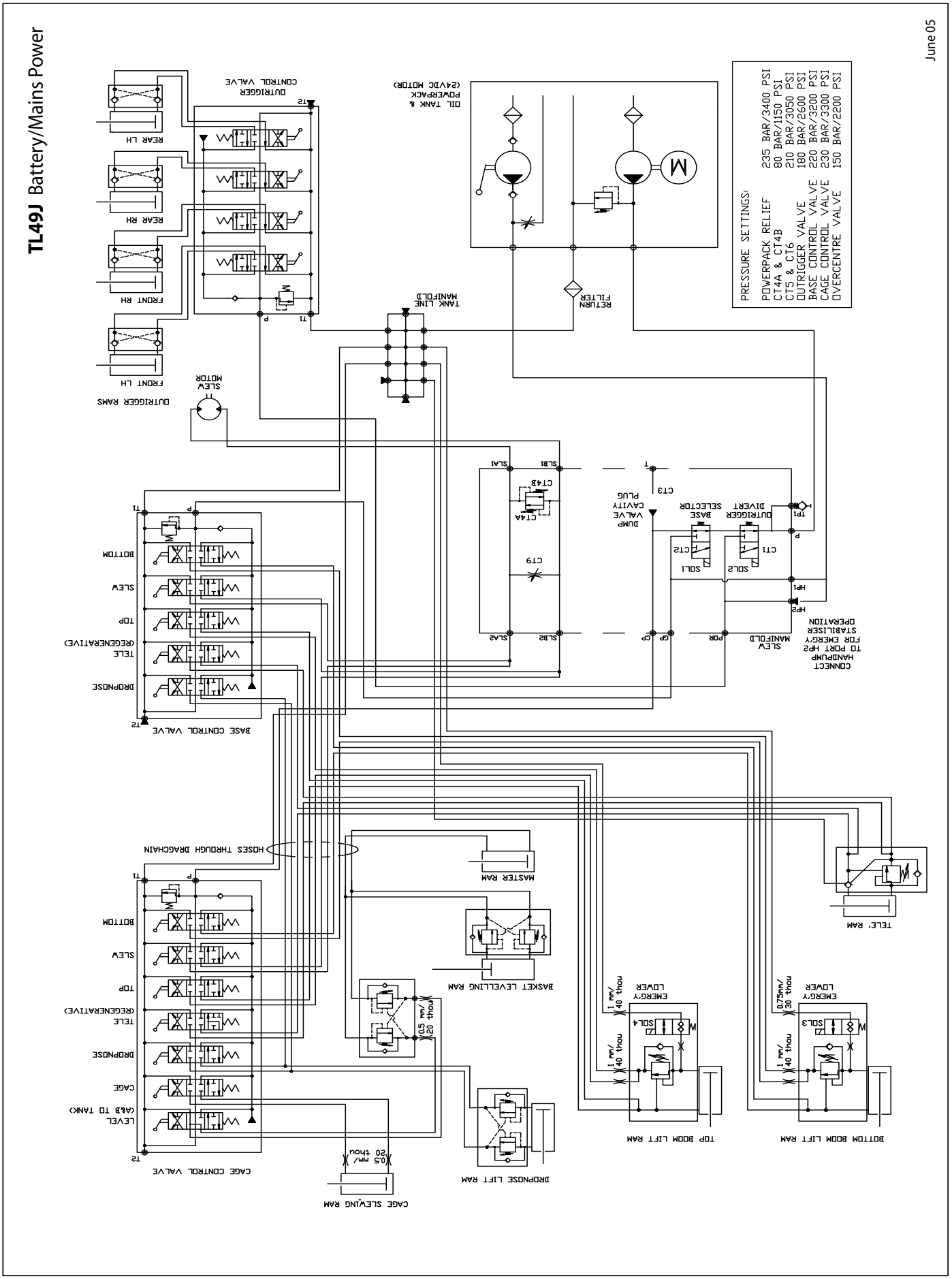


TL49 MAINS-GENSET PG ELECTRIC SCHEMATIC - 513354-007



TL49 BATTERY/MAINS HYDRAULICS SCHEMATIC - 515057-000



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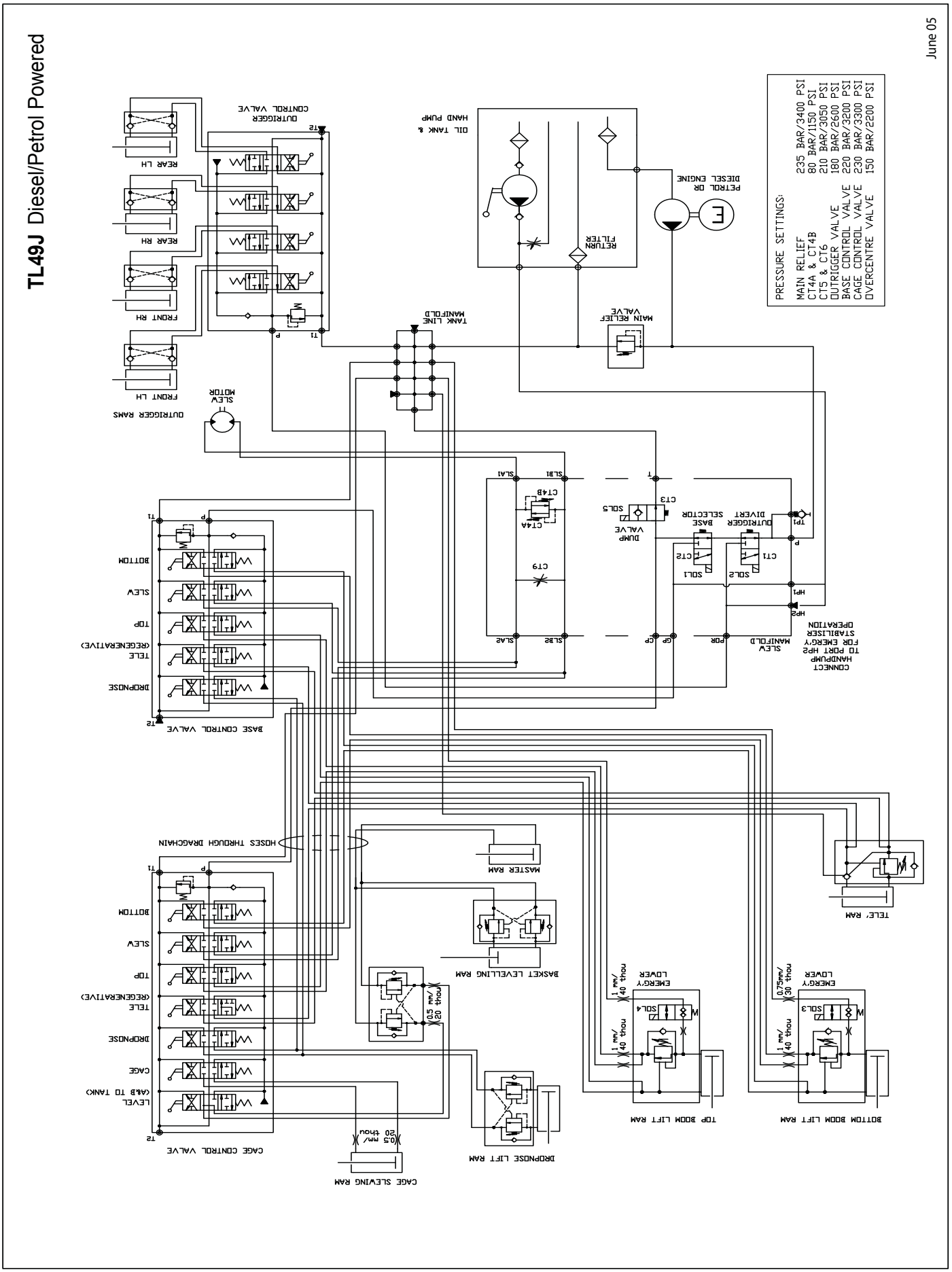

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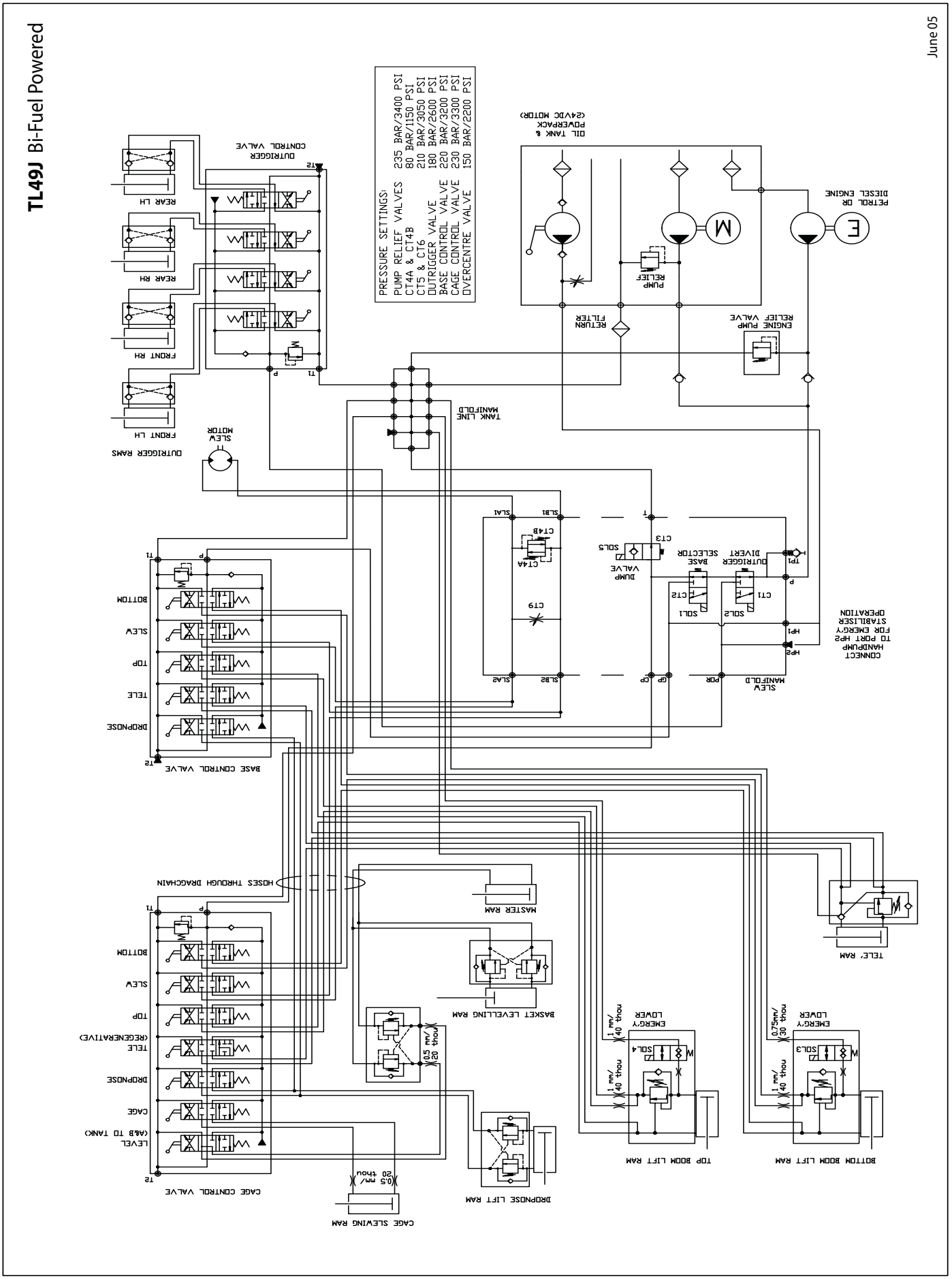

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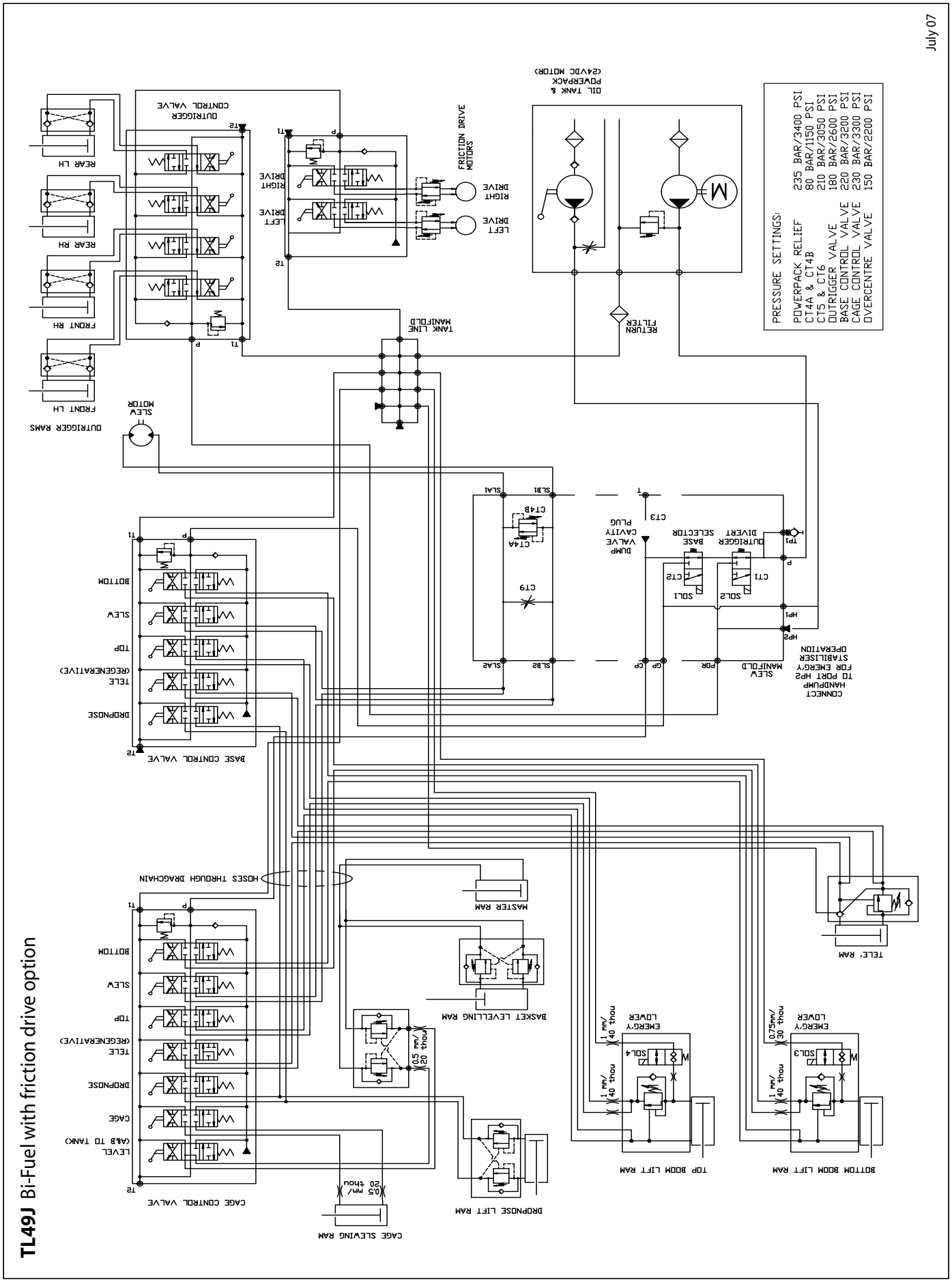


ILLUSTRATED PARTS LIST

INTRODUCTION

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

Each part list contains the component parts for that assembly.

CONTENTS

ILLUSTRATED PARTS LIST

LIGHTING BOARD ASSEMBLY

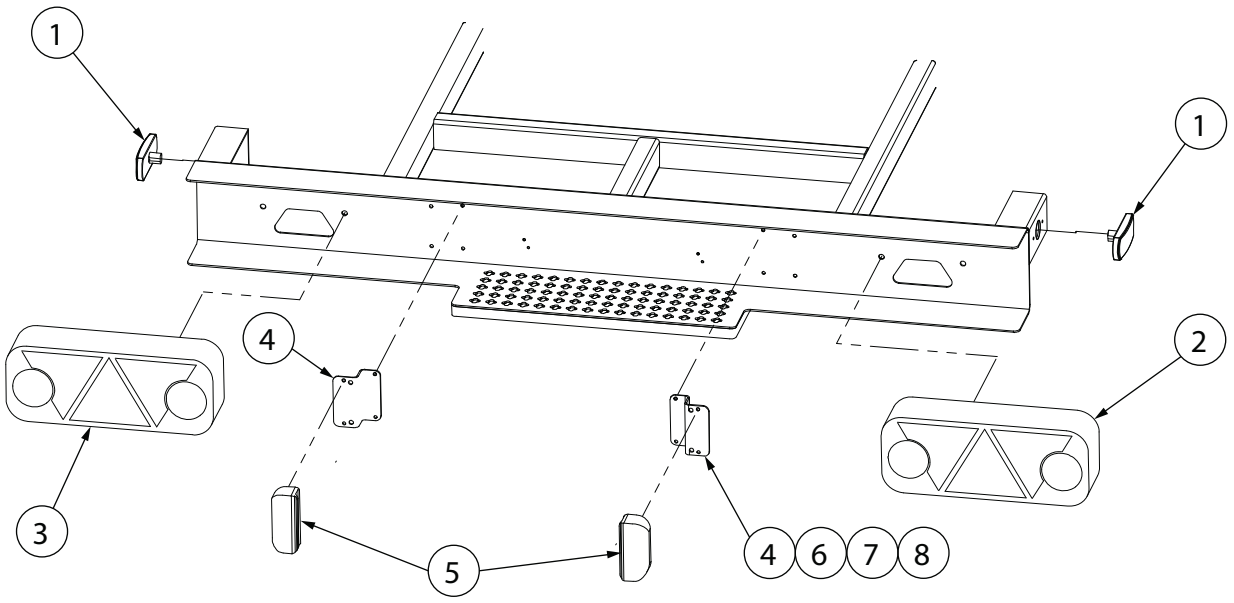


Figure 6-1: Lighting board assembly.

ITEM	PART #	DESCRIPTION	QTY
1	512492-000	Amber reflector	2
2	513301-000	RH Light cluster	1
3	513302-000	LH Light cluster	1
4	513742-000	Registration lamp mounts	2
5	513300-000	Registration lamp	2
6	058490-016	Set screw, M5 x 16 mm	4
7	056069-005	M5 Flat washer	8
8	056066-005	M5 Nylock nut	8

Table 6-1: Lighting board components.

PART #	DESCRIPTION	QTY
513836-000	Harness, tow hitch to chassis	1
513836-001	Harness, chassis to side marker lamps	1
513839-000	Harness, rear light to registration lamp	2
513838-000	Harness, rear light to side marker lamp	2
513492-000	Amber marker lamp	6
513403-000	White reflector	2
512687-000	13 pin plug	1
512689-000	8 core cable	10m

Table 6-2: Marker lamp kit components.

OUTRIGGER ASSEMBLY

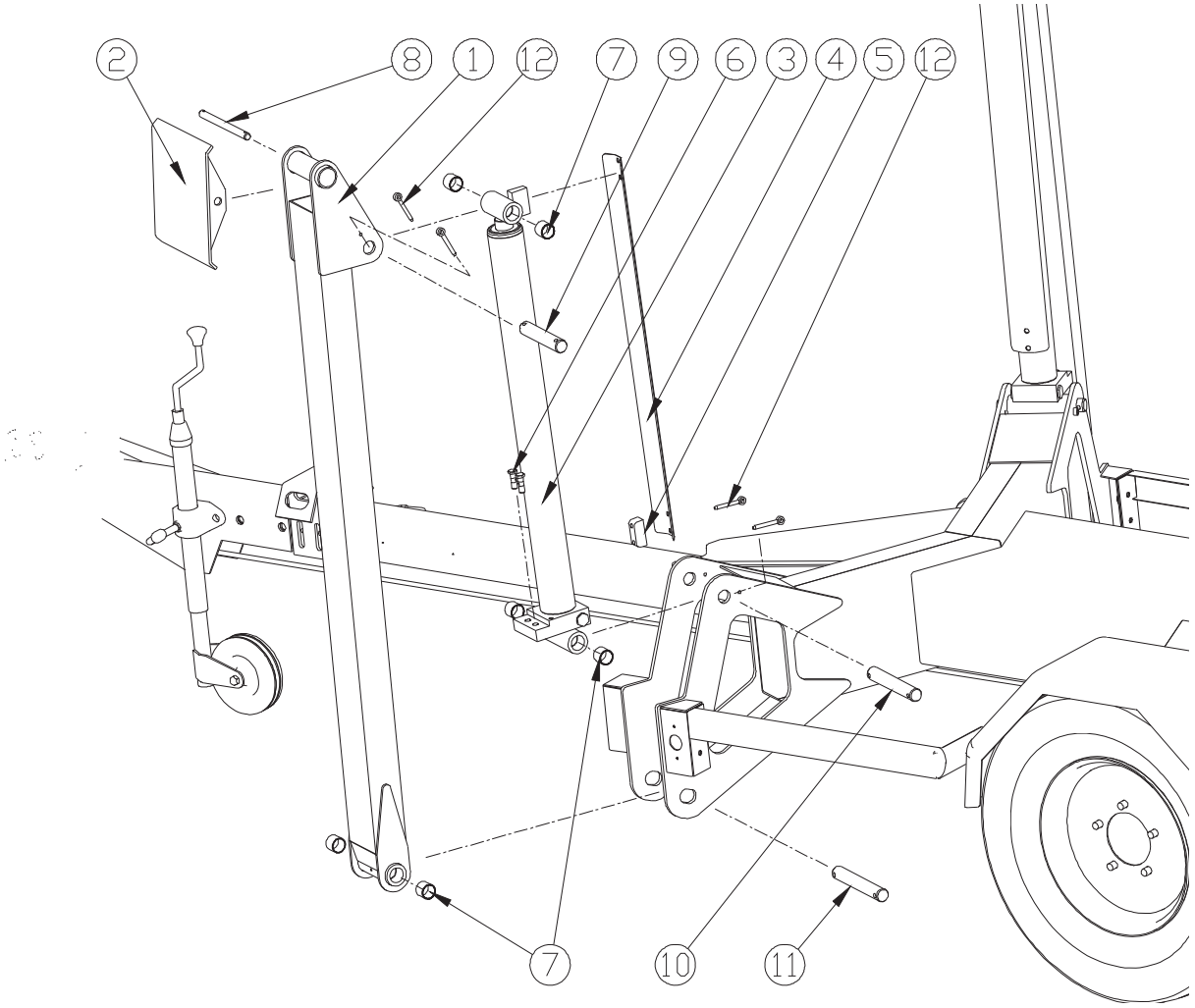


Figure 6-2: Outrigger assembly.

ITEM	PART #	DESCRIPTION	QTY
1	10-5069	Outrigger	4
2	10-5070	Outrigger foot	4
3	13-3608	Outrigger ram	4
4	22-5179	Outrigger ram cover	4
5	15-0886	Ram cover skid pad	4
6	12-2054	Banjo bolt	8
7	SB-030030	Bush	24
8	SP-016E216	Pin	4
9	SP-030D171	Pin	4
10	SP-030D203	Pin	4
11	SP-030K211	Pin	4
12	10-2627	Retaining peg	16

Table 6-3: Outrigger components.

CHASSIS ASSEMBLY

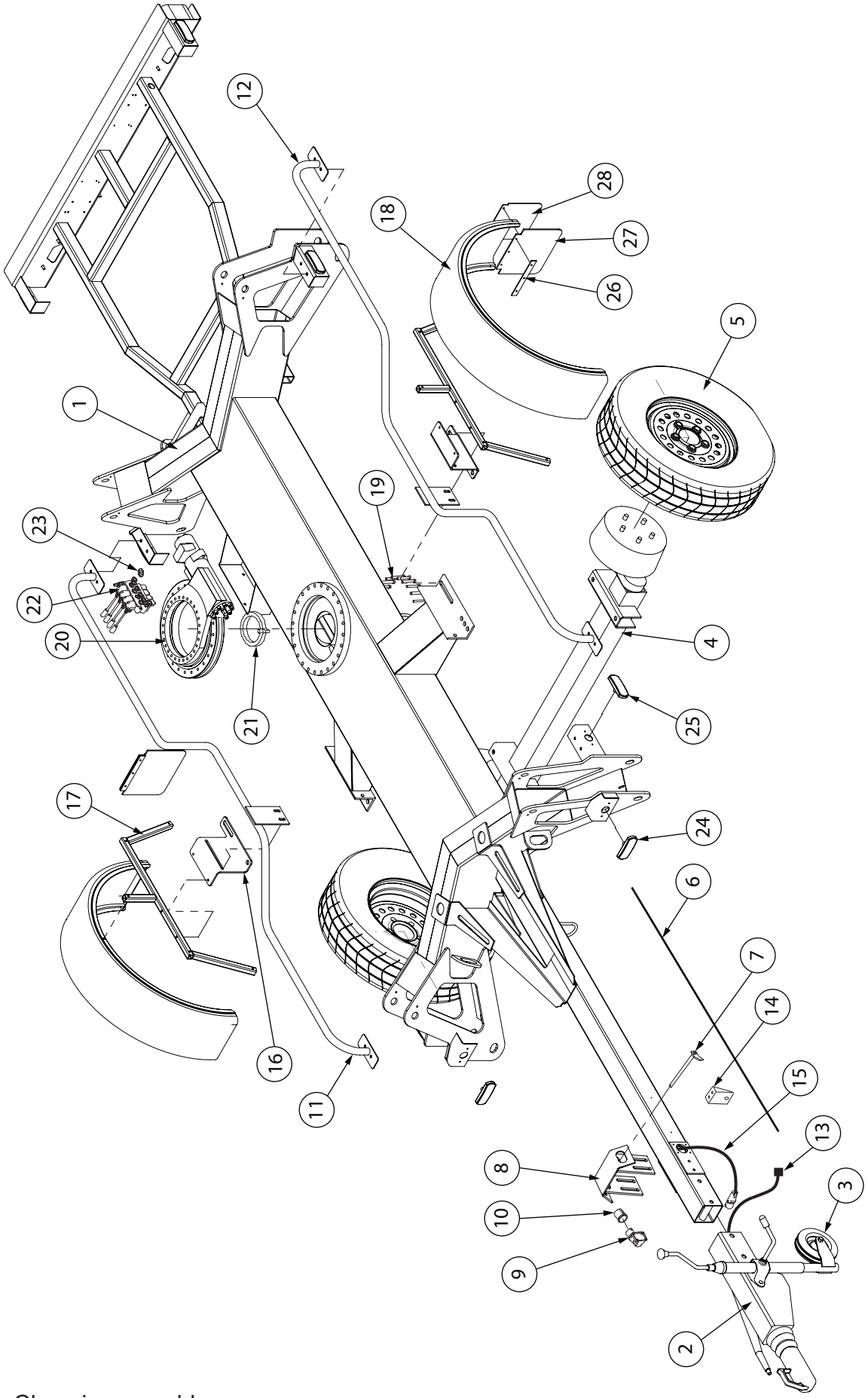


Figure 6-3: Chassis assembly.

ITEM	PART #	DESCRIPTION	QTY
1	513439-000	Chassis	1
2	508106-000	Towing coupling	1
3	508107-000	Adjustable jockey wheel	1
4	513441-000	3000 kg rubber suspension axle c/w brake cables	1
5	513443-000	215/75R16 wheel assembly (5 stud)	2
	03-0275/01	Wheel studs	10
	03-0275/02	Wheel nuts	10
6	24-3998	Brake rod	1
7	21-0855	Boom retaining pin	1
8	10-5068	Boom lock	1
9	09-1273	Inlet plug	1
10	09-1394	Inlet plug cap	1
11	513398-000	Cycle guard R/H	1
12	513397-000	Cycle guard L/H	1
13	508133-000	Bowden cable	1
14	508134-000	Cable bracket	1
15	508112-000	NATO plug	1
16	513450-000	Mudguard support bracket L/H	1
	513449-000	Mudguard support bracket R/H	1
17	513416-000	Mudguard mount bracket	2
	513793-000	Mudguard mount bracket (Friction drive units only)	2
18	IT250	Mudguard	2
19	11-3449	Bolt (M12 x 80 mm)	26
20	08-0192	Slew bearing/worm drive c/w motor	1
21	10-5271	Slew limiting ring	1
22	13-2537	Stabilizer control valve	1
23	25-0239	Levelling bubble	1
24	513403-000	White marker lamp	2
25	513492-000	Amber marker lamp	6
26	513522-002	Mudflap bracket	2
27	513522-000	Mudflap	2
28	513522-001	Mudflap support bracket	2

Table 6-4: Chassis components.

PART #	DESCRIPTION	QTY
14305.08	Knott 300 x 60 std. Brake assembly	2
DPSM 63 90 10	Oil seal	2
368A/362A	Inner Bearing cone/cup	2
LM501349/501310	Outer bearing cone/cup	2
24929.03	Standard brake shoe	2
1053 08	Load washer	2

Table 6-5: Brake hub components.

SLEW - BI-FUEL POWER

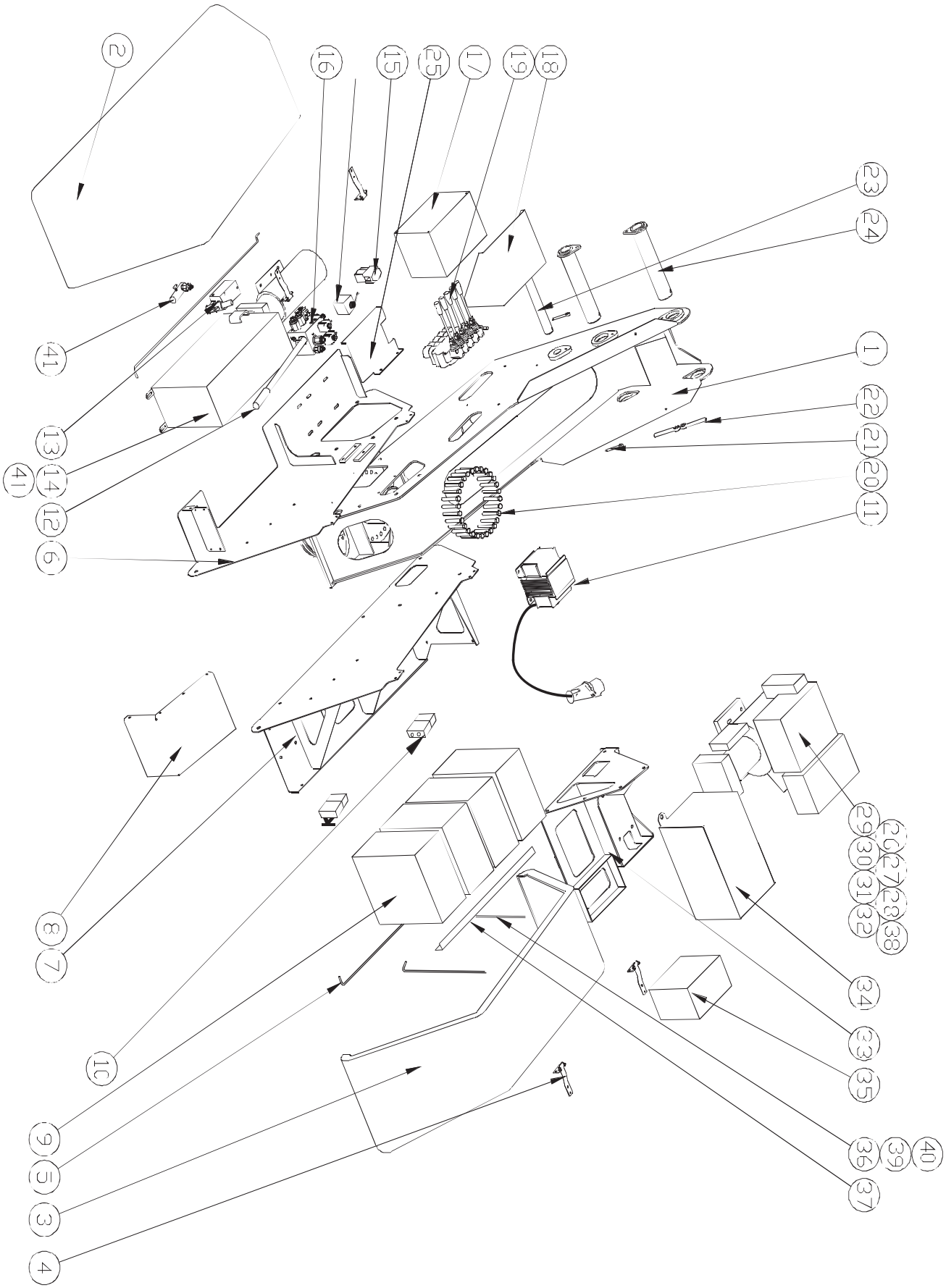


Figure 6-4: Slew (Bi-fuel) assembly.

SLEW - BI-FUEL POWER

ITEM	PART	DESCRIPTION	QTY
1	10-5071	Slew platform	1
2	16-0157	GRP cover	1
3	16-0156	GRP cover	1
4	15-0858	Hinge	4
5	24-4097	Cover stay	2
6	10-5266	Power-pack tray	1
7	10-5267	Battery tray	1
8	22-5576	Cross Brace	1
9	09-1185	Battery 6V	4
10	513325-000	Battery cable set	1
11	069199-001	Charger battery	1
12	19-0154/2	Hand-pump handle	1
13	19-0154/1	Hand-pump	1
14	19-0154	Power-pack	1
15	09-0998	Contactor	1
16	13-3609	Hydraulics manifold	1
17	513348-000	Electrical control box - part list	1
18	22-5581	Control cover box	1
19	13-0888	Base control valve	1
20	11-3448	Bolt (M12 x 85 mm)	28
21	10-2672	Retaining peg	2
22	24-2880	Retaining peg - large	2
23	SP-035D320	Pin	2
24	21-0852	Pin	4
25	22-5577	Splash guard	1
26	20-0055	Kubota OC60 diesel engine c/w stop/start kit	1
	20-0044	Honda petrol engine	1
27	13-0529	In-line check valve	2
28	13-1949	Bell housing	1
29	13-1950	Flexible coupling	1
30	13-3649	Pump	1
31	13-3650	Outlet elbow	1
32	13-3651	Suction elbow	1
33	10-5269	Engine mounting bracket	1
34	10-5270	Battery/Pump cover	1
35	09-1010	Battery 12 V	1
36	24-4438	Ø 10mm tie bar	2
37	24-4439	Battery hold down bracket	1
38	13-2419	3-way valve	1
39	056064-010	M10 nyloc nut	2
40	056069-010	Flat washer	2
41	13-0339	Suction strainer	1

Table 6-6: Slew (Bi-fuel) components.

SLEW - MAINS POWER

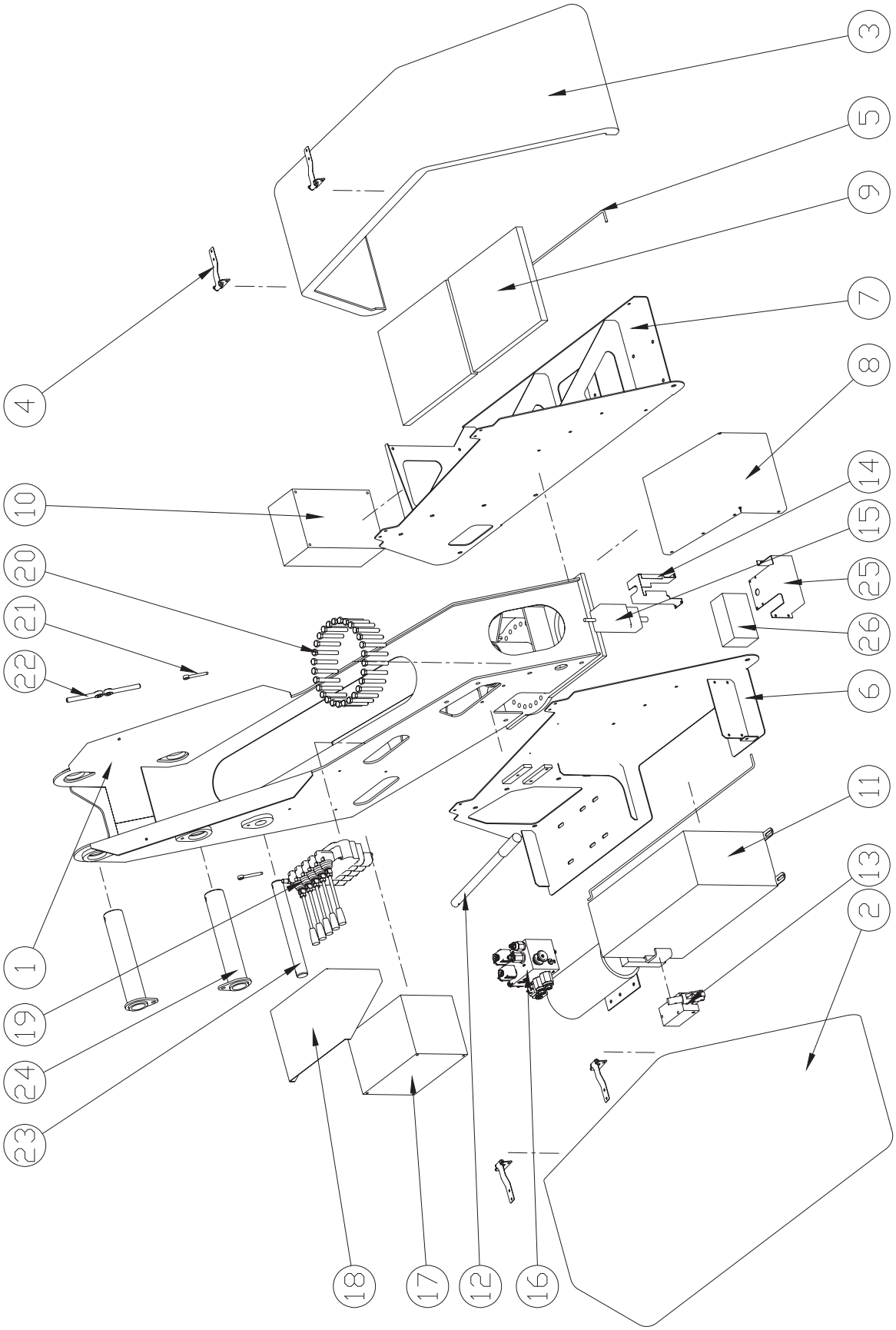


Figure 6-5: Slew (mains) assembly.

SLEW - MAINS POWER

ITEM	PART #	DESCRIPTION	QTY
1	10-5071	Slew platform	1
2	16-0157	GRP cover	1
3	16-0156	GRP cover	1
4	15-0858	Hinge	4
5	24-4097	Cover stay	2
6	10-5266	Powerpack tray	1
7	10-5267	Battery tray	1
8	22-5576	Cross Brace	1
9	10-5267	Ballast Plate	2
10	513999-000	Motor starter assy mains	1
11	19-0155	Tank/Powerpack	1
12	19-0155/2	Handpump handle	1
13	19-0155/1	Handpump	1
14	22-5516	Float charger cover	1
15	09-1937	Float charger	1
16	13-3609	Hydraulics manifold	1
17	513348-000	Ground control box	1
18	22-5581	Control box cover	1
19	13-0888	Base control valve	1
20	11-3448	Bolt	28
21	10-2672	Retaining peg	2
22	24-2880	Retaining peg - Large	2
23	SP-035D320	Pin	2
24	21-0852	Pin	4
25	22-5508	Emergency Battery Holder	1
26	09-2087	Dry battery	1

Table 6-7: Slew (mains) components.

SLEW - BATTERY POWER

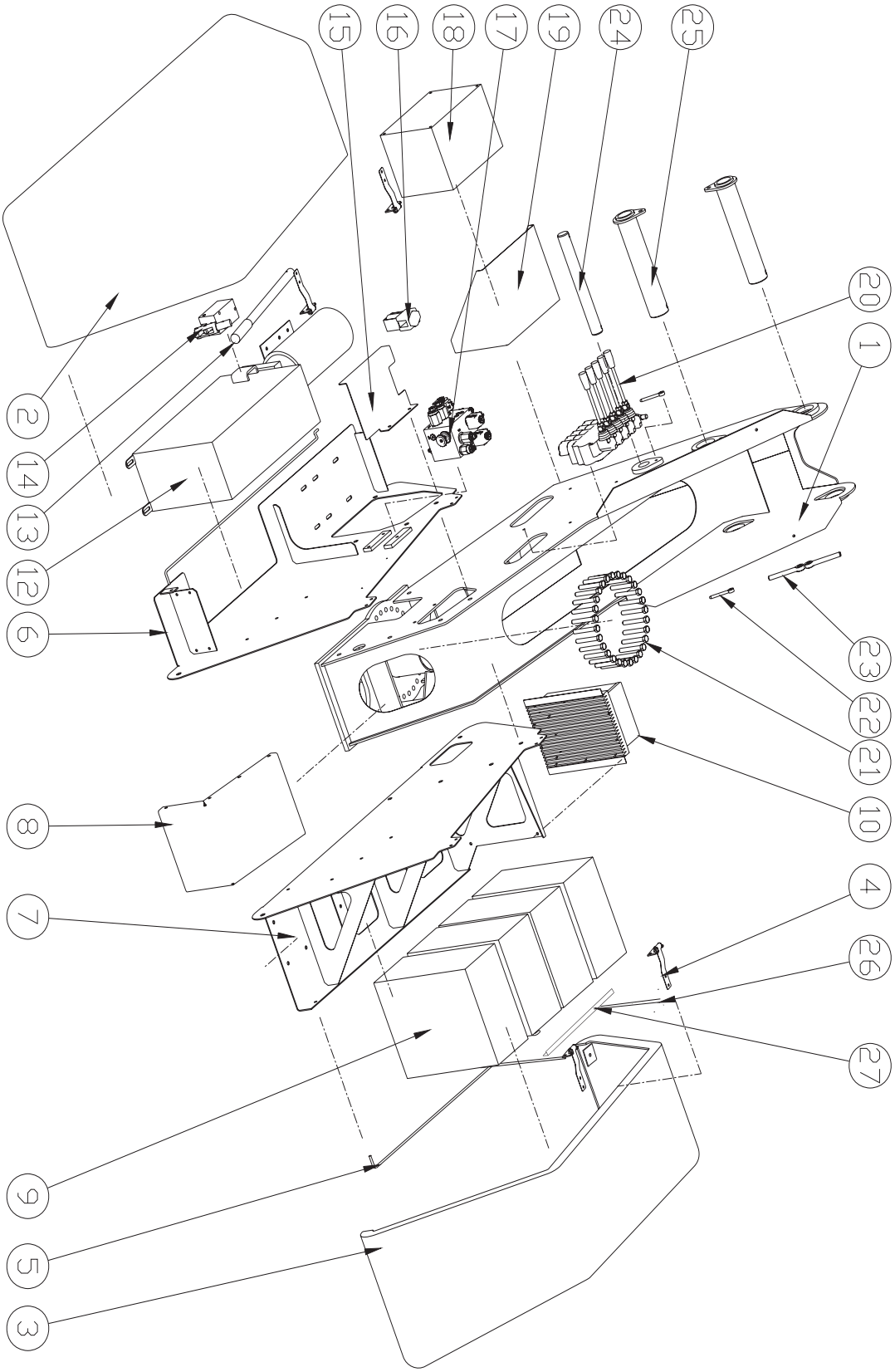


Figure 6-6: Slew (battery) assembly.

SLEW - BATTERY POWER

ITEM	PART #	DESCRIPTION	QTY
1	10-5071	Slew platform	1
2	16-0157	GRP cover	1
3	16-0156	GRP cover	1
4	15-0858	Hinge	4
5	24-4097	Cover stay	2
6	10-5266	Powerpack tray	1
7	10-5267	Battery tray	1
8	22-5576	Cross brace	1
9	09-1185	Battery	4
10	069199-001	Battery charger	1
12	19-0154	Tank/Powerpack	1
13	19-0154/2	Handpump handle	1
14	19-0154/1	Handpump	1
15	22-5577	Splash guard	1
16	09-0998	Contactor	1
17	13-3609	Hydraulics manifold	1
18	513348-000	Ground control box	1
19	22-5581	Control box cover	1
20	13-0888	Base control valve	1
21	11-3448	Bolt	28
22	10-2672	Retaining peg	2
23	24-2880	Retaining peg - large	2
24	SP-035D320	Pin	1
25	21-0852	Pin	2
26	24-4438	Ø 10mm tie bar	2
27	24-4439	Battery hold bracket	1

Table 6-8: Slew (battery) components.

SLEW - ENGINE POWER

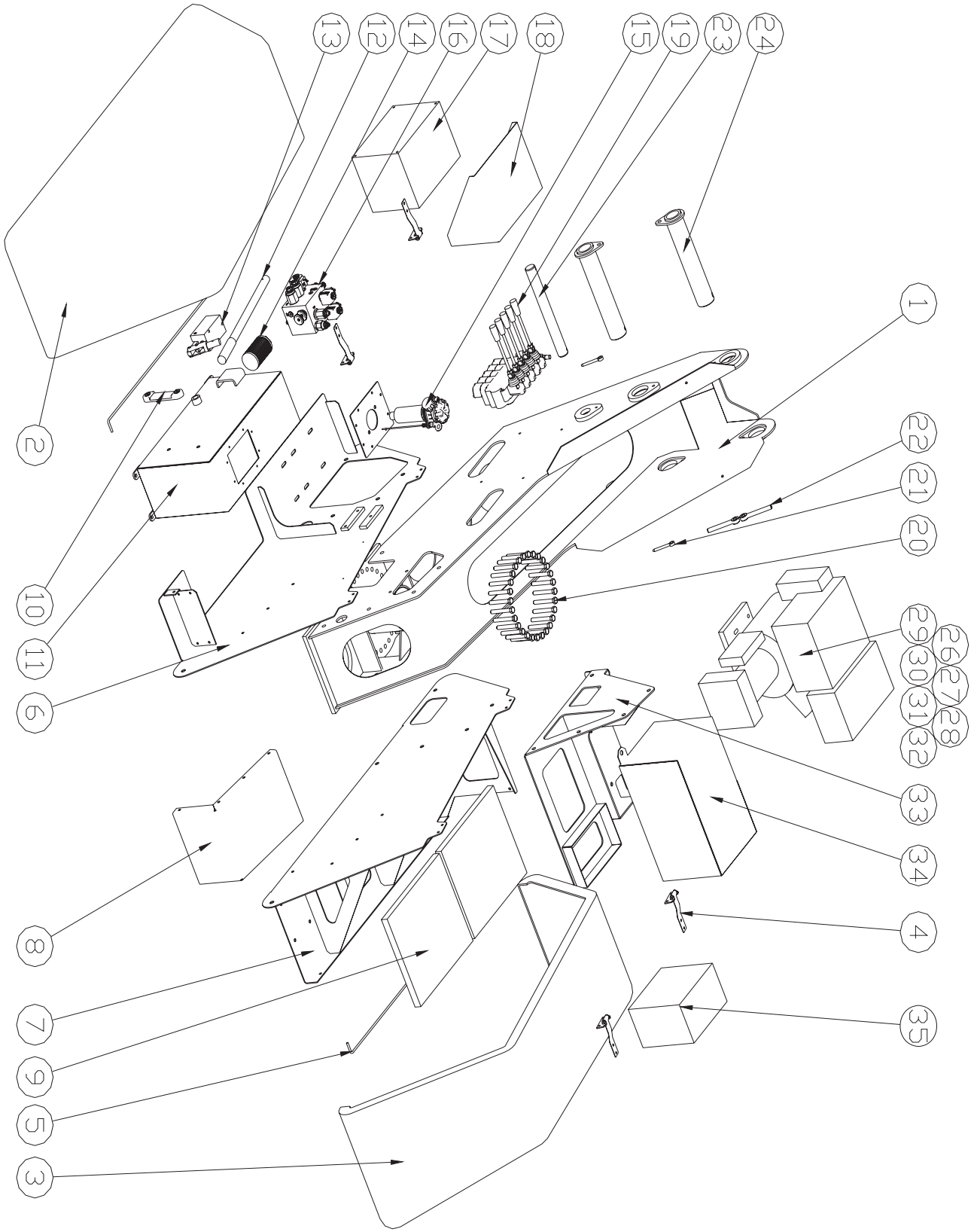


Figure 6-7: Slew (engine) assembly.

SLEW - ENGINE POWER

ITEM	PART #	DESCRIPTION	QTY
1	10-5071	Slew platform	1
2	16-0157	GRP cover	1
3	16-0156	GRP cover	1
4	15-0858	Hinge	4
5	24-4097	Cover stay	2
6	10-5266	Powerpack tray	1
7	10-5267	Battery tray	1
8	22-5576	Cross brace	1
9	10-5267	Ballast plate	2
10	100287-000	Sight gauge	1
11	10-5310	Hydraulic tank	1
12	19-0154/2	Handpump handle	1
13	19-0154/1	Handpump	1
14	13-0339	Suction strainer	1
15	13-2543	Return line filter	1
16	13-3609	Hydraulics manifold	1
17	513348-000	Slew control box	1
18	22-5581	Control box cover	1
19	13-0888	Base control valve	1
20	11-3448	Bolt	28
21	10-2672	Retaining peg	2
22	24-2880	Retaining peg - Large	2
23	SP-035D320	Pin	1
24	21-0852	Pin	2
25	22-5613	Tank lid	1
26	20-0044	Engine (petrol)	1
	20-0055	Engine (diesel)	1
27	13-3549	In-line check valve	2
28	13-1949	Bell housing	1
29	13-1950	Flexible coupling	1
30	13-3649	Pump	1
31	13-3650	Outlet elbow	1
32	13-3651	Suction elbow	1
33	10-5269	Engine mounting bracket	1
34	10-5270	Battery/pump cover	1
35	09-1010	Battery	1

Table 6-9: Slew (engine) components.

LOWER BOOM

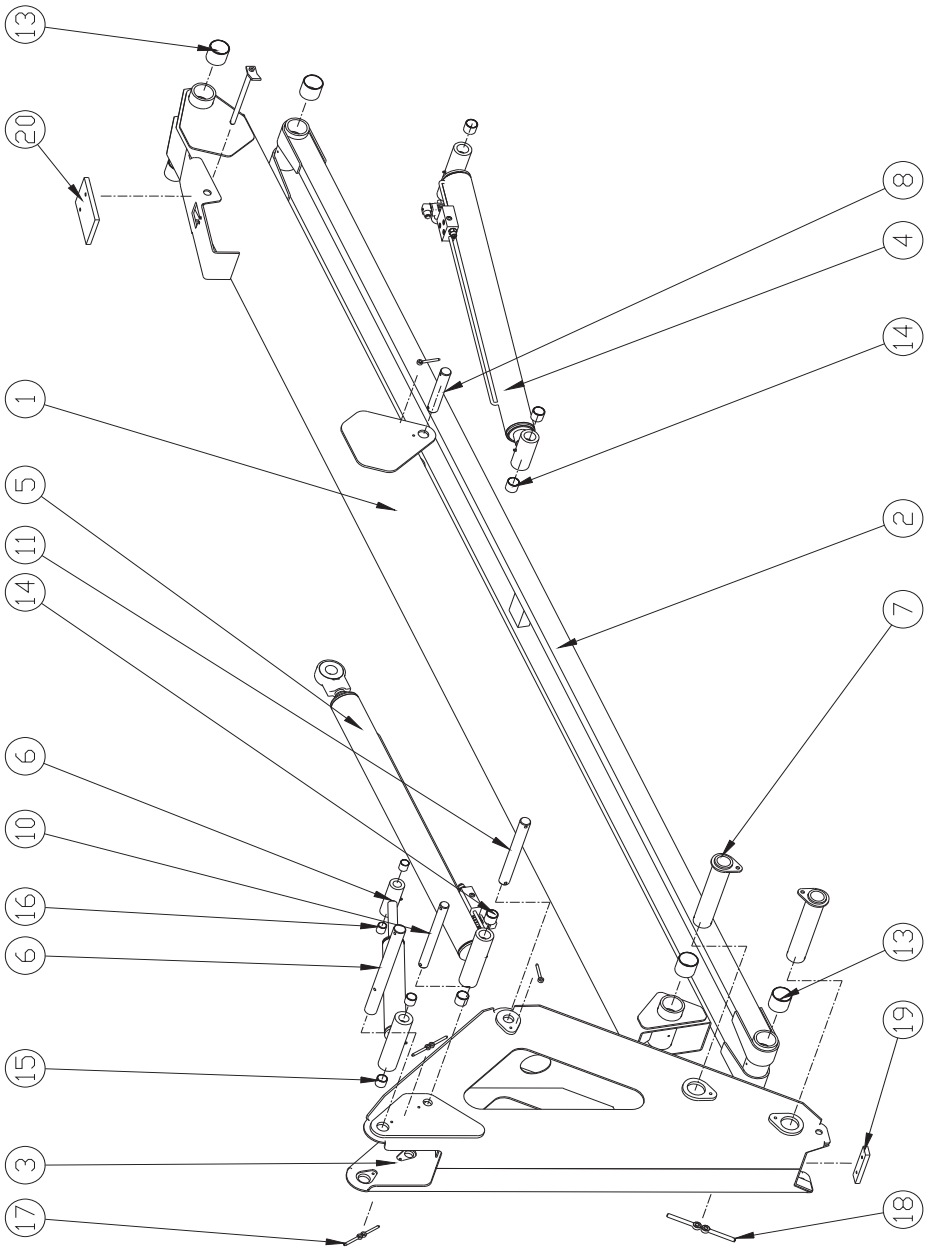


Figure 6-8: Lower boom assembly.

LOWER BOOM

ITEM	PART #	DESCRIPTION	QTY
1	10-5072	Bottom boom	1
2	10-5073	Tie bar	1
3	10-5263	Vertical boom	1
4	13-3607	Bottom ram	1
5	13-3606	Top ram	1
6	13-3604	Master ram	1
7	21-0852	Pin	2
8	SP-035D201	Pin	1
9	21-0850	Pin	1
10	SP-030D320	Pin	1
11	SP-035D320	Pin	1
13	SB-060060	Bush	8
14	SB-035035	Bush	6
15	SB-030030	Bush	2
16	SB-025025	Bush	2
17	10-2672	Retaining peg	8
18	24-2880	Retaining peg	2
19	15-0884	Boom rest pad	1
20	15-0883	Boom rest pad	1

Table 6-10: Lower boom components.

TOP BOOM

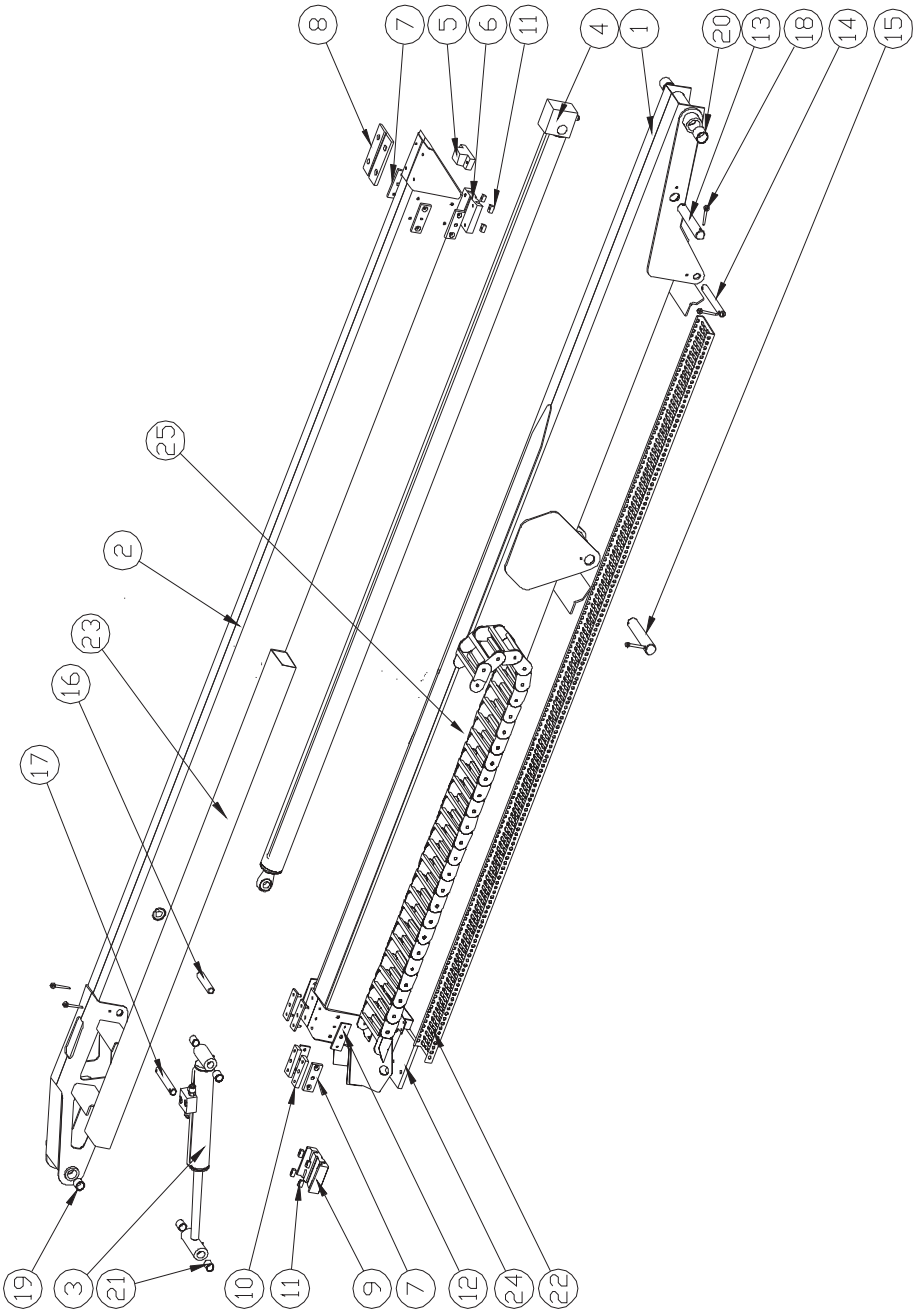


Figure 6-9: Top boom assembly.

TOP BOOM

ITEM	PART #	DESCRIPTION	QTY
1	10-5075R	Top boom	1
2	10-5076	Telescopic boom	1
3	13-3603	Cage levelling ram	1
4	13-3605	Telescope ram	1
5	15-0899	Tele ram support block	1
6	15-0881	Wear pad	1
7	15-0880	Wear pad	6
8	15-0895	Wear pad	1
9	15-0896	Wear pad	1
10	15-0882	Wear pad	2
11	24-3952	Pad retaining nut	8
12	10-5138	Wear pad keep plate	4
13	SP-035D203	Pin	1
14	SP-025D200	Pin	1
15	SP-040D203	Pin	1
16	SP-025A120	Pin	1
17	SP-025D164	Pin	1
18	10-2672	Retaining peg	8
19	SB-030030	Bush	2
20	SB-040040	Bush	2
21	SB-025025	Bush	4
22	09-2121	Cable tray	1
23	24-3909	Hose trunking	1
24	15-0883	Boom rest pad	1
25	15-1009	Drag chain complete	1

Table 6-11: Top boom components.

DROP NOSE

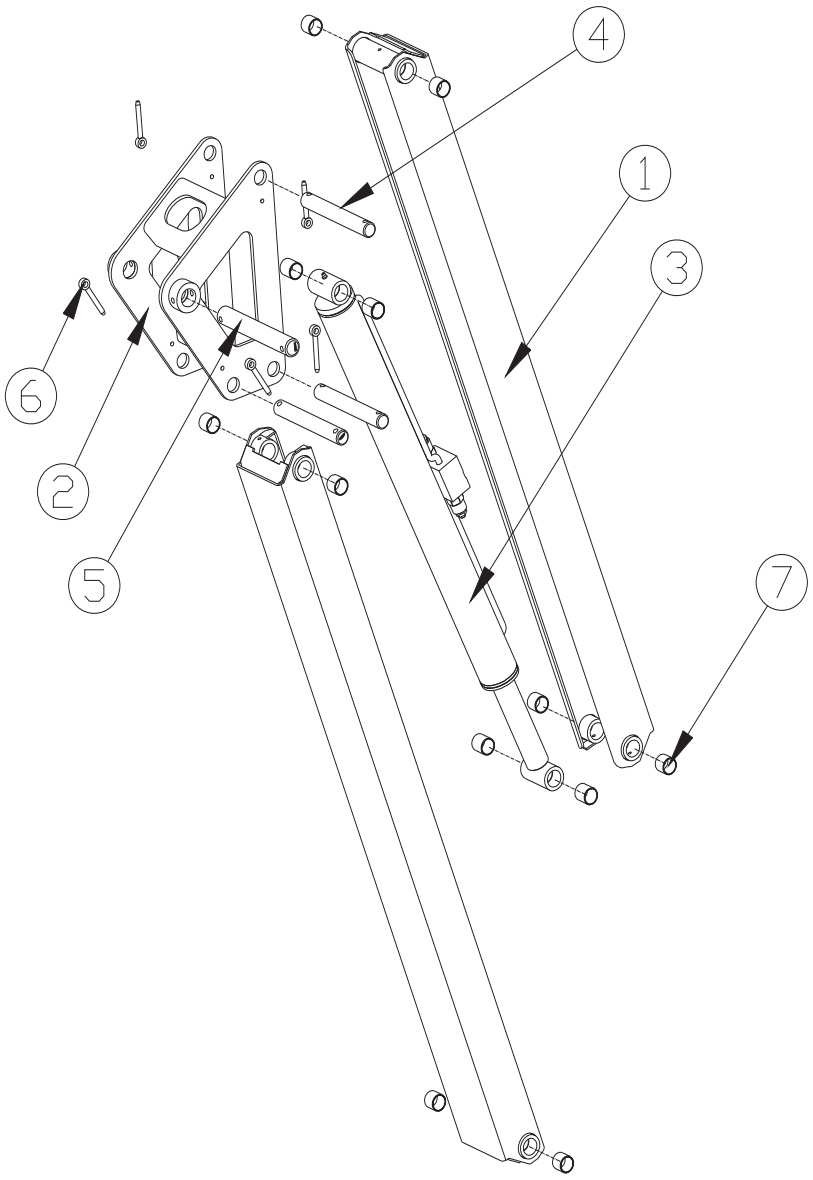


Figure 6-10: Drop nose assembly.

ITEM	PART #	DESCRIPTION	QTY
1	10-5078	Drop nose boom	2
2	10-5077	Quadrant	1
3	13-3602	Drop nose ram	1
4	SP-025D200	Pin	3
5	SP-030D216	Pin	1
6	10-2672	Retaining peg	6
7	SB-025025	Bush	12

Table 6-12: Drop nose components.

CAGE SUPPORT

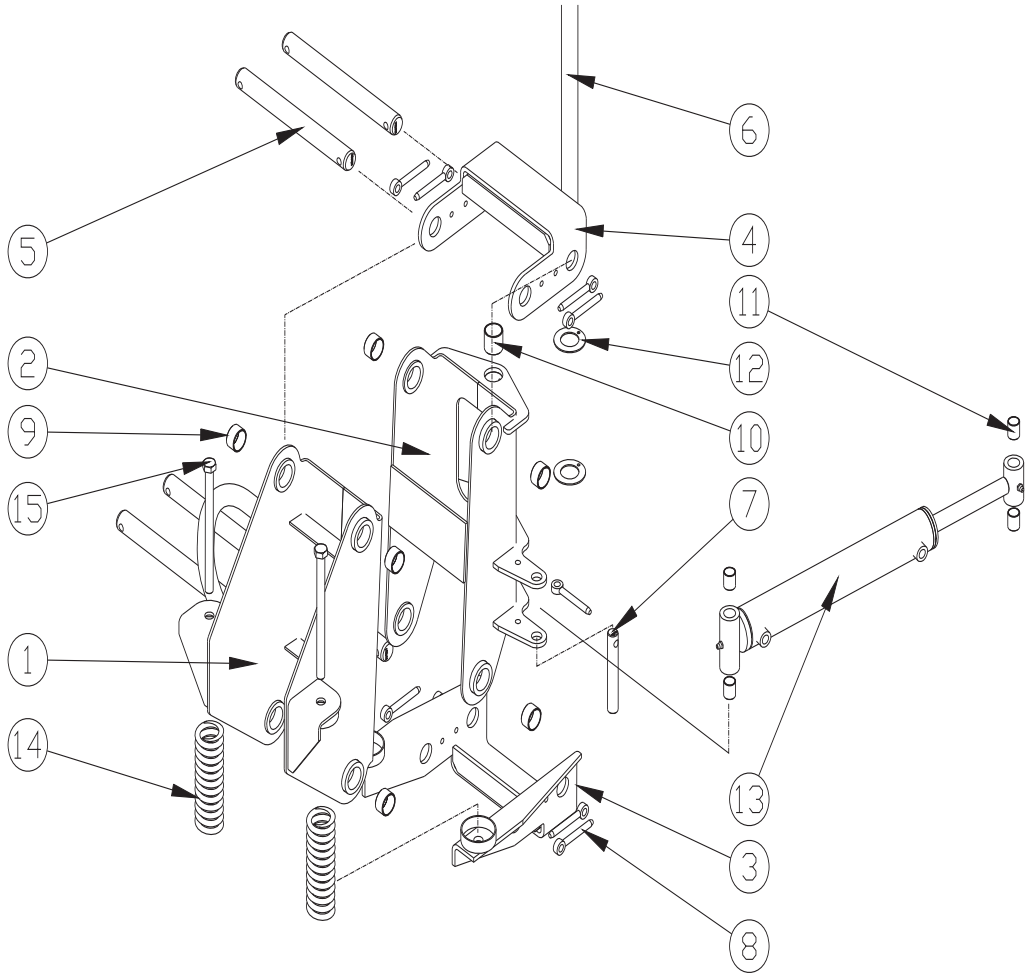


Figure 6-11: Cage support assembly.

ITEM	PART #	DESCRIPTION	QTY
1	10-5232	Pivot support	1
2	10-5231	Cage slew pivot	1
3	10-5229	See-saw bracket	1
4	10-5230	Upper link bracket	1
5	SP-025D235	Pin - CE	4
	SP-025D200	Pin - ANSI	2
6	SP-025D330	Pin	1
7	SP-016B108	Pin	1
8	10-2672	Retaining peg	9
9	SB-025015	Bush	8
10	SB-025025	Bush	2
11	SB-016020	Bush	4
12	04-0113	Thrust washer	2
13	13-2403	Cage rotation ram	1
14	23-0031	Spring	2
15	11-3442	Bolt (M12 x 170 mm)	2

Table 6-13: Cage support components.

STEEL CAGE

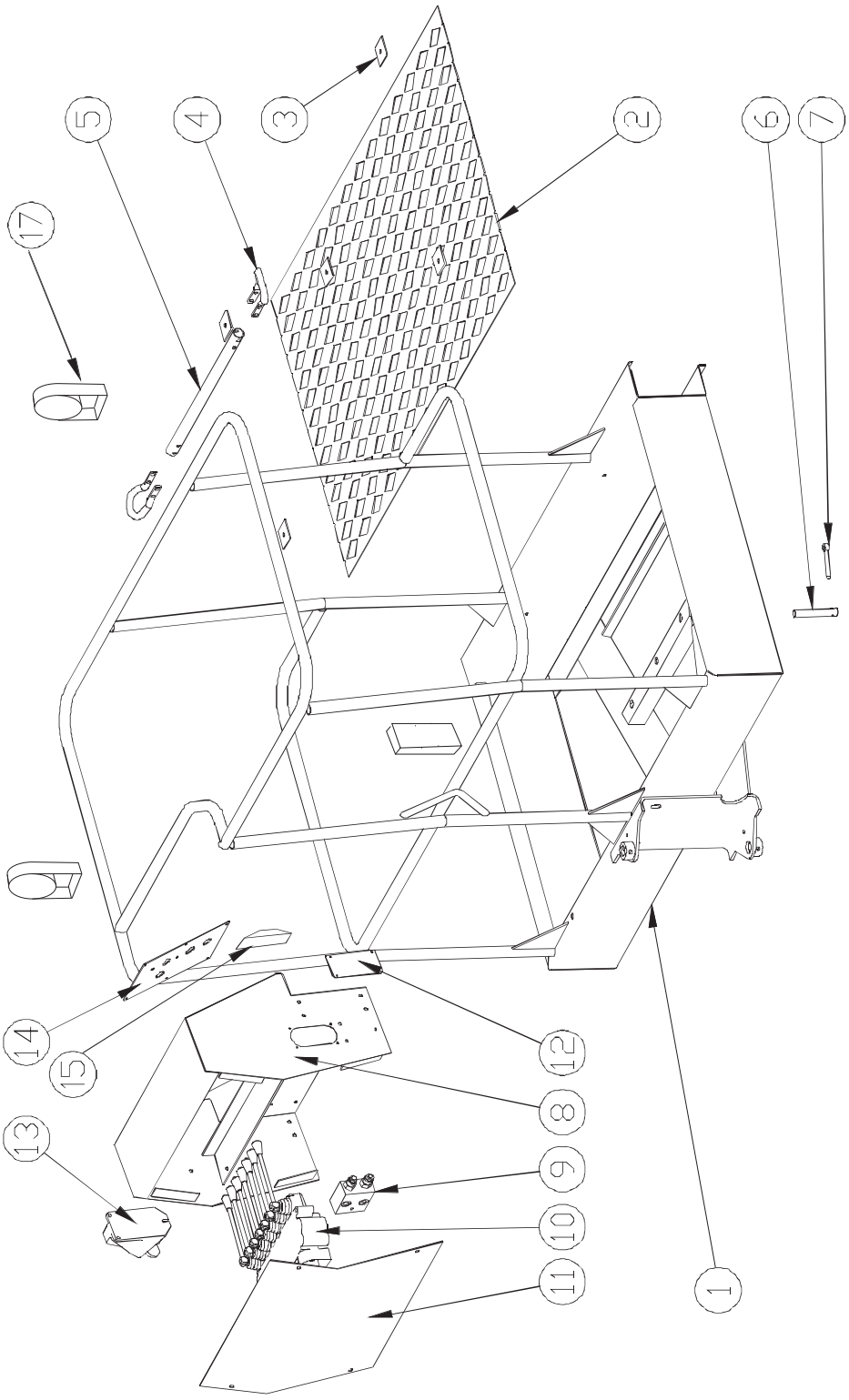


Figure 6-12: Steel cage assembly.

STEEL CAGE

ITEM	PART #	DESCRIPTION	QTY
1	10-5201	Steel Cgae	1
2	22-5065	Cage floor	1
3	11-3438	Clamp plate	5
4	508932-000	U-clamp	2
5	508934-000	Access bar	1
6	SP-016B102	Pin	1
7	10-2672	Retaining peg	1
8	513590-000	Control support	1
9	13-0176	Double over-centre valve	1
10	13-2200	Control valve	1
11	22-5370	Rear cover	1
12	22-5601	Blanking plate	1
13	09-1276	Socket (110 V)	1
14	513321-004	Platform control panel (Battery)	1
	513321-005	Platform control panel (Engine)	1
	513321-006	Platform control panel (Bi-fuel)	1
	513321-004	Platform control panel (Mains)	1
15	508140-000	RCD	1
16	09-2126	Amber marker lamp	2
17	09-1939	Swivel light	2

Table 6-14: Steel cage components.

GRP BASKET

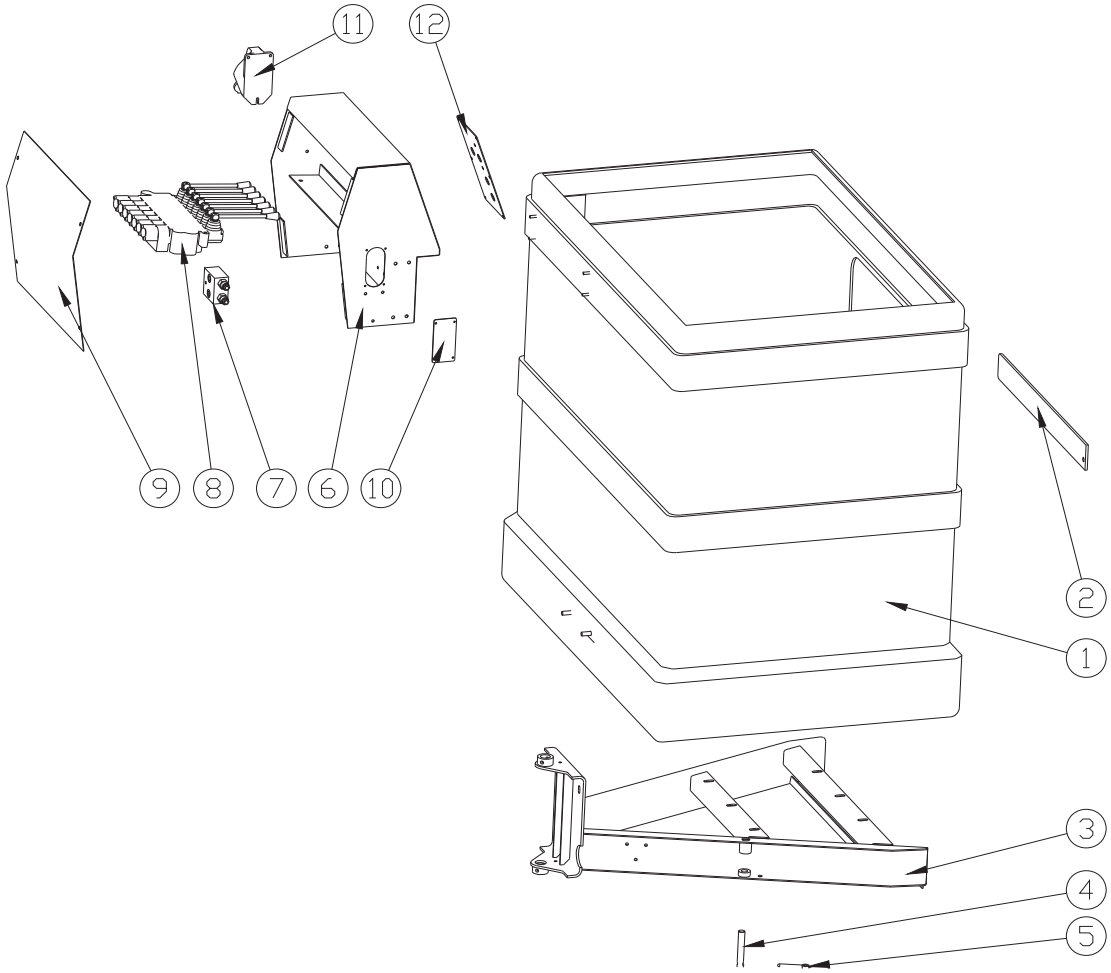


Figure 6-13: GRP basket assembly.

ITEM	PART #	DESCRIPTION	QTY
1	02-2674	GRP basket	1
2	22-5603	Access guard	1
3	10-5317	Basket support	1
4	SP-016B102	Pin	1
5	10-2672	Retaining peg	1
6	513590-000	Control support	1
7	13-0176	Double overcentre valve	1
8	13-2200	Control valve	1
9	22-5370	Rear cover	1
10	22-5601	Blanking plate	1
11	09-1276	Socket (110 V)	1
	09-1392	Socket (230 V)	1
12	513321-004	Platform control panel (Battery)	1
	513321-005	Platform control panel (Engine)	1
	513321-006	Platform control panel (Bi-fuel)	1
	513321-004	Platform control panel (Mains)	1

Table 6-15: GRP basket components.

OUTRIGGER RAM

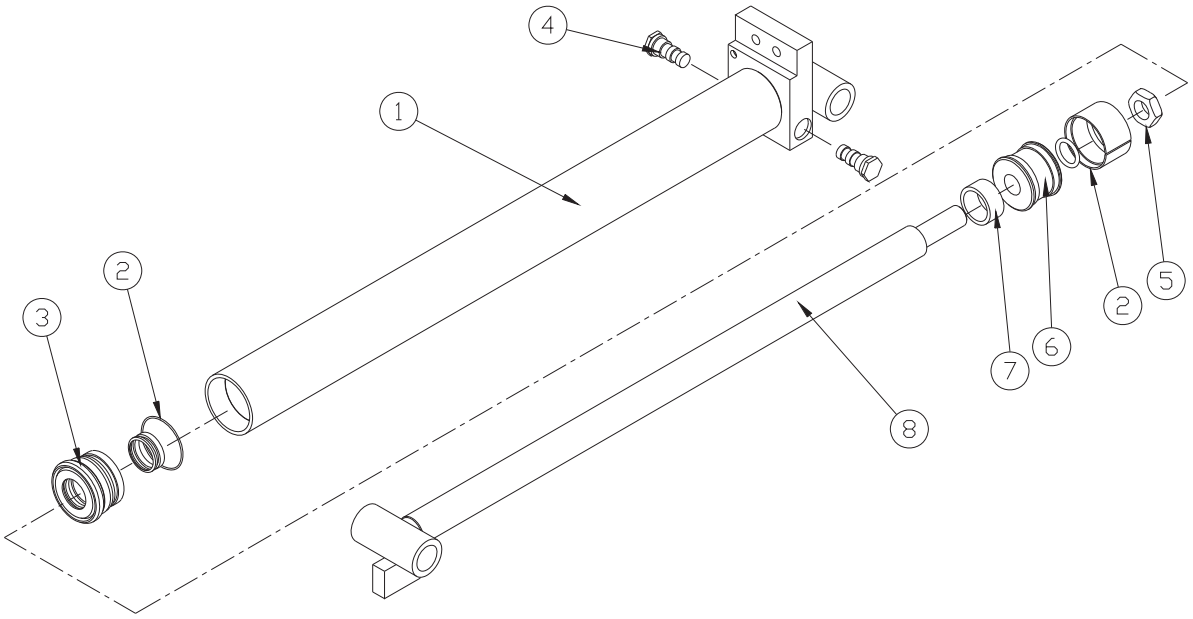


Figure 6-14: Outrigger ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-3608-1	Tube assembly	1
2	13-2351	Seal kit	1
3	13-1004	Head bush	1
4	13-0604	PO Check valve	2
5	13-0973	Locknut	1
6	13-1007	Piston	1
7	SS-0400023	Spacer	1
8	13-3608-2	Rod assembly	1

Table 6-16: Outrigger ram components - 13-3608.

BOTTOM RAM

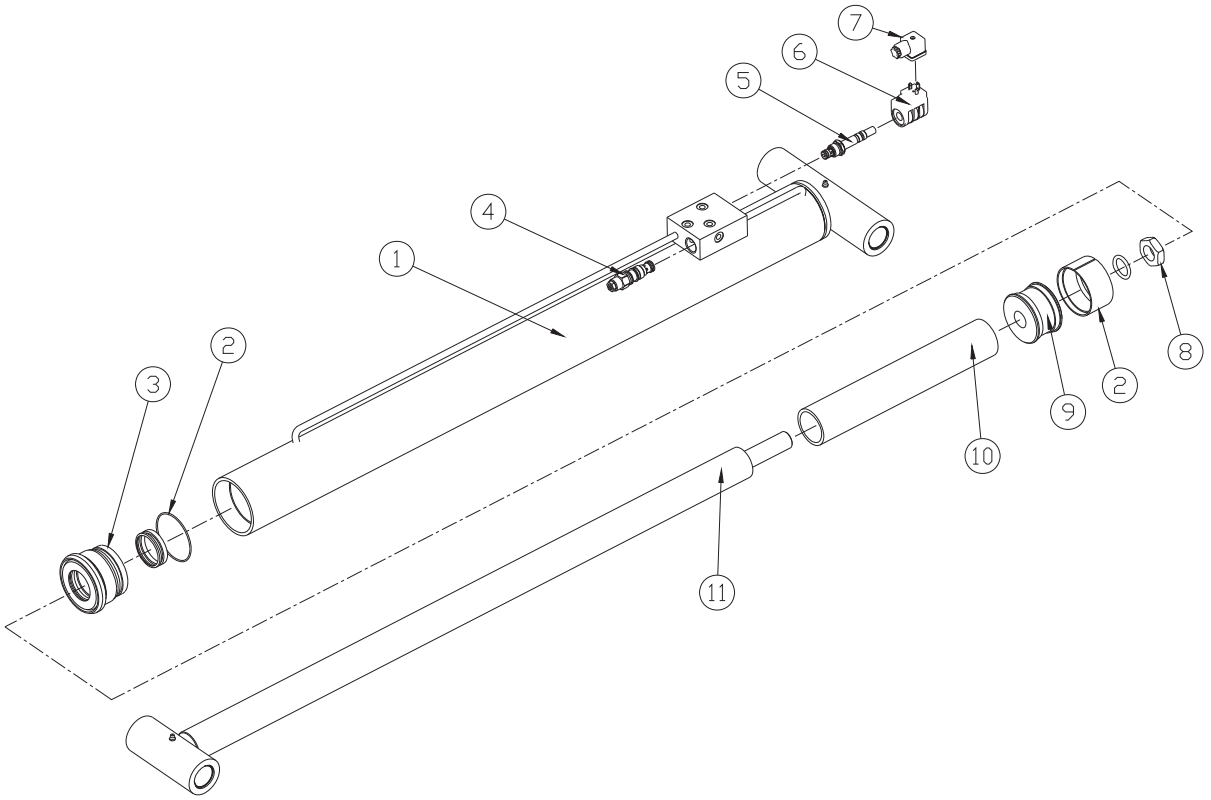


Figure 6-15: Bottom ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-3607-1	Tube assembly	1
2	13-0972	Seal kit	1
3	13-0968	Head bush	1
4	13-0392	Over-centre valve	1
5	13-2474/2	Emergency lower valve	1
6	09-2090	Solenoid	1
7	13-2425/77	Hirschmann connector	1
8	13-0973	Locknut	1
9	13-0971	Piston	1
10	SS-0500343	Spacer	1
11	13-3607-2	Rod assembly	1

Table 6-17: Bottom ram components - 13-3607.

TOP RAM

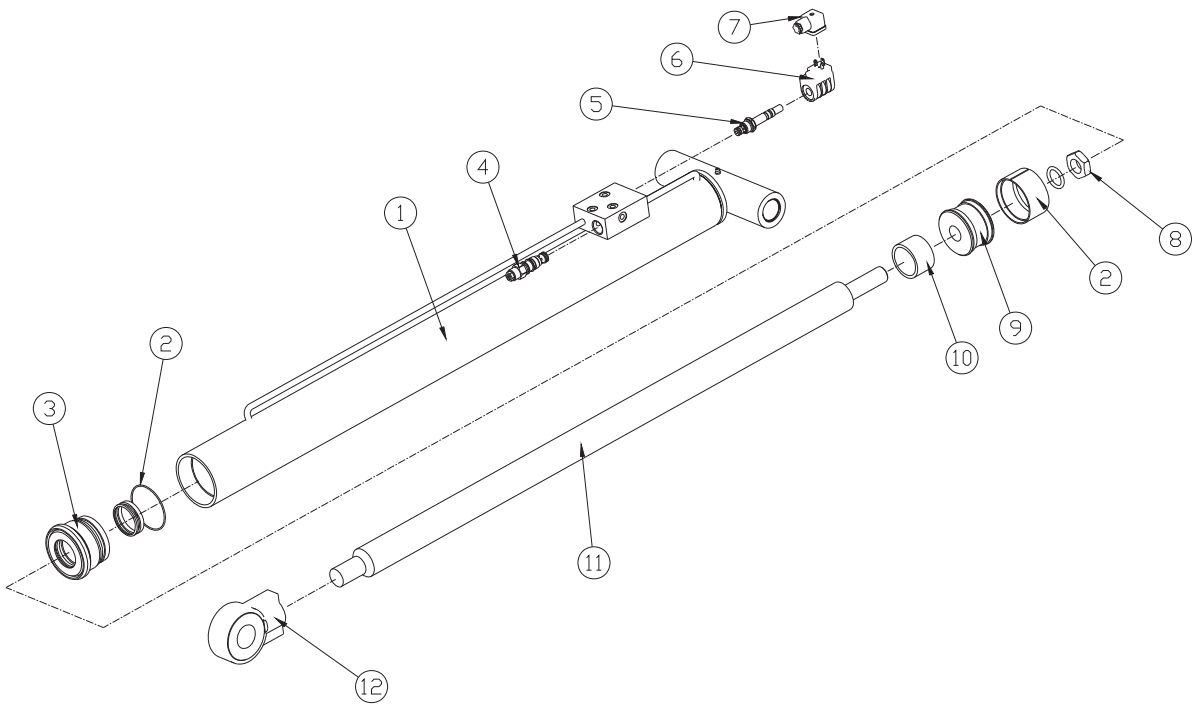


Figure 6-16: Top ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-3606-1	Tube assembly	1
2	13-0972	Seal kit	1
3	13-0968	Head Bush	1
4	13-0392	Over-centre valve	1
5	13-2474/2	Emergency lower valve	1
6	09-2090	Solenoid	1
7	13-2425/77	Hirschmann	1
8	13-0973	Locknut	1
9	13-0971	Piston	1
10	SS-0500037	Spacer	1
11	13-3606-2	Rod	1
12	13-3606-3	Bearing	1

Table 6-18: Top ram components - 13-3606.

MASTER RAM

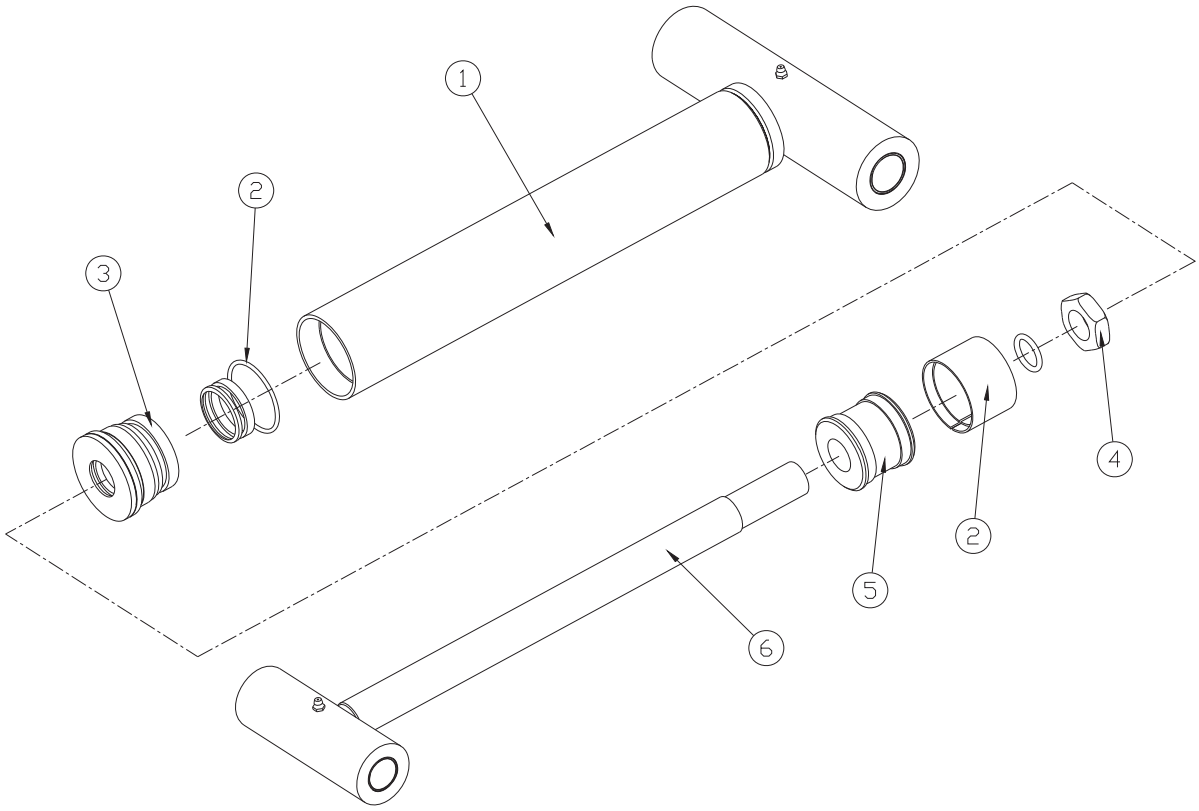


Figure 6-17: Master ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-3604-1	Tube assembly	1
2	13-3603-3	Seal kit	1
3	13-1061	Head bush	1
4	13-0973	Locknut	1
5	13-1064	Piston	1
6	13-3604-2	Rod assembly	1

Table 6-19: Master ram components - 13-3604.

TELESCOPIC RAM

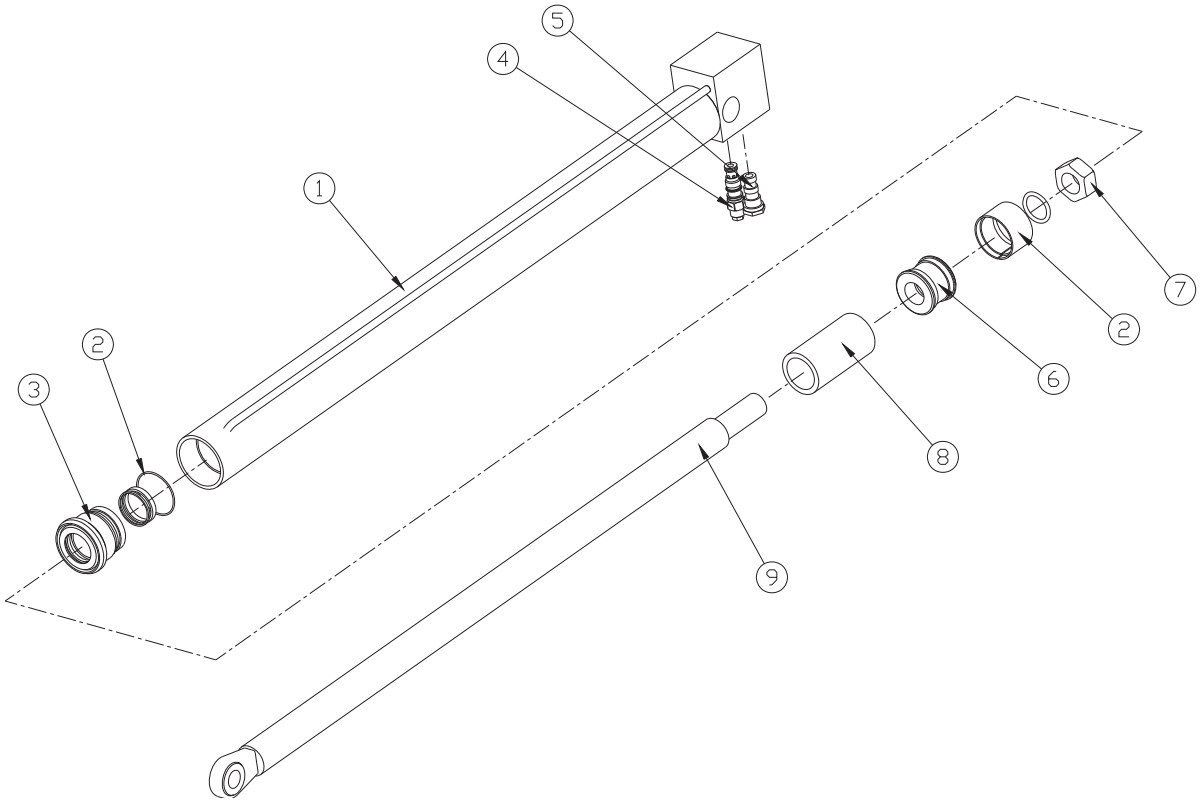


Figure 6-18: Telescopic ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-3605-1	Tube assembly	1
2	13-3605-3	Seal kit	1
3	13-3605-4	Head bush	1
4	13-0472	Over-centre valve	1
5	13-0659	PO check valve	1
6	13-3605-5	Piston	1
7	13-3605-6	Locknut	1
8	13-3605-	Spacer	1
9	13-3605-2	Rod assembly	1

Table 6-20: Telescopic ram components - 13-3605.

LEVELLING RAM

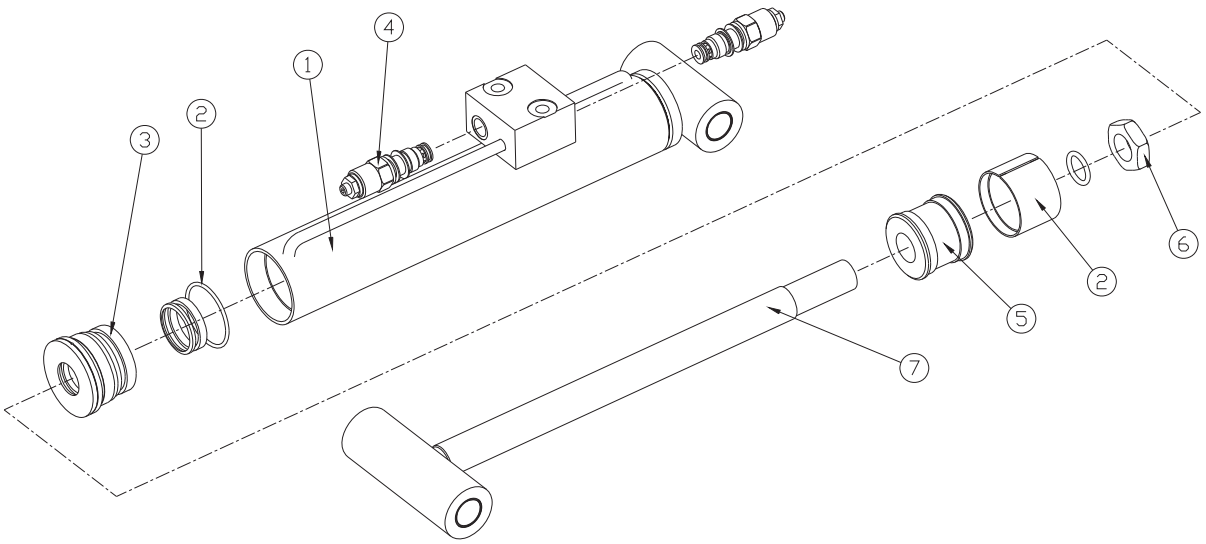


Figure 6-19: Levelling ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-3603-1	Tube assembly	1
2	13-3603-3	Seal kit	1
3	13-1061	Head bush	1
4	13-2489	Over-centre valve	2
5	13-1064	Piston	1
6	13-0973	Locknut	1
7	13-3603-2	Rod assembly	1

Table 6-21: Levelling ram components - 13-3603.

DROP NOSE RAM

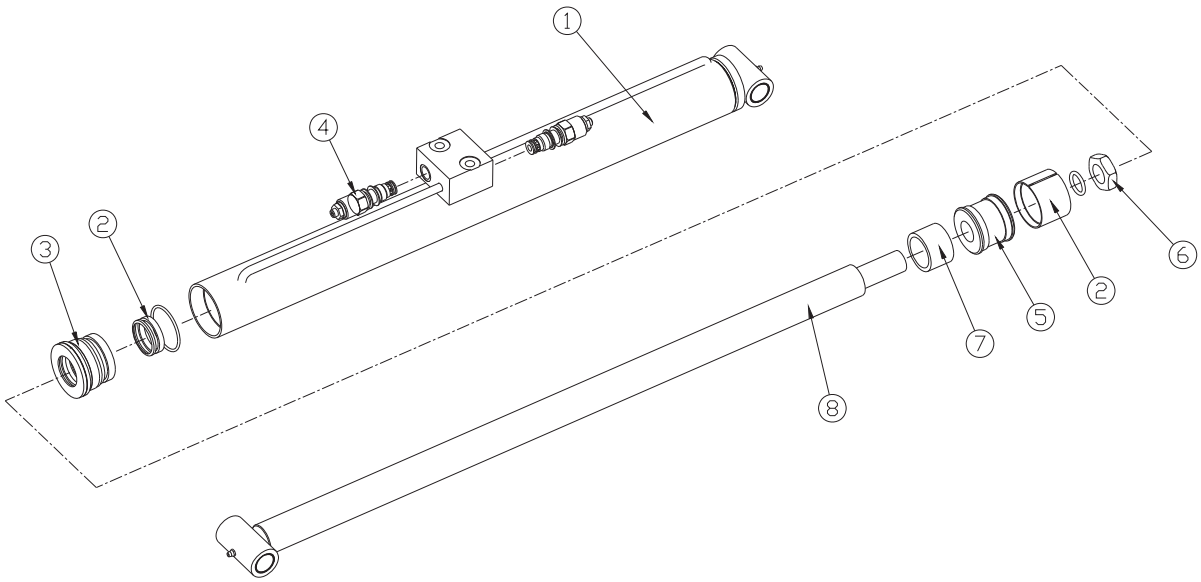


Figure 6-20: Drop nose ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-3602-1	Tube assembly	1
2	13-3603-3	Seal Kit	1
3	13-1061	Head bush	1
4	13-2489	Over-centre valve	2
5	13-1064	Piston	1
6	13-0973	Locknut	1
7	13-3602-3	Spacer	1
8	13-3602-2	Rod assembly	1

Table 6-22: Drop nose ram components - 13-3602.

CAGE ROTATION RAM

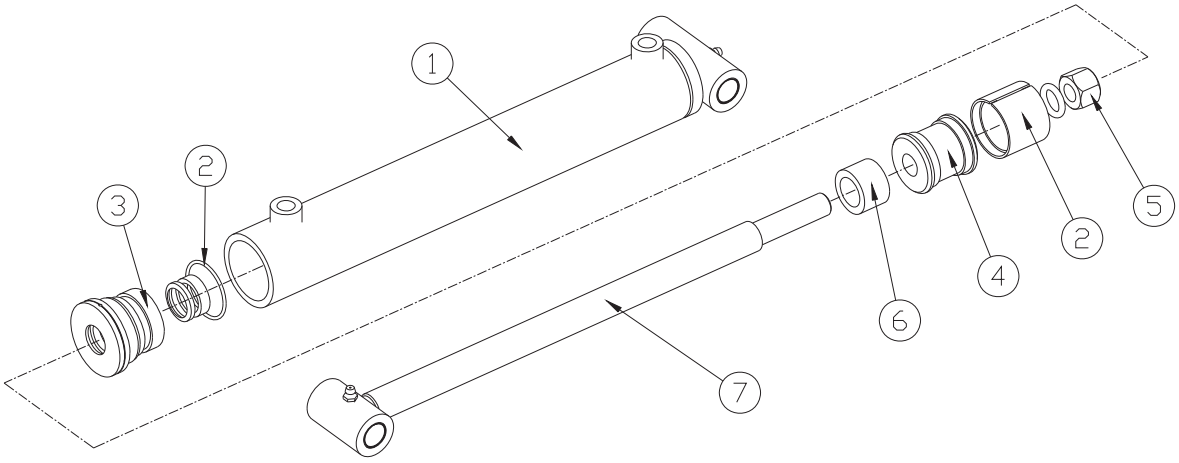


Figure 6-21: Cage rotation ram assembly.

ITEM	PART #	DESCRIPTION	QTY
1	13-2403-1	Tube assembly	1
2	13-0993	Seal kit	1
3	13-0988	Head bush	1
4	13-0992	Piston	1
5	13-0994	Locknut	1
6	SS-0200020	Spacer	1
7	13-2403-2	Rod assembly	1

Table 6-23: Drop nose ram components - 13-2403.

TRAILER ELECTRIC KIT PARTS

STANDARD LOWER CONTROL PANEL

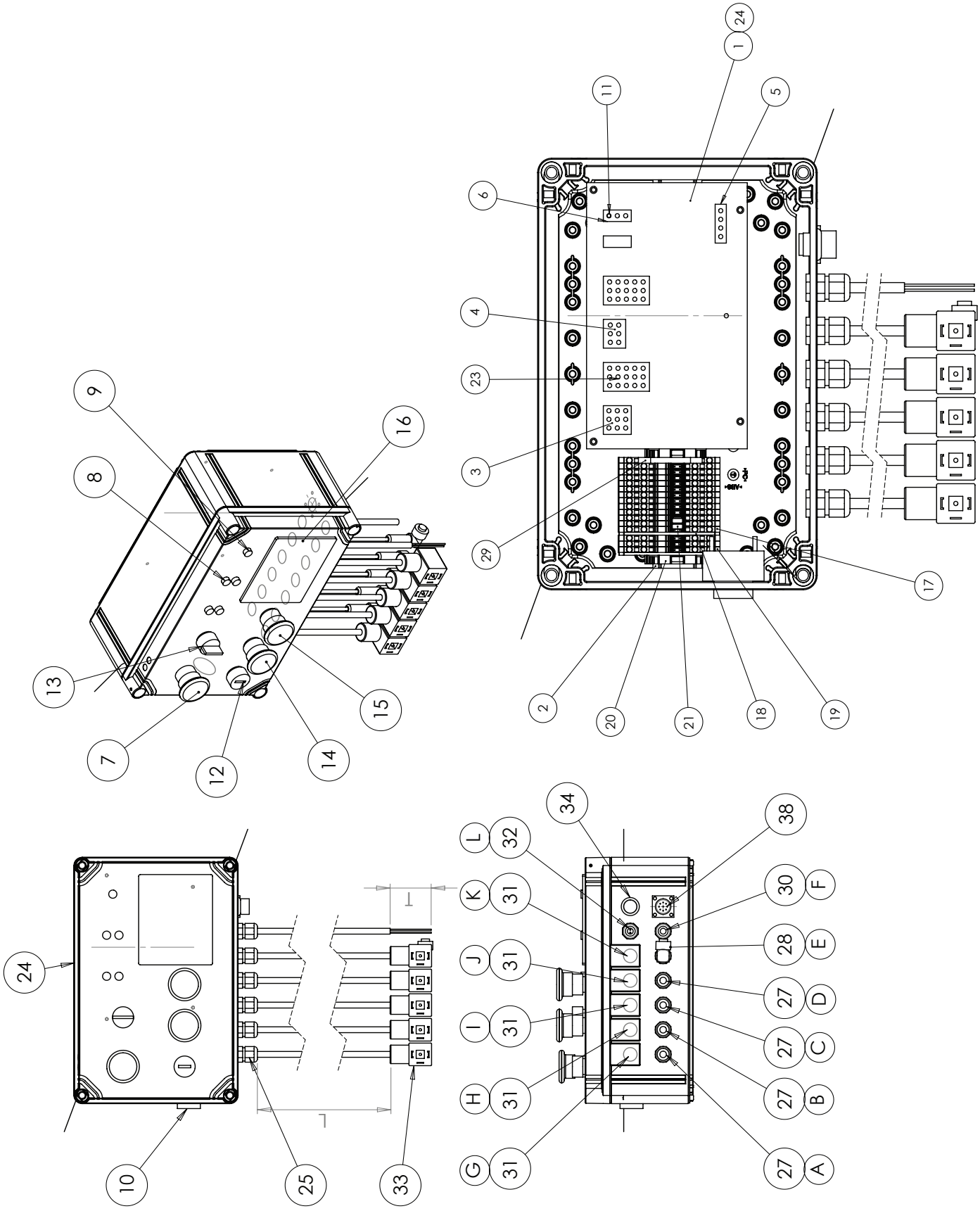


Figure 6-22: Standard lower control panel assembly - 513348-000.

STANDARD LOWER CONTROL PANEL

ITEM	PART	DESCRIPTION	QTY
1	513316-000	GP450 I/F Board	1
2	512368-000	Din rail (170 mm)	1
3	510156-000	9 way panel plug	1
4	510154-000	6 way panel plug	1
5	512366-000	4 way panel plug	1
6	510155-000	3 way panel plug	1
7	510524-000	SW twist release E/stop	1
8	512935-000	LED green 12 V	4
9	512934-000	LED red 12 V	1
10	502588-000	Alarm	1
11	510145-000	Mate-n-lock SCKT contact	34
12	512543-000	Keyswitch 3 position stayput	1
13	513307-000	Switch 3-way spring to centre	1
14	513308-000	Switch push button black mushroom	1
15	513309-000	Switch push button green mushroom	1
16	3087803	EZcal display	1
17	513310-000	Feed through terminal 4 way	12
18	513312-000	End plate	2
19	513311-000	Feed through terminal 4 way ground	3
20	513314-000	Terminal end stop	2
21	513313-000	Jumper	2
22	513315-000	Spacer	4
23	512817-000	15 way panel plug	2
24	513319-000	Lower control box - trailers	1
25	510152-000	Cable gland	12
26	510153-000	Cable gland	12
27	09-2378	Switch cable	4
28	09-2379	Switch cable	1
29	09-2326	Relay 24 V DC	1
30	513350-000	5-Core cable	1
31	508075-000	2-Core cable	5
32	513457-000	3-Core cable	1
33	508637-000	Hirschmann connector	5
34	513351-000	Blanking grommet	1
35	509741-000	Fuse holder	2
36	509740-005	Fuse 7.5 A	2
37	513349-000	Overlay	1
38	513949-000	9 way chassis socket	1

GLAND ID	LENGTH L (mm)	TAIL Length T (mm)
A	3300	N/A
B	3300	N/A
C	3300	N/A
D	3300	N/A
E	2700	N/A
F	2700	100*
G	1600	N/A
H	1600	N/A
I	1600	N/A
J	7400	N/A
K	1600	N/A
L	1600	100*

Table 6-24: Standard lower control panel components - 513348-000.

STANDARD PLATFORM CONTROL PANEL

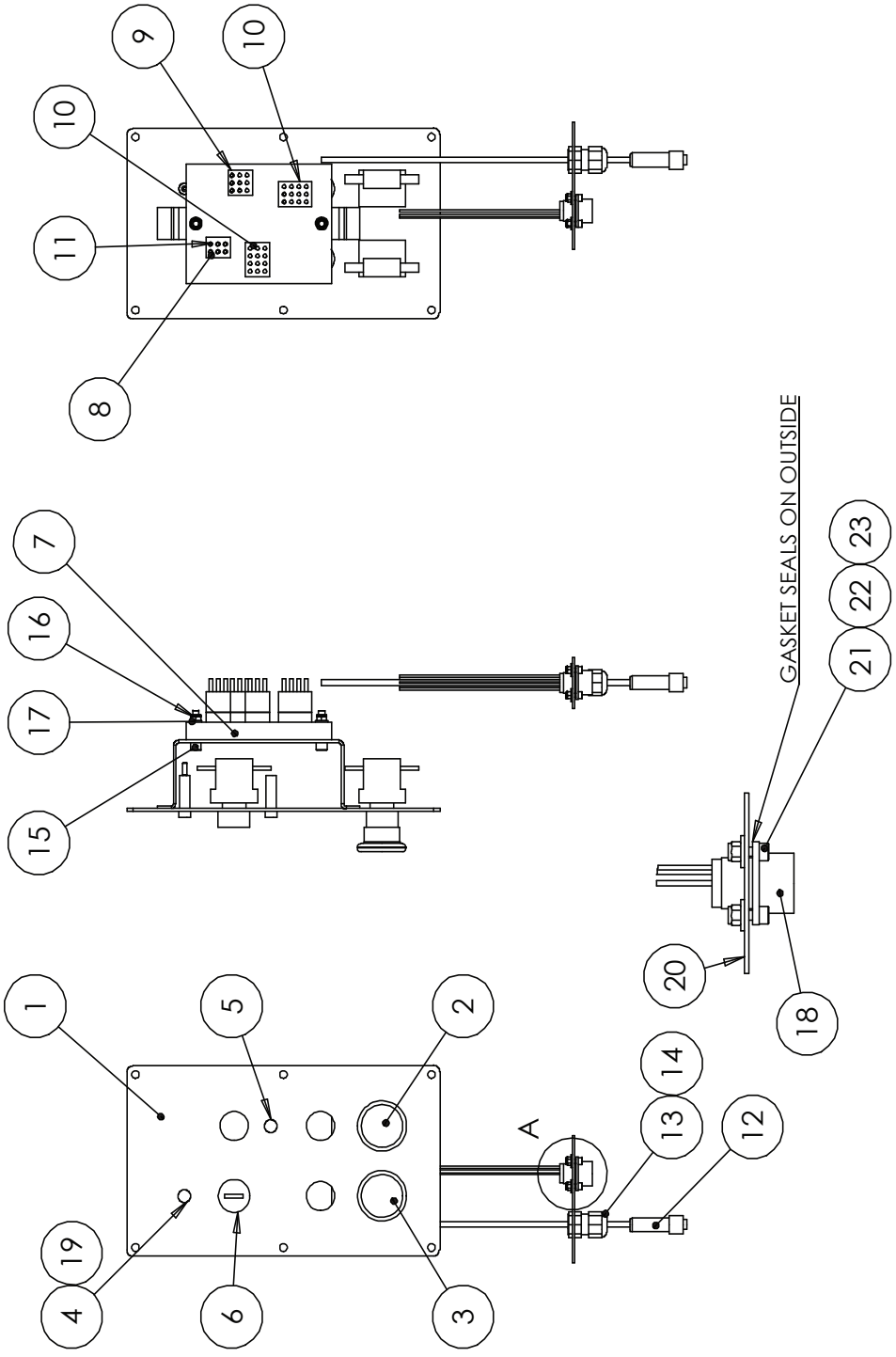


Figure 6-23: Standard platform control panel assembly - 513321-000.

STANDARD PLATFORM CONTROL PANEL

ITEM	PART #	DESCRIPTION	QTY
1	513327-000	Upper control panel	1
2	510524-000	Sw twist release E/stop	1
3	513309-000	Switch push button green mushroom	1
4	512934-000	LED red 12 V	1
5	512935-000	LED green 12 V	1
6	513318-000	Keyswitch 2 position spring return	1
7	510472-000	Matrix board	1
8	510154-000	6 way panel plug	1
9	510156-000	9 way panel plug	1
10	510157-000	12 way panel plug	2
11	510145-000	Mate-N-lock socket contact	14
12	09-2378	Switch cable	1
13	510152-000	Cable gland	1
14	510153-000	Cable gland	1
15	058501-025	M5 x 25 S.C.H.S. - GR 12.9	2
16	056066-005	M5 nylock nut - 8	2
17	056069-005	M5 washer - Grade 8	2
18	513949-000	9 way chassis socket	1
19	514327-000	Resistor 1 K 0.5 W 5%	1
20	513590-002	Cable mounting plate	1
21	512651-010	Socket HD capscrew - M3 x 10	4
22	510561-003	Flat washer - M3	4
23	510569-003	M3 nylock nut - stainless steel	4

Table 6-25: Standard Platform control panel components - 513321-000.

BATTERY/MAINS PLATFORM CONTROL PANEL

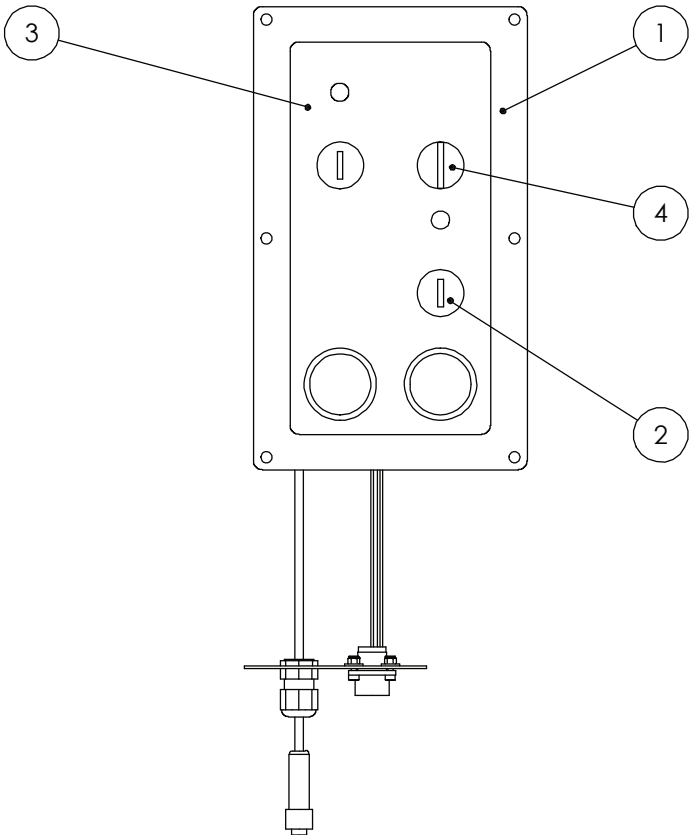


Figure 6-24: Battery/Mains platform control panel assembly - 513321-004.

ITEM	PART #	DESCRIPTION	QTY
1	513321-000	Platform control panel (standard)	1
2	512449-000	Keyswitch 2 position stayput	1
3	513328-004	TL49 UCP overlay bat/mains	1
4	513307-000	Switch 3-way spring to center	1

Table 6-26: Battery/Mains Platform control panel components - 513321-004.

ENGINE PLATFORM CONTROL PANEL

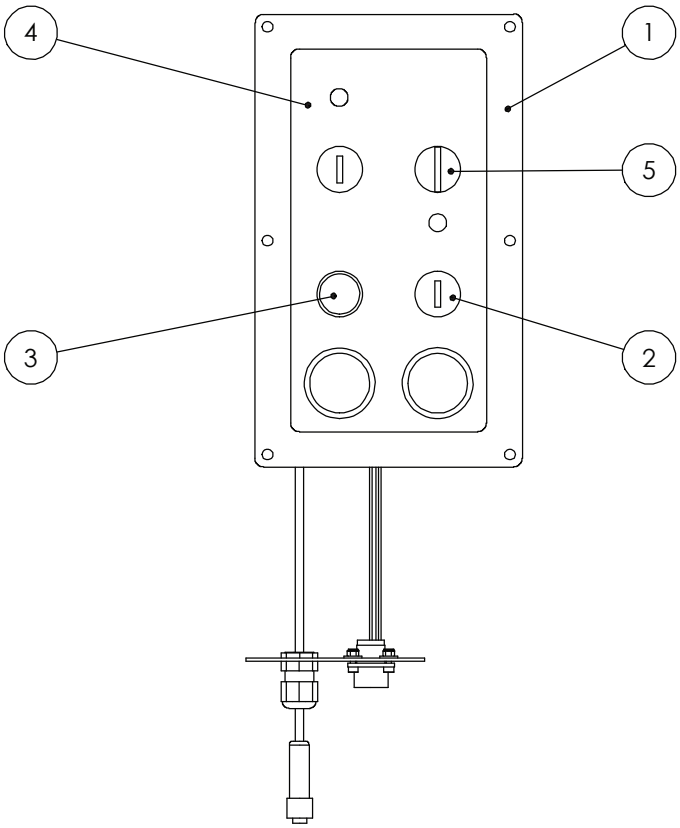


Figure 6-25: Engine platform control panel assembly - 513321-005.

ITEM	PART #	DESCRIPTION	QTY
1	513321-000	Platform control panel (standard)	1
2	512449-000	Keyswitch 2 position stayput	1
3	513317-000	Green push button	1
4	513328-005	TL49 UCP overlay engine	1
5	513307-000	Switch 3-way spring to center	1

Table 6-27: Engine Platform control panel components - 513321-005.

BI-FUEL PLATFORM CONTROL PANEL

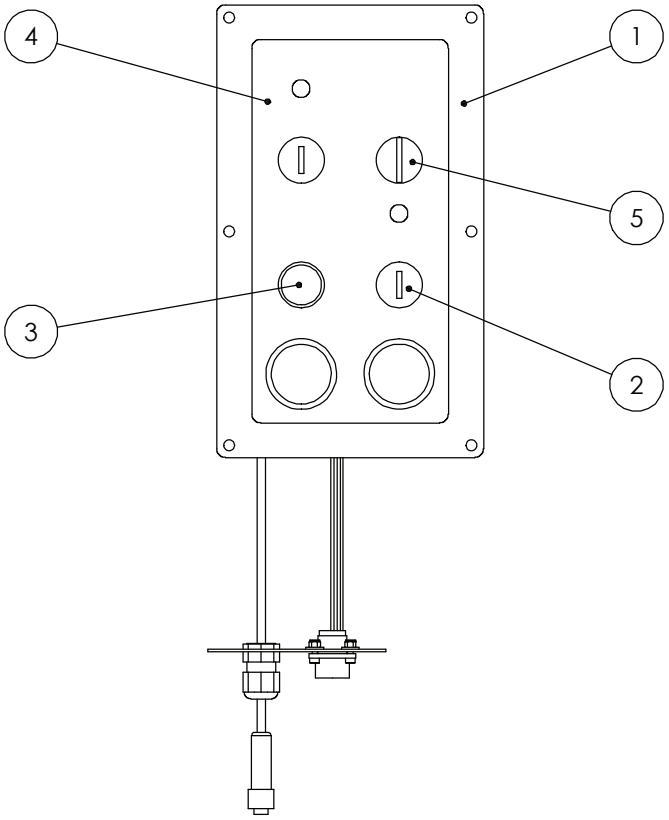


Figure 6-26: Bi-fuel platform control panel assembly - 513321-006.

ITEM	PART #	DESCRIPTION	QTY
1	513321-000	Platform control panel (standard)	1
2	512543-000	Keyswitch 3 position stayput	1
3	513317-000	Green push button	1
4	513328-006	TL49 UCP overlay bi-fuel	1
5	513307-000	Switch 3-way spring to center	1

Table 6-28: Bi-fuel Platform control panel components - 513321-006.

MAINS MOTOR STARTER

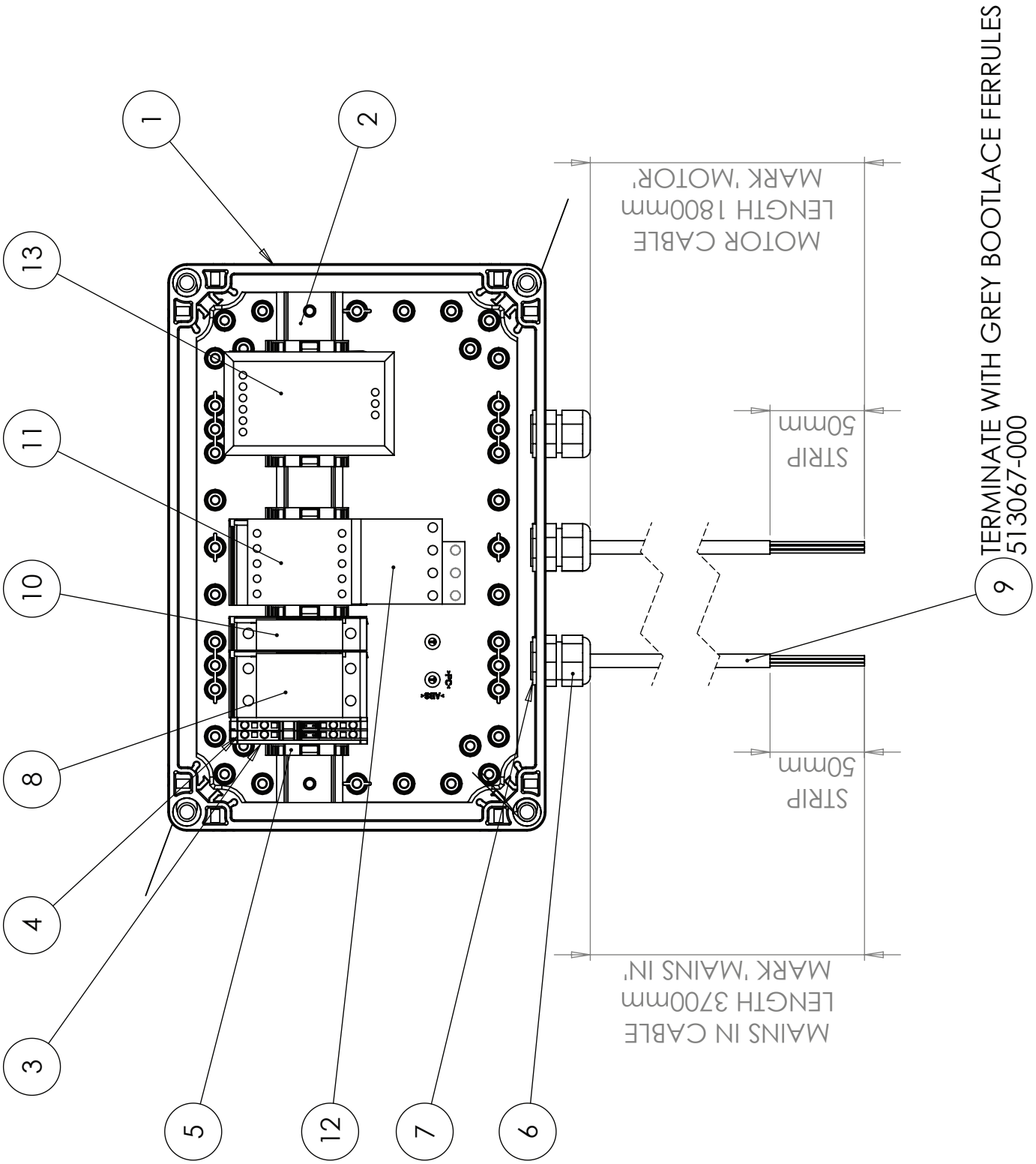


Figure 6-27: Mains motor starter assembly - 513999-000.

MAINS MOTOR STARTER

ITEM	PART #	DESCRIPTION	QTY
1	514000-000	Mains motor starter box	1
2	512368-000	Din rail (170 mm)	1
3	513312-000	End plate	2
4	514006-000	Feed through terminal 4 way ground 2.5 mm^2	2
5	513314-000	Terminal end stop	5
6	509440-000	Cable gland M20	3
7	510146-000	Cable gland nut M20	3
8	514001-000	RCD 16 A- 30 mA	1
9	508077-000	3-core cable 2.5 CSA HO7RN-F	6 m
10	514002-000	MCB 16 A	1
11	514003-000	Motor starter contactor 12 V DC coil	1
12	514004-000	Overload relay	1
13	514005-000	PSU 230 V AC to 12 V DC 7.5 A	1
14	514007-000	Decal ‘isolate supply’	1
15	514008-000	Cable 2.5 mm CSA Tri-rated brown	0.5 m
16	514009-000	Cable 2.5 mm CSA tri-rated blue	0.5 m
17	514010-000	Cable 2.5 mm CSA tri rated green/yellow	0.5 m
18	513067-000	Grey bootlace ferrule	23

Table 6-29: Mains motor starter components - 513999-000.

EXTERNAL COMPONENTS

PART #	DESCRIPTION	QTY
09-2088	Solenoid coil 12 V/22 W	2
09-2091	Solenoid coil 12 V/14 W	3
02-2639/16	Overload switch	1
02-2639/22	Stabilizer switch	4
09-1961	Elevation switch	1
09-2355	Elevation switch connector	1
09-2389	Conduit	1

Table 6-30: External components - All variants.

PART #	DESCRIPTION	QTY
502494-000	Fuse 175 A	1
501877-000	Fuse holder	1

Table 6-31: External components - All battery variants.

PART #	DESCRIPTION	QTY
502494-000	Motor starter box assembly	1

Table 6-32: External components - All mains variants.

CABLE ASSEMBLIES

PART #	DESCRIPTION	QTY
513323-000	Platform Cable TL49	1

Table 6-33: Platform cable assembly.

PART #	DESCRIPTION	QTY
513325-000	Battery cable set TL49	1

Table 6-34: Battery cable assembly.

BASIC FITTINGS KIT

PART #	DESCRIPTION	QTY
12-1008	1/4" BSP male x 7/16" JIC male straight adaptor	29
12-1007	3/8" BSP male x 7/16" JIC male straight adaptor	41
12-9005	3/8" BSP male x 7/16" JIC male staright 25th restrictor	4
12-9004	3/8" BSP male x 7/16" JIC male staright 40th restrictor	2
12-1013	3/8" BSP male x 9/16" JIC male straight adaptor	10
12-1017	1/2" BSP male x 9/16" JIC male straight adaptor	3
12-1869	1/4" BSP male x 7/16" JIC male positional elbow	6
12-1110	7/16" JIC equal Tee female-on-run	6
12-1501	1/2" Dowty washer	6
12-1502	3/8" Dowty washer	64
12-1507	1/4" Dowty washer	45
12-1511	1/8" Dowty washer	1
12-1867	9/16" JIC male/female elbow	1
12-2001	1/2" BSP male plug	1
12-2003	3/8" BSP male plug	6
12-2002	1/8" BSP male plug	1
12-0927	9/16" UNF male x 9/16" JIC male straight adaptor	1
12-9007	9/16" UNF male plug	1
5063701	7/16" (-4) JIC female cap	1
12-0916	1/4" BSP male x 1/4" BSP female straight adaptor	1
12-1001	3/8" BSP male x 1/4" BSP male straight adaptor	6
12-1502	3/8" Dowty washer	6
12-1879	1/4" BSP female x 1/4" BSP female compact 90° elbow	1

Table 6-35: TL49J basic fittings kit - All specifications.

END FITTINGS KIT

PART #	QTY	LOCATION	HOSE SIZE	END FITTINGS		LENGTH/ mm
				END 'A'	END 'B'	
G1	2	Outrigger valve to outrigger ram 1	1/4 R7	7/16 JIC female straight	7/16 JIC female 135°	3000
G2	2	Outrigger valve to outrigger ram 2	1/4 R7	7/16 JIC female straight	7/16 JIC female 135°	3100
G3	2	Outrigger valve to outrigger ram 3	1/4 R7	7/16 JIC female straight	7/16 JIC female 135°	1800
G4	2	Outrigger valve to outrigger ram 4	1/4 R7	7/16 JIC female straight	7/16 JIC female 135°	1700
G5	1	Outrigger valve to manifold P	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	1700
G6	1	Outrigger valve to tank manifold	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	1700
G7	2	Base valve to bottom ram	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	1500
G8	1	Bottom ram emergency lower	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	1530
G9	2	Base valve to top ram	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	6700
G10	1	Top ram emergency lower	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	6800
G11	2	Base valve to telescope ram	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	6900
G12	1	Telescope ram drain	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	6900
G13	1	Base valve P to manifold GP	3/8 702	9/16 JIC female straight	9/16 JIC female straight	1200
G14	2	Base valve to manifold slew Tee	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	1000
G15	1	Hand-pump to manifold HP1	1/4 R7	7/16 JIC female 90°	7/16 JIC female straight	700
G16	2	Slew motor to manifold SLA/SLB	1/4 R7	7/16 JIC female 90°	7/16 JIC female 90°	1200
G17	2	Base valve to drop nose ram	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	18200
G18	2	Basket valve to bottom ram	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	17800
G19	2	Basket valve to manifold slew tee	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	18700
G20	1	Basket valve P to manifold CP	3/8 702	9/16 JIC female straight	9/16 JIC female straight	18700
G21	1	Tank manifold to manifold T	3/8 702	9/16 JIC female straight	9/16 JIC female straight	600
G22	1	Tank manifold to base valve T	3/8 702	9/16 JIC female straight	9/16 JIC female straight	370
G23	1	Pump to manifold P	3/8 702	9/16 JIC female straight	9/16 JIC female 90°	400
G24	1	Tank manifold to filter	3/8 702	9/16 JIC female straight	9/16 JIC female straight	1000

END FITTINGS KIT

PART #	QTY	LOCATION	HOSE SIZE	END FITTINGS		LENGTH/ mm
				END 'A'	END 'B'	
G26	1	Basket valve to tank manifold	3/8 702	9/16 JIC female straight	9/16 JIC female straight	18300
G27	2	Basket valve to top ram	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	12700
G28	2	Basket valve to telescope ram	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	12000
G29	2	Master ram to DOC valve	1/4 R7	7/16 JIC female straight	7/16 JIC female straight	12100
G30	1	Basket valve to slewing ram	1/4 R7	7/16 JIC female straight	7/16 JIC female 90°	2300
G31	1	Basket valve to slewing ram	1/4 R7	7/16 JIC female straight	7/16 JIC female 90°	2200
G32	2	Basket valve to drop nose ram	1/4 R7	7/16 JIC female straight	7/16 JIC female 90°	4100
G33	2	DOC valve to basket levelling ram	1/4 R7	7/16 JIC female straight	7/16 JIC female 90°	3900
G34	2	Basket valve to DOC valve	1/4 R7	7/16 JIC female straight	7/16 JIC female 90°	600
H1	1	Pump to manifold	1/4 R7	9/16 JIC female straight	7/16 JIC female 90°	300
H2	1	Engine pump to manifold tee	1/4 R7	9/16 JIC female straight	9/16 JIC female 90°	1200
H3	1	Engine pump to tank suction port	1/2 R1AT	1/2 BSP female straight	1/2 BSP female 90°	1940
H14	1	Pressure relief V/V to tank	1/4 R7	9/16 JIC female 90°	9/16 JIC female straight	1060

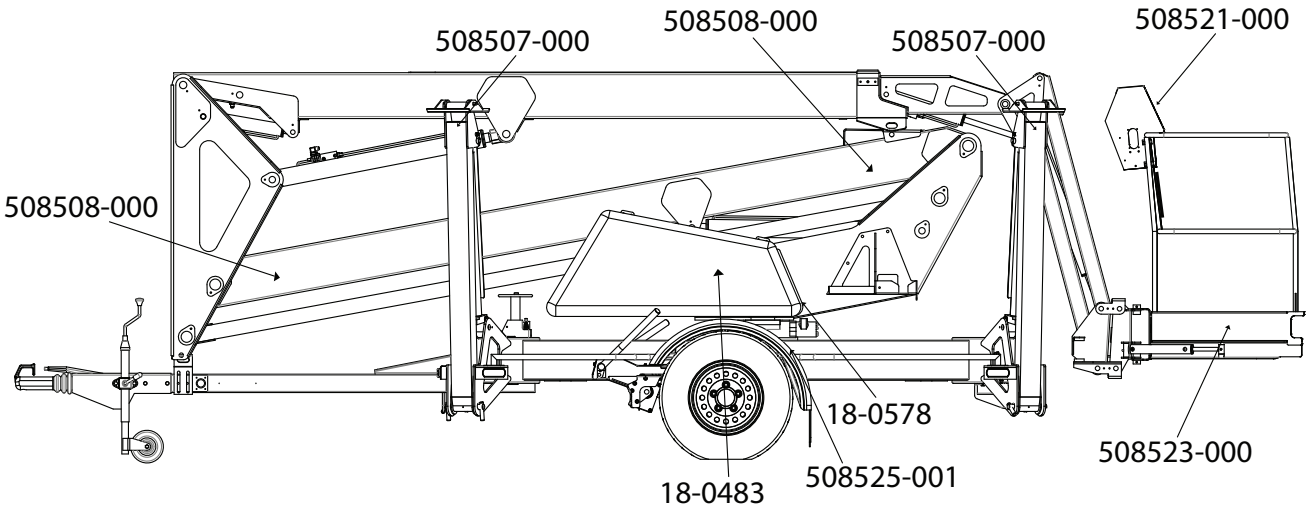
Table 6-36: TL49J end fittings kit.

TL49 FRICTION DRIVE KIT

LINDEN PART #	DESCRIPTION	QTY
H4	1/4 1SN 9/16 JIC F STR x 9/16 JIC F 90 200	1
H5	1/4 1SN 9/16 JIC F 45 x 9/16 JIC F 90 215	1
H6	1/4 1SN 9/16 JIC F STR x 9/16 JIC F 90 190	1
H7	1/4 1SN 9/16 JIC F 45 x 9/16 F 90 250	1
H8	1/4 1SN 9/16 JIC F 45 x 9/16 f 90 1525	2
H9	1/4 1 SN 9/16 JIC F 45 x 9/16 F 90 1650	2
H10	3/8 1SN 9/16 JIC F STR x 9/16 JIC F 45 3275	1
H11	3/8 1SN 9/16 JIC F STR x 9/16 JIC F 90 3275	1
H12	1/4 1SN 9/16 JIC F STR x 9/16 JIC F STR 910	2
H13	1/4 1SN 9/16 JIC F STR x 9/16 JIC F STR 1220	1

Table 6-37: TL49J friction drive kit - 13-3670.

TL49 DECAL LOCATIONS



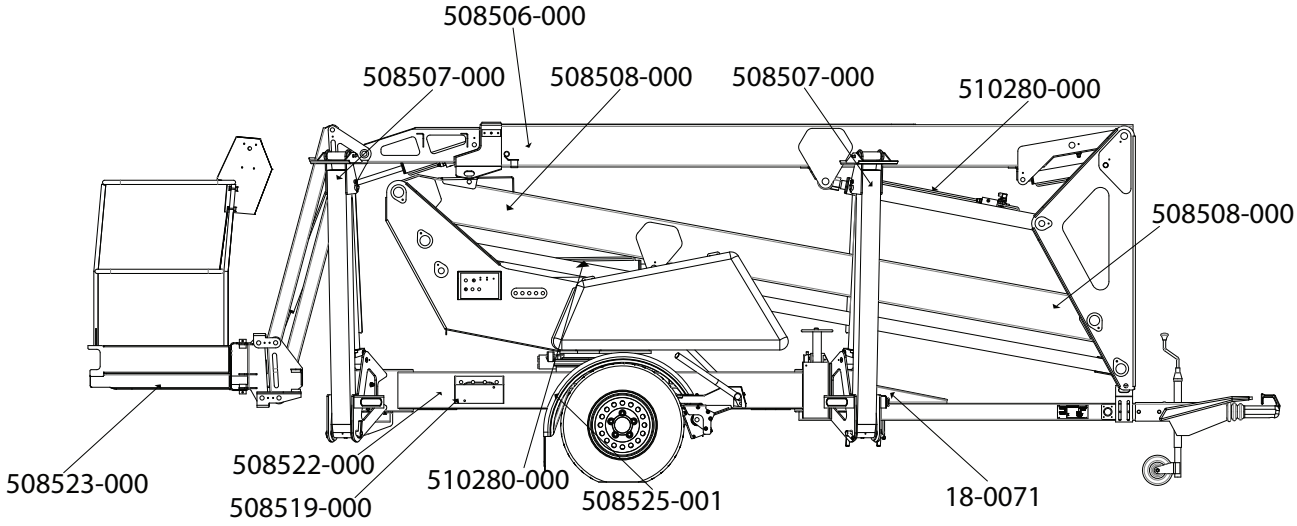
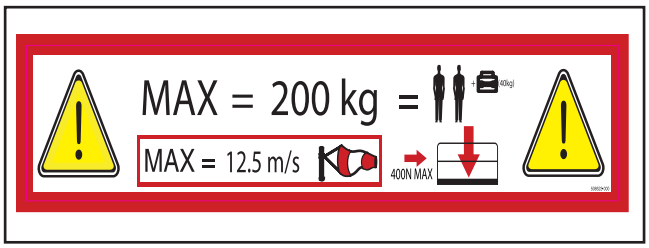


Table 6-27: TL49J decal locations.



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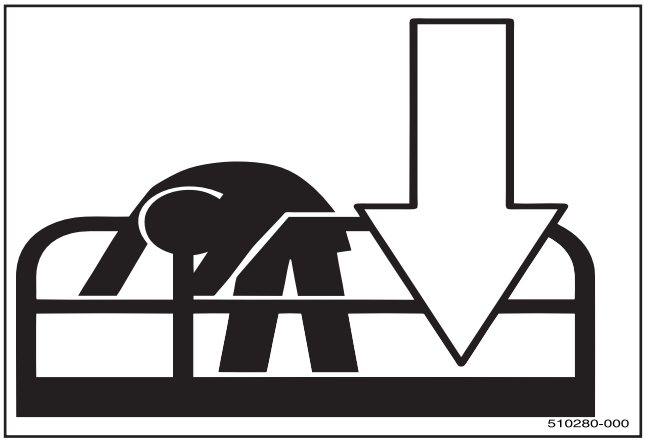

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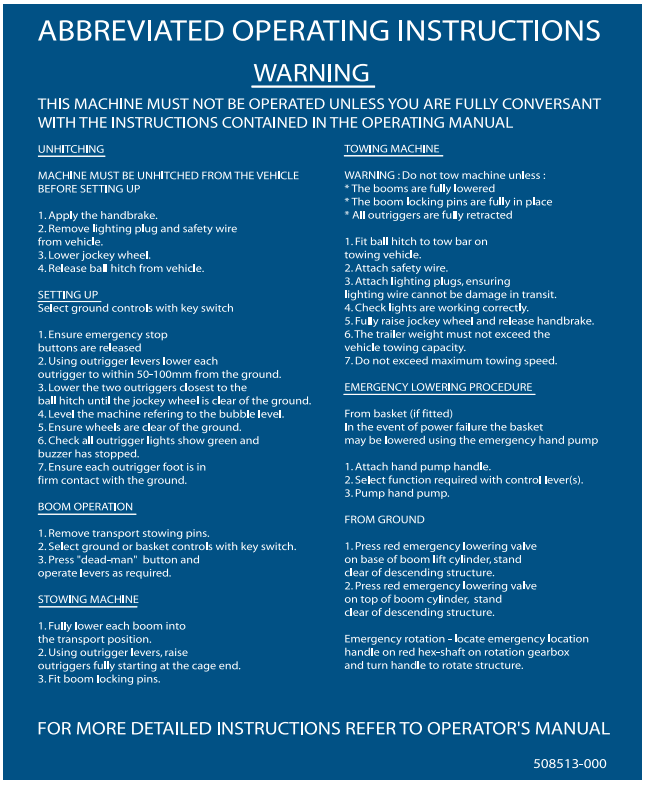

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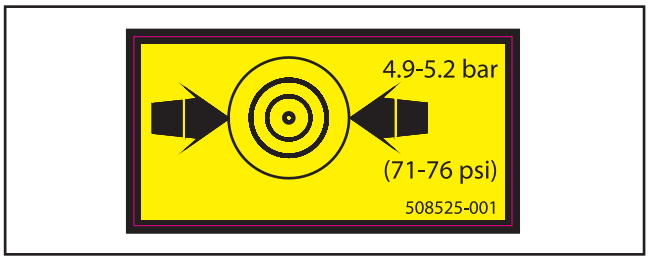
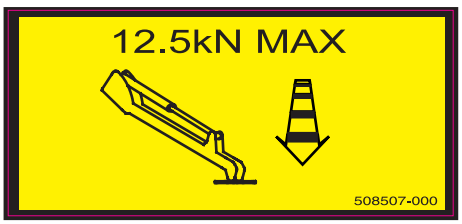


508525-001

18-0483

18-0578



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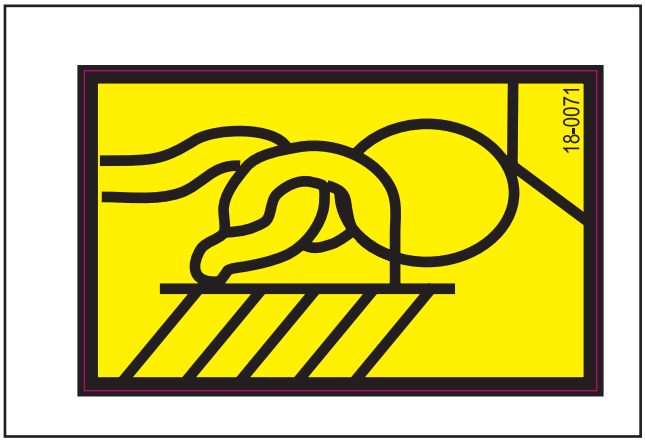

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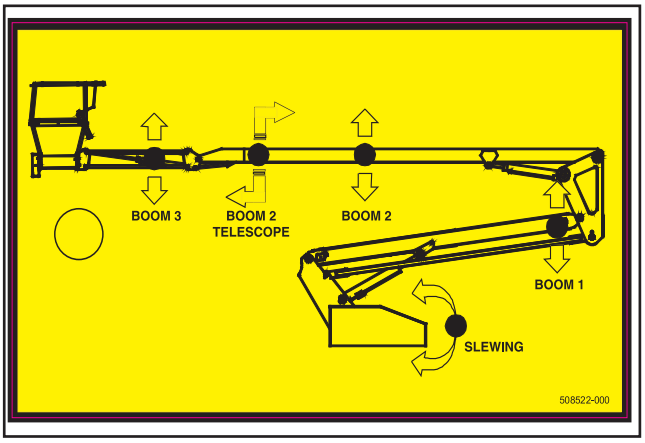

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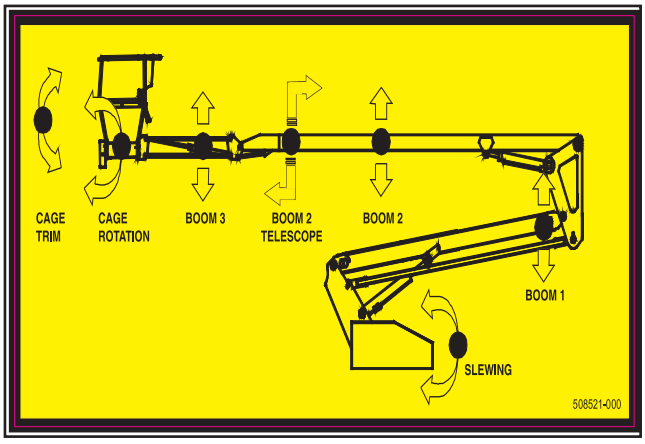

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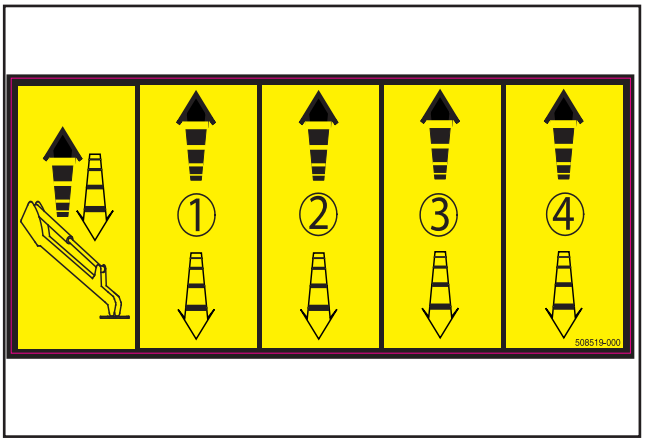

508519-000

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