

OPERATING & MAINTENANCE INSTRUCTIONS WITH PARTS LIST

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KELC

Electric Hoists

For Capacities:

1/4, 1/2, 1, 2, & 3 Ton



IMPORTANT - CAUTION

To safeguard against the possibility of personal injury or property damage, follow the recommendations and instructions of this manual. This manual contains important information for the correct installation, operation and maintenance of this equipment. All persons involved in the installation, operation and maintenance of this equipment should be thoroughly familiar with the contents of this manual. Keep this manual for reference and further use.

▲WARNING

To prevent personal injury, do not use the equipment shown in this manual to lift, support or otherwise transport people, or to suspend unattended loads over people.

FOREWORD

This book contains important information to help you install, operate, maintain and service your new Electric Hoist. We recommend that you study its content thoroughly before putting your hoist into use. Then, through proper installation, application of correct operating procedures, and by practicing the recommended maintenance suggestions you will be assured maximum lifting service from the hoist.

Complete inspection, maintenance and overhaul service is available for Yale Electric Hoists at Authorized Repair Stations. All are staffed by qualified factory-trained service men; have authorized testing equipment; and stock a complete inventory of factory approved Yale replacement parts.

Complete replacement parts information is given in Section IX. It will likely be a long time before parts information is needed, therefore, after you completely familiarize yourself with operation and preventive maintenance procedures, we suggest that this instruction and parts manual be carefully filed for future reference.

Notice: Use only factory approved Yale replacement parts, available from Authorized Repair Stations or Yale Hoist Distributors.

The "Accident Prevention Manual for Industrial Operations" (8th Edition) by the National Safety Council states:

"Employees who work near cranes or assist in hooking on or arranging loads should be instructed to keep out from under loads. Supervisors should watch closely to see that this rule is strictly followed.

From a safety standpoint, one factor is paramount: conduct all lifting operations in such a manner that if there were an equipment failure, no personnel would be injured. This means keep out from under raised loads!"

THE INFORMATION CONTAINED IN THIS MANUAL IS FOR INFORMATIONAL PURPOSES ONLY AND YALE HOISTS DOES NOT WARRANT OR OTHERWISE GUARANTEE (IMPLIEDLY OR EXPRESSLY) ANYTHING OTHER THAN THE COMPONENTS THAT YALE MANUFACTURES AND ASSUMES NO LEGAL RESPONSIBILITY (INCLUDING, BUT NOT LIMITED TO CONSEQUENTIAL DAMAGES) FOR INFORMATION CONTAINED IN THIS MANUAL.

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Notice: Information contained in this book is subject to change without notice.

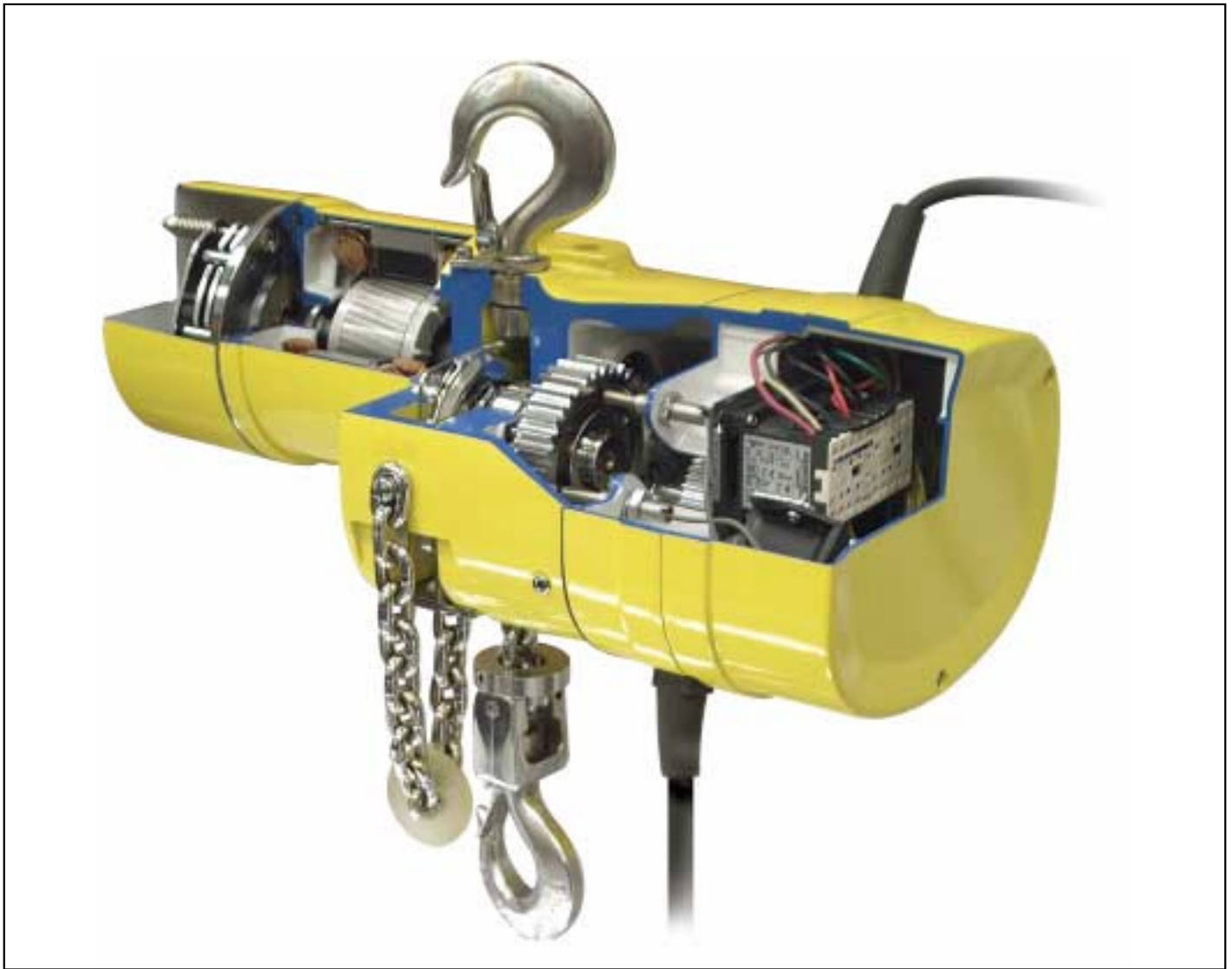


Figure 1-1. Cutaway View Of Typical Yale Electric Hoist

SECTION I - GENERAL DESCRIPTION

1-1. GENERAL. **Yale** Portable Electric Hoists are precision built chain type hoists ranging in six rated load sizes from 1/4 ton through 3 tons with various lifting speeds and electrical power supplies. In addition to the capacities, there are model variations with hook or lug type suspension, and single or two speed. In addition to standard models, there are four rated load sizes of Yale Electric Hoists ranging from 1/4 ton through 2 tons suitable for plating hoist service with various lifting speeds and electrical power.

1-2. HOIST SERVICE CLASSIFICATION

a. **Yale** electric hoists at the time of manufacture comply with our interpretation of applicable sections of ANSI B30.16 "Overhead Hoists", National Electric Code ANSI/ NFPA 70 and Occupational Safety and Health Act, 1992.

b. OSHA places the burden of compliance for hoist installations on the user. The user must install the equipment in accordance with the National Electric Code ANSI/NFPA 70 as well as other federal, state and local regulations which apply to the installation and application in your particular area.

⚠ WARNING

Equipment covered herein is not designed or suitable as a power source for lifting or lowering persons. Do not use as an elevator.

c. These hoists meet ANSI/ASME HST-1M "Performance Standard for Electric Chain Hoists" hoist duty class ratings as outlined in the sales bulletin.

1-3. BASIC CONSTRUCTION. All sizes and models of these **Yale** Electric Hoists are of the same basic designs, having many common and interchangeable parts. They consist primarily of an aluminum alloy frame and gear case cover which houses the gear train. An electric driving motor and external motor brake are mounted on the rear of the frame. Electrical control components are mounted on front of the gear case cover and encased by aluminum alloy end cover. An upper hook or lug bracket for suspending the hoist is attached to the top of the frame. A high strength low alloy coil load chain with lower block assembly is employed to raise and lower loads. Hoist operation is controlled by a pendant push button station.

1-4. DIFFERENCES BETWEEN MODELS AND SIZES. The main differences between hoist models are in the service classification, type of load chain and the suspension employed. These are described in paragraphs (a) through (d), below. The differences between sizes of hoists are in the number of gear reductions used and the reeving of the load chain. Two-reduction gearing is used for 1/4 through 1/2 ton rated load hoists; three-reduction gearing for 1, 2 and 3 ton rated hoists. On 1/4 through 1 ton rated load hoists, the load chain is single reeved (one part of chain); on 2 ton rated loads, the chain is double reeved (two parts of chain); on three ton rated loads, the chain is triple reeved (three parts of chain).

a. Coil type chain is full-flexing electric welded link chain. It is especially designed for use in **Yale** Electric Hoists and only factory approved chain of the correct size, pitch, hardness, and strength can be used with these hoists.

b. Suspension differences include a conventional hook type mounting and a lug type mounting. Hook suspension allows portability permitting hoist to be easily moved from job to job. Lug suspension permits hoist to be rigidly mounted to overhead structure or attached to **Yale** Rigid Mount Trolleys, affording unusual headroom advantage.

c. Some hoists are adaptations of standard model hoists to permit use in some mildly corrosive atmospheres, high ambient temperatures and high duty cycle operation. They are available in either hook or lug suspension. Construction variations from standard models are as follows:

- (1) Load chain is zinc plated for corrosion resistance.
- (2) All exposed aluminum parts are prime painted with corrosion resistant paint.
- (3) Aluminum castings are specially treated.

1-5. OVERLOAD CLUTCH. **Yale** Electric Hoists are equipped with an overload clutch that is designed to help guard against excessive overloads. It is a cone-friction clutch that connects the first reduction gear to the clutch pinion shaft. A belleville disc spring provides clutch pressure between the gear and its cone shaped gear center. An excessive overload causes the gear to rotate without turning the gear center and pinion shaft. See paragraph 3-5 for operation.

⚠ WARNING

THE OVERLOAD CLUTCH IS A PROTECTIVE DEVICE THAT WILL PERMIT OPERATION OF YOUR HOIST WITHIN ITS RATED LOAD AND WILL PREVENT LIFTING OF EXCESSIVE OVERLOADS WHICH CAN CAUSE PERMANENT DEFORMATION OR WEAKENING OF A PROPERLY MAINTAINED HOIST AND/OR ITS SUSPENSION.

SECTION II - INSTALLATION

2-1. GENERAL. **Yale** Electric Hoists are completely lubricated and load tested under their own power before being shipped from the factory. To place hoist in service, attach to suitable overhead suspension (par. 2-2) in area to be used; make pre-installation check (par. 2-3); and connect to the proper power supply (par 2-4).

2-2. INSTALLATION.

NOTICE

Lubricate load chain before operating hoist. See paragraph 4.3

a. On hook suspended hoists, select a suitable overhead support in area hoist is to be used (one capable of holding weight of hoist and its rated load) and hang up hoist. Be certain upper hook is firmly seated in center of hook saddle. Upper hook is equipped with a spring type hook latch; it may be necessary to remove latch to attach hook to support. Replace latch after hoist is installed.

b. On lug suspended hoists, select a suitable overhead support in area hoist is to be used (one capable of holding weight of hoist and its rated load). Mount hoist using through bolts, of appropriate size, to fit mounting holes in suspension lug at top of hoist frame. (See table below.) The structure used to suspend hoist must be of sufficient strength to withstand reasonable forces to which hoist and support may be subjected. Hoist must be aligned with load to avoid side pulls.

c. On lug suspended hoists, the suspension lug is factory oriented to cross mount the hoist. This is the recommended orientation. To rotate the lug 90° for parallel mounting, follow instructions below:

(1) On 1/4 through 1 ton hoists, remove the two screws securing the anti-rotation bracket and remove the bracket. Rotate the suspension lug in 90° increments. Reinstall the anti-rotation bracket and secure with two screws and lock washers.

(2) On 2 ton hoists, remove hex socket head screw in lower lock plate. Remove lower lock plate. Rotate suspension lug to selected position and replace lock plate and hex socket head screw.

(3) On 3 ton hoists, the hanger bracket must first be removed from the hoist to provide access to suspension nut per Section VII, par. 7-2. a. (4) and figures 7-2 and 7-3. To remove lug bolt, follow instructions in Section VII, par. 7-3. b. (3). With bolt removed lift lug from hanger and reposition as desired. The lug is located and prevented from turning by integral lugs on adjacent surfaces of the lug and the hanger. Reinstall suspension bolt, spherical washers and nut. Align hole in nut and suspension bolt. Reassemble hanger bracket to hoist.

d. On rigid mount trolley suspended hoists, the trolley side plates must be properly spaced so trolley will fit I-beam on which hoist will operate. Adjustment for various I-beam sizes is accomplished by rearrangement of spacer washers on through bolts which connect trolley side plates to suspension lug on hoist. Refer to instruction sheet furnished with Yale Rigid Mount Trolleys for complete instructions.

SUSPENSION LUG BOLT SIZES AND SPACING

Hoist Rated Load (tons)	Bolt Diameter (in)	Distance Between Holes (in)
1/4, 1/2 & 1	5/8	3-1/8
2	1	5
3	1-1/4	6

2-3. PRE-INSTALLATION CHECK.

Check Oil Level (Fig. 4-1). The gear case has been filled with oil, to the proper level at the factory. However, the oil level should be checked before hoist is operated. Remove pipe plug from oil filler on side of hoist frame. Replace with supplied oil hole cover. Check oil level by removing oil level plug (side of frame). Observe if oil level is even with bottom of tapped hole. If it is not, add oil, as specified in paragraph 4-2c. Also check load chain. Be sure it is properly lubricated. See para. 4-3.

Check Limit Stops:

Paddle limit equipped. Make sure the actuator on the tail chain side is securely pinned to the proper link. (See chart on page 30). On single part hoists, make sure steel actuator is pinned to the first chain link above the lower block. Multiple part reeved hoists do not have an actuator on the lower block side.

Electronic limit switch equipped. Make sure the stop on the tail chain side is securely fastened to the proper link. (See chart on page 30). There is no stop on the lower block side.

2-4. CONNECTING HOIST TO ELECTRICAL SERVICE.

a. All hoists are equipped with a flexible power cable extending from the hoist. A grounding type male plug or permanent connection in an outlet box may be used for connecting hoist to power supply. See table (fig. 2-1) for branch circuit conductor sizes.

H.P.	Power Supply	AWG Wire Size					
		#16	#14	#12	#10	#8	#6
1/4	115-1-60	80	130	210	330		
	230-1-60	230	330	835			
	200, 230-3-60	465	740	1180			
	460, 575-3-60	1440	2390				
1/2	115-1-60	45	75	120	190	310	490
	230-1-60	195	305	490	775	1235	
	200, 230-3-60	280	450	715	1135		
	460, 575-3-60	860	1440				
1	115-1-60	*	45	75	120	190	300
	230-1-60	120	190	300	475	720	
	200, 230-3-60	180	290	460	730		
	460, 575-3-60	560	900				
2½	200, 230-3-60	60	100	150	250		
	460, 575-3-60	260	420				

*Do not use

Figure 2-1. Branch Circuit Conductor Size. Maximum length in feet for wire size based on horsepower and power supply. Wire size for entire length of branch circuit and permanent wiring to main feeder. Power supply measured at hoist, while running and with normal load, must not vary more than $\pm 5\%$ of voltage on motor nameplate.

b. Follow local & National Electrical Codes when providing electrical service to hoist. Connect power wires in accordance with appropriate wiring diagram. Power supply must be the same voltage, frequency and phase as specified on the hoist nameplate.

⚠ WARNING

The green wire provided in the power supply cable is a grounding wire and must be connected to a proper ground. (Follow local code requirements and/or National Electrical Code Article 250).

c. Dual voltage hoists with reconnectable 230/460 volts, 3 phase, 60 hertz are (unless otherwise specified on customer's order) shipped from factory pre-connected for operation on 460 volts. If hoist is to be operated on 230 volts convert wiring by changing connections on terminal board. With hoist disconnected from power source, remove electrical compartment cover and reconnect terminal board leads. Refer to Wiring Diagram.

d. Dual voltage hoists with reconnectable 115/230 volts, 1 phase, 60 hertz are (unless otherwise specified on customer's order) shipped from factory pre-connected for operation on 230 volts. If hoists are to be operated on 115 volts convert wiring by changing connections on terminal board. With hoist disconnected from power source, remove electrical compartment cover and reconnect terminal board leads. Also refer to Wiring Diagram.

⚠ WARNING

On electrically operated hoists it is possible to have "Reverse Phasing" causing the lower block to raise when the down button is depressed. When this condition exists, the block operated limit switches will not function properly. Serious damage to the hoist can occur with resulting hazard to operator and load. Hoists must be properly phased each time they are installed or moved to a new power source, or when service is performed on mainline (power source).

e. To properly phase the hoist follow these steps:

- (1) Temporarily connect hoist to power source.
- (2) Operate "↑" button briefly to determine direction of travel.
- (3) If hook raises, phase is correct and temporary connections should be made permanent.
- (4) **IF HOOK LOWERS, HOIST IS "REVERSE PHASED" AND MUST BE CORRECTED BY INTERCHANGING ANY TWO LEADS AT POWER SOURCE CONNECTION. DO NOT CHANGE INTERNAL WIRING OF HOIST.**

f. For connecting hoist to a motor driven trolley, refer to instructions furnished in trolley manual.

2-5. ELECTRONIC ADJUSTABLE LIMIT SWITCH (if equipped).

The limit switch arrangement consists of two sensors which protrude into the gear case at the sprocket gear, and a control module. The control module has two buttons for programming set points, an UP and DOWN green LED, and a red ALERT LED.

The electronic adjustable limit switch is factory set to the extreme upper and lower limits to allow for testing. The limits may be left as they are, or can be reset according to the following procedure:

When power is first applied to the hoist, one or both of the green LED's should be on, and the red ALERT light should be off. The hoist will operate between the points set at the factory. If red ALERT light is on and both green lights are off, the hoist will not operate, the limits need to be set.

To set limits:

(1) Press both SET buttons simultaneously. Both green LED's should come on, and the red ALERT LED should flash. Hoist can now be operated through full range of lift.

(2) Raise or lower hook to desired set point. It does not matter whether upper or lower limit is set first. Press the set button that corresponds to UP if the upper limit is to be set first, or DOWN if the lower limit is to be set first. The corresponding green LED should go out.

(3) Move hook to desired upper limit if the lower limit was previously set, or to the lower limit if the upper limit was previously set. The LED corresponding to the limit just set will come back on, indicating the hoist is no longer at that limit. Press the set button that corresponds to UP if the upper limit is being set, or DOWN if the lower limit is being set. The corresponding green LED should go out. The red ALERT light should also go out.

(4) The upper and lower limits are now set. Operate the hoist to confirm the settings are at the desired limits.

Tips for setting limits:

For the initial setting, both limits must be set. If one setting is more critical, that one should be set first. For example, if the position at the lower limit is more important than the position at the upper limit, the lower limit should be set first.

Once the upper and lower limits are set, they can be changed without having to do both *if the new limit is within the previously set limits*. For example, if the lower limit is set too low, stop the hook at the desired position and press the DOWN set button. The hook will now stop at the new limit.

When positioning the hook to set a limit, stop the hook in the same manner as it is likely to be stopped during normal operation. If it is likely that the limit will be reached when the hoist is traveling at full speed, then position the hook by pressing the pushbutton and releasing when the hook is at the desired position, without jogs. If jogs are used to position the hook for setting the limit, the hook may drift past the limit if tripped at full speed.

Note: The limit switch has a setting increment of 1/4 revolution of the sprocket gear. This applies when setting the limits. The hoist may stop up to a maximum of 1-1/2 inches before the desired position for 5/16 chain, or 1-1/4 inches for 1/4" chain. Once set, the hoist will repeatedly stop at the same location.

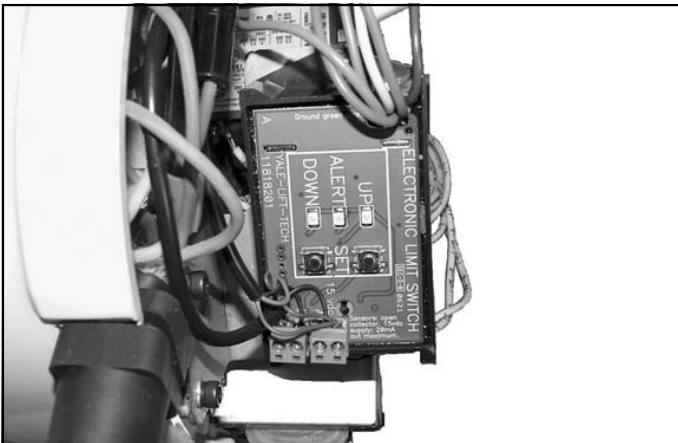


Figure 2-2.

SECTION III - OPERATION

3-1. GENERAL. Operation of Yale Electric Hoists are controlled by a push button station suspended from the hoist electrical compartment. The station has a built-in mechanical interlock to prevent depressing both buttons simultaneously.

3-2. OPERATING HOIST.

a. Depress push button marked "↑" to raise load.

b. Depress push button marked "↓" to lower loads.

c. Jogging the push buttons will give "hairline" load movement. The quickness of the depressing motion will determine the amount of movement. Excessive use of this "jogging" feature will cause premature burning of contact points, motor overheating, and rapid motor brake wear.

3-3. PULLING AND ROTATING HOIST AND LOAD.

a. The push button station conductor cable has a built-in strain cable suitable for pulling trolley suspended hoists when not loaded. Do not use for pulling bridge cranes. Push on load or load chain or use a hand geared or motor driven type trolley to traverse loaded hoists.

b. To rotate hoist and load, push on one corner of load. The lower hook will pivot through 360 degrees to permit load to be swung to the desired position. The upper hook (hook suspension models) is also designed to rotate so that side pulls will swing hoist to face load, thus reducing side thrust.

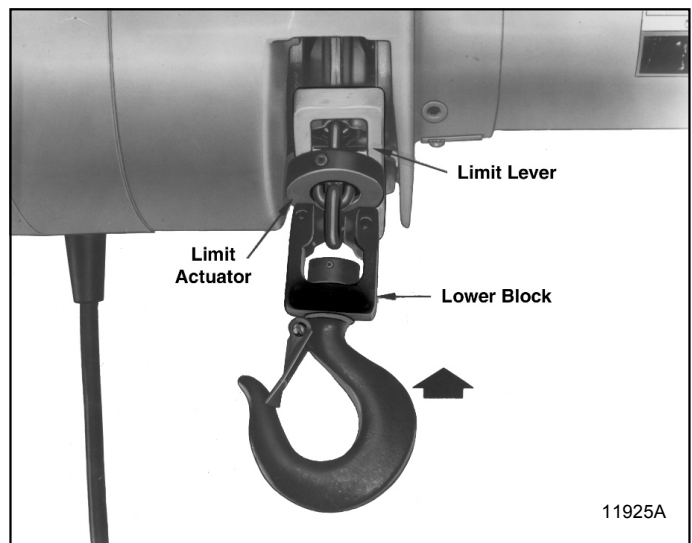


Figure 3-1a. Limit Lever Being Tripped By Actuator Above Lower Block on Single Line Hoist (paddle limit)

3-4 UPPER AND LOWER LIMITS. Yale Electric Hoists are equipped with either a paddle type limit switch, operated by the lower block in the up direction and an actuator attached to the chain in the lowering direction, or an electronic limit switch which relies on proximity switches mounted in the gear case cover. Refer to the appropriate section below:

3-4a. UPPER AND LOWER LIMIT STOPS (paddle limit). A lower block and chain operated limit stop is provided to guard against overtravel of load in either raising or lowering direction, which can cause damage to hoist. When highest position is reached a limit actuator on the load chain, above the lower

block, trips the limit lever (fig. 3-1a). When lowest position is reached, a limit actuator on the tail end of load chain trips the limit lever (fig. 3-1b). The limit lever is connected to a limit switch that automatically stops the hoist motor. This is intended as a safety device and is not to be used on a routine basis to stop travel of lower block or shut off hoist.

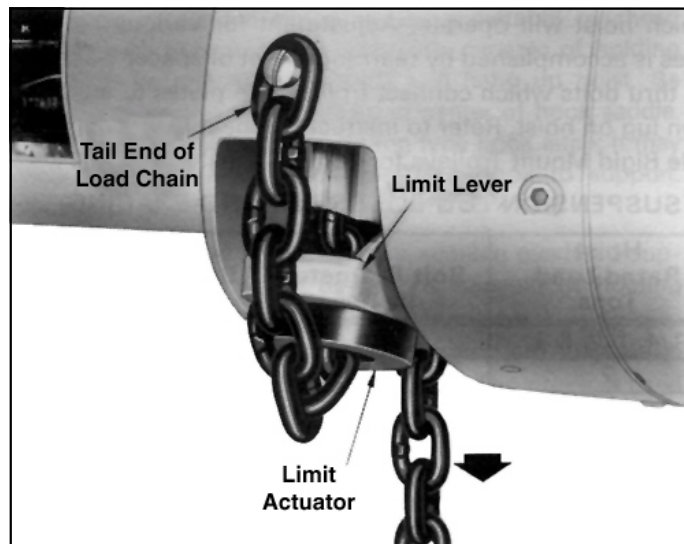


Figure 3-1b. Limit Lever Being Tripped By Actuator on Tail End of a Load Chain (paddle limit)

3-4b. UPPER AND LOWER LIMIT STOPS (electronic limit switch). Upper and lower limit stops are provided to guard against overtravel of load in either raising or lowering direction, which can cause damage to hoist. When highest position is reached, the lower block will cause the overload clutch to slip (fig. 3-1c). When the lowest block position is reached, the tail chain stop will cause the overload clutch to slip (fig. 3-1d). Limit stops are intended as safety devices and are not to be used on a routine basis to stop block travel. Lowering full rated capacity load at full rated speed into the limit stop is an especially severe condition and must be avoided at all times.



Figure 3-1c. Lower Block Contacting Stop Shoe at Upper Limit of Travel (electronic limit switch)



Figure 3-1d. Chain Stop Contacting Stop Shoe Tail Chain End of Load Chain (electronic limit switch)

3-5. OVERLOAD CLUTCH OPERATION. The overload clutch is factory preset at assembly so that the hoist will lift its full rated load but will refuse to lift overloads within a range of 150 percent rated load to 200 percent rated load. If the load to be lifted exceeds the clutch factory setting, the motor will continue to run and will rotate the clutch gear without lifting the load. Whenever this occurs, immediately release the “↑” push button to prevent overheating of the clutch friction surfaces and motor, and reduce the load to rated hoist capacity. Should it be impractical to reduce the load, replace the hoist with one of suitable rated capacity.

NOTE: Always know load to be lifted. **Yale•Lift-Tech** does not recommend lifting loads greater than the rated load of your hoist.

3-6. OPERATING PRECAUTIONS.

⚠ WARNING

Equipment covered herein is not designed or suitable as a power source for lifting or lowering persons. Do not use as an elevator.

Safe operation of an overhead hoist is the operator's responsibility. Following 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 read ANSI B30.16 Safety Standard for Overhead Hoists and the Operation, Service and Parts Manual
- b. DO be familiar with hoist operating controls, procedures and warnings.
- c. DO make sure hook travel is in the same direction as shown on controls.
- d. DO make sure hoist limit switches function properly.
- e. DO maintain firm footing when operating hoist.
- f. DO make sure that load slings or other approved single attachments are properly sized and seated in the hook saddle.
- g. DO make sure that the hook latch, is closed and not supporting any part of the load.
- h. DO make sure that load is free to move and will clear all obstructions.
- i. DO take up slack carefully, check load balance, lift a few inches and check load holding action before continuing.
- j. DO avoid swinging of load or load hook.
- k. DO make sure that all persons stay clear of the suspended load.
- l. DO warn personnel of an approaching load.
- m. DO protect load chain from weld splatter or other damaging contaminants.
- n. DO promptly report any malfunction, unusual performance, or damage of the hoist.
- o. DO inspect hoist regularly, replace damaged or worn parts, and keep appropriate records of maintenance.
- p. DO use the hoist manufacturer's recommended parts when repairing a hoist.
- q. DO use hook latches wherever possible.
- r. DO apply lubricant to load chain as recommended. DO NOT lift more than rated load.
- s. DO NOT use the hoist load limiting device to measure the load.
- t. DO NOT use damaged hoist or hoist that is not working correctly.
- u. DO NOT use the hoist with twisted, kinked, damaged or worn chain.
- v. DO NOT lift a load unless chain is properly seated in chain wheel(s) or sprocket(s).
- w. DO NOT use load chain as a sling or wrap chain around the load.
- x. DO NOT lift a load if any binding prevents equal loading on all supporting chains.
- y. DO NOT apply the load to the tip of the hook.
- z. DO NOT operate unless load is centered under hoist.
- aa. DO NOT allow your attention to be diverted from operating the hoist.
- ab. DO NOT operate the hoist beyond limits of load chain travel.
- ac. DO NOT use limit switches as routine operating stops unless recommended. They are emergency devices only.
- ad. DO NOT use hoist to lift, support or transport people.
- ae. DO NOT lift loads over people.
- af. DO NOT leave a suspended load unattended unless specific precautions have been taken.
- ag. DO NOT allow sharp contact between two hoists or between hoist and obstructions.
- ah. DO NOT allow the chain or hook to be used as a ground for welding.
- ai. DO NOT allow the chain or hook to be touched by a live welding electrode.
- aj. DO NOT remove or obscure the warnings on the hoist.
- ak. DO NOT adjust or repair a hoist unless qualified to perform hoist maintenance.
- al. DO NOT attempt to lengthen the load chain or repair damaged load chain.
- am. DO NOT allow personnel not physically fit or properly qualified to operate the hoist.
- an. DO NOT operate hoist unless upper and lower limit switch stops are operating properly.
- ao. DO always be sure there is no twist in coil load chain. On 2 & 3 ton coil chain hoists, check to see that lower block is not capsized between strands of chain.
- ap. DO avoid operating hoist when hook is not centered under hoist. Be sure that hoist trolley or other support mechanism is correctly positioned for handling the load before lifting.
- aq. DO operate hoist within recommended duty cycle and do not "jog" unnecessarily.
- ar. DO conduct regular visual inspections for signs of damage or wear.
- as. DO NOT operate hoist with hooks that have opened up. See Figures 5-5 and 5-6.
- at. DO provide supporting structure or anchoring means that has a load rating at least equal to that of the hoist.
- au. DO NOT use hoists in locations that will not allow operator movement to be free of the load.
- av. DO when starting to lift or pull, move the load a few inches at which time the hoist should be checked for proper load holding action. The operation shall be continued only after the operator is assured that the hoist is operating properly.
- aw. DO NOT leave a loaded hoist unattended at the end of a work shift or for extended periods during the work shift. Where operations are such that this condition cannot be avoided the operator must be assured that the condition does not create a hazard to personnel or property.
- ax. DO use common sense and best judgement whenever operating a hoist. Observe American National Standard Safety standard, ANSI B30.16, latest issue.

SECTION IV - LUBRICATION

4-1. GENERAL. The lubrication services outlined in paragraphs 4-2 through 4-5 should be performed at regular intervals to maintain top hoist performance and insure long life. The frequency for lubrication services will depend on the type of hoisting service that hoist is subjected to and should coincide with periodic preventive maintenance inspection. See Section V-Maintenance.

4-2. CHANGE GEAR CASE OIL (Fig. 4-1).

- Remove drain plug from bottom of hoist frame and drain oil from gear case. Replace plug.
- Remove oil level plug from side of hoist.
- Refill gearcase through oil filler to proper level (bottom of oil level plug hole) using Automatic Transmission Fluid - DEXRON Type. This is an all-weather oil available from all major oil companies. 1-1/2 pints of oil are required.
- Reinstall oil level plug and breather.

4-3. LUBRICATE LOAD CHAIN. A small amount of lubricant will greatly increase load chain life, therefore, chain should not be allowed to run without lubricant. Chain should be cleaned and lubricated as directed in paragraph a below. User should set up a regular schedule for chain lubrication after observing operating conditions for a few days. Use Bar and Chain Oil (LUBRIPLATE or equal) on load chain.

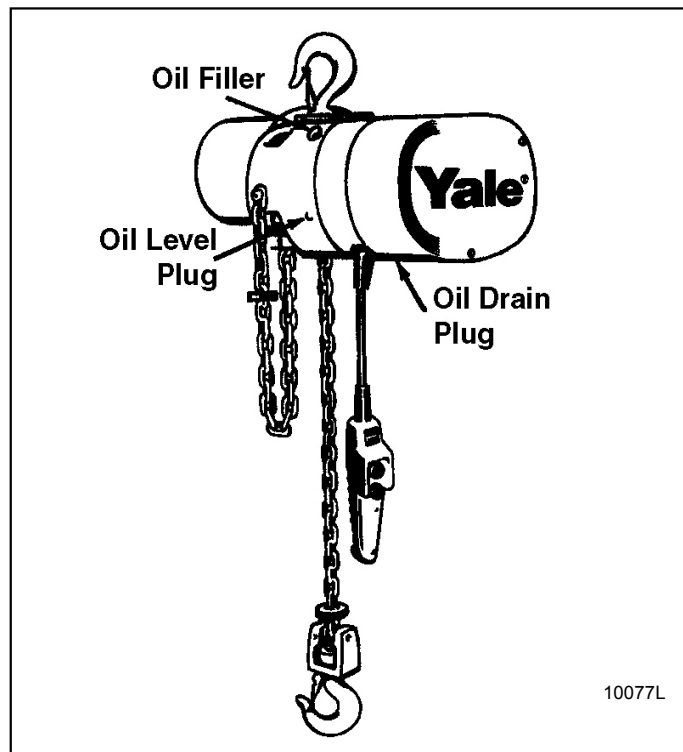


Figure 4-1. Location of Oil Filler and Plugs

a. Coil Chain. Under ordinary conditions only weekly attention will be necessary. Under hot and dirty conditions it may be necessary to clean chain at least once a day and lubricate it several times between cleanings. Thoroughly clean chain with an oil solvent and re-lubricate by coating it lightly with oil. Make sure that lubricant coats wear surfaces between links. Zinc plated load chain should be cleaned and lubricated daily.

4-4. LUBRICATE UPPER HOOK AND LOWER BLOCK ASSEMBLY.

- Apply a few drops of Bar and Chain Oil on shank of upper hook where it enters frame.
- Apply a few drops of Bar and Chain Oil on shank of lower hook where it enters lower block. Hook rotation bearing may be removed for cleaning and re-lubricating if necessary. See section 7-5.
- On lower block assemblies of 2 and 3 ton capacity hoists, also apply heavy duty lithium soap grease with EP additives through pressure fitting in end of sprocket pin to lubricate bearing in chain sprocket.
- On 3 ton model lubricate sprocket in hanger bracket with a few drops of Bar and Chain Oil in hole provided in center of sprocket hub.

4-5. LUBRICATE LIMIT LEVER CONTROL SHAFT AND GEARS.

Apply a few drops of Bar and Chain Oil on limit lever shaft at bearing points.

⚠ WARNING

Before performing any internal work on hoist, be certain power is shut off. Lock main service switch in the open position.

SECTION V - MAINTENANCE

5-1. GENERAL. Preventive maintenance services required on Yale Electric Hoists are for the most part, simple periodic inspection procedures to determine condition of hoist components. Below are suggested inspection procedures, based on daily average hoist usage.

5-2. THIRTY-DAY INSPECTION. Hoist may be left suspended.

a. Inspect Load Chain.

(1) Operate hoist under load and observe operation of chain over sprocket in both directions of chain travel. Chain should feed smoothly into and away from the sprocket. If chain binds, jumps or is noisy, first see that it is clean and properly lubricated. If trouble persists, inspect chain as outlined below.

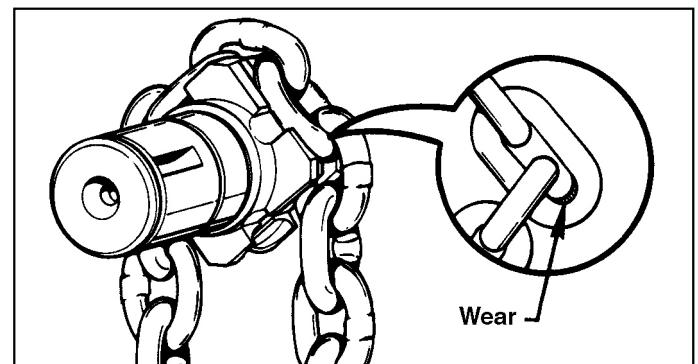


Figure 5-1. Check Chain Wear at Bearing Surfaces Between Links

(2) **Coil Type Load Chain.** Clean chain for inspection. Examine visually for gouges, nicks, weld spatter, corrosion or distorted links. Slacken chain and check bearing surfaces between links

for wear, fig. 5-1. Greatest wear will often occur at sprocket at high or low point of lift, particularly when hoist is subjected to repetitive lifting cycles. Case hardness of chain is about .015" deep. Chain must be replaced before the case is worn through. Also check chain for elongation using a vernier caliper (fig. 5-2). Select an unworn, unstretched section of chain (usually at slack or tail end) and measure and record the length over the number of chain links (pitches) indicated in figure 5-2. Measure and record the same length of a worn section in the load side of the chain. Obtain the amount of wear by subtracting the measurement of the unworn section from the measurement of the worn section. If the result (amount of wear) is greater than the amount specified in the **"ALLOWABLE CHAIN WEAR"** table, the chain has elongated beyond the maximum allowable length and must be replaced. Chain with excessively pitted, corroded, nicked, gouged, twisted or worn links should be replaced using only factory approved chain. Never weld or attempt to repair coil chain.

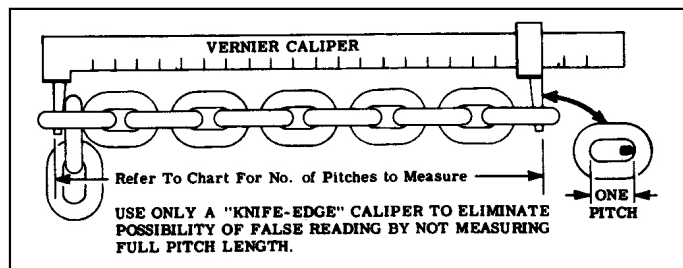


Figure 5-2. Check Coil Chain Using Vernier Caliper

ALLOWABLE CHAIN WEAR - ELONGATION

Hoist Rated Load (tons)	Chain Size (wire dia.)	No. of Pitches to Measure	Maximum Wear Limit
1/4 & 1/2	1/4"	13	.145"
1 thru 3	5/16"	11	.142"

⚠ WARNING

Do not assume that load chain is safe because it measures below replacement points given herein. Other factors, such as those mentioned in visual checks above, may render chain unsafe or ready for replacement long before elongation replacement is necessary.

⚠ WARNING

To avoid serious personal injury from a dropped load caused by chain breakage, when replacing coil load chain, use only factory approved chain conforming to Yale hoist specifications for material, hardness, strength and link dimensions. Chain not conforming to factory Specifications may be dangerous as it will not fit in the load sprocket and chain guide correctly, causing serious internal damage to hoist and it will wear prematurely, deform and eventually break.

(3) Removing and Replacing Coil Load Chain.

(a) Replacement Coil load chain is installed by attaching it

to tail end of old chain, after disconnecting old chain from side of hoist frame and removing limit actuator. New chain is then run into hoist as old chain is run out. Use open "C" links, figures 5-3 and 5-4, for attaching chains. Links must be identical in size to hoist chain - 1/4" wire size with .745" pitch length for 1/4 through 1/2 ton models, 5/16" wire size with .858" pitch for 1 through 3 ton models. Be certain that all welds on links of replacement chain face away from center of load sprocket.

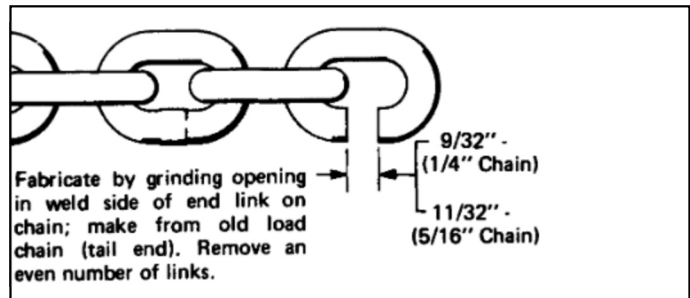


Figure 5-3. Open "C" Link for Removing and Installing Coil Load Chain



Figure 5-4. Installing Coil Load Chain Using Two "C" Links (1/4, 1/2 & 1 ton hoists)

(b) Remove lower block assembly and actuator from old chain and attach them to replacement chain at end which was just run through hoist. Install limit actuator (as noted below) on other end of chain and anchor chain to side of hoist frame.

NOTICE

Use one or two "C" links to orient chain for chain anchor screw. Position first link of new chain to be flat against hoist housing without twisting the chain.

NOTE: See table on page 30 for location of tail chain limit stop.

On 2 ton double reeved models, also connect opposite end of chain (from lower block) to load chain anchor inside of frame. On 3 ton triple reeved models, the opposite end of the chain is attached to the lower block connecting link.

NOTE: In the event the old chain is to be removed from hoist and reinstalled, a short length of chain (about 18" long) must be run into hoist when the old chain is removed. This short length can then be used in the same manner as shown in paragraph 5-2. a.(3). Be sure to use the proper number of open "C" links in order to correctly position end link on tail end of chain to fit anchor at side of hoist frame.

NOTICE

To avoid serious internal damage to hoist, when installing coil load chain do not attempt to hand feed chain into hoist, or use a piece of wire in place of the method described herein. To do so may result in serious internal damage to hoist, as coil chain links must be properly seated in chain sprocket before chain is run into hoist. Install chain only as described in this manual.

CAUTION

Keep fingers clear of chain sprocket when replacing load chain.

(4) Check connection of chain to lower block on 1/4 through 1 and 3 ton hoists. Replace parts showing evidence of damage, twisting or elongation.

(5) Check connection of chain to anchor inside hoist frame on double-reeved, 2-ton hoists. Replace parts showing evidence of damage, twisting or elongation. (Also see Sec. VII, par. 7-2. a. (2)).

(6) Lubricate load chain before using hoist. See paragraph 4-3, Section IV.

b. Inspect Lower Block.

(1) Check for bent or distorted hook. If hook is opened beyond the dimension given in figure 5-5, it must be replaced. Also check to see that hook swivels and is free to pivot. Lubricate these points if necessary.

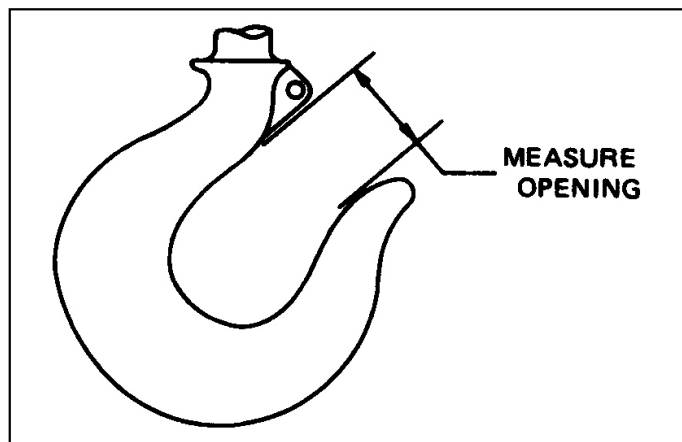


Figure 5-5. Lower Hook Opening
(Shown with latch removed for clarity.)

Hoist Rated Load (tons)	Hook Throat Opening	
	Normal Opening	Replace Hook if Opening is Greater Than
1/4 & 1/2	1-1/8	1-1/4
1	1-1/4	1-7/16
2	1-3/8	1-9/16
3	1-1/2	1-11/16

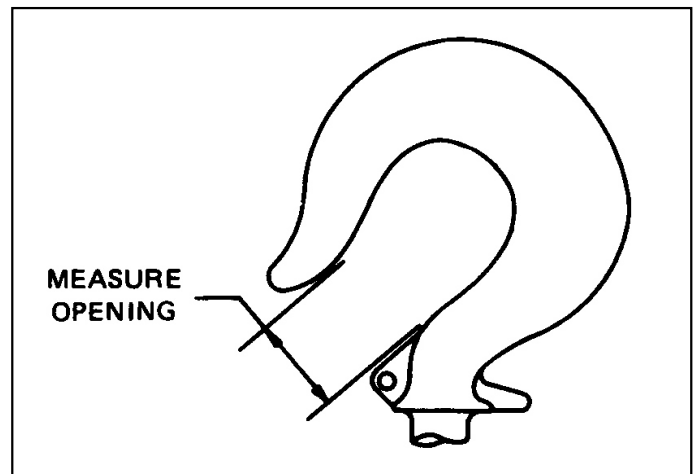
(2) On 2 through 3 ton hoists, check sprockets and bearings in lower block for freedom of movement and signs of damage. Lubricate if necessary. Replace damaged parts.

(3) Check hook latches. Replace damaged or bent latches or broken springs.

WARNING

Hooks, upper or lower, damaged from chemicals, deformation or cracks or having more than 15 percent in excess of normal throat opening or more than 10 degrees twist from the plane of the unbent hook, or opened, allowing the hook latch to bypass hook tip must be replaced.

Any hook that is twisted or has excessive throat opening indicates abuse or overloading of the hoist. Other load bearing components of the hoist should be inspected for damage. (See Section V. Par. 5-2. d. (2) below).



Hoist Rated Load (tons)	Hook Throat Opening	
	Normal Opening	Replace Hook if Opening is Greater Than
1/4 & 1/2	1-1/8	1-1/4
1	1-1/4	1-7/16
2	1-3/8	1-9/16
3	1-1/2	1-11/16

Figure 5-6. Upper Hook Opening
(Shown with latch removed for clarity.)

c. Inspect Upper Suspension.

(1) On hook suspended models, check for bent or distorted hook. If hook is opened beyond the dimension given in figure 5-6, it must be replaced. Also check to see that hook pivots. Lubricate if necessary.

(2) On lug suspended models, check condition of suspension lug. Replace lug if damaged or cracked. Check to see that lock plate is in place on lug and screw holding it is tight. (All capacities see figure 7-18).

(3) On 2-ton hoists, check to see that upper lock plate securing hook or lug bushing is in place and screws holding it are tight. Lubricate hook shank.

(4) Check hook latch. Replace damaged or broken parts.

(5) Inspect threaded upper suspension bushing. Verify keeper is in place against flat of suspension bushing, and securing screw and lock washer are in place and tight.

d. Inspect Motor, Frame and Electrical Compartment Cover.

(1) Check to see that bolts securing motor to frame are tight. Also check for any visible damage to motor, such as a cracked end bell or dented stator housing. Replace damaged parts.

(2) Check hoist frame for signs of visible damage. If frame shows evidence of fracture, the hoist should be disassembled and inspected for further signs of damage from possible overloading. Replace damaged parts.

(3) Check for possible damage to electrical compartment cover. Be sure screws holding cover are tight.

e. **Check Oil Level.** Remove oil level plug (fig. 4-1). If oil level is not even with bottom of tapped hole, add Automatic Transmission Fluid, DEXRON Type, to bring to proper level.

5-3. SIX-MONTH INSPECTION OR 500-750 HOURS OF OPERATION. Hoist may be left suspended. Same as thirty day inspection plus the following:

a. **Inspect Electrical Controls.** Shut off power supply to hoist and remove electrical compartment cover from hoist. Use caution as some covers contain counterweights. Two speed hoists with a 2-1/4 horsepower motor have an externally mounted counterweight at the electrical compartment cover.

(1) Check all wiring and terminals. Insulation should be sound and terminals securely crimped to wires. Terminal screws should be tight and plug-type terminals completely mated. Replace terminals or wires as necessary.

(2) Check control circuit transformer for evidence of overheating. Replace if necessary.

(3) Check limit switch to see that wires are securely attached and mounting screws are tight.

(4) Check contactor solenoid coils and replace coils if they show evidence of overheating.

(5) Check control cable wire strain reliever to see that it is in good condition and securely attached to gear case cover. Replace rubber strain reliever grommets if damaged.

a. **Change Gear Case Oil.** See Section IV, paragraph 4-2.

b. **Relubricate Load Chain.** See Section IV, paragraph 4-3.

c. **Lubricate Upper Hook and Lower Block.** See Section IV, paragraph 4-4.

5-4. INSPECTION: 5000 HOURS "ON" TIME OR 5 YEARS ELAPSED TIME. Hoist must be removed from overhead suspension.

a. **Disassemble Hoist into Subassemblies.** Follow procedure outlined in Section VII, paragraph 7-2.

b. Motor shaft oil seal, sprocket shaft bearing, seal and all gaskets should be replaced.

c. **Inspect Load Brake and Overload Clutch.** Disassemble load brake (if equipped) and clutch assembly as outlined in paragraph 7-4. Friction discs should be discarded and replaced with new discs. Check load brake friction surfaces on flange, ratchet assembly and gear clutch cone. Replace parts if badly scored or worn. Check condition of pawl and ratchet assembly. If pawl, ratchet teeth or pawl spring are broken, damaged or badly worn, replace complete assembly. Check contact faces of load brake cam and gear clutch cone. Brake gear and pinion teeth should be inspected for wear or broken teeth. Clean parts thoroughly with an oil solvent before reassembly.

NOTE: The overload clutch assembly should not be disassembled as it is preset at the factory to provide proper clutch pressure for a specific hoist capacity range. If there is evidence of the clutch slipping or wear or damage to the clutch components, the complete clutch assembly should be replaced or sent to an authorized Yale Hoist Repair Station to be rebuilt and properly adjusted to factory specifications.

d. Inspect Sprocket and Intermediate Gears.

(1) On 1 through 3 ton hoists, check condition of gear teeth on intermediate gear and pinion shaft assembly. Replace worn or damaged parts.

(2) Check condition of pockets on chain sprocket (all capacities). Replace worn or damaged parts.

e. **Inspect Motor Brake.** Check braking surfaces for wear and scoring. Replace badly worn or scored parts. Check spring studs and guide pins to make sure they are not bent or loose. Check coil shock mounts for deterioration and damage. Check air gap adjustment. (See 7-11c)

f. **Reassemble and Test Hoist.** Reassemble hoist from subassemblies following procedure outlined in paragraph 7-11. After assembly is complete, test hoist as outlined in paragraphs 7-12 and 7-13.

SECTION VI - TROUBLE SHOOTING

Trouble	Probable Cause	Remedy
6-1. Hoist Will Not Operate.	<p>a. No power to hoist.</p> <p>b. Wrong voltage.</p> <p>c. No control voltage.</p> <p>d. Loose or broken wire connections in hoist electrical system.</p> <p>e. Contactor assembly not functioning.</p> <p>f. Starting switch burned out (single phase motor).</p> <p>g. Motor burned out.</p> <p>h. Electronic Limit Switch not set.</p>	<p>a. Check switches, circuit breakers and connections in power supply lines. Check power collectors.</p> <p>b. Check voltage required on motor data plate against power supply.</p> <p>c. Check transformer fuse. If blown, check for grounding and/or short in the pushbutton station. Check the transformer coil for signs of overheating. Replace transformer if burned out. Verify the transformer secondary is the same voltage as the coils to which it is connected.</p> <p>d. Shut off power supply, remove electrical cover from hoist and check wiring connections. Also check connections in push button station and limit switches.</p> <p>e. Check for burned out solenoid coil. See that the necessary jumper wires are properly installed.</p> <p>f. Replace burned out parts.</p> <p>g. Replace motor. On single-phase motors the starting switch may be burned out.</p> <p>h. Adjust electronic Limit Switch. See section 2-5.</p>
6-2. Hook Moves in Wrong Direction.	<p>a. Reverse phasing on three-phase hoists.</p> <p>b. Hoist wired wrong.</p> <p>c. Starting switch not working correctly (single phase motor).</p>	<p>a. Interchange any two of the three power supply line leads. Do not change green ground lead. Refer to Section II, par. 2-4.</p> <p>b. Check wiring connections with appropriate wiring diagram.</p> <p>c. Check for correct starting switch part number and function. Replace if necessary.</p>
6-3. Hook Will Raise But Not Lower.	<p>a. "DOWN" electrical circuit open.</p> <p>b. Contactor assembly not functioning.</p> <p>c. Push Button Inoperative.</p> <p>d. Load Brake locked up and overload clutch slipping.</p>	<p>a. Check for loose connections. See that necessary jumper wires are properly installed on contactor. Check limit switch condition and electrical connections.</p> <p>b. See that necessary jumper wires are properly installed. Verify that the contactor armatures are free to move. If binding occurs replace contactor. Check for burned out contactor coils.</p> <p>c. Check push button contacts and wires.</p> <p>d. Consult Authorized Yale Hoist Repair Station.</p>
6-4. Hook Will Lower But Not Raise (continued on next page).	<p>a. Excessive load, causing overload clutch to slip.</p> <p>b. Overload clutch out of adjustment.</p> <p>c. "UP" electrical circuit open.</p>	<p>a. Reduce loading to rated load of hoist, as shown on nameplate.</p> <p>b. Test hoist and replace clutch if hoist will not lift rated load.</p> <p>c. Check for loose connections. See that necessary jumper wires are properly installed on contactor. Check limit switch condition and electrical connections.</p>

SECTION VI - TROUBLE SHOOTING (Continued)

Trouble	Probable Cause	Remedy
6-4. Hook Will Lower But Not Raise (continued).	d. Contactor assembly not functioning. e. Push button inoperative.	d. See that necessary jumper wires are properly installed. Verify that the contactor armatures are free to move. If binding occurs replace contactor. Check for burned out contactor coils. e. Check push button contacts and wires.
6-5. Hoist Will Not Lift Rated Load.	a. Low voltage b. Overload clutch out of adjustment. c. Motor brake not releasing.	a. See that power supply is same voltage listed on motor data plate. Check size of power supply lines. Refer to fig. 2-1. b. Remove and replace clutch assembly. Refer to Section IV, par. 7-2 and 7-4. c. Check brake components. Refer to Section VII, par 7-2.d, 7-2.e and 7-2.f.
6-6. Excessive Drift When Stopping.	a. Excessive load. b. Motor brake not holding. c. Motor brake not setting due to insufficient plunger air gap. d. Load brake not holding.	a. Reduce loading to rated load, shown on nameplate. b. Check brake components. Refer to Section VII, par. 7-2.d. c. Adjust air gap. Refer to Section VII, par. 7-11.c. d. Remove load brake and inspect parts. Refer to Section V, par. 5-4.
6-7. Hoist motor overheats.	a. Excessive load. b. Excessive duty-cycle. c. Excessive "jogging." d. Wrong voltage. e. Starting switch on single-phase motors not opening starting winding. f. Damaged motor or worn bearings in motor or hoist frame. g. Motor brake not releasing.	a. Reduce loading to rated load of hoist, shown on nameplate b. Reduce frequency of lift. c. Reduce frequency of jogs. d. Check voltage rating on motor data plate against power supply. e. Refer to Section VII, par. 7-9.b. (3) (b). Inspect Switch. f. Disassemble hoist and inspect for worn or damaged parts. g. Check brake components. Refer to Section VII, par. 7-2.d.

SECTION VII - DISASSEMBLY AND REASSEMBLY

7-1. GENERAL.

a. The following disassembly and reassembly instructions apply to all standard models in the line of **Yale** Electric Hoists equipped with overload clutch. Where needed, variations to instructions are provided to cover differences between models (suspensions, rated load sizes and motor voltage ratings), with applicable models specifically noted.

b. A complete teardown procedure is given, however, if only certain parts require repair or replacement, a partial teardown may be performed using the applicable portions of the instructions.

c. For easier handling during disassembly, the following

disassembly steps may, where conditions permit, be completed before hoist is removed from its overhead suspension or disconnected from its power supply: Remove chain container, if hoist is so equipped; remove lower block and load chain assembly, following procedure outlined in paragraph 7-2. a. Drain and discard gear case oil, by removing plug at bottom of frame.

d. These hoists contain precision machined parts and should be handled with care at disassembly and at reassembly. When removing or installing parts with press fits, be careful to apply pressure evenly. On ball bearings, apply pressure to face of inner or outer race, whichever is adjacent to mating part. This will avoid damage to bearing races from brinelling by pressing through bearing balls. Apply a thin film of sealant to parts having a press fit when they are installed.

7-2. DISASSEMBLY OF HOIST INTO SUBASSEMBLIES.

a. Removal of Lower Block and Load Chain Subassembly.

(1) On models with single-reeved load chains (1/4 through 1 ton rated loads) disconnect tail end of load chain from anchor at side of frame. Remove fillister head screw holding end link to frame. Remove grooved pin from the limit actuator and pull it off end of chain. With hoist connected to power supply, run chain out of hoist by operating in “lowering” direction. (See note following paragraph (2) below and note in Sec. V, par. 5-2. a. (3) for inserting short length of chain.)

(2) On models with double-reeved load chains (2 ton hoists) disconnect tail end of load chain from anchor at side of hoist frame and remove limit actuator as in (1) above, run chain out of hoist by operating it in “lowering” direction, and disconnect opposite end of load chain from anchor inside hoist frame. To disconnect this end of chain, remove cotter pin from end of anchor pin, press pin from anchor and withdraw chain. The drive pin securing threaded end of anchor in upper block assembly (at top of frame) must be removed in order to rotate the anchor.

NOTE: If hoist is inoperative and **not** equipped with a load brake, chain can be pulled through by hand by first manually releasing motor brake. If hoist is equipped with a load brake it will be necessary to wait until after load brake is removed (paragraph. c., below), then the chain can be pulled through the hoist by hand.

(3) On triple-reeved 3 ton hoists, remove retaining ring and connecting link pin as shown in figures 7-30 and 7-31. Remove connecting link with chain from lower block.

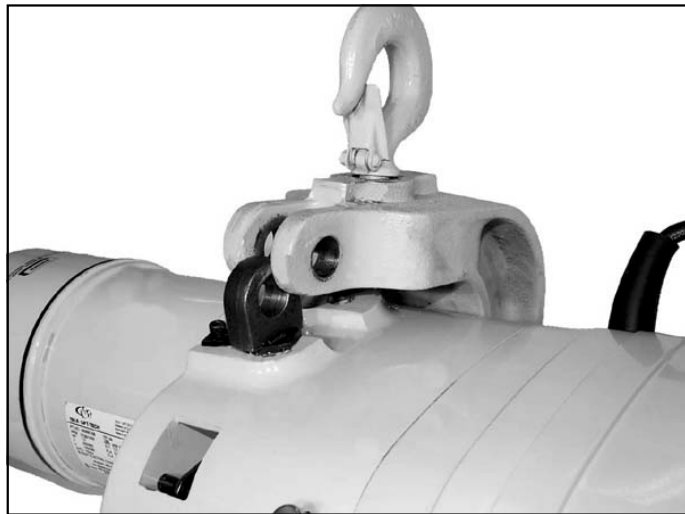


Figure 7-2. 3 Ton Hanger Bracket Connection Pin Removed

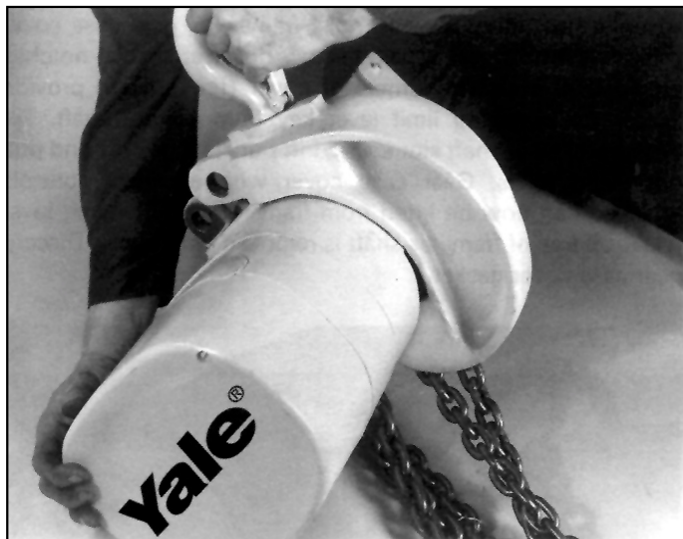


Figure 7-3. Removing 3 Ton Hanger Bracket from Hoist Frame

To remove connecting link from chain, take out cotter key and push anchor pin from connecting link. Chain can now be pulled through hanger bracket and lower block. Unfasten tail chain from hoist frame, remove limit actuator, and if power is available, operate hoist in lowering direction to remove chain. (See note in Sec. V, par. 5-2. a. (3) for inserting short length of chain). If hoist is inoperative see note below but be sure to install short length of chain into hoist before removing load chain.

NOTE: If hoist is inoperative and **not** equipped with a load brake, chain can be pulled through by hand by first manually releasing motor brake. If hoist is equipped with a load brake it will be necessary to remove load brake (paragraph. c., below) so chain can be pulled through the hoist by hand.

(4) To remove 3 ton hanger bracket from hoist, remove retaining ring and connecting rod pin (see fig. 7-2). Rotate hoist approximately 45° (see fig. 7-3) and hanger will slip free from hoist frame.

b. Removal of Electrical Compartment Cover, Electrical Controls and Gear Case Subassembly.

(1) Disconnect hoist from power source. Remove three cover retaining screws and lift off cover (fig. 9-1). Cover screws have retaining rings which hold them in cover. Use caution as some covers contain counterweights. Two speed hoists with a 2-1/4 horsepower motor have an externally mounted counterweight at the electrical compartment cover.

(2) Disconnect push button conductor cable leads at plug-in type connectors that can be pulled apart. Remove screw and washer securing strain reliever (fig. 9-8) and pull the cable and grommet from its slot in gear case cover.

(3) Disconnect power supply flexible cable leads from terminals of contactor. Remove screw attaching ground leads to gear case cover and pull flexible cable and grommet from slot in cover.

(4) Disconnect motor leads from electrical control units. Number of leads depends on type of motor. (See wiring diagrams in accompanying this manual).

(5) Remove eight hex socket head screws and lockwashers securing gear case cover to hoist frame. Pry gear case cover off hoist frame using screw driver at special notches provided at opposite corners of cover (fig. 7-4). Discard gear case cover gasket.

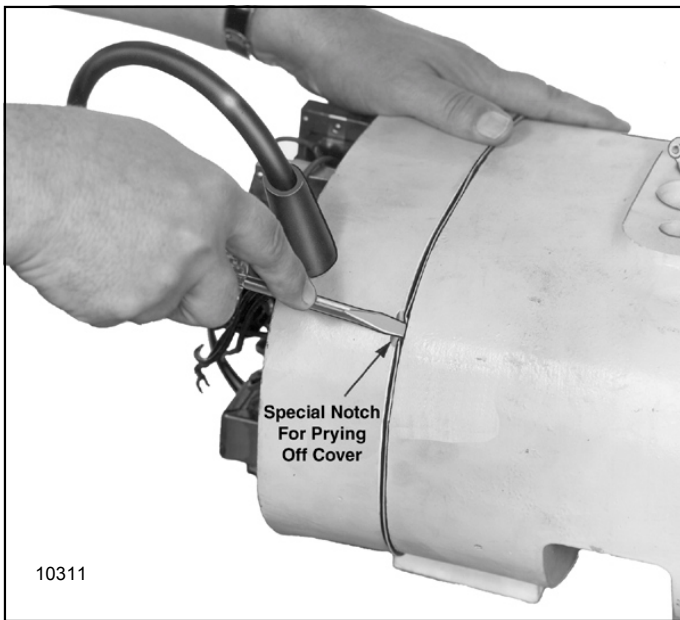


Figure 7-4. Prying Gear Case Cover from Hoist Frame

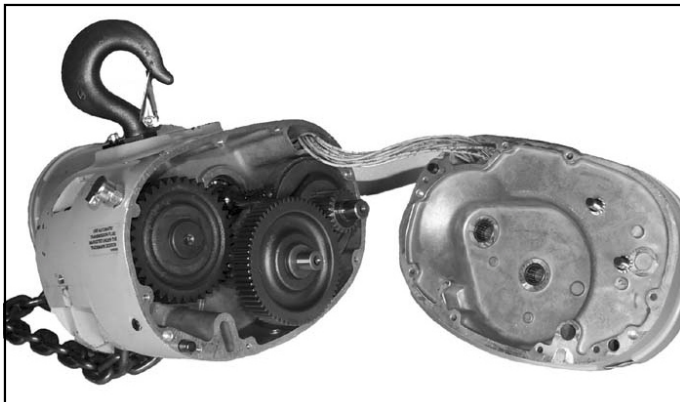


Figure 7-6. Gear Case Cover with Electrical Controls Removed from Frame

c. Removal of Load Brake and Clutch Assembly and Intermediate Gear Subassembly.

(1) On 1/4 through 1/2 ton hoists, pull load brake/clutch assembly if equipped or overload clutch assembly and the shaft washers from inside hoist frame (fig. 7-7). Caution: Grease-retained bearing has 36 rollers (all capacities) and may be reinstalled unless rollers are broken or missing or cup is damaged.

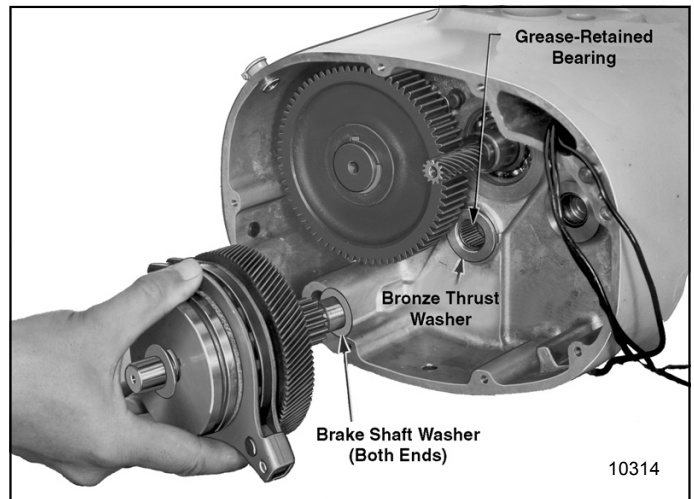


Figure 7-7. Removing Load Brake and Clutch Assembly (1/4 & 1/2 Ton Hoists)

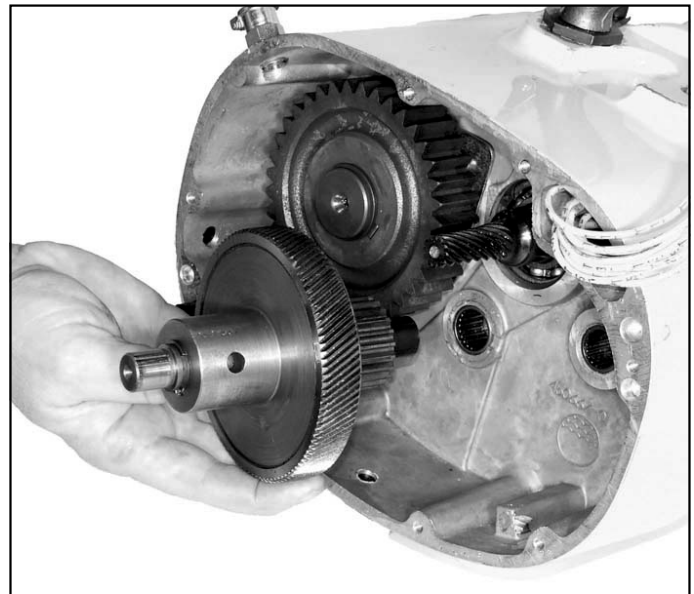


Figure 7-7a.

(2) On 1 through 3 ton hoists, pull load brake or clutch assembly and intermediate gear assembly, including the thrust washers for each unit, from hoist frame (fig. 7-8).

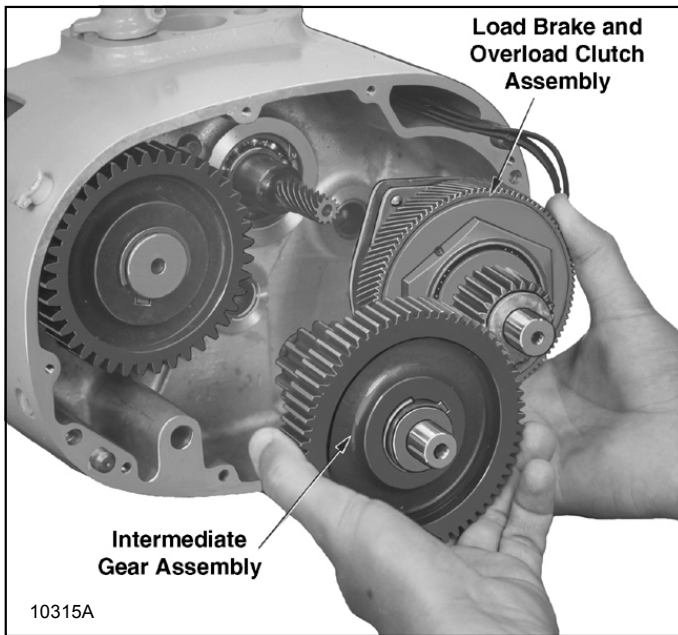


Figure 7-8. Removing Load Brake and Clutch and Intermediate Gear Subassemblies (1 through 3 Ton Hoists)



Figure 7-9. Removing Motor Assembly

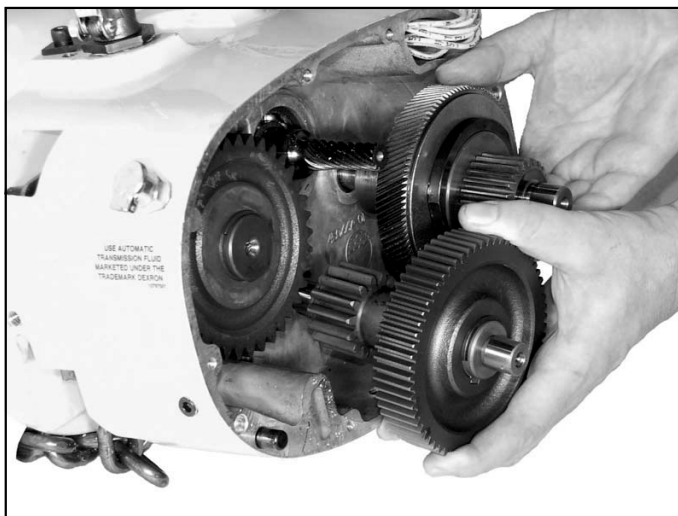


Figure 7-8a.

d. Removal of Motor Brake.

(1) Remove acorn nuts holding brake cover and remove brake cover (fig. 9-16).

(2) Disconnect wire nuts on brake coil leads.

(3) Remove brake mounting plate screws (fig. 9-16) and lift brake assembly off to gain access to the motor mounting bolts.

e. Removal of Motor Assembly.

(1) Place hoist frame on wood blocks to protect integral gear on motor shaft. Loosen four motor mounting bolts and lift motor assembly from frame (fig. 7-9). Guide motor leads through wire passage to avoid damage.

7-3. REBUILD OF HOIST FRAME, SPROCKET GEAR, SPROCKET SHAFT AND CHAIN GUIDE.

a. Disassembly of Sprocket Gear, Shaft and Chain Guide.

(1) Remove retaining ring from end of sprocket shaft and pull off sprocket gear using a common puller (fig. 7-10). Remove Woodruff key from shaft.

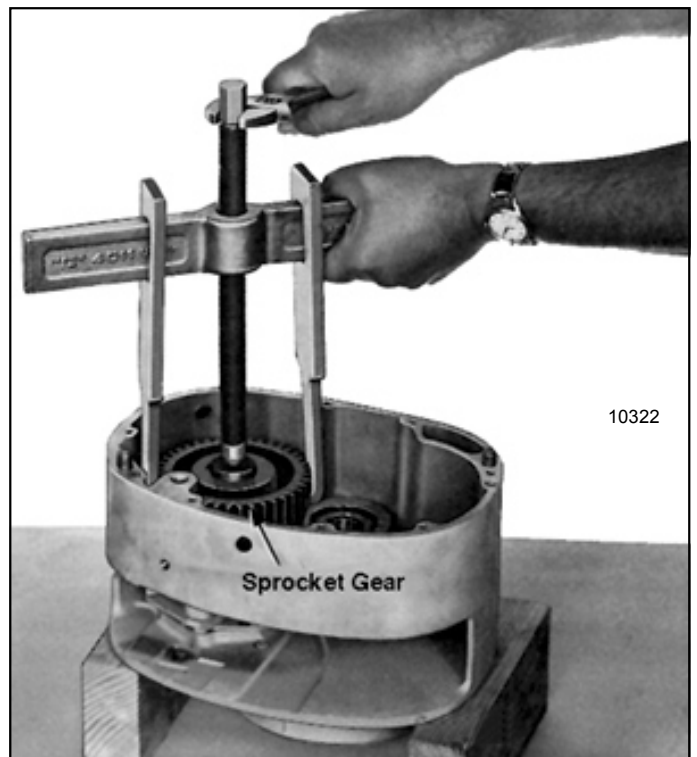


Figure 7-10. Pulling Sprocket Gear from Sprocket Shaft using Common Puller

(2) Unscrew four fillister head machine screws securing sprocket bearing retaining plate and remove plate (fig. 7-11). Remove and discard ring gasket from groove around bearing.

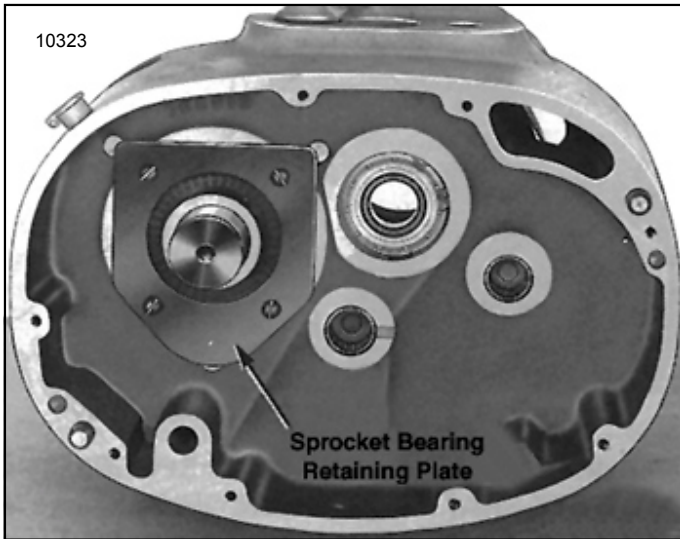


Figure 7-11. View of Sprocket Bearing Retaining Plate

(3) Remove "C" clips holding chain guide pins in place. Pull guide pins out from motor side of frame. (Fig 7-13)



Figure 7-13. Removing Chain Guide Support Pins

(4) Remove sprocket shaft and front ball bearings assembly from frame by lifting up on end of shaft while prying up on sprocket as illustrated in figure 7-14. The chain guide will need to be repositioned in frame as sprocket shaft is raised to allow the sprocket to pass through hole of guide (fig. 7-15).

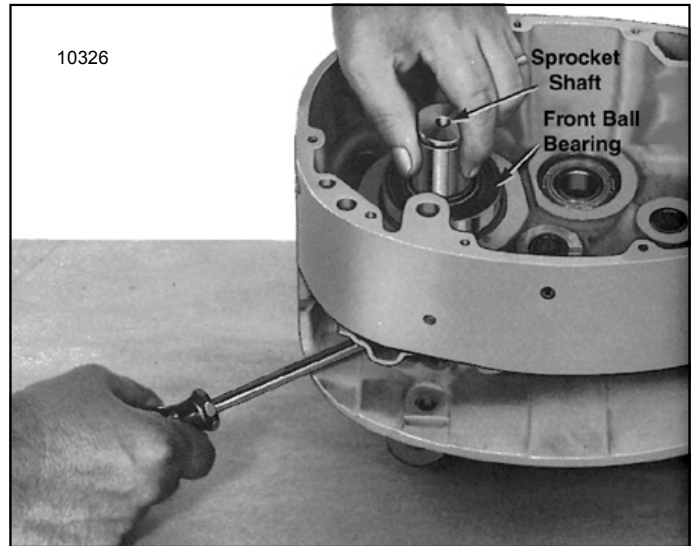


Figure 7-14. Removing Sprocket Shaft and Front Bearing

NOTE: Do not remove oil seal, ball bearings, and needle bearings from their bores in the frame unless they show evidence of wear or damage and require replacement. When replacing rear sprocket ball bearing pack bearing 1/2 full with NLGI No. 2 grease.

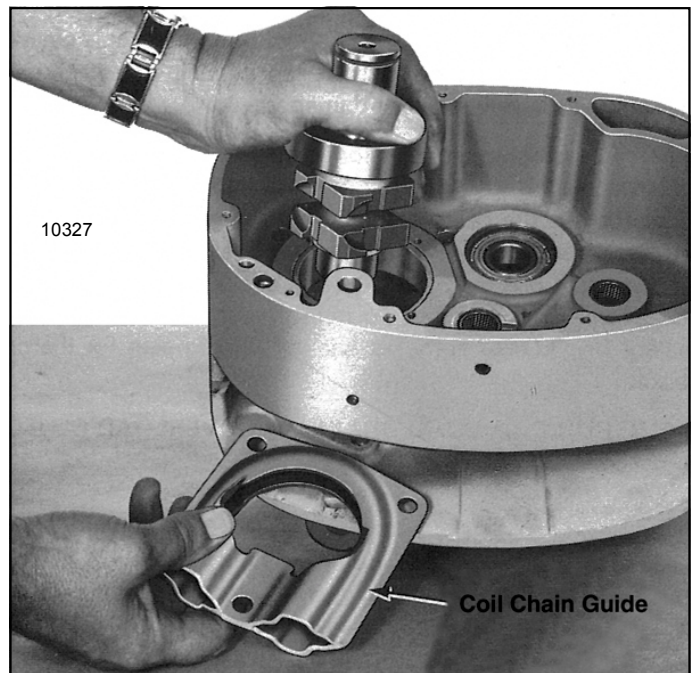


Figure 7-15. Chain Guide Being Removed from Frame as Sprocket Shaft is Lifted Out

b. Disassembly of Upper Hook. (Hook Suspension Models)

(1) On 1/4 through 1 ton models, remove screw securing suspension bushing keeper. Unscrew suspension bushing from frame to remove hook.

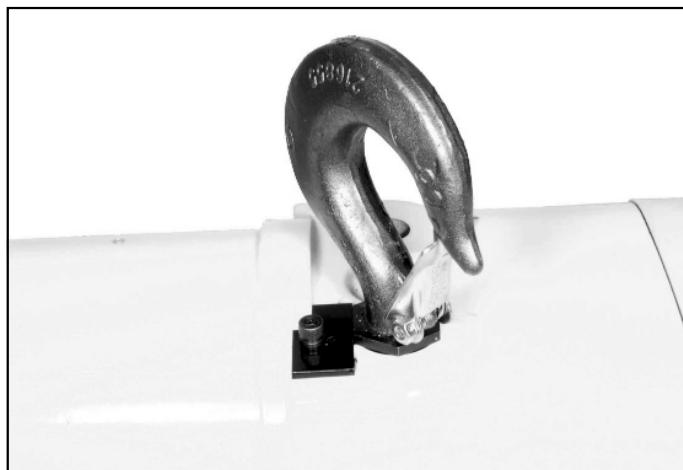


Figure 7-18. Removing Upper Hook and Hook Nut from Hoist Frame (1/4 through 1 Ton Models)

(2) On 2 ton models, unscrew two hex socket head screws holding suspension bushing lock assembly to upper bloc (fig. 7-19) and remove lock. Unscrew suspension bushing from block to remove hook. To disassemble block from frame, remove screw securing suspension bushing keeper. Remove drive pin securing threaded end of chain anchor in block and unscrew anchor. Unscrew suspension bushing to remove block.



Figure 7-19. View of Upper Hook Assembled to Hoist Frame (2 Ton Models)

NOTE: Hook and bushing assembly is not to be further disassembled as nut securing bushing to hook shank is welded in place at the factory. Only the assembly is available for replacement.

(3) On 3 ton models, remove retaining ring from connecting rod pin and push connecting rod pin through bracket and connecting rod, releasing hanger (see fig. 7-2). Raise hanger above hoist frame to provide access to hook nut. Rotate hook

until grooved pin in nut is visible from end of hanger frame. Using a drift punch, drive grooved pin through hook nut until it hits hanger pocket. Remove drift far enough to hold nut from turning and unscrew hook from nut. Thrust washer will fall free.

(4) To remove connecting rod (fig 7-2) on 3 ton hoist, remove screw securing suspension bushing keeper. Unscrew suspension bushing to remove connecting rod from frame.



Figure 7-20. Removing Suspension Lug (1/4 through 1 Ton Models)

c. Disassembly of Suspension Lug (Lug Suspension Models).

(1) On 1/4 through 1 ton models, remove two screws securing anti-rotation bracket and remove bracket. Remove screw securing suspension bushing keeper, and remove keeper. Remove suspension lug using an extra thin 1-1/4" open end wrench to unscrew suspension bushing from frame. (See fig. 7-20).

(2) On 2 ton models, remove three hex socket head screws securing the two lock plates to block at top of frame and pull out locks. Remove suspension lug, using an extra thin 1-1/4" open end wrench to unscrew suspension bushing from block. Instructions for removing block from frame are given in paragraph b. (2).

NOTE: The suspension lug is not to be further disassembled, as nut securing suspension bolt and bushing to lug is permanently secured in place at the factory. Only the suspension lug assembly is available for replacement.

(3) On 3 ton models lug bolt is removed in same manner as hook. See paragraph 7-3. b. (3).

d. Reassembly.

(1) Before assembly, all parts should be thoroughly cleaned and inspected to determine their serviceability. Replace parts that are excessively worn or damaged.

(2) Reassemble suspension hook or lug, chain guide, sprocket shaft and sprocket gear to frame following a reverse procedure of the disassembly steps listed in paragraphs (a.) through (c.), above. If ball bearing is to be reinstalled on sprocket be certain to position it so that the seal side of bearing faces out, away from sprocket. To help prevent oil seepage, apply sealant on O.D. of sprocket bearing and in seat for the ring gasket.

7-4. REBUILD OF LOAD BRAKE AND OVERLOAD CLUTCH ASSEMBLY. (If hoist is equipped with overload clutch less load brake, see 7-4a.)

a. Disassembly.

(1) Place load brake and clutch assembly, flange up, in a vise equipped with brass or copper jaw plates to protect pinion gear teeth. Remove snap ring of load brake shaft (fig. 7-21).

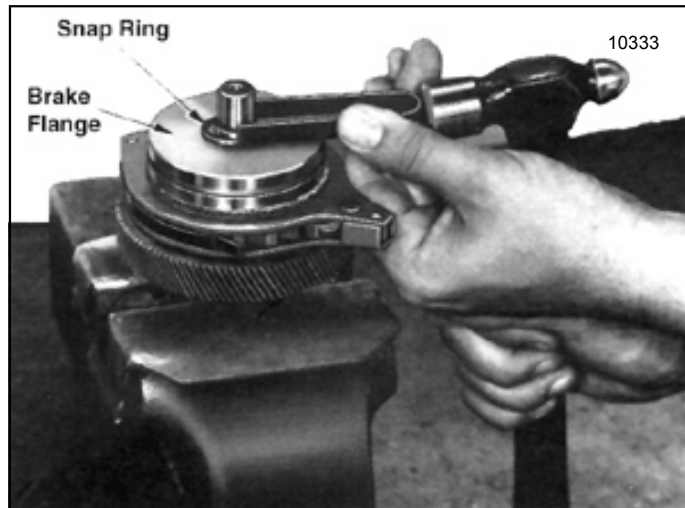


Figure 7-21. Removing Snap Ring from Load Brake Shaft

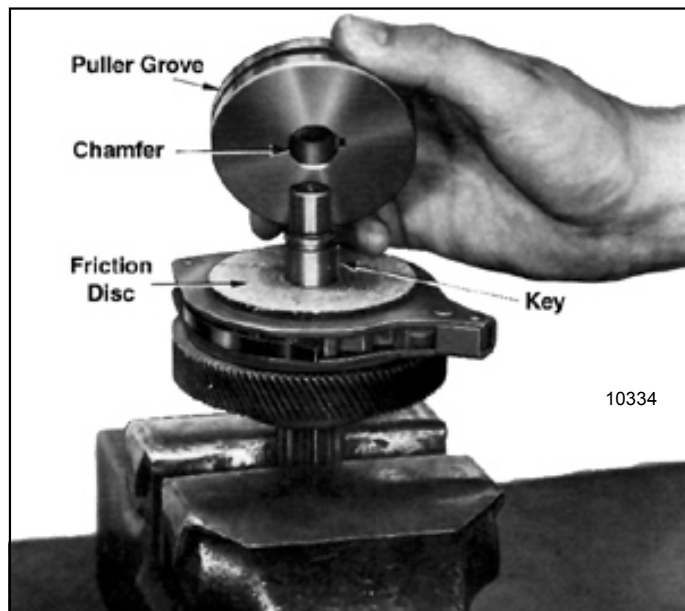


Figure 7-22. View Showing Load Brake Flange Removed

(2) Using a puller tool, remove brake flange from shaft. A groove is provided around outer diameter for this purpose. See figure 7-22. Remove key from shaft and lift off 2 friction discs, and the pawl and ratchet assembly (fig. 7-23).

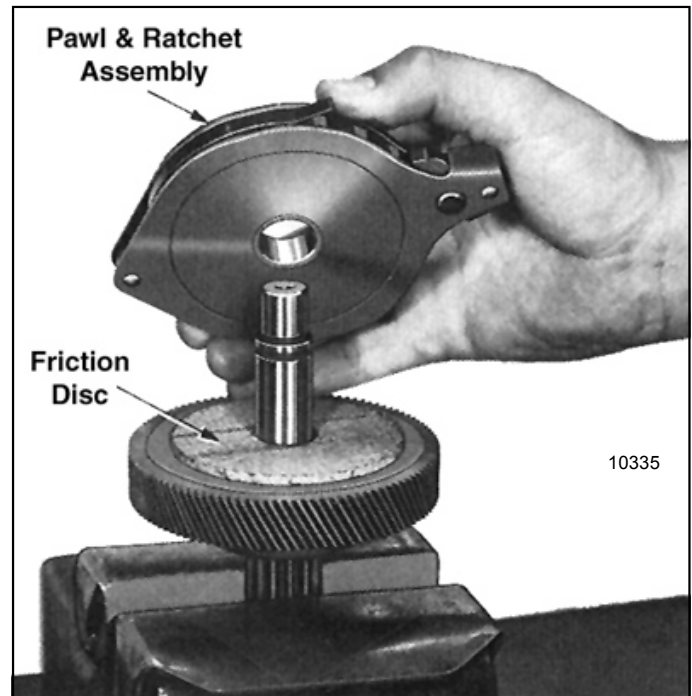


Figure 7-23. Removing Pawl and Ratchet Assembly from Load Brake Shaft

(3) Remove load brake gear and overload clutch assembly from output pinion shaft. Pull the spring from its recess in clutch cone (fig. 7-24) but do not further disassemble gear and clutch assembly. See **NOTE** below.

NOTE: Disassembly of the load brake gear and overload clutch assembly (fig. 7-24) is not recommended. Clutch pressure is preset by the factory at assembly to provide the correct torque to allow the clutch to refuse loads within a specified range (150% of rated load to 200% rated load). It is suggested whenever there is a need to repair or readjust the gear and clutch assembly that it be sent to an authorized **Yale** Hoist Repair Station where adequate tools, fixtures and appropriate test equipment is available.

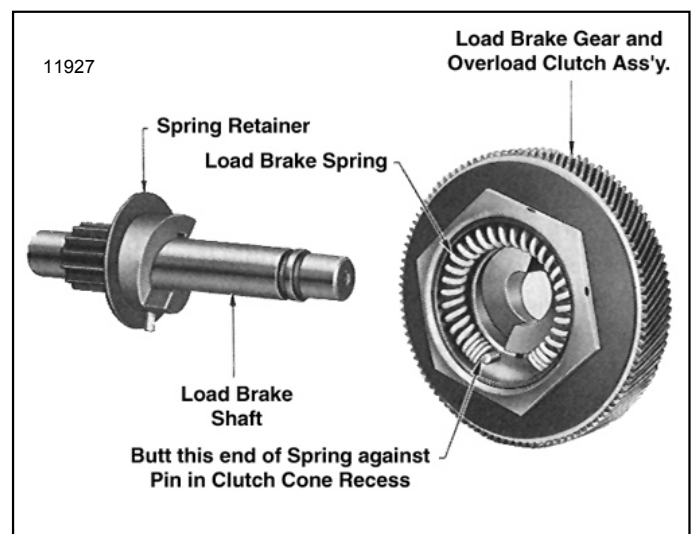


Figure 7-24. Load Brake Gear and Overload Clutch Assembly Removed from Load Brake Shaft Showing Brake Spring Installed in Clutch Cone

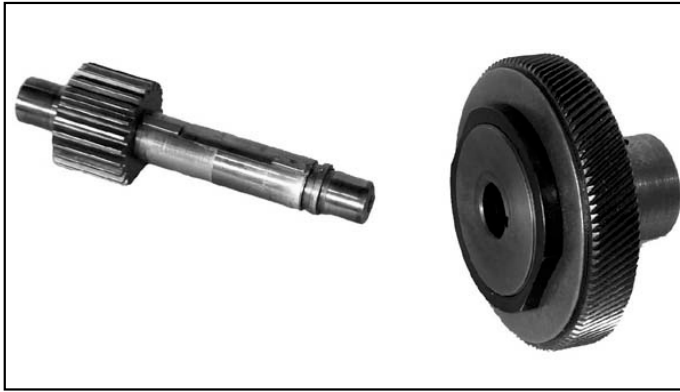


Figure 7-24a.

(4) The load brake pawl and ratchet is a riveted assembly and is not to be disassembled.

b. Reassembly.

(1) Before assembly, all parts should be cleaned and inspected to determine their serviceability. Replace parts that are worn or damaged.

(2) Reassemble load brake parts following a reverse procedure of the disassembly steps listed above, observing the assembly steps (3) through (6) below.

(3) Before installing spring in its recess in center of clutch cone (fig. 7-24) apply a good grade of ball bearing grease to inside of recess. Spring must be positioned exactly as illustrated, abutted against pin.

(4) When installing pawl and ratchet assembly on load brake shaft, be certain that teeth on ratchet face are in the same direction as shown in fig. 7-23. The ratchet assembly should rotate freely when turned counterclockwise and the pawl should engage ratchet teeth when unit is turned clockwise.

(5) When installing brake flange position it with chamfer facing friction disc, figure 7-22.

(6) The brake spring must be pre-loaded at assembly to a torque of from 6 to 10 lb. ft. when used with yellow (color code) spring and a torque of 10 to 14 lb. ft. when used with plain (no color code) spring. (See Section IX for proper spring). This is accomplished using a plumber's strap wrench to wind (rotate) load brake gear to set up spring (fig. 7-25) while pressing brake flange into place using an arbor press. Clamp pinion end of shaft into a portable vice to keep brake from rotating in press. Use brass or copper jaw plates on vise to protect pinion gear teeth. Wind gear counterclockwise (viewing brake from flange end) with strap wrench and press down on flange until snap ring groove in shaft is exposed allowing snap ring to be installed. Use extreme care not to over wind spring as yield will result and final spring torque will be reduced. Do not wind gear beyond point necessary to install snap ring in groove.

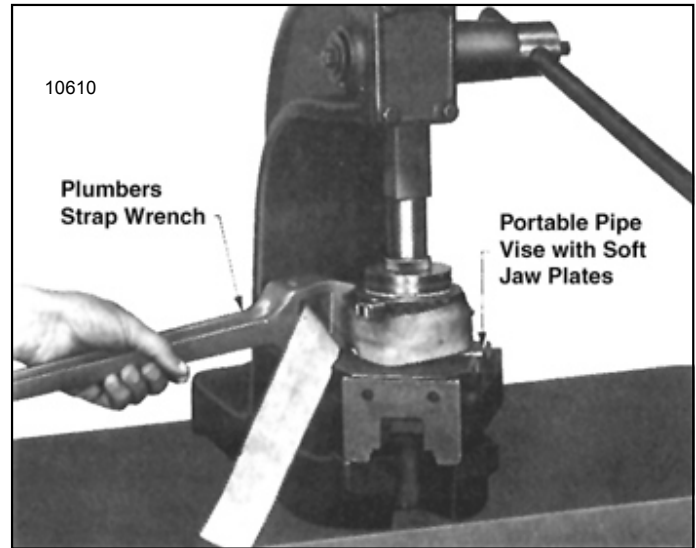


Figure 7-25. Winding Load Brake Gear
Using a Strap Wrench to Set Up Load Brake Spring

7-4A. OVERLOAD CLUTCH WITHOUT LOAD BRAKE.

Disassembly of the clutch gear and overload clutch assembly (fig 7-24a) is not recommended. Clutch pressure is preset at the factory at assembly to provide the correct torque to allow the clutch to refuse loads within a specified range (150% of rated load to 200% rated load). It is suggested whenever there is a need to repair or readjust the overload clutch assembly that it be sent to an authorized Yale Hoist Repair Station where adequate tools, fixtures, and appropriate test equipment is available.

7-5. REBUILD OF LOWER BLOCK AND LOAD CHAIN ASSEMBLY.

a. Disassembly (1/4 through 1-ton, single reeved models).

(1) Separate load chain from lower block assembly. Drive out small roll pin securing lower block pin in lower block yoke and push lower block pin from yoke to release chain.

(2) Drive grooved pin from limit actuator and pull actuator from end of chain.

(3) Lower blocks are of a pinned construction, permitting replacement of body, thrust bearing, or hook and nut assembly. To disassemble, drive spring pin from hook nut (fig. 7-26). With pin removed, hold hook nut from turning with drift punch and rotate hook to unscrew it from nut.



Figure 7-26. Removing Roll Pin Securing Hook Nut to Hook Shank

Separate hook, bearing shield, needle bearings and two thrust washers from body. Hook and nut are drilled at assembly and are replaced only as an assembly.

b. Disassembly (2-ton, double reeved models).

(1) Remove fillister head screw securing center guide in top of lower block body and lift out guide (fig. 7-27) and sprocket pin lock (fig. 7-28). Press sprocket pin from body and pull out chain, sprocket and washer (fig. 7-29). Do not remove bushing type bearing from sprocket or pressure lube fitting from sprocket pin unless replacement is necessary.

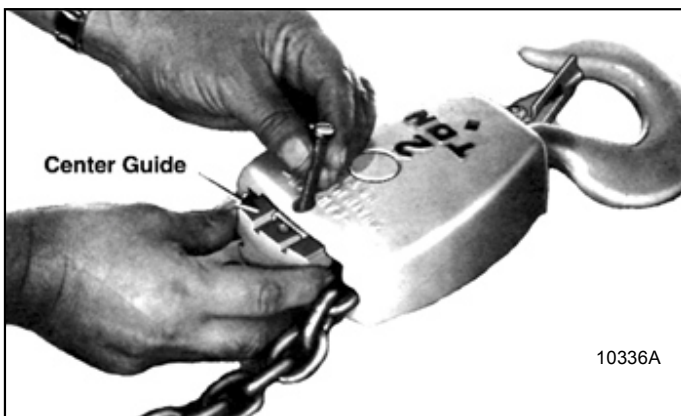


Figure 7-27. Removing Chain Center Guide from 2 through 5 Ton Lower Block Assembly



Figure 7-28. Removing Sprocket Pin Lock on 2 through 5 Ton Lower Block Assembly



Figure 7-29. Removing Coil Chain and Sprocket on 2 through 5 Ton Lower Block Assembly (Link Chain Model)

(2) To disassemble hook and nut, drive groove pin from hook nut with drift punch. With pin removed, hole hook nut from turning with drift punch and rotate hook to unscrew it from nut. Separate hook, nut, bearing shield, needle bearing and two thrust washers from body. Hook and nut are drilled at assembly and are replaced only as an assembly.

c. Disassembly (3-ton, triple reeved models).

(1) Remove chain sprocket from lower block following procedure for 2-ton link chain models described in paragraph 7-5. b. (2) above.

(2) To disconnect end of chain anchored to lower block, remove retaining ring from pin bore (fig. 7-30). Push connecting link pin from bore by pressing through hole provided in opposite side of block (fig. 7-31). Chain connecting link is now free and can be further disassembled for inspection.

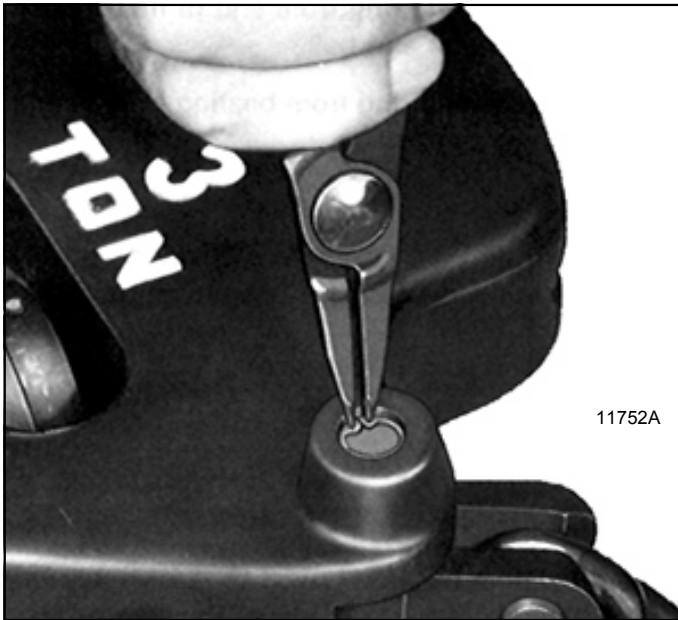


Figure 7-30. Removing Retaining Ring from Bore of Connecting Link Pin - 3 Ton Lower Block Assembly

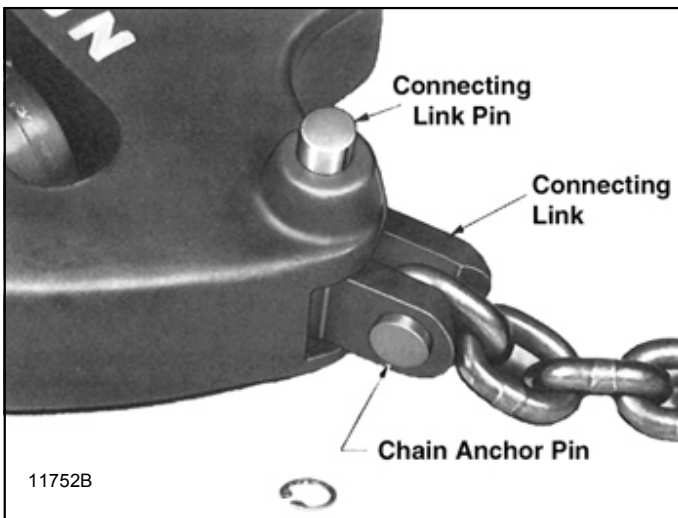


Figure 7-31. Removing Connecting Link Pin from 3 Ton Lower Block Assembly

(3) To remove hook from lower block body, first drive grooved pin from hook nut. Then hold nut from turning using drift punch and rotate hook to unscrew it from nut. Separate hook, shroud and thrust washer from body. Note that bearing surface of washer faces nut.

(4) To remove chain sprocket from upper suspension hanger, first remove hanger as outlined in paragraph 7-2. a. (4). With hanger removed, push sprocket pin from hanger and sprocket. **NOTE:** Sprocket pin must be removed toward side having small anti-rotation pin slot in hanger.

d. Reassembly of Lower Blocks.

- (1) Clean, inspect and replace worn or damaged parts.
- (2) Lubricate and reassemble following a reverse procedure of the disassembly steps above.

7-6. REBUILD OF ELECTRICAL CONTROLS AND GEAR CASE COVER SUBASSEMBLY.

a. Disassembly.

(1) Disconnect two limit switch leads from contactor. Also, if hoist has a transformer, disconnect transformer leads at the contactor or terminal board.

(2) Remove reconnectable terminal board if so equipped.

(3) Remove two screws and lift transformer from gear case cover if hoist is so equipped.

(4) Remove two screws attaching contactor assembly to cover and lift off contactor. Refer to paragraph 7-8 for instructions for rebuild of contactor assembly.

(5) Remove two hex socket head screws and lockwashers securing limit switch assembly to gear case cover and pull limit switch assembly and control shaft from cover.

(6) Loosen two nuts and screws holding limit switches to retainer bracket and remove.

(7) Remove self-locking nut from end of control shaft and pull off washer, switch activator, centering lever, spring, spacer tube, retainer bracket and washer.

NOTE: Do not remove needle bearings from gear case cover unless they show evidence of wear or damage and require replacement.

b. Reassembly.

(1) Before assembly, all parts should be thoroughly cleaned and inspected to determine their serviceability. Replace parts that are worn or damaged.

(2) Reassemble parts to gear case cover in reverse of the disassembly steps above. Ends of centering spring must straddle centering levers. Lubricate contact segments of limit switch with small amount of graphite grease.

7-7. REBUILD OF PUSH BUTTON STATION AND CONDUCTOR CABLE ASSEMBLY.

a. Disassembly.

(1) Remove seven pan head machine screws and lockwashers from back of push button station and lift off rear cover.

(2) Loosen three terminal screws and remove strain cable screw, lockwasher and plain washer.

(3) Remove two pan head machine screws and lockwashers from housing cap and remove cap, grommet and cable assembly.

(4) Remove two pan head screws, contact assembly and button assembly.

b. Reassembly.

(1) Before assembly, all parts should be thoroughly cleaned and inspected to determine their serviceability. Replace all parts that are worn or damaged.

(2) Reassemble push button station and conductor cable following a reverse procedure of the disassembly steps listed above.

NOTE: Do not attempt to shorten or lengthen push button conductor cable. Odd length conductor cable assemblies for other than standard 10 ft. lift hoists can be procured from the factory.

7-8. REBUILD OF CONTACTOR ASSEMBLY.

a. General. Wear or damage to contactor parts requires replacement of complete contactor assembly.

7-9. REBUILD OF SINGLE PHASE MOTOR ASSEMBLY.

a. Disassembly.

(1) To inspect capacitor, remove two cover mounting screws and lift off capacitor cover. Do not disconnect wires at capacitor unless capacitor must be replaced.

(2) Remove external retaining ring from end of shaft and press shaft out of bearing in end bell.

(3) Remove motor end bell from stator assembly. If necessary loosen it by tapping with soft mallet.

(4) Remove internal retaining ring from bearing bore in end bell and press out bearing assembly.

b. Reassembly.

(1) Before assembly, all parts should be cleaned and inspected to determine their serviceability. Replace all parts that are worn or damaged.

(2) Reassemble motor following a reverse procedure of the disassembly steps listed above.

(3) After reinstalling hoist motor, connect hoist to power supply and carefully complete both checks (a) and (b) below:

(a) To check direction of rotation, briefly operate "↑" button. If hook lowers, interchange motor lead "T1" with "T4" at the contactor or controller. Hook must raise when the "↑" push button is operated.

(b) To check the starting winding switch, connect ammeter (minimum 10 ampere) to motor lead "T5". Amperes must drop to zero in approximately one second when operating hoist in both "↑" and "↓" directions. If ampere reading does not drop to zero, interchange motor leads "T7" and "T8". If, after above checks were made with motor having been run in both directions, the ammeter reading still does not return to zero, the motor switch is not functioning properly and should be replaced.

⚠WARNING

Do not change circuit wiring. Severe damage and malfunction of hoist may result.

7-10. REBUILD OF THREE PHASE MOTOR ASSEMBLY.

a. Disassembly.

(1) Pull four motor mounting bolts from motor and separate stator assembly from the end bell and rotor shaft assembly.

(2) Remove external retaining ring from end of motor shaft and press shaft from bearing in end bell.

(3) Remove internal retaining ring from bearing bore in end bell and press out bearing assembly.

b. Reassembly.

(1) Before assembly, all parts should be cleaned and inspected to determine their serviceability. Replace all parts that are worn or damaged.

(2) Reassemble motor following a reverse procedure of the disassembly steps listed above.

7-11. REASSEMBLY OF HOIST FROM SUBASSEMBLIES.

a. General. The procedure to be followed to reassemble the hoist from subassemblies is in reverse order of the disassembly steps outlined in paragraph 7-2. Listed below are special assembly precautions which should be observed to assure proper assembly.

NOTE: Grease retained bearings (see Section VII, par. 7-2. c. (1) and fig. 7-7) have loose rollers. When reassembling hoist, make certain the correct number of rollers are held in roller cup with grease before assembling load brake shaft to hoist.

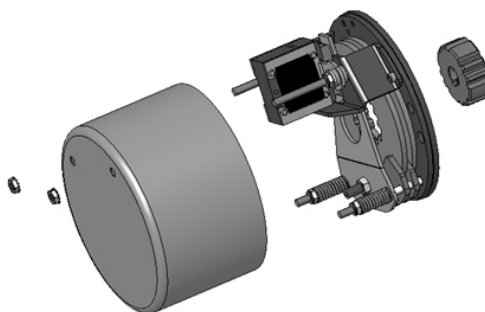
b. Assembly of Load Brake Thrust Washers. When reinstalling load brake assembly be certain thrust washers are properly installed at both ends of load brake shaft, as noted below.

(1) A bronze thrust washer with a lug on one side belongs on pinion end of shaft and must be installed so that its lug engages the special slot located on spotface surrounding bearing bore inside hoist frame or gearcase cover. Use heavy grease to hold washer in proper position in frame or cover (depending upon hoist capacity) during assembly.

(2) A 5/8" I.D. steel thrust washer is to be installed on the brake flange end (end opposite pinion) of load brake assembly.

c. Motor Brake. Check brake adjustment after first 30 days of service and regularly thereafter during the six-month inspection procedure.

Installation and Service Instructions for 54,000 Series (rev. A) Manual Adjust Brakes.



Important - Please read these instructions carefully before installing, operating, or servicing. Failure to comply with these instructions could cause injury to personnel and/or damage to property if the brake is installed or operated incorrectly.

1. Installation and servicing must be made in compliance with all local safety codes including Occupational Safety and Health Act (OSHA). All wiring and electrical connections must comply with the National Electric Code (NEC) and local electric codes in effect.

2. To prevent an electrical hazard, disconnect power source before working on the brake. Lock disconnect in the off position and tag to prevent accidental application of power.
3. Be certain power source conforms to the requirements specified on the brake nameplate.
4. Be careful when touching the exterior of an operating brake. Allow sufficient time for brake to cool before disassembly. Surfaces may be hot enough to be painful or cause injury.
5. Do not operate brake with housing removed. All moving parts should be guarded.
6. After usage, the brake interior will contain burnt and degraded friction material dust. This dust must be removed before servicing or adjusting the brake.

- Wear a filtered mask or a respirator while removing dust from the inside of a brake.
- Use a vacuum cleaner or a soft brush to remove dust from the brake. When brushing, avoid causing the dust to become airborne. Collect the dust in a container, such as a bag, which can be sealed off.

Operating Principle - When the brake coil is energized the lever arm retracts the spring force from the disc pack, allowing the friction disc to rotate with the hub and motor shaft. When power is removed the lever arm pushes down on the stationary disc and friction discs. The hub is held from rotating, and the load is held in place.

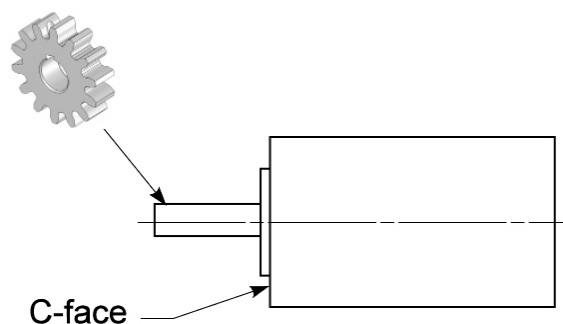
Do not release brake if there is a suspended load on the hoist hook.

Weight of load chain may be sufficient to cause entire chain to run through hoist if brake is released. Be sure chain is secured.

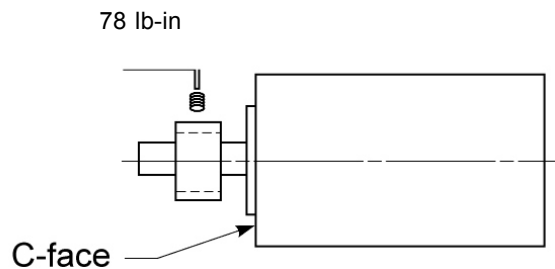
If chain is moved causing rotation of the sprocket without the electronic limit switch powered, check upper and lower limit settings before resuming normal operation.

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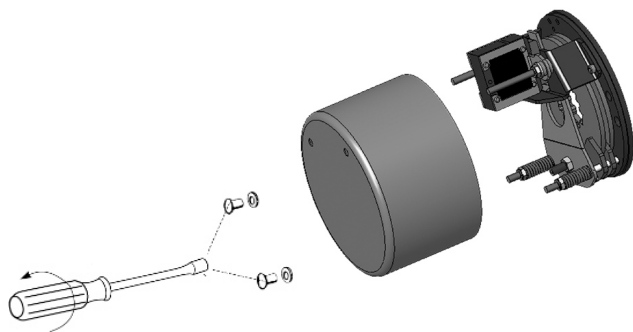
- 1 Place hub on motor shaft.



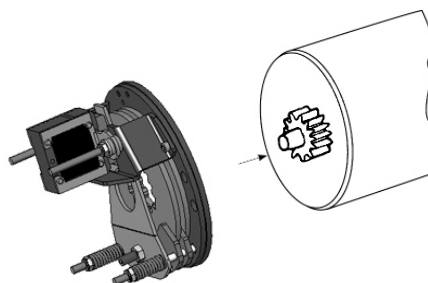
- 2 Apply Loctite 680 to set screws. Tighten set screws on motor shaft.



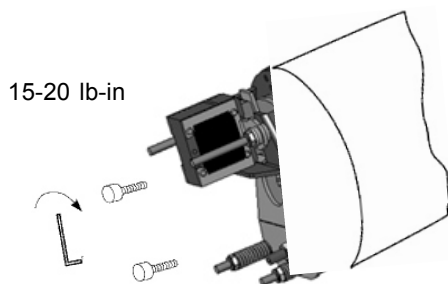
- 3 Remove brake housing and gasket.



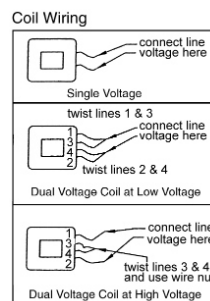
- 4 Align friction disc with splined hub and slide brake against motor face.



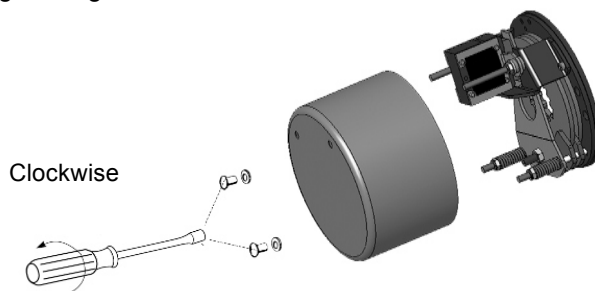
- 5 Insert mounting screws and tighten.



- 6 Connect coil leadwires to power supply. Refer to nameplate for voltage rating.*
Caution: Keep wiring away from pinch points and moving components.



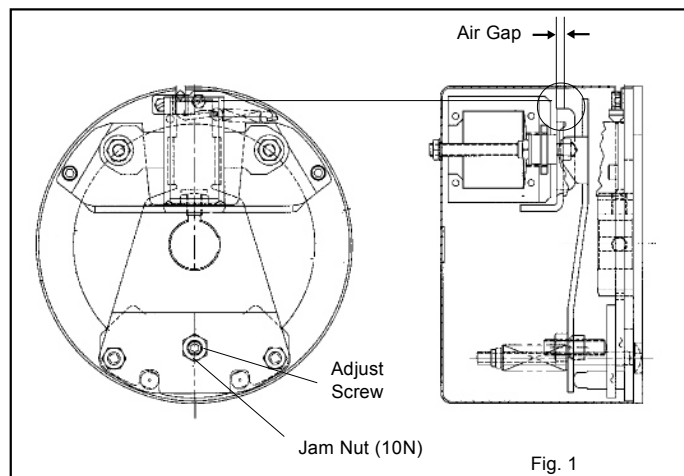
- 7 Replace brake housing and tighten to 8 lb-in.



Air Gap Adjustment

Brake air gaps are factory adjusted to .100". As friction discs wear the air gap will increase. When the gap reaches .200" it will need to be readjusted to .100".

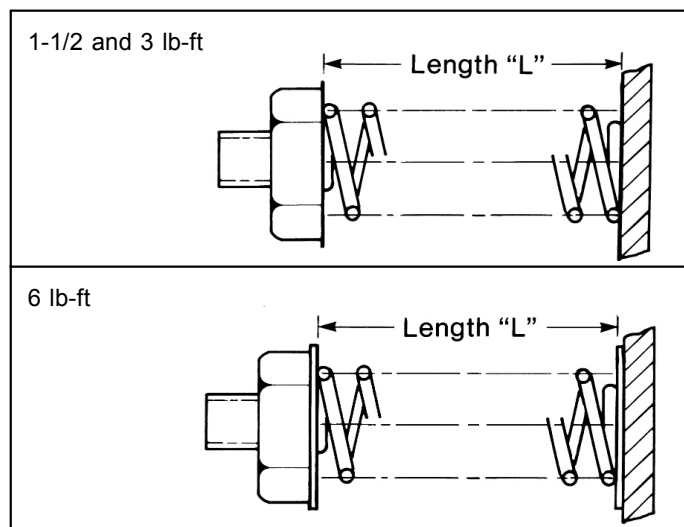
1. Loosen jam nut (10N).
2. Turn adjusting screw (10) CW until .100" gap is reached (see Fig. 1).
3. Retighten jamb nut.
4. Check air gap again...



Torque Adjustment

The brake is factory set for nominal rated torque. No further adjustment to increase torque may be made. The approximate compressed torque spring height is shown below. Torque reduction may not exceed 1 full turn in the CCW direction (1.5 lb-ft brake cannot be reduced). Note that the spring measurement for the 6 lb-ft spring is from inside the shoulder washer.

Brake Torque (lb-ft)	Length "L" (in.)	Max Torque Reduction (ccw turn of torque nut)	% Reduction
1.5	1.102	0	0
3	.954	1	15
6	1.286	1	25

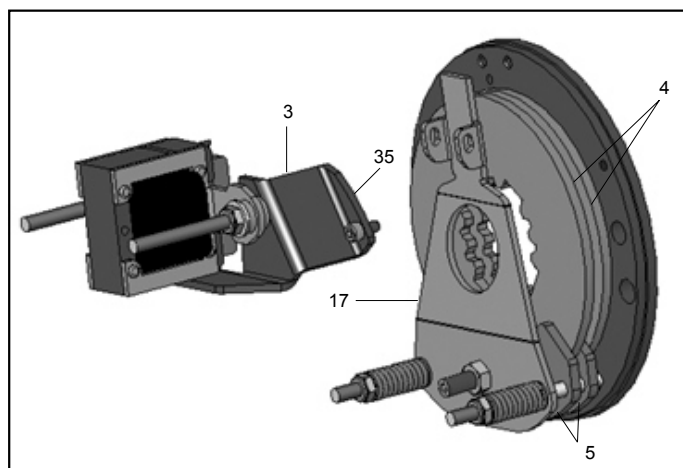


Friction Disc Replacement

Friction disc(s) should be replaced when the wear area is 3/32" thick or less.

1. Remove the two brake mounting screws and lift the brake assembly from the hub / motor.
2. Remove the two support bracket screws (3s), and lift the brake and solenoid assembly (3) off the brake.
3. Lift the lever arm (17) forward and slide the friction disc(s) out of the brake assembly.
4. Insert new friction disc(s) under the stationary disc (5). If brake has two friction discs align the center spline holes with each other.
5. Align the brake and friction disc assembly on the hub (16) and slide onto the motor. Insert and tighten the two brake mounting screws (15-20 lb-ft).
6. Reposition the support bracket assembly (3) on the brake, and retighten the two support bracket screws (3s), (52 lb-in).

Note: Air gap readjustment will be required after disc replacement.



Coil Replacement

1. Remove the two support bracket screws (3s), and lift the bracket and solenoid assembly (3) off the brake.
2. Remove the plunger guide (140) from the inside of the coil.
3. Remove the thru-bolt (160) from the leadwire side of the coil by backing off the lock-nut (210). Slide the bolt, shock mount pads and flat washer out of the way.
4. Remove the coil (12) from the solenoid frame (79) by pushing down on the coil locking tab on the side opposite the leadwires. Push the coil out of the frame.
5. Insert the new coil into the solenoid frame in reverse of the steps of removal. Insert the new plunger guide (140) into the coil, locking tabs first.
6. Position a shock mount pad (150) on both sides of the solenoid mounting bracket, and reinsert the thru-bolt (160) through the shock pads and bracket.
7. Slide a flat washer (170) over the bolt, and tighten the locknut down until the shock pads begin to flatten.