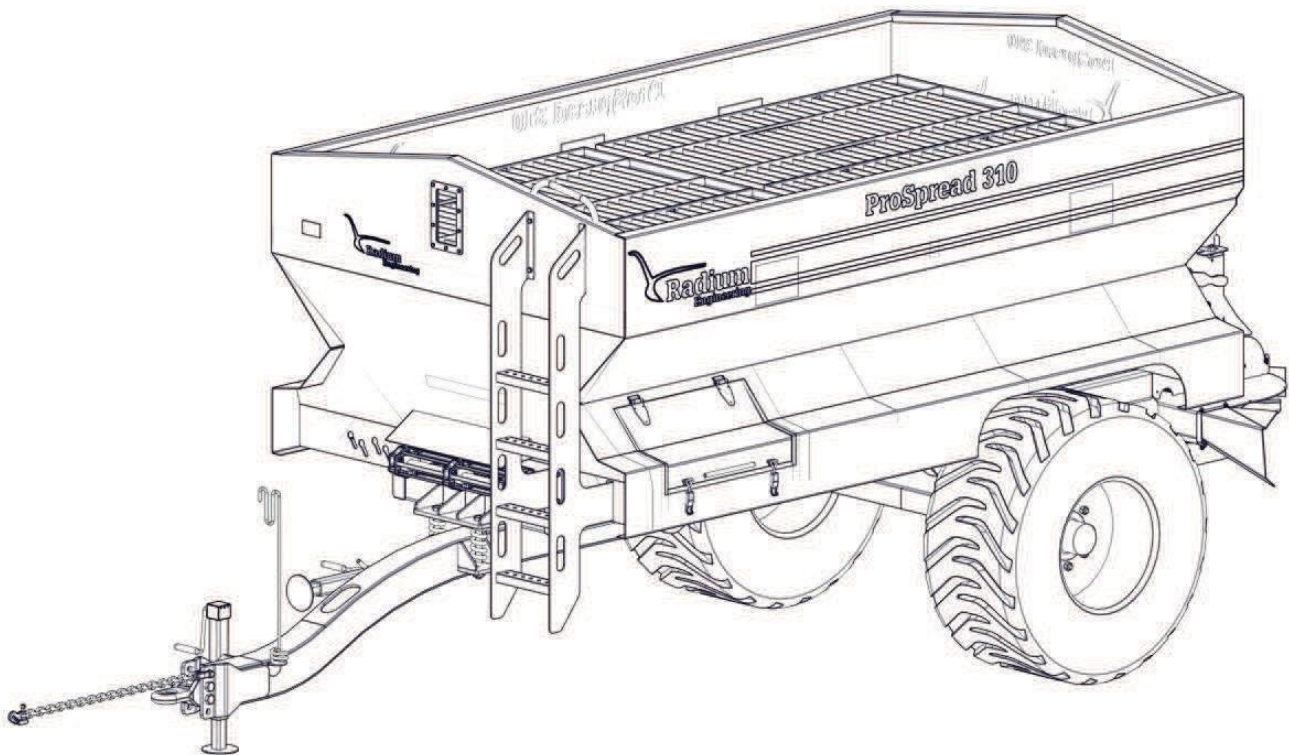


Operator's Manual



Generation III

ProSpread/ BulkSpread/ EconoSpread

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www.radium.co.za



Made in South Africa



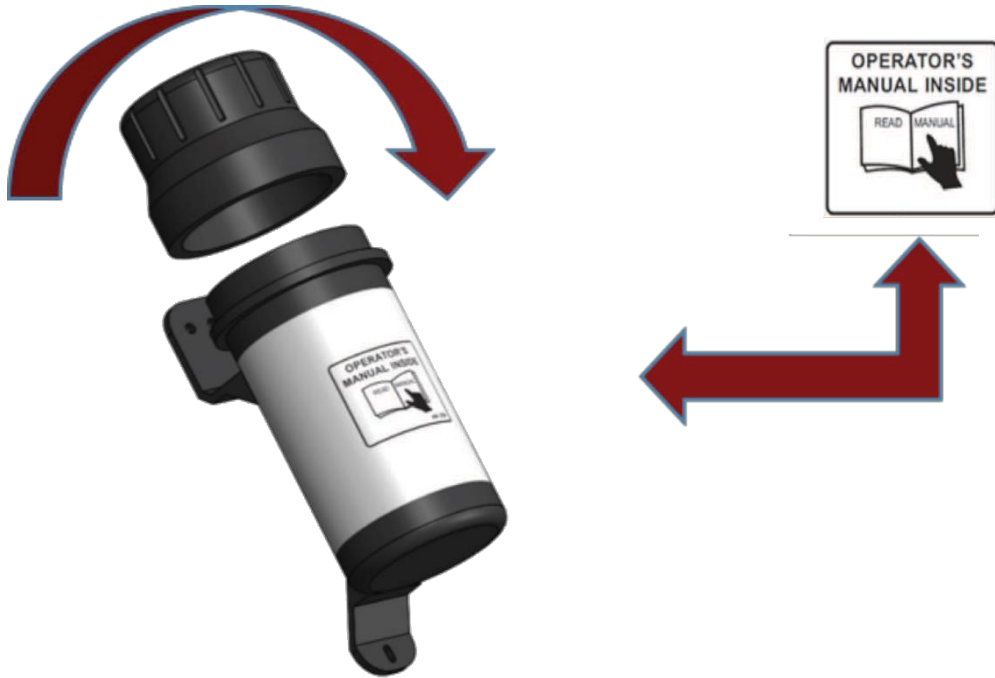
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Ensure that the **Operators Manual** together with the **Parts book** and **Rate Tables** is placed within the sealed tool tube that is supplied attached to the Spreader.



If more copies of any manual is required. Visit www.radium.co.za for an electronic link to the manual.

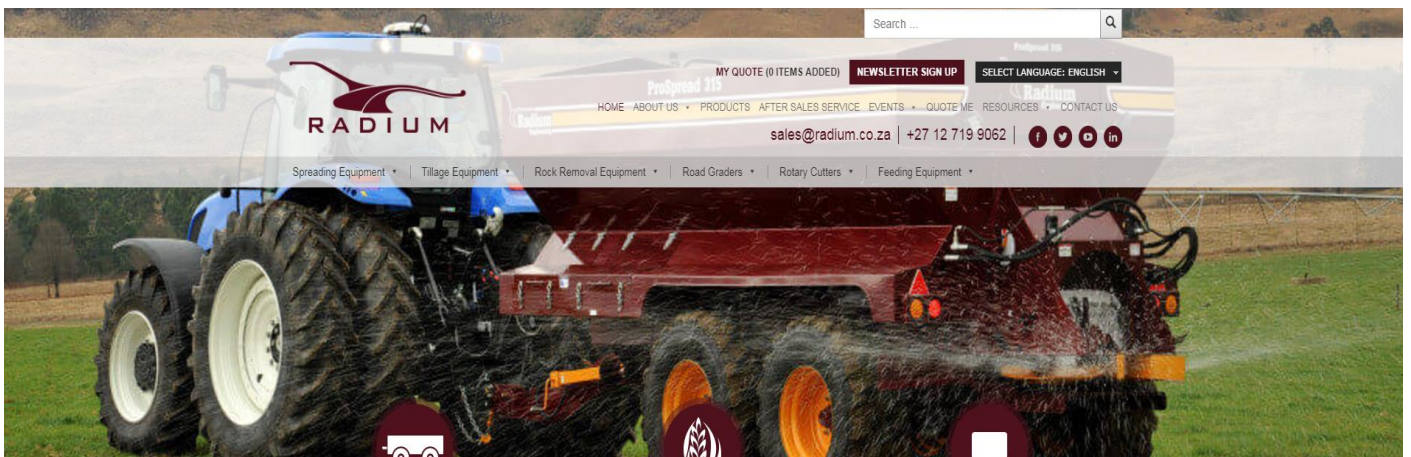
All Specifications are subject to change without notice.

Introduction

Congratulations on your purchase of a Radium Engineering Spreader for your farming operation! The spreader has been designed and manufactured to meet the market needs for an efficient and uniform spread pattern. For safe trouble free operation of the spreader ensure that you, the operator and the individual maintaining the spreader have read and understood the Safety, Operation and Maintenance information that is contained within this manual. Provided the instruction set out in this manual is followed, your machine will serve you well for many years to come.

It is the Owner’s responsibility to read this manual and learn how to operate the machine safely and to its maximum efficiency. This manual in conjunction with the parts manual will supply information pertaining to part codes and drawings that will come in handy when trying to order spare components for your machine. Please use this manual as your first source of information about the Spreader.

Call Radium Engineering if any assistance is needed for ordering parts or if more copies of this manual is required. Further you can visit www.radium.co.za for 3D views, part codes and exploded assembly drawings of your spreader for a better understanding of your machine. A link is provided for an electronic copy of the Operators Manual should the manual be lost.



- 

OUR PRODUCTS
Our implements are known for their in-built quality and we continuously review our systems and processes to ensure we stay at the forefront of the industry.
- 

CONTACT US
Contact us for a chat with a sales rep, further information about our product range and to get quotes for the implements your farm needs most.
- 

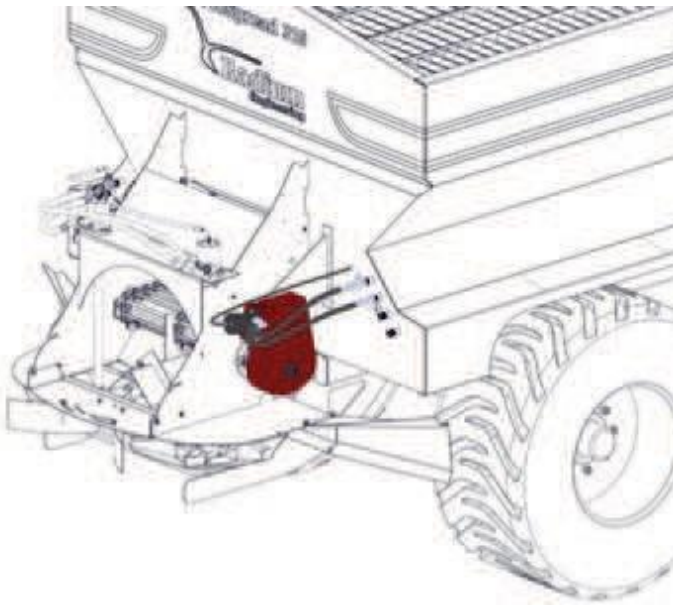
BLOG
Read industry articles about 'SA's Secret Exports' and Radium's Top Sellers, amongst others.

RADIUM ENGINEERING

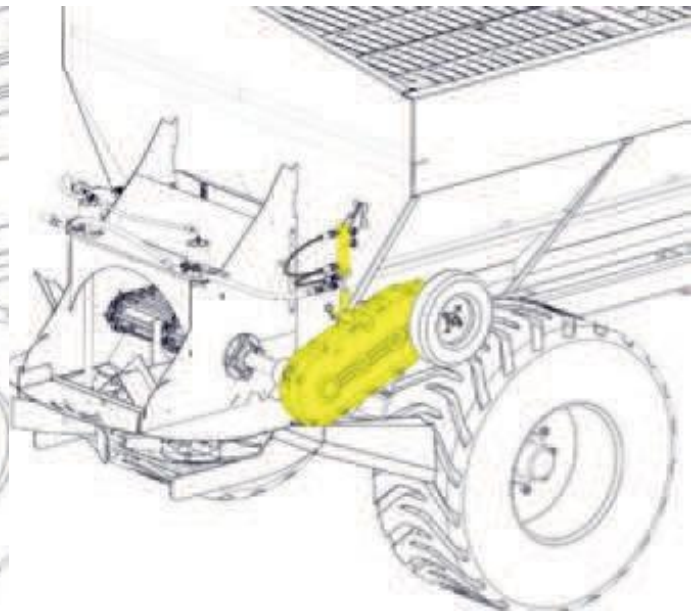
Design Overview

A Radium Engineering Spreader can come in one of two configurations, Ground Related drive or Hydraulic drive. The heart of the spreader is the floor chain conveyor system powered by a three speed ground related gearbox or, for variable rate spreading, an easy adaptation can be made to a hydraulic drive gearbox.

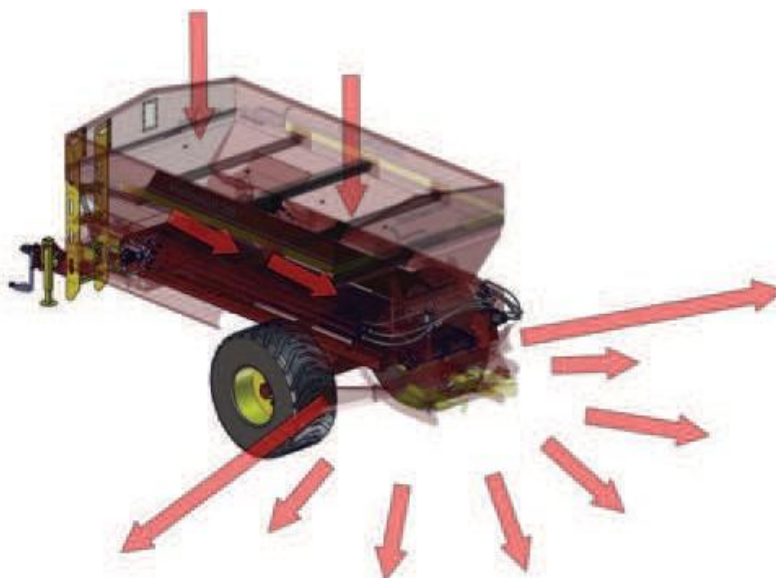
Hydraulic Drive Gearbox



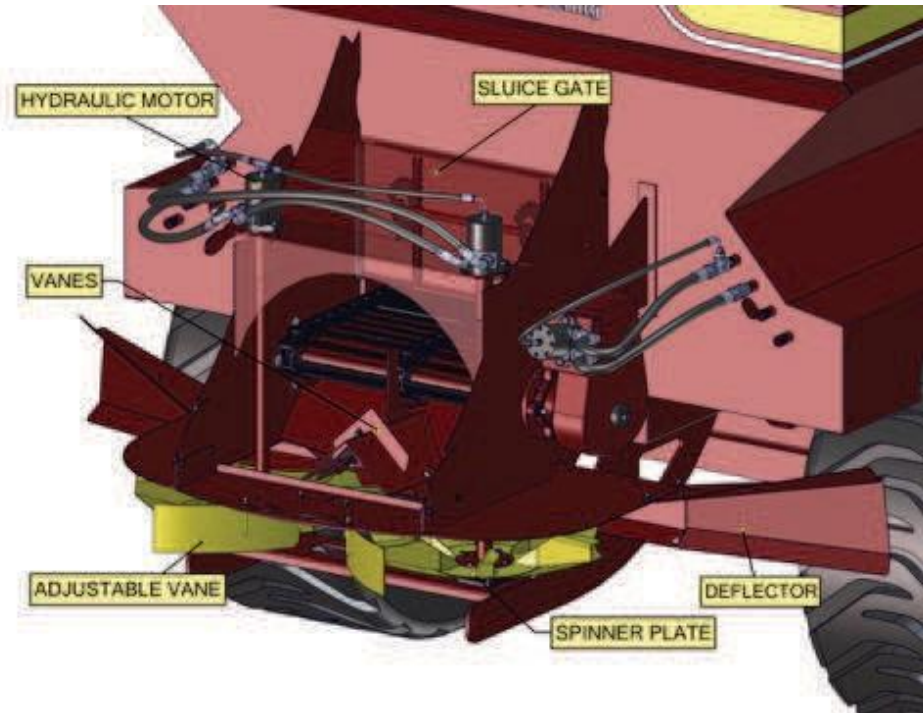
Ground Related Gearbox



In both configurations the gearbox determines the speed at which the chain moves the material out of the hopper. The well designed sheet metal bin is built around the chain conveyor system that pulls material out at a steady rate through an adjustable sluice gate at the rear of the machine. The material then lands on two counter rotating spinners which distributes the material in a uniform spread pattern by means of centrifugal force. Various adjustable vanes and slides are designed around the spinners, directing the flow of material to the spinners and also optimizing the distribution of material creating a perfect spread pattern.



The rear spinners are driven by means of high performance hydraulic motors, this allows the operator to vary the speed of the spinners in accordance to the material being spread, further enhancing the spread pattern and reduces the coefficient of variation. The manually adjustable rear sluice gate controls the low and rate of material exiting the hopper, landing on the spinners to be distributed.



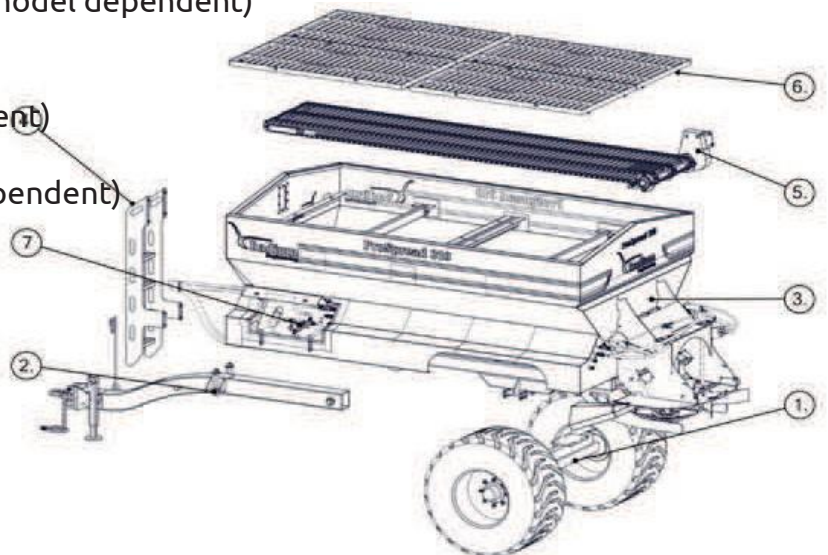
Principal Components

In the exploded view below the principal components that make up the spreader are illustrated.

Certain components displayed in this image are model specific such as the screen and access ladder.

Spreader Components

1. Removable axle and wheels (model dependent)
2. Drawbar
3. Sheet metal bin
4. Access ladder (model dependent)
5. Chain Conveyor System
6. Removable Screen (Model dependent)
7. Hydraulic Control Valves



Capabilities and Specifications

Spreadable Material

The Radium Engineering Spreader will spread all types of granulated fertilizer as well as lime, gypsum and organic materials such as salts, grit, sand and seed.

Loading Capacities

All the machines' load capacities are calculated based on a material density of 1 200 kg/m³ (1200 kg's per cubic meter) [75 pounds per cubic feet]. The entire construction of the machine including the wheels and axels are designed around this criteria. It is critical to exercise caution when loading the hopper with materials that exceed this density to avoid overloading and potential failure to vital components.

Spreading Width

The Spreader can broadcast different materials at various widths depending on the material's texture and granule size because one is able to adjust the spinner speed in accordance with the material being spread. Thus a perfect spread pattern can be achieved with less than 5% coefficient of variation. On average the Spreaders are able to spread the following materials at the respective distances represented below, first in metric and then in imperial units.

Material	Width - Metric	Width - Imperial
• Granular Fertilizer	18 to 50m (28m Average)	60' to 164' (92' avg.)
• Agricultural lime	6 to 20m (12m avg.)	60' to 118' (78' avg.)
• Chicken Litter	6 to 16m (10m avg.)	20' to 65' (40' avg.)
• Urea	18 to 36m (24m avg.)	12' to 52' (26' avg.)
• Gypsum	4 to 16m (8m avg.)	20' to 52' (32' avg.)
• Cattle Manure	4 to 20m (12m avg.)	12' to 66' (40' avg.)

Minimum and Maximum Rates

The Radium Spreaders have a vast range of rates that can be easily applied from as low as 25kg's per hectare [22 lb/ac] to 10,000kg's per hectare [8920 lb/ac] with various materials. The rates are effected by spread width, forward speed and the rear sluice gate opening. Please refer to the Rate Tables Manual.

Operational Speeds

The Radium Spreaders have been design to operate in the fields up to 25km/hr. [15 mph] under load, and up to 40km/hr. [25 mph] on service roads unloaded.

Specifications

As a base guideline to size an appropriate tractor to pair with the Radium Spreader an estimate of 9Kw [12 hp] per ton can be used. So if a 10 Ton Spreader is used a tractor of 90Kw [120 hp] would be appropriate. This should be used as a guide in selecting a tractor of appropriate horse power.

Chain Specifications

Each Spreader chain is specified by the pintle chain. There are three types of chains used in the range of spreaders:

- Single chain which makes use of 2 pintle chains with flat bar welded in-between.
- Single chain which makes use of 3 pintle chains with flat bar welded in-between.
- Dual Chain which consists of two separate 2 pintle chains with flat bar welded in-between.

Over the life of the chain a maximum of 2 links can be removed to restore tension to the conveyor system.

Hydraulic

Ensure that the tractor can supply **a minimum** of 45 liters per minute [12 gpm] for ground related models and **a minimum** of 90 liters per minute [24 gpm] for hydraulic drive models. $\frac{3}{4}$ " or $\frac{1}{2}$ " hydraulic hose is used to route all the spreaders hydraulic motors and a $\frac{1}{4}$ " bleed off line is used to route back to tank. Two types of check valves are present in the range. An inline check valve as well as a cartridge check valve. Both full-fill the purpose of preventing reverse motion of the motors where the latter allows for the ground related gearbox contact to disengage. A brand valve is present within the system to allow the spinner speed to be controlled on tractors which make use of fixed displacement (open center) hydraulic pumps.

Adding Precision Farming

The Hydraulic system has been designed to allow for easy installation of a proportional brand valve for precision farming applications. In this case a single or dual channel ISO Bus kit will be added to the spreader. One channel to control the spinners, the other to control the chain. In the case of a dual channel a proximity sensor is installed to monitor the sprocket on the spinner shaft and thus pick up the spinner speed. The ISO bus system is plug and play with tractors.

Gearboxes

Two different gearboxes, fast and slow, are used on the ground related models and are paired with the machines for different configurations. The Fast Gearbox is used on Econospread models with a 500mm chain. A deep low configuration can be achieved when a slow gearbox is used on the Econospread, 500mm chain, for applying ultra-low rates. A slow gearbox is used on Bulksread models as well as on ProSpread models with 1000mm and 730mm chain respectively.



Three different sized jockey wheels can be used to alternately increase or decrease the required rate. Please refer to the Rates Manual when doing so. The jockey wheel tyre is a solid tyre filled with hardening foam.

Jockey Wheel Diameters		
300 mm	418 mm	500 mm
11-13/16 "	16-1/2"	19-11/16"

On hydraulic drive spreader models hydraulic motors of different sizes are paired with different ratio gearboxes. The gear ratio of the hydraulic gearbox used on the spreader is stated in the table below:

Gearbox Ratio	Spreader Model
10:1	Compac Spread & 5 ton EconoSpread Models
16:1	7 ton Econospread Model
22:1	Prospread & Bulkspread Models

All gearboxes are mated in combination with Eaton 80cc, 100cc, 150cc or 200cc depending on the model of the hydraulic drive Spreader.

Tyres

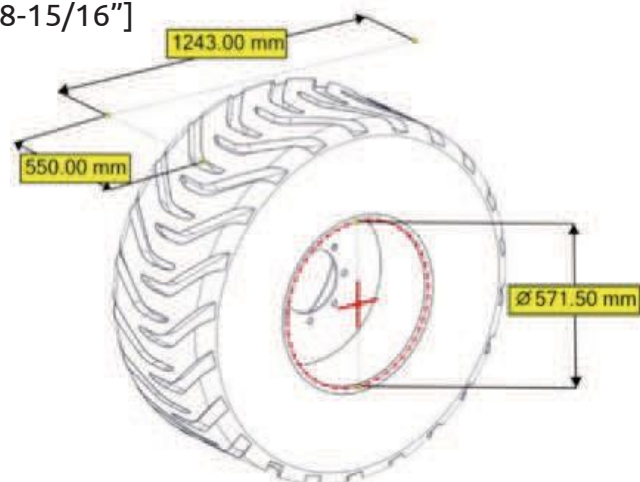
Below is a list of all the tyre sizes used on the various Spreader models. The pressure that the tyres need to be pumped up to is stated in bar. Tyres on the spreader can come in two different configurations: Radial or Flotation. Radial refers to the way in which the ply cords are laid. Where a floatation has a cross ply configuration. Each configuration has specific attributes

Tyre Specification	Configuration	Pressure (Bar)
600/55/R26.5	Radial	4
600/55/26.5	Flotation	3
500/60/R22.5	Radial	4
500/60/22.5	Flotation	3
560/60/R22.5	Radial	4
480/80/R30	Radial	4
480/80/R30	Radial	4
500/50-/22.5	Flotation	3

R in the tyre size designation indicates a Radial type Tyre.

An example at working out tyre sizes: For a 560/60/R22.5:

- 560mm [22"] is the tyre width.
- 560mm [22"] x60% = 336mm [13-1/4"] is the side wall height.
- 22.5" inch is the rim diameter (22.5 x25.4= 571.5mm [22-1/2"])
- Overall diameter = 571.5mm + 2x (336) = 1243mm [48-15/16"]



Applications

The Radium Spreaders have been designed to accommodate various different forms of applications as listed below. The spreaders can be fitted with different attachments to suit a wide range of operations. Wheel centers and wheel systems are adapted to provide a complete solution.

Broadcasting

This is the most common use for the Radium Spreaders whereby the material in the hopper is distributed evenly and consistently over the set spread width. Various controllers and devices can be fitted to the tractor to ensure accurate driving and constant/variable rate control. Various tests can also be set up to enhance and verify the spread pattern.

Band Placing

A simple belt attachment can be fitted to the rear of the machine in place of the spinners to direct and concentrate the respective material where it is desired in the field. Options of single direction, Bi-direction and 3-way belt attachments are available depending on the customers' requirements as well as different lengths.

Side-way Distribution

What we call our "Orchard Spreader Kit" can be fitted to the rear of the machine, this attachment encases the spinners and directs the flow of material out both sides of the machine without distributing material behind the machine. This is used in the orchards and vineyards to direct and concentrate the material where it is needed at the base of the trees.

Top Dressing

Various models of the Radium Spreaders are fitted with narrow high rise wheels with customized wheel centers to fit in between the row crops for top dressing applications.



Safety

By following safe operating practices a safe environment is created for the operator and bystanders. **THINK SAFE, WORK SAFE!** At all times follow the safety decals that are laid out over the machine to ensure operation that is safe and responsible. Accidents can be avoided, accidents are costly and accidents can disable and kill.



General Safety

1. Read the operator's manual and description of all safety stickers before operating the Spreader.
2. Owner of the spreader must supply the operator or employees with operating instructions before allowing them to operate the spreader.
3. Wear appropriate protective gear. This includes: hard hat, protective shoes, protective glasses, heavy gloves, hearing protection and a respirator.
4. Clear the area of people and remove any foreign objects from the machine before operation.
5. Do not allow any riders in or on top of the machine.
6. Do not modify the equipment in any way. Unauthorized modification may impair the function and safety of the machine.
7. If safety decals are damaged or removed it is the responsibility of the owner to ensure that the decals are ordered again from Radium Engineering and placed on the spreader.



Hydraulic Safety

1. Replace any worn, cut or frayed hydraulic hoses and crimping.
2. The hydraulic system operates under extremely high pressures. Do not attempt any make shift repairs by using tape or cements. Such repairs will fail catastrophically creating a hazard.
3. Use the necessary protective eye wear when trying to obtain a high pressure hydraulic leak. Use a piece of cardboard when trying to identify a leak instead of your hand.
4. Serious infection can develop from hydraulic fluid piercing the skin surface. Seek medical attention immediately.
5. Always relieve pressure before disconnecting or working on a hydraulic system



Tyre Safety

1. Failure to follow proper procedures when mounting a tyre on a rim can result in a blowout which may result in serious injury. A tire should only be mounted if the proper equipment and experience is present.
2. Only reputable tyre brands must be used on the Spreader
3. Place blocks under the frame before removing tyres or working beneath the machine.



Safety Decals

On each safety decal an appropriate signal word is used. The signal word is selected based on the following guidelines:



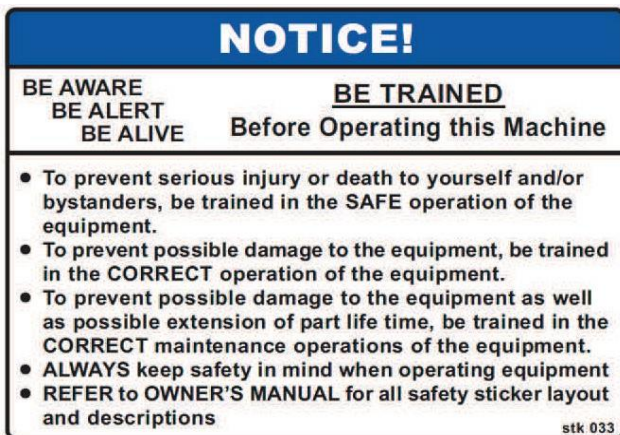
Indicates an imminent hazardous situation that WILL result in death or serious injury if proper precautions are not taken.



Indicates a potentially hazardous situation that COULD result in death or serious injury if proper precautions are not taken.

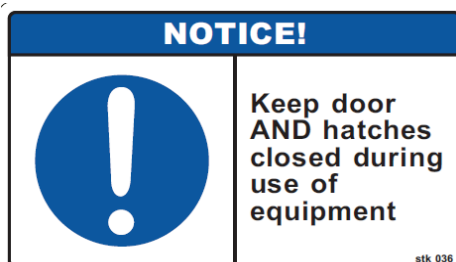


Supplies information that is valuable to the operation of the machine. Serves as a reminder to follow appropriate safety practices that if avoided MAY result in minor to moderate injury.



ENSURE before use of the equipment:

- The owner's manual has been read and understood.
- Read and understand all safety decals on equipment.
- Contact dealer to explain any instructions not fully understood.




To Prevent Damage to equipment ensure that all cabinets are closed SHUT, including latches, during operation.

⚠ WARNING

Non-genuine parts can fail catastrophically. AVOID SERIOUS INJURY OR DEATH

- ONLY use genuine RADIUM ENGINEERING replacement parts
- NON-GENUINE parts can fail creating hazardous conditions for operator and bystanders as well as damage equipment



FOR PARTS contact RADIUM ENGINEERING at:
 www.radium.co.za | T: +27 (0) 12 719 9062/3
 30 Third Street, Babelegi, Temba
 North West, South Africa, 0407
 Private bag x2008, Hammanskraal
 Gauteng, South Africa, 0400

stk 032

ONLY use Radium Engineering designed replacement parts. Always replace worn or damaged components

⚠ WARNING



HYDRAULIC HAZARD

AVOID SERIOUS INJURY OR DEATH FROM SKIN PENETRATION DUE TO HIGH PRESSURE HYDRAULIC OIL LEAKS
 HIGH PRESSURE FLUID LEAKS CAN BE INVISIBLE

stk 025

AVOID SERIOUS INJURY OR DEATH FROM SKIN PENETRATION DUE TO HIGH PRESSURE HYDRAULIC OIL LEAKS:

- DO NOT operate equipment with oil leaks.
- Keep all hoses, lines and connections in good condition and replace if needed.
- Relieve hydraulic pressure before disconnecting lines from system.

HIGH PRESSURE FLUID LEAKS CAN BE INVISIBLE:

- DO NOT use hands to check for leaks.
- ALWAYS wear Personal Protective Equipment (PPE) when working on lines.
- Keep hands and body away from nozzles and connections ejecting oil.
- When injury occurs involving hydraulic fluid seek medical attention immediately.

⚠ WARNING



CONTROL HAZARD

AVOID SERIOUS INJURY OR DEATH WHEN TOWING EQUIPMENT
 AVOID LOSS OF TRACTOR CONTROL

stk 026

AVOID SERIOUS INJURY OR DEATH WHEN TOWING EQUIPMENT:

- DO NOT tow with a truck or any other vehicle.
- ONLY transport and use with proper sized and equipped tractors.
- ALWAYS attach safety chain.
- ENSURE that equipment is properly and correctly attached to tractor.
- ENSURE tractor and equipment is clear when attaching and detaching.

AVOID LOSS OF TRACTOR CONTROL:

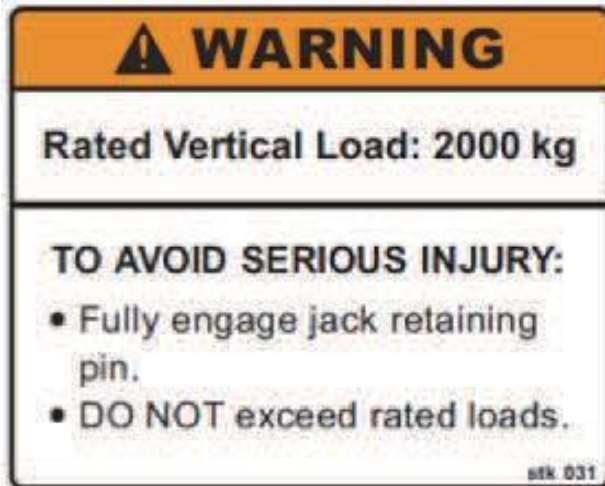
- DO NOT drive with equipment attached at speeds over 25 km/h [15 mph]
- REDUCE speed on inclines, turns and in poor conditions.



Rated Vertical Load: 5000 kg / 2000 kg
 Rated Vertical Load: 11 000 lbs / 4 400 lbs

AVOID SERIOUS INJURY WHEN USING JACK STAND:

- Fully engage jack, ENSURE retaining pin is locked in.
- DO NOT exceed the stated rated load indicated on the model type of jack.



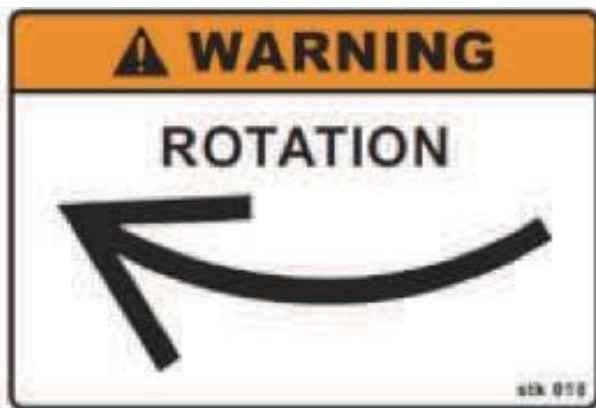
CHECK EQUIPMENT BEFORE OPERATION:

- Tighten all bolts and nuts
- Grease all grease points

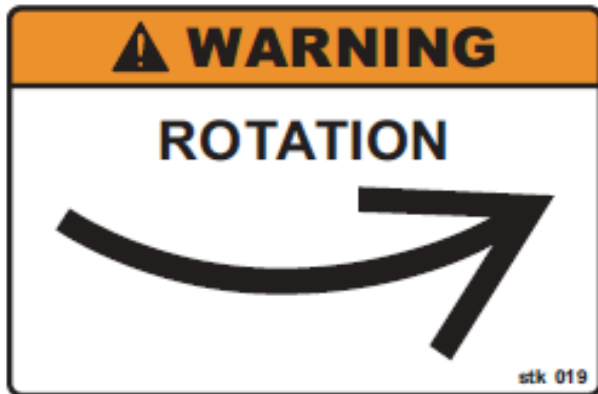


LADDER AND OPERATION SAFETY: AVOID SERIOUS INJURY OR DEATH,

- DO NOT use ladder if equipment is in use.
- DO NOT use ladder if equipment is parked unstable.
- DO NOT climb into/on the equipment while in use.



The arrow indicates the direction of rotation in which moving parts rotate.





RUN OVER HAZARD:

AVOID SERIOUS INJURY OR DEATH,

- STOP PTO and ENGINE and allow ALL moving parts to come to a complete stop before working on equipment.
- Know how to stop tractor AND equipment quickly in the case of an emergency.
- DO NOT mount or dismount tractor while in motion.
- NEVER allow riders on the equipment.
- Keep bystanders clear of tractor and equipment at all times.



ENTANGLEMENT, CUTTING

HAZARD: AVOID SERIOUS INJURY OR DEATH,

- Do not stand or work near the spinners while they are rotating as severe harm can be caused.
- Do not place your hands into the spinners.
- ENSURE tractor is shut down before removing spinners.
- Do not operate the spreader in an area where damage to property or bystanders can occur.



PERSONAL PROTECTIVE

CLOTHING: AVOID SERIOUS INJURY OR DEATH,

- WEAR all Personal Protective Equipment (PPE) when operating equipment.



THROWN OBJECTS HAZARD:

AVOID SERIOUS INJURY OR DEATH to operator

OR bystanders,

- STOP operation if bystanders come within **100 m [110 yards]**
- DO NOT operate without shields and covers in place.
- Keep shields and covers in place and replace if damaged.
- Avoid and remove hazardous objects in the working area.
- DO NOT operate in transport position.

Pre Delivery Inspection (PDI)

A Pre delivery check list is carried out before loading the machine for transportation to the customer. This check list is available from Radium Engineering on request. The serial number of the machine can be captured in this manual at the back in **Machine and Contact Information** section. In the space provided record the required fields which will assist when dealing with the Company. Always provide Radium with your serial number when ordering parts or when requesting service or other information.

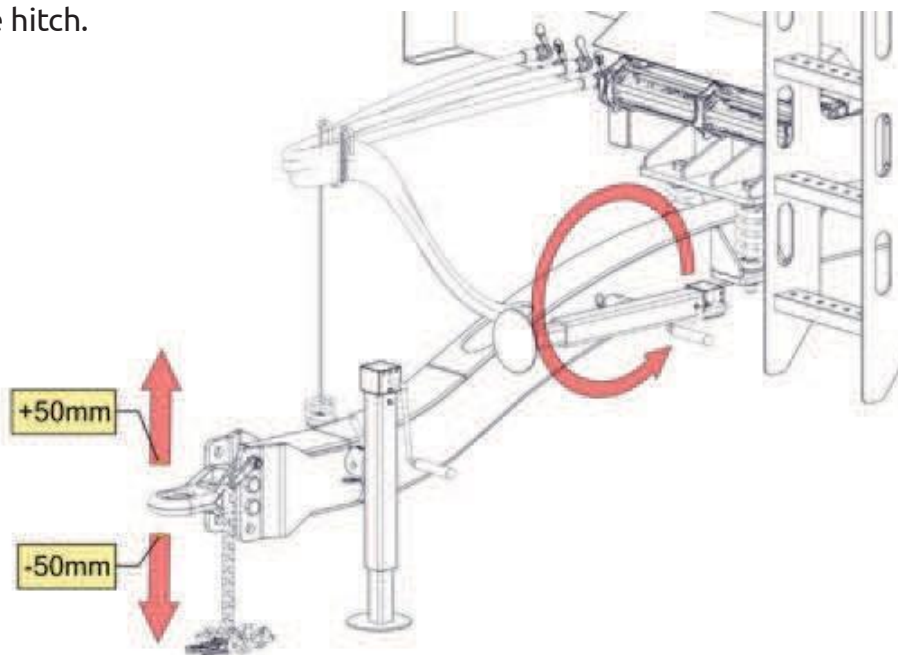
Ensure the following:

1. Tighten all bolts. All bolts are checked at the factory when assembled but need to be checked again as vibrations caused during transportation may have loosened them slightly.
2. Lubrication of the machine. The first initial lubrication is provided by the factory. Proper maintenance is the user's responsibility and must be carried out upon first use. Read the Maintenance section for the lubrication procedure.
3. Ensure no leaks are present on the hydraulic circuit this can result in damaged components from contaminants entering the system.
4. Tire pressures is set to specification.

Installation & Procedures

Always ensure that the spreader is parked on dry level ground that is free from any foreign objects. Ensure that there is enough space to back the tractor up to the hitch. Use the jack-stand to raise or lower the hitch to align with the drawbar of the tractor.

1. Connect the Spreader to the tractor by backing the tractor to the drawbar hitch of the spreader. The hitch of the spreader is adjustable and can move up +50mm [2"] or down -50mm [2"] from the middle position. This adjustment must be made according to the height of the tractor drawbar to ensure that the spreader is as level as it can be. Ensure the hitch pin is connected. The safety chain can either be above the hitch or below the hitch.









2. Decrease the stroke of the jack-stand and remove the connecting pin from the bush. Place the jack stand in the appropriate storage position, rotated 90 degrees for operation, ensuring that the connecting pin is again placed through the bush together with the retaining clip

3. Ensure that once the spreader is hitched the safety chain is routed to a secure appropriate point on the tractor drawbar. The safety chain ensures that the hydraulic hoses are not ripped from the spreader in the unlikely event that a hitch fails.



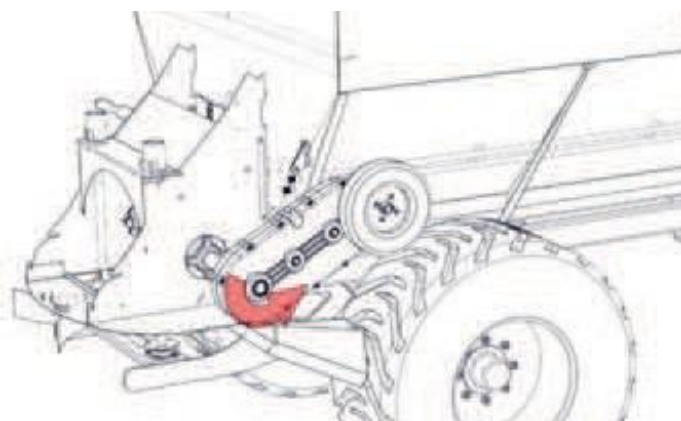
4. Connect the hydraulic hoses to the tractor couplings. The spreader has four quick couplers each marked with an individual color tagging scheme. Red indicates pressure. Blue indicates return. Use the table below to connect the spreader to the tractor accordingly.

Pipe Identification			
Spinners		Chain	
Pressure		Pressure	 
Return		Return	 

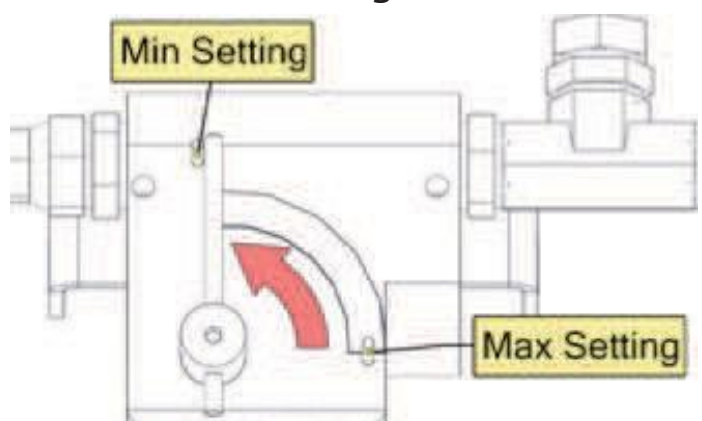
5. Use a clean cloth to clean the ends of the couplers. Connect the couplers according to the available ports on the tractor. Ensure pressure and return lines are matched up on the same valve bank.

- Ensure that your tractor has sufficient oil flow and pressure before operation of the machine– **Minimum** 45 liters per minute [12 gpm] for the ground related models and a **minimum** of 90 liters per minute [24 gpm] for hydraulic drive models.
 - Connect the Blue return hose of the spreader to the return coupling of your tractor.
 - Connect the red pressure hose of the spreader to the pressure coupling of your tractor.
 - Ensure that the couplings are matched to the tractor, i.e. pin on pin and ball on ball, DO NOT couple a pin to a ball and vice versa this will restrict the oil **low**.
 - On hydraulic drive models make sure the chain conveyor system is always connected to the tractors priority valve to ensure this system always receives the optimum **low** of oil.
 - On hydraulic drive models the operator can connect the return line from the spinners directly to the tractors hydraulic dump port to reduce heat buildup.
 - Ground drive models require reversed pressure to disengage the contact drive, hence the hydraulic hoses need to be connected to the tractors spools to achieve this and the return line should not be connected to the tractors dump line.
 - Open Centre (Fixed Displacement) hydraulic systems on the tractor are used in conjunction with the spreaders **low** control valve (brand valve) to set the spinner speed in accordance to the material being spread.
 - Closed Centre (Variable Displacement) hydraulic systems on the tractor should be controlled from the tractors side only and the **low** control valve (Brand Valve) on the spreader should be set to the most open position. The required oil **low** to set the spinner speed should then be set from the tractors remotes and spools using only the constant **low** setting.
6. Connect the electrical light plug if there is one present on the machine. (Optional Extra)
7. When unhitching from the tractor repeat the above process in reverse order

Disengagement of drive



Brand Valve Setting

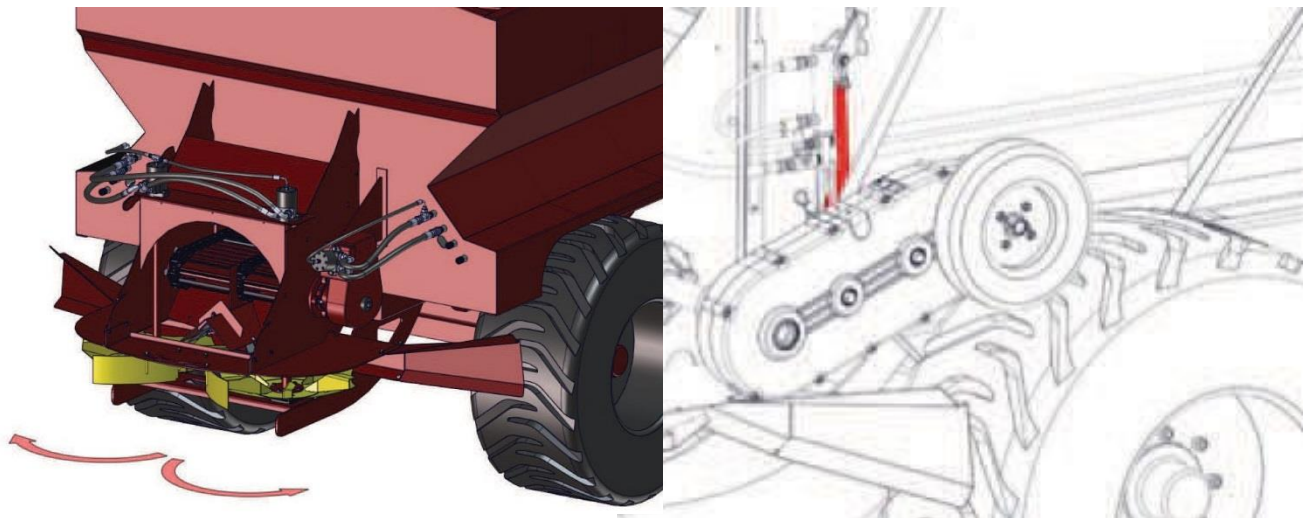


Spreader Preparation

Before operating the spreader for the first time ensure that the Operator's Manual has been read through and understood. There are no operational restrictions on the Radium Spreader when it is new. When using the machine for the first time, carry out the following procedure:

1. Ensure all bolts are tight. They were tightened at the factory, however, vibrations in shipment may have loosened them.
2. Lubricate the machine properly. Refer to **the Maintenance section** of this manual for the lubrication procedure. Initial grease was applied at the factory but maintenance is the user's responsibility and must begin before first use.
- 3.1 Determine the tractor's hydraulic circuit and follow the instructions as stated below.
Open Center (Fix Displacement) hydraulic Circuits :

- 3.1.1 Run the tractor until the oil has reached operating temperature.
- 3.1.2 With the tractor in idle position, engage the hydraulic spinners of the spreader.
- 3.1.3 The right hand spinner should rotate anti-clockwise. The left hand spinner should rotate clockwise. From reference point at the back of Spreader. If the spinners do not rotate then the delivery and return hoses are not connected correctly to the tractor and may have to be swapped over. Consult the **Troubleshooting section** as well as the **installation section**.



- 3.1.4 Run the tractor at operating throttle and adjust the Brand valve on the spreader so that the spinner speed is operating between 600rpm to 1000rpm. CAUTION, the spinners can be over spun.
- 3.1.5 Before operating the belt ensure that the transportation arm(Indicated in red) on the ground related gearbox is removed .Slowly operate the belt for a short period of time ensuring that the chain runs in. Operate the spinners as well to ensure that the lubrication within the bearings is well lined.
4. Ensure that all cabinets are closed and nothing is impeding the motion of the spreader upon set of.
5. Operate the machine slowly for a short period of time ensuring that all parts work freely.

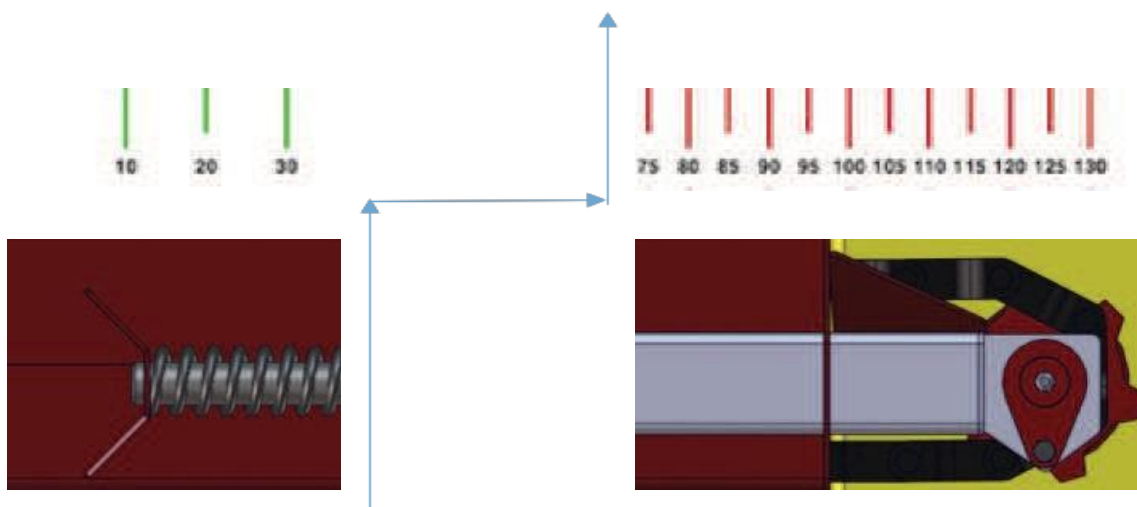
Pre Operation Check List

These checks are to be carried out before loading the machine with material to ensure that every aspect of the machine is in working order.

1. A tractor of adequate power for the type of model spreader is being used.
2. The oil level in the tractor hydraulic reservoir is correct.
3. Ensure that the machine is properly hitched to the tractor drawbar and the safety chain is correctly hitched. Refer to the Installation Section.
4. The spinners and chain are rotating freely.
5. For a hydraulic drive gearbox ensure that there is oil in the gearbox. For a ground related gearbox ensure that the hydraulic lift arm is raising and lowering the gearbox to engage and disengage drive of the chain.
6. The wheel tyre pressure is inflated to the correct bar.
7. Ensure that the tension on the chain tensioner on both sides of the spreader is set to 70mm as described below.

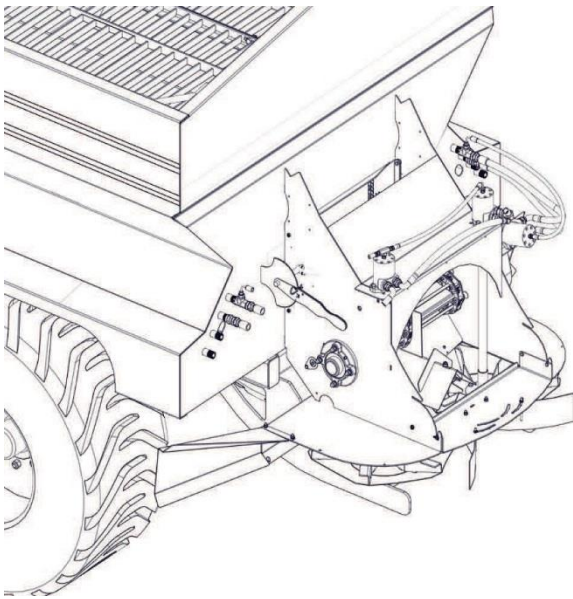
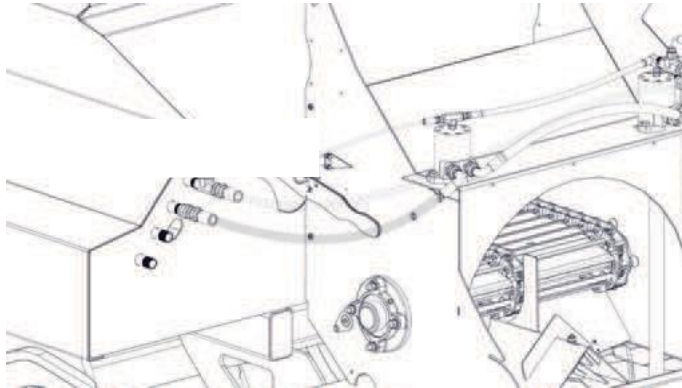
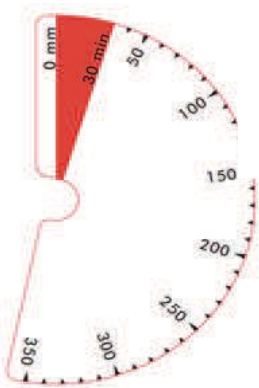
The chain Tensioners are found on the left and right hand side of the Spreader just behind the front plate. Indexed stickers are used to gauge the pretention on the chain. The end point of the spring mated against the adjuster bolt must be set at the 70mm [2-3/4"] increment on the sticker. To adjust to this tension a 36 size spanner must be used to increase or decrease the tension. During use of the Spreader the chain will stretch. Over time as the chain stretches a maximum of 2 link slats can be removed to restore the required 70mm [2-3/4"] of tension back on the chain.

The chain tension should never be set when the machine is fully loaded



Setting the Application Rate-Door opening

Refer to the Spreader Rate Manual to determine the door opening in millimeters [inch] and which gear should be selected based on the density and spread width parameters. Once a door opening is obtained in (mm or inch) at a particular gear, the spreader can be set up accordingly. On the Spreader this is controlled by manually setting the opening of the rear door and selection of an appropriate gear on the gearbox gear selector.



The sluice door opening is indicated by a yellow needle on an incremented indexed dial sticker. The door should not be closed more than the minimum, indicated by the red section on the dial, while the Spreader is in operation. The minimum door opening is set at 30 mm [1-3/16"]. The needle- sticker relationship should be calibrated on a regularly basis to ensure that the door is open accurately to the indication by the needle. Once the desired rate has been selected of the charts, remove the retaining pin in the door handle and adjust the door appropriately. Ensure that the retaining pin is replaced to lock the door and handle in position.

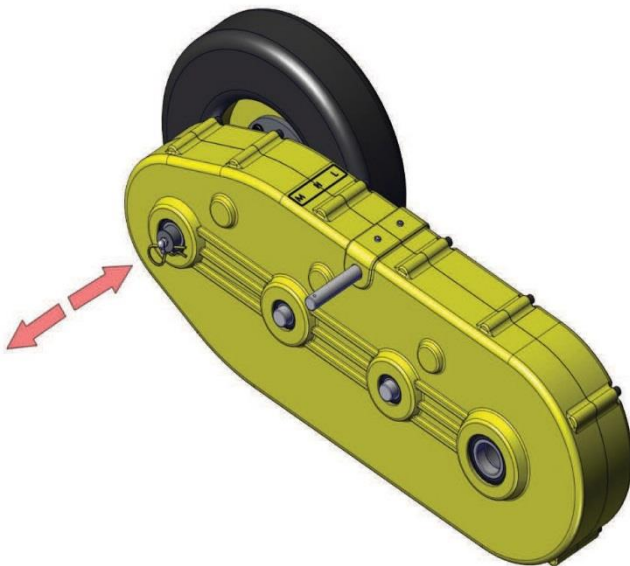
To calibrate the needle, the nuts on the needle base can be loosened and the needle then adjusted to represent the actual door opening. The actual door opening is measured from below the chain to the bottom flange of the door. In some instances the measurement must be taken from the bottom of the steel bin or if there is a plastic floor present from above the plastic.

It is vital to correctly set the yellow needle to the correct index marking on the dial sticker. This is the essence of the spreader and ensures that the correct amount of fertilizer is being laid per hectare or acre.

Ground Related Gearbox-Selecting a gear

Depending on the application rate a particular gear will need to be selected. High, Medium or Low Gear. The sticker indicated on the gearbox refers to the three gears that can be engaged by the gear box selector on the inside of the jockey wheel drive arm. The gears are selected in the following manner:

- Low Gear: Select this gear by pushing the selector fully into the gearbox.
- High Gear: Select this gear by placing the arm in a central position.
- Medium gear: Select this gear by pulling the arm furthest away from the gearbox.
- Neutral Gear: Neutral is selected in the midway position between each gear. As a test always rotate the jockey wheel to test if the neutral gear has been selected successfully.



CAUTION, always remember to insert the retaining pin after selecting gears. This is vital to ensure that the gear remains selected.

Do not reverse the spreader whilst the ground related gearbox is in gear. Ensure that the selector of the gearbox is in the neutral position or the hydraulic lift has lifted the gearbox jockey wheel form the spreader axle wheel.

Variable Rate Application

A ground related spreader is calibrated by selecting the appropriate gear and rate from the application rate charts. A variable rate Spreader needs to be calibrated with a test load. The following formula can aid in the calibration procedure. First the formula for METRIC units followed by the formula for IMPERIAL units.

METRIC unit Formula

Decide on the following variables for one hectare:

$$1 \text{ hectare} = 10\,000 \text{ m}^2$$

Spread width	24 m
Required rate per hectare	250 kg
Calibration weight	100 kg
Driving speed	12 km/h

Use the following formula to determine the time duration to unload the calibration weight:

$$\text{Time (seconds)} = \left(\frac{10\,000}{0.28 \times \text{driving speed} \times \text{spreading width} \times \text{required rate}} \right) \times \text{calibration weight}$$

Imperial unit Formula

Decide on the following variables for one hectare:

$$1 \text{ acre} = 43\,560 \text{ ft}^2$$

Spread width	78'
Required rate per hectare	550 lb
Calibration weight	220 lb
Driving speed	7.5 mph

Use the following formula to determine the time duration to unload the calibration weight:

$$\text{Time (seconds)} = \left(\frac{43\,560}{1.47 \times \text{driving speed} \times \text{spreading width} \times \text{required rate}} \right) \times \text{calibration weight}$$

Conclusion

Once the calibration load has been dispensed over the required time duration weigh the dispensed load and see the difference to the input calibration load. If the difference is less, increase the chain speed by opening the brand valve. If the difference is more decrease the chain speed by closing the brand valve. When spreading ensure the driving speed is then maintained.

Variable rate with Precision Farming

Radium Engineering offers a precision farming kit that can be added to the Spreader at extra cost. The kit is ISOBUS compatible and can integrate with all ISOBUS tractor systems. Either a single or dual channel ISO Bus kit can be purchased. The addition of the ISOBUS kit improves the overall spread accuracy of the spreader.

An 8 tooth sprocket is added to the rear spinner shaft that is read by a proximity sensor. This is then coupled with a proportional valve. The proportional valve can then throttle the hydraulic low rate to the spinners. This ensuring a constant spinner rpm is maintained based on user input. In the same way the chain speed can also be variable.

Single Channel

Single channel will only control the chain, allowing for variable rates to be laid down. A fan speed sensor can be added for the sole purpose of supplying an indication of spinner rpm.

Dual Channel

Allows for both variable rate spreading whilst selecting an rpm and ensuring that the rpm is maintained by the spinners.

Radium adds the following:

- Electronic proportional valves.
- Proximity sensor and slotted sprocket on spinner shaft.
- Computer control unit.
- ISO Bus Cable Hitch through drawbar.

Operation

Loading

Follow the following Procedure for loading the machine:

1. When the spreader is parked for loading ensure that the tractor is in park or neutral and that the brake is applied.
2. It is recommended to make sure that the chain is operating properly before loading the spreader.
3. Ensure that there are no hardened lumps of material that are frozen to the chain floor which could prevent the chain from movement.
4. Fully close the rear adjustable door.

THE DENSITY AND MOISTURE CONTENT OF THE MATERIAL TO BE SPREAD DETERMINES HOW FULLY LOADED THE SPREADER CAN BE. Material with a density in the range of 1000kg/m³ [62 lb/ft³] to 1200kg/m³ [75 lb/ft³] can be loaded in the bin, level to a slight heap. However, if a material of a greater density is used the level of bin capacity must be decreased accordingly as described by the calculation in the table below. The Relative density of the material can be determined by a density meter as described in the Rates Manual.

WARNING, HIGH MOISTURE CONTENT MATERIALS ARE HEAVIER and may limit loading resulting in a broken axle if not accounted for. As an example calculation in the table below consider a 10 Ton ProSpread Spreader with a volumetric capacity of 8m³[282 ft³]. [1 ton US = 0.907 ton Metric]

Metric Example

Density	1200 kg/m ³	1400 kg/m ³
Load Calculation	Load = density x volume =1200 [kg/m ³] x 8 [m ³] = 9 600 kg = 9.6 ton	Load = density x volume =1400 [kg/m ³] x 8 [m ³] = 11 200 kg = 11.2 ton
Conclusion	9.6 ton is within the 10 ton capacity of the machine. The bin can be filled with a heap.	11.2 ton is out of the capacity range of the machine. Fill the bin 90% of its total capacity

Imperial Example 10 Ton Spreader is 8m³[282 ft³]. [1 ton US = 0.907 ton Metric

Density	75 lb/ft ³	87 lb/ft ³
Load Calculation	Load = density x volume = 75 [lb/ft ³] x 282 [ft ³] = 21 150 lb = 10.6 ton US Thus = 10.6 x 0.907 [metric] = 9.6 ton	Load = density x volume = 87 [lb/ft ³] x 282 [ft ³] = 24 534 lb = 12.3 ton US Thus = 12.3 x 0.907 [metric] = 11.2 ton
Conclusion	9.6 ton metric is within the 10 ton metric capacity of the machine. The bin can be filled with a heap.	11.2 ton metric is out of the capacity range of the machine. Fill the bin 90% of its total capacity

The relationship is established: An increase in material density, results in a decrease of bin level capacity.

The purpose of the screen in the bin is to trap any foreign, unwanted or large destructive objects that is detrimental to the working of the spreader. Before re-loading is repeated the screen must be inspected, removing any of these objects that may have gotten rejected or clogged by the screen.

Unloading

A suggested travel speed of 12km/h [7.5 mph] up to 25km/h [15.5mph] should be maintained when unloading a spreader. Ensure that the rear door is open and set according to the desired application rate. CAUTION! The rear door should never be operated in a closed position with fertilizers that can pack. In some cases with certain fertilizers the rear door should not be operated with less than 40mm [1-1/2"] of opening as packing may occur and the rear door may jam.

1. Start the spinners and wait until they are at operating speed.
2. Maneuver the tractor and spreader into position where spreading will take place.
3. Turn on the hydraulics used to start the chain conveyor. The low control dial in the tractor adjusts the conveyor speed pulling the material towards the spinners.
4. Run the spreader until the bin level is empty. This can be monitored through the inspection flange or noted by a decrease in spread width of the spreader.
5. Once the spreader is emptied before re-loading the bin remove any obstructions that may have entered the bin during the loading process such as rocks or weeds that could impair the functioning of the spreader.
6. The Spreader can achieve speeds of up to 40km/h [25 mph] when unloaded on service roads.

If a problem is encountered and the machine is still fully loaded it can be unloaded by fully opening the rear door and operating the chain to dispense the bin. During this operation the spinners must not under any circumstances be rotated. The spreader must intermittently move forward dispensing heaps of material. This process will be repeated until the bin is emptied.

Setting the Spinner Speed

Spinner speed is the most important factor in achieving an accurate spread pattern. The Spinner speed is adjusted by altering the brand valve. When setting the spinner speeds ensure the engine of the tractor is running at the same RPM as it will normally be operating in the field. Make sure that the oil is warmed up to the normal operating temperature. If the spinner speed is too high there will be too much material behind the spreader. If the spinner speed is too low there will be too little material behind the spreader.

- 450rpm to 600rpm should be used for gypsum, chicken litter and lime.
- 600rpm to 800rpm should be used for spreading fertilizer.

Starting/Stopping Spreading

Always ensure that engine RPM is within the range as when the spinner speed was set. Maintain engine RPM whilst using the tractor gearbox to keep the engine from laboring. This will ensure the hydraulic low will be sufficient to maintain spinner speed.

Ground Drive Spreaders

Single spool tractors

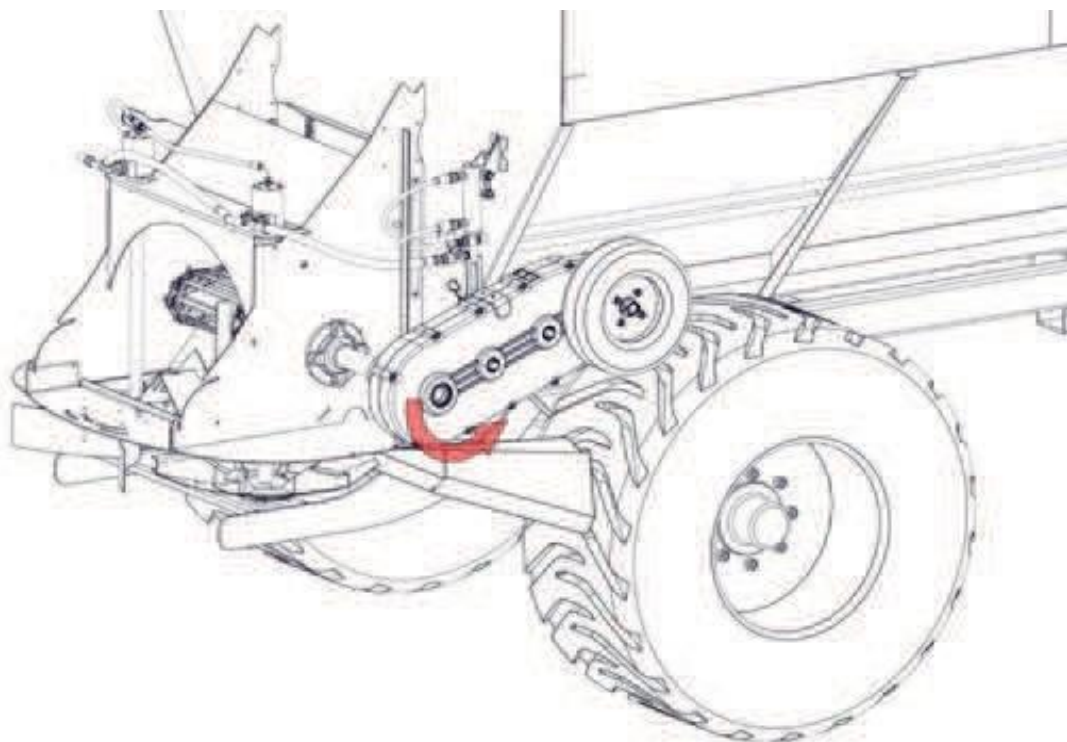
Start Spreading by operating the tractor spool valve. This will automatically lower the gearbox jockey wheel. Stop spreading by pulling the selector through neutral to reverse low until the jockey wheel is lifted and clear of the main wheel, thus disengaging the chain drive.

Twin spool tractors

Start the spinners by opening the one spool valve. Engage the gearbox by lowering the hydraulic ram until the gearbox jockey wheel is in full contact with the spreader main wheel. Stop Spreading by raising the jockey wheel clear of the main wheel through the one spool valve. Stop the spinners by returning the other spool valve to neutral.

Hydraulic Drive Spreaders

All hydraulic drive spreaders make use of twin spool valves. One spool would be used to operate the chain through the hydraulic gearbox, the other spool for the spinners. Each function is independent of the other.



Maintenance and Service

The stickers below highlight key maintenance points all around the spreader. They have been used to remind the user of routine maintenance that needs to be carried out over the spreader.



Found at grease point locations. These points are to be greased according to maintenance Schedule



Found where a grease point is allocated out of the line of normal sight. These points are to be greased according to maintenance Schedule.



Found at gearbox reservoir that contains oil. The oil level should be checked according to maintenance Schedule.

- Fluids and Lubricants

1. Grease: Use a SAE multi-purpose lithium base grease or a multi-purpose grease.
2. Gearbox Oil: Use only EP 90 oil or higher Grade. Oils that foam cannot be used under any circumstances as this creates pressure build up within the gearbox, blowing the seals.
3. Always check oil level indicator on hydraulic gearboxes before use. (See through Perspex Inspection bolt).

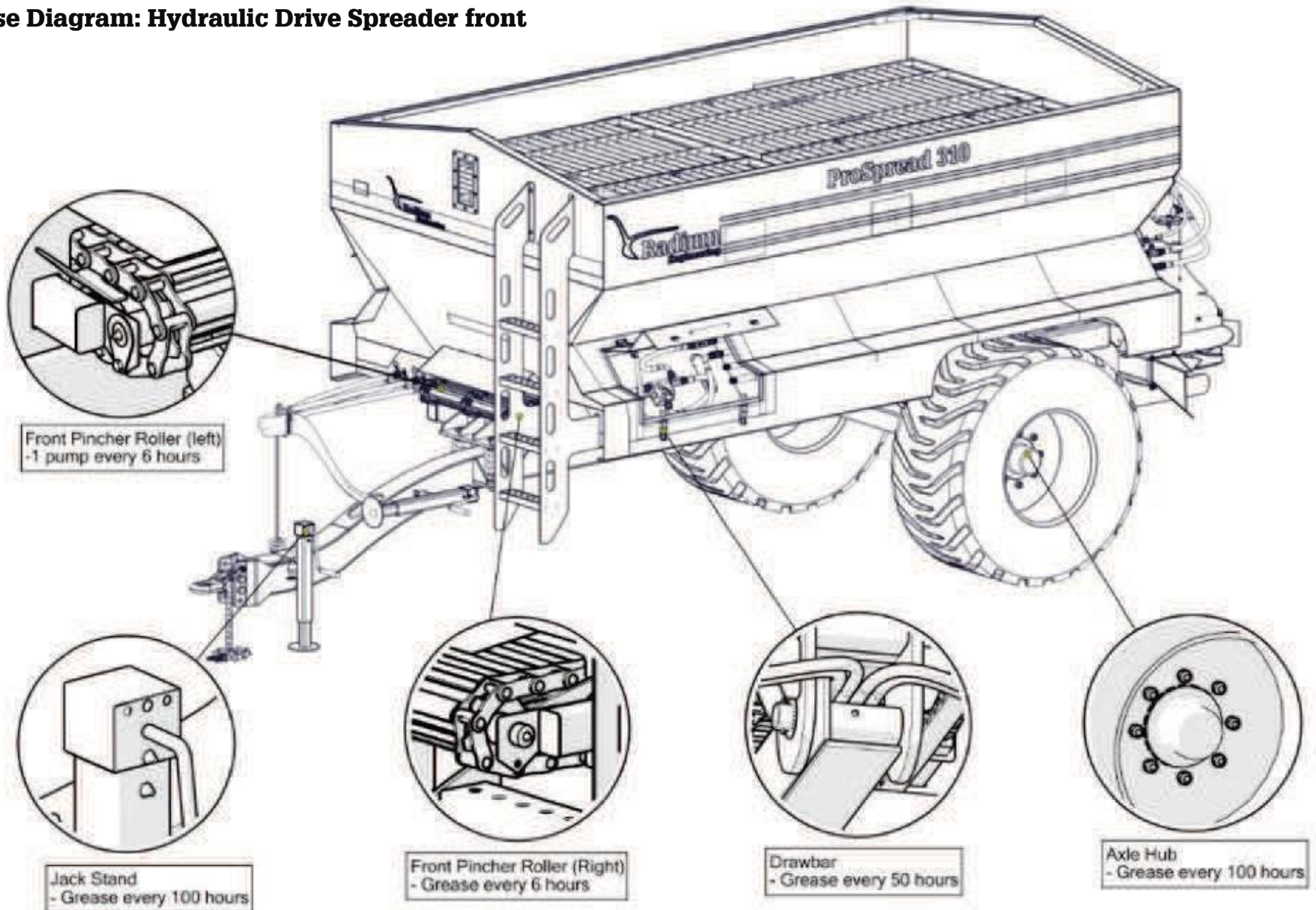
- Greasing

1. Ensure grease nipples are clean before pumping with grease to avoid injecting dirt.
2. Use only a hand held grease gun.
3. Replace and repair any broken grease nipples.
4. Inject grease until you see the grease being expelled from the bushing areas.
5. Do not over pump causing bearing seals to lift and fracture.
6. Follow the grease hour based schedule illustrated on the next page.

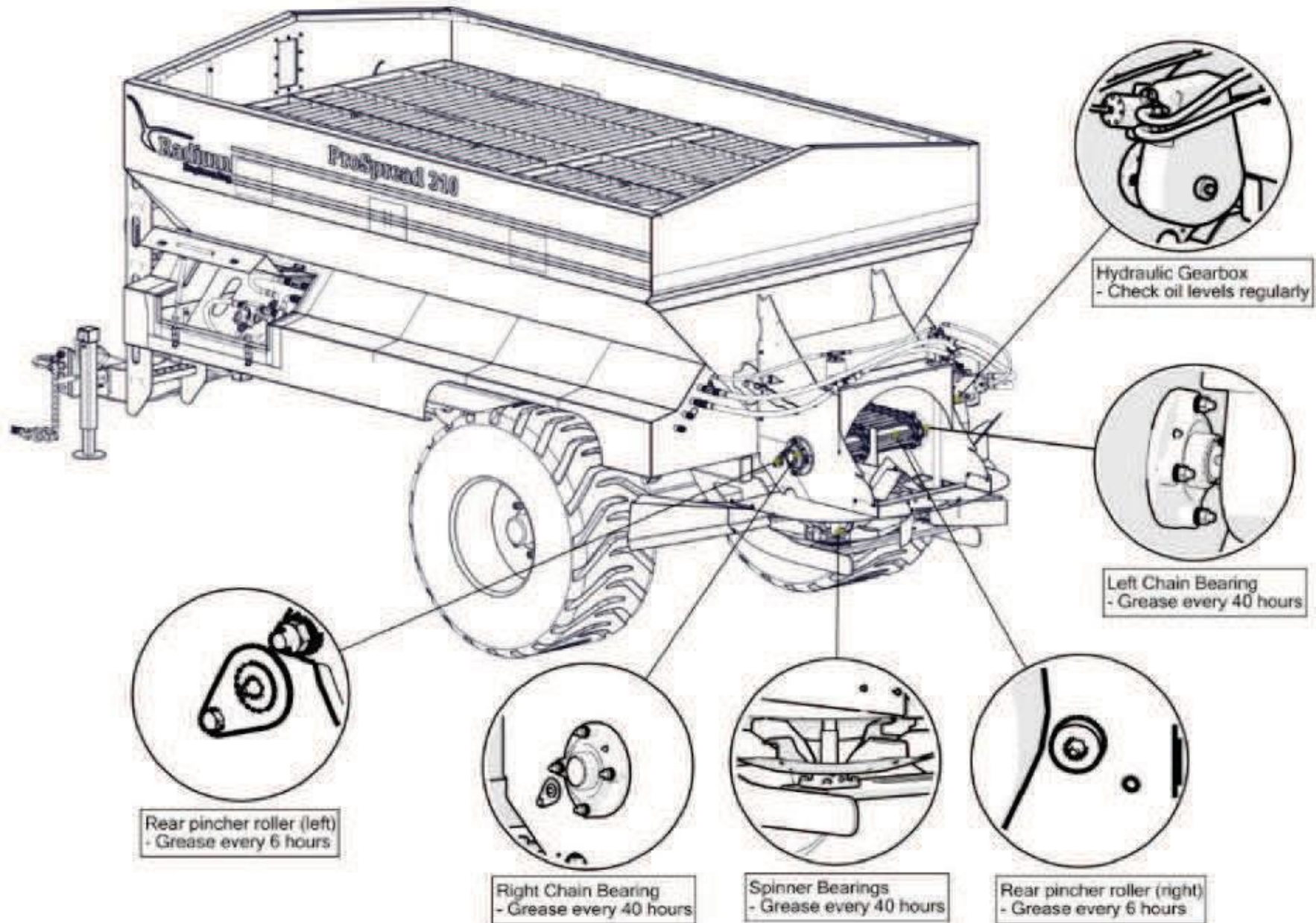
- Hydraulic hose Specifications

All hydraulic hose sizes are $\frac{3}{4}$ " or $\frac{1}{2}$ " except for the bleed lines for the hydraulic motors which are $\frac{1}{4}$ ". When replacing a leaking hydraulic hose ensure that a reputable hydraulic manufacturer is used.

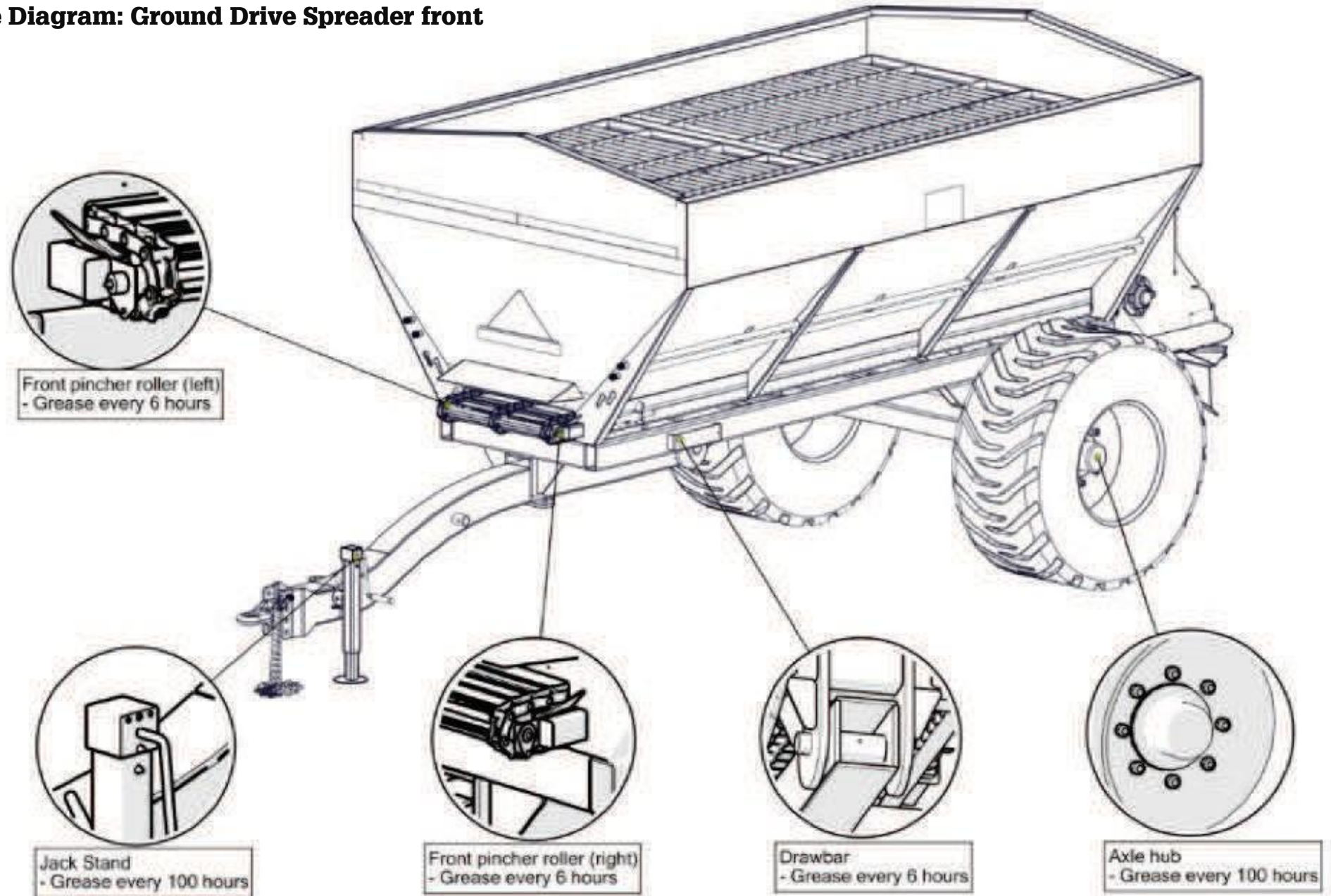
Grease Diagram: Hydraulic Drive Spreader front



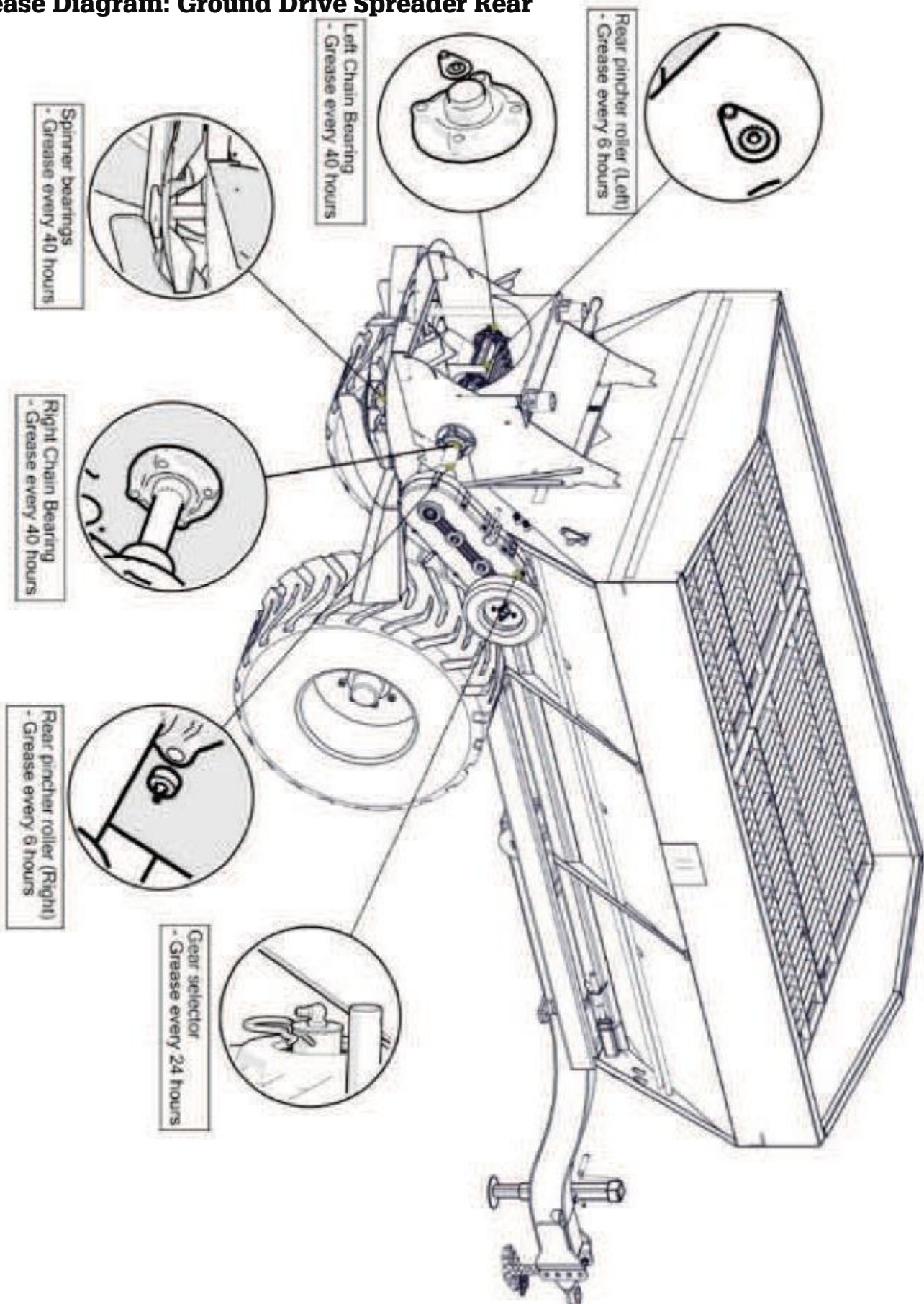
Grease Diagram: Hydraulic Drive Spreader Rear



Grease Diagram: Ground Drive Spreader front



Grease Diagram: Ground Drive Spreader Rear



Summary of Grease schedule according to hourly use of machine:

- Grease points on spreader:
 1. Drawbar:
 - Jack stand (Grease every 100 hours)
 - Drawbar pin (Grease every 6 hours)
 2. Front of spreader:
 - Pincher roller, both sides (Grease every 6 hours)
 3. Rear of spreader:
 - Pincher roller, both sides (Grease every 6 hours)
 - Spinner bearings (sealed bearing) (Grease every 40 hours)
 - Chain Bearings (Sealed Bearing) (Grease every 40 hours)
 - Gearbox gear selector (Grease every 24 hours the selector must be pushed fully in (low gear) for grease to enter)
 4. Axle:
 - Wheel hubs (Grease every 100 hours)

- **Fasten all bolts (after each interval of use). Most important bolts:**

1. Wheel nuts
2. Axle bolts
3. Hitch bolts
4. Spinner plate bolts
5. Spinner bearing bolts
6. Spinner motor bolts
7. Gearbox bolts
8. Screen bolts
9. Drawbar Spring Bolts (on Sprung Drawbar Options)

- **Make sure that the drawbar pin is in place and that the bolt is in place**

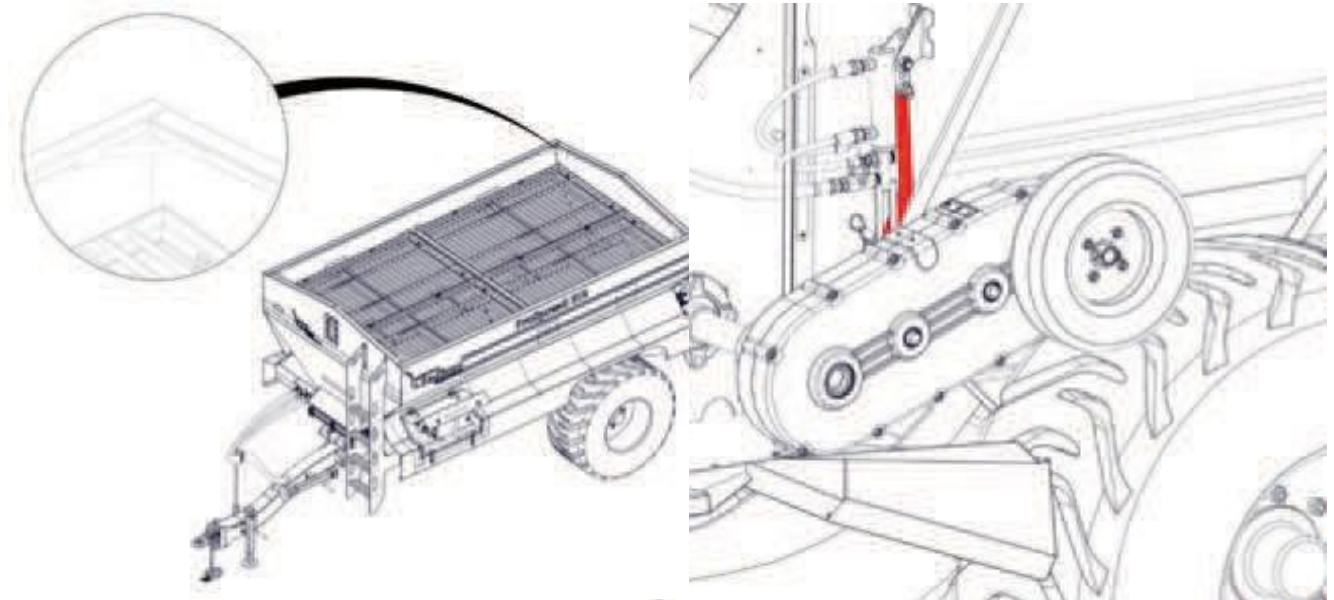
Always ensure that the chain tension is set to 70mm on both sides of the spreader (Check every 40 hours), can be done with a Spanner size 36. For adjustment of this tension refer to the procedure described in the pre operation check list section.

General Maintenance Practices

- After use of the spreader all fertilizer etc. should be removed from the bin as well as spinner areas. Wash down the machine preferably with a high pressure hose. Self-aligning bearing units are used on the spinner shafts. Because of the abrasive qualities of fertilizer grease must be applied in accordance with the grease schedule. Ensure that the bearing seals are not fractured by pumping too much grease into the unit.
- The spinners should be checked on a regular basis for damage. If one of the pins of the spinner is damaged the spinner should be replaced immediately.
- Wheel nuts check tension regularly. Check wheel nuts daily before use. If necessary to remove a blockage or a repair is required or to access the bin chain, the screens can be removed from the spreader bin via the connecting bolts.

Transportation and Storage

When transporting the machine on public roads be aware of transportation safety. Do not use the Spreader as a people carrier. Obey all applicable safety laws and regulations of the road. Refer to the Parts manual for the footprint dimensions of the machine. Use these dimensions as a guideline for determining access gates and roads that the machine can navigate. When lifting the Spreader onto a load bed, crane lifting lugs are provided on the four corners of the bin for secure lifting as seen in the image. On ground related models ensure that the gearbox has the steel hinge transportation arm secured indicated in the image as red. This prevents the gearbox from jumping around during transportation due to the lack of pressure from the lifting hydraulic ram. This must be done to prevent damage to the gearbox. When the spreader is loaded ensure that the transportation arm is removed and stored appropriately.



At the end of season's use inspect all major systems of the machine. Replace any worn or damaged components in order to prevent any down time at the beginning of the next season. Follow the procedure when preparing to store:

1. Wash down the machine preferably with a high pressure hose. Remove all dirt and mud. Manure is acidic and will damage paint thus causing rusting.
2. Inspect moving and rotating parts, removing any material that may have entangled itself in them.
3. Lubricate the chain with a mixture of engine oil and diesel or a chain lubrication.
4. Lubricate all grease fittings to remove any moisture within. Run the machine thereafter to ensure lubrication is distributed.
5. Inspect hydraulic hoses, fittings, couplers and valves. Tighten any loose fittings and replace any hoses that are damaged.
6. Touch up scratches and paint nicks to prevent rusting
7. Oil hydraulic shaft on gearbox lift arm to prevent rusting
8. Store the machine in a dry shaded area as the sun can perish the rubber hydraulic hoses. Ensure that the machine is stored in a unit away from human activity.

Troubleshooting

In the table below we have listed some of the problems, causes and solutions you may encounter whilst working with the Spreader. If you have encountered a problem that is difficult to solve after consulting this troubleshooting section, please contact Radium Engineering for further assistance.

Hydraulics		
Spinner Circuit		
Problem	Cause	Solution
Spinners won't rotate when hydraulics are engaged	Incorrect coupling to tractor	Recouple to tractor following correct procedure stated in installation section, ensuring the pressure and return pipes are associated to the correct spool valve.
	Insufficient oil supply	Check tractor's oil low, is there enough oil in the tractor reservoir?
	Male or female couplings blocked or the mating of the two are unequal	Replace the male couplings or check for blockages
	Check Valve is blocked (Ground Drive Models only)	Remove lower plug from the silver check valve and clean the spring while also re-stretching the spring then re-insert as removed
	Spinners are blocked	Remove material from the spinners, ensure no obstacles have been caught in the spinner region
Spinners rotate and then loose performance	Back Pressure in the hydraulic system	Check male and female couplings or control oil low from the tractor's hydraulics and not from the spreaders brand valve – ensure the brand valve is positioned on maximum opening (10)
	High rates of material are being applied	Call the factory to fit a proportional valve with a revolution sensor (rpm)
Spinners Loose Performance when the hydraulic drive conveyor chain is engaged	Insufficient Oil Flow	Check the tractor's oil low and the priority valves, ensure that the spinners are connected to the priority valve

Hydraulics		
Chain Circuit		
Problem	Cause	Solution
Chain won't rotate when hydraulics are engaged	Insufficient oil supply	Check the tractor's oil low
	Male or female couplings blocked or the mating of the two are unequal	Replace the male couplings or check for blockages
	Brand valve is blocked	Set the Brand valve to the correct low .
	Proportional valve is blocked	
	(On ISO Bus spreader)	Set the Proportional valve manual override open on the system and see if chain turns, if the chain turns it can be a setup problem, if the chain does not turn it can be an electrical problem
Chain rotate and then loose performance	Back Pressure in the hydraulic system	Check male and female couplings. Control oil low from the tractor's hydraulics and not from the spreader's brand valve. Ensure the brand valve is positioned on maximum opening (10)
Ground drive Chain		
Gearbox wheel not engaging	Transport arm/chain still in tuck	Remove the transport arm/chain
	Gearbox lifting cylinder still engaged (gearbox wheel not making contact with spreader wheel)	Spinners must be engaged to lower gearbox lifting cylinder
Gearbox wheel turning but chain not turning	Gearbox not in gear	Set the gearbox in High, Medium or Low gear (mind the neutral between the gear selections)
	Chain broken in gearbox	Contact Radium Eng.
Overall Chain Troubleshooting		
Stuck chain	Blocked door	Open rear door and clear the obstruction
	Overloaded chain	Empty bin and see what the max weight for the spreader is.
	Bent drive shaft	Contact Radium Eng.
	Seized/broken bearing on drive shaft	Replace bearing (Contact Radium Eng.)
	Bent chain slats	Replace the section of the chain
Chain not turning but drive shaft is	Tension on the chain tensioners is incorrect	Set the tension of the chain on 70mm [2-3/4"] (as shown on tensioner sticker) There must be no load on the chain when the tension is checked or set.

If your Spreader is equipped with a camera system or a Raven ISOBUS system please consult the relevant instruction guides and troubleshooting guides that are supplied with the Spreader. Alternatively contact the manufacturers of the product

Warranty

The Company warrants that the goods will be free from defects in materials or workmanship and will conform to the Company specifications. The warranty extends only to the repair or replacement at the option of the Company of warranted goods which are returned, carriage prepaid to the Company by the Customer and which have been determined by the Company to be defective or non-conforming provided always that the Company shall be under no liability for:

- Any consequential loss or damage of any kind whatsoever.
- Any defect or deficiency judged by the Company to be caused by wear and tear or by the improper or unskilled handling of the goods, more specifically: Ground engaging parts, tyres and electronic parts including electronic sensors.
- If the Customer is aware that the goods are not in conformity with specifications and Notwithstanding, accepts them, the Company shall have no liability.
- A warranty claim shall not be valid unless received by the Company within thirty days following discovery and shall not in any case be valid unless sub fitted within three months of the invoice date.
- The Company cannot be held responsible for errors in drawings or samples after they have been approved by the Customer.
- Notwithstanding the aforementioned, all expressed or implemented warranties or conditions statutory of otherwise as to quality or fitness for purpose are hereby expressly excluded

Failure of the operator to read the operators manual is misuse of the machine. It is the responsibility of the customer/operator to read the owner's manual, lubricate, maintain, store and operate the equipment in accordance with all instructions and safety procedures described in this manual.

Radium Engineering shall not be responsible or liable for incidental or consequential damages or loss of anticipated benefits or profits, work stoppage or loss or inability to use equipment or any of its components. Radium Engineering shall not be held responsible for any modifications or repairs made outside our facilities nor damages resulting from inadequate maintenance of equipment.

It is the responsibility of the customer/operator to inspect the product and have any part(s) repaired or replaced when continuous usage would cause damage or excessive wear to other parts.

For further information regarding warranties Please Visit
www.radium.co.za



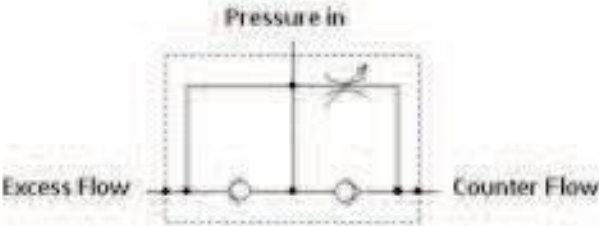





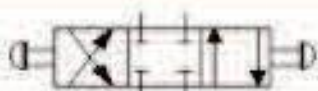
** Due to a process of on-going product development, Radium Engineering reserves the right to change any drawings, designs, details and specifications without prior notice.*

Hydraulic Circuits

Please use the following hydraulic diagrams to understand the hydraulic workings of your Spreader. They have been designed to ensure the best possible configuration and efficiency of the Spreader. If alterations are to be made to the hydraulics Radium Engineering will not accept any responsibility.

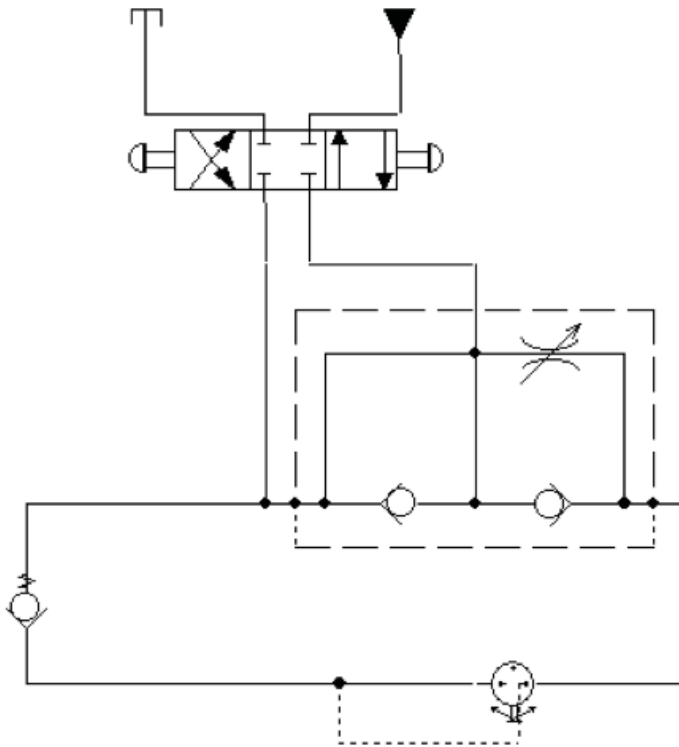
Hydraulic Legend

In The table below the various symbols that are used in the hydraulic schematics of the Spreader are listed and titled.

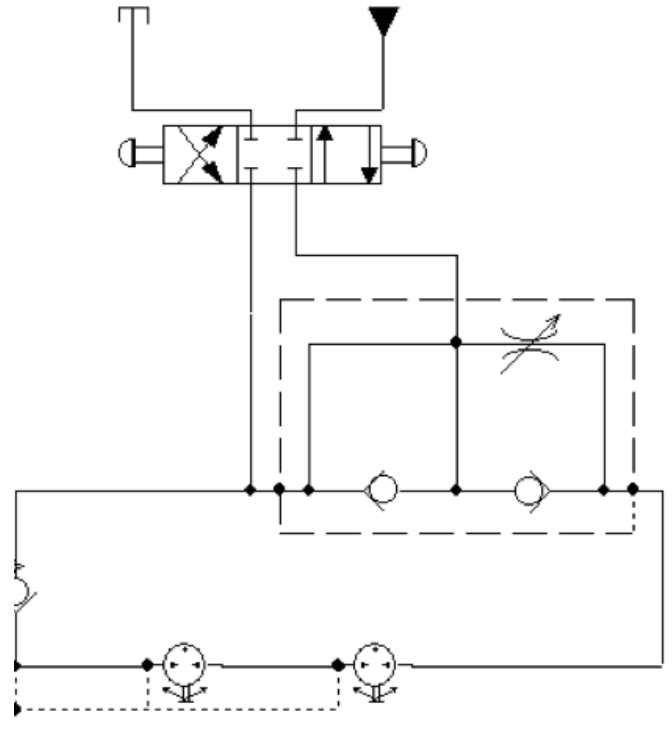
Schematic	Symbol
	Spring loaded check valve
	Three way check block with pilot
	Brand Valve (Proportional Valve)
	Check Valve
	Throttle Valve
	Pressure Source
	Tank (Reservoir)
	2 way hydraulic Motor
	4-3 Directional Spool Valve

Hydraulic Drive Spreader

Chain Drive Circuit Schematic

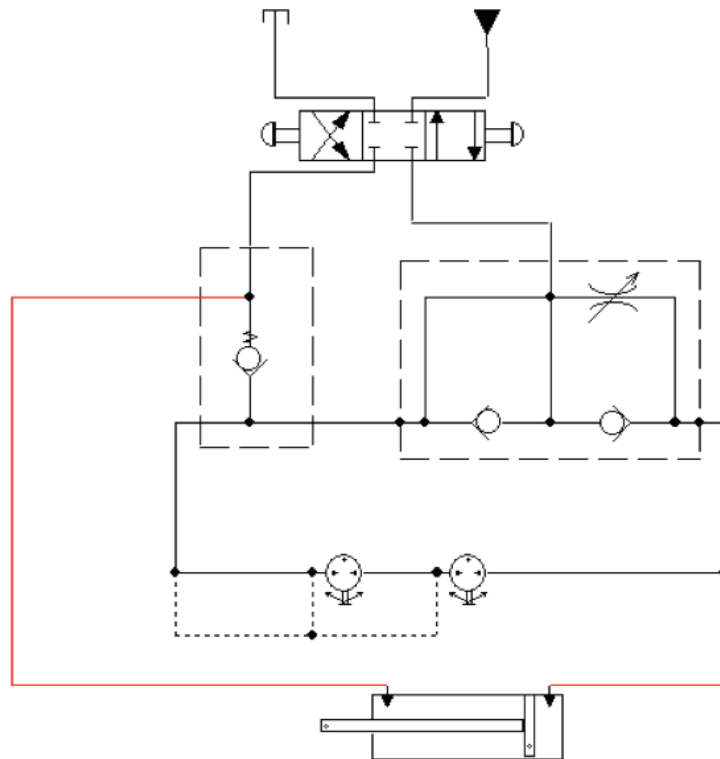


Spinners Circuit Schematic

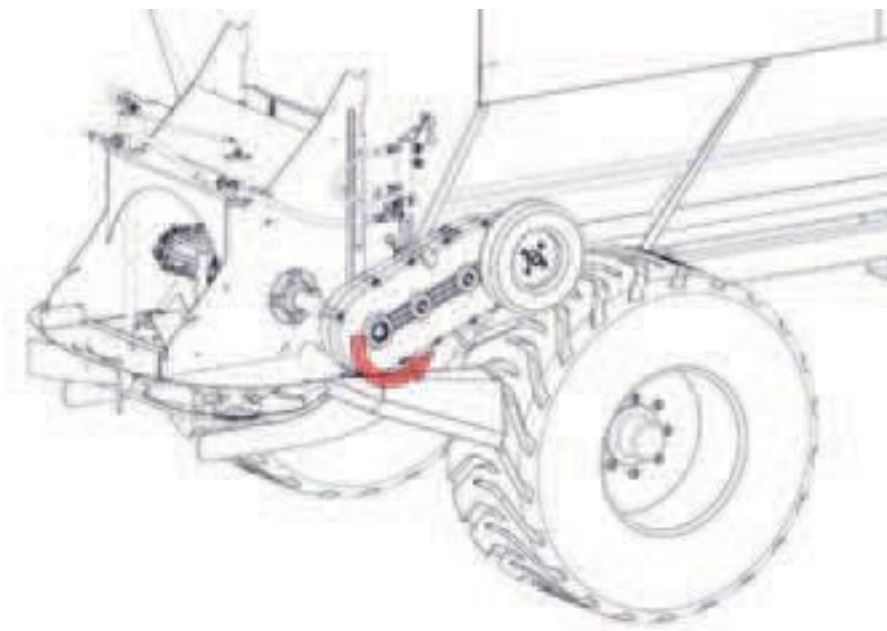


- Note that each circuit is connected to an individual spool bank.
- Both Circuits prevent the reverse motion of the motors.
- The spinner circuit allows the motors to wind down once the spool has been placed in neutral, preventing the seals from blowing on the motors.
- The dotted line by the motors in the schematic represent the case drain lines for the motors.
- If excess back pressure is experienced in the spinner circuit a dump straight back to tank can be implemented on the return line instead of returning back to the valve spool.

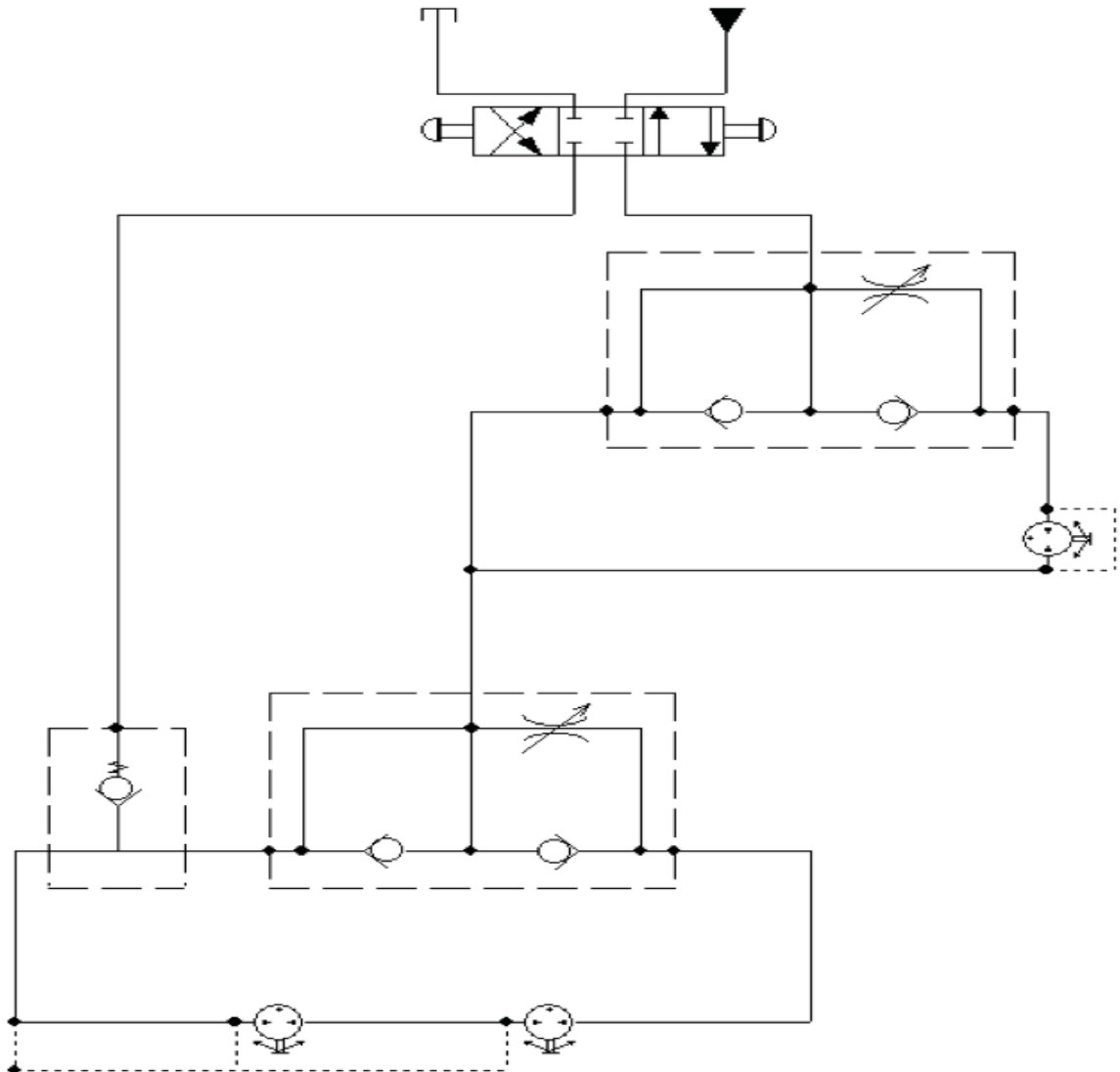
Ground Drive Spreader



- The entire circuit is connected to a single spool bank.
- Note that the Spinner circuit is connected in conjunction with the hydraulic cylinder that is responsible for engaging and disengaging the gearbox drive for the chain. (Red Line)
- Therefore do not dump straight back to tank as the gearbox cylinder needs to be reversed to disengage the drive of the spreader chain. As seen in image below.
- This circuit configuration prevents the reverse motion of the motors.
- The circuit allows the motors to wind down once the spool has been placed in neutral, preventing the seals from blowing on the motors.



Series connection system



- Single spool series connection system.
- Spinners run in conjunction with chain. Each individual function can be terminated by closing the brand valve to 0 %.
- The circuit allows the motors to wind down once the spool has been placed in neutral, preventing the seals from blowing on the motors. Reverse motion on motors is prevented.

Conversion Table [Imperial and Metric]

Below follows a table that can be used to convert the relevant units from Metric to Imperial or vice versa.

Metric Units	Imperial Units
1 kilogram [kg]	2.2 pound [lb]
25.4 millimeter [mm]	1 inch ["]
1 meter [m]	3.28 feet [']
1 cubic meter [m ³]	35.315 cubic feet [ft ³]
1 hectare [ha]	2.47 acre [ac]
100 kilogram per cubic meter [kg/m ³]	6.243 pound per cubic feet [lb/ft ³]
1 kilogram per cubic centimeter [kg/cm ³]	62428.0 pound per cubic feet [lb/ft ³]
10 kilogram per ha [kg/ha]	8.922 pound per acre [lb/ac]
10 liter [L]	2.642 gallon (USA) [gal US]
10 liter per minute [L/min]	2.642 Gallon (USA) per minute [gpm US]
1.6 kilometer [km]	1 mile [mi]
1.6 kilometer per hour [km/h]	1mile per hour [mph]

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⚠ WARNING

**Non-genuine parts can fail catastrophically.
AVOID SERIOUS INJURY OR DEATH**

- ONLY use genuine RADIUM ENGINEERING replacement parts
- NON-GENUINE parts can fail creating hazardous conditions for operator and bystanders as well as damage equipment



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