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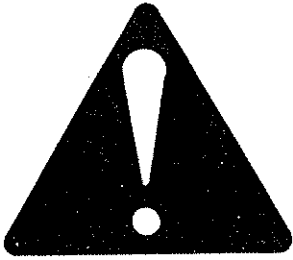
Part No.

71.15.853



# **POWER ARM 7, 8 & A16**

## **OPERATOR MANUAL**



## **WARNING**

### SAFETY PRECAUTIONS

- NEVER ... Permit inexperienced personnel to operate machine without supervision.
- ... Lift the machine on the tractor linkage unless the main arm is centralized.
- ... Stand near the digger feet when the machine is raised on the tractor linkage.
- ... Stand under a raised arm or load.
- ... Grasp control levers when mounting the machine.
- ... Attempt to use the machine with Cat I top link.
- ALWAYS ... Re-check cab clearance after making any adjustment to the tractor linkage.
- ... Lower the machine to the ground when not in use and place the bucket on the ground.
- ... Secure the slew column with the transport lock particularly when travelling on public highways.
- ... Adjust tractor wheel widths for maximum stability and add front end weight as required.
- ... Reverse straight up a steep bank.
- ... When loading, grab material from the side and discharge to the rear.
- ... Make sure no hoses are chafed, pinched or trapped when the machine is being operated.
- ... Use at least one stabilizer bar.
- ... Lock the lift ram tap after disconnecting machine from tractor.
- ... Use only the top link supplied with the machine ensuring a minimum of 2½" thread engagement.

## 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 spare parts on McConnel equipment and machines. This manual includes an illustrated spare parts breakdown and the interpretation which precedes it should be read before ordering replacement components.

## 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 emphasize.

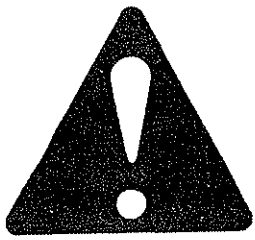
### Left and Right Hand

This term is applicable to the machine when fitted to the tractor and viewed from the rear. This also applies to tractor references.

Record the serial number of your machine on this page and always quote this number when ordering spares. Whenever information concerning the machine is requested remember to also state the type of tractor to which it is fitted.	
MACHINE SERIAL NUMBER	INSTALLATION DATE:
MODEL DETAILS	
DEALER'S NAME	
DEALER'S TELEPHONE NUMBER	

## LIMITATIONS

The McConnel Warranty specifically excludes any hydraulic pump and controls supplied with the machine if they are used to power equipment other than the McConnel machine for which they were supplied. Prior confirmation and warranty cover that the pump is suitable for any other purposes must be obtained from the hydraulic component manufacturers.



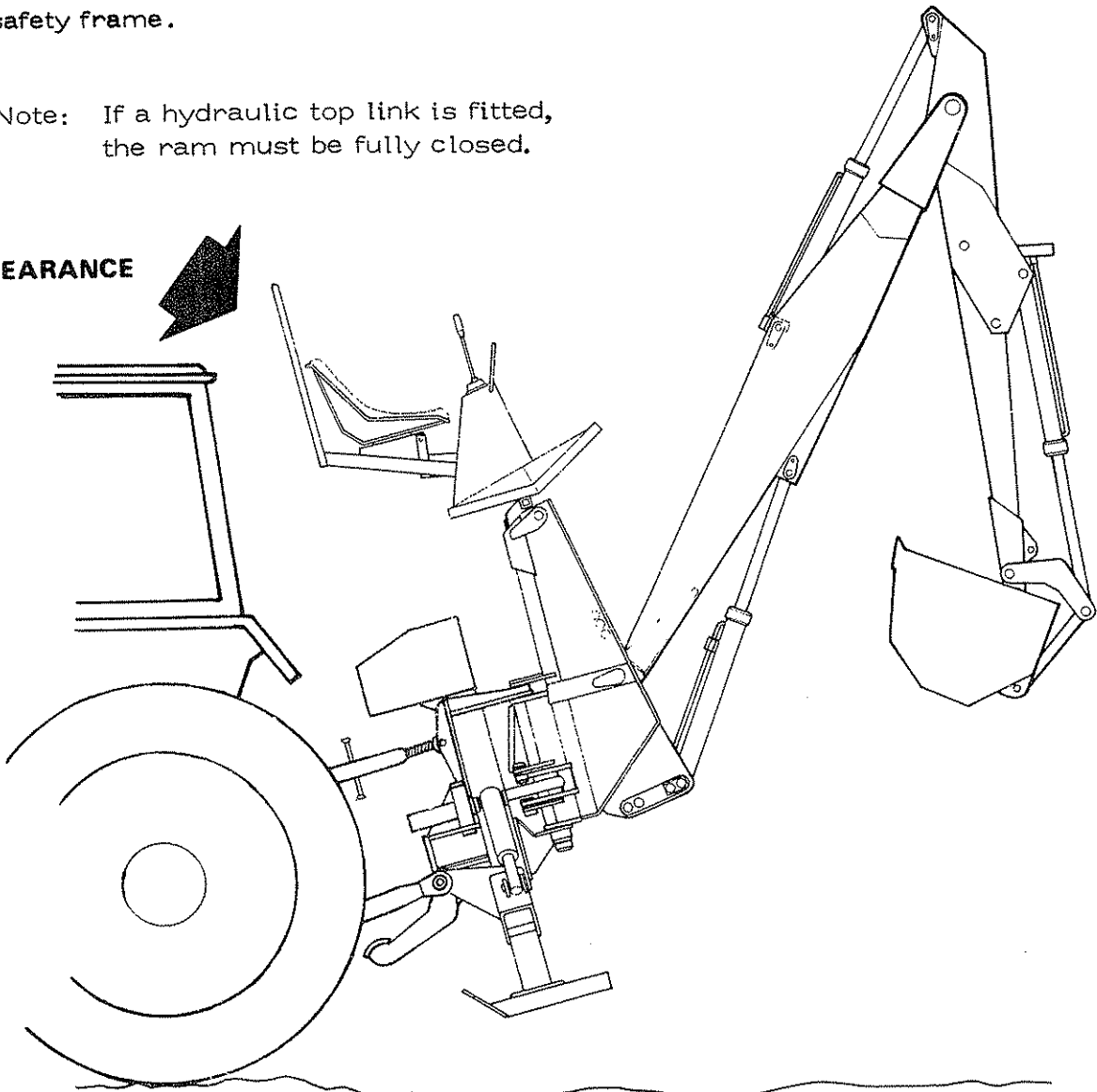
# WARNING

**FAILURE TO OBSERVE THE FOLLOWING PRECAUTIONS  
COULD RESULT IN A FATAL INJURY TO THE OPERATOR.**

Before attempting to use the machine from the operators seat, fully raise the machine on the tractors hydraulic linkage and check that the cab clearance frame does not foul against the cab roof or rear cross-member of the tractor safety frame.

Note: If a hydraulic top link is fitted, the ram must be fully closed.

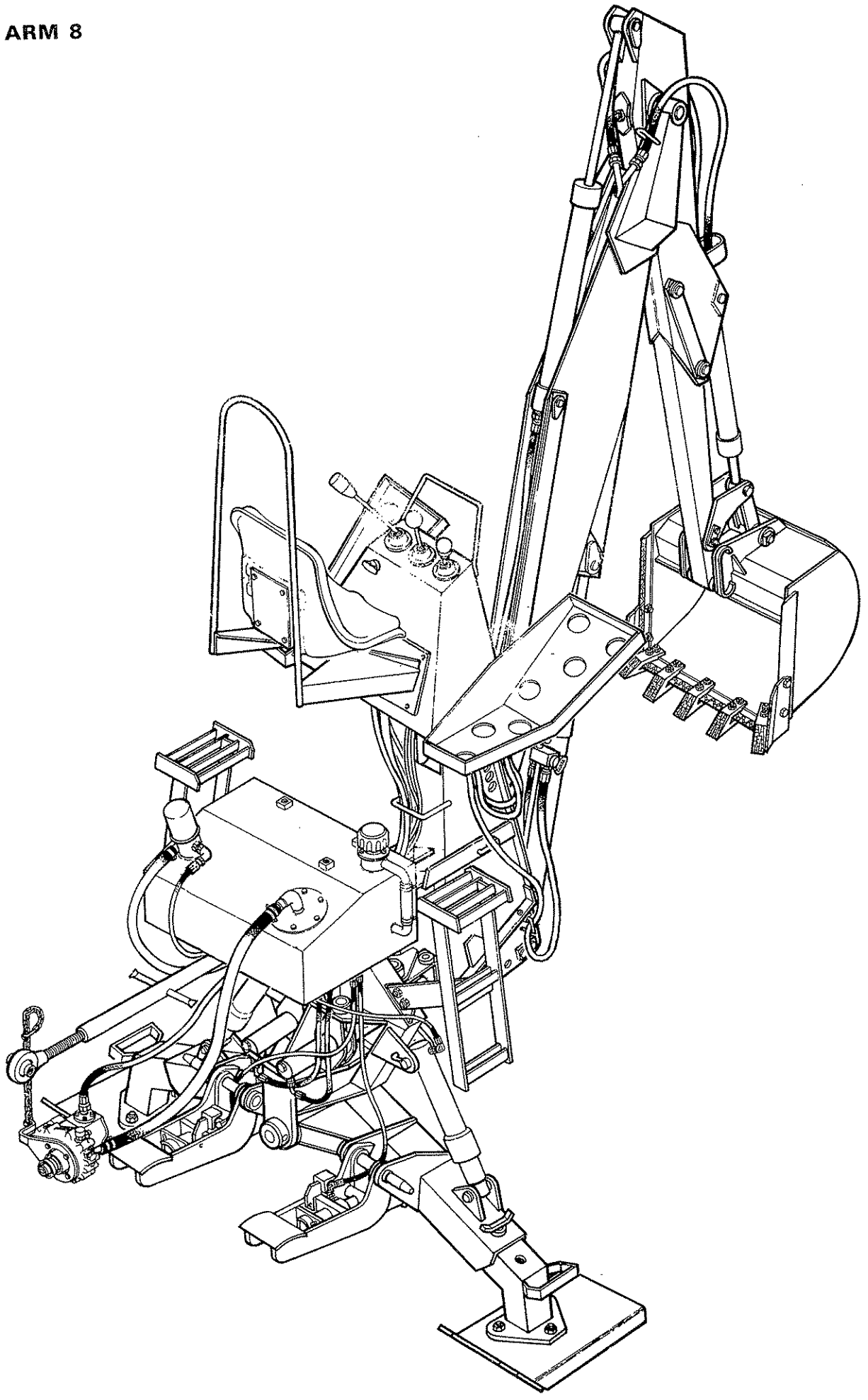
**CLEARANCE**



If after adjustment of the top link, the clearance frame still fouls any part of the tractor cab structure then the machine must not be used on that tractor.

Note: On some models of safety cab the roof section and support can be removed without violating the cab safety certificate. Check with your tractor dealer that this can be done if necessary to obtain clearance.

**POWER ARM 8**



## INTRODUCTION

1. The Power Arm 7 and 8 machines have been designed for marketing in such a way that they can be altered in stages from their most basic form to machines that embrace every option. Both the Power Arm 7 and 8 machines with their derivatives share common parts which are directly interchangeable. As well as simplifying the problem of ordering spares it readily allows the owner to upgrade the machine after purchase if desired.

For an example the new owner of a basic Power Arm 7 will notice that the hydraulic control chest is fitted with sections that are blanked off. Subsequent installation of any accessory pack involves only the removal of blanking plugs rather than the replacement of the complete valve chest.

2. For the purpose of producing an instruction manual, the specification for a Power Arm 8 will be followed. Variations for alternative structured machines will be dealt with as they arise.

3. Accessory packs are available which allow owners to upgrade their machine after purchase.

Pack A	Part No. 71 15 259	Independent Hydraulic Kit
Pack B	Part No. 71 15 258	Instant Weight Transfer Kit
Pack C	Part No. 71 15 260	Sideway Levelling Kit
Pack D	Part No. 71 15 257	Hydraulic Top Link Kit
Pack E	Part No. 71 15 256	Cable Control Kit

Important It should be noted that Packs 'B' and 'E' will only be supplied in conjunction with Pack 'A'.

4. The Power Arm 7 and 8 will fit most tractors with Category II three point linkage. Tractors fitted with Category I draft links are generally considered of insufficient size to cope with the loads that can be transmitted through the linkage.

### WARNING

Do not attempt to instal the machine on tractors fitted with Category I top hitch. The consequences of top hitch failure could seriously injure the operator.

#### 1. Tractor Preparation

a) Ballast

For increased stability wheels should be spaced out as far as is practicable and additional front end weight added to tractor.

b) Tractor Drop Arms

Adjust the tractor drop arms so that the ball ends are both the same height from the ground. Because of the great variation in makes and models of tractors no figures can be given but the draft links should be adjusted as low as possible while still maintaining adequate thread engagement.

Certain tractors, particularly the International Harvester range have an adjustment on the drop arms that enables them to be used in a floating position. This adjustment is secured by a roll pin, with an R clip through it. It is advisable to replace this assembly with a high tensile steel bolt right through the arm to secure it.

c) Top Hitch

The higher pressure relief settings on these machines subjects the top hitch to considerably greater forces than were developed with McConnel's earlier model diggers. It is therefore necessary to ensure that the tractor selected has Category II top hitch facilities or is fitted with an adaptor bracket to allow Category II to be used. Brackets are available from F.W. McConnel Ltd for most tractors that are equipped with Category I top hitch points.

Wherever possible, attach the top link to a fixed or 'dead pin' position on the tractor. The draft control rocker should be locked and/or the tractor hydraulic controls should be positioned to zero draft/minimum response to prevent as far as possible the operation of the draft control mechanism while working.

On certain tractors where there is no provision for locking or neutralizing the top hitch point, F.W. McConnel have designed special brackets which can be fitted. Check with your dealer if in doubt.

Bracket Part No	Tractor	Model/Remarks
71-15-372	Massey Ferguson	65 135 240 550 20
71-15-375 Draft lock assy.	Massey Ferguson	148 158 165 175 178 185 188 250 265 275 285 290 565 575 590 675 690
71-15-368	Fiat/Universal	450 540 640 U445 U530 U550 U640
71-15-374	David Brown	990 995 996 1200 1210 1212 1410 1412 1290 1390 1490 1690
71-15-165 Pin 2 off 71-15-164 Bushes	John Deere	All models USA build
71-15-222 sleeve	John Deere European	Tractors top link pin is a loose fit in Cat. II link end. Use sleeve 71-15-222. In some circumstances grind 1/32" off ball width to enable link to be fitted in the tractor casing.

d) Linkage Pins

Category II pins only are fitted. Tractors fitted with Category I draft links are generally considered of insufficient size to cope with the loads that can be transmitted through the linkage.

e) Check Chains/Stabilizer Bars

It is essential that adjustable check chains and/or stabilizer bars are available and they are in good condition.



## 2. Fitting Power Arm to tractor

- a) Cut free all packing wire and set the instant weight transfer knob to the 'off' position, depressing the foot pedal at the same time. This allows the weight transfer arms to be lowered to their full extent.
- b) Connect tractor draft links to the linkage pins and instal top link with reference to advice given in 'Tractor preparation' paragraph.

The threaded sections of the top link supplied with the machine have a ringed groove cut about 2½" (62 mm) from the end. To ensure adequate thread engagement when making adjustments to the top link, do not expose this groove.

If it is found necessary that the tractors own top link has to be used, care should be taken in ensuring that there is sufficient thread engagement, as considerable forces are applied through this link when the machine is at work.

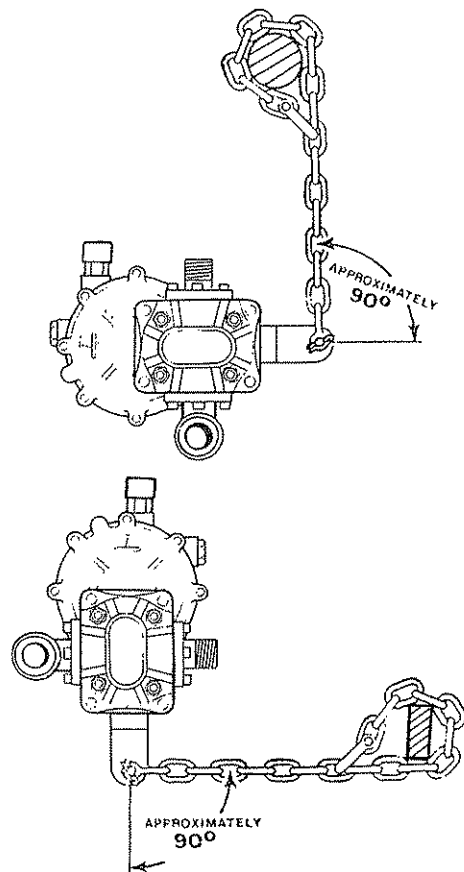
- c) Instal check chains or otherwise secure stabilizer bars. Do not tighten them up at this time.

- d) Check that the PTO gearbox contains oil. Its capacity is ¼ pint (150 mls) of EP 90 gear oil. Fit the gearbox pump unit to the tractors PTO shaft ensuring that the spring loaded locking collar is fully engaged. The gearbox may be mounted vertically or on its side. In either position chosen, the breather must be positioned at the top and for this reason the sight level plug and the breather assembly can be interchanged,

Secure the torque chain so that the angle is approximately 90° to the torque arm and is in a lateral alignment.

A suitable anchorage point for the torque chain is around the bottom of the drop arm or the draft link,

Do not wrap the chain around the top link. The additional loads could cause failure of this component.



**CAUTION:** The torque arm should not be allowed to rest against the drawbar otherwise damage may be caused to the drive splines of the tractor pto shaft as well as internal splines of the gearbox.



- e) Connect pressure hose with the 90° fitting to the output side of the pump and the large bore suction hose to the inlet port. Prime suction hose before connection to the reservoir and secure with two worm drive hose clips at both ends. Locate the barrels of the the hose clips opposite each other and do not use jointing compound.
- f) Fill the reservoir until the oil level is approximately halfway up the sight tube with a light hydraulic oil as recommended in the chart. The correct capacity is approximately 10 gallons (45 litres). Do not overfill.

Supplier	Cold or temperate climate	Hot climate.
Castrol	Agricastrol hydraulic oil Hy-spin AWS32	Hy-spin AWS68
Shell	Tellus 27	Tellus 33
Mobil	D.T.E. 25	D.T.E.26
Esso	Nuto 'H' or 'A' 32	Nuto 'H' or 'A' 68

- g) Start tractor, engage pto drive and allow the pump to work under a no load condition i.e. with operating controls in neutral for several minutes with tractor engine at high idle.
- h) Remove packing strips and by operating the control levers extend and fit the lift and reach ram rod pins in this order.

#### 4. Functional check

WARNING

Great care should be exercised when carrying out CAB CLEARANCE check. Damage to cab structure, rear windows, lamps etc. as well as personal injury can be caused by carelessness.

##### a) Cab clearance

Fully close the ram on the hydraulic top link if fitted, and ensure that the IWT is disengaged (see page 28). Operate the tractor hydraulic lift slowly and raise the machine on the linkage. Have an assistant stand at a suitable vantage point well clear of the machine to observe that the clearance frame attached behind the seat clears the cab structure.

If it appears that a foul is evident, lower machine to the ground and lengthen the top link by its threaded sections. Keep the hydraulic ram fully closed.

When satisfied that the machine can be raised to maximum height on the linkage and clearance is still effective, lower machine to the ground.

##### IMPORTANT

The ability of being able to move the tractor backwards and forwards under favourable conditions without leaving the operators seat can present a further problem. Movement is achieved by pressing down on the main arm to lift the machine off the ground while at the same time operating the dipper arm. Lifting the machine in this way can raise the tractor draft links beyond their normal operating range and further affect cab clearance.

- b) It should be observed that when the machine is being raised, that the torque chain does not apply additional load to the gearbox.
- c) With the tractor standing on level ground, raise draft links sufficiently to lift the machine's feet off the ground and centralize machine by check chains or stabilizer bar adjustment. Tighten up to prevent sideways, and lower to ground.
- d) With the machine operational, engage IWT and operate lift ram. Pads on the IWT arms should centrally contact the underside of the draft links. Ensure that the pto pump and hoses are not endangered by operation of the 3 point linkage and in particular the hoses cannot be trapped between the IWT pads and the draft link.
- e) Check levers for correct operation. Coloured rings around the handles match the coloured bands around the rams that they operate.
- f) Operate machine throughout its work cycle to purge all air from the system. Check that no hoses are being trapped, frayed, kinked or stretched in any way.
- g) Close all rams to transport position, re-check oil level and top up as necessary.
- h) Every effort is made during manufacture and assembly to ensure that dirt and swarf are not allowed to contaminate the hydraulic system. Operational life will be greatly increased if after initial assembly the pump is allowed to work under no load for about fifteen minutes or more at fast engine idle so that the full flow oil filter can trap any dirt that has found its way into the system.
- i) From time to time and especially during the first few hours of operation, check the hose clips on the suction hose at both ends and re-tighten. Any leakage of air into the system on the suction side will cause the oil to foam. If allowed to continue unchecked, the reservoir will 'boil over' through the filler cap. Aeration also causes a 'spongy' action, overheating and rapid wear of hydraulic components.

## OPTION PACKS

### PACK A Independent hydraulic kit. Part No. 71 15 259

Kit comprises the following :-

Reservoir, pump and gearbox assembly, suction hose.

#### Installation

a) Bolt reservoir into position using the two M12 x 110 bolts and nuts.

Note Release one of the step holding bolts and swivel the step out of the way to improve access.

b) Remove tractor connection (if any) from the return hose and refit the hose to the low pressure connection at the base of the return line filter.

c) Re route the return drain line from the slewing valve block to connect the return elbow on the filter block.

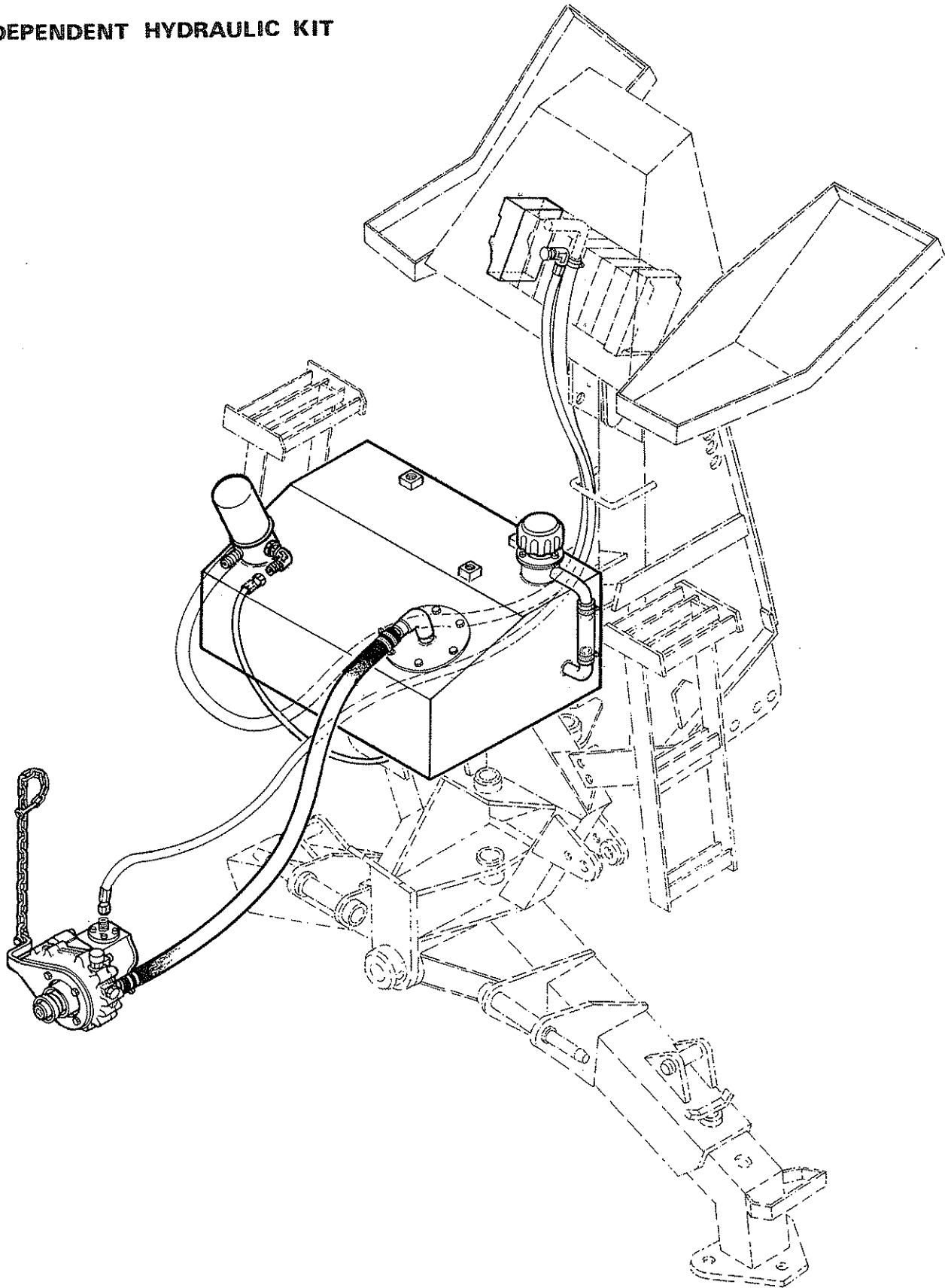
d) Instal gearbox/pump assembly and fit the pressure hose to the pump outlet after removal of self-seal coupling.

e) Fit the large bore suction hose to the pump and use two hose clips to secure it. Prime the pump by filling the hose with oil before attaching the other end to the reservoir outlet.

f) Fill reservoir with 45 litres (10 gallons) of the recommended oil.

g) Start tractor, engage pto and check for leaks.

**INDEPENDENT HYDRAULIC KIT**



Kit comprises lift arm assemblies, rams and hoses, selector valve block and control linkage.

### Installation

Reference to the spare parts page as well as the illustrated diagram opposite will assist in correct assembly.

The pressure setting of the main relief valve requires uprating from 2250 psi to 2500 psi (170 bars). If conversion is being made for the loader armhead, the pressure setting must be increased to 2700 psi (184 bars).

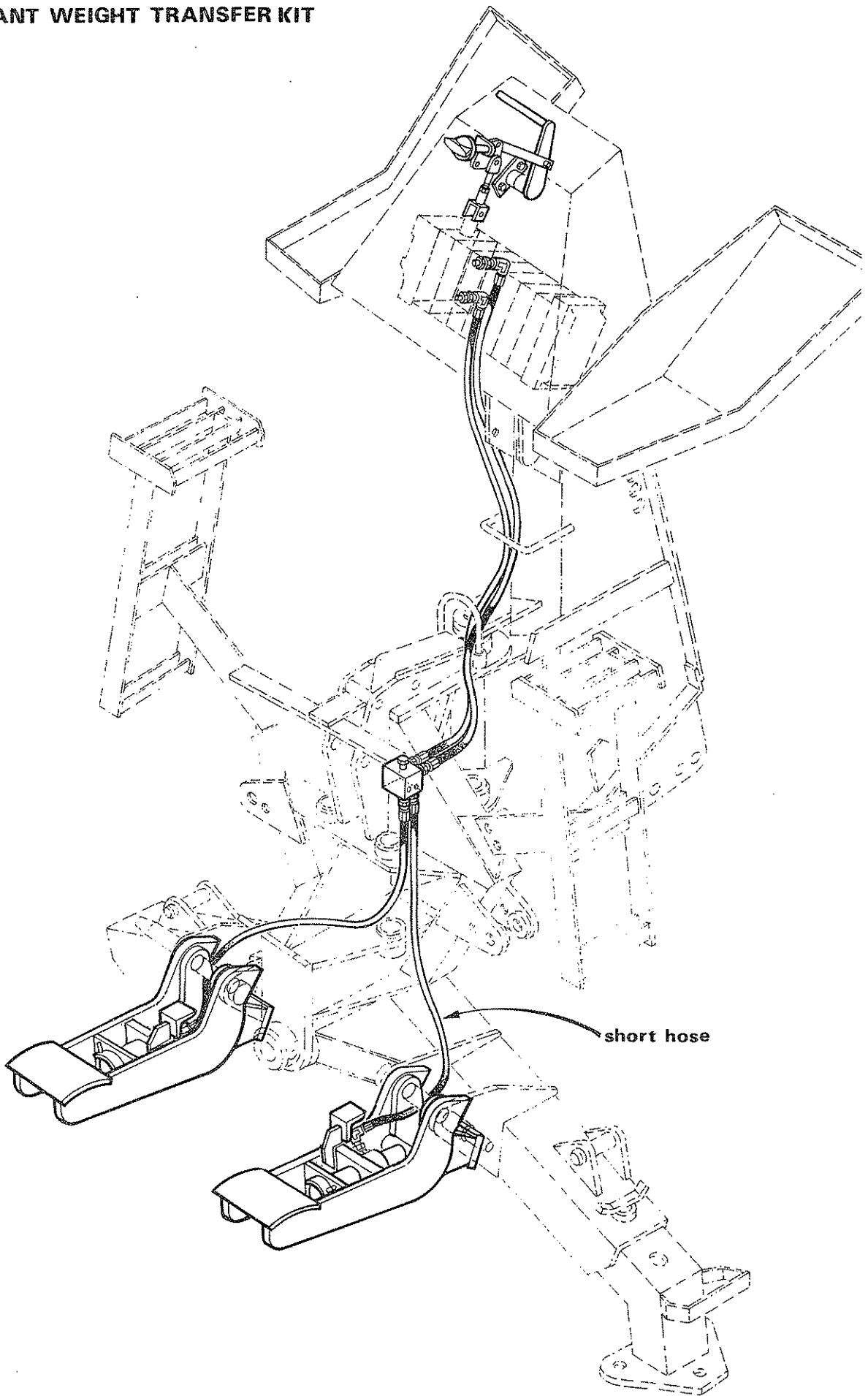
Re-calibrating the main relief valve should only be attempted using a reliable pressure gauge. Adjustment is made by releasing the locknut and turning the screw in a clockwise direction. Re-check the pressure after the locknut is tightened and the protective cap repositioned.

When assembling the lock mechanism in the console ensure that the dimpled spot on the knob is lined up with latch. When correctly sensed, the control valve spindle should be held down when the knob is turned to the 'OFF' position.

CAUTION: Take particular care when installing the two hoses between the control valve and the selector block. Ports should be correctly routed to their similarly identified ports marked 'A' and 'B' on the selector valve.

Note: The left hand hose from the selector block to the lifting arm is shorter than the other three. Your attention is drawn to the paragraph on 'Definitions' printed on Page 1.

**INSTANT WEIGHT TRANSFER KIT**



Kit comprises rams and hoses, levelling valve block, handle and control valve linkages.

Installation    Reference to the spare parts section of the book as well as the illustration opposite will assist in correct assembly.

If converting a PA7, start by removing one of the screwed levelling adjusters, instal a ram in its place and fit the packing stay across the ram pins and secure with split pins. Longer ram pins with extra drilled holes are provided for this purpose.

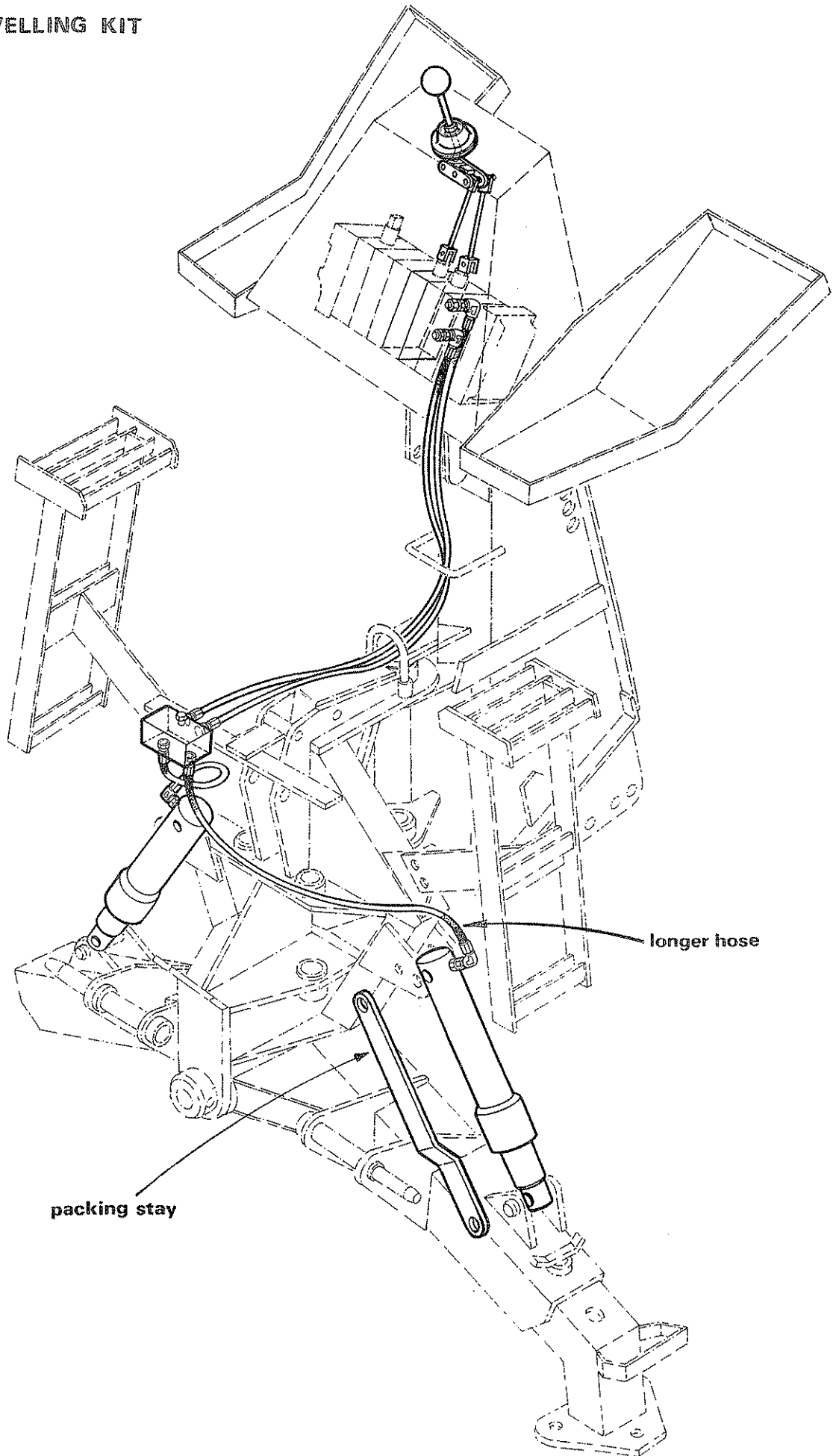
WARNING

The packing stay must be fitted to avoid the machine accidentally tipping to one side.

Note that the offset position of the levelling block requires the longer ram hose to be routed to the left hand levelling ram. Similarly the left hand hose from the levelling block is routed to the lower port on the control valve. Your attention is drawn to the paragraph on 'Definitions' printed on page 1.



**SIDE LEVELLING KIT**



PACK D     Hydraulic top link kit. Part No. 71 15 257

Kit comprises hydraulic ram with Cat. II ball link ends, hoses, lever and linkage assembly.

Installation

Reference to the spare parts section of the book as well as the illustration opposite will assist in correct assembly.

Install the hydraulic rod end of the top link towards the tractor and ensure that the rod is fully closed.

Wind out by equal amounts both ends of the link to engage the ball ends in their respective positions and secure with the linkage pins.

The left hand hose must be routed to the upper port at the control valve.

Special Note

If this kit is being supplied together with the levelling kit, one set of control linkage and handle will be surplus to requirements.

Refer to the WARNING on page three and carry out a cab clearance check as detailed on page seven of this manual.

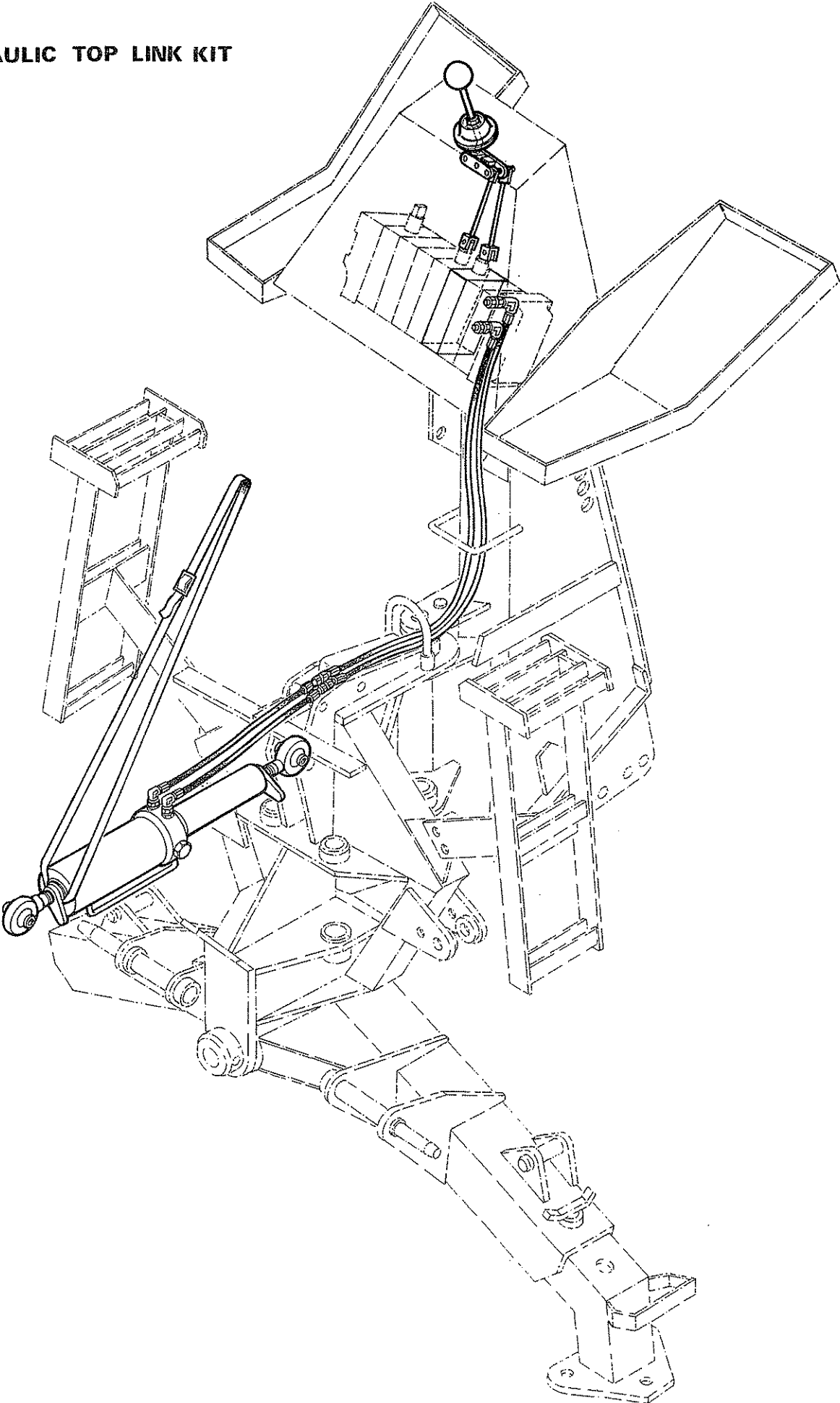
To obtain cab clearance, make any adjustments to the top link by the threaded sections. Keep the hydraulic ram closed.

CAUTION

The threaded link ends have a ringed groove cut into the threads about 62 mm (2.1/2") from the end. To ensure adequate thread engagement do not expose this groove.

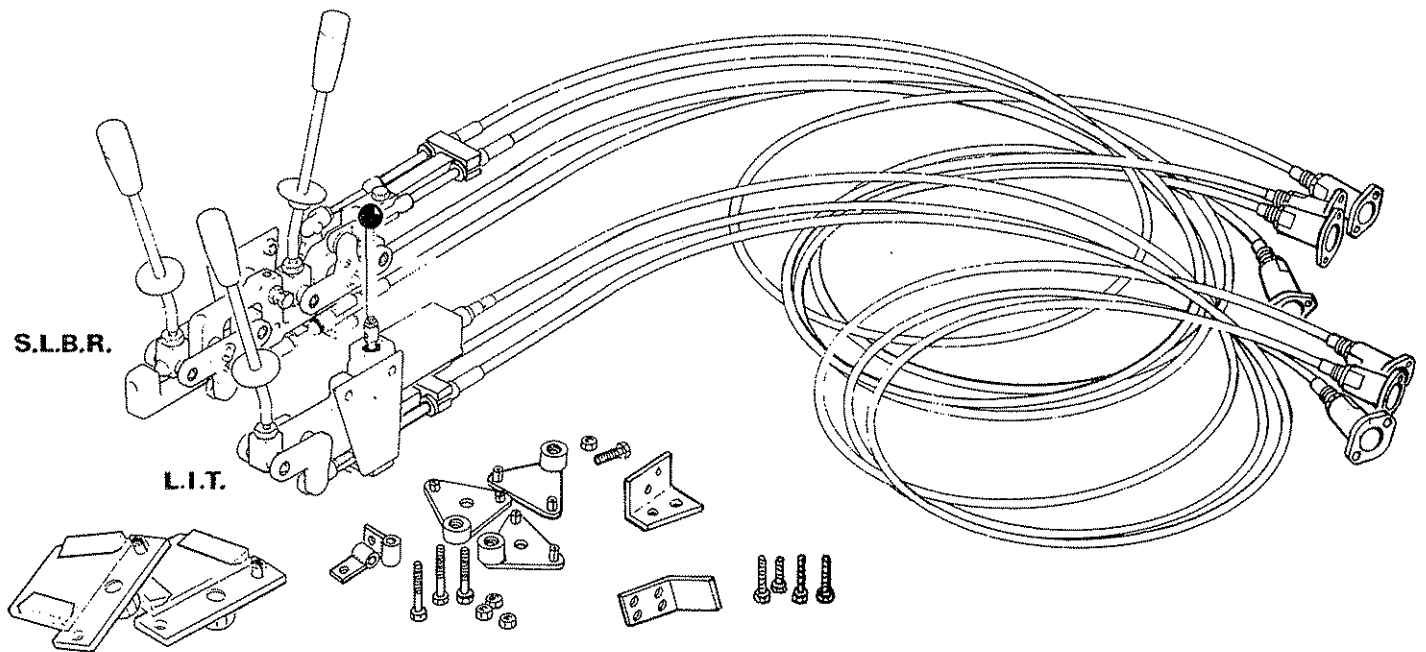
When disconnecting the machine from the tractor a flexible parking strap supports the weight of the top link. The strap is anchored to a metal loop on the reservoir on the PA8 and around a bolt beneath the seat of a PA7.

**HYDRAULIC TOP LINK KIT**



## CABLE CONTROLS FOR PA8

The cable control kit enables the PA8 or its loader variant to be operated from either within the tractor cab or from the existing console assembly.



On receipt of the cable control kit check that you have received all parts i.e. main control unit (S.L.B.R.) for slew, lift, bucket and reach. The auxiliary control unit (L.I.T.) for level, I.W.T. and hydraulic top link, the two sockets for mounting the units, adaptor brackets for converting to console use, and the nuts, bolts, roll pins and hose guides that are required for fitting.

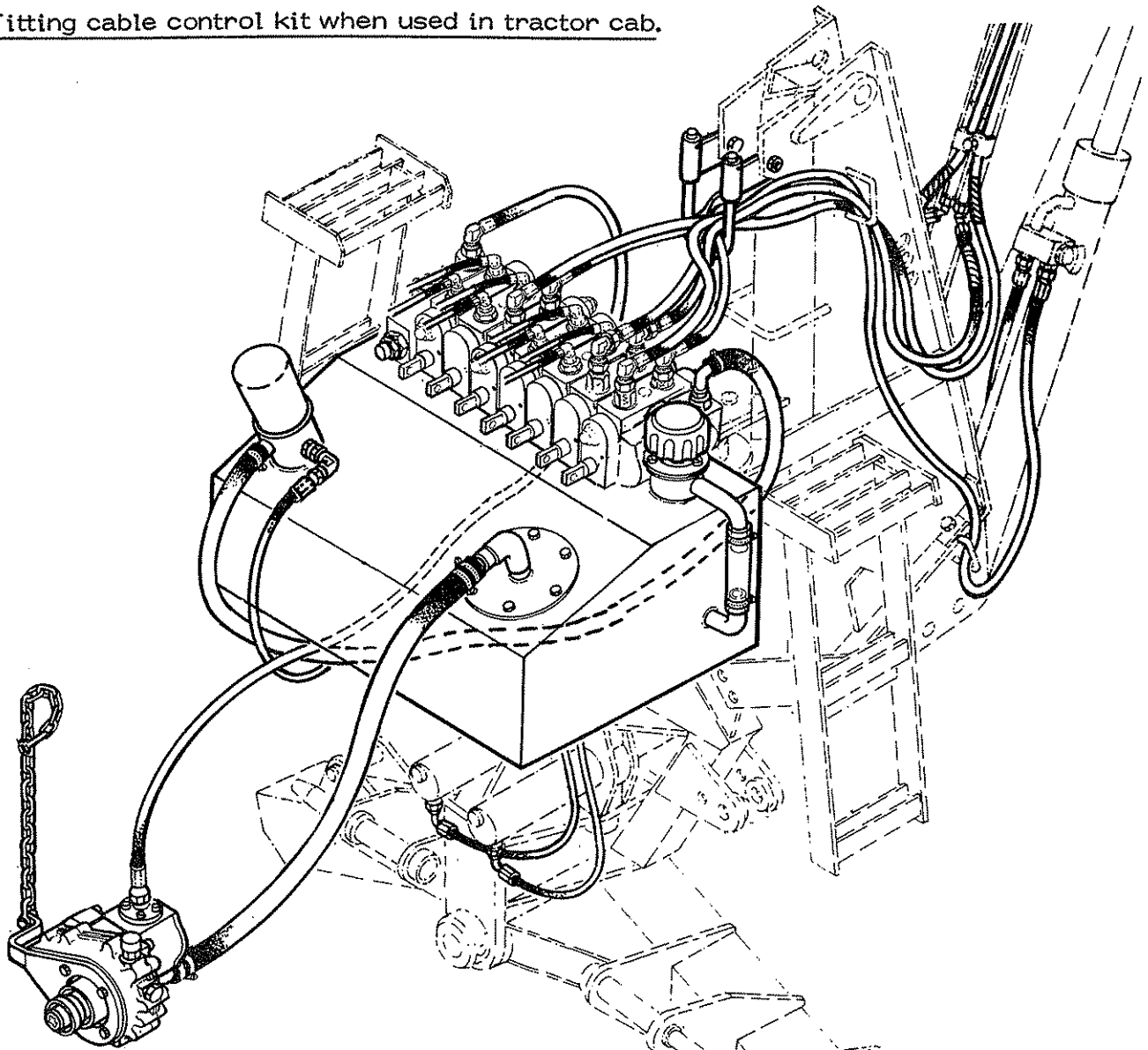
When supplied, the control units will be assembled for working from the tractor cab on the right hand side of the tractor i.e. main control unit on the right hand mudwing, auxiliary control unit on the left.

Care should be taken during installation that bends in the cables are as sweeping as possible and that during operation they do not become trapped or kinked.

After initial setting no routine adjustment of the cables is necessary as they do not stretch. Maintenance is restricted to sealing any abrasion or damage to the outer casing with plastic insulation tape to prevent moisture penetrating the cable.

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

Fitting cable control kit when used in tractor cab.



Preparation of P.A.8

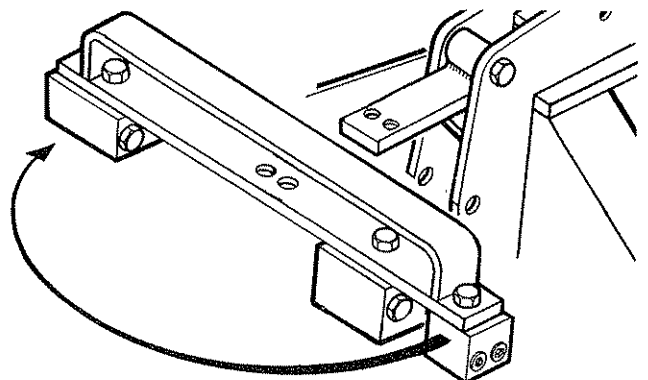
Remove the rear console cover and disconnect the operating rods from the valve spool ends and the rockers.

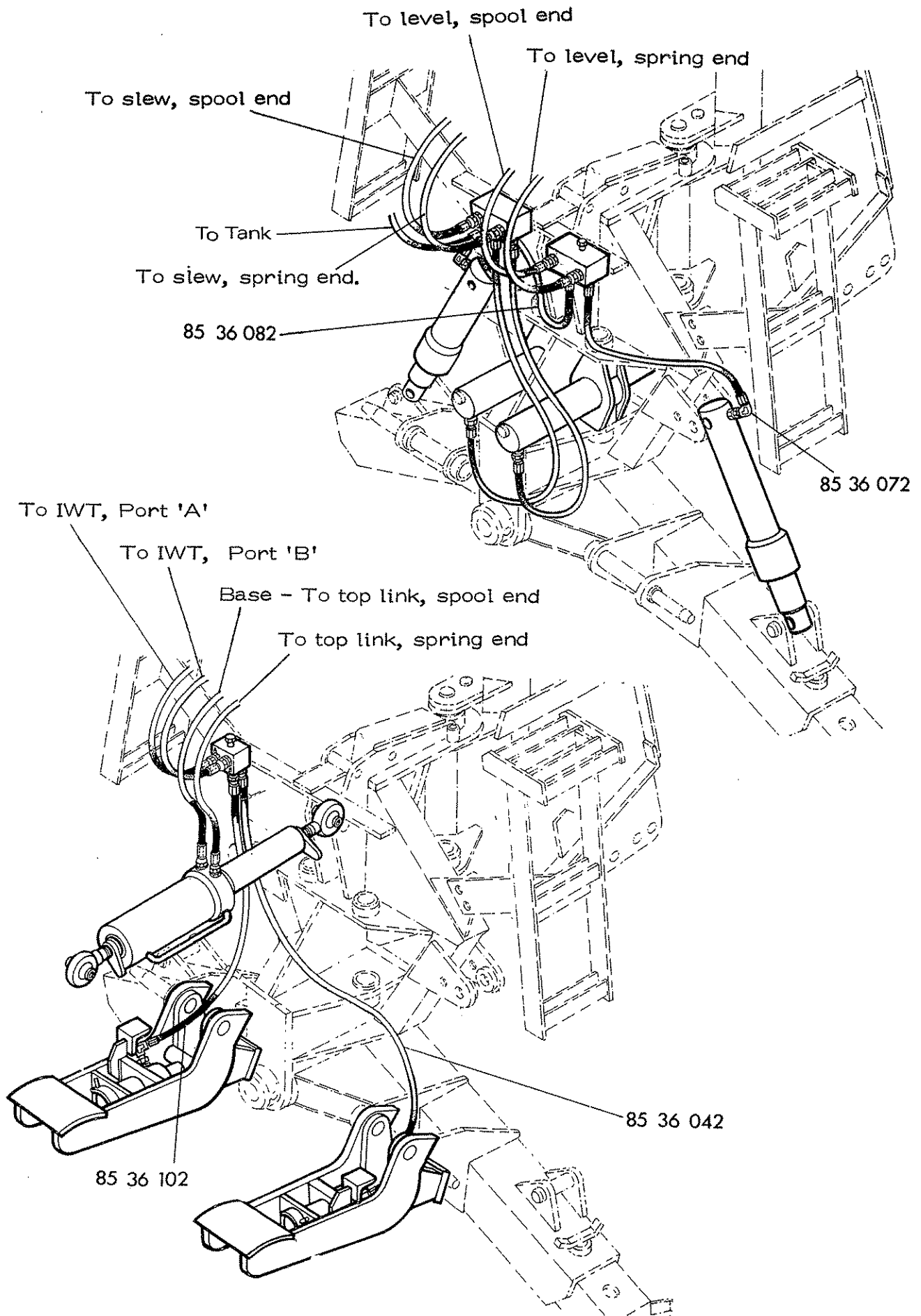
Disconnect the hoses for the IWT, slew, level and hydraulic top link sections. With the remaining hoses still in position the control valve can then be removed from the console and repositioned on top of the hydraulic tank with the spool ends facing forward.

If required the console can now be removed completely to improve working visibility. Assemble hose guide in position shown using tubes supplied and the existing 'U' bar from the top of the main frame.

The hoses to the auxiliary valves i.e. IWT, Slew and level must be disconnected at both valves and rams.

The carrier bracket for these valves is then released, rotated horizontally through 180° and re-bolted into position.





The hoses are then re-connected as shown in the diagrams.

The two shorter hoses to the hydraulic top link are removed at the jointing connectors and the straight ends of the hoses remaining are connected to the ram as shown in the diagram.

### Control lever mounting

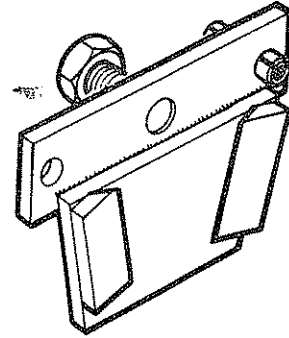
The control units can be mounted in the cab in numerous ways using three basic methods. Details of components necessary and method of fitting to individual tractor makes and models will be found with the tractor fittings kit supplied.

#### a) Mudwing mounting (standard attachment)

Two small brackets in the form of a fabricated slot are bolted to the tractors mudwings. The tongue plate of the lever assembly fits into the slot and is locked in place by a setscrew in the cable carrier.

The brackets which are supplied as a standard fitting are complete with a roll pin and locking screw which are both discarded in this application.

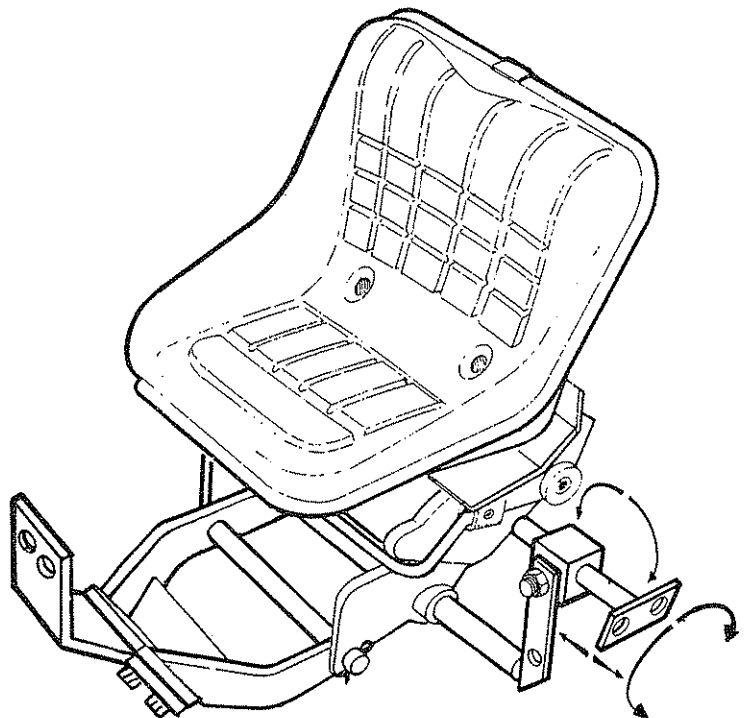
It can be fitted to tractors equipped with a safety frame or safety cab (not 'Q' cab) and is suitable for ditching.



#### b) Tip-over seat mounting

Where rearward facing work such as digging is required an optional tip-over seat assembly can be supplied that takes the place of the existing tractor seat. The tip-over seat is suitable for all types of operation and can be used where the tractor is equipped with a 'Q' cab and drilling the mudwing is not allowed.

For this application the small slotted brackets are not used, the control units being bolted through the tongue plate directly to the swivelled mounting stalk on the side and the extension mounting bracket at the rear.





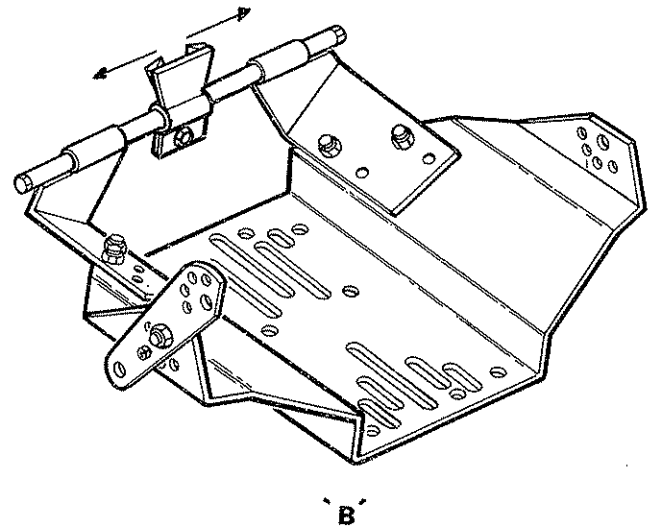
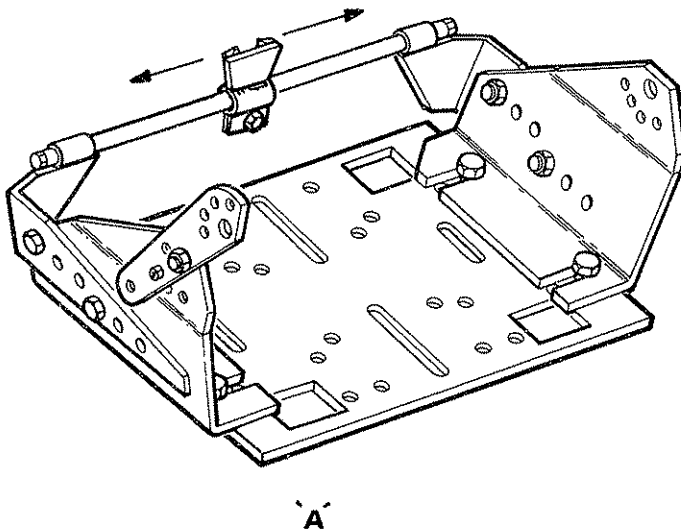
c) Sandwich mounted bracket

In certain cases the side mounting bracket attached to the tip-over seat assembly may be found unsuitable as it can interfere with the tractor quadrant levers or control system. In quiet cabs where bolt on mudwing brackets are not allowed the alternative is a 'sandwich' mounted bracket which is trapped between the tractor and the seat runners and held in position by the existing tractor seat mounting bolts.

There are two types of sandwich bracket :-

- i) Flat deck type 'A'
- ii) Well-base type 'B'

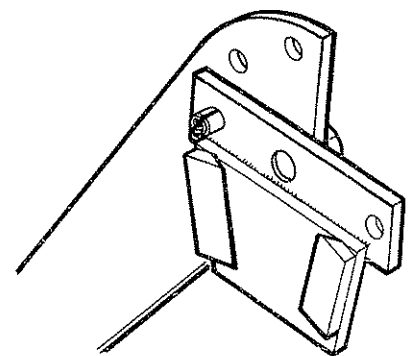
Between them, these two brackets cover the majority of tractor makes and models. Extra holes can be drilled in the base plate or they may be slotted to suit individual circumstances.



The small mounting bracket which is supplied as a standard fitting is then bolted to the side member which in turn can be fixed in a number of positions on either side.

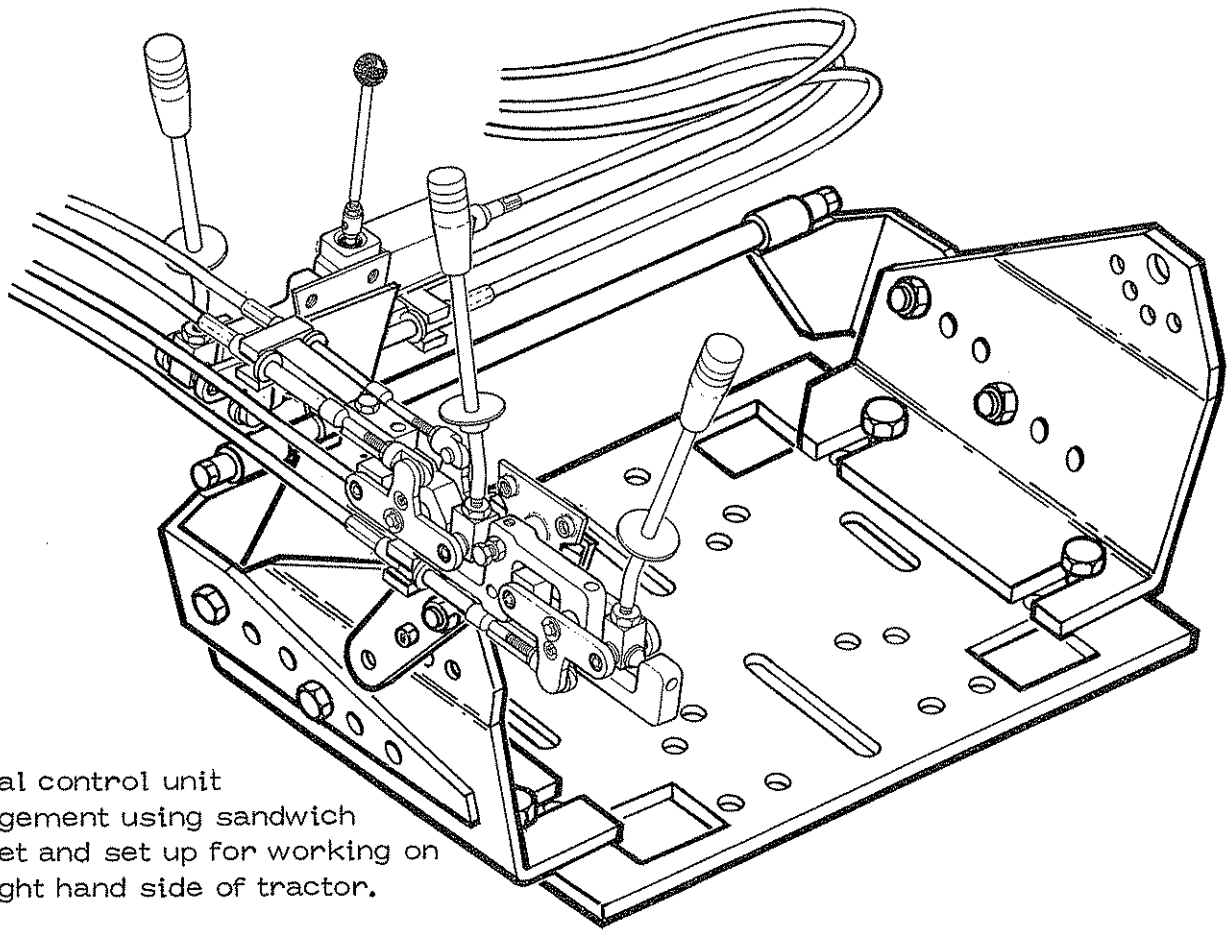
A range of holes in the side member is for location of the spring dowel which allows the control unit to be held at any desired angle. The setscrew locks the spigot against the bracket.

In addition the socket at the rear of the seat can be slid along its carrying bar to the most convenient position.



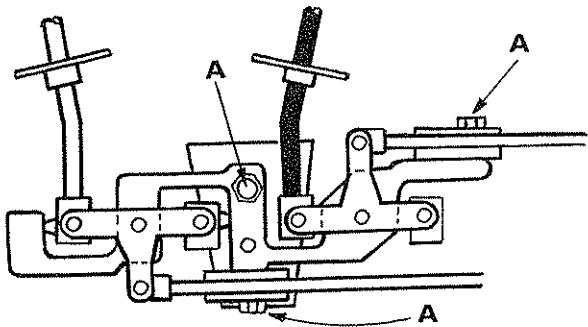
When positioning the control units the main controls (S. L. B. R.) should be located first in the most comfortable and convenient position for the work being done. The auxiliaries, less frequently operated, should then be mounted as conveniently as possible.

By utilising the tongue plate itself or its bolt on facilities the position of the control units can be moved around the cab to best suit the type of work being carried out and the mounting facilities available i.e. on either side or behind the seat.

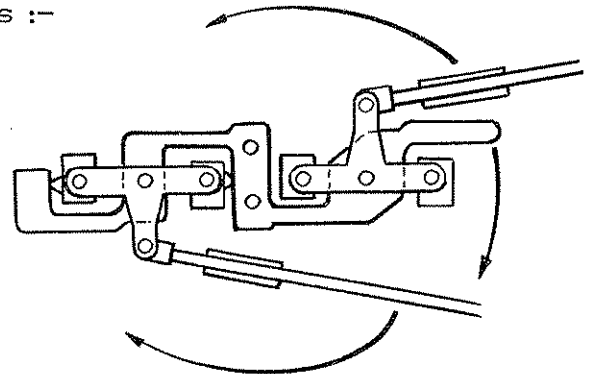


Typical control unit arrangement using sandwich bracket and set up for working on the right hand side of tractor.

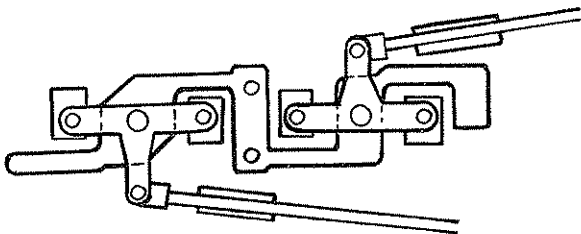
In addition when moving the main control unit from right to left or vice-versa the unit itself has to be converted, this is done as follows :-



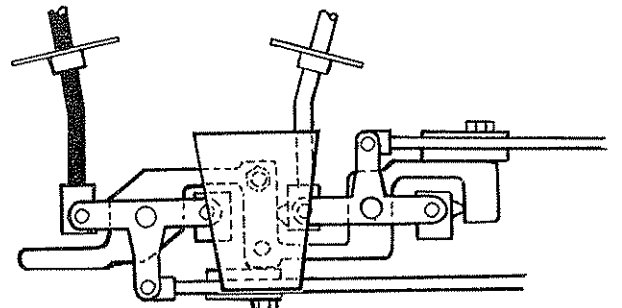
Remove the handles and set screws 'A'. Release unit from its mounting and remove the tongue plate.



Grasp the cables and turn the top cable upwards through  $180^\circ$  and the bottom cable downwards through  $180^\circ$ .

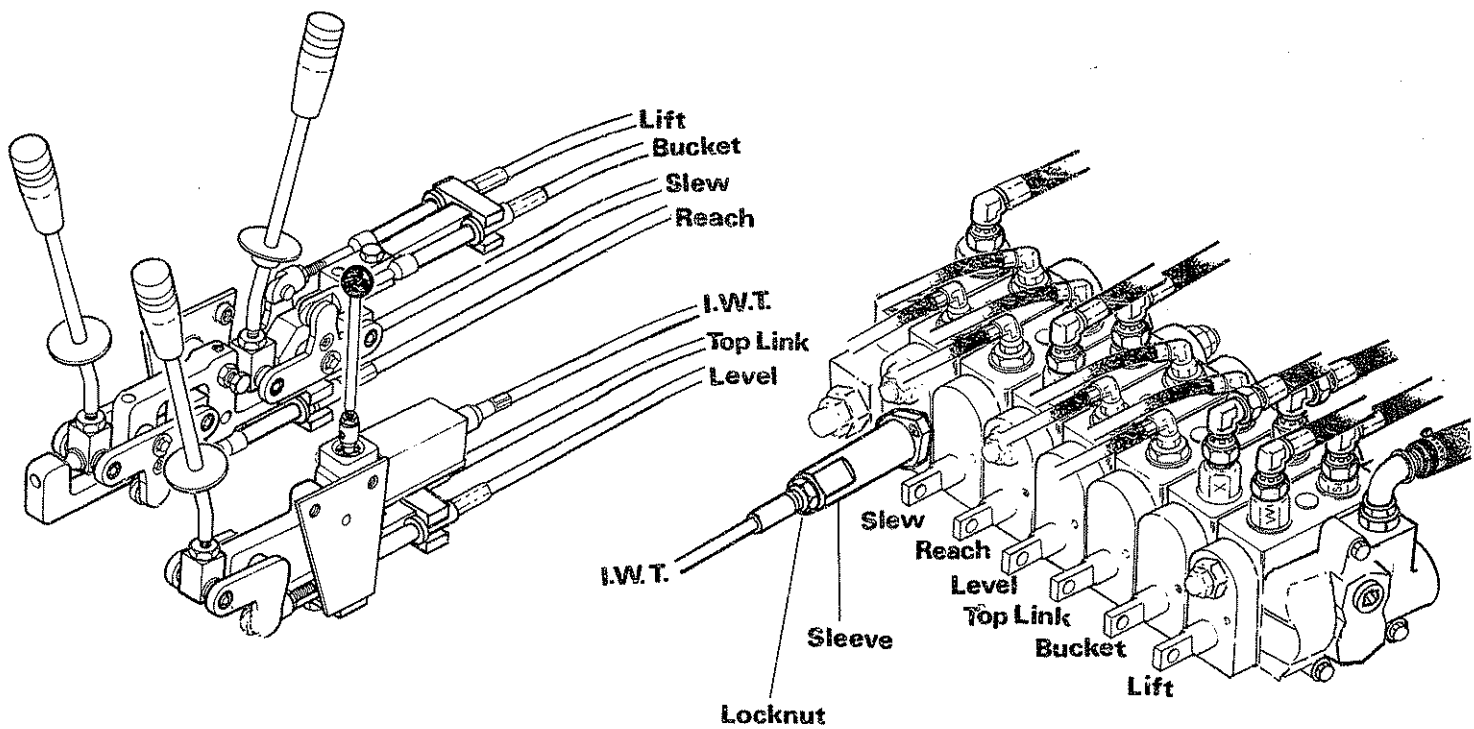


This simultaneously turns the rocker and cable carrier through  $180^\circ$  and effectively has turned the assembly inside-out.

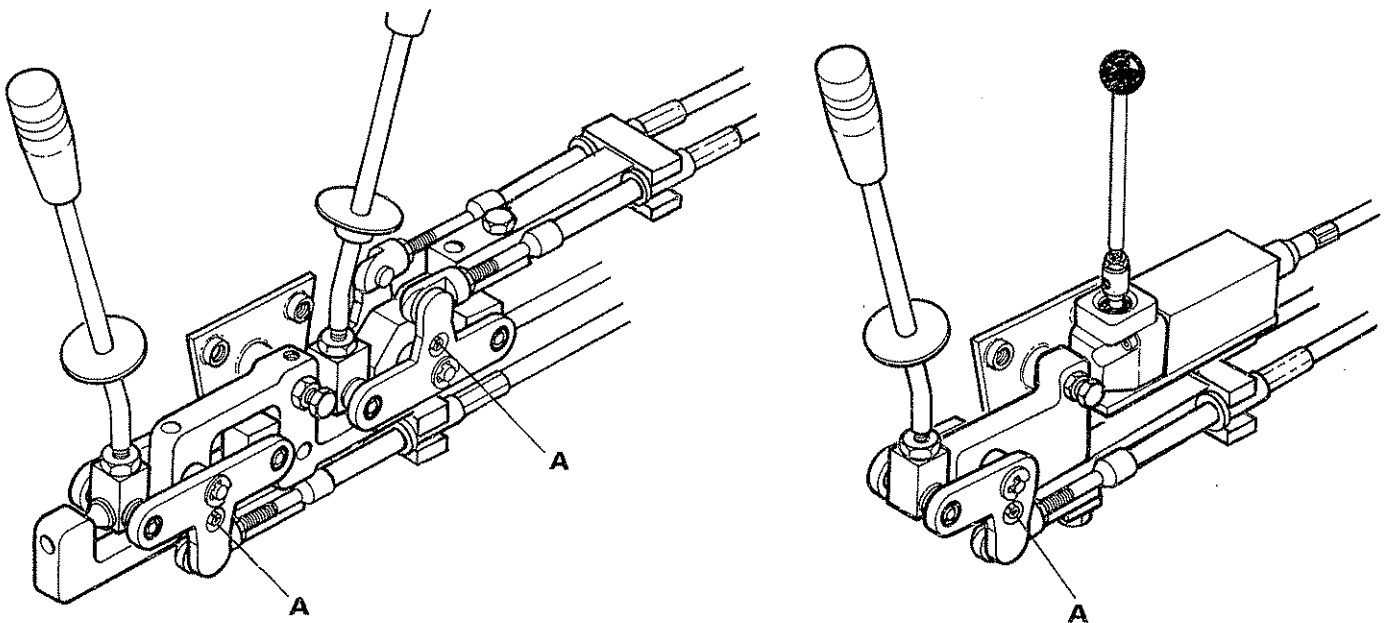


Replace the set screws and levers in their correct position shown. Reposition tongue plate to suit - usually on the opposite side of the unit.

The auxiliary control unit is not handed and any positional adjustments are carried out by moving the tongue plate or by adjusting the mounting facilities themselves.



Connect the cables to their corresponding valve spool ends and screw the sleeve into position without clamping down fully to the valve face.



Adjust the cables travel to obtain the correct neutral position. For all services excepting I.W.T. this is done by releasing the locknut and rotating the sleeve until the spring dowel 'A' is located centrally in the lever travel stop.

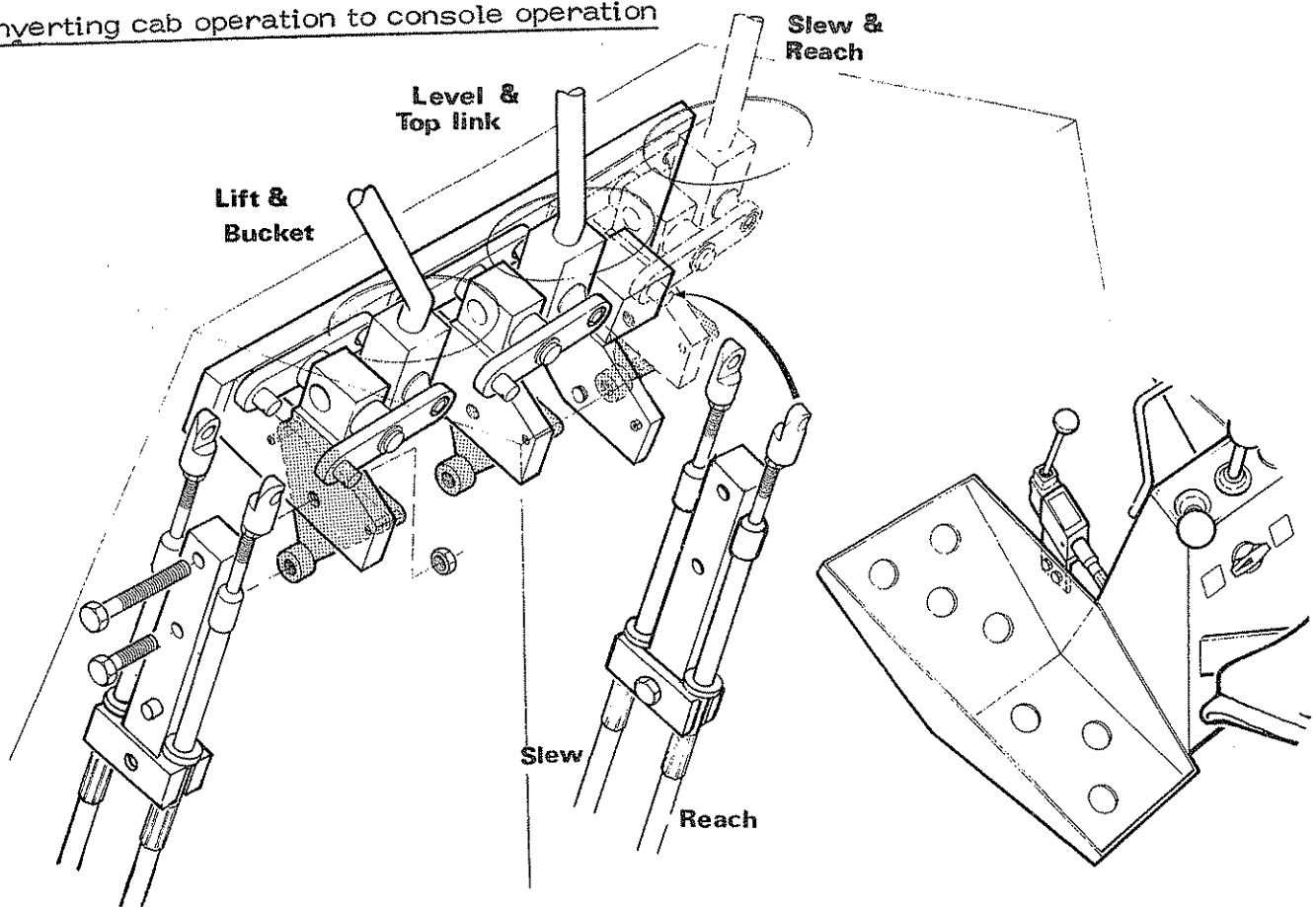
The IWT cable is set in the following manner :-

The lever is put in the release position and the sleeve is rotated until it is  $\frac{1}{4}$ " from the valve face. The lever is then put into the work position and the sleeve moved fully down to the valve face where it is clamped in position.

Check. If on returning the lever to the release position it will not hold, the sleeve has to be unscrewed back from the valve face until it will do so.

If on returning the lever to the release position it holds easily but the IWT rams occasionally fail to release the sleeve must be screwed towards the valve face.

## Converting cab operation to console operation



Remove the console rear cover and the spool actuating rods (if not already done).

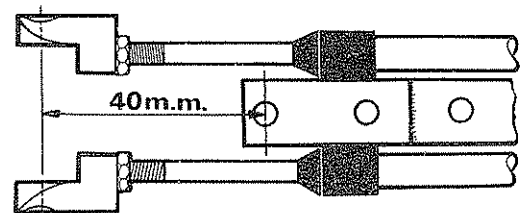
Remove the existing IWT rocker linkage rod and foot pedal assembly.

If cable controls ordered as original equipment this will already have been carried out.

Locate and fix the three triangular cable mounting brackets into the console in the position shown using the spring dowels supplied.

Free the cable pairs for lift, bucket, slew, reach, level and top link from their assemblies by releasing the retaining screws and removing the tongue plate.

The end fittings of the cable must then be rotated through 180° until the shoulders face inwards as shown.



The cables are then attached into the console with the long bolt through the upper hole in the block. See drawing.

Note: The cable end for slew and reach services is mounted reversed to the other two. Study drawing carefully. This is to retain the correct sensing of the services.

The IWT block is released from its carrier plate and is then fixed in position on its bracket which is bolted to the foot well in place of the original IWT foot pedal assembly.

Resetting the cable neutral position should not be necessary. However if console operation is the first installation, the cable and setting is correct when the distance between the centre of the top hole in the cable end block and the centre of the cable end eye is 40 mm. This adjustment should be achieved by adjusting the cable sleeve not by screwing the cable eye. For setting IWT cable follow instructions previously given on page 26

## OPERATION

### 1. Tractor Setting

- a) Position machine on site and lower to ground.  
Leave 'Position Control' or quadrant lever in the lowered position and select zero or minimum draft.
- b) Do not isolate the linkage as this prevents correct operation of the IWT mechanism.
- c) Set IWT lever to the 'work' position by releasing the white knob on the console.
- d) Engage pto drive and set tractor engine r.p.m. to give approximately 300 r.p.m. at the pto shaft. As the operator becomes familiar with the machine operation, this figure can safely be increased to a maximum of 360 r.p.m. Do not exceed this speed.

### 2. Instant weight transfer (I.W.T.)

The IWT lever which is operated by the left foot is connected by mechanical linkage to the main control valve.

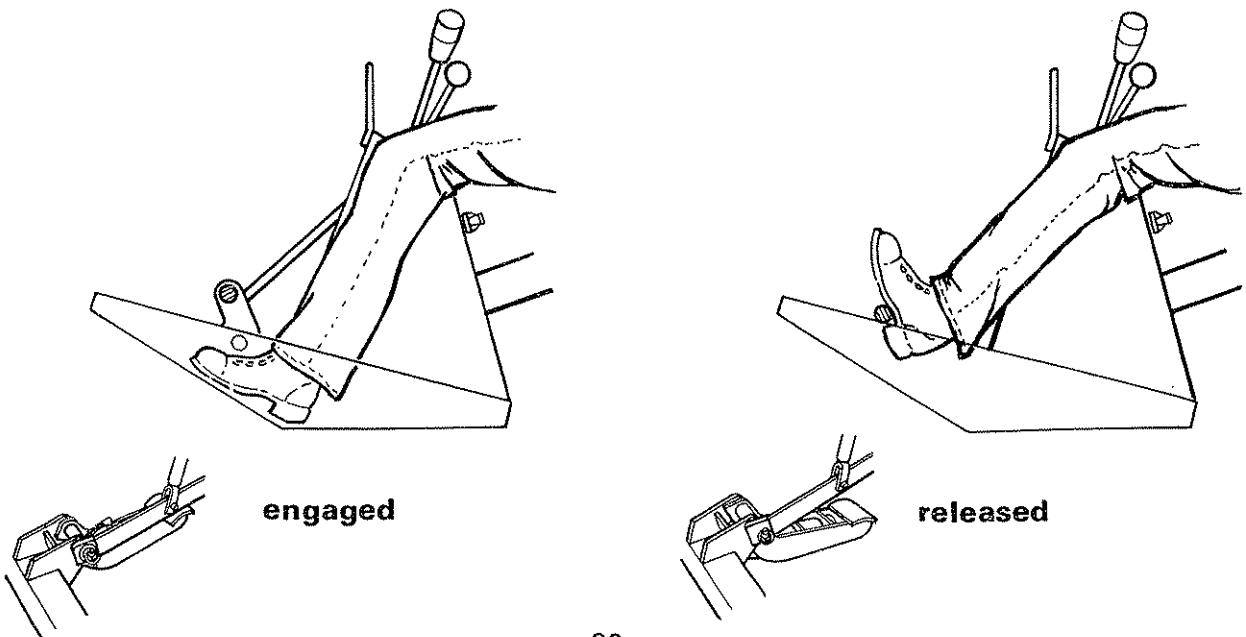
Movement of any of the hand control levers will also pressurise the IWT rams, lifting up the arms to contact the underside of the tractor's draft links.

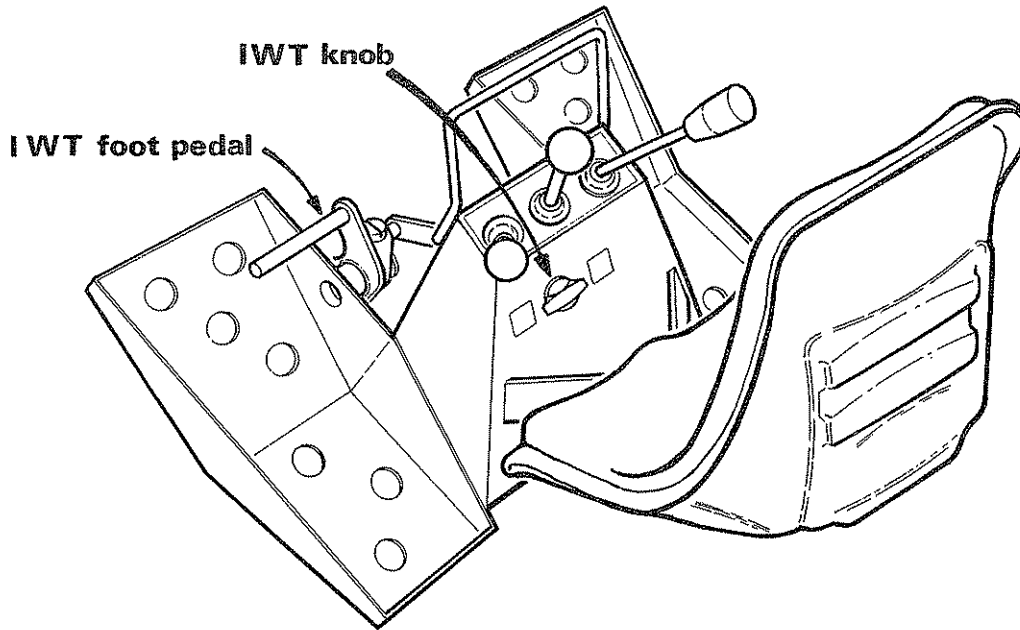
Tractor back-end weight is thus transferred to the machine's feet for stability. It also allows maximum force to be exerted on the lip of the bucket. Any sinkage of the machine's feet is automatically adjusted by further movement of the IWT arms as the control levers are being worked.

Before the machine can be lifted off the ground, either by the tractor draft links or by downward movement of the main arm the locked pressure in the IWT rams has to be released and this is accomplished by pressing down the foot-operated lever.

To hold the valve in the released position i.e. should the operator want to dismount and move the machine with the tractor, the white knob on the console should be rotated to the 'OFF' position while the foot lever is being held down.

No attempt should be made to lift the machine off the ground with the tractor draft links unless the IWT has been disengaged.



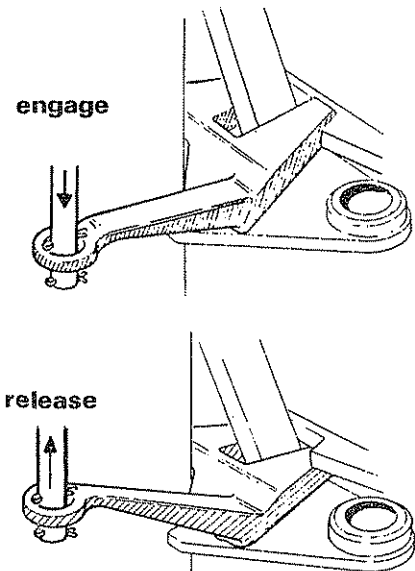


### 3. Transport lock

The locking plate which prevents accidental slewing or 'creeping' of the slew column is operated by a vertical rod which passes through a bracket on the column below the console.

To engage the lock, centralize slew column and press down the operating rod. Pass a spring cotter through the hole in the rod immediately beneath the bracket.

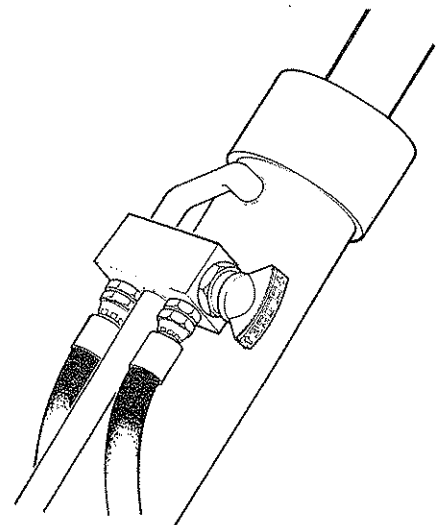
To disengage, the locking plate is held up and secured with the spring cotter above the bracket.



### 4. Lift ram lock

A hydraulic tap is fitted adjacent to the lift ram rod. Close the tap completely for machine transport - particularly on the highway. This will prevent the arm from 'creeping' or falling to the ground if the lever is accidentally touched.

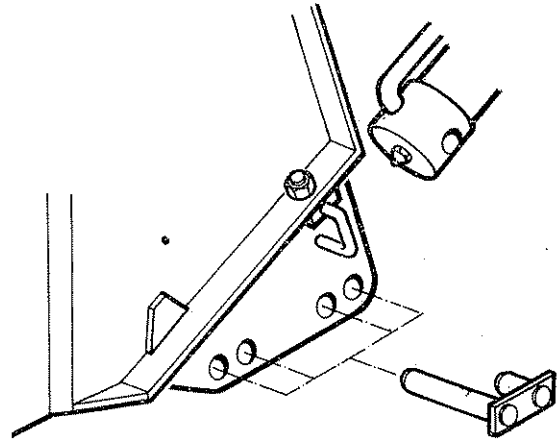
The tap should also be closed after the machine has been parked and removed from the tractor.



5. Lift Ram Mounting

Alternative positions for the base end of the lift ram are provided that give a range from maximum depth to maximum height.

Maximum depth is achieved by mounting the ram in the closest position to the slew column, while the position furthest out will give maximum height.



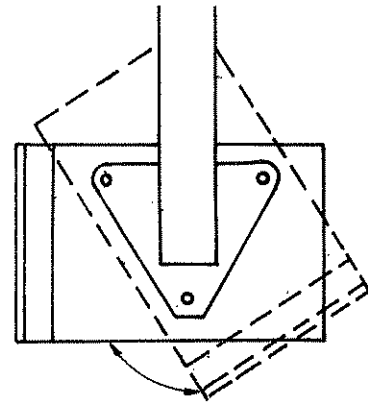
6. Adjustable legs

Leg setting can be altered to give maximum digging/loading height or reach over wire. After any alteration, adjust the top link to bring the machine to the vertical and recheck the cab clearance.

For all 'slew-loading' operations, set the feet to maximum width for the greatest stability. For trenching across slopes, or other work that requires unequal leg settings, adjust the tractor linkage to avoid any excessive load on the drop arms.

7. Adjustable feet

Bolt holes in the feet are equi-distant apart to allow the foot to be turned through 120°. This can be particularly beneficial when trenching in hard ground to prevent the machine from 'back-sliding'. Another alternative to improve anchorage even more is to turn the foot upside down.

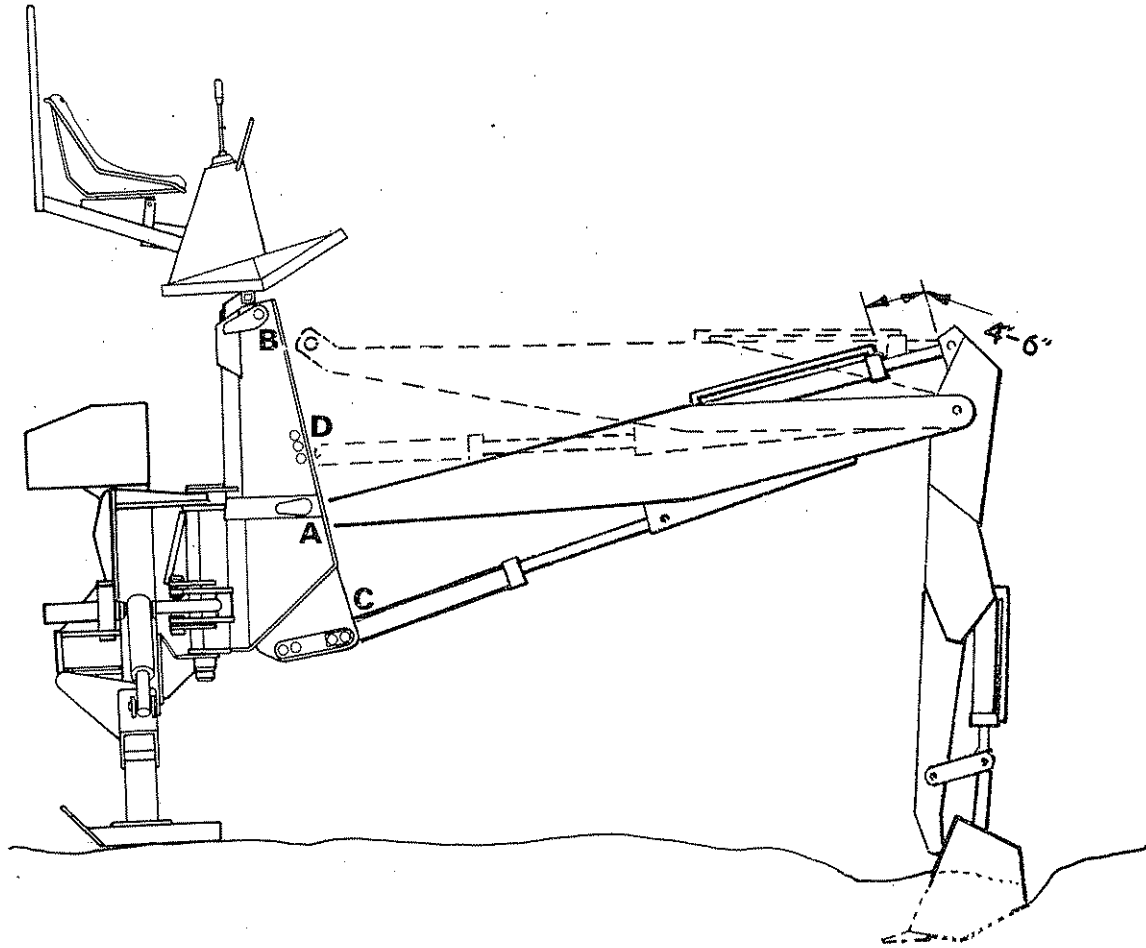


8. Sideway levelling

This facility is provided to allow the column to remain upright while working on sloping ground. Operation of the central lever to activate the levelling and/or hydraulic top link rams can assist in maintaining the column as upright as possible.

If the slew column is allowed to operate at an extreme angle complaints of loss of power may arise, as the arm has to constantly traverse in an uphill motion.





### 9. High/Low Arm Change

The main arm has two alternative pivot positions on the slewing column. Shifting from 'low' to 'high' position is simply and quickly carried out without releasing hoses or having to use lifting gear.

Conversion should be carried out in the following order, following the sequence A to D in the diagram.

- a) Instal lift ram in the maximum height position.
- b) Extend reach ram 4"-6" and dig bucket teeth into the ground to act as an anchor.
- c) Operate the lift ram sufficiently to take the weight off the main arm and drive out the arm pivot pin.
- d) Continuing to operate the lift ram, carefully extend it to enable the main arm to clear the slewing column.
- e) Using both reach and lift rams, re-locate the main arm in the high pivot position and re-fit the pivot pin.
- f) Drive out the pin from the base end of the lift ram and then retract the ram before locating the base end in anyone of the three positions in the slew column. The lowest position will have the greatest power and the highest position will give the greatest reach.

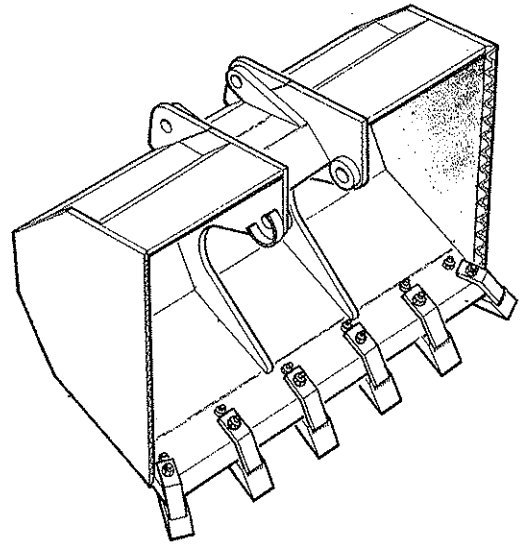
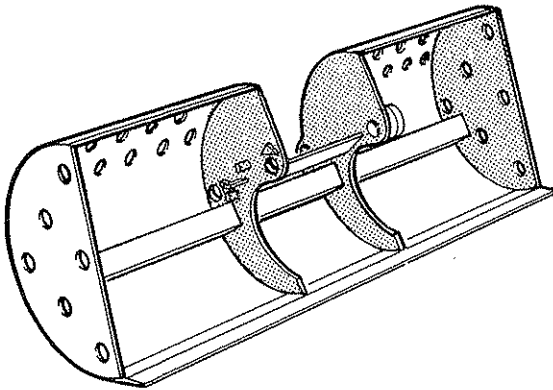
Note: Shifting from 'high' to 'low' position, reverse the above instructions, moving the ram first and the arm second.

## 10 Buckets

There are four ranges of bucket currently available for use with the Power Arm 7 and 8.

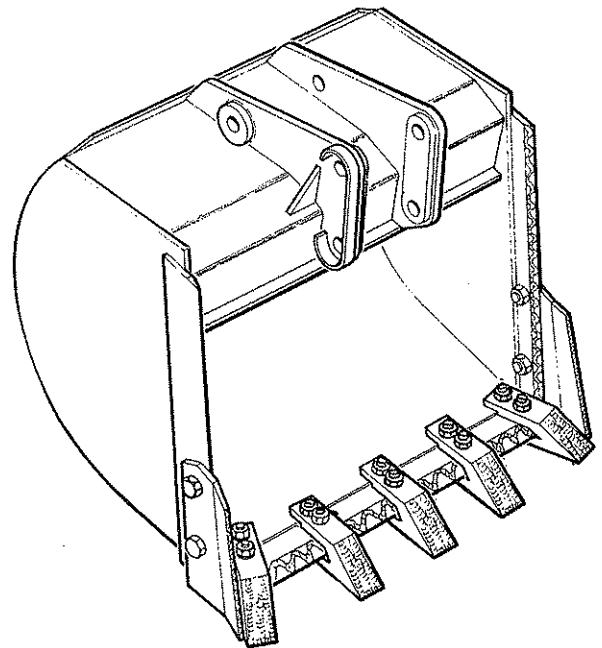
### i) Ditching Bucket

Two types of ditching bucket are available and can be classified as ditch digging and ditch cleaning models. The basic difference is that the ditch digging bucket is fitted with teeth while the ditch cleaning bucket has an unobstructed leading edge and a perforated back for water drainage.



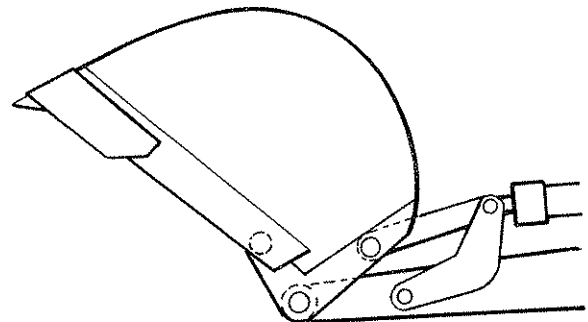
### ii) Excavating Bucket

Classified as heavy duty digging buckets with hard faced reinforced teeth. These buckets have alternative mounting pivots for 'square-hole' action although some loss of power must be expected when used in this geometry.



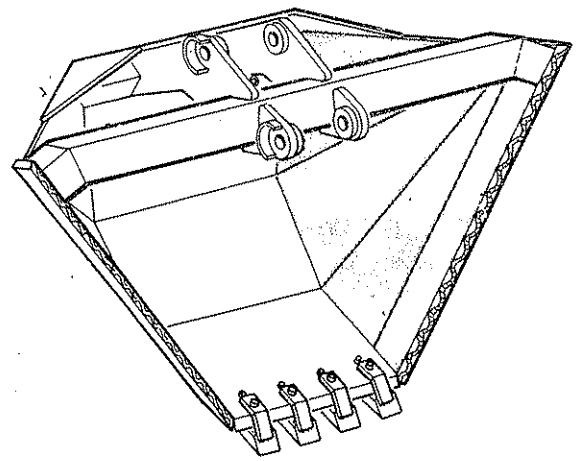
#### Square hole geometry

Where it is desired to form a vertical face as in the digging of a straight sided pit, the bucket may be hinged in the upper pivot position to give square hole action. Slight loss of power must be expected from this geometry as well as a limitation to the fully closed position of the bucket.



iii) 'Vee' Bucket

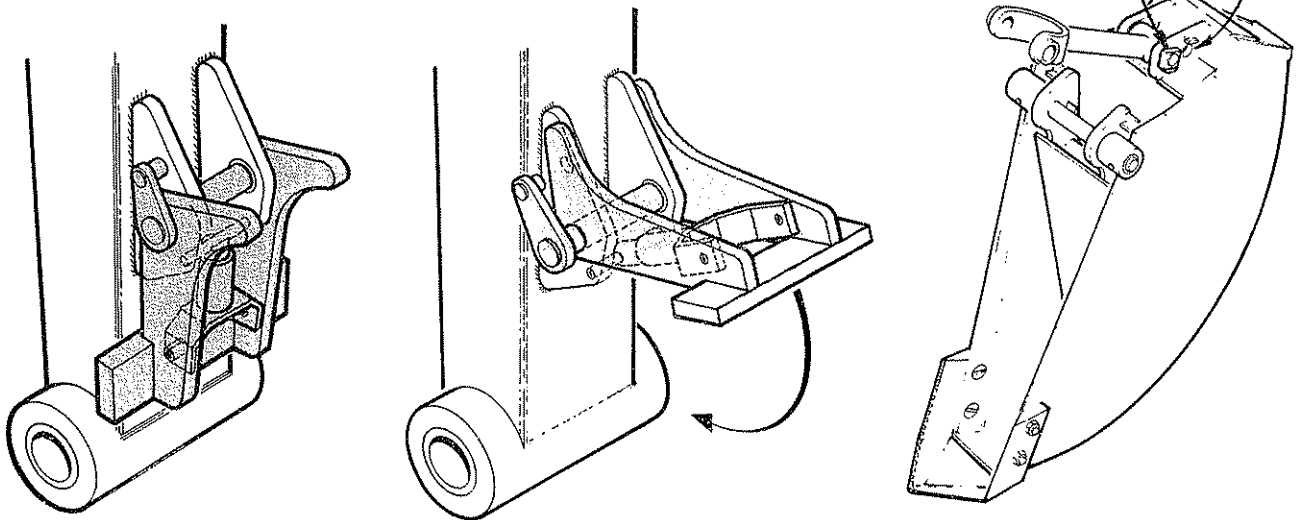
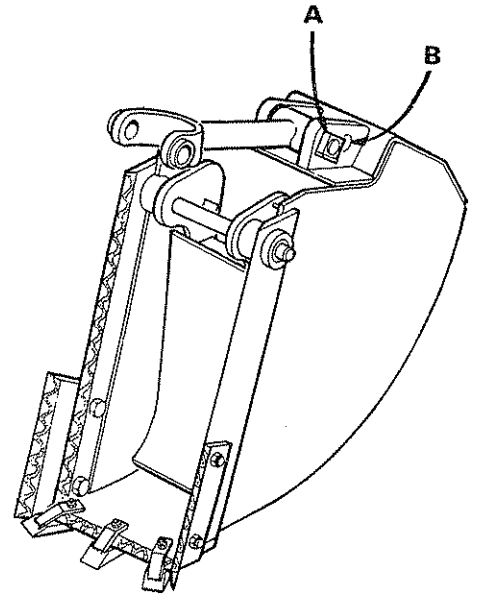
This bucket can be used for cutting a new ditch in light sandy soils. When operating a 'vee' bucket both sides as well as the bottom cutting edge are continuously in work as the ditch deepens and for this reason the power requirement is greater than for normal operation with a bucket having vertical sides.



iv) Trenching Ejector Bucket

The bucket has two positions in which the slave link can be mounted. Used in position 'A' the bucket closes to a greater angle for loading purposes. Position 'B' should be used for normal trenching where the spoil is placed alongside the trench.

If difficulty is found in mounting the ejector latch to the back of the dipper arm, do not fully engage the mounting pin. This allows the latch to be swung outwards and the sprung plunger to be located against the dowel. The latch can now be swung back into position and the mounting pin fully engaged and secured. Install the bucket on the end of the dipper arm using the special pins supplied with the bucket. Also use the special slave link supplied in place of the standard link.



Bucket attachment

All buckets other than ejector buckets use the same two pivot pins to attach to the dipper arm and slave link. To fit, place bucket on ground and lower dipper arm end into position between the pivot plates and fit bucket pivot pin. Lift bucket clear of ground, adjust stroke of bucket ram and fit the slave link pivot pin. Ensure that the flats on both pin heads rest against the welded abutment to prevent the pins from turning within the bucket and secure with linch pins.

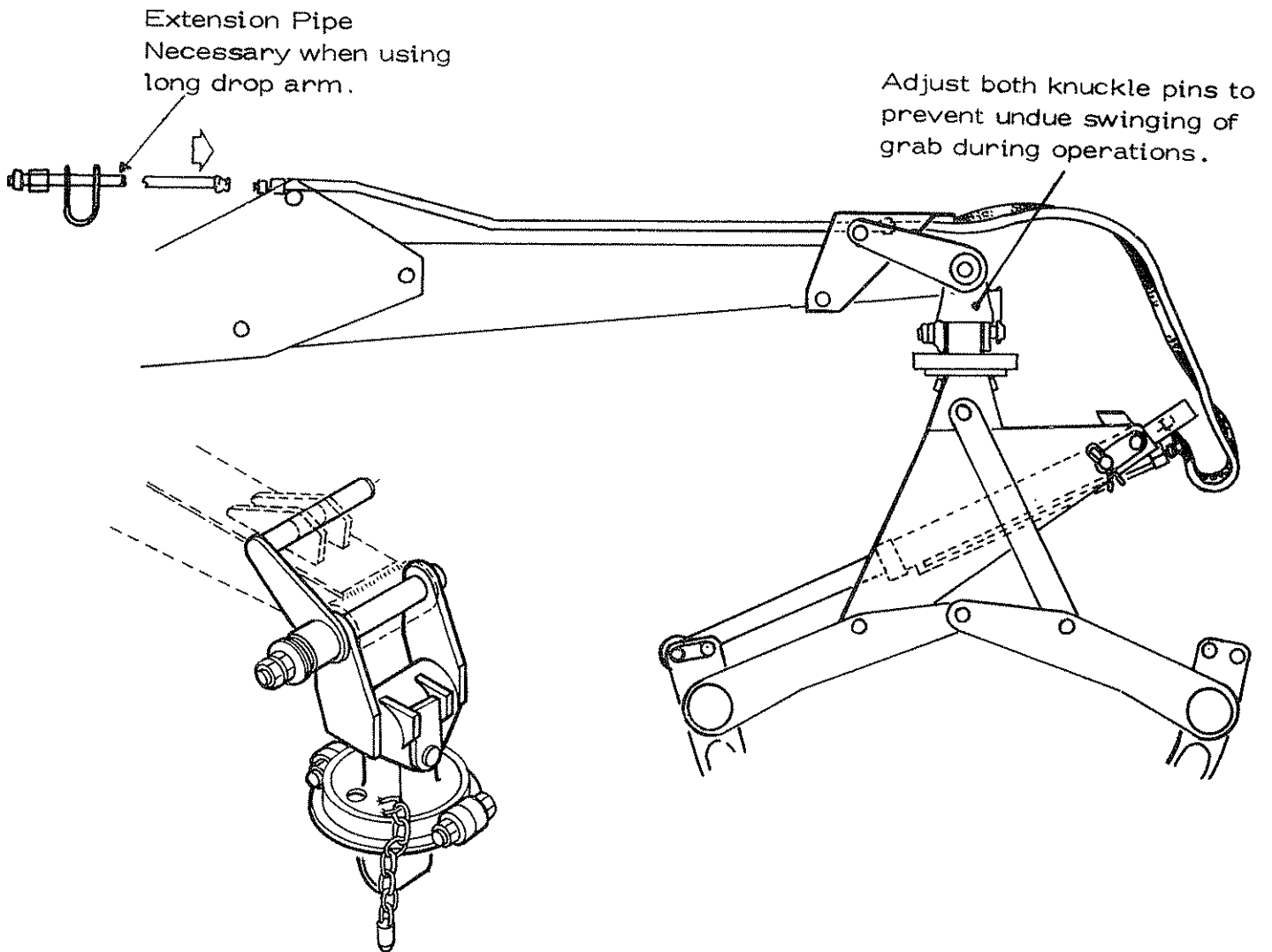
## 11. Grabs

- a) There are two types of loading grab currently available for the Power Arm 7/8.

The tined grab is used for manure and silage. The enclosed bulk grab is used for lime and other ballast.

The grab is attached to the lower dipper arm by the K44 swivel assembly which is pinned through the bucket pivot. The degree of rotation of the grab is restricted so that the hoses are not damaged by twisting. The knuckle incorporates friction dampers in both planes to prevent excessive swinging. Damping is increased by tightening the locknuts. Do not allow the friction sleeves to become contaminated with oil or grease.

The rotation of the grab can be held by a locating pin through the swivel plate that engages with a series of holes in the head plate of the grab suspension frame.



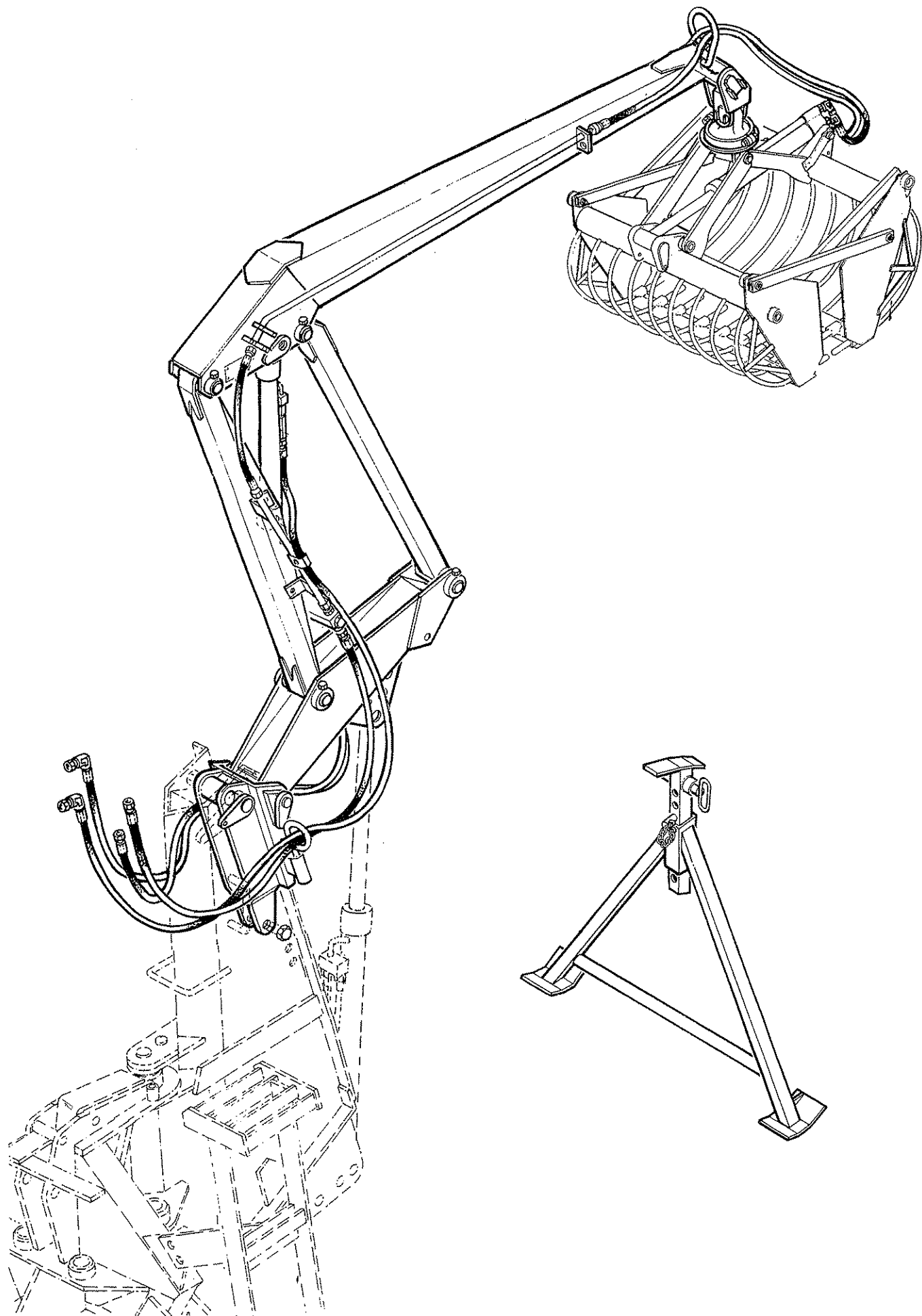
b) Fitting Instructions

- i) Fit the knuckle/damper assembly to the head of the grab and secure with the clamp.
- ii) Position dipper arm in alignment above knuckle.
- iii) Stop tractor engine to minimise oil loss then fit the rigid pipe assembly along the top of the dipper arm and connect up all hoses.
- iv) Lower the dipper arm into the knuckle and fit pivot pin ensuring the peg on the torque arm secures the pipe bracket to the lugs on the dipper arm.
- v) Check arc of rotation to ensure that the base end of the grab ram cannot get directly beneath the dipper arm.
- vi) Check the full range of machine movement for adequate clearance around tractor cab.
- vii) Check that the rod end of the grab ram is located in the outer hole of the tine frame. The inner hole is for an alternative shorter stroke ram as supplied for a Power Arm 6.

c) Extra long dipper arm

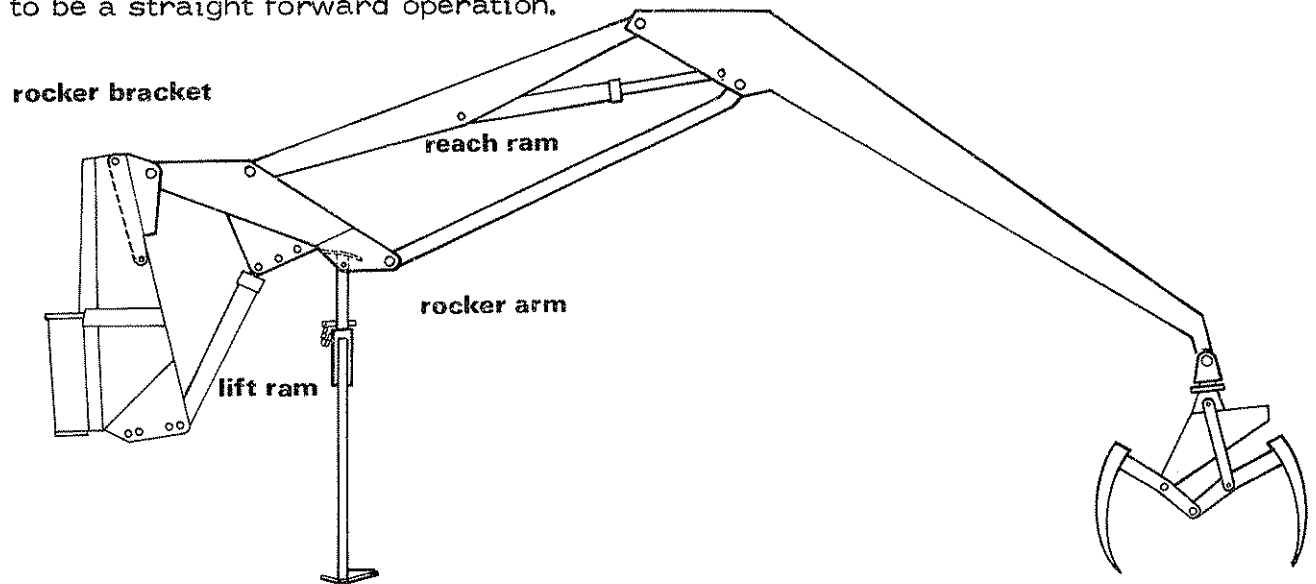
Use of the longer dipper arm increases loader reach by 24" but some decrease in lift capacity must be expected. An extension pipe assembly part no. 73 12 367 is required for this conversion.

# LOADER ARMHEAD



## Loader armhead 16

The armhead 16 is a purpose built loader which can only be attached to the Power Arm 8. It can be fitted with a choice of grabs and is equipped with its own parking stand which allows changeover to the digger armhead to be a straight forward operation.



### Installation of Loader armhead

#### 1. Relief valve adjustment

For loader use the pressure setting of the main relief valve should be updated from 2500 psi to 2750 psi (187 bars). Re-calibration should only be attempted using a reliable pressure gauge. Adjustment is made on the control valve block after removal of the protective cap. Release the locknut and turn the screw in a clockwise direction. Re-check the pressure after the locknut is tightened and the cap replaced.

2. Ensure lift ram is in maximum height position (see page 30)
3. Assemble rocker bracket into the top of the slewing column, tightening the upper bolt before tightening the two lower nuts which should face inwards.
4. Support lift ram to avoid damage to hoses while manoeuvring tractor and main frame assembly squarely to the rocker arm.
5. Lower tractor linkage to place feet on the ground and extend lift ram to enable the rod end pin to be fitted in one of the three alternative hole positions in the rocker.
6. Connect up reach and grab ram hoses to the control chest.
7. Operate lift ram to take the weight off the loader stand but at this point do not remove the stand for safety reasons.
8. By operating reach and lift rams the forward end of the rocker arm can now be located within the rocker bracket and the main rocker pin can be installed through the top of the rocker bracket. The parking stand may now be removed completely.
9. Slot the grab and reach hoses through the two pig-tail hose guides on both sides of the slew column and locate the guides in the holes provided.

#### CAUTION:

Carefully operate the loader through its full range of movements checking that hoses are not trapped, kinked stretched or frayed. Also be alert to the fact that in its fully retracted position the boom is reasonably close to the operator.



### Removing loader armhead

1. Select a firm level surface and centralize machine.  
Fully open grab and rotate it until the chained swivel restraint pin can be dropped in.  
Lower feet and grab to ground with the reach ram rod in approximately half-open position.
2. Instal parking stand, locating the mounting pin through the lower hole provided on the rocker arm. The stand feet should be biased toward the tractor (see diagram).  
Remove telescopic stand pin to allow the feet to rest on the ground.
3. Operate lift ram until rocker arm pin can be easily withdrawn.  
Note that hose guide should be removed from its mounting tube in the rocker bracket.
4. Continue to operate the lift ram to raise the rocker arm out of the rocker bracket and high enough to expose lower hole in the telescopic section of the stand. Instal the stand pin.
5. Close lift ram to take the weight on the stand which will allow the rod end pin to be withdrawn.
6. Completely close lift ram and tie in position to avoid it falling and damaging hoses.  
Stop tractor and disconnect both grab and reach ram hoses at the control valve .

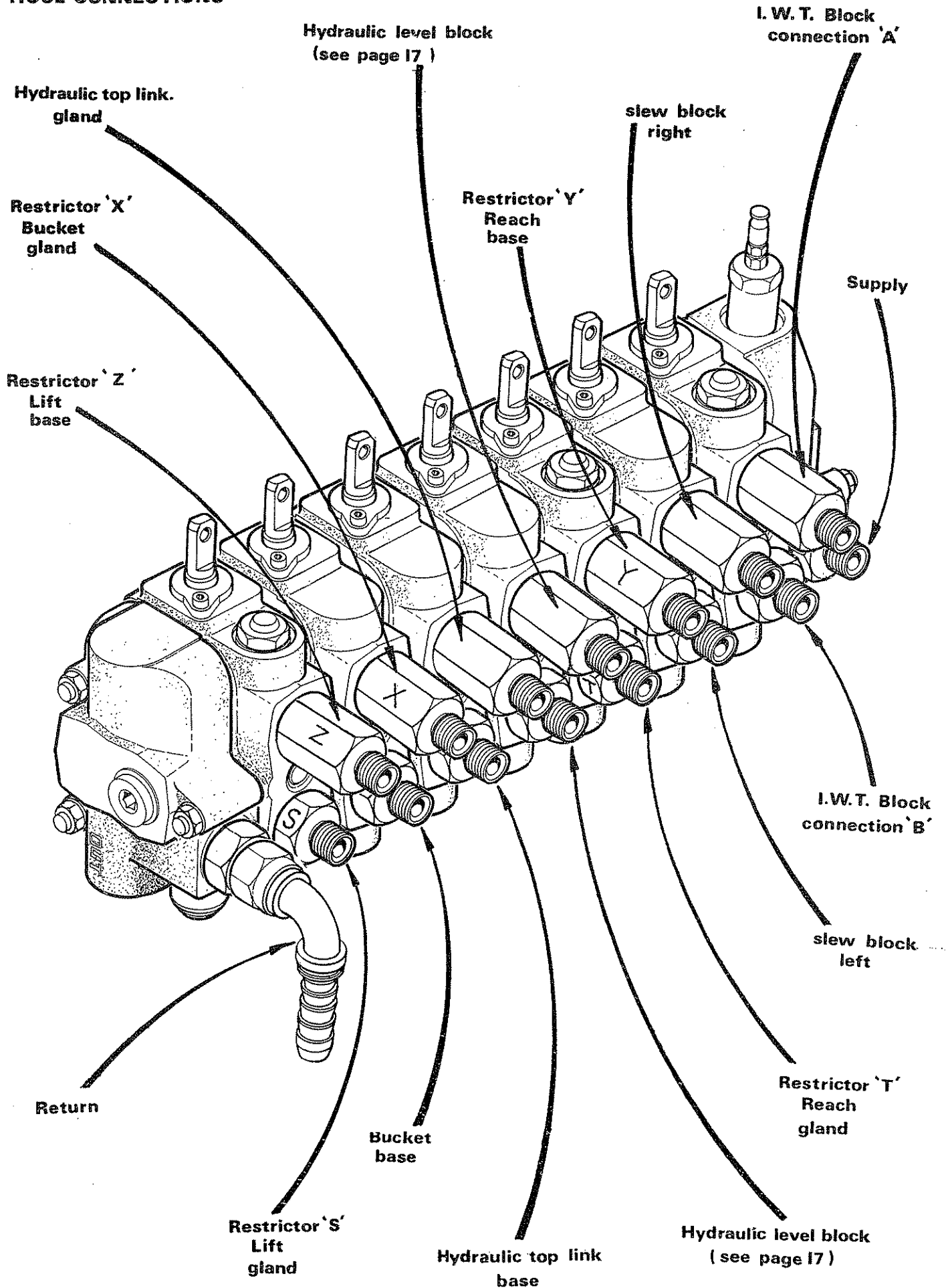
### CAUTION:

If machine is being converted to digger use, the main relief valve must be re-adjusted back to 2500 psi (170 bars). See relief valve adjustment on previous page.

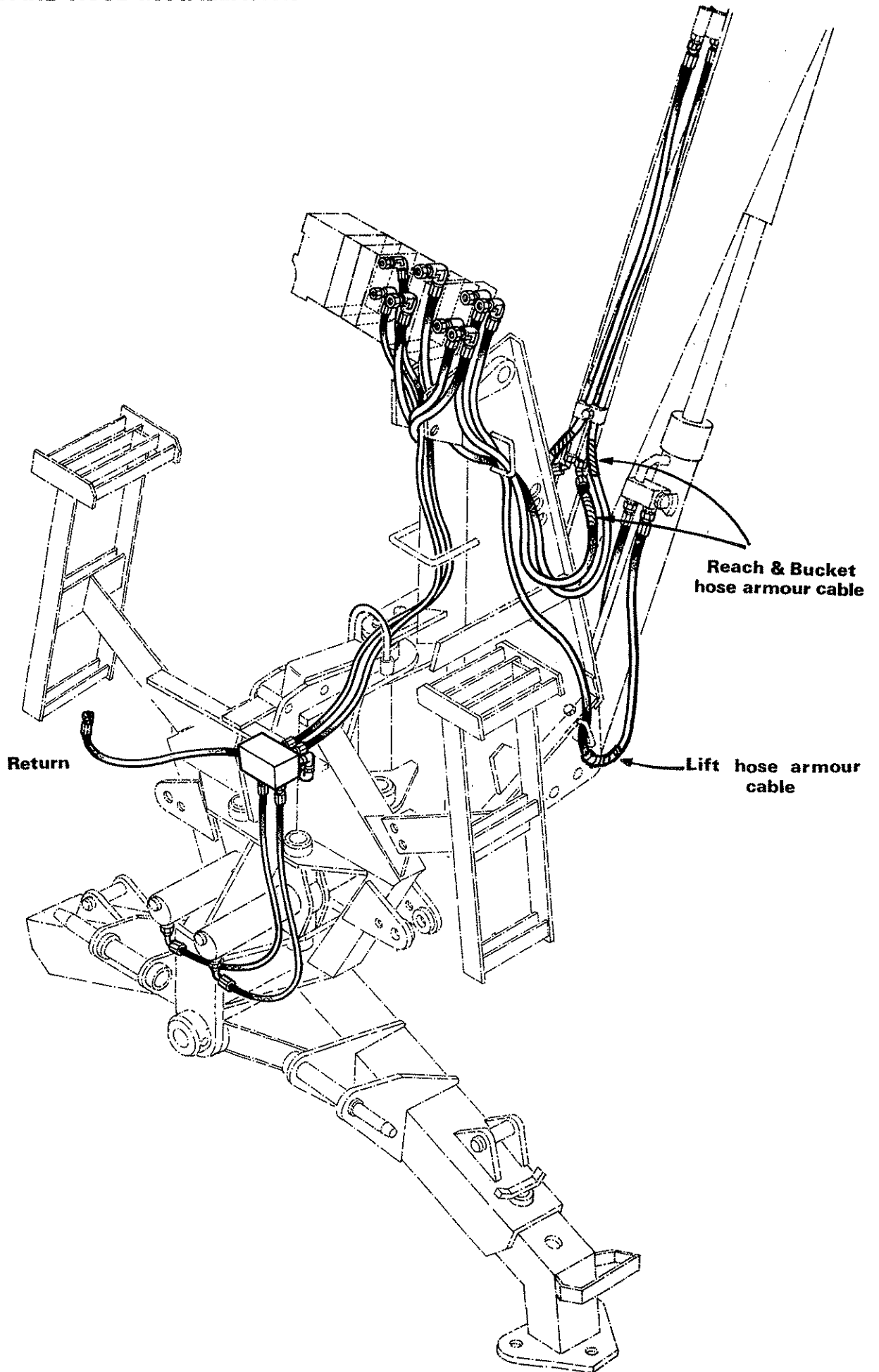
### Note:

The rocker bracket may be left in place when the machine is converted for digger use if the main arm is used in the normal lower position on the slew column. For high clearance digger work the rocker bracket must be removed.

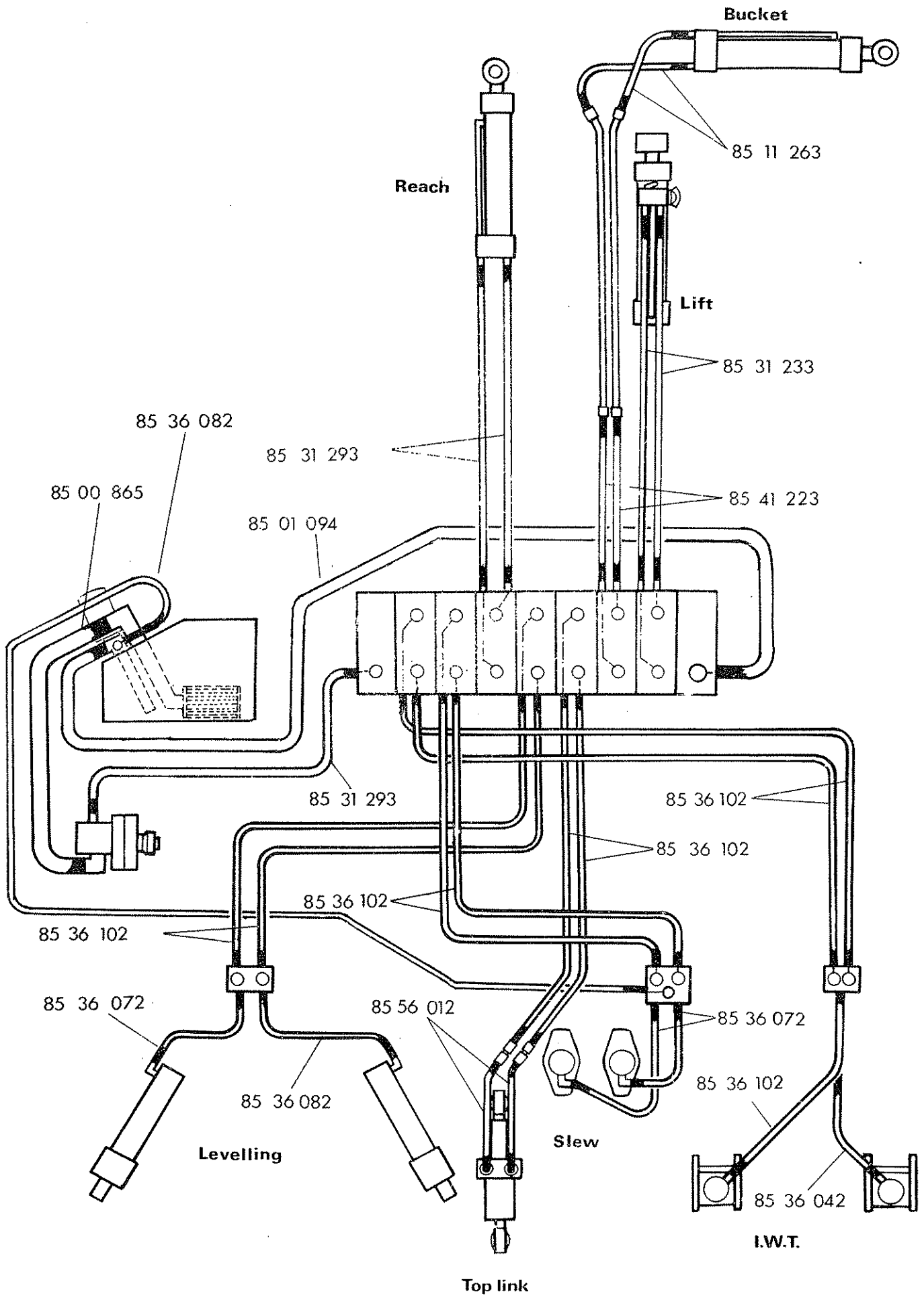
# HOSE CONNECTIONS



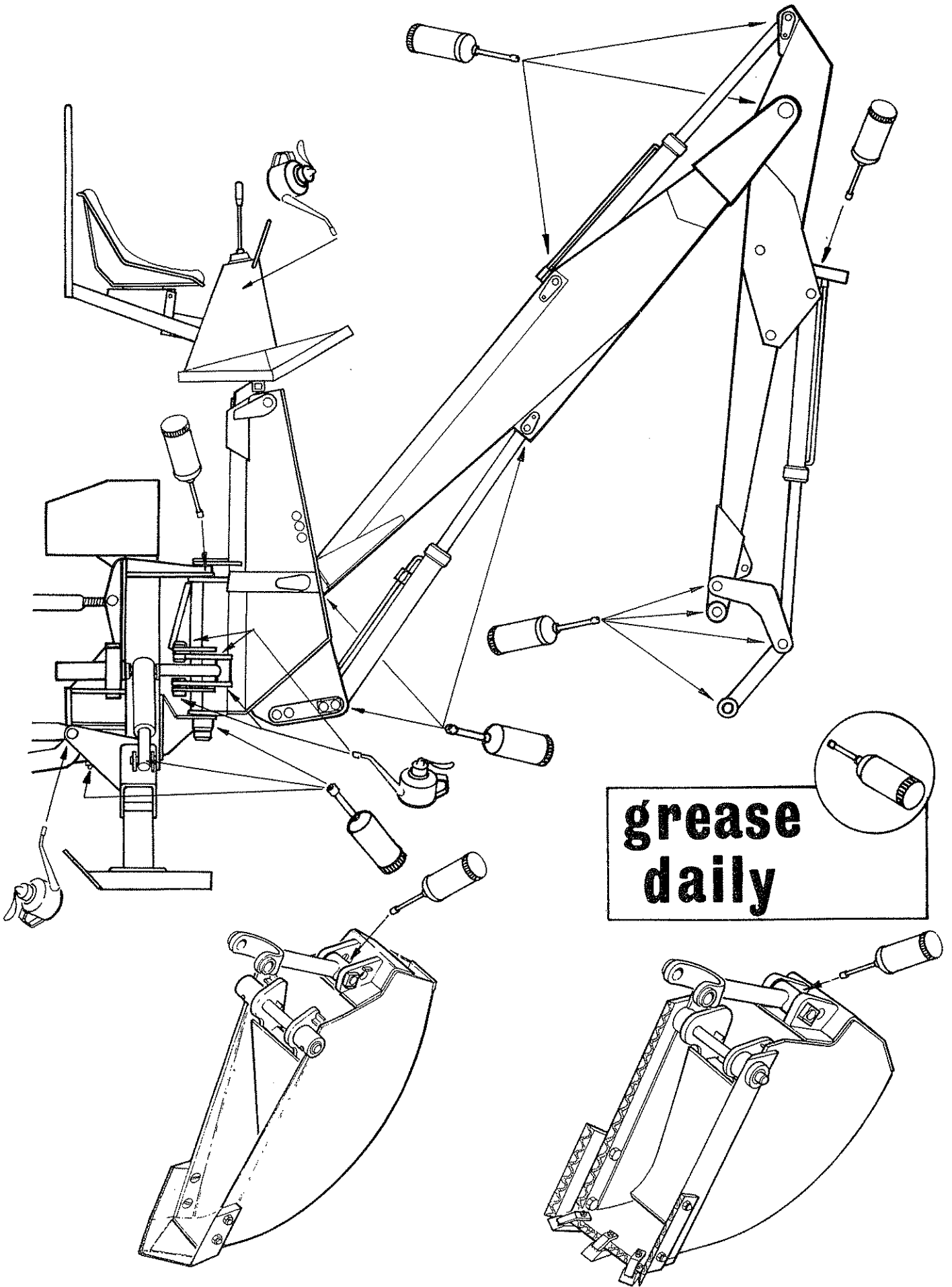
# STANDARD HOSE INSTALLATION



**HOSE DIAGRAM**



**LUBRICATION**



## 1. Independent Supply

The capacity of the oil reservoir when filled to its correct level halfway up the sight tube is 45 litres (10 gallons). Do not overfill.

Within the reservoir is a suction strainer which should be cleaned annually. The cover plate must be removed to gain access and should be re-jointed by a silicone based non-hardening gasket compound when re-fitting. The strainer does not have a by-pass thus the pump is completely protected from dirt. A choked suction element will cause poor operation, i.e., spongy and intermittent movement of the arms. Some pump noise may be noticed particularly with cold oil. If at any time these symptoms develop, the strainer should be removed and washed, preferably in clean diesel fuel.

A return line canister type filter is directly attached to the top of the reservoir. It is recommended that this filter is changed after the first fifty hours use and thereafter, annually.

The wide range of temperature change that occurs within the reservoir causes condensation to form. Provision is made at the base of the reservoir to drain off any accumulated water and sediment. Moisture that becomes emulsified in the oil cannot be trapped by the filter, and eventually the oil itself breaks down through use, oxidation and condensation. It is recommended therefore, that the oil in the reservoir is changed at 1000 hour intervals or every two years, whichever occurs first.

## 2. Tractor supply

For machines operating off the tractor supply system, check daily the tractor's hydraulic oil level and keep to the full mark. Use a 20/30 Multigrade or Universal type oil, or the oil supplied by the tractor manufacturer. Oil filtration is taken care of by the tractor's own filtration system. The manufacturer's recommendations should be followed.

Oil contamination can be reduced further by:-

- i) Carrying out all hydraulic servicing in clean dust free surroundings.
- ii) Cleaning off around tractor filler or reservoir cap before removal.
- iii) Using clean containers.

### 3. Hydraulic pump

The Power Arm 8 is fitted with an independent pump driven through a gearbox mounted onto the tractor p.t.o. shaft. The pump is a gear type of clockwise rotation. No routine maintenance is necessary other than a periodical check for tightness of the mounting bolts and a visual check for oil leakage especially around the pump supply and pressure unions. Where two hose clips are used on the pump supply hose, their worm-drive barrels should be placed opposite each other at 180°. These clips should be checked frequently during the first few hours of work to avoid possibility of drawing in air.

Pump servicing is limited to replacing seals, gaskets and 'O' rings. Servicing should take place under clean dust-free conditions. Pumps should be thoroughly washed and their end plates and body lightly identified with scribe marks to ensure correct assembly.

When re-assembling, lubricate all components with clean oil and tighten down the securing tie bolts in a diagonal sequence to pull the pump squarely together, finally tightening to a torque load of 6.5 Kg/m (47 lbs/ft). Check for freedom of rotation. The gears should be rotated whilst the bolts are being tightened and should turn under a hand load applied on a 6" radius arm. If tight, the 'O' rings and/or anti-extrusion rings have been trapped and the unit must be dismantled to rectify this.

After installation, the serviced pump should be run for several minutes under 'no load' condition before load is gradually applied. During this time frequent checks should be made of the pump casing temperature. An excessive temperature rise will indicate that the pump has been assembled incorrectly.

In the event of shaft seal failure it should not be necessary to dismantle the pump for renewal. The shaft seal part no. is 86 29 135. The overhaul seal kit is part no. 86 99 176.

Generally, it is unwise to replace major components within the pump as they have to be matched in sets. Unless this is done the pump will be inefficient, resulting in overheating and power loss. No detailed parts breakdown is shown. Factory reconditioned units are available within our service exchange scheme.

### 4. Gearbox

Known as the model BF2/B the gearbox has a ratio of 3.9 : 1. The gearbox when fitted with its pump assembly and despatched with the digger will be full of oil. However, when despatched as a spare from the factory it should be filled with 150 mls (approx. 1/4 pint) of E.P.90 gear oil before use. It is always a precaution to check the oil level before use.

Dependent on whether the gearbox is to be mounted horizontally or vertically both the level and breather plugs which have the same thread size can be inter-changed. The breather plug should always be uppermost.

The torque arm should be bolted firmly to the back of the gearbox and the torque chain attached to it and wrapped around a suitable point i.e. the draft arm so that the chain lies at approximately 90° to the torque arm. The location will depend on the mounting position of the gearbox. Additionally the torque arm which is cranked may be reversed on the gearbox to allow for better chain alignment. Excessive side thrust will apply further load and shorten bearing life.

In the final assembly great care should be observed that when the machine is raised on the draft links to the fullest extent, the chain does not tighten up and apply load to the torque arm which can break the gearbox.

Routine maintenance of the gearbox will primarily consist of making a check on the oil level which should be visible through the transparent plug. The complete assembly should be kept clean especially in the input shaft area. An accumulation of dust and grit can have an abrasive effect on the shaft seal and cause leaks. The oil should be changed annually. Shaft seal part no.86 29 134 and the overhaul seal kit part no. 86 99 178.

## 5. Hoses

The condition of all hoses should be carefully checked during routine service of the machine. Hoses that have been chafed 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

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

### Hose Warranty

Warranty is limited to replacement of hoses which have failed due to faulty materials or manufacture. Warranty will not be considered on hoses that have suffered damage by abrasion, cuts or being pinched or trapped while in work. Neither will a claim be considered where a hose end has been damaged by a blow or where the threads or unions have been damaged by overtightening.

## 6. Hydraulic rams

### a) Ram seal replacement – general information.

- i) Whenever possible the ram should be removed from the machine and cleaned off before dismantling on a clean work bench.
- ii) When using a bench vice do not apply excessive pressure to the cylinder and use soft metal jaws when grasping the ram rod.
- iii) Remove scores or nicks on the ram rod by using a fine oil stone. Do not use a file or emery cloth.

### b) Bucket, Reach and Lift Rams

Unscrew gland nut and withdraw the complete rod assembly.  
Remove locking wire from groove of ram nut and unscrew nut.  
Remove piston, piston seals and the gland housing assembly from the rod.  
Renew all seals including the 'O' ring located between piston and rod.  
Lubricate all seals on assembly and do not overtighten the ram nut.  
Re-assemble the locking wire, ensuring the tang is fully located in the drilled hole. Viewed from the end of the rod, the hole location is identified by a centre punch mark.

After assembling the ram, tighten the gland nut securely and centre-pop the thread joint to stop it working loose.

### Note:

Where anti-extrusion rings are used they should always be placed behind the 'O' ring or pressure seal.



c) Level, Slew & IWT Rams

These are all single acting rams. To dismantle, grip the cylinder in a bench vice and rotate the gland housing to expose the tail of the locking wire. Pry up with a file tang or similar tool and counter rotate the housing to wind the wire completely out of its groove. The gland housing can now be withdrawn complete with the rod.

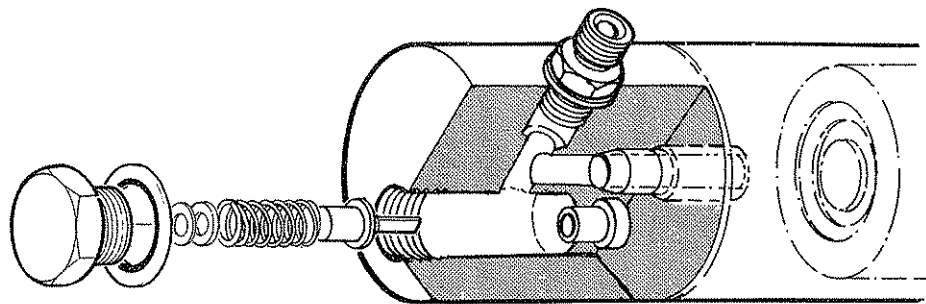
Ram spanner

A combination spanner that fits all the rams on the machine is available under part no 80-04-253.

d) Cushion relief valves

Incorporated in the rear of the slewing rams are cushion relief valves. It is not necessary to disturb these when servicing the ram seals. The cushion relief valve protects the machine from shock overload. Failure of the valve will result in the slew column stopping violently at the end of its travel. Remove cushion body and valve assembly and examine interior seat for dirt or damage. Do not attempt to dismantle the pre-set relief valve. Ensure the cone shaped spring is placed behind the relief valve on re-assembly.

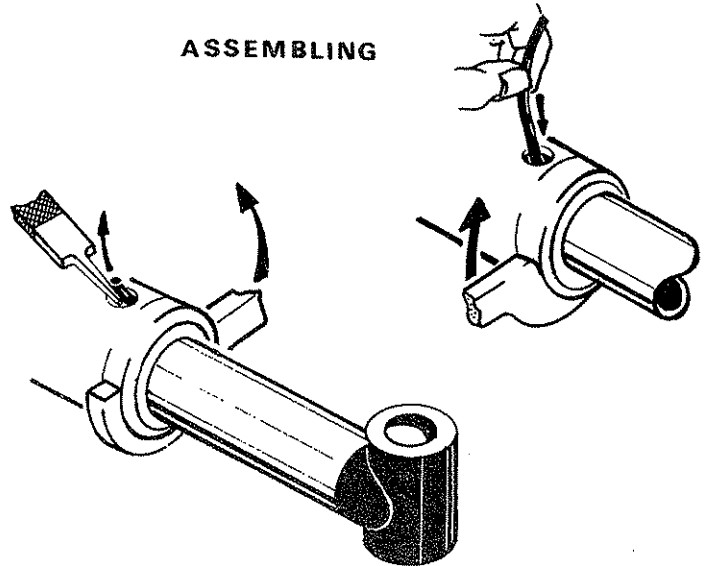
Alternative cushion relief valves for diggers after Nov. 1984



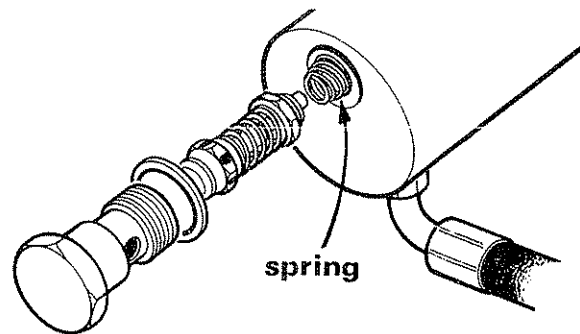
Failure of the valve to operate effectively will result in the slew column stopping violently at the end of its travel. In all probability dirt in the oil will either have caused the cushion valve to stick open or prevented the plate in the end of the ram rod from seating properly on the tube in the base of the ram thus allowing the oil to partially by-pass the cushion valve altogether. The valve should be dismantled, the needle removed and cleaned and the ram blown out with an airline. Examine the needle for damage and buff up with a fine emery cloth, if damage is irreparable the needle and spring carrier assembly must be replaced as one unit.

The cushion valves are shim calibrated to 3000 PSI (210 Bar) If the needle/carrier is replaced check pressure setting with the aid of a guage and adjust to this figure by adding or deducting shims in the valve cap.

ASSEMBLING



DISMANTLING



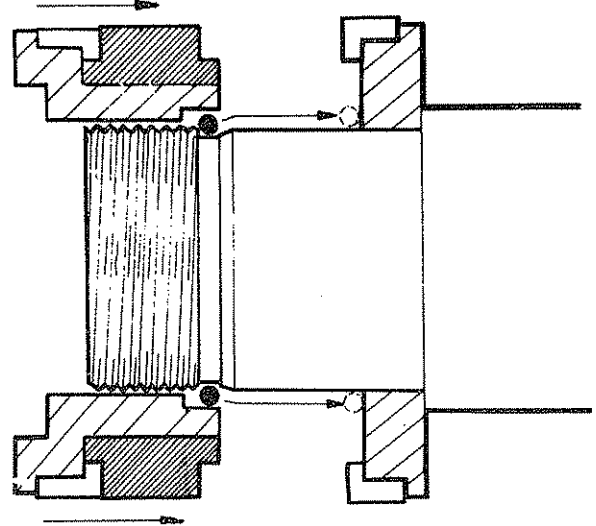
Note:

Failure or leakage of the cushion relief valve will not cause 'creep' of the slewing column.

e) Top link ram

This is a double acting ram. The ram is operated by check valves and an actuator assembly. This avoids top link loads being transmitted through to the hydraulic control unit. It will be necessary to remove the check valves, which will release the locked line pressure to enable the ram to be dismantled. In other respects servicing of the ram is similar to the other double acting rams.

Particular care should be taken when re-assembling the piston components to the rod. Place the piston back plate in position on the rod first, then lubricate the 'O' ring and work it carefully over the threads, leaving it in the undercut adjacent to the last thread. Lubricate the piston and slide it onto the rod. In so doing, the 'O' ring will be expanded as it leaves the undercut and is forced along the rod and will be correctly located when the piston nut is tightened.



f) Check valves

Servicing of the check valves in the top link ram is limited to cleaning only. The valve cap is a light press fit in the valve body and can be removed by driving a knife edge between the two. The steel ball seats against the underside of the valve cap and where leakage is suspected i.e. the ram rod moves when operating lever is in neutral the steel ball should be placed on its seat and struck a light blow to form a re-seat. If this fails to cure the problem the complete check valve should be replaced.

When the valves are removed, the actuator should be checked to ensure that it slides freely within its bore.

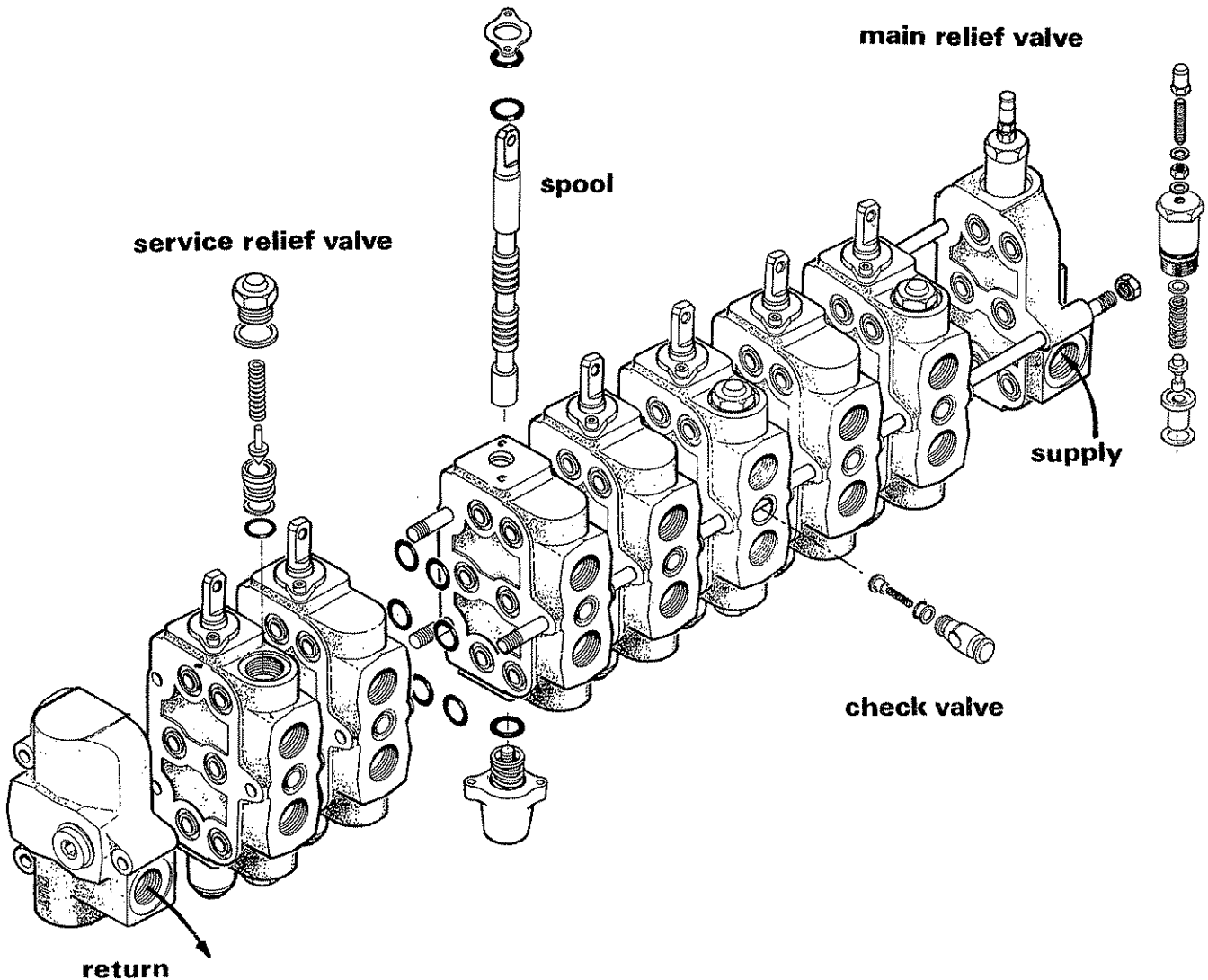
Note: Under locked pressure the check valve is very likely to come apart as it is being unscrewed from its housing. This is of no consequence; although the valve must be re-assembled before screwing it back into the ram housing.

## Control valve

The Valvoil control valve as fitted to the Power Arm 7 and 8 supercedes the earlier Kontak and Rohyd models. The valve is instantly recognisable in having the supply and return connections at opposite ends of the assembly. The valve operates on an open-centre principle, each of the seven banks are double acting and are controlled by rocking levers enabling two services to be operated simultaneously from one lever movement. The complete system is protected by a main relief valve and further protection to the individual services from locked line pressures is given by service relief valves.

Where it is desired to control speed of movement, built in restrictors are incorporated in the service ports. These restrictors are carefully calibrated and should not be interchanged or modified in any way.

Servicing and overhaul of the Valvoil valve is restricted to the renewal of 'O' rings and seals, or the replacement of a complete section. The spools are individually matched to their housings, have a close tolerance fit and cannot be interchanged or replaced.



Servicing of the valve is dealt with in six parts:-

a) Section renewal

To replace a valve section or the 'O' rings between them, it is necessary to remove the complete valve assembly from the machine. Mark each section to identify for correct re-assembly before releasing the tie rod nuts. Ensure all section faces are clean and 'O' rings correctly positioned in their grooves, held in place by a light smear of grease.

The plugs located between the service ports which are check valve housings should not be disturbed. One of the assembly tie-rods passes through them.

Replace the three nuts of the tie-rods finger tight and then place the valve assembly horizontally on a flat surface to align the sections before finally tightening the nuts evenly to a torque of 25 lbs/ft. Uneven or overtightening will cause distortion and the spools to stick when at operating temperature.

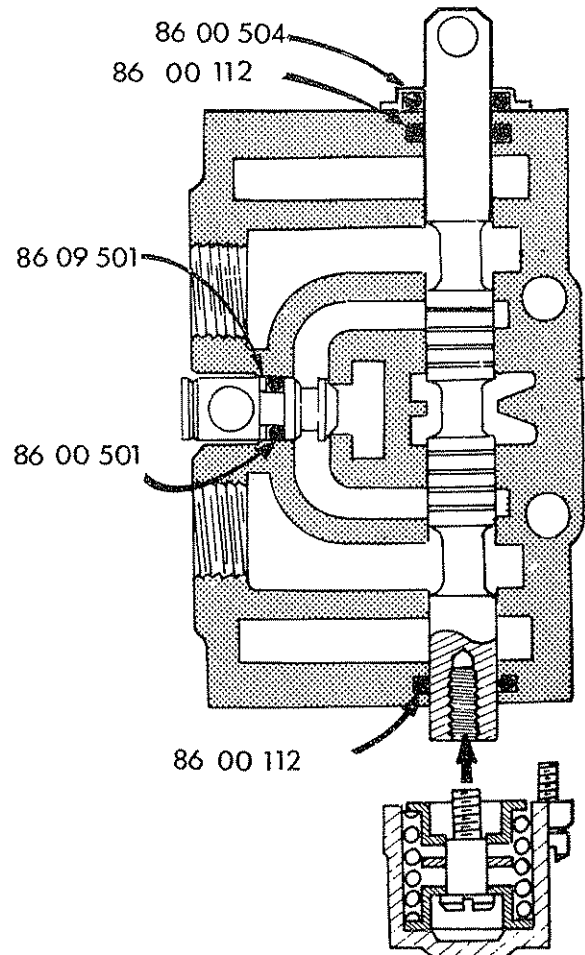
b) Servicing valve sections

Renewal of the spool 'O' rings can be conveniently carried out with the valve in position in the console. Grooves within the spool bore house the 'O' rings which are easily damaged unless the following method is adopted when renewing.

- i) Remove the two screws which hold the spring housing.
- ii) Undo the retaining screw that holds the spring to the spool.
- iii) Release the operating rod from the top of the spool and after removing the two screws, lift off the wiper seal with its housing.
- iv) Gently rotate and move the spool towards the lever end just sufficiently to expose the 'O' ring at the spring end. Remove the 'O' ring. Do not replace it at this stage.

Note: If the spool is moved too far it can chop fragments off the 'O' ring at the lever end which can then circulate inside the valve block and cause further trouble.

- v) Move the spool down through the spring end to expose the 'O' ring within the bore at the top. Remove and renew this 'O' ring.
- vi) Gently rotate and move the spool towards the lever end until the lower groove is again exposed. Fit a new 'O' ring and move the spool back into a central position.
- vii) Re-assemble the wiper seal/housing and refit operating rod.
- viii) Replace centring spring assembly, remove all traces of oil from the central retaining screw threads and smear with 'Loctite screw-lock' before replacing screws. Refit the spring housing.
- ix) Check spool action for full travel without binding.



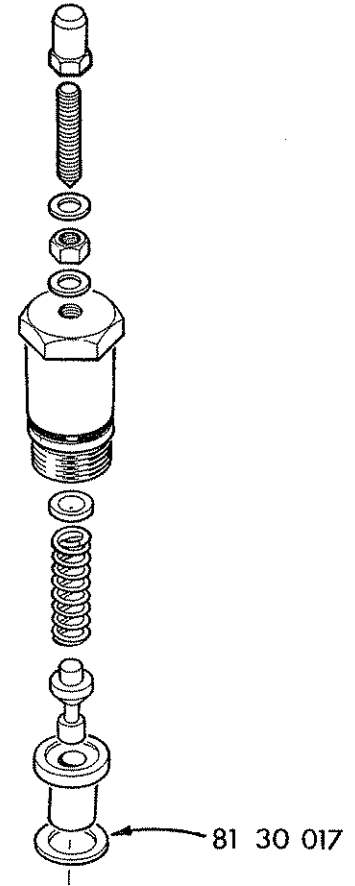
c) Servicing main relief valve

Pressure settings

PA7	2250 psi	153 bars
PA8	2500 psi	170 bars
A16	2750 psi	187 bars

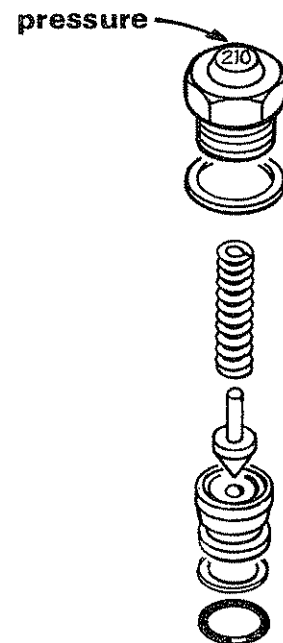
The main relief valve can be stripped and cleaned without disturbing its pressure setting. Leaving the small protective cap in position, undo the large hexagon valve housing. The relief valve spring, needle and seat may now be withdrawn. If difficulty is experienced in extracting the seat, remove the hexagon plug in the bottom of the section and drive out with a soft brass drift. Note that between the seat and locating shoulder there is a copper sealing washer.

If any components of the valve are being renewed it is most advisable to instal a reliable pressure gauge into the system. To re-calibrate the valve, remove protective cap and release the locknut. Using a 4 mm A/F allen key back off the adjustment screw before applying load; operate the bucket circuit to achieve this. When relief valve operates, screw in adjustment for the correct setting and tighten locknut. After replacement of protective cap, re-check the pressure setting. When making adjustment of the main relief valve it is advisable for the oil to be at operating temperature.



d) Service relief valves

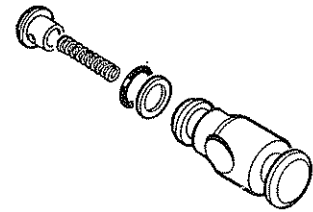
Sometimes referred to as locked line relief valves; service relief valves limit the pressure in individual services which can be caused by external load conditions. The valve is dismantled by removing the pressure cap, the poppet needle and spring can now be withdrawn. To remove the valve seat, it will be necessary to remove the port union adjacent to the valve. Around the base of the seat is an 'O' ring and back-up ring which retain the seat in position. Use a lever through the port to pry the seat from its housing. No adjustment is possible. The valve is calibrated by the measured depth of the bore within the pressure cap. The pressure reading is stamped on the top of the cap. Under no circumstances should any attempt be made to shim up the pressure spring. Very serious damage to the machine could result as well as possible risk of personal injury.



#### e) Check Valves

A spring loaded check valve is located in each spool section between the service ports. This valve prevents interaction of services and momentary load drop on selection.

Malfunctioning is most unlikely, but contaminant can prevent free movement or re-seating. To remove the check valve it will be necessary to dismantle the tie rod that passes through the valve body which can now be withdrawn, revealing the spring and poppet. Wash free of contaminant and check for free movement of the poppet within its housing. Examine the poppet face for damage and renew if necessary. Re-assemble in the reverse order using a new 'O' ring part no. 86 00 501 and back up ring part no. 86 09 501 coated with a light smear of grease on the valve body. Finally tighten the nuts on the tie rod to a 25 lbs/ft torque. Do not overtighten, which could cause binding of the main spools of the valve assembly.

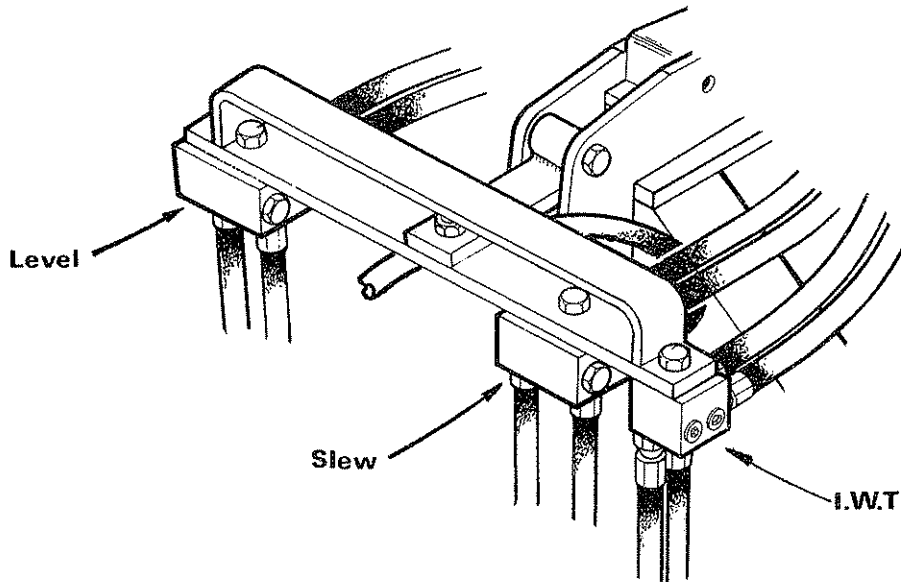


## 9. Auxiliary Hydraulic Block Assemblies

Situated adjacent to the main frame beneath the reservoir are three hydraulic valve assemblies which control functions of the IWT, slewing and levelling rams.

Servicing of these hydraulic assemblies should only be carried out if a malfunction occurs in their operation.

Note: If hoses to any of these auxiliary valve blocks are disconnected and another service is operated, oil will flow at pressure from these hoses.

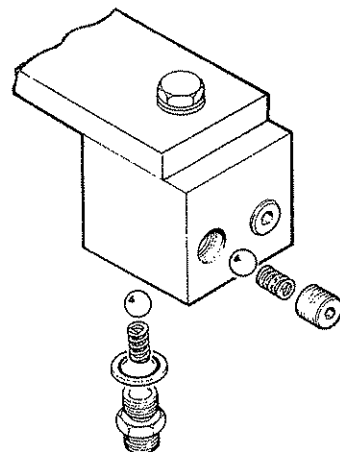


### a) IWT selector valve block

The function of this block is to maintain the IWT rams under a constant pressure while other service levers are in neutral, and also to allow further pressurizing to counteract settlement of the feet on each occasion that any service lever is operated.

Selection of the release position on the IWT control allows the oil to be discharged from the rams as the tractor linkage is being raised.

The block consists of four one-way valves which are simple steel ball and spring assemblies. They can be dismantled after removal of the ram hose unions and by releasing the socket screw plugs. Ensure no dirt is lodged around the ball seats. The balls and springs are not matched assemblies. When rebuilding, use P.F.T.E. tape around the plugs and ensure bonded seals are in position behind the unions.



### CAUTION:

It is most important that the hoses from the control valve to the block are correctly connected. Ports stamped A & B on the block should be connected to their respective positions identified with 'A' and 'B' stampings on the valve.

(b) Levelling valve block

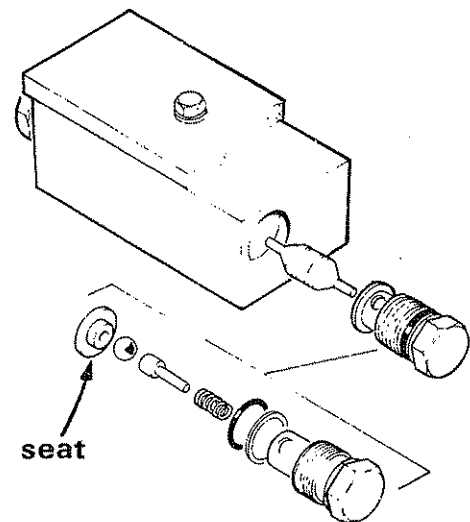
The function of the levelling valve block is to prevent any creep of the levelling rams when they are under load. The block contains two horizontally opposed check valves which lock the hydraulic oil within the rams. An actuator piston shuttles between the two check valves. On selection of a service to extend one of the 'levelling' rams, the actuator moves across to open the opposite check valve and release oil from the closing ram.

A leaking check valve will allow a ram to collapse thus making it difficult to maintain the slewing column in a vertical position. To verify a leaking check valve, fully extend a loaded bucket well clear of the ground to the suspect side and release the controls. Observe if there is further movement of the ram.

Note: Any ram leakage would be external and therefore obvious.

Before attempting to remove either check valve, the slewing pillar should be centralized and the packing stay 71 15 247 secured in position across the ram holding pins to prevent the machine collapsing. Alternatively the pillar can be canted right over to one side before removal.

After removal the check valve may be dismantled by driving a knife blade between the seat and cap to separate them. The ball seat should be examined for damage. Giving the ball a light blow against its seat may cure any leakage. The face of the seat should also be free of burrs and form a seat against the stepped bore within the block. If leakage still occurs after re-assembly and test then the ball and seat should be replaced.



Before re-installing the check valve the actuator piston should be checked to ensure that it is free to shuttle to and fro within the block. Its total movement is about 6 mm.

When installing the check valve in the block ensure that the 'O' ring is in good condition and that the anti-extrusion ring is in place behind the 'O' ring.

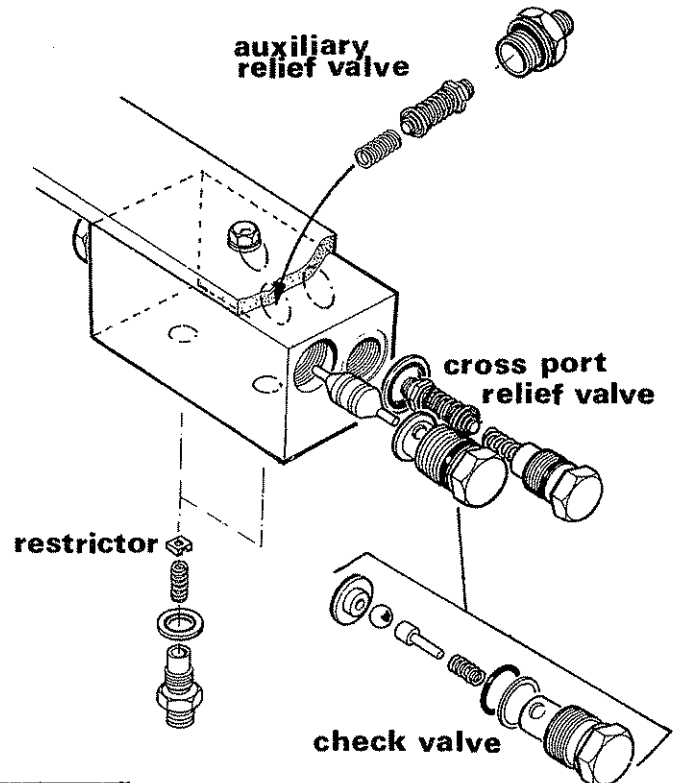
Note: When trouble-shooting a malfunction of the levelling system do not overlook the possibility of blockage in the restrictor union screwed into the ram itself.



c) Slew block - PA7 and PA8

The slew block contains two horizontally opposed check valves which lock the oil within the rams. An actuator piston shuttles between the two check valves. On selection of service to extend one slew ram, the actuator moves across the gallery to open the opposite check valve so allowing oil to be discharged from the closing ram.

Within the block is a second gallery that carries two opposed relief valves pre-set to 3000 psi (204 bars). Their purpose is to absorb shock loads. Releasing the slewing lever while traversing with a laden bucket or grab abruptly closes the check valves. The continued momentum however, will raise the pressure in the now 'locked line' to the point where it could burst the hose or rupture seals unless a means of relieving that pressure is found. At 3000 psi, the relief valve opens and oil is passed through the gallery, bodily lifting the opposing relief valve off its seat against the action of a light spring. The oil is then discharged into the ram that is extending. In this way both rams are always kept fully charged with oil to prevent sloppiness of the slew column.



**WARNING**

All service work on the slew block should be carried out with the bucket resting on the ground.

A leaking check valve will allow a ram to leak back so making it difficult to hold the slewing column in a fixed position. To verify a leaking check valve, tilt the king post to one side or position the machine on sloping ground and fully extend the bucket just clear of the ground. Release controls and observe if the arm is creeping round under gravity. Ram seal leakage would be external and therefore obvious. Lower the bucket to ground before removing and servicing the check valve as described in previous chapter. If, by swapping the check valves round in the block the trouble is transposed to the opposite side, the problem is bound to be in the check valve.

In addition to a faulty check valve causing 'creep' of the slewing column the problem could also be caused by a leaking relief valve or its seat within the block. Swap the relief valves round and if the creep is still in the same direction the fault is the valve seat - Minor imperfections on the valve seat can sometimes be remedied by placing a 1/2" ball bearing on the seat and striking it. The valve block should be removed from the machine to do this.

If it is found that the fault is within the relief valve itself, then it should be replaced. No attempt should be made to dismantle it. When re-assembling the valve into the block ensure that the light coil spring is correctly positioned between the valve and cap.

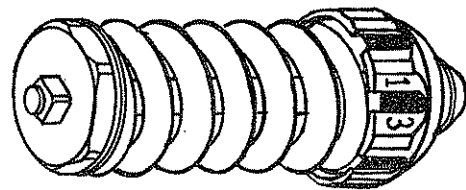
### Auxiliary relief valve

Mounted in one side of the slewing block is a locked line relief valve. It is located behind a hexagon union and its purpose is to relieve pressure build-up which it is possible to create by a swinging grab or by the weight of the arm suspended on sideland ground. This relief valve operates at 1800 psi (125 bars) and dumps oil directly to the base of the return line filter.

Caution: It should be noted that this locked line relief valve looks identical to the two opposed relief valves but operates at considerably lower pressure. On no account should it be interchanged. It should also be observed that this relief valve is assembled into the block with the spring in first. The internal bore of the hexagon union forms the valve seat.

Pressure settings of all locked-line relief valves are pre-set and non-adjustable. Their settings are etched in code on the shoulder of the seat.

Code	Pressure
08	1800 psi 125 bars
13	3000 psi 210 bars
16	4000 psi 280 bars



### One-way Restrictors

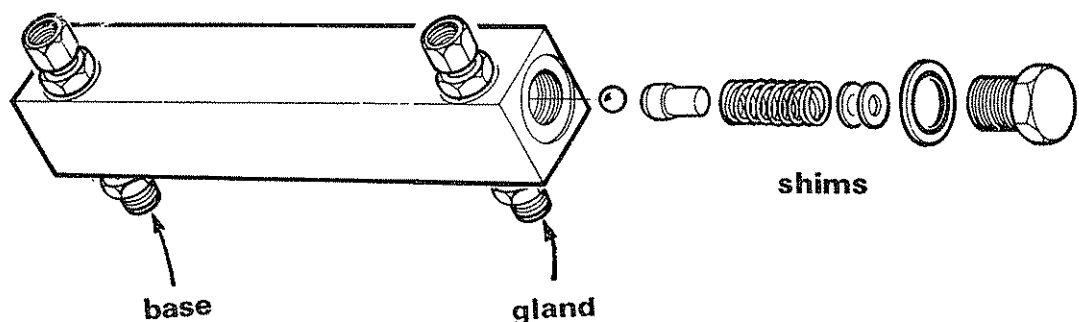
Slewing speed is governed by the rate that oil is discharged from the closing ram. Spring loaded restrictors are positioned behind the ram hose union in the valve block. The restrictors are calibrated to slew the column through 180° in approximately 5 seconds. (with oil at operating temperature). Dirt or debris lodged in the restrictor can cause the slew column to work erratically.

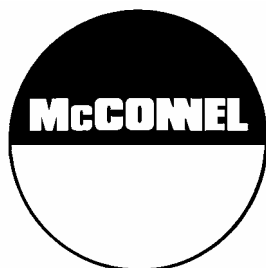
Apart from dismantling to clean them, no other adjustment or modification to the restrictors should be attempted.

### (d) Crossport relief valve

This assembly is required for the loader armhead only and is positioned on the loader arm adjacent to the tension link. Its function is to protect the grab by limiting the pressure developed in the grab ram to 140 Kg/cm<sup>2</sup> (2000 psi). If the unit is removed it should always be replaced with the cap nut on the left hand side of the machine (as viewed from the rear).

The relief valve is pre-set by shims and no attempt should be made to alter the adjustment. Servicing is limited to stripping and cleaning only. The ball may be re-seated by striking it a firm blow against its internal seat with the aid of a pin punch.





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