

MK. II 4.W.D.
Dumpers

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2000 swing
3000
3000 swing
4000
4000 swing
5000
5000 swing
6000
6000 swing
7000
9000

This equipment has been designed and tested to meet the requirements of the
Machinery Safety Directive 89/392/EEC and Amendments
and therefore carries the CE mark

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Instruction Manual

Useful Information

Model/Capacity	_____	<table><thead><tr><th>Service</th><th>Date</th></tr></thead><tbody><tr><td>1</td><td rowspan="9"></td></tr><tr><td>2</td></tr><tr><td>3</td></tr><tr><td>4</td></tr><tr><td>5</td></tr><tr><td>6</td></tr><tr><td>7</td></tr><tr><td>8</td></tr><tr><td>9</td></tr></tbody></table>	Service	Date	1		2	3	4	5	6	7	8	9
Service	Date													
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VIN	_____													
Purchase Date	_____													
Engine Make/No.	_____													
Gearbox No.	_____													
Transfer Box No.	_____													
Axle No.'s - Front	_____													
Rear	_____													
Tyre Specification	_____													
Battery Specification	_____													
Oil Specifications & Quantity	_____													

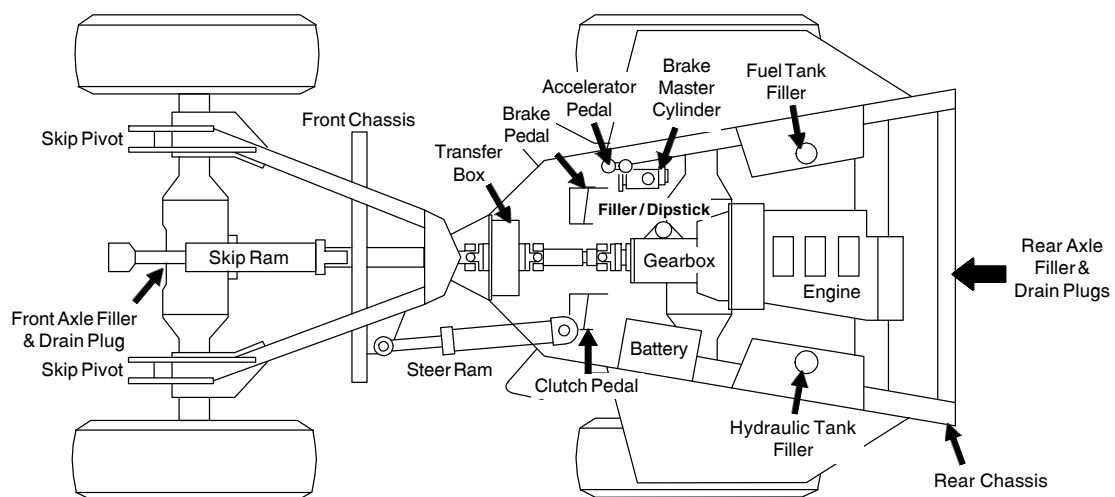
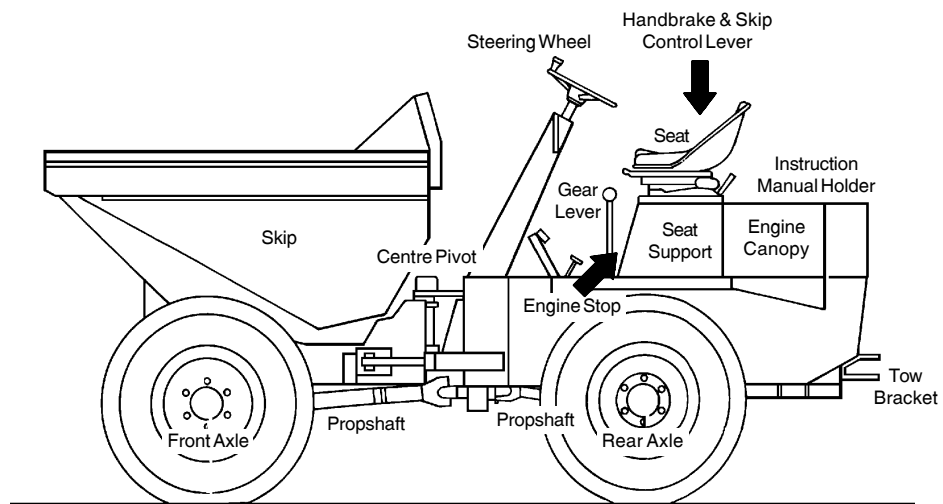
Engine	_____	Front Axle	_____
Gearbox	_____	Rear Axle	_____
Transfer Box	_____	Hydraulic	_____

Distributor

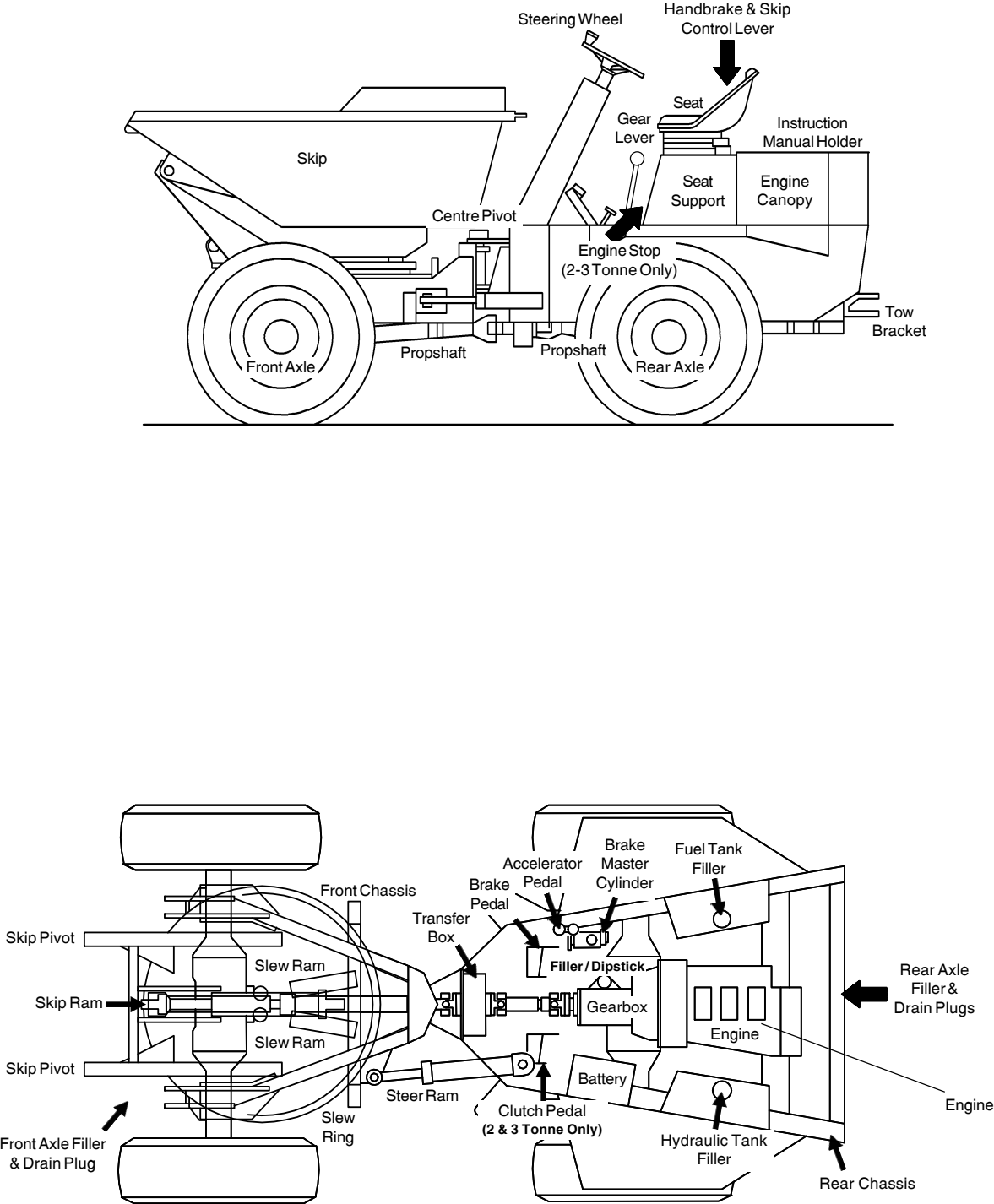
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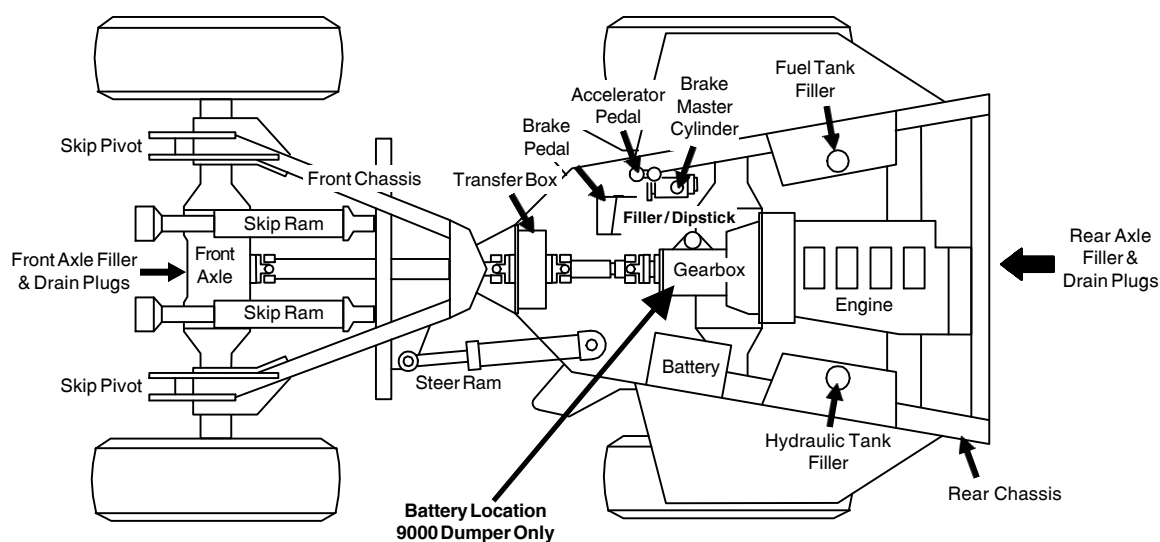
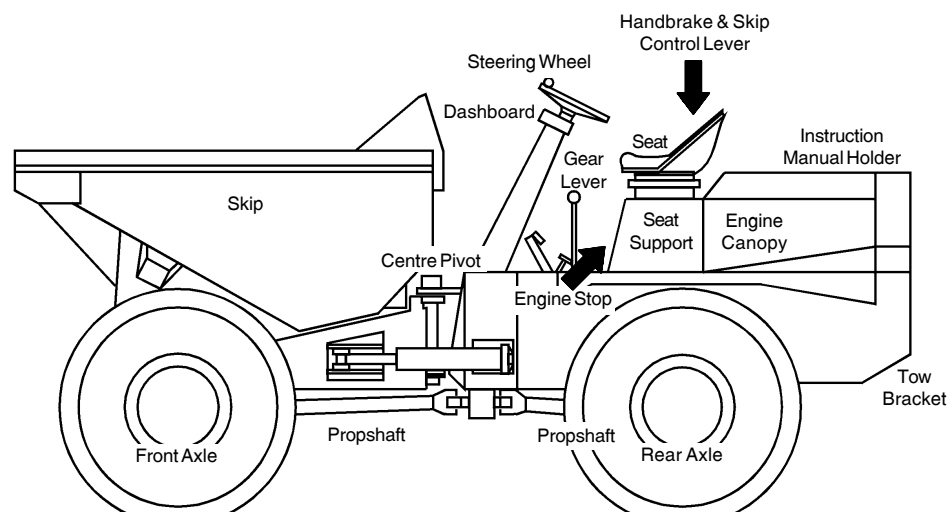
2 and 3 Tonne Dumpers - Straight Skip



2, 3, 4, 5 and 6 Tonne Dumpers - Swing Skip



4, 5, 6, 7 and 9 Tonne Dumpers - Straight Skip



Introduction

The range of 2 to 9 tonne payload site dumpers have been designed to provide the greatest degree of component standardisation possible, thus providing the user with simplified servicing requirements. It is for this reason that this handbook covers the entire range of dumpers, and users of one, or all of the models will benefit from having a single source of information for all the models in their fleet.

General Description

Skips - Standard and Swing

All models in the range are 4 wheel drive dumpers having a load carrying skip located over the front axle, and ahead of the driver. The 2, 3, 4 and 6 tonne models are available with a turntable skip which rotates through 180°. The skip is mounted on a ball bearing slew ring and is rotated by double hydraulic rams.

Engines

Engines on all machines are multi-cylinder diesel which transmit power to the wheels by means of mechanical gearboxes and axles.

All machines are fitted with electric starting of the engine. A separate key operated start switch is provided and is located adjacent to the steering wheel. A battery isolator switch is provided in the engine compartment.

Chassis

The chassis of the dumpers is of the two part articulating type having a centre pivot joint which articulates in both vertical, and horizontal planes.

Steering

Steering of the dumper is by an 'Orbitrol' hydrostatic steering unit, powering a single ram connecting the front and rear chassis units.

Transmission

The transmission of the dumpers comprise of heavy duty constant mesh gearboxes with three forward and one reverse gear on all models up to 3 tonne capacity. The 4, 5, 6, 7 and 9 tonne models have torque converter four speed shuttle gearboxes.

Braking

The vehicle braking is provided by means of totally enclosed oil immersed brakes located within the drive axles. These brakes are self adjusting sintered multi-plate discs which are hydraulically operated by means of single or tandem master cylinders depending upon whether the dumper has 1 or 2 axle braking.

In the case of two axle braking the tandem master cylinder provides the feature of totally independent front and rear systems. In the event of failure of one system, braking will still be available on the alternative axle.

Electric System

All models are available with full lighting to comply with British road traffic regulations. All models use a belt driven alternator to charge the battery.

Safety

These machines are designed to carry out the function of transporting various free flowing materials. If used correctly they will provide an effective and safe means of transportation and meet the appropriate performance standards.



It is essential the machine Operator is an able bodied adult, adequately trained in its safe operation. The Operator must also be authorised to operate the machine and have sufficient working knowledge of the machine to ensure it is in a full and safe working condition before it is put to use

Operational Safety Points

When using this machine the following list of basic Do's and Don't's should be applied. This list is not necessarily a complete list, but applying these rules will greatly reduce the possibility of an accident occurring.

Always

- ☒ Carry out a daily pre-start check of the machine.
- ☒ Ensure this Instruction Manual is placed in the special holder behind the seat.
- ☒ Look around the machine before starting the engine - children could be out of sight.
- ☒ Before starting the engine, ensure the transmission control lever and/or gearlever is in the NEUTRAL position.
- ☒ Examine working area looking for possible dangers e.g. trenches, confined areas, people working.
- ☒ Park the machine on safe, firm, level ground and remove the start switch key.
- ☒ Clear away obvious hazards and always operate with caution.
- ☒ Ensure you have a clear view when driving.
- ☒ Exercise great care when working on gradients - especially when crossing.
- ☒ When refuelling make sure the engine is cold and the machine is in a well ventilated area, with the engine stopped. Use clean fuel and container. Beware of naked flames, grinding sparks etc.
- ☒ Winch or lift the machine from any situation where it cannot extricate itself.
- ☒ Wear appropriate protective clothing,
 - ☐ Hard Hat at all times
 - ☐ Safety Boots at all times
 - ☐ Safety Glasses at all times
 - ☐ Reflective Clothing at all times
 - ☐ Gloves as conditions dictate
 - ☐ Ear Protectors as conditions dictate
 - ☐ Respirator in dusty conditions
- ☒ Wash and Clean machine at end of working day - Keep water away from electrical components.
- ☒ Ensure drivers seat is correctly adjusted as described in the *Seat Operating* section of this manual.
- ☒ Use footsteps and grabrails provided when getting on and off the machine.
- ☒ Keep floorplate free of mud, oil, debris etc.
- ☒ Use seatbelt when ROPS or FOPS is fitted.
- ☒ Reduce the payload if the materials are of a sticky non-flowing nature.
- ☒ Ensure materials being tipped are of a free-flowing nature - Swing skips only.



Never

- ☒ Attempt to 'jump' obstacles such as kerbs and manholes.
- ☒ Drive at speed over rough ground - drive slowly.
- ☒ Leave the machine unattended with the engine running, this practice is not only dangerous but can cause premature engine wear.
- ☒ Carry out maintenance unless engine is stopped and the start key has been removed.
- ☒ Carry out maintenance unless the wheels are chocked and the skip is propped.
- ☒ Tamper with any of the safety devices on the machine.
- ☒ Tighten or disconnect any hose whilst the engine is running.
- ☒ Attempt to start the engine from OFF the machine.
- ☒ Stand in the CRUSH area between front and rear frames when the engine is running.
- ☒ Carry passengers.
- ☒ Use the machine as a towing vehicle.
- ☒ Allow the dumper to be loaded such that vision and safe driving is impaired.
- ☒ Overload the dumper beyond its rated payload.
- ☒ Carry loads which extend over side of dumper - they create instability and danger to pedestrians.
- ☒ Tip materials into a trench unless a banksman is employed with a stop bar or baulk of timber, to prevent the dumper getting too close to the edge and either falling in or causing the trench sides to collapse.
- ☒ Drive the dumper with the skip elevated.

Safe Operation Decals

The machine has a number of special decals fitted which draw the users attention to various points of operation or safety.

Before Using the Machine

Read all the decals attached to the machine and fully understand their meaning. If you don't understand their meaning contact your supervisor for clarification.

Condition of Decals

Ensure the decals are always clean and readable, replace when necessary.

Spare decals are obtainable from the Manufacturers Spares Department.

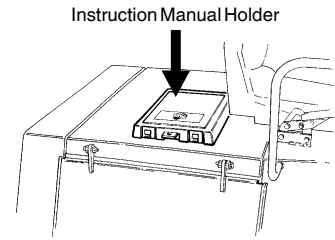
Delivery Checks



Immediately on taking delivery of your new dumper, and before putting it into service:

- Read this handbook completely -- it could save a great deal of unnecessary expense. Put this Instruction Manual in its holder on the engine canopy.
- Read the engine handbook supplied with the dumper.
- Check the general condition of the machine, -- has it been damaged during delivery?
- Check the following, where appropriate:
 - ☐ Oil levels in engine, gearbox, transfer box, both axles and torque converter.
 - ☐ Hydraulic oil and fuel levels using tank top level gauges.
 - ☐ Brake fluid level in the reservoir located under the floor plate or seat support on 5, 6, 7 and 9 tonne dumpers.
 - ☐ Tyre pressures and the battery electrolyte level.
 - ☐ Coolant level in radiator - if fitted.

Recommended lubricants are detailed both on a prominent transfer on the machine and also in the *Maintenance* section of this manual.



Transportation

Loading



When loading the dumper onto a trailer or lorry, strong loading ramps, a crane or similar lifting device should be used. See *Technical Data* section for machine weights.

Ramps

- Ensure the trailer or lorry will not move during loading by applying their brakes and also chocking their wheels if necessary.
- The angle of the ramps must not exceed the gradeability of the machine and in wet or muddy conditions may need to be less.



Gradeability Will Be Reduced In Wet, Muddy, Oily Conditions

- It is recommended a winch is used whenever machine is loaded using ramps. Use a two legged chain attached to lashing points to secure the winch hook to machine.

Crane - except 9 Tonne

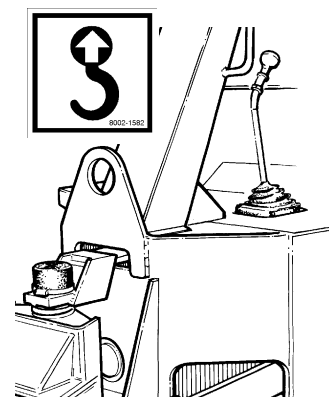
- A single lifting point is provided for lifting the complete machine. The position of this point will ensure a safe stable lift of the machine in working condition using standard lifting gear.

Other Methods of Lifting Are Not Recommended

- If using a crane or lifting device the rope, chain, strap etc. should be of sufficient strength to support the machine safely and be free from damage. See *Technical Data* section for machine weights.



No Lifting Point On 9 Tonne Dumper



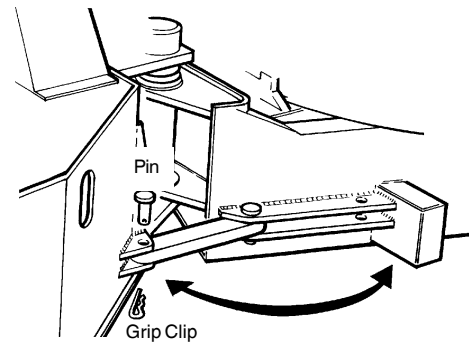
- Before lifting the dumper ensure that the vehicle is positioned in the straight ahead position, i.e. front and rear chassis are in line.

To prevent both chassis halves swinging relative to each other the articulation lock must be used.

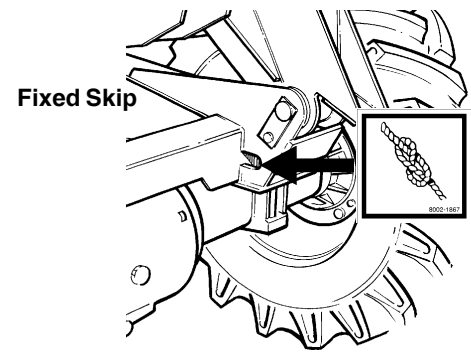
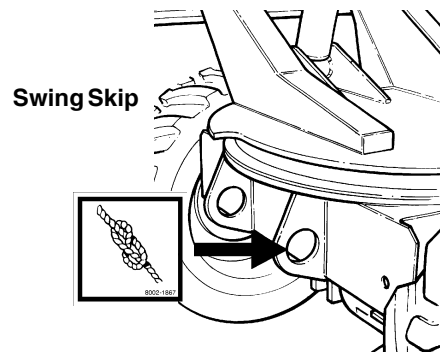
To fit the lock remove the grip clip and pin from the front storage position. Pivot the locking bar around until the holes in the bar are in line with the holes in the rear chassis locking bracket.

Fit the pin through the holes and secure with the grip pin.

- Secure the dumper to the lorry chassis using chains, straps or ropes of sufficient strength attached to the machines front lashing points and the rear towing hitch.



Towing - Torque Converters Models



If towed, disconnect the top drive propshaft to prevent gearbox oil starvation. Failure to observe this instruction may cause extensive gearbox damage

Using Dumper as a Towing Vehicle

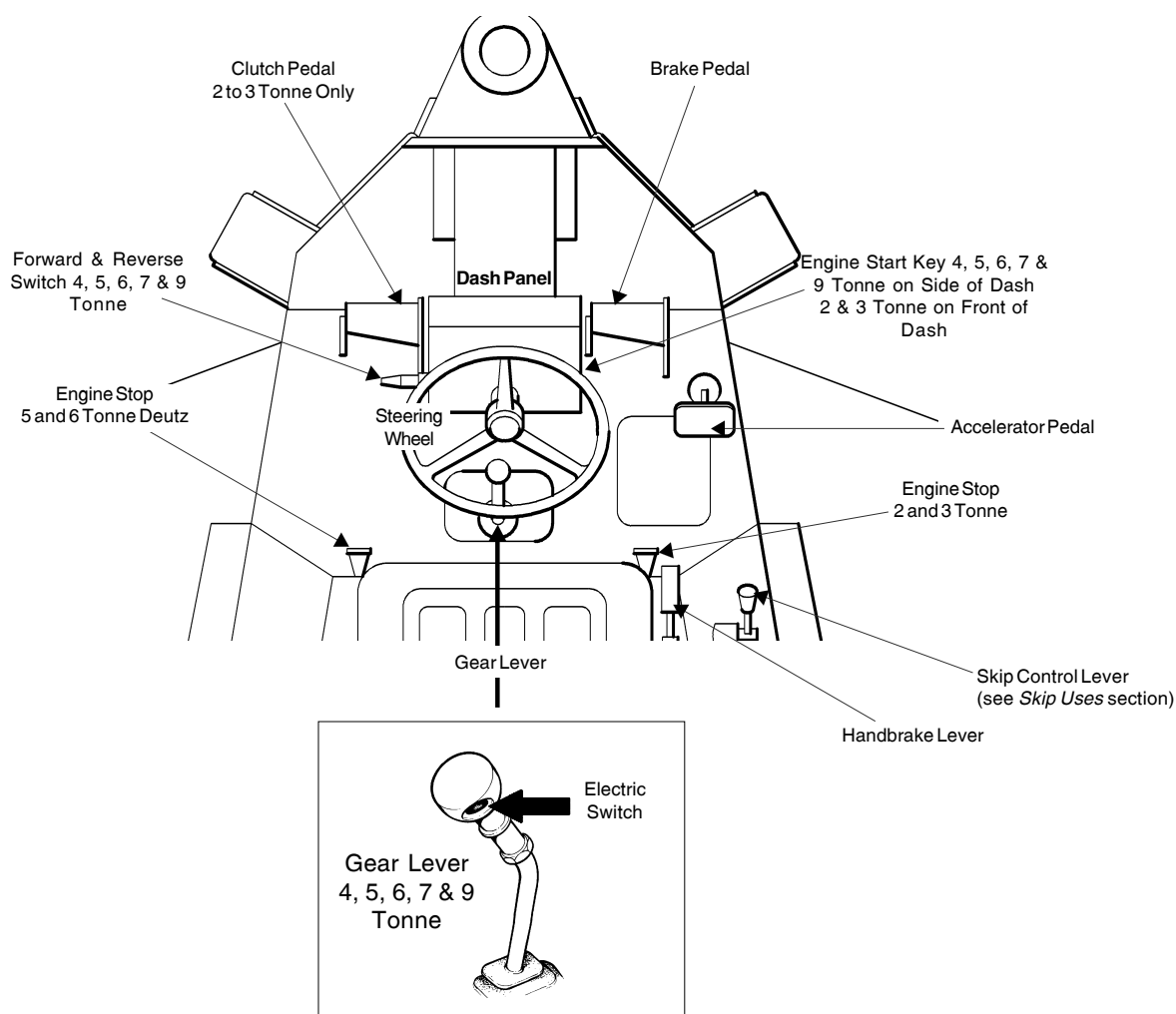
The dumper is not purpose designed as a towing vehicle, but if so used always make sure the weight of any trailer and its load does not exceed half the rated payload of the dumper. It is important that if used as a towing medium skip should be loaded with half the rated payload to provide adhesion when braking. Never tow down gradients as 'jack knifing' may occur and always tow in first gear on level ground.



Manufacturer Cannot be Held Responsible for Any Accident Resulting from the Use of this Dumper as a Towing Vehicle

Driving Controls

The range of dumpers have a common driving position and controls for all models up to 3 tonne capacity. The 4, 5, 6, 7 and 9 tonne capacity models have a shuttle torque converter transmission whereby an electric switch on the gearlever is used in place of a clutch pedal to enable gear changes to be made, and an electric forward/reverse selector is provided to give the machine a common range of speeds in forward and reverse.



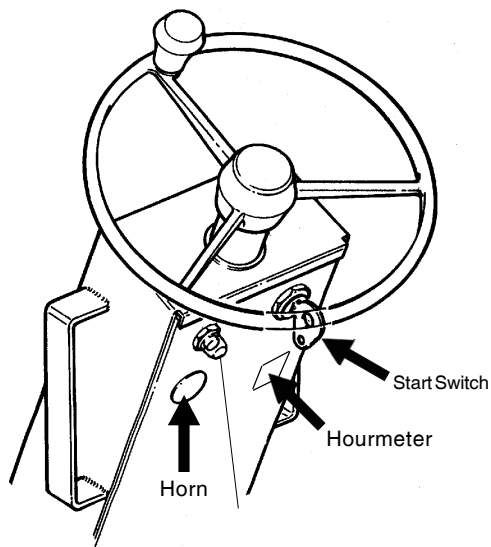
Description

The driver is centrally positioned with the gear lever immediately in front. The handbrake is located to his right on the seat support.

Clutch, footbrake and accelerator pedals are located in standard automotive format.

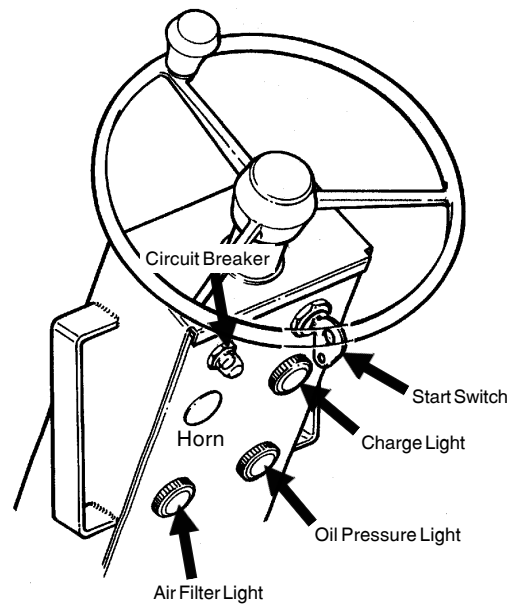
The tipping of the skip is controlled from the driving position by a lever operating the hydraulic control valve; which is located adjacent to the drivers right hand.

Steering Column Control Variations



No Lights

2 Tonne	Lister/Petter TS2
2 Tonne Swing	Lister/Petter TS2
3 Tonne	Lister/Petter TS3
3 Tonne Swing	Lister/Petter TS3

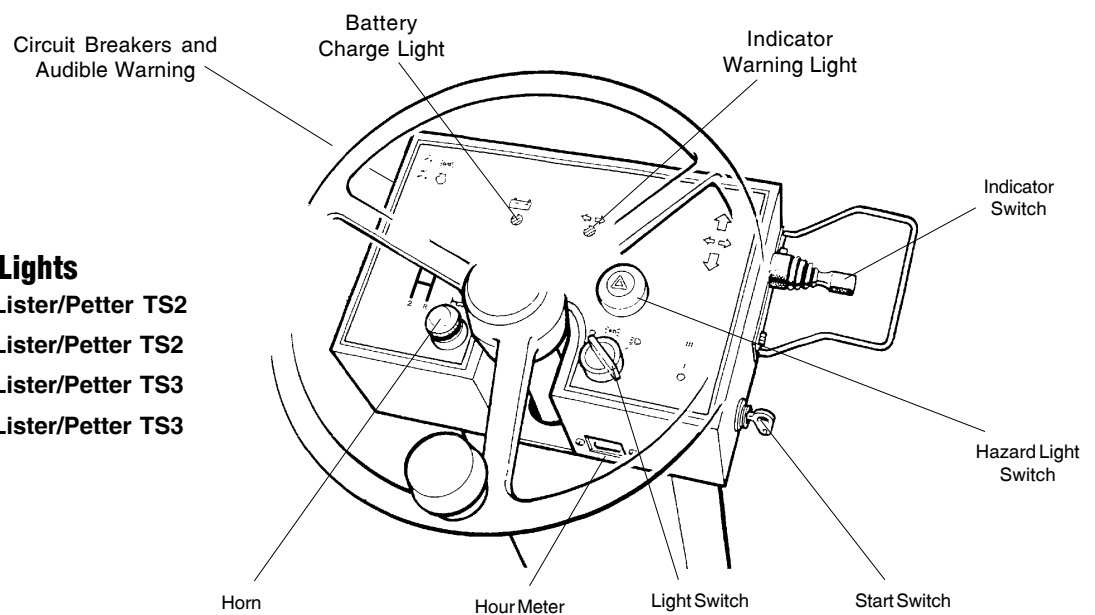


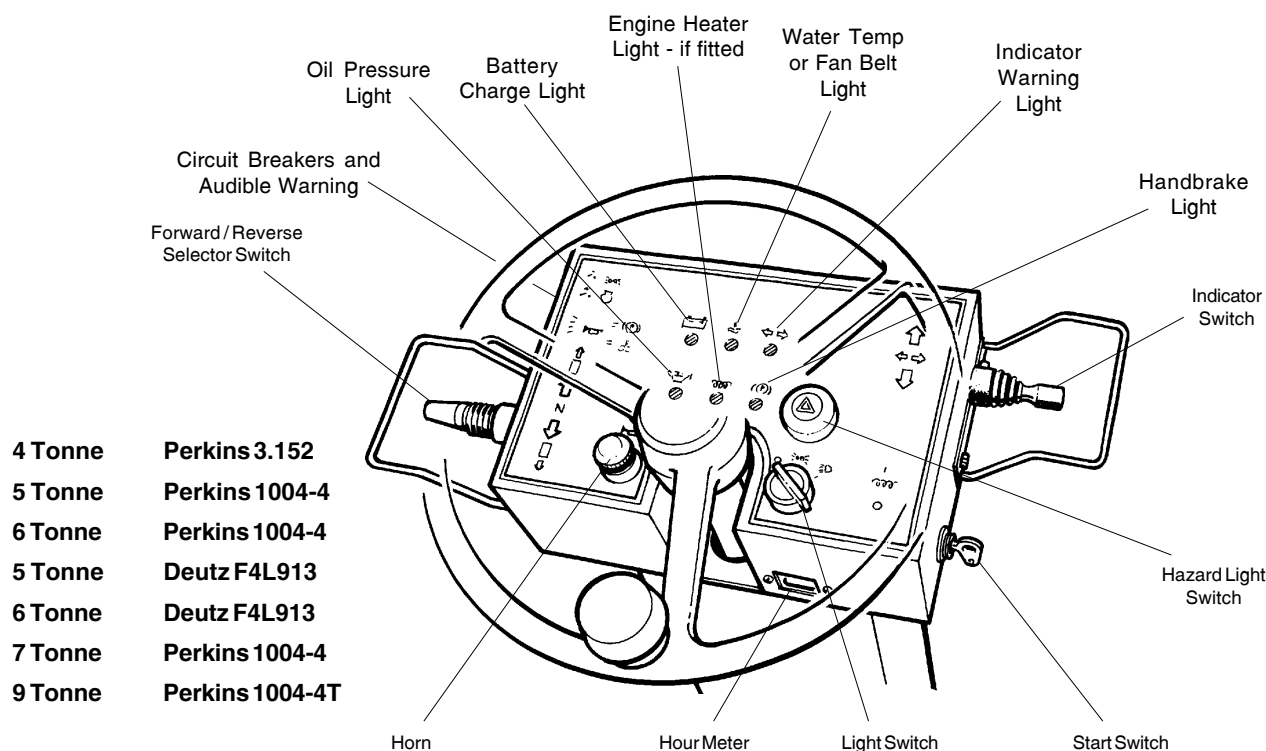
No Lights

2 Tonne	Hatz 2L31S
2 Tonne Swing	Hatz 2L31S
3 Tonne	Hatz 3L40S

With Lights

2 Tonne	Lister/Petter TS2
2 Tonne Swing	Lister/Petter TS2
3 Tonne	Lister/Petter TS3
3 Tonne Swing	Lister/Petter TS3





Circuit Breakers

In the event of a fault occurring, the circuit breaker will trip out, this being indicated by the button protruding out beyond its normal position. Should this occur, the reason for the overload must be found and the components at fault replaced or repaired. When the repair has been completed the circuit breaker should be reset by pressing the button until it locks in position thus restoring the electrical supply.

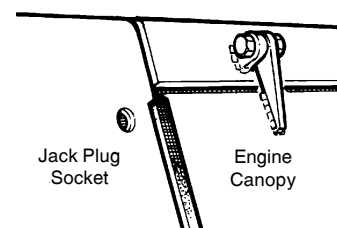
2 and 3 Tonne

On machines with full lighting, four extra circuit breakers are housed in the lighting control box. These four circuit breakers control the following circuits:

- | | | |
|----|-----|---|
| 1. | 20A | Flashing Beacon, Rear Fog, Rear Worklamps |
| 2. | 20A | Headlights |
| 3. | 10A | Sidelights |
| 4. | 10A | Indicators |

Jack Socket - if fitted

A jack socket is provided for powering a flashing beacon, if fitted, or accessories. It is located on the side of the rear panel.



Audible Warnings

On machines fitted with belt driven alternators, a continuous tone audible warning will sound when start switch is in the RUN position, but the engine is not running. This is fitted to warn the operator that he has left the start switch in the RUN position which will result in battery drain. To avoid the 4, 5 and 6 tonne dumper being driven with the handbrake still applied, a switch is built into the system which gives both audible warble sound and illuminated warning under these conditions. Where the engine is cooled by a 'V' belt driven blower, a switch is built into the system which senses a 'V' belt breakage and operates a warbler audible alarm.



Take immediate action to safely park the vehicle and stop the engine until a replacement 'V' belt is fitted. Running the engine without a 'V' belt will DESTROY IT

Seat Operating Instructions

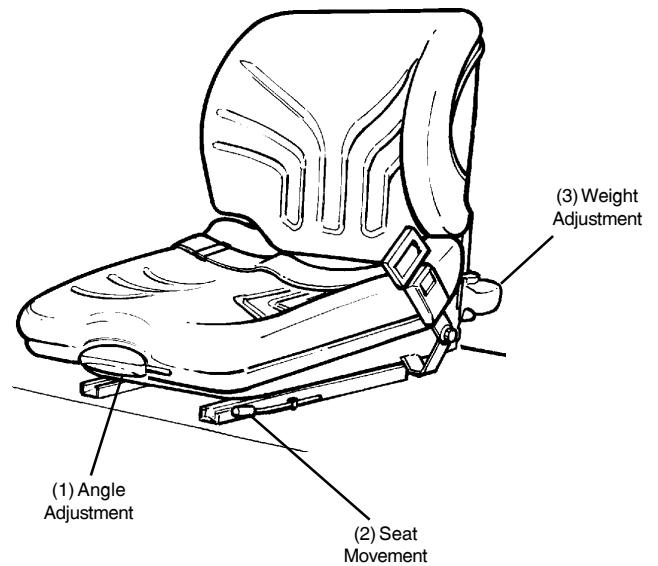
Angle Adjustment

The seat backrest is adjustable for angle, this is achieved by lifting the lever **(1)** at the front of the seat cushion and sliding the seat cushion forwards/backwards.

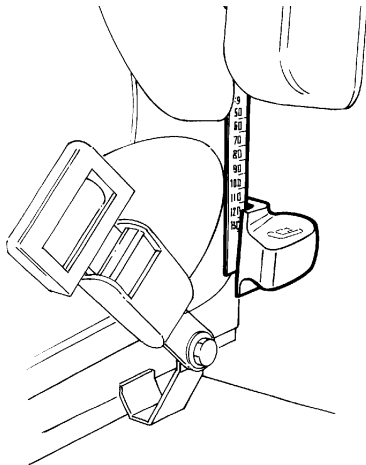
Release the lever and ensure the seat runners engage in one of the preset locking positions.

Seat Movement

On all machines the operator is able to adjust the seat in the fore-aft direction by lifting knob **(2)** and sliding seat to desired position, then releasing the knob to lock the seat into position.



Do Not Adjust Seat While Machine Is Moving



Weight Adjustment

The seat may be adjusted for drivers weight by sliding lever **(3)** downwards to the relevant weight position, as indicated by the scale on the side of the seat.

To return the lever to the top of the scale push the lever fully downwards to the bottom of the scale and then lift the lever to the top.

The seat MUST always be adjusted to suit the weight of EACH Operator. Incorrect weight adjustment may inhibit the operation of the seat switch fitted on 4, 5, 6, 7 and 9 tonne dumpers.



4, 5, 6, 7 and 9 Tonne Machines Will Not START Unless Operator is Sitting on the Seat

Start Inhibitors - 2 and 3 Tonne Machines

The operator must be correctly positioned on the drivers seat and the clutch pedal must be fully depressed to operate the start inhibitor switch, before the engine can be started

Start Inhibitors - 4, 5, 6, 7 and 9 Tonne Machines

- To help prevent accidents a safety system is controlled by a switch operated by the weight of the Operator on seat.
- The engine cannot be started unless the Operator is sitting on the seat



The Seat MUST Always be Adjusted to Suit the Weight of EACH Driver

Incorrect weight adjustment may inhibit starting of the engine due to the operation of the seat switch.

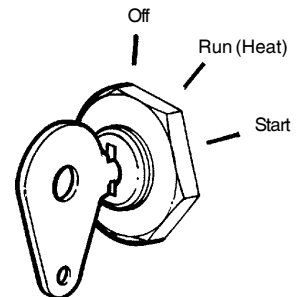
Starting the Engine



Do Not Use Starting Sprays to Assist Engine Starting

Before attempting to start the engine ensure :-

- There are no obvious faults with the machine.
- **The Operator is Sitting on the Operators Seat.**
- The gear lever or Forward/Reverse switch is in neutral.
- The Engine Stop knob is pushed fully in - if fitted.
- To start the engine turn the key-switch, located to the right of the steering wheel - 4, 5, 6, 7 and 9 tonne machines and on the front of dash for the 2 and 3 tonne machines, clockwise to the start position ensuring the key is released as soon as the engine is running.



Never Engage the Starter Motor Whilst the Engine is Running



- **On machines fitted with Perkins engines -**

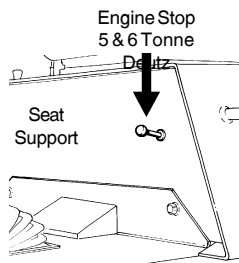
To start the engine turn the key switch clockwise to the RUN / HEAT position and hold for up to 10 seconds. Turn key switch to the START position ensuring the key is released as soon as the engine is running.

Do Not Crank the Engine for More than 10 Seconds

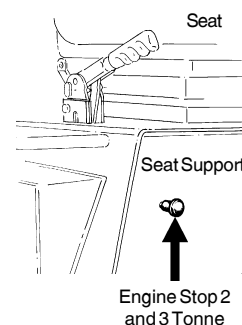
Audible Warning will be Heard If Start Switch is in RUN Position Without Engine Running

Stopping the Engine

- Before stopping the engine the machine must be on firm stable ground, the handbrake must be applied and the transmission should be in neutral.



- The engine is stopped in normal use by the Operator pulling the Engine Stop knob out and turning the start switch anticlockwise to the off position when the engine has stopped.



Perkins

- To stop the engine on machines fitted with Perkins engines simply turn the start switch to the OFF position.

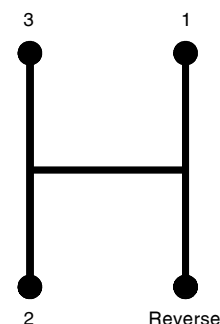
Do Not Allow Engine to Idle for Long Periods

Using Clutch and Gearbox

Constant Mesh Gearbox 2 and 3 Tonne Models Only

Moving Off

- Press down clutch pedal and move the gear lever into first gear.
- Press down accelerator pedal slightly to increase engine speed.
- Release pressure on clutch pedal by slowly lifting foot off pedal, at the same time release the handbrake, and also gradually increase the downward pressure on the accelerator pedal.



Double De-Clutching

The dumper will now be moving forward slowly and movement of the gearlever into the 2nd and 3rd gears should be made by double declutching, a procedure which is described below.

Changing Up

- Accelerate so that the engine runs slightly faster than idling speed.
- Press clutch pedal down with left foot and at same time take the right foot off accelerator pedal.
- Move gear lever into neutral and release clutch pedal and pause for about one second.
- Press clutch pedal down and move gear lever into the next gear position.
- Release clutch pedal and at same time press accelerator pedal gently to increase engine speed.

Use the Same Procedure for Changing Into Any Successive Higher Gear

Changing Down

- Press clutch pedal down with left foot and at the same time take the right foot off the accelerator. Move gear lever into neutral.
- Lift foot off the clutch pedal and at the same time press down the accelerator pedal to build up and maintain increased engine speed.
- Whilst removing the foot from the accelerator, press down the clutch pedal and engage a lower gear as quickly as possible.
- Release the clutch pedal slowly and press down the accelerator pedal. Increase the speed as required.

Use the same procedure for changing down to any successive lower gear

Reversing 2 and 3 Tonne Machines Only

The dumper must be stationary before selecting reverse gear.

Press the clutch pedal down, and if changing from a forward gear pause in neutral before selecting reverse. Increase engine speed slightly whilst releasing the clutch and handbrake.



ALWAYS REVERSE SLOWLY AND LOOK BEHIND

Torque Converter & Shuttle Gearbox

4, 5, 6, 7 and 9 Tonne Models Only

These models are fitted with a Spicer Compact powershift reversing shuttle with an integral 4 speed synchronised transmission and a Borg Warner Torque Converter.

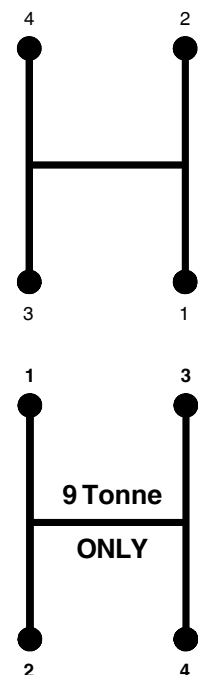
The procedure for driving the vehicle is as follows:-

- Select forward/reverse using the Direction Switch.
- Depress the electric control button on the gearlever and hold whilst moving into first gear.
- Release the button and gearlever.
- Release the handbrake.
- Press down the accelerator pedal slowly and drive will be progressively taken up through the torque converter and the dumper will move off.

Changing gear, up or down the range, is effected by depressing the electric control button on the gearlever and moving gearlever into a higher or lower gear position.



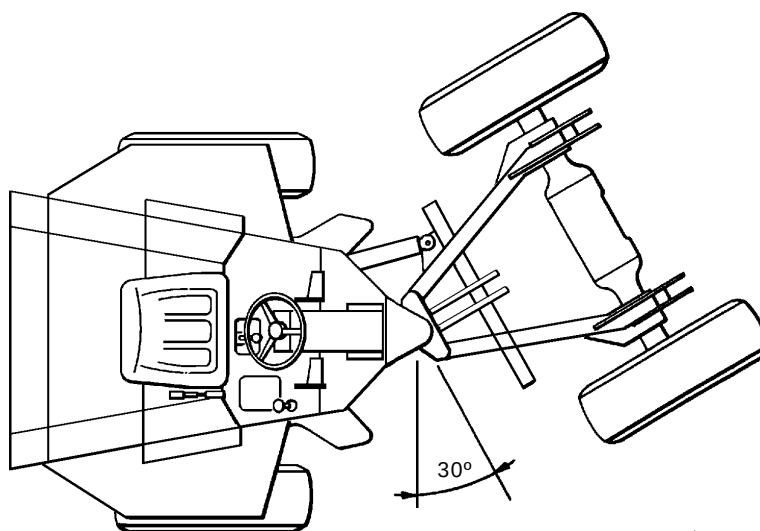
Due to the 'SOFT' shift incorporated on the transmission it is possible to switch between forward and reverse motion without braking, but care should be taken to ensure this operation can be conducted with safety



Steering

The dumpers have a chassis which incorporates a design known as centre pivot articulated steering. The chassis is in two parts, a front and a rear section which are joined together in the middle by a vertical pivot pin and a link which between them provides movement in the horizontal and lateral planes.

This combined movement allows the front frame to be moved relative to the rear frame, by means of a single double acting ram to provide steering.



The link in the system enables the front and rear frames to articulate relative to each other and thus provide the ability to maintain maximum adhesion with the ground at all times.

The steering referred to above (i.e. a hydraulic ram connecting the frames) is controlled through the steering wheel acting on an 'Orbitrol' hydrostatic steering unit.

Hydraulic power is supplied via an engine driven pump to the steering unit, which on turning the steering wheel meters oil to the steering ram and thus provides movement in either direction of the vehicle.

In the event of a hydraulic failure the vehicle can still be steered. Under these circumstances steering loads are high and the dumper should only be driven at slow speeds.



The articulating frames can create a trap when steered into a full lock position, transfers are located in this area to warn of the danger

Stopping the Dumper

Manual Gearbox

- Remove foot from the accelerator pedal.
- Depress the clutch pedal and apply the footbrake.
- When the dumper has stopped apply the handbrake and move the gearlever into the neutral position.
- Release the clutch pedal.

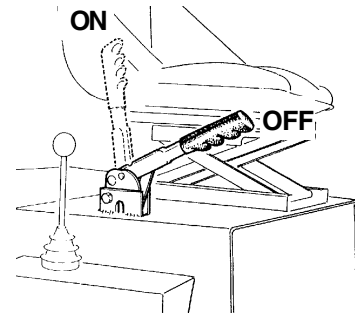
Torque Converter Transmission

- Remove the foot from the accelerator pedal.
- Apply the footbrake.
- When the vehicle has stopped apply the handbrake.
- Move the gear lever into the neutral position.

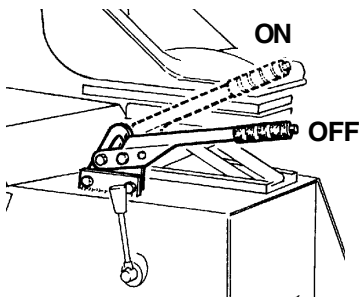
Parking Brake

Models 2 to 3 Tonne

These dumpers have a parking brake system which is integral with the front axle and is operated by an over centre handbrake, located to the right of the drivers seat.



Models 4, 5, 6, 7 and 9 Tonne



These dumpers have a separate parking brake system comprising a transmission disc brake interposed between the gearbox and transfer box, which is operated by a ratchet handbrake, located to the right of the drivers seat.

Skip Uses



Never Elevate Dumper Skips Unless the Dumper Is On Level Ground

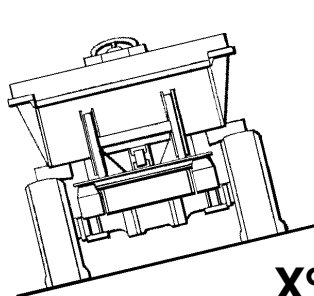
The dumper vehicle is basically a load carrier and can be used for a multitude of building/contracting site functions, but essentially it is used for carrying materials from excavations or demolitions and commonly carrying materials to general building activities. The carrying of soil, sand, gravel, debris, bricks etc. requires that the materials can be placed accurately at the place point and in some cases without damage to the materials themselves.

It is for this reason that the load carrying skip is power lifted and lowered by means of double acting hydraulic cylinder(s) mounted between the front chassis and the underside of the skip which is (are) controlled from the drivers seat by a double acting hydraulic control valve. The power for the system is provided by an engine driven hydraulic pump and the circuit is described in detail in the *Hydraulic System* section.

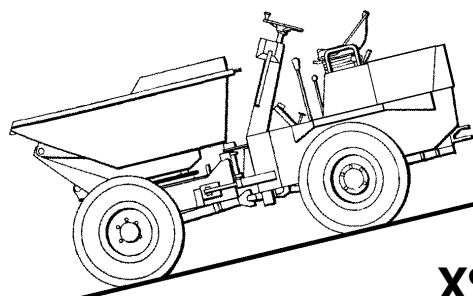
The skip in the lowered or loading position is located such that the driver has a good view ahead, therefore when loading the skip get off the machine and do not allow the load to be heaped in such a fashion as to impair the drivers view.



Do Not Use the Raised Skip as a Bulldozer Blade



X%



X%

2 to 7 Tonne X = 25%

9 Tonne X = 19.5%



Do Not Drive on Land Which May Cause the Dumper to Exceed the Safe Limits Shown Above

Swing Only

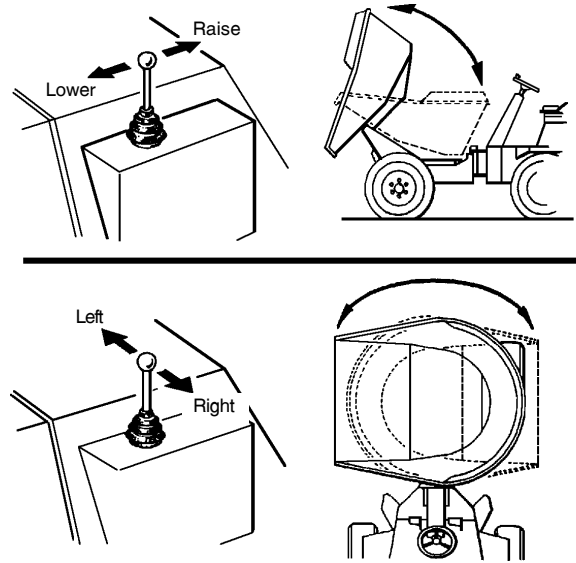


This special purpose skip enables the load to be discharged through a range of 180° about the fore and aft axis of the dumper. This feature is particularly useful for side tipping into trenches, but because of this feature it is important that only free flowing materials are used.

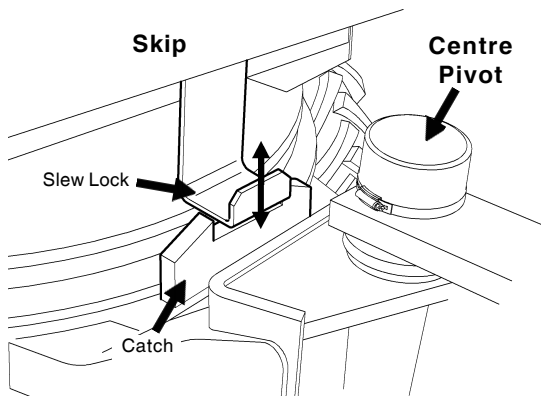
Only Use Swing Skip For Free Flowing Materials

Swing Skip Elevation and Slewing

- Elevation of the skip is by means of a single double acting ram.
- The slewing action is controlled by a dual axis control valve - move the lever forwards and backwards to lower or raise the skip, and sideways to slew skip left or right.



Anti Slew Skip Lock

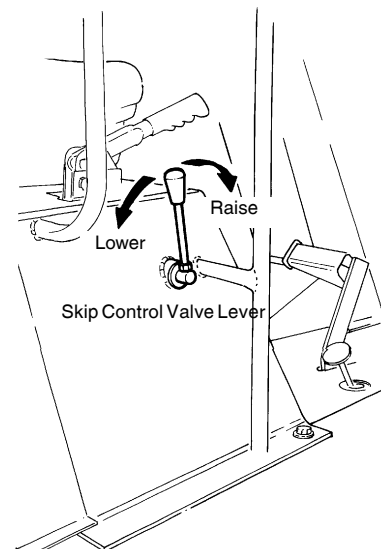


- A locking device is used to locate the skip in the straight ahead position when the skip is fully lowered. Before slewing to the left or right, raise the skip slightly to clear the catch.
- To lock the skip in the straight ahead position, elevate the skip until the skip slew lock clears the catch then rotate the skip until the slew lock is directly above the catch and lower the skip.

Straight Skip Elevation

The control lever will return to the neutral position automatically if released.

- To tip skip, move control valve lever forwards.
- To lower the skip, move control valve lever backwards.



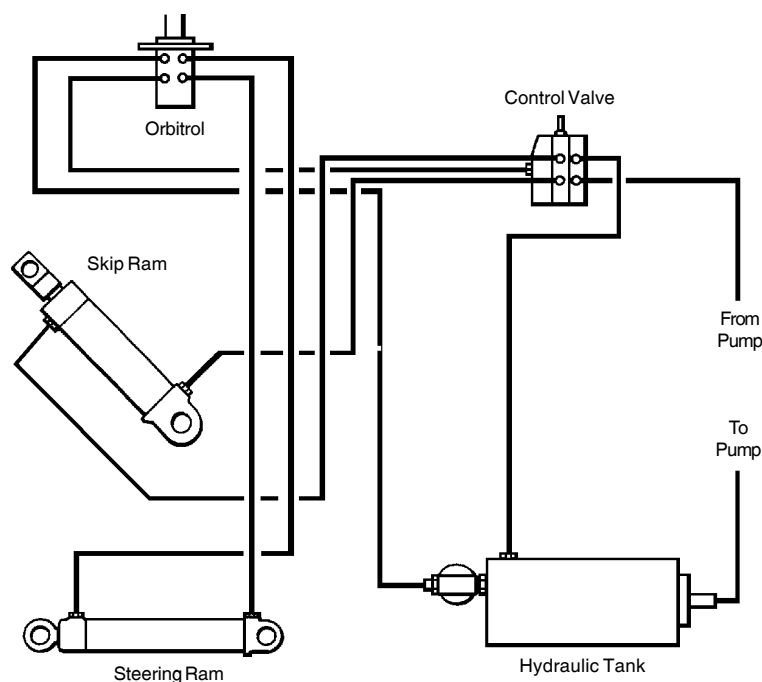
How the Hydraulics Function

The hydraulic system provides power to operate the vehicle steering and to power the skip elevation.

All dumpers other than the turntable models have a similar hydraulic circuit layout (see circuit diagrams) and all the components other than the skip ram, steering ram and the hydraulic pump are common.

In the case of the turntable dumpers, additional rams are required to slew the skip to the left or right positions.

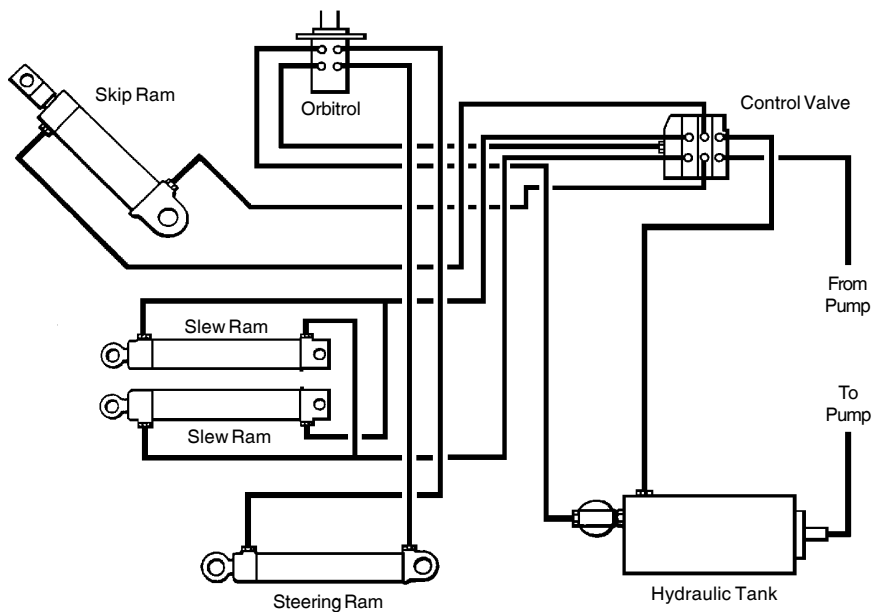
2 to 4 Tonne Hydraulic Circuit



The system comprises an engine driven hydraulic pump drawing oil from a tank located inside the chassis. The tank is fitted with a suction strainer, an oil level gauge, and a filler/breather cap. The pump generates a maximum pressure of 150 bar (2200psi) on the standard skip dumpers and 170 bar (2500psi) on the turntable skip dumpers. The system is protected by a relief valve in the control valve which is set at the same pressure. A return line filter is fitted to the circuit and is of the replaceable cartridge type.

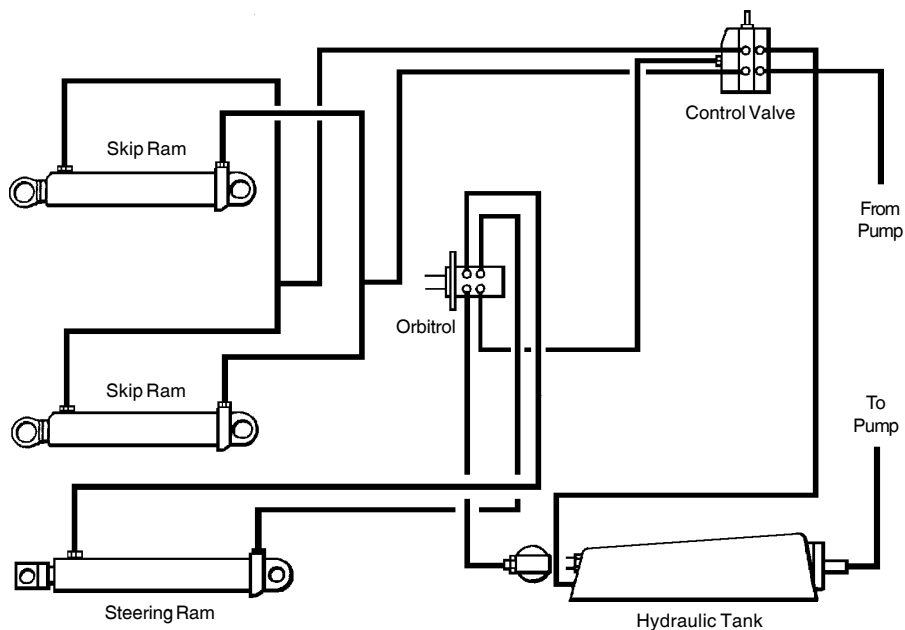
Steering of the dumper is by means of a single hydraulic ram connecting the front and rear frames, the oil supply to the ram is controlled by an Orbitrol hydrostatic steering unit. The unit receives oil via a carry over port in the 3 way control valve and meters oil to the steering ram as the steering wheel is turned, at all times.

2 to 6 Tonne Swing Hydraulic Circuit



The control valve, operated by a lever adjacent to the drivers seat, controls the lifting, lowering and slewing of the dumper skip. The skip can be elevated at varying speeds dependent on engine speed, and it can be stopped at any intermediate point for discharging of partial loads.

5, 6, 7 and 9 Tonne Straight Hydraulic Circuit



ROPS - 9000 Only

Only Lower ROP's / FOP's when Transporting Dumper on a Lorry / Trailer

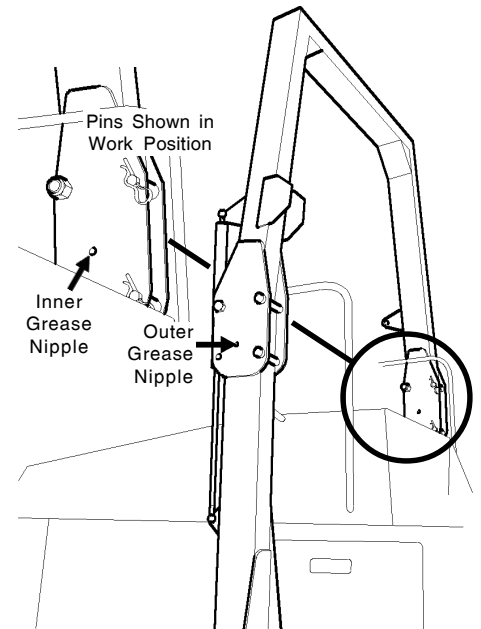
The ROP's on the 9000 dumper is pivoted at seat level to allow the ROP's to be lowered to reduce the transportation height - **not the working height.**

A gas strut is fitted to the ROP's to assist the Operator when lifting the ROP's into its working position or lowering it into its travelling position.

Machine fitted with with a FOP's have TWO gas struts fitted, one either side.

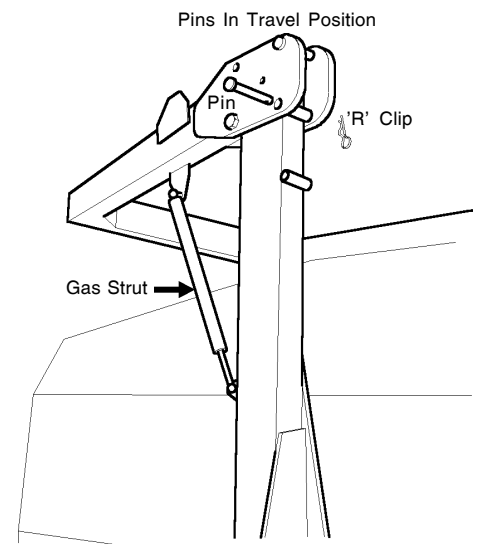
Work Position

- Remove the four 'R' clips from the locking pins, two either side, and remove the pins.
- Lift the ROP's into the vertical, working position and secure by fitting the four pins as shown.
- Secure the pins in position using the 'R' clips.



Travelling Position

- Remove the four 'R' clips from the locking pins, two either side, and remove the pins.
- Lower the ROP's into the travelling position and secure by fitting the four pins as shown.
- Secure the pins in position using the 'R' clips.



Maintenance

- Check the securing pins are free from damage and are serviceable.
- Regularly grease the four mating, pivoting surfaces of the ROP's using the four grease nipples provided in the upper frames pivot plates.

2000 to 9000

Four Wheel Drive Dumpers

Including

**2000, 3000, 4000,
5000 and 6000 Swing**

Maintenance Section

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For Your Safety

If the Machine Develops a Fault

- Park the machine in a safe area, if possible
- Remove the Start Switch Key
- Attach a warning tag to the machine
- Contact a qualified person to rectify the fault
- Do not place hands, arm etc. in any area where there is a hydraulic leak while the hydraulic system is pressurised

The Repair Area

- The repair area should be level, clean, dry and have adequate light and ventilation
- Keep the floor clean, wipe up spilt oil and grease
- Always use the correct tool for the job and ensure tools are kept in good condition
- Jacks, hoists, lifting chains and ropes should be checked before using. Do they have sufficient lifting capacity?
- Do not attempt to lift heavy objects on your own

When Repairing

- Prop an elevated skip
- Always wear eye protection
- Always wear ear protectors when grinding or working in a noisy environment
- Always wear goggles or a face mask when grinding or drilling
- Always wear the correct goggles or protector when welding or burning
- Release any pressure in the hydraulic circuit before carrying out hydraulic system repairs etc.
- Always block the wheels before carrying out any repairs
- If the machine is suspended or lifted always support the machine on adequate blocks
- Always remove the start switch key to stop accidental starting
- Never work with the engine running unless absolutely necessary
- Never start the engine unless the area is well ventilated
- Always exercise extreme caution when welding, grinding or burning, against fire risk. Ensure adequate fire extinguishers are available
- Never smoke or leave the engine running when refuelling
- Always use Genuine Benford Spare Parts
- Always test the machine thoroughly before putting it back to work

Observing these points will not make the repair of the machine safe but combined with the skill and knowledge of a trained fitter they will certainly help

Battery



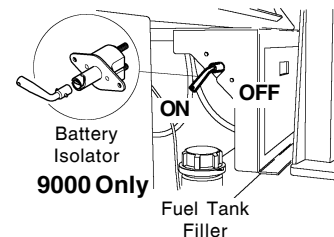
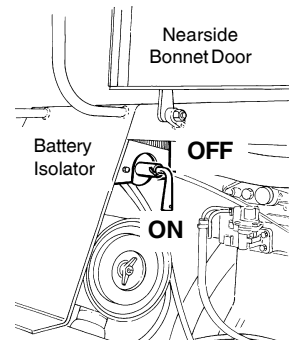
Before Attempting Any Major Maintenance Disconnect Battery

Battery Isolator

The Battery Isolator must always be used when carrying out service/maintenance work which would be dangerous if the engine was to be started or the machine electric system were to be activated.

When major maintenance work is being carried out the battery must be disconnected.

The battery isolator lever is removable when in the OFF position and may be used as an anti-vandal device when the machine is left for periods of time.



Use Isolator for Emergency Battery Isolation

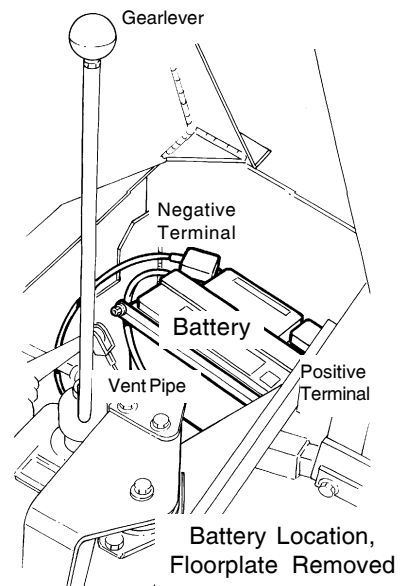
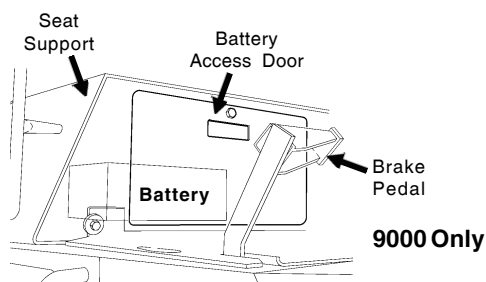
Battery Maintenance



Disconnect Negative Battery Lead Connection First



- Always wear safety glasses when working on the battery.
- Always disconnect Negative (-) battery lead before disconnecting the Positive (+) battery lead.
- Always connect the Positive (+) battery lead first when reconnecting the battery and ensure the battery vent pipe is correctly fitted.
- Never allow metal objects to touch both battery terminals at same time or allow metal objects to touch Positive (+) terminal and frame.
- When charging the battery hydrogen gas is produced. Ensure the area is well ventilated to prevent the risk of explosion from a build up of hydrogen.
- Do not smoke, weld, cut, grind etc. in vicinity of a battery being charged.
- If the skin is exposed to battery electrolyte it must be washed immediately with running water.
- If the eyes are exposed to battery electrolyte wash eyes with running water and obtain immediate professional medical attention.



Gel Batteries - 9000 Dumper Only



BATTERY



*The Special Battery Supplied with a 9000 Dumper Must **NEVER** be Replaced with a Conventional Lead / Acid Battery for Safety Reasons*

Battery Maintenance

The machine is fitted with a special battery which should never be replaced with a conventional lead / acid battery.

Maintenance Free

- The battery is a completely sealed system which does not contain any free electrolyte.
- The battery electrolyte is all contained in thin microporous glass separators between the lead plates.
- The hydrogen and oxygen which form within the battery are automatically turned into water.
- You never need to top up the cells with water.
- Corrosion does not need to be cleaned off, because none forms on the terminals.

Safety

The design of the battery, with its electrolyte absorbed in microporous glass, makes it an extremely safe battery. It can be placed at all sorts of odd angles, even upside down, without any risk of leakage.

The risk of overcharging it is small, because the battery tolerates a wide variation in charge voltage and current. If, in spite of everything, it should happen to be incorrectly charged, its self-sealing safety valves would come into play and prevent an explosion.

The tough and robust design can withstand some very rough treatment. Even if the battery is damaged no electrolyte will leak out.

Care and Maintenance

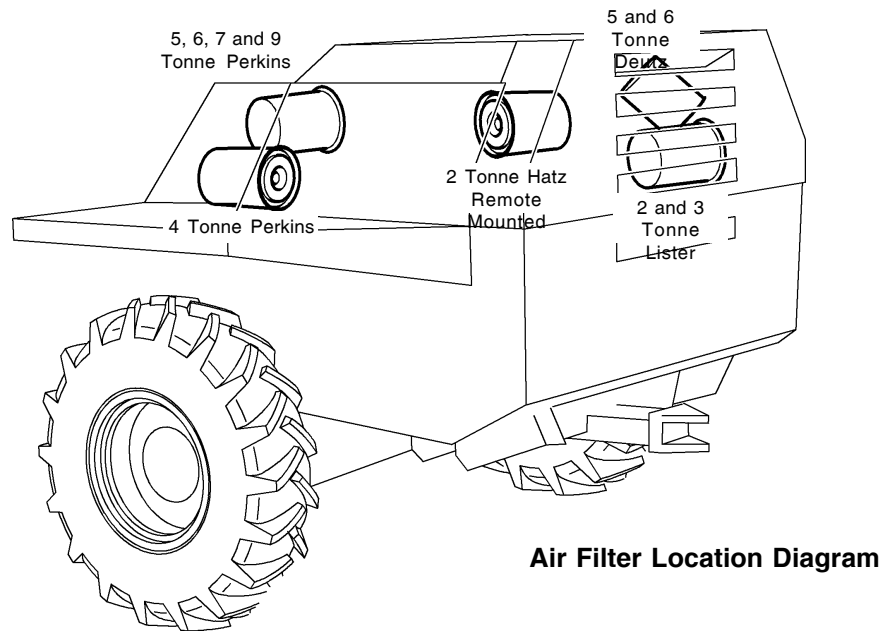
Before carrying out any service or maintenance work ensure that all safety precautions have been taken, for example:

The Engine

See manufacturers handbook supplied with this vehicle.

Always follow instructions given in engine manufacturers handbook for servicing, and particularly when starting or stopping the engine.

Engine Air Cleaner Servicing



Daily

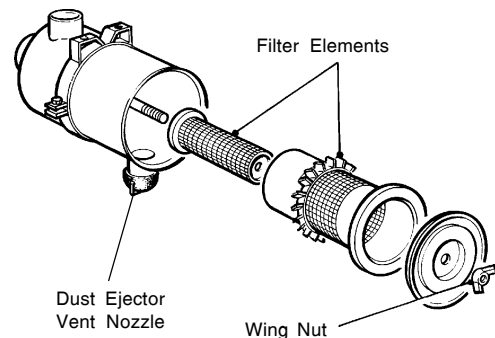
- Squeeze the dust ejector vent nozzle to remove dust build up in the air cleaner case.

Servicing

- To service air cleaner first clean its surrounding area and then loosen clamp holding the sediment cup to air cleaner.
- Remove the cup and clean it out. Remove the wing nut holding the filter element and extract the filter.
- Renew, or clean the element by carefully using compressed air to blow dust out of the filter.
- Reassemble by reversing the above procedure.

Maximum engine protection against dust is possible only if the air cleaner is serviced at regular intervals. No hard and fast rules apply to the regularity of servicing because operating conditions vary so much.

The only way to determine if an air cleaner requires cleaning or replacing is to physically check it.

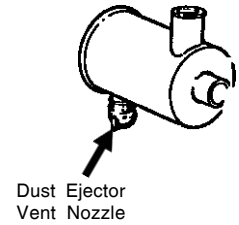


If In Doubt - Check Air Cleaner Frequently

Cleaning Air Filter

On the underside of the air cleaner casing is the dust ejector vent nozzle. Squeeze this rubber nozzle to remove dust build up in the air cleaner case. **Failure to do this will mean the air filter element will clog very quickly.**

The air cleaner elements should be cleaned by blowing gently with an airline or tapping gently against a firm object.



Site Conditions Will Dictate Frequency of Element Replacement

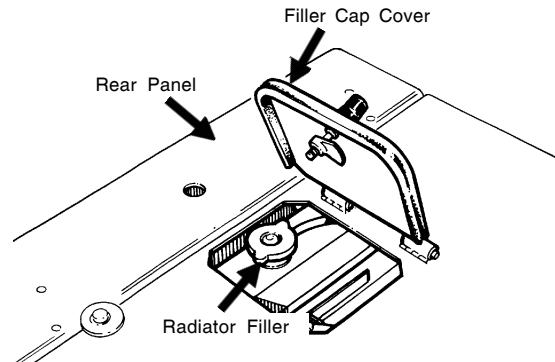
Checking Coolant Level - Perkins Only

To Prevent Scalding Do NOT Remove Radiator Filler Cap when Engine is Hot!

- When the engine is cold open the radiator filler cap cover and undo the radiator cap.
- If the coolant level is more than 20 to 25mm from the bottom of the filler neck add coolant.

Draining Cooling System

- **Ensure the engine is cold** and undo the radiator cap cover.
- Undo the hose clip on the bottom radiator hose and pull the hose off the radiator.
- Remove the radiator cap and allow the coolant to drain into a suitable container.
- Refit the bottom hose and tighten the clip.



Refilling Cooling System

- **Ensure the engine is cold.**
- Add coolant to the radiator until the coolant level is just below the filler neck, allow time for the coolant to settle adding coolant as required.
- Start the engine and allow it to reach its operating temperature. When the water is hot in the radiator header tank and all trapped air has been expelled, stop the engine, allow to cool, and top up the coolant level.
- Replace the radiator cap and lock the radiator cap cover in position.
- Start the engine and allow it to run for 5 to 10 minutes.
- Allow the engine to cool down and recheck coolant level. Top up coolant as required.
- **The coolant level should be 20 to 25mm below the bottom of the radiator filler neck.**



See *Technical Specification* Section for Anti-Freeze Details

Cleaning



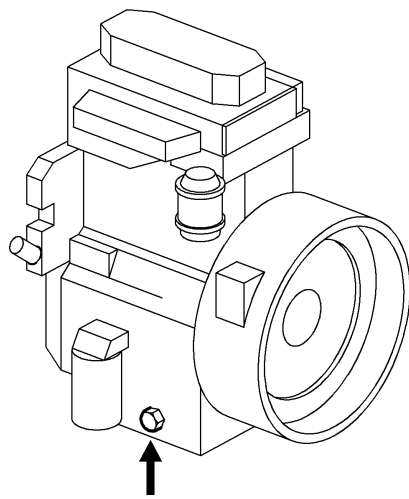
Avoid Spraying Electrical Equipment with Pressure Washers

- Clean the dumper thoroughly, this will make it easier to find oil leaks and loose fittings etc.
- Take care to clean the oil, fuel and water tank filler necks.
- Drain plugs should also be cleaned.
- Using water or a pressure washer to wash down the exterior of the dumper with or without detergent is generally all that is required.
- When cleaning the dumper it is preferable to use a biodegradable cleaner. Do not use solvents or like products which can damage rubber and plastics.

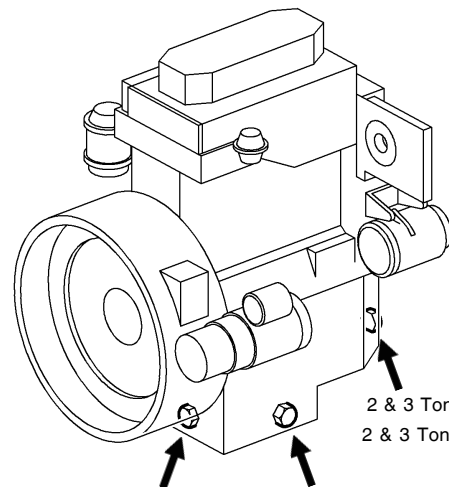


Contaminated Water / Fluids / Oils Must Be Disposed of Safely

Draining and Refilling Engine Oil



5 & 6 Tonne Deutz
5, 6, 7 and 9 Tonne Perkins
2 & 3 Tonne Lister



4 Tonne Perkins
2 & 3 Tonne Hatz
5, 6, 7 & 9 Tonne Perkins



Ensure Engine Oil is Warm but NOT HOT!

- Ensure engine oil is warm but not hot. This will allow the old oil to drain quicker and more thoroughly.
- Place a suitable receptacle under the engine drain plug. See diagram above for drain plug location.
- Unscrew the drain plug and allow the old engine oil to drain completely.
- Thoroughly wash the drain plug and renew the washer - if fitted. Refit the drain plug.
- The engine oil filter **MUST** be changed when the engine oil is renewed. See *Engine Manufacturers* handbook.
- Add the correct grade and quantity of engine oil to the engine. See *Engine Manufacturers* handbook. **DO NOT OVERFILL.**
- Start the engine and check for leaks.
- Stop engine, leave for a few minutes and recheck engine oil level. Top up as required. **DO NOT OVERFILL.**

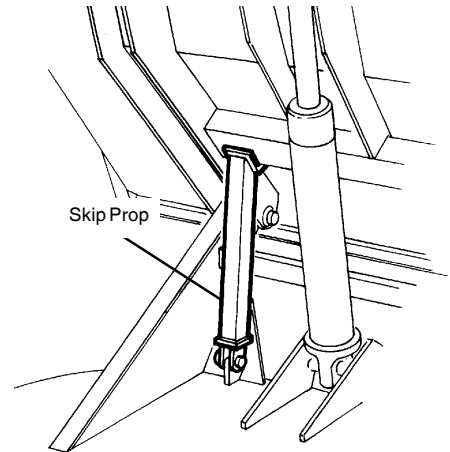


The Dumper **MUST** be On Firm Level Ground When Checking / Changing Oils

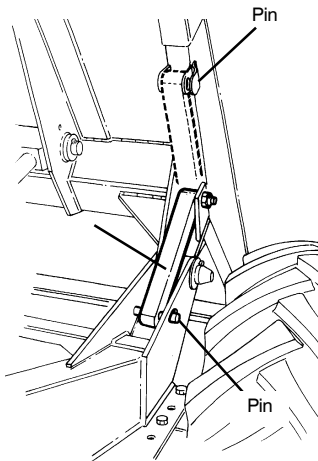
Skip Prop Instructions

Swing Skip

- Elevate the skip fully and lift the skip prop into its upright position
- Lower the skip until the skip prop supports the skip



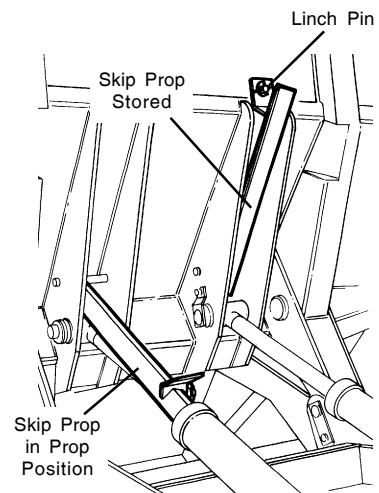
2, 3 and 4 Tonne Straight Skip



- Elevate the skip fully and remove the grip clip from the pin securing the prop in its storage position
- Remove the pin and lower the prop until the hole in the prop and chassis are aligned
- Push the pin through the holes and secure with the grip pin
- Lower the skip until the skip prop supports the skip
- When replacing the prop in its storage position ensure the pin is fitted from the outside to prevent it fouling on the front chassis

5, 6, 7 and 9 Tonne Straight Skip

- Elevate skip fully and remove the lynch pins securing the props in their storage position
- Lower both props gently onto the extended rams
- Lower skip until skip props support the skip

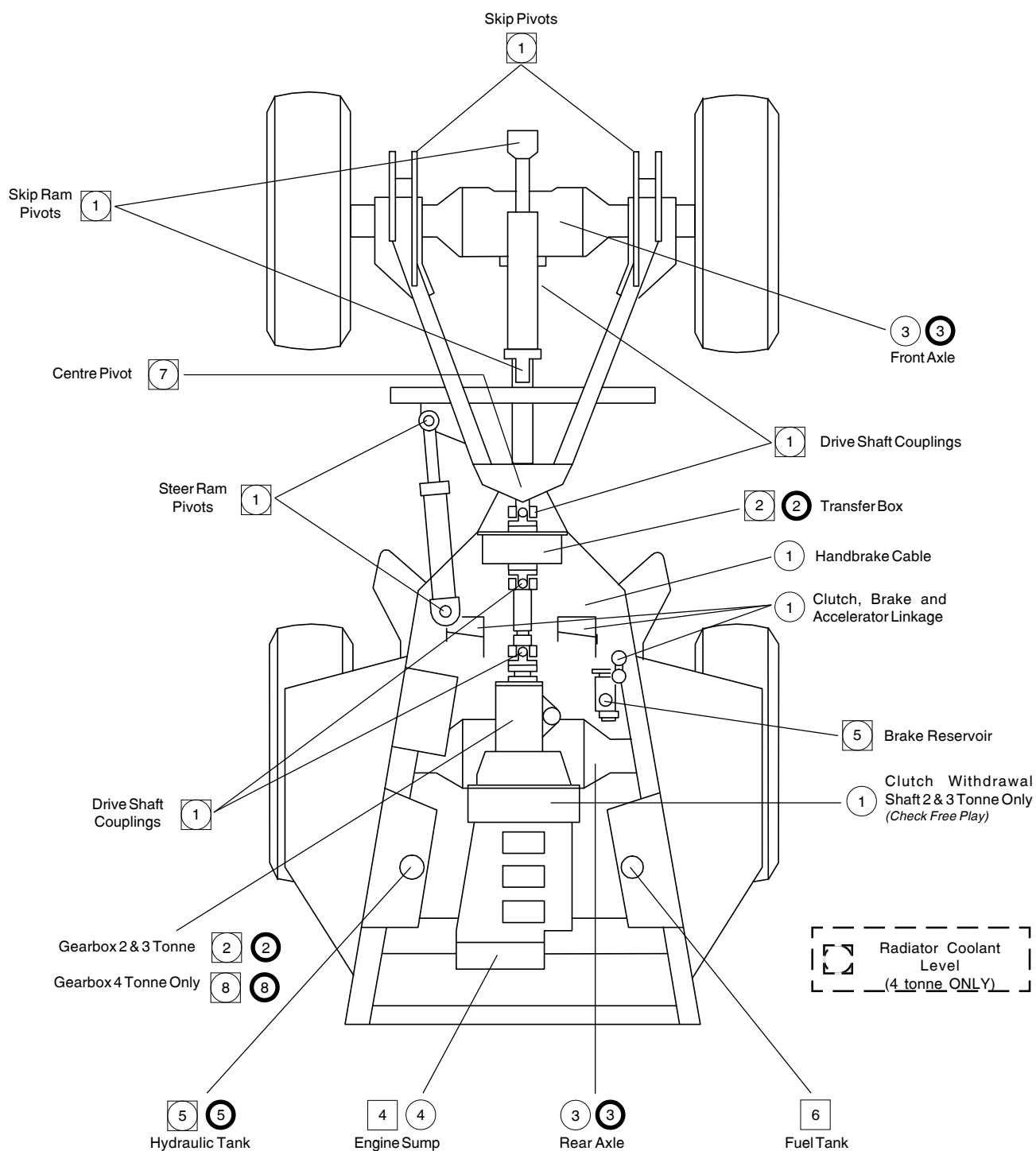


Service Schedule

DAILY	Fill fuel tank (NEVER allow tank to run dry). Check engine oil - top up if required. Squeeze vent nozzle on cyclone type air cleaner or in very dusty conditions service as 'WEEKLY' below.
WEEKLY	IMPORTANT - Lubricate centre pivot (use only grease specified). Check hydraulic oil level. Check gearbox and transfer box oil levels, top up if necessary. Lubricate points as shown on the lubrication chart. Oil all control pivots, ram pivots and links. Check radiator coolant level. Check brake reservoir level. Remove end cap on cyclone type air cleaner and inspect element, clean or replace as necessary. Check wheel nut tightness (see Technical Data section for torque figures).
MONTHLY	Drain engine and refill with fresh oil. Renew and/or clean air cleaner element depending on the operating conditions. Check alternator belt. (if fitted). Lubricate points as shown on the lubrication chart. Check tightness of centre pivot pin lock screws Check oil levels on front and rear axles, top up where required. Check and replace transfers as necessary.
SIX MONTHLY	Drain gearbox and transfer box - refill with fresh oil. Change hydraulic oil and filters. Drain front and rear axles - refill with fresh oil. Check battery electrolyte level. To be 5mm above plates

The above, suggested service schedules, are for guidance only. Under extreme operating conditions service schedules should be adjusted to allow for local working environment

Lubrication Points and Lubricants 2, 3 and 4 Tonne Straight



1 Multi-Purpose Grease

2 SAE 85W/90

3 Mobilfluid 422 or Texaco AS Trans.

4 SAE 10W/30

5 ISO VG32

6 Diesel

7 Texaco Multifac EP2 Grease

8 Texomatic C3

Daily

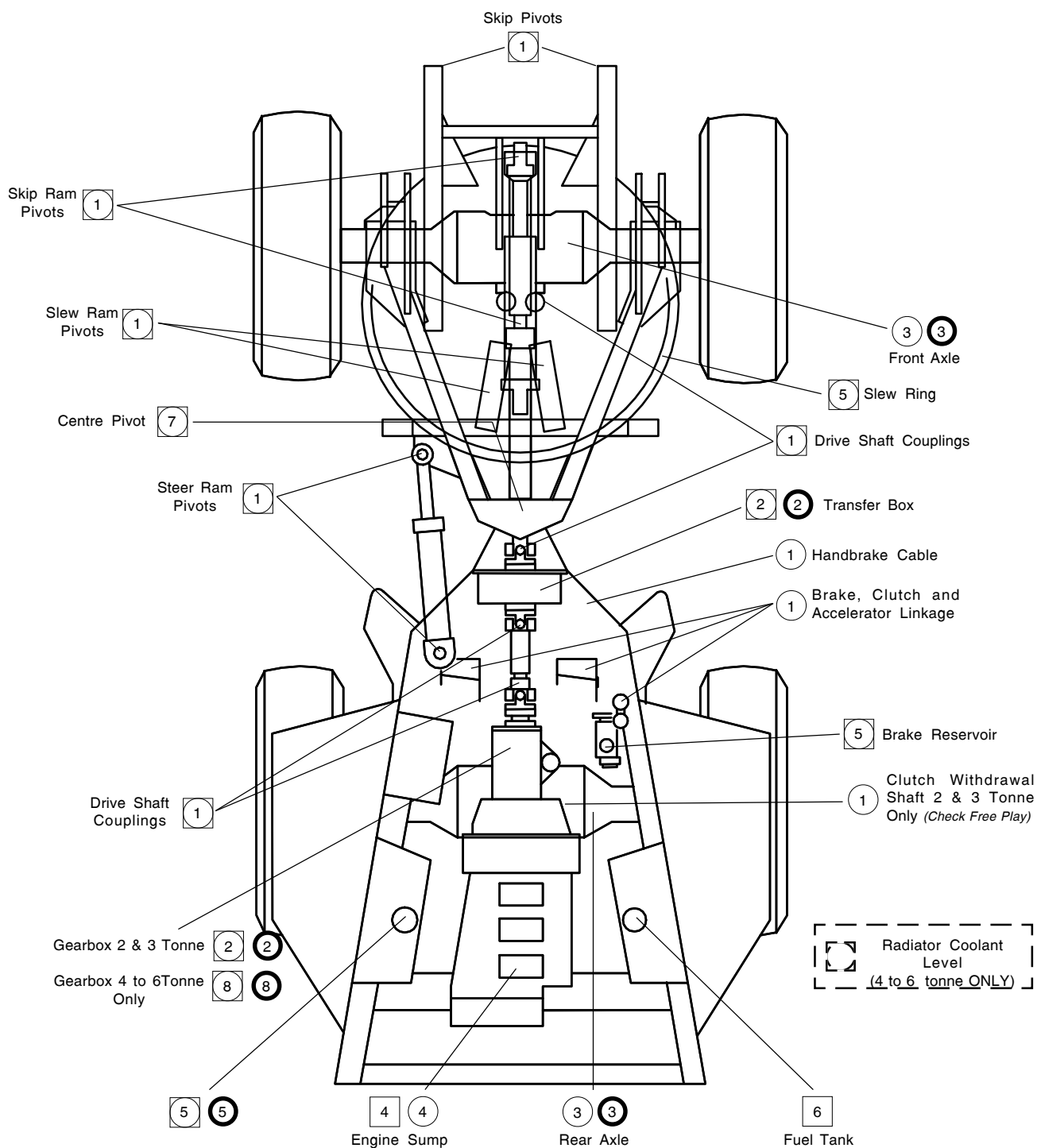
Weekly

Monthly

Six Monthly

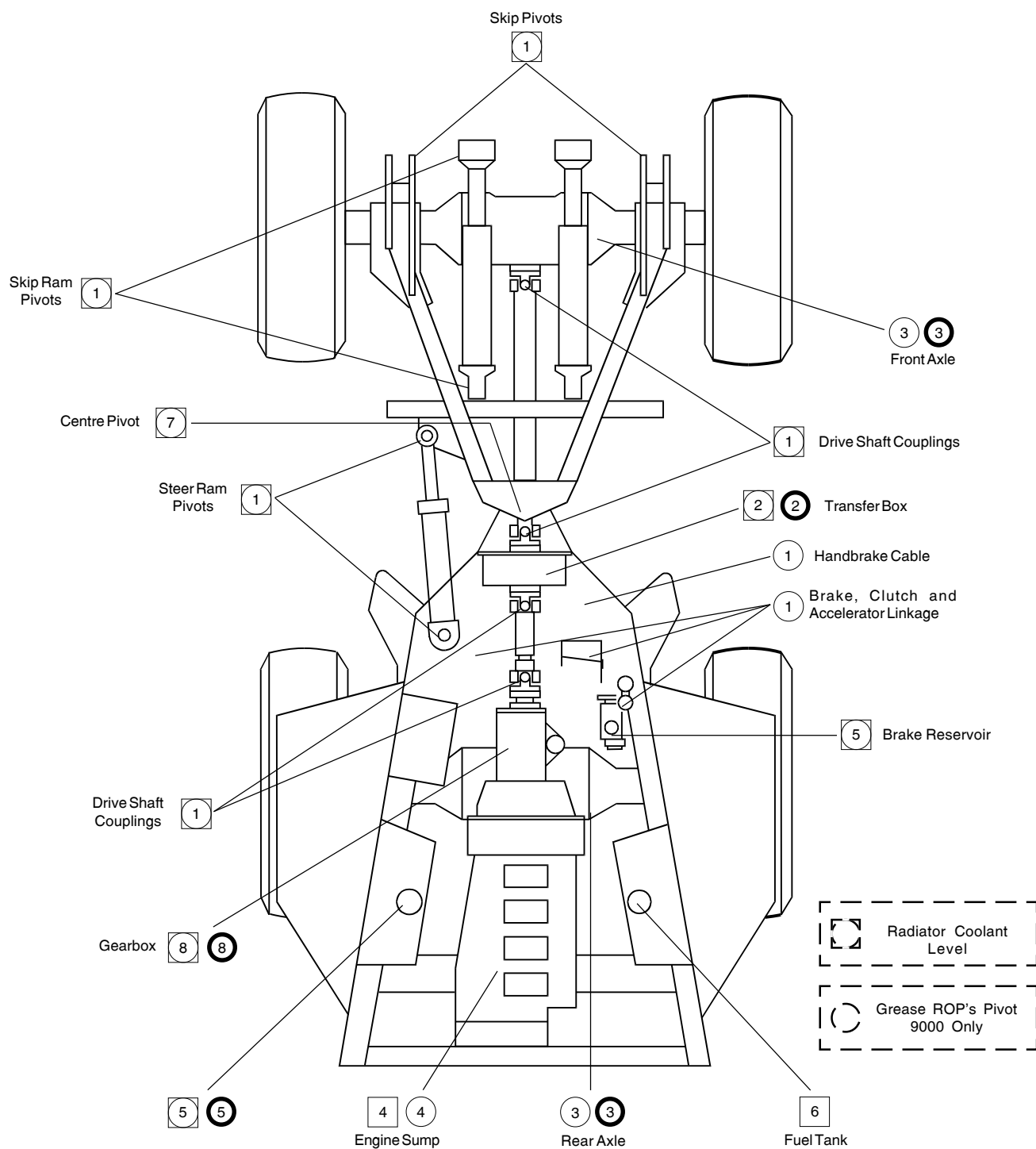


Lubrication Points and Lubricants 2, 3, 4, 5 and 6 Tonne Swing



1 Multi-Purpose Grease	5 ISO VG32	Daily	☐
2 SAE 85W/90	6 Diesel	Weekly	☐
3 Mobilfluid 422 or Texaco AS Trans.	7 Texaco Multifac EP2 Grease	Monthly	☐
4 SAE 10W/30 - 2 & 3 Tonne	8 Texomatic C3	Six Monthly	☒
..... SAE 15W/40 - 4, 5 & 6 Tonne			

Lubrication Points and Lubricants 5, 6, 7 and 9 Tonne Straight



1 Multi-Purpose Grease

2 SAE 85W/90

3 Mobilfluid 422 or Texaco AS Trans. - 8 Stud

4 15W/40 API CC/SE 5, 6 & 7

..... SAE 15W/40 API CD/SE 7000PT / 9000

5 ISO VG32

6 Diesel

7 Texaco Multifac EP2 Grease

8 Texomatic C3

Daily

Weekly

Monthly

Six Monthly



Brakes

Arrangements



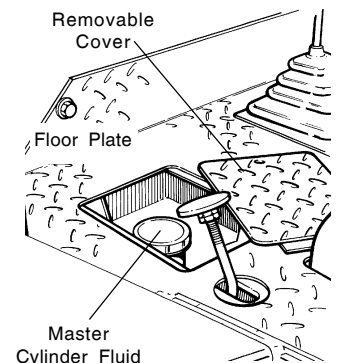
Models 2 - 4 tonne have NEWAGE axles with oil immersed totally enclosed multi-plate brakes (4 plate front and 2 plate rear). Some models have braking on front axle only, see *Technical Data* section, others have brakes on both front and rear axles operating on independent hydraulic circuits giving dual circuit safety. 5, 6 and 7 tonne models have Newage axles and dual brake circuits with 2 plates front and rear. The 9 tonne model uses the PD70 ITL axles with dual brake circuits and 3 plates.

The brake system is charged with mineral oil, **NOT BRAKE FLUID**, via a fluid reservoir which is integral with the brake master cylinder. In the case of a single braked axle the master cylinder is of the single type whereas on the 2 braked axle system a tandem master cylinder is used to provide 2 completely independent circuits.

Normally adjustment of the brakes is unnecessary due to the automatic compensation which is built into the brake design, but bleeding of the system may be necessary on occasions if pipework is damaged causing system leakage.



Under NO circumstances allow conventional BRAKE FLUID to be added to the system and NEVER purge the system and refill with brake fluid, otherwise damage will occur to all the rubber sealing components in the brake system



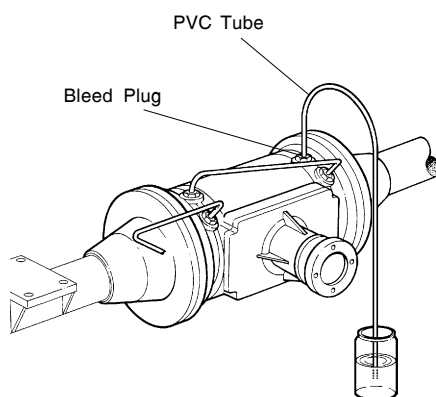
Brake Bleeding

To bleed braking system ensure only mineral hydraulic oil is used.

Procedure

- Remove master cylinder floor plate cover, 2 to 4 tonne, and the reservoir cap. The reservoir is located under the seat support on the 5, 6, 7 and 9 tonne. Ensure the reservoir is full.
- Remove dust cap from bleeder plug of the slave cylinders.
- Attach a length of 8mm (5/16") internal diameter, clear P.V.C. tubing to bleed valve. Place the other end of the tube into a jar containing hydraulic oil ensuring that the end of the tube is below the level of the oil.
- In the case of tandem master cylinders, always bleed the rear axle brakes first.
- Slacken off bleed valve on the axle then proceed to pressurise the system by pressing down the brake pedal repeatedly - as far as it will go - until all air is expelled from the system.

Top Up the Fluid Reservoir as Bleeding Proceeds



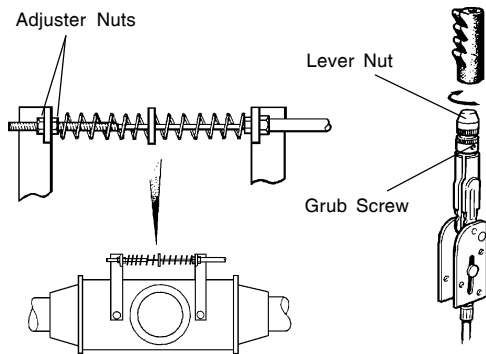
- With brake pedal pressed down, tighten bleed valve, then release the pedal. Remove tubing. Do not forget to replace dust cap.
- If the other axle has been serviced repeat the above sequence.
- Test system by applying maximum load to brake pedal for two or three minutes to ensure that there are no leaks in the system.
- Check fluid level in reservoir.
- Road test the dumper. Re-check brake system for leaks or damage.

Parking Brake - 2 and 3 Tonne (Including Swing Models)

The parking brake facility is incorporated into the brakes of the front axle and is self compensating.

Adjustment

The parking brake lever fitted is of the over centre type, and if incorrectly adjusted can place excessive load onto the brake cable.



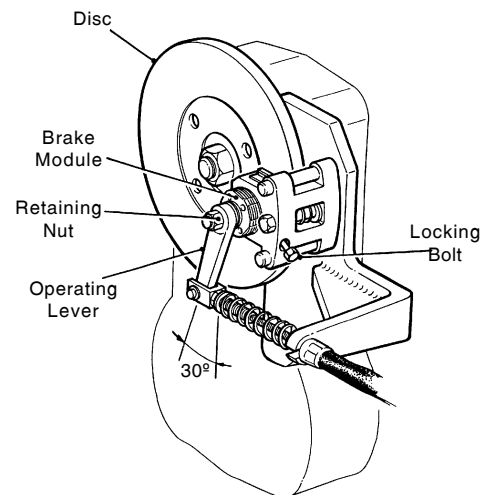
- If the cable requires adjustment remove the plastic hand grip and slacken the locking grub screw.
- Turn the hand lever nut in a clockwise direction until the correct adjustment is achieved. Retighten the grub screw and replace the plastic grip.
- If further handbrake cable adjustment is required use adjuster nuts on the front axle

Transmission Parking Brake - 4, 5, 6, 7 and 9 Tonne

The parking brake is mounted on the transmission between the gearbox and the transfer box, and can be accessed from the underside of the dumper. Wear can occur either by stretching of the handbrake cable, or wear on the disc pads themselves, and cause a reduction in efficiency.

Adjustment

- Slacken locking bolt and screw in brake module until linings contact disc.
- Back off module until flat lines up with locking bolt. Tighten locking bolt.
- Remove retaining nut from piston and position operating lever as shown.
- Refit nut and tighten securely.
- Reconnect brake cable.



The brakes on the range of machines provide means of effective braking with minimum maintenance, but it is vital during maintenance on the machine that the general condition of the system. i.e. pipework, pedal operation, fluid level and general oil tightness is checked and deficiencies corrected immediately

Failure to do so Could Result in an Accident



Front and Rear Axles

Totally enclosed sealed multi-plate brake axles are fitted, which have automatic compensation for wear of the friction discs. Normal servicing is limited to lubrication as detailed in the schedule in the *Maintenance* section, details of procedures for major repairs may be obtained from sections at the manual.

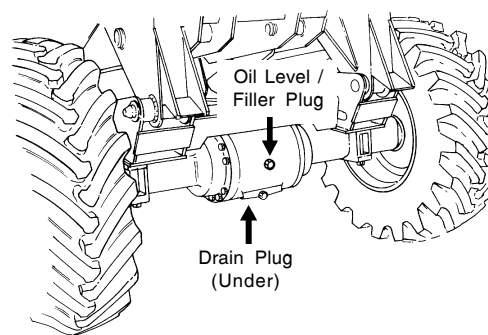
Over a period of time wear may necessitate replacement of the friction discs and/or the slave cylinder seals. These parts should be replaced as required and the system bled in accordance with the brake bleeding instructions in the *Brakes* section.

The Dumper MUST be On Firm Level Ground When Checking / Changing Oils

Checking Axle Oil Level



- Position the machine on level ground.
- Clean dirt from around oil level / filler plug.
- Remove the oil level / filler plug.
- The oil level should be level with the bottom of the oil level / filler plug hole.
- Add the specified oil, as required, until the oil begins to run out of oil level / filler plug hole. See *Lubrication Points and Lubricants* section for correct oil.
- Refit the filler plug.



Changing Axle Oil



- Ensure axle oil is warm - *Not Hot*, to facilitate draining. Position the machine on level ground.
- Clean dirt from around the drain plug and the oil level / filler plug.
- Place a suitable container of adequate size under the drain plug.
- Remove the oil level / filler plug and remove the drain plug. Allow the oil to drain.
- Refit the drain plug.
- Refill the axle through the filler hole until the oil in axle is level with the bottom of the filler plug hole. See *Lubrication Points and Lubricants* section for correct oil.
- Refit the filler plug.



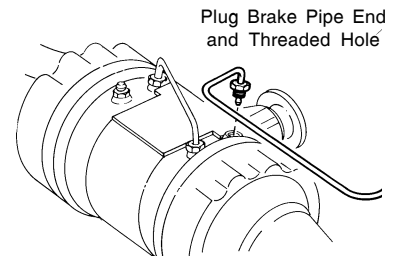
Contaminated Water / Fluids / Oils Must Be Disposed of Safely

Front Axle

Removal

- **Ensure the machine is positioned on firm, level ground and the handbrake is ON and the rear wheels are chocked.**
- Elevate the skip and **PROP**. Clean the area around the front axle and front frame.
- Loosen the front wheel nuts.
- Lift and support the front of the dumper so front wheels are just clear of the floor. Leave a 'trolley' jack positioned under the centre of the axle - this will be used to lower and pull the axle from under the dumper.
- Remove the front propshaft from the axle drive flange and lower the front of the propshaft on to the ground.

- Clamp the front flexible brake pipe at the centre pivot.
- Disconnect the brake pipe from the front axle and cap the open ends.
- Remove the handbrake cable from the axle.
- Loosen the eight nuts and bolts fixing the axle to the front frame and remove the two front wheels.
- Undo the eight nuts and bolts fixing the axle to the front frame and lower the axle on the trolley jack.
- Pull the axle from under the dumper.



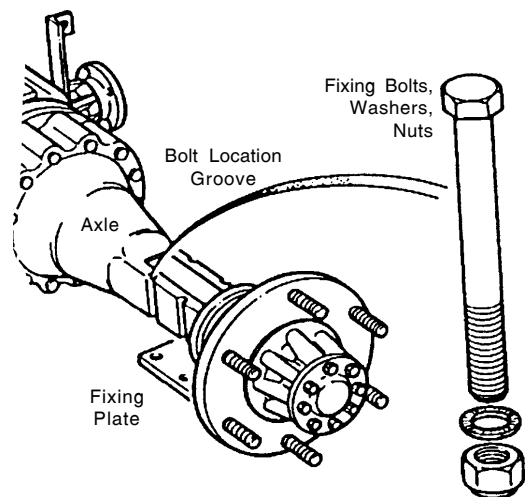
Under NO circumstances allow conventional BRAKE FLUID to be added to the system and NEVER purge the system and refill with brake fluid, otherwise damage will occur to all the rubber sealing components in the brake system

Refitting

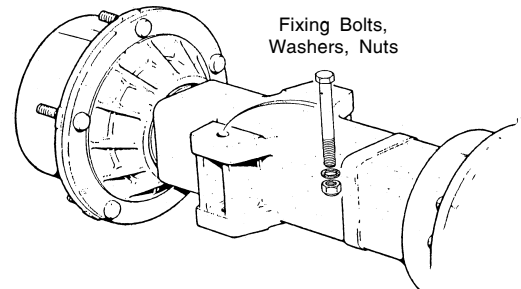
- Ensure the axle and axle mounting faces are clean.
- Push the axle into position under the front of the dumper using a 'trolley' jack.
- Lift the axle into position. Place new bolts through the frame mounting pads ensuring they fit into their respective grooves in the axle casing.

Place the bottom mounting plates into position on the bolts, fit new nuts and washers and tighten the nuts evenly until the axle is in its correct position, tight against the front frame.

- Refit the wheels - tighten the wheels nuts until wheels are firmly held. When the machine is lowered to the ground the wheel nuts must be torqued to the recommended torque - see *Torque Figures* section.
- Torque the axle mounting nuts to the correct torque - 216 Nm.
- Remove the plugs and refit the brake pipe, release the clamp on the flexible brake at the centre pivot.
- Refit the handbrake cable and adjust - see the *Brakes* section.
- Refit the propshaft.
- Lift the front of the dumper off the supports, remove the supports and lower the machine to the ground.
- Bleed the brakes - see the *Brakes* section.
- Torque the wheels nuts. See the *Torque Figures* section for the wheel nut torques.
- Lower the skip and check the machine is in working condition.



ITL Axle



Check Wheel Nut Torque Daily for 20 days After

Rear Axle

Removal

- Ensure the machine is positioned on firm, level ground and the handbrake is ON and the front wheels are chocked.
- Clean the area around the rear axle and frame. Loosen the rear wheel nuts.
- Lift and support the rear of the dumper so rear wheels are just clear of the floor. Leave a 'trolley' jack positioned under the centre of the axle - this will be used to lower and pull the axle from under the dumper.
- Remove the rear propshaft from the axle drive flange and lower the rear of the propshaft on to the ground.
- Disconnect the brake pipe from the rear axle and cap the open ends.
- Loosen the eight nuts and bolts fixing the axle to the front frame and remove the two rear wheels.
- Undo the eight nuts and bolts fixing the axle to the rear frame and lower the axle on the trolley jack. Pull the axle from under the dumper.



Under NO circumstances allow conventional BRAKE FLUID to be added to the system and NEVER purge the system and refill with brake fluid, otherwise damage will occur to all the rubber sealing components in the brake system

Refitting

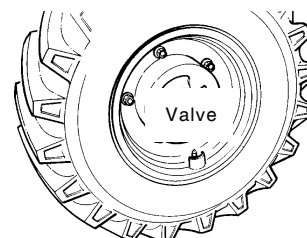
- Ensure the axle and axle mounting faces are clean. Push the axle into position under the rear of the dumper using a 'trolley' jack.
- Lift the axle into position. Place new bolts through the frame mounting pads. Fit new bolts, nuts and washers and tighten the nuts evenly until the axle is in its correct position, tight against the rear frame.
- Refit the wheels - tighten the wheels nuts until wheels are firmly held. When the machine is lowered to the ground the wheel nuts must be torqued to the recommended torque.
- Torque the axle mounting nuts to the correct torque - 216 Nm
- Remove the plugs and refit the brake pipe, release the clamp on the flexible brake at the centre pivot.
- Refit the propshaft.
- Lift the rear of the dumper off the supports, remove the supports and lower the machine to the ground.
- Bleed the brakes - see the *Brakes* section.
- See the *Wheel Torque* table in the *Technical Data* section for the wheel nut torques and torque the wheels nuts.
- Check the machine is in working condition.



Wheels and Tyres



Check the tyres regularly for damage by cuts and embedded particles, i.e. nails, steel, glass etc. and check / adjust the pressures weekly. See *Technical Data* section for tyre pressures



Lowering tyre pressures below the stated level can improve traction in difficult ground conditions, but the loads carried must be reduced pro-rata to avoid tyre wall damage

Gearbox

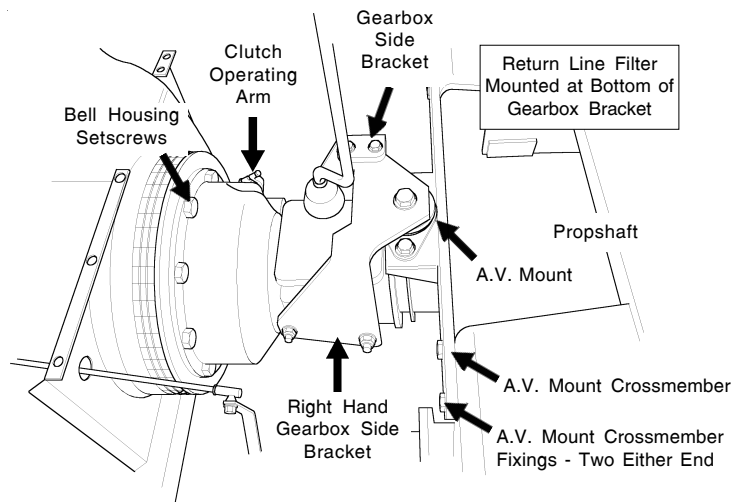
Due to the complexity of the Shuttle Gearbox only routine servicing tasks are described for this gearbox in this manual.

Removing Gearbox - Models 2 and 3 Tonne Straight and Swing Skips

Before removing the gearbox the machine must be cleaned and positioned on firm level ground. The wheels must also be chocked to prevent the machine moving.



CAUTION - Engine / Gearbox Assembly Uses a 3 Point Mounting Arrangement

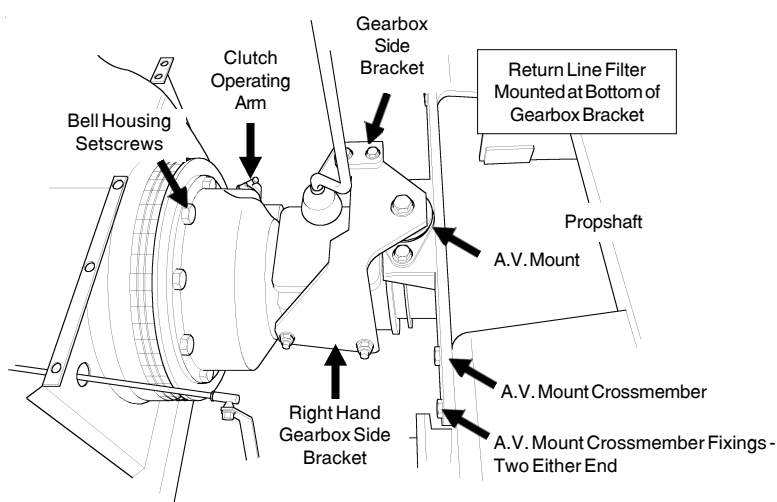


- Remove the complete floor plate.
- Remove the battery.
- Place a wooden wedge or similar between the engine bed plate and the front of the engine to support the engine when the gearbox is being removed.
- Remove the split and clevis pin from the clutch operating rod on the gearbox end.
- Undo and remove the two nuts and bolts, joining the two gearbox side brackets, located on the top of the gearbox.
- Undo the nuts fixing the gearbox side brackets to the gearbox.
- Remove the return line filter, complete with bracket, and allow it to hang safely out of the way. Remove the left hand gearbox bracket.
- Undo the four nuts and bolts fixing the anti-vibration mount crossmember to the rear frame and lift the crossmember, complete with the right hand gearbox side bracket, out of the frame.
- Remove propshaft nuts and bolts, from the gearbox end, and allow propshaft to hang from the transfer box.
- Place a suitable sling under the gearbox and attach to a lifting device. Take the weight of the gearbox / engine assembly on the lifting device.
- Remove the eight setscrews, fixing the gearbox to the engine, from around the bell housing. **Leave one of the two top setscrews until the gearbox is ready to be lifted out.**
- Remove the last bell housing setscrew and pull the gearbox away from the engine.
- When gearbox is free from the engine lift out of the frame, turn the gearbox through 90° when lifting to facilitate removal.

Refitting Gearbox

Before Refitting Gearbox Ensure ALL Worn and Damaged Components Have Been Replaced

- Clean inside bell housing and check for gearbox oil leaks. Also check the spigot bearing in the end of the crankshaft is free from damage and wear, replace as necessary.
- Lower the gearbox into the frame and enter the first motion shaft into the crankshaft spigot bearing.
- Ensure the gearbox is in gear and the gearbox is in line vertically and horizontally with the engine. When the splines of the first motion shaft are against the splines in the clutch plate turn the gearbox output flange to align the splines. When the splines are aligned push the gearbox fully into position.
- Turn the gearbox to align the bell housing and engine fixing holes, refit the eight setscrews around the bell housing and tighten. Refit the propshaft.



- Loosely refit the anti-vibration crossmember complete with the right hand gearbox bracket. Fit the left hand gearbox mount and return line filter bracket. refit the two nuts and bolts holding the gearbox side brackets together at the top of the gearbox.
- Take the weight of the gearbox / engine assembly and remove the piece of wood supporting the front of the engine.
- When all the fixings are in place, fully tighten the side bracket nuts, the two top nuts and bolts and the four nuts and bolts holding the anti-vibration crossmember.
- Remove the lifting sling.
- Replace the clutch operating rod. Adjust as necessary.
- Replace the battery and reconnect.
- Replace the floorplate.
- Road test the machine and rectify any problems.



Make Sure the Clutch Pedal Start Inhibitor is Working Correctly

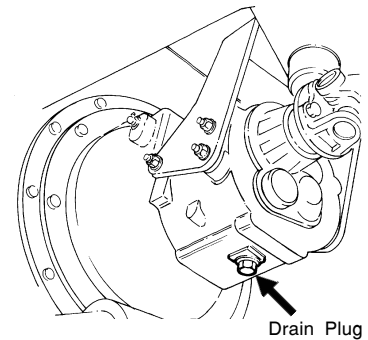
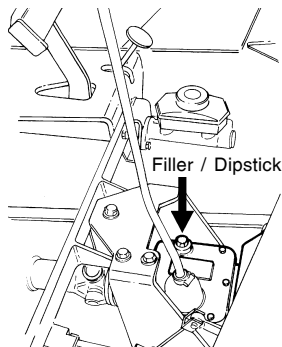
Gearbox and Transfer Box

Three types of gearbox are used on the range of machines plus a transfer box which has 2 varying ratios. The appropriate combination for each is as below. **NO** adjustments are necessary to any of these units, all that is required is adherence to the lubrication schedule in the *Maintenance* section.

Check All Oil Levels with Machine on Flat Ground

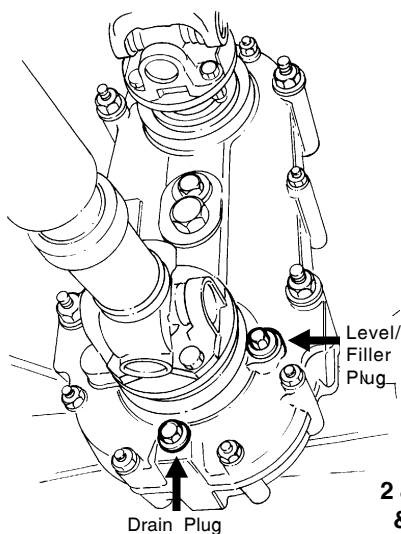
Newage Gearbox

- Ensure axle oil is warm - *Not Hot!*, to facilitate draining. Position the machine on level ground.
- Clean dirt from around drain plug and the filler/dipstick.
- Place a suitable container of adequate size under drain plug.
- Remove filler/dipstick and remove drain plug. Allow the oil to drain.
- Refit the drain plug.

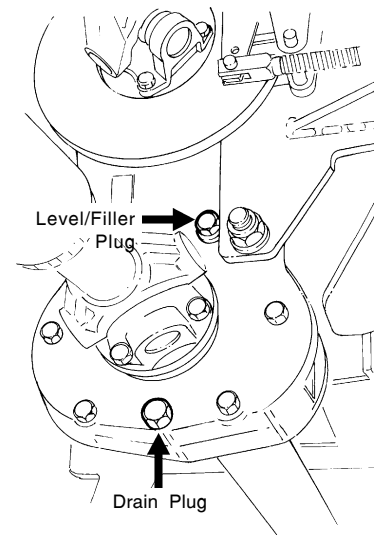


- Refill the gearbox through the filler hole, with the correct grade of oil, until the oil level reaches the full mark on the dipstick.

Newage Transfer Boxes



2 & 3 Tonne Straight
& Swing Dumpers



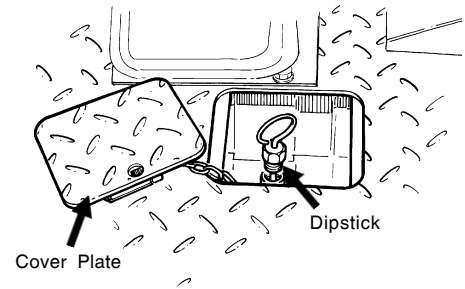
4 Tonne Straight / Swing, 5
& 6 Tonne Straight / Swing
& 7 and 9 Tonne Dumpers

Turner Shuttle Gearbox - 4, 5, 6, 7 and 9 Tonne Only

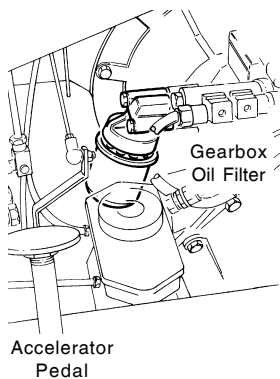


**If Towed, Disconnect Top Drive Propshaft to Prevent Gearbox Oil Starvation
Failure to Observe this Instruction May Cause Extensive Gearbox Damage**

The only routine maintenance required is weekly checking of gearbox oil level using the screw in dipstick accessed through the removable cover plate to left of gearlever, and changing oil at the specified intervals, as detailed in the *Maintenance* section. Ensure oil cooler is full by running engine for a few seconds prior to checking oil level.

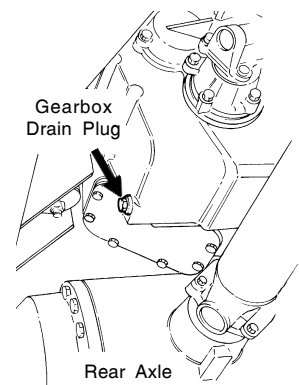


Check Oil Level with Engine Running at IDLE Speed and Transmission in Neutral



When draining gearbox oil the oil should be warm but *not hot!*. Ensure container used to drain the oil into is of sufficient capacity to hold the oil.

The oil should initially be changed between the first 25 and 100 hours running time, also the filter should be changed and the suction strainer cleaned. Thereafter, regular oil and filter changes are recommended at 750 hour intervals.



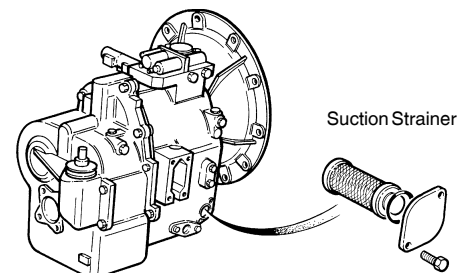
Renewing Gearbox Oil Filter

- Thoroughly clean the area around the filter. Unscrew the filter bowl from the filter body and clean the contact face of the filter body
- Smear rubber sealing ring on new filter with clean oil or grease and screw the new filter to the filter body. After refilling the gearbox, drive the dumper and check for oil leaks.

**Use Hand Pressure to Tighten Filter - Do Not Use ANY
Mechanical Pressure**

Suction Strainer

- Remove the two fixing bolts and withdraw the strainer.
- Wash the strainer, dry thoroughly.
- Refit to the gearbox using new seals.



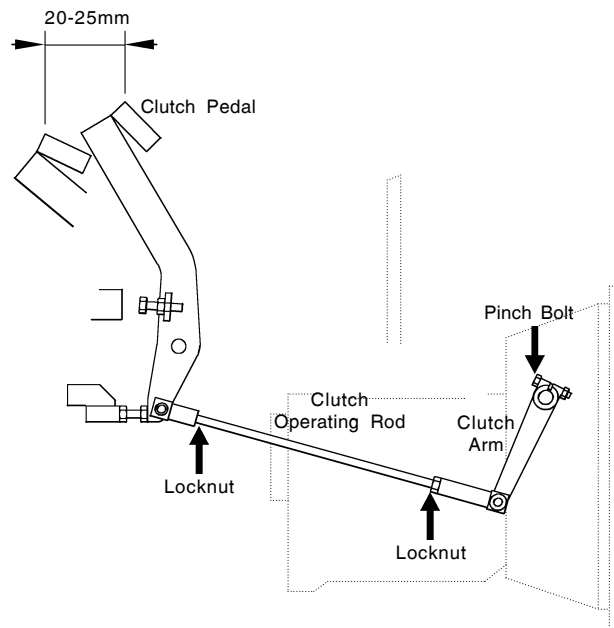
The Clutch - Models 2 and 3 Tonne Straight and Swing Skips

Clutch Type

230mm (9in) Spring Centre type

Spring Centre Clutch

The clutch is set up correctly on its initial build, but bedding in of the friction surfaces may necessitate adjustment to remove excessive free pedal travel after a few hours use. Subsequent adjustments will be at lengthy intervals if the machine is used correctly and the clutch is not abused by slipping.



Routine Adjustment



Adjustment stops 1 and 2 are preset and normally require no adjustment. (see following sections *Adjustment Stop 1* and *Adjustment Stop 2*).

When correctly adjusted, the clutch pedal should have 20-25mm of free pedal movement before resistance is felt.

In order to obtain the correct 20-25mm free pedal travel

- Slacken both locknuts on the clutch operating rod
- Turn the operating rod in the correct direction to reduce or increase the effective length of the operating rod until pedal travel is correct
- Retighten the locknut.
- If greater clutch adjustment is required remove pinch bolt and clutch arm from the serrated clutch withdrawal shaft which passes through the bell housing.

Reposition the lever arm on shaft after moving it clockwise one serration.

Refit pinch bolt and tighten. Repeat the instructions for adjustment as above.

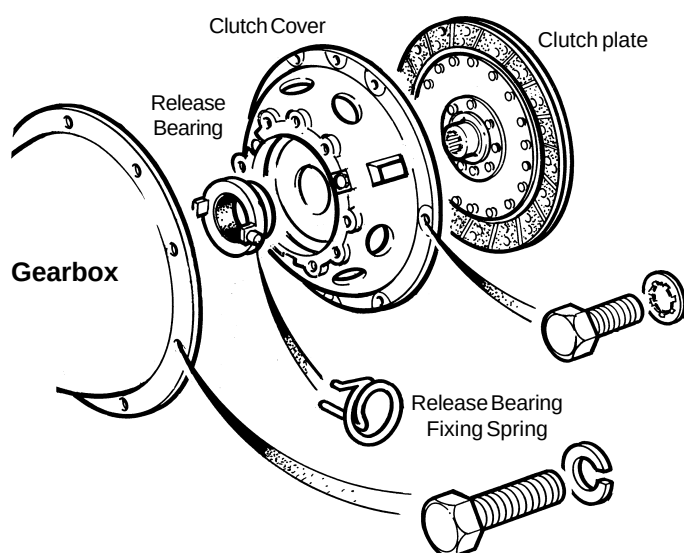
Take great care when repositioning the clutch arm as only a small movement of this lever can seriously affect the clutch performance.

Clutch Replacment - Models 2 and 3 Tonne Straight and Swing Skips



Before carrying out the following procedure it is advisable to thoroughly clean the machine.

- Remove the gearbox, see *Gearbox Section*.
- Slacken the six setscrews around the clutch cover. Once the setscrews have been loosened undo them in a diagonally opposite sequence, two turns at a time until the clutch cover is loose.



- Remove all the setscrews, the clutch cover and the clutch plate.
- Check for oil leaks from the rear of the engine and from inside the clutch bell housing. **If there are leaks they must be rectified before fitting a new clutch assembly.**

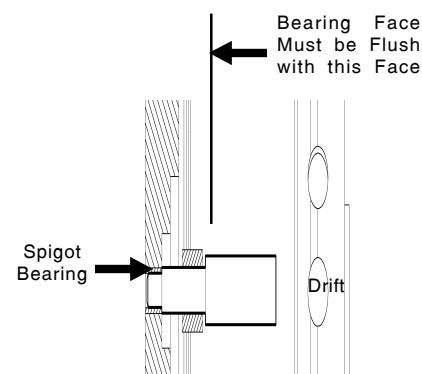


ALL Worn Components MUST be Replaced

- It is advisable to renew the Clutch Plate, Cover and Release Bearing when servicing clutch.
- Clean and check the engine flywheel fitted to the engine crankshaft, and check the primary shaft spigot bearing for wear - replace as necessary.

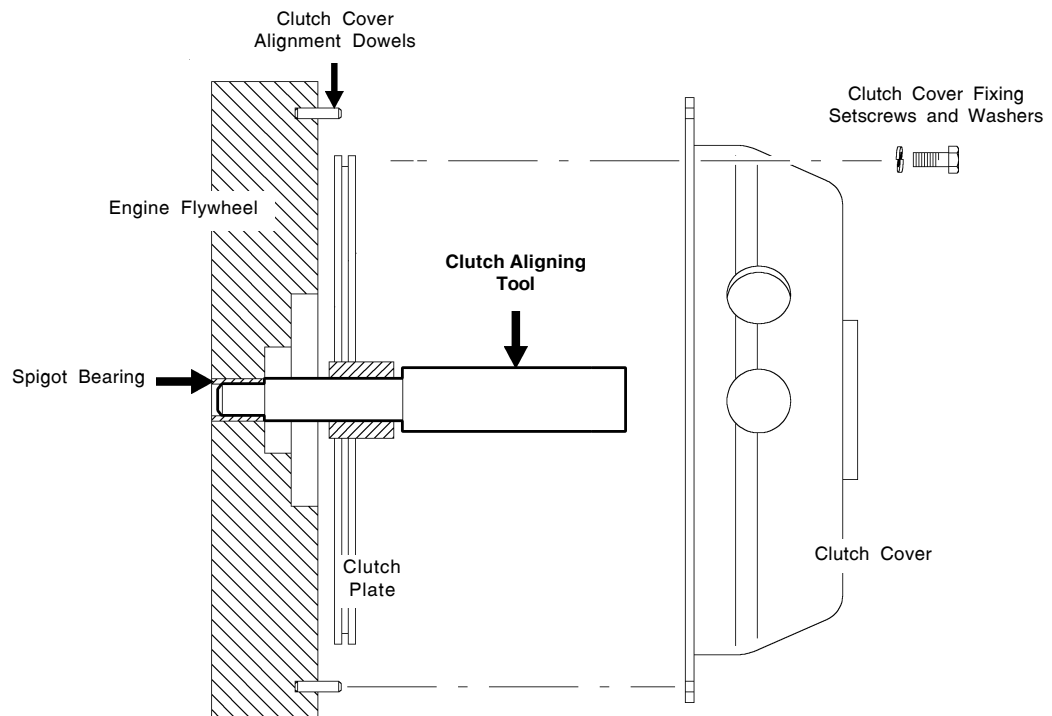
When replacing the spigot bearing, care must be taken to use the correct size drift or damage to the bearing may occur preventing the aligning tool from entering the bearing. The outside bearing face must be level with the face of the mating flywheel.

If problems, other than wear, have been experienced with the clutch the engine flywheel should be checked for run out using a dial gauge. The crankshaft endfloat should also be checked using a dial gauge. These procedures are beyond the scope of this manual and reference should be made to the Lister / Petter T Series workshop manual.



Clutch

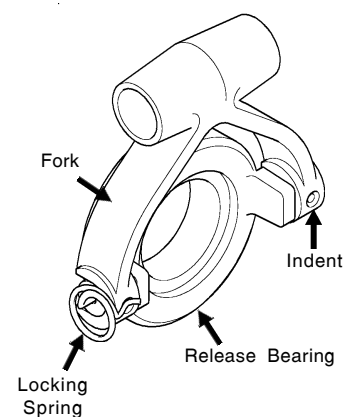
- Place a clutch alignment tool through the new clutch plate, ensuring the plate is the correct way round - *Flywheel Side* is stamped on the metal just below the clutch lining, and fit the alignment tool into the spigot bearing.
- Clean the contact face of the new clutch cover with petrol to remove all traces of grease.
- Place the clutch cover over the alignment tool and position on the two dowels.



- Hold in position using six new setscrews and washers. Screw in until resistance is felt.
- Tighten the setscrews in a diagonally opposite sequence, two turns at a time until the setscrews are tight.
- Use a torque wrench to finally tighten the setscrews to 23.5 Nm. (17 lbs/ft.)



- Renew the release bearing, if necessary. Ensure the locking spring is located correctly in the indent on the operating fork.
- Refit the gearbox, see *Gearbox Section*.



Hydraulics

During **ANY** hydraulic maintenance extreme care should be taken to ensure the cleanliness of hydraulic circuit. By observing strict hydraulic cleanliness the machine will benefit from fewer hydraulic failures through contamination. For example :

Always

- Thoroughly clean the machine before any maintenance.
- Use fresh, clean hydraulic oil from a sealed container.
- Ensure old gasket particles and excess sealing compound etc. do not enter the system. If they do clean them out.
- Ensure new parts and fittings are kept in sealed bags etc. and they are stored away from any contamination.
- Remove flaking paint from around the area being maintained.
- Use paper roll, not rag, to wipe parts.
- Inspect the inside of new tanks for welding debris, rust etc.

Never

- Fit new hoses if both ends have not been fitted with plastic caps.
- Fit new valves, pumps, motors, filters etc. if all the ports have not been plugged.
- Use dirty containers for oil storage.
- Use dirty containers or funnels for filling the hydraulic system.
- Store hydraulic components on the floor, in areas where welding or grinding is done, in a dirty environment etc.

Filters



A description of the hydraulics, and circuit diagrams are contained in this manual under the section headed *Hydraulic System*. The system components are maintenance free other than the suction strainer, return line filter and transmission pump filter which require renewing at the intervals specified in the *Service Schedule* section.

When renewing these filters the area around the filter should be cleaned before removing the old filters to prevent the ingress of dirt into the hydraulic system

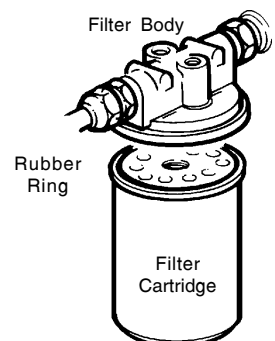


Whilst removing these parts it is desirable to drain and refill the system with clean new hydraulic oil as specified on the lubrication chart in the *Lubrication* section. To drain hydraulic tank, place a suitable container beneath the hydraulic tank and remove the drain plug located in bottom of the tank.

Dispose of Waste Oil Sensibly

Return Line Filter Servicing

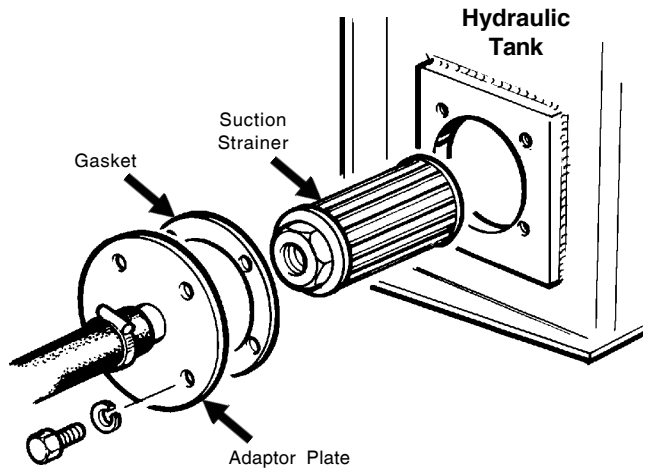
- Drain the hydraulic system
- Unscrew the filter bowl from the filter body
- Clean the contact face of the filter body
- Smear rubber sealing ring on new filter with clean oil or grease and screw the new filter to the filter body.
- Refill the hydraulic tank with the correct oil, see *Maintenance* section.
- Start the engine and check for leaks around the filter



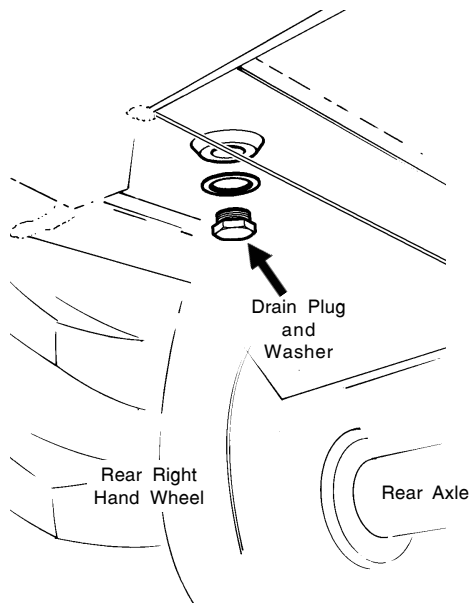
Use Hand Pressure to Tighten Filter - Do Not Use ANY Mechanical Pressure filter adaptor plate

Suction Strainer Servicing

- Drain the hydraulic system, remove the hose and the four fixing bolts from the filter adaptor plate
- Extract the adaptor plate and suction filter from the hydraulic tank. Replace or clean the suction strainer
- Clean the mating faces of the adaptor plate and hydraulic tank.
- Refit the adaptor plate to the tank using a new gasket and reconnect the hose.
- Refill the hydraulic tank with the correct oil, see *Maintenance* section
- Start the engine and check for leaks



Draining and Refilling Hydraulic Tank



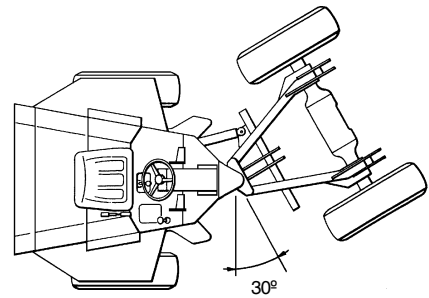
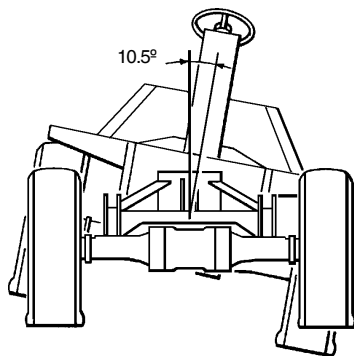
- **The return line filter must be changed when performing this operation.** See *Return Line Filter Servicing*.
- Ensure the hydraulic oil is warm - **NOT HOT!**
- Place a suitable receptacle under the drain plug.
- Remove the drain plug and allow the oil to drain into the receptacle. Thoroughly wash off all particles from the magnet on the drain plug.
- When the oil has finished draining turn the tap off, replace and tighten the plug.
- Refill the tank with clean, fresh oil.

Chassis

The two part chassis is of the centre pivot articulating type and is of a design which enables both front and rear axles to be attached directly to the chassis members.

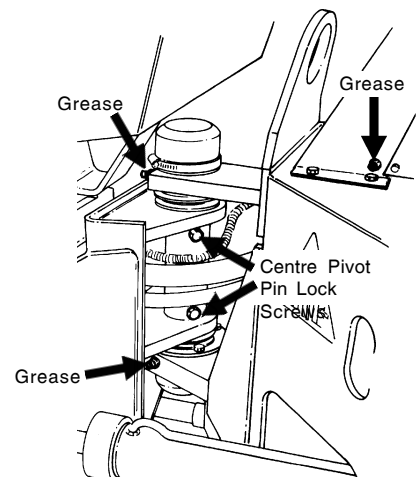
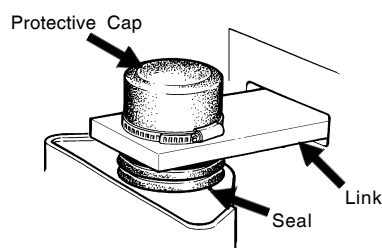
The front and rear frames are connected in the middle by a vertical pivot in spherical bearings and a horizontal link, which connects between the spherical bearing of the vertical pivot and an additional spherical bearing located in the rear frame.

This arrangement is illustrated in the diagram above and allows full movement of the chassis in both horizontal and vertical planes, thus ensuring maximum wheel adhesion at all times.



Centre Pivot

Lubrication of the three bearings in the assembly is important and should be carried out weekly in accordance with the schedule in the *Maintenance* section.



Protective caps are fitted over the pivot bearing housing's and these should be replaced in the event of damage to avoid ingress of dirt and moisture to the bearings.

Overhauling Centre Pivot

Before commencing work it is advisable to clean / wash down the dumper especially where parts are to be removed and reused. Pay particular attention to the hydraulic and brake line connections which should be thoroughly cleaned to stop dirt from entering the systems. Any open hydraulic / brake connections on the machine should be plugged / capped when the disconnection is made.

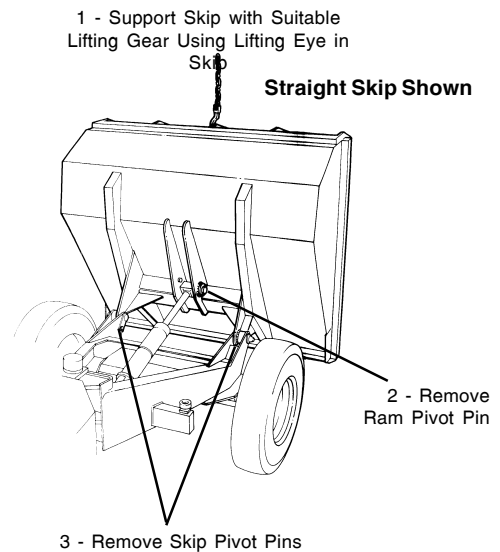


Only Work with the Dumper on Solid Level Ground

Removing Skip

Chock the Rear Wheels to Prevent Dumper Rolling

- Use dumper hydraulics to lift skip to its full dump position. Stop engine.
- Using suitable lifting gear support weight of the skip - a lifting hole is provided at the back of the skip for this purpose.
- Drain hydraulic tank into a suitable container. Refit drain plug after draining.
- Remove the skip pivot pins and ram pivot pin on skip. Support skip ram and knock out its pivot pin. Remove remaining two skip pivot pins. Lift skip away.

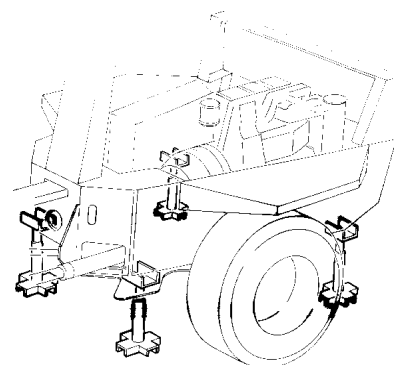


DANGER - The Skip May Swing on the Lifting Gear as the Last Pin is Removed

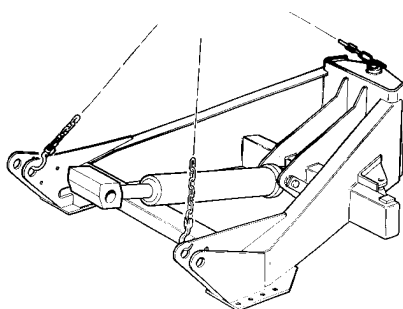
- Disconnect battery earth lead.
- Disconnect front drive shaft from drop box flange. Let drive shaft rest on the ground.
- Disconnect steering ram at the front chassis by removing the 36mm A/F hexagon head pin and 30mm A/F self locking nut.
- Clamp the flexible brake hose to prevent loss of oil. Disconnect front metal brake pipe - see diagram.
- Disconnect handbrake cable from front axle and pull cable clear of the front chassis.

Supporting Rear Chassis

- Fit supports to each corner of rear chassis to prevent chassis tipping when the front chassis is removed.



Supporting Front Chassis



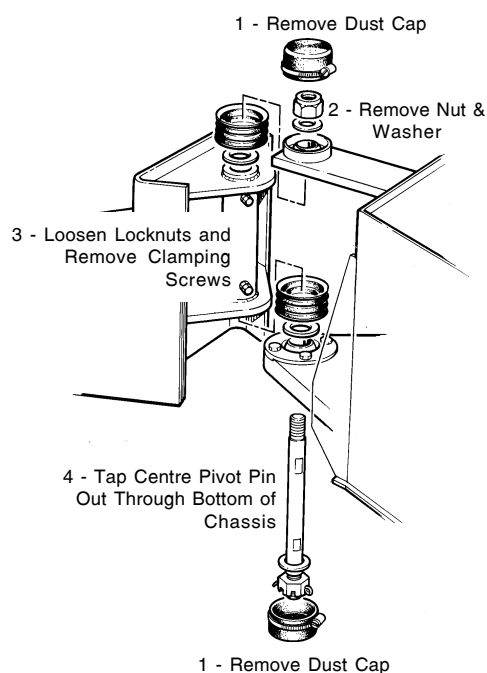
- Attach suitable lifting gear to front chassis as shown, use centre pivot tube for rear attachment point.



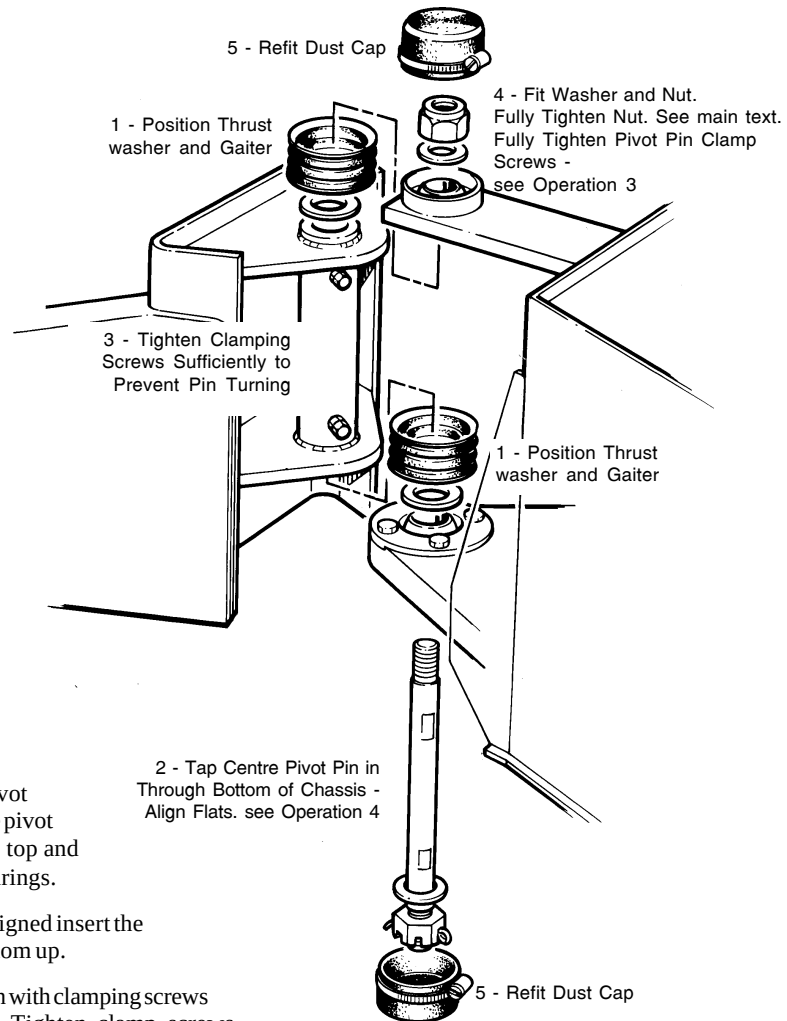
If the Front Axle is Left Attached to the Chassis Extreme Care Must be Taken to Prevent the Rear of the Front Chassis Turning About the Axle

Dismantling Centre Pivot

- Remove the two plastic dust caps from top and bottom of the centre pivot pin.
- Remove the 1.7/8" A/F nut from top of the centre pivot. Note : this nut has been torqued to 1,090 Nm.
- Slacken the two clamping screws in the side of front chassis centre pivot tube to release centre pivot pin. Tap chassis pivot pin downwards through chassis.
- Remove the clamping washer, two gaiters and two thrust washers from each side of the centre pivot tube.
- Move front chassis away from axle and rear chassis.
- Clean centre pivot and renew all worn and damaged parts.



Re-Assembling Centre Pivot



- Align front chassis centre pivot with rear chassis and fit centre pivot thrust washers and gaiters to top and bottom of the pivot tube / bearings.
- With all pivots and top link aligned insert the centre pivot pin from the bottom up.
- Align the flats machined on pin with clamping screws in front chassis pivot tube. Tighten clamp screws sufficiently to prevent pin rotating.
- Refit flat washer and self locking nut to top of centre pivot pin. Fully tighten centre pivot pin nut and torque to 1,085 Nm., 1,620 Nm on the 5 & 6 tonne swing and 7 & 9 tonne dumpers. Fully tighten centre pivot pin clamp screws.
- Refit plastic dust caps to top and bottom centre pivot pin nuts.
- Reconnect steering ram to front chassis with original pin and nut. Torque nut to 283 Nm.
- Reconnect front drive shaft to transfer box flange. Use four new 7/16" UNF x 1.3/16" bolts and nyloc nuts, tighten to 81 Nm.
- Refit front axle if it has been removed. Tighten front axle to chassis bolts to 216 Nm.
- Refit handbrake cable.
- Reconnect front brake hydraulic piping. Remove clamp from flexible brake pipe. Bleed air from braking system, see *Brake* section for correct procedure.



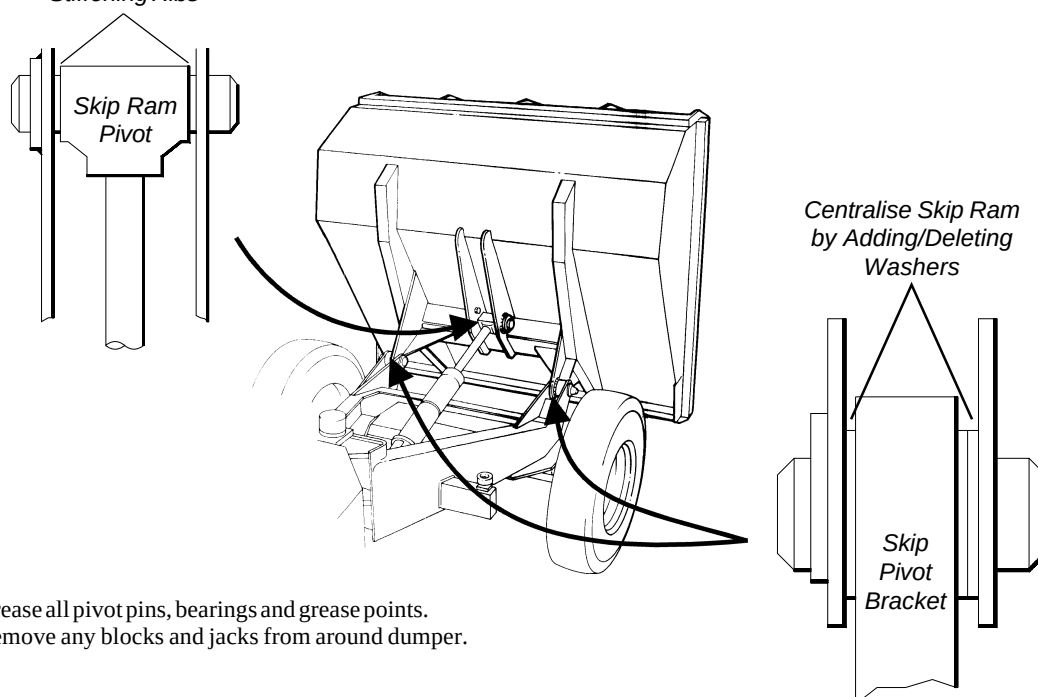
Important - Only use Mineral Oil (Hydraulic Oil) for Topping Up Brake System

- Reconnect all hydraulic pipes and refill hydraulic tank with clean, fresh oil - see *Lubrication* section for correct grade and quantity.

Refitting Skip

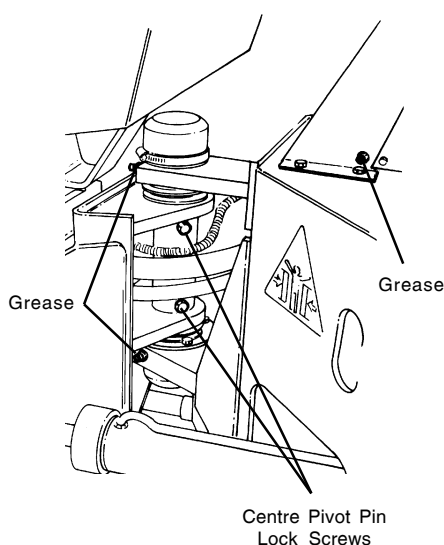
- With suitable lifting gear position skip on dumper and fit new pivot pins. Centralise skip so skip ram lies centrally between stiffening ribs on the bottom of the skip. With the skip in this position determine the number of large washers required to pack out the clearances on the skip pivot pins - see diagram below.
- Remove skip pivot pins, one at a time, and fit the large washers in their correct positions. Refit new pivot pin and retain with washer and split pin supplied. Align the hole in the head of the pin with the tapped hole in skip. Fit M8x25 setscrew and spring washer to prevent the pin from rotating.
- Position skip ram at its skip location and fit new pivot pin. Align pin so its cross drilled hole mates with the cross drilled hole in skip pivot boss. Retain pin with an 8mm x 75mm split pin.

*Skip Ram MUST be
Central Between Skip
Stiffening Ribs*



Finally

- Grease all pivot pins, bearings and grease points. Remove any blocks and jacks from around dumper.



- Re-connect battery.
- Start engine and run at idle, check for any hydraulic leaks.
- To remove air from the hydraulic circuit operate skip ram to its extremes of movement until the operation is smooth.
- If operation of control valve lever does not match direction of movement of the skip; stop engine, operate the control valve lever to remove trapped air and pressure in hydraulic circuit, swap over hose connections.

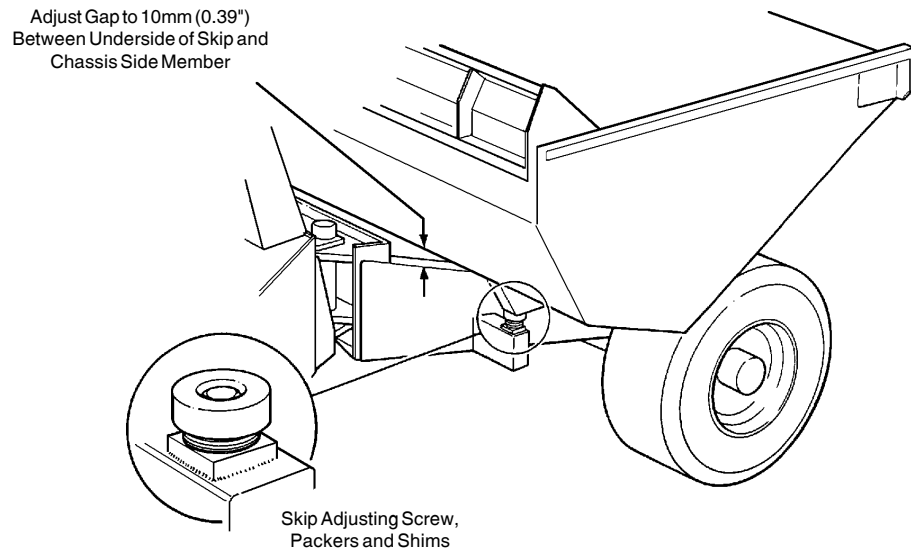
Restart engine and check operation of skip again, check for and correct any hydraulic leaks.

WARNING - The skip may act unpredictably while air exists in the hydraulic circuit Before operating skip ensure area around skip is clear of obstructions and people

Straight Skip Adjustment

The skip has 2 adjustment stops located on the front frame outrigger supports. These stops require adjustment to ensure the skip is supported by the chassis and does not rest on the hydraulic ram

The clearance between the chassis and skip at the closest point should be a minimum of 10mm (0.39"). Adjust the height by shimming as shown below.



Preservation and Storage

If machine is to be stored for a long period of time the following procedures should be applied :

- Thoroughly wash down the exterior of the machine and remove any build up of material
- Grease all greasing points
- Start the engine and warm it up. Drain engine oil and refill with clean fresh oil to the correct specification. See engine manufacturers handbook for further information on prolonged engine storage with regards to anti-corrosion oils and fluids.



Contaminated Water / Fluids / Oils Must Be Disposed of Safely

- Check the hydraulic oil level and top up as required
- Store the machine on solid level ground which is not liable to flooding, standing water or airborne contamination.
- Smear any exposed metal parts with grease
- Leave the parking brake in the *off* position

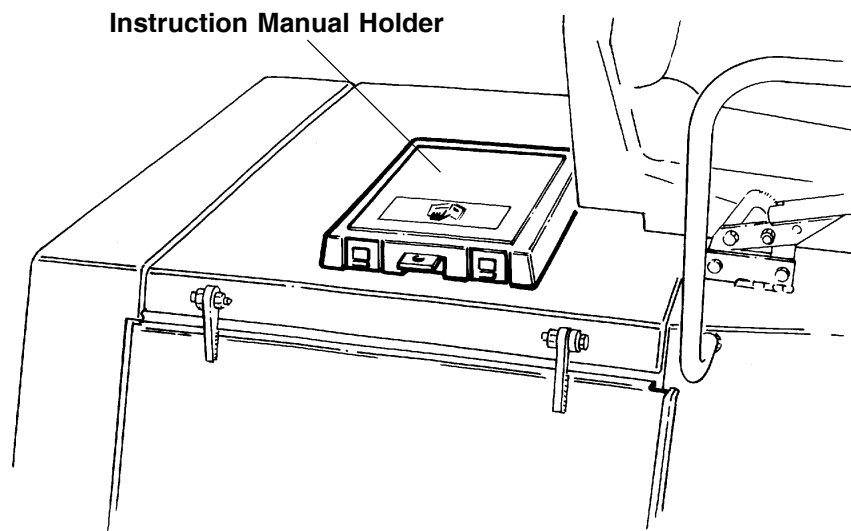


Chock the Wheels Securely to Prevent the Dumper Moving

Finally



Make Sure this Instruction Manual is Placed in its Container on Engine Canopy



2000 to 9000

Four Wheel Drive Dumpers

Including

2000, 3000, 4000,

5000 and 6000 Swing

Technical Specification

Vibration Declaration

Whole Body Vibration Level $a_w(m/s^2)$: - 0.7 - 0.8 Typical *

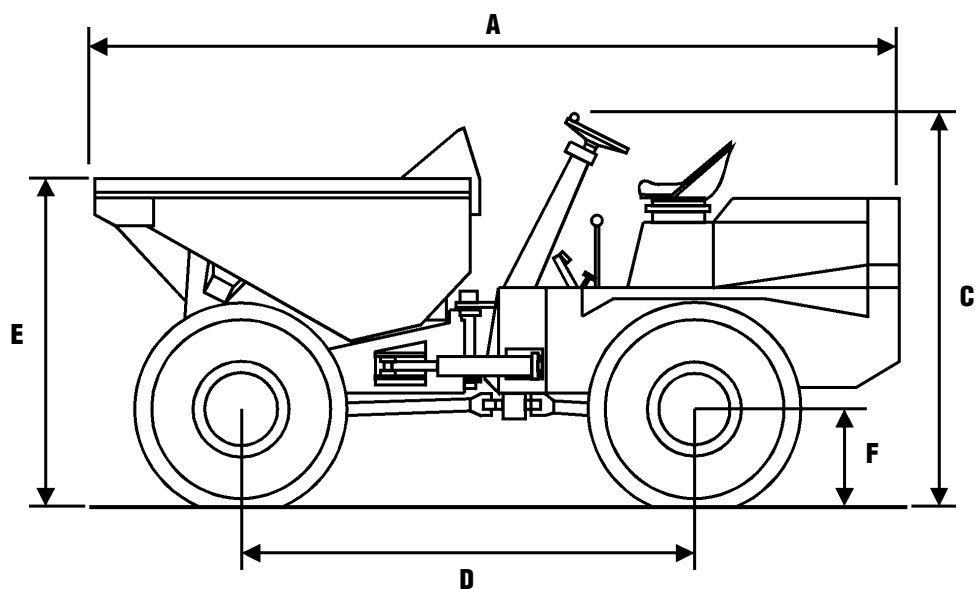
* Note :- The absence of a harmonised test code together with the variable conditions under which this equipment may be used allows only representative figures to be quoted.

Hand/Arm vibration level $a_{ha}(m/s^2)$: - Less than 2.5

Contents

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Dimensions and Weights - 2 to 9 Tonne Straight Skip Dumpers

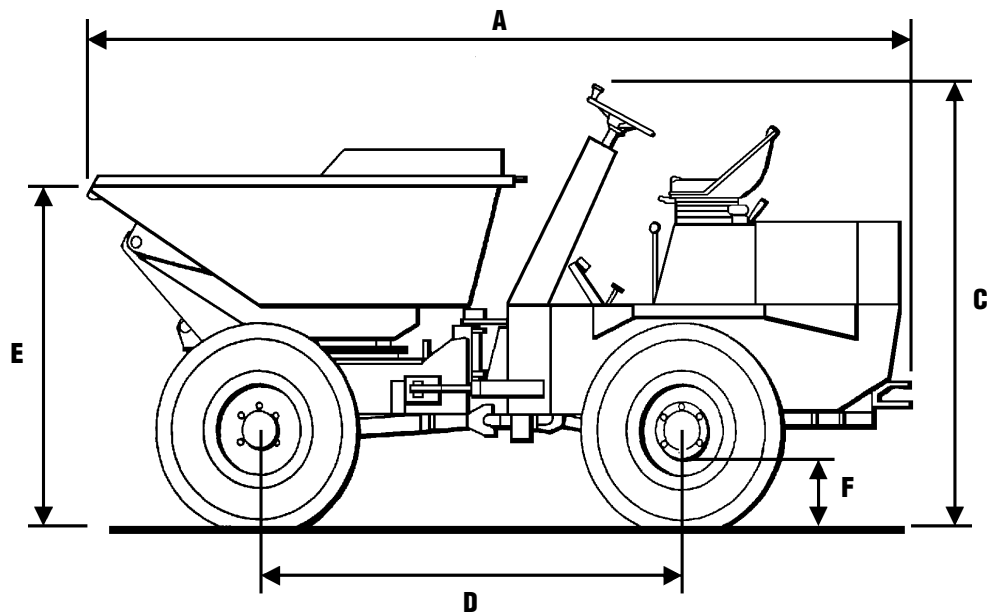


B = Overall Width

G = Overall Height with ROP's

Dimensions = mm	A	B	C	D	E	F	G	Weight (wet) kg
2000	3,485	1,860	1,895	1,830	1,270	275	2,625	1,770
3000	3,755	1,950	1,925	1,950	1,400	290	2,660	2,125
4000	3,880	2,170	2,020	2,100	1,460	330	2,795	3,200
5000	4,270	2,250	2,050	2,450	1,500	308	2,835	3,560
6000	4,320	2,350	2,100	2,450	1,600	358	2,910	3,980
7000	4,320	2,500	2,100	2,450	1,600	358	2,910	4,210
9000	4,330	2,500	2,532	2,450	1,722	338	3,282	4,420

Dimensions & Weights - 2 to 6 Tonne Swing Dumpers



B = Overall Width

G = Overall Height with ROP's

Dimensions = mm	A	B	C	D	E	F	G	Weight (wet) kg
2000 Swing	3,485	1,860	1,770	1,830	1,270	275	2,625	2,080
3000 Swing	3,755	1,950	1,800	1,970	1,400	290	2,660	2,380
4000 Swing	3,880	1,980	2,020	2,100	1,550	330	2,795	3,200
5000 Swing	4,550	2,075	2,050	2,450	1,720	308	2,835	4,065
6000 Swing	4,590	2,170	2,100	2,450	1,755	358	2,910	4,295

General Specification

Engine Rating

	Engine	k.W.	h.p.	@ R.P.M.
2000	Lister/Petter TS2	17.40	23.40	2,500
	Hatz 2L31S	18.30	24.60	2,500
2000 Swing	Lister/Petter TS2	17.40	23.40	2,500
	Hatz 2L31S	18.30	24.60	2,500
3000	Lister/Petter TS3	26.10	35.00	2,500
	Hatz 2L40S	22.15	29.70	2,500
3000 Swing	Lister/Petter TS3	26.10	35.00	2,500
	Hatz 2L40S	22.15	29.70	2,500
4000 & Swing	Perkins D3-1524	38.8	52.00	2,500
5000 & Swing	Perkins 1004-4	57.70	77.00	2,200
	Deutz F4L913	56.00	75.00	2,300
6000 & Swing	Perkins 1004-4	57.70	77.00	2,200
	Deutz F4L913	56.00	75.00	2,300
7000	Perkins 1004-4	56	76.00	2,200
	Perkins 1004-4T	79	106.00	2,200
9000	Perkins 1004-4T	79	106.00	2,200

Engine.tbl

Skip Capacities - 1 litre = 0.001 Cubic Metre

	Payload Kg lbs		Water Level litres	Struck Level litres	Heaped litres
2000	2,000	4,400	910	1,080	1,550
2000 Swing	2,000	4,400	840	991	1,400
3000	3,000	6,600	1,250	1,500	1,950
3000 Swing	3,000	6,600	960	1,150	1,850
4000	4,000	8,800	1,416	1,840	2,463
4000 Swing	4,000	8,800	1,350	1,660	2,500
5000	5,000	11,000	1,700	2,264	2,973
5000 Swing	5,000	11,000	1,523	2,150	2,900
6000	6,000	13,200	1,980	2,575	3,282
6000 Swing	6,000	13,200	1,640	2,460	3,500
7000	7,000	15,400	2,077	2,934	3,724
9000	9,000	19,800	2,438	3,821	4,560

Dumper Speeds

	Engine	Speed in Gears KPH				
		1	2	3	4	Reverse
2000	Lister/Petter TS2 Hatz 2L31S	4.3	10.1	18.7	-	4.8
2000 Swing	Lister/Petter TS2 Hatz 2L31S	4.3	10.1	18.7	-	4.8
3000	Lister/Petter TS3 Hatz 2L40S	4.0	9.6	17.7	-	4.5
3000 Swing	Lister/Petter TS3 Hatz 2L40S	4.0	9.6	17.7	-	4.5
4000	Perkins D3-1524	3.11	5.89	11.44	18.02	As Forward
4000 Swing	Perkins D3-1524	3.11	5.89	11.44	18.02	As Forward
5000	Perkins 1004-4 Deutz F4L913	4.7	8.9	17.4	30.0	As Forward
6000	Perkins 1004-4 Deutz F4L913	5.6	10.6	20.0	32.0	As Forward
7000	Perkins 1004-4 Perkins 1004-4T	5.6	10.6	20.0	32.0	As Forward
9000	Perkins 1004-4T	4.3	8.2	15.9	28.0	As Forward

Speed.tbl

Noise Levels

	LPA Operators Ear (dBA)	LWA Sound Power Level
2000 Lister Petter TS2 Straight & Swing	86.00	105.00
3000 Lister Petter TS3 Straight & Swing	84.70	106.00
4000 Perkins Straight & Swing	85.00	107.00
5000 & 6000 Deutz Straight & Swing	84.00	116.50
5000, 6000 Straight & Swing. 7000 & 9000 Perkins	81.50	104

Noiselev.tbl

General Specification

Brake Arrangements

	2000 & Swing	3000 & Swing	4000 & Swing	5000 & Swing	6000 & Swing	7000 & 9000
Front Brakes	Standard	Standard	Standard	Standard	Standard	Standard
Rear Brakes	None	Standard	Standard	Standard	Standard	Standard

Brakes.tbl

Gear and Transfer Boxes

	Gears	Gearbox	Transfer Box
2000 & 2000 Swing	3F 1R	40M2 Constant Mesh	G2000
3000 & 3000 Swing	3F 1R	85M2 Constant Mesh	G2000
4000 & Swing	3F 1R	85M2 Constant Mesh	D3000
5000 & Swing, 6000 & Swing, 7000 & 9000	4F 4R	Turner Compact plusT/C Shuttle	D3000

Geartran.tbl

Tyre Specification / Capacity / Pressures / Wheel Torques

Tyres.tbl

	Specification - Capacity	Pressure (bar)		Wheel Nut Torque
		Front	Rear	
2000 & Swing	10.0/75 x 15.3 x 8ply - 1260 kg	2.75	2.07	163 Nm
3000	11.5/80 x 15.3 x 8ply - 1675 kg	2.75	1.50	298 Nm
3000 Swing	11.5/80 x 15.3 x 8ply - 1675 kg	2.75	2.07	298 Nm
4000 & Swing	12.00 x 18 x 12ply - 2910 kg	2.50	1.50	298 Nm
5000 & Swing	12.00 x 18 x 12ply - 2910 kg	3.75	2.07	298 Nm 8-Stud
6000 & Swing	16.00 x 20 x 12ply - 3650 kg	2.70	1.70	298 Nm 8-Stud
7000	16.00 x 20 x 12ply - 3650 kg	3.00	1.80	298 Nm 8-Stud
9000	18.00 x 19.5 x 16ply - 4628 kg	4.25	2.00	680 Nm 5-Stud

Anti-Freeze Concentrations

Anti-Fr.tbl

	Ratio	°C	°F	16°C 60°F	27°C 81°F	38°C 100°F
20%	1 : 4	-9	15.8	S.G. 1.032	S.G. 1.030	S.G. 1.028
25%	1 : 3	-12	10.4	S.G. 1.041	S.G. 1.037	S.G. 1.033
33.3%	1 : 2	-19	-2.2	S.G. 1.054	S.G. 1.049	S.G. 1.044
50%	1 : 1	-37	-34.6	S.G. 1.080	S.G. 1.074	S.G. 1.068
Use Good Quality Ethylene Glycol - Check Concentration Regularly						

Lubricant Capacities - (Litres)

Lubcapac.tbl

	2000	2000 Swing	3000	3000 Swing	4000 & Swing	5/6000 & Swing	7000	9000
Front Axle	3.50	3.50	6.00	6.00	6.00	8-Stud 7.00	7.00	23.0
Rear Axle	2.50	2.50	3.50	3.50	6.00	8-Stud 7.00	7.00	23.0
Gearbox	1.70	2.50	2.00	2.80	13.00*	13.00 *	13.00 *	13.00 *
Transfer Box	1.00	1.00	1.00	1.00	1.00	0.86	0.86	0.86
Hydraulic Reservoir	34.00	34.00	34.00	34.00	34.00	50.0	50.0	50.0
Grease Points	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd
Brake Fluid	0.25	0.25	0.2	0.2	0.2	0.2	0.2	1.2
Centre Pivot	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd	As Reqd

* Total oil capacity of the Gearbox, Torque Converter and Oil Cooler

Replacement of oils is best carried out when the engine and transmission is warm allowing the oil to flow freely, carrying away any contamination at the same time

Engine Fuel, Lubrication and Coolant

<i>Fluids = litres</i>	Maximum Payload	Engine Model	Engine Sump	Fuel	Coolant
2000	2,000 kg	Lister/Petter TS2	5.3 *	34	-
		Hatz 2L31S	5.5 *	34	-
2000 Swing	2,000 kg	Lister/Petter TS2	5.3 *	34	-
		Hatz 2L31S	5.5 *	34	-
3000	3,000 kg	Lister/Petter TS3	7.2 *	34	-
		Hatz 2L40S	5.5 *	34	-
3000 Swing	3,000 kg	Lister/Petter TS3	7.2 *	34	-
		Hatz 2L40S	5.5 *	34	-
4000 & Swing	4,000 kg	Perkins D3-1524	7.2 *	34	9.9
5000 & Swing	5,000 kg	Perkins 1004-4	10.0 **	50	18
		Deutz F4L913	10.0 **	50	-
6000 & Swing	6,000 kg	Perkins 1004-4	10.0 **	50	18
		Deutz F4L913	10.0 **	50	-
7000	7,000 kg	Perkins 1004-4	10.0 **	50	18
9000	9,000 kg	Perkins 1004-4T	10.0 **	50	18

Fu_lu_coo.tbl

*** - SAE 10W/30 Engine Oil**

**** - SAE 15W/40 Engine Oil**

Alternators and Batteries

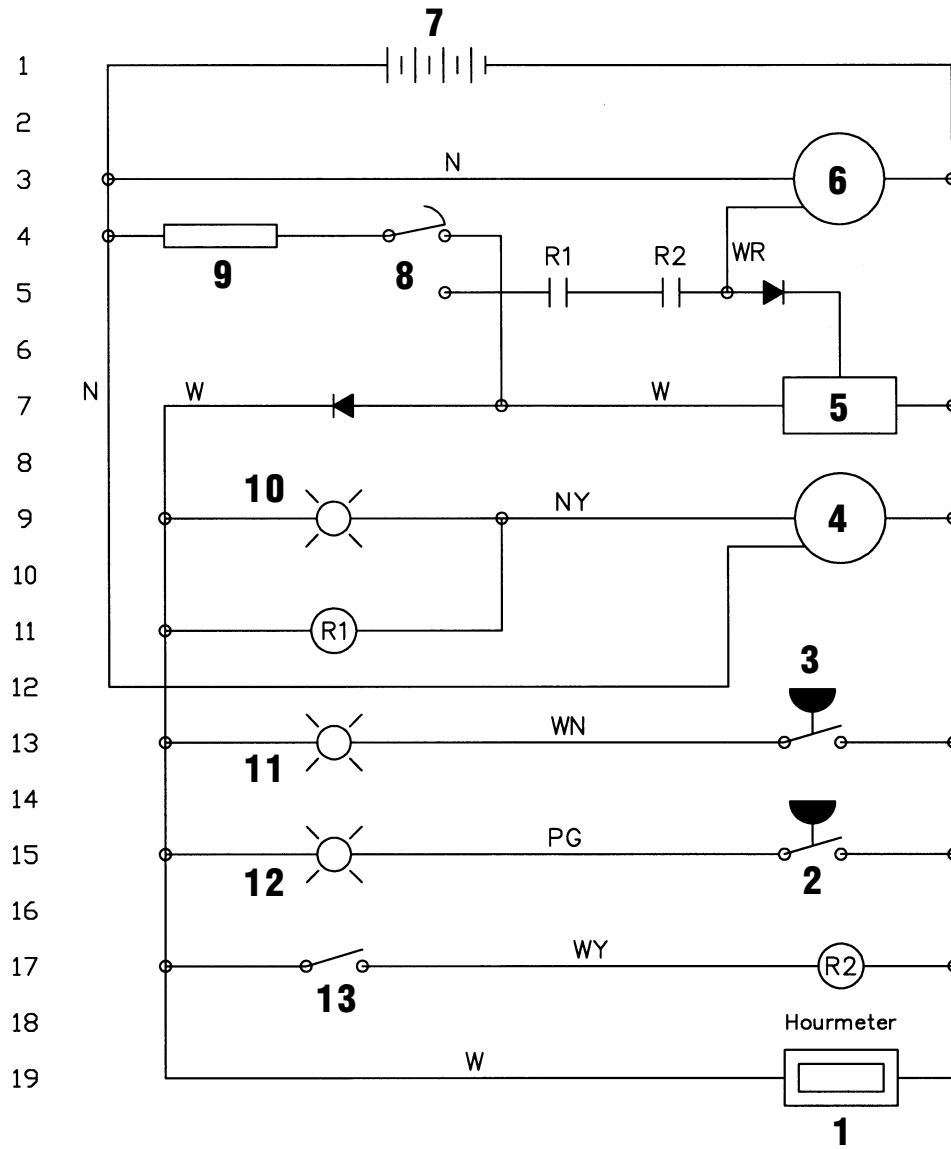
Alternat.tbl

	Engine	Alternator	Output	Battery Cold Start Amps
2000	Lister TS2	Beltdriven	45 amps	Type 072 DIN 340A - IEC 420A
	Hatz 2L31S	Beltdriven	50 amps	Type 665 DIN 460A - IEC 570A
2000 Swing	Lister TS2	Beltdriven	45 amps	Type 072 DIN 340A - IEC 420A
	Hatz 2L31S	Beltdriven	50 amps	Type 665 DIN 460A - IEC 570A
3000	Lister TS3	Beltdriven	45 amps	Type 072 DIN 340A - IEC 420A
	Hatz 2L40S	Beltdriven	50 amps	Type 665 DIN 460A - IEC 570A
3000 Swing	Lister TS3	Beltdriven	45 amps	Type 072 DIN 340A - IEC 420A
	Hatz 2L40S	Beltdriven	50 amps	Type 665 DIN 460A - IEC 570A
4000 & Swing	Perkins D3-1524	Belt Driven	35 amps	Type 072 DIN 340A - IEC 420A
5000 & Swing	Perkins 1004-4	Belt Driven	55 amps	Type 665 DIN 460A - IEC 570A
	Deutz F4L913	Belt Driven	33 amps	Type 665 DIN 460A - IEC 570A
6000 & Swing	Perkins 1004-4	Belt Driven	55 amps	Type 665 DIN 460A - IEC 570A
	Deutz F4L913	Belt Driven	33 amps	Type 665 DIN 460A - IEC 570A
7000 9000	Perkins 1004-4 Perkins 1004-4T	Belt Driven	55 amps	Type 665 DIN 460A - IEC 570A

Electrical System - 2 and 3 Tonne Hatz Circuit Diagram

- 1 - Hour Meter**
- 2 - Blocked Air Filter Switch**
- 3 - Oil Pressure Switch**
- 4 - Alternator**
- 5 - Fuel Valve**
- 6 - Starter**
- 7 - Battery 12v**
- 8 - Start Key Switch**
- 9 - Circuit Breaker 10A**
- 10 - Charge Light**
- 11 - Oil Light**
- 12 - Blocked Filter Light**
- 13 - Clutch Pedal Switch**

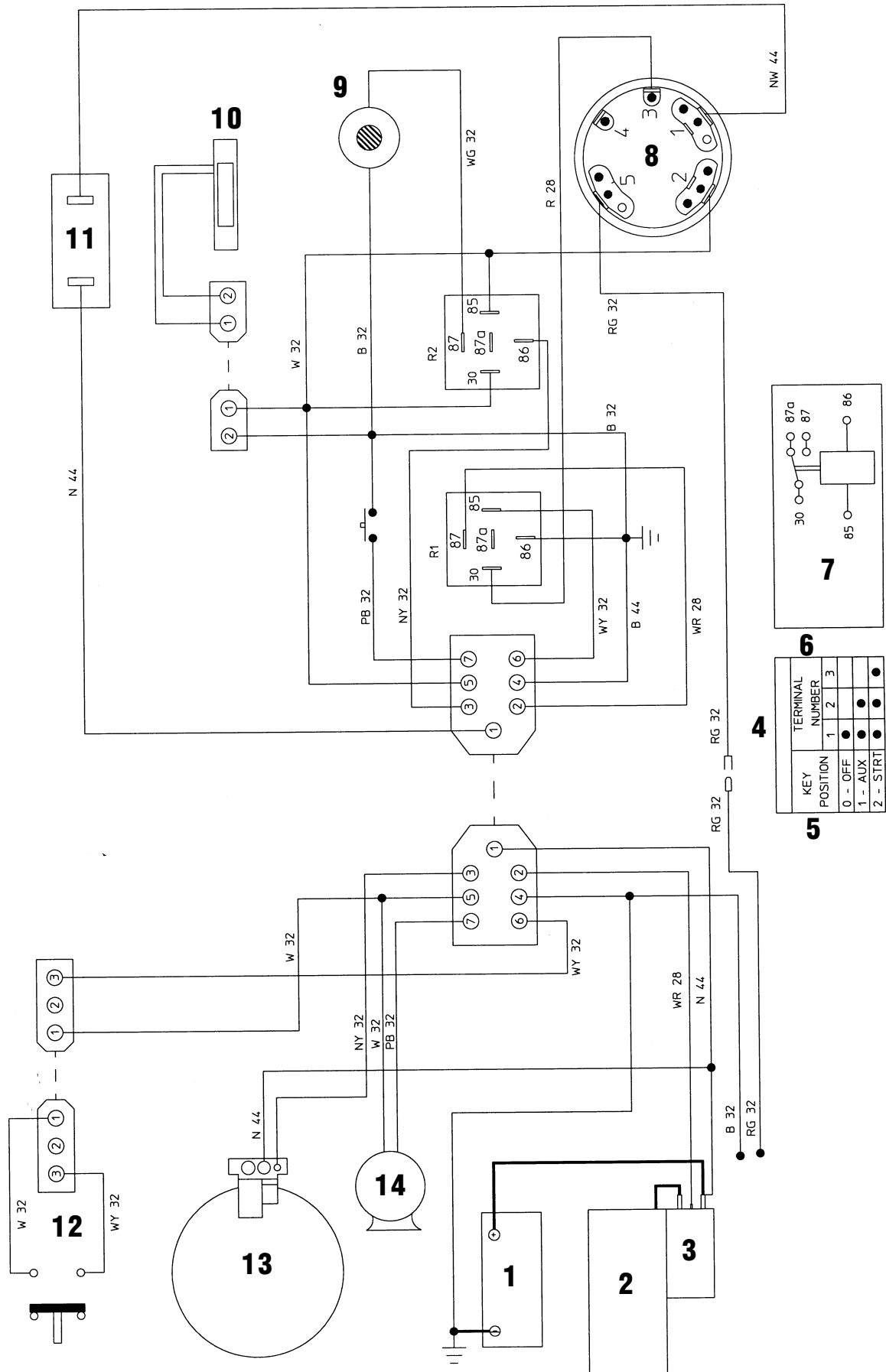
Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate



Electrical System - 2 and 3 Tonne Lister No Lights Circuit Diagram

- 1 - Battery 12v**
- 2 - Starter**
- 3 - Starter Solenoid**
- 4 - Ignition Switch**
- 5 - Key Position**
- 6 - Terminal Number**
- 7 - Relay Connections**
- 8 - Ignition Switch**
- 9 - Ignition Audible Warning**
- 10 - Hour Meter**
- 11 - Circuit Breaker**
- 12 - Clutch Pedal Start Inhibitor Switch**
- 13 - Alternator**
- 14 - Horn**

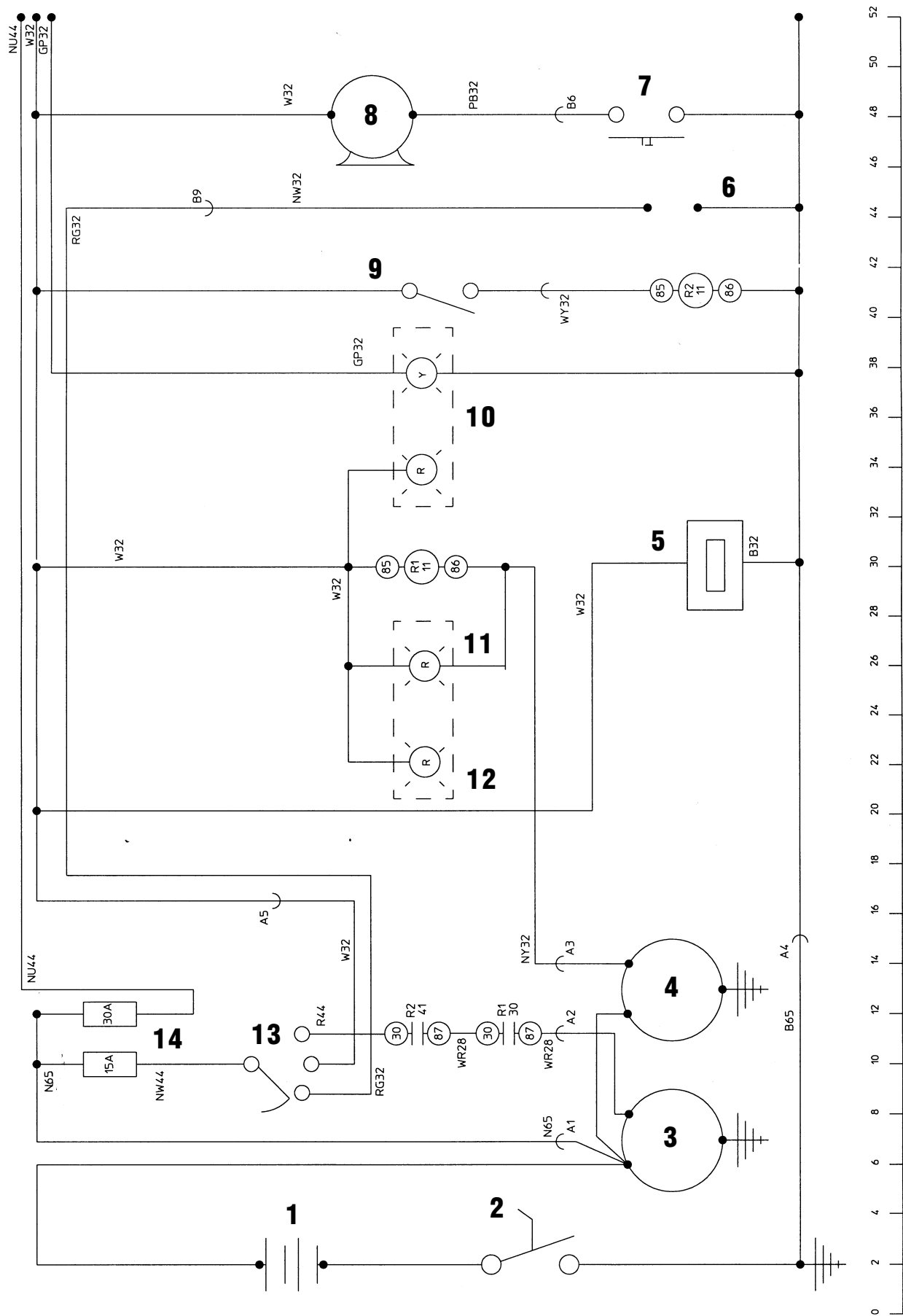
Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate



- 1 - Battery 12v**
- 2 - Battery Isolator**
- 3 - Starter**
- 4 - Alternator**
- 5 - Hour Meter**
- 6 - Flashing Beacon / Auxillary Socket**
- 7 - Horn Button**
- 8 - Horn**
- 9 - Clutch Switch**
- 10 - Engine Temperature Warning Light - if fitted**
- 11 - Charge Warning Light**
- 12 - Oil Pressure Warning Light - if fitted**
- 13 - Engine Start Key Switch**
- 14 - Circuit Breakers**

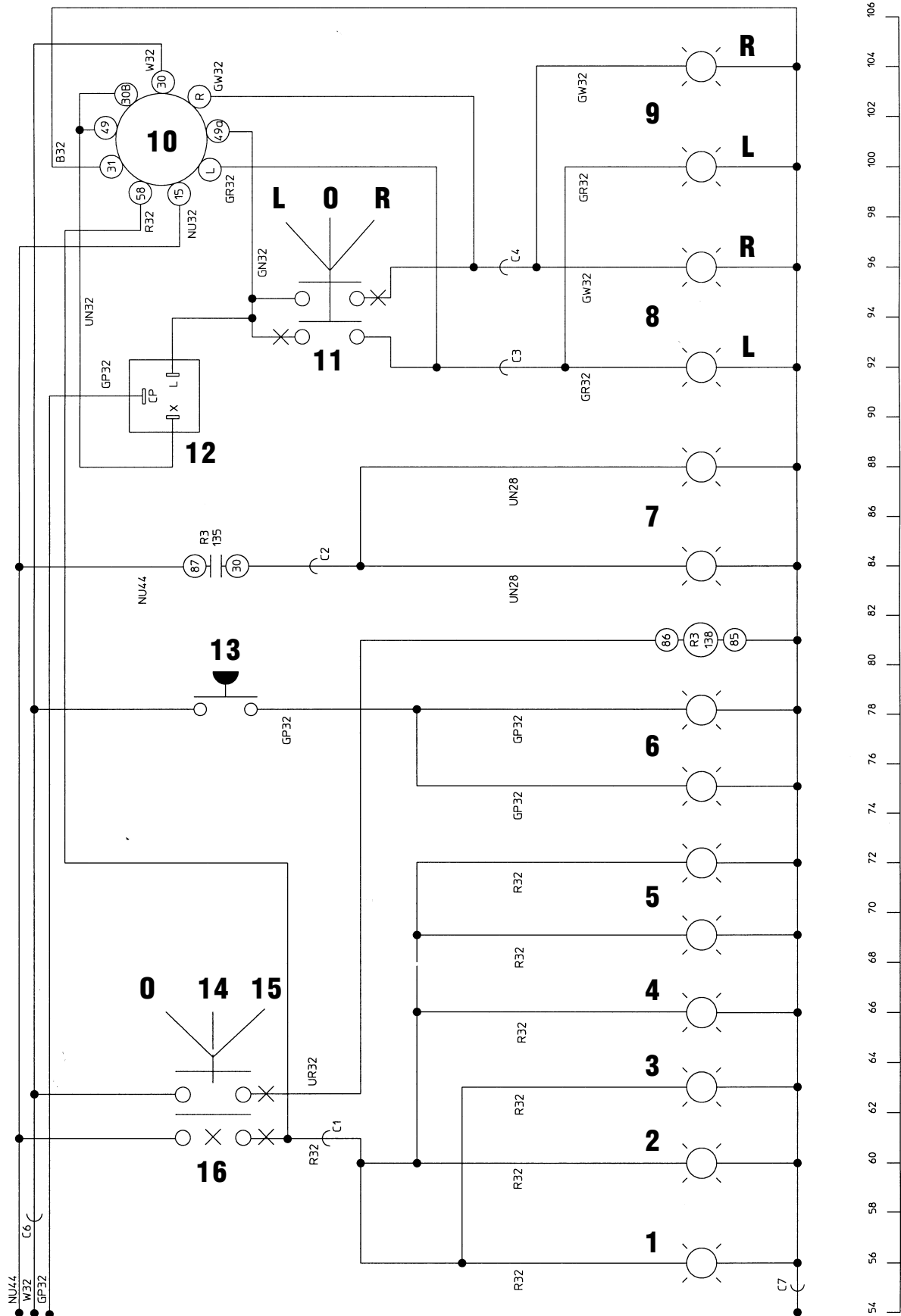
Cable Colour Codes	
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G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

Electrical System - 2 and 3 Tonne Lister With Lights Circuit Diagram



- 1 - Marker Light Front Left**
- 2 - Marker Light Front Right**
- 3 - Marker Light Rear Left**
- 4 - Marker Light Rear Right**
- 5 - Number Plate Lights**
- 6 - Brake Lights**
- 7 - Front Head Lights**
- 8 - Front Indicator Lights**
- 9 - Rear Indicator Lights**
- 10 - Hazard Light Switch**
- 11 - Indicator Switch**
- 12 - Flasher Can**
- 13 - Brake Pressure Switch**
- 14 - Side Lights**
- 15 - Head Lights**
- 16 - Light Switch**
- L - Left**
- R - Right**
- 0 - Off**

Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

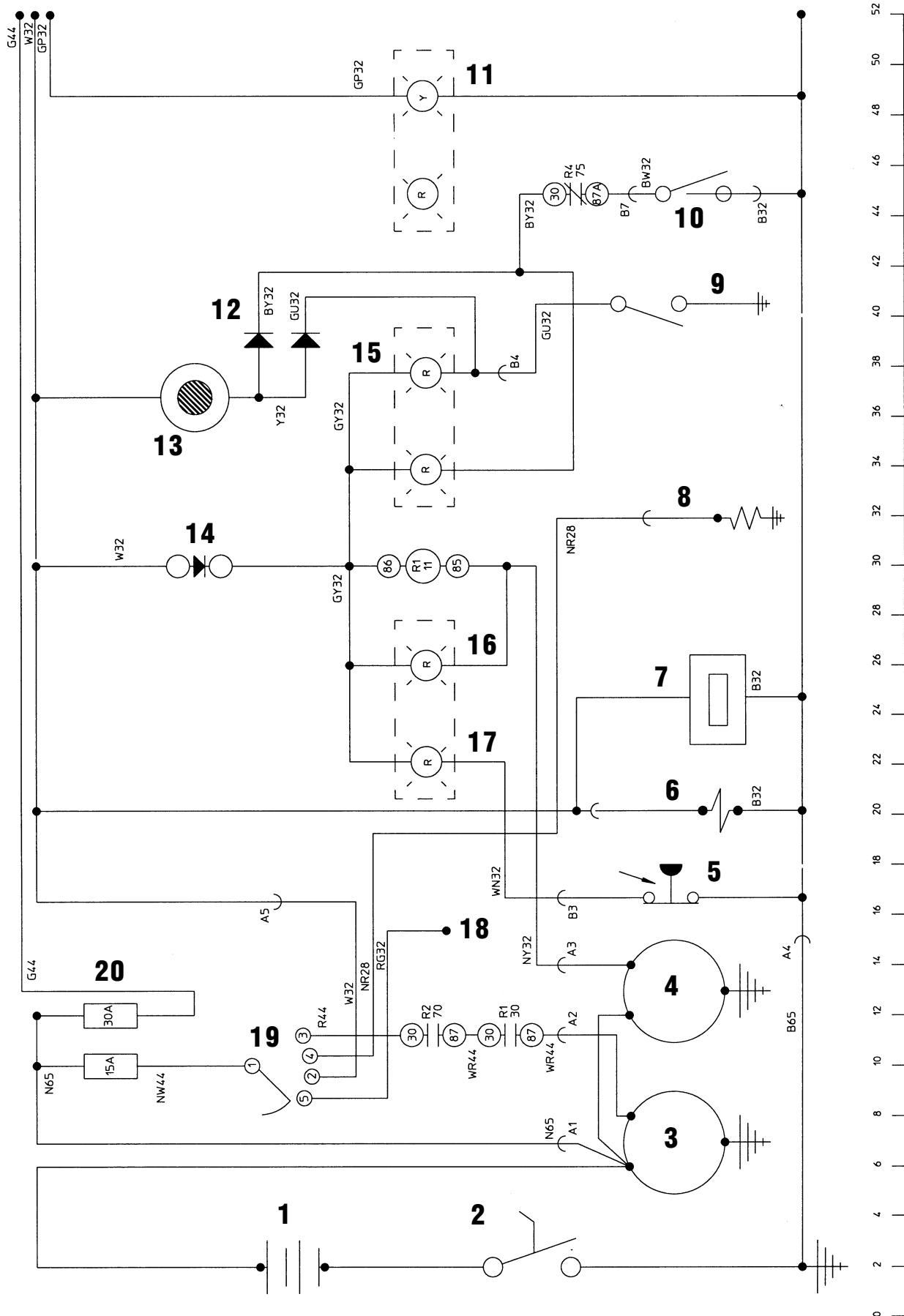


Electrical System - 4, 5, 6, 7 & 9 Tonne Perkins Circuit Diagram

- 1 - Battery 12v**
- 2 - Battery Isolator**
- 3 - Starter**
- 4 - Alternator**
- 5 - Engine Oil Pressure Switch**
- 6 - Engine Fuel Solenoid**
- 7 - Hourmeter**
- 8 - Engine Start Heater**
- 9 - Water Temperature Switch**
- 10 - Hand Brake Switch**
- 11 - Indicator Warning Light**
- 12 - 1 amp 400v Diodes**
- 13 - Audible Warning**
- 14 - 3 amp 600v Diode**
- 15 - Water Temperature Light**
- 16 - Charge Warning Light**
- 17 - Oil Pressure Warning Light**
- 18 - Auxillary Power Supply - Beacon**
- 19 - Engine Start Key Switch**
- 20 - Circuit Breakers**

Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

Electrical System - 4, 5, 6, 7 & 9 Tonne Perkins Circuit Diagram

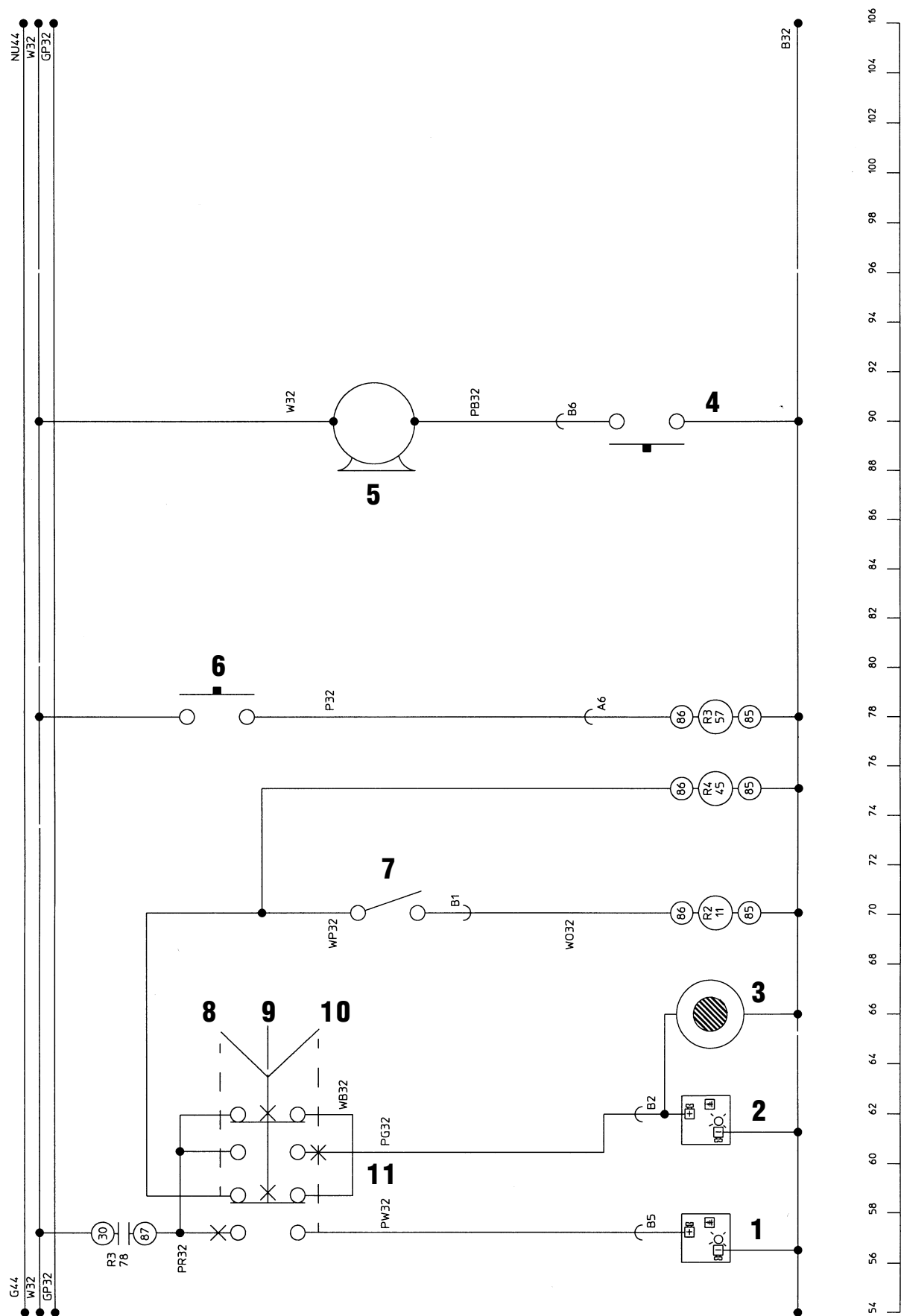


Electrical System - 4, 5, 6, 7 & 9 Tonne Perkins Circuit Diagram

- 1 - Forward Drive Solenoid**
- 2 - Reverse Drive Solenoid**
- 3 - Reverse Bleeper**
- 4 - Horn Button**
- 5 - Horn**
- 6 - Gear Stick Button**
- 7 - Seat Switch**
- 8 - Forward**
- 9 - Neutral**
- 10 - Reverse**
- 11 - Direction Switch**

Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

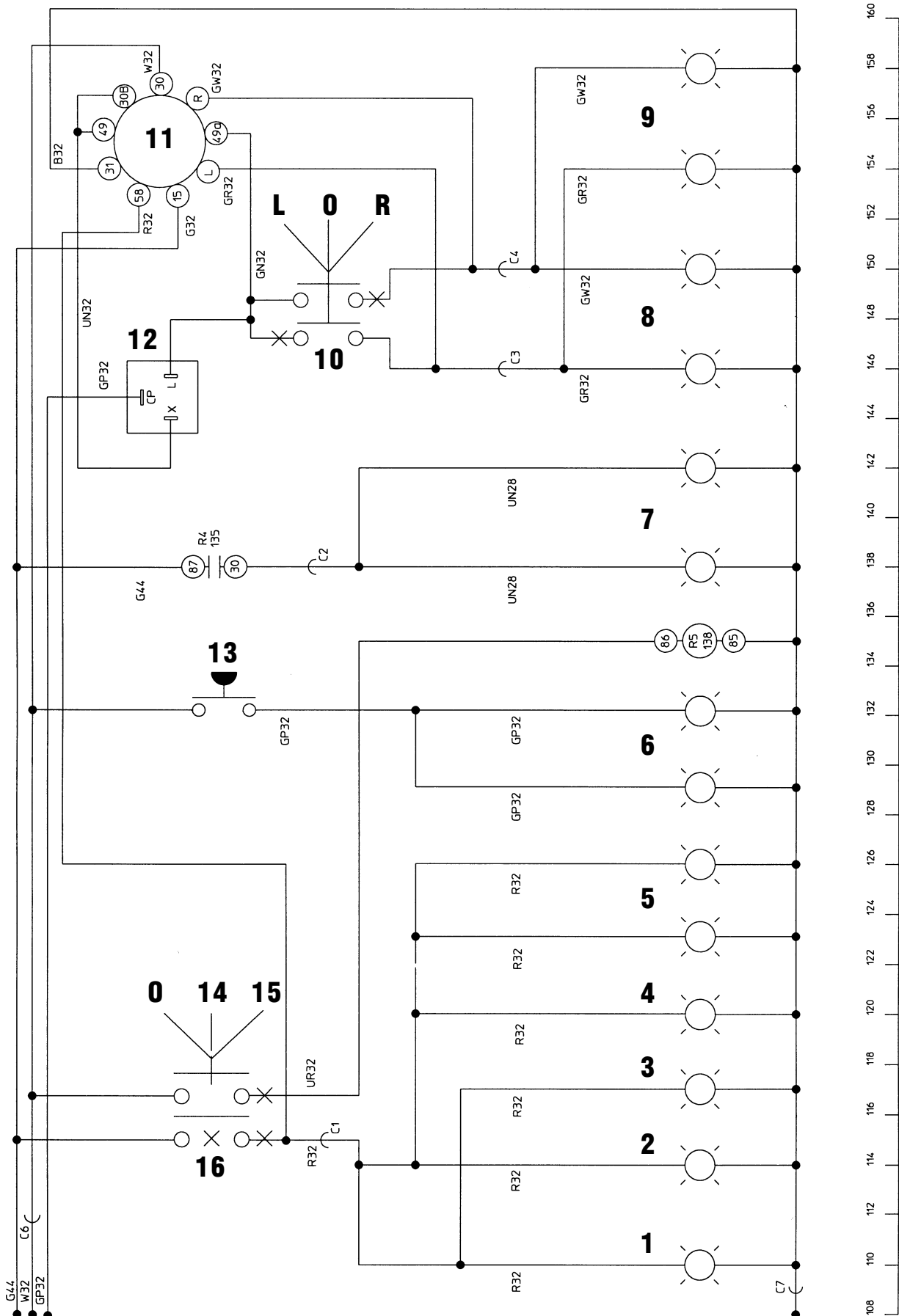
Electrical System - 4, 5, 6, 7 & 9 Tonne Perkins Circuit Diagram



- 1 - Marker Light Front Left**
- 2 - Marker Light Front Right**
- 3 - Marker Light Rear Left**
- 4 - Marker Light Rear Right**
- 5 - Number Plate Lights**
- 6 - Brake Lights**
- 7 - Front Head Lights**
- 8 - Front Indicator Lights**
- 9 - Rear Indicator Lights**
- 10 - Indicator Switch**
- 11 - Hazard Lights Switch**
- 12 - Flasher Can**
- 13 - Brake Pressure Switch**
- 14 - Side**
- 15 - Headlights**
- 16 - Light Switch**
- L - Left**
- R - Right**
- 0 - Off**

Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

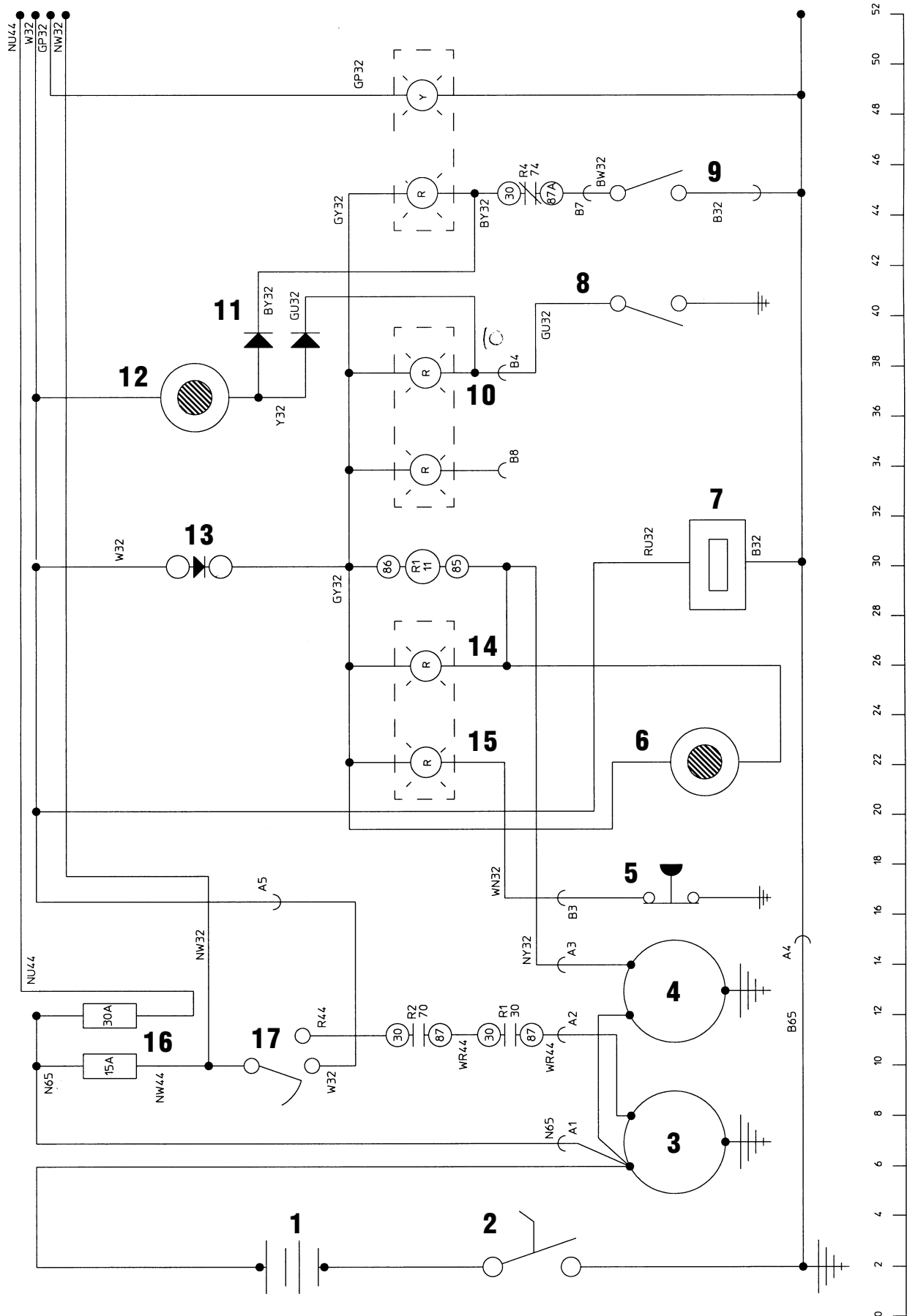
Electrical System - 4, 5, 6, 7 & 9 Tonne Perkins Circuit Diagram



- 1 - Battery 12v**
- 2 - Battery Isolator**
- 3 - Starter**
- 4 - Alternator**
- 5 - Engine Oil Pressure Switch**
- 6 - Audible Warning - Start Key Left ON**
- 7 - Hourmeter**
- 8 - Switch - Cooling Fan Belt Broken**
- 9 - Hand Brake Switch**
- 10 - Warning Light - Engine Overheating**
- 11 - 1 Amp 400v Diodes**
- 12 - Audible Warning**
- 13 - 3 amp 600v Diode**
- 14 - Charge Warning Light**
- 15 - Oil Pressure Warning Light**
- 16 - Circuit Breakers**
- 17 - Engine Start Key Switch**

Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

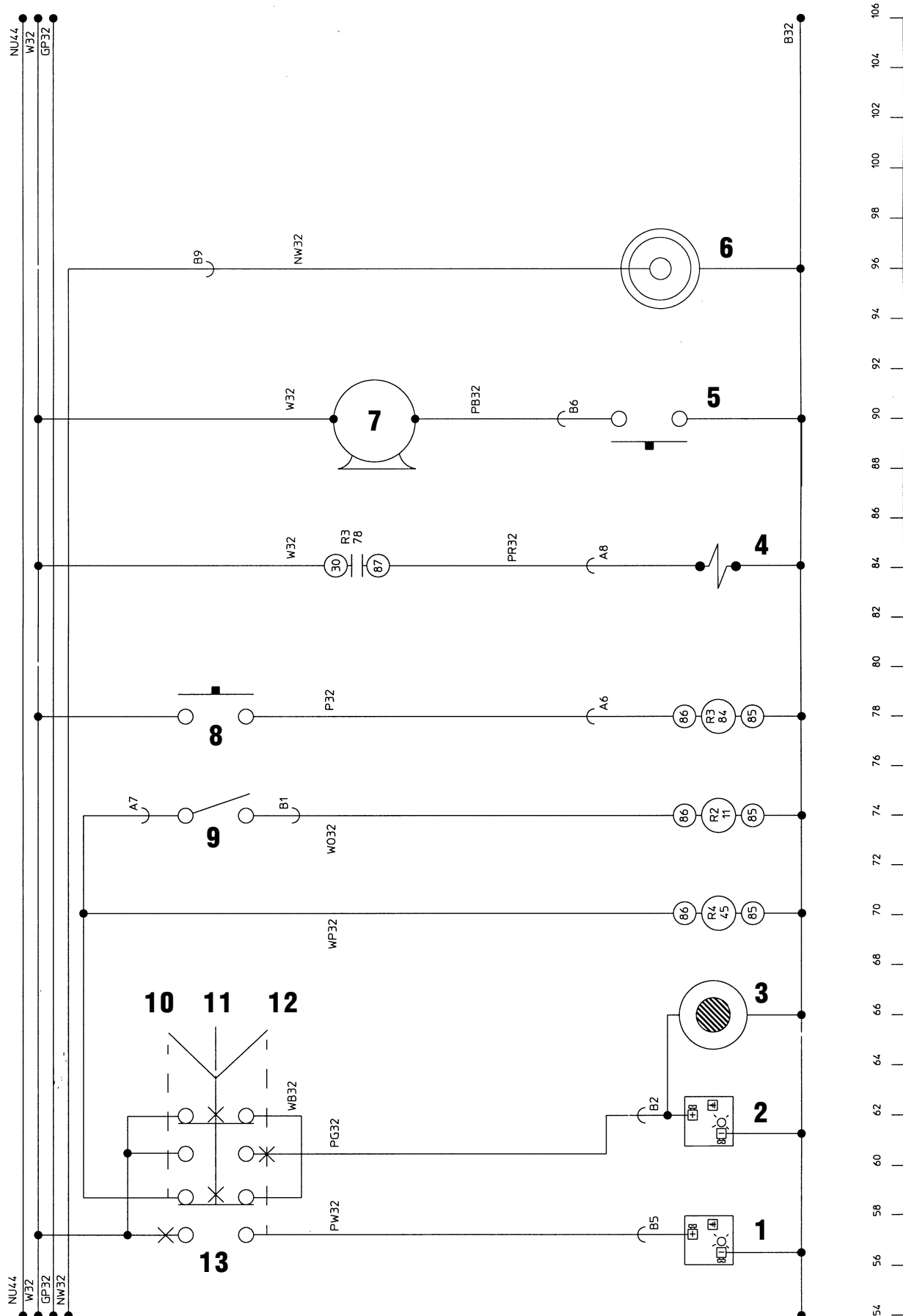
Electrical System - 5 and 6 Tonne Deutz Circuit Diagram



- 1 - Forward Drive Solenoid**
- 2 - Reverse Drive Solenoid**
- 3 - Reverse Bleeper**
- 5 - Horn Button**
- 6 - Flashing Beacon / Auxillary Socket**
- 7 - Horn**
- 8 - Gear Stick Button**
- 9 - Seat Switch**
- 10 - Forward**
- 11 - Neutral**
- 12 - Reverse**
- 13 - Direction Switch**

Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

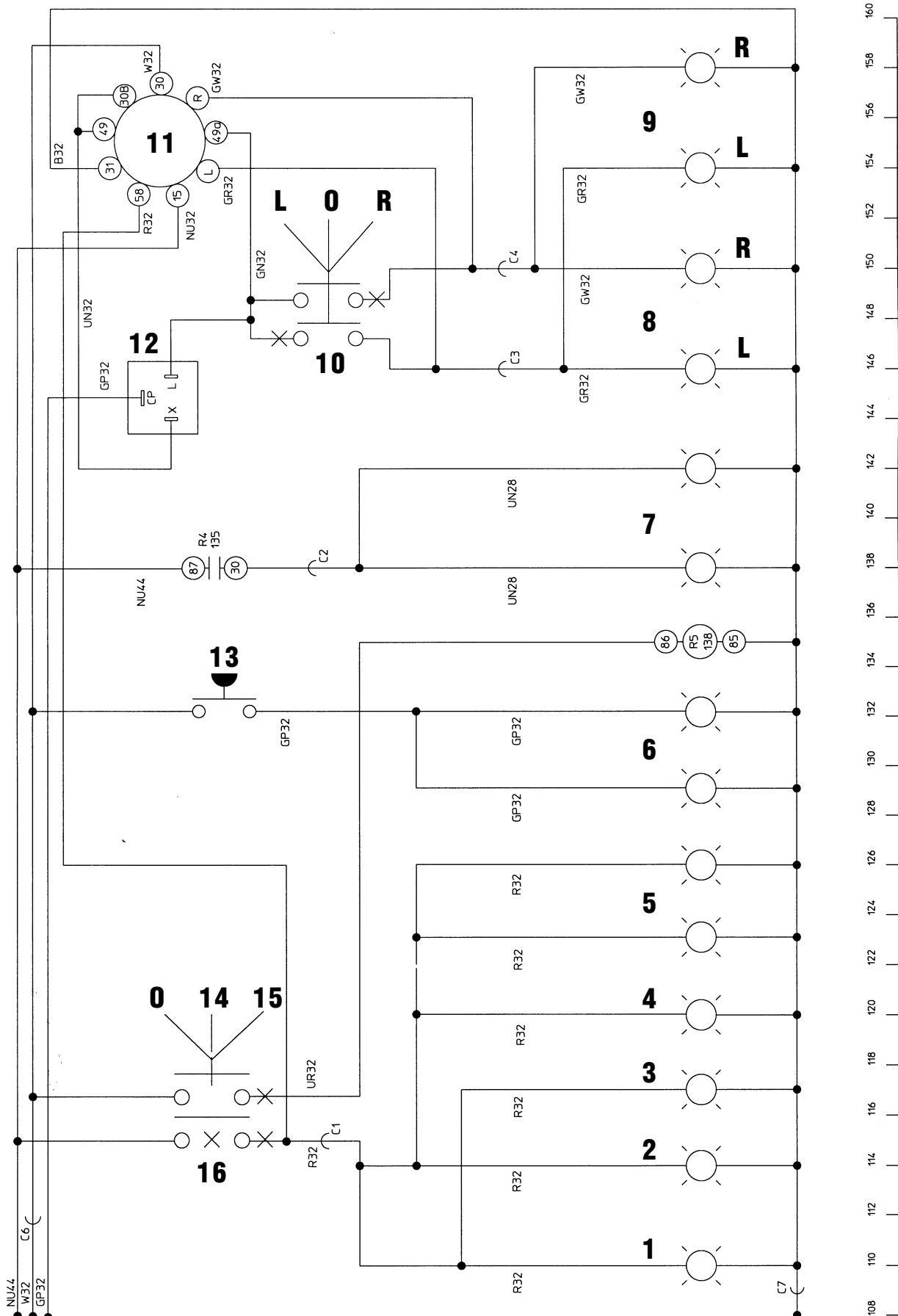
3 - 29



- 1 - Marker Light Front Left**
- 2 - Marker Light Front Right**
- 3 - Marker Light Rear Left**
- 4 - Marker Light Rear Right**
- 5 - Number Plate Lights**
- 6 - Brake Lights**
- 7 - Front Head Lights**
- 8 - Front Indicator Lights**
- 9 - Rear Indicator Lights**
- 10 - Indicator Switch**
- 11 - Hazard Lights Switch**
- 12 - Flasher Can**
- 13 - Brake Pressure Switch**
- 14 - Side**
- 15 - Headlights**
- 16 - Light Switch**
- L - Left**
- R - Right**
- 0 - Off**

Cable Colour Codes	
R	Red
B	Black
Y	Yellow
G	Green
O	Orange
P	Purple
K	Pink
U	Blue
T	Turquoise
W	White
N	Brown
S	Slate

Electrical System - 5 and 6 Tonne Deutz Circuit Diagram



Standard Nut and Bolt Torque Figures - Nm			
Material Grade ISO			
Dia. (mm) / Pitch	8.8	10.9	12.9
8 / 1.25	23.5	33	39
10 / 1.25	46.8	65.8	79
12 / 1.75	87.7	132	147.8
14 / 2.0	131.5	185	222
16 / 2.0	206	290	348
18 / 2.5	253	355	426
20 / 2.5	402	566	678

Correction Factors for Plate Finishes			
Nut Finish	Bolt Finish		
	<i>Self Colour</i>	<i>Zinc</i>	<i>Cadmium</i>
<i>Self Colour</i>	1.0	1.0	0.8
<i>Zinc</i>	1.15	1.2	1.35
<i>Cadmium</i>	0.85	0.9	1.2

Durlock Unit Torque Figures - Nm	
Material Grade ISO	
Dia. (mm) / Pitch	12.9
8 / 1.25	39
10 / 1.25	79
12 / 1.75	147.8
14 / 2.0	222
16 / 2.0	348
20 / 2.5	678

Conversion Factor Example

The tightening torques given on the previous pages are for unplated nuts and bolts. As finish and lubrication materially affect tightening torque by increasing or reducing friction, it is necessary to apply correction factors to achieve the required bolt loading when one or both of the components is plated.

Example of Correction

Nut Finish - *8mm Self Colour*

Bolt Finish - *8mm 8.8 Grade Cadmium*

Correct Tightening Torque = 23.5 x 0.8 = 18.8 Nm

