

RECOVERER RECOVERY UNIT



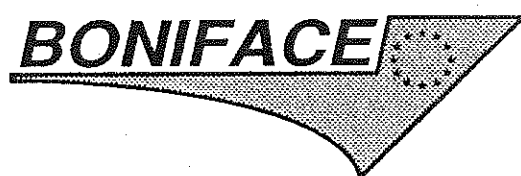
USER'S HANDBOOK



RECOVERER RECOVERY UNIT

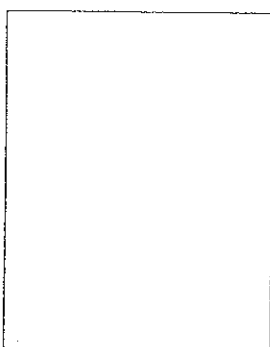


USER'S HANDBOOK



RECOVERER RECOVERY UNIT

This Recoverer was built by the team led by:



Assisted by: _____

Electrical Installation _____

Chassis Engineering _____

Tested by _____

UNIT NUMBER			
DATE OF MANUFACTURE			
UNDERREACH BOOM	TYPE E	TYPE F	TYPE G
WHEEL FRAMES	HEAVY DUTY	SUPER HEAVY	NONE
WINCHES			

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PREFACE

1. This book is written to cover the technical details of the 'Recoverer' Unit, and failure to pay regard to the instructions, suggestions and warnings in it may invalidate the maker's warranty. The book cannot, however be authoritative about the vehicles upon which the unit may be fitted, and so it is essential also to refer to the vehicle manufacturer's handbook.

2. The unit complies with all the requirements of the European Machinery Directive. Appendix 1 of this book quotes the weights and dimensions and other relevant details of the unmounted unit.

3. This recovery unit has been designed for use in all normal vehicle recovery situations, i.e. winch hauling, lifting, suspend towing and flat towing. The load limits on these aspects are given on Pages 9 and 10 (Figure 6, 7 & 8).

4. This book covers the variations of build which may be encountered. In some cases the book covers items which may not be fitted to your particular unit. Please ignore such information. The variations which normally occur are:

- a) Type E (Fully hydraulic) extending boom
or Type F (Extra heavy duty) extending boom
- b) Adapted for metric hydraulic hoses.

The Recoverer can be supplied with lifting forks, wheel frames or both. Both modes of operation are described in this book. Other special customer requirements (e.g. special winches, 12volt vehicle supply etc.) might not be covered by this book.

5. Usually the supply of this recovery equipment includes full bodywork, beacons, tailgate fittings etc, and this will vary depending upon the customer's requirements. This equipment is not covered by this book, except for circuit diagrams for beacons, locker lamps etc ('services') which are standard and are given in Section 8.

6. The unit can be combined with 'Sidewinder' winching system and support legs. They are dealt with in another publication, and so they are not covered in this book. Note: When the unit is used in conjunction with the Sidewinder, open cable guides are fitted to the fairleads to enable the winch ropes to be reeved through the fairleads for rearward winching, or freed for direct winching sideways.

7. This book is not intended to be a comprehensive guide to recovery operations, but certain procedures are outlined in Part 3 in order to describe how to use the unit safely. Each recovery operation is a separate problem, and should be treated accordingly.

GENERAL INFORMATION

PREFACE (Continued)

7. The lifting capacity of the unit is given in Figures 6, 7 & 8. However the chassis size, weight and boom rating may limit the actual loads which can be lifted or towed. The installation of extra leaf springs is recommended, and if a choice is available, a higher rated chassis should be used in order to allow an increased payload. (See the test certificate for your vehicle.

8. IMPORTANT NOTE: The European Machinery Directive covers the design and use of all forms of machinery, and requires all machinery to be safe to use in all normal circumstances. There is also an obligation on the user of the machinery to keep it in good working order. It is therefore a legal requirement for users to maintain their equipment, to use only approved spare parts when effecting a repair, and not to modify the equipment in any way without first checking with the manufacturer.

9. This book applies to a recovery unit which has been properly mounted on a chassis by Boniface Engineering Ltd. When the unit is supplied for self mounting a separate set of instructions for mounting and testing are available.

10. When using this equipment, due regard must be paid to published Codes of Practise, British Standards and legislation affecting recovery operations. Nothing contained in this book is intended to countermand any such regulations.

11. When taking the delivery of a new Recoverer unit, Boniface Engineering will undertake a comprehensive hand-over which includes a short course of instructions on how to use the unit. However that is not intended to cover all aspects of recovery, and if the intended operator of the unit has not been adequately trained, it is essential that the operator should enrol on a properly approved training course for heavy vehicle recovery.

SAFETY PRECAUTIONS.

THE PROCEDURES DESCRIBED IN THIS BOOK HAVE BEEN WRITTEN WITH SAFETY IN MIND. ASPECTS OF PERSONAL SAFETY AND USE OF THE MACHINE SO AS NOT TO CAUSE DAMAGE ARE DEALT WITH AT THE RELEVANT PLACE IN THE TEXT.

GENERAL SAFETY PRECAUTIONS ARE INCLUDED AS APPENDIX 2 OF THIS BOOK, AND A COPY OF THE RECOVERY INDUSTRY'S CODE OF PRACTISE FOR WORKING AT THE ROADSIDE IS GIVEN IN APPENDIX 3. IT IS IMPERATIVE THAT ALL RECOVERY PERSONNEL SHOULD PAY DUE REGARD FOR THAT INFORMATION.

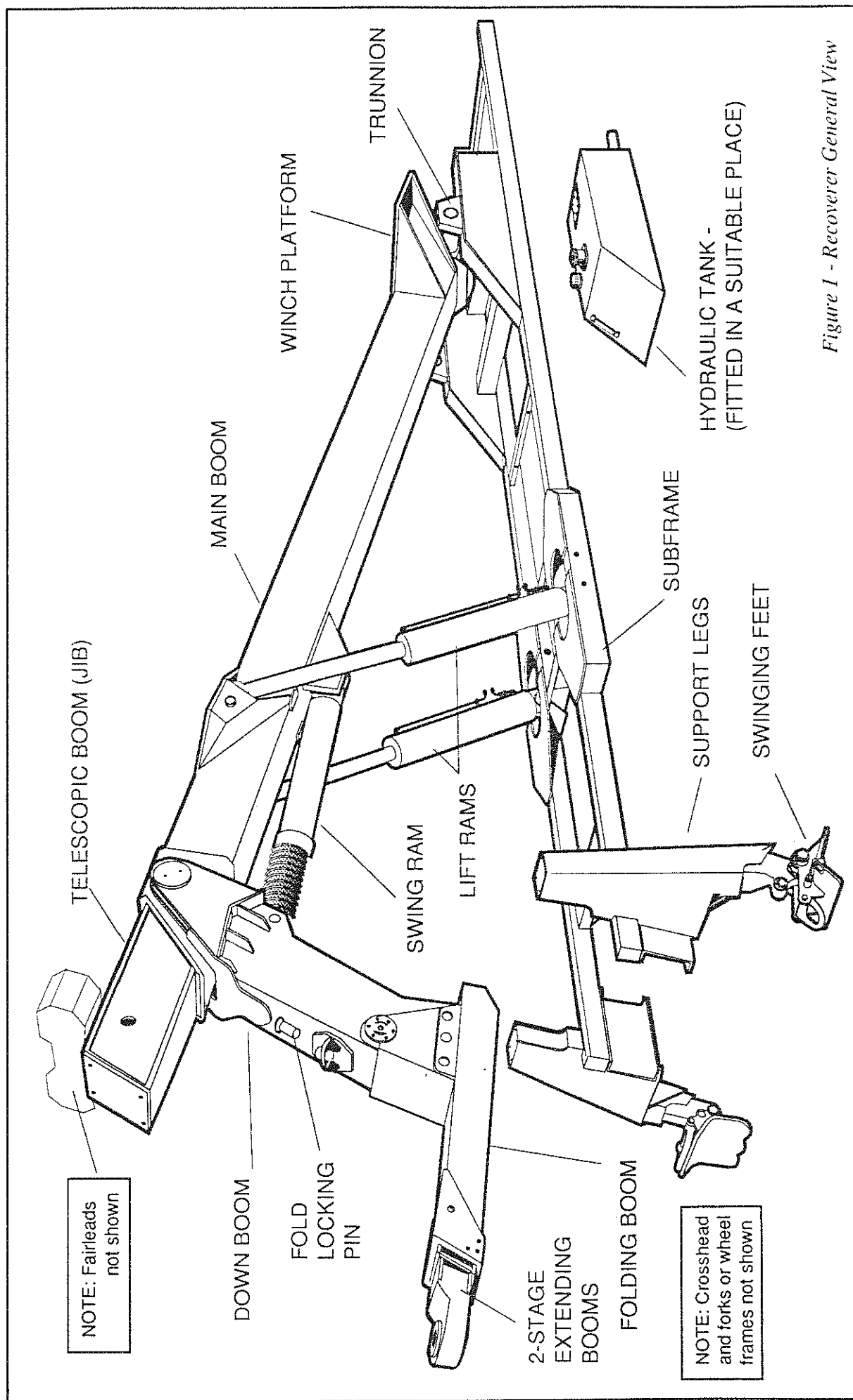


Figure 1 - Recoverer General View

GENERAL INFORMATION

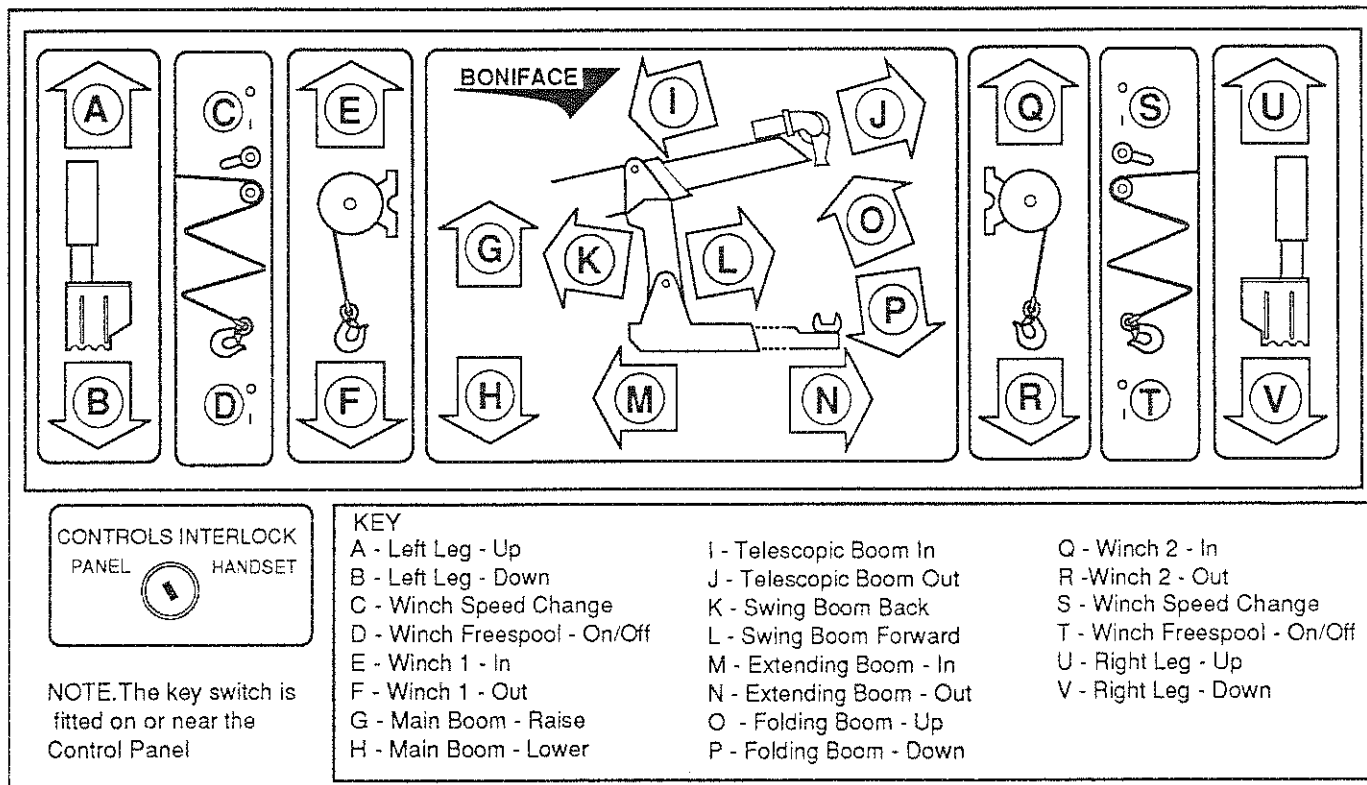


Figure 2- Control Panel

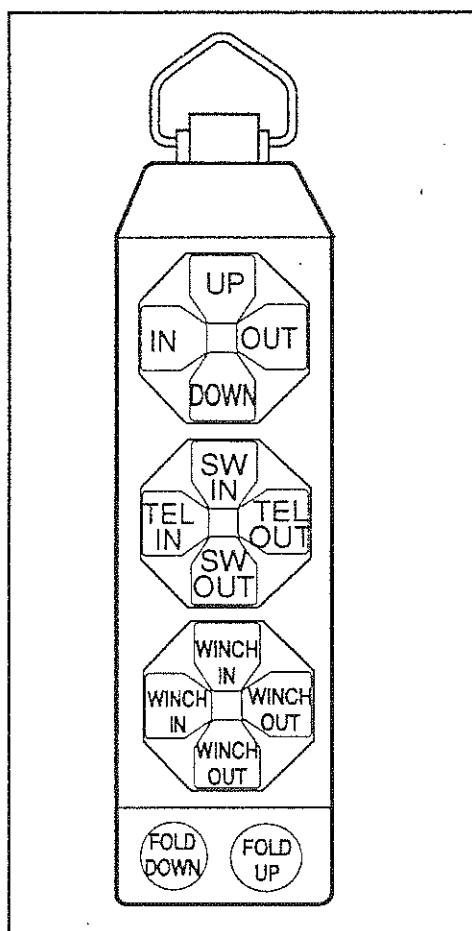


Figure 3 - Remote Control Handset

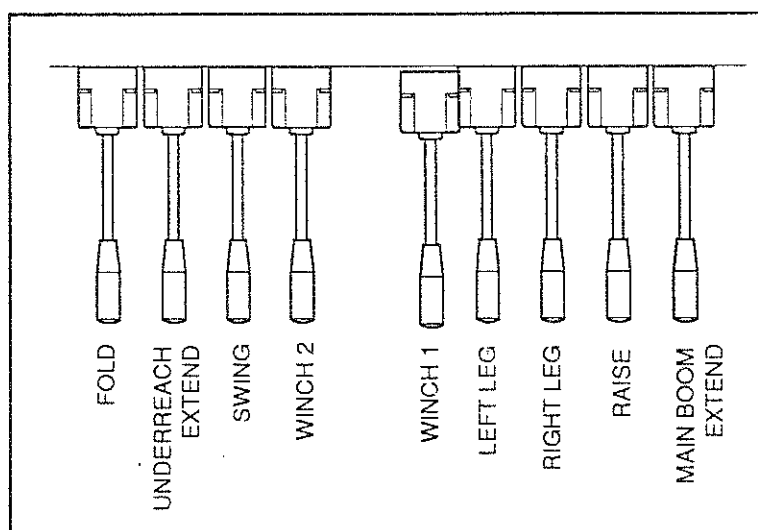


Figure 4- Hydraulic Lever Controls

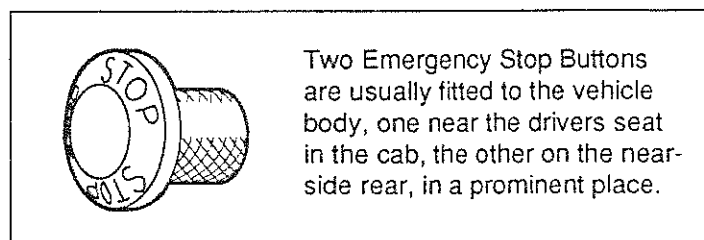


Figure 5 - Emergency Stop Buttons

GENERAL INFORMATION

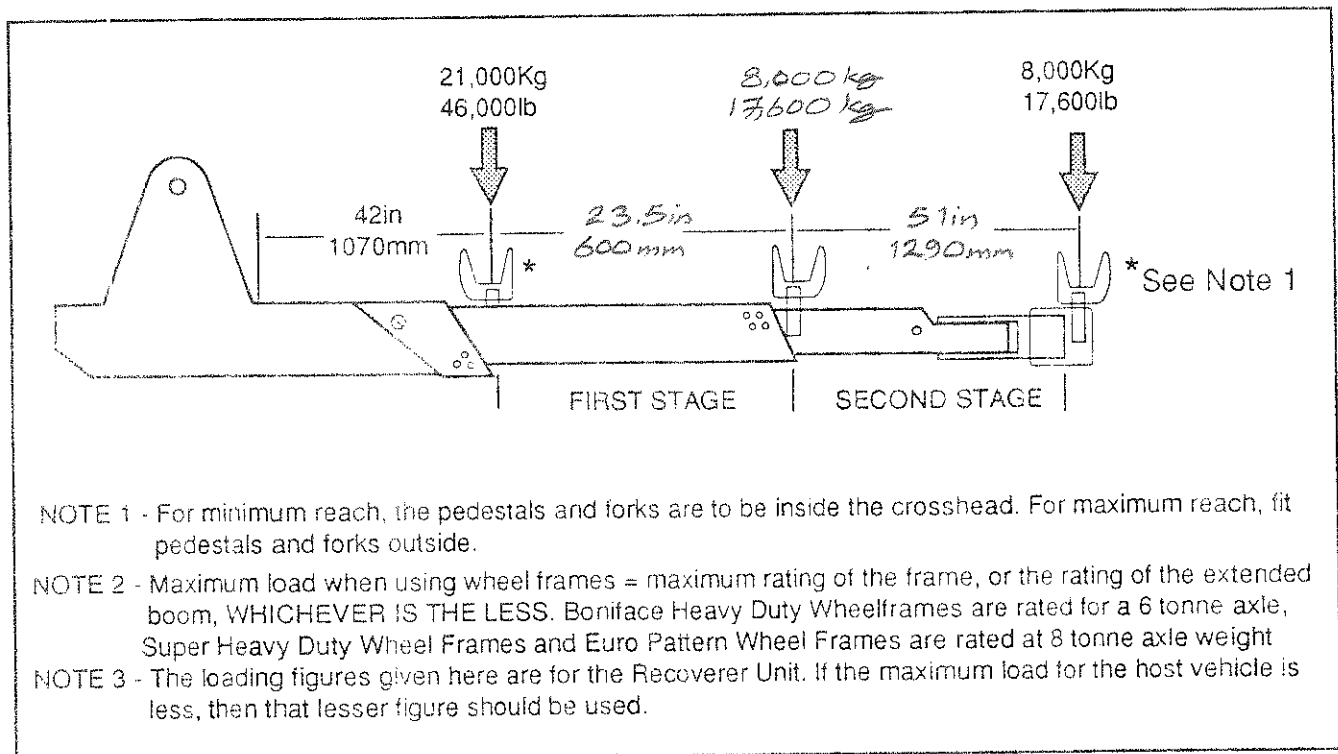


Figure 6 - Performance Figures for the Type E Extending Boom

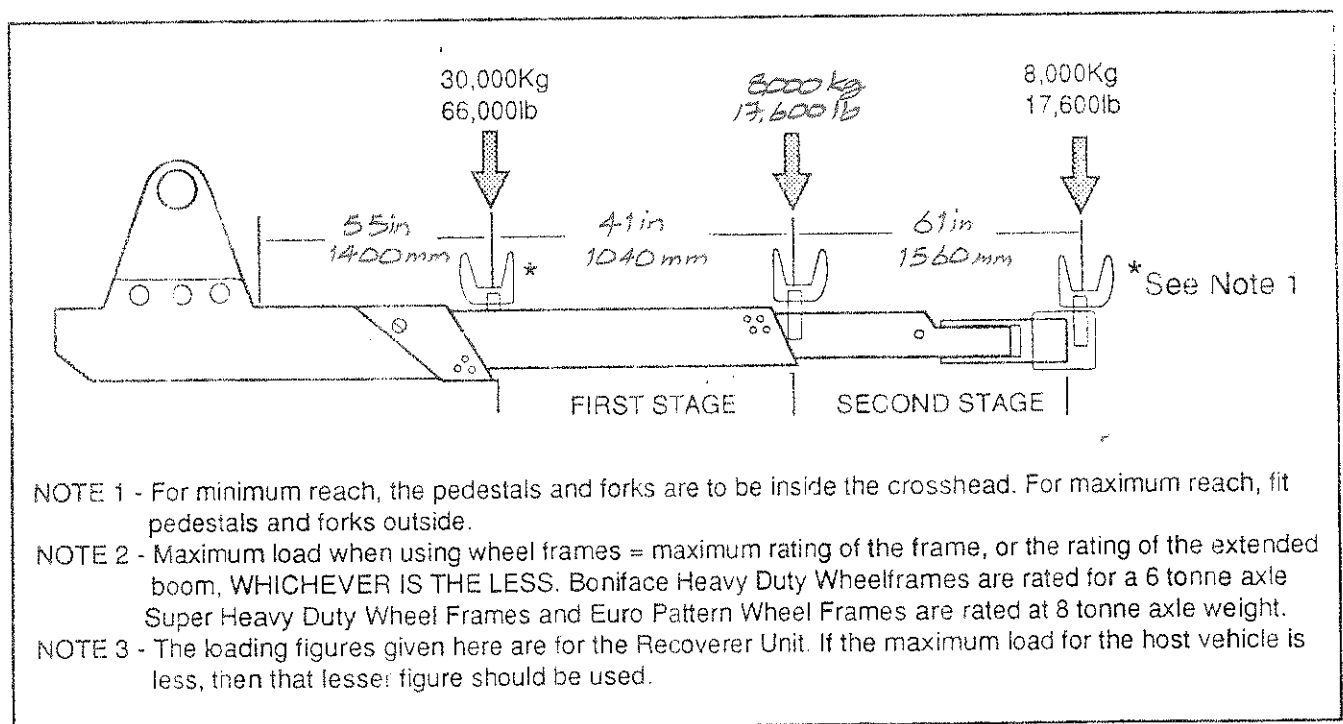


Figure 7- Performance Figures for the Type F Extending Boom

PART 1

GENERAL INFORMATION

RECOVERER

NOTE:

The load values quoted are for the structure of the boom.
Due account must be taken of the SWL of the winch ropes.
By multiple reeving (See Figure 17) it is sometimes possible
that the maximum capacity of the two winches will be greater
than the capacity of the boom. The lesser figure is the limit in
any situation.

ELEVATION = 30 degrees

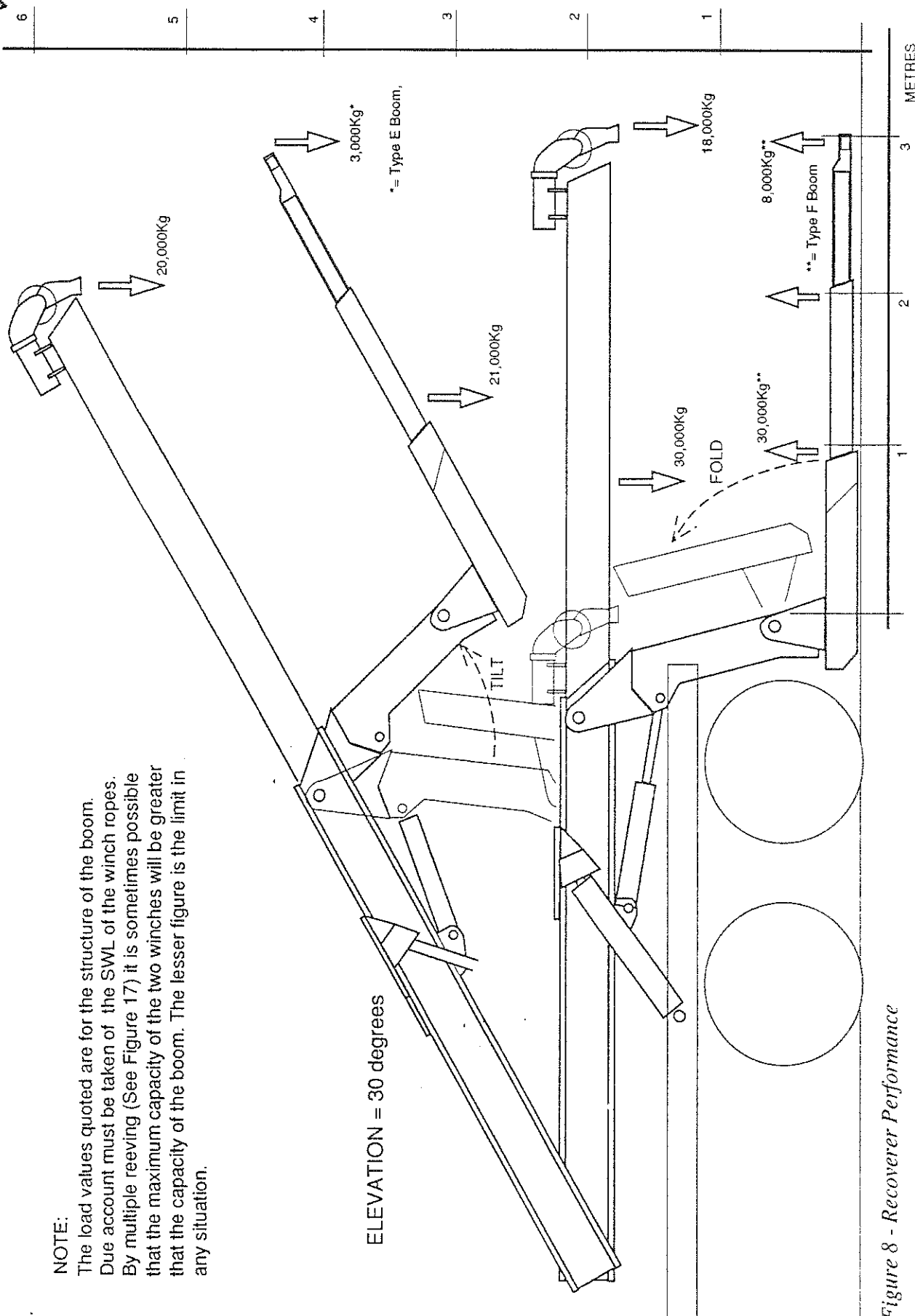


Figure 8 - Recoverer Performance

ACCEPTANCE CHECKS**2.1 ACCEPTANCE CHECK - STATIC**

NOTE 1 This check should be carried out any time when the serviceability has to be verified, i.e. upon delivery from the supplier, after repairs or if a fault is suspected. It will confirm that all functions operate under no-load conditions.

NOTE 2 This check should be carried out with the recovery vehicle on a level, even surface.

NOTE 3 If the unit should fail any part of this test, it should not be used until the fault is rectified. If it cannot be rectified by the operator, then contact your supplier.

2.1.1 Make sure the hydraulic shut-off valves at the rear of the hydraulic tank are open start the recovery vehicle engine and engage the Power Take Off (P.T.O.)

2.1.2 With the folding boom down, the main boom at its lowest and the extending boom fully in, ensure that the hydraulic tank is full to the top of the sight glass with the correct grade of hydraulic oil.

2.1.3 Ensure that the Key Switch on or by the Control Panel is set to "Control Panel"
NOTE: The function of the key switch is for safety. If it is set to "Control Panel" the Remote Control Handset is inoperative, and vice-versa.

2.1.4 Check for oil leaks between the pumps and the valve block.

2.1.5 Make sure there is slack in the winch rope, and using the Winch Push Switches, operate the winch in both directions and ensure that they operate in the correct sense. If not reverse the winch hose connections. Check for oil leaks in the winch supply pipes and hoses.

2.1.6 Ensure the folding boom lock is released. This is done by operating the folding boom control to slightly raise it, and to relieve the load on the lock pin. Lift the lock pin and lower the folding boom.

2.1.7 Raise and lower the folding boom once or twice and check for oil leaks in the pipe run between the valve block and the folding boom hydraulic ram.

2.1.8 Using the Lift Push Switches on the control panel, operate the main boom fully up and down and check the pipe and hose runs for leaks. Ensure that the main boom moves parallel and equidistant from the support legs without fouling the sides.

2.1.9 Repeat operation 2.1.8, and part way through operate one Emergency Stop Button and check that all hydraulic functions are immobilised. To reset the Stop button turn it anticlockwise half a turn. Repeat for all other Emergency Stops.

2.1.10 Using the Boom Out Push Switch, operate the Telescopic Boom fully out and check for leaks. Ensure that the extension is that specified in Figure 8.

NOTE: Before operating the Boom Out control, ensure that the winches are able to freespool, or there is enough slack in the rope to allow the full range of movement.

2.1.11 While the telescopic boom is out, operate the Swing Push Switches, and ensure that the down boom moves in both directions. Do not allow the underlift boom to hit the underside. Check the pipes and hoses for leaks. Return the telescopic boom to the fully in position.

ACCEPTANCE CHECKS**2.1 ACCEPTANCE CHECK - STATIC (Continued)**

- 2.1.12 Using the Boom Extend Push Switch, operate the extendible underlift boom and check for leaks. Ensure that the extension is that specified in Figure 6 or 7.
- 2.1.13 Using the hydraulic control lever, operate the rear support legs simultaneously and check for leaks between the valve block and the support leg hydraulic rams. With much of the weight of the recovery vehicle supported on the legs, wait at least five minutes and check that there is no tendency for the vehicle to sink down.
NOTE: Be sure not to damage a floor or hard standing. It is best to release the swinging feet (See Fig. 16) and to insert timbers under the feet for protection.
- 2.1.14 Raise the legs completely.
- 2.1.15 Top up the hydraulic tank if necessary.
- 2.1.16 Using the control panel push buttons, operate the winch releases and check that the winches release correctly.
- 2.1.17 Connect the remote control handset, set the key switch to "Handset" and ensure that all the controls function as expected.

2.2 CHECKING THE UNDERLIFT FUNCTION UNDER LOAD

- The method used to load the unit for testing will vary from situation to situation. The methods suggested here would seem to be practical for most operators.
- 2.2.1 Without aiming to overload the Recoverer or the vehicle it is fitted to, (See Figure 6 or 7 for loadings at full hydraulic extension), chose another vehicle which can be lifted by the unit, and prepare for an underlift as described in Part 3 of this book.
 - 2.2.2 With the recovery vehicle's handbrake applied, and the handbrake of the loading vehicle released, raise the lift rams as high as possible without damaging the loading vehicle. Ensure a smooth action and no leaks from the hydraulic system. Hold the load high for at least five minutes and check that there is no tendency for the main rams to sink under load.
 - 2.2.3 Lower the loading vehicle as low as possible without the front wheels actually touching the ground.
 - 2.2.4 Operate the extendible boom over its complete hydraulic range and ensure a smooth action and no leaks from the hydraulic system.
 - 2.2.5 Release the loading vehicle.
 - 2.2.6 From fully down raise the folding boom about one quarter of its travel and hold it there for five minutes. Check the folding boom does not sink under its own weight.
 - 2.2.7 The action of the winches under load can be checked by arranging a heavy load on sliders, or perhaps another vehicle on sloping ground. Ensure that the winches perform smoothly and efficiently.

ACCEPTANCE CHECKS

- 2.3 CHECKING THE LIFT FUNCTION UNDER LOAD
- 2.3.1 Position the recovery unit on firm, level ground.
- 2.3.2 Arrange a moderate load which can be picked up by the Telescopic boom at full extension, which will not exceed the rating of either the boom or the winch rope, and prepare it for lifting.
- 2.3.3 Deploy the swinging feet (See Fig.16) and lower the support legs. If necessary place timbers under the feet so as not to damage a paved or other costly surface. Ensure the feet are firmly on the ground, but do not raise the recovery vehicle on its suspension significantly.
- 2.3.4 Ensure that the underlift folding boom is up and locked in place.
- 2.3.5 With the telescopic boom at full extension and at an angle near the horizontal, raise the load a short way off the ground using the winch controls.
- 2.3.6 Raise the boom to its full height using the main lift rams.
- 2.3.7 Retract the extended telescopic boom fully in, taking care not to let the suspended load swing about, and if necessary operate the down boom Swing control to keep the underlift booms out of the way.
- 2.3.8 Lower the boom slowly to near horizontal, ensuring that the suspended load will not foul the vehicle as it is lowered. Extend the telescopic boom a little if necessary.
- 2.3.9 Lower the load to the ground using the winch controls.
- 2.3.10 Throughout this test the action of the booms and winches should be steady and without undue jerks and stops. Check all hydraulic lines and hoses for leakage.

PART 3
OPERATION

RECOVERER

3.0 THE CROSSHEADS

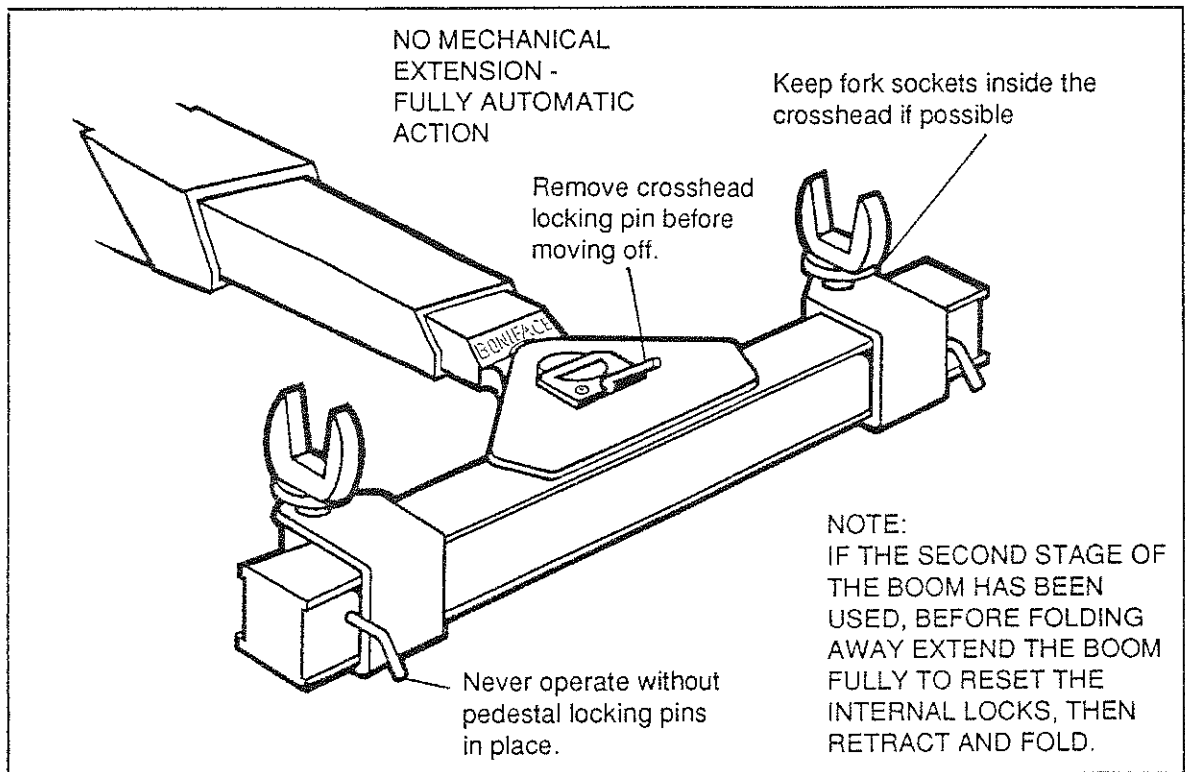


Figure 9 - The Type E Extendible Boom

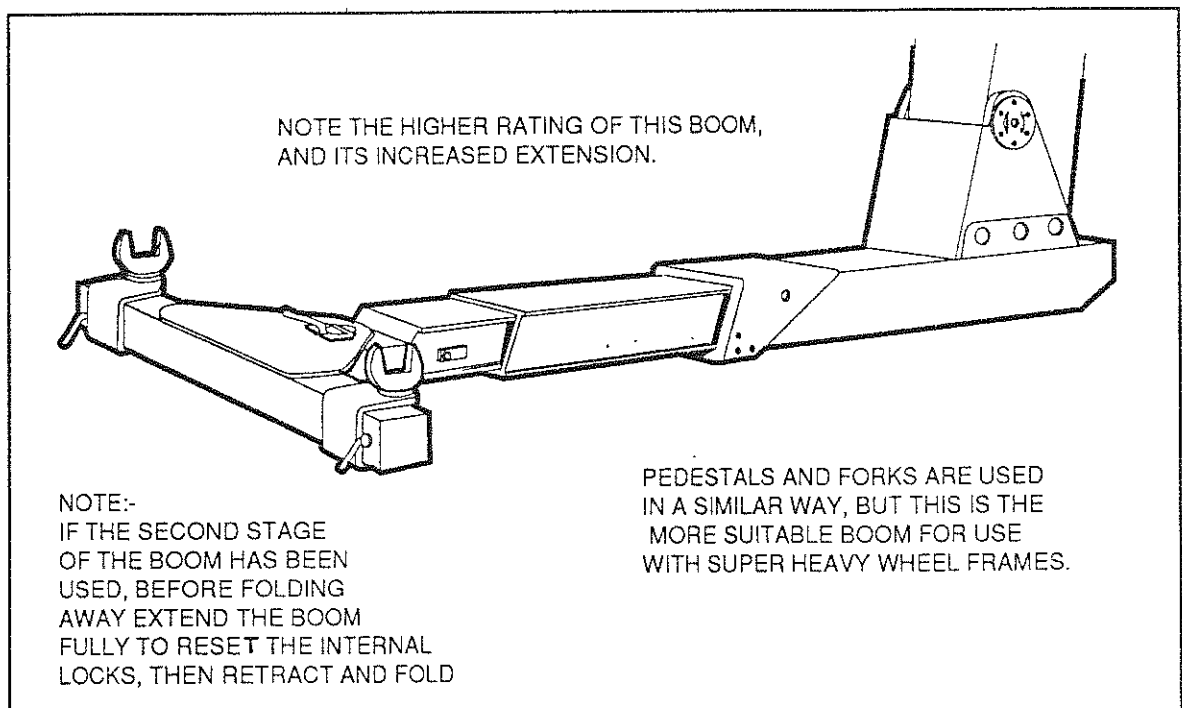


Figure 10 - The Type F Extendible Boom

3.0 OPERATION

NOTE: This part of the manual is written to describe how to operate the Recoverer Recovery Unit and its associated equipment, and refers to procedures in a typical breakdown situation. IT IS NOT INTENDED TO BE A COMPREHENSIVE GUIDE TO RECOVERY OPERATIONS. As all recovery operations are unique, to give instruction on every situation is impractical. Therefore, no liability can be accepted for the procedure described.

3.1 PREPARATION

- 3.1.1 Assume the unit is in full working order. This can be verified by carrying out the procedure detailed in Part 2 of this book.
- 3.1.2. Assume the rear tag axle or mid tag axle (if fitted) is lowered.
- 3.1.3 Ensure that the key switch is set to the correct mode. If set to 'Remote' the control panel will be inoperative and vice versa.
- 3.1.4 Assume that the Recoverer is in its normal travelling position, viz:
 - a) Main boom in and down with the lift cylinders fully closed.
 - b) Folding boom locked in the vertical position.
 - c) Extendible boom fully in.
 - d) Main crosshead pinned in the 'straight' position.
 - e) Fork pedestals and forks stowed in their respective housings.

NOTE: If the user prefers to operate with wheel frames they are usually left fitted to the crosshead and are only removed if a lift on forks is the only option.

3.2 LIFTING WITH CROSSHEAD AND FORKS

- 3.2.1 Park the recovery vehicle directly in front of (or on occasions, behind) the casualty, close to, but not so close that there is no room for the boom to fold down.
- 3.2.2 Check that the recovery vehicle parking brake is on.
- 3.2.3 Depress the clutch, engage Power Take Off and release the clutch. NOTE: The engine revs. should be at idle, between about 700 and 800 rpm.
- 3.2.4 Move to the rear of the recovery vehicle and connect the remote control.
- 3.2.5 Release the boom latch and fold the boom fully down.

ALWAYS KEEP WELL CLEAR OF AN UNSUPPORTED FOLDING BOOM, A HYDRAULIC FAILURE CAN CAUSE IT TO FALL WITHOUT RESTRAINT, AND DEATH OR SERIOUS INJURY COULD RESULT.
- 3.2.6 Remove the crosshead locking pin, and ensure that the crosshead is free to pivot.
- 3.2.7 Adjust the height of the main boom so that the crosshead is within 1" from the ground and, by using the swing controls, ensure that the boom is parallel to the ground.

OPERATION**3.2. (Continued)**

- 3.2.8 The pedestals and forks can be fitted now, or later, according to the operation. Normally it is probably better to fit the pedestals at this stage, and fit the forks later. Whenever possible fit the low pedestals with the fork socket in front of the cross-head (toward the recovery vehicle). This will maximise the lifting capacity of the unit.
- 3.2.10 The best distance between the two vehicles must now be established, but this can only be learned by experience. In general, if the boom is extended under the casualty, the position where the forks locate on the chosen lifting point (e.g. front axle) can be determined. If the extending boom is not fully extended, nor fully retracted, then the forks can be moved both forwards and back to find the correct position. Raise the main boom slightly to verify that the forks locate correctly. (Fit now if not fitted before!)
- 3.2.11 When the forks are correctly located, the main boom can now be raised to a point where the operator can assure himself of a good, safe lift. He should now keep clear of the casualty vehicle. **NEVER WORK UNDER A VEHICLE WHICH IS SUPPORTED ONLY BY THE RECOVERY UNIT. IF IT IS NECESSARY TO GET UNDER THE CASUALTY AGAIN, USE CORRECTLY RATED JACK STANDS. A SLIP WOULD PROBABLY BE FATAL.**
- 3.2.12 For the main lift, it may be necessary to increase the engine revs to 800 - 1000 rpm. by means of the remote throttle control (If fitted). **NEVER TRY TO USE THE FOLDING FACILITY FOR LIFTING. IT WAS NOT DESIGNED FOR THAT.**
- 3.2.13 The main lift can now be implemented. Before the full weight of the casualty is taken up, release the parking brake of either the casualty vehicle, or the recovery vehicle, **BUT FOR SAFETY'S SAKE, NOT BOTH**, to allow the distance between the two vehicles to be adjusted.
- 3.2.14 The best distance between the two vehicles is as short as possible, while still allowing enough clearance for cornering. Adjust this distance using the extendible boom control. **NEVER STAND, OR ALLOW ANYONE ELSE TO STAND BETWEEN THE CASUALTY AND THE RECOVERY VEHICLES WHEN RECOVERY IS IN PROGRESS.**
- 3.2.15 Lift to a suitable height for towing, and using the swing controls, ensure that the boom is parallel to the ground. Fit restraints and lashings.

3.3 SECURING THE CASUALTY ON FORKS

- 3.3.1 Before moving off the casualty should be secured with chains or lashings to prevent dangerous movement between the casualty and recovery vehicles. We cannot anticipate all the problems which might be encountered, but the following are the more usual precautions which need to be considered.
- 3.3.2 If the vehicle is being lifted by another part of its structure, then the axle will hang down, and the casualty would need to be towed at an excessive height to prevent the wheels or axle from dragging on the ground. This can be prevented by lashing the axle up to the chassis before the lift is implemented.

OPERATION

3.3 (Continued)

- 3.3.3 When braking occurs, there is a tendency for the casualty to ride forward. Chains to restrain this potential movement should be laid between the crosshead and some strong point on the vehicle. See Figure 11. The tension in the chains should be firm, not bar-tight. This can be achieved by slight adjustment of the boom extension facility. If the

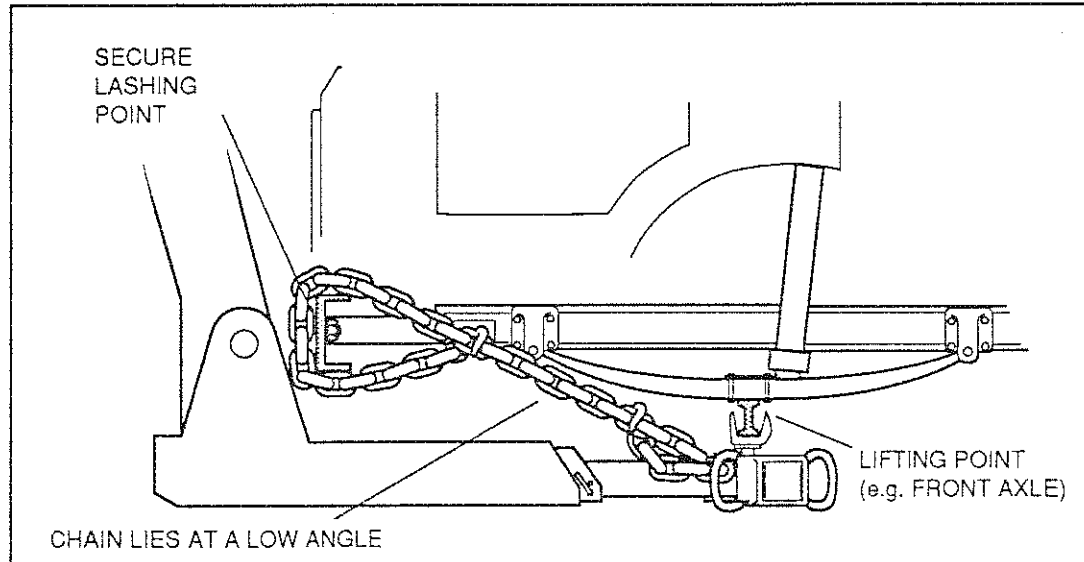


Figure 11 - Restraint against overrun

lashing chains are at too steep an angle, they would suffer periodic slackening and jarring as the springs of the casualty worked while travelling. To reduce this effect the lashing chains should be as near to the horizontal as possible.

- 3.3.4 When the recovery vehicle accelerates, the casualty will tend to get left behind. This is a similar effect to 3.3.2. above, but lesser in extent. This can be countered by using a nylon strap and hand ratchet. Ideally the ratchet should have a short 'tail' fitted with a means of attaching to a chain from an anchor point. The nylon strap should have a cargo hook to connect to the fork pedestal. Tension with the hand ratchet. See Figure 12. Again it is recommended that the path of the restraining strap should lie near to horizontal.

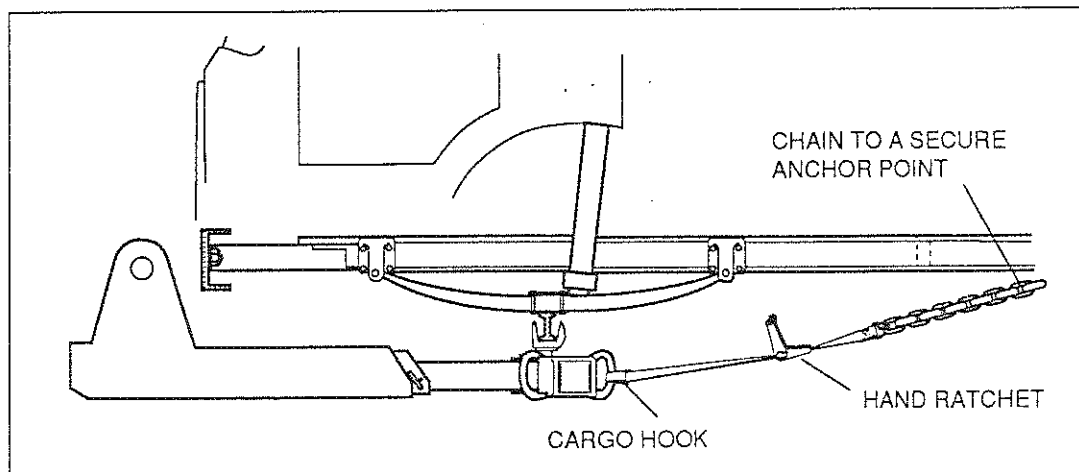


Figure 12 - Restraint against acceleration

3.3 (Continued)

- 3.3.5 Before driving off, fit a safety chain between the casualty and a strong point on the recovery vehicle. This will prevent a disaster should the casualty break free.
- 3.3.6 Boniface Engineering can supply all the necessary items if required. Please remember that safety is of paramount importance in any lifting or towing operation, and if there is any doubt about what is the correct procedure, seek advice before proceeding. At Boniface Engineering we are always pleased to hear from operators, and if you require help please do not hesitate to contact us.

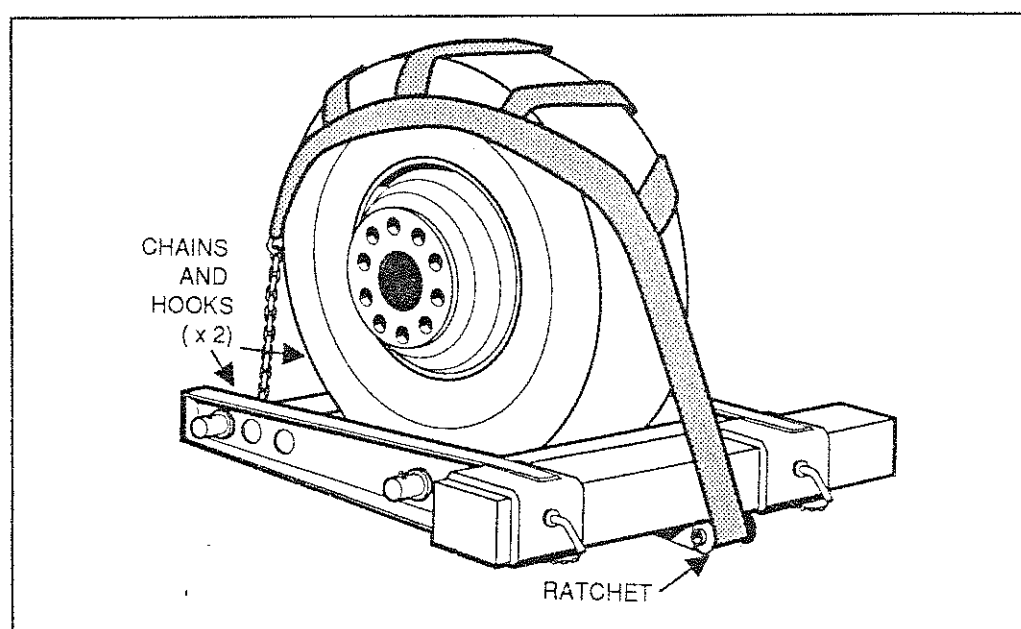


Figure 13 - Heavy Duty ('Euro') Wheel Frames

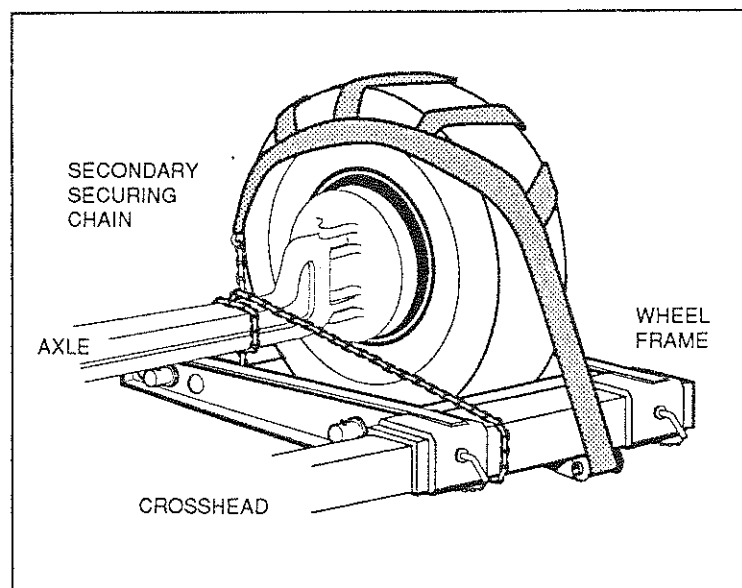
3.4 LOADING A CASUALTY ON WHEEL FRAMES

Note: Wheel frames are perhaps easier to use as long as the wheels are not badly damaged. Various designs are available. Before use, ensure that they are of the correct rating for the job.

- 3.4.1 Park the recovery vehicle directly in front of (or on occasions, behind) the casualty, close to, but not so close that there is no room for the boom to fold down.
- 3.4.2 Check that the recovery vehicle parking brake is on.
- 3.4.3 Depress the clutch, engage Power Take Off and release the clutch. NOTE: The engine revs. should be at idle, between about 700 and 800 rpm.
- 3.4.4 Move to the rear of the recovery vehicle and connect the remote control.
- 3.4.5 Release the boom latch and fold the boom fully down.
- 3.4.6 ALWAYS KEEP WELL CLEAR OF AN UNSUPPORTED FOLDING BOOM, A HYDRAULIC FAILURE CAN CAUSE IT TO FALL WITHOUT RESTRAINT, AND DEATH OR SERIOUS INJURY COULD RESULT.

- 3.4 (Continued)
- 3.4.7 Remove the crosshead locking pin, and ensure that the crosshead is free to pivot.
- 3.4.8 With the crosshead at a convenient height, fit the wheel frames at a width to suit the casualty. Keep the frames 'open'.
- 3.4.9 Adjust the height of the main boom so that the crosshead and wheel frames are within 1" from the ground and ensure it is parallel to the ground by use of the boom Swing control.
- 3.4.10 Extend the boom until the wheel frames span the casualty's wheels and firmly touch both tyres.
- 3.4.11 Close the wheel frames. The method varies with the type of wheel frame.
- 3.4.12 Raise the casualty a short way to confirm that the lift will be satisfactory.
- 3.4.13 Attach and tighten the wheel straps. The method will vary with the design.
- 3.4.14 Fit secondary lashing chains. It is not possible to specify exactly how to fit secondary chains for every type of casualty vehicle and for every situation. Their function is to take over the function of the wheel straps should they work loose or come adrift. The chains must prevent the casualty from rolling forwards, rolling backwards or from bouncing out of the wheel frames.
- 3.4.15 Raise the casualty to a suitable towing height, keeping the extending boom level by use of the Swing control.
- 3.4.16 Fit a safety chain between the casualty and the recovery vehicle. This is to prevent the casualty from breaking free should there be a disastrous failure of the equipment.
- 3.4.17 Release the casualty's brakes and with the extend control adjust the distance between casualty and recovery vehicle to the shortest suitable distance. Allow enough room for cornering.

*Figure 14 -
Secondary
Securing Chains*



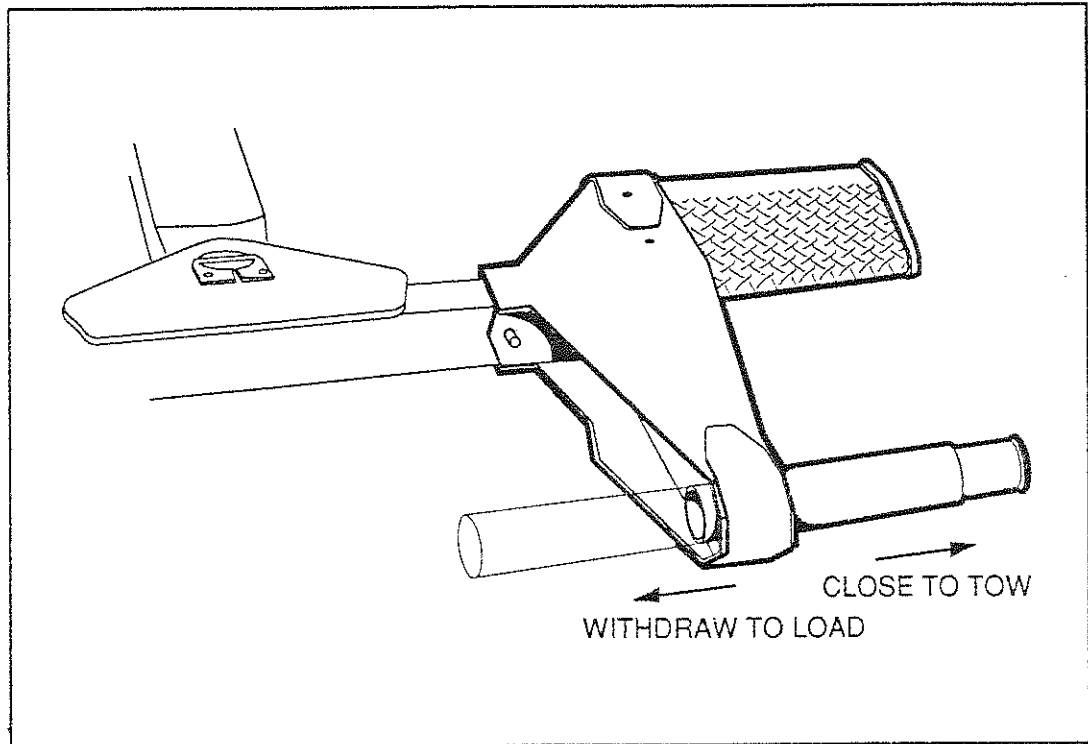


Figure 15 - Super-Heavy Wheel Frames

3.5 TOWING THE CASUALTY

- 3.5.1 Use the remote throttle (If fitted) to control the engine idling revolutions.
- 3.5.2 If towing on forks, ensure that the fork pedestal safety pins are in place, and that they too are secured with 'R' clips.
- 3.5.3 Unplug the remote control handset and stow away.
- 3.5.4 Apply the recovery vehicle handbrake and release the handbrake of the casualty.
- 3.5.5 Depress the recovery vehicle clutch and disengage the Power Take Off.
- 3.5.6 Ensure that all legal requirements regarding loading, braking and lighting are observed.
- 3.5.7 When moving off, do so very slowly so that there is sufficient weight remaining on the steering axle. If the steering is unacceptably light then either the boom must be further retracted, or a new lifting position for the forks must be found.
- 3.5.8 It is advisable to stop the vehicle after about half a mile and make a further check of the locking pins and the tension in the lashing chains.
- 3.5.9 Ensure that the crosshead pivot pin remains well greased in use.

OPERATION**3.6 RELEASING A CASUALTY VEHICLE.**

- 3.6.1 Engage the Power Take Off.
- 3.6.2 Engage the handbrake on the casualty.
- 3.6.3 Connect the remote control handset.
- 3.6.4 Set the throttle at 800 - 1000 rpm.
- 3.6.5 Lower the main boom. Slightly wxtend or retract the extendible boom to allow the safety chains and lashings to be freed and disconnected.
- 3.6.6 Remove the forks and pedestals.
- 3.6.7 Retract the extendible boom.
- 3.6.8 Drive the recovery vehicle clear of the casualty to a position where the folding boom may be folded.
- 3.6.9 Replace the crosshead locking pin.
- 3.6.10 Raise the folding boom.
- 3.6.11 Lower the main boom to the travelling position.
- 3.6.12 Turn off the Power Take off

3.7 RELEASING THE CASUALTY WHEN TOWED ON WHEELFRAMES

- 3.7.1 Engage the Power Take Off.
- 3.7.2 Engage the handbrake on the casualty.
- 3.7.3 Connect the remote control handset.
- 3.7.4 Set the throttle at 800 - 1000 rpm.
- 3.7.5 Disconnect the safety chains and secondary chains.
- 3.7.6 Loosen and remove the wheel straps.
- 3.7.7 Lower the main boom until the casualty's wheel are resting on the ground.
- 3.7.8 Remove the wheel frames.
- 3.7.9 Retract the extendible boom.
- 3.7.10 Drive the recovery vehicle clear of the casualty to a position where the folding boom can be folded.
- 3.7.11 Replace the crosshead locking pin.
- 3.7.12 Raise the folding boom.
- 3.7.13 Lower the main boom to the travelling position.
- 3.7.14 Turn off the Power Take Off.

3.8 USE OF THE REAR SUPPORT LEGS

- 3.8.1 NOTE: Leg controls are not normally featured on the remote control handset. Ensure that the key switch is set to 'Panel' before attempting to lower the legs.
- 3.8.2 Each leg can be operated by means of the hydraulic control levers, or the electrical push-switches on the control panel. During recovery operations, use of the hydraulic levers is not recommended for reasons of safety.

OPERATION

- 3.8.3 The legs have a dual purpose. Firstly they may be used as a support for the chassis when lifting heavy loads which would otherwise cause the front axle of the vehicle to leave the ground. In that mode the swinging feet should be deployed and please note that the pressure on the ground can be much greater than the load being lifted. It can be enough to break concrete so it is advisable to place timbers under the feet when being used on a made surface. NOTE: When using the legs in this mode, lower them firmly onto the ground, but do not raise the recovery vehicle significantly on its suspension. That will reduce the effectiveness of the brakes, and there is much less friction between the ground and the support feet. Let the suspension hold the vehicle, and let the legs support the *extra load* imposed by the lift.
- 3.8.4 Secondly when they are used to provide resistance to winching forces. On soft ground a great deal of resistance can be achieved by using the feet in 'Spade' mode, and driving them well into the ground. Use the full weight of the recovery vehicle to drive them in, but do not operate with the vehicle up in the air. Let the braked wheels add to the resistance of the whole.
- 3.8.5 On hard ground the spades cannot be used as such. They can be used as support feet, but for a heavy haul scotch blocks used correctly will provide better resistance.
- 3.8.6 When using the support legs it is better to lower one leg at a time to a point where the blade is just touching the ground, and then lowering the other to a similar position before applying power both. This will avoid undue racking of the chassis.

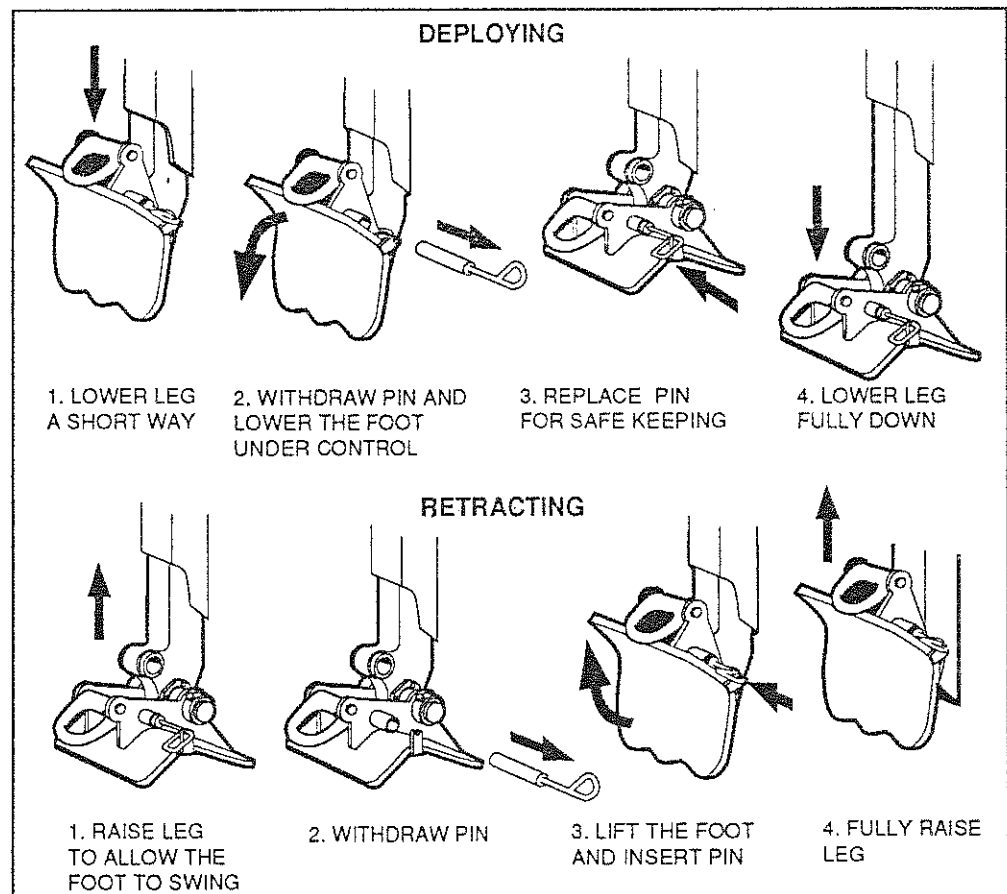


Figure 16 - Using the Swinging Feet

3.8 USE OF THE REAR SUPPORT LEGS (Cont)

SAFETY NOTE: To avoid losing the Foot Locking Pin while travelling, ensure that it is hooked on as shown here.

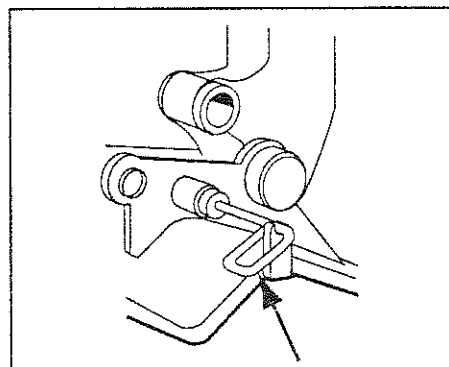


Figure 17 - Retaining the Locking Pin.

3.9 USE OF THE WINCHES FOR HORIZONTAL WINCHING (HAULING)

- 3.9.1 When haul winching, the main boom must be fully down, so that the boom trunnions are not strained by any sideways forces which may occur. It is assumed that during this procedure the winch ropes will be fed through the fairleads.
- 3.9.2 The maximum Safe Working Load of the winch is shown on a plate on the winch. It is also shown on the vehicle test certificate. That load should never be exceeded. For fuller technical details of the winches refer to the winch maker's published information.
- 3.9.3 Release the hooks from their anchor points and release the rope tensioners.
- 3.9.4 Ensure that the winches are in neutral gear.
- 3.9.5 Pull out the cables. **NOTE:** A cable can also be paid out under power, but never without a load applied to it. A man pulling hard will normally be enough, but if the cable is left loose it can get into a monstrous tangle.
- 3.9.6 Attach the winch cables to a strong point on the casualty. In all circumstances, especially if the pull is likely to be a strong one, it is vital that the point of attachment should not fail when power is applied. Axles and chassis members are normally good points to use, bumpers (fenders) and bodywork are not good. **IF A WINCH ROPE FAILS UNDER POWER, SERIOUS HARM CAN OCCUR.**
- 3.9.7 Check that the recovery vehicle's brakes are firmly applied.
- 3.9.8 Lower the rear support legs and load them until, on unconsolidated ground, the spades will dig in no further. On hard roads it might be better to use scotch blocks. Otherwise deploy the swinging feet, but note that lowering the legs too far will be counter productive, as they will take the load off the braked wheels of the recovery truck.
- 3.9.9 Winch in.

NOTE: It is acceptable to use a snatch block at the load end, and return the cable back to hook onto a side or rear anchor point on the recovery vehicle. This will reduce by half the loads imposed on the recovery equipment, but it also means that the total reach of the winch rope will be halved.

SAFETY NOTE: Avoid handling the winch cable, but if that is imperative, use heavy duty gloves, for a loose cable strand can cause a nasty injury.

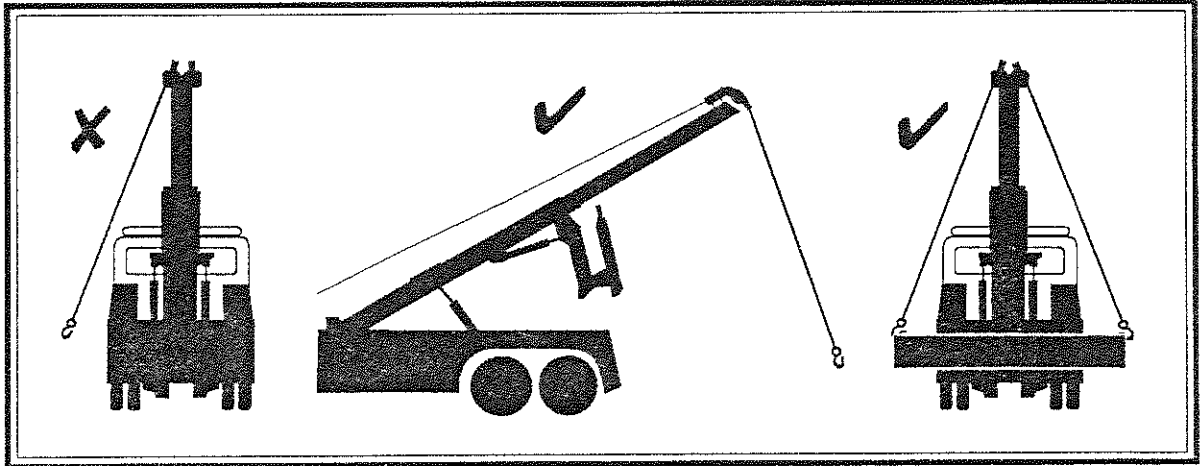


Figure 18 - Do Not Allow the Winch Rope to Impose Sideways Forces

3.10. WINCHING OVER THE SIDE

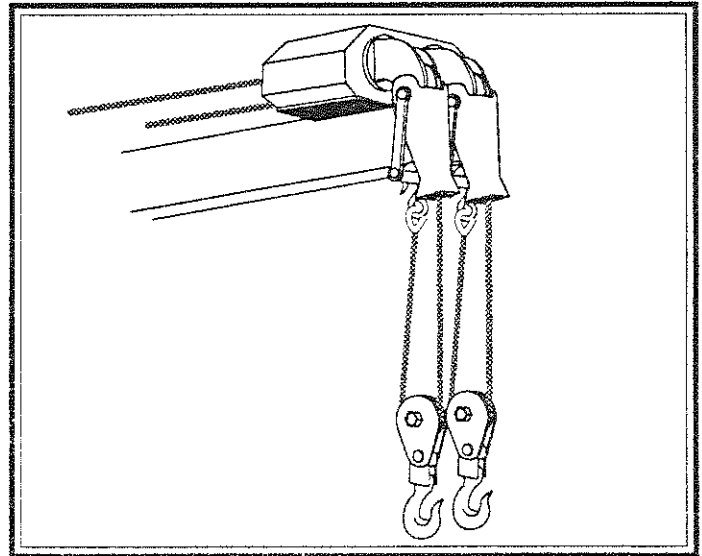
- 3.10.1 It is sometimes convenient to haul a load sideways to the recovery vehicle, using one winch with its fairlead swung out horizontally. Unless the recovery vehicle is fitted with side support legs, the load it can handle in this mode is limited. For a very heavy haul, it is best to make sure that the recovery vehicle is placed so that the winch ropes feed straight out of the back of the vehicle. As before, the boom must be fully down before a load is applied, otherwise the main boom trunnions will be severely strained.

3.11 LIFTING

- 3.11.1 The Recoverer can be used as an overhead crane, and then all the regulations regarding the use of a crane should apply. These regulations include the following:
- A. The SWL of equipment used for a direct lift might be different from that when used in another mode. For example the SWL of a winch rope used for lifting is one fifth of its minimum breaking load.
 - B. The SWL of all other tackle must be compatible with the SWL of the winch rope.
 - C. The crane must not be used without the support legs being deployed.
 - D. Hard hats must be worn by everyone concerned with the lifting operation.
 - E. On no account should anyone stand or work under a suspended load.
- 3.11.2 As far as this crane is concerned, it is important that the crane boom is used principally for lifting, and whilst the rope can be allowed to pull out of the vertical in a fore-and-aft direction, the load should not be allowed to exert a sideways pull on the boom. Otherwise the Trunnion and the Trunnion Bearings could get distorted. The rating of the unit at various extensions and angles of elevation are given in Figure 8 on Page 10.
- 3.11.3 On the fairlead assembly a hook-back is provided, and many operators like to reeve the winch rope through a snatch block at the load end, and bring the winch hook back to the cable guide. This will halve the load in the rope, and so prolong the fatigue life of the rope. Also, if only one winch is being used, hooking the rope back to the cable guide will prevent the load from spinning when it is fully suspended.

3.10 (Continued)

- 3.10.4 NOTE: When rigged as shown in Figure 19, the winches together are capable of lifting four times the S.W.L of one fall of rope on its own. Be careful that this does not overload the crane boom when it is extended.



*Figure 19 - Rigging
for an Overhead Lift*

SAFETY NOTE:

BEWARE OF EXTENDING THE MAIN BOOM IF THE LOAD ON THE HOOK IS NEAR TO THE LIMIT FOR THAT EXTENSION. THE BOOM WILL BECOME OVERLOADED AND WILL BE EXPENSIVELY DAMAGED.

3.11 AFTER WINCHING OPERATIONS

- 3.11.1 Rewind the cables, one at a time. After a recovery when the winches have been used, it is advisable to pay out the winch ropes, and rewind them neatly and evenly. This will release any tension trapped in the rope on the lower turns. The ropes can be inspected whilst doing so and any signs of damage or broken strands noted and dealt with.
- 3.11.2 Hook cables into their stowing points.
- 3.11.3 Switch off the tensioners.

SAFETY NOTE.

ON ALL RECOVERER UNITS THE LEVER CONTROLS ARE INTENDED FOR USE AS A MANUAL OVERRIDE ONLY IN THE WORKSHOP OR WHEN THE ELECTRO-PNEUMATIC CONTROLS ARE INOPERATIVE. RECOVERY WORKERS SHOULD AVOID BEING ON THE BACK OF THE RECOVERY VEHICLE WHEN WINCHING AND LIFTING OPERATIONS ARE TAKING PLACE. THAT IS A VERY DANGEROUS PLACE TO BE.

MAINTENANCE**4.1 MAINTENANCE - GENERAL**

- 4.1.1 In order to ensure correct and efficient working, the Recoverer should be properly lubricated and serviced. The working conditions under which the recovery unit operates will determine the frequency of servicing and maintenance required, and it is for the owner of the recovery vehicle to determine what that period should be. If the unit is being used every day, then the servicing detailed below is recommended.
- 4.1.2 In all hydraulic systems, strict cleanliness is essential for continued efficiency. Before dismantling any part of the hydraulic system, ensure that the surrounding area is completely clean. This also includes the hydraulic oil filler cap. Care should be taken not to introduce muck into the system from the outside, including the container from which the oil is dispensed.
- 4.1.3 The unit can be spray painted, if required, but hydraulic hoses, pressure gauges, the chrome plated filler cap etc. should be masked off before spraying. The use of paint strippers in the vicinity of hydraulic hoses, pneumatic and electrical gear is not advised. **DO NOT PAINT OVER WARNING SIGNS, SWL PLATES etc.**

4.2 DAILY AFTER USE.

- 4.2.1 Check through all ancillary equipment to ensure that it is properly stowed, and can all be accounted for.
- 4.2.2 Lubricate the crosshead pivot pin.
- 4.2.3 Inspect the unit for obvious signs of wear, distortions, chafing hoses, loose fasteners, loss of hydraulic oil etc. The driver of the unit should confer with the service engineer, (if he is not the same person) to pass on faults or observations he may have.

4.3 WEEKLY

- 4.3.1 Lubricate all round. See Figure 20 - Lubrication Chart.
- 4.3.2 Check the level of oil in the hydraulic tank. It should be observable through the level plug hole. Top up if required. **NOTE:** This check can only be carried out with the vehicle standing level, the main boom fully down, folding boom down and the extending boom fully retracted.
- 4.3.3 Carry out a more detailed inspection for damage. All pipes should be examined for leaks, chafing, kinks etc. Ensure all hydraulic rams are not leaking, and ensure that all electrical and pneumatic components are free from dirt or contamination from hydraulic oil.
- 4.3.4 Start the vehicle engine, engage the Power Take Off, and check that all controls - lever, remote control handset and switch panel - function correctly. Whilst raising the main boom operate the Emergency Stop Button and ensure that all hydraulic functions are rendered inoperative. Reset the Emergency Stop.

4.4. ANNUALLY

- 4.4.1 Thoroughly inspect the unit for signs of wear and damage. Rectify as required.
- 4.4.2 Remove the covers and check that all electrical connections and components, all pneumatic connectors and components are secure and clean. Replace covers.
- 4.4.3 Drain the hydraulic tank using the drain plug at the front of the unit.
- 4.4.4 Remove the inspection plate at the rear of the hydraulic tank and remove the oil strainer(s) for cleaning. Refit when clean.
- 4.4.5 Change the filter element. If the strainers or filter element are excessively dirty, then the hydraulic system should be flushed out by filling with a proprietary flushing oil, and running the pumps to circulate the oil. Discard the dirty flushing oil.
- 4.4.6 Refill with clean hydraulic oil (H32).
- 4.4.7 Thoroughly clean down the unit, with steam if available. Care should be taken not to force steam or cleaning fluid behind the covers and into the electrical and pneumatic components.
- 4.4.8 After cleaning, (and painting if applicable) lubricate all round.
- 4.4.9 Run out both winch cables and inspect them for signs of corroding, fraying, stretching or undue kinking. Renew if necessary. Lubricate the cable if required.
- 4.4.10 Service the winch(es) according to the winch maker's instructions.
- 4.4.11 Inspect all ancillary equipment for damage, cleanliness and lubricate any moving parts (e.g. sheaves in snatch blocks etc.).

NOTE:- The Crosshead Pivot Pin (not illustrated) needs to be kept well greased. It should be inspected every day it is in use. The grease nipple is to be found on the underside of the Pivot Pin.

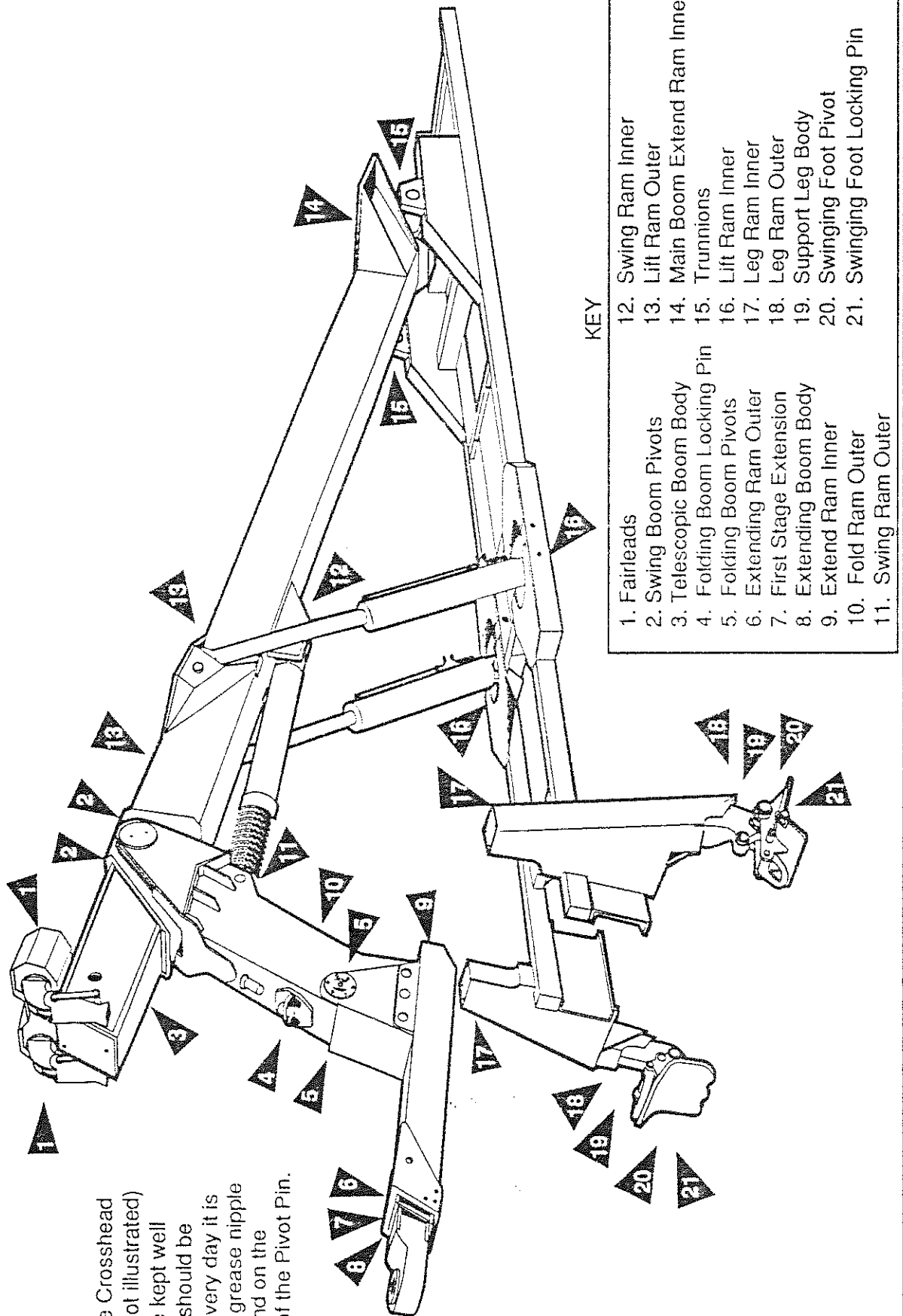


Figure 20 - Lubrication Diagram

ADJUSTMENTS**5.0 ADJUSTMENTS****5.1 MAIN LIFT HYDRAULIC RAMS**

NOTE: The rams were correctly adjusted when the unit left the factory. Only in exceptional circumstances (e.g. if a ram has been replaced) will this procedure be necessary.

- 5.1.1 If the main boom is observed to kick sideways at the top of its travel (See Part 2.1.8) that shows that the strokes of the two lift rams are not exactly equal. The Left Hand ram is adjustable. Proceed as follows.
- 5.1.2 With the main boom raised about half way, support the boom securely and relieve completely the pressure in the hydraulic system.
- 5.1.3 Remove the locating pin from the top of the selected ram. A 5/8in UNC extraction hole is provided to allow the use of a puller or slide hammer.
- 5.1.4 Slacken one of the hydraulic hose connections to relieve any residual pressure, allowing the ram to be manually closed enough to give room to work.
- 5.1.5 Slacken the lock nut at the top of the ram (see Figure 28) and adjust the stroke by screwing the rod end in or out as required.
- 5.1.6 Tighten the lock nut, and refit the ram locating pin.
- 5.1.7 Test to verify the adjustment has been effective.

5.2 FOLDING BOOM COUNTER-BALANCE VALVE ADJUSTMENT

The folding ram is not intended to lift a load other than its own weight. To protect it against damage should a load be inadvertently be applied, a counterbalance valve is fitted to it. This item is adjustable, and if the folding boom has a tendency to creep down from a raised position, its setting can be increased as follows:

- 5.2.1 Lower the folding boom against its stops.
- 5.2.2 Remove the left hand fairlead roller if fitted, or the boom end cover plate if fitted.
- 5.2.3 Reach down to locate the valve mounted at the top of the folding ram.
- 5.2.4 Remove the cap nut using a 22mm wrench.
- 5.2.5 Adjust the valve using a 8mm allen key. Screwing down will increase the setting.
- 5.2.6 If the folding boom still will not remain upright when not in use, and there is no more adjustment on the counterbalance valve, then the hydraulic system probably needs overhaul.

REPAIRS**6.1 REPAIRS.**

- 6.1.1 Many repairs can be effected by simple component replacement. Please use only approved replacements, from the spares list published in this book. The use of non-approved spare parts may render the Maker's warranty invalid.
- 6.1.2 When replacing a component in the hydraulic system, strict care must be taken not to introduce dirt into the system. The area surrounding the part being replaced should be cleaned meticulously before breaking the system open.
- 6.1.3 It is recommended that structural repairs involving welding should be carried out only by the manufacturer. The work will be carried out by certified welders, and the unit must be proof tested before being returned to use.
- 6.1.4 As soon as seepage from a hydraulic ram is noticed, the seals should be replaced. If the ram has been in use for a great length of time, it would probably benefit from a complete overhaul. Boniface Engineering can arrange for that.
- 6.1.5 Modifications should only be carried out with written agreement with the designers at Boniface Engineering Ltd.

IMPORTANT NOTE: Use only approved spare parts when repairing this unit. An inferior product could fail under load, and if that results in an accident the person who authorised its use could be liable to legal proceedings.

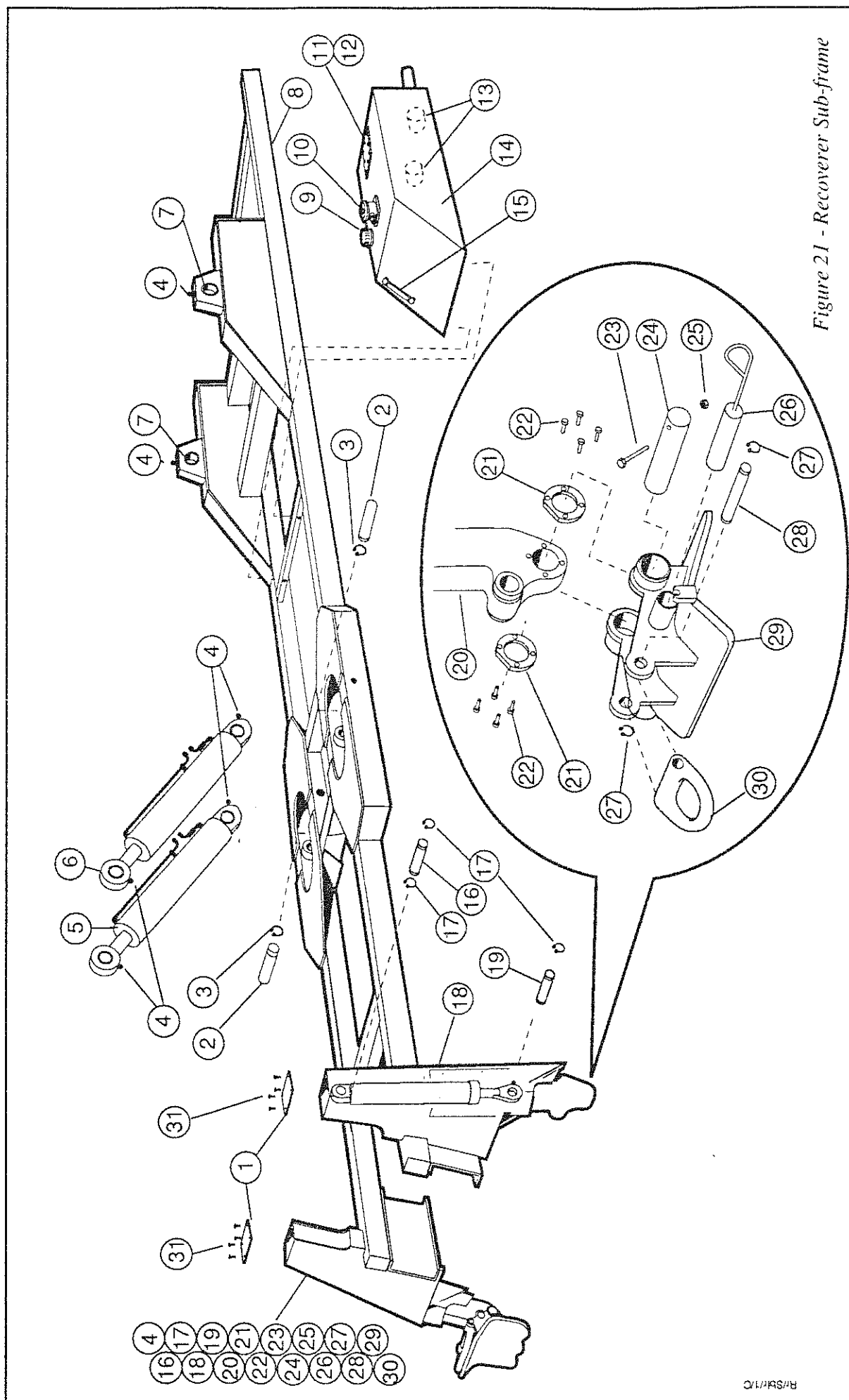


Figure 21 - Recoverer Sub-frame

SPARES

1. SUBFRAME

ITEM No	DESCRIPTION	QTY
1	Rear Leg Cover	2
2	Lift Ram Locating Pin (Lower)	2
3	Circlips 1 1/2 in i.d.	2
4	Grease Nipples Straight	8
5	Lift Ram R.H.	1
6	Lift Ram L.H.	1
7	Spherical Bearing	2
8	Subframe	1
9	Hydraulic Filler Cap	1
10	Oil Filter	1
10A	Filter Element (Not illustrated)	1
11	Inspection Cover	1
12	Fixing Screws	8
13	Strainers	2
14	Hydraulic Tank	1
15	Sight Glass	1
16	Leg Ram Locating Pin (Upper)	2
17	Circlips 1 1/4 in i.d.	8
18	Leg Ram „	2
19	Leg Ram Locating Pin (Lower)	2
20	Inner Leg	2
21	Bearing Ring	4
22	Retaining Bolts	16
23	Pivot Retaining Bolt	2
24	Foot Pivot Pin	2
25	Nut	2
26	Foot Locking Pin	2
27	Circlip	4
28	Anchor Pivot Pin.	2
29	Swinging Foot	2
30	Anchor Point Eye	2
31	Fixing Screws	8

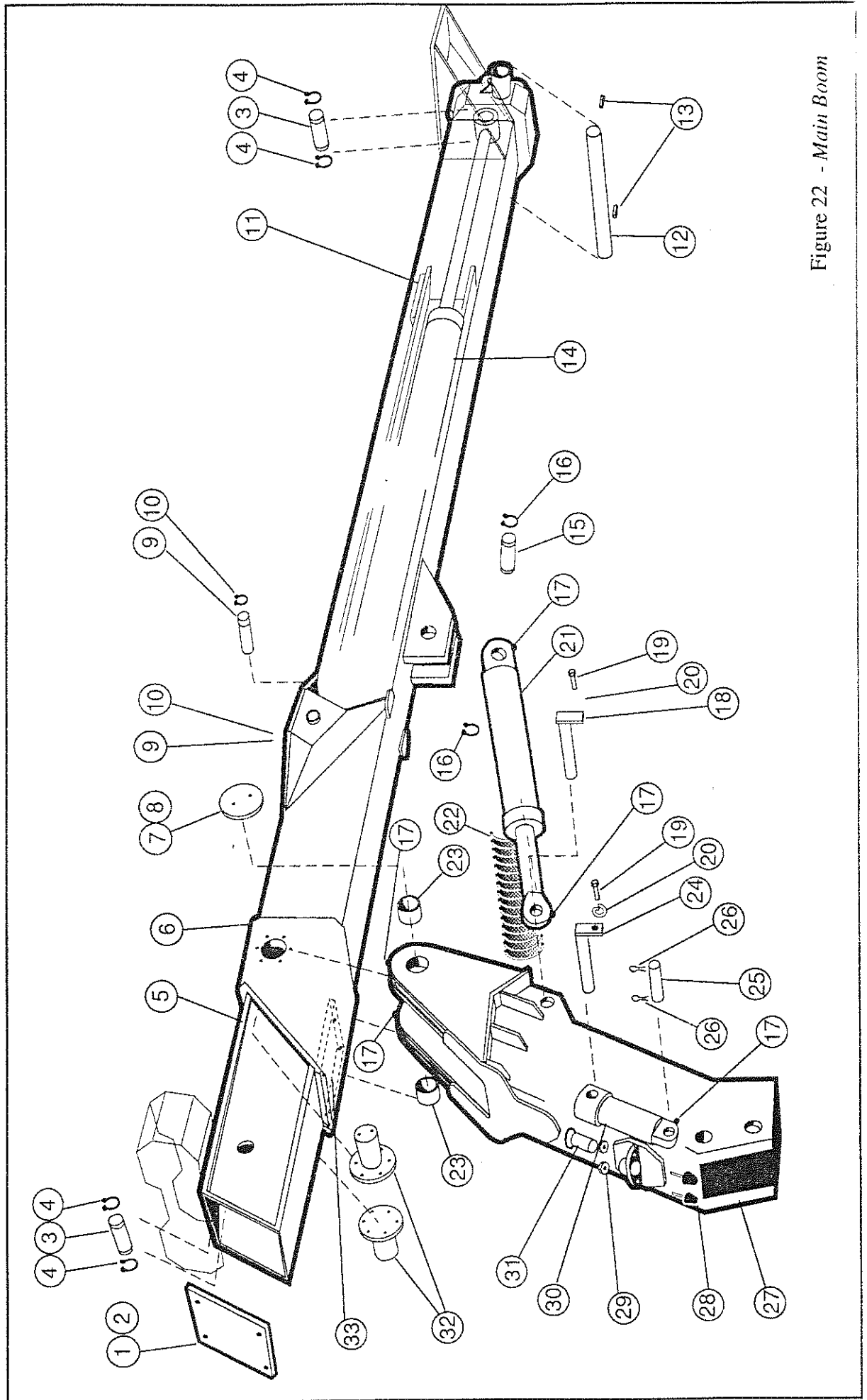
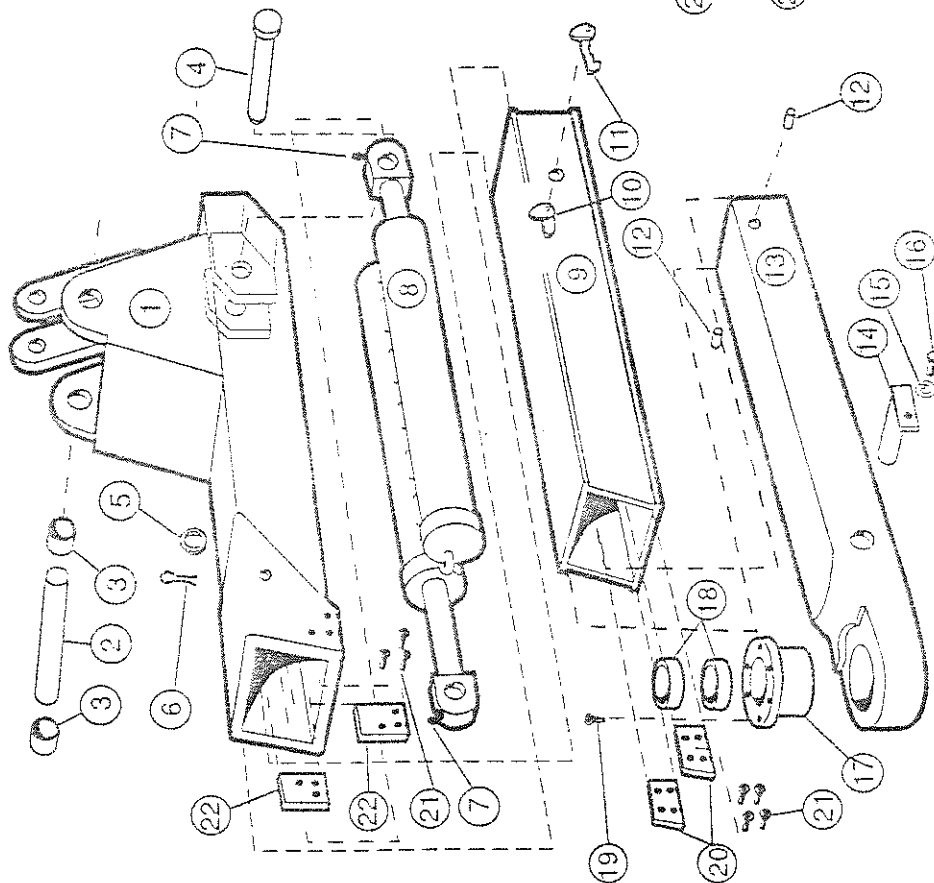


Figure 22 - Main Boom

PART 7**RECOVERER****SPARES****2. MAIN BOOM**

ITEM No	DESCRIPTION	QTY
1	Boom End Cover	1
2	Fixing Screws	4
3	Jib Ram Locating Pin (Inner & Outer)	2
4	Circlips	4
5	Telescoping Boom	1
6	Main Boom	1
7	Bearing Cover Plate	2
8	Fixing Screws	2
9	Lift Ram Locating Pin (Upper)	2
10	Circlip	2
11	Bearing Plate	1
12	Main Boom Pivot Pin	1
13	Grub Screws	2
14	Main Boom Ram	1
15	Swing Ram Locating Pin (Inner)	1
16	Circlips	2
17	Grease Nipple	5
18	Swing Ram Pivot Pin (Outer)	1
19	Fixing Screw	2
20	Spring Washer	2
21	Swing Ram	1
22	Expanding Sleeve	1
23	Swing Boom Bearing	2
24	Fold Ram Locating Pin (Upper)	1
25	Fold Ram Locating Pin (Lower)	1
26	Split Pins	2
27	Down Boom	1
28	Rubber Stops	2
29	Nuts	2
30	Fold Ram	1
31	Folding Boom Locking Pin	1
32	Swing Boom Pivot Pin	2
33	Bearing Plate	1

TYPE 'E' UNDERREACH BOOM



TYPE 'F' UNDERREACH BOOM

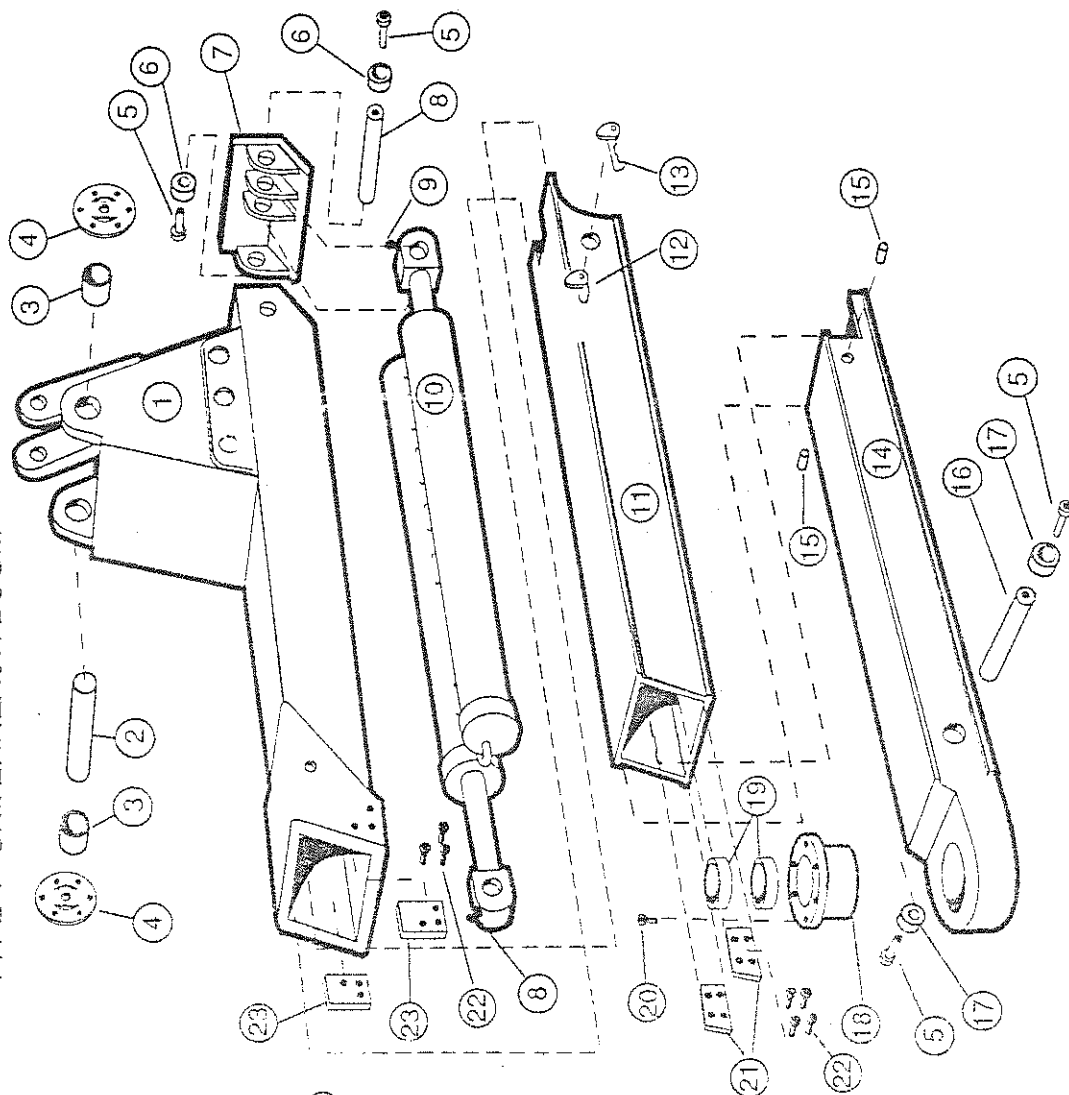


Figure 23 - Underreach Booms

SPARES

3. UNDERLIFT BOOMS

ITEM No	DESCRIPTION	QTY
	Type 'E' UNDERREACH BOOM	
1	Folding Boom	1
2	Folding Boom Pivot Pin	1
3	Folding Boom Bearing	2
4	Extend Ram Pivot Pin (Inner)	1
5	Washer	1
6	Split Pin	1
7	Grease Nipple	2
8	Extend Ram	1
9	Extending Boom First Stage	1
10	Interlock Stop Assembly	1
11	Interlock Hook Assembly	1
12	Actuating Pin	2
13	Extending Boom Second Stage	1
14	Extend Ram Pivot Pin (Outer)	1
15	Spring Washer	1
16	Fixing Screw	2
17	Crosshead Bearing Housing	1
18	Crosshead Bearing Bushes	2
19	Fixing Screws	6
20	Bearing Plates (Inner)	2
21	Fixing Screws	14
22	Bearing Plates (Outer)	2
	Type 'F' UNDERREACH BOOM	
1	Folding Boom	1
2	Folding Boom Pivot Pin	1
3	Folding Boom Bearing	2
4	Retaining Plate	2
5	Fixing Screw	4
6	Cup Washer	2
7	Boom End Plate	1
8	Extend Ram Pivot Pin (Inner)	1
9	Grease Nipple	2
10	Extend Ram	1
11	Extending Boom First Stage	1
12	Interlock Stop Assembly	1
13	Interlock Hook Assembly	1
14	Extending Boom Second Stage	1
15	Actuating Pin	2
16	Extend Ram Pivot Pin (Outer)	1
17	Cup Washer	1
18	Crosshead Bearing Housing	1
19	Crosshead Bearing Bushes	2
20	Fixing Screws	6
21	Bearing Plates (Inner)	2
22	Fixing Screws	14
23	Bearing Plates (Outer)	2

PART 7

RECOVERER

SPARES

4. FAIRLEAD

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Tab Washer	1
3	Nut	1
4	Tension Arm Outer	1
5	Tension Arm Inner	1
6	Spring	1
7	Tension Roller Pivot Bolt	1
8	Washer	2
9	Tension Roller	2
10	Sheave Pivot Pin	1
11	Tension Roller Bearing	2
12	Nut	1
13	Washer	2
14	Sheave Pivot Bolt	1
15	Cable Guide	2
16	Snout	1
17	Sheave	1
18	Sheave Bearing	1
19	Nut	1
20	Tension Arm Bearing	2

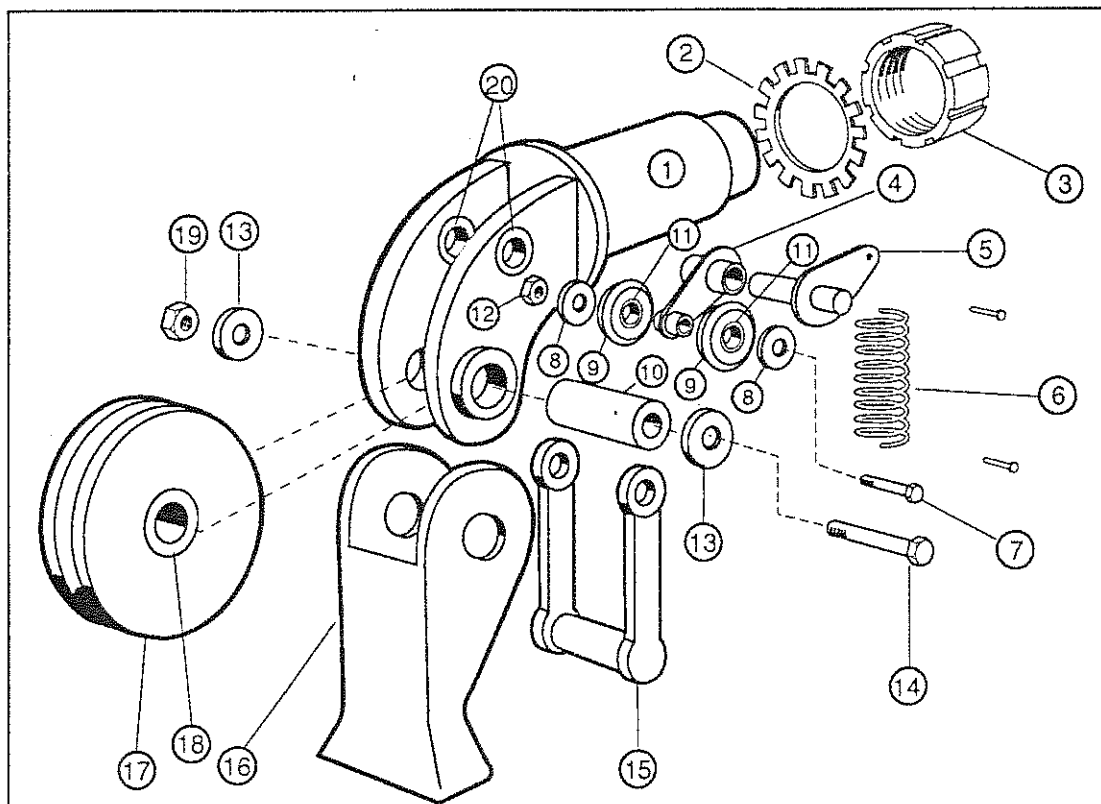


Figure 24 - Fairlead Exploded View

PART 7

RECOVERER

SPARES

5. LIFTING EQUIPMENT

ITEM No	DESCRIPTION	QTY
1	Crosshead	1
2	Crosshead Pivot Pin	1
3	Crosshead Pin Retaining Plate	1
4	Crosshead Locking Pin	1
5	Securing Bolts	1
6	Pedestal Safety Pin c/w 'R' clips	2
7	Low Pedestal	2
8	High Pedestal	2
9	6" Forks (07-01)	2
10	4.5" Forks (07-02)	2
11	7" Forks (07-06)	2
12	Chain Forks	2
13	Chains c/w Grab Hooks 16mm	2
14	Chains c/w Grab Hooks 7mm	4
15	Hand Ratchets	2
16	Straps	2

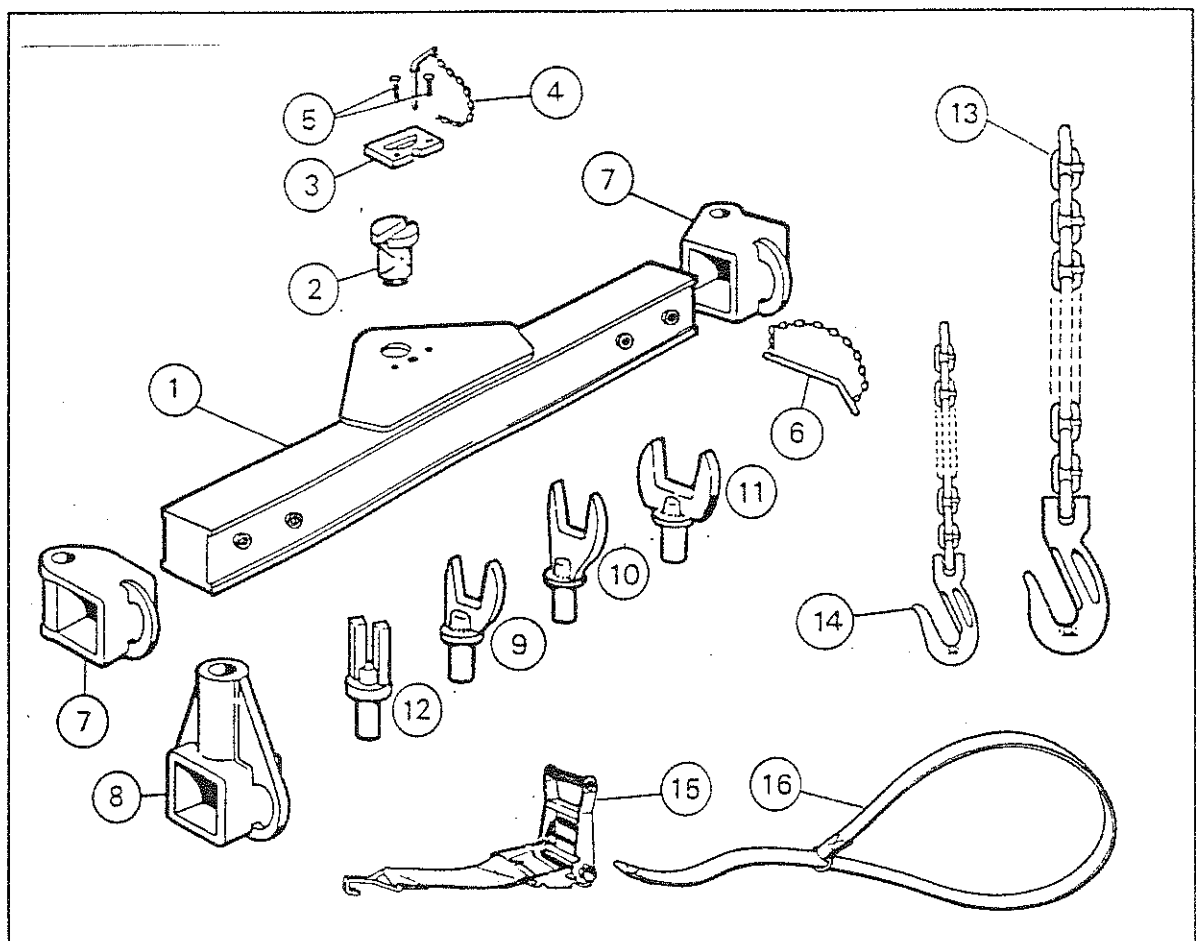


Figure 25 - Lifting Equipment

SPARES

6. WHEEL FRAMES

ITEM No	DESCRIPTION	QTY
	SUPER HEAVY DUTY WHEEL FRAMES (ONE PAIR)	
1	Frame Body L.H.	1
	Frame Body R.H.	1
2	Front Support Plate L.H.	1
	Front Support Plate R.H.	1
3	Front Support Locking Pin	2
4	Rear Support Tube	2
5	Support Tube Locking Pin	2
6	Frame-Crosshead Locking Pin	2
	HEAVY DUTY ('EURO') WHEEL FRAMES (ONE PAIR)	
7	Frame Body	2
8	Frame Arms	4
9	Spacer Bars	4
10	Spring Clips	4
11	Arm-Body-Crosshead Locking Pins	4
	RESTRAINING STRAPS c/w RATCHETS AND HOOKS	
12	For Super Heavy Wheel Frames	2
13	For Heavy ('Euro') Wheel Frames (Not illustrated)	2

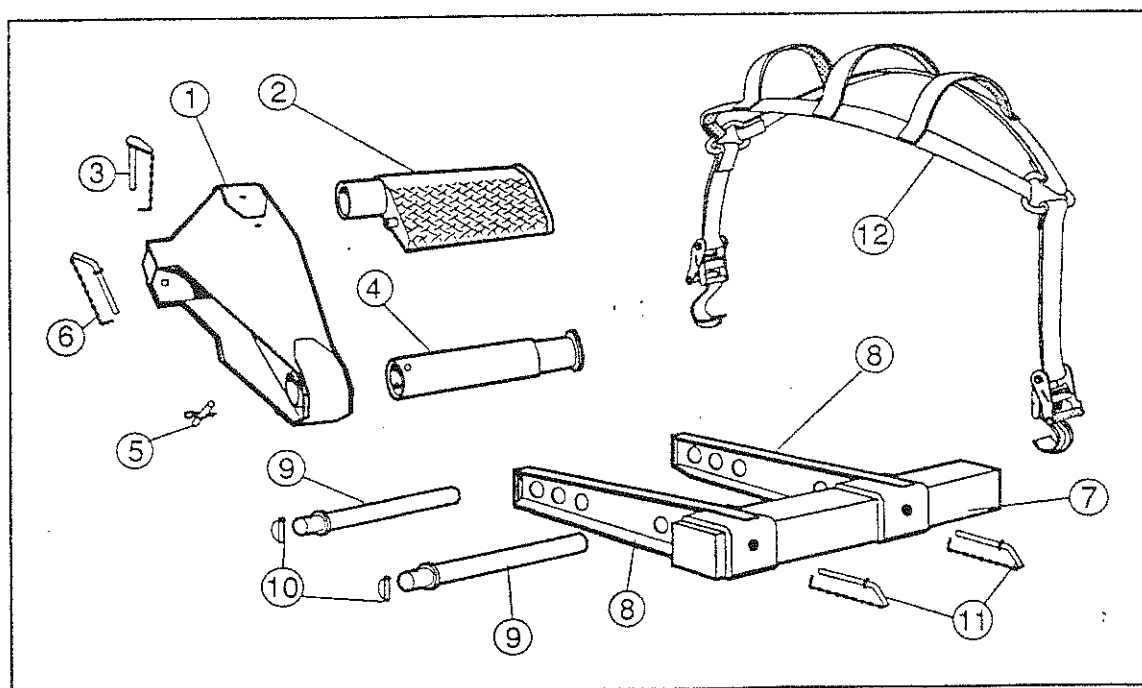
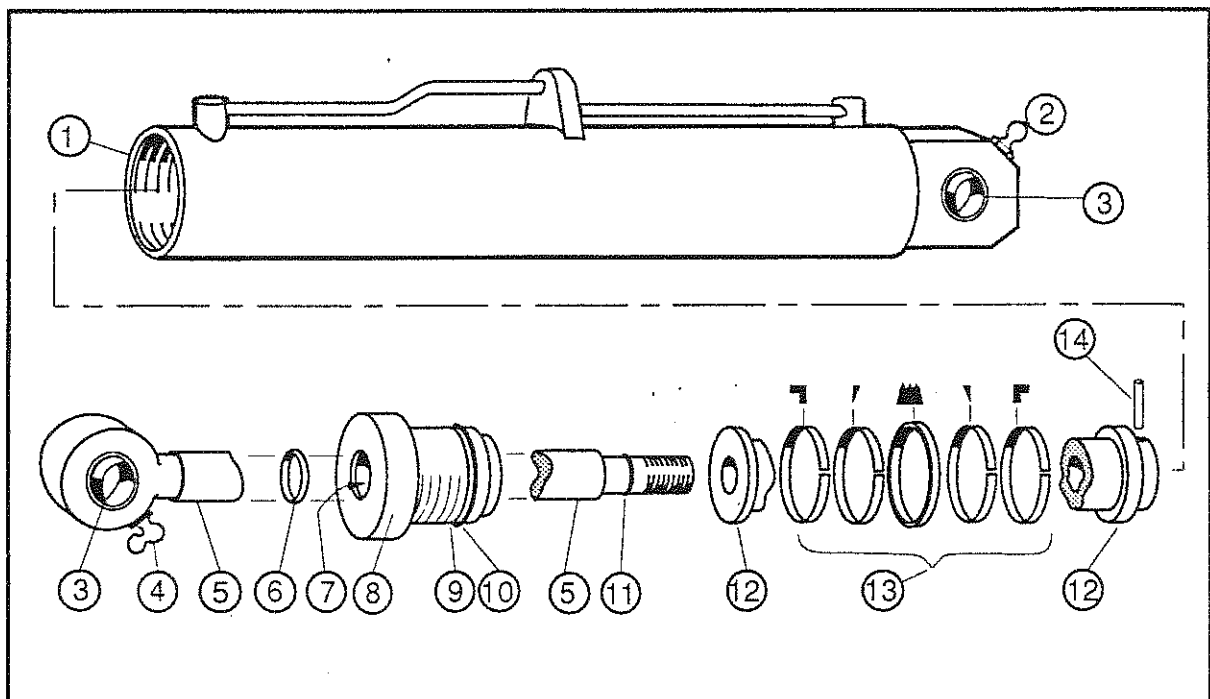


Figure 26 - Wheel Frames

PART 7**RECOVERER****SPARES****7. HYDRAULIC RAMS - LIFT (NON-ADJUSTABLE)**

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Grease Nipple Straight 1/8in BSP	1
3	Spherical Bearing	2
4	Grease Nipple 90deg 1/8in BSP	1
5	Piston Rod	1
6	Wiper Seal	1
7	Gland Seal	1
8	Gland	1
9	Back Up Ring	1
10	Gland 'O' Ring	1
11	Piston 'O' Ring	1
12	Piston Head	1
13	Piston Seal Set - 5 Items	1
14	Roll Pin 6mm	1

*Figure 27 - Lift Ram (Non-adjustable)*

SPARES

8. HYDRAULIC RAMS - LIFT (ADJUSTABLE)

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Grease Nipple Straight 1/8in BSP	1
3	Spherical Bearing	2
4	Grease Nipple 90deg 1/8in BSP	1
5	Rod End	1
6	Locknut	1
7	Piston Rod	1
8	Wiper Seal	1
9	Gland Seal	1
10	Gland	1
11	Back Up Ring	1
12	Gland 'O' Ring	1
13	Piston 'O' Ring	1
14	Piston Head	1
15	Piston Seal Set - 5 Items	1
16	Roll Pin 6mm	1

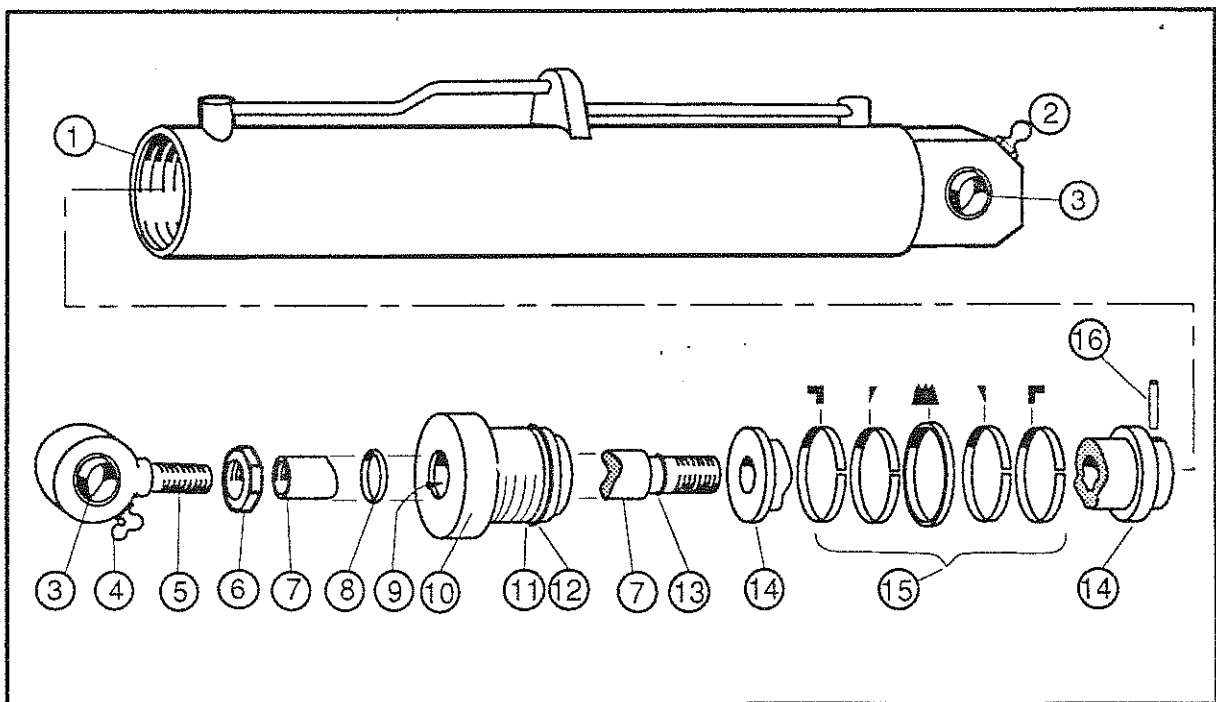


Figure 28 - Lift Ram (Adjustable)

SPARES

9. HYDRAULIC RAM - REAR LEGS

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Grease Nipple Straight	2
3	Spherical Bearing	2
4	Piston Rod	1
5	Wiper Seal	1
6	Gland Seal	1
7	Gland	1
8	Back Up Ring	1
9	Gland 'O' Ring	1
10	Piston 'O' Ring	1
11	Piston	1
12	Piston Seal Set - 5 items	1
13	Retaining Nut	1

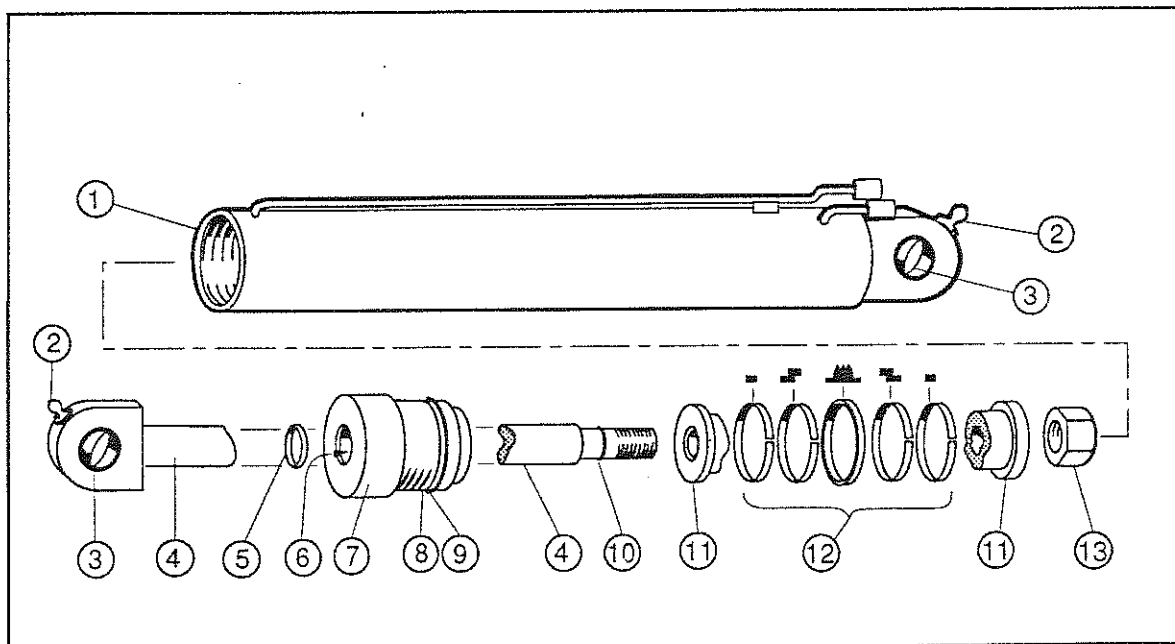


Figure 29 - Hydraulic Rams, Rear Support Legs

SPARES

10. HYDRAULIC RAM - FOLD TYPE 'E' BOOM.

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Plastic Sealing Ring	1
3	Piston Rod	1
4	Grease Nipple Straight	1
5	'O' Ring	1
6	Gland	1
7	Gland Seal	1
8	Back Up Ring	1
9	Wiper Seal	1
10	Counterbalance Valve	1

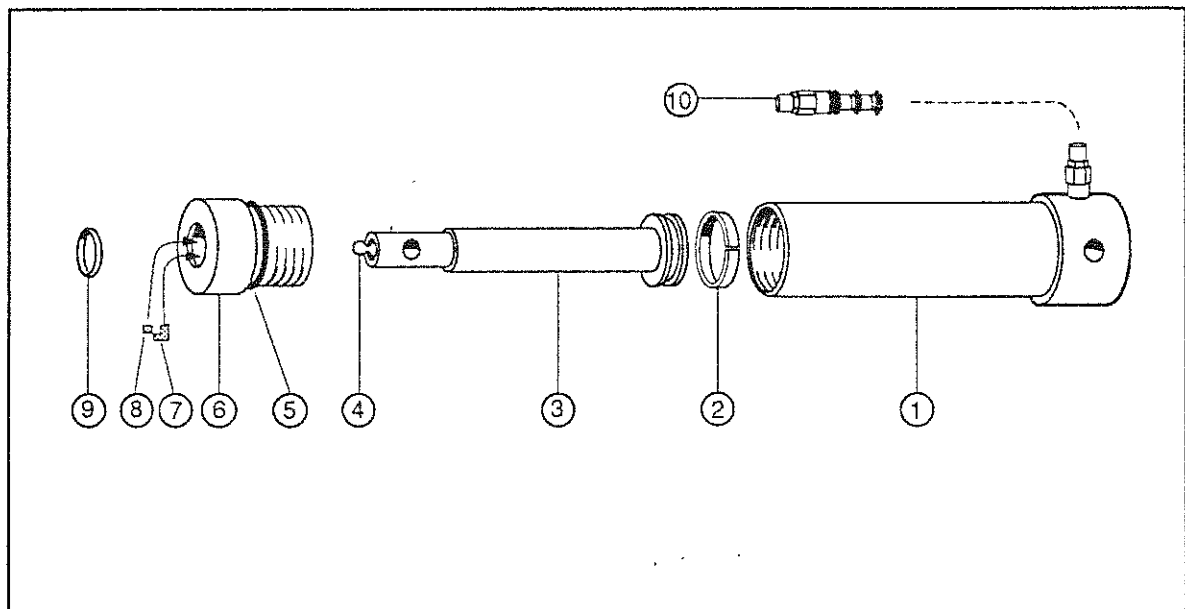


Figure 30 - Hydraulic Ram, Fold

IMPORTANT NOTE: Although the Spare Parts List and the Illustration of this hydraulic ram appears to be the same as that for the Type 'F' boom, they are of different sizes. When ordering spares from this page be sure to quote which boom you have.

SPARES

11. HYDRAULIC RAM - FOLD TYPE 'F' BOOM.

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Plastic Sealing Ring	1
3	Piston Rod	1
4	Grease Nipple Straight	1
5	'O' Ring	1
6	Gland	1
7	Gland Seal	1
8	Back Up Ring	1
9	Wiper Seal	1
10	Counterbalance Valve	1

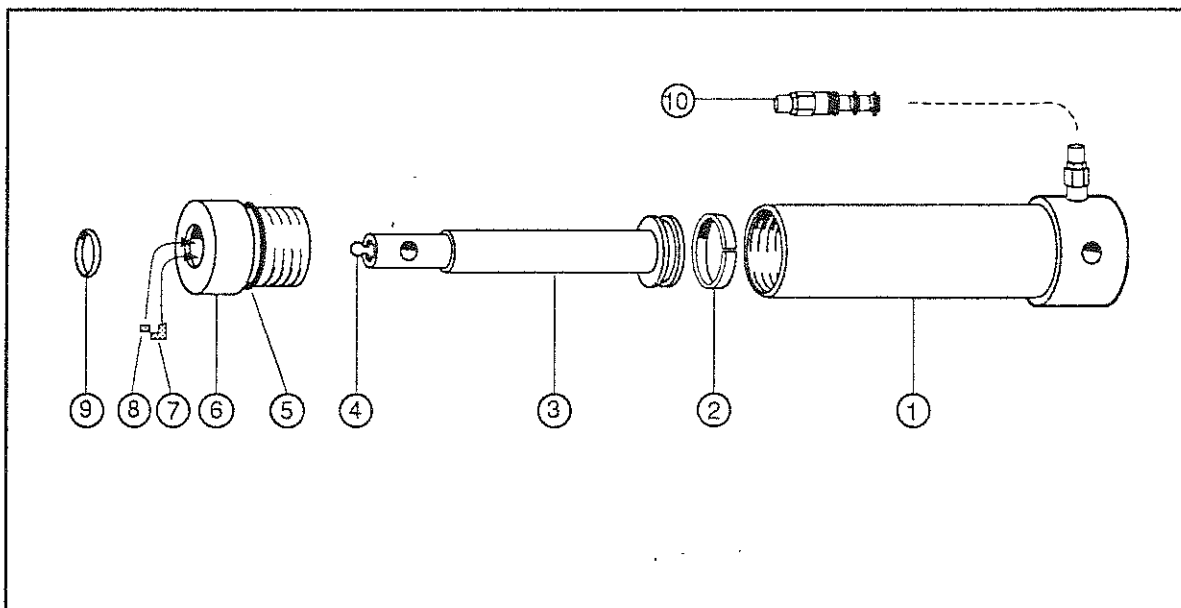


Figure 31 - Hydraulic Ram, Fold

IMPORTANT NOTE: Although the Spare Parts List and the Illustration of this hydraulic ram appears to be the same as that for the Type 'E' boom, they are of different sizes. When ordering spares from this page be sure to quote which boom you have.

SPARES

12. HYDRAULIC RAMS SPECIAL - EXTENDING TYPE E Model

ITEM No	DESCRIPTION	QTY
1	Body - Special	1
2	Spherical Bearing	4
3	Grease Nipple Straight 1/8in BSP	4
4	Grub Screw 6mm	2
5	Piston Rod	2
6	Gland Cap	2
7	Wiper Seal	2
8	Gland	2
9	Gland Seal	2
10	Back Up Ring	2
11	Gland 'O' Ring	2
12	Piston 'O' Ring	2
13	Piston Head Top	2
14	Piston Seal Set - 5 items	2
15	Piston Head Threaded	2
16	Roll Pin 3mm	2
17	Integral Pilot Operated Check Valve	1

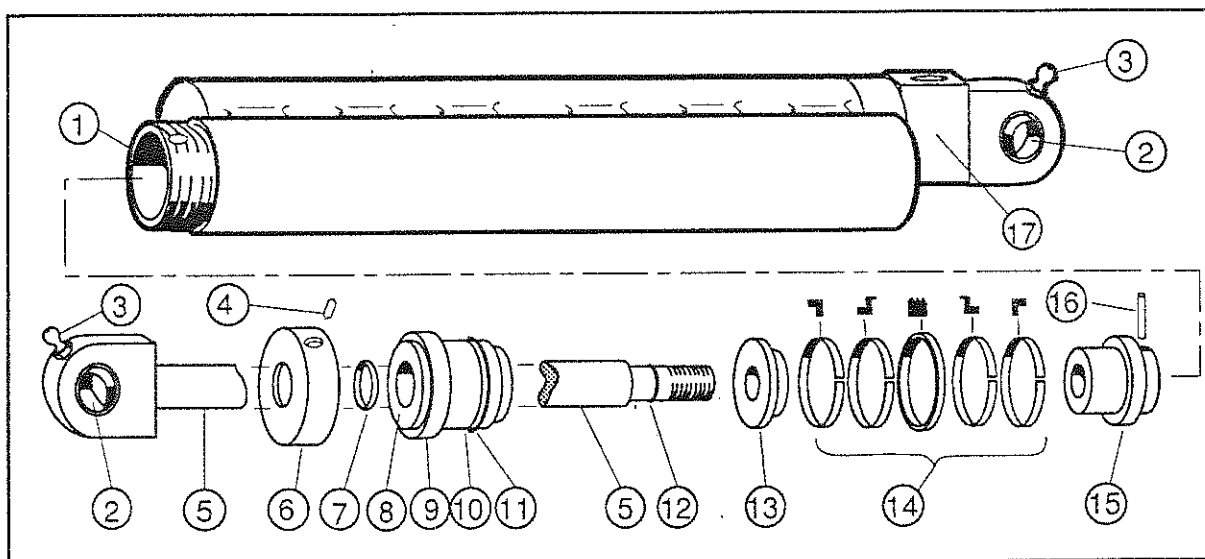


Figure 32 - Hydraulic Ram, Type E Extending Boom

IMPORTANT NOTE: Although the Spare Parts List and the Illustration of this hydraulic ram appears to be the same as that for the Type 'F' boom, they are of different sizes. When ordering spares from this page be sure to quote which boom you have.

13. HYDRAULIC RAMS SPECIAL - EXTENDING TYPE F Model

ITEM No	DESCRIPTION	QTY
1	Body - Special	1
2	Spherical Bearing	4
3	Grease Nipple Straight 1/8in BSP	4
4	Grub Screw 6mm	2
5	Piston Rod	2
6	Gland Cap	2
7	Wiper Seal	2
8	Gland	2
9	Gland Seal	2
10	Back Up Ring	2
11	Gland 'O' Ring	2
12	Piston 'O' Ring	2
13	Piston Head Top	2
14	Piston Seal Set - 5 items	2
15	Piston Head Threaded	2
16	Roll Pin 3mm	2
17	Integral Pilot Operated Check Valve	1

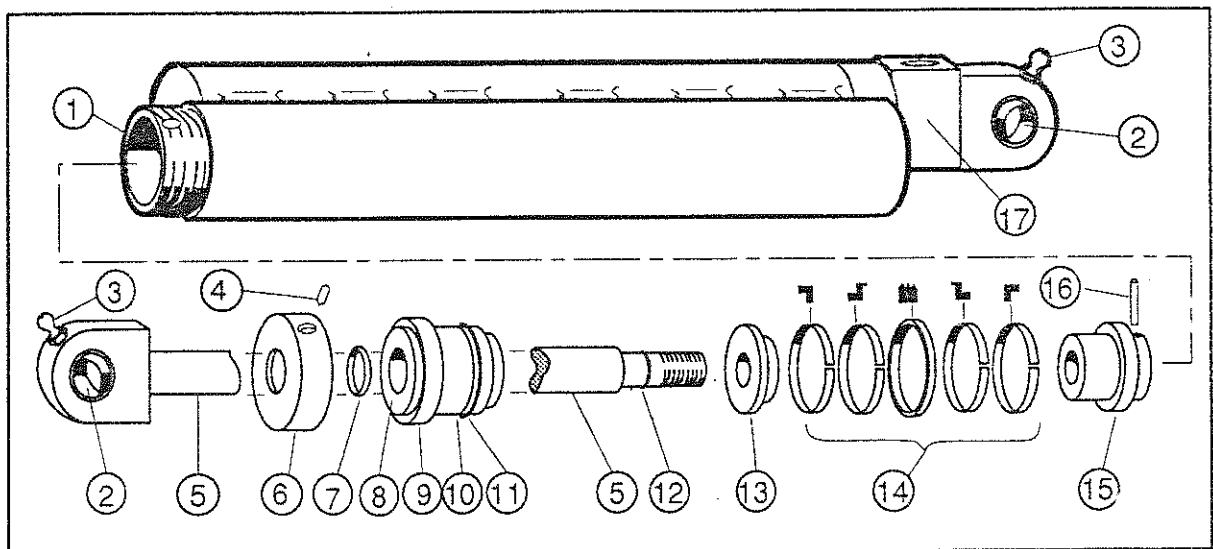


Figure 33 - Hydraulic Ram, Type F Extending Boom

IMPORTANT NOTE: Although the Spare Parts List and the Illustration of this hydraulic ram appears to be the same as that for the Type 'E' boom, they are of different sizes. When ordering spares from this page be sure to quote which boom you have.

SPARES

14. HYDRAULIC RAM, SWING

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Spherical Bearing	2
3	Grease Nipple Straight	2
4	Grub Screw, 6mm	1
5	Piston Rod	1
6	Gland Cap	1
7	Wiper Seal	1
8	Gland	1
9	Gland Seal	1
10	Gland Back-Up Ring	1
11	Gland 'O' Ring	1
12	Piston 'O' Ring	1
13	Piston Head Half	1
14	Piston Seal Set (5 items)	1
15	Piston Head Half	1
16	Lock Nut	1
17	Roll Pin, 6mm	1

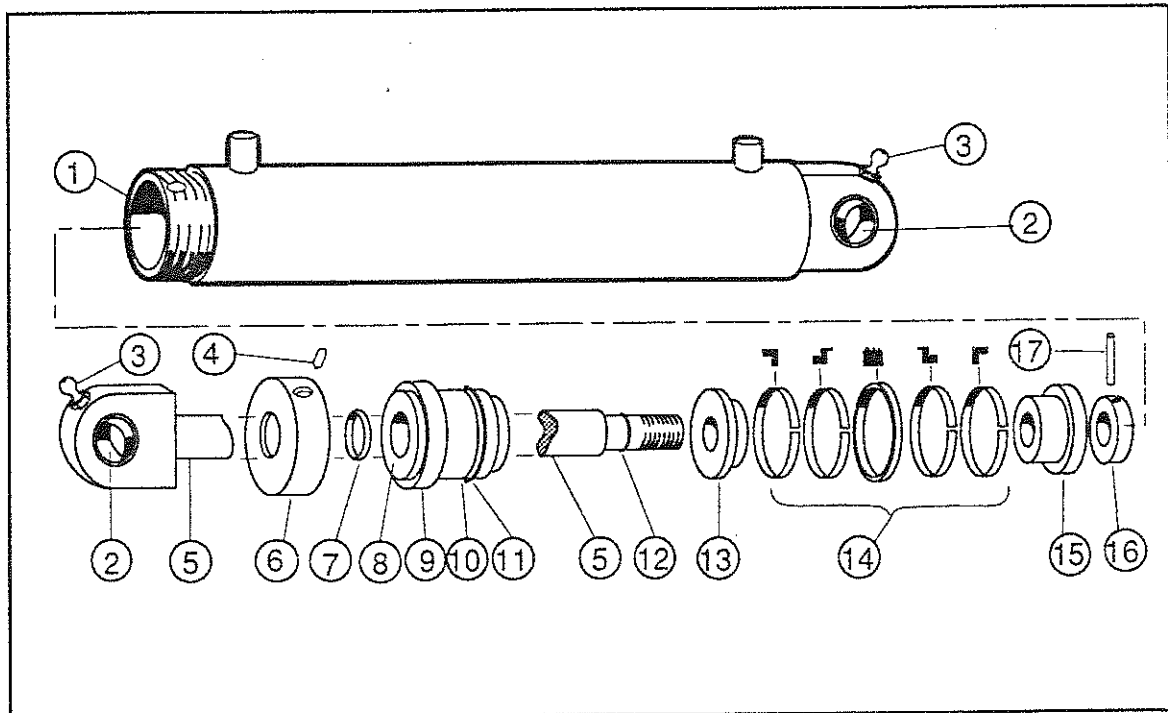


Figure 34- Hydraulic Ram, Swing Boom

PART 7
SPARES

RECOVERER

15. HYDRAULIC RAM, MAIN BOOM EXTEND

ITEM No	DESCRIPTION	QTY
1	Body	1
2	Spherical Bearing	2
3	Piston Rod	1
4	Wiper Seal	1
5	Gland Seal	1
6	Gland	1
7	Gland Back-Up Ring	1
8	Gland 'O' Ring	1
9	Spacer	1
10	Piston Rod 'O' Ring	1
11	Piston Head Half	1
12	Piston Seal Set (5 items)	1
13	Piston 'O' Ring	1
14	Piston Head Half	1
15	Locking Grub Screw	1

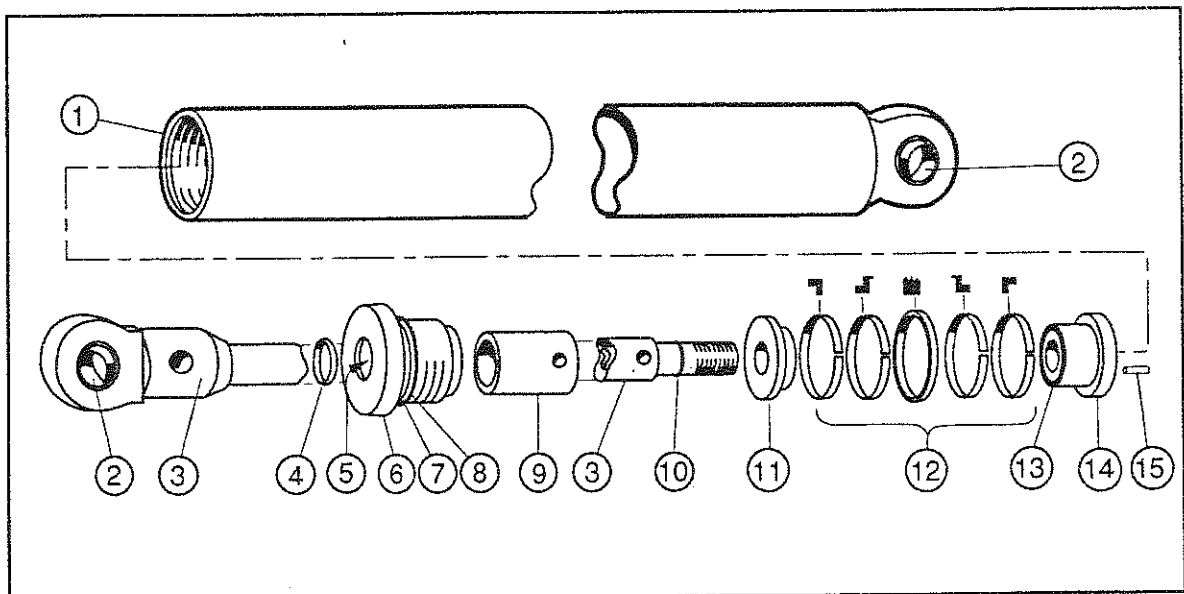


Figure35 - Hydraulic Ram, Main Boom Extend

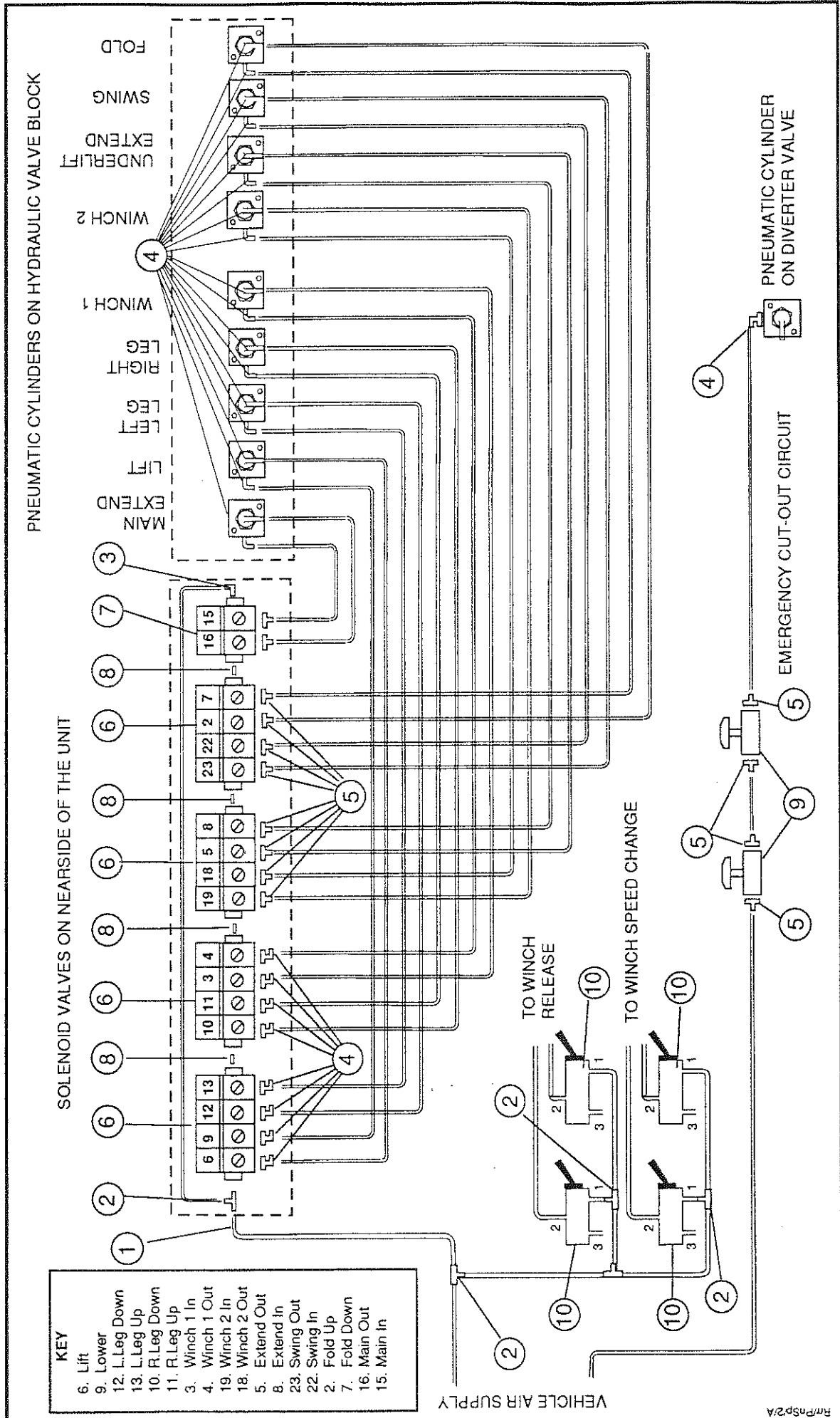


Figure 36 - Pneumatic Components

SPARES

16. PNEUMATIC COMPONENTS

ITEM No	DESCRIPTION	QTY
1	Nylon Pneumatic Piping	
2	Tee	1
3	Elbow	3
4	Connector, Right Angled	31
5	Connector, Straight	12
6	4 Bank Solenoid Valves	5
7	2 Bank Solenoid Valves	1
8	Adaptor	4
9	Single Solenoid Valve	2
10	Pneumatic Switches	2

ITEM No	DESCRIPTION	QTY
1	16 Pin Socket	1
2	Push Switch	18
3	Front Panel	1
4	Steel Box	1
5	Key Switch c/w 2 keys	2

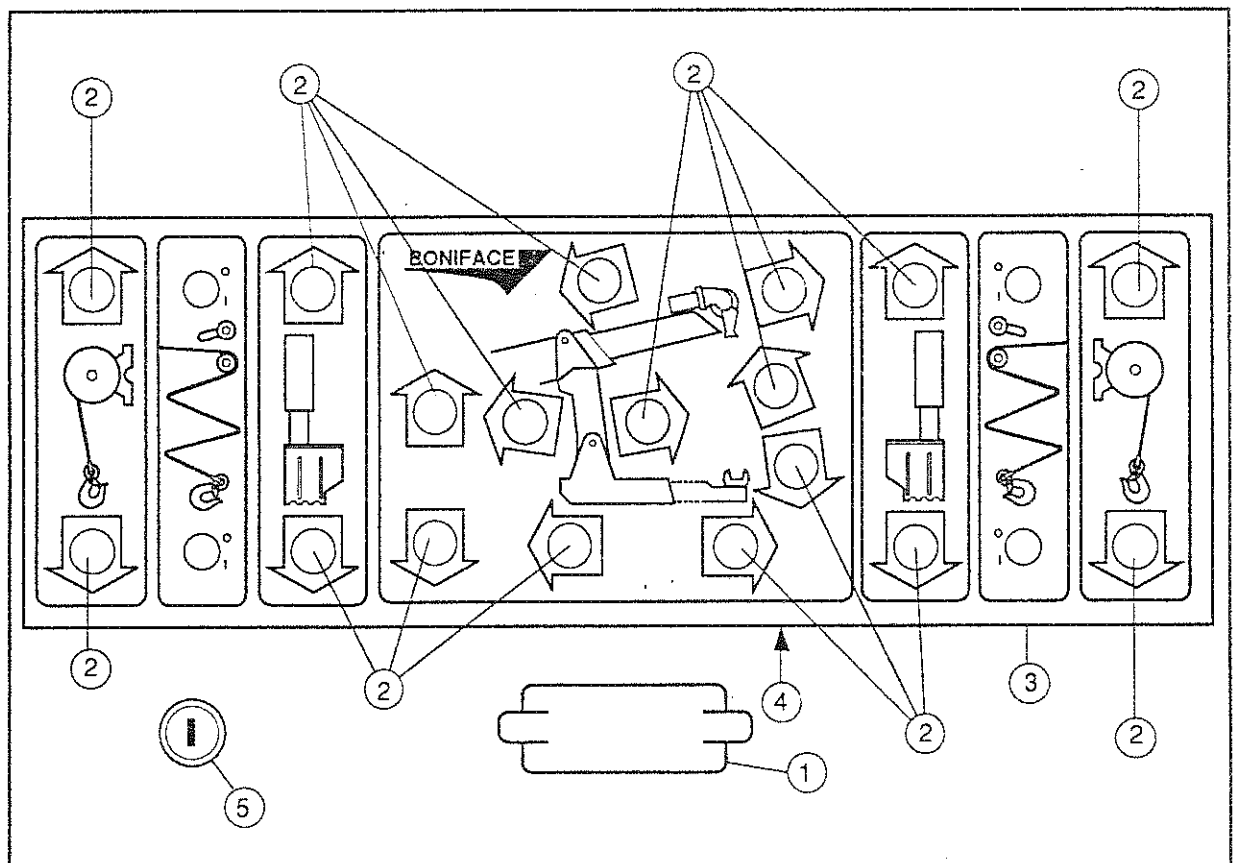


Figure 37 - Electrical Components (Control Panel)

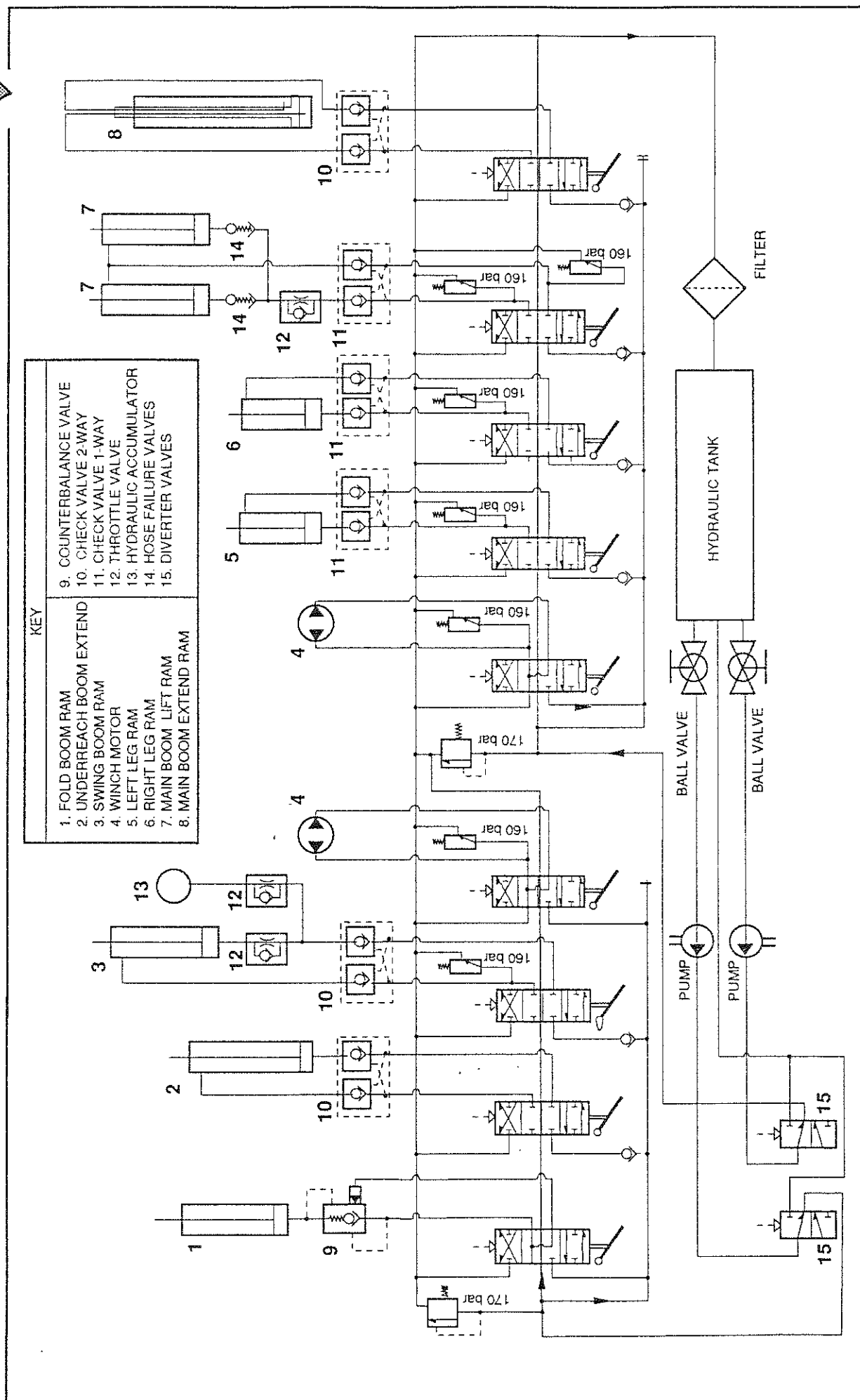
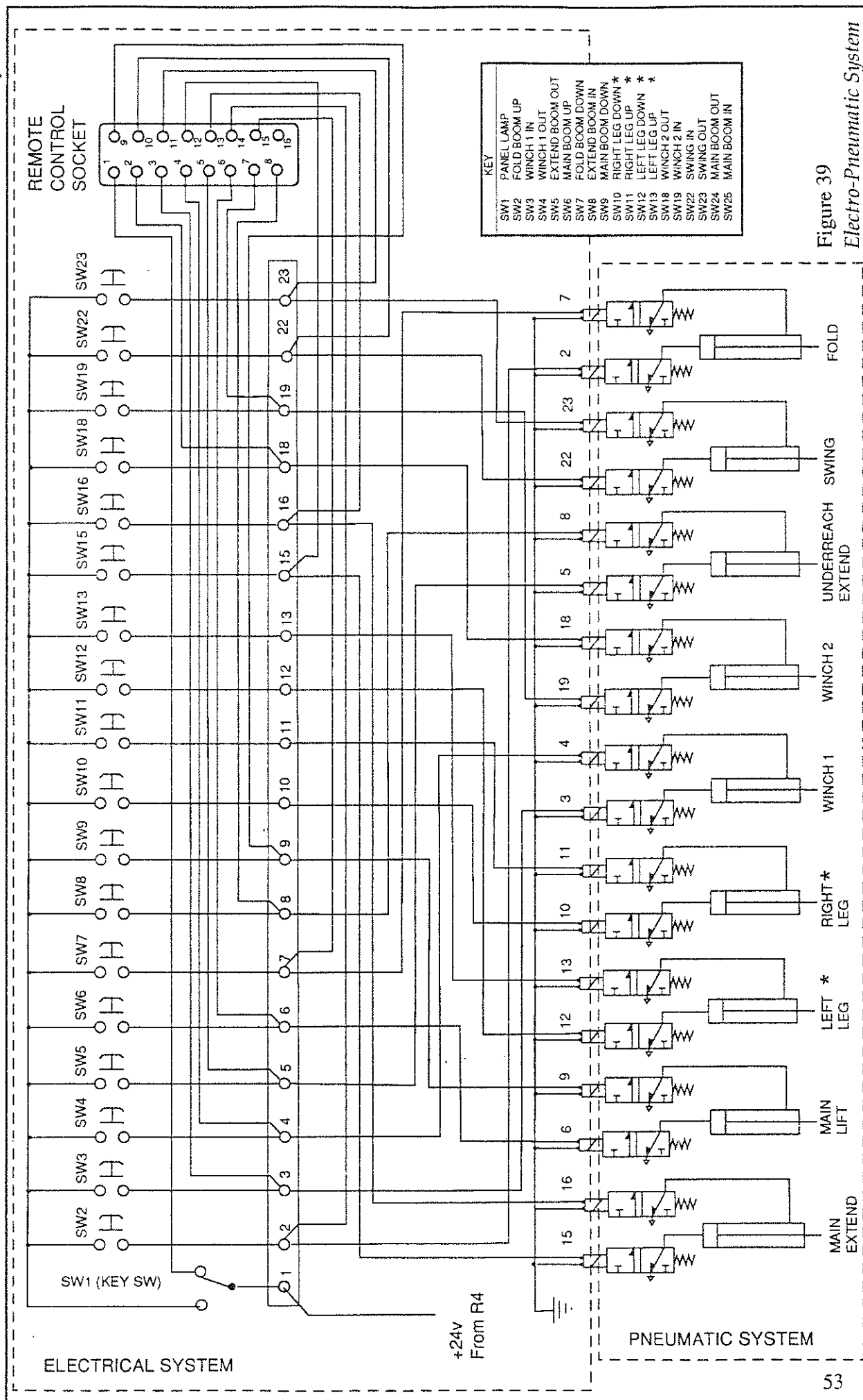


Figure 38 - Hydraulic System



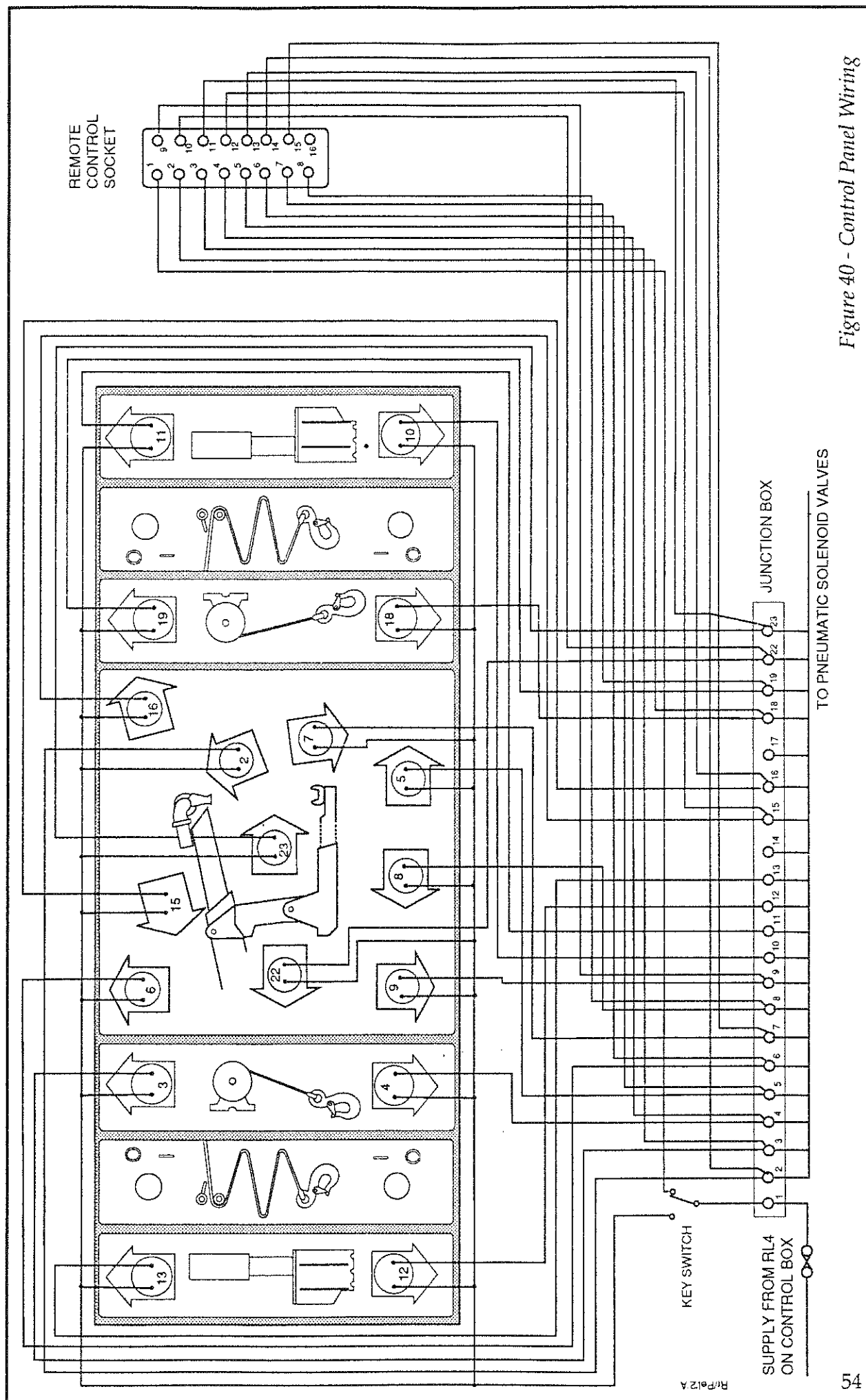


Figure 40 - Control Panel Wiring

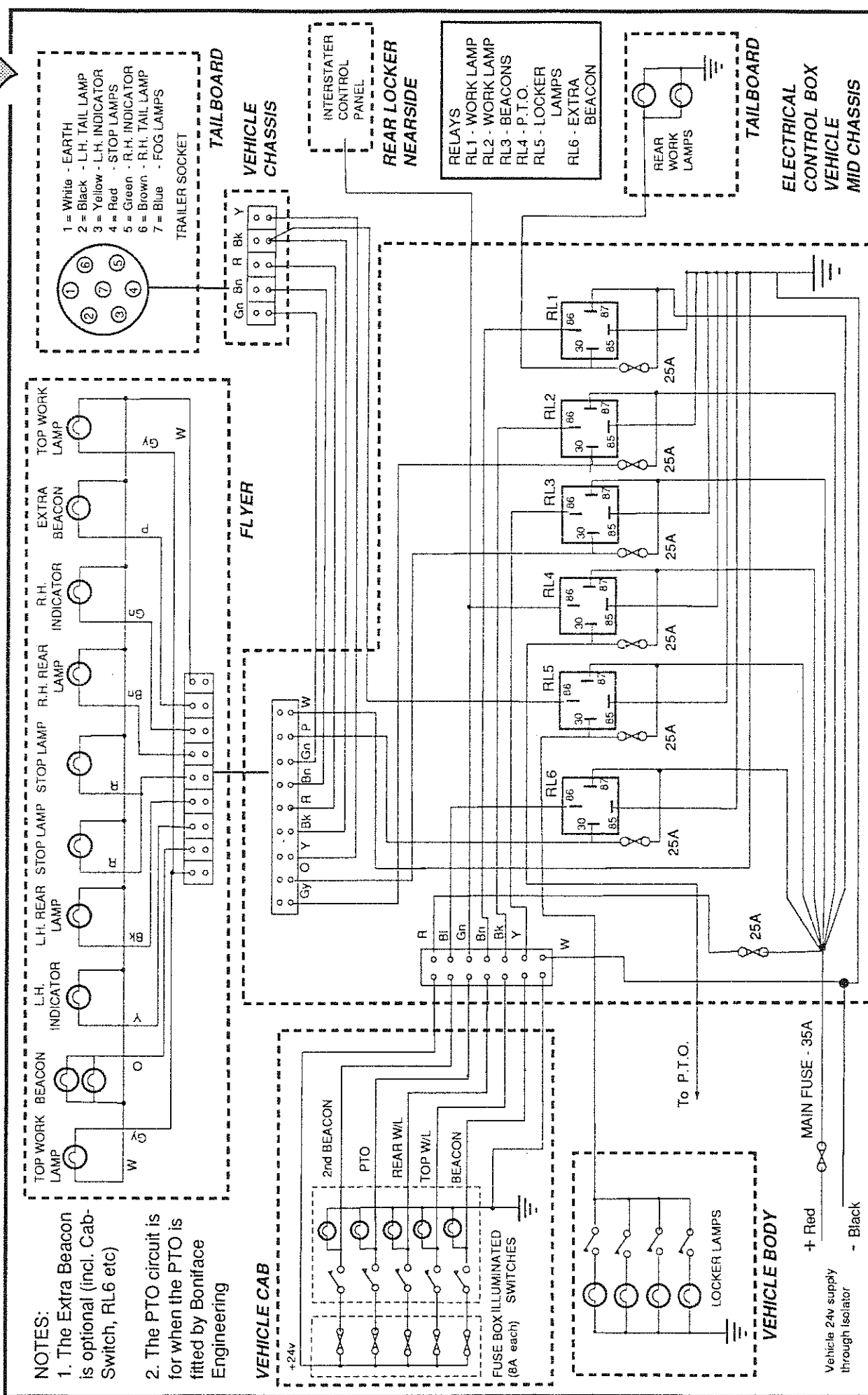


Figure 41 - Electrical Circuit (Services)

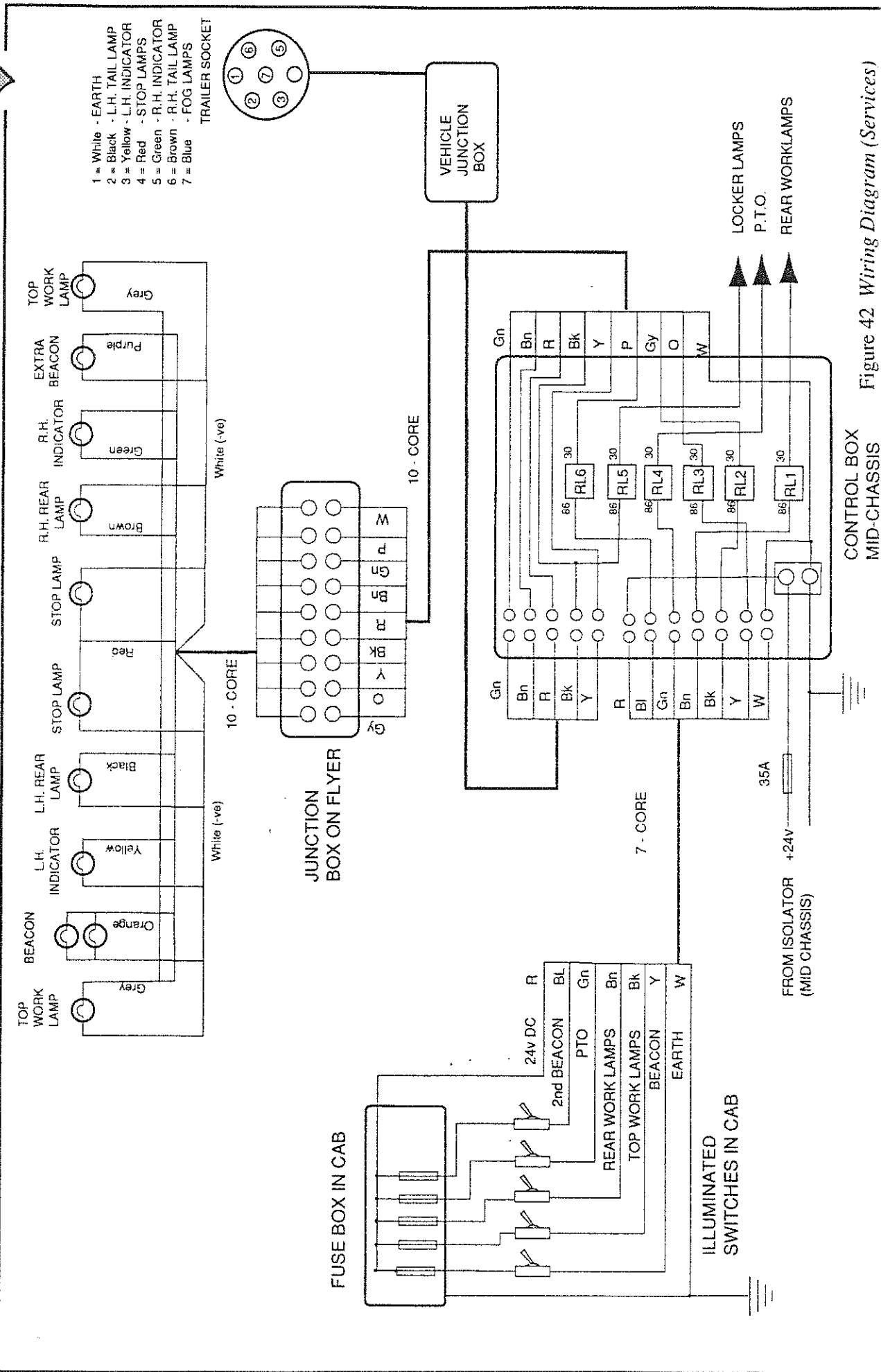


Figure 42 Wiring Diagram (Services)

WEIGHTS OF LOOSE EQUIPMENT

ITEM	FIG No	ITEM	PART No	WEIGHT
STANDARD CROSSHEAD	23	1-5	06-035	73Kg.
LOW PEDESTAL	23	7	07-009	11Kg.
HIGH PEDESTAL	23	8	07-105	10kg.
6in FORK	23	9	07-001	9Kg.
4.5in FORK	23	10	07-002	7Kg.
7in LOW FORK	23	11	07-006	8Kg.
16mm CHAIN FORK	23	12	07-177	5Kg.
16mm LIFT CHAIN complete	23	13	21-SS-002	19Kg.
7mm SAFETY CHAIN complete	23	14	21-SS-001	2Kg.
EURO WHEELFRAME BODY	24	7	07-249	39Kg.
EURO WHEELFRAME ARM	24	8	07-249/250	24Kg.
EURO WHEELFRAME SPACERS	24	9	07-252	10Kg.
S.H.D. WHEELFRAME BODY	24	1	07-208	46Kg.
S.H.D. FRONT SUPPORT PLATE	24	2		15Kg.
S.H.D. REAR SUPPORT TUBE	24	3		11Kg.

SAFETY PRECAUTIONS

GENERAL

Please note that for all Recoverer Units mounted on the host vehicle by Boniface Engineering, an electrical interlock ensures for reasons of safety, that when the PTO is not running, no power is supplied to the Recoverer controls, which are therefore inactive.

Also for safety reasons a key switch is fitted on or near the Recoverer control panel which will select either 'Control Panel' or 'Handset'. In other words when one is selected, the other will be inoperative.

THE UNDERLIFT UNIT

1. The safe working loads of the Recoverer/Concept unit are displayed in a prominent place. Be sure not to exceed those ratings.
2. When operating the unit controls, always make sure that it is safe to do so, and there is no one else in a vulnerable position when doing so.
3. The control levers must not be used during recovery operations, they are used during workshop tests and servicing. When engaged in normal recovery work always use the control panel and the remote control handset.
4. Never work under a vehicle which is not properly supported. If the casualty has been lifted, even slightly, by the recovery unit, no one should get under it without properly rated jack stands to support it.
5. Beware of leaving equipment, blocks of wood etc. on top of the body work when operating the main boom. If the boom sits down onto a piece of kit, it can damage it, and the hydraulic pipes or the controls of the unit as well.
6. Do not use the 'Fold' control when lifting a load.
7. Be aware when removing the folding boom lock that if there is a fault in that part of the hydraulic system, the folding boom could fall unexpectedly. Mind your feet.
8. Do not let your Recoverer/Concept get neglected. Regular maintenance pays off.
9. Use the Emergency Cut-outs when a dangerous situation occurs. The best way to ensure that they will work when needed is to test them regularly, say once per week.

THE OVERHEAD CRANE BOOM

10. Never use the overhead crane without first lowering the support legs.
11. Remember that the Safe Working Load of the winch ropes performing a straight lift will be less than that when haul winching.
12. Beware of extending the main boom if the load on the hook is near the limit for that extension. Expensive damage could occur due to overloading.
13. Never stand or work under a suspended load.

SAFETY PRECAUTIONS (Continued)**THE WINCHES**

14. Do not overload the winch or winch ropes. If the calculations indicate too great a load for the winches, rig tackle to reduce the loading.
15. Make sure that winch ropes wind onto the drums tidily. Overlaps can cause the winches to lock up, and could also damage the ropes beyond repair.
16. Never operate the clutch or freespool controls when there is a load on the winch.
17. Take special care during winching operations. Choose a firm anchor point on the casualty to haul with. Make sure no one is standing in line with the winch cable when heavy winching is taking place.
18. Watch out for signs that a winch rope is about to fail. The warning signs are:
 - a) The winch rope getting very hot - look for steam coming off.
 - b) In the dark sometimes sparks can be seen.
 - c) The rope 'sings' as strands part in succession.

LIFTING AND TOWING

19. Never drive off with the PTO still engaged. It will be ruined.
20. When lifting on forks rig securing chains to prevent the casualty from jumping out of the forks. Also rig a safety chain between the casualty and the recovery vehicle in case equipment failure allows the casualty to break free whilst towing.
21. When lifting on wheel frames do not exceed the load limits of the frames.
22. When using wheel frames, lash the wheels with wheel straps, and fit secondary chains as a back-up. Also fit a safety chain between the casualty and the recovery vehicle.
23. Both lifting fork pedestals and wheel frames rely on locking pins to hold them in place. Never drive off without ensuring that all locking pins are in place.
24. The load figures given in the User's Handbook are for the Recoverer/Concept underreach boom. With some recovery vehicles it is possible to put too great a load on the crosshead so as to take most of the weight off the steering axle, even though the boom is not itself overloaded. If that happens the load will have to be re-rigged.

NOTE: These safety notes are given in good faith and without prejudice to Boniface Engineering Ltd.

APPENDIX 3

SAFE ROADSIDE WORKING - CODE OF PRACTICE

ALL RECOVERY/BREAKDOWN VEHICLES

1. All vehicles must be maintained in a clean condition and comply with current legislation
 2. All vehicles should be marked with reflective tape on the sides and rear
 3. All vehicles to be fitted with four-way flashing hazard warning lights.
 4. All vehicles to be fitted with a minimum of two roof beacons or a full width lighting bar.
 5. Any additional working lamps must comply with Construction & Use Regulations.
-

VEHICLE EQUIPMENT

All vehicles must carry the following items:

- Fire Extinguisher
 - First Aid Kit
 - Six Identical Traffic Cones
-

SERVICE/BREAKDOWN/RECOVERY PERSONNEL

1. All personnel attending a breakdown/recovery scene must be in possession of a reflective safety garment, BS6629 Class A (appendix G)
 2. Garment must be stored and maintained in good, clean condition.
 3. Reflective garment must be worn at all times when working outside on a vehicle.
 4. At no time will wet weather clothing or any other item be worn over a reflective safety garment.
 5. It is strongly recommended that the following items be used:
 - Safety Footwear - BS 1870
 - Safety Gloves
 - Safety Glasses - BS 2092
-

WORKING PRACTICE AND PROCEDURES (GENERAL RULES)

Initial attendance at the scene:

1. All approaches to be made from the rear.
2. Park the recovery vehicle parallel with the offside running lane, as close to the nearside as possible, with front wheels turned full lock to the nearside.
3. Park the recovery vehicle 2 - 3 car lengths to the rear of the disabled vehicle.
4. Illuminate roof beacons and hazard flashers
5. Exit the vehicle from the nearside.
6. Place the traffic cones 3 - 4 car lengths to the rear of the recovery vehicle.

Disabled Vehicles - Occupants

It is the responsibility of recovery/breakdown personnel to ensure the safety of immobilised vehicle occupants.

All movements between vehicles must be confined to the nearside of the vehicle.

MOTORWAY PROCEDURES (Additional to General Rules)

1. Park on hard shoulder as far away from the nearside running lane as possible.
2. Where immobilised vehicles are found to have come to rest in an unsafe position - in all cases inform the Police.
3. Under no circumstances will recovery/breakdown personnel attempt to cross a motorway running lanes or central reservation on foot or in their vehicles.
4. At no time will recovery/breakdown personnel reverse on a motorway slip road or hard shoulders to gain access to immobilised vehicles - in all cases of difficulty, inform the Police.
5. Never work on the offside of your vehicle or of the immobilised vehicle.

APPENDIX 3

CODE OF PRACTICE (continued)

MANOEUVRING OF BREAKDOWN VEHICLES

The longer you are at a breakdown scene, the greater the danger.

1. Only where absolutely necessary will recovery / breakdown vehicles be manoeuvred or parked to the front of a disabled vehicle, i.e. to connect up for a recovery.
2. If recovery is to be undertaken, recovery equipment must be connected, whenever possible, prior to moving recovery vehicle to the front of immobilised vehicle. All such manoeuvres must be completed with extreme care.
3. If breakdown faults cannot be rectified quickly and safely, immediately recover the vehicle to a place of safety.

REMOVAL OF IMMOBILISED VEHICLES (GENERAL RULES)

1. In all cases - inform the driver of the immobilised vehicle of the recovery procedures to be undertaken.
2. Before moving off from the breakdown scene, be mindful of the other road users and their safety.
3. Where a recovery manoeuvre is likely to obstruct the flow of traffic - contact the Police.
4. Before moving off, remove debris, tools, equipment and cones.

REMOVAL FROM MOTORWAY HARD SHOULDER.

Use the hard shoulder to build up speed and, having identified a suitable space in the nearside lane, signal and move off the hard shoulder. Extreme care should be taken during this manoeuvre, being mindful of other vehicles that may be stationary on the hard shoulder.

REMOVAL OF ACCIDENT DAMAGED VEHICLES.

Action in all cases of removal of accident damaged vehicles:

- a) If Police present - under their direction. b) If no Police - comply with all safety guidelines.

GENERAL ADVICE TO MOTORIST

Following a repair, the driver of a previously immobilised vehicle should be given advice regarding the safe procedures for re-joining the traffic flow.

GENERAL ADVICE TO BREAK/RECOVERY PERSONNEL

Hazardous Chemicals

All recovery/breakdown personnel should be aware of the legal requirements in respect of vehicles carrying hazardous loads. If in doubt - contact the Police.

ALL PERSONNEL SHOULD BE AWARE OF THE EVER-PRESENT DANGERS TO THEMSELVES AND OTHER ROAD USERS WHEN ATTENDING THE SCENE OF A BREAKDOWN/RECOVERY INCIDENT

FAILURE TO COMPLY WITH THE CODE OF PRACTICE COULD SERIOUSLY DAMAGE YOUR HEALTH

This Code of Practice has been formulated and sponsored by the following organisations:

THE AUTOMOBILE ASSOCIATION
THE ROYAL AUTOMOBILE CLUB
NATIONAL BREAKDOWN RECOVERY CLUB
THE INSTITUTE OF VEHICLE RECOVERY