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PA55 *Mk2*
PA60 *Mk2*
PA65T
PA70T

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 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.

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. 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.

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

1.07. 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.

1.08. 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.

1.09. 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.

1.10. 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.

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

1.11.1. Hoses, exposed pipes and hydraulic tank breathers.

1.11.2. Filters.

1.11.3. Rubber mountings.

1.11.4. External electric wiring.

1.11.5. Bearings and seals.

1.12. *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.*
1.13. *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 Ltd 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.*

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 Hedgecutter / Grass Mower*

Product Code; *P55A, P60A, P65T, P70A*

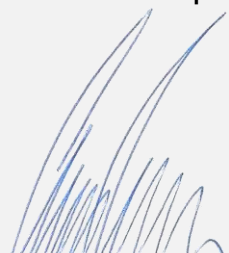
Serial No. & Date …… Type ……

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 953 (1997) + A1 (2009) 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: *September 2015*

POWER ARM INSPECTION AND MAINTENANCE

A daily equipment inspection of the tractor and mower should be conducted before the equipment is used. You may use the inspection sheets to assist with these daily inspections. Any damaged or missing guards should be repaired or replaced before operating the mower. Failure to repair the damaged shield can result in objects being thrown from the mower and possibly hitting the operator or bystander.

Inspect the Mower for Safe Operating Condition

- Make sure the driveline guards and shielding are in place and in good repair.
- Inspect the flexible thrown object shielding to assure that they are in place on the front and rear of the mower head and in good repair. Repair or replace any damaged or missing thrown object shields.
- Ensure the mower cutting height is set high enough to reduce the possibility of the mower blades contacting the ground. Actual height will be dependent on the ground conditions. Increase the height when working in rough or undulating conditions.
- Inspect for broken, chipped, bent, missing, or severely worn blades. Replace damaged blades before operating the mower. Ensure the blade retaining bolts and fasteners are secure and tight.
- Ensure all head bolts and nuts are tight.
- Lubricate the driveline universal joints and telescoping members daily.
- Grease the rotor and roller bearings and inspect their condition.
- Inspect for any oil leaks or damaged hoses
- Inspect for worn or damaged decals and safety instructions. Replace unreadable, damaged or missing safety decals.
- Follow the operator's manual(s) inspection and maintenance instructions for lubricating parts, and keeping thrown object shielding, driveline guards, rotating parts shields, mower blades and decals in good repair.

Inspect the Tractor for Safe Operating Condition:

- Inspect the controls, lights, SMVs (Slow Moving Vehicle sign), seat belts, and ROPS to assure that they are in place and in good working order.
- Be sure the tires, wheels, lug bolts/nuts are in good condition.
- Make sure the tractor brakes and steering are in proper operating condition.
- Follow the operator's manual(s) inspection and maintenance procedures for keeping the tractor in good and safe condition before operating.

The inspection sheet on the following page should be kept in this book as a record. A second sheet is included for you to cut out and photocopy or the inspection sheets can be downloaded from our website at;
http://www.mcconnel.com/support/aftersales/default.aspx?nav=After Sales

POWER ARM PRE-OPERATION Inspection

Power Arm ID _____ Date: _____ Shift: _____

WARNING 

Before conducting the inspection, make sure the tractor engine is off, the key removed, all rotation has stopped and the tractor is in park with the parking brake engaged. Make sure the mower head is resting on the ground or is securely blocked up and supported and all hydraulic pressure has been relieved.

Item	Condition at start of shift	Specific Comments if not O.K.
The Operator's Manual is in the Canister on the mower		
All Warning Decals are in place, clean and legible		
All Lights are clean and working		
The Mounting frame bolts are in place and tight		
The Arm pivot pins are tight and correctly secured		
There are no cracks in the arms		
The Hyd. Cylinder pins are tight and correctly secured		
The Hyd Cylinder hose connections are tight		
The Hyd. Pump hose connections are tight		
The Hyd. Valve hose connections are tight		
The Hyd. Valve controls function properly		
There are no damaged hoses		
The Oil level is to the green mark on the tank sight glass		
There is no evidence of Hydraulic oil leaks		
Flails are not missing, chipped, broken or excessively worn		
The Flail bolts are tight		
The Front & Rear Flaps are fittrd and in good condition		
The Front hood is in place and in good condition		
The Wire Trap is in good condition		
The Skid shoes are in good condition & tight		
There are no cracks or holes in flail casing		
The Hyd. motor mounting bolts are tight		
All Flail Head Nuts and Bolts are tight		
The Rotor Bearings are in good condition and greased		
The Roller bearings are in good condition and greased		
The drive line Shaft guard is in good condition		
The drive line shaft guard is correctly secured		
Controls are securely mounted in the cab		
With engine running check arm operation		
Have a spare pack of flails, bushes, bolts and nuts		

Operators Signature: _____

DO NOT OPERATE an UNSAFE TRACTOR or MOWER

TRACTOR PRE-OPERATION Inspection

Power Arm ID _____ Date: _____ Shift: _____

WARNING **Before conducting the inspection, make sure the tractor engine is off, the key is removed all rotation has stopped and the tractor is in park with the parking brake engaged. Any implement attached to the tractor is firmly on the ground.**

Item	Condition at start of shift	Specific Comments if not O.K.
The flashing lights function properly.		
All lights are clean and working correctly		
All cab windows are clean and wipers working correctly		
The SMV sign, where required, is clean and visible.		
The tyres are in good condition with correct pressure.		
The wheel nuts are tight.		
The tractor brakes are in good condition.		
The steering linkage is in good condition.		
There are no visible oil leaks.		
The hydraulic controls function properly.		
The ROPS or ROPS cab is in good condition.		
The seatbelt is in place and in good condition.		
The 3-point hitch is in good condition.		
The drawbar/pick up hook is secure & in good condition		
The PTO master shield is in place.		
The engine oil level is full.		
The brake fluid level is full.		
The power steering fluid level is full.		
The fuel level is adequate.		
The engine coolant fluid level is full.		
The radiator & oil cooler are free of debris.		
The air filter is in good condition		

Operators Signature: _____

DO NOT OPERATE an UNSAFE TRACTOR or MOWER

POWER ARM PRE-OPERATION Inspection

Power Arm ID _____ Date: _____ Shift: _____

WARNING 

Before conducting the inspection, make sure the tractor engine is off, the key removed, all rotation has stopped and the tractor is in park with the parking brake engaged. Make sure the mower head is resting on the ground or is securely blocked up and supported and all hydraulic pressure has been relieved.

Item	Condition at start of shift	Specific Comments if not O.K.
The Operator's Manual is in the Canister on the mower		
All Warning Decals are in place, clean and legible		
All Lights are clean and working		
The Mounting frame bolts are in place and tight		
The Arm pivot pins are tight and correctly secured		
There are no cracks in the arms		
The Hyd. Cylinder pins are tight and correctly secured		
The Hyd Cylinder hose connections are tight		
The Hyd. Pump hose connections are tight		
The Hyd. Valve hose connections are tight		
The Hyd. Valve controls function properly		
There are no damaged hoses		
The Oil level is to the green mark on the tank sight glass		
There is no evidence of Hydraulic oil leaks		
Flails are not missing, chipped, broken or excessively worn		
The Flail bolts are tight		
The Front & Rear Flaps are fittrd and in good condition		
The Front hood is in place and in good condition		
The Wire Trap is in good condition		
The Skid shoes are in good condition & tight		
There are no cracks or holes in flail casing		
The Hyd. motor mounting bolts are tight		
All Flail Head Nuts and Bolts are tight		
The Rotor Bearings are in good condition and greased		
The Roller bearings are in good condition and greased		
The drive line Shaft guard is in good condition		
The drive line shaft guard is correctly secured		
Controls are securely mounted in the cab		
With engine running check arm operation		
Have a spare pack of flails, bushes, bolts and nuts		

Operators Signature: _____

DO NOT OPERATE an UNSAFE TRACTOR or MOWER

TRACTOR PRE-OPERATION Inspection

Power Arm ID _____ Date: _____ Shift: _____

WARNING **Before conducting the inspection, make sure the tractor engine is off, the key is removed all rotation has stopped and the tractor is in park with the parking brake engaged. Any implement attached to the tractor is firmly on the ground.**

Item	Condition at start of shift	Specific Comments if not O.K.
The flashing lights function properly.		
All lights are clean and working correctly		
All cab windows are clean and wipers working correctly		
The SMV sign, where required, is clean and visible.		
The tyres are in good condition with correct pressure.		
The wheel nuts are tight.		
The tractor brakes are in good condition.		
The steering linkage is in good condition.		
There are no visible oil leaks.		
The hydraulic controls function properly.		
The ROPS or ROPS cab is in good condition.		
The seatbelt is in place and in good condition.		
The 3-point hitch is in good condition.		
The drawbar/pick up hook is secure & in good condition		
The PTO master shield is in place.		
The engine oil level is full.		
The brake fluid level is full.		
The power steering fluid level is full.		
The fuel level is adequate.		
The engine coolant fluid level is full.		
The radiator & oil cooler are free of debris.		
The air filter is in good condition		

Operators Signature: _____

DO NOT OPERATE an UNSAFE TRACTOR or MOWER

For best performance…

USE ONLY McCONNEL SERVICE PARTS

To be assured of the latest design improvements purchase your **'Genuine Replacements'** from the **Original Equipment Manufacturer**: **McCONNEL LIMITED** through your local Dealer or Stockist.

GENUINE PARTS ~ QUALITY SERVICE

LIST OF CONTENTS

Notes

READ THE BOOK FIRST

It might save hours and pounds later !

When ordering spare parts always quote

- ***The Machine Type***
- ***The Machine Serial Number***
- ***The Part Number***

Factory re-built service exchange units of the major hydraulic components are available from your Dealer

NOISE

The equivalent daily personal noise exposure from this machine, measured at the operators' ear, is within the range 78 – 85 DB. These figures apply to a normal distribution of use where the noise fluctuates between zero and maximum. The figures assume that the machine is fitted to a tractor with a quiet cab with the windows closed in a generally open environment. We recommend that the windows are kept closed. With the cab rear window open the equivalent daily personal noise exposure will increase to a figure within the range 82 – 88 DB. At equivalent daily noise exposure levels of between 85 and 90 DB, ear protection is recommended, it should be used if any window is left open.

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 machines.

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.

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:	

FEATURES

PA55, PA60, PA65T & PA70T – *all models*

- *Linkage mounted.*
- *Right or Left hand cutting.*
- *Front, Rear and Reverse Drive models.*
- *Cast iron gearbox.*
- *Operator guard.*
- *Hydraulic breakaway.*
- *108° powered slew.*
- *200 Litre hydraulic reservoir.*
- *Choice of Flailheads.*
- *65HP Hydraulic System*

PA55, PA60, PA65T & PA70T TI

- *Totally Independent Hydraulics - powered by tandem PTO pump.*
- *Independent reversible rotor on/off valve.*
- *65HP Hydraulic System.*
- *Cable Controls.*
- *Head Angle Float.*

PA55, PA60, PA65T & PA70T E

- *Totally independent hydraulics powered by tandem PTO pump.*
- *Independent reversible rotor on/off valve.*
- *Solenoid operated controls.*
- *Choice of 'Multi switch' or 'Joystick' controls.*
- *65HP Hydraulic System.*

PA65T & PA70T

- *Telescopic Dipper Arm*

OPTIONAL EXTRAS

- *Lift Float – available for all models.*
- *Electric Rotor Control – available for Electric models and above.*
- *Proportional Builds c/w Power Monitor.*
- *Proportional EDS Build.*

SAFETY INFORMATION

SAFETY INFORMATION

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 this machine, read and understand the following section to ensure that they are fully aware of the dangers that do, or may exist, and their responsibilities surrounding the use and operation of the machine.
The operator of this machine is responsible not only for their own safety but equally for the safety of others who may come into the close proximity of the machine, as the owner you are responsible for both.
When the machine is not in use the cutting head should be lowered to rest on the ground. In the event of a fault being detected with the machine's operation it should be stopped immediately and not used again until the fault has been corrected by a qualified technician.

POTENTIAL SIGNIFICANT DANGERS ASSOCIATED WITH THE USE OF THIS MACHINE:

▲ *Being hit by debris thrown by rotating components.*

▲ *Being hit by machine parts ejected through damage during use.*

▲ *Being caught on a rotating power take-off (PTO) shaft.*

▲ *Being caught in other moving parts i.e.: belts, pulleys and cutting heads.*

▲ *Electrocution from Overhead Power Lines (by contact with or 'flashover' from).*

▲ *Being hit by cutting heads or machine arms as they move.*

▲ *Becoming trapped between tractor and machine when hitching or unhitching.*

▲ *Tractor overbalancing when machine arm is extended.*

▲ *Injection of high pressure oil from hydraulic hoses or couplings.*

▲ *Machine overbalancing when freestanding (out of use).*

▲ *Road traffic accidents due to collision or debris on the road.*

BEFORE USING THIS MACHINE YOU MUST:

▲ *Ensure you read all sections of the operator handbook.*

▲ *Ensure the operator is, or has been, properly trained to use the machine.*

▲ *Ensure the operator has been issued with and reads the operator handbook.*

▲ *Ensure the operator understands and follows the instructions in operator handbook.*

▲ *Ensure the tractor front, rear and sides ar e fitted with metal mesh or polycarbonate guards of suitable siz e and strength to prot ect the operator against thrown debris or parts.*

▲ *Ensure tractor guards are fitted correctly , are undam aged and kept properly maintained.*

▲ *Ensure that all m achine guards are in pos ition, are unda maged, and are kept maintained in accordance with the manufacturer's recommendations.*

- *Ensure flails and their fixings are of a type recommended by the manufacturer, are securely attached and that none are missing or damaged.*

- *Ensure hydraulic pipes are carefully and correctly routed to avoid damage by chaffing, stretching or pinching and that they are held in place with the correct fittings.*

- *Always follow the manufacturer's instructions for attachment and removal of the machine from the tractor.*

- *Check that the machine fittings and couplings are in good condition.*

- *Ensure the tractor meets the minimum weight recommendations of the machine manufacturer and that ballast is used as necessary.*

- *Always inspect the work area thoroughly before starting to note obstacles and remove wire, bottles, cans and other debris.*

- *Use clear suitably sized warning signs to alert others to the nature of the machine working within that area. Signs should be placed at both ends of the work site. (It is recommended that signs used are of a size and type specified by the Department of Transport and positioned in accordance with their and the Local Highways Authority guidelines).*

- *Ensure the operator is protected from noise. Ear defenders should be worn and tractor cab doors and windows must be kept closed. Machine controls should be routed through proprietary openings in the cab to enable all windows to be shut fully.*

- *Always work at a safe speed taking account of the conditions i. e.: terrain, highway proximity and obstacles around and above the machine.*

- *Extra special attention should be applied to Overhead Power Lines. Some of our machines are capable of reach in excess of 8 metres (26 feet) this means they have the potential to well exceed, by possibly 3 metres (9' 9"), the lowest legal minimum height of 5.2 metres from the ground for 11,000 and 33,000 volt power lines. It cannot be stressed enough the dangers that surround this capability, it is therefore vital that the operator is fully aware of the maximum height and reach of the machine, and that they are fully conversant with all aspects regarding the safe minimum distances that apply when working with machines in close proximity to Power Lines. (Further information on this subject can be obtained from the Health & Safety Executive or your Local Power Company).*

- *Always disengage the machine, kill the tractor engine, remove and pocket the key before dismounting for any reason.*

- *Always clear up all debris left at the work area, it may cause hazard to others.*

- *Always ensure when you remove your machine from the tractor that it is left in a safe and stable position using the stands and props provided and secured if necessary.*

WHEN NOT TO USE THIS MACHINE:

▲ *Never attempt to use this machine if you have not been trained to do so.*

▲ *Never uses a machine until you have read and understood the operator handbook, are familiar with, and practiced the controls.*

▲ *Never use a machine that is poorly maintained.*

▲ *Never use a machine if guards are missing or damaged.*

▲ *Never use a machine on which the hydraulic system shows signs of wear or damage.*

▲ *Never fit, or use, a machine on a tractor that does not meet the manufacturer's minimum specification level.*

▲ *Never use a machine fitted to a tractor that does not have suitable front, rear and side(s) cab guarding made of metal mesh or polycarbonate.*

▲ *Never use the machine if the tractor cab guarding is damaged, deteriorating or badly fitted.*

▲ *Never turn a machine cutting head to an angle that causes debris to be ejected towards the cab.*

▲ *Never start or continue to work a machine if people are nearby or approaching - Stop and wait until they are at a safe distance before continuing. WARNING: Some Cutting Heads may continue to 'freewheel' for up to 40 seconds after being stopped.*

▲ *Never attempt to use a machine on materials in excess of its capability.*

▲ *Never use a machine to perform a task it has not been designed to do.*

▲ *Never operate the tractor or machine controls from any position other than from the driving seat, especially whilst hitching or unhitching the machine.*

▲ *Never carry out maintenance of a machine or a tractor whilst the engine is running – the engine should be switched off, the key removed and pocketed.*

▲ *Never leave a machine unattended in a raised position – it should be lowered to the ground in a safe position on a level firm site.*

▲ *Never leave a tractor with the key in or the engine running.*

▲ *Never carry out maintenance on any part or component of a machine that is raised unless that part or component has been properly substantially braced or supported.*

▲ *Never attempt to detect a hydraulic leak with your hand – use a piece of cardboard.*

▲ *Never allow children near to, or play on, a tractor or machine under any circumstances.*

FRONT MOUNTED MACHINES – Additional Safety Advice

During transportation and operation of 'Front-Mounted Machinery', the operator should be reminded that the machine is located further away from his point of vision than a rear mounted machine, and in many cases the immediate work area is out of view. Additional care should therefore be applied whilst working with machinery of this nature. The intended work area should be thoroughly scrutinised immediately prior to work to check for potential hidden hazards and dangers, bearing in mind that these many not be identifiable from the operating position on the tractor. Removable objects that may cause a hazard should be removed from the work area and any fixed hazards should be clearly indicated with a visible marker that can easily be seen from the operating position.
The operator should also be reminded that rotating cutting heads will throw debris either forwards or rearwards - dependent upon the nature of the job - it is therefore vital that suitable safety guarding is fitted where danger to the operator, bystanders or property exists. Tractor windows should be protected with suitable materials of the correct specification to ensure the safety of the operator whilst allowing good all round visibility without impairing the functions of the tractor. Any side guarding fitted to the tractor to protect it from thrown debris should be fitted in such a way that it does not further obscure the operators vision of the machine or the working area. – *Contact your tractor manufacturer or local dealer for advice on this subject.*

LIGHTING KITS

For added safety, the following Lighting Kits are available for this machine:

Rear Mount Lighting Kit *(Part No. 7155719)*
Front Mount Lighting Kit *(Part No. 7452774)*

NOTE: The front mount headlights are fully adjustable to suit differing conditions. It is the responsibility of the operator to ensure that they are correctly adjusted and are used within the confines of the law when working or transporting on a public highway, and that they do not impede the vision of, or cause hazard to, other road users - *Contact the Department of Transport or your Local Highways Authority to obtain detailed information on this subject.*

ADDITIONAL SAFETY ADVICE

TRAINING

Operators need to be competent and fully capable of operating this machine in a safe and efficient way prior to attempting to use it in any public place. We advise therefore that the prospective operator make use of relevant training courses available such as those run by the Agricultural Training Board, Agricultural Colleges, Dealers and McConnel.

WORKING IN PUBLIC PLACES

When working in public places such as roadsides, consideration should be paid to others in the vicinity. Stop the machine immediately when pedestrians, cyclists and horse riders etc. pass. Restart only when they are at a distance that causes no risk to their safety.

WARNING SIGNS

It is advisable that any working area be covered by suitable warning signs and statutory in public places. Signs should be highly visible and well placed in order to give clear advanced warning of the hazard. Contact the Department of Transport or your Local Highways Authority to obtain detailed information on this subject. The latter should be contacted prior to working on the public highway advising them of the time and location of the intended work asking what is required by way of signs and procedure. – '*Non-authorised placement of road signs may create offences under the Highways Act'.*

SUGGESTED WARNING SIGNS REQUIRED

"Road works ahead" *warning sign with a supplem entary* ***"Hedge cutting"*** *plate.* ***"For 1 mile"*** *or appropriate shorter distance may be added to the plate.*

"Road narrows" *warning sign with supplementary* ***"Single file traffic"*** *plate.*

White on blue ***"Keep right"*** *arrow sign on rear of machine.*

USE OF WARNING SIGNS

On two way roads one set of signs is needed facing traffic in each direction.
Work should be within 1 mile of the signs.
Work only when visibility is good and at times of low risk e.g.: NOT during 'rush-hour'.
Vehicles should have an amber flashing beacon.
Ideally, vehicles should be conspicuously coloured.
Debris should rem oved from the road and pat h as soon as practicable, and at regular intervals, wearing high visibility clothing and before removing the hazard warning signs.
Collect all road signs promptly when the job is completed.

Although the information given here covers a wide range of safety subjects it is impossible to predict every eventuality that can occur under differing circumstances whilst operating this machine. No advice given here can replace 'good common sense' and 'total awareness' at all times but will go a long way towards the safe use of your McConnel machine.

MINIMUM TRACTOR WEIGHTS - *including ballast weight if necessary.*
PA55 Model – 3500kg
PA60 Model – 3600kg
PA65T Model – 4000kg
PA70T Model – 4500kg

MINIMUM HP REQUIREMENTS:
All models – 65HP

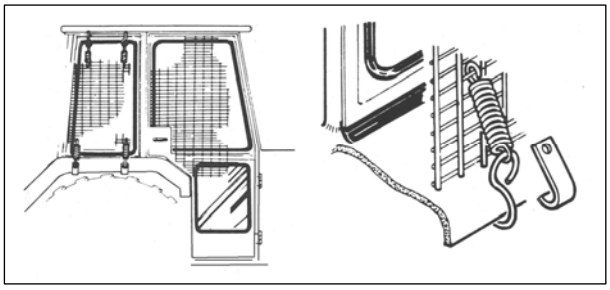
LINKAGE:
Category 2

PTO SHAFT:
Tractor must be equipped with a live drive PTO to enable forward motion to be stopped while the flailhead continues to operate.

CHECK CHAINS/STABILIZERS:
Check chains or stabilizers must be fitted and tightened.

FRONT MOUNTED MODELS
Before fitting a front mounted machine to your tractor, seek advice from the tractor manufacturer or dealer regarding its suitability and additionally any necessary linkage, ballast or weight requirements that may be needed.

VEHICLE/ TRACTOR PREPARATION



We recommend vehicles are fitted with cabs using safety glass windows and protective guarding when used with our machines.
Fit Operator Guard (part no. 73 13 324) using the hooks provided. Shape mesh to cover all vulnerable areas.
Remember the driver must be looking through mesh and/or polycarbonate glazing when viewing the flail head in any working position - unless the vehicle/ cab manufacturer can demonstrate that the penetration resistance is equivalent to, or higher than, that provided by mesh/polycarbonate glazing. If the tractor has a roll bar only, a frame must be made to carry both mesh and polycarbonate glazing. The operator should also use personal protective equipment to reduce the risk of serious injury such as; eye protection (mesh visor to EN1731 or safety glasses to EN166), hearing protection to EN352, safety helmet to EN297, gloves, filter mask and high visibility clothing.

Vehicle Ballast: It is imperative when attaching 'third-party' equipment to a vehicle that the maximum possible stability of the machine and vehicle combination is achieved – this can be accomplished by the utilisation of 'ballast' in order to counter-balance the additional equipment added.
Front weights may be required for rear mounted machines to place 15% of total outfit weight on the front axle for stable transport on the road and to reduce 'crabbing' due to the drag of the cutting unit when working on the ground.
Rear weights may be required to maintain a reasonable amount of rear axle load on the opposite wheel from the arms when in work; for normal off-ground work i.e. hedge cutting this should be 20% of rear axle weight or more for adequate control, and for ground work i.e. verge mowing with experienced operators, this can be reduced to 10%.
All factors must be addressed in order to match the type and nature of the equipment added to the circumstances under which it will be used – in the instance of Power Arm hedgecutters it must be remembered that the machines centre of gravity during work will be constantly moving and will differ from that during transport mode, therefore balance becomes critical.

Factors that effect stability:

- *Centre of gravity of the tractor/machine combination.*
- *Geometric conditions, e.g. position of the cutting head and ballast.*
- *Weight, track width and wheelbase of the tractor.*
- *Acceleration, braking, turning and the relative position of the cutting head during these operations.*
- *Ground conditions, e.g. slope, grip, load capability of the soil/surface.*
- *Rigidity of implement mounting.*

Suggestions to increase stability:

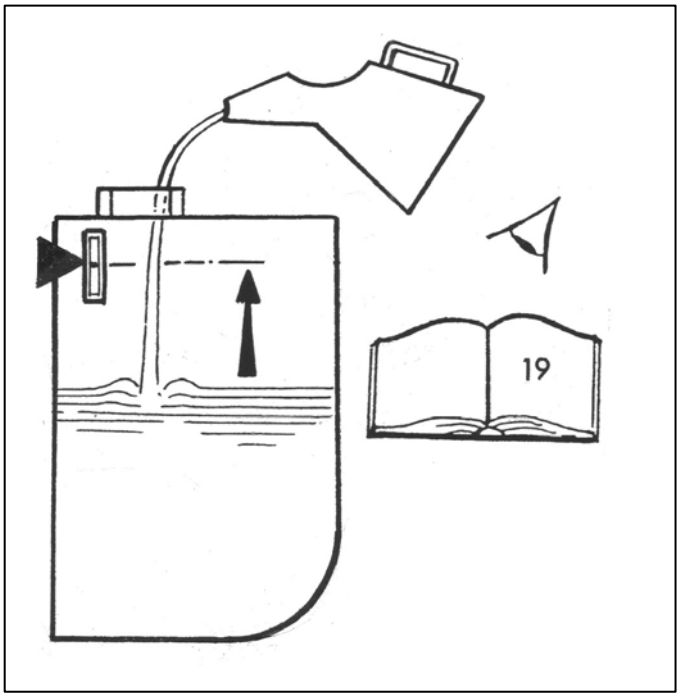
- *Increasing rear wheel track; a vehicle with a wider wheel track is more stable.*
- *Ballasting the wheel; it is preferable to use external weights but liquid can be added to around 75% of the tyre volume – water with anti-freeze or the heavier Calcium Chloride alternative can be used.*
- *Addition of weights – care should be taken in selecting the location of the weights to ensure they are added to a position that offers the greatest advantage.*
- *Front axle locking, check with tractor manufacturer.*

The advice above is offered as a guide for stability only and is not a guide to vehicle strength. It is therefore recommended that you consult your vehicle manufacturer or local dealer to obtain specific advice on this subject, additionally advice should be sought from a tyre specialist with regard to tyre pressures and ratings suitable for the type and nature of the machine you intend to fit.

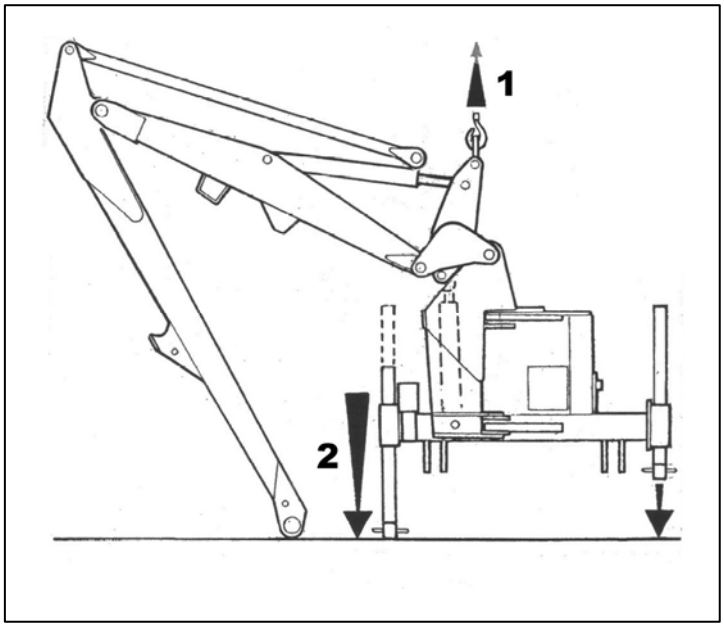
INITIAL ATTACHMENT TO TRACTOR

The machine will be delivered in a partially dismantled condition, secured with transport strap and banding.

- Choose a **firm level site**.
- Remove the transport strap, banding straps and loose items.
- Fill tank with oil – *refer to page 28 for a list of recommended oils.*

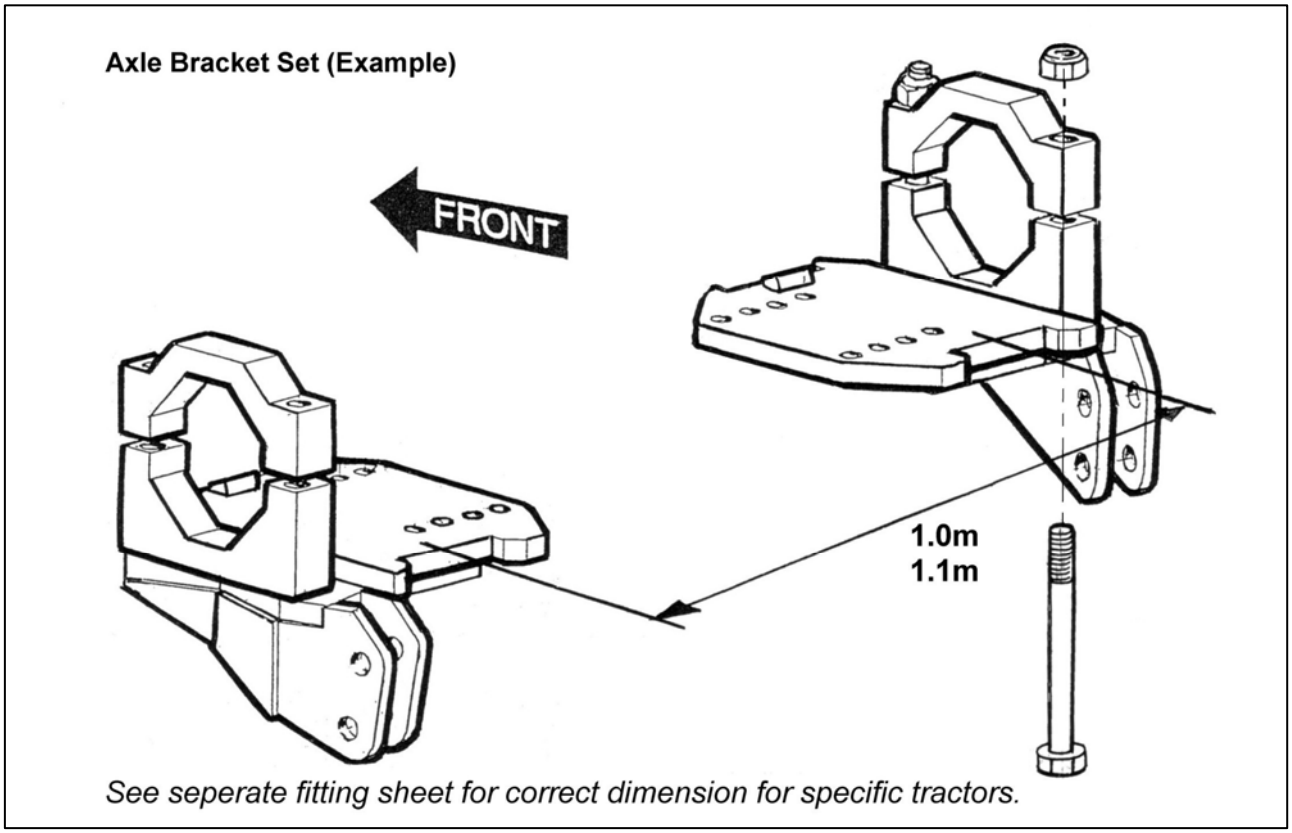


- Raise the machine using overhead lifting equipment with a minimum capacity of 1500kg SWL. **LEAVE IN POSITION AT THIS STAGE.**
- Lower the legs and pin in position selecting the holes that position the machines gearbox stub shaft approx. 75 mm below the tractors P.T.O. shaft.
  Note: Leg pin position used.
- Unbolt stabiliser from machine and remove the stabiliser nose quadrant pin.



WARNING!
Always place and secure the lifting eye on the machines rocker into its stowed position when not in use. **Never** attempt to operate the machine with the lifting eye out of its stowed position – failure to observe this may result in damage to machine components.

AXLE BRACKET/CATCH ASSEMBLY – Fitting by Dealer



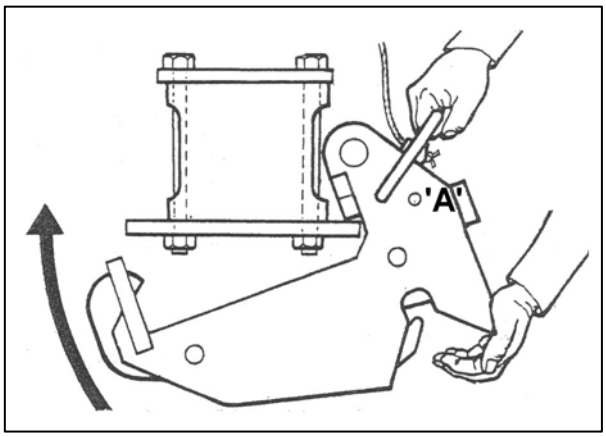
See seperate fitting sheet for correct dimension for specific tractors.

Bolt axle plates to the tractor axle at either 1.0M or 1.1M apart - this may necessitate the to removal of the tractor's check chains and/or assister ram brackets, if this is the case the axle plate will include replacement brackets for these functions.

The axle brackets supplied will be accompanied by a fitting sheet with instruction for their attachment to your tractor, follow the instructions exactly as they are specific to your particular make and model of tractor. Replace assister ram(s) if fitted.

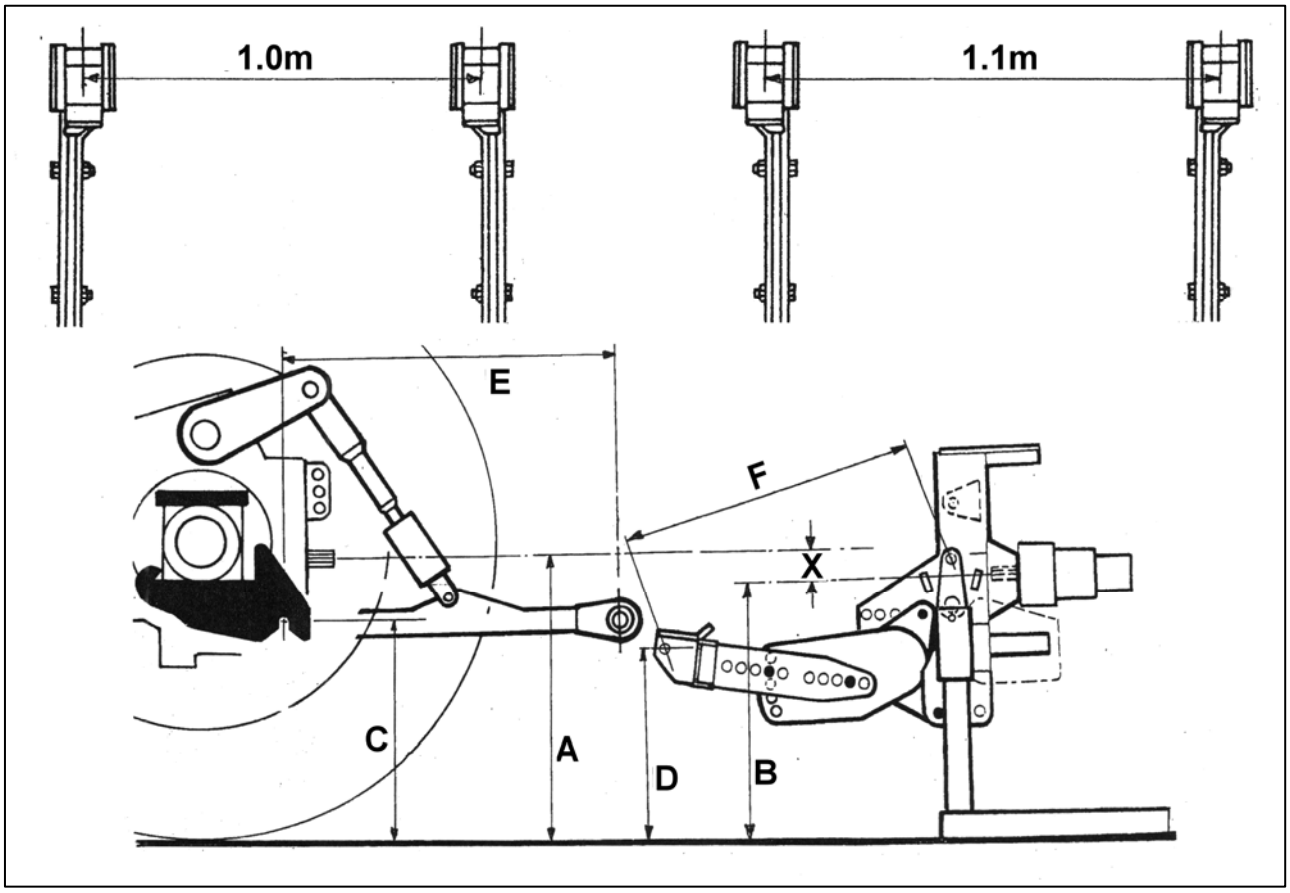
Hook the catch assemblies onto the rear of the axle plates, push firmly against the plate and vigorously pivot the catch in a forward and up direction until the spring loaded hook 'snaps' into position. Pass the release cords up into the cab.

NOTE:
On some tractors fitted with auxiliary fuel tanks, there is insufficient space for the spring catches to be fitted, in thes e instances special axle brackets and catches with a 'pin on' facility are available on request.

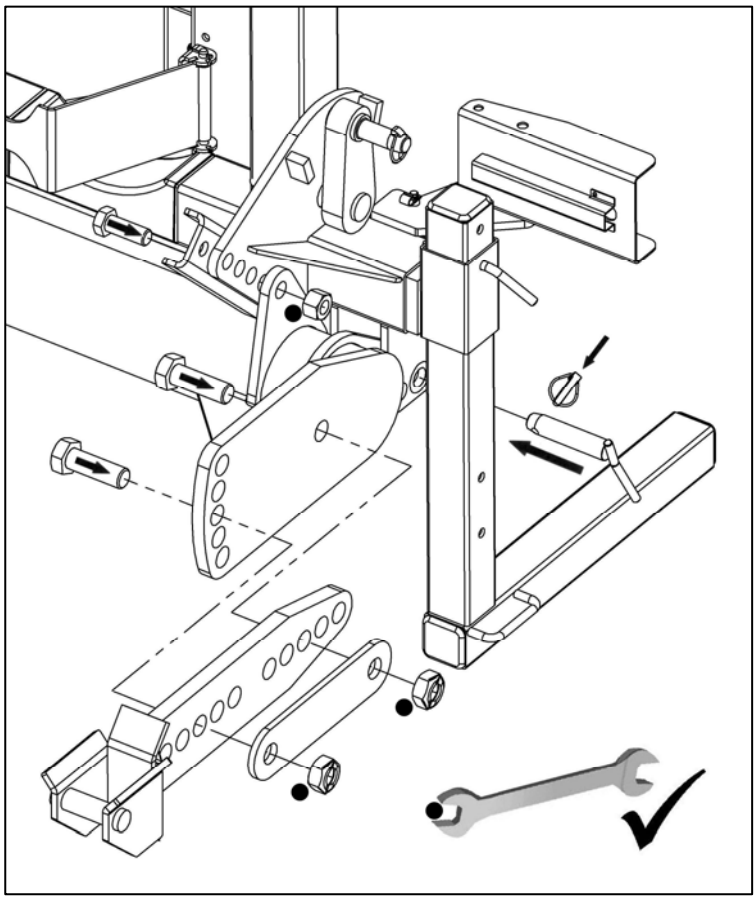


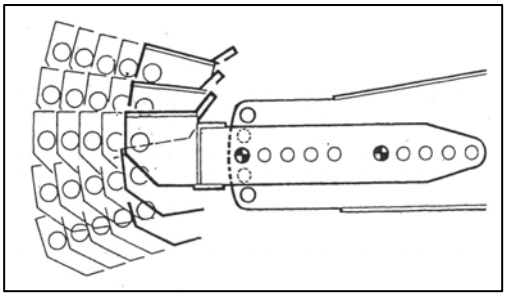
Ensure catch-locking pin 'A' is removed.

STANDARD TYPE BRACKETS



Locate axle-mounting arms onto the mainframe and secure in position using the correct nuts and bolts supplied, tighten nuts when correct hole location has been selected - *see below for details on mounting hole selection.*





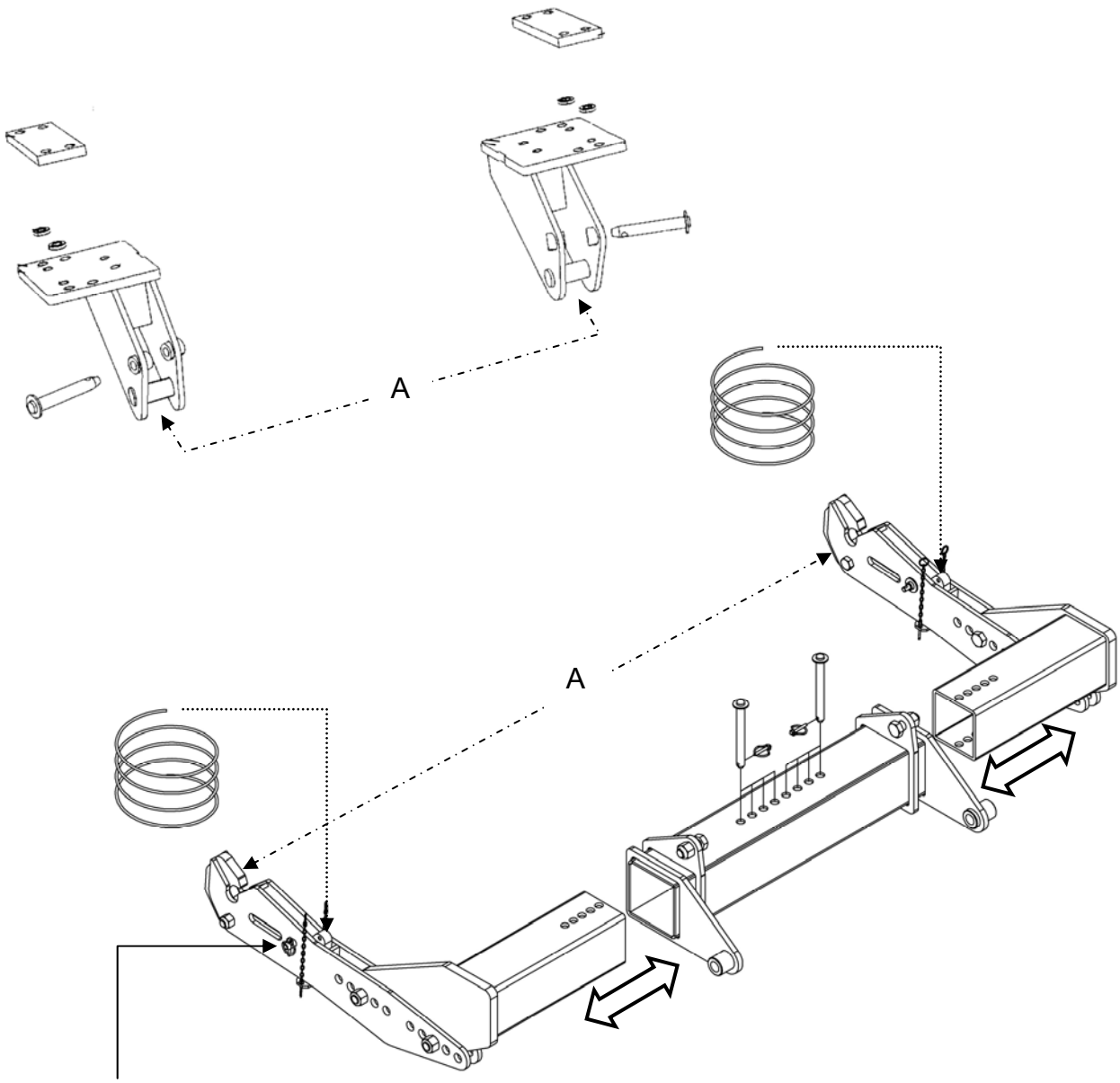
With the frame in the vertical position, measure dimensions 'A' and 'B', subtract 'B' from 'A' to obtain measurement 'X'. Measure dimension 'C'.

Select mounting holes which position the mounting bars in the end of the latch arms so that dimension 'D' equals dimension 'C' minus measurement 'X' and also when the draft link is horizontal and the rocking draft pin is in the upright position dimensions 'E' and 'F' are equal.

Frame Adjustment

Measures the distance between the centres of the existing brackets fitted to the tractor's axle and adjust the frame (by equal amounts each side) to the same width by sliding the outer mounts within the frame, secure in position with the pins provided – *see diagram below.*

Attach cords to latches at the positions indicated to assist future removal of the frame – stow cords neatly where they will not 'foul' any components or moving parts.

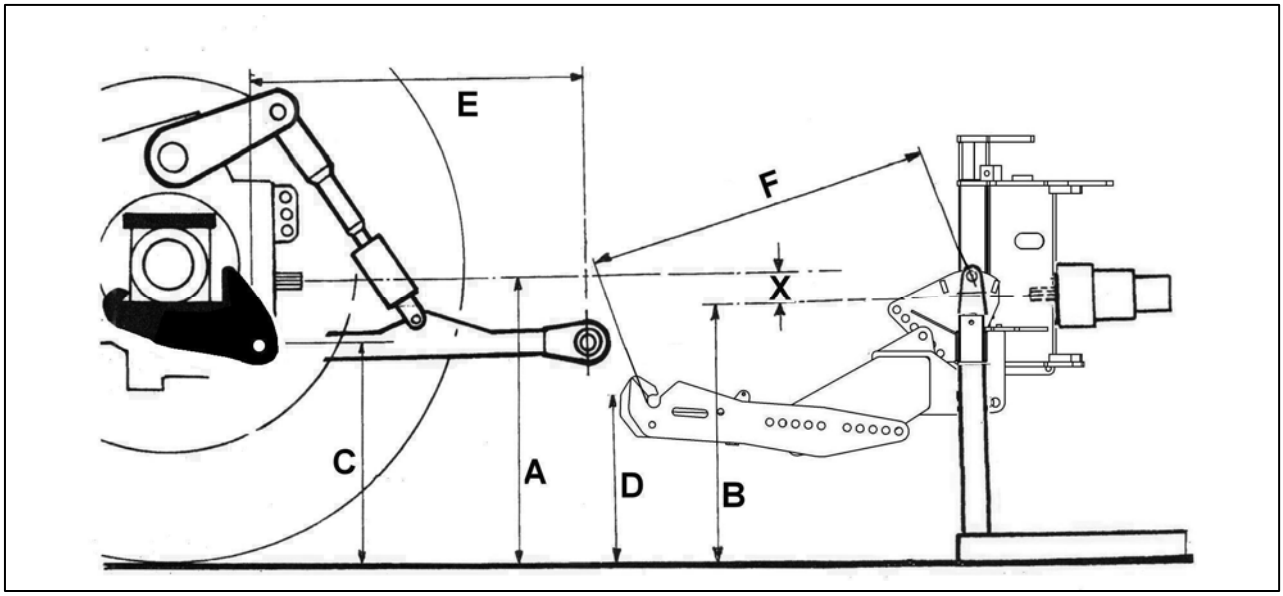


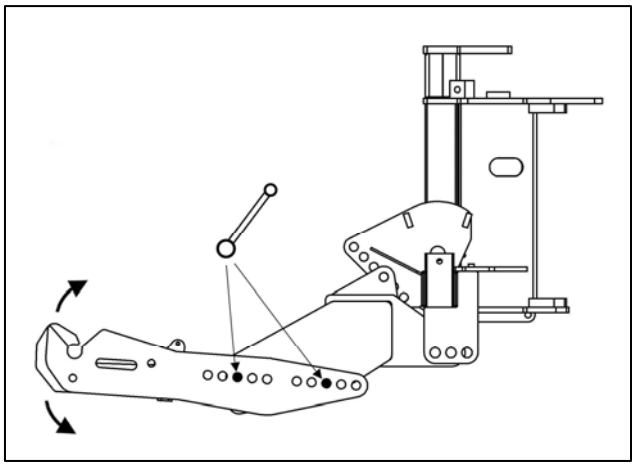
Pins illustrated in the locked positi on – pins should be rem oved only for attachment or removal of the bracke ts, once brackets are conn ected the pins must be replaced to lock the latches in place.

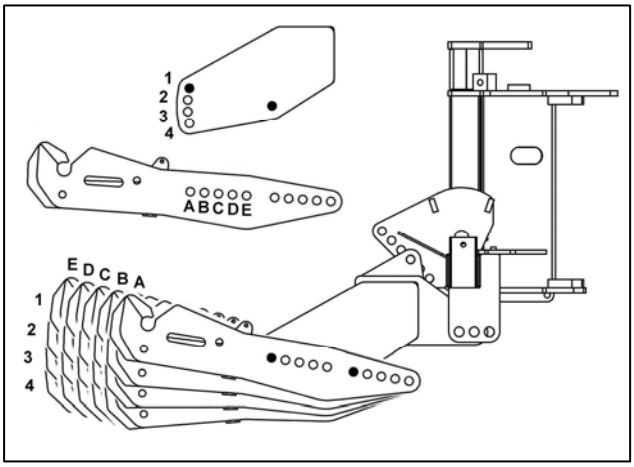
Note: locking pins are located through the arms and above the latches.

The correct mounting position is determined by the formula outlined below -
Note: in some cases certain tractors hav e a low PTO and/or sma ll wheels and therefore have limited ground c learance, where this is the case, the oper ator must decide what is sufficient ground clearance for his needs; where t here is insufficient ground clearance t he latch arms can be piv oted down to a lower position. W hen doing this be aware that it will cause the PTO shaft to becom e mis-aligned - Ensure you do not exceed the angular m is-alignment allowed by the PTO shaft m anufacturer and rem ember that this will reduc e the working life of the shaft, increase noise and cause vibration.

ALTERNATIVE TYPE BRACKETS

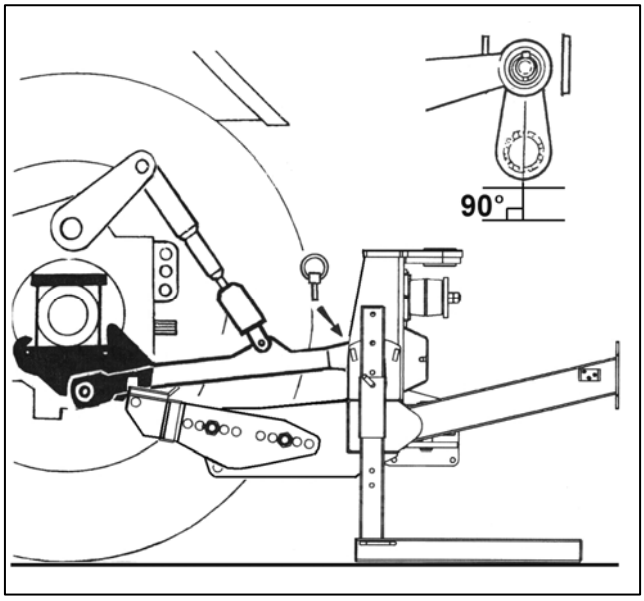




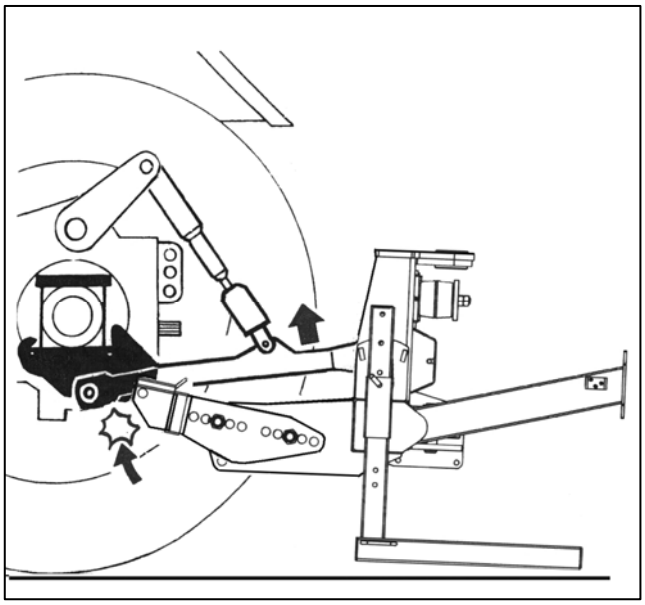


With the frame in the vertical position, measure dimensions 'A' and 'B', subtract 'B' from 'A' to obtain measurement 'X'. Measure dimension 'C'.
Select mounting holes which position the mounting bars in the end of the latch arms so that dimension 'D' equals dimension 'C' minus measurement 'X' and also when the draft link is horizontal and the rocking draft pin is in the upright position dimensions 'E' and 'F' are equal.

Reverse tractor squarely into position adjacent to the machine and connect the draft links to the machine - *manoeuvre tractor until both dr aft pin rockers are vertical.*



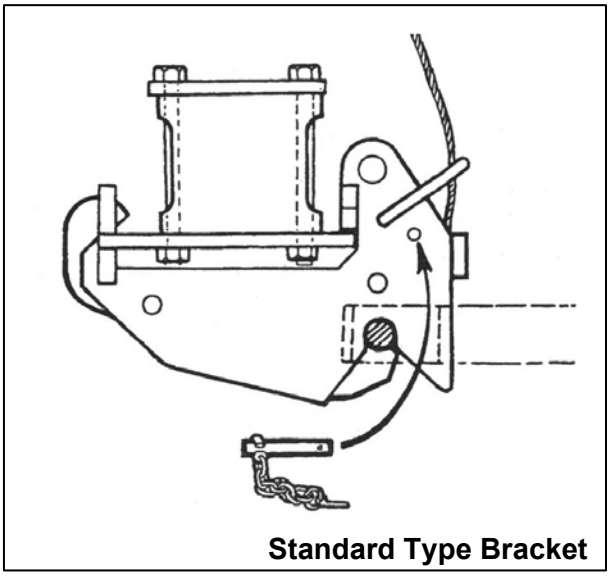
Raise the machine on the tractors linkage sufficient only for the latch bar to fully engage in the axle catch.



WARNING!
The quadrant lever or machine controls must only be operated from the tractor seat. Ensure no one is standing close to or within the linkage arms or bars.

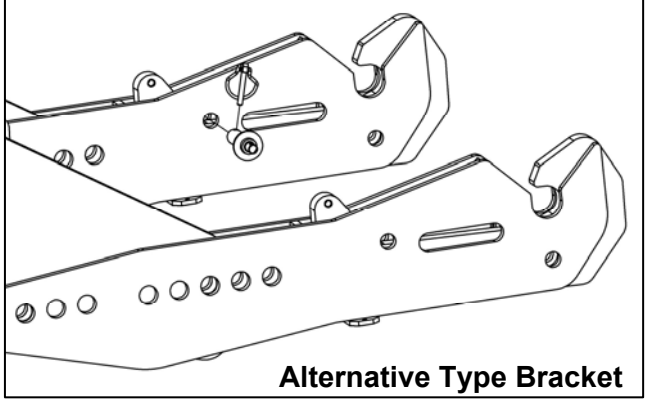
NOTE:
Be aware - as lift occurs the machinery may tilt slightly.

Insert catch lock pins – *refer to diagrams below for specific type*



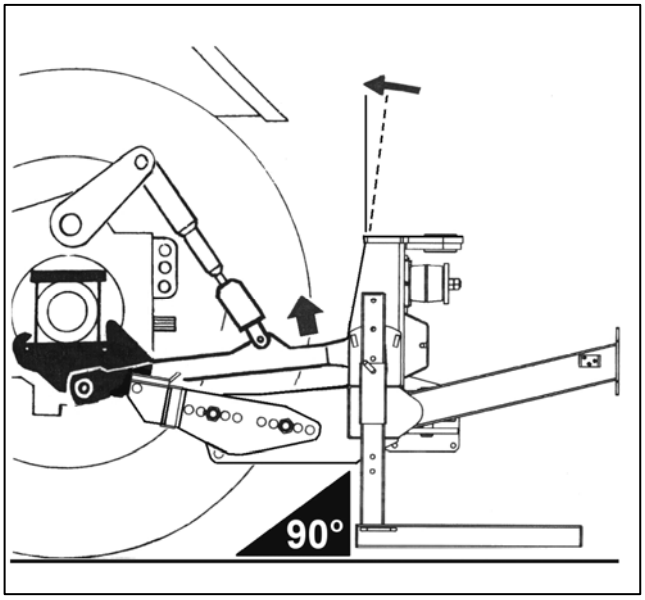
Standard Type Bracket

Locking Pins on this type of bracket pass through the arms above the latches and are secured with lynch pins.

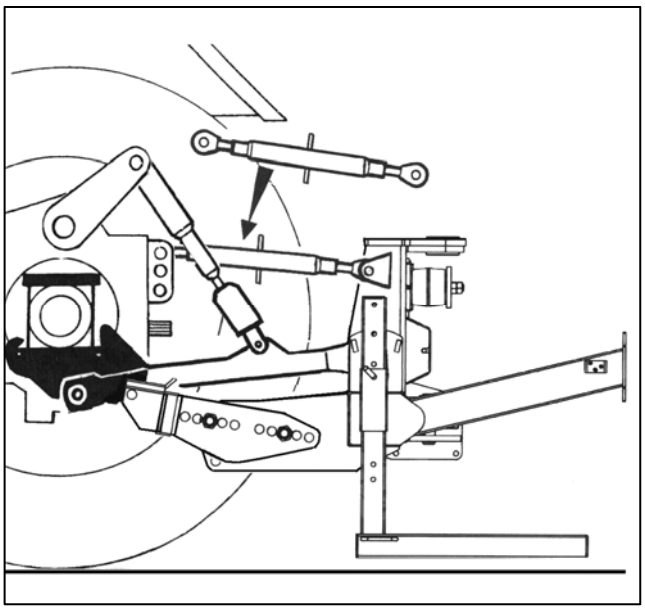


Alternative Type Bracket

Raise the machine on the tractors linkage until the frame is vertical.

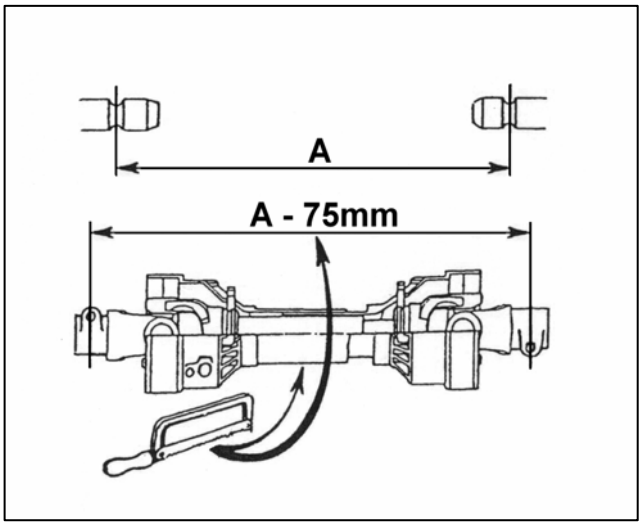


Fit top link.



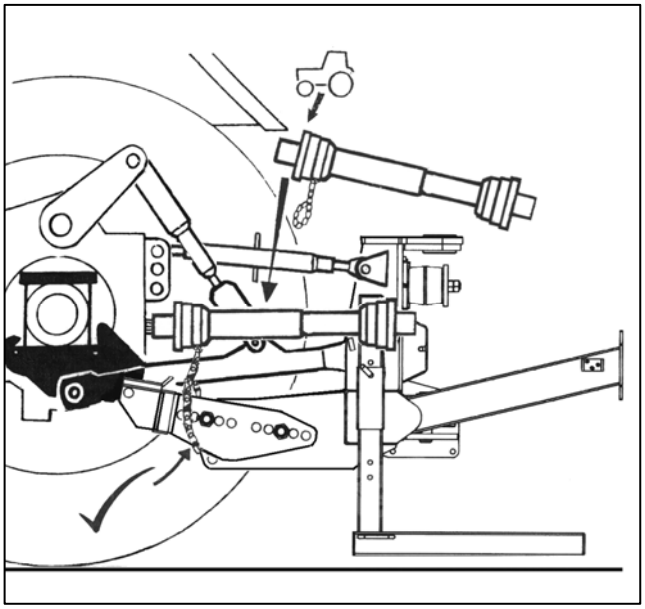
Measure PTO shaft and cut to dimension shown (distance 'A' minus 75mm) - *see diagram opposite and refer to maintenance section for further details.*

NOTE:
For subsequent use on a different tractor measure again - ther e must be a minimum of 6" (150mm) of shaft overlap.



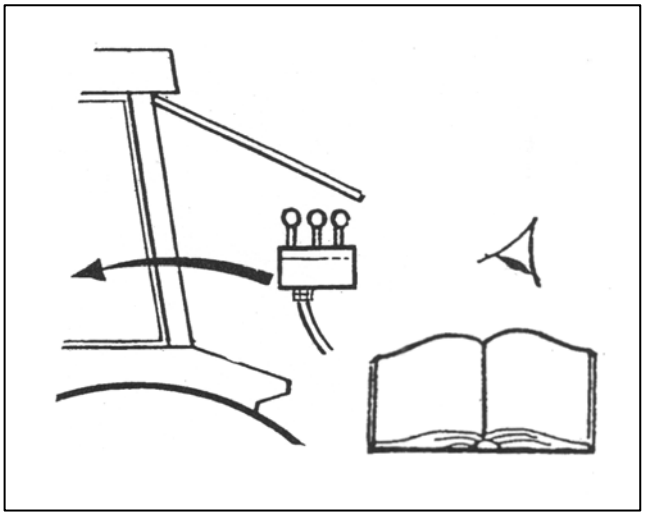
Fit PTO shaft into position.

Attach the torque chains to a convenient location to prevent rotation of the shaft guards.

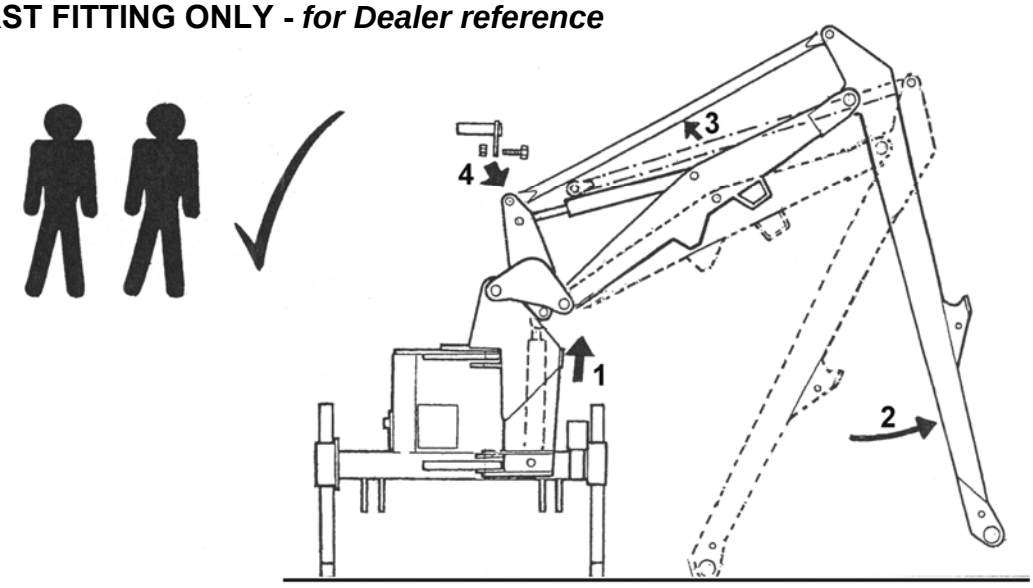


Fit machine controls into the cab - *refer to the specific page on t his subject for further details.*

NOTE: VFR Models with security lock tap
Where fitted this lock tap must be opened before attempting to operate the machine – *refer to page 25 for further details.*



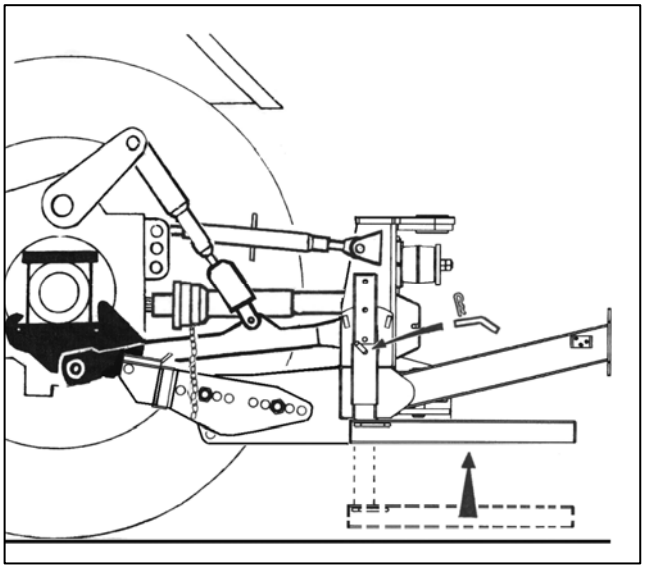
FIRST FITTING ONLY - *for Dealer reference*



Request assistance.

- Operate 'Lift up' on machine controls sufficient only for the dipper arm to clear the ground.
- Pivot out the dipper until the tension link can be reconnected.

Raise the stand legs into the work position and secure with their pins - *see diagram opposite.*



Tighten check chains and/or stabiliser bars.

The machine should now be carefully operated throughout its full range of movements to check hoses are not being strained, pinched, chafed or kinked, and that all movements are functioning correctly.

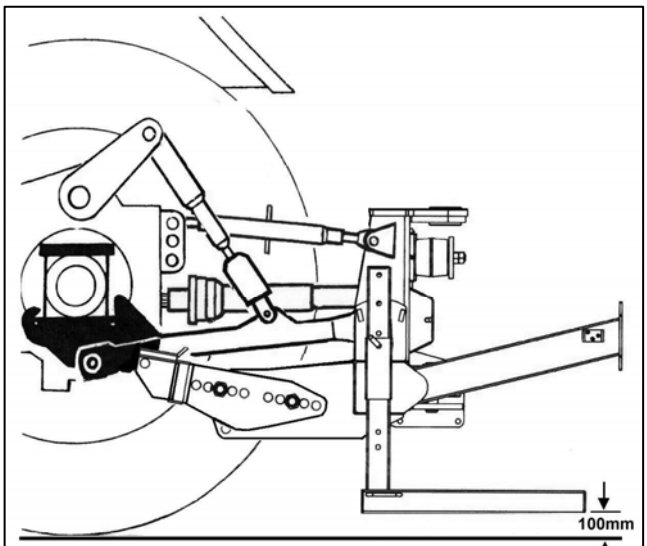
The machine can now be folded into the transport position ready to proceed to the work site - *Refer to the section on Transport Position for details on this subject.*

REMOVAL FROM TRACTOR

Select a firm safe site to remove the machine

Locate parking legs into their housings.

NOTE: The correct, and most stable, position for removing the machine from the tractor is with the arm positioned to the rear of the machine.



Locate parking legs into their housings.

Position the flail head on the ground directly to the rear of the machine at approximately half reach.

Disengage PTO.

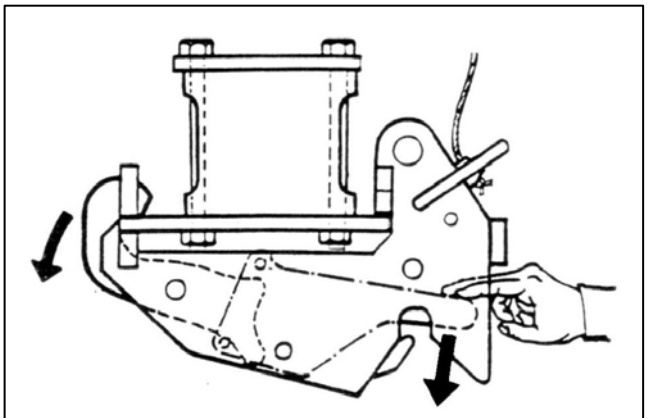
Remove latch security pins.

Take machine weight on draft links sufficient only to allow the top link to be disconnected.

Open axle catches using the release cord and lower the machine.

Disconnect draft links and remove the PTO shaft.

Remove control units from the tractor cab and stow clear of the ground in a location where they are protected from the weather or risk of accidental damage.



Remove the axle catches from the tractor.

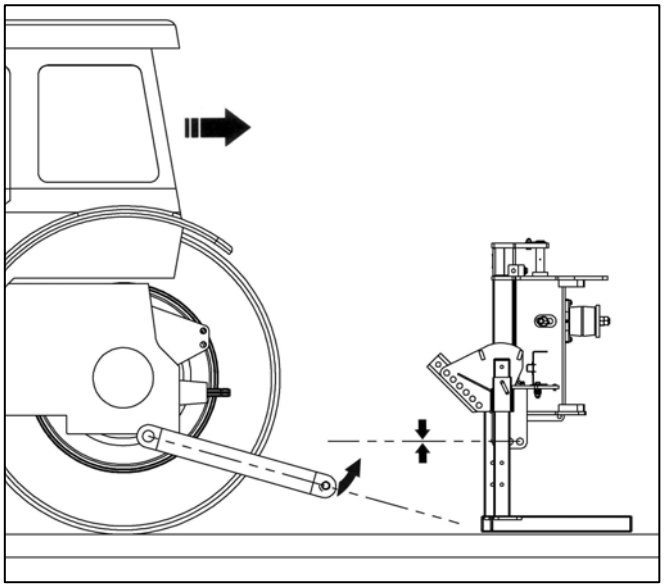
Drive tractor away from machine.

Replace check chains / stabiliser bars
– The axle plates can remain permanently in position.

STORAGE

If the machine is to be left standing for extended periods of ti me, lightly coat the exposed portions of the ram rods with grease. Subsequently this grease should be wiped off before the rams are next moved. If the machine is to be stored outside tie a piece of tarpaulin or canvas over the control assembly - ***do not use a plastic bag*** *as this can lead to corrosion in the unit.*

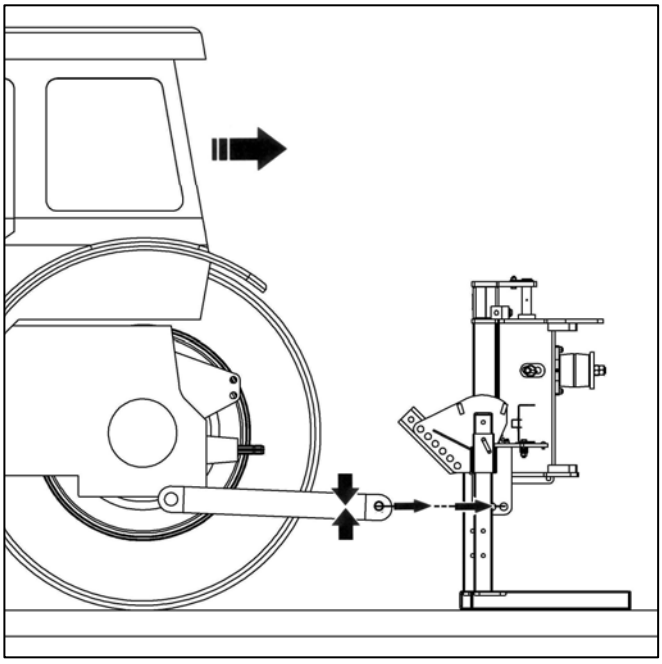
With the machine positioned on a firm level site and securely supported, manoeuvre the tractor squarely up to the machine.



Set the tractor's draft links to a height level with the machines lower link brackets and carefully reverse the tractor to a point that allows attachment of the lower links.

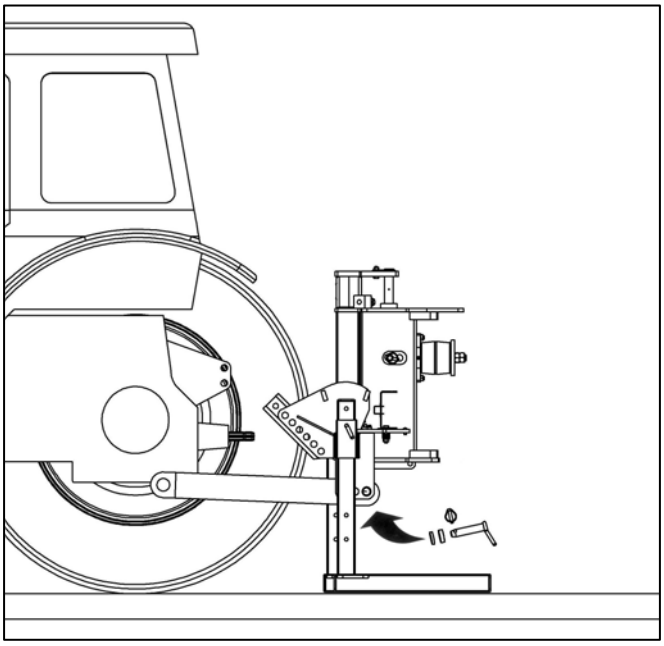
NOTE: *The hole selected on the lower link bracket should be the rear most that permits the machine to be m ounted without fouling the tractor.*

Ensure the same hole position is selected both sides of the machine.

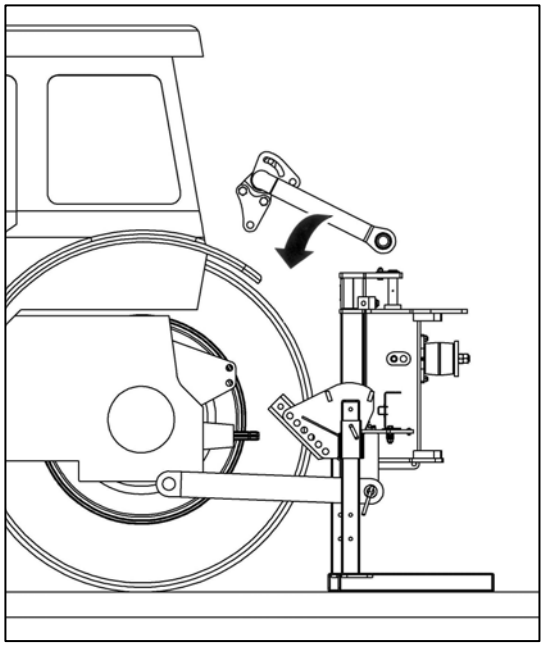


Insert lower linkage pins and spacers and secure in position with lynch pins.

ANY LIFTING EQUIPMENT USED TO POSITION THE MACHINE MAY NOW BE REMOVED

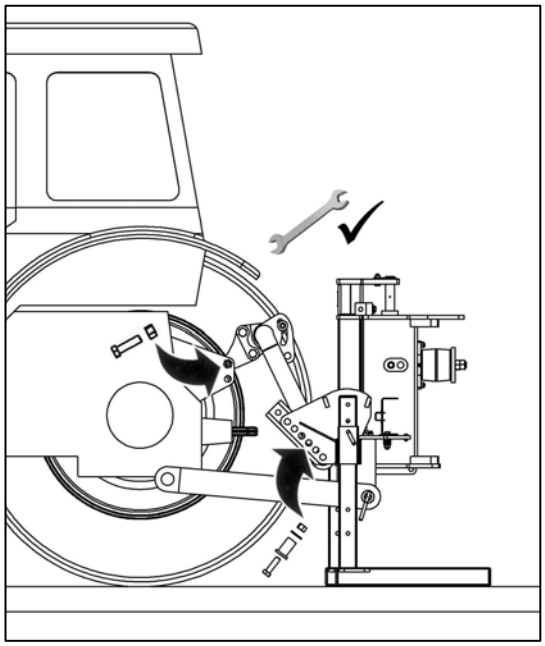


Fit the stabilizer into position with its arms aligned in the connection channels of the main frame and attach the stabilizer nose to the tractors top link – select the highest possible position available avoiding any load sensing properties.
NOTE: *The bolt on nose of the stabilis er is reversible in order to accommodate variations of tractor linkage designs.*

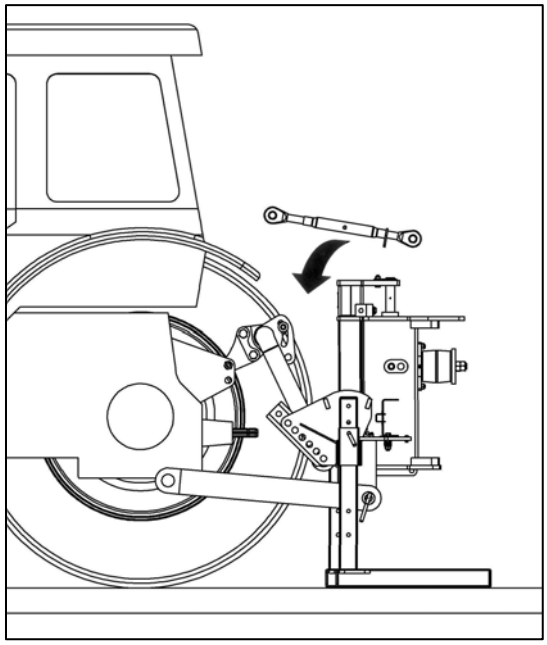


McConnel offer various versions of stabilizer noses for differing types and makes of tractors – contact your local dealer or McConnel Parts Department for further information.

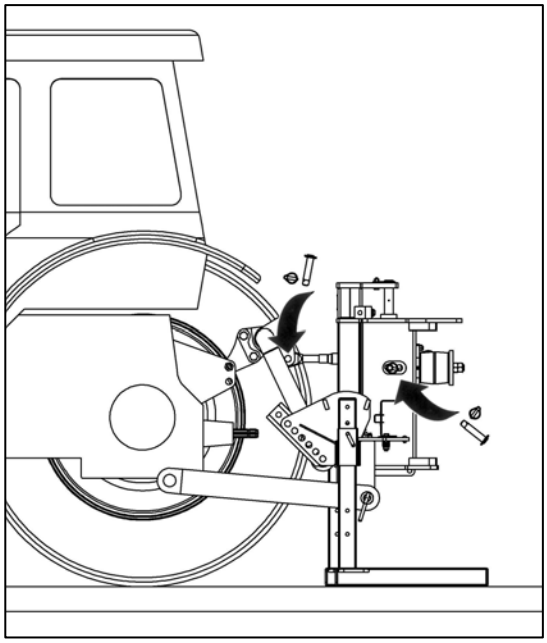
Secure the stabilizer in position with the fixings supplied – the arms of the stabilizer should be attached to the main frame selecting the hole that is farthest away from the back of the tractor.



Place the machines top link into position between the stabilizer and the machine main frame.



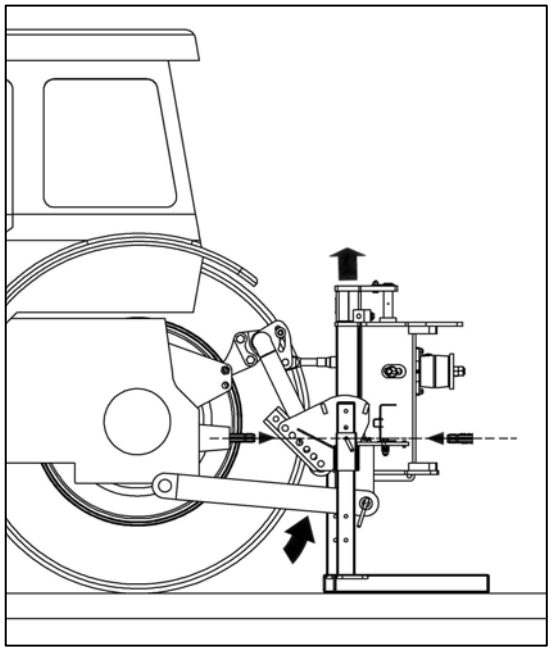
Attach the machines top link to both the stabilizer and the main frame using the linkage pins supplied and secure in position with lynch pins.



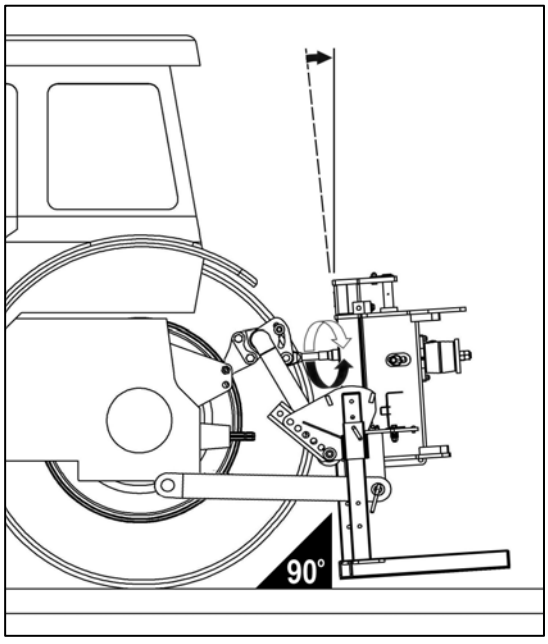
Raise the machine on the tractors linkage to a height where the tractors PTO and the stub axle of the machines gearbox are approximately in line with each other.
Note: *As lift occurs be aware the m achine may tilt slightly.*

WARNING

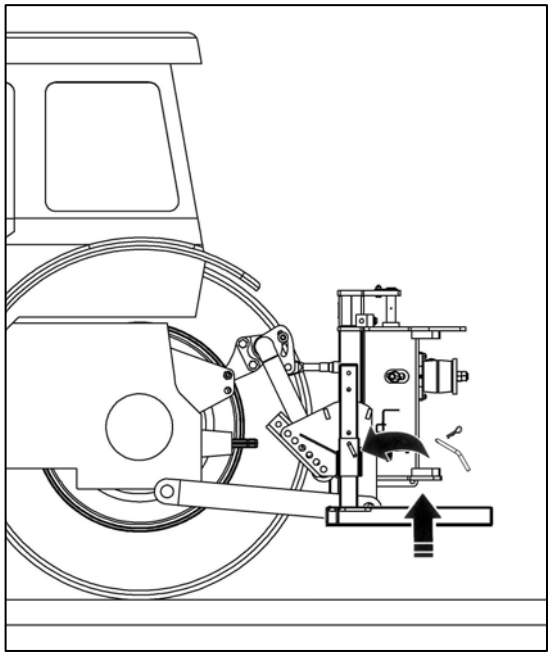
The quadrant lever or machine controls must only be operated from the tractor seat. Ensure no one is standing on, between, or near the linkage arms or bars during this procedure.



Adjust the top link to bring the machine frame into the vertical position.

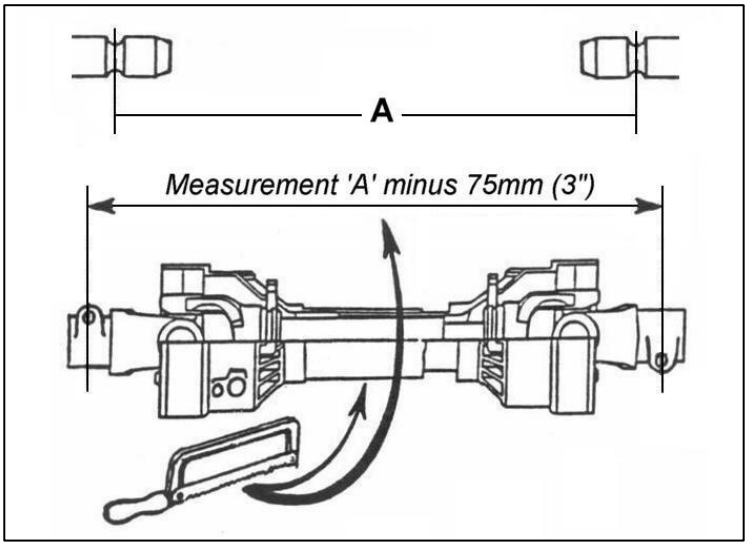


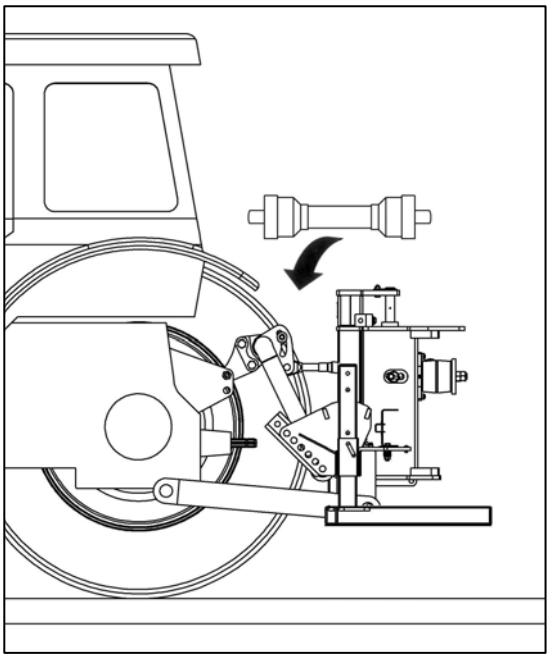
Remove leg pins and raise the stand legs to their stowage position – replace leg pins and secure in place with ‘R’ clips.



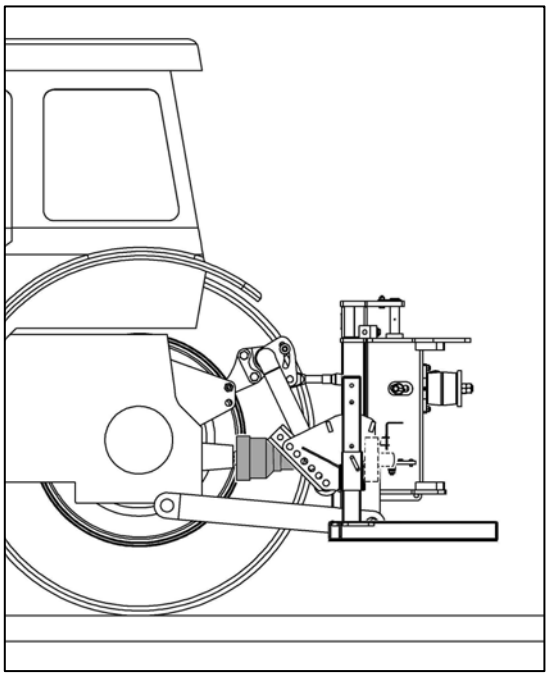
Adjust check chains to prevent sideways movement of the tractor’s linkage.

Measure the PTO shaft and cut to the dimension shown below. The finished length of the shaft should be 75mm (3”) less than the measured distance ‘A’ between tractor shaft and gearbox stub shaft to allow for fitting.

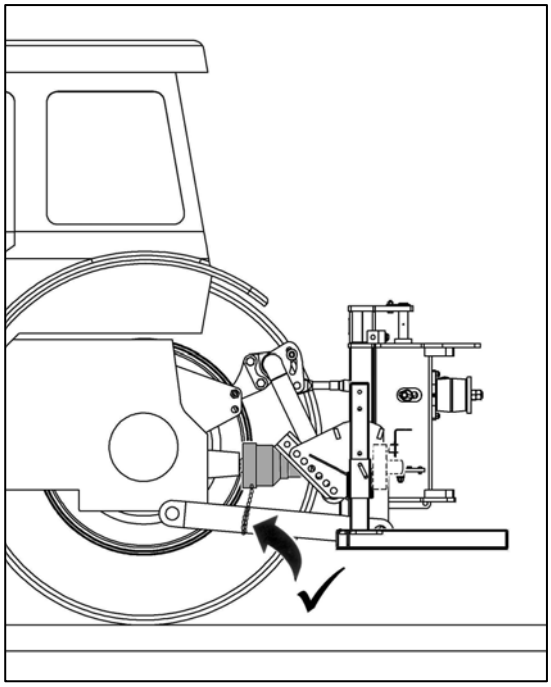




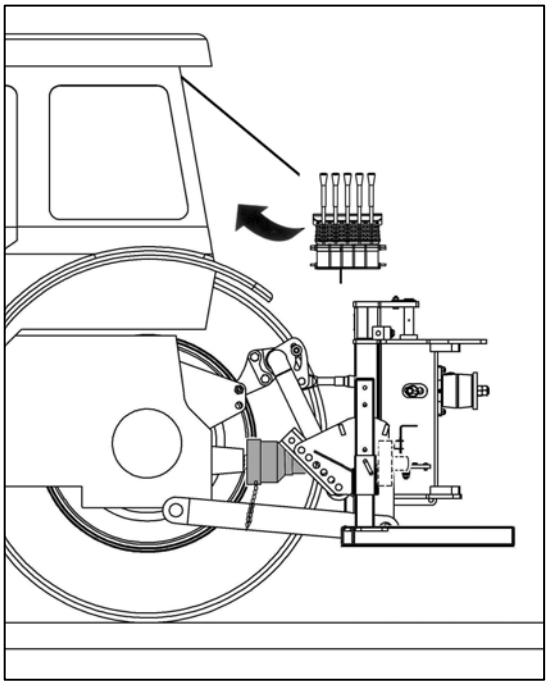
NOTE: *For subsequent use with different tractors measure again - ther e must be a m inimum shaft overlap of 150mm (6”).*



When the PTO shaft is in position attach torque chains to convenient locations to prevent rotation of the shaft guarding.



Fit the machine control unit in the tractor cab in a convenient location that allows for safe and easy operation of all the controls and functions.

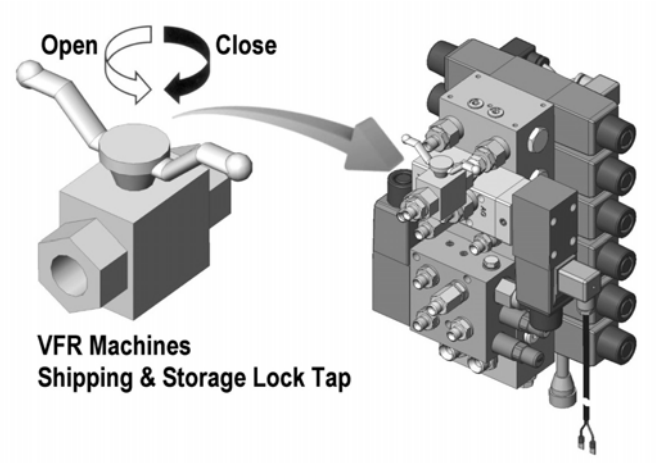


VFR Lock Tap - Pre-Operational Check

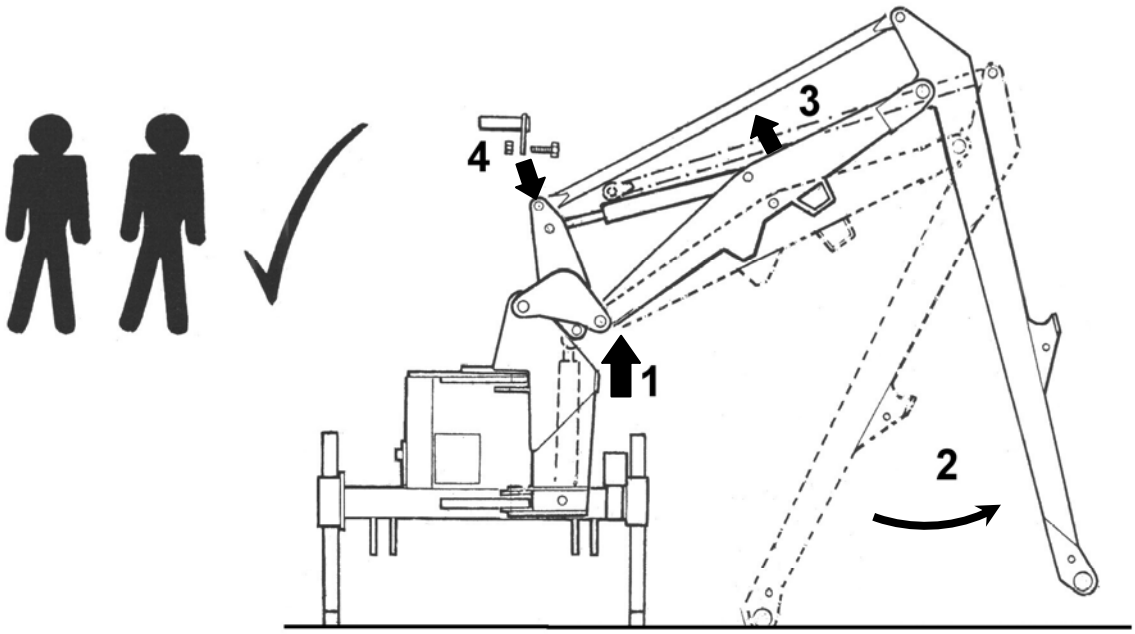
VFR machines produced after late 2012 are fitted with a security lock tap located on the control valve's reach gland port; this is to prevent the risk of arm movement during shipping of the machine.

Ensure the lock tap is fully opened before attempting to operate the machine.

The tap should be kept open and only closed for any future shipping or as an added safety precaution when storing the machine detached from the tractor.



- Ensure the Lift Ram tap and Slew Ram taps are open.



- **Request assistance.**
- Operate ‘lift up’ on machine controls sufficient only for the end of the dipper arm to clear the ground.
- Pivot out the dipper arm until the tension link can be connected.

- Operate the controls to ‘slew’ the arms towards the rear only until the frame is horizontal.

- Carefully operate the machine through its full range of movements whilst checking that hoses are not strained, pinched, chaffed or kinked, and that all machine movements are functioning correctly.

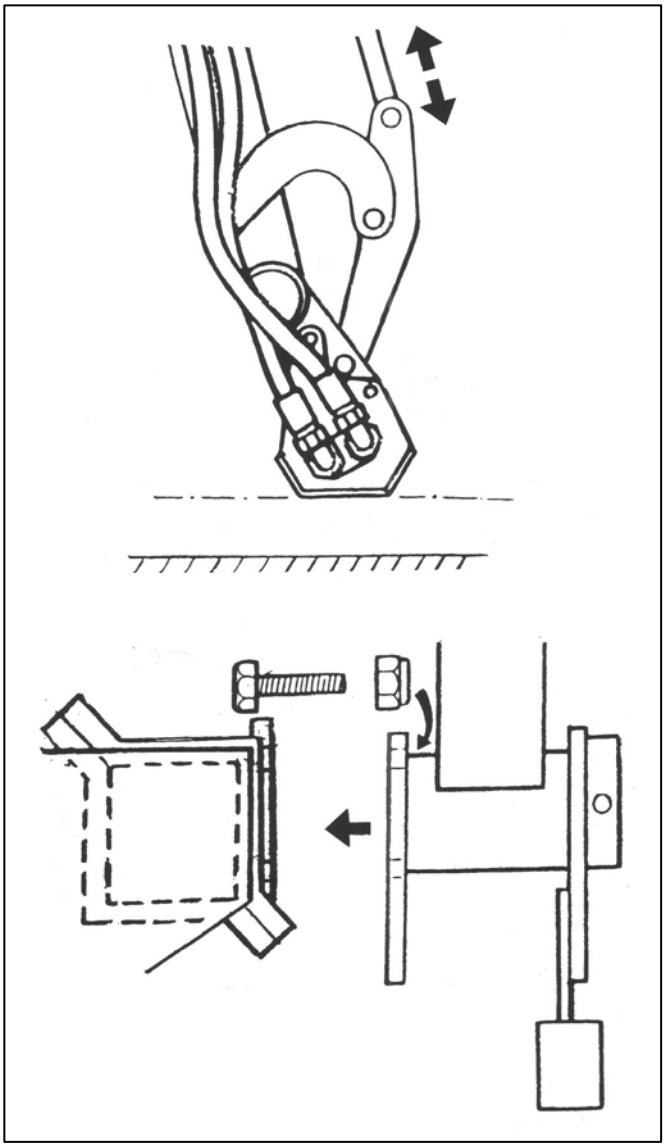
- On initial installation, the machine is now ready for attachment of the flailhead *(see following page for fitting details).*

- Fold the machine into the transport position *(refer to pages 51-54 for details).* The machine is now ready to proceed to the work site.

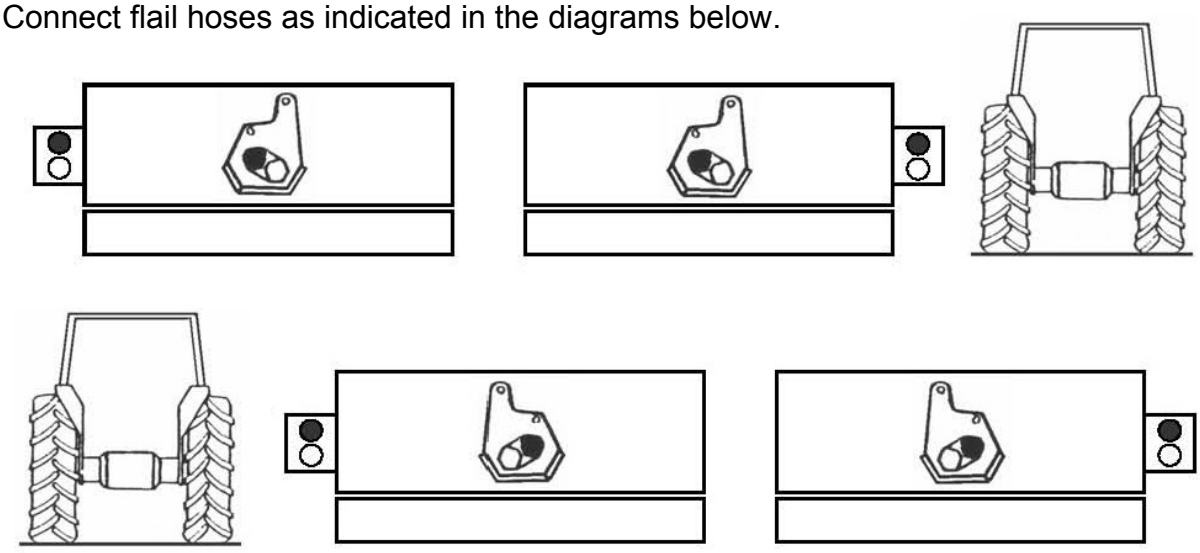
FLAILHEAD ATTACHMENT

Operate machine controls to manoeuvre into a position to enable attachment of the flailhead – the bottom of the hose junction bracket must be parallel with the ground.

Refer to 'Pre oper ational checks' for correct bolt torque settings.



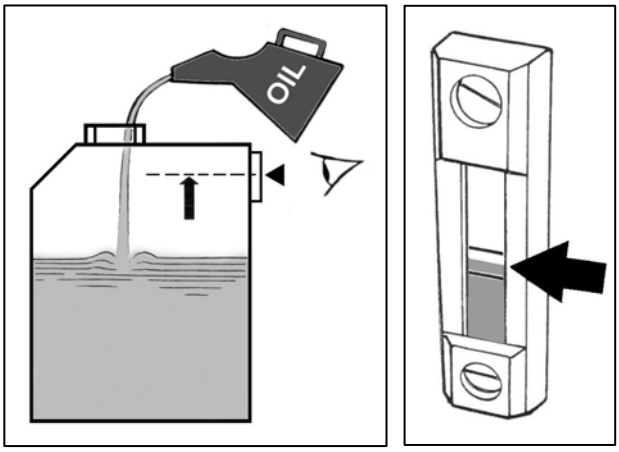
Connect flail hoses as indicated in the diagrams below.



With machine arms at 'half reach' and the flailhead clear of the ground carry out final adjustment of the lift arm levelling box to bring the main frame horizontal.

Hydraulic Oil Reservoir

Fill the tank with oil selected from the chart below or a good quality equivalent to a point where the level is between the minimum and maximum marks on the tank gauge. When the machine is initially run the level will drop as the oil is drawn into the circuit - *top back up as required to the correct l evel on the gauge.*



Always use clean receptacles when handling and transferring oil to avoid moisture or dirt contamination that can damage components and/or reduce machine performance.

NOTE: Refer to the maintenance section for further information on the subject of hydraulic oil and system filtration.

Reservoir Capacity

The oil tank capacity of the machine is approximately **200 Litres**.

Recommended Hydraulic Oils

For initial filling of the oil reservoir, periodic oil changes and replenishment purposes the following hydraulic oils, or a good quality equivalent are recommended:

NOTE: Only use oils that are ISO 18/16/13, NAS7, or cleaner.

Manufacturer	Cold or Temperate Climate	Hot Climate
BP	Bartran 46 Energol HLP-HM 46	Bartran 68 Energol HLP-HM 68
CASTROL	Hyspin AWH-M 46	Hyspin AWH-M 68
COMMA	Hydraulic Oil LIC 15	Hydraulic Oil LIC 20
ELF	Hydrelf HV 46 Hydrelf XV 46	Hydrelf HV 68
ESSO	Univis N 46	Univis N 68
FUCHS (UK/Non UK markets*)	Renolin 46 Renolin HVZ 46 Renolin CL46/B15* Renolin AF46/ZAF46B*	Renolin 68 Renolin HVZ 68 Renolin CL68/B20* Renolin AF68/ZAF68B*
GREENWAY	Excelpower HY 68	Excelpower HY 68
MILLERS	Millmax 46 Millmax HV 46	Millmax 68 Millmax HV 68
MORRIS	Liquimatic 5 Liquimatic HV 46 Triad 46	Liquimatic 6 Liquimatic HV 68 Triad 68
SHELL	Tellus 46 Tellus T46	Tellus 68 Tellus T68
TEXACO	Rando HD 46 Rando HDZ 46	Rando HD 68 Rando HDZ 68
TOTAL	Equivis ZS 46	Equivis ZS 68

FITTING CONTROL UNIT IN CAB

Electric controlled models.
A mounting pillar is supplied to which the control unit is bolted. The pillar is bolted to the tractor ensuring that no structural member of the cab or roll bar is drilled and it can be bent or twisted to achieve a comfortable working position.

The supply cable should be connected directly to the tractors battery. Do not use cigarette lighter type connections as these prove to be sporadic and unreliable for control applications.

The control is 12 volt D.C. operated; the brown lead is Positive and the blue is Negative.

Cable controlled models.
The control unit is bolted to a mounting bracket

This bracket may be bolted to the mud wing or cab cladding in a convenient location ensuring that no structural member of the cab or roll bar is drilled.

In deciding the final position of the control box remember not to exceed the minimum acceptable bend -radii of 8" for the cables.

The control lever for the cable operated rotor control valve is mounted in a similar fashion adopting the same precautions pertaining to drilling and cable runs.

RUNNING UP PROCEDURE

CAUTION! Before initial use of a new machine, all lubrication points must be greased and the gearbox and oil tank levels checked and where required topped up before attempting to use the machine. ***See maintenance section for details.***

Ensure that the rotor control valve is in "STOP" position, start tractor, engage PTO allow the oil to circulate through the return line filter for about 5 minutes without operation of the armhead control lever.

Operate the armhead levers through their complete range ensuring that all movements are functioning correctly.

Place the flail head at a safe attitude and move the rotor control to "START" position. After initial fluctuation the rotor should settle to a steady speed. Increase PTO speed to approximately 360 rpm. and run for a further five minutes before disengaging and stopping tractor.

Check the hose runs and observe that they are free from any pinching, chaffing, straining or kinks. Re-check the oil level in the tank-and top up as necessary.

DANGER

READ CAREFULLY BEFORE COMMENCING TO REMOVE THE MACHINE FROM THE TRACTOR.

THE ORDER OF THE FOLLOWING STEPS MUST BE FOLLOWED EXACTLY
DISCONNECTING THE TOP LINK MUST BE THE LAST OPERATION PRIOR TO DRIVING THE TRACTOR AWAY FROM THE MACHINE.

WARNING!
Do not operate quadrant lever or machine controls through the rear cab window whilst standing on or amongst linkage components - Always seek assistance.

- Select a firm level site for parking the machine.
- Position stand legs in their lowest position – secure with leg pins and lynch pins.
- Raise the machine on the tractor linkage until the weight is taken off the stabiliser.
- Remove the lower stabiliser pins.
- Unscrew the lift ram tap.
- Lower the machine to be ground.
- Extend the arms and place the flail head on the ground at half reach.
- Disengage tractor PTO and remove.
- Disconnect stabiliser bars or loosen check chains as applicable.
- Unbolt the control unit from the mounting pillar, remove from tractor cab and stow the levers or switchbox clear of the ground.
- Disconnect the stabiliser from the tractors top hitch position.
- Remove draft link pins and drive tractor away from machine.

STORAGE

If machine is to be left standing for an extended period of time, lightly coat the exposed portions of the ram rods with grease. Subsequently this grease should be wiped off before the rams are next moved.

If the machine has to be stored outside tie a piece of tarpaulin or canvas over the control assembly, do not use a plastic fertilizer bag which could lead to rapid corrosion.

SUBSEQUENT ATTACHMENT TO IDENTICAL TRACTOR

Refer to and follow steps on ***'initial attachment to tractor'*.**

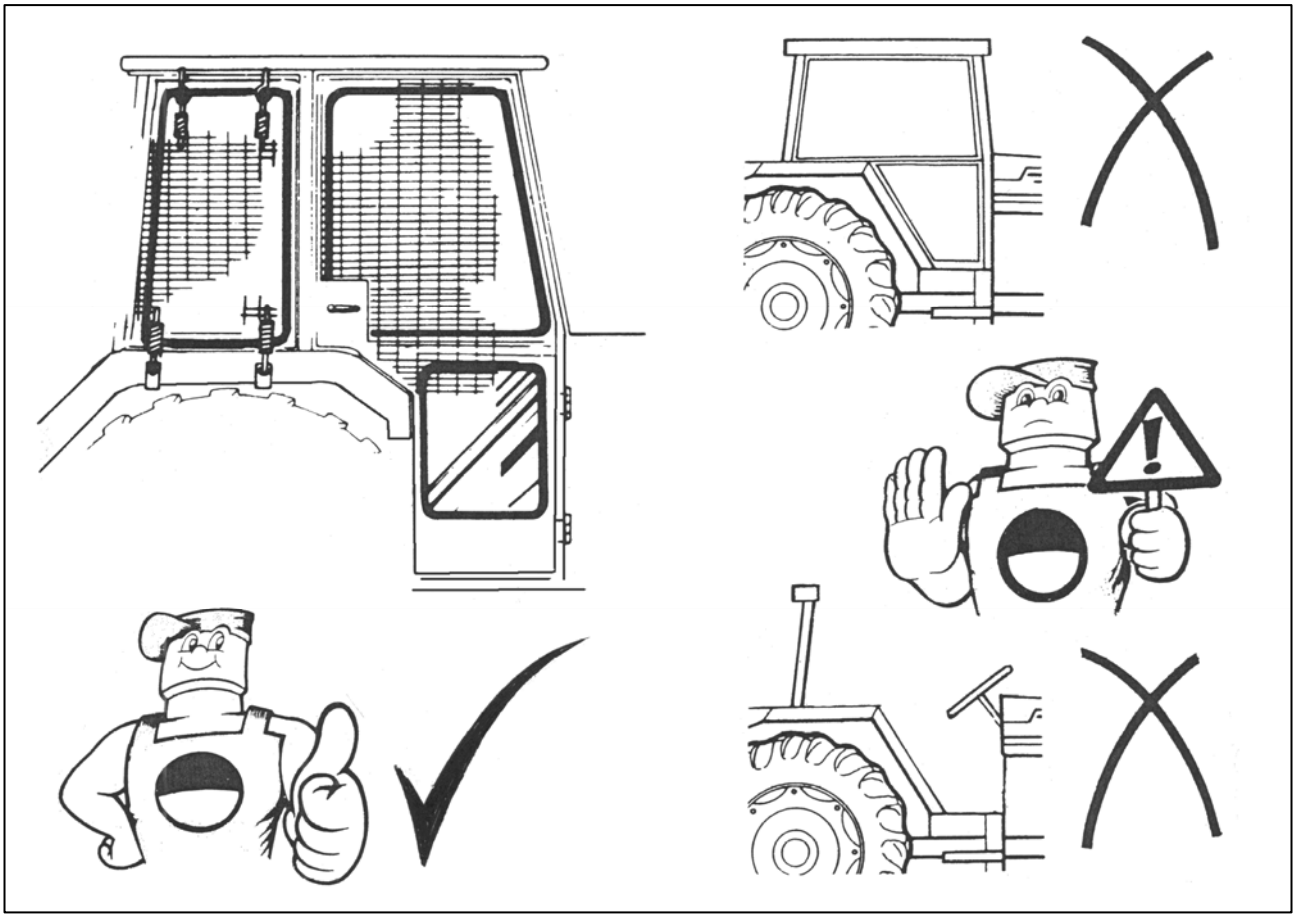
- Connect Stabiliser into tractors top hitch position used previously.
- Raise the machine on the tractor linkage until the Stabiliser contacts the eccentric stops.
- Fit Stabilizer lower pins.
- Mount controls in the tractor cab.
- Fit PTO Shaft and attach torque chain to a convenient point to prevent the shaft guard rotating.
- Place arms in work position at half reach and adjust lift arm levelling box to bring frame horizontal.
- Tighten check chains if fitted.
- Stow parking legs.
- Fold machine into transport position *(see pages 51-54).*
- Proceed to the work site.

SUBSEQUENT ATTACHMENT TO DIFFERENT TRACTOR

- Remove Stabiliser and Top Link from machine and separate.

Refer to and follow steps ***'initial attachment to tractor'.***

OPERATOR GUARD



PREPARATION

READ THE BOOK FIRST

Practices operating the machine in an open space without the rotor running until you are fully familiar with the controls and operation of the machine.

CAUTION

Care must be taken when working with the flail head close in as it can come into contact with the tractor.

CABLE CONTROLS

Cable controlled machines are supplied with a control unit of the type shown below – the particular version will be dependent on the specification and features of the machine. Versions differ primarily in the number of armhead control levers assembled within the control bank – some versions will have the rotor control lever assembled alongside the armhead control levers as shown below left and others will be supplied with the rotor control lever as a 'standalone' unit with its own individual mounting bracket.
The armhead control levers all move in a forwards and backwards direction each controlling a specific arm function with the exception of the auto reset lever which operates only in the backward direction (from central 'off' position to the backwards 'on' position).
Where applicable, if a machine is fitted with the optional lift float feature, operation of the lift float will be via an additional electrical switch which will need to be installed in a convenient location in the tractor cab.

Basic Cable Control Unit

Cable Control Unit with Auto Reset

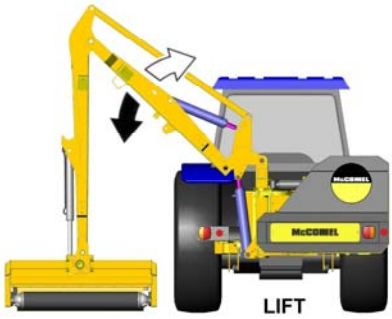
LOCATION & FUNCTION OF CONTROLS

1. **Arm Lift Control**
2. **Arm Reach Control**
3. **Head Angle Control / Angle Float Selection**
4. **Arm Slew Control**
5. **Rotor Control**
6. **Auto Reset *(where applicable)***
7. **Midcut/VFR *(where applicable)***

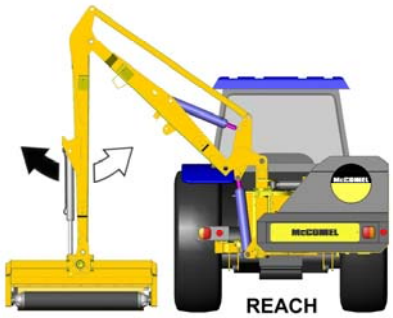
Cable Control Unit with Auto Reset & Midcut

NOTE: The illustrations on the following pages show the method of operating all possible functions – depending on individual specifications some features may not be present on your particular machine and therefore will not be applicable.

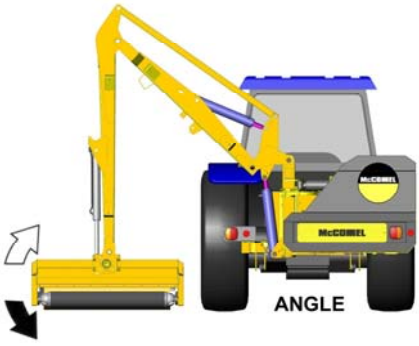

1


LIFT

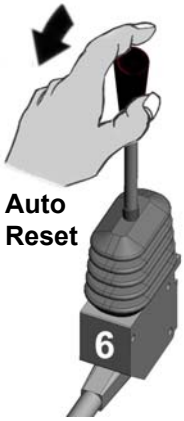

2

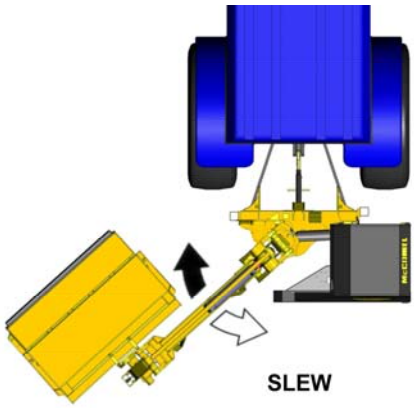

REACH


3

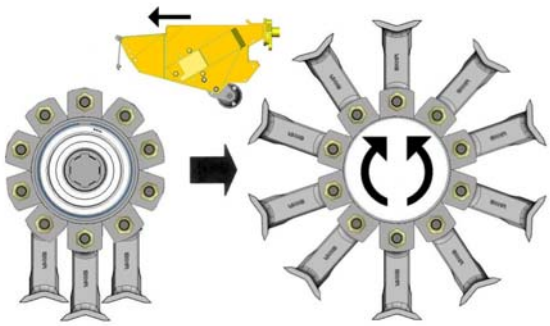

ANGLE


4


Auto
Reset
6

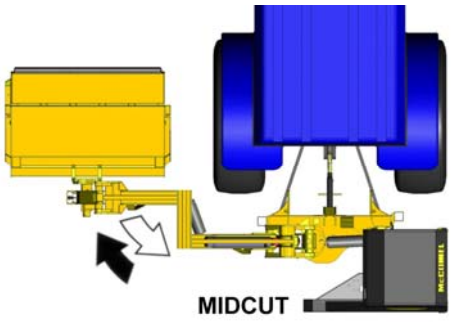

SLEW

Rotor Control



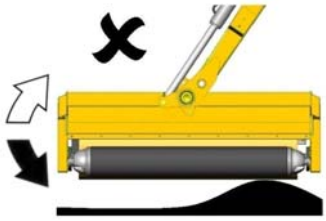
Refer to specific cable rotor control section for additional information on rotor operation

Midcut/VFR Models



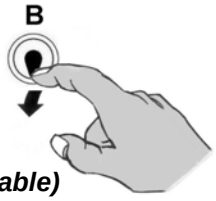
FLOAT OPERATION (Angle Float standard/ Lift Float optional)

HEAD ANGLE FLOAT - Push angle lever fully forward into the detent position.

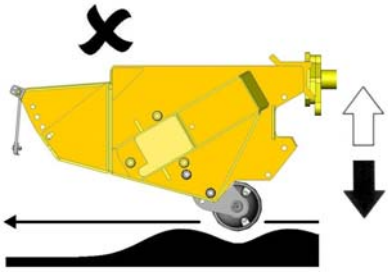


A) Angle Float OFF

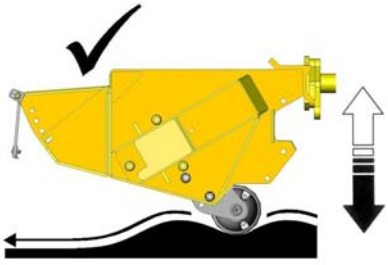
B) Angle Float ON



Lift Float *(where applicable)*



A) Lift Float OFF

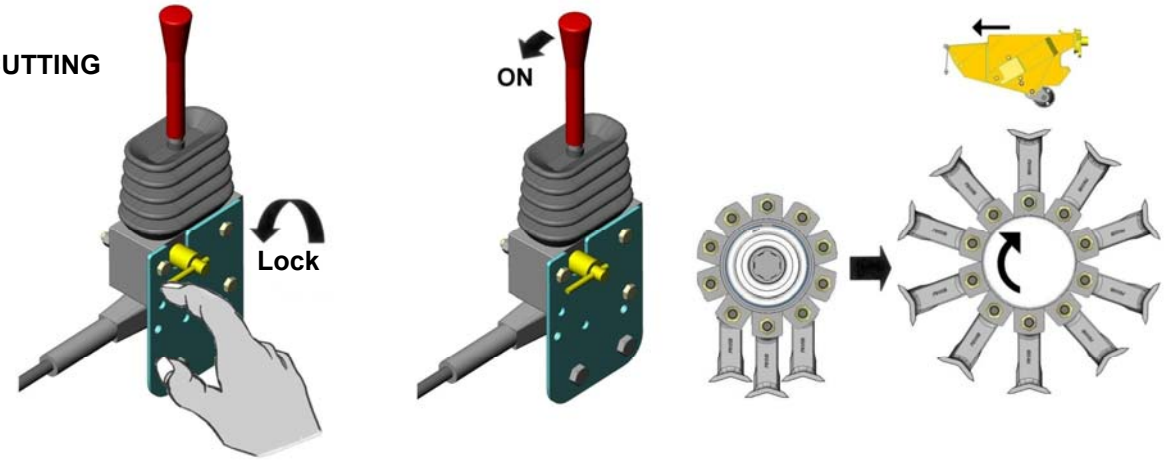


B) Lift Float ON

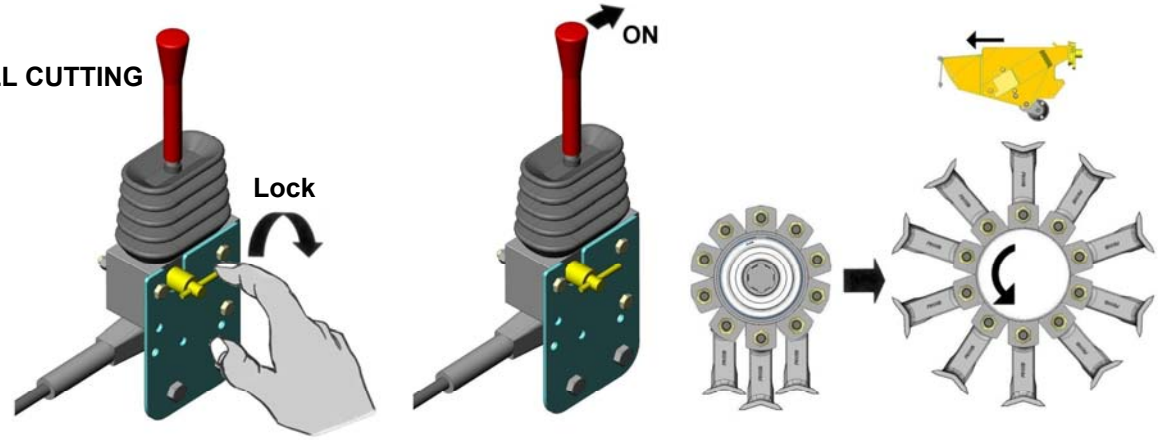
CABLE ROTOR CONTROL

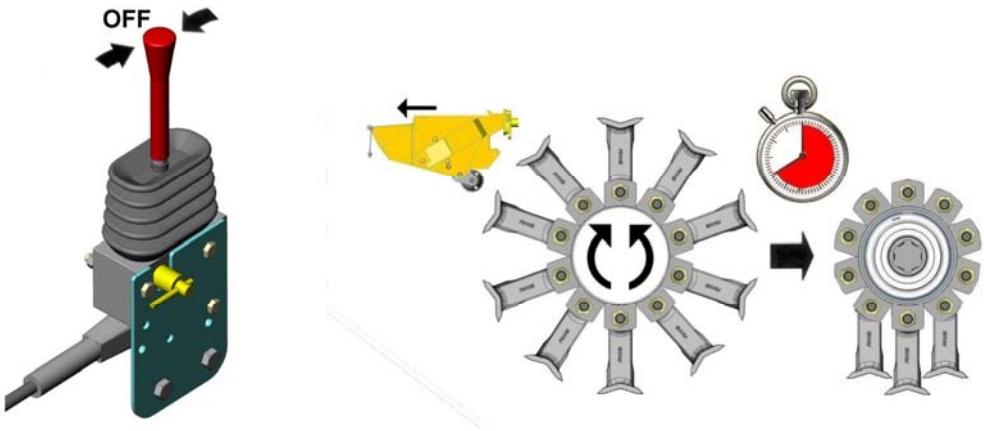
On cable rotor control machines the rotor is operated by the lever shown below – from the upright ‘off’ position pushing the lever forward switches the rotor on for downhill cutting and pulling the lever backwards switches the rotor on for uphill cutting. The small pivot locking lever mounted on the side of the control assembly rotates through 180° to lock the rotor in a specific cutting direction – this is a safety feature to avoid changes of rotor direction without first stopping the rotor. To change the direction of cut the rotor lever must be placed in the upright ‘off’ position; when the rotor has stopped rotating completely the pivot locking lever can be turned to the opposing position allowing the control lever to be operated for opposite cutting direction.
On some cable operated machines the rotor control lever will be assembled as part of the main bank of controls, whereas on others and all electric models it will be supplied as a ‘standalone’ unit with its own mounting bracket.

UPHILL CUTTING



DOWNHILL CUTTING





CAUTION: Ensure the rotor has stopped turning completely before attempting to change direction - When switched off a rotor can continue to ‘freewheel’ under its own momentum for up to 40 seconds before stopping.

ELECTRIC SWITCHBOX CONTROLS

Machines with Electric Switchbox Controls will be supplied with one of the control units shown below, the particular version will be dependent on the specification of the machine; machines fitted with cable rotor control will use the unit shown left whilst machines with electric rotor control will use the unit shown right – the only differences between the units is that the latter has 2 addition switches fitted for operation of the electric rotor control.

Cable Rotor Control Version
▼

Electric Rotor Control Version
▼

LOCATION & FUNCTION OF CONTROLS

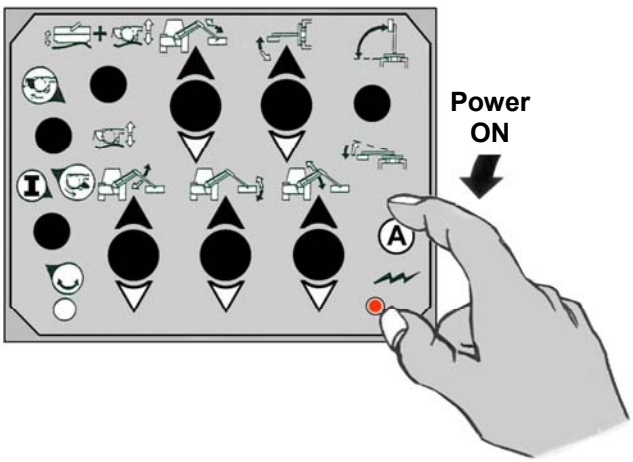
1. **Arm Lift Control**
2. **Arm Reach Control**
3. **Flailhead Angle Control**
4. **Arm Slew Control**
5. **Tele/Midcut/VFR Control *(Applicable models only)***

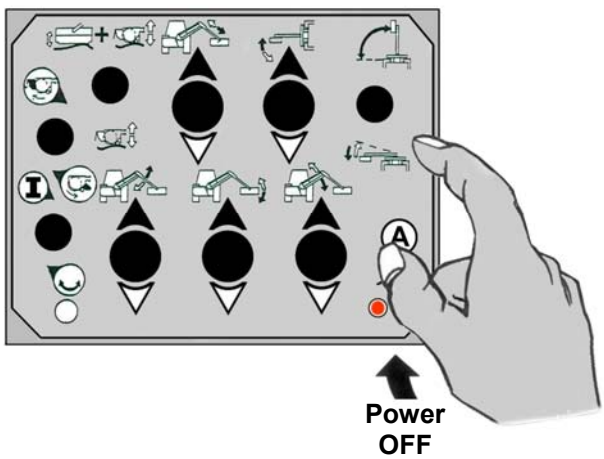
- **A. Power On/Off**
- **B. Auto Reset**
- **C. Head Float - Angle/Lift (Option)**
- **D. Rotor On/Off (Electric RCV models)**
- **E. Rotor Direction (Electric RCV models)**

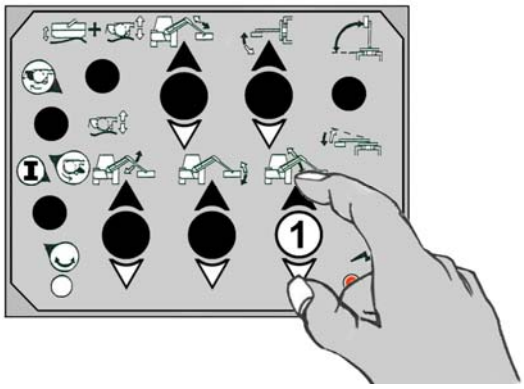
Powering the Controls

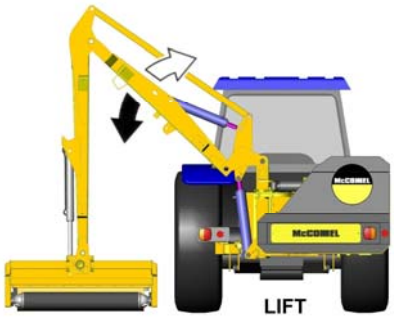
Activation of power to the control unit is by operation of switch ‘A’ as shown below:

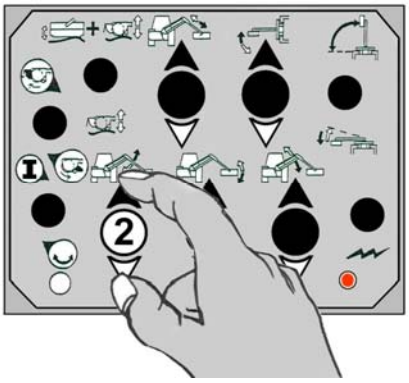
Press the switch down for Power ON (LED light on)
Press the switch up for Power OFF (LED light off)

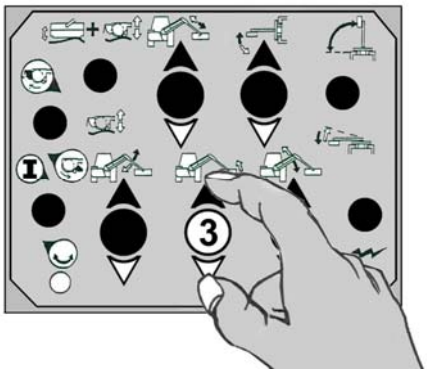


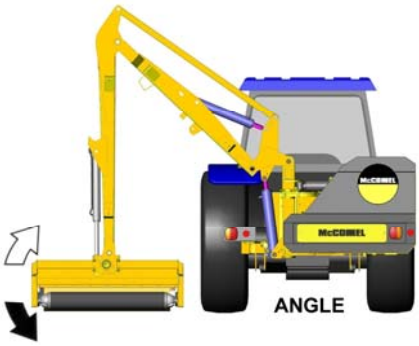


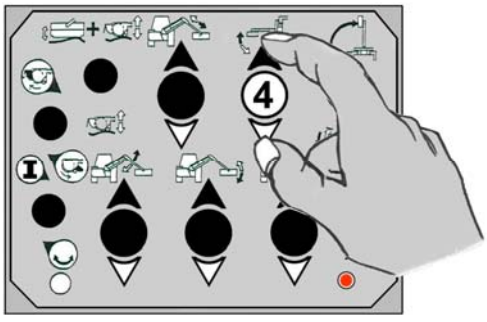


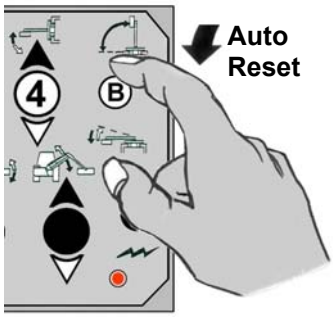


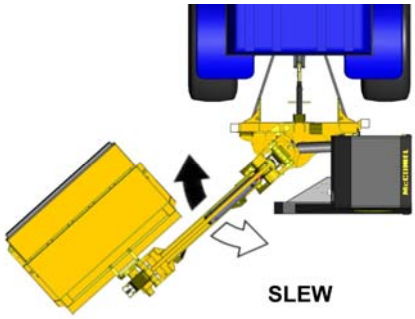




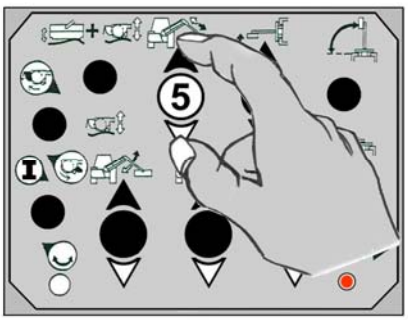


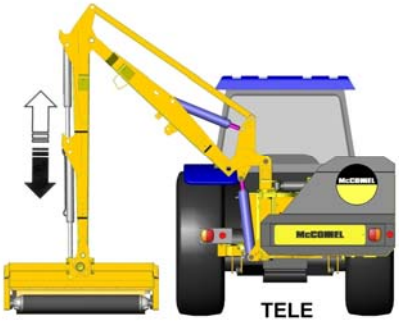


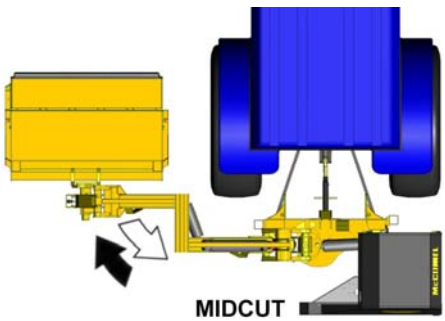




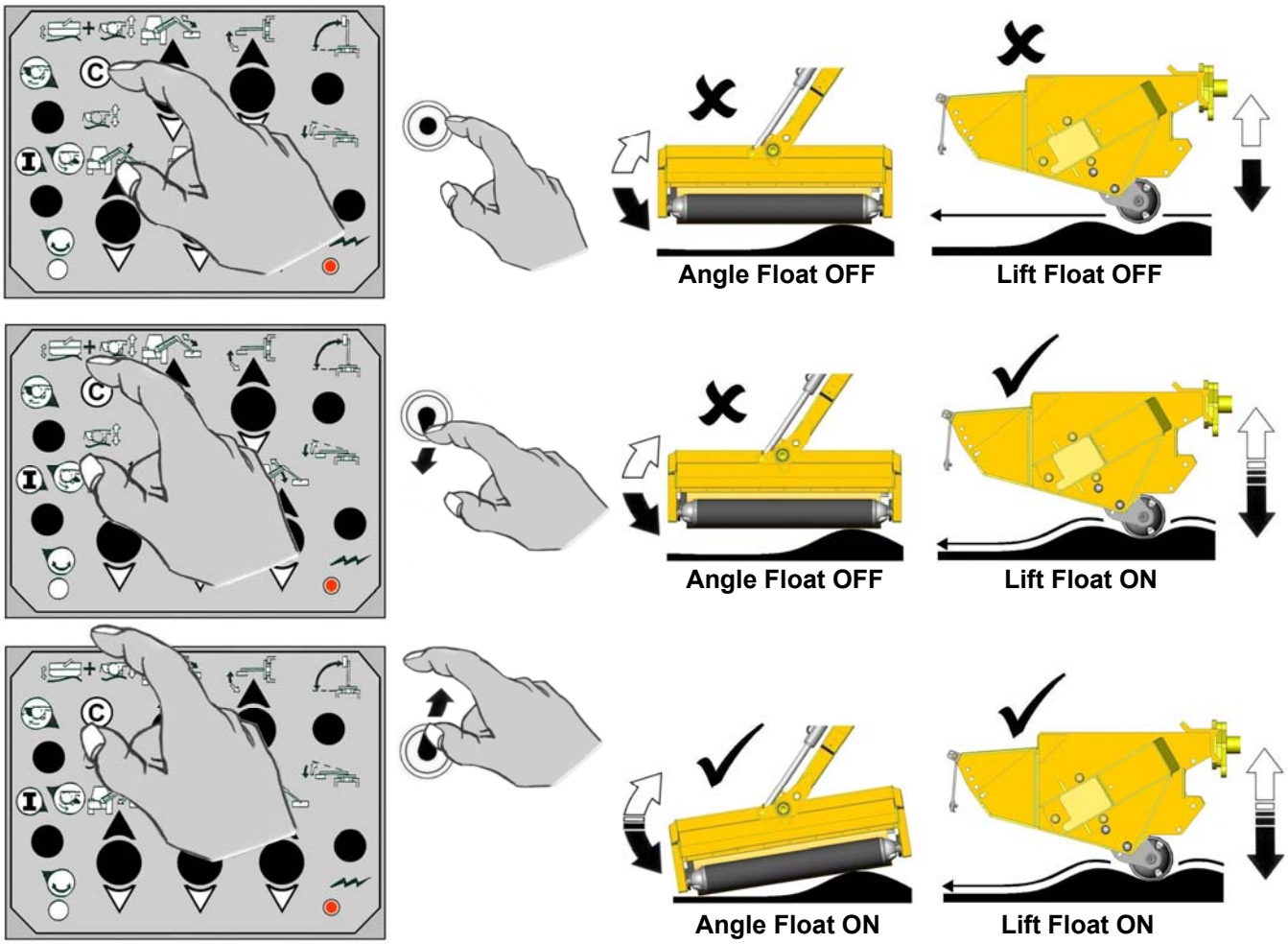
Tele or Midcut/VFR Models only







HEAD FLOAT OPERATION (Angle Float standard / Lift Float optional)



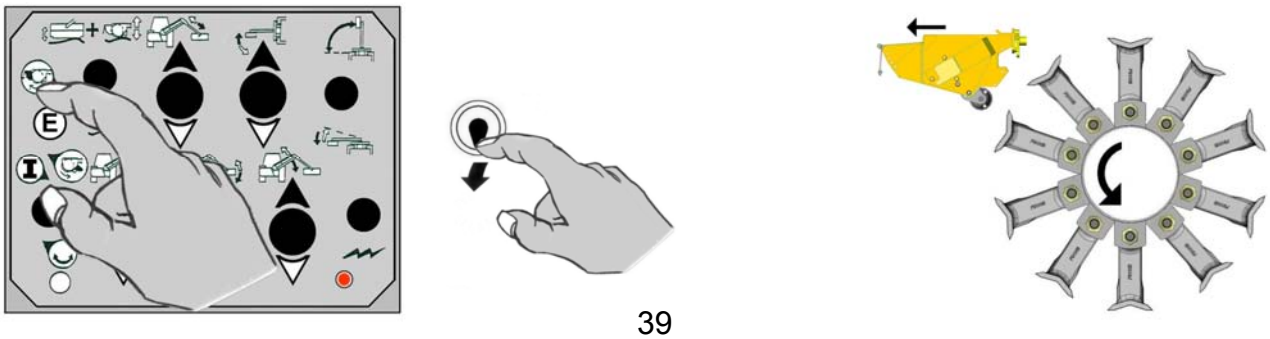
ROTOR OPERATION – Electric Rotor Control Models only

NOTE: The following section relates to machines with Electric Rotor Control only – for Cable Rotor Control models refer to the cable rotor control section.

Selection of Rotor Cutting Direction

Uphill Cutting

Downhill Cutting

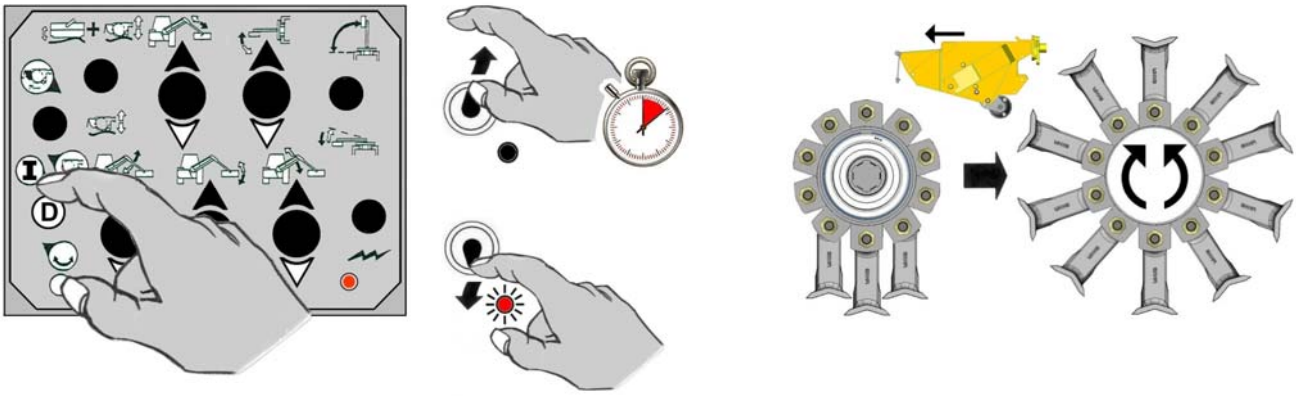


Switching the Rotor On

For safety reasons, to prevent accidental starting of the rotor, the 'Rotor On' switch cannot be activated in a single operation or without first selecting the direction of cut – the procedure for starting the rotor is as follows:

Select the required cutting direction - the Rotor On/Off Switch (D) must then be switched upwards and held in position for a minimum of 8 seconds before switching it into the fully down 'on' position where it will remain until it is switched off. When the switch is moved to the down position the red LED light below the switch will be lit to signify the rotor is on – if the LED does not light the switch was not held in its up position for long enough and the rotor will not have started, repeat the process again holding the switch upwards for a longer period.

Rotor Start

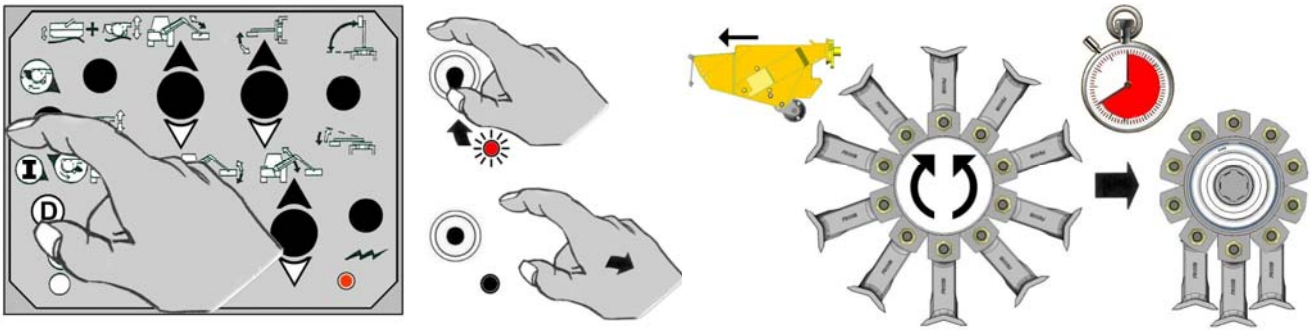


Switching the Rotor Off

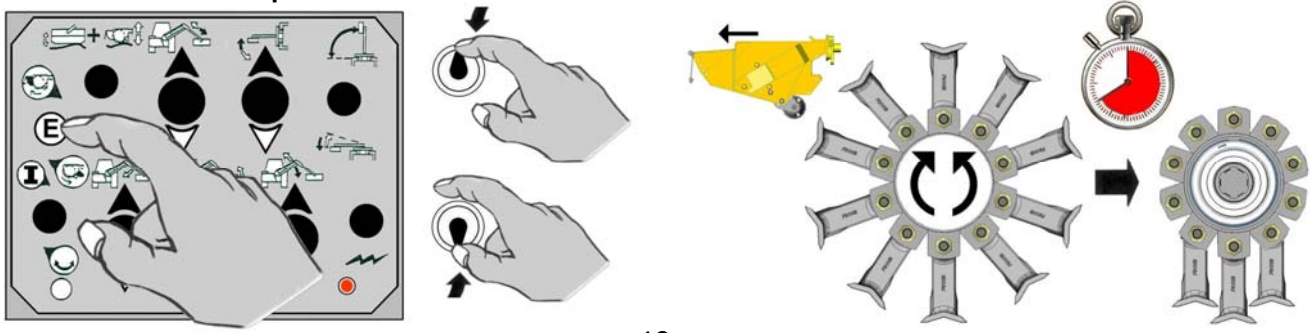
Stopping the rotor is performed by switching either the Rotor Power Switch (D) or the Rotor Direction Switch (E) to the central (off) position – the red LED light will go out to signify the rotor has been switched off.

CAUTION: When the rotor is switched off it will continue to 'freewheel' under its own momentum for up to 40 seconds before finally coming to a standstill – do not leave the tractor cab or attempt to approach the flailhead until the rotor has stopped turning completely.

Rotor Stop



Alternative Rotor Stop



ELECTRIC MONOLEVER CONTROLS

Machines with Electric Monolever Controls will be supplied with one of the control units shown below, the particular version will be dependent on the specification of the machine; machines fitted with cable rotor control will use the unit shown left whilst machines with electric rotor control will use the unit shown right – the only differences between the units is that the latter has 2 addition switches fitted for operation of the electric rotor control.

Cable Rotor Control Version

Electric Rotor Control Version

LOCATION & FUNCTION OF CONTROLS

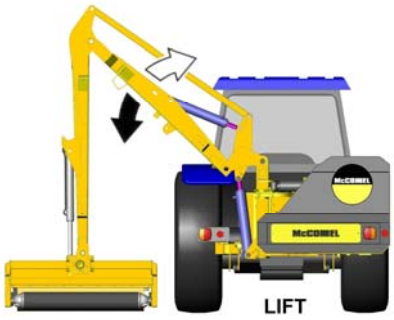
1. **Arm Lift Control**
2. **Arm Reach Control**
3. **Flailhead Angle Control**
4. **Arm Slew Control**
5. **Tele/Midcut/VFR Control *(Applicable models only)***

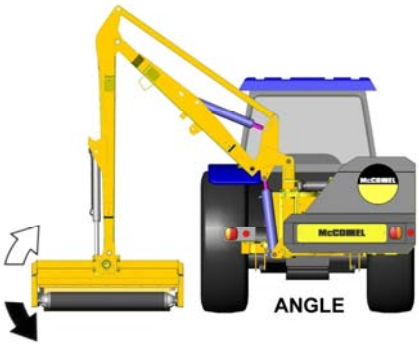
A. **Power On/Off (Emergency Stop)**
B. **Auto Reset**
C. **Head Float - Angle/Lift (Option)**
D. **Rotor On/Off (Electric RCV models)**
E. **Rotor Direction (Electric RCV models)**

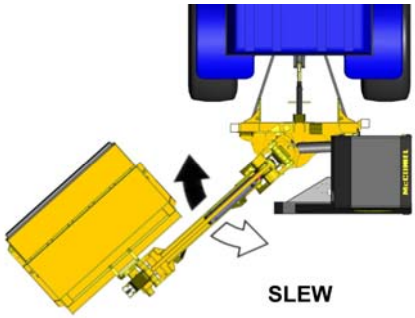
Powering the Controls

Activation of power to the control unit is by operation of switch ‘A’ as shown below:

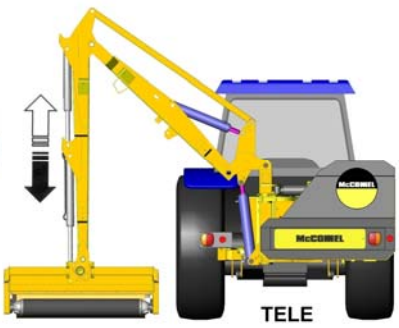
Rotate the switch clockwise to Power ON (LED light on)
Press the switch to Power OFF or Emergency Stop (LED light off)

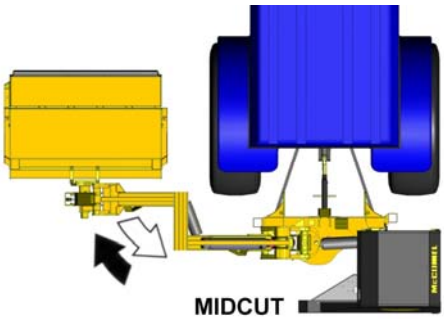




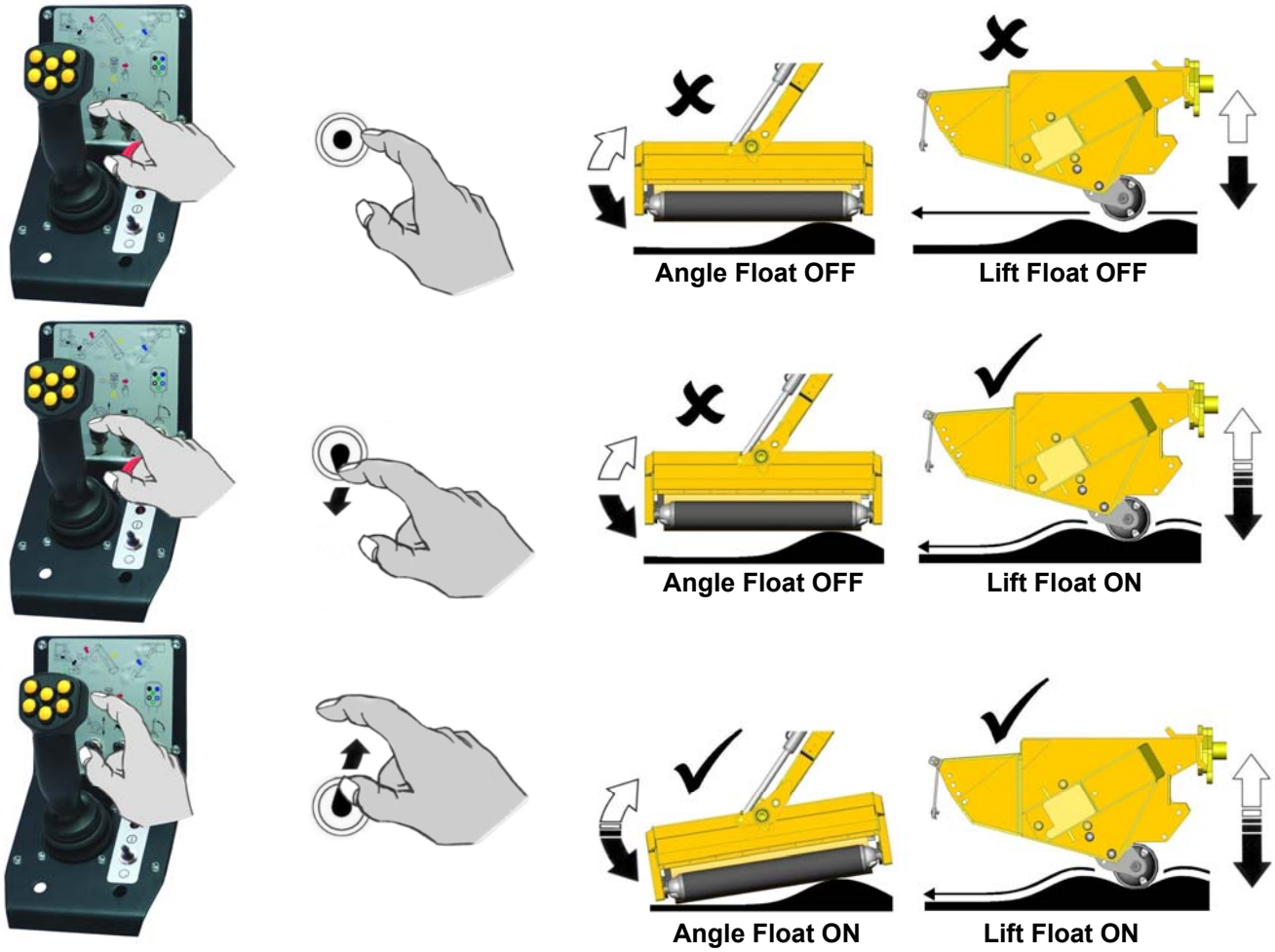


Tele or Midcut/VFR Models only





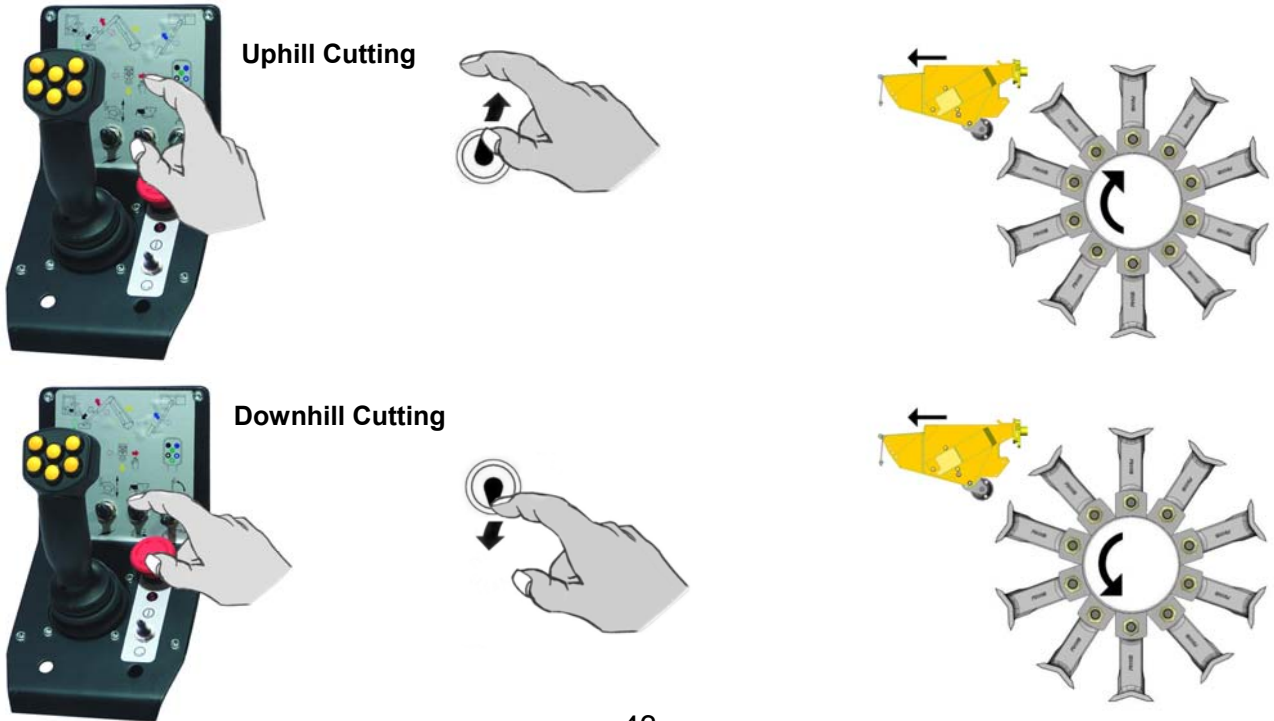
HEAD FLOAT OPERATION (Angle Float standard / Lift Float optional)



ROTOR OPERATION – Electric Rotor Control Models only

NOTE: The following section relates to machines with Electric Rotor Control only – for Cable Rotor Control models refer to the cable rotor control section.

Selection of Rotor Cutting Direction

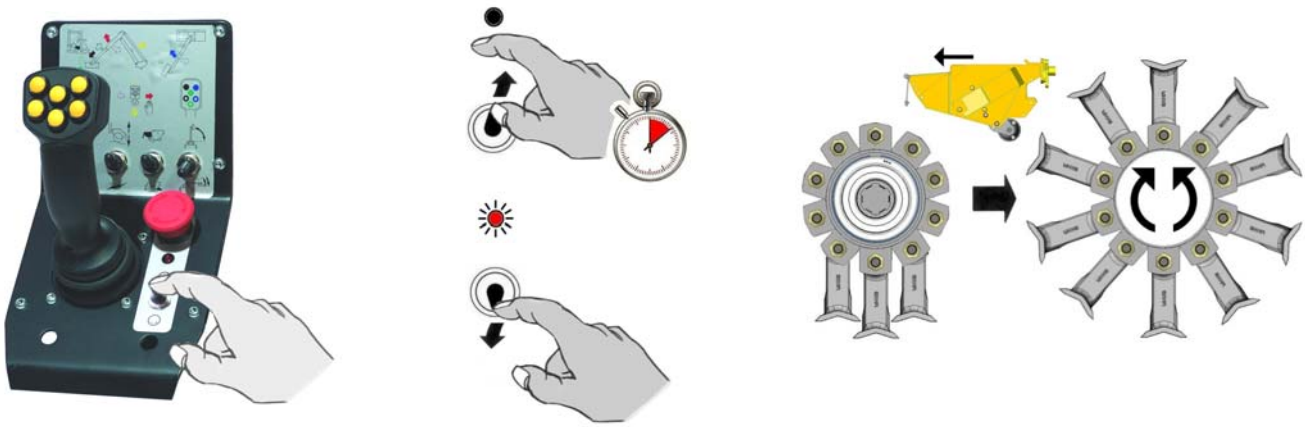


Switching the Rotor On

For safety reasons, to prevent accidental starting of the rotor, the 'Rotor On' switch cannot be activated in a single operation or without first selecting the direction of cut – the procedure for starting the rotor is as follows:

Select the required cutting direction - the Rotor On/Off Switch (D) must then be switched upwards and held in position for a minimum of 8 seconds before switching it into the fully down 'on' position where it will remain until it is switched off. When the switch is moved to the down position the red LED light above the switch will be lit to signify the rotor is on – if the LED does not light the switch was not held in its up position for long enough and the rotor will not have started, repeat the process again holding the switch upwards for a longer period.

Rotor Start

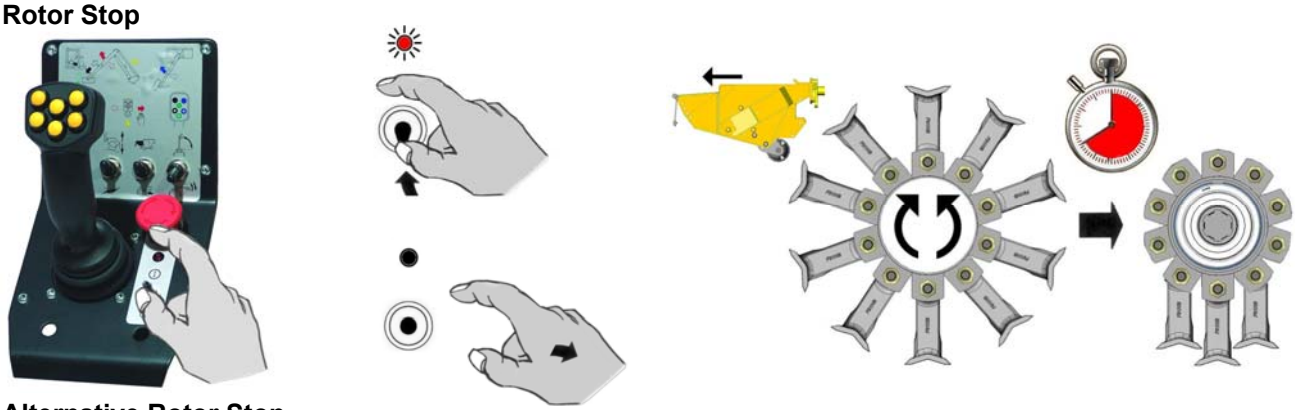


Switching the Rotor Off

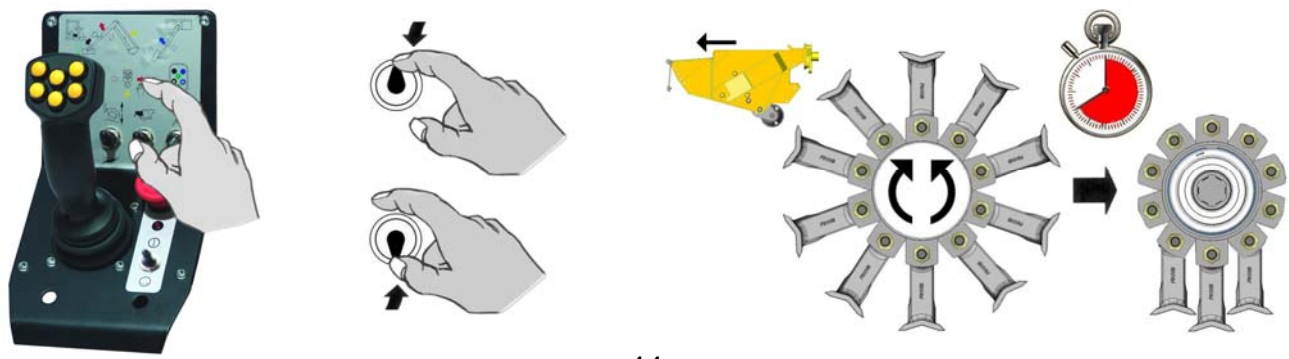
Stopping the rotor is performed by switching either the Rotor Power Switch (D) or the Rotor Direction Switch (E) to the central (off) position – the red LED light will go out to signify the rotor has been switched off.

CAUTION: When the rotor is switched off it will continue to 'freewheel' under its own momentum for up to 40 seconds before finally coming to a standstill – do not leave the tractor cab or attempt to approach the flailhead until the rotor has stopped turning completely.

Rotor Stop

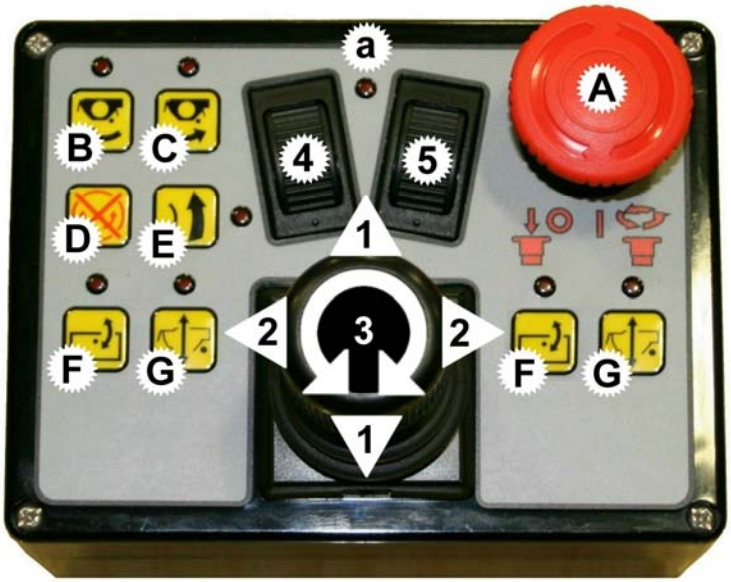


Alternative Rotor Stop



XTC (Mk2) PROPORTIONAL SWITCHBOX CONTROLS (5 Service Models)

Machines with XTC Mk2 Proportional Controls (5 service models) will be supplied with the control unit shown below. The units for both electric and cable controlled rotor machines are identical except that for cable versions the rotor control switches B, C & D *(shown below)* will not provide a function as rotor operation will be controlled by a separate cable lever unit *(refer to specific cable rotor control page for operation details of that unit).*



LOCATION & FUNCTION OF CONTROLS

1. **Arm Lift Control**
2. **Arm Reach Control**
3. **Head Angle Control**
4. **Arm Slew Control (Default Mode)**
5. **Tele*/Midcut*/VFR* Control (Default Mode)**

**** Applies to the specific model only***

- **A. Power On/Off (LED 'a' indicates status)**
- **B. Rotor Start (Uphill Cutting Direction)**
- **C. Rotor Start (Downhill Cutting Direction)**
- **D. Rotor Stop**
- **E. Auto Reset**
- **F. Head Angle Float On/Off**
- **G. Lift Float On/Off (Option)**

Note: 2 sets of control buttons are installed on each side of the unit for operation of Angle Float & Lift Float, both sets of buttons and their LED's are linked and therefore perform exactly the same function; they are installed to allow for operator preference.

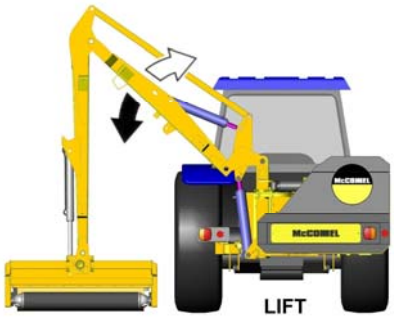
LED Lights

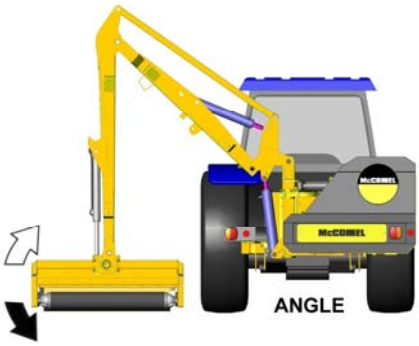
An LED light adjacent to each control button reports the status of that particular function – when the function is selected the LED light will illuminate to confirm the function is active; the light will switch off on de-selection of that function.

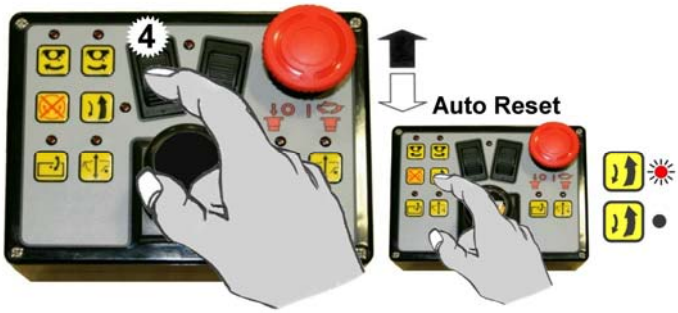
Powering the Controls

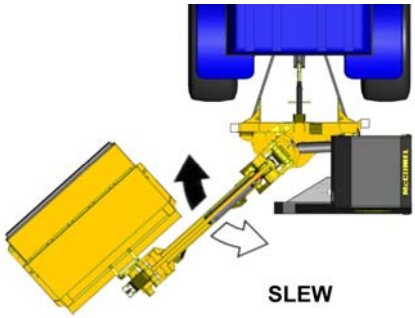
Activation of power to the control unit is by operation of the red button switch 'A' as shown below:

Rotate clockwise for **Power ON** (LED light on)
Press for **Power OFF / Emergency Stop** (LED light off)

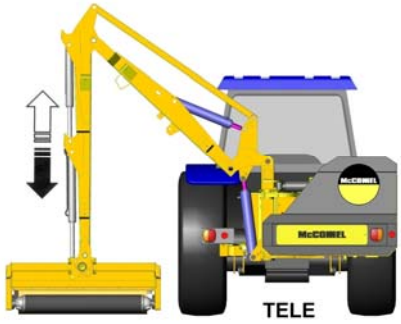


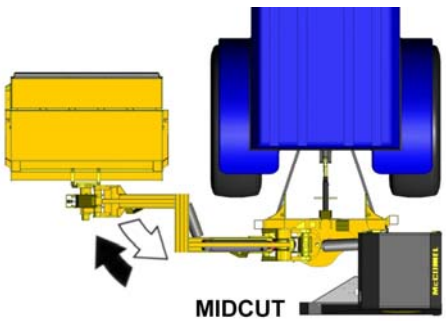






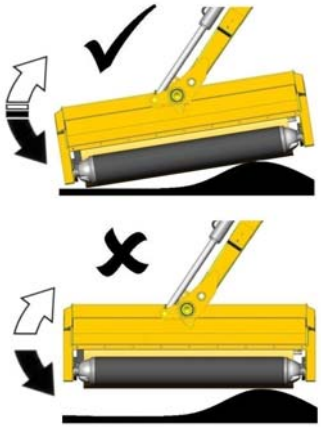
Tele or Midcut/VFR Models only



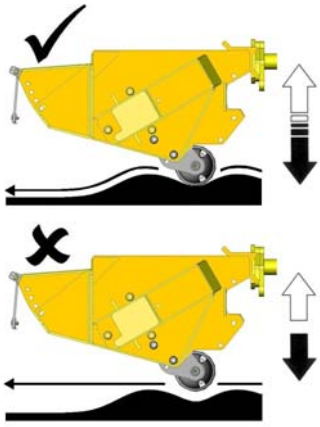


HEAD FLOAT OPERATION

Angle Float (Standard Feature)



Lift Float (Optional Feature)



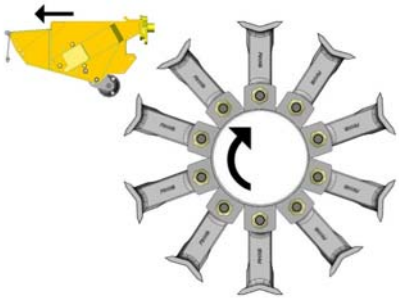
ROTOR OPERATION – Electric Rotor Control Models only

NOTE: The following section relates to machines with electric rotor control only – for cable rotor control models refer to the specific cable rotor control section.

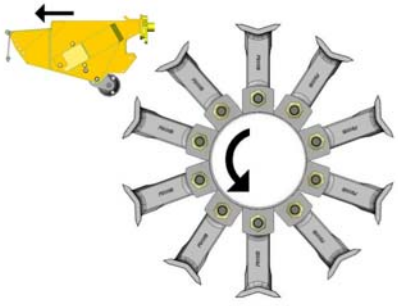
Rotor Start (Selection of Rotor Cutting Direction)

Select rotor start for required direction (LED will light to indicate the active direction).

Uphill Cutting

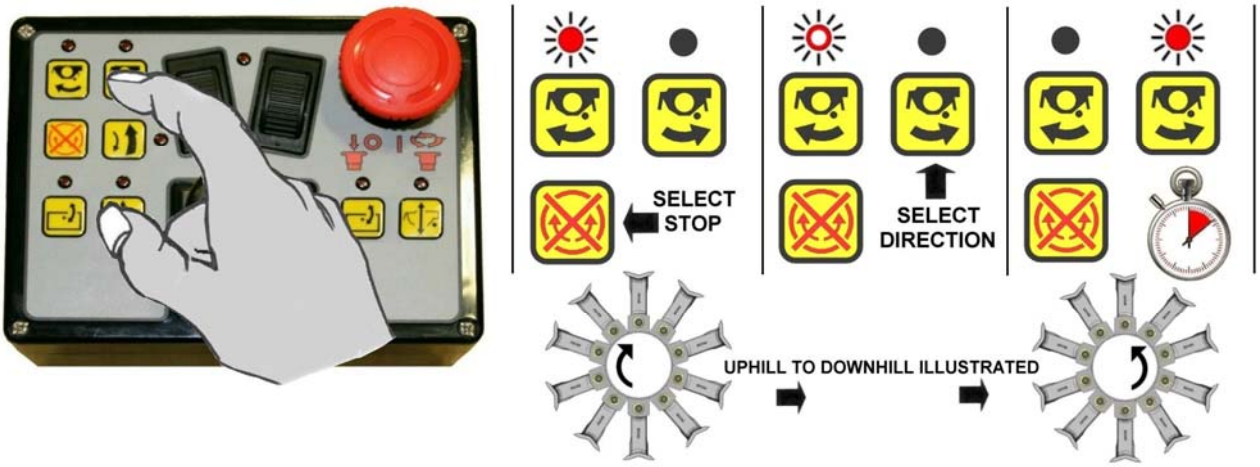


Downhill Cutting



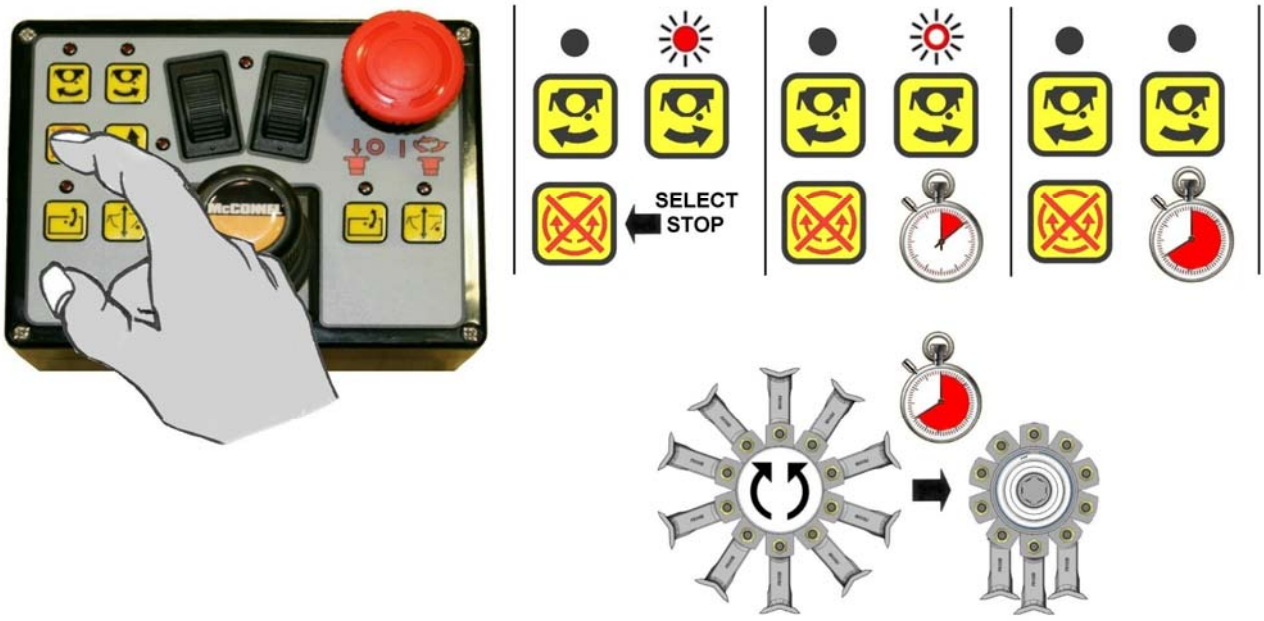
Switching Rotor Direction

With the rotor running, changing the rotor cutting direction can only be achieved after first operating ‘rotor stop’, when stop has been selected the specific direction button can then be operated to command the rotor to switch to the desired direction. NOTE: This function has a built in time delay of approximately 8 seconds - this is a machine protection feature that allows the rotor sufficient time to de-accelerate before restarting in the opposite direction. The LED light of the active cutting direction will flash on and off during the slowing down period, when the direction has changed the LED for the new direction will be illuminated.



Switching the Rotor Off

Stopping the rotor is performed by operation of the rotor stop button as illustrated below. When rotor off has been selected the LED light above the button of the active cutting direction will flash on and off for approximately 8 seconds to signify that the rotor has been switched off, after this 8 second period the light will go off completely. NOTE: The rotor will continue to rotate under its own power until it finally comes to a standstill.

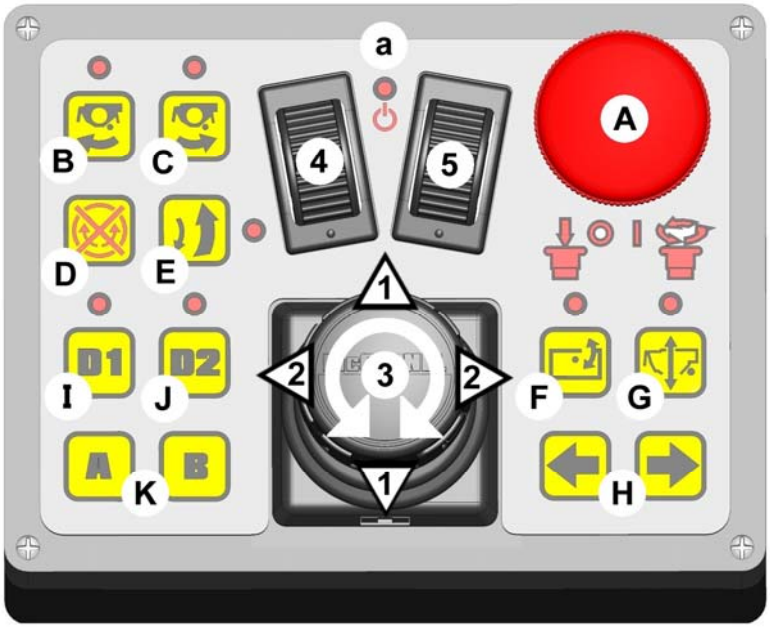


CAUTION: When the rotor is switched off it will continue to ‘freewheel’ under its own momentum for up to 40 seconds before finally coming to a standstill – do not leave the tractor cab or attempt to approach the flailhead until the rotor has stopped turning completely.

XTC (Mk3) PROPORTIONAL SWITCHBOX CONTROLS (7 Service)

Machines with XTC Mk3 Proportional Controls (7 service) will be supplied with the control unit shown below. The units for both electric and cable controlled rotor machines are identical except that for cable versions the rotor control switches B, C & D *(shown below)* will not provide a function as rotor operation will be controlled by a separate cable lever unit *(refer to specific cable rotor control page for operation details of that unit).*

Identification & Function of Controls



1. Arm Lift Control.
2. Arm Reach Control.
3. Head Angle Control.
4. Slew Control (Default) / 6th Service*
5. Tele/Midcut/VFR Control.

A. Power On/Off (LED 'a' indicates status).
B. Rotor Start (Uphill Cutting Direction).
C. Rotor Start (Downhill Cutting Direction).
D. Rotor Stop.
E. Auto Reset.
F. Head Angle Float On/Off.
G. Lift Float On/Off (Option).
H. 6th Service* / Slew (Swapped Mode).
I. 6th Service Activation Switch
J. 7th Service On/Off (if applicable)
K. N/A
** If applicable*

*NOTE: On machines that feature a controllable 6th service the functions are operated by default using the ◄ ► buttons (H), this control can be swapped to operation by the left hand thumb switch (4) by activation of the D1 control panel button; in this case Slew is then operated by use of the ◄ ► buttons (H). Control panel button D2 is used for any other additional services that require on/off control only i.e. Debris Blower / Diverter Valve.

LED Lights

LED lights adjacent to control button reports the status of that particular function; when the function is selected the LED light will illuminate to confirm that the function is active; the light will switch off on de-selection of the function.

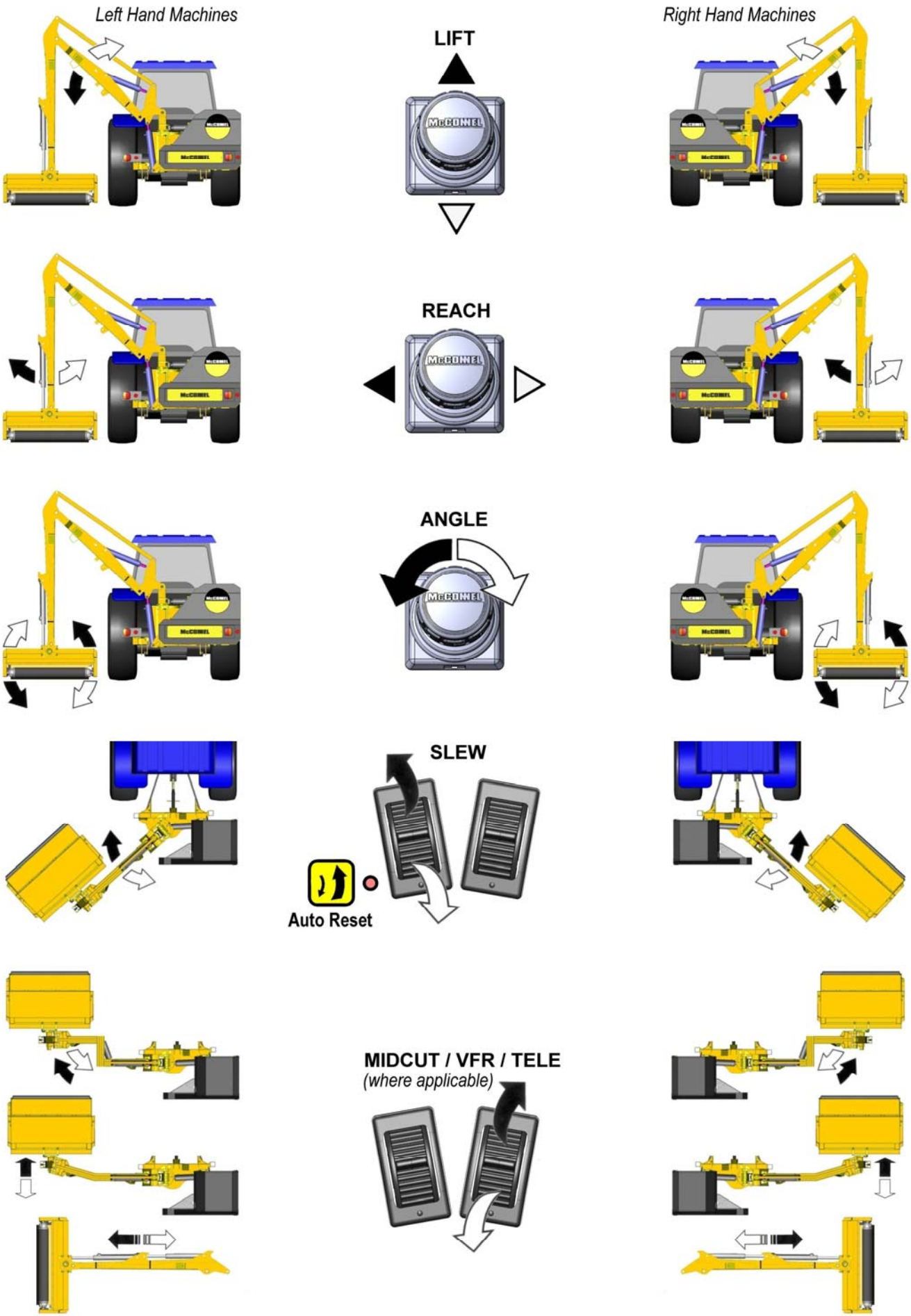
Powering the Controls

Activation of power to the control unit is by operation of the red button switch as shown below:

Rotate clockwise for **Power ON**
(LED light on confirms power on)

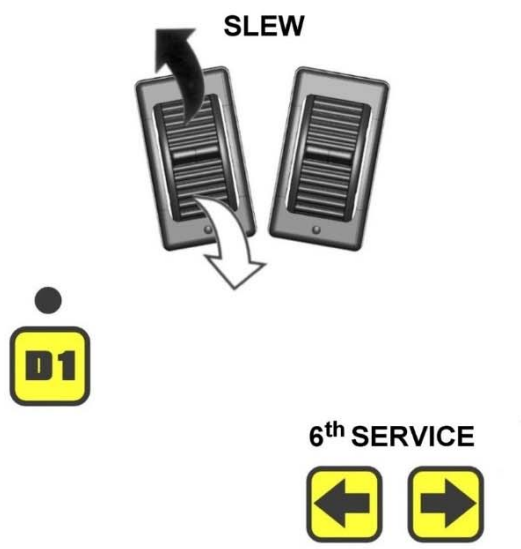
Press for **Power OFF / Emergency Stop**
(LED light off confirms power off)

ARMHEAD OPERATION

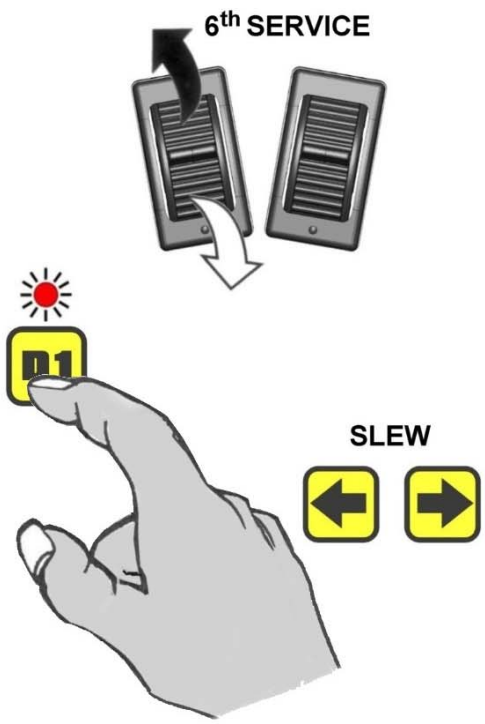


6th SERVICE *(Where applicable)*

Default Mode

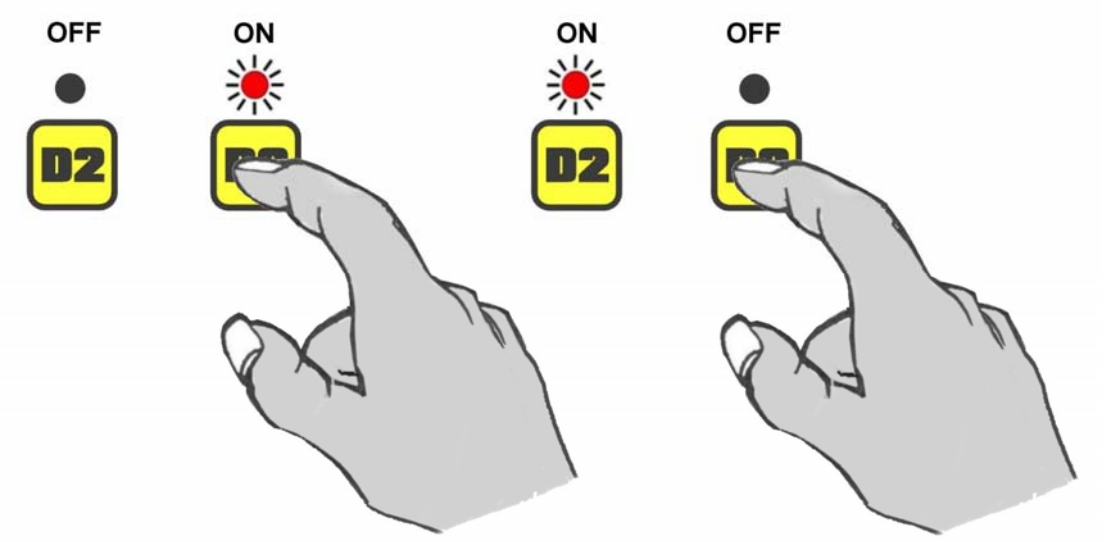


Swapped Mode (D1 Activated)



On machines fitted with a controllable 6th service default operation of that function will be via the ◄ ► buttons on the control unit. If required, control of the function can be swapped to the left hand toggle switch by activating the D1 button on the control panel; in this mode slew operation will then be transferred to the ◄ ► buttons. De-activating D1 will return the functions to their default controls. An LED light above the button confirms when the service is active.

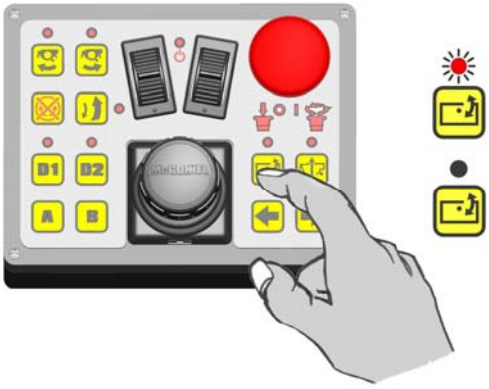
7th SERVICE *(Where applicable)*

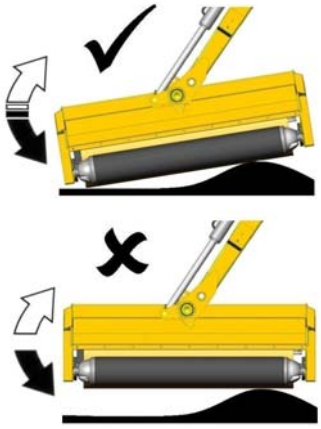


Additional services that require ON/OFF control only are operated by the D2 button on the control panel; pressing the button will switch the service on, pressing the button again will switch it off. An LED light above the button confirms when the service is active.

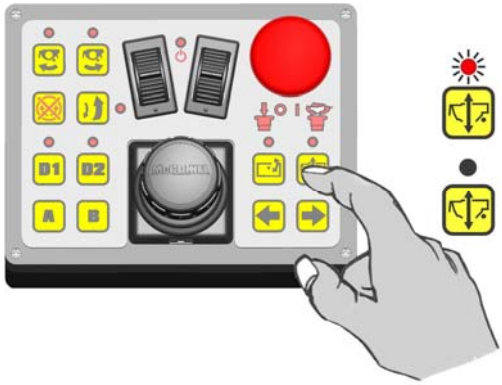
HEAD FLOAT OPERATION

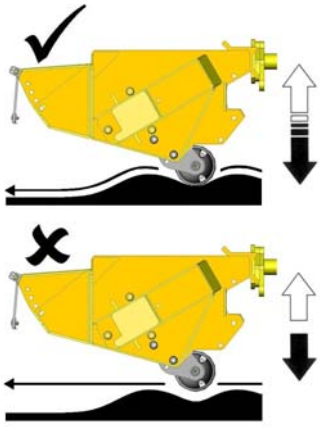
Angle Float (Optional)





Lift Float (Optional)





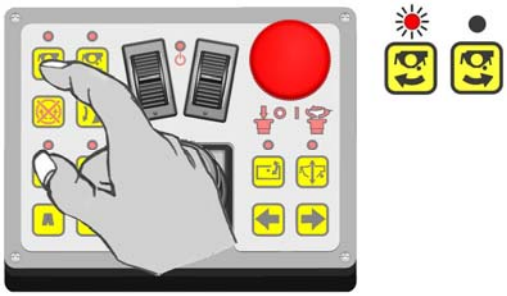
ROTOR OPERATION – Electric Rotor Control Models only

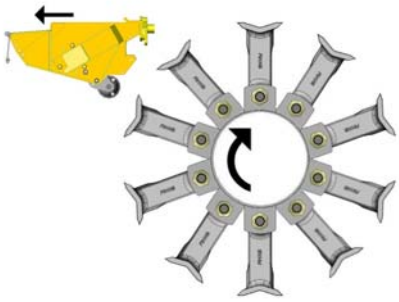
NOTE: The following section relates to machines with electric rotor control only – for cable rotor control models refer to the specific cable rotor control section in the manual.

Rotor Start (Selection of Rotor Cutting Direction)

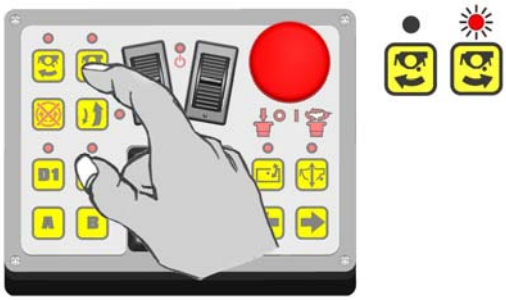
Select rotor start for required direction (LED will light to indicate the active direction).

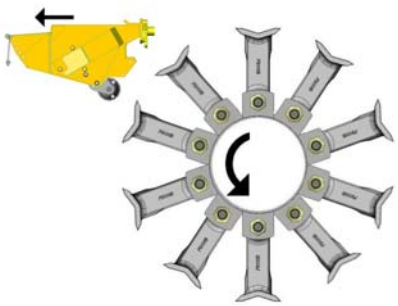
Uphill Cutting





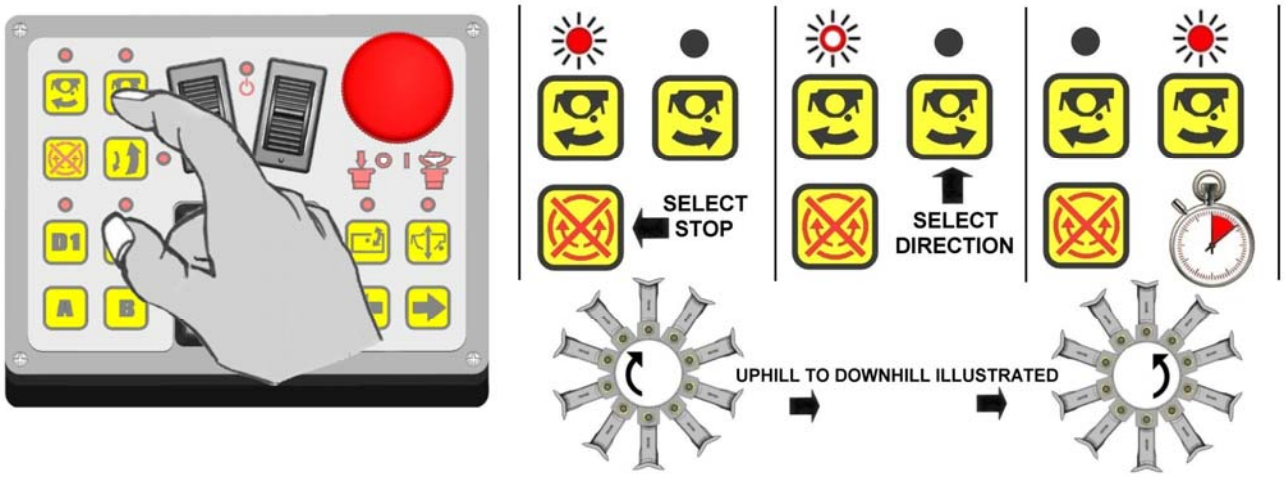
Downhill Cutting





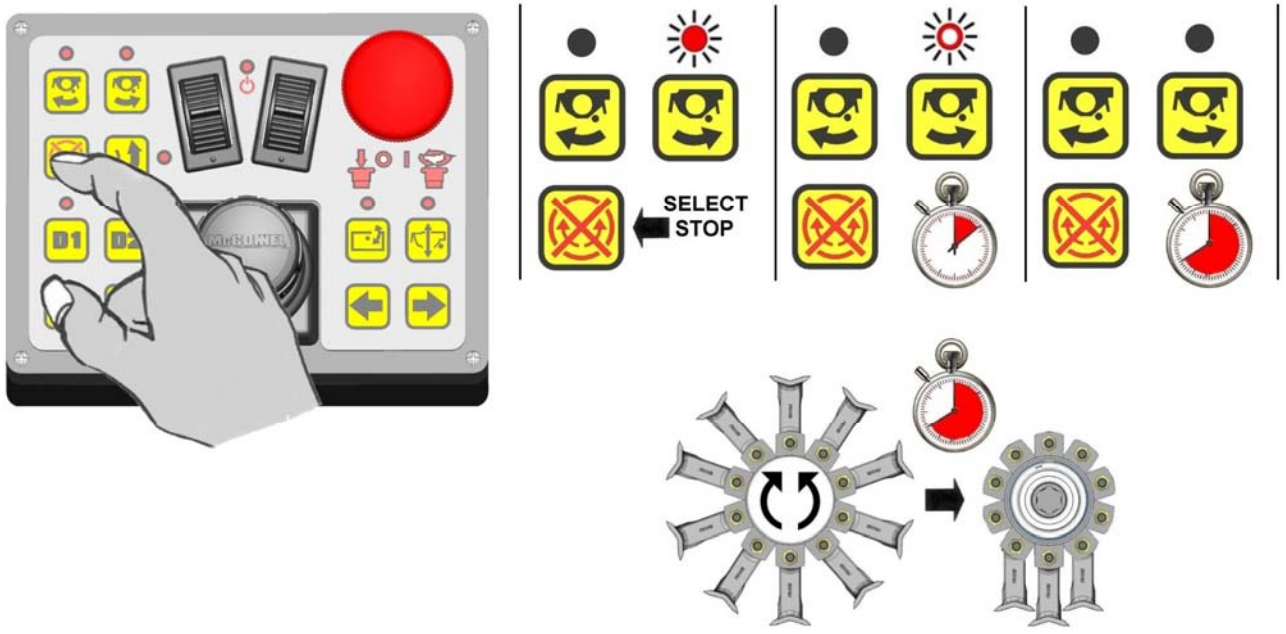
Switching Rotor Direction

With the rotor running, changing the rotor cutting direction can only be achieved after first operating ‘rotor stop’, when stop has been selected the specific direction button can then be operated to command the rotor to switch to the desired direction. NOTE: This function has a built in time delay of approximately 8 seconds - this is a machine protection feature that allows the rotor sufficient time to de-accelerate before restarting in the opposite direction. The LED light of the active cutting direction will flash on and off during the slowing down period, when the direction has changed the LED for the new direction will be illuminated.



Switching the Rotor Off

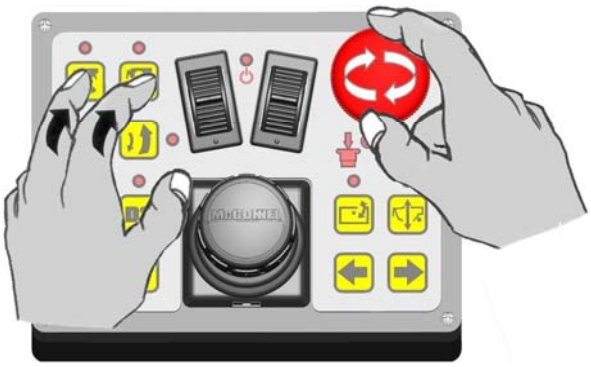
Stopping the rotor is performed by operation of the rotor stop button as illustrated below. When ‘rotor off’ has been selected the LED light above the button of the active cutting direction will flash on and off at an increasing frequency for approximately 8 seconds to signify that the rotor has been switched off, after this 8 second period the light will go off completely. NOTE: The rotor will continue to rotate under its own power until it finally comes to a standstill.



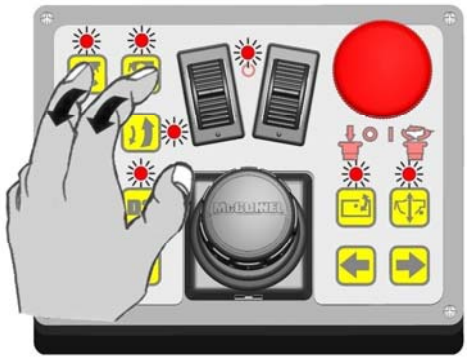
CAUTION: When the rotor is switched off it will continue to ‘freewheel’ under its own momentum for up to 40 seconds before finally coming to a standstill – do not leave the tractor cab or attempt to approach the flailhead until the rotor has stopped turning completely.

CONTROL UNIT CALIBRATION

If for any reason the controls should stop responding the unit will need to be calibrated; the procedure for this is shown below.



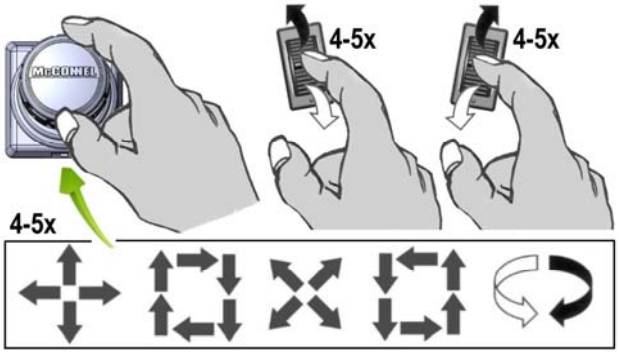
With the unit powered off; simultaneously press and hold both rotor direction buttons before then powering on the unit.



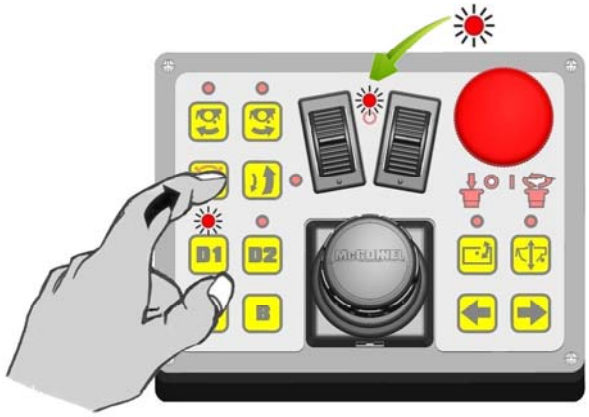
When all the led's light up; release both buttons.

Press and release the rotor stop button to enter calibration mode; all led's will simultaneously flash once to confirm.

Power led will flash on and off continuously whilst the unit is in calibration mode.



Operate the joystick through its complete range of movements 4 to 5 times then operate each toggle switch fully forwards and fully backwards 4 to 5 times.



Press the rotor stop button once to exit calibration mode; the rotor stop led will flash rapidly to confirm and the power led will stop flashing and remain lit.

BREAKAWAY

The machine is fitted with a hydraulic breakaway device which protects the structure of the machine should an unforeseen obstacle be encountered.

NOTE:
The breakaway function does not relieve the operator of his responsibility to drive carefully, be alert and AVOID OBVIOUS HAZARDS BEFORE CONTACT OCCURS.

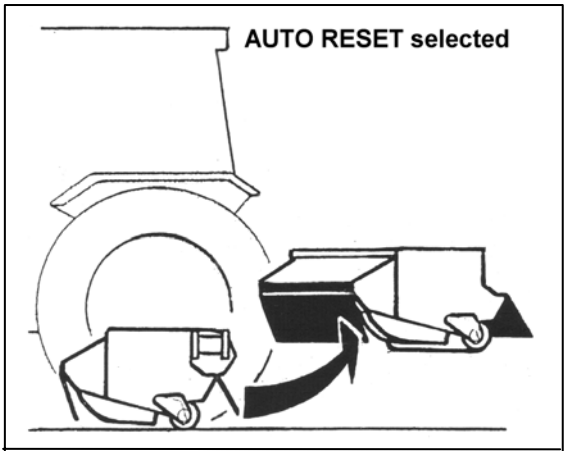
Breakaway may occur momentarily during normal work should an extra thick or dense patch of vegetation be encountered. In these instances tractor forward motion may be maintained with care.
Where breakaway has occurred as a result of contacting a post or tree etc. the tractor must be halted and the controls of the machine utilised to manoeuvre the head away from the obstacle. **NEVER CONTINUE FORWARD MOTION TO DRAG THE HEAD AROUND THE OBSTACLE IN BREAKBACK POSITION.**

NOTE:
The force required to activate the breakaway system will vary dependent upon the gradient of work. It will require less force when working uphill and vice versa.

On mid-cut machines the geometry of the breakaway will cause the head to initially move outwards in addition to rearwards. Therefore be aware that the breakaway action will be impeded if the outer end of the head is working against a steep bank. In this circumstance extra care must be taken during operation to avoid this occurrence.
Breakaway occurs at the slew column pivot. When an obstacle is encountered continued forward motion causes the pressure in the slew ram base to rise until the relief valve setting is exceeded.

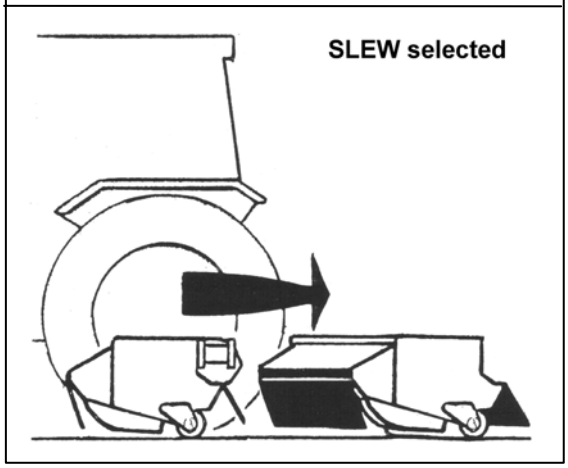
With 'AUTO RESET' selected:
When the slew relief valve setting is exceeded oil is displaced from the slew ram into the base of the lift ram which causes the head to rise as the arm pivots backwards to clear the obstruction.

Resetting of the head into the work position occurs automatically.



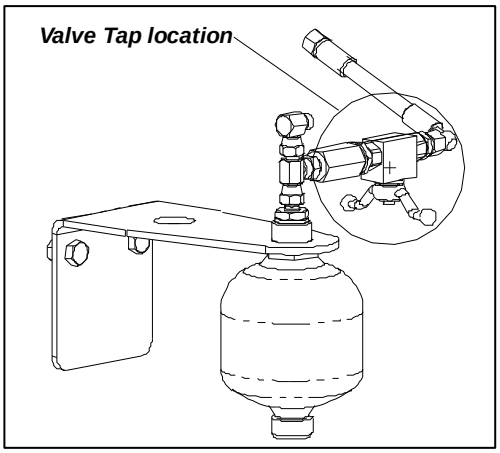
With 'SLEW' selected:
When the slew relief valve setting is exceeded oil is displaced from the slew ram allowing the arm to pivot backwards horizontally and the obstacle to be cleared.

Re-setting the head into the work position is carried out manually by selecting 'SLEW OUT' on the control assembly



AUTO-RESET – Pressure Setting for Front Mounted Machines

The procedure for automatically setting pressures for Auto-reset on Front Mounted models is as follows:

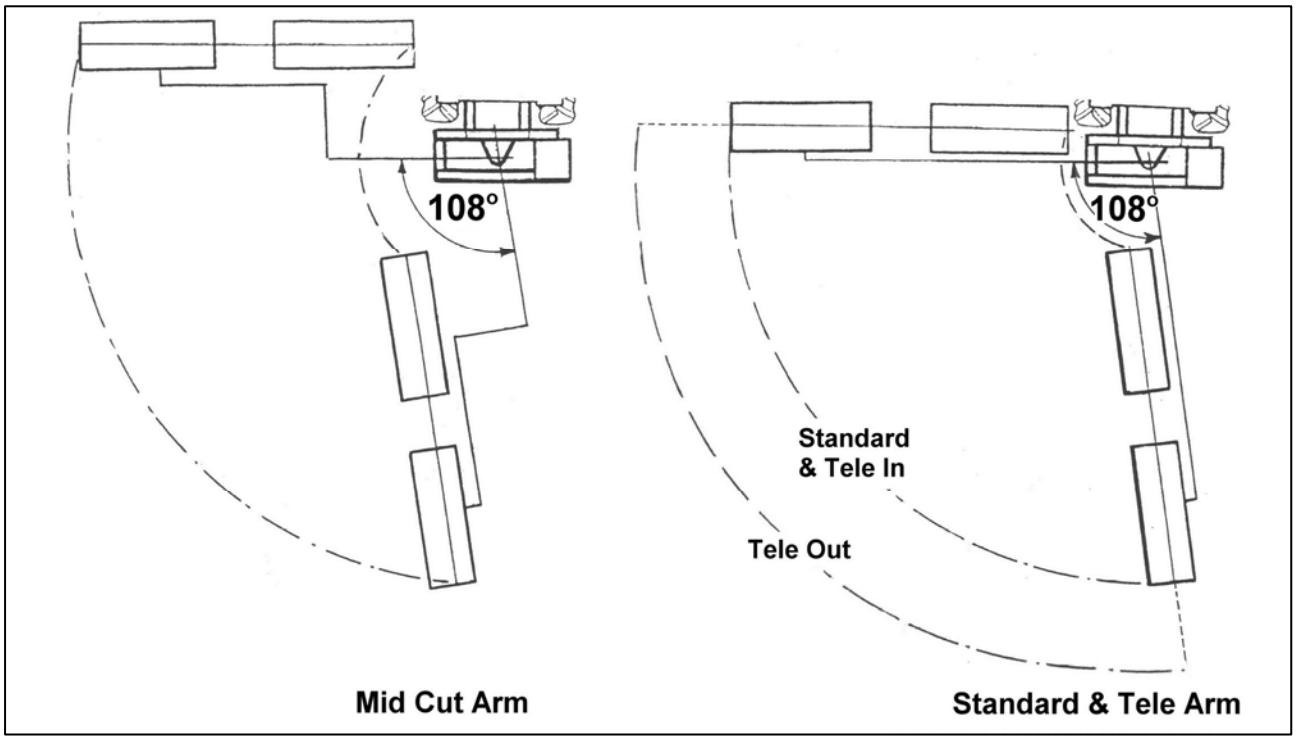


- Manoeuvre flailhead to a horizontal position where it is close to the tractor and resting on the ground.
- Open valve tap to allow oil in - *see diagram opposite for tap location.*
- Operate machine to raise the flailhead until it is clear of the ground and then return it back to the ground.
- Close valve tap.

The pressures will now be automatically set.

NOTE: *A test point is located on the Breakaway Ram to allow pressure to be checked or to 'bleed' air from the system should it be required.*

POWERED SLEW

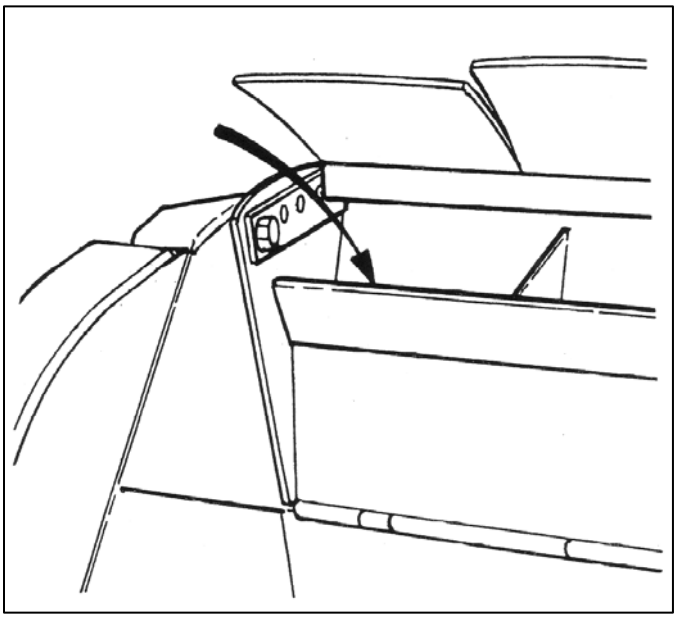


The slew feature allows a 108° arc of powered arm movement on the working side, from right angles to the tractor, to 18° beyond the direct line astern.
This feature is required to place the machine in the transport position but can also be used to sweep the arm 'to and fro' whilst cutting awkward areas and corners thus avoiding the need to constantly re-position the tractor. To operate in this way 'slew' must be selected on the control assembly.

If breakaway occurs the slew motion must be reversed to allow the slew breakaway relief valve to re seat and the ram to become operable again.

CAUTION!
Extra care must be taken when working in 'SLEW' mode with the reach fully in
IT IS POSSIBLE FOR THE FLAIL HEAD TO HIT THE TRACTOR OR MACHINE FRAME.

The flail head is equipped with a wire cutting edge welded into the underside. This is to ensure that the ends of any wire that may be entwined in the rotor are cut and fall within the confines of the flail head. ***This plate should not be interfered with in any way.***
Any wire caught in the rotor must be immediately removed *(see below).*



REMOVING WIRE

- Select rotor **'OFF'** and wait until it has **stopped rotating.**
- **STOP** the tractor and **only then** remove wire.

Do not reverse the rotor in an attempt to unwind any wire.

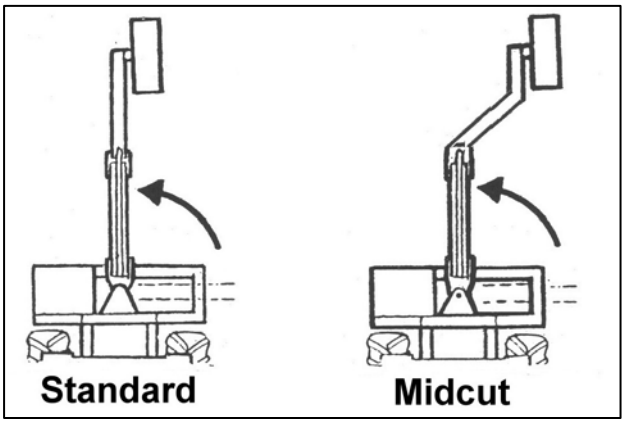
MOVING INTO THE TRANSPORT POSITION

- Select ‘ROTOR OFF’ and wait until the **rotor has stopped turning.**

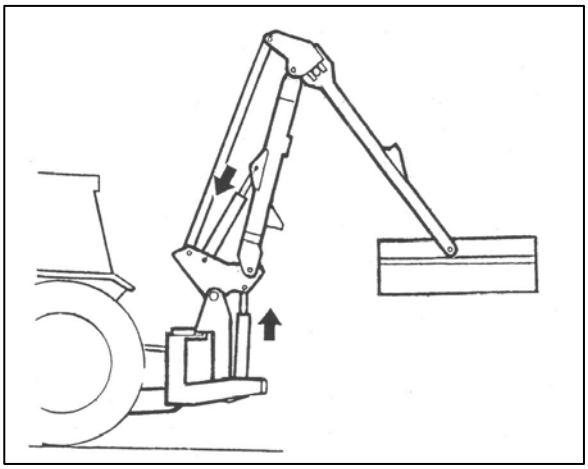
- Ensure that the **‘lift’** and **‘angle float’** are switched **off.**

- Select ‘SLEW’ mode on the control assembly.

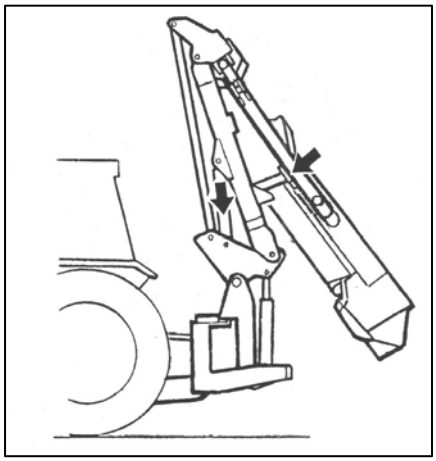
- Operate ‘SLEW IN’.



- Operate ‘LIFT’ and ‘REACH’ to position the machine *(see diagram).*



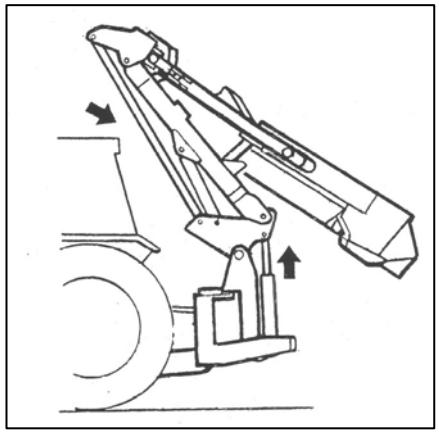
- Operate ‘REACH IN’ until the dipper arm contacts the transport cradle.



- Select ‘LIFT UP’ and raise the arms until the tension link is 300mm from the tractor cab.

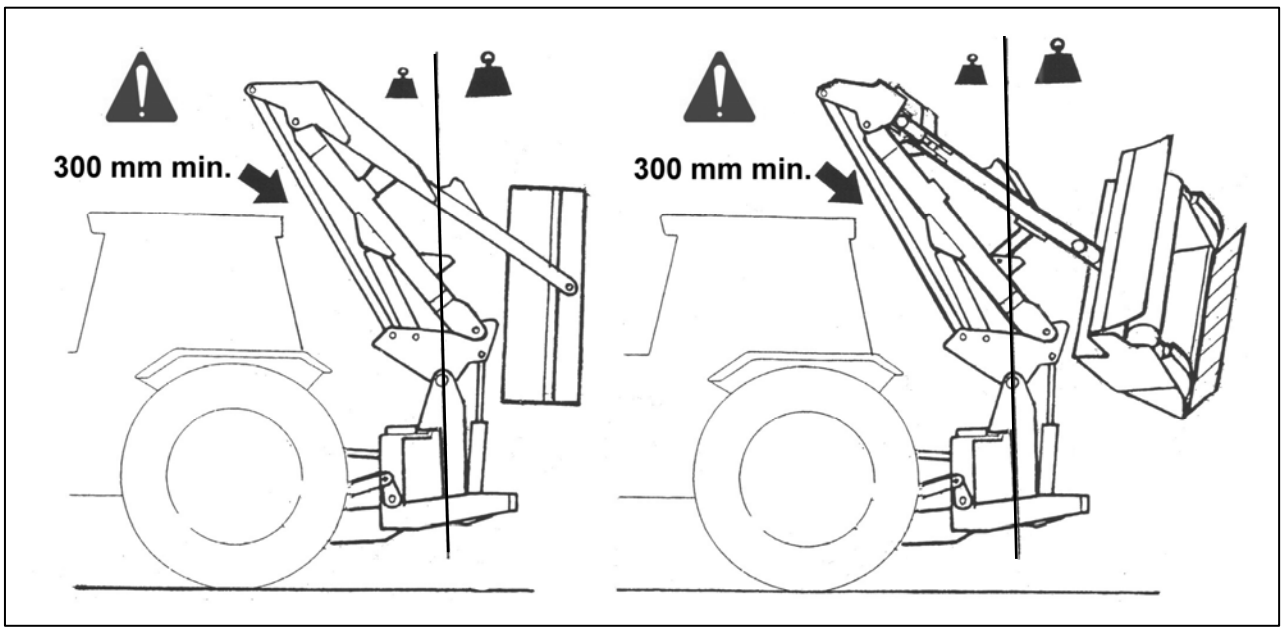
- Operate ‘ANGLE’ and position the flail head in as compact position as possible. *(see transport position)*

- Fully screw in the lift ram and slew ram taps.

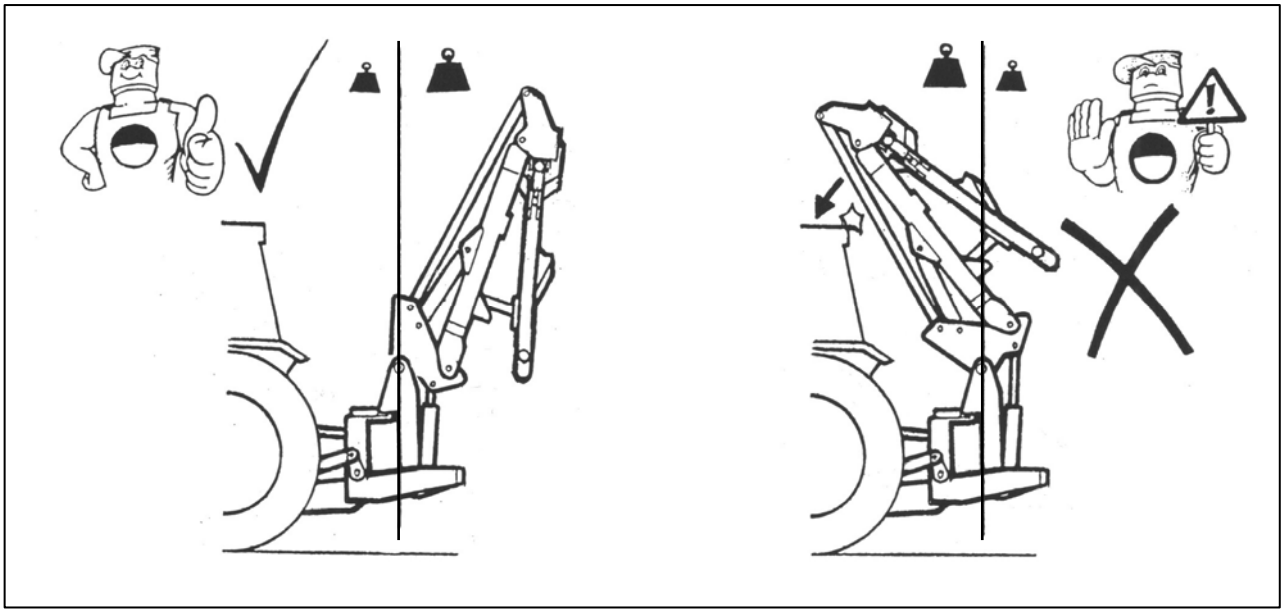


TRANSPORT POSITION – Rear Mounted Machines

The machine is transported in line to the rear of the tractor with a minimum of 300mm clearance between the tension link and the rear cross member of the tractor cab.



TRANSPORT POSITION WITH FLAILHEAD REMOVED

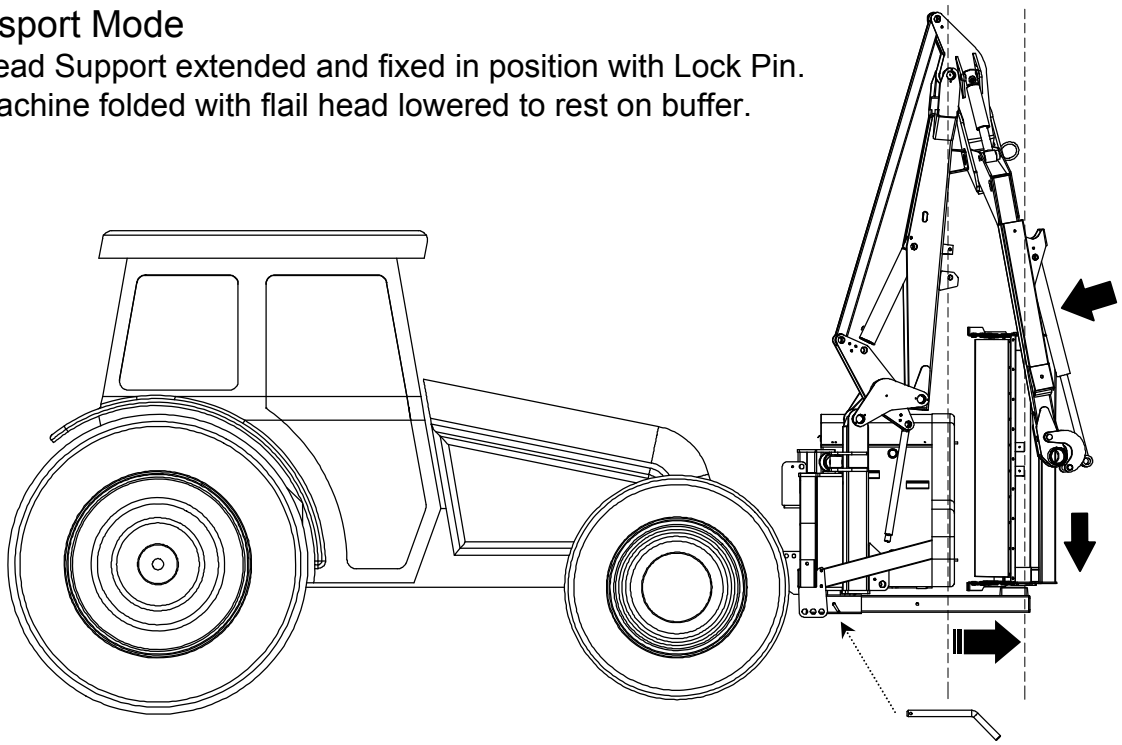


With the flailhead removed the arms are fully folded but with the lift ram fully retracted. If the lift ram is extended the weight of the arms will result in the balance of the machine to go ‘over centre’ causing the tension link to crash into the rear cross member of the tractor’s cab.

WARNING!
During transport the 'SLEW’ mode must ALWAYS be selected on the controls.

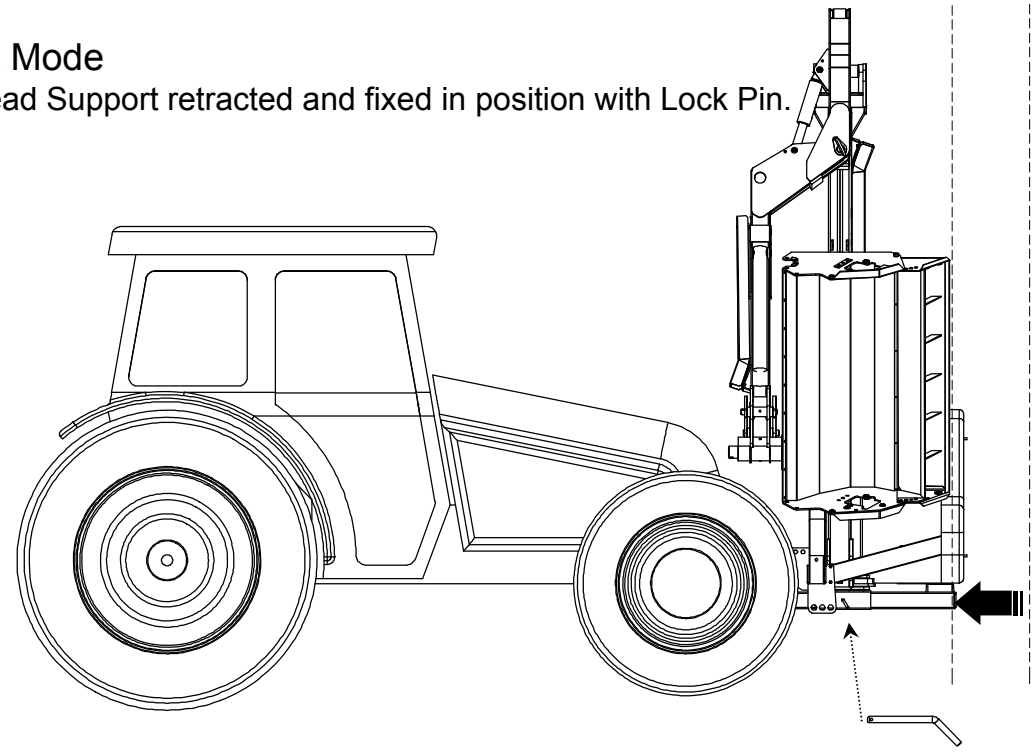
Transport Mode

- Head Support extended and fixed in position with Lock Pin.
- Machine folded with flail head lowered to rest on buffer.



Work Mode

- Head Support retracted and fixed in position with Lock Pin.

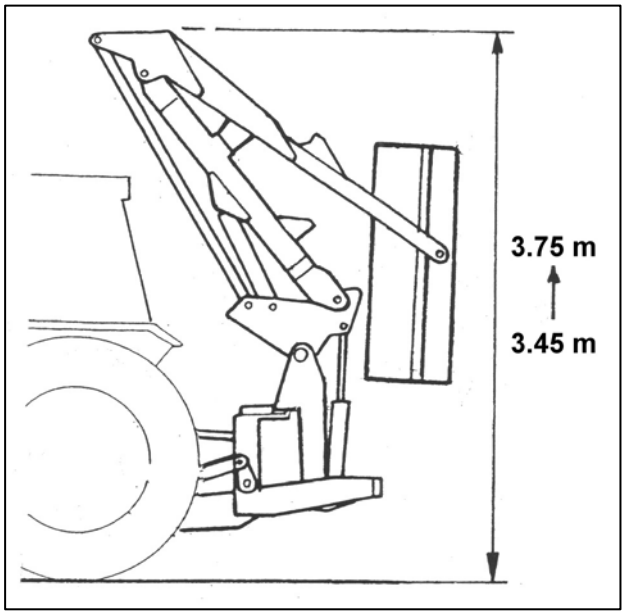


TRANSPORT

When in transport the PTO must be disengaged and the power to the control box switched off.
The acceptable speed of transport will vary greatly depending upon the ground conditions. In any conditions avoid driving at a speed which causes exaggerated bouncing as this will put unnecessary strain on the tractors top hitch position and increase the likelihood of the tension link contacting the cab rear cross member.

TRANSPORT HEIGHT
There is no fixed dimension for transport height. It will vary depending on the height that the machine is carried and the degree of arm fold that the rear of the cab will allow.

For the majority of installations the transport height will generally fall between a minimum of 3.45m and a maximum of 3.65m when the machine is correctly folded



MOVING FROM TRANSPORT TO WORK POSITION (all models)

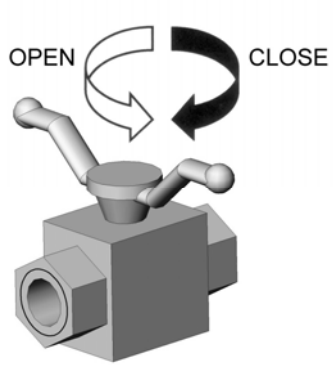
To revert to the work position' the previous procedures for the relevant models are largely reversed.

NOTE: Remember to unscrew the lift ram tap.

ENGAGING DRIVE
Ensure that the rotor control lever is in the 'Stop' position before engaging the PTO shaft. Allow the oil to circulate for a minute or so before operating the armhead levers. Position the flail head in a safe position, increase the engine speed to a high idle and move rotor control lever to 'START' – After initial 'surging' the rotor will run at an even speed.

Slew Lock

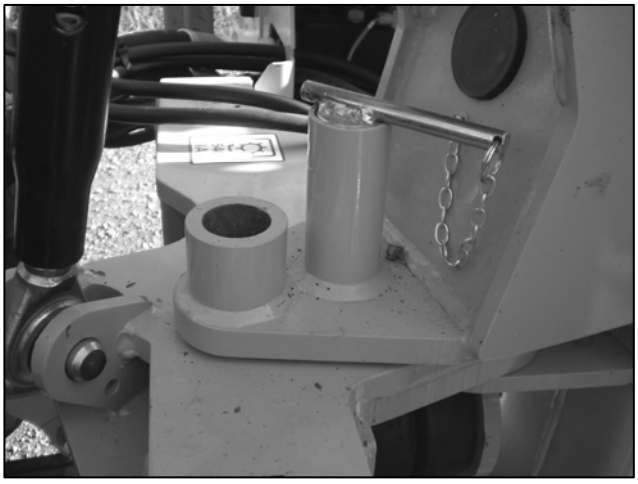
All machines with slewing capability are fitted with a slew lock – depending on the particular machine this will either be in the form of a lock tap fitted to the slew ram or a slew locking pin that locates through the pillar into the top of the mainframe. The slew function must be 'locked' at all times during transportation and storage of the machine and only unlocked for work. The illustrations opposite and below show the different types of slew locks:



TAP TYPE SLEW LOCK ►
Open – *only for working*
Closed – *always for transport & storage*

PIN TYPE SLEW LOCK *(NOTE: PA600 model shown for illustration purposes only)*

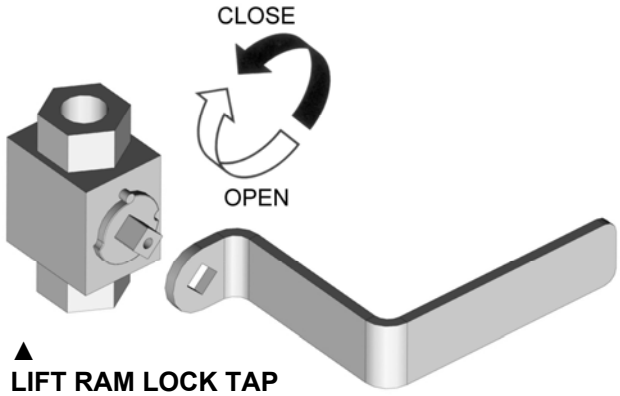
Slew Locked – *always for transport & storage*



Slew Unlocked – *only for working*

Lift Ram Lock

Certain machines, predominantly larger models, will be fitted with either one or two lift ram lock taps – on machines where these are fitted the tap(s) should always be closed during transportation and storage of the machine to prevent movement of the arms during transport or when the machine is parked up. The tap lock(s) will be similar to the one illustrated opposite.

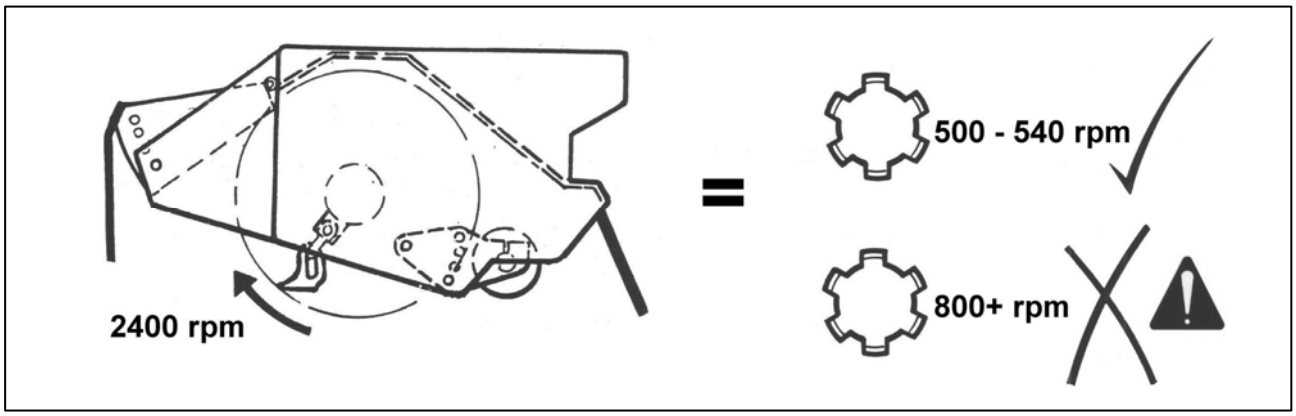


▲
LIFT RAM LOCK TAP
Open – *only for working*
Closed – *always for transport & storage*

CAUTION!

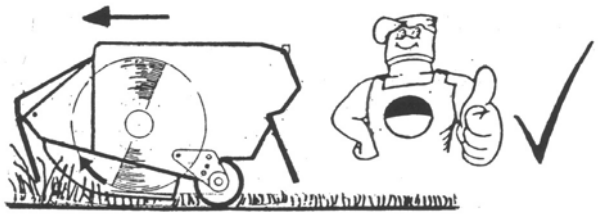
Where fitted Slew and Lift Locks must be in the closed / locked position at all times during machine transportation and storage – open / unlock only for work.

ROTOR OPERATING SPEED - Rear Mounted 65HP Gear Machines

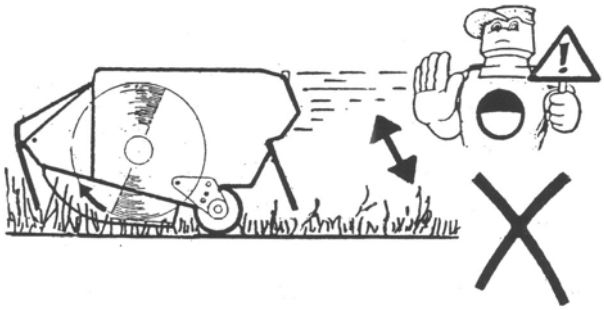


TRACTOR FORWARD SPEED

The material being cut determines tractor forward speed. Forward speed can be as fast as that which allows the flail head sufficient time to cut the vegetation properly.



Too fast a speed will be indicated by over frequent operation of the breakaway system, a fall off in tractor engine revs and a poor finish to the work leaving ragged uncut tufts and poorly mulched cuttings.



EMERGENCY STOPPING

In all emergency situations machine operation and functions must be stopped immediately; **Stop PTO operation** using the tractor controls then immediately kill electrical power to the machine using the **Off (Emergency Stop)** switch on the machine's control unit.

WARNING: Auto-Reset Machines

When the Auto-Reset feature is active the machines arm set is capable of unintentional movement even when the PTO is switched off and stationary. Always ensure that electrical power to the machine is switched off using the **Off (Emergency Stop)** switch on the machine's control unit in emergency situations and/or when the machine is not being operated.

WARNING: Cable Operated Machines

In certain conditions, and/or if the Auto-Reset feature is active, the arm sets on cable operated machines possess the potential to move unintentionally, even when the PTO is switched off and stationary, if the levers were to be accidentally operated. Care must be adopted to avoid any movement of the levers when the machine is not being operated. Ensure arm sets are lowered fully to the ground when the machine is parked up or not in use.

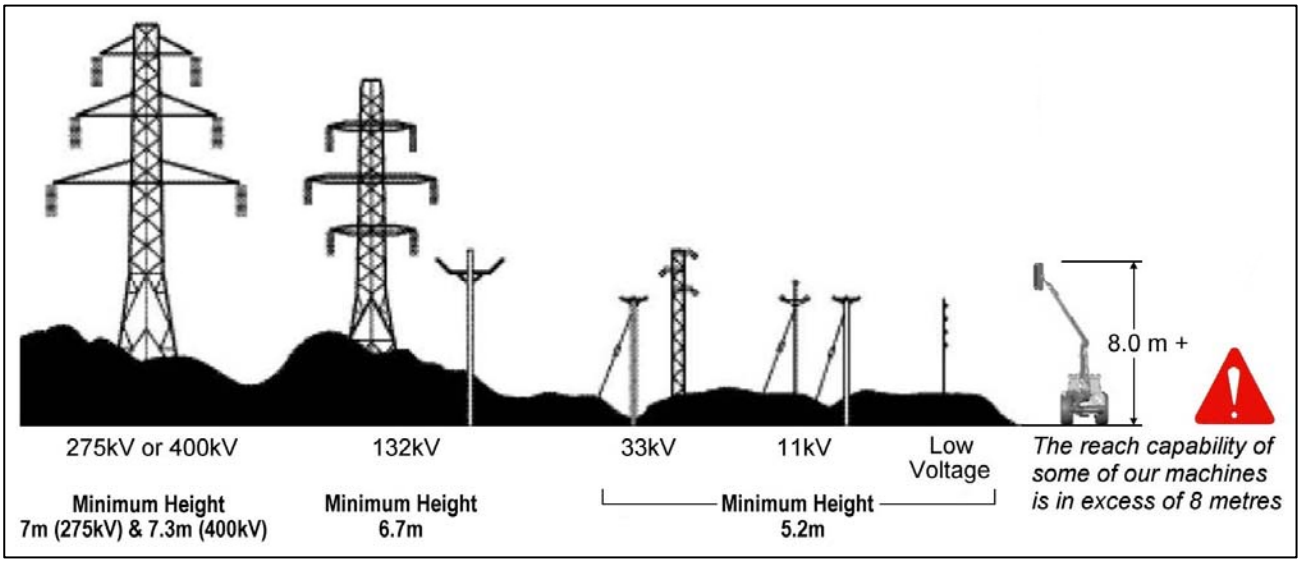
OVERHEAD POWER LINES (OHPLs)

It cannot be stressed enough the dangers involved when working in the vicinity of Overhead Power Lines (OHPLs). Some of our machines are capable of reach in excess of 8 metres *(26');* they have the potential to well exceed, by possibly 3 metres *(9' 9"),* the lowest legal minimum height of 5.2 metres from the ground for 11,000 and 33,000 volt power lines.
Remember electrocution can occur without actually coming into contact with a power line as electricity can 'flashover' when machinery gets close to it.

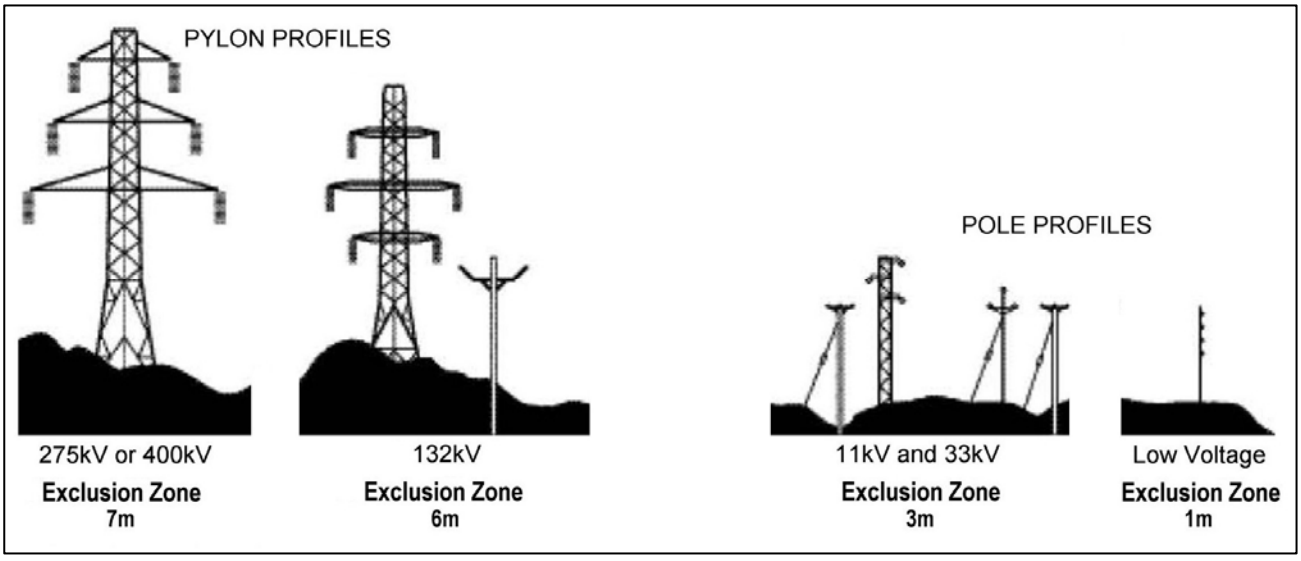
WARNING: All operators must read the following information and be aware of the risks and dangers involved when working in the vicinity of Overhead Power Lines (OHPLs).

Wherever possible the safest option is always to avoid working in areas close to OHPLs.
Where unavoidable, all operators must perform a risk assessment and implement a safe procedure and system of work – *see following page for details.*
All operators should perform a risk assessment before operating the machine within 10m horizontal distance of any OHPLs.

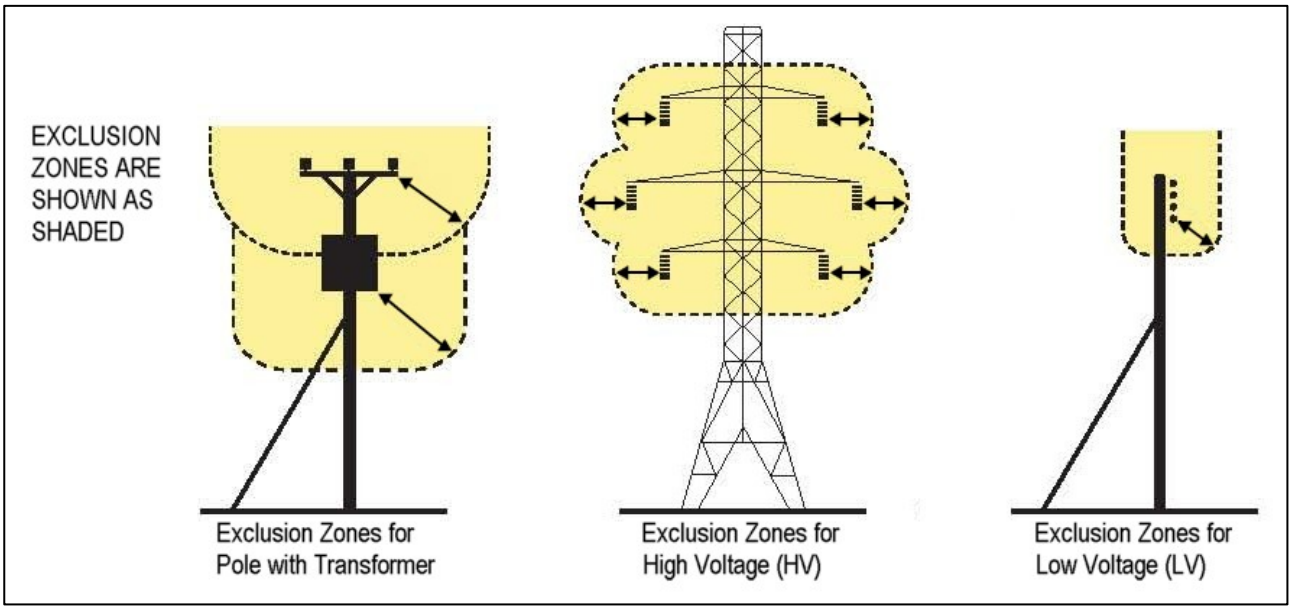
Minimum Heights for Overhead Power Lines



Absolute Minimum Exclusion Zones for Specific Overhead Power Lines



Definitions of Exclusion Zones



Risk Assessment

Before starting to work near OHPLs you should always assess the risks. The following points should be observed;

- **Know** the risks of contacting OHPLs and the risk of flashover.
- **Find out** the maximum height and maximum vertical reach of your machine.
- **Find out** the location and route of all Power Lines within the work area.
- **Find out** the operating voltage of all Power Lines within the work area.
- **Contact** the local Distribution Network Operator (DNO) who will be able to advise you on the operating voltage, safe minimum clearance distance for working, and additional precautions required.
- **Never** attempt to operate the machine in exclusion zones.
- **Always** work with extreme caution and plan your work ahead to avoid high risk areas.
- **If doubt exists** do not work in the area – never risk the safety of yourself or others.

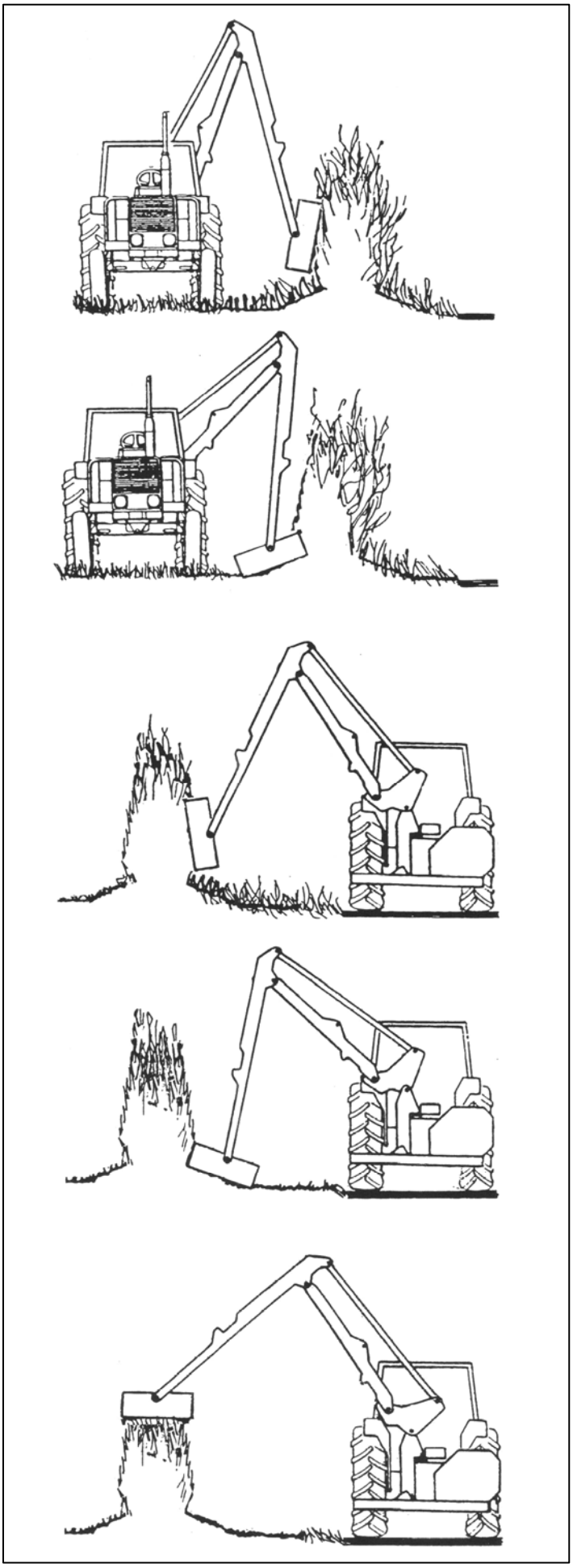
Emergency Action for Accidents Involving Electricity

- Never touch an overhead line - even if it has been brought down by machinery, or has fallen. Never assume lines are dead.
- When a machine is in contact with an overhead line, electrocution is possible if anyone touches both the machine and the ground. Stay in the machine and lower any raised parts in contact or drive the machine out of the lines if you can.
- If you need to get out to summon help or because of fire, jump out as far as you can without touching any wires or the machine - keep upright and away.
- Get the electricity company to disconnect the supply. Even if the line appears dead, do not touch it - automatic switching may reconnect the power.

Further information and leaflets on this and other agricultural safety subjects are available on the 'Health & Safety Executive' website at the following address: www.hse.gov.uk/pubns/agindex.htm

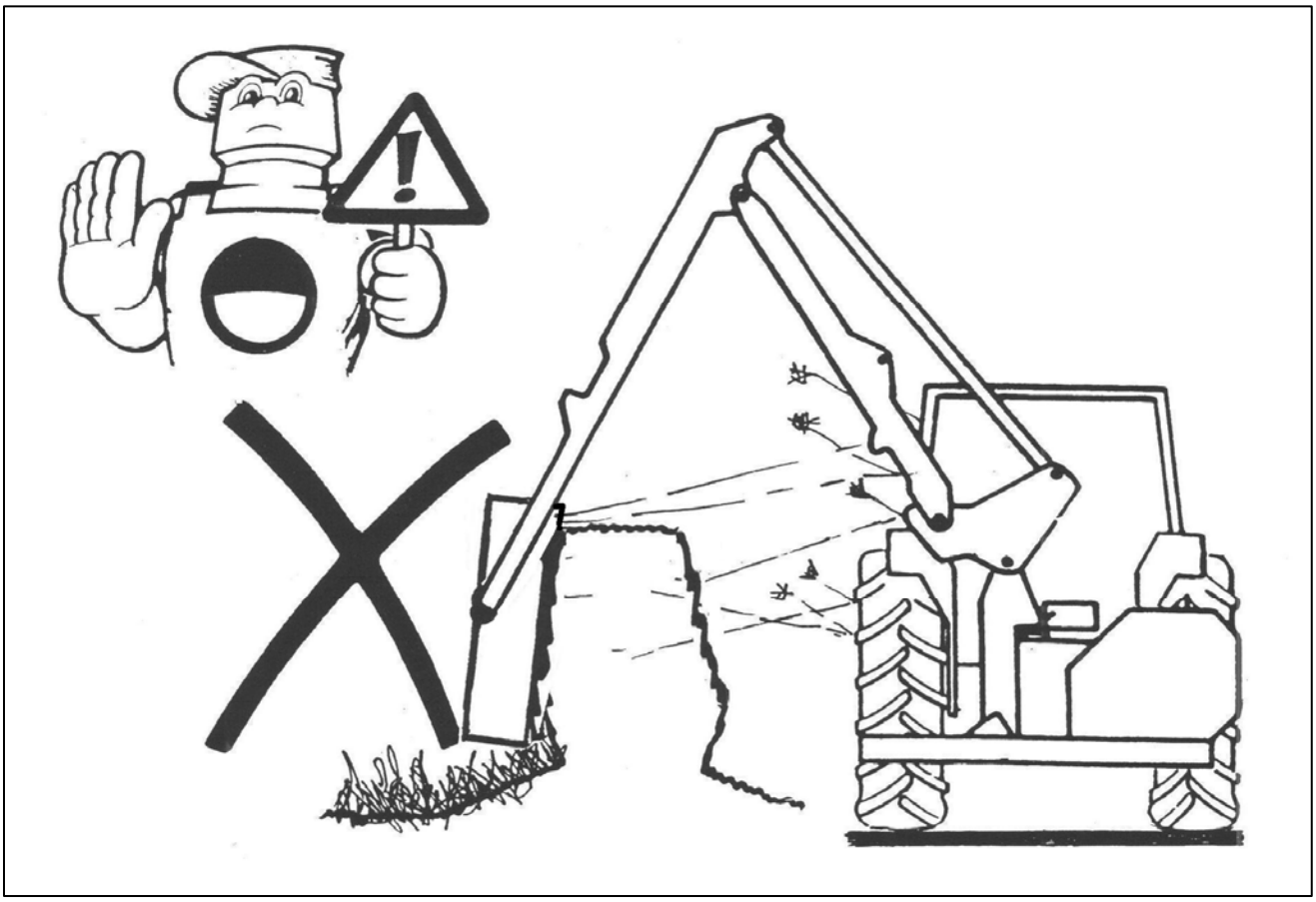
HEDGE CUTTING PROCEDURE

1. Cut the side and bottom of the field side first. This leaves the maximum thickness of hedge on the road side to prevent the possibility of any debris being thrown through the hedge into the path of oncoming vehicles.



2. Cut the side and bottom of the road side.

3. Top cut the hedge to the height required.



WARNING!

NEVER CUT ON THE BLIND SIDE OF THE HEDGE.

It is impossible to see potential hazards or dangers and the position of the flail head would possibly allow debris to be propelled through the hedge towards the tractor and the operator.

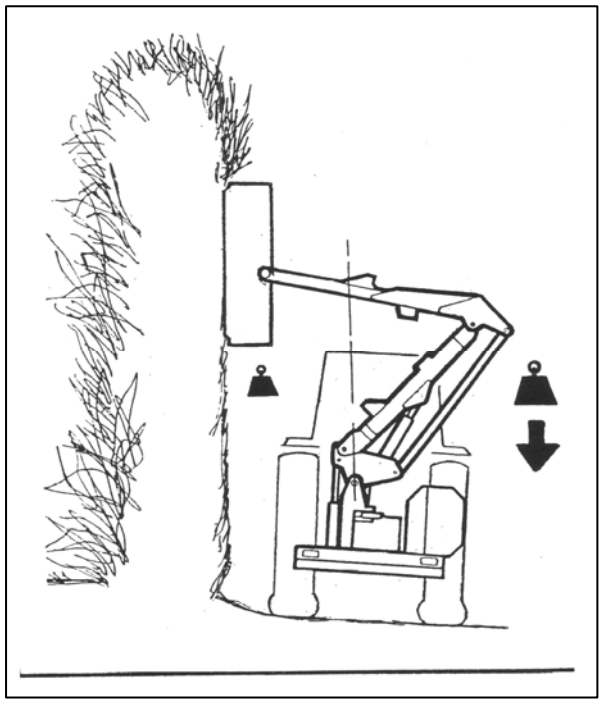
WORKING ON ADVERSE SLOPES

When working high with the reach fully in it is possible for the main arm balance to go over centre and take the weight off the lift ram. A restrictor in the gland connection of the lift ram prevents sudden unpredictable movements should this occur.

WARNING

Do not remove this restrictor from the lift ram gland connection.

The machine is fitted with a cam valve which stops unpredictable movements when working with the machine in a high position.

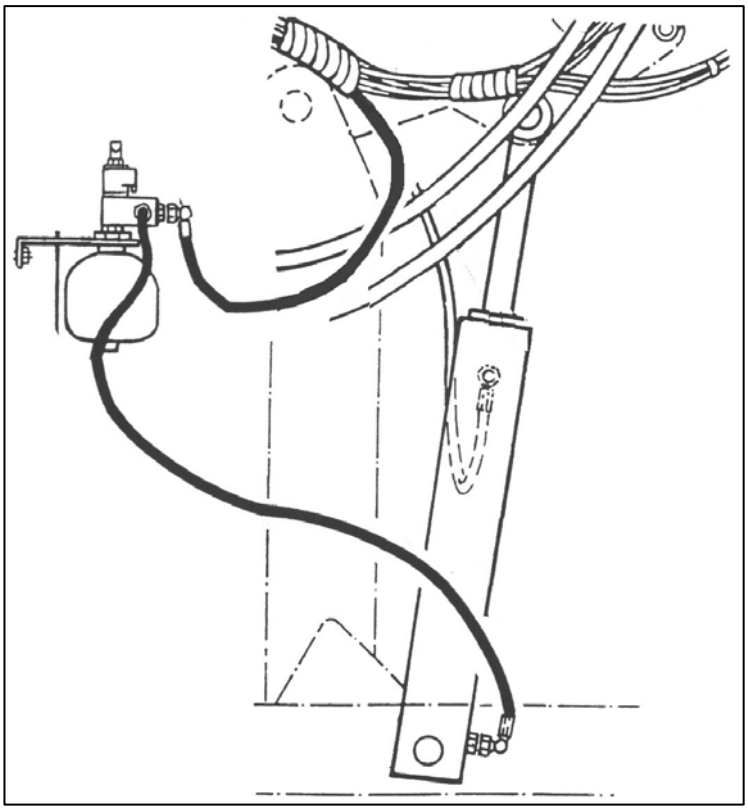


HEAD ANGLE FLOAT KIT – Standard Feature

This facility allows the flailhead to angle itself automatically to suit the contours of the ground – on multilever and monolever switchboxes the function is activated by selecting 'C'.

LIFT FLOAT KIT – Optional Extra for ground cutting

When fitting float kits always ensure they are mounted on their special bracket and positioned such that they do not foul or interfere with other components during the slewing movements of the machine.



CABLE CONTROLLED MACHINES

On cable controlled machines the switch is mounted in a convenient location in the cab. The supply cable from the poppet valve solenoid is connected into the tractors ignition system. The brown lead is positive and the blue is negative.

ELECTRIC CONTROLLED MACHINES

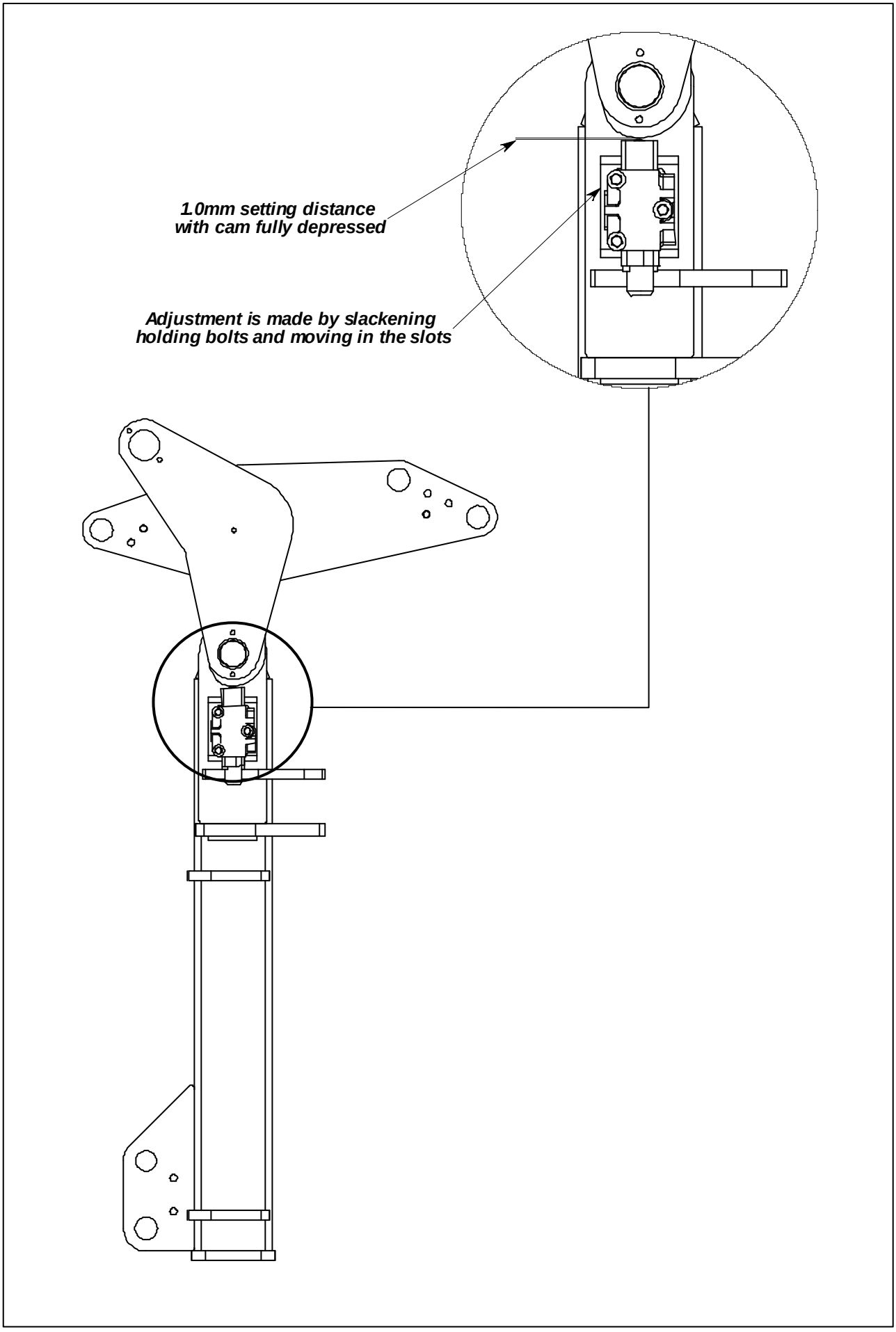
The auxiliary switch on multilever electric controlled machines is a three-position type, which will allow the selection of head float alone, or head and angle float in unison, if both options are fitted. For standard electric controlled machines power to the unit is via connection 15 and common connection 16. V.3 non-EDS proportional machines use connections LF and C.

In work with the solenoid valve open the flailhead will automatically follow the ground contours. The float action is engaged by selection of the auxiliary switch.

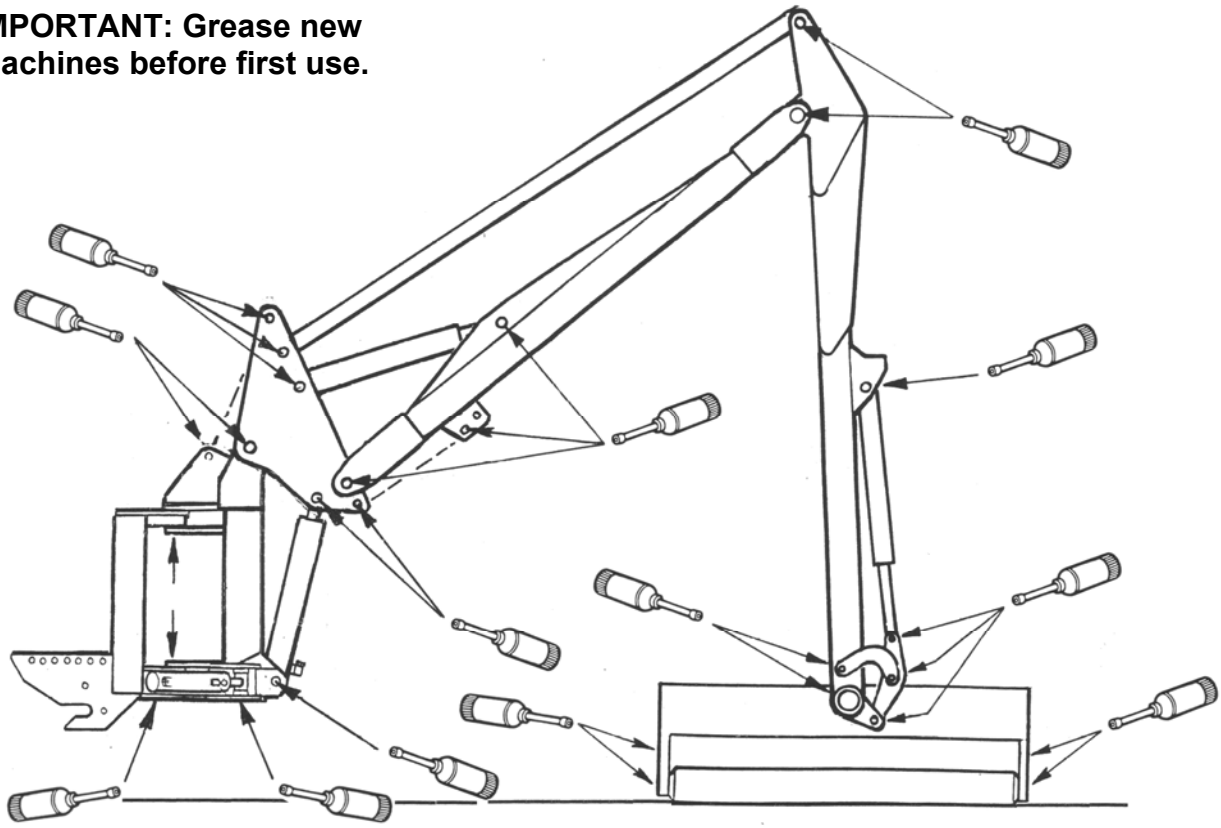
The lift control should be operated to take a proportion of the flail head weight off the flail roller. This is important, too little weight on the roller will leave areas of grass while with too much weight on the roller the ground will be scalped in places and increased flail wear, damage, or even loss of flails could occur.

To revert to standard operation the accumulator(s) is isolated from the lift ram by deselecting the float switch.

CAM VALVE ADJUSTMENT



IMPORTANT: Grease new machines before first use.



GENERAL

All points shown above should be greased on a daily basis and prior storage of the machine. New machines must be greased prior to first use.

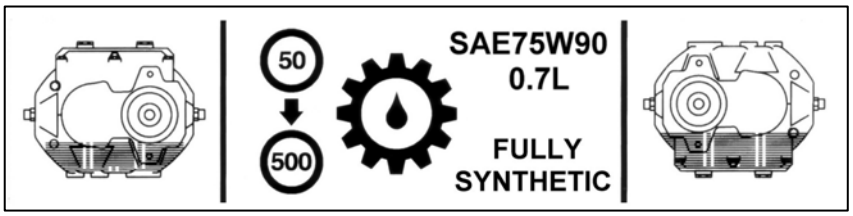
GEARBOX LUBRICATION

Check gearbox oil level on new machines prior to first use, top up if required before using the machine. Refill the gearbox after an initial 50 hours of use and thereafter at annual or 500 hour intervals, whichever occurs earliest.

Gearbox Capacity:

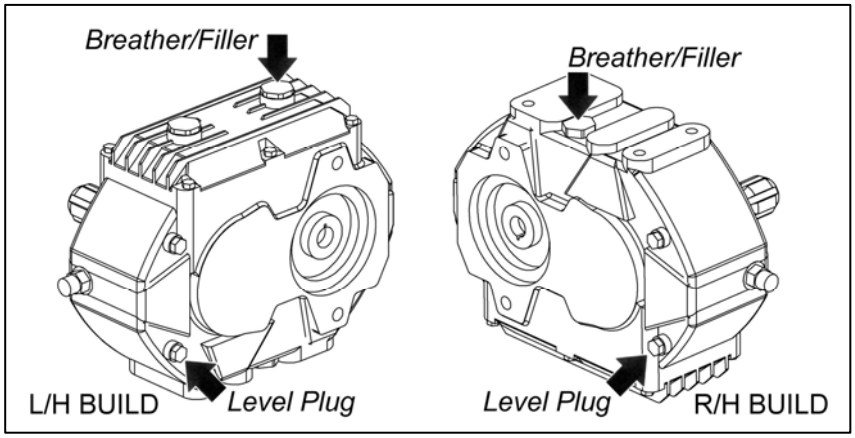
0.7 Litre SAE75W90 Fully Synthetic which meets the following minimum requirements;

Viscosity at 40°C, cSt, 100.0 min.
Viscosity at 100°C, cSt, 17.2 min.



Drainage of the gearbox for changes of oil is via the drain plug located on the base of the gearbox.

For refilling or for 'topping up' the oil remove both plugs indicated opposite and fill gearbox via the filler plug to a point where the oil starts to run from the level plug orifice *– replace plugs and tighten securely.*



Every Day

- Grease machine fully prior to work (and prior to storage).
  NOTE: New machines must be greased before initial use.
- Check for broken or damaged flails.
- Check tightness of flail nuts and bolts.
- Visually check for oil leaks and damaged hoses.
- Check all guards and safety shields are correctly fitted and undamaged.
- Ensure all lights are working and clean.
- Check oil level.
- Clean the cooler matrix, in dusty conditions more frequent cleaning is required.

After initial 12 Hours

- Change return line filter element. *Failure to do so will invalidate the warranty.*
  Note; factory fitted filter elements are identified differently to replacement elements.

After initial 50 Hours

- Change gearbox oil.

Every 25 Hours

- Grease PTO Shaft universal joints and tubes.

Every Week

- Check tightness of all nuts and bolts.
- Check gearbox oil level.
- Check for wear on telescopic arm pads – *where applicable.*

Every 100 Hours

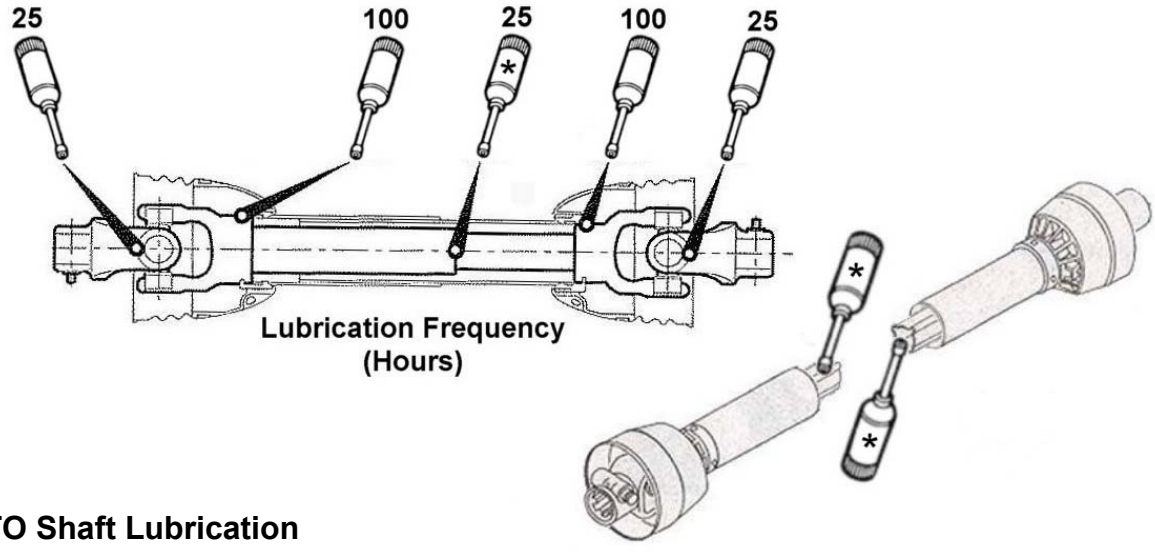
- Grease PTO shaft shield lubrication points.

Every 500 Hours

- Change return line filter element.
- Change gearbox oil.
- Check condition of hydraulic oil and change if required; *when changing oil new return line filter and suction strainer elements should be fitted and return line filter changed again after 12 hours of work.*

Annually

- Change tank breather.



PTO Shaft Lubrication

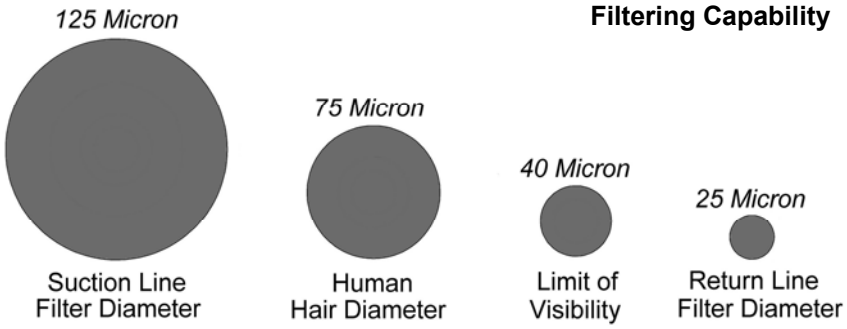
Oil Supply
Check the oil level in the reservoir daily.

Oil Condition & Replacement
No fixed time period can be quoted for oil changes as operating conditions can vary widely but a visually inspection of the oil will often indicate its current overall state. Signs of a reduction in its condition will be apparent by changes in colour and appearance when compared to new oil. Oil in poor condition can be dark, smell rancid or burnt, or in some cases be yellow, unclear or milky in appearance indicating the presence of air or emulsified water. Moisture resulting from condensation can become entrapped in the oil causing emulsification that can block the return line filter, consequentially the filter system will be by-passed and the oil and any possible contaminants present will continue to circulate without filtration risking damage to hydraulic components. All are indications or conditions that will require replacement of the oil.

Hydraulic oil is a vital component of the machine; contaminated oil is the root cause of 70% of all hydraulic system failures. Contamination can be reduced by the following:

- Cleaning around the reservoir cap before removal, and keeping the tank area clean.
- Use of clean containers when replenishing the system.
- Regular servicing of the filtration system.

Filtration System
Machines are protected by both replaceable 125 micron suction strainers and low pressure 25 micron full flow return line filters – the diagram below is a 'scaled up' view illustrating the filtering capability built into the hydraulic system of the machine:



Suction strainers
The replaceable 125 micron suction strainers *(Part No. 8401097)* are fitted within the hydraulic tank and are 'screw' fitted with easy access for removal and replacement.

Return Line Filter
The 25 micron absolute filter elements *(Part No. 8401089)* should be changed after the first 12 hours and thereafter at 500-hour intervals. It is important to note hours worked as if the filter becomes blocked an internal by-pass within the canister will operate and no symptoms of filter malfunction will occur to jog your memory.

Tank Breather
To reduce the risk of pump cavitation it is advisable to replace the 25 micron absolute tank breather *(Part No. 8401050)* on an annual basis under normal working conditions – for machines operating in dry dusty environments it is recommended that replacement be increased to 6 monthly.

HYDRAULIC HOSES

The condition of all hoses should be carefully checked during routine service of the machine. Hoses that have been chaffed or damaged on their outer casing should be securely wrapped with waterproof adhesive tape to stop the metal braid from rusting. Hoses that have suffered damage to the metal braid should be changed at the earliest opportunity.

HOSE REPLACEMENT

- Replace one hose at a time to avoid the risk of wrong connections.
- When the hose is screwed to an additional fitting or union, use a second spanner on the union to avoid breaking both seals.
- Do not use jointing compound on the threads.
- Avoid twisting the hose. Adjust the hose line to ensure freedom from rubbing or trapping before tightening hose end connections.

Before changing hoses study the installation these are carefully calculated to prevent hose damage during operation. Always replace hoses in exactly the same manner. This is especially important for the flail hoses where they must be crossed, upper to lower, at the dipper and head pivots.

All Hydraulic Hoses (B.S.P.) now fitted to McConnel Power Arm Hedge/Grass Cutters have ‘Soft Seal’ connections on both flail and ram circuit hoses.

Recommended torque settings for nut security are as follows:-

					REF.'O' ring
1/4" BSP	***=***	***24 N.m***	***or***	***l8 lbf ft***	***10 000 01***
3/8" BSP	***=***	***33 N.m***	***or***	***24 lbf ft***	***10 000 02***
1/2" BSP	***=***	***44 N.m***	***or***	***35 lbf ft***	***10 000 03***
5/8" BSP	***=***	***58 N.m***	***or***	***43 lbf ft***	***10 000 04***
3/4" BSP	***=***	***84 N.m***	***or***	***62 lbf ft***	***10 000 05***
1" BSP	***=***	***115 N.m***	***or***	***85 lbf ft***	***10 000 06***

For hose unions (B.S.P.) fitted in conjunction with bonded seals the recommended torque settings are as follows:-

1/4" BSP	***=***	***34 N.m***	***or***	***25 lbf ft***
3/8" BSP	***=***	***75 N.m***	***or***	***55 lbf ft***
1/2" BSP	***=***	***102 N.m***	***or***	***75 lbf ft***
5/8" BSP	***=***	***122 N.m***	***or***	***90 lbf ft***
3/4" BSP	***=***	***183 N.m***	***or***	***135 lbf ft***
1" BSP	***=***	***203 N.m***	***or***	***150 lbf ft***

SAFETY NOTE

Soft Seal hose connections are capable of holding pressure when the nut is only ‘finger tight’. It is therefore recommended that when dismantling, the hose be manually flexed, to relieve any residual pressure, with the retaining nut slackened prior to complete disassembly.

CABLES

The cables operate on a push/pull system with the spool centring springs always returning the spool to the neutral position when the handle is released.
Care should be taken during installation and operation to ensure that the cables are not trapped or kinked. Any abrasion or damage to the outer casing should be sealed with plastic insulation tape to avoid moisture penetrating.
No routine adjustments of the cables are necessary, as they do not stretch. The threaded collar is correctly adjusted when the lever is in a vertical position in its housing allowing an equal amount of travel in either direction.

CAUTION

On no account should any attempt be made to lubricate the cables, which are assembled with a special lubricant during manufacture.

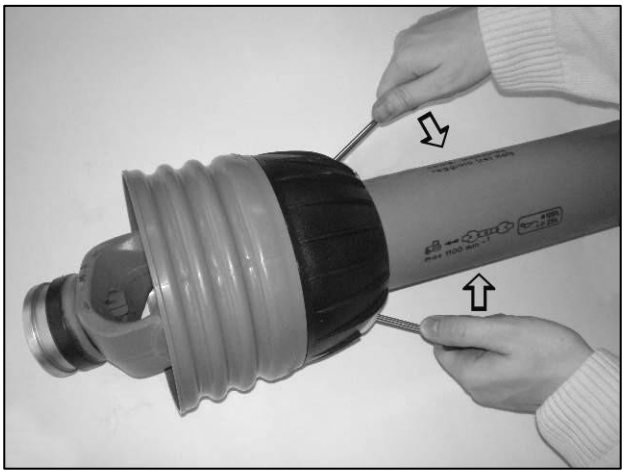
Note: Take care to ascertain the correct cable connections on both the control unit and the valve in the event of cable replacement.

PTO Shaft Lubrication

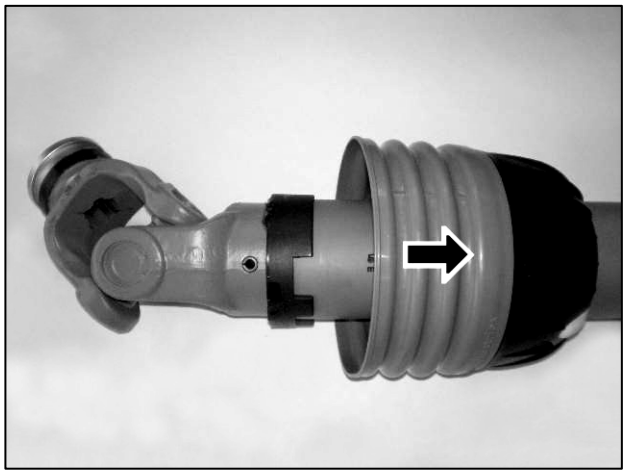
The PTO shaft should be lubricated on a regular basis using lithium based grease – each end of the shaft has 2 greasing points; one for lubrication of the universal joint and one for lubricating the rotating fixing ring of the shaft shield – access to the lubrication points is gained by releasing the shaft shield from its fixing ring and sliding it back along the body of the driveshaft – *the procedure and lubrication frequency is illustrated below.*

Shaft shield fixing clasps

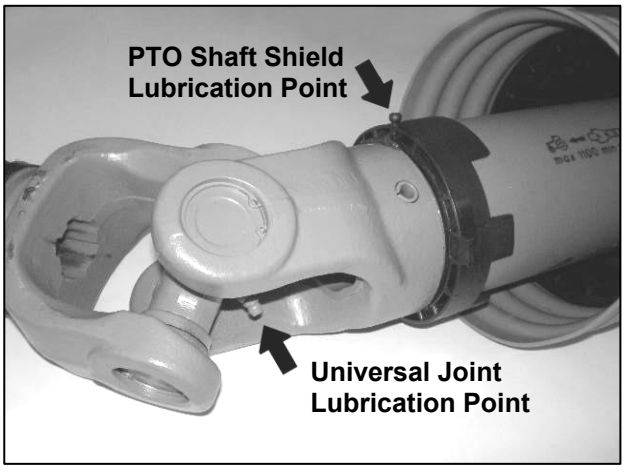
Insert screwdrivers into the clasps



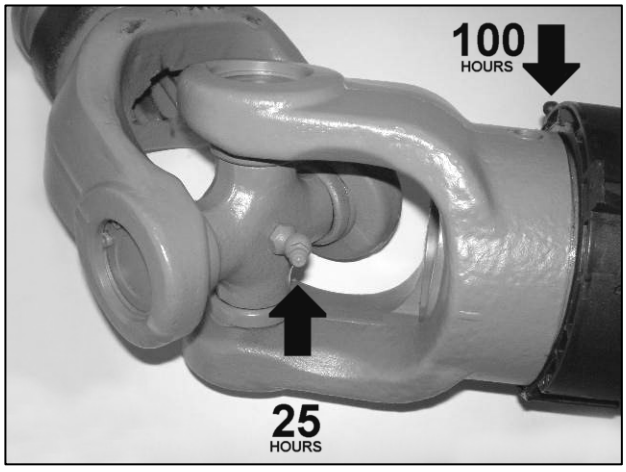
Prise clasps open to release the shield



Slide shield back to reveal universal joint



Location of lubrication points



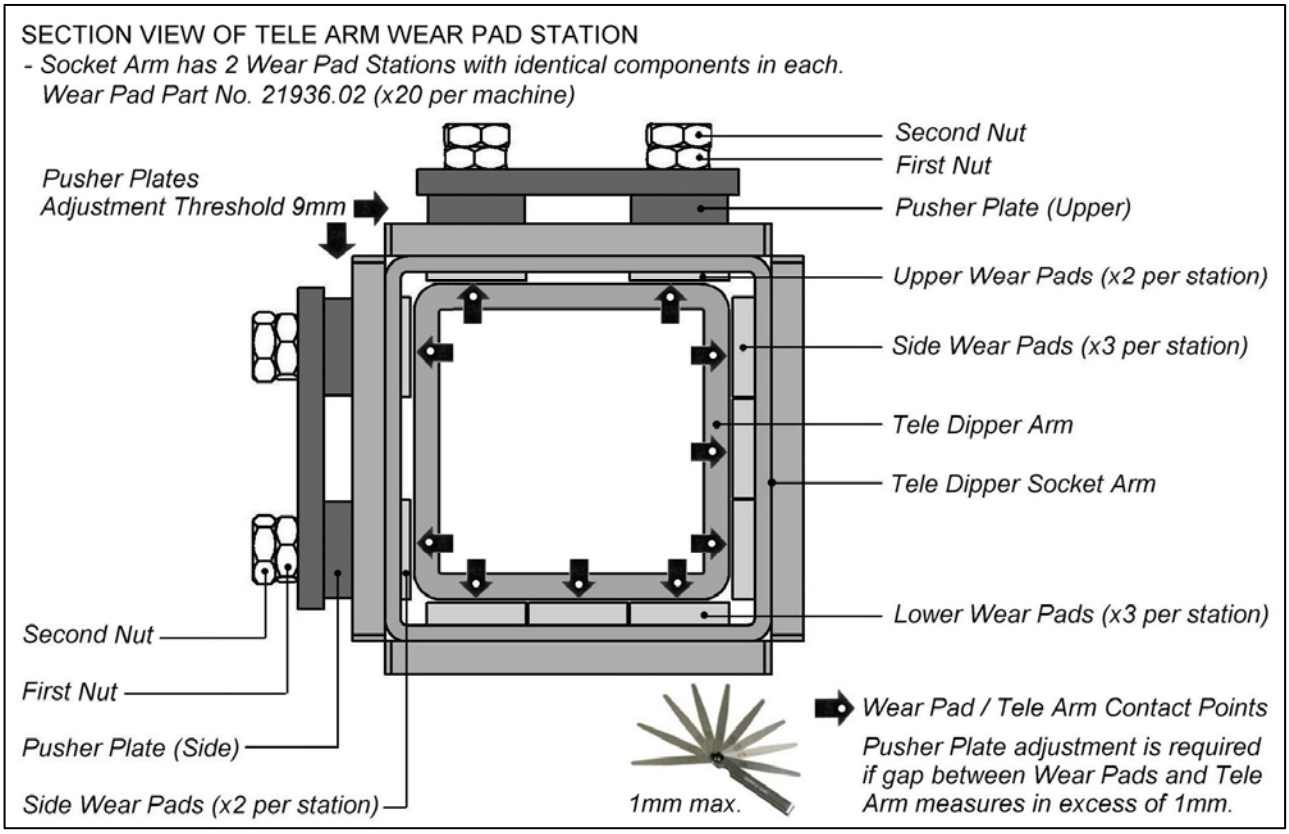
Recommended lubricating frequency

Slide the shaft shield back into place after lubrication ensuring the clasps relocate correctly in the fixing ring – always fit torque chains to the shields to stop them from rotating with the shaft during operation.

TELE ARM WEAR PADS

Over a period of time during normal use the contact faces of the replaceable wear pads will erode due to friction generated from the sliding surfaces of the tele arm – the wear rate of these nylon compound pads may vary considerably and will be determined by the frequency of use of the telescopic function. To accommodate for pad wear the side and upper pusher plates located at the two wear pad stations on the socket arm will each offer approximately 9mm of adjustment.
Wear of the pads should be checked on a regular basis by measuring the gap between the pads and the tele arm using a feeler gauge at the open end of the socket arm - if the gap is in excess of 1mm the pusher plates will need to be adjusted. *NOTE: The tele arm should be fully retracted before attempting to loosen or adjust the pusher plates.*
Wear pads will need replacing when their respective pusher plate comes into contact with the outer arm and no further adjustment is possible – *always replace the pads in opposing sets.*

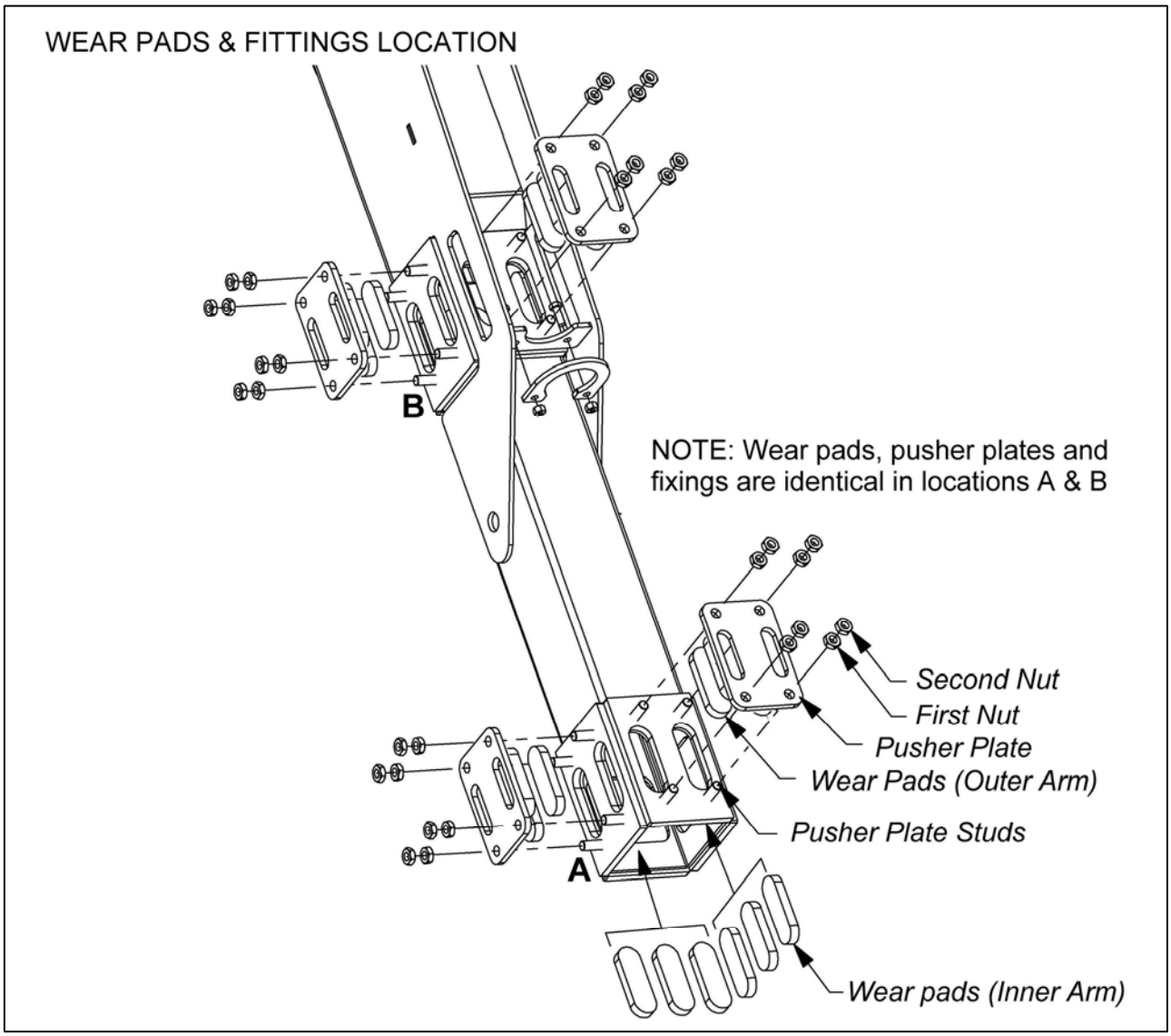
Refer to the following sections for details of wear pad installation and adjustment.



Wear Pad Installation
Replacement of the tele arm wear pads will necessitate the removal of the following components in order to remove the tele dipper arm from the dipper arm socket:

- Removal of the flail head.
- Disconnection of the flail head hoses from the angling gear.
- Removal of the lower end fixings of the rigid flail pipes.
- Disconnection of the angling ram's hoses.
- Removal of the tele ram (piston rod end) from the tele dipper arm.
- Release of the pusher plates and withdrawal of the tele dipper arm from its socket.

With the dipper arm socket and telescopic dipper separated coat the inner surfaces of the socket arm and outer surfaces of the tele arm with wax oil prior to re-assembly this will serve to both protect and lubricate the arms - this procedure should be performed in a clean and dry dust free environment to ensure the lubricated sliding surfaces of the arms do not become contaminated by dirt, grit or moisture.
Prior to insertion of the tele dipper into the socket arm the 12 inner wear pads should be assembled within the dipper arm socket – 6 are located midway within the arm and 6 are located at the 'open' end of the arm, in both locations the pads are fitted in sets of 3's to the both the lower and one side surface of the arm (when viewed from the 'open end' of the arm these side surfaces will be to the right hand side on left hand machines and the left hand side on right hand machines). *Note: A few 'dabs' of grease placed on the backs of inner wear pads will help to keep them in position during the assembly procedure.*



The tele arm may now be inserted into the socket arm (care should be adopted to avoid dislodging the inner wear pads), slide the tele arm into the socket to its furthest point. Place the outer wear pads (8 in total) into their slots in the socket arm and fit the pusher plates over the studs and retain 'loosely' in place with the first set of nuts.

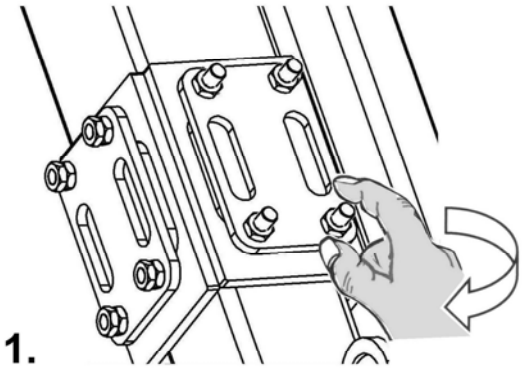
Adjustment
When all pads and pusher plates have been located correctly tighten each set in a cross sequence to a torque setting of 20 Nm. When they have all have been tightened they should then be 'slackened back' by 1/2 a turn; *the tele arm will now be held securely in place but capable of being slid with a slight degree of effort.* Assemble the second set of nuts on the studs and evenly tighten them against the first set to a torque setting of 50 Nm.

NOTE: When tightening second sets of nuts the first nuts should be held in position with a spanner to ensure their correct torque setting is retained.

The tele arm should now be extended out to its furthest point and a coating of good quality agri-grease applied to its sliding surfaces. Re-attach all components previously removed to complete the job.

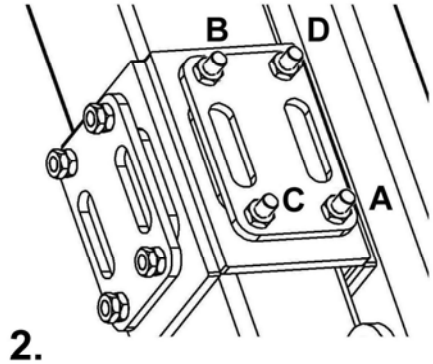
WEAR PAD PUSHER PLATE ADJUSTMENT

Fit all sets of first nuts finger tight



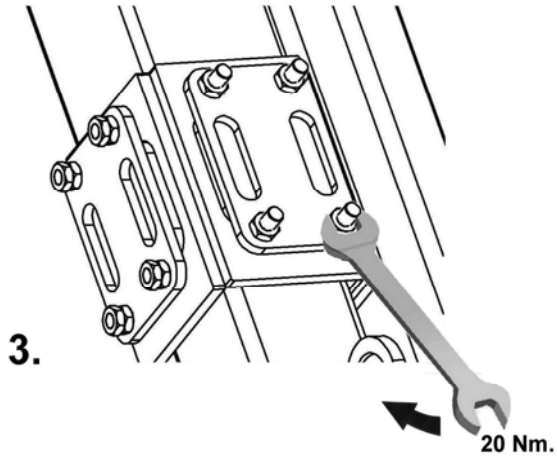
1.

Tighten pusher plates in a cross sequence



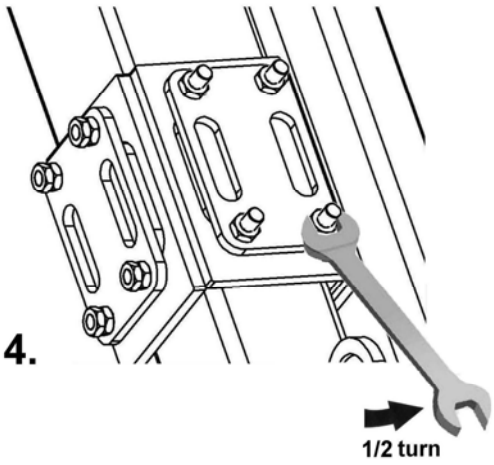
2.

Evenly torque all sets of first nuts to 20 Nm.



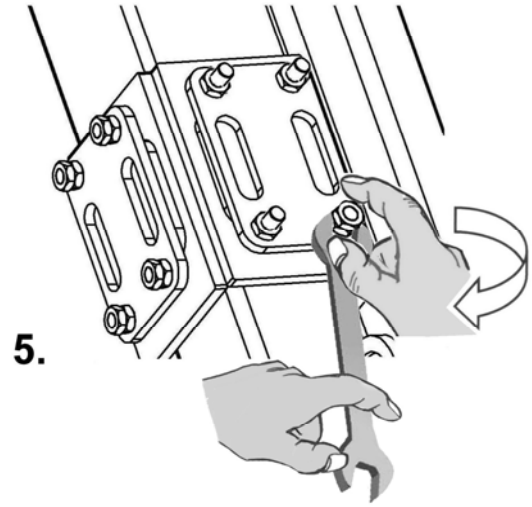
3.

Slacken off each set by 1/2 turn



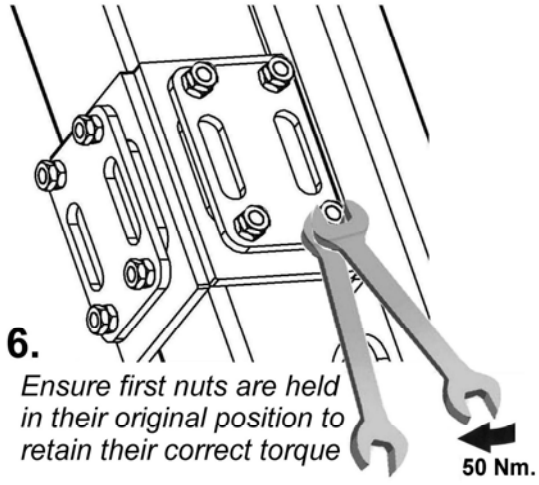
4.

Fit all sets of second nuts finger tight



5.

Evenly torque second sets of nuts to 50 Nm.

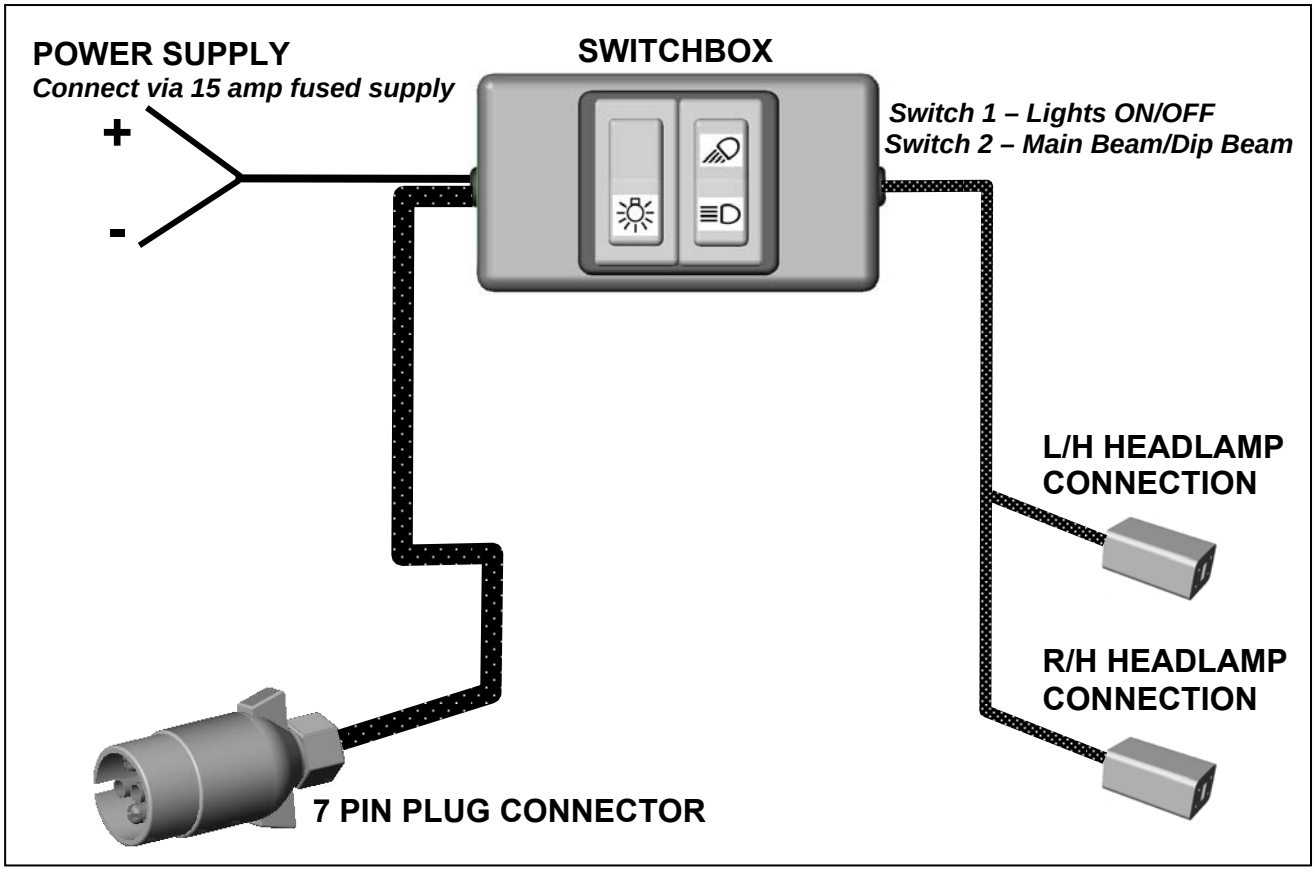


6.

Ensure first nuts are held in their original position to retain their correct torque

FRONT LIGHTING KIT INSTALLATION

The Switchbox for the Front Lighting Kit should be located in a convenient position within the tractor cab.

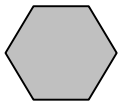


TORQUE SETTINGS FOR FASTENERS

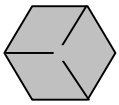
The chart below lists the correct tightening torque for fasteners. This chart should be referred to when tightening or replacing bolts in order to determine the grade of bolt and the correct torque unless specific torque values are assigned in the text of the manual.

Recommended torque is quoted in Foot-Pounds and Newton-Metres within this manual. The equation for conversion is 1 Nm. = 0.7376 ft.lbs.

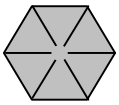
TORQUE VALUES FOR IMPERIAL BOLTS



Head Marking
No Marks
Grade Two



Head Marking
Three Lines
Grade Five



Head Marking
Six Lines
Grade Eight

Bolt Dia.	Value (Dry) ft.lb.	Nm.	Value (Dry) ft.lb.	Nm.	Value (Dry) ft.lb.	Nm.
1/4"	5.5	7.5	9	12.2	12.5	17.0
5/16"	11	15.0	18	25.0	26	35.2
3/8"	20	27.0	33	45.0	46	63.0
7/16"	32	43.0	52	70.0	75	100.0
1/2"	50	68.0	80	110.0	115	155.0
9/16"	70	95.0	115	155.0	160	220.0
5/8"	100	135.0	160	220.0	225	305.0
3/4"	175	240.0	280	380.0	400	540.0
7/8"	175	240.0	450	610.0	650	880.0
1"	270	360.0	675	915.0	975	1325.0
1-1/8"	375	510.0	850	115.0	1350	1830.0
1-1/4"	530	720.0	1200	1626.0	1950	2650.0
1-3/8"	700	950.0	1550	2100.0	2550	3460.0
1-1/2"	930	1250.0	2100	2850.0	3350	4550.0

NOTE:
The values in the chart apply to fasteners as received from the supplier, dry or when lubricated with normal engine oil. They DO NOT apply if special graphited, molydisulphide greases, or other extreme pressure lubricants are used. This applies to both UNF and UNC coarse threads.

TORQUE VALUES FOR METRIC BOLTS.

Head Marking
4.8

Head Marking
8.8

Head Marking
10.9

Head Marking
12.9

Bolt Dia.	Value (Dry) ft.lb.	Nm.	Value (Dry) ft.lb.	Nm.	Value (Dry) ft.lb.	Nm.	Value (Dry) ft.lb.	Nm.
6mm	4.5	6.1	8.5	11.5	12	16.3	14.5	20.0
8mm	11	14.9	20	27.1	30	40.1	35	47.5
10mm	21	28.5	40	54.2	60	81.4	70	95.0
12mm	37	50.2	70	95.0	105	140.0	120	160.0
14mm	60	81.4	110	150.0	165	225.0	190	260.0
16mm	92	125.0	175	240.0	255	350.0	300	400.0
18mm	125	170.0	250	340.0	350	475.0	410	550.0
20mm	180	245.0	350	475.0	500	675.0	580	790.0
22mm	250	340.0	475	645.0	675	915.0	800	1090.0
24mm	310	420.0	600	810.0	850	1150.0	1000	1350.0
27mm	450	610.0	875	1180.0	1250	1700.0	1500	2000.0
30mm	625	850.0	1200	1626.0	1700	2300.0	2000	2700.0

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