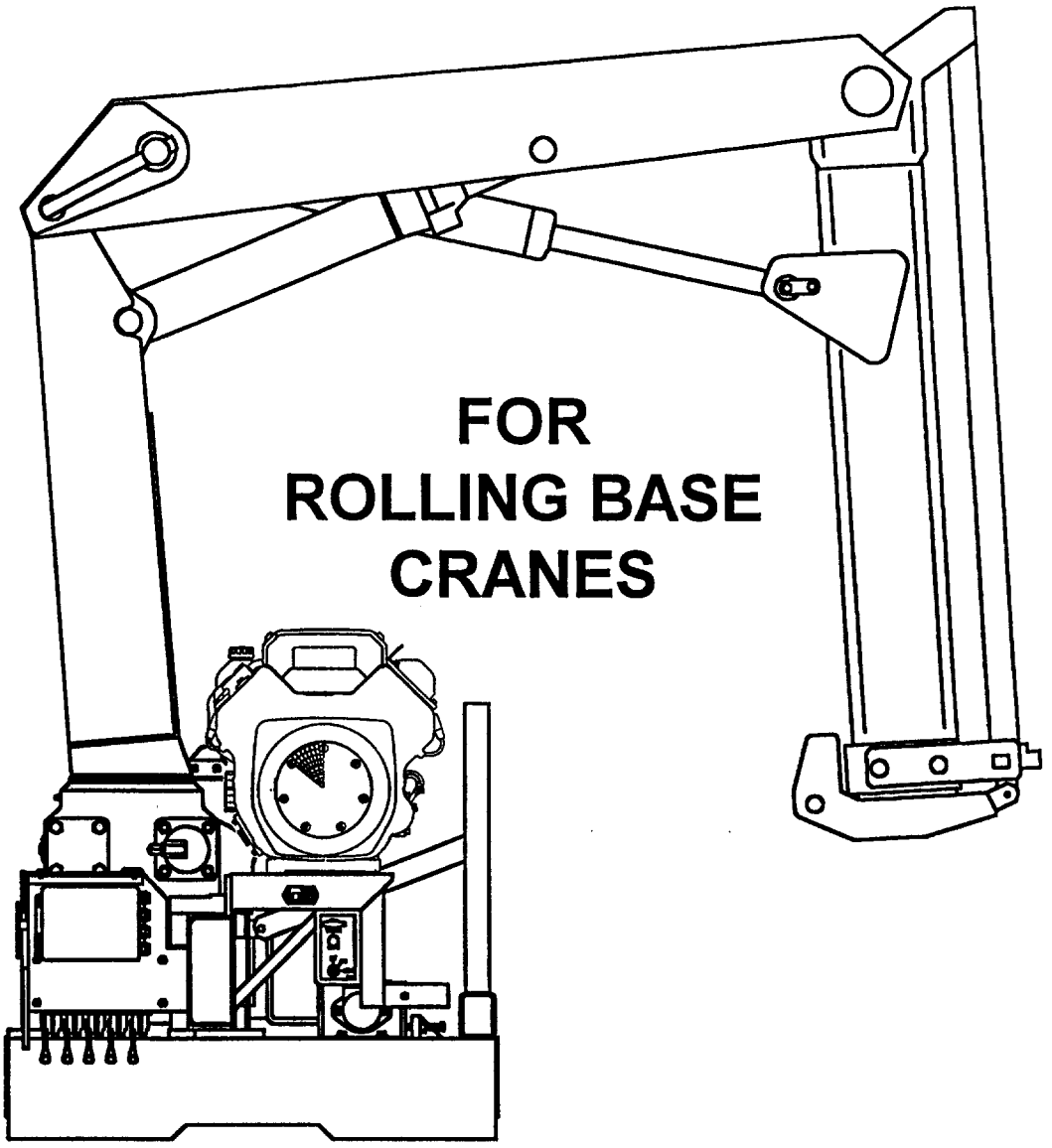
HIAB 710

Operator's Manual



FOR
ROLLING BASE
CRANES

Cargotec, Inc.
307 Broadway
Swanton, Ohio 43558
1993

FOREWORD

This Operator's Manual deals with your new crane. Take the time to read it through - it will be time well spent. The manual contains a short description of the crane together with instructions on its operation and maintenance. If you wish to ensure long life for your crane, you should carefully carry out all maintenance instructions.

However, all servicing, apart from lubrication and minor repairs that you can attend to yourself, should be entrusted to the well-trained personnel of your dealer's service shop.

We reserve the right to introduce, without notice, changes in data, equipment and in the instructions for maintenance and other servicing jobs.

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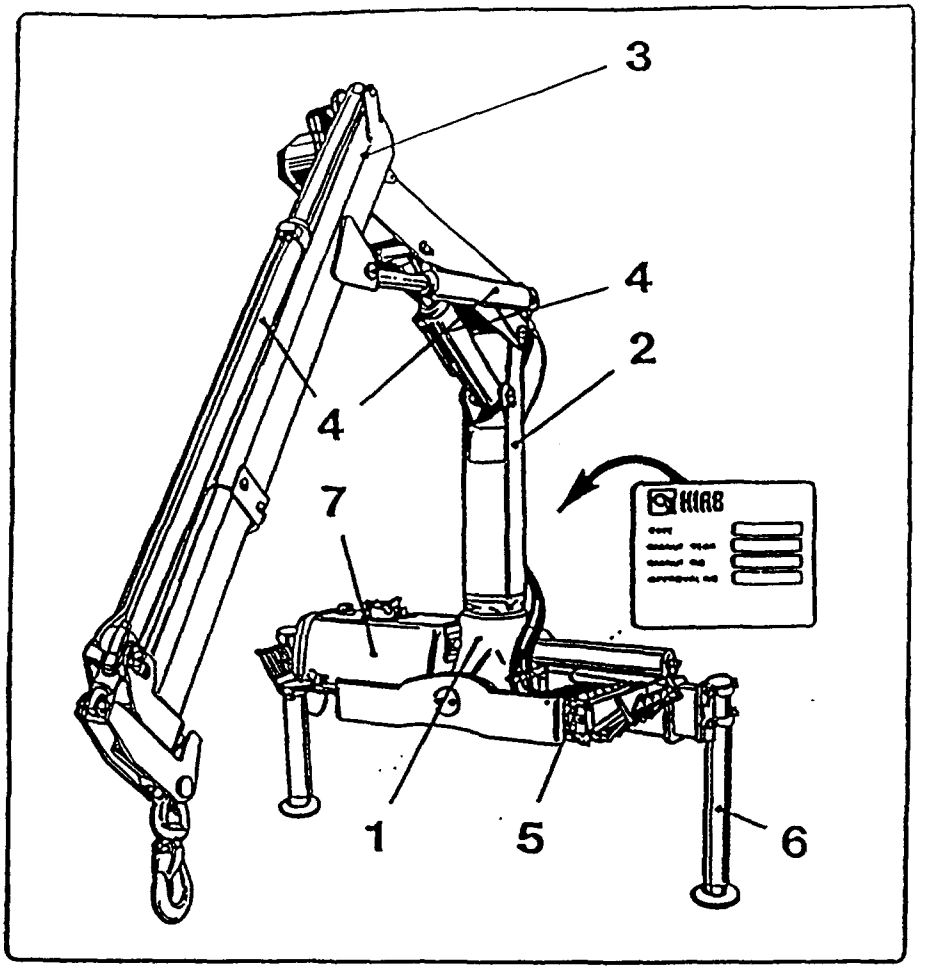
*** These pages reference wet line applications only !**

Section 1. GENERAL DESCRIPTION



GENERAL DESCRIPTION

The HIAB 710 is a compact, all hydraulic vehicle crane in the 54,000 ft-lb capacity class, specially adapted for hook and attachment service.

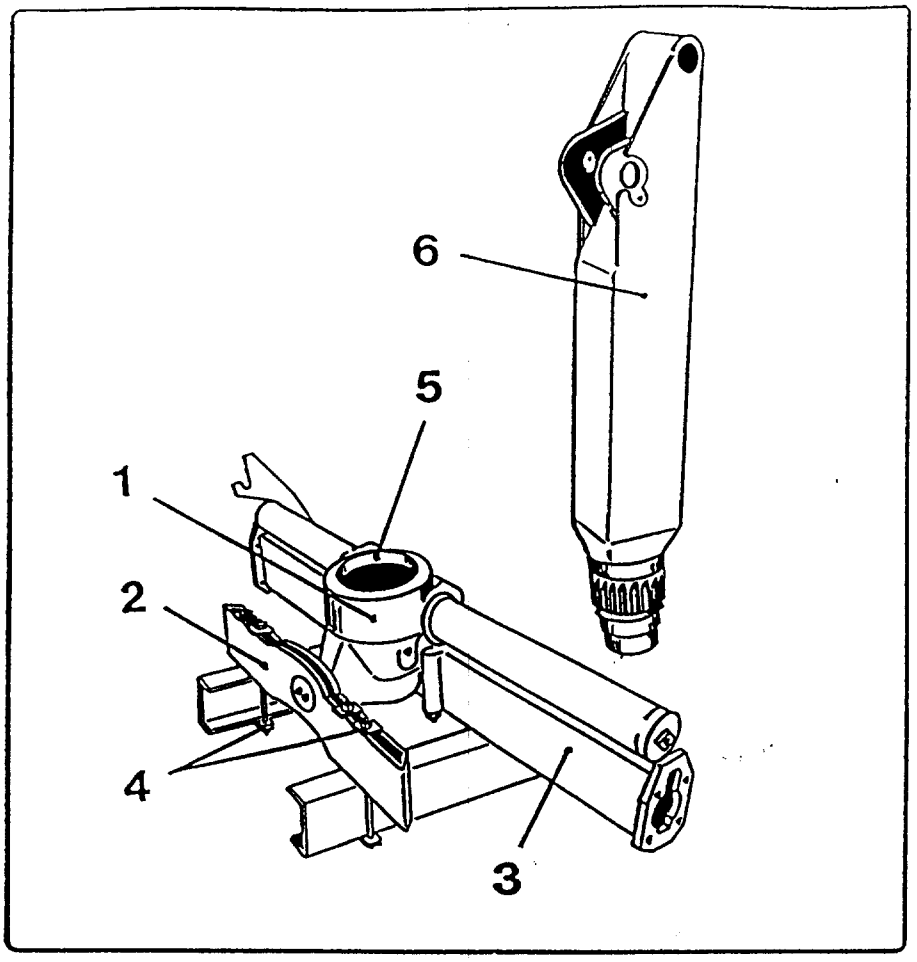
The crane comes in the following versions:

HIAB 710-1 with a hydraulic outreach of 17'5", and HIAB 710-2 with a hydraulic outreach of 23'7".

The main crane components are:

1. Base with slewing system
2. Body
3. Boom system
4. Hydraulic cylinders
5. Valve system
6. Support legs
7. Oil tank

Your crane's type and serial number can be found on the name plate.



BASE WITH SLEWING SYSTEM

The crane base is in the form of a casting and comprises an upper and a lower body bearing, a slewing system and a three point bridge.

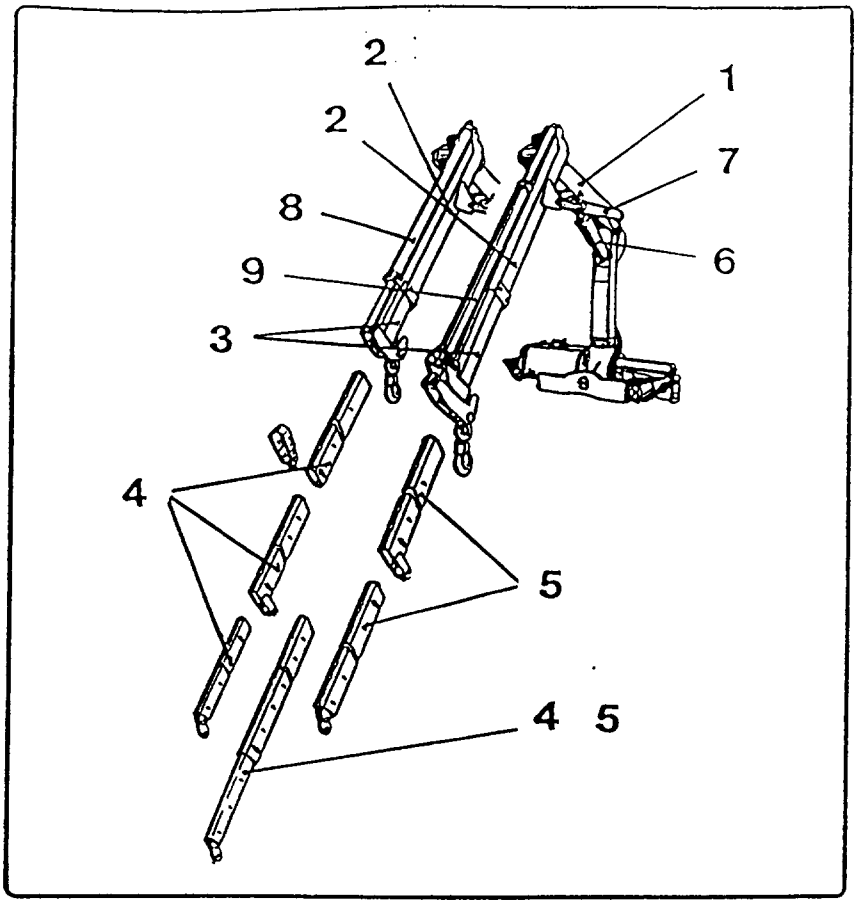
The guide pad on the rack consists of a lubrication free bearing. The outrigger-leg beam is bolted to the crane by 8 stud bolts.

1. Base
2. Three-point bridge
3. Outrigger-leg beam
4. Frame fastening
5. Body bearing

BODY

The body is an all-welded, box design with a cast column welded to its lower end. The body can be easily lifted out of the base once the catch has been released. The catch is locked on the base.

6. Body



BOOM SYSTEM

The boom system consists of an inner boom, an outer boom and an extension. The extension is single in the case of the -1 version and double telescopic in the case of the -2 version.

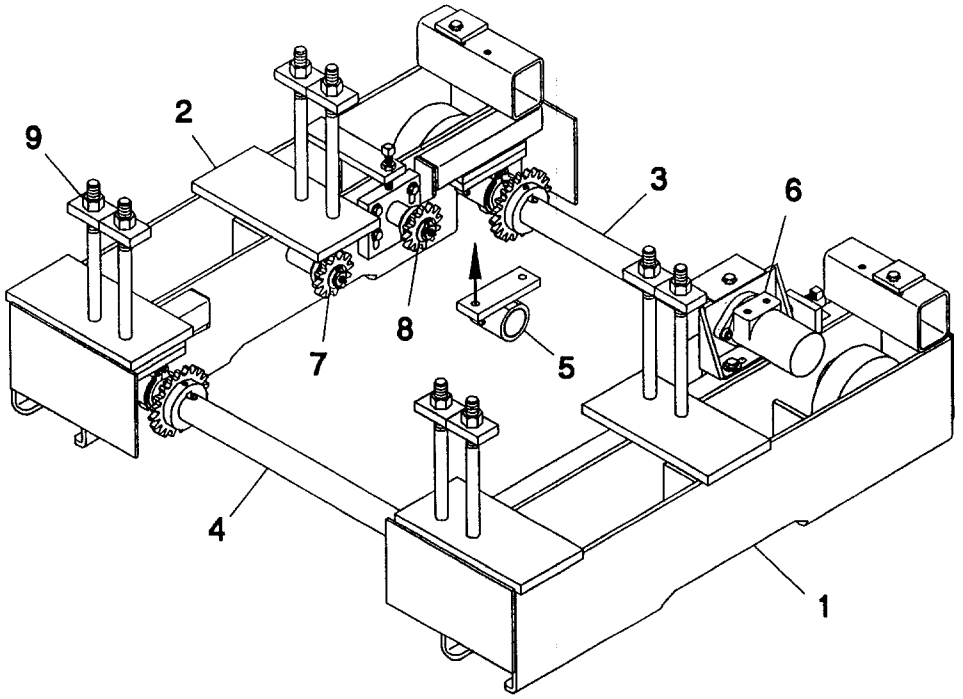
The outer boom and hydraulic extension are hexagonal sections, and the extensions run on lubrication free adjustable slide pads that bear against two opposing oblique surfaces. This arrangement provides exact guidance of the extension without backlash.

1. Inner boom
2. Outer boom
3. Hydraulic extension
4. Manual extension -1
5. Manual extension -2

HYDRAULIC CYLINDERS

The hydraulic cylinders are double acting; the extension cylinder for the 710-2 is telescopic in addition. The inner boom and outer boom cylinders are fitted with check valves which lock the booms in the event of a hose failure.

6. Inner boom cylinder
7. Outer boom cylinder
8. Extension cylinder -1
9. Extension cylinder -2

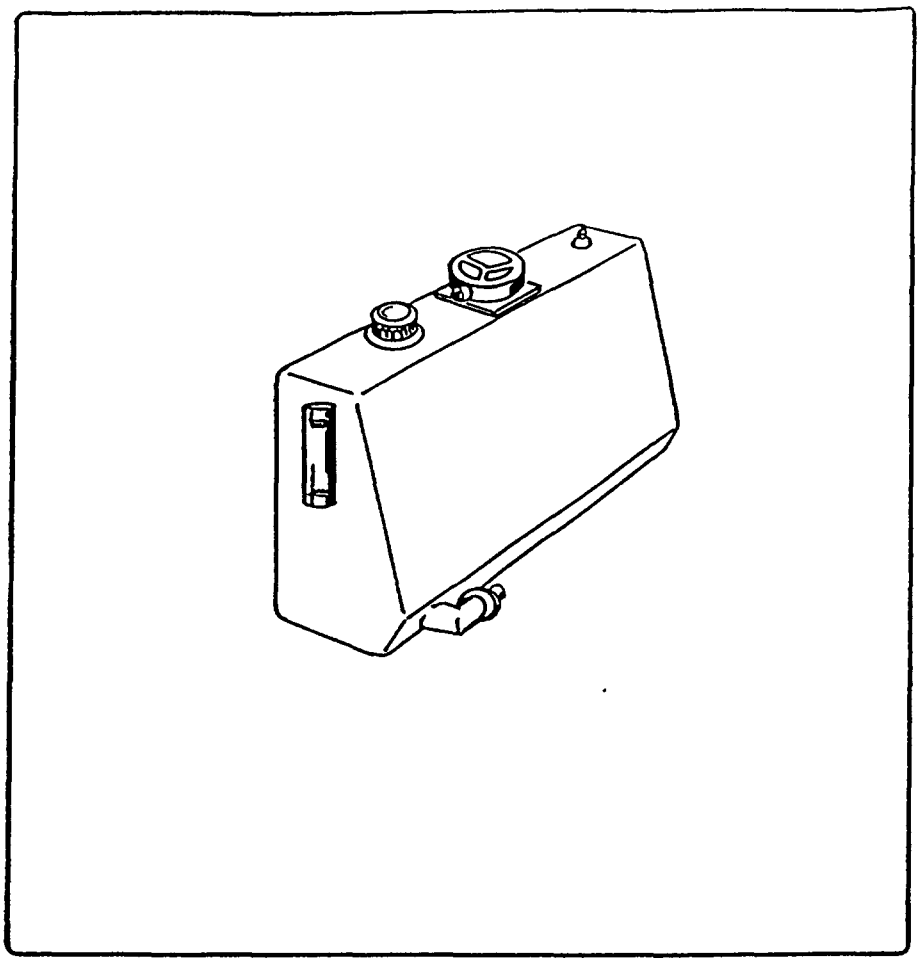


ROLLING BASE UNDERCARRIAGE

The rolling base undercarriage is custom built to fit your trailer, or truck body, I-beam flanges. The crane is secured to the undercarriage by means of 8 high strength mount bolts.

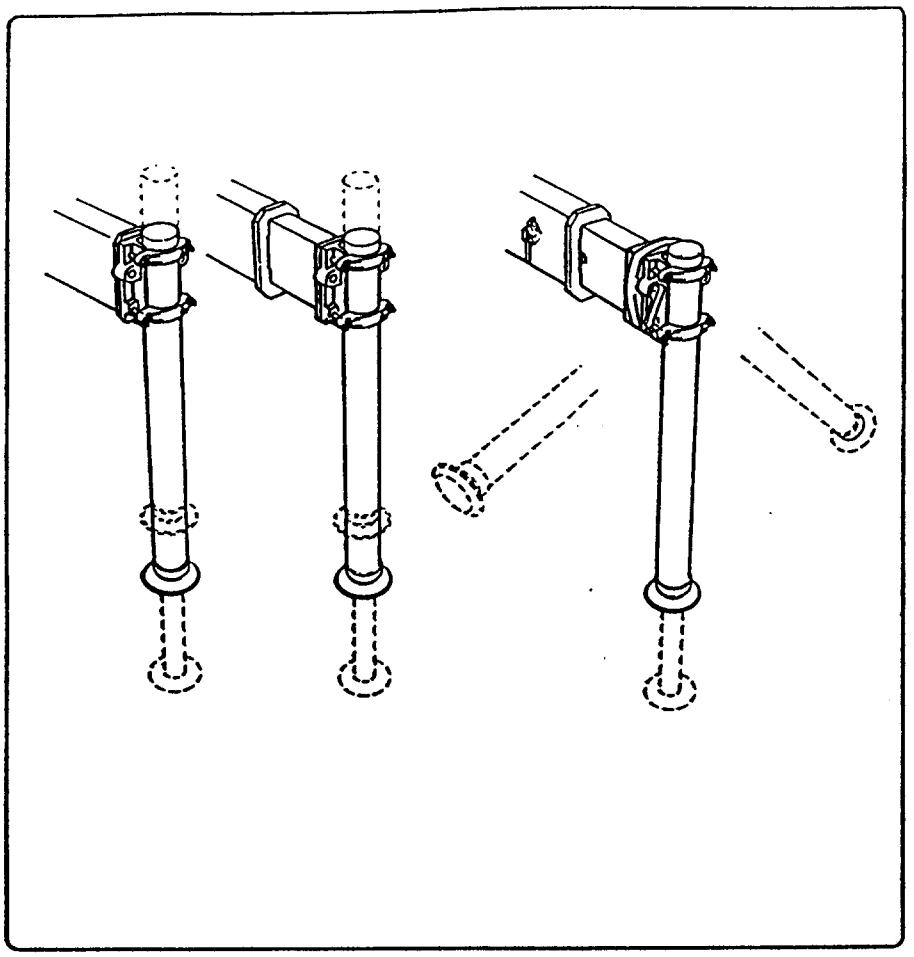
The drive motor drives the forward axle by a chain and sprocket. The forward axle drives the rear axle via a chain. Slack can be removed from both chains either by the idler system or by adjusting the torque motor position.

1. Drive side main gripper weldment
2. Idler side main gripper weldment
3. Forward axle
4. Rear axle
5. Axle bearing assembly
6. Drive motor assembly
7. Fixed idler assembly
8. Adjustable idler assembly
9. Mount bolts



OIL TANK

In the standard version, the oil tank is mounted beside the loader base. It has internal baffles to prevent foaming. The tank also has a built in return filter, oil level indicator, filling stud with strainer and air filter and a water cock at the bottom of the tank. On the side of the tank there is a plugged connection which could be used as a draining connection, for instance when a winch is mounted. The oil tank volume is about 12 gallons.



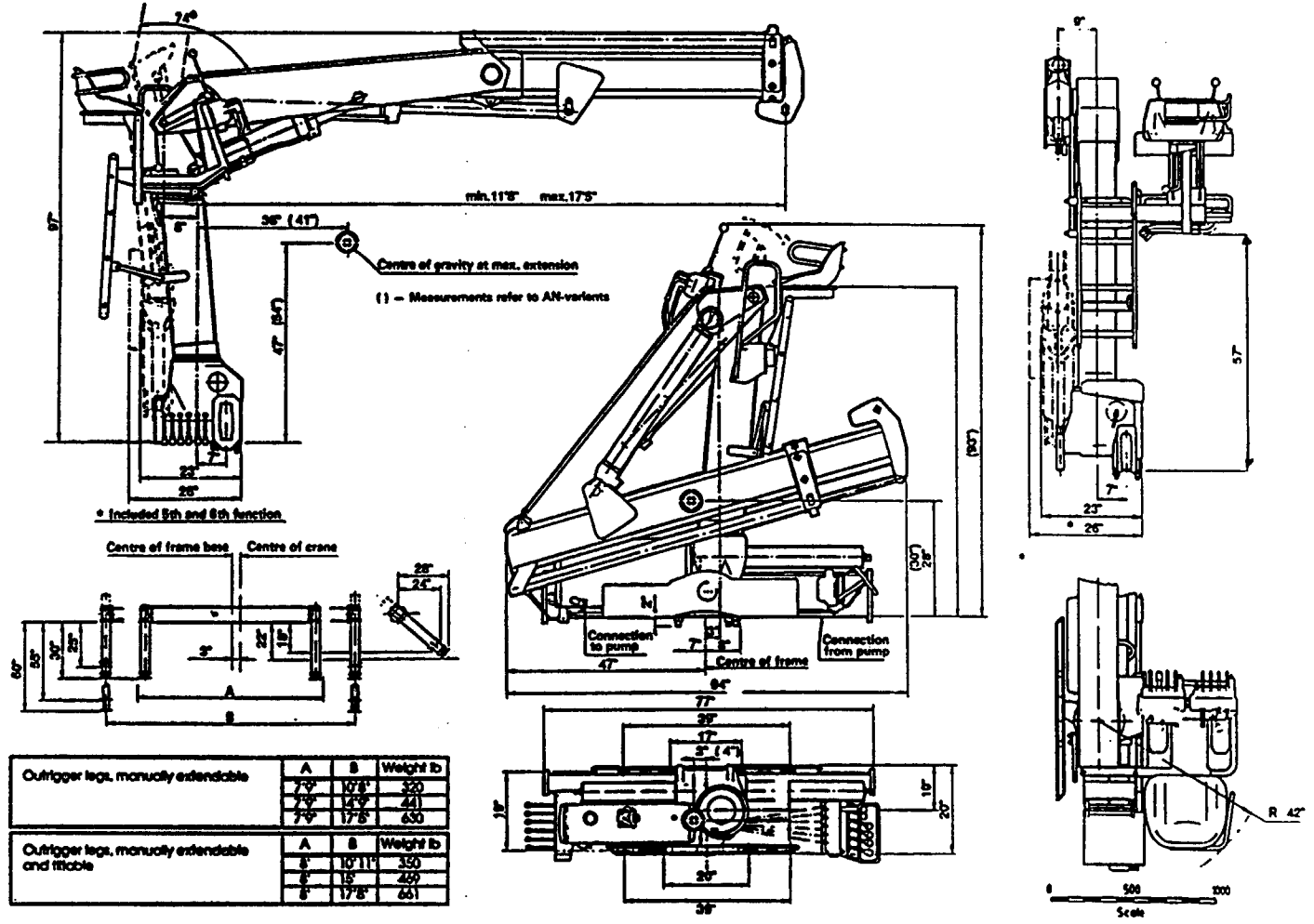
SUPPORT LEGS

The support legs are intended to keep the outfit steady while the crane is in use. The outrigger leg extensions slide on rollers greased in plain bearings, making sure that the extensions are easy to handle. The outrigger extensions are available with a tilting device that allows the legs to rotate in a position that is appropriate for transport. The outriggers are locked in position by means of spring catches applied by hand.

HIAB 710-1

GENERAL DIMENSIONS

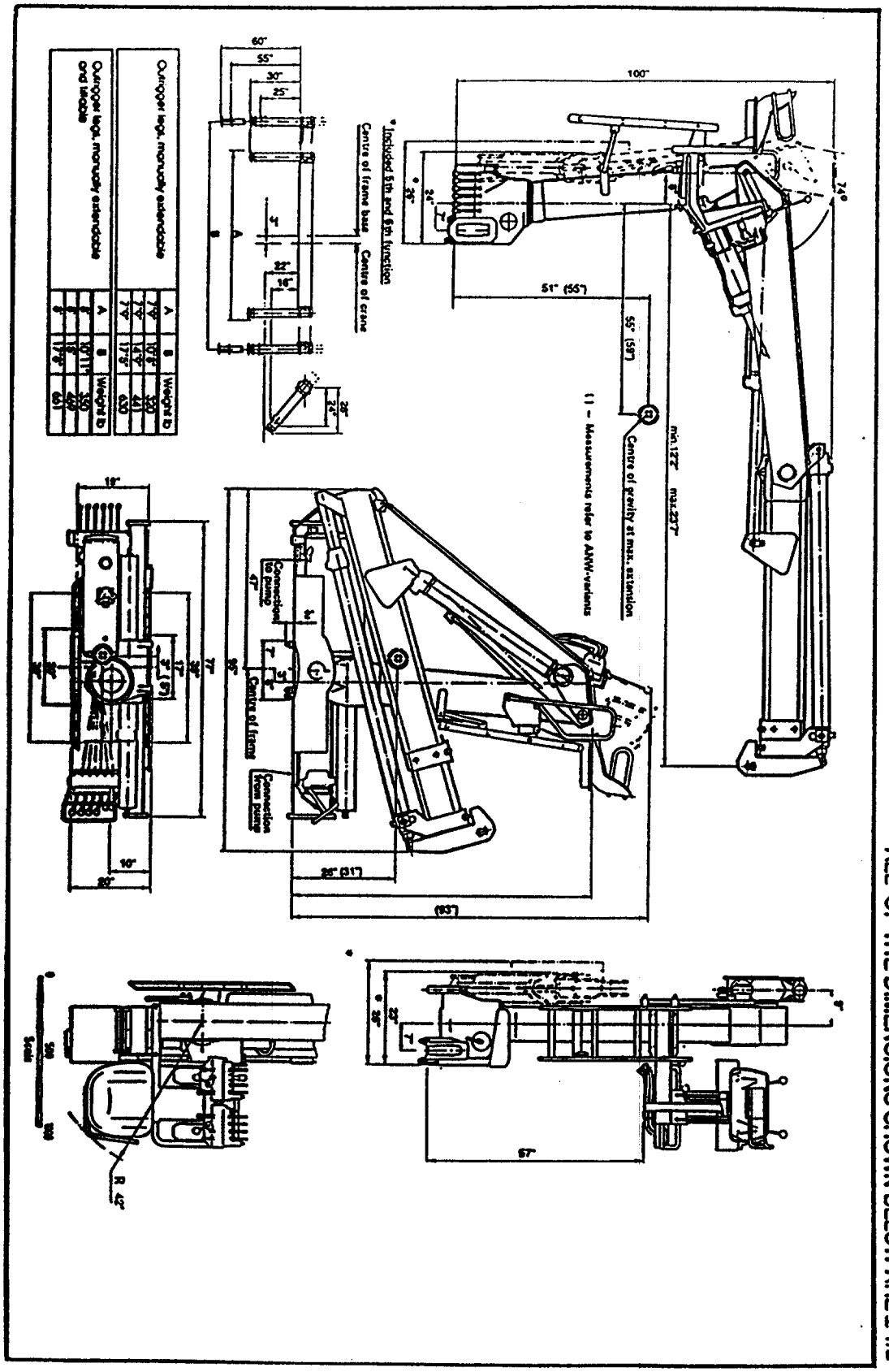
ALL OF THE DIMENSIONS SHOWN BELOW ARE ± 1/2"



Outrigger legs, manually extendable	A	B	Weight lb
	7'9"	10'6"	320
	7'9"	14'9"	441
	7'9"	17'5"	630

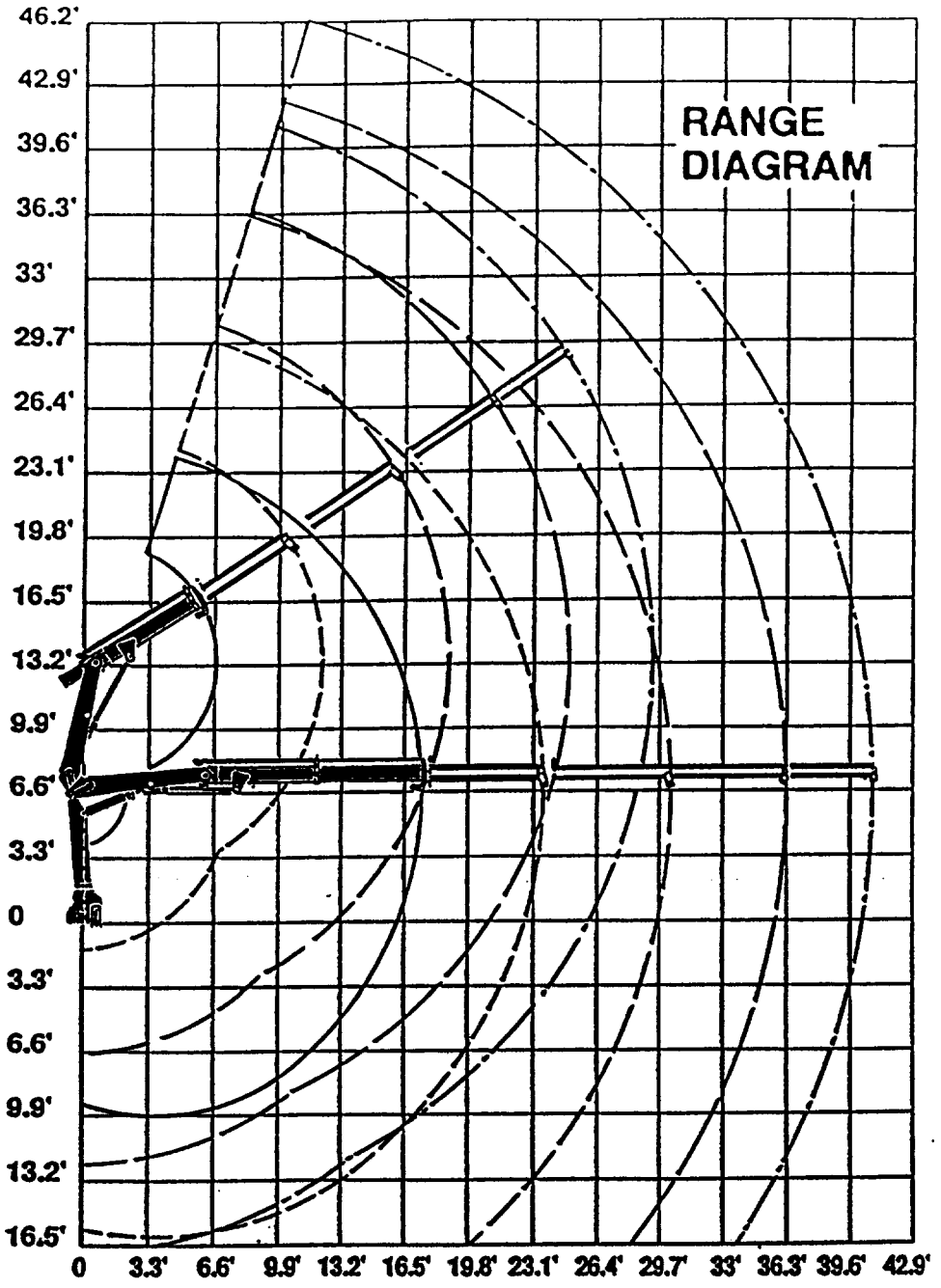
Outrigger legs, manually extendable and tiltable	A	B	Weight lb
	8'	10'11"	350
	8'	15'	499
	8'	17'5"	661

GENERAL DIMENSIONS 710-2



RANGE DIAGRAM 710-1

HIAB 710-1



——— Range diagram for hydraulic telescoping extensions

– – – – – Range diagram with manual extensions step 1

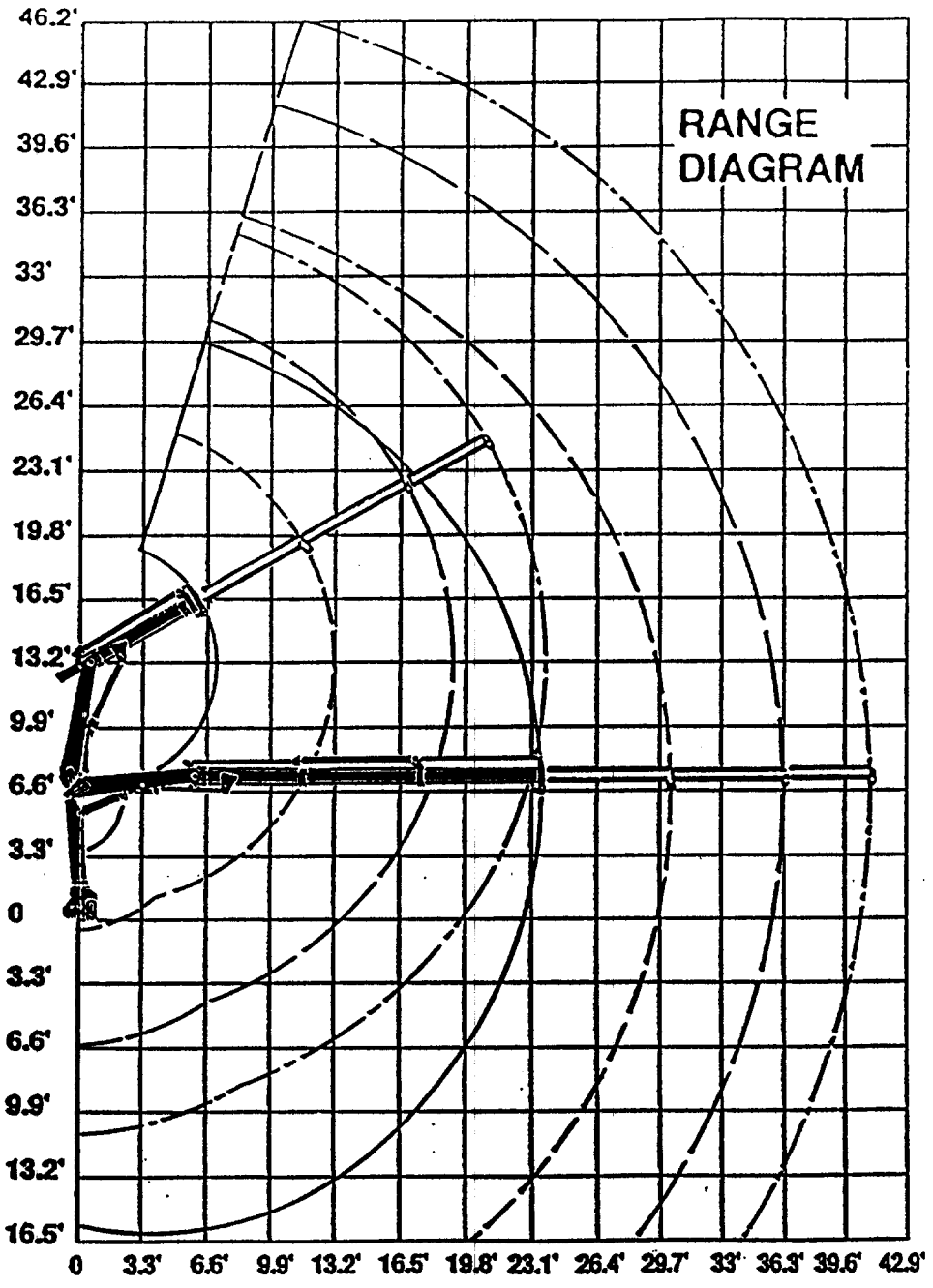
— — — — — Range diagram with manual extensions step 2

—— ——— Range diagram with manual extensions step 3

— - —— - — Range diagram with manual extensions step 4

RANGE DIAGRAM 710-2

HIAB 710-2



——— Range diagram for hydraulic telescoping extensions

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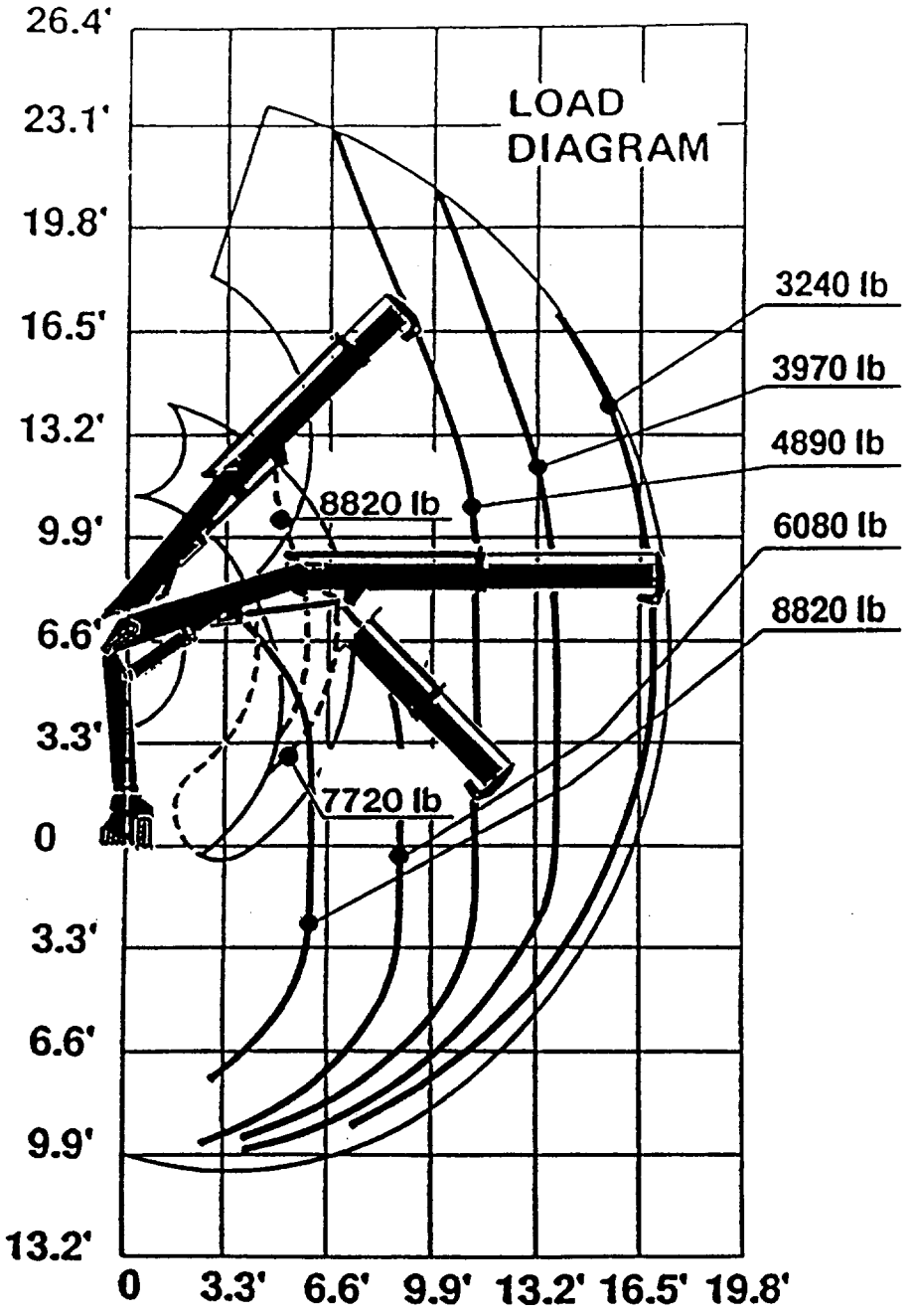
— — — — Range diagram with manual extensions step 2

— · — · — Range diagram with manual extensions step 3

LOAD DIAGRAM 710-1

HIAB 710-1



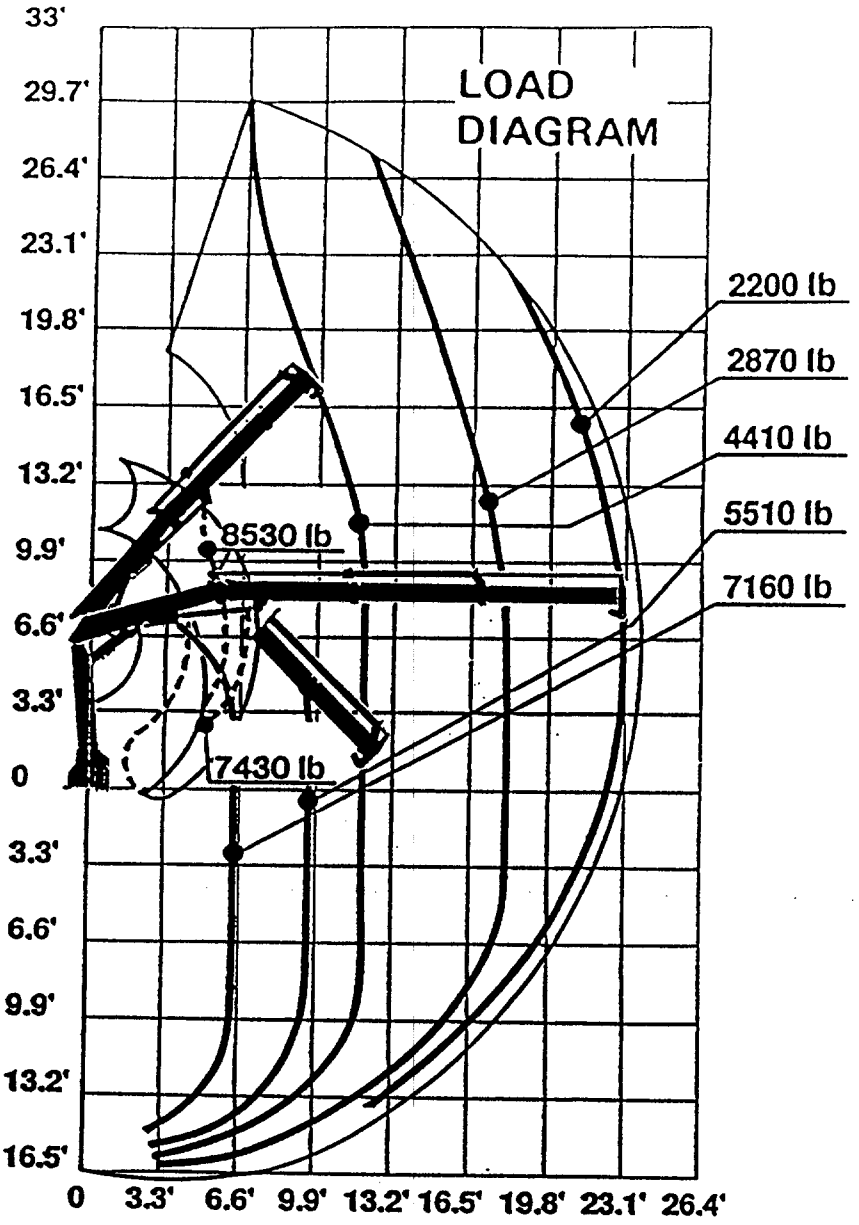
To the left of the curve the indicated load can be handled with any loader function provided that the positions of the booms are optimized from a force point of view

——— Standard hook attachment

– – – – Inner hook attachment, for hook application

LOAD DIAGRAM 710-2

HIAB 710-2



To the left of the curve the indicated load can be handled with any loader function provided that the positions of the booms are optimized from a force point of view

——— Standard hook attachment

– – – – – Inner hook attachment, for hook application

TECHNICAL DATA — HIAB 710-1

Loader capacity	54,235 ft-lbs
Hydraulic outreach	17'5"
Hydraulic boom extension	5'9"
Outreach, manual extension	23'7", 30'2"
	36'1", 41'
Lifting height above inst. surface	23'11"
Outreach/Lifting capacity	5'11" - 8820 lbs *
	11'2" - 4890 lbs
	16'9" - 3240 lbs
Outreach/Lifting capacity, manual extension	23'0" - 2200 lbs
	29'10"- 1190 lbs
	35'9" - 880 lbs
	40'4" - 710 lbs
Oil Flow	8 gpm
Working pressure	3260 psi
Oil in tank	12 gal
Tank volume	16 gal
Slewing angle	415°
Height folded, crane only	6'8"
Width folded	7'10"

Weights:

Loader in standard version without outriggers	2100 lbs
Rolling base version complete without outriggers	3060 lbs
Support leg equipment	180 - 440 lbs
Oil in tank	80 lbs

* Inner hook attachment

TECHNICAL DATA — HIAB 710-2

Loader capacity	52,070 ft-lbs
Hydraulic outreach	23'7"
Hydraulic boom extension	11'6"
Outreach, manual extension	30'2", 36'1", 30'8"
Lifting height above inst. surface	29'10"
Outreach/Lifting capacity	5'11" - 8530 lbs *
	11'10" - 4410 lbs
	17'9" - 2870 lbs
	22'8" - 2200 lbs
Outreach/Lifting capacity, manual extension	29'6" - 1190 lbs
	35'5" - 880 lbs
	40' - 710 lbs
Oil Flow	8 gpm
Working pressure	3260 psi
Oil in tank	12 gal
Tank volume	16 gal
Slewing angle	415°
Height folded, crane only	6'8"
Width folded	7'11"

Weights:

Loader in standard version without outriggers	2350 lbs
Rolling base version complete without outriggers	3310 lbs
Support leg equipment	180 - 440 lbs
Oil in tank	80 lbs

***** Inner hook attachment

Section 2. OPERATING INFORMATION

INTRODUCTION

Safe, efficient crane operation depends upon five basic conditions. These conditions are: (1) the crane and vehicle unit must be properly serviced and maintained; (2) the operator must be competent and thoroughly trained; (3) safe work practices must be observed at all times; (4) load limits must never be exceeded; and (5) control functions must be used in the prescribed, correct operating sequence. It must be stressed that not one of these five requirements can be safely eliminated from the crane operating procedure.

CRANE OWNER RESPONSIBILITY

The owner of this crane is responsible for proper maintenance and repair of the unit and establishing support documentation of the same. The owner is also obligated to perform the ongoing tasks of selecting only competent operator and service candidates and providing personnel the training necessary to assure safe operation of the crane unit.

CRANE OPERATOR RESPONSIBILITY

The operator, operator trainer, or service person is responsible at all times for the safe transport and use of the crane unit. Safe transport and use includes proper storage, recognition and avoidance of all observable hazards to personnel and property, pre-operation inspection, and operating the crane at all times within load and range restrictions stated in this manual.

CRANE MAINTENANCE

The crane should be subject to regular inspections and preventative maintenance procedures as prescribed in Section 3 of this manual, and appropriate records of maintenance must be kept. In addition, any defect which is observed and reported in the course of regular pre-operation inspections should be corrected and recorded before the unit is returned to service.

OPERATION

1. Crane operation shall be limited to the following persons:
   a. qualified operators;
   b. trainees under the direct supervision of a qualified operator;
   c. maintenance and test personnel (when it is necessary in the performance of their duties);
   d. inspectors (crane).

2. No one other than the personnel specified in (1.) above shall enter the operating area of a crane with the exception of persons such as oilers, supervisors whose duties require them to

do so and then only in the performance of their duties and with the knowledge of the operator or other appointed person.

OPERATOR QUALIFICATIONS

1. Operators shall be required by the employer to pass a practical operating examination. Qualifications shall be limited to the type of equipment for which examined.
2. Operators and operator trainees shall meet the following physical qualifications:
   a. vision of at least 20/30 Snellen in one eye and 20/50 in the other, with or without corrective lenses;
   b. ability to distinguish colors, regardless of position, if color differentiation is required for operation;
   c. adequate hearing, with or without hearing aid, for the specific operation.
3. Evidence of physical defects or emotional instability which could render a hazard to the operator or others, or which in the opinion of the examiner could interfere with the operator's performance, may be sufficient cause for disqualification. In which cases, specialized clinical or medical judgements and tests may be required.
4. Evidence that an operator is subject to seizures or loss of physical control shall be sufficient reason for disqualification. Specialized medical tests may be required to determine these conditions.
5. Operators and operator trainees should have normal depth perception, field of vision, reaction time, manual dexterity, coordination, and no tendencies to dizziness or similar undesirable characteristics.
6. In addition to the above listed requirements, the operator shall:
   a. demonstrate the ability to comprehend and interpret all labels, operator's manuals, safety codes, and other information pertinent to correct crane operation;
   b. possess knowledge of emergency procedures and implementation of same;
   c. demonstrate to the employer the ability to operate the specific type of equipment;
   d. be familiar with applicable safety regulations;
   e. understand responsibility for maintenance requirements of the crane;
   f. be thoroughly familiar with the crane and its control functions;
   g. understand the operating procedures as outlined by the manufacturer.

CONDUCT OF OPERATOR

1. The operator shall not engage in any practice which will divert his attention while actually engaged in operating the crane.
2. Each operator shall be responsible for those operations under the operator's direct control. Whenever there is any doubt as to safety, the operator shall consult with the supervisor before handling the loads.
3. The operator should not leave a suspended load unattended unless specific precautions have been instituted and are in place.
4. If there is a warning sign on the switch or engine starting controls, the operator shall not close the switch or start the engine until the warning sign has been removed by the appointed person.

5. Before closing the switch or starting the engine, the operator shall see that all controls are in the "off" or neutral position and all personnel are in the clear.
6. If power fails during operation, the operator shall:
   a. move power controls to "off" or neutral position;
   b. land the suspended load and boom, if practical.
7. The operator shall be familiar with the equipment and its proper care. If adjustments or repairs are necessary, the operator shall report the same promptly to the appointed person, and shall also notify the next operator.
8. All controls shall be tested by the operator at the start of each shift. If any controls do not operate properly, they shall be adjusted or repaired before operations are begun.
9. Stabilizers shall be visible to the operator while extending or setting unless the operator is assisted by a signal person.

OPERATING PRACTICES

Handling the Load

1. Size of Load
   a. No crane shall be loaded beyond the rated load except for test purposes.
   b. The load to be lifted is to be within the rated load of the crane in its existing configuration.
   c. When loads which are not accurately known are to be lifted, the person responsible for the job shall ascertain that the weight of the load does not exceed the crane rated the load at the radius at which the load is to be lifted.
2. Attaching the load
   a. The load shall be attached to the hook by means of slings or other devices of sufficient capacity.
   b. Hoist rope shall not be wrapped around the load.
3. Moving the Load
   a. The operator shall determine that:
      i. the crane is level and, where necessary, the vehicle/carrier is blocked properly;
      ii. the load is well secured and balanced in the sling of lifting device before it is lifted more than a few inches (mm);
      iii. means are provided to hold the vehicle stationary while operating the crane.
   b. Before starting to lift, the hook shall be brought over the load in such a manner as to minimize swinging.
   c. During lifting, care shall be taken that:
      i. there is no sudden acceleration or deceleration of the moving load;
      ii. load, boom, or other parts of the crane do not contact any obstruction.
   d. Cranes shall not be used for dragging loads sideways.
   e. Articulating boom cranes are designed and intended for handling materials. They do not meet personnel lift or elevator requirements. Therefore, no lifting, lowering, swinging, or traveling shall be done while a person is on the hook or load. Hook-attached suspended work platforms (baskets) shall not be used. Work platforms (baskets) attached to the boom shall be approved by Cargotec, Inc.
   f. The operator should avoid carrying loads over people.

g. When the crane is so equipped, the stabilizers shall be fully extended and set. Blocking under stabilizers shall meet the requirements as follows:
   i. strong enough to prevent crushing;
   ii. of such thickness, width, and length as to completely support the stabilizer pad.
h. Firm footing under all tires, or individual stabilizer pads should be level. Where such a footing is not otherwise supplied, it should be provided by timbers, cribbing, or other structural members to distribute the load so as not to exceed allowable bearing capacity of the underlying material.
   i. In transit, the boom shall be carried in stowed position.
j. When rotating the crane, sudden starts and stops shall be avoided. Rotational speed shall be such that the load does not swing out beyond the radius at which it can be controlled.
k. The crane shall not be traveled with a load on the hook.
l. No person should be permitted to stand or pass under a suspended load.

4. Stowing Procedure. Follow procedure and sequence when stowing and unstowing the crane.

OPERATOR & SERVICE PERSONNEL TRAINING

The owner-employer is responsible for providing adequate employee training and training documentation. The training should substantiate that any designated operator or service person assigned to the crane unit has satisfactorily met the performance objectives outlined in "Operator Qualifications." Training methods and materials are left to the informed discretion of the owner-employer.

SAFE WORK PRACTICES

Safe crane operation requires operator competence, mechanical soundness, and observation of equipment load limits at all times. Safety procedures outlined in this section should be carefully read by all associated personnel prior to operation, always observed and periodically reviewed to avoid oversight. The safety considerations addressed in this section are pre-operation inspection and safe operating practices.

Preliminary Safety Inspection - Before operating the crane, always perform the following safety inspection:

1. POSITION CRANE VEHICLE: Locate crane unit in a safe work area free from electric power lines or any other obstructions.
2. PERFORM WALK AROUND INSPECTION: Inspect major system components:
   a. Hydraulic System: Inspect visible hoses, connections, and components for signs of physical breakdown or leakage.
   b. Mechanical System: Inspect visible mechanical structure for damaged or deformed members, and loose or missing bolts or nuts.
   c. Electrical System: Inspect visible electrical wiring and components for damage. Make sure system connections are secure and free of conductivity hazards.

d. Winch-Wire Rope-Hook System: Inspect hook and block for soundness; wire rope eye for secure thimble and clamp connections; wire rope for signs of excessive corrosion, wear, broken wires, stretch, kinking or twisting; sheave alignment; and outer wire rope wrap on drum for evenness.

3. CLEAR TEST AREA: Clear intended test area (extended crane travel field) of all personnel.
4. POWER CRANE SYSTEM: Energize crane unit power supply - PTO or auxiliary engine.
5. POSITION OUTRIGGERS: Set outriggers in stabilizing position, making sure the supporting surface provides solid footing.
6. TEST CONTROLS: At slow speed, test all crane control functions. Take care to check return-to-neutral response from both control directions on each manual lever or toggle switch.

NOTE

During the control test, observe system response for any signs of unusual vibration, noise, grinding, or binding. If any of these conditions are observed, STOP the test and make appropriate repairs.

7. TEST WINCH BRAKE: Test the hydraulic brake function by engaging a test load, raising the load six inches above rest position, and allowing the lift control function to idle for 30 seconds. Note any observable down drift of the load. If brake is not functioning, the load will drop. Correct before operation.
8. DE-ENERGIZE EQUIPMENT FOR REPAIRS: When repairs are necessary, always shut down or disconnect system power before making them.
9. CORRECT ALL MALFUNCTIONS: Before any work is performed with the equipment, be sure that all observed defects are corrected. Failure to do so can result in serious personal injury or costly equipment damage.

NOTE

This pre-operation inspection should be performed before every use. This inspection does not qualify as an alternative to the regular preventative maintenance inspections as described in Section 3.

Range & Load Limits - A maximum range and load capacity chart as shown in Section 1 is posted at the crane operator station. The load-range limits identified on this chart should be read and thoroughly understood before any payload lifting is carried out. Do not exceed the maximum load for any range. Overloading gives risk to tipping and structural failure of the crane, and poses serious safety hazards. Lift all loads with crane boom. Do not lift load with winch as winch capacity may exceed crane load-range capacity and create an overload condition.

WARNING

A tipping hazard exists when operating the crane on a slope or across a slope grade. Rated range and load capacities must be restricted to compensate for slope operation and to avoid tipping.

Work Site Location - The safe, recommended work site location for the crane vehicle is a level, dry, firm paved surface. Unpaved ground should provide solid support for gross vehicle weight and any load lifted, and sound outrigger footing.

Parking on slopes requires special precautions:

1. Park with the grade - vehicle facing upgrade or downgrade.
2. Use wheel chocks on downgrade side of rear vehicle wheels.
3. Parked at curbside with front facing downgrade - turn front wheels into curb.
4. Parked at curbside with front facing upgrade - turn front wheels away from curb.
5. Avoid parking cross-grade. If cross grade parking is unavoidable, then load lifting capacities must be restricted to reduce tipping risk. See **WARNING** on previous page.
6. Never park on any grades greater than 6°.

The working field (envelope) of the crane should be as free as possible of overhead obstructions, equipment, and materials which could restrict crane operation. The operator should take note of all objects noted above and limit the crane lifting operation to remain well clear of them. Electric power lines pose special hazards and are specifically addressed in ANSI B30.22-3.3.1-1987.

POWER LINE PROXIMITY

1. Except where the electrical distribution and transmission lines have been de-energized and visibly grounded at point of work, or where insulating barriers not a part of, or an attachment to, the crane have been erected to prevent physical contact with the lines, cranes shall be operated so that no part of the crane or load enters into the "danger zone" shown in Figure 2-1.

    a. For lines rated 50 kV or below, minimum clearance between the lines and any part of the crane or load (including handling appendages) shall be 10 ft (3 m). For higher voltages, see table 1.

    b. Caution shall be exercised when working near overhead lines having long spans as they tend to move laterally or vertically due to the wind which could breach the safety zone.

    c. In transit with no load and boom lowered the clearance shall be as specified in Table 1.

    d. A qualified signal person shall be assigned to observe the clearance and give warning before approaching the above limits.

2. Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities verify that it is not an energized line.

3. Exceptions to this procedure, if approved by the owner of the electrical lines, may be granted by the administrative or regulatory authority if the alternate procedure provides equivalent protection and is set forth in writing.

4. Durable signs shall be installed at the operator's station and on the outside of the crane, warning that electrocution or serious bodily injury may occur unless a minimum clearance of 10 ft (3 m) is

maintained between the crane or the load being handled and energized power lines. Greater clearances are required because of higher voltage as stated in (a) above. These signs shall be revised but not removed when local jurisdiction requires greater clearances.

Above information is taken from ASME-ANSI B 30.22-1987.

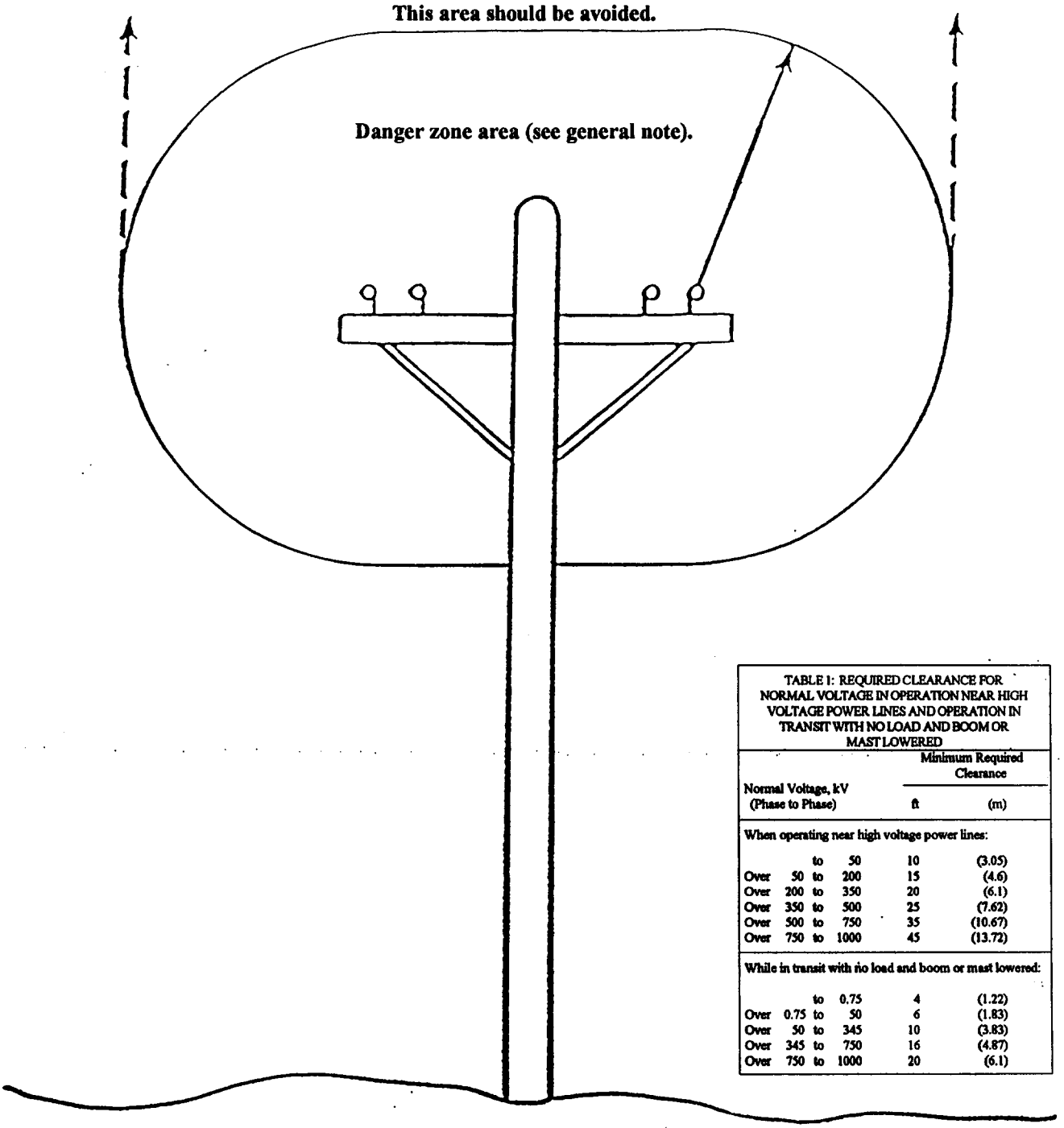


TABLE 1: REQUIRED CLEARANCE FOR NORMAL VOLTAGE IN OPERATION NEAR HIGH VOLTAGE POWER LINES AND OPERATION IN TRANSIT WITH NO LOAD AND BOOM OR MAST LOWERED

Normal Voltage, kV (Phase to Phase)	Minimum Required Clearance ft	(m)
When operating near high voltage power lines:		
to 50	10	(3.05)
Over 50 to 200	15	(4.6)
Over 200 to 350	20	(6.1)
Over 350 to 500	25	(7.62)
Over 500 to 750	35	(10.67)
Over 750 to 1000	45	(13.72)
While in transit with no load and boom or mast lowered:		
to 0.75	4	(1.22)
Over 0.75 to 50	6	(1.83)
Over 50 to 345	10	(3.83)
Over 345 to 750	16	(4.87)
Over 750 to 1000	20	(6.1)

GENERAL NOTE: For minimum radial distance of danger zone, see Table 1.

Figure 2-1

Power Line "Danger Zone"

Operating Safety - In order to operate the crane in a safe manner, the following safety precautions should always be observed:

1. Always perform the pre-operation inspection and correct all defects before use.
2. Never allow unauthorized personnel to perform crane service or repair tasks.
3. Never attempt maintenance or repair on energized crane.
4. Never operate crane in an electrical storm or high wind conditions.
5. Always locate crane vehicle on firm, dry, level terrain.
6. Never locate or operate crane near electrical power lines, see previous section on "Power Line Proximity".
7. Always make sure crane vehicle is stabilized correctly before load lifting begins.
8. Always have all personnel clear during outrigger positioning.
9. Always keep operating area clear of all personnel.
10. Never lift people with the crane.
11. Always use the correct, prescribed sequence for energizing the crane system.
12. Always operate crane controls through a full cycle before load lifting.
13. Always operate controls smoothly and at prudent speed.
14. Never exceed rated load-range capacities.
15. Always know the position of the crane.
16. Always include the weight of load handling attachments in total load weight.
17. Always keep work area in full view.
18. Never leave the control station unattended with a suspended load.
19. Never operate or swing the crane over people.
20. Always keep boom and load free of loose objects.
21. Always start, rotate, and stop a loaded boom slowly.
22. Always lift loads vertically.
23. Never drag a load sideways to position for lifting; side loading can cause damage or failure.
24. Always operate with load as near to grade level as possible.
25. Always keep boom tip as close to load as possible.
26. Always keep three or more full wire rope wraps on winch drum.
27. Always extend winch wire rope before extending crane boom. Failure to observe this rule can result in two-blocking and crane failure.
28. Always feather controls to minimize load sway.
29. Never leave crane controls unattended on energized crane.
30. Always inspect the work site before resuming use of the crane if it has been left unattended.
31. Always store crane, outriggers, and attachments in approved manner for transport.
32. Never operate the crane without a basic knowledge of the operation and safety measures.
33. Always apply the handbrake and if necessary, place wedges underneath the wheels before operating the crane.
34. Never drive the vehicle with a suspended load.
35. Always park the crane in its transport position. If the crane has to be folded in any other position on the truck bed or over the load, the boom system must always be locked to the vehicle in a way that prevents lateral movement.
36. Always be sure that the lifting attachment will be secure during transport.
37. Never use the crane for towing.
38. Always disengage the PTO or shut off the auxiliary engine after crane operation.

39. Never weld on structural parts of the crane without a recommendation from an approved service workshop.
40. Always be sure the spring catches are properly engaged on the manual, telescoping outrigger legs in both operation and transport.
41. Never stand between the rolling base and a stationary load while operating the travel function.
42. Never operate the crane unless it is properly fixed to a truck or trailer.
43. Always be aware that the hand held remote controller unit does not isolate the operators form electric shock. See previous section on "Power Line Proximity"
44. Always keep all parts of your body from moving parts booms, cylinders, chains, sprockets etc.

WARNING

The points to which attention is drawn in the preceding Safe Work Practices section are the keypoints of safe crane operation. Each item noted is of vital importance for the safety of the operator, crews, and non-involved persons. No item should be overlooked or treated casually; to do so is to risk injury, death, equipment failure.

Controls - Model 710 Cranes may be equipped with manual over hydraulic crane mounted controls or combination remote and manual controls. Remote handset and crane mounted controls are labeled with each function control direction indicated as shown in Figures 2-2 and 2-3. Standard control functions for the crane are swing, inner boom, outer boom, and extension boom. Depending upon the user specified options selected, additional functions appearing on the control labels may include winch, fork, rotator, and travel (rolling base applications).

The hand held remote controller shown in Figure 2-2 provides specified system control functions (return-to-neutral toggle switches) and one system ON/OFF push button. The functions are standard with provision for one option. In the event that the user designates more than one option, an expanded-function handset is provided.

The manual control labels shown in Figure 2-3 are examples of various control label configurations which vary with selected options. Control function is self-explanatory.

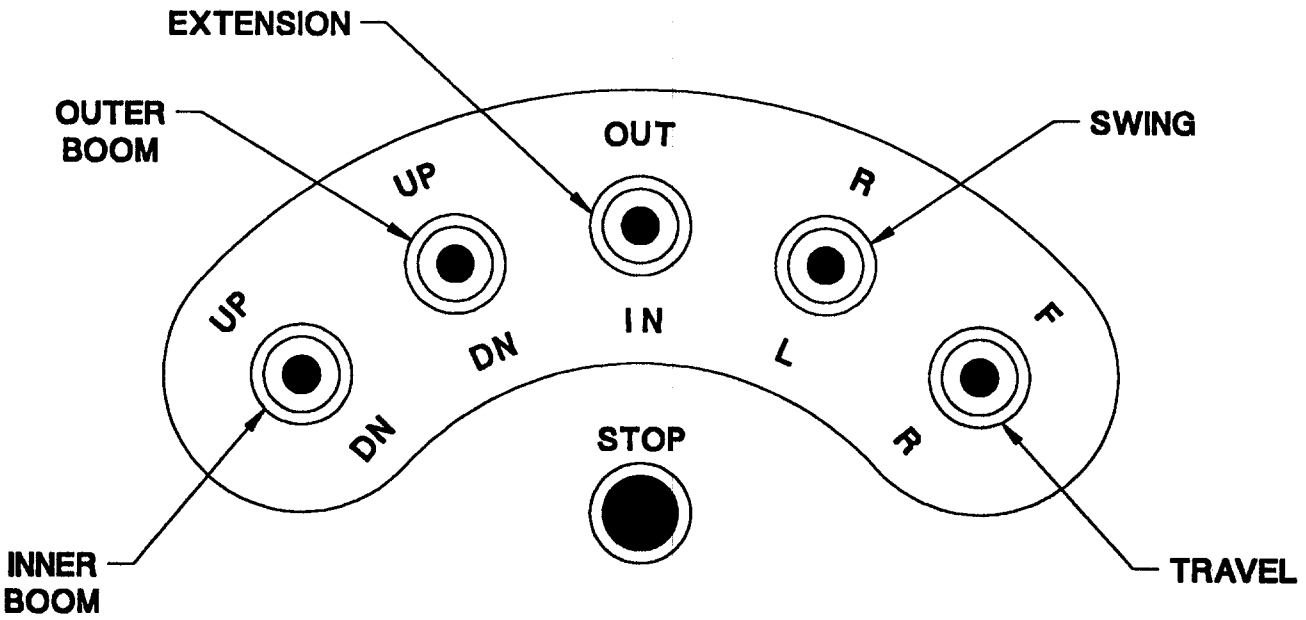
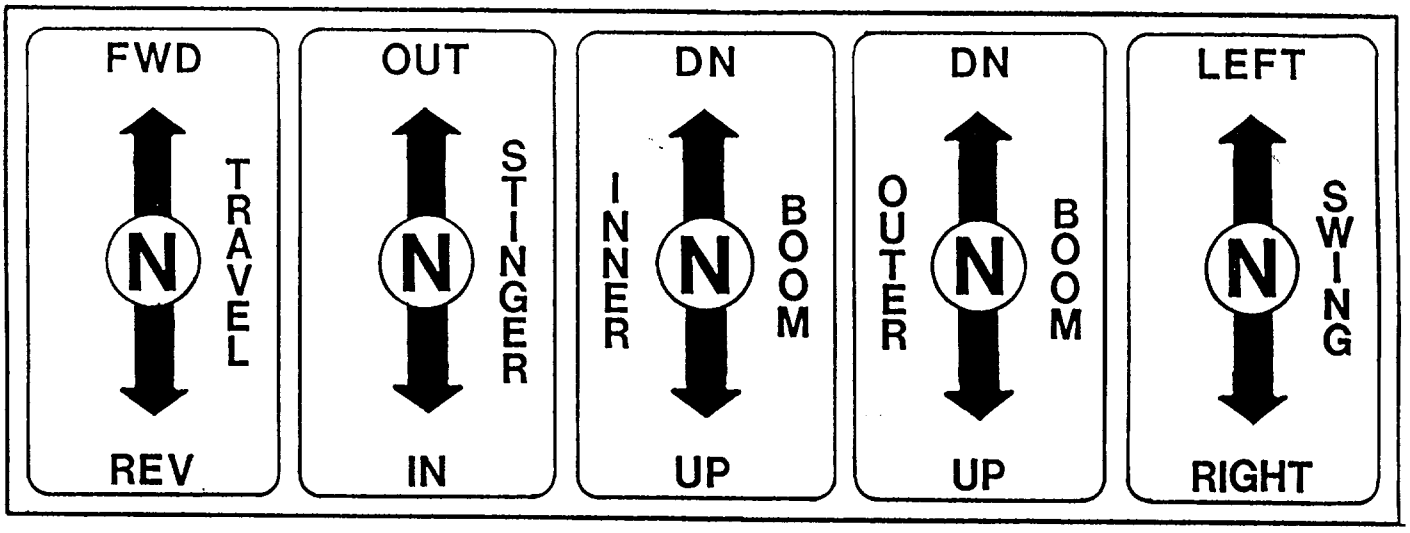


Figure 2-2

Electric Remote Controller Handset Control Functions

NOTE

On standard five function control handset the specified option will determine the function of the toggle switch to the far right. When more than one control option is specified an expanded switch handset is provided and appropriately labeled.



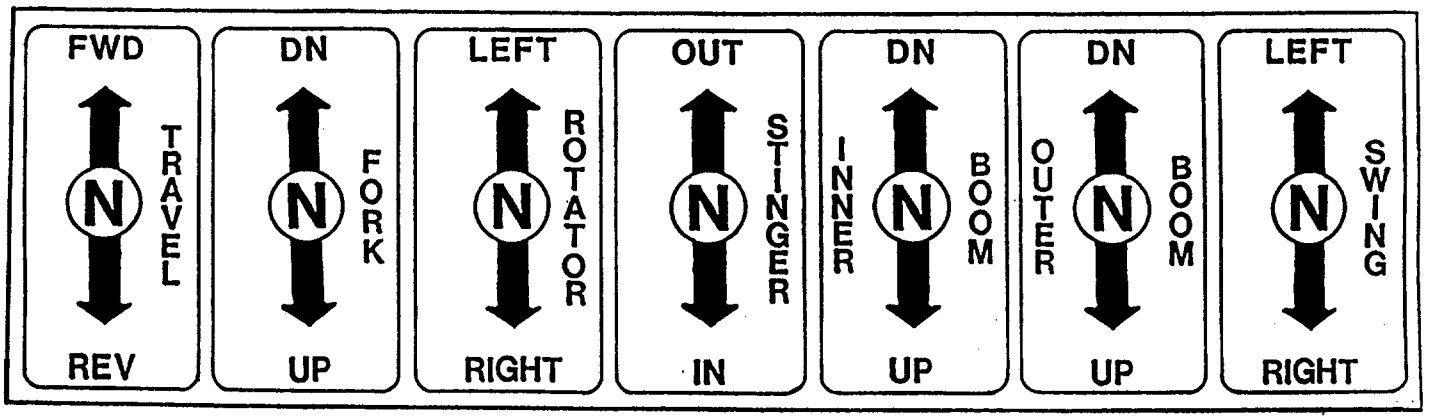


Figure 2-3

Manual Control Function Labels

WARNING

Do not attempt to operate any crane without total understanding of crane control functions. To do so gives risk to serious personal injury or death, and equipment damage.

Power Supply - HIAB 710 Series Cranes may be equipped with several hydraulic power supply options, depending upon the mounting application specified.

1. POWER-TAKE-OFF: A transmission mounted power-take-off, with manual or air shift, drives a fixed displacement pump.

2. GASOLINE ENGINE: A gasoline engine and fixed displacement pump system is specified for truck or semi-trailer rolling base crane system installations.

Operation Start Up - Prior to load handling the following set of tasks must be performed to assure protection of personnel, equipment, and payload:

1. SELECT SUITABLE WORKSITE: Park vehicle close to load handling site, on dry, firm, level surface, with a crane operating field free of obstructions and power lines.
2. SECURE VEHICLE: Set vehicle parking brake and engage parking gear or other locking device if provided. If slope parking is unavoidable take the additional precautions as noted in previous section "Work Site Location."
3. CLEAR WORKSITE: Remove all personnel from crane worksite area. Make sure all obstructions to crane and load travel path are removed or noted for avoidance. Comply exactly with all electric power line regulations as stated previously.
4. CHECK TIRES: Inspect tires and make sure they are inflated to recommended pressure.
5. DESIGNATE SIGNALMAN: If signalman or helper assistance is required, designate a qualified person for the task and make sure all communication signals are understood by both operator and helper.
6. REMOVE RESTRAINTS: Remove all tie down straps, latches, or hooks from crane and attachments.
7. PERFORM WALK AROUND INSPECTION: Inspect major system components - mechanical, hydraulic, and electrical - as previously described.
8. POWER CRANE SYSTEM: Energize crane unit power supply - PTO or auxiliary engine.
9. POSITION OUTRIGGERS: Set outriggers in stabilizing position, making sure the supporting surface provides solid footing.
10. TEST CONTROLS: At slow speed, test all crane control functions. Take care to check return-to-neutral response from both control directions on each manual lever or toggle switch.

> **NOTE**
>
> During the control test, observe system response for any signs of unusual vibration, noise, grinding or binding. If any of these conditions are observed, **STOP** the test and make the appropriate repairs.

11. TEST WINCH BRAKE: Test the hydraulic brake function by engaging a test load, raising the load six inches above rest position, and allowing the lift control function to idle for 30 seconds. Note any observable down drift of the load. If brake is not functioning, the load will drop. **Do not operate the equipment with a malfunctioning winch brake.**

12. INSPECT ATTACHMENTS: Inspect any load handling attachment for mechanical soundness and correct hydraulic control response.
13. DE-ENERGIZE EQUIPMENT FOR REPAIRS: When repairs are necessary, always shut down or disconnect system power before repairs are made.
14. CORRECT ALL MALFUNCTIONS: Before any work is performed with the equipment be sure that all observed defects are corrected. Failure to do so can result in serious personal injury or costly equipment damage.

Payload Handling - When all "Operation Start Up" conditions are met, load lifting can begin. During any load lifting operation, the operator must retain control of the load using the following guidelines:

1. CHECK LOAD-RANGE CAPACITY: The combined weight of load and any load-handling attachment must not exceed the rated crane load-reach capacities shown on the Capacity Chart Label (figure 2-4). This label is located proximate to the operator station for easy reference.

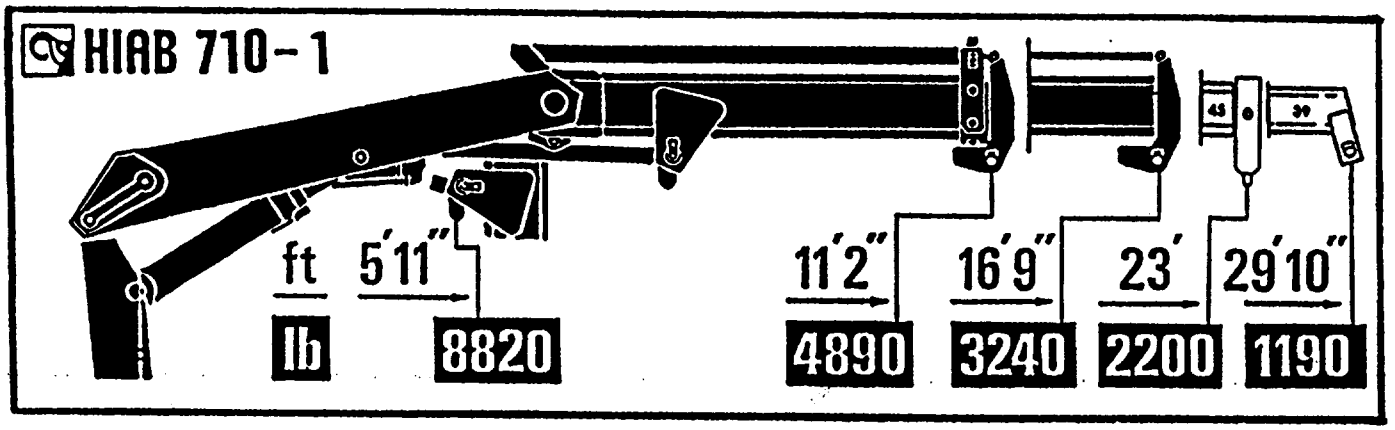


Figure 2-4

Capacity Chart

WARNING

All rated capacities for Reach and Load stated on a crane capacity chart are for crane operation on solid, level ground with outriggers correctly placed. Any operation on sloped terrain requires stability testing and severe load-reach restrictions due to increased tipping hazard.

WARNING

All rated load-range capacities stated on capacity charts are for vertical lifting only - load to boom tip. Side loading is **expressly prohibited**.

2. EXTEND WINCH LINE: If system is equipped with a winch, extend wire rope sufficient to avoid two-blocking during crane positioning.

3. POSITION CRANE FOR LIFTING: Using crane control functions, maneuver crane tip or tip with lifting attachment into lifting position over the load so that:

   a. Crane Hook, if used, is directly over load using the most efficient load range crane boom extension for the intended load transport. Keep crane tip as close to hook block as is prudent in winch applications.

   b. Lifting Attachment, if used, is placed for correct load engagement without side loading boom stress.

4. ENGAGE LOAD: Using correct, secure procedures, engage and secure load to hook or attachment making sure:

   a. Hook is secure and safety catch is in place.

   b. Rigging is correct and properly balanced so no load shift will occur during transport.

   c. Load Attachment has completely and securely engaged load and no loose, falling material hazard will exist during transport.

   d. Boom Tip is positioned directly over load and hook or load attachment ring so that no side loading of boom (dragging) will occur when load lifting begins.

WARNING

Preparation for load lifting is not complete until all boom side loading possibility has been eliminated. Side loading or dragging can cause equipment failure and serious injury or death.

5. LIFT LOAD: Lift slowly using the following guidelines:

   a. Use Boom for lifting and lowering. Where a winch is integral to the system, make sure boom capacity is not exceeded.

   b. Keep Load in sight or in sight of designated signalman at all times.

   c. Pause when load is no more than one foot above rest position to observe any down drift, load imbalance, or shifting. If any of these conditions are observed, lower the load and take corrective action before resuming the lifting operation.

> **WARNING**
> Do not proceed with load lifting if any down drift, load imbalance, or shifting is observed. Correct any of these conditions before continuing. Failure to do so is a **life threatening** hazard.

   d. Raise Load to clear all obstacles in the intended travel path. Never raise load higher than necessary for safe clearance.

6. ROTATE CRANE: With load elevated to desired height, rotate crane using a cautious speed and damping all swaying when desired location is reached. Avoid abrupt starts and stops.

> **CAUTION**
> When crane rotation is stopped, sway will result. Swaying must be damped by slow stopping and then rotating crane slightly (inching) in the direction of the sway. To neglect this maneuver causes the boom side loading effect previously noted.

7. EXTEND LOAD: When desired crane-load alignment with load landing site is reached, boom reach may be extended as follows:

   a. Extend Winch Wire Rope if winch line is in use, to allow sufficient play before any boom extension is made.

   b. Boom Extension must not exceed specified load-reach capacity.

8. LOWER LOAD: Using care to assure correct load placement, lower load at reasonable speed using boom or winch attachment as needed.

Operation Shutdown - When load handling is completed, shutdown is accomplished as follows:

1. STOW CRANE: Return crane to transport position with any slack winch wire rope rewound and load handling attachment correctly stored.

2. RETRACT OUTRIGGERS: Return outriggers to storage position.

3. DE-ENERGIZE CRANE SYSTEM: Disengage PTO or shut down auxiliary engine.

4. STORE REMOTE CONTROL UNIT: If electric remote control handset is in use, coil it with the cable and return to storage bracket.

Operating the Support Legs

When the crane is equipped with tilting support legs and these legs are in the parked position, see Figure 2-5, proceed as follows:

- Disengage the catch (B) and pull the outrigger (C) out a short distance.
- Lock the catch (B) and pull the outrigger out as far as will go. Make sure that the catch is engaged.
- Pull out the locking handle (A) and swivel the outrigger leg down to the working position.
- **Always make sure that the catch (B) and the lock (A) secure the outriggers in both the parked and operating positions.**

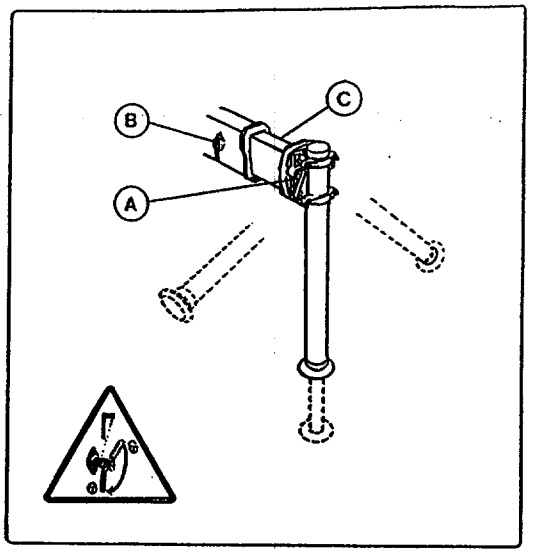


Figure 2-5

Support Leg Diagram

Preparing the Crane for Operation

Unfolding the Crane - To erect the crane from the parked position, proceed as follows:

1. Apply the parking brake.
2. Check the oil level in the tank (see Section 3 - Equipment Maintenance).
3. Engage PTO or start remote engine.
4. Set outriggers.
5. See that the extension is in its proper position.
6. Fold the outer boom as close as possible to the inner boom. Check that the outer boom has left its support. See Figure 2-6.
7. Lift the inner boom to sufficient height to permit unfolding of the outer boom.
8. Unfold the outer boom. The loader is now ready for use.

Folding the Crane - When work is finished, the loader is to be folded into its transport position:

1. Turn the boom system to a position straight across the vehicle.
2. Retract the extension to its proper position.
3. Fold the outer boom up under the inner boom as much as possible.
4. Fold the inner boom towards the transport support on the outrigger beam.
5. Retract and properly stow the outrigger extensions and legs into the transport position.
6. Disengage the PTO or shut off the remote engine.

NOTE !!

Always fold the loader in its transport system. If the boom system has to be parked in another way, for instance on the truck body or over the load, the boom system must always be locked to the truck in such a way that the boom system can not move laterally.

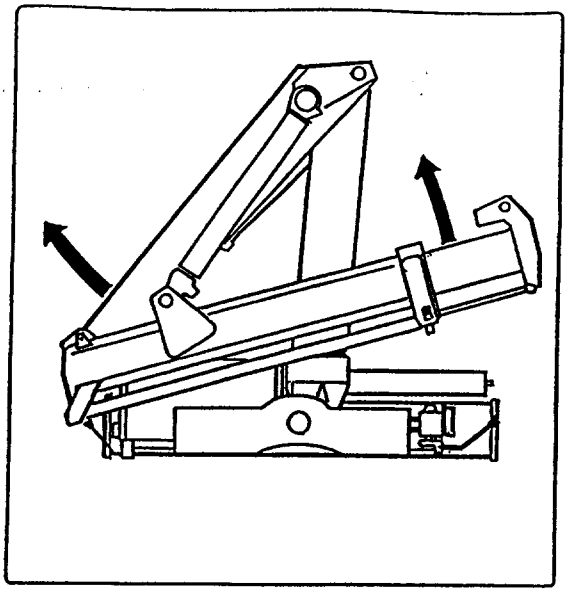


Figure 2-6

Unfolding Diagram

Starting Up in Cold Weather

When the crane is started up in cold weather the wear on the hydraulic system, particularly on the pump, is greater than in normal operating temperatures. In order to minimize wear, the crane should be started like this:

1. Engage the PTO, or start the remote engine and leave it at a low speed.
2. Let the oil circulate for a few minutes - don't operate any functions.
3. Raise the engine RPM to the proper level.
4. Raise the crane from the parked position, as described previously.
5. Operate the "IN" function of the outer boom for about 1-2 minutes.
6. Operate the "OUT" function of the outer boom for about 1 minute.
7. The crane is now ready for use.

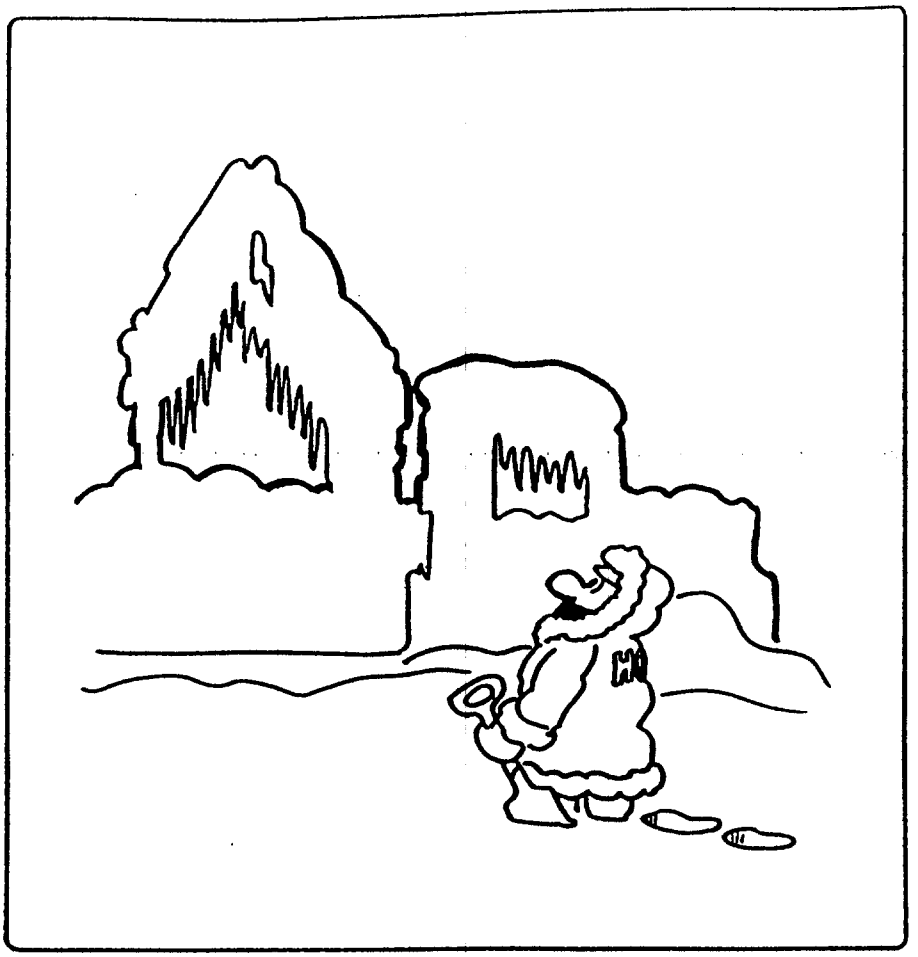


Figure 2-7

Cold Weather Starts

Safe Load Handling

Figure 2-8 shows an example of a maximum load curve. The curves on the load diagram indicate the maximum capacity of your crane at a certain outreach and height. To the left of this curve (dashed area) the stated maximum load can be handled if you operate the boom to its full capacity. See the following recommendations:

Before handling a certain load, it is important to check on the diagram in which range your crane is capable of handling this load. During operation, do not increase the outreach beyond this range.

If the load capacity at a certain outreach has been mistaken or exceeded, resulting in boom drop, you should quickly shorten the outreach to get the load within the correct range.

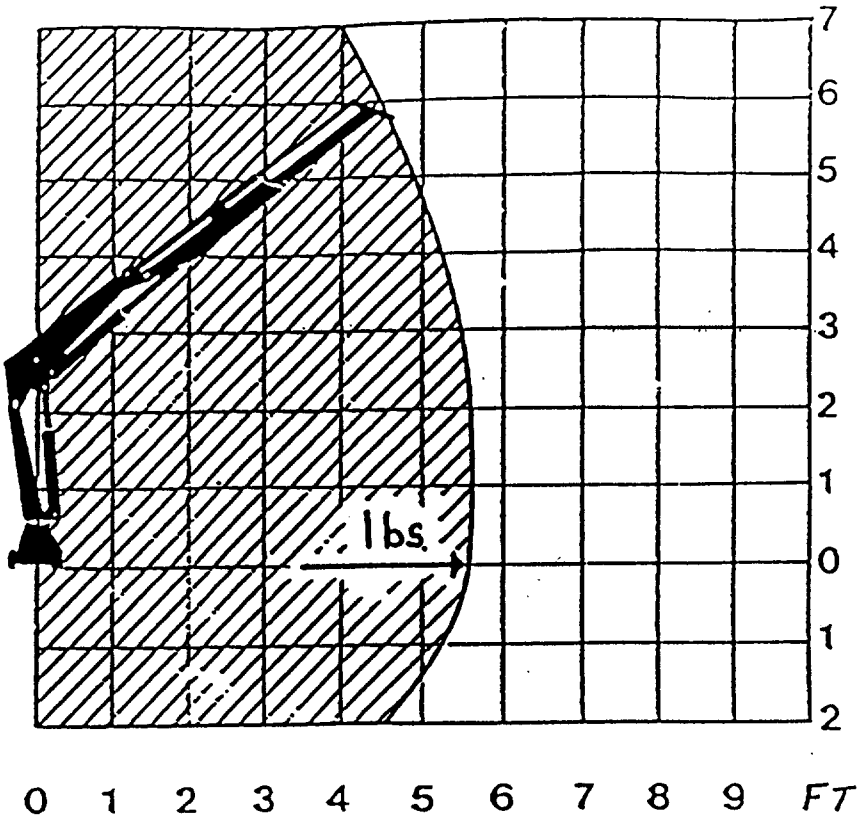


Figure 2-8

Maximum Load Curve Diagram

Maximum Utilization of the Loader Capacity

For safe handling of loads which need full capacity of the crane you should operate according to the following recommendations (see Figure 2-9):

Range A: Use mainly the inner boom and extensions. Operate with the outer boom slightly out of line with the inner boom and minimize the extension.

Range B: Use mainly the outer boom and extension. Ideal position of the inner boom is 15° over the horizontal plane.

Do not overload your crane! Follow the instructions given on the load plate or in your operator's manual. Remember the maximum permissible loads stated are total loads. The weight of the tool (i.e.: grapple, fork etc.) must not be forgotten!

Example:

Max. load stated on chart	3,000 lbs
Weight of tool	600 lbs
You may handle	2,400 lbs

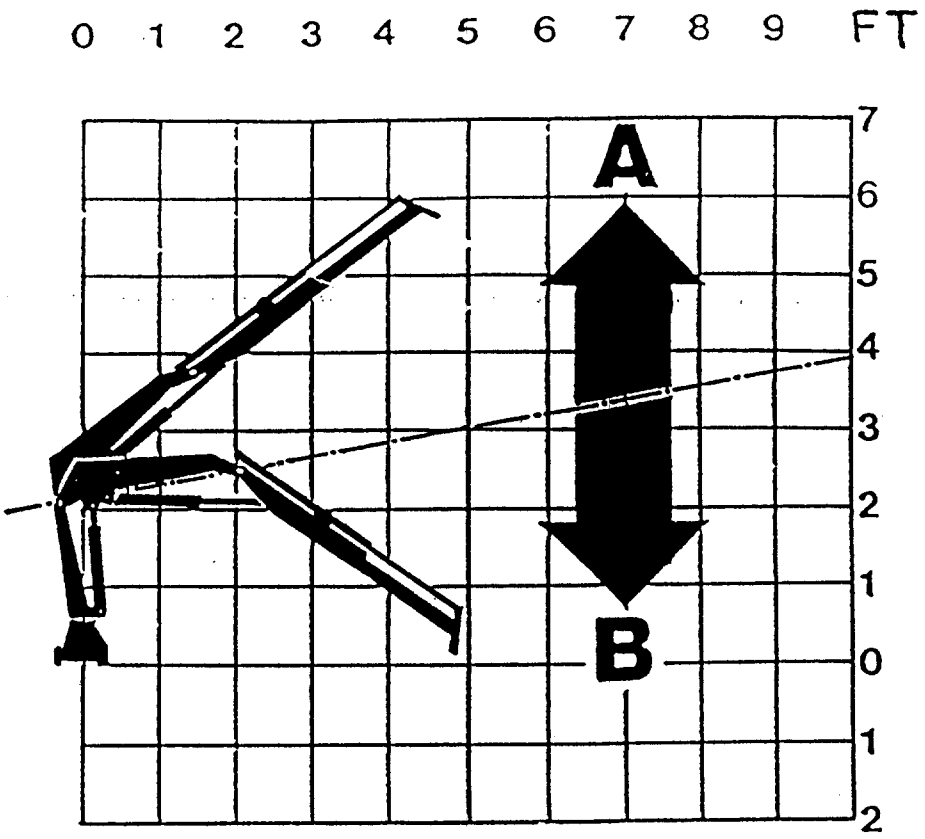


Figure 2-9

Maximum Utilization Capacity Chart

Section 3. EQUIPMENT MAINTENANCE

HIAB Service

Your new HIAB crane comes from the world's leading manufacturer of hydraulic truck cranes. You can therefore rely on the fact that technical service, advice and spare parts are always within reach.

Guarantee

As the owner of a new HIAB crane, you will expect it to satisfy your demands as to operational safety and profitability. In order for us, as the manufacturers, to fulfill these demands we must ask you, the owner, to observe our requirements as to maintenance and service. In this section we will deal with these requirements. Above and beyond this we also expect that you do not alter or in any other way modify the crane's construction. It is, for example, forbidden to alter the control valve's pressure settings as this effects the crane's construction.

Why Genuine parts?

When you or your service workshop carry out service or repair your HIAB crane, it is important that you fit HIAB genuine spare parts. The HIAB crane is a product of high technical quality when it is delivered from the factory. A guarantee that this quality will continue throughout the life of the crane presupposes that it gets regular service and that genuine spare parts are used. A pre-condition for HIAB's guarantee on its products is that only genuine spare parts are used and that they get regular service.
HIAB guarantees that you can get spare parts for at least 10 years after we have manufactured the last crane from that series.

Routine preventative maintenance is essential to keep this machine at peak operating efficiency. The maintenance procedures and frequency schedules outlined in this section should always be adhered to by operating and maintenance personnel. In addition to procedures presented in this manual, the user should refer to the accompanying set of individual manuals for each of the major components - basic crane, engines, control valves, etc. - as applicable.

LUBRICATION

Lubrication Points - Principal lubrication points on the crane are shown in Figure 3-1. Additional lubrication points on the undercarriage are the four axle bearings as well as the two idler sprockets, as shown in Figure 3-2. Load handling attachments - forks, clamshells and rotators should also be lubricated routinely to assure proper operation. Be sure to keep the manual fork swivel properly greased. **Should the swivel bearing cease to rotate, the swivel could disassemble itself resulting in the load falling!**

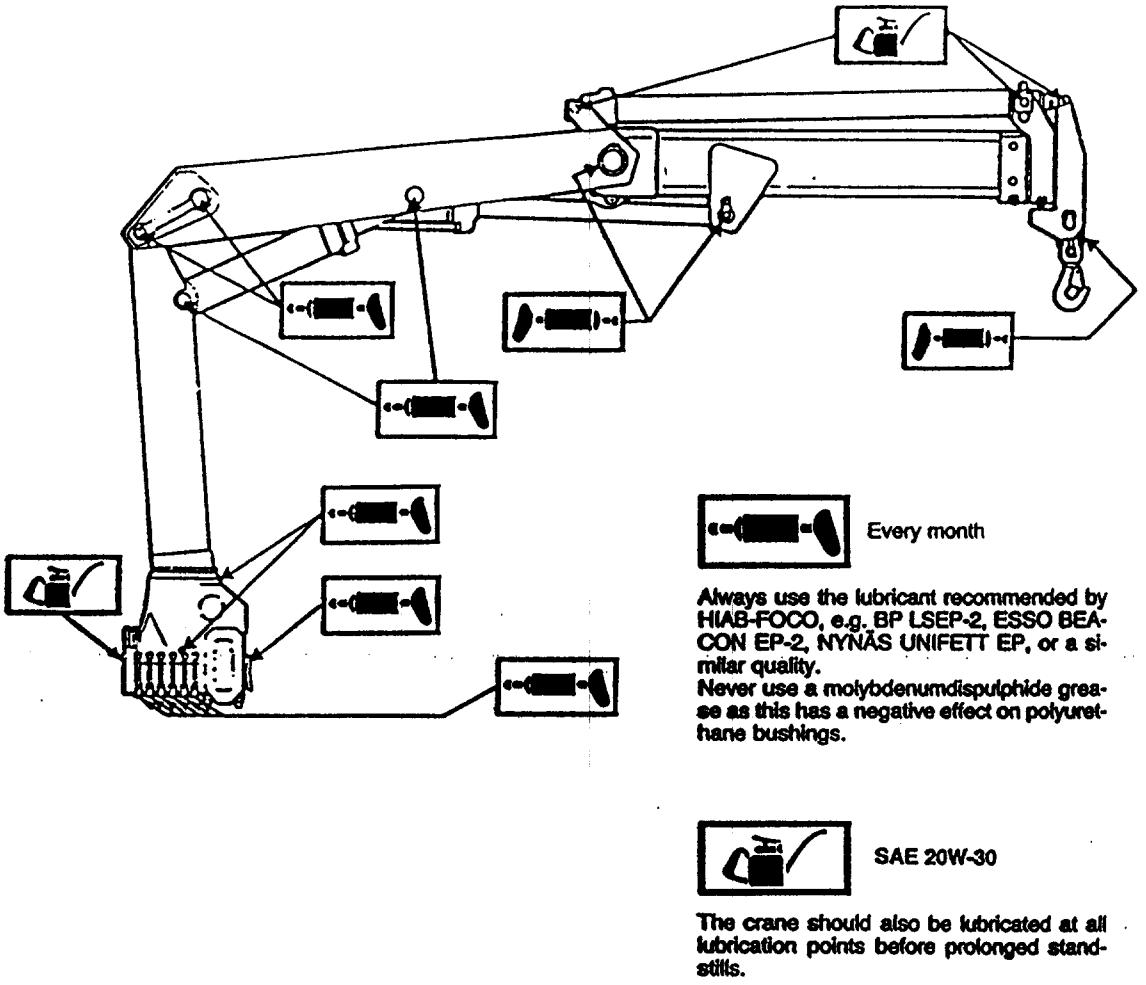
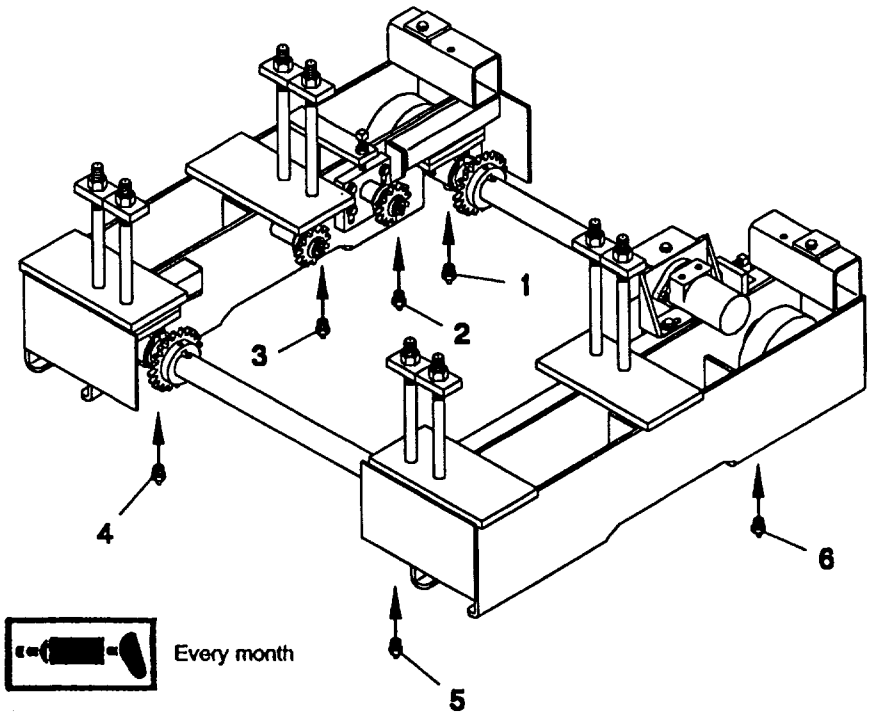


Figure 3-1

Crane Lubrication Points



1. Axle Bearing
2. Adjustable Idler
3. Fixed Idler
4. Axle Bearing
5. Axle Bearing
6. Axle Bearing

Figure 3-2

Undercarriage Lubrication Points

HYDRAULIC SYSTEM

Oil Specifications - The hydraulic system and the hydraulic fluid are matched in respect of lubricating performance, effect on seals and other materials, and non flammability. For this reason, do not mix different types of hydraulic fluid, such as mineral oils, synthetic fluids and water-based fluids and never adulterate you hydraulic fluid with diesel oils or alcohol-based products. A hydraulic oil of the "right" grade will be characterized by good shear stability, high oxidation resistance, good corrosion protection, negligible foaming, negligible air pick-up, negligible water miscibility, and a viscosity that is appropriate for the current temperature and operating conditions. These properties are conferred upon the oil by chemical additives.

Accordingly, HIAB recommends three different grades of mineral-based hydraulic oil:

	Summer grade	Standard grade	Winter grade
Viscosity:	@ O°F Max. 4000 cSt Min. 7.5 cSt	@ -20°F Max. 3500 cSt Min 6.0 cSt	@ -20°F Max. 1500 cSt Min. 3.2 cSt
Pour point:	-11°F	-38°F	-38°F
Flash point:	Min. 302°	Min. 302°	Min. 266°
Rustproofing:	Approved	Approved	Approved
Max. permissible oil temperature to maintain min. viscosity of 10 cSt	185°F	167°F	122°F
Lowest starting oil temperature at max. viscosity of 1500 cSt	23°F	-13°F	-22°F

For marine application, however, the hydraulic oil must have enhanced rust protection. Fluids that are especially fire-resistant may also be called for when the crane is used in environments where there would be a fire hazard in the event of leakage.
Don't hesitate to contact HIAB's Service Department for advice and guidance.

Hydraulic Oil Replacement - Hydraulic oil in the unit reservoir should be changed every six months or after any major hydraulic component failure.

In addition to regular hydraulic oil replacement, the oil should be periodically sampled and examined for breakdown, sludge, and water contamination. If any of these conditions are observed, the oil should be changed between service intervals.

Hydraulic oil replacement and system purging is as follows:

1. Prepare for the procedure by having sufficient new oil on hand to completely fill the unit reservoir, cylinders, lines and other hydraulic components; and extra oil to allow for loss. Also have a receptacle of adequate size to catch all waste oil. Waste oil disposal is left to the lawful discretion of the user.

2. Select a vehicle parking location which will provide secure outrigger footing and allow full extension of the crane unit to the side horizontally and to full elevation range.

3. Park vehicle on selected location, extend outriggers full stroke where applicable, and extend crane to its maximum horizontal side reach position. Shut off system power.

4. With waste oil container in place, remove the suction from the pump drain plug in bottom of reservoir and remove breather to allow air flow. Wipe reservoir and suction strainer bowl clean with lint free cloth. Replace suction line and inspection port cover.

5. Disconnect, drain, and reconnect pump pressure hoses. Replace return line filter element. Make sure all connections are secure.

CAUTION

Before proceeding with the system purge routine, make sure each step is understood and you are prepared to follow through without interruption. Two operators are recommended to avoid excessive oil waste.

NOTE

Purging the hydraulic system consists of supplying new oil to the lines and components via the reservoir while the return line is disconnected and the old oil is diverted to a waste container. During this procedure, the oil level in the reservoir should be maintained at no less than 1/3 of reservoir capacity to insure no air introduction to the system.

6. Fill reservoir to "Full" mark and check the suction line to assure there are no leaks.

7. Disconnect the reservoir return line hose and securely direct the oil flow to the waste container.

8. Power the system - truck PTO or auxiliary engine - and with slow speed: (1) retract extension booms fully; (2) rotate crane; (3) elevate inner boom to fullest height; (4) fold outer boom to its lowest position; and (5) retract outriggers. The system is now fully purged.

9. Shut system power off. Reconnect return line and check oil level. Fill reservoir to "Full" as required.

Hydraulic System Filter - The hydraulic system is equipped with a disposable return line filter. This filter is located in the system reservoir. To change this filter, shut the system power to "Off," and replace filter element (see spare parts section). Make sure the new element is securely tightened and turn system power to "On" to check for leaks. This filter element should be replaced every six months in normal service.

Crane Base Oil Replacement - The crane base is filled with hydpoid gear oil to the center of the slewing cylinder. Remove the plug at the bottom of the crane base to drain the oil and replace with SAE 80 W-90. Run the slewing system 2-3 times and recheck the base oil level. Correct if necessary. The base oil should be changed at least once a year.

Hydraulic System Schematic - The system hydraulic schematic is shown at the end of this section.

ELECTRICAL SYSTEM

A detailed discussion of the unit electrical system is beyond the scope of this manual. If electrical problems should occur, or a need for maintenance is required, the user is advised to secure the services of a competent electrical technician.

Electrical System Schematic - The electrical system schematic is shown at the end of this section. This schematic is provided for the reference of qualified personnel only.

CHAIN DRIVE SYSTEM

The rolling base crane installations have a single chain drive system. Chain and sprocket drives are efficient, reliable, and simple to maintain. Emphasis must be put upon adherence to the regular and preventative maintenance requirements of these systems.

Chain Tension - Chain drives are factory installed with correct tension. With wear or new chain installation, it is necessary to adjust chain tension. The system power drive chain should be adjusted to tight on the drive side and 2-3% slack on the sag side. Chain tension adjustment may be made by link removal, motor/idler adjuster, or both.

Sprockets - Sprockets should be checked for wear, broken teeth and correct alignment. If sprocket teeth show abnormal wear, the chain tension and sprocket alignment should be checked. If wear is sufficient to impair function the sprocket, it should be replaced before adjusting the chain.

Chain Lubrication - Always ensure that the wear surfaces of the chain are properly lubricated to manufacturer's specifications.

WINCH SYSTEM

In systems equipped with a winch option, there are several winch components which require maintenance attention. For a detailed description of wire rope rigging inspection and repair, it is necessary to consult a reputable rigging source book. The following discussion of work rope rigged winches is for general reference only and not intended as an instructional primer for the layman.

Winch Drum - The winch drum is generally not subjected to fatigue stress. Primary attention to the drum is that the wire rope is securely anchored and that no scoring to surface is severe enough to cause non-symmetrical wire rope wrap.

Sheaves, Guides & Guards - Winch system sheaves, guides and guards should be inspected regularly for deformations which could impede wire rope travel. If any obstruction to rope travel is observed, the component should be replaced or realigned to correct the condition, and the wire rope should be inspected to assure no damage has occurred.

Wire Rope Inspection - At periods of regular inspection, unwind the working length of wire rope and thoroughly inspect for wear and damage. Rope inspection interval must not exceed 30 days and should be logged. General flaws to be looked for are kinks, fraying, flattening, heat damage, and condition of rope end attachments.

Wire Rope Replacement - Wire rope with any one of the following defects shall be removed and replaced immediately:

1. Severe Corrosion: Any development of severe corrosion should be considered hazardous.

2. Broken Wires: One or more valley breaks (a wire break occurring in the valley between two adjacent strands), six randomly distributed broken wires in one rope lay, or three broken wires in one strand in one rope lay.

3. End Attachments: The development of broken wires in the vicinity of end attachments.

4. Abrasion: Any abrasion, scrubbing, peening, or flattening which diminishes the original diameter by one-third.

5. Kinking: Any distortion of the rope structure by severe kinking, bird caging, crushing, or other damage.

6. Heat Damage: Any evidence of heat damage from a torch or contact with electrical wires.

7. Rope Diameter Reduction: Reduction of any rope up to 3/4 inch in diameter by more than 3/64 inch.

Used Wire Rope - Used wire rope returned to service as replacement rope must be subjected to the same scrutiny as noted above.

Wire Rope Maintenance - Lubrication or dressing should be performed in accordance with rope manufacturer specifications.

REGULAR INSPECTION

It is recommended that the equipment user establish a regular maintenance inspection schedule and an appropriate record system of same.

Recommended Preventative Maintenance - A regular preventative maintenance schedule for this unit is provided in this manual. The user may wish to expand upon it, but at no time should the points outlined be omitted. It is also important that records be routinely kept of these inspections and actions taken.

Emergency Inspection - In addition to a regular inspection schedule, it may be necessary to perform special inspections of the unit if it is subjected to periods of unusually heavy use, long periods of idleness, or is damaged in any way.

PREVENTATIVE SERVICE

The following section describes the service and maintenance measures which are needed and permissible to be performed on the various components of the crane. These components must be checked regularly for proper functioning, and adjustments must be carried out as necessary. Before the crane left our factory, every valve in the hydraulic system and every other part in the crane was thoroughly tested and properly adjusted. Servicing and any subsequent adjustment that is necessary must be carried out by a duly trained and competent service technician.

It is important to carry out daily inspections and regular maintenance so as to ensure that the crane will give long and trouble free operation.

Daily Inspection:

- Check the oil level in the hydraulic oil tank.
- Inspect the lines, connections and other components of the hydraulic system so as to detect any oil leakage.
- Check ropes, rope clamps, rope guides and other attachments used with the crane to ensure that they are free from damage.
- Check that the crane can be operated with ease and that the controls automatically return to their neutral position.
- Check that the rest of the crane is free from damage (i.e.: metal deformation, weld failure, loose or damaged chain etc).
- Preform a dynamic load holding test both raising and lowering a load to a stop.
- Be sure that the manual fork swivel is rotating freely.
- Repair at once any part or component of the crane that is damaged.

Monthly Inspection:

- Check pressure settings.
- Check for oil leakage.
- Check and advance all screwed connections.
- Check and advance the attachment bolts of the crane.
- Check and advance hose and pipe couplings.
- Check catches and other locking devices.

- Check the function and lever symbols of control levers.
- Check hooks, ropes and chains, and other lifting tackle that is used.
- Check that all prescribed notices are in place and are clearly legible.
- Carry out a visual inspection of structure to detect any deformation, play in joints, weld or material failure etc.
- Clean the machine.
- Check/adjust slide pads and bearings for excessive play and deformation.
- Examine a sample of hydraulic oil for contamination and breakdown.
- Check all hydraulic lines for flattening, wear, pitting and blistering.
- Check hose fittings and couplings for signs of leakage.
- Inspect pump, valves and torque motor for signs of leakage.
- Check chain drive system for deformation, slack, half link security, sprocket wear/damage and alignment.
- Check electrical cables and receptacles for defects damage and deterioration.
- Check all oil levels and lubricate in accordance with the lubrication chart.
- Put the crane through test running and test loading, and listen for any suspicious noises.
- Make sure all warning decals are in place and legible. See page 3-21 for placement.

Six month inspection:

- Clean the crane.
- Check pressure settings.
- Check for oil leakage.
- Check and tighten all screwed connections.
- Check and tighten the attachment bolts of the crane.
- Check and tighten hose and pipe couplings.
- Check catches and other locking devices.
- Check the function and lever symbols of control levers.
- Check hooks, ropes and chains, and other lifting tackle that is used.
- Check that all prescribed notices are in place and are clearly legible.
- Carry out a visual inspection of structure to detect any deformation, play in joints, weld or material failure etc.
- Check all oil levels and lubricate in accordance with the lubrication chart.
- Check chain drive system for deformation, slack, half link security, sprocket wear/damage and alignment.
- Check/adjust slide pads and bearings for excessive play and deformation.
- Examine a sample of hydraulic oil for contamination and breakdown.
- Check all hydraulic lines for flattening, wear, pitting and blistering.
- Check hose fittings and couplings for signs of leakage.
- Inspect pump, valves and torque motor for signs of leakage.
- Check chain drive system for deformation, slack, half link security, sprocket wear/damage and alignment.
- Check electrical cables and receptacles for defects, damage and deterioration.
- Change the hydraulic oil and the return filter.
- Change the oil in the crane's base.
- Do a security check of the pump and power unit.
- Check all linkages, joints, bearings, slide pads and guides for play.

- Put the crane through test running and test loading, and listen for any suspicious noises.
- Inspect undercarriage clearance with I-beam. Look for signs of rubbing and wear. Adjust undercarriage setting if necessary.

In addition to this maintenance program inspection forms and log can be found in your CARGOTEC Warranty book that came with your warranty registration. This book will have to be maintained in order to keep your warranty valid and is highly recommended to keep your machine in optimum working order.

TROUBLE SHOOTING

The trouble shooting chart provided is for quick reference should operating trouble occur and to assist in diagnosis if an inspection of operating functions results in any of these effects.

MALFUNCTION	POSSIBLE DEFECT
Controls fail.	1. PTO is not engaged. 2. Control "STOP" is engaged. 3. Hydraulic pressure failure. a. Faulty pump. b. Hose or fitting failure. c. Low oil level. d. Relief valve failure.
Rolling base carriage binds in tracks; **OR** Unusual vibration or noise in rolling base function.	1. Obstruction on track. 2. Sprocket loose on shaft. 3. Damaged wheel or carriage member. 4. Bearing failure. 5. Drive chain failure.
Load will not hold in idle.	1. Mechanical brake is out of adjustment.
Slow operation.	1. Hydraulic pump is defective. 2. Hydraulic valve is defective. 3. Stop valve is defective. 4. Oil level is low.
Function (lifting, rotation, extension) continues when lever is used.	1. Control lever is not returning to neutral position. 2. Control valve is defective.
Unusual noise in crane function operation.	1. Cavitation caused by low hydraulic oil supply. 2. Suction line is restricted or collapsed. 3. System is overloaded.

ROLLING BASE INSTALLATION

A rolling base crane can be installed on either a truck body or flatbed trailer. The applications are varied. For this reason, the installation instructions given in this section are a general reference and not directed to a specific truck or trailer application.

Rail Installation - Figure 3-3 illustrates a typical truck rolling base installation with the appropriate cut-aways.

1. Refer to Figure 3-4 and locate body stringers, floor, and cross members. Cut a one inch (1") wide path in bed floor on both sides of body I-beam stringers full travel length of carriage.

2. Make sure there is 7/8" clearance from the flange bottoms to crossmember tops to allow rolling base travel.

3. Cut clearance paths at the rear of the body and provide removable stops at the rear of the body. These brackets are to be of sufficient strength to prevent the accidental driving of crane off rear of vehicle.

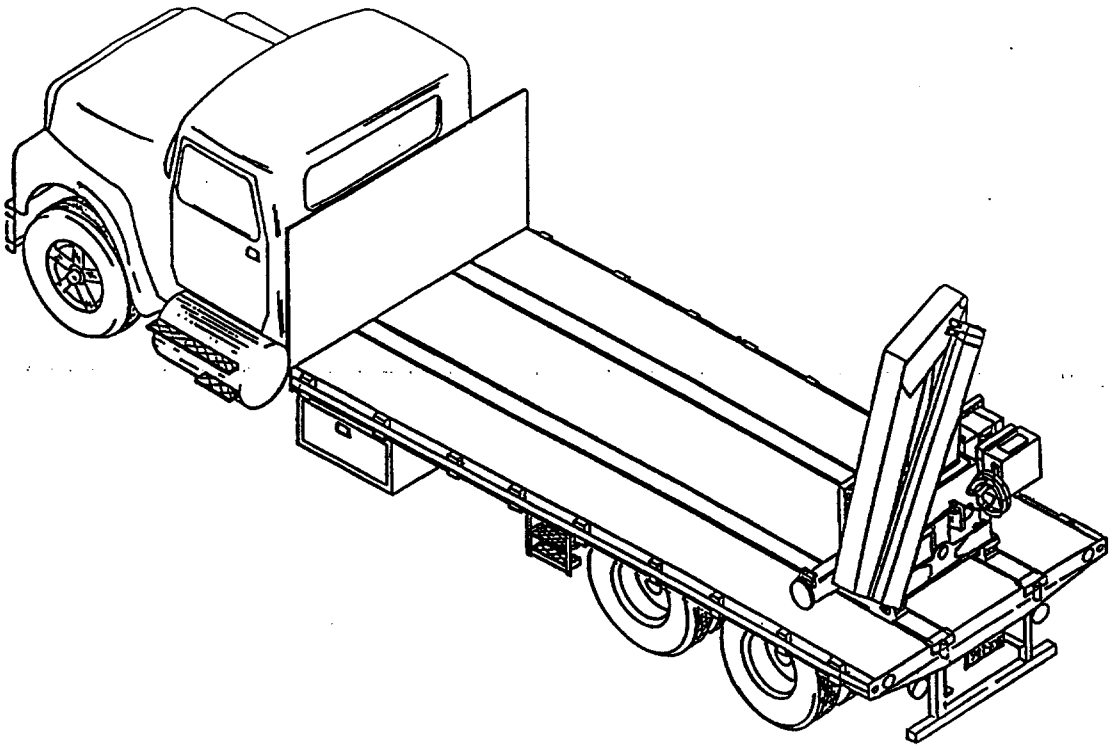


Figure 3-3

Typical Truck Rolling Base Installation

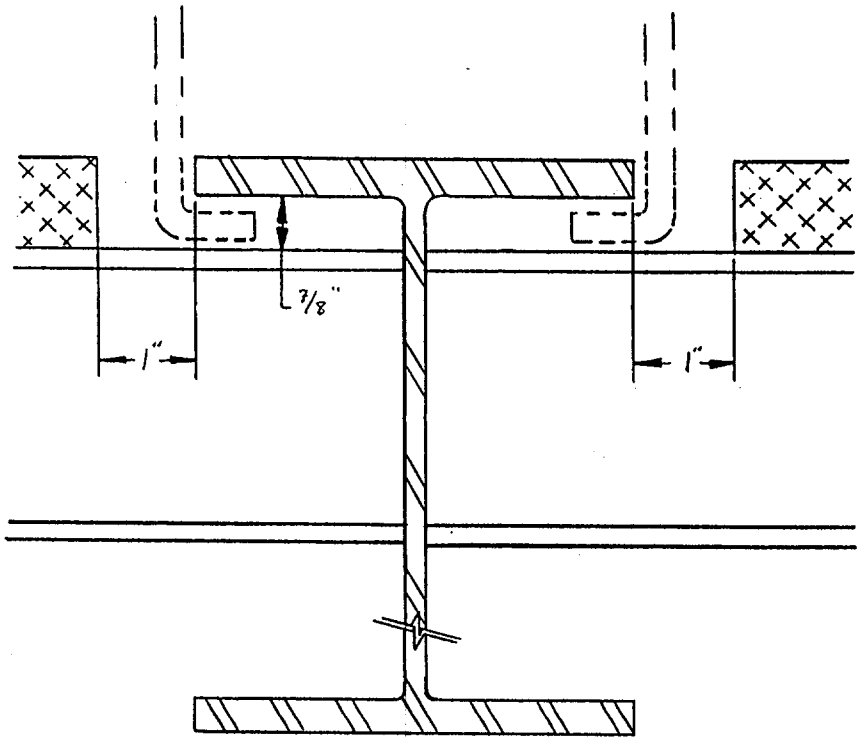


Figure 3-4

Truck Bed Cutaway Illustration

Carriage Installation - With bed rails correctly prepared and stops fabricated and ready for placement, install crane and carriage assembly as follows:

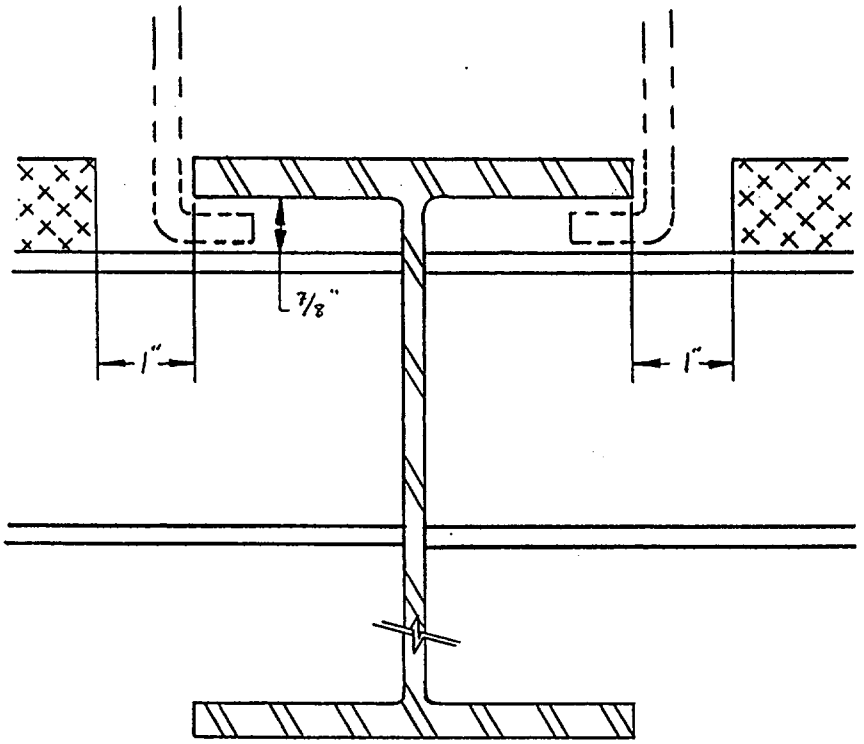
1. Using fork lift or other lifting device, insert rolling base into body rails far enough to be clear of bed rear. Secure the crane and carriage assembly to the lifting device before attempting the installation.

2. Install rear stop brackets.

3. Move crane to an operating position and test all functions.

4. Move crane to desired transport position.

5. Crane transport tie-down means are required. These can be load binders or chains. As shown in Figure 3-5 a section of rec. tube is welded to both sides of the rolling base. At the transport position a length of chain can be passed through these tubes and used to secure the crane in position.



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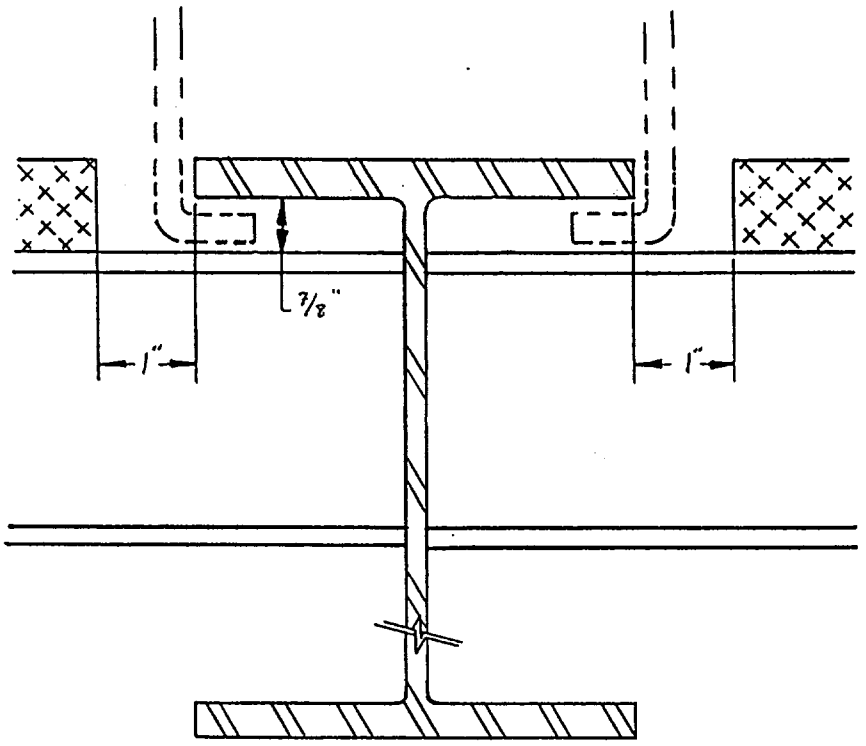

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4. Move crane to desired transport position.

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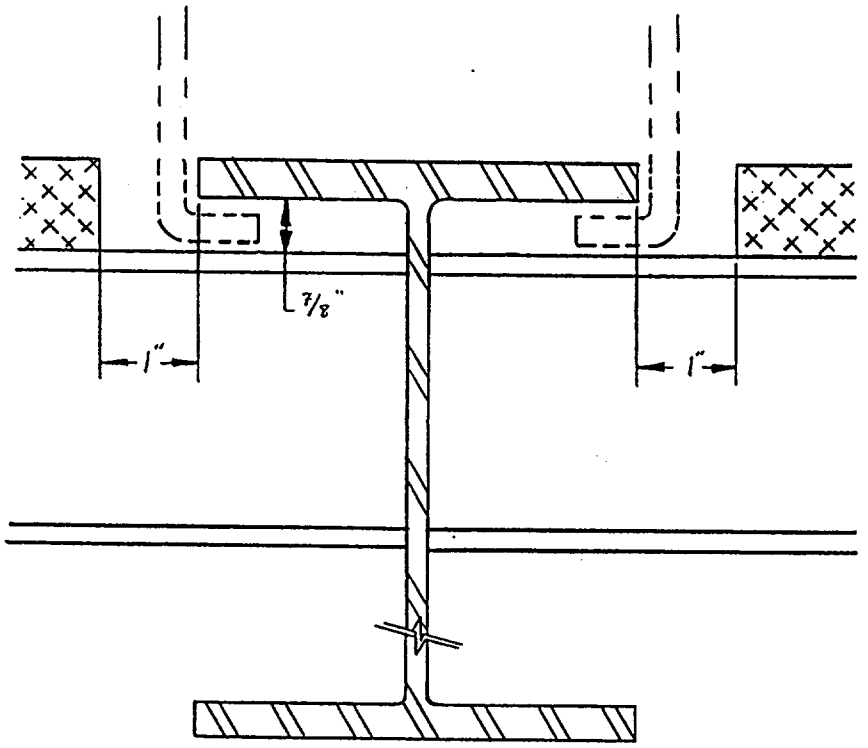

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3. Move crane to an operating position and test all functions.

4. Move crane to desired transport position.

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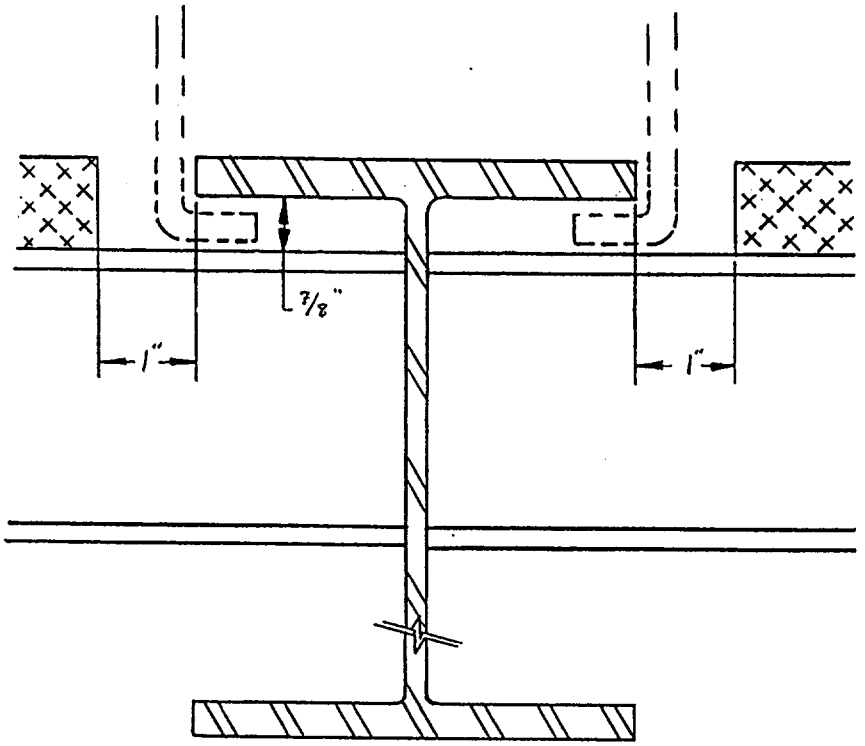

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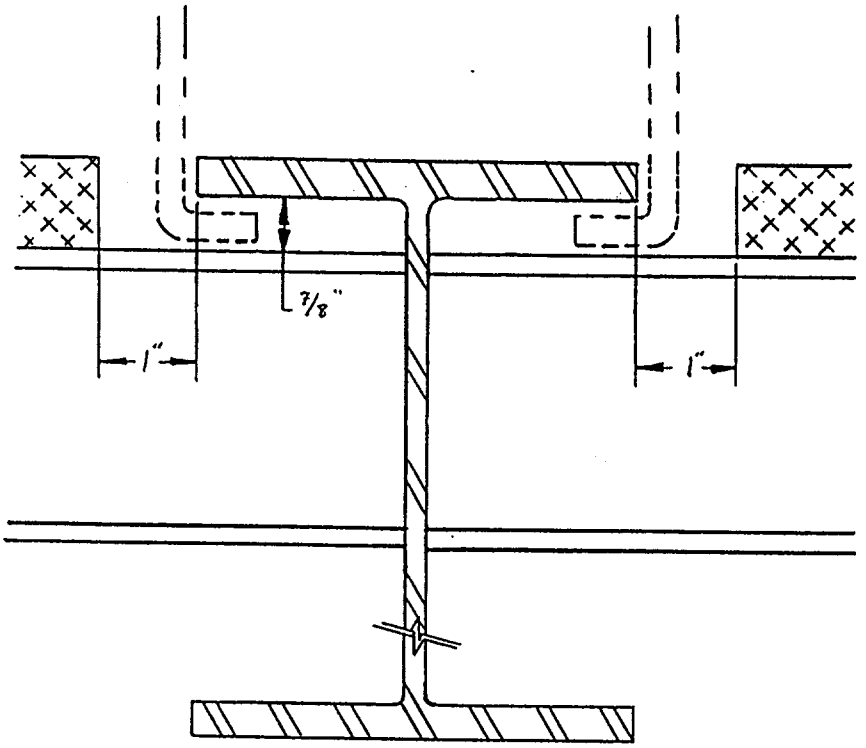

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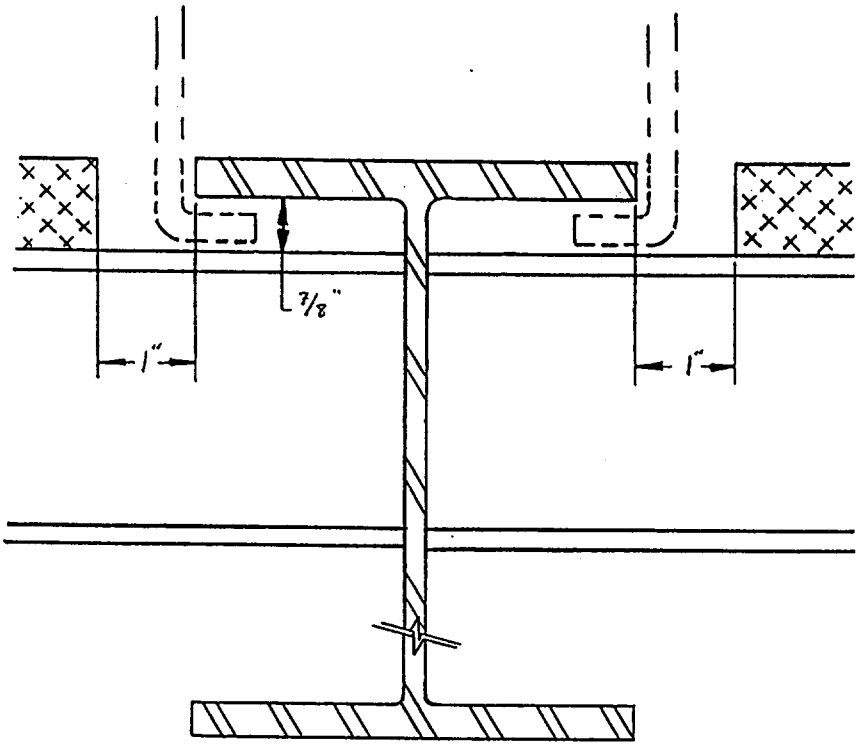

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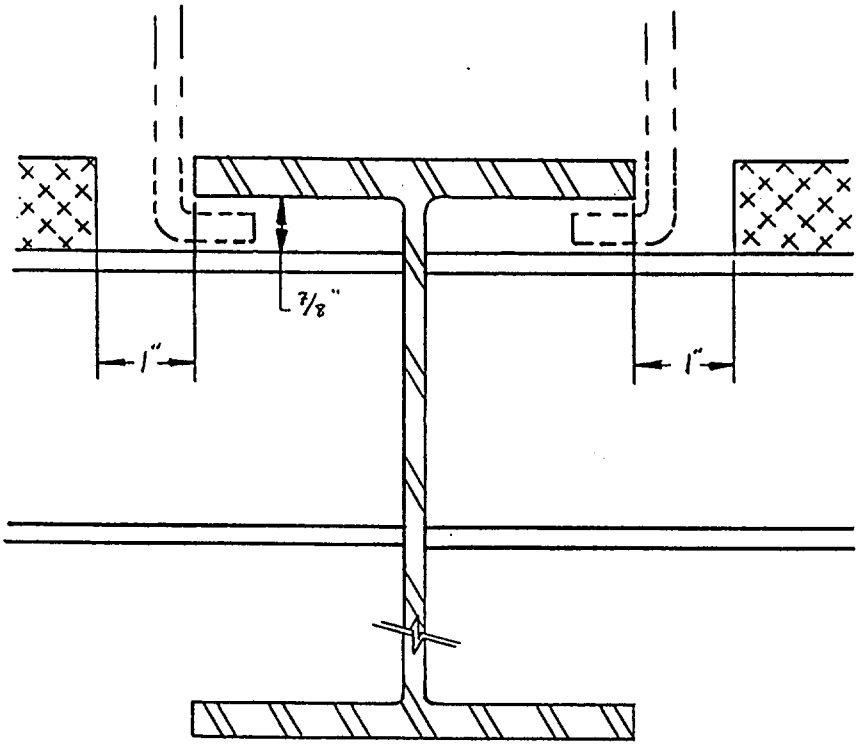

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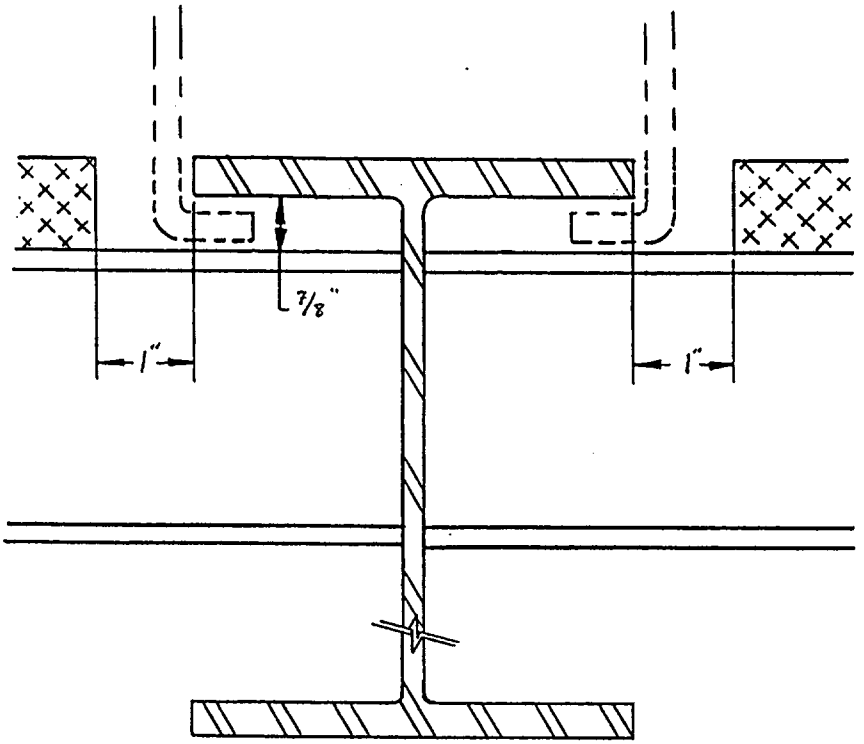

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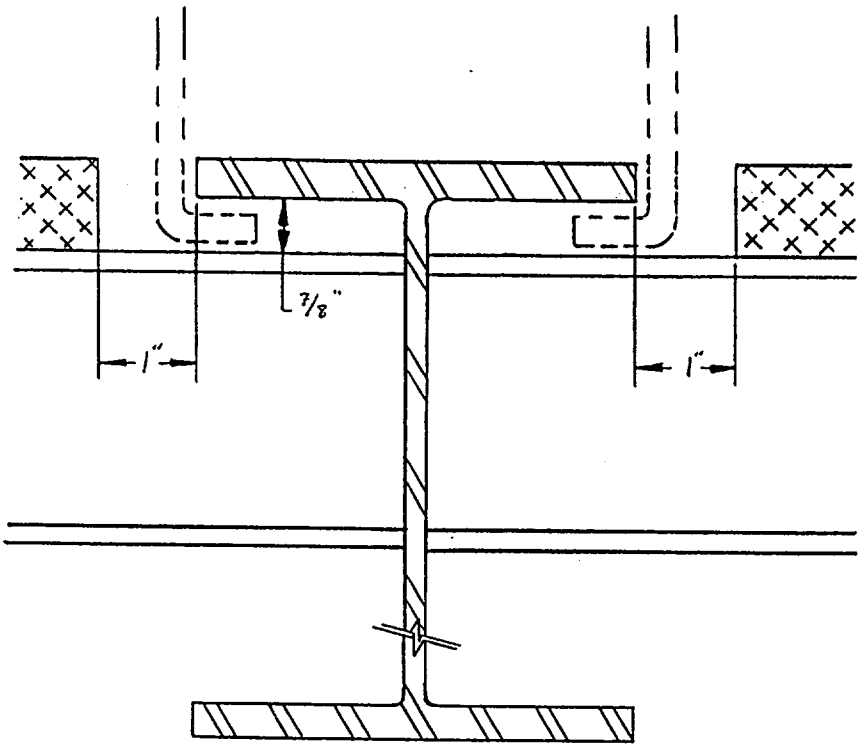

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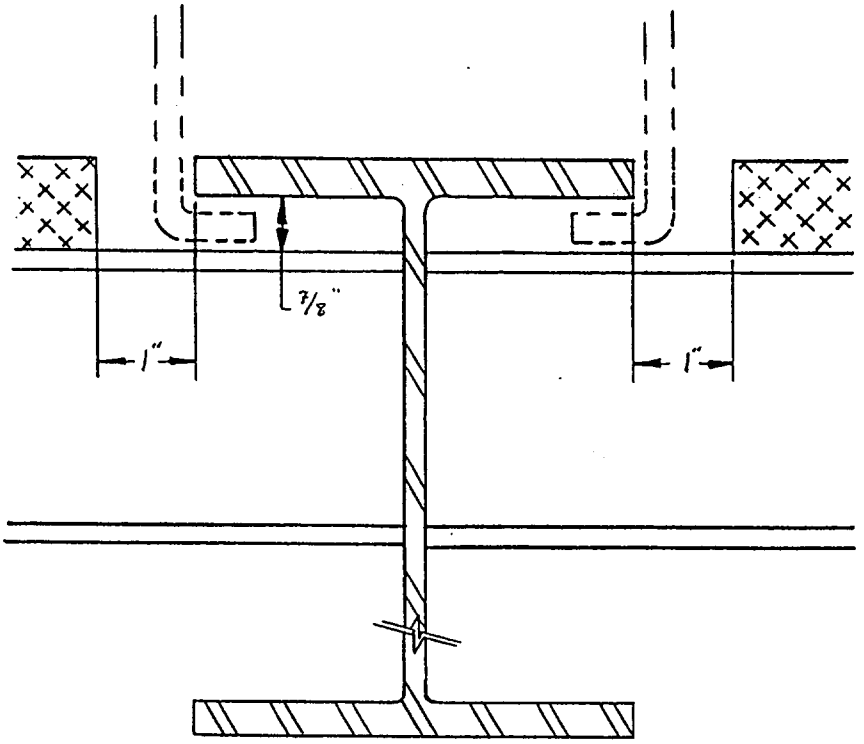

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6. Travel the crane along the full I-beam length several times. Look for any signs of binding or scraping between the edges of the I-beams and the undercarriage. **Crane must be in folded position before any adjustment is attempted.** If any adjustment is required, loosen the mount ing bolt nuts on the torque motor side of the undercarriage and adjust the box weldment position by traveling the crane the length of the I-beams several times. Carefully observe the internal clearances and adjust as needed. Re-tighten the mounting bolt nuts when finished.

7. Observe the clearance between the underside of the I-beam and the gripper. If they are rubbing, then use a smaller shim at the axle bearings. If the gap is in excess of 1/8" than a thicker shim should be considered.

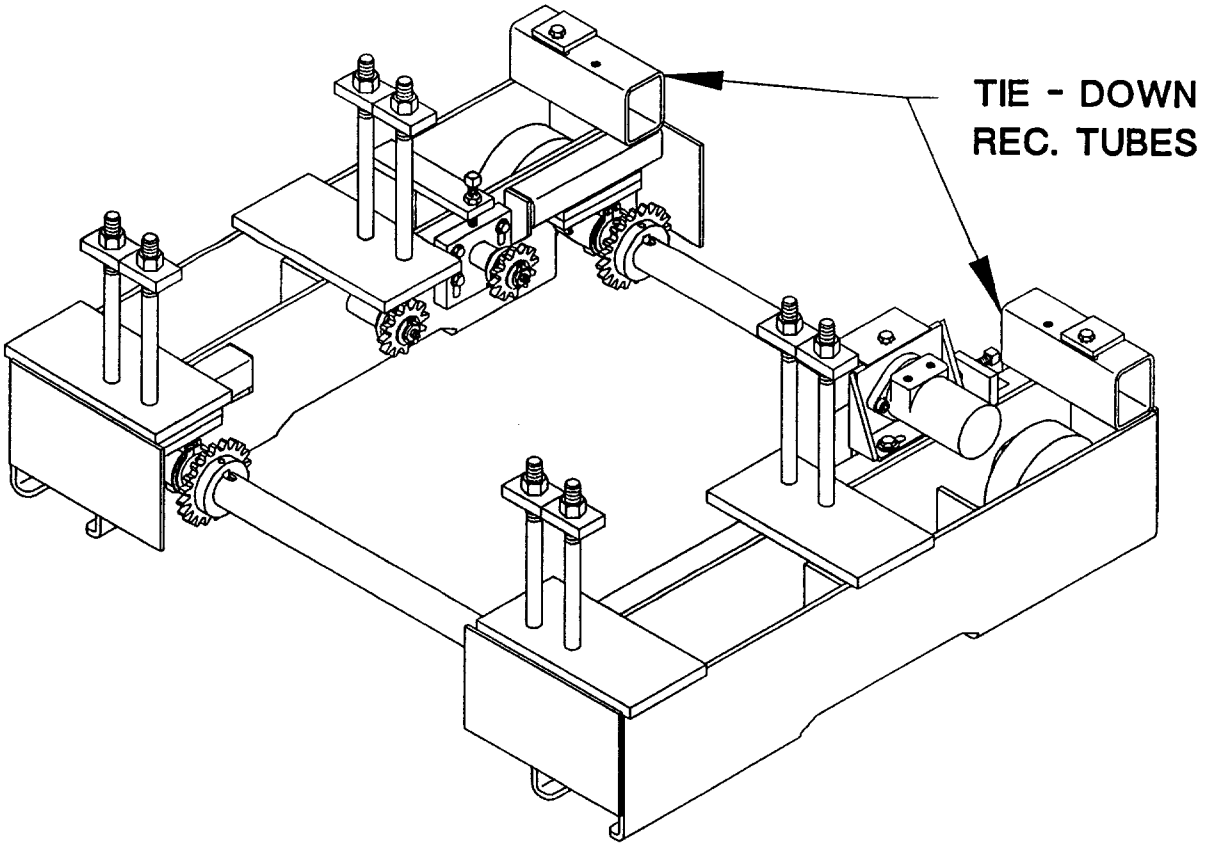


Figure 3-5

Rolling Base Tie-Down Tubes

CRANE SPEED ADJUSTMENT

!!! WARNING !!!

1. DO NOT ADJUST THE CRANE'S SPEED UNLESS YOU ARE A COMPETENT, TRAINED SERVICE TECHNICIAN.

2. YOUR CRANE'S SPEED IS FACTORY SET. DO NOT INCREASE THE CRANE'S LOWERING SPEED BEYOND THE FACTORY SETTING.

3. ALWAYS SET THE CRANE'S NEW SPEED WITH A TEST LOAD THAT IS 100% OF CAPACITY. IT IS YOUR RESPONSIBILITY NOT TO LET THIS CRANE GO BACK INTO SERVICE WITHOUT CHECKING THE SPEED WITH A MAXIMUM CAPACITY LOAD.

4. THE CRANE CAN BE DANGEROUS IF THE SLEWING SPEED OR THE LOWERING SPEED IS TO FAST.

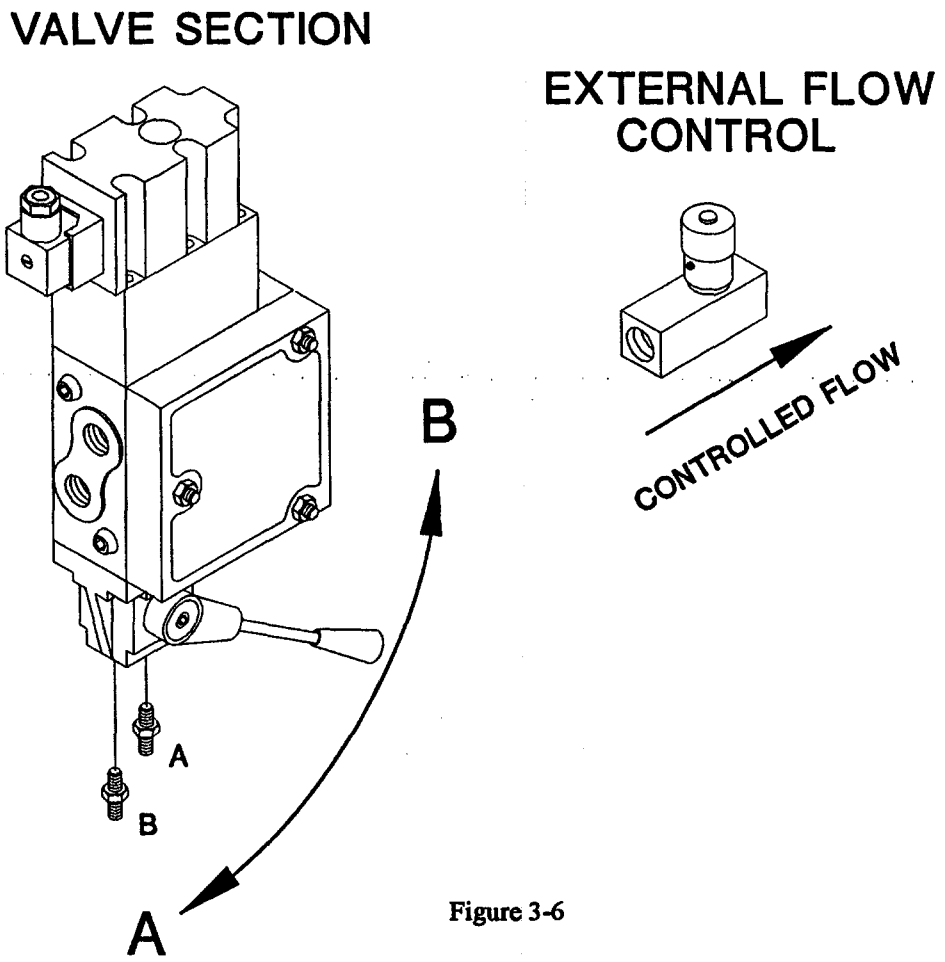


Figure 3-6

Valve Spool Stroke Limiters and External Flow Control

Depending on the function, the speed can be adjusted by changing the valve spool stroke, adjusting the external flow controls or both. See Figure 3-6. The spool stroke in each direction can be adjusted by turning the adjustment screws in the handle assembly. When turning the screw in, you are decreasing the spool's maximum stroke and therefore reducing the flow to that function. When turning the screw out, you are increasing the spool's maximum stroke. After an adjustment is made, the screw must always be locked in place by tightening the jam nut. The external flow control will cause a one way flow restriction in the line. This restriction can be used to meter the flow created by the valve. By turning the knob on the external flow control this restriction can be adjusted. Once adjusted, always lock the knob in place by tightening the set screw on the knob.

Swing Speed - The swing speed is controlled by both the spool stroke and the external flow controls. In order to keep the crane's rotation smooth and steady, the flow must be externally restricted.

1. With an empty boom, open up the external flow controls.
2. Adjust the stroke of the swing spool until the crane is rotating slightly faster than you wish, with the same speed in both directions.
3. Tighten the external flow controls until the crane's rotation is reduced to the desired speed. Make certain that the rotational speed is the same in both directions. You should also note that the hydraulic pressure is rising as you do this.
4. Observe the slewing speed with a maximum load at full reach to make sure that it is not set too fast.
5. Be sure to lock the settings of the spools by tightening the jam nuts and the external flow controls by tightening the set screws on the adjustment knobs.

Inner and Outer Boom Lowering Speed - The inner and outer boom speed is controlled solely by the spool's stroke. The lowering side of the inner and outer boom is in the "B" direction and therefore the adjustment screw marked "B" in Figure 3-6 needs to be adjusted. Beware that too fast a lowering speed can not only do severe structural damage to the crane, but can also be extremely hazardous in operation. Do not attempt to make this adjustment unless you are a competent, trained service technician and thoroughly understand this procedure.

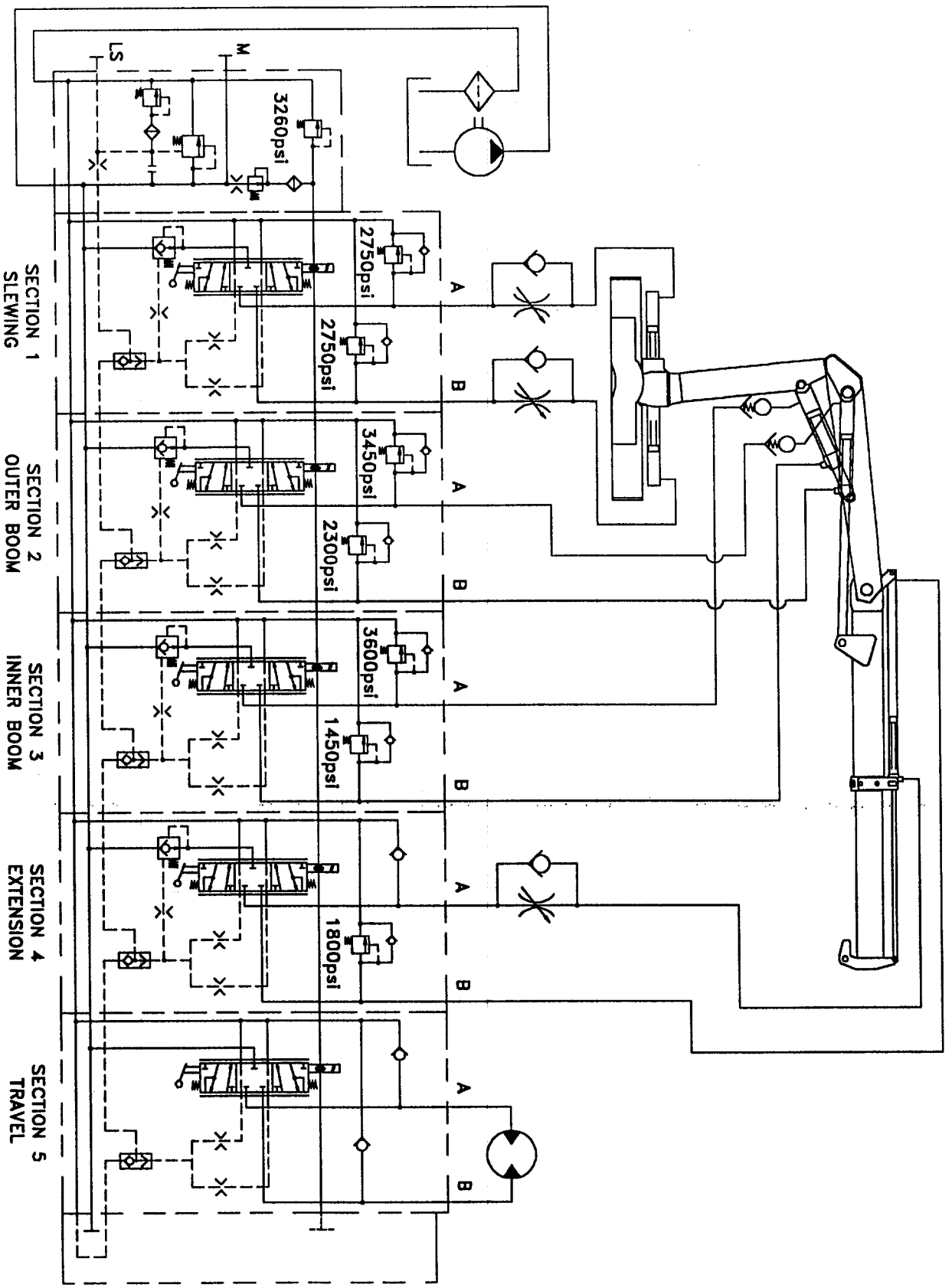
1. Look at the load chart, select a full capacity load and prepare to lift it at nearly its full radius.
2. Turn the adjustment screw for the "B" side nearly all of the way in, for minimal speed.
3. Lift the load and manually lower it by moving the lever until it hits the stop set in the last step.
4. Carefully and slowly back the screw out until the desired lowering speed is reached.
5. Once this speed is reached, lock the setting by tightening the jam nut.
6. Too fast a lowering speed will have a tendency to lock up the hose failure valve. Such a speed is considered much faster than acceptable.
7. Once the new lowering speeds are set, run the machine with a 100% capacity load in both manual and remote modes operating several functions at once in several boom positions.

If you have any questions regarding this procedure, contact your HIAB service representative.

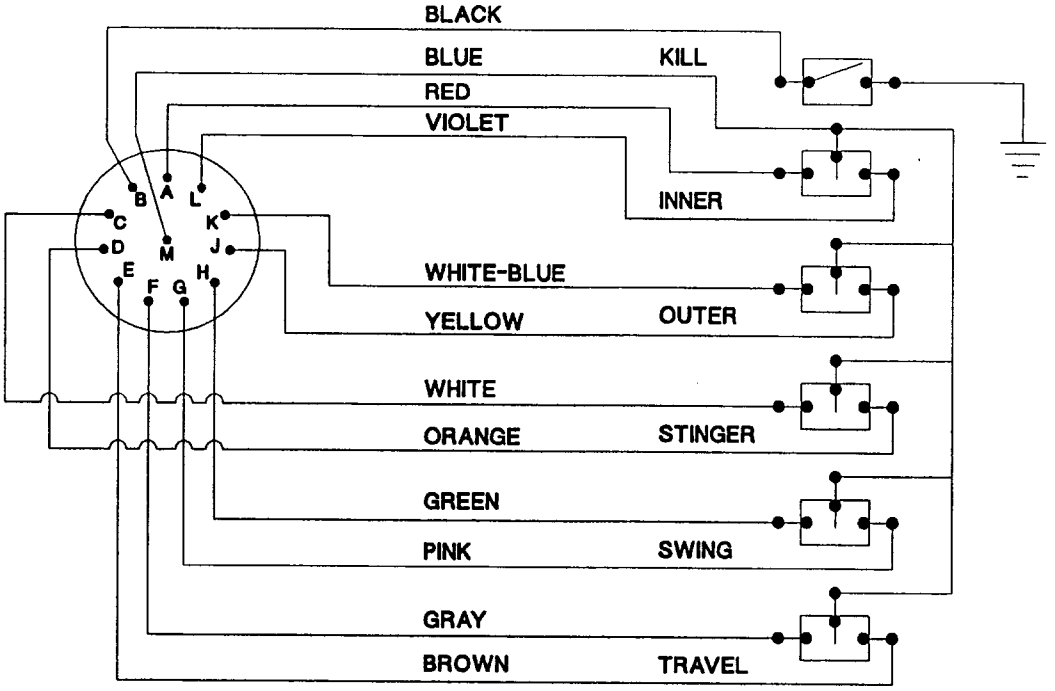
Warning

The danger of operating a crane with a lowering speed that is set too fast cannot be emphasized enough. The potential for personal harm as well as structural damage is very high.

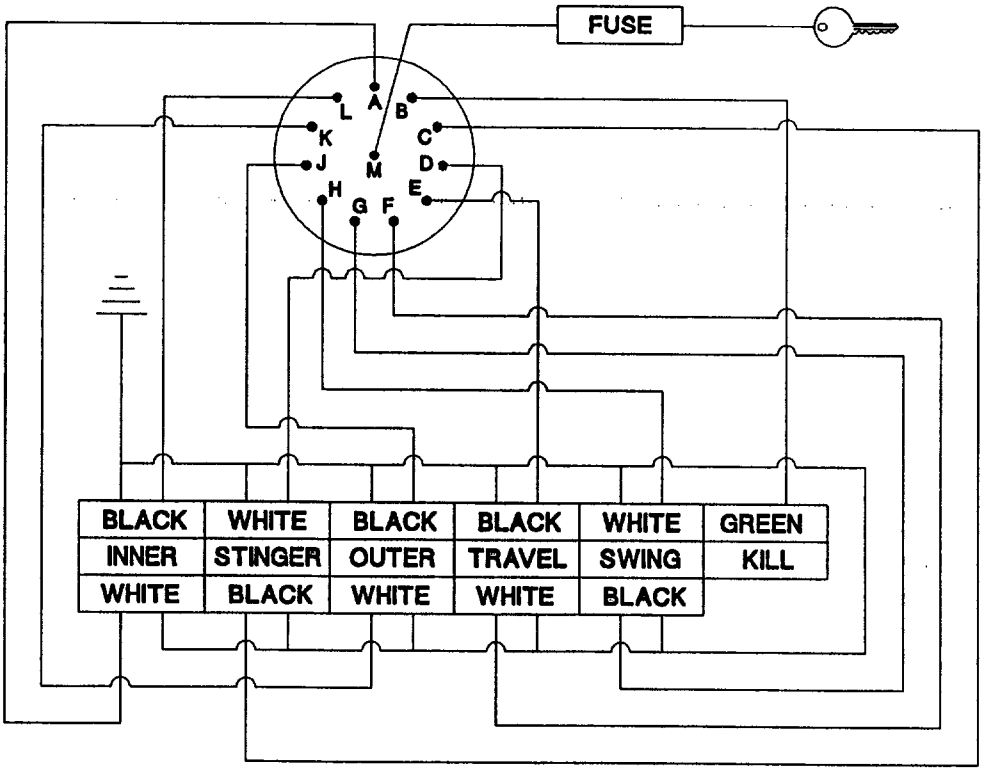
HYDRAULIC SCHEMATIC - 5 FUNCTION ELECTRIC w/KILL



ELECTRICAL SCHEMATIC - 5 FUNCTION w/KILL

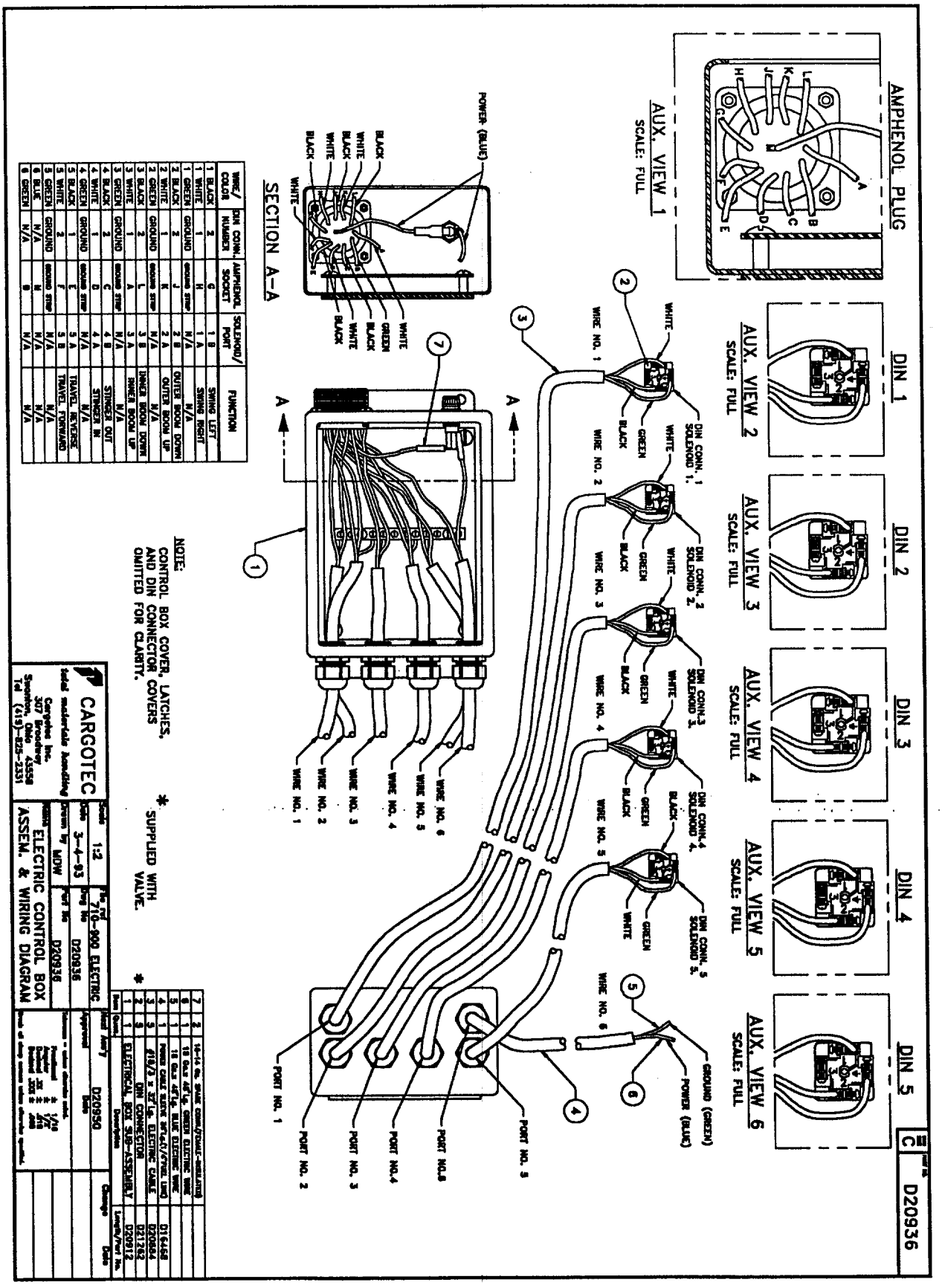


5 BANK HANDSET WITH KILL



CRANE: 5 FUNCTION WITH KILL

WIRING DIAGRAM - 5 FUNCTION w/KILL



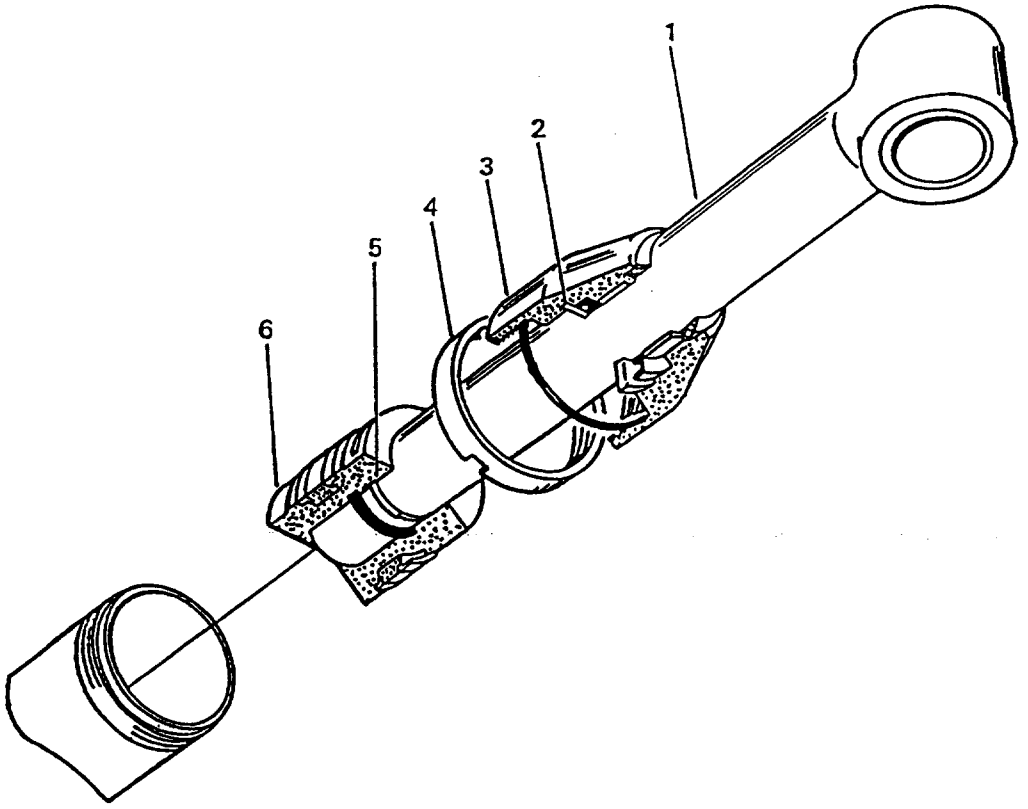
WIRE/ COLOR	DIN CONN. NUMBER	AMPHENOL SOCKET	SOLENOID/ PORT	FUNCTION
1 BLACK	3	G	1 B	SWING LEFT
1 WHITE	1	H	1 A	SWING RIGHT
1 GREEN	GROUND	GROUND STRP	N/A	N/A
2 BLACK	2	J	2 B	OUTER BOOM DOWN
2 WHITE	1	K	2 A	OUTER BOOM UP
2 GREEN	GROUND	GROUND STRP	N/A	N/A
3 BLACK	2	L	3 B	INNER BOOM DOWN
3 WHITE	1	A	3 A	INNER BOOM UP
3 GREEN	GROUND	GROUND STRP	N/A	N/A
4 BLACK	2	C	4 B	STINGER OUT
4 WHITE	1	D	4 A	STINGER IN
4 GREEN	GROUND	GROUND STRP	N/A	N/A
5 BLACK	1	E	5 A	TRAVEL REVERSE
5 WHITE	2	F	5 B	TRAVEL FORWARD
5 GREEN	GROUND	GROUND STRP	N/A	N/A
6 BLUE	N/A	M	N/A	N/A
6 GREEN	N/A	B	N/A	N/A

INNER AND OUTER BOOM CYLINDER REMOVAL

Removal of the inner and outer boom cylinders

Disassembly

1. Mark the position of the locking nut (4) and top nut (3).
2. Undo the locking nut (4) a half turn using a hook spanner or drift. It easiest to loosen it if you put pressure on the piston side. Up to 30 MPa is allowed.
3. Release the hydraulic pressure and undo the top nut.
4. Withdraw the piston rod (1) with the top nut (3) and piston (6).
*5. The piston (6) is held in place using a locking wire (5). This is forced out when the piston is rotated on the piston rod. See the next page.
6. Drive the piston off the piston rod using a rubber mallet.
7. Remove the top nut (3) from the piston rod (1).
8. Remove the locking ring (2).
9. Remove the seals and clean all components. Check all chromed, sliding and sealing surfaces and threads for corrosion or scratches.

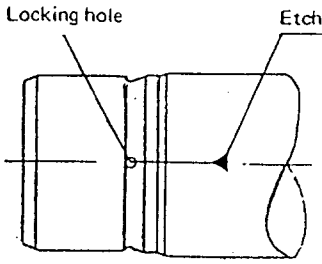


Reassembly

1. All seals should be renewed.
2. Lubricate the seals using oil or grease.
3. Reassemble the components in reverse order of disassembly. The top nut (3) must be relocked in its original position.
4. In order to prevent the top nut (3) and locking nut (4) from seizing up, the threads should be lubricated with Never Seez.

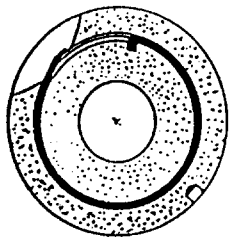
* Re: Fitting the piston to the piston rod see the next page.

INNER AND OUTER BOOM CYLINDER REMOVAL

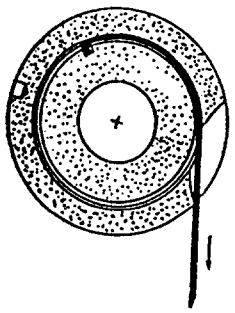


Disassembly

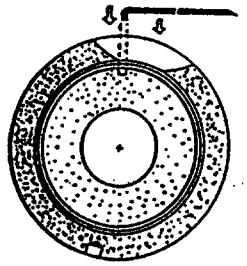
- To facilitate disassembly the piston rod has been marked specially*. See the diagram:
  The marking is used to locate the locking hole.



1 The piston is rotated until the recess in the piston comes in line with the mark on the piston rod. Push the hooked part of the locking wire into the locking hole. (The hook may already have come loose from the hole).

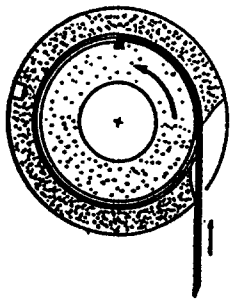


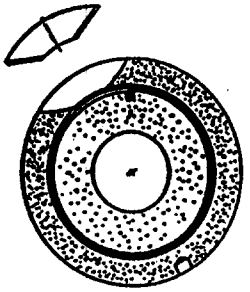
2 Rotate until the pointed end of the locking wire can be lifted out of the recess using a screwdriver. Continue to rotate until the locking wire is completely free.



Reassembly

1 Always fitted a new locking wire. The old locking wire is likely to work-harden if refitted and may crack.





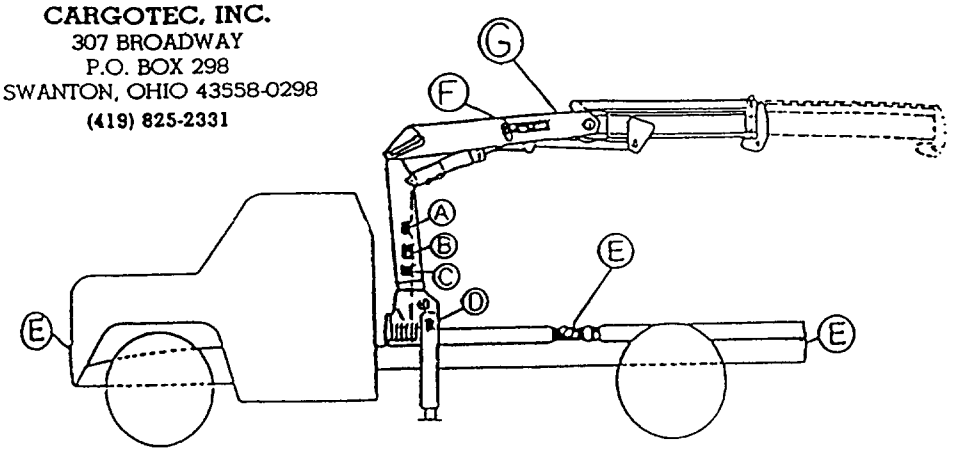
2 Don't forget to fit the stop**

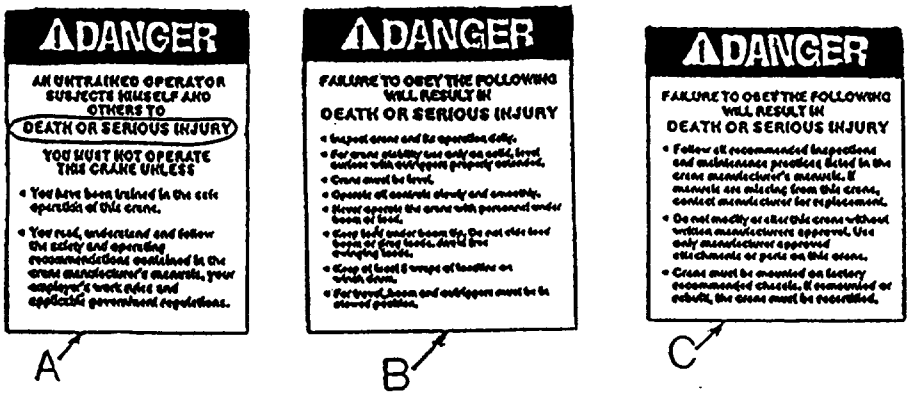
* Marking of piston rods was introduced in production in January 1989.

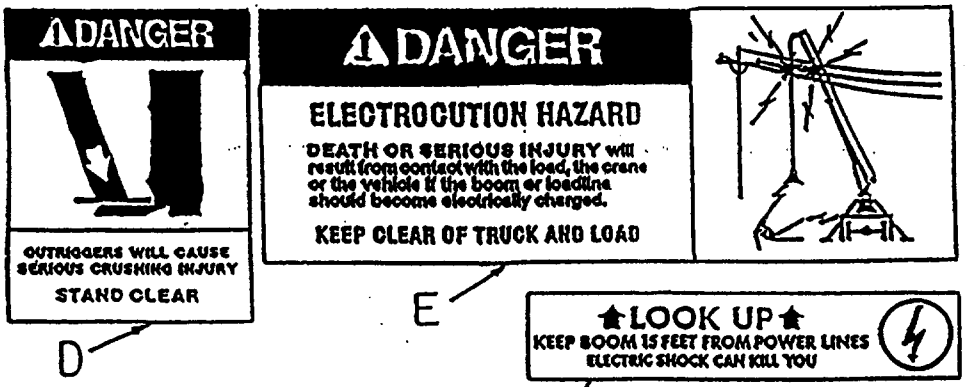
** The stop catch was brought into production in March 1989.

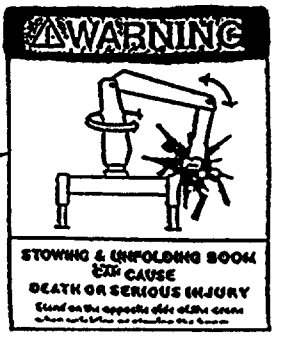
WARNING DECAL PLACEMENT

CARGOTEC, INC.
307 BROADWAY
P.O. BOX 298
SWANTON, OHIO 43558-0298
(419) 825-2331









2 - OF EACH A, B, AND C DECAL AT EACH CONTROL STATION.

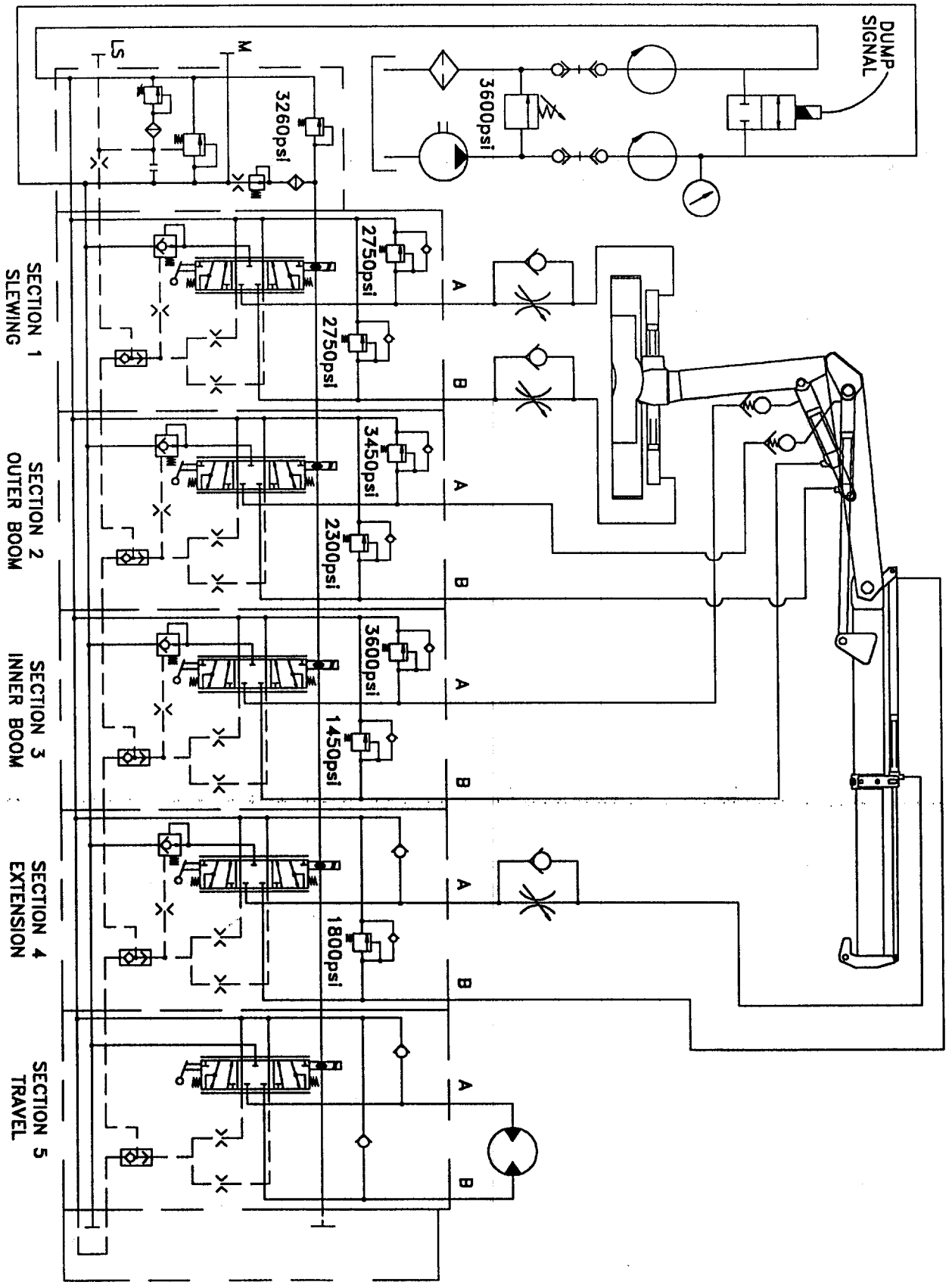
2 - D DECAL ON EACH OUTRIGGER.

4 - E DECAL ON FRONT, BACK AND BOTH SIDES OF THE VEHICLE.

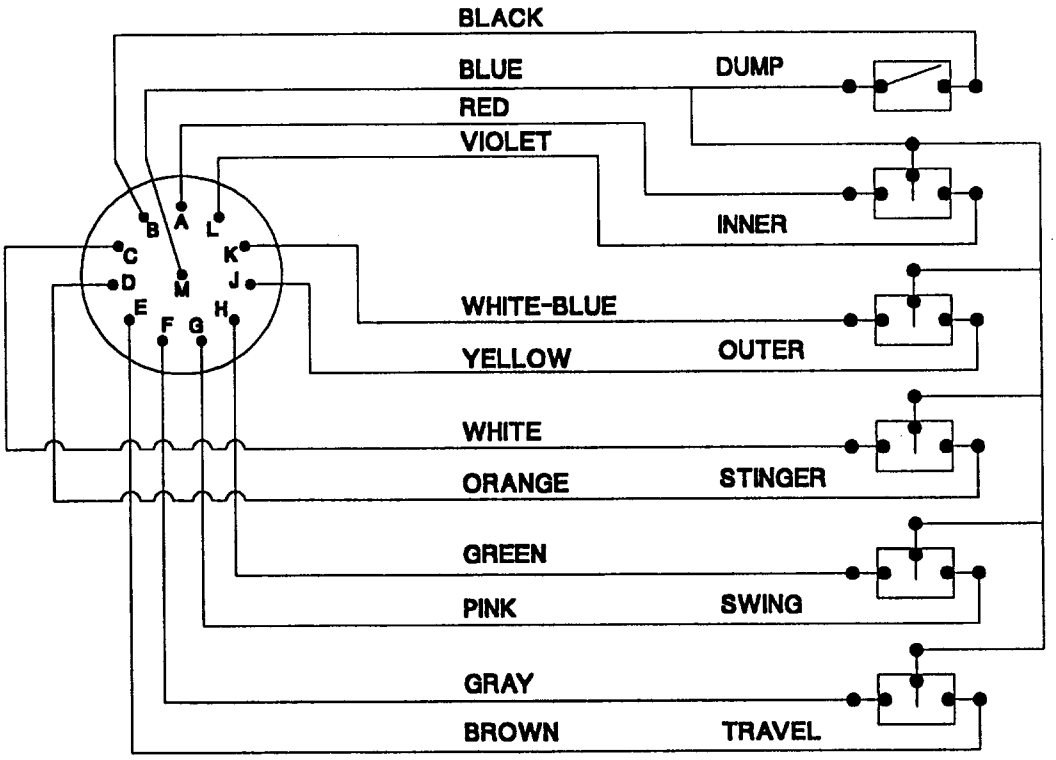
2 - F DECAL ON BOTH SIDES OF INNER BOOM.

2 - G DECAL ON THE TOP OF THE INNER BOOM AND IN AN EYE LEVEL POSITION, ON A NON-MOVING PART OF THE CRANE AT THE OPERATOR'S STATION THAT IS INCORRECT FOR BOOM SYSTEM FOLDING.

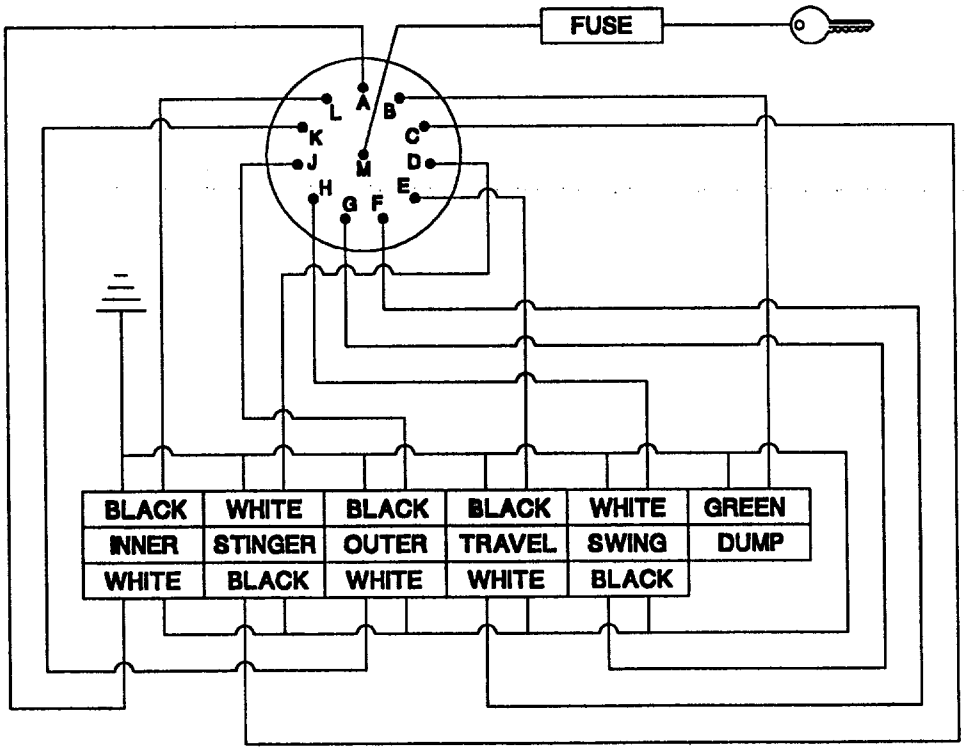
HYDRAULIC SCHEMATIC - 5 FUNCTION ELECTRIC w/DUMP



ELECTRICAL SCHEMATIC - 5 FUNCTION w/DUMP



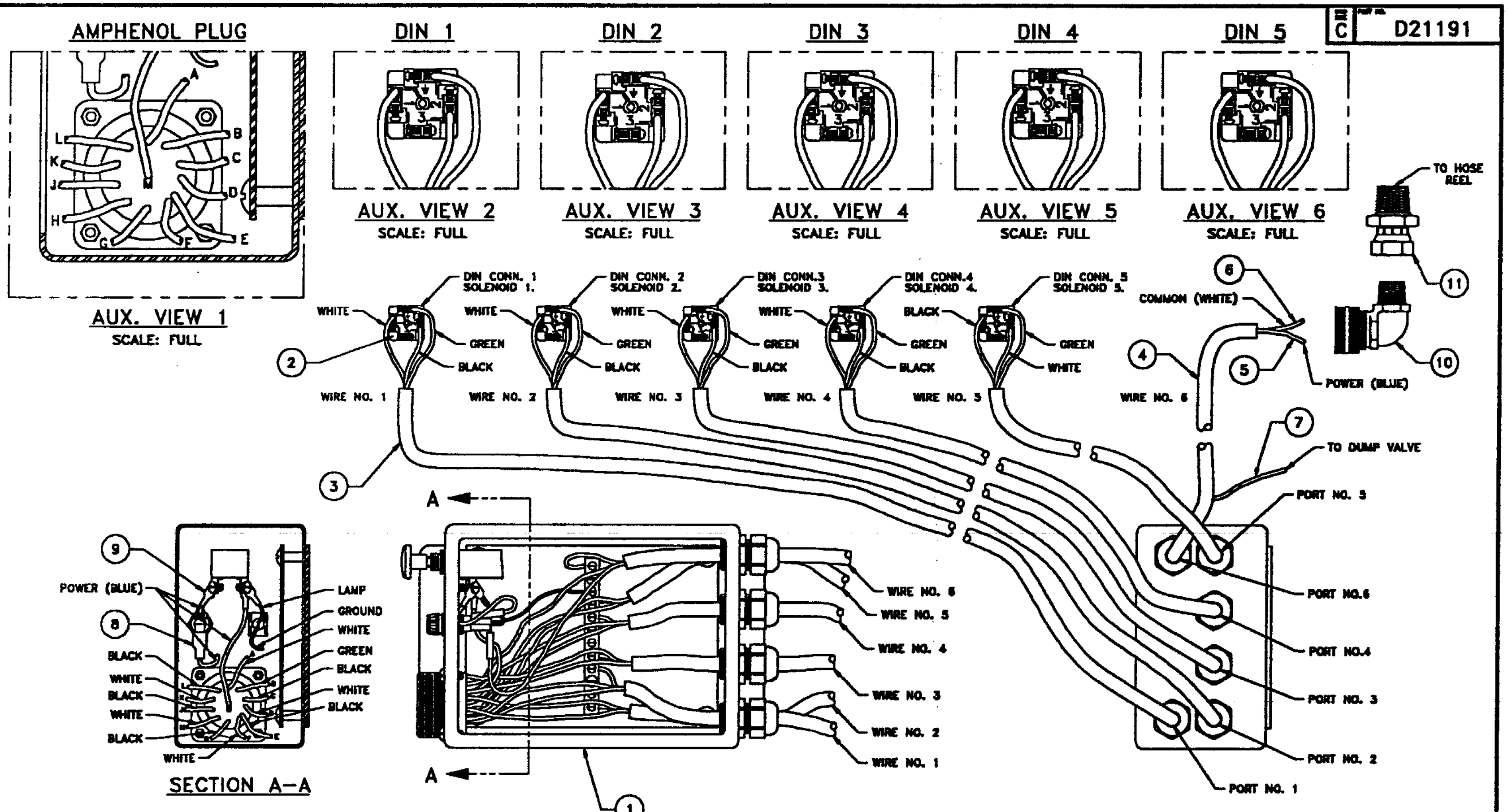
5 BANK HANDSET WITH DUMP



CRANE: 5 FUNCTION WITH DUMP

WIRING DIAGRAM - 5 FUNCTION w/DUMP

C | D21191



WIRE/ COLOR	DIN CONN. NUMBER	AMPHENOL SOCKET	SOLENOID/ PORT	FUNCTION
1 BLACK	2	G	1 B	SWING LEFT
1 WHITE	1	H	1 A	SWING RIGHT
1 GREEN	GROUND	GROUND STRIP	N/A	N/A
2 BLACK	2	J	2 B	OUTER BOOM DOWN
2 WHITE	1	K	2 A	OUTER BOOM UP
2 GREEN	GROUND	GROUND STRIP	N/A	N/A
3 BLACK	2	L	3 B	INNER BOOM DOWN
3 WHITE	1	A	3 A	INNER BOOM UP
3 GREEN	GROUND	GROUND STRIP	N/A	N/A
4 BLACK	2	C	4 B	STINGER OUT
4 WHITE	1	D	4 A	STINGER IN
4 GREEN	GROUND	GROUND STRIP	N/A	N/A
5 BLACK	1	E	5 A	TRAVEL REVERSE
5 WHITE	2	F	5 B	TRAVEL FORWARD
5 GREEN	GROUND	GROUND STRIP	N/A	N/A
6 BLUE	N/A	M	N/A	N/A
6 GREEN	N/A	B	N/A	DUMP VALVE

NOTE:
CONTROL BOX COVER, LATCHES, AND DIN CONNECTOR COVERS OMITTED FOR CLARITY.

* SUPPLIED WITH VALVE.

Item	Quan.	Description	Length/Part No.
11	1	12 MP/8 FPS	A2045-12-8
10	1	C890-6258 FITTING	D16095
9	3	16-14 Ga. RING TERMINAL	
8	2	16-14 Ga. SPADE CONN.(FEMALE-INSULATED)	
7	1	18 Ga.x 48"Lg. GREEN ELECTRIC WIRE	
6	1	18 Ga.x 84"Lg. WHITE ELECTRIC WIRE	
5	1	16 Ga.x 84"Lg. BLUE ELECTRIC WIRE	
4	1	POWER CABLE SLEEVE 72"Lg.(1/4"FUEL LINE)	D16468
3	5	#18/3 x 32"Lg. ELECTRIC CABLE	D20884
* 2	5	DIN CONNECTOR	D21262
1	1	ELECTRICAL BOX SUB-ASSEMBLY	D21190

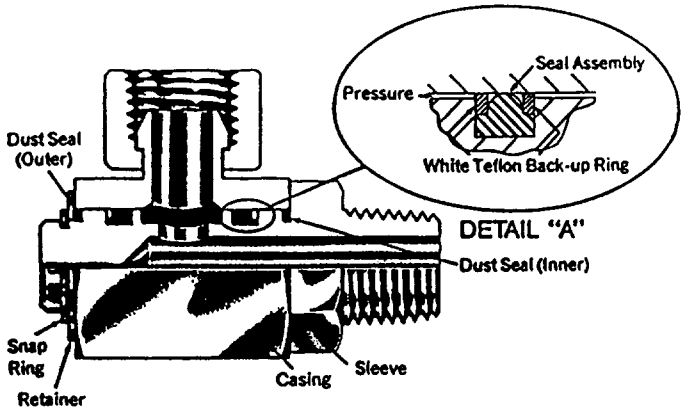
CARGOTEC
total materials handling
Cargotec Inc.
307 Broadway
Swanton, Ohio 43558
Tel (419)-825-2331

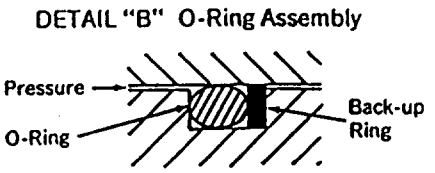
Scale 1:2	File ref 710-900 WETLINE	Next Ass'y D21097	Change / Date
Date 8-6-93	Dwg No D21191	Approved / Date	
Drawn by MDW	Part No D21191	Tolerance - unless otherwise noted: Fractional ± 1/16, Angular ± 1/2°, Decimal .XX ± .015, Decimal .XXX ± .005	
Name ELECTRIC CONTROL BOX ASSEM. & WIRING DIAGRAM		Break all sharp corners unless otherwise specified.	

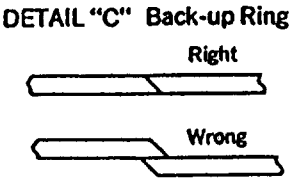
Aeroquip

Bulletin JB14A
Supersedes Bulletin JB14

5500 Series Balanced Pressure Swivel Joints







Seal Replacement Instructions

Disassembly

1. Remove snap ring, retainer and outer dust seal.
2. Remove sleeve from casing by hand or by gently tapping solid end of sleeve.
3. Remove the inner dust seal and seal assemblies (take care not to scratch groove).
4. Clean thoroughly and inspect bearing surfaces of sleeve and casing and seal grooves of sleeve. If these surfaces appear to be galled, scratched, or worn in any way, the sleeve, casing or entire swivel joint should be replaced.

Assembly

1. Assemble the seals to the sleeve as follows:
   - A. Lubricate sleeve and rubber portion of seal with any petroleum or silicone base lubricant.* The seal nearest the fitting end of the sleeve is to be assembled first.
   - B. Assemble the rubber portion of the seal into groove in sleeve (care must be taken so that the rubber portion is not damaged during assembly).
   - C. Assemble back-up ring portions of seal into groove in sleeve (see Details "A" and "B").

     CAUTION - Back-up rings must be expanded carefully or they are likely to be damaged. Visually examine seal assembly to assure that it is properly and completely seated in the seal grooves. When in the groove the skive cut back-up rings must be completely closed (see Detail "C").
2. Assemble the inner dust seal to the sleeve by stuffing it into its sleeve groove so that when assembled the dust seal contacts the chamfer in the casing and forms a seal (the outer dust seal slides over the sleeve end and the above technique does not apply).
3. Reassemble sleeve into casing after lubricating casing bearing surfaces with any petroleum or silicone base lubricant.*
4. Assemble outer dust seal, dust seal retainer and snap ring. Use snap ring pliers to prevent deformation of the snap ring.

*Use only silicone base lubricant with EPR seals (all kits with the last two digits of the kit part number, "-04" have EPR seals).

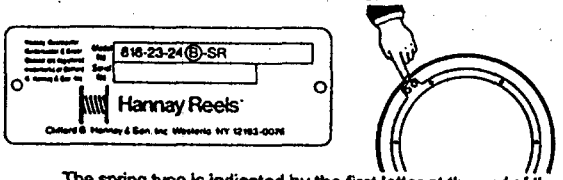
HANNAY HOSE REEL - SPRING REWIND REEL INSTRUCTIONS

IMPORTANT INSTRUCTIONS

FOLLOW CAREFULLY OR GUARANTEE MAY BE VOID.

SPRING REWIND REELS

1. CHECK TYPE OF SPRING



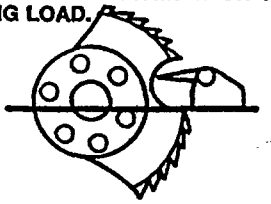
The spring type is indicated by the first letter at the end of the model number on the nameplate and is also stamped on the mounting ear of the spring housing.

The maximum number of usable turns for which each spring is designed is shown below:

A SPRING – designed for 23 usable turns.
SA SPRING – designed for 17 usable turns.
B SPRING – designed for 18 usable turns.
C SPRING – designed for 12 usable turns.
G SPRING – designed for 25 usable turns.
D SPRING – designed for 31 usable turns.
J SPRING – designed for 17 usable turns.
SCR 10-17-19 SPRING – designed for 26 usable turns.
HGR-50 B6 SPRING – designed for 30 usable turns.
HGR-100 B5 SPRING – designed for 42 usable turns.

NEVER WIND MORE THAN THE NUMBER OF TURNS LISTED ABOVE AND NEVER WIND SPRING IN REVERSE OR FREE WHEEL PAST START OF SPRING LOAD.

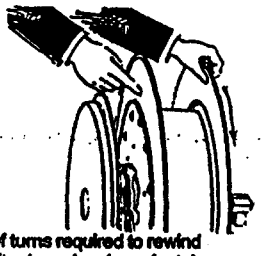
2. RELEASE SPRING



To release the spring, disengage the pawl from the ratchet wheel and allow the spring to unwind completely and slowly.

slowly.

3. SET SPRING TENSION



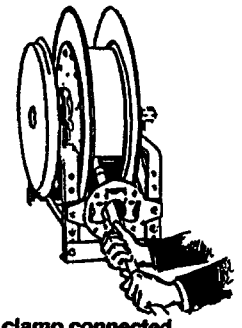
To set spring tension, turn the discs by hand, carefully, in the direction the outlet is facing, the number of turns listed above for your particular spring. Lock the reel by engaging the pawl in the ratchet wheel.

CAUTION:

Do not wind more than the number of turns required to rewind the hose. Tension can be reduced after hose has been installed on the reel. (SEE 6)

NEVER WIND MORE THAN THE NUMBER OF TURNS LISTED ABOVE AND NEVER WIND SPRING IN REVERSE OR FREE WHEEL PAST START OF SPRING LOAD.

4. ATTACH HOSE OR CABLE



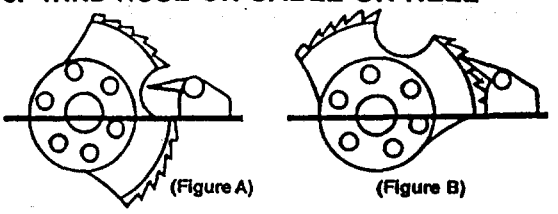
Hose: After setting spring tension, insert hose between rollers and attach hose fitting to reel outlet.

NOTE: On Series 900 reels, outlet riser may be removed to attach hose.

Cable: After setting spring tension, feed cable through drum and hub, then connect to collector ring terminals, (remove cover to expose collector ring).

IMPORTANT: Always use a cable clamp connected to drum, to keep pressure off the wire connections.

5. WIND HOSE OR CABLE ON REEL



(Figure A) (Figure B)

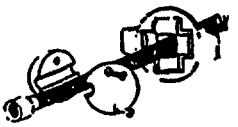
Pull gently on hose until pawl drops into one of the cut-out positions on the ratchet wheel. (Figure A) Release hose slowly and allow to retract until it is completely on the reel. Then, pull hose out until the pawl drops into one of the locking notches on the ratchet wheel (Figure B) to lock the reel.

6. REDUCE SPRING TENSION

If spring tension is greater than needed to properly retract the amount of hose attached, tension can be decreased by winding hose completely on reel, allowing end of hose to pass through the roller assembly, and allowing spring to carefully unwind until the proper tension is reached. Relock the reel, as above, and pass hose back through rollers.

7. ATTACHING HOSE OR CABLE STOP

Draw hose through rollers to point where hose stop should be attached according to your individual requirements. At this point, put the two halves of hose stop over hose and fasten with bolts provided.



IMPORTANT:

A flexible connector must be used between the inlet pipe and the swivel joint on the reel or our guarantee will be void.

Spring motors are matched to a specific length and diameter of hose or cable. The reel may not function properly if the length or diameter of hose varies from that for which the reel is designed.

When ordering parts, always give model number and serial number of reel and describe part as fully as possible.

GUARANTEE: Equipment manufactured by Clifford B. Hannay & Son, Inc. is guaranteed for one year from date of shipment when installed according to our instructions, given proper care, and used for the purpose for which it is designed.

Equipment which proves to be defective upon our inspection will be replaced free of charge, F.O.B., Westerlo, New York. No allowance will be made for labor charges incurred in making exchanges, replacements or repairs.

We expressly disclaim any liability for damage or injuries resulting from the use, operation, installation, service, maintenance or failure of equipment.

Before returning any material to us for our inspection, contact our factory for proper authorization, or material will not be accepted.

Hannay Reels®
The reel leader.®

Clifford B. Hannay & Son, Inc., 600 East Main Street
Westerlo, New York 12193-0076
Telephone 518-797-3791
FAX 1-800-REELING (733-5464)

20M HP 1-92 FORM H-16-SR