

# OPERATION, SERVICE & PARTS MANUAL



12959

# SHAW-BOX®

## LOADMAX

## DOUBLE GIRDER TROLLEYS

**LIFTTECH**™ 

LIFT-TECH INTERNATIONAL  
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MUSKEGON, MICHIGAN 49443

**SHAW-BOX**

## FOREWORD

This manual contains important information to help you install, operate, inspect and maintain your new SHAW-BOX trolley. We recommend that you study its contents thoroughly before putting your trolley into service. It is also recommended that users of overhead trolleys read ANSI B30.16, safety standard for overhead hoists and ANSI B30.2.0, safety standards for overhead and gantry cranes.

The contents of this manual are of necessity general in nature and may cover features which are not incorporated in your hoist and trolley; therefore, the user must exercise care in applying instructions given in this manual to his hoist and trolley. When specific information not contained in this manual is required, contact the Field Service Department of LIFT-TECH Crane & Hoist Operations outlining your request. Please identify your trolley by referring to its serial number which is shown on a plate attached to the trolley.

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## SECTION I - GENERAL DESCRIPTION

**1-1. GENERAL.** SHAW-BOX LOADMAX trolleys are manufactured in five rated load sizes (10, 15, 20, 25 and 30 tons) with various lifts, speeds and electrical services.

**1-2. BASIC CONSTRUCTION.** A welded steel frame, that traverses on wheels with anti-friction bearings, supports the lifting drum. Attached to the drum is hoisting cable with a lower block assembly for lifting the loads. The gear case houses the gear train and, for hoist motor horsepowers less than 40, also houses a mechanical load brake. For hoist motor horsepowers of 40 and over, an eddy current brake is mounted between the hoist motor and the gear case. The hoist drive motor mounts on the trolley frame and the side of the motor opposite the gear case connects to a shoe brake. Electrical system components are located in an enclosure that is shipped loose and may be located at the customer's preference. An upper limit stop is used to limit the travel of the lower block in the raising direction to protect the hoist from damage.

## SECTION II - INSTALLATION

**2-1. GENERAL.** SHAW BOX LOADMAX trolleys are tested before being shipped from the factory. To place trolley in service, set on bridge and connect to electrical service.

### WARNING

**Before attempting installation of hoist or trolley, the main power switch must be locked in the open position.**

LOADMAX trolleys are shipped with wire rope reeved and lower blocks in place.

Perform pre-operation checks (Paragraph 2-4) and tests (Paragraph 2-5) before placing in service.

**2-2. BRIDGE REQUIREMENTS.** The successful operation of a double girder trolley depends upon a properly installed bridge. The bridge should be checked for adequacy of the following:

- a. Trolley rail should be a 40# ASCE rail.
- b. Trolley rails are to be solidly fastened to the supporting girder.
- c. The rails shall be straight, parallel, level and at the same elevation. The distance (gage) center to center of bridge rails as well as the rail elevation shall be within a tolerance of plus or minus 1/8" (.32 cm).
- d. Rail joints must be smooth and held in tight alignment by properly fitted rail joint bars so that ends are held tightly with no crack or opening.
- e. The bridge should be designed in accordance with specifications outlined by the Crane Manufacturers Association of America for maximum wheel loads involved.
- f. Size and placement of trolley bumper stops should be checked to insure that they are of the proper height and width to fully contact the trolley bumpers and also placed so as to stop the trolley with sufficient clearance between any portion of the trolley and the building.
- g. The trolley is grounded through the wheel's contact with the trolley rails. If the environment prevents the wheels from making continuous contact with the rails, a separate cross

conductor for grounding purposes shall be added to the cross conductor system.

**2-3. LUBRICATION.** All SHAW-BOX trolleys are completely lubricated at the factory. It is important that all components requiring lubrication be checked. Complete instructions concerning initial lubrication are to be found in SECTION IV. Refer to the manufacturer's instruction manuals on purchased equipment (those components not built by LIFT-TECH). The manufacturer's lubrication instructions supersede instructions given in this manual for similar equipment.

**2-4. PRE-OPERATION CHECKS.**

### WARNING

**Before energizing the trolley, and prior to running any motion, be certain that you have read this manual in its entirety and you are familiar with your trolley.**

- a. Check the main switch serving the runway conductors and also the main disconnect switch on the bridge. Lock both switches in the open position (power off).
- b. Check trolley wheel engagement to the rail for float clearance. Make visual as well as measured checks.
- c. Check all connections for tightness of bolts, inclusion of lock washers or other type fasteners, to insure correct material has been used. This check must be made for all connections, mechanical, structural and electrical including both field and factory made connections.
- d. Check to insure that all shipping supports, tie downs, brackets or other items which were used only for shipping or storage purposes are removed from the trolley.
- e. Check alignment of trolley collectors to the bridge conductors.
- f. Check electrical wiring for conformance to the wiring diagram.
- g. Check all gear cases for oil level, and check all other parts for lubrication.
- h. Check to be certain that the trolley and bridge is clear and free of all obstructions.

**2-5. PRELIMINARY TESTING.** Prior to the start of these tests, make a last minute check to see that loose parts, such as tools, covers, excess hardware, nuts, bolts, etc., have been picked up and safely stored.

All personnel not required or involved in testing of the trolley should vacate the area. Only qualified journeymen, electricians and millwrights should be used for this work.

### CAUTION

Verify that the trolley furnished has the same voltage, frequency, and phase as the bridge power supply. Place all master control switches in the OFF position. If trolley is pendant push button operated, check that all buttons are in the OFF (fully released) position. Open power circuit knife switches of each control panel. If the panels are not so equipped, then remove fuses in the motor circuit.

a. Hoist Test:

(1) Lower the hook manually to a position 8 to 10 feet (2.5 to 3.5m) below the trolley. This can be done by manually releasing the brake. If the hoist is equipped with a mechanical load brake, some effort will be required to rotate the motor shaft.

(2) Close the mainline disconnect switch serving the run-way conductors.

(3) Using a voltmeter, check all legs of the power leads at the mainline disconnect switch, located on the crane. Determine that power being supplied is of the correct voltage.

(4) Close the mainline disconnect switch after checking to see that fuses are in place.

(5) Energize the mainline contactor by depressing the START button. De-energize by depressing the STOP button. The action of the contactor in closing and opening the circuit is audible. After determining reset circuit is operating leave circuit with mainline contactor energized.

(6) At the hoist control panel, check all legs of the power leads. Determine that power is being supplied at the correct voltage.

(7) Check out reversing contactor and accelerating contactor sequencing. Operate the hoist master switch in the cab, or the hoist push button on the pendant control, step by step in both directions. At each step, check contactor sequence with sequence shown on panel wiring diagram for proper operation.

(8) Open mainline disconnect switch and replace fuses in the hoist motor circuit of the hoist panel.

(9) Close mainline disconnect switch and reset mainline contactor by pressing the START button.

(10) Jog the hoist master switch or push button in the UP direction. Check to insure that the drum is rotating in a direction which would raise the hook. (Refer to reeving instructions, Paragraph 2-6, to determine drum direction for raising.) If direction is wrong, correct by interchanging any two leads at motor conduit box (for example, interchange HT1 and HT2). Be certain main disconnect switch is open (power off) when making this correction.

(11) Operate the hoist several revolutions of the drum in both directions, observing that the motor brake releases properly, and that the gear train and bearings operate without binding.

(12) After the hoist is reeved and before placing trolley in service, a confirming load test is recommended under the direction of an appointed qualified person. See SECTION V, Paragraph 5-3.

b. Hoist Limit Switch Test: (no load)

After the hoist is completely reeved as outlined in Paragraph 2-6, the upper and lower (if so equipped) limit switches must be checked for proper operation and safe stopping distance.

(1) Set upper and lower limits of lower block travel as outlined in SECTION IX.

(2) Slowly raise the lower block. Observe the relationship of the lower block to the underside of the trolley. The hoist limit switch should stop the upward travel of the lower block within a few inches (centimeters).

 **WARNING**

**Do not contact or strike trolley frame with lower block. If hoist motion is not interrupted by limit switch, stop hoist by depressing the STOP button.**

(3) If the limit switch does not stop the lower block, or if stopping distance exceeds several inches (centimeters) check electrical circuit against wiring diagram, determine cause and correct. Also check brake adjustment.

(4) Repeat test increasing the speed until test is performed at full speed.

 **WARNING**

**Distance required to stop the lower block after tripping the limit switch increases with speed. Be certain that the limit switch trips soon enough so that the lower block will not contact the trolley frame or other obstruction in stopping.**

(5) If trolley is equipped with a lower limit switch, check switch trip setting by lowering hook until motor stops. With hook in extreme low position, two full wraps of rope must be on the drum.

c. Trolley Test:

(1) At the trolley control panel, check all legs of the power leads. Determine that power is being supplied at the correct voltage.

(2) Check reversing contactor and accelerating contactor sequencing by operation of the trolley master switch in the cab, or by the trolley push button on the pendant control in both directions. Check sequence with panel wiring diagram to determine proper operation.

(3) Open mainline disconnect switch and replace fuses in the trolley motor circuit of the trolley panel.

(4) Close mainline disconnect switch and reset mainline contactor by pressing the START button.

 **CAUTION**

When operating the trolley motion, place hook in high position and watch out for overhead or side interferences between the building and the crane.

(5) Jog trolley master switch or push button in the forward direction (be sure trolley is free to move in either direction). If direction of trolley is incorrect, reverse leads as described under Hoist Test 2-5.a.(10) above.

(6) Operate the trolley slowly across the entire bridge and slowly contact the end stops. Check contact of bumpers or wheels to end stops. Operate several times back and forth across the bridge avoiding contact with end stops, working the unit up to full speed. Observe that the gear train and bearings operate without binding and that the trolley travels across the bridge without skewing.

## 2-6. REEVING

a. **General.** As previously indicated, trolleys may be shipped with the hoist completely reeved at the factory. This should not be interpreted as a commitment for factory reeving of all hoists. It is an option which LIFT-TECH may or may not choose to exercise.

b. These SHAW-BOX trolleys are arranged for CONVENTIONAL reeving arrangements with reeving diagrams as shown in Figure 2-1.

c. Select the proper reeving diagram for your crane as follows: Examine lower block; count number of sheaves and multiply by (2). This is the total parts of ropes. Select correct diagram.

### CAUTION

NOTE that in conventional reeving, the rope from the drum leads to the outside sheave in the lower block.

d. Take care that the floor in the reeving area is clean. Dirt picked up by the rope can cause excessive wear of parts and shortened rope life.

e. The following reeving instructions are based upon 8 parts of rope. Figure 2-2 illustrates CONVENTIONAL reeving. As shown in the Figure, provide a support stand for the lower block, and position block directly under the trolley. Provide a support for the reel, positioned as shown, which will allow reel to turn freely. (If rope is furnished in a coil, provide similar support to allow coil to rotate as rope is removed.)

### CAUTION

Rotation of the reel or coil of rope is necessary to eliminate twisting and kinking. A severely kinked rope is cause for rejection, and is unsafe to use. See Figure 2-3 for correct method of handling rope.

f. As shown in Figure 2-2, thread free end of rope through lead (drum) side of the outside sheave of the lower block. From there pull rope up to upper block sheave. Pass free end of rope over upper sheave and then down and under the inside sheave in the lower block. Continue to pull rope back up the upper block and pass over the equalizer sheave. Now pull rope down from equalizer and pass under the inside lower block sheave, and back up to the upper block sheave. Pass the rope over the top of upper sheave, back down and under the outside sheave of the lower block, and then up to the drum. Anchor rope as shown in Figure 2-2, spin off remaining rope on the reel, and bring free end of rope to the drum and anchor.

g. Energize hoist in UP direction. Proceed at slow speed to wind rope on the drum, making certain that rope is winding in drum grooves. Stop hoist as soon as block is lifted from the support cradle. Check rope at each sheave to make certain that rope is properly located in sheave groove. Operate hoist up and down several times through a distance of several feet (meters), checking rope for proper tracking on drum and in sheaves. Proceed to set limit switches as outlined in Paragraph 2-5.b.

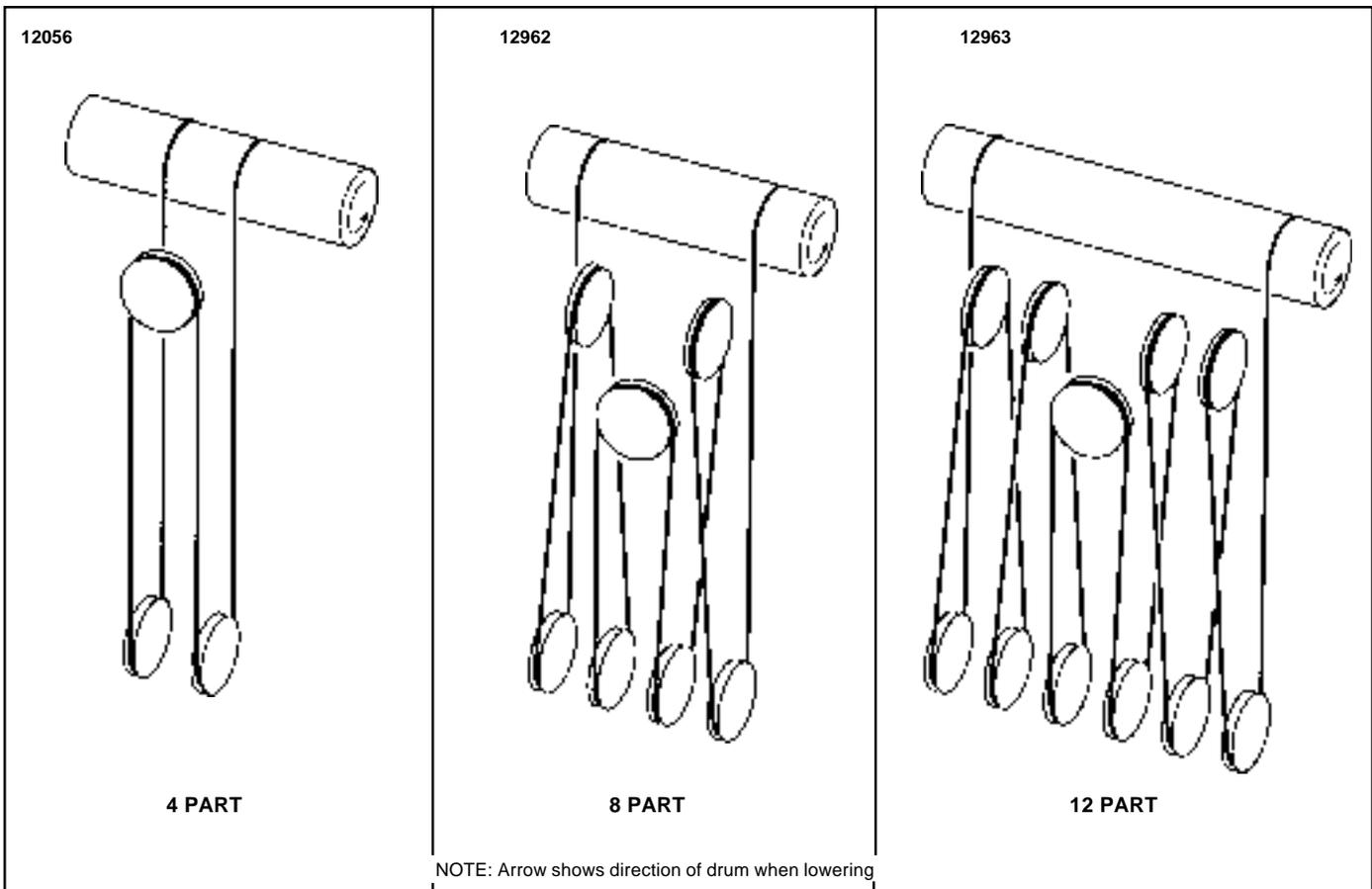


Figure 2-1. Diagrams Illustrating Conventional Type Reeving.

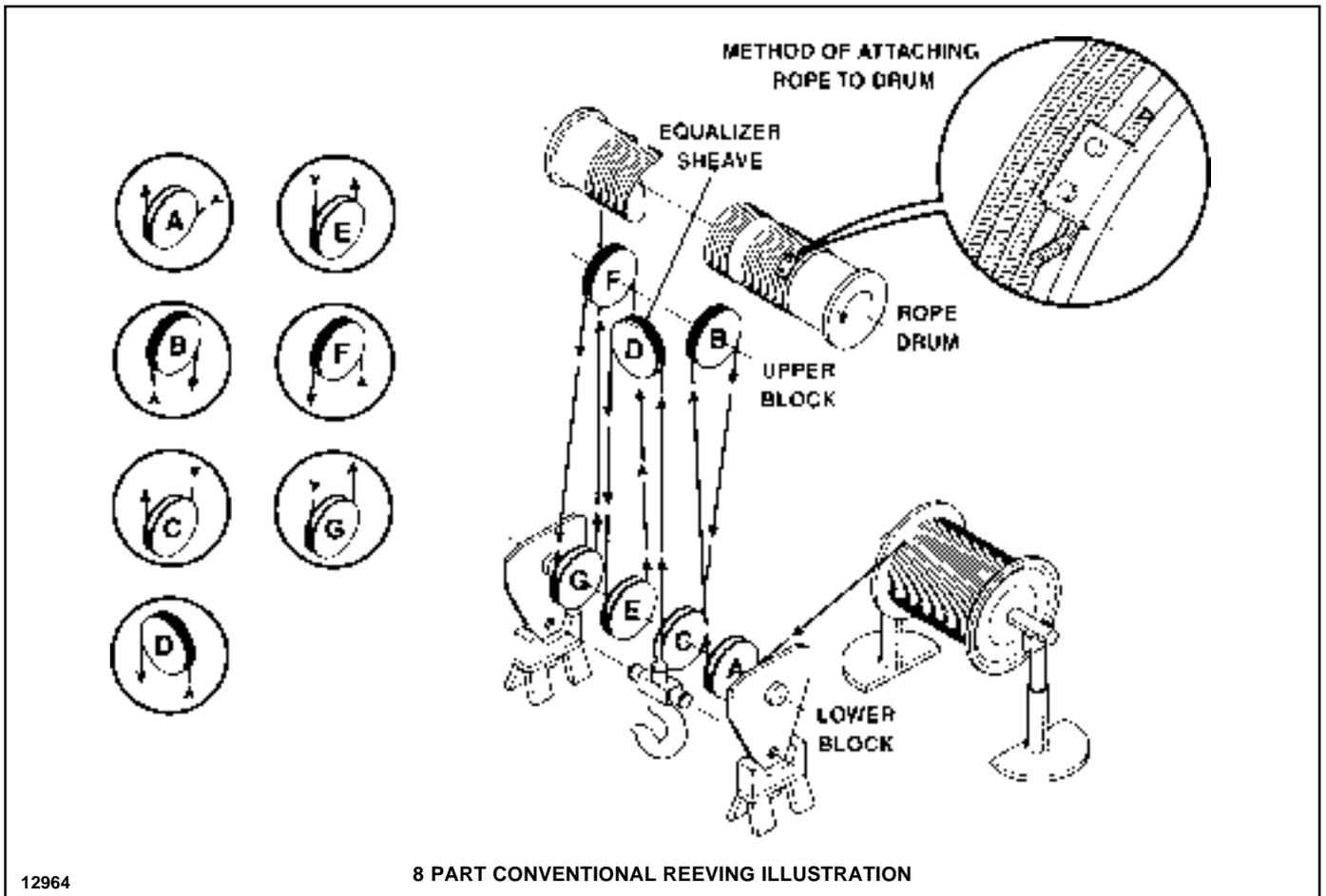


Figure 2-2. Conventional Reeving.

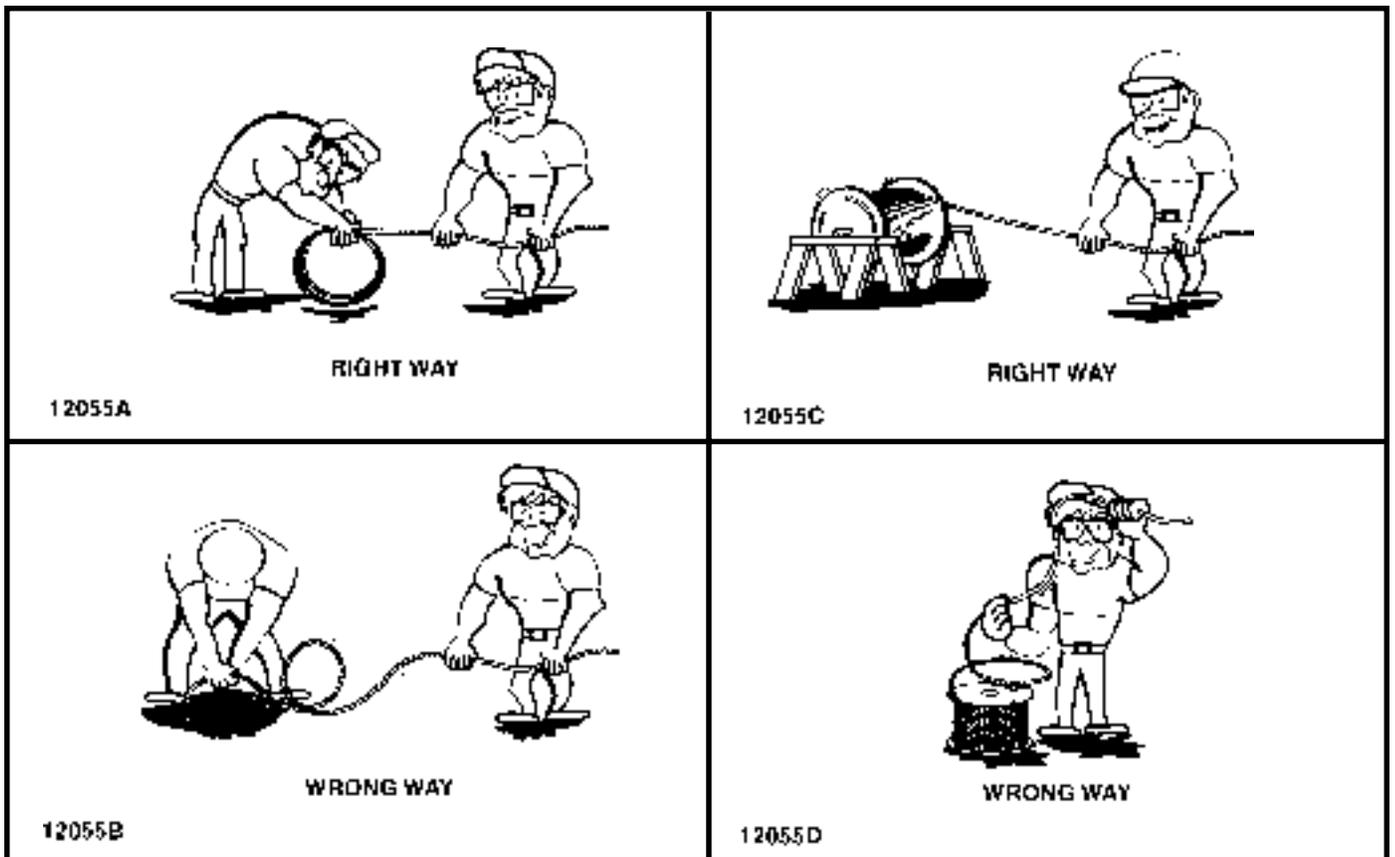


Figure 2-3. Rope Handling Instructions.

## SECTION III – OPERATION

### 3-1. GENERAL.

a. The importance of safe handling of overhead hoisting apparatus cannot be overstated. The operator should be aware at all times that he is in control of a powerful machine, which if used carelessly, can do a great deal of damage. Correct usage is fundamental to reliable operation and minimum maintenance costs of the trolley. One measuring stick of a good operator is his smoothness of operation. Jumpy or jerky trolley movements, flying starts, quick reversals and sudden stops are the “trade marks” of the careless operator.

b. Equally important to the safe operation of the trolley is frequent and systematic inspection and maintenance. Mandatory requirements on a National level are detailed in OSHA Part 1910.179. The user should become familiar with those regulations, along with any other state or local codes.

### 3-2. OPERATOR QUALIFICATIONS.

a. Safe and efficient trolley operation requires skill, extreme care, good judgement, alertness, concentration, knowledge of and rigid adherence to proven safety rules and practices. No person should be permitted to operate a trolley:

- (1) Who does not possess above characteristics,
- (2) Who is not qualified or has handicaps that could adversely affect such operations,
- (3) Who has not been properly instructed,
- (4) Who has not been informed and does not have thorough knowledge of all applicable safe operating practices, including those in this book as well as rigging equipment and practices.

b. The user is also referred to American National Standard ANSI B30.2.0 Section 2-3.1 for qualification and conduct of operators. Additionally, the user should become familiar with National, State or Local safety codes which may apply.

### 3-3. OPERATING PRECAUTIONS.



**Equipment covered herein is not designed or suitable as a power source for lifting or lowering persons.**

Safe operation of an overhead hoist is the operator’s responsibility. Listed below are some basic rules that can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Observance of these rules in addition to frequent examinations and periodic inspection of the equipment may save injury to personnel and damage to equipment.

#### a. DO

- (1) read ANSI B30.2.0 Safety Standard for Overhead and Gantry Cranes.
- (2) be familiar with hoist operating controls, procedures and warnings.
- (3) make sure hook travel is in the same direction as shown on controls.
- (4) make sure hoist limit switches function properly.

(5) maintain firm footing when operating hoist.

(6) make sure that load slings or other approved single attachments are properly sized and seated in the hook saddle.

(7) make sure that the hook latch is closed and not supporting any part of the load.

(8) make sure that load is free to move and will clear all obstructions.

(9) take up slack carefully, check load balance, lift a few inches and check load holding action before continuing.

(10) avoid swinging of load or load hook.

(11) make sure that all persons stay clear of the suspended load.

(12) warn personnel of an approaching load.

(13) protect wire rope from weld spatter or other damaging contaminants.

(14) promptly report any malfunction, unusual performance, or damage of the hoist.

(15) use common sense and best judgement whenever operating a hoist.

(16) inspect hoist regularly, replace damaged or worn parts, and keep appropriate records of maintenance.

(17) use the hoist manufacturer’s recommended parts when repairing a hoist.

(18) use hook latches.

(19) apply lubricant to the wire rope as recommended by the hoist manufacturer.

#### b. DO NOT

(1) lift more than rated load.

(2) use the hoist load limiting device to measure the load.

(3) operate damaged hoist or hoist that is not working correctly.

(4) operate the hoist with twisted, kinked, damaged or worn wire rope.

(5) lift a load unless wire rope is properly seated in its grooves.

(6) use load rope as a sling or wrap rope around the load.

(7) lift a load if any binding prevents equal loading on all load supporting ropes.

(8) apply the load to the tip of the hook.

(9) operate unless load is centered under hoist.

(10) allow your attention to be diverted from operating the hoist.

(11) operate the hoist beyond limits of load rope travel.

(12) use limit switches as routine operating stops unless recommended. They are emergency devices only.

(13) use hoist to lift, support or transport people.

- (14) lift loads over people.
- (15) leave a suspended load unattended unless specific precautions have been taken.
- (16) allow sharp contact between two hoists or between hoist and obstructions.
- (17) allow personnel not physically fit or properly qualified to operate the hoist.
- (18) allow the rope or hook to be used as a ground for welding.
- (19) allow the rope or hook to be touched by a live welding electrode.
- (20) remove or obscure the warnings on the hoist.
- (21) adjust or repair a hoist unless qualified to perform hoist maintenance.
- (22) attempt to lengthen the load rope or repair damaged load rope.

 <b>WARNING</b>
<p><b>Do not operate the hoist with the hoisting rope out of the drum grooves. Such operation may result in the rope breaking and dropping the load which can cause damage to equipment and injury to operator or other personnel. Hoist rope will remain in the drum grooves during proper operation under normal operating conditions, however, slack or kinked rope, excessive side pulls, swinging or jerking of load, or similar abuse, may cause the rope to leave the grooves.</b></p>

**3-4. HAND SIGNALS.** Standard hand signals are shown in ANSI B.30.2.0.

**3-5. LEARNING THE CONTROLS.** The operator should locate and be familiar with the operation of the runway mainline disconnect switch and for this exercise lock switch in the OPEN (power off) position. The operator should now manipulate the various push buttons to get the “feel” and determine that they do not bind or stick in any position. The operator should become familiar with the location of the buttons or switches for their respective motions, as well as the “START” and “STOP” buttons which operate the mainline contactor. The “STOP” button should be used in any emergency since it will shut off power to all motions.

 <b>WARNING</b>
<p><b>If a push button binds or sticks in any position or does not return to the OFF position - do not turn power on - determine the cause of malfunction and correct before operating trolley.</b></p>

**3-6. OPERATING THE CONTROLS (NO LOAD).**

- a. Close the mainline disconnect switch. Press the START button. The trolley is now under power and ready to operate. For descriptive purposes assume the trolley is push button controlled with three speed points. Be certain the area is clear of all obstructions and people.
- b. Hoist motion. Depress the “Down” push button to the first speed point. Observe that the hook is moving down slowly.

If the hook does not start down, depress the push button to the second speed point to start the hook in motion, then back off to the first speed point. This may occur if the hoist is new or has been idle for a period of time. If the hook still does not move on the first speed point after an initial break-in period, the hoist secondary resistance can be modified. This should be done only after consultation with the LIFT-TECH Electrical Engineering Department.

With the hook moving downward, push to the 2nd and finally to the 3rd (full speed) point of control observing the increase in speed as the button is depressed. With no load on the hook the speed change may be detectable only by the use of a tachometer.

Release push button and observe distance required to stop hook. The hook may be lowered until two full wraps of cable remain on the drum. Never lower hook below this position.

In the same manner, depress the “Up” push button to the first speed point, then to the 2nd speed point and finally to the 3rd (full power) point. Release push button and observe stopping distance. During this practice be certain to stop the hook several feet below the bottom of the trolley.

At the beginning of each shift the operator must check the hoist upper limit switch with no load. Extreme care must be exercised to avoid accidental damage in the event the switch does not operate. Raise the hook by slow inching. Carefully observe the relationship of the hook block and the bottom of the trolley frame. The hoist upper limit switch, when working properly, should cause the hoist upward motion to stop.

 <b>WARNING</b>
<p><b>Do not contact or strike trolley frame, drum or upper block with hook block. If hoist motion is not interrupted by limit switch, stop hoist. Do not attempt further operation. Report condition to proper supervisor for correction.</b></p>

Repeat upper limit switch test described above several times, each time increasing the hoist speed until switch is tested at full speed. Do not use this upper limit switch as an operating control.

c. Trolley motion. The operator must develop complete familiarity with response of the trolley motion and direction relative to position of the controls. As with the hoist, the operator should become familiar with each speed point working to full speed ONLY after stopping from each speed point. This practice should continue long enough so that direction, speeds, stopping distance, hook swing control, etc., become “second nature” to the operator’s judgement and reflexes.

**3-7. OPERATING THE CONTROLS (WITH LOAD).**

The exact same procedures apply with load as given in Paragraph 3-6 for no load. Start operation using a light load of 10 to 15% full load graduating to approximately 50% load then to full load in three load steps. This will give the operator a feel for control response throughout the load range. The most important effect of a changing load with which the operator must become familiar is the variation of stopping distance required.

Motor torque in the first speed point is limited to approximately 50% and therefore the hoist will not raise or lower loads exceeding approximately 50% of the rated load while on the first speed point.

## SECTION IV - LUBRICATION

### 4-1. GENERAL.

Lubrication services outlined in this manual should be performed at regular intervals to reduce friction and wear between moving parts. The intervals between lubrication recommended in this Section are average for moderate duty installations. Moderate duty, as considered here, is a trolley in a normal indoor environment having 20 percent "on" time installed in a plant which operates one 40 hour shift per week (8 hrs. per day, 5 days per week). For moderate duty the recommended lubrication interval is based on 400 hours per year trolley operation. If the user finds that his plant operates more than one 40 hour shift per week or the trolley duty is greater or less than 20 percent of plant operating time, the lubrication interval must be adjusted proportionately. However, lubrication intervals for standby, infrequent or light service cranes should not exceed the following for normal indoor environment: Speed reducer oil changes - 24 months, greasing - 6 months, general oiling to prevent rust and corrosion - 1 month.

Environmental conditions in which the trolley operates are important considerations for the user when adjusting lubrication intervals. Equipment subjected to severe atmospheric environmental conditions such as, cement or other dust, corrosive vapors, extreme heat or cold and other airborne contaminants may require more frequent lubrication or special lubricants. For example, a trolley operating in an atmosphere of corrosive vapor which dissolves in the speed reducer oil and diminishes the lubrication quality of the oil, would require frequent changes of oil or a special lubricant. Extreme temperature changes, which commonly occur with outdoor service, can cause condensation to accumulate in the speed reducers. In this case, frequent oil changes should be made to avoid dispersing water into the bearings, seals and other critical areas. Environmental conditions often require more frequent lubrication and oil replacement. The user should be alert for all environmental conditions and adjust the lubricant and/or the lubrication interval as may be required. Consult LIFT-TECH Field Service Department for advice for unusual conditions.

The lubricants and specifications shown in Paragraph 4-7 are based on latest product information available at the time of publication. Typical commercial products listed are for convenience only. A local equivalent product which meets the specifications and is produced by any reputable manufacturer may be used. Many interchange lists are available which show equivalent lubricants for brands produced in various localities. Contact your local lubricant distributor for information.

Since there are many variations of trolley and hoisting arrangements, all of the possible configurations may not be described in this section, but rather the components and typical arrangements. The general outline on the following pages for proper lubrication applies to any trolley equipped with the components, regardless of the arrangement of these components.

For equipment manufactured by other than LIFT-TECH that may be furnished, see manufacturer's manual concerning lubrication instructions. The manufacturer's instructions take precedence over lubrication recommendations in this manual should any conflict exist. Manuals for equipment manufactured by others are furnished to the user with each order. Lubrication instructions for electrical equipment such as mo-

tors, limit switches, etc., may be found in SECTION IX - ELECTRICAL.

Lubrication fittings on your trolley have been greased at the factory with a lithium base, multipurpose grease. Mixing different types of lubricants is not recommended since they may not be compatible. If at any time during the life of the crane the type of grease at any lubrication point is unknown, the existing grease should be removed and the bearing thoroughly cleaned before adding the new lubricant.

Speed reducers on your trolley were filled with lubricant for factory testing. However, during preparation for shipment of the trolley, the oil may have been drained from the speed reducers. When the speed reducers have been drained at the factory, the oil is not shipped with the trolley. Quantities of proper lubricant to refill all speed reducers will be provided by the user at the trolley installation site.

The quantity of oil required for the various speed reducers on the trolley and hoist is indicated on a label attached to the speed reducer. The type of oil to be used is indicated by the lubricant specifications tabulated in Paragraph 4-7 of this section. The lubricant properties described in Paragraph 4-7 are not a complete description of the product required. Where the environment in which the cranes operate is other than normal atmospheric environment, special lubricants may be required. Consult LIFT-TECH Field Service Department for recommendations.

The following practices should be observed when lubricating your trolley:

- a. With a clean rag, wipe all fittings before and after lubricating.
- b. Be certain lubricants are not contaminated before using.
- c. Do not overfill gear case. Use oil level riser to determine proper level.
- d. Wipe up any spilled or excess lubricants.
- e. Do not allow oil or grease to come in contact with brake shoes or wheels, or any electrical equipment where no oil is desired.

For standby, infrequent or light service, lubrication intervals may be extended for normal indoor environment. Greasing intervals should not exceed 12 months for standby service and 6 months for more frequent service. Hoists and trolleys in these service classes installed outdoors are subject to atmospheric environment which may cause condensation or foreign matter to enter the speed reducers. Before using outdoor cranes which have been idle for long periods, drain a quantity of oil from the speed reducer. Check oil for discoloration, presence of water, sludge or dirt. Replace oil if it contains any foreign matter to avoid dispersing foreign matter into bearings, seals or other critical areas. Regrease all points with fittings to prohibit entry of water, dirt, dust, or air borne chemicals. General oiling to prevent rusting should be performed each month during idle periods. The user should provide lubrication, based on the existing environmental and operating conditions, to protect idle hoist and trolley and keep ready for operation.

General Oiling should be performed once a week to prevent rusting and provide limited lubrication for points not having lubrication fittings nor considered normal wear points. Pins, levers, rods, hinges, linkages, current collectors, and other moving parts where rusting or corrosion may interfere with normal operation, should be oiled with a few drops of GO oil

(see Paragraph 4-7). During each oiling a visual inspection is recommended for any leakage of oil or grease from any speed reducer or other lubricated component.

 **CAUTION**

Leakage of oil or grease may indicate damaged seals, over lubrication or worn parts. Determine and correct the cause of leaks before operating hoist or trolley.

**4-2. HOIST GEAR CASE.**

- a. Remove the cap from the oil level riser (lower right when facing the gear case).
- b. Remove one of the inspection covers from the top of the gear case.
- c. Fill the gear case with approximately 7-1/2 gallons of lubricant GCOH (paragraph 4-7) until the lubricant level is with the top of the oil level riser.
- d. Replace the oil level riser cap and the inspection cover.

The hoist gear case should be drained and refilled at least every 12 months.

To drain gear case oil:

- a. Add 5% solution of Mobilsol A (or equal) to the oil and run for a short time.

 **WARNING**

**Avoid skin contact with Mobilsol A. In case of skin contact; dry wipe the skin, cleanse the area with a waterless hand cleaner and follow by washing thoroughly with soap and water.**

- b. Remove the oil drain plug from the bottom of the oil level riser and drain out oil.
- c. Wipe out any foreign matter and reinstall drain plug.

To refill hoist gear case follow steps above.

**4-3. UPPER AND LOWER BLOCKS, DRUM SUPPORT BEARING, LIMIT SWITCH AND SHOE BRAKES.**

- a. Lubricate upper and lower block grease fittings and drum support flanged bearing grease fitting every 3 months with MPG lubricant.
- b. Apply a few drops of oil GO to hook thrust bearings and shoe brake pivot pins.
- c. Provide a light film of MPG on bevel gear of limit switch.

**4-4. TRAVERSE GEAR CASE.** Drain (drain plug on bottom of gear case) and refill (fill plug at top of gear case) traverse gear case with approximately 3.4 quarts of GCOT every 10,000 hours of operation or 2 years.

**4-5. WHEEL BEARINGS AND FLEXIBLE COUPLINGS.**

- a. Lubricate wheel grease fittings with MPG every 3 months.
- b. Remove 2 lube plugs from one side of flexible coupling and pump MPG into one hole until it flows from other hole. Replace plugs and repeat process for other side of flexible coupling. Do this every 3 months.

**4-6. LUBRICATION OF WIRE ROPE.** Wire rope is one of the most important components on your hoist requiring lubrication. As the rope bends over sheaves and drums the internal wires continually move and rub against each other. Each wire becomes a bearing surface that grinds and wears against other wires if all are not properly lubricated. Lubrication not only helps prevent wire rope wear, but also helps protect the wires from corrosion and deterioration of the core. Lubrication intervals for wire rope depends on the conditions to which the rope is subjected. Active ropes should be lubricated regularly not only to prevent corrosion, but also to reduce wear of rope and allied equipment. Inactive ropes such as those used for standby, or infrequent service are subject to corrosion quickly, unless they are adequately protected by thorough lubrication. The severity of the duty and the degree to which the rope is subjected to corrosive elements will serve as an index for the user to determine an adequate lubrication interval. No set rule can be given for the frequency of wire rope lubrication.

Wire ropes that have been in service should always be cleaned thoroughly before they are relubricated. Rope can be cleaned with wire brushes or compressed air. Remove all foreign matter and old lubricant from the valleys between the strands and the spaces between the outer wire.

Wire rope lubricant can be applied to rope using a brush or swab. Lubricant, applied hot, will penetrate wires and form filler and coating to resist water and corrosion.

Another method of applying lubricant to wire rope is "pour-on" method. Select a point where the rope passes around a sheave, that can be reached with a measuring type oil can with a spout. Slowly rotate the rope through this sheave while pouring oil on the rope. Always hold a wiping swab on side of the sheave paying out the rope.

 **WARNING**

**Rotating ropes through sheaves with hands nearby is dangerous. Use extreme caution when lubricating moving ropes.**

Be certain that ropes normally hidden during lubrication are properly lubricated. Rope not normally unwound from rope drum and those passing over or attached to equalizers, require special attention.

Use lubricant (CL) as recommended in Lubricant Specifications (Paragraph 4-7) or approved equal.

**4-7. LUBRICANT SPECIFICATIONS.**

AMBIENT TEMPERATURE		
-20° to +50°F (-29° to +10°C)	50° to 125°F (10° to 52°C)	125° to 250°F (52° to 121°C)

<b>GCOH</b>	AGMA Lubricant	No. 6 EP	No. 7 EP	
Gear Case Oil.	Viscosity @ 100°F	1335-1632 SUS	1919-2346 SUS	
Hoist Gear Case.	Viscosity Index	95	95	
	Pour Point	0°F	20°F	
	Amoco Oil Co. Mobil Oil Corp. Shell Oil Co. Sun Oil Co. Texaco Inc.	Permagear 320 Mobilgear 632 Omala 320 Sunep 320 Meropa 320	Permagear 460 Mobil 634 Omala 460 Sunep 460 Meropa 460	Refer to LIFT-TECH Field Service Department.

<b>GCOT</b>	AGMA Lubricant	No. 4 EP	No. 5 EP	
Gear Case Oil.	Viscosity @ 100°F	626-765 SUS	918-1122 SUS	
Trolley Gear Case.	Viscosity Index	95	95	
	Pour Point	-10°F	0°F	
	Amoco Oil Co. Mobil Oil Corp. Shell Oil Co. Sun Oil Co. Texaco Inc.	Permagear 150 Mobilgear 629 Omala Oil 100 Sunep 150 Meropa 150	Permagear 220 Mobil 630 Omala Oil 220 Sunep 220 Meropa 220	Refer to LIFT-TECH Field Service Department.

<b>CL</b>	No Specification		
Cable Lubricant.	Amoco Oil Co.	----- Amovis 5-X -----	
Wire Rope Lubricant.	Mobil Oil Corp.	----- Mobilarma 798 -----	
	Sun Oil Co.	----- Sunoco Wire Rope Lubricant -----	
	Texaco Inc.	Crater A	Texclad 2

<b>GO</b>	AGMA Lubricant	No. 1	No. 2
General Oil.	Viscosity @ 100°F	193-235 SUS	284-347 SUS
General Oiling to Prevent Rusting and Provide Limited Lubrication for Points Not Considered Normal Wear Points.	Viscosity Index	60 Min.	60 Min.
	Pour Point	-20°F	10°F
	Amoco Oil Co. Mobil Oil Corp. Shell Oil Co. Sun Oil Co. Texaco Inc.	Rykon Oil 46 ----- Rotella 10W Sunvis 932 Rando Oil 46	American Industrial Oil 68 ----- Mobil DTE Oil Heavy Rotella 10W-30 Sunvis 968 Rando Oil 68

<b>MPG</b>	NLGI Grease	No. 1	No. 2
Multipurpose Grease.	6ASTM Worked Penetration	310 - 340	265 - 295
Grease Lubricated Wear Points Provided with Fittings and Grid or Gear Type Flexible Couplings.	Dropping Point	360°F	360°F
	Base	Lithium	Lithium
	Amoco Oil Co. Mobil Oil Corp. Shell Oil Co. Sun Oil Co. Texaco Inc.	Amolith Grease 1 EP Mobilith AW 1 ----- Prestige 741 EP Multifak EP 1	Amolith Grease No. 2 EP Mobilith AW 2 ----- Retinax LC Sunoco Multipurpose 2 EP Multifak EP 2

## SECTION V – INSPECTION AND MAINTENANCE

**5-1. GENERAL.** Regular inspections and preventative maintenance programs not only help reduce overall maintenance costs, but also may prevent serious shutdowns by forewarning of problems that could cause these shutdowns. Regular inspections, periodic minor adjustments, regular cleaning and lubrication, and replacement of worn parts can help preserve good performance and operation of your trolley.

Many factors influence the inspection and preventative maintenance program required for each trolley. Frequency and severity of service, material handled, local environmental conditions and various applicable codes are some of the factors that the user must consider to adjust inspection and maintenance program described in this Section to meet his specific conditions.

The inspection and preventive maintenance program recommended and outlined in this Section is considered average for moderate duty installations. Moderate duty installation is defined here as an installation in a plant which operates one shift of 40 hours per week (8 hours per day, 5 days a week) with trolley operating 20 percent of this time in a normal environment. Moderate duty is based on 400 hours per year trolley operation. If the user finds that his plant operates more than one 40-hour shift per week or that the trolley duty is greater or less than 20% of the plant operating time, the frequency of inspection and maintenance program should be adjusted in proportion to increase or decrease of duty requirements.

Environmental conditions in which the trolley operates are also important considerations for the user when adjusting trolley inspection and maintenance program to local conditions. Equipment subjected to severe atmospheric environmental conditions such as corrosive vapors, extreme heat or cold, cement or other dust and other airborne contaminants require more frequent inspection and maintenance than recommended herein.

A typical condition requiring special consideration for frequency of inspection and degree of maintenance is an outdoor installation where temperatures vary considerably. In this environment, condensation can form in gear case and cause rusting or corrosion of gear case components. Another condition, where corrosive vapor may exist, the oil seals, current conductors, and other parts exposed to these vapors may also become corroded and adversely affect crane operation.

The user should carefully consider all environmental conditions, and increase frequency of inspection and degree of maintenance program for his local conditions. Consult LIFT-TECH Crane & Hoist Field Service Department for advice for unusual environmental conditions including elevated ambient temperatures.

Various codes also regulate inspection and maintenance programs. Attention must be given to applicable Federal Standards, National Standards, OSHA regulations, state and local codes which may include mandatory rules relating to trolley inspection and maintenance. The user should become familiar with all applicable codes in his area and be guided accordingly.

### 5-2. INSPECTION.

a. General. Listed below are recommended inspection frequencies and requirements. Perform these inspections regularly as scheduled and additionally as may be required for activity, severity of service and environment of your trolley.

Close attention must be given to the trolley the first few days and weeks of operation, following which routine inspection procedures should be instituted. The operator should be alert to any defects which might appear during operation and refuse to continue operation until a determination has been made by a qualified person as to whether a safety hazard exists.

Inspections listed under Operator Daily Inspections marked with a solid dot (•) are mandatory inspections requirements (OSHA). Daily Inspections listed must be performed in addition to weekly, monthly, semi-annual or annual inspections listed herein. Any defect should be reported to your foreman and the defect should be carefully examined to determine whether a safety hazard exists before operating the trolley.

#### b. Operator Daily Inspections.

- (1) Inspect all functional operating mechanisms for mal-adjustment interfering with proper operation. This includes items such as limit switches, control systems, brakes, etc. Adjust as required.
- (2) Visually inspect hooks for throat opening, twisting, cracks or saddle wear.
- (3) Visually inspect hoist and load attachment chains for excessive wear, twist, distorted or stretched links.
- (4) Visually inspect rope slings, including and connections, for excessive wear, broken wires, abrasions and twisting.
- (5) Inspect all components of functional operating mechanisms including items such as, limit switches, controller components, drive components, brake linings and contactor tips for excessive wear.
- (6) Visually inspect hoist ropes for excessive wear, broken wires, abrasions, kinks, twisting or evidence of not spooling properly on drum, and proper lubrication.

c. Weekly Inspections. In addition to daily inspections the following should be performed each week:

- (1) Inspect all gear cases for proper oil level. Lubricate pins, levers, rods, hinges, linkages, collector wheel or slide pivot pins where general oiling is required.
- (2) Check operation of all brakes and adjust, if required. (See SECTION VIII.)
- (3) Check hoist rope for proper seating in all sheaves and drum grooves.

#### d. Monthly Inspection.

- (1) Perform steps outlined under Weekly Inspection.
- (2) Check all operating mechanisms for wear, distortion or fractures.
- (3) Inspect general condition of all contacts on all contactors, relays, disconnect switches, circuit breakers, limit switches, master switches and push button stations.
- (4) Check all gear cases for proper oil level. Add oil per SECTION IV, if required.
- (5) Check conductor and collector shoe alignment, and wear on collector shoes, if so equipped.
- (6) Check motor brushes to be certain they have enough stock for wear and move freely in brush holders.
- (7) Check all motor and speed reducer hold down bolts for tightness.
- (8) Inspect hoist hooks for distortion and throat opening. Record throat opening. (See SECTION VIII.)
- (9) Inspect hoist ropes per SECTION VIII.
- (10) Inspect all sheaves and drums for wear, cracks or other damage or corrosion.

# INSPECTION SCHEDULE AND MAINTENANCE REPORT

TROLLEY SERIAL NO. (MFGRS) \_\_\_\_\_  
 RATED LOAD \_\_\_\_\_  
 TYPE \_\_\_\_\_  
 VOLTAGE \_\_\_\_\_

CUSTOMER'S IDENTITY NO. \_\_\_\_\_  
 LOCATION IN PLANT \_\_\_\_\_  
 THIS INSPECTION IS    MONTHLY     ANNUAL   
    SEMI-ANNUAL   
 INSPECTED BY: \_\_\_\_\_    DATE \_\_\_\_\_

COMPONENT, UNIT OR PART and location on hoist		* Recommended Inspection Interval			CONDITION (Check column best indicating condition when part or unit is inspected. Use note column to the right if condition is not listed below.)						CORRECTIVE ACTION NOTES
LOCATION	COMPONENT, UNIT OR PART	MONTHLY	SEMI-ANNUAL	ANNUAL	GOOD	ADJUSTMENT REQUIRED	REPAIR REQUIRED (Loose Parts or Wires)	REPLACEMENT REQUIRED (Worn or Damaged)	LUBRICATION REQUIRED (Low Oil or Grease, Rust or Corrosion)	CLEANING OR PAINTING REQUIRED	(Indicate corrective action taken during inspection and note date. For corrective action to be done after inspection, a designated person must determine that the existing deficiency does not constitute a safety hazard before allowing unit to operate. When corrective action is completed, describe and note date in this column.)
											DATE
HOIST	Motor	<input type="checkbox"/>									
	Motor Brake	<input type="checkbox"/>									
	Mechanical Load Brake	<input type="checkbox"/>									
	Couplings	<input type="checkbox"/>									
	Gear, Shafts & Bearings	<input type="checkbox"/>									
	Upper Block	<input type="checkbox"/>									
	Lower Block	<input type="checkbox"/>									
	Hook & Throat Opening	<input checked="" type="checkbox"/>		X							Record Hook Throat Opening
	Hoist Rope	<input checked="" type="checkbox"/>									
	Rope Drum		<input type="checkbox"/>								
	Guards		<input type="checkbox"/>								
Limit Switch		<input type="checkbox"/>									
CONTROL STATION OR PUSH BUTTON	Push Button		<input type="checkbox"/>								
	Wiring		<input type="checkbox"/>								
TROLLEY	Motor	<input type="checkbox"/>									
	Brake (when so equipped)	<input type="checkbox"/>									
	Couplings	<input type="checkbox"/>									
	Gear, Shafts & Bearings	<input type="checkbox"/>									
	Frame			<input type="checkbox"/>							
	Wheels		<input type="checkbox"/>								
	Bumpers		<input type="checkbox"/>								
	Guards		<input type="checkbox"/>								
	Conductors		<input type="checkbox"/>								
	Collectors		<input type="checkbox"/>								
RESISTORS	Hoist		<input type="checkbox"/>								
	Trolley		<input type="checkbox"/>								
RUNWAYS	Main Conductors		<input type="checkbox"/>								
	Main Collectors		<input type="checkbox"/>								
MISC.	General Condition		<input type="checkbox"/>								
	Load Attachment Chains	<input checked="" type="checkbox"/>									
	Rope Slings & Connections	<input checked="" type="checkbox"/>									
	Change Gearcase Lub.			<input type="checkbox"/>							
	Grounding Faults		<input type="checkbox"/>								

\* See text for DAILY & WEEKLY REQUIREMENTS.      ● SIGNED & DATED REPORT REQUIRED – OSHA.  
 ○ INSPECTION INTERVAL.      X MAGNETIC PARTICLE OR EQUIVALENT EXAMINATION REQUIRED.

e. Semi-Annual Inspection.

- (1) Perform steps outlined under Monthly Inspection.
- (2) Record voltage and amperage reading at main hoist panel while lifting maximum load. This should be done with bridge at the greatest distance from the runway conductor feed point. Voltage reading should be within  $\pm 10\%$  of rated line voltage.
- (3) Check trolley with a megger for high resistance ground faults.
- (4) Inspect all motor resistors, control panel components, and other electrical connections for tightness and broken wires. (See SECTION IX.)
- (5) Inspect wheels for diameter and flange or tread wear.

f. Annual Inspection.

- (1) Perform the steps outlined in Semi-Annual Inspection.
- (2) Inspect all structural members for deformation, cracks, corrosion or other damage.
- (3) Inspect hoist hooks by magnetic particle examination.
- (4) Inspect all connections for loose bolts or rivets or other signs of wear. Inspect fitted bolts by removing and inspecting for signs of wear.
- (5) Inspect all drive mechanisms and parts, such as pins, bearings, shafts, gears, rollers, locking and clamping devices for wear, cracking or distortion.
- (6) Inspect general condition of trolley – rust, corrosion, paint, accumulation of dirt and debris.
- (7) Drain and flush all gear cases. Refill with new lubricant as recommended in SECTION IV.

g. Inspection Schedule and Maintenance Report Form.

Shown in this Section is a recommended Inspection Schedule and Maintenance Report form. The user should revise the inspection interval, add additional units or provide a similar form to suit particular conditions which may exist. However, written, dated and signed inspection reports should be maintained particularly on critical items, such as hoist hooks, hoisting ropes, sheaves, drum and brakes. Periodic review of old inspection reports can point out service life of trolley components, forecasting need for adjustment, repair or replacement of these components.

As a matter of expedience, appointed maintenance personnel inspecting trolley can also take care of minor adjustments, repairs and cleaning, where required. Note column on Inspection Schedule and Maintenance Report form headed Corrective Action Notes. When corrective action is made during inspection, note condition of part or unit as inspected in appropriate Condition column with a check mark (✓). Note "during inspection" corrective action taken and date in space provided. In this manner, items requiring further attention will be checked (✓) without showing corrective action. This will advise the designated person responsible for trolley operation and safety who reviews the reports that deficiencies exist. The designated person will check all deficiencies as listed and re-examine or otherwise determine whether they constitute a safety hazard.



**Deficiencies may be hazardous to personnel and equipment. Do not operate a trolley having deficiencies unless a designated qualified person has determined that these deficiencies DO NOT constitute a safety hazard.**

Written, dated and signed inspection reports for many items are mandatory under OSHA regulations, and many state safety codes. It is strongly recommended that the Inspection Schedule and Maintenance Report, shown herein, be completed by a qualified person designated with the responsibility for trolley operation and safety or an inspector appointed by this person.

Inspection records can point out the service life of trolley components and help forecast the need for adjustments, repairs and ordering of replacement parts. Review and file these reports after each inspection.

**5-3. REPAIR AND TESTING.**

a. Precautions Before Performing Maintenance or Repair.

Before performing adjustments, maintenance or repairs, observe the following precautions:

- (1) Get permission from your foreman.
- (2) Inform operator before boarding. Be certain operator understands what you are to do and what he is to do.
- (3) When boarding a trolley, always use platforms, steps and ladders provided.
- (4) Have operator move trolley to be inspected or repaired to a location where it will not interfere with other operations.
- (5) Lock main power switch in open position (power off).
- (6) Display "WARNING" or "OUT OF ORDER" sign on the trolley and also on the floor beneath the trolley.
- (7) Provide rail stops to prevent interference with the idle crane by other cranes operating on the same runway. A signalman may be used if temporary railstops are not available.
- (8) Raise and lower all tools or parts with a hand line or block and tackle. Be certain that parts and tools do not fall to floor. Keep both hands free when using ladders.
- (9) Replace all guards, safety devices or other parts removed to facilitate repairs. Remove all tools and temporary rail stops, if used.
- (10) Inform operator when inspection, maintenance or repairs are completed.

In addition to the above precautions, if repair required is part of the hoisting units, the lower block should be lowered to the floor. If this is not possible, secure lower block to a part of the trolley that will adequately support it.

b. General Disassembly Instructions. Some general disassembly instructions are listed below. More specific instructions are given in the Components Section of this manual. Refer to the index to find the part or units that you may be repairing. General recommendations for disassembly are as follows:

- (1) Be certain that power is "OFF" and main switch is locked in the open position before attempting repair. Place warning signs on the main switch.
- (2) Disassemble a unit only to a point required to make the repair.
- (3) Use of heat from a torch to remove parts may damage the part permanently. If the part is to be replaced and reused, such as a shaft having new bearing races installed, torch heating may reduce the strength of the shaft which could later fail and damage equipment or cause serious accidents. Never use a torch to assist in removing parts unless the part will not be reused.
- (4) Using a great deal of force to disassemble a unit is

usually not required. Parts which may have force or interference fits should be removed by use of an arbor press or puller.

(5) Use care in disassembly of all parts. Nicking, scaring or abrasions on parts may reduce the strength of the part or cause trouble in reassembly.

(6) When removing and replacing electrical components, tag or identify the wires removed. Use the appropriate wiring diagram furnished with the crane to help identify the wires.

(7) Always secure parts which are too heavy to handle conveniently with a rope or chain to prevent them from falling to the floor. Protect surfaces which contact rope or chain with cloth or heavy paper.

c. General Repair and Inspection Instruction. Whenever major components have been disassembled to repair or replace a part, other parts of the component should be cleaned and inspected for wear, damage or corrosion. Some items which require particular attention are listed below:

(1) Inspect gearing for worn, cracked, chipped or broken teeth.

(2) Oil seals and O-rings should be replaced.

(3) Inspect anti-friction bearings for end play, roller and race wear or damage, or seal damage, if so equipped.

(4) Inspect bushings for wear, scoring or galling.

(5) Replace all threaded items having damaged threads.

(6) Seal surfaces on shafts must be very smooth to prevent seal lip from wearing away. Smooth out any ridges, nicks or burrs with fine emery.

(7) Replace any parts which are in questionable conditions.

d. General Reassembly Instructions. When reassembling units which have been disassembled, follow instructions for the various components. The general instructions listed here require attention and should be observed.

(1) Make certain all parts have been thoroughly cleaned and properly lubricated.

(2) Bearings which require heating for assembly purposes should be immersed in an oil bath to insure that they are heated throughout. For bearings with inseparable races, do not heat a part of the bearing, such as the inner race alone. Doing so may damage the bearing.

(3) Keys should drop into keyways with snug fit. File or grind the key to obtain this fit.

(4) Replace all gaskets with new gaskets of the same material and thickness as the old gaskets.

(5) For threaded parts requiring specific torque values refer to Components Sections of this manual.

(6) Always prepack grease lubricated anti-friction bearings with proper grease before final assembly.

e. Testing After Repairs.

(1) Operational Testing. All trolleys which have been altered or have undergone major repairs, shall be tested for the following operations:

(a) Hoisting and lowering - slow to maximum speed.

(b) Trolley travel - slow to maximum speed.

(c) Limit switches and safety devices.

1. Adjust trip setting of hoist limit switches so that with empty hook traveling at maximum speed (start with slower speeds) the limit switch trips before lower

block or hook drifts to contact any part of the trolley.

2. Test and properly adjust any other safety devices installed on the trolley.

(2). Load Testing. All new trolleys and trolleys which have been altered or extensively repaired, should be tested to confirm the load rating of the trolley by or under the supervision of an appointed person qualified to make this test. The confirmed load rating should not be more than 80 percent of the test load. Test loads shall not exceed 125 percent of the rated load of the trolley.

## **WARNING**

**Before attempting to test trolley with a test load equal to 125% of the rated load, an appointed person shall have determined that the bridge, runway, and building supporting structures are capable of safety supporting the test load and the weight of complete trolley. Failure to provide adequate support for testing could cause injury to personnel and damage to equipment.**

Apply test load of 125 percent of the rated load to hoist using adequate attachments and having trolley located on the bridge so that the test load produces maximum loading on the bridge structures, as determined by the appointed person. The purpose of this test is to confirm the load rating of the bridge, trolley and hoist structures. Lifting test load to full height or moving test load with trolley or bridge motions is not recommended.

At the time of trolley installation, load testing, at the discretion of the user, may have included testing trolley and hoist motions in addition to moving the rated load across the full span. However, major repairs made only to hoisting equipment, such as hoist gearing replacement, load brake repair or replacement, structural alteration of hoist frame require a confirmation of load rating for hoist only.

Repairs on trolley drive components not involving structural alterations may require load testing, if required by the user or safety codes.

Maintain and file reports on all load tests for future reference.

f. Spare Parts. Regular review of the Inspection Schedule and Maintenance Reports can identify parts requiring replacement sufficiently in advance of actual need to permit ordering of parts when approaching need is identified. It is generally advisable to carry on hand a reasonable minimum inventory of repair parts. The required inventory varies with the type and age of trolley, The severity of service, repair history and availability of parts. Typical recommended spares may include:

Brake discs and shoes

Hoist limit switches

Contactors

Timing relays

Motor couplings

Load hooks, nuts, thrust bearings and latches

Hoisting ropes

Load brake disc assembly

Hoist brake rectifier

Trolley brake rectifier

Fuses

Parts listed above can be ordered from LIFT-TECH Crane & Hoist Spare Parts Department.

## SECTION VI – TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	POSSIBLE REMEDY
<p><b>6-1.</b> Hoist Or Trolley Or All Motions Will Not Operate.</p>	<p>(1) No power to trolley.</p> <p>(2) Mainline contactor not functioning.</p> <p>(3) No control voltage.</p> <p>(4) No power to hoist or trolley panel.</p> <p>(5) Loose connections or broken wires in panel.</p> <p>(6) Contactors in the panels not functioning properly.</p> <p>(7) Wrong voltage or frequency.</p> <p>(8) Open motor secondary for wound rotor motor. (Gearing may sound as though there is excessive back lash.)</p> <p>(9) Motor burned out.</p> <p>(10) Damaged secondary resistor (for a wound rotor motor) or loose or broken terminal connections at the resistor.</p> <p>(11) Thermal overload relay tripped.</p>	<p>(1) Check collectors for making proper electrical contact with the conductors. Check disconnect switch and main fuses or main circuit breaker. Measure supply voltage by a volt-meter and check against electrical data sheet and motor nameplate.</p> <p>(2) Shut off main power supply. Check connections to mainline contactor. Check contact points. Replace if excessively burned or pitted. Check for open circuited or short circuited coil. Also check connections for start-stop buttons at pendant station, especially the common wire.</p> <p>(3) Check transformer fuse. Replace if blown. A blown fuse generally indicates the control circuit is shorted.</p> <p>(4) Shut off main power supply. Check power fuses in panels.</p> <p>(5) Shut off main power supply. Check wiring connections. Check also wiring connections at push button station.</p> <p>(6) Shut off main power supply. Check connections to contactors. Check contact points. Replace, if excessively burned or pitted. Check for open circuited or burned short circuited coil.</p> <p>(7) Check data on motor nameplate against actual power supply.</p> <p>(8) Shut off main power supply. Check connections at motor secondary and secondary resistor.</p> <p>(9) Replace motor.</p> <p>(10) Disconnect main power supply. Inspect resistor. Check all connections. Replace, if required.</p> <p>(11) Verify overload relay is set in accordance with motor nameplate. Overload tripping when set at motor nameplate generally indicates abuse of hoist; dragging load, overloading, excessive jogging, etc.</p>
<p><b>6-2.</b> Hook Moves In Wrong Direction.</p>	<p>(1) Reverse phasing on three phase hoist.</p> <p>(2) Hoist panel or hoist push buttons wired wrong.</p>	<p>(1) Interchange any two supply lines.</p> <p>(2) Check wiring connections with appropriate wiring diagram.</p>
<p><b>6-3.</b> Hook Will Raise But Not Lower.</p>	<p>(1) Limit switch set improperly or defective.</p>	<p>(1) Check limit switch.</p>

## SECTION VI – TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	POSSIBLE REMEDY
<b>6-3.</b> Hook Will Raise But Not Lower (Continued).	<p>(2) Lowering electrical circuit open.</p> <p>(3) Lowering (down) contactor is malfunctioning.</p> <p>(4) Mechanical load brake malfunction.</p>	<p>(2) Check for loose connections in the lowering contactor circuit. See that the reversing jumpers are properly installed. Check connections at the lowering button in push button station.</p> <p>(3) Shut off main power supply. Check contact points. Replace, if excessively burned or pitted. Check for open circuited or burned short circuited coil.</p> <p>(4) Inspect mechanical load brake per Paragraph 8-6.</p>
<b>6-4.</b> Hook Will Lower But Not Raise.	<p>(1) Hoist motor temperature switch open.</p> <p>(2) Excessive load.</p> <p>(3) Limit switch set improperly or defective.</p> <p>(4) Hoisting circuit is open.</p> <p>(5) Hoisting (up) contactor malfunctioning.</p>	<p>(1) See 6-7 below.</p> <p>(2) Reduce loading to rated load of hoist, as shown on nameplate.</p> <p>(3) Check limit switch.</p> <p>(4) Check for loose connection, both in hoist panel and at the up button in push button station.</p> <p>(5) Shut-off main power supply. Check contact points. Replace if excessively burned or pitted. Check for open circuited or burned short circuited coil.</p>
<b>6-5.</b> Hoist Will Not Lift Rated Load.	<p>(1) Low voltage.</p> <p>(2) Motor brake mechanism sticking or out of adjustment.</p>	<p>(1) Check voltage at motor terminals against motor nameplate data. Check wire size of power supply lines for hoist motor.</p> <p>(2) Disassemble mechanism and inspect for defective, worn or damaged parts. Check voltage to brake coil.</p>
<b>6-6.</b> Load Drifts Excessively When Hoist Is Stopped.	<p>(1) Excessive load.</p> <p>(2) Motor holding brake is not functioning properly.</p>	<p>(1) Reduce loading to rated load of hoist, shown on nameplate.</p> <p>(2) With no load, check hoist for drift, If drifting is excessive, inspect and adjust brake for proper torque and lining wear.</p>
<b>6-7.</b> Hoist Motor Overheats.	<p>(1) Excessive load.</p> <p>(2) Excessive duty cycle.</p> <p>(3) Wrong voltage or frequency.</p> <p>(4) Malfunctioning of accelerating contactors.</p>	<p>(1) Reduce loading to rated load of hoist, shown on nameplate.</p> <p>(2) Reduce frequency of lifts or amount of jogging.</p> <p>(3) Check power supply against motor nameplate data.</p> <p>(4) Check sequence of contactors on the hoist panel against wiring diagram.</p>

## SECTION VI – TROUBLE SHOOTING

TROUBLE	PROBABLE CAUSE	POSSIBLE REMEDY
<p><b>6-7. Hoist Motor Overheats (Continued).</b></p>	<p>(5) Gear box is bound up or not functioning freely, causing a strain on the motor.</p> <p>(6) Defective motor or worn bearings.</p> <p>(7) Motor brake mechanism sticking or out of adjustment.</p> <p>(8) Improper lubricant or level too low.</p> <p>(9) Running excessively at low speeds (variable frequency).</p> <p>(10) Loose connections in the motor secondary resistor for a wound rotor motor.</p>	<p>(5) Inspect gear box.</p> <p>(6) Disassemble motor and inspect for defective, worn or damaged parts.</p> <p>(7) Disassemble mechanism and inspect for defective, worn or damaged parts. Check voltage to brake coil.</p> <p>(8) Check lubricant and/or level.</p> <p>(9) Increase running speed of hoist.</p> <p>(10) Disconnect main power supply. Inspect secondary resistor and tighten all connections. Check accelerating contacts for burnt or pitted tips.</p>
<p><b>6-8. Hoist Operates Intermittently.</b></p>	<p>(1) Collectors making poor contacts. Grease, dirt or paint spray on conductor/runways.</p> <p>(2) Loose connection in mainline panel.</p> <p>(3) Loose connection in hoist panel.</p> <p>(4) Loose connection in hoist push buttons.</p> <p>(5) Broken wire in push button cable which sometimes makes contact when cable is twisted.</p> <p>(6) Loose hoist motor secondary resistor leads. Brushes hanging up in brushholders.</p>	<p>(1) Check collectors and conductor runway system.</p> <p>(2) Check all wiring in mainline panel.</p> <p>(3) Check all wiring in hoist panel.</p> <p>(4) Check push button station.</p> <p>(5) Check push button cable for continuity of each wire in cable.</p> <p>(6) Check secondary resistor. Tighten all leads. Check brushes. Adjust if required.</p>
<p><b>6-9. Motor Runs (Any Motion) But Machinery Does Not.</b></p>	<p>(1) Broken or loose motor coupling.</p> <p>(2) Shaft key sheared.</p>	<p>(1) Tighten or replace coupling.</p> <p>(2) Replace key.</p>

## SECTION VII TROLLEY MECHANICAL COMPONENTS

### 7-1. TYPES OF DRIVE.

The traverse drive has a double reduction helical gear reducer with a face mounted motor and brake as shown in Figure 7-1. This reducer is keyed to one drive wheel axle and both drive axles are connected to the traverse drive shaft by couplings. Drive wheels are keyed to their axles.



Figure 7-1. Trolley Drive Arrangement.

**7-2. GEAR REDUCER.** During inspection shafts should be checked for end play, looseness of bearing fits and general alignment. Rotate shafts to insure freedom of rotation. Check lubricant for water, metal particles, sludge or other contamination. If this occurs, the factory recommends complete replacement of these gearboxes.

### 7-3. MOTOR AND BRAKE.

The factory recommends replacement of the motor rather than rebuilding.

See Figure 10-14 for the traverse motor brake.

- a. Remove acorn nuts holding brake cover and remove brake cover.
- b. Remove support plate mounting screws and support plate.
- c. Remove stationary disc and friction disc.
- d. Check braking surfaces for wear or scoring. Replace badly worn or scored parts.
- e. Reinstall parts in reverse of disassembly.
- f. Adjust brake as follows.

Instructions for adjusting the brake are inside the brake cover and are repeated below. Check brake adjustment after the first 30 days of service and regularly thereafter during the six months inspection procedure.

- g. Remove acorn nuts holding brake cover and remove brake cover.
- h. Depress the solenoid plunger and allow it to snap out several times.
- i. Turn both wear adjustment screws equal amounts clockwise in increments of 1/8 turn until the air gap is at the set level of the set, reset label (counterclockwise rotation will increase the air gap).
- j. Replace brake cover.

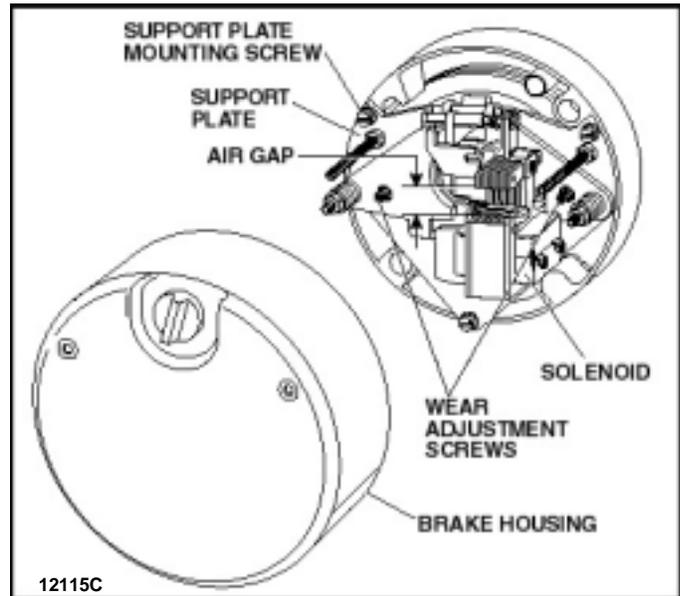


Figure 7-2. Motor Brake.

### 7-4. WHEEL ASSEMBLY.

a. General. Flat or straight treads are used for both driver and trailer wheels on all trolleys. These wheels have a "float" allowance, that is, the distance between the inside flanges of the wheels is wider than the width of the rail head on which they operate. Driver wheels must be mated to insure correct operation.

b. Construction. Driver wheels are keyed to the driver axles which are supported by roller bearings on both sides of the truck. Trailer wheel construction is identical to driver wheel construction except that axles are not extended.

c. Inspection and Maintenance. The schedule for inspection and maintenance is outlined in SECTION V and is to be followed along with these points:

- (1) Check wear pattern on the wheel tread surface and flanges for signs of galling, spalling or cracking. Wheels showing these kinds of problems should be replaced.
- (2) The full length of the bridge (trolley) rail is to be checked for abnormal wear, such as mushrooming of the head over the sides of the rail head, and scheduled for replacement if conditions warrant. The rail should also be examined for loose rail clamps, bad joints or cracked welds on cranes where the bridge rail is welded to the girder. If any of these conditions are found, immediate corrective action should be taken.
- (3) Check the circumference of the driver wheels by a cloth tape. Variations exceeding 1/32 inch (.08 cm) between driver wheels is cause for replacement.

### CAUTION

- Driver wheels should only be replaced in matched pairs.
- (4) Inspect wheel assemblies for looseness of the wheel on axle, axle in bearing or the bearing in the capsule. Jack driver wheels free of the rails, disconnect drive coupling and rotate wheels by hand. In this manner, bearings having defects can be felt. Replace bearings if found defective.
  - (5) Check for adequacy of lubrication.
  - (6) Check all bolts for tightness and retighten if required.

## SECTION VIII HOIST MECHANICAL COMPONENTS

### 8-1. TYPE OF DRIVE.

The standard hoist drive has the hoist motor mounted on the inside of the trolley frame with the hoist speed reducer mounted on the outside of the trolley frame as shown in Figure 8-1.

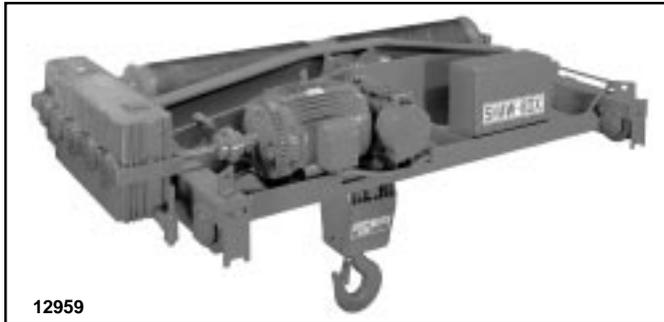


Figure 8-1. Hoist Machinery Arrangement.

### 8-2. GEAR REDUCER.

a. General. The hoist gear case is horizontally split with the top half bolted to the bottom half. This four reduction unit has helical gearing. Shafts are carried by anti-friction bearings supported by the gear case wall. Units with a hoist motor horsepower of 30 or less are also equipped with a roller ratchet type of mechanical load brake in the gear case.

b. Inspection and Maintenance. In general, the inspection and maintenance of these speed reducers follows the same procedure as that outlined in SECTION VII. However, the reducer described herein will be further discussed in Paragraph 8-6; Mechanical Load Brake.

### 8-3. COUPLING.

a. General. Connection of the hoist motor to the speed reducer is made by flexible coupling. Both the reducer shaft and the motor shaft are keyed to the coupling.

b. Inspection and Maintenance.

- (1) Check for play in the coupling to assure there is no abnormal wear of keys.
- (2) Check bolts on flanges for tightness.
- (3) Lubricate according to Paragraph 4-5.

### 8-4. ROPE AND ROPE DRUM.

a. Rope Construction. The type and construction of wire rope used for hoisting cable on hoists can vary through a wide range depending upon the application, environment, usage and other factors.


WARNING

**Replacement rope must be equal to the original rope furnished with the hoist. It is recommended that replacement rope be supplied only by the hoist builder.**

b. Rope Inspection. Hoisting rope is completely exposed to all sorts of external damage as a result of usage and environ-

ment, and is usually difficult to properly lubricate. This exposure to damage and lubrication problems make it mandatory that the rope be frequently inspected and maintained. All wire ropes will eventually deteriorate to a point where they are not safe and will require replacement. The schedule for inspection, lubrication and maintenance can be found in SECTIONS IV and V. The inspection of hoisting rope should be made by an authorized person and determination made when further use of the rope would constitute a safety hazard. Inspections revealing, but not limited to, the following conditions should cause the inspector to question remaining strength of rope and consider replacement:

- (1) Reduction of rope diameter due to loss of core support, internal or external corrosion or wear of outside wires from nominal diameter of more than 3/64 inch (1.19 mm) for diameter to and including 3/4 inch (19.05 mm). Correct method of measuring hoisting rope is shown in Figure 8-2.

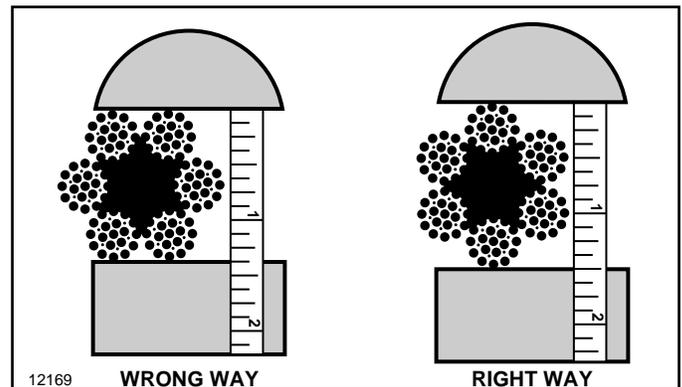


Figure 8-2. Correct Method of Measuring Rope.

- (2) Broken outside wires exceeding twelve randomly distributed wires in one rope lay, or four broken wires in one strand in one rope lay. (See Figure 8-3.)

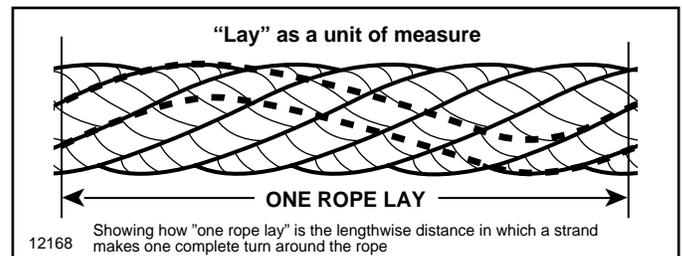


Figure 8-3. Description of One Rope Lay.

- (3) Worn outside wires in which wear exceeds one-third of the original diameter of outside individual wires.
- (4) Sections of rope which may be hidden by the sheave housing or the rope passing over the equalizer sheave must be given close inspection as these are likely points for rope failure.
- (5) Corroded or broken wires at end connections or improperly applied end connections.
- (6) Severe kinking, crushing, bird caging or any other damage resulting in distortion of the rope structure.
- (7) Evidence of gross neglect of lubrication.
- (8) Ropes which have been idle exceeding one month due to shut-down or storage of the trolley.

c. Rope Maintenance. Rope should be maintained in a well lubricated condition. It is important that those sections of rope which are located over sheaves or otherwise hidden be given special attention when lubricating. Proper lubrication reduces both internal and external wear of the individual wires, and also provides some protection from corrosion. If the rope is to be stored, proper precaution is to be taken so that damage or deterioration does not occur. Correct handling of the rope has been previously discussed in SECTION II, Paragraph 2-6. Cutting of the hoist cable is not recommended; however, if cutting is required, rope must have seizings applied to the rope on each side of the place where the rope is to be cut.

On pre-formed rope, one seizing on each side of the cut is required. On non-pre-formed ropes of 7/8 inch (22.2 mm) diameter or smaller, two seizings on each side of the cut are required. Each seizing should consist of 8 closely wound wraps of seizing wire. The distance between seizings should be equal to one rope diameter, except where cut is to be made. Distance should be increased if cut is by torch. Seizing should be fully annealed iron wires. For rope up to and including 7/8 inch (22.2 mm) diameter, seizing wire is .063 inches (1.60 mm) diameter. Cutting may be accomplished by practically any method which produces a clean cut. Flame (torch) cutting, when properly done, leaves the wire ends welded together.

d. Rope Drums. Rope drums are of all welded steel construction, with stub ends machined for the gear and bearing fits. Balanced reeving is used which provides for two ropes operating on the drum in machined right and left hand grooves. Each end of this rope is anchored to the drum by a curved steel plate held to the drum by machine bolts and lock washers. The rope straddles these bolts and is captured between the groove in the drum and the curved plate. Bolts should be tightened until they flatten the lock washers. Tightening of the bolts produces a clamping pressure which securely holds the rope in place. This anchorage is shown in Figure 2-2 in SECTION II.

e. Drum Inspection and Maintenance. Inspection should consist of, but not be limited to, the following:

- (1) Check to ensure that the rope clamps are in correct position and tightly clamped.
- (2) Check that the inactive rope on the drum has been properly lubricated.
- (3) Check the wear of the grooves in the drum and general condition of the drum grooves and land between grooves. (It is recommended that the bottom diameter of the drum groove is measured and recorded at the time crane is received and subsequently measured at inspection intervals. With this data, scheduled drum replacement can be determined.)
- (4) The drum bearing supporting the drum end away from the speed reducer should be checked for adequacy of lubrication and general condition.

### 8-5. HOLDING BRAKE.

a. General. Hoists are equipped with a holding brake which applies torque to the motor shaft sufficient to hold the load. This hoist uses a foot mounted shoe brake.

b. Construction. Shoe brakes are DC magnet operated, spring set brakes. The shoe brake for up thru 30 hoist motor horsepower has a 10" brake drum. The shoe brake for 40 and 50 hoist motor horsepower has a 13" brake drum.

c. Adjustment.


WARNING

**Before attempting brake adjustment, be certain hoist lower block is resting on the floor.**

The brake, as shipped with the trolley, has been adjusted for the proper torque, magnet air gap and shoe clearance. As linings wear through usage of the brake, magnet stroke increases and brake action becomes sluggish. Refer to Figure 8-4 (while the two brakes are not identical, they are similar) in making the following adjustments.

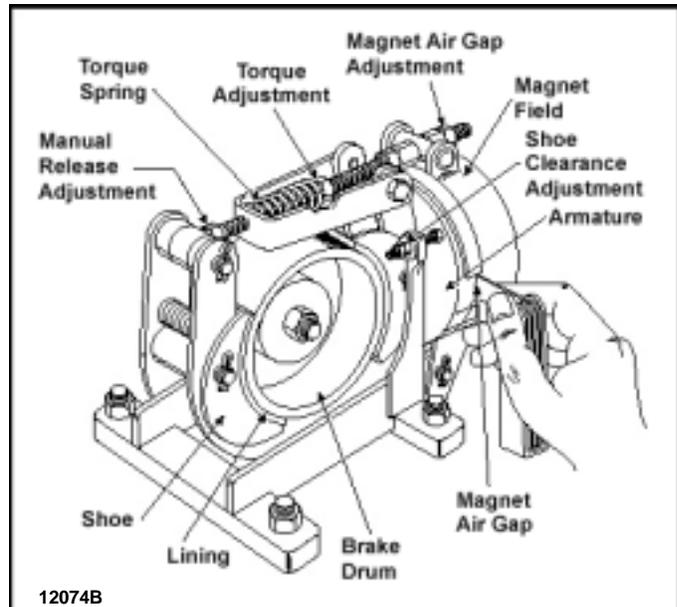


Figure 8-4. Typical Shoe Brake.

(1) Magnet Air Gap Adjustment. For the 10" brake set magnet air gap adjustment nuts so that top of armature will move 1/8" (3.175 mm) toward magnet when brakes operate. As shown in Figure 8-4, clearance with feeler gauge at midpoint of armature should be approximately 1/16" (1.58 mm). The 13" has an indicator fitted to the top of the magnet to which the gap should be set.

(2) Shoe Clearance Adjustment. For the 10" brake clearance between brake shoes and drum is equalized at time of installation and checked whenever brake shoe travel is adjusted. Readjustment if necessary, is accomplished by setting stop screw so that shoes clear the wheel equally on each side, approximately 1/32" (0.79 mm). The 13" brake has a shoe equalizer stud at the base.

(3) Torque Adjustment. For the 10" brake, braking torque can be adjusted by varying the compression of the torque spring by a self locking nut.

Hoist Motor Horsepower	Length of Spring	Length of Spring
15	5.64"	14.3 cm
20	5.59"	14.2 cm
25	5.55"	14.1 cm
30	5.51"	14.0 cm

The 13" brake has an adjustment screw in the magnet body, with a setting plate, which will adjust this brake to full

rated torque. The brake springs can be slackened to reduce torque, if required, but should not be overtightened, as this may overload the magnet and prevent the brake shoes from releasing properly.

(4) Manual Release. The 10" brake can be released manually by adjustment of the manual released nut. Keep locked when not in use. The 13" brake can be released by loosening the nut above the magnet and swinging the brake rod up.

d. Inspection and Maintenance.

 <b>WARNING</b>
<p><b>Before attempting disassembly be certain the mainline switch is locked in the open (power off) position and that all load is removed from the drum by resting the lower block on the floor.</b></p>

- (1) Open brakes up and check shoe friction surfaces.
- (2) If worn, replace worn linings and shoes by first removing pin holding shoe and rotating shoe out of brake assembly.
- (3) Reassemble with new shoe in reverse order of disassembly. It is recommended that a new set of brake shoes be kept on hand to reduce down time for replacement.
- (4) Adjust brake per paragraph 8-5. c.

**8-6. MECHANICAL LOAD BRAKE.**

a. General. Mechanical load brakes used in the hoist gear system of hoists with 30 or less hoist motor horsepower are of the "Weston" type and operate automatically. Brakes are located within the gear case and operate in the gear case lubricant.

b. Construction. A roller-ratchet type load brake is standard on these hoists. The roller-ratchet brake is incorporated on the shaft next to the input (high speed) shaft and consists of the load brake flange, friction discs, load brake ratchet, gear with helix machined into the face of the hub and the helix which is splined to the shaft.

c. Operation. Figure 8-5 shows the action of the roller-ratchet load brake in both hoisting and lowering. The slots into the ratchet are sloped in a manner which forms a clearance between the rollers and the retaining plate (outer race) when the ratchet is rotated in the hoisting direction. However, when rotating the ratchet in the lowering direction, the slot

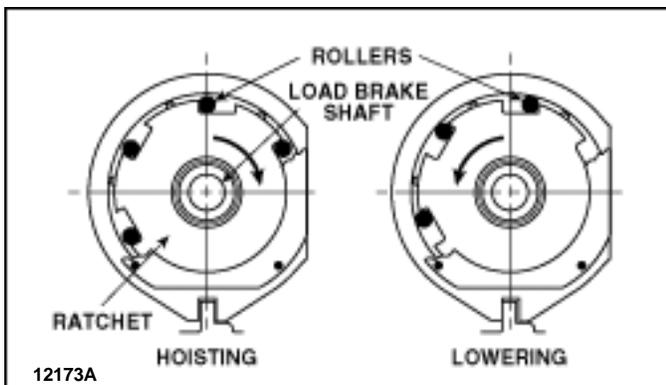


Figure 8-5. Illustration of Roller-Ratchet Brake.

slopes so as to force the roller into a wedged position. This action stops the ratchet from further rotation.

d. Adjustment. The roller-ratchet load brake is non-adjustable.

e. Inspection and Maintenance.

 <b>WARNING</b>
<p><b>Lock mainline switch in the open (power off) position and be certain that all weight is removed from the hoist by resting the lower block on the floor before working on the mechanical load brake.</b></p>

- (1) To inspect the load brake and gear, drain the oil from the gear case. Remove the top two bolts from nine circular bearing retainers on the sides of the gear case. Remove fifteen bolts holding the top of the gear case to the base. Remove inspection covers on top of gear case and thread a lifting sling through the inspection holes. The flange of the top cover has a tapped hole, 1/2-13. Screw a jack bolt through this hole to loosen the top cover for removal. Using a lifting device, remove the top gear case cover.

 <b>WARNING</b>
<p><b>Gear case cover weighs approximately 260 pounds. Use appropriate lifting equipment to remove.</b></p>

 <b>CAUTION</b>
<p>Many components of the gear case are too heavy to be handled by one person unassisted and may therefore require lifting devices to assist in removing from the gear case.</p>

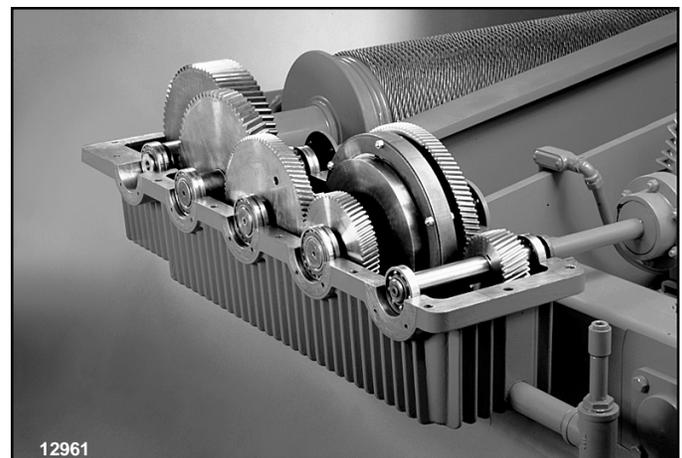


Figure 8-6. View of Gear Case.

(2) Remove the front bearing retainer at the end of the load brake shaft. The load brake shaft is adjacent to the input shaft. The load brake shaft and assembly can now be removed. Use a lifting sling to lift the load brake shaft from the gear case.

(3) To further disassemble the load brake, remove 3 hex socket head cap screws from each of two retaining plates and remove plates from the groove on the spline of the load brake shaft (see Figure 8-7).



Figure 8-7. Removing Retainer Plates on Load Brake Shaft.

- (4) Pull off brake helix, then load brake gear.
- (5) Remove the roller-ratchet assembly friction disc.
- (6) Check the condition of all parts for evidence of wear or damage. Replace worn or damaged parts. Do not attempt to repair the roller-ratchet assembly. Inspect needle bearing under roller-ratchet.
- (7) Reassemble in reverse procedure, after cleaning all parts and the interior of the gear case.
- (8) Refill gear case with fresh lubricant (see SECTION IV).

#### 8-7. EDDY CURRENT BRAKE.

- a. General. An eddy current brake is used as the load brake in hoists with more than 30 hoist motor horsepower. This brake is mounted to the motor frame between the motor and the gear case.
- b. Construction. The eddy current brake acts as a self loaded generator resisting the load of the motor.
- c. Adjustment. There is no adjustment on the eddy current brake.
- d. Inspection and Maintenance. Periodic cleaning by compressed air to dislodge and remove foreign matter is necessary. Repeat this procedure as often as necessary to keep the unit clean. If, after operating for a long time, compressed air is not sufficient to remove all foreign matter, disassemble the whole unit and clean using compressed air and a cleaning solution. Bearings are lifetime lubricated and there is no provision for additional lubrication.

#### 8-8. GEARS AND BEARINGS.

- a. General. All gearing is supported by shafts with anti-friction bearings at both ends of shaft.
- b. Construction. All gearing is helical and gears are either keyed to the shaft or an integral part of the shaft.
- c. Inspection and Maintenance.
  - (1) Follow instructions of paragraph 8-6 e. through (1).
  - (2) Inspect the drum shaft gear and bearing for wear or damage. If either requires replacement, remove the bearing retainer on the outside of the gear case, the retaining ring outside of the bearing and the pillow block at the opposite side of the frame. The drum must then be lifted clear of the frame and bottom gear case in order to replace the bearing or gear.

- (3) Other bearings in the gear case may be removed by removing the bearing retainers and the retaining ring on the outside of the gear case.
- (4) Examine gear teeth for general wear, galling, spalling or any other abnormal tooth condition.
- (5) Bearings should be visually inspected for defects. Rotate the bearing by hand to feel for smooth rotation. Bearings which do not rotate freely and smoothly are to be replaced.
- (6) Replace worn or damaged parts.
- (7) Reassemble in reverse procedure, after cleaning all parts and the interior of the gear case.
- (8) Refill gear case with fresh lubricant (see SECTION IV).
- (9) Check and clean air breather on outside of gear case periodically.

#### 8-9. UPPER BLOCK.

- a. General. The upper block is the sheave arrangement supported by the trolley structural frame which supports the hoisting ropes.
- b. Construction. All sheaves except one (an equalizer) are carried by a common pin, with each sheave rotating on a separate anti-friction bearing. The 10 ton hoist has only an equalizer sheave.
- c. Inspection and Maintenance. Check sheaves for adequate lubrication, freedom to rotate, and worn or damaged grooves. Check spacers between sheaves for wear, corrosion or other signs of defects. Replace any parts required.

#### 8-10. LOWER BLOCK.

- a. General. The lower block is the assembly of sheaves into a frame to which the hook is attached. The lower block is connected to the hoist by ropes only, so that the block is free to swing in any direction.
- b. Construction. All sheaves are carried by a common pin, with each sheave rotating on a separate anti-friction bearing. The inner race of the bearing is eliminated and the rollers operate directly on the pin. Where this is the case, the pin is a special alloy steel heat treated for the application. All sheaves are of the same diameter. The hook is held in its support (crosshead) by a hook nut threaded to the shank of the hook. A drilled hole through the hook nut and shank into which a dowel pin is tightly fitted prevents the hook nut from loosening. A thrust bearing is imposed between the hook nut and crosshead which allows hook to rotate.
- c. Inspection and Maintenance.
  - (1) Check lubrication of all parts. If the thrust bearing is not equipped with a grease fitting, lubricate with a general purpose oil. Also lubricate the shank of the hook which passes through the crosshead.
  - (2) Check each sheave to ensure rope groove is smooth and free from burrs, or other surface defects.
  - (3) Check each sheave for freedom of rotation, replace bearings if defective.
  - (4) Make certain that dowel pin holding the hook nut to the hook, is securely in position.
  - (5) If hook is equipped with a safety latch or rotational lock, check to determine that they are in good operating condition.
  - (6) Check throat opening of hook. (Refer to Figure 8-8.) It is recommended that upon receipt of the crane, a

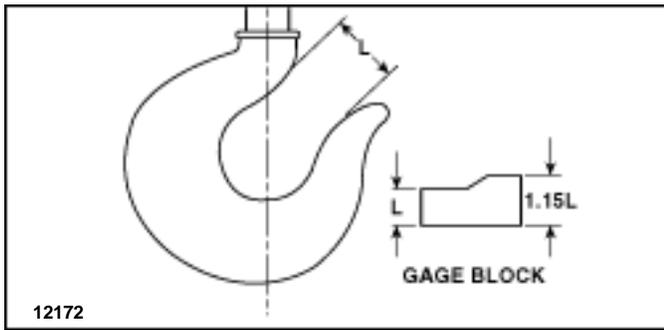


Figure 8-8. Method of Measuring Hook Throat Opening.

measurement be made and recorded of the hook throat opening. OSHA regulations require that the hook be replaced if the throat opening exceeds 15 percent of the original opening, or if the hook is twisted more than 10 degrees from the unbent plane. A gage block, properly identified to the crane, similar to the one shown in Figure 8-8 is suggested to be made for each hook for use in these measurements.

(7) Hooks showing signs of cracks must be replaced.

(8) Check wear of the hook, especially at the saddle and replace if badly worn.

## SECTION IX – ELECTRICAL

Descriptions and instructions included in this Paragraph are for standard components only.

### 9-1. MOTORS.

a. General. All motors furnished are suitable for trolley and hoist duty and will perform satisfactorily if operated per ratings shown on motor nameplate. Exceeding or deviating from ratings could result in poor performance of motor and shortened expected life. For example, sustained operation of motor in an ambient 10°C over rated ambient temperature of 40°C could shorten expected life of motor insulation to one half.

b. Maintenance. General maintenance procedures for A.C. Wound Rotor motors should include the following steps:



**Lock open main disconnect switch (power off) on crane before starting any work on motor.**

(1) Inspection. It is recommended that a periodic inspection schedule should be set up. Inspect motors for excessive dirt, moisture, loose mounting bolts, loose coupling, and bearing problems. Also, check brushes for wear and adjustment. Insulation and mechanical parts of motor should be kept clean. Dust that is free from oil and grease may be removed by wiping with a cloth or preferably by suction. Dust may be blown from inaccessible parts with clean, dry air using not more than 30 to 50 pounds of pressure.

When grease or oil is present, wipe with a petroleum solvent of a safety type, such as Stoddard Solvent or similar material.

Wear suitable gloves to prevent skin irritation. Tighten loose bolts and coupling, if necessary.

(2) Brushes (Wound Rotor motors only). Figure 9-1 shows a typical brush holder with brush. (Details may be different for motors by other manufacturers.)

To inspect brushes or to do any work on brushes or slip rings, remove cover at slip ring end of motor. Check all brushes to make sure that they make good contact with slip rings.

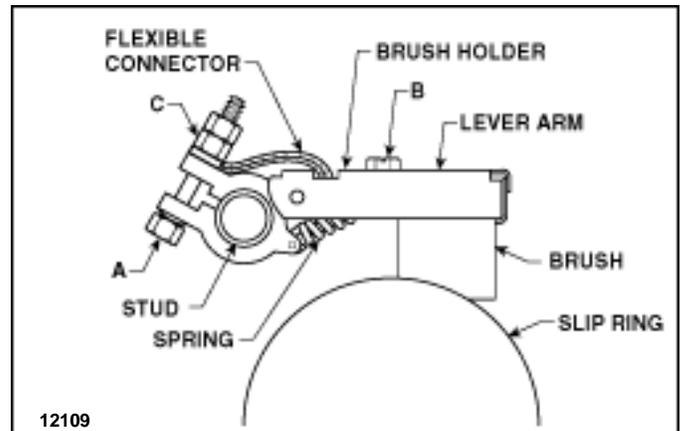


Figure 9.1 Brush Holder with Brushes.

To adjust brush pressure on slip ring, loosen or tighten nut A (see Figure 9-1) until concave surface of brush makes good contact with slip ring.

To replace brushes, use following steps (see Figure 9-1):

- (a) Loosen nut C.
- (b) Loosen nut A.
- (c) Take brush holder assembly out from stud.
- (d) Tilt brush lever arm upwards.
- (e) Loosen screw B.
- (f) Remove brush (worn out) from brush holder.
- (g) Insert new brush.
- (h) Tighten screw B.
- (i) Tighten nut C.
- (j) Put brush holder assembly on stud and tighten nut A. Make sure brush makes proper contact with slip ring.

(3) Slip Rings. Slip rings of a wound rotor motor (see Figure 9- 1) must be kept clean, smooth and concentric. They can be cleaned by a fine sandpaper or any commercial electrical cleaning solvent.

(4) If motor requires any parts other than brushes, replace motor.

c. Reconnection of A.C. Motors. Reconnectable dual voltage A.C. motors show connections required both for low voltage and high voltage on a plate attached either to conduit box cover or motor frame.

### 9-2. RESISTORS.

a. General. Resistors are normally used with A.C. Wound Rotor motors to limit peak torque and peak current as they accelerate, and to provide a means for torque control of motors. These features are obtained for an A.C Wound Rotor motor by varying resistance in series with motor secondary. Taps on resistors provide for decreasing the resistance in steps as motor accelerates. Inasmuch as resistors convert electrical energy to thermal energy (heat), they are

mounted outside of control panel enclosure so that the heat is more readily dissipated. Resistor enclosures are ventilated to allow free passage of cooling air. Depending upon HP, duty cycle and application, resistor could be of punched grid or edgewound construction. Edgewound resistors, which are most commonly used, are made by mounting a spiral wound stainless steel resistance element on a refractory core-insulated steel support member. Each resistor unit is then called a tube.

b. Maintenance

**⚠ WARNING**

**Lock open main disconnect switch (power off) before starting any work on a resistor. Also, make sure that the unit has cooled down to room temperature.**

Resistors need very little maintenance. Terminals should be checked periodically to make certain that connections are clean and secure.

If any of the tubes need replacement, refer to resistor wiring diagram to obtain replacement tube part number and tap settings. After new tube is installed and terminals are properly located, check the resistance of each step for all three phases by means of a ohmmeter. These measurements should agree with values shown on resistor wiring diagram. When measuring resistance, make certain that all external wiring is disconnected from resistor, and that resistor has cooled down to room temperature.

**9-3. VARIABLE FREQUENCY CONTROL.**

a. General. Variable frequency control may be provided for some motors. Variable frequency control provides smooth acceleration by changing the frequency and voltage to the motor. All components required for this control are combined in one unit.

b. Maintenance. No maintenance is required for this unit. Since any servicing of the unit should be done by only a qualified serviceman it is recommended that if problems occur the complete unit be replaced.

**9-4. CONTACTORS.**

a. General. Contactors are normally used for reversing, accelerating and mainline control, and are located in hoist, trolley, bridge and mainline panels. Coil style number, voltage and frequency are marked on the side of contactor coil, normally rated for 110 volt, 60 Hz.

b. Maintenance. A systematic and periodic maintenance program will provide the assurance of long life, reliable performance and minimum down time. Any plan of preventive maintenance should include inspection, cleaning and replacement of worn or faulty contactors.

**9-5. OVERLOAD RELAYS.**

a. General. Overload relays are used to provide running over-current protection for hoist or trolley drive motors. Do not tamper with this relay as it has been accurately calibrated at factory.

**9-6. LIMIT SWITCH.**

a. General. This limit switch has a rotary screw driven by a gear reduction which is coupled to the end of the drum shaft. Adjustment discs operate the contacts of separate switches; one for the hoisting circuit and one for the lowering. The switch assembly must be wired in accordance with the appropriate wiring diagram, which is packaged with hoist.

b. Adjustment. Adjustment of this screw type limit switch is accomplished as follows (see Figure 9-2).

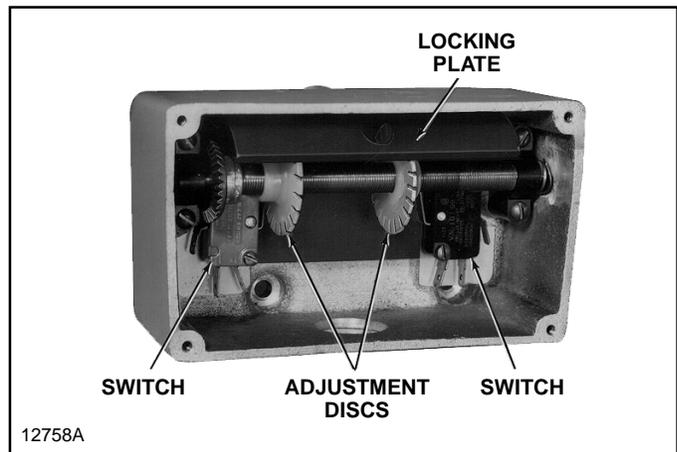


Figure 9-2. Screw-Type Limit Switch Adjustment.  
(Wires Not Shown For Clarity.)

- (1) Remove four screws and lift off switch cover.
- (2) Lift and hold up locking plate while making adjustment.
- (3) Turn proper adjustment disc (right for up, left for down) toward switch to reduce hook travel or away from switch to increase hook travel.
- (4) Release locking plate and ensure slots on adjustment disc are engaged.
- (5) Replace cover.

**⚠ WARNING**

**Check limit switch operation carefully, without load, before placing hoist in service. If mis-adjusted, SEVERE DAMAGE AND/OR DROPPED LOAD COULD RESULT. Allow 6" for hook drift in both directions. Never allow less than 1-1/2 complete wraps of rope on drum with hook in lowest position.**

**9-7. WIRING DIAGRAMS.**

Wiring diagrams for SHAW-BOX trolleys have been omitted from this book because of many possible variations. This is due to different currents and types of electrical components used in their construction. A print of the correct wiring diagram for each trolley is furnished as a separate insert and shipped with the trolley. We suggest you carefully file the wiring diagram with this book for future reference.

## SECTION X – PARTS LIST

**10-1. GENERAL.** The parts list and illustrations in this section of the manual cover parts for standard SHAW-BOX trolleys. For this reason certain variations may occur from the information given. Always give the Trolley Serial Number and Rated Load; and Motor Horsepowers, Voltage, Phase and Frequency.

No parts illustrations are included for electrical parts; therefore provide the name of the item required and all data given on the identification plate on the item.

Certain parts of your hoist will, in time, require replacement under normal wear conditions. It is suggested that these parts be purchased for your hoist as spares for future use. See back cover for a list of these parts.

**The numbers assigned to the parts of our various assemblies in our parts list are not the part numbers used in manufacturing the part. They are identification numbers, that when given with the trolley serial number, permit us to identify, select or manufacture, and ship the correct part needed for any trolley.**

### 10-2.

<b>LIST OF PART ILLUSTRATIONS</b>		
Title	Figure No.	Page No.
Hoist Motor and Brakes .....	10-1	28
Hoist Gear Case .....	10-2	30
Hoist Motor Pinion Shaft .....	10-3	32
Hoist Intermediate Shaft .....	10-4	33
Hoist Load Brake Shaft .....	10-5	34
Drum Pinion Shaft .....	10-6	36
Drum, Gear and Bearings .....	10-7	37
Upper Block .....	10-8	38
Lower Block – 4 Parts of Rope (10 Ton) .....	10-9	40
Lower Block – 8 Parts of Rope (15 & 20 Ton) .....	10-10	42
Lower Block – 12 Parts of Rope (25 & 30 Ton) .....	10-11	44
Wheel Assemblies and Drive Shaft .....	10-12	46
Traverse Motor and Gear Box .....	10-13	48
Traverse Motor Brake .....	10-14	49
Screw Type Limit Switch .....	10-15	51

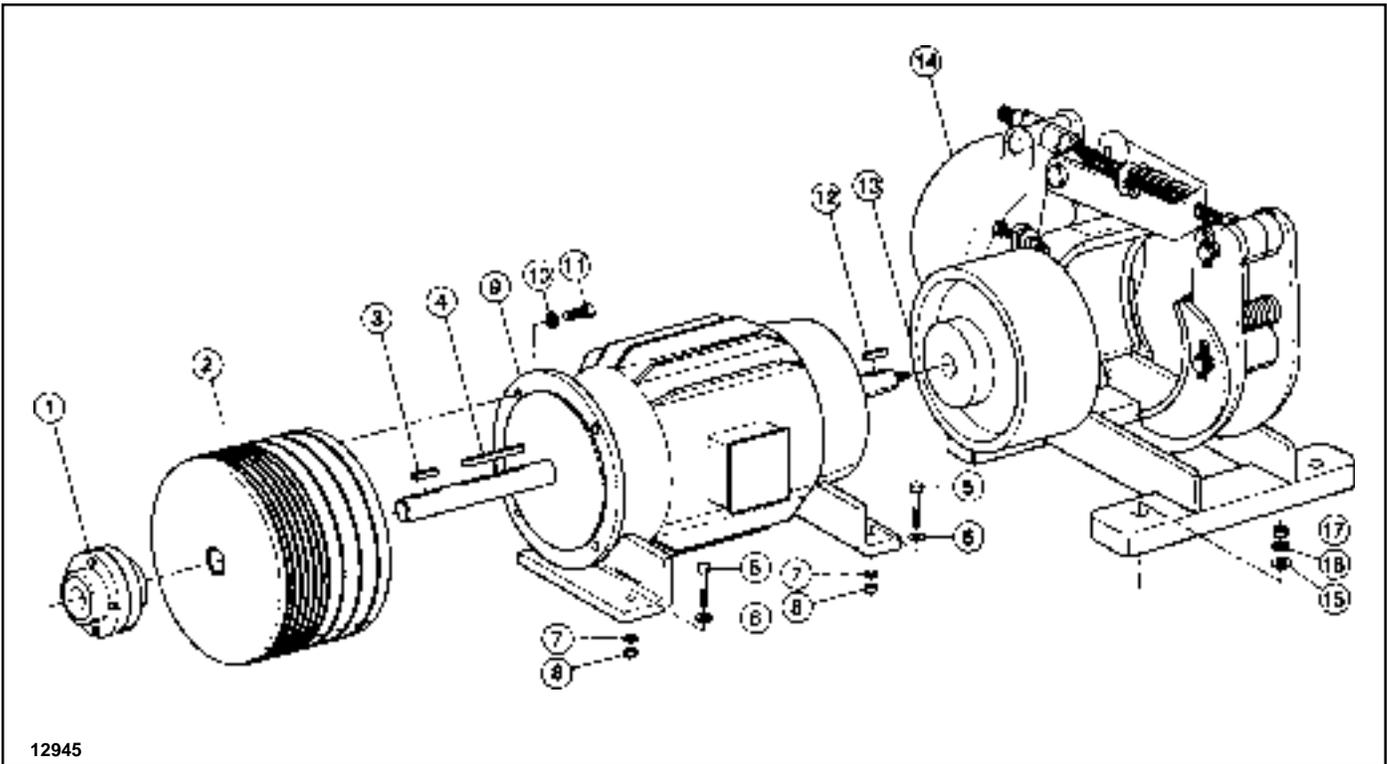


Figure 10-1. Hoist Motor and Brakes.

Ref. No.	Part Number	Description	Qty. Req'd
1	LM-101 LM-102 LM-103 LM-104	Hoist Motor Coupling Motor Frames 254T, 256T and 286U Motor Frames 284T, 286T and 326U Motor Frames 324T and 326T Motor Frames 364U and 365U	1
2	LM-105 LM-106 LM-107 LM-108	Eddy Current Brake For 15 Motor HP For 20 Motor HP For 25 and 30 Motor HP For 40 and 50 Motor HP	1
3	LM-109 LM-110	Parallel Key for Hoist Motor to Coupling Motor Frames 254T, 256T and 286U Motor Frames 284T, 286T, 324T 326T, 326U, 364U and 365U	1
4	LM-111 LM-112	Parallel Key for Eddy Current Brake For 15 and 20 Motor HP For 25, 30, 40 and 50 Motor HP	1
5	LM-113 LM-114	Hex Head Bolts Motor Frames 254T, 256T, 284T, 286T & 286U (1/2-13 x 2-1/4) All Other Motor Frames (5/8-11 x 2-1/2)	4
6	LM-115 LM-116	Hardened Flat Washers For LM-113 (1/2) For LM-114 (5/8)	8
7	LM-117 LM-118	Lockwashers For LM-113 (1/2) For LM-114 (5/8)	4
8	LM-119 LM-120	Hex Nuts For LM-113 (1/2-13) For LM-114 (5/8-11)	4



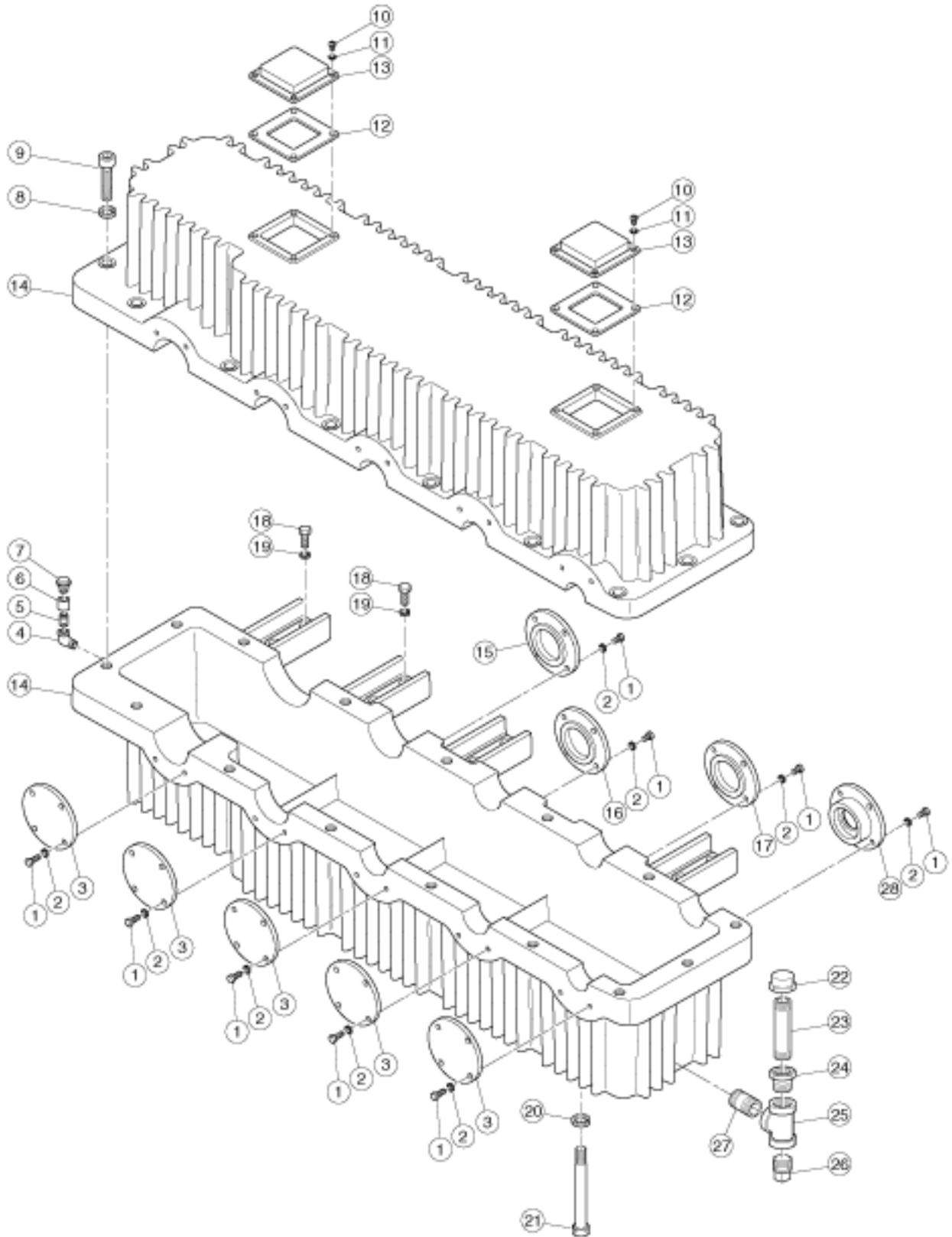


Figure 10-2. Hoist Gear Case.

Figure 10-2. Hoist Gear Case. (Continued)

Ref. No.	Part Number	Description	Qty. Req'd
1	LM-201	Hex Head Bolts (3/8-16 x 1)	36
2	LM-202	Lockwashers (3/8)	36
3	LM-203	Bearing Retainers	5
4	LM-204	90° Street Elbow (3/8 NPT)	1
5	LM-205	Short Nipple (3/8 NPT x 1-1/2)	1
6	LM-206	Coupling (3/8 NPT)	1
7	LM-207	Air Breather	1
8	LM-208	Hi-Collar Lockwashers - Plated (3/4)	15
9	LM-209	Hex Socket Cap Screws - Plated (3/4-10 x 2-3/4)	15
10	LM-210	Round Head Machine Screws (#10-24 x 1/4)	8
11	LM-211	Lockwashers - Plated (#10)	8
12	LM-212	Gaskets	2
13	LM-213	Inspection Covers	2
14		Gear Case (Includes top and bottom)	1
	LM-214	For Hoist Motor HP's thru 30	
	LM-215	For Hoist Motor HP's of 40 and 50	
15	LM-216	Bearing Retainer	1
16		Bearing Retainer	1
	LM-217	For LM-214	
	LM-216	For LM-215	
17		Bearing Retainer	1
	LM-217	For LM-214	
	LM-218	For LM-215	
18	LM-219	High Strength Hex Head Bolts - Plated (5/8-11 x 1-3/4, SAE J429 Grade 5)	8
19	LM-220	Lockwashers - Plated (5/8)	8
20	LM-221	Lockwashers (7/8)	2
21	LM-222	Hex Head Fit Bolts	2
22	LM-223	Plain Pipe Cap (3/4 NPT)	1
23	LM-224	Nipple (3/4 NPT x 4-5/8)	1
24	LM-225	Reducing Bushing (1-1/2 to 3/4)	1
25	LM-226	Tee (1-1/2 NPT)	1
26	LM-227	Square Head Plug (1-1/2 NPT)	1
27	LM-228	Nipple (1-1/2 NPT x 3-1/4)	1
28		Bearing Retainer	1
	LM-229	For LM-214	
	LM-230	For LM-215	

**NOTES**

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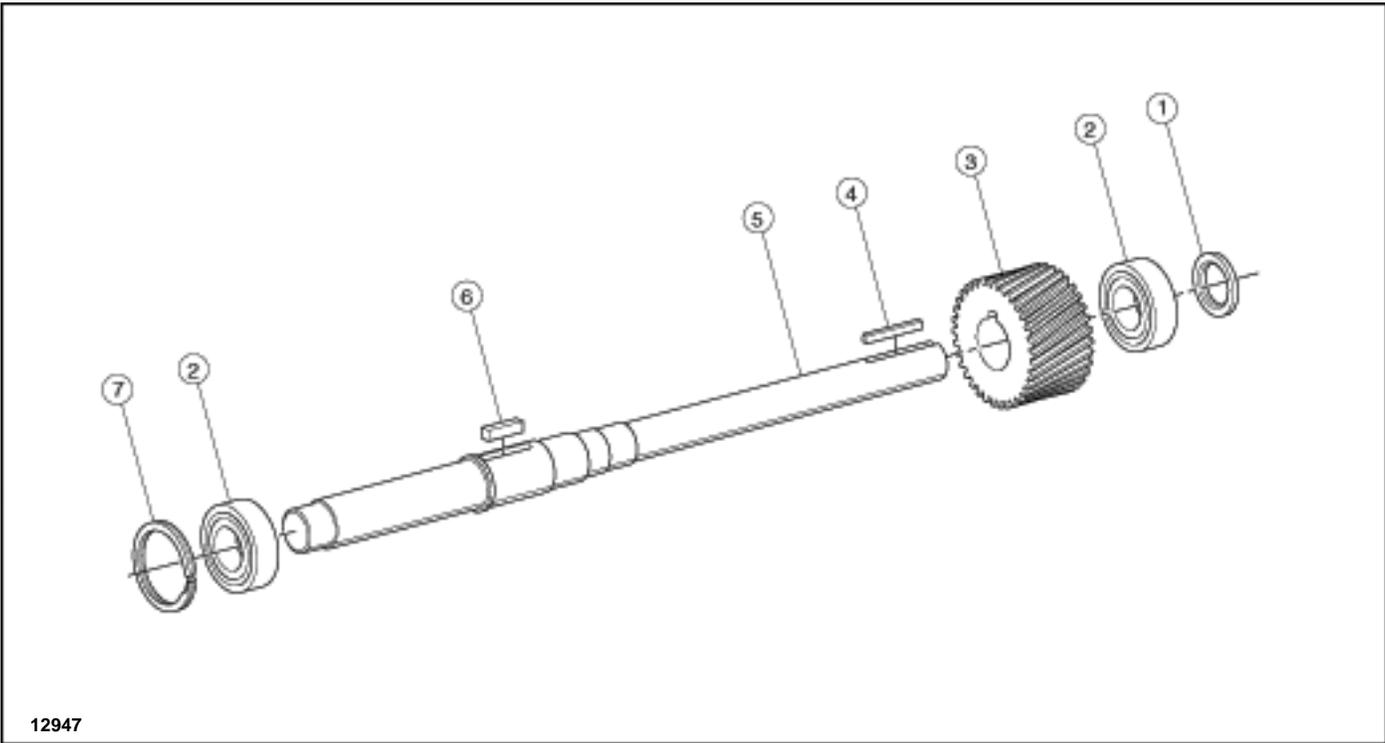


Figure 10-3. Hoist Motor Pinion Shaft.

Ref. No.	Part Number	Description	Qty. Req'd
1	LM-301 LM-302	Oil Seal For Hoist Motor HP's thru 30 For Hoist Motor HP's of 40 and 50	1
2	LM-303 LM-304	Ball Bearings For Hoist Motor HP's thru 30 For Hoist Motor HP's of 40 and 50	2
3	LM-305 LM-306	Motor Pinion For Hoist Motor HP's thru 30 For Hoist Motor HP's of 40 and 50	1
4	LM-307 LM-308	Parallel Key For Hoist Motor HP's thru 30 For Hoist Motor HP's of 40 and 50	1
5	LM-309 LM-310	Hoist Motor Pinion Shaft For Hoist Motor HP's thru 30 For Hoist Motor HP's of 40 and 50	1
6	LM-311 LM-312	Parallel Key For Hoist Motor HP's thru 30 For Hoist Motor HP's of 40 and 50	1
7	LM-313 LM-314	Retaining Ring For Hoist Motor HP's thru 30 For Hoist Motor HP's of 40 and 50	1

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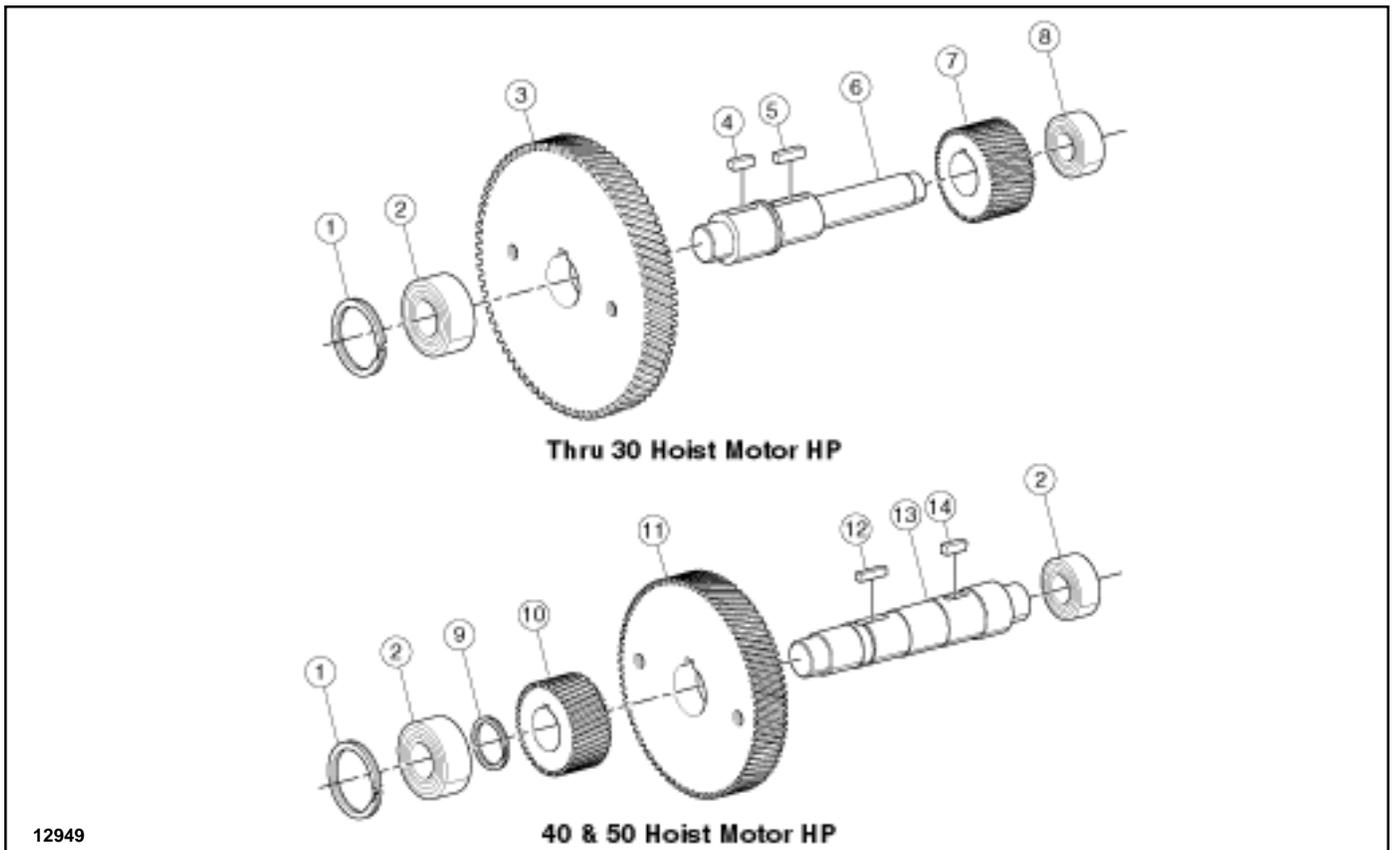
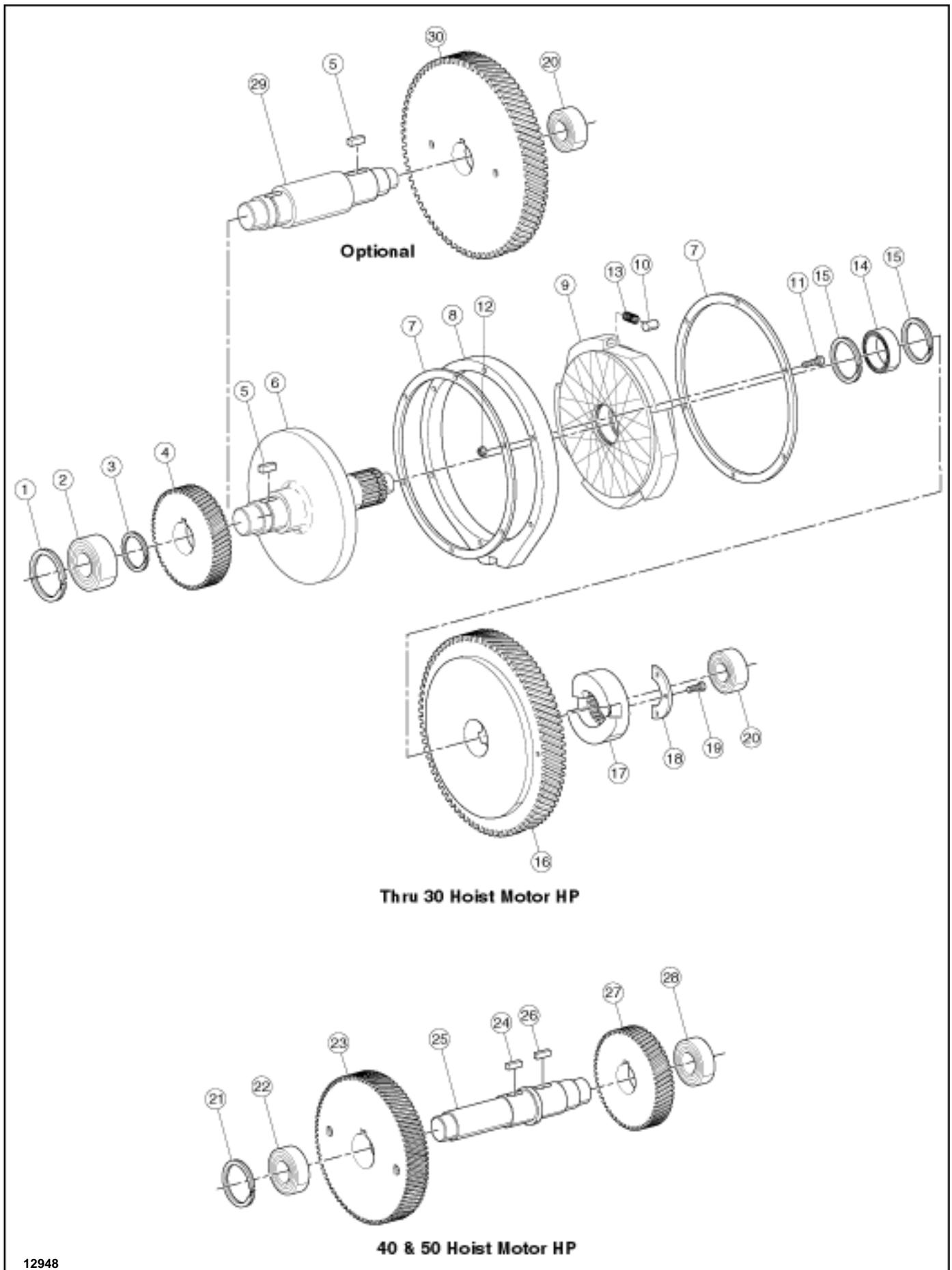


Figure 10-4. Hoist Intermediate Shaft.

Ref. No.	Part Number	Description	Qty. Req'd
		Ref. Nos. 1 thru 8 Are For Hoist Motor HP's thru 30.	
1	LM-401	Retaining Ring	1
2	LM-402	Roller Bearing	1
3		Intermediate Gear	1
	LM-403	88 Teeth	
	LM-404	95 Teeth	
	LM-405	102 Teeth	
	LM-406	111 Teeth	
	LM-407	119 Teeth	
4	LM-408	Parallel Key	1
5	LM-409	Parallel Key	1
6	LM-410	Intermediate Shaft	1
7	LM-411	Intermediate Pinion (22 Teeth)	1
8	LM-412	Ball Bearing	1
		Ref. Nos. 1, 2 and 9 thru 14 Are for Hoist Motor HP's of 40 and 50.	
1	LM-401	Retaining Ring	1
2	LM-402	Roller Bearings	2
9	LM-413	Retaining Ring	1
10		Intermediate Pinion	1
	LM-414	22 Teeth	
	LM-415	25 Teeth	
11		Intermediate Gear	1
	LM-416	88 Teeth	
	LM-417	95 Teeth	
12	LM-409	Parallel Key	1
13	LM-418	Intermediate Shaft	1
14	LM-408	Parallel Key	1



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Figure 10-5. Hoist Load Brake Shaft.

Figure 10-5. Hoist Load Brake Shaft. (Continued)

Ref. No.	Part Number	Description	Qty. Req'd
		Ref. Nos. 1 thru 20 Are For Hoist Motor HP's thru 30.	
1	LM-501	Retaining Ring	1
2	LM-502	Roller Bearing	1
3	LM-503	Retaining Ring	1
4		Intermediate Pinion	1
	LM-504	36 Teeth	
	LM-505	43 Teeth	
	LM-506	53 Teeth	
	LM-507	59 Teeth	
	LM-508	65 Teeth	
5	LM-509	Parallel Key	1
	LM-510	Load Brake Assembly (Includes Ref. Nos. 6 thru 19)	1
6	LM-511	Load Brake Shaft	1
	LM-512	Roller Ratchet Assembly (Includes Ref. Nos. 7 thru 13)*	1
7	LM-513	Roller Retaining Plates	2
8	LM-514	Roller Race	1
9	LM-515	Roller Ratchet and Friction Discs	1
10	LM-516	Rollers	5
11	LM-517	Hex Head Bolts (5/16-18 x 2)	6
12	LM-518	Self Locking Hex Nuts (5/16-18)	6
13	LM-519	Springs	5
14	LM-520	Needle Bearing	1
15	LM-521	Retaining Rings	2
16	LM-522	Load Brake Gear (121 Teeth)	1
17	LM-523	Load Brake Helix	1
18	LM-524	Half Retaining Rings	2
19	LM-525	Hex Socket Head Self Locking Cap Screws - Plated (1/4-20 x 1/2)	6
20	LM-526	Ball Bearing	1
		Ref. Nos. 21 thru 28 Are For Hoist Motor HP's of 40 and 50.	
21	LM-527	Retaining Ring	1
22	LM-528	Ball Bearing	1
23	LM-529	Motor Gear (111 Teeth)	1
24	LM-530	Parallel Key	1
25	LM-531	Intermediate Shaft	1
26	LM-532	Parallel Key	1
27		Intermediate Pinion	1
	LM-533	59 Teeth	
	LM-534	65 Teeth	
28	LM-535	Ball Bearing	1
		Optional for Hoists thru 30 Hoist Motor HP Without Load Brake -	
		Ref. Nos. 1 thru 5 Plus:	
5	LM-509	Parallel Key	1
29	LM-536	Shaft	1
30	LM-537	Motor Gear (121 Teeth)	1
20	LM-526	Ball Bearing	1

\* When Ref. Nos. 7 thru 13 require replacement, the factory recommends use of the above assembly instead of individual parts. Orientation of the bolts and nuts in this assembly must be as shown.



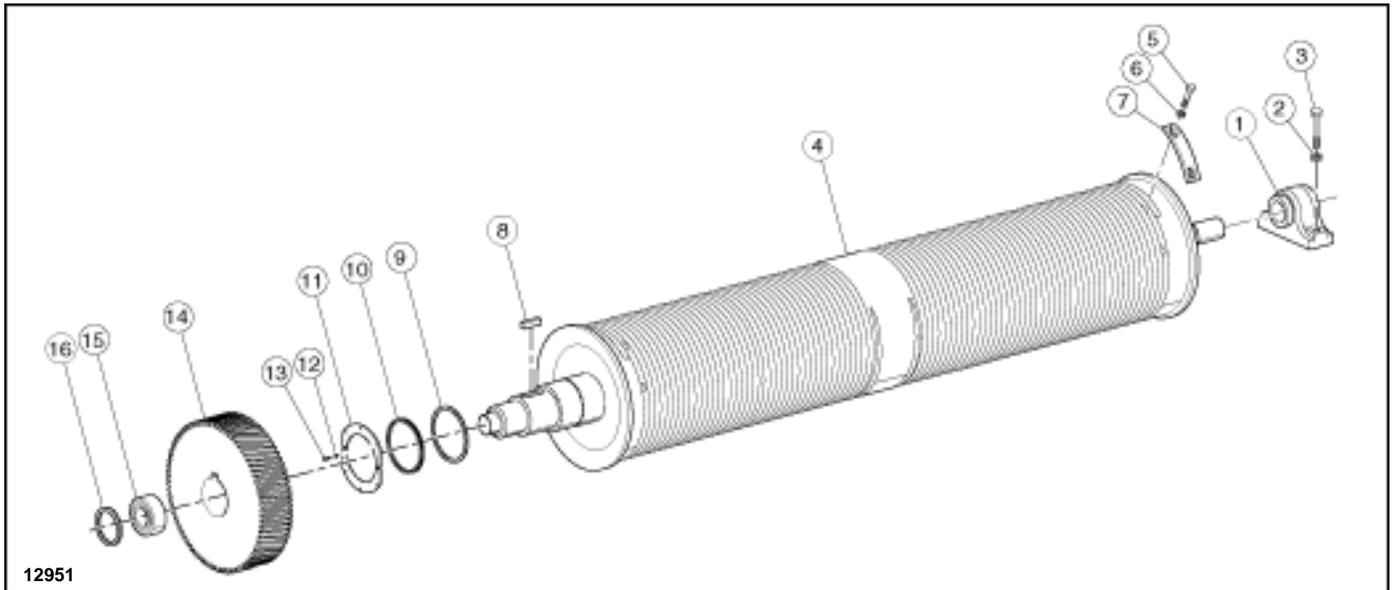


Figure 10-7. Drum, Gear and Bearings.

Ref. No.	Part Number	Description	Qty. Req'd
1	LM-701	Pillow Block	1
2	LM-702	Lockwashers (5/8)	2
3	LM-703	Hex Head Bolts (5/8-11 x 3)	2
4		Drum	1
	LM-704	60" Gage	
	LM-705	72" Gage	
	LM-706	84" Gage	
	LM-707	96" Gage	
	LM-708	108" Gage	
	LM-709	120" Gage	
5	LM-710	Hex Head Bolts (1/2-13 x 1-3/4)	4
6	LM-711	Lockwashers (1/2)	4
7	LM-712	Rope Clamps	2
8	LM-713	High Strength Parallel Key	1
	LM-714	Split Oil Seal Assembly (Includes Ref. Nos. 9 thru 13)	1
9	LM-715	Retaining Ring	1
10	LM-716	Split Oil Seal	1
11	LM-717	Plates	2
12	LM-718	Lockwashers (1/4)	6
13	LM-719	Hex Head Bolts (1/4-20 x 3/4)	6
14	LM-720	Drum Gear (79 Teeth)	1
15	LM-721	Roller Bearing	1
16	LM-722	Retaining Ring	1
		Wire Rope (Not Shown)	1
		For 10 Ton Hoist	
	LM-723	60" Gage	
	LM-724	72" Gage	
	LM-725	84" Gage	
	LM-726	96" Gage	
	LM-727	108" Gage	
	LM-728	120" Gage	
		For 15, 20, 25 and 30 Ton Hoists	
	LM-729	60" Gage	
	LM-730	72" Gage	
	LM-731	84" Gage	
	LM-732	96" Gage	
	LM-733	108" Gage	
	LM-734	120" Gage	

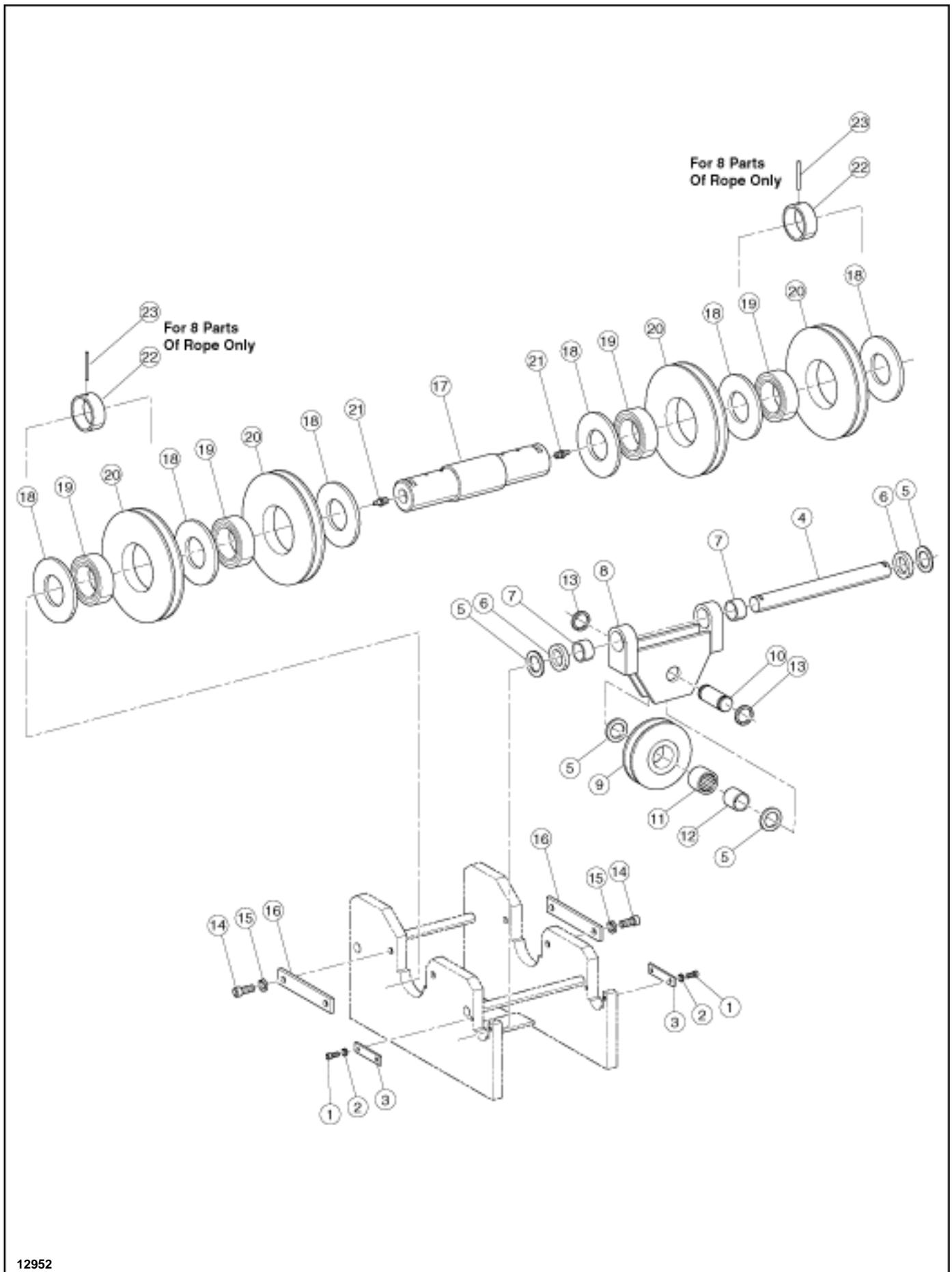
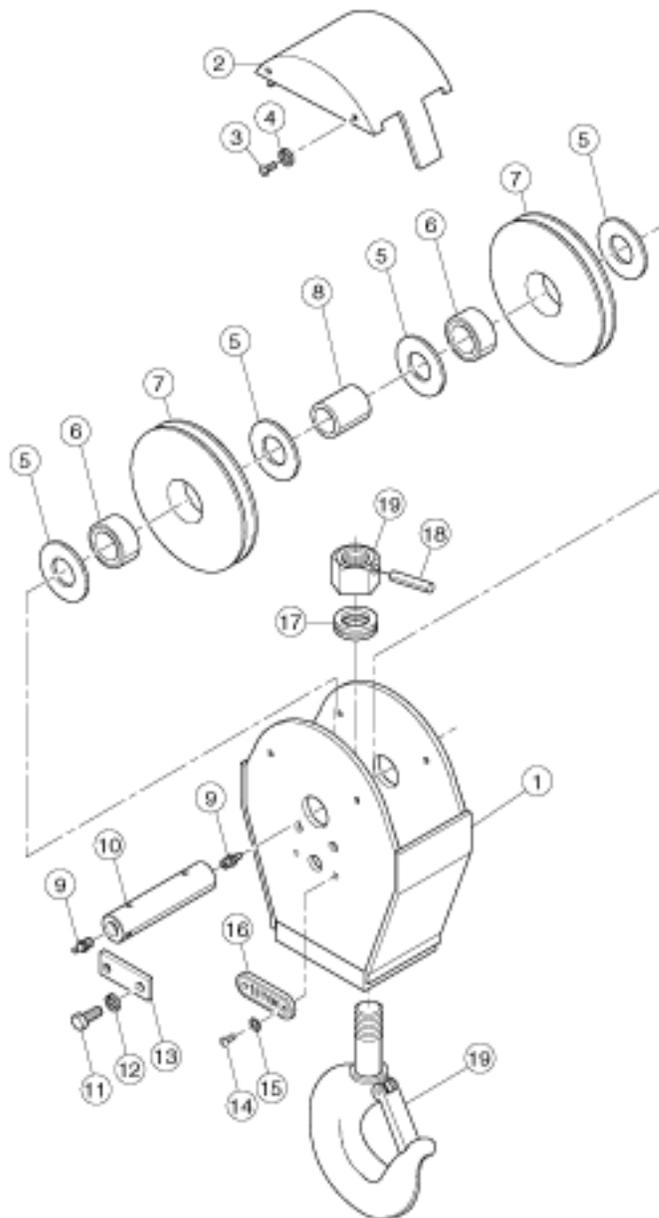


Figure 10-8. Upper Block.



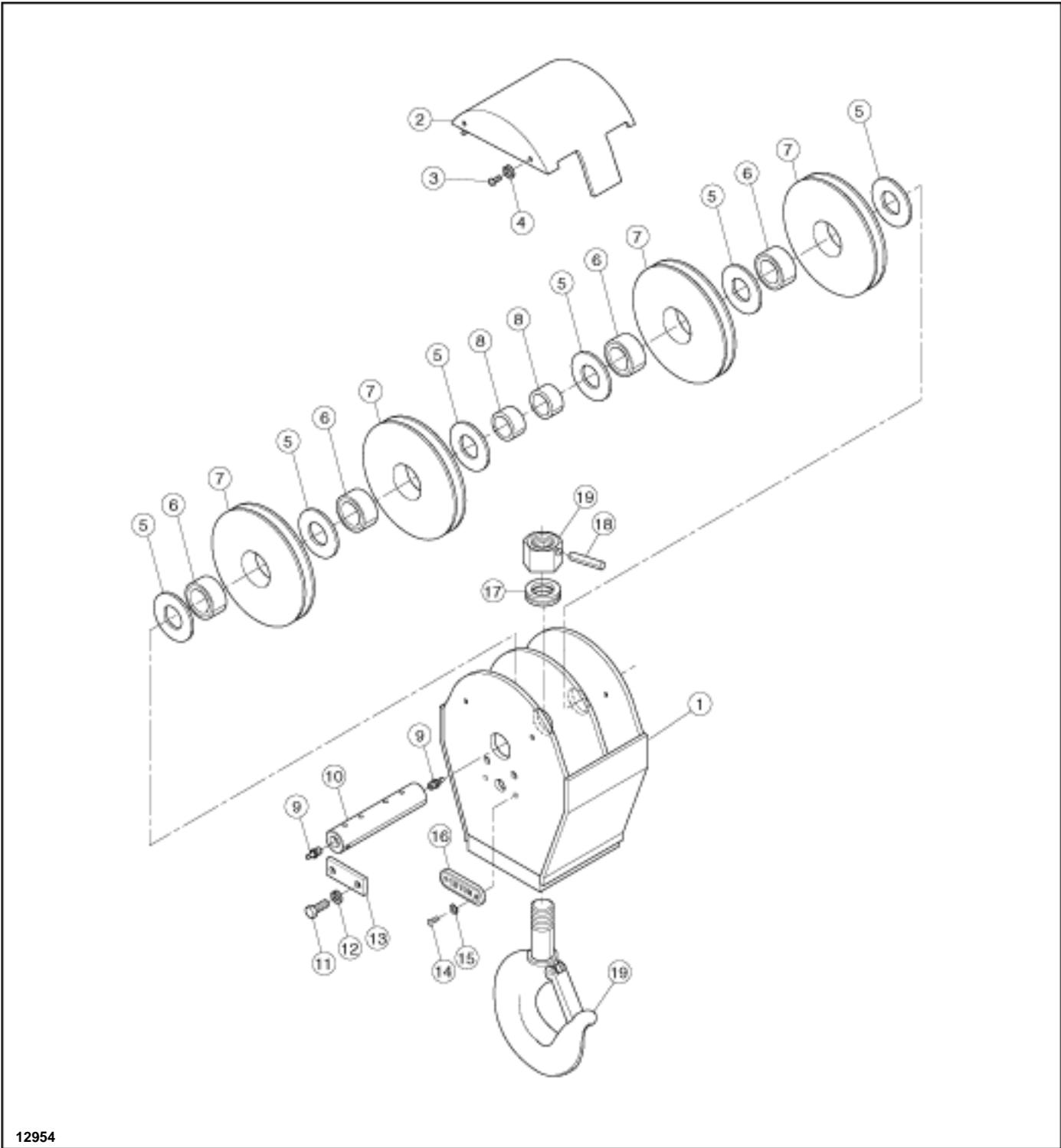


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Figure 10-9. Lower Block - 4 Parts of Rope. (10 Ton.)

Ref. No.	Part Number	Description	Qty. Req'd
	LM-901	Lower Block Assembly (Includes Ref. Nos. 1 thru 19)	1
1	LM-902	Lower Block Weldment	1
2	LM-903	Rope Guard	1
3	LM-904	Hex Head Bolts (3/8-16 x 3/4)	4
4	LM-905	Lockwashers (3/8)	4
5	LM-906	Thrust Washers	4
6	LM-907	Roller Bearings Without Inner Race	2
7	LM-908	Sheaves	2
8	LM-909	Spacer	1
9	LM-910	Grease Fittings (1/8 NPT)	2
10	LM-911	Sheave Pin	1
11	LM-912	Hex Head Bolts (1/2-13 x 3/4)	2
12	LM-913	Lockwashers (1/2)	2



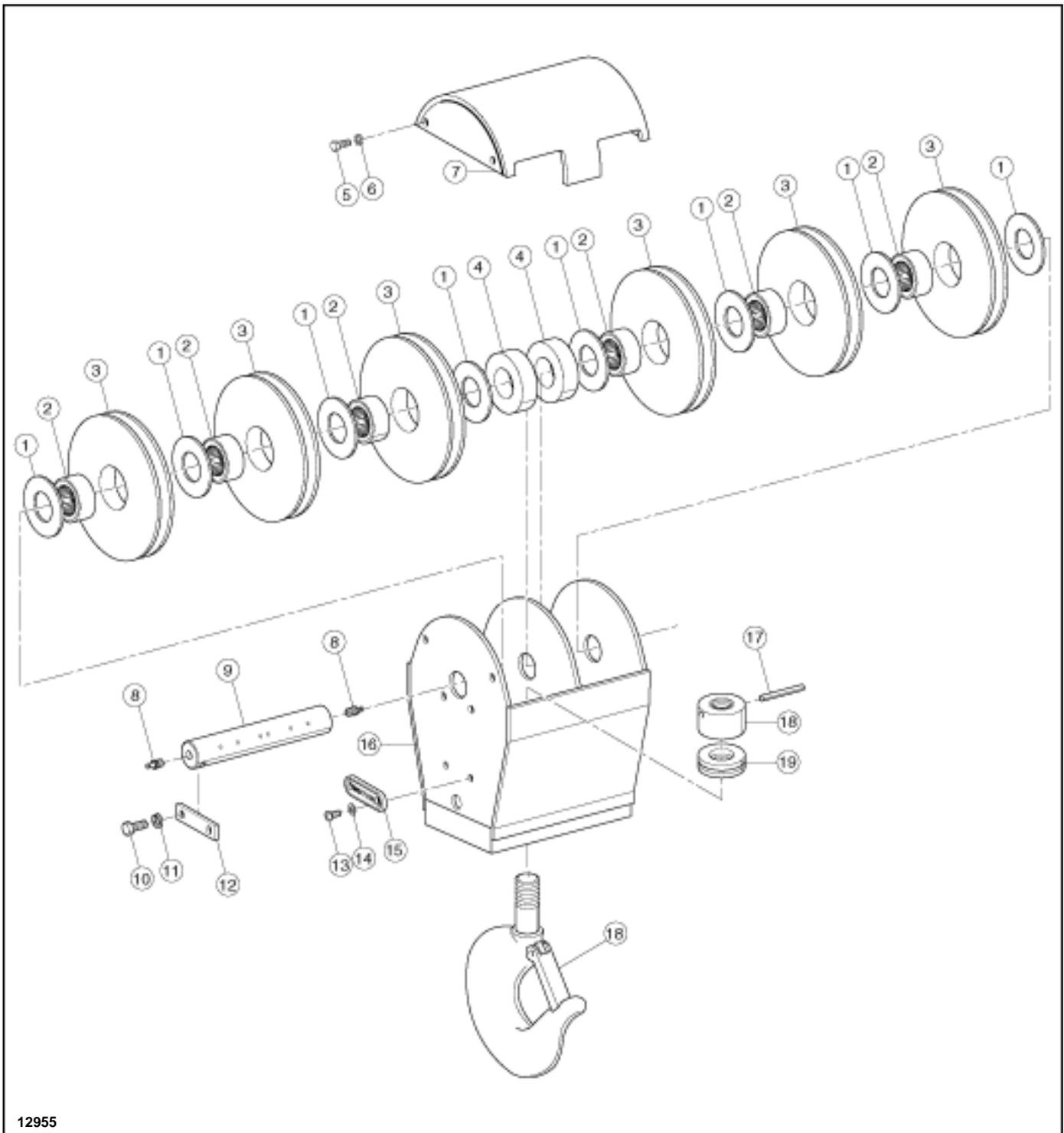


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Figure 10-10. Lower Block - 8 Parts of Rope. (15 & 20 Ton.)

Ref. No.	Part Number	Description	Qty. Req'd
		Lower Block Assembly (Includes Ref. Nos. 1 thru 19)	1
	LM-1001	15 Ton	
	LM-1002	20 Ton	
1	LM-1003	Lower Block Weldment	1
2	LM-1004	Rope Guard	1
3	LM-1005	Hex Head Bolts (3/8-16 x 3/4)	4
4	LM-1006	Lockwashers (3/8)	4



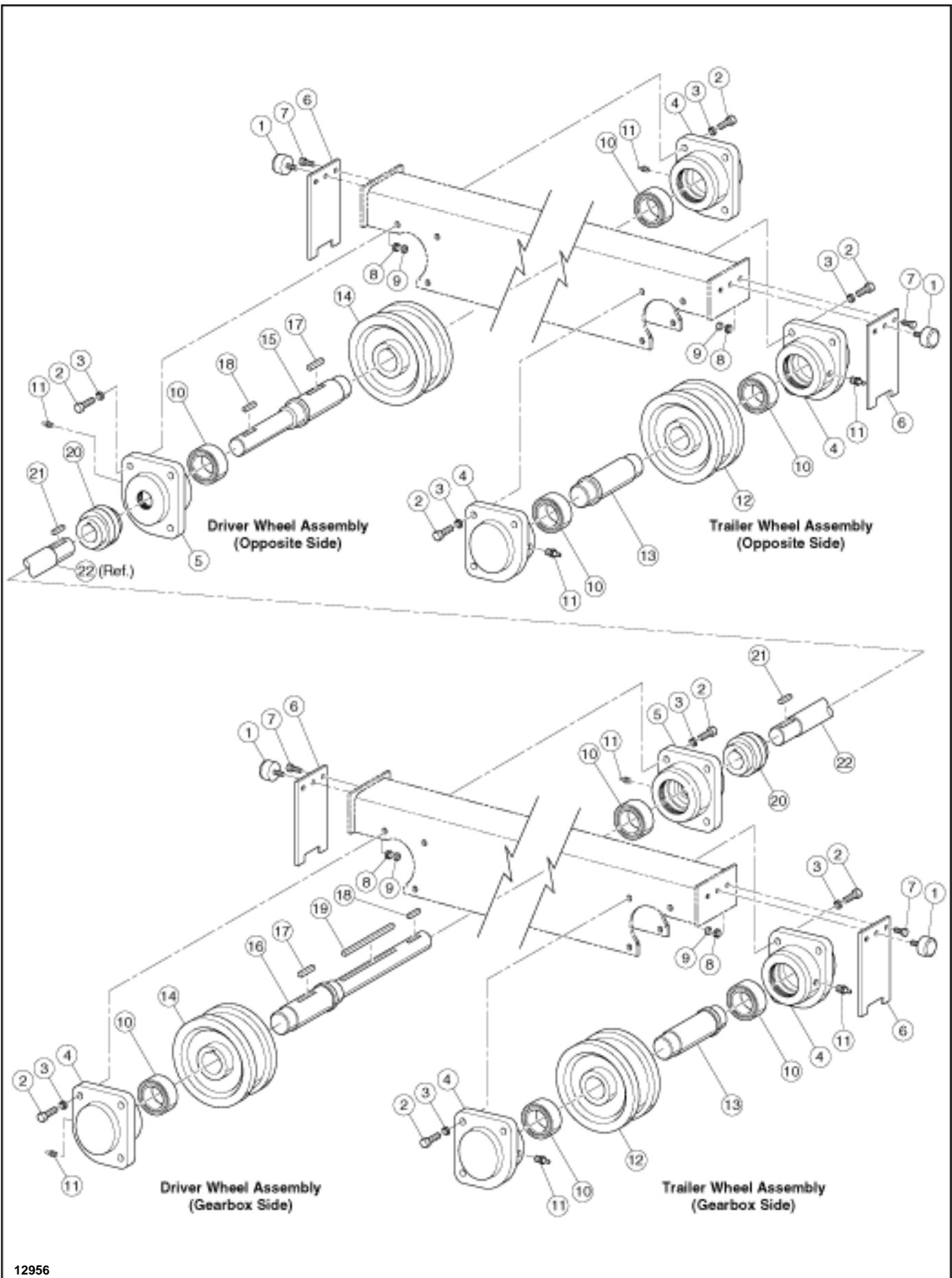


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Figure 10-11. Lower Block - 12 Parts of Rope. (25 & 30 Ton.)

Ref. No.	Part Number	Description	Qty. Req'd
		Lower Block Assembly (Includes Ref. Nos. 1 thru 19)	1
	LM-1101	25 Ton	
	LM-1102	30 Ton	
1	LM-1103	Thrust Washers	8
2	LM-1104	Roller Bearings Without Inner Race	6
3	LM-1105	Sheaves	6
4	LM-1106	Spacers	2
5	LM-1107	Hex Head Bolts (3/8-16 x 3/4)	4





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Figure 10-12. Wheel Assemblies and Drive Shaft.



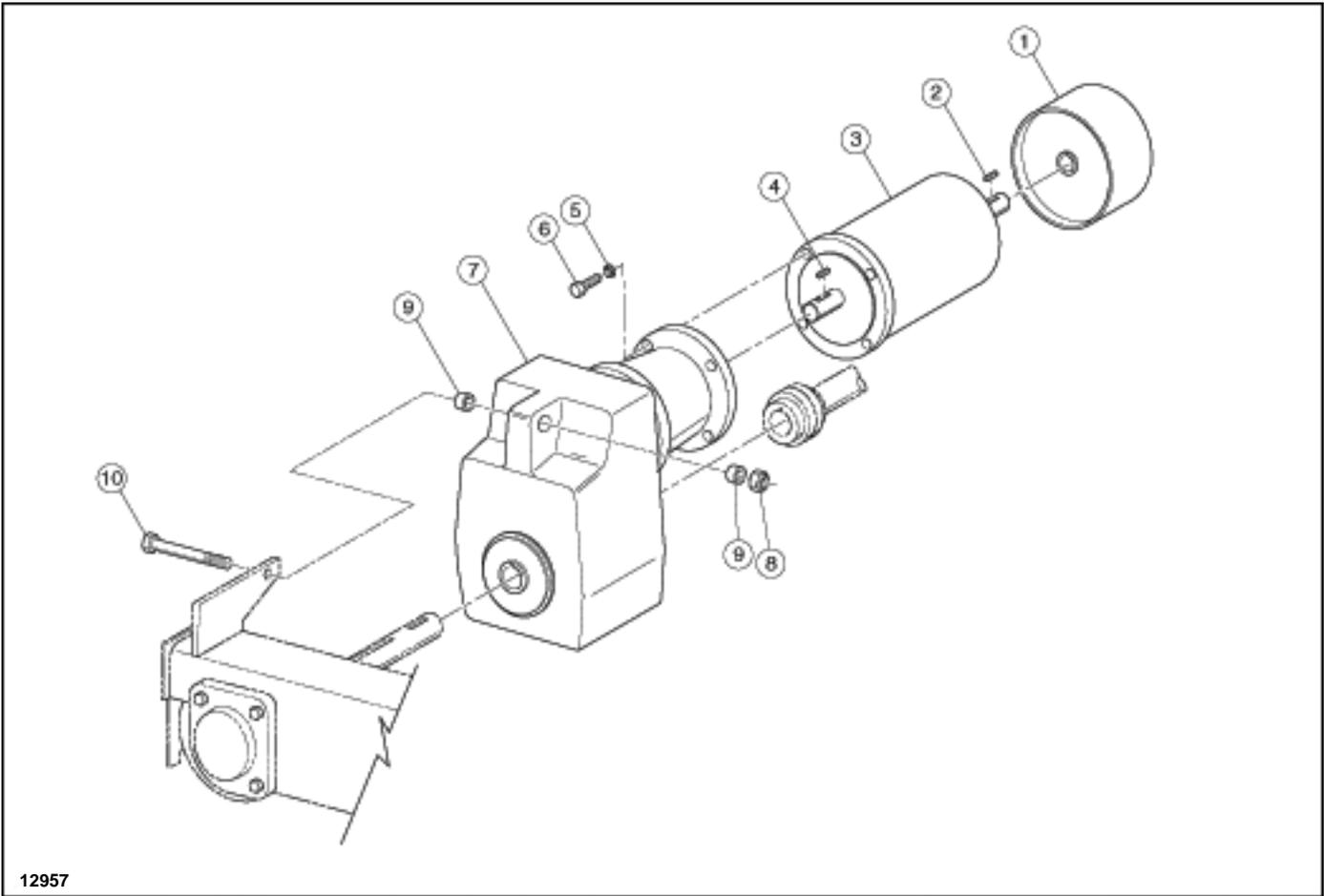
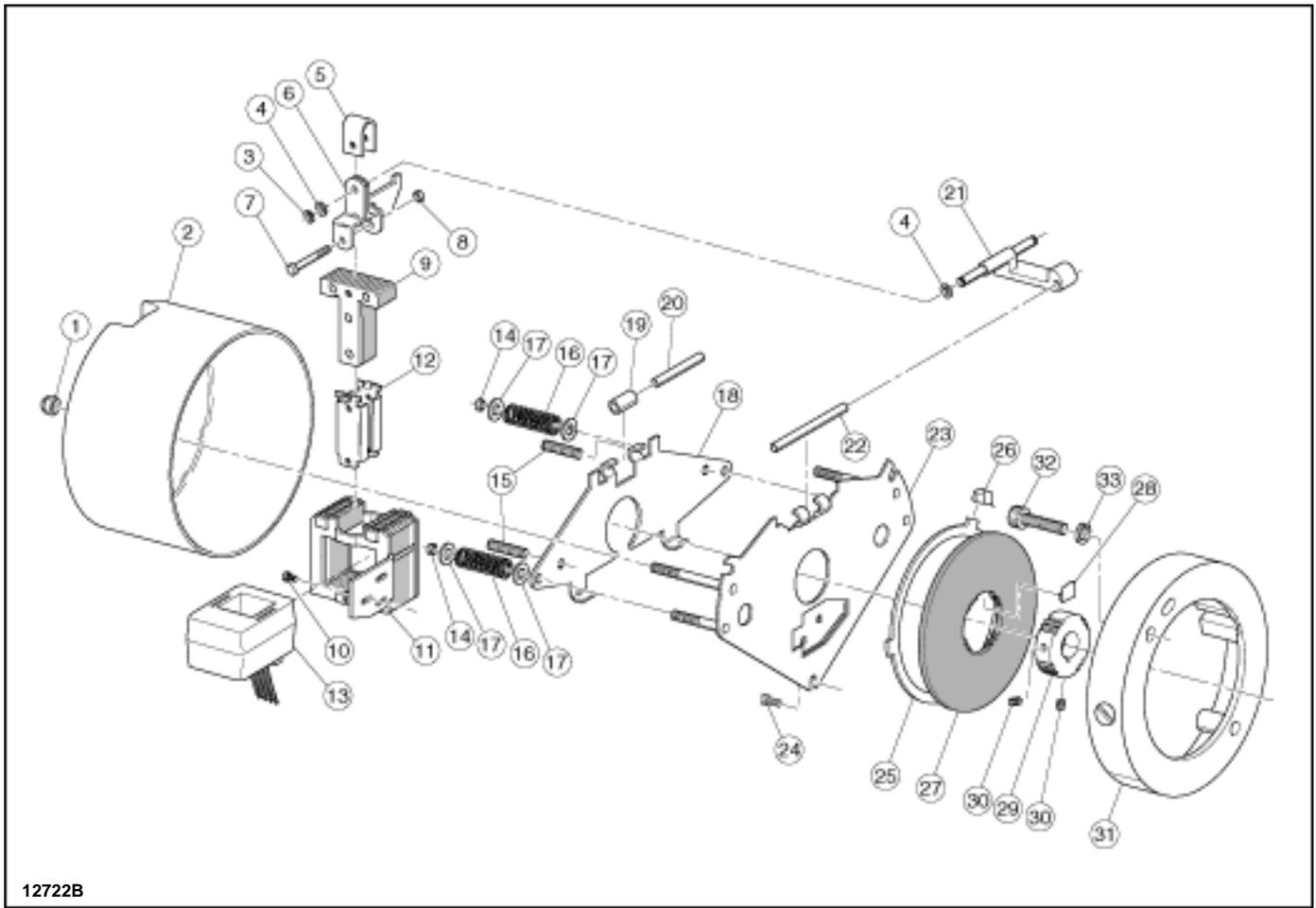


Figure 10-13. Traverse Motor and Gear Box.

Ref. No.	Part Number	Description	Qty. Req'd
1		Traverse Brake - See Figure 10-14.	1
2	LM-1301	Traverse Brake Parallel Key	1
3	LM-1302	Traverse Motor (Specify HP, Phase, Voltage & Frequency)	1
4	LM-1303	Traverse Motor Parallel Key	1
5	LM-1304	Lockwashers - Plated (3/8)	4
6	LM-1305	High Strength Hex Head Bolts - Plated (3/8-16 x 1-1/4 SAE J429 Grade 5)	4
7		Gear Reducer	1
	LM-1306	50 FPM for 10, 15 and 20 Ton	
	LM-1307	50 FPM for 25 and 30 Ton	
	LM-1308	74 FPM for 10 and 15 Ton	
	LM-1309	74 FPM for 20, 25 and 30 Ton	
	LM-1310	92 FPM for 10 Ton	
	LM-1311	92 FPM for 15, 20 and 25 Ton	
	LM-1312	143 FPM for 10 Ton	
	LM-1313	143 FPM for 15 Ton	
	LM-1314	143 FPM for 30 Ton	
8	LM-1315	Nylok Self Locking Nut (1/2-13)	1
9	LM-1316	Bushings	2
10	LM-1317	Hex Head Bolt (1/2-13 x 3-1/2)	1



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Figure 10-14. Traverse Motor Brake.

Ref. No.	Part Number	Description	Qty. Req'd
		Motor Brake Assembly (Includes Ref. Nos. 1 thru 31)	1
	LM-1401	For 1 and 1.5 HP at 200V, 230V and 460V	
	LM-1402	For 1 and 1.5 HP at 575V	
	LM-1403	For 2 and 3 HP at 200V, 230V and 460V	
	LM-1404	For 2 and 3 HP at 575V	
	LM-1405	For 5 HP at 200V, 230V and 460V	
	LM-1406	For 5 HP at 575V	
	LM-1407	Housing Kit (Includes Ref. Nos. 1 and 2)	1
1	LM-1408	Acorn Nuts Only	2
2		Housing	1
3	LM-1409	Retaining Ring	1
4	LM-1410	Spacers	2
5	LM-1411	Plunger Stop	1
	LM-1412	Solenoid Kit (Includes Ref. Nos. 6 thru 11)	1
6		Solenoid Link	1
7		Cap Screw	1
8		Nut	1
9		Plunger	1
10		Mounting Screws	3
11		Frame	1
		Coil Kit (Includes Ref. Nos. 12 thru 13)	1
	LM-1413	For 200V, 230V and 460V	
	LM-1414	For 575V	

Figure 10-14. Traverse Motor Brake. (Continued)

Ref. No.	Part Number	Description	Qty. Req'd
12		Plunger Guide	1
13		Coil	1
14	LM-1415	Torque Adjustment Nuts	2
15	LM-1416	Wear Adjustment Screws	2
16		Pressure Springs	2
	LM-1417	For LM-1401 and LM-1402	
	LM-1418	For All Other Brakes	
17	LM-1419	Spring Washers (On LM-1403 thru LM-1406 only)	4
18	LM-1420	Lever Arm Plate	1
19	LM-1421	Bearing	1
20	LM-1422	Bearing Pin	1
21	LM-1423	Solenoid Lever	1
22	LM-1424	Pivot Pin	1
23	LM-1425	Support Plate	1
24	LM-1426	Mounting Screws	3
		Stationary Disc Kits (Includes Ref. Nos. 25 and 26)	
	LM-1427	For LM-1401 thru LM-1404	1
25		Stationary Disc	1
26		Stationary Disc Separator Springs	3
	LM-1427	For LM-1405 and LM-1406	2
25		Stationary Discs	2
26		Stationary Disc Separator Springs	6
		Friction Disc and Spring Kits (Includes Ref. Nos. 27 and 28 - No Ref. No. 28 for LM-1405 & LM-1406)	
	LM-1428	For LM-1401 thru LM-1404	1
27		Friction Discs	1
28		Stabilizing Springs	2
	LM-1428	For LM-1405 and LM-1406	2
27		Friction Discs	2
	LM-1429	Hub and Set Screw Assembly (Includes Ref Nos. 29 and 30)	1
29		Hub	1
30		Set Screws	2
31	LM-1430	Endplate and Stationary Disc Assembly	1
32	LM-1431	Self-locking Hex Socket Head Cap Screws - High Grade Alloy Steel - Plated (3/8-16 x 1-3/4)	2
33	LM-1432	Hi-Collar Lockwashers - Plated (3/8)	2

**NOTES**

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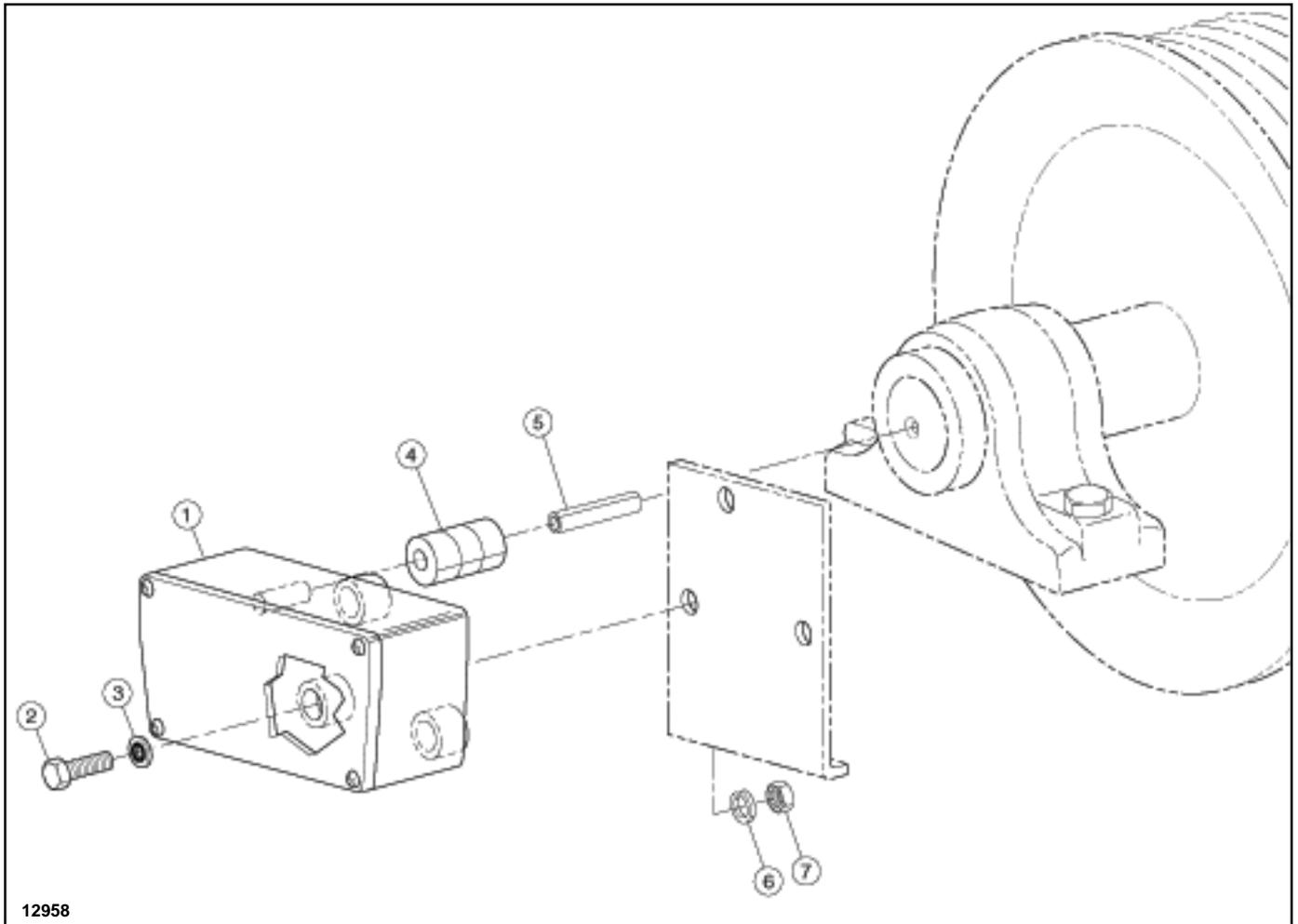
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Figure 10-15. Screw Type Limit Switch.

Ref. No.	Part Number	Description	Qty. Req'd
1	LM-1501	Limit Switch Assembly (Includes Ref. Nos. 2 and 3)	1
2	LM-1502	High Grade Alloy Steel Hex Socket Head Cap Screws - Plated (#10-24 x 3/4)	3
3	LM-1503	Sealing Washers (#10)	3
4	LM-1504	Flex Coupling	1
5	LM-1505	Rollpin (5/16 x 2)	1
6	LM-1506	Lockwashers - Plated (#10)	3
7	LM-1507	Hex Nut - Plated (#10-24)	3

For switch element replacement order LM-1508.

**NOTES**

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## **Recommended Spare Parts for Your SHAW-BOX Trolley**

Certain parts of your trolley will, in time, require replacement under normal wear conditions. It is suggested that the following parts be purchased for your hoist as spares for future use.

Brake discs	Motor couplings
Hoist limit switches	Load hooks, nuts, thrust bearings and latches
Contactors	Hoisting ropes
Timing relays	Load brake discs
	Hoist brake rectifier
	Trolley brake rectifier
	Fuses

NOTE: When ordering parts always furnish Trolley Serial Number; Rated Load; Motor Horsepowers, Voltage, Phase, Frequency and Size 4 designation.

Parts of your trolley are available from your local authorized SHAW-BOX repair station. For the location of your nearest repair station, write:

### **In USA**

LIFT-TECH INTERNATIONAL INC  
CRANE & HOIST OPERATIONS  
P O BOX 769  
MUSKEGON MICHIGAN 49443-0769

### **In Canada**

LIFT-TECH INTERNATIONAL  
CRANES & HOIST INC  
53-D COWANSVIEW ROAD  
CAMBRIDGE ONTARIO N1R 7L2

or phone:

**616-733-0821**

**519-621-3201**

# **WARRANTY**

## **WARRANTY AND LIMITATION OF REMEDY AND LIABILITY**

A. Seller warrants that its products and parts, when shipped, and its work (including installation, construction and start-up), when performed, will meet applicable specifications, will be of good quality and will be free from defects in material and workmanship. All claims for defective products or parts under this warranty must be made in writing immediately upon discovery and, in any event, within one (1) year from shipment of the applicable item unless Seller specifically assumes installation, construction or start-up responsibility. All claims for defective products or parts when Seller specifically assumes installation, construction or start-up responsibility, and all claims for defective work must be made in writing immediately upon discovery and, in any event, within one (1) year from completion of the applicable work by Seller, provided; however, all claims for defective products and parts must be made in writing no later than eighteen (18) months after shipment. Defective items must be held for Seller's inspection and returned to the original f.o.b. point upon request. THE FOREGOING IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES WHATSOEVER, EXPRESS, IMPLIED AND STATUTORY, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS.

B. Upon Buyer's submission of a claim as provided above and its substantiation, Seller shall at its option either (i) repair or replace its product, part or work at either the original f.o.b. point of delivery or at Seller's authorized service station nearest Buyer or (ii) refund an equitable portion of the purchase price.

C. This warranty is contingent upon Buyer's proper maintenance and care of Seller's products, and does not extend to fair wear and tear. Seller reserves the right to void warranty in event of Buyer's use of inappropriate materials in the course of repair or maintenance, or if Seller's products have been dismantled prior to submission to Seller for warranty inspection.

D. The foregoing is Seller's only obligation and Buyer's exclusive remedy for breach of warranty, and is Buyer's exclusive remedy hereunder by way of breach of contract, tort, strict liability or otherwise. In no event shall Buyer be entitled to or Seller liable for incidental or consequential damages. Any action for breach of this agreement must be commenced within one (1) year after the cause of action has accrued.