

Operating Instructions and Parts Book for

FLAIL TRIMMERS: 400

Edition No: 8044-06-97

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THIS MANUAL IS TO BE HANDED TO THE CUSTOMER BEFORE
THE MACHINE IS USED FOR THE FIRST TIME.

TWOSE

Twose of Tiverton Ltd.
Lowman Green
Tiverton
Devon
EX16 4JT
Tel: (01884) 253691
Fax: (01884) 255189

All dimensions and capacities mentioned in this book are approximate.
In pursuance of the company's policy of constant development the right is reserved to depart, without notice, from any detail illustrated or specified in this book, without incurring the obligation to provide such modifications on machines previously delivered.

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GENERAL.

SPECIFICATION FOR 400 MACHINES

Overall Height (machine folded for transport)	1.95 m
Overall Width (machine folded for transport taken from tractor's centre line)	0.99 m
Overall Length of machine (inc. Head)	1.29 m
Total Weight of machine (inc. Oil)	0.64 T

Note - Dimensions are approximate and will vary from tractor to tractor.

AIRBORNE NOISE EMISSIONS

The equivalent continuous A-weighted sound pressure level at the workstation (tractor seat) does not exceed 74dB(A). This value was recorded cutting hedges using a Dawe 1405C Sound Meter (BS 3489) on a Massey Ferguson 3090 Tractor complete with M/F Safety Cab.

GENERAL INFORMATION

NOTE:- The provision of this information is a requirement of the Health and Safety at Work Act 1974.

NOTE:- This handbook has been written to help the operator and service engineer/mechanic to use and understand the machine fully, safely and efficiently. It is written bearing in mind the Health and Safety requirements and the new CE requirements which came into force from January 1st 1995.

NOTE:- The handbook/manual is supplied in a waterproof plastic outer cover to prevent damage from rain, condensation, etc. The cover of the handbook includes its own part number, which includes information as to the type of machine and issue date of the manual in question.

NOTE:- DANGER - It is very important that the handbook/manual is read thoroughly throughout, and is completely understood before attempting to attach, use or maintain the machine in any way.

Further copies of this handbook/manual can be obtained from:

Twoose of Tiverton Ltd.
Lowman Green
Tiverton
Devon
EX16 4JT
Tel: (01884) 253691
Fax: (01884) 255189

SAFETY NOTES AND WARNINGS

Throughout the handbook the following sub headings are used to draw attention to various points of importance.



**DANGER
WARNING**

This is used to draw attention to very important instructions which **MUST** be followed precisely to avoid injury or death.

CAUTION

This is used to draw attention to instructions which **MUST** be followed to avoid damage to operator, machine, process or the environment.

NOTE

This is used to highlight points used for supplementary information.

ABOUT THE MACHINE

This machine is a Hedgetrimmer of the type known throughout the agricultural industry as a "Flail Hedgetrimmer".

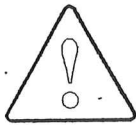
The machine is intended to be attached to an agricultural vehicle by means of the three-point-linkage couple-up system. The linkage is in turn is locked into position (to prevent movement between tractor and Hedgetrimmer) by means of two sets of adjustable tie bars - forming an 'A' frame to ensure a rigid attachment/lock system.

The purpose for its production and its sole intention is to cut/trim hedges, banks, verges, etc.

AT NO TIME must this machine be used for anything other than, or to do any job other than, that for which it has been designed (see above) - In particular:

NEVER USE JIB ARMS AS A CRANE

HEALTH AND SAFETY POINTS.



**DANGER
WARNING**

Never attempt to assemble, couple up, or operate machinery until you understand fully the functions, controls and safety precautions required, as shown in the operators manual.



**DANGER
WARNING**

Always follow tractor safety operations and instructions VERY carefully.



**DANGER
WARNING**

NEVER TAKE RISKS



**DANGER
WARNING**

**NEVER LEAVE TRACTOR SEAT WHILST
ENGINE - OR MACHINE IS RUNNING**



**DANGER
WARNING**

**NEVER USE HEDGETRIMMER BOOM
ARMS AS A CRANE IN ANY FORM.**



**DANGER
WARNING**

It may be necessary to stabilise the whole unit once coupled up - by ballasting tractor's rear wheels and/or fitting counterbalance weights to tractor.

Tractor rear wheel track setting could also be widened as a further method of increasing stability. (Check with agent).

CAUTION - Be aware of all warning and instruction stickers on the machine as care must be taken and instructions obeyed.

CAUTION - Contact your dealer should you need advice, assistance, or if you do not understand any part of the manual or machine.
NEVER ASSUME - if you are not sure - ASK.

CAUTION - A machine **MUST NOT** be altered or modified in any way without permission.
No liability will be accepted in respect of a machine which has been modified without the manufacturers permission.



DANGER
WARNING

Never attempt to service/work on/adjust in any way any machinery that is in an unsupported or poorly supported state.

Most machines will need additional support in order that the worker's safety is not reliant only on hydraulic or other services of the machine or tractor.

For example: Any three point linkage mounted machinery
Front Loaders
Digger Booms
Hedgetrimmer booms
etc.

Always ensure that machinery is safely supported and propped in position.



DANGER
WARNING

Always ensure that the wheels of any wheeled implement or machine are chocked firmly and that the implement will not move, before attempting to service or work on the implement/machine in any way or form.



DANGER
WARNING

Always **SWITCH OFF** tractor engine before attempting to carry out adjustment, service repairs or inspections on machinery.



**DANGER
WARNING**

Always be aware of your surroundings, and operate machinery accordingly. Beware of confined or tight areas and restricted height due to buildings, overhangs, etc. Drive and operate machines with weather conditions in mind; such as sun, rain, ice, snow, wind, etc. **Make allowances for all situations.**

CAUTION - Never operate machine in a reckless or uncaring manner. Respect other road users and be patient.

HIGHWAY USE

When operating machinery on the Highways the operator should consult the local Highways Department regarding notification and approval, as rules and regulations will vary from local authority area to area. The Highways Department regulations must be followed.

NOTE:- In general it is expected that the tractor/implement will follow (go with) the flow of traffic - but this should be confirmed by consulting the local Highway Authority rules.

Always use 'STOP/GO' boards or whatever system the local Highways Department advise and ensure that these are positioned correctly in relation to the machine's operating area.

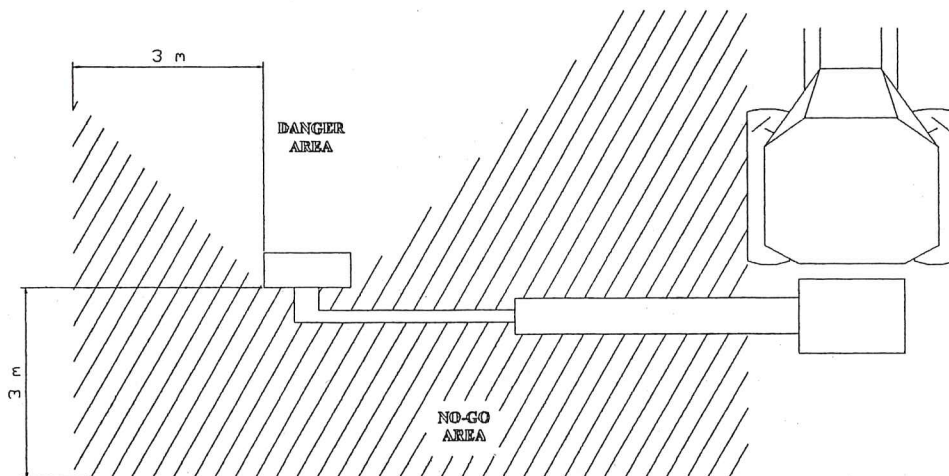
Have respect for passing traffic and keep any passing lane free from obstruction. Allow time for walkers and cyclists to clear the site. Consult the Lighting Regulations for correct procedures when using or travelling on the highway.

CAUTION Never carry passengers on machinery or on tractors. Ensure bystanders/onlookers are kept well away from the operational area of the machine.

NOTE:-

NEVER ALLOW ONLOOKERS/BYSTANDERS TO STAND IN FRONT OF CUTTER HEAD OR IN LINE WITH FLYING DEBRIS.

A sideways and rearward NO-GO area should be kept:



CAUTION - Never operate cutting rotor with blades looking towards operator or towards others. Cutters must always be operated towards hedge or bank/verge etc.

CAUTION - Never walk underneath the machine for any reason, especially if unit is still operating.

PARKING MACHINE.

When machine is being removed from tractor linkage and being 'parked up' it is essential that a good firm base and level site be found.

CAUTION Always chock and prop machine to ensure a good firm position for parking. Ensure that stand legs of machine are correctly locked into position.

CAUTION Never allow children to play on, or around, parked machinery.

CAUTION

Never wear loose fitting or ragged clothing which could get caught in machinery or controls.



DANGER
WARNING

Always ensure safety screens are fitted into position to protect operator from flying debris.

CAUTION

Ensure visibility through cab-screens is clear at all times.

CAUTION

Ensure workstation controls, joysticks, cable levers etc. are positioned correctly to suit operator, and not obstructing other driving functions. Controls must NOT obstruct entry and exit to cab.

Worn-out and spent waste oil, grease and other noxious substances must always be disposed of in suitable and legally approved dumping containers suitable for the waste in question.

CAUTION

Always dispose of discarded or worn out parts thoughtfully - by disposing of them in an approved and specified legal scrap site, bin or skip.

If the head is not closed-up during transportation from job to job and especially between bouts, whip can be caused in the booms due to uneven surfaces, etc. Such whip will stress the machine much more than typical work.

CAUTION

Ensure that the whole machine is folded in as close to the tractor as possible for transportation.

SAFETY OF CONTROL LEVERS/JOYSTICK CONTROLLERS.

The control levers which operate the hydraulic boom cylinders on the machine will automatically centralise themselves in the centre-off position when the control lever is released. This reduces the chance of unwanted movement or overrun of booms.

NOTES.

AMENDMENTS.

AMENDMENT	DATE	DETAILS

GENERAL INSTRUCTIONS

1. Before attaching any machine to a tractor or loader make sure that implement is still standing firmly on a good solid level site. (This will depend of course on how well the site was chosen previously).

Check that any wheels are chocked correctly and that supports/props are in position where necessary to prevent booms, etc. from dropping.

2. Before and during the manoeuvring of the tractor or vehicle to attach machinery/implements, make sure that NO other persons are in the vicinity.

Keep other persons well clear and make known your intentions, all the while keeping a sharp lookout whilst reversing and aligning machines for coupling up.

3. Always ensure that brakes are applied correctly to secure the tractor into the selected position. This will prevent the vehicle from moving off on its own to cause injury and damage.

4. Make sure that the lift arms and top link ball ends of the tractor are properly fitted to the machine/implement by using the correct adaptor sleeves where necessary. Retaining pins of the correct type should be used on all three point linkage points.

Secure pins with relevant pin and ring assembly.

5. If the machine is of the drawbar type - check that the hitch on the tractor is in good condition and that the hitch pin used is of the correct size and type, and is properly secured when fitted.

6. Should it become necessary to make any adjustments or service the machine while raised on the tractor linkage, or raised on a front end loader, trestles or suitable supports MUST be positioned to support machine to prevent accidental dropping of lift arms, loader arms or mechanical failure.

MACHINES MUST ALWAYS BE PROPPED AND CHOCKED

7. Never attempt to work on, adjust or service/repair machinery of any kind whilst it is still running or working. Always stop the machine and **STOP THE TRACTOR ENGINE** before any adjustments/service/repairs begin.

SWITCH OFF TRACTOR ENGINE BEFORE LEAVING TRACTOR SEAT

8. In transit always use transport stays or locking devices where provided.

If, as in the case of some longer machines, the unit is transported lengthwise, make sure that the front of the tractor is suitably ballasted to maintain stability.

A method of achieving this is to add suitable weights to a correctly specified and fitted front weight frame.

9. Always use machines in a sensible and reasonable manner and do not attempt to use them for work for which they are not intended. Avoid overloading and abusing them as this can cause damage to machine and tractor and can be very dangerous.

10. When unhitching/detaching a machine from a three point linkage or from a front end loader ensure that any stands or legs are securely positioned. The machine must be parked where it will not be a safety hazard or cause annoyance to others.

Make sure that chosen parking site is firm and level.

11. Carry out regular periodic maintenance, always with safety in mind.

12. Ensure regular maintenance procedures are maintained for the lifetime of the machine.

13. **HEALTH AND SAFETY RULES AND REGULATIONS MUST BE ADHERED TO IN ALL AGRICULTURAL RESPECTS.**

INTRODUCTION.

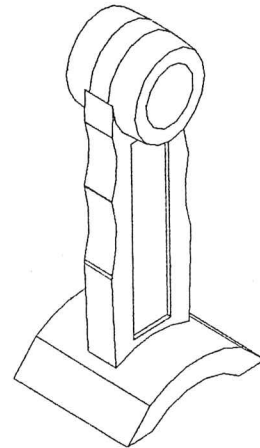
1. The construction is of welded steel fabricated assemblies with various options available covering such things as controls, hydraulics, heads, booms, etc. The cutting head is of a robust construction.

2. The cutting flail blades offered are:-

(a) Heavy, double-edged design, one piece.

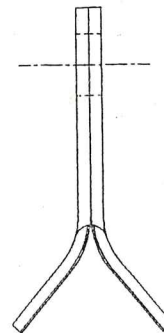
- For UP or DOWN cutting

- Suitable for all types of conditions and growth.



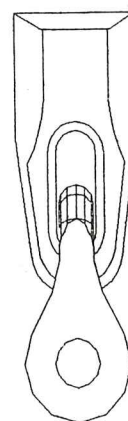
(b) Back to back rigid, one piece blade, in pairs.

- For UP or DOWN cutting, grass mowing and trimming.



(c) Back to back on shackle, in pairs.

- For UP or DOWN cutting of grass and mowing.



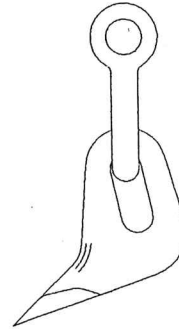
(d) Heavy single edge blade flail (twisted pattern).

- For grass cutting and hedge trimming



(e) Boot Flail (on shackle).

- For grass cutting and hedge trimming



3. The drive is direct from the hydraulic motor to the rotor, utilising a large splined coupling.
4. A hydraulically powered breakback system is built into all models. This protects components when encountering obstructions, but can also act as an aid when cutting in difficult and awkward corners.
5. Two parking stand legs are fitted to machine. Each can be moved from work to parking by the removal and replacement of one pin while the stand pivots on the other.
7. The use of a single-acting main lift ram prevents any chance of the head unit being powered into the ground which would cause undue stresses. This protects the whole machine and is most useful when cutting verges, banks, etc. An optional accumulator float kit allows most of the weight of the head to be carried by the booms even when cutting undulating terrain.
8. Hydraulic hoses on the machines have been made as unobtrusive as possible to minimise the risk of their snagging.
9. The control valve slice for angling the cutting head has a detent facility for head flotation which is of value when cutting verges, banks, etc.

10. The 'nose' or front guard of the flail head incorporates a welded-in strip which is there to reduce the risk of wire being dragged onto the rotor at high speed. This is not, however, as good a safeguard as ensuring that the machine doesn't come into contact with wire in the first place.

OPERATIONS.

TRACTOR SELECTION FOR 400 FLAIL HEDGETRIMMERS.

Tractor size must be a minimum of 26kW (35 HP)

The tractor must be equipped with a power take off shaft which must be run at no more than 540 rpm during operation.

The PTO shaft should run clockwise when looking at the rear of tractor and should be 1 3/8" S.A.E. - 6 spline type enabling the standard PTO shaft supplied to be fitted.

It may be necessary to fit counterbalance weights (on approved mountings) or to ballast the tractor's rear wheels. **It is vital to ensure that the unit is stable.**

A wider track setting can be advantageous in curing stability problems: contact your agent for advice.

Four wheel drive tractors, with their extra weight, larger front wheels and better grip tend to be more stable when operating these machines.

ATTACHING MACHINE TO TRACTOR.

IMPORTANT:- Ensure machine is parked on a firm and level site without any bystanders or onlookers.

READ AND UNDERSTAND the general and Health and Safety instructions given in this manual.

1(a). FOR PIN TYPE LOWER LINKAGE EYES ONLY

Remove spring pins, lift pins and spacers supplied with hedgetrimmer from lower link positions of linkage frame.

Slowly and very carefully reverse the tractor towards the machine linkage frame.

With care, ensure that tractor lower link ball eyes fit between the lower jaws of the linkage frame and that the pin holes are aligned.

SWITCH OFF TRACTOR ENGINE AND ENSURE HANDBRAKE IS ON.

With holes of tractor lower link eyes in line with lower jaw holes of frame, the lower linkage pins should now be refitted:

Secure lift pin into position using the 7/16" diameter pin and ring assembly.

1(b). FOR AUTOMATIC QUICK CROOK-ON ONLY LOWER LINKS

Remove spring pins and lift pins supplied with Hedgetrimmer from lower link positions of linkage frame. Then push lift pin through the tractor's lower link ball end between ears of frame. Then secure into position using 7/16" diameter pin and ring also supplied.

Next, slowly and very carefully reverse the tractor towards the machine's linkage frame. Carefully ensure that tractor lower links fit between the lower jaws of the linkage frame and are aligned with the relevant ball eyes (now already on lower lift pins).

Raise tractor lower link arms to a position that allows the ball to engage correctly into the housing in the lift arm.

2. Staybars are designed to allow for Category 1 or Category 2 linkages. The holes in one of each pair of bars will be found to be 3/4" Diameter, 20mm (Cat 1) and in the other 1", 25mm (Cat 2). The shouldered spacer which fixes the lower ends of the bars to the main frame can be placed so that it suits whichever hole size remains. For 'continental' hitches, placing the 1", 25mm holes to the top will allow the staybars to be affixed to the 'continental' ladder hitch frame rather than the top link position.

With the bases of the staybars detached from the main frame of the machine their tops can be secured along with the top link to the tractor's top link position (or ladder frame of 'continental' hitch).

3. Start up tractor. Raise the whole machine on the linkage until a height is reached which is a compromise between a horizontal path for the PTO shaft and 300mm (12") of ground clearance for the main frame.

With machine at this height, remove the two M12 bolts on each side to move the lower staybar of each pair in relation to the upper to get its bottom hole closest to alignment with the intended position in the main frame. The two M16 bolts for each pair can then be replaced (ensuring the two sides match) and the height of the linkage adjusted to allow the bolt and spacer to secure the lower ends of the staybars to the main frame. Tighten all relevant nuts/bolts.

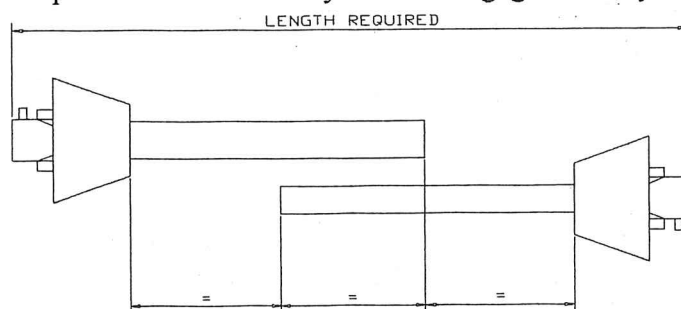
Lower the three point linkage to allow weight of machine to be taken on stabilisers.

Tractor lower linkage check chain assemblies should now be tightened to ensure that tractor arms are locked sideways and machine is positioned centrally at rear of tractor. Loose check chains are the primary cause of machines rocking on the back of the tractor.

Top link should now be adjusted to ensure hedgetrimmer is level from front to rear.

4. Check the length of the PTO shaft.

When connected from tractor to machine the shaft should engage by 1/3rd of the total shaft length: male part should be halfway from disengaged to fully bottomed out.



Do not use the machine until shafts have been cut to the correct length.

5. Fit the PTO shaft. Ensure the shaft is correctly fitted to matching splines at both ends. Fit the anti-spin chains of the PTO guard to a rigid non-turning assembly.

6. Each stand leg is held in place by two pins and R clips. Removing the inboard pin in each case will allow the stand legs to be swung inwards and secured by the same pins and R clips..
7. The mesh safety screens should now be fitted.



**DANGER
WARNING**

All glass screens on the relevant side of the cab must be protected.

The screens are designed to be fitted to the tractor cab on the cutting head side (i.e. for left-hand cut machines to left-hand side of cab). Bolts, nuts and washers are supplied for fixing purposes.

8. Fix valve control handles into position. Control levers are supplied bolted together as a unit. Cables should not be forced into arcs of less than 150mm (6") in radius otherwise the controls will be stiff to operate and the cables will be damaged. The unit includes a support leg, which will slot into a bracket supplied for fitting to the tractor. Depending on the model there may be 4, or 5 controllers in the set. The locating bracket should be positioned on the inner wing face of the tractor cab in a suitable position for easy operation. It is suggested that the bracket is fitted to the left-hand wing for left-hand cut machines and right-hand wing for right-hand cut machines. Bolts, nuts and washers are supplied for fixing. Certain cabs should not have any holes drilled in their sides: if in doubt check with your tractor dealer, who will be able to advise how to proceed if this is the case.

Once the bracket is fitted the controller unit can be lowered into the slot in the bracket and secured by tightening securing screw (clockwise).

9. **IMPORTANT** - Check the oil level within the tank: it should be at or near the green dipstick band (on the filler/breather unit cap) and well above the red band.

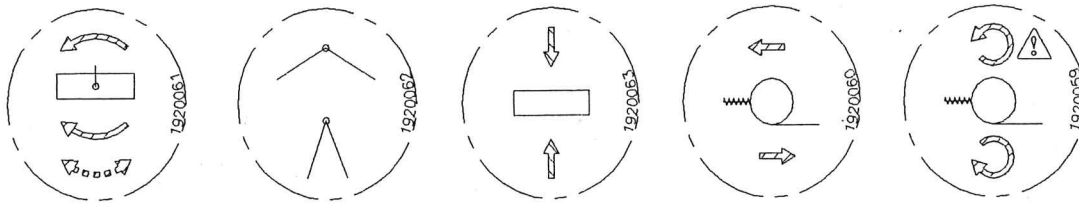
10. The tractor's power take off can now be engaged **CAREFULLY**.

Check that PTO is running correctly and that the guard is not spinning. Oil will now be pumping within the hydraulic system.

11. Check the movement of the hydraulic valves by operating the control handles. This should be done with great care until the operator gets a good 'feel' for the controls and feels competent. Each control lever top is individually labelled as to which operation it controls.

The controller units are assembled in the following formation:

<i>Anti-clock</i>	<i>Out</i>	<i>Down</i>	<i>Forward</i>	<i>Cut Down</i>
^	^	^	^	^
<u>Head Rot</u>	<u>Boom 2</u>	<u>Boom 1</u>	<u>Breakback</u>	<u>Rotor</u>
v	v	v	v	v
<i>Clockwise</i>	<i>In</i>	<i>Up</i>	<i>Back</i>	<i>Cut Up</i>



The formation could be changed to suit the individual, if so desired. Note that the order in which the valve slices are grouped on the block differs from this.

REMOVING HEDGETRIMMER FROM TRACTOR.

1. Select a good clear, level and firm site on which to detach and store machine.
2. IMPORTANT. Using the hydraulics, fully close the head angling ram and open the breakback ram. Then fully close the first and second rams; bringing the machine to a stable closed position.
3. Disengage the PTO drive and STOP THE TRACTOR ENGINE.
4. Swing the stands from their 'stored' positions to their 'down' positions, securing them with the pins and R clips provided.

The speed of cutting when trimming will depend on the size, quantity and type of growth to be cut. A speed slow enough to suit the conditions should be selected, ensuring that engine speed gives a PTO speed of 450 rpm for general use. This 450 rpm is recommended for best trimming results and performance. Variation from this recommended rpm should be kept to a minimum and never at any time should PTO rpm exceed 540 rpm.



**DANGER
WARNING**

Cutting head should be kept as close to tractor as conditions and cutting position permit. This ensures the maximum stability of the unit.

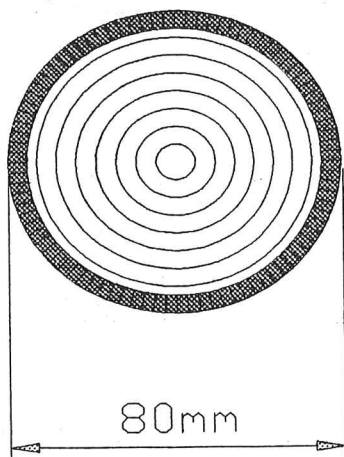


**DANGER
WARNING**

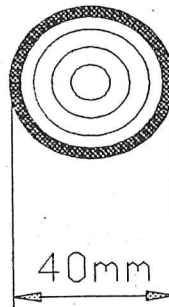
Never operate rotor with cutter flails directly towards operator, i.e., underside of head towards operator.

CUTTING THICKNESS LIMIT.

SOFTWOOD



HARDWOOD



ROTOR ROTATION DIRECTION

On fully-independent machines (only) a choice of rotation direction is offered.

The 'upward' cut is recommended for trimming grass and one to two years' growth of hedge. The 'downward' cut is NOT RECOMMENDED and should only be considered for really heavy cutting of large diameter growth. Even then, it is important that down cutting be limited to a minimum and only for very short periods. There is a risk of serious damage to the hydraulic system should the rotor direction be reversed without it first coming to rest.



**DANGER
WARNING**

At NO TIME should the rotor be cutting upwards at front with front cowling removed.

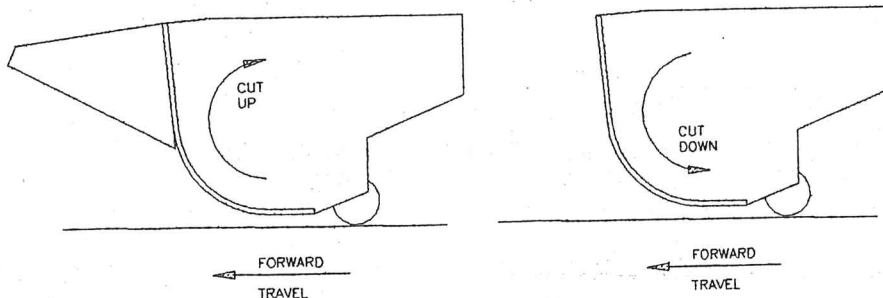


**DANGER
WARNING**

With rotor cutting downwards at the front the roller must not be removed.

On leaving the factory the machine will be set for upward rotor cutting.

NEVER CHANGE DIRECTION OF CUT WHILST ROTOR IS STILL TURNING.



The motor spool control lever has a 'balk lock' control built into it to ensure that the rotor's cut direction cannot be accidentally reversed. The control allows the lever to be moved in one direction only, from centre OFF position to selected rotor cut direction.

The controller/cable sets can come from two suppliers and though physically different, their actions are similar. When the lever is rotated to its extent (- red cables) or pin is rotated till horizontal (- grey cables) the control handle can be moved to and from neutral in that direction. On the 'grey cable' controller placing the pin vertically stops the lever from being moved at all.

HYDRAULIC CONTROLS - CUTTING POSITION.

The cutting head must at all times be lowered gently into its cut position. Never drop the head into work at speed.

When cutting at ground level (grass, etc.), the head must be lowered gently to give a slight contact pressure of roller to ground.

IMPORTANT: Ensure rotor and roller do not get involved in high obstacle forces such as rocks, stones, stumps, etc. Keep rotor away from and free from wire, as to entangle wire in the rotor is very dangerous and very costly.

Should large obstacles be encountered or wire be caught in rotor then you must **STOP IMMEDIATELY**. Reset or clear before starting.

Normal obstacles and level variations should be overcome by operator slowing the forward speed and raising or lowering the head to suit.

CUTTING HEAD.

The rotor of the cutting head has been balanced prior to fitting: this is to ensure a vibration-free cutting unit.

Should the rotor become blocked, hit an obstacle, lose a blade or blades, the rotor may be put into a state of imbalance. This will result in vibration in the rotor that will also be transmitted to other parts of the machine.

Should vibration occur **STOP IMMEDIATELY**, as to continue working could have serious consequences, not least damaging bearings and weakening the structure.

Once stopped clean rotor and check for loss of blades and bolts, replacing as required.

In severe cases, perhaps as a result of hitting solid objects with serious force, rotors can become bent, which will also cause vibrations. In such cases the rotor will have to be re-balanced, repaired and re-balanced or even replaced.

BREAKAWAY.

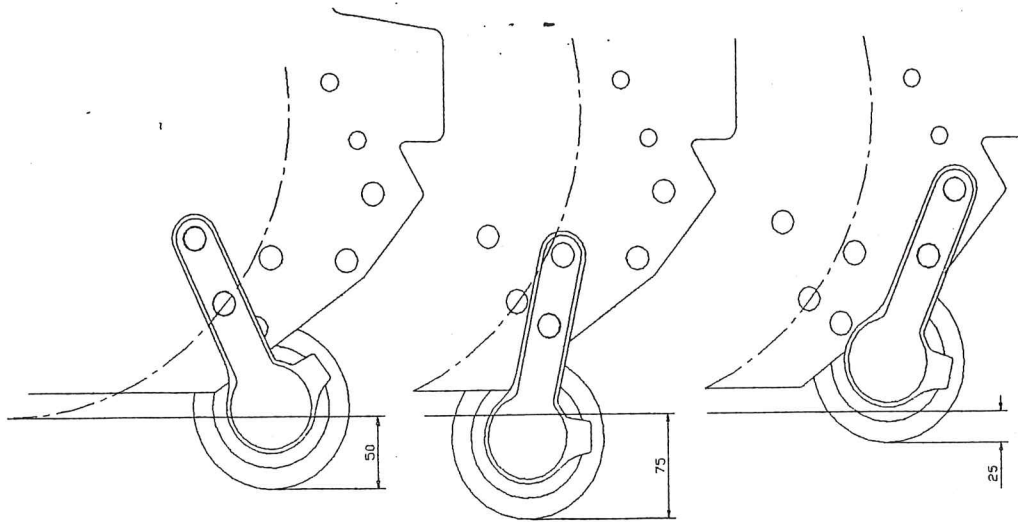
When the head meets an obstruction the breakaway ram opens steadily due to the action of a relief valve built into the valve block. This allows the outer boom to pivot backwards around its near end. In order to reset the position of the cutting head the control lever for the breakaway will need to be operated.

TRANSPORTATION.

- (1) Disengage rotor drive.
- (2) Turn cutting head until head is approximately at right angles to outer boom with flails away from tractor.
- (3) Swing head rearwards by powering breakback ram.
- (4) Fully fold in second boom.
- (5) Operate the main lift ram, breakback ram and head angling ram to position head behind and slightly inside of the tractor rear tyre.
- (6) The unit is now ready for transport.

ADJUSTING ROLLER HEIGHT.

The roller controlling the flail head cutting height can be set in one of three positions:



The three positions allow cut heights of 25, 50 and 75mm (1,2 and 3"). The 50mm (2") height is the one set at the factory.

If doing hedging work only, the roller can be removed.

MAINTENANCE.

GREASE POINTS.

On each pivot of booms, links or rams a grease nipple will be found and its position will be highlighted by a transfer symbolising a grease gun. These should be greased daily.

PTO SHAFT.

The PTO shaft should be examined weekly, both in regard to its mechanical condition and that of its plastic guarding. Any damage to the guarding should be rectified with urgency and the anti-spin chains **must** be used. Universal joints should be greased sparingly at this time. Fortnightly the internal shaft should be greased along its length to ensure that it will continue to allow the unit to telescope.

HYDRAULIC OIL.

The hydraulic system will have been run-up and checked at factory prior to the machine being dispatched.

The hydraulic tank will be filled with EXCELUBE ULTRA 46 hydraulic oil when the machine is delivered. Oil tank capacity is 120 litres (27 Gallons).

It is advisable NEVER to mix hydraulic oils, but if another suppliers' oil is to be used, then one that is known to be compatible must be chosen (check with oil supplier).

A bypass will operate should the return filter become excessively clogged. Though this protects the operator and other personnel it does mean that filtration then ceases. It is important therefore that:

THE OIL FILTER MUST BE CHANGED AT 50 HOURS INITIALLY AND EVERY 250 HOURS THEREAFTER.

The oil level in the tank should be checked daily, using the dipstick integral with the filler/breather cap.

Contamination of the oil will necessitate it being changed: this is indicated by a darkening in its colour and/or it smelling 'burnt'.

Keeping the area around the filler cap clean (particularly when removing the cap), changing filters on time and using clean containers will all help to reduce oil contamination.

GEARBOX FOR HYDRAULIC PUMP.

The gearbox powering the hydraulic pump(s) will be pre-filled to the correct volume of 0.5 litres, with an SAE EP90 gear oil. This grade must be used when topping up. Level should be checked every few months using the sight glass on the gearbox and the oil should be replaced every 2 years.

HOSES.

Hoses should be regularly checked to ensure that the metal braiding is undamaged. Should damage have occurred, affected hoses should be replaced as their ability to withstand pressure will be reduced, increasing the risk of their bursting. Care should be exercised when replacing hoses to ensure that each new hose terminates at the same places as the hose it replaces and that its route is as the original.

Hose ends and other hydraulic connections should be checked daily to ensure there are no leaks.

CABLES AND CONTROL HANDLES.

No maintenance of cables or controllers is necessary and cables should **not** be lubricated. Should the controls become difficult to operate the route of the cables should be checked to ensure that there are no kinks or excessively small radii.

FLAIL HEAD.

Keep the cutting blades **VERY SHARP**; this should be inspected daily. Bolts and nuts holding flails to rotor should be checked frequently and kept **tight**. Missing or broken flails should be replaced immediately, as the imbalance will rapidly harm bearings and structure. When a flail is renewed; if it has an opposing pair, this should be renewed also to maintain balance.

LAYING-UP

Clean the machine and note any damage or repairs needed. Arrange for spares and repairs as required in preparation for next season.

The machine should be lubricated fully and any exposed bright surfaces greased **particularly** any exposed rods of rams. (The breakaway ram will have exposed rod.)

Store machine in dry conditions, preferably undercover.

PARTS LIST

Always order genuine Twose spare parts for your machine. They are designed and manufactured to give the best operational results. In some cases these parts will be of a higher specification than their usual counterparts and this will not be immediately apparent.

ORDERING SPARE PARTS.

In order for both Twose and your dealer to give the best possible service when ordering spare parts, please specify:

- (a) Machine type and serial no.
- (b) Part no. of component(s)
- (c) Description of component(s)
- (d) Quantity required
- (e) Full address to which spares are to be sent
- (f) Method of delivery required

In the absence of specific instructions consignments will be sent by post or carrier, if it is not possible to deliver by our own transport.

Please double-check that you have ordered the correct parts and a sufficient quantity to complete the job.

Twose have a policy of continuous improvement which means that parts may be modified/replaced in the course of time due to the introduction of new materials, or improved design. The latest parts, if compatible, will be supplied whenever possible.

Should it become necessary to return any item for exchange or credit please state the number of our invoice or sales slip and the reason for the return.

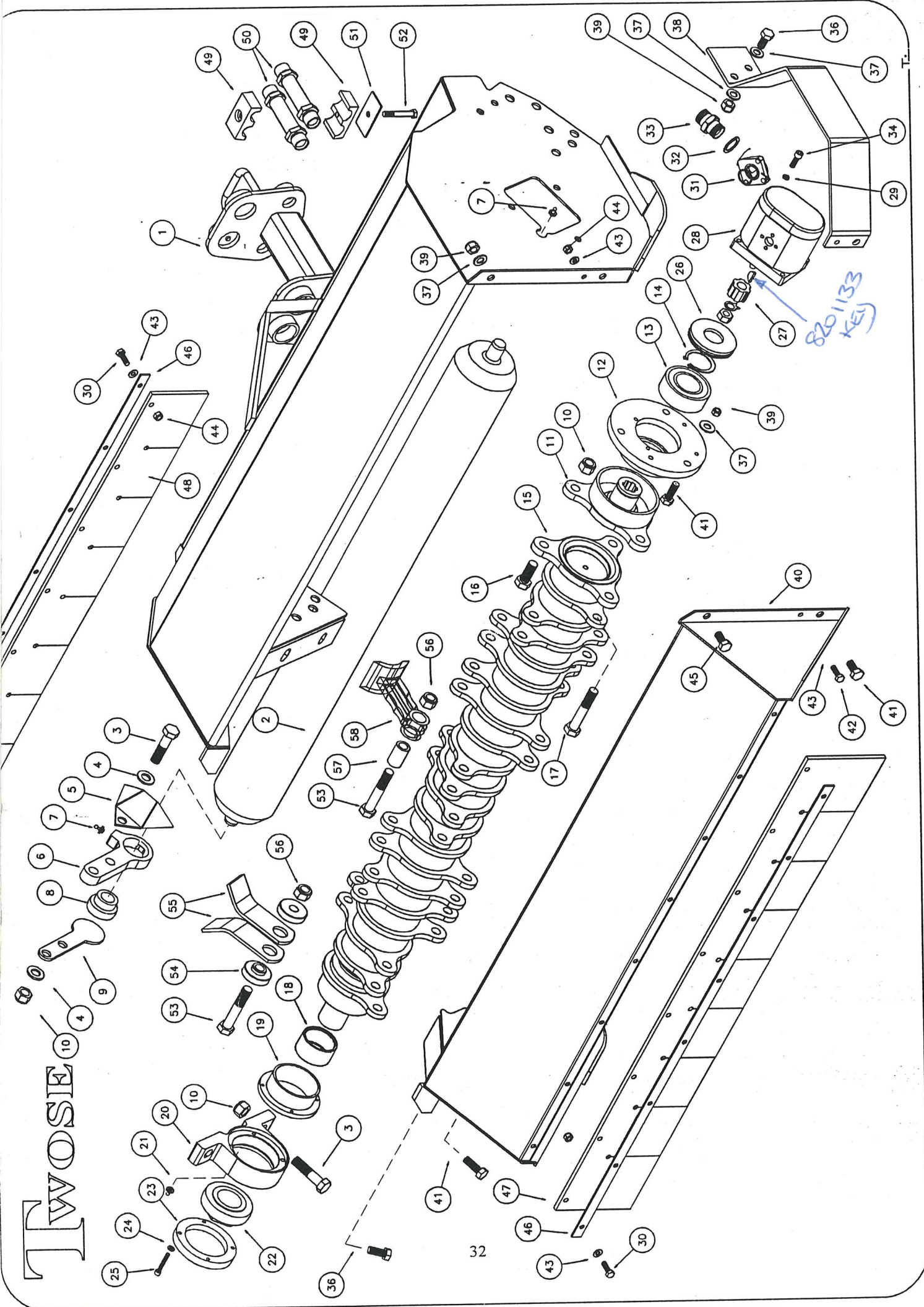
WARRANTY AND SPARE PARTS.

Enquiries regarding these machines and orders for spare parts should be addressed to:

Twose of Tiverton Ltd.
Lowman Green
Tiverton
Devon
EX16 4JT

Tel: (01884) 253691
Fax: (01884) 255189

TWOSIE



FLAIL HEAD PARTS.

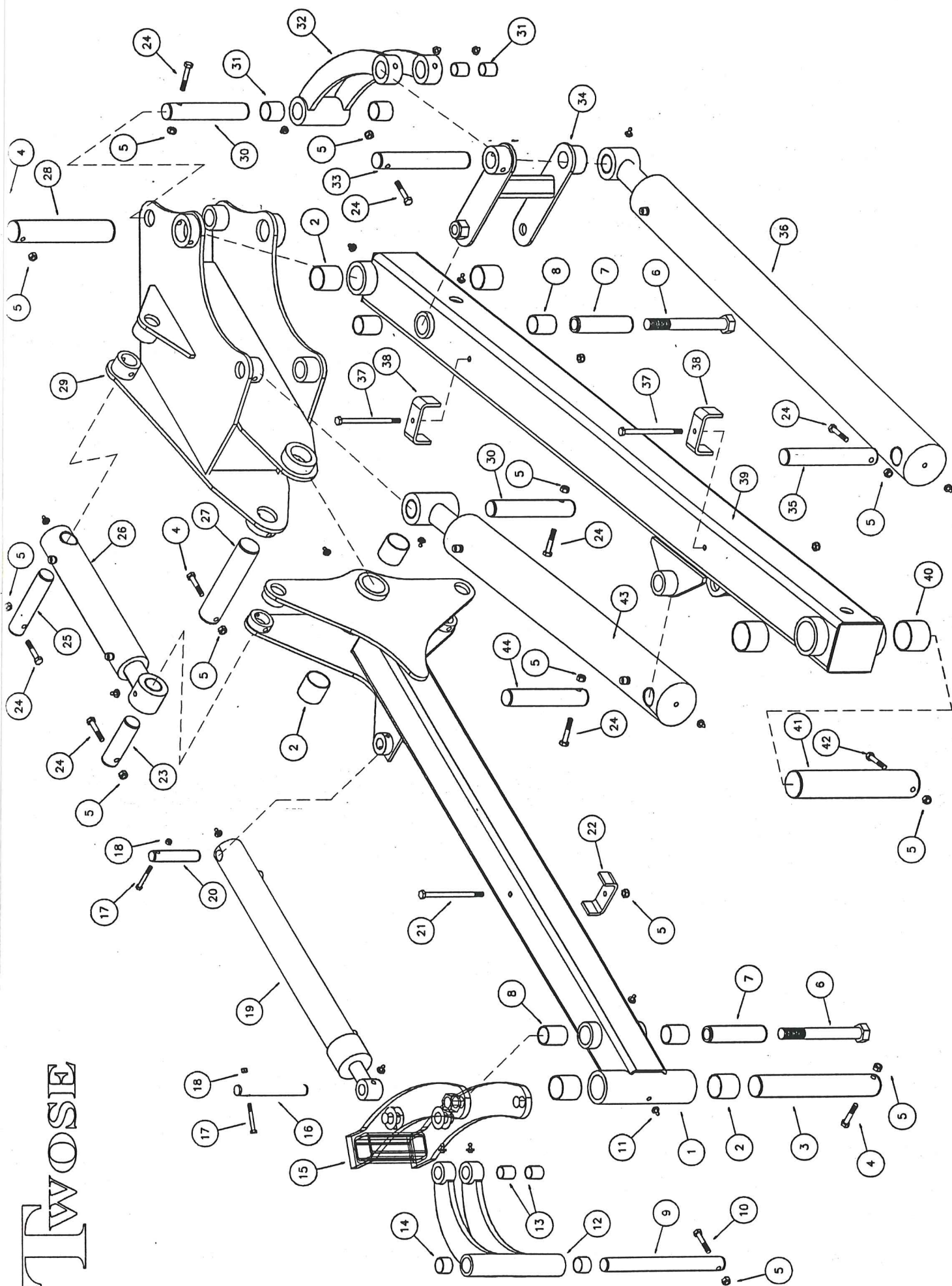
Item	Part No.	Description	Qty.
1	192.035	Head	1
2	192.037	Roller	1
3	2878	Bolt M16 * 55 (8.8)	6
4	2867	Washer M16 Form A	8
5	192.040	Shield Bearing	2
6	192.038	Bracket Roller	2
7	2923	G/Nipple M10	3
8	8035	Bearing 1225-25ECG	2
9	192.039P	Cover Bearing	2
10	3747	Stiffnut M16 Nyloc	9
11	192.044	Flange Drive	1
12	192.041	Housing for Bearing 50MS	1
13	8033	Bearing 3209B	1
14	8034	Circlip D1400-0450	1
15	192.045.100	Rotor Welded, Machined and Balanced	1
16	2892	Setscrew M16 * 40 (8.8)	2
17	2872	Bolt M16 * 90 (8.8)	1
18	192.046	Spacer for Bearing	1
19	192.026	Shield for Bearing	1
20	192.024	Housing for Bearing	1
21	6956	G/Nipple M 6	1
22	7941	Bearing 1050-45KG c/w Adaptor Sleeve, Washer + Locknut.	1
23	192.025	Cap for Bearing	1
24	2731	Washer M 6 Spring	4
25	6985	Setscrew M 6 * 45 Cap Socket	4
26	192.042	Collar Motor	1
27	192.027	Coupling Drive Male	1
28	8038	Motor c/w Key Nut Washer	1
29	3001	Washer M 8 Spring	4
30	2987	Setscrew M 8 * 25 (8.8)	20
31	7553	Elbow 3/4" T40/20 c/w O Ring + Screws	2
32	0934	Seal 3/4" Bonded	2
33	0935	Adaptor 3/4 bsp	2
34	2729	Washer M12 Spring	3
35	2711	Setscrew M12 * 20 (8.8)	3
36	2950	Setscrew M12 * 30 (8.8)	3
37	2716	Washer M12 Form A	12
38	192.043	Guard Motor	1
39	3082	Stiffnut M12 Nyloc	6
40	192.036	Nose	1
41	2962	Setscrew M12 * 35 (8.8)	2
42	3110	Setscrew M 8 * 30 (8.8)	1
43	3111	Washer M 8 Form A	34
44	3182	Stiffnut M 8 Nyloc	17
45	2712	Setscrew M12 * 25 (8.8)	1
46	192.031	Clamp Strip Curtains	2
47	1920030A	Curtain Front 1100x 160	1
48	1920030B	Curtain Rear 1100x 120	1
49	3758.3	Clamp	2
50	192.047	Steel Hydraulic Pipe	2
51	3758.2	Top Plate	1
52	3548	Bolt M 8 * 50 (8.8)	1
53	7943	Bolt M16 * 80 Fine Structural	19
56	7942	Stiffnut M16 Nyloc Fine Pitch	19
Flail Options:			
54	184.500	Spacer for Flail	40
55	1840497	Flail Blade Back-to-back	40
or:			
57	184.106	Spacer for Flail	20
58	1840093	Flail Heavy Duty	20

192.045AC ROTOR COMP WITH T FLAILS

1920027

** 192.054AF ROTOR COMP WITH BACK TO BACK FLAILS*

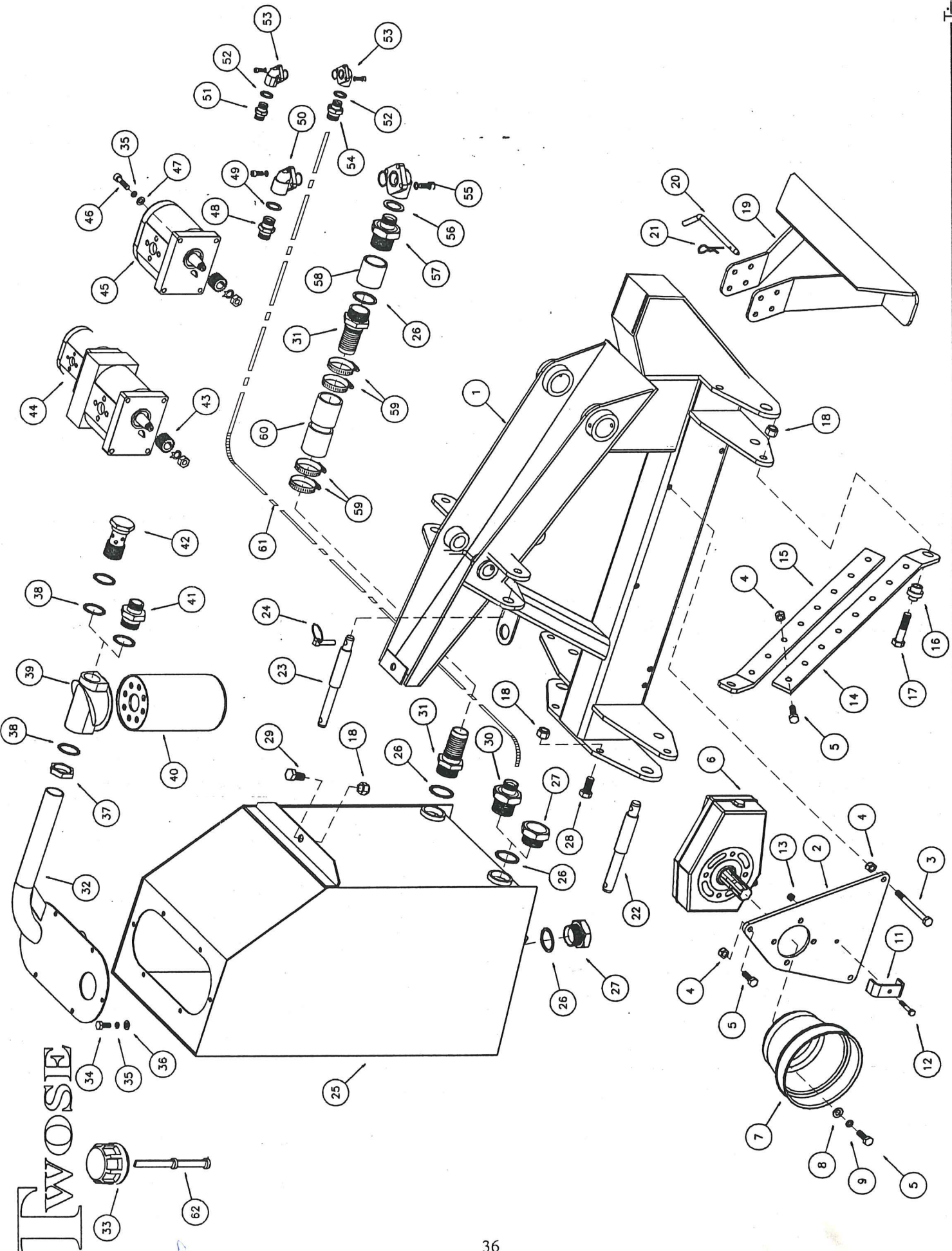
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PARTS FOR BOOMS.

Item	Part No.	Description	Qty.
1	192.007	Outer Boom	1
2	6257N	bush 4040M Nylon -	6
3	192.005	Pin Head Pivot	1
4	2765	Bolt M 8 * 70 (8.8)	3
5	3182	Stiffnut M 8 Nyloc	15
6	3634	Bolt M20 *170 (8.8)	2
7	187.034	Pin, Head Link Anchor	2
8	3124	Bush 3040M Nylon	4
9	192.006	Pin Head/Head Angling Link	1
10	3548	Bolt M 8 * 50 (8.8)	1
11	2923	G/Nipple M10	19
12	192.004	Second Banana	1
13	7802	Bush 2025M Nylon	2
14	8039	Bush 2520M	2
15	187.026	First Banana	1
16	187.036	Pin, Angling Ram Rod	1
17	6981	Bolt M 6 * 50 (8.8)	2
18	4776	Stiffnut M 6 Nyloc	2
19	1780034	Ram Head Angling	1
20	192.009	Pin Angling Ram Anchor	1
21	8036	Bolt M 8 *130 (8.8)	1
22	192.032A	Pipe Clamp	1
23	192.008	Pin Breakback Rod	1
24	3262	Bolt M 8 * 60 (8.8)	7
25	192.012	Pin Breakback Ram Anchor	1
26	1920003	Ram Breakback	1
27	192.013B	Pin Outer Boom Anchor	1
28	192.013A	Pin Knuckle Anchor	1
29	192.010	Knuckle	1
30	192.014	Pin 2nd Ram Rod	2
31	5178	bush 3030m Nylon	4
32	192.017	Banana 2nd Lift	1
33	192.022	Pin 1st Ram Rod	1
34	192.016	Banana 1st Lift	1
35	192.023	Pin 1st Ram Anchor	1
36	1920001	Ram 1st	1
37	8037	Bolt M 8 *160 (8.8)	2
38	192.032B	Pipe Clamp	2
39	192.011	Boom 1st	1
40	7900	Bush 5040M	2
41	192.021	Pin Main Pivot	1
42	5383	Bolt M 8 * 80 (8.8)	1
43	1920002	Ram 2nd	1
44	192.015	Pin 2nd Ram Anchor	1

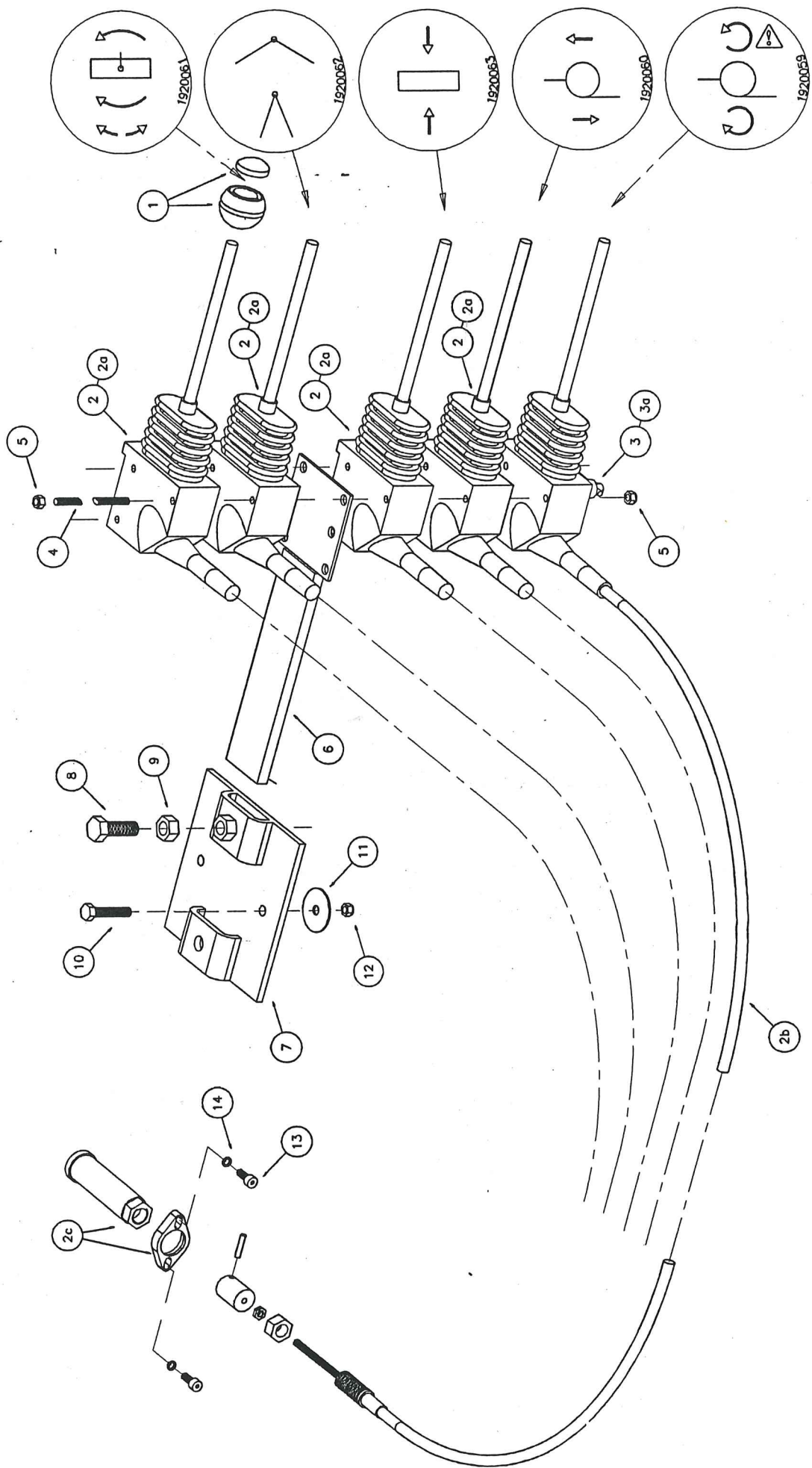
TWOSE



PARTS FOR MAIN FRAME.

Item	Part No.	Description	Qty.
1	192.018	Main Frame	1
2	192.020	Pump Mounting Plate	1
3	2997	Bolt M12 *130 (8.8)	2
4	3082	Stiffnut M12 Nyloc	3
5	2962	Setscrew M12 * 35 (8.8)	9
6	7556	Gearbox 1:3.4	1
7	6385	PTO Guard	1
8	2716	Washer M12 Form A Bright	4
9	2729	Washer M12 Spring	4
11	192.032A	Pipe Clamp	1
12	3548	Bolt M 8 * 50 (8.8)	1
13	3182	Stiffnut M 8 Nyloc	1
14	192.033A	Stabiliser Bar	2
15	192.033B	Stabiliser Bar	2
16	192.034	Spacer 16id	2
17	2871	Bolt M16 * 70 (8.8)	2
18	3747	Stiffnut M16 Nyloc	5
19	192.028	Stand	2
20	192.029	Pin Stands	4
21	6573	R Clip S12	4
22	192.065	Pin Linkage 7/8"-1.1/8"	2
23	192.064	Pin Linkage 3/4"-1"	1
24	0832	Pin Linch 7/16"	3
25	192.050	Tank	1
26	3078	Seal 1.1/2" Bonded	4
27	7894	Plug 1.1/2 bsp	1
28	2901	Setscrew M16 * 35 (8.8)	2
29	2948	Setscrew M16 * 30 (8.8)	1
30	8010	Adaptor 3/4 bsp x 1.1/2	1
31	7999	Hose Tail 1.1/2" BSP	2
32	192.019L	Return Line / Tank Cover	1 or
	192.019R	Return Line / Tank Cover	1
33	6334	Filler/Breather	1
34	2709	Setscrew M10 * 20 (8.8)	6
35	2728	Washer M10 Spring	10
36	3332	Washer M10 Form C Bright	6
37	8043	Backnut 1.1/4" bsp	1
38	3155	Seal 1.1/4" Bonded	2 or 3
39	3345	Body for 3126 Filter	1
40	3346	Element for 3126 Filter	1
41	5241	Adaptor 1 bsp x 1.1/4	1
42	071.418	Banjo Bolt 1.1/4" BSP	1
43	7551	Coupling Taper GR3	1
44	7939(41C.8.0)	Pumps Dual (Cast/Aluminium)	1 or
45	7939(41C.0.0)	Pump GP2 Cast	1
46	5639	Setscrew M10 * 40 Cap Sock	4
47	3219	Washer M10 Form A Bright	4
48	0935	Adaptor 3/4 bsp	1
49	0934	Seal 3/4" Bonded	2
50	7939-E06	Elbow 3/4" c/w O Ring and Screws	1
51	1826	Adaptor 1/2 bsp	1
52	0909	Seal 1/2" Bonded	3
53	7939-E04	Elbow 1/2" c/w O Ring + Screws	2
54	1834	Adaptor 1/2 bsp x 3/4	1
55	7939-E08	Elbow 1" c/w O Ring and Screws	1
56	1934	Seal 1" Bonded	1
57	7559	Adaptor 1 bsp x 1.1/2T	1
58	7873	Socket 1.1/2 bsp	1
59	7455	Clip Jubilee Diameter 40-55	4
60	8000	Hose Suction 38mm Bore	
61	004.681	Hose 3/4 STx45x 550	1
62	8067	Dipstick	1

TWOSE

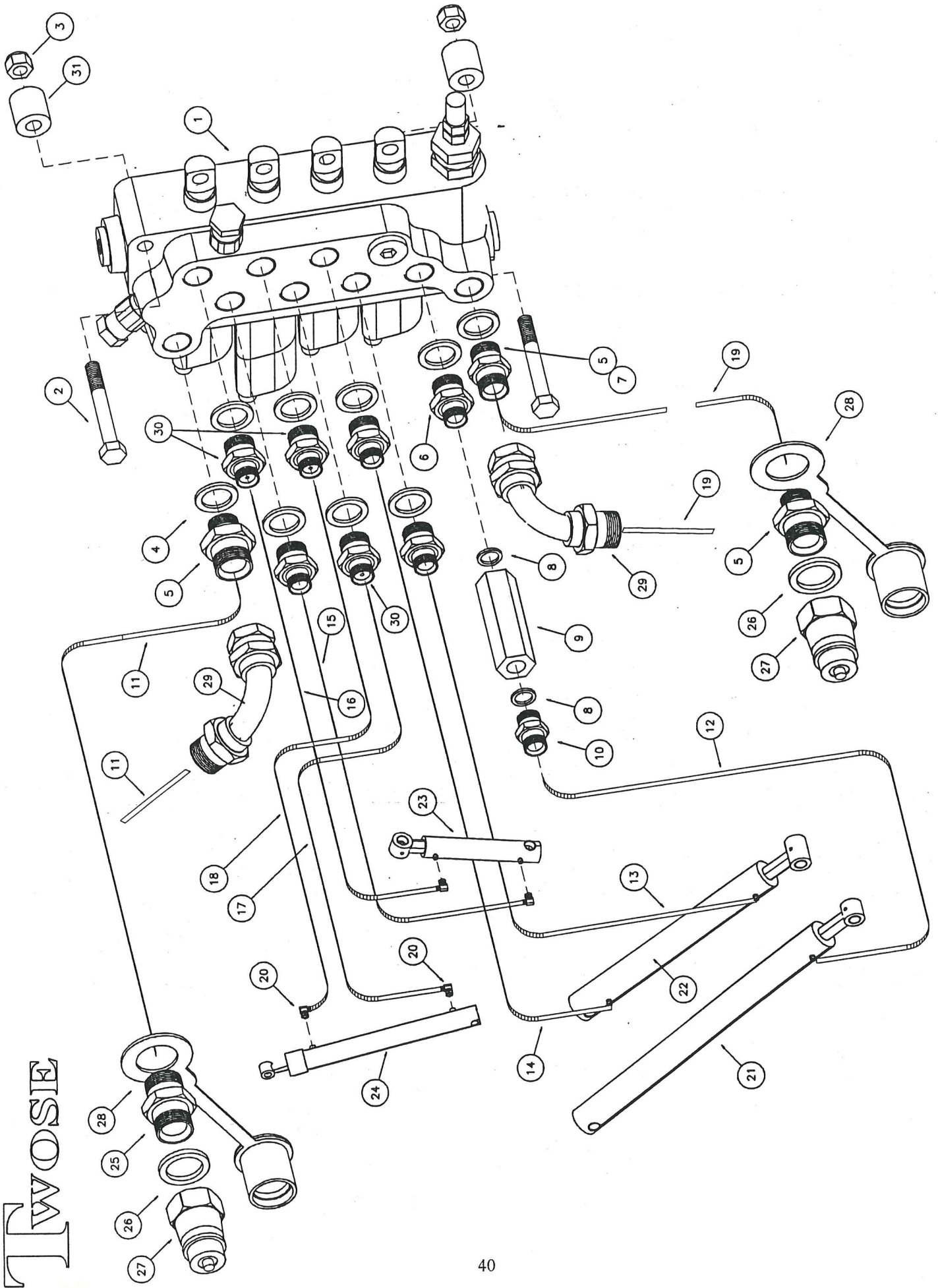


PARTS FOR CONTROLS.

Quantities in left-hand column are for Single Pump (Semi Independent) and in right-hand column Twin Pump (Fully Independent) machines.

Item	Part No.	Description	R Qty.	RI Qty.
	1920061	Transfer "Head Angle (symbol)"	1	1
	1920062	Transfer "2nd Boom (symbol)"	1	1
	1920063	Transfer "Main Lift (symbol)"	1	1
	1920060	Transfer "Breakback (symbol)"	1	1
	1920059	Transfer "Rotor (symbol)"		1
1	7835	Cable Control Knob and Lens	4	5
2	8045	Cable Control Assembly 2.5m	4	4
2a	7822.2	Controller Only	(4)	(5)
2b	8045.1	Cable Only 2.5m Long	(4)	(5)
2c	8045.2	Connection Kit	(4)	(5)
3	8046	Cable Control Assembly (Baulk) 2.5m		1
3a	7823.1	Controller Only		(1)
4	184.259D	Studding M 6 * 190	3	
4	184.259E	Studding M 6 * 235		3
5	4776	Stiffnut M 6 Nyloc	6	6
6	184.258	Bracket Controllers	1	1
7	184.257	Anchor Bracket - Controllers	1	1
8	2962	Setscrew M12 * 35 (8.8)	1	1
9	2721	Fullnut M12	1	1
10	3730	Setscrew M 8 * 40 (8.8)	2	2
11	3770	Washer Imp 1.1/2 x 5/16 Mudguard	2	2
12	3182	Stiffnut M 8 Nyloc	2	2
13	4695	Setscrew M 6 * 15 Cap Socket	8	10
14	2731	Washer M 6 Spring	8	10

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RAM VALVE AND HOSES.

Item	Part No.	Description	Qty.
1	8041	Valve Block for Rams	1
2	5383	Bolt M 8 * 80 (8.8)	2
3	3182	Stiffnut M 8 Nyloc	2
4	0670	Seal 3/8" Bonded	9
5	0914	Adaptor 3/8 x 1/2"	1 or 2
6	1180	Adaptor 1/4 x 3/8"	4
7	0665	Adaptor 3/8"	1
8	1181	Seal 1/4" Bonded	2
9	7813	Restrictor One Way	1
10	1823	Adaptor 1/4"	1
30	7739	Adaptor 1/4 x 3/8" Rest. 1mm	3
31	184.148	Spacer 8id	2

For Fully-Independent Machines:

11	004.682	Hose 1/2 90x90x 515 @090	1
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For Semi-Independent Machines:

11	004.511	Hose 1/2 STx90x1250	1
12	004.671	Hose 1/4 STx90x1800	1
13	004.672	Hose 1/4 90x91x1510 @000	1
14	004.673	Hose 1/4 90x91x 815 @000	1
15	004.675	Hose 1/4 STx90x2380	1
16	004.674	Hose 1/4 STx90x2555	1
17	004.677	Hose 1/4 STx90x3155	1
18	004.676	Hose 1/4 STx90x3570	1

For Fully-Independent Machines:

19	004.678	Hose 1/2 90x90x 440 @090	1
29	7075	Adaptor 1/2 bsp M-FLN 90	2

For Semi-independent Machines:

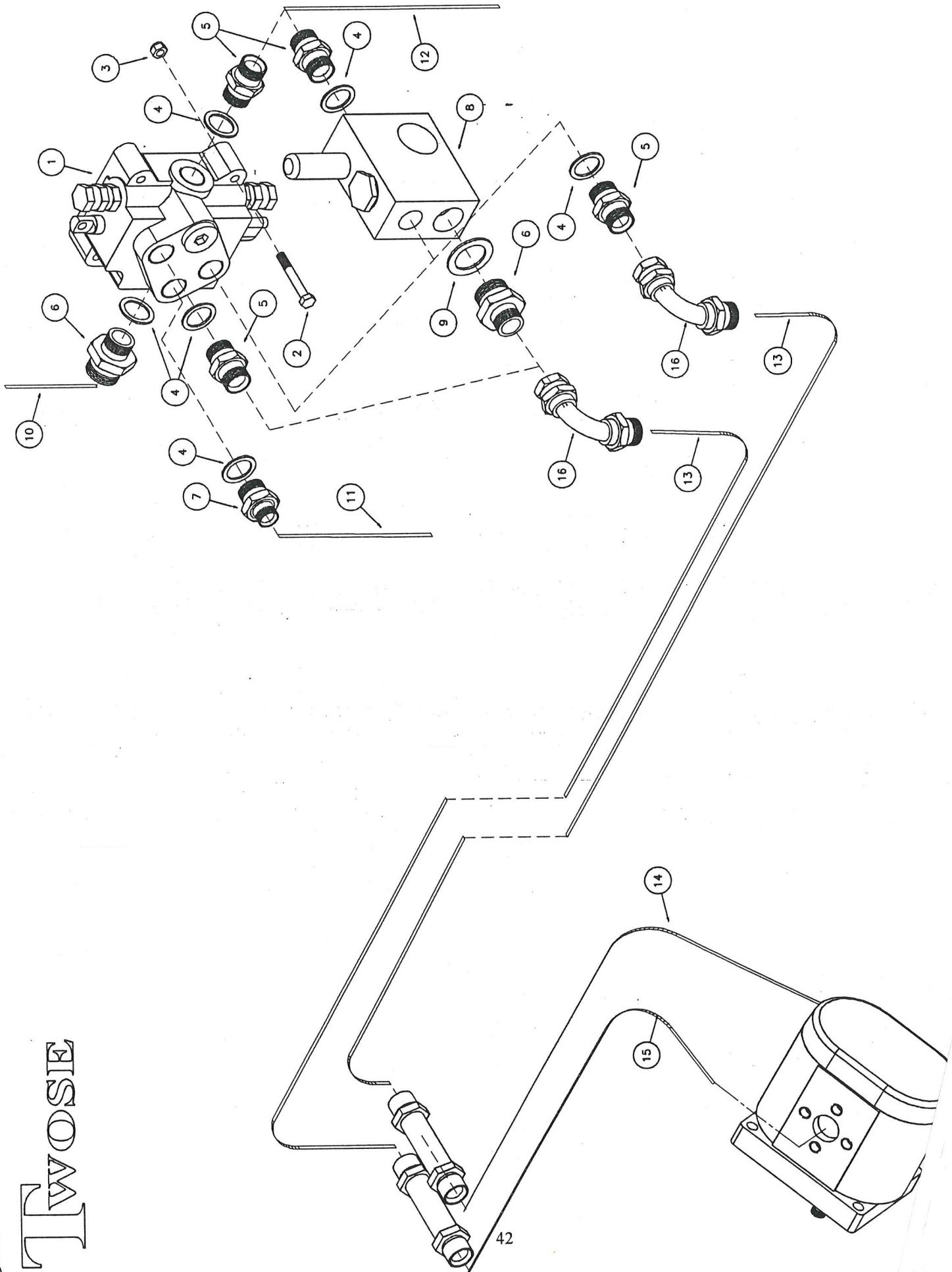
19	004.330	Hose 3/8 STx90x1250	1
20	6948	Adaptor 1/4 M-FLN 91	4
21	1920001	Ram 1st	1
22	1920002	Ram 2nd	1
23	1920003	Ram Breakback	1
24	1780034	Ram Head Angling	1

For Semi-independent Machines:

25	1826	Adaptor 1/2 bsp	1
26	0909	Seal 1/2" Bonded	2
27	5485	Coupling QRC Male 1/2"	2
28	5385	Dust Cap for QRC 5485	2

Note - Hoses attach to valve block with their 90° swept ends, except in the case of 004.682 and 004.678, where their straight ends attach to the swept adaptors listed and then to the valve block.

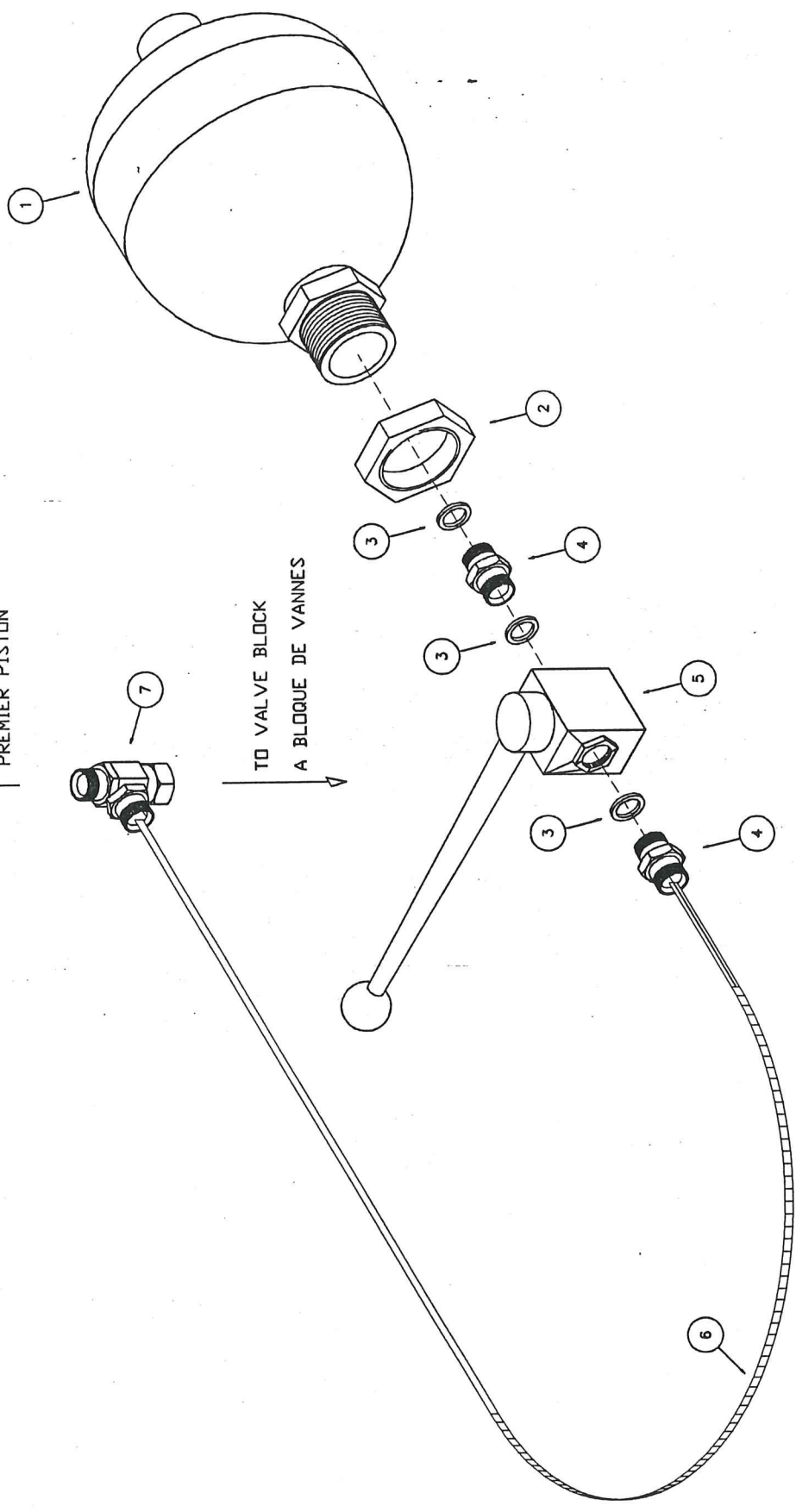
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ROTOR DRIVE - VALVES AND HOSES.

Item	Part No.	Description	Qty.
For Fully-Independent Machines:			
1	8040	Valve Block Motor Spool	1
2	3262	Bolt M 8 * 60 (8.8)	3
3	3182	Stiffnut M 8 Nyloc	3
4	0934	Seal 3/4" Bonded	5
5	0935	Adaptor 3/4"	3
6	1836	Adaptor 3/4 x 1"	1
7	1834	Adaptor 1/2 x 3/4"	1
10	004.678	Hose 1/2 STx90x 1140 @090	1
11	004.679	Hose 1 STxSTx 460	1
For Semi-Independent Machines:			
4	0934	Seal 3/4" Bonded	3
5	0935	Adaptor 3/4"	2
6	1836	Adaptor 3/4 x 1"	1
8	3154 R190	Valve Relief/AntiCav c/w Relief Cart 190bar	1
9	1934	Seal 1" Bonded	1
All Machines			
12	004.680	Hose 3/4 STx90x 500	1
13	004.685	Hose 3/4 STx90x5100	2
14	004.684	Hose 3/4 90x45x 740 @120	1
15	004.683	Hose 3/4 STx90x 830	1
16	3400	Adaptor 3/4" M-FLN 90	2

↑ TO ONE-WAY RESTRICTOR +
MAIN LIFT RAM
A RESTRICTEUR UN VOIE ET
PREMIER PISTON



ACCUMULATOR FLOAT.

Parts listed here are for the optional accumulator float kit.

Item	Part No.	Description	Qty.
1	8042	Accumulator	1
2	8047	Backnut M33x1.5	1
3	1181	Seal 1/4" Bonded	3
4	1823	Adaptor 1/4"	2
5	8048	Ball Valve 1/4"	1
6	004.686	Hose 1/4 STxSTx 825	1
7	7323	Tee 1/4 M-F-M	1

