

**TECHNICAL MANUAL**

**OPERATORS', UNIT, DIRECT SUPPORT  
AND GENERAL SUPPORT  
MAINTENANCE MANUAL  
(INCLUDING REPAIR PARTS AND  
SPECIAL TOOLS LIST)**

**FOR**

**WATER PURIFICATION BARGES  
(NSN 1930-01-234-2165)  
VOLUME 13  
HANDLING EQUIPMENT**

**This technical manual is an authentication of the manufacturer's commercial literature and does not conform with the format and content requirements normally associated with the Army technical manuals. This technical manual does, however, contain all essential information required to operate and maintain the equipment.**

**Approved for public release; distribution is unlimited.**

- **This manual supersedes TM 55-1930-209-14&P-13, 30 January, 1989**

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**HEADQUARTERS, DEPARTMENT OF THE ARMY  
15 OCTOBER 1992**

TECHNICAL MANUAL  
NO. 55-1930-209-14&P-13

HEADQUARTERS  
DEPARTMENT OF THE ARMY,  
WASHINGTON D.C., 15 OCTOBER 1992

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FOR

WATER PURIFICATION BARGES  
(NSN 1930-01-234-2165)  
VOLUME 13  
HANDLING EQUIPMENT

**REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS**

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028-2 located in the back of this manual direct to: Commander, US Army Troop Support Command, ATTN: AMSTR-MMTS, 4300 Goodfellow Blvd., St. Louis, MO 63120-1798. A reply will be furnished directly to you.

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**WARNINGS AND SAFETY NOTICES****WARNING**

DANGEROUS VOLTAGES AND HAZARDOUS MATERIALS  
ARE USED IN THIS EQUIPMENT.  
DO NOT TAKE CHANCES!

**GENERAL WARNINGS**

- Always redtag electrical equipment, controls, circuits, and switches before beginning repairs.
- Do not service or adjust high voltage electrical equipment when alone.
- Do not overload circuits.
- Always use authorized, insulated tools and test equipment when working on electrical equipment.
- Remove all jewelry before working on or around electrical equipment with exposed current-carrying areas.
- Do not wear clothing with exposed metal fasteners when working on electrical equipment.
- Always use approved breathing apparatus when working with chemicals.
- Avoid chemical contact with eyes, skin, and clothing.
- Always wear safety glasses, gloves, and rubber aprons when handling chemicals.
- Wear protective clothing and safety glasses as required when working on barge equipment.
- Always wear approved ear protection in noise hazard areas.

**SPECIFIC WARNINGS**

- Do not connect any new circuit to an existing circuit.
- Do not energize circuits if water condensation is present.
- If any sparks are seen, stop operation immediately. Determine cause and take corrective action.
- Never touch radio antennas of fixed-base radio transmitters. When transmitting, antennas contain high voltage.
- Always use approved breathing apparatus when handling material in multimedia filters and chlorination unit descaling acid crystals. Do not breathe dust from these materials.
- Avoid breathing vapors from coagulant aid chemicals. Use in a well-ventilated area. In case of chemical contact with skin, wash with water. For eyes, immediately flush at eyewash station and obtain medical help as soon as possible.
- Always wear work gloves and shirts with full length buttoned sleeves when handling fuel oil and gasoline.

- Do not smoke or have open flames within 10 feet when handling fuel oil or gas. Only minimum number of personnel necessary to conduct fueling operation is permitted in area.
- Before starting any repairs on compressed air system, always release pressure from air receiver and compressor and open and re-tag circuit breakers.
- On air compressor, do not adjust automatic regulator switch (pressure switch) and pilot valve settings.
- To avoid flying particles lodging in eyes, do not use compressed air to "dust-off" clothing or workspace.
- Stay clear of anchor cables when operating anchor winches.
- Always wear safety glasses or face shield when using power tools.
- Always wear lifevests when on weatherdeck and throughout the barge during storm conditions.
- Lifevests are to be worn at all times aboard workboat.
- Only qualified persons will operate and maintain arc and fuel gas welders.
- When welding, always make sure those working with or near the welder wear proper clothing: heavy, hole-free gloves, heavy shirt, cuffless trousers, high shoes, and cap. Keep clothing dry and free of oil and other flammable substances.
- Use dry heavy canvas drop cloth to cover work area and adjacent deck when arc welding.
- Before welding on bulkheads, deck plating and similar surfaces, always check carefully to make sure that the other side of the surface to be welded does not hide fuel or compressed gas tanks, flammable or hazardous materials, or electrical equipment or wiring.
- When welding, keep your head out of the fumes and make sure area is well ventilated.
- Before welding on surfaces which have been cleaned with cleaning solutions containing chlorinated hydrocarbons, always wash with water, dry and ventilate area thoroughly.
- Use shield with proper filter lens when welding. Do not allow others near welding operations to assist or observe without proper eye protection. This must include side shields during slag chipping operations.
- Warn personnel in area during welding operations not to look at arc or expose themselves to hot spatter or metal.
- In an extreme emergency, when welding is required in void 2 port, shut down chlorination system. Close all valves. Cover the parts of chlorination system not being welded with a heavy canvas drop cloth. Turn on vent 8 and, if available, provide additional forced air ventilation.

- Before welding on fuel oil or sludge tank, make sure tank is gas-free by: 1) removing all liquid from tank, 2) cleaning tank thoroughly, 3) seeing that tank is thoroughly dry, and 4) force ventilating tank.
- Connect arc welding work cable as close to welding area as possible. Work cables connected to barge framework or other locations far from welding site increase the possibility of the welding current passing through lifting chains, crane cables or other possible circuit paths. This can create fire hazards or weaken lifting chains or crane cables until they break or fall.
- Always weld with all doors, portholes, and hatches propped open and necessary ventilation systems operating.
- Take frequent breaks away from the area where you are welding.
- Do not take oxygen and acetylene tanks into confined areas when welding.
- Always use a friction lighter to start oxyacetylene torch.
- Always maintain all welding equipment in proper working condition. If you have any doubts about the safety of any welding equipment, do not use the welder.

### **ELECTRICAL SHOCK SAFETY STEPS**

Five safety steps to follow if someone is the victim of electrical shock.

1. Do not try to pull or grab individual.
2. Turn off electrical power when possible.
3. If you can not turn off electrical power, pull, push, or lift person to safety using a wooden pole, rope, or some other insulating material.
4. Get medical help as soon as possible.
5. After the injured person is free of contact with the source of electrical shock, move the person a short distance away and, if needed, start CPR immediately.

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**NOTE**

The following appendices, common to all TM's in this series, are in TM-55-1930-209-14&P-18.  
 MAINTENANCE ALLOCATION CHART (MAC)  
 TOOLS AND TEST EQUIPMENT LIST (TTEL)  
 EXPENDABLE /DURABLE SUPPLIES AND MATERIALS LIST (ESML)  
 REPAIR PARTS AND SPECIAL TOOLS LIST (RPSTL)  
 REPAIR PARTS LIST TO FIGURE NUMBER CROSS-REFERENCE LIST

**NOTE**

The following appendices, common to all TM's in this series, are in TM 55-1930-209-14&P-20.  
 COMPONENTS OF END ITEM LIST (COEIL) AND BASIC ISSUE ITEMS LIST (BIILL)  
 ADDITIONAL AUTHORIZED ITEMS LIST (AAL)

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**INTRODUCTION TO****TM 55-1930-209-14&P-13**

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**1. SCOPE**

TM 55-1930-209-14&P covers the Reverse Osmosis Water Purification Barges, Models 300-WPB-1, 300-WPB-2 and 300WPB-3, NSN 1930-01-234-2165. This manual consists of twenty-one volumes.

**2. REVERSE OSMOSIS WATER PURIFICATION BARGES**

The Reverse Osmosis Water Purification Barges provide up to 300,000 gallons of drinking water per 24 hour period. The drinking water, converted from seawater or brackish water, is for use by a Rapid Deployment Force in a forward area. When needed, the drinking water can be pumped to a shore facility or to another vessel. This manual provides operation and maintenance procedures for all the component systems on the barges.

**3. VOLUME 1 -- NORMAL OPERATIONS**

This volume provides information and procedures on normal Reverse Osmosis Water Purification Barge operations, including barge movement and deployment, communications and electrical power systems, drinking water production, shutdown, and required operational maintenance. Emergency shutdown procedures are also provided.

**4. VOLUME 2 -- SEAWATER SYSTEM**

This volume describes operation and maintenance of the seawater system which supplies seawater to the Reverse Osmosis Water Purification Units (ROWPUs) for processing to the air conditioning unit for cooling to the ballast tank for barge trimming to the chlorination unit for priming and cooling, and to the diesel generators for cooling.

**5. VOLUME 3 -- REVERSE OSMOSIS WATER PURIFICATION UNIT (ROWPU) SYSTEM**

Volume 3 provides operation and maintenance procedures for the ROWPU System which processes seawater or brackish water to produce drinking water. Normally, this system processes seawater supplied by the seawater system (TM 55-1930-209-14&P-2) to create product water. Chlorine is then added to this product water by the chlorination system (TM 55-1930-209-14&P-4). The resultant drinking water is discharged into four storage tanks that are part of the drinking water system (TM 55-1930-209-14&P-5).

**6. VOLUME 4 -- CHLORINATION SYSTEM**

Operation and maintenance procedures for the chlorination system onboard the Water Purification Barges are contained in this volume. This system produces chlorine in a sodium hypochlorite solution, upon demand, to water processed by the ROWPU system just before the water enters the four drinking water storage tanks.

## **7. VOLUME 5 -- DRINKING WATER SYSTEM**

The drinking water system provides storage for water produced by the ROWPUs and includes pumps and valves to move this water from onboard storage tanks to the shore discharge system, to another vessel, or overboard. The drinking water system also provides a pressurized water supply for drinking and washing onboard the barges.

## **8. VOLUME 6 -- SHORE DISCHARGE SYSTEM**

This volume provides operation and maintenance procedures for the shore discharge system which transfers drinking water from barge storage tanks to holding/storage facilities ashore.

## **9. VOLUME 7 -- COMPRESSED AIR SYSTEM**

Volume 7 describes the operation and maintenance of the compressed air system which provides compressed air to five air stations in the ROWPU space, one in the workshop, and one on stem weatherdeck. This system also provides compressed air to two air stations for blowdown of seachests in void 2 starboard and void 4 port. Compressed air is used on the barges to operate air-powered impact tools, to propel air through the shore discharge hose, to blowdown seachest, and for general cleaning blowdown.

## **10. VOLUME 8 -- FUEL OIL SYSTEM**

This volume provides operation and maintenance procedures for the fuel oil system which functions as a centralized receiving storage and distribution system for diesel fuel used for barge operations. This onboard fuel system provides fuel for two 155 kW diesel ship service generators, a 20 kW ship auxiliary generator, two ROWPU high-pressure pump diesel engines, and a fueling station for the barge workboat.

## **11. VOLUME 9 -- ELECTRICAL POWER SYSTEMS**

Operation and maintenance procedures for the two electrical power systems installed aboard the Water Purification Barges are contained in Volume 9. The normal electrical power system generates, controls and distributes all electrical power for operating the water purification system and its auxiliary systems. The emergency electrical system supplies 24 Vdc from a battery bank to 24 Vdc equipment and converts to 24 Vdc through an inverter to 120 Vac to power emergency lighting and equipment.

## **12. VOLUME 10 -- LIGHTING SYSTEM**

Volume 10 contains operation and maintenance procedures for the onboard lighting systems for the Water Purification Barges. This system supplies interior and exterior lighting. Normal and emergency interior lighting is provided in the deckhouse ROWPU space, dayroom, workshop, and voids. Exterior lighting consists of searchlights and floodlights for use at night or during reduced visibility. Lights on the weatherdecks and standard navigation and status lights are for use during operation and towing.

## **13. VOLUME 11 -- EQUIPMENT MONITORING SYSTEM**

This volume provides operation and maintenance procedures for the equipment monitoring system which monitors the operation of several equipment components onboard the Water Purification Barges. This system monitors operating conditions such as amount of drinking water in storage tanks and temperature of diesel engine cooling water. Sensors detect unacceptable operating conditions, the main processor flashes at double intensity and remote alarms (horns, strobe lights and buzzer alert crewmembers that corrective action is necessary).

**14. VOLUME 12 -- COMMUNICATIONS SYSTEM**

Operation and maintenance procedures for the communications system are provided in Volume 12. This system consists of three separate communications methods, radio communications, foghorn and intercom telephones.

**15. VOLUME 13 -- HANDLING EQUIPMENT**

This volume contains operation and maintenance procedures for handling equipment used for lifting, transporting and repositioning equipment and materials onboard the barges. The system includes a bridge crane, bow crane and a void 4 trolley hoist.

**16. VOLUME 14 -- ANCHOR, MOORING, AND TOWING EQUIPMENT**

Volume 14 describes the operation and maintenance procedures for the anchor mooring, and towing equipment on the Water Purification Barges. This equipment provides a method to hold (anchor) the barges in a fixed position offshore, at dockside, or next to another vessel and a method to move the barges from one location to another.

**17. VOLUME 15 -- MISCELLANEOUS EQUIPMENT (DAYROOM, WORKSHOP, ACCESSES, AND SANITATION SYSTEMS)**

Volume 15 addresses operation and maintenance procedures for miscellaneous equipment installed on the Water Purification Barges. This equipment includes the dayroom on the forward starboard side of deckhouse, the workshop on the forward portside of deckhouse, accesses such as deckhouse doors and portholes and various accesses to and from the voids, and two separate sanitation systems (toilets and bilge). Additional equipment addressed in this volume includes: guard rails, rubber fendering, removable rubber floor mats, eyewash stations, component labels, caution, warning and danger signs, and storage areas.

**18. VOLUME 16 -- VENTILATION, HEATING, AND AIR CONDITIONING SYSTEMS**

This volume contains operation and maintenance procedures for the deckhouse and voids ventilation systems and the heating and air conditioning (HAC) system installed on the Water Purification Barges. The ventilation system provides fresh air circulation in the deckhouse and voids with 17 hatches and 10 ventilation fans. The HAC controls the temperature in the dayroom and deckhouse.

**19. VOLUME 17 -- WORKBOAT, LIFESAVING, AND FIREFIGHTING EQUIPMENT**

Volume 17 includes procedures for the operation and maintenance of:

- a. Workboat -- provides water transportation for crew members and visitors, small cargo items, transportation of the messenger line for the shore discharge hose and similar work-related tasks associated with operating the Water Purification Barges.
- b. Lifesaving Equipment -- installed on the barges and consisting of 2 liferafts, 15 Type II and 24 Type V lifevests and 4 lifesaving rings.
- c. Firefighting Equipment -- installed on the barges and consisting of Halon 1301 system, 2 CO2 hose reel units, a smoke detector system, 17 portable CO2 fire extinguishers, 5 dry chemical fire extinguishers, 5 self-contained breathing apparatuses, and a portable, engine driven firefighting pump. The workboat also has a 1 0-pound, portable, dry chemical fire extinguisher.

**20. VOLUME 18 -- SUPPORTING APPENDICES FOR VOLUMES 1-17.**

Volume 18 contains the Maintenance Allocation Chart, Components of End Item List, Tools and Test Equipment List, Expendable/Durable Supplies and Materials List and the Repair Parts and Special



All of the information contained in this volume is common to volumes 1-17 and does not appear in each individual volume.

.Appendix A in volumes 1-17 provides information unique to each volume. Appendix B in volumes 1 - 17 provides manufacturers manuals and instructions unique to the system described in each volume. Appendixes C - G are located in Volume 18.

**21. VOLUME 19 -- PREVENTIVE MAINTENANCE CHECKS AND SERVICES (PMCS)**

Volume 19 contains PMCS pertinent to all onboard systems for the Reverse Osmosis Water Purification Barges.

**22. VOLUME 20 -- SUPPLEMENTAL DATA**

Volume 20 contains the Basic Issue Items Ust, and additional Authorization List for all onboard systems for the Reverse Osmosis Water Purification Barges.

**23. VOLUME 21 -- WINCH, DOUBLE DRUM, DIESEL**

This volume contains operation and maintenance procedures for the 20-ton double drum diesel engine winch used on the Water Purification Barges. Appendix B of Volume 21 contains the Maintenance Allocation Chart and the Repair Parts and Special Tools List for the winch.

## CHAPTER 1 INTRODUCTION

**1-1 Purpose.** This Technical Manual (TM) describes the operation and maintenance of the material handling systems on Water Purification Barges. Information on other systems onboard is in TM 55-1930-209-1 4&P-2 thru P-12 and P-14 thru P-17. TM 55-1930-209-14&P-18 and TM 55-1930-209-14&P-20 contain appendices common to all TM's. Location of major barge components is shown in Figure 1-1.

**1-2 Scope.** The handling equipment is used for lifting, transporting, and repositioning equipment and materials onboard the barge. This system includes a bridge crane, bow crane, and void 4 trolley hoist. The bridge crane is installed in the reverse osmosis water purification unit (ROWPU) space, bow crane on the forward weatherdeck, and the trolley hoist in void 4 starboard. The bridge crane is used also to load and offload supplies and equipment through the deckhouse starboard sliding door. The bow crane is used primarily to unload and load the workboat from the deckhouse top and to load and unload the shore winch from its carrying position in front of the bow crane on the forward weatherdeck. The trolley hoist is used to lift or reposition equipment in void 4.

**1-3 Warranties and guarantees.** Manufacturers' warranty/guarantee information is in Section VII of Chapter 2, Chapter 3, and Chapter 4.

**1-4 Maintenance forms and records.** Required maintenance forms and records are explained in DA PAM 738-750, The Army Maintenance Management System (TAMMS).

**1-5 Destruction of Army materiel to prevent enemy use.** This shall be as directed in TM 750-244-3.

**1-6 Storage.** For storage of this equipment, refer to Section V of Chapter 2, Chapter 3 , and Chapter 4.

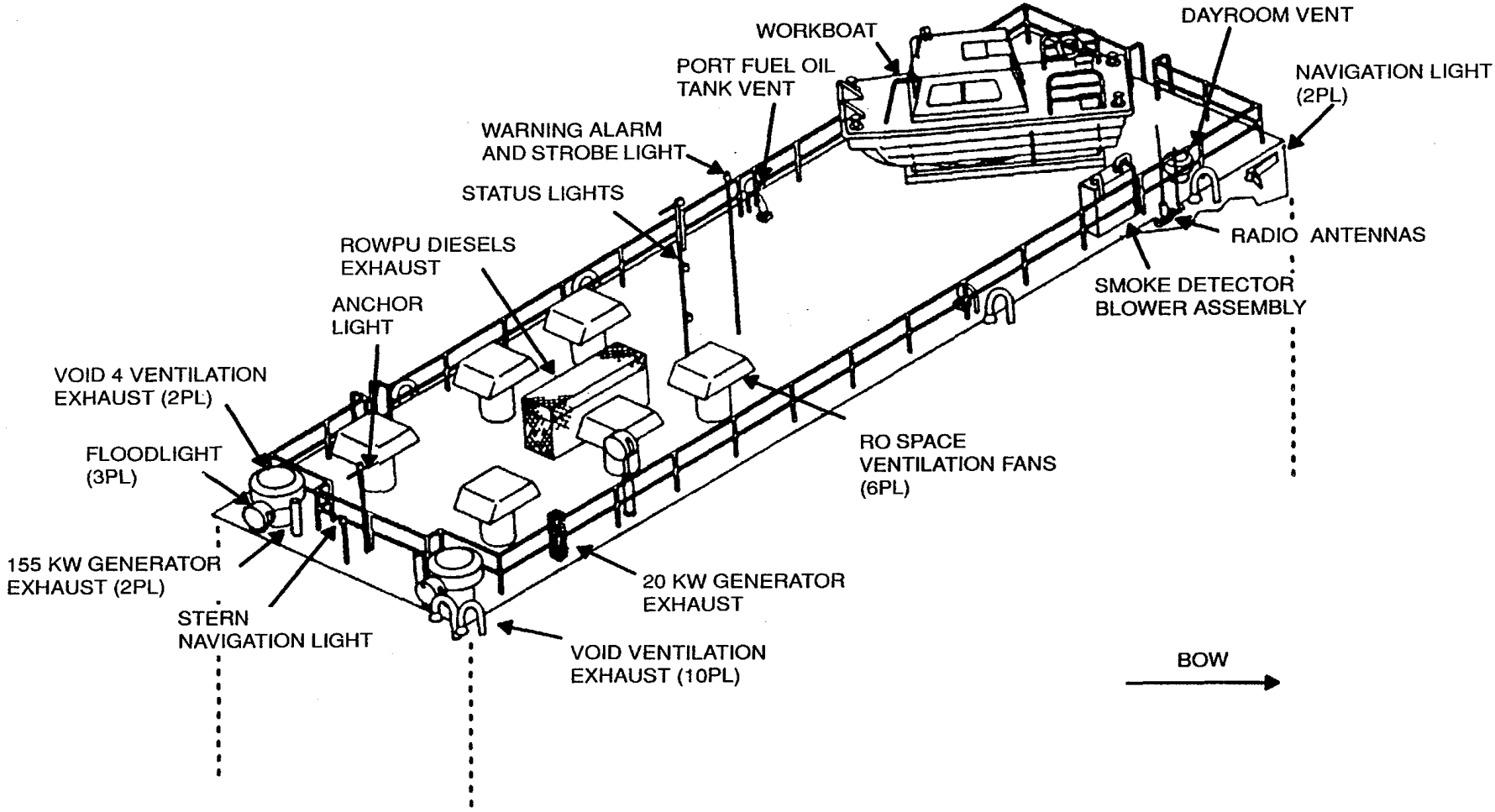


Figure 1-1 . Major Components of ROWPU Barge Systems and Equipment - Deckhouse Roof  
(Sheet 1 of 3

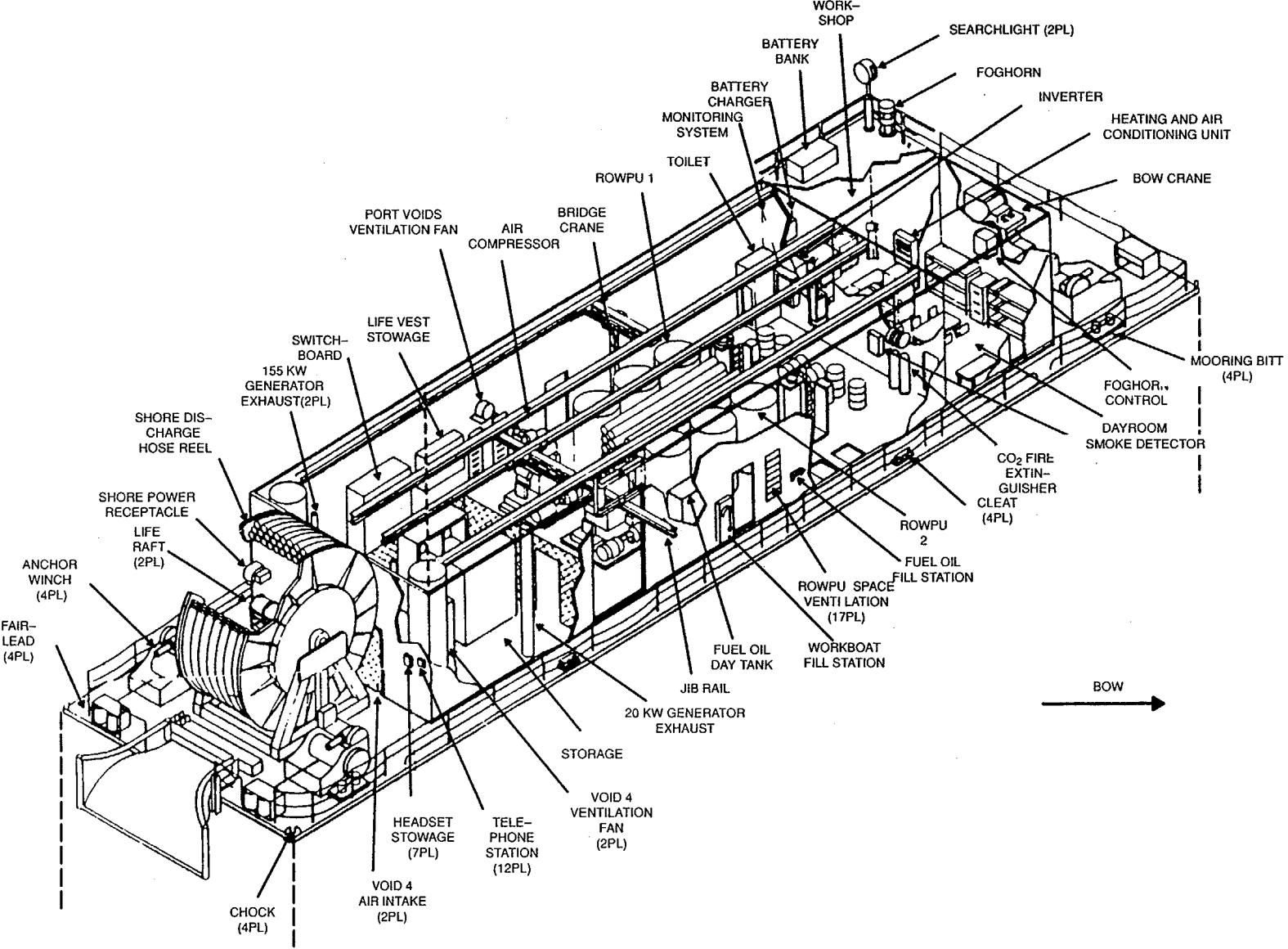


Figure 1-1 . Major Components of ROWPU Barge Systems and Equipment - Deckhouse (Sheet 2 of 3)

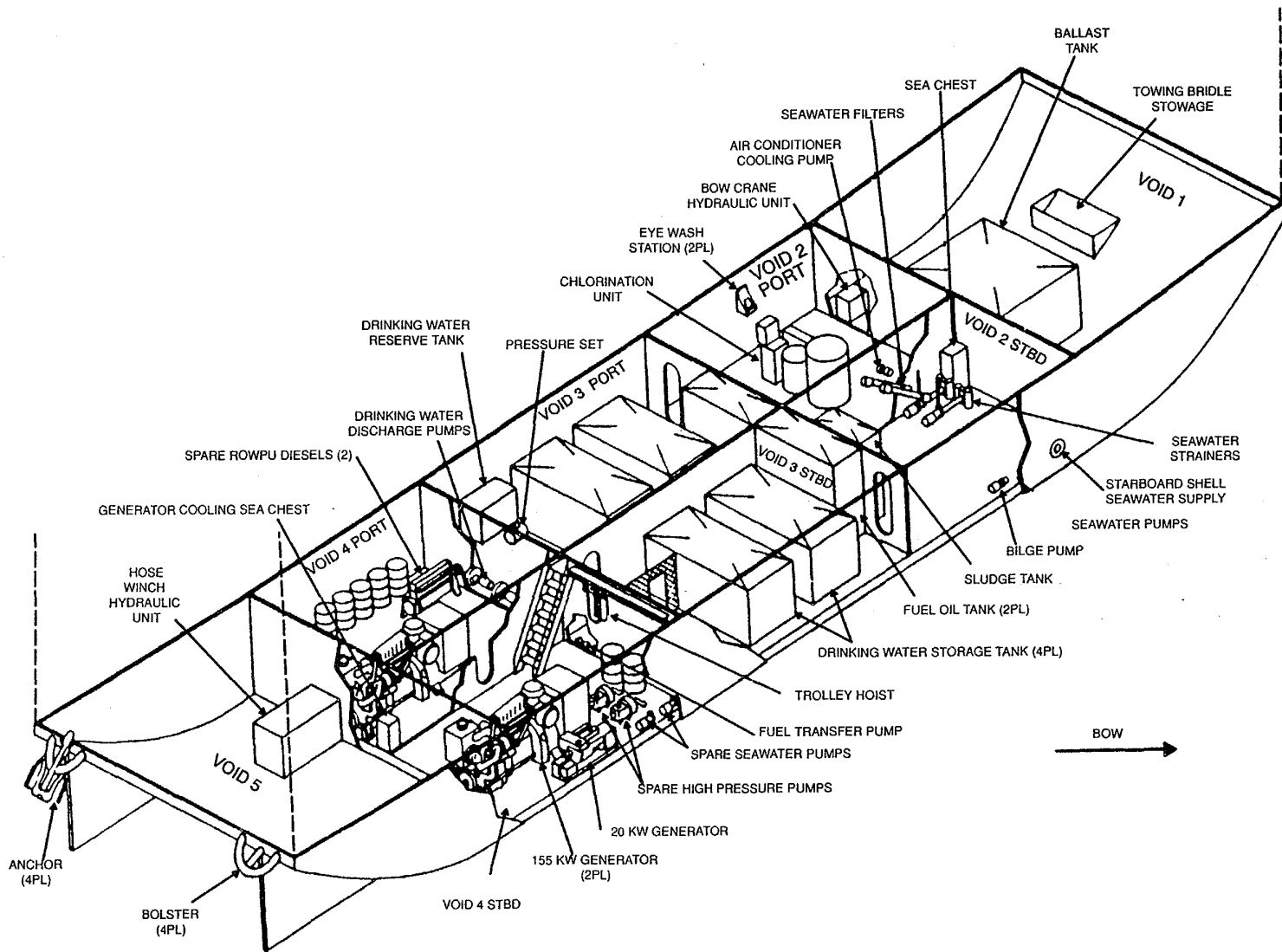


Figure 1-1 . Major Components of ROWPU Barge Systems and Equipment - Voids (Sheet 3 of 3)

**CHAPTER 2 BRIDGE CRANE SYSTEM**

**Section I. Description and data**

**2-1 Description.** The bridge crane system, in the ROWPU space, lifts and transports heavy equipment and materials, such as diesel generators and 55-gallon drums. The bridge crane is also used for loading and unloading equipment and materials through the deckhouse starboard sliding door. Bridge crane major components (Figure 2-1) include: two 5-ton capacity, motor-driven, overhead cranes with end truck assemblies; a manual, chain-operated, geared trolley hoist; a cable reel located midway on each ROWPU system; and an "I" beam rail system. The "I" beam rail system, over which the cranes move, is suspended from the deckhouse structure by a series of support posts. Two crossover members located between the port and starboard bridge cranes provide for transfer of the geared trolley hoist. A four-button, hand-held electrical control is used for controlling fore and aft crane movement. Electric power is provided to the crane through a cable that is extended or retracted by the cable reel as the crane moves forward or aft. Additionally, a 2-ton electric hoist provides for lifting lighter loads. A jib rail provides a method for moving suspended loads through the barge sliding door. Figure 2-2 provides a top-down view of the various equipment transport paths. The bridge crane system installation is shown on drawings listed in Appendix A.

**2-2 Capabilities.** The bridge crane lifts and transports loads of up to 5 tons with the geared trolley hoist. Loads of 2 tons or less are lifted with the electric hoist when installed on the trolley hoist.

**2-3 Limitations.** Load limitations are set at loads of 5 tons or less for the bridge crane and 2 tons or less with the electric hoist. Lifting slings, listed in paragraph 2-8.1, must be used to lift and transport such items as 155 kW generators, ship auxiliary generator (SAG), ROWPU high-pressure (HP) pumps, media filters, and 55-gallon drums.

**2-4 Performance characteristics.** See manufacturers' service manuals in Appendix B.

**2-5 Equipment specifications.**

a. Geared trolley hoist

Manufacturer	Monogram Industries, Inc.
	Chester Hoist Division
CAGEC	80735
Part no.	1422-5
Type	Low headroom with track
Capacity	5 tons (10,000 lb)
Quantity	1

b. Cable reel

Manufacturer	Aero-Motive Manufacturing Co.
CAGEC	82366
Part no.	0931-06-204
Type	Roller outlet w/40 ft of 4 conductor #14 wire
Quantity	2

c. Jib

Manufacturer	Spanmaster
	Division of Jervis B. Webb Co.
CAGEC	5N204
Part no.	NS-83-92580-A4
Type	Swinging w/hinge assemblies and tie rod
Length	9 ft 2 in.
Material	Steel
Quantity	1

d. Interlocking cross-over assembly

Manufacturer

Spanmaster  
 Division of Jervis B. Webb Co.  
 5N204  
 NS-83-92580-A3  
 Steel  
 2

CAGEC  
 Part no.  
 Material  
 Quantity

e. Crane assembly

Manufacturer

Spanmaster  
 Division of Jervis B. Webb Co.  
 5N204  
 NS-83-92580-A2 (starboard)  
 Interlock both ends  
 7 ft 8 in.  
 5 tons (10,000 lb)  
 3/4 Hp, 440 Vac, 3 ph, 60 Hz  
 1

CAGEC  
 Part no.  
 Type  
 Span  
 Capacity  
 Drive motor  
 Quantity

f. Crane assembly

Manufacturer

Spanmaster  
 Division of Jervis B. Webb Co.  
 5N204  
 NS-83-92580-A1 (port)  
 Interlock both ends  
 7 ft 8 in.  
 5 tons (10,000 lb)  
 3/4 Hp, 440 Vac, 3 ph, 60 Hz  
 1

CAGEC  
 Part no.  
 Type  
 Span  
 Capacity  
 Drive motor  
 Quantity

g. Hook

Supplier  
 CAGEC  
 Part no.  
 Type  
 Material  
 Quantity

McMaster-Carr Supply Co.  
 39428  
 3515T25  
 Swivel, clevis cap  
 Steel  
 5

h. 155 kW diesel generator sling

Supplier  
 CAGEC  
 Part no.  
 Type  
 Style  
 Chain size  
 Reach  
 Working load rating  
     19,500 lb  
     15,900 lb  
     11,250 lb  
 Material  
 Quantity

McMaster-Carr Supply Co.  
 39428  
 3406W999  
 Double leg  
 D-PS  
 1/2 in.  
 3 ft  
  
 @ 60 degree angle  
 @ 45 degree angle  
 @ 30 degree angle  
 Steel  
 1

i. 55 gallon drum lifter

Supplier	McMaster-Carr Supply Co.
CAGEC	39428
Part no.	3396T14
Working load rating	1000 lb
Quantity	1

j. ROWPU high pressure pump diesel engine lifting sling

Supplier	McMaster-Carr Supply Co.
CAGEC	39428
Part no.	3409W999
Type	Quad leg
Style	Q-OS
Chain size	3/8 in.
Reach	7 ft
Working load rating	
17,000 lb	@ 60 degree angle
14,000 lb	@ 45 degree angle
9,900 lb	@ 30 degree angle
Material	Steel
Quantity	1

k. Seawater pump lifting sling

Supplier	McMaster-Carr Supply Co.
CAGEC	39428
Part no.	3477W999
Type	Riggers, 4 leg
Size	1/4 in. cable rope
Length	5 ft
Working load rating	
3,700 lb	@ 60 degree angle
3,105 lb	@ 45 degree angle
2,192 lb	@ 30 degree angle
Material	Steel
Quantity	1

l. Electric hoist

Supplier	McMaster-Carr Supply Co.
CAGEC	39428
Part no.	3316T261
Type	Electric w/swivel hook
Capacity	2 tons (4000 lb)
Motor	1 Hp, 115 Vac, 1 ph, 60 Hz
Quantity	1



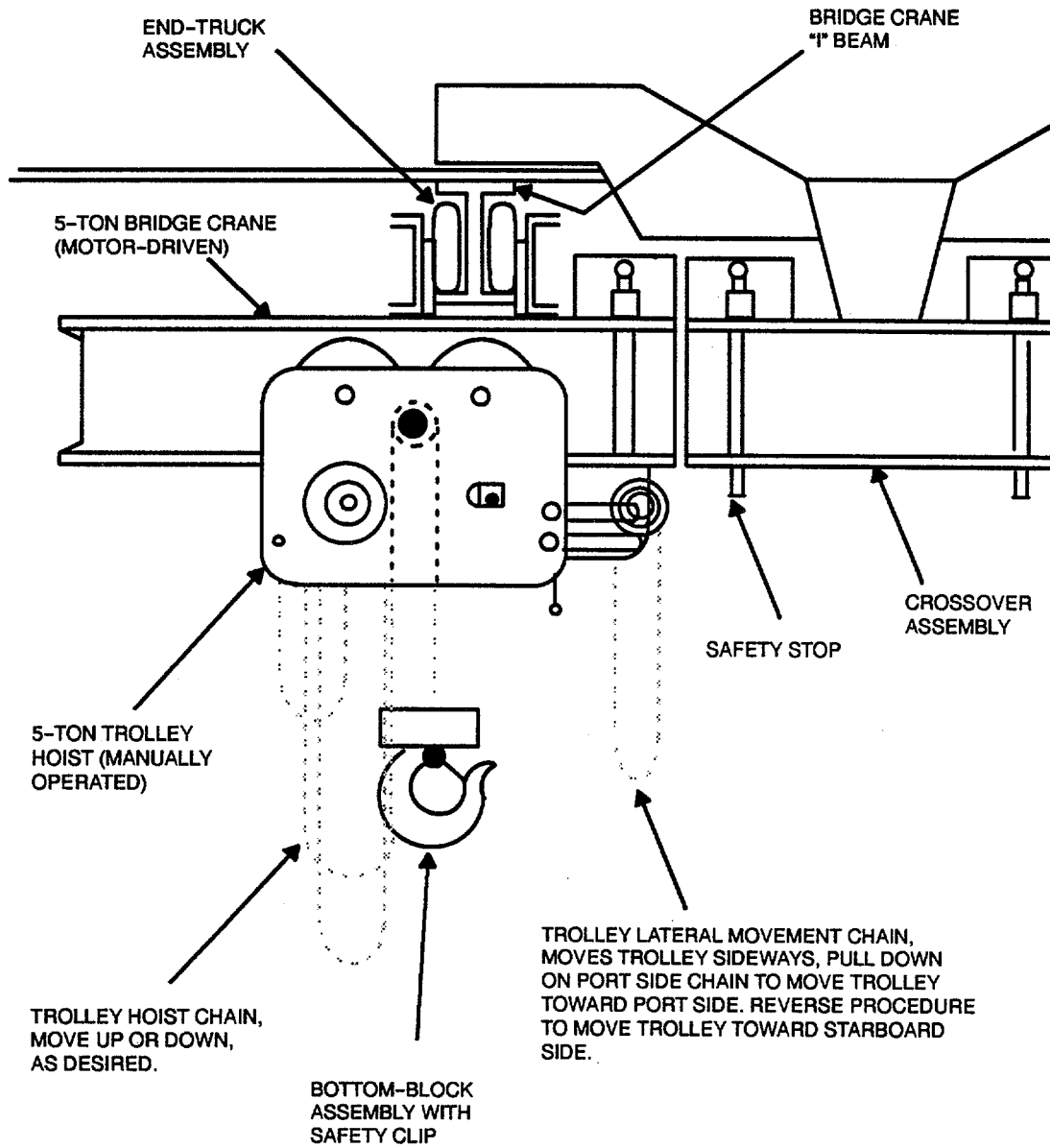


Figure 2-1 . Bridge Crane

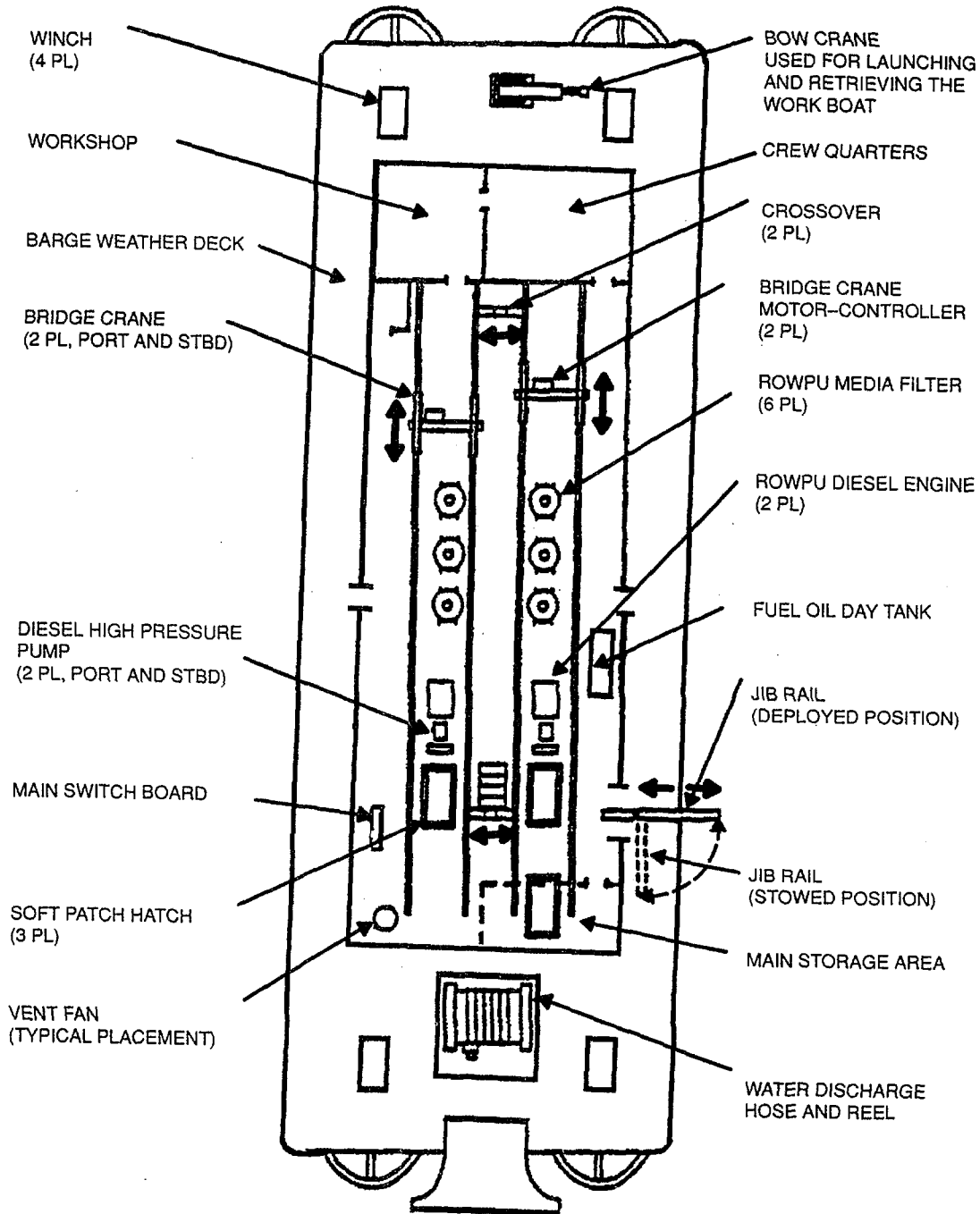


Figure 2-2. Bridge Crane Route Diagram (Typical Layout)

## 2-6 Items furnished

**2-6.1** Components installed as part of the bridge crane system are listed on the parts list of drawings referenced in Appendix A and in the Components of End Item List in TM 55-1930-209-1 4&P-20.

**2-6.2** Common and bulk items onboard are listed in the Expendable Supplies and Materials List in TM 55-1930 i/20914&P-20.

**2-6.3** Repair parts and special tools onboard are listed in the Repair Parts and Special Tools List in TM 55-1930209-14&P-18.

**2-7 Items required but not furnished.** All required items are furnished.

**2-8 Tools and test equipment.** Use existing tools and equipment onboard. A complete list of tools and test equipment onboard is in the Tools and Test Equipment List in TM 55-1930-209-1 4&P-18.

**2-8.1 Special devices.** Special devices such as slings, drum lifters, and hoisting rigs are used to increase the bridge crane lifting capabilities and to protect the equipment being transported. See Figure 2-3 and paragraph 2-5 for details. A description of these devices follows:

### WARNING

Personnel may be seriously injured and equipment damaged if slings, lifters, and hoisting rigs are not properly attached. Observe all safety recommendations in this manual and in manufacturers' service manuals.

- a. 155 kW diesel generator sling. Used to move any of the 155 kW diesel engines only not including the generator or support platform. Can also be used to move the 20 kW SAG.
- b. 55-gallon drum lifter. Adjustable attachments on the lifter allow drums to be lifted at various angles, facilitating loading and unloading. Working load limit for this device is 1000 pounds.
- c. ROWPU HP pump diesel engine lifting sling. Used to remove nonoperating diesel engine from engine mounts in ROWPU space. Also used to move replacement engine from voids storage and to place it on engine mounts in the ROWPU space.
- d. Water pump assembly lifting sling. This sling lifts either an HP water pump or a seawater pump.
- e. 2-ton electric hoist. When attached to the 5-ton trolley hoist, this electric motor-driven hoist lifts and transports small loads of 2 tons or less.
- f. Media filter hoisting rig. Used to lift ROWPU media filters. Manufactured locally in accordance with drawing number 132266E1917, rig design allows equalization of tension between the three hoisting cables and protects the media filter.

### WARNING

To reduce the possibility of injuring personnel or damaging equipment, secure all hoisting hooks by wrapping sides of each hook with .032 steel safety wire. This procedure (mousing) prevents hooks from straightening and releasing load.

Notify Intermediate Direct Support/Intermediate General Support (IDS/IGS) maintenance unit after repairing or replacing parts on any slings used on the barge. They must proof test the repaired item in accordance with , American Society of Testing and Material Specification A 391-65 and US Army procedures. In addition, all slings and lifting devices must be proof tested to these standards every 12 months. Record and maintain certification of all proof testing.

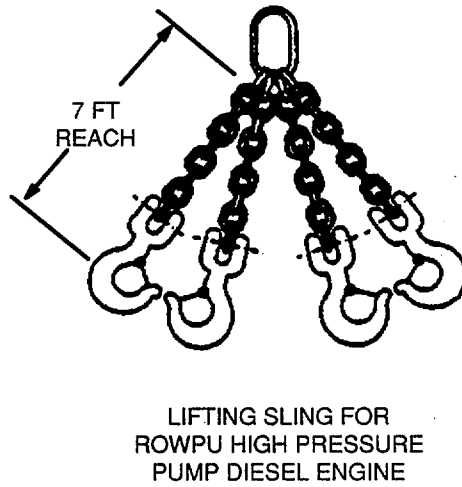
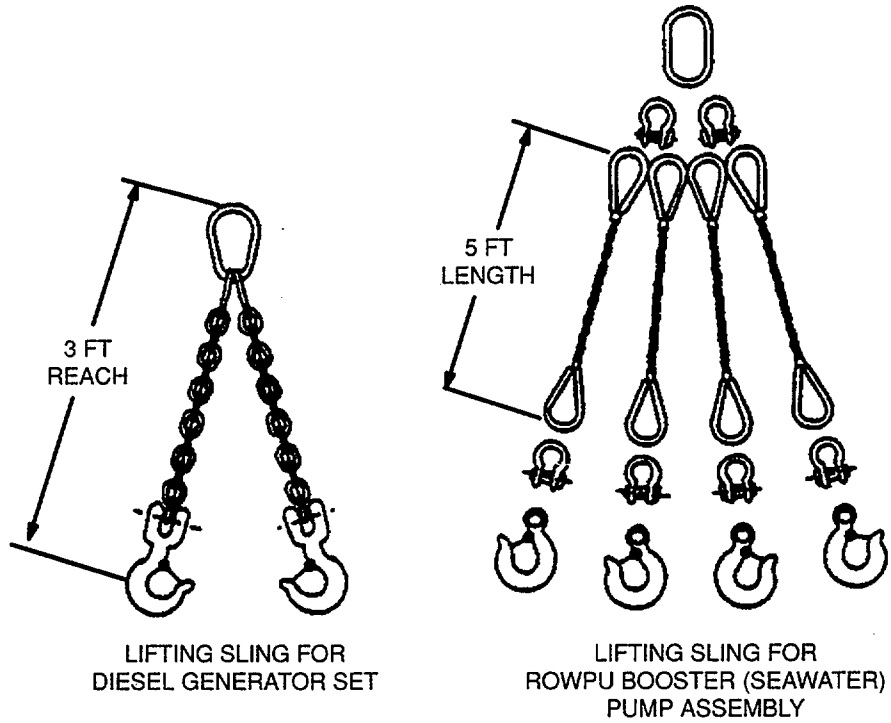


Figure 2-3 . Hoisting Rigs and Lifting Slings (Sheet 1 of 2)

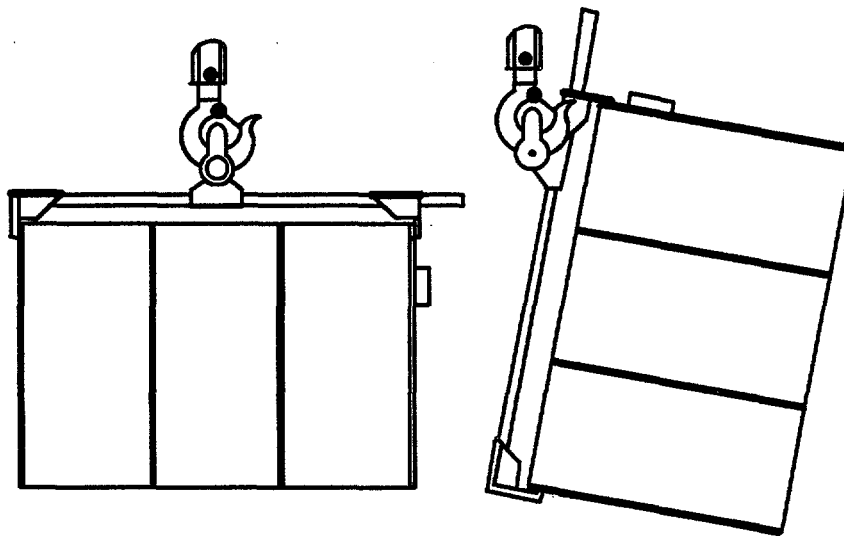
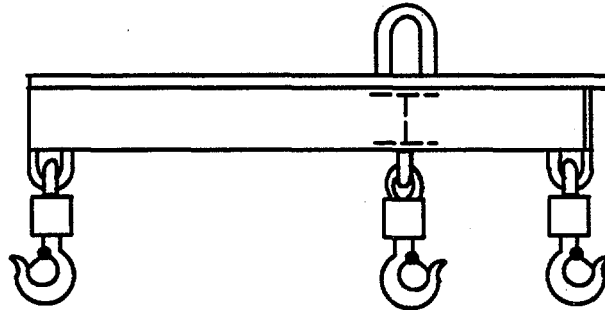
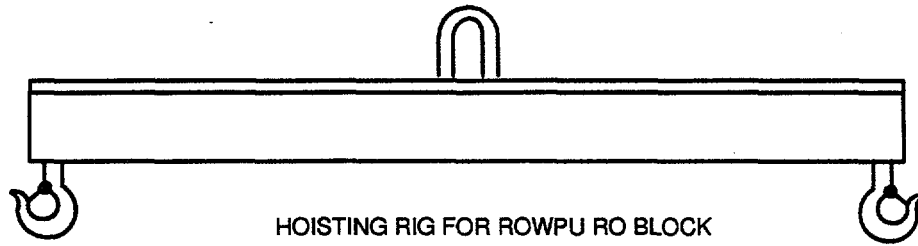


Figure 2-3 . Hoisting Rigs and Lifting Slings (Sheet 2 of 2)

## Section II. Description of operation

**2-9 General.** After load to be moved is securely in place, it can be moved forward and aft by using the electrical hand control. The load can be moved sideways on the bridge crane by manually operating the trolley chain that controls trolley lateral movement. The load can then be raised or lowered by manually operating the trolley chain that controls hoist movement. If desired, the load can be transported from the portside crane to the starboard side by using the crossover assemblies. Loading or unloading can be accomplished through the starboard side sliding door by using the jib rail. The jib rail is shown in Figure 2-4.

## Section III. Operating instructions

**2-10 Operating controls.** Controls for maneuvering loads include the bridge crane hand-held control shown in Figure 2-5 and 2-ton hoist hand-held control shown in Figure 2-6.

### 2-11 Operating procedures

- a. To move a load within the ROWPU space, perform procedures in paragraph 2-11.1.
- b. To move the ROWPU trolley from one side to the other, perform procedures in paragraph 2-11.2.
- c. To move a load through starboard sliding door, perform procedures in paragraph 2-11.3.
- d. To place jib rail in stowed position, perform procedures in paragraph 2-11.4.

**2-11.1 Using portside or starboardside crane.** Use either portside or starboardside crane for handling a load within the ROWPU space.

- a. Close (ON) power panel 1 circuit breaker 6P5 on ROWPU space portside.
- b. Start crane motor by pressing ON button on hand control (Figure 2-5). Press FORWARD or REVERSE button as necessary to move crane to load location.
- c. Move trolley sideways by using trolley lateral movement chain (Figure 2-1).
- d. Obtain appropriate lifting rig (Figure 2-3), if necessary, for use on load to be transported.

### WARNING

To reduce risk of personal injury or equipment damage, always find out weight of load from identification label, shipping data, or equipment manual to make sure proper hoist is used. Table 2-1 provides additional information on equipment weights and sizes.

Severe personal injury and equipment damage may result from improperly attaching slings, lifters, or hoisting rigs. Observe all safety recommendations in this manual and in manufacturers' service manual.

- e. Install lifting rig on hoist and secure to load. Center hoist hook directly over center of load.
- f. Use trolley hoisting chain (Figure 2-1) to raise load when 2-ton electric hoist is not installed. If load is within capacity of 2-ton electric hoist and it is installed, press UP button on hand control (Figure 2-6) to raise load. Make sure load is high enough to clear any equipment in the path of the load.
- g. Press crane hand control FORWARD or REVERSE button (Figure 2-5) as necessary to transport load to new location.
- h. Press hand control STOP button to stop crane.

- i. Use trolley lateral movement chain (Figure 2-1) to move trolley so load is at exact position for unloading.
- j. Use trolley hoisting chain to lower load when 2-ton electric hoist is not installed. If 2-ton electric hoist is used, press DOWN button on hand control (Figure 2-6) to lower load.
- k. Remove lifting rig and return to storage.
- l. If used, remove 2-ton electric hoist from 5-ton hoist and return to storage.
- m. Raise trolley hook to top position by using hoisting chain. Return bridge crane to aft end of ROWPU space.

Table 2-1 . Weights, Measurements, and Locations of Movable Equipment in Voids and Deckhouse

<u>Equipment</u>	<u>Weight (dry/wet)</u>	<u>Length</u>	<u>Width</u>	<u>Height</u>	<u>Location</u>
Media filter	5000/9217 lb	56.0 in	48.0 in	82.0 in	ROWPU space
155 kW diesels	3960/4180 lb	118.0 in	39.0 in	59.0 in	Void 4 port/ starboard
20kW diesel	1300/1451 lb	74.0 in	26.0 in	40.0 in	Void 4 starboard
HP pump assembly	5760/5980 lb	101.0 in	75.0 in	82.0 in	ROWPU space port and starboard
HP pump diesel engines	3960/4180 lb	80.0 in	31.0 in	75.0 in	ROWPU space port and starboard
HP pump	2800 lb (dry)	35.0 in	25.0 in	35.0 in	ROWPU space port and starboard, spare in void 4 starboard
Spare diesel	3900 lb (dry)	72.0 in	56.0 in	56.0 in	Void 4 port
Air compressor	425 lb (dry)	53.0 in	26.0 in	57.0 in	ROWPU space port
Reverse Osmosis (RO) block	4000/6144 lb	229.0 in	53.0 in	92.0 in	ROWPU space port and starboard
RO pretreatment skid	1518/1672 lb	111.0 in	39.0 in	71.0 in	ROWPU space port and starboard
Drill press	275 lb (dry)	72.0 in	56.0 in	70.0 in	Workshop

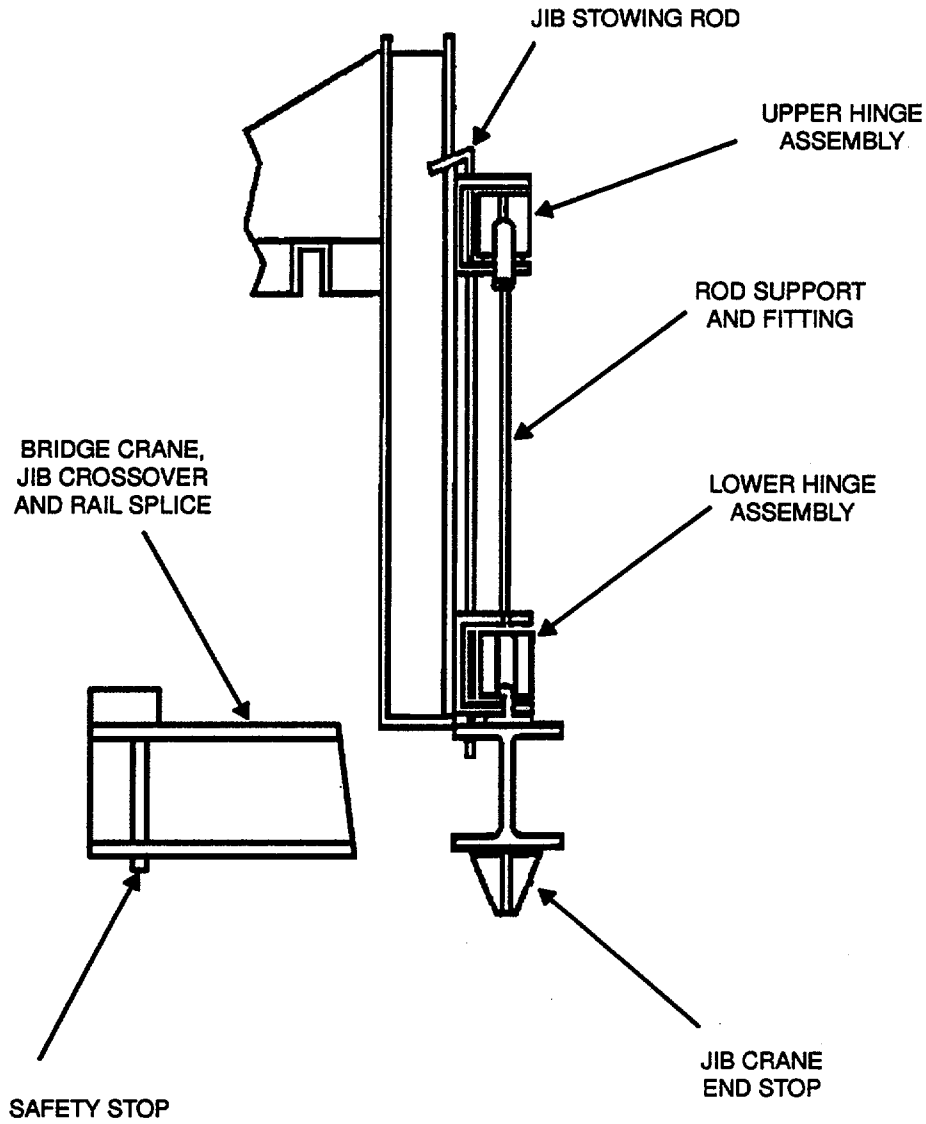


Figure 2-4 . Bridge Crane Jib Rail (Stowed Toward Aft)



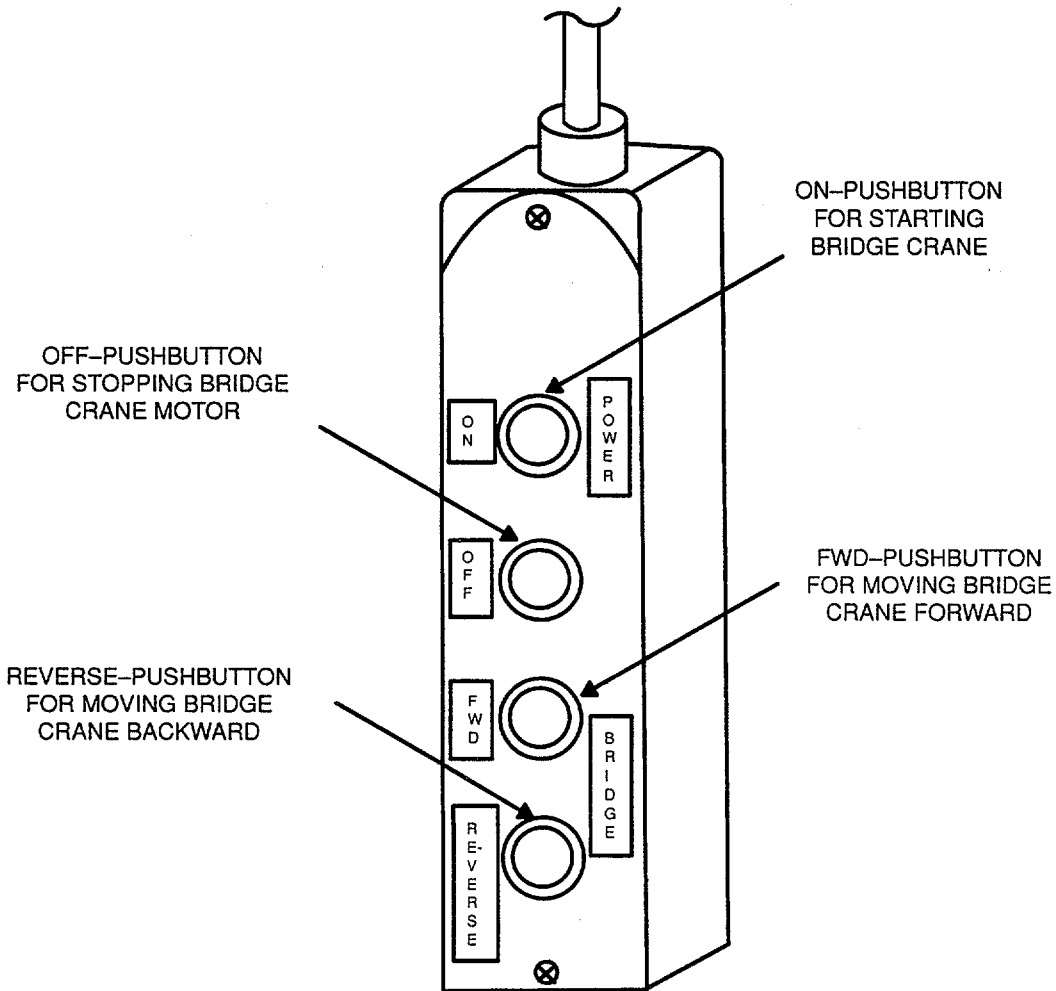


Figure 2-5. Bridge Crane Hand-Held Control

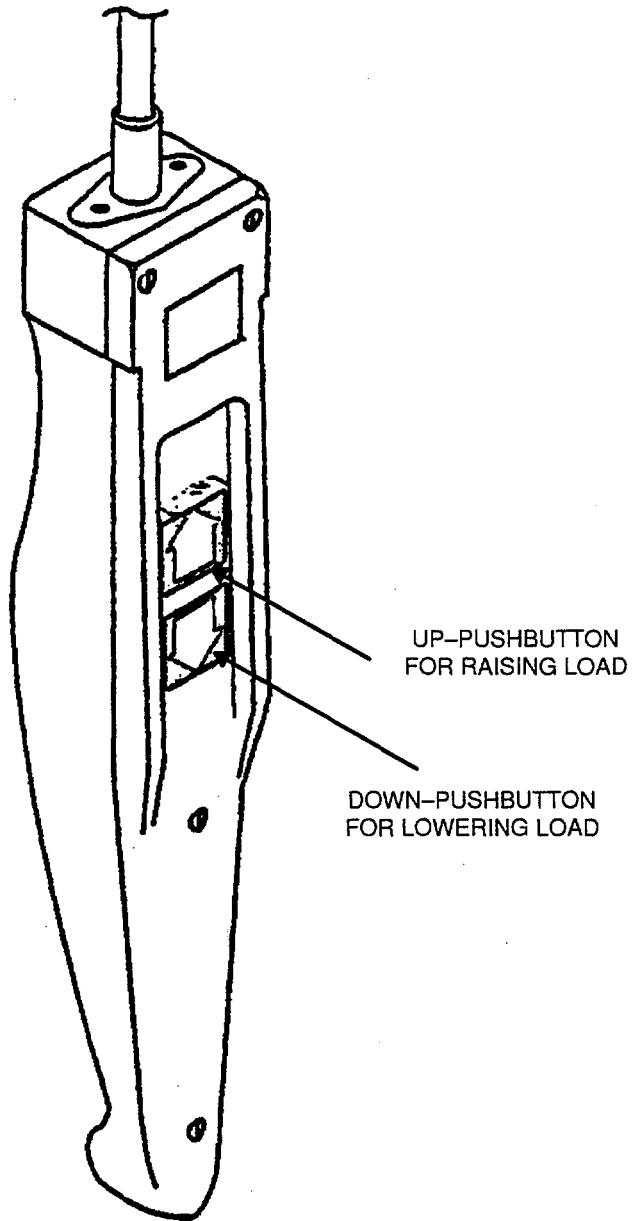


Figure 2-6 . Two-Ton Hoist Hand-Held Control

**2-11.2 Using crossover for trolley transfer.** To transfer trolley from one side to the other, with or without load, perform the following procedures:

- a. Move both portside and starboard side cranes to crossover (Figure 2-7).
- b. Align portside crane with crossover and pull interlock rope until interlocks engage.
- c. Align starboard side crane with crossover and pull interlock rope until interlocks engage.
- d. Use movement chain to move trolley from one crane to the other.
- e. Upon completion of moving trolley, disengage both crane interlocks by pulling interlock ropes.

**2-11.3 Using jib rail for moving loads through sliding door.** To use jib rail and trolley hoist for on loading or off loading equipment, perform the following procedures:

- a. Remove four bolts (Figure 2-8) from captive storage positions in jib rail base.
- b. Remove jib stowing rod that holds jib rail in aft stored position.
- c. Swing jib rail to loading position and return stowing rod to its position for storage.
- d. Secure jib rail with bolts removed in step a. Make sure crane rail and jib rail are properly aligned.
- e. Slowly move trolley hoist to jib rail crossover.
- f. When crossover and jib rail are realigned, pull interlock rope to retract interlock safety stops.

**CAUTION**

Do not move trolley hoist onto crossover until jib rail is secure in loading position.

- g. Transport load using either 5-ton trolley or 2-ton electric hoist, whichever is applicable.

**2-11.4 Placing jib rail in stowed position**

- a. Move trolley hoist onto bridge crane.
- b. Pull interlock rope to engage interlock safety stops.
- c. Remove four bolts securing jib rail.
- d. Remove stowing rod from storage position and swing jib rail to stowed position (Figure 2-8)
- e. Fasten rail in aft stowed position with stowing rod.
- f. Reinstall four bolts into captive nuts so that bolts are available for future use.

**2-12 Operation under extreme conditions.** Operating the bridge crane system in extreme hot or cold temperatures creates a special problem with lubricants. As a result, ambient temperatures above 150 degrees F or below 15 degrees F may cause hoist to move slower or faster than normal. To ensure safe and efficient operation of bridge crane system, use cold weather lubricants during extreme cold weather, and hot weather lubricants during extreme hot weather. Information about other problems that occur during operation under extreme conditions is in the manufacturers' service manuals/instructions listed in Section VI.

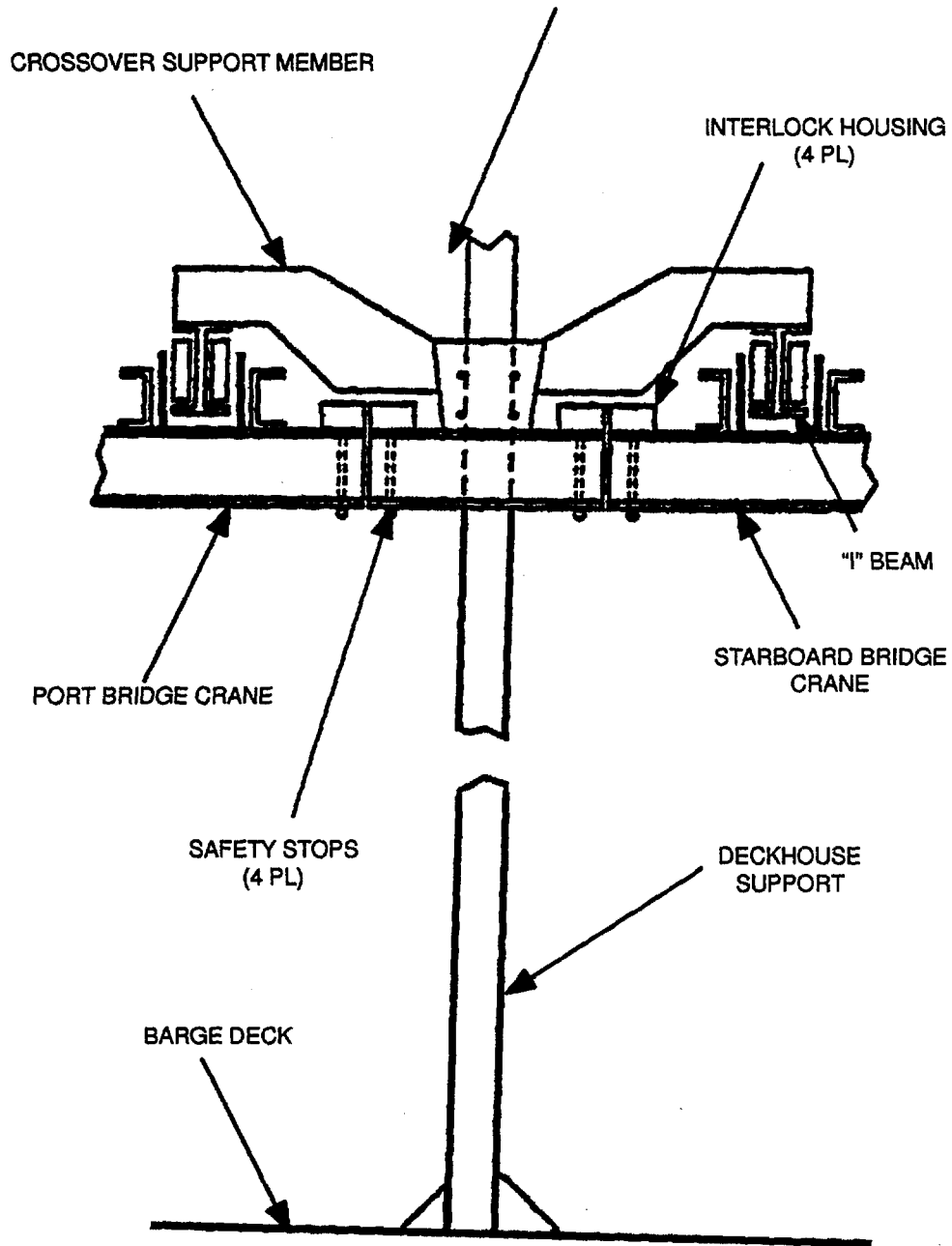


Figure 2-7 . Bridge Crane Crossover Assembly

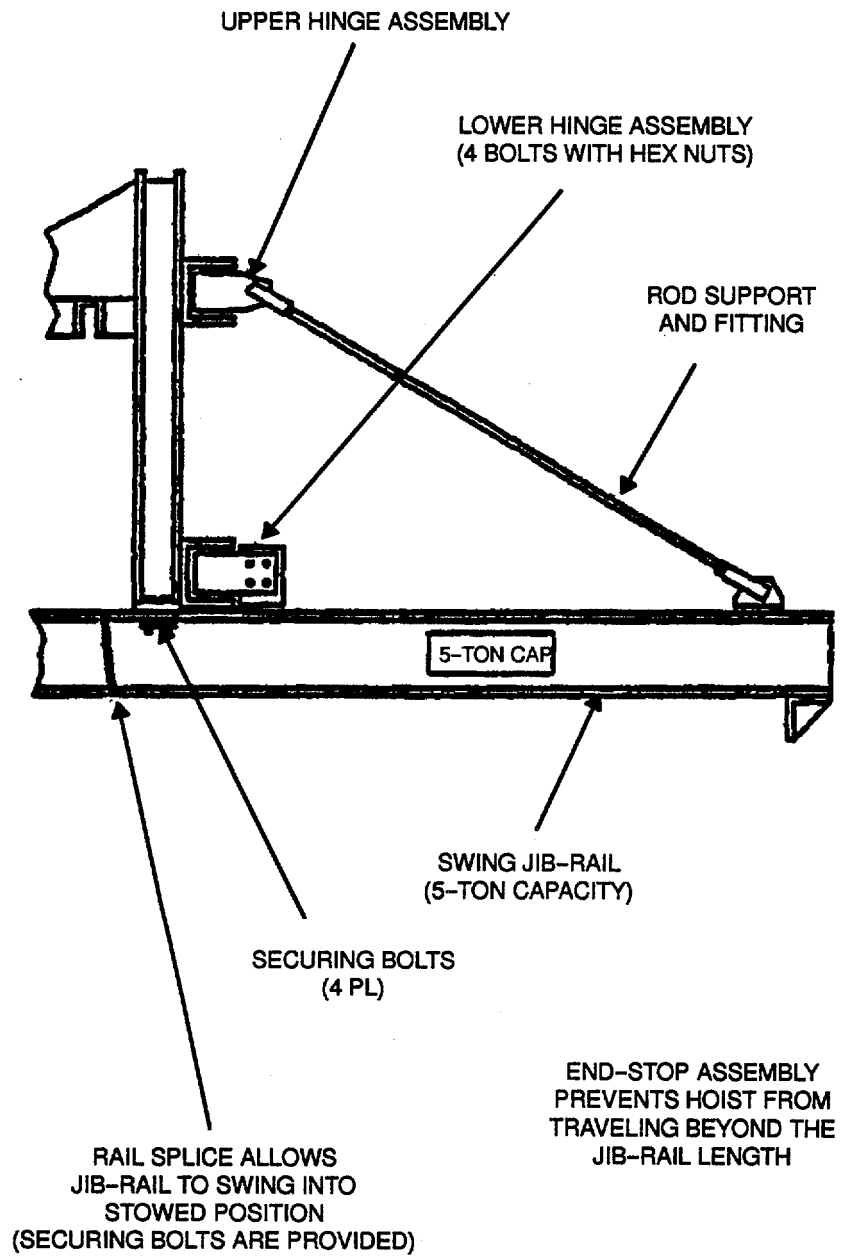


Figure 2-8 . Bridge Crane Jib Rail (Deployed)

## Section IV. Maintenance instructions

**2-13 General.** When inspecting bridge crane components, give special attention to pulleys, lifting hooks, chains, slings, and other load bearing components. Keep inspection reports and records on all hoist equipment. Required maintenance forms and records are explained in DA PAM 738-750. When performing maintenance, be sure to observe CAUTIONS and WARNINGS in this manual and the manufacturer's manual in Appendix E. Due to crane strength considerations, repair or replace parts or components of the crane with items the same as original construction. Use materials in accordance with the drawings referenced in Appendix A.

### WARNING

Notify IDS/IGS maintenance unit after repairing or replacing crane load bearing parts or parts on any lifting slings or rigs used with the crane. They must proof test and safety inspect the repaired item in accordance with TB 43-0142. In addition, the crane and all slings and lifting devices used with the crane must be proof and function tested, and safety inspected to this standard every 12 months. Record and maintain certification of all proof testing.

#### 2-13.1 Maintenance concept

**2-13.1.1** Unit level and IDS/IGS maintenance on the bridge crane system is performed onboard by barge crew members whenever authorized by the Bargemaster.

**2-13.1.2** Any IDS/IGS maintenance beyond the capability of crew members is provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

**2-13.1.3** Intermediate support maintenance is accomplished by replacing components or major end items.

**2-13.1.4** Unless other intermediate support procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area. Components to be disposed of are processed by this unit.

**2-13.1.5** Maintenance Allocation Chart (MAC) is in TM 55-1930-209-14&P-18. For maintenance of other equipment onboard, consult appropriate manual.

**2-13.2 Maintenance instructions.** Maintenance instructions are presented in the following paragraphs: paragraph 2-15, Troubleshooting procedures; and paragraph 2-16, Maintenance procedures.

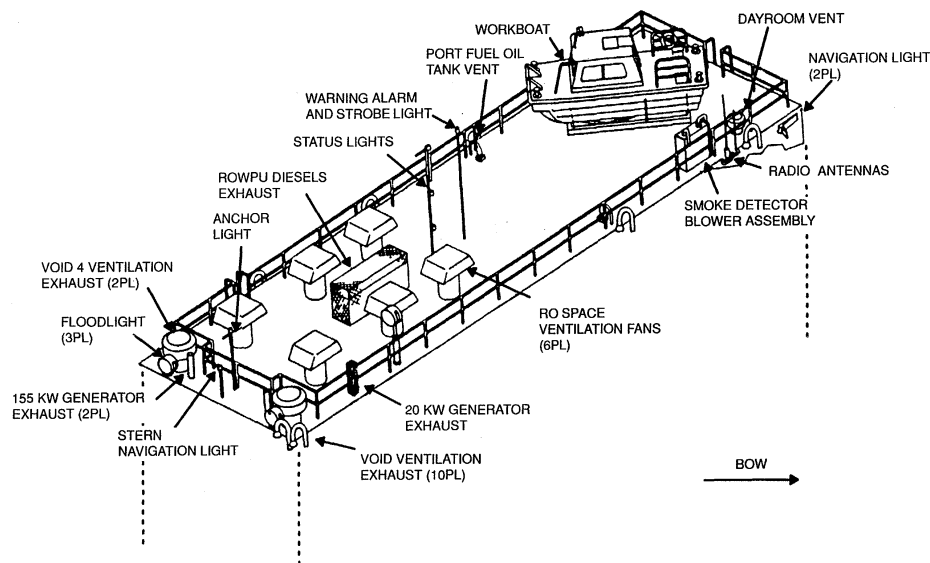
**2-14 Preventive maintenance checks and services.** See TM 55-1930-209-14&P-13, Appendix C for preventive maintenance checks and services for handling equipment. See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all systems on the ROWPU Barge.

**2-15 Troubleshooting.** Troubleshoot bridge crane system as directed in Table 2-2. Conditions listed in this section may occur during operation of the bridge crane system. Tests and inspections should be performed in the order listed. While this list is not all inclusive, it provides the most common faults that occur during bridge crane operation. For those discrepancies beyond barge crew member capability to correct, request unit or next higher level maintenance support.

## 2-16 Maintenance procedures

**2-16.1 General.** Maintenance for the bridge crane system consists of lubricating, disassembling, repairing, replacing, and reassembling equipment using repair parts listed in TM 55-1930-209-14&P-1 8. No special tools are required. A list of tools and test equipment is in TM 55-1930-209-14&P-1 8. When performing maintenance, be sure to observe safety precautions in this manual and manufacturers' manual/instructions and the following general shop practices:

- a. Always use new seals and gaskets, same as the original, when reassembling components that have been disassembled for repair. Carefully install so as not to damage during assembly.
- b. When replacing gaskets, make sure all mating surfaces are clean and free of old gasket material, adhesive, oil, or grease. These precautions will ensure a leak-proof joint.
- c. When replacing O-ring seals, make sure all surfaces are thoroughly clean and free of grit, dirt, and foreign material. Prior to installation, apply a thin coat of protective lubricant to O-ring for ease of assembly. Protect the O-ring by applying tape over threads, sharp corners, or edges.
- d. When replacing or repairing electrical components, follow procedures for soldering in TB SIG 222. Crimp connections as shown in Figure 2-9. Check all groundings. Check that afTER current-carrying members are properly insulated to avoid short-circuiting. Repair abrasions and chafed insulation with tape or replace as necessary.
- e. When replacing bearings, follow procedures in TM 9-214. Lubricate bearings with recommended lubricant. When installing bearings on shafts, apply pressure to inner race. When installing bearings in housing, apply pressure to outer race.
- f. Weld in accordance with TM 9-237. Welding can be used to repair cracks and breaks in steel parts such as bracket, panels, and light framework. Weld only when replacement parts are not available because of a chance of failure later.



- (1) Strip cable insulation equal to depth of terminal well.
- (2) Slide insulator, if used, over cable.
- (3) Insert cable into terminal well and crimp.
- (4) Slide insulator, if used, over crimped end of terminal.

Figure 2-9. Replacement of Crimped Terminals

Table 2-2. Bridge Crane Troubleshooting

<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
1 Crane does not operate when hand-held control buttons are pressed	<ul style="list-style-type: none"> <li>a Power panel 1 circuit breaker 6P5 open (OFF)</li> <li>b Loose connection or damaged wiring</li> <li>c Electrical collectors worn or out of alignment</li> <li>d Hand-held control malfunctioning</li> <li>e Crane gearbox drive shaft sheared</li> <li>f Crane drive wheels slipping on "I" beam</li> </ul>	<ul style="list-style-type: none"> <li>a Close (ON) circuit breaker</li> <li>b Tighten connector or replace damaged wiring</li> <li>c Replace collectors or adjust as required</li> <li>d Replace hand-held control</li> <li>e Replace drive shaft</li> <li>f Inspect drive wheels for warps and foreign matter Replace warped wheels and/or clean or remove foreign matter from "I" beam, as necessary</li> </ul>
2 Bridge crane chatters or hums	Brake improperly adjusted or worn excessively	Troubleshoot brake assembly in accordance with manufacturer's instruction manual (Dings Co.) No BK4613, 60
3 Trolley hoist hook difficult to lower or raise	<ul style="list-style-type: none"> <li>a Load to be hoisted exceeds hoist capacity</li> <li>b Hoist up-down chains kinked or twisted</li> <li>c Hoist not properly lubricated</li> <li>d Hoist internal brake has excessive clearance</li> <li>e Load chain binding lubrication required</li> </ul>	<ul style="list-style-type: none"> <li>a Reduce load to hoist capacity</li> <li>b Straighten chain Inspect for damage</li> <li>c Lubricate in accordance with instructions in manufacturer's manual</li> <li>d Inspect and adjust brake as required</li> <li>e Inspect chain for proper Lubricate chain as</li> </ul>
4 Trolley hoist makes scuffing sound when rolling along rails	<ul style="list-style-type: none"> <li>a Rails worn or severely pitted</li> <li>b Trolley wheels improperly installed or worn excessively</li> </ul>	<ul style="list-style-type: none"> <li>a Inspect rails Determine condition and repair as required</li> <li>b Check trolley wheels for proper installation and wear Adjust or repair as required</li> </ul>



Table 2-2. Bridge Crane Troubleshooting (Continued)

<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
5 Cable reel does not extend or retract	<ul style="list-style-type: none"> <li>a. Cable reel improperly mounted</li> <li>b. Reel ratchet spring and up lack proper tension</li> <li>c. Reel assembly not electrically grounded connected (See manufacturer's service manual SM-3120-04-LL, page 3, for component location)</li> </ul>	<ul style="list-style-type: none"> <li>a. Check that reel drum is center line to cable fun</li> <li>b. Remove and replace reel assembly</li> <li>c. Remove slip ring cover, ensure ground wire is properly Repair as necessary.</li> </ul>
6 2-ton trolley hoist brake does not release	<ul style="list-style-type: none"> <li>a. Power panel 1 circuit breaker 6P5 open (OFF)</li> <li>b. Electrical power not reaching brake magnet assembly</li> <li>c. Low voltage to brake magnet</li> </ul>	<ul style="list-style-type: none"> <li>a. Close (ON) circuit breaker</li> <li>b. Remove brake cover, check for any broken wires leading to magnet assembly Repair as required</li> <li>c. With power off and using a continuity meter, check wiring. Repair or replace as necessary</li> </ul>
7 Trolley hoist does not stop when hand-held controls are released	Brake release did not reset to normal position	Remove brake cover plate and inspect for damage or broken parts. If brake is defective, replace brake assembly
8 Bridge crane interlocks do not retract	<ul style="list-style-type: none"> <li>a. Safety stops binding</li> <li>b. Pull rod on connector interlock assembly bent or broken</li> <li>c. Operator wheel on crane interlock and operator assembly binding warped, or out of adjustment</li> </ul>	<ul style="list-style-type: none"> <li>a. Adjust stops and/or replace defective stops as required</li> <li>b. Check pull rod for proper condition. Remove and replace as required</li> <li>c. Check operator wheel assembly for proper operation. Adjust or replace components as required</li> </ul>

**2-16.2** Repair or replacement of bridge crane system components

**WARNING**

**Shut down bridge crane system before attempting maintenance. Be sure to open (OFF) circuit breaker 6P5 on power panel 1. Red tag circuit breakers with: "WARNING - DO NOT ACTIVATE REPAIRS BEING MADE."**

**2-16.2.1 5-ton geared trolley hoist****2-16.2.2 Cleaning and inspection**

- a. Wipe clean with rag dampened with hot soapy water or to remove grease with solvent. Wipe dry with clean cloth.
- b. Visually inspect trolley hoist structural members for evidence of bends, distortion, broken welds, cracks, corrosion, or damage. Remove corrosion and touch up painted parts according to TB 43-0144.
- c. Visually inspect hook for deformation, cracks, wear, damage, or malfunctioning latch and hook attachment. Replace hook if necessary.
- d. Visually check chains for excessive wear, twist, distorted links, stretch, nicks, and gouges. Apply lubricant, if necessary. Replace damaged chain.
- e. Visually inspect wheels for damage and wear, and drive wheel hubs for loose clamping bolts. Replace damaged wheel.
  - (1) Make sure bridge crane system is electrically dead by opening (OFF) and redtagging circuit breaker P16 on switchboard.
  - (2) Remove stop on end of track.
  - (3) Remove trolley from track after securing chains and providing means to safely lower trolley.
- f. Installation. Install trolley in reverse order of installation.

**2-16.3 Cable reel****WARNINGS**

**Shut down bridge crane system before attempting maintenance. Be sure to open (OFF) circuit breaker 6P5 on power panel 1. Red tag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." If one of the bridge crane assemblies must be operational, disconnect junction box-to-cable reel cable terminals at junction box to cut off electrical power to cable reel.**

**Remove all spring tension from reel before performing maintenance.**

**2-16.3.1 Cleaning and inspection**

- a. Make sure cable reel is electrically dead by opening (OFF) circuit breaker 6P5 on power panel 1. Red tag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."
- b. Wipe clean exterior of cable reel with clean rag.
- c. Remove all spring tension before vacuum cleaning inside of cable reel. Avoid using solvents inside of cable reel. Solvents leave greasy film on components that may reduce electrical conductivity.
- d. Visually inspect exterior and interior for loose connections, corrosion, and damage. Clean corrosion from terminals, tighten loose connections, and repair damage.

**2-16.3.2 Test**

- a. With power panel 1 circuit breaker 6P5 closed (ON) and red tagged, check input voltage to crane reel. If input voltage is not 440 Vac, go to step b. If input voltage is 440 Vac, go to step c.
- b. Open (OFF) circuit breaker 6P5 on power panel 1. Red tag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Check continuity of input wires from terminal box to crane reel. If check indicates open circuit, replace bad wire(s). If check indicates closed circuit, check circuit breaker 6P5 on power panel 1 and input wires from circuit breaker 6P5 to terminal box.
- c. With power panel 1 circuit breaker 6P5 closed (ON) and red tagged, check output voltage from crane reel. If output voltage is not 440 Vac, go to step d. If output voltage is 440 Vac, crane reel is not at fault.
- d. Open (OFF) and retag circuit breaker 6P5 on power panel 1. Remove all spring tension, remove cover and drum, and check cable connections and slip ring. Tighten loose connections and remove corrosion. Replace slip, if necessary.

**2-16.3.3 Repair.** Repair crane reel by replacing mainspring and clip as given in Section III, Service, page 4, in the Aero-Motive Service Manual in Appendix B. To disassemble crane reel, refer to the exploded view in the manual.

**2-16.3.4 Replacement**

## a. Removal

- (1) Make sure crane reel is electrically dead by opening (OFF) power panel 1 circuit breaker 6P5. Red tag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."
- (2) Remove all spring tension from crane reel.
- (3) Tag and disconnect cable from crane assembly motor controller.
- (4) Note mounting position, remove mounting hardware, and remove crane reel.

## b. Installation

- (1) Install crane reel as mounted previously. Follow installation instructions in Section I, Installation of Reel, on page 4 in the Aero-Motive Service Manual in Appendix B.
- (2) Adjust crane reel as given in Section II, Adjustment, on page 4 in the Aero-Motive Service Manual.
- (3) Connect wiring as tagged.
- (4) Close (ON) circuit breaker 6P5 on power panel 1.
- (5) Check operationally by moving crane fore and aft so that crane reel cable runs out as far as it can in both directions.

**2-16.4 Bridge Crane Assembly.** Maintenance of the bridge crane assembly includes the electric powered crane, rails, jib rail, and associated structures.

**WARNING**

Shut down bridge crane system before attempting maintenance. Be sure to open (OFF) circuit breaker 6P5 on power panel 1. Red tag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." However, if one of the bridge cranes must be operational, disconnect and tape voltage input cable terminals at crane reel of bridge crane to be shut down.

**NOTE**

See TB 43-0142 and Spanmaster Spare Parts and Maintenance Manual in Appendix B for additional information.

### 2-16.4.1 Cleaning and inspection

- a. Make sure bridge crane assembly is electrically dead by opening (OFF) power panel 1 circuit breaker 6P5. If one of the bridge cranes must be operational, open (OFF) and secure circuit breaker 6P5 and disconnect voltage input cable at crane reel of bridge crane to be repaired. Then close (ON) circuit breaker 6P5 so other bridge crane is operational.
- b. Wipe clean, except electrical components, with soapy damp cloth or remove grease with solvent.
- c. Wipe exterior of electrical components clean with cloth. Use vacuum cleaner or electrician's brush to clean inside of electrical components. Avoid using solvent to clean inside of motor controller.
- d. Visually inspect rails, jib rails, and other structural components for loose connections and securement. Repair, replace, and/or tighten as necessary.
- e. Visually inspect rail components for loose connections, wear, damage, corrosion, and chipped or worn paint. Remove rust and corrosion by wire brushing, chipping, or scraping. Immediately paint area with zinc chromate primer and finish to match surrounding area in accordance with TB 43-0144. Do not paint threads or labels.
- f. Visually inspect all stops and tighten bolts if required.
- g. Visually inspect drive tires for wear and slippage. If necessary, adjust all spring mounts uniformly at each drive wheel.
- h. Visually inspect and test interlocks for alignment, proper clearances, and freedom of operation.
- i. Visually inspect electrical components for indications of burns, corrosion, loose connections, damaged parts, or chipped paint. Clean corrosion from contacts or terminals, tighten loose connections, and replace damaged parts. Clean electrical components with silver polish, fine sandpaper, or burnishing tool. DO NOT use emery paper or steel wool. Vacuum to remove residue. Touch up paint according to TB 43-0144. Do not paint threads or labels.

### 2-16.4.2 Testing

**2-16.4.2.1 Load proof and function test and safety inspection.** Perform and record an annual load proof and function test and safety inspection of bridge crane assembly including jib rail, in accordance with TB 43-0144. All load carrying members must be visually inspected upon completion of the load proof and function test for wear and cracks. If visual inspection of painted members indicates possibility of cracks, perform the magnaflux or other accepted method to find cracks not visible to the eye.

#### 2-16.4.2.2 Electrical test and repair

#### **WARNING**

**Shut down bridge crane system before attempting maintenance. Be sure to open (OFF) circuit breaker 6P5 on power panel 1. Red tag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." If one of the bridge crane assemblies must be operational, disconnect junction box-to-cable reel cable terminals at junction box to shut off electrical power to cable reel.**

- a. With circuit breaker 6P5 at power panel 1 closed (ON), check bridge crane input line voltage at junction box (JP1) terminal pair A1 and A2, A1 and A3, and A2 and A3 for 440 Vac. If voltage across any terminal pair is not 440 Vac, go to step b. If voltage across all terminal pairs is 440 Vac, go to step c.
- b. Check circuit breaker 6P5 output voltage across all three terminal pairs for 440 Vac. If voltage across any terminal pair is not 440 Vac, circuit breaker or power source is at fault. If voltage across all terminal pairs is 440 Vac, repair or replace power cable to circuit breaker 6P5 to junction box.

**WARNING**

**Drive wheels must be lowered to prevent accidental movement of bridge crane while repairs are being made. Failure to do this may cause serious bodily harm.**

- c. Lower drive wheels by loosening  $\frac{3}{4}$  inch x 10 NC HEX and  $\frac{3}{4}$  inch x 10 NC tam nut. Loosen two nuts on each until both drive wheels are  $\frac{1}{8}$  inch to  $\frac{1}{4}$  inch from the I-beam.
- d. Close disconnect switch, open lockout limit switches ON, FORWARD, and REVERSE. Check voltage at motor connection inputs across terminal pairs T1 and T2, T1 and T3, and T2 and T3 for 440 Vac (in both FORWARD and REVERSE modes). If 440 Vac is not apparent across one or more terminal pairs in both modes, go to step e. If voltage is 440 Vac across all terminal pairs in one mode but not in the other mode, go to step e. If voltage is 440 Vac across all terminal pairs, in both modes, replace motor.
- e. Check fuses F1, F2, F3, F4, F5, F6, and F7 for blown condition. If all fuses are in proper working condition, go to step f. If any fuse indicates blown condition, replace with properly rated fuse.
- f. Check voltage at inputs of disconnect switch, across terminal pairs C1 and C2, C1 and C3, and C2 and C3 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step g. If voltage across any terminal pair is not 440 Vac, perform steps (1) and (2), following, as necessary.
  - (1) Check voltage at outputs of cable reel across terminal pairs B1 and B2, B1 and B3, B2 and B3 for 440 Vac. If voltage across any terminal pair is not 440 Vac, go to step (2). If voltage across any terminal pair is 440 Vac, repair wire(s) from cable reel to disconnect switch.
  - (2) Check voltage at inputs of cable reel across points A1 and A2, A1 and A3, and A2 and A3 for 440 Vac. If voltage across any terminal pair is not 440 Vac, repair or replace wire(s) from junction box-to-cable reel. If voltage across all terminal pairs is 440 Vac, replace cable reel contacts or cable reel assembly.
- g. Close (ON) disconnect switch and check voltage at outputs of disconnect switch across terminal pairs D1 and D2, D1 and D3, and D2 and D3 for 440 vac. If voltage across all terminal pairs is 440 Vac, go to step h. If voltage across any terminal pair is not 440 Vac, replace disconnect switch.
- h. Check voltage at inputs of contractor (CM) across terminal pairs F1 and F2, F1 and F3, and F2 and F3 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step i. If voltage across any terminal pair is not 440 Vac, repair or replace wire(s) from fuse(s) to contractor (CM).
- i. With bridge hand control ON button pushed, check voltage outputs of contractor (CM) across terminal pairs G1 and G2, G1 and G3, and G2 and G3 for 440 Vac. If voltage across all terminal pairs is not 440 Vac, perform steps (1) through (4), following, as necessary.
  - (1) Check voltage across points A and B of magnetic coil CM for 11 5 Vac. If voltage is not 11 5 Vac, replace starter CM.
  - (2) Check voltage at primary side of transformer T1 across points H 1 and H4 for 440 Vac. If voltage is 440 Vac, go to step (3). If voltage is not 440 Vac, replace or repair wire(s) from fuse(s) to transformer.
  - (3) Check voltage at secondary side of transformer T1 across points X1 and X2 for 11 5 Vac. If voltage is 11 5 Vac, go to step (4). If voltage is not 115 Vac, replace transformer.

**WARNING**

**Make sure bridge crane motor is electrically dead before making continuity checks. Red tag disconnect switch with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."**

- (4) Open (OFF) disconnect switch, disconnect wire from X1 at transformer and make continuity checks as follows:
- (a) With ON button at bridge hand control held in, check continuity of circuit between point A of magnetic coil CM and wire end of point X1. If open circuit exists, go to step (b). If continuity exists, repair or replace wire from X2 to CM point B.
  - (b) Check continuity of ON and OFF switches at bridge hand control between points A and B. If continuity exists, go to step ©. If open circuit exists from either check, replace faulty switch.
  - © Check continuity of wires between points X1 and F7- B, F7-A and TB-X, TB-X and OFF switch point A, OFF switch point B and ON switch point B, ON switch point A and TB1, TB1 and CM point A, ON switch point B and CM point 1, and CM point 2 and CM point A. Repair or replace any wires indicating an open circuit. If all wires indicate continuity, replace contactor CM.
- j. Check voltage at inputs to fuses across terminal pairs 11 and 12, 11 and 13, and 12 and 13 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step k. If voltage across any terminal pair is not 440 Vac, repair or replace wire(s) from contactor CM to fuses.
- k. Check voltage at inputs to contactor CM across terminal pairs K1 and K2, K1 and K3, and K2 and K3 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step 1. If voltage across any terminal pair is not 440 Vac, repair or replace wire(s) from fuses to contactor CM.
1. With ON button at bridge hand control pushed, lockout relays 1 LS and 2LS OPEN and FORWARD pushed, check voltage at outputs of contactor 1 M across terminal pairs J1 and J2, J1 and J3, and J2 and J3 for 440 Vac. If voltage across any terminal pair is not 440 Vac, perform steps (1) and (2), below, as necessary. If voltage across all terminal pairs is 440 Vac, go to step m.
- (1) Check voltage at contactor 1 M across points A and B for 115 Vac. If voltage is not 115 Vac, replace contactor 1 M. If voltage is 115 Vac, go to step (2).
  - (2) Check voltage at lockout relay 1CR for 115 Vac. If voltage is 115 Vac, replace lockout switches 1 LS and/or 2LS.
- m. Check voltage at inputs of contactor 2M across terminal pairs L1 and L2, L1 and L3, and L2 and L3 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step n. If voltage across any terminal pair is not 440 Vac, repair or replace wire(s)
- n. With ON button at bridge hand control pushed, lockout relays 1 LS and 2LS OPEN and REVERSE button pushed, check voltage at outputs of contactor 2M across terminal pairs M1 and M2, M1 and M3, and M2 and M3 for 440 Vac. Perform steps (1) and (2), below, as necessary.
- (1) Check voltage at contactor 2M across points A and B for 115 Vac. If voltage is not 115 Vac, go to step (2). If voltage is 115 Vac, replace contactor 1 M.
  - (2) Open (OFF) disconnect switch, disconnect wire from X1 at transformer, and make continuity check as follows:

### WARNING

**Make sure bridge crane motor controller is electrically dead before making continuity checks.**

**Redtag disconnect switch with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."**

- (a) Check continuity of lockout relay 1 CR contact between points 4 and 2. If continuity exists, go to step (b). If an open circuit exists, replace lockout relay 1CR.
- (b) Check continuity of contactor 1 M contact between points K4 and N4. If continuity exists, go to step ©. If open circuit exists, replace contactor 1 M.
- (c) With reverse switch pushed, check continuity of reverse switch between points A and B. If continuity exists, go to step (d). If open circuit exists, replace reverse switch.
- (d) Check continuity of all wires in reverse drive control circuit from reverse switch to B-OL'S. Also check continuity of any jumper wires in hand control station. Repair or replace any wires that indicate an open circuit.

- o. With forward button pushed, check voltage at inputs to resistor across terminal pairs K1 and K2, K1 and K3, and K2 and K3 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step p. If voltage across any terminal pair is not 440 Vac, replace wire(s) from 1 M to resistor.
- p. With reverse button pushed, check voltage at inputs to resistor across terminal pairs K1 and K2, K1 and K3, and K2 and K3 for 440 Vac. If voltage across all terminal pairs is 440 Vac, go to step q. If voltage across any terminal pair is not 440 Vac, replace wire(s) from 2M to resistor.
- q. Open (OFF) disconnect switch and make continuity check as follows:

**WARNING**

Make sure bridge crane motor controller is electrically dead before making continuity checks. Red tag circuit breaker wire with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."

- (1) Check resistance of three resistors between point P1 and Q1, P2 and Q2, and P3 and Q3 for 3 ohms. If resistance is 3 ohms, go to step (2). If resistance is not 3 ohms, reset or replace resistor(s).
  - (2) Check continuity of wires between points Q1 and R1, Q2 and R2, and Q3 and R3. If continuity exists, go to step (3). If open circuit exists, repair or replace wire(s).
  - (3) Check continuity of overload protection B-OL'S between points R1 and S1, R2 and S2, and R3 and S3. If continuity exists, replace wire(s) from B-OL'S to motor connections. If open circuit exists, replace overload protection B-OLS.
- r. Check voltage between points A and B to brake inputs for 440 Vac. If voltage is 115 Vac and magnetic coil is not energizing, replace magnetic coil. If voltage is not 115 Vac, replace wire(s) from points J1 and J2 to magnetic coil points A and B.

**2-16.5 Bridge Crane Trolley Brake**

**WARNING**

**Shut down bridge crane system before attempting maintenance. Be sure to open (OFF) circuit breaker 6P5 on power panel 1. Red tag circuit breaker with: "WARNING- DO NOTACTIVATE. REPAIRS BEING MADE." However, if one of the bridge crane assemblies must be operational, disconnect and tape voltage input wires at crane reel of bridge crane to be shut down.**

**2-16.5.1 Cleaning and inspection**

- a. Make sure bridge crane system is electrically dead by opening (OFF) power panel 1 circuit breaker 6P5. If one of the bridge cranes must be operational, open (OFF) and secure circuit breaker 6P5 and disconnect and tape voltage input cable terminals at crane reel of bridge crane to be repaired. Then close (ON) circuit breaker 6P5 so other bridge crane is operational.
- b. Wipe clean exterior of brake with clean cloth. Vacuum clean or clean inside with electrician's brush. Avoid using solvents for cleaning inside of brake. Solvents leave a greasy film on components that may reduce electrical continuity.
- c. Visually inspect exterior and interior for damage. Check friction disk for wear. Check springs and other components for damage or loose parts. Check magnet assembly for indications of burns, corrosion, loose connections, or damaged wires. Check exterior for chipped paint. Clean corrosion from terminals, tighten loose connections, and replace damaged parts. Adjust or replace worn friction disk. Replace bad magnet assembly.

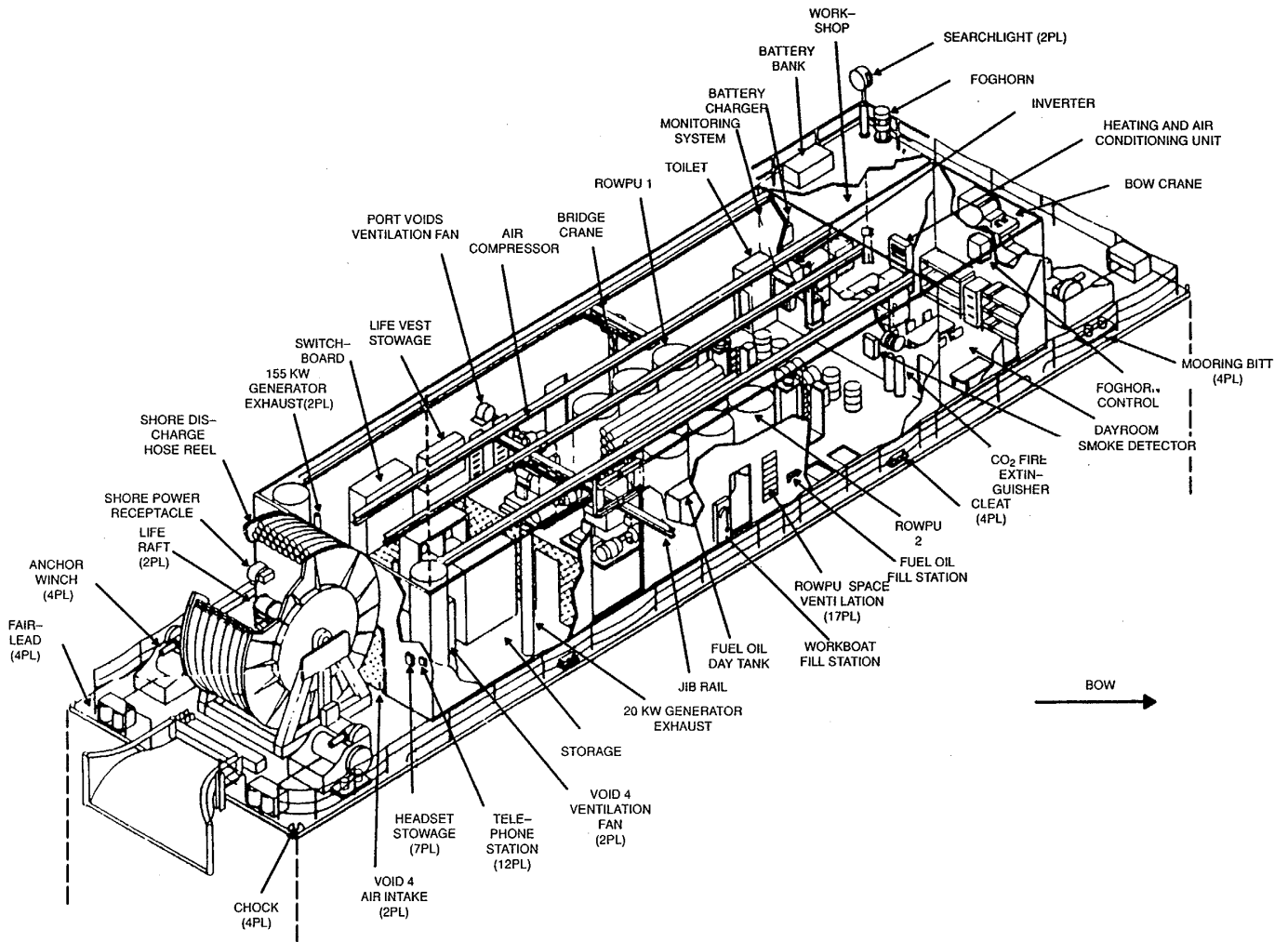


Figure 2-10. Bridge Crane System Schematic (1 of 2)



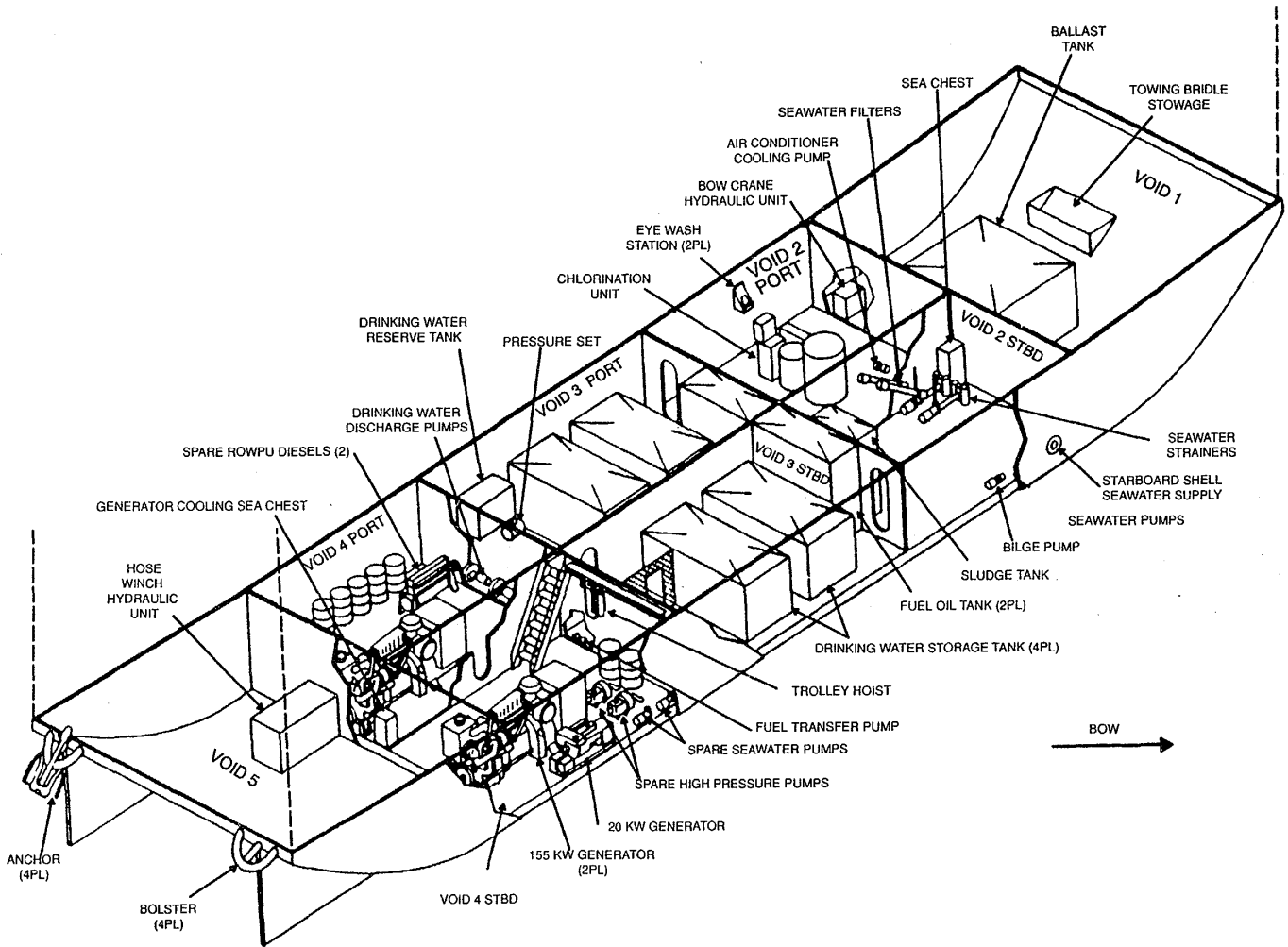


Figure 2-10. Bridge Crane System Schematic (2 of 2)

**2-16.5.2 Repair**

**2-16.5.2.1 Friction disk replacement.** See Friction Disk Replacement paragraph on page 2 of Dings 60 Series Heavy Duty Unipac Brake Instructions manual in Appendix B.

**2-16.5.2.2 Magnet assembly replacement.** See Magnet Assembly Replacement paragraph on page 2 of Dings 60 Series Heavy Duty Unipac Brake Instructions manual in Appendix B.

**2-16.5.3 Adjustment**

**2-16.5.3.1 Friction disk.** See Wear Adjustment paragraph on page 2 of Dings 60 Series Heavy Duty Unipac Brake Instructions manual in Appendix B.

**2-16.5.3.2 Torque adjustment.** See Torque Adjustment paragraph on page 2 of Dings 60 Series Heavy Duty Unipac Brake Instructions manual in Appendix B.

**2-16.5.4 Replacement**

a. Removal

- (1) Make sure bridge crane system is electrically dead by opening (OFF) power panel 1 circuit breaker 6P5. If one of the bridge cranes must be operational, first open (OFF) and retag circuit breaker 6P5 and disconnect tag and tape voltage input cable terminals at terminal box of crane to be repaired. Then close (ON) circuit breaker 6P5 to provide power to operational crane.
- (2) Remove brake in reverse order of Installation paragraph on page 1 of Dings 60 Series Heavy Duty Unipac Brake Instructions manual in Appendix B.

b. Installation

- (1) Install brake as given in Installation paragraph on page 1 of Dings 60 Series Heavy Duty Unipac Brake Instructions manual in Appendix B.
- (2) Open (OFF) and red tag circuit breaker 6P5 and connect voltage input wires if disconnected in step 2.1.
- (3) Close (ON) circuit breaker 6P5 and check brake for normal operation by operating crane. Adjust torque, if necessary.

**2-16.6 Lifting slings and rigs.** Lifting slings and rigs (Figure 3-2) used onboard the ROWPU Barge are listed below.

<u>Used to Lift</u>	<u>SLING or RIG</u>	<u>Type</u>
Diesel generator set	Lifting sling	1/2 in chain - 2 leg
ROWPU booster (sea water) pump	Lifting sling	1/4 in wire rope - 4 chain
ROWPU high pressure pump diesel engine	Lifting sling	3/8 in chain - 4 leg
ROWPU RO block	Hoisting rig	2 hook
ROWPU media filter	Hoisting rig	3 hook
55-gallon drum	Drum lifter	

**2-16.6.1 Cleaning and inspection**

- a. Wipe clean with cloth dampened in hot soapy water or approved solvent. Then wipe dry with clean cloth.
- b. Inspect chain and wire rope slings as given in Appendix C of TB 43-0144.
- c. Visually inspect lifting rigs and 55-gallon drum lifter for corrosion, damage, and worn or chipped paint. Remove rust and corrosion by wire brushing, chipping or scraping.

**2-16.6.2 Test.** IDS must perform and record an annual load proof and function test and safety inspection of each sling, rig, and drum lifter in accordance with TB 43-0144. Coordinate test and inspection with crane assembly test. All load carrying members must be visually inspected upon completion of the load and function test for wear and cracks. If inspection indicates possibility of cracks, perform magnaflux or other accepted method to find cracks not visible to the eye.

**2-16.6.3 Repair**

**2-16.6.3.1 Shackles.** Replace worn or damaged shackles by removing pin holding shackle to hook or wire. Install new shackle and secure pin.

**2-16.6.3.2 Hook.** Replace worn or damaged hook by removing pin securing shackle to hook. Install new hook and secure to shackle.

**2-16.6.3.3 Wire rope.** Replace wire ropes when worn or damaged in accordance with Appendix C in TB 43-0142.

**2-16.7 Electrical wiring and cables**

**2-16.7.1 Cleaning and inspection.** Inspect wiring and harnesses for chafed or burned insulation. Look for causes of chafing or burns. Inspect terminal connectors for corrosion, loose connections, and broken parts. Clean corrosion and replace damaged connector pins or wires, replace damaged connectors, or replace harness assembly. Check mounting hardware, hangers, and receptacles for tightness. Tighten if necessary.

**2-16.7.2 Repair and replacement.** When replacing wires or repairing wire harnesses, lay wires alongside wire or harness and cut new wires at least 1 ½ inches longer than wire being replaced.

**2-16.8 Threaded parts.** Visually inspect screws, nuts, and fittings for damage. Replace if damaged. If threads are only slightly damaged, chase threads with charing tool. Replace cross threaded parts. Visually inspect tapped holes for damage. If threads are damaged, tap holes for next oversize screw or thread. If retapping weakens part, replace part.

**Section V. Storage**

**2-17 Short-term storage.** If barge is taken out of service for more than 7 days but less than 30 days, and bridge crane is not to be used while in storage, perform the following procedures before placing this equipment in short-term storage.

- a. Perform weekly scheduled maintenance requirements as listed in paragraph 2-16.1.
- b. Move both cranes as far aft as possible. Raise hoist hook to topmost position and secure chains.
- c. Open power panel 1 circuit breaker 6P5 in ROWPU space.
- d. Store 2-ton hoist.

**2-18 Administrative storage.** If barge is taken out of service for more than 30 days but less than 6 months, perform the following procedures:

- a. Perform weekly scheduled maintenance.
- b. Perform monthly scheduled maintenance.

**WARNING**

**Corrosive preventive compound (MIL-C-16173) is flammable and slightly toxic. Avoid contacting skin and eyes or breathing vapors. Skin, eye, and breathing protection is required.**

- c. Repair all damaged equipment. Coat unprotected metal surfaces with a preservative conforming to MIL-C-16173, Grade 3.
- d. Lubricate crane system components in accordance with manufacturers' instructions.
- e. Move both trolleys as far aft as possible and secure chains with special fasteners on side of ROWPU space aft storage area.

**2-19 Long-term storage.** If barge is to be taken out of service for 6 months or more, turn it in to depot for preparation and placement into long-term storage. If barge is in administrative storage and is to be taken out of service and placed in depot long-term storage (6 months or more), process barge and bridge crane system for normal operations before releasing to depot.

**Section VI. Manufacturers' service manuals/instructions**

**2-20 General.** These references provide additional information on bridge crane system components. Ready reference copies are in Appendix B. Refer to both the reference copies and the drawings listed in Appendix A while performing procedures in these manuals.

<u>Component</u>	<u>Document title</u>	<u>Manufacturer</u>
5-ton bridge crane system (	Spare Parts and Maintenance Manual for VSE Corp US Army) NS-83-92580	Spanmaster, Division of Jervis B Webb Co. 739 Moore Road Avon Lake, OH 44012 Ph: (216) 933-6166
Crane cable reel Series 200a & 300a POW-R-	SM3120-04 IL, Service Manual  MITE & POW-R-MATIC 0931 & 228a-H Cord Reel Telex: 224420	Aero-Motive Mfg Co. P O Box 2678 Kalamazoo, MI 49003 Ph: (616) 381-1242
Crane brake	Bulletin No 60 Series, Heavy Duty Unipac Brake Instructions	BK461360 Dings Co. Dynamics Group 4740 W Electric Ave. Milwaukee, WI 53219 Ph: (414) 672-7830 Telex: 2-6602

<u>Component</u>	<u>Document title</u>	<u>Manufacturer</u>
Crane 5-ton trolley hoist	Bulletin J, Zephyr Low Head Room Hoists model 1422-5 PO	Chester Hoist Division Monogram Industries, Inc. 7573 State Route #45 Box 229 Lisbon, OH 44432 Ph: (216) 424-7248
	2-ton hoist CMHoist Division of Manual, Electric Hoist Equipped with Protector	Manual No 80-AM, Instruction, Maintenance and Parts Columbus McKinnon Corp. Audubon & Sylvan Pkwys. Amherst, NY 14228 Ph: (716) 689-5400

**Section VII. Manufacturers' warranties/guarantees**

**2-21 General.** Information on bridge crane system component warranties and guarantees is listed below.

Component	Manufacturer	Duration	Coverage
Bridge crane Jervis B	Spanmaster, Division of Webb Co 739 Moore Rd. Avon Lake, OH 44012 Ph: (216) 933-6166	3 months from date of shipment	Materials and workmanship
2-ton hoist	CM Hoist Division of Columbus McKinnon Corp Audubon & Sylvan Pkwys. Amherst, NY 14228 Ph: (716) 689-5400	1 year from date of shipment	Defective parts
Crane cable reel	Aero-Motive Mfg Co PO Box 2678 Kalamazoo, MI 49003 Ph: (616) 381-1242 Telex: 22 4420	1 year from date of shipment	Workmanship and materials

## CHAPTER 3 BOW CRANE SYSTEM

### Section I. Description and data

**3-1 Description.** The bow crane is a hydraulically operated articulating boom crane with a maximum outreach of approximately 47 feet. Maximum lift capacity at this extension is 2,425 pounds. Maximum lift is 41,895 pounds at an outreach of only 6 feet, 7 inches.

The crane is corrosion-proof and suitable for operation in a marine environment. The crane has five major assemblies: crane body, inner boom, outer boom, mounting base, and hydraulic control unit. When not in daily use, bow crane must be placed in its traveling (stowed) configuration (Figure 3-1). The crane body is a steel casting with the upper part being a closed welded box design through which hydraulic hoses are routed to inner and outer boom actuating cylinders. Inner and outer boom assemblies are positioned, as required, by extending or retracting hydraulic actuators. A winch assembly is mounted on top of the primary element of the boom for retrieving loads of 10,000 pounds or less. To winch loads greater than 10,000 pounds, the sheave block must be installed on the end of the outer boom.

Operator controls for the crane (Figure 3-2 for Barge 1 and Figure 3-3 for Barges 2 and 3) are on the forward side of the deckhouse top. They include five control levers for controlling crane movement, a START/STOP control switch, and a key lock for the anti-2-block control system. The START/STOP control switch and anti-2-block key lock are in a watertight storage box aft of the crane control levers. Another START/STOP control switch, primarily for emergency use, is on the weather deck forward bulkhead.

Hydraulic pressure for the bow crane is supplied by a hydraulic power unit in void 1 port. A 30 Hp electric motor drives the pump to produce 3600 psi of hydraulic pressure. A motor controller in void 1 (Figure 3-4), starts and stops the local unit and supplies power to the two remote START/STOP control switches. The motor controller requires 440 Vac, 3 phase, 60 Hz power. Bow crane system installation is shown on drawings listed in Appendix A.

**3-2 Capabilities.** The bow crane is primarily used for launching and retrieving the barge's work boat and for loading and unloading the shore winch. It is also used to move barge batteries, located on top of the deckhouse, and other equipment and supplies.

#### CAUTION

The crane's control valve system has built-in pressure relief valves that protect the various hydraulic components in the event the crane is overloaded. In case of overload, the boom will begin to drop at a slow rate. Correct this condition before continuing the lifting operation.

#### NOTE

A Non-Commissioned-Officer-in-Charge (NCOIC) must be present to direct operator in crane movement of material. Position the NCOIC so that he can direct crane operation with a standard system of hand signals (Figure 3-5). To avoid any confusion during lifting operation, only the NCOIC gives these signals. The crane operator and NCOIC should check with each other before using hand signals, to be sure that each person clearly understands all signals. As an alternate method, the NCOIC and crane operator can use walkie-talkies.

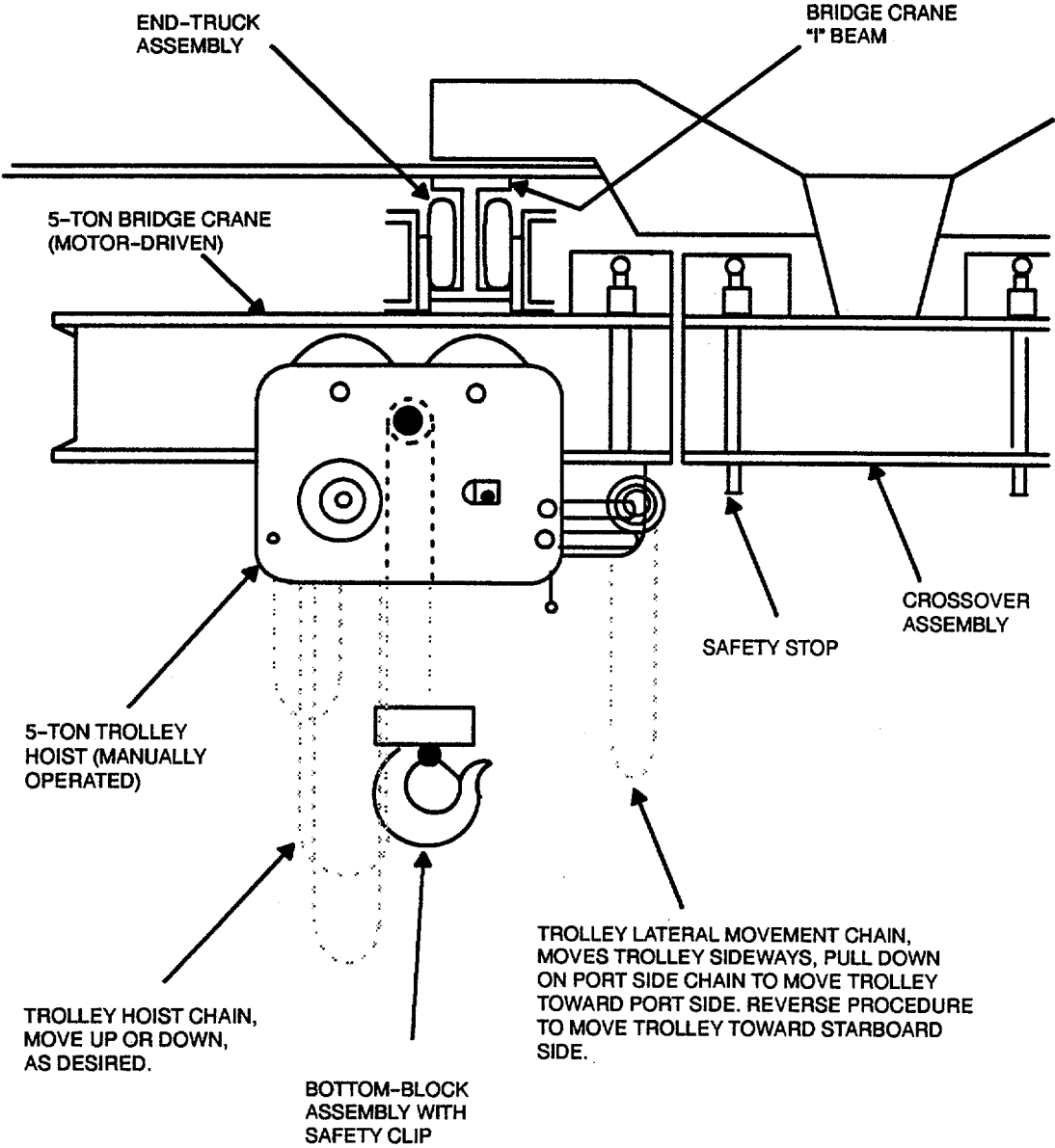


Figure 3-1. Bow Crane in Traveling (Stowed) Position  
3-2

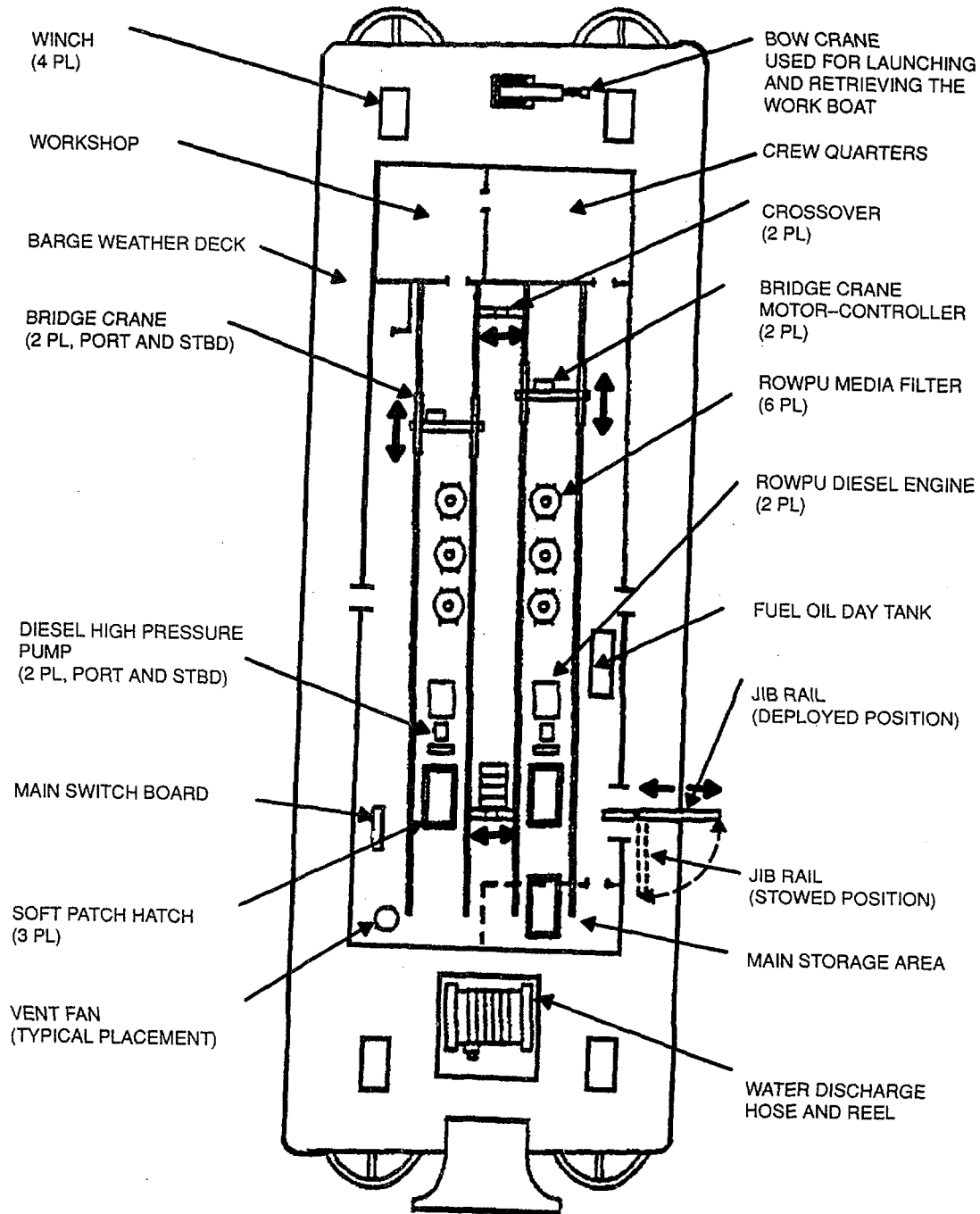


Figure 3-2. Bow Crane Operating Controls (Barge 1)



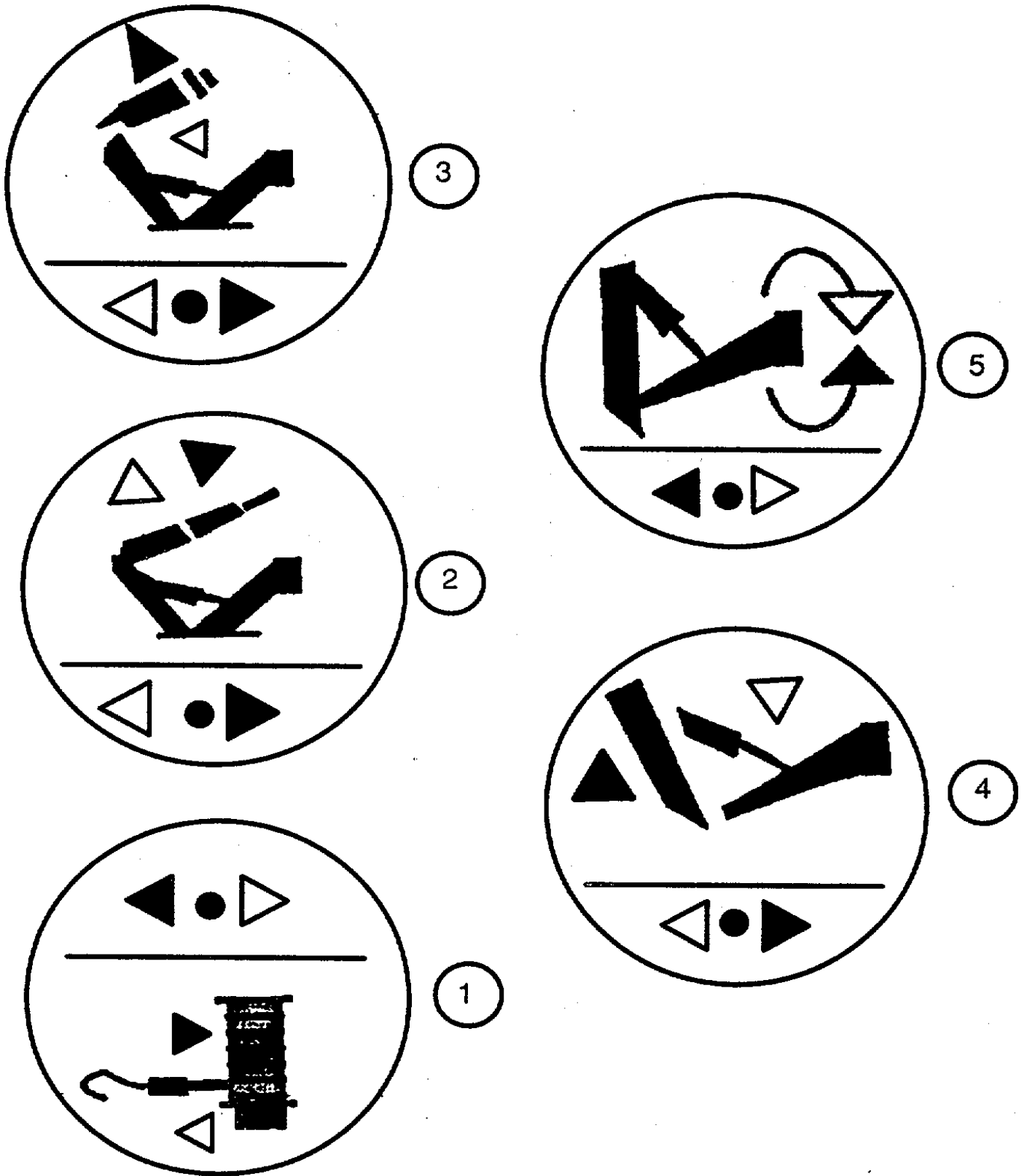


Figure 3-3. Bow Crane Operating Controls (Barges 2 and 3)

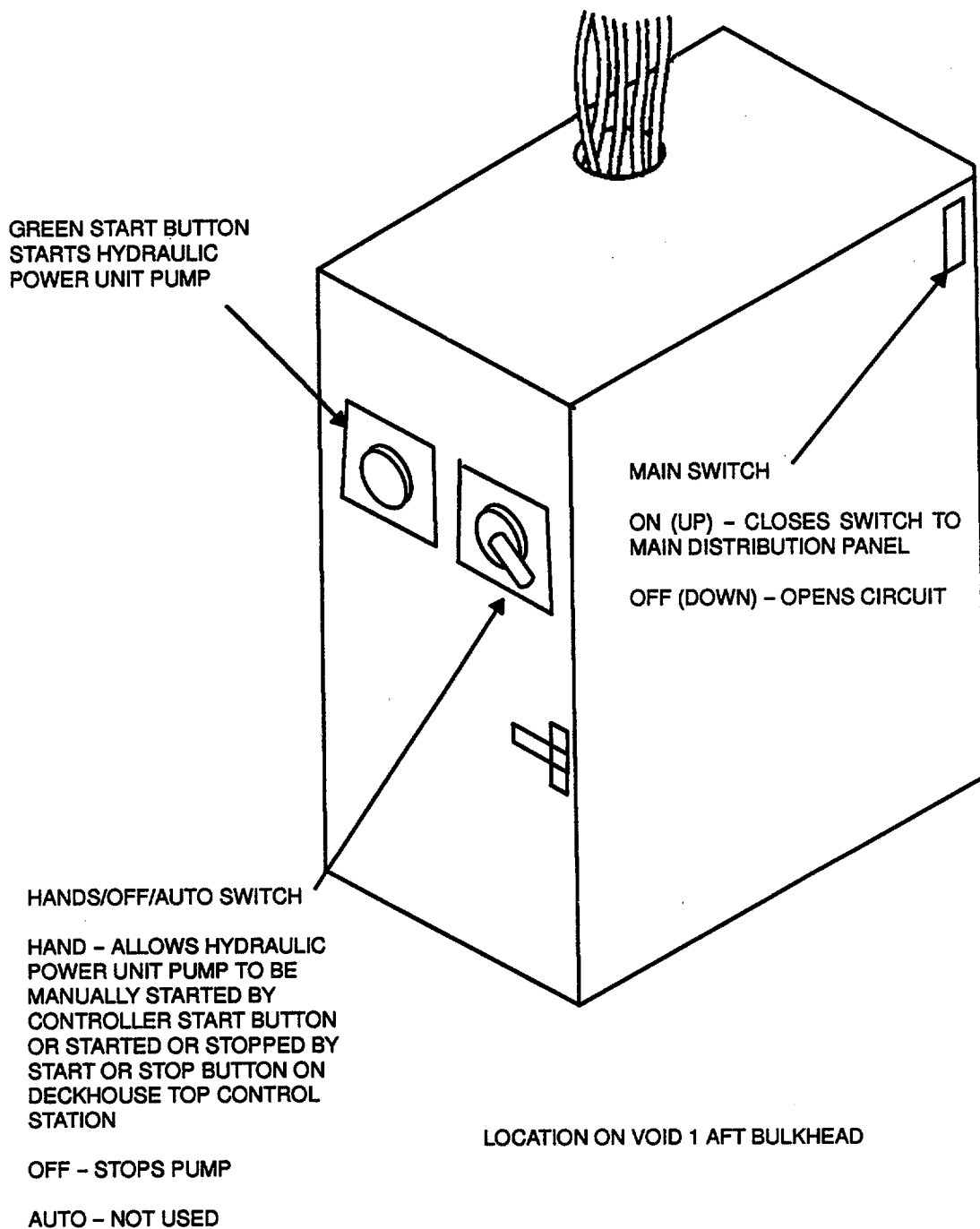
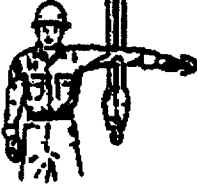



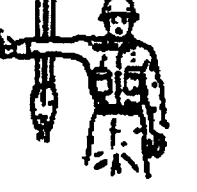
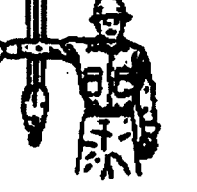


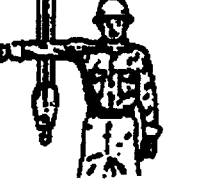





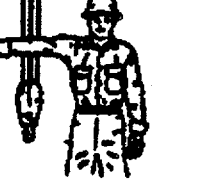







Figure 3-4. Hydraulic Power Unit Motor Controller

 <p>EMERGENCY STOP</p>	 <p>STOP</p>	 <p>DOG EVERYTHING</p>	 <p>MOVE SLOWLY</p>
 <p>RAISE BOOM</p>	 <p>LOWER BOOM</p>	 <p>USE MAIN HOIST. TAP FIST ON HEAD</p>	 <p>USE WHIP LINE. TAP ELBOW WITH ONE HAND</p>
 <p>SWING</p>	 <p>TRAVEL. MAKE PUSHING MOTION</p>	 <p>TRAVEL. (ONE TRACK) LOCK THE TRACK ON SIDE INDICATED BY RAISED FIST. TRAVEL OPPOSITE TRACK IN DIRECTION INDICATED BY CIRCULAR MOTION OF OTHER FIST. (FOR CRAWLER CRANES ONLY)</p>	 <p>TRAVEL. (BOTH TRACKS) USE BOTH FIST. IN FRONT OF BODY, MAKING A CIRCULAR MOTION, ABOUT EACH OTHER, INDICATING DIRECTION OF TRAVEL. FORWARD OR BACKWARD. (FOR CRAWLER CRANES ONLY)</p>
 <p>HOIST</p>	 <p>LOWER</p>	 <p>RAISE THE BOOM AND LOWER THE LOAD. THUMB POINTING UP, FLEX FINGERS IN AND OUT.</p>	 <p>LOWER THE BOOM AND RAISE THE LOAD. THUMB POINTING DOWN, FLEX FINGERS IN AND OUT.</p>
 <p>RETRACT BOOM. (TELESCOPING BOOMS) ONE FIST THUMB POINTING OUTWARD AND HEEL OF FIST TAPPING CHEST</p>	 <p>EXTEND BOOM. (TELESCOPING BOOMS) ONE FIST IN FRONT OF CHEST WITH THUMBS TAPPING CHEST.</p>	 <p>EXTEND BOOM. (TELESCOPING BOOMS) BOTH FISTS IN FRONT OF BODY WITH THUMBS POINTING OUTWARD.</p>	 <p>RETRACT BOOM. (TELESCOPING BOOM) BOTH FISTS IN FRONT OF BODY WITH THUMBS POINTING TOWARD EACH OTHER</p>

NOTE: USE ARMY STANDARD HAND SIGNALS TO DIRECT CRANE OPERATOR IN MOVEMENT OF CRANE AND WORKBOAT.

Figure 3-5. Standard Military Hand Signals

**3-3 Limitations**

- a. Load limitations and performance characteristics are shown in Table 3-1. Boom loads given are the maximum permissible and must include the weight of any support equipment used (i.e., cradles, pallets, slings, etc.).
- b. Winch loads without sheave block must not exceed 10,000 pounds. Winch loads with sheave block installed must not exceed 20,000 pounds.
- c. Do not use bow crane for lifting workboat or shore winch if barge rolling angle is greater than 5 degrees.

**3-4 Performance characteristics.** Bow crane is intended for service on the deck of watercraft and is especially suited for operation in a marine environment. It provides sufficient lift capability (Table 3-1) for deploying and retrieving the barge's workboat and shore winch.

**3-5 Equipment specifications.** The bow crane is designed in accordance with German crane code DIN 15018, crane group B3, and corresponds to British standard 2573. These specifications incorporate safety features that decrease the chance of fracture during normal use. Technical data for the bow crane and anti-2-block device is in the Morgan Crane Company's Operator Manual, in Appendix B.

- a. Crane, hydraulic

Supplier	Morgan Crane Co., Inc. 1009e Chestnut Avenue Santa Ana, CA 92701
Builder	FASSI Crane, Gmbh
Model	F10.3
Quantity	1

- b. Hydraulic power unit w/motor controller

Supplier	Morgan Crane Co., Inc.
Part no.	F10.3F(M)
Motor controller	30 Hp, 440 Vac, 3 ph, 60 Hz
Output	3600 psi hydraulic pressure
Quantity	1

- c. Anti-2-block device

Manufacturer	Krueger Crane Systems, Inc.
CAGEC	58584
Part no.	9009-HCMC
Power	24 Vdc
Quantity	1

- d. START/STOP control switches

Manufacturer	Square D Co.
CAGEC	Milwaukee Manufacturing Plant
Part no.	81487
Type	BW240
Quantity	Class 9001, NEMA Type 4
	2

**3-6 Items furnished**

**3-6.1** Components installed as part of the bow crane are listed on the parts list of drawings referenced in Appendix A and in the Components of End Item List in TM 55-1930-209-14&P-20.

**3-6.2** Common and bulk items onboard are listed in the Expendable Supplies and Materials List in TM 55-1930-209-14&P-20.

Table 3-1. Bow Crane Performance Characteristics and Load Limitations with Barge on an Even Keel\*

<u>Extension</u>	<u>Maximum Load</u>
6 ft 7 in.	41,895 lb
8 ft 8 in.	33,075 lb
10 ft 6 in.	27,562 lb
15 ft 3 in.	19,624 lb
19 ft 10 in.	14,773 lb
24 ft 9 in.	11,466 lb
30 ft	8,820 lb
35 ft 7 in.	6,835 lb
41 ft 2 in.	4,630 lb
46 ft 9 in.	2,425 lb

\* If barge is rolling 5 degrees or more, these maximum loads are severely reduced.

**WARNING**

Do not use bow crane for moving workboat or shore winch when barge is rolling 5 degrees or more.

**3-6.3** Repair parts and special tools onboard are listed in the Repair Parts and Special Tools List in TM 551930-209-14&P-18.

**3-7** **Items required but not furnished.** All required items are furnished.

**3-8** **Tools and test equipment.** Use existing tools and equipment onboard. A complete list of tools and test equipment onboard is in the Tools and Test Equipment List in TM 55-1930-209-14&P-18.

**Section II. Description of operation**

**3-9** **General.** The hydraulically operated bow crane is used to launch and retrieve the barge's workboat and to load and unload the shore winch. When not in daily use, place bow crane in traveling configuration (Figure 3-1).

**3-9.1** **Workboat.** This workboat weighs 6,590 pounds (wet, w/messenger line reel mount and line) and is approximately 26 feet long. This length includes an aluminum tubular protective frame around the outboard drive to protect it from damage. When not in daily use, the workboat is stowed in its cradle on top of the deckhouse. Three strap winches on each side hold the workboat in its storage cradle. These straps are hooked into three eyes on each side of the boat just under the rubber bumper. The boat is launched from storage using a three-point suspension harness attached to specially constructed points on the workboat. The other end of the suspension harness is securely attached to the bow crane hoisting hook.

After the workboat lifting harness is securely in place on the crane hook, the boat is picked up and lowered into the water by controlling the crane with its control panel levers (Figure 3-2 for Barge 1 and Figure 3-3 for Barges 2 and 3). Unload and retrieve workboat on the barge starboard side to preclude swinging the loaded boom over the crane operator position.

**3-9.2 Bow crane.** The bow crane moves the shore winch from its storage position forward of the bow crane base into an LCM-8, or similar capacity vessel, for movement to the beach. This operation, with the exceptions noted below, is very similar to moving the workboat to and from its cradle. This 20-ton capacity winch (dry weight 5.5 tons) is secured to the forward weatherdeck on six steel pads with two steel bolts per pad. The bow crane hooks onto the shore winch with a special lifting sling and takes up slack. Remove the 12 bolts and the bow crane lifts the shore winch off its pedestals. Extend the crane boom to move the shore winch forward to a waiting LCM-8, or similar capacity vessel, which is laying across the barge's bow. To provide sufficient maneuvering area for the LCM-8 to come in across the barge bow, unload before deploying the two bow anchors. The LCM-8 runs aground on the beach and lowers its bow ramp. The shore unit uses a rough terrain forklift to pick up the shore winch from the LCM-8 hold and position it ashore. To retrieve the shore winch, reverse the procedures.

### Section III. Operating instructions

**3-10 Operating controls.** Bow crane operating controls are on the forward side of the deckhouse top. The hydraulic power system controls are in void 1.

**3-10.1** Primary crane operating controls are five control levers for controlling crane movement (Figure 3-2 for Barge 1 and Figure 3-3 for Barges 2 and 3). This control valve system is factory sealed and is especially designed for use in a marine environment. It has a built-in pressure relief valve, which prevents damage to the crane from overloading; a suction valve, which ensures a continuous flow of hydraulic fluid; and a constant flow valve, which regulates and maintains the required system hydraulic pressure.

There is a START/STOP control station (Figure 3-6) for stopping and starting the crane hydraulic unit and an anti-2-block control panel in a watertight storage box aft of the control levers. Another START/STOP control station, primarily for emergency use, is on the weatherdeck forward bulkhead.

**3-10.2** The hydraulic power unit in void 1 portside, powered by a 30 Hp motor, produces 3600 psi of hydraulic pressure for operating the crane. A motor controller (Figure 3-4) in void 1 starts and stops the hydraulic power unit locally and supplies power to the two remote START/STOP control switches. The pump motor controller requires 440 Vac, 3 phase, 60 cycle power.

### 3-11 Bow crane prestart procedures

- a. Check barge maintenance log on bow crane and associated hydraulic system. Make sure there are no discrepancies that would prohibit bow crane operation.
- b. Make sure switchboard circuit breaker P16 is closed (ON).

#### CAUTION

Due to high pressure in hydraulic system, do NOT operate crane with any visible leaks. Repair crane prior to use. Correct leaks in flexible hose, hardpiping, or joints. Do not confuse seepage around hydraulic packing on actuator arms with leaks. A small amount of seepage is acceptable.

- c. In void 1, visually inspect hydraulic pump and motor and hard piping of crane hydraulic system for leaks or damage. Do not use system until such leaks have been repaired.
- d. Remove filler cap on hydraulic tank and make sure fluid level is within 1 inch of bottom of filler neck. If fluid is below this level, add hydraulic fluid before using crane. Screw cap on tightly before starting hydraulic pump.
- e. In void 1, push up on main switch on hydraulic power unit motor controller (aft bulkhead) and set HAND/OFF/AUTO switch to HAND position (Figure 3-4).

#### NOTE

Hydraulic power unit pump is started locally by pushing green START button on motor controller or pushing blank START button on START/STOP control station on deckhouse top. If bow crane has not been used recently, start pump by pressing green motor controller START button and make sure pump starts.

- f. On forward weather deck, visually check exposed hardpiping and flexible hydraulic lines for cracks or leaks. Check crane base (Figure 3-7) to ensure that it is secure and make sure forward weatherdeck is clear of any material that might obstruct bow crane movement. Inspect hold-down bolts for damage and check for tightness. If tightening is required, tighten to 350 foot pounds.

**CAUTION**

The anti-2-block horn must be activated. This system is an emergency switch that prevents the hook block from hitting the boom nose.

- g. On deckhouse top, inside watertight control box, make sure anti-2-block system HORN ON/OFF switch (Figure 3-4) is ON. Make sure that warning light is OFF.
- h. Push START button on START/STOP control station inside watertight control box. High pitched whine of hydraulic pump indicates that crane is ready for use.

**WARNING**

S Sheave block must be installed before using bow crane winch to lift loads of more than 10,000 lb.

Maximum lift for crane winch with sheave block installed must not exceed 20,000 lb.

- i. Install sheave block when using bow crane winch to lift loads in excess of 10,000 lb.
- j. Using crane control levers (Figure 3-2 for Barge 1 and Figure 3-3 for Barges 2 and 3), deploy crane from traveling position and exercise crane, without load, as follows: Extend all booms to their maximum length and slew crane around in one complete circle. During these movements, check for any change in pitch of hydraulic pump noise and any jerky, sticking or uneven movements of any part of the crane. Note such symptoms and check crane carefully before using.

**3-12 Bow crane procedures for deploying workboat**

**WARNING**

Non-Commissioned-Officer-in-Charge (NCOIC) must control boat movement by supervising crane operator and crew members on control lines. Crane operator cannot see all portions of workboat movement. To control crane movement, NCOIC uses hand signals (Figure 3-5) or walkie-talkies to direct crane operator.

- a. Turn crane counterclockwise and extend boom over center of workboat in its cradle on deckhouse top.
- b. Make sure two seawater drain plugs on bottom of workboat hull are installed with properly fitting gaskets. Make sure plugs and gaskets are tight.
- c. Take boat lifting harness from storage in cabin and attach to three lifting points on workboat; two eyes on bottom of stern mooring bitts and one eye under cabin floor. Open aft cabin top hatch to allow front lifting harness to reach crane hook without damaging cabin top.
- d. Place lifting harness ring in crane winch hook and use crane winch to take up slack in harness.
- e. Attach at least two control lines to boat to prevent swinging, twisting, and yawing when crane lifts boat from cradle.
- f. Check crane winch hook and harness alignment to make sure it will lift boat vertically.
- g. When ready, release tension on three tiedown straps (Figure 3-8) on each side of cradle and station crewmembers on control lines. Using crane winch, lift boat about 6 inches vertically from cradle.

**WARNING**

If anti-2-block horn sounds while operating crane, stop crane and make sure WARNING light on anti-2-block is lit. Position HORN ON/OFF switch to OFF. Then troubleshoot as discussed in manufacturer's service manual in Appendix B.

**CAUTION**

Bow crane's control valve system has built-in pressure relief valves that protect various hydraulic components in the event the crane is overloaded. In case of overload, boom begins to drop at a slow rate. Correct overload condition before continuing lifting operation.

- h. When ready, release tension on three tiedown straps on each side of cradle and station crewmembers on control lines. Using crane winch, lift boat about 6 inches vertically from cradle.
- i. If all is under control, unhook three tiedown straps on each side of cradle.

**WARNINGS**

- Crewmembers and workboat must never touch VHF/FM antenna mounted outboard of starboard railing. Antenna may contain high voltages that will seriously injure personnel.

In moving workboat with crane, workboat and crane must never pass over

- crane operator or other crewmembers.
- j. Lift boat vertically, using winch, to clear all items on deckhouse top and slew crane in a counterclockwise direction to move boat over starboard side.
  - k. Keep control lines tight to control boat during movement.
  - l. Slowly lower boat into water, keeping harness taut to maintain control of boat until it is secured to the barge.
  - m. Lower crane winch hook, remove lifting harness ring from hook and from three eyes on workboat. Store harness under port passenger seat in workboat cabin. Free control lines and store with lifting harness.

**NOTE**

If bow crane is left in unfolded position, apply a light coat of grease or hydraulic fluid to all exposed chromium plated parts of crane hydraulic cylinder system. Wipe this coating clean before using the crane. If crane must be left unfolded, exercise it daily.

**3-13 Workboat recovery procedures**

- a. To recover the workboat, reverse the deployment procedures provided above.
- b. Prior to starting recovery, perform all after operation checks and inspections on workboat as discussed in paragraph 2-16, TM 55-1930-209-14&P-17, and complete any scheduled maintenance services as indicated in paragraph 2-23 in TM 55-1930-209-14&P-17.
- c. Raise outboard drive to full UP (TILT) position.
- d. Fold down radio antenna, spotlight, and anchor light mast flat with cabin top.
- e. When boat is in its cradle and the three tiedown straps on each side have been fastened to boat and pulled tight, remove two seawater drain plugs and store them under operator's seat in the cabin.
- f. Remove marine radio and depthfinder and store in barge dayroom. Turn spotlight face down toward cabin roof. Store diving ladder and life ring buoy with rope and light in cabin. Secure cabin.



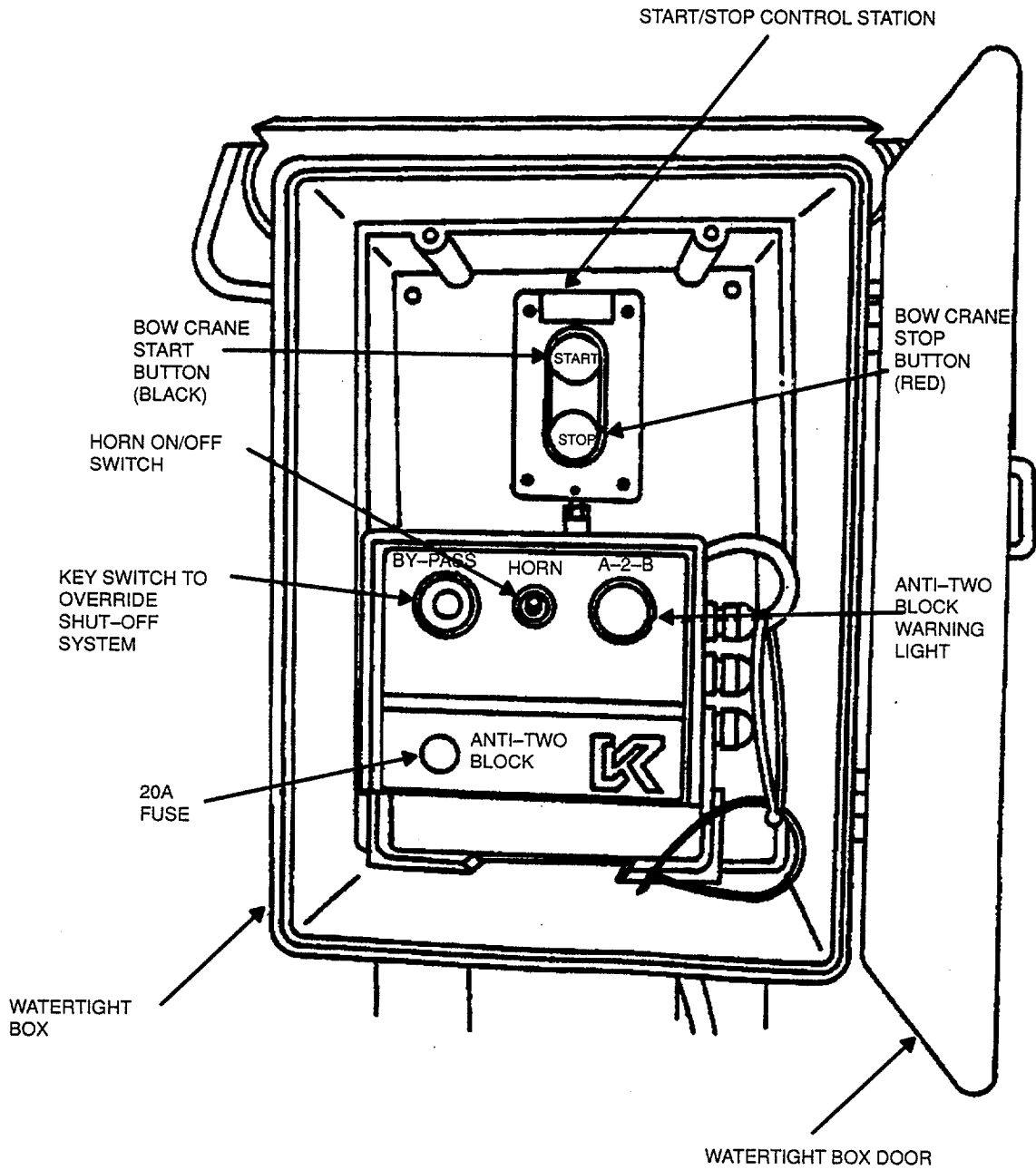


Figure 3-6. START/STOP Control Station and Anti-2-Block Control Box on Deskhouse Top

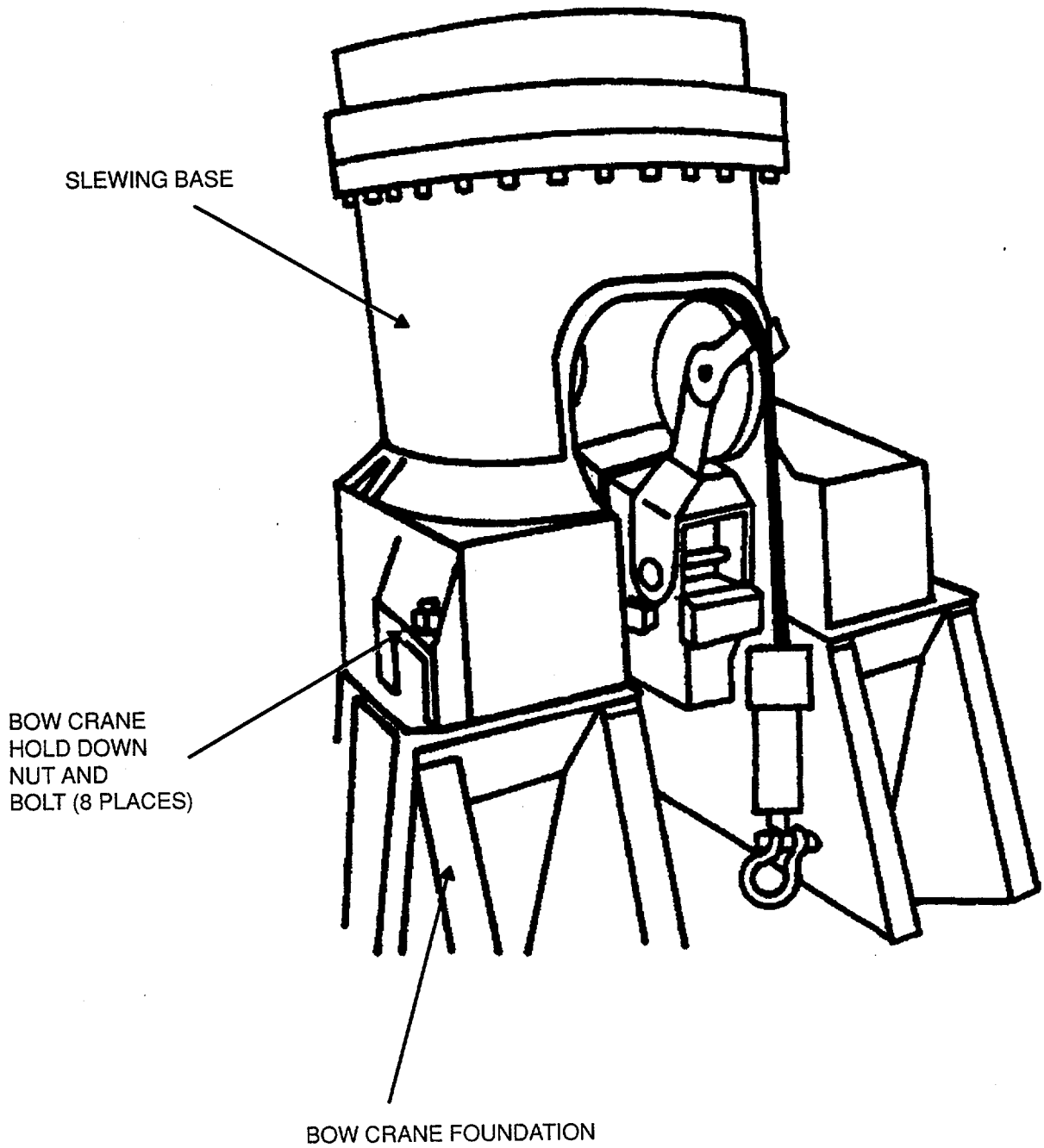


Figure 3-7. Bow Crane Base

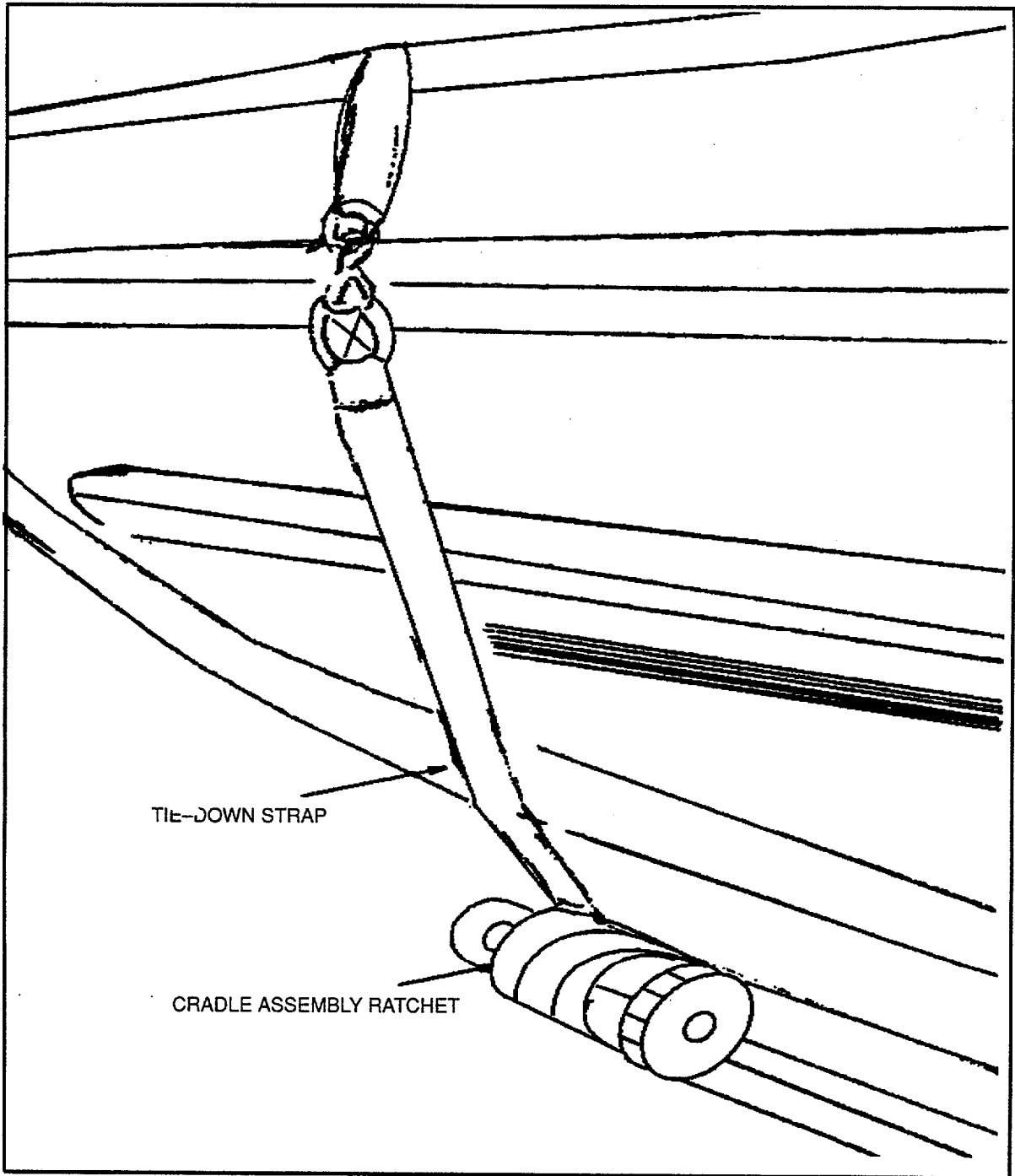


Figure 3-8. Workboat Cradle Tie-Down with Ratchet

**3-14 Bow crane shutdown procedures****CAUTION**

To avoid damage to bow crane and its hydraulic control system, always return bow crane to its traveling (folded) position for storage and travel.

- a. Draw back extension boom to its innermost position.
- b. Fold outer boom in position under inner boom.
- c. Swing lower boom into pedestal tunnel and pull up until pulley wheel touches pedestal (Figure 3-1).
- d. In watertight control box,
  - (1) Press STOP button on START/STOP control station (Figure 3-6).
  - (2) Set anti-2-block HORN ON/OFF switch to OFF (Figure 3-6).
  - (3) Close and secure box.
- e. In void 1, on hydraulic pump controller, turn HAND/OFF/AUTO (Figure 3-4) switch to OFF and pull down top switch.

**NOTE**

If bow crane is left in unfolded position, apply a light coat of grease or hydraulic fluid to all exposed chromium plated parts of crane hydraulic cylinders. Wipe this coating clean before using the crane. If crane must be left in this position, exercise it daily.

- f. After shutting down, perform after operation checks listed in Appendix C.

**3-15 Operation under extreme conditions.** Operating the bow crane in extreme hot or cold temperatures creates a special problem with lubricants. These temperatures may cause the crane to raise, lower, or turn at a slower or faster rate.

Problems occur especially during operation in extremely cold temperatures because of greater pressure on hydraulic seals. Check these seals frequently during cold weather operation.

**Section IV. Maintenance instructions**

**3-16 General.** When bow crane components are inspected, give special attention to pulleys, lifting hooks, slings, and other load-bearing components. Also, carefully check hydraulic lines, their connections, and hydraulic seals. Give particular attention to components that show evidence of hydraulic fluid leakage or severe corrosion. Keep inspection reports and records on all hoist equipment. Required maintenance forms and records are explained in DA PAM 738750.

Due to bow crane strength considerations, repair or replace parts or components of the crane with items the same as the original construction. Use materials in accordance with the drawings referenced in Appendix A.

**CAUTION**

Notify IDS/IGS maintenance unit after repairing or replacing parts on any slings used on the barge. They must proof test the repaired item in accordance with American Society of Testing and Material Specification A 391-65 and US Army procedures. In addition, all slings and lifting devices must be proof tested to these standards every 12 months. Record and maintain certification of all proof testing.

**3-16.1 Maintenance concept**

**3-16.1.1** Unit level and IDS/IGS maintenance on the bow crane is performed onboard by barge crewmembers whenever possible.

**3-16.1.2** Any IDS/IGS maintenance beyond capability of crewmembers is provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

**3-16.1.3** Intermediate support maintenance is accomplished by replacing components or major end items.

**3-16.1.4** Unless other intermediate support procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area. Components to be disposed of are processed by this unit.

**3-16.1.5** Maintenance Allocation Chart (MAC) is in Appendix C in TM 55-1930-209-14&P-18. For maintenance of other equipment onboard, consult appropriate manual.

**3-16.2 Maintenance instructions.** Maintenance instructions are presented in paragraph 3-18, Troubleshooting procedures.

**3-17 Preventive maintenance checks and services.** See TM 55-1930-209-14&P-13 for preventive maintenance checks and services for handling equipment. See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all systems on the ROWPU Barge.

**3-18 Troubleshooting**

- a. Troubleshoot bow crane system as directed in Table 3-2.
- b. Troubleshoot bow crane as given in suggestions of Fault Finding list on page 9 in FASSI manual, Terms of Warranty Use and Maintenance in Appendix B.
- c. Troubleshoot anti-2-block system according to Troubleshooting List in the Krueger Crane Systems manual, System Mark H Troubleshooting List, in Appendix B.

*Table 3-2. Bow Crane Troubleshooting*

<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
1. Hydraulic power unit does-not start when START button is pushed	a. Switchboard circuit breaker P16 open (OFF)	a. Close circuit breaker
	b. HAND/OFF/AUTO switch on motor controller not properly set	b. Turn switch to HAND
	c. START button inoperative	c. Replace button
	d. Loose or broken electrical connection at hydraulic power unit controls, located in void 1	d. Inspect and troubleshoot bow crane electrical system. Repair as necessary.
2. Booms drop continuously with or without load, control handle in neutral	a. Internal leakage in overflow valve	a. Replace overflow valve
	b. Load to be transported exceeds crane lifting capacity	b. Stop operation, decrease load to within crane's capacity
3. Crane will not lift load	a. Hydraulic system M21	a. Remove and replace pump with like item
	b. System hydraulic pressure too low	b. Check system hydraulic pressure. If lower than 3000 psi, adjust main overflow valve to correct pressure

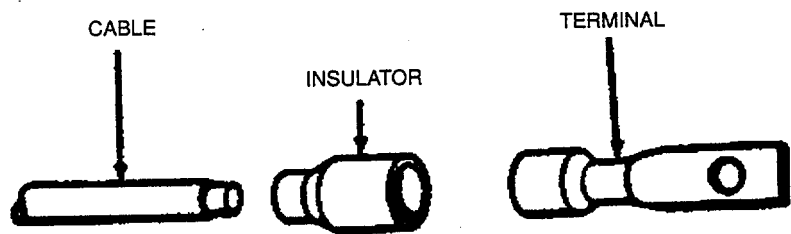
<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
4. Anti-2-block system malfunctioning	c. Internal leakage in activating cylinder	c. Remove and replace activating cylinder
b. System malfunctioning	a. Bad fuse in power circuit	a. Replace fuse
	b. Troubleshoot system	

**3-19 Maintenance procedures**

**3-19.1 General.** Maintenance procedures for the bow crane system follow. Repair concerns lubricating, disassembling, repairing, replacing, and reassembling equipment using repair parts listed in TM 55-1930209-14&P-18. No special tools are required. A list of tools and test equipment is in TM 551930-209-14&P-18.

When performing maintenance, be sure to observe safety precautions in this manual, the manufacturers' manual/instructions, and the following general shop practices:

- a. Always use new seals and gaskets, same as original, when reassembling components that have been disassembled for repair. Carefully install so as not to damage during assembly.
- b. When replacing gaskets, make sure all mating surfaces are clean and free of old gasket material, adhesive oil, or grease. These precautions will ensure a leakproof joint.
- c. When replacing O-ring seals, make sure all surfaces are thoroughly clean and free of grit, dirt, and foreign material. Prior to installation, apply a thin coat of protective lubricant to O-ring for ease of assembly. Protect the O-ring by applying tape over threads, sharp corners, or edges.
- d. When replacing or repairing electrical components, follow proper procedures for soldering or crimping connections. Check all groundings. Check that all current-carrying members are properly insulated to avoid short circuiting. Check for abrasion and chafed insulation on wires and cables. Repair with tape or replace as necessary.
- e. When replacing bearings, follow procedures in TM 9-214. Lubricate bearings with recommended lubricant. When installing bearing on shafts, apply pressure to inner race. When installing bearings in housing, apply pressure to outer race.
- f. Weld in accordance with TM 9-237 and MIL-STD-1261. Welding can be used to repair cracks and breaks in steel parts such as bracket, panels, and light framework. Weld only when replacement parts are not available because of a chance of failure later.



- (1) Strip cable insulation equal to depth of terminal well.
- (2) Slide insulator, if used, over cable.
- (3) Insert cable into terminal well and crimp.
- (4) Slide insulator, if used, over crimped end of terminal.

Figure 3-9. Replacement of Crimped Terminals

**WARNING**

Be sure that electric power is off before performing maintenance. Observe all safety precautions in this manual and manufacturers' manuals and instructions.

**NOTE**

Due to this vessel's mission and crew capabilities, maintenance normally assigned to organizational level or higher echelons may be assigned to the crew by the Bargemaster.

**3-19.2 Bow crane system.** This paragraph describes lubrication and repair of the bow crane system involving repair parts listed in TM 55-1930-209-14&P-1 8.

**WARNING**

Shut down bow crane system before attempting any repair. Be sure to open circuit breakers. Redtag circuit breakers with: "WARNING-DO NOT ACTIVATE. REPAIRS BEING MADE."

**3-19.2.1 Lubrication.** Lubricate bow crane as given in the FASSI manual, Terms of Warranty Use and Maintenance in Appendix B. Lubricate winch as instructed on page 6.

**3-19.2.2 Repair or replacement of system components****3-19.2.2.1 Bow crane****3-19.2.2.1.1 Cleaning and inspection**

- a. Wipe clean with rag dampened with soapy water or with approved solvent to remove grease. Wipe dry with clean cloth.
- b. Visually inspect bow crane for evidence of distortion, broken welds, cracks, corrosion, or damage. Remove corrosion and touch up painted parts according to TB 43-0144.
- c. Visually inspect structural parts (i.e., crane hold-down bolts, pulley lock pins, etc.) for signs of warp or excessive movement of joints or connections.
- d. Check all inner and outer boom attachment bolts for looseness or damage. Tighten as necessary.
- e. Visually inspect hook for deformation, heavy nicks, cracks, wear, damage, or malfunctioning latch and hook attachment. Replace hook if necessary.
- f. Visually inspect winch for damage. Extend winch cable to full length and carefully inspect wire rope for reduction of rope diameter below nominal value according to TB 43-0142. Check for broken or worn wires, attachment to drum, and other damage. Replace wire rope if necessary.
- g. Visually inspect lubrication points on page 8 of the FASSI manual, Terms of Warranty Use and Maintenance in Appendix B.
- h. Visually inspect hydraulic hose connections for leaks. Tighten connections or replace hoses if necessary.
- i. Check all slings used to hoist workboat for broken or frayed wires, smooth or worn spots, and corrosion. Remove slings with broken or frayed wires from service immediately. Inspect smooth or worn spots to determine cause of condition and corrective action to be taken. If no further action is required, coat spots with a thin coat of oil.

**3-19.2.2.1.2 Test.** Direct Support must perform and record an annual proof and function test and safety inspection of bow crane and workboat sling in accordance with TB 43-0142.

**3-19.2.2.1.3 Repair.** Repair bow crane in accordance with the exploded illustrations in the FASSI Spare Parts Catalog in Appendix B.

### 3-19.2.2.2 Bow crane anti-2-block control panel

#### WARNING

Make sure anti-2-block control panel is electrically dead before attempting maintenance. Be sure to remove fuses from fuse box 9P14 near 24 Vdc power panel in workshop. Redtag switchboard circuit breaker P16 and fuse box 9P14, after removing fuses, with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."

#### 3-19.2.2.2.1 Cleaning and inspection

#### WARNING

Make sure anti-2-block control panel is electrically dead by removing fuses from fuse box 9P14 near 24 Vdc power panel. Redtag fuse box with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."

- a. Wipe clean exterior of storage box with clean rag. Open storage box door and vacuum clean or clean inside with electrician's brush. Avoid using solvents for cleaning inside of storage box. Solvents leave greasy film that may reduce electrical conductivity of components.
- b. Visually check for indications of burns, loose connections, or damage. Clean corrosion from terminals, tighten loose connections, and repair damage.

#### 3-19.2.2.2.2 Test

With fuse box 9P14 fuses installed and 24 Vdc power panel power ON, check input voltage across anti-2-block control panel terminal board terminals TB1-1 and TB1-2. If voltage is not 24 Vdc, replace input wires to anti-2-block control panel. If voltage is 24 Vdc, troubleshoot anti-2-block control panel as given in the Krueger Crane Systems manual, Mark H Troubleshooting List, in Appendix B and/or as given in steps (1) thru (5). Replace faulty wires or components as necessary.

- (1) With bow crane hook lowered, check voltage across terminal board terminals TB1-3 and TB1-2. If voltage is 24 Vdc, go to step (2). If voltage is not 24 Vdc, replace fuse and/or wires from TB1 to fuse in anti-2-block control panel.
- (2) Check voltage across terminals TB1-2 and TB1-6. If voltage is 24 Vdc, go to step (3). If voltage is not 24 Vdc, replace anti-2-block switch and/or connecting wires.
- (3) Turn horn switch on. Raise hook to trip anti-2-block switch and to energize horn and warning light. If neither was activated, check voltage across terminals TB1 -2 and TB1-4. If voltage is 24 Vac, go to step (4). If voltage is not 24 Vac, replace printed circuit dl relay and/or wire in anti-2-block control panel.
- (4) Check A-2-B, warning light, horn ON/OFF switch, and horn for fault. If fault exists, replace faulty part. If no fault exists, go to step (5).
- (5) Disconnect wires to solenoid in anti-2-block control panel. Make sure that bow crane boom cannot be extended and lowered and that hoist cannot be raised. Then connect a ground and a hot wire to the solenoid. If bow crane does not function through all modes of operation, replace solenoid. If bow crane still does not operate normally, troubleshoot bow crane as given in Table 3-2.



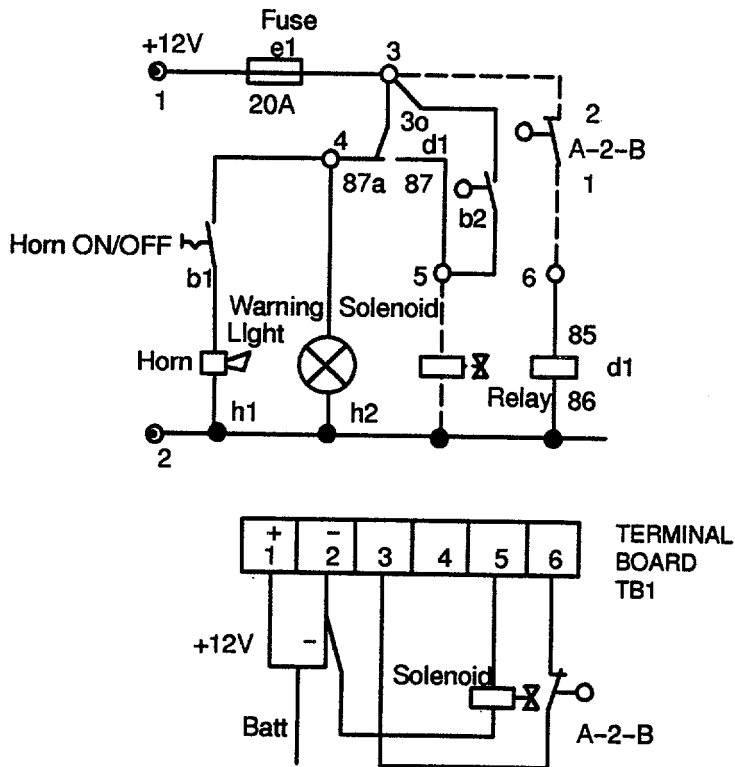
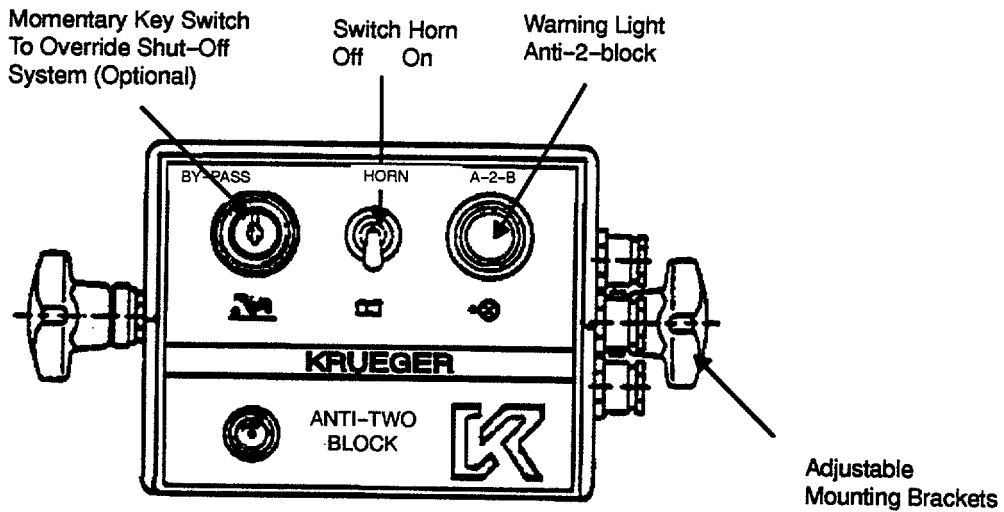


Figure 3-10. Anti-2-Block Control Panel

**3-19.2.2.2.3 Repair**

- a. Anti-2-block system control panel fuse replacement.
  - (1) Above 24 Vdc power panel in workshop, remove clips and cover from anti-2-block fuse block and remove fuse.
  - (2) On anti-2-block control panel in watertight box on deckhouse top, remove fuse holder (Figure 3-6).
  - (3) Remove blown fuse and install new 20 Amp fuse in holder.
  - (4) Reinstall fuse holder in anti-2-block control panel.
  - (5) Replace fuse in fuse block in workshop.
- b. Anti-2-block system warning light replacement.
  - (1) Remove lens (Figure 3-6).
  - (2) Remove bad bulb and install new bulb.
  - (3) Reinstall lens.
- c. Fuse box 9P14 fuse replacement.
  - (1) Above 24 Vdc power panel in workshop, release two clips holding cover on fuse box 9P14 and remove cover.
  - (2) Remove blown fuse and replace with new fuse.
  - (3) Close cover and secure with clips.

**3-19.2.2.2.4 Switch replacement**

- a. Removal.

**WARNING**

Make sure anti-2-block control panel is electrically dead before replacing switch by removing fuses from fuse box 9P14. Redtag fuse box with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE." (1) Open storage box cover.

- (2) Tag and disconnect wires to control panel.
- (3) Remove mounting hardware.
- (4) Remove control panel.

- b. Installation. Install control panel in reverse order of removal. Check operationally after installation.

**3-19.2.2.3 Bow crane remote Station 1 and 2 START/STOP switches****WARNING**

Make sure remote station 1 or 2 START/STOP switch is electrically dead before starting repair or removal. Redtag switchboard circuit breaker P16 (Crane Hydraulic Unit), REDTAG circuit breaker with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."

**NOTE**

Remote station 1 START/STOP switch is located on the weatherdeck forward bulkhead.  
Remote station 2 START/STOP switch is located in the watertight storage box aft of the bow crane control levers on the deckhouse top forward.

**3-19.2.2.3.1 Cleaning and inspection**

- a. Make sure remote station 1 or 2 START/STOP switch is electrically dead by opening (OFF) switchboard circuit breaker P16 for crane hydraulic unit. Redtag circuit breaker with: "WARNING DO NOT ACTIVATE. BEING MADE."
- b. Wipe clean exterior of remote station 1 START/STOP switch with clean rag. Open remote station 2 door and vacuum clean or clean inside with electrician's brush. Avoid using solvents for cleaning inside control station. Solvents leave a greasy film that may reduce electrical conductivity of components.
- c. Visually check for indications of burns, loose connections, or damage. Clean corrosion from terminals, tighten loose connections, and replace switch if damaged.

**3-19.2.2.3.2 Test and repair**

- a. Control station 1 START/STOP switch.
  - (1) With switchboard circuit breaker P16 closed (ON) and AUTO/OFF/HAND in HAND position, check input voltage to START/STOP switch. If input voltage is not 440 Vac, go to step (2). If input voltage is 440 Vac, go to step (3).
  - (2) Open (OFF) and redtag switchboard circuit breaker P16 and position AUTO/OFF/HAND switch to OFF. Check continuity of input wires to START/STOP switch. If check indicates open circuit, replace bad wires. If check indicates closed circuit, check hydraulic power unit motor controller.
  - (3) Open (OFF) and redtag switchboard circuit breaker P16 and position AUTO/OFF/HAND switch to OFF and check continuity as follows:
    - (a) Depress START button and check continuity across points F1 to F2. If check indicates closed circuit, go to step (b). If check indicates open circuit, replace START/STOP switch.
    - (b) Depress STOP button and check continuity across points E1 to E2. If check indicates closed circuit, START/STOP switch is good. If check indicates open circuit, replace START/STOP switch.
- b. Control station 2 START/STOP switch.
  - (1) Perform steps a.(1) and a.(2).
  - (2) Open (OFF) and redtag switchboard circuit breaker P16 and position AUTO/OFF/HAND switch to OFF and check continuity as follows:
    - (a) Open storage box on top of deckhouse, remove START/STOP switch cover, depress START button, and check continuity across points H 1 to H2. If check indicates closed circuit, go to step (b). If check indicates open circuit, replace START/STOP switch.
    - (b) Depress STOP button and check continuity across points 11 and 12. If check indicates closed circuit, START/STOP switch is good. If check indicates open circuit replace START/STOP switch.

### 3-19.2.2.3.3 Replacement

a. Control station 1 START/STOP switch.

(1) Removal.

**WARNING**

Make sure START/STOP switch is electrically dead before replacing switch by opening (OFF) circuit breaker P16 on switchboard. Redtag circuit breaker with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."

(a) Tag and disconnect wires to switch.

(b) Remove mounting hardware.

(c) Remove switch.

(2) Installation. Install switch in reverse order of removal in step (1).

b. Control station 2 START/STOP switch.

(1) Removal.

(a) Open storage box cover.

(b) Perform steps (a) through (c) in step a.

(2) Installation. Install switch in reverse order of removal in step (1). Check operationally after installation.

### 3-19.2.2.4 Hydraulic power unit motor controller

**WARNING**

Make sure hydraulic power unit motor controller is electrically dead before starting repair or removal. Redtag switchboard circuit breaker P16 with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."

#### 3-19.2.2.4.1 Cleaning and inspection

- a. Make sure hydraulic power unit motor controller is electrically dead by opening (OFF) switchboard circuit breaker P16. Redtag circuit breaker with: "WARNING DO NOT ACTIVATE. REPAIRS BEING MADE."
- b. Wipe clean exterior of motor controller with clean rag. Open motor controller door and vacuum clean or clean inside with electrician's brush. Avoid using solvents for cleaning inside motor controller. Solvents leave a greasy film on components that may reduce electrical continuity.
- c. Check fuse. Replace if necessary.
- d. Visually inspect for indications of burns, corrosion, loose connections, damaged parts, or chipped paint. Clean corrosion from contacts and terminals, tighten loose connections, and replace damaged parts. Clean electrical contacts with silver polish, fine sandpaper, or burnishing tool. DO NOT use emery paper or steel wool. Vacuum to remove residue. Touch up paint according to TB 43-0144. Do not paint threads or labels.

**3-19.2.2.4.2 Test and repair**

- a. With switchboard circuit breaker P16 closed (ON) and secured, check motor controller input line voltage across points AI and B1, B1 and CI, and AI and CI. If voltage across any terminal pairs is not 440 Vac, power source is at fault; go to step b to correct problem. If voltage across all three terminal pairs of points is 440 Vac, go to step c.
- b. Check switchboard circuit breaker P16 output line voltage. If voltage across any terminal pairs is 0, circuit breaker or power source is at fault. If circuit breaker voltage across all three terminal pairs is 440 Vac, replace faulty power cable from circuit breaker to motor controller.
- c. Close motor controller disconnect switch and check line voltage across points A2 and B2, B2 and C2, and A2 and C2. If voltage across any terminal pair is not 440 Vac, check main contactor contacts. If bad or corroded, clean or replace contacts. If contacts are good, replace disconnect switch. If voltage across all three terminal pairs is 440 Vac, go to step d to check inputs to main contactor.
- d. Check input voltage at main contactor across points L1 and L2, L2 and L3, and L1 and L3. If voltage across any terminal pairs is not 440 Vac, replace faulty wire(s). If voltage across all three terminal pairs is 440 Vac, go to step e to check motor controller output voltage.
- e. Check motor controller output voltage across points T1 and T2, T2 and T3, and T1 and T3. If voltage across any terminal pairs is not 440 Vac, go to step f. If voltage across all three terminal pairs is 440, check input voltage at motor connections T4 and T5, T5 and T6, and T4 and T6. If voltage is not 440 Vac across any terminal pair, replace faulty wire. If voltage across all three terminal pairs is 440 Vac, replace motor.
- f. Open (OFF) and secure switchboard circuit breaker P16. Visually check overload protection thermal units for burns or damage. If damage is noted, replace faulty overload protection thermal unit. If damage is not noted, check output voltage of overload protection thermal units across points N1 and T1, N2 and T2, and N3 and T3. If voltage across any terminal pair is not 440 Vac, replace faulty overload protection thermal unit. If voltage across all terminal pairs is 440 Vac, go to step g.
- g. Check voltage input from 24 Vdc panel to relay K across points D1 and D2. If input voltage is not 24 Vdc, go to step h. If input voltage is 24 Vdc, go to step i.
- h. Check output voltage at power source. If output voltage is not 24 Vdc, troubleshoot power source. If output voltage is 24 Vdc, check continuity of output wires. If check indicates an open circuit, replace wire(s). If check indicates a closed circuit, go to step i.
- i. Check continuity of relay K3 across points D3 and D4. If connections are good and continuity check indicates an open circuit, replace relay. If check indicates a closed circuit, and pump does not operate, go to step h. If pump operates but crane does not operate, go to step n.
- j. Check continuity of wires from relay K3 point D4 to overload (OL) contact point W1, from OL point W2 to main contactor coil point U2, and from relay K3 point D3 to L2. If connections are good and continuity check indicates a closed circuit, go to step k. If continuity check indicates an open circuit, replace wire.
- k. Depress or position the switches listed below and check continuity across points listed. If continuity check indicates a closed circuit, go to step l. If continuity check indicates an open circuit, replace switch.

Switch position	Across points
Start	
START	G1 to G2
Remote station 1	
START	F1 to F2
STOP	E1 to E2
Remote station 2	
START	H1 to H2
STOP	11 to 12
AUTO/OFF/HAND	
HAND	J1 to J2

- I. Check continuity of the switch wires listed below. If continuity check indicates an open circuit, replace bad wire. If continuity check indicates all closed circuits, go to step m.

<u>Switch</u>	<u>Wire connections</u> <u>Switch point</u>	<u>To point</u>
START	G1	Main contactor V2
	G1	Remote station 1 START F1
	G1	Remote station 2 START H1
	G2	Main contactor V1
	G2	Remote station 2 START H2
	G2	AUTO/OFF/HAND J1
Remote station 1	START F2	Main contactor V1
	STOP E1	Remote station 2 STOP 12
	STOP E2	Disconnect switch A2
Remote station 2 AUTO/OFF/HAND	START H1	Remote station 2 STOP 11
	J2	Main contactor U1

- m. If no faults were found in steps e thru l and output voltage in step e was not 440 Vac, replace main contactor.
- n. With power on and pump operating but bow crane not operating properly, test anti-2-block control panel (station) as given in paragraph 3-19.2.2.2.2.

### 3-19.2.2.4.3 Replacement

- a. Removal.

#### **WARNING**

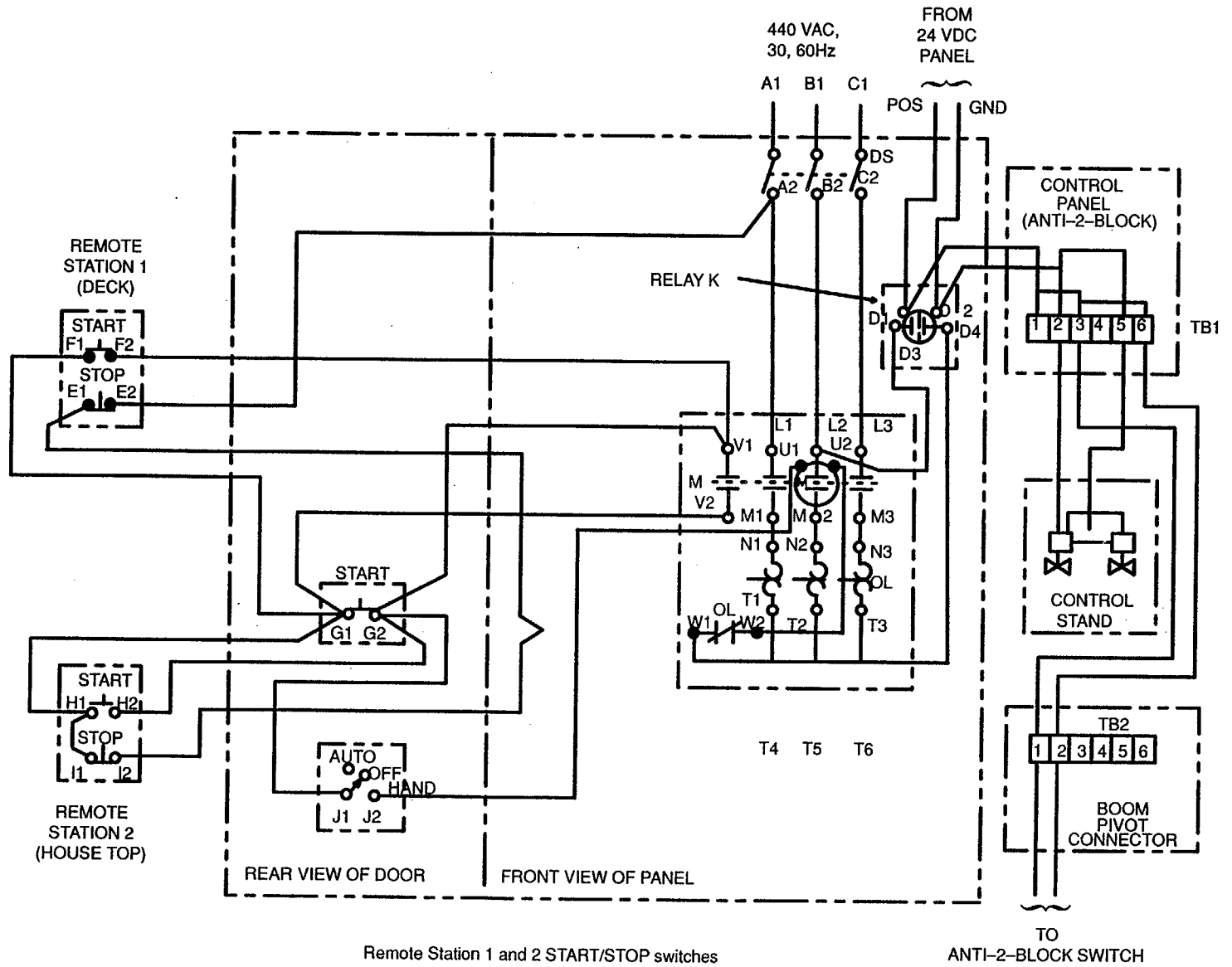
Make sure hydraulic power unit motor controller is electrically dead before replacing motor controller by opening (OFF) circuit breaker P16 on switchboard. Redtag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."

- (1) Tag and disconnect wiring with connection information.
- (2) Remove attaching hardware and remove motor controller.

- b. Installation.

- (1) Install motor controller using attaching hardware.
- (2) Connect wiring.
- (3) Close (ON) circuit breaker P16 on switchboard.
- (4) Check operationally that motor controller operates normally.

Figure 3-11. Hydraulic Power Unit Motor Controller Schematic



Remote Station 1 and 2 START/STOP switches

TO ANTI-2-BLOCK SWITCH

### 3-19.2.2.5 Hydraulic power unit

#### WARNING

**Make sure hydraulic power unit is electrically dead before starting repair or removal. Redtag switchboard circuit breaker P16 (Crane Hydraulic Unit).**

#### 3-19.2.2.5.1 Cleaning and inspection

- a. Clean exterior of hydraulic power unit with hot soapy water or with an approved solvent. Rinse thoroughly and dry with clean cloth or dry with filtered compressed air.
- b. Clean pump motor exterior with filtered compressed air or vacuum. Wipe, using clean cloth moistened with an approved solvent. Clean terminals and wipe wires with lint-free cloth or with electrician's brush.
- c. Visually inspect hydraulic power unit, including hoses, for leaks, corrosion, cracks, or damage. Repair leaks. Replace hoses, if necessary. Remove corrosion and touch up paint according to TB 43-0144.
- d. Visually inspect pump motor for burned, bent, loose, corroded, or otherwise damaged terminals. Inspect wiring for breaks, loose connections, or other obvious damage. Tighten loose connections, replace damaged terminals, and replace damaged wiring. Touch up paint according to TB 43-0144. Do not paint threads or labels.
- e. Visually inspect fill cap. Clean, if necessary.
- f. Visually inspect filter element. Replace filter element, if necessary.
- g. Visually inspect level and quality of hydraulic fluid. Add fluid or drain and refill as necessary.

#### 3-19.2.2.5.2 Repair. Repair involves replacement of the filter element and hydraulic fluid as follows:

- a. Turn hydraulic power unit motor controller HAND/OFF/AUTO switch to OFF. Redtag motor controller with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."
- b. Remove drain plug from bottom of hydraulic power unit tank and drain hydraulic fluid into bilge tank.
- c. Unscrew filter element.
- d. Install new filter element and make sure it has a tight seal.
- e. Replace drain plug.
- f. Remove filler cap and fill tank with new hydraulic fluid. Fill tank to within 1 inch of top of filler neck.
- g. Replace filler cap and make sure it is tight.
- h. Turn motor controller HAND/OFF/AUTO switch to HAND.
- i. On deckhouse top control panel inside watertight box, push START button on START/STOP control station (Figure 3-6) to start hydraulic power unit.

#### NOTE

**After filling bow crane hydraulic unit initially, crane movement may be jerky and erratic until the system works out air in the hydraulic lines.**

- j. Operate bow crane by extending all booms to their maximum length, raising them to maximum height, and slewing crane in a complete circle to the left and then to the right. Continue to operate crane without load until it runs smoothly in all actions.
- k. Stop hydraulic power unit by pushing STOP button on START/STOP control station on deckhouse top.



- l. In void 1, turn motor controller HAND/OFF/AUTO to OFF.
- m. Remove hydraulic tank filler cap and check fluid level. Add hydraulic fluid until level is within 1 inch of bottom of filler neck.
- n. Replace cap and make sure it is tight.
- o. Remove red tag from motor controller and record maintenance action in log book.

**3-19.2.2.5.3 Replacement.**

a. Removal

- (1) Make sure hydraulic power unit is electrically dead by opening (OFF) switchboard circuit breaker P16. Redtag circuit breaker with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE."
- (2) Remove drain plug from bottom of hydraulic power unit tank and drain hydraulic fluid to bilge tank.
- (3) Replace drain plug.
- (4) Tag and disconnect cable (P16c) from hydraulic power unit motor.
- (5) Disconnect piping to hydraulic power unit.
- (6) Remove mounting hardware.
- (7) Remove hydraulic power unit.

b. Installation.

- (1) Install hydraulic power unit on foundation and loosely secure to foundation.
- (2) Connect piping.
- (3) Connect electrical cable.
- (4) Tighten mounting hardware.
- (5) Remove filler cap and fill tank with new hydraulic fluid. Fill to within 1 inch of top of filler neck.
- (6) Replace filler cap and make sure it is tight.
- (7) Turn motor controller HAND/OFF/AUTO switch to HAND.

- c. On deckhouse top control panel inside watertight box, push START button on START/STOP control station to start hydraulic power unit.

**NOTE**

**After filling bow crane hydraulic unit initially, crane movement may be jerky and erratic until the system works out air in the hydraulic lines.**

- d. Operate bow crane by extending all booms to their maximum length, raising them to maximum height, and slewing crane in a complete circle to the left and then to the right. Continue to operate crane without load until it runs smoothly in all actions.
- e. Stop hydraulic power unit by pushing STOP button on START/STOP control station on deckhouse top.
- f. In void 1, turn motor controller HAND/OFF/AUTO to OFF.
- g. Remove hydraulic tank filler cap and check fluid level. Add hydraulic fluid until level is within 1 inch of bottom of filler neck.
- h. Replace filler cap and make sure it is tight.

**Section V. Storage**

**3-20 Short-term storage.** If barge is to be taken out of service for more than 7 days but less than 30 days, and bow crane system is not to be used while in storage, perform following.

- a. Shut down system.
- b. Perform after operation maintenance.

**3-21 Administrative storage.** When bow crane is taken out of service for more than 30 days but less than 6 months, barge remains a unit responsibility and is maintained by unit personnel. Before placing in administrative storage, perform the following.

- a. Shut down system.
- b. Perform after operation maintenance.
- c. Perform monthly maintenance requirements.

**3-21.1 Administrative storage inspection.** Bow crane, if not used during administrative storage, will be inspected every 30 days for corrosion, damage, or pilferage. Correct as necessary.

**3-22 Long-term storage.** If barge is to be taken out of service for 6 months or more, turn it in to depot for preparation and placement into long-term storage. If barge is in administrative storage and is to be taken out of service and placed in depot long-term storage (6 months or more), process barge and bow crane system for normal operations before releasing to depot.

**Section VI. Manufacturers' service manuals/instructions**

**3-23 General.** These references provide additional information on bow crane components. A ready reference copy is in Appendix B. Refer to both this manual and drawings listed in Appendix A while performing procedures in these manuals.

<u>Component</u>	<u>Document Title</u>	<u>Manufacturer</u>
FASSI bow crane, Model F10.3	F-10, Terms of Warranty, Use, and Maintenance  F-10 Spare Parts Catalogue	FASSI Gru Idrrauliche Supplier: Morgan Crane Co., Inc. 1009e Chestnut Avenue Santa Ana, CA 92701
Anti-2-block	System Mark H Installation and Checklist, Trouble-shooting List	Krueger Crane Systems, Inc. 4699 Colt Road Rockford, IL 61109 Ph: (815) 874-9402

**Section VII. Manufacturers' warranties/guarantees**

**3-24 General.** Information on bow crane component warranties/guarantees is listed below.

<u>Component</u>	<u>Manufacturer</u>	<u>Duration</u>	<u>Coverage</u>
FASSI bow crane Model F10.3	FASSI Gru Idrauliche Via dei Carmelitani 2 24021 Albino (Bergamo) Italia Ph: 035/751158	6 months from date of delivery	Materials and workmanship

**CHAPTER 4 VOID 4 TROLLEY HOIST**

**Section I. Description and data**

**4-1 Description.** Void 4 trolley hoist (Figure 4-1) in void 4 starboard is a low-headroom, manually-operated hoist. Major components include an "I" beam suspended from the void 4 overhead structure, a manual hoist assembly, load chains, a block hook, and a brake mechanism. The trolley hoist has a net weight of 230 pounds and a standard lift height of 8 feet. The load chains measure approximately 9 feet 6 inches and require 41 pounds of pull to lift a full load. The hook assembly has a diameter of 1 3/7 inches. The "I" beam measures approximately 6 inches in width.

**4-2 Capabilities.** This trolley hoist is used primarily for lifting heavy equipment such as the spare HP diesel-engine driven water pumps and spare seawater pump.

**4-3 Performance characteristics.** Void 4 trolley hoist is rated at 3000 pounds of lift. This is not sufficient to lift any configuration of any one of the generator sets or diesel engines. These items must be moved with the ROWPU bridge crane operating through hatches (access covers removed) to reach items in voids 4.

**4-4 Equipment specifications.** Technical data identifying void 4 trolley hoist equipment specifications is in manufacturer's maintenance manual/instructions in Appendix B.

Trolley hoist	
Manufacturer	Monogram Industries, Inc. Chester Hoist Division
CAGEC	80735
Part no.	1322-11/2
Capacity	3000 lbs
Quantity	1

**4-5 Items furnished**

**4-5.1** Components installed as part of the void 4 trolley hoist are listed on the parts list of drawings referenced in Appendix A and in the Components of End Item List in TM 55-1930-209-14&P-1 8.

**4-5.2** Common and bulk items onboard are listed in the Expendable Supplies and Materials List in TM 55-1930-209-14&P-20.

**4-5.3** Repair parts and special tools onboard are listed in the Repair Parts and Special Tools List in TM 55-1930-209-14&P-18.

**4-6 Items required but not furnished.** All required items are furnished.

**4-7 Tools and test equipment.** Use existing tools and equipment onboard. A complete list of tools and test equipment onboard is in the Tools and Test Equipment List in TM 55-1930-209-14&P-1 8.

**Section II. Description of operation**

**4-8 General.** After selecting the load to be moved, move it laterally on the trolley hoist rail. When it is necessary to remove the spare, HP pump or seawater pump from void 4, the void 4 hoist is used to move the pump(s) into position. Accomplish this by removing the securing bolts from the pump foundation and attaching the trolley hoist hook. After securing the load in place, raise, lower, or move the load laterally by manually operating the chains that control hoist movement.

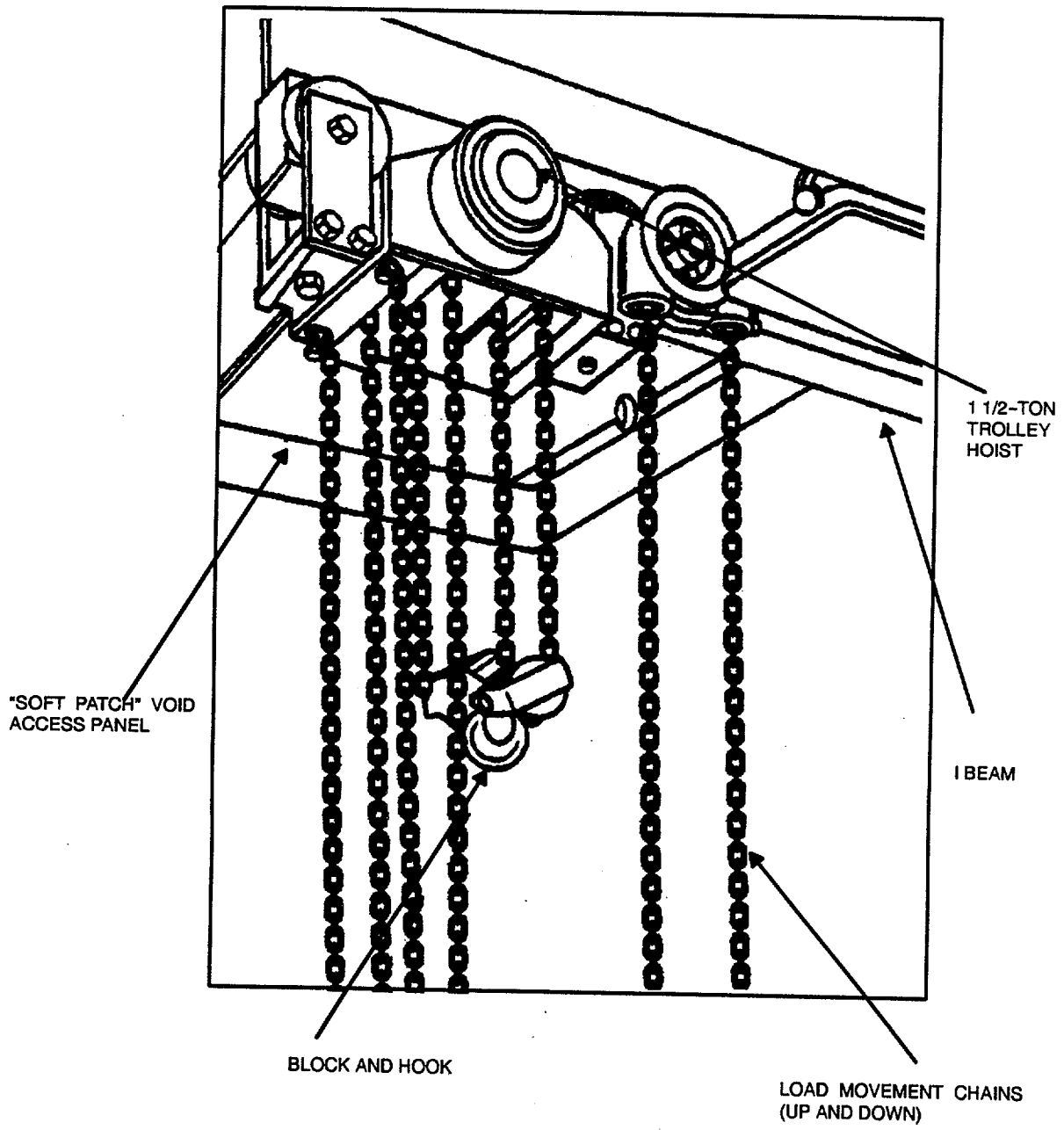


Figure 4-1. Void 4 Trolley Hoist

### Section III. Operating instructions

**4-9 Operating controls.** Controls for maneuvering loads are the pull chains located on the trolley hoist (Figure 4-1).

#### 4-10 Prestart Procedures

- a. Ensure trolley hoist has been properly lubricated. Chains must be kept clean and properly lubricated, because dirt damages or jams gears and creates excessive wear and operational delays. Chains, when rubbed with an open hand, should be free of dirt and grit. A light coat of lubricant should be present on chains.
- b. Check chains for proper seating on gears and freedom from twisting or other defects.
- c. Ensure that choice of slings matches load to be lifted.
- d. Move trolley hoist directly over the load by using trolley lateral movement chain.
- e. Be sure load will clear all equipment in movement path.

#### 4-11 Operating procedures

- a. Ensure trolley hoist is directly over the load to be moved and then lower trolley hoist hook and attach it to load.
- b. Using chains, raise load a few inches and ensure that load is being lifted vertically. Loads must not be pulled to one side or in one direction.
- c. Lift load only high enough to move it safely to new location.
- d. Using trolley hoist chains, manually move load to desired location and lower into place.

#### 4-12 Shutdown procedures

- a. Remove and secure lifting devices and jigs (if used).
- b. Raise lifting hook on void 4 trolley hoist to top position and secure chains to keep them from swinging.

**4-13 Operation under extreme conditions.** To ensure efficient operation of the trolley hoist in cold or hot weather, make sure that hoist is clean and properly lubricated. Changes in weather conditions do not require any special lubricants.

### Section IV. Maintenance instructions

**4-14 General.** When inspecting void 4 trolley hoist components, give special attention to pulleys, lifting hooks, chains, slings and other load bearing components. Keep inspection reports and records on all hoist equipment. Required maintenance forms and records are explained in DA PAM 738-750. When performing maintenance, be sure to observe precautions in this manual and in the manufacturer's manual. Due to stress and tolerance requirements for the trolley hoist, replace parts or components of the trolley hoist with items the same as original construction. Use materials in accordance with the drawings referenced in Appendix A.

#### WARNING

**Notify IDS/IGS maintenance unit after repairing or replacing crane load bearing parts or parts on any lifting slings or rigs used with the crane. They must proof test and safety inspect the repaired item in accordance with TB 43-0142. In addition, the crane and all slings and lifting devices used with the crane must be proof and function tested, and safety inspected to this standard every 12 months. Record and maintain certification of all proof testing.**

#### 4-14.1 Maintenance concept

**4-14.1.1** Unit level and IDS/IGS maintenance for the bridge crane system is performed onboard by barge crewmembers whenever possible.

**4-14.1.2** Any IDS/IGS maintenance beyond capability of crewmembers is provided by a shore-based area support maintenance unit. This unit also determines if depot support maintenance is required.

**4-14.1.3** Intermediate support maintenance is accomplished by replacing components or major end items.

**4-14.1.4** Unless other intermediate support procedures are directed, IDS/IGS maintenance normally is provided by an Army Transportation Corps floating craft intermediate support maintenance unit serving terminal operating area. Components to be disposed of are processed by this unit.

**4-14.1.5** Maintenance Allocation Chart (MAC) is in Appendix C in TM 55-1 930-209-14&P-18. For maintenance of other equipment onboard, consult appropriate manual.

**4-14.2 Maintenance instructions.** Maintenance instructions consist of paragraph 4-16, Troubleshooting.

**4-15 Preventive maintenance checks and services.** See TM 55-1930-209-14&P-13 for preventive maintenance checks and services for handling equipment. See TM 55-1930-209-14&P-19 for complete preventive maintenance checks and services for all systems on the ROWPU Barge.

**4-16 Troubleshooting.** Conditions listed in Table 4-1 may occur while operating the void 4 trolley hoist. While this list is not all inclusive, it does provide some of the more common faults that could occur during operation. Notify higher level maintenance of those discrepancies or tests that are beyond the capability of the unit level to correct or perform.

#### **4-17 Maintenance procedures**

**4-17.1 General.** Maintenance instructions for the void 4 trolley hoist involve lubricating, disassembling, repairing, replacing, and reassembling equipment requiring spare parts listed in TM 55-1930-209-14&P-18. No special tools are required. When performing maintenance, be sure to follow safety precautions in this manual and manufacturer's manual/instructions in Appendix B.

**4-17.2 Lubrication.** Lubricate 1 1/2-ton trolley hoist according to instructions on page 9, Chester Hoist Division, Parts and Instruction Manual Low Headroom, in Appendix B.

#### **4-17.3 Cleaning and Inspection.**

- a. Wipe clean with rag dampened with hot soapy water or to remove grease with solvent. Wipe dry with clean cloth.
- b. Visually inspect trolley hoist structural members for evidence of bends, distortion, broken welds, cracks, corrosion, or damage. Remove corrosion and touch up painted parts according to TB 43-0144.
- c. Visually inspect hook for deformation, cracks, wear, damage, or malfunctioning latch and hook attachment. Replace hook if necessary.
- d. Visually check chains for excessive wear, twist, distorted links, stretch, nicks, and gouges. Apply lubricant if necessary. Replace damaged chain.
- e. Visually inspect wheels for damage and wear, and drive wheel hubs for loose clamping bolts. Replace damaged wheel.
- f. Visually inspect brake mechanism for worn, glazed, or contaminated friction disks, worn pawls, and damaged pawl springs.
- g. Visually inspect hand chain wheels, chain attachments, suspension bolts, shafts, gears, and bearings for worn, cracked, or distorted parts.
- h. Visually check lubrication points specified on page 9 in the Chester Hoist Division Bulletin J in Appendix B.

**4-17.4 Test.** IDS must perform and record an annual proof and function test and safety inspection in accordance with TB 43-0142.

**4-17.5 Repair.** Repair and replace parts discussed in paragraph 4-17.3 as necessary. Perform maintenance as given on pages 7 through 9 in the Chester Hoist Division Parts and Instruction Manual Low Headroom Manual in Appendix B. Also reference the parts list for the 1 1/2-ton trolley hoist and exploded views on pages 10 through 27 of the same instruction manual.

**4-17.6 Replacement.**

a. Removal

- (1) Make sure bridge crane system is electrically dead by opening (OFF) and redtagging circuit breaker P16 on switchboard.
- (2) Remove stop on end of track.
- (3) Remove trolley from track after securing chains and providing means to safely lower trolley.

b. Installation. Install trolley in reverse order of removal procedure.

*Table 4-1. Void 4 Trolley Hoist Troubleshooting*

<u>Condition</u>	<u>Possible Cause</u>	<u>Suggested Action</u>
1. Trolley hoist hook difficult to lower or raise	a. Load to be hoisted exceeds hoist capacity	a. Reduce load to hoist capacity
	b. Hoist up-down chains kinked or twisted	b. Straighten chains. Inspect for damage
	c. Hoist not properly lubricated	c. Lubricate in accordance with instructions contained in manufacturer's manual (see page 9, section 825 of parts and instruction manual - low head room, ZLP-ZLG services, Chester Hoist Div., Monogram Industries, Inc.)
	d. Hoist internal brake has excessive clearance	d. Inspect and adjust as required
2. Trolley hoist has scuffing action while rolling along rails	a. Rails worn or severely pitted	a. Inspect rails, determine conditions and repair as required
	b. Trolley wheels improperly installed or worn excessively	b. Check trolley wheels for proper installation and wear. Adjust or repair as required



**Section V. Storage**

**4-18 Short-term storage.** If barge is taken out of service for more than 7 days but less than 30 days, and void 4 trolley hoist is not to be used while in storage, follow procedures below. Periodically inspect for corrosion, damage, and missing items.

- a. Ensure that trolley hoist is completely operational (all repairs complete).
- b. Remove all rust and corrosion by scraping, wire brushing, sanding, or buffing.
- c. Immediately after removing rust or corrosion, coat unpainted surfaces with paint.
- d. Cover all exposed gears, chains, chain drives, and cables with a coat of multipurpose water-resistant grease (MIL-G-24139A).

**4-19 Administrative storage.** If barge is taken out of service for more than 30 days but less than 6 months, barge remains a unit responsibility and shall be maintained by unit personnel.

**4-20 Long-term storage.** If barge is to be taken out of service for 6 months or more, turn it in to depot for preparation and placement into long-term storage. If barge is in administrative storage and is to be taken out of service and placed in depot long-term storage (6 months or more), process barge and trolley hoist for normal operations before releasing to depot.

**Section VI. Manufacturers' service manuals/instructions**

**4-21 General.** These references provide additional information on void 4 trolley hoist components. A ready reference copy is in Appendix B. Refer to both this manual and drawings listed in Appendix A while performing procedures in these manuals.

<u>Component</u>	<u>Document Title</u>	<u>Manufacturer</u>
1-1/2 ton trolley hoist, Model 1422-1 1/2	Bulletin J, Zephyr Low Head Room Hoists  Chester Parts and Instruction Manual Low Headroom ZLP-ZLG Series, sec. 825	Chester Hoist Division Monogram Industries, Inc. P.O. Box 229 7573 State Route #45 Lisbon, OH 44432 Ph: (216) 424-7248

**Section VII. Manufacturers' warranties/guarantees**

**4-22 General.** Information on void 4 trolley hoist component warranties/guarantees is listed below.

<u>Component</u>	<u>Manufacturer</u>	<u>Duration</u>	<u>Coverage</u>
1 1/2-ton hoist	Spanmaster Division of Jervis B. Webb Co. 739 Moore Road Avon Lake, OH 44012 Ph: (216) 933-6166	3 months from date of shipment	Materials and workmanship
"I" beam	Same as above	3 months from date of shipment	Materials and workmanship

**APPENDIX A**  
**REFERENCES**

**A-1**

**A-1 Drawings**

US Army Belvoir Research, Development and Engineering Center (97403)

13226E1892	ROWPU/Barge Arrangement
13226E1893	List of Label Plates
13226E1896	Drinking Water System
13226E1897	Drinking Water System Operational Instruction Placard
13226E1901	Hydraulic System
13226E 1903	Voids Ventilation
13226E1917	Bridge Crane System
13226E1923	Chlorination System
13226E1924	Crane and Personnel Boat Foundations
13226E1928	Alarm/Casualty Monitoring System
13226E1932	Electrical Power Schematic Diagram
13226E1933	Communication System
13226E1934	Load, Cables and Circuit Breakers Data
13226E1935	Electrical Power System Layout
13226E1939	Motor Controllers, Schematic and Wiring Diagram
13226E1941	Chlorination System Operational Instruction Placard
13226E1943	Battery Box
13226E1952	Multimedia Filter Assembly (Barge 1)
13226E1953	Tank, Multimedia Filter (Barge 1)
13226E1954	Plate, Information Multimedia Filter (Barge 1)
13226E1955	Distributor Assy, Bottom, Multimedia Filter (Barge 1)
13226E1956	Distributor Assy, Top, Multimedia Filter (Barge 1)
13226E1957	ROWPU Barge, Type 231A, Radial Hub (Barge 1)
13226E1958	ROWPU Barge, Type 231A, Lateral Slotted (Barge 1)

**A-2 Demolition to Prevent Enemy Use**

TM 750-244-3	Procedures for Destruction of Equipment to Prevent Enemy Use
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**A-3 Cleaning**

Fed Spec P-D-680	Metal Cleaning Solvent for Army Use
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**A-4 Rigging**

TB5-725 Rigging

**A-5 Maintenance**

DA PAM 738-750 The Army Maintenance Management System (TAMMS)

A 391-65 American Society of Testing and Material Specification

TB 43-0144 Painting of Vessels

MIL-STD-1261 Welding Procedure for Construction Steel

TM 9-214 Inspection, Care, and Maintenance of Antifriction Bearing

TM 9-237 Welding Theory and Application

TM 55-503 Marine Salvage and Hull Repair

TB 43-0142 Safety Inspection and Testing of Lifting Devices

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**APPENDIX B**

**MANUFACTURERS' SERVICE MANUALS/INSTRUCTIONS**

**B-1**

## APPENDIX B

## MANUFACTURERS' SERVICE MANUALS/INSTRUCTIONS

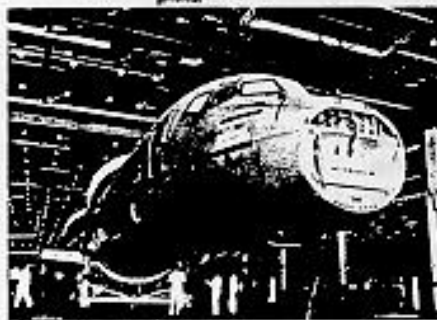
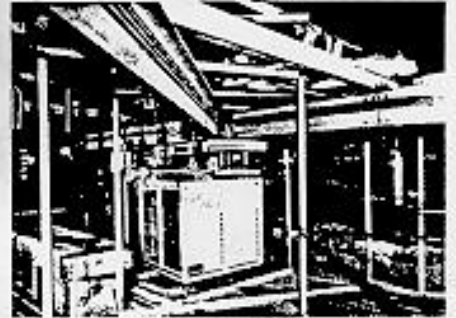
## B-1 Bridge Crane System

<u>Component</u>	<u>Document title</u>	<u>Manufacturer</u>
5-ton bridge crane system	Spare Parts and Maintenance Manual for VSE Corp. (US Army) NS-83-92580	Spanmaster, division of Jervis B. Webb Co. 739 Moore Road Avon Lake, OH 44012 Ph: (216) 933-6166
Crane cable reel	SM3120-04 IL, Service Manual Series 200a & 300A POW-R-MITE & POW-R-MATIC 0931 & 228a-H Cord Reel	Aero-Motive Mfg. Co. P.O. Box 2678 Kalamazoo, MI 49003 Ph: (616) 381-1242 Telex: 224420
Crane brake	Bulletin No. BK4613, 60 Series, Heavy Duty Unipac Brake Instructions	Dings Co., Dynamics Group 4740 W. Electric Ave. Milwaukee, WI 53219 Ph: (414) 672-7830 Telex: 2-6602
Crane 5-ton trolley hoist, model 1422-5	Bulletin J, Zephyr Low Head Room Hoists P.O. Box 229	Chester Hoist Division Monogram Industries Inc. 7573 State Route #45 Lisbon, OH 44432 Ph: (216) 424-7248
2-ton hoist	Manual No. 80-AM, Instruction, Maintenance and Parts Manual, Electric Hoist Equipped with Protector	CM Hoist Division of Columbus McKinnon Corp. Audubon & Sylvan Pkwy. Amherst, NY 14228 Ph: (716) 689-5400

## B-2 Bow Crane System

<u>Component</u>	<u>Document title</u>	<u>Manufacturer</u>
FASSI bow crane, Model F10.3	F-10, Terms of Warranty Use, and Maintenance  F-10 Spare Parts Catalogue	FASSI Gru Idrrauliche Supplier: Morgan Crane Co., Inc. 1009e Chestnut Avenue Santa Ana, CA 92701
Anti-2-block	System Mark H Installation and Checklist, Trouble-shooting List	Krueger Crane Systems, Inc. 4699 Colt Road Rockford, IL 61109 Ph: (815) 874-9402

# A SPANMASTER PRESENTATION



**Spare Parts and Maintenance**  
for VSE Corporation

NS-85-92929

**Spanmaster**

Division of Jervis B. Webb Company

739 Moore Rd. / Avon Lake, Ohio 44012 / (216) 933-6166





For over twenty-five years, Spanmaster, a division of Jervis B. Webb Company, has engineered and manufactured all types of underhung cranes. These cranes range from the common hand pushed variety to the more complex multi-span crane. In addition, we manufacture a complete line of monorail equipment including automatically dispatched carrier systems.

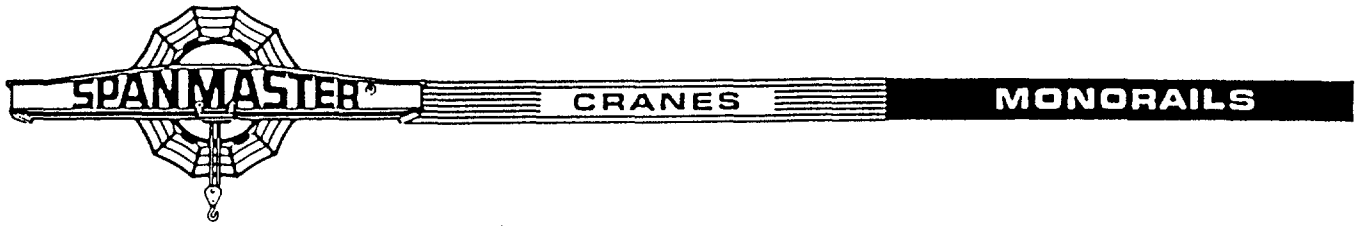
Our expertise extends to all facets of system design, installation and operation, in accordance with established specifications developed by the Monorail Manufacturers Association (MMA). By satisfying a wide range of customer applications, we continue to achieve new plateaus of engineering excellence in Spanmaster underhung crane and monorail systems.

Many systems require custom engineering incorporating many standard components to suit special or unusual job requirements. The variety of potential custom design options is virtually limitless. By combining our expertise in application and design engineering, we can develop equipment precisely suited to individual requirements.

Careful attention to customer requirements and satisfaction before and after the sale has become a Spanmaster trademark. In system and component design, concentration on innovative engineering features has simplified installation and general maintenance for most applications, minimizing costly downtime and wear. Prompt, satisfactory attention to customer needs has become an essential part of our company policy. Engineered reliability is backed by a continuing commitment to provide the most productive, yet the most economical equipment for the job.

After-sale service continues not only through installation, but well beyond the warranty period. Our dealers throughout the country are strategically located to provide prompt attention to our customers' needs.





TO:  
V S E Corporation  
2550 Huntington Avenue  
Alexandria, Virginia 22033

DATE: Aug. 3, 1985

CUSTOMER'S ORDER NO. 49406

SPANMASTER JOB NO. NS-85-92929

3 COPIES OF SPARE PARTS AND MAINTENANCE MANUALS  
ARE ENCLOSED FOR THE FOLLOWING JOB.

CUSTOMER:

V S E Corporation

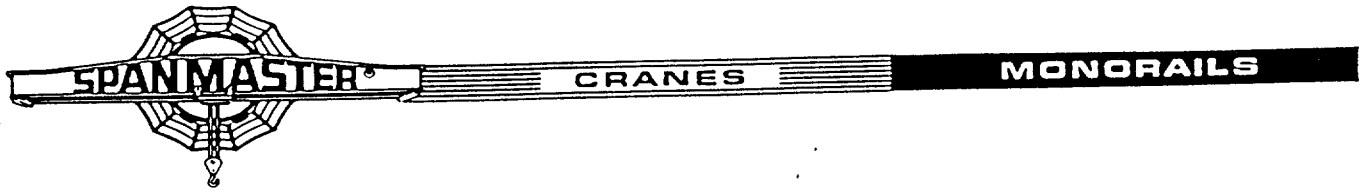
The following drawings are included:

EL-1,2,3, E-1

#1,2,4,15

#26-300-A-05

#35-300-A-50 Gearcase Dwg.



GENERAL REPLACEMENT PARTS INFORMATION FOR  
SPANMASTER EQUIPMENT

\* \* \* \* \*

HOW TO ORDER REPLACEMENT PARTS

This parts book covers all replacement required for this Span master machine. To insure prompt service, each repair parts order MUST contain the following information:

1. Span master Job No. NS-85-92929
2. Part number and description.
3. Voltage, phase and cycle.
4. Quantity.
5. Correct shipping destination.

When orders for parts are sent to Span master, they should be addressed as follows:

REPLACEMENT PARTS SALES  
Spanmaster Division  
Jervis B. Webb Co.  
739 Moore Road  
Avon Lake, OH 44012

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**A DIVISION OF JERVIS B. WEBB COMPANY  
739 MOORE ROAD. AVON LAKE. OHIO 44012**

## SPANMASTER REPLACEMENT PARTS MANUAL

THIS MANUAL IS DESIGNED TO ILLUSTRATE COMPONENTS USED IN PRODUCING STANDARD SPANMASTER PRODUCTS. THE SPANMASTER DIVISION OF THE JERVIS B. WEBB COMPANY DOES NOT WARRANT THAT ADHERENCE TO ANY GUIDELINES OR SUGGESTIONS SET FORTH HEREIN, WILL NECESSARILY RESULT IN PROPER SELECTION, MANUFACTURE, INSTALLATION AND MAINTENANCE OF THIS EQUIPMENT. UNLESS THERE ARE SPECIFIC WRITTEN SPECIFICATIONS OR RECOMMENDATIONS AND PURSUANT TO A WRITTEN CONTRACTUAL COMMITMENT FROM IT, THE SPANMASTER DIVISION OF THE JERVIS B. WEBB COMPANY HEREBY DISCLAIMS ALL RESPONSIBILITY FOR ANY EQUIPMENT AND/OR SYSTEM MALFUNCTION, ANY VIOLATIONS OF LAW, PROPERTY DAMAGE, PERSONAL INJURY, OR ANY OTHER DAMAGES RESULTING FROM EQUIPMENT AND/OR SYSTEM SELECTION, DESIGN, INSTALLATION, MAINTENANCE OR OPERATION CARRIED OUT BY ANYONE

**RECOMMENDED PREVENTATIVE MAINTENANCE PROGRAM  
FOR  
SPANMASTER MOTOR-OPERATED EQUIPMENT**

Extended equipment life, best operating characteristics and reduced downtime are the benefits to be obtained from a continuing preventative maintenance program. The following program is intended for systems in moderate industrial usage and if usage is heavy or the system is automatic in operation, a more frequent inspection and service routine should be established.

**MONTHLY SERVICE AND INSPECTION ROUTINE**

Hoisting Machinery:

1. Inspect cables for fraying, bends or kinks and lubricate with wire rope compound.
2. Inspect hook block for worn sheaves or broken sheave flanges.
3. Check block for loose or frozen bearings and lubricate.
4. Inspect sheave guards and repair if necessary.
5. If equipment is floor controlled, check pendent cable for cuts or abrasions that might lead to shorts or control interruptions.
6. Inspect strain cables or chains for loose connections and determine that the weight of pushbutton station is not supported by the electrical cable.
7. Inspect the push buttons for broken or damaged buttons or elements.
8. Check the oil level in gear case and add if necessary using type and grade as specified by hoist manufacturer.
9. Inspect electrical connections for loose connection or damaged wiring.
10. Inspect collectors for shoe wear and alignment and check the electrical connections.
11. Test brakes for operation and adjust if necessary.
12. If system is cab-operated and equipped with variable speed controllers, inspect contacts on drum or face plates for wear or pitting.
13. Lubricate points of wear and bearings in all controllers.

## Crane and Carrier Drive Machinery:

1. Inspect drive tires for wear and slippage and adjust all spring mounts uniformly at each drive wheel. Tires should be adjusted with only sufficient pressure to prevent slipping. If wheel pressure is excessive the crane will not operate properly, and if extreme, the drive motor can be stalled.
2. Inspect trolley wheels for wear and if equipment is equipped with lubrication fittings, add any necessary lubricant.

\*\*\*NOTE: Avoid over-greasing which can damage bearing seals.

3. Inspect and test interlocks for proper clearances and freedom of operation.
4. Inspect current collectors for shoe wear and alignment and adjust if necessary.
5. Inspect for loose electrical connections or damaged wiring.
6. Check oil level in gear cases and add a good grade of medium grade machine oil if required.
7. If equipment is equipped with travel brakes, test operation and adjust if necessary.

## Miscellaneous Accessory Equipment:

1. Inspect all interlocks and crossovers for alignment, clearance and freedom of operation.
2. If interlocks are motor-operated, check oil level and add a good grade of medium machine oil.
3. Test the stroke of motor-operated interlocks and adjust if necessary.
4. Inspect for loose electrical connections and damaged lead wires.
5. Inspect all end stops and tighten bolts if required.
6. Inspect all track switches, baffles and track device baffles or stops and straighten and adjust if damaged or misaligned.

## OPERATION AND SAFETY RECOMMENDATIONS FOR SPANMASTER EQUIPMENT

The operator of all motor propelled equipment literally has the life of the equipment as well as lives of fellow workmen in his hands. Only by careful and intelligent use can he prevent accidents or damage to his fellow workmen or equipment. A few safety and operational suggestions are listed below and the operator should become familiar with them and any other advisable safety measures that may be desirable because of unusual requirements of his individual installation.

1. Inspect frequently any below-the-hook devices such as slings, grabs, chains and hooks. Do not use if there is any doubt as to condition or ability to carry the load
2. Never make any lift until you are certain that your load is clear of overhanging equipment and that fellow workmen are clear of possible danger from swinging or rotation of the load.
3. Check hoist brakes frequently. If brakes do not hold load when lifted a few inches off floor, do not use equipment until brakes have been adjusted.
4. Avoid side or off-center lifting. Always center hook over the load.
5. Do not carry loads over workmen.
6. Be sure that all loads are safely and securely hooked.
7. When equipment is floor controlled, transport the load as close to the floor as possible. This permits the operator to guide the load and have the "feel" of the equipment.
8. Avoid bumping of other units on the system. The impact can damage equipment and cause load to swing dangerously.
9. Avoid bumping of safety stops and other protective baffles. They are intended for emergency stops only.
10. Be careful to determine that any track switches or interlocks that may be in the system are properly set for through travel by your unit.
11. Be sure to disengage interlocks on interlocking crane before attempting to move the crane. If care is not exercised in this respect, interlocks can become misaligned and difficult to operate.
12. Do not allow anyone to ride the hook.

13. Avoid excessive jogging or inching. The life of electrical equipment is adversely effected by unnecessary jogging or inching.
14. Avoid overloading the equipment.

## RECOMMENDED SPARE PARTS

A few items in most installations are unavoidably susceptible to damage or require periodical replacement due to wear and it is recommended that the following list of repair items be stocked to avoid costly delays or extended downtime.

1. Reversing contractor for bridge and carrier. i\*
2. A complete replacement pendent control cable and pushbutton station.
3. Mainline contractor. \*\*
4. Replacement brake coils for each type of electric hoist operated on the system.
5. A replacement hoist cable for each type of hoist operated on the system.
6. Replacement drive wheels for each type of drive (crane, carriers or tractor) operated on the system.
7. A set of resistor coils for each unit equipped with ballast resistor type control.
8. A complete set of replacement current collectors.

Part numbers are listed on assembly drawings, service bulletins, or catalog sheets enclosed in this manual.

\*\* See repair part order sheet for part number and other electrical parts recommended.

## QUARTERLY INSPECTION AND SERVICE ROUTINE

The following are in addition to those previously recommended for the monthly inspection.

### Hoisting Machinery:

1. Inspect all magnetic contractors and check operation.
2. Check contractor surfaces for wear or pitting, replace worn parts.
3. Check control items for weak springs, worn bearings, and replace worn items. Adjust and lubricate the bearing points with a drop of oil.
4. Inspect limit switches and test operation. Check contacts and clean and adjust if necessary.

### Crane and Carrier Drive Machinery:

1. Inspect line shaft for loose bearing support bolts.
2. Inspect couplings and drive wheel hubs for loose keys, bolts or set screws.
3. Inspect trolleys for loose axles, locknuts, or axle clamp bolts.
4. Inspect bridge connections to end trucks and tighten if necessary.
5. Check cross bridge conductors for bends or kinks and loose splices and correct if necessary.
6. Inspect motor mounting bolts and tighten if necessary.

### Miscellaneous Accessory Equipment:

1. Inspect electrical conductor system for bends and kinks and loose splices and correct if necessary.
2. Inspect and adjust all limit switches on operating trips, replace any worn or pitted contacts or any other worn or weak parts.
3. Inspect cab or special carrier structures for loose bolts or connections. Tighten if required.



## SEMI-ANNUAL INSPECTION AND SERVICE ROUTINE

The following are recommended in addition to those previously listed for the monthly and quarterly inspections.

1. Check the track system and supporting structure for loose bolts, clamps or rail splices.
2. Change oil in all gear cases and refill with proper lubricant as noted on gear case name plate.
3. Thoroughly clean equipment, touch-up any bare or rusty areas with paint.
4. Inspect all load carrying swivels or trolley to hoist or carrier connections for wear or cracks. Magna-fluxing or other accepted method of determining invisible fractures is recommended. Anneal or replace if necessary.
5. Inspect swivel seats and trolley swivel washers.

# SPANMASTER

## RECOMMENDED SPARE PARTS LIST FOR SPANMASTER EQUIPMENT

JOB NO. NS-85-92929 DATE July 24, 1985  
P.O. NO. 49406 DEALER OR SALES ENGINEER:  
CUSTOMER VSE Corp: Dave Bollinger  
Norfolk, VA Fort Washington, PA

QUANTITY	DESCRIPTION	UNIT LIST PRICE***
<u>FOR: BRIDGE CONTROL PANELS (4)</u>		
3	30-404-0-11 Fuse	13.00
2	30-900-P Resistor	170.00
3	30-351-0-02 Thermal Unit	14.00
3	30-404-0-02 Fuse	16.00
2	30-360-0-09 Transformer	80.00
2	30-404-0-10 Fuse	3.00
2	30-350-0-10 Overload Relay	78.00
2	30-211-0-34 Contractor	75.00
2	30-211-0-33 Reversing Switch	130.00
<u>FOR: 5 TON MOTORDRIVEN CRANES (4)</u>		
3	30-404-0-11 Fuse	13.00
2	30-900-P Resistor	170.00
2	16-106-E 7" Wheel Assembly	200.00
4	16-105-T Side Guide Roller Assembly	31.00
2	30-001-0-62 Motor 3/4 HP	440.00
1	35-300-G Gear case (Parts List Attached)	
2	26-100-8 9" Rubber Drive Wheel	160.00
<u>FOR INTERLOCK</u>		
3	30-404-0-11 Fuse	13.00
2	30-900-P Resistor	170.00
1	15-101-A Interlock Assembly	660.00
1	16-100-Q Interlock Operator	600.00

DELIVERY 2 weeks

SUBMITTED BY Betty Burkhardt

\*\*\* PRICES ARE SUBJECT TO CHANGE

WITHOUT NOTICE.  
F.O.B. AVON LAKE, OHIO 44012

## 35-300 SERIES GEARCASE

### B, C, F, & G

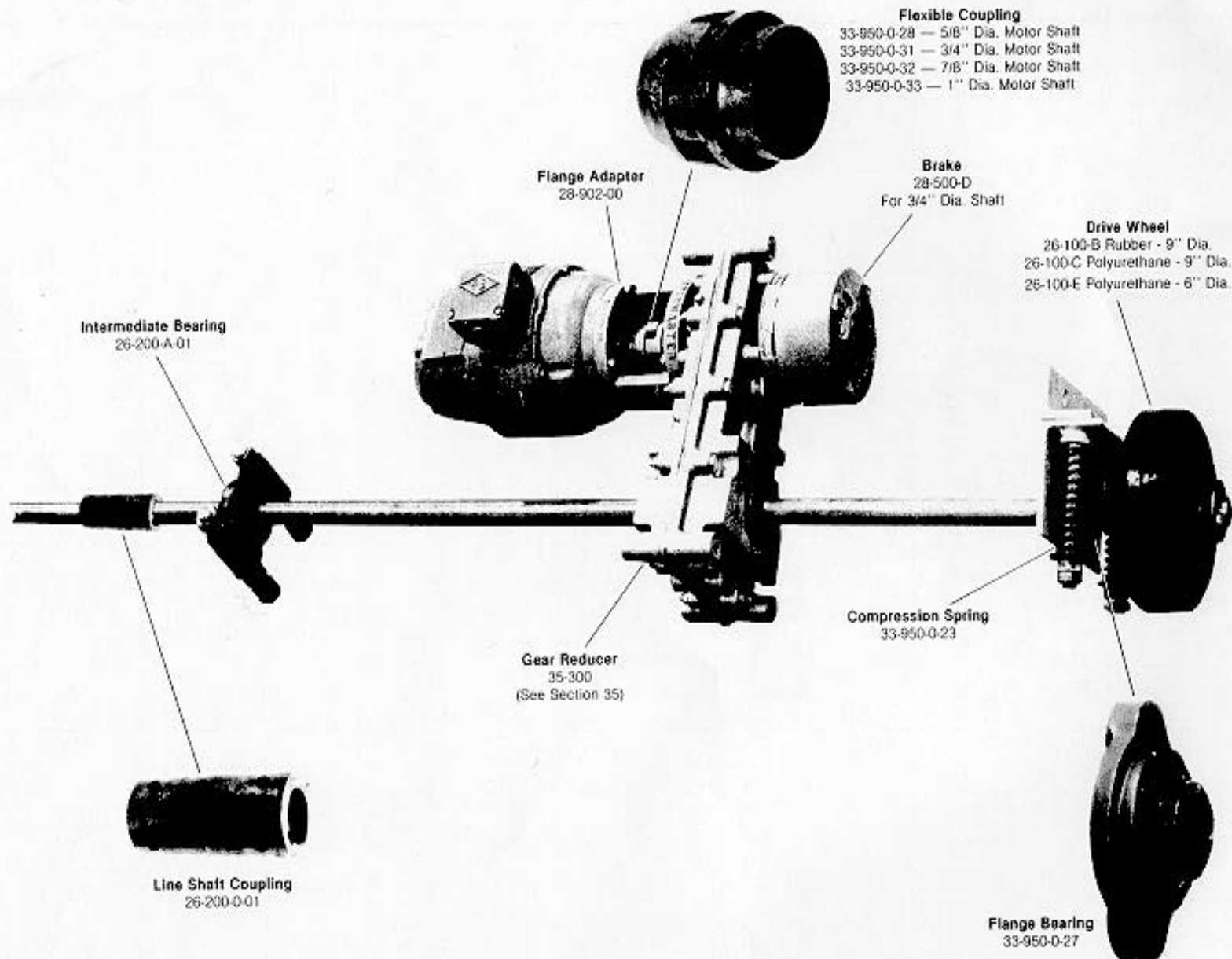
CATALOG #	DESCRIPTION	UNIT LIST PRICE
35-300-A-50	Complete Gear case	\$1,850.00
*****		
35-300-0-01	Input Integral Pinion Shaft w/ 16 T gear	126.00
35-300-0-03	Retaining Ring (6 required)	.60
35-300-0-05	Gear 68 Teeth	152.00
35-300-0-06	Retaining Ring (3 required)	3.00
35-300-0-07	Gear case Cover (consists of 2 PCS)	550.00
35-300-0-08	Bearing (2 required)	44.00
35-300-0-09	Seal (2 required)	14.00
35-300-0-10	Bearing (6 required)	16.00
35-300-0-11	Seal (2 required)	6.00
35-300-0-13	Gear 50 Teeth	100.00
33-900-0-14	3/8"-24 N.F. ESNA nut (10 required)	.50
32-224-0-22	3/8"-24 HHCS X 3/4 (10 required)	.80
35-300-0-25	Dowel pin 3/8" dia. (2 required)	2.00
35-300-0-26	Alwitco Breather	3.00
35-300-0-27	1/4" NPT pipe plug (7 required)	.50
35-300-0-28	Name Plate	4.00
35-300-0-29	Output Shaft	120.00
35-300-0-33	Woodruff Key (2 required)	4.00
35-300-0-34	2nd. Intermediate Integral pinion shaft	90.00
	3/8" sq. key x 1 1/8"	4.00

## CHANGE GEARS

	GEARCASE LETTER		
35-300-0-18	B	1st. Intermediate pin.shaft 27 teeth	120.00
35-300-0-17	C	1st. Intermediate pin.shaft 24 teeth	120.00
35-300-0-14	F	1st. Intermediate pin. shaft 18 teeth	120.00
35-300-0-31	G	1st. Intermediate pin.shaft 14 teeth	120.00
35-300-0-23	B	2nd. Intermediate Shaft gear 45 teeth	120.00
35-300-0-22	C	2nd. Intermediate Shaft gear 48 teeth	120.00
35-300-0-20	F	2nd. Intermediate Shaft Gear 54 teeth	120.00
35-300-0-31	G	2nd. Intermediate Shaft Gear 58 teeth	120.00

**NOTE:** Ratios formally available with "D" & "E" reductions can be obtained by using the "B" reduction & proper motor RPM's.

Contact factory if "A" reduction must be used.



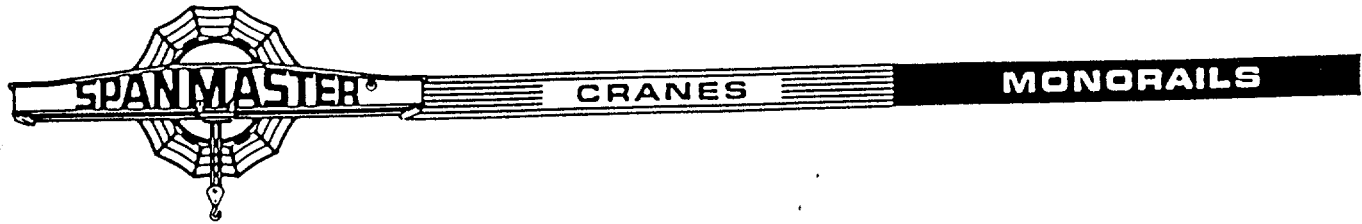
## CRANE DRIVE ASSEMBLY

Page RP-21.1  
 2-29-80

DIMENSIONS ARE FOR ESTIMATING PURPOSES ONLY.



Spenmaster  
 Division of Jervis B. Webb Company  
 739 Moore Road  
 Avon Lake, Ohio 44012  
 (216) 933-5195



## END TRUCKS

Spanmaster end trucks are designed to economically meet a wide range of modern industrial requirements. The 24-100 series end trucks are used primarily on hand propelled cranes and the 24-200 series on hand chain driven, single girder cranes and motor driven single and double girder cranes. Modified 24-200 series end trucks are also used in the construction of motor driven hoist carrier units that operate on double girder cranes.

The trolleys used on all end trucks incorporate the features described in Section 16 of this catalog. These features permit self-compensation of each trolley for slightly out of balance loading. Also, because the trolleys are fully articulated, the end trucks may be operated on runways that are suspended either rigidly or flexibly with equally satisfactory results.

The Spanmaster trolley wheel mounting described in Section 16 of this catalog provides the maximum in quick and easy removal, and interchangeability of trolley wheels without having to remove the trolley or end truck from the track.

The maximum allowable stress in all Spanmaster end truck components is 20% of the ultimate strength of the material used.

**DIMENSIONS ARE FOR ESTIMATING PURPOSES ONLY. REQUEST CERTIFICATION FOR CONSTRUCTION.**



**NO. 24-100-C END TRUCK ASSEMBLY  
3400 LB. CAPACITY - HAND PROPELLED**

**TWO WHEEL TROLLEYS:**

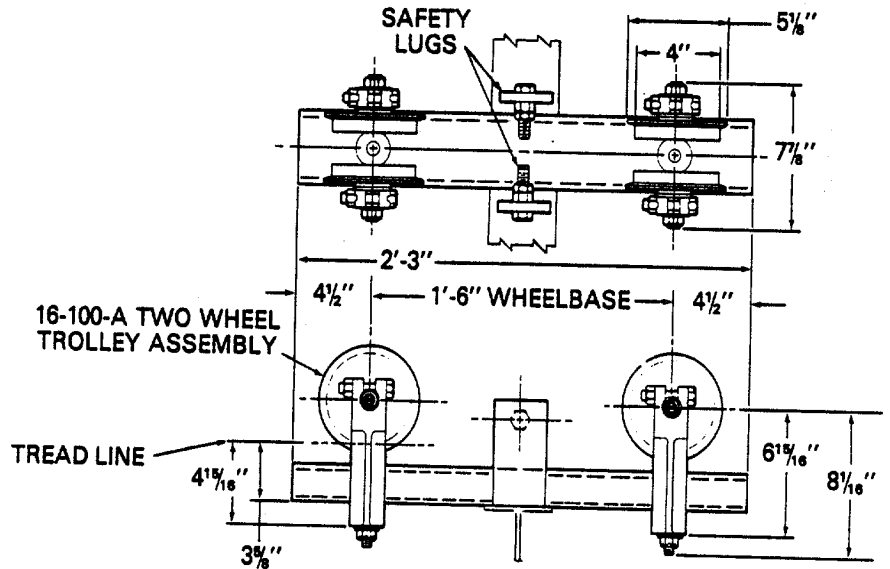
Cat. #16-100-A. Specification as noted in the trolley section of the catalog.

**END TRUCK FRAME:**

Rugged steel weldment,

**WEIGHT:**

64 pounds.



**NO. 24-101-B END TRUCK ASSEMBLY  
4600 LB. CAPACITY - HAND PROPELLED**

**TWO WHEEL TROLLEYS:**

Cat. #16-101-A. Specific in the trolley section c

**END TRUCK FRAME:**

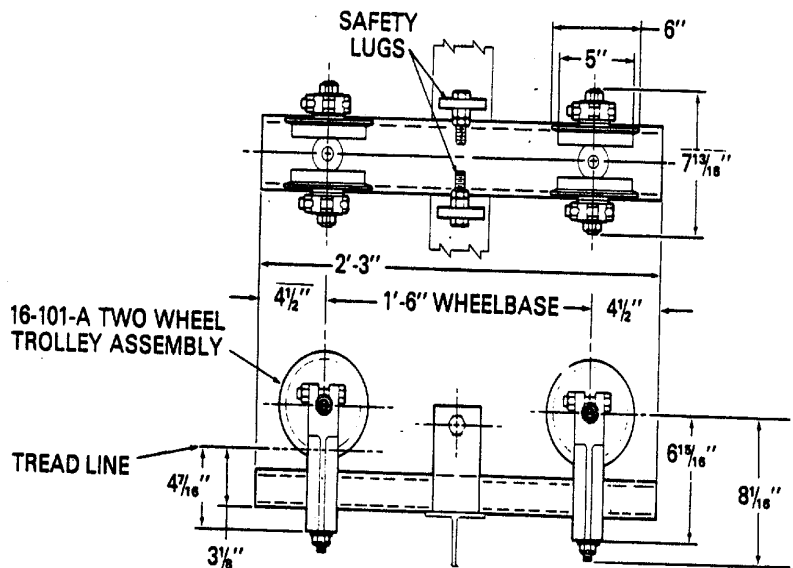
Rugged steel weldment,

**WEIGHT:**

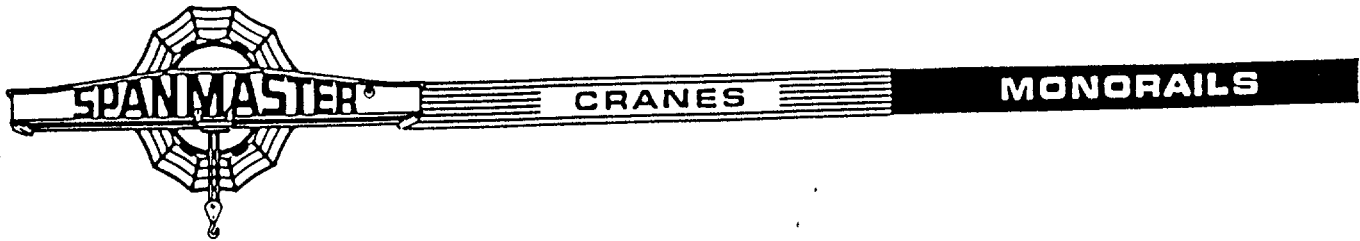
70 pounds.

**NOTE:**

These short wheel base en the most economical unit.; and are designed for short span, hand- propelled cranes.



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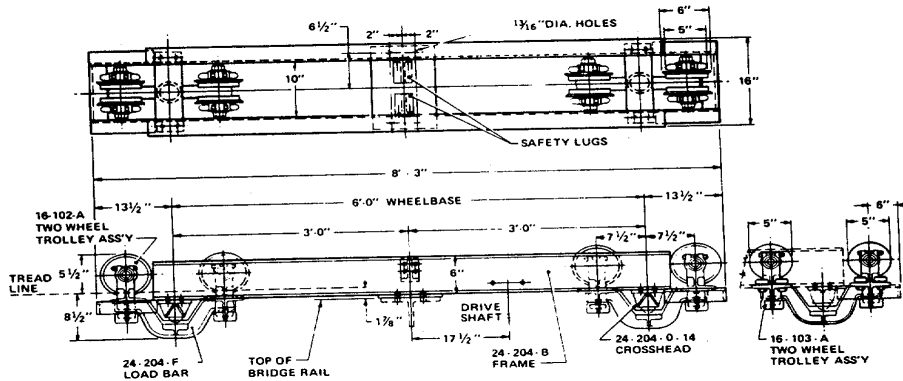
**NO. 24-204-A END TRUCK ASSEMBLY  
13,000 LB. CAPACITY -MOTOR DRIVEN**

**TWO WHEEL TROLLEYS:** Cat. #16-102-A. Specifications as noted in the Trolley Section of the catalog.  
**TROLLEY LOAD BARS:** Cat. #24-204-F. Heavy malleable casting, fixture machined.  
**END TRUCK CROSSHEAD:** Cat. #24-204-0-14. Heavy malleable casting, fixture machined.  
**END TRUCK FRAME:** Structural channel weldment, fixture fabricated.

**NO. 24-205-A END TRUCK ASSEMBLY**

Same as above except equipped with #16-103-A two wheel trolleys having flangeless wheels and side guide roller

**WEIGHT:** 495 pounds



**NO. 24-206-A END**

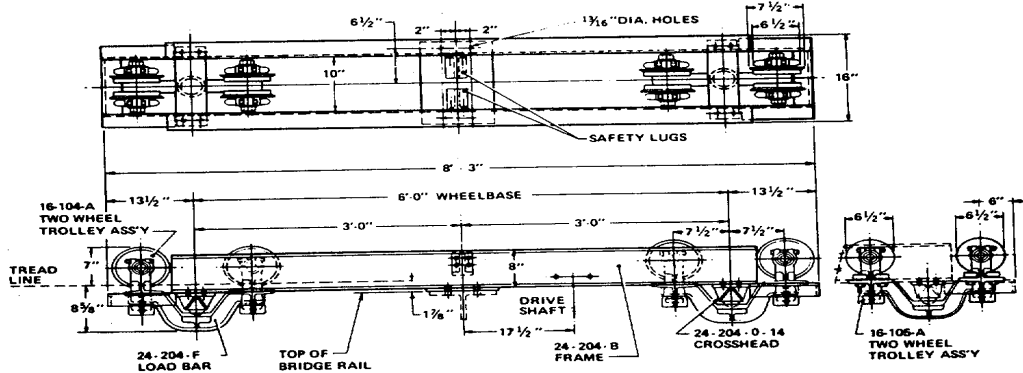
**TRUCK ASSEMBLY  
21,000 LB. CAPACITY - MOTOR DRIVEN**

**TWO WHEEL TROLLEYS:** Cat. #16-104-A. Specifications as noted in the Trolley Section of the catalog.  
**TROLLEY LOAD BARS:** Cat. #24-204-F. Heavy malleable casting, fixture machined.  
**END TRUCK CROSSHEAD:** Cat. #24-204-0-14. Heavy malleable casting, fixture machined.  
**END TRUCK FRAME:** Structural channel weldment, fixture fabricated.

**NO. 24-207-A END TRUCK ASSEMBLY**

Same as above except equipped with #16-105-A two wheel trolleys having flangeless wheels and side guide rollers.

**WEIGHT:** 550 pounds



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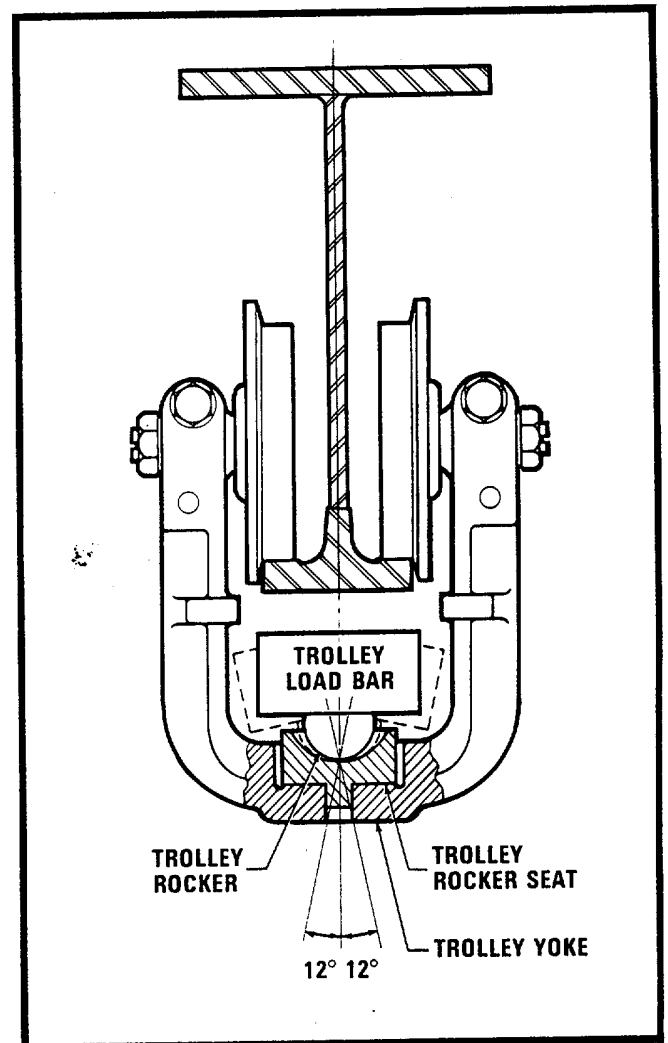


### TROLLEY ROCKER PRINCIPLE

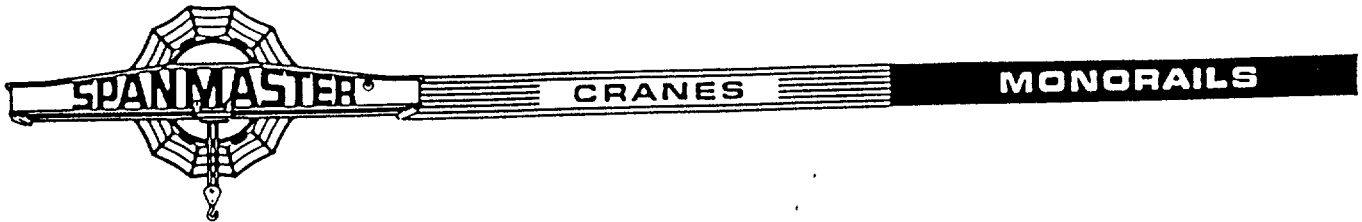
For the satisfactory operation of a trolley on a monorail track it is necessary to provide for freedom of certain motions, restrictions of other motions and elimination of still other movement tendencies. It is necessary for the trolley load bar or attachment fitting to be free to swing or tilt at right angles to the rail to compensate for slightly out of balance loads, the tendency to swing out on curves, off center lifting, etc. Most Spanmaster trolleys accomplish this by means of a cylindrically shaped trolley rocker which rides in a mating trolley rocker seat as shown in sketch and permits a swing or tilt up to 12 degrees each side of center.

Since the trolley rocker and the trolley rocker seat are cylindrical in shape they permit the above mentioned side to side swing and at the same time they eliminate any tendency of the trolley to rock fore and aft in the direction of the rail. This action would, of course, be undesirable since it causes chatter of the trolley and is detrimental to smooth, easy operation.

When negotiating curves it is necessary for the trolley load bar to swivel laterally in relation to the trolley yoke. If there is no provision for this swiveling the trolley will bind on the rail and go around a curve with great difficulty if at all. On the other hand if this swivel action is too free the trolley will have a great tendency to oscillate and chatter, especially on straight rail. Spanmaster meets these requirements by permitting the rocker seat to swivel in the yoke with just enough resistance to prevent oscillation or chatter of the trolley.



**DIMENSIONS ARE FOR ESTIMATING PURPOSES ONLY. REQUEST CERTIFICATION FOR CONSTRUCTION.**



**SPANMASTER TROLLEYS**

The Spanmaster line of monorail trolleys has been designed with an eye first to quality and service- ability and secondly to economy for the different capacities and service factors for which the various trolleys are designed and offered.

**WHEELS:** All wheels are made from high alloy forged steel. Treads are accurately machined and hardened to 425-480 Brinell.

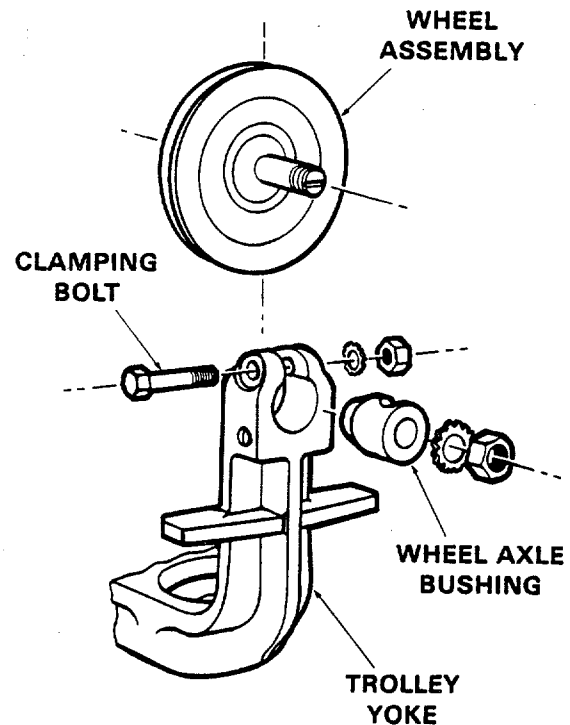
**BEARINGS:** All trolley wheels are equipped with first quality precision ball bearings which are lubricated and sealed at assembly. This feature eliminates the necessity for periodic checks and lubrication of the wheel bearings and assures satisfactory bearing life even under adverse operating conditions. For special conditions where unusual factors are present the wheel assemblies can be equipped with pressure lubrication fittings. Spanmaster wheel assemblies are designed to permit replacing a bearing, if necessary, without having to replace the entire wheel, bearing and axle assembly.

**SIDE ROLLERS:** Several of the heavier series of trolleys are available equipped with lubricated and sealed precision ball bearing, heavy, heat treated side guide rollers. These side roller trolleys are generally recommended for use on high speed, high service, power driven equipment. When used in this manner this type of trolley can materially extend the life of the rail by eliminating the scuffing action of the wheel flanges on the edge of the rail. Where there are curves in the system they also serve to guide the trolleys into and out of the curves when operating at high speeds.

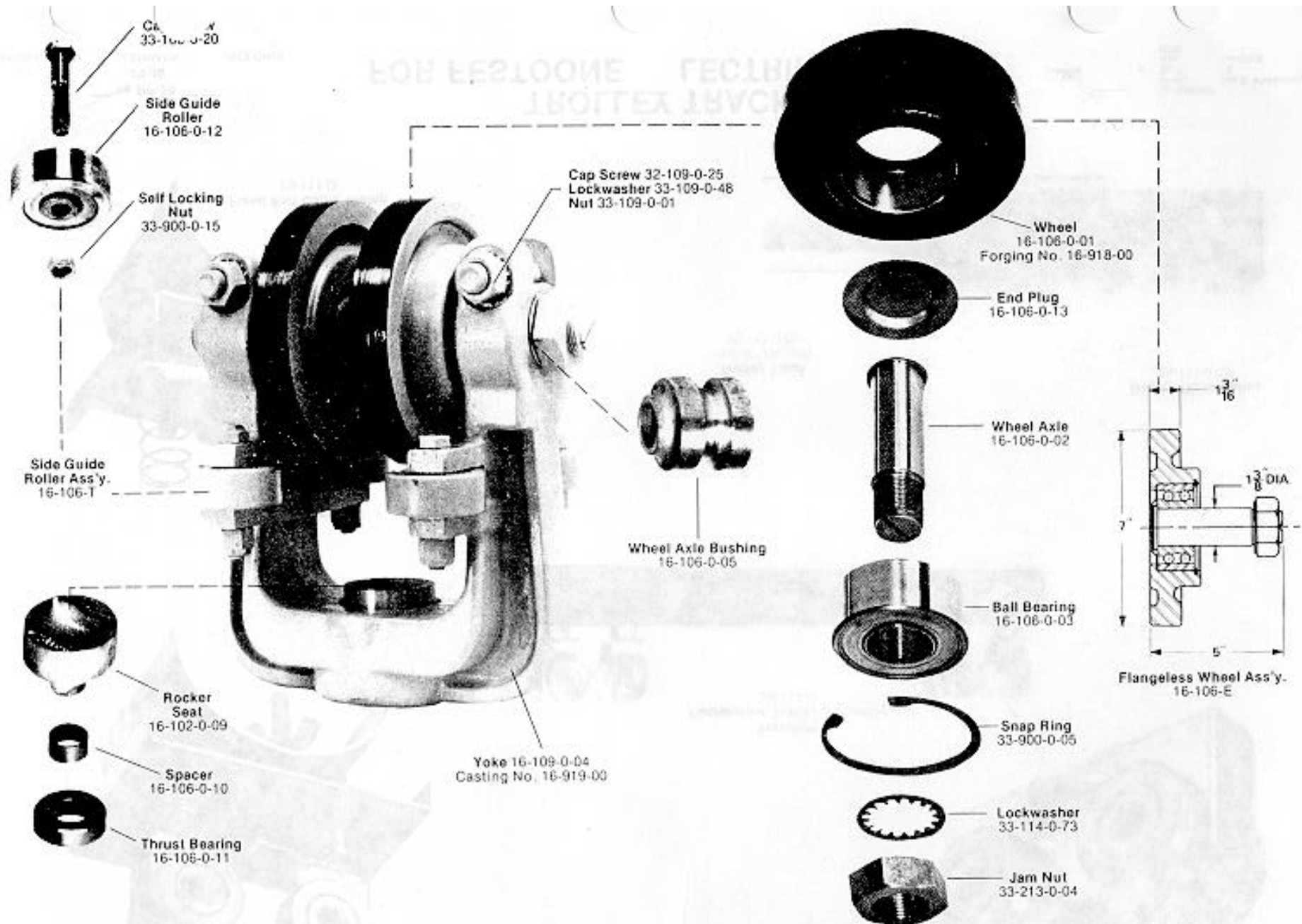
**TWO WHEEL TROLLEYS:** It will be noted that each trolley series includes a two wheel trolley. These two wheel trolleys are the basic assembly used to make up the various four wheel trolleys. They may also be used in pairs to mount on carriers, racks, etc., and suitable fittings are shown for that purpose. These two wheel units must not be used singly to carry a load since they will not operate properly if so used.

**TROLLEY WHEEL MOUNTING**

In the interest of easy installation and maintenance it is highly desirable that trolley wheels be easily in- stalled or removed while the trolley is on the rail. Spanmaster trolleys are equipped with a unique feature which permits this interchangeability of wheels without removing the trolley from the rail. In the accompanying sketch you will notice that there is a "Wheel Axle Bushing" which fits the bore in the trolley yoke and also accommodates the axle of the wheel assembly. This bushing is prevented from slipping or turning by the clamping bolt which also engages a notch in the bushing to insure and maintain correct wheel gaging. To remove a wheel with the trolley on the rail the hexagon nut and lockwasher are removed from the axle and the clamping bolt removed from the yoke. The bushing is then withdrawn from the yoke bore as shown. With the axle bushing removed the wheel axle will readily slip upward thru the slot in the top of the yoke thus freeing the wheel assembly from the trolley. Replacing the wheel simply involves the above procedure in reverse. This interchangeability of wheels is quick and simple and can be accomplished without the use of any special tools or devices.



**DIMENSIONS ARE FOR ESTIMATING PURPOSES ONLY. REQUEST CERTIFICATION FOR CONSTRUCTION.**



Page RP-16.7  
7-31-79

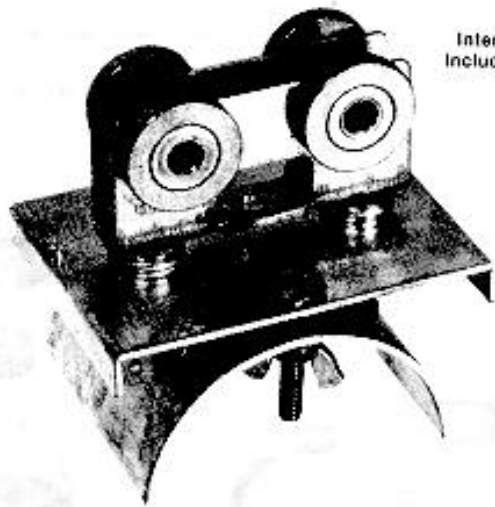
DIMENSIONS ARE FOR ESTIMATING PURPOSES ONLY

## 16-109-A 2 WHEEL TROLLEY

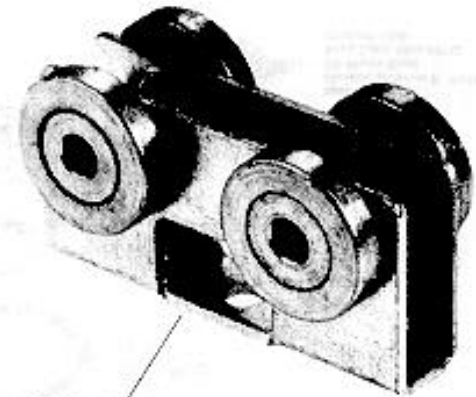
8000 L.B. CAPACITY



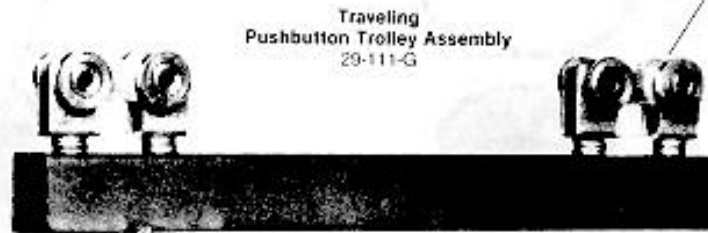
Spanmaster  
 Division of Jervis B. Webb Company  
 739 Moore Road  
 Avon Lake, Ohio 44012  
 (216) 503-6196



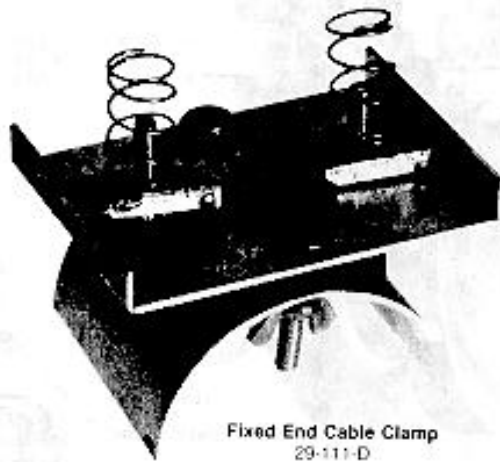
Intermediate Trolley  
Including Cable Clamp  
29-111-C



Intermediate  
Trolley  
29-111-0-09

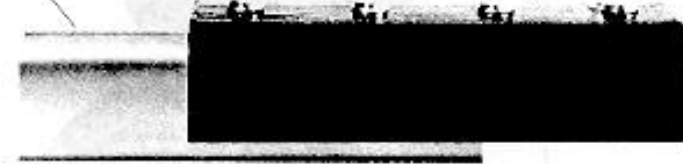


Traveling  
Pushbutton  
Trolley Assembly  
29-111-G



Fixed End Cable Clamp  
29-111-D

Trolley Track  
(10'-0" Length)  
29-111-0-02



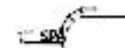
Trolley Track Splice  
29-111-0-03

## TROLLEY TRACK FOR FESTOONE ELECTRIFICATION

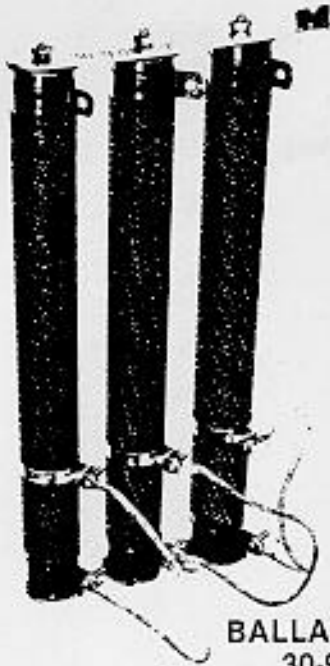
DIMENSIONS A1

RP-29  
-29-80  
ESTIMATE

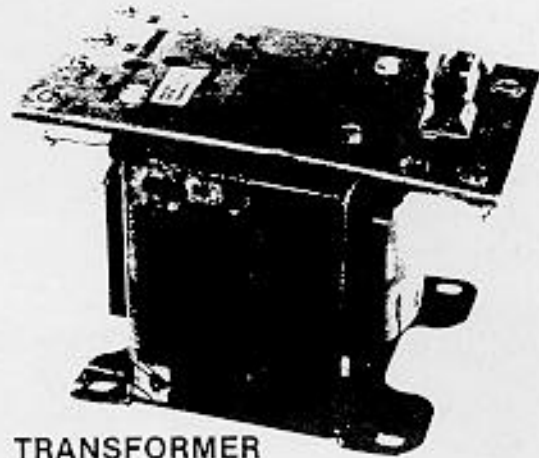
USES ONLY



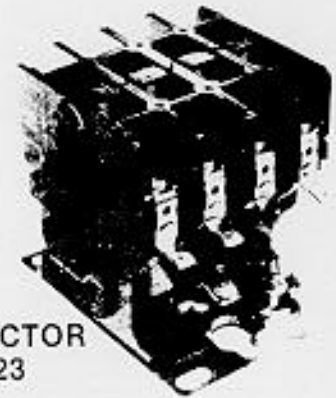
Spokane  
2802  
729 7  
Area  
(208)  
The B. Webb Company  
1  
2-66012



**BALLAST RESISTORS**  
30-900-E thru T



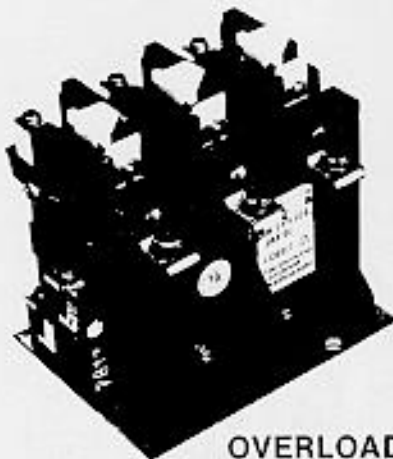
**TRANSFORMER**  
30-360-0-11



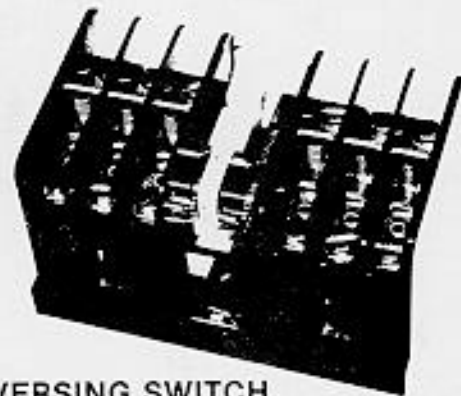
**MAINLINE CONTACTOR**  
30-211-0-21 or 23



**THERMAL UNIT**  
30-351-0-2 thru 11



**OVERLOAD RELAY**  
30-350-0-10

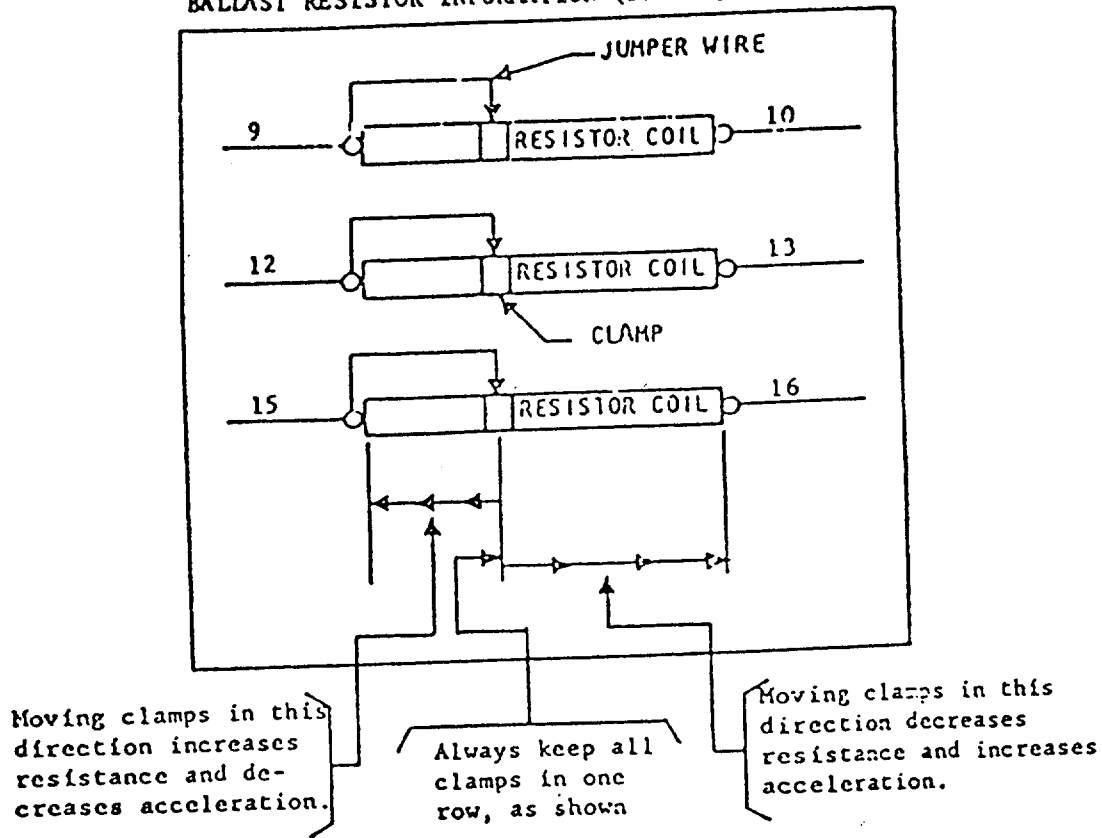


**REVERSING SWITCH**  
30-211-0-19

## **ELECTRICAL CONTROL PARTS**



**BALLAST RESISTOR INFORMATION (33-900)**



SAMPLE BALLAST RESISTOR DIAGRAM

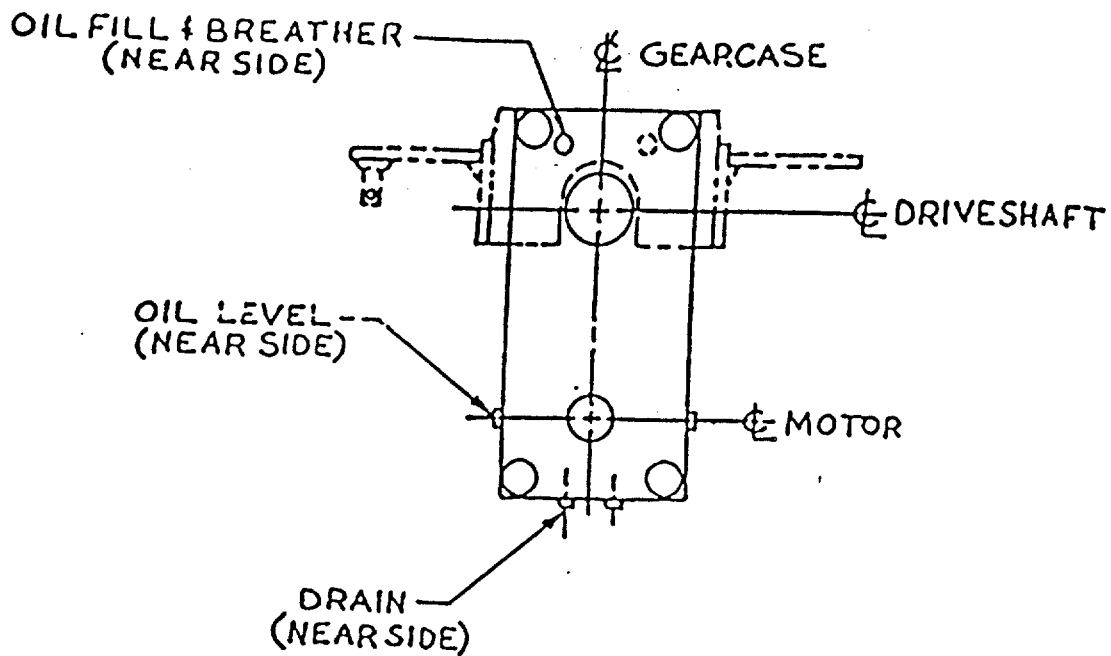
The procedure for adjusting the starting acceleration of a crane or tractor, with ballast resistance control, consists of three steps:

1. Pick up the heaviest load that is to be handled.
2. Move clamps A, B, & C toward 9, 12, and 15 until the crane or tractor stalls. (This coil adjustment increases resistance and decreases the starting acceleration).
3. Move clamps A, B, & C away from 9, 12, and 15 until the crane or tractor begins to slowly accelerate to the proper speed. (This coil adjustment decreases resistance and increases the starting acceleration).

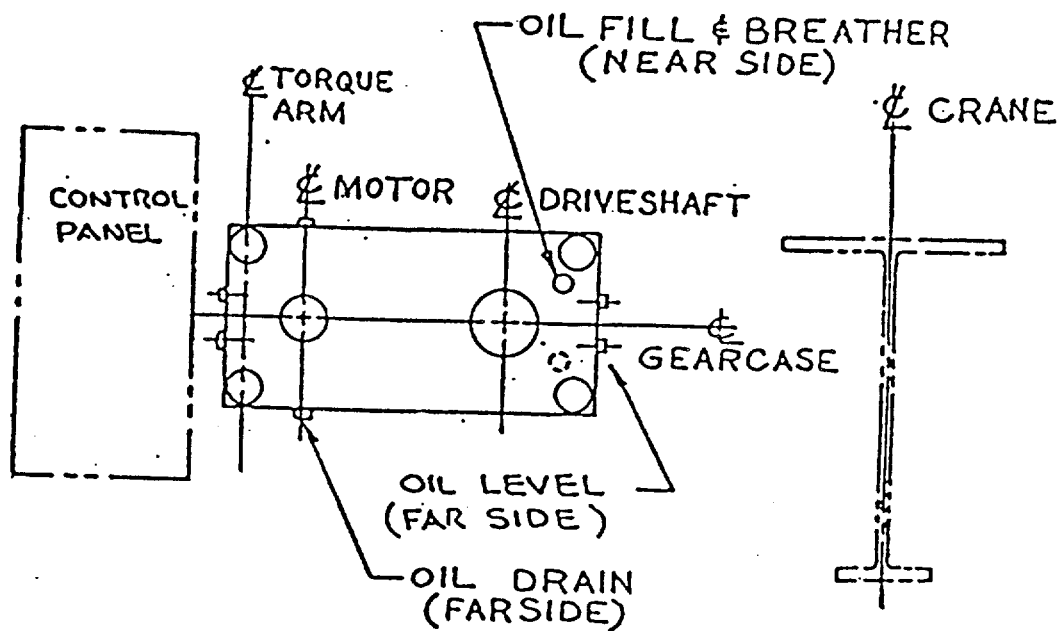
Once a ballast resistor has been adjusted, it should never need attention except for four (4) possibilities:

1. Different starting acceleration characteristics are desired.
2. The motor was replaced by one with different characteristics from the first motor.
3. Physical damage to the resistors.
4. The resistor coil has burned out.

For wound rotor motor, contact the factory office for resistor adjustments.



VERTICAL MOUNTING



HORIZONTAL MOUNTING

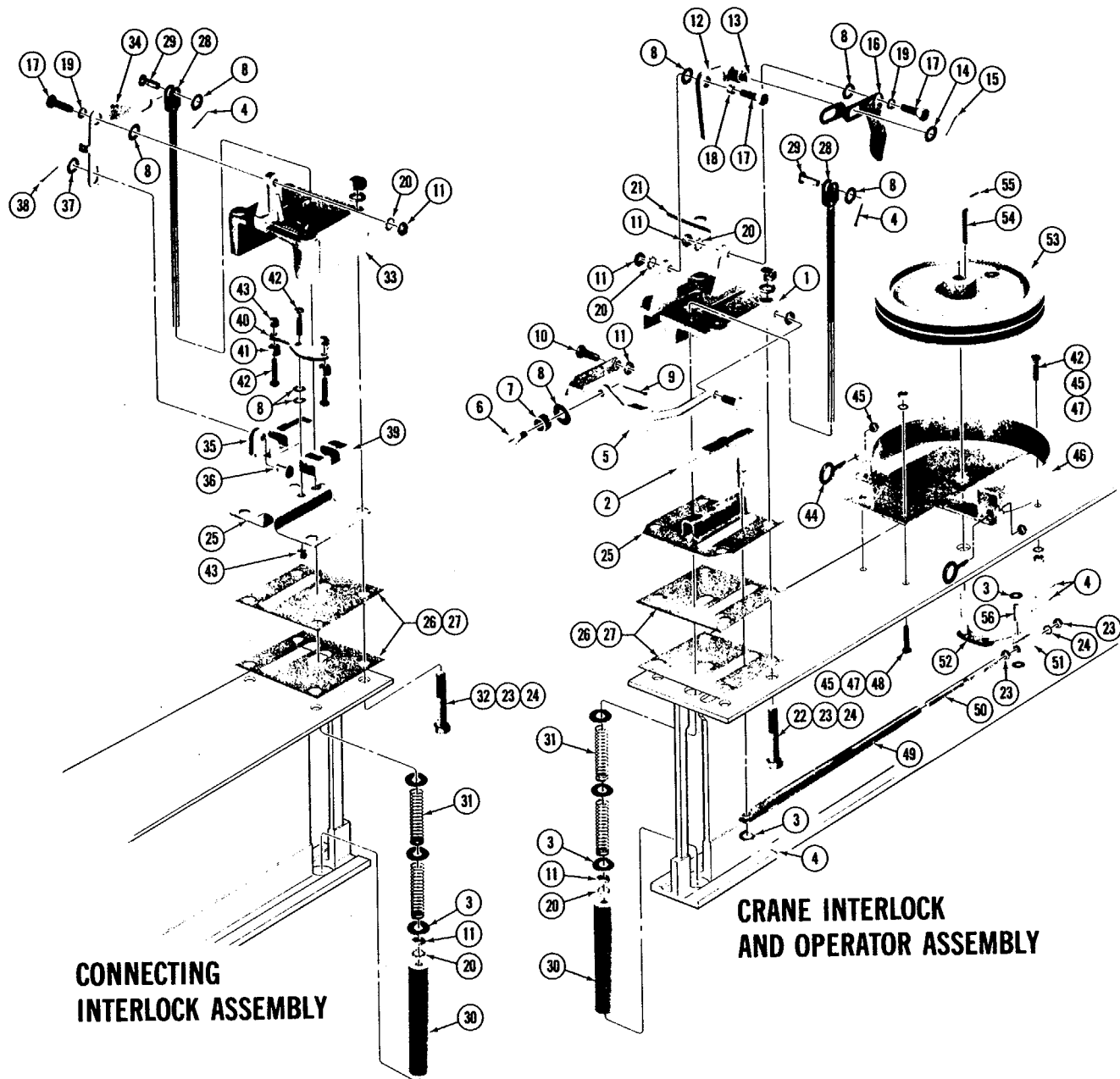
FOR 35-300-A THRU G  
GEARCASE

USE AGMA 5 EP OIL



LUBRICATION INSTRUCTIONS  
12-1-78 #28-300-0-06






TOTAL REQ'D.	MK. NO.	PART NO.	DESCRIPTION
	1.	15-101-0-01	Interlock Housing
	2.	15-101-0-02	Interlock Pin
9 Req'd.	3.	33-306-0-25	1/2" Dia. Plain Washer
5 Req'd.	4.	33-402-0-03	1/8" Dia. Cotter Pin x 1" Lg.
	5.	15-101-0-03	Keeper
	6.	15-101-0-05	Roller Axle
	7.	15-101-0-04	Roller
8 Req'd.	8.	33-306-0-45	1/2" Dia. S.A.E. Flatwasher
	9.	33-401-0-04	3/32" Dia. Cotter Pin
2 Req'd.	10.	32-106-0-12	1/2"-13 N.C. H.H.C.S. x 1-1/4" Lg.
7 Req'd.	11.	33-106-0-03	1/2"-13 N.C. Jam Nut
	12.	15-101-0-06	Actuating Lever
	13.	15-101-0-07	Crank Arm
	14.	33-307-0-46	9/16" Dia. S.A.E. Flatwasher
	15.	33-402-0-04	1/8" Dia. Cotter Pin x 1-1/4" Lg.
	16.	15-101-0-08	Safety Stop Elevating Lever
3 Req'd.	17.	32-106-0-14	1/2"-13 N.C. H.H.C.S. x 1-1/2" Lg.
	18.	15-101-0-10	Bushing
2 Req'd.	19.	15-101-0-09	Bushing
5 Req'd.	20.	33-106-0-45	1/2" Dia. External Shakeproof Lockwasher
	21.	15-101-0-18	Keeper Retainer
4 Req'd.	22.	32-108-0-22	5/8"-11 N.C. H.H.C.S. x 3-1/2" Lg.
10 Req'd.	23.	33-108-0-01	5/8"-11 N.C. Hex Full Nut
9 Req'd.	24.	33-108-0-27	5/8" Dia. Helical Lockwasher
2 Req'd.	25.	15-101-0-15	Interlock Base Plate
4 Req'd.	26.	15-101-0-16	16 Gage Shim
2 Req'd.	27.	15-101-0-17	11 Gage Shim
2 Req'd.	28.	15-101-K	Pull Rod
2 Req'd.	29.	15-101-0-14	Pin
2 Req'd.	30.	15-101-0-11	Safety Stop
4 Req'd.	31.	33-950-0-47	Spring
4 Req'd.	32.	32-108-0-26	5/8"-11 N.C. H.H.C.S. x 5" Lg.
	33.	15-102-0-01	Connecting Interlock Housing
	34.	15-102-0-03	Connecting Elevating Lever
	35.	15-102-0-04	Connecting Pin
	36.	15-102-0-08	Pin
	37.	33-305-0-24	3/8" Dia. Plainwasher
	38.	33-402-0-02	1/8" Dia. Cotter Pin x 3/4" Lg.
2 Req'd.	39.	15-102-0-02	Connecting Shoe
40.	15-102-0-05	Cross Connecting Lever	
2 Req'd.	41.	33-950-0-06	Oilite Sleeve Bearing
5 Req'd.	42.	32-104-0-14	3/8"-16 N.C. H.H.C.S. x 1-1/2" Lg.
3 Req'd.	43.	33-900-0-12	3/8"-16 N.C. ESNA Nut
2 Req'd.	44.	32-900-0-12	3/8" Eye Bolt
6 Req'd.	45.	33-104-0-01	3/8"-16 UNC Hex Hd. Nut
	46.	15-100-P	Manual Interlock Operator Guard
4 Req'd.	47.	33-104-0-23	3/8" Dia. Lockwasher
2 Req'd.	48.	32-104-0-16	3/8"-16 N.C. H.H.C.S. x 2" Lg.
	49.	15-100-0-16	Pusher Rod
	50.	15-100-0-08	5/8" Dia. Rod
	51.	15-100-0-10	Pusher Dog
	52.	15-100-G	Crank Assembly
	53.	15-100-0-04	Operator Wheel
	54.	33-950-0-57	1/4" Sq. Gib Head Key x 2-1/2" Lg.
	55.	33-950-0-56	3/16" Dia. Roll Pin x 1" Lg.
	56.	15-100-0-07	1/2" Dia. C.R.S. x 1-1/2" Lg.

RP-15.1  
12-21-81  
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# CRANE INTERLOCK


**Spanmaster**  
 Division of Jervis B. Webb Company  
 739 Moore Road  
 Avon Lake, Ohio 44012  
 (216) 933-6166



A SUBSIDIARY OF DANIEL WOODHEAD, INC.

**AERO-MOTIVE MFG. CO.**

P.O. Box 2678 · Kalamazoo, Michigan 49003  
Telephone (616) 381-1242 · Telex: 224420

FOR.M #SM3120-04BK  
DATED APRIL 1, 1980

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**Service Manual**

**Series 200a & 300a POW- R-MITE**

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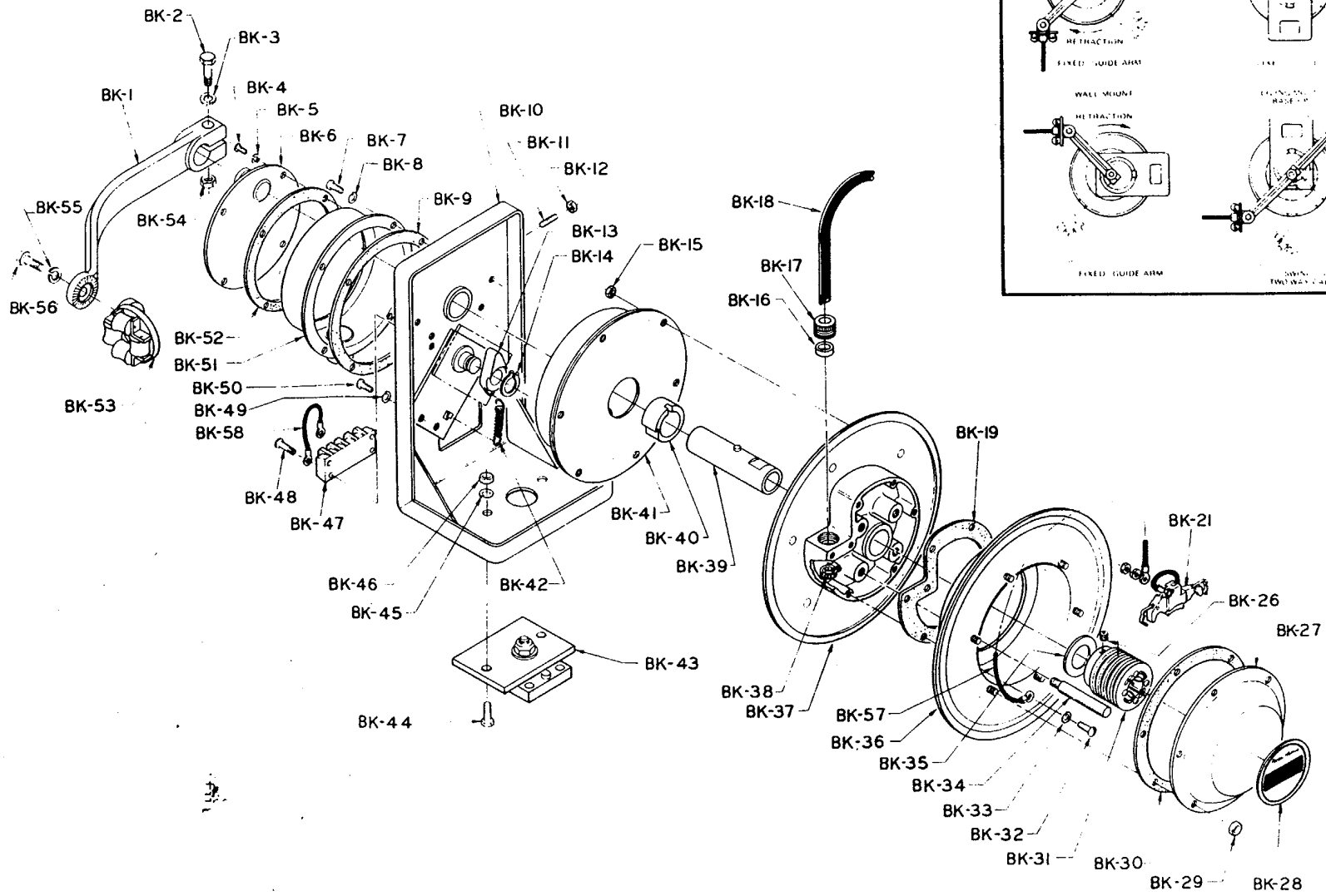
I. INSTALLATION OF REEL

- A. MOUNTING: Reel may be mounted base up, base down, or in any position which allows the mainshaft to be horizontal. Reel should be mounted with centerline of drum in line with cable run.
- B. PIVOT BASE: If optional pivot base (BK-43) is used, reel will be self-aligning to direction of cable run. The four-roller guide (BK-53) must be used with pivot or swivel mounts.
- C. WIRING: Input power connections are made at terminal board (BK-47) through a connector or coupling which is inserted into the 3/4 inch pipe thread opening at the bottom of the enclosure. Due to various types that may be used, this connector is not supplied with reel. Individual conductors are then connected to open side of terminal board (BK-47).
- D. SAFETY INTERNAL GROUNDING: Standard reels are not grounded internally with the exception of reels built to C. .A. standards and the model 228a-H. Internal grounding must be accomplished by the user by running one jumper wire from brushholder (BK-21) to screw(s) (BK-32) and a second wire from terminal (BK-47) to screw(s) (BK-48).
- E. SECONDARY SAFETY CABLE: It is strongly recommended that a secondary safety cable or chain be attached to all reels mounted overhead to prevent reel from falling.

II. ADJUSTMENT

- A. RATCHET LOCK: All models are supplied with a ratchet lock which works in any position. If ratchet lock is not required (constant tension), place lock adjustment plate in position shown in illustration on opposite side. For ratchet lock action, move plate to position shown with phantom lines.
- B. CABLE GUIDE: The cable guide arm (BK-1) may be set at any fixed position around the cable drum. The guide (BK-53) must be set so the cable pays off reel in a straight line without bends. If guide arm is to be free-swinging (self-aligning), loosen screw (BK-2) on base of guide arm.
- C. SPRING TENSION: Before making final connections of cable (BK-18), pretension reel by pulling cable out far enough to allow one full wrap of cable to be thrown back over spool, hold spool from turning, and place cable back on reel. Repeat until desired tension is set. After tension is set, pull cable out completely to insure enough spring travel remains for operating. Failure to test in this manner can lead to spring damage. Failure to pretension the reel may shorten the life of the spring. Caution: Always check for shorts and continuity before turning on electrical power.



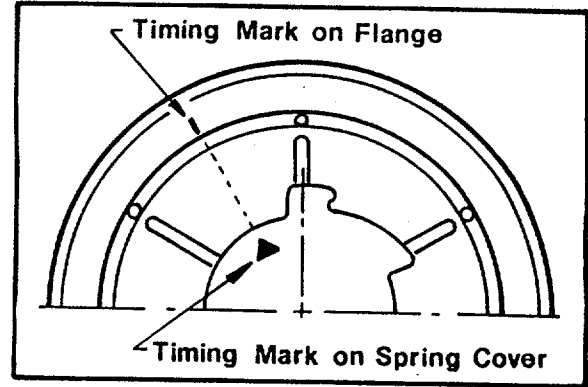


POW-R-MITE 200a & 300a

### III. SERVICE

**CAUTION:** Before performing any service to reel, remove all spring tension and lock out electric power.

- A. **MAINSRING AND CUP:** If reel will not develop tension or retract cable, mainspring and cup (BK-41) may need to be replaced. To replace mainspring, remove junction box (BK-51), disconnect wires on terminal board (BK-47) which enters junction box through mainshaft, remove set screw (BK-11), and remove spool from stand. Remove mainspring and cup assembly from spool and replace with new part if necessary. Reverse above to reassemble. When reassembling, be sure to line up arrow on spring cover with line on flange. (As shown on illustration.)



- B. **SLIP RING:** Remove cover (CK-27) and drum (BK-30) exposing slip ring. Brushholder assembly (BK-21) may be removed by unclipping brushholder from mounting studs (BK-34). Slip ring (BK-31) may be removed by removing all brushholders, set screw (BK-26) and wires on terminal board (BK-47). Slip ring will now slide off mainshaft. To reassemble, reverse above procedure. For ease of reassembly, place last brush (one closest to drum) in the top position, with cable entrance located to the left. Place subsequent brushes in clockwise rotation. Caution: Check continuity and replace all covers before turning on electrical power.

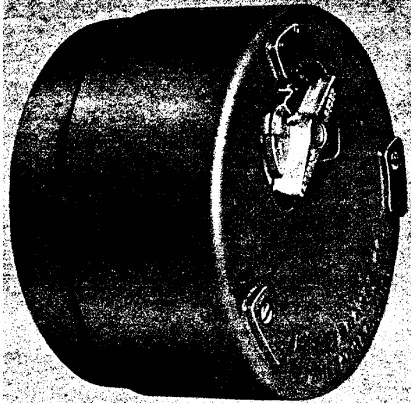
# AERO-MOTIVE

A SUBSIDIARY OF DANIEL WOODHEAD, INC.

AERO-MOTIVE MFG. CO.  
P.O. Box 2678 · Kalamazoo, Michigan 49003  
Telephone (616) 381-1242 · Telex: 224420

**Dings**  
DYNAMICS GROUP

**60 SERIES  
HEAVY DUTY UNIPAC BRAKE  
INSTRUCTIONS**



Standard Enclosure		Number Of Rotating Discs	General Dimensions In Inches				Wt. (Lbs.)		Thermal Capacity	Inertia Rotating Parts
Model	Torque (Lb. Ft.)		C	AC	G*	X	Net	Pkg'd.	H.P. Sec/Min.	WK <sup>2</sup> in Lb. Ft. <sup>2</sup>
2-61001-24	1½	1	4¼	¾	1½	¾	8½	9½	7	.0042
2-62006-24	6	2	4¼	¾	1½	¾	9	10	8	.0081
**2-63009-24	9	3	4¼	¾	1½	1½	10	11	9	.0119
2-62010-24	10	2	4¼	¾	1½	¾	9	10	8	.0081
**2-63010-24	10	3	4¼	¾	1½	1½	10	11	9	.0119
2-63015-24	15	3	4¼	¾	1½	1½	10	11	9	.0119
2-63020-24	20	3	4¼	¾	1½	1½	10	11	9	.0119

\* Length of mounting hole thru bracket.  
\*\* These models are replaced by 2-62010-24

**IMPORTANT**

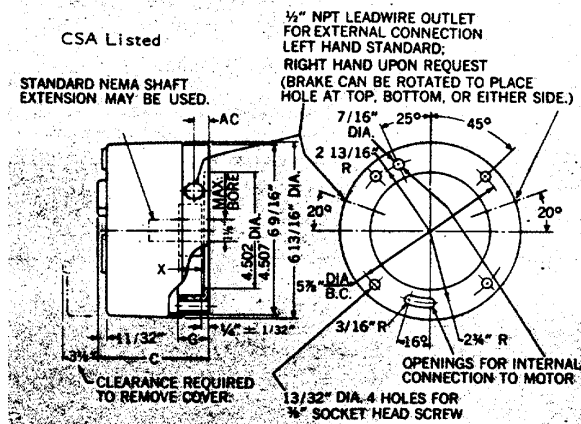
Read this bulletin carefully before installing or operating this- brake. Failure to comply with these instructions cancels all warranties.

**WARNING**

Brake performance and features must be carefully matched to the requirements of the application. Consideration must be given to torque requirements, especially where an overhauling condition exists, as well as thermal capacity, ambient temperature, atmospheric explosion hazards, type of enclosure and any other unusual conditions. Improper selection and installation of a brake and/ or lack of maintenance may cause brake failure which could result in damage to property and/or injury to personnel. If injury to personnel could be caused by brake failure, additional means must be provided to insure safety of personnel. Do not operate manual release or energize brake coil before installation in order to preserve prealignment of rotating discs for ease of installation.

**DESCRIPTION**

This brake is direct acting, electromagnetically released and spring set. It uses rotating and stationary disc contact to supply positive braking action. It retains quick release and setting capabilities at all times. Simplicity of design has reduced maintenance to an absolute minimum. As with any electromechanical equipment, however, periodic inspection and adjustment will assure optimum performance. As the friction discs wear, the magnet gap will increase. the magnet gap should be checked periodically and adjusted when necessary.



**INSTALLATION (see Figures 2,4 & 5**

1. Remove hub (1) from brake and position on motor shaft with key as illustrated in Figure 2. Stamped part number on hub should face away from motor. Tighten hub screws to shaft with 8-10 lb. ft. torque.
2. Remove two cover screws (32) and cover (31) and position brake over hub on shaft. Bolt brake to motor flange or floor mount.
3. connect coil wire leads as shown in Figure 4. Replace cover and cover screws.

### MANUAL RELEASE (See Figure 5)

To manually release the brake, rotate release knob (21) clockwise until it strikes stop pin (22). The brake will remain in the release position until manually reset, or automatically reset when electric power is restored.

### MAINTENANCE AND SERVICE

#### FRICITION DISC REPLACEMENT (See Figure 5)

When total wear on rotating friction disc reaches 1/16"; replace as follows:

Remove cover. With release knob (21) in released position, remove three mounting screws (27) and remove operator assembly (6) as a unit. Spring (5) is a loose part. Avoid loss. Remove stationary discs (3), install new rotating discs (4) and reassemble all parts in reverse order. After starting three screws (27), turn two wear adjustment screws (26) counterclockwise to allow the three posts on end plate assembly (7) to seat against the bracket (2). Tighten screws (27). Readjust magnet gap (see WEAR ADJUSTMENT). Replace cover.

#### MAGNET ASSEMBLY REPLACEMENT

Remove cover. Unscrew two flat head screws (13), remove shoulder nuts (12) and rubber washers (11). Remove and replace magnet assembly (9) and reassemble parts in reverse order. Magnet and armature faces must be clean and parallel to insure quiet operation (see WEAR ADJUSTMENT and TROUBLE SHOOTING). If manual release does not operate properly, see TROUBLE SHOOTING.

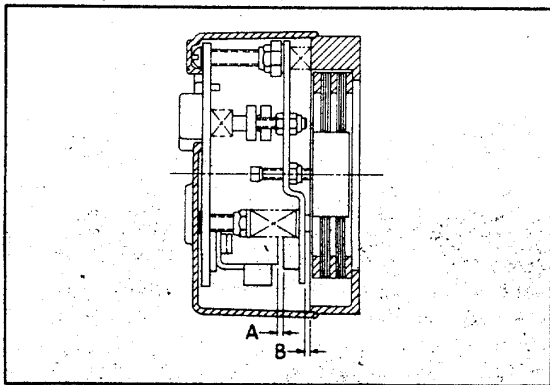


Figure 3. Brake Cap Adjustment

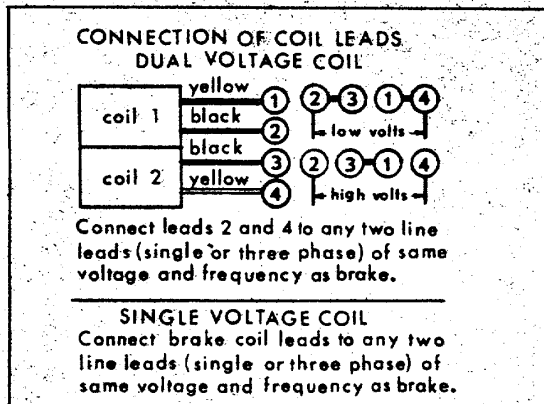


Figure 4. Wiring Diagram

### WEAR ADJUSTMENT (See Figure 3)

When armature plate (25) touches bracket (2), closing gap "B," adjustment for friction disc wear is required. Turn two screws (26) clockwise until magnet gap "A" reads .040" to .045" at narrowest gap, for 1 and 2 disc models, and reads .050" to .055" at narrowest gap, for 3 disc models. Any delay in adjusting gap will result in eventual loss of torque.

### TORQUE ADJUSTMENT

The 60 Series Brake is factory set for rated static torque. To increase stopping time and lower torque, turn two locknuts above torque springs (16) counterclockwise, increasing spring length. Each full turn decreases torque by approximately 10%. Do not adjust brakes for higher torque, as this will cause premature coil burnout.

### TROUBLE SHOOTING

#### BRAKE DOES NOT RELEASE

Check for failure of power supply to brake.  
Check brake visually for broken or damaged parts.  
Check for broken leadwire or bad electrical connection.  
Check for correct voltage. Voltage must correspond to that listed on brake nameplate. If voltage is more than 10% below figure stamped on nameplate, magnet will not pull in, causing coil to burn out within minutes. If voltage is more than 10% above, coil will overheat and burn out.  
Check for burned out coil (coil may be charred or burned).

#### BREAK DOES NOT STOP

Check that manual release is in normal reset position.  
Check brake visually for broken or damaged parts.  
Check disc wear (See WEAR ADJUSTMENT).  
Check for broken friction disc.  
Make certain hub has not shifted position on shaft and that all rotating discs are fully engaged on hub.

#### BRAKE CHATTERS OR HUMS

Clean magnet faces if dirty. Insert a clean sheet of paper between magnet faces and energize brake. Move paper around between faces to dislodge dirt. Finally, remove paper.

Check that magnet faces are parallel in closed position.  
1. If not parallel along length of magnet, check bushings (14) under torque springs for binding or excessive wear.  
2. If not parallel across width of magnet, adjust pivot nut (8) on post to obtain minimum magnet hum. After adjusting pivot nut, lock in place with nut (item 7, part "C"). Check magnet gap "A" and adjust if necessary (See WEAR ADJUSTMENT). Operate manual release (21) and adjust if necessary.

Check if shading coil (10) is cracked, broken or out of position. Replace magnet assembly if cracked or broken.

Check for low voltage. Magnet will not pull in and coil will burn out if voltage is more than 10% below figure stamped on nameplate.

#### MANUAL RELEASE DOES NOT WORK

Check for broken or damaged parts.  
Check return spring (24). Brake will not reset automatically if this spring is broken.  
Check magnet gap "A" with knob in released position. Gap must be .030" at narrowest point. If gap is too wide, motor shaft will not turn freely. If gap is too small, knob will not return automatically when power is applied. Adjustment for correct magnet gap is made by turning nuts (18 and 19). Make sure nuts are tight against armature plate (25) after adjusting release.

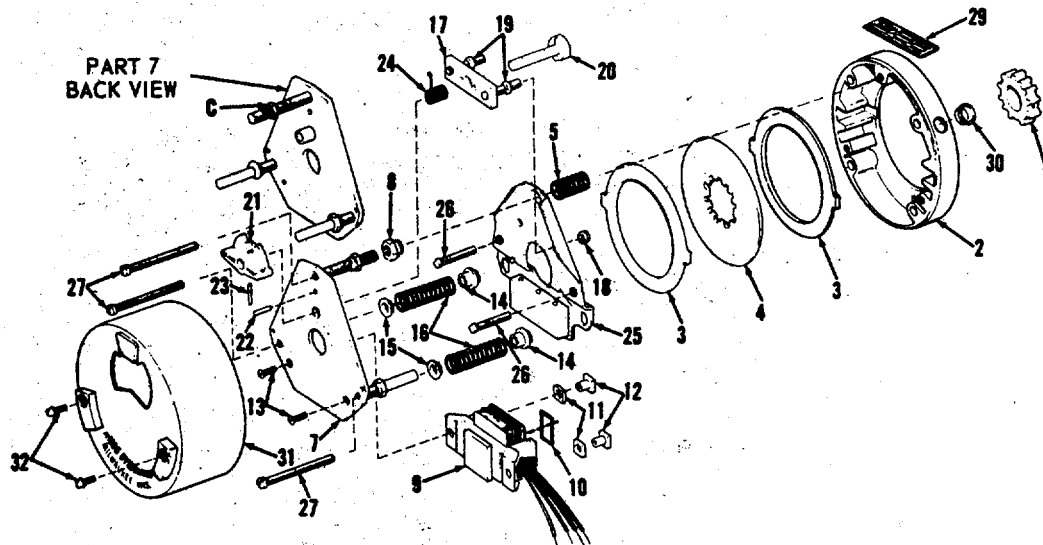


Figure 5. Exploded View of Brake

Item No.	Pcs. Req.	Net Wt. Per Piece (Oz.)	Description	Part No.	Item No.	Pcs. Req.	Net Wt. Per Piece (Oz.)	Description	Part No.
1	1	14	Hub with Set Screws (Specify Bore and Keyway)	K60107	16	2	1	Torque Spring, Models 2-62006-24 and 2-63009-24	G60275-2
2	1	14	Bracket, Models 2-61001-24, 2-61003-24, 2-62006-24 & 2-62010-24	L60038	<del>2</del>	1	<del>Torque Spring, Models 2-62010-24 &amp; 2-63015-24</del>	<del>G60275-4</del>	
2	1	20	Bracket, Models 2-63009-24, 2-63010-24, 2-63015-24 & 2-63020-24	L60075	16	2	<del>Torque Spring, Model 2-63010-24</del>	<del>G60275-5</del>	
3	**	7	Stationary Disc	H60147	17	1	6	Lift Bar Assembly (Includes Item 19)	G60295-1
4	*	7	Rotating Disc	H60157-1	18	2	1	Locknut	3-13-1
4A	*	13	Heavy Duty Rotating Disc	H60398-1	19	2	1	Jam Nut	3-7-1
5	1	1	Compression Spring	G60297	20	1	2	Release Camshaft	K60105-2
6	1	76	Operator Assembly (Includes Items 7 thru 26)	K60132	21	1	1	Release Knob	H60170-2
7	1	32	End Plate Assembly (Includes Item 8)	H60198	22	1	1	Groove Pin	5-4-2
8	1	1	Pivot Nut	G60267	23	1	1	Roll Pin	5-3-73
9	1	24	Magnet Assembly (Includes Item 10) Models 2-61001-24, 2-62006-24, 2-63009-24 and 2-63010-24	H60199	24	1	1	Return Spring	G60277
				208 v. COIL	25	1	20	Armature Plate Assembly (Includes Item 26) Models 2-61001-24 and 2-63010-24	H60162-1
		24	Magnet Assembly (Includes Item 10) Model 2-63020-24	H60200				Armature Plate Assembly (Includes Item 26) Models 2-63009-24, 2-63015-24 and 2-63020-24	H60162-2
				H60230					
10	1	1	Shading Coil	G60346	26	2	1	Set Screw, Square Head	2-3-1
11	2	1	Rubber Washer	G60310	27	3	1	Round Head Machine Screw w/Springtite Lockwasher	1-3-6
12	2	1	Shoulder Nut	G60305	29	1	1	Nameplate	K60210
13	2	1	Flat Socket Head Cap Screw with Nylok Insert	1-17-3	30	1	1	Cap Plug	8-3-1
14	2	1	Bushing	G60268	31	1	32	Cover	L50053
15	2	1	Washer	G60294	32	2	1	Pan Head Machine Screw w/Springtite Lockwasher	1-6-4
16	2	1	Torque Spring, Model 2-61001-24	G60275-1					

\* For number of rotating discs, see Table 1, page 1.  
 \*\* Number of stationary discs is one more than number of rotating discs.

Table 2. Parts List



**VERTICAL MOUNTING:**

**INSTALLATION AND ADJUSTMENT**

Installation and adjustment of the vertically mounted DINGS UNIPAC BRAKE is the same as on the standard model (this bulletin, pages 1 thru 3).

**FRICTION DISC REPLACEMENT**

When replacing friction discs, follow procedure outlined on page 1, with this addition:

Care must be taken. To insure proper insertion of disc separating springs. Springs are color coded for easy identification, and reference is made to spring color, (see Figure 6 and Table 3). The installation order of the disc springs is dependent on brake-mounting position, (above or below motor), so make sure to consult the correct diagram for spring location.

ITEM	DESCRIPTION	PART NO.	NO. OF ROT. DISCS		
			1	2	3
1	SPRING (SILVER)	G60350-1	2	2	2
2	SPRING (BLACK)	G60350-2	-	2	2
3	SPRING (BRONZE)	G60350-3	-	-	2
4	ROLL PIN - 1/8" x 5/8"	59-028-125-0625	2	-	-
5	ROLL PIN - 1/8" x 1"	59-028-125-1000	-	2	-
6	ROLL PIN - 1/8" x 1-3/8"	59-028-125-1375	-	-	2
7	STATIONARY DISC	H60203-4	1	2	3
8	STATIONARY DISC	H60203-3	1	1	1

Table 3. Parts for Vertical Mounting

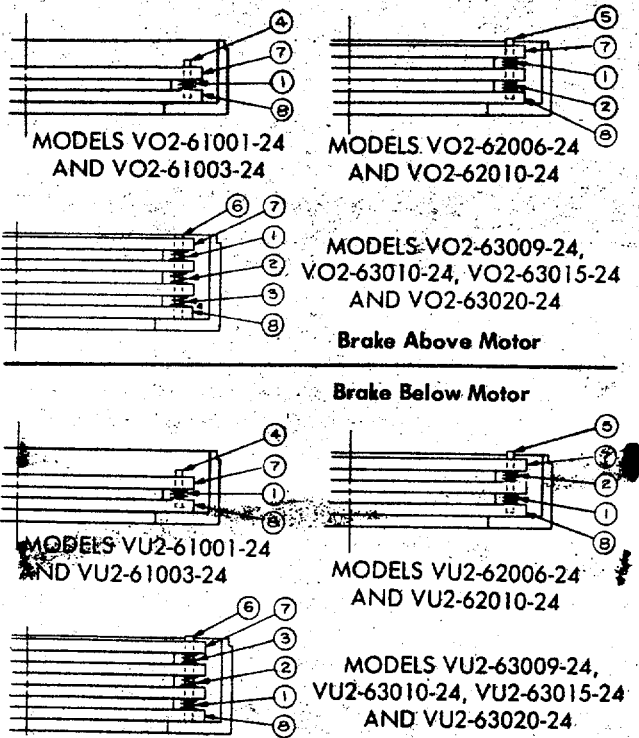


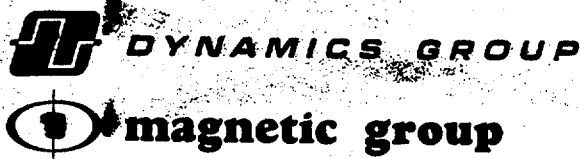
Figure 6. Vertical Mounting Brakes

**BRAKE SPECIFICATIONS**

- TORQUE: 1-1/2 thru 20 lb. ft
- MOTOR FRAMES: 56C, 66C, 143TC, 145TC
- HOUSING: All aluminum die cast.
- VOLTAGES: All. NEMA single phase voltages and frequencies are standard. Others optional.
- DUTY: Rated for continuous duty cycle.
- MOUNTING: Direct to NEMA "C" motor flanges. Adapters for larger or smaller frames, foot mounting, wall mounting, or vertical mounting, available on request.
- HUB MOUNTING: NEMA standard length motor shaft extensions may be used. Thru shaft also available with simple cover modifications.

**ORDERING INFORMATION**

- The following data should be furnished with your parts order:
- Brake Model Number.
- Serial Number if available.
- Part Number from Table 2.
- Part Description from Table.
- (On hub order, specify bore dia. & keyway dimensions. On electrical parts, specify voltage, phase & frequency.)



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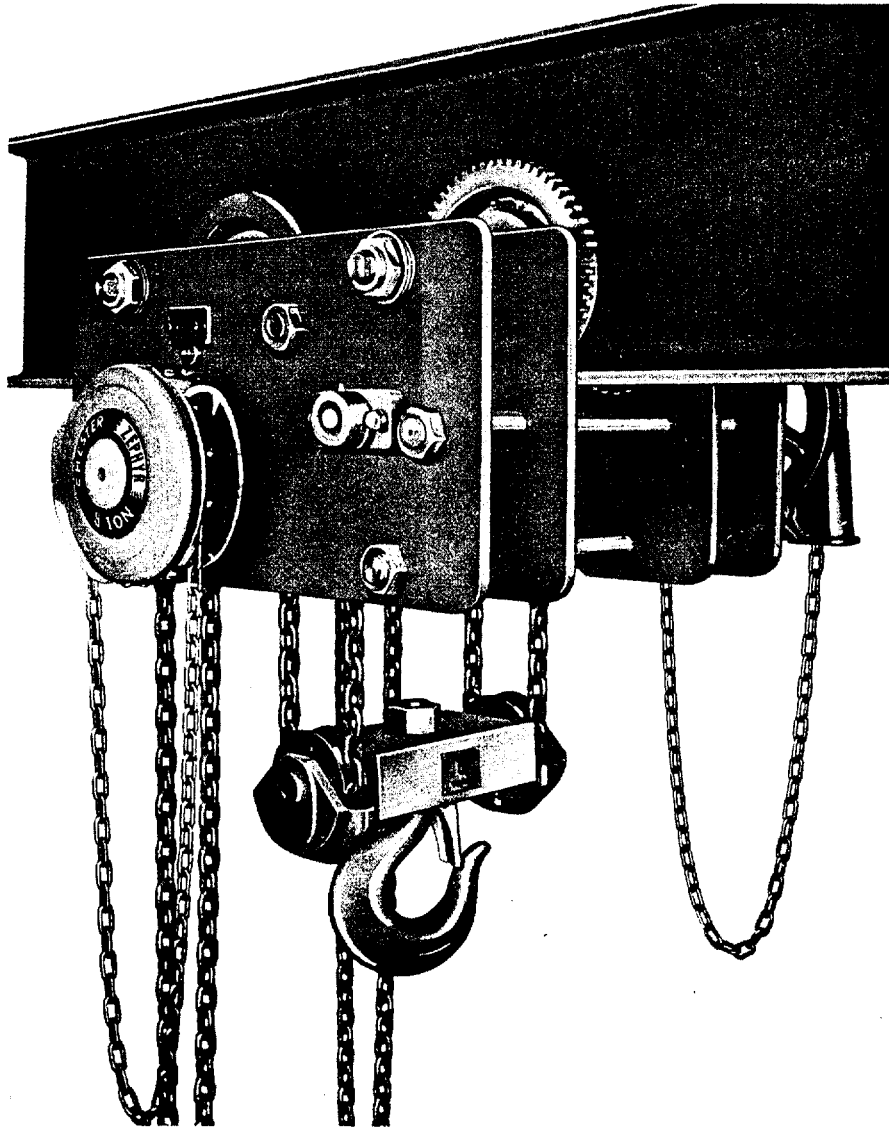
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SECTION  
825

Parts and Instruction  
Manual Low Headroom

CHESTER



CHESTER HOIST DIV.  
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P. O. BOX 229  
7573 STATE ROUTE # 45  
LISBON, OHIO 44432  
(216) 424-7248

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## DO'S AND DON'TS FOR SAFE OPERATION

### DO'S

1. CHECK lubricant before operating the hoist.
2. EXAMINE hoist before each shift. CHECK for damaged hooks or chains, also make sure the hoist is properly secured. Make sure your hoist is clean and well lubricated.
3. CHECK daily the chain for improper seating, twisting, kinking, wear or other defects before twisting, kinking, wear or other defects before operating the hoist. If these are not checked, the chain may break under a normal load.
4. BE SURE there are no objects in the way of a load or hook when moving the hoist on the trolley.
5. MAKE SURE a load clears neighboring stock piles or machinery when raising or lowering the load.
6. CENTER hoist unit over the load before lifting.
7. AVOID swinging of load or load hook when traveling the hoist.
8. PROPERLY secure outdoor hoist when unattended time and DO NOT leave a load unattended during
9. KEEP load block above head level when not in use.
10. BE SURE the sling is properly seated in the saddle of the hook. Tip loading leads to spreading and possible failure.

### DON'TS

1. NEVER lift load with hoist until all personnel are clear.
2. DO NOT allow any unqualified personnel to operate hoist.
3. AVOID collisions or bumping of hoists.
4. DO NOT transport load over personnel.
5. NEVER carry personnel on the hook or the load.
6. DO NOT operate hoist if you are not physically fit to do so.
7. NEVER pick up a load beyond the capacity appearing on the hoist.
8. DO NOT tamper with any parts of the hoist unless you are a qualified maintenance man.
9. NEVER use the hoist chain as a sling.
10. DO NOT use chain as ground for welding. NEVER touch the welding electrode to the chain.
11. DO NOT divert attention from load while operating hoist
12. DO NOT leave a load suspended in the air at the end of a work shift, or for extended periods of regular working hours.
13. DO NOT tip or "point" load a hook.

### Recommended Spare Parts List for Chester Zephyr Low Head Room Plain and Geared Trolley Hoists

CATALOG NO. \_\_\_\_\_ CAPACITY \_\_\_\_\_

Quantity	Part No.	Description
1	C-9301	Pawl Stud
1	C-908	Pawl Snap Ring
1	C-910	Pawl Spring
1	C-923	Pawl
1 pr.	C-934	Brake Discs
1	C-935	Ratchet
2	C-9329	Load Wheel only for 1-1/2, 2, 3, 4, 8, or 16-ton capacity units
C-9274	C-9374	(Sold in combination only for 5 & 6, 10 & 12, 20 & 24-ton capacity units.)
2	C-9390	
	C-9329	
2 pcs.	C-938-2	_____ ' _____ " lineal load chain
2 pcs	C-38	_____ ' _____ " lineal load chain
	C-9203-P	Plain Trolley only
	C-9203-G	Geared Trolley Wheel only

**CHESTER HOIST DIVISION • MONOGRAM INDUSTRIES • PHONE (216) 424-7248 • LISBON, OHIO, U.S.A. 44432**

This instruction and parts manual is provided as a convenience to assist you in ordering repa. parts for your Chester Zephyr Low Head Room Trolley Hoist.

Give all information listed below. This will enable the factory to promptly fill your order.

1. Provide complete identification data from hoist serial number or nameplate located on the trolley hoist side plate. In the event identification tags are missing, advise hoist capacity and complete beam size on which it operates.
2. Provide part numbers, description, and quantity required.
3. Provide correct shipping destination.

If it becomes necessary to return the complete hoist or certain parts to the factory, authorization is required. Provide a written explanation for return. All returns must be made by prepaid freight.

**CHESTER HOIST DIVISION  
P. O. BOX 229  
7573 STATE ROUTE #45  
LISBON, OHIO 44432  
Phone: (216) 424-7248**

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## **INSTALLATION**

The hoisting unit is custom sized at the factory to fit on a specific beam size. Most units are slipped over the end of the supporting rail or beam; however, removable wheels\* are provided which enables the unit to be fitted on a beam with obstructed ends.

See parts breakdown page 7 for additional information regarding disassembly.

The distance between trolley wheel flanges (measured at the tread diameter) should be 118" to 3/16" greater than the beam flange width for proper running clearance. This clearance should be checked before operating the hoist under load. The hoist should be traversed the entire length of the beam to check for beam interference points, proper side clearance and effectiveness of the beam stops. If everything is satisfactory, the procedure should be repeated with a capacity load as a functional installation test.

☆Feature not available on units operating on patented monorail tracks.

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## INSPECTION

requent Inspection - Daily or before using)

- (A) **BRAKING MECHANISM** Check by lifting load a short distance then lowering to its original position while checking for slippage or free run.
- (B) **LOAD CHAIN** For wear, twists, broken or otherwise damaged links. Chain should be clean and free of foreign material or excessive rust. Chain should be properly lubricated.
- (C) **HOOK** For wear, heavy nicks, cracks or deformation. The hook must turn freely and the latch should be operative.

**Note:** Any hook that is twisted or has throat opening in excess of normal indicates over- loading or abuse of the hoist and requires an inspection of all other load bearing components for damage.

Annual Inspection - (More often if in heavy use or an adverse environment)

- (A) Chain, load sheaves and other sheaves for excessive wear or chain stretch.
  - (B) **HOOK** Dye penetrant, magnetic particle or other suitable crack detecting inspection. The hook must turn freely and the latch should be operative.
  - (C) **HOOK RETAINING PINS OR WELDS** should be inspected.
  - (D) **BRAKE MECHANISM** Worn, glazed or contaminated friction discs, worn pawls and damaged pawl springs.
  - (D) **LOAD BEARING PARTS** Worn, cracked or distorted parts such as hand chain wheels, chain attachments, suspension bolts, shafts, gears, and bearings.
- 

## INSPECTION RECORD

Written, dated and signed inspection report and records should be made on the hoist. A sample log form is furnished on page 6.

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# RECORD COPY

## Inspection Log

Inspection No. \_\_\_\_\_ Date \_\_\_\_\_

Inspector \_\_\_\_\_

### Comments

- A. Chain and Sheaves \_\_\_\_\_
- B. Hook and Retainer \_\_\_\_\_
- C. Brake Mechanism \_\_\_\_\_
- D. Load Bearing Parts \_\_\_\_\_
- E. Other Parts \_\_\_\_\_

# RECORD COPY

## Inspection Log

Inspection No. \_\_\_\_\_ Date \_\_\_\_\_

Inspector \_\_\_\_\_

### Comments

- A. Chain and Sheaves \_\_\_\_\_
- B. Hook and Retainer \_\_\_\_\_
- C. Brake Mechanism \_\_\_\_\_
- D. Load Bearing Parts \_\_\_\_\_
- E. Other Parts \_\_\_\_\_

## HOIST MAINTENANCE

**CAUTION:** Before disassembling any portion of the hoisting mechanism, the hook assembly must be lowered to the floor level for support, then continue to lower until stopped by the bolted end of the chain. This should prevent the free fall of the hook assembly or load chain when the load brake is disengaged.

### Handwheel Side, Parts Service (Includes load brake)

- (A) Unscrew 4 screws to remove handwheel cover. Pull cover and lift hand chain from handwheel. chain will remain looped through handwheel cover. If it is necessary to remove hand chain, find the unwelded link and bend open for removal.
- (B) Unscrew 4 screws on gear cover and remove cover.
- (C) Back out the square head set screw to permit removal of the spindle (smallest gear).
- (D) Grasp handwheel and pull. After removal, the complete handwheel and brake assembly may be more conveniently placed in a soft jawed vise for disassembly.
- (E) Remove cotter pin and unscrew (counter clockwise) the handwheel from spindle. See Fig. 2 Page 8 for reassembly adjustment.
- (F) Lift off brake disc, ratchet, and second brake disc.
- (G) The pawl retaining ring and pawl spring nut should be removed to permit the pawl and pawl spring to be disassembled. The pawl stud can be disassembled by turning counter clockwise.
- (H) When reassembling, the smaller of the two brake discs is placed on the spindle last (against the handwheel assembly).

### Gear Cover Side Parts Service

- (A) Unscrew 4 screws on cover and remove cover.
- (B) Note the proper timing mark position of the two planet gears. See Figure 1 page 8.
- (C) Back-out the square head set screw to permit the pinion cage with the two planet gears to be pulled from the load shaft.
- (D) The two planet gears are removed by pulling the cotter pins and slipping the shafts from the gears.

Reassembling: Mount planet gears in pinion cage with cotter pins in place. Align set screw hole in pinion cage with cotter pins in place. Align set screw hole in pinion cage with the set screw hole in the drive shaft and time the planet gears as illustrated in Fig. 1 Page 8.

### Trolley Wheel Parts Service

- (A) To disassemble trolley wheels, back off axle nut, then force the axle toward center of hoist. The "C" washer should be free of its retaining cup shaped washer. When the "C" washer is removed. the axle can be withdrawn.

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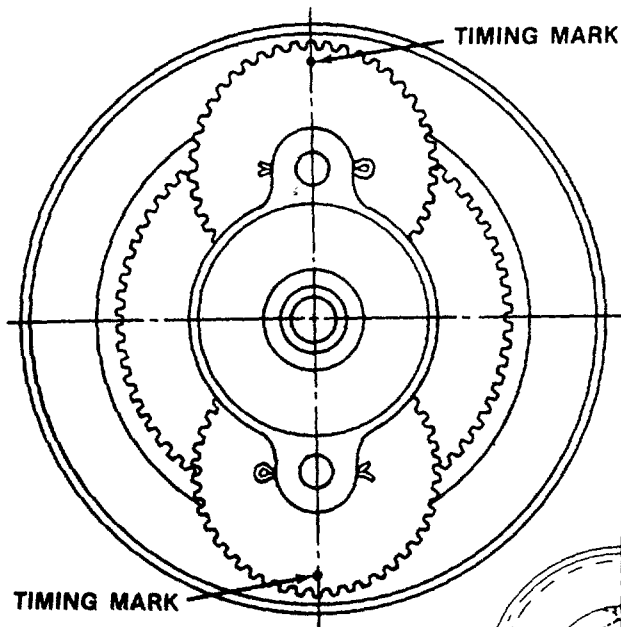


Fig. 1

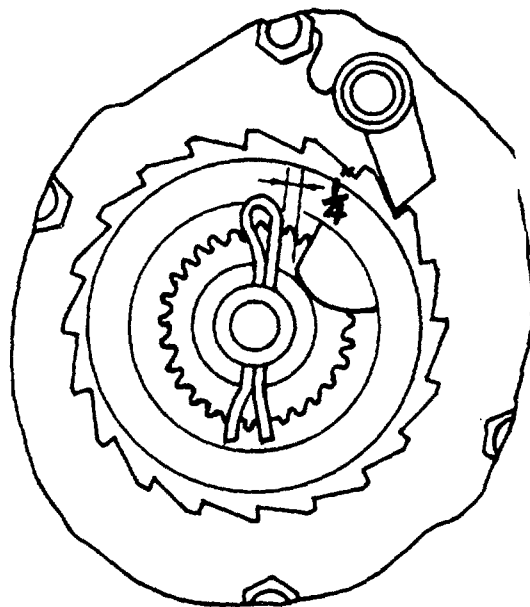


Fig. 2

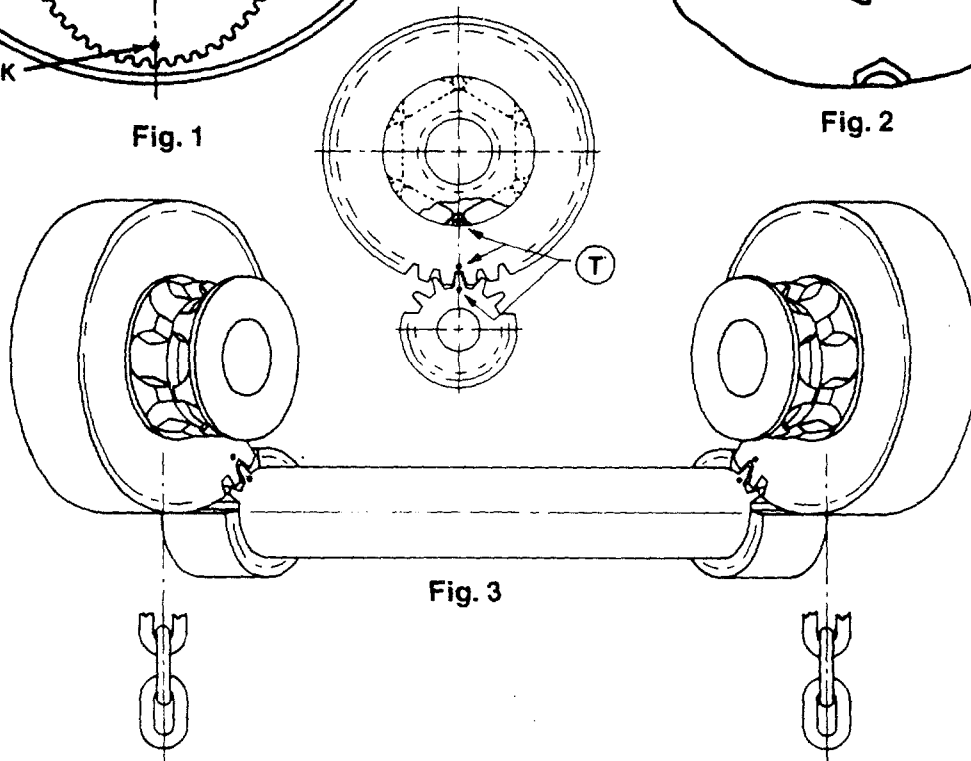


Fig. 3

**Ⓣ Indicates three timing marks in alignment**

To enable the two independent chains to lift the bottom block evenly, the large gears and load sheaves must first be timed as illustrated. Then both gears must be timed simultaneously with the shaft pinions. This timing procedure is only necessary when the gears have been disengaged during disassembly. Fig. 3.

When replacing load chain, the two chains must be exactly the same length. The starting chain link on each chain must be simultaneously fed into the two lifting load sheaves. The starting links will pass over the top of the load sheave in a horizontal position to permit end attachment without twisting the chain. The second link of chain will be a standing link of chain; this link should have the weld further away from the center of the load sheave. Fig. 3.

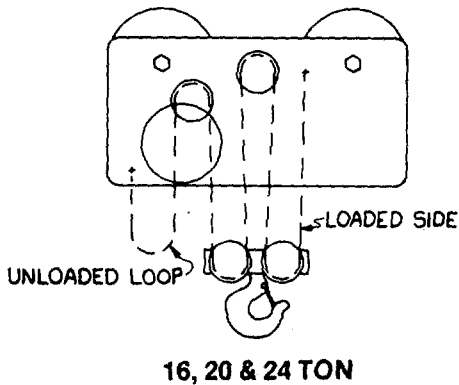
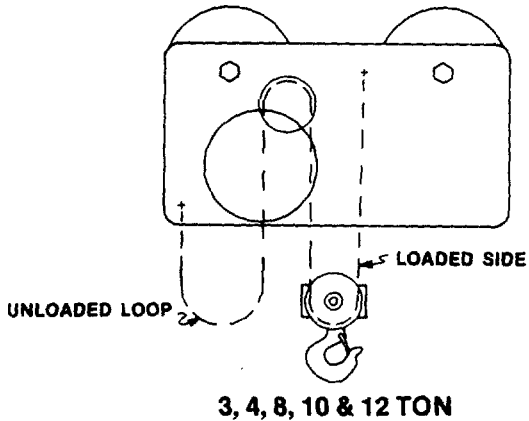
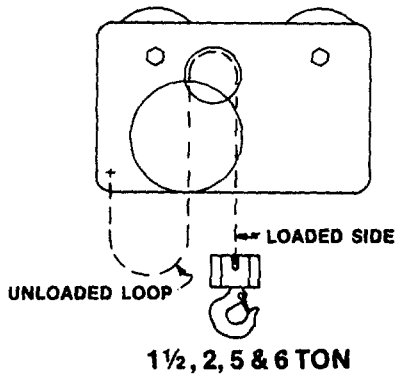
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## LUBRICATION

LUBRICANT	LOCATION	INSTRUCTIONS
NLGI No 2 Grease	Fittings on chain sheave pins (roller bearing) * Trolley wheels  Pawl Stud Brake square thread	Annually or as required  After prolonged use or at reassembly Coat lightly at reassembly Coat lightly at reassembly
NLGI No 2 with E.P additive	Gears	After prolonged use or at reassembly
Intermediate oils preferably with E.P additives	Chain	Immerse in container or swab with oil soaked rag Wipe off excess oil Should maintain chain rust free
Bonded lubricants (similar to Dow Molykote M-88)	Chain	Use in place of oil, if oil residues are objectionable

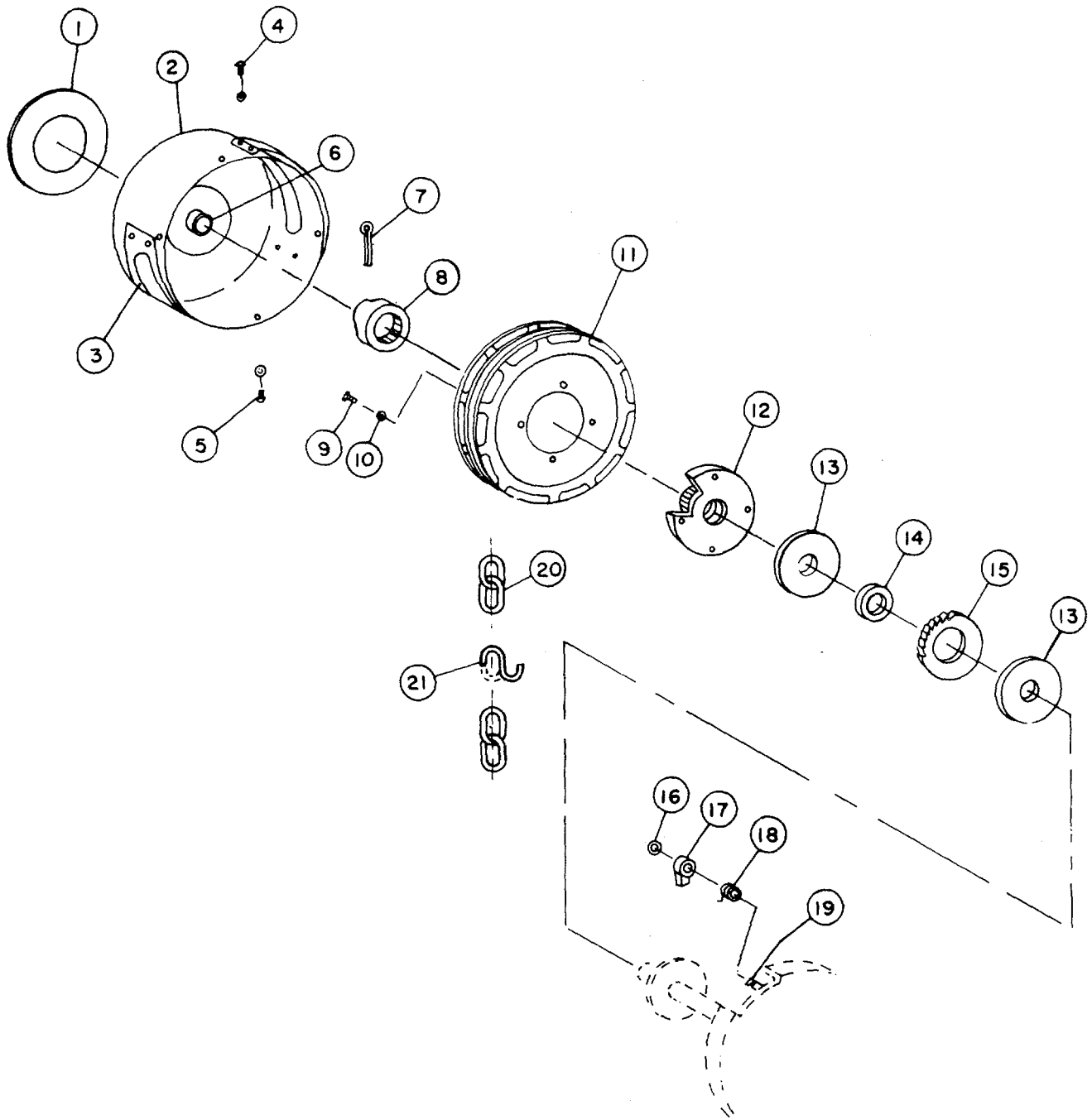
\*Not required on units equipped with sealed ball bearings(Wheels will not have grease fittings.)

## CHAIN REEVING



NOTE: LOOKING AT HANDWHEEL SIDE

Mechanism - Handwheel End



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# Mechanism - Handwheel End

## PART NO. PER CAPACITY

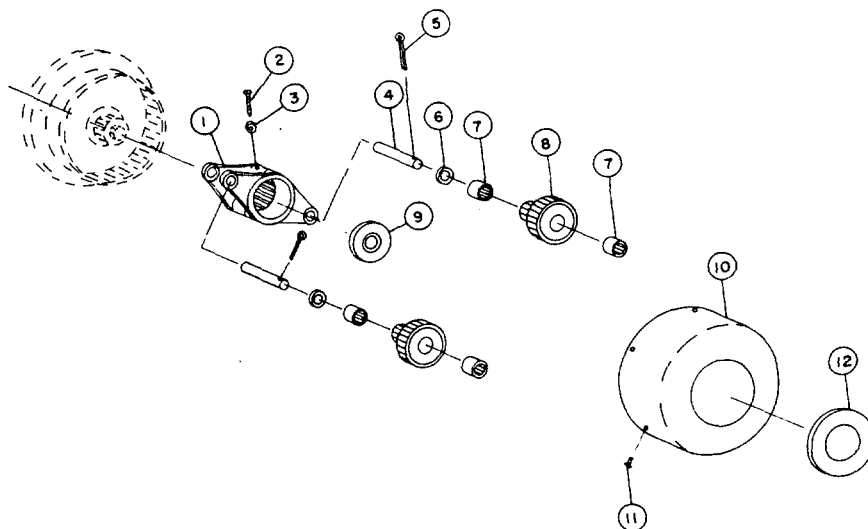
PC. NO.	DESCRIPTION	1½	QTY.	2	QTY.	3	QTY.
1	Decal		1		1		1
2	Cover, Handwheel	968-1½	1	968-2	1	968-3	1
3	Guide, Hand Chain	914-1½	2	914-2	2	914-3	2
4	Screw, Hand Chain Guide	999-1½	8	999-2	8	999-3	8
5	Screw, Handwheel Cover	998-1½	4	998-2	4	998-3	4
6	Bushing, Handwheel Cover	903-1½	1	903-2	1	903-3	1
7	Cotter Pin	909-1½	1	909-2	1	909-3	1
8	Ring, Adjustable Check	925-1½	1	925-2	1	925-3	1
9	Screw, Threaded Insert	2-25-500	4	2-25-500	4	2-25-500	4
10	Lockwasher, Threaded Insert	20-250	4	20-250	4	20-250	4
11	Handwheel	928-1½	1	928-2	1	928-3	1
12	Insert, Threaded H'dwheel	916-1½	1	916-2	1	916-3	1
13	Disc, Brake	934-1½	2	934-2	2	934-3	2
14	Bushing, Bronze for 935	907-1½	1	907-2	1	907-3	1
15	Ratchet	935-1½	1	935-2	1	935-3	1
16	Ring, Pawl Snap	908-1½	1	908-2	1	908-3	1
17	Pawl	923-1½	1	923-2	1	923-3	1
18	Spring, Pawl	910-1½	1	910-2	1	910-3	1
19	Stud, Pawl	9301-1½	1	9301-2	1	9301-3	1
20	Chain, Hand	C-937		C-937		C-937	
21	Link, Connector	937L	1	937L	1	937L	1
PC. NO.	DESCRIPTION	4	QTY.	5	QTY.	6	QTY.
1	Decal		1		1		1
2	Cover, Handwheel	968-4	1	968-5	1	968-6	1
3	Guide, Hand Chain	914-4	2	914-5	2	914-6	2
4	Screw, Hand Chain Guide	999-4	8	999-5	8	999-6	8
5	Screw, Handwheel Cover	998-4	4	998-5	4	998-6	4
6	Bushing, Handwheel Cover	903-4	1	903-5	1	903-6	1
7	Cotter Pin	909-4	1	909-5	1	909-6	1
8	Ring, Adjustable Check	925-4	1	925-5	1	925-6	1
9	Screw, Threaded Insert	2-25-500	4	2-25-500	4	2-25-500	4
10	Lockwasher, Threaded Insert	20-250	4	20-250	4	20-250	4
11	Handwheel	928-4	1	928-5	1	928-6	1
12	Insert, Threaded H'dwheel	916-4	1	916-5	1	916-6	1
13	Disc, Brake	934-4	2	934-5	2	934-6	2
14	Bushing, Bronze for 935	907-4	1	907-5	1	907-6	1
15	Ratchet	935-4	1	935-5	1	935-6	1
16	Ring, Pawl Snap	908-4	1	908-5	1	908-6	1
17	Pawl	923-4	1	923-5	1	923-6	1
18	Spring, Pawl	910-4	1	910-5	1	910-6	1
19	Stud, Pawl	9301-4	1	9301-5	1	9301-6	1
20	Chain, Hand	C-937		C-937		C-937	
21	Link, Connector	937L	1	937L	1	937L	1

# Mechanism - Handwheel End

PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	8	QTY.	10	QTY.	12	QTY.
1	Decal		1		1		1
2	Cover, Handwheel	968-8	1	968-10	1	968-12	1
3	Guide, Hand Chain	914-8	2	914-10	1	914-12	1
4	Screw, Hand Chain Guide	999-8	8	999-10	8	999-12	8
5	Screw, Handwheel Cover	998-8	4	998-10	4	998-12	4
6	Bushing, Handwheel Cover	903-8	1	903-10	1	903-12	1
7	Cotter Pin	909-8	1	909-10	1	909-12	1
8	Ring, Adjustable Check	925-8	1	925-10	1	925-12	1
9	Screw, Threaded Insert	2-25-500	4	2-25-500	4	2-25-500	4
10	Lockwasher, Threaded Insert	20-250	4	2-250	4	20-250	4
11	Handwheel	928-8	1	928-10	1	928-12	1
12	Insert, Threaded H'dwheel	916-8	1	916-10	1	916-12	1
13	Disc, Brake	934-8	2	934-10	2	934-12	2
14	Bushing, Bronze for 935	907-8	1	907-10	1	907-12	1
15	Ratchet	935-8	1	935-10	1	935-12	1
16	Ring, Pawl Snap	908-8	1	908-10	1	908-12	1
17	Pawl	923-8	1	923-10	1	923-12	1
18	Spring, Pawl	910-8	1	910-10	1	910-12	1
19	Stud, Pawl	9301-8	1	9301-10	1	9301-12	1
20	Chain, Hand	C-937		C-937		C-937	
21	Link, Connector	937L	1	937L	1	937L	1
PC. NO.	DESCRIPTION	16	QTY.	20	QTY.	24	QTY.
1	Decal		1		1		1
2	Cover, Handwheel	968-16	1	968-20	1	968-24	1
3	Guide, Hand Chain	914-16	1	914-20	1	914-24	1
4	Screw, Hand Chain Guide	999-16	8	999-20	8	999-24	8
5	Screw, Handwheel Cover	998-16	4	998-20	4	998-24	4
6	Bushing, Handwheel Cover	903-16	1	903-20	1	903-24	1
7	Cotter Pin	909-16	1	909-20	1	909-24	1
8	Ring, Adjustable Check	925-16	1	925-20	1	925-24	1
9	Screw, Threaded Insert	2-25-500	4	2-25-500	4	2-25-500	4
10	Lockwasher, Threaded Insert	20-250	4	20-250	4	20-250	4
11	Handwheel	928-16	1	928-20	1	928-24	1
12	Insert, Threaded H'dwheel	916-16	1	916-20	1	916-24	1
13	Disc, Brake	934-16	2	934-20	2	934-24	2
14	Bushing, Bronze for 935	907-16	2	907-20	1	907-24	1
15	Ratchet	935-16	1	935-20	1	935-24	1
16	Ring, Pawl Snap	908-16	1	908-20	1	908-24	1
17	Pawl	923-16	1	923-20	1	923-24	1
18	Spring, Pawl	910-16	1	910-20	1	910-24	1
19	Stud, Pawl	9301-16	1	9301-20	1	9301-24	1
20	Chain, Hand	C-937		C-937		C-937	
21	Link, Connector	937L	1	937L	1	937L	1

# Mechanism - Gear End



# Mechanism - Gear End

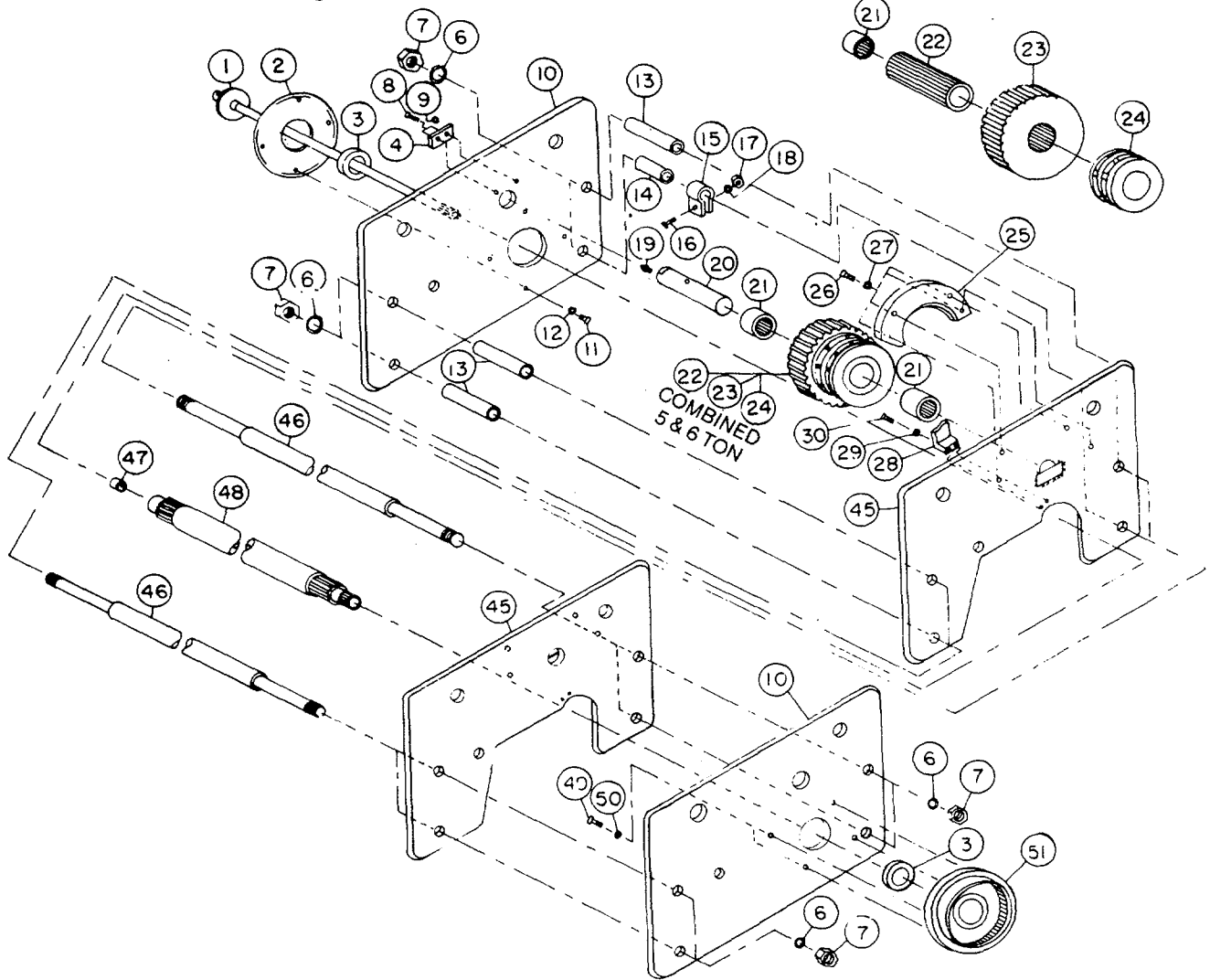
## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	1½ & 2	QTY.	3 & 4	QTY.	5 & 6	QTY.
1	Cage, Pinion	921-1½	1	921-3	1	921-5	1
2	Screw, Sq. Head	8-25-125	1	8-25-125	1	8-25-125	1
3	Nut, Lock	9-25	1	9-25	1	9-25	1
4	Shaft, Gear & Pinion	919-1½	2	919-3	2	919-5	2
5	Cotter Pin	1-125	2	1-125	2	1-125	2
6	Washer, Thrust	23	2	23	2	23	2
7	Bearing, Gear & Pinion	922-1½	4	922-3	4	922-5	4
8	Gear & Pinion	927-1½	2	927-3	2	927-5	2
9	Block, Cage Bearing	959-1½	1	959-3	1	959-5	1
10	Cover, Gear	930-1½	1	930-3	1	930-5	1
11	Screw, Cover	998	4	998	4	998	4
12	Decal		1		1		1

PC. NO.	DESCRIPTION	8	QTY.	10 & 12	QTY.	16	QTY.	20 & 24	QTY.
1	Cage, Pinion	921-8	1	921-10	1	921-16	1	921-20	1
2	Screw Set, Sq. Head	8-25-125	1	8-25-125	1	8-25-125	1	8-25-125	1
3	Nut, Lock	9-25	1	9-25	1	9-25	1	9-25	1
4	Shaft, Gear & Pinion	919-8	2	919-10	2	919-16	2	919-20	2
5	Cotter Pin	1-125	2	1-125	2	1-125	2	1-125	2
6	Washer, Thrust	23	2	23	2	23	2	23	2
7	Bearing, Gear & Pinion	922-8	4	922-10	4	922-16	4	922-20	4
8	Gear & Pinion	927-8	2	927-10	2	927-16	2	927-20	2
9	Block, Cage Bearing	959-8	1	959-10	1	959-16	1	959-20	1
10	Cover, Gear	930-8	1	930-10	1	930-16	1	930-20	1
11	Screw, Cover	998	4	998	4	998	4	998	4
12	Decal		1		1		1		1

# Hoist Assembly

1½, 2, 5 & 6 Ton



## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	1½	QTY.	2	QTY.	5	QTY.	6	QTY.
1	Spindle Assembly	9318-1½	1	9318-2	1	9318-5	1	9318-6	1
2	Frame Half, H'dwheel Side	93202-1½	1	93202-2	1	93202-5	1	93202-6	1
3	Bearing, Drive Shaft	960-1½	2	960-2	2	960-5	2	960-6	2
4	Keeper, Load Shaft	9362-1½	2	9362-2	2	9362-5	2	9362-6	2
5	Keeper, Idler Shaft	NONE		NONE		NONE		NONE	
6	Lockwasher, Separator Stud	20-875	8	20-875	8	20-1	8	20-125	8
7	Nut, Hex, Separator Stud	9-75-2A	8	9-87-2A	8	9-1-2A	8	9-1-2A	8
8	Bolt, Keeper	2-31-62	4	2-31-62	4	2-31-62	4	2-31-62	4
9	Lockwasher, Keeper	20-312	4	20-312	4	20-312	4	20-312	4
10	Side Plate, Outboard	9300A-1½	2	9300A-2	2	9300A-5	2	9300A-6	2

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# Hoist Assembly

# 1 ½, 2, 5 & 6 Ton

## PART NO. PER CAPACITY

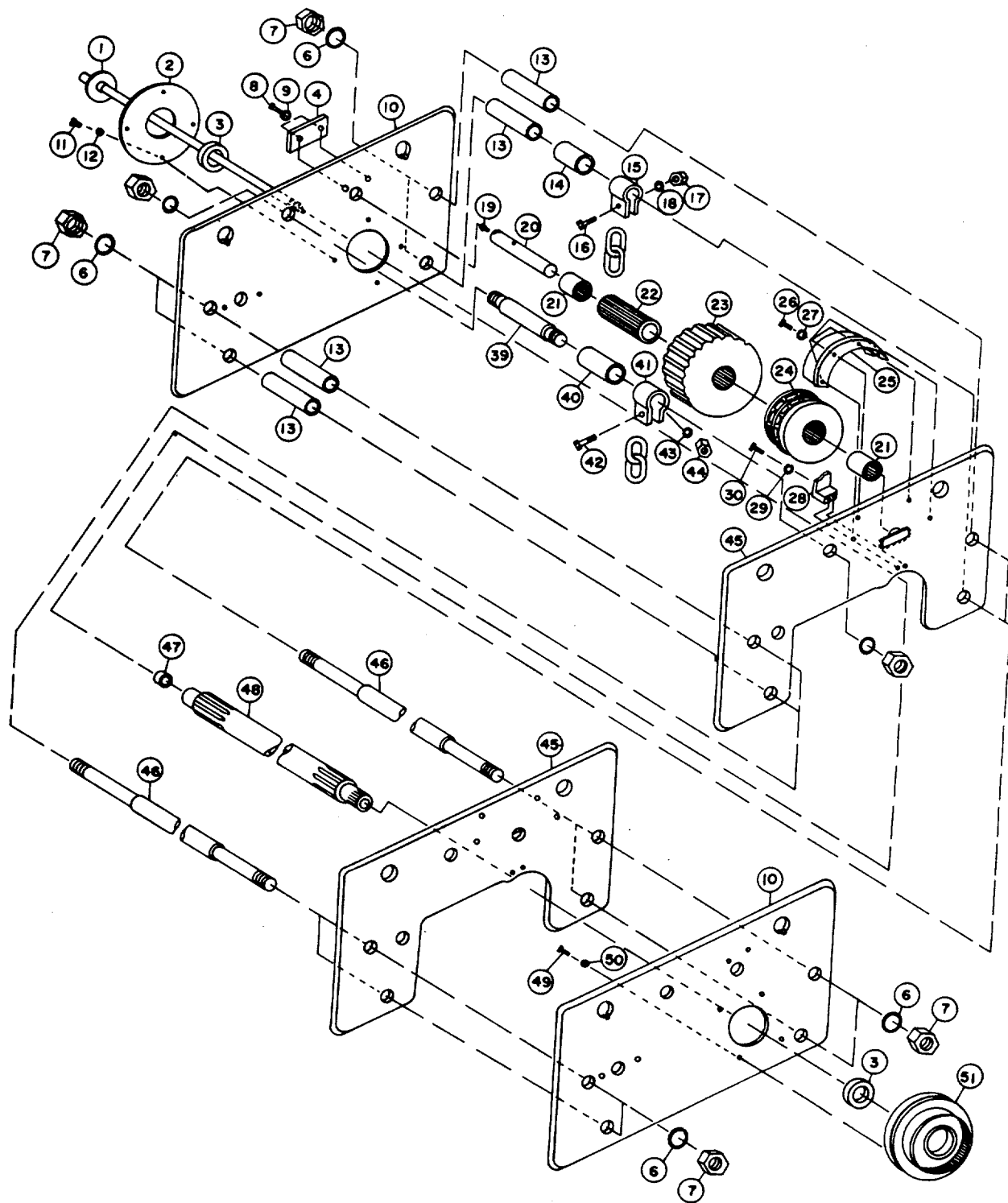
PC. NO.	DESCRIPTION	1 ½	QTY.	2	QTY.	5	QTY.	6	QTY.
11	Bolt, Frame Half H'dwh'l Side	3-375-1	4	3-375-1	4	3-375-1	4	3-375-1	4
12	Lockwasher, Frame Half	20-375	4	20-375	4	20-375	4	20-375	4
13	Pipe Spacer, Long	9307L-1 ½	8	9307L-2	8	9307L-5	8	9307L-6	8
14	Pipe Spacer, Short	9307S-1 ½	4	9307S-2	4	9307S-5	4	9307S-6	4
15	Bale, Dead End	9393-1 ½	2	9393-2	2	9393-5	2	9393-6	2
16	Bolt, Dead End	5-31-125	2	5-31-125	2	5-62-2	2	5-43-2	2
17	Nut, Hex, Bale	10-312	2	10-312	2	10-625	2	10-437	2
18	Lockwasher, Bale	20-312	2	20-312	2	20-625	2	20-437	2
19	Lube Fitting	1728B	2	1728B	2	1728B	2	1728B	2
20	Axle, Bull Gear	9338-1 ½	2	9338-2	2	9338-5	2	9338-6	2
21	Bearing	B1212	4	B1212	4	B2216	4	B2420	4
22	Shaft, Bull Gear Splined	9374-1 ½	2	9374-2	2	9374-5	2	9374-6	2
23	Gear, Bull	9390-1 ½	2	9390-2	2	9390-5	2	9390-6	2
24	Load Wheel	9329-1 ½	2	9329-2	2	9329-5	2	9329-6	2
25	Guide, Load Chain	9305-1 ½	2	9305-2	2	9305-5	2	9305-6	2
26	Bolt, Guide	3-31-75	8	3-31-75	8	3-37-1	8	3-37-1	8
27	Lockwasher, Guide	20-312	8	20-312	8	20-375	8	20-375	8
28	Stripper	9324-1 ½	2	9324-2	2	9324-5	2	9324-6	2
29	Lockwasher, Stripper	20-250	4	20-250	4	20-312	4	20-312	4
30	Bolt, Stripper	5-25-75	4	5-25-75	4	5-31-2	4	5-31-2	4
45	Plate, Inboard	9300B-1 ½	2	9300B-2	2	9300B-5	2	9300B-6	2
46	Stud, Separator	9312-1 ½	4	9312-2	4	9312-5	4	9312-6	4
47	Bushing, Drive Shaft	911-1 ½	1	911-2	1	911-5	1	911-6	1
48	Shaft, Drive	9384-1 ½	1	9384-2	1	9384-5	1	9384-6	1
49	Bolt, Frame Half Geared	3-375-1	4	3-375-1	4	3-437-1	4	3-437-1	4
50	Lockwasher Frame, Half Geared End	20-375	4	20-375	4	20-375	4	20-375	4
51	Frame Half, Geared End	93201-1 ½	1	93201-2	1	93201-5	1	93201-6	1

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# Hoist Assembly

3, 4, 8, 10 & 12 Ton



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# Hoist Assembly

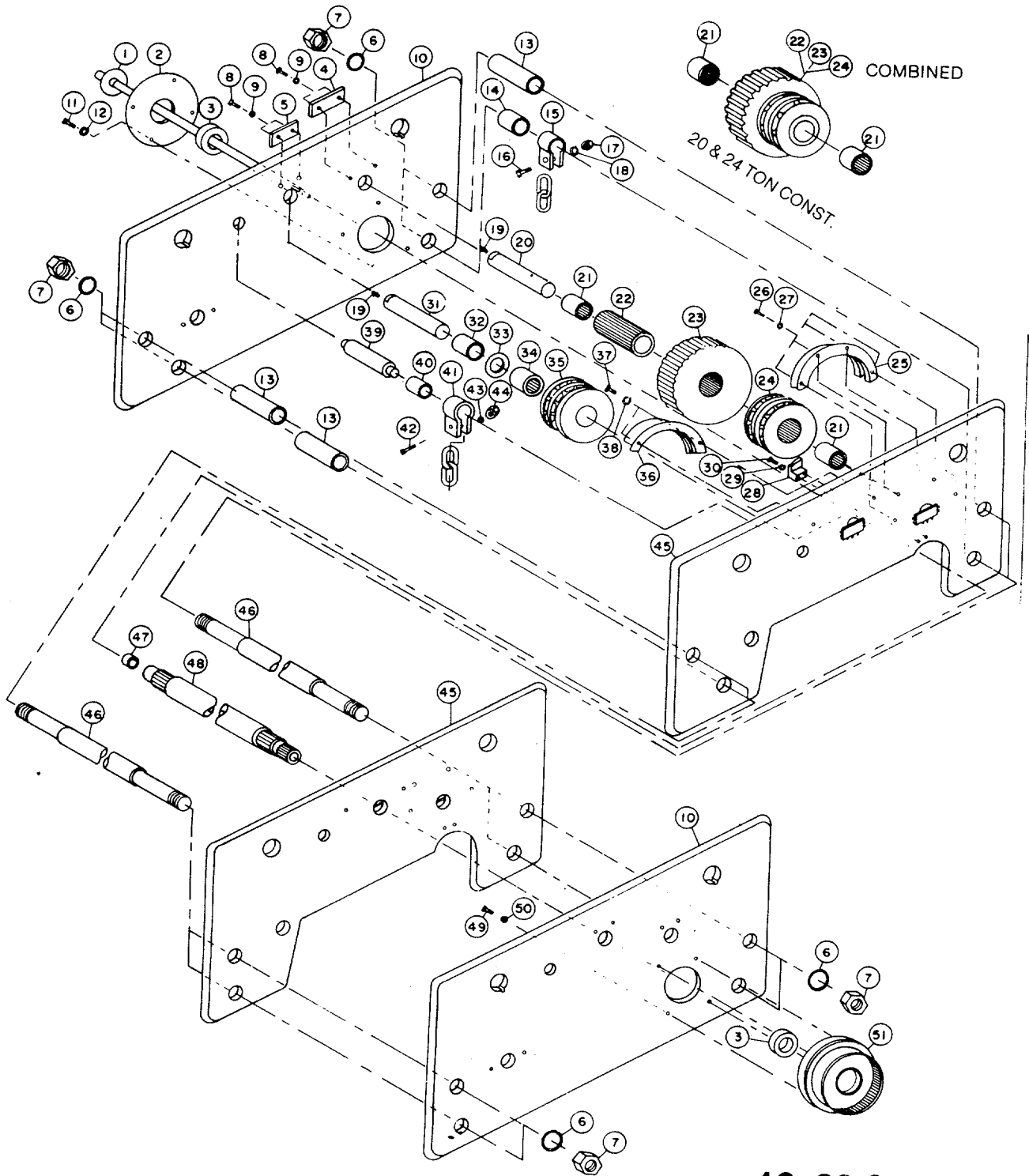
# 16, 20 & 24 Ton

## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	16T	QTY.	20T	QTY.	24T	QTY.
1	Spindle Assembly	9318-16	1	9318-20	1	9318-24	1
2	Frame Half, H'dwheel Side	93202-16	1	93202-20	1	93202-24	1
3	Bearing, Drive Shaft	960-16	2	960-20	2	960-24	2
4	Keeper, Bull Gear Axle	9632-16	2	9632-20	2	9632-24	2
5	Keeper, Idler Shaft	9363-16	2	9363-20	2	9363-24	2
6	Lockwasher, Separator Stud	NONE		NONE		NONE	
7	Nut, Hex Separator Stud	9-175-2A	8	9-2-2A	8	9-2-2A	8
8	Bolt, Keeper	2-37-75	8	2-37-75	8	2-37-75	8
9	Lockwasher, Keeper	20-750	8	20-750	8	20-750	8
10	Side Plate, Outboard	9300A-16	2	9300A-20	2	9300A-24	2
11	Bolt, Frame Half Handwheel	3-437-1	4	3-437-1	4	3-437-1	4
12	Lockwasher, Frame Half	20-437	4	20-437	4	20-437	4
13	Spacer, Pipe Long	9307L-16	12	9307L-20	12	9307L-24	12
14	Spacer, Pipe Short	9307S-16	4	9307S-20	4	9307S-24	4
15	Bale, Dead End	9393-16	2	9393-20	2	9393-24	2
16	Bolt, Dead End	2-37-165	2	2-62-2	2	2-62-2	2
17	Nut, Hex Bale	10-437	2	10-62	2	10-62	2
18	Lockwasher, Bale	20-437	2	20-625	2	20-625	2
19	Lube Fitting	1728-B	4	1728-B	4	1728-B	4
20	Axle Bull Gear	9338-16	2	9338-20	2	9338-24	2
21	Bearing	B2020	4	B2420	4	B2420	4
22	Shaft, Bull Gear Splined	9374-16	1	9374-20	1	9374-24	1
23	Gear, Bull	9390-16	2	9390-20	2	9390-24	2
24	Load Wheel	9329-16	2	9329-20	2	9329-24	2
25	Guide, Load Chain	9305-16	2	9305-20	2	9305-24	2
26	Bolt, Guide	3-37-75	8	3-37-75	8	3-37-75	8
27	Lockwasher, Guide	20-375	8	20-375	8	20-375	8
28	Stripper	9324-16	2	9324-20	2	9324-24	2
29	Lockwasher, Stripper	20-312	4	20-312	4	20-312	4
30	Bolt, Stripper	5-31-2	4	5-31-2	4	5-31-2	4
31	Shaft, Top Idler	9391-16	2	9391-20	2	9391-24	2
32	Spacer, Top Idler	9307-1	2	9307-1	2	9307-1	2
33	Washer, Top Idler	23-162-2	2	23-187-2	2	23-187-2	2
34	Bearing, Idler Top	B2620	4	B3016	4	B3016	4
35	Sheave, Top Idler	9347-16	2	9347-20	2	9347-24	2
36	Chain Guide, Idler	9334-16	1	9334-20	1	9334-24	1
37	Bolt, Idler Guide	3-37-1	2	3-37-1	2	3-37-1	2
38	Lockwasher Guide Idler	20-375	2	20-375	2	20-375	2
39	Stud, Live End	9389-16	2	9389-20	2	9389-24	2
40	Spacer, Bale	9389-S-16	2	9389-S-20	2	9389-S-24	2
41	Bale, Live End	9394-16	2	9394-20	2	9394-24	2
42	Bolt, Live End Bale	5-37-125	2	5-37-125	2	5-37-125	2

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# Hoist Assembly



**16, 20 & 24 Ton**

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# Hoist Assembly

# 16, 20 & 24 Ton

## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	16T	QTY.	20T	QTY.	24T	QTY.
1	Spindle Assembly	9318-16	1	9318-20	1	9318-24	1
2	Frame Half, H'dwheel Side	93202-16	1	93202-20	1	93202-24	1
3	Bearing, Drive Shaft	960-16	2	960-20	2	960-24	2
4	Keeper, Bull Gear Axle	9632-16	2	9632-20	2	9632-24	2
5	Keeper, Idler Shaft	9363-16	2	9363-20	2	9363-24	2
6	Lockwasher, Separator Stud	NONE		NONE		NONE	
7	Nut, Hex Separator Stud	9-175-2A	8	9-2-2A	8	9-2-2A	8
8	Bolt, Keeper	2-37-75	8	2-37-75	8	2-37-75	8
9	Lockwasher, Keeper	20-750	8	20-750	8	20-750	8
10	Side Plate, Outboard	9300A-16	2	9300A-20	2	9300A-24	2
11	Bolt, Frame Half Handwheel	3-437-1	4	3-437-1	4	3-437-1	4
12	Lockwasher, Frame Half	20-437	4	20-437	4	20-437	4
13	Spacer, Pipe Long	9307L-16	12	9307L-20	12	9307L-24	12
14	Spacer, Pipe Short	9307S-16	4	9307S-20	4	9307S-24	4
15	Bale, Dead End	9393-16	2	9393-20	2	9393-24	2
16	Bolt, Dead End	2-37-165	2	2-62-2	2	2-62-2	2
17	Nut, Hex Bale	10-437	2	10-62	2	10-62	2
18	Lockwasher, Bale	20-437	2	20-625	2	20-625	2
19	Lube Fitting	1728-B	4	1728-B	4	1728-B	4
20	Axle Bull Gear	9338-16	2	9338-20	2	9338-24	2
21	Bearing	B2020	4	B2420	4	B2420	4
22	Shaft, Bull Gear Splined	9374-16	1	9374-20	1	9374-24	1
23	Gear, Bull	9390-16	2	9390-20	2	9390-24	2
24	Load Wheel	9329-16	2	9329-20	2	9329-24	2
25	Guide, Load Chain	9305-16	2	9305-20	2	9305-24	2
26	Bolt, Guide	3-37-75	8	3-37-75	8	3-37-75	8
27	Lockwasher, Guide	20-375	8	20-375	8	20-375	8
28	Stripper	9324-16	2	9324-20	2	9324-24	2
29	Lockwasher, Stripper	20-312	4	20-312	4	20-312	4
30	Bolt, Stripper	5-31-2	4	5-31-2	4	5-31-2	4
31	Shaft, Top Idler	9391-16	2	9391-20	2	9391-24	2
32	Spacer, Top Idler	9307-I	2	9307-I	2	9307-I	2
33	Washer, Top Idler	23-162-2	2	23-187-2	2	23-187-2	2
34	Bearing, Idler Top	B2620	4	B3016	4	B3016	4
35	Sheave, Top Idler	9347-16	2	9347-20	2	9347-24	2
36	Chain Guide, Idler	9334-16	1	9334-20	1	9334-24	1
37	Bolt, Idler Guide	3-37-1	2	3-37-1	2	3-37-1	2
38	Lockwasher Guide Idler	20-375	2	20-375	2	20-375	2
39	Stud, Live End	9389-16	2	9389-20	2	9389-24	2
40	Spacer, Bale	9389-S-16	2	9389-S-20	2	9389-S-24	2
41	Bale, Live End	9394-16	2	9394-20	2	9394-24	2
42	Bolt, Live End Bale	5-37-125	2	5-37-125	2	5-37-125	2

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# Hoist Assembly

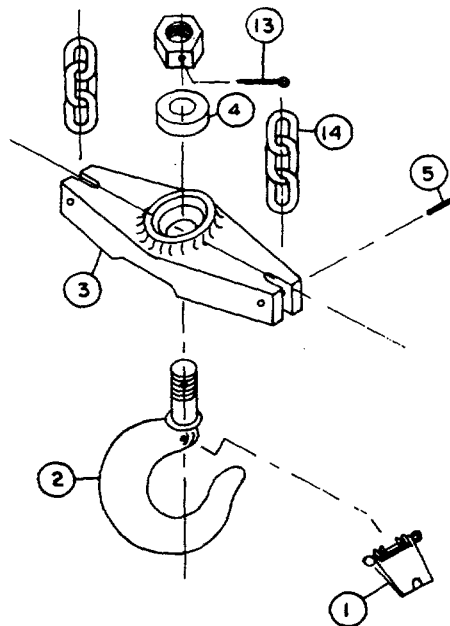
16, 20 & 24 Ton

PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	16	QTY.	20	QTY.	24	QTY.
43	Lockwasher, Bale	20-375	2	20-375	2	20-375	2
44	Nut, Bale	10-375	2	10-375	2	10-375	2
45	Plate, Inboard	9300B-16	2	9300B-20	2	9300-24	2
46	Stud, Separator	9312-16	4	9312-20	4	9312-24	4
47	Bushing, Drive Shaft	911-16	1	911-20	1	911-24	1
48	Shaft, Drive	9384-16	1	9384-20	1	9384-24	1
49	Bolt, Frame Half Geared	3-375-1	4	3-375-1	4	3-375-1	4
50	Lockwasher Frame Half Geared	20-375	4	20-375	4	20-375	4
51	Frame Half, Geared End	93201-16	1	93201-20	1	93201-24	1

# Bottom Block Assembly

1½, 2, 5 & 6 Ton



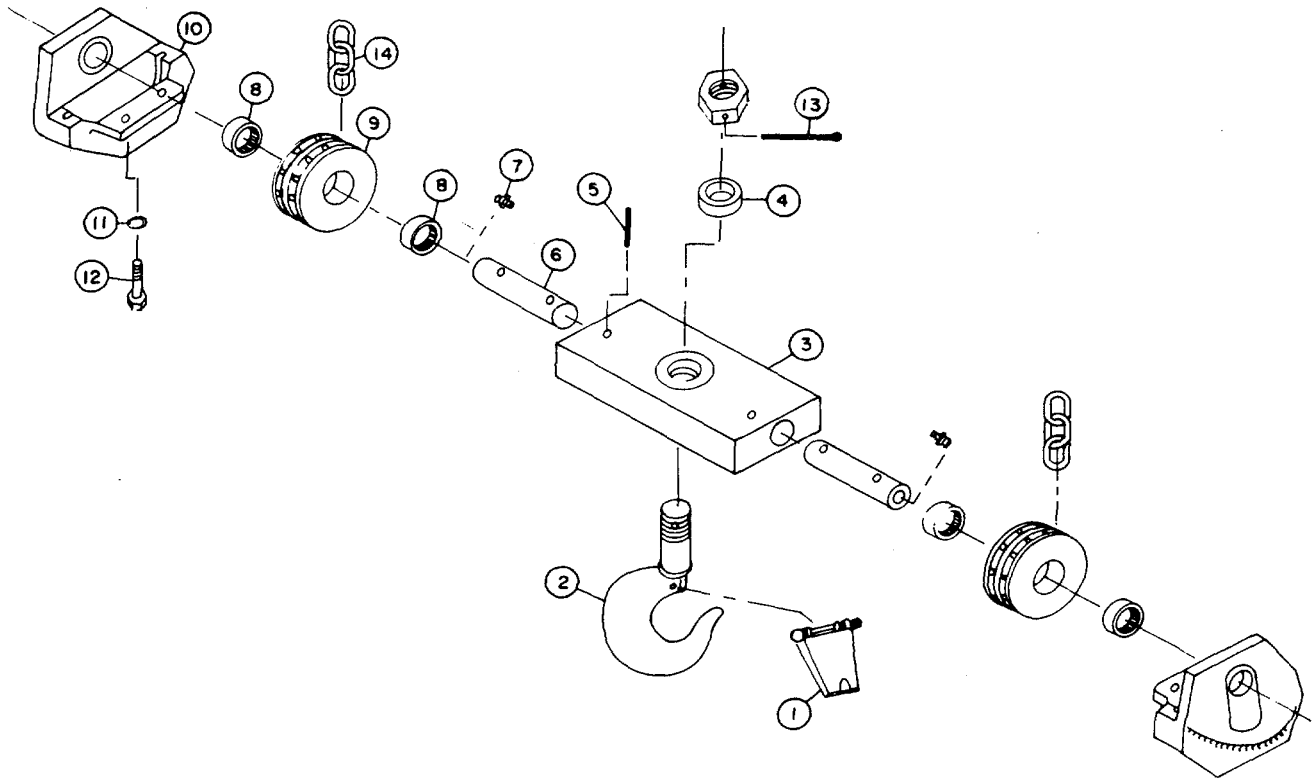
PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	1½	QTY.	2	QTY.	5	QTY.	6	QTY.
1	Latch Assembly	HL-1½	1	HL-2	1	HL-5	1	HL-6	1
2	Bottom Hook & Nut	940-1½	1	940-2	1	940-5	1	940-6	1
3	Bottom Crosshead	9352-1½	1	9352-2	1	9352-5	1	9352-6	1
4	Thrust Bearing	939-1½	1	939-2	1	939-5	1	939-6	1
5	Drive Pin	931-1½	2	931-2	2	931-5	2	931-6	2
13	Pin, Hook Nut	25-1½	1	25-2	1	25-5	1	25-6	1
14	Load Chain	C-38-½A		C-38-½A		C-38-3		C-38-3	

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# Bottom Block Assembly

3, 4, 8, 10 & 12 Ton



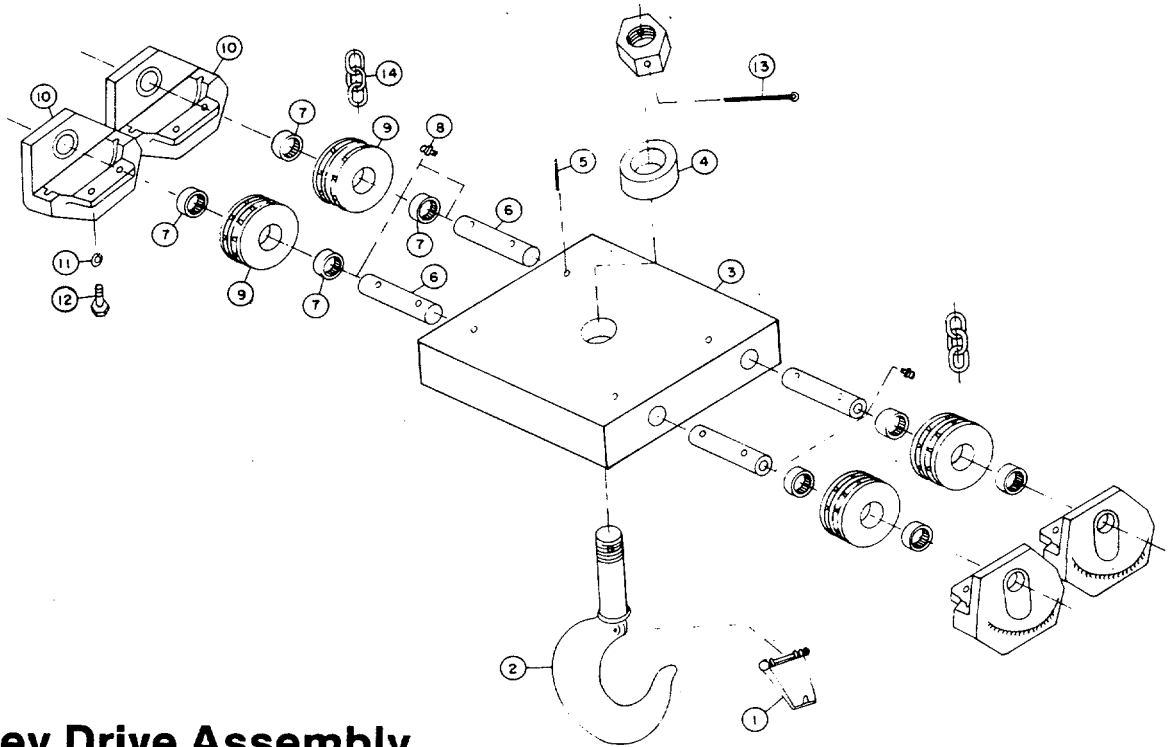
**PART NO. PER CAPACITY**

PC. NO.	DESCRIPTION	3	QTY.	4	QTY.	8	QTY.	10	QTY.	12	QTY.
1	Latch Assembly	HL-3	1	HL-4	1	HL-8	1	HL-10	1	HL-12	1
2	Bottom Hook & Nut	9340-3	1	9340-4	1	9340-8	1	9340-10	1	9340-12	1
3	Bottom Crosshead	9352-3	1	9352-4	1	9352-8	1	9352-10	1	9352-12	1
4	Thrust Bearing	939-3	1	939-4	1	939-8	1	939-10	1	939-12	1
5	Drive Pin	931-3	2	931-4	2	931-8	2	931-10	2	931-12	2
6	Axle, Bottom Block Idler	NONE		NONE		9354-8	2	9354-10	2	9354-12	2
7	Lube Fitting	NONE		NONE		1728-B	2	1728-B	2	1728-B	2
8	Bearing Idler	IR-1816	2	IR-1816	2	B2620	4	B-3016	4	B-3016	4
9	Sheave, Bottom Block Idler	9356-3	2	9356-4	2	9356-8	2	9356-10	2	9356-12	2
10	Guard, Bottom Idler	9388-3	2	9388-4	2	9388-8	2	9388-10	2	9388-12	2
11	Lockwasher, Guard	20-312	4	20-312	4	20-625	4	20-625	4	20-625	4
12	Bolt, Guard	3-31-75	4	3-31-75	4	3-62-125	4	3-62-125	4	3-62-125	4
13	Pin, Hook Nut	25-3	1	25-4	1	25-8	1	25-10	1	25-12	1
14	Load Chain	C-38-1/2A		C-38-1/2A		C-938-2		C-38-3		C-38-3	

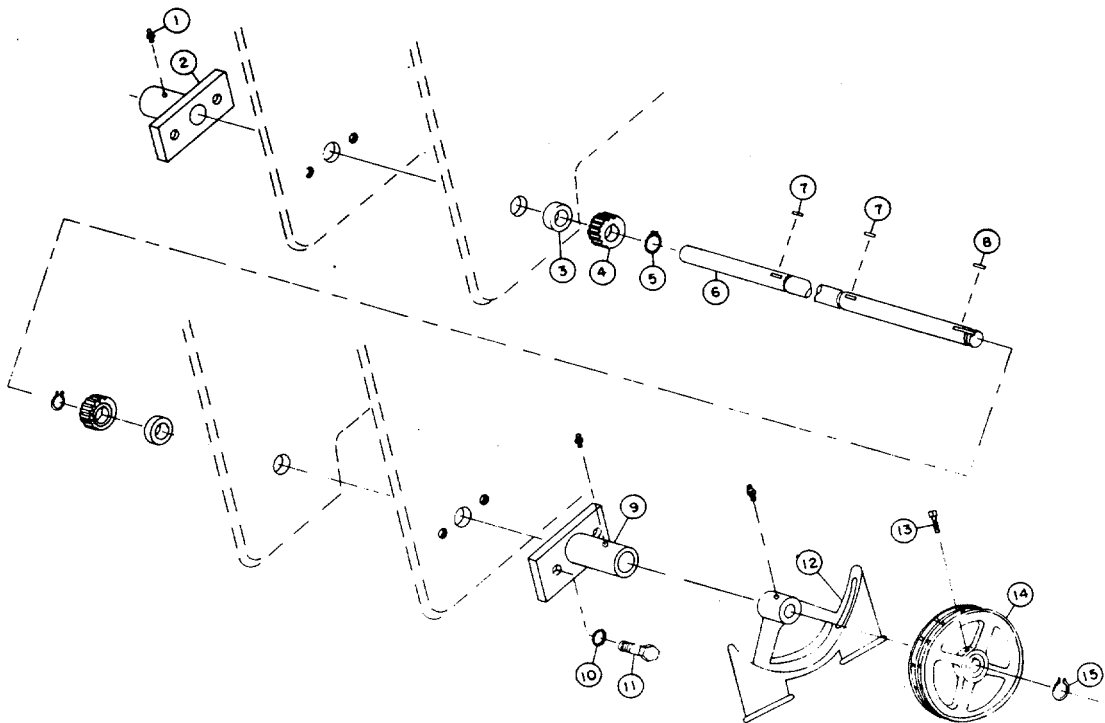
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# Bottom Block Assembly

16, 20 & 24 Ton



# Trolley Drive Assembly



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# Bottom Block Assembly

# 16, 20 & 24 Ton

## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	16	QTY.	20	QTY.	24	QTY.
1	Latch Assembly	HL-16	1	HL-20	1	HL-24	1
2	Bottom Hook & Nut	9340-16	1	9340-20	1	9340-24	1
3	Bottom Crosshead	9352-16	1	9352-20	1	9352-24	1
4	Thrust Bearing	939-16	1	939-20	1	939-24	1
5	Driving Pin	931-16	4	931-20	4	931-24	4
6	Axle, Bottom Block Idler	9354-16	4	9354-20	4	9354-24	4
7	Bearing Idler	B-2620	8	B-3016-20	8	B-3016-24	8
8	Lube Fitting	1728B	4	1728B	4	1728B	4
9	Sheave, Bottom Block Idler	9356-16	4	9356-20	4	9356-24	4
10	Guard, Idler Bottom	9388-16	4	9388-20	4	9388-24	4
11	Lockwasher, Guard	20-500	4	20-625	4	20-625	4
12	Bolt, Guard	3-500-125	8	3-62-125	8	3-62-125	8
13	Pin, Hook Nut	25-16	1	25-20	1	25-24	1
14	Load Chain	C-938-2	2	C-38-3	2	C-38-3	2

# Trolley Drive Assembly

# 1 1/2, 2, 3, 4, 5, 6, & 8 Ton

## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	1 1/2 & 2	QTY.	3 & 4	QTY.	5 & 6	QTY.	8	QTY.
1	Lube Fitting	1728-B	3	1728-B	3	1728-B	3	1728-B	3
2	Block, Bearing Short	906B	1	906B	1	T-9306B	1	T-9306B	1
3	Spacer, Pinion	9395-1 1/2	2	9395-3	2	9395-5	2	9395-8	2
4	Gear, Pinion	9611-1 1/2	2	9611-3	2	9611-5	2	9611-8	2
5	Snap Ring, Pinion	5100-87	2	5100-87	2	5100-87	2	5100-87	2
6	Shaft, Trolley Drive	9311-1 1/2	1	9311-3	1	9311-5	1	9311-8	1
7	Key, Pinion Gear	1/4" x 1/8" x 1/2"	2	1/4" x 1/8" x 1/2"	2	1/4" x 1/8" x 1/2"	2	1/4" x 1/8" x 5/8"	2
8	Key, Handwheel	1/4" x 1/8" x 1-3/4"	1	1/4" x 1/8" x 1-3/4"	1	1/4" x 1/8" x 1-7/8"	1	1/4" x 1/8" x 2"	1
9	Block, Bearing Long	906A	1	906A	1	T-9306A	1	T-9063A	1
10	Lockwasher, Brg. Block	20-312	4	20-312	4	20-312	4	20-312	4
11	Bolt, Bearing Block	3-31-1	4	3-31-1	4	3-31-1	4	3-31-1	4
12	Guard, Swinging	PG-1 1/2	1	PG-3	1	PG-5	1	PG-8	1
13	Set Screw, Sq. Head	8-25-125	1	8-25-125	1	8-25-125	1	8-25-125	1
14	Handwheel	P-1 1/2	1	P-3	1	P-5	1	P-8	1
15	Snap Ring, Handwheel	5100-87	1	5100-87	1	5100-87	1	5100-87	1

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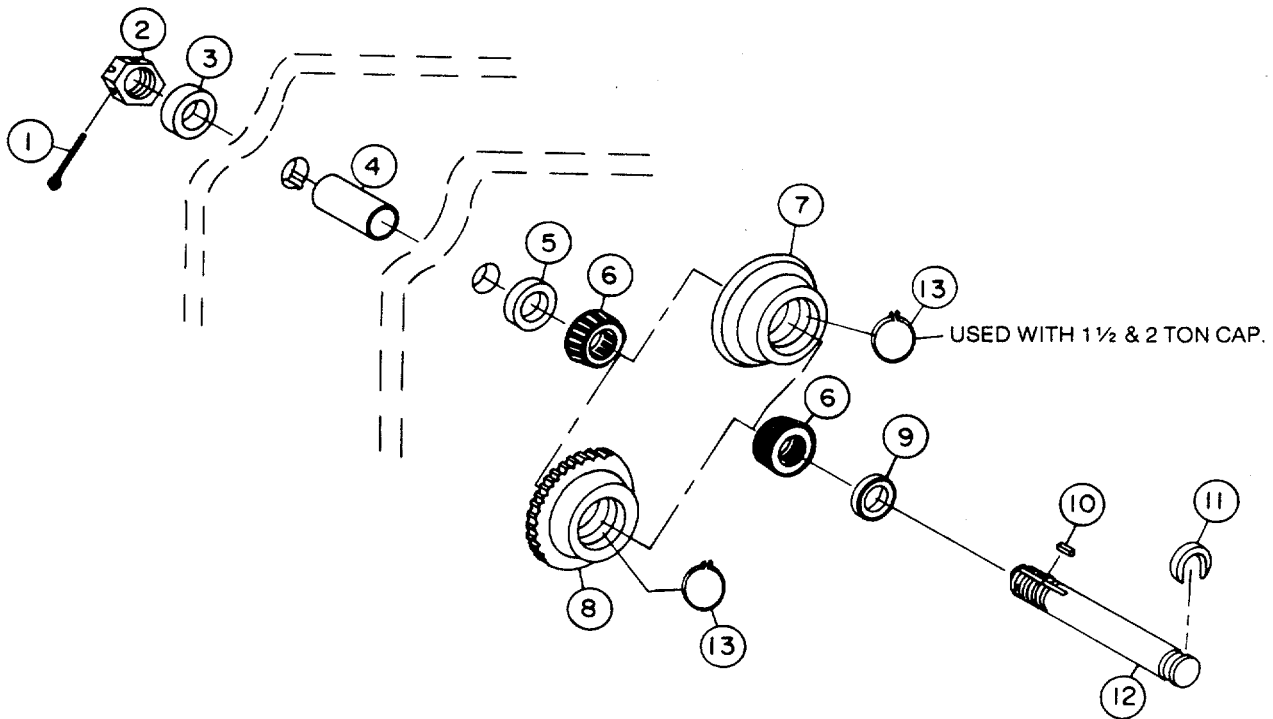
# Trolley Drive Assembly

# 10, 12, 16, 20 & 24 Ton

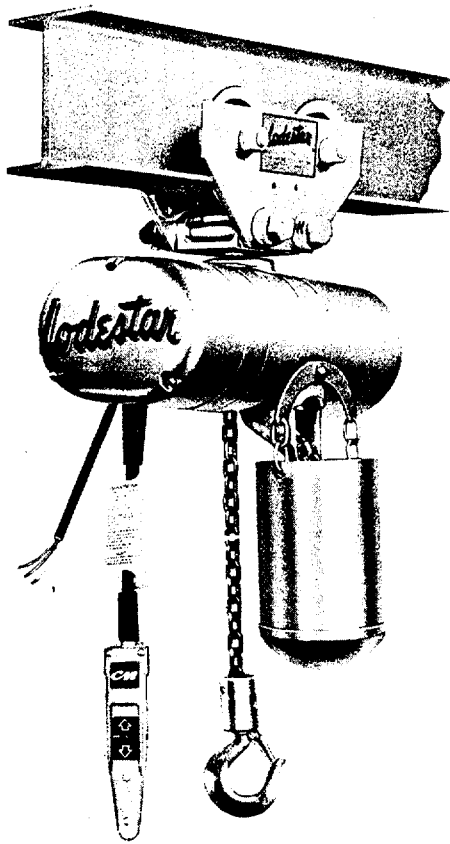
## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	10 & 12	QTY.	16	QTY.	20 & 24	QTY.
1	Lube Fitting	1728-B	3	1728-B	3	1728-B	3
2	Block, Bearing Short	T-9306B	1	T-9306B	1	T-9306B	1
3	Spacer, Pinion	9395-10	2	9395-16	2	9395-20	2
4	Gear, Pinion	9611-10	2	9611-16	2	9611-20	2
5	Snap Ring, Pinion	5100-125	2	5100-125	2	5100-137	2
6	Shaft, Trolley Drive	9311-10	1	9311-16	1	9311-20	1
7	Key, Pinion Gear	1/4" x 1/8" x 23/32"	2	5/16" x 5/32" x 1-3/8"	2	5/16" x 5/32" x 1-3/8"	2
8	Key, Handwheel	5/16" x 5/32" x 1-7/8"	1	5/16" x 5/32" x 2"	1	5/16" x 5/32" x 2"	1
9	Block, Bearing Long	T-9306A	1	T-9306A	1	T-9306A	1
10	Lockwasher, Brg. Block	20-500	4	20-500	4	20-500	4
11	Bolt, Bearing Block	3-50-1	4	3-50-1	4	3-50-1	4
12	Guard, Swinging	PG-10	1	PG-16	1	PG-20	1
13	Set Screw, Sq. Head	8-25	1	8-25	1	8-25	1
14	Handwheel	P-10	1	P-16	1	P-20	1
15	Snap Ring, Handwheel	5100-125	1	5100-125	1	5100-137	1

## Wheel Assembly



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# INSTRUCTION, MAINTENANCE and PARTS MANUAL

**CM** *Lodestar*<sup>®</sup>

**ELECTRIC HOIST  
EQUIPPED WITH PROTECTOR**

**CAPACITY: FROM  $\frac{1}{8}$  TO 2 TON**

## Caution — Important

If not properly installed, operated and maintained, the use of all mechanical equipment presents the possibility of personal injury or property damage. Before hoist use, all persons who will install, operate or maintain should read this manual thoroughly. For safe, dependable and economical performance, follow all instructions and recommendations contained herein. It is also important to retain this manual for future use.

For current information applying to the hoist accompanying this manual, use only this manual. Do not rely wholly upon earlier editions of this manual for such information.

**USE THIS MANUAL FOR LODESTAR HOIST MODELS A THRU RR-2 ONLY.**



# **CM** HOIST

**DIVISION COLUMBUS MCKINNON CORPORATION  
JAWANDA, NEW YORK 14150 USA**

**83874**

**MANUAL No. 80-AM**

**PRICE \$2.50**

"EACH LODESTAR HOIST IS BUILT IN ACCORDANCE WITH THE SPECIFICATIONS CONTAINED HEREIN AND AT THE TIME OF MANUFACTURE COMPLIES WITH OUR INTERPRETATION OF APPLICABLE SECTIONS OF THE AMERICAN NATIONAL STANDARD INSTITUTE CODE B30.16-1973 "OVERHEAD HOISTS", THE NATIONAL ELECTRICAL CODE (ANSI C-1) AND THE OCCUPATIONAL SAFETY AND HEALTH ACT--1970. SINCE OSHA STATES THAT THE NATIONAL ELECTRICAL CODE APPLIES TO ALL ELECTRICAL HOISTS, INSTALLERS ARE REQUIRED TO PROVIDE CURRENT OVERLOAD PROTECTION AND GROUNDING IN KEEPING WITH THE CODE. USERS SHOULD CHECK INSTALLATION FOR COMPLIANCE WITH THE APPLICATION, OPERATION AND MAINTENANCE REQUIREMENTS OF THIS LAW." THE SAFETY LAWS FOR ELEVATORS, LIFTING OF PEOPLE AND FOR DUMBWAITERS SPECIFY CONSTRUCTION DETAILS THAT ARE NOT INCORPORATED IN CM INDUSTRIAL HOISTS. FOR SUCH APPLICATIONS, REFER TO REQUIREMENTS THAT MEET STATE AND LOCAL CODES AND THE AMERICAN NATIONAL SAFETY CODE FOR ELEVATORS, DUMBWAITERS, ESCALATORS AND MOVING WALKS (ANSI A17.1-1978).

NOTE : COLUMBUS McKINNON CORP. SHOULD BE CONSULTED FOR ANY USAGE OF THE LODESTAR HOISTS THAT WOULD NOT INVOLVE LIFTING OF THE LOAD ON THE LOWER HOOK, OR USING THE HOIST IN AN INVERTED POSITION.

### DO'S AND DON'TS

Safe Operation of Hoists The following are Do's and Don'ts for safe operation of overhead hoists. Taking precedence over any specific rule listed here, however, is the most important rule of all, USE COMMON SENSE. A few minutes spent reading these rules can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Frequent examinations and periodic inspections of the equipment as well as a conscientious observance of safety rules may save lives as well as time and money.

### DON'TS--HOISTS 1.

1. NEVER lift or transport a load until all personnel are clear.
2. DO NOT allow any unqualified personnel to operate hoist.
3. NEVER pick up a load beyond the capacity appearing on the hoist. Overloading can be caused by jerking as well as by static overload.
4. NEVER carry personnel on the hook or the load.
5. DO NOT operate a hoist if you are not physically fit.
6. DO NOT operate hoist to extreme limits of chain or rope.
7. AVOID sharp contact between two hoists, between hoist and end post, and hooks and hoist body.
8. DO NOT tamper with any parts of the hoist.
9. NEVER use the hoist rope or chain as a sling.
10. DO NOT divert attention from load while operating hoist.
11. NEVER leave a suspended load unattended.
12. DO NOT attempt to lengthen load chain, or to repair damaged load chain.
13. DO NOT use chain or rope as ground for welding. NEVER touch a live welding electrode to the chain or rope.

### DO'S--HOISTS

1. READ and follow manufacturer's instruction, installation and maintenance manuals. When repairing or maintaining a hoist, use only manufacturer's recommended parts and materials.
2. READ and follow all instruction and warning information on or attached to a hoist.
3. REMOVE the hoist from service and thoroughly inspect and repair as necessary if unusual performance o, visual defects (such as peculiar noise, jerky operations, or travel in improper direction or obviously damaged parts) are noticed.
4. ESTABLISH a regular schedule of inspection and maintain records for all hoists with special attention given to hooks, ropes, chains, brakes and limit switches.
5. CHECK operation of brakes for excessive drift.
6. CHECK operation of limit switches.
7. CHECK for damaged hooks, ropes or chain.
8. KEEP load chain or rope clean and well lubricated.
9. CHECK the wire rope or chain for improper seating, twisting, kinking, wear or other defects before operating the hoists.
10. CHECK for broken wires in wire rope. Twelve randomly distributed broken wires in one rope lay or four broken wires in one strand in one rope lay are sufficient cause for replacement.
11. MAKE SURE a load clears neighboring stock piles, machinery, or other obstructions when raising, lowering, or traveling the load.
12. CENTER hoist over the load before operating.
13. AVOID swinging of load or load hook when traveling the hoist.
14. BE SURE the load attachment is properly seated in 1 saddle of the hook. Balance load properly before handling. Avoid tip loading.
15. PULL in a straight line, so that neither hoist body nor load chain or rope are angled around an object.
16. MAKE SURE you take up slack slowly.
17. ON LEVER OPERATED HOISTS, always release hand, gradually when under load to avoid flying handle.

Above reprinted from Hoist Manufacturers Institute "Do's and Don'ts."

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## FOREWORD

This manual contains important information to help you properly install, operate and maintain your Lodestar Hoist for maximum performance, economy and safety.

Please study its contents thoroughly before putting your hoist into operation. By practicing correct operating procedures and by carrying out the recommended preventive maintenance suggestions, you will experience long, dependable and safe service.

After you have completely familiarized yourself with the contents of this manual, we recommend that you carefully file it for future reference.

The information herein is directed to the proper use, care and maintenance of the Lodestar Hoist and does not comprise a handbook on the broad subject of rigging.

A word about rigging. Rigging can be defined as the process of lifting and moving heavy loads using hoists and other mechanical equipment. Skill acquired through specialized experience and study is essential to safe rigging operations. For rigging information, we recommend consulting a standard textbook on the subject.

The postage paid guarantee card included in the envelope with this manual should be filled in and mailed to the factory at once for recording and validating.

A copy of this manual is packed with each Lodestar Hoist.

**CM GUARANTEE** If any part proves defective within one year of shipment, we will replace the part at no charge, F.O.B. our factory, provided the part claimed defective is returned to our factory transportation prepaid.

We assume no responsibility for unauthorized alterations or repairs.

Use of materials or replacement parts other than CM manufacture may lead to dangerous operation. Accordingly, CM cannot be responsible in such cases and the guarantee would be void.

### CM LODESTAR PROTECTOR

The CM Lodestar Protector is a friction clutch assembly that is designed to protect the Lodestar Hoist from excessive, infrequent overloads. The Protector is not intended to be used as a scaling device for purposes of determining what is an appropriate or safe load to be lifted on a regular basis. This overload clutch is intended for use on the Lodestar Hoist only and is in the gear train of the hoist. The Lodestar Protector does not change the overall dimensions or operating characteristics of the hoist and it is available in kit form for installation in prior models of CM Hoists.

## SECTION A-INSTALLATION

### Hoist

After removing your Lodestar Hoist from the carton, inspect the frame and external wiring for damage which may have been caused during shipment or handling.

**IMPORTANT:** To assure extra long life and top performance, be sure to follow the load chain lubricating instructions on page load16.

### ATTACHING SUSPENSION

1. Remove the hook or lug suspension from its carton and the two socket head cap screws plus the socket screw key from the bag, see Figure 1.

The suspension for a double chain hoist (Models E, H, R, RR, E-2, H-2, R-2 and RR-2, includes a dead end bolt and block for supporting the dead end of the load chain as shown in Figure 2.

2. Place the suspension in the recess on top of Hoist.

On double chain hoist, the dead end block thru RR-2 should project through the bottom of hoist with the pin hole and slot aligned to the underside of hoist as shown in Figure 2. It may be necessary to lift the bolt head from the hex recess in the suspension adapter, turn and re-seat it, to obtain this alignment. **DO NOT CHANGE THE POSITION OF THE DEAD END BLOCK** ON

**THE BOLT.** The pin hole should clear the hoist frame by not more than 1/4" on Models E, H, E-2 and H-2 and 7/16" on Models R, RR, R-2, and RR-2.

3. Insert the screws through the adapter and engage the self-locking nuts enclosed in the hoist.

Screws will enter the nuts freely except for the last 1/4" of travel during which the resistance of the nut locking collar will be encountered.

4. Tighten screws with socket screw key provided. Then, with both hands on key securely seat screws. See table below:

MODEL NO.	SCREW SIZE	RECOMMENDED SEATING TORQUE
A thru H A-2 thru H-2 J thru RR	3/8-16 UNC-3a	40-45 Lb. Ft.
J-2 thru RR-2	1/2-20 UNF-3A	95-105 Lb. Ft.

**CAUTION:** Models J thru RR and J-2 thru RR, use special high strength, socket head suspension screws (stamped with the letters "SPS-K16" on the side of the head for identification.) Under no circumstances, should screws other than these be used to attach the suspensions to these hoists.

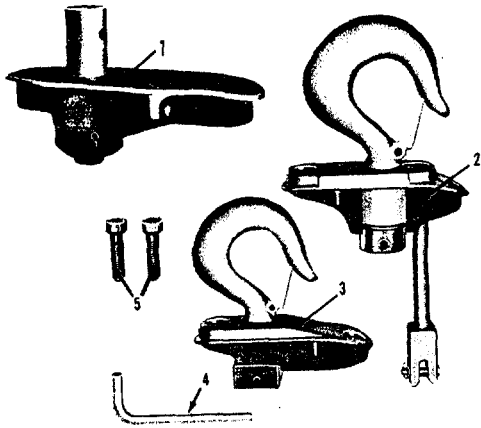


FIGURE 1. SUSPENSION ASSEMBLIES

1. Lug type (single reeved adapter) for use with Low Headroom Lodestar Trolley and Motor Driven Trolley.
  2. Swivel hook type (double-reeved adapter).
  3. Rigid hook type (single-reeved adapter).
  4. Socket screw key.
  5. Socket head suspension screws.
- (Do not order parts by these numbers. See parts list.)

**ATTACHING LOAD CHAIN**

Models E, H, R, RR, E-2, H-2, R-2 and RR-2

1. Suspend the hoist from an adequate support.
2. The hoist is shipped with the dead end of the load chain temporarily positioned a few links from the end by a light wire clip (1) as shown in Figure 2. Do not remove this clip until the chain is secured.
3. Insert the last link of the load chain into dead end block (2).
4. Secure with the dead end pin, washer and cotter pin furnished with the suspension.
5. Remove clip (1) by inserting a screw driver blade through a chain link and levering against the bottom of hoist.
6. Do not remove the ties from load chain.

Now, suspend the hoist from its permanent support or track system. If the hoist is to be hung from a Low Headroom Lodestar Trolley or a Lodestar Motor Driven Trolley, refer to the trolley installation instructions pages 7 and 8.

FIGURE 2. ATTACHING LOAD CHAIN  
(Models E, H, E-2 and H-2 illustrated)  
(Model R, RR, R-2 and RR-2 similar)

- |                                |                     |
|--------------------------------|---------------------|
| 1. Wire clip                   | 7. Chain guide      |
| 2. Dead end block              | 8. Loose end link   |
| 3. Suspension assembly         | 9. Liftwheel        |
| 4. Suspension self-locking nut | 10. Gear housing    |
| 5. Dead end bolt               | 11. Loose end screw |
| 6. Load chain                  |                     |

(Do not order parts by these numbers. See parts list.)

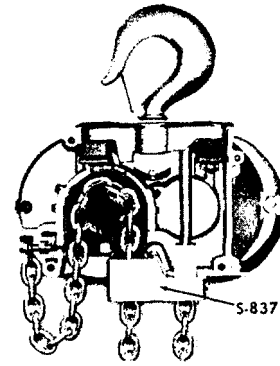


FIGURE 2A.

NOTE: Models R, R-2, RR and RR-2 are furnished with a contact block (S-837). The dead end block (2) passes thru the contact block and the contact block is supported by the dead end pin.

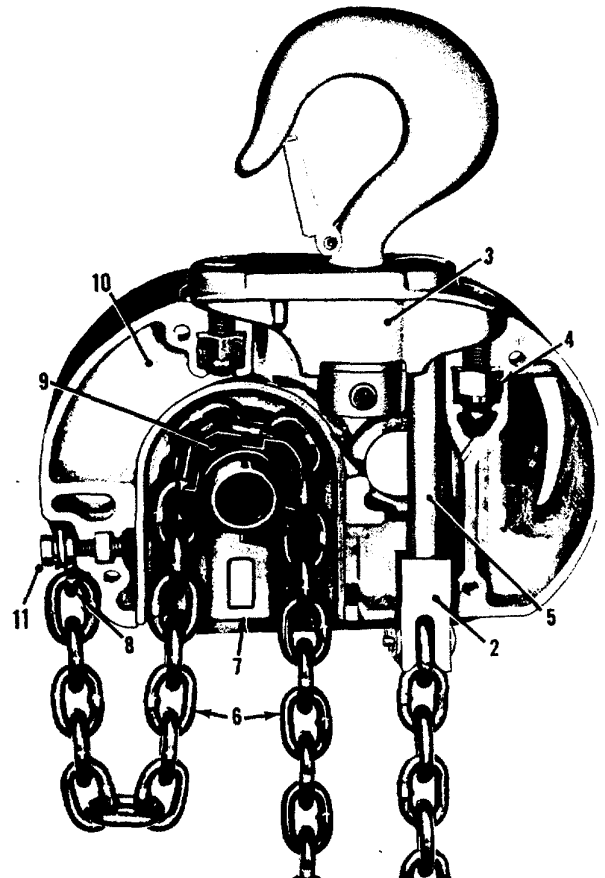
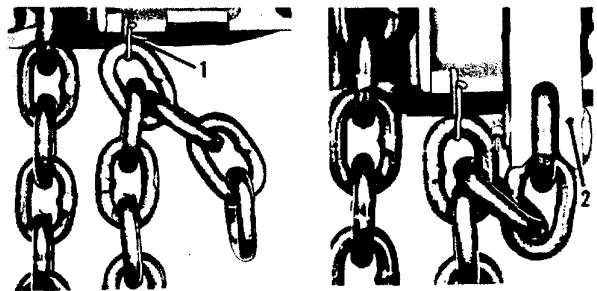


FIGURE 2.

**POWER SUPPLY AND ELECTRICAL CONNECTIONS**

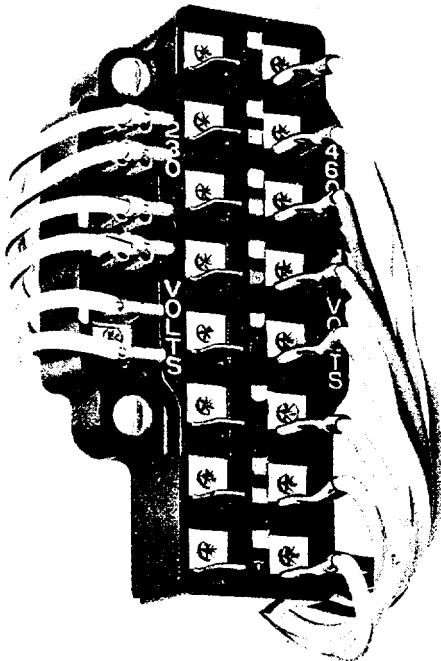
**ALL HOISTS**

The hoist should be connected to a branch circuit which complies with the requirements of the National Electrical Code and applicable local codes.

It is recommended, especially for a single phase hoist with a one horsepower motor, that a line of adequate capacity be run directly from the power supply to the hoist to prevent having problems with low voltage and circuit overloads.

For grounding of the hoist, the power cord includes a grounding conductor (green wire). On a standard single phase unit this cord is equipped with a three-prong plug. Be sure that the receptacle opening which receives the longest prong is properly grounded. Furthermore, the suspension system on which the hoist is mounted should also be permanently grounded.

Before connecting the hoist to the power supply, check that the power to be used agrees with that shown on hoist identification plate. In addition, for a three phase, dual voltage unit, check the voltage shown on the tag attached to power cord.



**FIGURE 3**

**VOLTAGE CONVERSION TERMINAL BOARD**

The nominal hoist voltage rating corresponding to the voltage range given on hoist identification plate is:

**SINGLE SPEED UNITS**

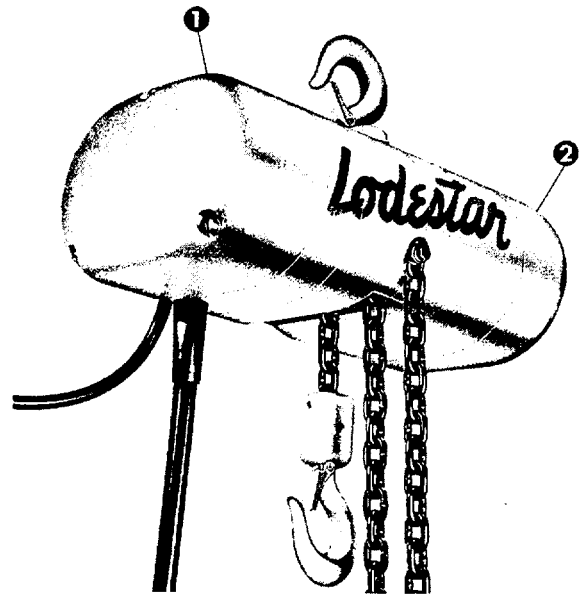
RANGE	NOMINAL VOLTS
110-120	115
208-240	230
440-480	460

**TWO SPEED UNITS**

RANGE	NOMINAL VOLTS
208-230	230
440-460	460

**THREE PHASE HOIST**

Changing the voltage connections on a single speed, three phase dual voltage unit, is easily done at the conversion terminal board shown in Figure 3 located in the hoist as shown in Figure 4.



**FIGURE 4**

Voltage conversion terminal board is located under back frame cover (1) for Models A thru H and under motor housing cover (2) for Models J thru RR.

Limit switches and electric brake are located under back frame cover for all hoists.

**NOTE:** The column of terminals on the left is marked 230 volts and the right-hand column is marked 460 volts.

To change the hoist voltage connections, simply shift eight wires to the column of terminals marked.

for the desired voltage. The insulation color combination of each wire must match the two colors adjacent to the terminal lug to which wire is attached. All eight wires must be in the same column and all terminals must be tight. Be sure to make a notation of the new hoist voltage on the tag attached to Dower cord.

Since the motor in a three phase hoist can rotate in either direction, depending on the manner in which it is connected to the power supply, the direction of hook movement must be checked during the original installation and each time hoist is moved to a new location. *Serious damage can result if the hook is run to the upper or lower limit of travel with the hook operating in a direction opposite to that indicated by the control station. Therefore, proceed as follows:*

1. Make temporary connections at the power supply.
2. Operate \* (UP) control in control station momentarily. If hook raises, connections are correct and can be made permanent.
3. If hook lowers, it is necessary to change direction by interchanging the Red lead and the Black lead of hoist power cord at power supply. Under no circumstances should the internal wiring of control station or hoist be changed to reverse hook direction. The wiring is inspected and tested before leaving the factory.

**CAUTION:** As with any power hoist, the hook block must not be allowed to run into the bottom of the hoist nor allow the chain to become taut between loose end screw and frame or else serious damage will result, which could drop the load. Do not force the Lodestar Protector to compensate for improperly adjusted limit switches or reverse voltage phasing.

**CHECKING FOR TWIST IN LOAD CHAIN -**  
Models E, H, E-2, H-2, R, RR, R-2 and RR-2.

The best way to check for this condition is to run the lower hook, without a load, up to within about 2 feet of hoist. If the dead end of the chain has been properly installed, a twist can occur only if the lower hook block has been capsized between the strands of chain. Reverse capsized to remove twist.

**CHECKING FOR ADEQUATE VOLTAGE AT HOIST**

Take voltage reading at end of the standard 15 foot power cord with the hoist operating in the **↑**(UP) direction with full load.

The minimum running voltage for proper hoist operation is given below:

NOMINAL CURRENT	MINIMUM RUNNING VOLTAGE	MINIMUM STARTING VOLTAGE
115-1-60	103.5	98
230-1-60	207	196
230-3-60	187	
460-3-60	396	

**CHECKING LIMIT SWITCH OPERATION**

Operate hoist over the entire length of its rated lift, checking upper and lower limit switches for correct operation as follows:

1. Press \* (UP) control and raise the lower hook until top of hook block is about one-foot below the hoist.
2. Cautiously continue raising the hook until the upper limit switch stops the upward motion.

The upper limit switch is set at the factory to stop the hook block 3 inches from bottom of hoist on all units with standard 10 foot lift except Models AA and AA-2. Factory setting is 6 inches for these models and for all other models equipped with chain for lifts longer than 10 feet.

3. If adjustment is necessary, see page 16 and 17. **CAUTION:** As with any lower hoist, the hook block must not be allowed to run into the bottom of hoist nor allow the chain to become taut between loose end screw and frame or else serious damage will result, which could drop the load.

4. Press + (DOWN) control and cautiously lower hook until lower limit switch stops the downward motion. From 7 to 11 chain links (depending on hoist model) should be between the loose end link and the hoist entry. See Figure 2.

5. If adjustment is necessary, see page 17.

**SHORTENING THE CONTROL CORD**

If it is necessary to shorten the cord, it is recommended that a "Control Cord Alteration Kit" (S-474) be obtained from a distributor of CM Hoist or from the CM Factory. However, if the proper solderless wiring terminals, etc. are available, proceed as follows:

1. After hoist operates properly, disconnect power supply, open control station and disconnect all wires and steel strain cable.
2. Remove cord from control station and slide the neoprene grommet and grommet retainer ring up on the cord.
3. Cut off control cord for a length equal to the distance station is to be raised, measuring from the end of longest wire.
4. Now, using the cut off piece of cord as a guide, strip outer insulation jacket and shorten individual wires (except Green wire) to the lengths previously used, refer to Figure 5. Strip insulation from each wire for distance required for appropriate terminal.
5. Attach proper terminals (either ARK-LES #3000H4A, ARK-LES #3000H9A, ARK-LES



#3500H1A, or ARK-LES #3500H4A) to the wires by squeezing or crimping terminal barrel until it firmly grips the conductor. Assemble conductor and terminal insulator (Shrink Tubing Alpha Wire and Cable Co. # Fit-221-1/4", 1/4" i.d. x 1" lg.), using heat source to appropriate conductors.

6. Shorten steel strain cable (Green wire) and strip insulation for 2/16".
7. Slide clamp sleeve (Nicopress sleeve type 18-1-C) onto strain cable. Form a tight loop in cable at a length of 1 1/2" from end of outer insulation jacket, inserting the loose end into sleeve.
8. Squeeze or crimp sleeve with a vise or large pliers to secure loop.

9. Remove (from the cut off piece of cord) the rubber sleeve covering the loop clamp and slip it over the clamp sleeve which you just prepared. Or, cover sleeve with vinyl electrical tape.
10. Insert control cord into control station case. Attach steel strain cable.
11. Refer to wiring diagram inside back fram cover of hoist (or packed with hoist) and care fully reconnect wires.
12. Reposition the neoprene grommet so that it fits in top of control station case and assemble grommet retainer ring. Reassemble cover and gasket.
13. Operate hoist carefully in both directions to check correctness of electrical connections.

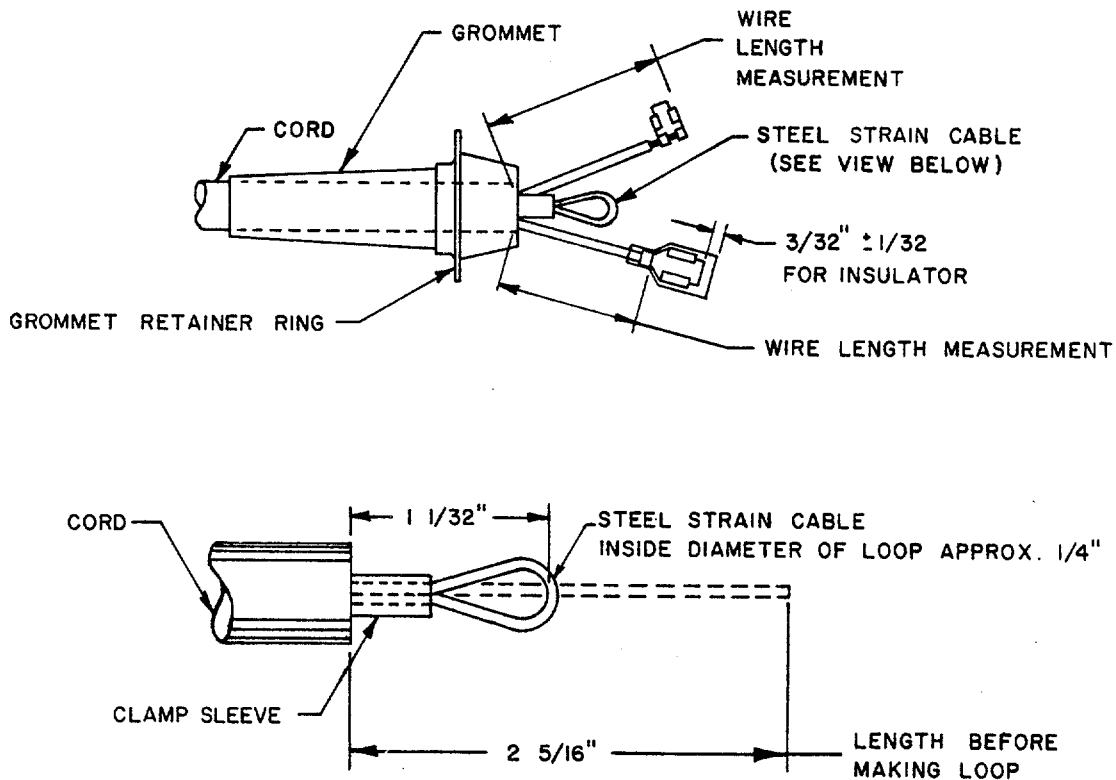


FIGURE 5.  
SHORTENING CONTROL CORD

## All Trolleys

For all trolley supported hoists, rail stops must be installed. These stops must not be positioned to exert impact force on the hoist but should contact the end of the trolley side frames.

### Low Headroom Trolley

This trolley is packed separately and must be properly adjusted by the user to fit the runway beam as follows:

1. Arrange the side frames, load bracket, spacer washers and nuts on the suspension bolts according to Figure 6 and Chart 1. (Warning, special trolleys shown in chart require special suspension bolts). Do not assemble cotter pins to the bolts.

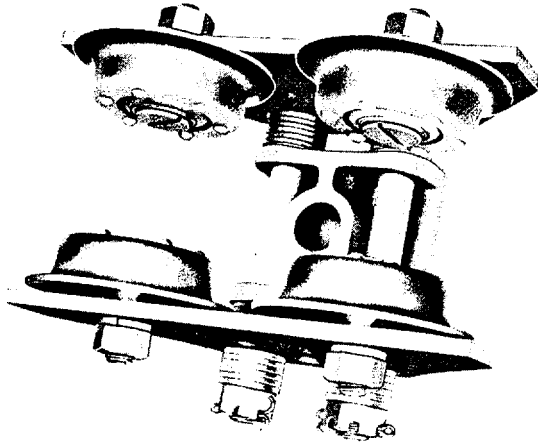


FIGURE 6. LOW HEADROOM LODESTAR TROLLEY.

2. The number of spacers as given in Chart I is nominally correct, however, due to the variation in size encountered on structural steel sections, it will be necessary in some cases to vary the number used. Therefore, the distance between the trolley trackwheel flanges, and the beam flange width should be measured to determine the exact distribution of the spacer washers. The distance between trackwheel flanges should be 1/8" to 1/4" greater than the width of the beam flange for straight runway beams and 3/16" to 1/4" if runway system includes sharp curves. The number of spacer washers between side frames and load bracket should be the same or differ only by one spacer to keep the hoist hook centered under the runway beam.
3. Install the trolley on beam by sliding one side frame out far enough to allow the trackwheels to clear the beam flange.

**WARNING:** Deviation from CM washer recommendations can cause trolley to fall from the beam. The trolley should be inspected periodically to assure its continued operation.

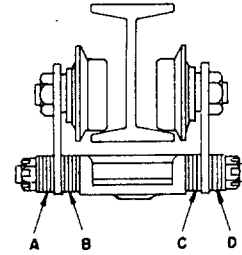


FIGURE 7. ATTACHING HOIST TO TROLLEY.

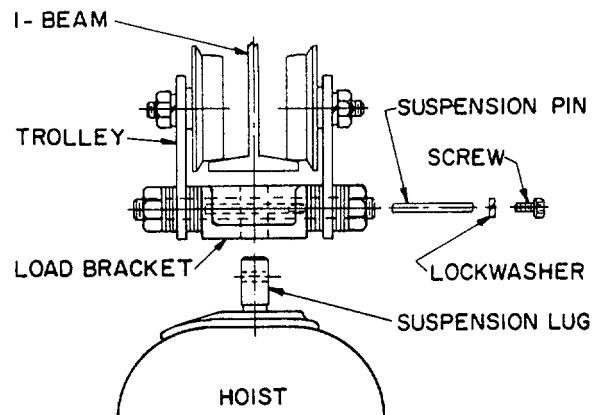
	FLANGE WIDTH	1 TON CAPACITY				2 TON CAPACITY			
		NO. OF SPACERS				NO. OF SPACERS			
		A	B	C	D	A	B	C	D
STANDARD TROLLEYS	2 5/8	6	0	0	6				
	3	5	1	1	5				
	3 3/8	4	2	2	4	8	0	0	8
	3 5/8	3	3	3	3	7	1	1	7
	4	2	4	4	2	6	2	2	6
	4 5/8	0	6	6	0	4	4	4	4
SPECIAL TROLLEYS	5	8	2	1	8	3	5	5	3
	5 1/4	7	3	2	7	3	5	6	2
	5 1/2	7	3	3	6	2	6	7	1
	6	5	5	5	4	0	8	8	0
	6 1/4	4	6	6	3	8	2	1	8
	7	0	9	9	1	5	5	4	5
	7 1/8					5	5	5	4
	7 1/4					4	6	5	4
	7 7/8					2	8	8	1
	8					1	9	8	1

\* Minimum Beam Radius 24" for all capacities.

\* Dimension applies to minimum I-Beam and will vary with larger I-Beams.

CHART I - TROLLEY SIDE FRAME SPACING.

4. Draw the side frames together and assemble cotter pins.



5. With the trolley mounted on the beam, attach the hoist by inserting the suspension lug into the trolley load bracket and inserting the suspension pin through the load bracket and suspension lug as shown in Figure 7.

6. Thread the socket head cap screw and lockwasher into load bracket and tighten securely.

7. Now, return to page 4 "Power Supply and Electrical Connections" and complete the hoist installation procedure.

8. Then with a capacity load on hoist, operate trolley over the entire length of runway or monorail system to be sure that the adjustment and operation is satisfactory. On systems with curves, the edges of the rail at the curved sections should be kept lightly lubricated with grease.

### Motor Driven Trolley

This trolley is shipped separately and must be assembled and wired to the hoist by the user. Refer to the instruction manual packed with the unit.

### Enclosed Collectors and Wiring

On low headroom trolley, collectors are to be installed on each side of trolley. On motor driven trolley, all collectors are to be installed on one side of trolley.

#### Installation Procedure-

1. Make sure power supply to conductor system is shut off.
2. Refer to Figure 9 to determine the proper mounting position for the collector bars and brackets.
3. Attach the brackets by inserting the screws into tapped holes in the side frames. Tighten screws securely.

#### ATTACH HOIST POWER CORD TO COLLECTOR SHUNT SCREW

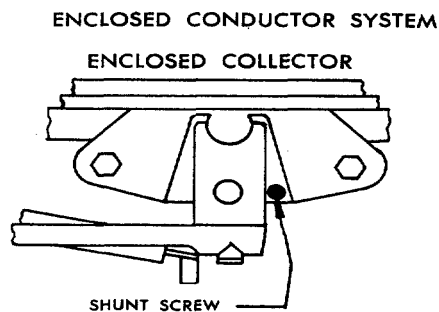


FIGURE 8.

4. Place an insulator on each collector bar.
5. Position the bars in the brackets and lock with set screws. Mount collectors on bar to match conductor system.
6. Again refer to Figure 9 position the collectors on the bars as shown.
7. Measure the length of power cable needed to reach the farthest collector. Allow for connecting the wire to the collector shunt screw and cut off the cable.
8. Strip back the insulation as required and cutoff Green wire if no ground conductor is installed.
9. Attach wires to collector's shunt screw ( Fig. 8).
10. Check installation to make sure that the collectors make proper contact throughout the entire length of trolley travel.
11. Energize conductor system. On three phase units check for proper direction of hook travel by following instructions on page 5.

### ALTERNATE METHODS OF WIRING

A flexible conductor cable can be used to supply power to a trolley mounted hoist. The length of conductor should be adequate for the full travel of trolley. A long conductor will usually require a clamp or strain relief (available from factory) fitting at the hoist to prevent kinking where the conductor enters hoist. To keep the slack conductor away from the hoist and load, a messenger wire system, a counterweighted pulley or a spring loaded cord reel (available from factory) can be used.

# Wheel Assembly

## 1 1/2, 2, 3, 4, 5 & 6 Ton

PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	1 1/2	QTY.	2	QTY.	3	QTY.	4	QTY.	5	QTY.	6	QTY.
1	Cotter Pin	NONE		NONE		NONE		NONE		NONE		NONE	
2	Nut, Axle	17-750	1	17-750	—	19-NT-8579	1	19-NT-8579	1	19-NT-8579	1	19-NT-8579	1
3	Spacer, Outboard	9315-1 1/2	1	9315-2	1	9315-3	1	9315-4	1	9315-6	1	9315-6	1
4	Spacer, Plate	9307-1 1/2	1	9307-2	1	9307-3	1	9307-4	1	9307-5	1	9307-6	1
5	Spacer, Inboard	9314-1 1/2	1	9314-2	1	9314-3	1	9314-4	1	9314-6	1	9314-6	1
6	Bearing	7054	2	7054	2	LM7048L	2	LM7048L	2	LM7048L	2	LM7048L	2
7	Wheel, Plain W/Bearing Cup	9203-1P	1	9203-1P	1	9203-2P	1	9203-2P	1	9203-3P	1	9203-3P	1
8	Wheel, Geared W/Brg. Cup	9203-1G	1	9203-1G	1	9203-2G	1	9203-2G	1	9203-3G	1	9203-3G	1
9	Washer, Axle Cup	9309-1 1/2	1	9309-2	1	9309-3	1	9309-4	1	9309-5	1	9309-6	1
10	Key, Axle	3/16" sq. x 1"	1	3/16" x 1"	1	1/4" sq. x 1"	1	1/4" sq. x 1"	1	1/4" sq. x 1"	1	1/4" sq. x 1"	1
11	Washer, Axle "C"	9308-1 1/2	1	9308-2	1	9308-3	1	9308-4	1	9308-5	1	9308-6	1
12	Axle	9310-1 1/2	1	9310-2	1	9310-3	1	9310-4	1	9310-5	1	9310-6	1
13	Ring, Snap	5000-175	1	500-175	1	NONE		NONE		NONE		NONE	

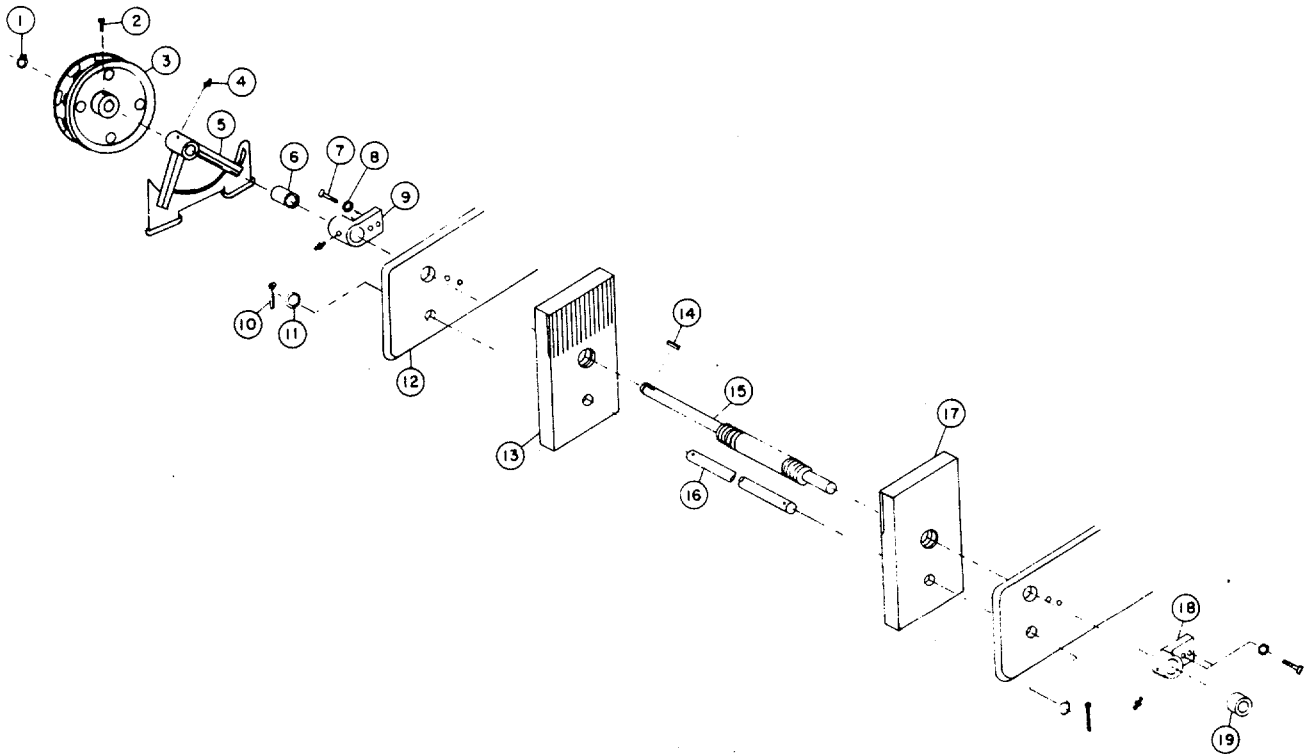
# Wheel Assembly

## 8, 10, 12, 16, 20 & 24 Ton

PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	8	QTY.	10	QTY.	12	QTY.	16	QTY.	20	QTY.	24	QTY.
1	Cotter Pin			1-25	1	1-25	1	1-37	1	1-37	1	1-37	1
2	Nut, Axle	19-NT-8583	1	18-250	1	18-250	1	1-37	1	1-37	1	1-37	1
3	Spacer, Outboard	9315-8	1	9315-10	1	9315-12	1	9315-16	1	9315-20	1	9315-24	1
4	Spacer, Plate	9307-8	1	9307-10	1	9307-12	1	9307-16	1	9307-20	1	9307-24	1
5	Spacer, Inboard	9314-8	1	9314-10	1	9314-12	1	9314-16	1	9314-20	1	9314-24	1
6	Bearing	13685L	2	399AL	2	399AL	2	399AL	2	NONE		NONE	
7	Wheel, Plain W/Brg. Cup	9203-4P	1	9203-5P	1	9203-5P	1	15B-1	1	15B-1	1	15B-1	1
8	Wheel, Geared W/Brg. Cup	9203-4G	1	9203-5G	1	9203-5G	1	15B-2	1	15B-2	1	15B-2	1
9	Washer, Axle Cup	9309-8	1	9309-10	1	9309-12	1	9309-16	1	9309-20	1	9309-24	1
10	Key, Axle	5/16" sq. x 1 1/4"	1	5/16" sq. x 1 1/4"	1	3/8" sq. x 2"	1	3/8" sq. x 2"	1	3/8" sq. x 2"	1	3/8" sq. x 2"	1
11	Washer, Axle "C"	9308-8	1	9308-10	1	9308-12	1	9308-16	1	9308-20	1	9308-24	1
12	Axle	9310-8	1	9310-10	1	9310-12	1	9310-16	1	9310-20	1	9310-24	1
13	Ring, Snap	NONE		NONE		NONE		NONE		NONE		NONE	

# Track Clamp Assembly



## Track Clamp Assembly

1½, 2, 3, 4 & 5 Ton

### PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	1½	QTY.	2	QTY.	3	QTY.	4	QTY.	5	QTY.
1	Snap Ring, Handwheel	5100-87	1	5100-87	1	5100-87		5100-87	1	5100-87	1
2	Set Screw, Square Head	8-25-175	1	8-25-175	1	8-25-175	1	8-25-175	1	8-25-175	1
3	Handwheel	P-1½	1	P-2	1	P-3	1	P-4	1	P-5	1
4	Lube Fitting	1728-B	3	1728-B	3	1728-B	3	1728-B	3	1728-B	3
5	Guard, Swinging	PG-1½	1	PG-2	1	PG-3	1	PG-4	1	PG-5	1
6	Bushing, Bearing Block	7/8" ID x 1" OD	2	7/8" ID x 1" OD	2	7/8" ID x 1" OD	2	7/8" ID x 1" OD	2	7/8" ID x 1" OD	2
7	Bolt, Bearing Block	2-31-1	4	2-31-1	4	2-31-1	4	2-31-1	4	2-31-1	4
8	Lockwasher, Bearing Block	20-312	4	20-312	4	20-312	4	20-312	4	20-312	4
9	Block, Bearing Long	906L	1	906L	1	906L	1	906L	1	906L	1
10	Cotter Pin	1-21-1	2	1-21-1	2	1-21-1	2	1-21-1	2	1-21-1	2
11	Washer, Guide Pin	21-625	2	21-625	2	21-625	2	21-625	2	21-750	2
12	Side Plate	153-1½	2	153-2	2	153-3	2	153-4	2	153-5	2
13	Jaw, Left Hand	150L-1½	1	150L-2	1	150L-3	1	150L-4	1	150L-5	1
14	Key, Handwheel	¼" sq. x 1-3/8"	1	¼" sq. x 1-3/8"	1	¼" sq. x 1-3/8"	1	¼" sq. x 1-3/8"	1	¼" sq. x 2"	1
15	Screw, Track Clamp	151-1½	1	151-2	1	151-3	1	151-4	1	151-5	1
16	Pin Guide	152-1½	1	152-2	1	152-3	1	152-4	1	152-5	1
17	Jaw, Right Hand	150R-1½	1	150R-2	1	150R-3	1	150R-4	1	150R-5	1
18	Block, Bearing Short	906S-1½	1	906S-2	1	906S-3	1	906S-4	1	906S-5	1
19	Bushing, Brg. Block Short	7/8" ID x 1" OD	1	7/8" ID x 1" OD	1	7/8" ID x 1" OD	1	7/8" ID x 1" OD	1	7/8" ID x 1" OD	1

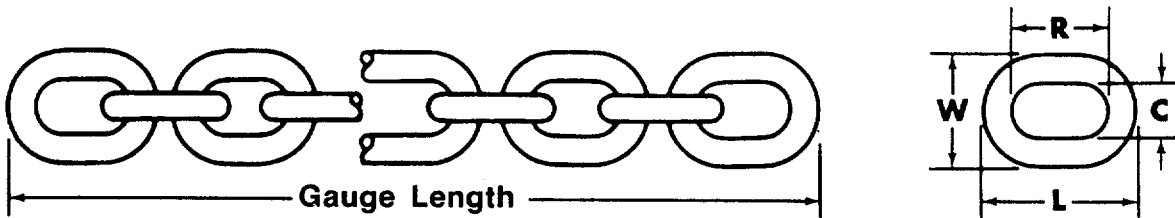
# Track Clamp Assembly

# 6, 8, 10 & 12 Ton

## PART NO. PER CAPACITY

PC. NO.	DESCRIPTION	6	QTY.	8	QTY.	10	QTY.	12	QTY.
1	Snap Ring, Handwheel	5100-87	1	5100-87	1	5100-87	1	5100-87	1
2	Set Screw, Square Head	8-25-175	1	8-25-125	1	8-25-125	1	8-25-125	1
3	Handwheel	P-6	1	P-8	1	P-10	1	P-12	1
4	Lube Fitting	1728-B	3	1728-B	3	1728-B	3	1728-B	3
5	Guard, Swinging	PG-6	1	PG-8	1	PG-10	1	PG-12	1
6	Bushing, Bearing Block	7/8" IDx1" OD	2	7/8" IDx1" OD	2	7/8" IDx1" OD	2	7/8" IDx1" OD	2
7	Bolt, Bearing Block	2-31-1	4	2-31-1	4	2-31-1	4	2-31-1	1
8	Lockwasher, Bearing Block	20-312	4	20-312	4	20-312	4	20-312	4
9	Block, Bearing Long	906L	1	906L-8	1	906L-10	1	906L-12	1
10	Cotter Pin	1-21-1	1	1-21-1	2	1-21-1	2	1-21-1	2
11	Washer, Guide Pin	21-750	2	21-750	2	21-750	2	21-750	2
12	Side Plate	153-6	2	153-8	2	153-10	1	153-12	2
13	Jaw, Left Hand	150L-6	1	150L-8	1	150L-10	1	150L-12	1
14	Key, Handwheel	1/4" sq. x 2"	1	1/4" sq. x 2"	1	1/4" sq. x 2"	1	1/4" sq. x 2"	1
15	Screw, Track Clamp	151-6	1	151-8	1	151-10	1	151-12	1
16	Pin, Guide	152-6	1	152-8	1	152-10	1	152-12	1
17	Jaw, Right Hand	150R-6	1	150R-8	1	150R-10	1	150R-12	1
18	Block, Bearing Short	906S-6	1	906S-8	1	906S-10	1	906S-12	1
19	Bushing, Bearing Block Short	7/8" IDx1" OD	1	7/8" IDx1" OD	1	7/8" IDx1" OD	1	7/8" IDx1" Od	1

## Chain Specifications



Use and Description	Cat. No.	Chain Size	C	W	R	L	Gauge Length	Net Weight
<b>LOAD CHAIN</b>								
1-1/2, 2, 3 & 4 Ton	C-38-1/2A	9/32"	.313	.876	.794	1.357	25 links: 20.406"	.75 lbs., ft.
8 & 16 Ton	C-938-2	3/8"	.466	1.216	1.147	1.897	13 links: 15.656"	1.23 lbs., ft.
5, 6, 10, 12, 20, 24 Ton	C-38-3	9/16"	.625	1.750	1.571	2.696	11 links: 18.406"	2.90 lbs., ft.
Use and Description	Cat. No.	Chain Size	C	W	R	L	Gauge Length	Net Weight
<b>HAND CHAIN</b>								
ALL CAPACITIES	C-937	15/64"	.347	.816	1.056	1.525	19 links: 20.533"	.46 lbs., ft.

**Warranty:** All goods sold by SELLER pursuant to this order are sold with only the following warranty: SELLER warrants that the goods shall be free from defects in material and workmanship under normal use and service. SELLER'S obligation under this warranty is limited to reworking or replacing at its option any goods which, within the time stated herein, shall be returned to it at its place of business at the address set forth herein with two-way packaging and shipping costs prepaid and which, upon examination and determination by SELLER, shall be found to have been thus defective. The rework, repair or replacement of defective goods under this warranty will be made without charge for material or labor. This warranty shall remain in force and be valid during the following periods and under the stated circumstances: (a) on goods manufactured by SELLER, or manufactured by others to SELLER'S detailed design for 3 months from date of shipment by SELLER to BUYER and (b) on purchased items not included in (a) and incorporated in the goods for the period and to the extent specified by the original manufacturer. Goods which are allegedly defective can not be returned to SELLER without prior written, approval of SELLER. SELLER, at its option may first request samples for inspection purposes. The provisions of this warranty shall not apply to, nor is any other warranty given on, as determines solely by SELLER, goods which have not been used or maintained in accordance with SELLER'S instructions or which have been subject to misuse, negligence or accident or which have been repaired, altered or modified in any way by anyone other than SELLER. THIS WARRANTY IS EXPRESSLY IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED (INCLUDING SPECIFICALLY, WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, AND ALL OTHER OBLIGATION AND ALL WARRANTIES OF MERCHANTABILITY AND FITNESS), AND ALL OTHER OBLIGATION AND LIABILITY ON THE PART OF SELLER. SELLER SHALL NOT BE LIABLE FOR CONSEQUENTIAL OR SPECIAL DAMAGES UNDER ANY CIRCUMSTANCES OR FOR MORE THAN REPLACEMENT OR REFUND OF THE PURCHASE PRICE ON DEFECTIVE GOODS. Upon request, SELLER will furnish such technical advice or assistance as it has available in reference to the use of the goods; however, it is expressly understood that (i) SELLER assumes no obligation or liability for the advice or assistance given or results obtained, (ii) all such advice or assistance is given and accepted at BUYER'S risk and (iii) such advice or assistance shall not waive or affect SELLER'S liability as herein defined.

#### **IMPORTANT. NOTICE**

Use of chain or replacement parts other than as supplied as original equipment on Chester Hoists may lead to dangerous operation. Accordingly, Chester Hoist cannot be responsible in such cases and our warranty would be voided.

"Caution: Some of the hoists and trolleys manufactured by the Chester Hoist Division can be adjusted to fit various sizes of runway beams. Others of our hoists and trolleys are built to fit a runway specified by our customers. Regardless, it is the customer's responsibility to apply such engineering calculations or tests as may be necessary to satisfy itself that the runway beam flanges are capable of carrying the loads expected to be handled."

**Chester Hoist Div.  
Monogram Industries Inc.  
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7573 State Route #45  
Lisbon, Ohio 44432  
(216) 424-7248**

Bulletin J  
**CHESTER ZEPHYR LOW HEAD ROOM HOISTS**

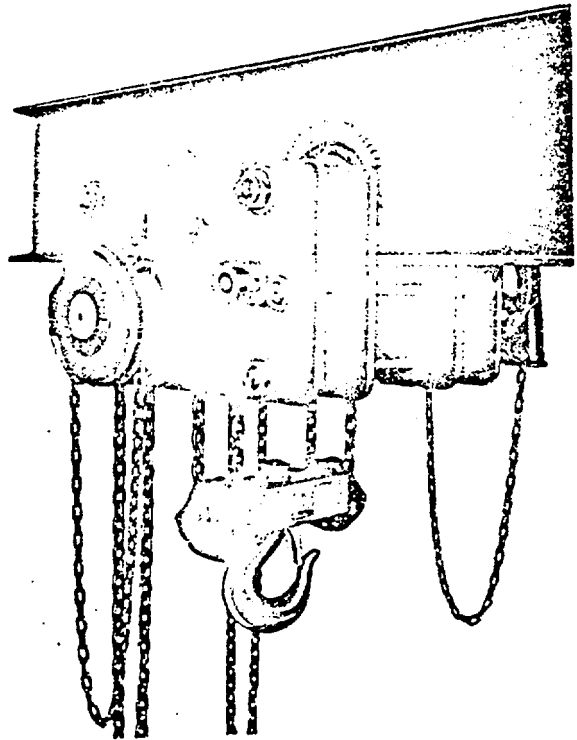
The equipment illustrated and described in this Bulletin are designed for manual operation only and are not to be power driven nor are they suitable for lifting persons.

**ZEPHYR**

Chester Zephyr Low Head Room Trolley hoists as the name implies are designed for those applications where head room is so limited that no other type hoist can be used. It offers the answer for existing structures with low ceilings and suggests interesting cost savings in new construction by allowing lower ceilings.

The Chester Low Head Room is not adjustable to varying size beams. Each unit is custom-built to fit the size beam specified in the order.

Zephyr Low Head Room hoists are equipped with through hardened, machined tread, precision bearing trolley wheels. Beam size, height, flange width, and curve radius are required for all orders.



Catalog Number:		Rated capacity in short tons	Standard lift in feet	Load chain length 2 chains per hoist	†† Minimum radius curve	Minimum distance bottom of I-beam to hook in inches	Chain pull to lift full load lbs.	Chain overhaul to lift load one foot	Net weight lbs.	
Plain	Geared								Plain	Geared
1421— 1½	1422— 1½	1½	8	9'-6"	6'-6"	6-1/2"	41	87'	207	230
1421— 2	1422— 2	2	8	9'-6"	6'-6"	6-1/2"	54	87'	210	233
1421— 3	1422— 3	3	8	18'-3"	6'-6"	7-1/2"	42	176'	305	335
1421— 4	1422— 4	4	8	18'-3"	7'-6"	8"	56	176'	308	340
1421— 5	1422— 5	5	8	10'	8'-6"	8-1/2"	79	165'	574	633
1421— 6	1422— 6	6	8	10'	8'-6"	8-1/2"	94	165'	574	633
1421— 8	1422— 8	8	8	19'	9'-6"	11"	54	355'	650	773
1421—10	1422—10	10	8	19'-6"	10'	11-1/2"	87	330'	1022	1105
1421—12	1422—12	12	8	19'-6"	†	12-5/8"	104	330'	1022	1105
1421—16	1422—16	16	8	38'-6"	†	13-1/2"	68	710'	1600	1681
1421—20	1422—20	20	8	39'	†	17-1/4"	87	731.5'	1950	2110
1421—24	1422—24	24	8	39'	†	17-1/4"	104	731.5'	1950	2110

†Straight track operation only recommended for these units. However curve radius must be specified on orders.

††Curves less than minimum may be lifted by special construction. Consult factory.

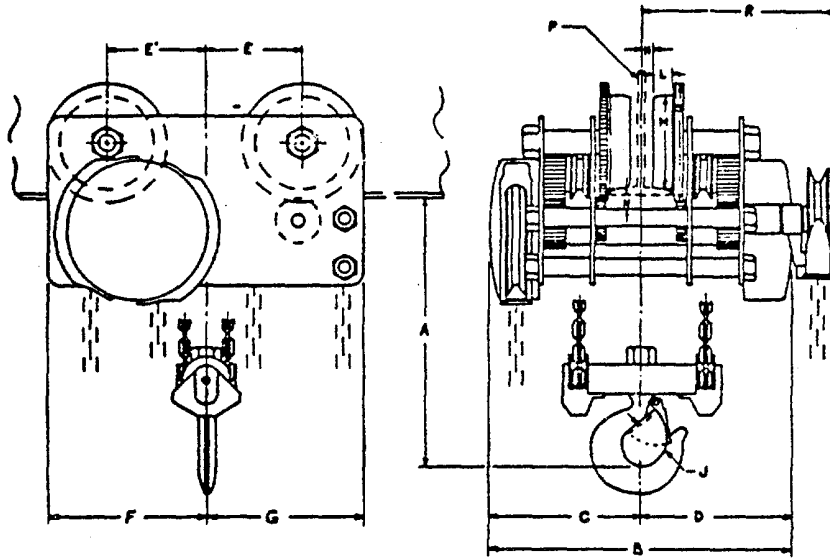
**ALL HEADROOM DIMENSIONS DETERMINED WHILE HOIST UNDER LOAD.**

CHESTER HOIST DIVISION • MONOGRAM INDUSTRIES • PHONE (216) 424-7248 • LISBON, OHIO, U.S.A. 44432



# CHESTER ZEPHYR LOW HEAD ROOM HOISTS

## CLEARANCE DIMENSIONS



### Minimum Radius Curves

CAPACITY	MINIMUM RADIUS CURVE
1 1/2-3 Ton	6'6"
4 Ton	7'6"
5, 6 Ton	8'6"
8 Ton	9'6"
10 Ton	10'0"

For over 10 Ton, straight track operation is recommended.

Curve radius must be specified on orders.

Curves less than minimum radius may be fitted upon application.

## PLAIN OR GEARED

Capacity Tons	A	B	C	D	E	E'	F	G	H
1 1/2	6-1/2"	20-3/8"	10-3/16"	10-3/16"	5-1/8"	5-1/8"	8-3/4"	8-1/4"	5/8"
2	6-1/2"	20-3/8"	10-3/16"	10-3/16"	5-1/8"	5-1/8"	8-3/4"	8-1/4"	5/8"
3	7-1/2"	20-3/8"	10-3/16"	10-3/16"	6-1/2"	6-5/8"	10-5/8"	10-5/8"	9/16"
4	8"	20-3/8"	10-3/16"	10-3/16"	6-1/2"	6-5/8"	10-5/8"	10-5/8"	9/16"
5	8-1/2"	26-1/4"	13-1/8"	13-1/8"	7-3/8"	7-3/8"	12"	12"	29/32"
6	8-1/2"	26-1/4"	13-1/8"	13-1/8"	7-3/8"	7-3/8"	12"	12"	29/32"
8	11"	26-1/4"	13-1/8"	13-1/8"	8-3/8"	8-7/8"	14"	13-1/2"	9/16"
10	11-1/2"	26-1/4"	13-1/8"	13-1/8"	8-1/2"	9-3/4"	15-5/8"	14-3/8"	9/16"
12	12-5/8"	26-1/4"	13-1/8"	13-1/8"	8-1/2"	9-3/4"	15-5/8"	14-3/8"	9/16"
16	13-1/2"	30-3/8"	15-3/16"	15-3/16"	11-7/8"	11-7/8"	18-5/8"	18-5/8"	9/16"
20	17-1/4"	30-3/8"	15-3/16"	15-3/16"	12-1/8"	12-3/8"	19-1/4"	19"	3/4"
24	17-1/4"	30-3/8"	15-3/16"	15-3/16"	12-1/8"	12-3/8"	19-1/4"	19"	3/4"

Capacity Tons	J	L	M	N	P*	R	S
1 1/2	1-7/32"	1-1/8"	4-1/2"	15/16"	6" I @ 12.5#	13-1/16"	6"
2	1-1/8"	1-1/8"	4-1/2"	15/16"	6" I @ 12.5#	13-1/16"	6"
3	1-5/8"	1-11/32"	6-3/8"	31/32"	8" I @ 18.4#	13-1/16"	8"
4	1-3/4"	1-11/32"	6-3/8"	31/32"	8" I @ 18.4#	13-1/16"	8"
5	1-11/16"	1-13/32"	7-3/16"	15/16"	10" I @ 25.4#	16-1/2"	9"
6	1-11/16"	1-13/32"	7-3/16"	15/16"	10" I @ 25.4#	16-1/2"	9"
8	2-5/16"	1-11/16"	8-1/4"	1-1/8"	10" I @ 25.4#	16-1/2"	10"
10	2-1/4"	1-3/4"	9-3/4"	7/8"	12" I @ 31.8#	16-1/2"	11-11/16"
12	2-1/4"	1-3/4"	9-3/4"	7/8"	12" I @ 31.8#	16-1/2"	11-11/16"
16	3"	2"	11-3/4"	1"	15" I @ 42.9#	18-7/8"	13-1/2"
20	4-3/16"	2"	11-3/4"	1"	18" I @ 54.7#	18-7/16"	13-1/2"
24	4-3/16"	2"	11-3/4"	1"	18" I @ 54.7#	18-7/16"	13-1/2"

All dimensions are in inches

\* P — Min. Beam for Proper Wheel Running Clearance

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# dimensions Series 0900

### SERIES 0900

Catalog No.	Dim. A In./mm	Dim. B In./mm	Dim. C In./mm	Dim. D Line Entrance
0931-xx-203 0931-xx-204	9.50/241	6.53/166	3.00/76	3/4" N.P.T.
0931-xx-204 0931-xx-208	11.60/295	6.53/166	3.00/76	3/4" N.P.T.
0941-xx-203 0941-xx-204	11.38/289	7.85/199	4.50/114	1" N.P.T.
0941-xx-204 0941-xx-208	13.47/342	7.85/199	4.50/114	1" N.P.T.
0941-xx-210 0941-xx-213	14.46/372	7.85/199	4.50/114	1" N.P.T.

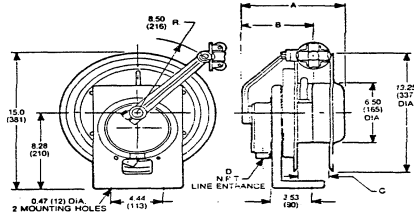


Chart shows dimensional variables within a reel series — "xx" in the catalog number listing represents the drive system and does not affect reel dimensions. Slip ring rating — see page 45. Dimensions are shown in decimal inches and millimeters.

# Series 1000

### SERIES 1000

Catalog No.	Dim. A In./mm
1041-xx-302 1041-xx-303 1041-xx-304 1041-xx-306	16.67/423
1041-xx-308 1041-xx-310	18.84/479
1041-xx-312 1041-xx-314 1041-xx-316	21.63/550
1041-xx-402 1041-xx-403 1041-xx-404	16.67/423
1041-xx-902	21.63/550

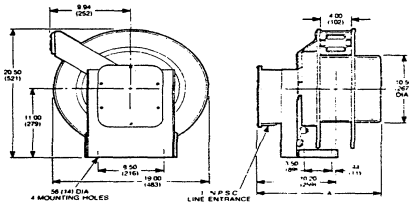
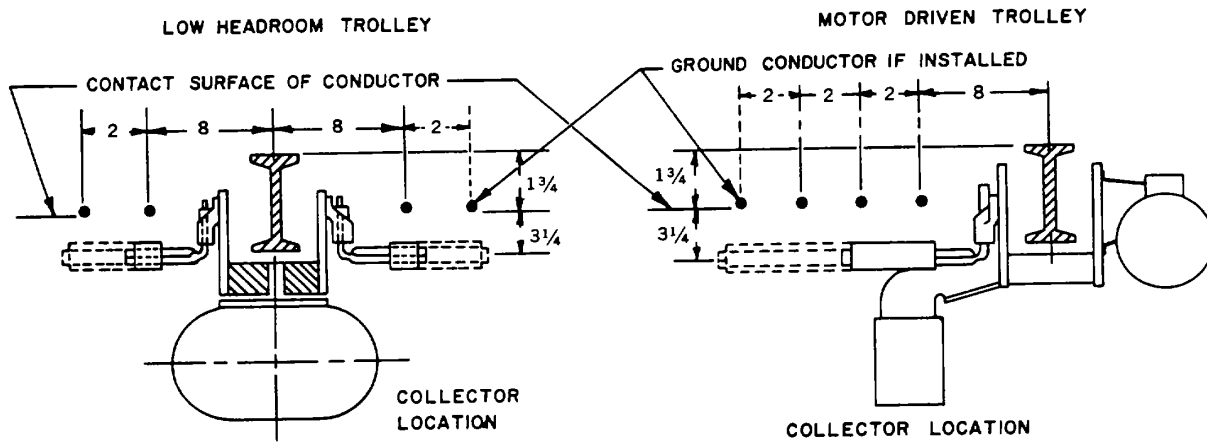


Chart shows dimensional variables within a reel series — "xx" in the catalog number listing represents the drive system and does not affect reel dimensions. Slip ring rating — see page 45. Dimensions are shown in decimal inches and millimeters.

# ENCLOSED COLLECTOR MOUNTING FOR LODESTAR LOW HEADROOM AND MOTOR DRIVEN TROLLEY

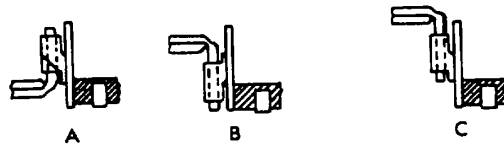


SINGLE PHASE - USE TWO COLLECTORS  
 THREE PHASE - USE THREE COLLECTORS

**CAUTION:**

Trolley Beam should always be electrically grounded. Be sure that there is good electrical contact between Trolley Beam and Trackwheels. Avoid the use of paint or other coatings on the Beam Flange which might form an insulation.

## MOUNTING POSITIONS FOR COLLECTOR BAR AND BRACKET.



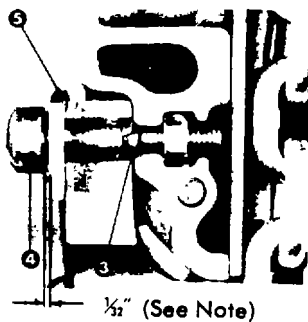
AM. STD. I-BEAM SIZE	LOW HEADROOM TROLLEY		MOTOR DRIVEN TROLLEY
	1 TON	2 TON	1/2 TO 2 TON
4	A	—	—
5	A	—	—
6	B	A	A
7	B	A	B
8	B	A	B
10	C	B	B
12	C	C	C
15 & OVER	C	C	C

**NOTE:** For wheel and shoe type collector mounting information, refer to page 54. (Back Cover)

FIGURE 9.

## Chain Container

1. Remove the loose end screw, lockwasher, plain washer and loose end link from the hoist, see Figure 2.  
These parts are not required for installation of the chain container.
2. Insert loose end of chain through chute and into bucket as shown in Figure 10.
3. Place lockwasher on shouldered screw.
4. With the shouldered screw through bracket and chute, insert screw in the loose end screw hole and firmly tighten the screw.  
NOTE: There must be approximately  $\frac{1}{2}$ " clearance between the bracket and head of the screw, as shown below, to allow the bracket to rotate on the screw. During normal hoist operation, the chain container swings freely back and forth. If the bracket is not free to rotate on the screw; the normal movement of the chain container may cause the screw to back-out.
5. The chain must be loose and hang straight down into bucket with a minimum of eight links showing below bottom of hoist when hook is at low position for Models A thru H and A-2 thru H-2, and ten links showing for Models J thru RR and J-2 thru RR-2. To obtain this setting may require adjustment of the lower limit switch, see page 17.
6. Set the uppermost point of hook travel just below bottom of chain bucket by adjusting the upper limit switch, see page 16.  
Under no condition should hook or load be permitted to come into contact with the chain container. If contact is permitted, the chain container function can be interfered with and its fasteners imperiled.



NOTE: The Chain Container furnished by CM is engineered and designed for use with a Lodestar hoist of specific size and lift. Hoist malfunction and damage to the unit can occur if other than properly engineered Chain Container is used.

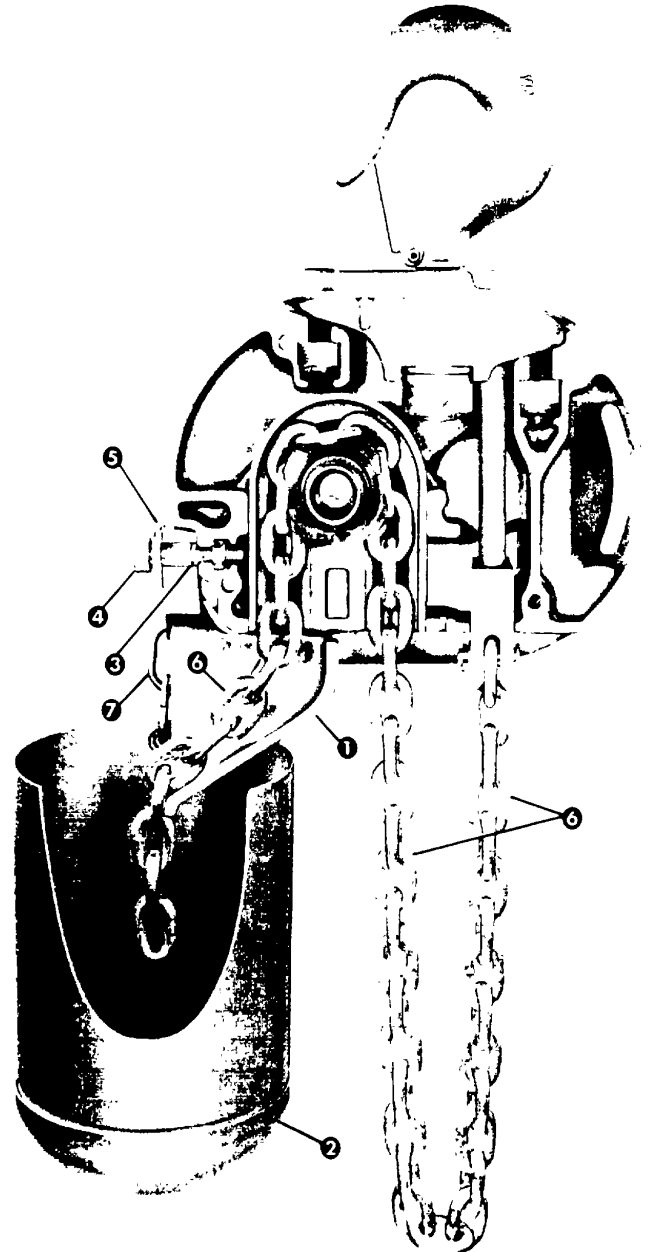


FIGURE 10. ATTACHING CHAIN CONTAINER.  
(Models E, H, E-2 and H-2 illustrated)  
(Models R, RR, R-2 and RR-2 similar)

- |                     |                         |
|---------------------|-------------------------|
| 1. Chute            | 5. Bracket              |
| 2. Bucket           | 6. Load Chain           |
| 3. Lockwasher       | 7. Bucket Support Links |
| 4. Shouldered Screw |                         |

(Do not order parts by these numbers. See parts list.)

## SECTION B - OPERATION

### General

1. The CM Lodestar Protector is designed to allow the intermediate gear to slip on an excessive overload. An overload is indicated when the hoist will not raise the load. Also, some clutching noise may be heard if the hoist is loaded beyond rated capacity. Should this occur, immediately release the up (i) control to stop the operation of the hoist. At this point, the load should be reduced to the rated hoist capacity or the hoist should be replaced with one of the proper capacity. When the excessive load is removed, normal hoist operation is automatically restored.

**CAUTION:** The CM Lodestar Protector is susceptible to overheating and wear when slipped for extended periods. Under no circumstance should the clutch be allowed to slip for more than a few seconds.

Due to the above, the Lodestar Hoist equipped with a Protector is not recommended for use in any application where there is a possibility of adding to an already suspended load to the point of overload.

This includes dumbwaiter ( \*) installation, containers that are loaded in mid-air, etc.

Also, if a Lodestar Hoist with a Protector is used at unusual extremes of ambient temperatures, above 150' F. or below 15' F., changes in lubricant properties may permit the hoist to raise larger loads than under normal operating conditions and presents possibility of damage or injury.

2. All hoists are equipped with an adjustable screw limit switch, which automatically stops the hook at any predetermined point when either hoisting or lowering.
3. The control station used on two speed hoist is similar to single speed unit, except that either of two definite speeds may be selected by the operator in both hoisting and lowering. Each control when partially depressed provides SLOW speed and when fully depressed gives FAST speed. Partial release of control returns hoist to slow speed, while complete release allows hoist to stop. Rated lifting speeds are shown on hoist identification plate. SLOW speed is intended as a means of carefully controlling or "spotting" the load, although the hoist may be operated solely at this speed if desired. It is not necessary to operate in the SLOW speed position as the hoist will pick up a capacity load at FAST speed from a standing start. In other words, it is not necessary to hesitate at the slow position when moving control from STOP and FAST position or vice versa.
4. If material being handled must be immersed in water, pickling baths, any liquid, dusty or loose solids, use a sling chain of ample length so that the hook is always above the surface. Bearings in the hook block are shielded only against ordinary atmospheric conditions.

Refer to limitations on inside cover sheet coning dumbwaiter applications.

### Operating Instructions

#### HOIST

1. Before picking up a load, check to see that the hoist is directly overhead.
2. WHEN APPLYING A LOAD, IT SHOULD BE DIRECTLY UNDER HOIST OR TROLLEY. AVOID OFF CENTER LOADING OF ANY KIND.
3. Take up a slack load chain carefully and start load easily to avoid shock and jerking of hoist load chain. If there is any evidence of overloading immediately lower the load and remove the excess load.
4. Do not allow the load to swing or twist while hoisting.

#### HOIST WITH LOW HEADROOM TROLLEY

This unit should be moved by pushing on the suspended load or by pulling the empty hook. However, the unit can also be moved by pulling on the control station since an internal steel cable extends the length of the control cord and is anchored to the hoist and to the control station.

#### HOIST WITH MOTOR DRIVEN TROLLEY

This unit should be moved by operating the controls marked \* (FORWARD) and \$ (REVERSE) in control station. Unless altered by the erector, depressing 4 (FORWARD) control will move the hoist toward motor housing end. Anticipate the stopping point and allow trolley to coast to a smooth stop. Reversing or "plugging" to stop trolley causes overheating of motor and swaying of load.

#### Safety Procedures

1. When preparing to lift a load, be sure that the attachments to the hook are firmly seated in hook saddle. Avoid off center loading of any kind, especially loading on the point of hook.
2. When lifting, raise the load only enough to clear the floor or support and check to be sure that the attachments to the hook and load are firmly seated. Continue lift only after you are assured the load is free of all obstructions.
3. Do not load hoist beyond the rated capacity shown on hoist identification plate or on the hoist motor housing cover, Models A thru H and A-2 thru H-2 and on hoist back frame cover, Models J thru RR and J-2 thru RR-2. Overload can cause immediate failure of some load carrying part or create a defect causing subsequent

failure at less than rated capacity. When in doubt, use the next larger capacity of CM Lodestar Hoist.

4. Do not use this or any other overhead materials handling equipment for lifting persons.
5. Stand clear of all loads and avoid moving a load over the heads of other personnel. Warn personnel of your intention to move a load in their area.
6. Do not leave the load suspended in the air unattended.
7. Permit only qualified personnel to operate unit.

8. Do not wrap the load chain around the load and hook onto itself as a choker chain. *Doing this will result in:*
  - a. The loss of the swivel effect of the hook which could mean twisted chain and a jammed lift wheel.
  - b. The upper limit switch is by-passed and the load could hit the hoist.
  - c. The chain could be damaged at the hook.
9. On two part reeved hoists, check for twists in the load chain. A twist can occur if the lower hook block has been capsized between the strands of chain. Reverse the capsize to remove twist.

## SECTION C- MAINTENANCE

### Inspection

To maintain continuous and satisfactory operation, a regular inspection procedure must be initiated so that worn or damaged parts can be replaced before they become unsafe. The intervals of inspection must be determined by the individual application based upon the type of service to which the hoist will be subjected and the nature of the critical components and the degree of their exposure to wear, deterioration or malfunction. The inspection of hoists is divided into two general classifications designated as "frequent" and "periodic".

The type of service to which the hoist is subjected can be classified as "Normal", "Heavy", and "Severe".

**Normal Service:** Normal service is defined as that service which involves operation with randomly distributed loads within the rated load limit, or uniform loads up to 65 percent of rated load, for not more than 25 percent of a single work shift.

**Heavy Service:** Heavy service is defined as that service within the "rated load limit which exceeds normal service.

**Severe Service:** Severe service is defined as that service which involves normal or heavy service with abnormal operating conditions.

Below is the recommended, maximum intervals of inspection. When the unit is subjected to extra heavy usage or dusty, gritty, moist or other adverse atmospheric conditions, shorter time intervals must be assigned. During the Periodic Inspection, inspection must be made of all parts for wear, corrosion effect, or damage, in addition to those specifically mentioned.

### Minimum Inspection Schedule

#### FREQUENT INSPECTIONS:

These inspections are usually visual examinations by the operator or other designated personnel and records of such inspections are not required. For Normal, Heavy and Severe Service, the frequent inspections are to be performed daily or monthly and shall include the following items:

- a) Brake for evidence of slippage daily.
- b) Limit switches for proper operation monthly (refer to page 5).
- c) Load chain for lubricant, wear, damaged links or foreign matter daily (refer to page 14)
- d) Hooks for damage, cracks, twists, excessive opening, latch engagement and latch operation monthly (refer to page d) Any deficiencies noted are to be corrected before the hoist is put into service.

#### PERIODIC INSPECTIONS:

These inspections are visual inspections of external conditions by an appointed person and records of periodic inspections are to be kept to provide the basis for continuing evaluation of the condition of the hoist. For Normal and Heavy Service, the periodic inspections are to be performed yearly with the hoist in place. For Severe Service, the periodic inspections are to be performed quarterly.

Periodic Inspections are to include those items listed under frequent inspections as well as the following:

- a) Inspect the loose end link, loose end screw and dead end block on double reeved units. Replace the loose end link if it has opened and check the operation of lower limit switch.
- b) Check that the loose end screw is tight and the pin seated at the dead end of chain.
- c) Inspect the upper suspension adapter making sure it is fully seated in the recess and that both cap screws are tight. If a condition of loose screws persists, replace the self-locking nuts in hoist frame.
- d) Inspect contactor and selector relay (two speed unit) for burnt or pitted contacts and loose or corroded terminals. Clean and tighten terminals. Replace when required.
- e) On single phase units (without a contactor) and two speed units, check operation of the control station switching arm that it pivots freely and does not stick in either position.

- f) Inspect electric brake friction linings and friction surfaces for wear, scoring or warpage. Check air gap between armature and field. If the gap exceeds 0.045 inch, adjust as described on page 16.
- g) Inspect the liftwheel pockets for wear as evidenced by a widening and deepening of the load end of pocket. That condition will cause the chain to lift up in pocket and result in binding between liftwheel and chain guides. Severely worn liftwheel should be replaced.
- h) Inspect the chain guides for wear or burring where chain enters hoist. Severely worn guides should be replaced.
- i) Inspect load chain, chain guides and liftwheel pockets for clogging with foreign matter which causes chain to bind. See hoist lubrication of chain guides, liftwheel, lower sheave wheel and load chain on page 16.
- j) Inspect trolley trackwheels for external wear on the tread and flange, and for wear on internal bearing surfaces as evidenced by a looseness on the stud.
- k) Inspect collector wheels or collector shoes and cotter pins for wear. Check the wheels and studs for corrosion and free turning. Badly worn parts should be replaced.
- l) Inspect the gasket between the gear housing and back frame for signs of leaks. Tighten the screws holding back frame to gear housing. If a leaking condition persists repack housing and gears with grease and install a new gasket.

Any deficiencies noted are to be corrected before the hoist is returned to service. Also, the external conditions may show the need for disassembly to permit a more detailed inspection which, in turn, may require the use of nondestructive type testing.

**TESTING:**

Prior to initial use, all altered or repaired hoists or used hoists that have not been operated for the previous 12 months shall be tested by the user for proper operation. Test the unit first in the unloaded state and then with a light load of 50 pounds times the number load supporting parts of load chain to be sure it operates properly and the brake holds the load when the control is released; then test with a \* load of 125% of rated capacity.

In addition, hoists in which load sustaining parts have been replaced shall be tested with \* 125% of rated capacity by or under the direction of an appointed person and a written report prepared for record purposes.

After this test, the function of the Protector is to be tested. If the Protector permits lifting a load in excess of 180% of rated load it should be replaced.

\* If the Protector prevents lifting of a load of 125% of rated capacity, reduce load to rated capacity.

NOTE : For additional information on inspection and testing, refer to Code B30.16 "Overhead Hoists", obtainable from American National Standards Institute, 1430 Broadway, New York, N. Y. 10018 U.S.A.

**HOOKS:**

Hooks damaged from chemicals, deformations or cracks, or that have more than a 10 degree twist from the plane of the unbent hook or excessive opening or seat wear must be replaced.

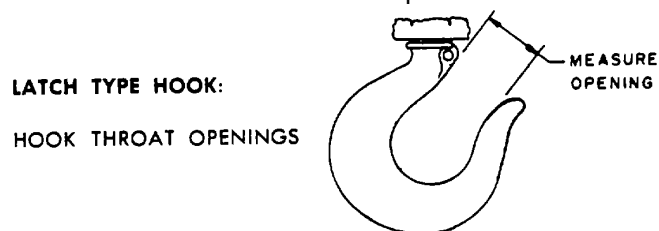
Also, on latch type hooks, hooks that are opened and allows the latch to disengage the tip, must be replaced.

Any hook that is twisted or has excessive throat opening indicates abuse or overloading of the unit.

Other load sustaining components of the hoist should be inspected for damage.

Check to assure latch is not damaged or bent.

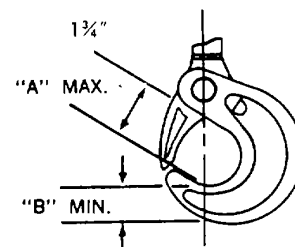
The charts below should be used to determine when the hook must be replaced. On latch type hooks, remove latch to measure opening. Be sure to replace latch after measurements are completed.



**LATCH TYPE HOOK:**

HOOK THROAT OPENINGS

MODELS	REPLACE HOOK WHEN OPENING IS GREATER THAN
A, A-2, AA, AA-2, B, B-2 C, C-2, F, F-2	1 3/8"
E, E-2, H, H-2, J, J-2 JJ, JJ-2, L, L-2, LL, LL-2	1 7/8"
R, R-2, RR, RR-2	1 3/4"



**LATCHLOK TYPE HOOK:**

HOOK THROAT OPENINGS AND SEAT WEAR

MODELS	REPLACE HOOK WHEN OPENING OR SEAT ARE:	
	"A" Max.	"B" Min.
A, A-2, AA, AA-2, B, B-2, C, C-2, E, E-2, F, F-2, H, H-2, J, J-2, JJ, JJ-2, L, L-2, LL, LL-2	1 3/4"	3/32"
R, R-2, RR, RR-2	1 5/8"	2 1/32"

FIGURE 11.

### Lodestar Protector

The Lodestar Protector should operate for the normal life of the hoist without service. The device has been lubricated and calibrated at the factory for a specific model of Lodestar hoist and is not adjustable or interchangeable with other models. For proper overload protection be sure before installing a protector that it is correct for the unit. The spring washer of the Protector has been color coded at the factory as follows:

Lodestar Models	Lodestar Protector Color Code
A, A-2	White
AA, AA-2	Light Blue
B, B-2, E, E-2	White
C, C-2	Orange
F, F-2, H, H-2	Orange
J, J-2	Red
JJ, JJ-2	White Green
L, L-2	Green
LL, LL-2	Yellow
R, R-2	Green
RR, RR-2	Yellow

**WARNING :** THE CM LODESTAR PROTECTOR IS NOT TO BE DISASSEMBLED. The spring washer of the Protector is under high compression and removing the snap ring holding the clutch assembly together could allow this washer to spring the parts out.

### Load Chain

#### CLEANING AND INSPECTION

First clean the load chain with a non-acid solvent then slack the chain and make a link-by-link inspection for nicks, gouges, twisted links, stretching and excessive wear, in particular, observe the bearing surface between links. If any of these conditions exist the load chain must be replaced. Chain should be gaged throughout its entire length and replaced if beyond serviceable limits.

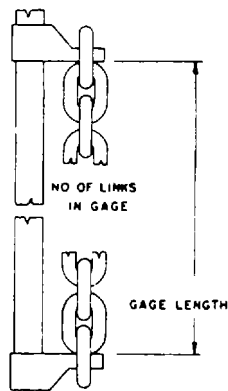


Figure 12.

### CAUTION

Before installing new load chain the unit must be disassembled to allow inspection for damage or wear, and replacement if required, of mating parts (liftwheel, chain guides, motor and gear housings).

There is no safe substitute for CM Alloy load chain because of size requirements and physical properties. These chains are specially heat treated and hardened and should always be returned to the factory for repair.

When installing new load chain or mating parts refer to lubrication instructions for chain guides, liftwheel, lower sheave wheel and load chain on page 16.

### GAGING LOAD CHAIN WEAR

To determine if load chain should be continued in service, check gage lengths as indicated in Figure 12. Chain worn beyond length indicated, nicked, gouged or twisted should be replaced before returning hoist to service. Chain should be clean, free of twists and pulled taut before measuring. In cases where the wear is localized and not beyond serviceable limits, it is sometimes possible to reverse the load chain, end for end, and allow a new section to take the wear. Removal and installation of the load chain is covered in subsequent paragraphs. To aid in gaging load chain for wear, a chain gage can be obtained from the factory.

### CUTTING CHAINS

CM Alloy load chain has a hard long-wearing surface and is difficult to cut. However, the following methods are recommended when cutting a length of new chain from stock or cutting off a length of worn chain.

1. Use a 7 inch minimum diameter by 1/8 inch thick abrasive wheel (of type recommended by wheel supplier) that will clear adjacent links.
2. Use a grinder and nick the link on both sides (Figure 13A), then secure the link in a vise and break off with a hammer (Figure 13B).
3. Use a bolt cutter (Figure 13C) similar to the H. K. Porter No. 4 with special cutter jaws for cutting carburized chain (1 inch long cutting edge).

### WARNING--LINK MAY FLY WHEN CUT.

An acetylene cutting torch can be used. The flame must clear adjacent links so as not to destroy the hardness properties.

Models	Dia. of Chain Stock (inches)	No. of Links to Gage	Max. Gage Length Allowable Used Chain (Inches)
A thru H A-2 thru H-2 J thru RR	.250	19	14 13/16
J-2 thru RR-2	.312	21	18 7/8



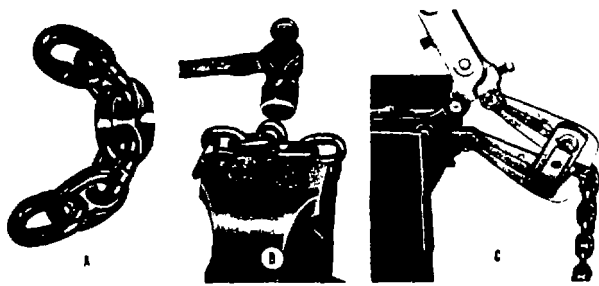


Figure 13.  
CUTTING LOAD CHAIN

### REMOVAL AND INSTALLATION OF LOAD CHAIN

Hoist load chain can be installed by any one of several methods. The first method is recommended when replacing severely worn load chain and requires disassembling the hoist. Method 2 does not require hoist disassembly, whereas Method 3 requires only partial disassembly.

NOTE: When installing load chain in Models E, H, R, RR, E-2, H-2, R-2 and RR-2 by either of the "starter chain" methods, two loose end connecting links S-743 must be used.

#### Method #1

- a) Disconnect hoist from power supply.
- b) Remove back frame cover and disengage the limit switch guide plate from the traveling nuts, see page 16.
- c) Detach loose end of load chain from hoist frame, see Figure 2. Also on single chain models, detach the lower hook block from the load chain.  
On double chain models E, H, R, RR, E-2, H-2, R-2 and RR-2, unfasten the dead end side of load chain.
- d) Continue to disassemble the hoist and inspect the liftwheel, chain guides, motor housing and gear housing which if worn or damaged could cause early failure of the new chain. Parts can be easily identified by referring to pages 29 and 31.
- e) If the liftwheel pockets, in particular the ends, are worn or scored excessively, replace liftwheel. If chain guides and housing are worn or cracked, these parts should also be replaced.
- f) Reassemble hoist with the new load chain inserted over the liftwheel. Position chain with the weld on upstanding links away from liftwheel and leave only one foot of chain hanging free on loose end side. Make sure the last chain link is an upstanding link and on double chain models that the new load chain has an even number of links. This will help prevent resulting twist in chain.

To simplify handling when reassembling the hoist, a short undamaged piece of the old chain may be used as a "starter chain". Position this piece of chain in exactly the same manner as explained above for the "new chain" and complete the reassembly of the hoist.

- g) Attach the loose end link to chain and connect it to the hoist frame with the loose end screw, washer and lockwasher, see Figure 2. **BE SURE THERE IS NO TWIST.**

If a starter chain is used, the loose end link (two links required for double chain models) can serve as a temporary coupling link to connect together the starter chain in the hoist and the new load chain to be installed. Then, under power, reeve the new load chain through the liftwheel area, replacing the starter chain in unit. Run enough chain through to attach loose end link to hoist frame.

CAUTION: For double chain models, be sure to disconnect one of the loose end links from load chain before attaching to hoist frame.

- h) For single chain models, attach the hook block to load chain and proceed to step m.  
For double chain models, run the hoist r (UP) until only 3 feet in chain remains on (lead end side). This will minimize the chance of introducing a twist between hook block and hoist.

Replace chain with CM "Star" load chain of the appropriate size, embossed with \* on side of barrels at intervals of approximately 19 inches.

- i) Allow the chain to hang free to remove twists.
- j) Using a wire as a starter, insert the chain, flat link first, into lower hook block (upstanding links will have weld toward sheave) and pull through.
- k) Insert last link into slot in dead end block making sure that no twist exists in the reeving at any point.
- l) Assemble dead end pin, washer and cotter pin as shown in Figure 2.
- m) Adjust limit switches as described on page 16 and 17. If the new load chain is longer than old, check to be sure limit switch will allow for new length of lift. In the event maximum adjustment does not allow entire length of lift, check with the factory for modification necessary.  
Do not allow hook block to hit hoist nor allow load chain to become taut between loose end screw and frame or else serious damage will result. If hook block should inadvertently hit the hoist the hoist frames, load chain and hook block should be inspected for damage before further use.

#### Method #2

Treat the old load chain in hoist as a "starter chain" and proceed with Steps la, b, c and f thru m above.

#### Method #3

- a) First proceed with Steps la, b, c above.
- b) Then, carefully run the load chain out of hoist.
- c) Disconnect hoist from power supply.
- d) Remove the electric brake assembly.
- e) Rotate the brake hub by hand, at the same time feeding the load chain into and through liftwheel area with hoist upside down or using a wire to pull the load chain up onto liftwheel.

Position the chain on liftwheel as explained in Step 1f.  
f) Refer to Steps 1g thru m above to complete the installation.

### **Hoist Lubrication**

**IMPORTANT:** To assure extra long life and top performance, be sure to lubricate the various parts of the Lodestar Hoist using the lubricants specified below. If desired, these lubricants may be purchased from the factory.

#### **GEAR**

- The Lodestar-Protector should operate for the normal life of the hoist without service. The device has been lubricated and calibrated at the factory for a specific model of Lodestar hoist and is not adjustable or interchangeable with

**CAUTION :** The CM Lodestar Protector is to be used with "American Lubricants #6283" grease. Do not use any other grease or the protector will not operate properly and parts could be damaged.

The gears and Protector (S-327 and S-328) are packed at assembly with grease and should not need to be renewed unless the gears have been removed from the housing and degreased.

**WARNING :** Never degrease the Protector or attempt to disassemble this device. Degreasing the Protector may damage parts and using a device that has been degreased may cause erratic, inconsistent operation. If the Protector has been degreased, it must be replaced by a factory calibrated device.

If the gears are removed from the housing, wipe the excess grease off of the outside surfaces of the Protector with a soft cloth, and degrease the remaining gears and housings. Upon reassembly, add 7 oz. of the above grease to gears and housing. Also, coat the spline on the end of the drive shaft (S-311) with a Molydisulphide lubricant such as "Super Herculon".

For Models JJ, LL, RR and JJ-2, LL-2, RR-2, see page 28 for special gearing alignment instructions.

- The limit switch gears are of molded nylon and require no lubrication.
- Apply a light film of machine oil to the limit switch shaft threads (S-220 pages 29 and 31) at least once a year.

#### **BEARINGS**

- All bearings and bushings except the lower hook thrust bearing are pre-lubricated and require no lubrication. The lower hook thrust bearing should be lubricated at least once a month.

#### **CHAIN GUIDES, LIFTWHEEL AND LOWER SHEAVE WHEEL**

- When the hoist is disassembled for inspection and/or repair, the chain guides, lower sheave

wheel (on double chain units) and liftwheel must be lubricated with LPS #3 (LPS Research Lab.) prior to re-assembly. The lubricant must be applied in sufficient quantity to obtain natural runoff and full coverage of these parts.

#### **LOAD CHAIN**

- A small amount of lubricant will greatly increase the life of load chain. Therefore, the chain should not be allowed to run dry.
- Keep it clean and lubricate at regular intervals with LPS #3 (LPS Research Lab.) or equal lubricant. Under ordinary conditions, weekly lubrication and cleaning with a solvent is satisfactory but under hot and dirty conditions, it may be necessary to clean the chain at least once a day and lubricate it several times between cleanings.
- When lubricating the chain, the lubricant must be applied in sufficient quantity to obtain natural run-off and full coverage of the chain.

#### **Trolley Lubrication**

##### **LOW HEADROOM TROLLEY**

- CM Trackwheel bearings are pre-lubricated and required no lubrication.

##### **Adjustments**

##### **ELECTRIC BRAKE ASSEMBLY**

The correct air gap between armature and field when brake is not energized, is 0.025 inch and need not be adjusted until the gap reaches 0.041 inch.

To adjust the brake, proceed as follows:

1. Disconnect hoist from power supply.
2. Remove back frame cover, see Figure 4.
3. Before adjusting the gap; a) back off the stud nuts and examine friction linings and friction surfaces for excessive wear, scoring or warpage. b) Check shading coils to be sure they are in place and not broken. A missing or broken shading coil will cause the brake to be noisy when hoist is operated. Any of these symptoms indicate the need for replacement of parts.
4. Turn adjusting nuts clockwise gaging the air gap at both ends.
5. Replace cover, reconnect the power and check operation.

##### **LIMIT SWITCHES -ENCLOSED TYPE**

If limit switch operation has been checked as described on page 5 and is not operating correctly or is not automatically stopping the hook at a desired position, proceed as follows:

1. Disconnect hoist from power supply.
2. Remove back frame cover, see Figure 4.
3. The position of upper and lower limit switches are indicated on the fiber insulator.
4. Loosen the screws and lockwashers to permit guide plate to be moved out of engagement with the traveling nuts, refer to Figures and 15.

CAUTION: THE "A" DIMENSIONS SHOWN IN THE TABLE ARE THE MINIMUM ALLOWED FOR SAFE OPERATION AND SHOULD NOT BE REDUCED.

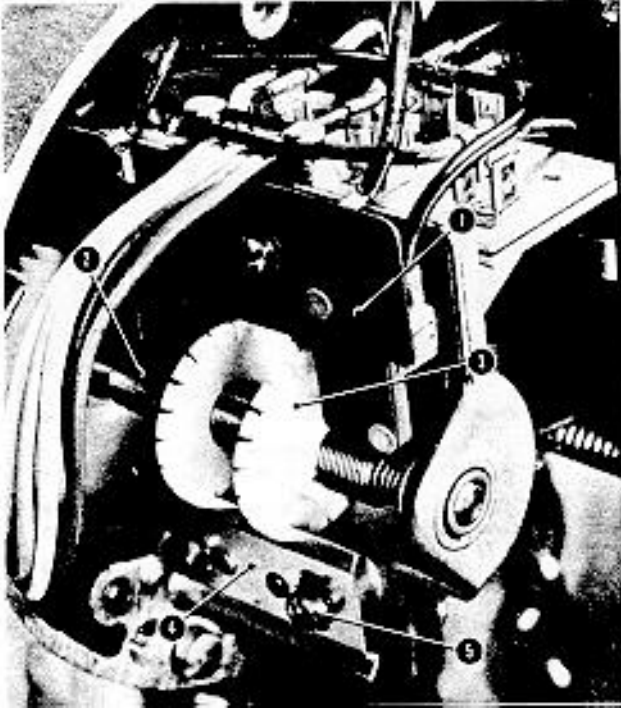


Figure 14.

ENCLOSED TYPE LIMIT SWITCHES, Models A thru H and A-2 thru H-2.

- |                           |                            |
|---------------------------|----------------------------|
| 1. Limit switch sub-assy. | 4. Guide plate             |
| 2. Limit switch shaft     | 5. Screws and lock washers |
| 3. Traveling nuts         |                            |

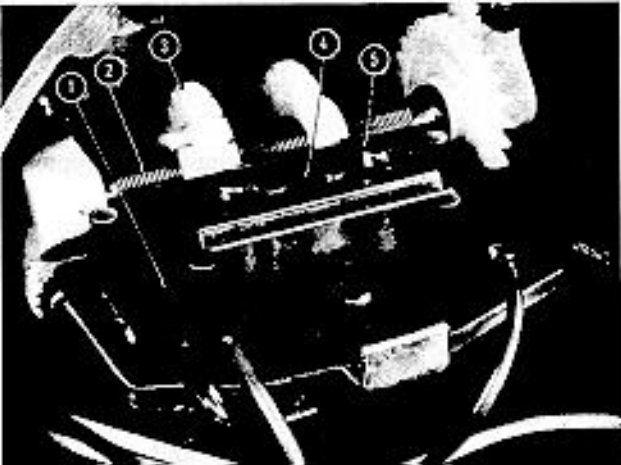


Figure 15.

ENCLOSED TYPE LIMIT SWITCHES, Models J thru RR and J-2 thru RR-2.

- |                           |                            |
|---------------------------|----------------------------|
| 1. Limit switch sub-assy. | 4. Guide plate             |
| 2. Limit switch shaft     | 5. Screws and lock washers |
| 3. Traveling nuts         |                            |

### SETTING UPPER LIMIT SWITCH

5. Refer to Table I The "A" dimensions given are the minimum distances that should be set between top of hook block and bottom of hoist. In other words, the highest allowable hook position.
6. Reconnect hoist to power supply.
7. Run hook to the desired upper position, cautiously operating the hoist without a load.
8. Disconnect hoist from power supply.
9. Moving one traveling nut toward the other increases hook travel and away from the other decreases the travel. Now, turn the nut nearest the switch indicated as the "UPPER LIMIT SWITCH" until it just breaks the limit switch contacts. An audible click will be heard as the switch opens. Continue to rotate the nut toward the switch an additional two full teeth on single limit switch gear reduction or one full tooth on double limit switch gear reduction, refer to Table I.
10. Reposition the guide plate in the next slot and securely tighten screws.
11. Reconnect hoist to power supply and check the stopping point of hook by first lowering the hook about 10 inches, then raise the hook by jogging cautiously until the upper limit switch stops upward motion. The stopping point of hook should be the desired upper position. If not, repeat the above instructions.
12. Double check setting by lowering the hook about 2 feet and then run the hook into the upper limit with i (UP) control held depressed.
13. Fine adjustment of the upper limit setting may be obtained by inverting the guide plate in Step 10. The offset on the plate gives adjustments equivalent to 1/2 notch, see Table I for the "Hook Travel Per Notch of Limit Switch Nut". When inverting the plate, it may be necessary to use the notch adjacent to the one used in the preliminary setting.

### SETTING LOWER LIMIT SWITCH

5. Refer to Table I The "B" dimensions given are the minimum number of load chain links that should be set between the loose end link and the hoist frame on the loose end side of the chain. In other words, the lowest allowable hook position.
- CAUTION: THE "B" DIMENSIONS SHOWN IN THE TABLE ARE THE MINIMUM ALLOWED FOR SAFE OPERATION AND SHOULD NOT BE REDUCED.
6. Reconnect hoist to power supply.
  7. Run the hook to the desired lower position, cautiously operating the hoist without a load.
  8. Disconnect hoist from power supply.

9. Moving one traveling nut toward the other increases hook travel and away from the other decreases the travel. Now, turn the nut nearest the switch indicated as the "LOWER LIMIT SWITCH" until it just breaks the limit switch contacts. An audible click will be heard as the switch opens. Continue to rotate the nut toward the switch an additional two full teeth on single limit switch gear reduction or one full tooth on double limit switch gear reduction, refer to Table I.
10. Reposition the guide plate in the next slot and securely tighten screws.
11. Reconnect hoist to power supply, and check the stopping point of hook by first raising the hook about 10 inches, then lower the hook by jogging cautiously until the lower limit switch stops the downward motion. The stopping point of hook should be the desired lower position. If not, repeat the above instructions.
12. Double check setting by raising the hook about 2 feet and then run the hook into the lower limit with the v (DOWN) control held depressed.
13. Fine adjustment of the lower limit setting may be obtained by inverting the guide plate in Step 10. The offset on the plate gives adjustments equivalent to 1/2 notch, see Table I for the "Hook Travel Per Notch of Limit Switch Nut". When inverting the plate, it may be necessary to use the notch adjacent to the one used in the preliminary setting.

**TABLE I**  
**ENCLOSED TYPE LIMIT SWITCHES**  
**Hook Travel Per Notch of Limit Switch Nut**

Model No.	Length of Max. Lift (Ft.)	Limit Switch Gear Reduction	Hook Travel Per Notch (In.)	A (Inches)			8
				1	3	6	
A, A-2	0 thru 44	Single	$\frac{9}{16}$	3	$1\frac{1}{2}$	6	
	Over 44 thru 90	Double	$2\frac{3}{16}$	$4\frac{1}{2}$	$2\frac{1}{2}$	6	
AA, AA-2	0 thru 83	Single	$1\frac{1}{4}$	6	2	6	
	Over 83 thru 90	Double	$3\frac{3}{16}$	8	$4\frac{1}{2}$	6	
B, B-2	0 thru 20	Single	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	6	
	Over 20 thru 65	Double	$1\frac{1}{4}$	2	2	6	
C, C-2	0 thru 44	Single	$\frac{9}{16}$	3	$1\frac{1}{2}$	6	
	Over 44 thru 90	Double	$2\frac{3}{16}$	$4\frac{1}{2}$	$2\frac{1}{2}$	6	
E, H, E-2, H-2	0 thru 10	Single	$1\frac{1}{4}$	$1\frac{3}{4}$	$1\frac{3}{4}$	6	
	Over 10 thru 30	Double	$1\frac{1}{2}$	3	$1\frac{3}{4}$	6	
F, F-2	0 thru 20	Single	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$	6	
	Over 20 thru 55	Double	$1\frac{1}{4}$	2	2	6	
J, J-2	0 thru 42	Double Worm	$1\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{2}$	8	
	Over 42 thru 80	Single Worm	$1\frac{1}{4}$	4	2	8	
JJ, JJ-2	0 thru 80	Double Worm	$1\frac{1}{2}$	—	$2\frac{1}{2}$	8	
	Over 80 thru 90	Single Worm	$2\frac{3}{16}$	—	3	8	
L, L-2	0 thru 42	Double Worm	$1\frac{1}{2}$	$2\frac{1}{2}$	$1\frac{1}{2}$	8	
	Over 42 thru 50	Single Worm	$1\frac{1}{4}$	4	2	8	
LL, LL-2	0 thru 80	Double Worm	$1\frac{1}{2}$	—	$1\frac{1}{2}$	8	
	Over 80 thru 90	Single Worm	$2\frac{3}{16}$	—	2	8	
R, R-2	0 thru 21	Double Worm	$1\frac{1}{4}$	$2\frac{1}{2}$	$2\frac{1}{2}$	8	
	Over 21 thru 40	Single Worm	$1\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	8	
RR, RR-2	0 thru 40	Double Worm	$1\frac{1}{4}$	—	$2\frac{1}{2}$	8	
	Over 40 thru 80	Single Worm	$1\frac{1}{2}$	—	$2\frac{1}{2}$	8	

### SECTION D - TROUBLE SHOOTING

#### All Hoists

TROUBLE	PROBABLE CAUSE	CHECK AND REMEDY
1. Hook does not respond to the control station.	<ol style="list-style-type: none"> <li>a) No voltage at hoist - main line or branch circuit switch open; branch line fuse blown or circuit breaker tripped.</li> <li>b) Phase failure (single phasing, three phase unit only) - open circuit, grounded or faulty connection in one line of supply system, hoist wiring, reversing contactor, motor leads or windings.</li> <li>c) Upper or lower limit switch has opened the motor circuit.</li> <li>d) Open control circuit--open or shorted winding in transformer, reversing contactor coil or speed selecting relay coil; loose connection or broken wire in circuit; mechanical binding in contactor or relay; control station contacts not closing or opening.</li> </ol>	<ol style="list-style-type: none"> <li>a) Close switch, replace fuse or reset breaker.</li> <li>b) Check for electrical continuity and repair or replace defective part.</li> <li>c) Press the "other" control and the hook should respond. Adjust limit switches as described on page 16.</li> <li>d) Check electrical continuity and repair or replace defective part.</li> </ol>

TROUBLE	PROBABLE CAUSE	CHECK AND REMEDY
	e) Wrong voltage or frequency  f) Low voltage  g) Brake not releasing--open or shorted coil winding; armature binding  h) Excessive load	e) Use the voltage and frequency indicated on hoist identification plate. For three phase dual voltage unit, make sure the connections at the conversion terminal board are for the proper voltage as described on page 4. f) Correct low voltage condition as described on page 5. g) Check electrical continuity and connections. Check that correct coil has been installed. The coil for three phase dual voltage unit operates at 230 volts when the hoist is connected for either 230 volt or 460 volt operation. Check brake adjustment as described on page 16. h) Reduce loading to the capacity limit of hoist as indicated on the identification plate.
2	Hook moves in the wrong direction  a) Wiring connections reversed at either the control station or terminal board (single phase unit only). b) Failure of the motor reversing switch to effect dynamic braking at time of reversal (single phase unit only). c) Phase reversal (three phase unit only)	a) Check connections with the wiring diagram. b) Check connections to switch. Replace a damaged switch or a faulty capacitor. c) Refer to installation instructions on page 5.
3	Hook lowers but will not raise  a) Excessive load b) Open hoisting circuit - open or shorted winding in reversing contactor coil or speed selecting relay coil; loose connection or broken wire in circuit; control station contacts not making; upper limit switch contacts open. c) Motor reversing switch not operating (single phase unit only)	a) See Item 1h. b) Check electrical continuity and repair or replace defective part. Check operation of limit switch as described on page 5. c) Check the switch connections and actuating finger and contacts for sticking or damage. Check centrifugal mechanism for loose or damaged components. Replace defective part.
4	Hook raises but will not lower  a) Open lowering circuit -open or shorted winding in reversing contactor coil or speed selecting relay coil; loose connection or broken wire in circuit; control station contacts not making; lower limit switch contacts open b) Motor reversing switch not operating (single phase unit only)	d) See Item 1b. a) Check electrical continuity and repair or replace defective part. Check operation of limit switch as described on page 5. b) See Item 3c.
5	Hook lowers when hoisting control is operated.  a) Phase failure (three phase unit only).	a) See Item 1b.

TROUBLE		PROBABLE CAUSE	CHECK AND REMEDY
6	Hook does not stop promptly	a) Brake slipping	a) Check brake adjustment as described on page 16.
7	Hoist operates sluggishly	b) Excessive load	b) See Item 1h.
		a) Excessive load	a) See Item 1h.
		b) Low voltage	b) Correct low voltage condition as described on page 5.
		c) Phase failure or unbalanced current in the phases (three phase unit only).	c) See Item 1b.
8	Motor overheats	d) Brake dragging	d) Check brake adjustment as described on page 16.
		a) Excessive load	a) See Item 1h.
		b) Low voltage	b) Correct low voltage condition as described on page 5.
		c) Extreme external heating	c) Above an ambient temperature of 104°F., the frequency of hoist operation must be limited to avoid overheating of motor. Special provisions should be made to ventilate the space or shield the hoist from radiation.
		d) Frequent starting or reversing	d) Avoid excessive inching, jogging or plugging. This type of operation drastically shortens the motor and contactor life and causes excessive brake wear.
		e) Phase failure or unbalanced current in the phases (three phase unit only).	e) See Item 1b.
		f) Brake dragging	f) Check brake adjustment as described on page 16.
9	Hook fails to stop at either or both ends of travel	g) Motor reversing switch not opening start winding circuit. (Single phase unit only).	g) See Item 3c.
		a) Limit switches not opening circuits	a) Check switch connections, electrical continuity and mechanical operation. Check the switch adjustment as described on page 16. Check for a pinched wire.
		b) Shaft not rotating	b) Check for damaged gears.
10	Hook stopping point varies	c) Traveling nuts not moving along shaft -guide plate loose;	c) Tighten guide plate screws. Replace damaged part. shaft or nut threads damaged.
		a) Limit switch not holding adjustment.	a) See Item 9.
		b) Brake not holding	b) Check the brake adjustment as described on page 16.
11	Hoist will not operate at slow speed in either direction	<b>Two Speed Hoists</b>	
		a) Open Circuit	a) Open or shorted motor winding, loose or broken wire in circuit, speed selector contactor stuck in opposite speed mode. Replace motor, repair wire and/or repair speed selecting contactor.
		b) Phase failure	b) See Item 1b.

	TROUBLE	PROBABLE CAUSE	CHECK AND REMEDY
12	Hoist will not operate at fast speed in either direction	a) Open circuit b) Open speed selecting control circuit	a) See Item 11a. b) Open or shorted winding in speed selecting contractor coil. Loose connection or broken wire in circuit. Mechanical binding in contactor. Control station contacts not making or opening. Replace coil; repair connection, contactor or control station.
13	Hook will not raise at slow speed	c) Phase failure a) Excessive load b) Phase failure c) Open speed selecting control circuit.	c) See Item 1b. a) See Item 6b. b) See Item 1b. c) See Item 12b.
14	Hook will not lower at slow speed	d) Brake not releasing a) Phase failure b) Open speed selecting control circuit.	d) See Item 1g. a) See Item 1b. b) See Item 12b.
15	Hook will not raise at fast speed	c) Brake not releasing a) Excessive load b) Phase failure	c) See Item 1g. a) See Item 6b. b) See Item 1b.
16	Hook will not lower at fast speed.	c) Brake not releasing a) Phase failure b) Brake not releasing	c) See Item 1g. a) See Item 6b. b) See Item 1g.
17	Hook moves in proper direction at one speed - wrong direction at other speed.	a) Phase reversal	a) Wiring reconnected improperly Interchange two leads of motor winding that is out of phase at the speed selecting relay.

### To Detect Open and Short Circuits In Electrical Components

Open circuits in the coils of electrical components may be detected by isolating the coil and checking for continuity with an ohmmeter or with the unit in series with a light or bell circuit.

Shorted turns are indicated by a current draw substantially above normal (connect ammeter in series with suspected element and impose normal voltage) or D. C. resistance substantially below normal. The current method is recommended for coils with very low D. C. resistance.

Motor current draw in the stator should be measured with the rotor in place and running. Brake, relay and contactor coil current should be measured with the core iron in operating position.

### Electrical Data

TRANSFORMER Voltage	Leads	D.C. Resistance (Ohms)
230/460 to 115	Secondary: Blue-Tan Stripe to Blue	21
	Primary: Red-Black Stripe or Black to Red-Blue Stripe	150
	White-Red Stripe to White-Green Stripe or Red	150
RELAY COIL Voltage	Normal Current (Amps.)	D.C. Resistance (Ohms)
120	0.09	200

HOIST Models	Contactor Coil Voltage	Normal Current (Amps.)	D. C. Resistance (Ohms)
J, L, R, J-2, I-2, R-2, JJ, LL, RR, JJ-2, LL-2, RR-2	120	0.23	81
A, AA, B, C, E, F, H, A-2, AA-2, C-2, E-2, F-2, H-2	115	0.12	132

Models	Rated Voltage	Nominal Current (Amps.) at Rated Voltage	D.C. Resistance (Ohms)
A, AA, B, C, E, F, H	115	0.5	6.2
A, AA, B, C, E, F, H	230*	0.25	24.7
A-2, AA-2, B-2, C-2, E-2, F-2, H-2	460	0.1	98.8
A, AA, B, C, E, F, H	115	1.25	1.2
J, L, R, JJ-2, LL-2, RR-2	230*	0.46	4.7
JJ, LL, RR, JJ-2, LL-2, RR-2	230*	4.6	2.4
J, L, R, JJ-2, LL-2, RR-2	460	0.25	18.8
JJ, LL, RR, JJ-2, LL-2, RR-2	460	4.2	8.5

\* On dual-voltage units connected for 460 volts brake coils operate on 230 volts.

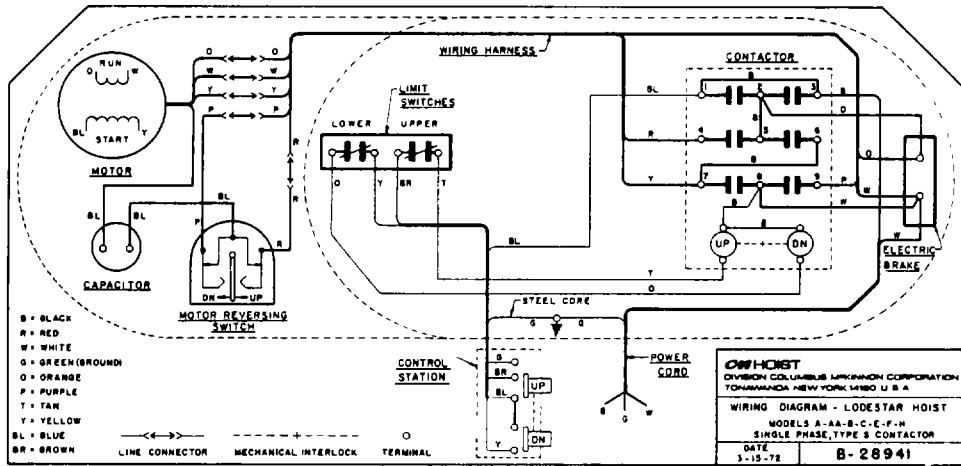
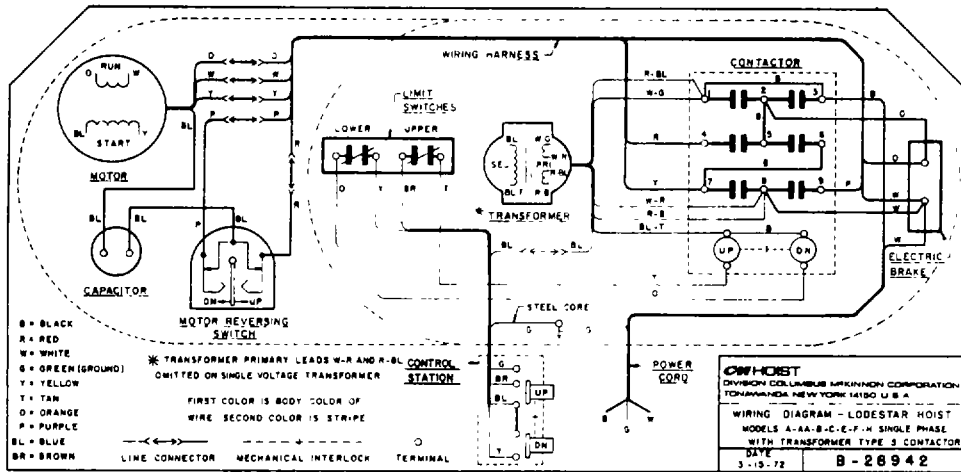
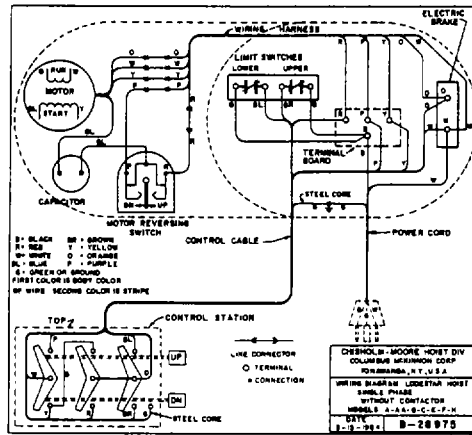
## MOTORS

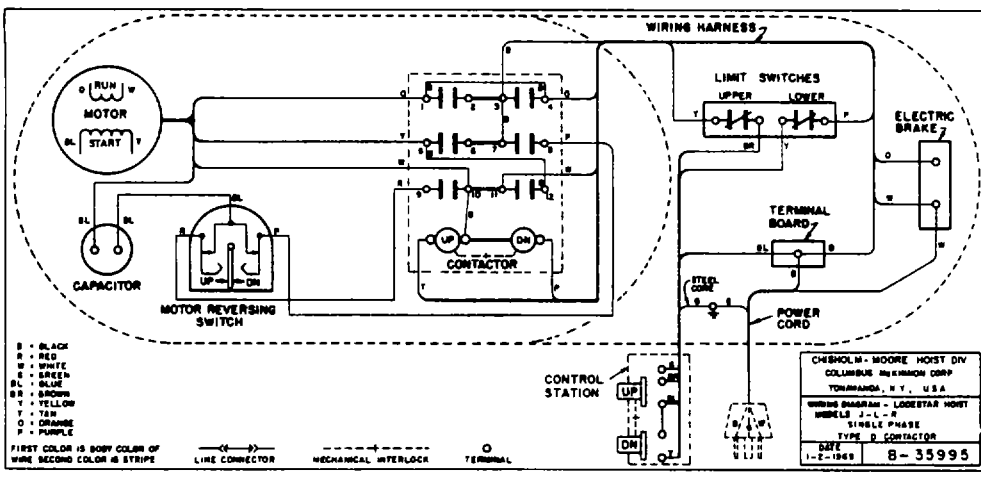
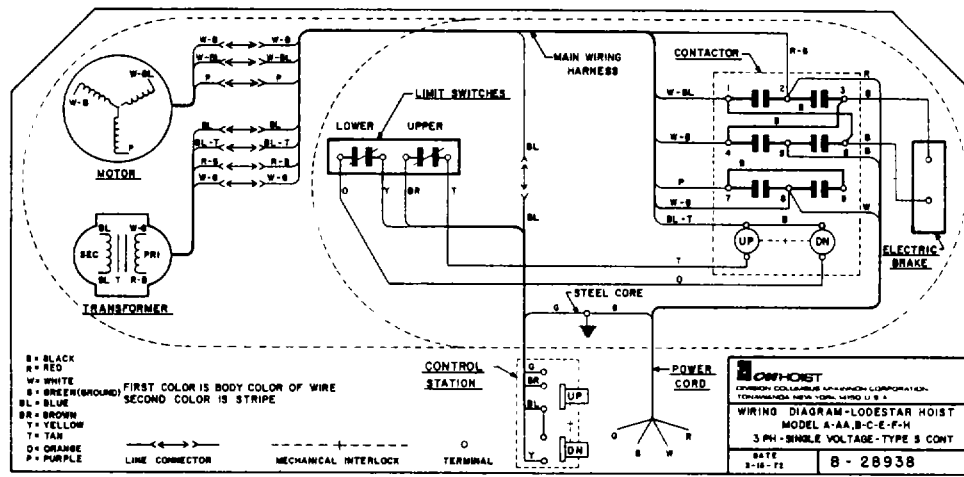
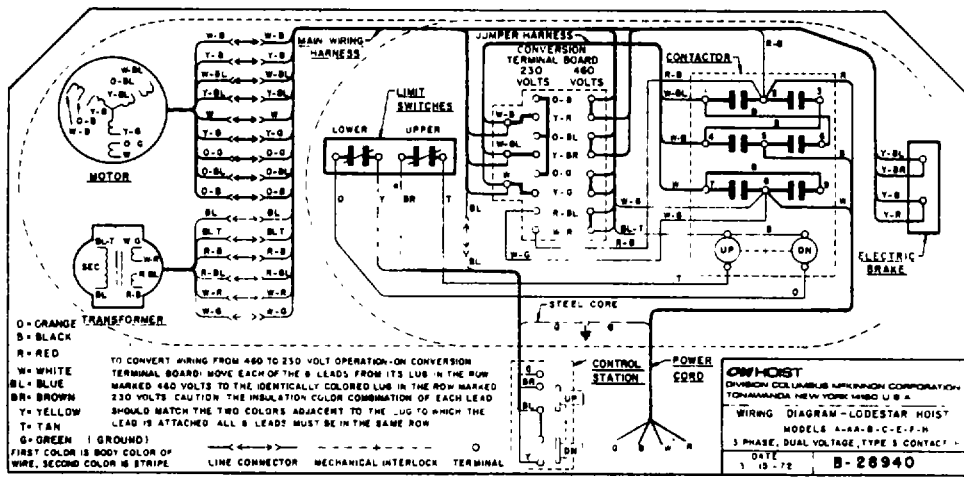
Models	Voltage Phase & Hertz	Full Load Current		Leads	*D.C. Resist. (Ohms)	Models	Voltage Phase & Hertz	Full Load Current		Leads	*D.C. Resist. (Ohms)
		M.P.	(Amps)					M.P.	(Amps)		
A, B, E	115-1-60	1/4	4.5	Blue to Yellow (Start Winding) White to Orange (Run Winding)	7.2 2.7	J, L, R	230-1-60	1	6.2	Blue to Yellow (Start Winding) White to Orange (Run Winding)	6.2 3.1
A, B, E	230-1-60	1/4	2.2	Blue to Yellow (Start Winding) White to Orange (Run Winding)	30.8 10.0	J, L, R	230/460 3-60	1	3/1.5	White-Black Stripe to Orange-Black Stripe White-Blue Stripe to Orange-Blue Stripe White to Orange- Green Stripe	6.8 6.8 6.8
A, B, E	230/460 3-60	1/4	1/1.5	White-Black Stripe to Orange-Black Stripe White-Blue Stripe to Orange-Blue Stripe White to Orange- Green Stripe Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to Yellow-Green Stripe Yellow-Blue Stripe to Yellow-Green Stripe Yellow-Black Stripe to Yellow-Blue Stripe	18 18 18 36 36 36 60 60 60 23 23 23	J-2, L-2, R-2	230-3-60	1/33	4.0/2.8	Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	14.0 14.0 14.0 14.0 18.5 18.5 18.5 7.5 7.5 7.5
A-2, B-2, E-2	230-3-60	25/08	1.9/1.1	White-Black Stripe to White White-Blue Stripe to White White-Black Stripe to White White-Blue Stripe to White	60 60 60 23 23 23	J-2, L-2, R-2	460-3-60	1/33	2.0/1.4	Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	75 75 75 29.5 29.5 29.5
AA-2, C-2, F-2, H-2	230-3-60	5/15	1.6/1.9	Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	40 40 40 18 18 18	JJ, LL & RR	230/460 3-60	2	5.8/2.9	White-Black Stripe to Orange-Black Stripe White-Blue Stripe to Orange-Blue Stripe White to Orange- Green Stripe Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to Yellow-Green Stripe Yellow-Blue Stripe to Yellow-Green Stripe	1.9 1.9 1.9 3.9 3.9 3.9
AA, C, F, H	115-1-60	1/2	7.2	Blue to Yellow (Start Winding) White to Orange (Run Winding)	4.3 1.3	AA, C, F, H	230-1-60	1/2	3.6	Blue to Yellow (Start Winding) White to Orange (Run Winding)	15.5 5.6
AA, C, F, H	230-1-60	1/2	3.6	Blue to Yellow (Start Winding) White to Orange (Run Winding)	12.5 12.5 12.5 25 25 25 25	AA, C, F, H	230/460 3-60	1/2	1.7/8.5	White-Black Stripe to Orange-Black Stripe White-Blue Stripe to Orange-Blue Stripe White to Orange- Green Stripe Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	12.5 12.5 12.5 25 25 25 25
AA, C, F, H	230/460 3-60	1/2	1.7/8.5	White-Black Stripe to Orange-Black Stripe White-Blue Stripe to Orange-Blue Stripe White to Orange- Green Stripe Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	12.5 12.5 12.5 25 25 25 25	JJ-2, LL-2 & RR-2	230-3-60	2/.67	7.2/4.2	Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	11.5 11.5 11.5 2.6 2.6 2.6
A-2, AA-2, B-2, C-2, E-2, F-2, H-2	460-3-60	.5/15	8/9	Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	140 140 140 140 72 72 72	JJ-2, LL-2 & RR-2	460-3-60	2/.67	3.6/2.1	Yellow-Black Stripe to Yellow-Blue Stripe Yellow-Black Stripe to White Yellow-Blue Stripe to White White-Black Stripe to White-Blue Stripe White-Black Stripe to White White-Blue Stripe to White	40.6 40.6 40.6 10.5 10.5 10.5
J, L, R	115-1-60	1	12.3	Blue to Yellow (Start Winding) White to Orange (Run Winding)	1.55 0.8	J, L, R	115-1-60	1	12.3	Blue to Yellow (Start Winding) White to Orange (Run Winding)	10.5 10.5

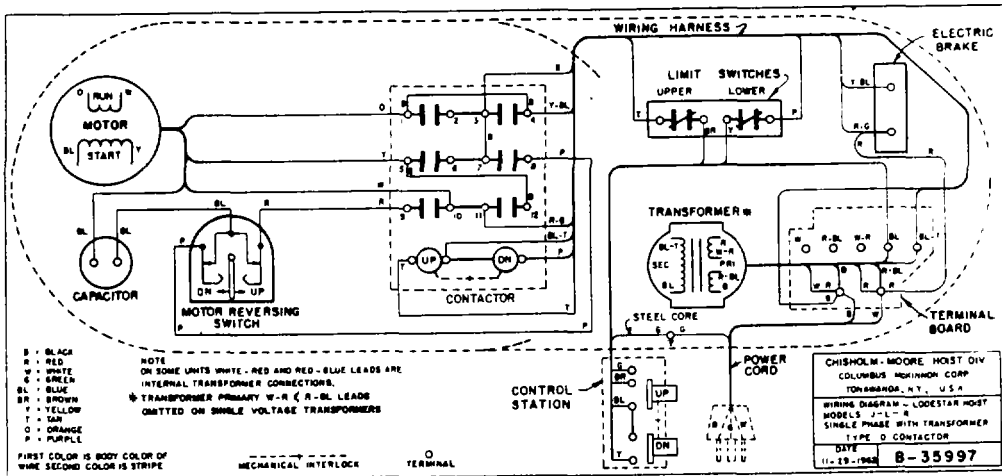
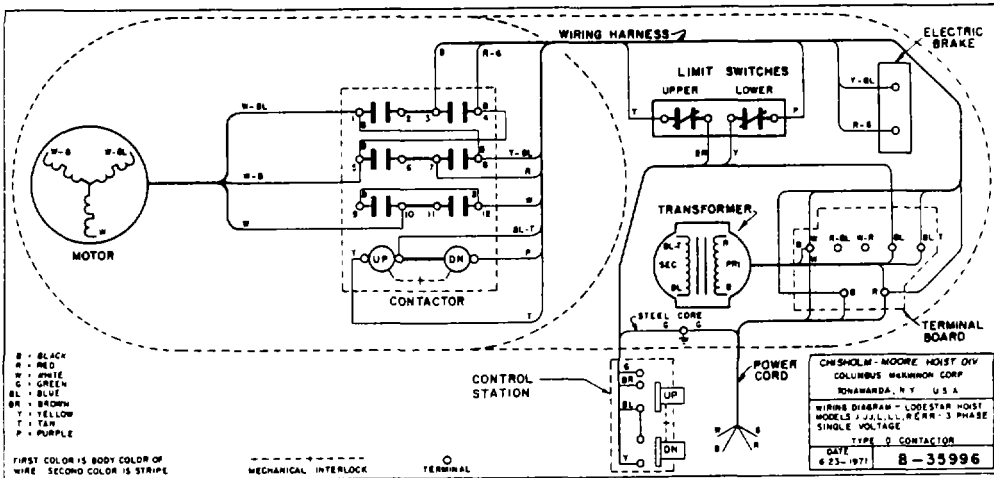
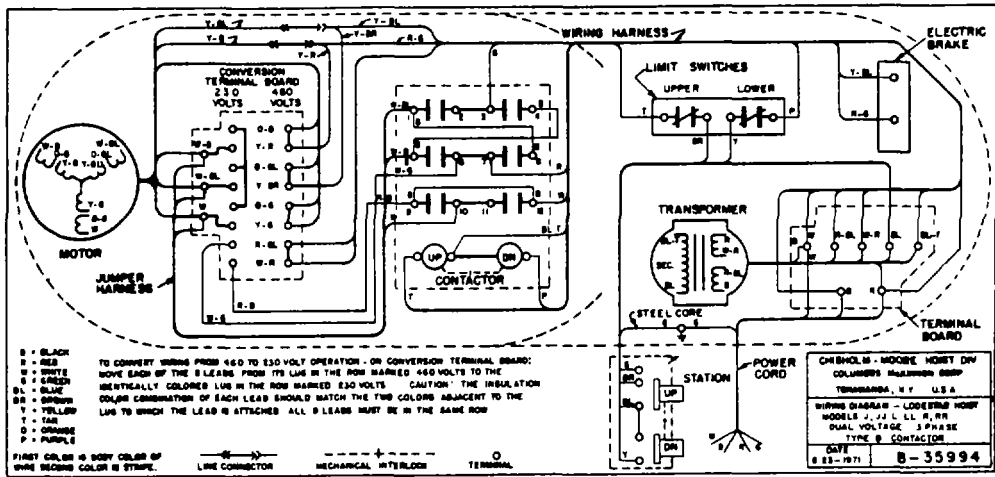
\* Resistance values listed are nominal and they may vary slightly from motor to motor.

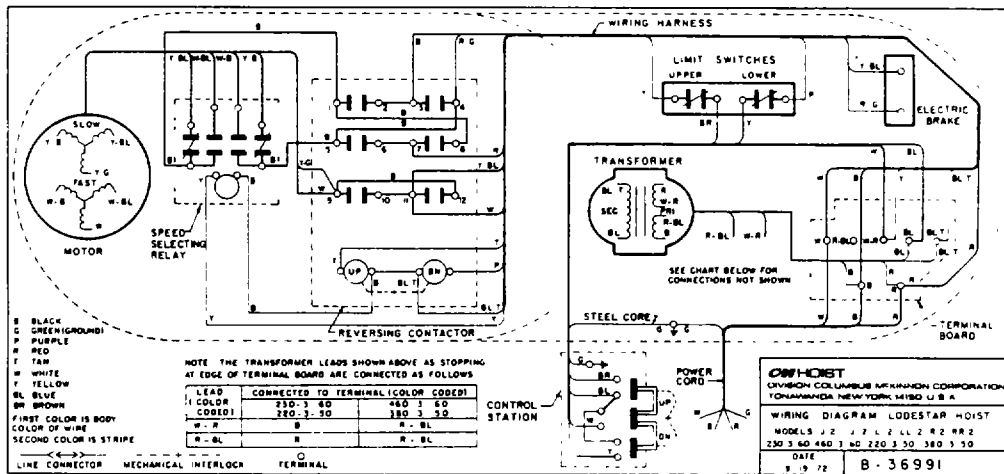
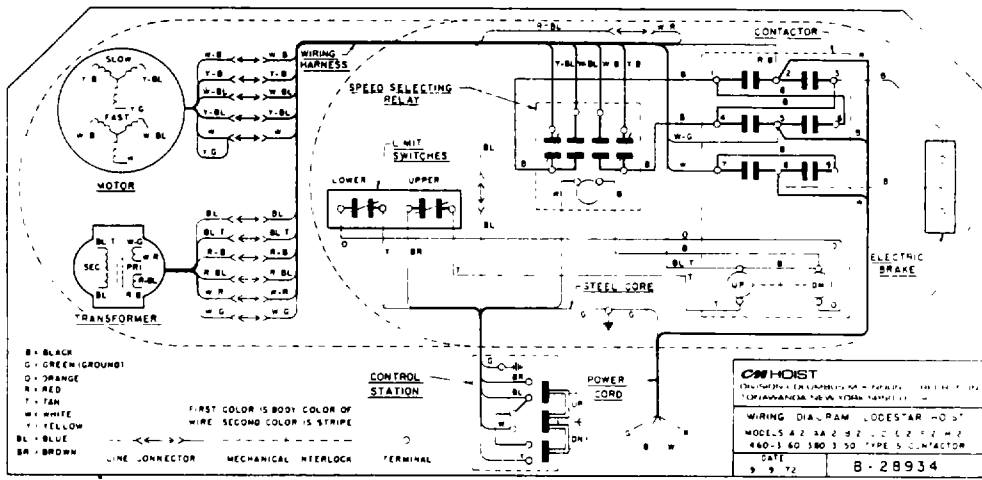
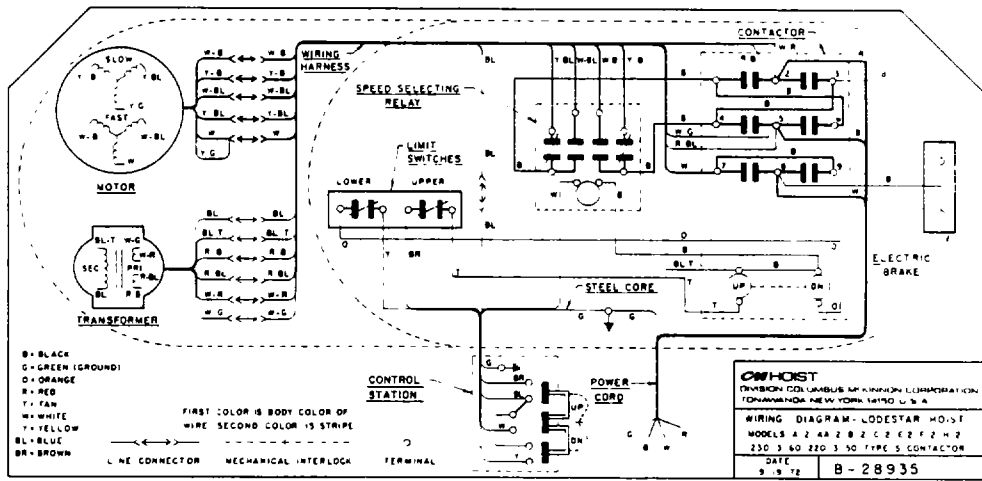


Wiring Diagrams shown are representative. Consult diagram in hoist or furnished with unit.









## SECTION E - REPLACEMENT PARTS LIST

### Ordering Instructions

The following information must accompany all correspondence or replacement parts orders:

1. Hoist model
2. Serial number of hoist
3. Voltage, phase, hertz

This information is marked on the hoist identification plate.

When ordering trolley parts, also specify the trolley capacity.

For parts orders specify:

1. Quantity desired
2. Key number of part
3. Part name

**NOTE:** When ordering replacement parts, it is suggested that the individual also consider the need (if he has not done so already) for such items as gaskets, fasteners, etc. These items may be damaged or lost during disassembly or may be just unfit for future service because of deterioration from age or service conditions.

The parts shown on pages 29-38 are for current hoists and trolleys. Additional parts which were used on older units are listed on pages 40-54.

### Assembly Instructions

**HOOK OR LUG SUSPENSION** - Models E, H, R, RR, E-2, H-2, R-2 and RR-2.

Assemble the dead end bolt and block through the suspension adapter as shown in Figure 16.

### CENTRIFUGAL MECHANISM

Centrifugal Mechanisms (S-430) are furnished in kit form which contains the centrifugal mechanism, spacers and an Instruction Sheet. The Instruction Sheet provides complete details on the installation of the replacement mechanism.

To install the replacement mechanism, a press-on tool (shown in Figure 17) will be required. The press-on tool is not included in the kit, however, it may be ordered from the Factory order Centrifugal Mechanism Press-On Tool Key No. S-438.

When installing the replacement mechanism, the spacer is placed between the rotor shaft shoulder and the centrifugal mechanism as shown in Figure 18. Using a slow-acting press, apply pressure to the press-on tool and press the mechanism onto the shaft until it sets against the spacer. To prevent damaging the mechanism and/or spacer, the force applied to the press-on tool to press the mechanism onto the shaft should not exceed 3000 pounds.

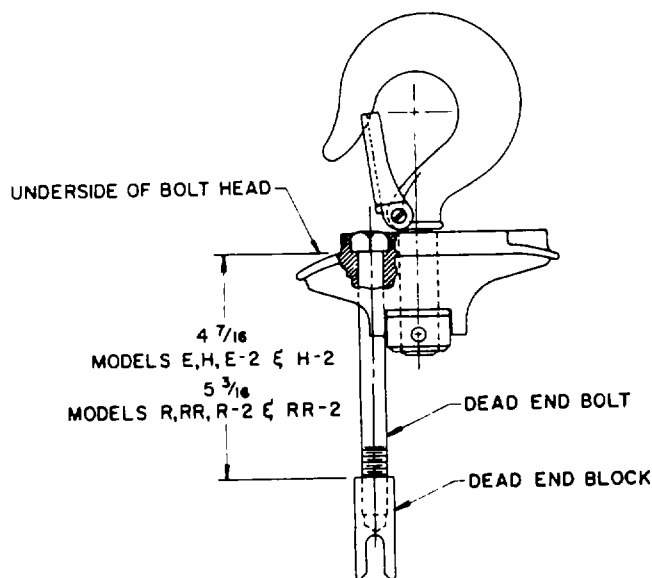


FIGURE 16.  
HOOK SUSPENSION.

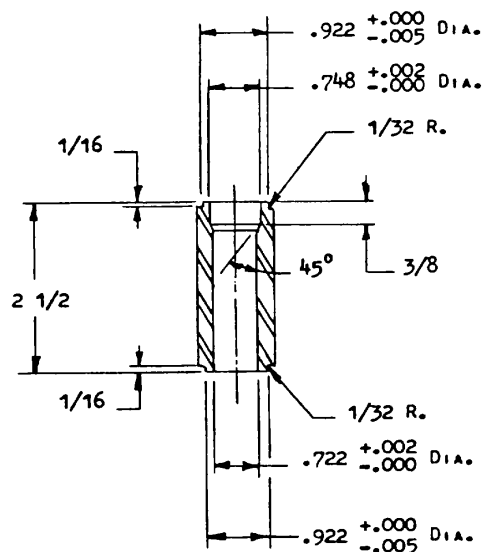


FIGURE 17.  
CENTRIFUGAL MECHANISM PRESS-ON TOOL. 27

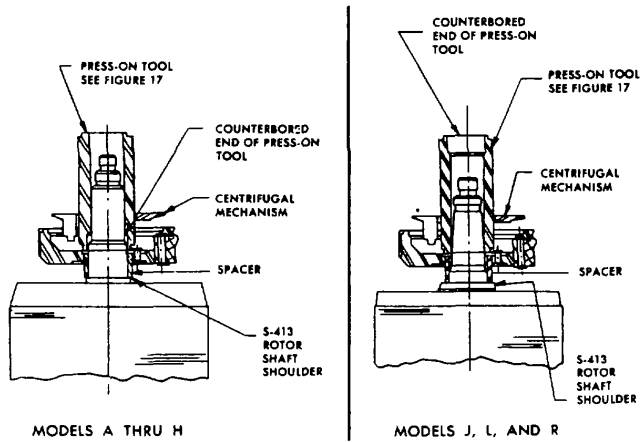


FIGURE 18. CENTRIFUGAL MECHANISM ASSEMBLY

### MOTOR REVERSWITCH

When replacing the switch on Models J, L and R, discard any plastic shims used with the old switch, Replacement switch includes an appropriate shim, when required. Be sure to reuse steel bearing retainer.

### WEATHERPROOF HOIST

Apply Permatex #2 (or equal) on all mating surfaces where gaskets are not used when reassembling.

Check to see that control station gasket and neoprene grommet are in good condition and in correct position when reassembling.

### GEARING

Models JJ, LL, RR, JJ-2, LL-2 and RR-2 have a special Liftwheel (S-302), Liftwheel Gear (S-303) and Intermediate Pinion (S-325). If the gear train in these hoists is disassembled, the following steps must be observed in order to properly orient the three parts when reassembling:

1. Assemble liftwheel gear to liftwheel. NOTE: These parts have their splines keyed in such a way that they will go together, only one way. See Figure 19.
2. To install the intermediate pinion, align the arrows that are stamped on the pinion and lift-wheel gear so they point toward each other.
3. Check operation of gear train by rotating the pinion four (4) complete revolutions; liftwheel gear will turn one (1) complete revolution and the arrows will again be aligned as shown. If the arrows do not align or there is binding between the gear teeth, repeat the above steps.
4. For gearing lubrication instructions, see page 16.

### FASTENERS

Models A thru H-2, tighten motor housing cover screws (S-108) to where they have a minimum breakaway torque of 48 inch pound and the brake attaching screws (S-253) have 50 inch pound minimum breakaway torque.

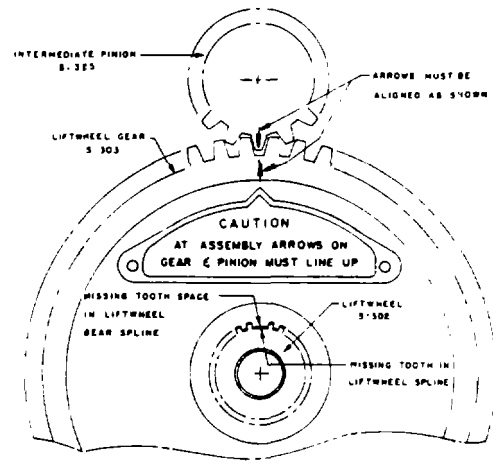


FIGURE 19.  
NON-CIRCULAR GEARING.

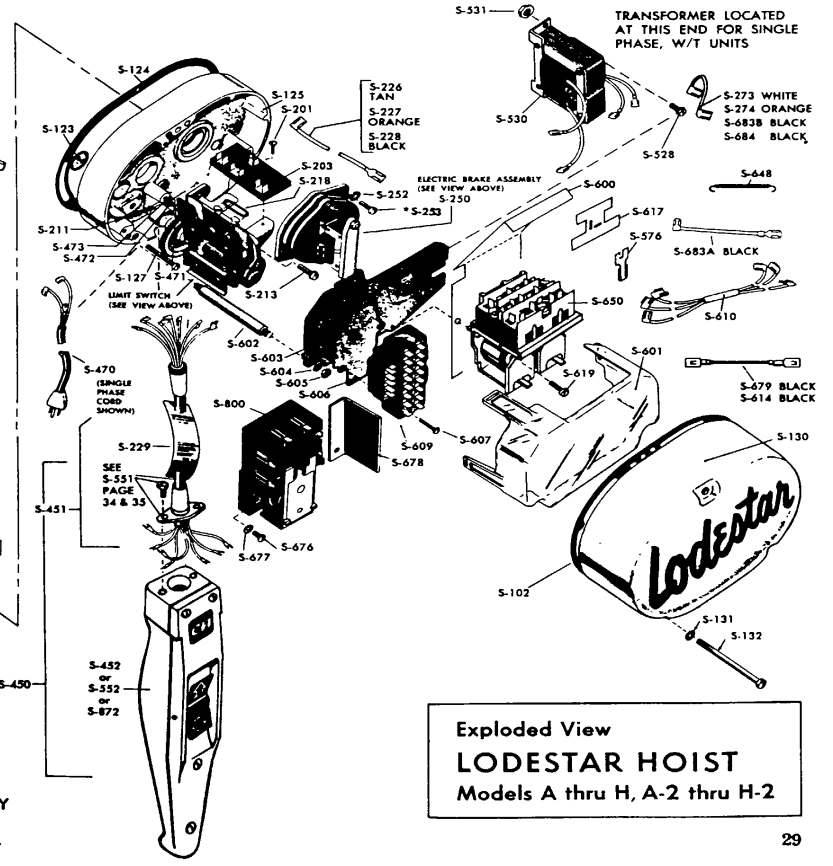
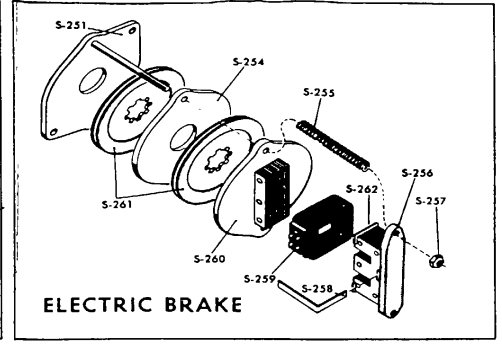
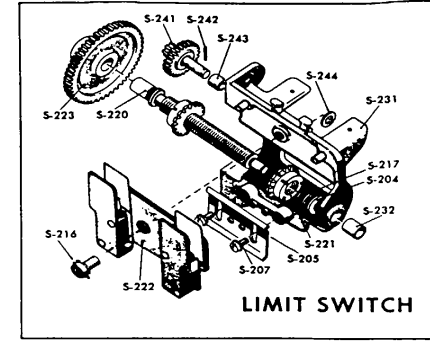
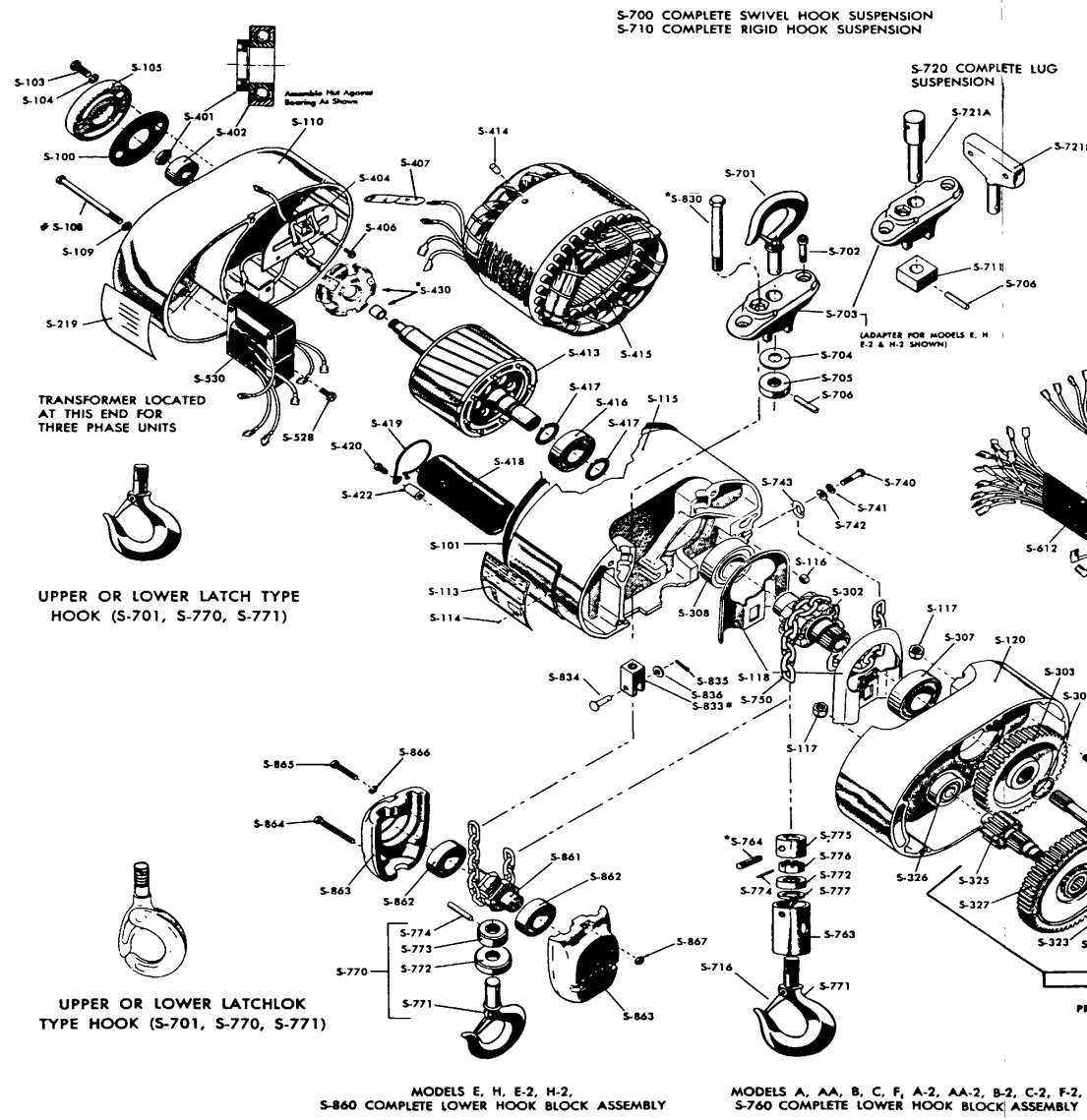
Models J thru RR-2 tighten limit switch bracket attaching screws (S-213), motor end bell attaching screws (S-411), brake attaching screws (S-253) and hexagonal brake stud (S-265) to where they have a minimum breakaway torque of 50 inch pound.

### LOWER HOOK BLOCK PIN

When removing or installing the lower hook block pin (S-764), care must be taken so as to prevent damaging the pin and/or hook block. These pins are tapered groove pins and as a result they can only be removed in one direction. To remove the pin, a V-Block, drift and hammer (or slow acting press) are required. The drift should be the same diameter as the pin (5/16" diameter for Models, A, A-2, AA, AA-2, B, B-2, C, C-2, F, and F-2: and 3/8" diameter for Models J, J-2, L and L-2) and it should be placed on the small end of the pin. The small end of the pin is the end opposite the end on which the 3 grooves are visible. Place the hook block in the V-Block and drive the pin out using the drift and a hammer or slow acting press.

To re-install the pin, the parts must be arranged the same as they were when the pin was removed. To do this, use the small end of the pin as a gage. First check the holes in the hook block body and determine which hole is the largest. Place the hook block body in the V-Block with the larger hole on top. Next, check each end of the hole in the lower hook chain block (S-775) and determine which end is the largest. Place the chain in the slot of the chain and insert the chain block, with the large hole on top, into the hook block body. Align the holes in the hook block body with the hole in the chain block and insert the small end of the pin in the hole. Push the pin in by hand until it stops and then use P hammer or slow acting press to drive the pin into position so that the end of the pin is flush with the outside surface of the hook block body.

CAUTION: These are special high strength pins . and under no circumstances should a pin of a different material be substituted.



\*REFER TO ASSEMBLY INSTRUCTIONS — PAGES 27 AND 28.

PARTS LIST

LODESTAR HOIST MODELS A THRU H, A-2 THRU H-2

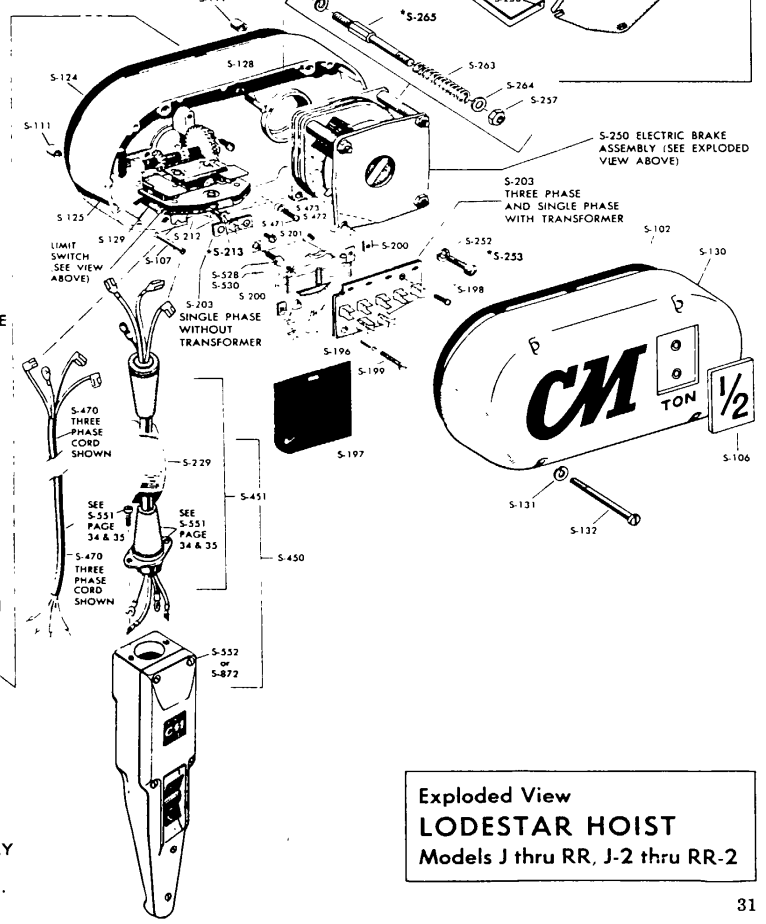
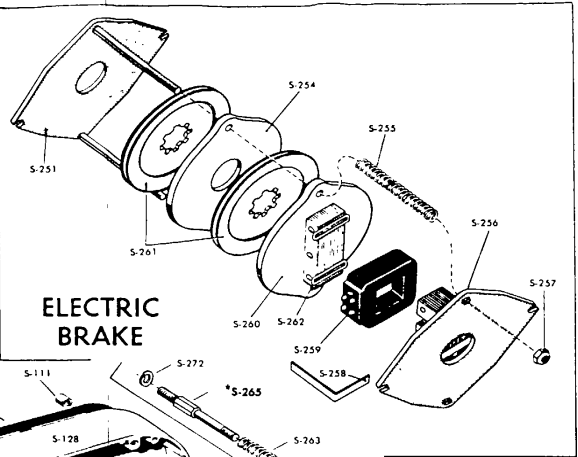
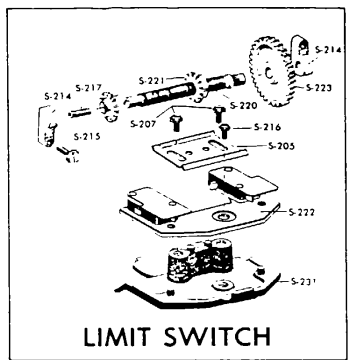
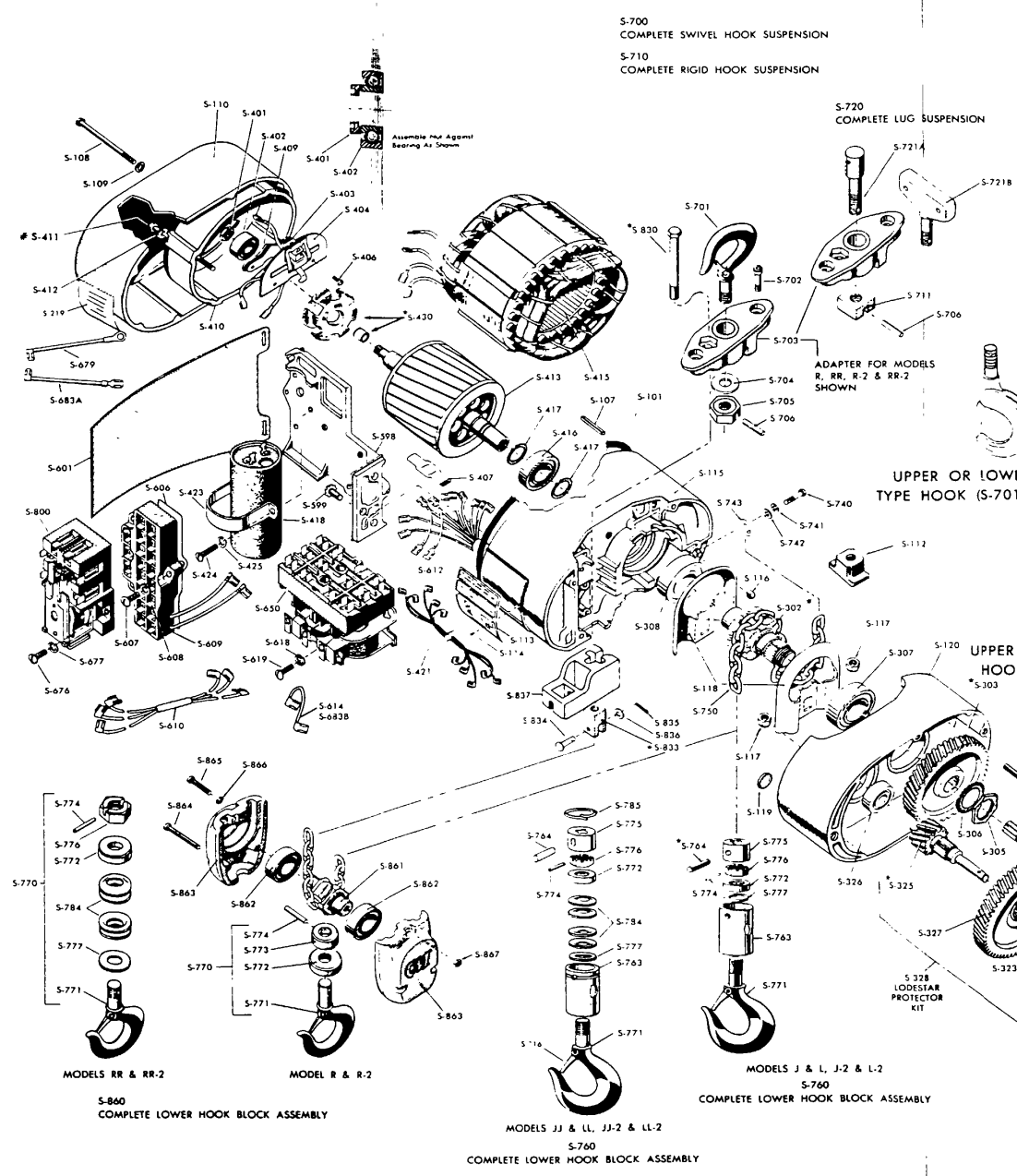
NOTE: NOT EVERY PART LISTED BELOW IS USED ON EVERY MODEL.

KEY NO.	PART NAME	NUMBER REQUIRED	KEY NO.	PART NAME	NUMBER REQUIRED	KEY NO.	PART NAME	NUMBER REQUIRED	KEY NO.	PART NAME	NUMBER REQUIRED
S-100*	Motor Bearing Cap Gasket	1	S-253	Brake Attaching Screw	2	S-528	Transformer Attaching Screw	2	S-711	Upper Hook or Suspension Lug Collar	1
S-101*	Motor Housing Cover Gasket	1	S-254	Brake Intermediate Pin	0 or 1	S-530	Transformer & Bracket Assembly	1		(For Swivel Hook or Lug Suspensions)	
S-102*	Back Frame Cover Gasket	1	S-255	Brake Spring (Color Coded Blue)	2	S-531	Transformer Attaching Screw Nut	2	S-716	Safety Latch Kit	—
S-103	Motor Bearing Cap Attaching Screw	2	S-256	Brake Field Sub-Assembly (S-262 Included)	1	S-552	Control Station, Single Phase with Contactor and Three Phase (see Page 35)	1	S-720	Lug Suspension	1
S-104	Motor Bearing Cap Attaching Screw Lockwasher	2	S-257	Brake Stud Nut	2	S-576	Terminal Adaptor	2		(Items S-702, S-703, S-706, S-711 & S-721A for Models A, AA, B, C, F, A-2, AA-2, B-2, C-2 & F-2)	
S-104*	Motor Bearing Cap Attaching Screw Washer	2	S-258	Brake Coil Retainer Strap	1	S-600	Wiring Shield	1		(Items S-702, S-703, S-706, S-711, S-721A, S-830 & S-833 thru S-836 for Models E, H, E-2 & H-2)	
S-105	Motor Bearing Cap	1	S-259	Brake Coil	1	S-601	Contactor Wiring Shield	1	S-721A	Suspension Lug (Specify Diameter of Lug)	1
S-108	Motor Housing Cover Screw	2	S-260	Brake Armature Sub-Assembly	1	S-602	Contactor Mounting Plate Stud	3	S-721B	Suspension Lug, Special (High Strength Bolts — Grade 6 or stronger — are required for attachment)	1
S-109	Motor Housing Cover Screw Lockwasher	2	S-261	Brake Friction Disc Sub-Assembly	1 or 2	S-603	Contactor Mounting Plate	1	S-740	Loose End Screw	1
S-109*	Motor Housing Cover Screw Washer	2	S-262	Brake Shading Coil	2	S-604	Contactor Mounting Plate Stud Lockwasher	3	S-741	Loose End Screw Lockwasher	1
S-110	Motor Housing Cover (includes S-219)	1	S-273	Brake Jumper — White	1	S-605	Contactor Mounting Plate Stud Nut	3	S-742	Loose End Screw Washer	1
S-113	Hoist Identification Plate	1	S-274	Brake Jumper — Orange	1	S-606	Conversion Terminal Board Insulator	1	S-743	Loose End Link	1
S-114	Hoist Identification Plate Drive Screw	2	S-302	Liftwheel	1	S-607	Conversion Terminal Board Mounting Screw & Lockwasher	3	S-750	Load Chain (Specify Length Required)	1
S-115	Motor Housing	1	S-303	Liftwheel Gear	1	S-609	Conversion Terminal Board	1	S-760	Lower Hook Block Assembly (Items S-764, S-770 & S-775)	1
S-116	Loose End Nut	1	S-304	Liftwheel Gear Snap Ring	1	S-610	Jumper Harness	1	S-763	Lower Hook Body	1
S-117	Suspension Adapter Nut	2	S-307	Liftwheel Bearing — Gear End	1	S-611	Wiring Harness Screw	1	S-764	Lower Hook Chain Block Pin (Special Alloy Pin)	1
S-118	Chain Guide	2	S-308	Liftwheel Bearing — Motor End	1	S-612	Wiring Harness	1	S-770	Lower Hook Sub-Assembly (Items S-771 thru S-774)	1
S-120	Gear Housing	1	S-310	Drive Shaft & Pinion Sub-Assembly (Items S-311 thru S-315)	1	S-614	Contactor Jumper — Black 2 3/4" Lg.	1	S-771	Lower Hook with Latch	1
S-122	Gear Housing Attaching Screw	4	S-311	Drive Shaft — Pinion	1	S-614	Contactor Jumper — Black 8 1/2" Lg.	1	S-771	Lower Hook with Latch	1
S-123	Back Frame Expansion Plug	1	S-312	Drive Shaft & Pinion Bearing	1	S-614	Contactor Jumper — Black 8 1/2" Lg.	1	S-772	Lower Hook Thrust Bearing	1
S-124	Gear Housing Gasket	1	S-313	Drive Shaft & Pinion Bearing Spacer	1	S-617	Terminal Insulator	1	S-773	Lower Hook Collar	1
S-125	Back Frame (S-123 & S-211 Included)	1	S-314	Brake Hub	1	S-619	Contactor Attaching Screw & Lockwasher	2	S-774	Lower Hook Nut Pin	1
S-127	Back Frame Attaching Screw	3	S-315	Brake Hub Snap Ring	1	S-648	Contactor Coil Jumper	1	S-774	Lower Hook Nut Pin	1
S-130	Back Frame Cover	1	S-321	Intermediate Gear & Pinion Bearing — Outboard	1	S-650	Reversing Contactor (Type SD) (Specify with or without Auxiliary Contacts)	1	S-775	Lower Hook Chain Block	1
S-131	Back Frame Cover Screw Lockwasher	3	S-322	Limit Switch Drive Pinion	1	S-676	Selector Relay Mounting Screw	2	S-776	Lower Hook Nut	1
S-131*	Back Frame Cover Screw Washer	3	S-323	Intermediate Gear Snap Ring	1	S-677	Selector Relay Mounting Screw Lockwasher	2	S-777	Lower Hook Block Washer	1
S-132	Back Frame Cover Screw	3	S-325	Intermediate Pinion (S-322 Included)	1	S-678	Relay — Contactor Shield	1	S-800	Selector Relay	1
S-201	Terminal Board Mounting Screw	2	S-326	Intermediate Gear & Pinion Bearing — Inboard	1	S-679	Aux. Contact Switch — Contactor Coil Jumper (Black)	2	S-830	Dead End Bolt (Special Alloy Bolt)	1
S-203	Terminal Board	1	S-327	Lodestar Protector	1	S-683A	Contactor — Relay Jumper (Specify Length)	2	S-833	Dead End Block	1
S-204	Limit Switch Shaft Washer	1	S-328	Lodestar Protector Kit (Items S-124, S-321, S-322, S-323, S-325 & S-327)	1	S-683B	Contactor — Relay Jumper (Specify Length)	1	S-834	Dead End Pin (Special Alloy Pin)	1
S-205	Limit Switch Guide Plate	1	S-401	Motor Shaft Bearing Retaining Nut	1	S-684	Contactor — Brake Coil Jumper	2	S-835	Dead End Pin Cotter Pin	1
S-207	Limit Switch Guide Plate Attaching Screw	2	S-402	Motor Shaft Bearing — Outboard	1	S-700	Swivel Hook Suspension (Items S-701 thru S-706 for Models A, AA, B, C, F, A-2, AA-2, B-2, C-2 & F-2)	1	S-836	Dead End Pin Washer	1
S-211	Limit Switch Shaft Gear Bushing	1	S-404	Motor Reversing Switch	1				S-861	Lower Sheave Wheel	1
S-213	Limit Switch Bracket Attaching Screw	2	S-406	Motor Reversing Switch Attaching Screw	2				S-862	Lower Sheave Wheel Bearing	2
S-216	Limit Switch Sub-Assembly Mounting Screw	1	S-407	Line Connector	1, 2, 5 or 6				S-863	Hook Block	2
S-217	Limit Switch Shaft Spring	1	S-413	Rotor & Shaft Sub-Assembly (S-416, S-417 & S-430 included) — Single Phase	1	S-701	Upper Hook with Latch	1	S-864	Hook Block Screw — 2" Lg.	2
S-218	Harness Hold Down	1				S-702	Suspension Adapter Screw (Special Alloy Screw)	2	S-865	Hook Block Screw — 1 1/2" Lg.	1
S-219	Warning Label	1				S-703	Suspension Adapter	1	S-866	Hook Block Screw Lockwasher	3
S-220	Limit Switch Shaft Sub-Assembly (Items S-221, S-223 & Shaft)	1	S-414	Stator Pin	1	S-704	Upper Hook Washer (For Swivel Hook Suspension)	1	S-867	Hook Block Screw Nut	3
S-221	Limit Switch Traveling Nut	2	S-415	Stator (S-414 included)	1	S-705	Upper Hook Collar (For Swivel Hook Suspension)	1	S-872	Control Station, Two Speed (see Page 34)	1
S-222	Limit Switch Sub-Assembly	1	S-416	Motor Shaft Bearing — Inboard	1						
S-223	Limit Switch Shaft Gear	1	S-417	Motor Shaft Inboard Bearing Snap Ring	2	S-710	Rigid Hook Suspension (Items S-701, S-702, S-703, S-706 & S-711 for Models A, AA, B, C, F, A-2, AA-2, B-2, C-2 & F-2)	1			
S-226	Upper Limit Switch Jumper — Tan	1	S-418	Capacitor (S-419 Included)	1						
S-227	Lower Limit Switch Jumper — Orange	1	S-419	Capacitor Mounting Spring	1						
S-228	Upper & Lower Limit Switch Jumper — Black	2	S-420	Capacitor Mounting Spring Screw	1						
S-229	Warning Tag	1	S-421	Wiring Harness	1						
S-231	Limit Switch Bracket Sub-Assembly (Items S-232 & Bracket)	1	S-422	Capacitor Mounting Spring Spacer	1						
S-232	Limit Switch Shaft Bushing (Items S-232, S-243 & Bracket)*	1	S-430	Centrifugal Mechanism Kit (see Page 27)	1						
S-241*	Limit Switch Intermediate Gear & Pinion	1	S-438†	Centrifugal Mechanism Press-On Tool	—						
S-242*	Limit Switch Intermediate Gear & Pinion Pin	1	S-450	Control Station & Cable Assembly (Items S-451 & S-452, Models A thru H)	1						
S-243*	Limit Switch Intermediate Gear & Pinion Bushing	1									
S-244*	Limit Switch Intermediate Gear & Pinion Washer	1	S-451	Control Cable — Complete (Specify Length Required)	1						
S-250	Electric Brake Assembly (Items S-251 & S-255 thru S-261 for Models A, B, E, A-2, B-2, E-2)	1	S-452	Control Station, Single Phase without Contactor (see Page 34)	1						
			S-470	Power Cord	1						
			S-471	Control Cable Attaching Screw	1						
			S-472	Control Cable Attaching Screw Lockwasher	1						
S-251	Brake Base Plate & Stud Sub-Assembly	1	S-473	Control Cable Attaching Screw Flat Washer	1						
S-252	Brake Attaching Screw Lockwasher	2	S-474†	Control Cable Alteration Kit	—						

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\* Used on Weatherproof Hoist only  
 † Used only on: Models A, C, A-2, C-2 over 44 foot lift; AA, AA-2 over 83 foot lift; B, F, B-2, F-2 over 20 foot lift; E, H, E-2, H-2 over 10 foot lift.  
 ‡ Not Shown  
 REFER TO PAGE 26 FOR ORDERING INSTRUCTIONS.





PARTS LIST  
LODESTAR HOIST MODELS J THRU RR & J-2 THRU RR-2  
NOTE: NOT EVERY PART LISTED BELOW IS USED ON EVERY MODEL.

KEY NO.	PART NAME	NUMBER REQUIRED	KEY NO.	PART NAME	NUMBER REQUIRED	KEY NO.	PART NAME	NUMBER REQUIRED	KEY NO.	PART NAME	NUMBER REQUIRED
S-101*	Motor Housing Cover Gasket	1	S-256	Brake Field Sub-Assembly	1	S-424	Capacitor Mounting Clip Screw	2	S-710	Rigid Hook Suspension	1
S-102*	Back Frame Cover Gasket	1	S-257	Brake Stud Nut	2	S-425	Capacitor Mounting Clip Screw Lockwasher	2		(Items S-701, S-702, S-703, S-706 & S-711 for Models J, JJ, L, LL, J-2, JJ-2, L-2, LL-2)	
S-106	Capacity Insert	1	S-257	Hex Brake Stud Nut	1	S-430	Centrifugal Mechanism Kit (see Page 27)	1		(Items S-701, S-702, S-703, S-706, S-711, S-830 & S-833 thru S-836 for Models R, RR, R-2 & RR-2)	
S-107	Motor Cover & Back Frame Cover Alignment Pin	8	S-258	Brake Coil Retainer Strap	1	S-438†	Centrifugal Mechanism Press-On Tool	—			
S-108	Motor Housing Cover Screw	4	S-259	Brake Coil	1	S-450	Control Station & Cord Assembly (Items S-451 & S-552 Models J thru RR)	1	S-711	Upper Hook or Suspension Lug Nut (For Rigid Hook or Lug Suspension)	1
S-109	Motor Housing Cover Screw Lockwasher	4	S-260	Brake Armature Sub-Assembly (S-262 Included)	1				S-716	Latch Kit	—
S-109*	Motor Housing Cover Screw Washer	4	S-261	Brake Friction Disc Sub-Assembly	2	S-451	Control Cord — Complete (Specify Length Required)	1	S-720	Lug Suspension (Items S-702, S-703, S-706, S-711 & S-721A for Models J, JJ, L, LL, J-2, JJ-2, L-2 & LL-2)	1
S-110	Motor Housing Cover (Includes S-219)	1	S-262	Brake Shading Coil	2	S-470	Power Cord	1		(Items S-702, S-703, S-706, S-711, S-721A, S-830 & S-833 thru S-836 for Models R, RR, R-2 & RR-2)	
S-111	Back Frame Dowel	2	S-263	Hex Brake Stud Spring	1	S-471	Control Cord Attaching Screw	1	S-721A	Suspension Lug	1
S-112	Suspension Adapter Anchor	2	S-264	Hex Brake Stud Spring Washer	1	S-472	Control Cord Attaching Screw Lockwasher	1	S-721B	Suspension Lug, Special (High Strength Bolts — Grade 6 or stronger — are required for attachment)	1
S-113	Hoist Identification Plate	1	S-265	Hex Brake Stud	1	S-473	Control Cord Attaching Screw Flat Washer	1			
S-114	Hoist Identification Plate Drive Screw	2	S-272	Hex Brake Stud Lockwasher	1	S-474†	Control Cord Alteration Kit	—	S-740	Loose End Screw	1
S-115	Motor Housing	1	S-302	Liftwheel	1	S-528	Transformer Attaching Screw	2	S-741	Loose End Screw Lockwasher	1
S-116	Loose End Nut	1	S-303	Liftwheel Gear	1	S-530	Transformer & Bracket Assembly	1	S-742	Loose End Screw Washer	1
S-117	Suspension Adapter Nut	2	S-305	Liftwheel Gear Nut	1	S-552	Control Station, Single Speed (see Page 35)	1	S-743	Loose End Link	1
S-118	Chain Guide	2	S-306	Liftwheel Gear Nut Lockwasher	1	S-577†	Transformer Mounting Hole Plug Screw	1	S-750	Load Chain (Specify Length Required)	1
S-119	Gear Housing Plug	1	S-307	Liftwheel Bearing — Gear End	1	S-578†	Transformer Mounting Hole Plug Screw Washer	1	S-760	Lower Hook Block Assembly (Items S-763, S-764, S-772, S-774, S-775, S-776 & S-777 for Models J, L, J-2 & L-2)	1
S-120	Gear Housing (S-119 Included)	1	S-308	Liftwheel Bearing — Motor End	1	S-598	Control Mounting Bracket	1	S-763	Lower Hook Body	1
S-122	Gear Housing Attaching Screw	4	S-310	Drive Shaft & Pinion Sub-Assembly (Items S-311, S-312, S-314 & S-315)	1	S-601	Contactor Wiring Shield	1	S-764	Lower Hook Chain Block Pin	1
S-124	Gear Housing Gasket	1				S-606	Conversion Terminal Board Insulator	1	S-770	Lower Hook Sub-Assembly (Items S-771 thru S-774 for Models R & R-2)	1
S-125	Back Frame	1	S-311	Drive Shaft & Pinion	1	S-607	Conversion Terminal Board Mounting Screw Lockwasher	3		(Items S-771, S-772, S-774, S-776, S-777 & S-784 for Models RR & RR-2)	
S-128	Back Frame Attaching Screw — 1 3/4" Lg.	2	S-312	Drive Shaft & Pinion Bearing	1	S-608	Conversion Terminal Board Mounting Screw Lockwasher	3	S-771	Lower Hook with Latch	1
S-129	Back Frame Attaching Screw — 2" Lg.	2	S-314	Brake Hub	1				S-772	Lower Hook Thrust Bearing	1
S-130	Back Frame Cover (S-106 Included)	1	S-315	Brake Hub Snap Ring	1	S-609	Conversion Terminal Board	1	S-773	Lower Hook Collar	1
S-131	Back Frame Cover Screw Lockwasher	4	S-321	Intermediate Gear & Pinion Bearing — Outboard	1	S-610	Converter Terminal Board	1	S-774	Lower Hook Nut Pin	1
S-131*	Back Frame Cover Screw Washer	4	S-323	Intermediate Gear Snap Ring	1	S-612	Jumper Harness	1	S-775	Lower Hook Pin (Special Alloy)	1
S-132	Back Frame Cover Screw	4	S-325	Intermediate Pinion	1	S-614	Wiring Harness	1	S-776	Lower Hook Chain Block	1
S-196	Terminal Board Spacer	1	S-326	Intermediate Gear & Pinion Bearing — Inboard	1	S-614	Contactor Jumper — Black, 2" Lg.	1	S-777	Lower Hook Nut	1
S-197	Terminal Board Wiring Shield	1	S-327	Lodestar Protector	1	S-614	Contactor Jumper — Black, 4 1/4" Lg.	2 or 3	S-777	Lower Hook Block Washer	1
S-198	Terminal Board Mounting Screw — 1/2" Lg.	1	S-328	Lodestar Protector Kit	1	S-614	Contactor Jumper — Black, 6" Lg.	1	S-784	Lower Hook Spring	4
S-199	Terminal Board Mounting Screw — 1 1/4" Lg.	1				S-618	Contactor Attaching Screw Lockwasher	3	S-785	Chain Block Pin Retaining Spring	1
S-200	Terminal Board Mounting Screw Nut	2				S-619	Contactor Attaching Screw	3	S-800	Selector Relay	1
S-201	Terminal Board Mounting Screw	2				S-650	Reversing Contactor (see Page 33)	1	S-830	Dead End Bolt	1
S-203	Terminal Board	1				S-676	Selector Relay Mounting Screw	2	S-833	Dead End Block	1
S-205	Limit Switch Guide Plate	1				S-677	Selector Relay Mounting Screw Lockwasher	2	S-834	Dead End Pin (Specify Length Req'd.)	1
S-207	Limit Switch Guide Plate Attaching Screw	2				S-679	Aux Contact Switch — Contactor Coil Jumper (Black)	2	S-835	Dead End Pin Cotter Pin	1
S-212	Limit Switch Bracket Attaching Screw Lockwasher	2				S-683A	Contactor — Relay Jumper (Specify Length)	1	S-836	Dead End Pin Washer	1
S-213	Limit Switch Bracket Attaching Screw	2				S-683B	Contactor — Relay Jumper (Specify Length)	2	S-837	Contact Block	1
S-214	Limit Switch Shaft Bearing	2				S-700	Swivel Hook Suspension (Items S-701 thru S-706 for Models J, JJ, L, LL, J-2, JJ-2, L-2 & LL-2)	1	S-860	Lower Hook Block Assembly (Items S-770 & S-861 thru S-867 for Models R, RR, R-2 & RR-2)	1
S-215	Limit Switch Shaft Bearing Attaching Screw	2	S-401	Motor Shaft Bearing Retaining Nut	1				S-861	Hook Block Sheave	1
S-216	Limit Switch Sub-Assembly Mounting Screw	1	S-402	Motor Shaft Bearing — Outboard	1				S-862	Hook Block Sheave Bearing	2
S-217	Limit Switch Shaft Spring	1							S-863	Hook Block	2
S-219	Warning Label	1							S-864	Hook Block Screw — 2" Lg.	2
S-220	Limit Switch Shaft Sub-Assembly (Items S-221, S-223 & Shaft)	1	S-403	Shim (For Motor Reverse Switch)	1				S-865	Hook Block Screw — 1 1/2" Lg.	1
S-221	Limit Switch Traveling Nut	2	S-404	Motor Reverse Switch (S-403 Included)	1	S-701	Upper Hook with Latch	1	S-866	Hook Block Screw Lockwasher	3
S-222	Limit Switch Sub-Assembly	1	S-406	Motor Reverse Switch and/or Bearing Retainer Attaching Screw	2	S-702	Suspension Adapter Screw (Special Alloy Screw)	2	S-867	Hook Block Screw Nut	3
S-223	Limit Switch Shaft Gear	1				S-703	Suspension Adapter	1	S-872	Control Station, Two Speed (see Page 34)	1
S-224	Limit Switch Worm	1	S-407	Line Connector	2						
S-225	Limit Switch Worm Attaching Pin	1	S-409	Bearing Retainer	1						
S-229	Warning Tag	1	S-410	Motor End Bell	1						
S-231	Limit Switch Bracket	1	S-411	Motor End Bell Attaching Screw	4						
S-250	Electric Brake Assembly (Items S-251 & S-254 thru S-261)	1	S-412	Motor End Bell Attaching Screw Lockwasher	4						
S-251	Brake Base Plate & Stud Sub-Assembly	1	S-413	Rotor & Shaft Sub-Assembly (S-416, S-417 & S-430 Included) — Single Phase (S-416 & S-417 Included) — Three Phase	1						
S-252	Brake Attaching Screw Lockwasher	1	S-415	Stator	1						
S-253	Brake Attaching Screw	1	S-416	Motor Shaft Bearing — Inboard	1						
S-254	Brake Intermediate Plate	1	S-417	Motor Shaft Inboard Bearing Snap Ring	2						
S-255	Brake Spring (Color Coded Yellow for Models J, J-2, L, L-2, R and R-2, Color Coded Green for Models JJ, JJ-2, LL, LL-2, RR and RR-2)	2	S-418	Capacitor	1						
			S-421	Wiring Harness	1						
			S-423	Capacitor Mounting Clip	1						

□ Specify if Latch or Latchlok Type Hook is required.

\* Used on Weatherproof Hoist Only

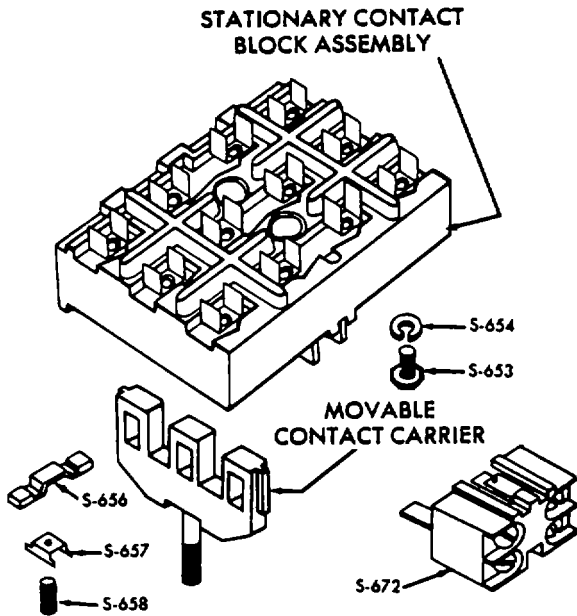
† Not Shown

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS.

**CONTACTOR**  
**MODELS A THRU H WITH CONTACTOR AND A-2 THRU H-2**  
**USES TYPE SD CONTACTOR. INDIVIDUAL COMPONENTS**  
**ARE NOT AVAILABLE FOR REPAIRS.**

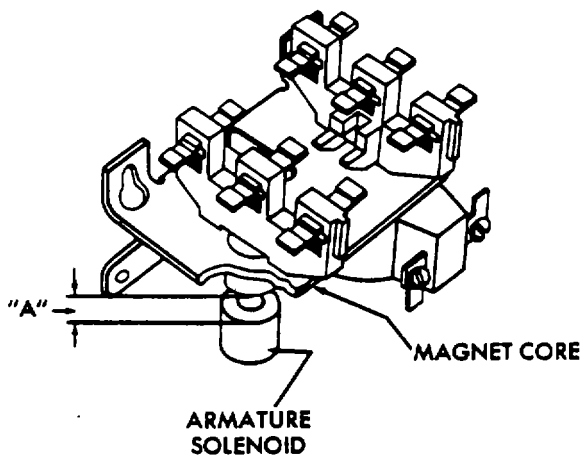
**MODELS J THRU RR AND J-2 THRU RR-2 USES TYPE D CONTACTOR.**  
**REPAIR PARTS LISTED BELOW.**

**Parts List**



Key No.	Part Name	Number Required
S-650	*Reversing Contactor (Complete)	1
S-672	Electrical Interlock Assembly (Specify N.O. Contacts or N.C. Contacts)	1
*S-673	Contact Kit (Items S-653, 654, 656 and 658)	1

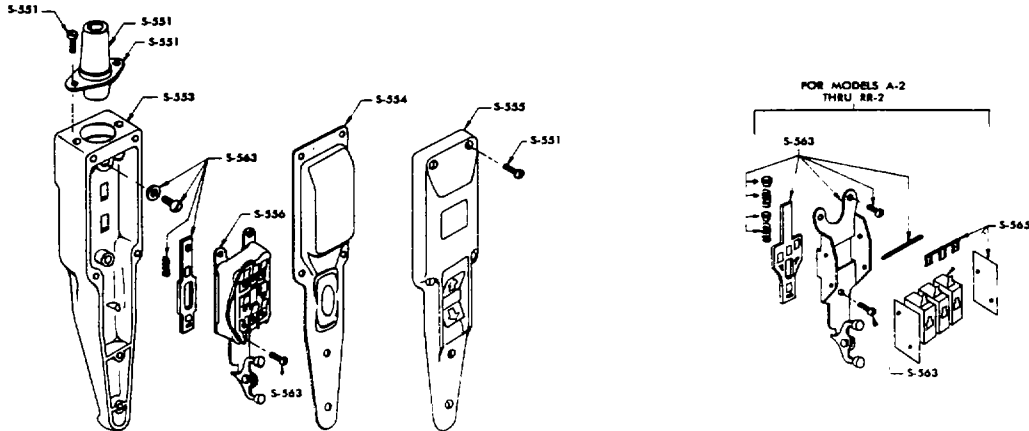
\*Other than S-672 and S-673, individual components are not available for the repair of this contactor.



**ADJUSTMENT:** If the Contactor is disassembled to remove the movable contact carrier, the armature solenoid may be adjusted by screwing the armature within "A" Dimension of the Magnet Core and Locking with slotted nut to 20 lb.-in. Torque. "A" Dimension depends upon the series stamped on the contractor nameplate. For series "C" contractors "A" = 15/64". For series "D" contractors "A" = 19/64".

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

**CONTROL STATION  
USED ON MODELS A THRU H, SINGLE PHASE WITHOUT CONTACTOR,  
AND MODELS A-2 THRU RR-2, ALL VOLTAGES**



**Parts List**

**FOR MODELS A THRU H, SINGLE PHASE WITHOUT CONTACTOR**

<b>Key No</b>	<b>Part Name</b>	<b>Number Required</b>
S-452	Control Station (Items S-551, S-553 thru S-556 & S-563)	1
S-551	Control Station Kit Consists of: 1 -- Neoprene Grommet 1 - Grommet Retainer Ring 2 - Grommet Retainer Ring Attaching Screw 6 - Cover Attaching Screw	1
S-553	Case	1
S-554	Gasket	1
S-555	Cover Assembly (Decal & Rocker included)	1
S-556	Switch Assembly	1
S-563	Control Station Parts Kit Consists of: 1 - Strain Cable Attaching Screw 1 - Strain Cable Attaching Screw Washer 1 - Link 3 - Switch Assembly Attaching Screw 1 - Link Return Spring	1

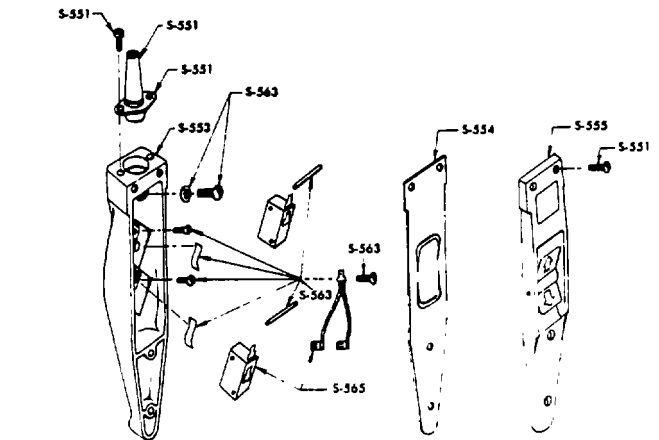
**FOR MODELS A-2 THRU RR-2**

<b>Key No</b>	<b>Part Name</b>	<b>Number Required</b>
S-551	Control Station Kit Consists of: 1 - Neoprene Grommet 1 - Grommet Retainer Ring 2 - Grommet Retainer Ring Attaching Screw 6 - Cover Attaching Screw	1
S-553	Case	1
S-554	Gasket	1
S-555	Cover Assembly (Decal & Rocker included)	1
S-563	Control Station Parts Kit Consists of: 1 - Spring 1 - Strain Cable Attaching Screw 1 - Strain Cable Attaching Screw Washer 2 - Switch Attaching Pin 1 - Sliding Cam 2 - Spring End Support 3 - Switch Mounting Plate & Rocker Assembly Attaching Screw 1 - Rocker Assembly 1 - Cam Return Spring	1
S-565	Control Station Switch Kit Consists of: 3 - Switch 2 - Insulator 1 - Jumper	1
S-872	Control Station (Items S-551, S-553 thru S-555, S-563 & S-565)	1

**CONTROL STATION**  
**USED ON MODELS A THRU H, THREE PHASE AND SINGLE PHASE WITH CONTACTOR,**  
**AND MODELS J THRU RR, ALL VOLTAGES**

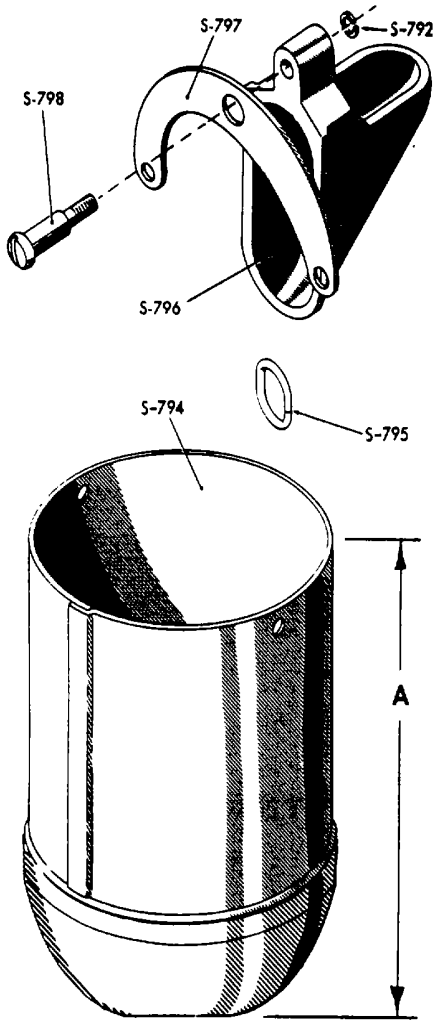
**Parts List**

Key No	Part Name	Number Required
S-551	Control Station Kit Consists of: 1 - Neoprene Grommet 1 - Grommet Retainer Ring 2 - Grommet Retainer Ring Attaching Screw 4 - Cover Attaching Screw	1
S-552	Control Station (Items S-551, S-553 thru S-555, S-563 & S-565)	1
S-553	Case	1
S-554	Gasket	1
S-555	Cover Assembly (Decal & Rocker included)	1
S-563	Control Station Parts Kit Consists of: 1 - Strain Cable Attaching Screw 1 - Strain Cable Attaching Screw Washer	1



	2 - Switch Mounting Pin	
	2 - Pin Retainer Screw	
	2 - Switch Leaf Spring	
	1 - Jumper Retainer Screw	
S-565	Control Station Switch Kit Consists of: 2 - Switch 1 -Jumper 1 - Terminal	1
S-566	Control Station Jumper Kit Consisting of: 1 -Jumper 1 -Terminal 1 - Screw	1

## CHAIN CONTAINER



### Parts List

Key No	Part Name	Number Required Per Installation
S-790	Chain Container Assembly (Items S-792 and S-794 thru S-798)	1
S-792	Chain Container Bracket Screw Lock washer	1
S-794	Chain Container Bucket	1
S-795	Chain Container Support Link	4
S-796	Chain Container Chute	1
S-797	Chain Container Bracket	1
S-798	Chain Container Bracket Screw (Special Alloy Screw) (S-792 included)	1

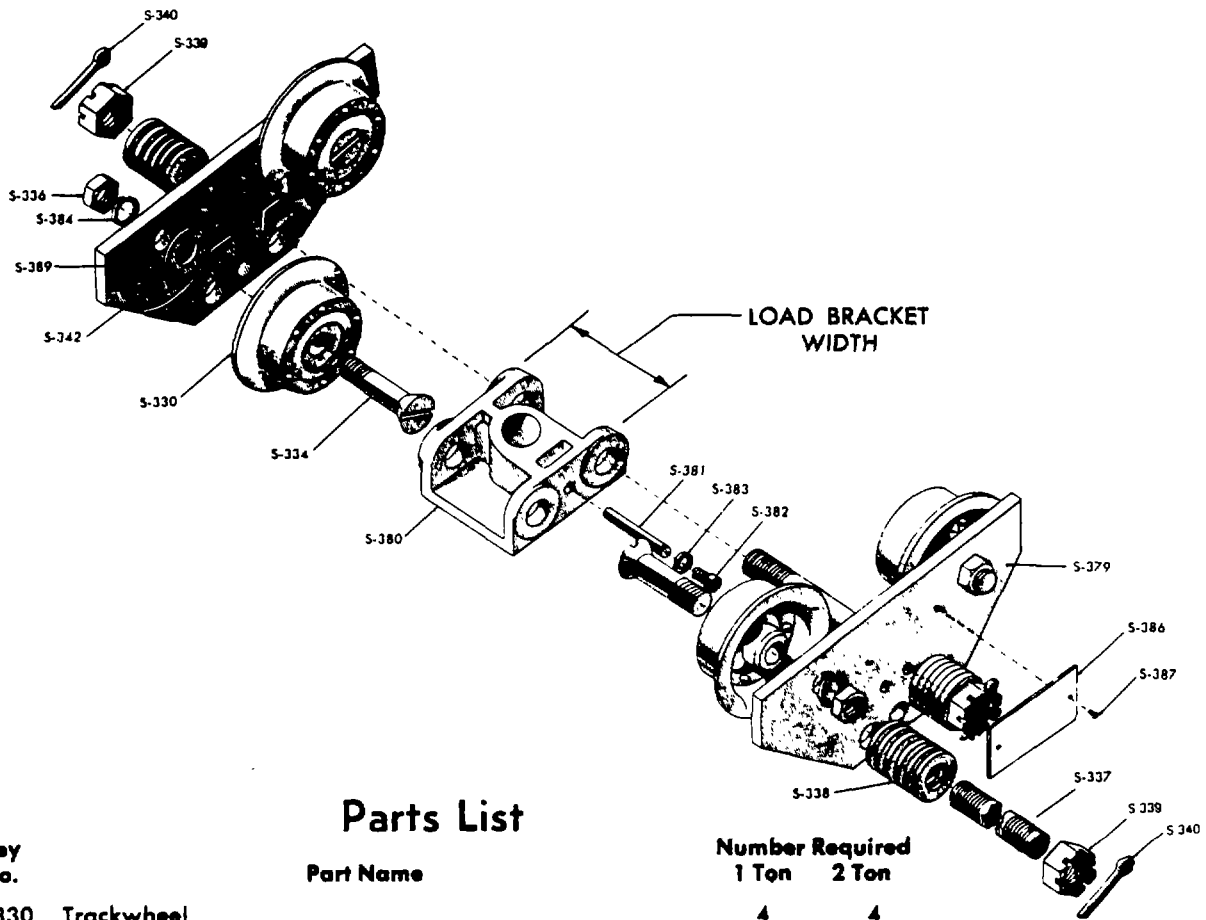
### CHAIN BUCKET LENGTH VS MODEL HOIST

Models	Lift (Ft. Incl.)	Min Length of Bucket ("A" Inches)
A, AA, B, C, F, A-2, AA-2, B-2, C-2, C-F	Up to 10	7 3/16
	Over 10 to 20	10 5/16
	Over 20 to 30	14 3/16
E, H, E-2, H-2	Up to 5	7 5/16
	Over 5 to 10	10 5/16
	Over 10 to 15	14 3/16
	Over 15 to 20	16 5/16
	Over 20 to 25	19 5/16
J, JJ, L, LL, J-2, JJ-2, L-2, LL-2	Up to 10	10 5/16
	Over 10 to 20	14 3/16
	Over 20 to 30	22 5/16
R, RR, R-2, RR-2	Up to 5	10 5/16
	Over 5 to 10	14 3/16
	Over 10 to 15	22 5/16
	Over 15 to 20	28 5/16
	Over 20 to 25	31 13/16
	Over 25 to 30	35 11/16

**NOTE:** The Chain Container furnished by CM is engineered and designed for use with a Lodestar hoist of specific size and lift. Hoist malfunction and damage to the unit can occur if other than properly engineered Chain Container is used.

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

# LOW HEADROOM LODESTAR TROLLEY



## Parts List

Key No.	Part Name	Number Required	
		1 Ton	2 Ton
S-330	Trackwheel	4	4
S-334	Trackwheel Stud	4	4
S-336	Trackwheel Stud Nut	4	4
S-337	Suspension Bolt (Special Alloy Bolt) (Specify Length of Bolt or Flange Width of I-Beam)	2	2
S-338	Trolley Spacer Washer	24	32
S-339	Suspension Bolt Nut	4	4
S-340	Suspension Bolt Nut Cotter Pin	4	4
S-342*	Side Frame S.A. (Plain Side)	1	1
S-379*	Side Frame S.A. (Name Plate Side)	1	1
S-380	Load Bracket (Specify Width of Bracket and Flange Width of I-Beam)	1	1
S-381	Vertical Load Bar Pin (Special Alloy Pin) (Specify Length of Pin and Flange Width of I-Beam)	1	1
S-382	Vertical Load Bar Pin Screw (Specify Length of Screw and Flange Width of I-Beam)	1	1
S-383	Vertical Load Bar Pin Screw Lockwasher	1	1
S-384	Trackwheel Stud Nut Lockwasher	4	4
S-386	Identification Plate	1	1
S-387	Identification Plate Drive Screw	2	2
S-389	Trackwheel Washer	—	4

\* Specify Flange Width of I-Beam and Whether or not Side Frame is Equipped with Spacer Block.

**REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS**

## ENCLOSED CONDUCTOR SYSTEM CURRENT COLLECTORS

Part No.	No. Reqd.	Part Name
70 E	3	Collector Assembly
601 BC	1	Clamp only
601 85	1	Swivel only
601 P	1	Post
601 E	1	Standard Arm
701 Y	1	Yoke
707	2	Case Half
70 S	1	Shoe
100 Z	1	Spring
COM 1	1	--16 Hex Nut
COM 2	1	S Lock washer
COM 3	1	- 16 x 1 1/2 Bolt
COM 5	1	1/4 - 24 Hex Nut
COM 6	1	1/4 Lock washer
COM 7	1	1, / _ 20 1/2 Bolt
COM 8	2	' / x 1 14 Roll Pin
COM 10	1	No. 6 Non-Insulated Terminal
COM 11	1	1/2 Retaining Ring

\* Two assemblies required for single phase installation  
 \*Three assemblies required for three phase installation

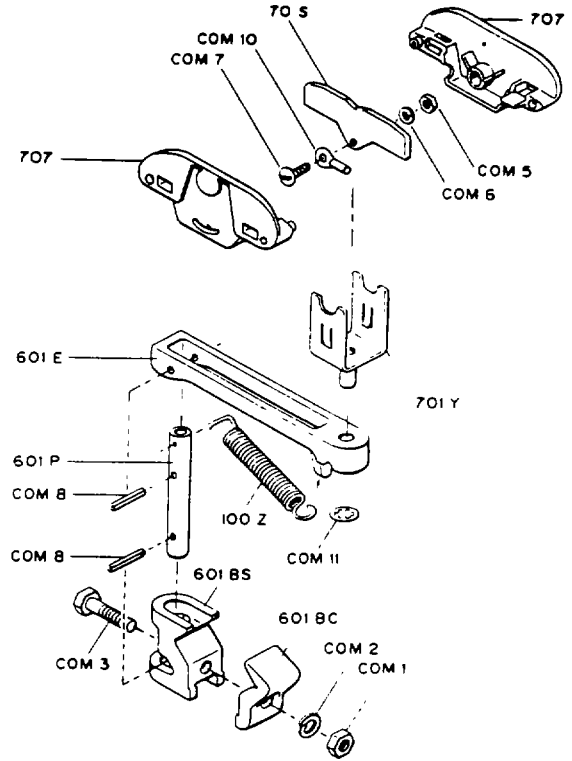
**Note:** For number 100 E Collector Assembly  
 Parts List Refer to Page 53.

Key No.	Part Name	Number Required Per Installation	
		Single Phase	Three Phase
5-960	Collector Bar Bracket	2	2
S-961	Collector Bar - Short (Specify whether for Single or Three Phase, Size of I-Beam and Capacity of Hoist)	2	1
S-962	Collector Bar - Long (Specify Size of I-Beam and Capacity of Hoist)	0	1
S-963	Collector Bar Insulator - Short	2	1
S-964	Collector Bar Insulator - Long	0	1
S-965	Collector Bar Bracket Attaching Screw	4	4
S-966	Collector Bar Bracket Attaching Screw Lock washer	4	4
S-968	Collector Bar Bracket Set Screw	4	4

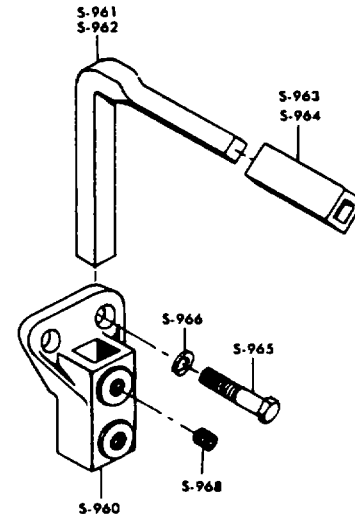
Specify whether for Single or Three Phase, size of I-Beam and Capacity of Hoist.

\*These components are also used with wheel and shoe type current collectors shown on page 52.

### COLLECTOR FOR ENCLOSED CONDUCTOR SYSTEM NUMBER 70 E



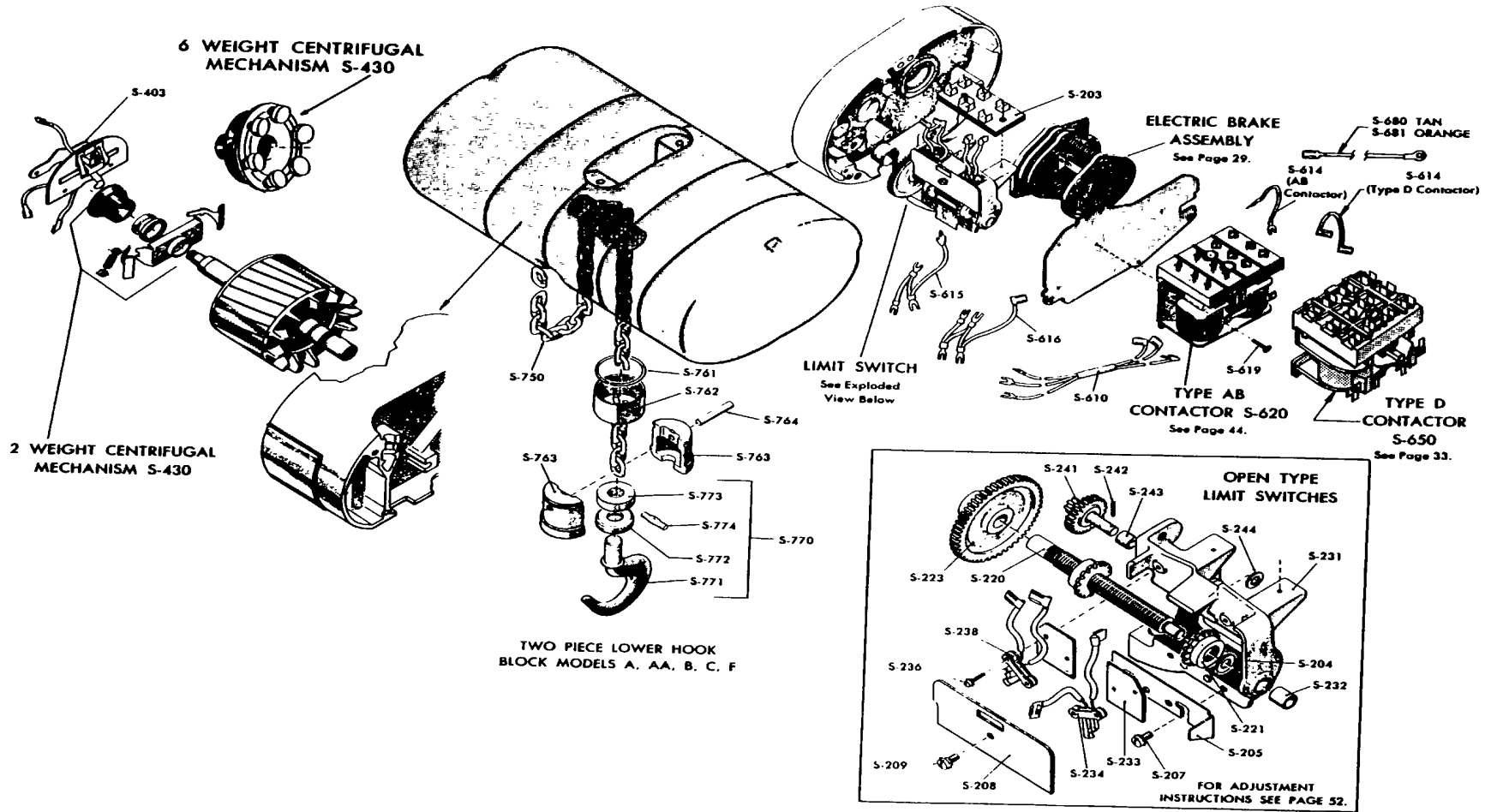
### \* COLLECTOR BRACKET & BAR FOR ENCLOSED CONDUCTOR SYSTEM





# MODELS A, AA, B, C, E, F & H

40



**SECTION F-NON-CURRENT PARTS**

The parts shown in this section were used on older units.  
See Page 27for ordering instructions.

<b>Key No.</b>	<b>Part Name</b>	<b>Number Required Per Model</b>	<b>Key No.</b>	<b>Part Name</b>	<b>Number Required Per Model</b>
S-203	Terminal Board (Single Phase, With- out Contactor, Open Type Limit Switches)	1	5-403	Shim (S-408 included)	As Required
5-204	Limit Switch Shaft Washer	1	S-408	Shim Gage	
S-205	Limit Switch Guide Plate	1	S-430	2 Weight Centrifugal Mechanism (See Note #2)	1
5-207	Limit Switch Guide Plate Attaching Screw and Lock washer	2	S-430	6 Weight Centrifugal Mechanism (See Note #2)	1
5-208	Limit Switch Fibre Cover	1	S-526	Motor Terminal Board Mounting Screw	3
5-209	Limit Switch Fibre Cover Screw and Lock washer	1	S-527	Motor Terminal Board Contactor Jumper	1
S-220	Limit Switch Shaft Sub-Assembly (S-221 and S-223 included)	1		(Single Phase With Type AB Contactor)2 (Three Phase With Type AB Contactor) 4 or 6	
5-221	Limit Switch Traveling Nut	2	S-614	Contactor Jumper - Black 2" Lg. For	1
S-223	Limit Switch Shaft Gear	1	S-614	Contactor Jumper - Type D Black 414" Lg. Contactor	2 or 3
S-231	Limit Switch Bracket Sub-Assembly Items S-232 and bracket)	1	S-614	Contactor Jumper - Black 6" Lg.	1
S-231	Limit Switch Bracket Sub-Assembly (Items S-232, 5-243 and bracket) (See Note #1)	1	5-615	Contactor Jumper Set, White (Single Phase With Type AB Contactor)	1
S-233	Limit Switch Insulator	2	5-616	Contactor Jumper Set, Orange (Single Phase With Type AB Contactor)	1
S-234	Upper Limit Switch	1	S-619	Contactor Attaching Screw and Lock- washer (Type AB and Type D Con- tactor)	3
S-236	Limit Switch Mounting Screw and Lock washer	4	S-680	Aux Contact Switch - Upper L.S. Jumper (Tan)	1
5-238	Lower Limit Switch	1	S-681	Aux Contact Switch - Lower L.S. Jumper (Orange)	1
S-239	Rolling Spring	2	S-761	Hook Block Snap Ring	1
S-241	Limit Switch Intermediate Gear and Pinion (See Note #1)	1	5-762	Hook Block Sleeve	1
5-242	Limit Switch Intermediate Gear and Pinion Pin (See Note #1)	1	5-763	Lower Hook Body (Obsolete, Order Page 29)	2
5-243	Limit Switch Intermediate Gear and Pinion Bushing (See Note #1)	1	5-764	Lower Hook Block Pin	1
S-244	Limit Switch Intermediate Gear and Pinion Washer (See Note #1)	1	5-770	Lower Hook Sub-Assembly (Items S-771 thru 5-774)	1
			5-771	Lower Hook	1
			5-772	Lower Hook Thrust Bearing	1
			S-773	Lower Hook Collar	1
			5-774	Lower Hook Pin	1

**NOTE #1.** Used only on: Models A and C over 50 foot lift  
B & F over 20 foot lift  
E and H over 10 foot lift

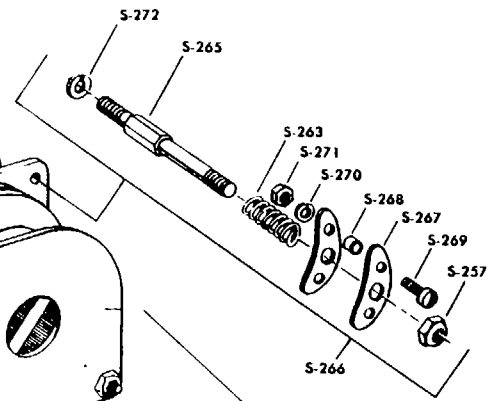
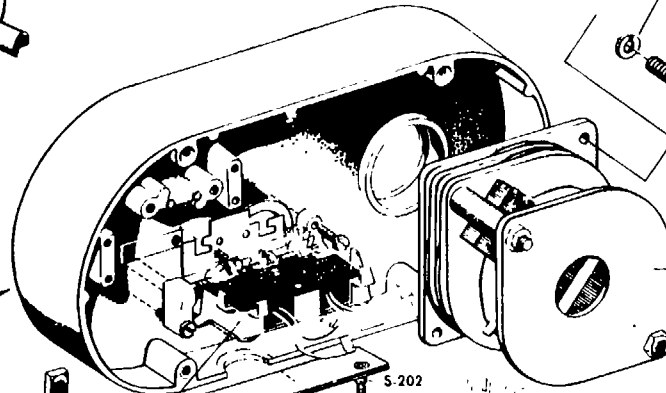
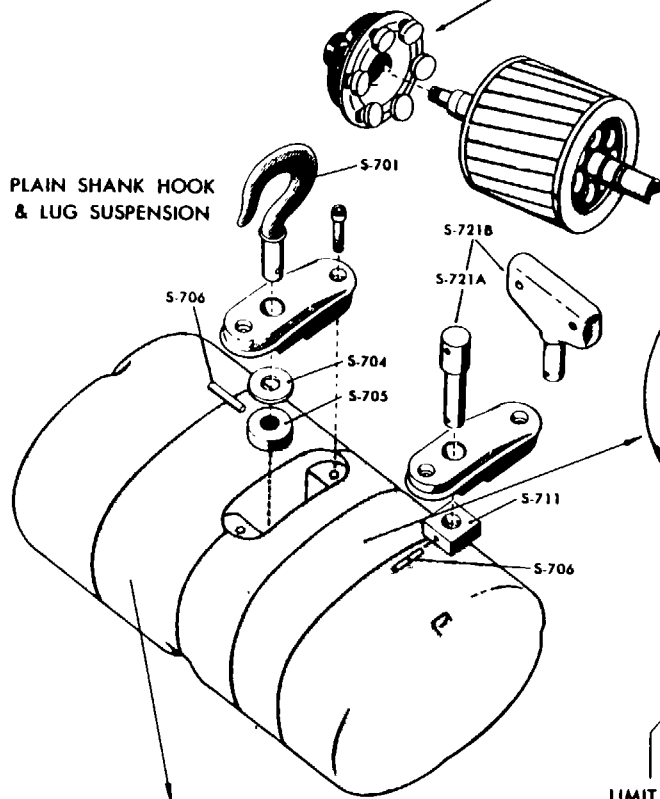
**NOTE #2.** Order Centrifugal Mechanism Kit, 5-430,  
see Page 27.

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

6 WEIGHT CENTRIFUGAL  
MECHANISM S-430.

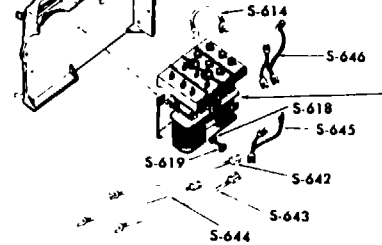
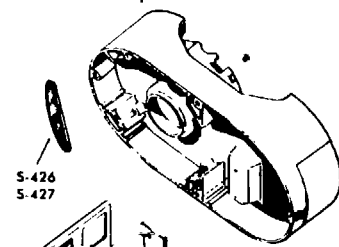
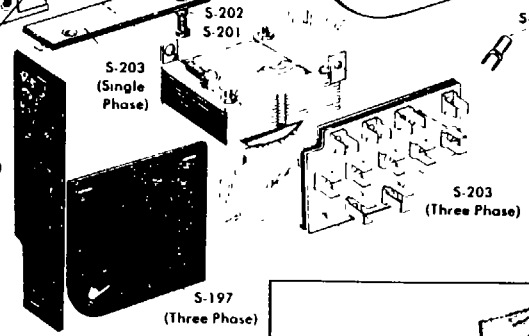
# MODELS J, L & R

PLAIN SHANK HOOK  
& LUG SUSPENSION

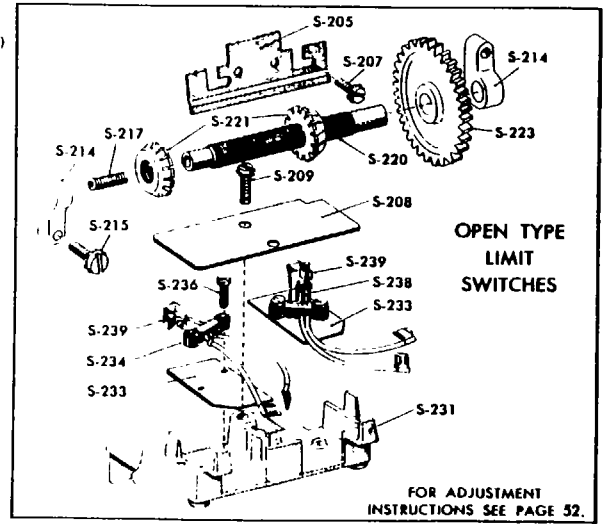


ELECTRIC BRAKE  
ASSEMBLY  
See Page 31.

LIMIT SWITCH  
See Exploded View Below



TYPE AB CONTACTOR S-620  
See Page 44



OPEN TYPE  
LIMIT  
SWITCHES

FOR ADJUSTMENT  
INSTRUCTIONS SEE PAGE 52.

**Parts List**  
**MODELS J, L & R**

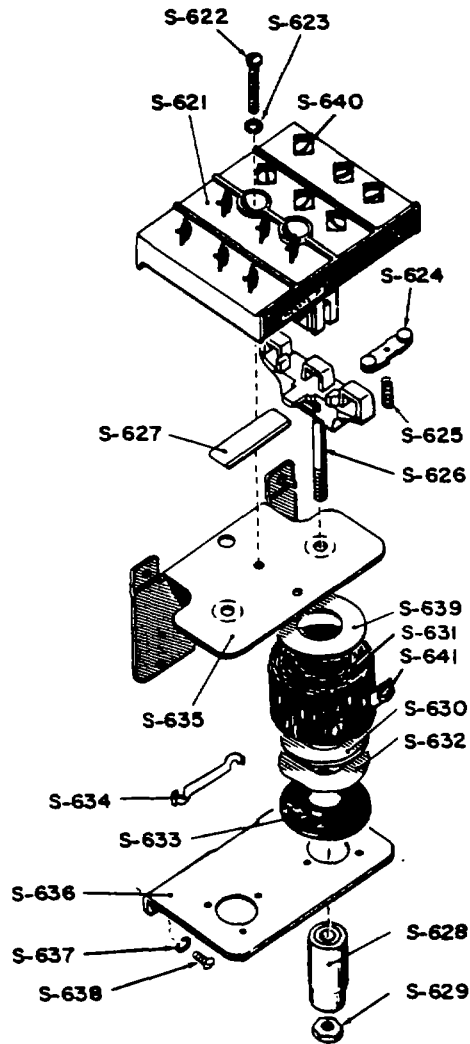
<b>Key No.</b>	<b>Part Name</b>	<b>Number Required Per Model</b>	<b>Key No.</b>	<b>Part Name</b>	<b>Number Required Per Model</b>
5-197	Terminal Board Wiring Shield	1	S270	Interim Brake Field Plate Clamp Screw	
S-201	Terminal Board Mounting Screw (Single Phase, Without Transformer)	2		Lock washer	2
5-202	Terminal Board Mounting Screw Lock-washer (Single Phase, Without Transformer)	2	S-271	Interim Brake Field Plate Clamp Screw Nut	2
5-203	Terminal Board	1	5-272	Interim Hex Brake Stud Lock washer	1
5-205	Limit Switch Guide Plate	1	5-426	Interim Motor Housing Cover Guide (Contactor Side)	1
5-207	Limit Switch Guide Plate Attaching Screw and Lock washer	2	S-427	Interim Motor Housing Cover Guide (Motor Side)	1
S-208	Limit Switch Fibre Cover	1	5-428	Interim Back Frame Cover Guide	4
S-209	Limit Switch Fibre Cover Screw and Lock washer	1	S-430	6 Weight Centrifugal Mechanism (See Note # 1)	1
S-214	Limit Switch Shaft Bearing	2	5-576	Terminal Adapter	2
S-215	Limit Switch Shaft Bearing Attaching Screw and Lock washer	2	S-619	Contactor Attaching Screw (Type AB Contactor)	3
5-217	Limit Switch Shaft Spring	1	5-642	Jumper, White-Blue (Three Phase Dual Voltage, With Type AB Contactor)	1
S-220	Limit Switch Shaft Sub-Assembly (S-221 and S-223 included)	1	S-643	Jumper, White-Black (Three Phase Dual Voltage, With Type AB Contactor)	1
5-221	Limit Switch Traveling Nut	2	S-644	Jumper, White (Three Phase Dual Voltage, With Type AB Contactor)	1
S-223	Limit Switch Shaft Gear	1	S-645	Jumper Set, White (Single Phase With Type AB Contactor)	1
5-231	Limit Switch Bracket	1	5-646	Jumper Set, Orange (Single Phase With Type AB Contactor)	1
5-233	Limit Switch Insulator	2	5-701	Upper Hook (Swivel Hook Susp. 5-704, 5-705 & 5-706 Incl.) (Rigid Hook Susp. 5-706 and S-711 Incl.)	1
5-234	Upper Limit Switch	1			
5-236	Limit Switch Mounting Screw and Lock washer	4	5-704	Upper Hook Washer	1
S-238	Lower Limit Switch	1	S-705	Upper Hook or Lug Collar (for Swivel Hook or Lug Suspension)	1
S-239	Rolling Spring	2	S-706	Upper Hook or Lug Pin I	
S-257	Interim Hex Brake Stud Nut	1	S-711	Upper Hook or Lug Collar (for Rigid Hook or Lug Suspension)	1
5-263	Interim Hex Brake Stud Spring	1	S-721A	Suspension Lug	1
5-265	Interim Hex Brake Stud	1	S-721B	Suspension Lug	1
S-266	Interim Hex Brake Stud Sub-Assembly (Items S-257, 5-263, S-265, 5-267 thru S-272)	1			
5-267	Interim Brake Field Plate Clamp	2			
5-268	Interim Brake Field Plate Clamp Spacer	2			
5-269	Interim Brake Field Plate Clamp Screw	2			

**NOTE #1.** Order Centrifugal Mechanism Kit S-430, see Page 27.

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

# TYPE AB CONTACTOR

## Parts List



Key No.	No. Required		Part Name
	3 POLE	2 POLE	
S-620	1	1	Contactors (Items S-621 thru S-641)
S-621	1	1	Contact Block
S-622	2	2	Contact Block Screw
S-623	2	2	Contact Block Screw Lockwasher
S-624	6	4	Movable Contact
S-625	6	4	Contact Spring
S-626	2	2	Contact Support
S-627	1	1	Interlock Bar
S-628	2	2	Sleeve
S-629	2	2	Nut
S-630	2	2	Coil Washer—Bottom (Now Part of S-631)
S-631	2	2	Operating Coil
S-632	2	2	Curved Washer
S-633	2	2	Spacer Guide
S-634	1	1	Coil Jumper
S-635	1	1	Mounting Base—Top
S-636	1	1	Mounting Base—Bottom
S-637	2	2	Mounting Base Screw Lockwasher
S-638	2	2	Mounting Base Screw
S-639	2	2	Coil Washer—Top (Now Part of S-631)
S-640	12	8	Terminal Screw
S-641	4	4	Coil Terminal Screw
S-647*	1	1	Auxiliary Contacts

\*Not Shown

### CAUTION

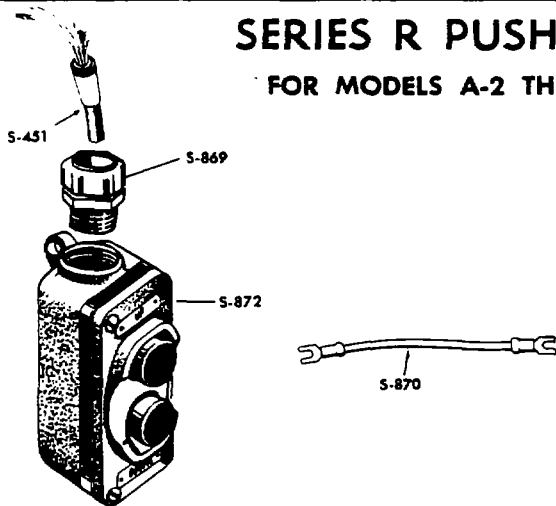
On three phase hoists, Models A, AA, B, C, E, F and H, having a 2-pole contactor (using four movable contacts S-624), do not install movable contacts in the center position of the contact support (S-626).

On single and three phase hoists having a 3-pole contactor, six movable contacts are used.

# SERIES R PUSH BUTTON STATION

FOR MODELS A-2 THRU H-2 AND J-2 THRU RR-2

## Parts List



Key No.	Part Name	Number Required
S-869	Push Button Box Connector	1
S-870	Push Button Switch Jumper	1
S-872	Push Button Station (Discontinued, Control Station page 34 will be furnished)	1
S-451	Push Button Cable (Specify Length Required)	

Also, individual components for this station are not available.

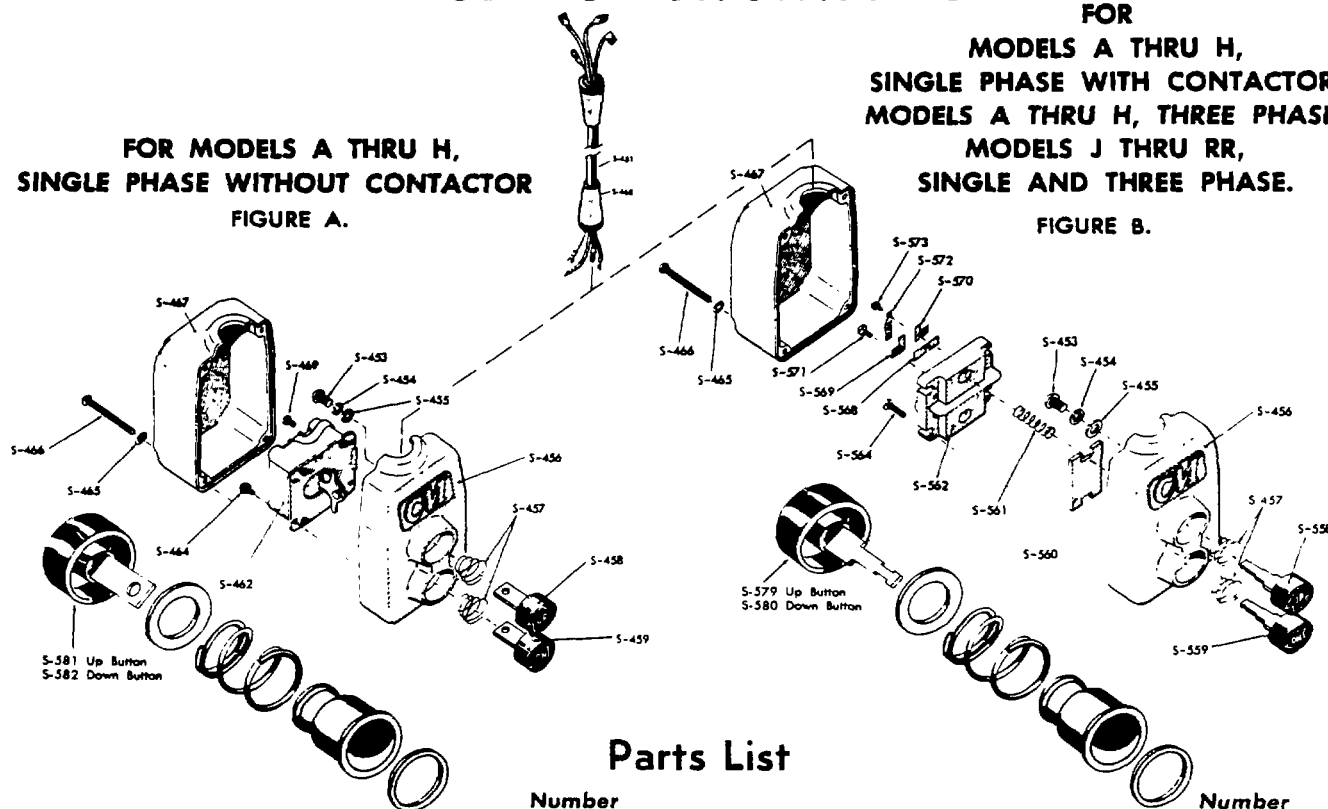
REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

# PUSH BUTTON SWITCHES

FOR  
**MODELS A THRU H,  
 SINGLE PHASE WITH CONTACTOR.  
 MODELS A THRU H, THREE PHASE.  
 MODELS J THRU RR,  
 SINGLE AND THREE PHASE.**

**FOR MODELS A THRU H,  
 SINGLE PHASE WITHOUT CONTACTOR  
 FIGURE A.**

**FIGURE B.**



## Parts List

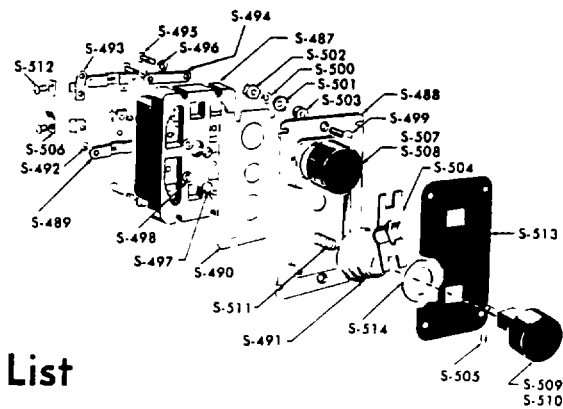
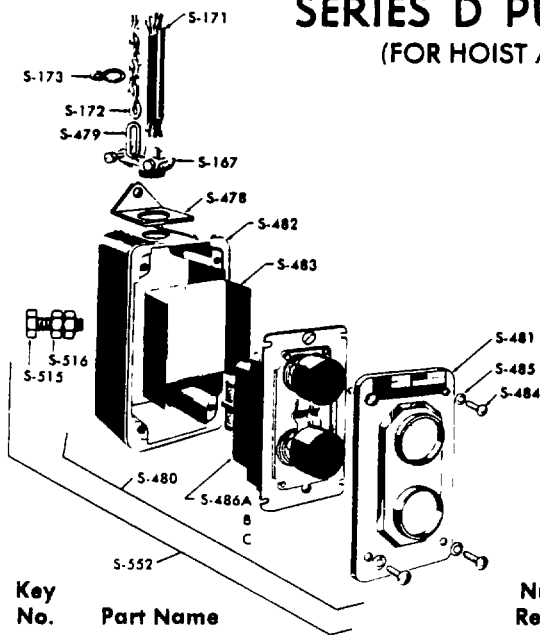
Key No.	Part Name	Number Required		Key No.	Part Name	Number Required	
		Figure A	Figure B			Figure A	Figure B
S-451	Push Button Cable (S-468 Included, Specify Length Required)	1	1	S-552	Push Button Switch (Items S-453 thru S-457, S-465 thru S-467, S-558 thru S-564 and S-568 thru S-573) (Discontinued, Control Station page 35 will be furnished)	0	1
S-452	Push Button Switch (Items S-453 thru S-459, S-462, S-464 thru S-467 and S-469) (Discontinued, Control Station page 34 will be furnished)	1	0	S-558	Up — Push Button	0	1
S-453	Switch Attaching Screw	1	1	S-559	Down — Push Button	0	1
S-454	Switch Attaching Screw Lockwasher	1	1	S-560	Interlock Bar	0	1
S-455	Switch Attaching Screw Washer	1	1	S-561	Movable Contact Spring	0	2
S-456	Body	1	1	S-562	Contact Block	0	1
S-457	Push Button Spring	2	2	S-564	Contact Block Screw	0	4
S-458	Up — Push Button	1	0	S-568	Movable Contacts	0	2
S-459	Down — Push Button	1	0	S-569	Stationary Contact — Right Hand	0	2
S-462	Contact Block Assembly	1	0	S-570	Stationary Contact — Left Hand	0	2
S-464	Contact Block Attaching Screw and Lockwasher	4	0	S-571	Terminal Screw	0	4
S-465	Back Cover Screw Lockwasher	4	4	S-572	Jumper	0	1
S-466	Back Cover Screw	4	4	S-573	Stationary Contact Screw and Lockwasher	0	4
S-467	Back Cover	1	1	S-579*	Up — Button Kit	0	1
S-468	Strain Relief	1	1	S-580*	Down — Button Kit	0	1
S-469	Terminal Screw	9	0	S-581*	Up — Button Kit	1	0
				S-582*	Down — Button Kit	1	0

\*For Weatherproof Switch Only

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

# SERIES D PUSH BUTTON STATION

(FOR HOIST AND MOTOR DRIVEN TROLLEY)



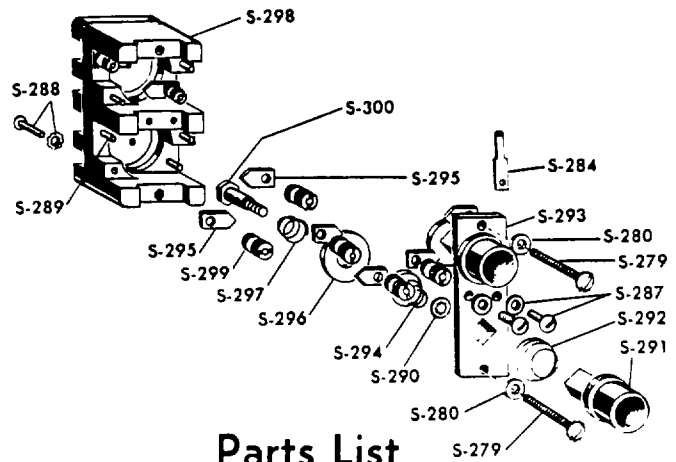
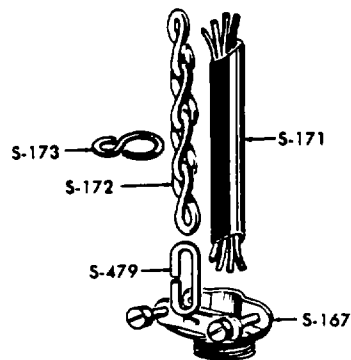
## Parts List

Key No.	Part Name	Number Required	Key No.	Part Name	Number Required
S-167	Box Connector	1	S-492	Contact Terminal	2
S-171	Push Button Cord (Specify Length)	1	S-493	Contact Terminal	2
S-172	Push Button Chain (Specify Length)	1	S-494	Link	2
S-173	Cable Clip (Specify No. Required)	1	S-495	Base Attaching Screw	4
S-478	Push Button Chain Clip	1	S-496	Base Attaching Screw L.W.	4
S-479	Push Button Chain Attaching Link	2	S-497	Terminal Attaching Screw	4
S-480	Push Button Station (M.D. Trolley, Items S-481 thru S-486A)	1	S-498	Terminal Attaching Screw L.W.	4
S-480	Weatherproof Push Button Station (M.D. Trolley, Items S-481 thru S-486C)	1	S-499	Ground Screw	1
S-481	Cover	1	S-500	Ground Screw L.W.	1
S-482	Box	1	S-501	Ground Screw Cup Washer	1
S-483	Box Liner	1	S-502	Ground Screw Nut	1
S-484	Cover Attaching Screw	4	S-503	Ground Screw Jam Nut	1
S-485	Cover Attaching Screw L.W.	4	S-504	Interlock Bar	1
S-486A	Switch Unit — marked For. —Rev. (Items S-487 thru S-504, S-505, S-506, S-508, S-510, S-511 and S-512)	1	S-504A	Interlock Bar (Weatherproof P.B.)	1
S-486B	Weatherproof Switch Unit — Marked Up-Down (Items S-487 thru S-503, S- 504A, S-505, S-506, S-507, S-509 and S-511 thru S-514)	1	S-505	Locking Clip	2
S-486C	Weatherproof Switch Unit — Marked For.-Rev. (Items S-487 thru S-503, S-504A, S-505, S-506, S-508 and S-510 thru S-514)	1	S-506	Connector	1
S-487	Push Button Base	1	S-507	Up-Button	1
S-488	Base Support	1	S-508	Fwd.-Button	1
S-489	Contact Finger	2	S-509	Down-Button	1
S-490	Insulating Liner	1	S-510	Rev.-Button	1
S-491	Spiral Spring	2	S-511	Contact Finger Spring	2
			S-512	Terminal Screw	4
			S-513	Neoprene Diaphragm (Weatherproof P.B.)	1
			S-514	Brass Washers (Weatherproof P.B.)	2
			S-515	Ground Screw (Weatherproof P.B. for Hoist)	1
			S-516	Ground Screw Nut (Weatherproof P.B. for Hoist)	2
			S-552	Weatherproof Push Button Station (For Hoist, Items S-481 thru S-485, S-486B, S-515 and S-516)	1

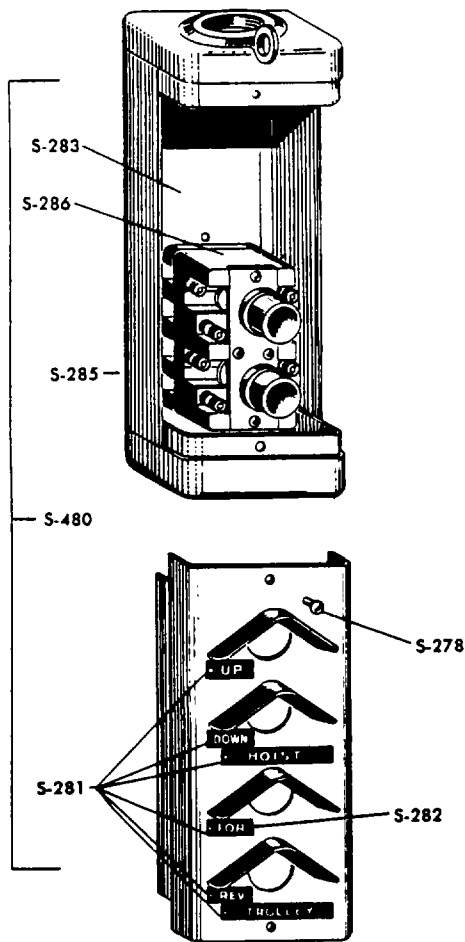
REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

# SERIES E PUSH BUTTON STATION

(FOR HOIST WITH MOTOR DRIVEN TROLLEY)



## Parts List



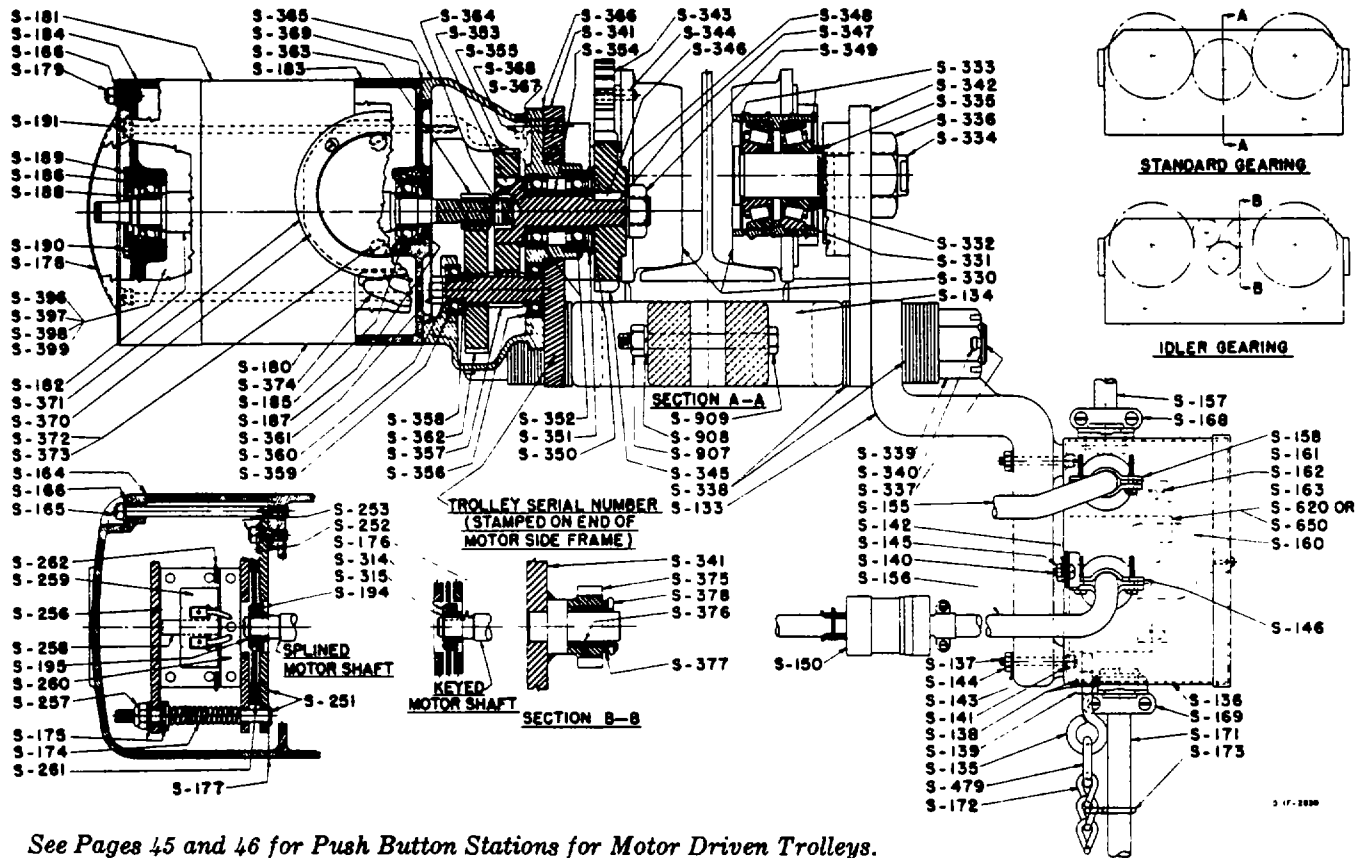
Key No.	Part Name	Number Required
S-167	Box Connector	1
S-171	Push Button Cord (Specify Length Required)	1
S-172	Push Button Chain (Specify Length Required)	1
S-173	Cable Clip (Specify No Required)	
S-278	Cover Attaching Screw	2
S-279	Switch Insert Unit Attaching Screw and L.W.	4
S-280	Switch Insert Unit Attaching Screw Flat Washer	4
S-281	Indicator Plate (Specify Plate Required — Up, Down, Hoist, Fwd., Rev. and Trolley)	6
S-282	Indicator Plate Drive Screw (2 per Plate)	12
S-283	Insulator Shield	1
S-284	Ground Wire Solderless Terminal	1
S-285	Sheet Steel Enclosure (Frame and Cover included)	1
S-286	Switch Unit Insert (Items S-287 thru S-300)	2
S-287	Push Button Guide Attaching Screw and L.W.	2*
S-288	Stationary Contact Attaching Screw and L.W. — Long	4*
S-289	Stationary Contact Attaching Screw and L.W. — Short	4*
S-290	Stud Lockwasher	2*
S-291	Push Button	2*
S-292	Tapered Spring, Top	2*
S-293	Push Button Guide	1*
S-294	Compression Spring, Center	2*
S-295	Stationary Contact	8*
S-296	Movable Contact	2*
S-297	Compression Spring, Bottom	2*
S-298	Base	1*
S-299	Terminal Nut	8*
S-300	Stud	2
S-479	Push Button Chain Attaching Link	2
S-480	Push Button Station (Items S-278 thru S-286)	1

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

\*Number required for one switch unit insert



# MOTOR DRIVEN TROLLEY



See Pages 45 and 46 for Push Button Stations for Motor Driven Trolleys.

## Parts List

Key No.	Number Required	Part Name	Key No.	Number Required	Part Name
S-133	1	Contacteur Bracket	S-156	1	Cable (Contacteur Box to Hoist)
S-134	1	Trolley Load Bar	S-157	1	Power Cord
S-135	1	Push Button Chain Eyebolt	S-158	1	Box Connector
S-136	1	Contacteur Box and Cover	S-159*	1	Contacteur Jumper
S-137	4	Contacteur Box Attaching Screw	S-160	1	Transformer and Bracket Assembly
S-138	2	Push Button Chain Eyebolt Washer	S-161	2	Transformer Attaching Screw
S-139	2	Push Button Chain Eyebolt Nut	S-162	2	Transformer Attaching Screw Lockwasher
S-140	3	Contacteur Attaching Screw	S-163	2	Transformer Attaching Screw Nut
S-141	4	Contacteur Box Attaching Screw Washer	S-164	1	Brake Cover
S-142	3	Contacteur Attaching Screw Lockwasher	S-165	3	Brake Cover Screw
S-143	4	Contacteur Box Attach. Screw Lockwasher	S-166	3	Brake and Motor Cover Screw Lockwasher
S-144	4	Contacteur Box Attaching Screw Nut	S-168	1	Box Connector
S-145	3	Contacteur Attaching Screw Nut	S-169	1	Box Connector
S-146	1	Box Connector	S-171	1	Push Button Cable (Specify Length Required)
S-147*	1	Cable Clamp	S-172	1	Push Button Chain (Specify Length Required)
S-148*	1	Cable Clamp Screw	S-173	1	Push Button Cable Clip (Specify No. Required)
S-149*	1	Cable Clamp Screw Lockwasher	S-174	2	Brake Spring
S-150	1	Plug and Body	S-175	10	Spacer Washer
S-155	1	Cable (Contacteur Box to Trolley Motor)			

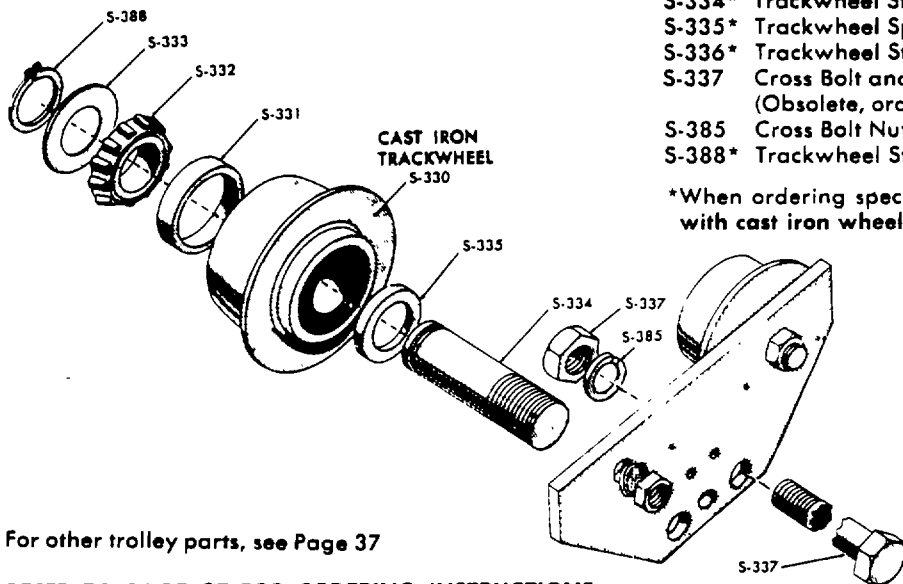
Key No.	Part Name	Number Required	Key No.	Part Name	Number Required
S-176	Brake Hub Key	1	S-342	Side Frame Sub-Assembly (Plain side)	1
S-177	Cover Gasket (Weatherproof Units)	2	S-343	Trackwheel Gear (S-344 included)	2
S-178	Motor End Cover	1	S-344	Trackwheel Gear Groov Pin	4
S-179	Motor Cover Screw	3	S-345	Trackwheel Gear Pinion	1
S-180	Trolley Motor (S-364 included)	1	S-346	Trackwheel Pinion Key	1
S-181	Frame with Stator	1	S-347	Trackwheel Pinion Shaft	1
S-182	Shaft and Rotor (S-364 included)	1	S-348	Trackwheel Pinion Lockwasher	1
S-183	End Bell (Inner)	1	S-349	Trackwheel Pinion Nut	1
S-184	End Bell (Outer)	1	S-350	Trackwheel Pinion Spacer	1
S-185	Ball Bearing (Pinion End)	1	S-351	Pinion Bearing Sleeve	1
S-186	Ball Bearing (Brake Hub End)	1	S-352	Pinion Shaft Ball Bearing	2
S-187	Spring Washer	1	S-353	Driven Gear Key	1
S-188	Snap Ring	1	S-354	Pinion Bearing Spacer	1
S-189	Bearing Cap	1	S-355	Driven Gear	1
S-190	Bearing Cap Screw	4	S-356	Intermediate Shaft Ball Bearing (Side Frame End)	1
S-191	Motor thru Bolt with Lockwasher	4	S-357	Intermediate Pinion	1
S-192*	Rubber Bushing (For Brake Leads)	1	S-358	Intermediate Bearing Spacer	1
S-194	Brake Hub (Splined)	1	S-359	Intermediate Shaft Ball Bearing (Motor End)	1
S-195	Brake Hub Snap Ring (Splined Shaft)	1	S-360	Intermediate Pinion Screw Lockwasher	1
S-249	Electric Brake Assembly Complete with Cover (Items S-164, S-165, S-166, S-176, S-250, S-252, S-253, S-314 and S-315)	1	S-361	Intermediate Pinion Nut	1
S-250	Electric Brake Assembly (Items S-174, S-175, S-251, S-256 thru S-261)	1	S-362	Intermediate Gear	1
S-251	Brake Base Plate and Stud Sub-Assembly	1	S-363	Motor Pinion	1
S-252	Brake Attaching Screw Lockwasher	2	S-364	Motor Pinion Groove Pin	1
S-253	Brake Attaching Screw	2	S-365	Gear Housing	1
S-256	Brake Field Sub-Assembly (S-262 included)	1	S-366	Gear Housing Gasket	1
S-257	Brake Stud Nut	2	S-367	Gear Housing Screw Lockwasher	4
S-258	Brake Coil Retainer Strap	1	S-368	Gear Housing Screw	4
S-259	Brake Coil	1	S-369	Motor End Bell Gasket	1
S-260	Brake Armature Sub-Assembly	1	S-370	Terminal Box	1
S-261	Brake Friction Disc Sub-Assembly	1	S-371	Terminal Box Cover	1
S-262	Brake Shading Coil	2	S-372	Terminal Box Attaching Screw	3
S-314	Brake Hub (Keyed)	1	S-373	Terminal Box Attaching Screw Lockwasher	3
S-315	Brake Hub Snap Ring (Keyed Shaft)	1	S-374	Box Connector	1
S-330	Trackwheel (S-331 included)	4	S-375	Idler Pinion	2
S-331	Trackwheel Bearing Cup	8	S-376	Idler Pinion Bearing	2
S-332	Trackwheel Bearing Cone	8	S-377	Idler Pinion Washer	2
S-333	Trackwheel Bearing Seal Washer	8	S-378	Idler Pinion Cotter Pin	2
S-334	Trackwheel Stud	4	S-390*	Capacitor (Single Phase)	1
S-335	Trackwheel Stud Collar	4	S-391*	Capacitor Housing (Single Phase)	1
S-336	Trackwheel Stud Nut	4	S-392*	Capacitor Housing Screw (Single Phase)	2
S-337	Hoist Suspension Bolt	2	S-393*	Capacitor Housing Screw Lockwasher (Single Phase)	2
S-338	Trolley Spacer Washer	62	S-394*	Capacitor Lead Grommet	1
S-339	Suspension Bolt Nut	4	S-396	Motor Reverse Switch (Single Phase)	1
S-340	Suspension Bolt Nut Cotter Pin	4	S-397	Centrifugal Switch (Single Phase)	1
S-341	Side Frame Sub-Assembly (Motor side)	1	S-398	Reverse Switch Attaching Screw (Single Phase)	2
			S-399	Reverse Switch Attaching Screw Lockwasher (Single Phase)	2
			S-407*	Line Connector (Specify No. Req'd.)	
			S-479	Push Button Chain Attaching Link	2
			S-614*	Contacto Jumper, Black	6
			S-620	Contacto Type AB (See Page 44)	1
			S-650	Contacto Type D (See Page 33)	1
			S-907	Suspension Lug Screw Nut	2
			S-908	Suspension Lug Screw Lockwasher	2
			S-909	Suspension Lug Screw	2

\*Not Shown

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

# LOW HEADROOM LODESTAR TROLLEY

## Parts List

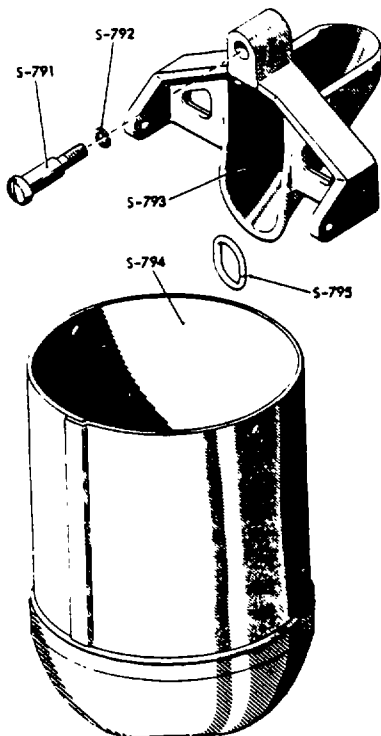


Key No.	Part Name	Number Required
S-330*	Trackwheel (S-331 included)	4
S-331*	Trackwheel Bearing Cup	8
S-332*	Trackwheel Bearing Cone	8
S-333*	Trackwheel Bearing Shield	8
S-334*	Trackwheel Stud	4
S-335*	Trackwheel Spacer	4
S-336*	Trackwheel Stud Nut	4
S-337	Cross Bolt and Nut (Obsolete, order S-337 Page 37)	2
S-385	Cross Bolt Nut Lockwasher	2
S-388*	Trackwheel Stud Snap Ring	4

\*When ordering specify that part is for a 2 ton trolley with cast iron wheels.

For other trolley parts, see Page 37

REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS



## CHAIN CONTAINER

### Parts List

Key No.	Part Name	Number Required
S-791	Chain Container Bracket Screw (Special Alloy Screw) (S-792 included)	1
S-792	Chain Container Bracket Screw Lockwasher	1
S-793	Chain Container Bracket (Obsolete Order S-792 and S-795 thru S-798, page 36)	1
S-794	Chain Container Bucket	1
S-795	Chain Container Support Link	2

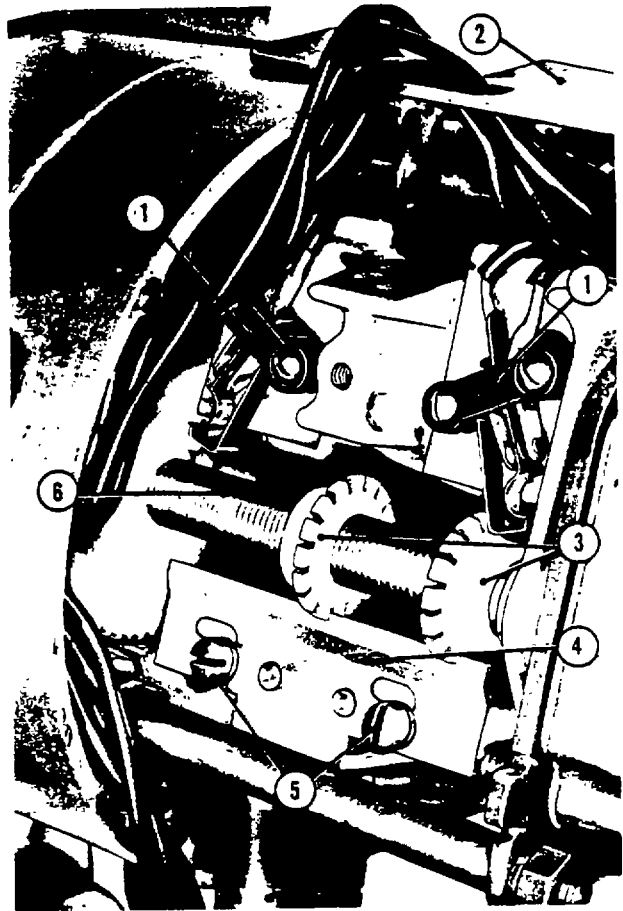
REFER TO PAGE 27 FOR ORDERING INSTRUCTIONS

## Adjustment of Open Type Limit Switches

Use the general instructions given on pages 16 and 17 for ENCLOSED TYPE LIMIT SWITCHES. However, use Table II and Figures 19 and 20 below in place of Table I and Figures 14 and 15 referred to in the text.

**TABLE II**  
**OPEN TYPE LIMIT SWITCHES**  
**Hook Travel Per Notch of Limit Switch Nut**

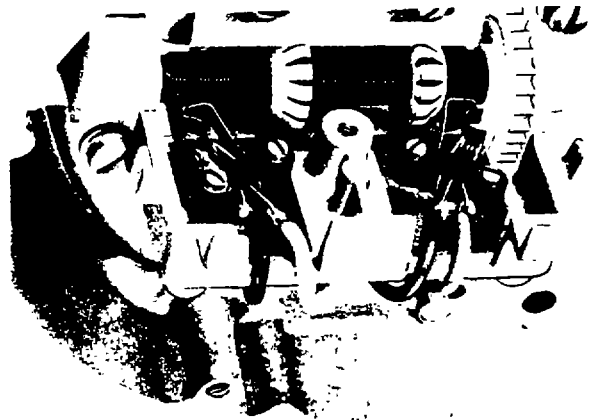
Model No.	Lifting Speed (FPM)	Length of Max. Lift (Ft.)	Limit Switch Gear Reduction	Hook Travel Per Notch (In.)	A	B
					(In.)	(Links)
E, H	8	0 thru 10	Single	$\frac{1}{4}$	1 $\frac{3}{4}$	6
		Over 10 thru 45	Double	$\frac{3}{8}$	3	6
B, F	16	0 thru 20	Single	$\frac{7}{8}$	1 $\frac{1}{2}$	6
		Over 20 thru 45	Double	1 $\frac{3}{4}$	2	6
B	16	Over 45 thru 90	Double	1 $\frac{3}{4}$	2	6
A, C	32	0 thru 50	Single	$\frac{7}{8}$	3	6
		Over 50 thru 70	Double	2 $\frac{3}{8}$	4 $\frac{1}{2}$	6
C	32	Over 70 thru 90	Double	2 $\frac{3}{8}$	4 $\frac{1}{2}$	6
AA	60	0 thru 90	Single	1 $\frac{3}{8}$	8	6
J	32	0 thru 20	Worm	$\frac{3}{4}$	2 $\frac{1}{2}$	8
		Over 20 thru 30	Worm	$\frac{3}{4}$	2 $\frac{1}{2}$	8
L	16	0 thru 20	Worm	$\frac{3}{4}$	2 $\frac{1}{2}$	8
		Over 20 thru 45	Worm	$\frac{3}{4}$	4	8
R	8	0 thru 10	Worm	$\frac{3}{4}$	2 $\frac{1}{2}$	8
		Over 10 thru 25	Worm	$\frac{3}{4}$	2 $\frac{1}{2}$	8
		Over 25 thru 45	Worm	$\frac{3}{4}$	2 $\frac{1}{2}$	8



**FIGURE 19.**  
**OPEN TYPE LIMIT SWITCHES, MODELS A THRU H.**

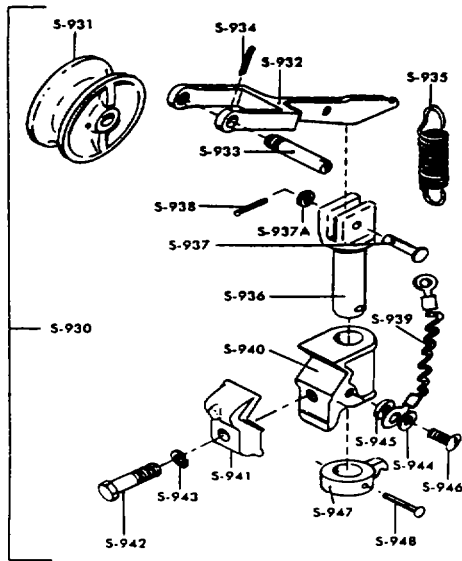
- |                   |                           |
|-------------------|---------------------------|
| 1. Limit switch   | 4. Guide plate            |
| 2. Fiber cover    | 5. Screws and lockwashers |
| 3. Traveling nuts | 6. Limit switch shaft     |

(Do not order parts by these numbers. See parts list.)

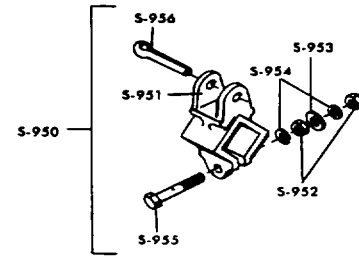


**FIGURE 20.**  
**OPEN TYPE LIMIT SWITCHES, MODELS J, L AND R.**

# CURRENT COLLECTORS



WHEEL COLLECTOR FOR BARE  
COPPER WIRE CONDUCTOR SYSTEM



SHOE COLLECTOR FOR BARE  
COPPER WIRE CONDUCTOR SYSTEM

Key No.	Part Name	Number Required Per Installation		Key No.	Part Name	Number Required Per Installation	
		Single Phase	Three Phase			Single Phase	Three Phase
S-928*	Wheel Collector Assembly (Items S-930, S-960, S-961, S-963, S-965, S-966, S-968)	1	0	S-939	Copper Shunt	2	3
S-928*	Wheel Collector Assembly (Items S-930, S-960 thru S-966, S-968)	0	1	S-940	Clamp Bearing (S-948 included)	2	3
S-929*	Shoe Collector Assembly (Items S-950, S-960, S-961, S-963, S-965, S-966, S-968)	1	0	S-941	Clamp	2	3
S-929*	Shoe Collector Assembly (Items S-950, S-960 thru S-966, S-968)	0	1	S-942	Clamp Screw	2	3
S-930	Wheel Collector (Items S-931 thru S-948)	2	3	S-943	Clamp Screw Lockwasher	2	3
S-931	Wheel	2	3	S-944	Shunt and Terminal Screw Lockwasher	2	3
△ S-932	Harp	2	3	S-945	Shunt and Terminal Screw Washer	2	3
S-933	Wheel Pin	2	3	S-946	Shunt and Terminal Screw	2	3
S-934	Wheel Pin Cotter Pin	2	3	S-947	Collar (S-948 included)	2	3
S-935	Spring	2	3	S-948	Rivet	2	3
S-936	Clevis Pin (S-948 included)	2	3	S-950	Shoe Collector (Items S-951 thru S-956)	2	3
S-937	Harp Pin (S-937A and S-938 included)	2	3	S-951	Collector Shoe	2	3
S-937A	Harp Pin Washer	2	3	S-952	Collector Shoe Clamp Screw Nut	4	6
S-938	Harp Pin Cotter Pin	2	3	S-953	Collector Shoe Clamp Screw Washer	2	3
				S-954	Collector Shoe Clamp Screw Lockwasher	4	6
				S-955	Collector Shoe Clamp Screw	2	3
				S-956	Collector Shoe Cotter Pin	2	3

\* ASSEMBLIES DISCONTINUED. INDIVIDUAL COMPONENTS AVAILABLE FOR REPAIRS ONLY.

△ INDIVIDUAL PART NOT AVAILABLE. CONTACT FACTORY FOR REPLACEMENT.

### COLLECTOR ASSEMBLY PARTS LIST

Part No.	No. Req'd.	Part Name
**100 E	**	Collector Assembly
601 BC	1	Clamp only
601 BS	1	Swivel only
601 P	1	Post
601 E	1	Standard Arm
601 Y	1	Yoke
601 AD	2	Case Half
100 S	1	Shoe
100 Y	1	Shoe Clip
100 Z	1	Spring
COM 1	1	3/8 - 16 Hex Nut
COM 2	1	3/8 Lockwasher
COM 3	1	3/8 - 16 x 1 1/2 Bolt
COM 4	2	1/4 - 20 x 1 Machine Screw
COM 5	3	1/4 - 20 Hex Nut
COM 6	1	1/4 Lockwasher
COM 7	1	1/4 - 20 x 1/2 Bolt
COM 8	2	1/4 x 1 1/4 Roll Pin
COM 9	2	Dot Fastener
COM 10	1	No. 6 Non-Insulated Terminal
COM 11	1	1/2 Retainer Ring

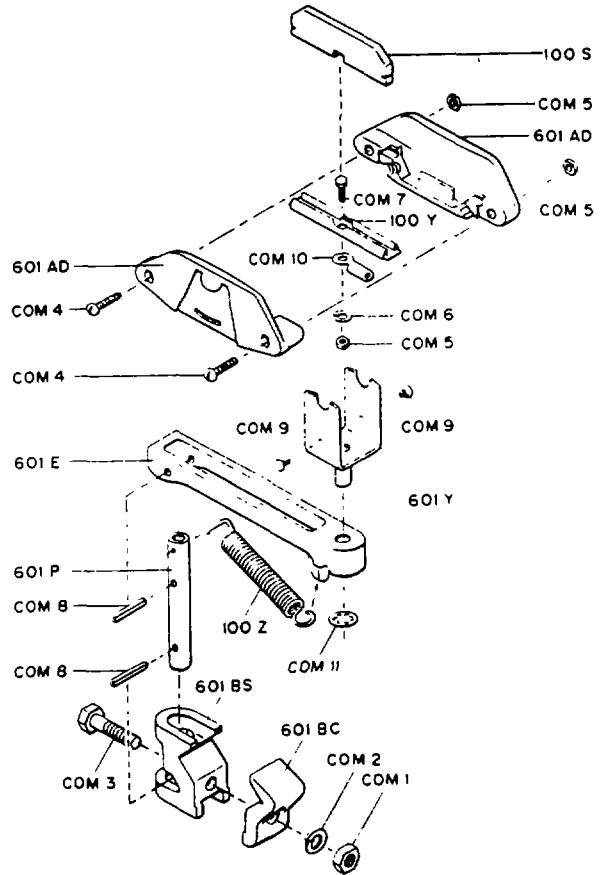
Specify whether for Single or Three Phase,  
size of I-Beam and Capacity of Hoist.

For Collector Bracket and Bar  
(Key Nos. S-960 thru S-968) Refer to Page 38.

- \*\* Two assemblies required for single phase installation
- \*\* Three assemblies required for three phase installation.

Refer to Page 9 for Mounting Instructions.

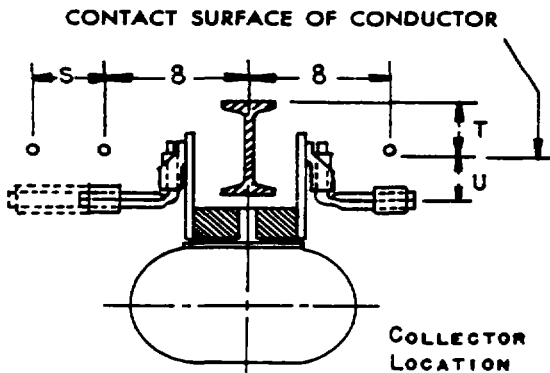
NOTE: Assemblies Discontinued. Individual Components Available For Repairs Only.



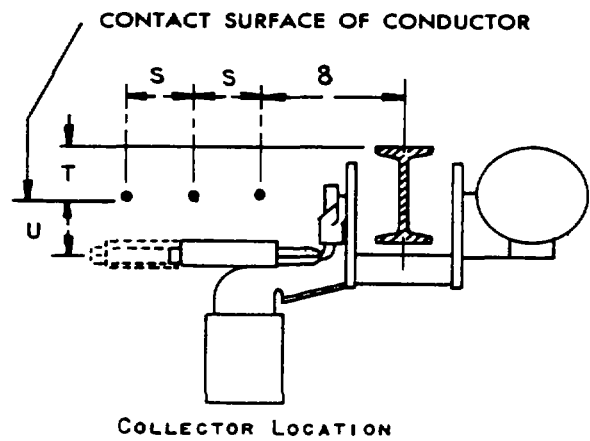
COLLECTOR FOR ENCLOSED  
CONDUCTOR SYSTEM  
NUMBER 100 E

**WHEEL AND SHOE TYPE COLLECTORS FOR BARE COPPER WIRE CONDUCTOR SYSTEMS  
CURRENT COLLECTOR MOUNTING FOR LODESTAR LOW HEADROOM AND MOTOR DRIVEN TROLLEY**

**LOW HEADROOM TROLLEY**



**MOTOR DRIVEN TROLLEY**



DIMENSION	COLLECTOR SYSTEM	
	SHOE	WHEEL
S	4	4
T	3 1/4	3 1/4
U	1 1/4	3

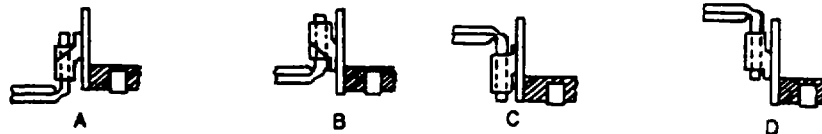
**CAUTION:**

Trolley Beam should always be electrically grounded. Be sure that there is good electrical contact between Trolley Beam and Trackwheels. Avoid the use of paint or other coatings on the Beam Flange which might form an insulation.

**SINGLE PHASE - Use Two Collectors**  
**THREE PHASE - Use Three Collectors**

When one ton low headroom trolley with wheel type collectors is used on 4" and 5" I Beam all collectors must be mounted on one side.

**MOUNTING POSITIONS FOR COLLECTOR BAR AND BRACKET.**



AM. STD. I-BEAM SIZE	LOW HEADROOM TROLLEY			
	SHOE		WHEEL	
	1 Ton	2 Ton	1 Ton	2 Ton
4	B	-	B	-
5	C	-	B	-
6	C	B	B	A
7	C	B	C	B
8	D	C	C	B
10	D	C	D	C
12	D	D	D	C
15 & OVER	D	D	D	D

MOTOR DRIVEN TROLLEY	
SHOE	WHEEL
-	-
-	-
B	B
C	B
C	B
D	C
D	D
D	D

TERMS OF WARRANTY

USE AND MAINTENANCE

F10





**PREPARING VEHICLE FOR USE OF THE CRANE**

- 1 Familiarize yourself with the instruction plate mounted on the base of the crane
- 2 Check that the vehicle is on level ground with the brakes on, and that the wheels are chocked
- 3 Start the truck and accelerate the engine to the required r.p.m. Make sure that the air pressure in the system of the truck has reached the correct level
- 4 Depress the clutch and engage the power take off by means of the dash mounted switch (for vehicles with mechanical power take off, move the lever behind the drivers seat)
- 5 For trucks also having tipper, be sure that the shuttle valve CRANE/TIPPER is in the CRANE position. **Each movement of the shuttle valve must be made with the clutch depressed or the power take off disengaged**
- 6 Before use of the crane stabilize the vehicle by means of the outrigger legs, see special instructions on Page 4 and following

**UNFOLDING OF THE CRANE**

- 7 Operate lever No 2 (fig. 1) until the main boom is in the horizontal position
- 8 Operate lever 1 (fig. 1) to slew the crane and bring the hook over the load to be lifted and lever 3 and 4 (fig. 1) to increase the hydraulic extension

**USE OF THE CRANE**

- 9 Hook the load. Make sure it is not over the lifting capacities shown on the radius plate. At no time must the crane be overloaded or the load moved out of the radii given on the lifting capacity plate

The loads that may be lifted with the standard hook correspond to those shown on the radius plate at the different extensions of the secondary boom. Heavier loads, within the capacity of the crane, must be lifted by the main hook, to be fixed in the special support placed on secondary boom.

To avoid possible damage to the lifting hook during operation, check that it is always free to rotate on it's pin and that there are no obstacles preventing vertical lift. Furthermore check the efficiency of hook security clip.

- 10 Avoid jerking the crane especially during descent of the load. Avoid sudden starting and stopping movements when loading, these can cause damage to the hydraulic system
- 11 The speed of different movements can be regulated by «feathering» the controls. Operate lever gently applying more pressure for faster movement
- 12 Slew loads with maximum care, avoid fast slewing. Pay attention to the stability of the vehicle when slewing, especially when the load hangs in front of the truck cab. In this area the lifting capacities are generally «0%» less
- 13 Do not continue to pull on any levers when the ram has come to the end of it's stroke. This will prevent overheating within the hydraulic system and possible damage to the pump
- 14 Be sure that no one stands within the working area of the crane during operation, and observe all safety precautions with regard to lifting equipment

**FOLDING OF THE CRANE**

- 15 Leaving inner boom in horizontal position, fold outer boom until outer ram has reached the stroke and lever 3 (fig. 1)
- 16 Slew the crane until the two black painted stripes on the column and column support coincide forming a single strip
- 17 Operating lever 2 (fig. 1) fold inner boom controlling that inner and outer booms lean on the stops welded on the base
- 18 Lift and withdraw the outriggers legs
- 19 Disengage the power take off.

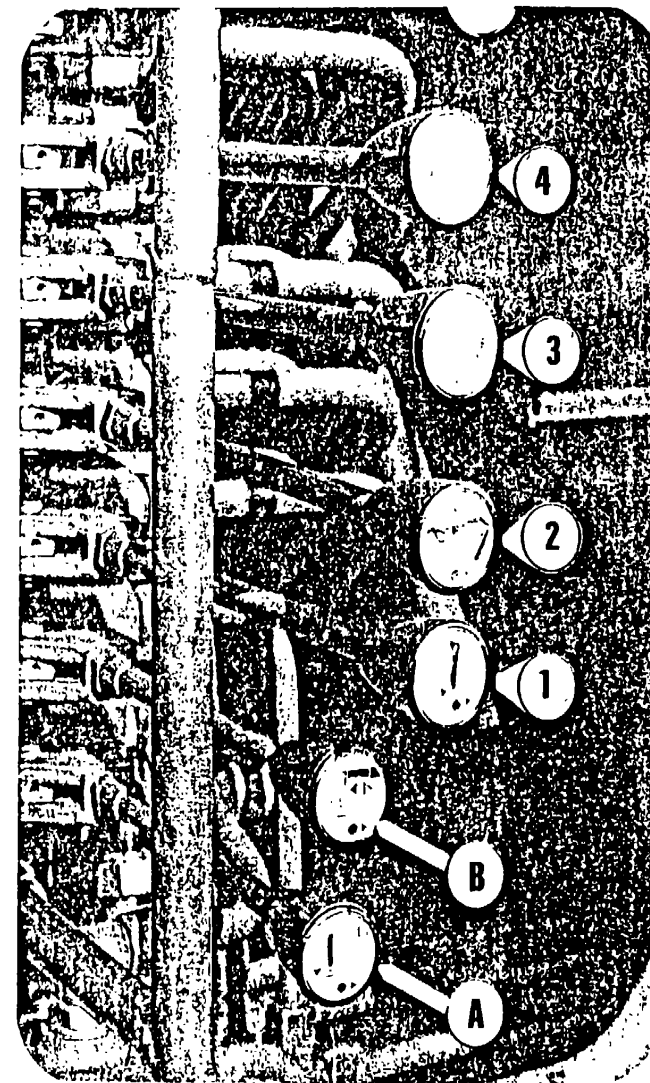


Fig. 1

On a Fassi crane it is possible to add hydraulic accessories of various types and functions, such as: extension booms, telescopic booms, hydraulic cranes, telescopic hydraulic cranes, and pipe work. When pipe work comes from the crane, special care must be taken in its use. It is necessary to act as follows:

- 1) Disengage the pins to take off
- 2) Release the pressure about the pipe work by operating the lever in both directions

#### GRAB ROTATOR

When mounting an accessory of this type, care must be taken that the overall weight does not exceed the capacity of the crane. Take care also that the maximum working pressure of the accessory is not superior to that of the crane. If the accessory requires a pressure considerably lower than that of the crane, it will be necessary to mount a bypass valve on the pipe work.

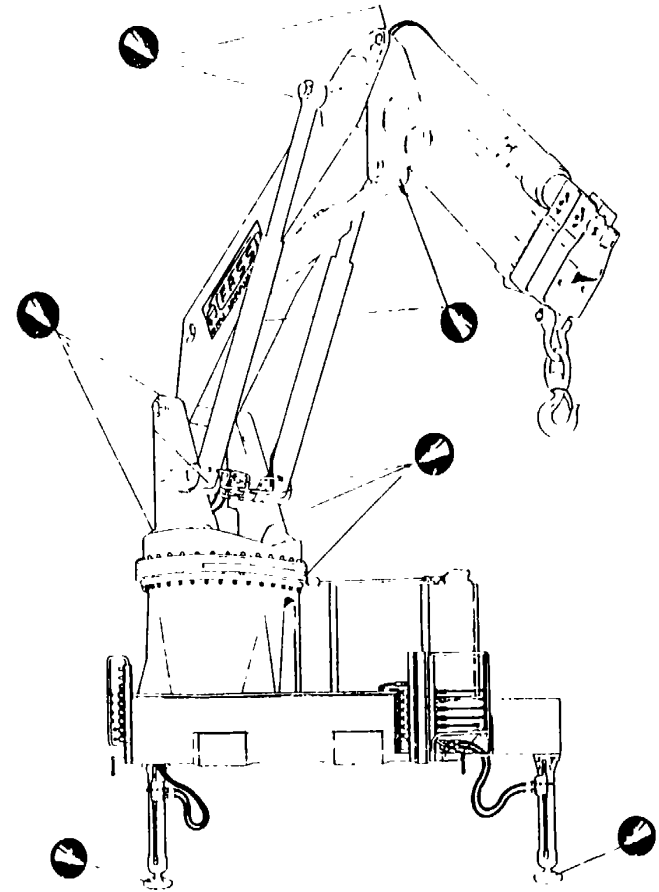
#### WINCH

The winch has its own lifting capacity shown on a separate plate, which can be higher than the capacity of the crane. Do not lift loads with the winch heavier than those shown on the crane rating plate. When loading the wire rope on to the winch barrel, check that the wire does not overlap itself, avoid rearing and if the wire is not sufficiently taut. After every 100 hours use, check the oil level inside the winch motor. After every 40 hours use, grease the pins and pulleys which guide the wire.

#### EXTENSIONS

##### Instructions for Mounting and Use

Manual extensions with self locking. By placing the boom slightly off horizontal, these can be extended or retracted. Take care not to exert too much force on the self locking device, which will be damaged.



 GREASING BY PRESSURE

(see instructions on page 8)

To avoid down time and repair work the following periodic maintenance is suggested:

**AFTER EVERY 40 HOURS USE**

- Check the locking bolts and fixing rods of the crane on the chassis. Retighten if necessary.
- Clean the oil filter at the base of the crane.
- Clean the filter mounted on the suctionway. So metimes this filter is not readily accessible and may be hidden by the truck chassis. If the hydraulic system for the crane is connected to that of a tipper, there could be an extra oil tank. Generally where this is the case, the filter will be mounted on the extra tank. Remove the cartridge, wash with petrol, and dry with compressed air.
- While the crane is folded, check that the level in the hydraulic tank is between minimum & maximum. When topping up use only the oil shown on the proper table.
- Grease all points as shown on page 7 including the points not easily visible. Spread grease on the surface of all telescoping booms to ensure easy movement (remove all sand, grit etc from these surfaces).
- Lubricate all jointed lever rods.

**AFTER EVERY 500 HOURS USE**

- Replace the filter element.
- Clean the air filter in the oil filter cap.
- Completely replace the hydraulic oil.

**GREASING TABLE**

Greasing	Esso Multi Purpose Grease H	AGIP Ft Grease 16
Oil	- 15° c      ESSO NUTO 1115 - 15° c - + 35° c      ESSO NUTO 1-46 - + 35° c      ESSO NUTO 11100	

When industrial oil is not available use the following motor oil:

- 15° c	ESSO HD5W
- 15° c - + 35° c	ESSO HD20W
- + 35° c	ESSO HD30

Industrial oil can't be mixed with motor oil

SYMPTOM	CAUSE	REMEDY
The different booms of the crane won't completely extend during working periods.	Temperature of oil too low  Oil short up  Dirty oil filters  Air inside the hydraulic system	Warm the oil by operating the crane for some minutes.  Top up, as necessary.  Clean the filters.  By passing the different levers operate all the tanks, releasing the dead points both ways.
Slow movements	Dirty oil filter	Clean the filter
Soft controls	Non lubricated joints	Lubricate joints & controls
The power take off does not engage	Fault pressure in the air system of the truck	Keep the pressure of the motor to a fixed speed until the air pressure reaches 5.6 atm.
The crane does not lift the specified loads	Non efficiency of the pump  Generaly parts not adjusted, broken or broken  Rings with worn out packings	Replace the pump.  Control the working pressure and adjust the valves.  Replace packings.
Crane slewing erratic	Vehicle not in level position  Flow regulator valve not correctly adjusted  Anti shock valve non adjusted  Worn out packing on the slewing cylinders  Excessive clearance of the rack	Stabilize the vehicle.  Adjust the valve.  Adjust the valve.  Replace packings.  Regulate the clearance.

**NOTE** The checking and adjustment of the pressure must be carried out by an authorized service center. Failure to comply may nullify warranty.



# F10

## CATALOGO PARTI RICAMBIO SPARE PARTS CATALOGUE



### IMPORTANTE

Per la richiesta dei pezzi di ricambio indicare chiaramente

- 1 - Numero di matricola della gru (stampigliato sul supporto colonna)
- 2 - Tavola e figura
- 3 - Denominazione del pezzo
- 4 - Numero di codice
- 5 - Numero dei pezzi

### IMPORTANT

When requesting spare parts specify

- 1 - Crane serial number (printed into pillar support)
- 2 - Table and figure
- 3 - Part name
- 4 - Code number
- 5 - Number of pieces

### IMPORTANT

Prière de spécifier clairement dans vos commandes de pièces de rechange

- 1 - Le chiffre de la grue (poinçonné sur le support de la colonne)
- 2 - Table et dessin
- 3 - Nom de la pièce
- 4 - Numéro de code
- 5 - Quantité des pièces

### WICHTIG

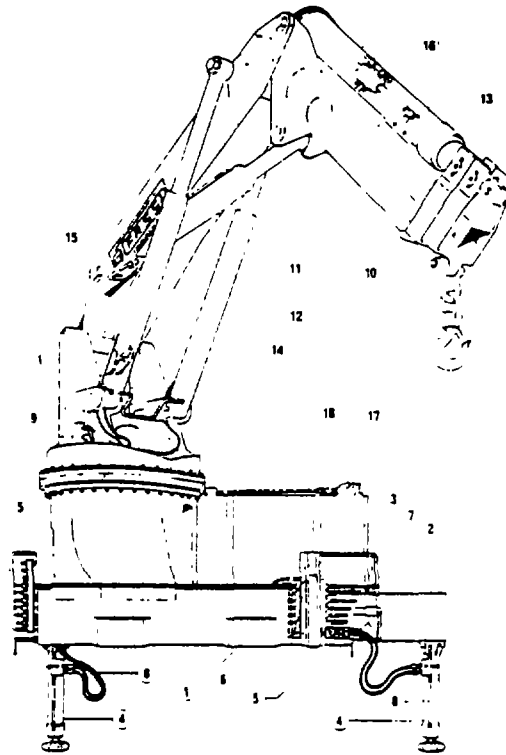
Bei Ersatzteilanfrage muss folgendes genau angegeben werden

- 1 - Bau-Nummer des Kranes (auf der Säulenstütze gedruckt)
- 2 - Tabelle und Bild
- 3 - Bezeichnung des Teiles
- 4 - Code-Nummer
- 5 - Menge der Teile

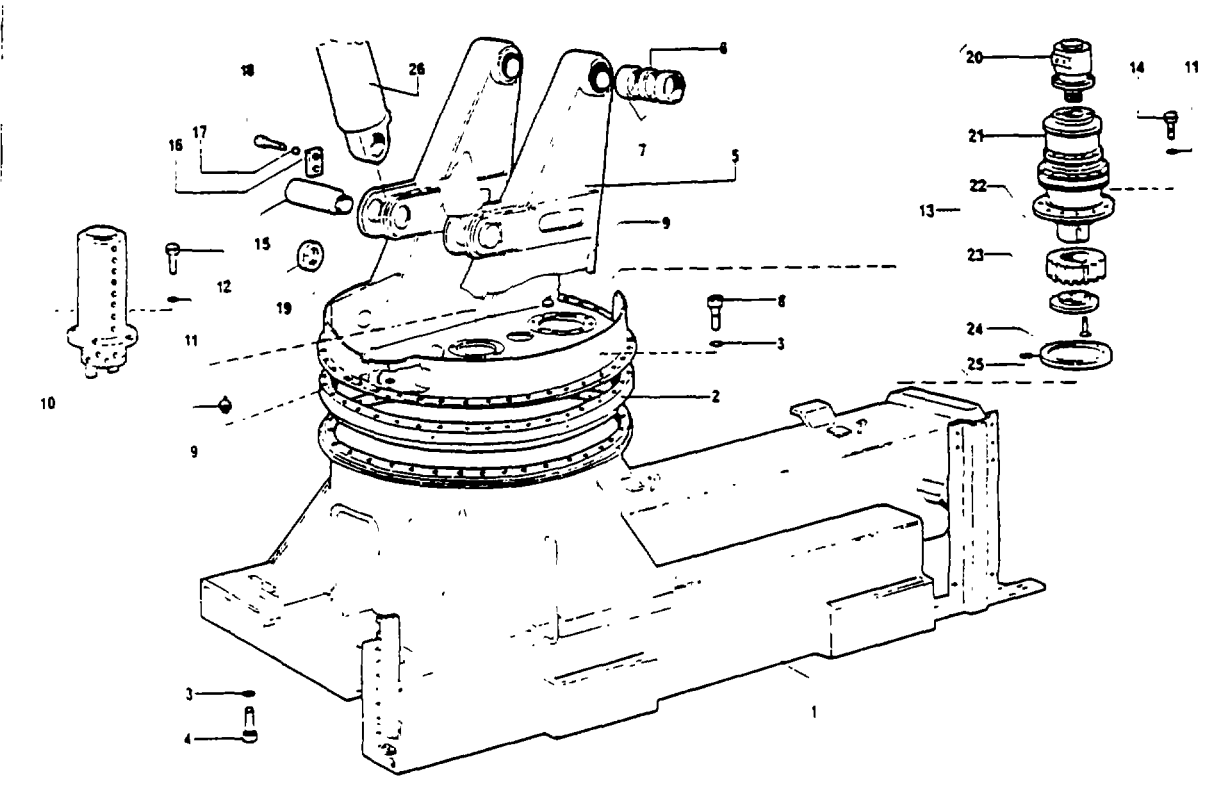
### IMPORTANTE

Por el pedido de las piezas de requesto indicar claramente

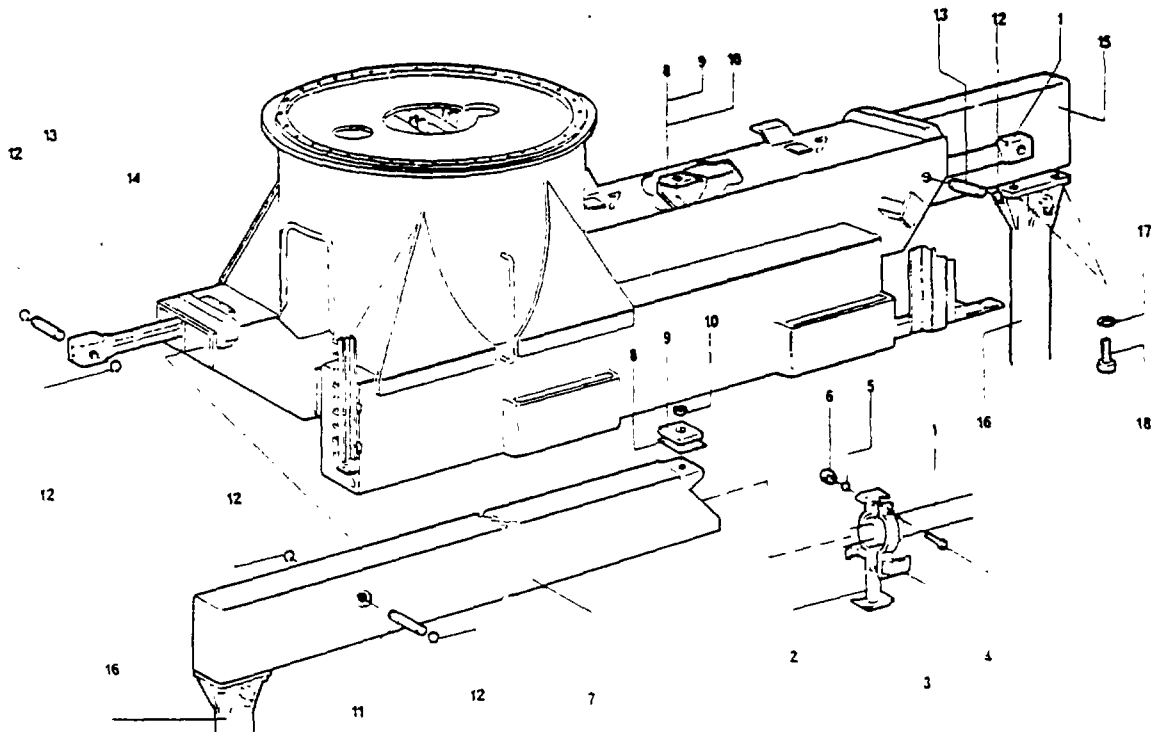
- 1 - Número de matrícula de la grua (sellado en la correspondiente columna)
- 2 - Tabla y figura
- 3 - Denominación de la pieza
- 4 - Número de código
- 5 - Número de las piezas



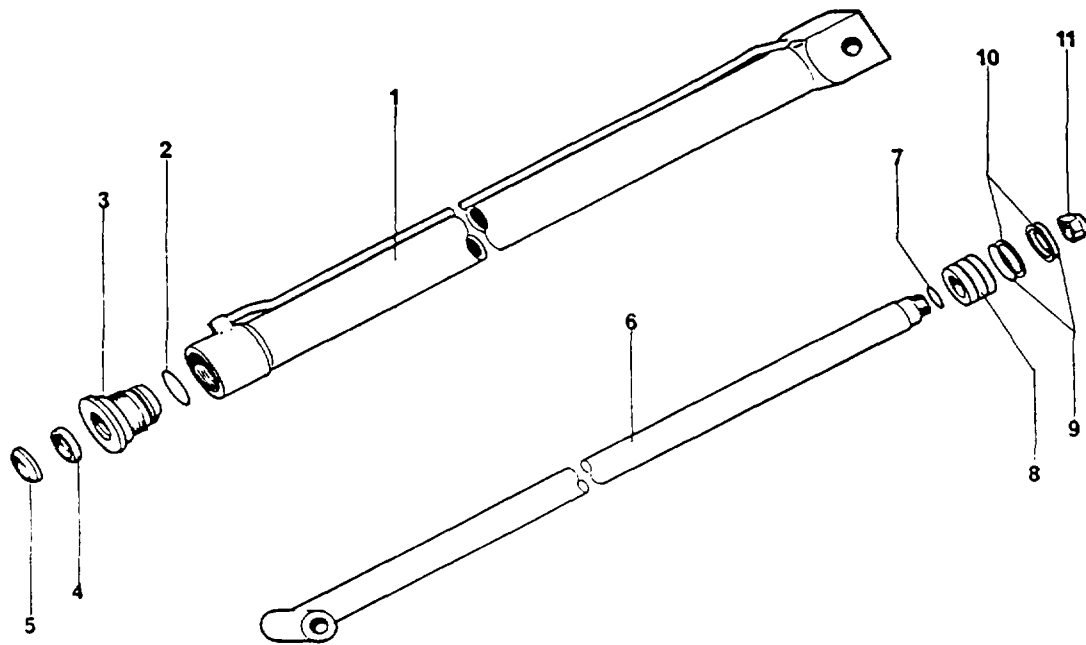
NOMENCLATURA GENERALE DELLA GRU	GENERAL CRANE NOMENCLATURE	TAV.	NOMENCLATURA GENERALE DELLA GRU	GENERAL CRANE NOMENCLATURE	TAV.
1	Asieme casamento e colonna	1	Varianti per gru con seggiolino	Modifications for crane with seat	
2	Asieme stabilizzatori	2	Asieme basamento e colonna	Pillar and base assembly	24
3	Maninetti estensione stabilizzatori	3	Asieme distributore e deviatore	Deviator and distributor assembly	25
4	Maninetti stabilizzatori	4	Distributore (particolari)	Distributor parts	26
5	Asieme distributore e deviatore con doppi comandi	5	Asieme distr. e segg. su colonna	Seat and distr. assembly on pillar	27
6	Distributore (particolari)	6	Tubazioni per distributore	Pipings for distributor	28
7	Tubazione per maninetti estensione stabilizzatori	7	Tubazioni per rotazione e man. principali	Pipings for rotation and main rams	29
8	Tubazione per man. stabilizzatori	8	Tubazioni per man. secondario e stiliamento	Pipings for secondary and extension rams	30
9	Tubazione per rotazione	9-10	Tubazioni supplementari	Extra pipings	31
10	Asieme bracci stabilizz. F10.2	11	Extra	Extra	
11	Asieme bracci stabilizz. F10.3	12	Asieme distr. e comandi per tubazione supplementare	Distributor and controls assembly for extra piping	32
12	Asieme braccio principale e stabilizz. F10.2	13	Asieme distr. e comandi per doppi tubaz. supplementare	Distributor and controls assembly for double extra piping	33
13	Asieme braccio principale e stabilizz. F10.3	14	Asieme tubaz. supplementare	Extra piping assembly	34
14	Maninetti principali e secondario	15	Asieme doppia tubaz. suppi.	Double extra piping assembly	35
15	Maninetti doppio stiliamento	16	Asieme traversa per stab. post.	Cross-bar assem. for rear outriggers	37
16	Maninetti triolo stiliamento	17	Maninetti per stablizz. post.	Rams for rear outriggers	38
17	Tubazione per man. principali	18-19	Tubazione per stablizz. post.	Piping for rear outriggers	39
18	Tubazione per man. secondario	20	Stabilizzatore per 690	Outriggers for truck with front axes	40
19	Tubazione per maninetti estensione bracci	21	Prolunghe C e CM per F10.2	Extensions C and CM for F10.2	41
20	Asieme serbatoio olio	22	Prolunga CMN per F10.2	Extension CMN for F10.2	42
21	Asieme tubazioni ritorno	23	Prolunga CMNP per F10.2	Extension CMNP for F10.2	43
			Prolunghe M e MN per F10.3	Extensions M and MN for F10.3	44
			Prolunga MNP per F10.3	Extension MNP for F10.3	45
			Ass. bracci per prolunga L-F10.2	Booms ass. for extension L-F10.2	46
			Ass. bracci per prolunga L-F10.3	Booms ass. for extension L-F10.3	47
			Maninetti per prolunghe L	Rams for extension L	48
			Tubazione per prolunghe L	Piping for extensions L	49
			Ass. bracci per prolunga L1-F10.3	Booms ass. for extension L1-F10.3	50
			Maninetti per prolunga L1-F10.3	Rams for extension L1-F10.3	51
			Tubazione per prolunga L1-F10.3	Piping for extension L1-F10.3	52



POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Basamento	Base	1	100437					
2	Colonna	Pillar	1	100439					
3	Rondella	Washer	2	RE229					
4	File	Screw	36	100220					
5	Colonna (compr. 6-7)	Pillar (compr. 6-7)	1	100439					
6	Distanziale	Spacer	1	100136					
7	Bronzina	Bush	2	52008					
8	File	Screw	36	100220					
9	Ingrassatore	Grease nipple	4	IN845					
10	Distributore rotante	Rotating distributor	1	DR100					
11	Rondella	Washer	14	RE269					
12	File	Screw	4	11587					
13	Motoriduttore completo	Complete motor-reducer	1	100426					
14	File	Screw	10	11526					
15	Perno	Pin	2	100016					
16	Plastina	Keep plate	2	100018					
17	Rondella	Washer	1	RE269					
18	File	Screw	4	11603					
19	Smiera	Ring nut	2	DA997					
20	motore	draulic motor	1	MT121					
21	Riduttore	Speed reducer	1	RD100					
22	Pignone	Pinion gear	1	PI100					
23	Tappo	Plug	1	FO100					
24	Flangia	Flange	1	100284					
25	File	Screw	1	11542					
26	Manifetto principale	Main ram	1	100025					

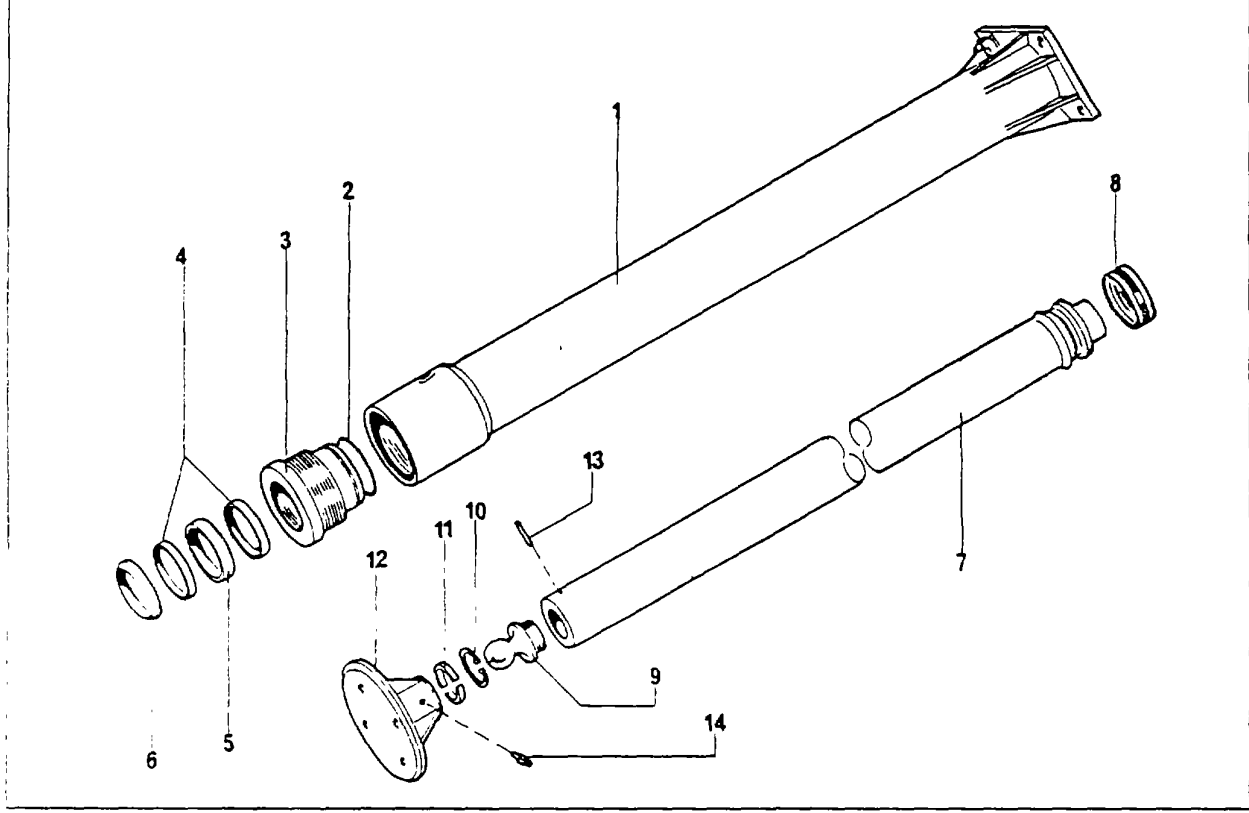


POS ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Manineto estensione sinistro	Left extension ram	1	•					
2	Supporto	Support	1	101120					
3	Supporto	Support	1	101223					
4	vite	Screw	2	11545					
5	Rondella	Washer	3	RE276					
6	Cado	Nut	2	DA695					
7	Supporto stabiliz. sinistro	Left outrigger support	1	100150					
8	Spessore (0,5)	Shim (0.5)	1	100433					
9	Spessore (0,8)	Shim (0.8)	1	100434					
10	Patino	Guide shoe	2	100432					
11	Ghiera	Ring nut	2	36114					
12	Perno	Pin	2	100149					
13	Anello d'arresto	Circle	8	AS948					
14	Perno	Pin	2	86512					
15	Manineto estensione destro	Right extension ram	1	•					
16	Supporto stabiliz. destro	Right outrigger support	1	100151					
17	Manineto stabilizzatore	Outrigger ram	2	•					
18	Rondella	Washer	3	RE258					
19	vite	Screw	3	11632					
	• vedi tavola 3)	• See table 3)							
	• vedi tavola 4)	• See table 4)							

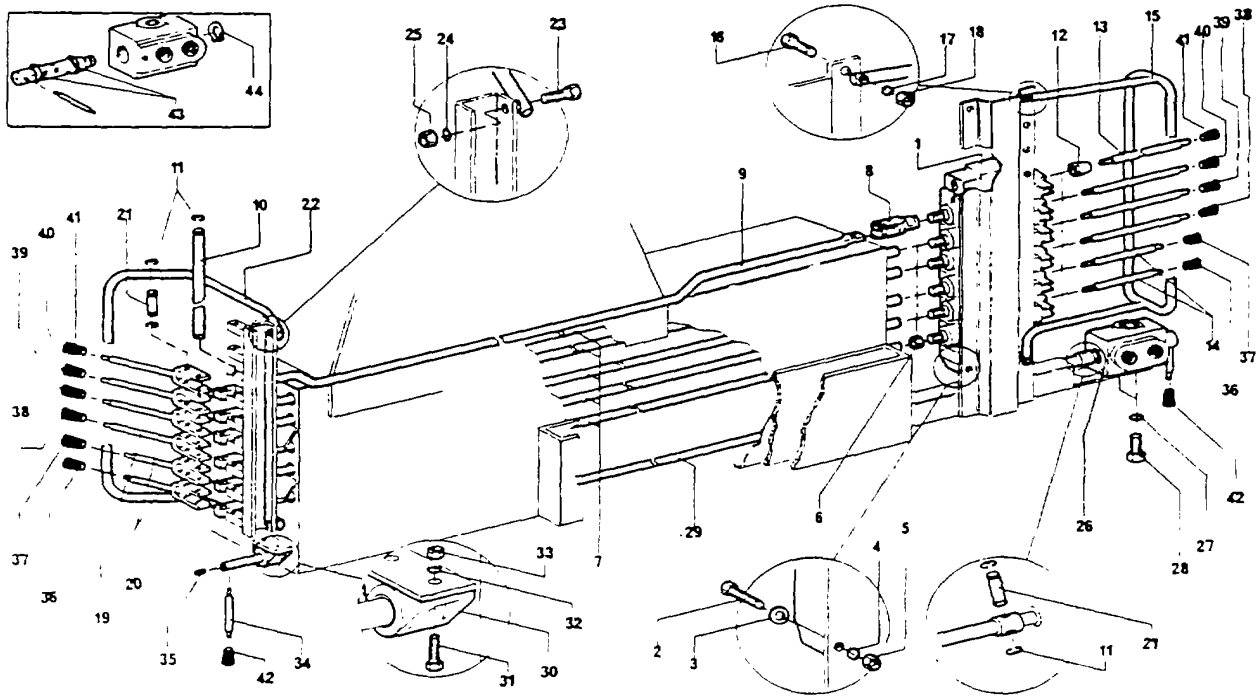


POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
•	Martinetto sinistro completo	Complete left ram	1	100040		Martinetto destro completo	Complete right ram	1	100891
1	Cilindro	Cylinder	1	100041	1	Cilindro	Cylinder	1	100892
2	Guarnizione OR	O-ring	1	GO142	2	Guarnizione OR	O-ring	1	GO131
3	Ghiera	Ring nut	1	51179	3	Ghiera	Ring nut	1	100883
4	Guarnizione	Seal	1	GM370	4	Guarnizione	Seal	1	GB348
5	Guarnizione parapolvere	Dust cover seal	1	GW413	5	Guarnizione parapolvere	Dust cover seal	1	GW435
6	Stelo	Rod	1	100042	6	Stelo	Rod	1	100899
7	Guarnizione OR	O-ring	1	GO132	7	Guarnizione OR	O-ring	1	GO132
8	Pistone	Piston	1	51180	8	Pistone	Piston	1	51180
9	Guarnizione OR	O-ring	2	GO142	9	Guarnizione OR	O-ring	2	GO142
10	Anello antistrusione	Support ring	2	BK920	10	Anello antistrusione	Support ring	2	BK920
11	Dado autobloccante	Self-locking nut	1	DA619	11	Dado autobloccante	Self-locking nut	1	DA619
	Serie completa guarnizioni	Complete set of seals	1	GSC21		Serie completa guarnizioni	Complete set of seals	1	GSC140
	• Vale fino alla gru main. 037)	(• Applicable up to the crane 037)							
•	Martinetto sinistro completo	Complete left ram	1	100880					
1	Cilindro	Cylinder	1	100881					
2	Guarnizione OR	O-ring	1	GO131					
3	Ghiera	Ring nut	1	100883					
4	Guarnizione	Seal	1	GB348					
5	Guarnizione parapolvere	Dust cover seal	1	GW435					
6	Stelo	Rod	1	100882					
7	Guarnizione OR	O-ring	1	GO132					
8	Pistone	Piston	1	51180					
9	Guarnizione OR	O-ring	2	GO142					
10	Anello antistrusione	Support ring	2	BK920					
11	Dado autobloccante	Self-locking nut	1	DA619					
	Serie completa guarnizioni	Complete set of seals	1	GSC140					
•	Martinetto destro completo	Complete right ram	1	90313					
1	Cilindro	Cylinder	1	90314					
2	Guarnizione OR	O-ring	1	GO142					
3	Ghiera	Ring nut	1	51179					
4	Guarnizione	Seal	1	GM370					
5	Guarnizione parapolvere	Dust cover seal	1	GW413					
6	Stelo	Rod	1	30315					
7	Guarnizione OR	O-ring	1	GO132					
8	Pistone	Piston	1	51180					
9	Guarnizione OR	O-ring	2	GO142					
10	Anello antistrusione	Support ring	2	BK920					
11	Dado autobloccante	Self-locking nut	1	DA619					
	Serie completa guarnizioni	Complete set of seals	1	GSC21					

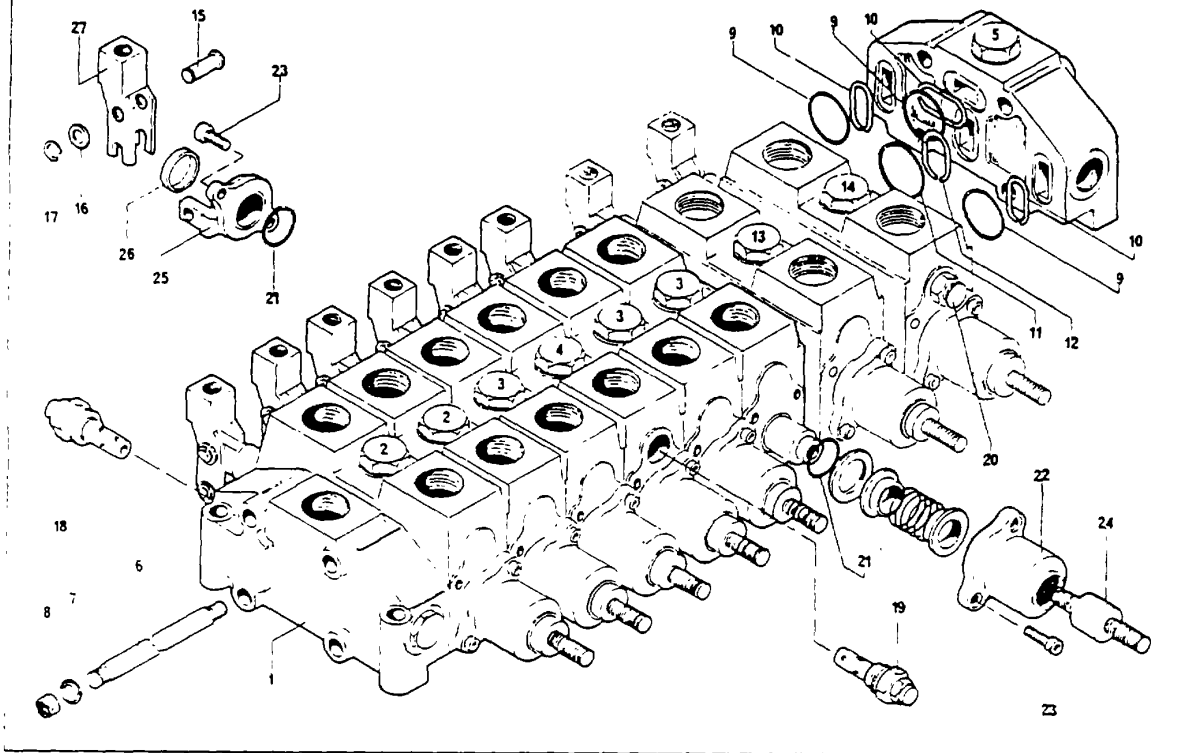




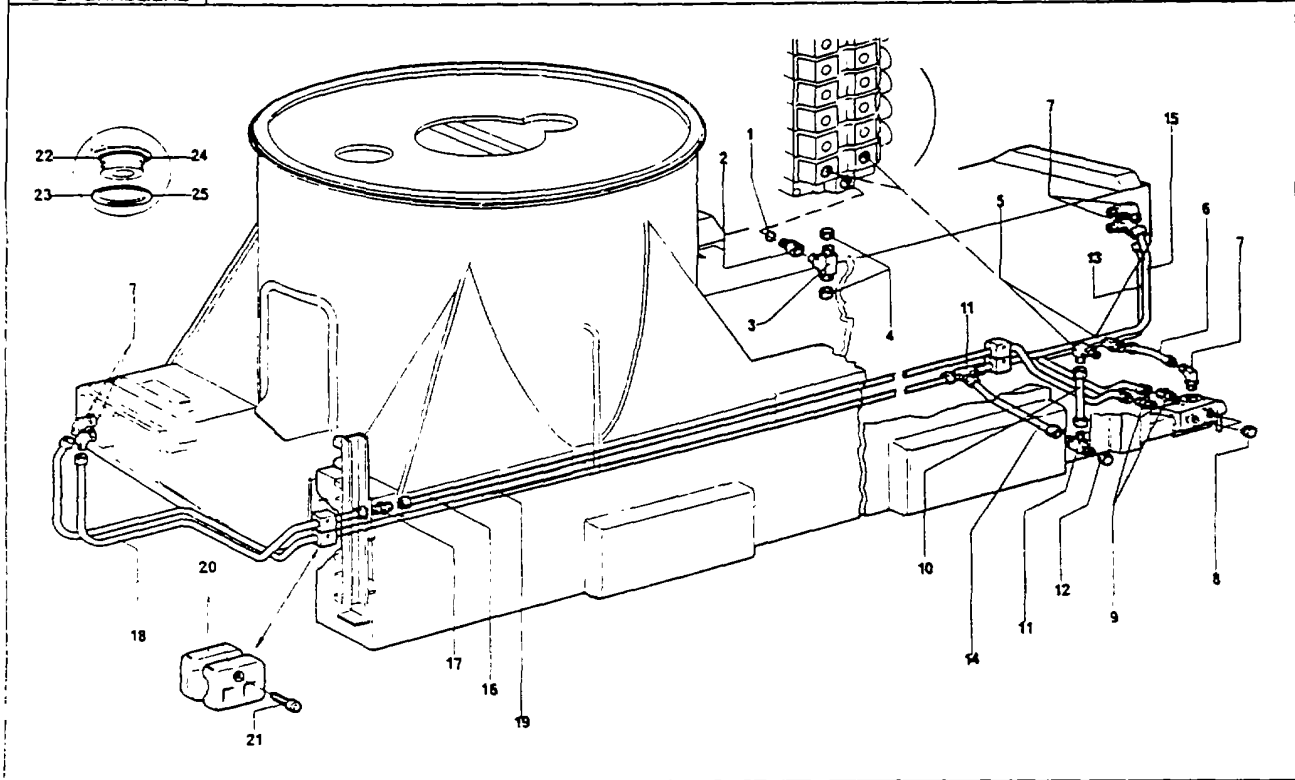
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	COD. CODE
1	• Marinetto completo	Complete ram	2	100174					
2	Cilindro	Cylinder	1	100175					
3	Guarnizione OR	O-ring	1	GO128					
4	Ghiera	Ring nut	1	100177					
5	Anello di guida	Guide ring	2	AG391					
6	Guarnizione	Seal	1	GB405					
7	Guarnizione parapolvere	Dust cover seal	1	GW430					
8	Stelo	Rod	1	100176					
9	Guarnizione	Seal	1	GP343					
10	Snodo sferico	Ball joint	1	100178					
11	Anello d'arresto	Circle	1	AS998					
12	Anello di fermo	Stop ring	1	90766					
13	Plastrina d'appoggio	Backing plate	1	100179					
14	Ingrassatore	Grease nipple	1	IN702					
	Sette completa guarnizioni	Complete set of seals	1	GSC118					
	(• Vale fino alla gru matr. 056)	(• Applicable up to the crane 056)							
1	• Marinetto completo	Complete ram	2	100925					
2	Cilindro	Cylinder	1	100926					
3	Guarnizione OR	O-ring	1	GO128					
4	Ghiera	Ring nut	1	100177					
5	Anello di guida	Guide ring	2	AG391					
6	Guarnizione	Seal	1	GB405					
7	Guarnizione parapolvere	Dust cover seal	1	GW430					
8	Stelo	Rod	1	100176					
9	Guarnizione	Seal	1	GP343					
10	Snodo sferico	Ball joint	1	100178					
11	Anello d'arresto	Circle	1	AS998					
12	Anello di fermo	Stop ring	1	90766					
13	Plastrina d'appoggio	Backing plate	1	100179					
14	Spina elastica	Spring pin	1	SP993					
	Ingrassatore	Grease nipple	1	IN845					
	Sette completa guarnizioni	Complete set of seal	1	GSC118					



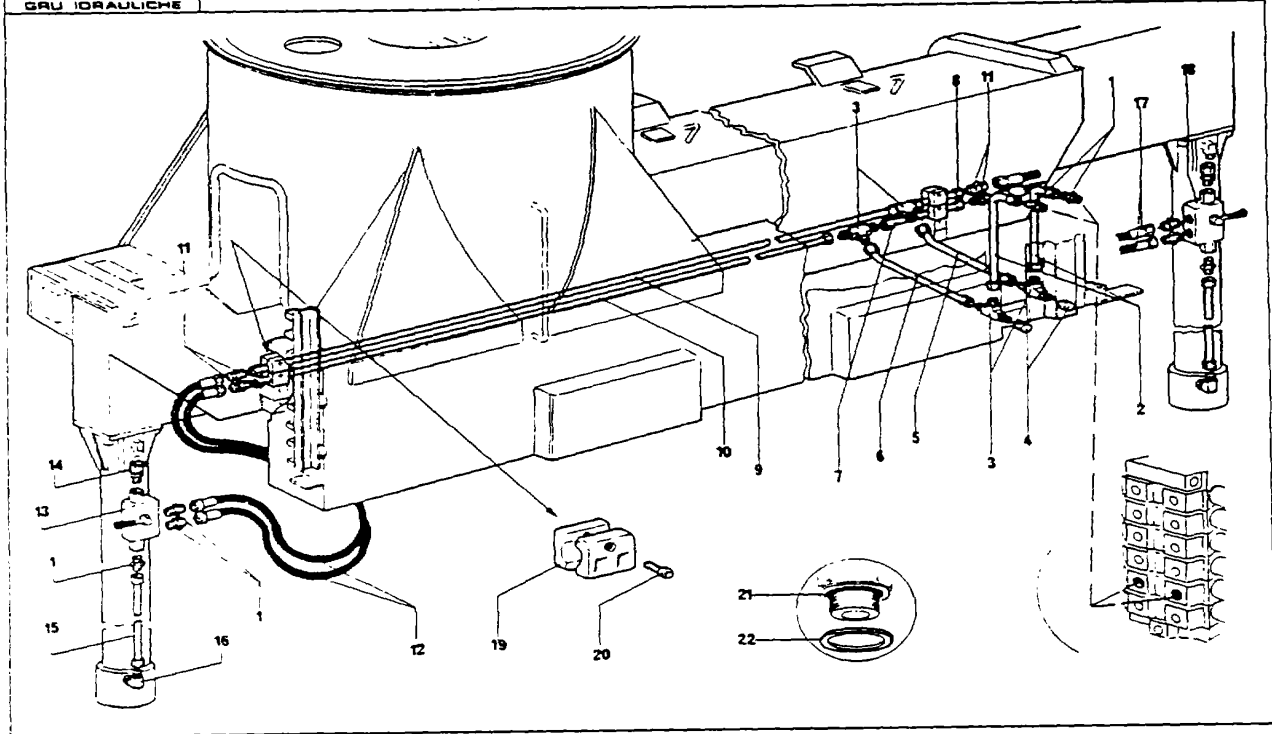
POS ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA QTY	CODICE CODE	POS ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA QTY	CODICE CODE
1	Distributore	Distributor	1	01063	40	Pomello matr. secondario	Secondary ram knoc	2	PC104
2	File	Screw	3	1614	41	Pomello matr. stiaamento	Extension ram knoc	2	PC105
3	Rondella	Washer	3	RP226	42	Pomello	Knoc	2	PC102
4	Rondella	Washer	3	RE227	43	Guarnizione OR	O-ring	1	GC132
5	Dado	Nut	3	DA602	44	Anello d'arresto	Circlo	1	6764
6	Dado	Nut	5	DA634					
7	File	Rod	5	100285					
8	Rondella	Fork	1	FR101					
9	File (di serie)	Rod (standard)	1	100664					
10	File (basamento centrale)	Rod (central base)	1	100594					
11	Perno	Pin	1	41190					
12	Anello d'arresto	Circlo	16	AR730					
13	Controcado	Lock nut	6	DI232					
14	Leva	Lever	4	36220					
15	Leva per stabilizzatori	Lever for outriggers	2	36221					
16	Paraleve	Levers guard	1	100451					
17	File	Screw	1	16504					
18	Rondella	Washer	1	RE277					
19	Dado	Nut	1	DA602					
20	Leva	Lever	4	100344					
21	Leva per stabilizzatori	Lever for outrigger	2	100345					
22	Perno	Pin	7	16374					
23	Paraleve	Levers guard	1	100409					
24	File	Screw	2	16522					
25	Rondella	Washer	2	RE276					
26	Dado	Nut	2	DA603					
27	Deviatore (combi 43+44)	Deviator (combi 43+44)	1	51236					
28	Rondella	Washer	2	RE277					
29	File	Screw	2	16550					
30	File	Transmission rod	1	100288					
31	Supporto	Support	1	90635					
32	File	Screw	1	16538					
33	Rondella	Washer	2	RE278					
34	Dado	Nut	2	DA603					
35	Leva	Lever	1	51341					
36	File	Screw	1	16542					
37	Pomello estension stia	Outrigger extension knoc	2	PC124					
38	Pomello stabilizzatori	Outriggers knoc	2	PC125					
39	Pomello rotazione	Rotation knoc	2	PC102					
40	Pomello matr. princ. ball	Main ram's knoc	2	PC103					



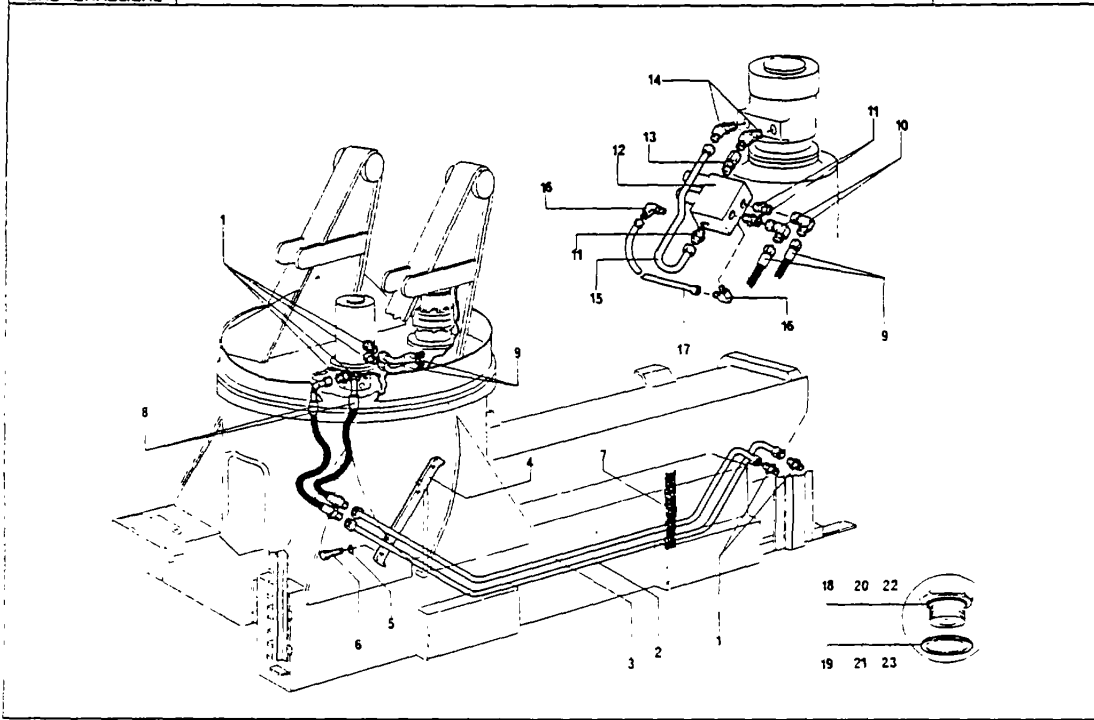
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
	Distributore (6 elem. di serie)	Distributor (6 segments-standard)		D1063	25	Supporto leva	Lever support		D1121
	Distributore di serie - 1 elem. a C.A.	Distributor (stand - 1 open center seg.)		D1067	26	Guarnizione	Seal		D1122
	Distributore di serie - 2 elem. a C.A.	Distributor (stand - 2 open center seg.)		D1068	27	Forcella	Fork		D1123
	Distributore di serie - 3 elem. a C.A.	Distributor (stand - 3 open center seg.)		D1069					
1	Testata d'entrata (compl. 18)	Inlet head (compl. 18)		D1105					
2	Elemento distributore a C.C.	Distr. closed center segment		D1106					
3	Elemento distributore a C.A.	Distr. open center segment		D1107					
4	Elemento distributore a C.A. - V.B. (compl. 19)	Distributor open center - V.B. segment (compl. 19)		D1135					
5	Testata d'uscita	Outlet head		D1109					
6	Tirante (di serie)	Tie rod (standard)		D1092					
	Tirante (7 elementi)	Tie rod (7 segments)		D1093					
	Tirante (8 elementi)	Tie rod (8 segments)		D1094					
	Tirante (9 elementi)	Tie rod (9 segments)		D1095					
7	Pondella	Washer		RE272					
8	Dado	Nut		DA647					
9	Guarnizione OR	O-ring		GO198					
10	Anello di sostegno	Support ring		D1125					
11	Guarnizione OR	O-ring		GO154					
12	Anello di sostegno	Support ring		D1126					
13	Elemento distr. suppl. in C.A.	Extra center segment		D1107					
14	Elemento distributore suppl. in C.A. - VA - VB. (compl. 20)	Extra open center - V.A. - V.B. segments (compl. 20)		D1191					
15	Perno	Pin		D1119					
16	Pondella	Washer		RP207					
17	Anello d'arresto	Circlip		AR730					
18	Valvola by-pass	By-pass valve		D1110					
19	Valvola di sovrappressione	Overpressure valve		D1111					
20	Valvola di sovrappressione	Overpressure valve		D1231					
21	Guarnizione OR	O-ring		GO132					
22	Coperchietto	Cover		D1122					
23	File	Screw		J1584					
24	Coccia	Tang		D1123					



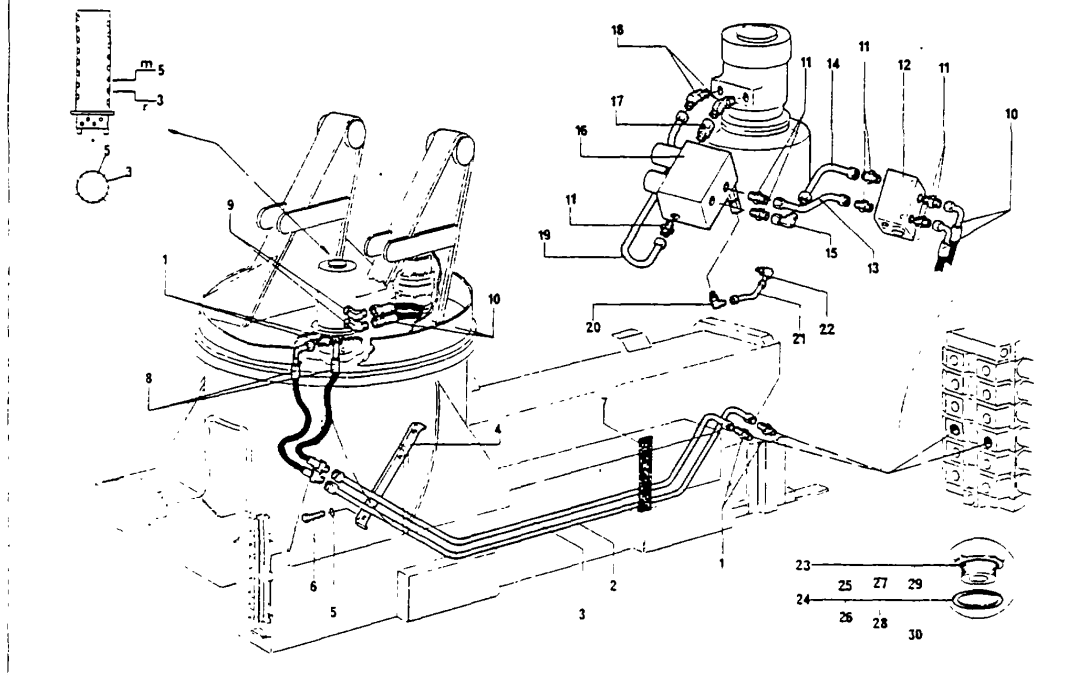
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Rondella rame	Copper washer	1	RR807					
1	Raccordo girevole	Revolving union	1	RV963					
1	Raccordo	Union	1	RV964					
1	Tapppo	Plug	2	TA734					
2	Racc. a gomito (com 22+23)	Elbow (compi 22+23)	2	RS946					
1	Tubo	Pipe	1	100395					
5	Racc. a gomito (com 24+25)	Elbow (compi 24+25)	5	RS947					
2	Tapppo	Plug	2	TA736					
2	Nippolo (comp. 24+25)	Nipple (compi 24+25)	2	NI985					
1	Tubo	Pipe	1	100261					
2	Raccordo	Union	2	RV960					
1	Tapppo	Plug	1	TA735					
1	Tubo	Pipe	1	100401					
1	Tubo	Pipe	1	100387					
1	Tubo	Pipe	1	100399					
1	Tubo	Pipe	1	100403					
1	Nippolo	Nipple	1	NI921					
1	Tubo	Pipe	1	100575					
1	Tubo	Pipe	1	100574					
3	Supporto tubo	Pipe support	3	CF104					
4	Vite	Screw	4	VI584					
2	Guarnizione OR	O-ring	2	GO145					
2	Rondella	Washer	2	RP225					
2	Guarnizione OR	O-ring	2	GO138					
2	Rondella	Washer	2	RP227					



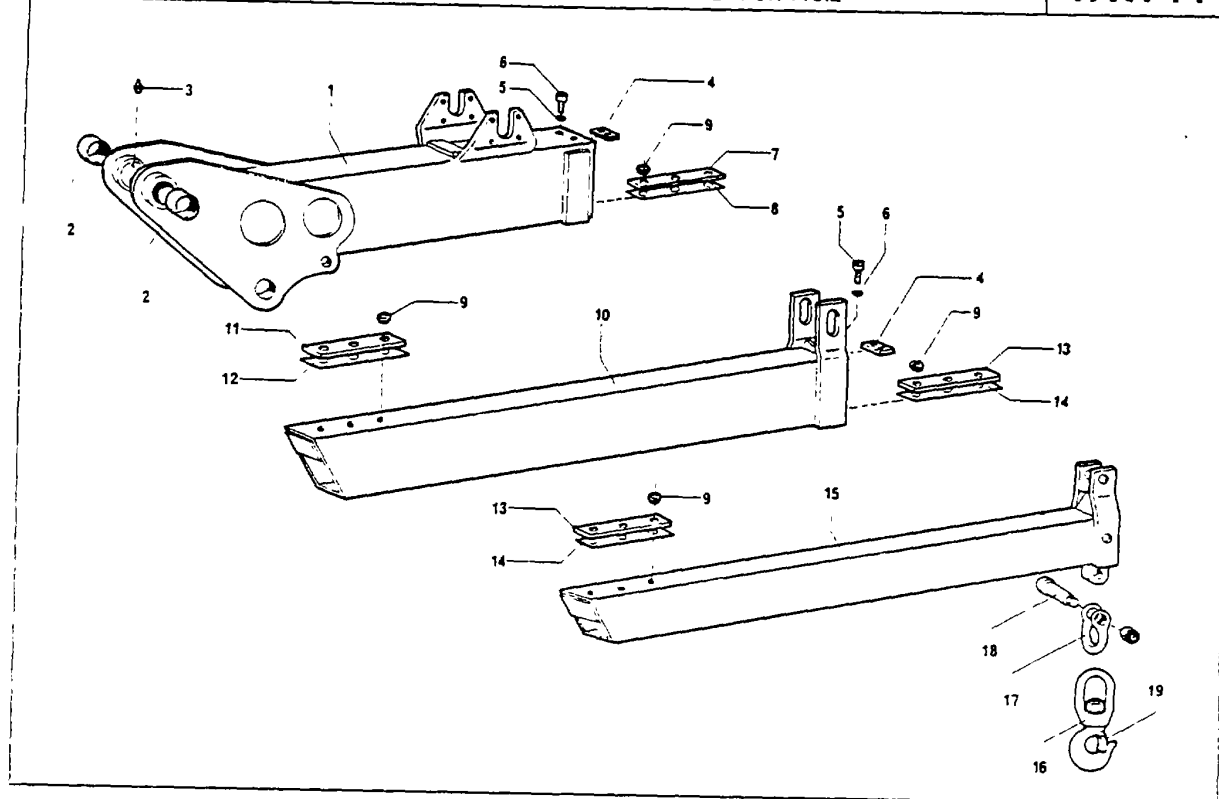
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Tubo (comp. 21+22)	Nipple (comp. 21+22)	8	NI920					
2	Tubo	Pipe	2	100393					
3	Raccordo	Union	4	RV980					
4	Tubo	Plug	2	TA735					
5	Tubo	Pipe	1	100407					
6	Tubo	Pipe	1	100385					
7	Tubo	Pipe	1	100381					
8	Tubo	Pipe	1	43133					
9	Tubo	Pipe	1	100383					
10	Tubo	Pipe	1	100406					
11	Tubo	Nipple	4	NI921					
12	Tubo flessibile	Hose	2	TG549					
13	Valvola di blocco	Block valve	1	VA140					
14	Raccordo girevole (comp. 21+22)	Revolving union (comp. 21+22)	2	RV992					
15	Tubo	Pipe	2	100389					
16	Raccordo a gomito (comp. 21+22)	Elbow (comp. 21+22)	2	RS946					
17	Tubo flessibile	Hose	2	TG548					
18	Valvola di blocco	Block valve	1	VA155					
19	Supporto tubo vite	Pipe support Screw	8	CF104					
20	Vite	Screw	4	V1584					
21	Guarnizione OR	O-ring	1	GO145					
22	Rondella	Washer	1	RP225					



POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
•	Valerino alla gru main 056	Appl up to the crane 056							
6	Nippio (compi 18+19)	Nipple (compi 18+19)	6	NI986					
2	Tubo	Pipe	1	100245					
3	Tubo	Pipe	1	100247					
4	Supporto tubi	Pipes support	1	100424					
5	Rondella	Washer	3	RE276					
5	Vite	Screw	3	VI545					
5	Soessore	Shim	1	100425					
3	Tubo flessibile	Hose	2	TG574					
3	Tubo flessibile	Hose	2	TG575					
10	Raccordo a gomito	Elbow	2	RV944					
11	Nippio (compi 20+21)	Nipple (compi 20+21)	3	NI988					
12	Valvola regolatrice	Regulator valve	1	VA150					
13	Raccordo girevole (compi 20+21)	Revolving union (compi 20+21)	1	RV943					
14	Raccordo a gomito (compi 18+19)	Elbow (compi 18+19)	2	RV958					
15	Tubo	Pipe	1	100833					
16	Raccordo a gomito (compi 22+23)	Elbow (compi 22+23)	2	RS955					
17	Tubo	Pipe	1	100834					
18	Guarnizione OR	O-ring	1	GO145					
19	Rondella	Washer	1	RP225					
20	Guarnizione OR	O-ring	1	GO173					
21	Rondella	Washer	1	RP228					
22	Guarnizione OR	O-ring	1	GO123					
23	Rondella	Washer	1	RP232					

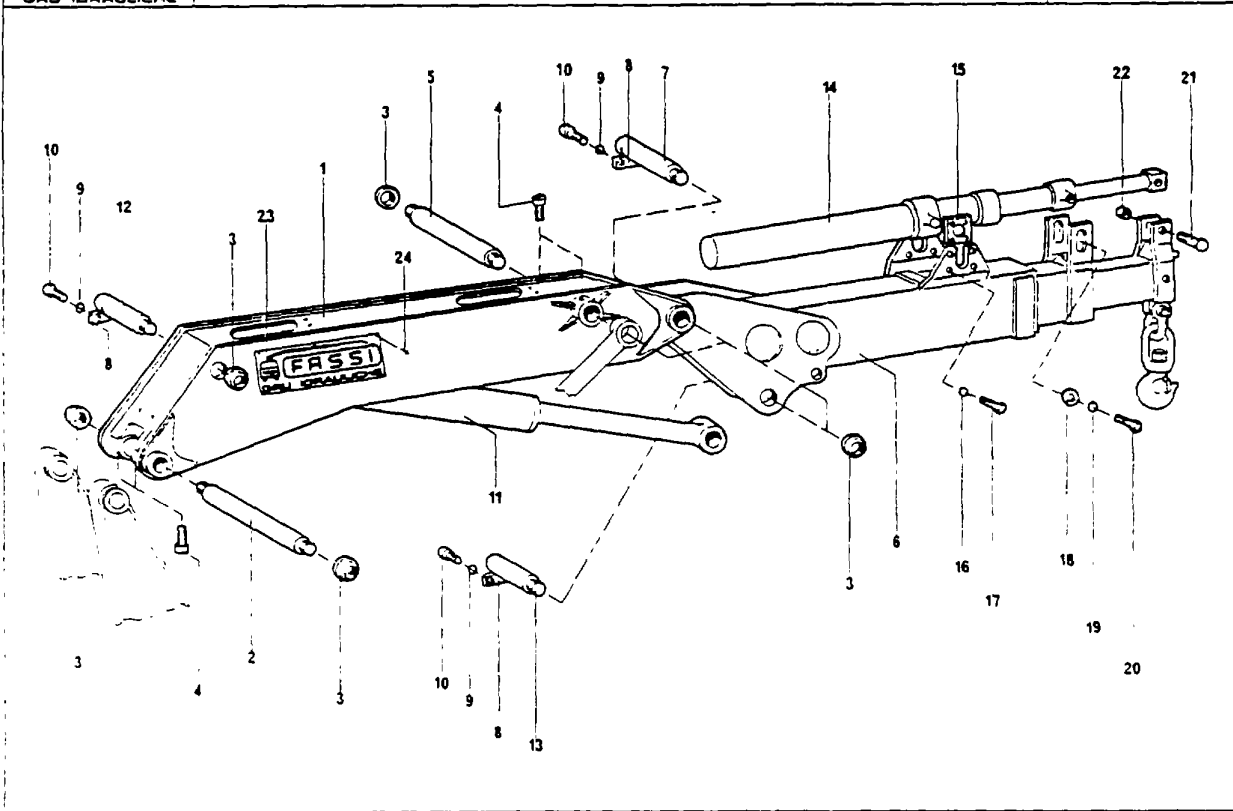


POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA O.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA O.TY	CODICE CODE
1	Nippio (comp. 23+24)	Nipple (comp. 23+24)	4	NI986	1	Tubo	Pipe	1	100245
2	Tubo	Pipe	1	100247	3	Tubo flessibile	Hose	2	TG574
4	Supporto tubi	Pipes support	1	100424	4	Raccordo a gomito	Elbow	1	101183
5	Rondella	Washer	3	RE276	5	Raccordo a gomito a vite regolabile	Regular valve	1	RV944
6	Vite	Screw	3	VI545	6	Raccordo girevole	Revolving Union	1	RV943
7	Spessore	Shim	1	100425	8	Raccordo a gomito	Elbow	2	RV958
8	Tubo flessibile	Hose	2	TG574	9	Tubo tipo Brevini	Pipe (Brevini type)	1	100833
9	Raccordo a gomito comp. 23+24)	Elbow (comp. 23+24)	2	RS951	10	Tubo tipo Trasmital	Pipe (Trasmital type)	1	101317
10	Tubo flessibile	Hose	2	TG653	11	Raccordo a gomito comp. 27+28)	Elbow	1	RS958
11	Nippio (comp. 25+26)	Nipple (comp. 25+26)	7	NI988	12	Tubo	Pipe	1	56676
12	Valvola	Valve	1	VA168	13	Raccordo (tipo Brevini comp. 29+30)	Union (Brevini type comp. 29+30)	1	RS955
13	Tubo	Pipe	1	101182	14	Raccordo (tipo Trasmital comp. 27+28)	Union (Trasmital type comp. 27+28)	1	RS958
14	Tubo	Pipe	1	101183	15	Guarnizione CR	O-ring	1	GO145
15	Raccordo a gomito a vite regolabile	Regular valve	1	VA150	16	Rondella	Washer	1	RP225
16	Raccordo a gomito comp. 23+24)	Elbow (comp. 23+24)	2	RV958	17	Guarnizione CR	O-ring	1	GO170
17	Tubo tipo Brevini	Pipe (Brevini type)	1	100833	18	Rondella	Washer	1	RP228
18	Tubo tipo Trasmital	Pipe (Trasmital type)	1	101317	19	Guarnizione CR	O-ring	1	GO174
19	Raccordo a gomito comp. 27+28)	Elbow	1	RS958	20	Rondella	Washer	1	RP227
20	Tubo	Pipe	1	56676	21	Guarnizione CR	O-ring	1	GO123
21	Raccordo (tipo Brevini comp. 29+30)	Union (Brevini type comp. 29+30)	1	RS955	22	Rondella	Washer	1	RP232
22	Raccordo (tipo Trasmital comp. 27+28)	Union (Trasmital type comp. 27+28)	1	RS958	23	Guarnizione CR	O-ring	1	GO145
23	Guarnizione CR	O-ring	1	GO145	24	Rondella	Washer	1	RP225
24	Rondella	Washer	1	RP225	25	Guarnizione CR	O-ring	1	GO170
25	Guarnizione CR	O-ring	1	GO170	26	Rondella	Washer	1	RP228
26	Rondella	Washer	1	RP228	27	Guarnizione CR	O-ring	1	GO174
27	Guarnizione CR	O-ring	1	GO174	28	Rondella	Washer	1	RP227
28	Rondella	Washer	1	RP227	29	Guarnizione CR	O-ring	1	GO123
29	Guarnizione CR	O-ring	1	GO123	30	Rondella	Washer	1	RP232
30	Rondella	Washer	1	RP232					

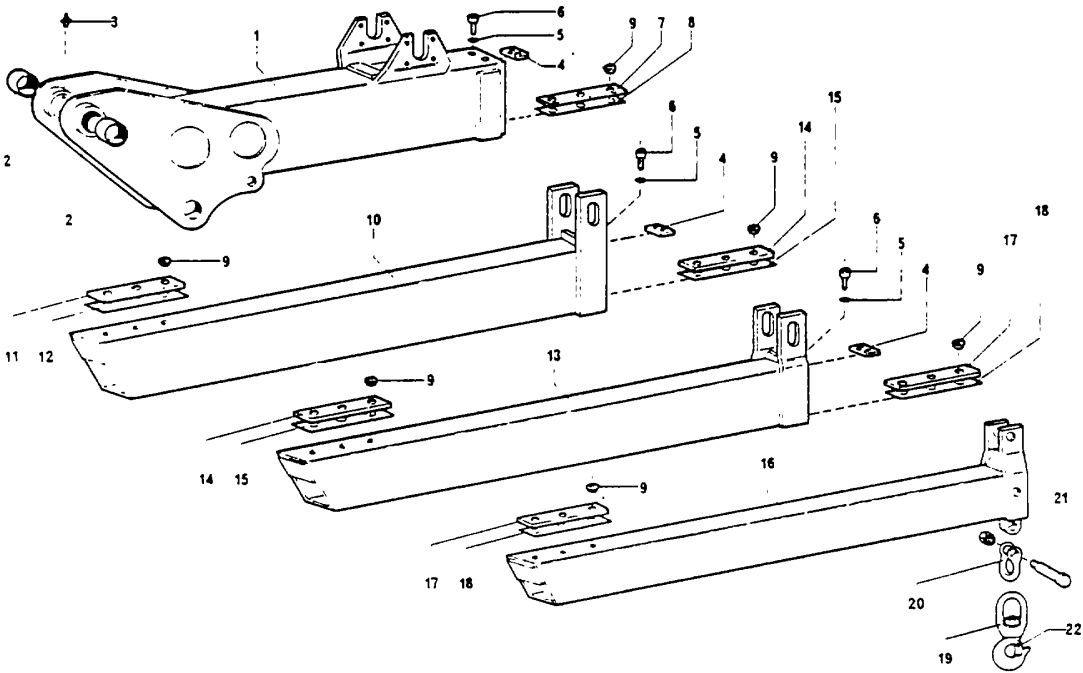


POS. ITEM	DENOMINAZIONE	DESCRIPTION	QTY	CODE	ITEM	DENOMINAZIONE	DESCRIPTION	QTY	CODE
1	Braccio secondario (compl. 2)	Secondary jib (compl. 2)	1	100045					
2	Bronzina	Bush	2	B2008					
3	Ingrassatore	Grease nipple	1	INB45					
4	Patino	Guide shoe	2	90732					
5	Rondella	Washer	4	RE269					
6	Vite	Screw	4	VI603					
7	Patino	Guide shoe	1	100450					
8	Soessore (0,5)	Shim (0,5)	1	100448					
	Soessore (0,8)	Shim (0,8)	1	100449					
9	Ghiera	Ring nut	12	36114					
10	Primo braccio sfilabile	First extension jib	1	100060					
11	Patino	Guide shoe	1	100323					
12	Soessore (0,5)	Shim (0,5)	1	100324					
	Soessore (0,8)	Shim (0,8)	1	100325					
13	Patino	Guide shoe	2	100088					
14	Soessore (0,5)	Shim (0,5)	2	100091					
	Soessore (0,8)	Shim (0,8)	1	100092					
15	Secondo braccio sfilabile	Second extension jib	1	100205					
16	Gancio (compl. 19)	Hook (compl. 19)	1	GA912					
17	Staffa	Bracket	1	GA771					
18	Perno con dado	Pin with nut	1	GA772					
19	Sicurezza per gancio	Security for hook	1	GA106					

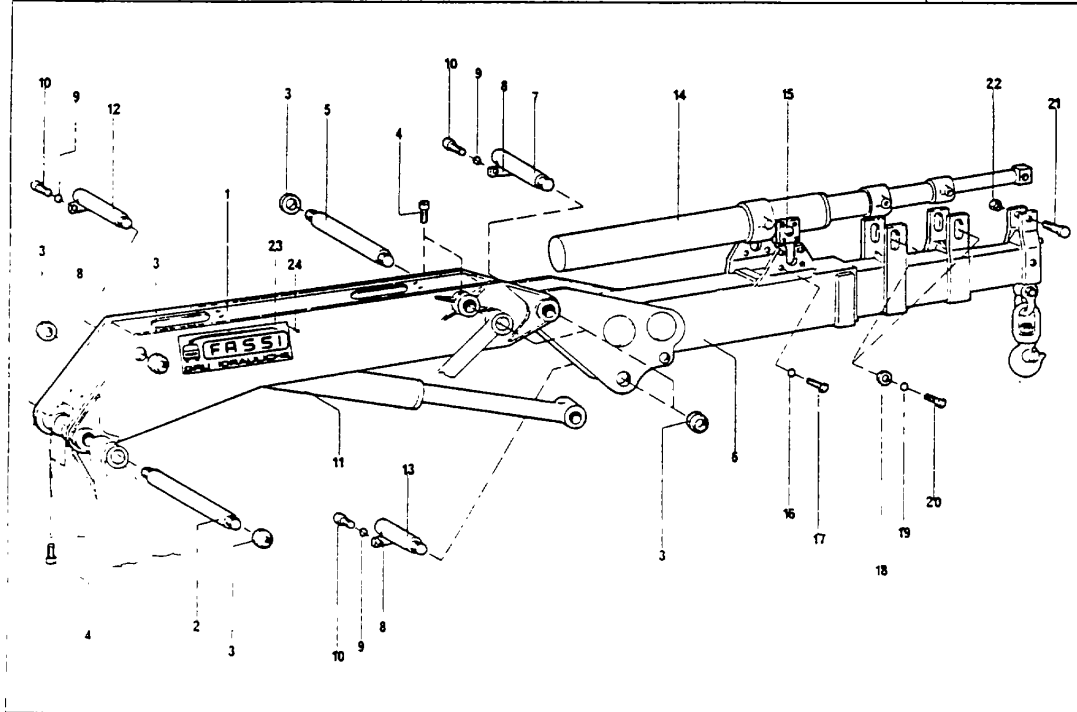




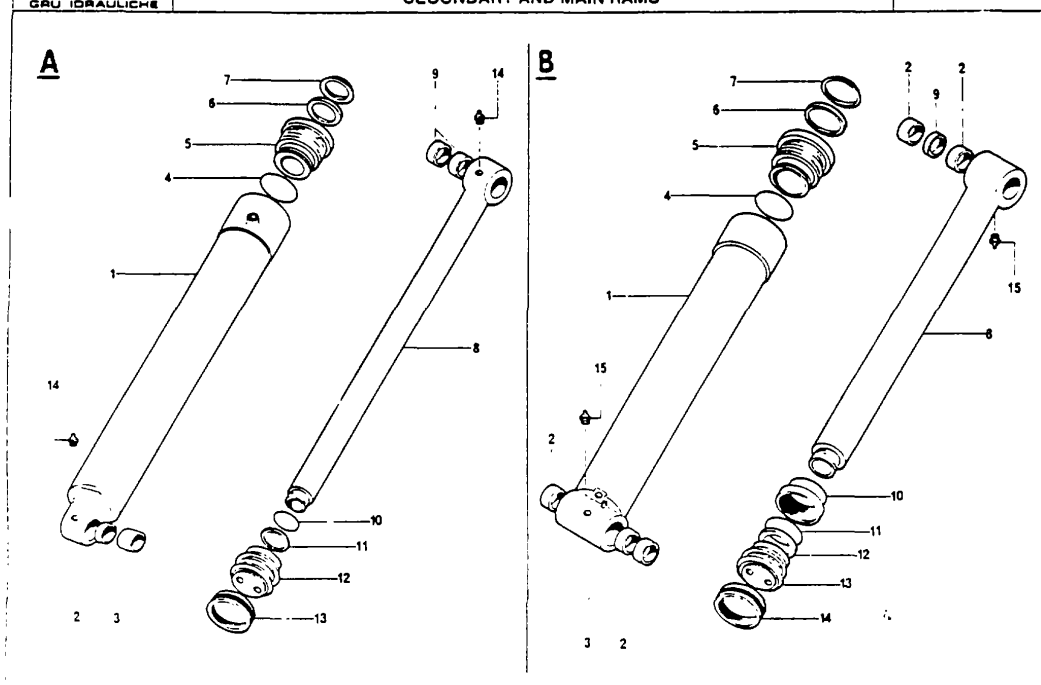
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Braccio principale	Main jib	1	100119					
2	Perno	Pin	1	100011					
3	Chiera	Ring nut	7	DA996					
4	Vite	Screw	4	V1604					
5	Perno	Pin	1	100012					
6	Bracci sfilabili	Extension booms							
7	Perno	Pin	1	100013					
8	Piastrina	Keep plate	3	100018					
9	Rondella	Washer	6	RE269					
10	Vite	Screw	6	V1603					
11	Maninnetto secondario	Secondary ram	1	100019					
12	Perno	Pin	1	100014					
13	Perno	Pin	1	100015					
14	Maninnetto doppio slamento	Double extension ram	1	100201					
15	Piastrina	Keep plate	2	100057					
16	Rondella	Washer	8	RE269					
17	Vite	Screw	8	V1604					
18	Rondella	Washer	2	55789					
19	Rondella	Washer	2	RE277					
20	Vite	Screw	2	V1507					
21	Perno	Pin	1	100017					
22	Deco	Nut	1	DA648					
23	Placca "FASSI"	"FASSI" plate	2	100564					
24	Rivetto	Rivet	12	RI961					



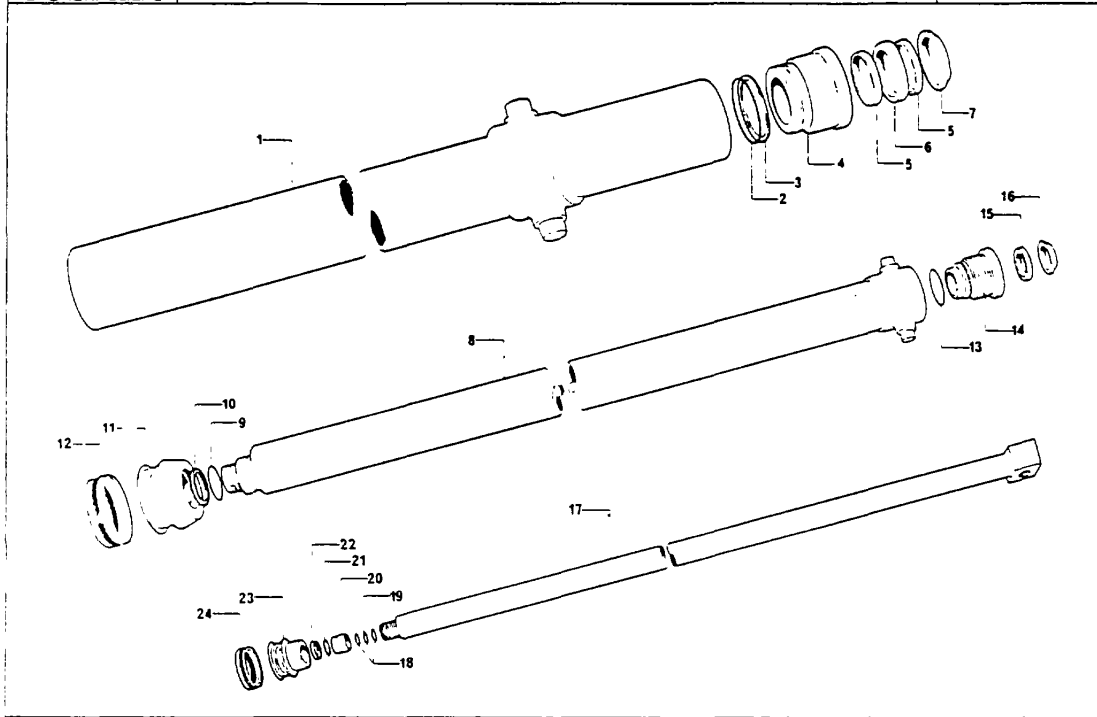
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Braccio secondario (compi 2)	Secondary jib (compi 2)	1	100045	2	Bronza	Bush	2	B2008
3	ingrassatore	Grease nipple	1	IN845	3	Patino	Guide shoe	3	90732
4	Washer	Washer	6	RE269	5	Spessore (0,5)	Shim (0,5)	1	100448
6	Screw	Screw	6	1/603	8	Spessore (0,8)	Shim (0,8)	1	100449
9	Patino	Guide shoe	1	100450	18	Anchiera	Ring nut	18	36114
10	Primo braccio sfilabile	First extension jib	1	100060	11	Patino	Guide shoe	1	100323
12	Spessore (0,5)	Shim (0,5)	1	100324	12	Spessore (0,8)	Shim (0,8)	1	100325
13	Secondo braccio sfilabile	Second extension jib	1	100069	14	Patino	Guide shoe	2	100088
14	Spessore (0,5)	Shim (0,5)	2	100091	15	Spessore (0,8)	Shim (0,8)	2	100092
16	Terzo braccio sfilabile	Third extension jib	1	100078	17	Patino	Guide shoe	2	100087
18	Spessore (0,5)	Shim (0,5)	2	100089	19	Gancio (compi 22)	Hook	1	GA912
20	Sicurezza per gancio	Security for hook	1	GA106	21	Sialla	Bracket	1	GA771
21	Perno con dado	Pin with nut	1	GA772	22	Perno con dado	Pin with nut	1	GA772
22	Sicurezza per gancio	Security for hook	1	GA106					



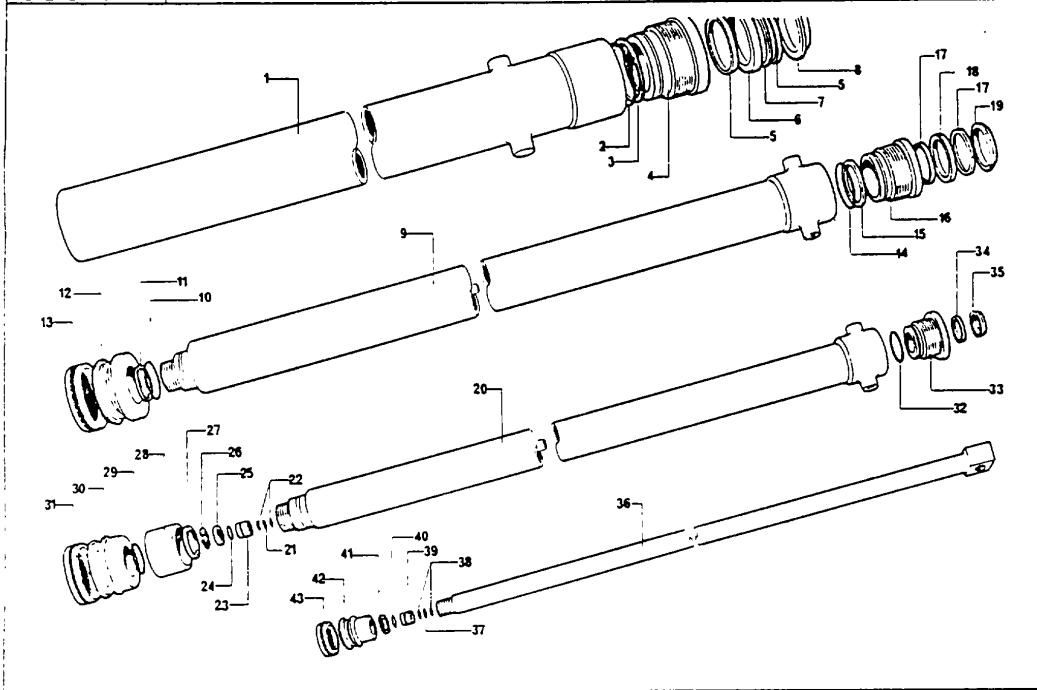
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Braccio principale	Main jib	1	100119					
2	Perno	Pin	1	100011					
3	Aniera	Ring nut	7	DA996					
4	Vite	Screw	4	V1604					
5	Perno	Pin	1	100012					
6	Bracci stabilizzatori	Extension booms	1						
7	Perno	Pin	1	100013					
8	Plastina	Keep plate	3	100018					
9	Rondella	Washer	6	RE269					
10	Vite	Screw	5	V1603					
11	Maninello secondario	Secondary ram	1	100019					
12	Perno	Pin	1	100014					
13	Perno	Pin	1	100015					
14	Maninello triplo sfiammento	Triple extension ram	1	100722					
15	Plastina	Keep plate	2	100057					
16	Rondella	Washer	8	RE269					
17	Vite	Screw	6	V1604					
18	Rondella	Washer	4	55789					
19	Rondella	Washer	4	RE277					
20	Vite	Screw	4	V1507					
21	Perno	Pin	1	100017					
22	Cono	Nut	1	DA646					
23	Targa "FASSI"	"FASSI" plate	2	100564					
24	Rivetto	Rivet	12	RI961					



POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
A	Manineto principale	Main ram	1	100025	13	Pistone	Piston	1	100022
	Manineto completo	Complete ram	1	100025	14	Guarnizione	Seal	1	GP101
1	Cilindro (compi 2+3)	Cylinder (compi 2+3)	1	100026	15	Ingrassatore	Grease nipple	2	IN845
2	Bronzina	Bush	1	BZ009		Serie completa guarnizioni	Complete set of seals		GSC116
3	Bronzina	Bush	1	BZ010					
4	Guarnizione OR	O-ring	1	GO105					
5	Ghiera	Ring nut	1	100044					
6	Guarnizione	Seal	1	GB405					
7	Guarnizione parapolvere	Dust cover seal	1	GW430					
8	Stelo (compi 9)	Rod (compi 9)	1	100027					
9	Bronzina	Bush	2	BZ008					
10	Guarnizione OR	O-ring	1	GO111					
11	Anello autobloccante	Self locking ring	1	71456					
12	Pistone	Piston	1	90182					
13	Guarnizione	Seal	1	GP392					
14	Ingrassatore	Grease nipple	2	IN845					
	Serie completa guarnizioni	Complete set of seals		GSC116					
B	Manineto secondario	Secondary ram							
	Manineto completo	Complete ram	1	100019					
1	Cilindro (compi 2+3)	Cylinder 2+3	1	100020					
2	Bronzina	Bush	2	BZ008					
3	Distanziale	Spacer	1	100058					
4	Guarnizione OR	O-ring	1	GO189					
5	Ghiera	Ring nut	1	100024					
6	Guarnizione	Seal	1	GB404					
7	Guarnizione parapolvere	Dust cover seal	1	GW431					
8	Stelo (compi 2+9)	Rod (compi 2+9)	1	100021					
9	Distanziale	Spacer	1	100059					
10	Distanziale	Spacer	1	100023					
11	Guarnizione OR	O-ring	1	GO128					
12	Anello autobloccante	Self locking ring	1	71207					

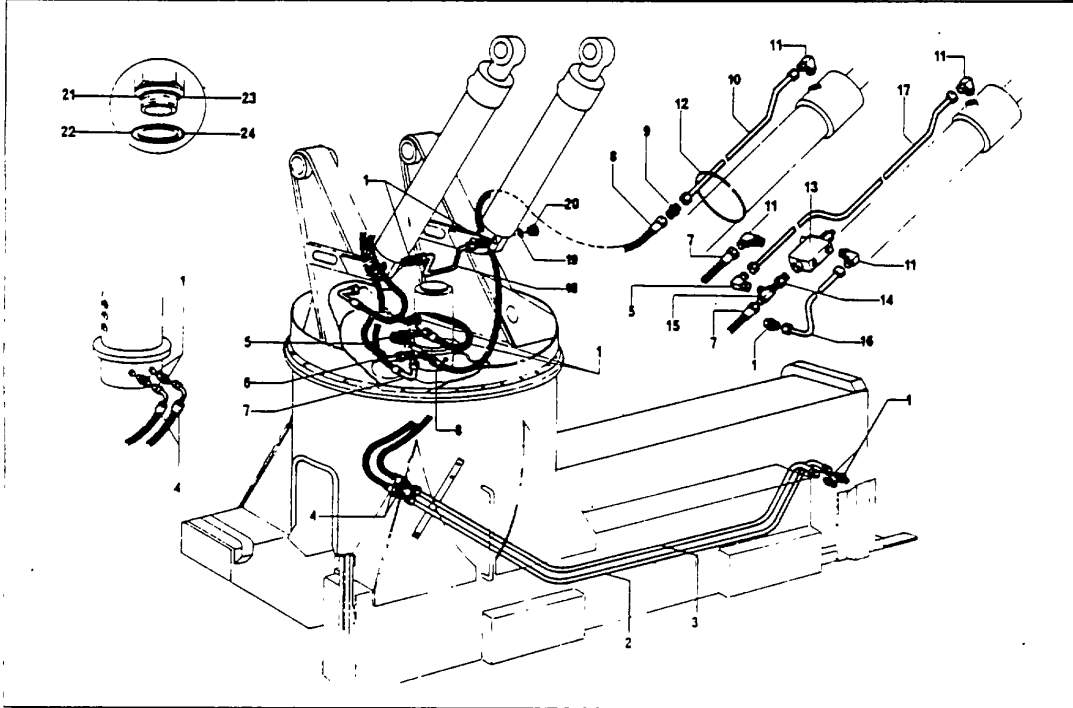


POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
	Mantinetto completo	Complete ram	1	100201					
	Cilindro	Cylinder	1	100202					
2	Guarnizione OR	O-ring	1	GO188					
3	Anello antiestrusione	Support ring	1	BK975					
4	Ghiera	Ring nut	1	100038					
5	Anello di guida	Guide ring	2	AG317					
6	Guarnizione	Seal	1	GB378					
7	Guarnizione parapolvere	Dust cover seal	1	GW432					
8	Stelo cilindro	Cylinder rod	1	100203					
9	Guarnizione OR	O-ring	1	GO120					
10	Anello autobloccante	Self-locking ring	1	62499					
11	Pistone	Piston	1	100034					
12	Guarnizione	Seal	1	GP399					
13	Guarnizione OR	O-ring	1	GO111					
14	Ghiera	Ring nut	1	100039					
15	Guarnizione	Seal	1	GB406					
16	Guarnizione parapolvere	Dust cover seal	1	GW426					
17	Stelo	Rod	1	100204					
18	Anello antiestrusione	Support ring	2	BK996					
19	Guarnizione OR	O-ring	1	GO168					
20	Bronzina	Bush	1	90179					
21	Guarnizione OR	O-ring	1	GO142					
22	Anello autobloccante	Self-locking ring	1	71468					
23	Pistone	Piston	1	100035					
24	Guarnizione	Seal	1	GP402					
	Serie completa guarnizioni	Complete set of seals		GSC131					

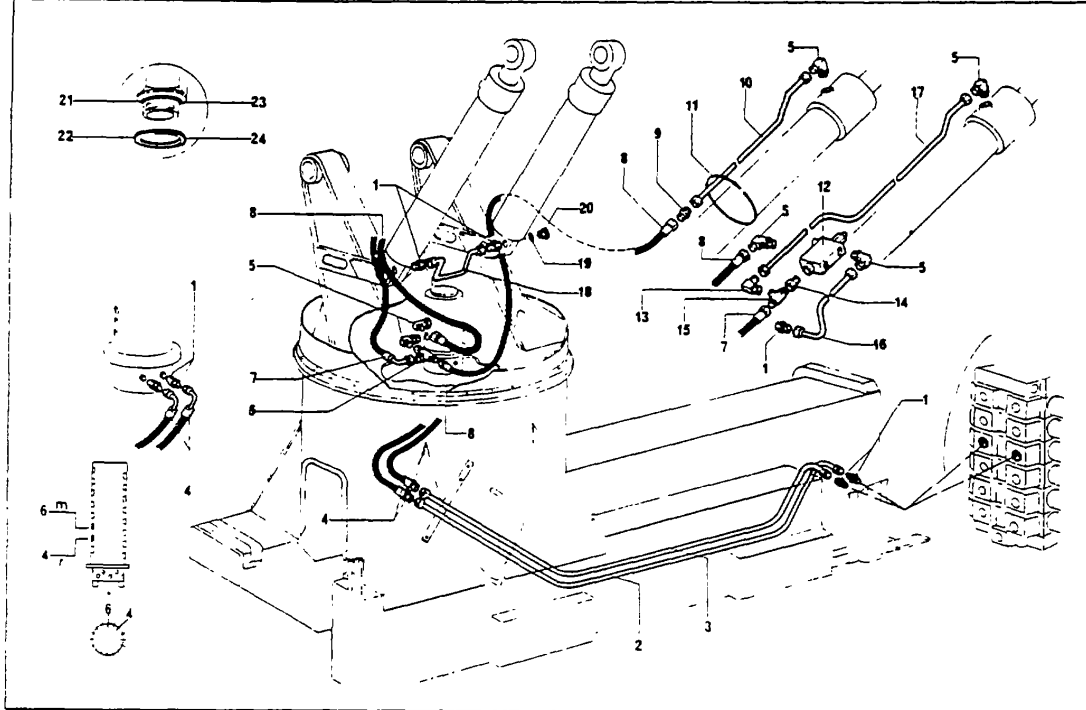


POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
	Manipolo completo	Complete ram		100722	37●	Guarnizione OR	O-ring	1	GO168
1	Cilindro	Cylinder	1	100029	38●	Guarnizione OR	O-ring	1	GL103
2	Guarnizione OR	O-ring	1	GO189	38●	Anello antiestrusione	Support ring	2	BK996
3	Anello antiestrusione	Support ring	1	BK976	39●	Bronzina	Bush	1	90179
4	Ghiera	Ring nut	1	100037		Bronzina	Bush	1	56533
5	Anello di guida	Guide ring	2	AG401	40	Guarnizione OR	O-ring	1	GC142
6	Guarnizione	Seal	1	GB407	41	Anello autobloccante	Self-locking ring	1	100724
7	Anello antiestrusione	Support ring	1	100043	42	Pistone	Piston	1	100723
9	Guarnizione parapolvere	Dust cover seal	1	GW433	43	Guarnizione	Seal	1	GP402
9	Primo stelo cilindro	First cylinder rod	1	100030	●	Serie completa guarnizioni	Complete set of seals	1	GSC133
10	Guarnizione CR	O-ring	1	GO187	●	Serie completa guarnizioni	Complete set of seals	1	GSC141
11	Anello autobloccante	Self-locking ring	1	100726					
12	Pistone	Piston	1	100725					
13	Guarnizione	Seal	1	GP403					
14	Guarnizione OR	O-ring	1	GO188					
15	Anello antiestrusione	Support ring	1	BK975					
16	Ghiera	Ring nut	1	100038					
17	Anello di guida	Guide ring	2	AG317					
18	Guarnizione	Seal	1	GB378					
19	Guarnizione parapolvere	Dust cover seal	1	GW432					
20	Secondo stelo cilindro	Second cylinder rod	1	100031					
21●	Guarnizione OR	O-ring	1	GO145					
22●	Guarnizione OR	O-ring	1	GL101					
23●	Anello antiestrusione	Support ring	2	BK938					
	Bronzina	Bush	1	55196					
	Bronzina	Bush	1	56532					
24	Guarnizione OR	O-ring	1	GO158					
25	Ghiera	Ring nut	1	100218					
26	Anello d'arresto	Circlip	1	AS999					
27	Anello autobloccante	Self-locking ring	1	52499					
28	Distanziale	Spacer	1	100036					
29	Guarnizione CR	O-ring	1	GO120					
30	Pistone	Piston	1	100034					
31	Guarnizione	Seal	1	GP399					
32	Guarnizione OR	O-ring	1	GO111					
33	Ghiera	Ring nut	1	100029					
34	Guarnizione	Seal	1	GB406					
35	Guarnizione parapolvere	Dust cover seal	1	GW426					
36	Stelo	Rod	1	100032					

● Vale fino alla gru matr. 0051 ● Applicable up to the crane C051

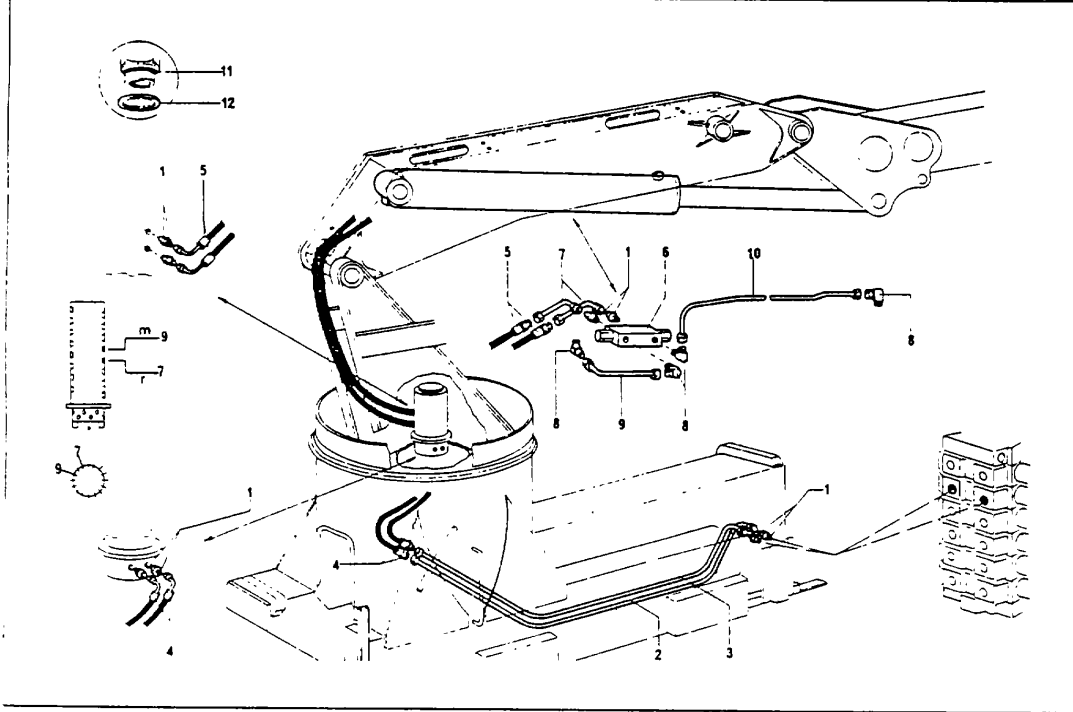


POS ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODIC CODE
	Nippolo (compil 21+22)	Nipple (compil 21+22)	9	N1986					
	Tubo	Pipe	1	100245					
	Tubo	Pipe	1	100247					
	Tubo flessibile	Hose	2	TG574					
5	Raccordo a gomito	Elbow	2	RV944					
6	Raccordo	Union	1	RV998					
7	Tubo flessibile	Hose	2	TG575					
8	Tubo flessibile	Hose	1	TG582					
9	Nippolo	Nipple	1	N1925					
10	Tubo	Pipe	1	100838					
11	Raccordo a gomito (compil 21+22)	Elbow (compil 21+22)	4	RS951					
12	Fascetta	Band	1	FS991					
13	Valvola di blocco	Block valve	1	VA156					
14	Raccordo (compil 23+24)	Elbow (compil 23+24)	1	RV943					
15	Raccordo	Union	1	RV995					
16	Tubo	Pipe	1	100836					
17	Tubo	Pipe	1	100837					
18	Tubo	Pipe	1	100835					
19	Rondella rame	Copper washer	1	RR808					
20	Tappo	Plug	1	TA737					
21	Guarnizione OR	O-ring		GO145					
22	Rondella	Washer		RP225					
23	Guarnizione OR	O-ring		GO173					
24	Rondella	Washer		RP228					

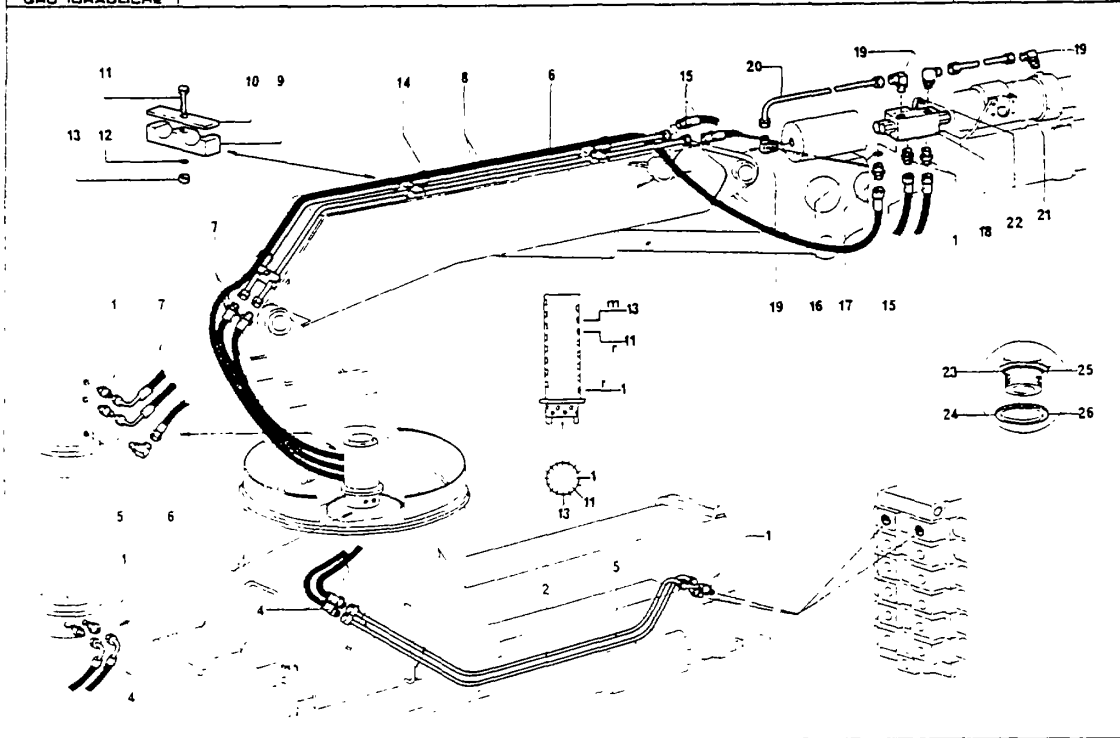


POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Nipolo (compl. 21+22)	Nipple (compl. 21+22)	7	N1986					
2	Tubo	Pipe	1	100245					
3	Tubo	Pipe	1	100247					
4	Tubo flessibile	Hose	2	TG574					
5	Raccordo a gomito (compl. 21+22)	Elbow (compl. 21+22)	6	RS951					
6	Raccordo	Union	1	RV998					
7	Tubo flessibile	Hose	1	TG575					
8	Tubo flessibile	Hose	2	TG582					
9	Nipolo	Nipple	1	N1925					
10	Tubo	Pipe	1	100838					
11	Fascetta	Band	1	FS991					
12	Valvola di blocco	Block valve	1	VA156					
13	Raccordo a gomito	Elbow	1	RV944					
14	Raccordo (compl. 23+24)	Elbow (compl. 23+24)	1	RV943					
15	Raccordo	Union	1	RV995					
16	Tubo	Pipe	1	100836					
17	Tubo	Pipe	1	100837					
18	Tubo	Pipe	1	100835					
19	Rondella rame	Copper washer	1	RR808					
20	Tappo	Plug	1	TA737					
21	Guarnizione OR	O-ring		GO145					
22	Rondella	Washer		RP225					
23	Guarnizione OR	O-ring		GO173					
24	Rondella	Washer		RP228					

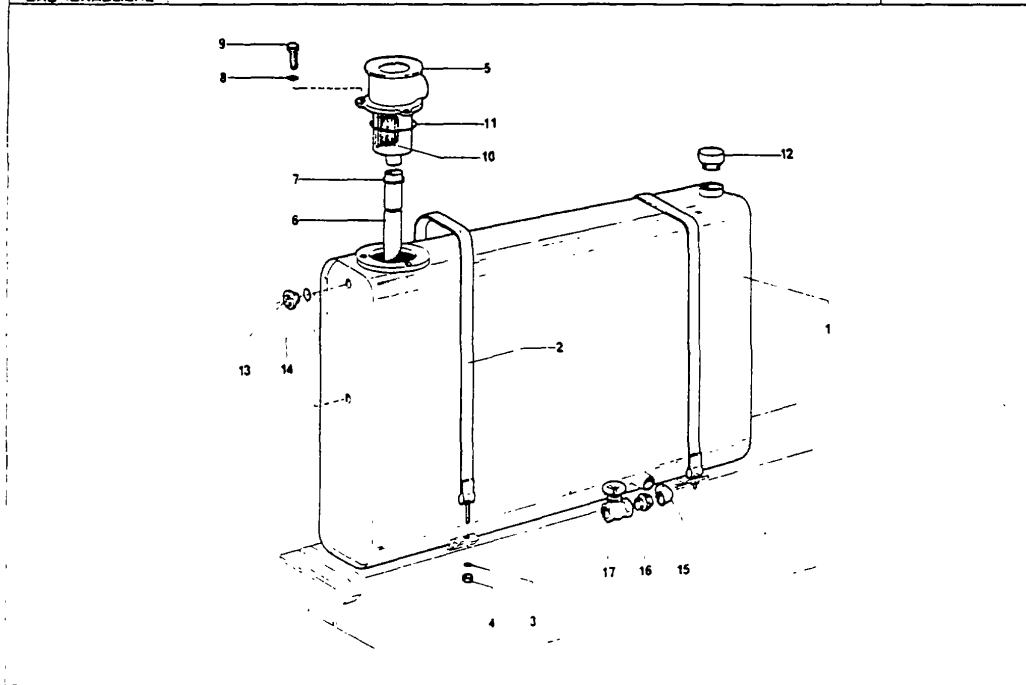




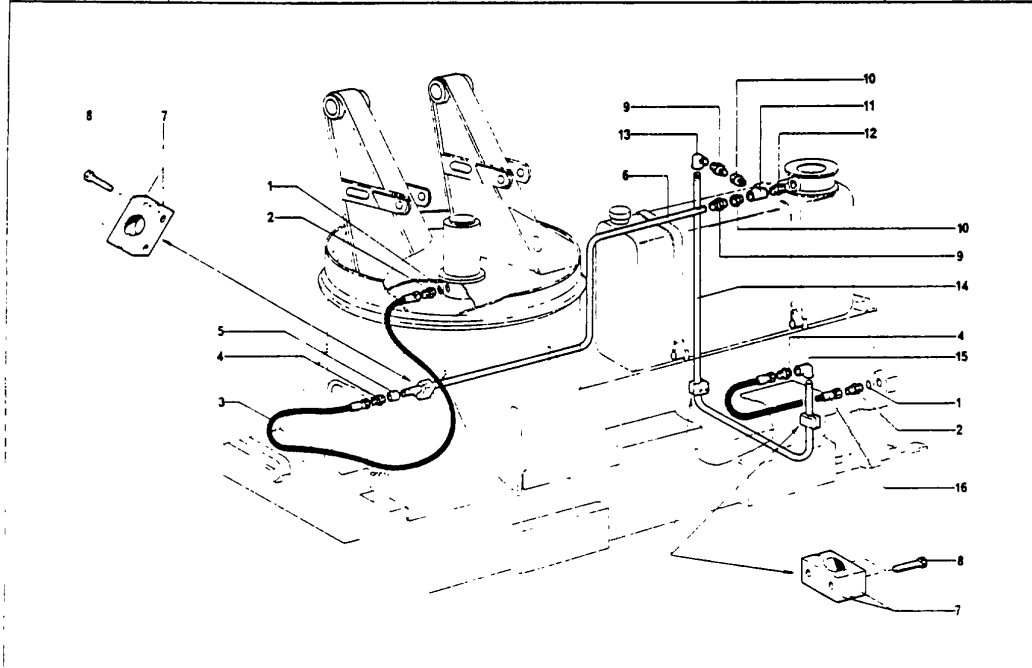
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
11	Nastro (combi 11+12)	Nioste (combi 11+12)	3	N1986					
12	Tubo	Pipe	1	100245					
13	Tubo	Pipe	1	100247					
4	Tubo flessibile	Hose	2	TG574					
5	Tubo flessibile	Hose	2	TG577					
6	Valvola di blocco	Block valve	1	VA126					
7	Tubo	Pipe	2	100422					
8	Raccordo a gomito (combi 11+12)	Elbow	4	RS951					
9	Tubo (combi 11+12)	Pipe	1	100412					
10	Tubo	Pipe	1	100414					
11	Guarnizione OR	O-ring		GO145					
12	Pancetta piana	Flat washer		RP225					



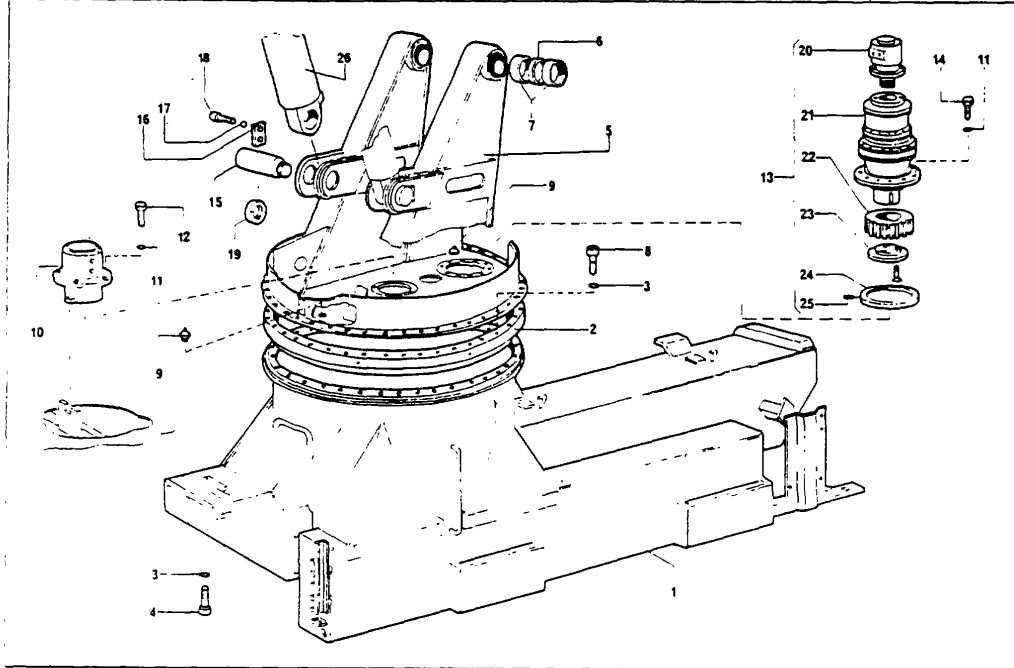
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA. Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA. Q.TY	CODICE CODE
1	Tubo comp. 23-24	Nipple (comp. 23-24)	3	NI966	1	Tubo	Pipe	1	00245
2	Tubo	Pipe	1	00247	3	Tubo flessibile	Hose	2	TG574
3	Raccordo a gomito (comp. 25-26)	Elbow (comp. 25-26)	1	RS953	4	Tubo flessibile	Hose	1	TG572
4	Tubo flessibile	Hose	1	TG577	5	Tubo	Pipe	2	00379
5	Tubo	Pipe	2	00379	6	Supporto tubo	Pipe support	3	CF101
6	Supporto tubo	Pipe support	3	CF101	7	Platina	Keep plate	3	CF102
7	Platina	Keep plate	3	CF102	8	Vite	Screw	3	VI571
8	Vite	Screw	3	VI571	9	Rondella dentellata	Tab washer	3	RE276
9	Rondella dentellata	Tab washer	3	RE276	10	Dado	Nut	3	DA634
10	Dado	Nut	3	DA634	11	Fascera	Band	3	FS968
11	Fascera	Band	3	FS968	12	Tubo flessibile	Hose	2	TG573
12	Tubo flessibile	Hose	2	TG573	13	Rondella rame	Copper washer	1	RR807
13	Rondella rame	Copper washer	1	RR807	14	Nippolo	Nipple	1	NI914
14	Nippolo	Nipple	1	NI914	15	Valvola di blocco	Block valve	1	VA101
15	Valvola di blocco	Block valve	1	VA101	16	Raccordo a gomito (comp. 23-24)	Elbow (comp. 23-24)	4	RS951
16	Raccordo a gomito (comp. 23-24)	Elbow (comp. 23-24)	4	RS951	17	Tubo (per FIO 2)	Pipe (for FIO 2)	1	00473
17	Tubo (per FIO 2)	Pipe (for FIO 2)	1	00473	18	Tubo (per FIO 3)	Pipe (for FIO 3)	1	00375
18	Tubo (per FIO 3)	Pipe (for FIO 3)	1	00375	19	Tubo	Pipe	1	00377
19	Tubo	Pipe	1	00377	20	Fascera	Band	1	FS927
20	Fascera	Band	1	FS927	21	Guarnizione OR	O-ring	1	GO145
21	Guarnizione OR	O-ring	1	GO145	22	Rondella piana	Flat washer	1	RP225
22	Rondella piana	Flat washer	1	RP225	23	Guarnizione OR	O-ring	1	GO202
23	Guarnizione OR	O-ring	1	GO202	24	Rondella piana	Flat washer	1	RP230
24	Rondella piana	Flat washer	1	RP230	25				
25					26				



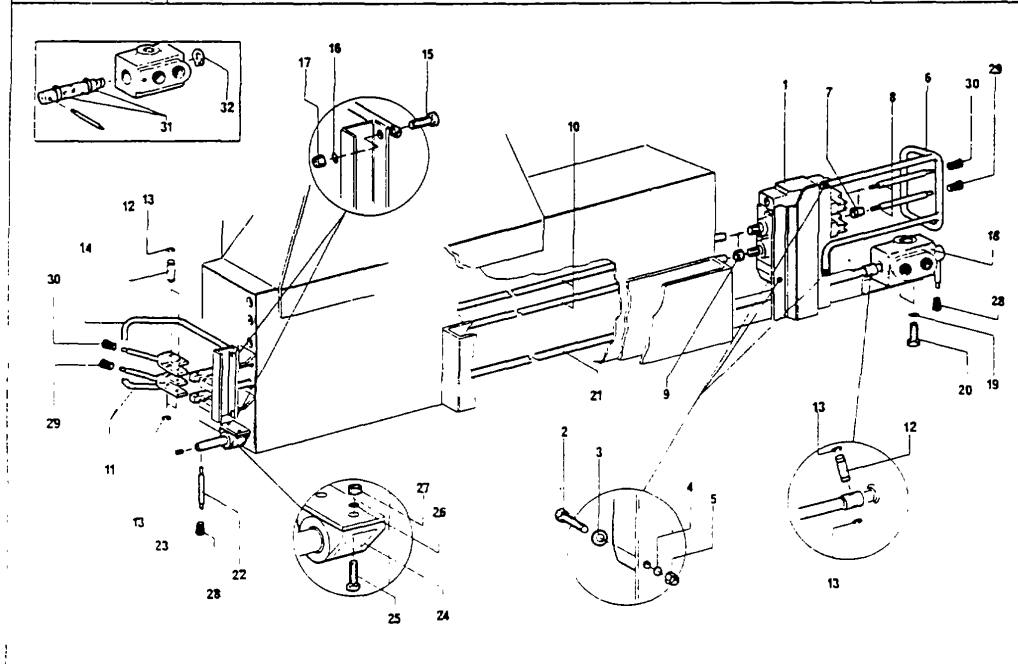
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Serbatoio	Tank	1	100197					
2	Brerella (compil 3+4)	Brace (compil 3+4)	2	100106					
3	Rondella	Washer	2	RE277					
4	Cavo	Nut	2	DA602					
5	Filtro olio completo	Complete oil filter	1	FR54					
6	Tubo gomma	Hose	1	TG461					
7	Fascetta	Band	1	FS736					
8	Rondella	Washer	3	RE276					
9	Vite	Screw	3	VI572					
10	Cartuccia	Cartridge		RE53					
11	Serie guarnizioni	Set of seals		GSC152					
12	Tappo	Plug	1	TA827					
13	Tappo di livello (compil 14)	Oil level plug (compil 14)	2	LO100					
14	Guarnizione	Seal		LO101					
15	Raccordo a gomito	Elbow	1	RV966					
16	Nippio	Nipple	1	RV962					
17	Ruonetto	Tap	1	RU965					



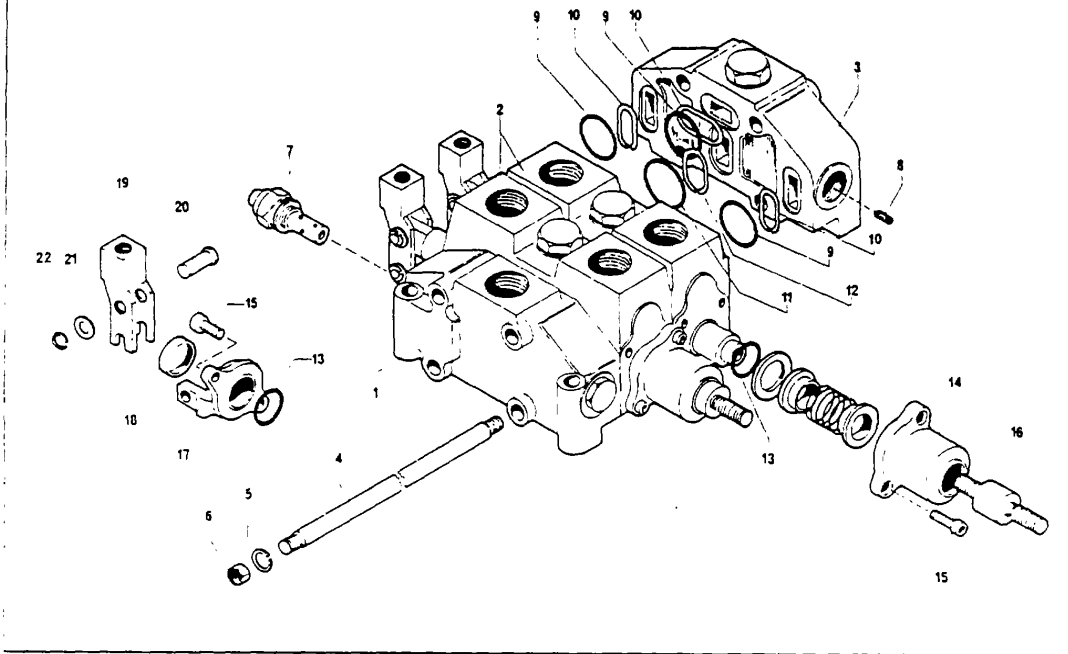
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Roncella rame	Cooper washer	2	RR874					
2	Nippio	Nipple	2	NB19					
3	Tubo flessibile	Hose	1	TG589					
4	Nippio	Nipple	2	NB14					
5	Manicoto	Coupling	1	RV817					
6	Tubo	Pipe	1	100573					
7	Collare	Collar	6	CF110					
8	Vite	Screw	12	V624					
9	Sacchettone	Pipe union	2	RV814					
10	Riduzione	Reduction	2	RV813					
11	Raccordo	Union	1	RV812					
12	Nippio	Nipple	1	RV962					
13	Raccordo a gomito	Elbow	1	RV815					
14	Tubo	Pipe	1	100572					
15	Raccordo a gomito	Elbow	1	RV816					
16	Tubo flessibile	Hose	1	TG580					



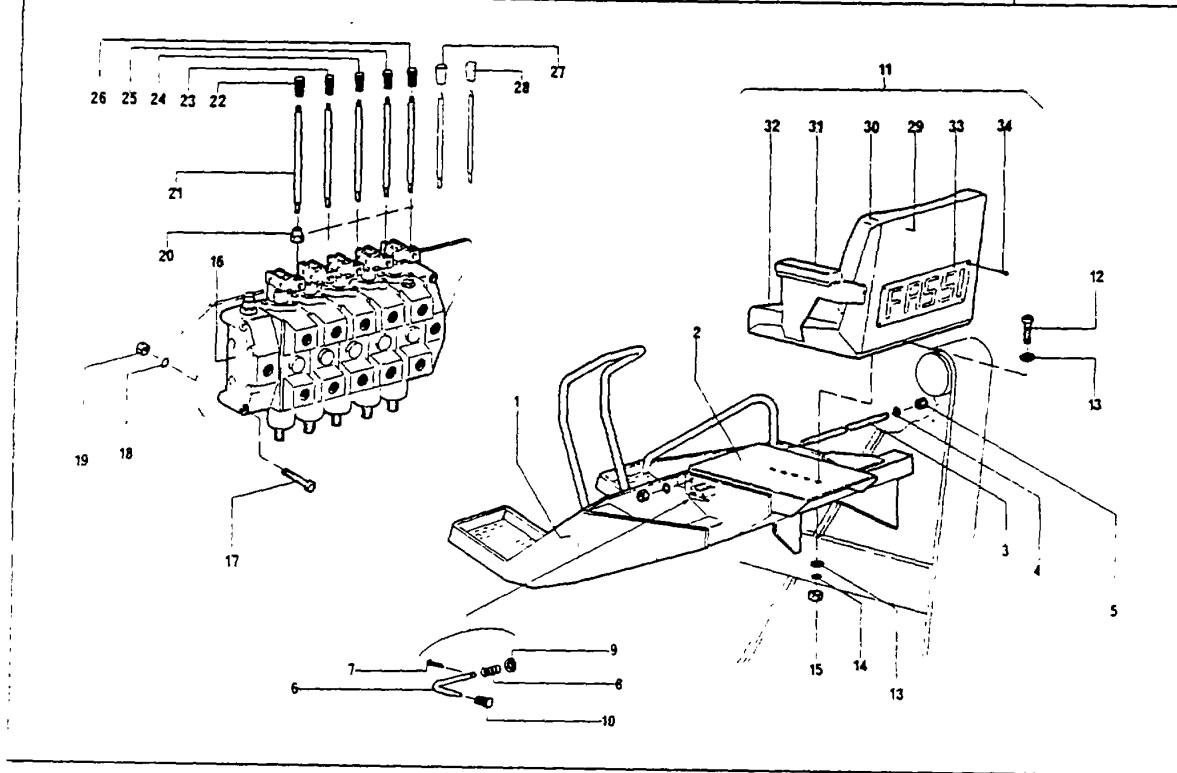
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Basamento	Base	1	100698					
2	Rota	Flth wheel	1	RA100					
3	Rondella	Washer	72	PP229					
4	Vite	Screw	36	100221					
5	Colonna (comp. 6+7)	Pillar (comp. 6+7)	1	100439					
6	Distanziale	Spacer	1	100136					
7	Bronzina	Bush	2	BZ008					
8	Vite	Screw	36	100220					
9	Ingrassatore	Grease nipple	4	IN845					
10	Distributore rotante	Rotating distributor	1	DR100					
11	Rondella	Washer	14	RE269					
12	Vite	Screw	4	VI587					
13	Motore completo	Complete motor-reduction	1	100428					
14	Vite	Screw	10	VI525					
15	Perno	Pin	2	100016					
16	Plastrina	Keep plate	2	100018					
17	Rondella	Washer	4	RE269					
18	Vite	Screw	4	VI603					
19	Chiara	Ring nut	2	DA997					
20	Motore	Hydraulic motor	1	MT121					
21	Riduttore	Speed reducer	1	RD100					
22	Ingone	Pinion gear	1	PI100					
23	Tappo	Plug	1	FO100					
24	Flangia	Flange	1	100284					
25	Vite	Screw	1	VI542					
26	Manineto principale	Main ram	2	100025					



POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Distributore	Distributor	1	DI137					
2	Vite	Screw	3	VI614					
3	Rondella	Washer	3	RP226					
4	Rondella	Washer	3	RE277					
5	Dado	Nut	3	DA602					
6	Paraleve	Levers guard	1	101248					
7	Controdado	Lock nut	2	DI232					
8	Leva	Lever	2	36221					
9	Dado	Nut	2	DA634					
10	Asa rinvio	Transmission rod	2	100285					
11	Leva	Lever	2	100345					
12	Perno	Pin	5	16374					
13	Anello d'arresto	Circlip	10	AR730					
14	Paraleve	Levers guard	1	101247					
15	Vite	Screw	2	VI522					
16	Rondella	Washer	2	RE276					
17	Dado	Nut	2	DA603					
18	Deviatore	Deviator	1	51336					
19	Rondella	Washer	2	RE277					
20	Vite	Screw	2	VI550					
21	Asa rinvio	Transmission rod	1	100288					
22	Leva	Lever	1	51341					
23	Vite	Screw	1	VI542					
24	Supporto	Support	1	90635					
25	Vite	Screw	2	VI538					
26	Rondella	Washer	2	RE278					
27	Dado	Nut	2	DA633					
28	Pomello	Knob	2	PO120					
29	Pomello estensione stabilizz.	Outriggers extension knob	2	PO124					
30	Pomello stabilizzatori	Outriggers knob	2	PO125					
31	Guarnizione OR	O-ring	1	GO132					
32	Anello d'arresto	Circlip	1	AS754					

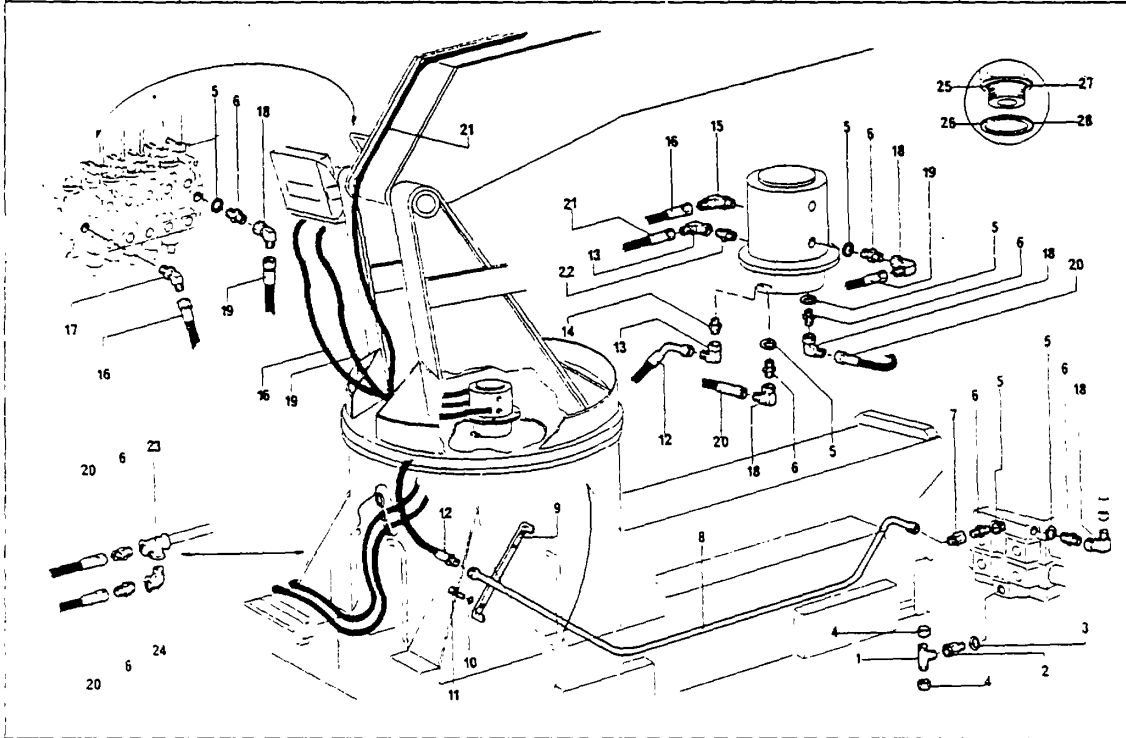


POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
	Distributore completo	Complete distributor	1	D1137					
1	Testa d'entrata (comol. 7)	Inlet head (comol. 7)	1	D1105					
2	Segmento distributore a C C	Dist. closed center segment	2	D1106					
3	Testata d'uscita (comol. 8)	Outlet head (comol. 8)	1	D1148					
4	Tirante	Tie rod	2	D1183					
5	Rondella	Washer	4	PE272					
6	dado	Nut	4	DA647					
7	Valvola by-pass	By-pass valve	1	D1110					
8	Vite	Screw	1	M622					
9	Guarnizione OR	O-ring		GO198					
10	Anello di sostegno	Support ring		D1125					
11	Guarnizione OR	O-ring		GO154					
12	Anello di sostegno	Support ring		D1126					
13	Guarnizione OR	O-ring		GO132					
14	Cappeletto	Cover		D1122					
15	Vite	Screw		M584					
16	Cavoio	Tang		D1123					
17	Supporto leva	Lever support		D1121					
18	Guarnizione	Seal		D1127					
19	Forcella	Fork		D1120					
20	Perno	Pin		D1119					
21	Rondella	Washer		RP207					
22	Anello d'arresto	Circlip		AR730					



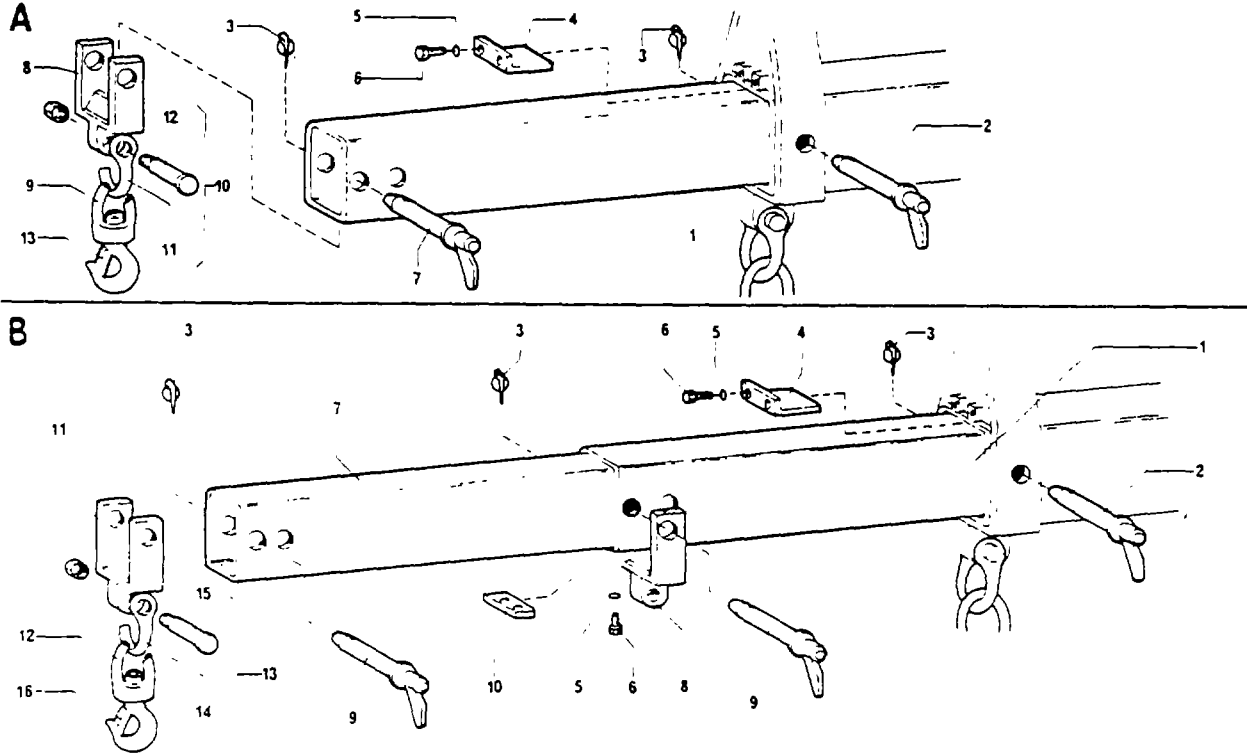
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Supporto distr. e segg. compl. 2-9)	Seat and distr. support (comp. 2-9)	1	101220					
2	Supporto seggiolino	Seat support	1	100607					
3	Perno	Pin	1	100612					
4	Rondella	Washer	2	RP226					
5	Dado	Nut	2	DA697					
6	Leva	Lever	1	43203					
7	Coppia	Cotter pin	1	CC710					
8	Molla	Spring	1	31293					
9	Rondella	Washer	1	RP226					
10	Pomello	Knob	1	PO120					
11	Seggiolino completo	Complete seat	1	SE911					
12	Vite	Screw	2	VI517					
13	Rondella	Washer	4	RP213					
14	Rondella	Washer	2	RE269					
15	Dado	Nut	2	DA621					
16	Distributore (di serie)	Distributor (standard)	1	D1160					
	Distributore - 1 elem. suppl.	Distributor + 1 extra segment		D1154					
	Distributore - 2 elem. suppl.	Distributor + 2 extra segment		D1155					
	Distributore - 3 elem. suppl.	Distributor + 3 extra segment		D1156					
17	Vite	Screw	3	VI614					
18	Rondella	Washer	3	RE277					
19	Dado	Nut	3	DA602					
20	Controdado	Lock nut	1	DI232					
21	Leva	Lever	1	36220					
22	Pomello rotazione	Rotation knob	1	PO111					
23	Pomello man. principale	Main ram knob	1	PO112					
24	Pomello man. secondario	Secondary ram knob	1	PO113					
25	Pomello man. silamento	Extension ram knob	1	PO114					
26	Pomello penna	Accessory knob		PO115					
27	Pomello rotatore	Rotator knob		PO116					
28	Pomello verricello	Winch knob		PO117					
29	Telaio	Frame		SE912					
30	Schienale	Back		SE914					
31	Bracciale	Arm-rest		SE915					
32	Cuscino	Cushion		SE913					
33	"Larga" "FASSI"	"FASSI" plate		16606					
34	Rivetto	Rivet		RI961					





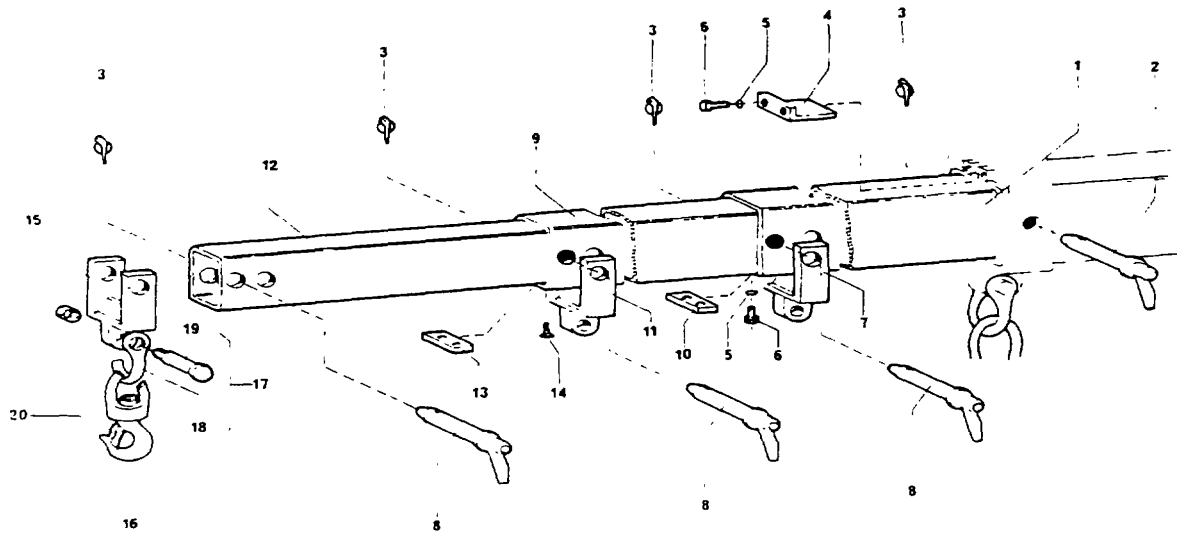
POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Raccordo	Union	1	RV964					
2	Raccordo	Union	1	RV963					
3	Rondella rame	Copper washer	1	RR807					
4	Tappe	Plug	2	TA734					
5	Rondella rame	Copper washer	8	RR874					
6	Nippolo	Nipple	5	NI919					
7	Raccordo	Union	1	92445					
8	Tubo	Pipe	1	100470					
9	Suocero tubo	Pipe support	1	100424					
10	Rondella vite	Washer	3	RE276					
11	Vite	Screw	3	VI545					
12	Tubo flessibile	Hose	1	TG574					
13	Raccordo a gomito	Elbow	2	RV944					
14	Nippolo (combi. 25+26)	Nipple (combi. 25+26)	1	NI986					
15	Raccordo a gomito (combi. 25+26)	Elbow (combi. 25+26)	1	RS951					
16	Tubo flessibile	Hose	1	TG585					
17	Raccordo a gomito (combi. 25+26)	Elbow (combi. 25+26)	1	RV958					
18	Raccordo a gomito	Elbow	4	RS957					
19	Tubo flessibile	Hose	1	TG557					
20	Tubo flessibile	Hose	2	TG569					
21	Tubo flessibile	Hose	1	TG572					
22	Nippolo (combi. 27+28)	Nipple (combi. 27+28)	1	NI987					
23	Raccordo	Union	1	RV960					
24	Raccordo a gomito	Elbow	1	RV815					
25	Guarnizione OR	O-ring	1	GC145					
26	Rondella	Washer	1	RP225					
27	Guarnizione OR	O-ring	1	GC202					
28	Rondella	Washer	1	RP230					

EXTENSTIONS "M" AND "MN" FOR FIG.3



POS ITEM	DENOMINAZIONE	DESCRIPTION	Q TA Q.TY	CODICE CODE	POS ITEM	DENOMINAZIONE	DESCRIPTION	Q TA Q.TY	CODICE CODE
<b>A</b>	<b>PROLUNGA "M"</b>	<b>EXTENSION "M"</b>							
1	Prolunga	Extension	1	100180					
2	Spina	Pin	1	100216					
3	Spina di fermo	Check pin	2	SS974					
4	Fermo	Lock	1	100188					
5	Rondella	Washer	2	RE277					
6	Vite	Screw	2	VI550					
7	Spina	Pin	1	100195					
8	Staffa	Bracket	1	100222					
9	Gancio (comp. 13)	Hook (comp. 13)	1	GA751					
10	Grillo completo	Complete shackie	1	GA754					
11	Grillo	Shackie	1	GA752					
12	Perno con dado	Pin with nut	1	GA753					
13	Sicurezza per gancio	Security clip	1	GA104					
<b>B</b>	<b>PROLUNGA "MN"</b>	<b>EXTENSION "MN"</b>							
1	Prolunga	Extension	1	100180					
2	Spina	Pin	1	100216					
3	Spina di fermo	Check pin	3	SS974					
4	Fermo	Lock	1	100188					
5	Rondella	Washer	4	RE277					
6	Vite	Screw	4	VI550					
7	Prolunga	Extension	1	100190					
8	Staffa	Bracket	1	100222					
9	Spina	Pin	2	100195					
10	Patino	Guide shoe	1	100185					
11	Staffa	Bracket	1	100346					
12	Gancio comp. 16)	Hook (comp. 16)	1	GA751					
13	Grillo completo	Complete shackie	1	GA754					
14	Grillo	Shackie	1	GA752					
15	Perno con dado	Pin with nut	1	GA753					
16	Sicurezza per gancio	Security clip	1	GA104					

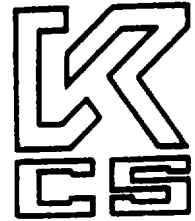
## EXTENSION "MNP" FOR FIO.3



POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE	POS. ITEM	DENOMINAZIONE	DESCRIPTION	Q.TA Q.TY	CODICE CODE
1	Spina	Pin	1	100180					
2	Spina di fermo	Lock pin	4	SS974					
3	Fermo	Lock	1	100188					
4	Rondella	Washer	4	RE277					
5	Vite	Screw	4	VI550					
6	Staffa	Bracket	1	100222					
7	Spina	Pin	3	100195					
8	Spina	Pin	1	100190					
9	Spina	Pin	1	100185					
10	Staffa	Bracket	1	100346					
11	Spina	Pin	1	100278					
12	Spina	Pin	1	100283					
13	Vite	Screw	2	VI609					
14	Staffa	Bracket	1	100348					
15	Gancio (comp. 20)	Hook (comp. 20)	1	GA751					
16	Grillo completo	Complete shackles	1	GA754					
17	Grillo	Shackle	1	GA752					
18	Perno con dado	Pin with nut	1	GA753					
19	Sicurezza per gancio	Security clip	1	GA104					

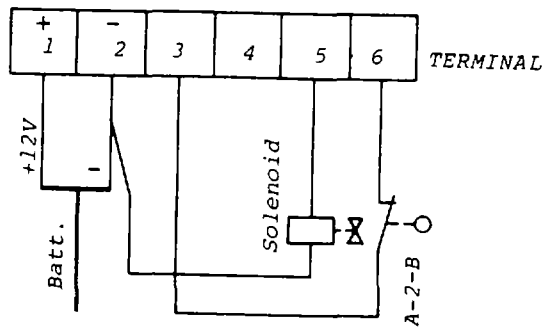
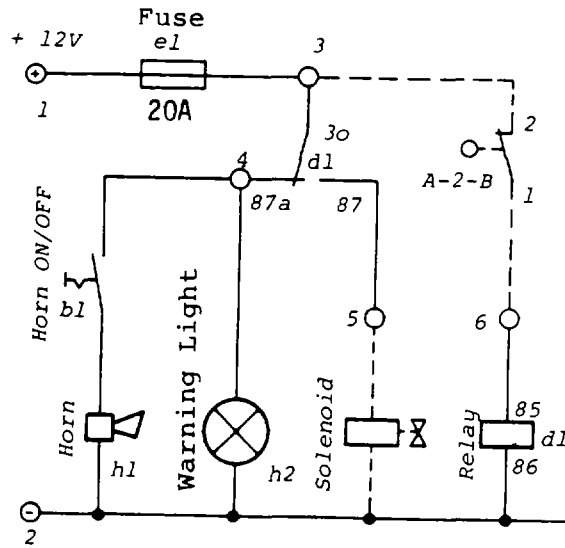
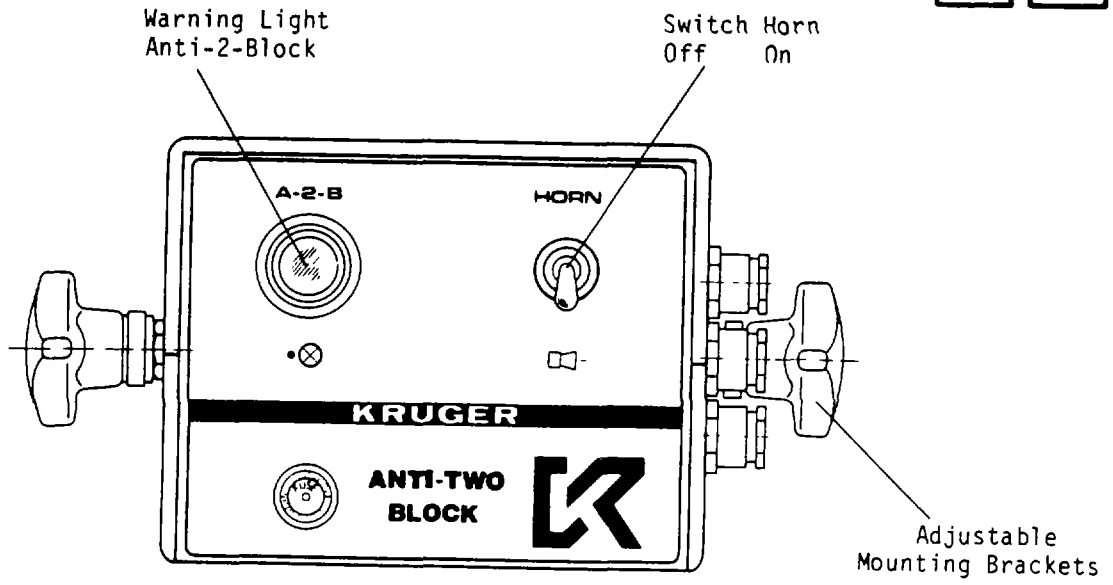
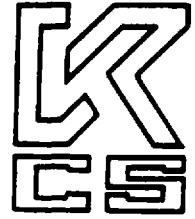
**SYSTEM MARK H**  
***TROUBLESHOOTING LIST***

**SYSTEM MARK H**  
***INSTALLATION & CHECKOUT***  
***PARTS LIST***  
***TROUBLESHOOTING LIST***



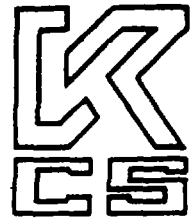
<b>A</b>	Cranes with one Anti-Two-Block switch Cranes with one Anti-Two-Block switch- Main Boom only - - Main Boom only -Cranes with two Anti-Two-Block switches
<b>B</b>	Cranes with two Anti-Two-Block switches- Main Hoist only - - Main Hoist only -Cranes with two or more Anti-Two-Block switches
<b>C</b>	Cranes with two or more Anti-Two-Block switches- Main & Aux. Hoist - - Main & Aux. Hoist -
Page:	2 Diagram Model "H" without key switch
Page:	3 Diagram Model "H" with key switch
Page:	4 Figure 1 - Panel in operating position
Page:	5 Figure 2 - Panel in shut-off position
Page:	6 Figure 3 - Panel in shut-off position with by-pass key
Page:	7 Figure 4, 5, 6 - Boom wiring diagram for A, B, C
Page:	8 Shut-off but no light - A, B, C
Page:	9 Shut-off and light is on - A
Page:	10 No shut-off but light is on - A, B, C
Page:	11 Defective Relay - A, B, C
Page:	12 Defective Solenoid - A, B, C
Page:	13 Defective Anti-Two-Block switch - A, B, C
Page:	14, 15 Shut-off and light is on - B
Page:	16-18 Shut-off and light is on - C

Krueger Crane Systems Inc.  
 4699 Colt Road, Rockford, Ill. 61109

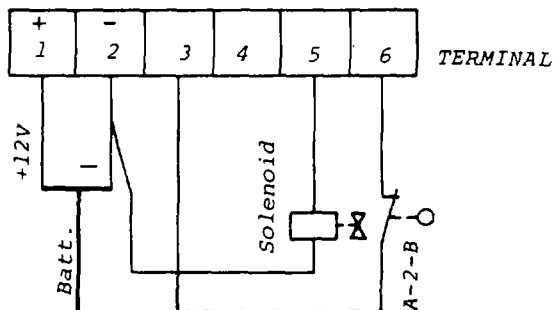
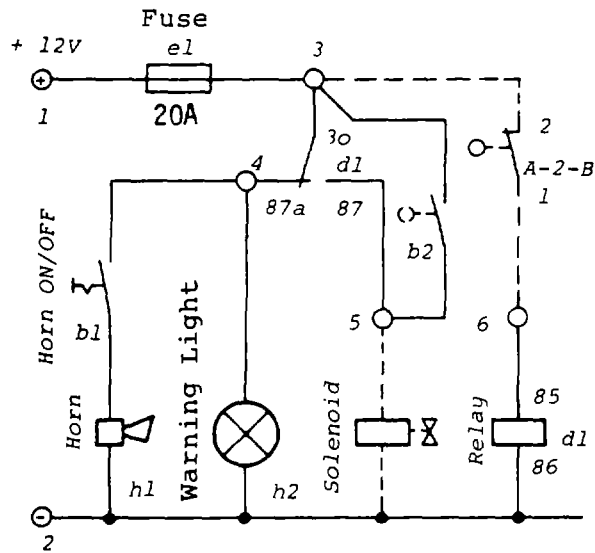
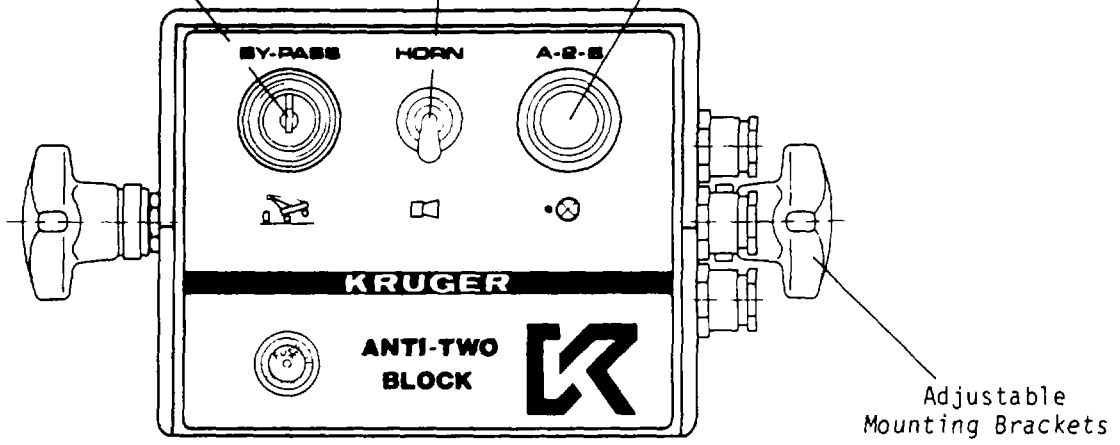


Phone (815) 874-9402  
 Telex 25-7400R

Krueger Crane Systems Inc.  
 4699 Colt Road, Rockford, III. 61109



Momentary Key Switch to Override Shut-Off System (Optional)  
 Switch Horn Off On  
 Warning Light Anti-2-Block



Phone (815) 874-9402  
 Telex 25-7498



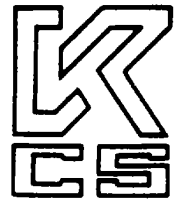
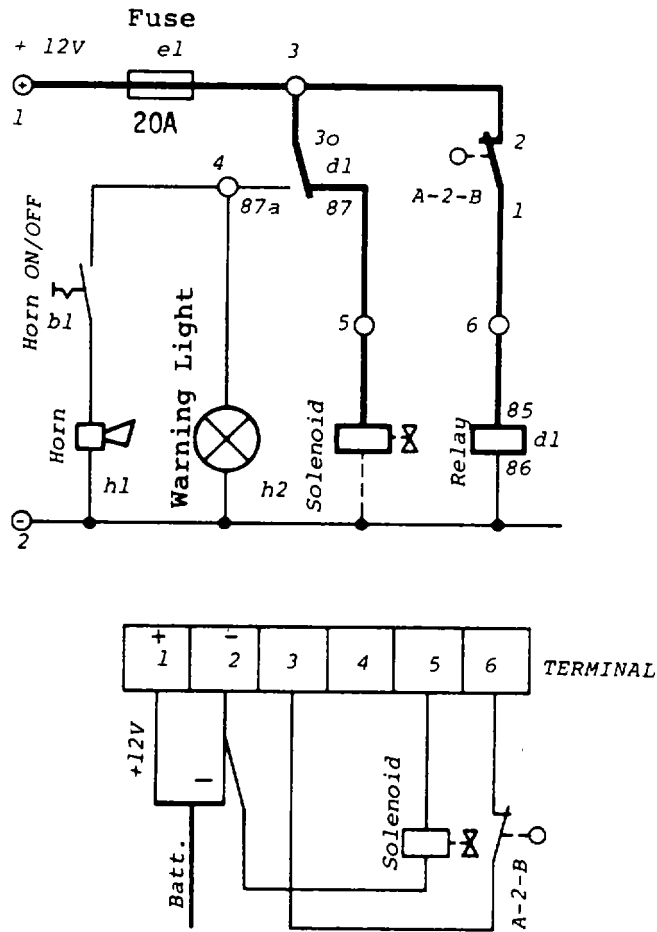


Figure 1

This diagram shows the operating condition. When the Anti-Two-Block switch is closed, the circuit between terminal No. 3 and No. 6 is closed and relay d1 is hot (pin 85). Relay d1 then switches the position of the contact d1 from 3o/87a to 3o/87 and carries the power to terminal No. 5 and from there to the solenoid.



**SYSTEM MARK H**  
***INSTALLATION & CHECKOUT***


## WARNING

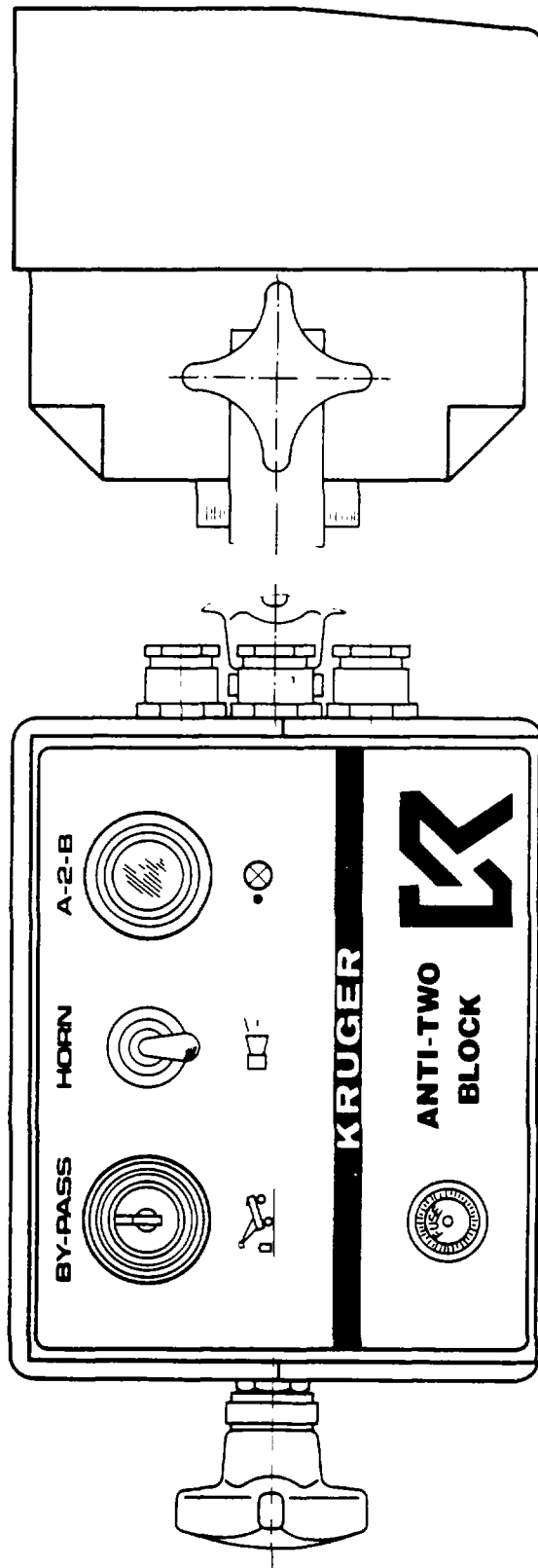
There are electrical and mechanical components included in the Krueger indicating system "H".

It should only be serviced by qualified individuals, who are either Krueger service representatives, or individuals, who received a special Krueger training.

To avoid damages and loss of warranty, we do not recommend any repairs being done by individuals without a strong electric/electronic background.

It is recommended that the systems by-passkey-switch is used with discretion, as unwarranted use of it to override the shut-off system can result in loss of life, destruction of property and irreparable damage to the crane. The key can be used in overriding the system in a case of extreme emergency. The operator using a key in extreme emergency should use sound judgement.

1980	Day	Name	Type	MARK "H"	 Krueger Crane Systems 4889 Con Road Rockford, Ill. 61109 - USA Tel.: (815) 874-8402 Telex: 28-7488
Drawn by					
Drawing No					
Ident No.					



1980	Day	Name	Type
Drawn by	7 - 3	<i>[Signature]</i>	MOD. H
Drawing No		03.0198 /	
Ident No			

**CONTROL PANEL  
TERMINAL**



**Krueger Crane Systems**

4899 Colt Road  
Rockford, Ill 61109 - USA

Tel (815) 874-9402  
Telex 25-7498

# ANTI - TWO - BLOCK



## I. THE KRUEGER INDICATING SYSTEM MARK "H"

### A. What it is

The Krueger Indicating System Mark "H" is an electro-mechanical sensing system which indicates an approaching anti-2-block condition and is to be considered as an emergency switch that prevents the hook block or equivalent hook equipment from being raised to the boom nose.

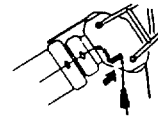
### B. What it does

- Before reaching an anti-2-block condition it
- 1 Alerts the operator by an audible/visible anti-2-block alarm
  - 2 This signal could be used to activate a shut-off system, which prevents the operator from performing movements of the following control levers
    - a Hoist up
    - b Boom lowering, and
    - c Boom extension (only with hydraulic booms)

## II. DESCRIPTION OF COMPONENTS

### A. The Anti-two-block switch

This switch is installed at the boom and jib nose and is activated by a counterweight suspended by chains. The length of these chains is in accordance with hook speed and sensitivity of the shut-off system and should not be shortened or a possible two-block condition could result.

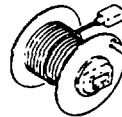


Anti-2-Block Switch

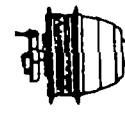
With even parts of hoisting line, the counterweight should be attached to the dead-end line. With odd parts of hoisting line, the counterweight should be attached to the line of lowest speed.

### B. The Cable Reel

The anti-2-block signal is transmitted by a cable attached to the boom and jib nose. With jibs this cable is wound on a manually operated rubber or steel-type cable reel mounted at the jib base section, and with extendable boom it is wound on a spring-type cable reel mounted on the base boom section.



Manual Operated Cable Reel for Jibs



Spring Type Cable Reel

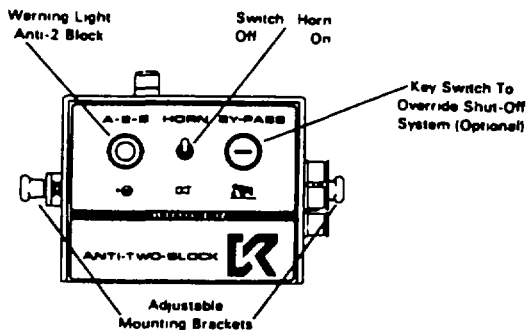
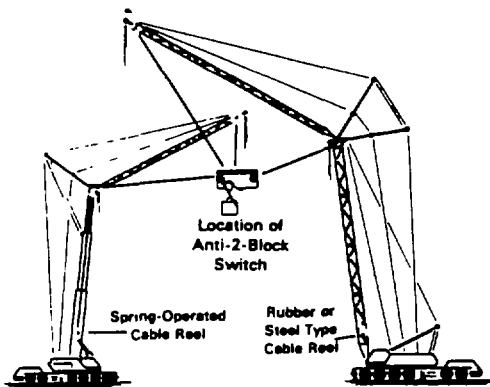
### C. The Panel

This control unit is located in the operators cab. It contains

- 1 "Visual warning light"
- 2 Toggle switch for audible alarm, and
- 3 Key switch to by-pass the shut-off system (optional)

The panel is mounted on adjustable mounting brackets and it can be adjusted for best operator view. The optional by-pass key switch deactivates the shut-off system.

## Set up of a Krueger indicating system MARK "H"



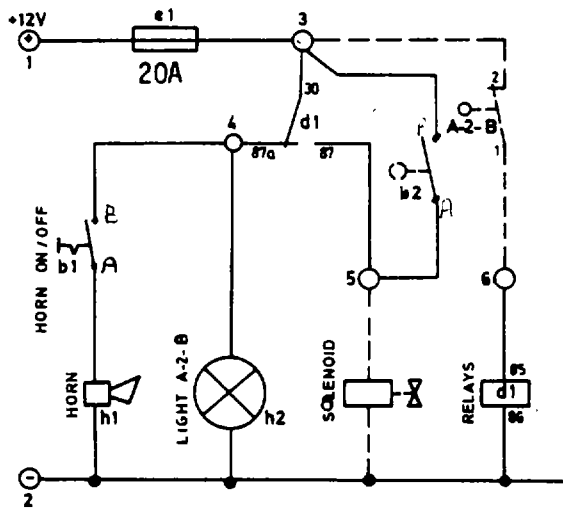
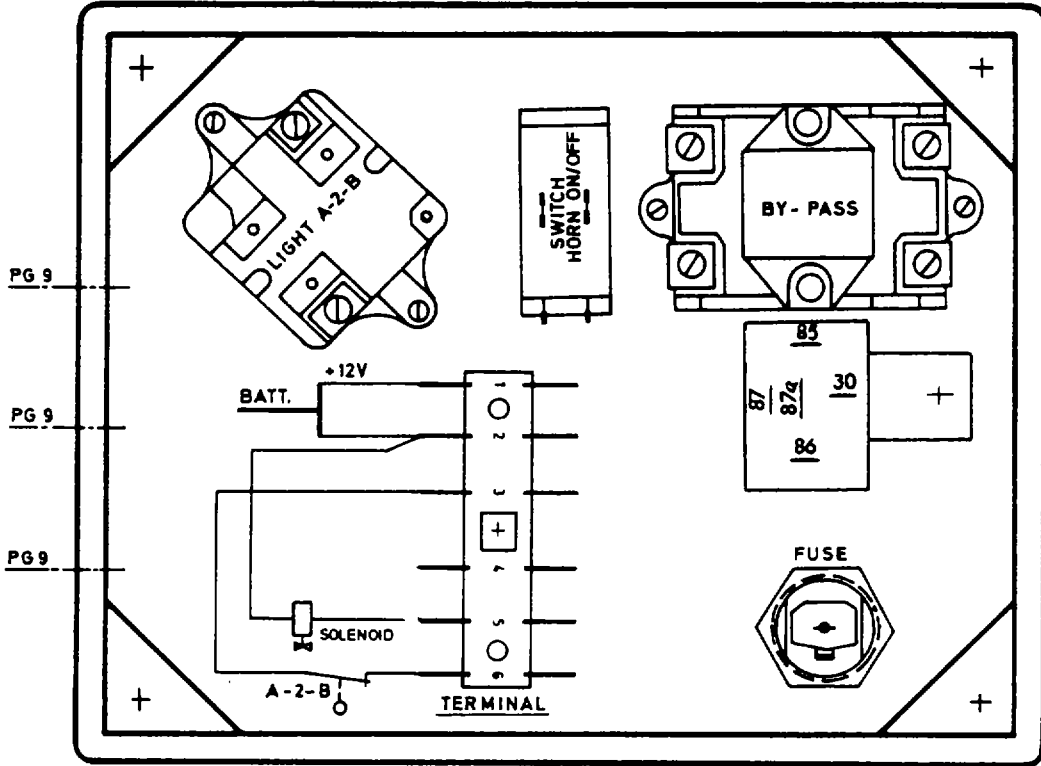
## KRÜGER GmbH & Co KG

Frielingsdortweg 4  
Postfach 4260  
4300 Essen 16 - Germany  
Tel:0201-40941-3  
Telex:8579552



## KRUEGER CRANE SYSTEMS, INC

4699 Cah Road  
Rackford, IL 61109 USA  
Tel:(815)874-9402  
Telex:25-7498



1980	DAY	NAME	DRAWG. NO.	ANTI TWO BLOCK	 Krueger Crane Systems 4899 Coll Road Rockford IL 61109 - USA Tel: (815) 874-9402 Telex: 28-7498
SCALE	3.7.		64.0534/00		

## Installation procedure

1. Install hardware and components according to engineering drawings. (for reference see fig.#1)
2. Power supply: (2 cond. cable)  
Connect the blue wire to terminal # 1 of the control panel and to +12 VDC (crane power supply).  
Connect the brown wire to terminal # 2 of the control panel and to a ground terminal on the crane. See fig. # 2 for connections on different models.
3. Two-block switch : ( 2 cond. cable)  
This cable runs from the control panel, terminal # 3 (blue) and # 6 (brown) to the two-block switch. For detailed connections refer to fig. # 2 which shows the wiring from the control panel to the boom nose, and fig. # 3, which shows the wiring for optional two-block switches (jibs ect.).
4. Shut-off: (2 cond. cable)  
Only the blue wire is used. (cut off the brown wire)  
Connect the blue wire to terminal # 5 of the control panel and to the coil of the shut-off solenoid. The second shut-off solenoid terminal has to be connected to ground. Refer to fig. # 2
5. Cable reel:  
For the system "H" there is no specific setting for the cable reel. Simply run the cable out to the boom nose, make all connections, and than take layers on/off the cable reel to get the necessary tension so that the cable winds up onto the reel when the boom is being fully retracted.  
Since the cable reel comes with standard length of cable on the reel (either 30m/98ft;40m/131ft;60m/196ft), one can start with a fully extended boom, including power pinned section. Pull the cable off the reel until there are 3 to 5 layers left on the reel, wrap the cable around the tube on the boom nose, tighten the clamping block and than cut off the access cable. This allows the cable reel to handle just the necessary length of cable that is actually needed.


1980	Day	Name	Type	<b>INSTALLATION</b>	 <b>Krueger Crane Systems</b> 4899 CoR Road Rockford, Ill 61109 - USA Tel.: (815) 874-8402 Telex: 26-7488
Drawn by	1/81	hlm	"H"		
Drawing No.: Page 4 of 8					
Ident No.: installation & checkout					

## Checkout procedure (ALSO REFER TO THE OPERATORS HANDBOOK)

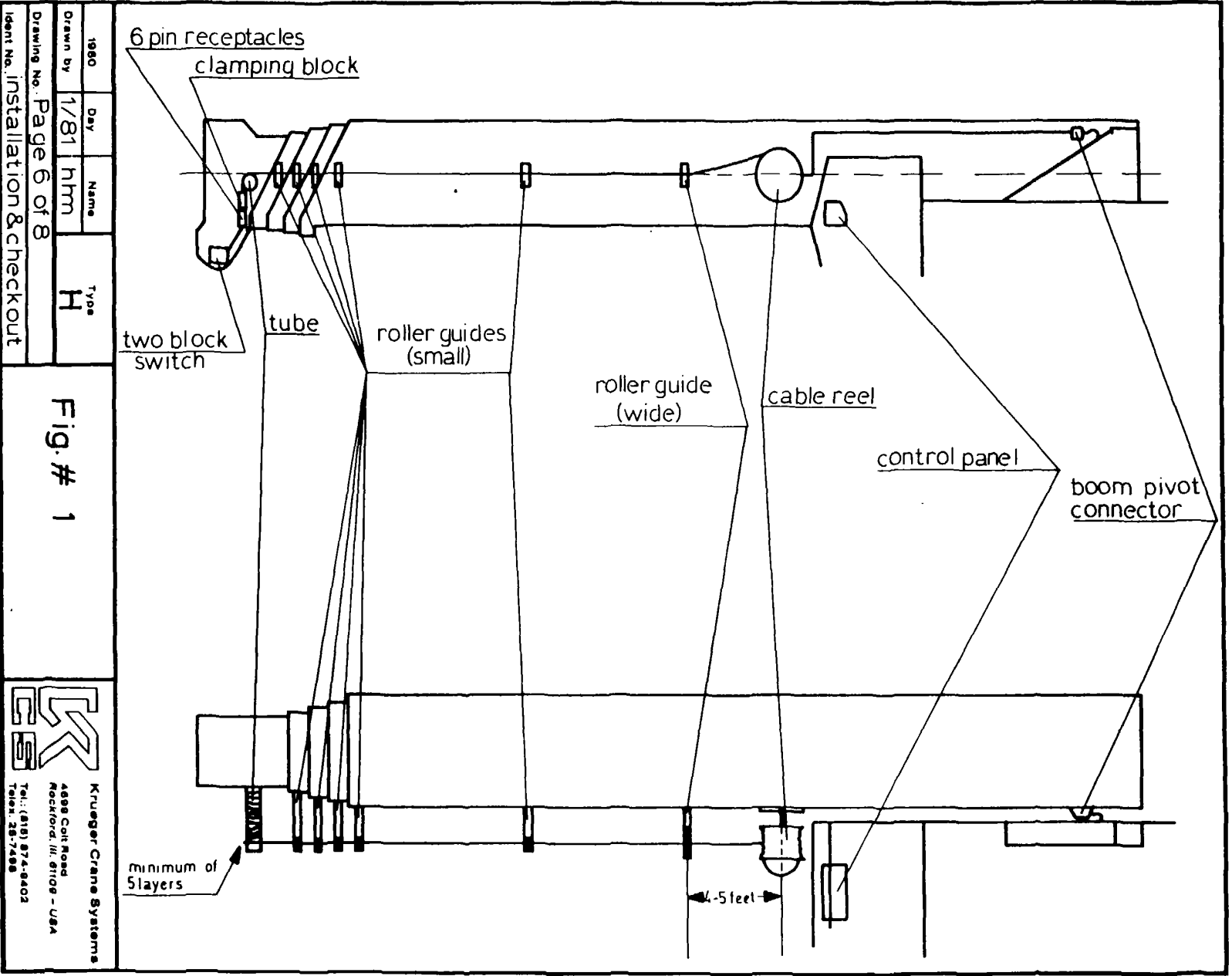
1. Make sure the system "H" is in operating condition, with counterweights attached to the two-block switch(es) (or the pin is in the hole at the two-block switch to hold down the lever-arm which activates the switch) and the jumper-cables for jib (Swing-away, A-frame, Rooster-sheave) are connected.
2. Activate the ignition switch (start engine).
3. Set the on/off toggle switch to position horn on.
4. Shut off light/horn has to be off.
5. Lift up the counterweight (pull out the pin).  
Light/horn is activated for the time the counterweight is being lifted up (the pin is out).  
Simultaneously to the light/horn, the cranes shut-off system is activated. Controls for hoisting up, booming down and extending boom sections are out of function.
6. Release counterweight (put pin back), light/horn has to go off. Crane is in normal operating condition.
7. If the light/horn does not come on, refer to the "Trouble-shooting list Mark 'H'".

**NOTE:**

Make sure that the wiring and connections are in accordance with the diagrams before using the "Trouble-shooting list."

1980	Day	Name	Type "H"	<b>CHECKOUT</b>	 <b>Krueger Crane Systems</b> 4888 Colt Road Rockford, Ill. 61109 - USA Tel.: (815) 874-8402 Telex: 25-7488
Drawn by	1/81	hnm			
Drawing No	Page 5 of 8				
Ident No.	installation & checkout				



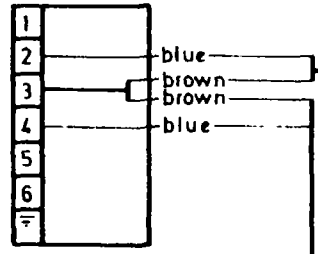


1980 Day Name  
 Drawn by 1/81 hmm  
 Drawing No. Page 7 of 8  
 Type "H"

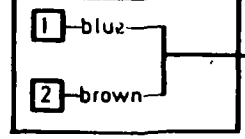
**FIG. # 2**

**K**  
 Krueger Crane Systems  
 4899 Con Road  
 Rockford, Ill. 61109 - USA  
 Tel.: (815) 874-4402  
 Telex: 26-7488

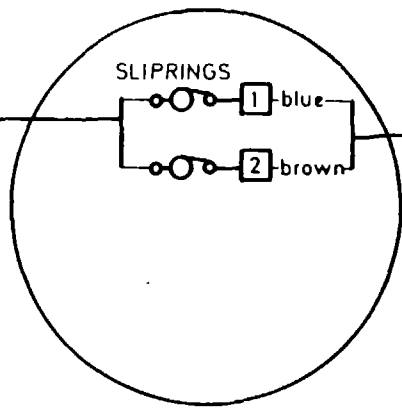
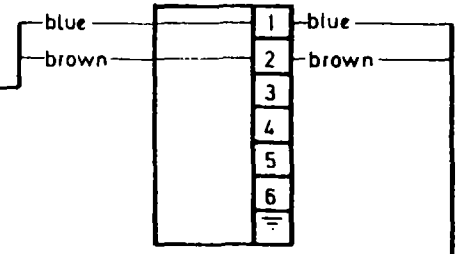
**BOOM NOSE CONNECTOR**



**MAIN BOOM A2B SWITCH**

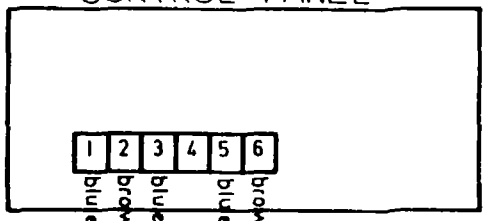


**BOOM PIVOT CONNECTOR**



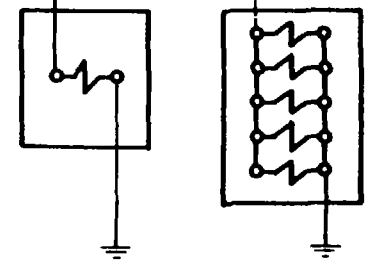
**CABLE REEL**

**CONTROL PANEL**

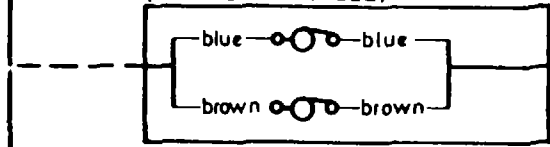


**POWER SUPPLY**  
 (+12VDC) blue  
 (ground) brown

**SHUT OFF SOLENOID(S)**



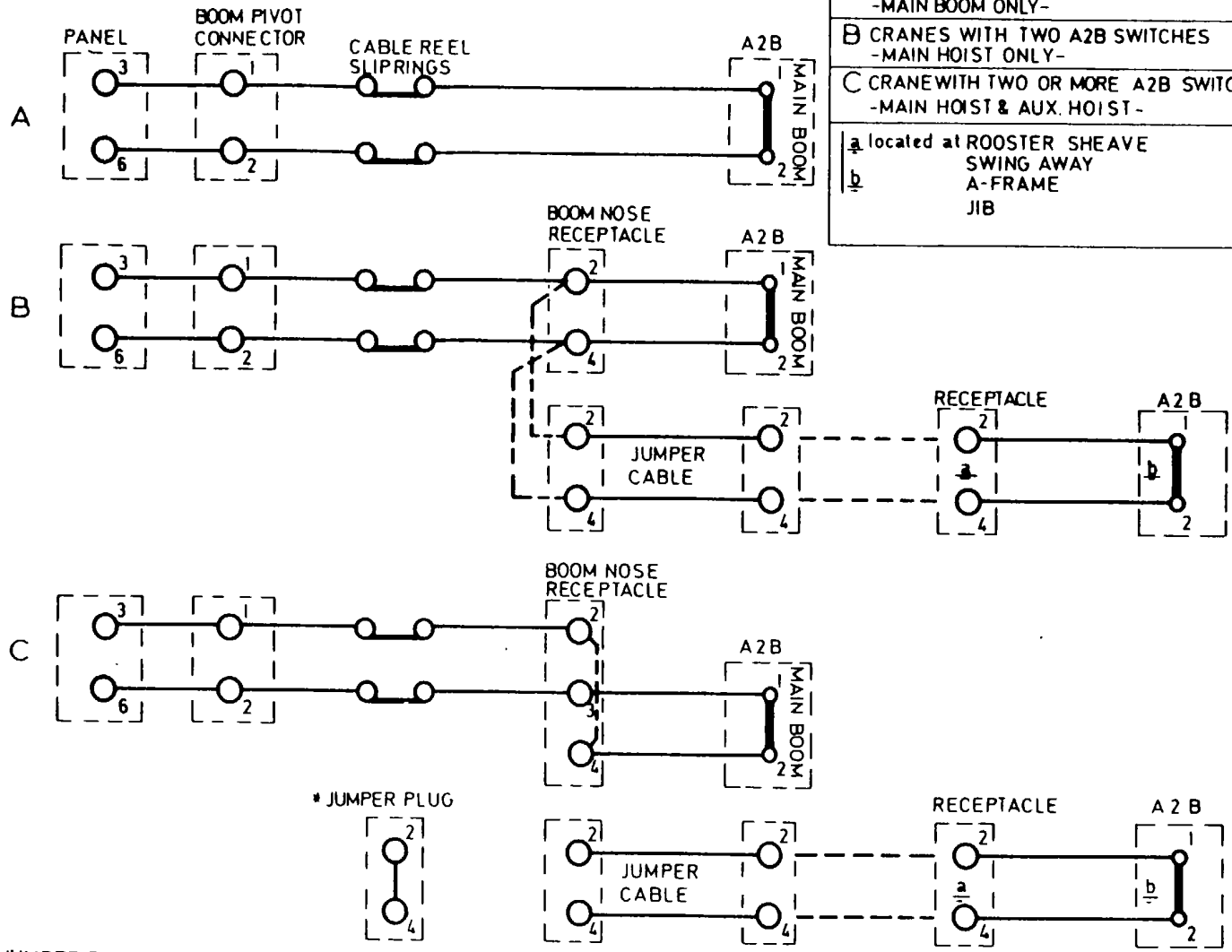
**ELECTRIC SWIVEL (WHERE APPLICABLE)**



1980	Day	Name
Drawn by 1/81	hmm	"Type" H
Drawing No Page 8 of 8	Installation & checkout	

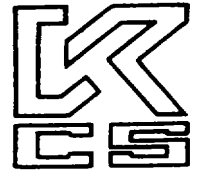
Fig. # 3

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 Telex 257749B



- A CRANES WITH ONE A2B SWITCH  
-MAIN BOOM ONLY-
  - B CRANES WITH TWO A2B SWITCHES  
-MAIN HOIST ONLY-
  - C CRANES WITH TWO OR MORE A2B SWITCHES  
-MAIN HOIST & AUX. HOIST -
- a located at ROOSTER SHEAVE  
 SWING AWAY  
 A-FRAME  
 JIB

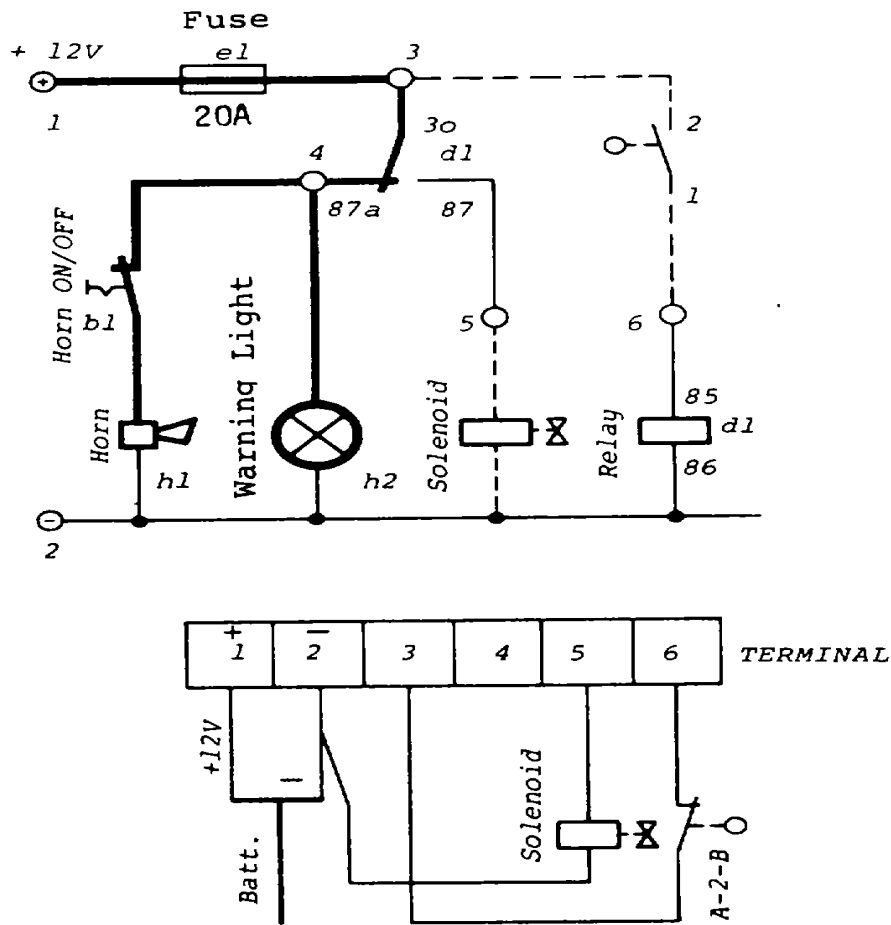
\* JUMPER PLUG HAS TO BE CONNECTED TO THE BOOM NOSE RECEPTACLE, OPERATING WITH MAIN BOOM (no jbs ecl)



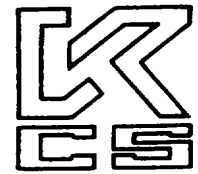
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Figure 2

This diagram shows the shut off condition. When the Anti-Two-Block switch is open the circuit between No. 3 and No. 6 is open. Relay d1 is not energized and switches the position of the contact d1 from 30/87 to 30//87a (normal position when the relay is not activated) and carries the power to the light and over an on/off toggle switch to the horn. The circuit between No. 3 and No. 5 is open and no power is transmitted to the solenoid. A shut off occurs.



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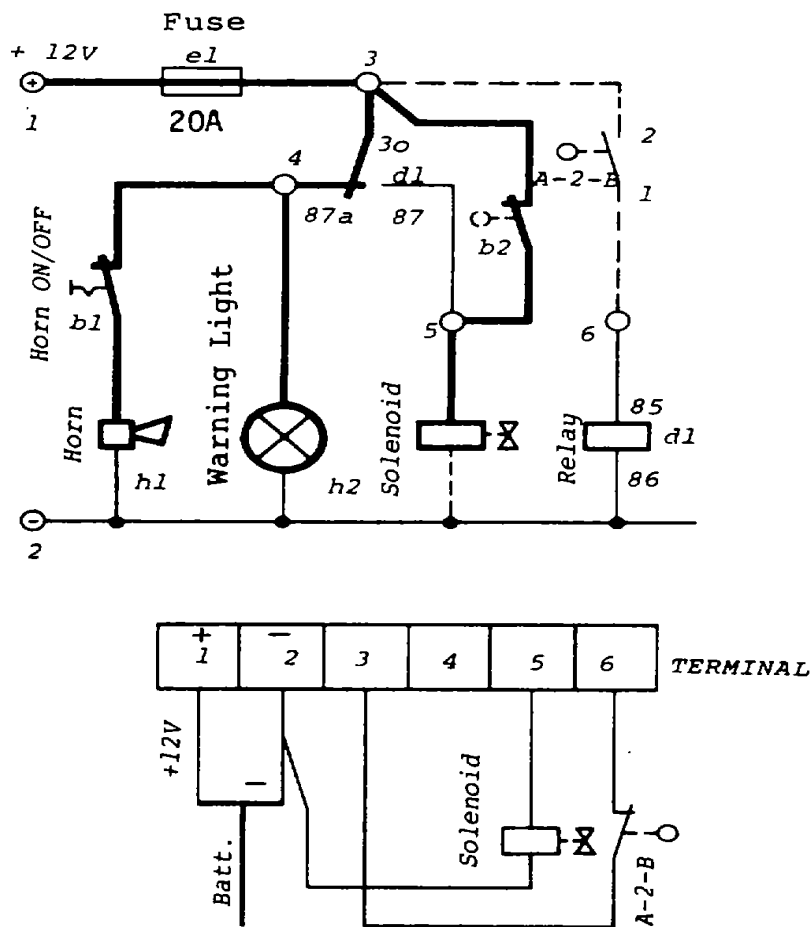


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**Figure 3**  
 (Option)

When a momentary by-pass key switch is installed in the control panel the circuit between No. 3 and No. 5 can be bypassed. It deactivates the shut-off system by turning the key and press it down. When the Anti-Two-Block switch is open, the light(horn) will come on (relay d1 switches over from 30/87 to 30/84a) but no shut-off occurs.

**Note:** The key switch should be used only in emergencies, or when the Anti-Two-Block switch is damaged during operations.



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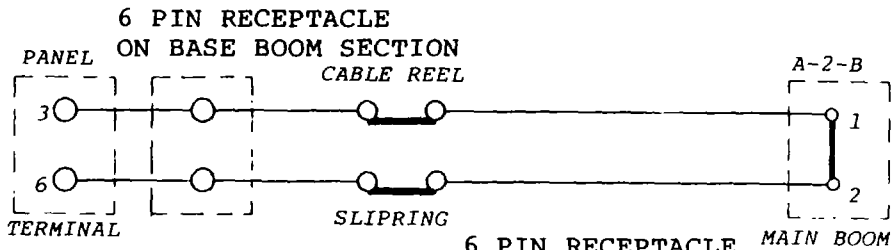


FIGURE 4

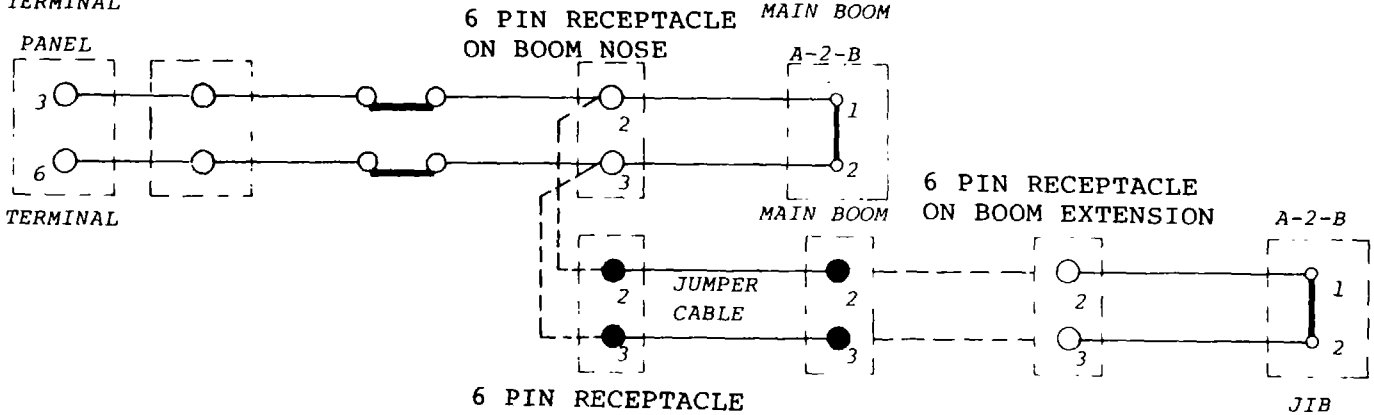


FIGURE 5

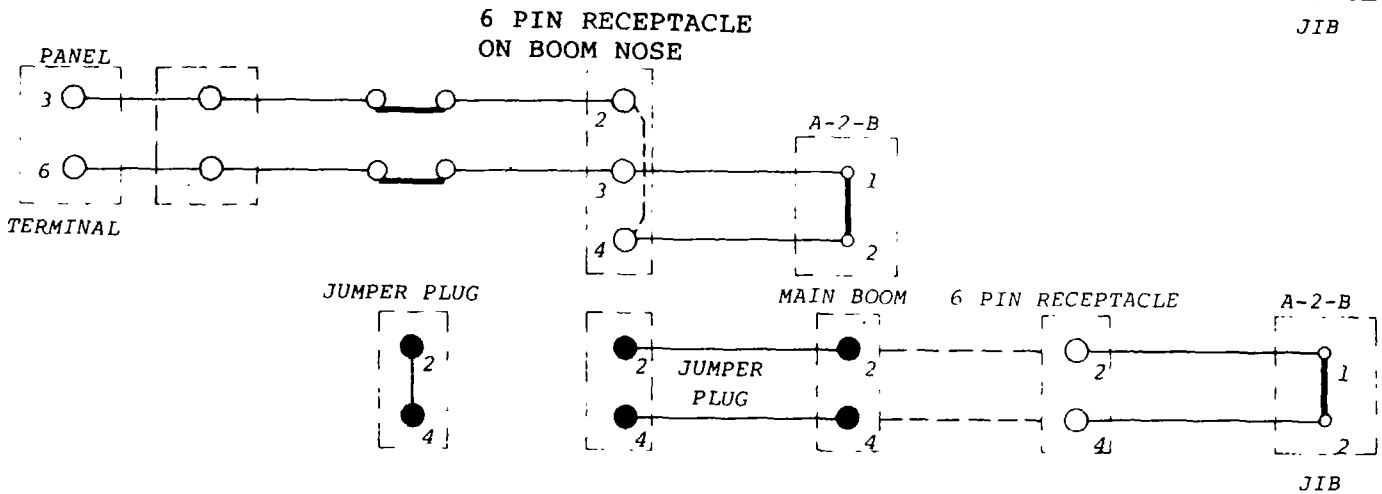
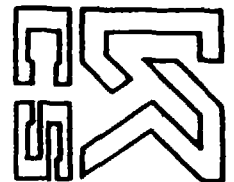
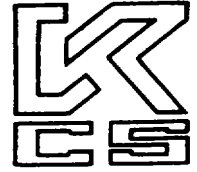


FIGURE 6





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**A**

**B**

**C**

Trouble

Shut-off but no light

Cause

1. Burned out fuse
2. Light bulb burned out
3. Broken cable

Corrective action

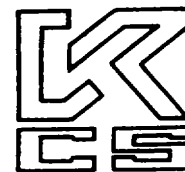
1. Check fuse and replace with 20A fuse only
2. Check light bulb and replace (12 VDC/24 VDC)
3. Check cable:
  - a. Measure voltage at control panel terminal No.1 (hot+) No.2 (ground -)
  - b. Measure voltage where wires are hooked up to the terminals of the crane power supply
  - c. Measure voltage at terminals No.5 (hot) and No.2 (ground) leading to solenoids
  - d. Measure voltage at the solenoids

**Note:**

If 12 VDC is on the power supply but not on terminal No.1 and No.2 replace cable.

If 12 VDC is on No.5 and No.2 but not at the solenoid replace cable.

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## **A**

### Trouble

Shut off and light is on

### Cause

1. Broken cable, bad connection
2. Counterweight
3. Defective relay, defective Anti-Two-Block switch

### Corrective action

1. Check all cable for outside damages. Use OHM meter to check Anti-Two-Block circuit as follows: Take wires off terminal No.3 and No.6 and check with OHM meter to make sure circuit is closed. If not, check the wires and connection inside the cable reel and from the cable reel to the Anti-Two-Block switch.

Refer to figure 4 on page 7

**Note:** Counterweight has to be connected to the Anti-Two-Block switch to close the circuit.

2. Make sure counterweight is attached to the Anti-Two-Block switch and is free to move.
3. Check if 12 VDC is on terminal No.3 and No.6

If 12 VDC is on No.3 but not on No.6 the Anti-Two-Block switch is open. Check step 2 on this page. Check steps A, B, C on page 13.

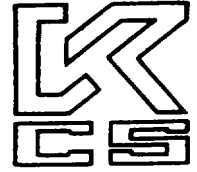
If 12 VDC is on No.3 and No.6 check if the voltage is on the relay pin 85 (hot) and 86 (ground). When the relay is powered you should read 12 VDC on pin 30 and 87.

If you read 12 VDC (with the Anti-Two-Block circuit closed, 12 VDC on terminal No.3 and No.6 on pin 30 and 87a check the Bosch relay.

Refer to A, B, C on page -1

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**A**  
**B**  
**C**

Trouble

No shut off but light is on

Cause

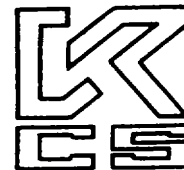
- 1 Defective Solenoid
- 2 Key Switch

Corrective Action

1. Disconnect both solenoid wires direct at the solenoid.  
Shut-off should occur.  
Refer to A, B, C on page 12.
2. Key switch position
  - a. When the key is removable, the shut-off system is engaged. That means the switch is open.
  - b. After the key is turned around (the key cannot be removed in this position) press the key down. The switch than is closed for the time the key is pressed down.

Refer to figure 3 on page 6.

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- A
- B
- C

Trouble

Defective relay.

Cause

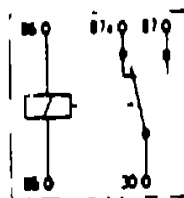
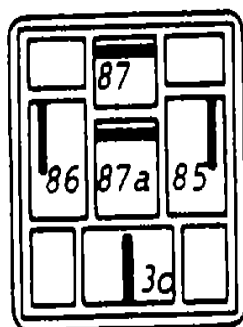
Burned out coil or bad contact

Corrective action

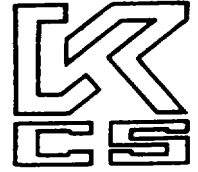
The Bosch relay has 5 marked terminal pins. No. 85 and No. 86 are connected to the relay coil. (85 and 86 are interchangeable, either 85 is hot and 86 is ground or 86 is hot and 85 is ground). No. 30, No. 87, No. 87a are the contacts. Using an OHM meter you can check the relay. The OHM meter should read, with no power at 85 and 86 (coil) a closed circuit, between No. 30 and No. 87a (normally closed) and an open circuit between No. 30 and No. 87 (normally open). With power at the relay the circuit is closed between No. 30 and No. 87 and open between No. 30 and No. 87a. If the contact is not changing replace relay.

**Relay Drawings**

**Wiring Diagram**



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- A**
- B**
- C**

Trouble

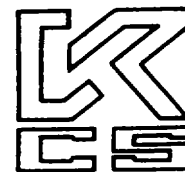
Defective solenoid (hyd. or air), (depends on model).

Cause  
Burned out coil

Corrective action

To operate the crane the solenoid has to be energized. 12 VDC has to be supplied to the coil. To check the solenoid, disconnect the wires on the solenoid terminals. The operator should not be able to hoist up, boom down or extend the telescopes. Connect a ground and a hot wire to the solenoid and the operator should be able to do all crane functions. If not replace solenoid.

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- A
- B
- C

Trouble

Broken Anti-Two-Block switch

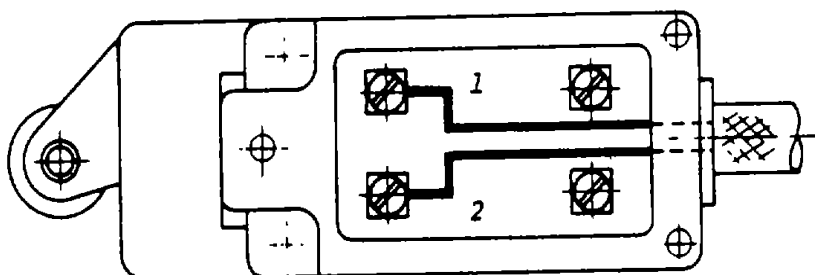
Cause

- 1. Mechanical damage
- 2. Electrical damage

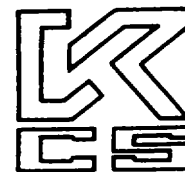
Corrective action

- 1. Check for mechanical damages. Move lever arm and check if switch is operated by the lever arm.
- 2. Wires from the cable reel should be connected to terminal No.1 and No.2 on the switch (normally closed). Pull the lever arm down and the OHM meter should read a closed circuit between No.1 and No.2 (disconnect wires before checking with OHM meter). When the lever arm is up the OHM meter should read an open circuit on No.1 and No.2. If not replace switch.

**ANTI-TWO-BLOCK SWITCH**



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## B

### Trouble

Shut off and light is on

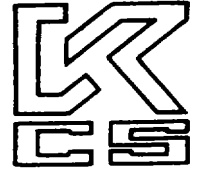
### Cause

1. Counterweight is missing.
2. Jumper cable is missing.
3. Broken cable, bad connection Main Boom.
4. Broken cable, bad connection Rooster Sheave/Jib.
5. Defective relay.
6. Defective Anti-Two-Block switch.

### Corrective action

1. Make sure the counterweight is attached to the Anti-Two-Block switch (Main Boom, Rooster Sheave or Jib) and free to move.
2. Make sure jumper cable is attached from:
  - Boom nose to Rooster Sheave
  - Boom nose to JibRefer to figure 5 on page 7
3. Check wiring for outside damages and loose connections, starting from the control panel to the boom nose. Check with an OHM meter (figure 5 on page 7) for an open circuit.
  - a. Take wires off, on terminal No.3 and No.6 in the control panel. Check at the wires you took off with an OHM meter. If the OHM meter reads a closed circuit, the wiring from the panel to the Anti-Two-Block switch is correct. The trouble is inside the control panel. If it reads an open circuit the trouble is between the panel and Anti-Two-Block switch.
  - b. Open the cable reel and take the wires off the cable reel slings. Check for an open circuit at the wires leading towards the Anti-Two-Block switch. If the OHM meter indicates a closed circuit the wiring from the cable reel to the Anti-Two-Block switch is correct. Replace the cable from the control panel to the cable reel.
  - c. If the OHM meter reads an open circuit, open the 6 pin receptacle and disconnect the wires on No.2 and No.4. Check on No.2 and No.4 for an open circuit. If the OHM meter reads a closed circuit replace the cable on the cable reel.
  - d. If the OHM meter indicates an open circuit check the Anti-Two-Block switch. Refer to A, B, C on page 13.
4. If Main Boom circuit is correct take the jumper cable and check with an OHM meter the 6 pin plugs on both ends. The OHM meter should read a closed circuit at No.2 and No.2 on both plugs, also on No.4 and No.4 on both plugs. If not replace jumper cable.

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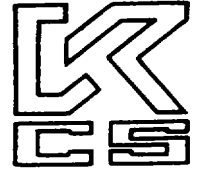


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If jumper cable is correct check No.2 and No.4 in the 6 pin socket at the Jib (Rooster Sheave). If the OHM meter reads an open circuit check the Anti-Two-Block switch. Refer to A, B, C on page 13. If the Anti-Two-Block switch is functioning, replace cable from 6 pin socket to Anti-Two-Block switch.

5. Refer to A, B, C on page 11.
6. Refer to A, B, C on page 13.

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## **C**

### To operate the crane with:

#### Main Boom:

The 6 pin jumper plug has to be connected to the boom nose 6 pin receptacle. Counterweight has to be attached to the Main Boom Anti-Two-Block switch.

#### Main Boom & Rooster Sheave

The 6 pin jumper cable has to be connected to the receptacle at the Main Boom nose and Rooster Sheave. Attach counterweight to Main Boom and to Rooster Sheave Anti-Two-Block switch.

#### Main Boom & Jib (swing around)

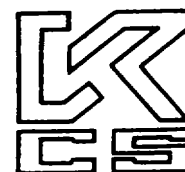
The 6 pin jumper cable has to be connected to the receptacle at the Boom nose and the Jib. Attach counterweight to Main Boom and to Jib Anti-Two-Block switch.

#### Main Boom & Extendable Jibs

The 6 pin jumper cable has to be connected from the Jib receptacle to the rubber cable reel and the plug of the reel to the Main boom receptacle. Attach counterweight to Main Boom and Jib Anti- Two-Block switch.

**Note:** Counterweight for Main Boom Anti-Two-Block switch has to be attached at all times to close the circuit while operating with Jibs or Rooster Sheave.

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## C

### Trouble

Shut off and light is on.

### Cause

1. Counterweight is missing
2. Jumper plug/cable is missing
3. Broken relay
4. Broken Anti-Two-Block switch
5. Broken cable, bad connection - Main Boom circuit
6. Broken cable, bad connection - Rooster Sheave, Jib.

### Corrective action

1. Refer to page 16.

2. Make sure counterweight is free to move

Refer to page 9.

3. Refer to A, B,,C on page 11.

4. Refer to A, B, C on page 13.

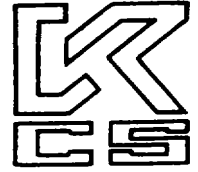
5.

- a. Check wiring and cable for outside damages and loose connections starting from control panel towards Anti-Two-Block switch..
- b. Check with an OHM meter (figure 6 on page 7) for an open circuit Take wires off, on terminal No.3 and No.6 in the control panel. Check at the wires you took off with an OHM meter. If the OHM meter reads a closed circuit the wiring from the panel to the Anti-Two-Block switch is correct. The trouble is inside the control panel. If it reads an open circuit the problem is between the panel and the Anti-Two-Block switch.
- c. Open the cable reel and take the wires off the cable reel sliprings. Check for an open circuit at the wires leading towards the Anti- Two-Block switch. If the OHM meter reads a closed circuit the wiring from the cable reel to the Anti-Two-Block switch is correct. Replace the cable from the control panel to the cable reel.
- d. If the OHM meter reads an open circuit, open the 6 pin receptacle and disconnect the wires on No.2 and No.3 coming in from the cable reel. With the jumper plug in, check for an open circuit on No.3 and No.4. If the OHM meter reads a closed circuit the wiring to the Anti-Two-Block switch is correct. Replace the cable on the cable reel.
- e. If the OHM meter reads an open circuit check the jumper plug. The OHM meter should read a closed circuit between No.2 and No.4 at the jumper plug. If not replace the jumper plug.

6. If the Main Boom wiring is correct check the jumper cables and rubber reel and go down the line to the Jib Anti-Two-Block switch in the same way as you did for the Main Boom circuit.

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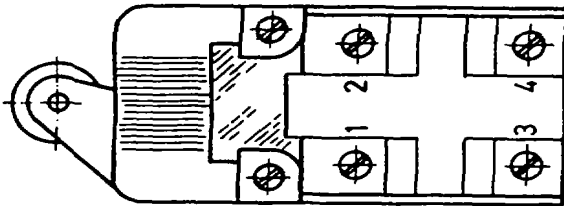
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The OHM meter should read a closed circuit between both ends of the jumper cable, and both ends of the rubber cable reel at pins No.2 to No.2 and No.4 to No.4. Refer to figure 6 on page 7.

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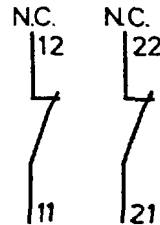
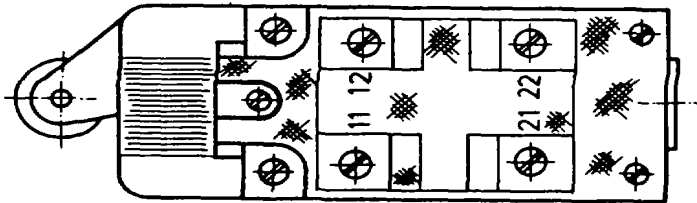
Old A2B cpl. Id.# 61.00011 / switch Id.# 61.00007 (Fanal ET 11)  
 New A2B cpl. Id.# 61.10002 / switch Id.# 61.00026 (Fanal ETW02)

Regular switch Id.# 61.00007



Connect wires to 1 and 2 to close the circuit



Waterproof switch Id.# 61.00026



Connect wires to 11 and 12 or 21 and 22 to close the circuit

The electric switch # 61.00026 does not fit into the # 61.00011 Anti-Two-Block switch.

Both Anti-Two-Block switches have the same outside dimensions and fit the existing welding brackets.

1981	Day	Name	Type	A 2 B	 Krueger Crane Systems 4599 Colt Road Rockford, Ill 61109 - USA Tel.: (815) 874-9402 Telex: 25-7498
Drawn by	4 / 30				
Drawing No.					
Ident No.					

**SYSTEM MARK H  
PARTS LIST**

Baugruppe: Kabeltrommel

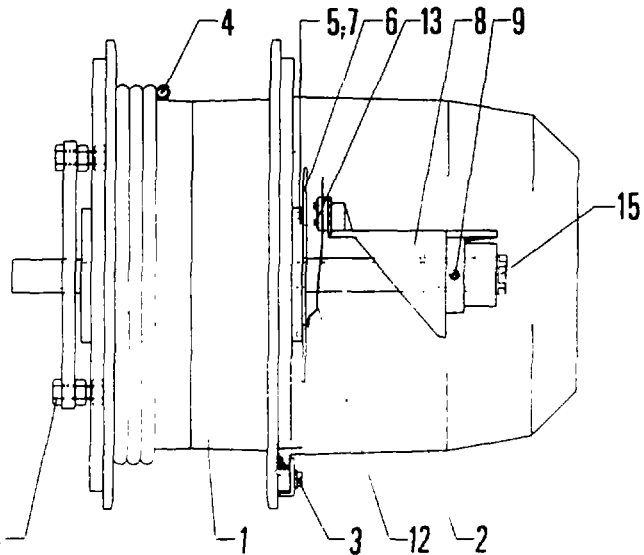
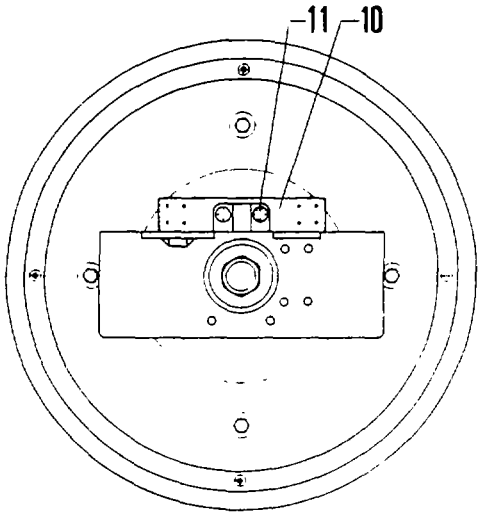
Group: Cable reel

Baugruppen Nr.: 30

Group No.: 30

Typ: 30.09030

Type: 30.09030



Lfd. Nr.  
Serial No.

Bezeichnung  
Name

Ident. Nr.  
Ident. No.

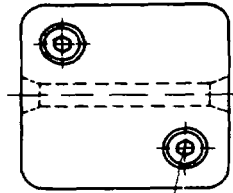
1	Cable reel body assy. comp.	31.00026
2	Cover compl. consisting of:	31.00028
	Cover	31.00029
	Seal	31.00030
3	Fastener assy. consisting of:	
	Angle clamp	101.00006
	Cyl. screw	96.08505-12
	Washer	96.00029
4	Cable	97.00130
5	Spacer	33.00075
6	Slipring 3-pol.	32.00017
7	Screw	96.96305-12
8	GFK angle bracket	33.00076
9	Allen setscrew	96.91606-10
10	Terminal strip 3-pol.	33.00071
11	Cyl. screw	96.08404-10
12	Slipper compl.	32.00004
13	Cyl. screw	96.0842,3-10
14	Screw assy. consisting of:	
	Screw	96.93308-25
	Nut	96.93408
15	Cable connector PG 16	98.00044

**KCS**

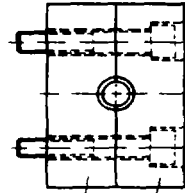
**ROCKFORD/ILLINOIS 61109**

*Baugruppe:* Kabelklemmklotz  
*Group:* Clamping block

*Baugruppen Nr.:* **39**  
*Group No.:*  
*Typ:* 39.00002  
*Type:*



3



1 2

*Lfd. Nr.*  
*Serial No.*

*Bezeichnung*  
*Name*

*Ident. Nr.*  
*Ident. No.*

1 Bottom part  
2 Top part  
3 Cyl. screw

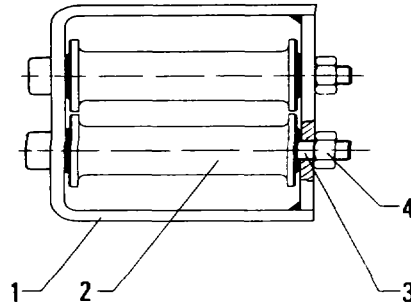
39.00047  
39.00046  
96.91208-40

*Beugruppe:* Kabelführungsrollen  
*Group:* Roller guides

*Beugruppen Nr.:*  
*Group No.:*  
*Typ:*  
*Type:*

**39**

39.00004



<i>Lfd. Nr.</i> <i>Serial No.</i>	<i>Bezeichnung</i> <i>Name</i>	<i>Ident. Nr.</i> <i>Ident. No.</i>
1	Frame	39.00217
2	Roller	39.00220
3	Cyl. screw	96.91210-110
4	Bolt	96.93410

**KCS**

**ROCKFORD/ILLINOIS 61109**

**Baugruppe:** Kabelführungsrollen

**Group:** Roller guides

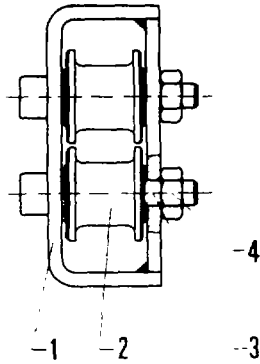
**Baugruppen Nr.:**

**39**

**Group No.:**

**Typ:**  
**Type:**

39.00009



**Lfd. Nr.**  
**Serial No.**

**Bezeichnung**  
**Name**

**Ident. Nr.**  
**Ident. No.**

1	Frame	39.00216
2	Roller	39.00219
3	Cyl. screw	96.91210-50
4	Bolt	96.93410

**KCS**

**ROCKFORD/ILLINOIS 61109**

**Baugruppe:** Kabelführungsrollen

**Group:** Roller guides

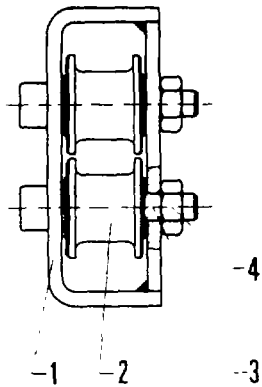
**Baugruppen Nr.:**

**Group No.:**

**39**

**Typ:**  
**Type:**

39.00009



**Lfd. Nr.**  
**Serial No.**

**Bezeichnung**  
**Name**

**Ident. Nr.**  
**Ident. No.**

1	Frame	39.00216
2	Roller	39.00219
3	Cyl. screw	96.91210-50
4	Bolt	96.93410

**KCS**

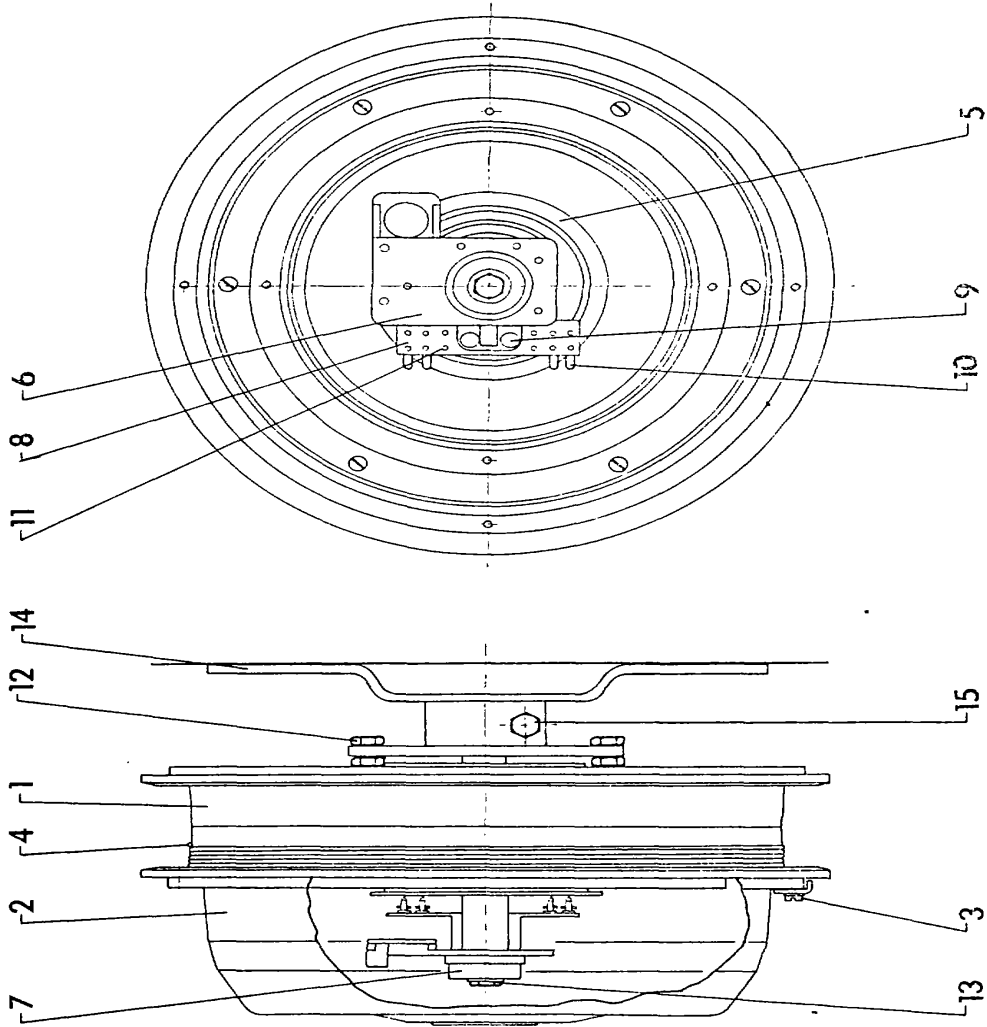
**ROCKFORD/ILLINOIS 61109**



Baugruppe: FEDERKABELTROMMEL  
Group: CABLE REEL

Baugruppen Nr.  
Group No.:  
Typ:

**30**  
30.24235



**KCS**

ROCKFORD/ILLINOIS 61109

Baugruppe: FEDERKABELTROMMEL

Baugruppen Nr.

Group: CABLE REEL

Group No.:

30

Typ:

Typo:

30.24235

Serial No.	Description	Piece	ID No.
1	Cable Reel Body Compl.	1	31.00097
2	Cover Compl. Consisting of	1	31.00080
	Cover	1	31.00066
	Seal	1	31.00078
3	Screw Assy. Consisting of		
	Angle Clamp	4	101.00005
	Slotted Flat Head Screw	4	96.08405-10
	Lock Washer	4	96.00029
4	Cable	1	97.07235
5	Slipring Compl.	1	31.00069
6	Angle Bracket	1	31.00067
7	Socket Set Screw	2	96.81406-10
8	Terminal Strip 3 Pin	1	33.00071
9	Slotted Flat Head Screw	2	96.08404-10
10	Slipper Compl.	4	32.00004
11	Slotted Flat Head Screw	8	96.08402.3-10
12	Screw Assy. Consisting of		
	Hex Head Cap Screw	2	96.93308-25
	Hexagon Nut	4	96.93408
13	Cable Connector PG 9	1	98.00114
14	Holding Device	1	121.00175
15	Screw Assy. Consisting of		
	Hex Head Cap Screw	1	96.93110-40
	Lock Washer	1	96.12710

RCS

ROCKFORD/ILLINOIS 61109

Baugruppe: Kabelführungsrollen

Group: Roller guides

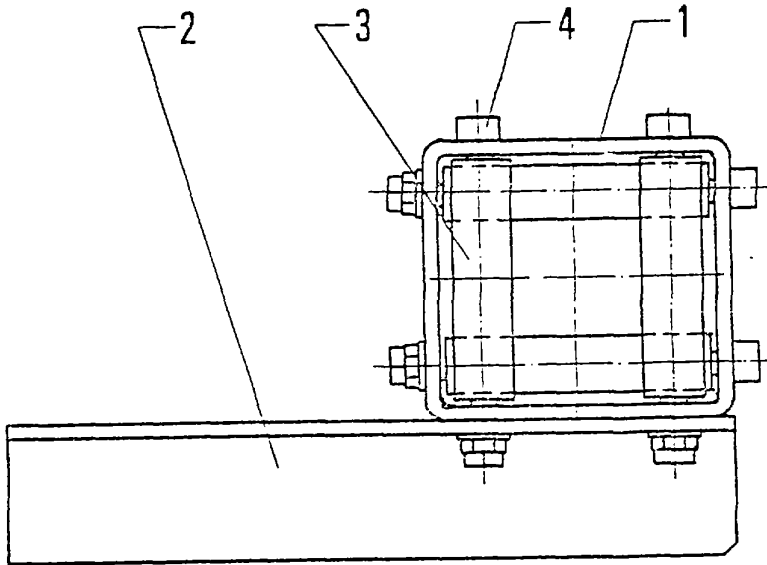
Baugruppen Nr.:

Group No.:

39

Typ:  
Type:

39.00348



Serial No.	Description	Piece	Id. No.
1	Frame	1	39.20001
2	Angle Bracket	1	39.20002
3	Roller	4	39.20003
4	Screw Assy. Consisting of:		
	Socket Cap Screw	4	96.91205-70
	Hexagon Nut	4	96.98505
	Flat Washer	4	96.12505

KCS

ROCKFORD/ILLINOIS 61109

**Baugruppe:** Anzeigegerät " H "

**Baugruppen Nr.:**

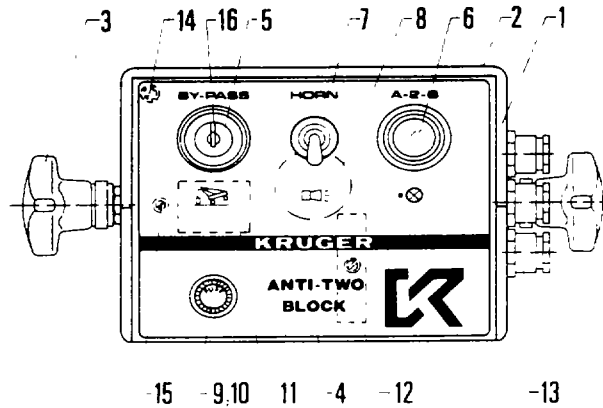
**50**

**Group:** Indicator panel

**Group No.:**

**Typ:**  
**Type:**

50.00189



**Lfd. Nr.**  
**Serial No.**

**Bezeichnung**  
**Name**

**Ident Nr.**  
**Ident No.**

1	Housing (Top part) GFK	51.00138
2	Housing (Back part) GFK	51.00127
3	Screw (Mounting Knob)	51.00004
4	Decal	53.00111
5	Key switch	19.00053
6	Warning light compl. (red) Bulb	51.00010 51.00009
7	Toggle switch (horn)	53.00001
8	Electr. beeper	53.00113
9	Fuse holder	12.00058
10	Fuse	12.00063
11	Relay	12.00064
12	Terminal strip 6-pol.	33.00032
13	Cable connector PG 9	98.00075
14	Screw assy. consisting of: Cyl. screw Washer	96.08404-40 96.00032
15	Screw assy. consisting of: Screw Nut Washer	96.96304-10 96.93404 96.00034
16	Key	19.00017

**KCS**

**ROCKFORD/ILLINOIS 61109**

**Baugruppe:** Hubendschalter

**Baugruppen Nr.:**

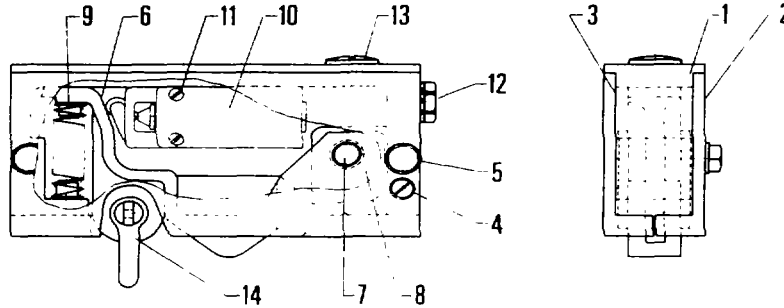
**Group:** Anti-two-block switch

**Group No.:**

**61.1**

**Typ:**  
**Type:**

61.10002



**Lfd. Nr.**  
**Serial No.**

**Bezeichnung**  
**Name**

**Ident. Nr.**  
**Ident. No.**

1	Housing	61.00025
2	Cover 1	61.00028
3	Cover 2	61.00029
4	Screw	96.96405-10
5	Screw assy. consisting of Screw Lock washer	96.93108-50 96.00033
6	Lever	61.00024
7	Bolt	61.00014
8	Gear	61.00015
9	Pressure spring	61.00016
10	Switch compl.	61.00026
11	Screw assy. consisting of Screw Nut Lock washer	96.96304-30 96.93404 96.00034
12	Cable connector Pg 11	98.00074
13	Closure plug Pg 11	98.00057
14	Shackle	61.00030

**KCS**

**ROCKFORD/ILLINOIS 61108**

**Baugruppe:** Gegengewicht kompl.  
**Group:** Counterweight compl.

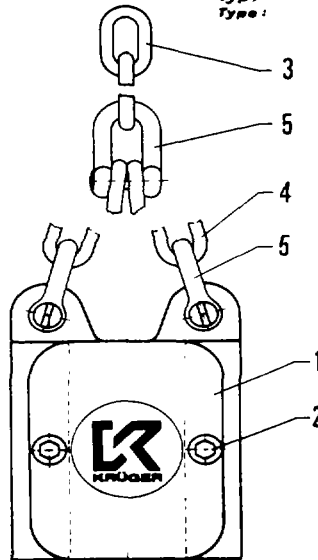
**Baugruppen Nr.:**

**Group No.:**

**62**

62.00005

**Typ:**  
**Type:**



**Lfd. Nr.**  
**Serial No.**

**Bezeichnung**  
**Name**

**Stück**  
**Piece**

**Ident. Nr.**  
**Ident. No.**

1	Counterweight	.2	62.00004
2	Cyl.screw	2	96.91210-80
3	Chain 1	1	62.00001
4	Chain 2	2	62.00002
5	Shackle	3	61.00010

**KCS**

**ROCKFORD/ILLINOIS 61109**

Baugruppe: Wieland-Steckverbindung 6-pol Baugruppen Nr.:

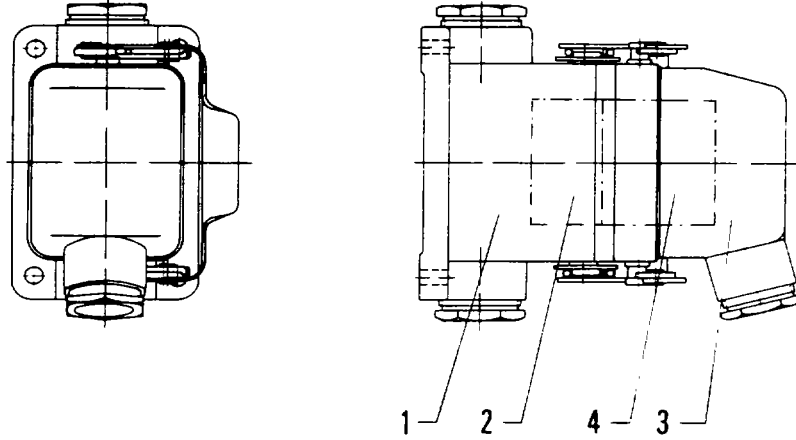
Group: 6-pin Wieland connection

Group No.:

**94**

Typ:  
Type:

94.0001  
94.0003



Lfd. Nr.  
Serial No.

Bezeichnung  
Name

Ident. Nr.  
Ident. No.

1	6-pin receptacle	94.0003
2	Insert for 6-pin receptacle (f)	94.00023
3	6-pin plug	94.0001
4	Insert for 6-pin plug (m)	94.00022

**KCS**

**ROCKFORD/ILLINOIS 61109**

## APPENDIX C

## Preventive maintenance checks and services (PMCS) for the Handling Equipment System

## C-1 Introduction to PMCS

## NOTE

TM 55-1930-209-14&P-19 contains PMCS for all systems on the ROWPU Barge. This appendix contains only PMCS for the Handling Equipment System

## a. General.

- (1) Systematic (B) before, (D) during, (A) after, and scheduled periodic PMCS are essential to ensure that the Reverse Osmosis Water Purification Barge is in operational readiness at all times. The purpose of the PMCS program is to discover and correct deficiencies and malfunctions before they cause serious damage or failure of the barges and their support systems. An effective PMCS program requires that operators report all unusual conditions noticed before, during and after operation as well as while performing periodic PMCS. All deficiencies and malfunctions discovered during maintenance inspections must be recorded, together with the corrective action taken, on DA Form 2404 (Equipment Inspection and Maintenance Worksheet).
- (2) A schedule for preventive maintenance inspections and service should be established and adhered to. When operating under unusual conditions, such as extreme heat or cold, it may be necessary to perform PMCS more frequently.
- (3) The PMCS items have been arranged and numbered in a logical sequence to provide for greater efficiency and the least amount of downtime required for maintenance.

## b. PMCS columnar entries.

- (1) Item Number Column. Checks and services are numbered in chronological order regardless of interval. This column is used as a source of item numbers for the "Item Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.
- (2) Interval Column. The interval columns tell you when to do a certain check or service: before, during, or after operation. Sometimes a dot may be placed in more than one interval column which would mean you should do the check or service at each of those intervals.
- (3) Item to Be Inspected Column. This column lists the common name of the item to be inspected such as "Air Filters." (4) Procedures Column. This column tells you how to do the required checks and services. Carefully follow these instructions.
- (5) Equipment is Not Ready/Available if Column. This column tells you when and why your equipment cannot be used.

## NOTE

The terms "Ready/Available" and "Mission Capable" refer to the same status: equipment is on hand and is able to perform its combat missions. (See DA PAM 738-750).



- (6) Increased Inspections. Perform weekly as well as Before Operations PMCS if:
  - (c) You are the assigned operator and have not operated the item since the last weekly PMCS.
  - (d) You are operating the item for the first time.
- (7) Leakage definitions. In checking for fluid leaks, the following leakage definitions apply to all ROWPU barges and barge equipment, product water, and seawater leakage by class type.
  - (a) Class I Seepage of fluid (as indicated by wetness or discoloration) not great enough to form drops.
  - (b) Class II Leakage of fluid great enough to form drops, but not enough to cause drops to drip from the item being checked/inspected.
  - (c) Class III Leakage of fluid great enough to form drops that fall from the item being checked/inspected.

**CAUTION**

Equipment operation is allowable with minor leakages (Class I or II). However, the fluid level or operating pressure of the item being checked/inspected must be considered. When in doubt, notify the shift leader or bargemaster.

When operating with Class I or Class II leaks, continue to check fluid levels as required by PMCS and operating instructions.

- (8) The following fuel and hazardous material leakage procedures apply for any fuel, chemical, or bilge system.

**WARNING**

Class I, II or III leaks or seepage occurring in a fuel, chemical, or bilge container, tank, line, piping, or valve can cause fire or health hazards.

- (a) If any leaks or seepage from a fuel, chemical, or bilge container, tank, or fluid line is detected, it must be immediately reported to the shift leader or bargemaster for corrective action.
- (b) To prevent combustible or toxic fumes from collecting or contaminated material from spilling, exercise extreme caution after detecting leaks or seepage of flammable or hazardous material.
- c. Continuous operation. When equipment must be kept in continuous operation for extended periods of time, check and service only those items that can be checked and serviced without disturbing operations. Perform complete checks and services when the equipment can be shut down.
- d. Maintenance log. Always record the time and date of PMCS, any deficiencies noted, and corrective action taken in the PMCS log book.

**C-2 Major components.** Handling equipment for the ROWPU Barge consists of a bridge crane, bow crane, and trolley hoist. Refer to Appendix A of TM 551930-209-14&P-20 for the Components of End Items List for this equipment.

**C-3 Handling equipment description.** The handling equipment is used for lifting, transporting, and repositioning equipment and materials onboard the barge. This system includes a bridge crane, bow crane, and void 4 trolley hoist. The bridge crane is installed in the reverse osmosis water purification unit (ROWPU) space, bow crane on the forward weatherdeck, and the trolley hoist in void 4 starboard. The bridge crane is used also to load and offload supplies and equipment through the deckhouse starboard sliding door. The bow crane is used primarily to unload and load the workboat from the deckhouse top and to load and unload the shore winch from its carrying position in front of the bow crane on the forward weatherdeck. The trolley hoist is used to lift or reposition equipment in void 4.

**C-3.1 Bridge crane system.** The bridge crane system, in the ROWPU space, lifts and transports heavy equipment and materials, such as diesel generators and 55-gallon drums. The bridge crane is also used for loading and unloading equipment and materials through the deckhouse starboard sliding door. Bridge crane major components include: two 5-ton capacity, motor-driven, overhead cranes with end truck assemblies; a manual, chain-operated, geared trolley hoist; a cable reel located midway in each system and an "I" beam rail system. The "I" beam rail system, which the cranes move over, is suspended from the deckhouse structure by a series of support posts. Two crossover members located between the port and starboard bridge cranes provide for transfer of the geared trolley hoist. A four-button, hand-held electrical control is used for controlling fore and aft crane movement. Electric power is provided to the crane through a cable that is extended or retracted by the cable reel as the crane moves forward or aft. Additionally, a 2-ton electric hoist provides for lifting lighter loads. A jib rail provides a method for moving suspended loads through the barge sliding door. The bridge crane system installation is shown on drawings listed in Appendix A.

**C-3.2 Bow crane system.** The bow crane is a hydraulically operated articulating boom crane with a maximum outreach of approximately 47 feet. Maximum lift capacity at this extension is 2,425 pounds. Maximum lift is 41,895 at an outreach of only 6 feet, 7 inches. The crane is corrosion-proof and suitable for operation in a marine environment. The crane has five major assemblies: crane body, inner boom, outer boom, mounting base, and hydraulic control unit. When not in daily use, bow crane must be placed in its traveling (stowed) configuration.

The crane body is a steel casting with the upper part being a closed welded box design through which hydraulic hoses are routed to inner and outer boom actuating cylinders. Inner and outer boom assemblies are positioned, as required, by extending or retracting hydraulic actuators. A winch assembly is mounted on top of the primary element of the boom for retrieving loads of 10,000 pounds or less. For winch loads greater than 10,000 pounds, the sheave block must be installed on the end of the outer boom.

Operator controls for the crane are on the forward side of the deckhouse top. They include five control levers for controlling crane movement, a START/STOP control switch, and a key lock for the anti-2-block control system. The START/STOP control switch, and a key lock for the anti-2-block control system. The START/STOP control switch and anti-2-block key lock are in a watertight storage box aft of the crane control levers. Another START/STOP control switch, primarily for emergency use, is on the weatherdeck forward bulkhead.

Hydraulic pressure for the bow crane is supplied by a hydraulic power unit in void 1 port. A 30 Hp electric motor drives the pump to produce 3600 psi of hydraulic pressure. A motor controller in void 1, starts and stops the local unit and supplies power to the two remote START/STOP control switches. The motor controller requires 440 Vac, 3 phase, 60 Hz power.

**C-3.3 Void 4 Trolley Hoist.** Void 4 trolley hoist in void 4 starboard is a low-headroom, manually-operated hoist. Major components include an "I" beam suspended from the void 4 overhead structure, a manual hoist assembly, load chains, a block hook, and a brake mechanism. The trolley hoist has a net weight of 230 pounds and a standard lift height of 8 feet. The load chains measure approximately 9 feet 6 inches and require 41 pounds of pull to lift a full load. The hook assembly has a diameter of 1 3/7 inches. The "I" beam measures approximately 6 inches in width.

ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A				
											HANDLING EQUIPMENT	<p style="text-align: center;"><b>NOTE</b></p> <p>If Handling Equipment System equipment fails to operate, troubleshoot according to TM 55-1930-209-14&amp;P-13. Report deficiencies and failures to the shift leader or bargemaster. Use proper forms to describe maintenance or repair problems. Keep Handling Equipment System operations and PMCS logs current.</p> <p style="text-align: center;"><b>WARNINGS</b></p> <p>Severe personal injury and equipment damage may result from improperly attaching slings, lifters, or hoisting rigs. Maximum load lift for trolley hoist is 5-tons and not more than 2-tons when using electric hoist. Observe all safety recommendations in this manual, in the manufacturers' service manual, and in TB 43-0142.</p> <p>Be sure electrical power is OFF before performing maintenance or repair on this system. OPEN circuit breakers. Redtag circuit breakers or motor controller with "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe safety precautions listed in the beginning of this manual and in manufacturers' manuals/instructions.</p> <p style="text-align: center;"><b>CAUTIONS</b></p> <ul style="list-style-type: none"> <li>• Avoid excessive joggling and inching. This causes crane and hoist to absorb impulse loads that can overload the system and shorten system life.</li> <li>• Avoid swinging load when transporting it. DO NOT allow load to twist. If used, make sure lifting rig is properly seated in center of hook and properly attached to load.</li> <li>• Always disengage interlocks on crane before attempting to move crane to avoid misalignment and difficult operation.</li> </ul>	

ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A				
1	•	•	•		•						BRIDGE CRANE SYSTEM  Hooks, Cables and Chains	a. Visually inspect hooks, cables, and chains for damage. Make sure crane and hoist cables and chains are properly secured, and clean. Avoid overloads.  b. Check cables and chains for fraying, bends, kinks, or loose connections. Repair, replace or tighten as necessary.  c. Check pendant control cable for cuts or abrasions that might lead to electrical shorts on controls.  d. Check hoisting hook for wear, heavy nicks, cracks, or bends. Make sure hook turns freely and that latch has freedom of movement.	Hooks, cables or chains damaged.  Cables frayed.  Cable has cuts or abrasions.  Hook does not turn freely.
						•	•						
2	•	•			•						Brake and Brake Assembly	a. Check interlocks are set properly for through travel.  b. Check brakes frequently. If brakes do not hold when lifted a few inches, do not use equipment until brakes are adjusted.  c. Avoid bumping safety stops and protective stops. Use for emergency stop only.  d. Check rotating friction disc for wear adjustment. Adjust as necessary or replace if total wear is 1/16 in.  e. Visually check brake assembly and manual release for broken or damaged parts. Replace or repair as required.  f. Clean brake magnet faces if dirty. Insert clean sheet of paper between magnet faces and energize brake. Move paper around between magnet faces to dislodge dirt. Remove paper.	Brakes do not hold.  Wear is 1/16 inch.
		•			•								

ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A				
3							•				Cable Reel Assembly, Cable Hand Held Controls	<p>g. Troubleshoot according to instructions contained in Dings Co., bulletin BK 4613, 60 series, for heavy duty unipac brake, included in Appendix B.</p> <p><b>WARNING</b></p> <p>To avoid the risk of injury to personnel or damage to equipment, make sure clamp ends on drum lifter are not broken, bent, or otherwise damaged.</p> <p>a. Visually check reel assembly and mounting for damage, broken or missing parts, or loose or missing fasteners and securements. Repair, replace, and/or tighten as necessary.</p> <p>b. Check cable guide to make sure that cable pays reel in a straight line without bends. Adjust as necessary.</p> <p>c. Visually check securement of secondary safety chain to prevent reels from falling from overhead.</p> <p>d. Troubleshoot according to instructions contained in Aero-Motive bulletin SM 3120-04 LL, Service Manual Series 0931 cord reel, included in Appendix B, TM 55-1930-209-14&amp;P-13.</p>	<p>Damaged, broken or missing parts.</p> <p>Cable line is not in straight line without bends.</p> <p>Safety chain is not secured.</p>
4	•										Electric Hoist	<p>a. Check tracking mechanism. Lift a load a few inches off deck and lower to original position while checking for slippage or free run. Adjust or repair as necessary.</p> <p><b>WARNINGS</b></p> <ul style="list-style-type: none"> <li>• Notify higher level of maintenance after repairing or replacing parts on any lifting equipment, slings, and rigs on the barge. They must safety inspect and proof test the repaired item in accordance with TB 43-0142. In addition, all lifting equipment, slings, and rigs must be proof tested to these standards every 12 months. Record and maintain certification of all proof testing.</li> <li>• Never leave suspended loads unattended. Always transport load to final destination.</li> </ul>	<p>Tracking mechanism slips or does not run free.</p>

ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A				
		•										b. Raise hoist block to top and move bridge crane to ROWPU space aft end. c. Secure chains with special attachments on sides of ROWPU aft of stowage area. d. Clean crane hoist components as necessary. Clean and/or remove debris and foreign matter from work area. <p style="text-align: center;"><b>NOTE</b></p> All bearings and bushings except the lower hook thrust bearing are prelubricated and require no lubrication. e. Lubricate lower hook thrust bearing. f. Check hooks and latches for damage, cracks, twists, excessive opening or wear. Repair as necessary.	Hooks and /or latches damaged, cracked, twisted, or worn excessively.
		•										<p style="text-align: center;"><b>WARNING</b></p> Never degrease the protector or attempt to disassemble this device. Degreasing the protector may damage parts and using a device that has been degreased may cause erratic, inconsistent operation. If the protector has been degreased, it must be replaced by a factory calibrated device. <p style="text-align: center;"><b>CAUTIONS</b></p> The Lodestar Protector friction clutch assembly should operate for the normal life of the hoist without service. The device has been lubricated and calibrated at the factory for a specific model of Lodestar Hoist and is not adjustable or interchangeable with other models. The CM Lodestar Protector is to be used with "American Lubricants #6283" Grease. Do not use any other grease or the protector will not operate properly and parts could be damaged. The gears and protector (Part Nos. S-327 and S-328) are packed at assembly with grease and should not need to be renewed unless the gears have been removed from the housing and degreased.	

ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A				
							•					g. Inspect the loose end link, loose end screw, and dead end block on double reeved units. Replace the loose end link if it has opened, and check the operation of lower limit switch.	End link is loose or open.
							•					h. Check that the loose end screw is tight and the pin seated at the dead end of chain.	
							•					i. Inspect the upper suspension adapter making sure it is fully seated in the recess and that both cap screws are tight. If screws continue to be loose, replace the self-locking nuts in hoist frame.	Capscrews are loose.
							•					j. On single phase units (without a contactor) and two speed units, check operation of the control station switching arm that it pivots freely and does not stick in either position.	Switching arm does not pivot freely and/or sticks in either position.
							•					k. Inspect electric brake friction linings and friction surfaces for wear, scoring, or warping. Check air gap between armature and field. Adjust if the gap exceeds 0.045 in.	Gap exceeds 0.045 in.
							•					l. Inspect the liftwheel pockets for wear. Severely worn liftwheel should be replaced.	Liftwheel is severely damaged.
							•					m. Inspect the chain guides for wear or burring where chain enters hoist. Severely worn guides should be replaced.	Chain guides severely worn.
							•					n. Inspect trolley trackwheels for external wear on the tread and flange, and for wear on internal bearing surfaces as evidenced by a looseness on the stud.	Excessive wear on tread and flange. Internal bearing exhibits looseness on stud.
							•					o. Inspect collector wheels or collector shoes and cotter pins for wear. Check the wheels and studs for corrosion and free turning. Badly worn parts should be replaced.	Collector wheels, shoes and other pins are worn.

Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

B - Before  
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ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A				
5	•				•		•				Miscellaneous	<p>p. Inspect the gasket between the gear housing and back frame for signs of leaks. Tighten the screws holding back frame to gear housing. If leaking persists, repack housing and gears with grease and install a new gasket.</p> <p>q. Apply light film of machine oil to the limit switch shaft threads.</p> <p>a. Check hoists and crane for proper lubrication. Lubricate as necessary.</p> <p>b. Inspect all end stops and tighten bolts if required.</p> <p>c. Inspect all structural components for loose connections, and secureness. Repair, replace, and/or tighten as required.</p> <p>d. Check that weight of pushbutton hand-held control device is not supported by its electric cable. Pendant cable must hang freely. Repair or replace as necessary.</p>	<p>Class III leaks.</p> <p>Structural components are loose or not secured.</p> <p>Cable does not hang freely.</p>
6											Void 4 Geared Trolley Hoist	<p style="text-align: center;"><b>WARNING</b></p> <p><b>Notify higher maintenance unit after repairing or replacing parts on the void 4 trolley hoist. They must safety inspect and proof test the repaired item in accordance with TB 43-0142. In addition, all slings and lifting devices must be proof tested to these standards every 12 months. Record and maintain certification of all proof testing.</b></p>	





Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

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ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF	
	B	D	A	D	W	M	Q	S	A					
							•					f. Check hook for free swivel movement. Adjust or repair as necessary.		
												NOTE		
												<b>Lubricant</b>	<b>Location</b>	<b>Instructions</b>
												NLGI No. 2 Grease	Fittings on chain sheave pins (roller bearings)	Annually or as required.
												*Trolley wheels		After prolonged use or at reassembly
												Pawl Stud		Coat lightly at reassembly
												Brake square thread		Coat lightly at reassembly
												NLGI No. 2 with E.P. additive	Gears	After prolonged use or at reassembly
												Intermedia oils preferably with E.P. additives	Chain	Immerse in container or swab with oil soaked rag. Wipe off excess oil. Should maintain chain rust free.
												Bonded lubricants (similar to Dow Molykote M-88)	Chain	Use in place of oil, if oil residues are objectionable.
												* Not required on unit equipped with sealed ball bearings. (Wheels will not have grease fittings. See also service lubrication specifications contained in MIL-L-2104 and MIL-L-46152)		
							•	•				g. Inspect load chain for lubrication, wear, damaged links, or foreign matter. Lubricate, clean or repair as necessary.		Load chain damaged.
							•					h. Check hook block for damage, rust, or corrosion. Clean as required.		Hook block damaged.
							•					i. Inspect trolley track wheels for external wear on the tread and flange. Repair as necessary.		Tread and flange excessively worn.
							•					j. Inspect chain guides for wear or burring where chain enters hoist. Replace severely worn guides.		Chain guides show severe wear or burring.

Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

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ITEM NO.	INTERVAL										ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF
	B	D	A	D	W	M	Q	S	A				
7	•						•				BOW CRANE SYSTEM	k. Check trolley hoist tracking mechanism. Lift load a few inches off deck and lower to original position while checking for slippage or free run. Adjust or repair as necessary.  l. Inspect load bearing parts such as hand chain wheels, chain attachments, suspension bolts, shafts, gears, and bearings.  <b>WARNING</b> Be sure that electrical power is OFF before performing any maintenance on electrical systems. Redtag appropriate switches and circuit breakers with: "WARNING - DO NOT ACTIVATE. REPAIRS BEING MADE." Observe all safety precautions listed at the beginning of this manual.  <b>CAUTION</b> Due to high pressure in hydraulic system, do NOT operate crane with any visible leaks. Repair crane prior to use. Correct leaks in flexible hose, hard piping, or joints. Do not confuse seepage around hydraulic packing on actuator arms with leaks. A small amount of seepage is acceptable.	Tracking mechanism does not run free or slippage occurs.
	•									Hydraulic System			

Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

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	B	D	A	D	W	M	Q	S	A				
	•			•								<p>c. Remove filler cap on hydraulic tank to assure fluid level is within 1 in. of bottom of filler neck. If fluid is low, add hydraulic fluid before using crane. Screw cap on tightly before starting hydraulic pump.</p> <p>d. Check hydraulic system operations. To test, turn main switch on at hydraulic power unit motor controller (void 1 aft bulkhead) and set HAND/OFF/AUTO switch to HAND position.</p> <p style="text-align: center;"><b>NOTE</b></p> <p>Hydraulic power unit pump is started locally by pushing green START button on motor controller or pushing black START button on START/STOP control station on deckhouse top. If bow crane has not been used recently, start pump by pressing green motor controller START button and make sure pump starts.</p> <p>e. On forward weatherdeck, visually check exposed hard piping and flexible hydraulic lines for cracks and leaks. Check crane base to ensure that it is secure and make sure forward weatherdeck is clear of material that might obstruct bow crane movement. Inspect hold-down bolts for damage and check for tightness. If tightening is required, tighten to 350 ft lb.</p> <p style="text-align: center;"><b>WARNING</b></p> <p>The anti-two-block alarm system consists of an emergency switch which when activated prevents the hook block from being raised to the boom nose level. The switch lights a warning lamp on the crane operator's control panel and sounds a horn signal. Allowing the hook block to rise above the boom nose level could cause serious damage to the crane structure and could cause severe personal injury.</p> <p>f. Activate crane hydraulic unit. Crane is ready for BEFORE functional test deployment when hydraulic pump reaches high pitched whine.</p>	<p>Fluid level is low.</p> <p>Class III leaks. Crane base is not secure</p>
	•	•											

Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

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ITEM NO.	INTERVAL									ITEM TO BE INSPECTED	PROCEDURES CHECK FOR AND HAVE REPAIRED OR ADJUSTED AS NECESSARY	EQUIPMENT IS NOT READY/ AVAILABLE IF												
	B	D	A	D	W	M	Q	S	A															
	•	•			•						g. Activate the anti-two-block alarm and visually check that system is operational.  h. Using crane control levers, deploy crane from traveling position and exercise crane, without load, as follows:  1) Extend all booms to their maximum length and slew crane around in one complete circle.  2) During each movement, check for a change in pitch of hydraulic pump noise and any jerky, sticking, or uneven movements of any part of crane.  3) Note any symptoms and check crane carefully before using.	Crane jerks, sticks, or parts move unevenly.												
											<p style="text-align: center;"><b>NOTE</b></p> <table border="0"> <thead> <tr> <th style="text-align: left;"><u>Lubricant</u></th> <th style="text-align: left;"><u>Temperature Range</u></th> <th style="text-align: left;"><u>Type</u></th> </tr> </thead> <tbody> <tr> <td>Grease</td> <td></td> <td>ESSO Multipurpose Grease H AGIP F1 Grease 16</td> </tr> <tr> <td>Industrial Oil</td> <td>less than -15°C -15°C+ +35°C greater than +35°C</td> <td>ESSO NUTO H15 ESSO NUTO H46 ESSO NUTE H4100</td> </tr> <tr> <td>Motor Oil</td> <td>less than -15°C -15°C+ +35°C greater than +35°C</td> <td>ESSO NUTO HD5W ESSO NUTO HD20W ESSO NUTO HD30</td> </tr> </tbody> </table> <p style="text-align: center;"><b>NOTE</b></p> <p>Industrial oil can not be mixed with motor oil. When industrial oil is not available use the motor oil. (See also service lubrication specifications contained in MIL-L-2104 and MIL-L-46152.)</p> <p style="text-align: center;"><b>WARNINGS</b></p> <ul style="list-style-type: none"> <li>• Sheave block must be installed before using bow crane winch to lift loads of more than 10,000 lb.</li> <li>• Maximum lift for crane winch with sheave block installed must not exceed 20,000 lb.</li> </ul>	<u>Lubricant</u>	<u>Temperature Range</u>	<u>Type</u>	Grease		ESSO Multipurpose Grease H AGIP F1 Grease 16	Industrial Oil	less than -15°C -15°C+ +35°C greater than +35°C	ESSO NUTO H15 ESSO NUTO H46 ESSO NUTE H4100	Motor Oil	less than -15°C -15°C+ +35°C greater than +35°C	ESSO NUTO HD5W ESSO NUTO HD20W ESSO NUTO HD30	
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Motor Oil	less than -15°C -15°C+ +35°C greater than +35°C	ESSO NUTO HD5W ESSO NUTO HD20W ESSO NUTO HD30																						
										250 hrs	i. Check return and suction filters. Replace as necessary													

Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

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	B	D	A	D	W	M	Q	S	A				
8						•					Hoisting Machinery	a. Inspect hoist cables for fraying, bends or kinks. Repair or replace as necessary. Lubricate with wire rope compound. b. Inspect hook block for worn sheaves or broken sheave flanges. Repair or replace as necessary. c. Check block for loose or frozen bearings and lubricate. d. Inspect sheave guards and repair if necessary. e. Check the oil level in gearcase and add MIL-L-2105C oil if necessary using type and grade as specified by hoist manufacturer. f. Inspect electrical connections for loose connection or damaged wiring. g. Inspect collectors for shoe wear and alignment, and check the electrical connections. h. Test brakes for operation and adjust if necessary. i. Lubricate points of wear and bearings in all controllers. j. Inspect all magnetic contactors and check operation. k. Check contactor surfaces for wear or pitting; replace worn parts. l. Check control items for weak springs and worn bearings. Replace worn items. Adjust and lubricate the bearing points with a drop of oil. m. Inspect limit switches and test operation. Check contacts. Clean and adjust if necessary.	Cables are frayed, bent or kinked.  Sheaves and/or flanges excessively worn.  Bearing loose or frozen.  Sheave guards inoperable.  Wiring damaged.  Shoes worn or misaligned.  Brakes inoperable.  Bearing and/or controllers excessively worn.  Magnetic contactors inoperable.  Springs and bearings worn.  Limit switches inoperable

Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

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	B	D	A	D	W	M	Q	S	A				
9							•	•			Crane and Carrier Drive Equipment	a. Inspect and test interlocks for proper clearances and freedom of operation. b. Inspect current collectors for shoe wear and alignment and adjust if necessary. c. Inspect for loose electrical connections or damaged wiring. d. Check oil level in gearcases and add BP LSEP-2 ALT BEACON EP2 machine oil if required. e. If equipment is equipped with travel brakes, test operation and adjust if necessary. f. Inspect lineshaft for loose bearing support bolts. g. Check crossbridge conductors for bends or kinks and loose splices. Correct if necessary. h. Inspect motor mounting bolts and tighten if necessary.	Connections loose or wiring damaged.  Brakes inoperable.  Bearing support bolt loose.  Crossbridge conductor bent, kinked or loose.  Motor mounting bolts loose.

Table C-1. Preventive Maintenance Checks and Services for Handling Equipment (Continued)

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	B	D	A	D	W	M	Q	S	A			
10										Miscellaneous Equipment	<p style="text-align: center;"><b>WARNING</b></p> <p><b>If hook is twisted or has throat opening greater than normal, notify IDS/IGS maintenance unit to inspect and/or replace.</b></p> <p>a. Check hooks and pulleys for cracks, bends, or deformed parts. Check cables for kinks or fraying. Repair as necessary.</p> <p>b. Inspect structural components for cracks and excessive play in joints and connections. Repair as necessary.</p> <p>c. If crane is not in traveling position, cover all exposed stainless steel rods with heavy coating of general purpose anti-corrosion grease or hydraulic fluid.</p> <p>d. Clean grease from stainless steel rods before operation.</p> <p>e. Check for leaks on hard piping, hoses, and hydraulic seals. Notify shift leader or bargemaster so that leaks can be repaired.</p> <p>f. Inspect all interlocks and crossovers for alignment, clearance, and freedom of operation.</p> <p>g. Extend winch cable to full length and carefully inspect it. Make sure that it is securely fastened to drum. Carefully record any broken strands or deterioration in winch cable and request IDS/IGS maintenance to determine whether further use of the winch constitutes a safety hazard.</p>	<p>Hooks and pulleys cracked, bent or deformed. Cables frayed.</p> <p>Cracks or excessive play in structural components, joints and connections.</p> <p>Class III leaks.</p> <p>Interlocks or crossovers are restricted or misaligned.</p> <p>Drum not securely fastened.</p>



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	B	D	A	D	W	M	Q	S	A					
													<p>h. Check all slings used to hoist workboat for broken or frayed wires, smooth or worn spots, and corrosion. Remove slings with broken or frayed wires from service immediately. Inspect smooth or worn spots to determine cause of condition and take corrective action. If no further maintenance is required, coat the spots with a thin coat of oil, remove corrosion, and treat as appropriate.</p> <p>i. While crane is folded, check hydraulic fluid level. Level should be between minimum and maximum.</p> <p>j. Remove and clean oil filter located at the base of the crane.</p> <p>k. Remove and clean filter mounted on the suction way. Remove the cartridge, wash with suitable solvent, and dry with low pressure compressed air.</p> <p>l. With grease gun, grease all joints.</p> <p>m. Lubricate all jointed lever rods.</p> <p>n. Clean components as necessary.</p> <p>o. Remove rust, corrosion, and worn or chipped paint by wire brushing, chipping, or scraping. Immediately paint cleaned area with zinc chromate paint and finish to match surrounding area according to TM 43-0144.</p> <p>p. Replace oil filter element.</p> <p>q. Clean the air filter in the oil filter cap.</p> <p>r. Drain and replace the hydraulic oil.</p> <p>s. Request annual proof testing of bow crane and allied slings and lifting devices. Test in accordance with TM 43-0142. Record and maintain certification of all proof testing.</p>	Slings have broken or frayed wires.

By Order of the Secretary of the Army:

Official:


MILTON H. HAMILTON  
*Administrative Assistant to the  
Secretary of the Army*  
06921

GORDON R. SULLIVAN  
*General, United States Army  
Chief of Staff*

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# The Metric System and Equivalents

## Linear Measure

1 centimeter = 10 millimeters = .39 inch  
 1 decimeter = 10 centimeters = 3.94 inches  
 1 meter = 10 decimeters = 39.37 inches  
 1 dekameter = 10 meters = 32.8 feet  
 1 hectometer = 10 dekameters = 328.08 feet  
 1 kilometer = 10 hectometers = 3,280.8 feet

## Weights

1 centigram = 10 milligrams = .15 grain  
 1 decigram = 10 centigrams = 1.54 grains  
 1 gram = 10 decigrams = .035 ounce  
 1 dekagram = 10 grams = .35 ounce  
 1 hectogram = 10 dekagrams = 3.52 ounces  
 1 kilogram = 10 hectograms = 2.2 pounds  
 1 quintal = 100 kilograms = 220.46 pounds  
 1 metric ton = 10 quintals = 1.1 short tons

## Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce  
 1 deciliter = 10 centiliters = 3.38 fl. ounces  
 1 liter = 10 deciliters = 33.81 fl. ounces  
 1 dekaliter = 10 liters = 2.64 gallons  
 1 hectoliter = 10 dekaliters = 26.42 gallons  
 1 kiloliter = 10 hectoliters = 264.18 gallons

## Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch  
 1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches  
 1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet  
 1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet  
 1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres  
 1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

## Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch  
 1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches  
 1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

## Approximate Conversion Factors

To change	To	Multiply by	To change	To	Multiply by
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29.573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

## Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C
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**PIN: 065364-000**