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71·93·852

PA93 & PA94

Operation manual

FOR NOTES

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.

DEFINATION

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.

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		
DEALERS NAME		
DEALERS TELEPHONE NUMBER		

INTRODUCTION

ALL MODELS

- Linkage mounted
- Right or left hand cutting
- Hedge or grass
- Spring assisted gravity breakaway
- Operator guard
- 25 gallon (117 litre) hydraulic reservoir

PA 93 Si

- Semi independent hydraulics - tractor power for arm movement. PTO pump for rotor
- Cable controls
- Rotor engagement by tractor's PTO lever

PA93 Ti

- Totally independent hydraulics powered by tandem PTO pump
- Cable controls
- Independent Rotor on/off valve

PA94

- Totally independent hydraulics powered by tandem PTO pump
- Electric controls solenoid operated
- Independent Rotor on/off valve

SAFETY PRECAUTIONS

WARNING

NEVER ... permit inexperienced personnel to operate the machine without supervision.

... stand under the raised flail head

... cut over the far side of a hedge with the flail cutting towards the operator.

... continue to operate the flail when wire has wrapped around the rotor.

... leave the tractor seat with the flail still rotating.

... operate the flail without the correct hood properly fitted in position.

... exceed 540 rpm on the p.t.o. shaft

... stop the engine with the p.t.o. engaged

... operate the machine without a cab safety guard

... operate the machine without the p.t.o. shaft guard in position.

ALWAYS ... inspect the work area or hedgerow for wire, steel posts, large stones, bottle and other dangerous materials and remove them before starting work.

... ensure bystanders are kept away from the machine during all flailing operations.

... check frequently, nuts and bolts for tightness and also check roll pins, shackles and flails for security.

... replace missing or damaged flails as soon as possible to avoid vibration and damage to the machine.

... disengage the p.t.o. and stop the tractor engine before making any adjustments.

... Take extra care when working close to or manoevring around overhead obstructions especially power lines

CAUTION One of the features of the Power Arm is the ability to cut close to the tractor in confined spaces. This means that in some instances the flail head casing can be made to foul the tractor if reasonable care is not observed.

FITTING

TRACTOR SELECTION

Linkage requirements

The Power Arm 93 and 94 will fit almost any tractor with a category II linkage

Linkage isolation

A linkage isolation facility is necessary for PA93 Si only.

Check chains/stabilisers

Check chains or stabiliser bars must be fitted and tightened.

Tractor relief valve

For PA93 Si tractor relief valve must be set above 2000 psi (140 bar)

Tractor hydraulic flow rate

Hydraulic flow rates are not crucial for PA93 Si

P.T.O. shaft

Tractor must be equipped with live drive independent PTO shaft to enable forward movement to be halted while the flail head continues to operate.

TRACTOR PREPARATION

Ballast weight

The tractor must be stable whilst operating the hedge cutters under all conditions. Due regard must be paid to operating on slopes and front end ballast as well as rear wheel weights to counterbalance the overhang of the flail head should be added as appropriate.

In addition rear wheel track should be set as wide as possible to increase stability. It will also increase the protection to the reservoir.

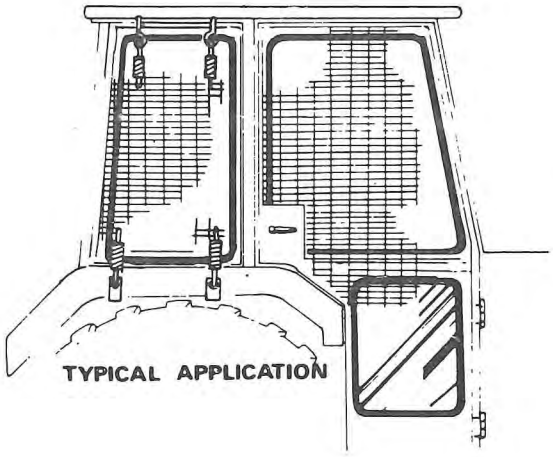
Fitting operator guard

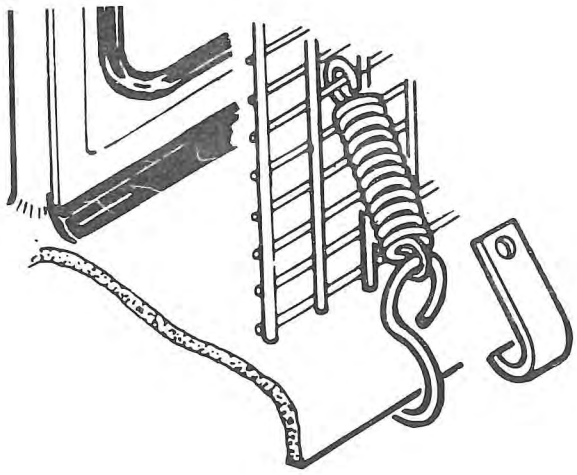
A tractor fitted with a cab that has safety glass windows should be used whenever possible.

An operator guard kit part number 73 13 324 is supplied and must be fitted to the tractor. It consists of two areas of wire mesh which can be shaped to suit and secured against the cab window with spring loaded hooks.

Owing to the great range of cabs it may be necessary to adapt or make brackets to secure the mesh.

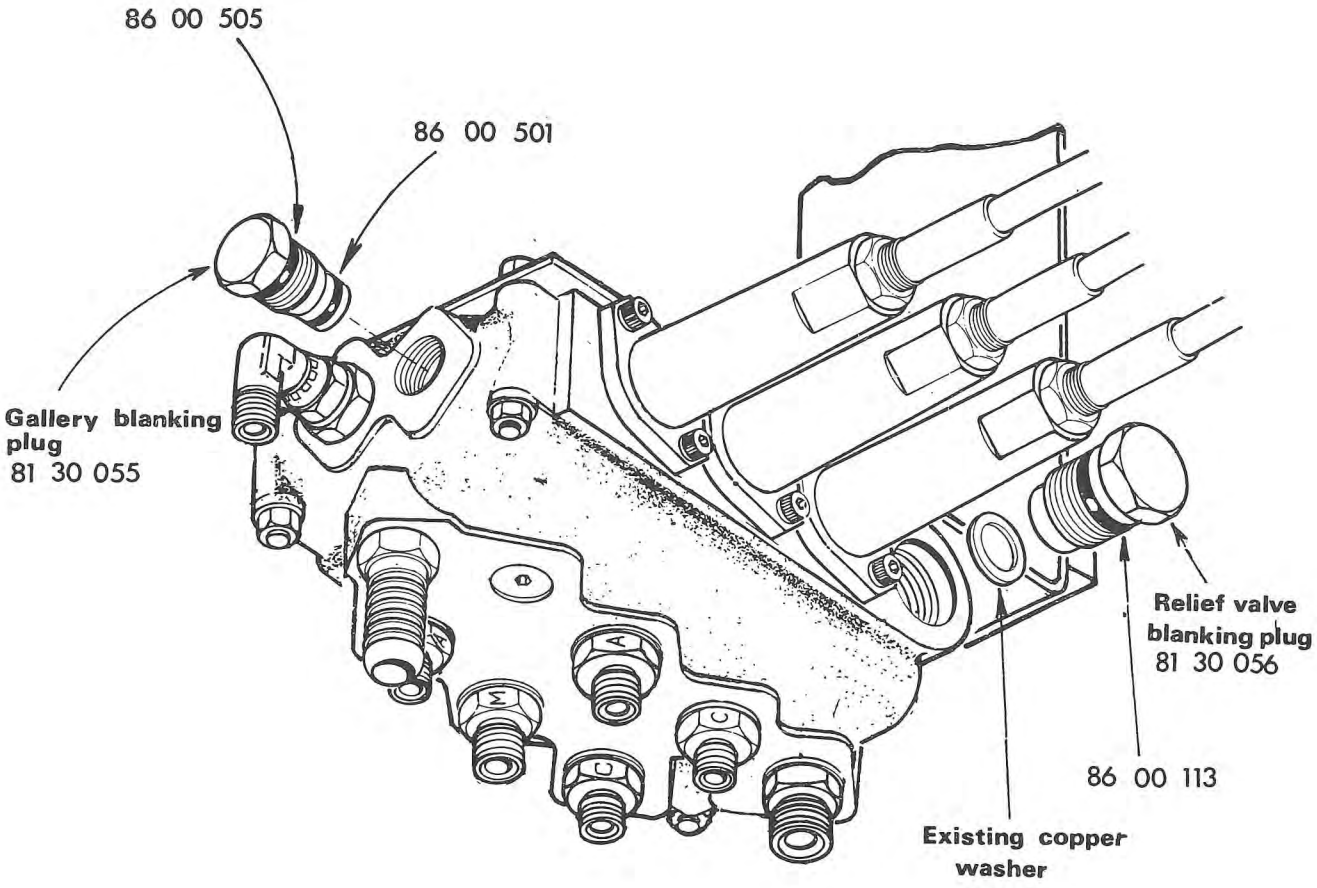
On tractors with a safety frame or roll bar only an additional frame must be fixed to the tractor on to which the guard mesh can be secured. In addition to the guard mesh, a sheet of Polycarbonate transparent glazing must be fitted to the frame to provide further operator protection. This material must also be used when the cab does not have safety glass installed.





Polycarbonate transparent sheeting is an impact resistant material which can be readily sawn and shaped to requirements. It is susceptible to scratching, therefore it is advisable to place the material on the inside of the window.

In case of difficulty in obtaining this material locally, contact F.W. McConnel Ltd through your normal dealer.



JOHN DEERE CONVERSION KIT 81 30 059

John Deere

The John Deere utilises a 'closed centre' hydraulic principle and because of this it is necessary to modify either the tractors external oil supply or the flails main control valve

These are the following two alternatives.

1. A flow limiting valve manufactured by John Deere is available to provide an 'open centre' external supply. For further advice consult your John Deere dealer.

2. A control valve conversion kit Part No. 81 30 059 consists of a relief valve blanking plug which should be installed in place of the existing relief valve and a pressure gallery blanking plug which is installed in place of the standard blanking plug at the valve outlet end next to the lift ram gland connection.

Take care when extracting the relief valve not to damage the copper sealing washer as it is re-used.

When working in this mode the tractor's pressure control valve must not exceed 2500 P.S.I (170 Bar).

DELIVERY

The machine is delivered in a partially dismantled condition. To make ready for attachment to the tractor it will be necessary to:-

Select a hard level surface

*Cut the banding straps and fit the hydraulic tank over the leg housing. Secure in position with the leg pin and stabiliser tank strap.

*Connect suction and return hoses. If two hose clips are used at each end, ensure that their worm drive barrels are opposed at 180 degrees.

*Mount the control valve in position hanging down from the pair of mounting bosses nearest the rear of the tank top edge.

*Fill the reservoir to capacity with oil selected from the chart on page

*Remove the lifting plate and re position the reach ram rod pin with the pin tail in its locating hole.

*Remove and discard the transport strap connecting the flail head to the frame.

ATTACHMENT TO TRACTOR

*For PA 94 only the base end pin of the angling ram and the rod end pins of the lift and reach rams must be removed.

*On PA93 Si only reverse the tractor up as closely as possible. Fit suitable return connection to the tractor and connect the return hose before connecting the supply hose to the tractors external services point with a suitable self seal coupling.

*With the aid of a crowbar prise the flail head sideways to allow the tractor to be reversed up.

For PA93 models only assistance will be needed to simultaneously select "Reach out" and "angle down" to allow the oil to flow whilst the arms are being moved.

WARNING

As a safety precaution to prevent the possibility of the flail head slipping sideways and the arm collapsing on the fitter as he is prying the head sideways, a loop of strong rope or wire, with sufficient slack to allow the required flail head movement should connect the frame and dipper. This will then act as an arrestor in the event of this happening. Leave in position until attachment is complete.

Adjust tractor drop arms to enable the draft links to lower within 15 ins (375mm) of the ground.

Remove the top link and machine yoke completely.

Reverse the tractor squarely to the front of the machine, engage draft link pins and secure.

Attach yoke to the top hitch position on the tractor ensuring the lug for the top link is uppermost.

Unlimber the machine controls and fit into the tractor cab. See page 10

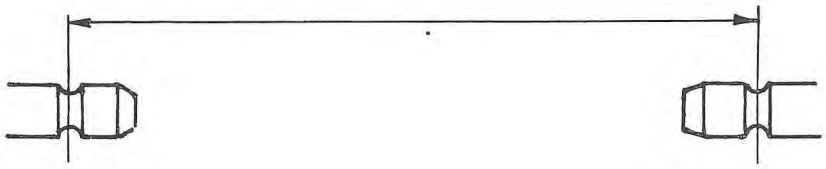
Install the top link between yoke and upper hitch position on the machine. If necessary fitting Cat. 1 sleeves into the ball ends of the top link.

*Raise the machine on its three point linkage until the PTO shaft and the gearbox stub shaft are as near as possible in a straight line.

WARNING

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

*Measure the PTO drive shaft length as shown in the diagram below and subtract 1 inch (25mm).



*This measurement which is the fully closed final length of the PTO drive shaft measured button to button should be taken carefully before the PTO drive shaft and guards is shortened to suit by cutting off both the driving and driven members of the tube by an equal amount.

Accurate measurement is important on some close coupled tractors to ensure maximum engagement during operation.

Lower the machine to the ground and fit the P.T.O. shaft in position. Ensure that the collar locking devices on the P.T.O. shaft are fully engaged and wrap the torque chain around any convenient point to prevent the shaft guard from rotating.

Raise the machine to the working height.

Check that the rotor control valve is in the stop position (PA93 Ti and PA94 only). Unscrew the white tap on the lift ram.

*For PA94 only engage the P.T.O. (see page 13) and select "Lift down" until the lift ram rod together with its pin can be re-assembled in position. Similarly selecting "Reach out" and "Angle down" will enable the respective ram rods and pins to be repositioned.

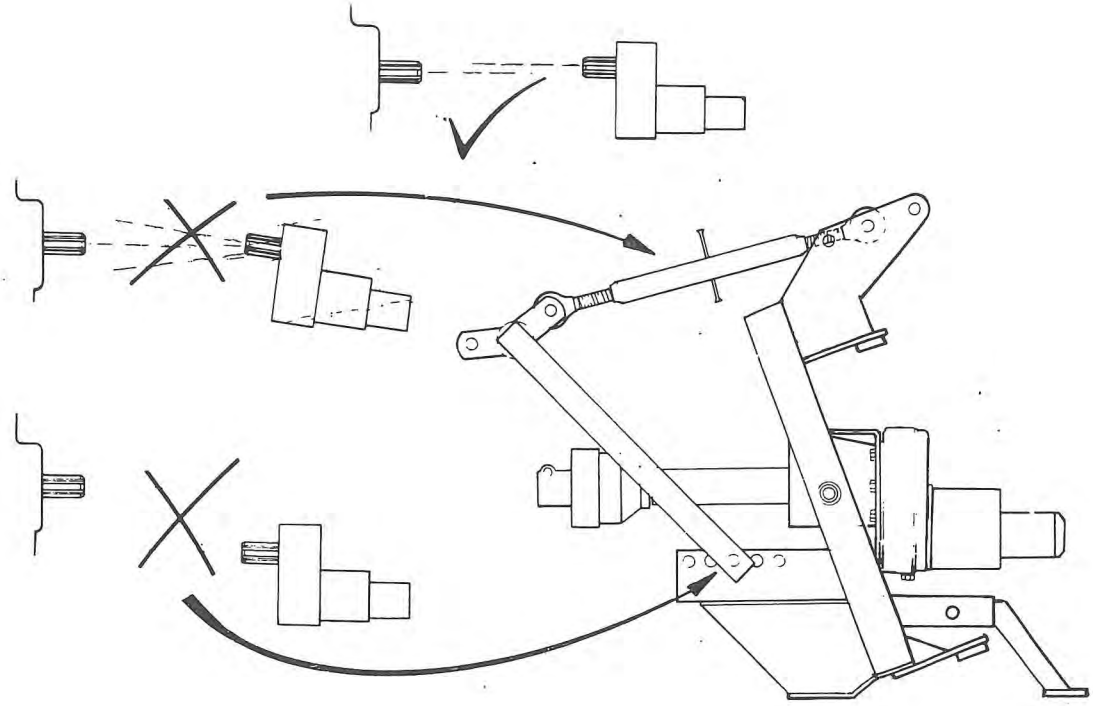
With the P.T.O. engaged on PA94 and PA93 Ti or with tractor external services activated PA93 Si (see page 13) select "Lift down" this will level the frame and enable the lower yoke pins to be fitted. Select the hole which will, as near as possible position the P.T.O. shaft horizontally in line.

Lower the quadrant lever so that the machines weight is taken by the yoke.

Adjust the top link to bring the pillar upright.

*Remove the rope arrestor loop.

Carry out final adjustment of the tractor lift arm levelling box to bring the main frame horizontal. This should be checked with the arms at approximately half reach with the flail head clear of the ground.



Tighten up the check chains or adjustable stabilisers to hold the machine rigid with out side-sway.

Remove the parking feet, turn inward 90 degrees and re-locate in their housings.

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

*Assemble the cover plate and the hedge hood in position

Fold the machine into the transport position (see page 16)

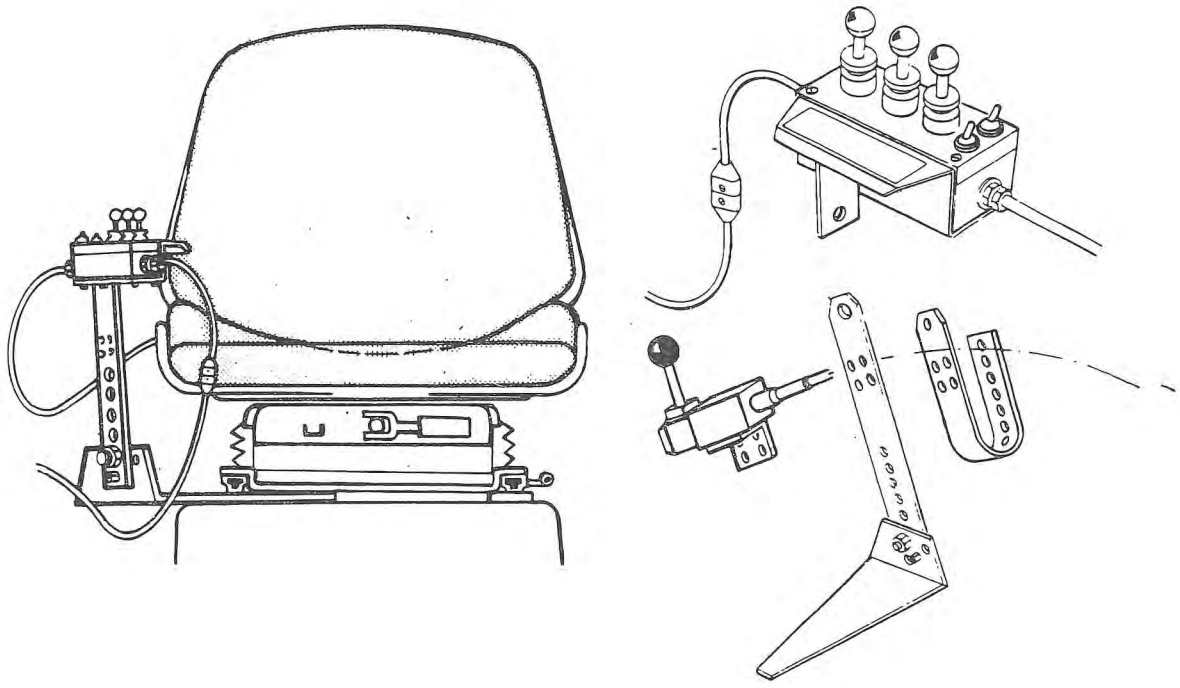
The machine is now ready to proceed to the work site

This procedure is for initial attachment only, for subsequent attachment paras marked * do not apply.

FITTING CONTROL UNIT IN CAB

The control unit is mounted on an adjustable stalk that is attached to universal seat bracket for mounting in many models of tractor. The bracket is normally trapped between the seat runners and their mounting base. It may sometimes be necessary to drill extra holes in the seat brackets to find the ideal operator position.

On tractors other than the quiet cab models it is permissable to attach the control unit to the mudwing or the cladding of the cab ensuring that no structural member of the safety frame should be drilled. For this purpose the mounting stalk can be bent round in a 'U' shape.

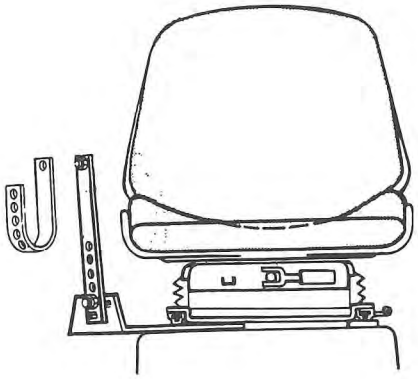


PA94

The supply cable with the disconnected plug should be connected to the tractors electrical system preferably at the fuse box or the ignition switch where it can be switched off with the tractors isolation key.

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

The control lever for the cable operated Flail rotor on/off valve is then bolted into position on the mounting stalk.



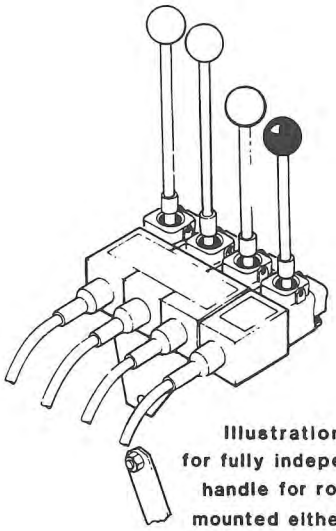


Illustration shows control unit arrangement for fully independent model with extra control handle for rotor ON - OFF.This handle can be mounted either end of the main control block to suit individual operator requirements

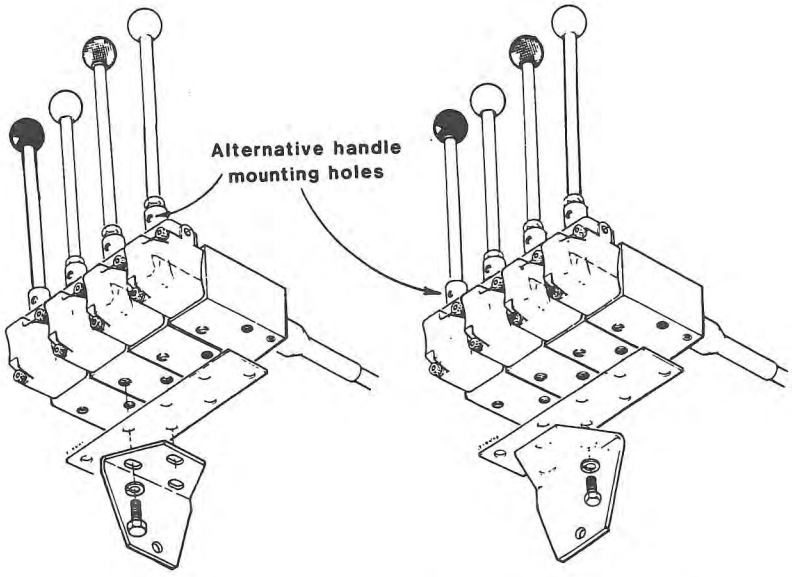


Illustration shows fully independent control unit arrangement

PA93

The control unit is bolted to an angled mounting bracket in either a transverse or longitudinal position thus giving a variety of mounting positions, which in conjunction with the flexibility of the mounting pillar will enable a satisfactory working position to be achieved.

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

The handles may be screwed into alternative holes in the levers to give an 'in line' installation should it be desirable.

OIL REQUIREMENTS

Tank

Fill the reservoir with approximately 2" below the top of the tank. The capacity is approximately 117 litres (25 galls)

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
Texaco	Rando HD 32	Rando D 68
Gulf	Hydrasil 32	Hydrasil 68
B.P.	Energal HLP 32	Energal HLP 68
Dalton	Silkolene Dove 32 or Derwent 32	Silkolene Dove 68 or Derwent 68
Elf	Hydrelf 32	Hydrelf 68

Gearbox

Check the gearbox oil level. On level ground gearbox should be filled until oil dribbles out of the level plug. Top up if required with SAE 30/50 Universal tractor oil.

RUNNING UP PROCEDURE

PA93 Ti and PA94

Ensure that the rotor control valve is in **"STOP"** position, start tractor, engage P.T.O. 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 P.T.O. 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, chafing straining or kinks. Re-check the oil level in the tank and top up as necessary.

PA93Si

Ensure P.T.O. lever is in neutral position, and isolate tractor hydraulic linkage. Start tractor and select external service supply. Allow the tractor to run for several minutes **before** attempting to operate any of the machine control levers.

On operating move the levers through their complete range ensuring that all movements are functioning correctly.

Check the tractor rear axle oil level and top up if necessary.

Place the flail head at a safe attitude and bring tractor engine revolutions to 1000 rpm. Engage P.T.O. and allow the rotor to run for several minutes. Do not leave the tractor cab or allow anyone to approach the flail head at this time.

Caution

Do not allow the pump to continue working if the rotor does not turn-Overheating and serious damage to the pump can be caused in a very short time.

After running up the machine increase P.T.O. speed to approximately 360 rpm. and run for a further five minutes to allow the oil to circulate through the return line filter before disengaging the P.T.O. and stopping tractor.

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

REMOVAL FROM TRACTOR

Select a firm level site for parking the machine.

Remove the parking feet, turn through 90 degrees and re-locate in their housings.

Unscrew the lift ram tap and with the machine at approximately half reach in normal working position, i.e. not broken back, operate the hydraulic services until the flail head roller is horizontal and level with the feet on the main frame.

Disengage tractor P.T.O. and remove

Disconnect stabilizer bars or loosen check chains as applicable.

Unbolt the control unit from the mounting pillar, remove from tractor cab and on PA93 Si stow the control unit clear of the ground. On PA94 the cables are wound round the switch box which is then stowed under the valve cover, on PA93 Si only disconnect the supply and return hoses and stow with hose ends clear of the ground.

Raise the machine on the tractors linkage to take the weight off the yoke and remove the lower yoke pins.

Lower the tractor draft links and place machine firmly on the ground.

Remove draft links and the top link from the machine, drive tractor forward and remove yoke. Blank off the end of the return hose with plug or small plastic bag if a self seal coupling is not fitted.

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.

OPERATION

LIMITATION

The Power Arms 93 and 94 have been designed as a light to medium weight hedge trimmer; is ideal for work on hedges that have been regularly maintained and is capable of making a reasonable job in up to two years growth.

HIGHWAY WORKING

If it is intended tocut in public areas it is a statutory requirement that warning signs are placed at both ends of the work area. These signs should not be more than 1/2 mile apart (.8 Km). To further promote highway safety, the use of headlamps and a flashing beacon on the cab roof would be beneficial. Hazard warning lamps should not be used since an oncoming vehicle could easily misjudge braking distance in presuming the tractor approaching them is stationary.

WARNING

Always keep any bystanders at a safe distance and ensure that they do not stand in the potential line of any debris that may be thrown.

OPERATOR GUARD

Owners are reminded that it is illegal to use a flail without an efficient operator guard.

PREPARATION

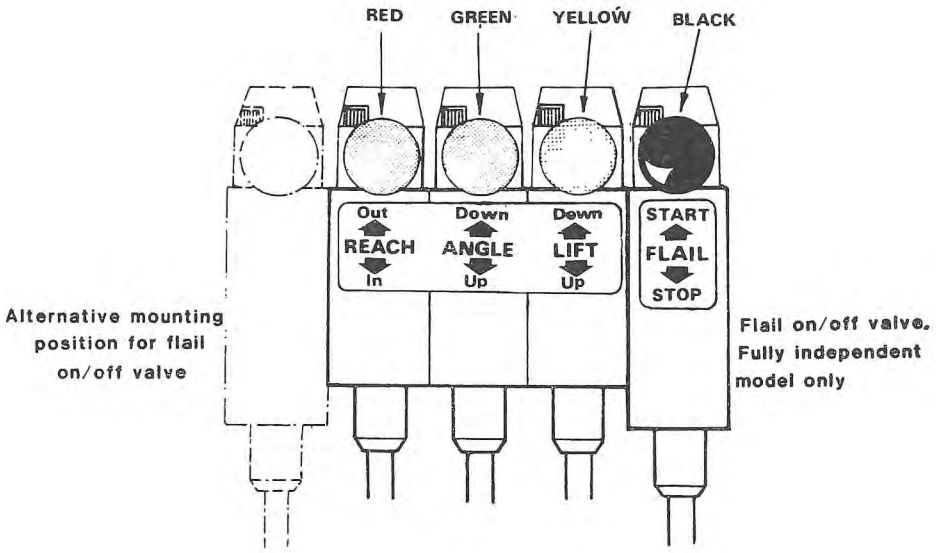
Before commencing work, the operator should read the instruction manual thoroughly, paying particular attention to **SAFETY PRECAUTIONS**. It is the operator's responsibility to ensure that a safe code of practise is followed.

If the operator is unfamiliar with the machine he should before commencing work, choose a clear unobstructed site and operate the arms throughout their range of movement until the response to the controls and the 'feel' of the machine is familiar. Test yourself by making a dummy run alongside the hedge with the rotor stationary. This is a wise precaution for all operators and a must for the inexperienced.

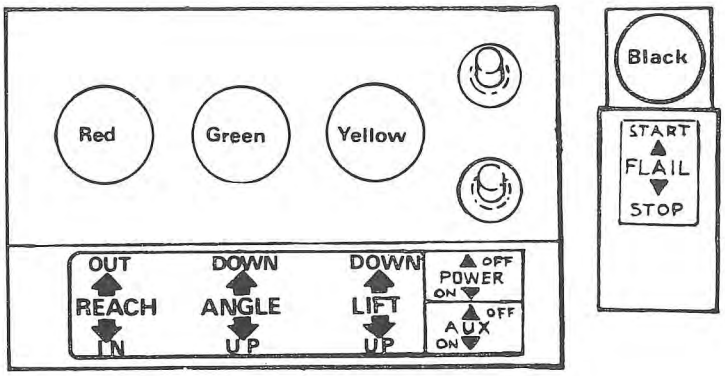
Caution

The ability for the flail head to work closely alongside the tractor wheel and to fold within the overall tractor width for transport presents the hazard of contact with, and damage to the tractors mudwing.

Care should be taken when operating under these conditions.



PA 93



PA 94

TRANSPORT POSITION

When transporting on the highway the arms should be latched securely in the broken back position and the white tap on the lift ram screwed fully in.

To achieve this position angle the flail head and place one corner of it on the ground. Raise the latch; drive forward and simultaneously select "lift down". Release the latch and check that it is fully engaged. Raise and fold the machine into the transport position taking care not to hit the tractor cab or mudwing. Screw the lift ram in fully to prevent any droop.

MOVING FROM THE TRANSPORT TO THE WORK POSITION

Unscrew the lift ram tap fully. Lower the flail head flat to the ground and release the transport latch, if it does not release take the weight off the latch by easing the tractor forward slightly. The working position can be achieved by either reversing the tractor or by operating the lift ram to raise the head which allows the breakaway mechanism to position the flail head for work.

TRACTOR CONTROLS

For PA93 Si models only the tractors linkage will need to be isolated.

ENGAGING DRIVE

a) Fully independent model.

Ensure that the rotor control lever is in the 'Stop' position before engaging the P.T.O. 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.

b) Tractor supply model

Place the flail head at a safe attitude and bring the tractor engine revolutions to 1000 r.p.m. Engage the P.T.O. and slowly increase revs. until operating speeds are attained.

FORWARD SPEED

Tractor ground speed is determined by common sense and experience. It should be slow enough to allow time for the flails to cut the work without overloading. It is obviously better to make a second pass or more in heavier growth to avoid undue strain

TRACTOR POSITION

The position of the tractor in relation to the hedgerow will again be determined by experience. For a normal straight forward hedgerow the position should be such as to allow the reach ram to be in mid-stroke.

OPERATING SPEED

The flail head should be run at a speed no higher than is needed to make a clean cut with not fall off in rotor speed. This also reduces the tendency of the operator to 'ride the clutch pedal'.

The recommended rotor speed is 2430 rpm.

To achieve these speeds it will be necessary to run the tractor engine to give a P.T.O. speed of 450 r.p.m.

WARNING

Never exceed 540 rpm on the P.T.O. shaft

WORKING PRACTISES

It is the operators responsibility to develop safe working procedures. From the first, develop good habits not bad ones, always:-Make sure **all** guards are in position and in good condition.
Disengage the P.T.O. before stopping the engine.
Wait until the flail has stopped rotating before leaving the tractor seat.
Disengage the P.T.O. **and** stop the tractor engine before making any adjustments.
Check frequently that all nuts and bolts are tight.
Use the breakaway latch and lift ram tap when transporting on the highway.

BREAKAWAY

An automatically resetting, spring assisted, gravity breakaway system protects the machine when an obstruction is encountered.

The spring pre-load is factory set and non adjustable.

Breakaway reset forces are absorbed by a pre-tensioned hollow rubber spring unit.

The breakaway geometry is such that there is a possibility of an unstable condition occurring when in the broken back position at full height. When operating in conditions where there is any likelihood of this happening e.g. when cutting high hedges on sloping ground the latch must **always** be in the lowered position, where it acts as an abutment stop.

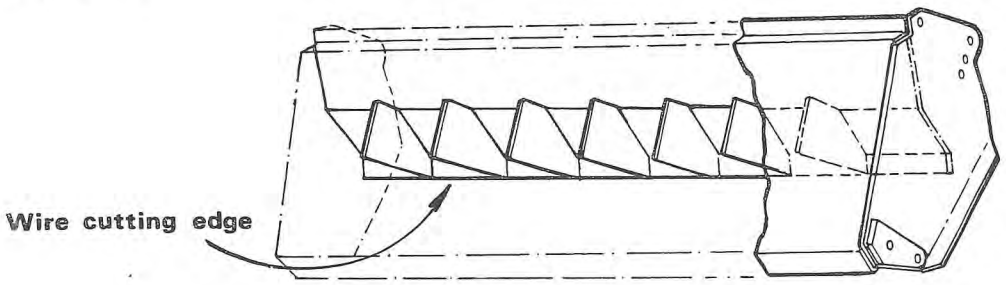
OVERHEAD OBSTRUCTIONS

Remember the machines are far higher than the tractor and therefore care must be taken when manoeuvring in and out of buildings or in the vicinity of overhead obstructions.

WARNING

To avoid the possibility of flashover in the vicinity of high voltage overhead power lines never work closer than 1.5 metres minimum. If in any doubt consult the local electricity board way leave officer for advice on a safe plan plan of working.

WIRE TRAP



Both flail hoods are equipped with a wire trap. The trap consists of a steel plate welded across the underside. This plate should not be interfered with or modified in any way.

Furthermore this wire trap does not relieve the operator of the responsibility of checking and cleaning the flail when it is suspected that wire has caught in the rotor.

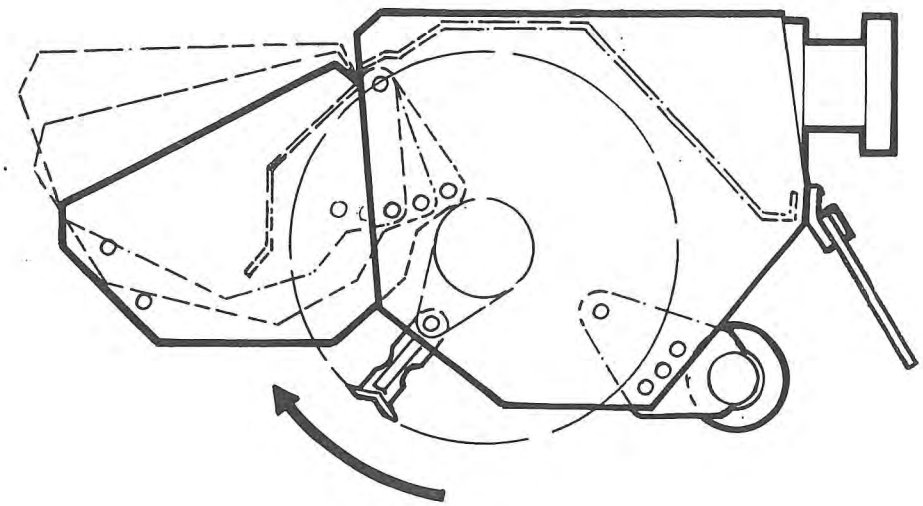
WARNING

If any wire is picked up by the rotor the machine should be stopped immediately and the rotor cleared before proceeding.

HEDGE CUTTING PROCEDURE

PRELIMINARY PRECAUTIONS.

The work area or hedgerow should be carefully inspected and dangerous materials removed. The position of any immovable objects should be particularly noted or identified to avoid running into them with the flail. Should the rotor accidently strike anything of a hazardous nature, the machine should be immediately stopped and the rotor examined for damaged or missing flails which should be replaced to retain rotor balance. Continuing to work the flail head with the rotor out of balance will cause vibration, damage the rotor bearings and break up the flail casing.

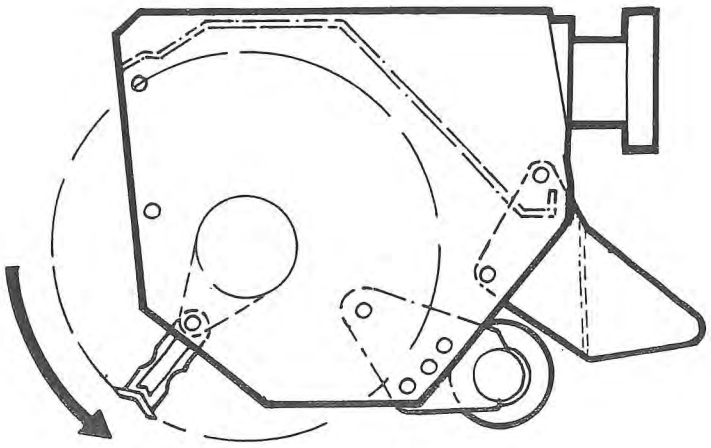


UPWARD CUTTING

The flail head is assembled for the flails to cut with an upward motion. Upward cutting produces a cleaner finish and is ideal for a light hedge. The front hood and rear flap must **always** be in position when hedging with an upward cutting action. The front hood is pivot mounted and can be adjusted to three working positions. The lowest position minimises the throwing of debris. Raising the hood will allow longer material to be but there will be a greater tendency for debris to be thrown. The rear flap is fitted to restrict the spread of cut debris from the rear.

ROLLER

The roller is adjustable vertically to three positions. For hedge cutting it is generally set in the highest position which places the roller slightly above the flails. The roller helps to prevent the flail head from bouncing and sinking into the hedge thus maintaining a level cut. The two lower positions may be used when making the ground cuts. These locate the roller below the flails which prevents the scalping of the earth and decreases the likelihood of hitting or throwing stones. Never attempt to operate the flail without the roller in position. It shields the flails, acts as a chopping bar and eliminates the chances of long lengths of cut material being thrown.



OPTIONAL DOWNWARD CUTTING.

It is possible to reverse the rotation of the flail for downward cutting in heavy growth. This chopping action subjects the rotor to violent usage and should therefore be avoided whenever possible.

For downward cutting a rear hood Part No 71-90-285 which is non adjustable **must** be used to deflect the cut material downwards into the hedge. It is permissable to remove the front hood to allow larger material to pass under the flail head.

REVERSING ROTATION (Ti only)

The flail rotor rotation can be reversed using the rotor control lever.

Before making the adjustment place the lever in the **'off'** position and **ensure that the rotor has stopped rotating.**

Rotate the lever stop gate through 180 degrees. This allows the selection of 'ON' and 'downward rotation'.

> **Caution.** Do not remove the lever stop gate as it prevents the unintentional instant reversal of rotation and the likely machine damage that would be caused as a result.

REVERSING ROTATION (Si only)

Fully extend the armhead and lower flail to the ground to minimise oil loss.

Release the hoses from the flail motor rigid pipes or the rotor control valve and interchange. Do not interchange the flail supply and return hoses at any other point as the hose routing and cross overs in the installation are necessary to allow the hoses to flex correctly during arm movements.

To ascertain the direction of cut without running the machine the following applies.

Connection MP - lower motor rigid pipe } upward cutting
Connection MR - Upper motor right pipe }

Connection MP - Upper motor rigid pipe } downward cutting
Connection MR - Lower motor rigid pipe]

CUTTING SEQUENCE

First - side the hedge. Where it is a road side hedge cut the field side first.

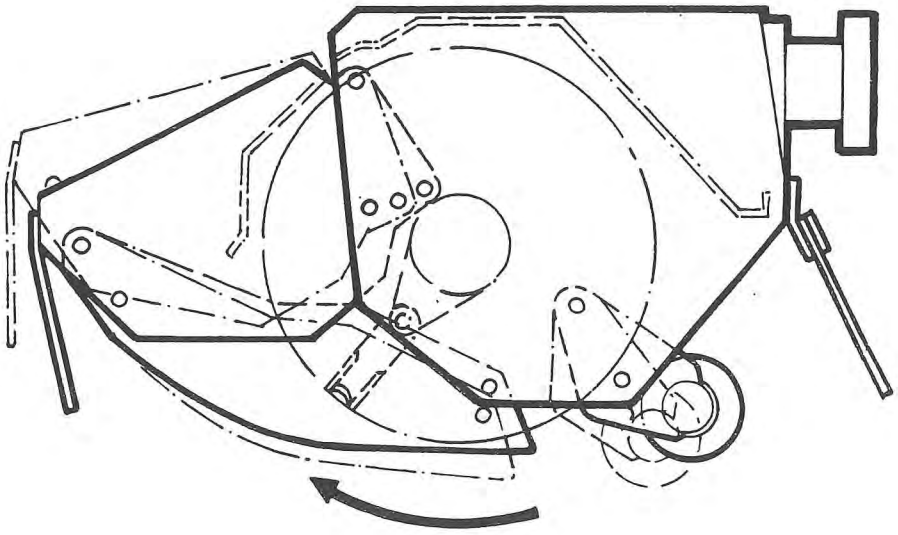
> **WARNING**
> **Do not be tempted to make a vertical cut on the far side of the hedge. This would entail cutting 'blind' and the rotating flail would be capable of throwing debris through the hedgerow in line with the operator.**

Second - Top cuts

Third - Ground cuts.

Note. More than one pass may be necessary to complete each operation.

Where the hedge has been well maintained in the past it may be found better to cut the top before siding up.



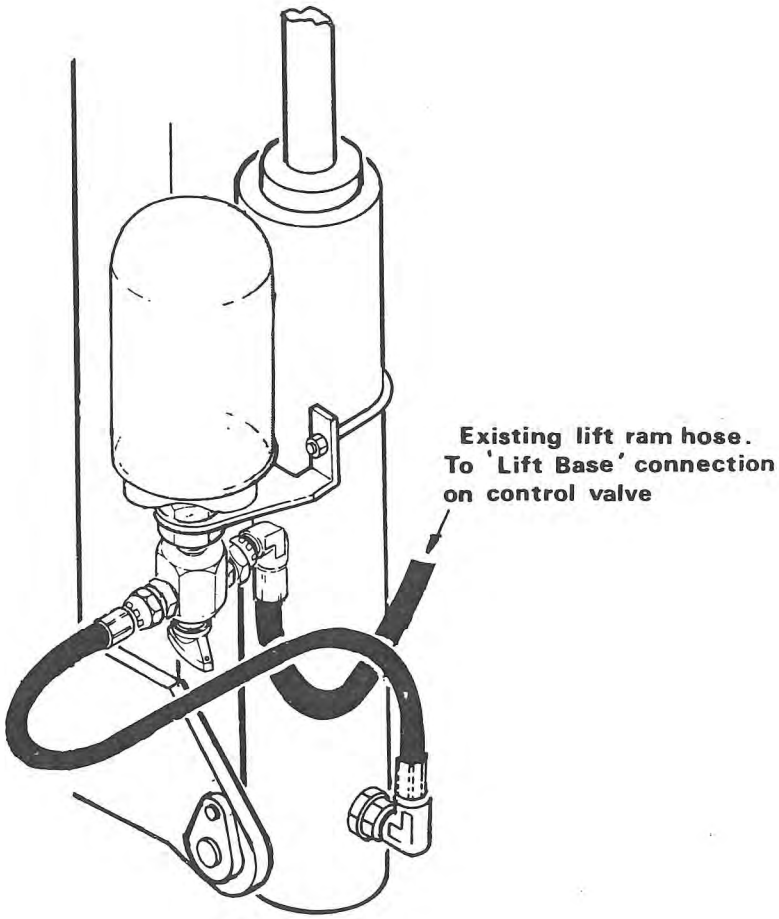
GRASS CUTTING

The flails must rotate in an upward motion for grass cutting. This causes the grass to stand erect allowing a neater cut finish to be achieved. The front hood, which can be used in either of the two lower positions depending on the length of material to be cut, is fitted with eight rubber flaps which shield the rotor at the front and direct all cut material up under the hood to discharge on to the ground at the rear, where it is contained by a rear flap.

The front hood provides a choice of two reinforced mounting locations for the front of the skid, the higher one of which is used when the hood is in the lower position and vice-versa.

The rear of the skid also provides two alternative mounting locations thus giving four alternative skid positions to suit the type of work to be done.

For grass cutting the roller can be set in either of the two lower positions depending on the length of finish required.



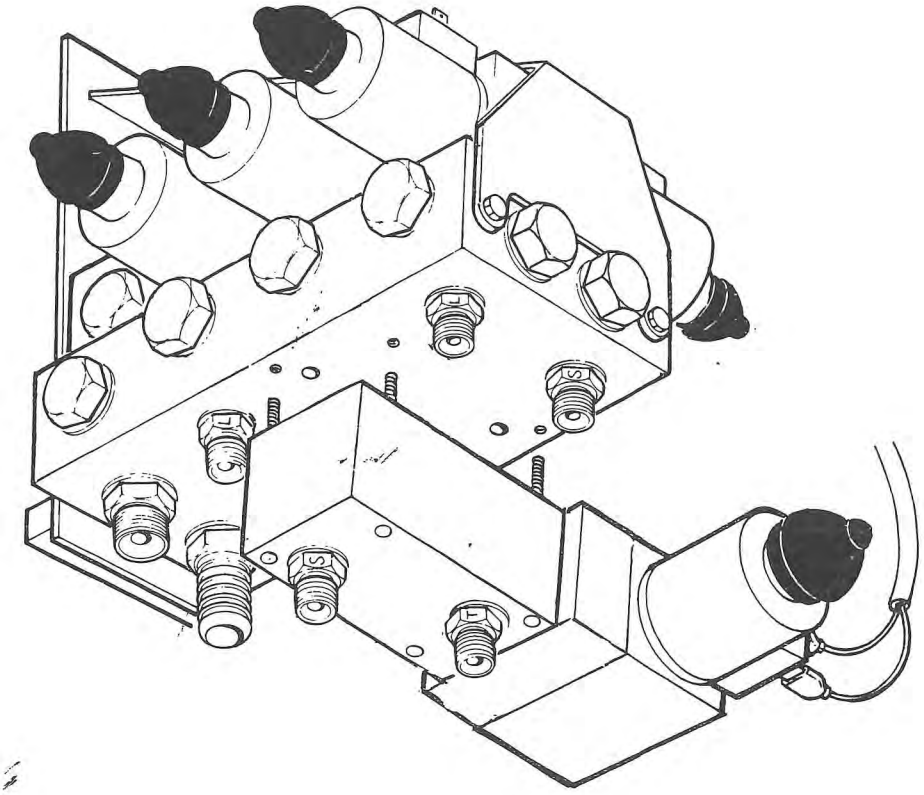
LIFT FLOAT KIT (optional extra)

Hydraulic float kit is available which is mounted as shown in the vertical position clamped to the lift ram barrel.

In work, with the stop tap open the flail runs along the ground and automatically lifts and rides over any bumps. Any shock loads are absorbed by the accumulator which is pre-charged with nitrogen to 600 p.s.i.

To obtain optimum working performance the lift control should be operated to take fifty per cent of the flail head weight off the flail roller. This is important as with too little weight on the roller the flail head will tend to remain in the air after riding over a bump and leave uncut areas of grass while with too much weight on the roller the float will be inoperative; the ground will be scalped in places and increased flail wear, loss, or damage to flails could occur.

To revert to hedge cutting or to use the flail without it running along the ground the stop tap should be closed to isolate the accumulator.



FLOATING HEAD ANGLE FACILITY

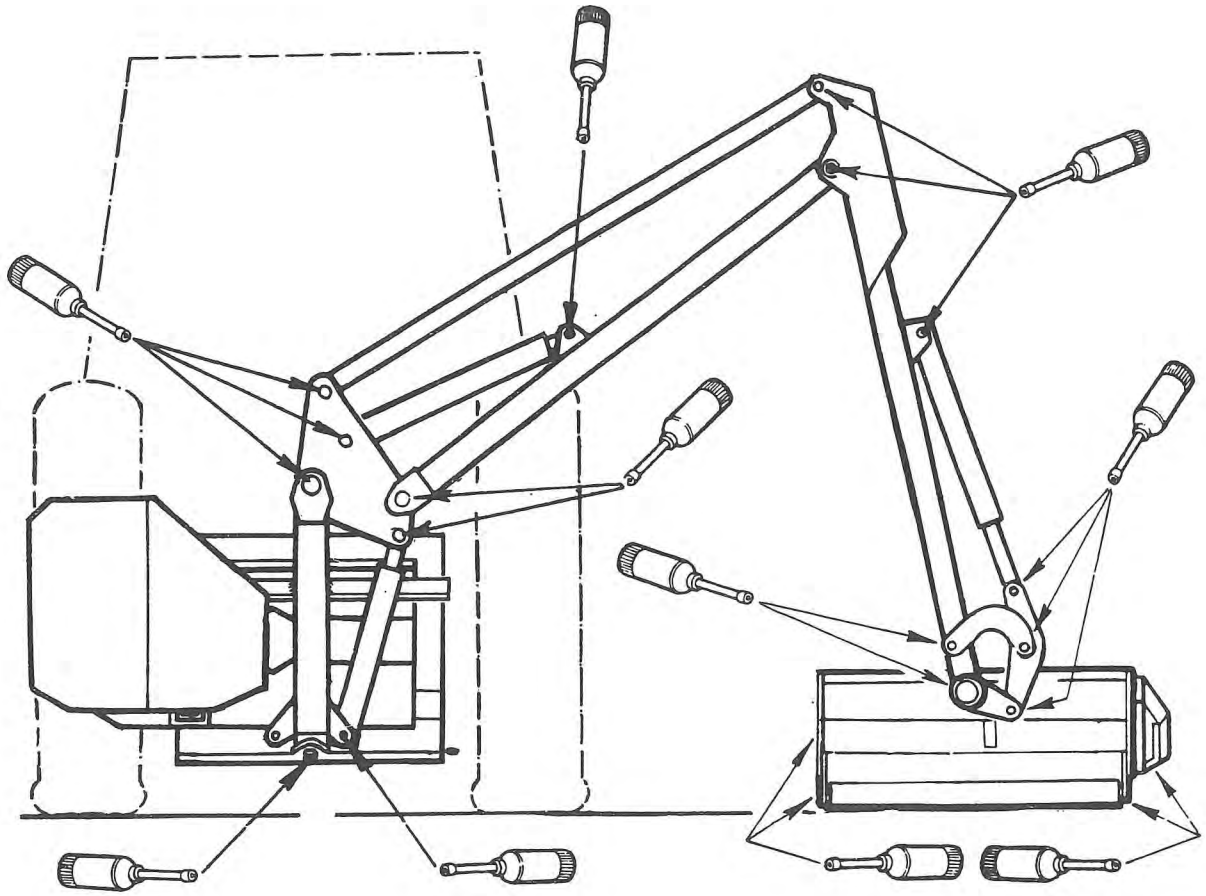
(Optional extra for grass flail on PA94 only)

A kit is available part No. 81 26 261 which will allow the flail head to angle itself automatically to suit the contours of the ground.

The kit is bolted to the manifold block in place of the hose plate. using the existing cap screws

The two core cable is connected from the solenoid to the common link harness and connection 9 on the main harness.

selection is by the auxiliary switch on the switchbox.



LUBRICATION

General

Grease daily all points shown.

Power take-off shaft

The P.T.O. shaft and its guards should be regularly examined. The universal joints should be greased very sparingly i.e. one shot weekly.

Note: Overgreasing a universal joint will blow-out the cork or neoprene sealing rings that exclude the dirt from the needle bearings inside.

The two halves of the plastic guard should be checked daily to ensure that they can spin freely on the shaft. The nylon slip rings which support the guard on the drive shaft should be lightly greased at weekly intervals.

The telescopic drive shaft should be similarly separated and grease applied to the internal shaft at approximately 100 hour intervals.

HYDRAULIC SYSTEM

Oil supply

Check daily the oil level in the reservoir

No fixed time period can be quoted for oil changes as operating conditions and maintenance standards vary so widely. Burnt and scorched oil odours and the oil darkening and thickening are all signs of oxidation and indicate the oil should be changed.

Moisture which results from condensation can become entrapped in the oil and cannot be removed by filtration so that contamination is a progressive factor.

Contamination can be reduced by:-

1) Cleaning off around the reservoir cap before removal, and keeping that area clean

11) Using clean containers when replenishing the system

111) Regular servicing of the filtration system

Filtration Maintenance

The machine is protected by a 125 micron suction strainer and a low pressure 10 micron full flow return line filter.

1) Suction strainer

The strainer is fixed in position within the reservoir.

Should symptoms of pump cavitation or spongy intermittent operation occur the tank must be drained and flushed out with a suitable cleaning agent eg. clean diesel oil

i11) Return Line Filter

The element should be changed after the first 50 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.

P.T.O. GEARBOX

The gearbox is rigidly bolted on to the main frame and has a filler plug. Oil level is correct when level with the filler plug aperture. The gearbox oil should be changed every two years or at 1000 hour intervals: whichever occurs first. The capacity of the gearbox is .25 litres (1/2 pint) S.A.E. 30/50 Tractor universal oil.

FLAILHEAD

Frequently inspect the rotor assembly for damaged or missing flails. Bolts and nuts securing the flails to the rotor should be regularly checked and kept tight. The correct torque setting for these locknuts is 135 Nm (100 lbf/ft.). Use only the correct flail bolt and locking nut. Check the flail pivot bushes for possible damage or wear. They do not require oil.

Do not attempt to run the rotor with flails missing. Im-balance will cause severe vibration and can rapidly damage the rotor shaft bearings. As an emergency measure if a flail is broken off or lost, remove another on the opposite side of the rotor to retain balance. Always replace flails in opposite pairs and never match up a new flail with a re-sharpened one which will of course be lighter.

Blunt flails absorb a lot of power and leave an untidy finish to the work. They should be sharpened on a grindstone or with a portable grinder periodically.

Wear protective gear when sharpening flails.

Ensure that the bearing housings and hydraulic mounting nuts and bolts are kept tight. They should be checked during servicing.

CABLES

The cables operate on a push/pull system with the spool centering 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 adjustment 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.

HYDRAULIC 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.

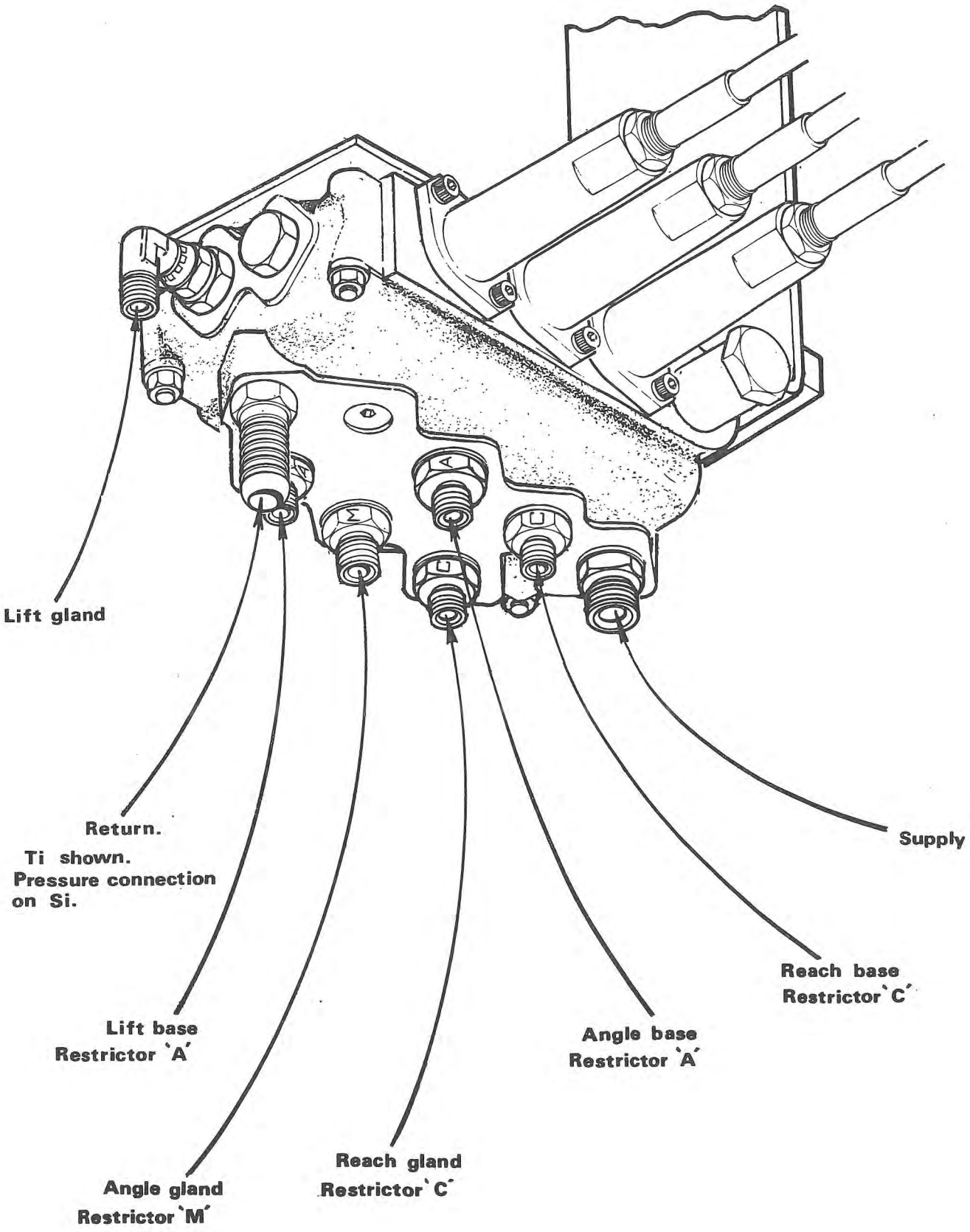
Before changing hoses study the installation these are carefully calculated to prevent hose damage during operation. Always replace hoses in exactly the same manner. This is especially important for the flail hoses where they must be crossed, upper to lower, at the dipper and head pivots. The 90 degree elbows at the head bracket must point directly across the pivot and the hoses must have no slack at this point.

Two hose clips are provided at either end of the large bore suction and return hoses. These should be positioned so that their worm drive barrels are opposed at 180 degrees to reduce the possibility of air entering the system.

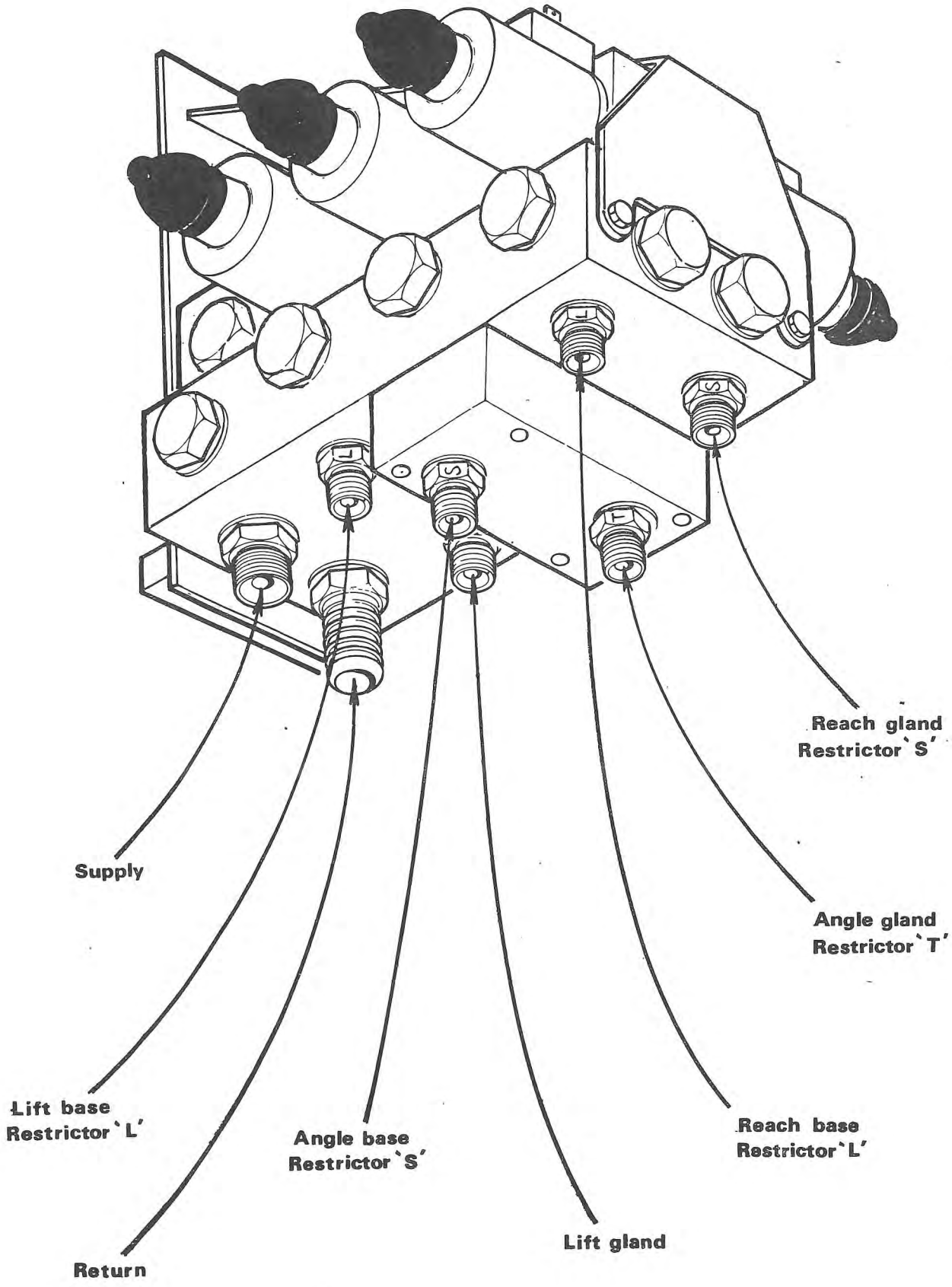
Hose warranty

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.

HOSE CONNECTIONS (PA 93)



HOSE CONNECTIONS (PA 94)



SPARE PARTS MANUAL

FOR BEST PERFORMANCE....

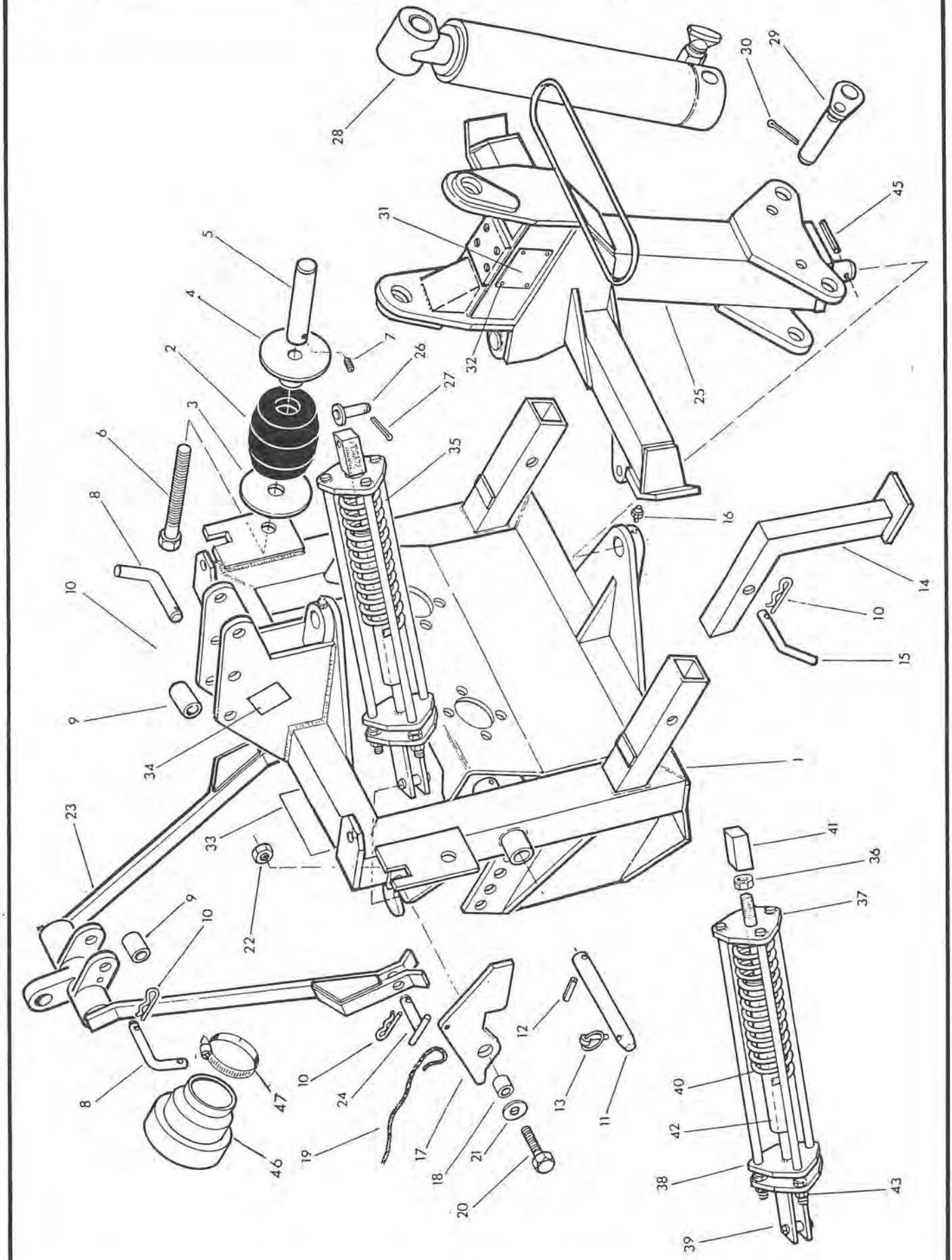
USE ONLY McCONNEL SPARE PARTS

To be assured of the latest design improvements purchase your genuine replacements from the original equipment manufacturer F.W. McConnel Ltd. through your local dealer or stockist.

Always quote machine type and serial number as well as the part number.

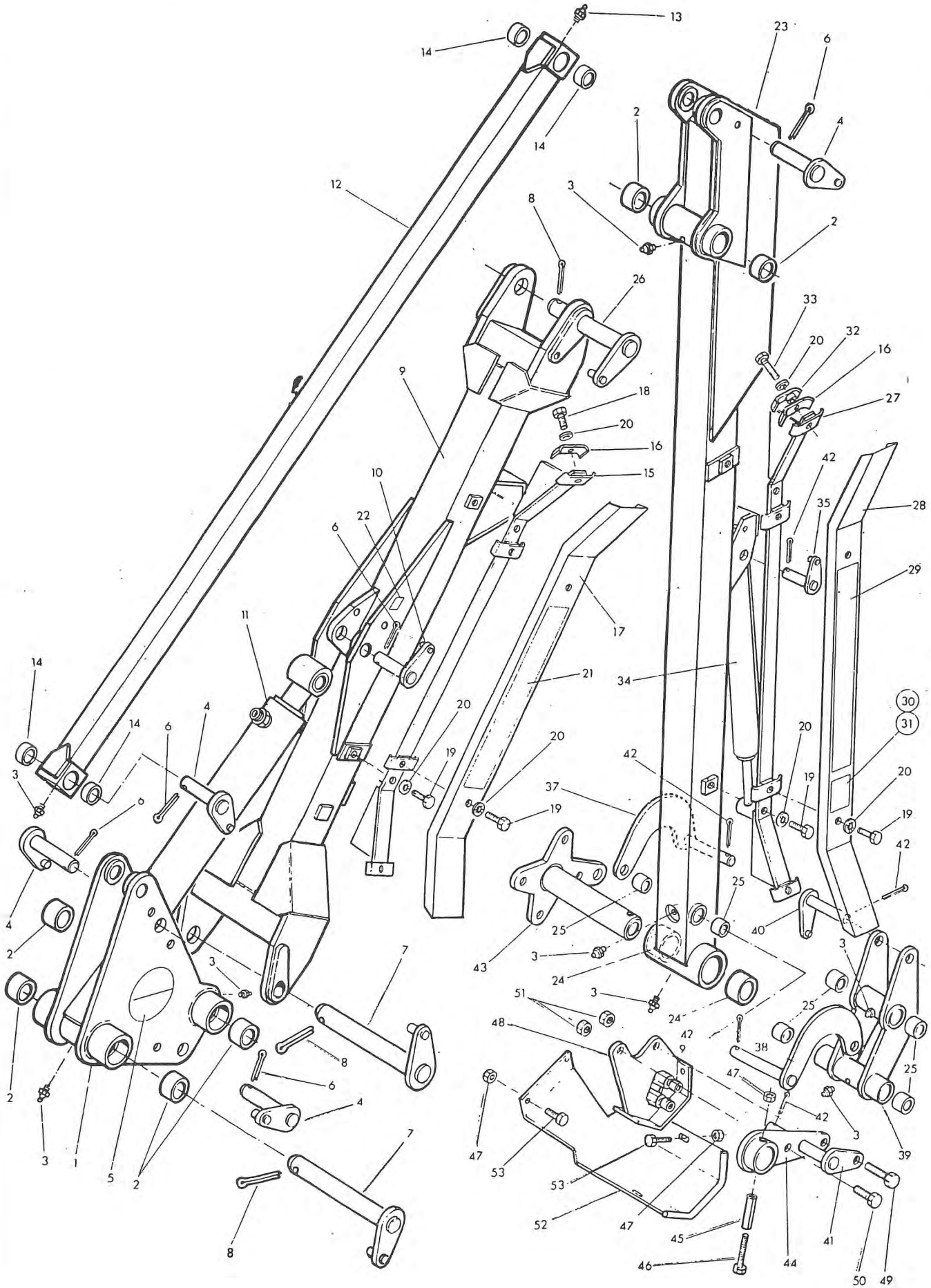
Design improvement may have altered some of the parts listed in this manual - The latest part will always be supplied when it is interchangeable with an earlier one

Model		McCONEL	Temeside Works, Ludlow, Shropshire, SY8 1JL, England.
YOKE , MAIN FRAME & PILLAR			



Ref.	Part No.	Qty.	Description
			MAIN FRAME, STABILISER & PILLAR
1	71-93-300	1	Main frame
2	71-35-033	1	Buffer
3	71-35-035	1	Buffer disc
4	71-35-034	1	Buffer locating disc
5	71-93-323	1	Buffer abutment
6	71-35-293	1	Buffer bolt
7	93-63-034	1	Grubscrew M8 x 12 cup point
8	71-92-026	2	Top link pin
9	14-67-063	2	Sleeve
10	04-31-105	6	Spring cotter
11	71-93-020	1	Linkage pin
12	04-22-628	2	Spring dowel 3/8" dia x 1 3/4" long
13	04-31-217	2	Linch pin
14	71-92-307	2	Stand leg
15	71-920023	2	Leg pin
16	09-01-121	2	Greaser 1/8 BSP- straight
17	71-93-325	1	Latch
18	71-35-097	1	Spacer
19	71-35-036	1	Operating cord
20	92-13-106	1	Bolt M12 x 50
21	91-00-106	1	Plain washer dia 12
22	91-43-006	1	Self locking nut M12
23	71-92-327	1	Stabiliser
24	71-92-027	2	Stabiliser pin
25	71-93-311	1	Pillar
26	71-93-021	1	Anchor pin
27	95-01-406	1	Split pin dia 5 x 40
28	71-93-333	1	Lift ram assembly see page 74
29	71-93-025	1	Pin - Lift ram base
30	05-03-166	1	Split pin 1/4" dia x 2" long
31	71-93-018	1	Serial No. plate
32	71-03-230	4	Pop rivet 1/8" dia
33	71-35-295	1	Sticker - "Tighten check chains"
34	71-05-130	1	Sticker - "Read instruction book first"
35	71-35-314	1	Breadaway assistor spring assy.includes
36	01-11-006	1	Nut 5/8 UNF
37	71-35-315	1	Spring cage
38	71-35-316	1	Tie Rod
39	71-35-317	1	Jaw end
40	71-35-298	1	Spring
41	71-35-081	1	Pinned end
42	71-35-318	1	Spacer
43	01-11-003	6	Nut 3/8 UNF
44	71-36-330	1	P.T.O. shaft assembly - not illus.
45	04-21-289	1	spring Dowel 1/4 " dia x 2" long
46	09-04-114	1	Hose clip
47	71-11-038	1	PTO Guard

Model		McCONNEL	Temeside Works, Ludlow, Shropshire, SY8 1JL, England.
ROCKER & ARMS			



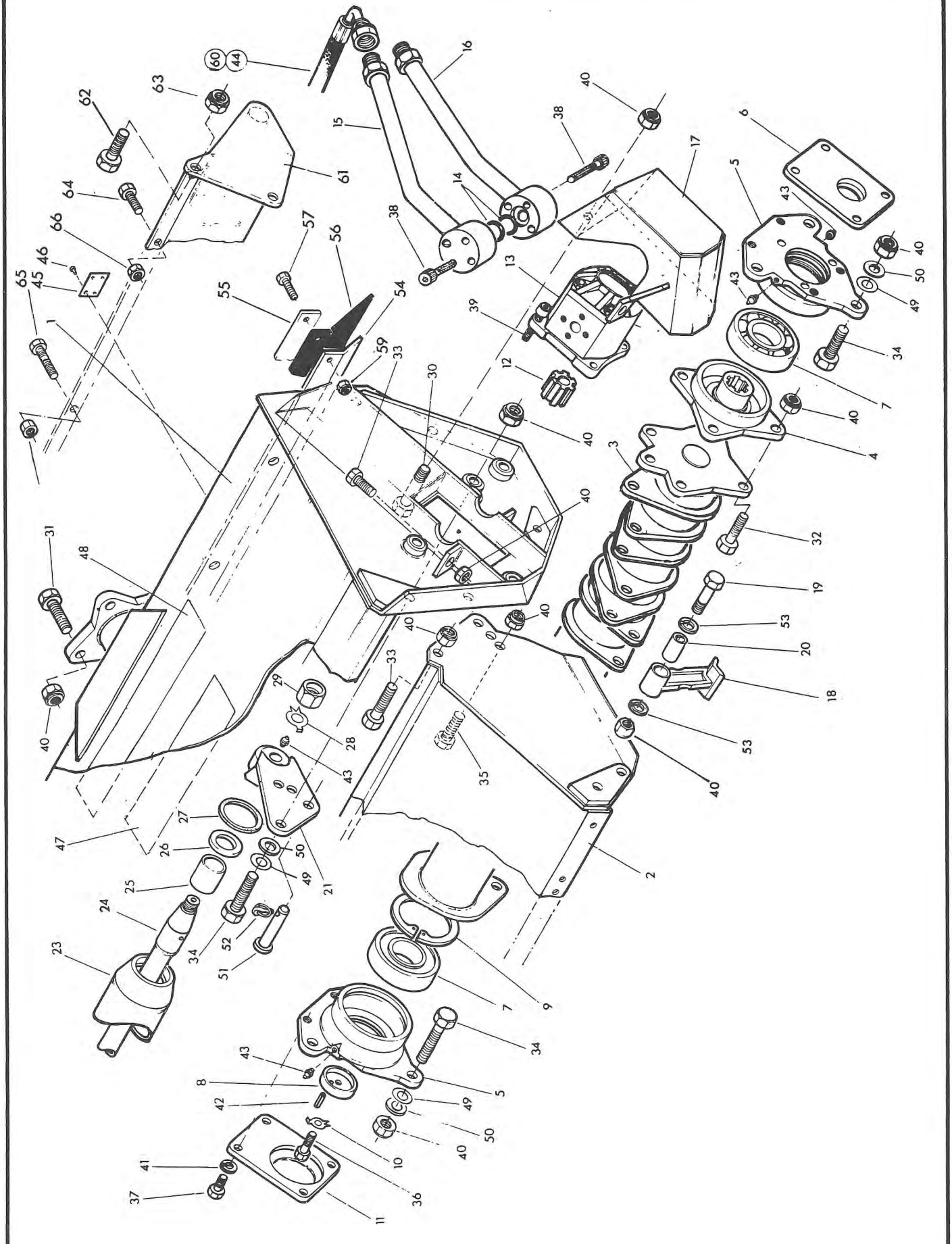
Ref.	Part No.	Qty.	Description
			ROCKER AND ARMS
1	71-93-330	1	Rocker
2	72-13-023	6	Bush-Rocker and dipper pivot
3	09-01-121	8	Greaser 1/8" BSP - straight
4	71-93-025	4	Pivot pin - Tension link, Reach ram base and lift ram rod
5	12-90-296	1	Sticker "Logo roundel"
6	05-03-166	5	Split pin 1/4" dia x 2" long
7	71-93-033	2	Pivot pin - Main Arm and rocker
8	95-01-509	3	Split pin dia 10 x 50
9	71-93-304	1	Main arm
10	71-93-022	1	Pivot pin - Reach ram rod
11	71-93-334	1	Reach ram assembly - see page 76
12	71-93-326	1	Tension link
13	09-01-124	1	Greaser 1/8 BSP 67 1/2 degree
14	60-12-032	4	Bush
15	71-93-312	1	Hose guide - Main arm
16	71-93-014	4	Hose clamp
17	71-93-320	1	Hose cover - main arm
18	92-13-085	3	Bolt M10 x 40
19	93-13-055	8	Setscrew M10 x 25
20	91-00-305	12	Internal serrated washer dia 10
21	12-90-255	1	Sticker "McConnel"
22	60-55-002	1	Sticker "Sling here"
23	71-93-308	1	Dipper arm
24	71-11-175	2	Bush - head pivot
25	71-01-083	6	Bush - Radius arm pivot & slave link
26	71-93-034	1	Pivot pin - Dipper
27	71-93-313	1	Hose guide - dipper
28	71-93-321	1	Hose cover - dipper
29	12-90-295	1	Sticker "Power Arm"
30	12-90-293	1	Sticker "93"
31	12-90-292	1	Sticker "94"
32	71-93-019	1	Hose clip - angle
33	92-13-125	1	Bolt M10 x 60
34	71-35-290	1	Angle ram assembly -see page 77
35	71-92-024	1	Pivot pin - Angle ram base
36	05-03-126	1	Split pin 1/4" dia x 1 1/2" long
37	71-92-311	1	Radius arm - front
38	71-92-310	1	Radius arm - rear
39	71-92-309	1	Slave link
40	71-92-008	1	Pivot pin - Angle ram rod
41	71-92-009	1	Pivot pin - Slave link
42	95-01-406	2	Split pin dia 5 x 40
43	71-92-308	1	Head pivot tube
44	71-92-316	1	Jaw plate
45	04-23-548	1	Spring dowel 5/8" dia x 3" long
46	92-13-185	1	Bolt M10 x 90
47	91-43-005	5	Self locking nut M10
48	71-92-321	1	Hose junction bracket
49	02-11-146	1	Bolt 5/8" UNF x 1 3/4" long
50	02-11-126	1	Bolt 5/8" UNF x 1 1/2" long
51	01-41-006	2	Self locking nut 5/8 UNF
52	71-92-324	1	Hose tray
53	93-13-045	4	Setscrew M10 x 20

Model

HEDGE FLAIL HEAD

McCONNEL

Temeside Works, Ludlow,
Shropshire, SY8 1JL, England.



Ref	Part No	Qty	Description
	71-90-252		1.2 METRE HEDGE FLAIL TO CUT ON R. HAND OF TRACTOR WITH MOTOR OUTBOARD
	71-90-253		1.2 METRE HEDGE FLAIL TO CUT ON L.HAND OF TRACTOR WITH MOTOR OUTBOARD - as illus.

Spares are identical in both builds and comprise:-

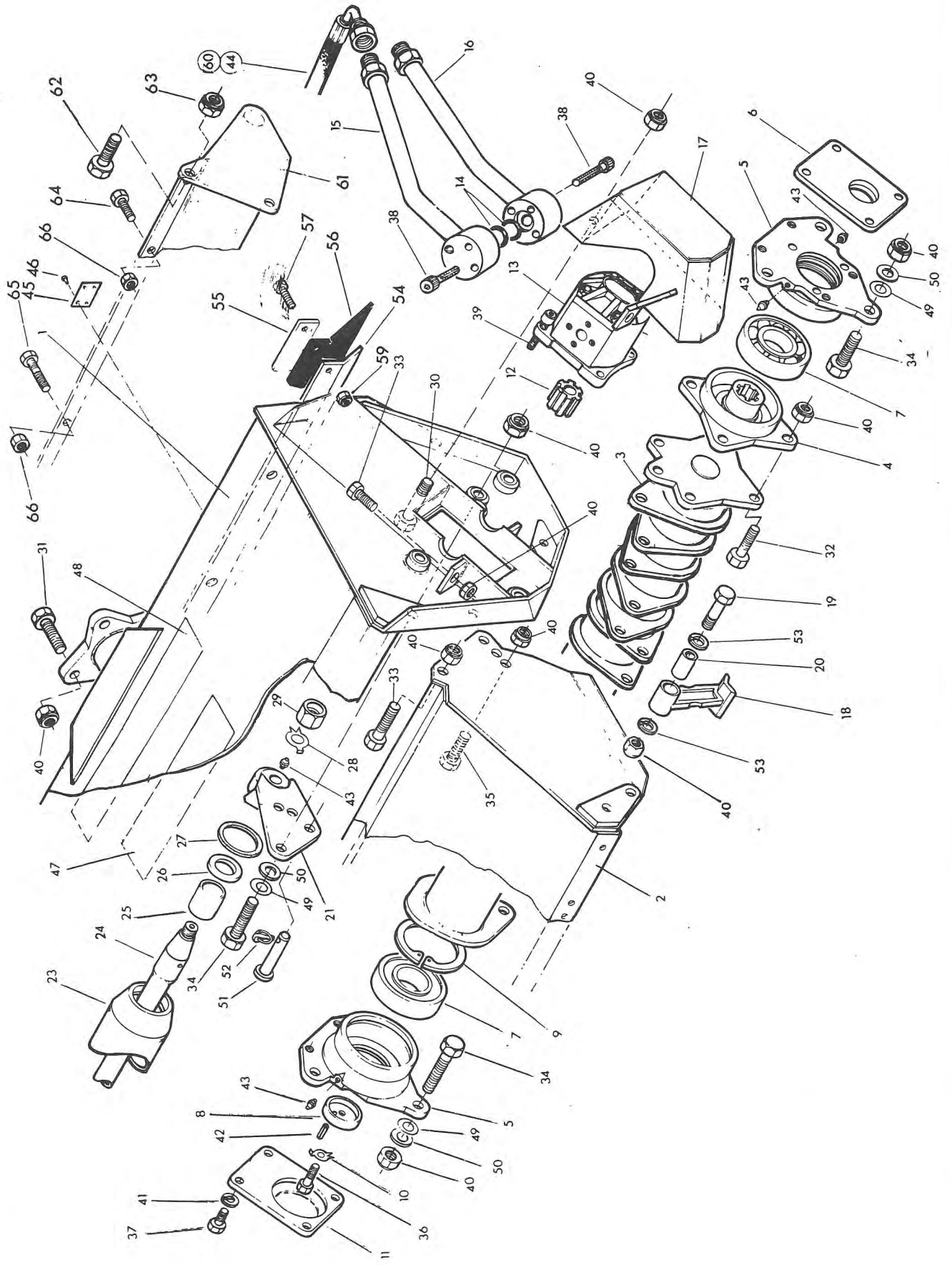
1	71-90-262	1	Flail casing
2	71-90-288	1	Front hood
3	71-90-275	1	Rotor
4	71-90-280	1	Rotor hub
5	71-90-261	2	Bearing housing
6	71-90-293	1	Motor spacer plate
7	06-00-018	2	Bearing
8	71-90-025	1	Clamp washer
9	71-90-022	1	Internal circlip dia 120
10	71-90-024	1	Tab washer dia12
11	71-90-292	1	Cover plate
12	71-90-009	1	Drive coupling
13	83-01-263	1	Hydraulic motor
14	86-00-121	2	'O' ring
15	71-90-295	1	Motor pipe upper
16	71-90-296	1	Motor pipe lower
17	71-90-282	1	Motor cover
18	73-14-366	24	Hedge flail F10H
19	73-14-201	24	Special bolt
20	73-14-223	24	Pivot bush
21	71-90-306	1	Roller bracket L.Hand
22	71-90-305	1	Roller bracket R.Hand - not illus
23	71-90-307	1	Roller
24	71-90-308	1	Roller tie rod
25	72-13-023	2	Bush
26	71-90-026	2	Thrust washer
27	71-90-028	2	Felt seal
28	71-90-023	2	Tab washer dia 20
29	71-14-176	2	Special nut M 20
30	02-11-266	1	Bolt 5/8 UNF x 3 1/4" long

Model

HEDGE FLAIL HEAD

McCONNEL

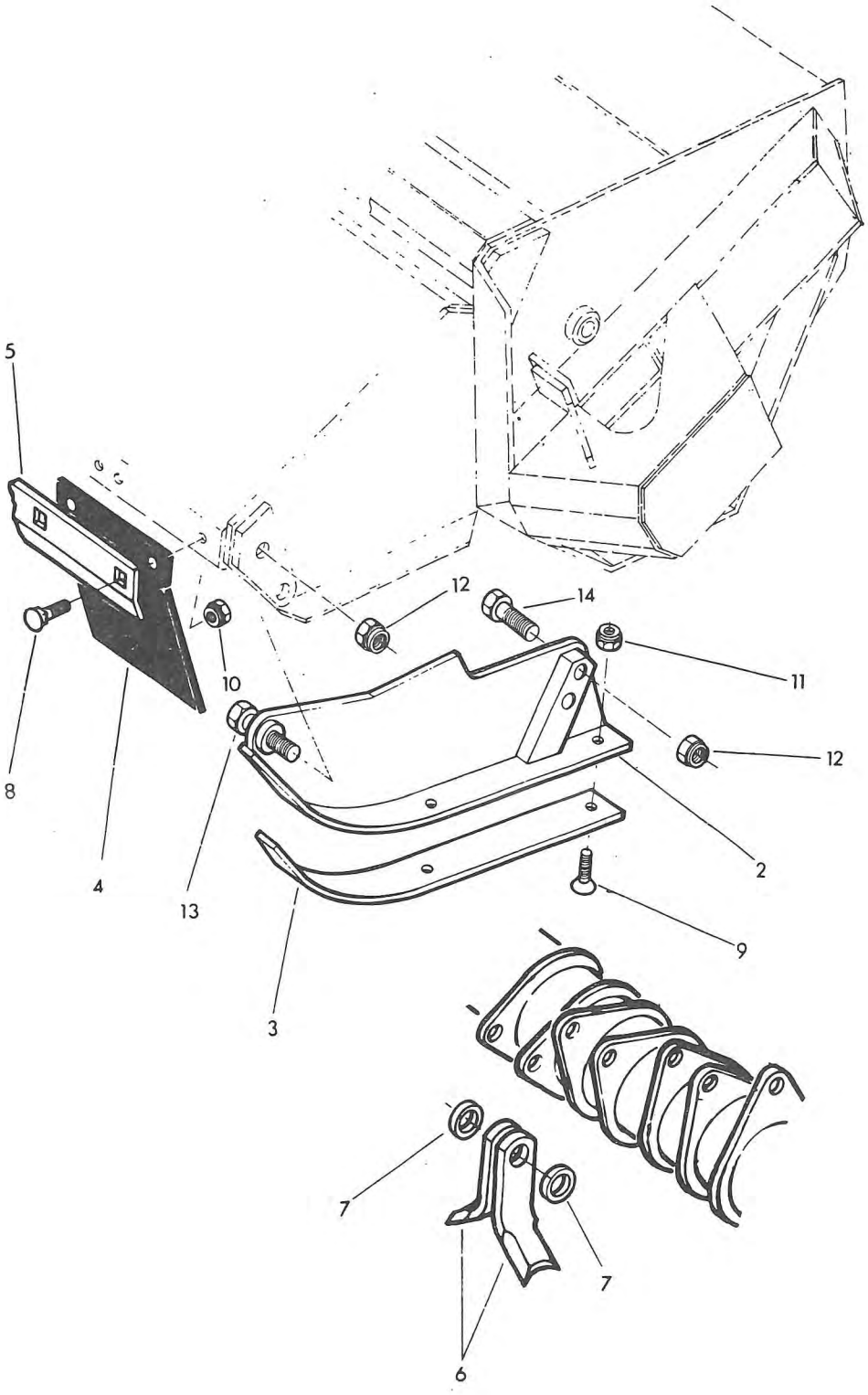
Temeside Works, Ludlow,
Shropshire, SY8 1JL, England.



Ref.	Part No.	Qty.	Description
	71-90-252		**1.2 METRE HEDGE FLAIL TO CUT ON R.HAND SIDE OF TRACTOR WITH MOTOR OUTBOARD-** continued
	71-90-253		**1.2 METRE HEDGE FLAIL TO CUT ON L.HAND SI DE OF TRACTOR WITH MOTOR OUTBOARD** as illustrated- continued.
31	02-11-186	4	Bolt 5/8 UNF x 2 1/4' long
32	03-11-146	4	Setscrew 5/8 UNF x 1 3/4" long
33	03-11-126	4	Setscrew 5/8 UNF x 1'1/4' long
34	03-11-166	8	Setscrew 5/8 UNF x 2" long
35	03-11-106	2	Setscrew 5/8 UNF x 1 1/4" long
36	93-13-076	1	Setscrew M12 x 35
37	93-13-045	4	Setscrew M10 x 20
38	93-00-014	6	Capscrew 'wedglok' M10 x 60
39	93-00-136	4	Capscrew 'wedglok' M10 x 45
40	01-41-006	49	Self locking nut 5/8 UNF
41	91-00-205	4	Spring washer Ø 10
42	04-21-608	1	Spring dowel 3/16" dia x 1/2" long
43	09-01-121	6	Greaser
44	85-38-015	2	Hose 3/4" BSP SF-90 F x 34" long for outboard motors
45	73-14-087	1	Serial No. plate
46	71-03-230	4	Pop rivet 1/8" dia
47	12-90-297	1	Flail head instruction Sticker
48	12-90-255	1	'McConnel' sticker
49	81-21-043	as reqd	Shim 0.15"
50	81-21-044	as reqd	Shim 0.25"
51	71-90-032	2	Pin
52	04-31-213	2	Linch pin
53	01-00-206	48	Spring washer 5/8" dia
54	71-90-312	1	Mounting strip
55	71-9-313	1	Clamp strip
56	71-90-314	1	Flap
57	93-13-055	11	Setscrew M10 x 25
58	93-13-045	1	Setscrew M10 x 20
59	91-43-005	12	Self locking nut M10
	86-99-216		**SEAL KIT FOR HYDRAULIC MOTOR** Contains all seals plus tab washer and nut
			OPTIONAL EXTRAS
60	85-38-025	2	Hose 3/4" BSP SF-90F x 42" long for flail heads with inboard mounted motors
	71-90-310	1	Rear hood kit for flail heads with downward cutting flails-containing:-
61	71-90-285	1	Hood
62	03-11-106	4	Bolt 5/8 UNF x 1 1/4"
63	01-41-006	4	Self locking nut 5/8 UNF
64	93-13-045	1	Setscrew M10 x 20
65	93-13-055	2	Setscrew M10 x 25
66	91-43-005	3	Self locking nut M10

McCONNEL

Temeside Works, Ludlow,
Shropshire, SY8 1JL, England.



Ref.	Part No.	Qty.	Description
	71-90-254		**1.2 METRE GRASS FLAIL TO CUT ON R.HAND SIDE OF TRACTOR WITH MOTOR OUTBOARD**
	71-90-255		**1.2 METRE GRASS FLAIL TO CUT ON L.HAND SIDE OF TRACTOR WITH MOTOR OUTBOARD** -As illustrated

Spares are identical in both builds and comprise: :-

Spare parts lists and seal kits are identical with their hedge flail counterparts on the previous page with the following exceptions.

Item 33 Part No. 73-14-36 6, 24 off, hedge flail is deleted

The following items are added

1	71-90-300	1	Skid - R.hand - not illustrated
2	71-90-301	1	Skid - L.hand
3	73-14-323	2	Replaceable skid
4	71-90-020	8	Flap
5	71-90-304	1	Flap clamp strip
6	71-90-315	48	Grass flail
7	71-90-010	48	Flail spacer
8	92-93-054	16	Cup square bolt M8 x 25
9	93-33-065	6	Setscrew c/sunk M10 x 30
10	91-43-004	16	Self locking nut M8
11	91-43-005	6	Self locking nut M10
12	01-41-006	4	Self locking nut 5/8 UNF
13	03-11-146	2	Setscrew 5/8 UNF x 1 3/4" long
14	02-11-186	2	Setscrew 5/8 UNF x 2 1/4' long

Spares Note.

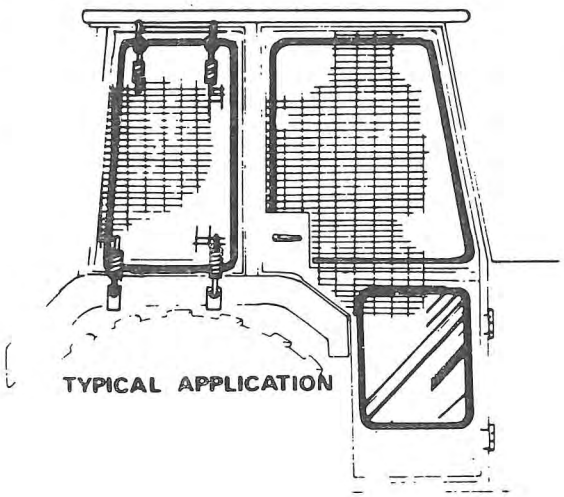
The items listed above can be ordered as a hedge to grass conversion kit under Part No.71-90-260

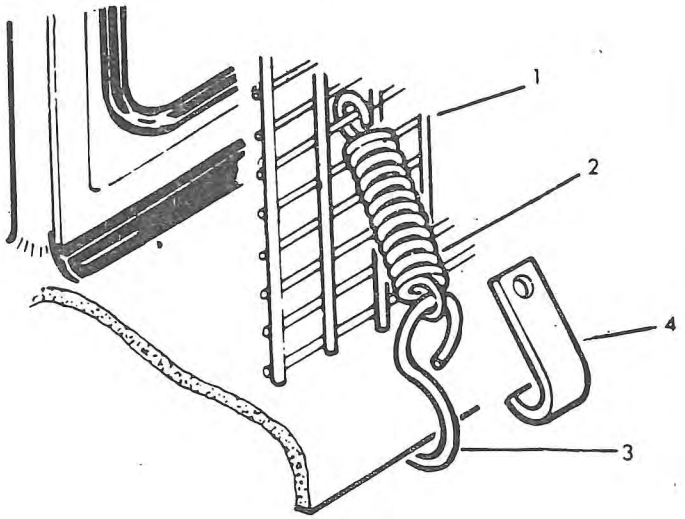
In addition a grass flail spares handy pak is availablePart No. 71-90-259 which comprises

71-90-299	10	Grass flail
71-90-100	2	Space
71-36-133	1	Pivot bush
73-14-222	1	Special flail bolt
01-41-006	1	Self locking nut 5/8 UNF

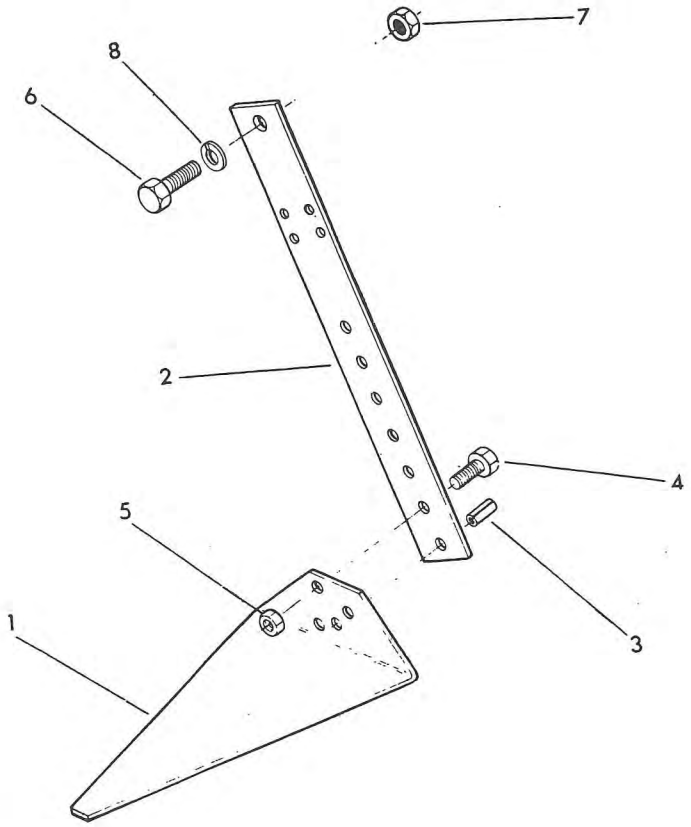
OPTIONAL EXTRAS

85-01-154	2	Hose 1" BSP SF-90 F x 42" long for fllail heads with inboard mounted motors-not illustrated



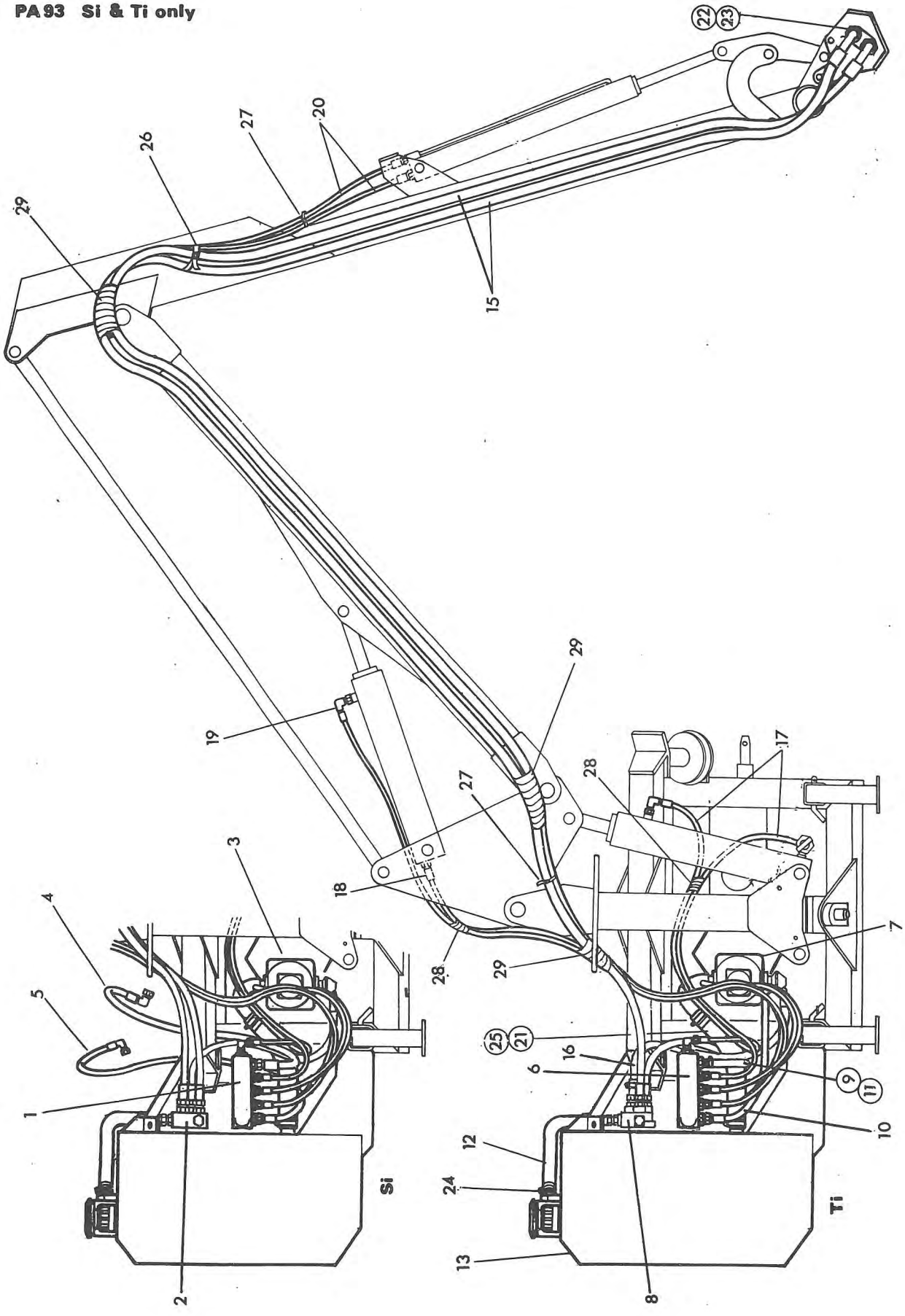


Ref.	Part No.	Qty.	Description
	73-13-324		**CAB GUARD KIT**
1	73-13-049	1	Guard panel - large
2	73-13-050	1	Guard panel - small
3	60-01-064	12	Spring
4	60-01-065	6	Hook
5	73-13-051	6	Hook



Ref.	Part No.	Qty.	Description
	71-90-319		**CONTROL MOUNTING ASSEMBLY**
1	71-09-320	1	Sandwich plate
2	71-09-146	1	Pillar including spring dowel
3	04-22-816	1	Spring dowel
4	93-13-066	1	Setscrew M12 x 30
5	91-13-006	1	Nut M12
6	93-11-086	1	Setscrew 5/8 UNF x 1" long
7	01-11-006	1	Nut 5/8 UNF
8	01-00-206	1	Spring washer 5/8" dia

PA93 Si & Ti only



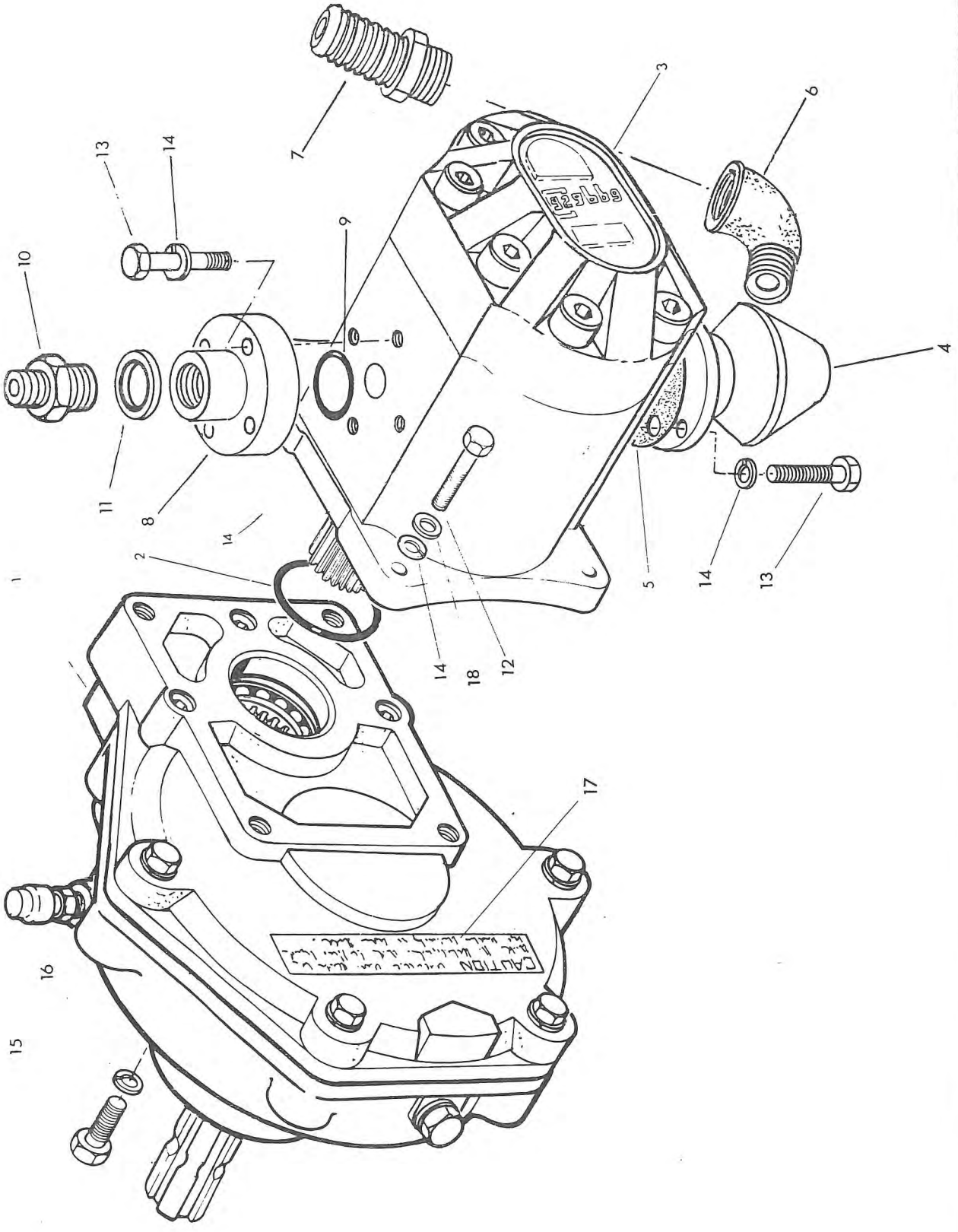
Ref.	Part No.	Qty.	Description
			HYDRAULIC INSTALLATION PA93 SEMI INDEPENDENT MODEL ONLY
1	81-30-372	1	Control valve assembly (see pages 50-53)
2	81-25-360	1	Rotor relief valve assemby (see page 48)
3	80-13-401	1	Gearbox /pump assembly (see page 46)
4	85-32-014	1	Hose 1/2 BSP-SF-90F x 80" long Return tractor
5	85-31-323	1	Hose 3/8 BSP SF 90 F x 80" long supply- tractor
			HYDRAULIC INSTALLATION PA 93 FULLY INDEPENDENT MODEL ONLY
6	81 30 372	1	Control valve assembly (see pages 50-53)
7	80-13-392	1	Gearbox/pump assembly (see page 56)
8	81-25-358	1	Rotor control valve assembly (see page 66)
9	85-01-158	1	Hose 5/8" bore x 24" long. Return to rotor on/off valve
10	85-11-253	1	Hose 3/8" BSP-SF-SF x 18" long. Supply from pump
11	09-04-204	2	Hose clip - 5/8 bore hose
The remaining items are common to all PA 93 models			
12	85-00-828	1	Hose low pressure 1" bore x 28" long rotor valve-tank
13			Tank assembly see page 66
14	71-09-319	1	Control mounting assembly-not illus-see page 43
15	85-38-065	2	Hose 3/4" BSP SF-90F x 200" long motor supply
16	85-38-045	1	Hose 3/4 BSP SF-90F x 29" long.Pump-RC valve
17	85-35-022	2	Hose 1/4' BSP SF-90F x 48" long. Lift
18	85-15-132	1	Hose 1/4' BSP SF-SF x 64" long. Reach base
19	85-35-142	1	Hose 1/4' BSP SF-90F x 80" long.Reach gland
20	85-15-122	2	Hose 1/4' BSP SF-SF x 162" long- Angle
21	85-01-122	1	Hose 1 1/2" bore x 11 3/4" long.Suction from tank
22*	85-81-247	1	Adaptor 3/4" BSP M-F
23	86-50-106	1	Bonded seal 3/4" BSP
24	09-04-106	4	Hose clip - 1" bore hose
25	09-04-107	4	Hose clip - 1 1/2' bore hose
26	71-06-187	2	Hose tie
27	71-35-084	2	Hose tie
28	72-13-005	2	Hose armour coil 3/8" dia
29	71-93-026	3	Hose armour coil 3/4" dia

* Spares Note
After April 1990 item 22 is deleted

McCONNEL

Temeside Works, Ludlow,
Shropshire, SY8 1JL, England.

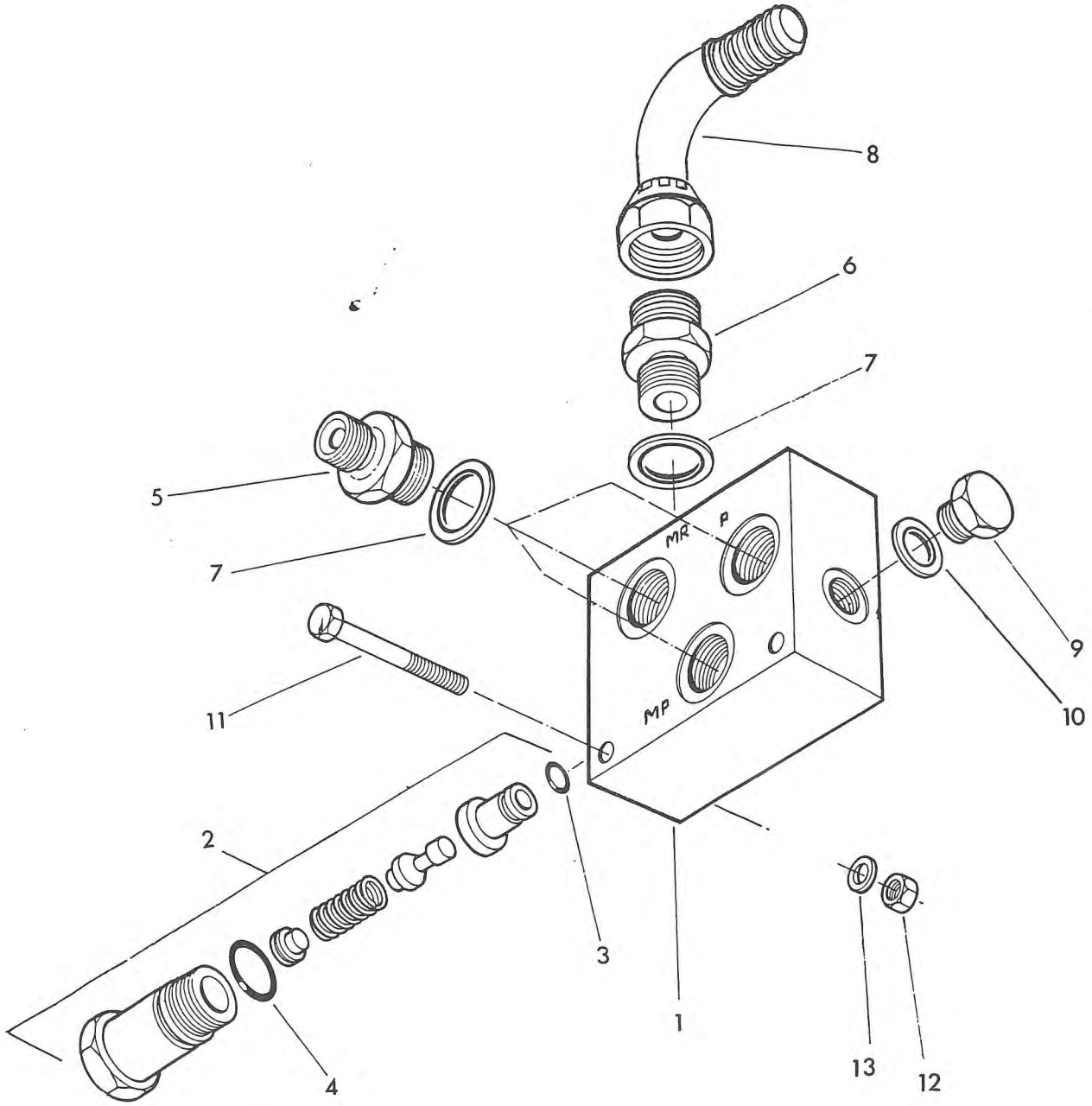
PA 93 Si only



Ref	. Part No.	Qty.	Description
	80-13-401		**GEARBOX PUMP ASSEMBLY FOR PA93 SEMI INDEPENDENT MODEL ONLY**
1	80-13-360	1	Gearbox 4.59:1 (see page 58)
2	86-00-523	1	'O' ring
3	82-01-463	1	Pump CPL 33
4	80-13-402	1	Suction adaptor
5	80-13-023	1	Gasket
6*	85-81-280	1	Elbow 3/4" BSPM -1" BSPF
7*	85-81-281	1	Adaptor 1" BSP M 1 1/2" low pressure
8	80-13-088	1	Pump flange 3/4 BSP F
9	86-00-119	1	'O' ring
10	85-81-136	1	Union 3/4" BSP MM
11	86-50-106	1	Bonded seal 3/4" BSP
12	92-13-094	4	Bolt M8 x 45
13	93-13-054	8	Setscrew M8 x 25
14	91-00-204	12	Spring washer dia 8
15	93-13-056	4	Setscrew M12 x 25
16	91-00-206	4	Spring washer dia 12
17	80-13-081	1	Gearbox label
18	91-00-104	4	Plain washer dia 8
	86-99-215		**PUMP SEAL KIT**

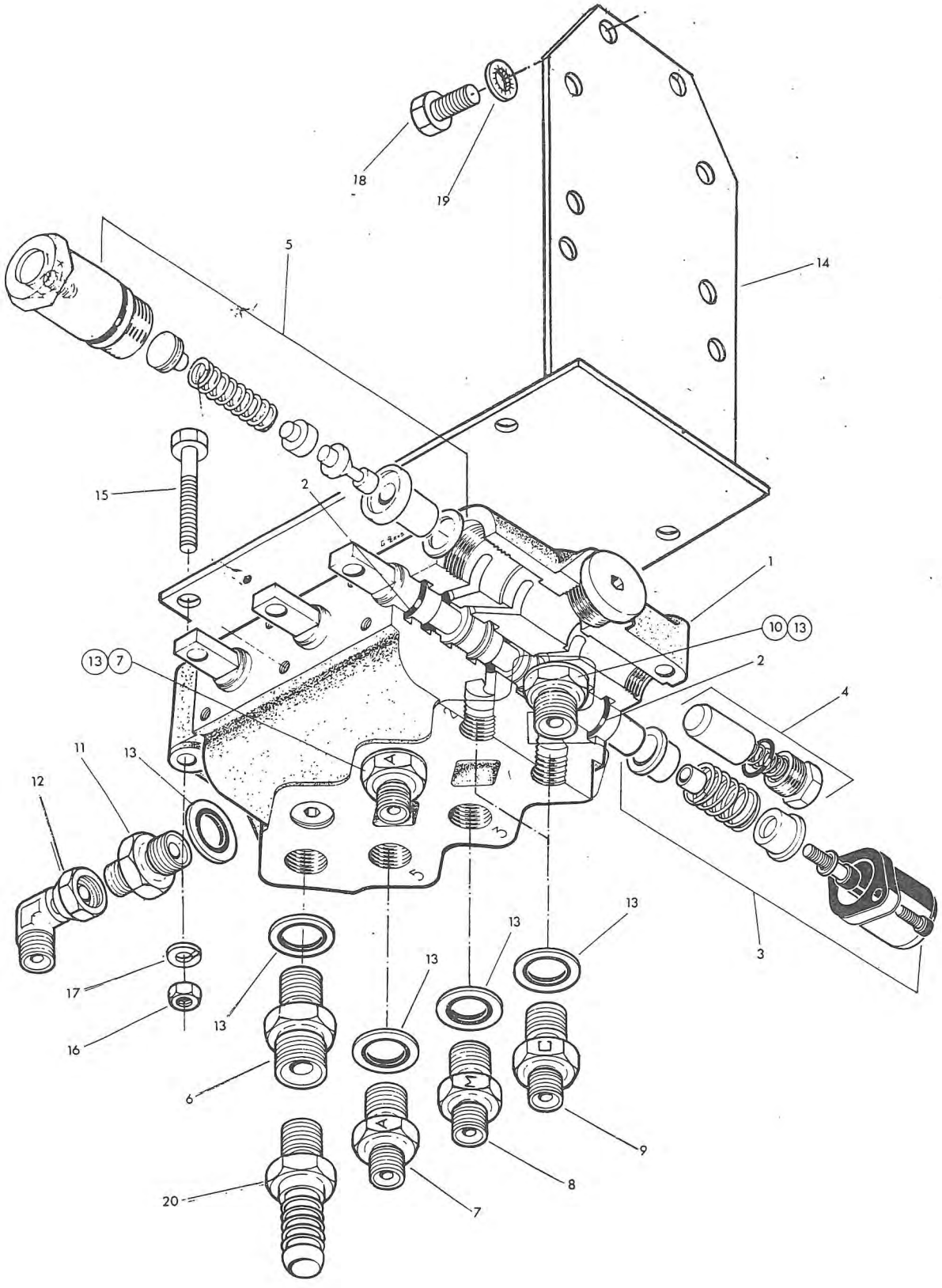
* Assembly note Items 6 & 7 to be assembled using PTFE tape

S.I. Only



Ref.	Part No.	Qty.	Description
	81-25-360		**ROTOR RELIEF VALVE ASSEMBLY (SI MODELS ONLY)**
1	81-25-352	1	Valve block
2	81-25-107	1	Relief valve cartridge c/w 'O' rings
3	86-00-505	1	'O' Ring
4	86-00-507	1	'O' Ring
5	85-81-136	3	Union 3/4" BSP MM
6	80-02-086	1	Adaptor 3/4" BSP - 1" BSP MM
7	86-50-106	4	Bonded seal 3/4" BSP
8	71-14-005	1	Swept 90 elbow 1" BSP F - 1" low pressure
9	80-03-001	1	Plug 3/8 BSP
10	86-50-103	1	Bonded seal 3/8" BSP
11	92-13-135	2	Bolt M10 x 65
12	91-13-005	2	Nut M10
13	91-00-205	2	Spring washer dia 10

PA 93 Si & Ti only



Ref.	Part No.	Qty.	Description
	81-30-372		**HYDRAULIC CONTROL ASSEMBLYFOR PA 93 SEMI INDEPENDENT MODEL**
	81-30-376	1	Valve c/w connections
1	81-30-252	1	Valve block c/w spools 'O' rings
2	86-00-112	6	'O' ring
3	81-30-022	1	Centering spring assembly
4	81-30-022	1	Non-return valve assembly
5	G381-2537	1	Relief valve assembly
6	60-00-112	1	Union 3/8" BSP - 1/2" BSP MM
7	81-30-046	2	Restrictor union A 1/4" BSP - 3/8 BSP-MM
8	81-30-066	1	Restrictor union M3/8" BSP - 1/4" BSP MM
9	81-30-048	2	Restrictor union 'C' 1/4" BSP- 3/8 BSP MM
10	60-00-113	1	Union 3/8 BSP M-M
11	85-81-115	1	Union 3/8 BSP -1/4 BSP M-M
12	85-81-190	1	Elbow 1/4 BSP
13	86-50-103	8	Bonded seal 3/8 BSP
14	71-93-039	1	Valve mounting plate
15	92-13-124	3	Bolt M8 x 60
16	91-13-004	3	Nut M8
17	91-00-204	3	Spring washer
18	93-13-045	2	Setscrew M10 x 20
19	91-00-305	2	Internal serrated washer dia 10
	86-00-163		**SEAL KIT**
	81-30-371		**HYDRAULIC CONTROL ASSEMBLYFOR PA 93 FULLY INDEPENDENT MODEL**

The parts list is identical to above with the following exceptions.

Second line becomes

81-30-375	1	Valve c/w connections

Item 6 becomes

81-25-008	1	Return connection 5/8" bore

Lever control. See following page

CONTROL HANDLE ASSY & CABLES

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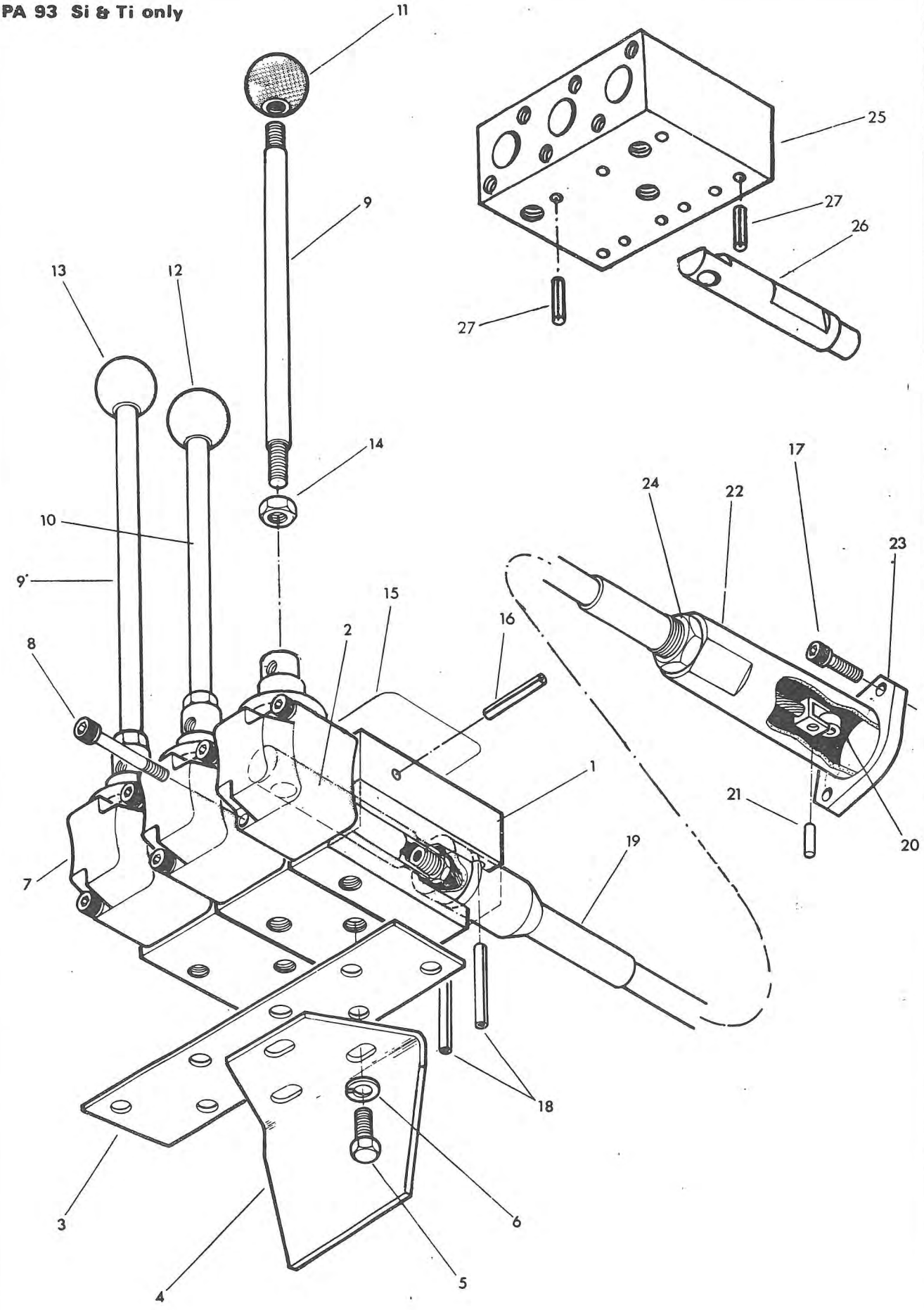
PA 93 Si & Ti only



Ref.	Part no.	Qty.	Description
	81-30-371		HYDRAULIC CONTROL ASSY. FORPA 93FULLY INDEPENDENT MODEL-continued
	81-30-372		HYDRAULIC CONTROL ASSY. FOR PA 93 SEMI INDEPENDENT MODEL ONLY- continued
1	81-30-052	3	Control block
2	81-30-053	3	Control block spindle
3	71-14-071	1	Control block mounting base
4	80-17-006	1	Mounting bracket
5	93-13-034	6	Setscrew M8 x 16
6	01-00-102	6	Thin washer 5/16" diameter
7	81-30-065	3	Lever pivot box assembly
8	92-43-072	6	Socket headed capscrew M5 x 35
9	71-09-131	2	Lever handle long
10	71-09-132	1	Lever handle short
11	09-03-112	1	Lever knob-Reach (Red)
12	09-03-113	1	Lever knob -Angle (Green)
13	09-03-114	1	Lever knob - Lift (Yellow)
14	91-13-004	3	Hexagon nut M8
15	81-19-010	1	Operating instruction label
16	04-25-540	3	Spring dowel dia 5 x 40
17	93-43-022	6	Socket headed capscrew M5 x 12
18	04-25-540	3	Spring dowel o 5 x 40
19	81-25-046	3	Cable & spacer and pin, sleeve,flange etc.
20	71-15-158	1	Spool eye bush
21	71-15-160	1	Pin
22	71-15-162	1	Sleeve
23	81-25-050	1	Flange
24	01-31-006	1	Thin locknut 5/8 UNF

* An alternative cable assembly may be fitted depending on supply availability

The complete assembly is interchangeable and thus retains the same assembly Part Number i.e 81-25-046

Individual cable components are not interchangeable thus before ordering spares the cable must be correctly identified.

The cable listed above is manufactured by **"BOWDEN"** and is **BLACK**

The alternative cable manufactured by **"TELEFLEX MORSE"**is **RED** and consists of

19	81-25-046	1	Cable assembly c/w sleeve, flange etc.
20	81-25-049	1	Cable sleeve
21	81-25-050	1	Flange
22	81-25-051	1	Pin
23	80-17-014	1	Thin locknut M16 x 1.5 pitch
24	80-17-004	1	Spool eye bush

Spares Note

Some machines may be supplied with an alternative "single block" control unit

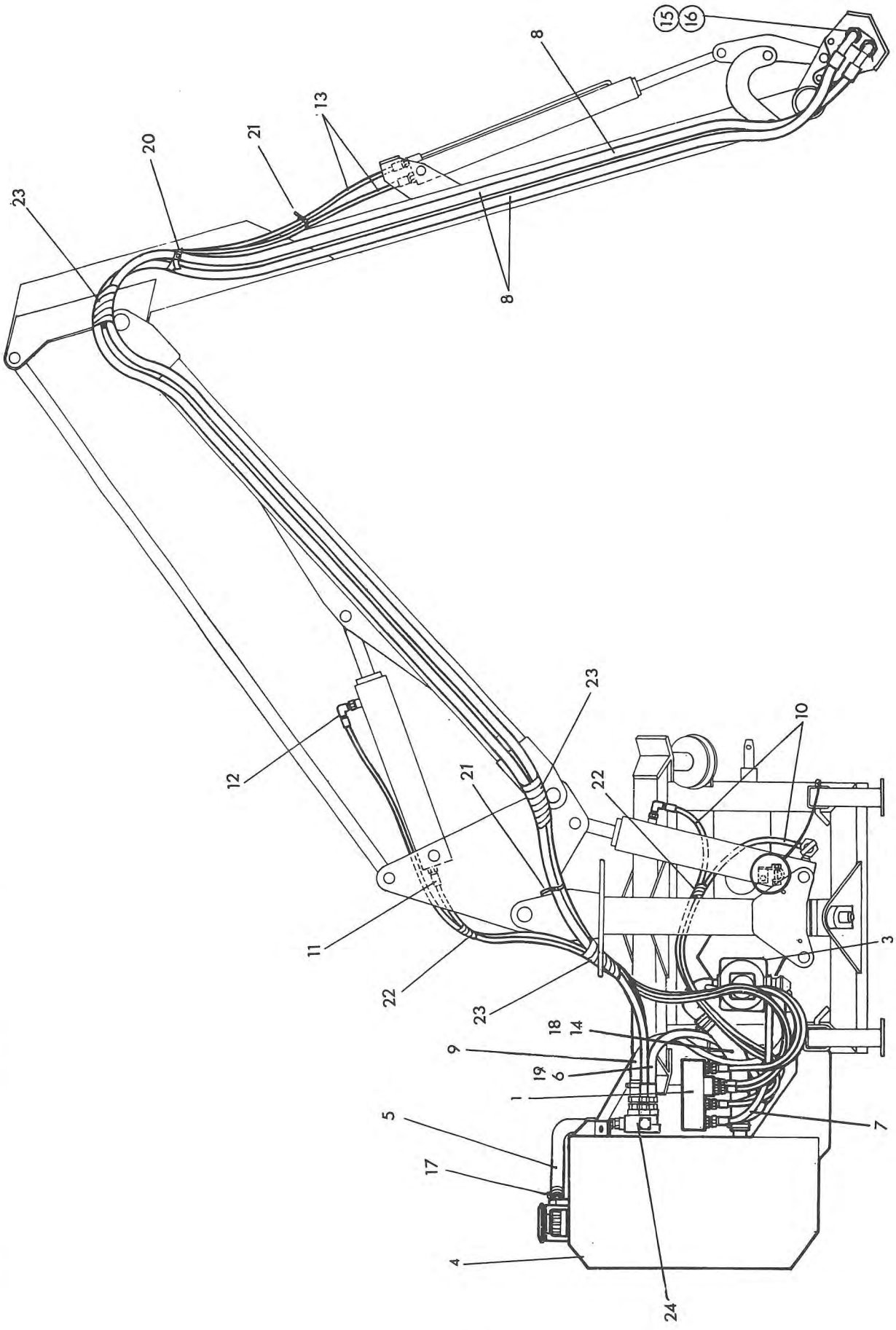
Item 1 is replaced by Item 25 Part No. 81 30 391 1 off

Item 2 is replaced by Item 26 Part No. 81-30-144 3 off

Item 16 and 18 are replaced by item 27 Part No. 04 25 525 9 off

Item 5 now becomes 3 off and item 6 becomes 3 off..

PA 94 only

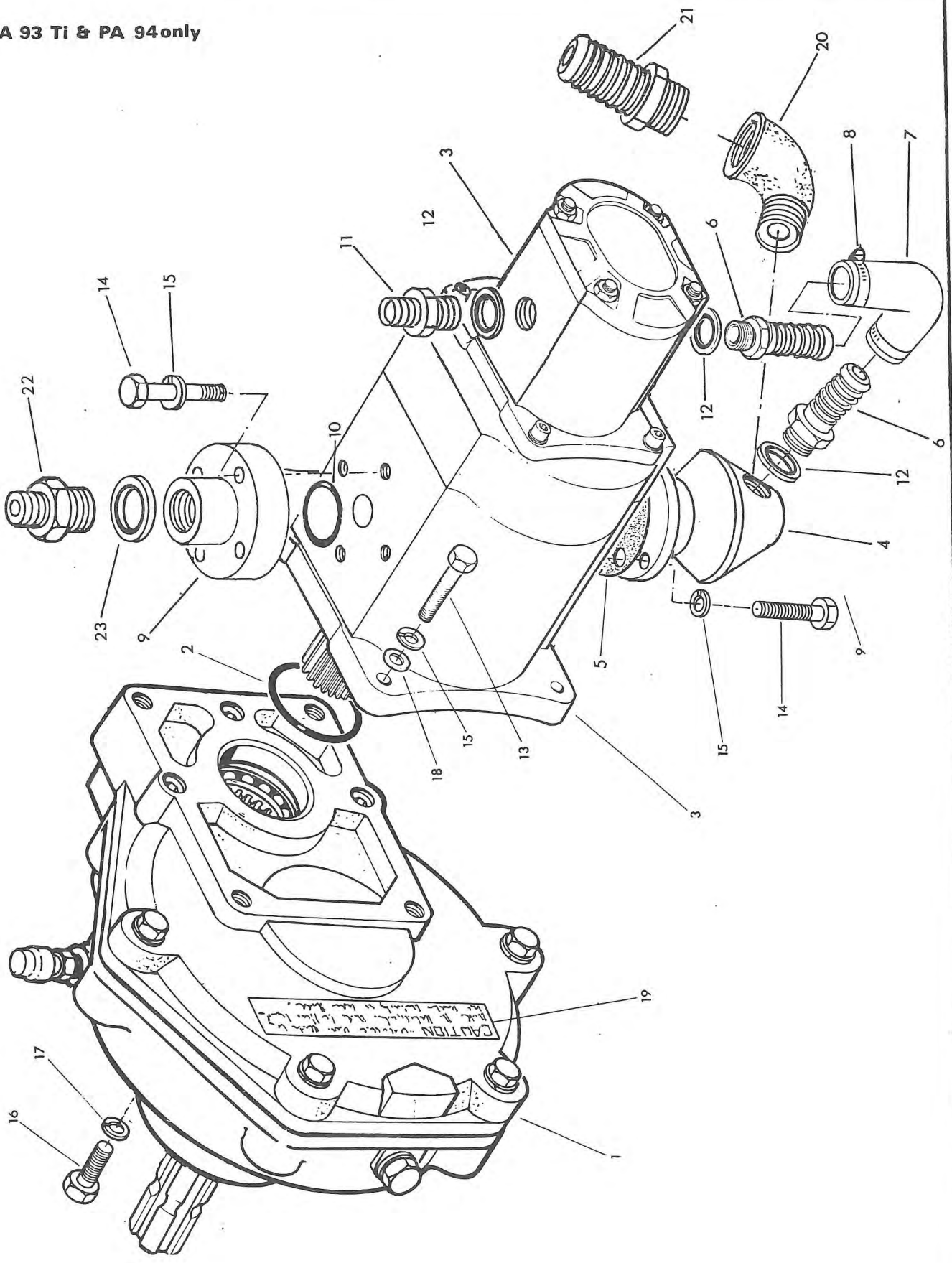


Ref	Part.No	Qty	Description
			HYDRAULIC INSTALLATION PA 94 ONLY
1	81-30-367	1	Control valve assembly (see pages 60-63)
2	71-09-319	1	Control mounting assembly (not illus-see page 43)
3	80-13-399	1	Gearbox/pump assembly (see page 56)
4		1	Tank assembly - (see page 68)
5	85-00-828	1	Hose -low pressure 1" bore x 28" long-rotor
6	85-01-158	1	Hose 5/8" bore x 24" long. Return to rotor valve
7	85-11-253	1	Hose 3/8" BSP SF-SF x 18" long-Supplyfrom pump
8	85-38-065	2	Hose 3/4" BSP SF-90F x 200 long-motor supply
9	85-38-045	1	Hose 3/4" BSP SF-90 Fx 29" long. Pump.RC valve
10	85-35-022	2	Hose 1/4 "BSP SF-90F x 48" long-Lift
11	85-15-132	1	Hose 1/4" BSP SF-SF x 64" long Reach base
12	85-35-142	1	Hose 1/4" BSP SF-90F x 80" long-Reach gland
13	85-15-122	2	Hose 1/4' BSP SF-SF x 162" long-Angle
14	85-01-122	1	Hose 1 1/2" bore x 11 3/4" long-suction from tank
15*	85-81-247	1	Adaptor 3/4" BSP M-F
16	86-50-106	1	Bonded seal 3/4" BSP
17	09-04-106	4	Hose clip - 1" bore hose
18	09-04-107	4	Hose clip - 1 1/2" bore hose
19	09-04-204	2	Hose clip - 5/8" bore hose
20	71-06-187	2	Hose tie
21	71-35-084	2	Hose tie
22	72-13-005	2	Hose armour coil 3/8" dia
23	71-93-026	3	Hose armour coil 3/4" dia
24	82-25-358	1	Rotor control valve. (See page66)

* Spares Note
After April 1990 item 15 is deleted

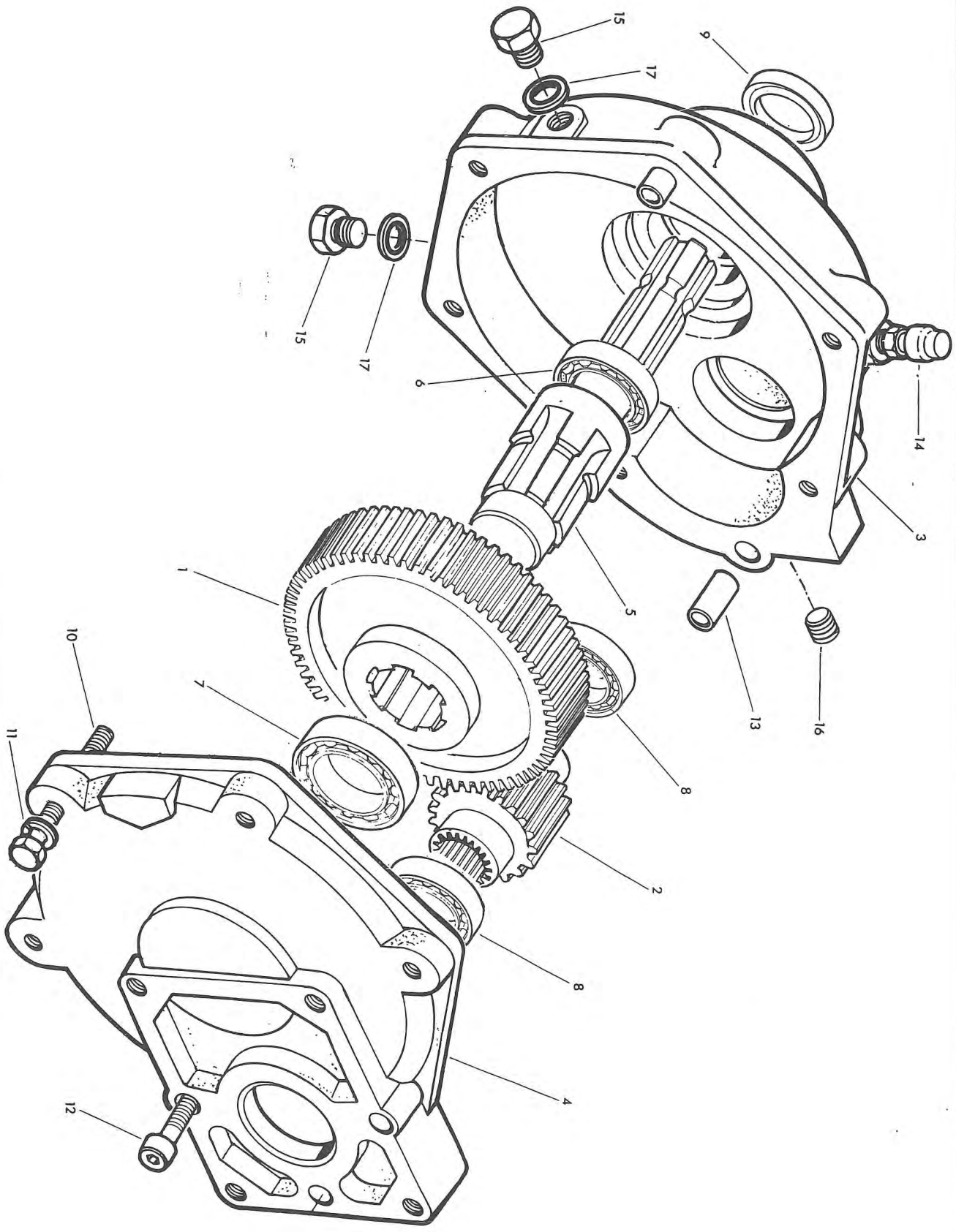
Model		McCONNEL	Temeside Works, Ludlow, Shropshire, SY8 1JL, England. Telephone: (0584) 3131. Telex 35313. Facsimile: (0584) 6463.
GEARBOX, PUMP			

PA 93 Ti & PA 94only



Ref.	Part No.	Qty.	Description
	80-13-399		**GEARB0X-PUMP ASSEMBLY FOR PA94 & PA93 with independent hydraulic**
1	86 13 360	1	Gearbox 4.59:1 (see page 58)
2	86-00-523	1	'O' ring
3	82-01-462	1	Tandem pum CPL 33/57
4	80-13-398	1	Suction adaptor
5	80-13-023	1	Gasket
6	80-02-059	2	Adaptor 1/2" BSP - 5/8" low pressure
7	85-01-091	1	Connecting hose
8	09-04-204	2	Hose clip
9	80-13-088	1	Pump flange
10	86-00-119	1	'O' ring
11	60-00-112	1	Adaptor 1/2" BSP - 3/8 BSP MM
12	86-50-104	3	Bonded seal 1/2" BSP
13	92-13-094	4	Bolt M8 x 45
14	93-13-054	8	Setscrew M8 x 25
15	91-00-204	12	Spring washer dia 8
16	93-13-056	4	Setscrew M12 x 25
17	91-00-206	4	Spring washer dia 12
18	81-00-104	4	Plain washer dia.8
19	80-13-081	1	Gearbox label
20	85-81-280	1	Elbow 3/4" BSPM -1"BSPF
21	85-81-281	1	Adaptor 1" BSPM - 1 1/2' low pressure
22	85-81-136	1	Union 3/4" BSP MM
23	86-50-106	1	Bonded seal 3/4" BSP
	86-99-215		**PUMP SEAL KIT**

Assembly Note Item 21 and 20 to be assembled using PTFE tape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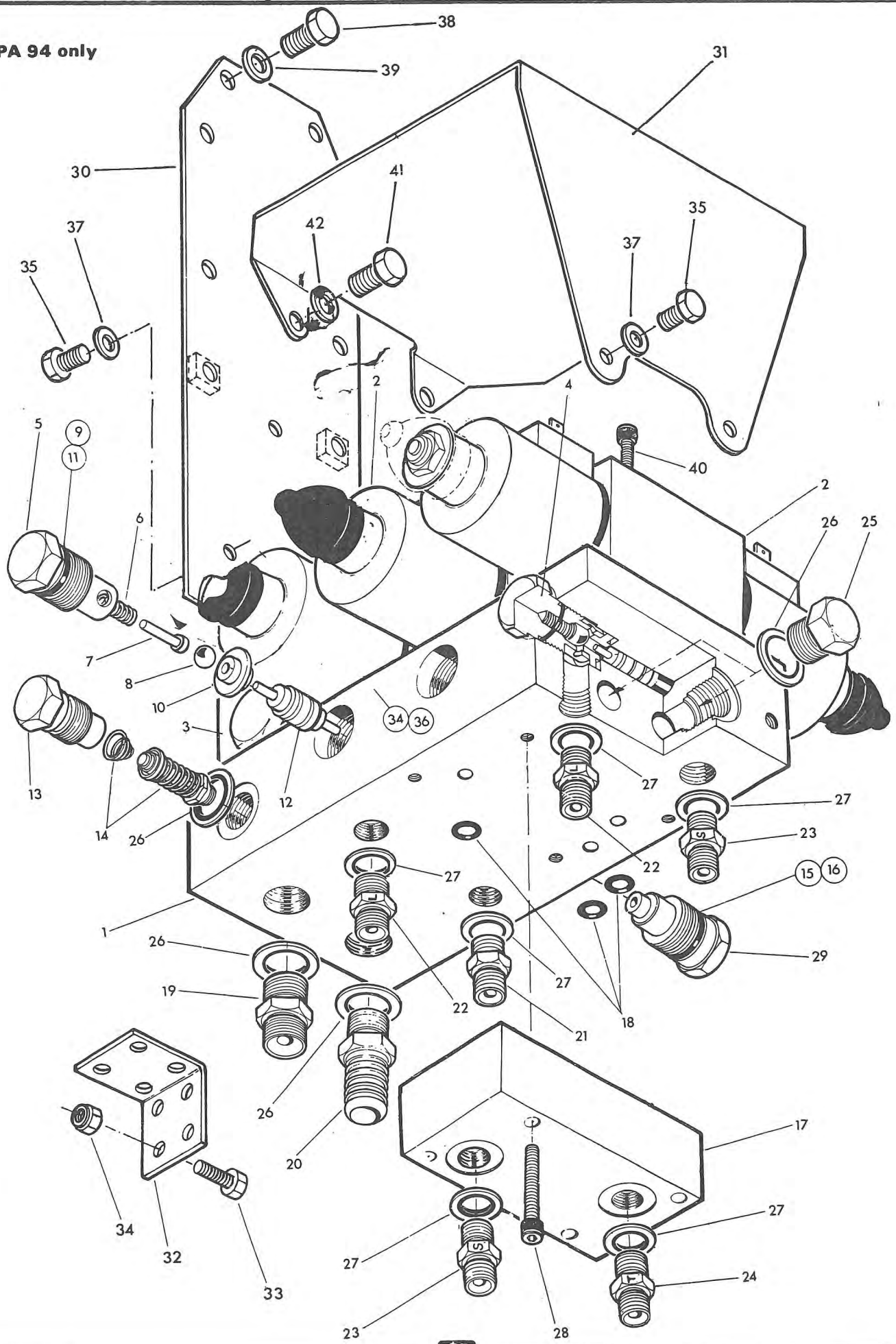
Ref.	Part No.	Qty.	Description
	80-13-360		**GEARBOX ASSEMBLY (4.59:1)**
1	80-13-384	1	Gear 78 teeth
2	80-13-385	1	Pinion 17 teeth
3	80-13-370	1	Gearbox casing - input
4	80-13-371	1	Gearbox lid - output
5	80-13-374	1	Input Shaft 1 3/8" dia x 6 spline
6	06-00-063	1	Bearing
7	06-00-064	1	Bearing
8	06-00-065	2	Bearing
9	86-29-151	1	Shaft seal 2 1/8" x 1 3/8" x 1/2"
10	92-13-064	4	Bolt M8 x 30
11	91-00-204	4	Spring Washer dia 8
12	93-43-074	3	Capscrew socket headed M8 x 35
13	80-13-375	2	Sleeve dowel
14	80-13-376	1	Breather
15	85-81-133	2	Plug-level and drain 1/4 BSP
16	85-82-042	1	Taper plug 1/4 BSPT
17	86-50-102	2	Bonded seal 1/4" BSP

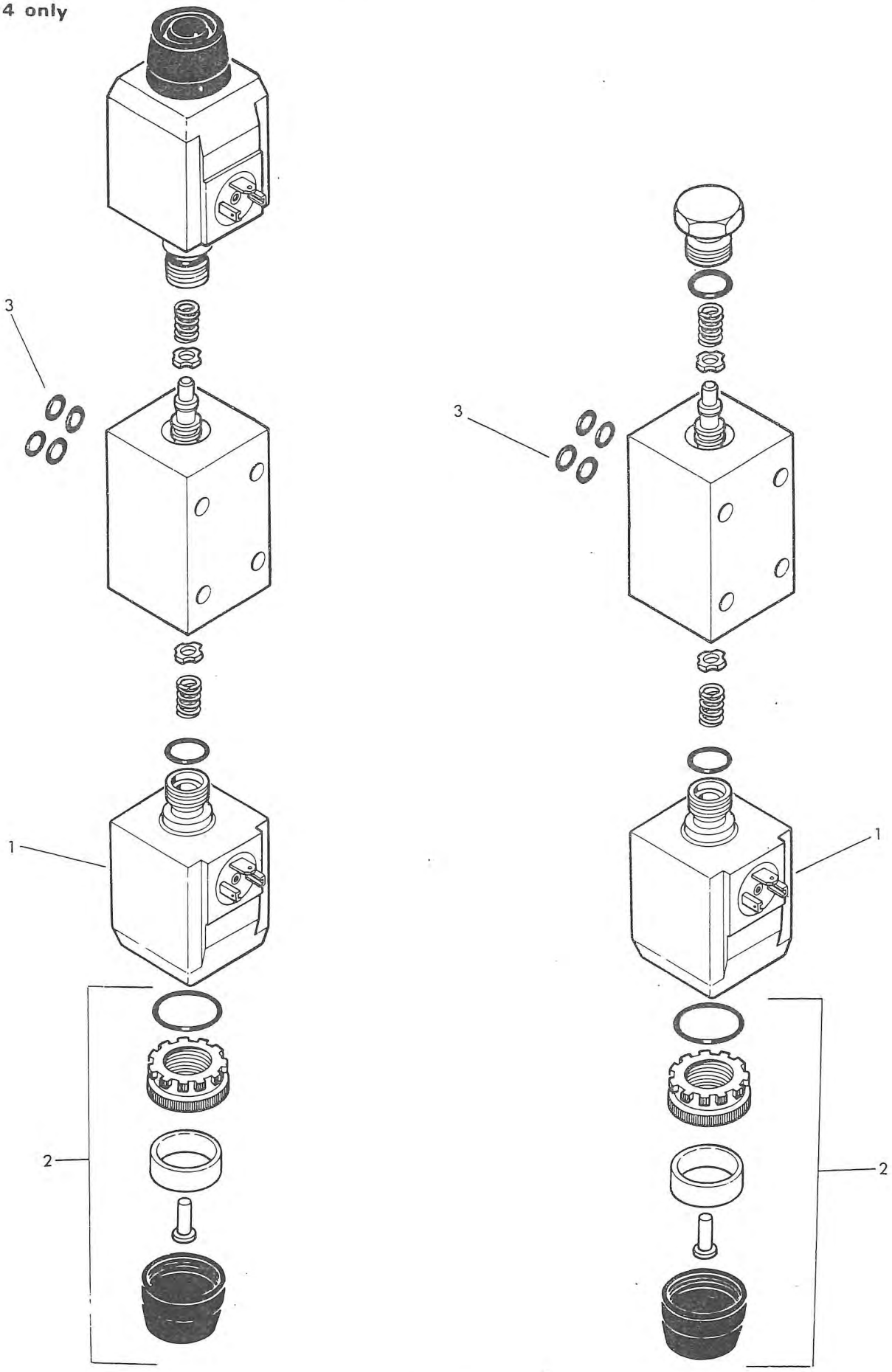
Model		McCONNEL	Temeside Works, Ludlow, Shropshire, SY8 1JL, England.
CONTROL VALVE			

PA 94 only



Ref.	Part No.	Qty.	Description
	81-30-367		**ELECTRIC CONTROL PACK FOR PA94 ONLY**
	81-30-318		Solenoid/manifold assembly compr:
1	81-30-321	1	Manifold block
2*	81-30-455	3	Double solenoid valve} See page 62
3*	81-30-456	1	Single solenoid valve}
4	81-30-090	5	Check valve assembly compr:-
5	81-30-025	1	Check valve cap
6	81-14-045	1	Spring
7	81-30-089	1	Spring guide
8	09-05-509	1	Steel ball dia 9
9	87-00-644	1	'O' ring
10	81-30-088	1	Check valve seat
11	87-09-644	1	Anti extrusion rin
12	81-30-087	3	Actuator
13	81-30-032	1	Relief valve cap
14	81-30-124	1	Relief valve c/w spring
15	87-09-644	1	Anti extrusion ring
16	87-00-644	1	'O' ring
17	81-30-322	1	Hose plate c/w 'O' rings
18	87-00-511	3	'O' ring
19	60-00-113	1	Union 3/8 BSP-MM
20	81-25-008	1	Return connection
21	80-02-117	1	Union 1/4BSP - 1/4" BSP M-M
22	81-30-038	2	Restrictor Union 'L' 1/4" BSP M-M
23	81-30-037	2	Restrictor Union 'S' 1/4" BSP M-M
24	81-30-103	1	Restrictor union 'T' 1/4' BSP M-M
25	80-03-001	2	Plug 3/8" BSP
26	86-50-103	5	Bonded seal 3/8 BSP
27	86-50-102	6	Bonded seal ›" BSP
28	92-43-082	20	Socket headed setscrew M5 x 40
29	81-30-078	1	Check valve gallery plug
30	71-94-003	1	Valve mounting plate
31	71-94-277	1	Valve cover
32	81-25-070	1	Flail on/off lever mounting bracket
33	93-13-044	2	Setscrew M8 x 20
34	91-43-004	1	'Clevelok' nut M8
35	93-13-034	5	Setscrew M8 x 16
36	71-09-151	1	Cable clamp
37	91-00-204	4	Spring washer dia 8
38	93-13-045	2	Setscrew M10 x 20
39	91-00-305	2	Int. seratted washer ø 10
40	92-43-102	16	Capscrew, socket headed M5 x 40
41	93-13-035	2	Setscrew M10 x 16
42	91-00-205	2	Spring washer dia10

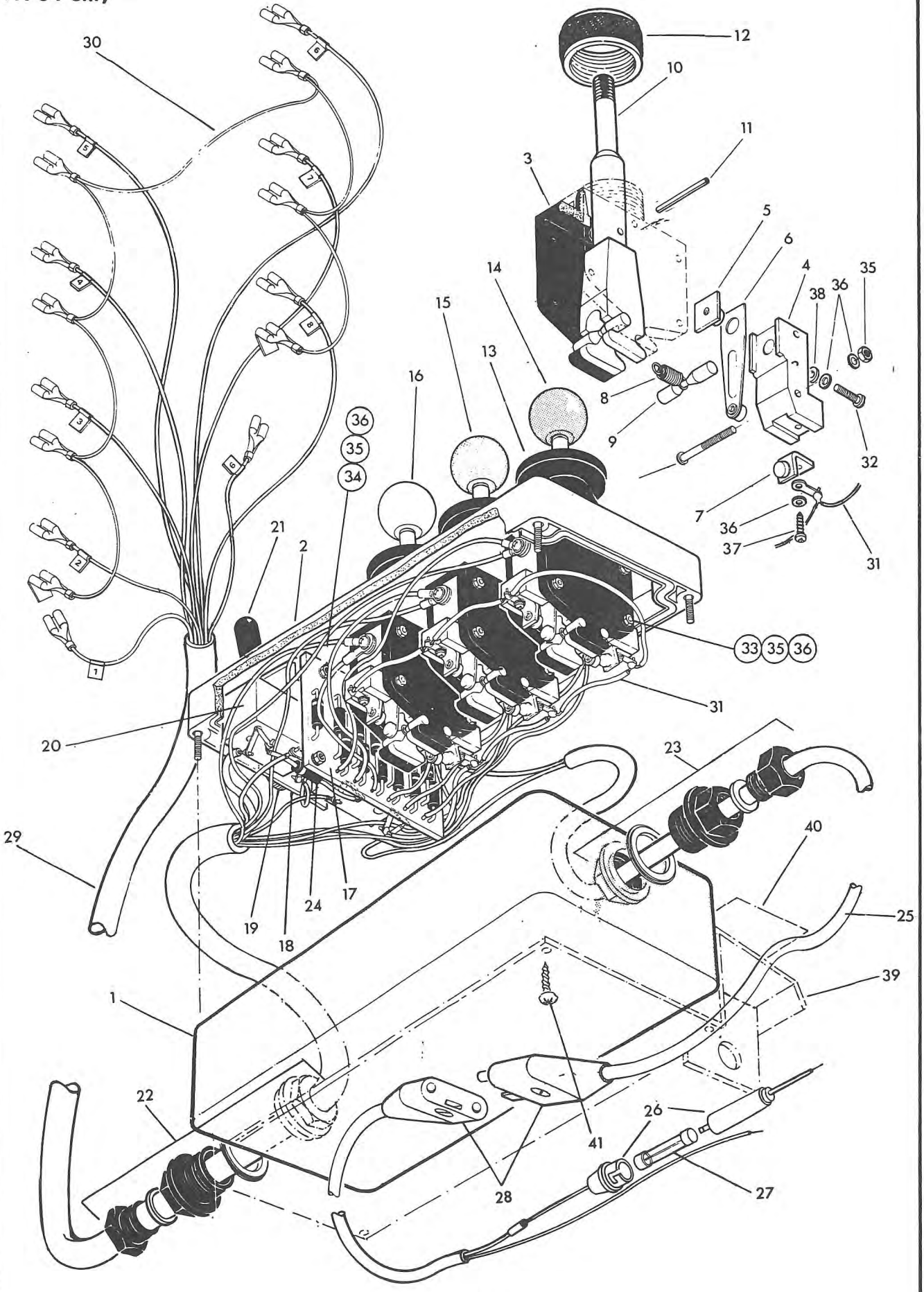
PA 94 only



	81-30-455		**DOUBLE SOLENOID VALVE**
1	81-30-175	2	Coil
2	81-30-176	2	Manual overide kit
3	87-00-511	4	'O' ring
	81-30-456		**SINGLE SOLENOID VALVE**
4	81-30-175	1	Coil
5	81-30-176	1	Manual overide kit
6	87-00-511	4	'O' ring
	86-99-224		**SEAL KIT**

McCONNEL

PA 94 only



Ref.	Part No.	Qty.	Description
	81-30-367		**ELECTRIC CONTROL PACK FOR PA94 -cont**
	84-02-280		Switch box assembly compr:-
	84-02-281	1	Box assembly
1	84-02-263	1	Box body
2	84-02-282	1	Box lid c/w screws
3	84-02-285	3	Body
4	84-02-106	6	Contact holder
5	84-02-109	6	Spring contact retainer
6	84-02-113	6	Spring contact
7	84-02-108	6	Fixed contact
8	84-02-101	3	Spring
9	84-02-111	6	Bar
10	84-02-256	3	Lever
11	04-25-320	3	Spring dowel dia. 3 x 20
12	84-02-051	3	Bezel ring
13	84-02-022	3	Lever gaiter
14	84-02-026	1	Knob red
15	84-02-027	1	Knob green
16	84-02-028	1	Knob yellow
17	84-02-115	1	Printed circuit assembly
18	84-02-110	1	Bracket c/w diode
19	84-02-281	1	Diode
20	84-02-023	2	Toggle switch
21	84-02-024	2	Switch cover
22	84-02-029	1	Gland assembly - large
23	84-02-042	1	Gland assembly - small
24	84-02-025	1	Diode BY 255
25	84-02-284	1	Power supply harness compr:-
26	84-02-114	1	Fuse Holder
27	84-02-037	1	Fuse - 10 amp
28	84-02-062	1	Plug / socket
29	84-02-283	1	Main harness c/w common link
30	84-02-058	1	Common link harness
31	84-02-116	1	Common link - switchbox
32	92-00-005	6	Screw - posidrive pan-head M3 x 12
33	92-00-006	12	Screw- posidrive pan-head M3 x 25
34	92-00-007	3	Screw-posidrive pan-head M3 x 10
35	91-00-013	15	Hexagon nut-plated M3
36	91-00-400	27	External serrated washer dia 3
37	84-02-119	6	Self tapping screw No 4 type 'B' x 10m/m long
38	84-02-280	6	Plain washer dia 3
39	84-02-260	1	Switch box mounting bracket c/w label
40	84-02-117	1	Instruction label
41	28-00-203	4	Self tapping screw No 10 x 1/2" long

Model	
ROTOR CONTROL VALVE	

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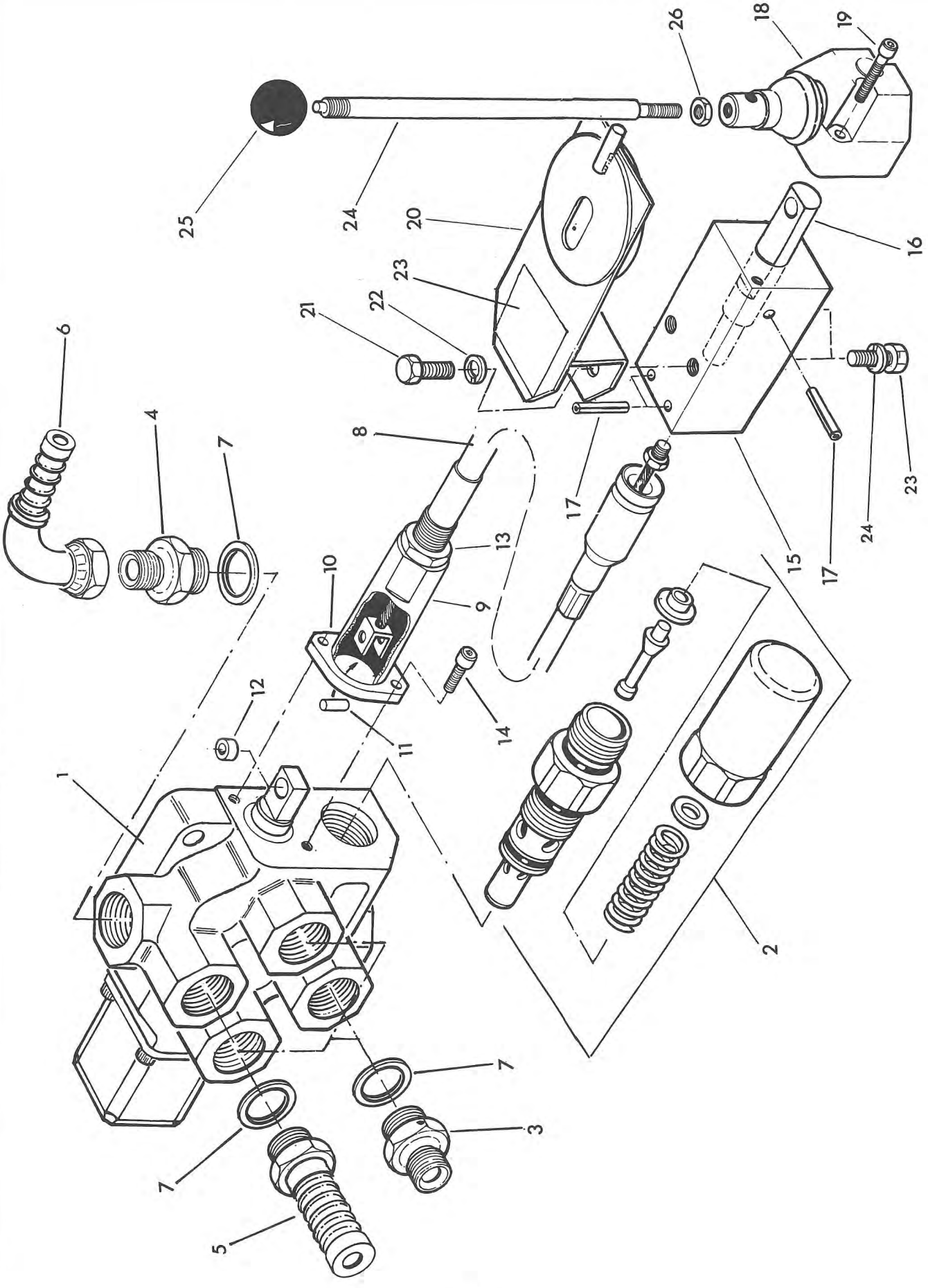
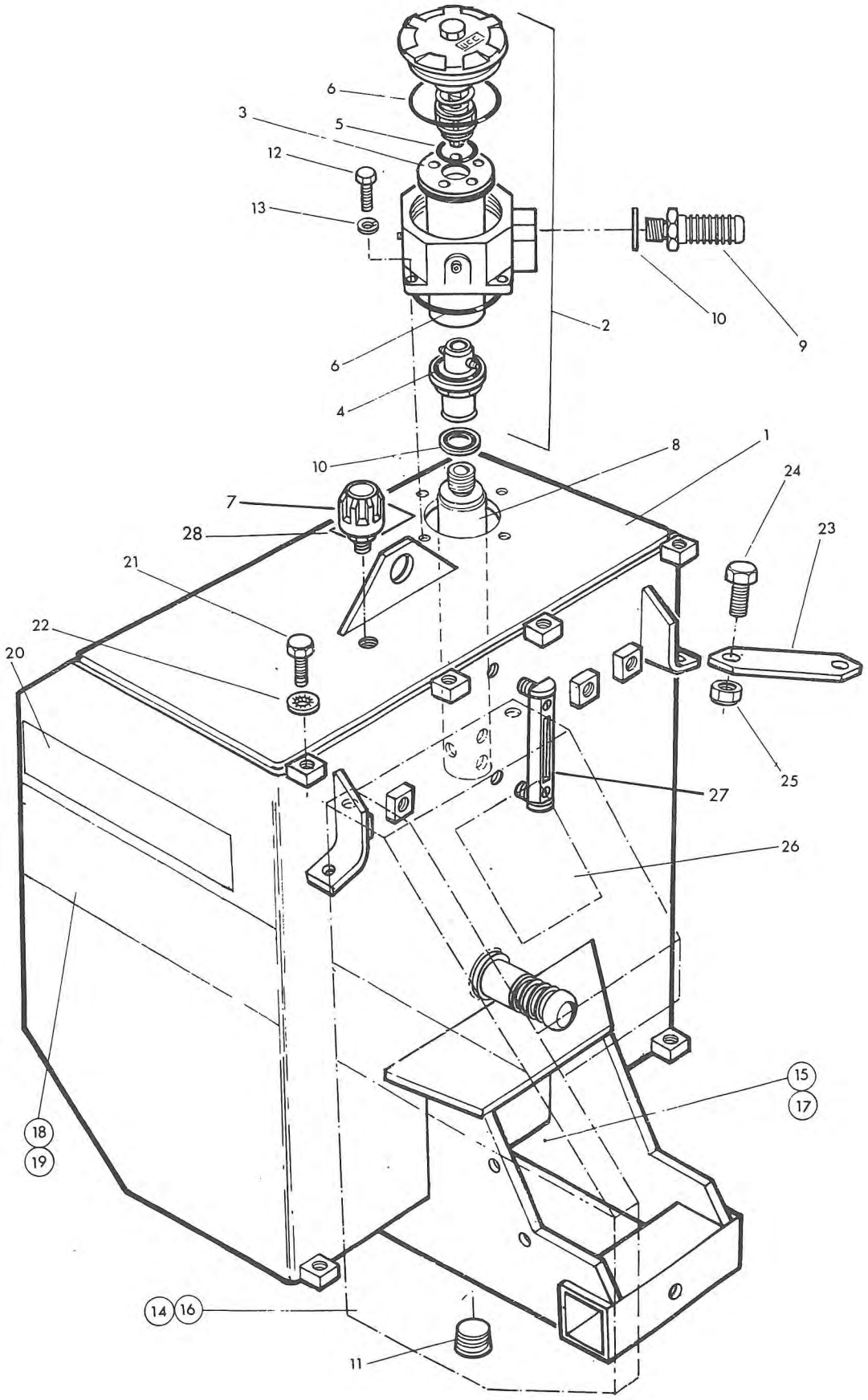
Shropshire, SY8 1JL, England.



Ref.	Part No.	Qty.	Description
	81-25-358		**ROTOR CONTROL VALVE ASSEMBLY**
1	81-25-355	1	Rotor control valve
2	81-25-107	1	Relief valve 3000 (210 Bar)
3	85-81-270	3	Union 3/4 BSP MM
4	80-02-086	1	Adaptor 3/4" BSP - 1" BSP MM
5	85-81-269	1	Adaptor 3/4" BSP x 5/8" low pressure connection
6	71-14-005	1	Elbow 1" BSP F- 1" low pressure connection
7	86-50-106	5	Bonded seal 3/4" BSP
8	81-25-102	1	Cable assembly c/w sleeve flange etc
9	81-25-097	1	Sleeve
10	81-25-098	1	Flange
11	81-25-099	1	Pin
12	81-25-100	1	Bush
13	01-31-006	1	Thin locknut
14	93-43-033	2	Capscrew - socket headed M6 x 16
15	81-25-093	1	Control block
16	81-30-053	1	Control spindle
17	05-25-525	3	Spring dowel dia 5 x 25
18	81-30-065	1	Pivot box assembly
19	92-13-072	2	Capscrew - socket headed M5 x 35
20	81-25-089	1	Lever control gate
21	93-13-034	4	Setscrew M8 x 16
22	91-00-204	4	Spring washer dia 8
23	12-90-338	1	Operating label
24	71-14-072	1	Lever
25	09-03-121	1	Knob - black
26	91-13-004	1	Thin nut M8
	86-99-218		**SEAL KIT**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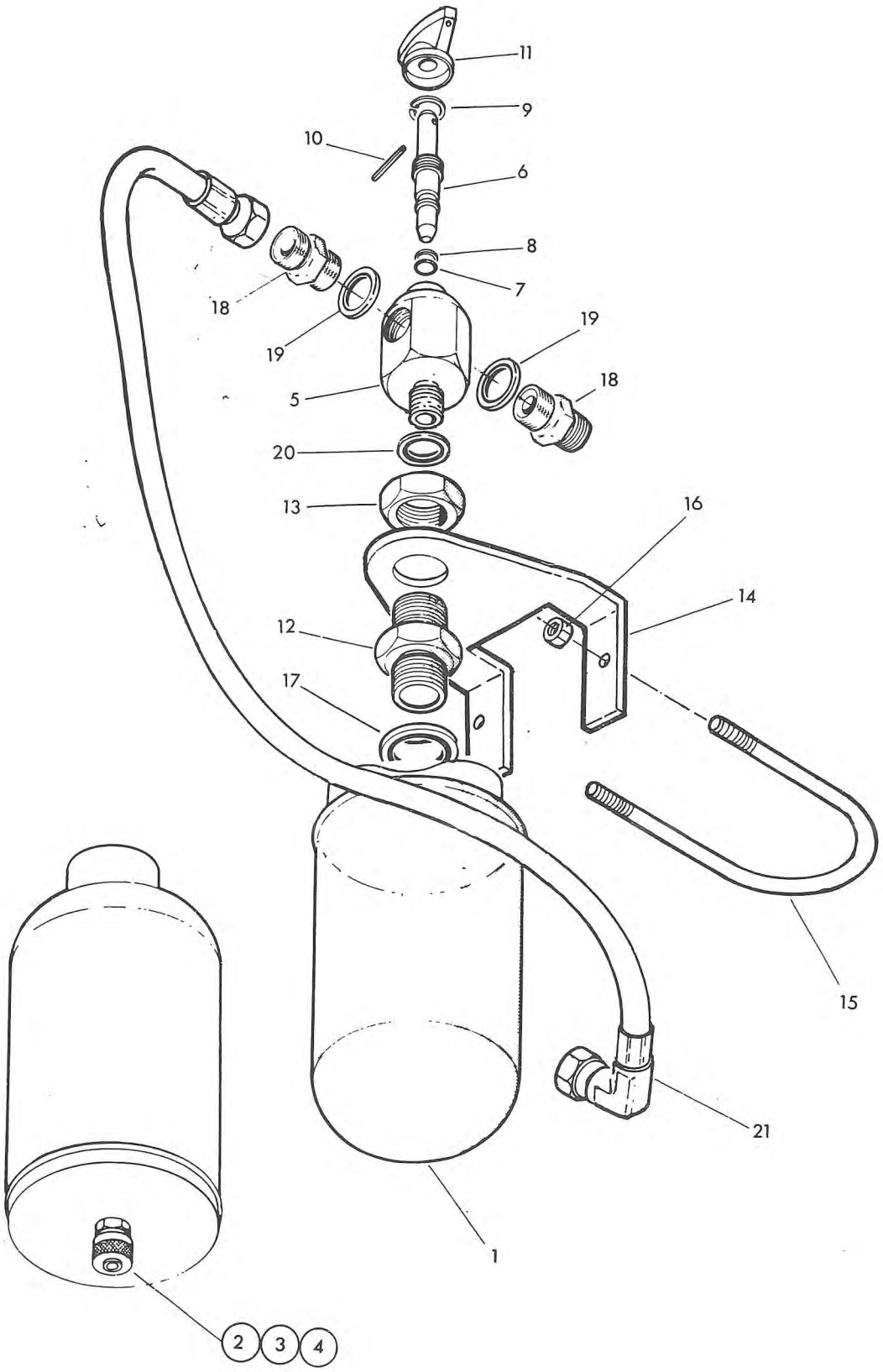
Ref.	Part No.	Qty.	Description
			HYDRAULIC TANK & COVER PLATE (for machines after July 1988)
	71-95-316		Oil tank assembly compr:-
1*	71-95-315	1	Oil tank
2	84-01-053	1	Return filter assy. inc. elementand 'O' rings
3	84-01-054	1	Element
4	86-00-135	1	'O' ring
5	86-00-126	1	'O' ring
6	87-00-223	2	'O' ring
7	84-01-055	1	Breather assembly
8	71-92-019	1	Return pipe
9	85-81-246	1	Return connection
10	86-50-106	2	Bonded seal 3/4" BSP
11	85-81-203	1	Drain plug 1" BSP
12	93-13-054	4	Setscrew M8 x 25
13	91-00-204	4	Spring Washer dia 8
14	71-93-327	1	Cover plate R-Hand
15	12-90-283	1	'Stripe'
16	71-93-328	1	Cover plate - not illustrated
17	12-90-284	1	'Stripe' - not illustrated
18	12-90-286	1	'Tank stripe - PA94'
19	12-90-287	1	'Tank stripe - PA93'
20	12-90-253	1	Sticker 'McConnel'
21	93-13-045	3	Setscrew M10 x 20
22	91-00-305	3	Internal serrated washer dia 10
23	71-92-029	1	Tank strap
24	93-13-056	2	Setscrew M12 x 25
25	91-43-006	2	Self locking nut M 12
26	71-09-143	1	Solenoid wiring label - PA 94 only
27	84-01-048	1	Oil level guage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Ref.	Part No.	Qty.	Description
	81-26-273		**LIFT FLOAT KIT**
1	81-26-271	1	Accumulator (600 psi)
2	81-26-015	1	Charge valve assembly c/w 'O' ring
3	81-26-016	1	Charge valve core
4	86-00-103	1	'O' ring
	71-35-007	1	Tap assembly compr:-
5	71-35-294	1	Tap body
6	71-35-006	1	Tap spindle
7	86-00-107	1	'O' Ring
8	86-09-107	1	Anti extrusion ring
9	04-16-110	1	Internal circlip
10	04-20-820	1	Spring dowel
11	81-08-006	1	Knob
12	85-81-205	1	Adaptor
13	85-81-151	1	Back nut
14	81-26-277	1	Bracket
15	81-26-031	1	'U' bolt M8
16	91-43-004	2	Self locking nut M8
17	85-50-106	1	Bonded seal 3/4" BSP
18	85-81-115	2	Adaptor 3/8 BSP 1/4" BSP M-M
19	86-50-103	2	Bonded seal 3/8 BSP
20	85-50-102	1	Bonded seal 1/4" BSP
21	85-35-062	1	Hose 1/4 " BSP SF-90 F x 15" long

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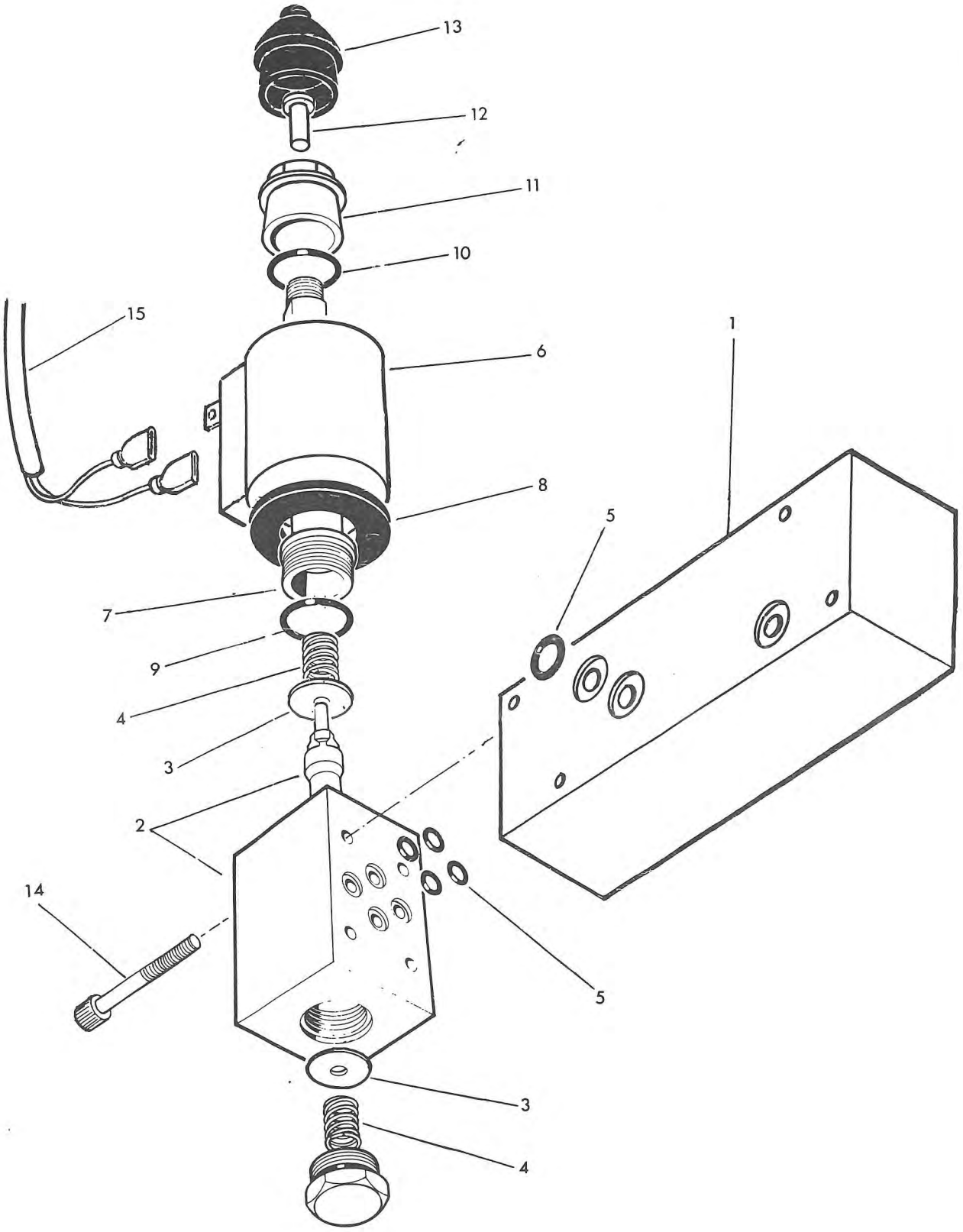
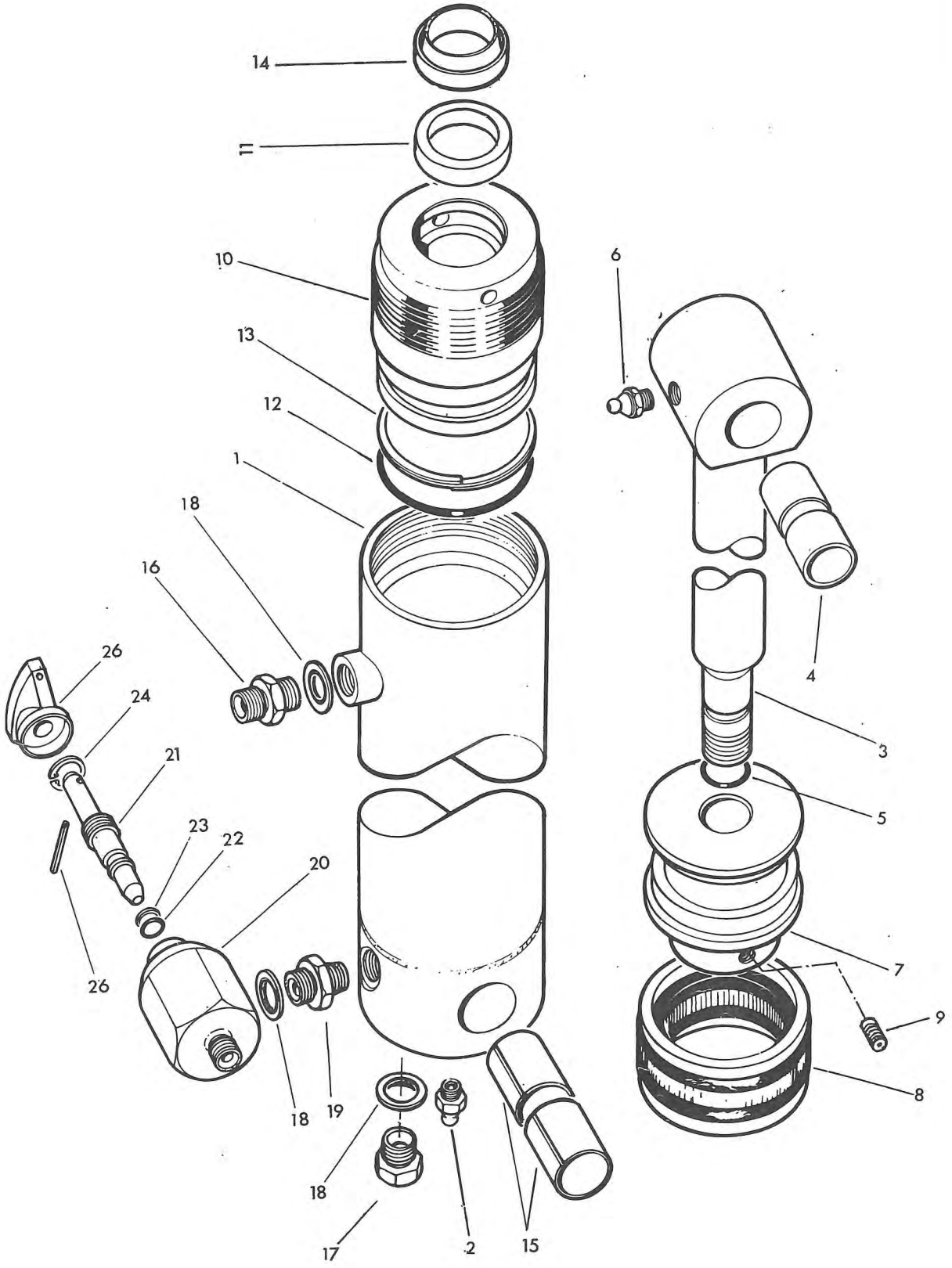
Optional extra for grass cutting. PA 94 only



Ref.	Part No.	Qty.	Description
	81-26-261		**ANGLE FLOAT KIT -Optional extra for ground cutting - available on PA94 only**
1	81-30-323	1	Float valve block
	81-30-314	1	Angle float solenoid compr:-
2	81-30-091	1	Block c/w spool
3	84-02-069	2	Washer
4	84-02-070	2	Spring
5	87-00-511	4	'O' ring
	84-02-125	1	Solenoid compr:-
6	84-02-126	1	Coil
7	84-02-127	1	Solenoid tube
8*	84-02-128	1	Gasket
9	86-00-507	1	'O' ring
10*	84-02-088	1	'O' ring
11	84-02-129	1	Shround nut
12*	84-02-086	1	Push pin
13*	84-02-087	1	Weather gaiter
14	92-43-102	4	Setscrew socket headed M5 x 50
15	84-02-059	1	Wiring harness
	86-99-212		***Comprises weather shield kit**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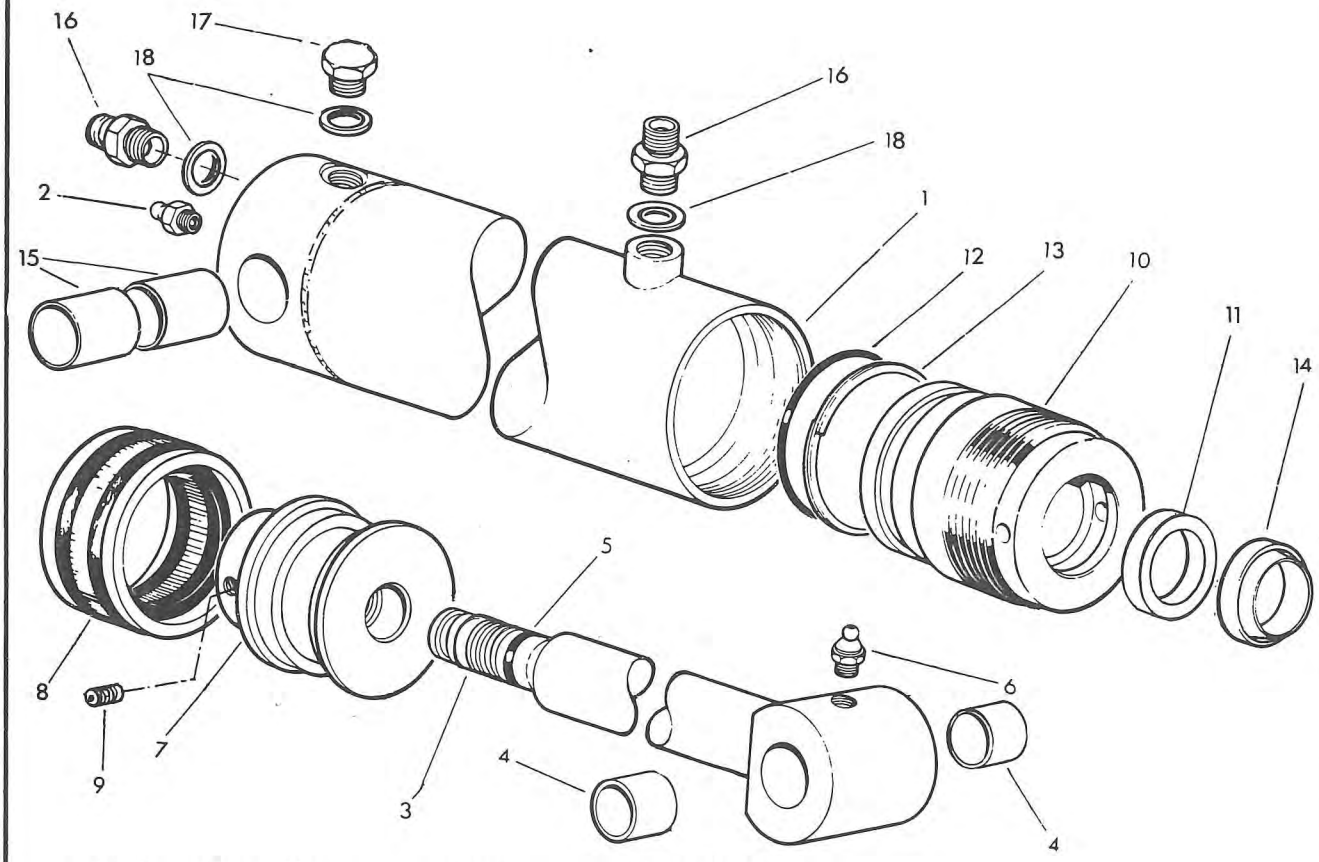
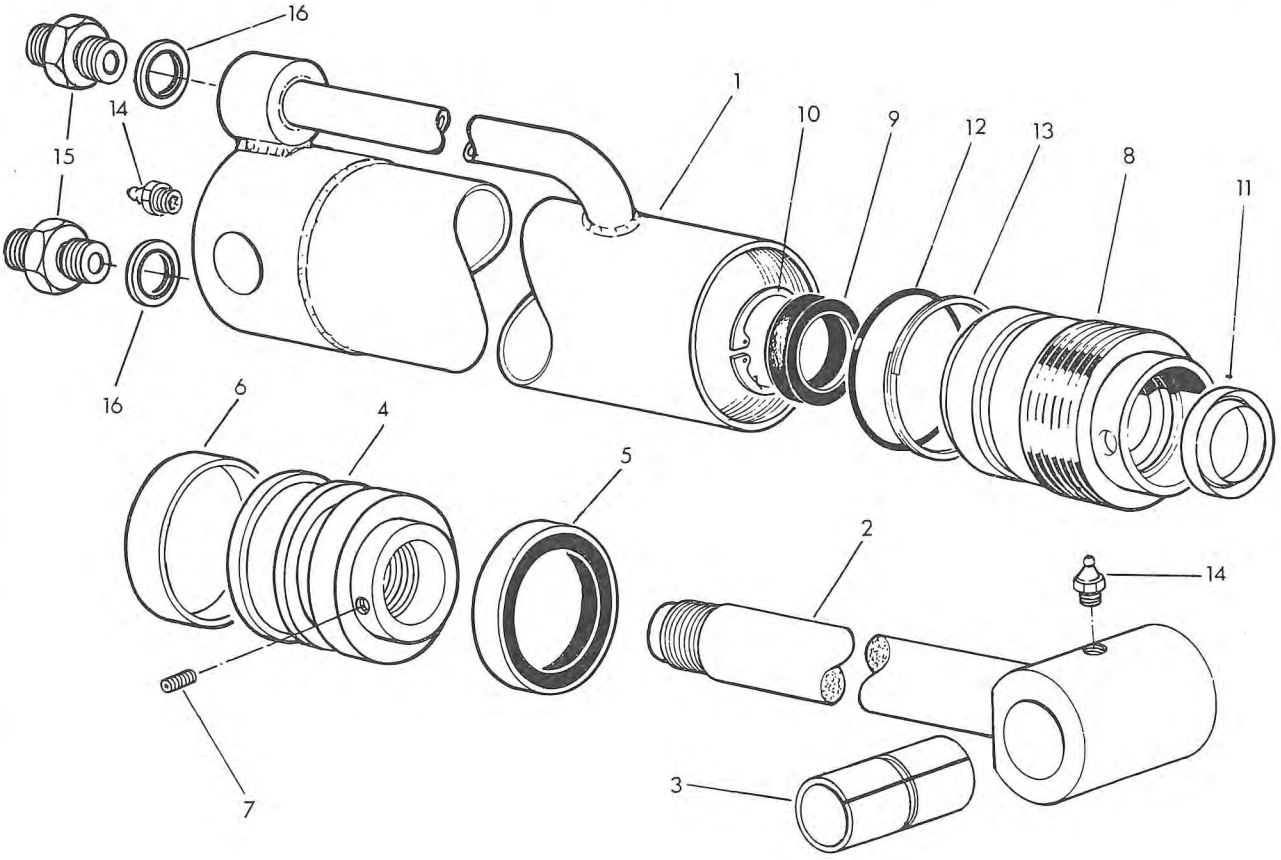
Ref.	Part No.	Qty.	Description
	71-93-333		**LIFT RAM ASSEMBLY**
	71-93-332		Ram basic compr:-
1	71-35-283	1	Ram cylinder
2	09-01-121	1	Greaser 1/8 BSP - straight
3	71-93-029	1	Piston rod
4	60-12-032	2	Bush
5	86-00-119	1	'O' ring
6	09-01-121	1	Greaser 1/8" BSP- straight
7	71-35-004	1	Piston
8	86-38-740	1	Piston seal
9	93-63-023	1	Grub screw M6 x 12 socket headed
10	71-35-282	1	Gland housing
11	86-29-164	1	Gland seal
12	87-00-740	1	'O' ring
13	87-09-740	1	Anti extrusion ring
14	86-29-147	1	Wiper
15	71-01-134	2	Bush - ram base
16	85-81-115	1	Union 1/4 BSP - 3/8 BSP M-M
17	80-03-001	1	Plug 3/8 BSP
18	86-50-103	3	Bonded seal 3/8 BSP
19	80-05-007	1	Taper adaptor 3/8 BSPT
	71-35-005	1	Lock tap assembly compr:
20	71-35-284	1	Tap body
21	71-35-006	1	Tap spindle
22	86-00-107	1	'O' ring
23	86-09-107	1	Anti extrusion ring
24	04-16-110	1	Internal circlip
25	81-08-006	1	Tap knob
26	04-20-820	1	Spring dowel 1/8" dia x 1 1/4" long
	86-99-187		**SEAL KIT**

Assembly note Fully tighten item 9 and centre pop edge of hole to retain.



Ref.	Part No.	Qty.	Description
	71-93-334		**REACH RAM ASSEMBLY**
	71-93-332		Ram base compr:-
1	71-35-283	1	Ram cylinder
2	09-01-121	1	Greaser 1/8 BSP-straight
3	71-93-029	1	Piston rod
4	60-12-032	2	Bush
5	86-00-119	1	'O' ring
6	09-01-121	1	Greaser 1/8 BSP - straight
7	71-35-004	1	Piston c/w seal and grub screw
8	86-38-740	1	Piston seal
9	93-63-023	1	Grub screw M6 x12 socket headed
10	71-35-282	1	Gland housing
11	86-29-164	1	Gland seal
12	87-00-740	1	'O' ring
13	87-09-740	1	Anti extrusion ring
14	86-29-147	1	Wiper
15	71-01-134	2	Bush - ram base
16	85-81-115	2	Union 1/4 BSP - 3/8 BSP M-M
17	80-03-001	1	Plug 3/8 BSP
18	86-50-103	3	Bonded seal 3/8 BSP
	86-99-187		**SEAL KIT**

Assembly note Fully tighten item 9 and centre pop edge of hole to retain.



Ref.	Part No.	Qty.	Description
	75-60-344		**ANGLING RAM ASSEMBLY**
1	71-35-292	1	Cylinder
2	71-35-009	1	Rod
3	71-05-050	1	Bush
4	75-60-095	1	Piston
5	86-29-187	1	Piston seal
6	86-29-188	1	Bearing ring
7*	93-63-023	1	Grub screw scoket head M6 x 12
8	71-35-291	1	Gland housing
9	86-29-148	1	Gland seal
10	04-16-240	1	Internal circlip
11	86-29-149	1	Wiper seal
12	86-00-302	1	'O' ring
13	86-09-302	1	Anti extrusion ring
14	09-01-121	2	Greaser
15	85-81-169	2	Union 1/4 BSP MM
16	86-50-102	2	Bonded seal 1/4" BSP
	86-99-188		**SEAL KIT**

*** Assembly note**

Tighten fully and centre punch edge of hole to secure.

F. W. McConnel Limited, Temeside Works, Ludlow, Shropshire, SY8 1JL, England.
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