OPERATION AND MAINTENANCE MANUAL

Delilah Spreaders
FBS Manure Spreaders
SDS Manure Spreaders

PROVEN IN THE FIELD

CONTACT US

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Richard Western Ltd, D'Urbans, Framlingham, Suffolk IP13 9RP

Make a Note of the Machine serial number in this box for future reference and when ordering replacement parts.

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Original Instructions

Please Read and follow all instructions before Operating the Machine

It is the responsibility of the operator to read and understand the contents of this manual before operating the machine for the first time.

The Operators manual must accompany the machine at all times. If the machine is resold the Operators manual must be given with the machine to the new owners.

Edition 1

Index

Introduction

This manual provides information on the use, adjustment and servicing of the RICHARD WESTERN range of spreaders

Models covered are:-

Delilah Spreaders

FBS Manure Spreaders

SDS Manure Spreaders

Following the advice on the correct maintenance and servicing procedures will ensure maximum performance and a long service life for your machine.

Failure to carry out maintenance work correctly, or incorrect operation will result in poor machine efficiency and loss of valuable time.

By ensuring the correct operation, and by carrying out maintenance and service work with care, you will be able to make full use of the technical knowledge and the experience with which your trailer was originally designed.

The Richard Western range of machines covered in this manual are trailed agricultural implements designed and constructed for the sole purpose of carrying and redistributing agricultural crops and associated materials.

This is their intended use.

The machines may contain, additional equipment which may function under the direct control of the operator of a towing vehicle, or in certain circumstances automatically and autonomously.

Use of the machine in any other way is considered by the manufacturer to be contrary to the intended use. Consequently the manufacturer does not accept any liability for such use and the user therefore accepts all risks arising from such use.

Intended use also includes the observation of the service, maintenance and repair conditions and routines as prescribed by the manufacturer.

Within this manual is the information required by an operator to assemble and put the machines to work, operate and maintain them and lay them up for storage.

Additionally comprehensive information relating to the machines safe use and the responsibilities of the operator is also given.

WARNING

The Operator and User must read this manual fully before commencing work with or transporting the machine. If the Operator or User does not understand any part of this manual further help and advice is available from the manufacturer or from the manufacturers agent shown on the following pages of this manual.

Tilly Pass

Richard Western Ltd recommends that thorough, planned maintenance is carried out on all our machines and trailers on a frequent and regular basis as under the Health and Safety at Work Act 1974, it is the employers responsibility to manage health and safety risks in their businesses.
As such employers have a duty to protect the health, safety and welfare of their employees and others who may be affected by their work activities.
It is important to maintain and repair your equipment in good mechanical working order. Richard Western Ltd would recommend that you replace worn and broken parts with genuine Richard Western parts.

You should have received a Richard Western manual when you purchased your trailer or machine, but these are also available online **www.richardwestern.com**.
Please note that Richard Western Ltd will not be liable for damage or personal injury caused by failure to comply with regular maintenance or the use of aftermarket parts.

Tilly Pass Scheme

There is no Ministry of Transport test on agricultural machinery as there is no government regulation that requires agricultural trailers to be registered for road use in the UK. This may result in trailers not being maintained in accordance with the Provision and Use of Work Equipment Regulations 1998 (PUWER) (**hse.gov.uk/work-equipment-machinery/puwer.htm**) with the potential of a trailer being used in a dangerous, unroadworthy condition.

Richard Western Ltd encourage their UK customers to register their trailer with the Tilly Pass scheme. This is a voluntary scheme for farm trailer operators whereby authorized Tilly Pass dealers carry out an annual maintenance inspection of the trailer, repair and issues and confirm the trailer has been inspected to PUWER.
A re-check is required each year and a new certificate will then be issued.

Find out more information about the Tilly Pass Scheme, including dealers that have subscribed to the scheme at **www.tillypass.co.uk**

Manufacturer

Manufacturers Name:
Richard Western Ltd.

Manufacturers Address:
D'Urbans,
Framlingham,
Suffolk,
ENGLAND
IP13 9RP.

Agent

Agents Stamp :

Disposal

Upon completion of the useful life of the machine, all parts can be disposed of at a suitable waste disposal facility.

Care must be taken if oxy-acetylene cutting equipment is to be used.

The wheels and tyres , hydraulic & pneumatic cylinders, valves and hoses must be removed before using cutting equipment.

Oil must be drained collected and disposed of in accordance with current legislation.

Electrical components must be disposed of in accordance with the relevant legislation.

Preface

Note that the Richard Western Range of Trailers may also be referred to simply as the machine(s) in the following sections.

The instructions set forth in this manual must be read carefully and followed by all persons concerned with the operation, maintenance, repair or inspection of this machine in order to prevent accidents.

Read especially sections relating to Safety and Before Operation.

The use of spare parts, accessories and additional equipment which is not originally manufactured, checked and released by Richard Western Ltd can have a negative effect on specific design features of the machine and on its operability.

This may impair its operating safety, as well as safety at work for the operator.

Richard Western Ltd will in no way be liable for damage or personal injury caused by the use of other than original Richard Western Ltd parts, accessories and additional equipment.

Technical specifications, dimensions and weights are given with the usual tolerances.

Front, rear, right and left refer to the direction of forward travel as viewed from the operators seat of the towing vehicle.

Fitment of Parts or accessories or modifications not approved in writing by Richard Western Ltd may compromise the effective and safe operation of the machines and could invalidate the warranty.

Richard Western Ltd operates a policy of continual improvement, as such some items in this manual may differ slightly from that of your machine. Richard Western Ltd reserve the right to make changes to the machine or this manual without notice.

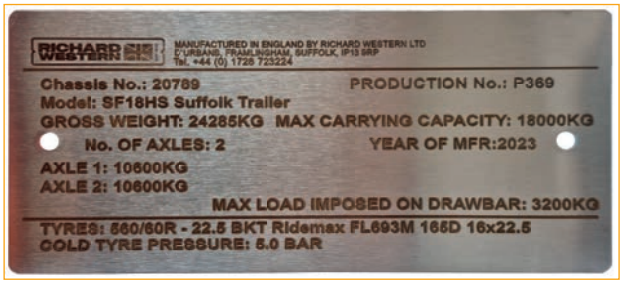
If in any doubt regarding any aspect of the design or operation of this machine contact Richard Western Ltd or your Richard Western Ltd agent for clarification.

IDENTIFICATION PLATE

The machine number (VIN), the model are required with all orders for spare parts and technical enquiries. This is necessary in order to ensure correct delivery of spare parts.

The identification plate with the machine Number (VIN) is attached to the front right side of the machine frame (**1**) on all machines

Additionally an identification number is located on the forward crossbrace of the main chassis (**2**)



ROAD TRANSPORT

Observe the applicable road regulations in your country.

Information

It is the duty of the operator to ensure that the machine is maintained and operated in accordance with all Local and National regulations.

Operating on public roads

Before operating on public roads the trailer must be correctly connected to the towing vehicle, the lights must be connected and function of the lighting equipment must be checked.

The trailers are equipped with hydraulic and/or Pneumatic braking systems. These must be correctly connected to the Towing Vehicle and checked for correct operation.

If the trailer has an air brake system the brake lines and any breakaway rope (breakaway brake) must be connected.

Number plate

To 15 m.p.h. (25 km/h) : Trailers must be fitted with a number plate issued to the vehicle owner for one of his vehicles

Over 15 m.p.h. (25 km/h) : Trailers must be fitted with a duplicate of the number plate fitted to the Towing Vehicle.

How to use this manual

The manual contains sections that cover all of the following, Safety , before and during operation, Assembly, Using the machine, Maintenance, Specifications and Technical data. Refer to the contents pages for the relevant page number.

Before use of the machine familiarise yourself with the manual and its contents.

The machine may only be operated, serviced and repaired by persons who are familiar with the machine and who have read and understood this manual, and are informed of the risks.

Observation of the relevant accident prevention regulations and other generally acknowledged regulations regarding safety, and occupational health is critical, as is conformance with local and nationally enforced standards relevant to motor vehicles and road traffic law.

Modifications to the machine without the specific approval of the manufacturer, exclude the manufacturer from any liability or damage resulting from the modifications.

Failure to follow the procedures given in this manual could invalidate the warranty given.

Safety Warnings

Identification of Warnings and Danger

All parts of the manual to do with the safety of the operator, or the safe operation of the machine, are marked with the following symbols.

WARNING

Warning

This symbol identifies that hazard exists. If proper precautions are not taken, it is highly probable that the operator (or others) could be killed or seriously injured.

CAUTION

Caution

This symbol identifies a reminder of safety practices. Failure to observe these safety practices could result in injury to the operator (or others) and possible damage to the machine.

Information

This symbol identifies instructions that make it easier to use the machine effectively and economically.

Warranty

The Richard Western range of machines are supplied with a full One Year warranty.

There are some exclusions, namely:-

- Wheels and Tyres
- Damage caused by misuse and abuse
- Damage caused by overloading
- Damage to ground engaging or suspension parts

For full details refer to the manufacturers documentation.

If you have a claim under warranty contact the manufacturer or the manufacturers agent.

Electrical Equipment

Your machine may be supplied with electrical control equipment for some of its functions.

To ensure correct operation care should be taken to ensure that these controllers are correctly connected when in use.

Ensure any damage howsoever caused is repaired immediately.

When not in use the controllers should be removed from the machine and stored in a suitable dry container on the towing vehicle or alternatively in the workshop.

If the machine is to be unused for a prolonged period of time, the open connections should covered and protected against water ingress and corrosion.

Controllers damaged by the ingress of water, water damage to electronic components or corrosion to electrical or electronic components will not be covered by the warranty agreement.

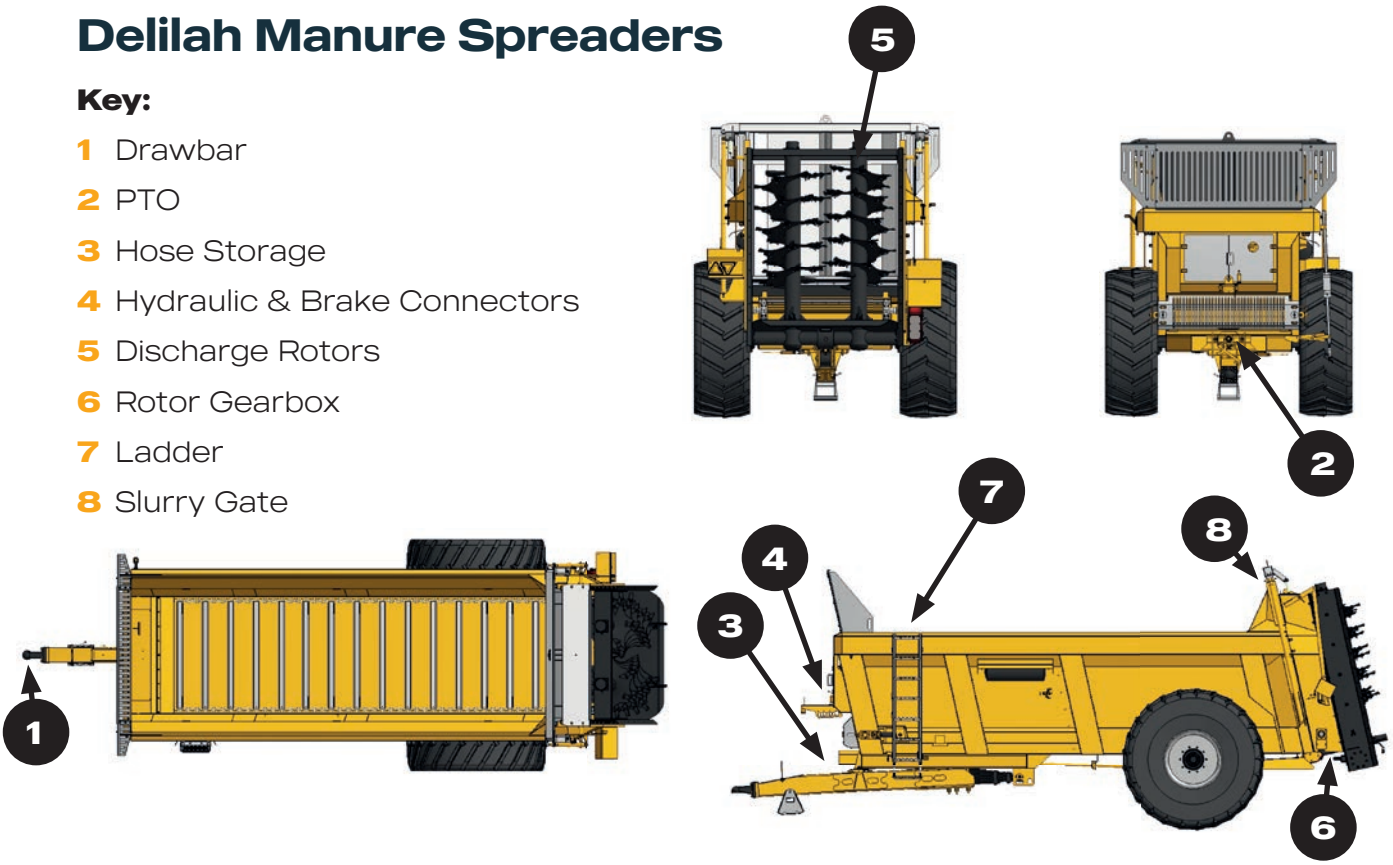
Overview

The information contained within this section identifies the major assemblies and component parts within each machine model.

Delilah Manure Spreaders

Key:

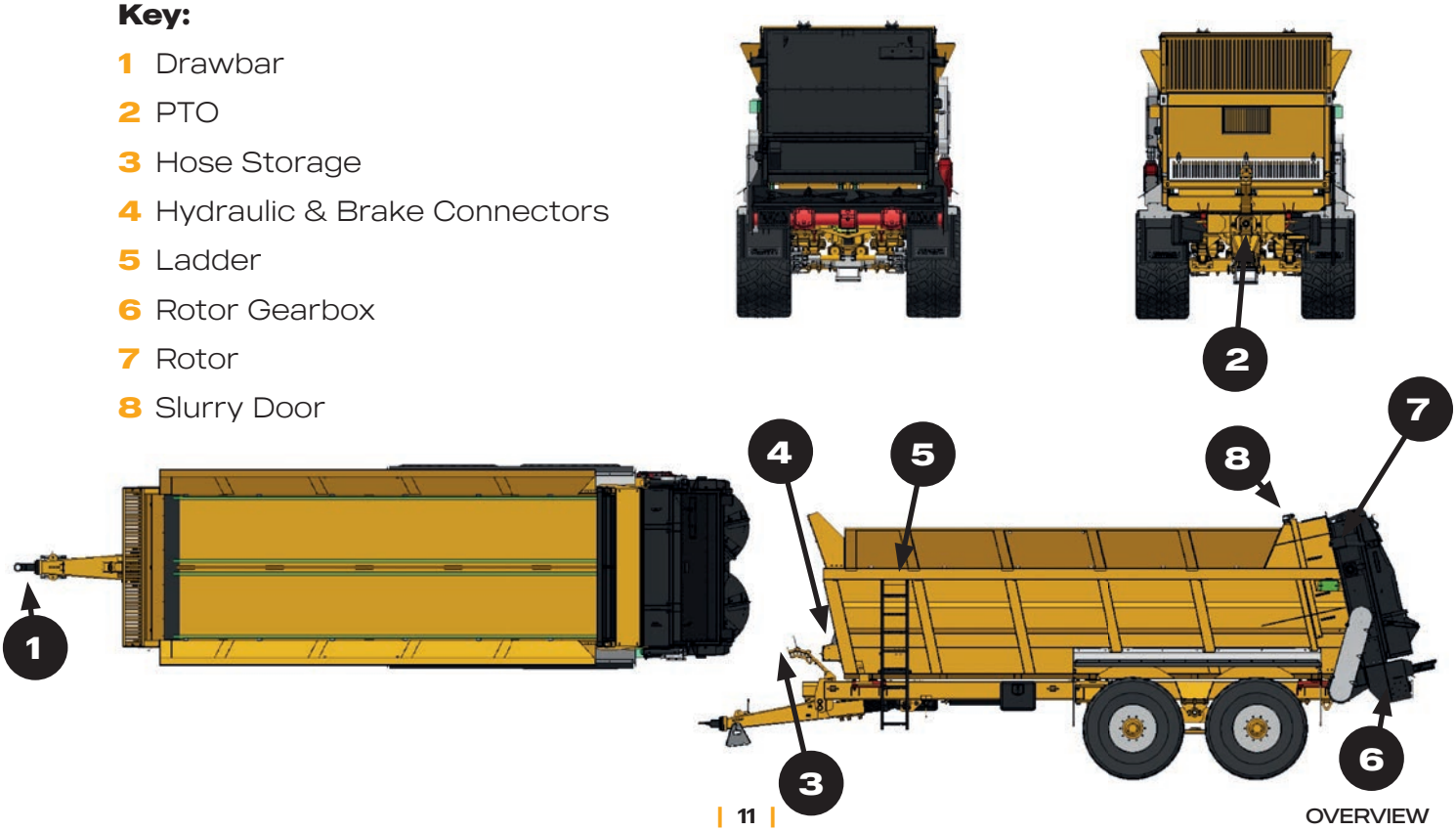
1 Drawbar
2 PTO
3 Hose Storage
4 Hydraulic & Brake Connectors
5 Discharge Rotors
6 Rotor Gearbox
7 Ladder
8 Slurry Gate



FBS Manure Spreaders

Key:

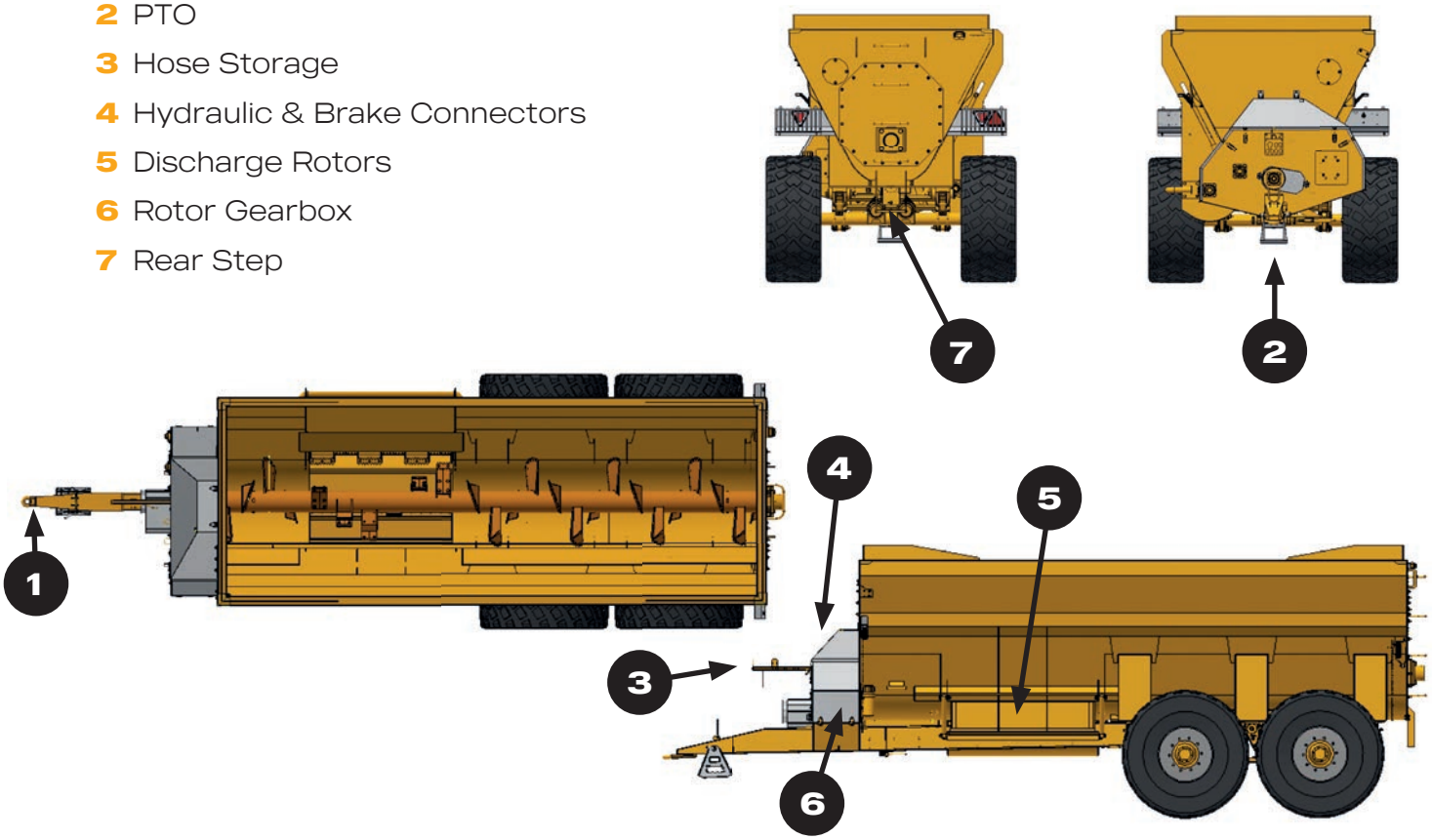
1 Drawbar
2 PTO
3 Hose Storage
4 Hydraulic & Brake Connectors
5 Ladder
6 Rotor Gearbox
7 Rotor
8 Slurry Door



SDS Manure Spreaders

Key:

1. Drawbar
2. PTO
3. Hose Storage
4. Hydraulic & Brake Connectors
5. Discharge Rotors
6. Rotor Gearbox
7. Rear Step



Safety Decals

LOCATION OF SAFETY DECALS

Safety decals & warning symbols are placed in danger areas of the machine to help identify risks of injury.

The decals fixed to a machine do not make the machine safe they are there as a guide and to direct appropriate behaviour when using the machine.

The operator is ultimately responsible for his own safety and that of other persons around the machine. Never permit anyone to ride on the trailer or to approach the trailer or any of its components whilst operating.

The information in these decals show how to avoid injury and accidents by appropriate behaviour.

The location of the decals on the machine and their wording is shown on the following pages.

Over time the manufacturer may change the type and quantity of decals. A machine may therefore contain a mixture of all of the decals shown.

The numbers against the explanation correspond to those showing the location on the illustrations.

CAUTION

Immediately replace damaged or illegible safety decals with new replacements.

When replacing parts with decals affixed to them, make sure you affix new decals again to the new parts.

Manure Spreaders

Typical

1

Overhead Power Lines

Warns the operator not to raise the body or any lifting device in the proximity of Overhead Power lines or obstructions.

2

Refer to Operators Manual

Reminds the operator to refer to the operators manual for Technical information and data.

3

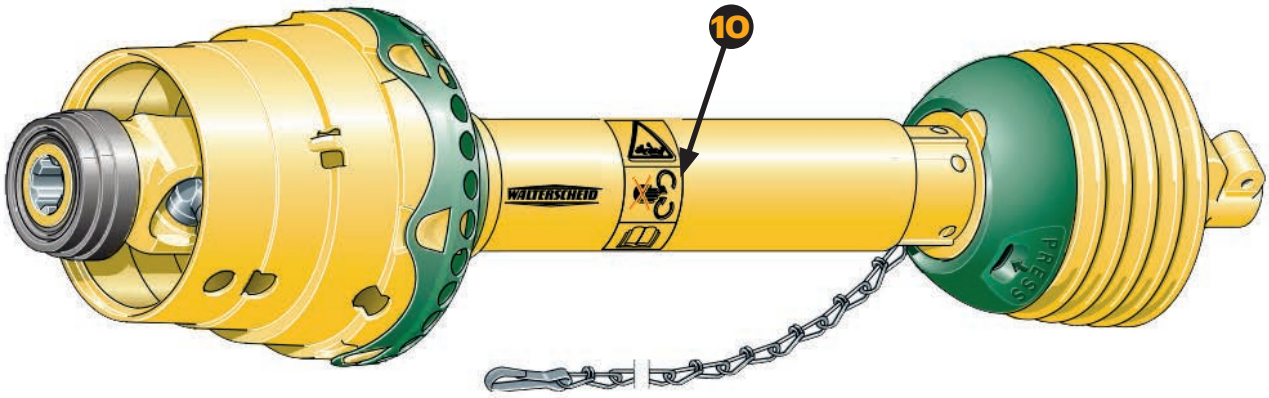
Refer to Operators Manual

Warns the operator to disable the Towing Vehicle and Isolate the trailer from any energy sources when undertaking maintenance.

4

Hydraulic & Pneumatic Pressure

Warns the operator of the danger of trapped residual pressures when coupling and de-coupling the trailer.



5

Crush Prevention

Warns the operator of the potential for crushing injuries in the area between the Trailer and Towing vehicle.

6

Crush Prevention

Reminds the operator of the need to raise the slurry door before operating the floor chains.

7

Maximum Allowable Speed

Reminds the operator of the maximum permissible towing speed.

8

Service Checks

Reminds the operator to refer to the Operators Manual for information on Tyre Pressures.

9

Service Checks

Reminds the operator to refer to the Operators Manual for information on Wheel Nut Torques.

10

Rotating Shafts

Warns the operator to refer to the Operators Manual for information related to fitting and using the rotating driveshaft and its guards.

11

Power Take Off

Reminds the operator to refer to the Operators Manual for information on Power Take Off Connection and permissible rotation Speed.

12

Rotating Shafts

Warns the operator of the danger in this area due to rotating machinery.

3

Service Check

Reminds the operator to refer to the Operators Manual for information on break checks.

13

Brake Connection Warning

Warns the operator not to connect hydraulic and air brakes at the same time.

General Safety

General Hazards

Introduction

Warnings or Cautions for hazards that may be present when operating the machine, or during maintenance of the machine, are shown in the following sections.

Before Operation

Operation

The following Warnings and Cautions are of a General nature and are not task specific.

All personnel operating or maintaining this machine must be fully aware of these warnings.

General

WARNING

Make sure the location of high voltage power lines and buried power cables are known. Serious injury or death, by electrocution, can occur if the machine contacts these hazards.

WARNING

Do not wear loose clothing or Jewellery, which can snag on the controls or machine structure, causing personal injury.

WARNING

Make sure that all protective guards and covers are secured in place on the machine. If guards and covers are removed, a hazard to personnel will exist.

WARNING

Make sure that all foreign objects and materials, such as oil, tools, debris and other items, are kept clear from equipment, walkways and steps on the machine. Failure to do this can cause personal injury.

WARNING

Always wear the correct protective equipment, including a hard hat and protective glasses, as required.

WARNING

Make sure that all loose items, such as tools, lunch boxes and other items, which are not part of the equipment, are secured correctly before operating the machine. Failure to do this can cause personal injury.

CAUTION

Machine operators must be aware of the correct hand signals and those personnel authorised to give them.

CAUTION

Operators must accept hand signals only from a single and authorised person.

CAUTION

Make sure that all fluids used during maintenance of the machine are stored in the correct containers.

CAUTION

Never store these fluids in other types, such as glass containers.

CAUTION

Make sure that all fluids are disposed of correctly and in accordance with Local Health and Safety Regulations.

CAUTION

Make sure that all cleaning fluids are used with care and that any necessary repairs are reported immediately.

CAUTION

Unauthorised personnel must not be permitted to operate or maintain this machine.

CAUTION

Make sure the size of the machine, including any load, is known. This will ensure a correct and safe clearance is maintained, when operating the machine in confined spaces or near obstacles.

General Hazards

Pressurised air and water.

WARNING

If released, air or water in pressurised machine systems can cause debris or hot water to be ejected. This can cause personal injury. Care must be taken when working on pressurised machine systems.

WARNING

Operators using pressurized air or water for cleaning purposes must wear the correct protective equipment. This includes protective clothing, shoes/ boots and goggles or face shield.

WARNING

Operators using pressurised air or water for cleaning purposes must not exceed the following maximum operating pressures:

Air - 205 kPa (30 psi)

Water - 275 kPa (40 psi).

Residual hydraulic pressure

WARNING

Refer to the Service Manual before releasing hydraulic pressure.

Non-operating hydraulic systems can retain residual hydraulic pressure. If released, this residual pressure can cause:

- Sudden movement of the machine or machine attachments.
- Disconnected hoses to whip.
- Hydraulic fluid to be sprayed, causing a personal hazard through direct contact or ingestion.

Fluid penetration

WARNING

Residual hydraulic pressure must be released before any hydraulic maintenance, disconnection or component removal is done. Refer to the Service Manual before releasing hydraulic pressure. Non-operating hydraulic systems can retain residual hydraulic pressure. If not released correctly, personal injury can occur.

WARNING

Leaking fluid, even from a pin hole leak, can penetrate the skin, causing serious injury or death. Always use cardboard or a board to check fluid leaks. If fluid penetration of the skin occurs, you must seek medical help immediately, preferably from experienced medical staff.

Fluid spillage

WARNING

Care must be taken to avoid fluid spillage during machine maintenance, testing, adjusting and repair. Before any possible fluid spillage can occur, a suit able container must be positioned to collect the fluid.

Disposal of waste material

WARNING

The disposal of waste materials, including potentially harmful fluids, must be in accordance with local Health and Safety Regulations.

Improper disposal procedures can be harmful to personnel and the environment. Always use the correct and leakproof type of container for the storage of waste fluids. Do not dispose of these fluids by pouring onto the ground, into water sources or into drains. Improper disposal procedures can be harmful to personnel and the environment.

Asbestos hazards

WARNING

Contact with asbestos must be avoided, particularly inhalation of airborne dust, which can cause serious Injury or death.

If it becomes necessary to come into contact with asbestos, you must use the guidelines that follow:

Avoid creating dust if handling debris or components that may contain asbestos, such as brake pads and bands, liner material, clutch plates and some gaskets. Never use compressed air for cleaning purposes.

Avoid machining or brushing materials that may contain asbestos.

Before disposal, use a wet, damping down method to concentrate material dust and debris.

If possible, a vacuum cleaner fitted with a high particle air filter (HEPA), should be used to collect debris and dust. Use exhaust ventilation on permanent machining work.

Wear an approved respirator if there is no other way to control any dust produced. Always comply with the applicable environmental regulations for the disposal of asbestos.

Stay away from areas that may contain airborne asbestos particles.

Always comply with the applicable rules and regulations for the work place.

Use genuine Richard Western equipment, components and parts, which are supplied asbestos free.

Crushing or cutting prevention

WARNING

Support equipment correctly before you do any work or maintenance from beneath that equipment.

WARNING

Unless instructed otherwise, never attempt to do adjustments whilst the machine is moving or the engine or other power source is running.

WARNING

Clearances in machine control linkages will change with control operation or machine movement. Always keep clear of controls or areas that may experience clearance changes.

WARNING

Always keep clear of rotating or moving parts of the machine. Always re-install any guard or cover that has temporarily removed.

WARNING

When handling cables, always wear protective gloves. Never use kinked or frayed cables.

WARNING

Striking any object can cause debris chips to fly off, causing personal injury. Always wear protective glasses/goggles before striking an object and make sure that the area is clear of other personnel.

WARNING

If a retaining pin is struck with force, it may be ejected and cause personal injury. Always wear protective glasses/ goggles before striking a retaining pin and make sure that the area is clear of other personnel.

General Hazards

Burn prevention

WARNING

Some components will get hot during operation, causing a potential burn hazard to personnel. Before you do any maintenance on these parts, you must:

WARNING

- Always allow these parts to fully cool before you do any maintenance work.

WARNING

- Always release residual pressure in the air, hydraulic and lubrication systems and associated pipe lines/ hoses, before you do any maintenance work.

WARNING

- Hot fluids and surfaces can cause personal injury. Avoid direct contact with hot fluid or surfaces.

Fire and Explosion prevention

WARNING

If a Fire extinguisher is fitted, make sure It is available and in a fully charged and serviceable condition.

CAUTION

Make sure you are fully aware of the operating instructions for the fire extinguisher.

Inspect and service the fire extinguisher at regular intervals or in accordance with the manufacturers instructions.

WARNING

All fuels, most lubricants and some coolant mixtures are flammable and if leaking onto a hot surface or electrical components, can create a fire. Fire can cause severe personal injury or death.

WARNING

Do not operate the machine close a naked flame or heat source.

WARNING

Always clean pipes and thoroughly with a non-flammable solvent first.

WARNING

Examine all electrical wires daily and check and tighten all electrical connections. If necessary, repair loose or frayed wires before you operate the machine.

WARNING

Dust produced from repairs to Non-metallic components, such as hoods or fenders, can be flammable. Always repair such components in a well ventilated area, away from naked flame and heat sources.

WARNING

Leaking pipes and hoses can cause a fire. Examine all pipes, hoses and associated supports for wear, deterioration and damage and ensure hat pipe and hose clamps are secure. Make sure pipe and hose connections are correctly torqued.

WARNING

Remove all flammable materials such as fuel, oil and debris from the machine. Do not allow the accumulation of flammable materials on or around the machine.

WARNING

Always store fuels and lubricants in the correct and properly marked containers and away from unauthorised personnel.

WARNING

Always store soiled oily rags and other flammable materials in protective containers.

WARNING

Do not smoke in areas that are used for the storage of flammable materials.

WARNING

Do not operate the machine close to naked flames.

WARNING

Make sure that heat shields, installed to prevent fluids or fluid spray from igniting, are fitted correctly.

WARNING

Do not weld or flame cut any pipes or tanks that contain flammable fluids or gases. Always clean such pipes and tanks thoroughly with a non-flammable solvent first.

Pipes, tubes and hoses

WARNING

Leaks from loose or damaged pipes, tubes or hoses can cause a system failure or a fire. Examine pipes, tubes and hoses regularly, particularly for signs of damage, leaks or being loose.

WARNING

Never use bare hands to check for leaks from pipes, tubes or hoses. Always use cardboard or a board and if necessary, torque connections to the recommended value.

CAUTION

Do not bend or strike high pressure pipes or install a bent or damaged high pressure pipe.

You must replace any pipe, tube or hose if:

CAUTION

- End fittings are damaged or leaking. Outer coverings are chafed or cut. Wires are exposed. Outer covering is blistered or ballooning. Flexible portion of a hose is kinked. Outer covers have embedded armouring. End fittings are damaged or displaced.

CAUTION

- Clamps, guards and heat shields are installed to prevent vibration, contact between components and excessive heat. Make sure that all clamps, guards and heat shields are installed correctly.

Tyre hazards

WARNING

An air inflated tyre can expand and explode if excessive heat is applied through welding, heating rim components, external fire or excessive use of the brakes. An exploding tyre can eject axle and wheel debris 500m (1500 ft) or more from the vehicle, causing damage and possibly personal injury or death. All personnel must be aware of the hazards of overheating tyres.

WARNING

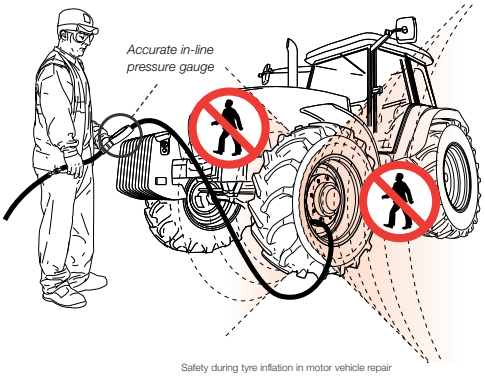
An over-inflated tyre can blow out or cause a rim failure. This can cause damage or personal injury. Inflation of tyres must only be done by trained personnel.

WARNING

When you inflate a tyre, you must stand behind the tyre tread and use a self-attaching inflator.

WARNING

Do not approach a warm or hot tyre. Keep the minimum distances away from the tyre and stay outside the shaded areas (refer to illustration below).



Safety during tyre inflation in motor vehicle repair

WARNING

Maintenance on tyres and rims can be hazardous. The use of incorrect procedures can result in a tyre exploding. An exploding tyre can eject axle and wheel debris 500m (1500 ft) or more from the vehicle, causing damage and possibly personal injury or death. Maintenance on tyres and rims must be done only by trained personnel, using the correct tools and procedures. The tyre dealer or manufacturers instructions must be followed.

General Hazards

Mounting and dismounting

WARNING

You must never attempt to mount, dismount or jump from a machine that is moving.

WARNING

Always mount or dismount the machine at the recognised locations, which have steps and/or hand holds. Make sure the steps and/or hand hold are clean and examined regularly. Make any necessary repairs.

CAUTION

When you mount or dismount the machine, always keep a three-point contact with the steps and hand holds. Three-point contact can be two feet/one hand or two hands/one foot.

CAUTION

When you mount or dismount the machine, always face the machine and never attempt to carry tools or supplies. Tools and supplies should be raised or lowered from the machine using a hand line or other suitable method.

Before operating the machine

CAUTION

This machine must be operated only by correctly trained and authorised personnel. Certain local operating conditions may require the machine operator to obtain an operators licence or a certificate.

CAUTION

The machine operator must be fully aware of the machines capabilities and limitations. The operator must also be familiar with the local working area or site and in particular:

CAUTION

Check the area for vertical and horizontal clearances. Check for overhead obstructions.
Check for electrical power lines and make sure the machine keeps at least 8m (25 ft) away.

CAUTION

Check the work area or site for changes in the stability of the ground surface, back filled trenches and structural integrity of buildings, roofs etc.

CAUTION

Make sure that all protective guards and covers are correctly installed on the vehicle.

CAUTION

Make sure that if the machine is equipped with a fully working lighting system that is adequate for the working conditions, and is compliant with local or national road traffic regulations.

CAUTION

Make sure that the machine reverse alarm and other warning devices are in full working order.

CAUTION

Make sure that all obstacles are cleared from the intended path or route of the machine.

CAUTION

Make sure that before the machine is moved, there are no personnel on, under or near the machine.

WARNING

Collision of high speed road traffic and slow moving machines can cause personal injury or death. When on a public road, use a flashing beacon and other lights according to local laws. Use a Slow Moving Vehicle (SMV) emblem displayed at the rear of the machine where this is a national requirement. Pull over to let faster traffic pass. Signal and slow down before turning off the road.

WARNING

Use warning devices (flags, SMV emblem, lights, etc.) which are approved for use by your local government agencies, when using equipment on public roads. Keep these devices clean and in good working order.

GENERAL SAFETY INSTRUCTIONS

Check that the machine is roadworthy and safe to operate every time it is put into operation!

1. Observe the current regulations regarding safety and accident prevention as well as the information in the operator's manual.
2. When using public roads observe all traffic regulations.
3. Make yourself familiar with all equipment and controls and their functions before starting work as it will be too late once you have set off.
4. Make sure that there is no one in close proximity to the machine before putting it into operation (Be especially aware of children!).

   Check that visibility is good, particularly when reversing (have someone direct you if necessary).
5. Clothing worn by the operator must be close-fitting. Avoid wearing loose fitting clothing when operating or maintaining the machine
6. Keep the machine clean to prevent fire.
7. If it is necessary to access the machine, the Engine of the towing vehicle must be switched off. The ignition key of the towing vehicle must be removed.
8. Any safety guards must be checked regularly for wear and replaced if necessary.
9. Any safety decals that are missing must be replaced immediately.

GENERAL

1. Use only the recommended fastenings on the machine!
2. Do not exceed the maximum load on the trailer drawbar
3. Use extreme caution when coupling and uncoupling the machine from the towing vehicle to avoid risk of injury.
4. During maintenance or after use prevent the machine from rolling away by use of the parking brake or wheel chocks.
5. A risk of injury due to crushing exists in the vicinity of the Towing vehicle 3-point linkage!
6. Couple and uncouple the machine to the towing vehicle only as specified in the instructions.
7. The performance of the towing vehicle can be influenced by the machine, ensure the towing vehicle has sufficient steering and braking capacity.
8. Make sure no one is between the machine and the towing vehicle unless both are secured and prevented from moving.
9. The travel speed must always be matched to the under wheel conditions. Avoid sudden turns and braking when driving up or down hill or across a slope.
10. Observe the maximum permissible axle loads and total weights!
11. Operate the machine only when all guards are fitted and in the correct position!
12. Ensure that the machine is stable when parked.
13. Ensure all equipment is placed in the transport position before driving on the road.
14. Always switch off the engine of the towing vehicle before carrying out troubleshooting, and for repair, maintenance and cleaning work. Remove the towing vehicle ignition key.

15. When working under raised covers ensure that they are sufficiently supported.
16. When handling sharp-edged parts, wear appropriate protection (gloves, shoes etc.).
17. Do not stand near hinged covers.

BRAKES

1. Check the brakes before every journey.
2. Check the brake system thoroughly at regular intervals.
3. If the brake system malfunctions, do not use the machine, stop the towing vehicle immediately. Repair faults immediately.
4. Any adjustments and repairs to the brake System must be carried out by your Richard Western agent or approved specialist work shop.
5. Engage a lower gear before going downhill.
6. Engage the parking brake before coupling or uncoupling the towing vehicle.
7. The brakes must always be correctly adjusted. No liability can be accepted for normal wear or unauthorised modifications.

HYDRAULIC SYSTEM

1. The hydraulic system is under high pressure!
2. When connecting the hydraulic hoses to the towing vehicle hydraulics, make sure that the hydraulic systems are depressurised on the tractor side and on the machine side.
4. The female and male couplings between the tractor and the machine should be labelled to prevent incorrect connections. If connections are reversed (e.g. lifting/ lowering), there is a risk of accident.
5. Keep the hydraulic plugs clean.
6. Check hydraulic lines at regular intervals, and replace them if they are damaged.
7. Any replaced hydraulic lines must meet the technical requirements of the manufacturer!
10. The towing vehicle engine must be switched off and the system depressurised before starting work on the hydraulic system.
11. Repair work on the hydraulic system must be carried out by approved specialised work shops only.

WHEELS AND TYRES

1. Repair work to the tyres must be carried out by qualified technicians using suitable tools.
2. When working on the wheels make sure that the trailer is secured and that wheels are chocked to prevent it from moving.
3. Tighten the wheel nuts after the first trip with a load.
4. After replacing the wheels retighten the wheel nuts or bolts after the first 10 operating hours, then check them every 50 hours.
5. Make sure that the jack used has sufficient load capacity.
6. Avoid excessive inflation pressure.
7. The specified tyre pressure must be maintained.
8. Stand clear of the tyre when inflating.
9. Check the pressure regularly.
10. Regularly check nuts and screws for tightness and retighten them, if necessary.
11. All mounting bolts and nuts must be tightened to the torque specified by the manufacturer.

MAINTENANCE

1. Always switch off the towing vehicle engine before carrying out any troubleshooting, and before all repair, maintenance and cleaning work. Remove the ignition key!
2. Use suitable tools and wear safety gloves when replacing working parts!
3. Always disconnect the power supply before working on the electrical system!
4. Protection devices that are subjected to wear must be checked at regular intervals and replaced as necessary.

Specifications

INTRODUCTION

This section contains tables covering the general specification of the machine, dimensions , weights and capacities.

All information given is subject to alteration without notice and is subject to manufacturing tolerances.

If in doubt contact the manufacturer or the manufacturers agent for further information or advice.

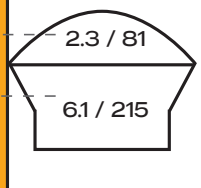
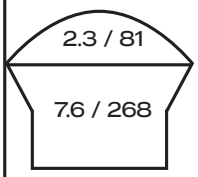
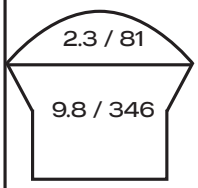
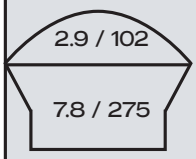
CAUTION

A number of factors may cause the overall dimensions to change EG Tyre pressures, etc. Always check actual dimensions before entering confined areas buildings and vehicles.

General Specification

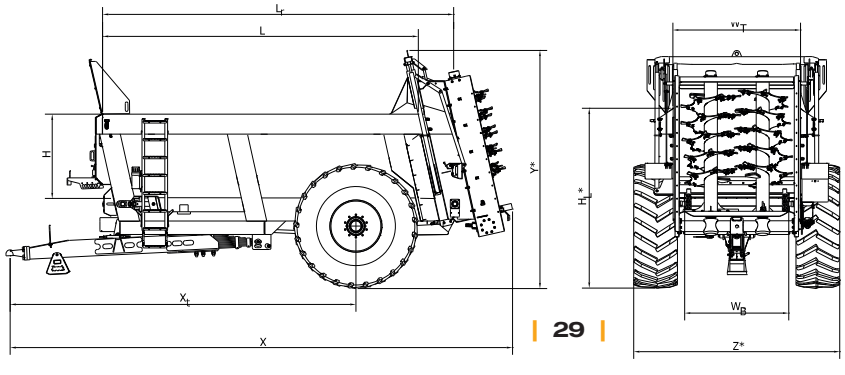
Model			DELILAH	FBS	SDS
Electric System					
Voltage		V	12 V DC	12 V DC	12 V DC
Current (cont)		A	10A	10A	10A
Current (max)		A	15A	15A	15A
Braking System					
Standard			Single line hydraulic brakes		
Option	1		**Eurosafe (™)** Hydraulic Failsafe with Load Sensing & ABS options		
Option	2		Dual line airbrakes		
Speed					
Standard braking system		kmh	32	32	32
Option	1	kmh	32	32	32
Option	2	kmh	Max towing vehicle speed	Max towing vehicle speed	Max towing vehicle speed
Hydraulic System					
Supply			As towing vehicle	As towing vehicle	As towing vehicle
Hyd working pressure		bar	As towing vehicle	As towing vehicle	As towing vehicle
Max hydraulic pressure		bar	200	200	200
Max hydraulic flowrate		l/min	75	75	75
Noise		dB(A)	< 70	< 70	< 70

Delilah DV Series Specification

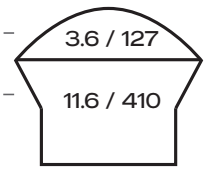
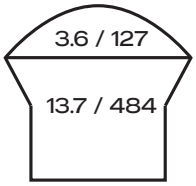
New Model Name	DV080		DV100		DV120		DV110	
Previous Model Name			D4080		D4100 COMPACT		D4095	
Chassis Size	Short		Short		Short		Medium	
Heap volume (m3 / cu ft) Level fill (m3 / cu ft) Internal dimensions and volumes measured with slurry door								
Heaped fill (m3 / cu ft) to slurry gate (Europe)	8.4	297	9.9	350	12.1	427	10.7	378
Heaped fill (m3 / cu ft) to centre of Rotors (UK)	9.7	343	11.5	406	14.1	498	11.3	399
Axle Carrying capacity (kg)	14,000		14,000		14,000		14,000	
Axle beam (mm / inch)	150x150x15	6x6x19/32"	150x150x15	6x6x19/32"	150x150x15	6x6x19/32"	150x150x15	6x6x19/32"
Brake size (ØxW, mm / inch)	420x180	16.53x7.08"	420x180	16.53x7.08"	420x180	16.53x7.08"	420x180	16.53x7.08"
Standard tyre size	23.1x26		23.1x26		580/70R38		23.1x26	
Rotor Ø (mm / inch)	890	35.03"	890	35.03"	890	35.03"	890	35.03"
Floor chains (qty x Ø, mm / inch)	2 x 16mm	2 x 5/8"	2 x 16mm	2 x 5/8"	2 X 16mm	2 x 5/8"	2 x 16mm	2 x 5/8"
Floor driveshaft Ø (mm / inch)	65	2 9/16	65	2 9/16	65	2 9/16	65	2 9/16
Power requirement (hp)	80		95		125		105	
PTO speed (rpm)	1000		1000		1000		1000	
Tare weight (kg)	4,895		4,895		4,995		5,530	
Floor drive torque (Nm)	5000		5000		5000		5000	
DIMENSIONS	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)
X, Overall length (mm / inch)	6,430	253"	6,430	253"	6,430	253"	7,475	294"
Y*, Overall height (mm / inch)	3,313	130"	3,313	130"	3,433	135"	3,020	119"
Z*, Overall width (mm / inch)	2,995	118"	2,995	118"	2,995	118"	2,995	118"
L, Interior length (mm / inch)	3,700	146"	3,700	146"	3,700	146"	4,700	185"
L_r, Interior length to rotor centre (mm / inch)	4,324	170"	4,271	168"	4,271	168"	5,267	207"
W_B, Interior width at bottom (mm / inch)	1,550	61"	1,550	61"	1,550	61"	1,550	61"
W_T, Interior width at top - loading width (mm / inch)	2,125	84"	2,125	84"	2,125	84"	2,125	84"
H, Interior height (mm / inch)	1,000	39"	1,250	49"	1,500	59"	1,000	39"
H_L*, Loading height (mm / inch)	2,200	87"	2,450	96"	2,820	111"	2,200	87"
X_t Towing Eye to centre of Axle (mm / inch)	4,280	169"	4,280	169"	4,280	169"	5,124	202"

* Dimension dependent on tyre sizing (580/70R38 shown)

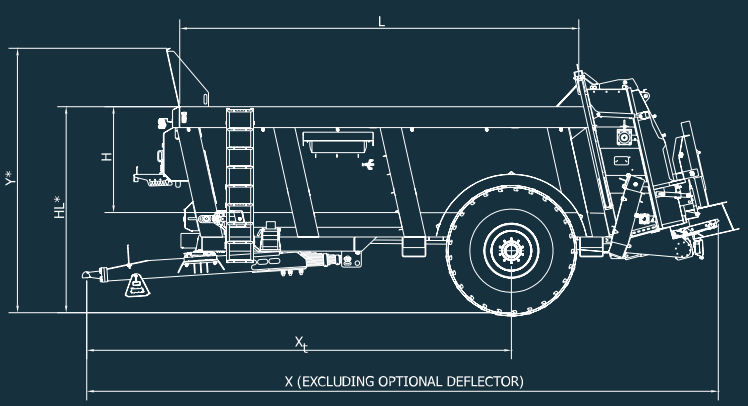
	DV125		DV145		DV130		DV150		DV175		DV150HD		DV175HD	
	D4100		D4120 Compact				D4120		D4140		D4130		D4150	
	Medium		Medium		Long		Long		Long		Long HD		Long HD	
	3 / 106 9.6 / 339		3 / 106 11.5 / 406		3.6 / 127 9.4 / 332		3.6 / 127 11.6 / 410		3.6 / 127 13.7 / 484		3.6 / 127 11.6 / 410		3.6 / 127 13.7 / 484	
	12.6	445	14.5	512	13.0	459	15.2	537	17.3	611	15.2	537	17.3	611
	13.8	487	15.9	562	14.1	498	16.5	583	18.8	664	16.6	586	19.1	675
	14,000		16,200		16,200		16,200		16,200		16,200		16,200	
	150x150x15	6x6x$^{19}/_{32}$"	150x150x16	6x6x$^{5}/_{8}$"	150x150x16	6x6x$^{5}/_{8}$"	150x150x16	6x6x$^{5}/_{8}$"	150x150x16	6x6x$^{5}/_{8}$"	150x150x16	6x6x$^{5}/_{8}$"	150x150x16	6x6x$^{5}/_{8}$"
	420x180	16.53x7.08"	420x220	16.53x8.66"	420x220	16.53x8.66"	420x220	16.53x8.66"	420x220	16.53x8.66"	420x220	16.53x8.66"	420x220	16.53x8.66"
	580/70R38		580/70R38		580/70R38		580/70R38		580/70R38		580/70R38		580/70R38	
	890	35.03"	890	35.03"	890	35.03"	890	35.03"	890	35.03"	1100	43.30"	1100	43.30"
	2 x 16mm	2 x$^{5}/_{8}$"	2 X 16mm	2 x$^{5}/_{8}$"	2 x 16mm	2 x$^{5}/_{8}$"	2 x 16mm	2 x$^{5}/_{8}$"	2 x 16mm	2 x$^{5}/_{8}$"	2 x 20mm	2 x$^{5}/_{8}$"	2 x 20mm	2 x$^{5}/_{8}$"
	65	2 $^{9}/_{16}$	65	2 $^{9}/_{16}$	65	2 $^{9}/_{16}$	65	2 $^{9}/_{16}$	65	2 $^{9}/_{16}$	80	3 $^{5}/_{32}$	80	3 $^{5}/_{32}$
	125		150		150		150		160		170		180	
	1000		1000		1000		1000		1000		1000		1000	
	5,630		5,730		6,120		6,120		6,220		6,120		6,500	
	5000		6500		6500		6500		10000		6500		10000	
	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)	(mm)	(in)
	7,475	294"	7,475	294"	8,475	334"	8,475	334"	8,475	334"	8,475	334"	8,475	334"
	3,433	135"	3,637	143"	3,020	119"	3,433	135"	3,637	143"	3,433	135"	3,637	143"
	2,995	118"	2,995	118"	2,995	118"	2,995	118"	2,995	118"	2,995	118"	2,995	118"
	4,700	185"	4,700	185"	5,700	224"	5,700	224"	5,700	224"	5,700	224"	5,700	224"
	5,214	205"	5,270	207"	6,163	243"	6,216	245"	6,216	245"	6,265	247"	6,321	249"
	1,550	61"	1,550	61"	1,550	61"	1,550	61"	1,550	61"	1,550	61"	1,550	61"
	2,125	84"	2,125	84"	2,125	84"	2,125	84"	2,125	84"	2,125	84"	2,125	84"
	1,250	49"	1,500	59"	1,000	39"	1,250	49"	1,500	59"	1,250	49"	1,500	59"
	2,570	101"	2,820	111"	2,320	91"	2,570	101"	2,820	111"	2,570	101"	2,820	111"
	5,124	202"	5,124	202"	5,943	234"	5,943	234"	5,943	234"	5,943	234"	5,943	234"

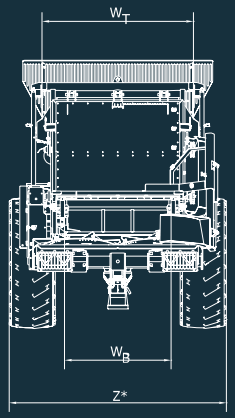


Delilah DS Series Specification

New Model Name	DS150HD		DS175HD	
Previous Model Name	D5130		D5150	
Chassis Size	Long		Long	
Heap volume (m3 / cu ft) Level fill (m3 / cu ft) Internal dimensions and volumes measured with slurry door				
Heaped fill (m3 / cu ft) to slurry gate (Europe)	15.2	537	17.3	611
Axle Carrying capacity (kg)	16,200		16,200	
Axle beam (mm / inch)	150x150x16	6x6x 5/8"	150x150x16	6x6x 5/8"
Brake size (ØxW, mm / inch)	420x220	16.53x8.66"	420x220	16.53x8.66"
Standard tyre size	580/70R38		580/70R38	
Rotor Ø (mm / inch)	1100	43.30"	1100	43.30"
Floor chains (qty x Ø, mm / inch)	2 x 20mm	2 x 25/32"	2 x 20mm	2 x 25/32"
Floor driveshaft Ø (mm / inch)	80	3 5/32"	80	3 5/32"
Power requirement (hp)	150		180	
PTO speed (rpm)	1000		1000	
Tare weight (kg)	6,120		6,500	
Floor drive torque (Nm)	6500		10000	
DIMENSIONS	(mm)	(in)	(mm)	(in)
X, Overall length (mm / inch)	8,475	334"	8,475	334"
Y*, Overall height (mm / inch)	3,433	135"	3,637	143"
Z*, Overall width (mm / inch)	2,995	118"	2,995	118"
L, Interior length (mm / inch)	5,700	224"	5,700	224"
W_B, Interior width at bottom (mm / inch)	1,550	61"	1,550	61"
W_T, Interior width at top - loading width (mm / inch)	2,125	84"	2,125	84"
H, Interior height (mm / inch)	1,250	49"	1,500	59"
H_L*, Loading height (mm / inch)	2,570	101"	2,820	111"
X_t Towing Eye to centre of Axle (mm / inch)	5,943	234"	5,943	234"

* Dimension dependent on tyre sizing (580/70R38 shown)

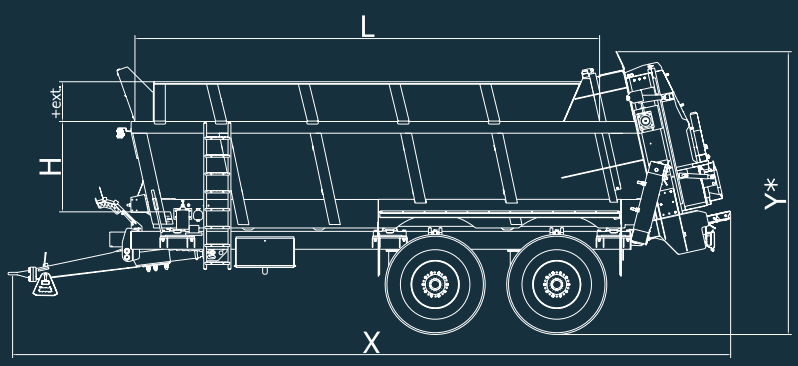


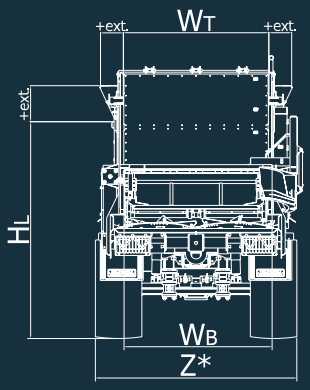


FBS Specification

Specifications	FBS12	FBS16	FBS18
Heap volume (m^3)	4.6	4.9	5.8
Level fill with extensions (m^3)	6.1	6.6	7.8
Level fill (m^3)	10.3	12.2	14.4
Internal dimensions and volumes measured with slurry door			
Heaped fill (m^3)	13.4	15.8	18.6
Heaped fill w/ extensions (m^3)	21.0	23.7	28.0
Carrying capacity (kg)	22,500	25,000	25,000
Axles (Qty x track/beam, mm)	2 x 2,000/ Ø127x16	2 x 2,000/ 150x150x12	2 x 2,000/ 150x150x12
Brake size (ØxW, mm)	420x180	420x180	420x180
Standard tyre size	560/60R22.5	560/60R22.5	560/60R22.5
Disc/rotor Ø (mm)	1100	1100	1100
Floor chains (qty x Ø, mm)	4 x 14mm	4 x 14mm	4 x 14mm
Floor driveshaft Ø (mm)	60	60	60
Power requirement (hp)	180	220	250
PTO speed (rpm)	1000	1000	1000
Tare weight (kg)	8,200	9,600	10,800
DIMENSIONS			
X, Overall length (mm)	8,170	9,150	10,040
Y*, Overall height (mm)	3,500	3,500	3,500
Z*, Overall width (mm)	2,600	2,600	2,600
L, Interior length (mm)	4,675	5,340	6,290
W_B, Interior width at bottom (mm)	2,000	2,000	2,000
W_T, Interior width at top – loading (std/ext, mm)	2,000/2,650	2,000/2,650	2,000/2,650
H, Interior height (std/ext, mm)	1,090/1,650	1,090/1,650	1,090/1,650
H_L*, Loading height (std/ext, mm)	2,660/3,060	2,660/3,060	2,660/3,060

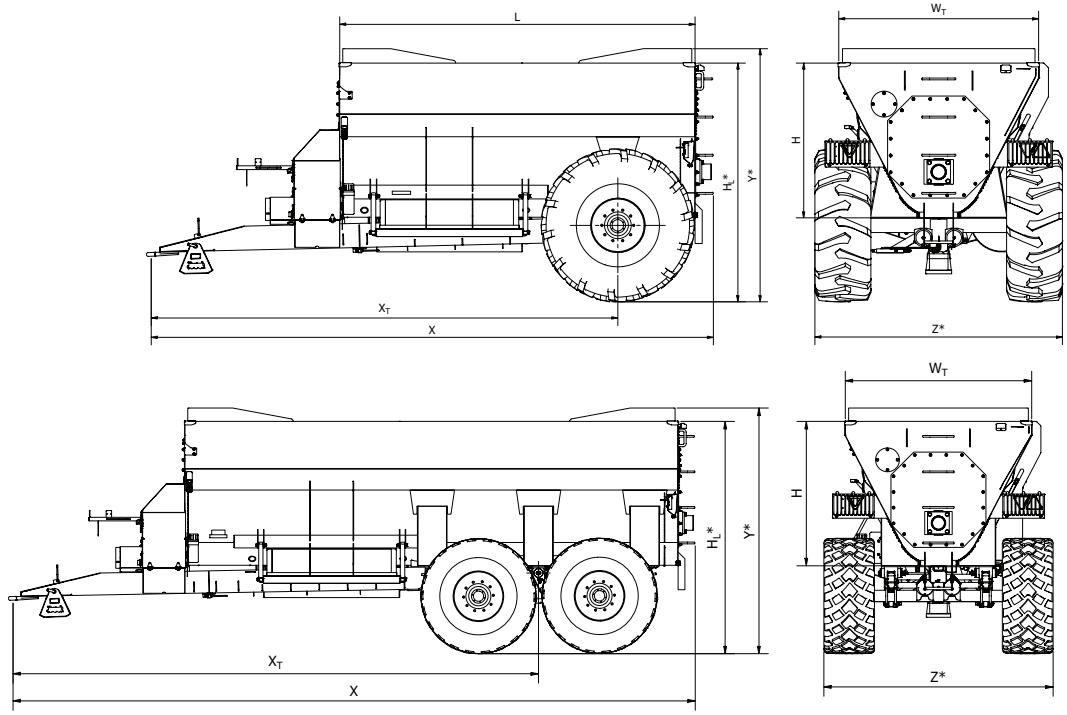
* Dimension dependent on tyre sizing (560/60R22.5 shown)





SDS Manure Spreaders Specification

Model	SDS16	SDS20	SDS24	SDS24T	SDS30T	SDS36T
Level Fill (m^3)	7.3	9.1	10.9	10.9	13.8	16.4
Carrying Capacity (kg)	7250	9090	10900	10900	13600	13600
Axles (Qty x track/beam, mm)	1 X 2000/150 X 150 X 12	1 X 2000/150 X 150 X 12	1 X 2000/150 X 150 X 12	2 X 2000/ Ø127	2 X 2000/ Ø127	2 X 2000/ Ø127
Brake Size (ØxW, mm)	420 X 180	420 X 180	420 X 180	420 X 180	420 X 180	420 X 180
Standard Tyre Size	23.1-26	23.1-27	580/70R38	560/60R22.5	560/60R22.5	560/60R22.5
Power Requirement (hp)	120	135	150	150	165	180
PTO Speed (rpm)	540	540	540	540	540	540
Tare Weight (kg)	4500	5125	5750	6250	6750	6900
DIMENSIONS	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
X, Overall Length (mm)	5900	6694	7680	7680	7680	7680
Y*, Overall Height (mm)	2630	2630	2630	2753	3000	3245
Z*, Overall Width (mm)	2597	2597	2697	2580	2580	2580
L, Interior Length (mm)	3725	4546	5546	5546	5546	5546
W^T, Interior Width at Top (mm)	1913	1913	1913	1913	1913	1913
H, Interior Height (mm)	1624	1624	1624	1624	1870	2116
H_L*, Loading Height (mm)	2478	2478	2478	2603	2850	3095
X_T, Towing Eye to Centre of Axle/ Suspension (mm)	4893	5179	5532	5909	5909	5909



Transportation & Handling

Richard Western Trailers are generally delivered ready for use.

However in some circumstances it is necessary to remove certain components for shipment and/or storage, these will need to be fitted before use.

General instructions for the fitting of these components are given in the following pages, for further information refer to your Richard Western agent.

WARNING

Assembling the machine should only be undertaken by a competent person. If in doubt about any procedure refer to the manufacturer or the manufacturers agent for further information.

WARNING

When working on the machine always ensure that the Towing vehicle engine is turned off and the Key removed.

PTO Driveshaft

The PTO Driveshaft is supplied loose with the machine. Ensure it is removed before use.

Before Operation

WARNING

When working on the machine always ensure that the Towing vehicle engine is turned off and the Key removed.

CAUTION

Dirty Quick release couplings can cause increased wear in Hydraulic pumps and Air Compressors. Incorrectly connected couplings can cause failure within the system. Always clean the couplings before connecting them.

BEFORE OPERATION CHECK THE FOLLOWING

1. The towing vehicle must be equipped for operation hydraulically with at least one feed and one free flow return.
2. Trailer Braking System
   The machines can be fitted with one of the two different types of brake systems (this may differ and be dependant on locally or nationally enforced traffic regulations:
   - Air brake system (dual-circuit system).
   - Hydraulically operated brake system.

   The towing vehicle brake system must be the same as that of the machine.

   Machines to be towed at speeds above 32 km/h (20 mph) are to be equipped with an ABS air brake system.
3. Check the brakes before every journey.
4. Check safety equipment for function and correct position.
5. Thoroughly lubricate the machine before operation.
6. Check all Bolts and Nuts are tight.
7. Couple the towing vehicle to the trailer at idle speed only.
8. Before connecting Air and Hydraulic lines turn off the engine of the towing vehicle and ensure the connections are clean.
9. Check the wheel nuts for tightness (see Specification section).
10. Check tyres for correct inflation pressures. Correct if necessary (see Specification section).
11. If a wheel is changed check the wheel nut torques after 10hrs of operation, and every 10 hours until the torque is maintained (see Specification section).
12. Wheels must be changed using a jack with sufficient lifting capacity for the weight of the machine.
13. Make sure that there are no loose parts on the machine and the towing vehicle before moving off. Secure or cover parts which could fall off during travel.
14. Make sure no persons are in the danger areas before moving off or raising the body. If any person approaches the danger areas turn off the Towing vehicles engine immediately and make safe.
15. When connecting the Air, Electric and hydraulic lines to the Towing vehicle, ensure they are fixed in a way which allows their full articulation as the machine steers.
16. Ensure the Air, Electric and hydraulic lines cannot be trapped or chaffed by moving parts during operation.

Coupling to the Towing Vehicle - Hitch

Reverse the towing vehicle until the tow hitch **(1)** is located beneath the Eye **(2)**

Raise the tow hitch **(1)** and lock into the raised position. Use chaining point **(3)** for secondary coupling.

Uncoupling from the Towing Vehicle - Hitch Ensure the tipping body is lowered fully.

Ensure the drawbar is in the tow position.

Lower the trailer onto the drawbar foot or Skid.

Decouple all hoses and electrical connections.

Apply the parking brake.

Unhitch the trailer.

WARNING

Ensure all personnel are outside of the danger area between the Towing Vehicle and Trailer before reversing.

WARNING

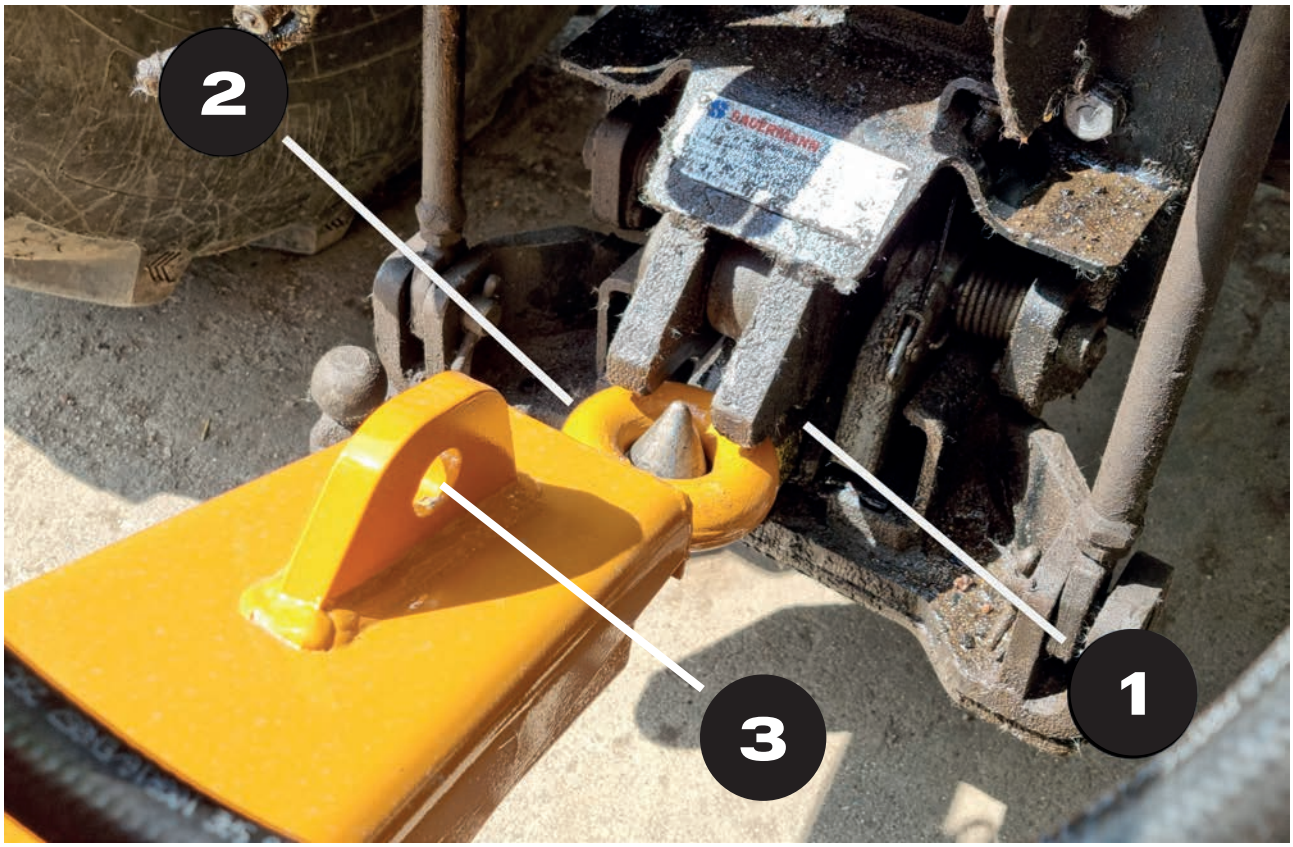
Check that the trailer is properly and securely attached to the Towing Vehicle before moving off.

CAUTION

Always park the trailer on firm level ground.

CAUTION

Check the Eye periodically for signs of damage or wear. Replace as required.



Coupling to the Towing Vehicle

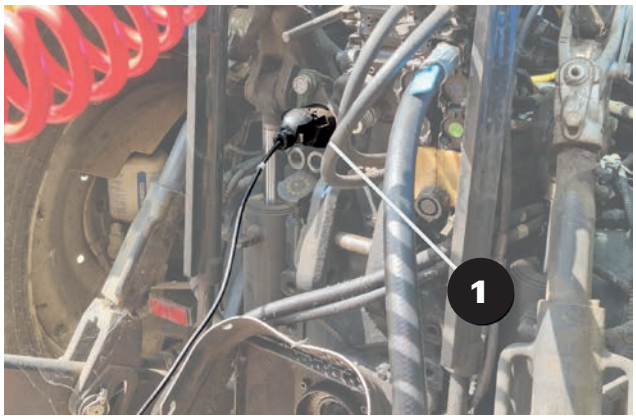
Air Braking Connections

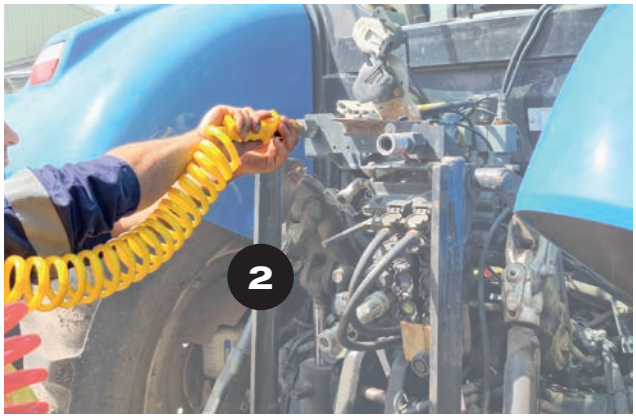
Connect Seven Pin Trailer Electric connector **(1)** to towing vehicle trailer lighting socket.

Connect Yellow Control Line Braking Connector **(2)** to the relevant connection on the Towing Vehicle

Connect Red Air Service Line Braking Connector **(3)** to the relevant connection on the Towing Vehicle

Always connect the Yellow line first when coupling and Disconnect the Red line first when uncoupling.





Note! The trailer will also be equipped with the standard hydraulic brake connections, it is not necessary to connect these when the Air service is used.

WARNING When working in the danger area between the trailer and the Towing Vehicle always ensure that the Towing vehicle engine is turned off and the Key removed.

WARNING When working in the danger area between the trailer and the Towing Vehicle always ensure that the hydraulic and Pneumatic controls are in Neutral.

CAUTION Release residual Pneumatic & Hydraulic pressure before connecting or disconnecting Air & Hydraulic lines.

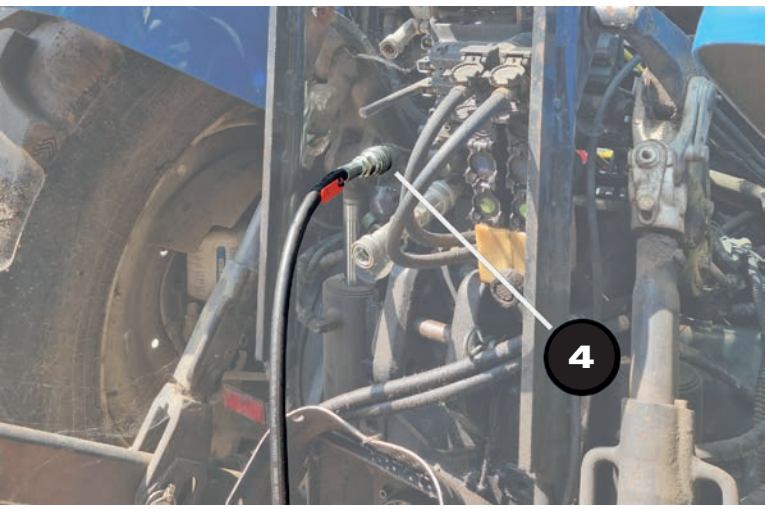
WARNING Ensure all personnel are outside of the danger area between the Towing Vehicle and Trailer before reversing.

WARNING Check that the trailer is properly and securely attached to the Towing Vehicle before moving off.

CAUTION Check the Ring Hitch periodically for signs of damage or wear. Replace as required.

CAUTION Dirty Quick release couplings can cause increased wear in Hydraulic pumps and Air Compressors. Incorrectly connected couplings can cause failure within the system. Always clean the couplings before connecting them.

WARNING When coupling to a tractor connect the Yellow line first when connecting and remove the Red line first when disconnecting.



Coupling to the Towing Vehicle Hydraulic Braking Connections

For trailers that are equipped with Hydraulic Brakes connect the Hydraulic Service Line **(4)** to the correct connection on the Towing vehicle.

Note! The trailer will also be equipped with the standard hydraulic brake connections, it is not necessary to connect these when the Air service is used.

Note! HYDRAULIC & AIR BRAKES: must not be connected to the tractor at the same time.

ABS Brake Connections

Some trailers are fitted with ABS braking, if applicable connect the ABS system plug to the relevant socket on the towing vehicle.

For connection information see from page 114.

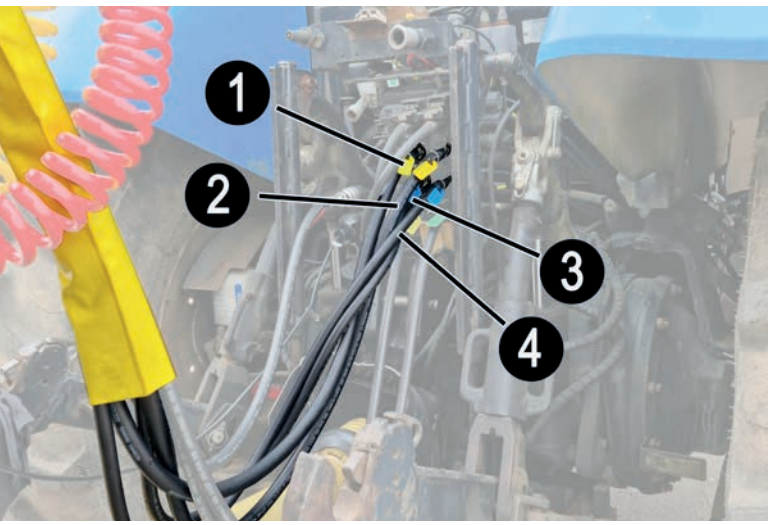
Coupling to the Towing Vehicle Steering Axle Connections

Some trailers are fitted with a self steering axle, this allows easier turning with less damage to tyres and to the road surface.

A Dual hydraulic connection from the towing vehicle is used for this.

When travelling forwards the spool valve should be moved to Power Cylinders this allows the pressure in the cylinders to be released , and the steering axle will follow the lead axle.

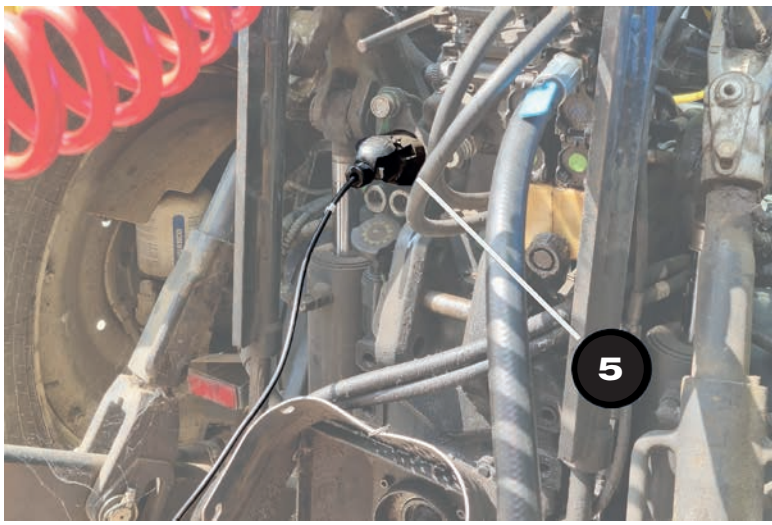
When reversing the trailer the spool position must be moved to extend the cylinders. The trailer wheels will then stay in line.



Coupling to the Towing Vehicle Hydraulic Connections

Connect the Hydraulic floor drive (Delilah & FBS models) service lines **(1)** and **(2)** to a spool valve connection on the towing vehicle.

Connect Hydraulic slurry gate (Optional) service lines **(3)** and **(4)** to double acting spool valve connections on the towing vehicle.



Coupling to the Towing Vehicle Lighting Connections

Connect the electrical seven pin connector **(5)** to the vehicle lighting socket.

WARNING

When working in the danger area between the trailer and the Towing Vehicle always ensure that the Towing vehicle engine is turned off and the Key removed.

WARNING

When working in the danger area between the trailer and the Towing Vehicle always ensure that the hydraulic and Pneumatic controls are in Neutral and that the Control Panel switch is off.

CAUTION

Release residual Pneumatic & Hydraulic pressure before connecting or disconnecting Air & Hydraulic lines.

Coupling the Drive shaft to the Towing Vehicle

Ensure the Tractor and Trailer PTO shafts are clean and suitably greased.

Ensure the driveshaft is of the correct length (Refer to the driveshaft manufacturers documentation for further information).

Ensure the correct orientation of the driveshaft (IE The tractor symbol on the guard indicates the Tractor end connection).

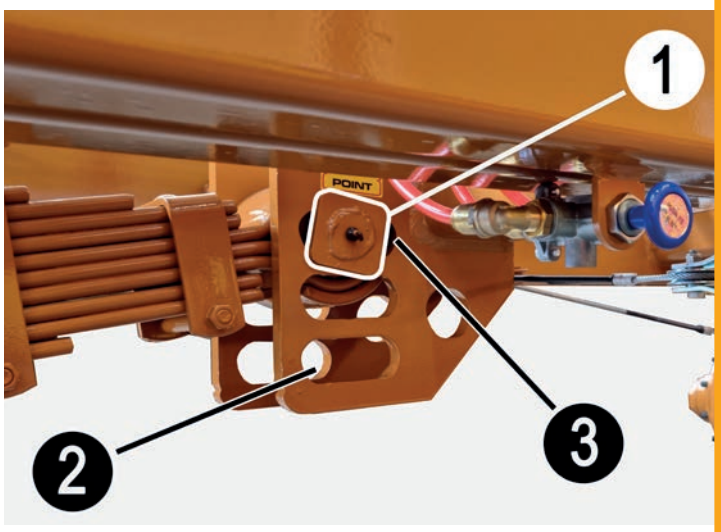
Slide back the guard sleeve and slide the shaft onto the trailer PTO , then repeat and fit to the Towing vehicle PTO.

Fit safety chains where applicable.

When not in use remove the driveshaft from the machine.

For normal operation the skid should be moved to its stowed position at the rear of the drawbar.

The correct skid must always be used when parking the machine.



Adjusting Sprung Drawbar Height

The trailer chassis should run level when connected to the towing vehicle.

Remove any load from the trailer, lower the body apply the parking brake and disconnect from the Towing Vehicle.

Support the front of the trailer chassis on suitable supports and remove all weight from the drawbar.

Using a suitable jack under the front of the drawbar, take the load and remove the Pin **(1)**.

Using the jack raise or lower the drawbar to the required height.

Insert the Pin **(1)** in the Lower hole **(2)** to increase the drawbar height, or in the Upper hole **(3)** to reduce it.

Remove jack and supports and check operation.

WARNING Never work beneath any unsupported vehicle.

Adjustments before Towing the Trailer

Adjust the drawbar and/or the hitch of the towing vehicle so that when towing the trailer body is slightly raised at the front.

Hitching the trailer so that the chassis is parallel to the road surface is acceptable, however this may cause additional wear to the trailer brakes and those of the Towing vehicle. When laden the rear axle wheels may lock when braking.

Hitching too low will cause unnecessary wear to the suspension and brake components of the front axle, and reduce the braking efficiency, and possibly locking the rear axle. It can also cause additional loading to be placed on the Towing vehicle, causing damage to rear axle and brake components.

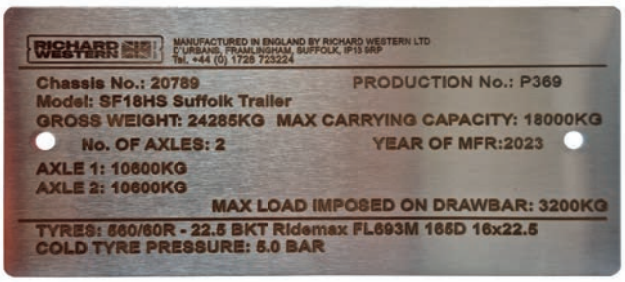
Operation

WARNING

Never exceed the trailers maximum permitted capacity as stated on the manufacturers plate

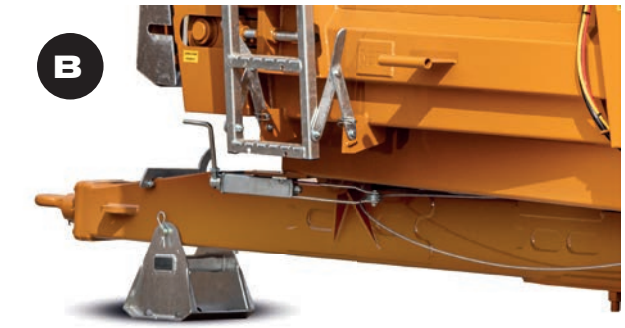
CAUTION

Dirty Quick release couplings can cause increased wear in Hydraulic pumps and Air Compressors. Incorrectly connected couplings can cause failure within the system. Always clean the couplings before connecting them.



A

B



C

Loading the Trailer

The capacity of the trailer is shown on the Manufacturers plate on the chassis.

Do not overload the trailer.

Always load by weight not volume.

Loading Method

Commence loading the Spreader from the rear of the machine and progress towards the front.

Avoid packing the material down into the body with the loader bucket, this will minimise the start up power requirements.

For Delilah and FBS models do not load higher than the beaters. **(a)**

Moving Off

Ensure all Hydraulic connections are made and that services are functioning correctly.

Ensure all Air connections are made and that the brakes are functioning correctly.

Ensure all electrical connections are made and that all lighting systems and the Eurosafe braking.

(option) are functioning correctly.

When the Air Braking system is fitted allow air pressure from the towing vehicle to build to the required level.

Release the manual Parking brake lever **(b)**.

If only using the hydraulic brakes or when shunting the trailer push the Air release valve **(c)** before moving off.

CAUTION

Check all around the trailer before moving away, especially in confined areas and when reversing.

CAUTION

Be especially careful when reversing, use a banksman if visibility is limited.

Spreading (Delilah & FBS Models)

The Beaters are driven directly by the towing vehicles Power Take Off.

The maximum spreading width is approximately 4 Meters (dependant on material density), this will be achieved with an appropriately powered Towing vehicle driving the PTO at 1000 rev/min.

Allow the beaters to reach full operating speed before engaging the floor drive.

The floor drive is operated by an appropriately configured double acting spool on the Towing Vehicle.

CAUTION

Ensure the spool valve is connected so the floor moves towards the beaters before spreading. Failure to do this will result in severe damage to the machine.

The floor drive speed should be adjusted by the in line spool valve to provide a suitable flow of material to the beaters. Overfeeding the beaters may lead to premature damage of the floor and beaters, aswell as increasing fuel consumption.

Spread Density

Variation of spreading density is controlled by varying the floor speed of the spreader and varying the forward speed of the towing vehicle.

Experience with the machine and different loads will ensure an equal spread pattern can be achieved.

Operators should take account of varying ground and weather conditions and for example work with the wind when spreading rather than against it.

Slurry Gate

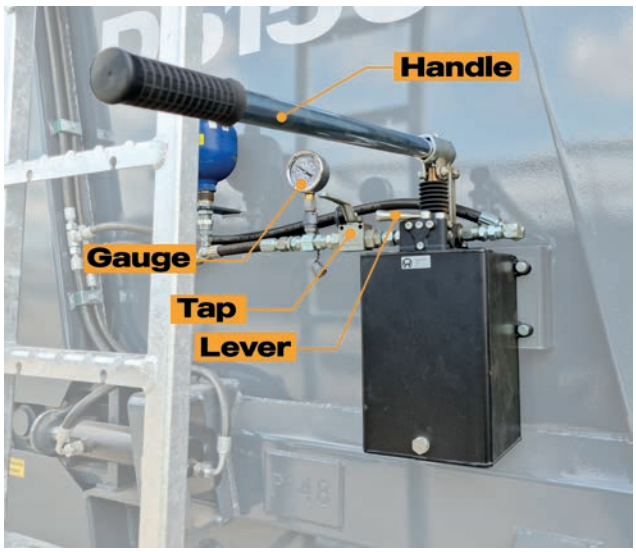
A gate controlled by a double acting spool on the Towing Vehicle can be supplied as option. The purpose of the gate is to hold semi solid material in the hopper and to limit the flow of material to the beaters.

This is essential when the material being spread is a semi solid slurry and light material such as poultry litter.

Using the gate will allow the fine control of material flow so that the a very fine spread can be achieved, however the gate should be fully opened spreading heavier materials.

CAUTION

Ensure the Slurry gate is raised to the required height before engaging the floor drive.. Failure to do this will result in severe damage to the machine



Hydraulic Floor Tensioning Delilah/FBS

The floor can be tensioned hydraulically using the hand pump located on the nearside of the machine.

The lever is stored adjacent to the pump against the post.

Open the tap located near the tank then ensure that the lever on top of the tank is pointing towards the GAUGE, pumping the lever will increase the pressure and so increase chain tension. In normal use the pressure should be set to around 450 PSI or 30 Bar this should give adequate chain tension.

Once this is pressure is achieved, it is however recommended to double check the tightness of the chains physically. This is done by climbing into the machine and lifting he slats in the centre of the floor; this is because the pressure required will vary according to the size/ length of the machine there should be around 100-150mm of lift.

Please note: This operation should only be carried out either with the machine detached from the towing vehicle, or the person doing the checking in possession of the tractor keys.

Once you are happy with the tension the main ball tap should be locked off to retain pressure in circuit.
Keep a note of the pressure setting and this should be the tensioning pressure shown on the gauge during operation if it drops pump up to preset level using above procedure. (you do not need to do the physical check once you know the pressure your machine requires.)

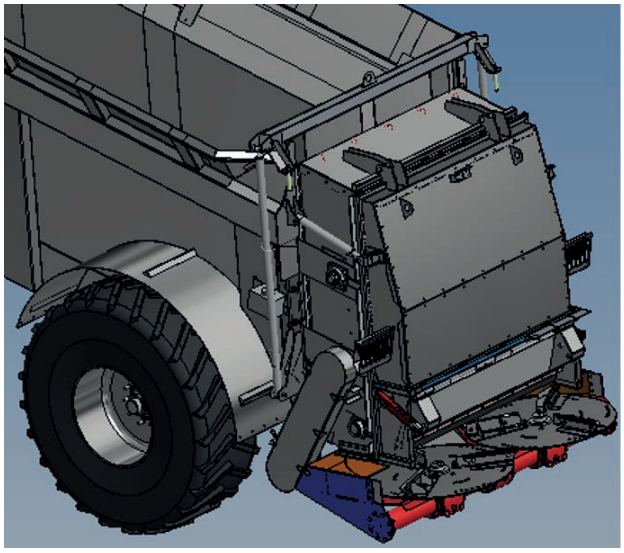
The two nuts on the threaded bars should be routinely tightened as well, this should be done when the chain is under tension, and this will ensure that should the hydraulic system fail for any reason then the nuts will act as a failsafe.
These nuts should not be used to do any tensioning but just bought to bear against the location tubes.

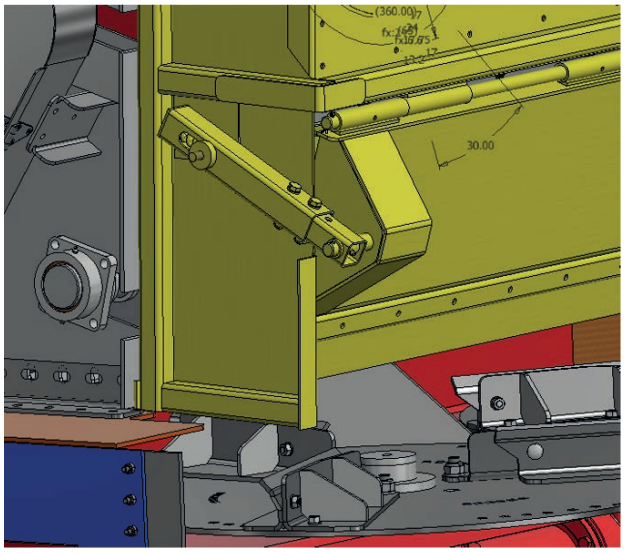
If for any reason the chain needs to be slackened the nuts should be loosened off and the lever moved to the in the opposite direction and the tap opened, when the lever is pumped the hydraulic rams will retract and allow the chain to slacken.

After carrying out the work move lever to right and re-tension the chains to previous pressure.

The lever should be either carried in the tractor cab/toolbox or in stowage position provided.

Richard Western spinning deck assembly 2022





Introduction

The spinning disc assembly is primarily designed for the wider spreading of lighter materials such as chicken or turkey litter at lower application rates than those typically used for farmyard manure. Farmyard manure may be spread however, but the application rates will not match those of a vertical backed spreader.

The spreading mechanism comprises two chain driven horizontal rotors across the rear of machine and a hood which drop the material onto twin PTO/ gearbox driven contra rotating discs which spread the material.

Adjustment of spread pattern

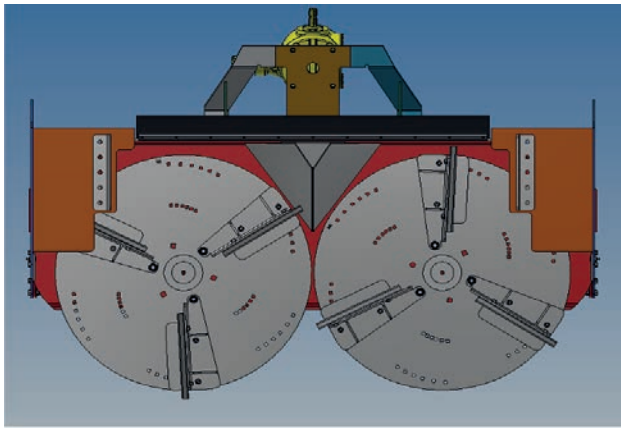
The spread pattern may be initially altered by use of the flap on rear of hood initially select a position that places the flap over the centre of the disc this will normally provide a starting point for the spreading of lighter materials with a wide spreading width requirement.

Moving the flap towards the rear of disc will aid in the spreading of heavier and or straw-based materials as it will allow material an easier exit from disc area.

Position of the flap is changed by removing bolts from the adjuster each side and moving to the desired position before replacing the bolts to lock into position. There is a spring built into the mechanism to allow for some shock relief should there be a larger than desired object in the disc area.

Each disc is fitted with 3 reversible blades it has been found that this arrangement gives the best spread pattern.

All blades should be adjusted to be at an equal angle to ensure balance. Moving the blades forward from the straight position cups the material and may with certain materials give an added throw, in general however the position as shown in diagram above gives the best result.



It is important not to overload the discs by feeding material into the discs faster than it can escape from rear of machine. Overloading the discs will result in increased wear to the spreading mechanism, an increase in horsepower required as well as fuel used, and ultimately may lead to damage of the spreading mechanism.

Control of material to the disc assembly can be controlled manually by a combination of slurry gate position and floor speed. The slurry gate should be open to approximately 500-800mm and the floor speed regulated to give the required flow to the disc spreading area.

There are three means of floor speed regulation available.

- Manual control either from the speed control on front of machine or from tractor spool.
- Constant rate application control utilizing the Griffith Elder system, this uses weigh cells and forward speed measurement to calculate and control the floor speed via a PWM (Pulse Width Modulation) valve giving an application rate consistent with that programmed in by the operator.

  (refer to the Griffith Elder book)
- Isobus control utilizes the panel built into some tractors couple with an ECU on machine to control application rate in conjunction with load cells and a PWM valve.(There is a separate manual for this)

General Principle of Operation (Subject to control used)

The machine is designed to run on a PTO speed of 1000RPM the higher speeds work well for drier materials and slowing the input speed slightly may aid the spreading of wet materials.

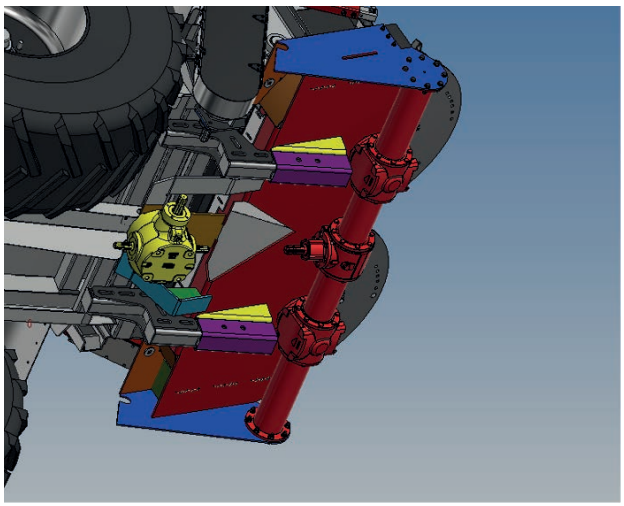
- Load the machine, an even load will help to ensure a consistent feed to spreading assembly.
- Drive to spreading area an align machine down field.
- Turn on oiler switch This can be on a switch box or may be part of Isobus screen if fitted.
- Engage pto and allow speed to build up to desired level.
- Open slurry gate 500 – 800 mm.
- Engage hydraulics to start floor (check movement to rear of machine)
- Start to drive down field for manual rate control forward speed and door position may be used to control application rate
- At end of work stop floor, shut gate, then turn into next bout do not exceed turning angle for input PTO.

General Maintenance

It is important to maintain the machine correctly in order to achieve its best performance.

In addition to the usual lubrication points on a spreader there are the following points to be taken into consideration.

- Each rotor shaft has a bearing at each end. (normally by remote greasing point) these need a daily grease
- The Lower shaft in the runs on twin bearings this also requires greasing daily
- The rear floor shaft bushes
- The hood and flap are also equipped with greasing points at the hinge area these need less frequent attention and should be greased monthly.
- On each side of the machine there is a reservoir for the oiling of the drive chains, these should be periodically filled with an SAE30 oil. The rate of oil feed to the chain is controlled by a dripper mounted with the brushes under each chain cover.
- There are additional PTO shafts fitted to the machine and these will require greasing in line with the PTO shaft recommendations.
- The tee gearbox requires SAE90 oil and should be drained and filled after 50 hours of work with approximately 4 litres of oil. Thereafter change every 500-800 hours of operation or yearly.



- The disc gearbox uses SAE90 oil and again change after first 50 hours of operation then every500-800 hours of operation of yearly.
- Fill gearbox to centre of sight glass then allow to settle for a while, check level and top up again, repeat procedure until level does not change, this will ensure that oil has reached the outer gearbox casings to correct levels.
- Periodically check chain tensions in side casings and adjust as required 25/30mm movement is acceptable.
- The rear hood of the machine lifts to give access to the rotors and rear shaft area, for the purpose of maintenance and a cylinder stop should be used when working under the hood when raised.

To ensure good shredding of material ensure the tips are not allowed to wear down excessively, also the paddles like the tips are reversible and should be changed as they wear to ensure a decent spread pattern.

Taper Lock Installation Instructions

TO INSTALL

1. After ensuring that the mating tapered surfaces, bore and shaft are completely clean and free from oil or dirt, insert bush in hub so that holes line up.
2. Sparingly oil thread and point of grub screws, or thread and under head of cap screws. Place screws loosely in holes threaded in hub, shown thus ◎ in diagram.
3. If a key is to be fitted place it in the shaft keyway before fitting the bush. It is essential that it is a parallel key and side fitting only and has TOP CLEARANCE.
4. Clean shaft and fit hub to shaft as one unit and locate in position desired, remembering that bush will nip the shaft first and then hub will be slightly drawn on to the brush.
5. Using a hexagon wrench tighten screws gradually and alternately to torque shown in table below.
6. Hammer against large-end of bush, using a block or sleeve to prevent damage. (This will ensure that the bush is seated squarely in the bore.) Screws will now turn a little more. Repeat this alternate hammering and screw tightening once or twice to achieve maximum grip on the shaft.
7. After drive has been running under load for a short time stop and check tightness of screws.
8. Fill empty holes with grease to exclude dirt.

INSERT BUSH

INSERT SCREWS AND LOCATE ON SHAFT

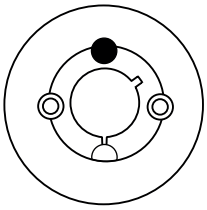
TIGHTEN SCREWS FINGER TIGHT

TIGHTEN SCREWS ALTERNATELY

REMOVAL

TO REMOVE

1. Slacken all screws by several turns, remove one or two according to number of removal holes shown thus ● in diagram. Insert screws into removal holes after oiling thread and under head of cap screws.
2. Tighten screws alternately until bush is loosened in hub and assembly is free on the shaft.
3. Remove assembly from shaft.



REMOVAL HOLES ●

Bush Size		2517	3020
Screw tightening torque (Nm)		50	90
Qty		2	2
Screw details	Size (BSW)	1/2″	5/8″
	Hex. socket size (mm)	6	8
Large end doa. (mm)		85.5	108
Bush length (mm)		44.5	50.8
Approx mass (kg)		1.5	2.7

List of common parts

Part description

PART DESCRIPTION	LOCATION	QTY	RW PART NUMBER
DISC PADDLE	DISC	6	RWP2064X
LH PADDLE SUPPORT BRACKET	DISC	3 LH	RWA31320LH
RH PADDLE SUPPORT BRACKET	DISC	3 RH	RWA31320RH
LH DISC ASSEMBLY	DECK	1 LH	RWA23436L/H
RH DISC ASSEMBLY	DECK	1 RH	RWA23436R/H
PADDLE BOLTS	DISC	12	RWF-S21478
CENTRE SUPPORT BOLT (M20)	DISC	6	RWF205CUP
M20 NYLOC NUT FOR ABOVE	DISC	6	RWF0020N
PADDLE BRACKET BOLTS	DISC	12	RWF78141
REVERSIBLE TIP	DS-ROTOR	36 PER ROTOR	RWP1279X
DECK RUBBER	DS-DECK	1	RWP29386
HOOD RUBBER TOP	DS-HOOD	1	RWP34586
HOOD DEFLECTOR RUBBER	DS-HOOD	1	RWP38324
HOOD RUBBER LOWER	DS-HOOD	1	RWP34587
REVERSIBLE TIP	FBS-ROTOR	60 PER ROTOR	RWP1279X
DECK RUBBER	FBS-DECK	1	RWP38514
HOOD RUBBER TOP	FBS-HOOD	1	RWP29729
HOOD DEFLECTOR RUBBER	FBS-HOOD	1	RWP38511
HOOD RUBBER LOWER	FBS-HOOD	1	RWP29730

Spreading (SDS Models)

The Auger and side discharge rotors are driven mechanically from the Towing vehicle PTO.

The maximum spreading pattern is approximately 16 Meters (dependant on material density), this will be achieved with an appropriately powered Towing vehicle driving the PTO at 540 rev/min.

When commencing spreading the Slurry door should be opened as the PTO is engaged. The PTO should not be engaged whilst the door is closed.

After use and when turning on the headland the door should be closed and the PTO disengaged.

Leaving the door open and the PTO disengaged may lead to blocking of the spreading rotor.

When restarting this will place additional loads on the rotor and may lead to breakage of the shear bolts.

Spread Density

Variation of spreading density is best controlled by varying the forward speed of the towing vehicle.

Experience with the machine and different loads will ensure an equal spread pattern can be achieved.

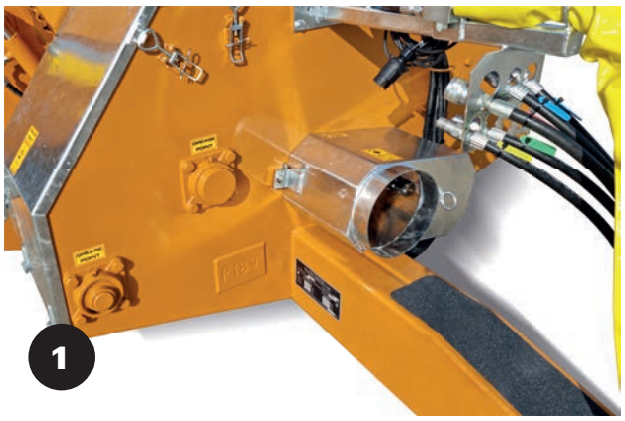
Operators should take account of varying ground and weather conditions and for example work with the wind when spreading rather than against it.

Slurry Gate

A gate controlled by a double acting spool on the Towing Vehicle Seals the Hopper and can be used to meter light material to the rotors.

This is essential when the material being spread is a semi solid slurry and light material such as poultry litter.

Using the gate will allow the fine control of material flow so that the a very fine spread can be achieved. The gate should be fully opened when spreading heavy material.



Unblocking the spreader (Delilah & FBS Models)

In the event of a blockage the floor direction can be reversed momentarily by using the appropriate double acting spool of the towing vehicle.

Never attempt spread whilst in this configuration, as serious damage will occur.

Return the floor direction to the correct direction when the blockage has been cleared.

Unblocking the spreader (SDS Models)

In the event of a blockage the auger direction can be reversed

Stop the towing vehicle and turn off the engine.

Remove the PTO drive shaft from the Spreader.

Remove the Guard **(1)** and turn it to expose the offset drive input. **(2)**

Replace the PTO Driveshaft

Start the machine and run the spreader, the auger will now turn in reverse to clear the blockage.

WARNING

Only run the auger in reverse for a short period of time as it could result in damage to the machine.

CAUTION

Never operate the machine whilst stood in the vicinity of rotating shafts or with the guards removed.

If the above procedure does not remove the blockage it may be necessary to intervene manually.

Fully open the Slurry gate and block in the raised position.

Stop the machine and turn off the engine.

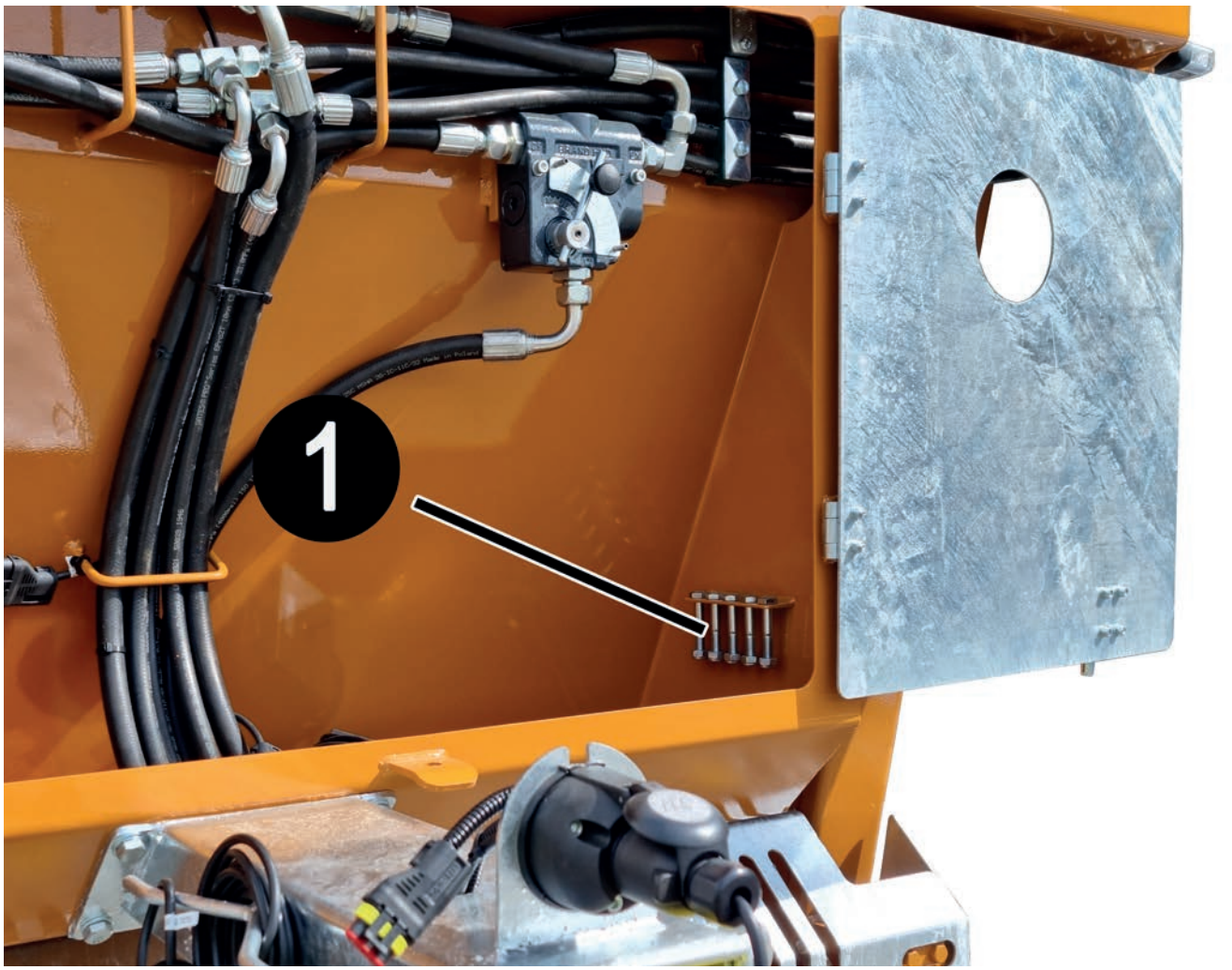
Open the Hydraulic Stone trap to allow access to the blockage .

The stone trap is fitted to the Left side of the machine and is designed to catch larger stones and solids.

During use this should be opened at least twice a day to allow any accumulation to clear.

Troubleshooting

Problem	Possible Cause
Towing Vehicle Stalls	Excessive material packed into body
	Foreign Body jamming Auger / Beaters
	Shear Bolts broken
	Insufficient power from Towing vehicle PTO
Auger / Beaters Fail to Start	Excessive material packed into body
	Foreign Body jamming Auger / Beaters
	Shear Bolts broken
	Incorrect PTO speed
	PTO Clutch incorrectly adjusted
Material Not Shredded properly	Floor advance too fast
	PTO speed too low
	Insufficient power from Towing vehicle PTO
Floor Fails to move	Spool Valve incorrectly adjusted
	Hydraulic Hoses incorrectly fitted to rear of Towing Vehicle



Driveshaft Shear Bolts

The PTO Driveshafts are equipped with shear bolts which will fail and cut the drive in the event of a severe blockage, and therefore prevent mechanical damage.

Spare Shear bolts **(1)** are provided, conveniently located adjacent to the Drive input.

Always replace shear bolts after use.

On SDS machines additional shear bolts are located under the front cover.

All Shear bolts are Grade 8.8. Higher grade bolts must not be used if severe damage to the machine is to be prevented.

Reversing the trailer

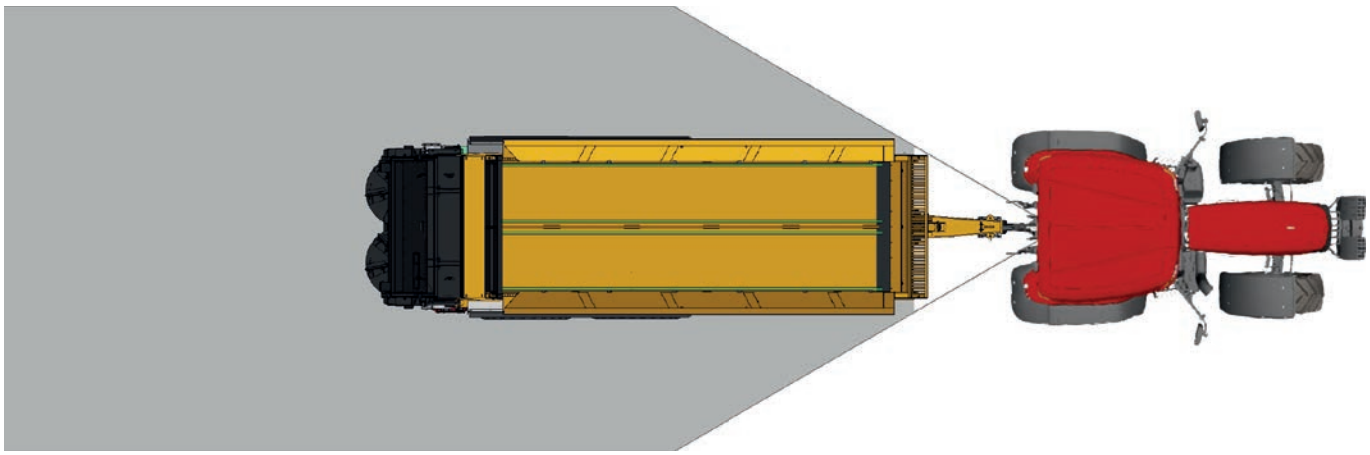
Blind Spots

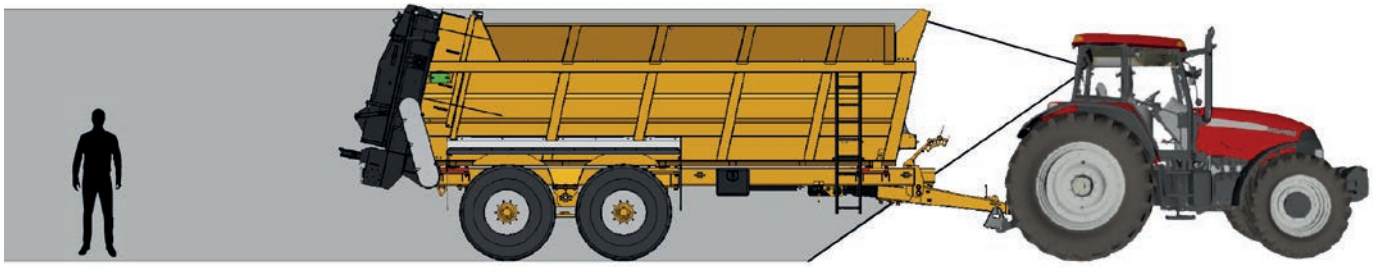
Appropriately trained and experienced personnel recognise the dangers when reversing, less experienced operators may not.

When reversing, even small trailers can have significant blind spots where visibility is reduced both behind and to the sides of them.

Failure to spot an obstruction can endanger the life of personnel or damage the trailer.

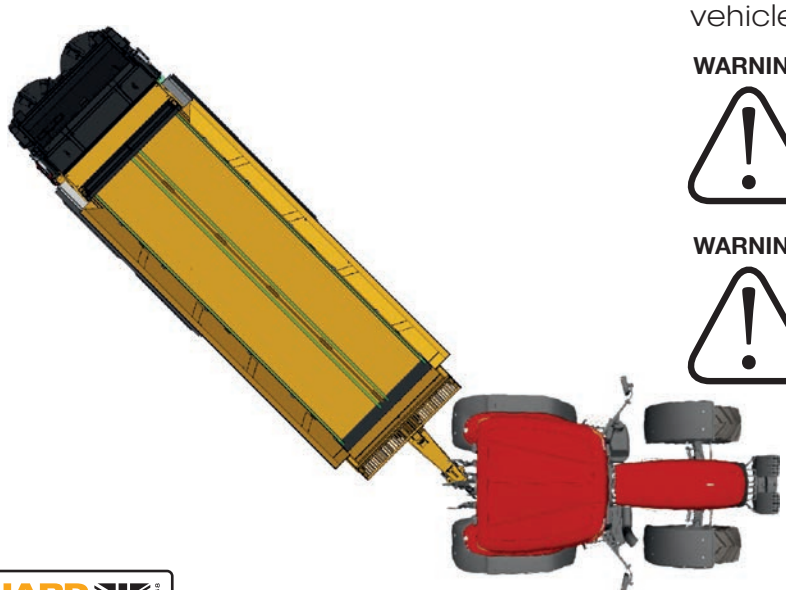
Consider the use of audible reverse warning aids and additional lighting especially in low light conditions.





Jack knife

Avoid jack knifes when reversing as this will inevitably lead to contact between the trailer and the towing vehicle, resulting in damage to both the towing vehicles tyres and the trailer drawbar.

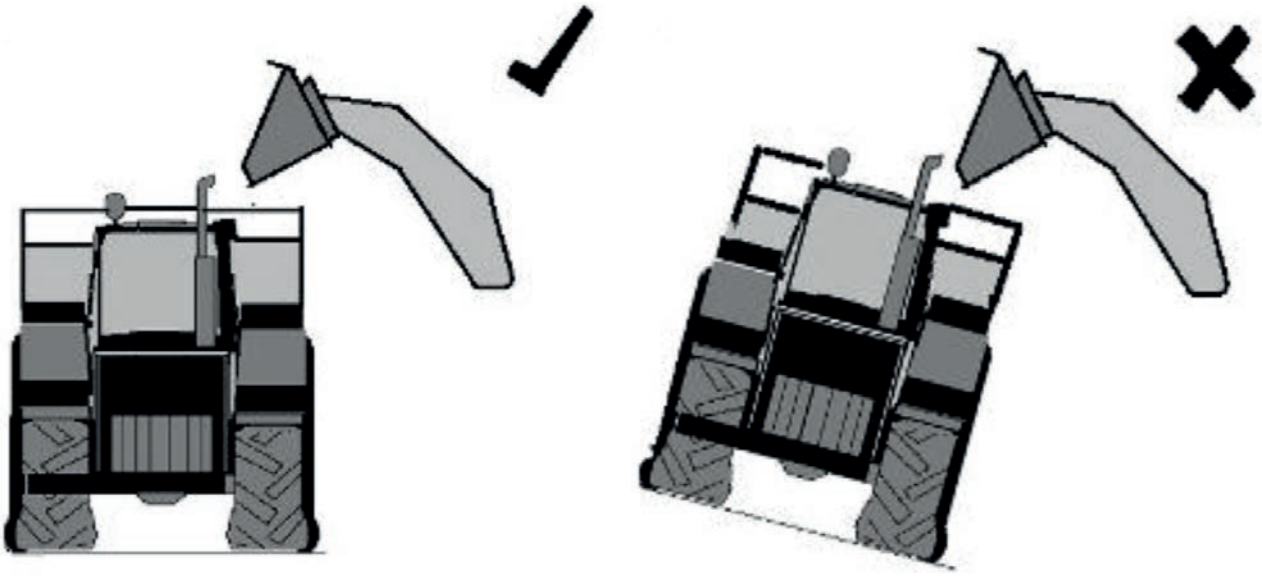


WARNING

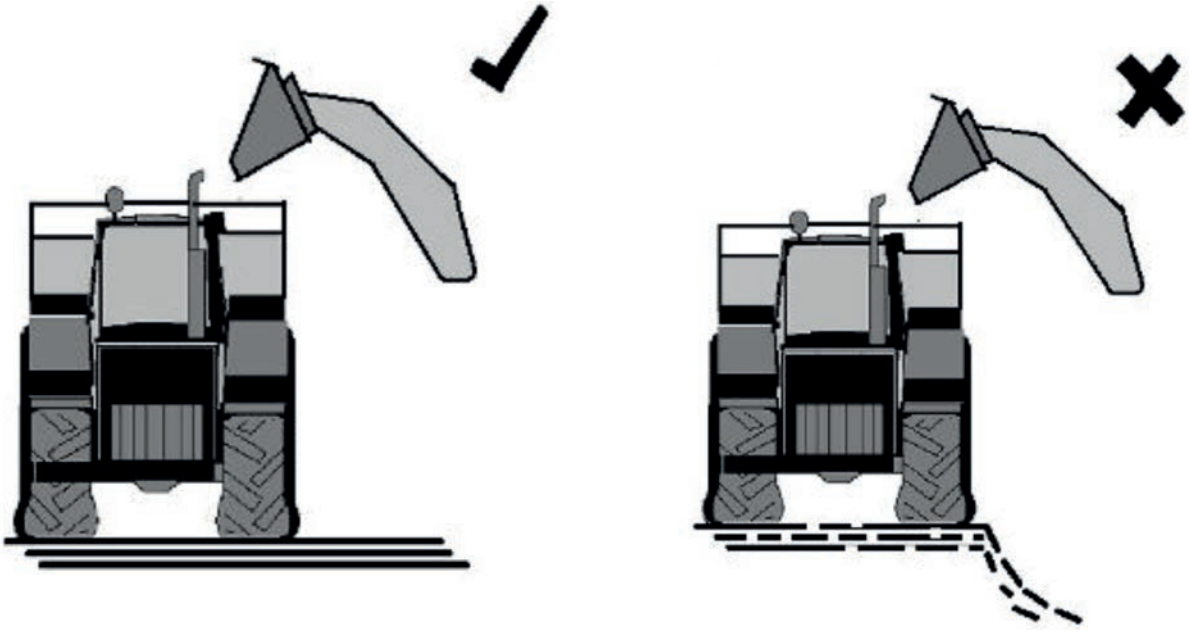
Always check behind when reversing to ensure the area is clear of obstructions and personnel.

WARNING

If in any doubt employ the services of a banksman to assist you with your manoeuvre.



Load and travel on Level Ground as far as practical. Avoid Traversing slopes.



Always load on firm Ground, avoid trenches and submerged services.

Maintenance & Service Schedules

The service and maintenance schedule must be adhered to ensure the optimum availability and efficiency of the machine is maintained.

Failure to adhere to these schedules may cause damage to the machine and possibly endanger the operator and others.

The warranty given for the machine will become void if the maintenance schedule is not followed.

WARNING

Ensure all personnel are outside of the danger area between the Towing Vehicle and Trailer before use.

WARNING

When working in the danger area between the trailer and the Towing Vehicle always ensure that the Towing vehicle engine is turned off and the Key removed.

WARNING

When working in the danger area between the trailer and the Towing Vehicle always ensure that the hydraulic and Pneumatic controls are in Neutral and that the Control Panel switch is off.

WARNING

Ensure the control panel or Joystick power is in the off position before maintaining the machine.

WARNING

Ensure the Cylinder locks are installed before working under the raised bed.

WARNING

Wear the correct personal protective clothing. The brake linings may contain asbestos, a respirator should be worn whilst handling brake components.

WARNING

Ensure tyre pressures are correct. Incorrect tyre pressures can cause stability and handling problems for the trailer and Towing vehicle .

CAUTION

Release residual Pneumatic & Hydraulic pressure before connecting or disconnecting Air & Hydraulic lines.

CAUTION

Ensure that decals are clearly visible. Replace damaged or missing decals immediately.

CAUTION

Carry out all maintenance at the correct intervals and in accordance with the instructions in this manual.

Service Schedule

	Delilah Manure Spreaders	FBS Manure Spreaders	SDS Manure Spreaders
■ **Perform task**			
■ **Check**			
Maintenance Task			
Daily			
Inspect for damage due to the load or loading machine	■	■	■
Check Brake operation	■	■	■
Check Park brake operation	■	■	■
Drain Water from Air reservoir (if fitted)	■	■	■
Grease Rocking Beam Pivots (if fitted)	■	■	■
Grease Floor chain Tensioner Bearings	■	■	
Grease Drive Shaft support bearings	■	■	■
Grease Floor drive shaft bearings	■	■	
Grease Rotor Top Bearings	■	■	
Check Floor Drive Gearbox Oil level	■	■	
Check Rotor gearbox Oil level	■	■	
Grease PTO Shaft (Input)	■	■	■
Grease Rotor PTO Shaft	■	■	■
Grease Main Rotor Bearings	■	■	■
Grease Chain Drives			■
Grease Rear Thrust bearing			■
Grease All Support Bearings			■

	Delilah Manure Spreaders	FBS Manure Spreaders	SDS Manure Spreaders
■ **Perform task**			
■ **Check**			
Weekly			
Check Lights	■	■	■
Check Wheel nut torque	■	■	■
Check Hydraulic hose condition	■	■	■
Check air line condition	■	■	■
Check connections to Towing Vehicle	■	■	■
Check Towing Eye condition	■	■	■
Check Tyre Pressures	■	■	■
Check Tyre condition	■	■	■
Grease all nipples on running gear	■	■	■
Inspect the machine for loose Nuts and Bolts	■	■	■
Adjust Floor Chain Tension	■	■	
Every Month			
Lubricate PTO			
Every 3 Months			
Check Brake clearance & wear	■	■	■
Adjust Brakes	■	■	■

	Delilah Manure Spreaders	FBS Manure Spreaders	SDS Manure Spreaders
■ **Perform task**			
■ **Check**			
Every 6 Months			
Check the Axle Hubcaps	■	■	■
Check Wheel bearing wear	■	■	■
Tighten All Suspension U-Bolts	■	■	■
Tighten All Spring Drawbar U-Bolts	■	■	■
Every Year			
Check Suspension	■	■	■
Every 2 Years			
Lubricate Wheel Bearings	■	■	■
Laying Up Protection			
Protect all Electrical Connections	■	■	■
Clean down machine	■	■	■
Repaint any areas where paint has been removed	■	■	■
Replace worn or damaged parts	■	■	■
Replace missing or damaged decals	■	■	■
Grease all bright parts	■	■	■
Cover ends of all Quick release connectors	■	■	■

ABS Brakes

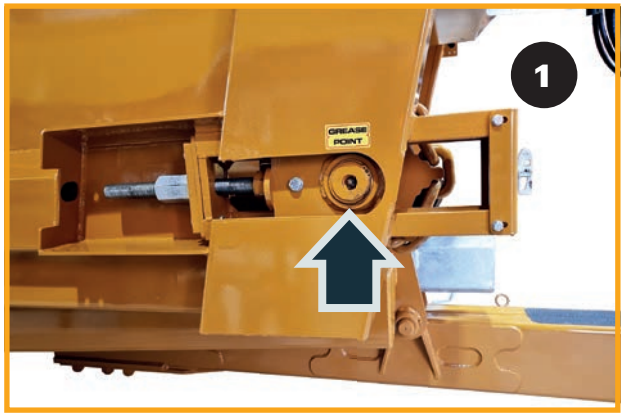
Additional requirements

	Delilah Manure Spreaders	FBS Manure Spreaders	SDS Manure Spreaders
■ **Perform task**			
■ **Check**			
Every 3 Months			
Check all system components for signs of damage	■	■	■
Test whole system for air leakage	■	■	■
Every Year			
Check Electrical wiring for damage	■	■	■
Check piping for damage & security)	■	■	■
Check Sensor for Wear & Readjust as required	■	■	■
Every 2 Years			
Replace Modulator & Solenoid	■	■	■
When Hubs removed			
Check and readjust Exciter & Sensor	■	■	■

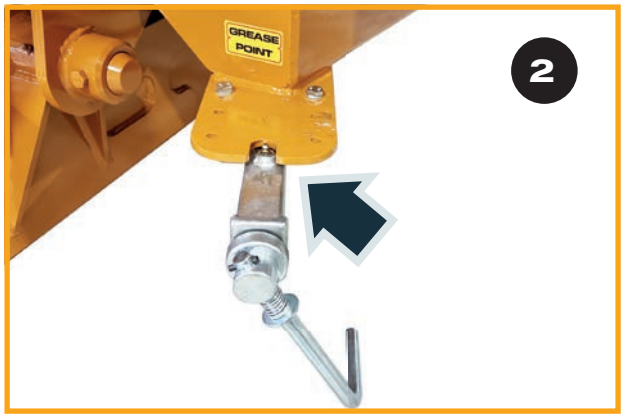
Lubrication Points

(Delilah Types)

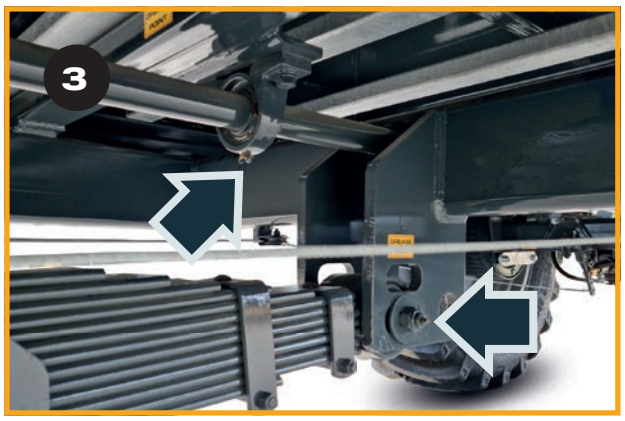
Every 8hrs or daily unless specified



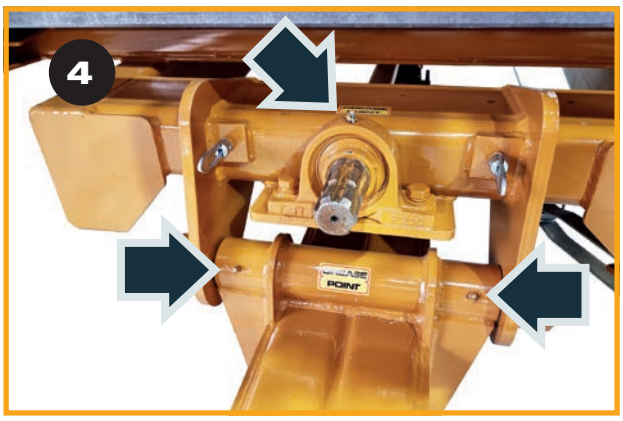
Grease idler shaft (2 Off).



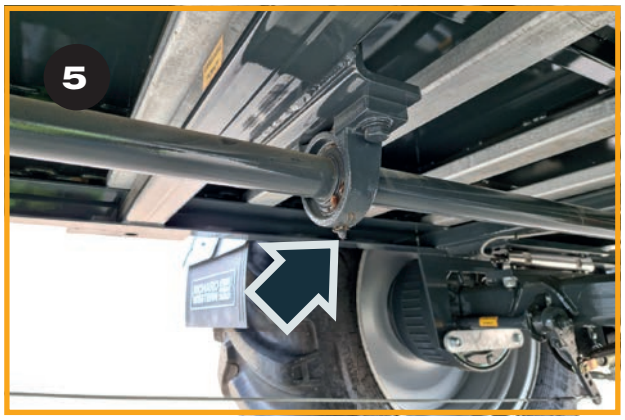
Grease Parking Brake Mechanism.



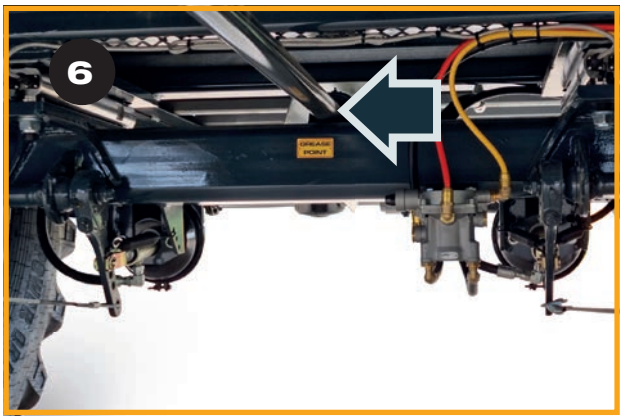
Grease Drive Shaft Support Bearings & Sprung Drawbar Pin.



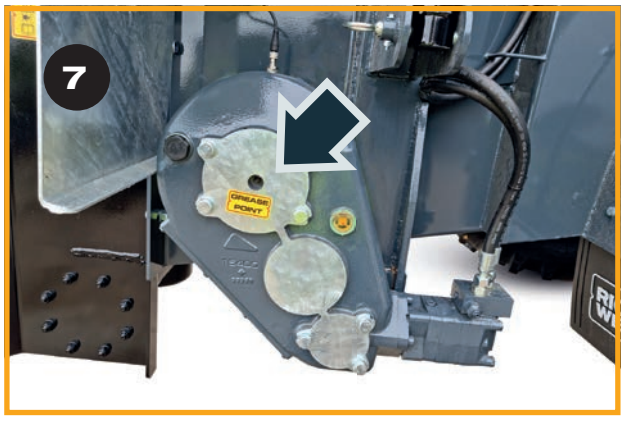
Grease Drive Shaft Support Bearings & Sprung Drawbar Pivots where applicable.



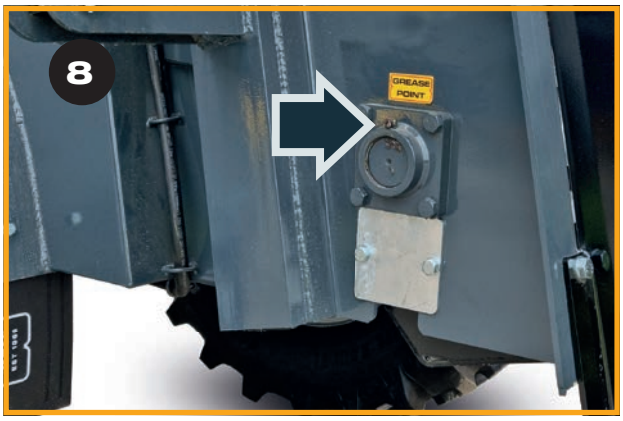
Grease Drive shaft Support Bearings.



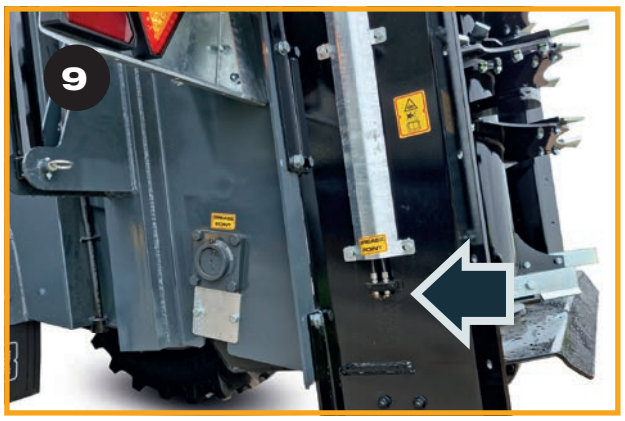
Grease Drive shaft Support Bearings.



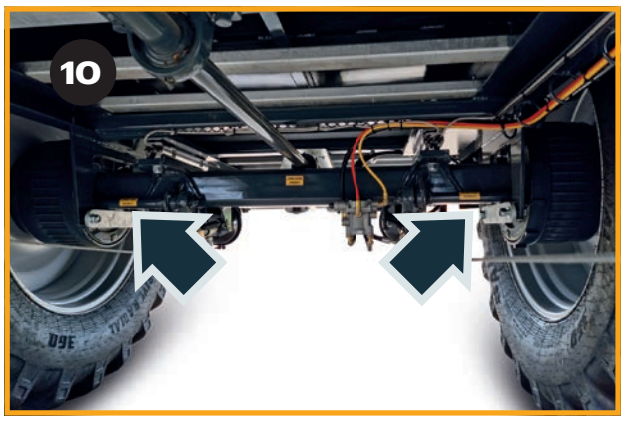
Grease Floor Drive Gearbox Centre Shaft.



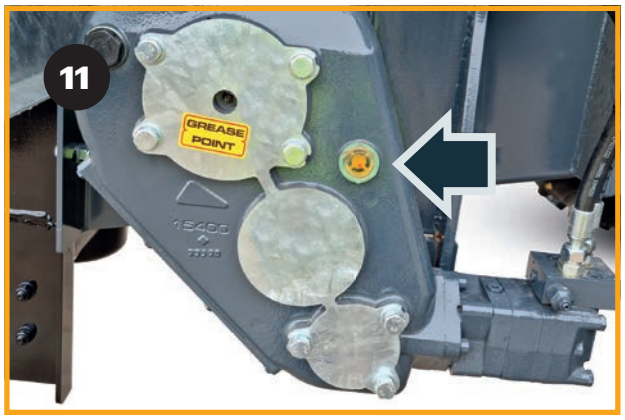
Grease Floor Drive Shaft bearings (Narrow Back Machines).



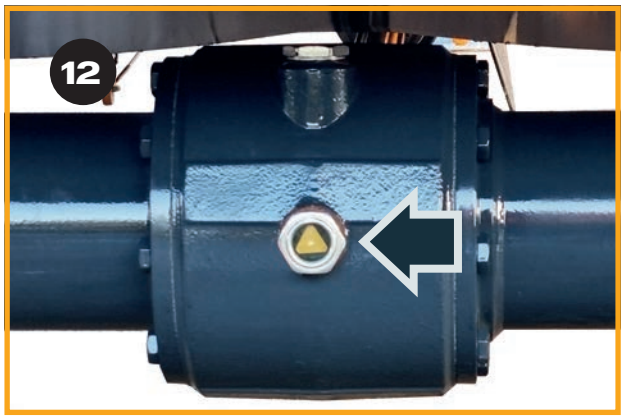
Grease Rotor Top Nipples.



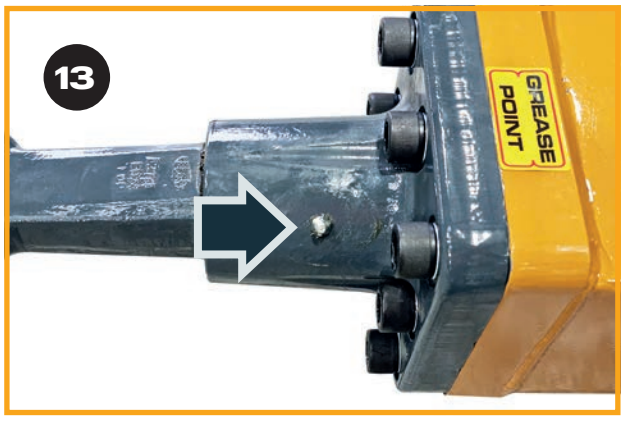
Grease Brake Actuators (Weekly).



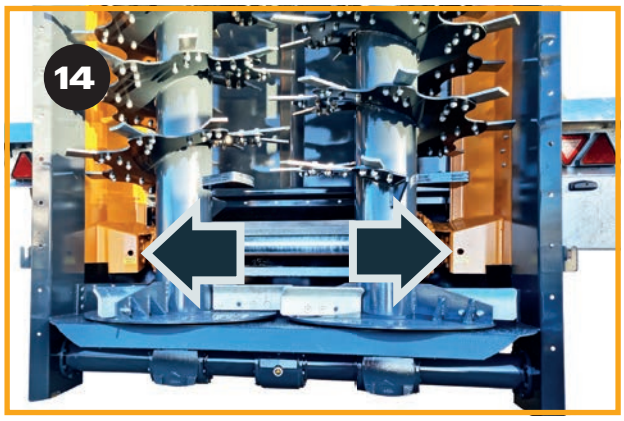
Check Floor Drive Gearbox oil level & top up as required.



Check Rotor Drive Gearbox oil level & top up as required.

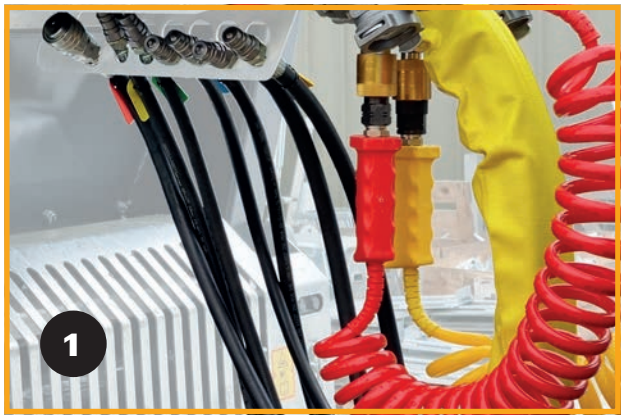


Grease Hitch where applicable.

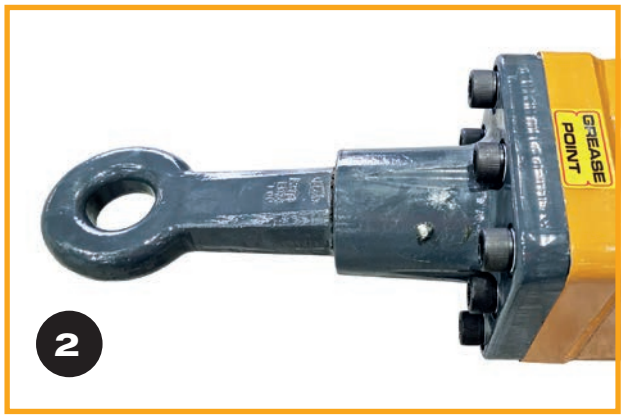


Grease Floor Drive Shaft Bearings (2 Off) (Wide Back Machines Only).

Service Checks
(Delilah Types)



Check All Air and Hydraulic Lines for signs of Damage Check Connections to Towing Vehicle.



Check the condition of the Towing eye for signs of wear or damage.

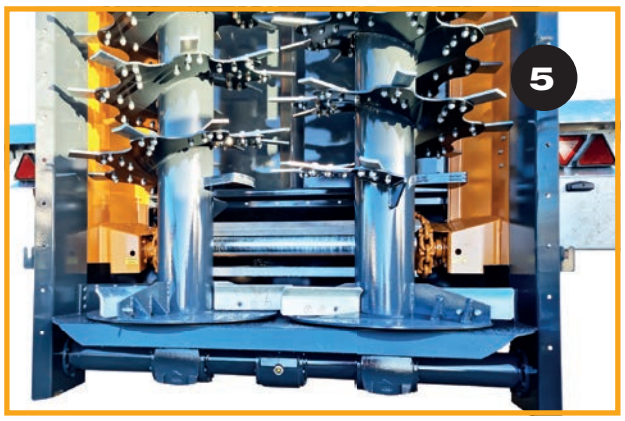
Play Daily Check List video by scanning QR Code

For Daily, Weekly, and monthly check list please visit link below or scan QR Code to visit on your mobile device.

https://www.richardwestern.com/support/head-to-tow/

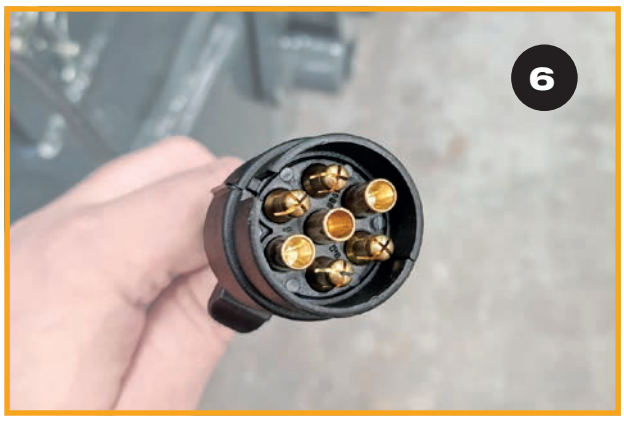
Check Wheel Nut Torque.

Check Tyre Pressure & Tyre condition.



Adjust Floor chains. To give equal tension on each chain.

When lifted in the centre of the body there should approx. 100mm free play.



Check 7 pin plug connector.

Drain water from air tank.

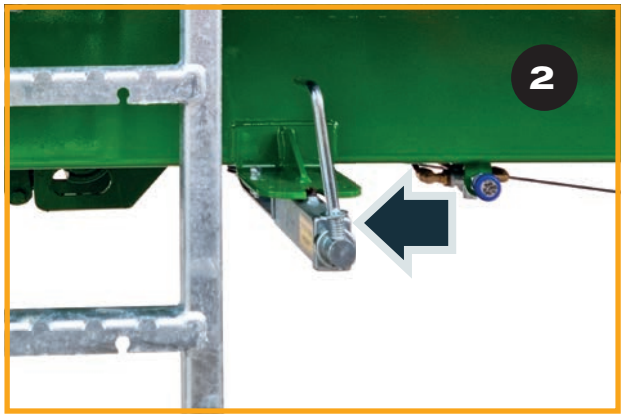
Check Lights & Reflectors for Correct operation & Damage.

Lubrication Points

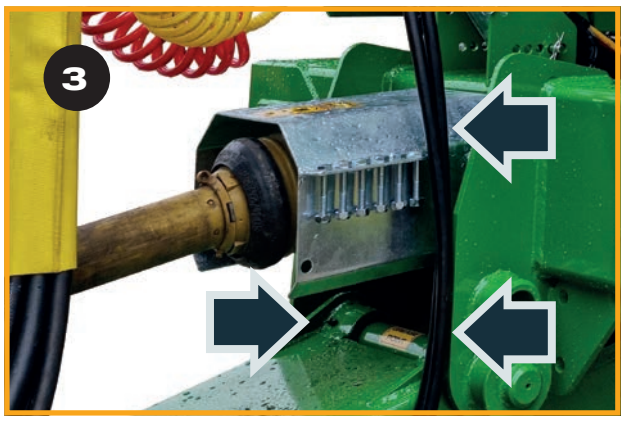
(FBS Types)

Every 8hrs or daily unless specified

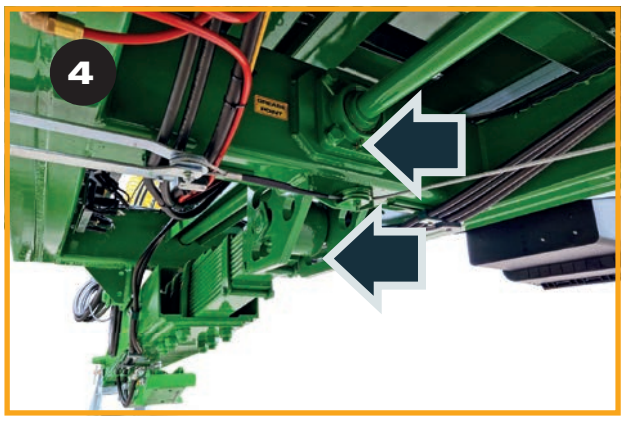
Lift Cover and Grease idler shaft bushes (4 Off).



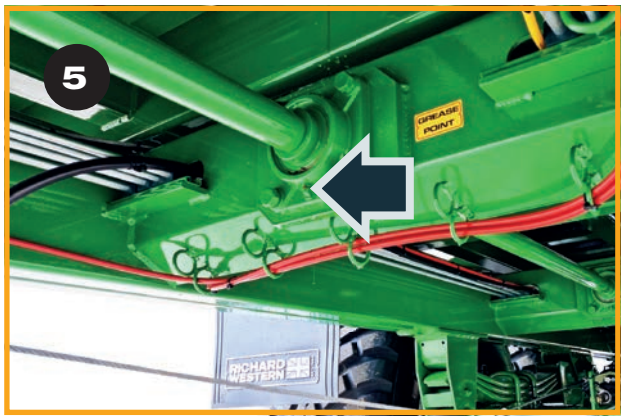
Grease Parking Brake Mechanism.



Grease Drive Shaft Support Bearings & Sprung Drawbar Pivots where applicable.

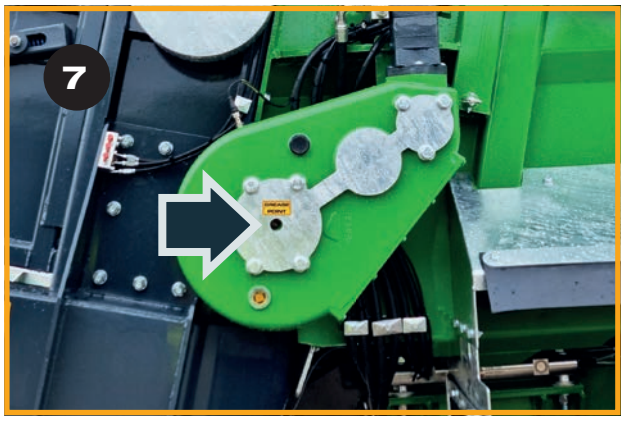


Grease Drive Shaft Support Bearings & Sprung Drawbar Pin.



Grease Drive Shaft Support Bearings.

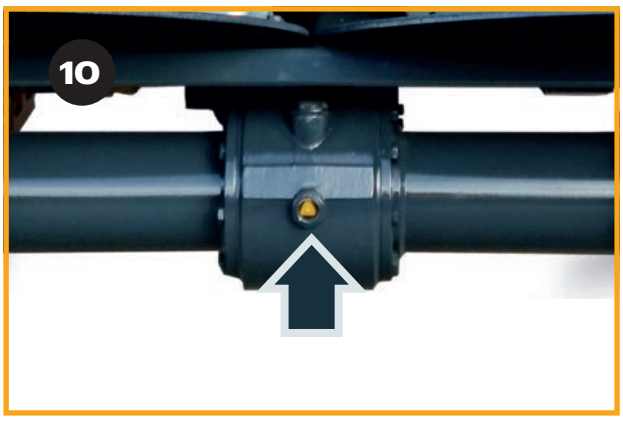
Grease Drive Shaft Support Bearings.



Grease Floor Drive Gearbox Centre Shaft.

Grease All support bearings.

Grease Brake Actuators (Weekly).

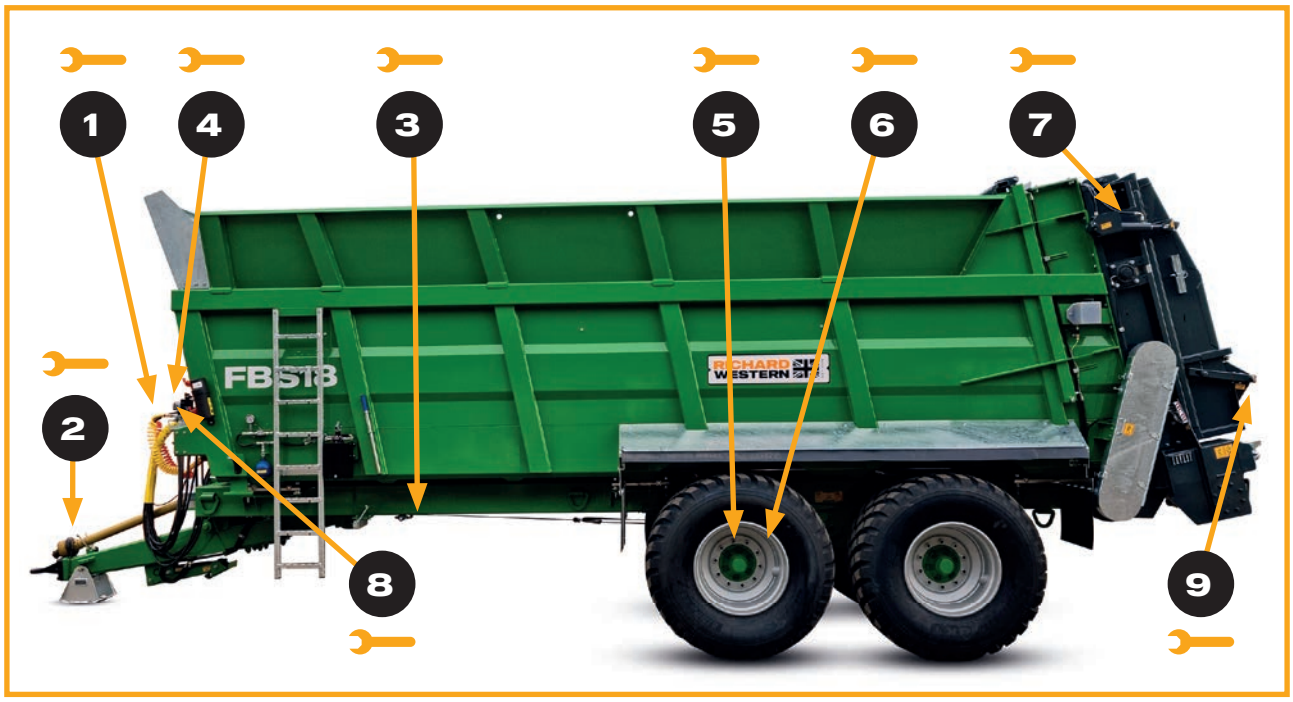


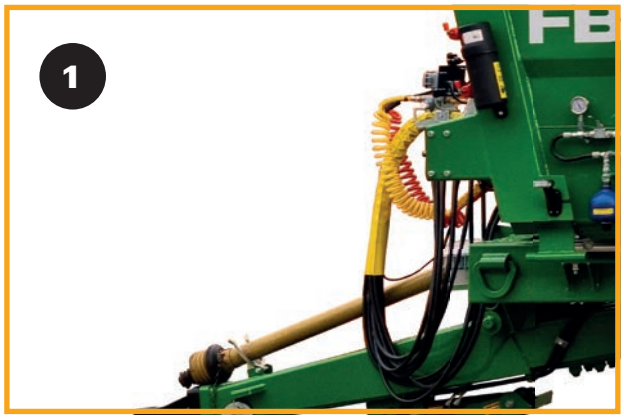
Check Rotor Drive Gearbox oil level & top up as required.

Check Oil is Base of Breather Hole & top up as required.

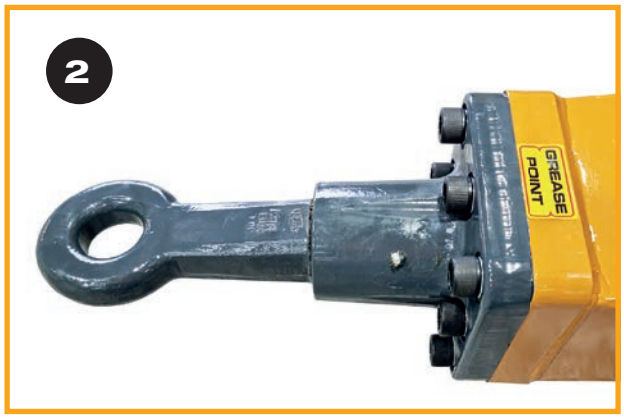
Grease Hitch where applicable.

Service Checks
(FBS Types)

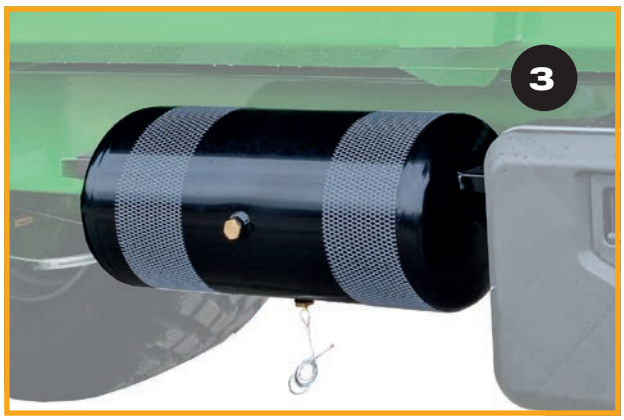




Check All Air and Hydraulic Lines for signs of Damage Check Connections to Towing Vehicle.



Check the condition of the Towing eye for signs of wear or damage.

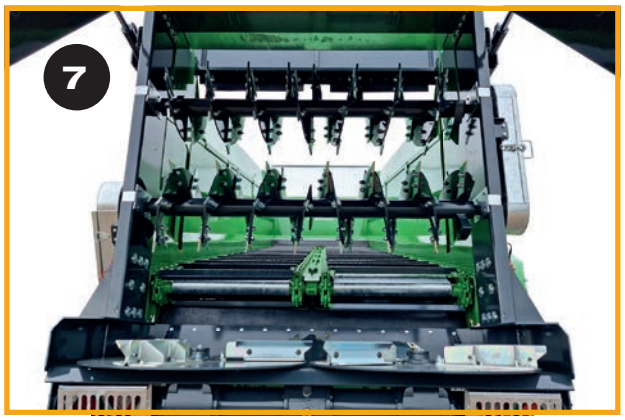


Drain water from air tank.

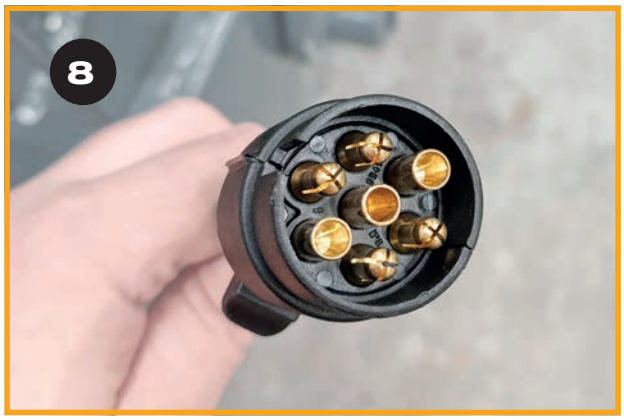
Adjust Floor chains. To give equal tension on each chain. When lifted in the centre of the body there should approx. 100mm free play.

Check Wheel Nut Torque.

Check Tyre Pressure & Tyre condition.



Replace the rotor blades when they become worn to prevent damage to auger See procedure below.



Check 7 pin plug connector.

Check Lights & Reflectors for Correct operation & Damage.

Replace the rotor blades when they become worn to prevent damage to auger See procedure below.

Rotor Blade Replacement

Remove all of the old blades from the machine.

It is important to maintain the rotors balance and clearance when replacing blades.

Start from the bottom of the flighting and work upwards.

All blades should be placed on top of the flighting.

Note the leading edge of the flight is plain and the trailing edge is chamfered.

If using mixed flails (IE Straight and Twisted), like flails should be fitted opposing each other on the rotor to maintain balance.

Always use new nuts and bolts.

Play Daily Check List video by scanning QR Code

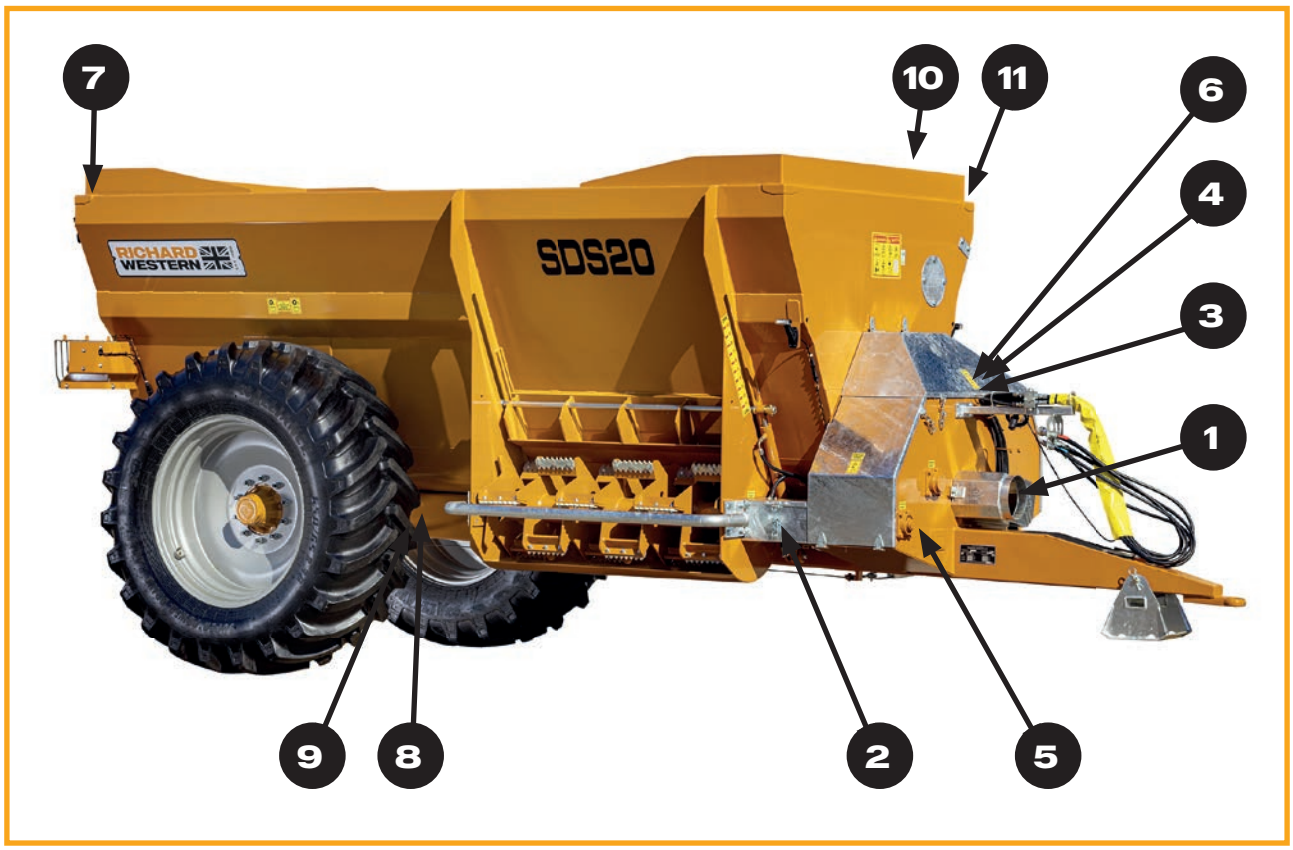
For Daily, Weekly, and monthly check list please visit link below or scan QR Code to visit on your mobile device.

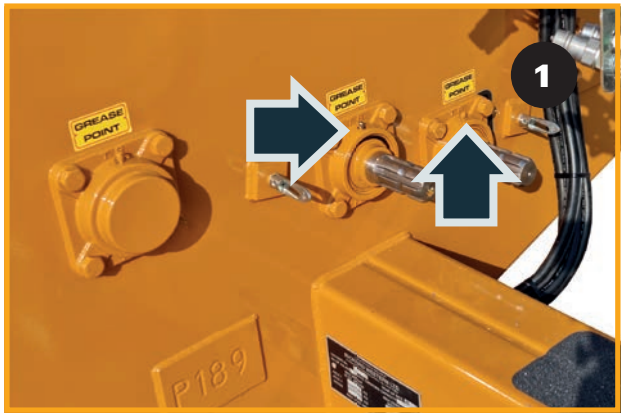
https://www.richardwestern.com/support/head-to-tow/

Lubrication Points

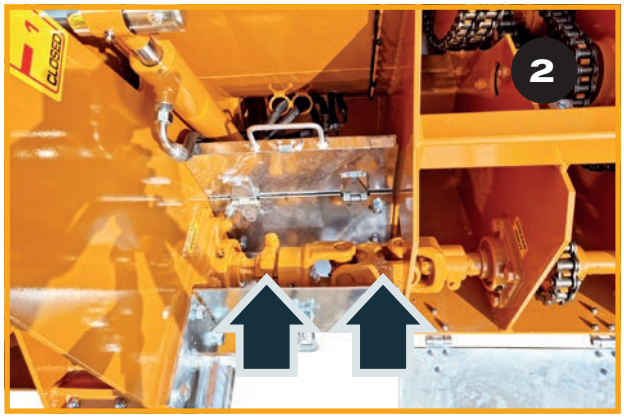
(SDS Types)

Every 8hrs or daily unless specified

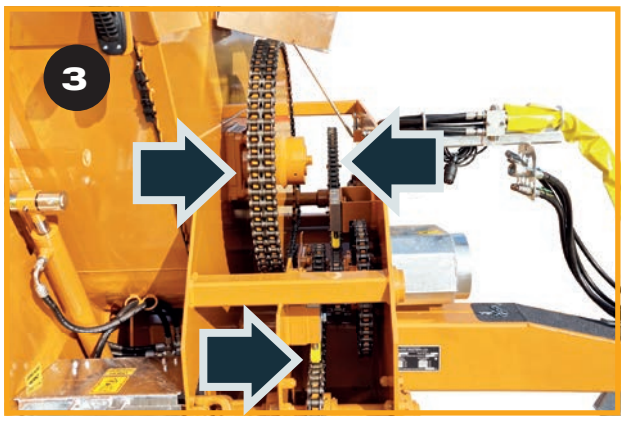




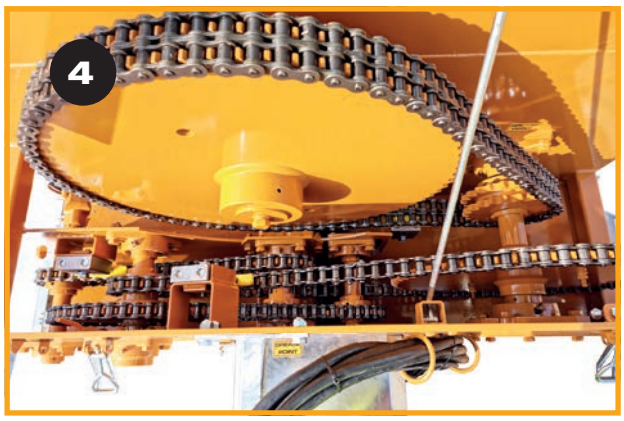
Grease PTO Support Bearings.



Grease Rotor PTO shaft.

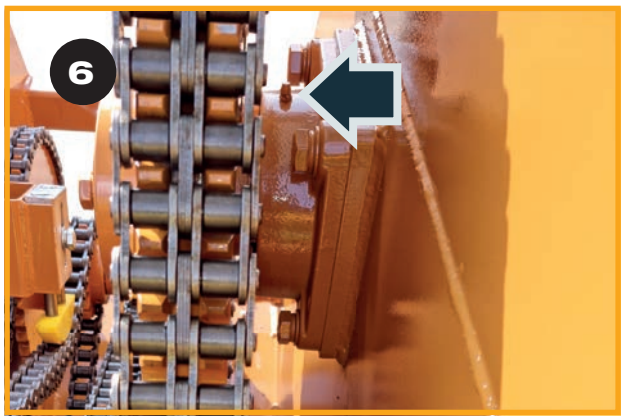


Grease Chain Drives.

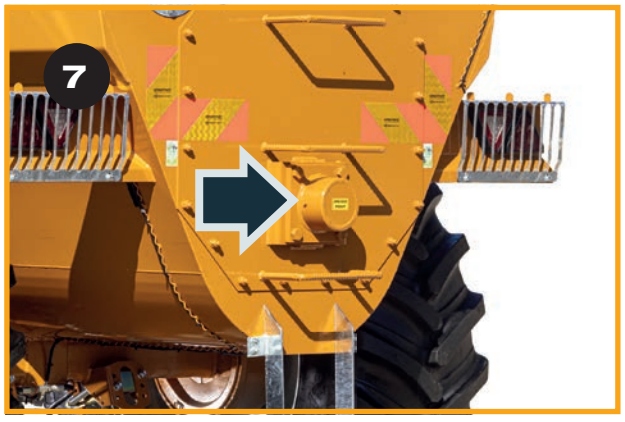


Grease All support bearings.

Grease All support bearings.

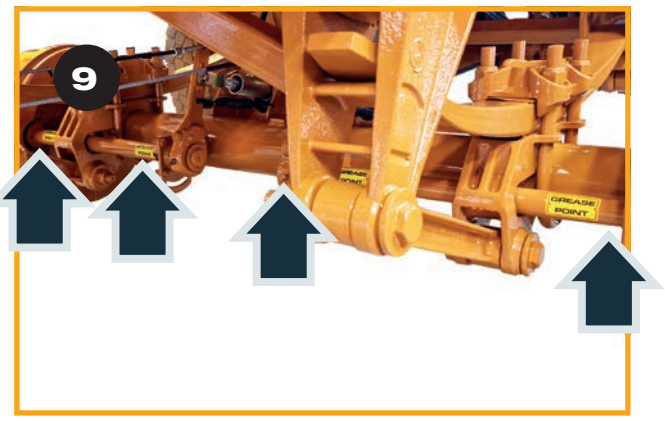


Grease Main shaft Support bearings Front.



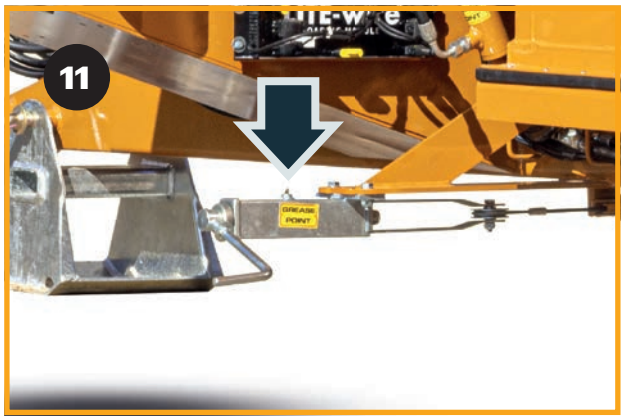
Grease Main shaft Support bearings Rear.

Grease Brake Actuators (Weekly) (Single Axle Machines).



Grease Brake Actuators (Weekly) (Tandem Axle Machines).

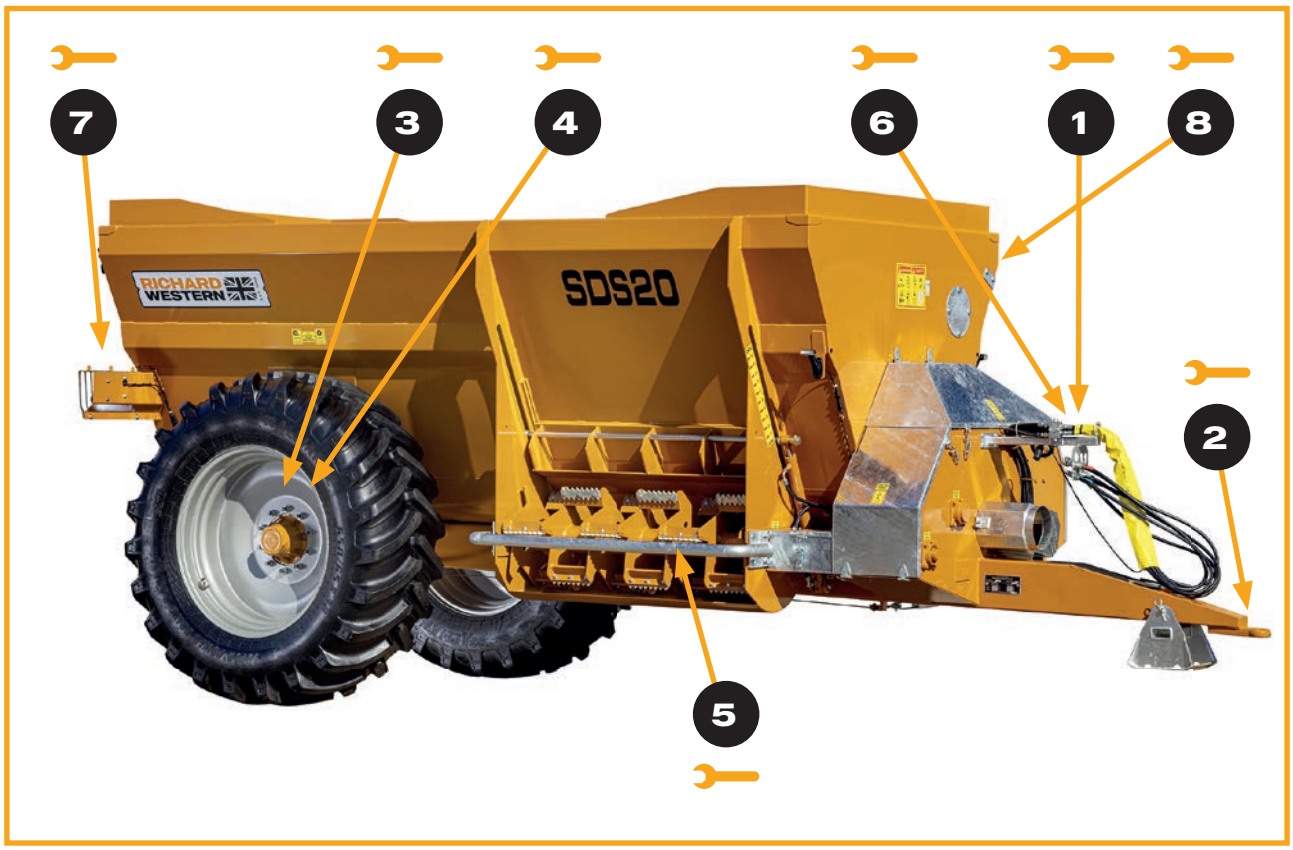
Grease All hydraulic cylinders on Machine.

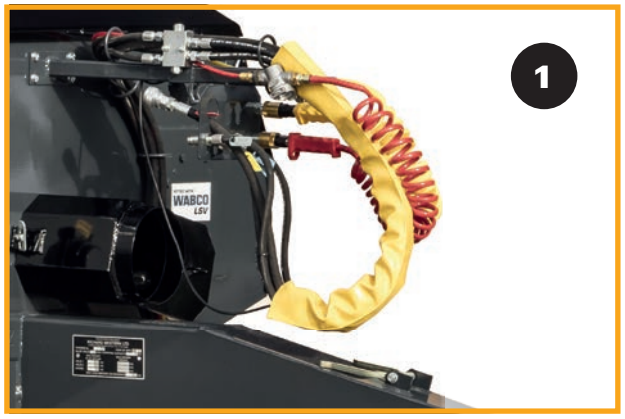


Grease Parking Brake Mechanism.

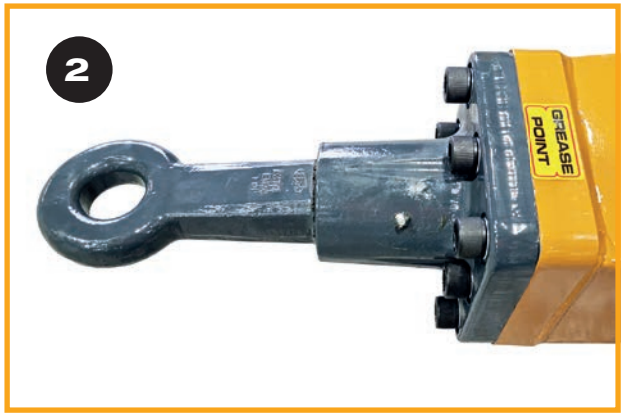
Service Checks

(SDS Types)





Check All Air and Hydraulic Lines for signs of Damage Check Connections to Towing Vehicle.



Check the condition of the Towing eye for signs of wear or damage.

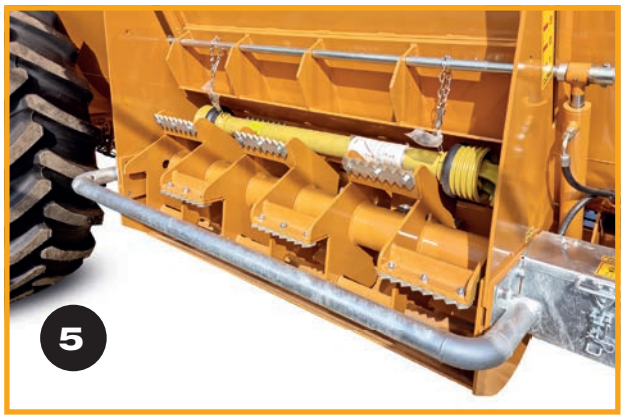
Play Daily Check List video by scanning QR Code

For Daily, Weekly, and monthly check list please visit link below or scan QR Code to visit on your mobile device.

https://www.richardwestern.com/support/head-to-tow/

Check Wheel Nut Torque.

Check Tyre Pressure & Tyre condition.



Replace the rotor blades when they become worn to prevent damage to auger See procedure below.

Rotor Blade Replacement Remove all of the old blades from the machine.

It is important to maintain the rotors balance and clearance when replacing blades.

Start from the bottom of the flighting and work upwards.

All blades should be placed on top of the flighting.

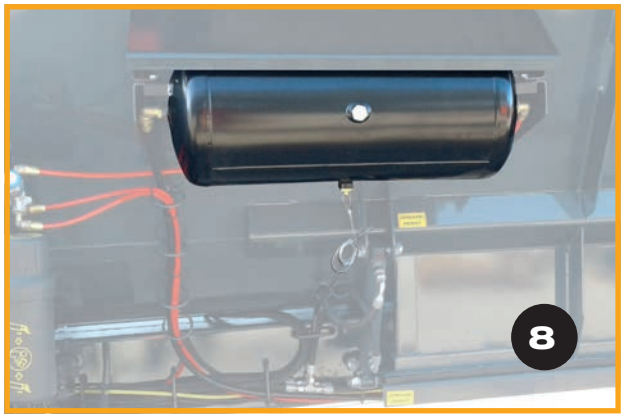
Note the leading edge of the flight is plain and the trailing edge is chamfered.

If using mixed flails (IE Straight and Twisted), like flails should be fitted opposing each other on the rotor to maintain balance.

Always use new nuts and bolts.

Check 7 pin plug connector.

Check Lights & Reflectors for Correct operation & Damage.



Drain water from air tank.

Power Take Off

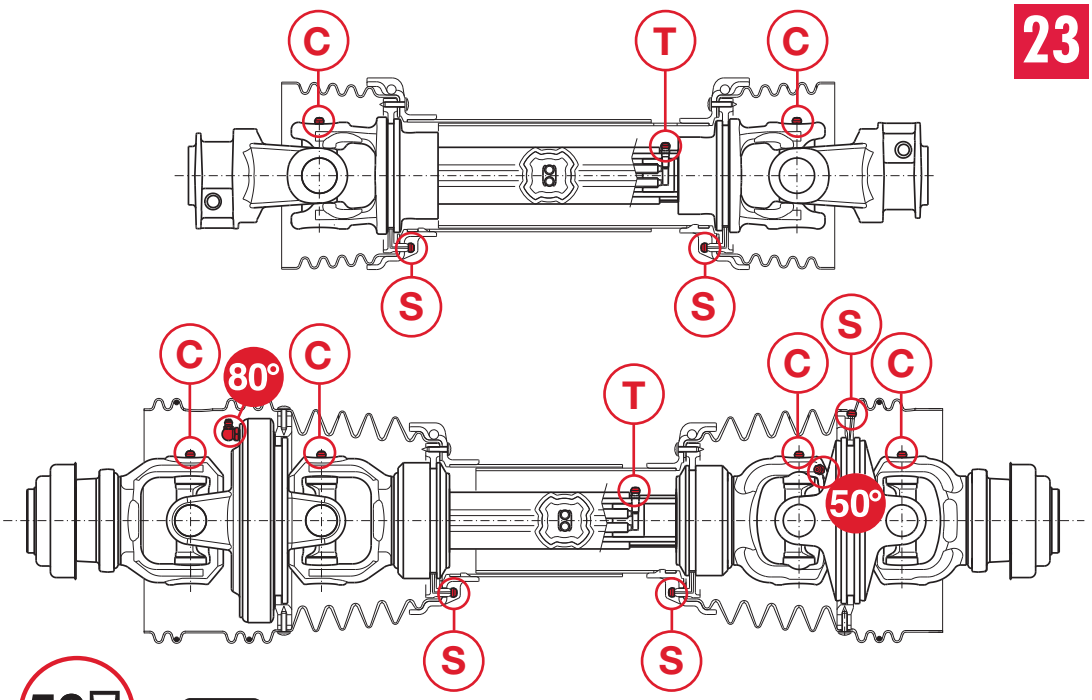
Ensure the tubes are well greased and free from debris before coupling.

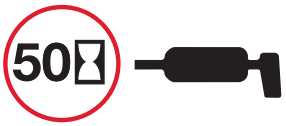
Regularly lubricate and check the movement of the spring couplings at both ends of the shaft.

Grease the Joints daily and before laying up the machine for extended periods.

Clean the guards and grease the bearings regularly especially in arduous conditions.

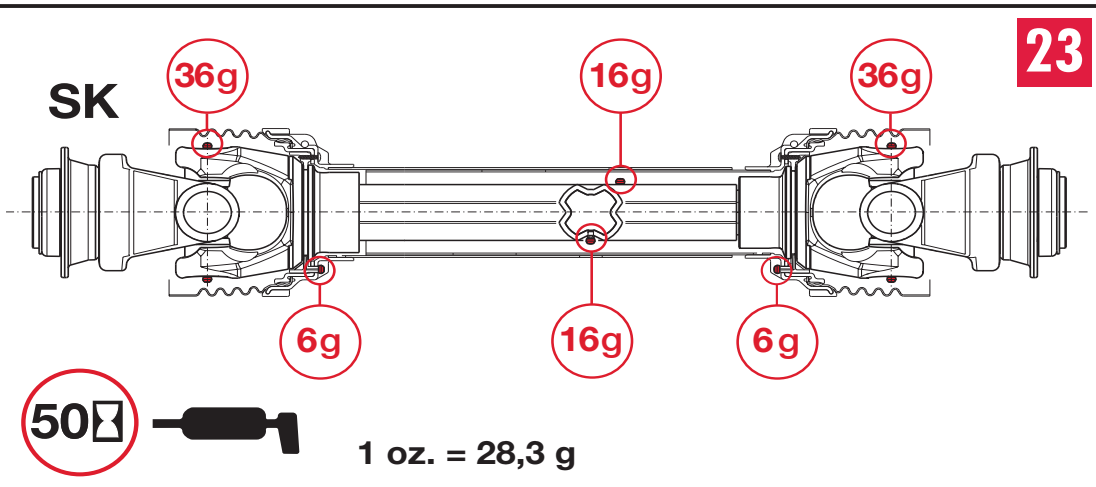
Avoid use at extreme angles, declutch on turning.



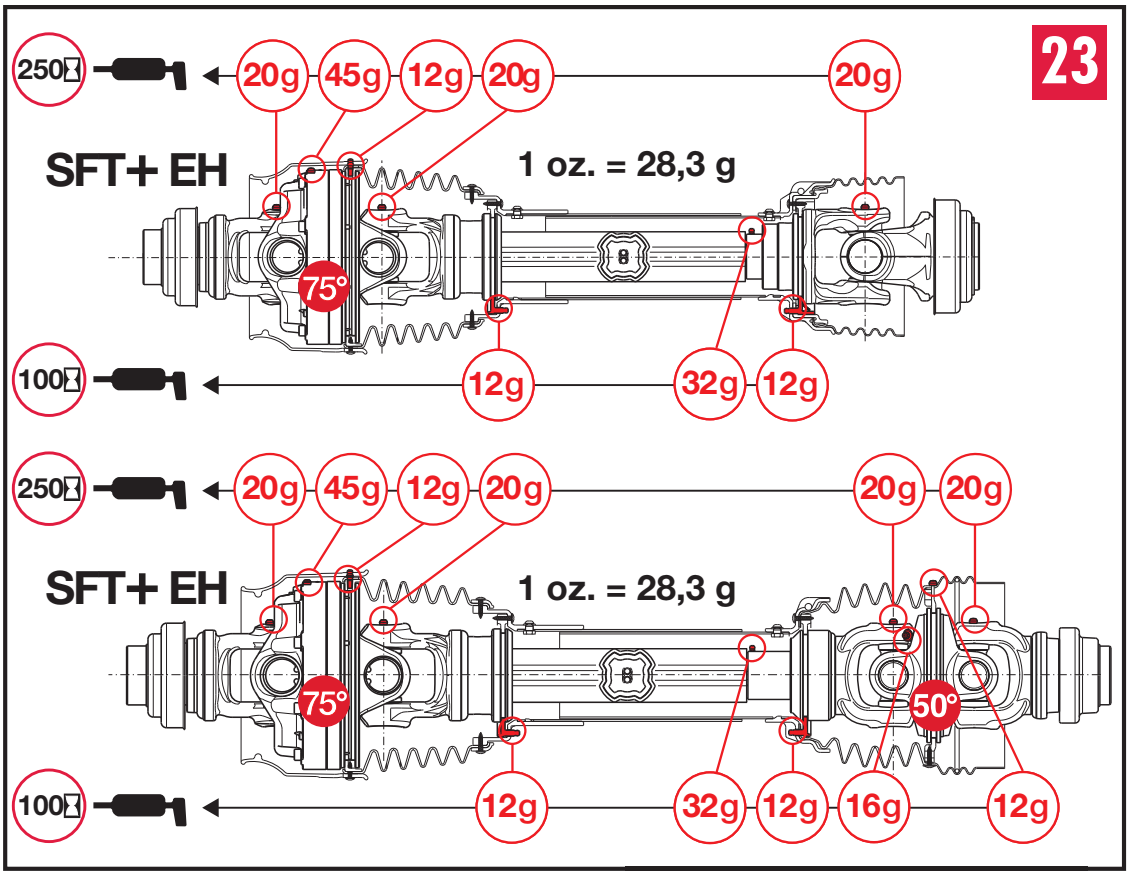


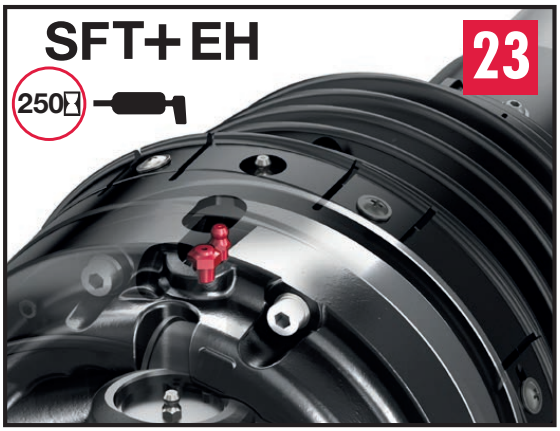
1 oz. = 28,3 g

	S1	S2	S4	S5	S6	H7	S8	H8	S9	SH	S0
C	4 gr.	7 gr.	10 gr.	13 gr.		18 gr.	22 gr.		26 gr.	28 gr.	30 gr.
S	6 gr.										
T	12 gr.		20 gr.				32 gr.				
80°		20 gr.	30 gr.		40 gr.		50 gr.		70 gr.	100 gr.	
50°			5 gr.		6 gr.		7 gr.		8 gr.		

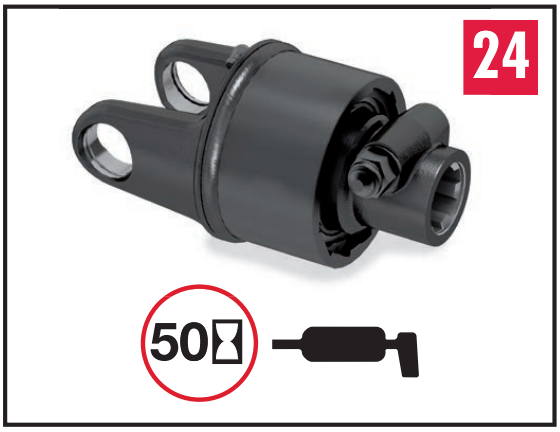


1 oz. = 28,3 g


23
250
20g
45g
12g
20g
20g
SFT+ EH
1 oz. = 28,3 g
75°
100
12g
32g
12g
250
20g
45g
12g
20g
20g
20g
SFT+ EH
1 oz. = 28,3 g
75°
50°
100
12g
32g
12g
16g
12g


SFT+ EH
23
250


25
50


24
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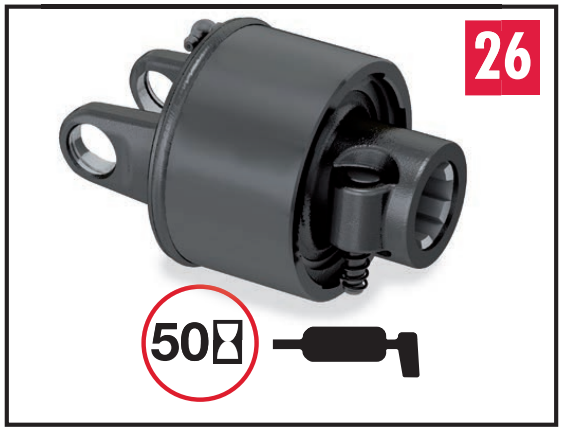

26
50

Axles Brakes & Suspension

This section contains information that must be followed to ensure the correct functioning of the axles and wheel brakes.

If in doubt contact the manufacturer or the manufacturers agent for further information or advice.

CAUTION

Failure to adhere to these instructions may affect the performance of the brakes and axles and could therefore lead to injury.

For additional Information refer to the manufacturers documentation.

Changing Wheels on a Trailer with Tandem Springs

CAUTION

DANGER: -
NEVER work under a trailer which is unsupported.
NEVER remove more than one wheel at a time.
ALWAYS stand clear of the trailer with the wheel removed.

CAUTION

FAILURE TO FOLLOW THIS PROCEDURE COULD RESULT IN SERIOUS INJURY OR DEATH

1. If loaded, empty the trailer.
2. Ensure trailer is parked on firm level ground.
3. Check trailer is securely hitched to the tractor, apply the tractor park brake, stop the engine and remove the key.
4. Ensure brakes are applied and wheels which are not being removed are chocked.
5. Slightly loosen the wheel nuts of the wheel to be removed.
6. Place jack below axle, as close to wheel as possible ensuring to leave room for an axle stand between the jack and the wheel.

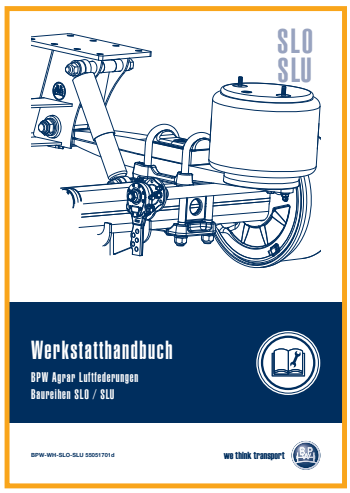
Minimum jack & axle stand ratings must be equal to or greater than axle weight (e.g. for 10 tonne axle weight jack must be minimum 10 tonne). The use of a bottle jack is not recommended

7. Using the jack raise the wheel to be removed ensuring other wheels remain on the ground. Raise the trailer until high enough for a fully inflated wheel to be refitted.
8. Position axle stand below axle as close to wheel as possible.
9. Lower axle onto stand.
10. Completely remove wheel nuts.
11. Remove wheel with additional help to remove large wheels.
12. To fit new wheel, place the wheel onto the axle hub using additional help.
13. Tighten all wheel nuts.
14. Raise machine from axle stand using the jack.
15. Remove the axle stand and lower the machine fully.
16. Tighten the wheel nuts to the prescribed tightening torque - see general tightening torque recommendations.

BWP Suspension & Axle Maintenance

Scan QR codes or visit richardwestern.com/bpw-manuals for latest manuals.

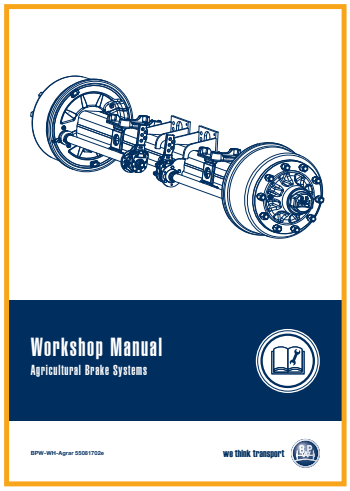
Workshop manual for air suspensions



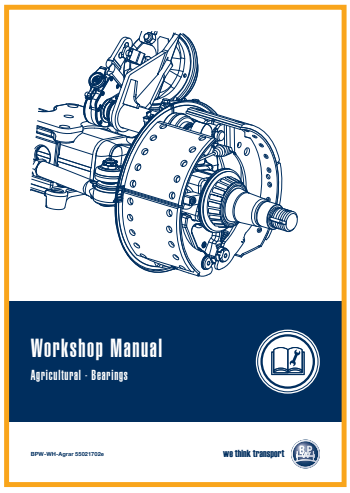
Workshop manual for hydraulic suspensions

AGRO Turn steering angle settings

Agricultural brake systems



Agricultural bearings



ADR Suspension & Axle Maintenance

Scan QR code or visit richardwestern.com/adr-manual for latest manual.

Maintenance Manual

Spring Drawbar

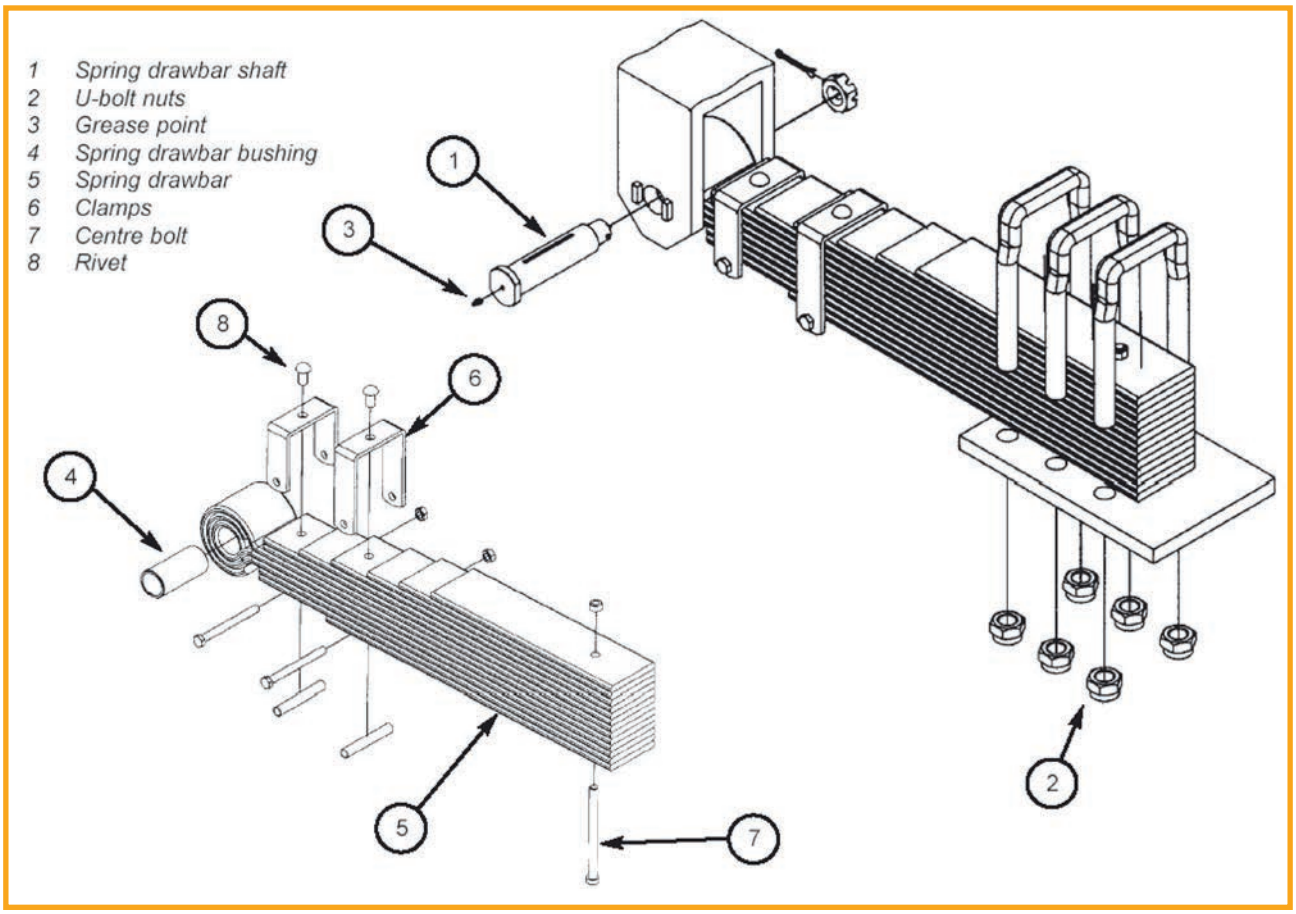
Every 6 Months

After the first laden journey, and before intensive use.

Retighten all the mounting U-bolt nuts **(2)** to the 980Nm torque.

Lubricate the attachment shaft **(3)**.

CAUTION Under harsh or intensive operating conditions, maintenance should be carried out more frequently.



Every year

Check the play between the bushing **(4)** and the spring drawbar shaft **(1)** and, if there is excessive play, replace the worn parts.

Check the general condition of the spring **(5)** clean it thoroughly and brush the sides of the springs to check for cracks.

Check the condition of the clamps **(6)**.

Service & Maintenance Manual

1. Introduction:

Thank you very much for purchasing a Distag QCS axle, this manual aims to ensure the safety of operators, through the maintenance and service of the axle through its lifetime.

Please Note:

- This manual does not replace the manual provided by the vehicle manufacturer.
- This manual describes everyday maintenance and service operations and does not cover major repairs.
- Maintenance and service should be carried out by a suitably qualified personal using the appropriate tools and equipment.
- **The authors and publisher are not liable for any physical damage or personal injury resulting from errors or omissions in this manual.**

Carrying out repairs and maintenance work may be dangerous. This safety notice describes only some of the potential hazards and is intended to make users aware of the risks and encourage them to take care.

Unstable vehicles:

- Always ensure the vehicle is stable and secure by using appropriate forces to stop movement during service and maintenance.
- Never work underneath or near a vehicle that has been raised using only a jack. When working underneath a vehicle that has been jacked up, ensure that the jack is used in conjunction with stands or other effective supports and that the jack and stands used can bear the weight of the vehicle. Also ensure that the ground is firm underneath the vehicle during maintenance and service.

Risk of Burn

- Beware of parts which may be hot after operation, such as brake drums should be left to cool before attending to service these.

Personal Protection:

- Ensure appropriate PPE is worn and equipment is in good working condition, always work in the presence of others.

1.1 Warranty

1.1.1 Conditions of Warranty

1.1.1.1 The warranty commitment below is only available from Distag QCS, strictly subject to the following conditions;

- The warranty period will commence 4 weeks from invoice date, or
- The warranty period commences once the machine in question has been duly registered with Distag QCS, within 4 weeks of first registration or entry into service. The registration document should include the serial number of the axle being used, and this serial number should be quoted on all correspondence.

1.1.1.2 It is advisable and highly recommended, for users to read through the "Maintenance Instruction" before using any Distag QCS Axle. Failure to carry out required routine maintenance could invalidate the warranty.

1.1.2 Scope of Warranty

1.1.2.1 For the duration of the warranty period, Distag QCS will cover the costs for replacement parts, as well as labour costs for disassembly and installation in line with Distag QCS standard time guideline. Such work must be agreed in advance with Distag QCS or the relevant machine manufacturer, and performed by suitably qualified person.

1.1.2.2 Defective or damaged parts, that have been dissembled, must be kept in storage, and made available for either:

- Detailed photograph's to be taken to support the claim, or
- Recall of the concerned parts to Distag QCS premises, or to the factory.

1.1.2.3 Duration of the warranty for the parts:

- Axle Beam: Subject to normal usage, and appropriate loading, the axle beam will have a 2 year warranty.
- Components: Subject to normal usage, the warranty period will be 1 year

1.1.3 Exclusion from Warranty

1.1.3.1 Normal wear and tear e.g. brake linings.

1.1.3.2 Damage caused by foreign objects entering the brake drum area of the axles.

1.1.3.3 Damage caused by use of the machine in abnormal conditions, or in an inappropriate application, or by operator misuse.

1.1.3.4 Failure attributed to the basic maintenance tasks as listed in this document not being followed e.g. lack of lubrication, or regular checking and re torqueing of U-Bolts.

1.1.3.5 Any failure attributed to the original machine design, or where the axles is not fitted in accordance with the correct criteria for normal use, or where the axle used has not been specified for the machine application.

1.1.3.6 Any consequential losses, beyond the replacement of the defective items, unless agreed in writing with Distag QCS.

1.1.4 Repairs During the Warranty Period

1.1.4.1 If repairs are carried out during the warranty period, the guarantee covering the replaced component will continue as the original component; and not start afresh.

1.1.4.2 It is essential that all maintenance work is carried out in accordance with the prescribed intervals, in order to maintain the safe operation, and roadworthiness of the machine. The relevant operation and service guidelines of the machine manufacturer must also be adhered to.

1.1.4.3 We strongly recommend that only Genuine HO'S Unite parts are used when fitting spare parts.

Axle Service & Maintenance Manual

2. Axles

2.1 Maintenance

2.1.1 Check Wheel Nuts for Tightness

The tightening torque of the wheel nuts must be checked after,

1. The first use.
2. The first high load journey after the wheels have been fitted.
3. The first 1000 km.
4. Every 1 month or 10,000 Km

- Tighten wheel nuts diagonally using a torque wrench to the specified tightening torque shown in Table 1 & Table 2 below.
- Note that wheel contact surfaces should not have additional coats of paint as this increases the risk of the wheels becoming detached.
- The torque values shown below can be achieved using a normal wheel nut spanner and a length of tubing as shown in the image below.
- Distag QCS recommend the use of wheel nut indictors to insure wheel security.

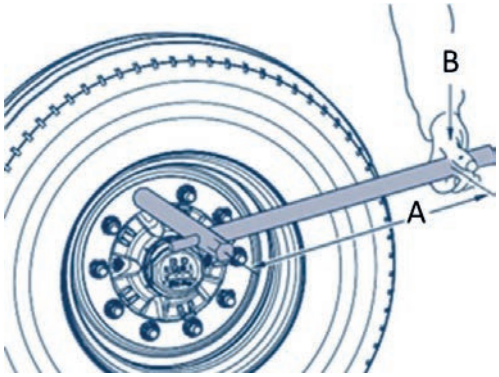


Figure 1 Calculated Tightening Torque

Table 1 Tightening Torque Value for Wheel Nut and Conical Washer

Stud Alignment	Tightening Torque	Tubing Length "A"	Physical Weight "B"
M20x1.5	380 Nm (360 - 400 Nm)	600mm	60-67Kg
M22x1.5	510 Nm (485 - 535 Nm)	800mm	60-67Kg

Wheel Nut & Conical Washer

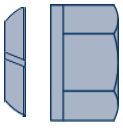
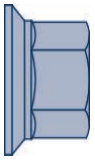


Table 2 Tightening Torque for Wheel Nut with Collar

Spigot Alignment	Tightening Torque	Tubing Length "A"	Physical Weight "B"
M20x1.5	480 Nm (455 - 505 Nm)	800mm	57-63Kg
M22x1.5	630 Nm (600 - 660 Nm)	1000mm	60-67Kg

Wheel Nut with Collar



2.1.2 Checking the Manual Slack Adjuster Operation

Please Note: Frequent checks of the manual slack adjuster are necessary, depending upon application every 1 to 3 weeks. Follow the procedure described below to check the slack adjusters.

- Actuate slack adjusters by hand, pulling against the return spring. If there is more than 35 mm of play, the slack adjuster must be reset. This can be done by adjusting the nut on the slack adjuster as shown.
- Adjust the play, shown as ”a” in the diagram below, to 10 -12% of the connected brake lever length ”B”, e.g. lever length 150 mm = 15 - 18 mm of play.
- Please Note: Automatic slack adjusters make this adjustment automatically whenever the camshaft is rotated by more than 17.5°.

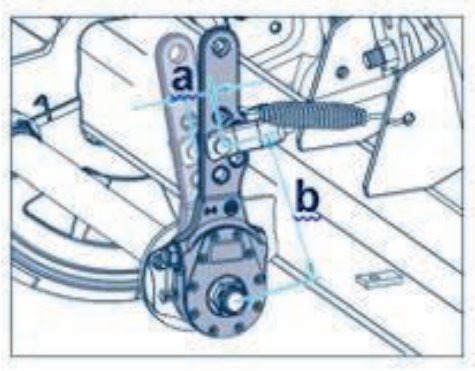


Figure 2 Manual Slack Adjuster

2.1.3 Checking Brake Lining Thickness

The checking of the brake lining thickness should be conducted every 3 months.

Open inspection hole by folding back the rubber flap. The brake lining should be replaced at a residual lining thickness of 5 mm (check with slide gauge) or on reaching the bottom of the indicator machined into the edge of the lining. Re-insert the rubber flap.

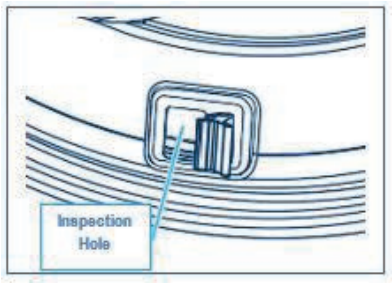


Figure 3 Inspection Hole

2.1.4 Check Wheel Hub Bearings

In order to check the wheel hub bearing play,

1. Lift the axle until the wheels are off the ground.
2. Release the brake.
3. Apply a lever between the tyre and the ground and check the play.

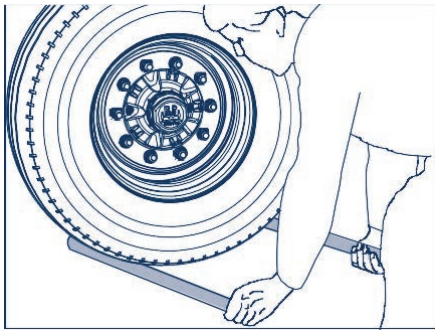


Figure 4 Checking Wheel Hub Bearings

If bearing play is detected, the bearing must be adjusted.

To adjust the wheel hub bearing:

1. Unscrew the cap.
2. Remove the split pin from the axle nut.
3. Fasten the axle nut using a torque wrench and with the continuous turning of the wheel hub. It should take several turns until the tightening torque has reached the desired value.

Tightening torques:

6 to 14 tons axle load = 150 Nm +8/-23 Nm.

-If a normal axle nut spanner is used, tighten the axle nut until the wheel bearing race drags slightly.

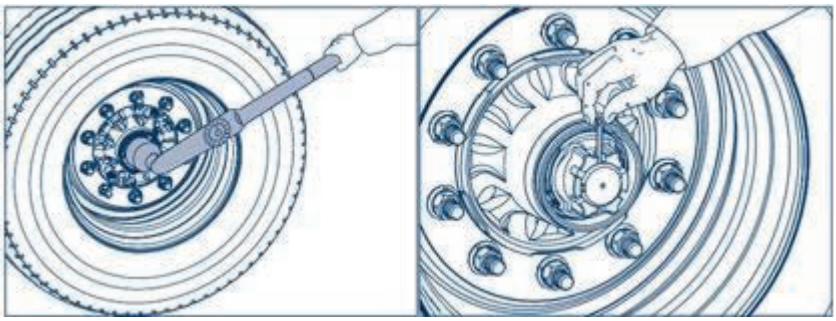


Figure 5 Tightening of the Axle Nut

Turn back the axle nut to the next available split pin hole. Should they already be in line turn back to the next hole (30° at the maximum).

Insert the split pin and bend upwards slightly.

Refill the cap as required with Ho's Unite special long-life grease.

Tighten the hub cap. Internal thread hub cap – 450Nm, External thread hub cap 400Nm

2.1.5 Check Hub Caps Tightness

This should be completed every 6 months

Check caps for tightness using a torque wrench or power tool.

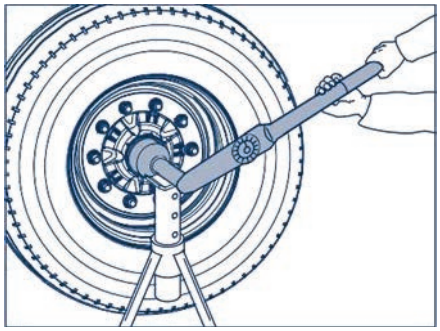


Figure 6 Checking Hub Cap Tightness

In an emergency the caps can be tightened using a normal cap spanner, by striking the latter with a hammer, or also with the aid of a piece of tubing placed over the wheel nut.

Tighten to the correct tightening torque as soon as possible.

2.1.6 Visual Inspection

– Every 3 months –

Check the tyre condition

– Every 6 months –

Check all components for damage and wear.

2.2 Lubrication

Note: After cleaning the vehicle with high-pressure cleaners, all lubrication points must be re-lubricated.

Ho's Unite Trailer axles / Ho's Unite Steering axles

Table 3 Axle Lubrication Schedule

#	Type	Every 2 Months	Every 3 Months	Every 6 Months	Every 12 Months	Every 24 Months	With each brake lining change
2.1.1	Steering Pivot (Top & Bottom)	✓					
2.1.2	Low maintenance brake camshaft bearing (Inner & Outer)		*	✓			✓
2.1.3	Slack Adjuster		✓				✓
2.1.4	Wheel Hub Bearing				*	✓	✓
*	Off-Road use						

2.2.1 Steering Pivot (Top & Bottom)

* Every 2 months*

Lift axle in order to relieve the steering pivot bearing. Grease lubrication nipple with Ho's Unite special long-life grease until fresh grease emerges from the bearing points.

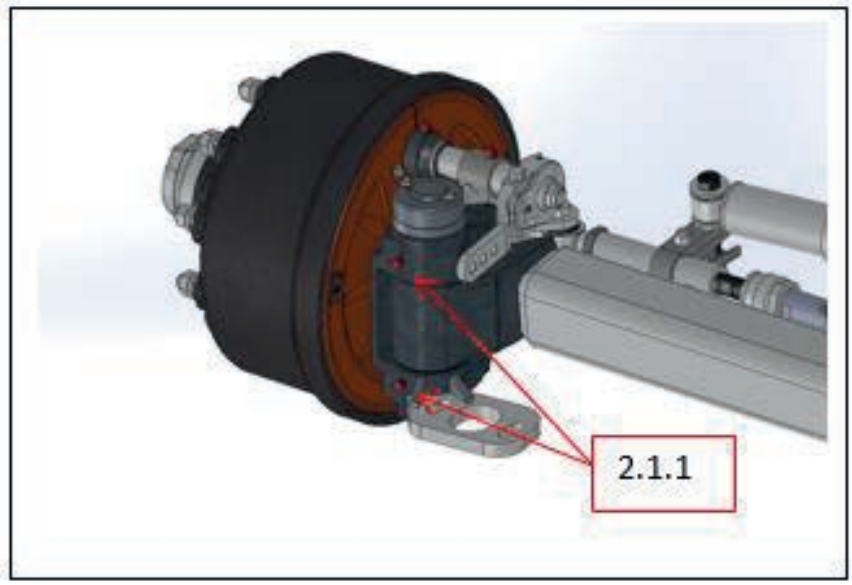


Figure 7 Showing Steering Pivot Grease Points

2.2.2 Brake Camshaft Bearing (Inner & Outer)

– Every 6 months – On-Road use

– Every 3 months – Off-Road use

– With each brake lining change -

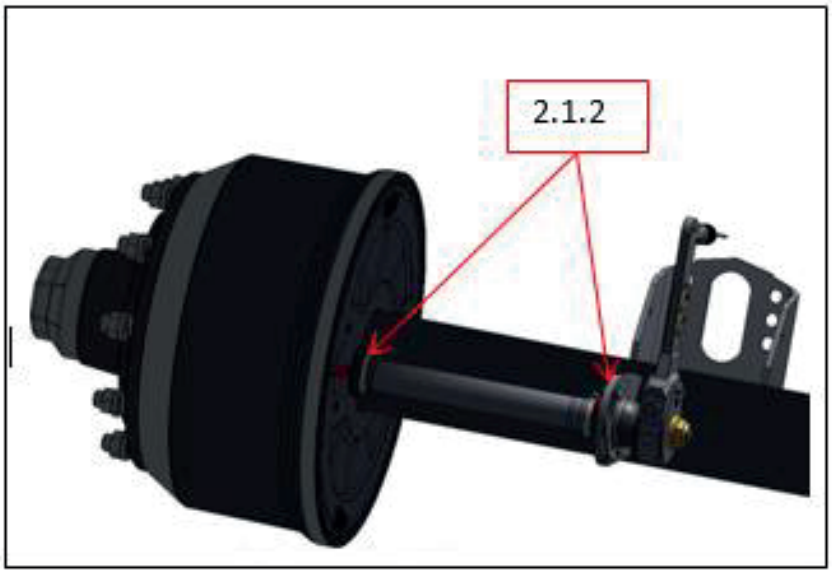


Figure 8 Showing Camshaft Grease Points

Prevent the vehicle from rolling away. Release the service brakes and the handbrake.

Lubricate the brake camshaft bearing through the grease nipple with Ho's Unite special long-life grease until fresh grease emerges from the bearing points.

2.2.3 Manual Slack Adjuster

* Every 3 months *

Grease lubrication nipple with Ho's Unite special long-life grease until fresh grease emerges.

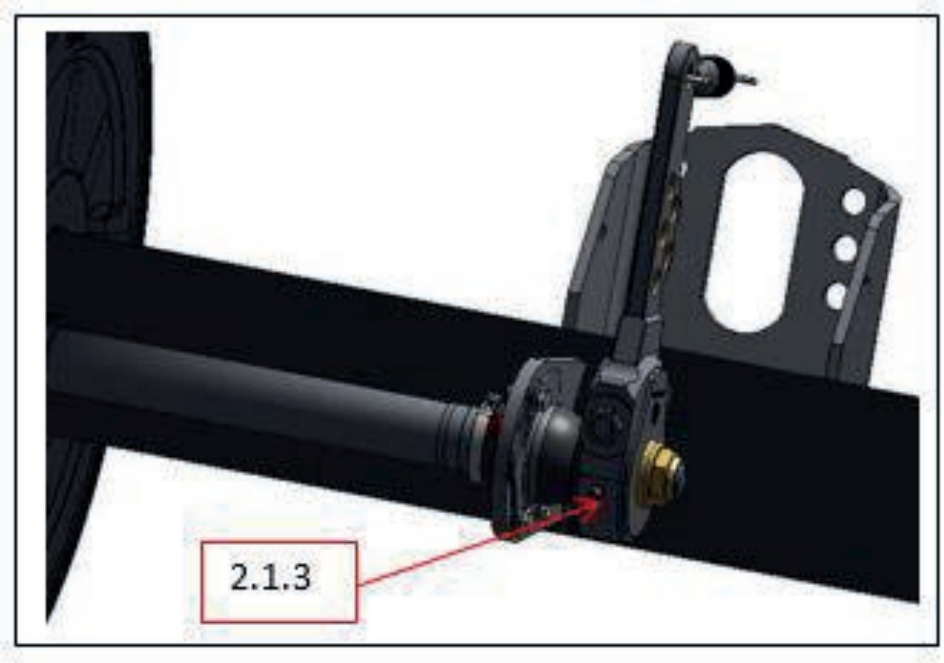


Figure 9 Showing Grease Point on Slack Adjuster

Automatic Slack Adjuster

– Every 12 months – On-Road use

– Every 6 months – Off-Road use

– With each brake lining change –

Grease with Ho's Unite special long-life grease (approx. 80 g) until sufficient new grease emerges from the adjustment bolt.

Turn back adjustment screw (keep clutch sleeve pressed down) by approx. one turn using a ring spanner. Actuate the brake lever several times by hand. The adjustment must be carried out smoothly. If necessary, repeat several times.

Adjust the brake

2.2.4 Wheel Hub Bearing

– Every 24 months or up to 150,000 Km's – On-Road use

– Every 12 months or up to 75,000 Km's – Off-Road use

– With each brake lining change –

Axle Service & Maintenance Manual

Remove the wheel hub and bearing, thoroughly clean the taper roller bearing and seals, dry and check if they can be re-used. Work Ho's Unite special long-life grease into the cavities between the taper rollers and cage in both taper bearing. (For grease quantity, see table below). Fit the wheel hub, tighten the axle nut whilst at the same time turning the wheel hub.

Table 4 Lubrication Instructions for Wheel Hubs

Lubrication Quantity Per Each Wheel Hub.			
Axle Size	**Capacity**	**Inner Bearing**	**Outer Bearing**
Ø310*190	11,000Kg	180g	320g
Ø406*120	11,000Kg	180g	320g
Ø420*180	12,000Kg	180g	320g
Ø420*180	14,000Kg	240g	500g
Ø420*200	16,000Kg	400g	800g
Ø420*220	16,000Kg	400g	800g

Steering Axle Service & Maintenance Manual

3. Steering Axles

3.1 Introduction

For the general procedure on the service and maintenance of steering axles, please refer to sections 2.2 (Maintenance) and 2.3 (Lubrication) above as all the guidelines given also apply to steering axles.

Self-steering axles incorporate 1 locking cylinder and either 1 or 2 shock absorbers. The shock absorbers purpose is to stabilise the mechanism and reduce sudden movements of the wheels. The locking cylinder is used to lock the steering axle when reversing, and can also be used when driving forwards on roads at higher speeds, or on hilly terrain.

3.2 Maintenance

3.2.1 General Maintenance for Steering Axles

- Lubricate the various components as outlined in section 2.3 above.
- Visual inspection for any leaks of oil from the hydraulic cylinder or shock absorber, also check for any signs of damage to these components.
- Inspect the tightness of all nuts and bolts associated with the steering elements of the axle, the procedure for this is shown in section 3.2.2.
- Visually inspect the connecting rod, ball joint and clevis assembly connected to the axle drum and cylinder for any damage as this will affect the steering angle.
- Check the positioning of the angle limit screws on the axles.

It is essential before carrying out any work on hydraulic or pneumatic systems, take all necessary actions to ensure that the hydraulic fluid or air is not under pressure.

3.2.2 Tightening of Bolts and Nuts

Check the tightness of all nuts and bolts located on the steering axle every 6 months and tighten if necessary.

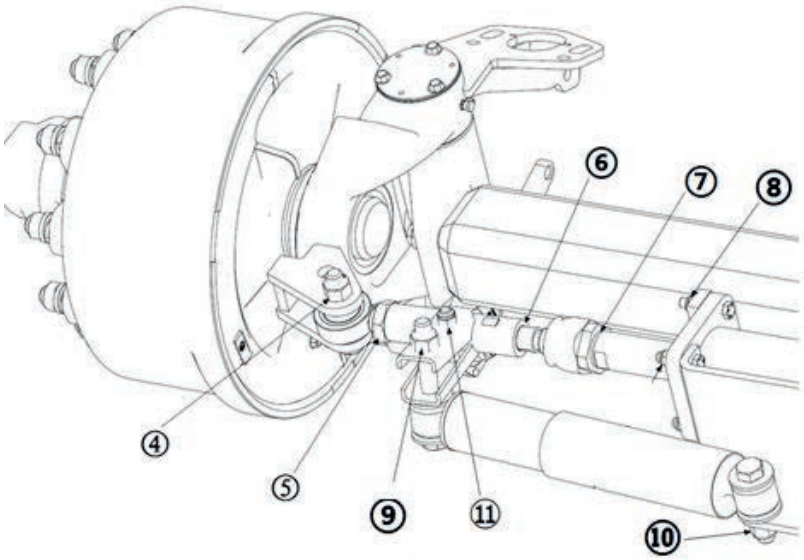


Figure 10 Showing the Tightening Points on Steering Axles

- No.4 above must be tightened in order to secure the connecting rod to the axle drum.
- The tightening torque of the connection rod nut on the ball joint and clevis assembly No.5 is 750 – 850 Nm.
- The tightening torque of the ball joint and the centre piece No.6 is 650 – 700Nm.
- The tighten torque of the cylinder piston and the ball joint end No.7 is 380 – 450Nm.
- The tightening torque for the fixing of the cylinder to the axle nut No.8 is 80-100Nm.
- The tighten torque of the shock absorbers hanger and cylinder connection nut No.9 is 45-55Nm.
- Tighten the shock absorbers fixed nut No.10.
- The tightening torque for the locking nut of the clamp No.11 is 120-140Nm.

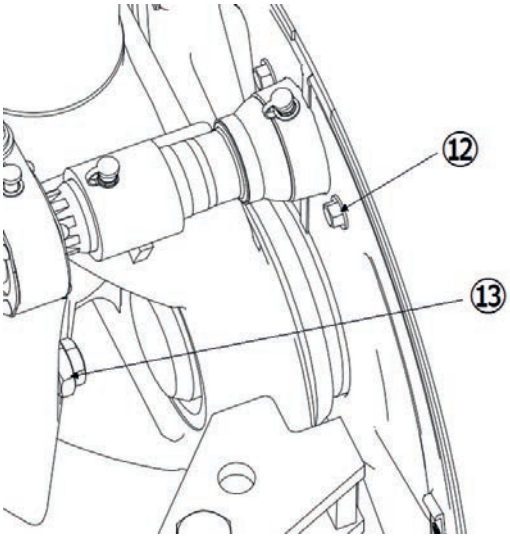


Figure 11

1. The tightening torque of the dust cover screw No. 12 is 45-55 Nm.
2. The tightening torque of the steering limit nut No.13 is 180-220 Nm.

3.2.3 Checking the Steering Pin

The steering pin should be checked every 6 months. The procedure for checking the steering pin is as follows,

Step 1: Remove bolts as shown below and remove cap.

Figure 12a

Steering Axle Service & Maintenance Manual

NOTE: The orientation of the kingpin may vary, depending on the year of manufacture of the axel.

If the kingpin nut is located on the underside of the axel, the following steps (a-c) will need to be taken before proceeding on to ***Step 2***.

a. *Raise axel above the ground using hydraulic jack.*
b. *Remove opposite cap and rubber seal, as shown in in Figure 1b.*
c. *Tap kingpin downwards using hammer to tighten taper fit of kingpin, as seen in Figure 1c.*
d. *Approximate end position of Kingpin shown in Figure 1d.*

Figure 1b

Figure 1c

Figure 1d

Step 2: Loosen lateral bolt using Allen key.

Figure 13

Step 3: Replace the steering pin, install the new steering pin in position (the steering pin must fit in place, the tapered surface of the steering pin and knuckle seat must match to auto lock), if necessary replace the lubrication bearing in advance. Install

the washer and seal ring in turn, and tighten the steering nut with a torque of 120-150Nm, and back loose 30°- 45°.

Figure 14a

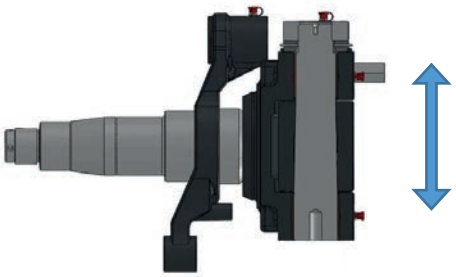
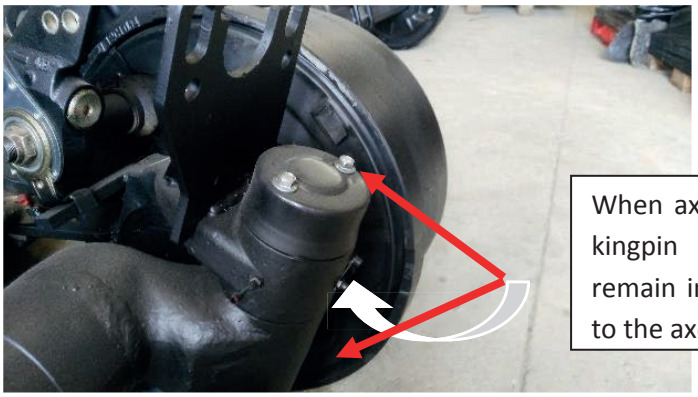


Figure 3b

Step 4: Apply Loctite or a different thread lock to lateral bolt and tighten with a torque of 45-55Nm.

Figure 15

1. **Step 5**: Install the knuckle end cap, and the M10 lock nut (3) with a torque of 35-40Nm as described below.



When axle is steering the kingpin and cap should remain in a fixed position to the axel.

Figure 16

3.2.4 Checking and Adjusting the Wheel Alignment

If an operator feels that the vehicle wheel alignment may be off, it is important to perform this check as early as possible in order to avoid tyre wear or component damage.

To perform a wheel alignment check,

1. Place the vehicle and the self-steering axle in line on a flat and perfectly horizontal surface.
2. This should be done with the cylinders extended, therefore the axle in the locked position.

Measure the distance between the wheel rims at the front of the self-steering axle, and then at the rear, (A and B) you should find the same measurement within tolerance of + or - 1mm.

Repeat this procedure after turning the wheels half a turn to ensure accurate measurement.

If the measurement continues to be outside of the specified tolerance follow the given procedure below in order to adjust wheel alignment.

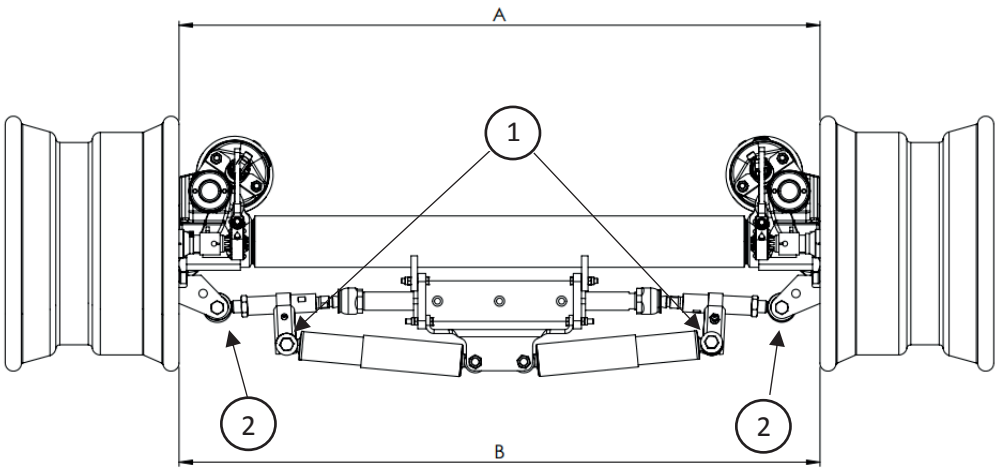


Figure 17 Distance A and B Shown for Wheel Alignment Check

Procedure for adjusting wheel alignment:

1. Ensuring Cylinder is fully pressurised and in the locked position.
2. Remove the 2 Shock Absorber Pins shown in Figure 17 as item No. 1.
3. Remove the 2 Clevis head Pins shown as No. 2 in Figure 17.
4. Once removed, drive vehicle forwards on a straight line reference for approx. 5- 10 metres.
5. Adjust clevis head by turning until it is in position for the pin to be reinserted.
6. Re-check using procedure given above.
7. Please Note: If problems persist contact main dealer for further examination.

3.2.5 Adjusting the Steering Angle Stopper Screws

If necessary it may be required to adjust the steering angle limit by adjusting the stopper screws, these are located as shown in Figure 18.

Check the full-lock angle regularly by turning fully to the right and to the left and checking that the tyres do not touch the trailer chassis or suspension as this might wear or damage the tyres.

If fouling occurs adjust the screws to limit the steering angle.

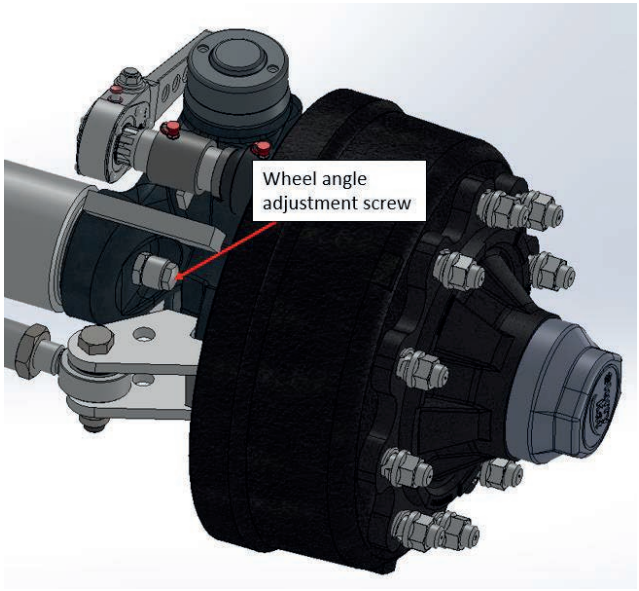


Figure 18 Showing the Location of the Wheel Adjustment Screw

Suspension Service & Maintenance Manual

5.Suspension

5.1 Slipper & Eye Suspension

Suspension service and maintenance on the slipper & eye type suspension should be carried out,

1. After the first laden journey.
2. Every 6 months thereafter.

In order to conduct this service please follow the following procedure whilst referring to Figure 22

1. Lubrication should be applied to the 6 grease points identified in Figure 22.
2. U-Bolts should be tightened to the recommended torque as outlined in Table 5, section 4.1.
3. Ensure tightness of nuts identified as No.9, 10, 11 and 12 in Figure 23.

Under harsh or intensive operating conditions, maintenance should be carried out more frequently.

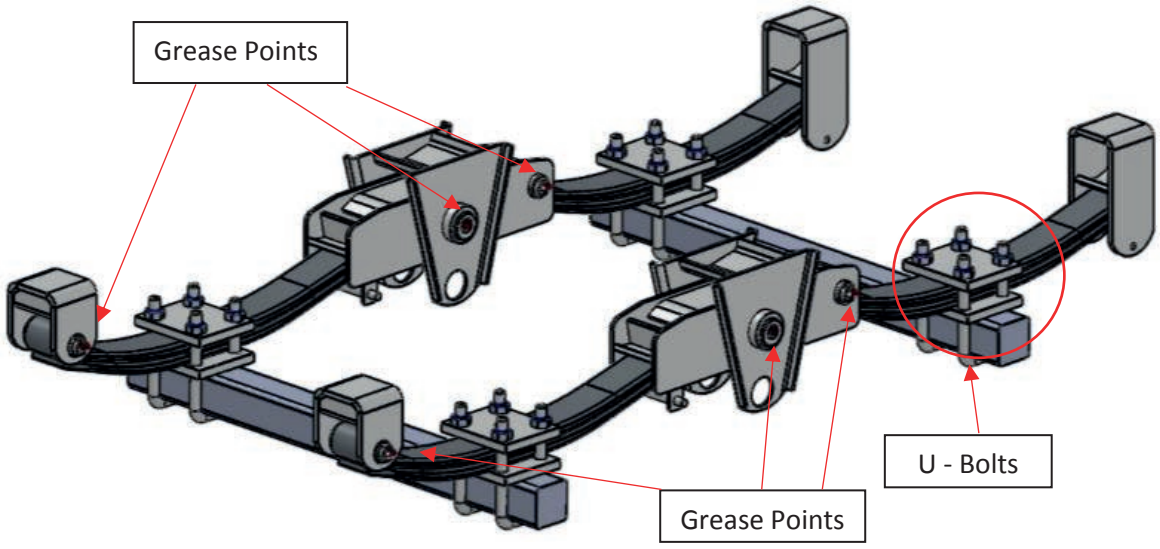


Figure 22 Showing the Service areas on Slipper and Eye Suspension

Yearly maintenance checks of the slipper and eye type suspension is also required. The following procedure should be followed to achieve this, please refer to Figure 23 in conjunction with this procedure.

- Visually inspect the condition of the springs by thoroughly cleaning them to check for any cracks or deformation.
- Check the clearance between the bushings No. 2 and the rocker shaft No. 1, if excessive clearance is seen, replace the worn parts.
- Inspect the spring shackle pin for any deformation or wear No.10 and replace if there is excessive wear or deformation.
- If clearance between the springs and the axles is visible, proceed to check the whole of the clamping system, items No.5, No.6, No.7 and No.8.

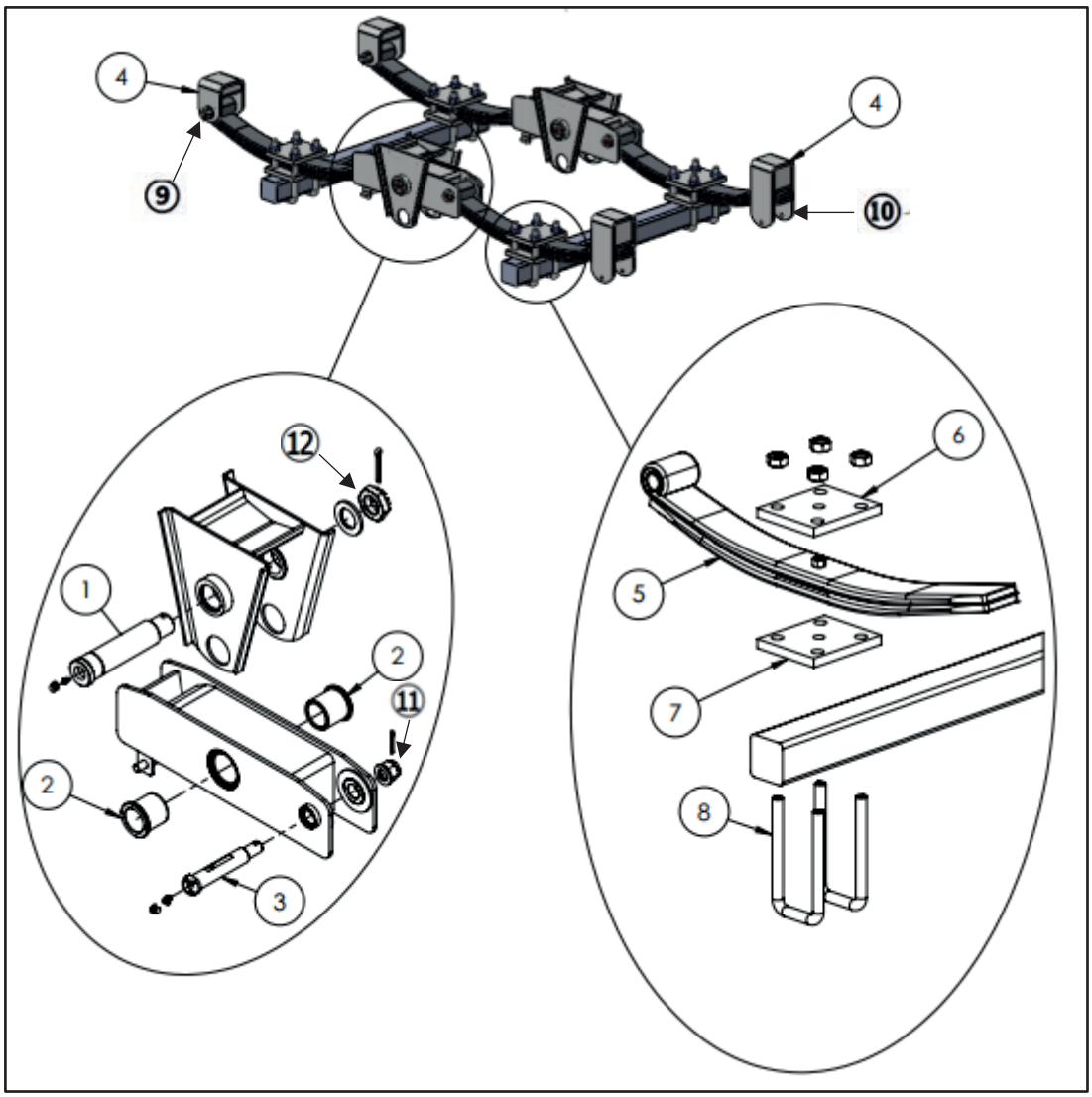


Figure 23 Exploded View of Slipper & Eye Suspension

Suspension Service & Maintenance Manual

5.2 RSC & YSC Suspension

Suspension service and maintenance on the RSC & YSC suspension should be carried out,

1. After the first laden journey.
2. Every 6 months thereafter.

In order to conduct this service please follow the following procedure whilst referring to Figure 27.

1. U-Bolts should be tightened to the recommended torque as outlined in Table 5, section 4.1.
2. Ensure tightness of the nuts identified in Figure 24 on each side and Figure 25 if applicable.
3. Ensure that the clamping bracket and the suspension bracket do not touch, these can be seen in Figure 26 below. If they do, replace the conical washer which is shown as No.6 in Figure 27.

Under harsh or intensive operating conditions, maintenance should be carried out more frequently.

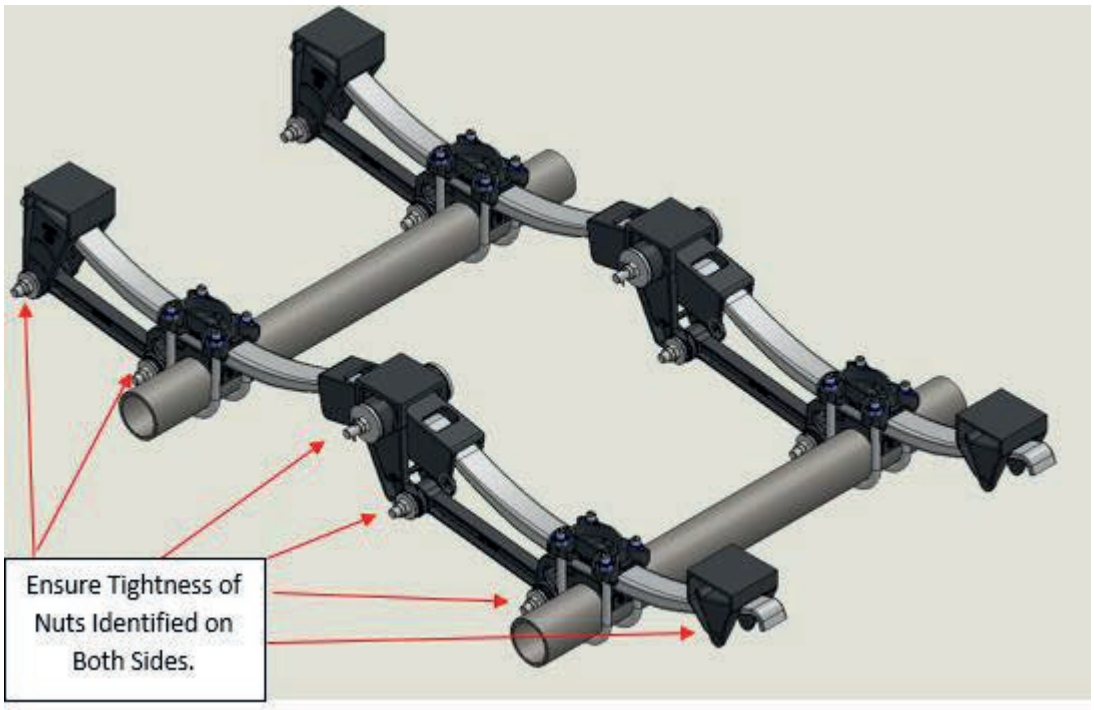


Figure 24 Showing Tightening Points for a RSC and YSC Suspension

Please Note, If a suspension incorparates an adjustable torque arm as shown in Figure 25, ensure tightness of the 4 bolts as identified also whilst serviceing.

Figure 25 Adjustable Torque Arm

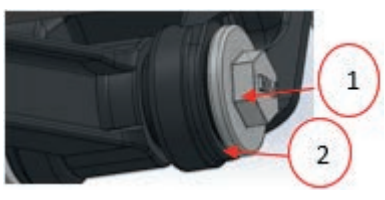


Figure 26 Space Between Washer and Bracket Edge

Suspension Service & Maintenance Manual

Yearly maintenance checks of the RSC and YSC suspension is also required. The following procedure should be followed to achieve this, please refer to Figure 27 in conjunction with this procedure.

- Visually inspect the condition of the springs by thoroughly cleaning them to check for any cracks or deformation.
- Check the clearance between the hanger bushings No. 5 and the central equaliser pin No. 4, if excessive clearance is seen, replace the worn parts.
- If clearance between the springs and the axles is visible, proceed to check the whole of the clamping system as shown in the right section view below.

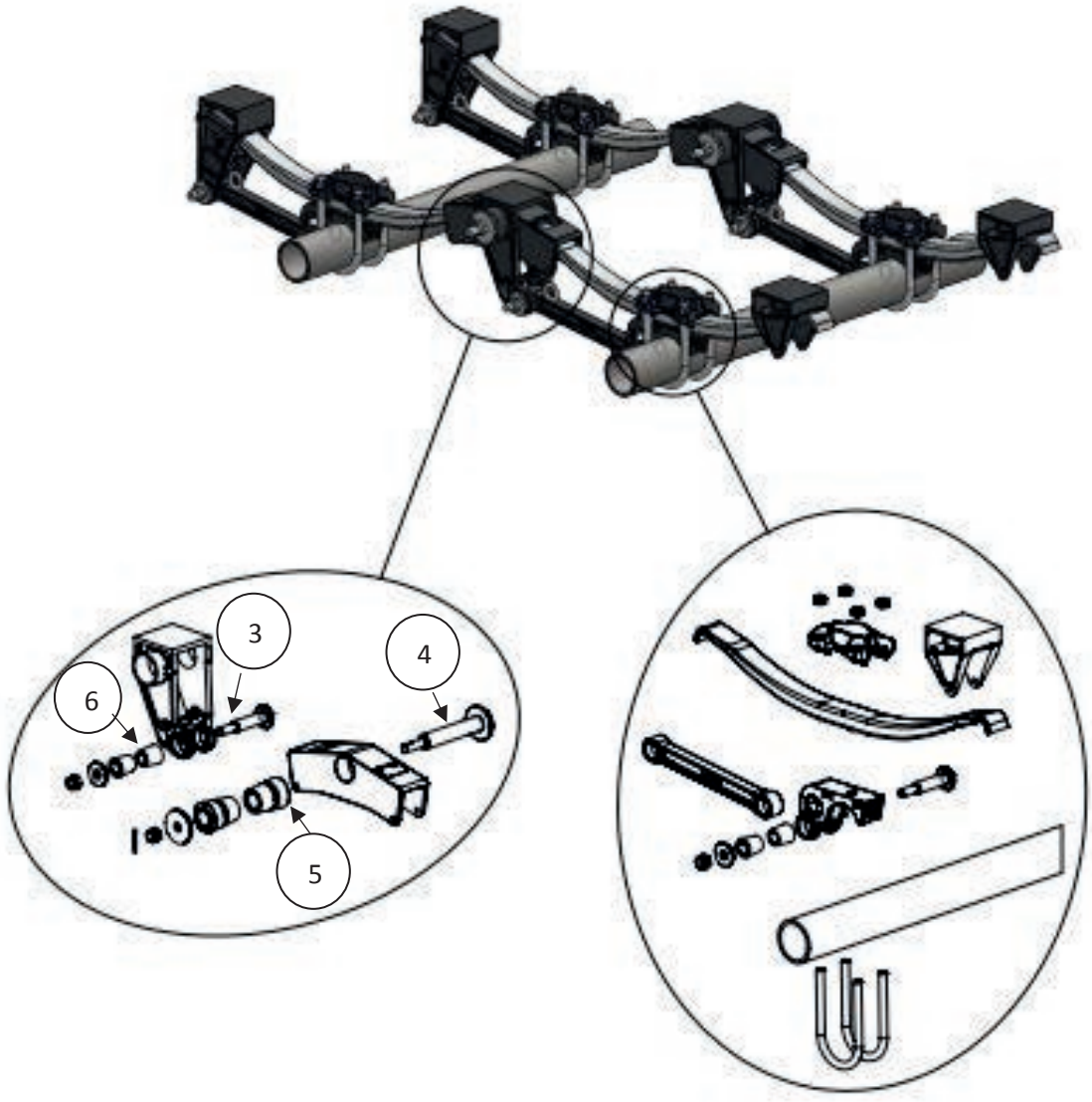


Figure 27 RSC and YSC Suspension Exploded View

Tyre Size	Load/ Speed	Make	Design	TT/ TL	Fits Rim	Diam-eter x Width	Load (Kg)	Bar	Speed (kmh)
23.1-26	159A8 (16PR)	Alliance	347	TL	20 x 26	1605 x 587	4375	2.3	40
23.1-26	159A8 (16PR)	BKT	TR-135	TL	20 x 26	1605 x 587	4375	2.3	30
23.1R26 (620/75R26)	167A8/164B	Alliance	360	TL	20 x 26	1590 x 625	5450/5000	3.2	40/50
650/55R26.5	167E	Alliance	380	TL	20 x 26.5	1360 x 645	7900/5450	4	40/70
650/65R26.5	173D	Alliance	380/390	TL	20 x 26	1450 x 660	8840/7870	4	40/50
650/65R30.5	176D	Alliance	380	TL	20 x 30.5	1625 x 680	9660/8590	4	40/50
650/65-30.5	16PR	BKT	FL648	TL	20 x 30.5	1650 x 650	5450/4875	2.2	40/50
650/75R32	172A8/172B	Alliance	360	TL	20/21 x 32	1800 x 625	6300	3.2	40/50
700/50-26.5	166C 16PR	Alliance	328	TL	24 x 26.5	1333 x 700	8040/6360	3.3	40/60
710/50R26.5	172D	Alliance	390	TL	24 x 26.5	1390 x 730	8750/6300	4	40/65
800/65R32	173A8/170B	Alliance	360	TL	27 x 32	1850 x 800	6500/6000	2.4	40/50
800/65R32	181A8/178B	Alliance	360	TL	27 x 32	1850 x 800	8250/7510	3.6	40/50
18.4-34	153A8 (14PR)	Alliance	324	TT	15 x 34	1650 x 467	3650	2.5	40
850/45R34	178A8/168D	Alliance	388	TL	28 x 34	1657 x 843	7600/5600	2.1	40/65
520/85R38	169A8/169B	Alliance	Farm-PRO	TL	18 x 38	1850 x 525	5800	3.6	40/50
520/85R38	155A8	BKT	RT855	TL	18 x 38	1849 x 516	3875	1.6	40
520/85R38	170A8	BKT	RT855	TL	18 x 38	1849 x 516	6000/5450	3.6	40/50
580/70R38	180A8	Alliance	370	TL	18 x 38	1817 x 577	8000/7280	4.6	40/50
580/70R38	180A8	Alliance	Farm-PRO	TL	18 x 38	1835 x 577	8000	5.4	40/50
710/55R34	169D	Alliance	388	TL	24 x 34	1656 x 712	7890/5800	2.8	40/50
710/70R38	172A8	Alliance	Farm-PRO	TL	23 x 38	1958 x 716	6300/6300	2.4	40/55
710/70R38	178D181A8	Alliance	360	TL	23 x 38	1948 x 716	8210/7500	3.5	40/50
710/70R38	178A/175B	Alliance	360	TL	23 x 38	1948 x 716	7500/6830	2.8	40/50
710/70R42	177D/180A8	Alliance	356	TL	23 x 42	2055 x 740	8000/7300	3.2	40/65
650/65R38	178A8/175B	Alliance	360	TL	20 x 38	1835 x 645	7500/6900	3.5	40/50

Cleaning and Maintenance of Paint

Cleaning and Maintenance of SELEMIX ® Paint films in the industrial market

Background

For Industrial coatings, the durability and resistance to aggressive climate conditions are key requirements.

SELEMIX® provides high performance Industrial paint systems that are able to cope with the toughest of environmental conditions. Even so, as for any coating system, the owner will need to take appropriate care in maintaining the condition of the paint film to maintain a high quality appearance and image over the life of the unit.

Part of this requirement is the need to clean the paintwork regularly.

This document has been created with this in mind, and provides guidance and recommendations for the use of commercially available cleaners with SELEMIX® paint systems.

Description

When a unit is painted in a SELEMIX® paint system, you can be sure that the quality of the paint film is excellent and will remain so for the life of the unit if maintained properly. The SELEMIX® brand delivers the most efficient process at the highest level of quality for the Industrial market.

Note: Commercial washes, high pressure washes, and use of strong detergents, should not be used during the first 30 days after application of the paint film. The use of aqueous detergents for cleaning is possible. Any deposits of road tar should be removed with a soap solution.

Automatic cleaning machines can be used, but attention must be paid to the dosing parameters of cleaning machines. The maximum concentration should not be higher than 500:1 (water:detergent).

The pH value of these solutions should be between 7 and 8, and clean water must be used for a very thorough final rinse.

IMPORTANT: Cleaners containing the following aggressive chemicals are strictly not recommended:

Description	CAS Number	CAUTION
Caustic soda	1310-73-2	NOT recommended
Butyldiglycol	111-76-2	NOT recommended

High pressure cleaning can be carried out as long as the temperature is maintained below 50°C. The lance must be used at a minimum of 60 cm from the paint surface (180 bars maximum).

Always carry out cleaning processes in a shaded area, never in direct sunlight.

To prevent corrosion problems, any stone chips / damage must be rapidly repaired with the correct SELEMIX® paint system.

Detergents and their modes of use

Type	Description	Function
Detergent	Great variety available: the simplest versions are soap based.	Easily wet on the surface of paint films and emulsify organic deposits.
Phosphate	Generally Sodium Phosphate.	Removes the Calcium / Magnesium salts in Hard water.
Organic Solvent	In general Alcohols and Ketones.	Helps to soften and remove grease deposits.
Free Alkali agents	Sodium Hydroxide (Caustic Soda) NaOH.	Dissolves oils and waxes. Can attack paint resins and pigments. Cleaners containing the following aggressive chemicals are strictly not recommended.

Soaps and detergents

The molecules of soap possess a hydrophilic nature (soluble in water) and also a hydrophobic nature (soluble in greases).

They are capable of mixing with some greases which are not soluble in water and dispersing these greases in an emulsion solution.

Also they reduce the surface tension of insoluble particles allowing them to be removed more easily from a paint surface.

Acids, alkalis and the PH scale

The pH scale is a numeric graduation going from 0 to 14.

The neutral aqueous solutions have a pH of 7, Acids have a pH < 7, and Alkalis have a pH > 7.

The graduation is logarithmic, and one unit of pH has a factor equivalent to 10 in the concentration of acids or alkalis.

The pH Scale

Acidity increasing **Alkalinity increasing**

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Acid Strong		**Acid Weak**			**Neutral**		**Alkaline Weak**			**Alkaline Strong**				

For the dilution of Alkalis by a factor of 10, the pH is reduced by one unit. For the dilution of Acids by a factor of 10 the pH is raised by one unit.

Factor of dilution	Change of pH
x 10	1 Unit
x 100	2 Unit
x 1000	3 Unit

Cleaning of paintwork

The table below lists the different types of dirt and the recommended methods of removal.

Read carefully the recommendations supplied with the different cleaning agents and ensure that they are used correctly. Do not use any abrasive products. Rinse carefully with clean water, before use of any detergents and always thoroughly rinse after using detergent cleaners.

Contamination	Causes	Method of Cleaning
Pollution coming from the road or from the road or	Sand, oil, carbon, exhaust gases, road tar, dust, resin from trees, bird lime, acid rain, etc.	Clean with a suitable aqueous detergent, rinse thoroughly and dry.
General dirt	Mud, earth, etc.	General cleaning with a pressure washer.
Pollution coming from substances coming into contact in used	Cement, Lime, Ashes	Clean using dedicated solution
	Oils and Greases	Steam clean or use a cleaner with an alkaline base (ensure correct dilution and strictly avoid Caustic Soda)
	Flour	Clean using dedicated solution in a pressure washer.
	Other substances	Specific agents depending upon the contamination.

Methods and Tools used for cleaning paintwork

Rinse the vehicle thoroughly using clean water, before using a solution containing a cleaner. After cleaning, rinse thoroughly again using clean water.

Type	Recommendation
Detergent Products	Great variety available: the simplest versions are soap based. Alkaline - Dilution as per cleaner TDS pH 7-8 (maximum)
Brushes	With long, soft bristles, and must be properly maintained and replaced regularly.
Sponges	Clean and soft
Buckets	Washed and cleaned regularly. Replace with fresh clean water and detergent after each use.
Pressure Washing	The lance must be kept at a minimum distance of 60 cm from the paint film, with a maximum pressure of 180 bars. Always use the correct dilution.
Temperature of Water	Maximum 50°C for cleaning. Ambient temperature for rinsing.
Rinsing	A large volume of cold clear water should be used, so that no detergent/ Cleaner is left on the surface of the paint film.

Problems caused by ineffective cleaning

Problem	Cause
Unit remains dirty after the cleaning	Greasy film has not been removed, bad choice of detergent. Temperature too low. Inadequate rinsing.
Solid residues on the paint surface when the vehicle is dried	Inadequate rinsing allowing the cleaning solution to dry on the paint surface.
Matt Appearance when dry, gloss can only be returned by polishing	Caustic attack from the cleaner. Usually due to incorrect dilution of the cleaner or inadequate rinsing.
Residues of Cement / Lime not removed	Incorrect type of cleaner.
Change of colour, reduction of gloss, marbled appearance.	Pigments attacked by very strong acids or alkalis.
Matt patchy appearance	The effect of strong sunlight (UV) on poorly rinsed areas can result in an accelerated and irregular matting of the paint.

Recommended Lubricants

	Grease	Oil Floor Drive Gearbox	Oil Rotor Drive Gearbox
bp	Energrease LS/LS2	Energear Hypoid 80w-90	Energear Hypoid 80w-90
CALTEX	Marfak All Purpose 2 Multifak EP2		
Castrol	Agricastrol Multi Use Spheerol AP2 Castrol LM	EPX 80w - 90	EPX 80w - 90
Esso	Esso Multi-Purpose Beacon 2		
Mobil	Mobilux 2 Mobigrease MP	Mobilube 1 SHC 75W-90	Mobilube 1 SHC 75W-90
	Farm Grease Universal Retinax A	Spirax A 80w-90	Spirax A 80w-90
	Multifak EP2 Totalfarm Multis 2	Geartex EP-C 80w-90	Geartex EP-C 80w-90

OPERATING INSTRUCTIONS & TEST PROCEDURES

For Two-Line Air Systems Including ABS

IMPORTANT!

Before working on braking systems and components always observe the following precautions: -

a) Stop the engine before working under a vehicle.
b) Always chock the trailer wheels, because depleting the system pressure may cause the vehicle to roll.
c) Keep hands away from actuators and brake levers as they may move as the system pressure changes.
d) Never connect or disconnect an air line containing pressure, it may whip as the air is released.
e) Never remove a component or plug unless you are certain all system pressure has been released.
f) Never exceed maximum working pressures.
g) Never attempt to dismantle a component until you have fully read and understood the recommended procedures.
h) Use only the correct tools and observe all safety precautions pertaining to use of these tools.

IF ALL INSTRUCTIONS ARE FOLLOWED CORRECTLY THE TWO-LINE AIR BRAKING SYSTEM WILL PROVIDE YEARS OF TROUBLE FREE SERVICE

J H MILNES LIMITED
NEW CHAPEL FARM,
CHAPEL LANE,
PENISTONE,
SHEFFIELD
S36 6AQ
ENGLAND
TEL: - 0044 (0)1226 766251
FAX: - 0044 (0)1226 370651
EMAIL: - steve@eurosafebraking.com
WEB: - www.eurosafebraking.com

WARNING!

Thoroughly read and understand this manual before attempting any remedial work, or adjustments to this braking system.

DOCUMENT CONTENTS

Introduction:

Since 1986 trailers used for the sole purpose of Agriculture, Horticulture or Forestry, and travelling below 20mph have been allowed to have a braking performance of just 25%. This means that a tandem axled agricultural trailer with 16 tonnes of weight imposed on the road, by its tyres, would need to generate a minimum braking force of 1000 kg per wheel.

However, the same trailer travelling above 20mph, or not being used for Agriculture, Horticulture or Forestry would be required to have twice the braking capacity, and generate a minimum or 2000 kg braking per wheel.

Trailers travelling at above 20mph are required to have a two-line air braking system, and meet the prevailing standards for HGV trailers. The tractors will also need to meet the higher braking performances, and other design criteria.

Two-line system – Maintenance:

Generally speaking, the trailer two-line air braking system requires little specific maintenance. However, the whole system should be drained regularly to remove any water from the tanks.

Regular inspections should be undertaken, where all of the pipes are visually inspected to ensure that none have become kinked or worn, and all mechanical linkages should be checked, and lubricated as necessary.
The air filters can be checked for contaminants (after disconnecting both of the air susies), and these can be cleaned/replaced as necessary.

The ABS system, if fitted, is designed to monitor itself for faults.
As long as the ABS warning lamp functions correctly and the wheels do not lock, then most of the ABS system is virtually maintenance free.
However, after removing the drums/hubs care should be taken to ensure that the ABS sensors are in their correct positions, and that the teeth on the pole-wheels are free from damage and ferrous contamination. The ABS sensors should be greased using high melting point grease, so that they do not seize in their mounting bushes, and they should be pushed in by hand until they are in contact with the pole-wheels.

In order to maintain a safe level of braking, the foundation brakes need to be serviced to the same levels as HGV trailers. Any reduction in the performance of the trailer's foundation brakes can adversely affect the life of the tractor's brakes, and possibly invalidate any warranty claims.

Two troubleshooting pages are included at the end of this document, as well as extra technical detail concerning the RELSV and ABS.

Specialist diagnostic services are available to cover any aspect of the air/ABS system, and help should be sought if any doubt exists about safety critical items.

Two-line trailer air braking systems:

The two-line trailer braking system is based on HGV trailer braking systems which were designed to meet the European Council Directive 71/320/EEC. These systems use one red air line (known as a supply or emergency line) which is permanently pressurized by the tractor when coupled to the trailer, and one yellow line (known as the service or control line) which has a variable pressure. This variable pressure is controlled by the driver, and is determined by the how quickly the driver wishes to slow down, or whether the tractor's handbrake is applied. Also, this is often fully pressurized when the tractor's ignition is switched OFF.

Figure 1 is a typical layout of a tandem-axle trailer, with a combined RELSV and ABS. The RELSV is mounted between the axles, and connects to either a telescopic pole or an angle iron which fits between them, the angle iron system is sometimes supported by rubber bobbings.

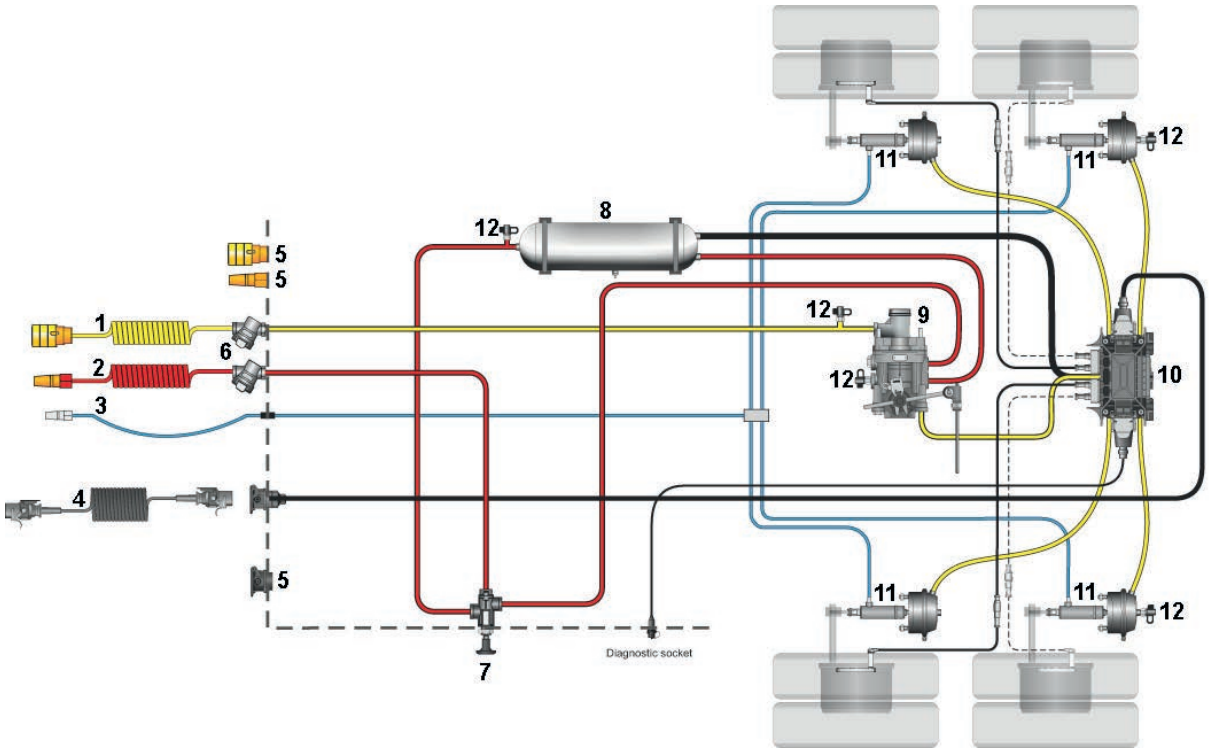
For a two sensor ABS system the front axle should be ABS sensed, and the layout below also shows extra (optional) ABS sensors connected to the rear axle. These extra ABS sensors should ensure that the rear axle does not lock.

Where no ABS system is fitted, then the RELSV delivers the air directly to the brake chambers from each of its delivery ports. (The brake chambers are also fitted with hydraulic cylinders, which are fed directly from the tractor's hydraulic brakes, when the tractor does not provide trailer air braking.)

For tri-axle trailers with ABS, then the centre axle is normally ABS sensed, when using a two ABS sensor system. With a four ABS sensor system, the extra two sensors could be fitted on the front or rear axle, dependent upon trailer design and weight distribution.

With a tri-axle trailer the RELSV is generally fitted above the centre axle and connected directly to it, so no telescopic pole,angle iron or bobbings are required.

Figure 1:



Position Number	Description	Position Number	Description
1	Yellow line Susie	7	Shunt Valve
2	Red line Susie	8	Air Tank
3	Hydraulic brake hose	9	RELSV
4	ABS Power Susie (5 core)	10	ABS Modulator Valve + Cables
5	Dummy Couplings	11	Air + Hydraulic Brake Chambers
6	Filters	12	Pneumatic Test Points

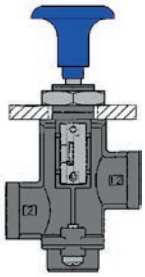
Two-line system – Operation:

The air enters the trailer via the red susie (2), and passes through a filter (6). The filter is designed to trap particles of dirt, to stop them entering other valves further down the line. It is not designed to stop water entering the trailer's system, as this function is part of the tractor's braking system when fitted with an air dryer. From time to time it is worthwhile dismantling each filter, and cleaning out any debris that has been caught.

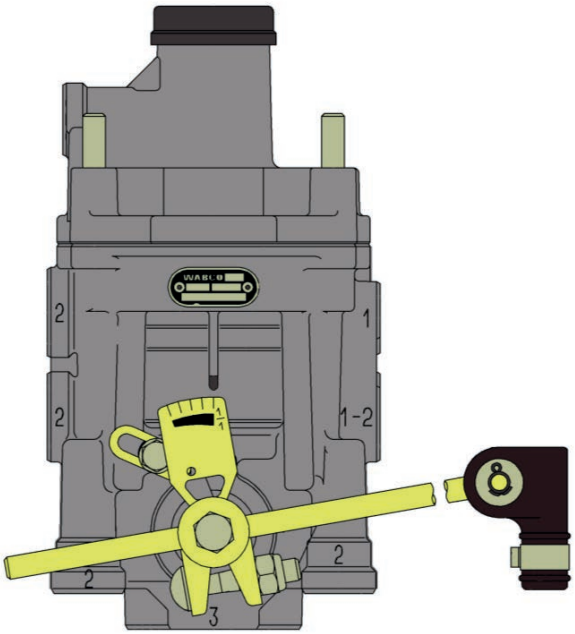
Filter (6):

The air then passes through a shunt valve (7), which is mounted on the side of the trailer, and the air pressure pushes out its button. This button can be pushed in to release the trailer's brakes, when a tractor with air braking is not available. The button can be pulled out again, to re-apply the brakes, or it will automatically be reset after the red susie is re-connected to a tractor with air braking.

Shunt Valve (7):



RELSV (9):

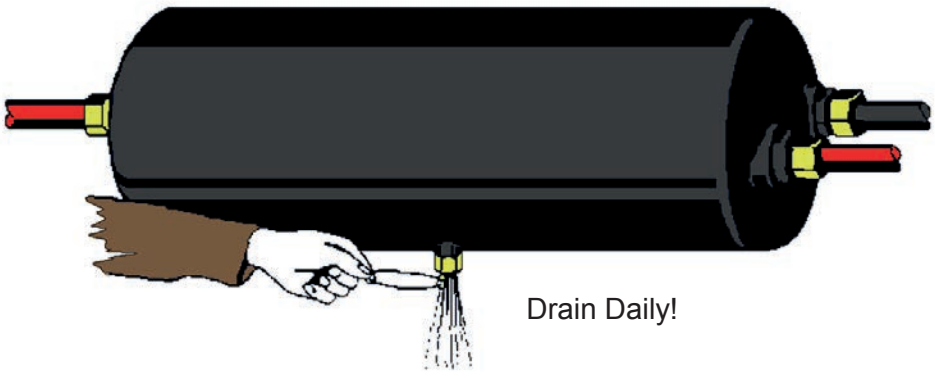


The air travels into the combined RELSV (9) at port 1, before exiting at port 1-2 to feed the air tank (8). The tank is linked back to the shunt valve, and this link is used to "fool" the RELSV into thinking the red susie has been re-connected, after the shunt button is pushed in. The tank then charges up with air until it reaches the system pressure set by the tractor. This is normally between 6.5 bar and 8.5 bar, and this pressure is also present at port 1 of the ABS modulator valve (10).

Note: Any pipe shown as red in Figure 1 (and the black pipe between the tank and ABS) will be pressurized all of the time the tractor is connected, and charged up. None of these pipes should be removed, for diagnostic or repair purposes, until the tractor has been disconnected from the trailer and all of the air drained from the trailer's air tanks.

Draining is achieved using a drain valve which is found at the bottom of each air tank. Draining should be done periodically to remove any water that has condensed in the air tanks. Failure to drain the tanks will lead to a reduction in the available air capacity of the tanks, affecting the brake performance, and this water may also freeze in the winter, causing other problems.

Air Tank (8):



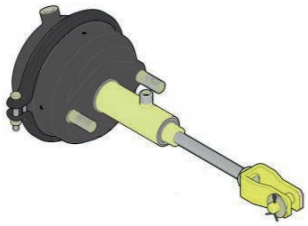
Drain Daily!

Two-line system – Operation (Continued):

During service braking, a control pressure is sent to the trailer down the yellow susie (1). This pressure is determined by how hard the driver presses the brake pedal, and the pressure may be anything up to the maximum pressure in the tractor's system. However, under normal braking (known as check braking) this control pressure is often around 2 bar. The control pressure enters the trailer and passes through the yellow line filter, before reaching the RELSV at port 4.

The RELSV has several functions, one of which is load sensing.
The service pressure may be modified by the RELSV based upon the weight sensed by the valve, as the RELSV is connected to the suspension via a vertical linkage (rod) and its operating arm.
With tandem axled trailers it is common to be connected between the two axles by either telescopic pole or an angle iron, in order to give the RELSV an average spring deflection. The angle iron is usually mounted using rubber bobbings which absorb the movement between the axles.
(With tri-axled trailers there is no need for an angle iron, as the RESLV is generally connected directly to the centre axle.)
As weight is removed from the trailer its chassis raises, causing the RELSV's operating arm to lower (rotate clockwise). This has the effect of increasing the ratio between input and output pressures, thus reducing the braking pressures.
This new, modified pressure exits the RELSV at port 2, and signals the ABS modulator valve at its port 4 (just below where the ABS sensors plug in). The ABS modulator then delivers this same pressure to all of the brake chambers, unless a "wheel locking tendency" is detected. (A full description of ABS function is given later).

Air + Hydraulic Brake Chamber (11):

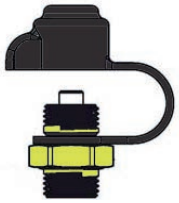


The brakes are applied in a controlled manner, as the pressure builds up behind a rubber diaphragm housed inside the brake chambers (11), and the output forces act on the slack adjusters (or levers) increasing the torque entering the foundation brakes via the camshafts.

As the driver releases the brakes, the control pressure drops. This results in the air within the brake chambers returning back up to the ABS modulator, where it exhausts to atmosphere. Therefore no pressure should be evident at the brake chambers whilst the service brakes are not being applied. This can be checked using the test points (12), one of which should be found in one of the spare ports in the brake chambers. (A test procedure is given later).

Test Point (12):

Test points can be added to any spare ports, and they come in two standard port sizes being M16x1.5 and M22x1.5. They can also be used to drain the air tanks, should no drain valve be fitted.

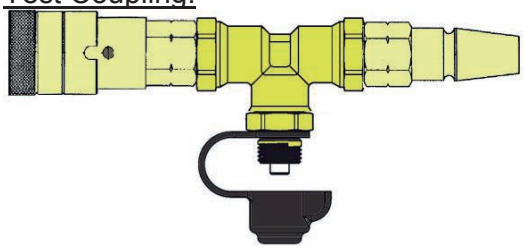


The two-line air braking system contains an "emergency" function, which is designed to apply full tank pressure into the brake chambers (irrespective of load condition) should the red susie be removed, or become ruptured.
This function is part of the RELSV, where the pressure in the red line and tank are "compared", and tank pressure is delivered into the brake chambers, via the ABS modulator, should the red line pressure fall below 2.5 bar. This happens automatically when the trailer's red susie is removed during uncoupling.
This emergency function is **not** a substitute for using the trailer's mechanical parking brake, as any air leak would cause the brakes to release, and the trailer would be left without any effective parking brake.

Basic pneumatic checks:

In order to perform some basic air checks, at least two good quality, calibrated air gauges are required, along with their connecting hoses, and often a few extra assorted test points. The trailer should have test points positioned around the system, so that tests can easily be carried out. All test points have the same size connecting thread (M16x1.5) where the test hoses attach, and it is useful to have long test hoses so that two gauges can be positioned close together and viewed simultaneously.

Test Coupling:



If there are no test points in the yellow line leading up to port 4 of the RELSV (port in the top section), then a good alternative is to make up a test coupling c/w a test point to fit between the tractor and trailer's susie. These can have a male C-Coupling at one end, and a female at the other, or suitable Palm Couplings if these are fitted.

These test couplings are useful to test the pressures coming from the tractor, whilst still connected to the trailer.

Test 1 (Charging Test):

Disconnect the red susie from the tractor, and drain all of the air from the trailer's air tank(s), and attach one gauge to a test point on one tank (fit test point if necessary – normally M22x1.5 threaded).

Fit a second air gauge in the red line (using male/female test coupling as described above), push in the shunt valve button and reconnect the red susie. The button should pop out as the red susie is connected.

Have the two gauges side-by-side and monitor each gauge as the system charges up. You want to see the tank pressure rise in line with the red line (it may be slightly behind), until the tank is fully charged and the tractor unloads (blows off).

If the tank pressure is much lower than the red line pressure when the tractor unloads, then this indicates an internal problem with the RELSV, or the pipe work leading to port 1 of it. This pipe can be tested by disconnecting the red susie, and temporarily removing the pipe from port 1 of the RELSV, and replacing it with a new one. This new pipe can then be connected to the tractor's red coupling, and the test repeated.

If the pressures rise correctly, then examine any filters for blockages, and the original pipe work for kinks.

If the pressures still fail to equalize, then the RELSV has an internal fault. Repair or replace as necessary.

Test 2 (Red Line/Leak Test):

Fully charge the trailer and disconnect the red susie. A "chuff" of air should be heard as the air exits the open red line. Observe the air gauge connected to the trailer's air tank, and the pressure should drop momentarily, then stabilize.

If the tank pressure continues to drop, then check the open red line for the presence of air pressure (A new thin rubber glove is ideal for this, as it can be attached to the open red susie, and sealed with tape/cable tie and left. If it inflates quickly, this indicates a leaking RELSV).

If no air is seen leaking from the open red susie, this indicates that the leak is downstream of the RELSV, and this is best identified using a soap-water mixture. Pay particular attention to pipe fittings, and note that these do not require to be tightened too much, as their seals will often become damaged by over-tightening.

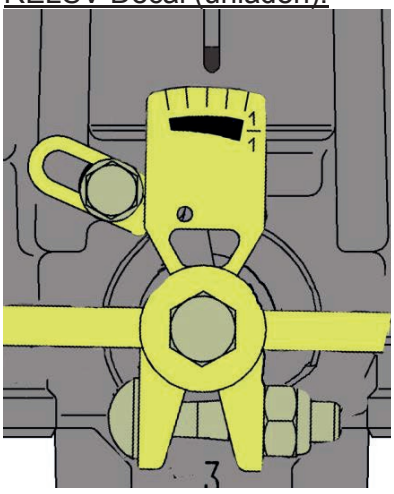
Finally, if the tank pressures drop very slowly over an extended period, then this is acceptable as long as the leaking is not audible. This is known as "permissible leakage".

Basic pneumatic checks (Continued):

Test 3 (Smooth Operation/No Residual Pressure):
Swap the test coupling to the yellow line, or attach the gauge and test hose to any test point in the yellow line leading up to port 4 of the RELSV.
Attach the other gauge to a test point on any brake chamber. If none are available, then an M16x1.5 threaded one can be added to a brake chamber, as most brake chambers have an extra port which has been blanked.
Fully charge the trailer, and keep the red susie connected.
Place the two gauges close together, and monitor them both as the service brakes are slowly and repeatedly applied on and off.
Both pressures should be seen to rise and fall smoothly, with both showing zero bar when the tractor's brakes are released. (Do not worry if the pressure at the brake chamber is lower than that of the yellow line, as we are not yet testing the settings of the RELSV.) If the pressure in the yellow line is "jerky", then so will be the pressure in the brake chamber. This would indicate a problem with the tractor's brakes, in particular with its trailer control valve.
If the yellow line pressure is smooth, but jerky at the brake chamber, then the problem is trailer related, and this is found by moving the gauge from the brake chamber to the output of the RELSV (port 2). The test can be repeated, and if the pressure still is not smooth then this indicates a faulty RELSV. If it was smooth, then the problem is inside the ABS modulator, as it must be giving out a jerky pressure, even though it is signalled with a smooth one.
The same tests can be repeated for looking for residual pressure problems, should both gauges not show zero pressure when the service brakes are released.

Test 3 (Output of the RELSV):
The RELSV is connected between the chassis and axles, and senses the way the springs deflect, as increasing weight causes them to flatten. This movement is transferred to the RELSV operating arm via a vertical linkage. This linkage, along with any other components (angle iron, cotton reels etc) should be periodically checked for signs of damage, or becoming loose.
In order to check that the RELSV is functioning correctly, the linkage can be removed from the operating arm, and the service brakes applied. The red susie needs to be connected for this test. An air gauge in the brake chamber will show the output pressure, and this gauge can be observed whilst the operating arm is rotated. As the operating arm is raised the brake chamber pressure should increase until it matches the service line pressure, and decrease as the arm is lowered. This demonstrates that the load sensing function of the RELSV is working.

RELSV Decal (unladen):



When the vertical linkage is reattached to the operating arm, it is important that the arm is at the correct angle to give the proper braking pressure for the weight being carried.
A decal is fitted to the arm, which rotates with the arm passing a pointer on the RELSV's casting. This decal shows the approximate setting for the RELSV, but the valve is best set when the trailer is empty, and the linkage adjusted until the correct unladen pressure is given, when a known "test pressure" is used.
A typical unladen decal position is shown to the left, but this is only shown for a guide.

The trailer builder should be able to provide this information, if it does not appear on a LSV data plate attached to the chassis.

Full RELSV setting instructions are given on the next two pages.

RELSV Setting Instructions:

The RELSV is probably the most important part of the trailer's braking system, whether ABS is fitted or not. A poorly set up RELSV can be both dangerous and expensive.
Too little output pressure leads to under braking, and this could result in a jack-knife.
Too much pressure can cause the trailer to lock, and "swing" passed the tractor. Also, too much pressure causes premature and expensive trailer tyre wear.
Periodically it is worthwhile checking the RELSV output pressures, and making sure they match the suspension correctly. To do this properly you will require two gauges, a tape measure, calculator and a little patience!

Step 1:
Have the trailer completely laden (the maximum weight allowed) and stand it on level ground whilst still connected to the tractor. If the RELSV is connected to one axle, then measure the distance between the top of this axle and the underside of the chassis (If the trailer is fitted with a bar between the axles, then you can measure the distance above each axle and halve the total).

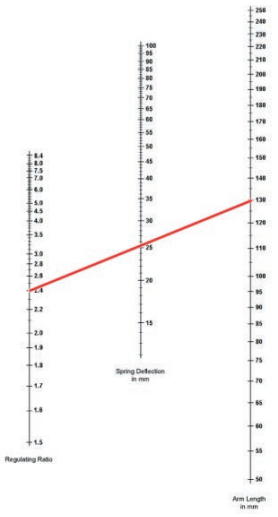
Step 2:
Remove the load completely and repeat the same measurements as taken above. The difference between these two measurements is the "unladen to laden spring deflection". For this example we shall assume it was **25mm**.

Step 3:
Find out the recommended unladen LSV setting pressure for your trailer. This may be on a data plate, or available from the trailer manufacturer, or J H Milnes.
This is not the pressure present in the trailer's brakes during normal unladen braking, but is a pressure used for setting up the RELSV!
Along with this unladen pressure you should also get its associated "test pressure", as well as the laden brake pressure.
Typically these could be 6.0 bar (Test) 2.5 bar (Unladen) and 6.0 bar (Laden). If you cannot get access to the actual test pressures for your trailer, then the above figures may be close enough.

Step 4:
Calculate the "regulating ratio".
An acceptable way of doing this is by dividing the test pressure by the unladen pressure.
Using the example above, this would be 6.0 divided by 2.5 = **2.4**

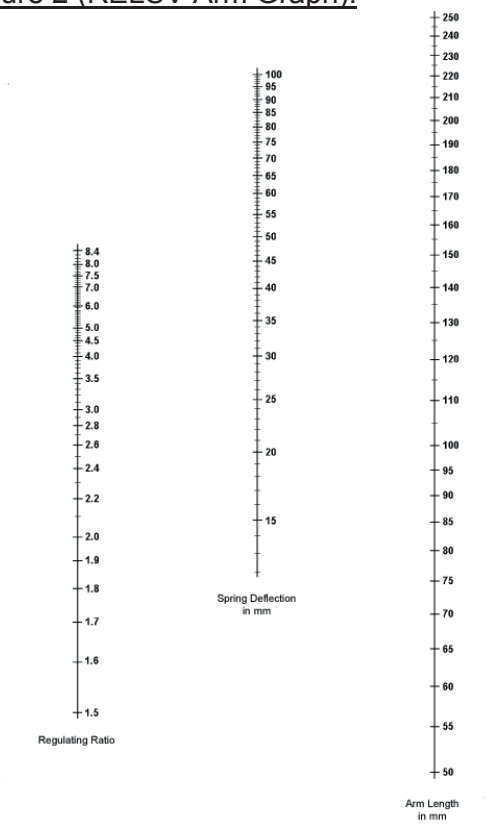
Step 5:
Look at the graph (Figure 2 below), and find the point on the left hand column which relates to the regulating ratio (2.4) which you have just calculated. Mark that point.
In the central column find the point which relates to your unladen to laden spring deflection, which you measured in Step 2 (25mm). Mark that point.
Draw a straight line from the point you marked in the left column, through the point in the second column, and extend this line until it crosses the right hand column.
Where it crosses this column read off the measurement, as this is the correct RELSV arm length for this trailer. This length is measured from where the arm connects to the RELSV (centre of the securing bolt head) and the point where the rubber linkage fits on the other end.
Adjust the arm length on the valve accordingly, and tighten the securing bolt.

Figure 2 Example:

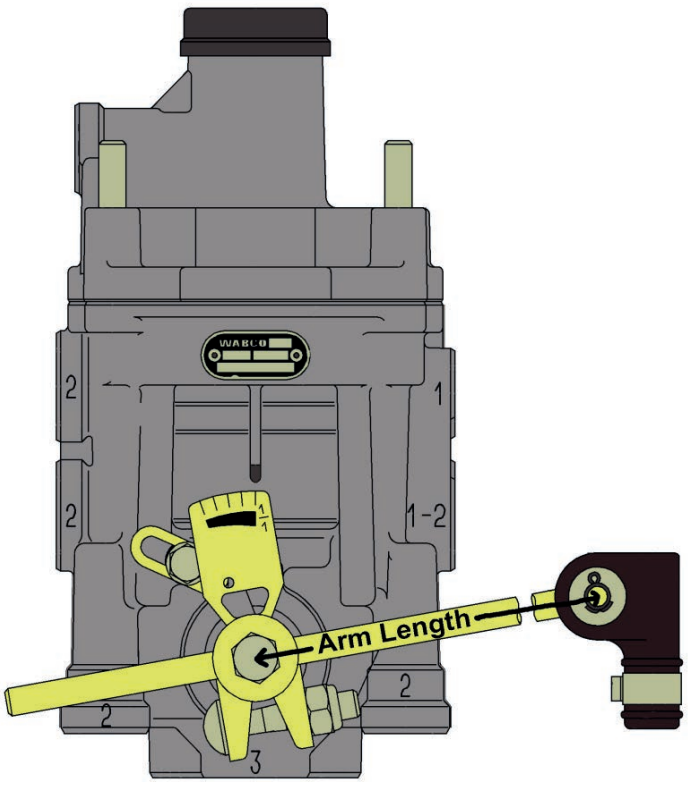


RELSV Setting Instructions (Continued):

Figure 2 (RELSV Arm Graph):



RELSV (Arm length and laden decal shown):



Step 6:
Check the unladen setting by applying the test pressure down the yellow line (6.0 bar used in this example), and measure the RELSV output pressure.
This can be measured directly at any unused port 2, or on a brake chamber.
If the pressure is correct (2.5 bar in this example), then the valve is now set up.
If the pressure is too low (2.0 bar for example), then the vertical linkage between the RELSV arm and the axle (or bar) is too short.
Conversely, if the output pressure is too high, then the vertical linkage is too long.
Amend the length until the unladen output pressure is correct (tolerance ± 0.2 bar).

Having set the RELSV at its correct unladen setting, and adjusted the arm length to match the true unladen/laden spring deflections, the valve should now automatically adjust to the correct brake pressure settings.

Safe coupling and uncoupling of tractor/trailers with two-line air braking:

The safe operation of the two-line air system relies on the driver correctly connecting the two air lines between the tractor and trailer, as well as any ABS power cable.

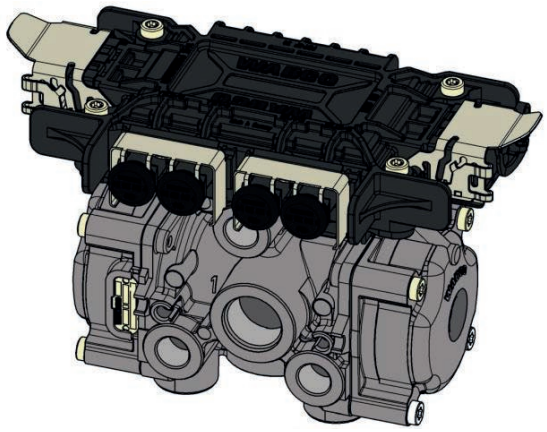
When coupling an air braked trailer to a tractor never have just the red line connected.
(That is to say, connect the yellow line first when coupling, and remove the red line first when uncoupling.)

Follow all other Health & Safety rules and remember it is always good practice to not walk/climb between the tractor and trailer during coupling and uncoupling.

ABS Description and operation:

The ABS system is designed to stop the wheels from locking, when the trailer is braked and the road surface is slippery. Under normal braking operation the ABS does not affect the braking performance, but merely monitors the changing wheel speeds looking for a “locking tendency”.
The ABS system consists of an electronic control unit (ECU) and a modulator valve which is hard wired directly onto the ECU.

ABS ECU and Modulator Valve:



Both the ECU and modulator are internally split into two halves, so that one half of the ECU controls one half of the modulator, which in turn controls the braking going to one side of the trailer. The braking going to the other side of the trailer is controlled by the other half of the ECU and modulator.
Two ABS sensors are mounted in the brake assemblies on one axle, and these are in close proximity to toothed “polewheels”, which pass by the ABS sensors, as the wheels rotate. These ABS sensors are connected to the ECU by extension cables, and they are connected so that the nearside sensor controls the braking for the nearside wheels.

Even though a trailer may have four wheels and just two ABS sensors, the unsensed wheels still receive ABS modulated braking. However, unsensed wheels may still lock, as the ECU cannot detect this locking tendency, unless sensors are fitted to all wheels. Because of this, ABS systems are available with two or four ABS sensors.

Trailer ABS systems comes in either 12 volt or 24 volt variants, which cannot be towed by a vehicle with the other voltage. Although they look very similar, the main dedicated power supply socket (known as ISO7638) is different. Once correctly powered, the ECU “exercises” the ABS modulator valve, and this can be heard as a series of clicks, including some quick exhausting, if the service brakes are applied.

During initial power up, a cab mounted trailer ABS warning lamp should illuminate briefly, before going out. This warning lamp will indicate any ABS related failure to the driver, and if it comes on during driving, the driver should proceed with great caution, and get the system checked out as soon as possible by a trained person, with the correct diagnostic equipment. A simple rule of thumb is that the lamp must come on and go out, and stay out whilst driving. If it stays on until the vehicle is driven, then this is OK as well.

Note: ABS lamp illumination will not cause a failure of the brakes to apply. However, the ABS functions may be impaired to any greater or lesser extent, so wheel locking may be evident which could lead to a loss of stability, and an accident.

The ABS ECU monitors, processes and compares the wheel speeds detected at the wheel sensors, and only acts on this information if it believes there is a chance that one, or more of the sensed wheels are about to lock. At that point the ECU sends a signal to the half of the modulator valve which is connected to that wheel, and this closes the inlet port, stopping further pressure building up in the brake cylinders. If the locking tendency persists, a further signal is also sent to the exhaust port, resulting in air being dumped from the respective brake chambers. The wheels speeds are controlled in this way until the ECU is satisfied that the lock-up has been averted, and then normal braking is resumed.

Basic ABS Checks:

As mentioned earlier, the cab-mounted warning lamp should illuminate and extinguish once the tractor's ignition has been switched on. If this happens, then no checks are necessary. Should the warning lamp stay on until the vehicle is moving, then this is also OK, and no further checks are required.
However, should the warning lamp fail to illuminate upon ignition, or fail to extinguish when pulling away, or come on again during driving, then a few basic checks may help find the cause.
"Wiggle tests" can be done at any time to see if cables have intermittent breaks.
These are best done with the ignition ON, following the warning lamp going out.
By wiggling any cable, check to see if the cab warning lamp illuminates, or flickers, or whether the ABS is heard to exercise again. If the ABS exercises, then you know that it switched OFF momentarily during the wiggle test, indicating a break in the power feed.
Wiggle testing the ABS sensor extension cables, where they connect to the ECU, is also very worthwhile, and these cables can be "tightened" using a small flat screwdriver to slightly distort the two small female pins found inside the ABS extension cables, having firstly disconnected them from the ECU.
Always make sure that they are correctly reconnected following any removal.

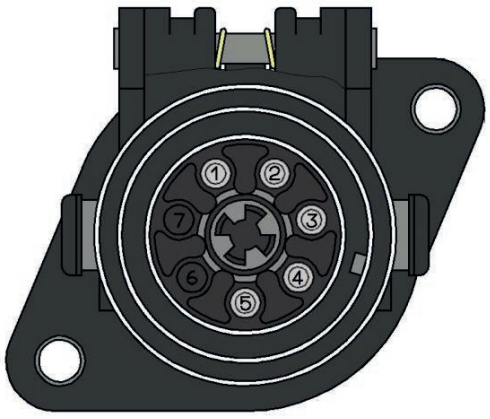
Power and warning lamp checks are best performed using two bare wires attached to a 21watt bulb, with the voltage to match the ABS system, rather than an LED tester or multimeter.
These checks can be performed in stages, initially at the tractor's ISO 7638 socket, then into an attached ABS susie, and finally in the ISO 7638 power cable after removing it from the ABS ECU. In this way the various segments of the cabling are checked in turn, which will pinpoint any cable problems. All of the power and ABS warning lamp tests shown below take place within the ISO 7638 power supply.

Test 1 (Exercise check):
When the ignition is switched ON, can the trailer be heard to exercise? (This is often four sharp clicks, or click chuff click chuff, if the service brakes are applied.) If these four noises are heard, then the ABS is being powered correctly. If OK ignore Test 3 (ABS Power Test).

Test 2 (ABS warning lamp check):
With the ABS susie disconnected from the tractor (ignition ON) the ABS warning lamp should be OFF. (If the ABS warning lamp is ON, the tractor has a wiring problem.)

At the tractor socket, connect one wire from the test lamp to pin 5, and the other to pin 4 (see Figure 3 for pin positions). The ABS warning lamp should illuminate, but not the test bulb (If the test bulb illuminates brightly, the tractor has a wiring fault).
If the warning lamp fails to switch ON and OFF as the test lamp is connected and disconnected, then the ABS warning lamp fault is within the tractor wiring.
If the warning lamp operates correctly, repeat the tests into the plug on the ABS susie (Figure 4), having firstly reconnected it to the tractor, and disconnected it from the trailer's ABS socket

Figure 3 (12v ABS Socket on tractor):



If the lamp is still working correctly, repeat the test into the ISO Power cable where the cable connects to the ABS ECU.
Note: The pin numbers have changed to pins 4 and 7 (see Figures 5 & 6).

Basic ABS Checks (Continued):

Figure 4 12v ABS Plug:

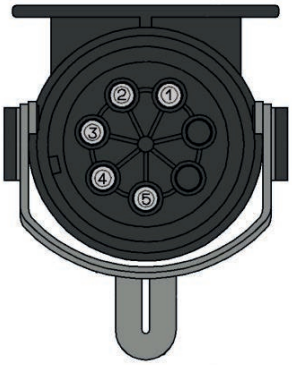
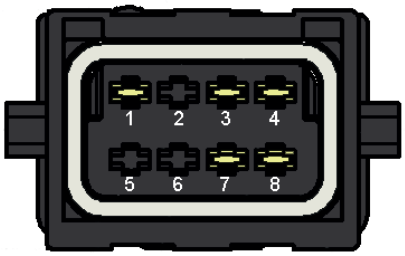


Figure 5 ABS Wiring:

Figure 6 ISO Power cable:

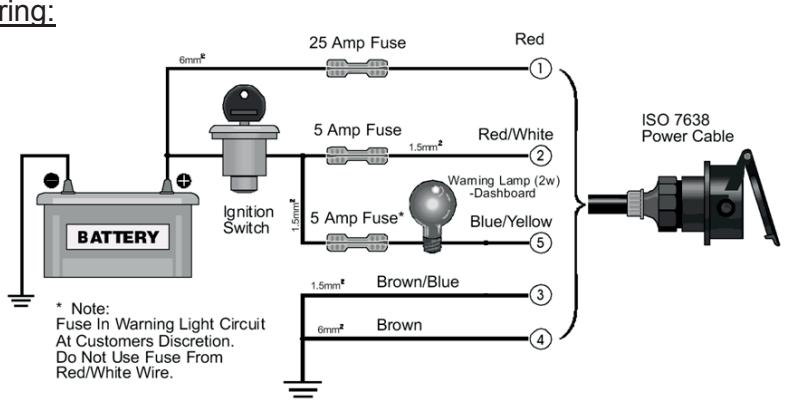


If the warning lamp is functioning correctly, then we now know that all of the ABS warning lamp wiring is correct.
Should the ABS warning lamp fails to illuminate now, after reconnecting all of the cables, and switching the ignition ON, then the fault must be inside the ABS ECU.
However, if the ABS warning lamp stays on, then further tests are required.
By cycling the ignition ON (2 seconds) OFF (2 seconds) and ON again, a request is sent to the trailer's ABS ECU to give out a "blink code". If the ABS warning lamp starts flashing, we now know that the ECU is functioning correctly, so make a note of the number of flashes, as these can be used to identify the source of the problem.

Test 3 (ABS Power Test):
Using the 21 watt test lamp, and with the ignition switched ON, check that it illuminates brightly when connected across pins 2 and 3 of the tractor's socket.
If it fails to illuminate then check the fuse (often 5 Amp). Also check that that it switches ON/OFF with the ignition ON/OFF.
Repeat the test with the test lamp across pins 1 and 4.
If the lamp fails to illuminate then check the fuse (often 25 Amp). With the test lamp across pins 1 and 4, the lamp **may** stay illuminated, even after the ignition is switched OFF, and if it does then this is OK as well.
Connect the test lamp across pins 4 and 5. The lamp **must not** illuminate, but the cab warning lamp should come on.

All of the above tests can be repeated into the ABS 7638 susie, having firstly disconnected it from the trailer's socket, in order to check the susie for damage.
Finally the rest of the ISO 7638 cable can be checked by repeating the tests at the ABS ECU end, remembering that the pin numbers are different, so refer to wiring diagram shown in Figure 5.

Tractor's ABS Wiring:



Basic ABS Checks (Continued):

Basic blink code errors:
By starting the blink code, any current ABS wiring fault error codes are blinked out by the trailer's ABS warning lamp, which is in the tractor. The error codes are repeated three times. A table of the error codes is shown below.

Fault Code	Component	Comments
3	ABS Sensor BU1 C	Broken wire – normally nearside of trailer
4	ABS Sensor YE1 D	Broken wire – normally offside of trailer
5	ABS Sensor BU2 E	Broken wire – normally nearside with 4 sensor system
6	ABS Sensor YE2 F	Broken wire – normally offside with 4 sensor system
7	Extra Modulator	Broken wire/solenoid – only on 4S/3M systems
9	Internal Modulator	Broken wire – new ABS assembly required
10	Internal Modulator	Broken wire – new ABS assembly required
11	Internal Modulator	Broken wire – new ABS assembly required
14	Power Supply	Check for over/under voltage
15	Internal ECU fault	Replace ABS assembly

With fault codes 3 4 5 6 7 14 and 15, these same numbers appear as casting numbers on the ABS ECU, allowing the faults to be traced to a specific connection.

Component Checking:

As the ABS system consists mainly of three basic components (ECU, Cables and ABS Sensors) the best way to diagnose many faults is by way of substitution.
This is ideal for checking cabling/ABS Sensor wiring problems, when no specialist diagnostic tools are available.

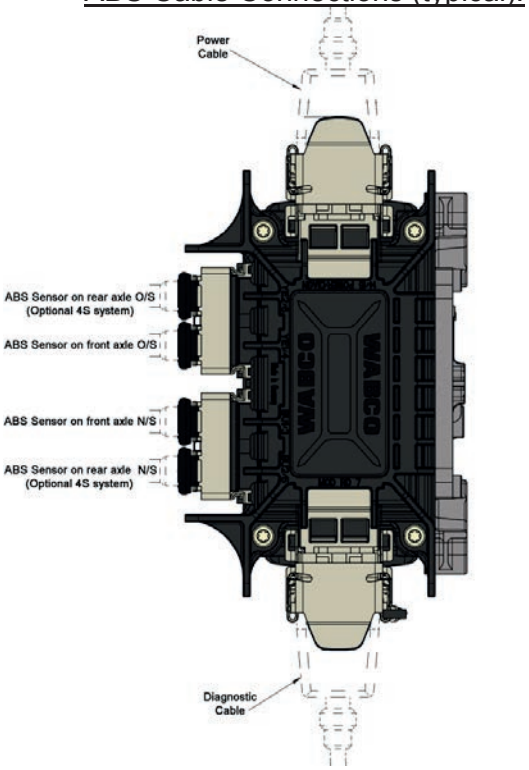
When removing any cable it is vital that the cable is marked, so it can be returned to its original position. It is also imperative to ensure that no unused electrical connections are left open, as water will enter the electronics and cause premature failure.

Water can also enter the electronics via "repaired cables", where water migrates up the inside of the repaired cable, and corrodes the inside of the ECU.

The cable connections are shown opposite, and only the two central ABS cables are used for a two ABS Sensor system.

If in doubt contact a specialist ABS repairer!

ABS Cable Connections (typical):



TROUBLE SHOOTING - PNEUMATICS

PROBLEM	CAUSE	SOLUTION
TRACTOR (TRAILER CIRCUIT) LOW PRESSURE WARNING BUZZER ON ALL OF THE TIME	AIR LEAK IN SYSTEM	DISCONNECT TRAILER TO ASCERTAIN WHETHER LEAK IS IN THE TRACTOR, OR TRAILER
	COMPRESSOR OR UNLOADER/AIR DRYER PROBLEM	CHECK IF COMPRESSOR IS BLOWING-OFF AT UNLOADER, OR AIR DRYER.
	LOW PRESSURE SWITCH PROBLEM	CHECK CONNECTIONS - REPAIR AS NECESSARY CHECK LP SWITCH PRESSURES AGAINST THOSE IN THE AIR TANK (TRAILER CIRCUIT)
TRAILER BRAKES DO NOT RELEASE WHEN SYSTEM FULLY CHARGED, AND THE TRACTOR'S HAND BRAKE IS RELEASED	INSUFFICIENT RED LINE "FLOW"	CHECK SELF-SEAL VALVE TO ENSURE IT IS LIFTING SUFFICIENTLY TO ALLOW A HIGH FLOW OF AIR TO THE TRAILER
	INSUFFICIENT RED LINE PRESSURE	CHECK PRESSURE AT THE TRACTOR'S RED COUPLING USING CALIBRATED AIR GAUGE. PRESSURE SHOULD BE BETWEEN 6.5 BAR AND 8.5 BAR
	PRESSURE STILL IN YELLOW LINE	CHECK TRACTOR'S IGNITION IS SWITCHED ON
		CHECK CABLE LINKAGE (IF FITTED) TO TRACTOR'S TRAILER CONTROL VALVE, AND ADJUST/REPAIR AS NECESSARY
	RELSV EXHAUST PORT BLOCKED	ENSURE RELSV EXHAUST IS OPEN
TRAILER BRAKES DO NOT APPLY DURING TRACTOR BRAKING	INSUFFICIENT YELLOW LINE "FLOW"	CHECK LIFTER VALVE PRESENT IN TRAILER'S YELLOW SUSIE
		CHECK SELF-SEAL VALVE IN TRACTOR'S YELLOW COUPLING
		CHECK TRAILER'S YELLOW AIR LINES FOR KINKS OR BLOCKAGES
	INSUFFICIENT PRESSURE IN TRAILER'S AIR TANK	CHECK THAT AIR FLOWS UNRESTRICTED FROM PORT 1-2 OF RELSV, WHEN THE RED SUSIE IS CONNECTED AND PRESSURIZED
INSUFFICIENT PRESSURE IN TRAILER'S AIR TANK	POOR AIR FLOW TO TRAILER'S AIR TANK	CHECK FOR KINKED OR BLOCKED PIPES
		CHECK THAT AIR FLOWS UNRESTRICTED FROM PORT 1-2 OF RELSV, WHEN THE RED SUSIE IS CONNECTED AND PRESSURIZED
TRAILER'S BRAKES "SNATCHING"	RELSV NOT WORKING SMOOTHLY - INPUT AND OUTPUT PRESSURES JERKY WHEN COMPARED USING AIR GAUGES	REPAIR/REPLACE RELSV AND ENSURE THAT ANY REPLACEMENT IS SET UP CORRECTLY (SEE INSTRUCTIONS ON PAGE X)
TRAILER BRAKING TOO HARD, OR TOO WEAK	INCORRECT LSV SETTING	CHECK SETTINGS AGAINST RECOMMENDATION
	INCORRECT SLACK-ADJUSTER LENGTH	CHECK LENGTH AGAINST RECOMMENDATION
	INCORRECT BRAKE CHAMBER SIZE	CHECK SIZE AGAINST RECOMMENDATION
	LSV LINKAGE DAMAGED	CHECK LINKAGE AND ANGLE IRON
TRAILER BRAKES GETTING TOO HOT	HAND BRAKE PARTIALLY APPLIED	CHECK HANDBRAKE CABLES/ADJUSTMENT
	RESIDUAL PRESSURE IN BRAKES	ENSURE NO AIR TRAPPED IN YELLOW LINE
	HYDRAULIC LINE ALSO CONNECTED	DISCONNECT HYDRAULIC BRAKE LINE
TRAILER BRAKES NOT GOING INTO "EMERGENCY", AFTER RED LINE REMOVED	KINKED PIPE IN LINE TO RELSV	CHECK ALL PIPES TO PORT 1 OF RELSV
	INCORRECT RED SUSIE COUPLING	CHECK COUPLING HAS NO SELF-SEAL VALVE
	RELSV EXHAUST PORT BLOCKED	ENSURE RELSV EXHAUST IS OPEN

TROUBLE SHOOTING - ABS

PROBLEM	CAUSE	SOLUTION
ABS WARNING LAMP IN TRACTOR CAB ILLUMINATED WHEN NO ABS TRAILER CONNECTED	EARTH PROBLEM WITHIN TRACTOR'S ISO 7638 WIRING	CHECK ABS SOCKET FOR TOUCHING, LOOSE WIRES
		CHECK WIRING FROM ABS SOCKET TO CAB ABS WARNING LAMP.
ABS WARNING LAMP IN TRACTOR CAB DOES NOT ILLUMINATE WHEN TRACTOR CONNECTED TO TRAILER WITH ABS FITTED	ABS WARNING LAMP BULB BLOWN	REPLACE BULB
	ABS WARNING LAMP FUSE BLOWN	REPLACE FUSE (OFTEN 5 AMP)
	NO ABS SUSIE CONNECTED	CONNECT ABS SUSIE TO TRACTOR'S SOCKET
	FAULTY ABS SOCKET	IS PIN 5 PUSHED BACK INTO ABS SOCKET?
	FAULTY ABS SUSIE	REPLACE ABS SUSIE
	FAULTY ABS POWER CABLE	CHECK/REPLACE (SEE TEST INFORMATION)
	FAULTY ABS ECU	REPLACE ABS UNIT
ABS WARNING LAMP IN TRACTOR CAB DOES NOT EXTINGUISH AFTER CIRCA 2 SECONDS, WHEN CONNECTED TO TRAILER WITH ABS FITTED	POWER FAULT	CHECK FOR 12 VOLTS ACROSS PINS 1 & 4 OF ABS SOCKET
		CHECK FOR 12 VOLTS ACROSS PINS 2 & 3 OF ABS SOCKET
		CHECK FOR 12 VOLTS ACROSS PINS 1 & 8 OF ABS POWER CABLE, AT ABS ECU END
		CHECK FOR 12 VOLTS ACROSS PINS 3 & 4 OF ABS POWER CABLE, AT ABS ECU END
	ABS SENSOR SHORT/OPEN CIRCUIT	CHECK BLINKCODE FOR SENSOR FAULT LOCATION (SEE LIST)
	ECU PROBLEM	CHECK BLINKCODE FOR 12 FLASHES - REPLACE IF NECESSARY
	ABS POWERED FOR EXTENDED TIME	TOW TRAILER AND CHECK THAT LAMP GOES OUT AFTER CIRCA 7 KM/H
ABS WARNING LAMP IN CAB GOES OUT AFTER CIRCA 2 SECONDS, BUT ILLUMINATES AGAIN WHILST DRIVING	ABS SENSOR AIR GAP	CHECK ABS SENSOR INSTALLATION, AND PUSH SENSOR UPTO ABS POLEWHEEL
	POLEWHEEL WOBBLE	CHECK ABS SENSOR AND POLEWHEEL INSTALLATION, AS WELL AS WHEEL BEARING
SYSTEM DOES NOT "EXERCISE" AFTER POWERING UP (NO CLICKING/CHUFFING AUDIBLE)	POWER FAULT	CHECK FOR 12 VOLTS ACROSS PINS 1 & 4 OF ABS SOCKET
		CHECK FOR 12 VOLTS ACROSS PINS 2 & 3 OF ABS SOCKET
		CHECK FOR 12 VOLTS ACROSS PINS 1 & 8 OF ABS POWER CABLE, AT ABS ECU END
		CHECK FOR 12 VOLTS ACROSS PINS 3 & 4 OF ABS POWER CABLE, AT ABS ECU END
	FAULTY ABS ECU	REPLACE ABS UNIT
WHEELS LOCK DURING BRAKING - NO ABS WARNING LAMP ILLUMINATED	TOO MUCH BRAKE PRESSURE	CHECK RELSV SETTINGS
	NO ABS SENSORS FITTED TO LOCKING WHEELS	ADD EXTRA ABS SENSORS TO LOCKING AXLE TO CONVERT TO A 4S/2M SYSTEM
WHEELS LOCK DURING BRAKING - ABS WARNING LAMP ILLUMINATED	POWER FAULT	SEE POWER FAULTS ABOVE
	ABS SENSOR AIR GAP	CHECK ABS INSTALLATION
	POLEWHEEL WOBBLE	CHECK POLEWHEEL INSTALLATION

ISOBUS Control

This manual provides information about operating and maintaining this Topcon Precision Agriculture product. Correct use and servicing is important for safe and reliable operation of the product.

It is very important that you take the time to read this manual before using the product.

Information in this manual is current at the time of publication. A system may vary slightly. The manufacturer reserves the right to redesign and change the system as necessary without notification.

Technical documentation and utility software

On the myTopcon NOW! support website (**mytopconnow.topconpositioning.com**) or myTopcon NOW! app you can access the following support material:

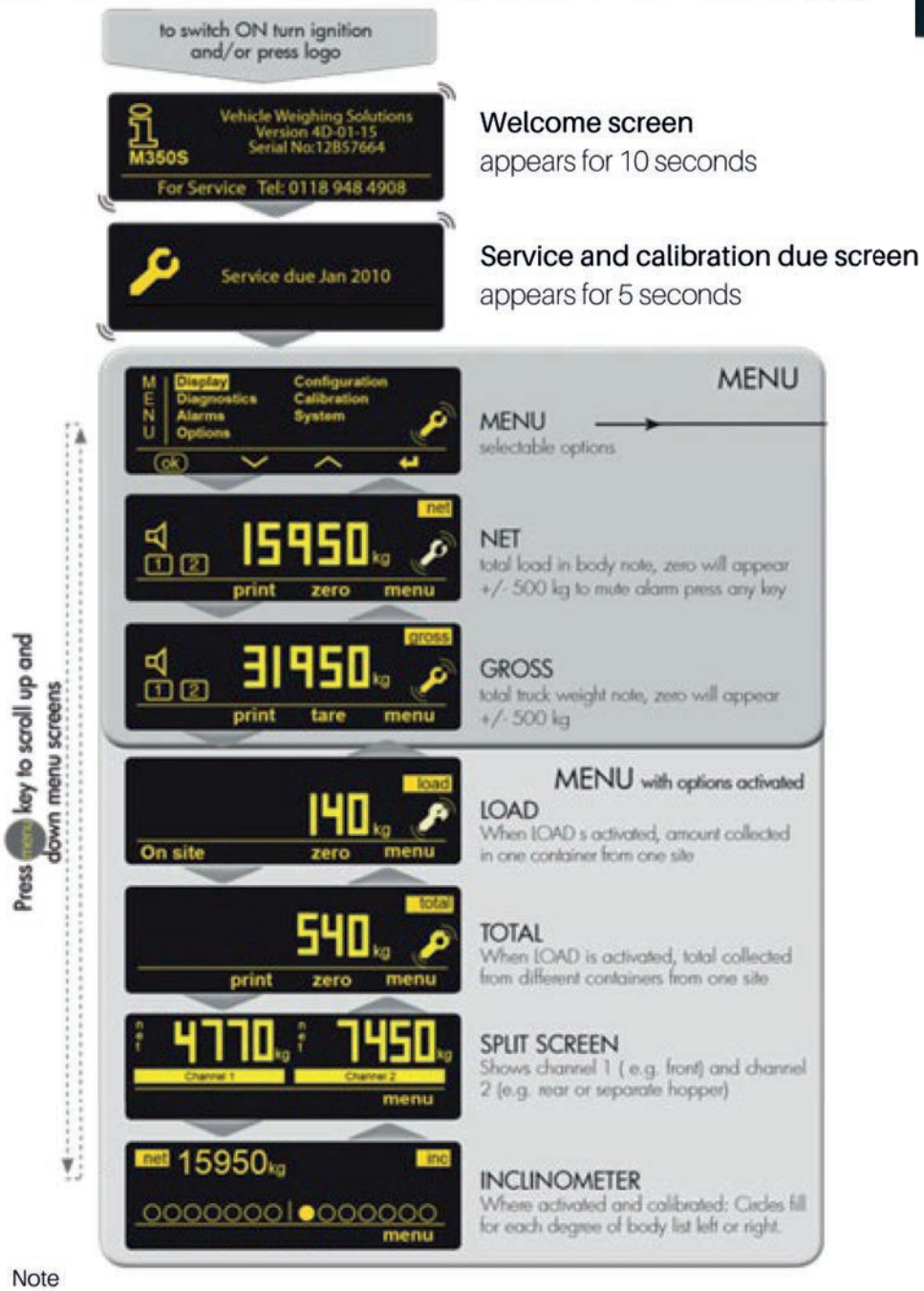
- Firmware and software updates
- Product manuals
- Product quick guides
- Training videos
- System layouts

Register for a free account today to access this material.

Spreader Weighing

LOADWEIGH - M350S user & quick setup guide - Firmware version 4D.01 .16

Power-up the display by either switching on the ignition (ignition live wiring) or press the power button behind the logo (where fitted) if the indicator is permanently wired to the vehicle supply.



Note

GROSS	or GVW (gross vehicle weight) is the total truck weight (NET + TARE)
NET	'net load' means the payload weight in the truck body
LOAD	means part load collected or delivered, press PRINT to print and zero the load, weight collected is stored as an accumulation to NET
SPAN	where used, means the NET weight used to calibrate the weigher
TARE	weight means the weight of the empty vehicle
ALARM	where fitted, an alarm sounder flashing beacon will activate when alarm setpoint is reached
ON SITE	when 'load' is turned on in options, on site allows logging onto site and off site for weighing loads collected from a site with multiple bins (waste only)

MENU Screen

- A Alarm graphic - shows both alarms
- B Alarm set key
- C Print key - prints net, gross, time & date in weighing screens
- D Menu key - scrolls thru' NET, GROSS & MENU screens
- E Service reminder, flashes when weigher service is due
- F OK key - enters data
- G Down arrow key - scrolls down menu
- H Up arrow key - scrolls up menu
- I Back Up key - goes back a step

Display	Changes OLED contrast to high, medium or low. Also shows info: version & serial no.
Diagnostics	Engineers screen. Shows two channel weights and input milli-volt signals
Alarms	Two alarm setpoints - PIN code required To mute alarm - press any key
Options	Modes: Switches GROSS on & off Load: On or off RS232: Printer or scoreboard mode Count by: 1, 10, 20, 50, 100, & 200 kgs Z/func: Allow/inhibit keyboard zero
Configuration	To select 1 or 2 channels, air, oil or fifth wheel. Split: For split axle systems. Option for total Ch1 + Ch2 or separate Ch1 & Ch2 calibrations
Calibration	Weighing system calibration settings
System	Accesses password set and resets. Note. for PUK (PIN unlock code) contact service who will take you through your PIN retrieval. Edit time and date in system.

Display	Changes OLED contrast to high, medium or low. Also shows info: version & serial no.
Diagnostics	Engineers screen. Shows two channel weights and input milli-volt signals
Alarms	Two alarm setpoints - PIN code required To mute alarm - press any key
Options	Modes: Switches GROSS on & off Load: On or off RS232: Printer or scoreboard mode Count by: 1, 10, 20, 50, 100, & 200 kgs Z/func: Allow/inhibit keyboard zero
Configuration	To select 1 or 2 channels, air, oil or fifth wheel. Split: For split axle systems. Option for total Ch1 + Ch2 or separate Ch1 & Ch2 calibrations
Calibration	Weighing system calibration settings
System	Accesses password set and resets. Note. for PUK (PIN unlock code) contact service who will take you through your PIN retrieval. Edit time and date in system.

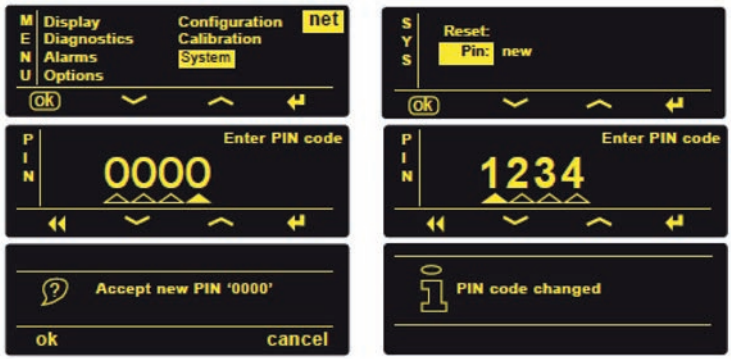
CALIBRATION AND SET UP - follow these five steps

STEP 1 ENTERING PIN CODE

1. In MENU screen select SYSTEM press ok
2. Press ▼ key to select PIN:
3. Press ok o display PIN input screen
4. Press ▼ & Keys to number. Press ◄ to move cursor left
5. When PIN is entered press ↵ to enter code
6. Press ok o accept PIN
7. Press ↵ to back up to MENU
8. To set PIN, select PIN ok epeat 2 - 6

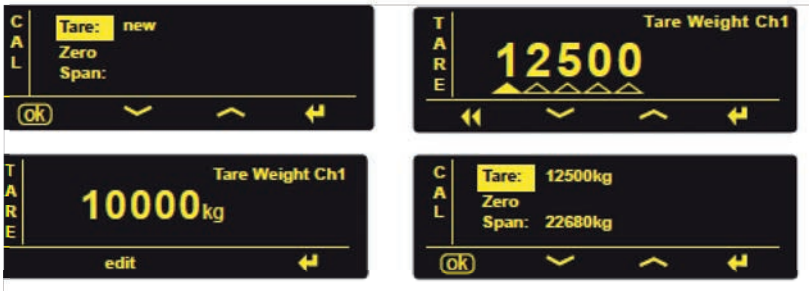
Note. PIN is needed for every calibration change

PIN can be reset to a new code of your choice. If PIN is lost call Service.



STEP 2 SET THE VEHICLE TARE WEIGHT

1. Ensure vehicle is empty, weigh & record TARE (kerb empty) weight
2. In MENU screen select CALIBRATION press ok
3. Select TARE press ok defaults to 10000)
4. Press edit
5. Enter the vehicle TARE (empty weight) as in stage 1
6. When done press ↵
7. Press ↵ to return to MENU screen

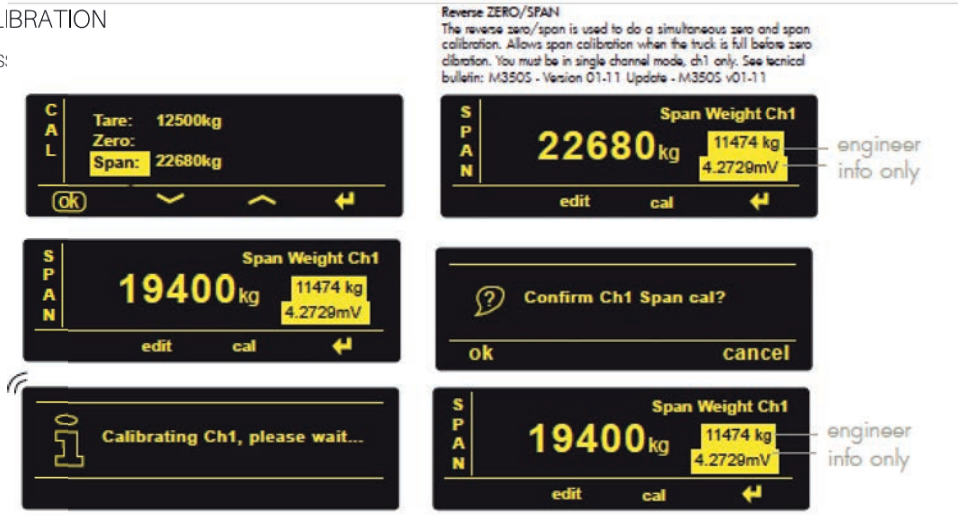


STEP 3 SET THE ZERO (EMPTY) CALIBRATION

1. If the vehicle is a tipper, raise the body clear of the chassis
2. In CAL menu Press ▼ to select Zero
3. Press ok
4. Press cal key
5. Press ok o confirm channel 1 Zero CAL
6. Press ↵ o return to CAL menu

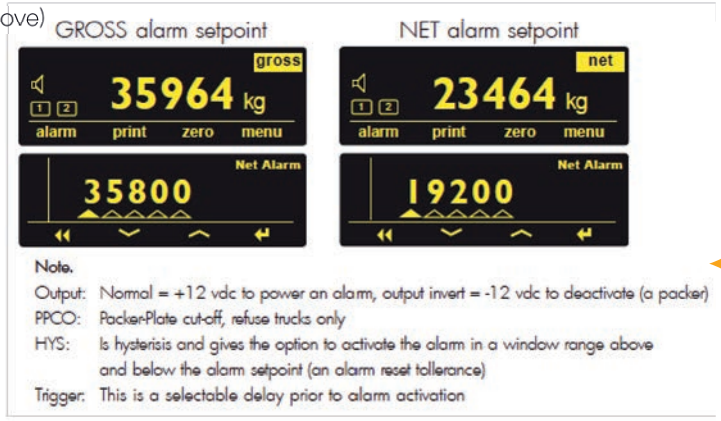
STEP 4 FULL SPAN (NET LOAD) CALIBRATION

1. Load vehicle to its legal maximum, weigh & record GROS
2. Subtract the TARE (or KERB) weight from the GROSS weight to give the SPAN (NET) weight. E.g. 31900kg GROSS - 12500kg, TARE = 19400kg SPAN (NET) PAYLOAD
3. If the vehicle is a tipper, raise the body clear of the chassis
4. In CAL menu press ▼ to select Span
5. Press ok defaults to 22680kg)
6. Press edit
7. Edit the SPAN (NET) PAYLOAD weight, as in STEPS 1 & 2 above, press ↵ when done
8. Press cal to enter CAL. Press ok :o confirm
9. Press ↵ twice to return to MENU screen



STEP 5 ALARM SETPOINTS (pin code required, see step on above)

1. In MENU, select ALARMS. Two setpoints appear, select 'Alarm 1'
2. Press 'OK' to toggle between 'ON' or 'OFF', select 'ON'
3. Select 'Output' Invert or Normal (see note)
4. Select: 'Gross-Sounder', 'Net-Sounder', 'Gross-PPCO' or 'Net-PPCO'
5. Select 'Alm', alarm will activate at this weight. Press 'Edit' and enter target weight setpoint using techniques in previous steps.
6. 'Hys' Hysterisis (see note) edit in kg
7. 'Trigger' select- OFF, 2 seconds, 5 seconds or 10 seconds (see note)
8. When all settings are correct press ↵ to input settings
9. For alarm 2, select a'Alarm 2' and repeat STEP 5



Note.
Output: Normal = +12 vdc to power an alarm, output invert = -12 vdc to deactivate (a packer)
PPCO: Packer-Plate cut-off, refuse trucks only
HYS: Is hysterisis and gives the option to activate the alarm in a window range above and below the alarm setpoint (an alarm reset tollerance)
Trigger: This is a selectable delay prior to alarm activation

Constant Application Control (Griffith Elder)

1. Introduction

Please ensure that the Fitting Instructions are followed carefully before operating the system.
The indicator is powered by 12 Volts DC as shown in the connections diagram. The 12 volts dc supply must be connected at all times for the indicator to operate and MUST be connected directly to a good 12 volt supply.
Please refer to the setup diagram which shows the connections of the indicator.

1.1 System Overview

The WS4 system uses loadcells to determine weight of product spread
A proximity sensor receiving inputs from the wheel or rotating object that is directly related to forward speed is used to measure distance covered. Combining this with the width of spread gives the area over which the product has been spread and hence an application rate in weight per area (for example tonnes/hectare or tons/acre).

The WS4 can be set to auto output mode to automatically maintain a preset target application rate. This is achieved by adjusting the speed of the bed chain or belt to change the delivery rate of product to the spreading mechanism (the output from the WS4 Vout Controller is provided as a 0 to 5V or PWM and is used to change the speed of a hydraulic motor powering the bed feed)

The system can be set to manual mode via a switch on the bed control valve, in this case the system will monitor and display current application rate but changes in rate are achieved by operator action in changing bed speed or vehicle forward speed.

The system only records **application rate, spread weight** and **area** when in spread mode, this is activated either manually by the operator using a switch or can be automatic using a sensor to detect bed movement (whilst the bed is moving the system will remain in spread mode). There is a variable switch time out on deactivation of spread mode, this keeps the system in spread mode for the set time after bed movement (and hence product delivery) has stopped. This allows any material in the spreading mechanism to clear and be accounted for in the spread record.
In addition to this the operator can press the ‘Start’ or ‘Stop’

2. Functions

2.1 Switching On

Press the key for two to three seconds to switch the system on.

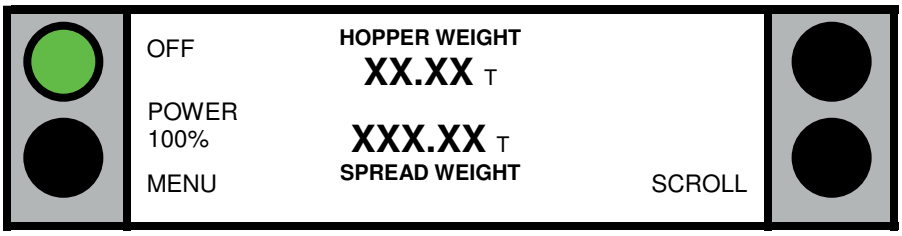
The display shows the Griffith Elder logo and the software reference number for 5 seconds.
The Griffith Elder logo may be replaced by a an individual manufacturers logo.

The screen will then change to the basic display screen, shown below.

Note: Always switch the indicator ON after the engine has been started.

2.2 Basic Function

Use the key next to the command to change the parameter.

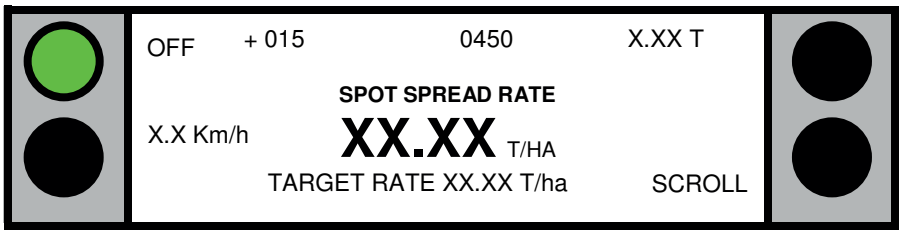


OFF switches the system off completely. Hold for 2 to 3 seconds.
MENU brings up a new screen with options to choose from.
SCROLL changes the screen between “HOPPER WT / SPREAD WT” to “SPREAD RATE / AREA”, shown below:

Units are shown in tonnes/hectare or T/acre or lb/acre (user defined – see 3.3.4 for reference).

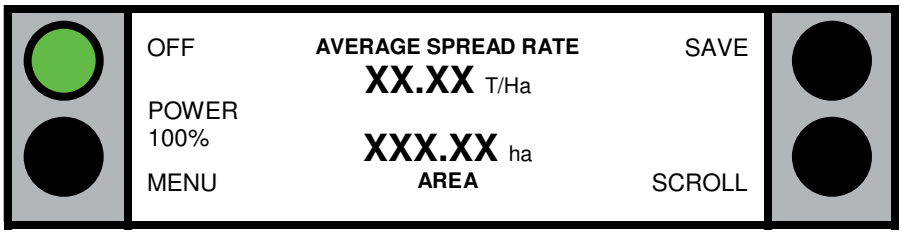
2.3 Spreading

When spreading starts turn the spread switch on.(this may be set to be automatic see fitting instructions).
The display will change to showing the 'SPOT SPREAD RATE' screen.
On this screen the figure in the top right is the 'CURRENT HOPPER WEIGHT'.
If control output is selected as ON there will be a 4 digit figure at the top mid right of the screen. This indicates the position of the bed control valve, i.e the bed speed (0 = fully closed, 1000 = fully open) this will vary up and down as the system maintains the pre set target rate, the figure to the left of this indicates by how much the bed rate is due to change.
The ground speed of the spreader is shown on the left hand side of the screen.
The Hopper/Spread screen and the Spread rate/Area screen can be viewed by pressing the SCROLL key.



When spreading finishes, turn the spreading switch off (if being used manually), the display will return to the hopper weight and spread weight screen. Press SCROLL to view the spread rate and area (see 2.2 for reference).

2.4 Printing / Saving Records

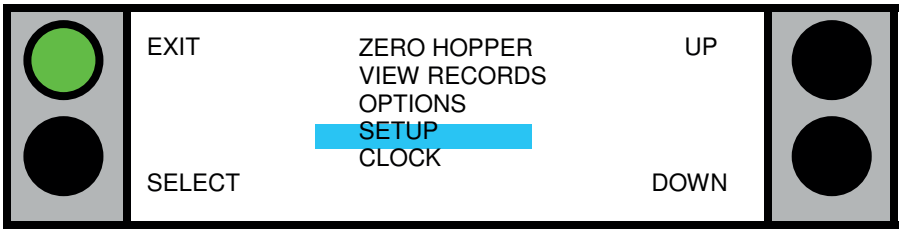


To save a ticket and store the reading in the indicator memory and the USB drive, ensure the spreading mode is off. The SPREAD RATE / AREA screen must display. Press SCROLL if necessary.
To store the reading, press SAVE. Note that in either case, the reading may be viewed and printed at a later date.
Pressing SAVE zeros the display and spreading may restart.
Press SCROLL to view the hopper weight and spread weight again.

3. Menus

From the main screen press MENU.

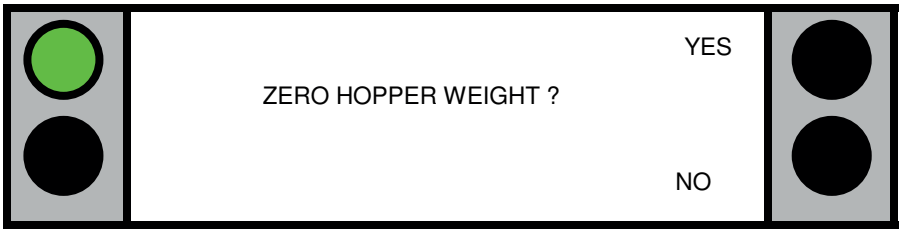
MENU screen:



When entering the menu screen SETUP is highlighted. Use the UP or DOWN keys to scroll through the menu items.
Press SELECT to select the required menu item.
Press EXIT to revert to the basic display screen without making any alterations.

3.1 Zero Hopper

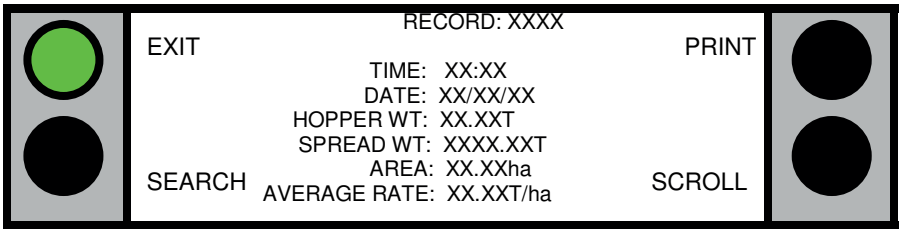
MENU / SETUP / ZERO HOPPER screen:



ZERO HOPPER WEIGHT, exactly as it describes.(it is not necessary for the hopper weight to be exactly on zero when empty for the spreader monitor to work correctly).
Press YES to zero the Hopper Weight and return to the SETUP screen.
Press NO to cancel the operation and return to the SETUP screen.

3.2 Records

MENU / RECORDS screen:

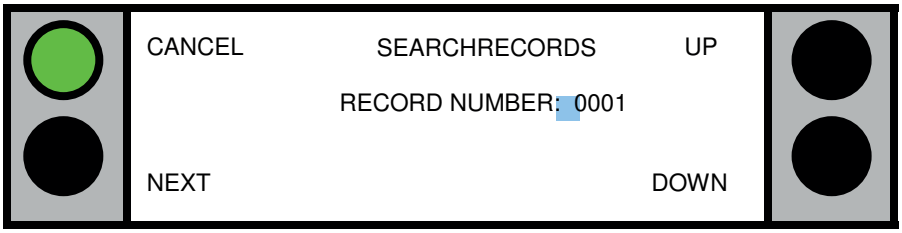


The system will automatically display the most recent record. It displays the time, date, average spread rate, and area spread. To print this record, press PRINT.

3.2.1 Search records

To search the records by record number, press SEARCH.

The screen will change to:

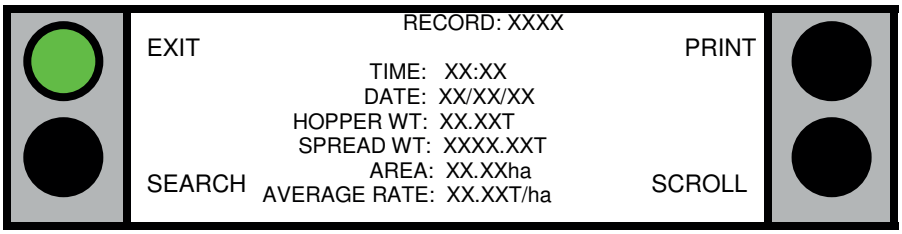


Change each highlighted digit by pressing the UP or DOWN keys until the required number is shown. Press NEXT to move to the next digit. When all digits have been scrolled through, NEXT will change to SELECT. Press SELECT to display the required record. Press PRINT if required.

3.2.2 Scroll through records

To search through the records one at a time, press SCROLL.

The screen will change to:

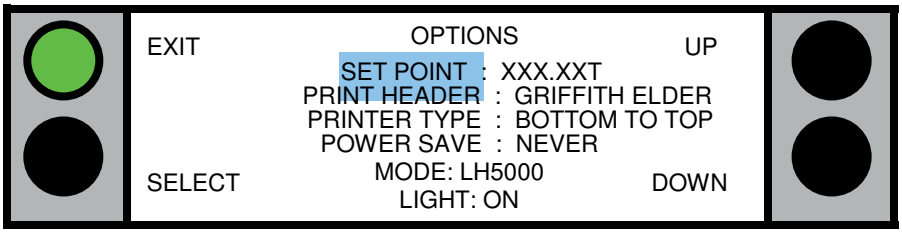


Use the UP and DOWN keys to scroll through the records. Once the required record has been found, press SELECT. The screen will revert to the MENU / RECORDS screen displaying the required record. Press PRINT if required.

Note that if no printer is connected this screen will automatically display when you select VIEW RECORDS. Press EXIT to return to the basic display screen.

3.3 Options

MENU / OPTIONS screen:



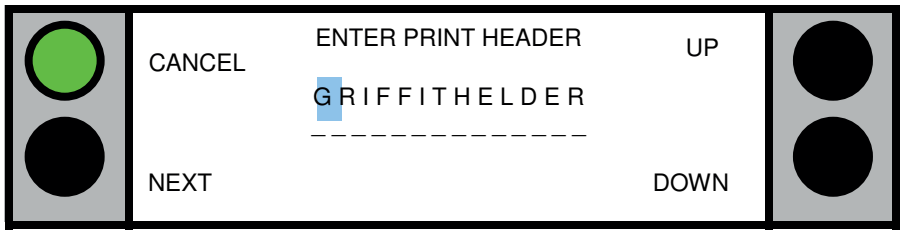
Use the UP and DOWN keys to select the required option.

3.3.1 Set Point

A configurable set point, to give indication when a weight a weight value is reached.

3.3.2 Print header

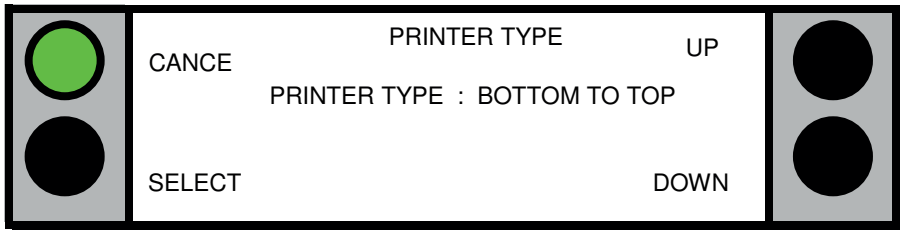
MENU / OPTIONS / PRINT HEADER screen:



PRINT HEADER allows the user to change the header on the printed weight ticket. The maximum print header length is 15 characters including spaces.
Use the UP and DOWN keys to change each letter in turn. Press NEXT to move to the next letter. When all letters have been scrolled through, NEXT will change to SELECT. Press SELECT to save the header. This will then return to the MENU / OPTIONS screen.
Press CANCEL to cancel the operation and return to the MENU screen.

3.3.3 Printer type

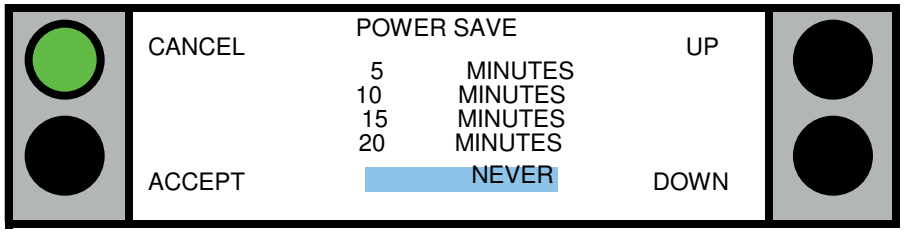
MENU / OPTIONS / PRINTER TYPE screen:



Use the UP and DOWN keys to scroll through the printer type options. Available options are: NONE, LABEL PRINTER, BOTTOM TO TOP, TOP TO BOTTOM. Choose the appropriate option for the type of printer being used. Press SELECT for the required option.
Press CANCEL to cancel the operation and return to the MENU screen.

3.3.4 Power save

MENU / OPTIONS / POWER SAVE screen:



POWER SAVE turns the indicator off after the set number of minutes.
Use the UP or DOWN keys to scroll through the options. Press ACCEPT to choose the highlighted option. This will then return to the MENU / OPTIONS screen showing the newly selected timeout.
Press CANCEL to cancel the operation and return to the MENU screen.

3.3.5 Mode

The mode specifies the type of peripheral equipment the WS4 unit will communicate with.

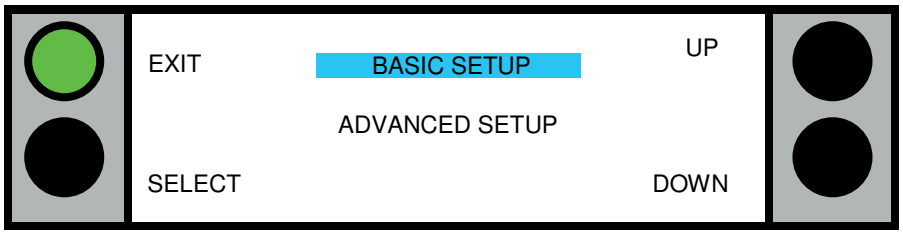
- LH5000 - A host device can specify dosing, typically used with application maps.
- GPS - GPS data can be obtain via connection to a Griffith-Elder GPS device.
- TUVR - A Trimble host device can specify dosing, typically used with application maps.

3.3.6 Back Light

Set whether the back light of the unit is on or off.

3.4 Setup

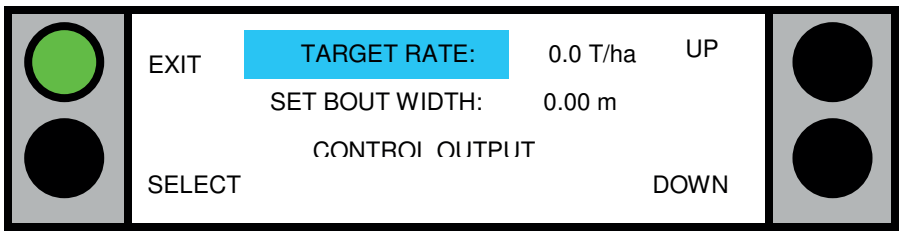
MENU / SETUP screen



3.4.1 Basic Setup

MENU / SETUP / BASIC SETUP screen

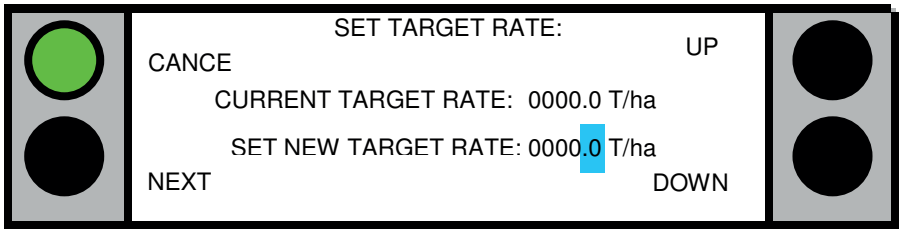
Use UP/DOWN to choose the item to adjust then press SELECT.



3.4.1.1 Set Target Rate

MENU / SETUP / BASIC SETUP /TARGET RATE screen

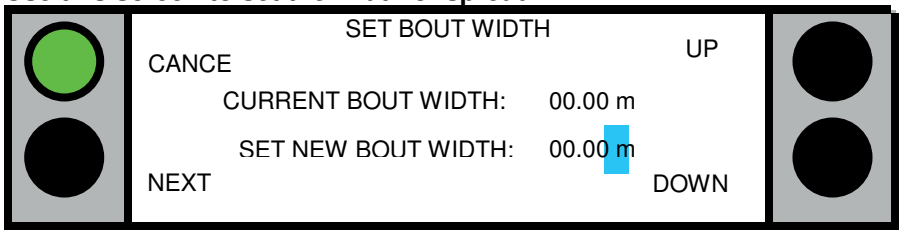
Use this screen to set the target application rate you wish the spreader to automatically maintain.
Use the NEXT key to move the cursor and the UP/DOWN keys to change the value.
When the last digit has been entered the NEXT key will change to ACCEPT press to accept the new target rate. Use CANCEL to return to the basic set up screen.



3.4.1.2 Set Bout Width

MENU / SETUP / BASIC SETUP /SET BOUT WIDTH screen

Use this screen to set the width of spread.



Use the UP and DOWN keys to change the value of the TRUE SPREAD WIDTH. Press NEXT to move to the next digit. When all digits have been scrolled through, NEXT will change to ACCEPT. Press ACCEPT to change the calibration. Press CANCEL to cancel the operation and return to the CALIBRATION screen.

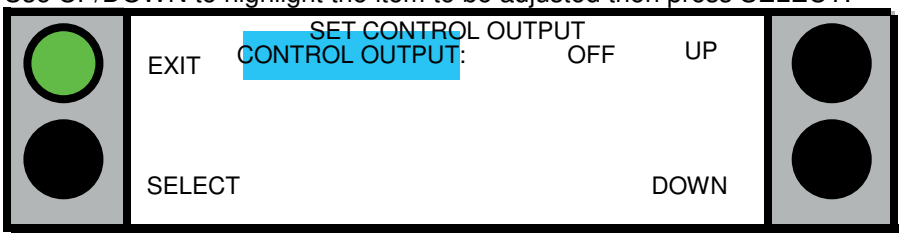
3.4.1.3 Setting the Control Output

MENU / SETUP / CALIBRATION / CONTROL OUTPUT screen:

The control output is used to automatically maintain the TARGET APPLICATION RATE by control of the bed speed via an electrically operated variable flow valve. The control output operates over a range of 0 to 1000, with 0 representing the valve fully close and 1000 fully open.
Three levels can be pre-set for the control output:

- MINIMUM LEVEL restricts how far the valve will close (below a certain level there may be insufficient oil flow to move the bed chain).
- MAXIMUM LEVEL restricts how far the valve will open (in some circumstances if the bed speed is increase too far the load on the spreading augers may cause the tractor to stall).
- START LEVEL sets the position the valve will open to when spreading is started.

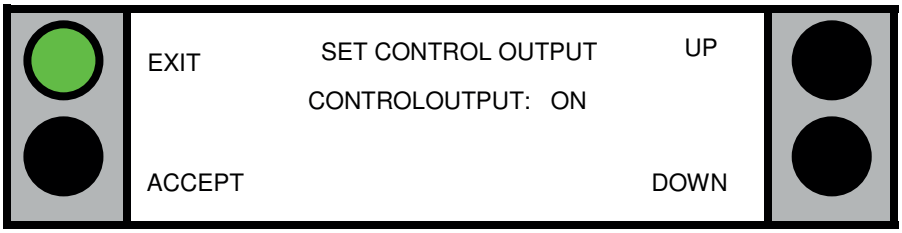
Use UP/DOWN to highlight the item to be adjusted then press SELECT.



Values shown here are the factory settings

MENU / SETUP / CALIBRATION / SET CONTROL OUTPUT screen:

For AUTO RATE CONTROL to work the control output needs to be set to ON.
(NOTE THE SWITCH ON THE MANUAL CONTROL POT BOX MUST ALSO BE SET TO AUTO)
Use UP/DOWN to change the status of the control output then press ACCEPT.



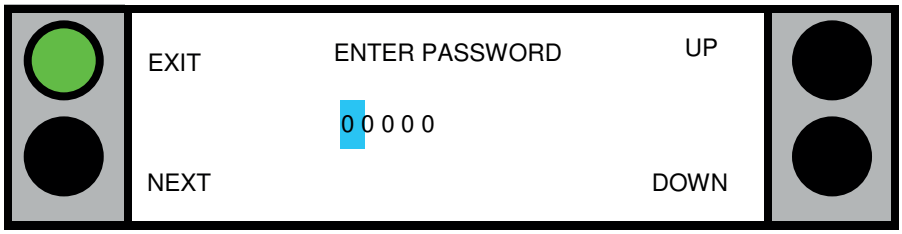
3.4.2 Advanced setup

3.4.2.1 Password

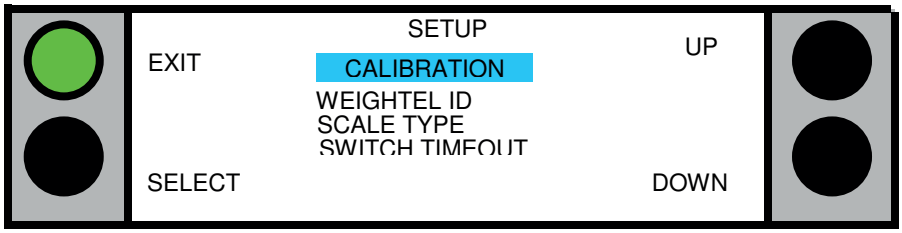
MENU / SETUP password screen:

The password for the setup menu is pre-set to 63616. Use the UP and DOWN keys to change each digit. Press NEXT to move to the next digit. When all digits have been scrolled through, NEXT will change to SELECT. Press SELECT once all digits have been entered.

If the password is incorrect an error message will appear:

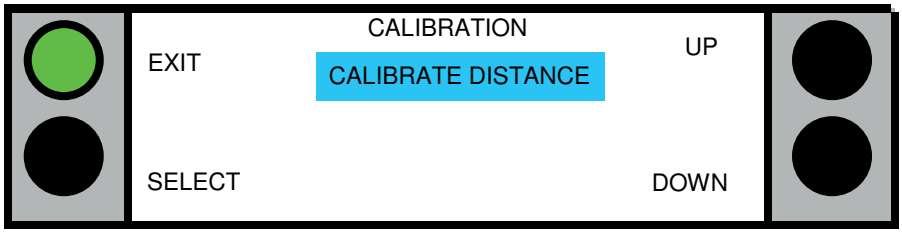


MENU / ADVANCED SETUP screen:



Use the UP and DOWN keys to select the required option.

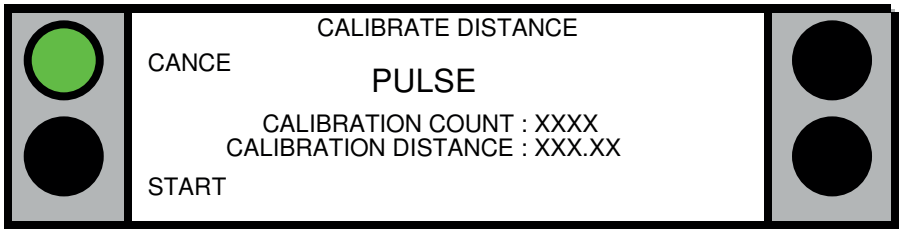
MENU / ADVANCED SETUP / CALIBRATION screen:



3.4.2.2 Calibration

3.4.2.2.1 Distance

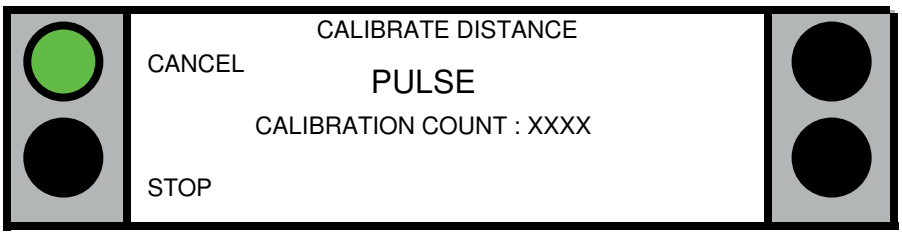
MENU / SETUP / CALIBRATION / CALIBRATE DISTANCE screen:



"PULSE" displays at the top of the screen to indicate each time the distance sensor receives a signal. To ensure the distance sensor is working properly, drive forwards slowly to view "PULSE" displaying on the screen at regular intervals.

*** * Important: To calibrate the distance, "PULSE" must display on the screen to start calibration. * ***

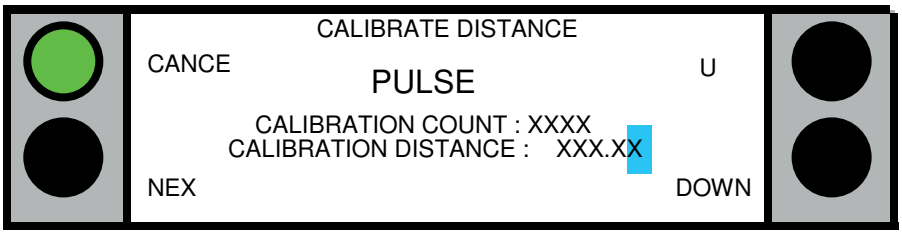
To calibrate the distance, drive forwards until "PULSE" displays on the screen. Stop driving.
Mark the ground next to a point on the spreader.
Press START to start the calibration.



Drive forwards slowly in a straight line for a distance of at least 20 metres but not more than 200 metres (65 feet to 650 feet). The CALIBRATION COUNT will count the number of pulses as you drive. Ensure "PULSE" displays when you stop driving.

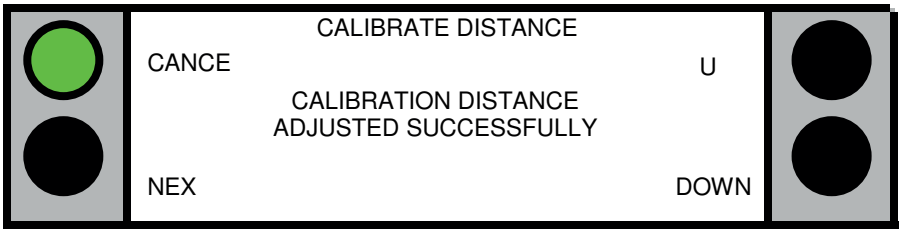
*** * Important: "PULSE" must display on the screen to stop calibration. * ***

Press STOP to stop the calibration.
Mark the ground next to the same point on the spreader. Measure the distance travelled to the nearest centimetre.



Use the UP and DOWN keys to change the value of the CALIBRATION DISTANCE. This is the distance travelled. Press NEXT to move to the next digit.
When all digits have been scrolled through, NEXT will change to ACCEPT.
Press ACCEPT to change the calibration.
Press CANCEL to cancel the operation and return to the CALIBRATION screen.

When you press ACCEPT, a reference screen will display for 5 seconds before returning to the CALIBRATION screen:



3.4.2.2.2 Radar/Shaft

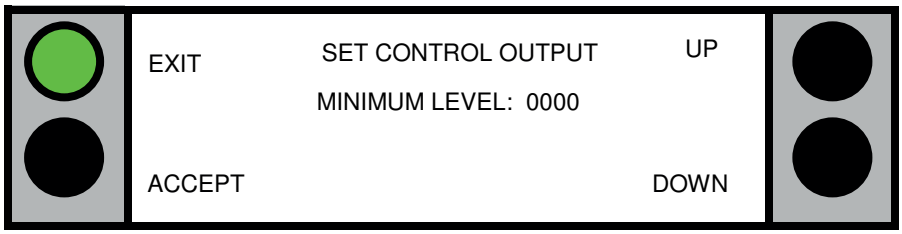
Specify whether the pulse input is coming from a pulse sensor, connected to a wheel shaft, or a radar output.

3.4.2.2.3 Bed Value

Specify the minimum value needed for the bed to actuate, and the maximu, value, whereby the bed is at its full speed.

MENU / SETUP / CALIBRATION / SET MINIMUM/MAXIMUM/START LEVEL screen:

Select the item to be changed from the control output setup screen (MINIMUM, START or MAXIMUM).
Use UP/DOWN to change the value (count rate will accelerate if the button is held down).
Press ACCEPT to save and return to control output setup screen.

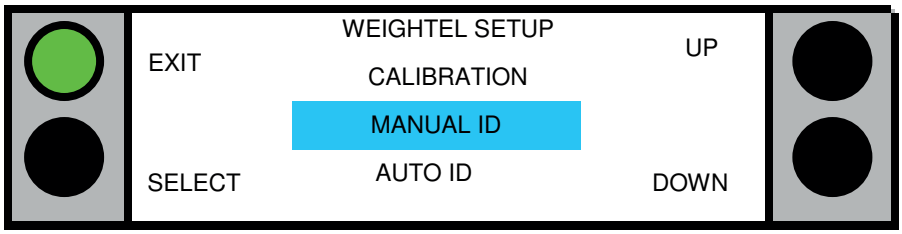


*** * Important: Changing this value will cause the bed to start moving. * ***

3.4.2.3 Weightel ID

This menu should only need to be used if a loadcell is changed on the spreader or for diagnosing a weighing fault.

MENU / SETUP / WEIGHTEL ID screen:

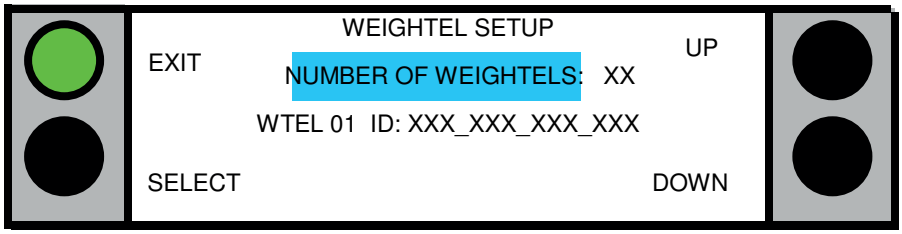


This section is used to enter the Weightel (load cell) ID numbers. The indicator needs to have the correct ID numbers entered for it to see weights from each load cell.
The Spreader may be fitted with Griffith Elder Digital Load Cells each a unique Weightel ID or it may be fitted with analogue load cells wiring back to a Weightel Junction Box which has the unique Weightel ID.

Weightel IDs can be entered manually, or the indicator can automatically detect the Weightels and their IDs.
Use the UP and DOWN keys to select the required option.

MANUAL ID

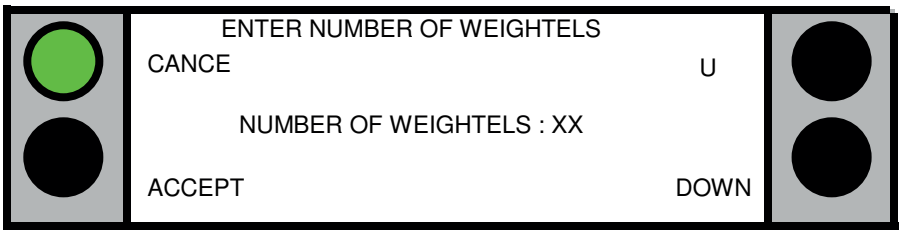
MENU / SETUP / WEIGHTEL ID / MANUAL ID screen:



This section is used to manually enter the Weightel (load cell) ID numbers.

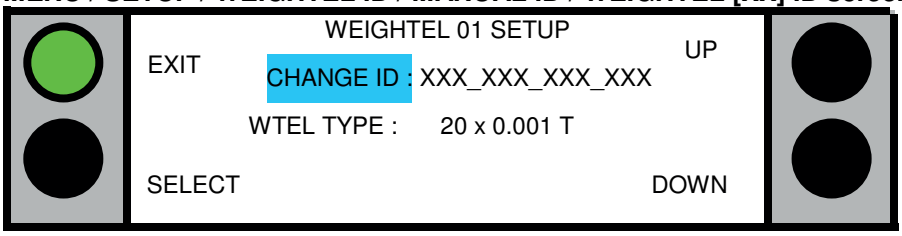
Use the UP and DOWN keys to scroll through the options. If more than one Weightel is connected to the indicator, press DOWN to scroll through each Weightel.
Press ACCEPT to select the required option.

MENU / SETUP / WEIGHTEL ID / MANUAL ID / NUMBER OF WEIGHTELS screen:



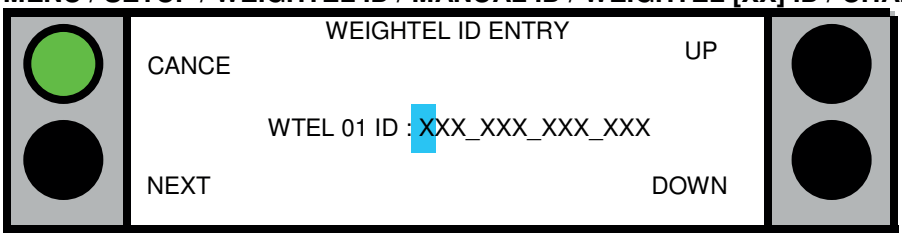
Use the UP and DOWN keys to change the number of Weightels connected.
When changed as required, press ACCEPT to return to the WEIGHTEL ID screen.

MENU / SETUP / WEIGHTEL ID / MANUAL ID / WEIGHTEL [XX] ID screen:



Use the UP and DOWN keys to scroll through the options.
Press SELECT to select the required option.
Press EXIT to return to the SETUP screen.

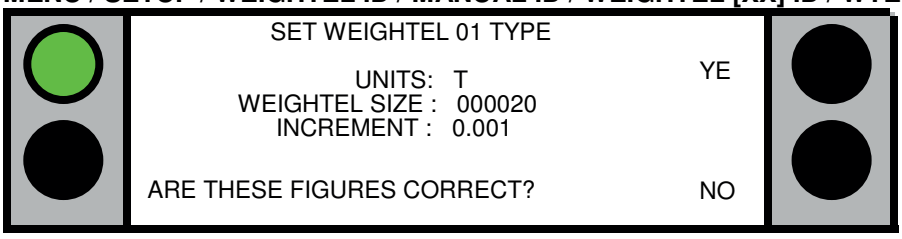
MENU / SETUP / WEIGHTEL ID / MANUAL ID / WEIGHTEL [XX] ID / CHANGE ID screen:



*** * Important: Do not change Weightel IDs unless on the advice of a Griffith Elder Engineer * ***

Use the UP and DOWN keys to change each digit of the Weightel ID.
Press NEXT to move to the next digit. When all digits have been scrolled through, NEXT will change to ACCEPT. Press ACCEPT when all digits are changed as required.
Press CANCEL to cancel the operation and return to the SETUP screen.

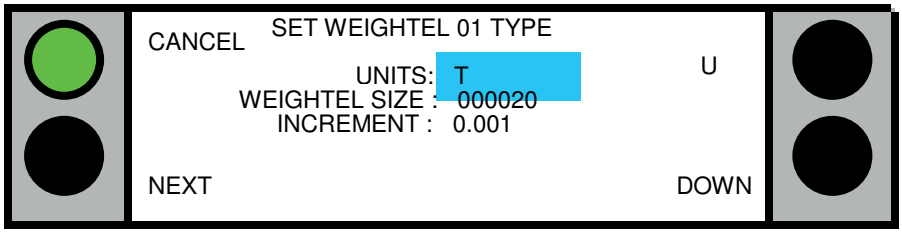
MENU / SETUP / WEIGHTEL ID / MANUAL ID / WEIGHTEL [XX] ID / WTEL TYPE screen:



*** VERY IMPORTANT: NEVER CHANGE THE WEIGHTEL TYPE unless on the advice of a Griffith Elder Engineer ***

If the figures shown are correct, press YES to return to the SETUP screen.
If the figures shown are incorrect, press NO.

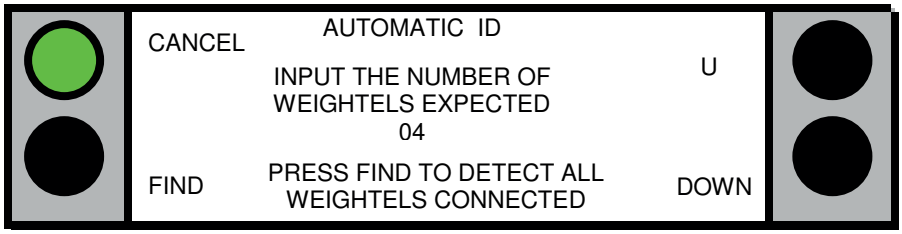
The screen will change to:



Use the UP and DOWN keys to adjust each value. Press NEXT to move to the next item.
Available UNITS are: LB, T (pounds, tonnes).
WEIGHTEL SIZE is adjusted one digit at a time.
Available increments are: 0.001, 0.002, 0.005, 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50.
When the INCREMENT box is highlighted, NEXT changes to ACCEPT. Press ACCEPT when all digits are changed as required.
Press CANCEL to cancel the operation and return to the SETUP screen.

AUTO ID

MENU / SETUP / WEIGHTEL ID / AUTO ID screen:

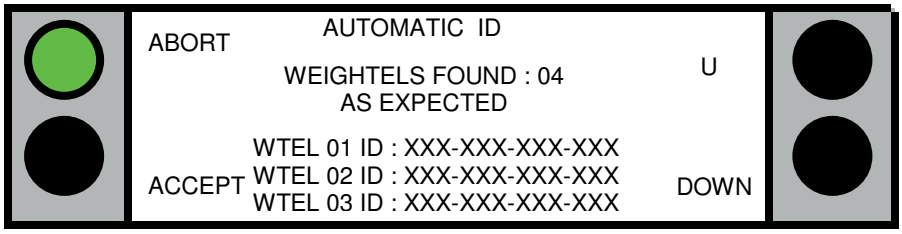


Use the UP and DOWN keys to adjust the number of Weightels expected to be connected.
Press FIND to let the indicator automatically detect all Weightels connected.

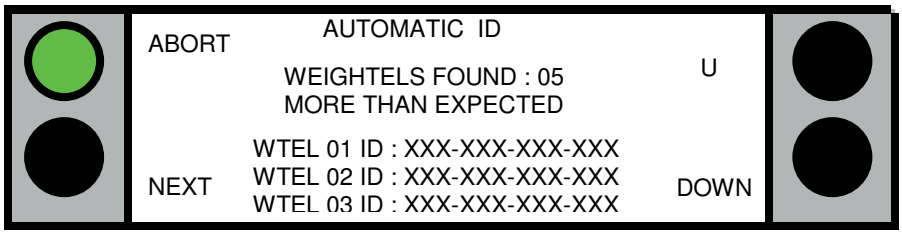
The screen will change to:

Weightels will be listed in the order found.

If the number of Weightels found is as expected, AS EXPECTED will display on the screen.
Press ACCEPT to accept the listed ID numbers and return to the basic display screen.

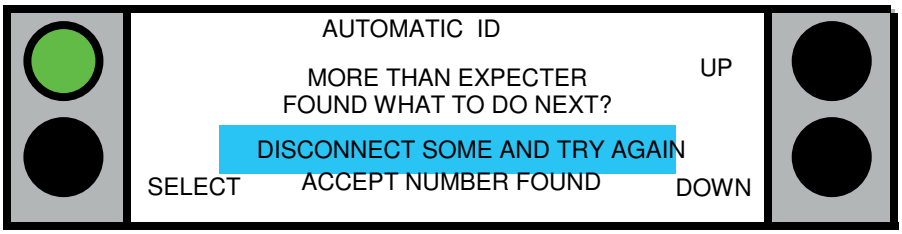


If the number of Weightels found is more than expected, the screen will change to:



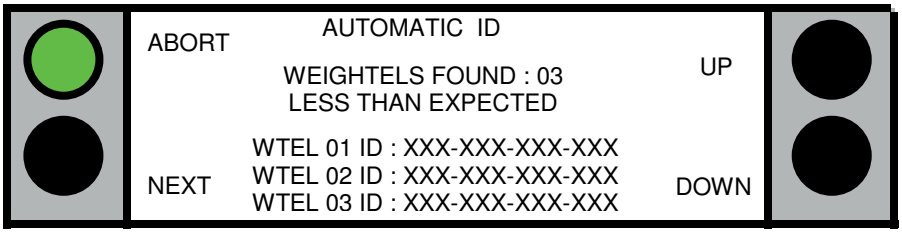
Press NEXT to continue.
Press ABORT to cancel the operation and return to the SETUP screen.

The screen will change to:



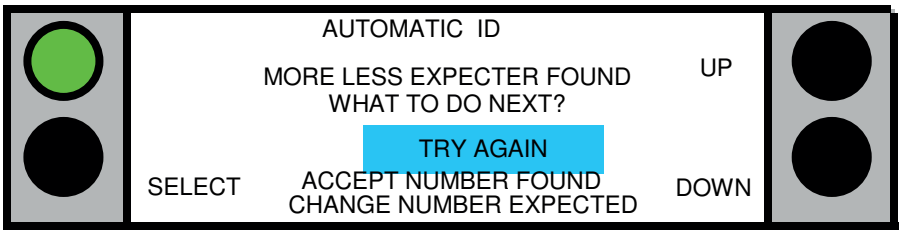
Use the UP and DOWN keys to scroll through the options. Press SELECT to select the required option.
Press DISCONNECT SOME AND TRY AGAIN to disconnect some Weightels and to readjust the number of Weightels expected. The screen will return to the AUTO ID screen.
Press ACCEPT NUMBER FOUND to accept the listed ID numbers and return to the basic display screen.

If the number of Weightels found is less than expected, the screen will change to:



Press NEXT to continue.
Press ABORT to cancel the operation and return to the SETUP screen.

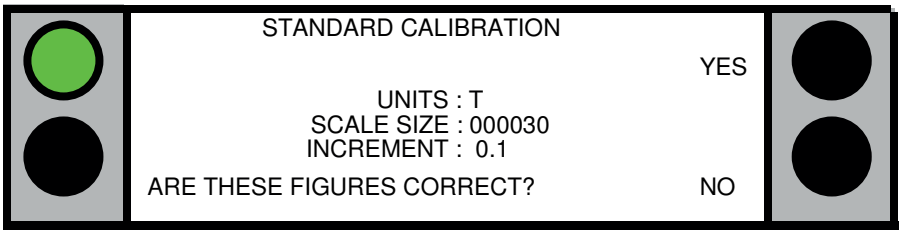
The screen will change to:



Use the UP and DOWN keys to scroll through the options. Press SELECT to select the required option.
Press TRY AGAIN to let the indicator redetect all connected Weightels. The screen will return to the AUTO ID screen.
Press ACCEPT NUMBER FOUND to accept the listed ID numbers and return to the basic display screen.
Press CHANGE NUMBER EXPECTED to readjust the number of Weightels expected. The screen will return to the AUTO ID screen.

3.4.2.4 Scale Type

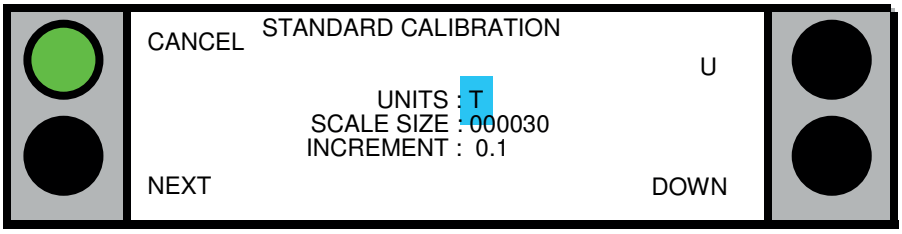
MENU / SETUP / SCALE TYPE screen:



The SCALE TYPE screen is used to set up what the indicator will display. Note that the UNITS must be the same as the settings in the Weightel (see 3.4.2.3 – MANUAL ID for reference).

If the figures shown are correct, press YES to return to the SETUP screen. If the figures shown are not correct, press NO.

The screen will change to:

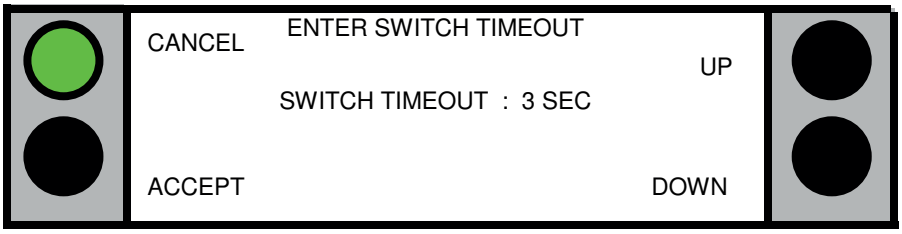


Use the UP and DOWN keys to adjust each value. Press NEXT to move to the next item.
Available UNITS are: T–HA–M, LB–AC–FT, TON (tonnes-hectares-metres, pounds-acres-feet, imperial ton-acre -feet).
SCALE SIZE is adjusted one digit at a time.
Available scale increments are: 0.001, 0.002, 0.05, 0.01, 0.02, 0.05, 0.1, 0.2, 0.5, 1, 2, 5, 10, 20, 50.
When the INCREMENT box is highlighted, NEXT changes to ACCEPT. Press ACCEPT when all items are changed as required.
Press CANCEL to cancel the operation and return to the SETUP screen.

Note: Metres are measured to the nearest 0.01m. Feet are measured to the nearest 0.1ft.

3.4.2.5 START TIMEOUT

MENU / SETUP / ADVANCED SETUP / START TIME OUT screen:

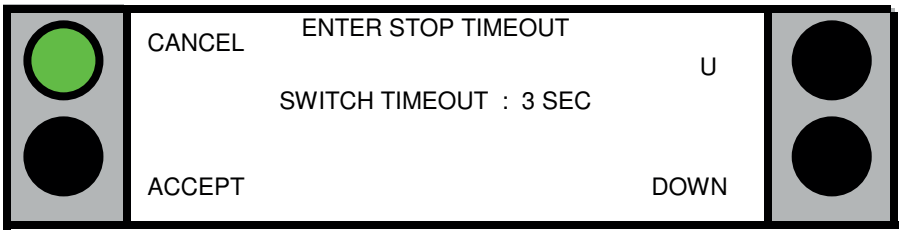


*** Factory Set to 3 Seconds***

Use the UP and DOWN keys to adjust the switch time out.
Press ACCEPT to use value entered.
Once the Spread On / Off input goes off i.e. the bed stops spreading then there will be a time delay before the indicator stops allowing anymore product leaving the spreader to be added to the amount spread.
This setting allows for any product still leaving the spreader after the bed stops moving to be added to the spread total.

3.4.2.6 STOP TIMEOUT

MENU / SETUP / ADVANCED SETUP / STOP TIME OUT screen:



*** Factory Set to 3 Seconds***

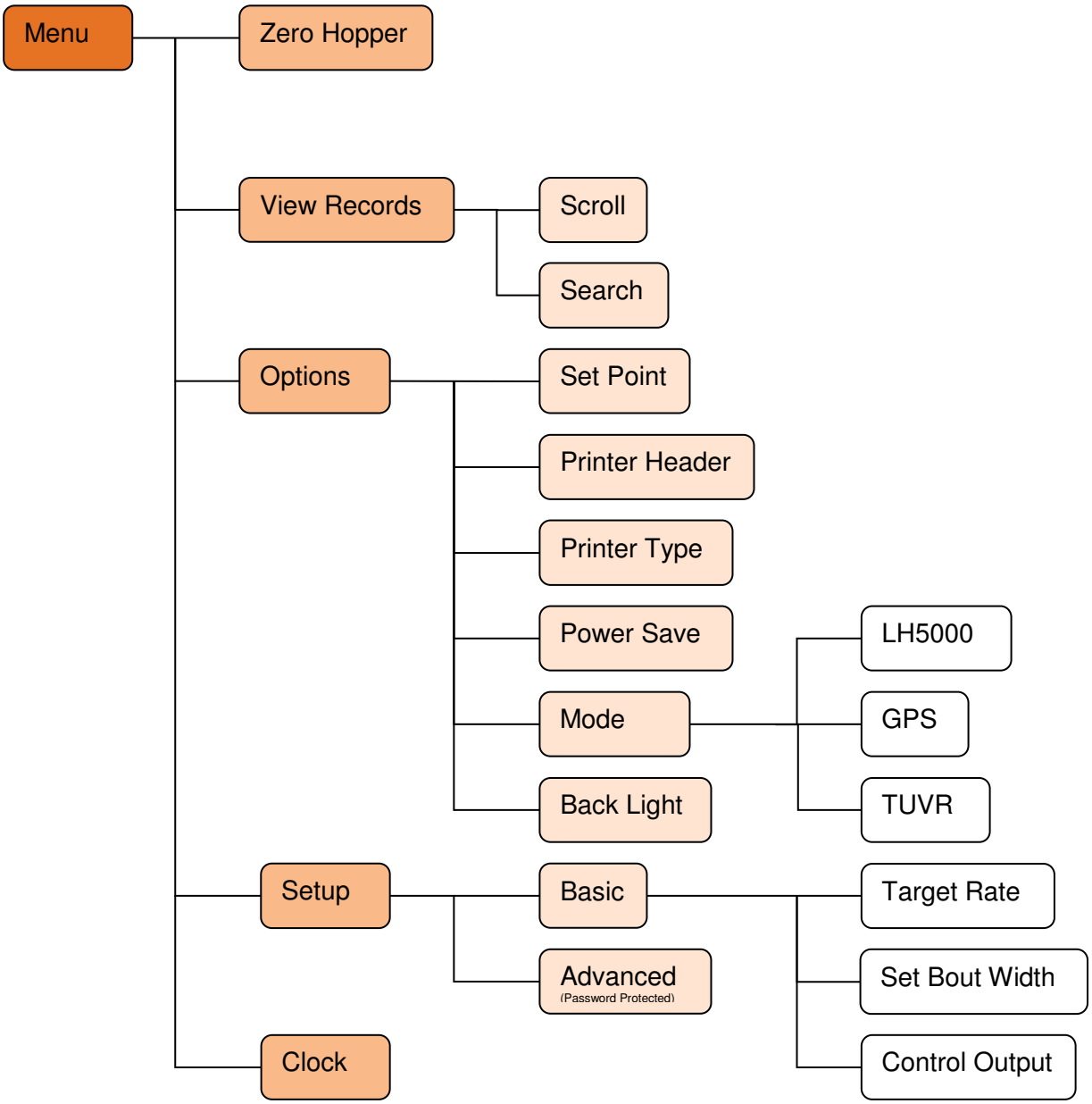
Use the UP and DOWN keys to adjust the switch time out.
Press ACCEPT to use value entered.
Once the Spread On / Off input goes off i.e. the bed stops spreading then there will be a time delay before the indicator stops allowing anymore product leaving the spreader to be added to the amount spread.
This setting allows for any product still leaving the spreader after the bed stops moving to be added to the spread total.

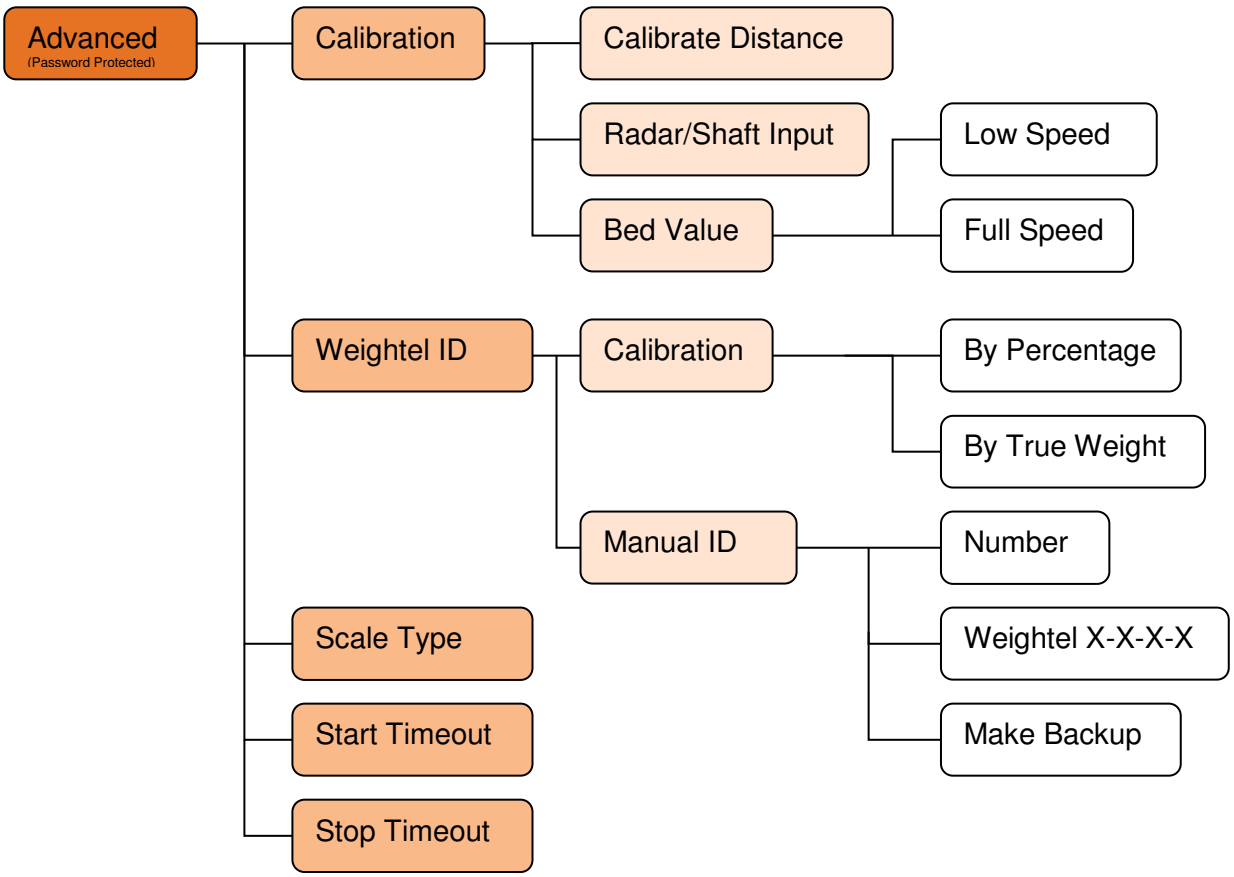
3.5 Time and date

MENU / CLOCK screen:

To change the date and time, press SET. The SET command will change to NEXT and the figure representing the day will be highlighted. Use the UP and DOWN keys to change each highlighted figure in turn (day / month / year / hour / minute / second), pressing NEXT to move to the next digit. When all digits have been scrolled through, NEXT will change to ACCEPT. Press ACCEPT when all digits are changed as required.
Press CANCEL to cancel the operation and return to the MENU screen.

The spreading hours figure is a cumulative record of how long the machine has actually been operating in spread mode.


Menu
Zero Hopper
View Records
Scroll
Search
Options
Set Point
Printer Header
Printer Type
Power Save
Mode
Back Light
LH5000
GPS
TUVR
Setup
Basic
Advanced
(Password Protected)
Target Rate
Set Bout Width
Control Output
Clock


Advanced
(Password Protected)
Calibration
Calibrate Distance
Radar/Shaft Input
Low Speed
Bed Value
Full Speed
Weightel ID
Calibration
By Percentage
By True Weight
Manual ID
Number
Weightel X-X-X-X
Make Backup
Scale Type
Start Timeout
Stop Timeout

Notes

Notes

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