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SHAKAERATOR

Standard, Compact, Grassland & Folding Models

McCONNEL

Operator Manual

IMPORTANT

VERIFICATION OF WARRANTY REGISTRATION

DEALER WARRANTY INFORMATION & REGISTRATION VERIFICATION

It is imperative that the selling dealer registers this machine with McConnel Limited before delivery to the end user – failure to do so may affect the validity of the machine warranty.

To register machines go to the McConnel Limited web site at **www.mcconnel.com**, log onto '**Dealer Inside**' and select the '**Machine Registration button**' which can be found in the Service Section of the site. Confirm to the customer that the machine has been registered in the section below.
Should you experience any problems registering a machine in this manner please contact the McConnel Service Department on 01584 875848.

Registration Verification

Dealer Name: ……

Dealer Address: ……

Customer Name: ……

Date of Warranty Registration: ……/……/..…… Dealer Signature: ……

NOTE TO CUSTOMER / OWNER

Please ensure that the above section above has been completed and signed by the selling dealer to verify that your machine has been registered with McConnel Limited.

IMPORTANT: During the initial 'bedding in' period of a new machine it is the customer's responsibility to regularly inspect all nuts, bolts and hose connections for tightness and re-tighten if required. New hydraulic connections occasionally weep small amounts of oil as the seals and joints settle in – where this occurs it can be cured by re-tightening the connection – *refer to torque settings chart below.* The tasks stated above should be performed on an hourly basis during the first day of work and at least daily thereafter as part of the machines general maintenance procedure.

CAUTION: DO NOT OVER TORQUE HYDRAULIC FITTINGS AND HOSES

TORQUE SETTINGS FOR HYDRAULIC FITTINGS

HYDRAULIC HOSE ENDS		
BSP	**Setting**	**Metric**
1/4"	18 Nm	19 mm
3/8"	31 Nm	22 mm
1/2"	49 Nm	27 mm
5/8"	60 Nm	30 mm
3/4"	80 Nm	32 mm
1"	125 Nm	41 mm
1.1/4"	190 Nm	50 mm
1.1/2"	250 Nm	55 mm
2"	420 Nm	70 mm

PORT ADAPTORS WITH BONDED SEALS		
BSP	**Setting**	**Metric**
1/4"	34 Nm	19 mm
3/8"	47 Nm	22 mm
1/2"	102 Nm	27 mm
5/8"	122 Nm	30 mm
3/4"	149 Nm	32 mm
1"	203 Nm	41 mm
1.1/4"	305 Nm	50 mm
1.1/2"	305 Nm	55 mm
2"	400 Nm	70 mm

WARRANTY POLICY

WARRANTY REGISTRATION

All machines must be registered, by the selling dealer with McConnel Ltd, before delivery to the end user. On receipt of the goods it is the buyer's responsibility to check that the Verification of Warranty Registration in the Operator's Manual has been completed by the selling dealer.

1. LIMITED WARRANTIES

1.01. All mounted machines supplied by McConnel Ltd are warranted to be free from defects in material and workmanship from the date of sale to the original purchaser for a period of 12 months, unless a different period is specified.
All Self Propelled Machines supplied by McConnel Ltd are warranted to be free from defects in material and workmanship from the date of sale to the original purchaser for a period of 12 months or 1500 hours. Engine warranty will be specific to the Manufacturer of that unit.

1.02. All spare parts supplied by McConnel Ltd and purchased by the end user are warranted to be free from defects in material and workmanship from the date of sale to the original purchaser for a period of 6 months. All parts warranty claims must be supported by a copy of the failed part invoice to the end user. We cannot consider claims for which sales invoices are not available.

1.03. The warranty offered by McConnel Ltd is limited to the making good by repair or replacement for the purchaser any part or parts found, upon examination at its factory, to be defective under normal use and service due to defects in material or workmanship. Returned parts must be complete and unexamined. Pack the component(s) carefully so that any transit damage is avoided. All ports on hydraulic items should be drained of oil and securely plugged to prevent seepage and foreign body ingress. Certain other components, electrical items for example, may require particular care when packing to avoid damage in transit.

1.04. This warranty does not extend to any product from which McConnel Ltd's serial number plate has been removed or altered.

1.05. The warranty policy is valid for machines registered in line with the terms and conditions detailed and on the basis that the machines do not extend a period of 24 months or greater since their original purchase date, that is the original invoice date from McConnel Limited.
Machines that are held in stock for more than 24 months cannot be registered for warranty.

1.06. This warranty does not apply to any part of the goods, which has been subjected to improper or abnormal use, negligence, alteration, modification, fitment of non-genuine parts, accident damage, or damage resulting from contact with overhead power lines, damage caused by foreign objects (e.g. stones, iron, material other than vegetation), failure due to lack of maintenance, use of incorrect oil or lubricants, contamination of the oil, or which has served its normal life. This warranty does not apply to any expendable items such as blades, belts, clutch linings, filter elements, flails, flap kits, skids, soil engaging parts, shields, guards, wear pads, pneumatic tyres or tracks.

1.07. Temporary repairs and consequential loss - i.e. oil, downtime and associated parts are specifically excluded from the warranty.

1.08. Warranty on hoses is limited to 12 months and does not include hoses which have suffered external damage. Only complete hoses may be returned under warranty, any which have been cut or repaired will be rejected.

1.09. Machines must be repaired immediately a problem arises. Continued use of the machine after a problem has occurred can result in further component failures, for which McConnel Ltd cannot be held liable, and may have safety implications.

1.10. If in exceptional circumstances a non McConnel Ltd part is used to effect a repair, warranty reimbursement will be at no more than McConnel Ltd's standard dealer cost for the genuine part.

1.11. Except as provided herein, no employee, agent, dealer or other person is authorised to give any warranties of any nature on behalf of McConnel Ltd.

1.12. For machine warranty periods in excess of 12 months the following additional exclusions shall apply:

1.12.1. Hoses, exposed pipes and hydraulic tank breathers.

1.12.2. Filters.

1.12.3. Rubber mountings.

1.12.4. External electric wiring.

1.12.5. Bearings and seals

1.12.6. External Cables, Linkages

1.12.7. Loose/Corroded Connections, Light Units, LED's

1.12.8. Comfort items such as Operator Seat, Ventilation, Audio Equipment

1.13. All service work, particularly filter changes, must be carried out in accordance with the manufacturer's service schedule. Failure to comply will invalidate the warranty. In the event of a claim, proof of the service work being carried out may be required.

1.14. Repeat or additional repairs resulting from incorrect diagnosis or poor quality previous repair work are excluded from warranty.

NB Warranty cover will be invalid if any non-genuine parts have been fitted or used. Use of non-genuine parts may seriously affect the machine's performance and safety. McConnel Ltd cannot be held responsible for any failures or safety implications that arise due to the use of non-genuine parts.

2. REMEDIES AND PROCEDURES

2.01. The warranty is not effective unless the Selling Dealer registers the machine, via the McConnel web site and confirms the registration to the purchaser by completing the confirmation form in the operator's manual.

2.02. Any fault must be reported to an authorised McConnel Ltd dealer as soon as it occurs. Continued use of a machine, after a fault has occurred, can result in further component failure for which McConnel Ltd cannot be held liable.

2.03. Repairs should be undertaken within two days of the failure. Claims submitted for repairs undertaken more than 2 weeks after a failure has occurred, or 2 days after the parts were supplied will be rejected, unless the delay has been authorised by McConnel Ltd. Please note that failure by the customer to release the machine for repair will not be accepted as a reason for delay in repair or submitting warranty claims.

2.04. All claims must be submitted, by an authorised McConnel Ltd Service Dealer, within 30 days of the date of repair.

2.05. Following examination of the claim and parts, McConnel Ltd will pay, at their discretion, for any valid claim the invoiced cost of any parts supplied by McConnel Ltd and appropriate labour and mileage allowances if applicable.

2.06. The submission of a claim is not a guarantee of payment.

2.07. Any decision reached by McConnel Ltd. is final.

3. LIMITATION OF LIABILITY

3.01. McConnel Ltd disclaims any express (except as set forth herein) and implied warranties with respect to the goods including, but not limited to, merchantability and fitness for a particular purpose.

3.02. McConnel Ltd makes no warranty as to the design, capability, capacity or suitability for use of the goods.

3.03. Except as provided herein, McConnel Ltd shall have no liability or responsibility to the purchaser or any other person or entity with respect to any liability, loss, or damage caused or alleged to be caused directly or indirectly by the goods including, but not limited to, any indirect, special, consequential, or incidental damages resulting from the use or operation of the goods or any breach of this warranty. Notwithstanding the above limitations and warranties, the manufacturer's liability hereunder for damages incurred by the purchaser or others shall not exceed the price of the goods.

3.04. No action arising out of any claimed breach of this warranty or transactions under this warranty may be brought more than one (1) year after the cause of the action has occurred.

4. MISCELLANEOUS

4.01. McConnel Ltd may waive compliance with any of the terms of this limited warranty, but no waiver of any terms shall be deemed to be a waiver of any other term.

4.02. If any provision of this limited warranty shall violate any applicable law and is held to be unenforceable, then the invalidity of such provision shall not invalidate any other provisions herein.

4.03. Applicable law may provide rights and benefits to the purchaser in addition to those provided herein.

McConnel Limited

DECLARATION OF CONFORMITY

Conforming to EU Machinery Directive 2006/42/EC

We,

McCONNEL LIMITED, Temeside Works, Ludlow, Shropshire SY8 1JL, UK

Hereby declare that:

The Product; *Tractor Mounted Cultivator*

Product Code; *SH20, SH25, SH30, SH37, SH45, SA40, SF50*

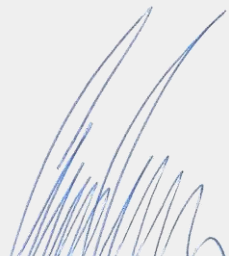
Serial No. & Date …… Type ……

Manufactured in; *United Kingdom*

Complies with the required provisions of the Machinery Directive 2006/42/EC
The machinery directive is supported by the following harmonized standards;

- BS EN ISO 12100 (2010) Safety of machinery – General principles for design – Risk assessment and risk reduction.
- BS EN 349 (1993) + A1 (2008) Safety of machinery - Minimum distances to avoid the entrapment with human body parts.
- BS EN ISO 14120 (2015) Safety of machinery - Guards general requirements for the design and construction of fixed and movable guards.
- BS EN 4413 (2010) Hydraulic fluid power. Safety requirements for systems and their components.

McCONNEL LIMITED operates an ISO 9001:2008 quality management system, certificate number: FM25970.
This system is continually assessed by the;
British Standards Institution (BSI), Beech House, Milton Keynes, MK14 6ES, UK
BSI is accredited by UK Accreditation Service, accreditation number: UKAS 003.
The EC declaration only applies if the machine stated above is used in accordance with the operating instructions.



Signed …….. *Responsible Person*
CHRISTIAN DAVIES on behalf of McCONNEL LIMITED

Status: *General Manager* Date: *January 2018*

For Safety and Performance…

ALWAYS READ THE BOOK FIRST

McCONNEL LIMITED

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Ludlow
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www.mcconnel.com

Operating, servicing and maintaining this equipment can expose you to chemicals including gasoline, diesel fuel, lubricants, petroleum products, engine exhaust, carbon monoxide, and phthalates, which are known to the State of California to cause cancer and birth defects or other reproductive harm. To minimize exposure, avoid breathing exhaust, do not idle the engine except as necessary, service your vehicle in a well-ventilated area and wear gloves or wash your hands frequently when servicing your vehicle. Battery posts, terminals and related accessories contain lead and lead compounds, chemicals known to the state of California to cause cancer, birth defects or other reproductive harm. For more information go to www.P65Warnings.ca.gov. This website, operated by California's Office of Environmental Health Hazard Assessment, provides information about these chemicals and how individuals may be exposed to them.

LIST OF CONTENTS

GENERAL INFORMATION

Read this manual before fitting or operating the machine. Whenever any doubt exists contact your dealer or the McConnel Service Department for assistance.

Use only 'McConnel Genuine Parts' on McConnel equipment and machinery

DEFINITIONS - The following definitions apply throughout this manual:

WARNING:
An operating procedure, technique etc., which can result in personal injury or loss of life if not observed carefully.

CAUTION:
An operating procedure, technique etc., which can result in the damage of either machine or equipment if not observed carefully.

NOTE:
An operating procedure, technique etc., which is considered essential to emphasise.

LEFT AND RIGHT HAND:
This term is applicable to the machine when fitted to the tractor and viewed from the rear. This also applies to tractor references.

Note: The illustrations in this manual are for instructional purposes only and may on occasion not show some components in their entirety. In some instances an illustration may appear slightly different to that of your particular model but the general procedure will be the same. E&OE.

MACHINE & DEALER INFORMATION

Record the Serial Number of your machine on this page and always quote this number when ordering parts. Whenever information concerning the machine is requested remember also to state the make and model of tractor to which the machine is fitted.	
Machine Serial Number:	**Installation Date:**
Machine Model details:	
Dealer Name:	
Dealer Address:	
Dealer Telephone No:	
Dealer Email Address:	

Standard Rigid Frame Models

- Available in various working widths from 2.0M up to 4.5M
- Choice of 540RPM or 1000RPM vibrator unit
- 600mm *(24")* legs
- Choice of points for shallow or deep cultivating
- Option of adjustable depth wheels on certain models
- Linkage kit provision on models 2.5m upwards
- Shearbolt safety
- Choice of Smooth, Oxford or Packer Rollers

Compact Models

- Available in 3.0M and 4.0M working widths
- Hydraulic vibration unit
- 600mm *(24")* legs
- Choice of points for shallow or deep cultivating
- Close fitting tractor coupling
- Linkage arms allow for fitting of additional implements
- Ratchet adjustable depth control wheels standard on 4.0m models
- Choice of Smooth, Oxford or Packer Rollers

Grassland Models

- Available in 2.0M & 2.5M working widths
- Depth adjusting rear roller
- Choice of 540RPM or 1000RPM vibrator unit
- Choice of points for shallow or deep cultivating
- Choice of 600mm *(24")* fixed or 750mm *(30")* breakback legs
- Choice of mechanical or hydraulic breakback system

Folding Models

- Available in 4.0M and 5.0M versions
- Hydraulically operated folding mechanism for ease of transport
- Hydraulic vibration unit
  - Standard on 4000/5000 models, Optional on 400/500 Classic models
- 750mm *(30")* adjustable legs
- Choice of points for shallow or deep cultivation
- Slipper points as standard for ease of fitting
- Points protector for added safety & protection *(4000 & 5000 models only)*
- Lighting bar as standard
- Packer Roller fitted as standard

INTRODUCTION

McConnel Shakaerators are multi-purpose cultivators available in various forms and sizes. They are not just 'another linkage-mounted toolbar'; they are suitable and capable of being utilized in the following ways:

- In its simplest form it may be used as a heavy-duty cultivator.
- With land wheels added for depth control it is suitable for shallow cultivations, scarifying and fallow operations.
- With a power driven vibrator unit it is an all-purpose cultivation tool that gives an earth shattering effect when pan-busting or breaking new ground.
- With PTO through-drive facility, power driven implements hydraulically mounted on the rear of the main frame can be utilized for 'seedbed' preparation therefore effectively employing a one-pass technique for minimum compaction and rapid preparation.
- With ratchet operated depth control, but without through-drive facility, ground engaging implements such as the Oxford or Flexicoil Roller may be mounted thus making it suitable for clod breaking or for land re-settlement when operating on grass land.

Frame Specifications

Currently within the range there are six sizes of frame available.

Frame Size	No. of Shanks (Legs)	Guide to drawbar h.p. req.
2.0 metre	5 Shank	From 60 h.p.
2.5 metre	7 Shank	From 75 h.p.
3.0 metre	9 Shank	From 100 h.p.
3.7 metre	11 Shank	From 120 h.p.
4.5 metre	13 Shank	From 140 h.p.
5.0 metre*	10 Shank	From 200 h.p.

** Folding model*

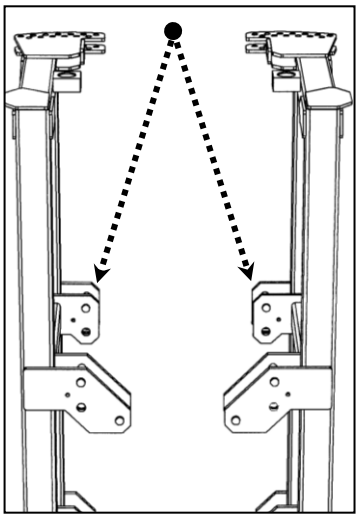
Provision is made on the 2.5m, 3.0m, 3.7m and 4.5m models to be equipped with PTO through drive facility and hydraulic linkage for the independent mounting of an additional implement. An additional mounting bracket is available for the 4.5 metre frame model to allow for the mounting a second slave ram - this can be supplied as an optional extra.

4000 & 5000 Folding Models - Lifting Point Locations

The illustration opposite shows the location of the lifting points for optimum balance on the 4000 & 5000 Folding Shakaerators when they are in the upright (folded) position with components attached.

Suitable substantial lifting equipment capable of supporting the weight of the machine must always be used and the operation should only be carried out on a firm level site.

Bystanders should be kept at a safe distance from the machine at all times whist carrying out this procedure.



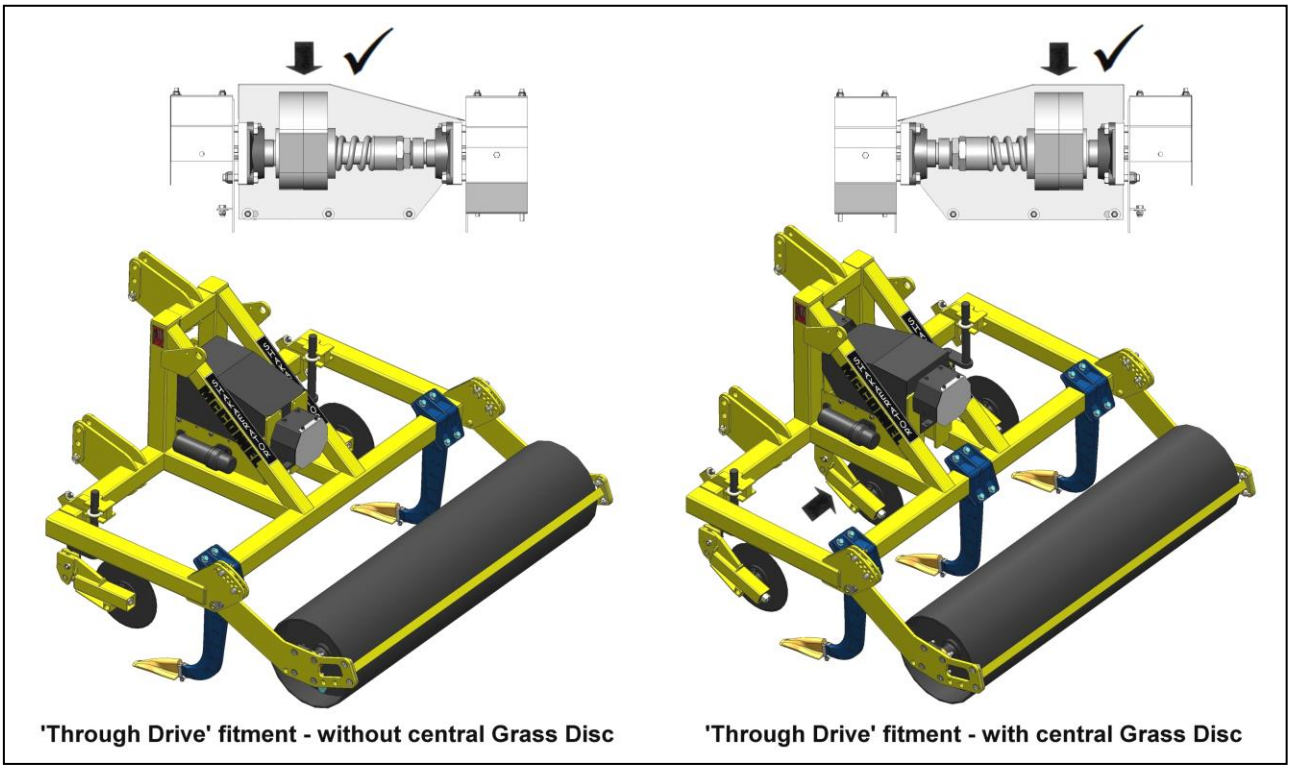
Construction
The combination of the clamp and shank and the clamp plate permits the rigid attachment of the shank to the toolbar using high tensile steel bolts and nuts. In the event of an immovable underground obstruction being encountered, as a safety feature, the thread of the nuts strip allowing the shank to 'swing' back.

Through Drive Vibrator Unit
On all machines vibrator units may be bolted to the flange plates on the frame and are provisioned for through drive, which is supplied as standard. There are three options of through drive shaft – these are as follow:

1) 540 rpm - 6 Spline.
2) 1000 rpm - 1⅜" diameter (21 Spline).
3) 1000 rpm - 1¾" diameter (20 Spline).

IMPORTANT: On Grassland models where a grass disc assembly is fitted in the centre of the frame directly below the through drive, the through drive assembly must be fitted with the flywheel nearest the rear of the frame to avoid the components colliding during operation - failure to observe this will result in damage to components.

CAUTION!
Always ensure Through Drive is fitted to the machine with the flywheel nearest the rear of the frame when a centrally mounted Grass Disc is attached.


'Through Drive' fitment - without central Grass Disc

'Through Drive' fitment - with central Grass Disc

Shanks
All standard rigid frame models use 24" clamp type shanks with a choice of either 'knock on' or 'slipper' type points. As an option grassland models are available with either mechanical or hydraulic 'breakback' legs – 'breakback' legs are fitted with 30" shanks.
Folding models use a 30" Adjustable Shearpin Shank only.

Shank Options

Fixed Frame Models:

- *24" Shank for 'Knock On' Points*
- *24" Shank for 'Slipper' Points*

Grassland 'Breakback Leg' Models:

- *30" Shank for 'Slipper' Points*

Folding Models:

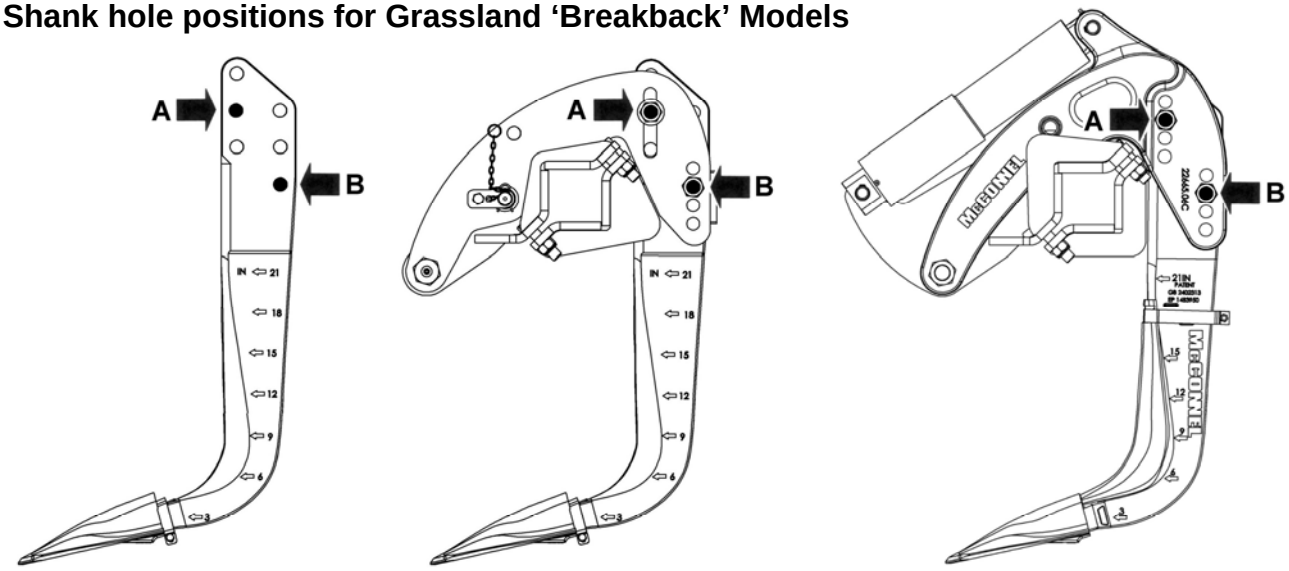
- *30" Adjustable Shank for 'Slipper' Point*

Adjustable Shanks

The 30" shanks used on the folding models are height adjustable via combinations of hole positions located at the top of the shank; this allows the working depth of the machine to be varied to suit particular requirements or conditions. The same shanks are utilized on grassland models fitted with breakback legs, but it is important to stress that when used on these models they **should not** be height adjusted as the working depth is controlled by the rear roller only and any adjustment of the shanks would result in them fouling on the rear roller when they breakback.

The correct front and rear hole height positions when used on grassland models are indicated A & B below:

Shank hole positions for Grassland 'Breakback' Models



30" Shank | Mechanical Breakback Leg | Auto-Reset Leg

CAUTION: Do not use hole positions other than those indicated above on Grassland models – failure to observe this can result in the shank fouling the rear roller during breakback.

Points

All shanks use a choice of two types of points as listed below;

- *Wide points for shallow cultivation down to a depth of approx 12"*
- *Narrow points for deep cultivation down to a depth of approx 24"*

All folding models use 'slipper' points only whereas standard fixed frame models can use either 'knock on' or 'slipper' type points dependant on the type of shank they are to be fitted to.

NOTE: 'Slipper' and 'knock on' points are not inter-changeable – they will only fit the specific type of shank they were designed for.

This machine has the potential to be extremely dangerous - in the wrong hands it can kill or maim; It is therefore imperative that both owner and operator of the machine reads and understands the following section to ensure they are fully aware of the dangers that do, or may exist, and their responsibilities surrounding the use and operation of the machine.
When the machine is not in use it should be lowered to rest on the ground. In the event of any fault being detected with the machine's operation it must be stopped immediately and not used again until the fault has been corrected by a qualified technician.

- ALWAYS ensure all operators have read and understood the operation and safety information in the manual before using the machine.
- ALWAYS inspect the work area for possible dangers or risk before starting work.
- ALWAYS ensure all guards are in place and are kept in good condition – they are there for your protection and the safety of others.
- ALWAYS keep clear of any moving or rotating components.
- ALWAYS ensure that nuts holding the shanks to the machine frame are on the underside.
- ALWAYS stop a working machine when other people enter a work area and only restart when the area is clear of any risk.
- ALWAYS wear protective eye shields when striking points.
- ALWAYS ensure point protectors are fitted to folding models when in the transport or storage position.
- ALWAYS be alert – if any help is being given during the coupling or uncoupling of machines or any other equipment ensure the assistant is kept clear of risk of entrapment.
- NEVER wear loose or flapping clothing near a working machine
- NEVER permit anyone to ride on the machine, whether in transport or in work.
- NEVER approach a working machine or attempt any kind of maintenance on a working machine.
- NEVER work under a machine that is unsupported or raised on the tractors hydraulic lift – always use suitable substantial supports placed under the machine on a firm level work area.
- NEVER allow bystanders near a working machine – ensure they remain at a safe distance from the machine.
- NEVER permit children to play on a machine even when removed from the tractor and stored.

Tractor Power Requirements
It is impossible to give any hard and fast figures on horsepower requirements as ground conditions can vary enormously. The figures quoted in the frame specification section are advisory only and the removal or addition of one or two shanks might be necessary to obtain the optimum performance from the tractor.
A marked increased in the draft requirement will be necessary under moist conditions when the vibrations are more readily absorbed by the damp soil.

Front End Weight
It may be found to advantageous to apply front-end weight to some smaller and medium powered tractors. The amount of weight necessary can only be determined by local circumstances. It should be borne in mind that any tendency of the tractor to rise on the front end will produce a corresponding lowering of hitch points and in doing so, the angle of penetration of the shanks is further increased.

Tractor Linkage
It is essential that only the correct linkage arms for each particular tractor are used with the Shakaerator. The arms have been properly matched with the horsepower of the tractor and should be more than ‘just’ adequate. Nothing on the Shakaerator offers protection against the failure of unmatched, repaired, badly worn, weak or below category tractor linkage.
Failure of either of the tractor's draft links can cause the tractor to run away from one end of the implement or in the case of the top link, the implement to tip forwards. The result could mean that the PTO shaft assumes an impossible angle that may bend it or tear out the yokes or their bearings. Even the PTO stub shaft in the tractor and the drive spline of the vibrator unit could be damaged.
Under no circumstances should tractors operate in tandem to gain extra traction. It is far more practicable to make two or three passes over the ground with one tractor while increasing the depth on each pass.

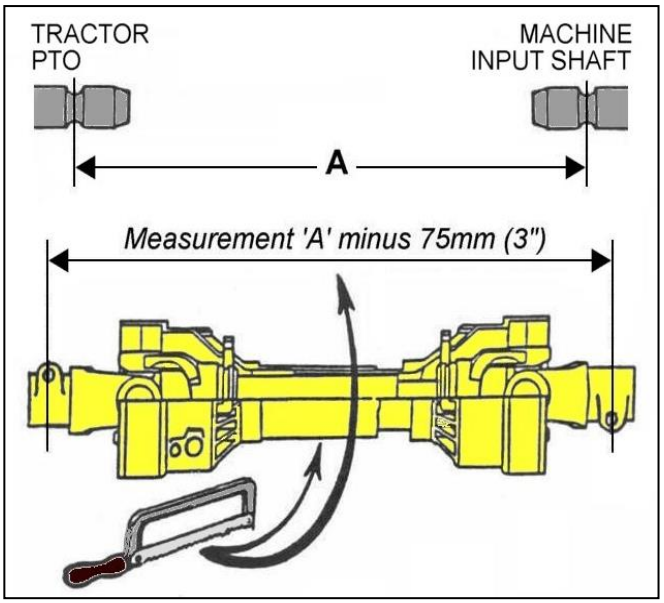
Stabilizers
The implement must be capable of some side-to-side movement in relation to the tractor therefore stabilizer chains or sway bars must be adjusted to allow for this. They should however be tightened up to prevent side sway when traveling on the highway. In field operations stabilizer bars that hold the implement rigid should not be used.

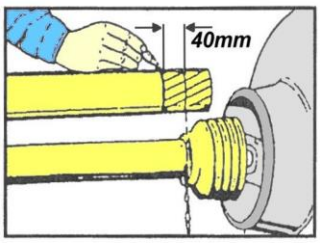
Draft Control
Use of draft control is beneficial to traction in reducing wheel slip thereby also reducing tyre wear and saving fuel. *Refer to individual tractors instruction book for detailed guidance on the best location for top link fitting.*
For mounting the cultivator on linkage behind crawler tractors, the draft links should be allowed to 'float' - *provision for this is usually made in the hydraulic control valve.*
Do not use position control for regulation of depth. This should be done with the aid of depth wheels or rear roller.

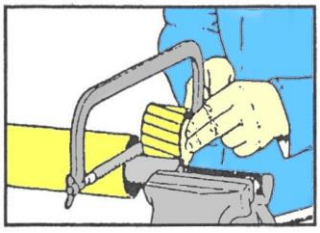
Power Take Off Drive (PTO)
The PTO drive shaft is fitted with snap lock couplings at either end to facilitate assembly. Additionally, the PTO shaft is protected against the high stop/start loads by a torque limiter device built into the shaft and mounted adjacent to the tractor on Series 1 machines. On current machines a slip clutch in the form of friction discs is incorporated within the eccentric flywheel.
Tractor PTO shaft heights can vary between 37cms to 81cms *(14"-31")* and although the standard drive shaft length supplied will suit the majority of tractors, a careful check should be made to ascertain that in the shortest possible position it must not be allowed to 'bottom out', - *a minimum of 31mm (1/2") clearance must be maintained.* Both driving and driven members should be shortened with a hacksaw by the same amount, care being taken not to cut off more than necessary on either section. A minimum engagement of 150mm *(6")* is required – *see below.*

PTO Drive Shaft Installation
The PTO driveshaft attaches between the tractor and the machine gearbox to transfer the power required to the run and operate the machine – it is important to achieve the correct shaft length to avoid risk of it 'bottoming out' when raising or lowering the machine.
The procedure for measuring and cutting the shaft is as follows:

Measuring the PTO Shaft
With the machine attached to the tractor in the working position measure the horizontal distance 'A' from the tractor's PTO to the input shaft on the machines gearbox and subtract 75mm *(3")* – *this figure is the required shaft length.*
Place the fully closed PTO shaft on the ground and measure its overall length, if the shaft is shorter than the required length you can use it without the need to shorten - *providing it allows for a minimum 150mm (6") overlap when fitted.*
If the shaft is longer subtract the required shaft length plus an additional 75mm *(3")* - *the resulting figure is the excess length that will need to be removed from each half of the shaft.*







Cutting the PTO Shaft
Separate the two halves and using the measurement obtained above shorten both the plastic guarding and the inner steel profile tubes of each shaft by this same amount. De-burr the cut tubes with a file to remove rough or sharp edges and thoroughly clean to remove swarf before greasing, assembling and fitting the shaft.

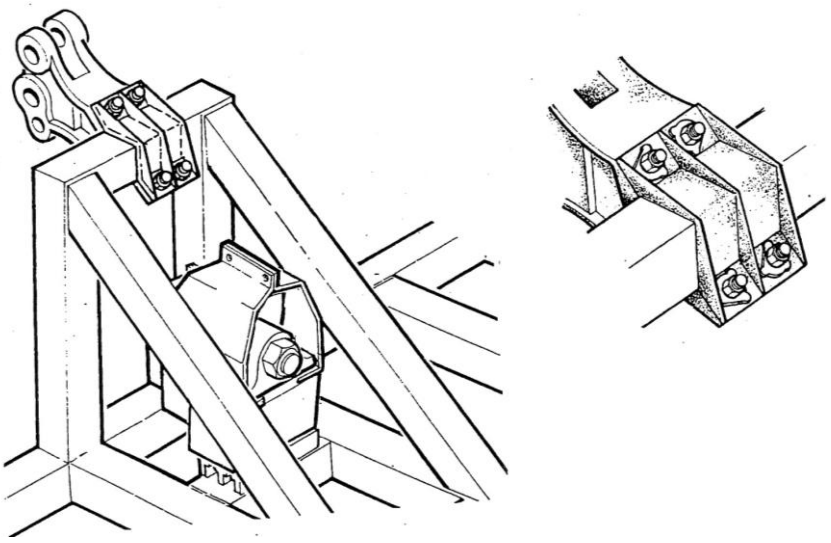
PTO Maintenance
To increase the working life of the PTO shaft it should be periodically checked, cleaned and lubricated.
NOTE: *For subsequent use with different tractors the shaft should be measured again to check suitability ensuring correct shaft overlap is retained.*

PTO Angle
The angle of operation of universal drive shafts has recommended limits. On tractors with low PTO output shafts the angle becomes acute when the implement is lifted to its maximum travel. This should not present a hazard as the PTO drive should be disengaged before lifting the implement clear of the ground or alternatively the lift height should be restricted.
The vibrator unit on current machines is bolted to two flange plates. The vibrator can be adjusted vertically by selecting the most suitable holes in the plates, which give the minimum deflection of the shaft when in operation. It should be noted that the rear cover plate on the through drive unit can be turned over to increase the adjustment range.

Machine Assembly
The Shakaerator is despatched with the vibration unit mounted in position on the frame and, where applicable, the land wheels fixed in the stowage position. The remaining items, shanks, clamps, slippers, PTO shaft, nuts and bolts etc., are despatched separately.

- Place the frame (tower up) on an even flat surface.
- Place the top link attachment bracket, with linkage pin holes forward and inclined upwards in the centre of the tower cross-bar. Fasten in position with clamp plate, bolts, washers and the self locking nuts. The washer must always go on the clamp plate.

Nuts must be tightened evenly and care taken to ensure there is maximum surface contact between the clamp and frame. Final tightening of the nuts should be diagonally and not exceed 60 ft lbs torque.



NOTE:
4.5 metre frames only - the top link attachment is assembled to the frame without using washers.

IMPORTANT: On some tractors, which have extra long draft links, there is a risk of the top link only having a few threads of engagement when the machine is mounted. Should this be the case, it is permissible to mount the top hitch bracket in an inverted position for greater thread engagement.

- On 2.0m, 2.5m and 3.0m machines, raise the front of the frame approximately 5” *(125mm)* from the ground, attach the linkage arm attachment brackets, holes forward and inclined upwards 5” *(125mm)* outside the tower uprights and clamp in position.
- Attach the frame of the Shakaerator to the tractor's three point linkage with the pins and linch pins provided; use the highest hole in the bottom hitch bracket unless there is a clearance problem, this is to give adequate top link force for draft control.

Depth Wheels
The depth wheels, where applicable, are hinge mounted and are adjusted by means of a handled ratchet.

'Knock On' Points
The points must now be assembled on the shanks. It must be decided which type of point to fit, *Longlife or Delta,* the choice of which will primarily be dependant on the depth of cultivation required. Check that the point socket is empty of any form of debris. The point must be tapped firmly onto the Shakaerator shank foot until the indentation in the shank socket engages the raised 'pip' cast in the shank.
If, by using reasonable force, the point will not engage far enough onto the shank foot, it is permissible to grind the corners of the shank until sufficient engagement is obtained. Care should be taken not to over grind, which would result in a loose fit and possible loss of the point when working.

NOTE: Older machines that were fitted with 'knock on' type points were dispatched with a long handled hammer, the head of which was made of mild steel so there was little likelihood of chipping the hardened steel point when striking it during fitting. As an added precaution eye shields were also supplied with the machines; when fitting these types of points eye shields must always be worn.
When fitting points to shanks already fixed to the machine stand to the rear or to one side of the frame when using the hammer, do not crouch beneath the frame.

'Slipper' Points
Attachment of the 'slipper' type point is achieved by sliding the point onto the foot of the shank, which, when in position may be angled downwards at the front to permit the 'toe' of the wear shin to locate between the shank and the upper rear of the point – *the shin may require 'tapping' into position to ensure a tight fit is achieved*, the top of the shin is then secured into position on the shank with its fixing bracket, nut and bolt.

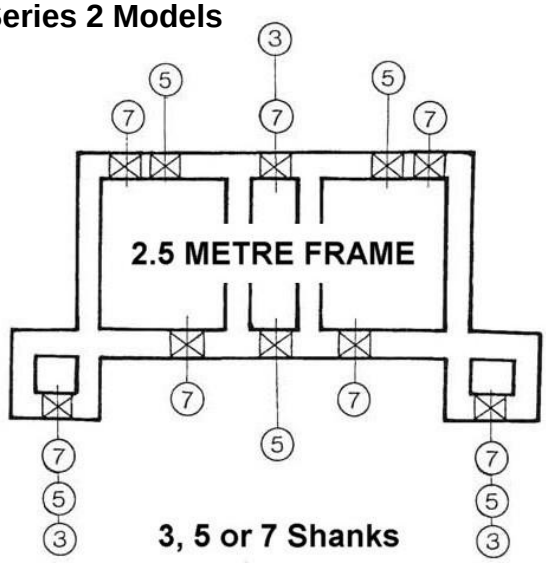
NOTE: Ensure when ordering replacement points that the correct type of points are ordered to suit the shanks as they are not interchangable with each other – a 'slipper' point will not fit a 'knock on' type shank and visa versa.

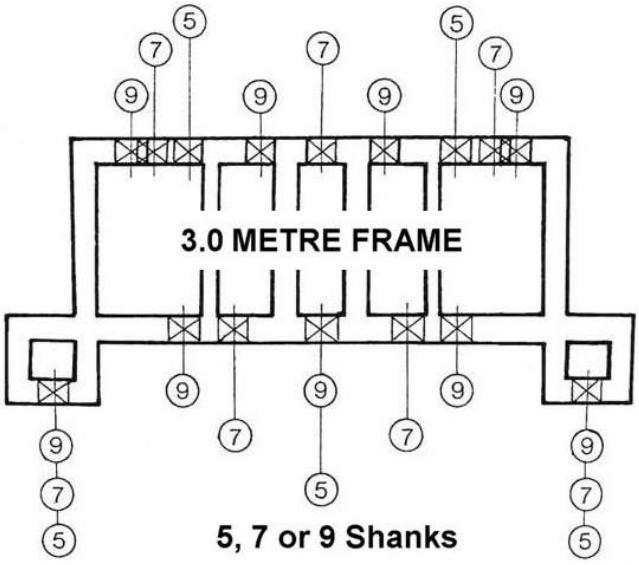
WARNING: Always ensure protective eye shield are worn when 'knocking' points onto shanks.

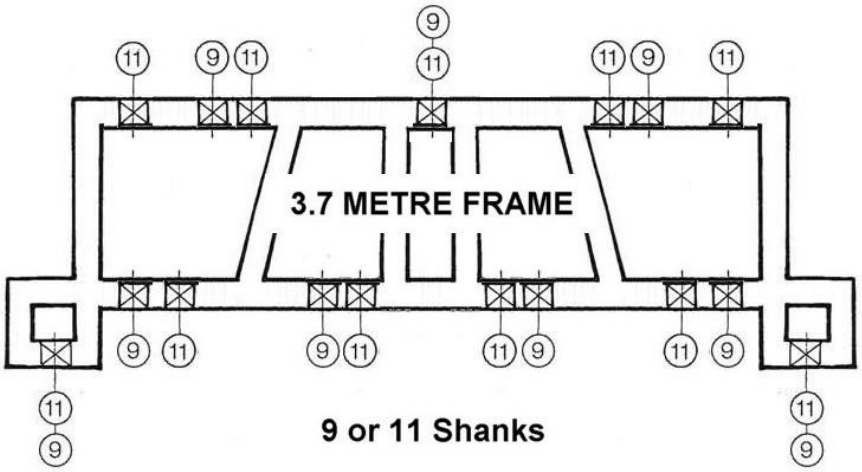
Fitting Shank Assemblies (Legs)
The shank set-up is governed by the work to be done. Normal shank arrangement is to have one more assembly mounted on the rear toolbar than on the front.
The shank assemblies should be fitted to the toolbar in the required position and the nuts tightened evenly and diagonally to a torque setting of 225-255 ft.lbs *(305-350Nm)*.

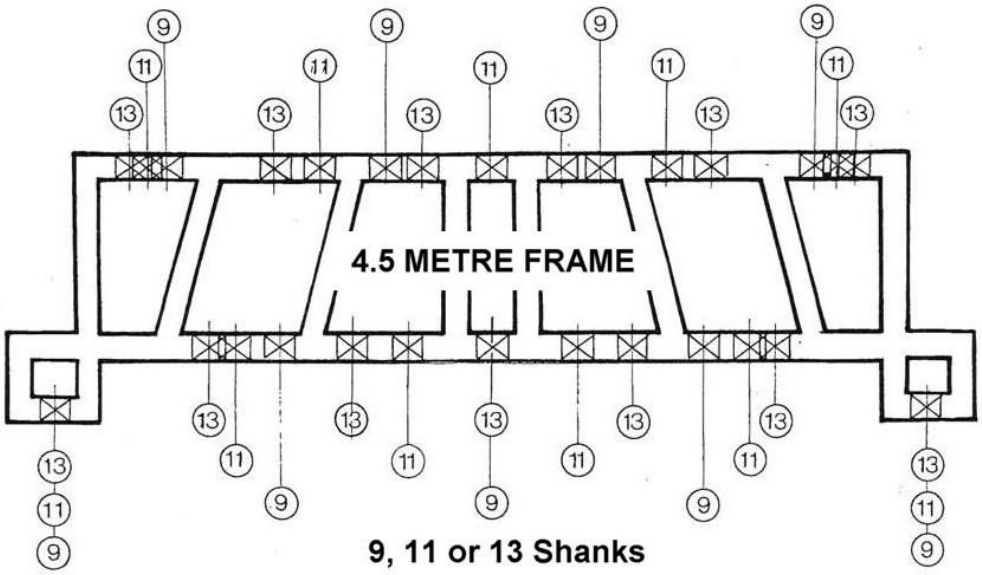
PTO Connection
Connect up the PTO shaft ensuring that it does not 'bottom out' in any position.

Series 2 Models

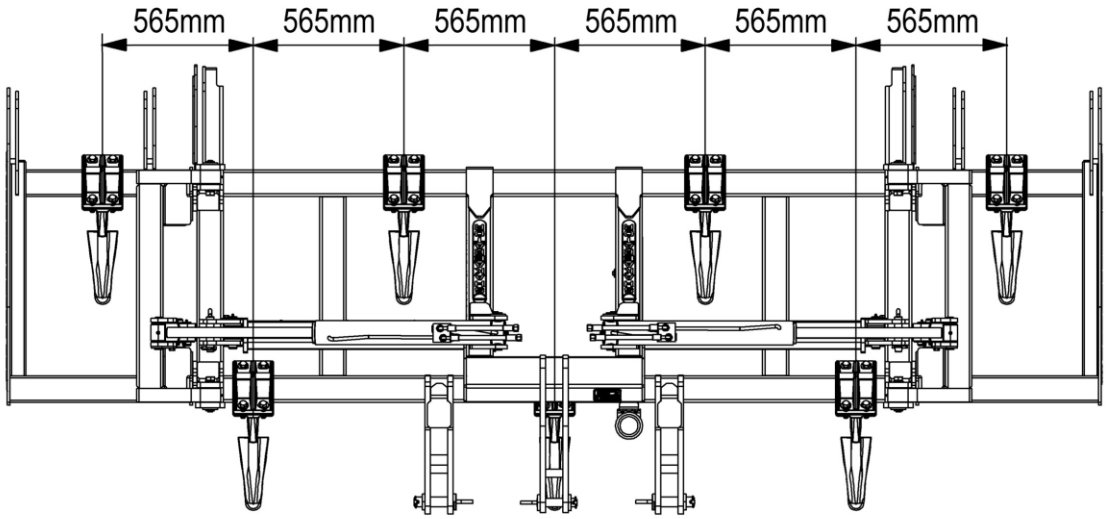




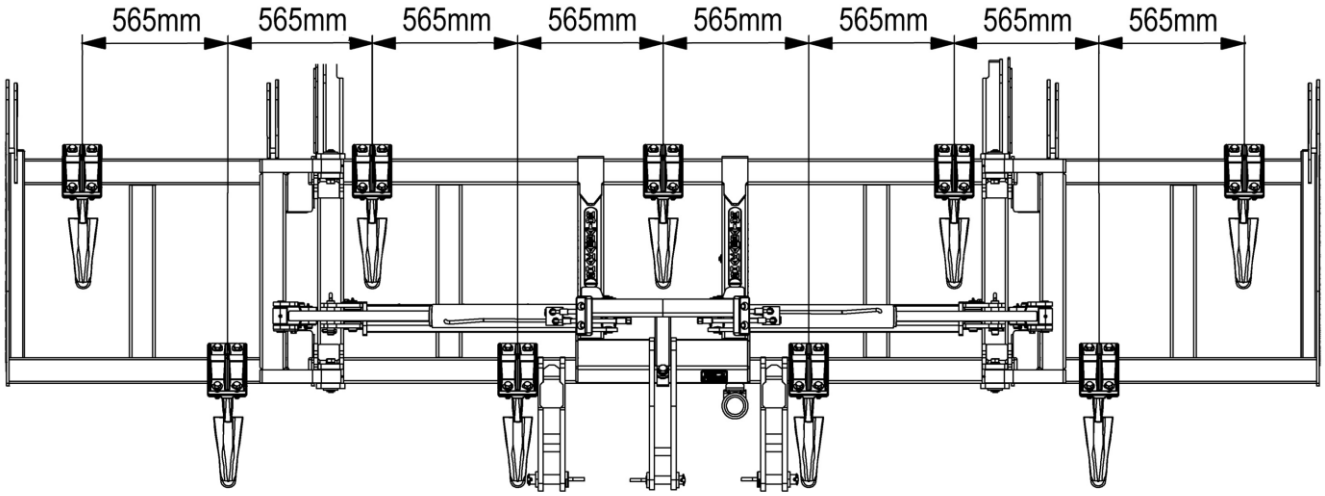




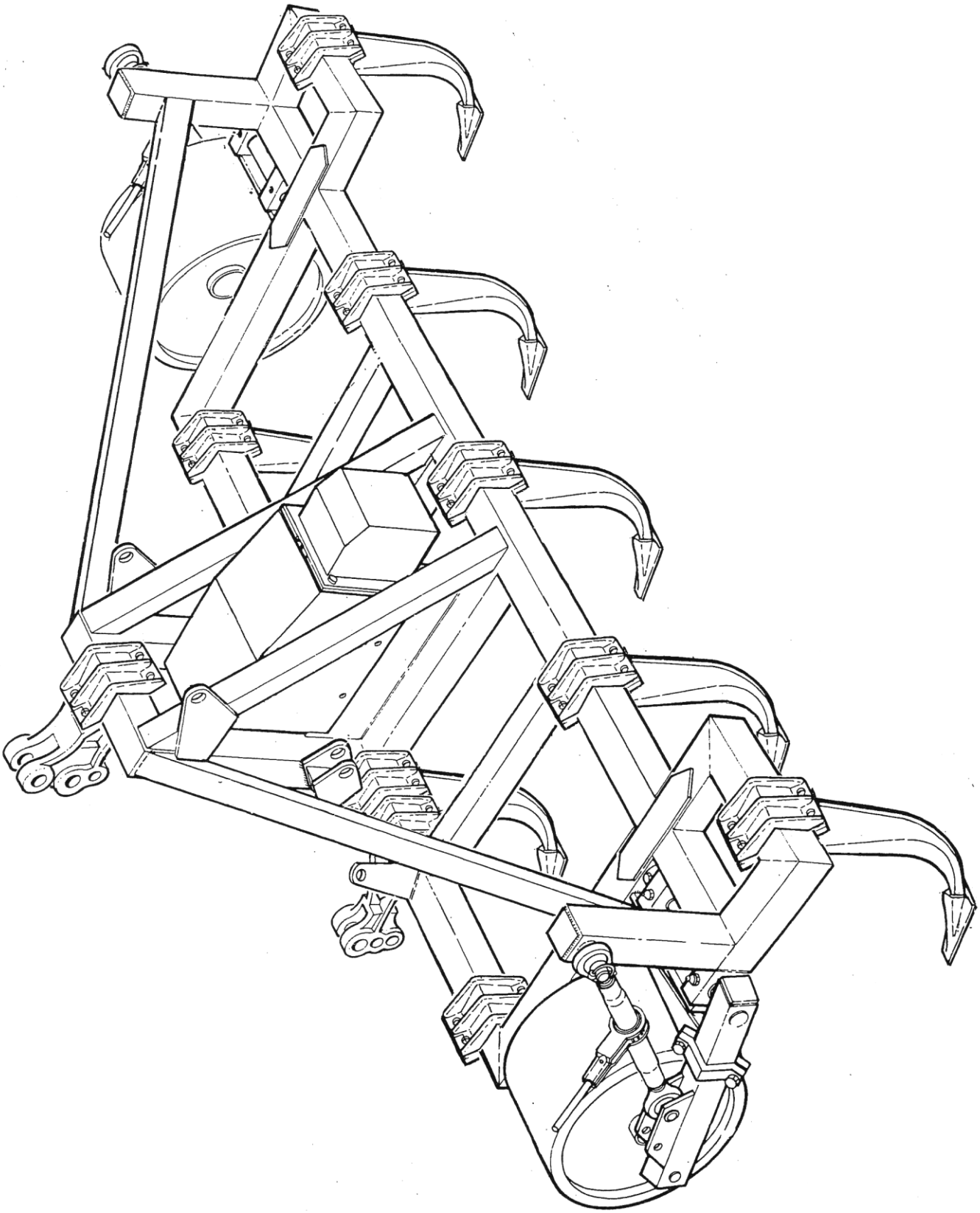
400 Classic Model – 7 Leg



500 Classic Model – 9 Leg



General View (Standard Model)



Speed
When first putting the Shakaerator into operation, the tractor's forward speed should be limited to less than 3mph *(5kph)* with the engine speed adjusted to give a PTO shaft speed of 540RPM. Forward speed can be gradually increased later as experience with the machine is gained.
The points should be on or in the ground before the PTO is engaged and similarly should be disengaged before lifting the points out of the ground. On tractors that share a common drive to both the hydraulic lift and PTO engine speed should be reduced to a minimum and the machine lifted only as far as is necessary.

Working Direction
The points are designed to engage the ground in a forward direction only, before reversing the points should be clear of the ground.
Moving in a rearward direction with the points in the ground may cause them to become removed from the leg.

Depth Control
To achieve maximum depth with a lower draft requirement it is possible where necessary to make more than one pass over the ground increasing the depth each time. Alternatively, some shanks can be removed.
Calibration marks are cast into the sides of the shanks; centimetres on one side and inches on the other to assist the operator in maintaining more precise depth control. These are approximate calibrations and, obviously, will vary as the points wear.
In setting the depth, it may be an advantage to pull the points into the earth to the depth required without engaging the PTO drive, the depth wheels can then be lowered to the ground.
In matching the holes on the adjustment pins, select the nearest one, shallower, than the depth required; the normal action of the point is to pull in deeper. The wheels exert a positive, but not heavy pressure to hold the point from penetrating further. Even so, it is sometimes necessary to reset the depth wheels to a shallower notch after the start of digging as the wheels will generally sink into the disturbed earth and increase the depth of penetration.
Depending on which points are selected and how they are used, the Shakaerator can do at least some of the work of a sub-soiler, a chisel plough and a cultivator. Its greatest use is to loosen soil that has been compacted to a higher density then is desirable for optimum crop production. This compaction may be at the surface, deep compaction or as a pan. The latter is a thin impervious layer caused by a plough or other implement smearing the soil whilst working in wet conditions.
For folding and grassland models the working depth is determined by the height setting of the rear roller(s).

Point Settings

Narrow points (Longlife Points)
These are the normal choice for deep cultivation - the points will lift and shatter the soil structure with low draft and minimum mixing.

Wide points (Delta Points)
Wide points will break up a bigger area of ground and can therefore be spaced further apart - this is particularly useful for shallow cultivations.

Any set up of the Shakaerator working at depths below cultivation, *i.e. below 8" (200mm),* has the great advantage of loosening the soil without mixing or inverting. Clods are not formed or brought to the surface.

Working Depth

The depth to which the Shakaerator can best be used depends entirely on soil type and moisture content, the combination of these factors produces a critical depth, below this depth less soil is loosened and the tractor draught force is considerably greater. Down to the critical depth the breakout pattern is similar to figure 1. Below the critical depth figure 2 applies. This can often be recognised from the surface but is very clearly seen by digging the profile.

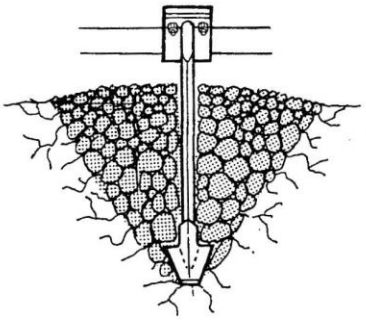


Fig.1

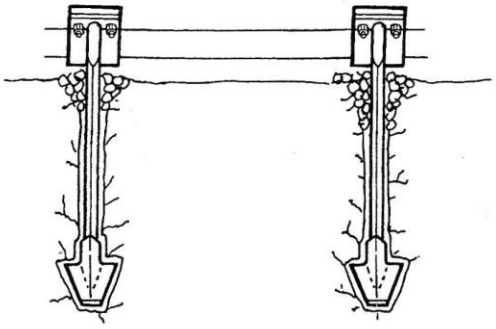


Fig.2

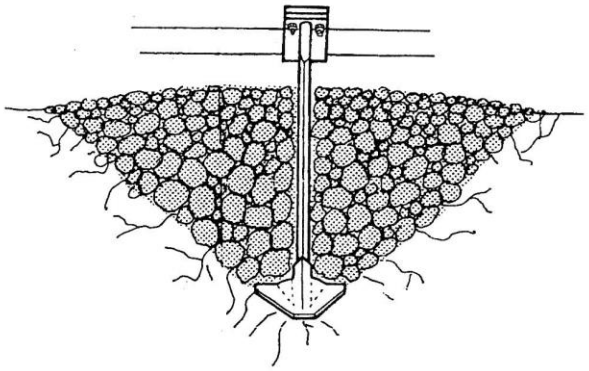


Fig.3

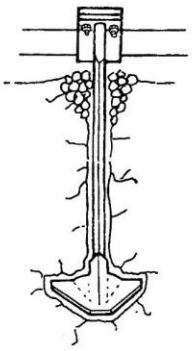


Fig.4

Figure 1 is the pattern produced by the narrow points and figure 3 is the pattern of the wide points – the wide points produce a much greater loosened area.

Figure 4 shows the wide point working below the critical depth. This critical depth with the wide points may be lower than for the narrow points.

The reason for this critical depth is that in for example figure 3 the soil has been loosened upwards because that is the direction of least resistance. In figure 4 the resistance to upwards movement is greater and it is easier for the soil to compact sideways than to loosen upwards. The very small amount of loosened soil at the top of the tine is because the loosening has been done by only the width of the shank. The sides of the compacted channel may be smeared and it is obvious that this is a very detrimental condition in which to leave the soil.

Tine Spacing

The tine spacing is related to the working depth for each type of point. With the narrow points the spacing should be 1.2 - 1.5 times the depth. This gives the least draught force and most even surface finish *(Fig.5)* with complete break up of the soil profile. Figure 6 shows the same tines too far apart giving incomplete break up. With the wide points the spacing can be 2 - 2.2 times the working depth *(Fig.7).*

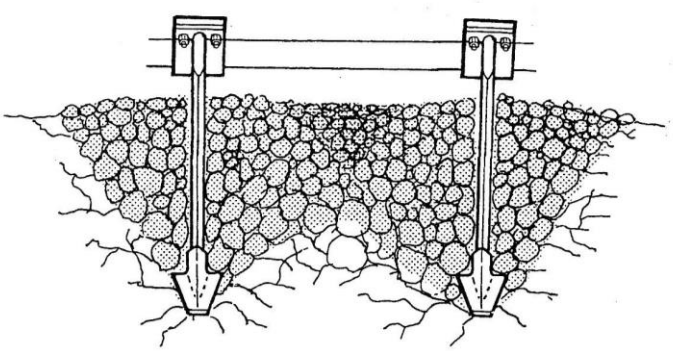


Fig.5

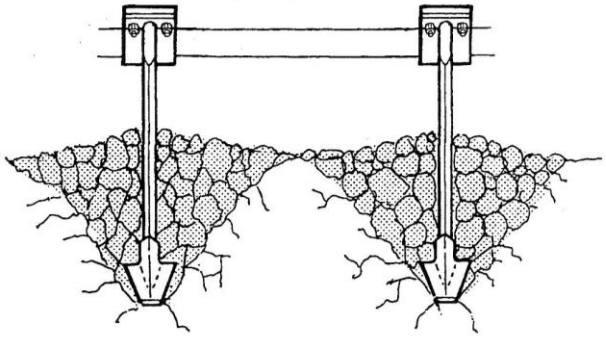


Fig.6

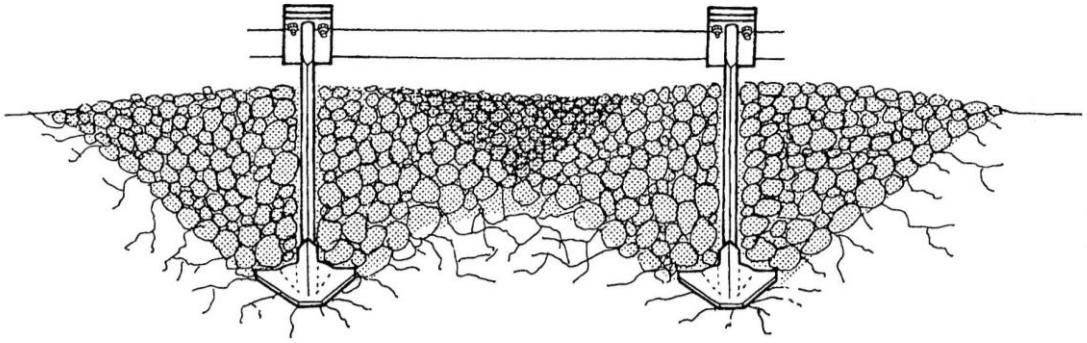


Fig.7

Shallow Leading Tines

Draught force can be reduced and the amount of soil loosened increased by using shallow tines in front of long ones. The 460mm shanks should be mounted to each side of the 610mm shank and not directly in front. Figure 8 shows an ideal setup.

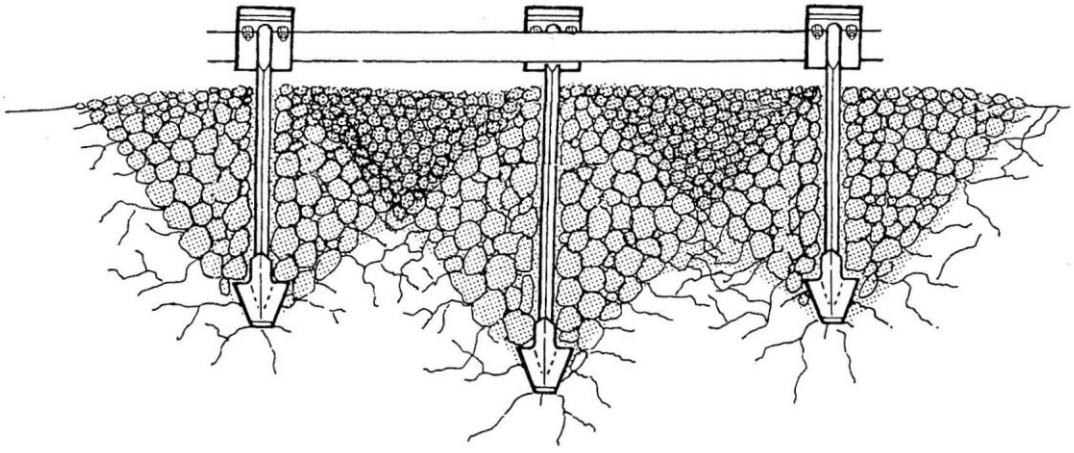


Fig.8

Re-compaction
Loosened soil is extremely prone to re-compaction by subsequent traffic especially in wet conditions when loosening can be achieved by using wide points and shallow leading tines but any re-compaction will be more severe than the original problem. For this reason it is not a good idea to use two passes in different directions but to try to combine the two in one pass with for example shallow leading tines.
If power is inadequate to cover the full width of the toolbar it is better to remove the shanks in the middle of the frame, which will leave an undisturbed strip of ground in the centre. On the return bout across the field the tractor wheels should be positioned on the unmoved strip to complete the cultivation on a straddle and overlap principle.

Underground Obstructions
If a point becomes jammed in a root or rock operating the vibrator slowly and alternatively attempting to raise and lower the frame can sometimes free it. Should this fail, engage reverse gear and with the vibrator unit still operating back-up slightly. This will usually release the shank but a check should be made immediately to ensure that the point has not remained embedded in the obstruction.

Fail-Safe for 'Bolt On' Leg Assemblies
Most types of 'fail-safe' arrangement on farm machinery such as shear bolts, pins, slip clutches etc., are designed to protect the implement in the event of overloading or striking an obstruction. On the Shakaerator however, the 'fail-safe' is designed to protect the tractor. The upper two bolts and nuts securing the clamp shanks to the frame are designed to 'fail' if a really solid obstruction is met.
It is vital that only 'Genuine McConnel Parts' are used for the replacement of bolts and nuts as they are special grades which are specific to the design requirement.
In action the threads of the two upper nuts will shear off, the shank may then twist around the toolbar. To release, the shank should be swung back into its normal position and the upper nuts, bolts and washers replaced.
There is a possibility that the nuts will fail if the bolts are loose, if the hardened steel clip washers are omitted from the top of the clamp plates or if the speed is excessive in rough ground.

It is vital that only the correct nuts and bolts are used, they should be checked regularly and retightened as when required. Only an accurate and tight fit of the clamps on the toolbars provides the ideal transmission of vibration to the points. On initial start up all nuts and bolts should be checked for tightness after one hour's operation or in the case of very rough ground, after the first fifteen minutes. Nuts should be tightened uniformly to the applicable torque figure stated in the chart below.

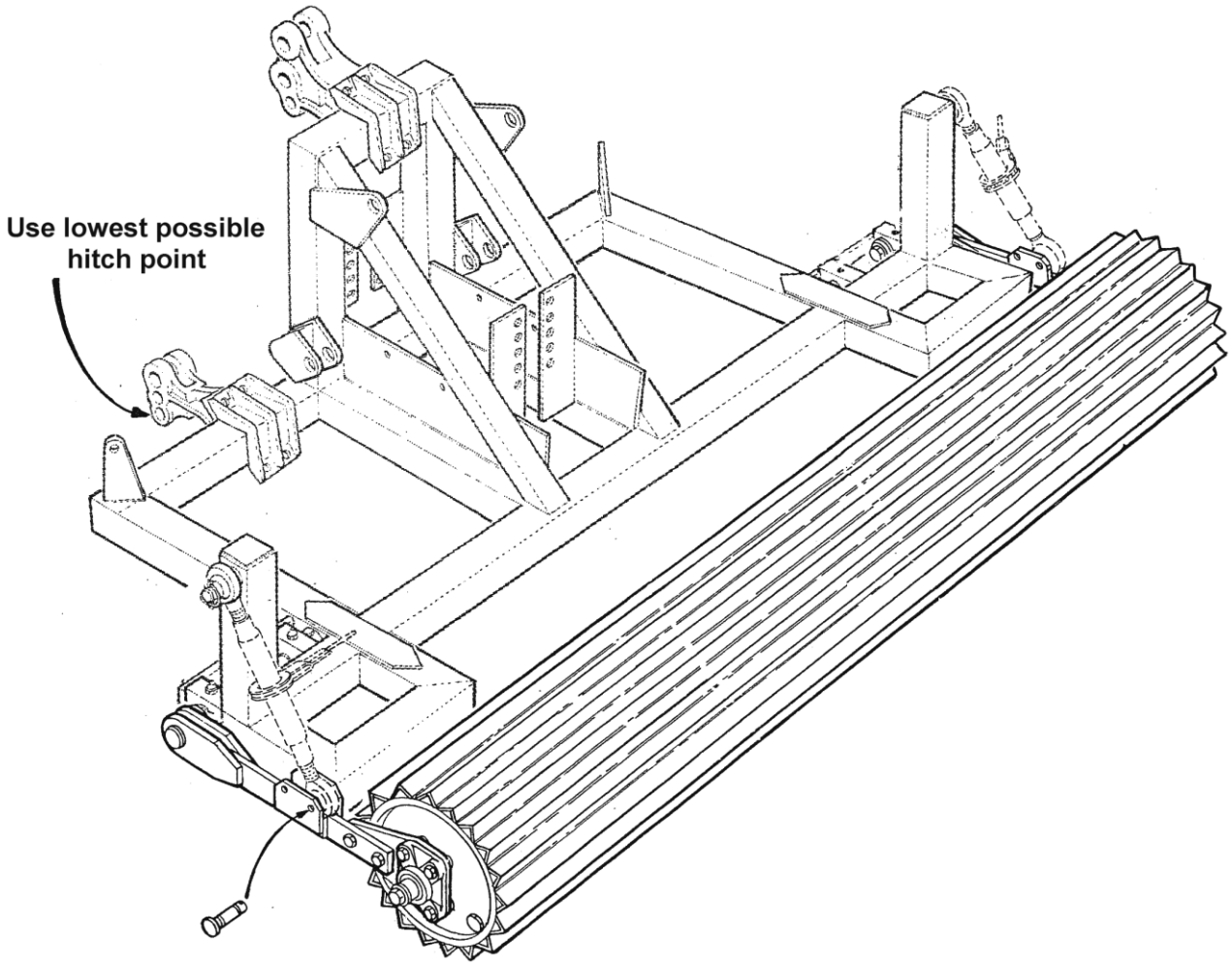
Leg Mount Fittings & Torque Settings

Leg Type	Bolt Part No.	Nut Part No.	Torque Setting
24" Bolt On Shank Leg	0200020	0111006	85Nm *(63 ft.lb.)*
Mechanical Breakback Leg	9200053	9163008	475Nm *(350 ft.lb.)*
Auto-Reset Leg	9200053	9163008	475Nm *(350 ft.lb.)*

Trailed Implements
Attachments that can be fitted behind the Shakaerator such as the roller do not require hydraulic linkage. The depth control wheels are removed and the ratchet adjusters are used on the trailed implement to control depth.

When coupling the tractor to the Shakaerator use the lowest practicable hitch point, and where possible, turn the mounting bracket over to achieve this. Use the highest possible hitch point for the top link mounting. Forces applied through the top link are reduced when operated in this way and the risk of top link failure is minimised.

Where it is not possible to obtain the geometry with the tractor's existing top link, a McConnel Heavy Duty Top Link Assembly *(Part Number 7115275)* is available. Closed length (pin centres) 800mm *(2' 7½")* open length 1150mm *(3' 8½")*.
If there is ever any doubt of the strength or serviceability of the tractor's top link, then a McConnel top link should be used. Any failure of the top link could result in serious damage to the through-drive assembly.



Operation
To correctly set the machine for use the roller should be raised – the Shakaerator is then drawn forward into the ground. When the points have reached the required depth the roller should be lowered to the ground.

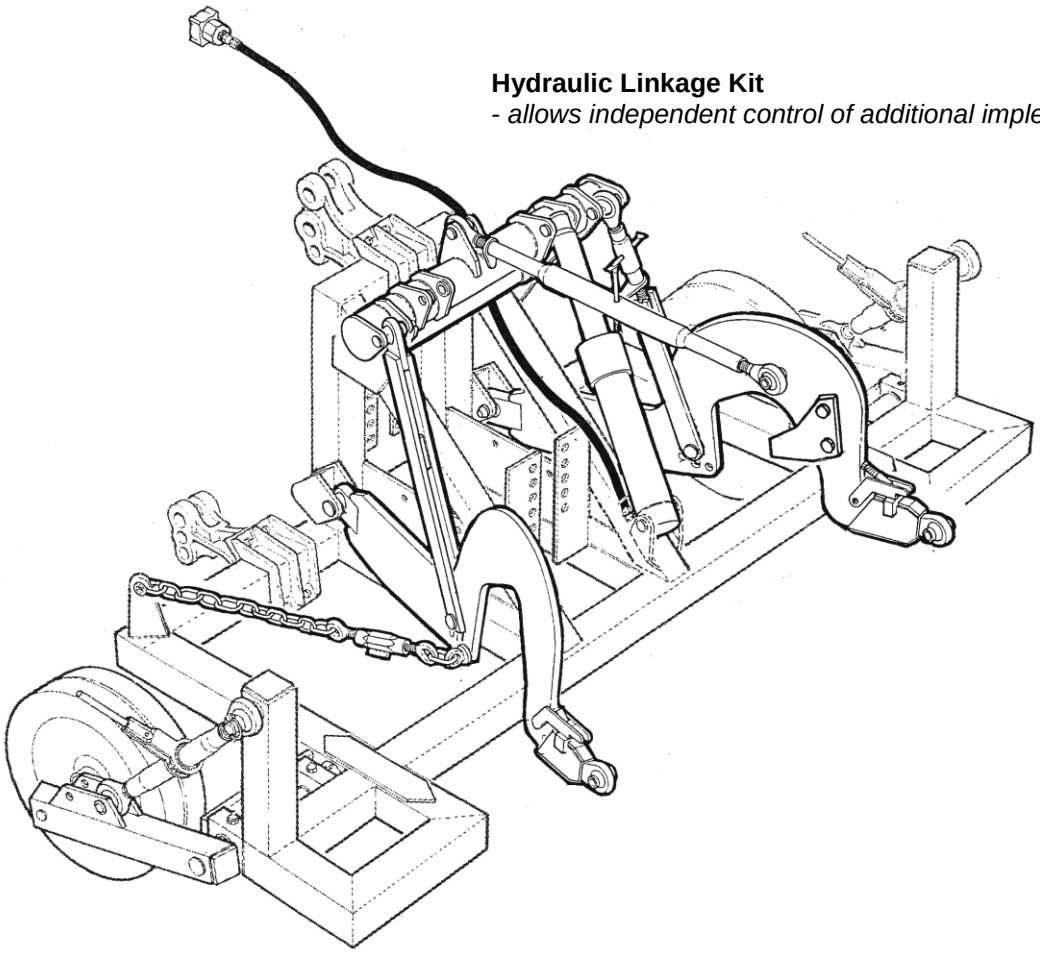
Shear Pins
As the roller is mechanically held in position by the ratchet adjusters, no movement relevant to the main frame is possible. When the roller run over a large rock or stump its action would try to lift the shanks out of the ground. If it fails to do so, the body of the roller would be damaged or bent. To avoid this accidental damage special shear pins are fitted in the lower link ends to the ratchet adjusters. In the event of these shear pins being ‘sheared’, do not substitute an ordinary bolt or metal rod.

Ballast
If extra weight is required when using the roller, water ballast can be added. Precaution against frost should be taken in cold climates by either storing in a frost free building or draining the roller.

Hydraulic Linkage
To enable an implement being worked in conjunction with the Shakaerator to be controlled independently, an optional hydraulic linkage kit is available to accommodate almost any Cat.ll three-point linkage implement. Using a single acting ram, the linkage is powered by an external services supply from the tractor. Stabilizer chains are supplied as standard and optional Cat.1 or 11 top link ends supplied as required.

The drop stops bolts on to the inside face of the draft link and by inverting, give two fixed height working positions for the link ends. It is also advantageous as the combination can be lifted at the end of the row using just the tractor's linkage without altering the existing alignment of the PTO shaft.

For hitching the implement or for operating without stops the top bolt can be loosened, the bottom one removed and the stop pivoted down and out of the way. The bottom bolt is replaced which then acts as a latch to prevent the stop swinging back into a 'foul' position.

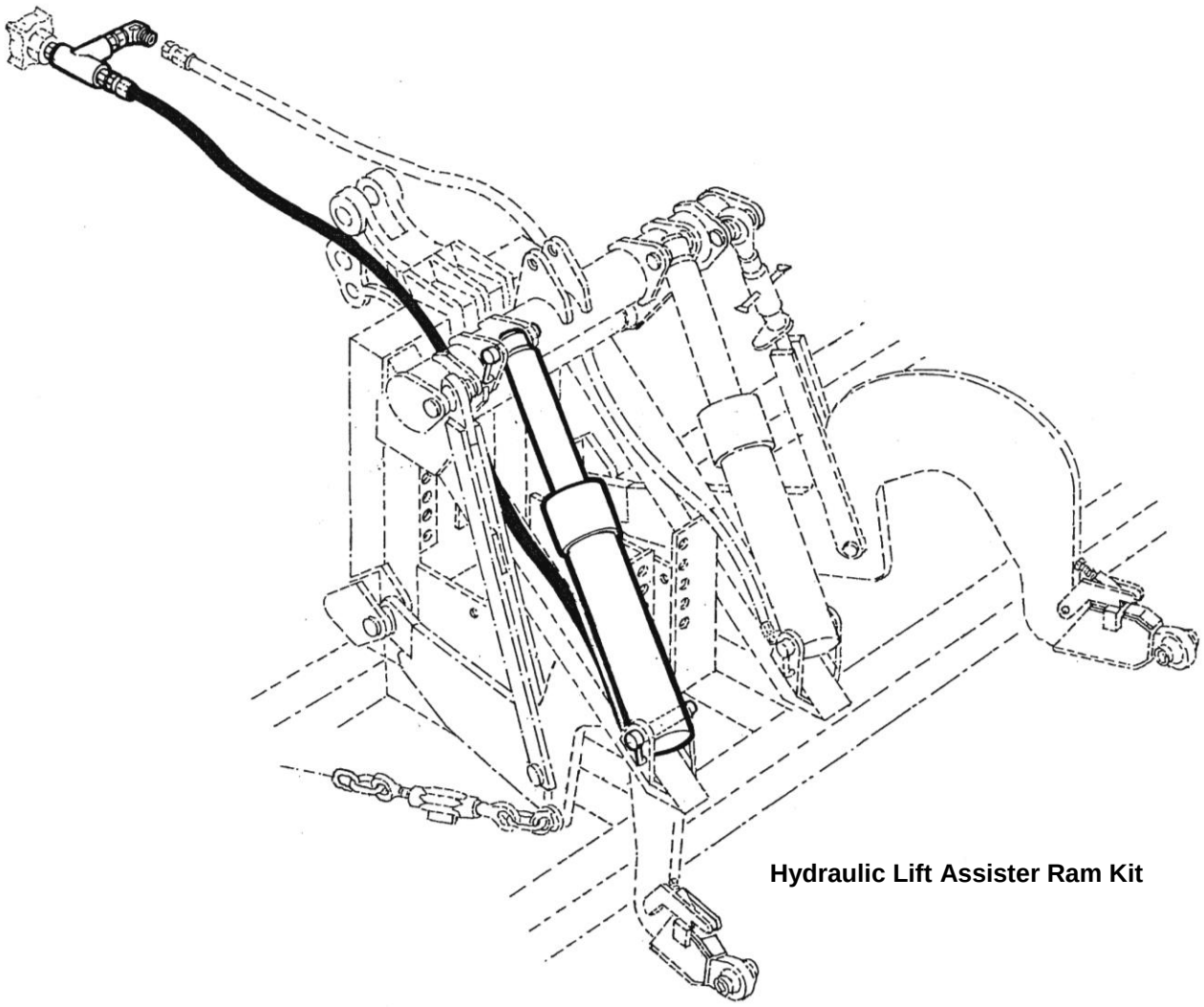


Hydraulic Linkage Kit
- allows independent control of additional implements

Hydraulic Lift Assister Ram (Optional Extra)

On 3.7m and 4.5m frames only, additional lugs are welded to accommodate an assister ram when an extra heavy implement is to be mounted. The extra hydraulic hose required is junctioned into the initial supply with a 'T' piece.

It should be noted that all linkage rocker shafts are provisioned for accepting the rod end of any extra ram leaving it for the customer to weld additional lugs to the frame if it is envisaged that a very heavy implement is to be attached to any of the alternative frames.



Hydraulic Lift Assister Ram Kit

Power Driven Implements

Great care should be taken when using a power driven implement behind the Shakaerator to ensure that the implement’s drive shaft is not subjected to acute angles when in motion. The tractor's PTO shaft must be disengaged before lifting the unit on the linkage. To accommodate a variation in shaft operating heights for different implements the whole of the through-drive assembly can be raised or lowered by means of a range of adjustment holes on the vertical mounting plates. Caution should also be exercised that the implement's drive shaft does not 'bottom out' when raised to its maximum on the linkage. Also check the full range of operation of the linkage to ensure that the drive shaft does not foul any part of either implement.

Power Take Off Guard

At all times when an auxiliary implement is not in use the stub shaft guard should be secured in position.

When operating auxiliary equipment the following applies:

The rear section of the stub shaft guard is removed. As shown, the guard is suitable for the central and top mounting positions of the through drive shaft. For the lower position the guard mounting plate is inverted and the top guard assembled on secondary flange 'A' provided. Remember these guards are a legal requirement and on no account should the Shakaerator be used on its own or in a combination without the relevant guards securely in position.

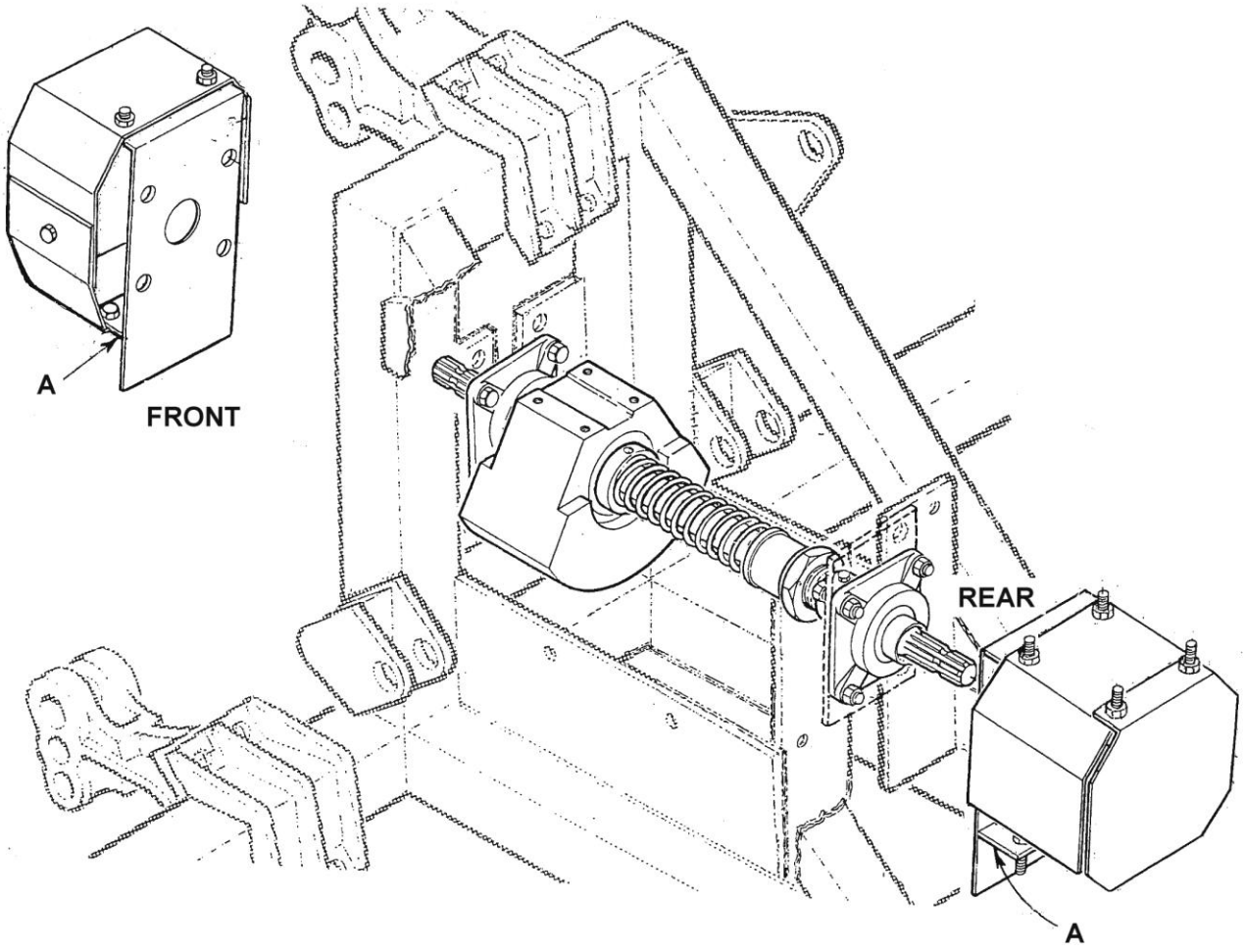
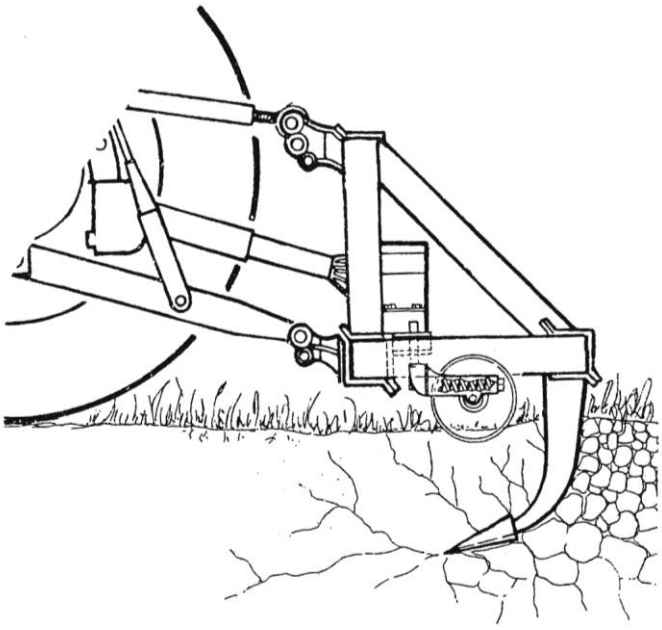


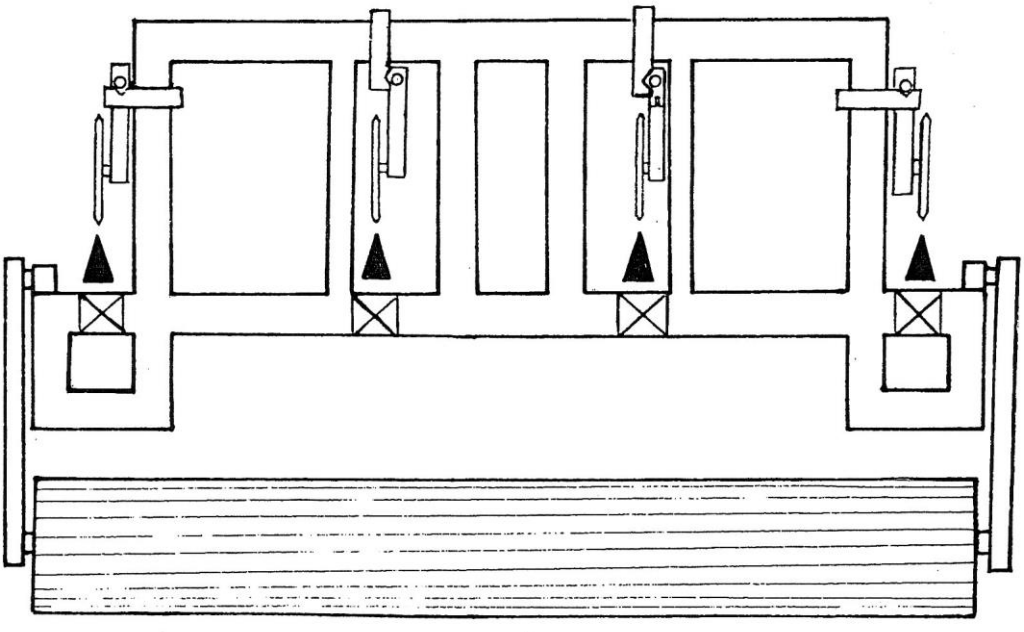
Illustration Note: *The illustration above shows an early through drive – current machines will have a shorter through drive shaft with a shorter spring and the rear bearing and bearing back block inboard of the through drive mounting plate.*

Turf Discs

Spring loaded turf discs are available, which are supplied as an option, when it is desired to create a minimal surface disturbance in pastureland. The normal application is to mount the discs on the front toolbar in a position where they will slice the turf immediately in front of the following shank.

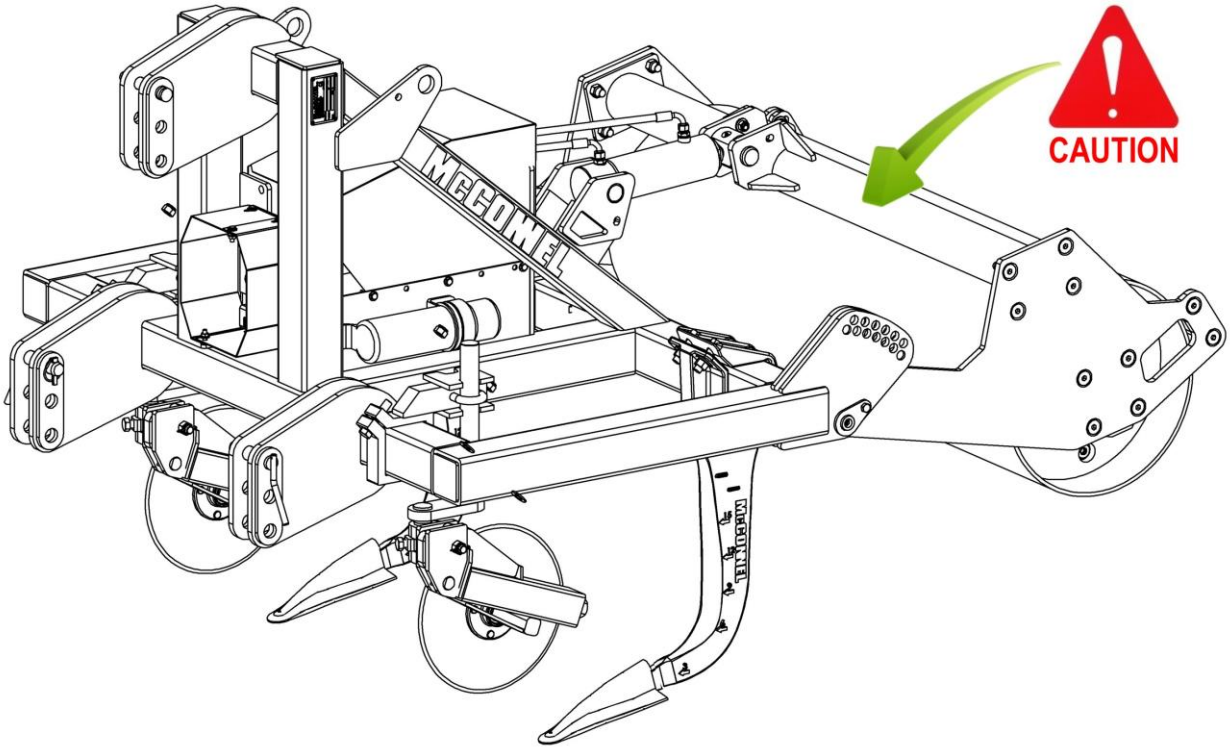


Turf discs are normally used with a roller. It is not possible to use the outermost disc mounting position with wheels installed. A typical arrangement of four discs and shanks on a 3m frame is shown below. Up to six discs and shanks can be used on a 4.5m frame.



In some circumstances it is possible to fit a disc in the centre, but in this position clearance beneath the frame is limited, so that the maximum working depth would be reduced.

Hydraulic Roller Adjustment



Hydraulically operated rollers must only be operated when the machine is raised and the legs are clear of the ground or in work when the machine is travelling forwards with the legs in the ground.

Never attempt to operate the hydraulic roller when the machine is stationary with the legs in the ground; failure to observe this will result in undue stress and/or damage to linkage points and/or hydraulic components.

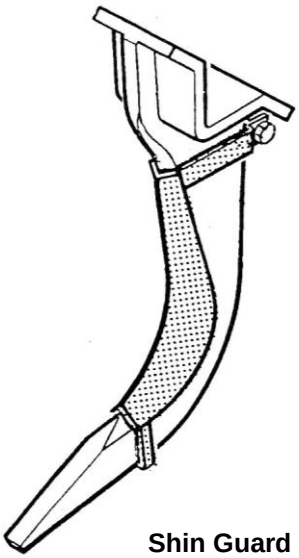
Shin Guards

Shin guards can be strapped to the leading edge of the shank. They are easily fitted or removed after releasing the point and removing the nut and bolt that secures them at the top of the shank.

CAUTION! Do not attempt to hard face or otherwise weld the shank - this would destroy the shank's properties.

Shanks are made from extremely tough abrasive resistant steel and are subjected to a special heat treatment during manufacture. Do not attempt to hard face or otherwise weld the shank as this will destroy the shank's properties. Owners are reminded that no warranty can be entertained on shanks that show evidence of welding.

Shin guards, which can be supplied as an option, are made of special hard steel that will readily accept hard-face welding reinforcement.



Shin Guard

FOLDING MODELS

Folding models can be raised into the upright position for ease of transportation and storage; on 400 and 500 Classic models the wing rams are connected to individual spools on the tractor and are operated independently, on 4000 and 5000 models the wing rams are connected to a single spool on the tractor and both wings of the machine will raise simultaneously, they cannot be raised independently.

Unfolding the Machine – 400 & 500 Classic Models
400 & 500 Classic models are supplied with transport locking pins for added security when transporting the machine in the folded position – ensure these pins are removed from their transport position before attempting to unfold the machine, failure to observe this may result in damage to the machine. *See following page for details of pin locations and positions.*

CAUTION!
Remove transport pins from their locking position before attempting operate rams – failure to observe this may result in machine damage.

Unfolding the Machine – 4000 & 5000 Models
When unfolding 4000 and 5000 models, ensure the point protection guards have been removed and stowed in their storage location on the light bar before releasing the 'locking' latch and lowering the wings into the work position.

WARNING!
Ensure there is sufficient space around the machine before attempting to unfold it.

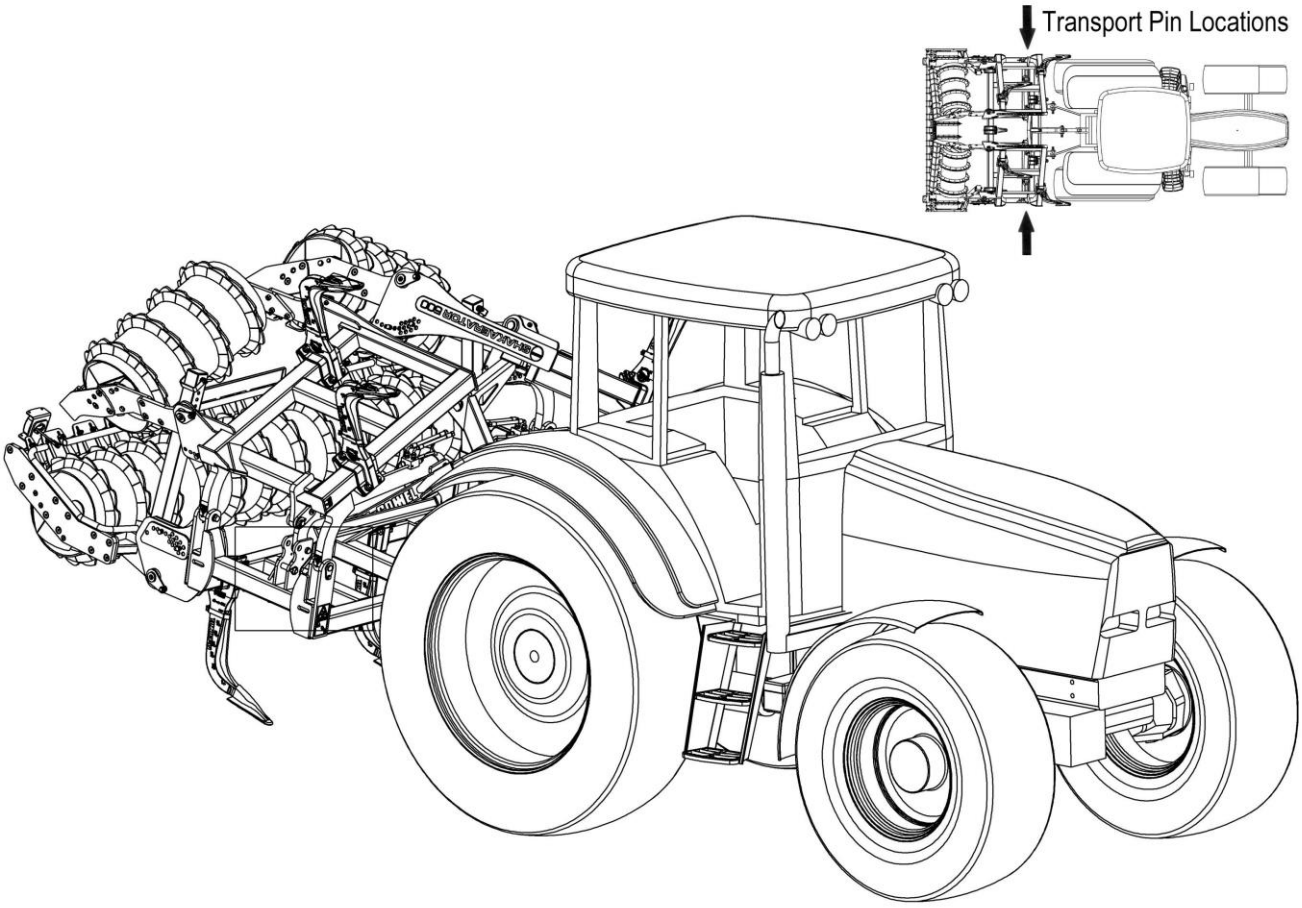
WARNING!
Ensure bystanders are kept at a safe distance from machine at all times.

NEVER FOLD OR UNFOLD A MACHINE WITH PERSONS ON OR NEAR IT – ENSURE BYSTANDERS ARE KEPT A MINIMUM DISTANCE OF 5 METRES WHILST UNFOLDING THE MACHINE.

CAUTION!
Auto-Reset models should only be folded with the struts in the work position, never attempt to fold the machine if the struts are in 'break-back'.

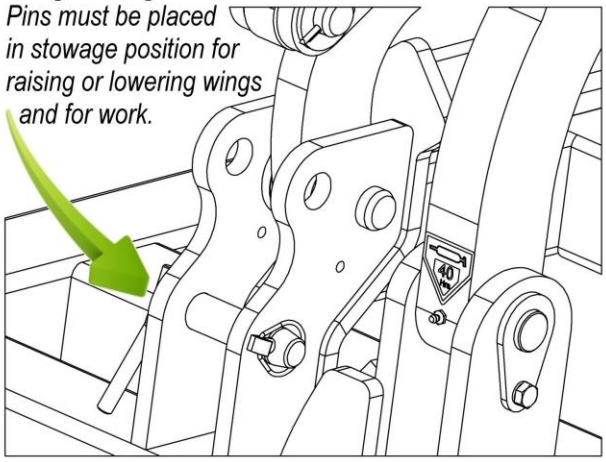
CAUTION!
On 4000 & 5000 models it is vital that rollers are locked into their lowest possible position with their pins before attempting to fold the machine – failure to observe this will result in the rollers contacting each other causing damage to the machine.

Transport Locking Pins – 400 & 500 Classic models only (Early Builds)



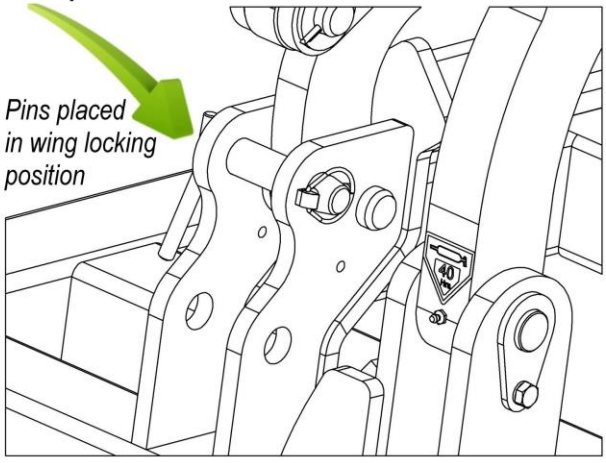
Wing Folding & Work Position

Pins must be placed in stowage position for raising or lowering wings and for work.

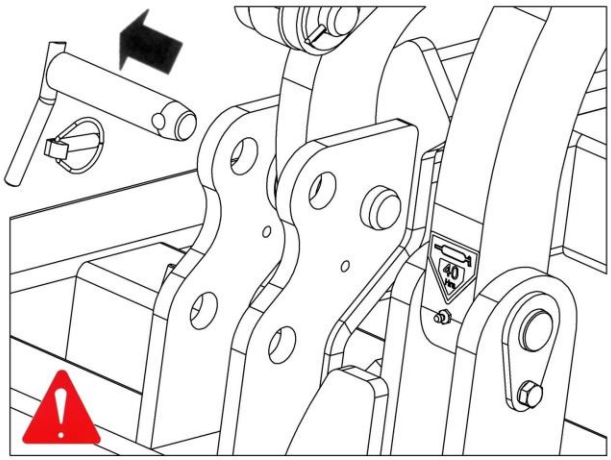


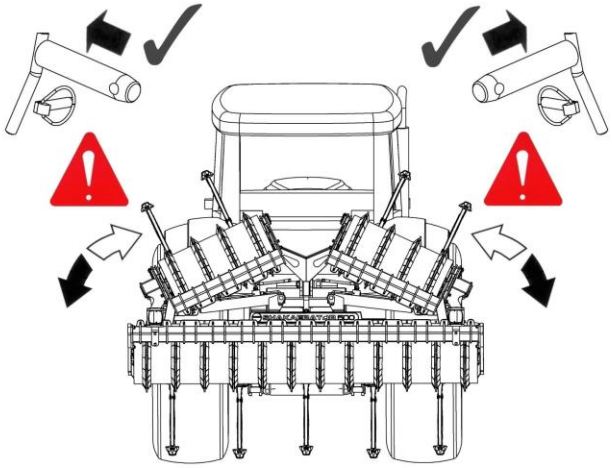
Transport Position

Pins placed in wing locking position

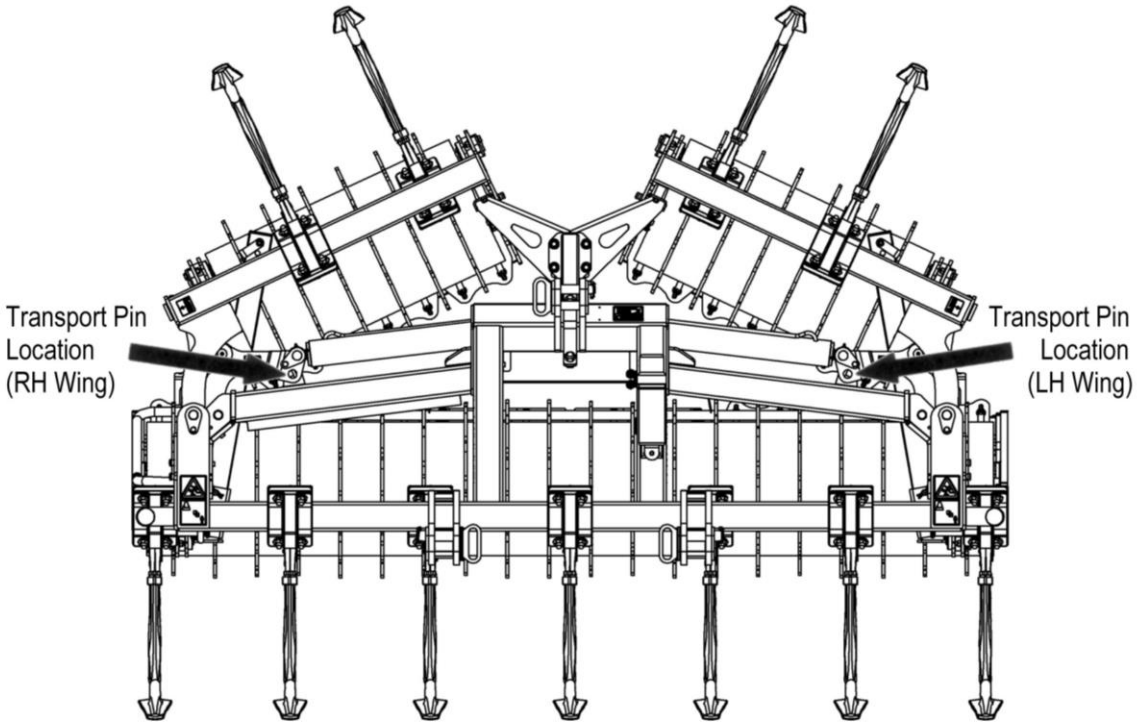


CAUTION - Ensure pins are removed from the transport position before attempting to unfold or fold the machine

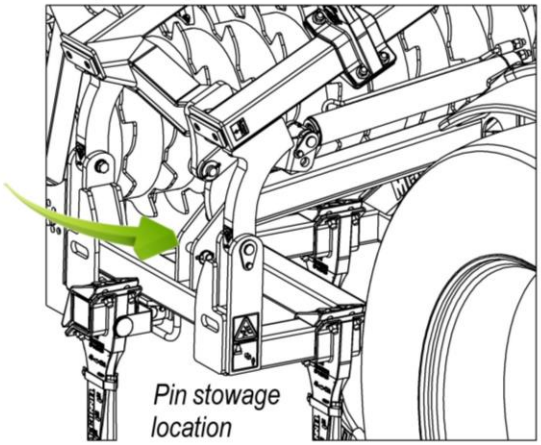




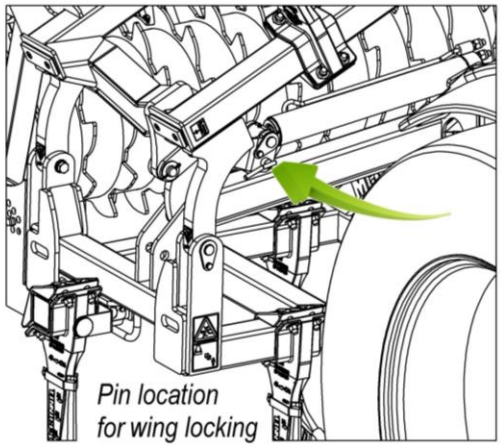
Transport Locking Pins – 400 & 500 Classic models only (Current Builds)



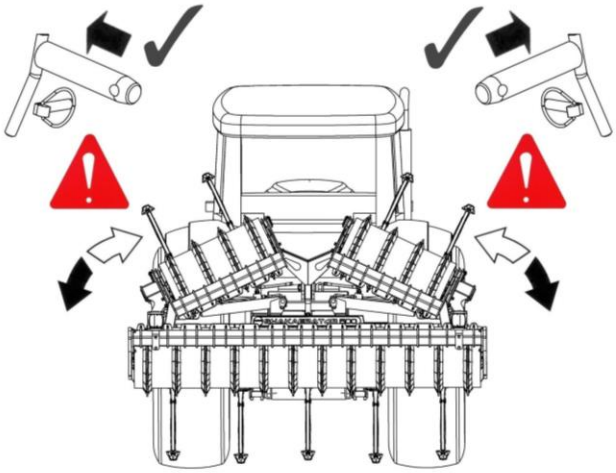
Wing Folding & Work Position



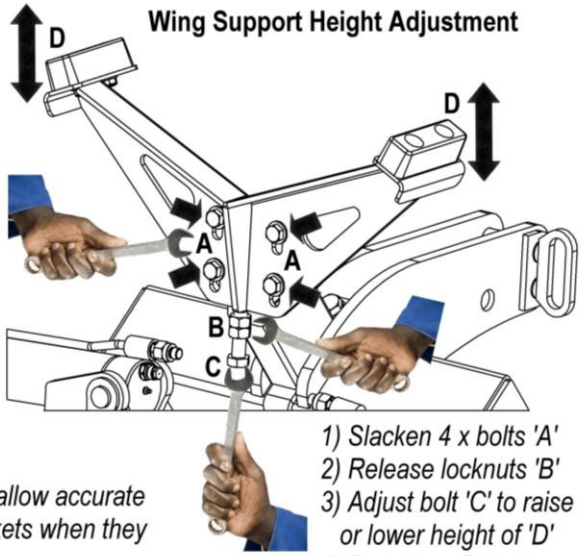
Transport Position



CAUTION - Ensure pins are removed from the transport position before attempting to unfold or fold the machine



Wing Support Height Adjustment

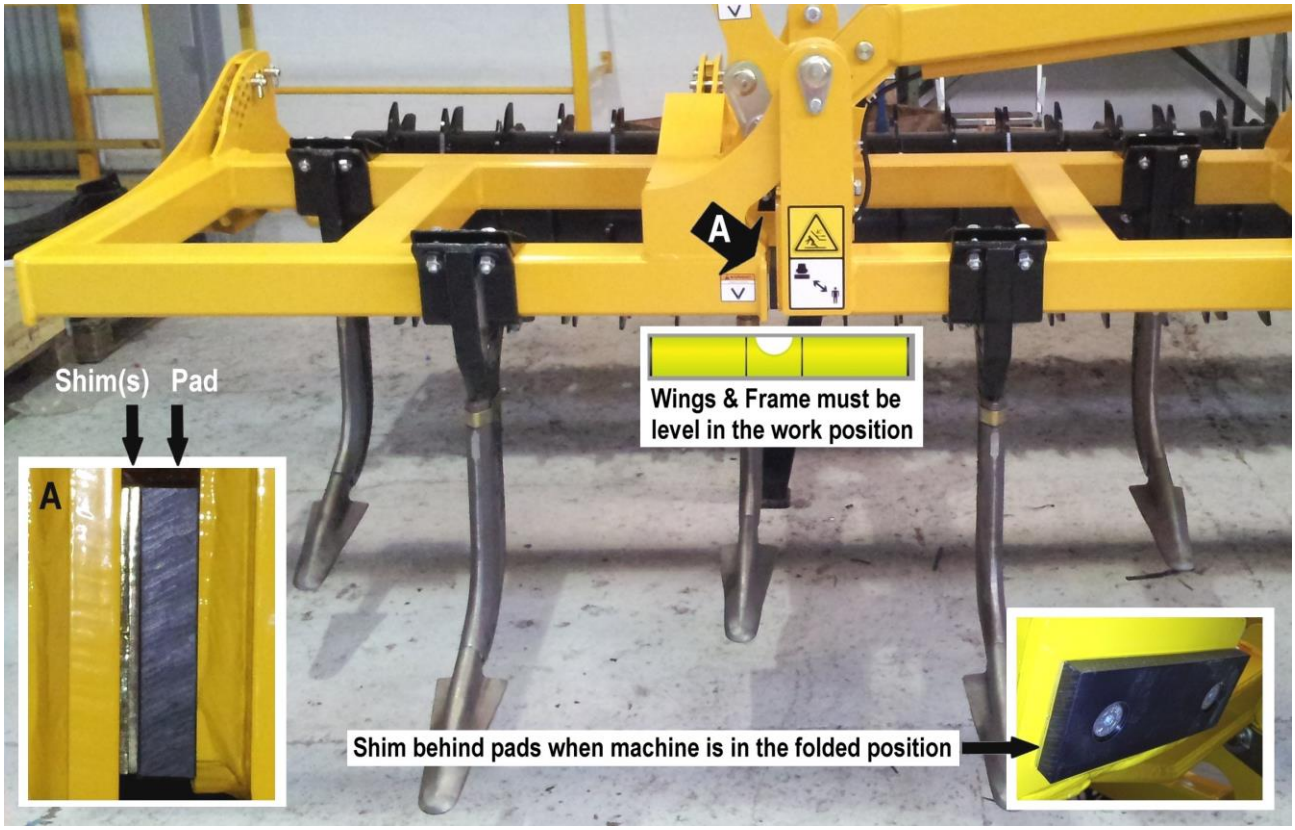


1) Slacken 4 x bolts 'A'
2) Release locknuts 'B'
3) Adjust bolt 'C' to raise or lower height of 'D'
4) Retighten 'B' & 'A'

NOTE: Height adjustment of the wing supports is provided to allow accurate alignment of the holes on the mainframe to wing locking brackets when they are folded into the transport position.

Wings & Frame Alignment

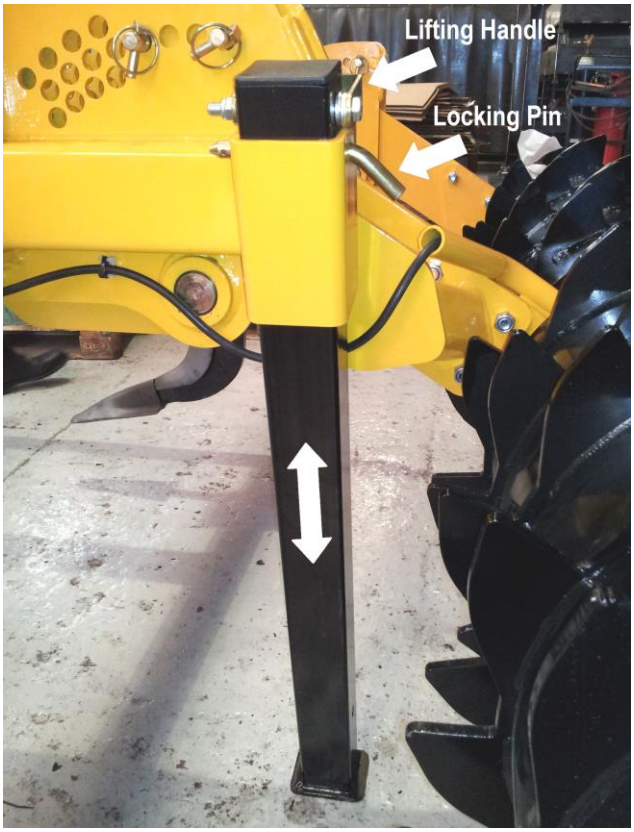
The wings and center frame must be level with each other when the machine is in the working position; occasional adjustment may be necessary should the frame protection pads suffer wear or compression. The addition of shims *(part number 23312.60)* placed behind the pads will allow for accurate alignment of the wings to the frame. Wings must be raised into the folded position to permit access to the pads.



Stand Legs

The machine is equipped with stand legs for use when the machine is being parked up or in storage.

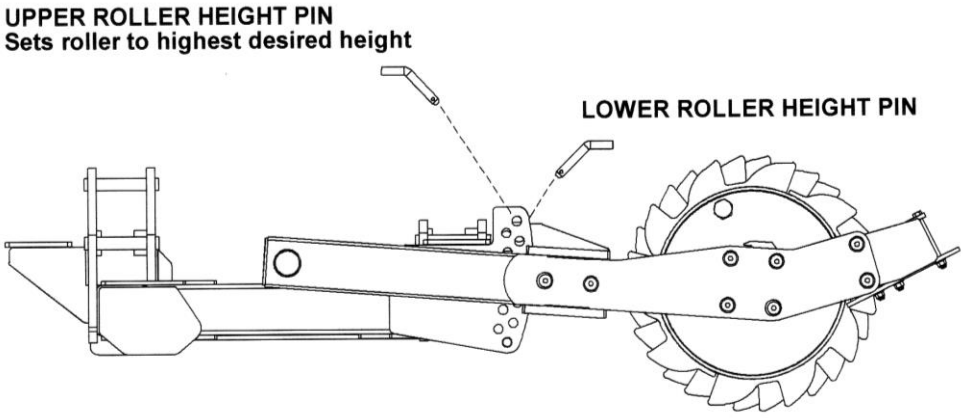
Stand legs must be placed into their raised position for transportation and work; the legs are secured in position with a lock pin and security pin.



Roller Height Adjustment – Folding Models with Mechanical Legs

With the machine raised clear of the ground; select the highest desired position on the adjustment bracket that you want the roller to achieve then insert the 'roller height pin' into a suitable hole on the adjustment bracket to set that height, this will need to be repeated at both ends of each roller, ensuring the same respective hole is selected on each. The machine may be worked with just these higher roller height pins inserted - this will allow continual rolling and compaction of the surface 'riding' any machine undulations up to a point where the machine is removed from the ground.

Alternately after inserting the higher pins the machine can be lowered, the points drawn into the ground to the desired depth, and lower pins located through the roller arms and frame to 'lock' the rollers to a determined height – in this mode the rollers will be 'fixed' therefore raising the machine will also raise the rollers.



Working with the lower pin removed permits roller movement for maximum ground contact
Working with the lower pin fitted prevents roller movement - roller will move with the machine.

CAUTION!

On 4000 & 5000 models it is vital that rollers are locked into their lowest possible position with their pins before attempting to fold the machine – failure to observe this will result in the rollers contacting each other causing damage to the machine.

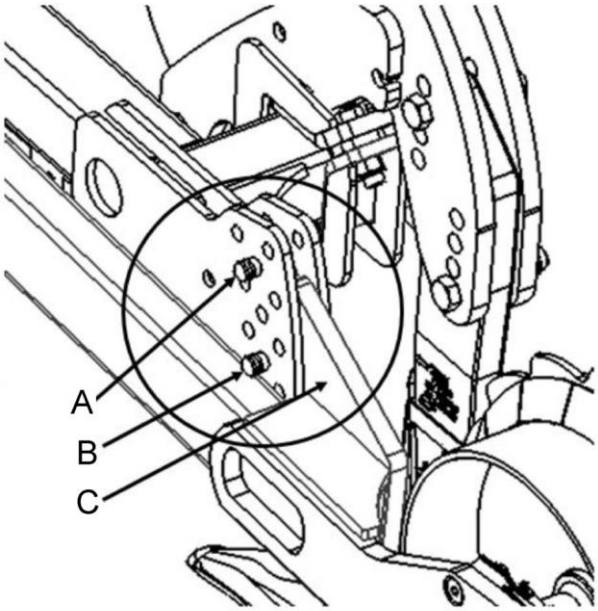
CAUTION!

Auto-Reset models should only be folded with the struts in the work position, never attempt to fold the machine if the struts are in 'break-back'.

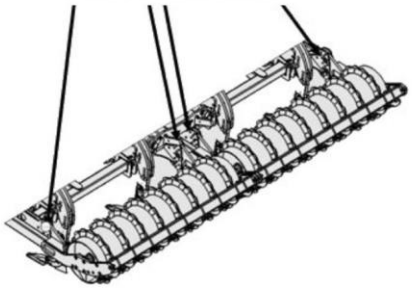
Roller Height – Folding Models with Auto-Reset Legs

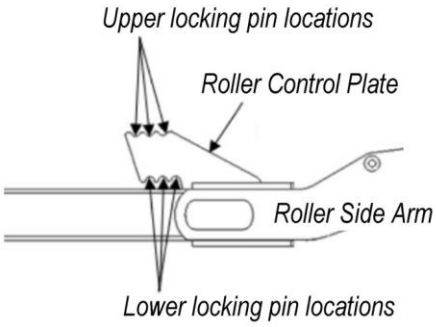
The rollers on these models are each fitted with 4 locking pins, 2 upper and 2 lower; the pins are used to control the working depth of the machine. Additionally, on 4000 & 5000 models they are also used to position the roller correctly before folding the machine for transportation.

Pins & Control Plate Identification



Pin Locations





A) Upper Locking Pin B) Lower Locking Pin C) Roller Control Plate

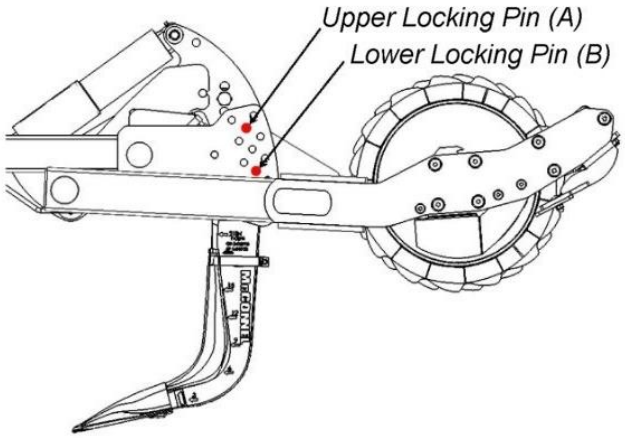
CAUTION! Upper locking pins (A) must be fitted and correctly positioned before attempting to fold the machine or pull the machine into the ground – failure to observe this can result in damage to the machine.

The procedures for placing the rollers into transport and work positions are described on the following pages.

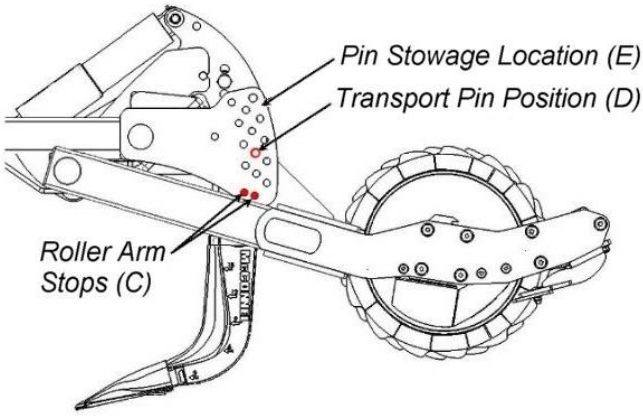
Positioning Rollers for Folding and Transport – 4000 & 5000 Models

Note: These instructions apply to all Auto-Reset 4000 & 5000 Folding Shakaerator builds regardless of the particular roller type fitted.

Work Position



Transport Position



Before attempting to fold the machine the rollers must be positioned in their lowest setting. The procedure is as follows;

1. Remove load off the lower locking pins ‘B’ by pulling the machine into the ground so that the weight of the machine is carried by the upper locking pins and the roller.
   Note; In the event of having to perform this task on ‘hard standing’, overhead lifting equipment would need to be used to raise the roller.

2. Remove the lower locking pins ‘B’ and lift the machine slowly out of the ground - the roller will now lower and come to rest against arm stops ‘C’.

3. Fit the 4 upper locking pins in hole positions ‘D’ at both ends of each roller.

4. The remaining 4 pins can be stowed in location ‘E’ (using any of the holes that are above position ‘D’) for safe storage during transport.

The machine can now be safely folded for transportation or storage.

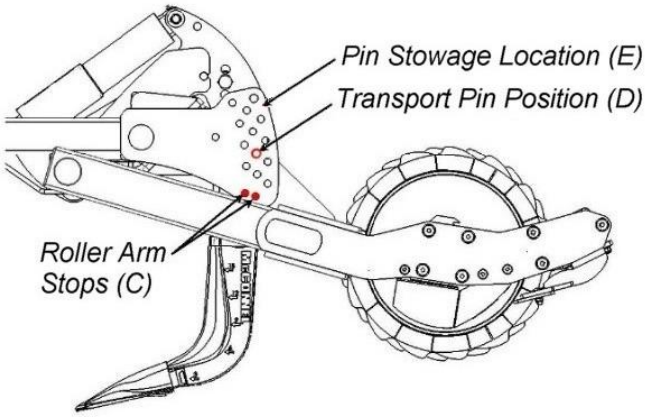
CAUTION! Failure to correctly position the rollers before folding the machine for transport can result in damage to machine and components.

Point Protection Guards – 4000 & 5000 Models

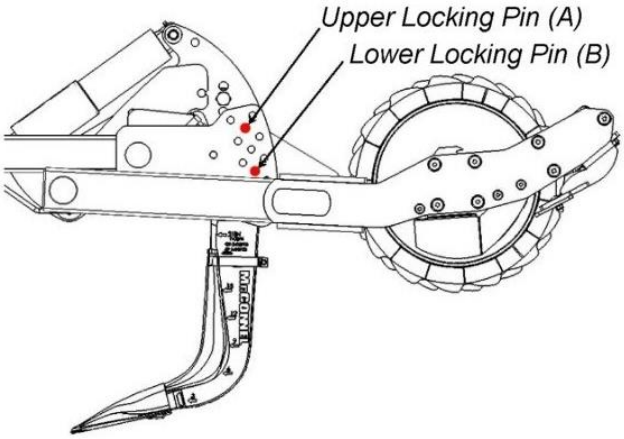
4000 & 5000 Folding models are supplied as standard with ‘Point Protector Guards’ these attach onto each rows of points with spring fixings. These guards are supplied not only to protect the machine from accidental collision damage but more importantly for the safety of others especially when transporting the machine on the highway or in public places.
It is therefore good practice and a wise precaution to ensure they are fitted at all times whilst the machine is in transport or when stored. When the machine is being worked the protectors can be stowed in their storage housing on the lighting bar.

Positioning Rollers for Work

Transport Position



Work Position



The procedure for setting the roller working depth is as follows;

1. With the machine located on the work site, unfold the wings.

2. Remove all 4 locking pins from their transport pin position ‘D’ and fit in the upper locking pin position ‘A’. These pins will control the working depth of the machine.

3. Pull the machine into the ground so that the weight of the machine is on the roller and the control plates are in contact with upper locking pins ‘A’.

4. Remove the remaining 4 pins from their transport stowage position ‘E’ and fit in their lower locking positions ‘B’.

Each roller arm is now controlled by the locking pins which are positioned above and below the roller control plates. This position provides a working depth of 18” *(457mm).*

Roller Position – Adjusting Working Depth
If adjustment to the working depth is required;

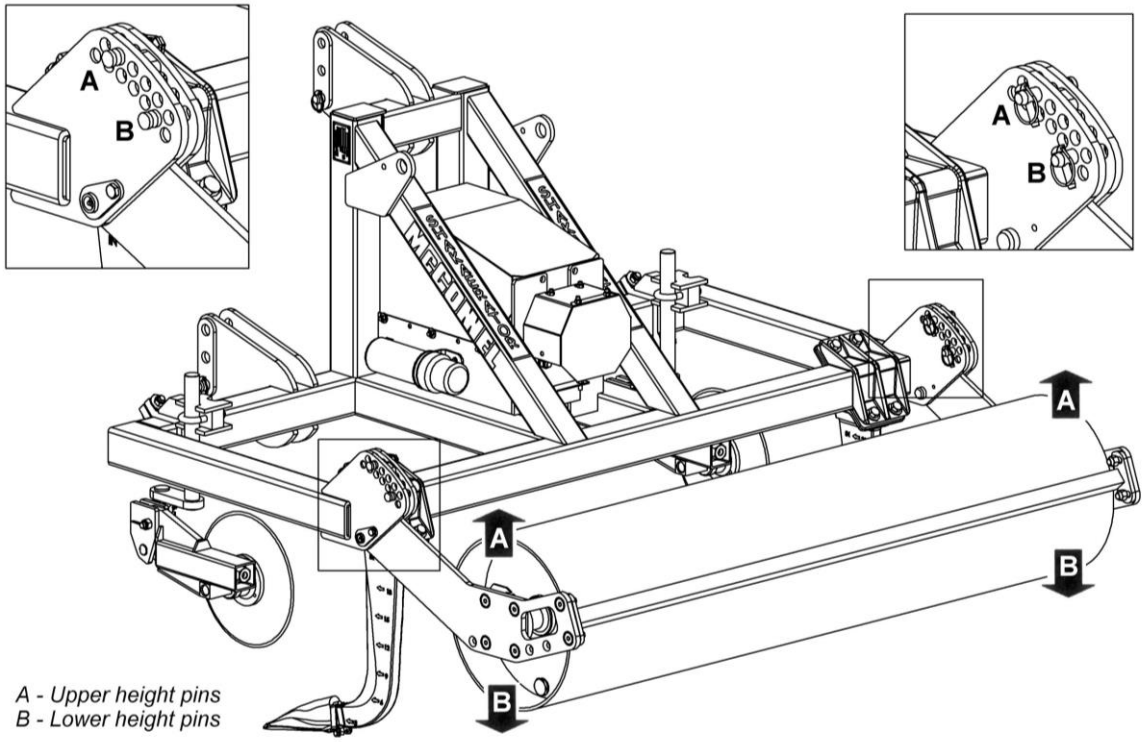
1. Remove the load from the upper locking pins by lifting the machine out of the ground then remove and refit the upper locking pins in either a lower position for shallower work or a higher position for deeper work. Ensure the same respective hole positions are selected on both rollers.

2. Draw the machine back into the ground so that the roller control plate comes up against the pins. Then install the lower locking pins in the highest position possible below the roller control plate.

NOTE: 6 roller positions are available giving adjustable working depths from 11” - 20” *(280mm to 508mm)* when using a 600mm Ridge Roller.
An additional 4 positions of adjustment are available at each leg assembly if required.

Roller Height

The working depth of grassland models is determined and regulated by the height at which the rear roller is set. A selection of holes in the roller bracket attachment point on each side the rear of the frame allows for a choice of height settings at which to set the roller. After selecting the desired height the ‘dog legged’ roller brackets are locked in position with the pins and lynch pins provided. Pin position ‘A’ indicated in the illustration below regulates the upper height and pin position ‘B’ the lower height. Ensure at all times that matching hole positions are selected on each side of the machine.

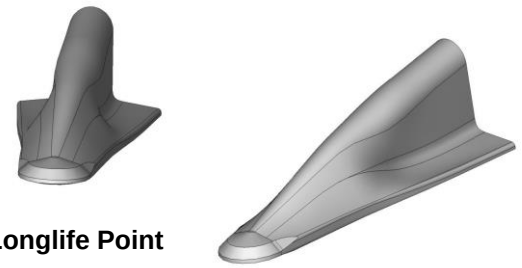


NOTE: It is advisable during transportation of the machine that the roller is locked ‘tight’ in position to avoid risk of the roller bouncing when traveling over rough terrain – this will reducing stress on components and increase stability of the carrying vehicle.

Point Types

Narrow points (Longlife Points)

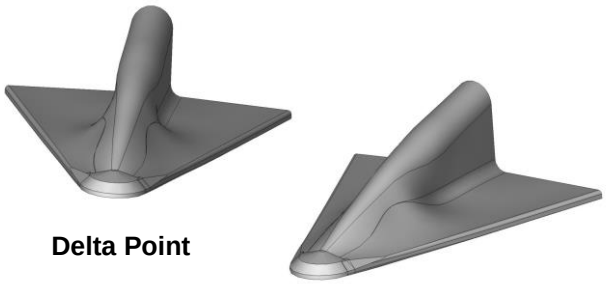
These are the normal choice for deep cultivation; the points will lift and shatter the soil structure with low draft and minimum mixing.



Longlife Point

Wide points (Delta Points)

Wide points will break up a bigger area of ground and can therefore be spaced further apart; particularly useful for shallow cultivations.



Delta Point

‘Knock On’ Point Attachment – 24” Leg Models only

Grassland Shakaerators with 24” Legs are fitted with ‘knock on’ type points. The machines are despatched with a special long handled hammer and safety glasses specifically for use in fitting these types of points; the head of the hammer is made of mild steel to reduce the possibility of ‘chipping’ the hardened points when striking them during fitment.

‘Knock On’ Point Fitment

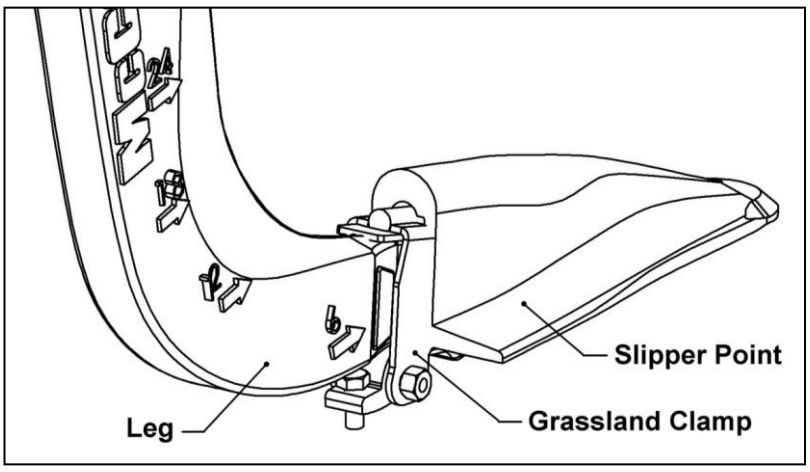
Check that the point socket is empty of any form of debris. The point must be tapped firmly onto the Shakaerator shank foot until the indentation in the shank socket engages the raised 'pip' cast in the shank.

If, by using reasonable force, the point will not engage far enough onto the shank foot, it is permissible to grind the corners of the shank until sufficient engagement is obtained. Care should be taken not to over grind, which would result in a loose fit and possible loss of the point when working.

WARNING! When fitting these types of points eye shields must always be worn.
When fitting points to shanks already fixed to the machine stand to the rear or to one side of the frame when using the hammer, do not crouch beneath the frame.

‘Slipper Point’ Attachment – 30” Leg Models only

Grassland Shakaerators use McConnel ‘Slipper’ Points which are securely held in position on each leg by a Grassland Clamp *(Part Number 21347.03)* as shown opposite.

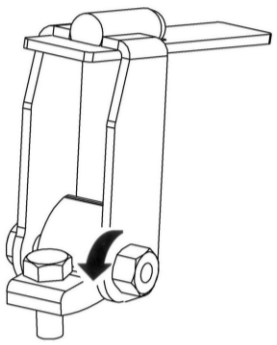


It is important to ensure correct fitment of the clamp and point to the leg.

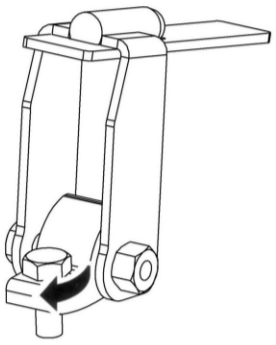
Incorrect fitment can result in the point coming loose or adrift during work.

The correct procedure for fitment is shown on the following page.

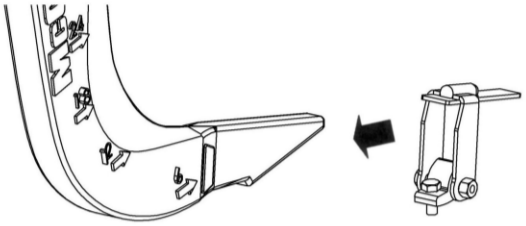
Grassland Clamp & Point Fitment – 30” Leg Models only

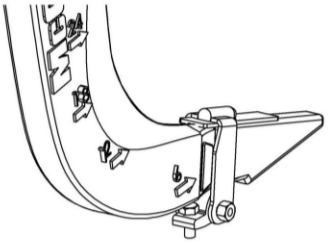


Slacken off clamp block retaining nut.

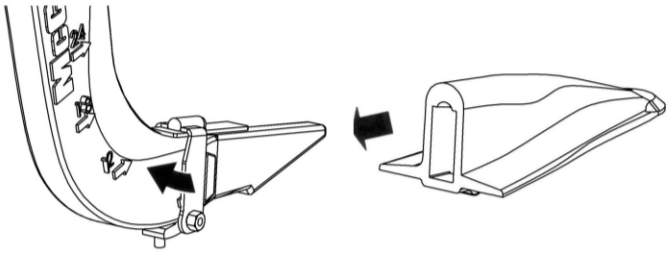


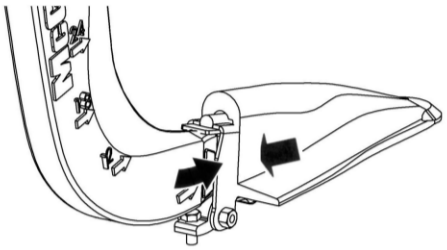
Screw adjuster bolt to its fully in position.



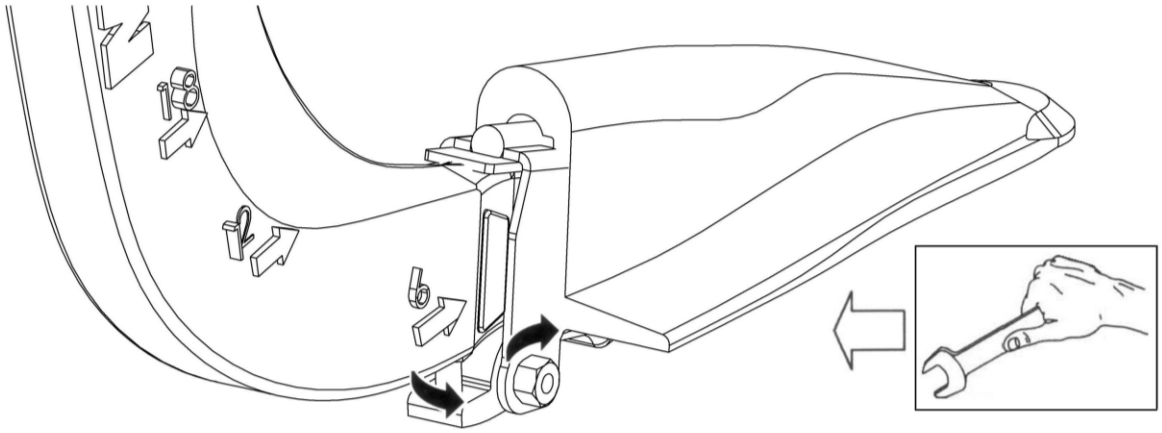


Locate clamp onto base of the leg with adjuster bolt to the rear - *do not secure at this stage.*

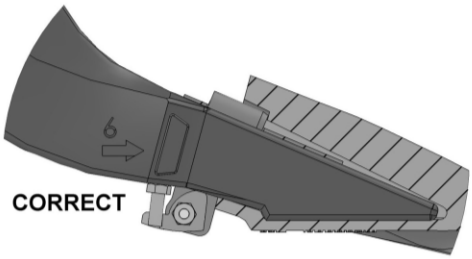


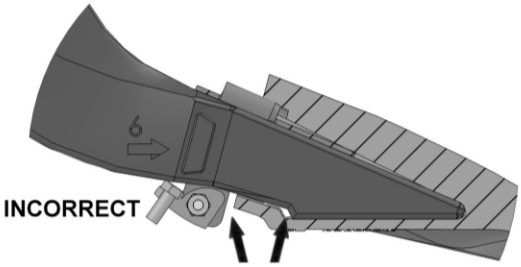


Locate slipper point over toe of leg as far as it will go ensuring tight contact on underside of leg - slide the nose of the clamp fully into the upper slot of the point as far as possible.



Tighten adjuster bolt and clamp block retaining nut to achieve a tight secure fitment.

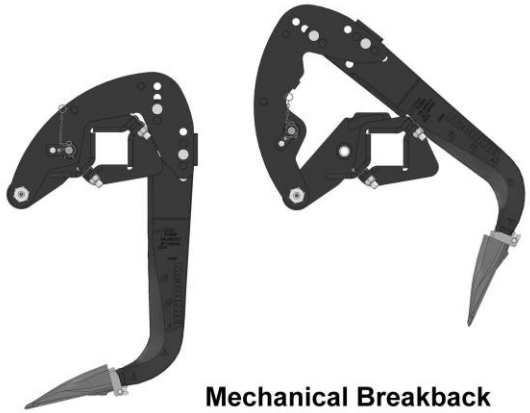




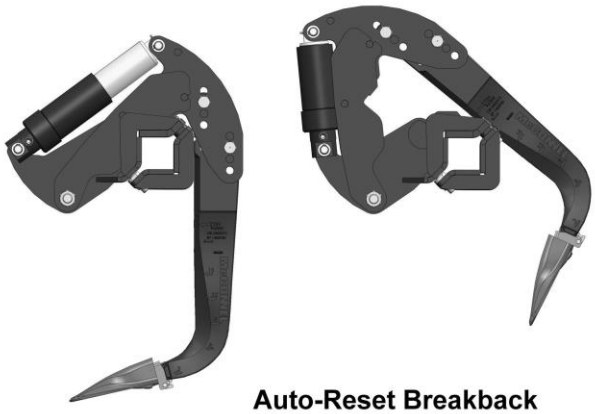
Breakback Protection Systems

There are 2 types of breakback protection systems available for the Grassland Shakaerator; these are Mechanical Breakback or Auto-Reset Breakback.

NOTE: Early Auto-Reset machines utilised hydraulic accumulators and rams to provide breakback - from late 2010 onwards this system is superseded by self-contained gas struts.



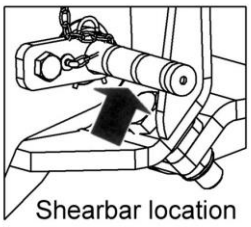
Mechanical Breakback

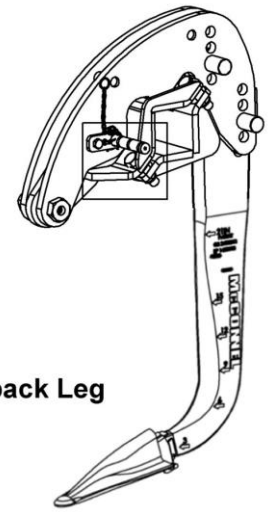


Auto-Reset Breakback

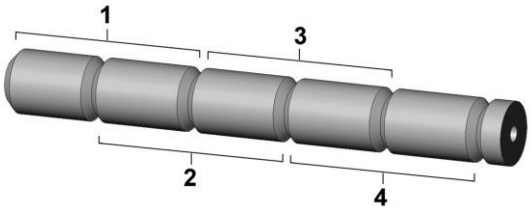
Mechanical Breakback System

This system works on a shear bar method where a contact force with an object in excess of a measured limit will shear the locking bar of the leg allowing it freedom to pivot backwards and upwards, thus protecting major components from damage. Each shear bar has a total of 4 'lives' before a replacement will be required.





Mechanical Breakback Leg



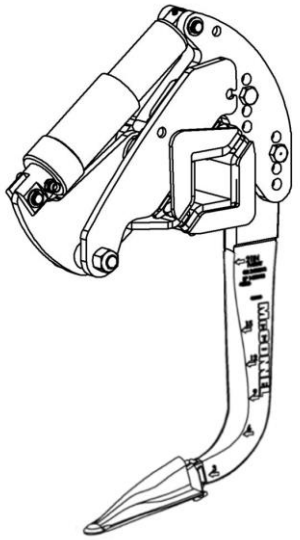
The '4 Lives' Shear Bar *(Part No. 22520.54)*

NOTE: It is important when replacing shear bars that genuine McConnel replacements *(Part No. 22520.54)* are used as these are specially designed to shear under a pre-determined force. Use of non-genuine parts will risk expensive damage to the machine and/or tractor. Under no circumstances should the shear bolt be replaced by a bolt or a metal rod.

Hydraulic Auto-Reset Breakback System (Early Machines)

This system provides protection via hydraulic rams and accumulators; each leg is held in the work position by a hydraulic ram pressurized by pre-charged accumulators. When an object is struck producing a force in excess of a measured limit, the oil in the rams is forced back into the accumulators allowing the leg to breakback. Once the obstruction has been passed the accumulators will return the oil to re-pressurize the ram which then automatically returns the leg into the work position.

DANGER! Keep clear of hydraulic legs when they are in the breakback position, residual pressure in the system may cause them to move without warning.

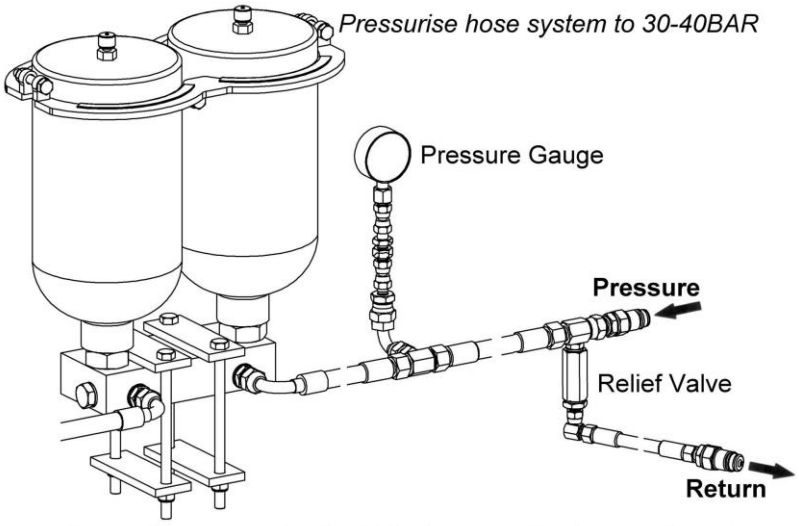


Auto-Reset Breakback Leg

Pressurising the Hose System

The hose system from the tractor spool valve should be pressurised to 30-40BAR, an inline pressure gauge is fitted for both measuring and checking of the pressure. Pressurise the system by operation of the tractor spool valve until the correct pressure is reached, the spool valve must be set to minimum flow during this procedure to allow control of the flow rate into the system and also prevent the relief valve from being 'overwhelmed' with oil. Once the correct pressure is achieved the tractor spool valve should be returned to the neutral position.

The pressure should always be checked prior to work and at regular intervals thereafter to ensure pressure remains within the specified limits.



Ensure hoses are plumbed into the same tractor spool service

Shanks

Shanks are made from extremely tough abrasive resistant steel and are subjected to a special heat treatment during manufacture. Do not attempt to hard face or otherwise weld the shank as this will destroy the shank's properties. Owners are reminded that no warranty can be entertained on shanks that show evidence of welding.

Shin guards, which can be supplied as an option, are made of special hard steel that will readily accept hard-face welding reinforcement.

CAUTION! Do not attempt to hard face or otherwise weld the shanks - this will destroy the shank's properties.

Hydraulic System (Hydraulic Breakback Models only)

The hydraulic system for hydraulic breakback models comprise of single acting rams plumbed into three hose runs. The circuit is primed at the factory prior to delivery of the machine and will only require bleeding when hydraulic components are replaced.

Bleeding the Hydraulic System

Before attempting to bleed the system the oil safety note below should be read and the advice strictly adhered to.

The 3 rams located at the ends of the hose runs are fitted with end caps, these will be the 2 outer rams and the centre ram. With the supply hoses attached to the tractor, loosen the end caps of the 3 rams – *do not loosen too much, ½ turn should be sufficient to allow the air to escape*. Start the oil flow and observe the end caps, when oil begins to escape from the end caps, stop the flow and re-tighten the end caps.

NOTE: Suitable containers should be used to catch any oil that escapes from the system – dispose of oil as advised by the manufacturer.

Oil Safety

Always wear suitable eye, hand and body protection when working with hydraulic oils – refer to the oil manufacturers' safety information for further details and advice.

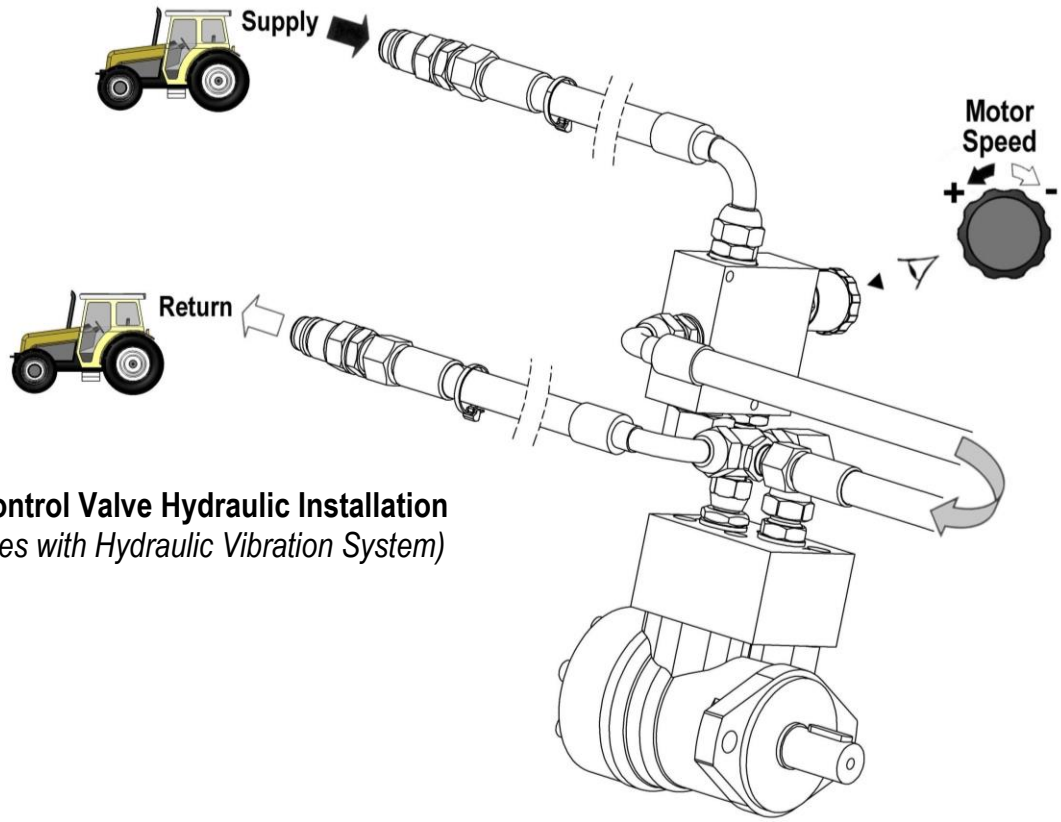
Escaping oil under pressure is extremely dangerous – never check for leaks with your hand, use a piece of cardboard or similar material held at arms length.

Accumulators
Machines with hydraulic breakaway utilise tandem accumulators that are pre-charged with nitrogen when they leave the factory. Valves are located on the top of the accumulator cylinders for charging purposes only – **do not open the valves or release the pressure;** re-charging the accumulators requires the correct use of specialised equipment and must only be performed by the manufacturer or dealers qualified in this subject.

Gas Struts
Later version auto-reset machines are equipped with Nitrogen filled Gas Struts; these are factory pre-charged to 100Bar and will not require any intervention or maintenance by the operator. The filling valve located on the base of the strut must not be opened or interfered with under any circumstances – any adjustments or maintenance to this component must only be carried out by specialists or the manufacturer.

WARNING! Folding machines fitted with Gas Struts must never be folded with a strut 'broken-back'. In the unlikely event of a problem that causes a gas strut to remain in the 'break-back position' the problem should be rectified or the strut removed before attempting to fold the machine; failure to observe this will result in the strut and the frame colliding.

Hydraulic Vibration System
In addition to the vibration systems primary function of dramatically increasing breakup of the soil, the use of controlled vibration can also reduce the tractive effort required to pull the legs of the machine through the ground, which is especially advantageous when working in drier conditions.
The hydraulic motor that operates the vibration unit is speed adjustable via a flow control valve; the speed at which the motor runs determines the level of vibration, in the fully open position the motor speed will be approximately 500 RPM. The minimum flow requirement is 50 l/min.
Hydraulic connections for the flow control valve are shown below. Return to the tractor should ideally be via the tractors free return allowing the motor to continue running when the spool valve is put into neutral; the same can be achieved by moving the tractors spool valve to 'float' if the option is available on the tractors spool selection lever.



Flow Control Valve Hydraulic Installation
(Machines with Hydraulic Vibration System)

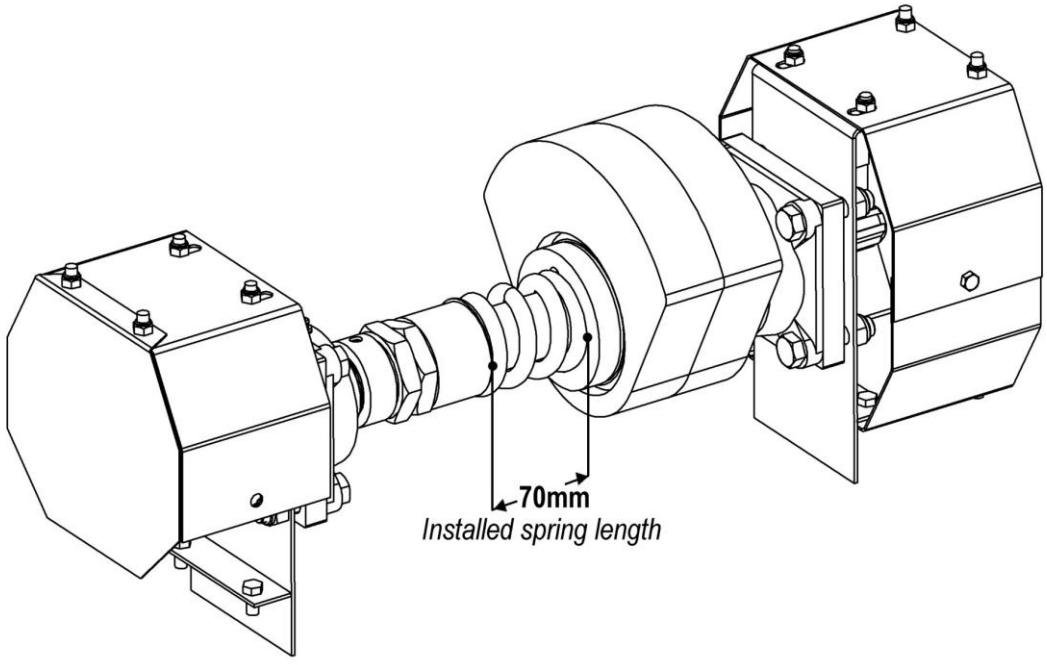
Service and Maintenance
Maintenance of the Shakaerator is limited to annually cleaning and re-packing the wheel bearings with grease, regularly checking the points for security and the clamp bolts for tightness. Rear roller and roller bracket greasing points should be lubricated on a daily basis prior to work and before storage of the machine.

Power Take Off Shaft
The PTO drive shaft and its guarding should be regularly examined to ensure that it is in good condition. The two halves of the plastic guard should be checked on a daily basis to ensure that they spin freely on the shaft. Ensure that all PTO shaft guard are fitted with torque chains to stop them from spinning with the shaft. Lubricate the shaft as indicated in the individual shaft leaflet provided with this component.

Vibrator Unit
This unit is used on all machines. The vibrator weight is carried by a shaft mounted in 'self-aligning' sealed ball bearings at each end. The bearings are housed in cast blocks in which the grease fitting is located. Grease passes into an annulus machined in the block from where it is forced into the bearing through a hole in the periphery of the outer race bearing.

CAUTION: It is of the greatest importance that these bearings are greased very sparingly. Excessive grease will blow out the seals and allow dust and dirt to enter the bearing and damage it. Once per season using a single stroke from a small push type domestic grease gun should be sufficient.

The vibrator weight is mounted on the shaft and allowed limited movement by compression of a spring against friction discs. Neither the bushes on which the weight rotates or the friction discs at either end should be lubricated. The tension applied on the friction discs is correct when the spring has been compressed to a length of 2⅞" *(70mm).*



CAUTION: Regularly check the tightness of the through drive mounting bolts. Any movement can elongate the bolt holes and damage the bearing blocks. Tighten to a torque of 200 ft.lbs *(275Nm).*

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