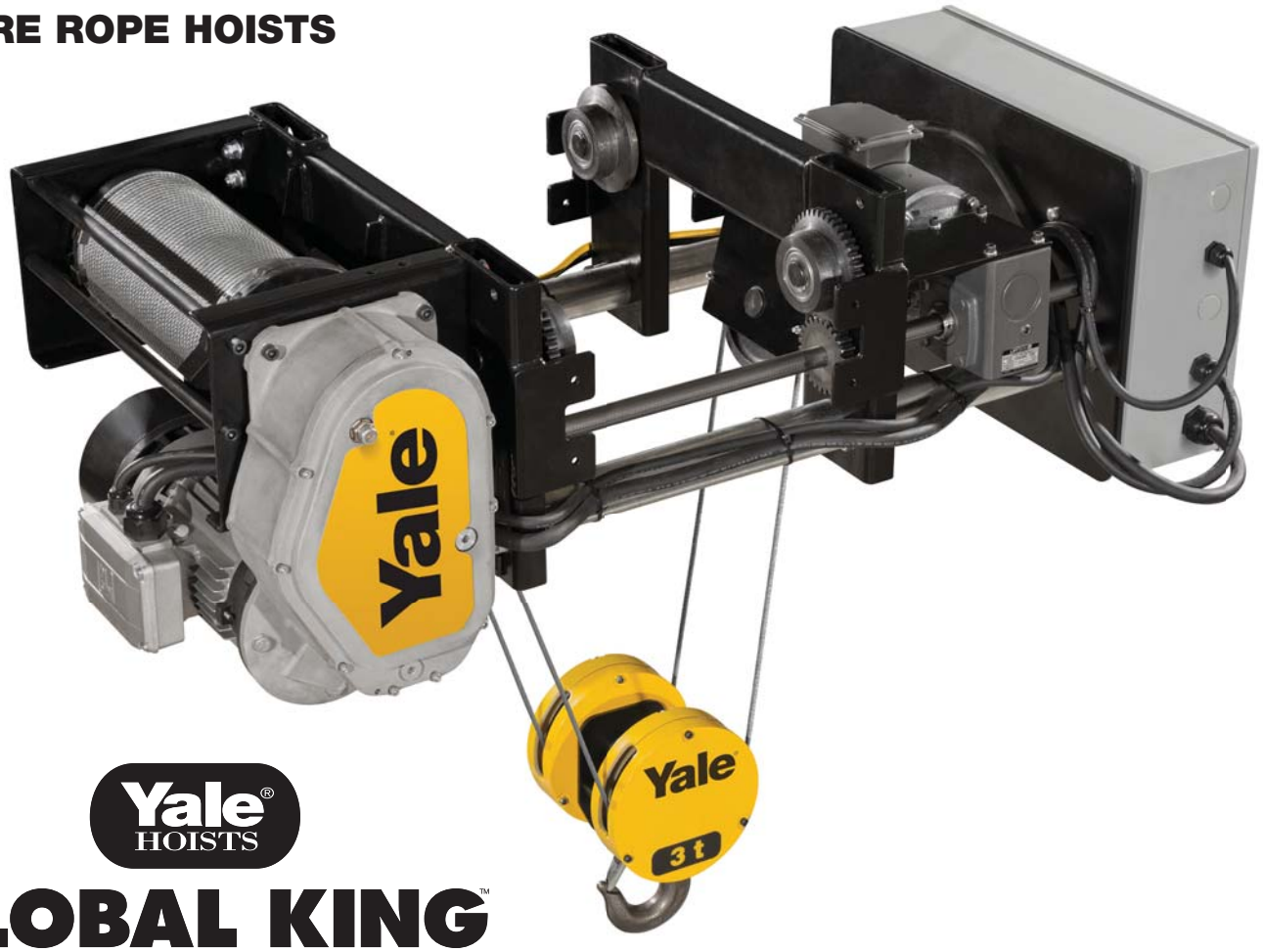
OPERATION, SERVICE & PARTS MANUAL

WIRE ROPE HOISTS



Yale® HOISTS

GLOBAL KING™

ELECTRIC WIRE ROPE HOISTS

Before installing hoist, fill in the information below.
Refer to the Hoist and Motor data plates.

Model No. _____
Serial No. _____
Purchase Date _____
Voltage _____
Rated Load _____

RATED LOADS THRU 3.2 METRIC TONNE

Follow all instructions and warnings for inspecting, maintaining and operating this hoist.

The use of any hoist presents some risk of personal injury or property damage. That risk is greatly increased if proper instructions and warnings are not followed. Before using this hoist, each operator should become thoroughly familiar with all warnings, **instructions and recommendations in this manual. Retain this manual for future reference and use.**

Forward this manual to operator. Failure to operate equipment as directed in manual may cause injury.

Yale® HOISTS

A-FRAME MODEL

October 2013

P/N: 11817505 REV. AA 10/2013

FOREWORD

This manual contains important information to help you install, operate, maintain and service your new YALE electric hoist. We recommend that you study its contents thoroughly before putting the hoist into use. We also recommend that you read Section IX - Series Lifting Equipment of the European Federation of Materials Handling and Storage Equipment (FEM) and the applicable performance and safety standards referenced therein. Then, through proper installation, application of correct operating procedures, and by practicing the recommended maintenance procedures, you can expect maximum lifting service from the hoist.

It will likely be a long time before parts information found in the Parts List is needed. Therefore, after the hoist is installed and you have completely familiarized yourself with operation and preventative maintenance procedures, we suggest that this book be carefully filed for future reference.

When ordering replacement parts from this book, it will be necessary that you include with your order: the Hoist Serial Number and Model Number that are found on the nameplate attached to the hoist as shown in Figure 4-1. For your convenience, a space has been provided on the front cover of this Manual for entering this information. We recommend that you fill it out immediately so it is readily at hand when needed.

The contents of this manual are of necessity, general in nature and may cover features not incorporated on your hoist; or, you may have ordered features not covered by this manual. Therefore, the user must exercise care in applying instructions given in this manual. If specific information not in this manual is required, contact the factory.

THE INFORMATION CONTAINED IN THIS MANUAL IS FOR INFORMATIONAL PURPOSES ONLY AND YALE 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.

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

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SECTION I - GENERAL DESCRIPTION

1-1. GENERAL

Yale “Global King” electric hoists are wire rope and drum type hoists that are manufactured with an integral trolley. These hoists are all low headroom models with the rope drum and upper block supported on opposite sides of the beam, by the trolley frame. There is one basic frame configuration for both the two and four part single reeved hoists. Both reeving configurations are referred to as “A” Frame hoists with the distinction made between reeving styles. The S4 designation refers to the 3.2 tonne (3200 kg) capacity with a four parts of rope single reeving configuration. The S2 designation refers to the 1.6 tonne (1600 kg) capacity with a two part of rope single reeving configuration. Both hoists feature an integral trolley that are offered with three different flange width ranges; 4-5/8” through 6”, 6-1/8” through 10” and 10-1/8” through 14” on a maximum flange thickness of 1-5/8”

Trolley is also available for operation on patented track beams using an optional wheel arrangement and special alignment bars.

The hoist motor is 2-speed with a 4:1 ratio between high and low speeds, as standard. The motor driven trolley has two available speeds with 1, 2 speed, or variable frequency control.

Throughout this manual, you will see references to the “S2” and “S4” Frame hoists. If you are unsure about which frame you have, count the number of rope falls that are supporting the lower block and/or see Section IV, Paragraph 4-2 for a simple gearcase measurement to determine the configuration of your hoist.

1-2. BASIC CONSTRUCTION.

Yale “Global King” hoists consist of a rugged steel frame which houses a lifting drum and serves as the suspension for carrying the entire hoist load.An aluminum gearcase, attached to one end of the drum frame, houses a triple-reduction, helical gear train. Applying power to the gearcase is a 2-speed, AC hoisting motor with a 4:1 speed ratio coupled with a 200% torque DC brake. High strength wire rope and a covered lower sheave block act as the load carrying means. Standard equipment includes a rope guide, a rotary-geared limit switch to limit hook travel in both up and down directions and an overload capacity limit switch. An optional block operated limit switch can be used to limit the upward travel of the lower block. An integral trolley, consisting of a 2-speed AC motor and a sealed worm reducer, applies torque to the trolley wheels through a cross shaft and pinion arrangement, which provides traverse motion to the hoist. A single NEMA 4/12 control enclosure houses both the hoist and trolley electrical system controls. A push button control station (purchased separately) for operating the hoist is suspended on a wire strain cable attached to the hoist.

1-3. SELECTION & APPLICATION GUIDE.

Hoist Duty Classification

Your YALE “Global King” hoist was designed to meet a specific duty classification as described by the FEM “Rules for the Design of Serial Lifting Equipment”. The methodology used to determine the duty class requirements of your specific application is shown below.

YALE “Global King” hoists are defined as “mechanisms” by the FEM and are classified as such by the following factors: **Class of Operating Time** and **Load Spectrum**. Your application must be definable by these two factors in order to determine duty classification.

Class of Operating Time

Class of Operating Time indicates the average period per day during which the mechanism is in operation, which is anytime the equipment is in motion. The Class of Operating Time is determined by calculation of the average daily operating time (average daily use):

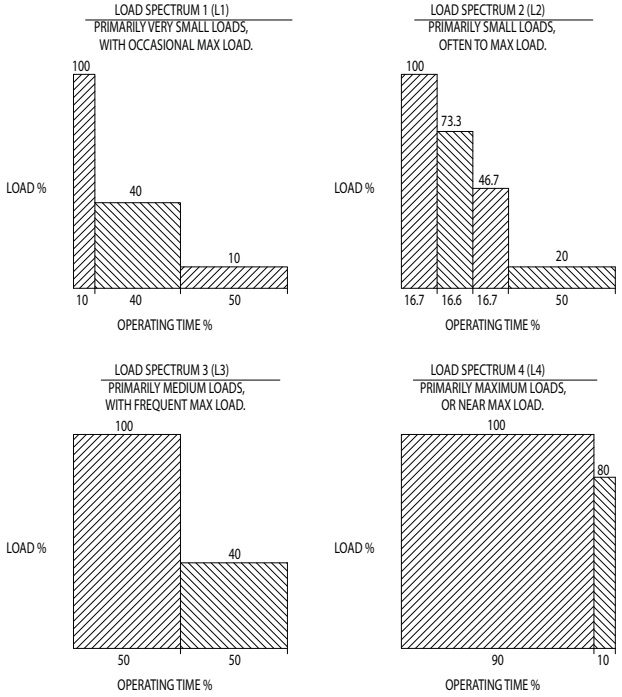
Where:

t = Average Daily Operating Time (hr/day)
H = Average Hoist Height (ft)
N = Number of Cycles Per Hour (cycles/hr)
T = Daily Working Time (hr/day)
V = Hoisting Speed (ft/min)

$$t = \frac{2 \times H \times N \times T}{V \times 60}$$

Load Spectrum

Load Spectrum indicates the extent of which the mechanism is subjected to maximum stresses (full capacity lifts) or whether it is subject to smaller loads only. Use the charts below to estimate your load spectrum. For an exact means of calculating your load



spectrum, refer to FEM 9.511 “Classification of Mechanisms”.

Once the average daily operating time, “t”, is calculated for a specific application, the Class of Operating Time can be identified. Using the Class of Operating Time along with the Load Spectrum, one can determine the duty classification requirement of the application. Defining the proposed equipment usage in this manner is critical to selecting the correct hoist for the application.

Classification of Mechanisms

Load Spectrum	Class of Operating Time				
	T2	T3	T4	T5	T6
	Average Daily Operating Time (hr/day)				
	¼ – ½	½ – 1	1 – 2	2 – 4	4 – 8
L1	1Dm	1Cm	1Bm	1Am	2m
L2	1Cm	1Bm	1Am	2m	3m
L3	1Bm	1Am	2m	3m	4m
L4	1Am	2m	3m	4m	5m

Example:

An application requires that a hoist be used to repeatedly lift and move small to medium size loads, but occasionally will be required to lift heavy loads equal to 3.2 metric tonne. This hoist will be operated daily for a single 8-hour shift and will be required to perform 15 lifting cycles per hour. The average height, which the load is lifted, is 18 ft. at a desired speed of 20ft/min.

The average daily operating time can be calculated from the above information:

$$t = \frac{2 \times 18 \times 15 \times 8}{20 \times 60} = 3.6 \text{ hr/day}$$

The description of the example application implies that the load spectrum is likely an L1 or L2. Choosing an L2 load spectrum factor and using the calculated average daily operating time, one can determine from the “Classification of Mechanisms” table above, the duty classification for this application is 2m for a 3.2 metric ton rated hoist.

For a more thorough explanation of the determination of mechanism classification, refer to FEM 9.511 “Classification of Mechanisms”.

Your YALE “Global King” hoist was designed to meet the duty classifications as described above. The standard 3.2 tonne and 1.6 tonne capacity models are rated at 2m duty classification. A 3m duty classification is available at a derated capacity.

SECTION II - INSTALLATION

2-1. GENERAL

Yale “Global King” electric hoists are lubricated and tested before being shipped from the factory. To place a hoist in service, install onto beam by adjusting appropriately for the flange width, connect to electrical service and perform pre-operation tests and checks.

⚠ WARNING

Only qualified personnel with proper supervision shall install the hoist on the monorail and perform the final pre-operation inspection.

⚠ WARNING

Working in or near exposed energized electrical equipment presents the danger of electric shock.

TO AVOID INJURY:

DISCONNECT POWER AND IMPLEMENT LOCKOUT/ TAGOUT PROCEDURE BEFORE REMOVING COVER OR SERVICING THIS EQUIPMENT.

2-2. Installing Hoist

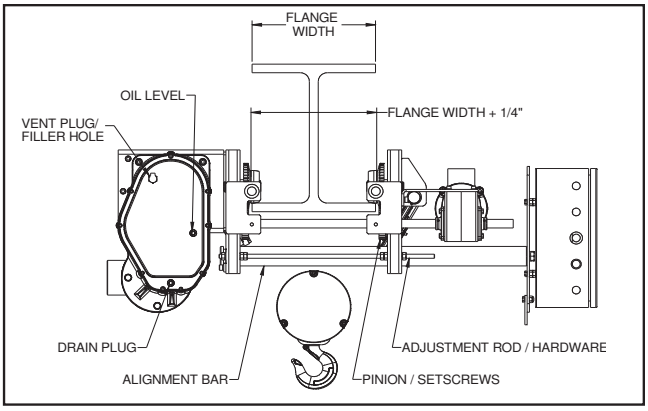


Figure 2-1. Trolley Wheel Spacing

OPEN-END BEAM:

If the trolley can be installed directly from the end of the supporting beam, adjust the spacing between the trolley wheel flanges to be 3/16”-1/4” greater than the exact width of the beam flange (See Figure 2-1). Before adjusting the width of the trolley frame, make sure to loosen the pinion set screws on the keyed cross shaft nearest the traverse drive reducer. Do not lose the keys for the pinion during adjustment. Also, the electrical conduit/ cable must not be constrained when attempting to adjust the trolley sides, in or out. The trolley width is adjusted by loosening the jam nuts on the traverse drive side of the threaded rods at each end of the hoist. If necessary, lubricate the frame alignment bars with penetrating oil before attempting to adjust trolley width. The trolley side may then be pushed or driven into position by turning the adjusting nuts on the threaded rods. Adjust nuts on each side of the hoist simultaneously, to avoid binding. After adjusting the trolley to the proper width, tighten all adjusting nuts and setscrews, and re-secure the electrical conduit/cable. Verify that the geared wheels mesh properly with the traverse drive pinions. Using proper equipment, carefully lift the hoist and install on the end of the beam. Lubricate the wheel gear and all pinions (WG, Section IV, Paragraph 4-5).

When hoists are adjusted or repaired in the field, all set screws must return to the original settings from the manufacturer. This is done by following the below instructions:

1) Apply Loctite 242 to the threads and install the setscrews back into the proper location

2) Tighten setscrews for the traverse pinion gear down onto the key and shaft to 70 in-lbs before beginning the use of the hoist

CLOSE-END BEAM:

NOTICE

Loosen all electrical cable or conduit attached to the frame and alignment bars before adjusting trolley width. Ensure that the electrical cable is not stretched, pinched, twisted or otherwise damaged when adjusting trolley width.

For trolleys which are to be mounted along the span of a beam not having open ends, the trolley must be adjusted in the same manner as described above to a width that allows clearance between the axle ends and the beam flange. Using proper lifting equipment, the trolley and hoist must then be lifted to the beam where it is to be installed. Once in position, adjust the spacing between the trolley wheel flanges to be 3/16”-1/4”” greater than the exact width of the beam flange (See Figure 2-1). After tightening all adjusting bolts, set screws, and all electrical conduit/cable clamps, carefully set the trolley on the beam. Lubricate the wheel gear and all pinions (WG, Section IV, Paragraph 4-5).

2-3. CONNECTING HOIST TO ELECTRICAL SERVICE

Electrical service to the hoist may be power cable or a guarded system having sliding shoe or wheel type collectors.

Follow ANSI/NFPA 70, state, and local electrical codes including the grounding provisions thereof when providing electrical service to the hoist.

Make electrical connections using the appropriate wiring diagrams furnished with the hoist. Only qualified journeyman electricians shall make any electrical connections, including connections to collectors or power cord.

⚠ WARNING

Be certain that electrical power supply is OFF and locked in the open position before attempting any electrical connections to the hoist. This equipment must be effectively grounded according to the National Electric Code ANSI/ NFPA 70, or other applicable codes.

⚠ CAUTION

Power supply to hoist and trolley must be the same voltage, frequency, and phase that are specified on the hoist and trolley nameplate.

2-4. PRE-OPERATIONAL CHECKS

a) Check Oil Level. (Figure 2-1) The gearcase has been filled with oil to the proper level. However, this should be rechecked before operating the hoist.

Check oil level by removing the oil level plug indicated in Figure 2-1. When properly filled, oil should be level with the bottom of the tapped hole. Fill to this level with oil as specified in Paragraph 4-2.e.

b) Check all connections for tightness of bolts, inclusion of lock washers or other type fasteners to ensure correct components have been used. This check must be made for all connections: mechanical, structural and electrical, including both field and factory-made connections.

c) Check to ensure that all shipping supports, tie-downs, brackets or other items used only for shipping or storage purposes are removed from the equipment.

d) Check Push Button Operation and Phasing. To properly check the phase of the hoist, follow these steps:

(1) With “POWER OFF”, operate all the push buttons and determine that they do not bind or stick in any position.

(2) Connect hoist to power source.

⚠ WARNING

If any push button binds or sticks in any position - DO NOT TURN POWER ON - determine the cause and correct the malfunction before operating.

(3) Operate “UP” button briefly to determine direction of hook travel.

(4) If hook raises when “UP” button is depressed, phasing is correct.

(5) If hook lowers when “UP” button is depressed, hoist is “Reverse Phased.” TURN AND LOCK POWER OFF and check the pushbutton wiring. If the pushbutton was wired properly, correct the problem by interchanging any two leads at power source connection. Do not change internal wiring of hoist.

⚠ WARNING

On three phase hoists, it is possible to have “Reverse Phasing” causing the block to lower when the “UP” button is depressed. When this condition exists, the automatic limit switch is inoperative and hoist operation will be dangerous.

e) Check Lower Block and Hoisting Cable. Depress “DN” push button and run lower block to its lowest position. No less than two wraps shall remain on the drum with the loaded hook in its lowest position. Also check to see that the lower block and rope do not twist excessively. If it does twist to the extent that two ropes rub against each other, disengage the swaged rope end from the frame anchor and twist the rope four or five turns in a direction opposite to that which the block turns. Reconnect rope to the frame anchor, holding firmly to eliminate rope twisting back to its original position. Operate hoist up and down a few times. If lower block still rotates excessively, repeat process until twisting is corrected.

f) Lubricate Hoisting Cable. For longer cable life, it is recommended that the cable be lubricated at time of installation by applying a heavy coating of lubricant CL (Para. 4-7) as outlined in SECTION IV, Paragraph 4-3.

g) Check Limit Switch Operation.

(1) A geared rotary type upper and lower limit switch is provided as standard equipment on YALE “Global King” hoists. This switch is adjustable and although preset by the factory, it should be adjusted at time of installation to the desired high and low limits of lower block travel. Refer to SECTION VII, Paragraph 7-3.

(2) A block operated upper limit switch can be furnished as optional equipment on YALE “Global King” hoists. This limit stop is factory set to stop the lower block at the safest high position, guarding against over travel and possible damage to hoist. Minimal adjustments can be made. When equipped with this option, the hoist should be tested by jogging the lower block against the limit switch actuator arm to assure the switch is functioning properly. When the lower block lifts the actuator, the hoist will automatically stop. If the lower block coasts through the limit switch when lifting, a reversing switch will automatically close and reverse direction of motion to lowering.

h) An overcapacity limit switch is provided as standard equipment on YALE “Global King” hoists. This switch is adjustable and although preset by the factory, it should be adjusted at the time of installation to the desired setting. Refer to SECTION VII, Paragraph 7-4.

i) When first using the hoist and trolley, operate with lighter loads through full travel before applying maximum load.

⚠ WARNING

Damage to the hoist, a dropped load, and injury may result if limit switches fail due to improper use.

TO AVOID INJURY:

UNDER NORMAL OPERATING CONDITIONS, STOP HOIST TRAVEL BEFORE ENGAGING LIMIT SWITCHES. LIMIT SWITCHES ARE SAFETY DEVICES AND SHOULD NOT BE USED AS NORMAL OPERATING CONTROL.

⚠ WARNING

Some hoists may be shipped with the electrical controls loose (disconnected) and will not have the upper and lower limit switches connected. DO NOT OPERATE HOIST UNTIL LIMIT SWITCHES ARE PROPERLY CONNECTED AND ADJUSTED. Failure to do so may allow hoist to be operated beyond proper travel limits, which can cause load to drop, resulting in damage to equipment or injury.

SECTION III - OPERATION

3-1. GENERAL

Operation of YALE "Global King" hoists is controlled by a convenient pendant push button station. With it, the hoist can be controlled to give fast lifting and lowering; or controlled to lift or lower the load in small increments, providing accurate positioning capability. The push button station has a built-in interlock to prevent depressing opposing buttons simultaneously.

When first using the hoist, break in by operating under lighter loads to full travel before applying maximum load.

3-2. PUSH BUTTON OPERATION

a.) For the hoist motion depress push button marked "UP" to raise load.

b.) For the hoist motion depress push button marked "DN" to lower load.

c.) For the trolley traverse motion:

With two speed control depress buttons marked "<<" , ">>" or "N", "S" to activate the trolley traverse motion

With one speed control depress buttons marked "<" , ">" or "N", "S" to activate the trolley traverse motion.

d.) On two-speed hoist or trolley motions, partial depression of a button operates hoist or trolley at slow speed; depressing button completely operates hoist or trolley at full speed.

NOTICE

Excessive "jogging" will cause premature burning of contact tips, motor overheating and premature brake wear.

3-3. OPERATING PRECAUTIONS

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 prevent injury to personnel and damage to equipment.

⚠ WARNING

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

a) **DO** read applicable sections of FEM Section IX, Series Lifting Equipment 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 the controls. If opposite direction occurs, see Pre-Operation Checks, Section II, Paragraph 2-4.b.

d) **DO** make sure hoist limit switches function properly.

e) **DO** maintain firm footing when operating hoist.

f) **DO** make sure that the load slings or other approved attachments are properly sized and seated in the hook saddle.

g) **DO** make sure that the hook latch is closed and not supporting 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's 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 wire rope 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.

r) **DO** apply lubricant to the wire rope as recommended.

s) **DO NOT** lift more than rated load.

t) **DO NOT** use the hoist load-limiting device to measure the load.

u) **DO NOT** use damaged hoist or hoist that is not working properly.

v) **DO NOT** use the hoist with twisted, kinked, damaged, or worn wire rope.

w) **DO NOT** lift a load unless wire rope is properly seated in its groove(s).

x) **DO NOT** use wire rope as a sling or wrap rope around the load.

y) **DO NOT** lift a load if any binding prevents equal loading on all supporting ropes.

z) **DO NOT** apply the load to the tip of the hook.

aa) **DO NOT** operate unless load is centered under hoist.

bb) **DO NOT** allow your attention to be diverted from operating the hoist.

cc) **DO NOT** operate the hoist beyond limits of wire rope travel.

dd) **DO NOT** use limit switches as routine operating stops unless recommended. They are emergency devices only.

ee) **DO NOT** use hoist to lift, support, or transport people.

ff) **DO NOT** lift loads over people.

gg) **DO NOT** leave a suspended load unattended unless specific precautions have been taken.

hh) **DO NOT** allow sharp contact between two hoists or between hoist and obstructions.

ii) **DO NOT** allow the rope or hook to be used as a ground for welding.

jj) **DO NOT** allow the rope or hook to be touched by a live welding electrode.

kk) **DO NOT** remove or obscure the warnings on the hoist.

ll) **DO NOT** adjust or repair a hoist unless qualified to perform hoist maintenance.

mm) **DO NOT** attempt to lengthen the wire rope or repair damaged wire rope.

nn) **DO NOT** allow personnel not physically fit or properly qualified, to operate hoist.

oo) **DO NOT** operate hoists unless hook moves in the same direction as indicated on the push button. If opposite direction occurs, see pre-operation checks, Section II Paragraph 2-4.b.

pp) **DO NOT** operate hoist unless limit switches are operating properly.

qq) **DO** avoid operating hoist when hook is not centered under hoist. Avoid side pulls and swinging of load or load hook when traveling hoist.

rr) **DO** operate hoist within recommended duty cycle and **DO NOT** "jog" unnecessarily.

ss) **DO** conduct regular visual inspections for signs of damage and wear.

tt) **DO NOT** operate hoist with hooks that have opened up. See Section V, Paragraph 5-2.f.

uu) **DO** provide supporting structure that has an appropriate design factor based on the load rating and dead weight of the hoist. If in doubt of the supporting structure's strength, consult a structural engineer.

vv) **DO NOT** use hoist in location that will not allow operator movement to be free of the load.

⚠ WARNING

DO NOT operate hoist with the hoisting rope out of the drum grooves. Such operation may result in damage to the rope guide and rope and could result in the rope breaking. This may result in dropping the load that can cause damage to equipment and injury to operator or other personnel. Hoist rope will remain in the drum grooves during operation under normal operating conditions, however, slack or kinked rope, excessive side pulls, swinging or jerking of load, or similar abuse, may cause damage to the rope guide causing the rope to leave the grooves.

ww) **DO**, when starting to lift, 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 and that the load is supported in the center of the base/bowl/saddle of the hook.

xx) **DO** observe recommended inspection and maintenance procedures.

yy) **DO** use common sense and best judgment whenever operating a hoist.

zz) **DO NOT** remove drop lugs. Removal will create an unsafe operating condition.

aaa) **DO NOT** lift guided loads.

SECTION IV - LUBRICATION

4-1. GENERAL

The lubrication services outlined in Paragraphs 4-3 thru 4-6 should be performed before initial operation of the hoist. The lubrication services outlined in Paragraphs 4-2 thru 4-6 should be performed at regular intervals at least every six (6) months, coinciding with spring and fall seasons is recommended. The reason for this is that on hoists installed outside or in unheated areas a "cold test" oil is required in such (below freezing) climates making seasonal changes necessary.

4-2. CHANGING GEARCASE OIL

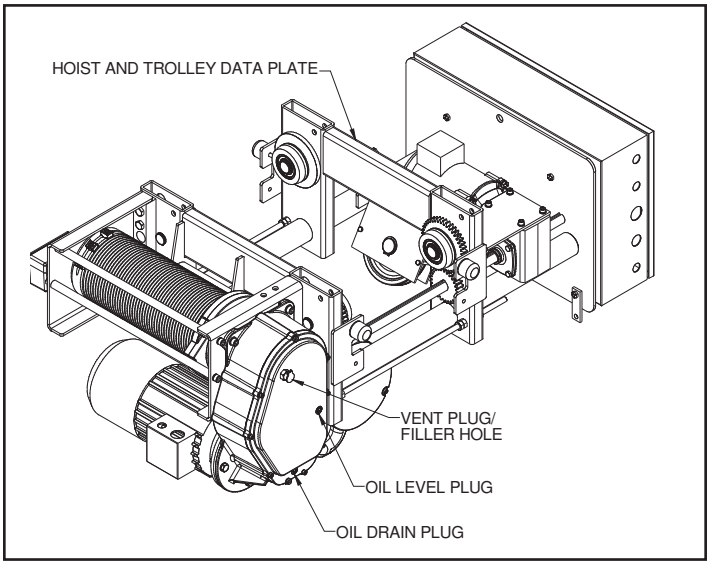


Figure 4-1. View of Hoist Showing Location of Name Plates and Oil Plugs

a) Add 5% solution of Mobilsol A (or equivalent) to the oil and run for a short time. This will clean components and hold particles in suspension for draining.

b) Remove oil drain plug from bottom of gearcase and drain oil out. Dispose of oil in accordance with local environmental codes.

⚠ CAUTION

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.

c) Reinstall drain plug.

d) Remove oil level plug from front of gearcase cover.

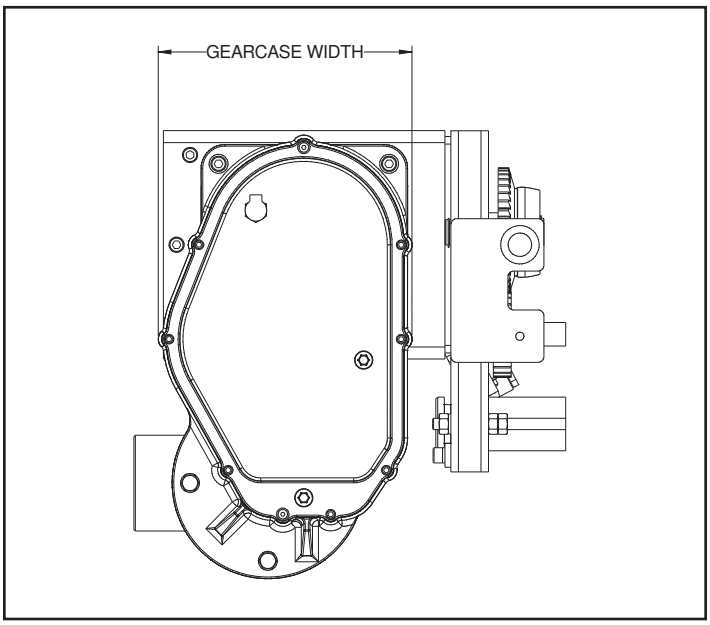


Figure 4-2. Gearcase Width Illustration

e) Refill through filler hole to proper level (bottom of oil level plug hole) using GCOH (Paragraph 4-7). The amount of oil required depends on the overall size of the gearcase. Both versions of the "A" Frame hoist utilize the same size gearcase, although their contents differ. To confirm the version of your gearcase refer to Figure 4-2. Your gearcase should have a similar shape to that shown and will measure 10 in width and requires approximately 3 quarts of oil.

4-3. LUBRICATION OF HOISTING CABLE

Hoists are shipped from the factory without an exterior coating of grease on hoisting cable. It is recommended that the cable be thoroughly coated at installation and kept well lubricated with CL (Paragraph 4-7).

4-4. LUBRICATION OF LIMIT SWITCH

Provide a light film of grease MPG (Paragraph 4-7) on bevel gear of rotary geared limit switch.

4-5. LUBRICATION OF GEARED TROLLEY WHEELS AND PINIONS

At installation and periodically, apply grease WG (Paragraph 4-7) to the traverse drive pinions and the gears of the trolley wheels.

4-6. LUBRICATION OF ROPE GUIDE

a) Maintenance. The rope guide is made of a molded self-lubricated reinforced nylon material. It is lubricated prior to installation at the factory and requires only periodic inspection.

(1) Periodically re-grease with MPG (Paragraph 4-7) by applying grease to the leading edge of the guide and rope drum.

(2) Every 6 months, the rope guide should be removed per Section V, Paragraph 5-5, cleaned and inspected. When reassembled, the rope guide should be thoroughly greased with MPG (Paragraph 4-7) and the hoist run up and down to lubricate both the drum and the wire rope.

NOTES

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)
GCOH	AGMA Lubricant	No. 6	No. 7 EP	No. 7
Gear Case Oil Hoise Gearcase	Viscosity @ 100° F	1335-1632 SUS	1919-2346 SUS	1919-2346 SUS
	Viscocity Index	154	95	158
	Pour Point	-40° F	20°F	-37°F
	Mobil® Oil Corp	Mobil® SHC 632	Mobilgear® 634	Mobil® SHC 634
	Shell® Oil Corp	Omala® RL 320	Omala ® 460	Omala® RL 460
	Texaco® Inc.	Pinnacle® 320	Meropa® 460	Pinnacle® 460
SG	NLGI Grease	No.1		
Spline Grease	ASTM D217 Worked Penetration	310-340		
	Dropping Point	320°F (160°C)		
	Base	Lithium		
	Mobile® Oil Corp.	---------- Mobilux® EP 111 ----------		
WG	Viscocity @ 100° F	25,000 SUS (contains diluent)		
Wheel Gear and Pinion Grease	Mobil® Oil Corp.	---------- Molitac® 375 NC ----------		
	Texaco® Inc.	---------- Crater H® ----------		
CL	No Specification			
Cable Lubricant Wire Rope Lubricant	Amoco® Oil Co.	---------- Amovis® 5-X ----------		
	Mobil® Oil Corp.	---------- Mobilarma® 798 ----------		
	Sun® Oil Corp.	---------- Sunoco® Wire Robe Lubricant ----------		
	Texaco® Inc.	Crater A	Texclad® 2	
GO	AGMA Lubricant	No. 1	No. 2	
General Oil General Oiling to Prevent Rusting an Provide Limited Lubrication for Points Not Considered Normal Wear Points	Viscosity @ 100° F	193-235 SUS	284-347 SUS	
	Viscosity Index	60 Min.	60 Min.	
	Pour Point	-20°F (-29°C)	10°F (-12°C)	
	Amoco® Oil Co.	Rykon® Oil 46	American Industrial Oil® 68	
	Mobil® Oil Corp.	----------Mobil® DTE Oil Heavy----------		
	Shell® Oil Co.	Rotella® 10W	Rotella® 10W-30	
	Sun® Oil Co.	Sunvis® 932	Sunvis® 968	
	Texaco® Oil Inc.	Rando® Oil 46	Rando® Oil 68	
MPG	NLGI Grease	No.1	No. 2	
Multipurpose Grease Grease Lubricated Wear Points Provided	6ASTM Worked Penetration	310-340	265-295	
	Dropping Point	360°F (182°C)	360°F (182°C)	
	Base	Lithium	Lithium	
	Amoco® Oil Co.	Amolith® Grease 1 EP	Amolith® Grease No. 2 EP	
	Mobil® Oil Corp.	Mobilith® AW1	Mobilith® AW 2	
	Shell® Oil Co.	----------Retinax LC----------		
	Sun® Oil Co.	Presitge® 741 EP	Sunoco® Multipurpose 2	
	Texaco Oil Inc.	Multifak® EP 1	Multifak® EP 2	
GCOT	AGMA Lubricant	No. 7 or 7C (Compounded)	No. 8 or 8C Compounded	Refer to YALE Hoist Field Service Department for Gearcase **Operating Temperatures** above **125° F**
Gear Case Oil Traverse Gear Case	ISO Viscosity Grade	460	680	
	Amoco® Oil Corp.	Worm Gear Oil	Cylinder #680	
	Mobil® Oil Corp.	Mobil® SHC 643 Synthetic, Mobil® 600W	Mobil® SHC 634 Sythetic, Extra Hecla Super	
	Shell® Oil Co.	Valvata® J460	Valvata ® J680	
	Texaco Oil Inc.	Meropa® 460	Meropa® 680	

SECTION V - INSPECTION AND PREVENTIVE MAINTENANCE

5-1. GENERAL

All YALE “Global King” hoists are inspected and tested at the factory. Regular in-service inspection and preventative maintenance programs not only help reduce overall maintenance costs but may also prevent service 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 hoist.

Many factors influence the inspection and preventative maintenance program required for your hoist. Frequency and severity of service and 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 outlined in this section to meet his specific conditions.

The inspection and maintenance intervals outlined in this section are considered a minimum. Recommended in the schedule are minimum inspection and maintenance intervals based on average daily use in a normal environment. Your YALE “Global King” hoist was designed to meet a specific duty classification as described by the FEM “Rules for the Design of Serial Lifting Equipment” and is to be used in accordance with the duty rating identified on the equipment nameplate. For more details regarding hoist duty cycles and average daily use, please reference FEM Section IX, Series Lifting Equipment or the Hoist Duty Classification page in this manual.

Environmental conditions in which the hoist operates are also important considerations for the user, when adjusting hoist inspection and maintenance programs to local conditions. Frequency of inspection and maintenance must be increased if hoist is subjected to severe atmospheric environmental conditions, such as corrosive vapors, extreme heat or cold, cement or dust and other airborne contaminants. The user should carefully consider all environmental conditions and adjust frequency and degree of maintenance for his local conditions. Consult the factory’s Field Service Department for advice regarding unusual environmental conditions.

Various codes also regulate inspection and maintenance programs. Attention must be given to applicable federal standards, OSHA regulations, national standards, state and local codes which may include mandatory rules relating to hoist inspection and maintenance. The user should become familiar with all applicable codes for his area and be guided accordingly.

Listed on the Recommended Inspection and Maintenance Schedule are inspection frequencies and requirements. Perform these inspections regularly as scheduled and additional inspections as may be required for activity, service, and environment of your hoist. The hoist operator must be responsible for determining the operating conditions and severity of service.

Inspection Schedule and Maintenance Report Form.

Shown on page 12 of this manual is a recommended Inspection Schedule and Maintenance Report form that lists various components of the hoist. The form also includes trolley components, runway components, and miscellaneous items. This form is suggested as a guide for written inspection reports. Inspections are recommended each month and should be performed thoroughly enough to inform the hoist user of deficiencies for any item listed. This form does not supersede the Inspection and Maintenance Schedule listed on page 11 of this manual but may be used to record scheduled inspection and maintenance services required.

The user should revise the inspection interval, add additional units or provide a similar form to suit particular conditions that may exist. However, written, dated and signed inspection reports should be maintained particularly on critical items such as hoist hooks, hoisting rope, sheaves, drums and brakes. Periodic review of old inspection reports can point out service life of hoist components, forecasting need for adjustment, repair or replacement of these components.

As a matter of expedience, appointed maintenance personnel inspecting hoist can also take care of minor adjustments, repairs and cleaning, where required. Note column on Inspection Schedule and Maintenance Report form headed Corrective Action and Notes. When corrective action is made during inspection, note condition of part or unit as inspected in appropriate Condition column with a check mark (Ö). Note “during inspection” corrective action taken and date in space provided. In this manner, items requiring further attention will be checked (Ö) without showing corrective action. This will advise the person responsible for hoist operation and safety, or whoever reviews the inspection 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.

⚠ WARNING

Deficiencies may be hazardous to personnel and equipment. Do not operate a hoist 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 hoist operation and safety or an inspector appointed by this person.

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

All YALE “Global King” hoists are equipped with a Pulse™ monitor, which is wired into the control circuit in the control enclosure. This equipment consists of a circuit board, a serial communications port, and onboard memory, which will retain data even when the hoist is removed from power. The Pulse monitor takes the “pulse” of the equipment by recording the most recent hoist activities including all normal operation events, motor starts, overcapacity lifts and thermal overload events. In addition, the monitor records the total cumulative operating time and motor starts for the life of the equipment. Each Pulse monitor is programmed with the equipment serial number at the factory.

Data may be downloaded from the monitor, via the serial communications link, by a certified technician. Pulse monitor data may be used to determine equipment usage and to verify that the application does not exceed the hoist duty rating as identified on the equipment nameplate. The data can also be helpful in establishing and scheduling preventative maintenance as well as an aid in troubleshooting the equipment. For additional information refer to the Pulse monitor manual (P/N 11817503) sent with this manual.

RECOMMENDED INSPECTION AND MAINTENANCE SCHEDULE	
TIME INTERVAL	**INSPECTION OR MAINTENANCE**
Daily or start of each shift (visual)	*Check operation of all functional mechanisms including limit switch operation, brakes and control. Check hoist cable for kinks, abrasions, corrosion or broken wires or evidence of improper spooling on drum. Inspect hooks, upper and lower blocks, and all load bearing components for damage.
1 Month	*HOIST CABLE - Inspect per Paragraph 5-6 and lubricate per Paragraph 4-3.
1–3 Months	*ELECTRICAL CONTROLS - Inspect per Paragraph 5-4. Check hoist gearcase oil level - add oil as required per Paragraph 4-2.e.
6 Months	*LOWER BLOCK -Inspect per Paragraph 5-2. *UPPER BLOCK -Inspect per Paragraph 5-3. *ROPE GUIDE-Inspect per Paragraph 5-5. *OVER-CAPACITY LIMIT SWITCH-Inspect per Paragraph 5-13. *BLOCK OPERATED LIMIT SWITCH (if equipped)-Inspect per Paragraph 5-12. Lubricate hoist cable per Paragraph 4-3. Lubricate upper and lower hook block, Lubricate outboard bearing cartridge at grease fitting, Add a light film of MPG grease to the bevel gear in the screw type limit switch per Paragraph 4-7.
Annually	*Complete inspection. Motor brake and actuating mechanisms inspected and adjusted per Paragraph 5-10. Inspect hooks with crack detecting procedures per Paragraph 5-2.

Hours of "On" Time			
Load Spectrum	**Hoist Duty**		
	2m	**3m**	
L1	12500	25000	*Complete inspection, disassembly and maintenance required. It is recommended that your YALE repair Station be contacted for this service.
L2	6300	12500	
L3	3200	6300	
L4	1600	3200	

NOTES

INSPECTION SCHEDULE AND MAINTENANCE REPORT

HOIST SERIAL NO. (MFGRS) _____ **CUSTOMER CRANE IDENTITY NO.** _____

RATED LOAD _____ **LOCATION IN PLANT** _____

TYPE _____ **THIS INSPECTION IS MONTHLY ☐ ANNUAL ☐**

VOLTAGE _____ **SEMI-ANNUAL ☐**

INSPECTED BY: _____ **DATE** _____

Component, Unit Or Part and Location		* Recommended Inspection Interval			CONDITION (Check column best indicating contition 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	○										
	Motor Brake	○										
	Mechanical Load Brake	○										
	Overload Clutch	○										
	Couplings	○										
	Gears, Shafts, & Bearings	○										
	Upper Block	○										
	Lower Block	○										
	Hook & Throat Opening	●		X							Record Hook Throat Opening	
	Hoist Rope	●										
	Rope Drum		○									
	Rope Guide		○									
	Guards	○										
	Limit Switch											
CONTROL STATION OR PUSH BUTTON	Pushbutton		○									
	Wiring		○									
TROLLEY	Motor	○										
	Brake (when so equipped)	○										
	Couplings	○										
	Gears, Shafts, & Bearings	○										
	Frame			○								
	Wheels		○									
	Bumpers		○									
	Guards		○									
	Conductors	○										
	Collectors	○										
RESISTORS	Hoist		○									
	Trolley		○									
RUNWAYS	Monorail Joints		○									
	Monorail		○									
	Main Conductors	○										
	Main Collectors	○										
MISC.	General Condition		○									
	Load Attachment Chains	●										
	Rope Slings & Connections	●										
	Change Gearcase Lub.			○								
	Grounding Faults		○									

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

Typical Inspection Schedule and Maintenance Report form.
User must adjust inspection interval and components to suit his individual conditions and usage. 12375gwr

⚠ WARNING

Do not operate a hoist having unusual vibrations, sounds, or with anything visibly or otherwise wrong. Danger may be present that the hoist operator cannot see. Determine and correct the cause of unusual conditions and make certain hoist can be operated safely.

5-2. INSPECTION OF LOWER BLOCK
Refer to the Section IX, Figure 9-4. Lower Block Assembly.

a) Check lubrication of all parts. Also lubricate the shank of the hook that passes through the crosshead. If the thrust bearing is removed, apply MPG grease (Section IV, Paragraph 4-7).

b) Check each sheave to insure rope groove is smooth and free from burrs, or other surface defects.

c) Check each sheave for freedom of rotation; replace bearings if defective.

d) Make certain that the spring pin holding the hook nut to the hook is securely in position.

e) If hook is equipped with a hook latch or rotational lock, check to determine that they are in good operating condition.

f) Check throat opening of the hook. (Refer to Figure 5-2.) It is recommended that upon receipt of the hoist, a 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. We suggest that a gage block properly identified to the hoist, similar to the one shown in Figure 5-2, be made for each hook for use in these measurements.

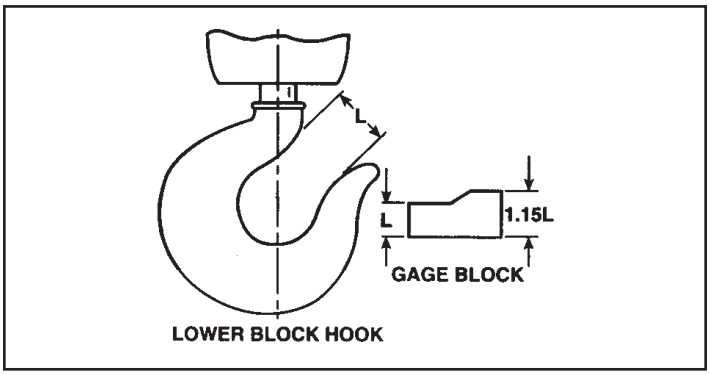


Figure 5-2. Gage Block

g) Hooks showing signs of cracks must be replaced. Hooks should be inspected at least once per year using dye penetrants, magnetic particle, or other suitable non- destructive test methods.

h) Check wear of the hook, especially at the saddle and replace if worn more than 10% of original dimensions.

5-3. INSPECTION OF UPPER BLOCK
Refer to the Section IX, Figure 9-5. Upper Block Assembly.

a) Check upper block sheaves for wear, damage and freedom of rotation. If sheaves do not rotate freely, disassemble block and inspect bearings. Replace worn or damaged bearings, washers, pins, or sheaves.

b) Make certain that all sheaves, bearing and hanger pins are free of foreign material. Bearings without grease fittings are lubricated for the life of the bearing and require no further lubrication.

c) Make certain that the rope retention bolts are not bent, loose or otherwise distorted; bolts must have close clearance to sheave flange to keep rope in sheave grooves.

5-4. INSPECTION OF ELECTRICAL CONTROLS

Arrangement of electrical control equipment varies with the type of control, physical space and the optional control features ordered with the hoist.

Note the location in the electrical enclosure of the control circuit fuse, transformer, limit stop switches and the hoist contactors. Trolley contactors and optional hoist and trolley fuses are also located in this enclosure.

Use wiring diagrams furnished with hoist to determine electrical components on your hoist; then determine component location and identity on your hoist.

⚠ WARNING

Be certain that main power switch is locked in open position (OFF) before opening hinged control enclosure cover mounted to the counterweight.

a) Open hinged control panel enclosure cover mounted to the counterweight and inspect wiring and terminals. Terminals should be securely crimped to wires and insulation sound. Terminal screws should be tight.

b) Check condition of contactor assembly, transformer, and upper limit switches.

5-5. INSPECTION OF ROPE GUIDE

a) General. The rope guide is intended to help prevent the rope from “back-winding” and to hold the rope in the proper groove. Side pulling and excessive load swing will severely damage the rope guide and must be avoided.

⚠ WARNING

Side pulling and excessive load swing will severely damage the rope and rope guide. Failure of these components may result in injury.

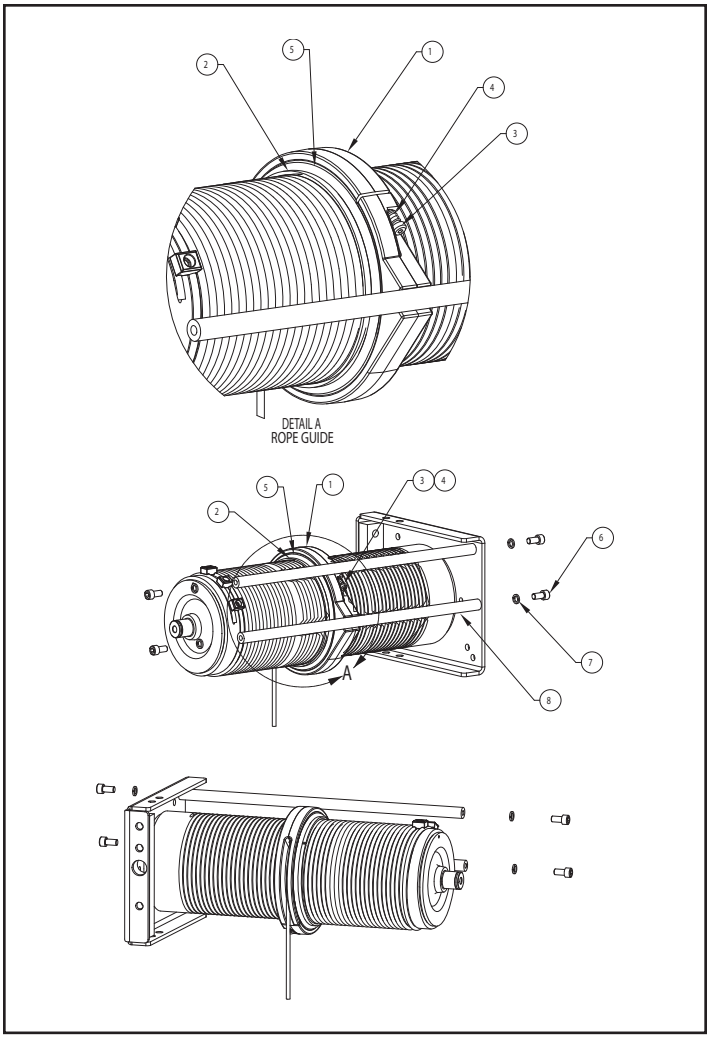


Figure 5-3 Rope Guide Assembly

b) Disassembly of "A" Frame Rope Guide. Refer to Fig. 5-3. For further assistance in locating components, refer to the parts list in Section IX.

(1) Remove socket head cap screws and lock washers (Items 6 and 7). Remove drum frame rod (Item 8).

(2) Remove shoulder bolts (Item 3) and compression springs (Item 4). The two halves of the rope guide body (Item 1) can now be pulled off the drum separately. When reassembling be sure that the half with the rope slot is on the top half of the drum.

⚠ WARNING

Once shoulder bolts are removed, the halves will separate and, if not properly supported, the halves could fall.

(3) Carefully unhook the rope tensioning spring (Item 5), which is under tension.

⚠ WARNING

The rope tensioning spring is under considerable tension; use caution when unhooking to avoid injury.

(4) Remove the split plastic shroud (Item 2) from the drum. When reassembling the rope guide, be sure the plastic shroud (Item 2) fits snugly in the rope guide body groove.

(5) Thoroughly clean and inspect all components.

(6) Follow steps in reverse to reassemble. Be sure to re- grease the rope guide with **MPG** (Paragraph 4-7), after assembling.

5-6. ROPE INSPECTION, MAINTENANCE AND REPLACEMENT

⚠ WARNING

Wire Rope improperly handled or abused can create a SAFETY HAZARD. Read and comply with inspection, maintenance and replacement information given herein.

a) Inspection. Wire rope on your hoist is one of the most important components requiring frequent inspection and maintenance. All wire ropes will eventually deteriorate to a point where they are not safe and will require replacement. Wire rope should be thoroughly inspected at regular monthly intervals by an authorized person and a determination made when further use of the rope would constitute a safety hazard. Each inspection should include a written dated and signed report of rope condition. Reports should be filed and reviewed each month and any rope deterioration carefully noted. Inspections revealing, but not limited to the following conditions, should cause inspector to question remaining strength of rope and consider replacement. Inspections should take place at the most active sections of the rope, which may be identifiable through visual inspection of rope color. Ropes will wear more quickly in areas that are more frequently in contact with the running sheaves and drum.

(1) Replace wire rope if the number of visible broken wires exceeds 13 over a length of 6 times the nominal diameter (6d) or exceeds 26 wires over a length of 30d.

(2) Replace wire rope, if a complete strand has broken.

(3) Replace wire rope, if rope exhibits swelling, bruises, permanent bends, kinks, crushing, bird-caging or especially heavy wear.

(4) Replace wire rope, if rope has suffered heat damage from any cause.

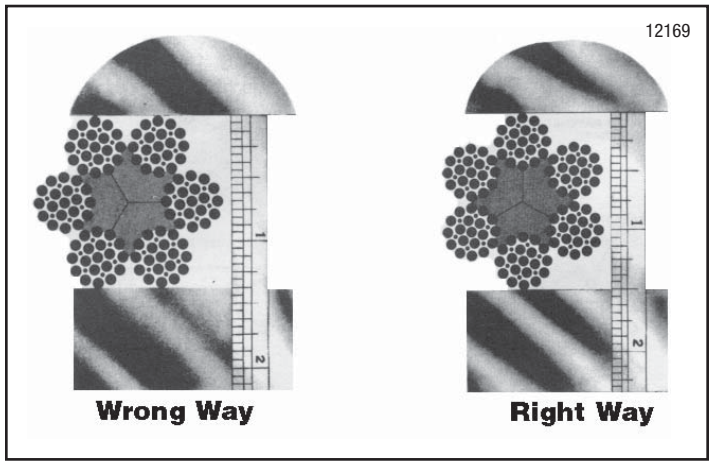


Figure 5-4. Correct Method of Measuring Rope

(5) Rope corrosion and/or rust formation, internal or external.

(6) Effects from improper lubrication.

(7) Rope being idle for one month or more due to shutdown or inactivity.

Special attention should be exercised when inspecting rope normally hidden during inspecting procedures.

Please refer to FEM Section IX, Series Lifting Equipment, namely Section 9.661, “Dimensions and Design of Rope Reeving Components” and ISO 4309, “Wire Ropes - Care, Maintenance, Installation, Examination and Discard”, for illustrations and definitions when following the above guidelines for rope inspection.

b) Maintenance. Keep rope well lubricated to help reduce internal friction and prevent corrosion. Lubricant, as described in Paragraph 4-3, should be applied as a part of the regular maintenance program. Special attention is required to lubricate sections of rope over equalizing sheaves and other hidden areas.

Avoid dragging ropes in dirt or around sharp objects that will scrape, nick, crush, or induce sharp bends in the rope.

⚠ WARNING

Use only factory-approved rope with swaged wire rope socket.

c) Replacement. When recommended by an authorized inspector, the rope should be replaced. Replacement rope assemblies are shipped from the factory carefully coiled to prevent damage by kinking. Care must be taken to avoid twisting or kinking when uncoiling and handling during reeving.

Before replacing rope, check condition of grooves in sheaves and drums to determine if they are excessively worn.

When first using hoist after rope replacement, break in rope by operating under lighter loads to full travel before applying maximum load.

5-7. ROPE REEVING

a) General. Place reel on stand with shaft through the center of reel so rope can be pulled straight out with reel rotating.

⚠ WARNING

It is imperative that rope reel or coil rotates as rope unwinds. If coil or reel does not rotate the wire will be twisted as it is uncoiled and kinking will result. A kinked rope is unsafe and must be removed from service.

b) Before removing the old rope, refer to reeving diagram, Figure 5-5. To assist with re-reeving your hoist, refer to the reeving diagram and corresponding paragraph that describes the reeving procedure.

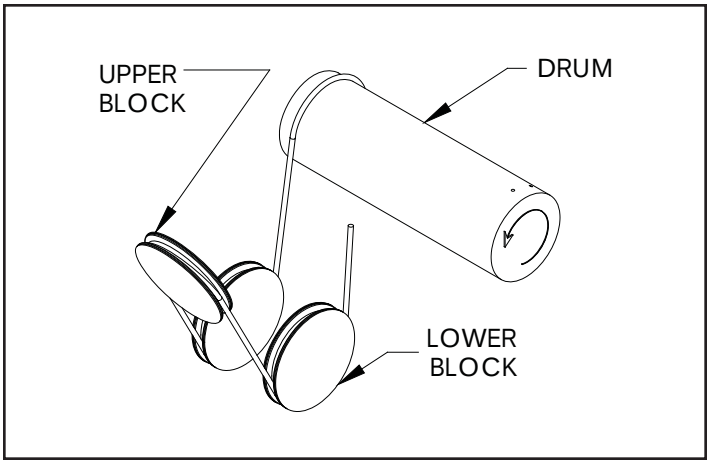


Figure 5-5a. Reeving Diagram - 4 Part Single Reeved. (Note: Arrow on Drum Indicates Direction of Drum when Lowering.)

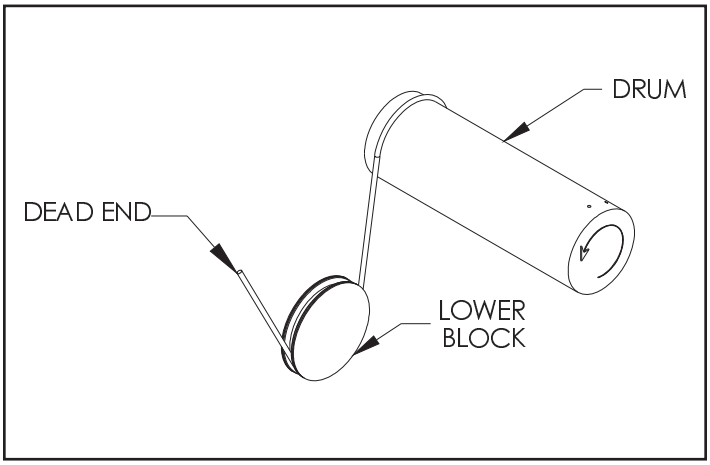


Figure 5-5b. Reeving Diagram 2 Part Single Reeved

c) Removing old rope. Please refer to Section IX to assist in locating components referred to in the following paragraphs.

(1) Lower the lower block to a scaffold 6 to 7 feet below hoist to relieve tension on wire rope. (Lower block may be lowered to the floor if desired; however, to handle less weight and for ease of reeving, adequate scaffold below the hoist is recommended.)

⚠ CAUTION

Be certain all personnel are clear of hoist as components, hardware, and wire rope are removed from hoist.

(2) Remove the cap screws and hex nuts that retain the lower block sheave covers. Remove covers.

(3) Remove retaining rings from lower block sheave pin.

(4) Slide out lower block sheave(s) and remove wire rope.

(5) Remove two (2) rope retention bolts and nuts from the upper block yoke, as needed.

(6) Remove one retaining ring on upper block to allow removal of upper block sheave pin.

(7) Securely grasp the upper block sheave before carefully sliding the sheave pin out. Note that two spacers will Also be released as the pin is removed.

(8) Remove wire rope from sheave.

(9) Remove retaining ring(s) and washer from dead end anchor pin. Securely grasp the swaged wire rope before removing the anchor pin.

(10) Remove rope guide per Section V, Paragraph 5-5.

(11) Make certain all personnel are clear of hoist and operate hoist "DN" to completely unwind all wire rope from drum. Stop hoist so all (3) rope clamps are accessible. Remove rope clamps and wire rope from drum.

⚠ WARNING

Winding rope on rope drums with power can be hazardous. Keep hands safe distance from drum; wear gloves and use extreme care when winding rope.

d) Installing new rope.

(1) Thread rope to drum from trolley frame side then secure with rope clamps as follows:

(a) Make sure that the rope clamp is orientated such that the clamp grooves capture and fully seat the rope in the drum grooves. The clamps are designed for use specifically with the 6.4mm wire rope that was supplied with your "A" Frame hoist.

(b) With the rope lying in the bottom of the drum groove, begin by tightening the rope clamp at the tail end of the rope. Torque the "A" Frame clamps to 12-15 ft.-lbs. (16-20 N-m).

(c) Applying tension to the rope and keeping it properly seated in the drum groove, install the remaining two clamps to the specified torque above.

(2) With all personnel clear of hoist - TURN ON POWER.

(3) Operate hoist "UP" guiding six (6) wraps of new rope into drum grooves with gloved hand.

(4) Reinstall rope guide over rope in rope drum grooves as shown in Figure 5-3a. & 5-3b. and outlined in Section V, Paragraph 5-5. Continue lubricating as rope is spooled onto the drum until about 24'-0" remain unwound.

(5) With outer lower block covers removed, thread the wire rope through the sheaves of the upper and lower block as shown in Figures 5-5a and 5-5b.

(6) Attach swaged rope end to the dead end anchor pin and fasten with the retainer rings provided with the hoist.

(7) Replace the lower block sheave covers.

(8) Lubricate cable per Paragraph 4-3.

e) Checking for and removal of rope twisting.

(1) To remove rope twist in "A" Frame single reeved hoists:

(a) Observe direction block tends to rotate.

(b) Lower the block to a low position and TURN OFF (lock out) POWER.

(c) Remove swaged fitting from anchor pin and rotate rope several turns in a direction tending to correct block rotation.

(d) TURN ON POWER; raise and lower the block several times to feed the correcting twist in the rope through the reeving.

⚠ WARNING

The hoist must be removed from service and placed on the ground for any maintenance that requires removal of the output shaft assembly or drum.

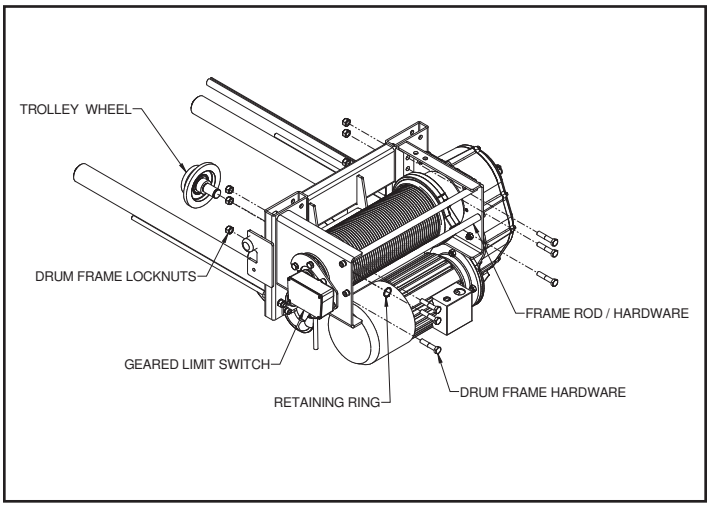


Figure 5-6. Drum Frame & Geared Limit Switch

5-8. INSPECTION OF ROPE DRUM AND SHAFT

a) To remove the rope drum, remove the rope guide and hoisting cable, as outlined in Section V, Paragraphs 5-5. and 5-7.c., respectively.

b) Remove the geared limit switch or disconnect the wires so that the electrical cable will not inhibit removal of the drum. (see Figure 5-6).

c) Remove the hoist from the beam, place it on the ground and provide adequate means to support the drum before removing the frame rod cap screws and rods at the outboard end drum frame (see Figure 5-6).

e) The hardware attaching the drum frame to the hoist and trolley frame may then be removed.

f) Keeping the drum level, remove the drum from the splined output shaft at the gear case end.

g) Inspect the gearcase output shaft and drum splines for wear.

h) Before re-assembling, by reversing above instructions, make sure to apply a liberal amount of SG (Paragraph 4-7) spline grease to both the output shaft and drum splines. Torque "A" Frame drum mounting bolts to 60-80 ft.-lbs. (81-108 N-m).

5-9. INSPECTION OF HOIST GEARING

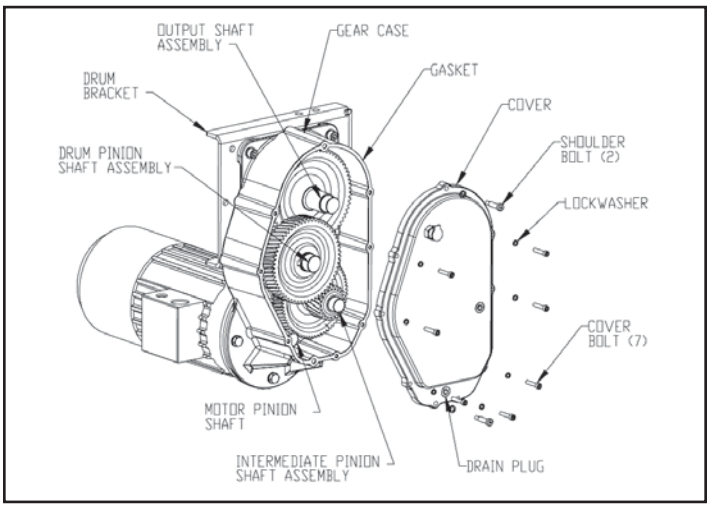


Figure 5-7. Hoist Gear Case Assembly

a) General. The hoist gear case is a triple-reduction, splash lubricated, vertically split, cast aluminum case and cover. A helical gear train provides smooth and quiet hoisting operation. The gear shafts are supported with ball and roller bearings housed in the back of the case and in the cover. The input pinion is integrated onto the motor shaft. An oil seal housed in the gear case at the motor input seals the motor shaft as it passes into the gear case. Since the entire motor shaft is submerged in oil, anytime the motor is removed, the oil must be drained from the gear case. All pinions are integral with their shafts while the gears are keyed and pressed onto their shafts, with exception of the integral output shaft. The output shaft passes through an oil seal in the back of the gear case and drives the drum by means of a crowned spline. One end of the rope drum is supported on this output shaft.

b) Inspection and Disassembly.
Gearcase. (See Figure 5-7.)

(1) Lower hook block to the floor and relieve all load from ropes.

(2) Make sure power to hoist is off and locked out.

⚠ WARNING

Before disassembly, prevent rope drum from free spinning by wedging drum in place with a block of wood, and resting lower block on work surface so all weight is off rope drum. Rope may also be removed from hoist drum.

(3) Drain the oil from the gear case per Section IV, Paragraph 4-2.

(4) On the “A” Frame hoist, the bolts supporting the gearcase are installed through tabs on the outside of the housing and do not pass through the gearcase cover. These bolts are not to be removed, unless the entire gearcase assembly is being removed from the hoist.

(5) Provide adequate means to support the gearcase cover. Remove the smaller socket head cap screws and lockwashers holding the cover to the gearcase. Carefully draw the cover directly away from the gearcase, as damage to this surface will prevent the gasket from sealing properly. If needed, lightly tap on the top and bottom cover tabs to release. As the cover is removed, ensure that all gear and shaft assemblies remain in the case and are fully supported by the gearcase bearings.

⚠ WARNING

If output shaft assembly is pulled out of the gear case with the cover, it will disengage from the drum allowing the drum to drop. Be certain all shaft assemblies stay in the case.

(6) If it is necessary to remove the output shaft assembly from the gear case, the rope drum must first be removed from the hoist. See Section V, Paragraph 5-8. Only once the output shaft is free of the rope drum, can the output shaft assembly be safely removed from the gearcase. Provide an adequate means to support this shaft and gear assembly before removing, as it is heavy. The “A” Frame gear assembly weighs 14 lbs.

⚠ WARNING

The hoist must be removed from service and repaired on the ground for any maintenance that requires removal of the output shaft assembly or drum.

(7) The pinion shaft and gear assemblies may be removed as necessary.

(8) Inspect all gears, pinions, bearings, and the output shaft spline for wear, pitting, or mechanical damage. Replace the gearcase assembly, as necessary. Thoroughly clean the output shaft external spline teeth before reassembly.

(9) Assembly is opposite of removal. Use a new gasket. Do not attempt to assemble the cover to the gear case without a gasket, as the spacing between bearings will be reduced. Severe damage to the hoist will occur if no gasket or the wrong gasket is used. Refill gear case with new lubricant per Section IV, Paragraph 4-2 before use. Using SG (Paragraph 4-7), grease the spline teeth on the output shaft before reinstalling rope drum.

(10) Test hoist per Section V, Paragraph 5-14 to ensure proper lubrication.

Hoist Motor.

(1) Lower hook block to the floor and relieve all load from ropes.

(2) Make sure power to hoist is off and locked out.

(3) Drain the oil from the gear case per Section IV, Paragraph 4-2.

(4) Disconnect the wiring and conduit from the motor junction box.

(5) Provide a means to support the hoist motor. The “A” Frame S4 hoist motor weighs approximately 70 lbs. and the S2 hoist motor weighs approximately 50 lbs. The motor must be adequately supported and held horizontally while removing and installing, to avoid input seal damage.

(6) Once the motor is properly supported, remove the hardware fastening it to the gear case. Carefully withdraw the motor horizontally straight out from the gear case. Do not tip or move the motor from side to side.

(7) Replace the motor shaft seal using an appropriate seal driver. It is recommended that a new seal be installed each time the motor is removed from the case.

IMPORTANT!

(8) Before reinstalling the motor, pack the gear teeth with MPG grease (Paragraph 4-7) and wrap the gear teeth with a number of layers of Teflon tape to protect the seal lip from being damaged by the gear teeth. Coat the seal lip and the motor shaft with MPG grease.

NOTICE

Failure to use a factory replacement seal will cause premature seal failure due to specific lip material requirements that must be met.

(9) Install the motor to the gear case. The motor shaft must be in line with the seal bore and perpendicular to the mounting surface before attempting to insert the shaft through the seal. The motor shaft must remain horizontal and not rock up and down or side-to-side while installing the motor or seal damage will occur. It may be necessary to rotate the rope drum slightly to align the gear teeth to mesh with the teeth on the motor shaft. Ensure that the motor seats properly into the rabbet fit machined in the gear case. Fasten the motor to the gear case.

(10) Reconnect the conduit and power leads to the motor. See Section VIII and refer to the specific wiring diagrams shipped with your hoist.

(11) Refill gear case with lubricant per Section IV, Paragraph 4-2.

(12) Test hoist to ensure proper operation per Section V, Paragraph 5-14.

5-10. INSPECTION OF MOTOR BRAKE AND ACTUATING MECHANISM

a) General Operation. The hoist brake is an electro-magnetically released, spring set non-adjustable brake. Torque is generated by compressing a friction disk between the stationary motor end bell and the spring loaded brake armature. The friction disk is fixed to and rotates with the motor shaft. When the magnet coil is energized, the armature plate is pulled across the air gap. The friction disk is carried by a splined hub that permits axial movement when the brake is released. This axial movement releases both sides of the friction disk from their mating stationary surfaces and allows the friction disk to rotate freely when the brake is energized. When power is removed from the magnetic coil, the compression springs push the armature against the friction disk and the other side of the friction disk against the motor end bell generating the torque necessary to stop the hoist machinery and hold the load.

It will be necessary to compensate for the friction disk wear when a greater amount of hook movement (drift) is noticed when stopping. There is no torque adjustment of the brake. Friction disk wear can only be compensated for by resetting air gap.

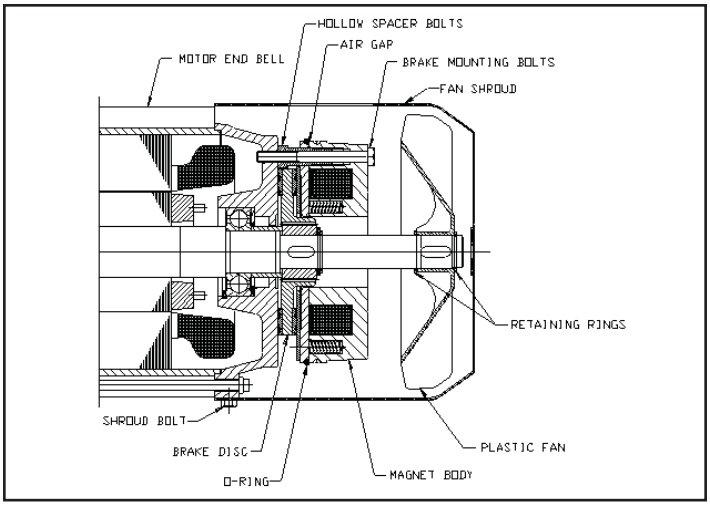


Figure 5-8. Motor Brake

b) Friction Disk Inspection and Air Gap Adjustment.

(1) Lower hook block to the floor and relieve all load from ropes.

(2) Make sure power to the hoist is off and locked out.

⚠ WARNING

Check to be certain main power switch is locked in open position (OFF), before removing fan shroud.

(3) Remove the four (4) bolts attaching the fan shroud to the motor and remove the fan shroud. See Figure 5-8.

(4) Carefully roll the large O-ring from the groove over the air gap back toward the magnet body. Do not excessively stretch this O-ring.

(5) Measure the air gap using feeler gages. If the air gap exceeds the maximum value shown in Table 5-1, the air gap must be reset.

(6) To measure the thickness of the friction disk, it is necessary to remove the brake body from the motor end bell. Remove the three (3) brake mounting bolts and draw the brake body away from the friction disk. Carefully set the brake body down on the motor shaft directly in front of the fan. Draw the friction disk away from the end bell and measure the thickness across the friction surfaces. If the friction disk thickness is less than the minimum shown in Table 1, it must be replaced. See Section IX, Figure 9-8. If the friction disk thickness is within the allowable, reassemble the brake body to the motor end bell and torque the mounting bolts to the value shown in Table 5-1. Whenever the friction disk is replaced, it is necessary to reset the air gap.

Hoist	“A” S2	“A” S4
Mounting Bolt Torque	7.5 ft-lbs. (10 Nm)	7.5 ft-lbs. (10 Nm)
Nominal Air Gap	0.012 in. (.3 mm)	0.016 in. (.4 mm)
Maximum Air Gap	0.024 in. (.6 mm)	0.028 in. (.7 mm)
Minimum Brake Disk Thickness	0.335 in. (8.5 mm)	0.374 in. (9.5 mm)

Table 5-1. Motor Brake Data

(7) To reset the air gap, begin by releasing the (3) mounting bolts 1/2 turn. Turn the hollow spacer bolts into the magnet body approximately 1/4 turn. Retighten all three mounting screws. Measure the air gap at a minimum of three places around the circumference. Threading the hollow spacer bolts into the magnet body will decrease the air gap, while backing these spacer bolts out of the magnet body will increase the air gap. Repeat this step, as necessary, until the required air gap is achieved. The air gap must be the same all the way around the brake. Once the air gap is correct, torque the mounting bolts to the value shown in Table 5-1.

(8) Replace the large O-ring over the air gap and reassemble the fan shroud to the motor.

(9) Test hoist per Section V, Paragraph 5-14 to ensure proper brake operation.

c) Brake Disassembly.

(1) Lower hook block to the floor and relieve all load from ropes.

(2) Make sure power to the hoist is off and locked out.

(3) Remove the four (4) bolts attaching the fan shroud to the motor and remove the fan shroud. See Figure 5-8.

(4) Remove the snap ring behind the plastic fan. Carefully remove the fan and key from the motor shaft. Remove the snap ring in front of where the fan was mounted.

(5) Disconnect the two wires from the terminal block on the magnetic body.

(6) Remove the three mounting bolts that attach the brake body to the motor end bell and remove the brake body from the motor. Remove the friction disk from the motor shaft.

(7) Clean and inspect all components and working surfaces. Replace all damaged or worn components as necessary. Measure friction disk thickness and replace if less than the minimum thickness shown in Table 5-1.

d) Brake Re-assembly.

(1) Install the friction disk on the splined hub. The friction disk must slide on the splined hub and seat against the end bell of the motor.

(2) Install the brake body to the motor end bell using the three (3) mounting bolts. The air gap must be reset as described in Section V, Paragraph 5-10.b. Torque the mounting bolts to the values shown in Table 5-1. Install the large O-ring in the groove over the air gap. Ensure this O-ring is not pinched in the air gap.

(3) Connect the brake leads to the terminal block on the brake body.

(4) Install the forward fan mounting retaining ring and install the fan. Install the rear retaining ring. Install the fan shroud and bolts.

(5) Test hoist per Section V, Paragraph 5-14.

5-11. INSPECTION OF HOIST TRAVERSE DRIVE

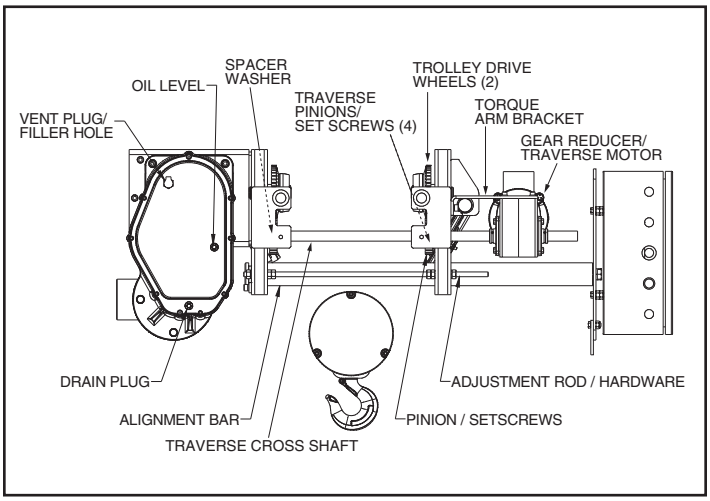


Figure 5-9. Traverse Drive Arrangement

a) Ensure that the hoist is properly fitted to the beam. The hoist must be centered on the beam with clearance between the sides of the bottom of the beam flange and the inside faces of the wheel flanges. Proper clearance must exist along the entire length of beam that the hoist can traverse. An amount of 3/32 to 1/8 inch clearance per side is recommended for a total of 3/16 to 1/4 inch wider than the beam flange. If too little or too much clearance is determined, adjust trolley per Section II, Paragraph 2-2.

b) Inspect wheel treads, flanges, and gear teeth for wear. Check for adequate lubrication (**WG**, Section IV, Paragraph 4-7) on the wheel gear and pinion mesh. Check wheel bearings for any signs of wear, including rough rotation and signs of lubricant leakage. Replace all damaged or missing items. Wheels must always be changed in opposing pairs and drive wheels should be changed when the drive pinions are replaced.

NOTICE

Ensure that the cross shaft is properly positioned and locked into place by means of the setscrews. Failure to do so may allow the drive shaft to contact the hoist gearcase.

c) Examine the drive pinions, cross shaft, and cross shaft bearings. Check pinions for gear tooth wear and proper alignment with wheel gear. A spacer washer between the cross shaft bearings and the pinion aligns the gear mesh. Set screws hold the pinions and spacer washers tight against the bearings. Verify that the setscrews are tight on the cross shaft. If it is necessary to adjust or reset the pinions, verify that the cross shaft surface is free of mechanical damage and oil before tightening the setscrews. Drive pinions must be replaced as sets and should be replaced along with the drive wheels. The cross shaft bearings are sealed for life and should be replaced at any sign of mechanical wear or lubricant leakage.

When hoists are adjusted or repaired in the field, all set screws must return to the original settings from the manufacturer. This is done by following the below instructions:

1) Apply Loctite 242 to the threads and install the setscrews back into the proper location

2) Tighten setscrews for the traverse pinion gear down onto the key and shaft to 70 in-lbs before beginning the use of the hoist.

d) Inspect the traverse gearbox and motor. Look for signs of rough operation, mechanical damage or lubricant leaks. Inspect the reducer and driving pinion for wear. Verify that all hardware that mounts the reducer to the trolley frame and the motor to the gear reducer are all present and tight. Replace and tighten as necessary. The factory recommends complete replacement of the traverse gearbox. However, gearbox service may be available from your local authorized YALE repair center.

For the trolley gear reducer, the key must be captured in the keyway between the 2 setscrews. The setscrews are located on each side of the trolley gear reducer. The key will float in the keyway between the setscrews. Do not tighten the setscrew down to the keyway. Screw the setscrew down until the setscrew is flush with the outside of the collar.

5-12. TESTING BLOCK OPERATED LIMIT SWITCH

a) General. The optional block operated limit switch is a secondary upper limit switch actuated when the lower block contacts the actuator rod. The rotary-geared limit switch (screw type limit switch) is the primary upper limit switch and must be temporarily bypassed to allow the block operated limit switch to be tested.

b) Procedure. Remove load from the hook. To disconnect the geared limit switch, refer to Figure 7-2. Remove the limit switch cover then loosen the two (2) screws holding the locking plate in place. Allow the locking plate to slide down and disengage from the adjustment discs. Do not rotate the adjustment discs.

The block operated limit switch may now be tested by slowly and carefully raising the hook until the limit switch rod contacts the lower block. If the hook does not stop when the limit switch rod is lifted, immediately release the pushbutton before damage to your hoist occurs. If the block operated switch functions properly, proceed by testing in the same manner with rated load on the hook. Once it has been determined that the block operated limit switch is functioning properly, the geared limit switch must be reconnected and tested.

Position the lower block three inches (3") below the point where the block operated limit switch is activated. The geared limit switch shall be reconnected by sliding the locking plate back into position ensuring slots on adjustment discs are fully engaged and tightening locking plate screws to 4 in-lbs. (See Figure 7-2). The geared limit switch must then be tested.

Test the geared limit switch by raising the lower block until it stops. Ensure that the geared limit switch stopped the hoist before the block operated limit switch was activated. If this is not the case, see Section VII, Paragraph 7-3 for adjusting the geared limit switch. Replace geared limit switch cover when testing and adjusting is complete.

5-13. TESTING OVER-CAPACITY LIMIT SWITCH

The over-capacity limit switch is provided as standard equipment on YALE "Global King" hoists. This switch is integral to the wire rope dead end assembly and is factory preset to prevent over-capacity lifts. This device is preset at the time of hoist inspection to prevent the lifting of loads weighing 125-150% of rated capacity.

⚠ CAUTION

Damage to the hoist may occur if the block operated limit switch fails during testing.

Damage can be avoided by immediately releasing the pushbutton once the lower block has traveled through the limit switch weight.

⚠ WARNING

Check limit switch operation carefully, without load, before placing hoist in service. If misadjusted, SEVERE DAMAGE AND/OR A DROPPED LOAD COULD RESULT. Allow 3" for hook drift in both directions. Never allow less than two (2) complete wraps of rope on drum with hook in lowest position.

To test the function of the over-capacity limit switch, apply 125% of the rated capacity to load hook. If hoist is capable of lifting the load, then actual switch setting may be higher than necessary and needs to be adjusted. If hoist cannot lift load, then the switch setting is correct. Refer to SECTION VII, Paragraph 7-4 for information regarding the adjustment of the limit switch setting

5-14. TESTING HOIST

a) General. Testing shall be performed in accordance with FEM Section IX, Series Lifting Equipment, namely Section 9.811 "Specification for rope and chain hoists", and this manual. Before placing hoist in service, hoist should be tested to insure safe operation, when hoist has been disassembled and reassembled. To test, suspend hoist from an overhead supporting member of sufficient strength to support the weight of the hoist and the rated load. Connect hoist to power supply as shown on hoist nameplate and perform the checks listed in b) and c) below.

b) Check hoist as outlined in PRE-OPERATION CHECKS, SECTION II, Paragraph 2-4.

c) Check hoist with rated load.

(1) Attach rated load to lower hook.

(2) Depress "UP" push button and raise load. When push button is released, hoist should stop immediately and hold load at that level.

(3) Depress "DN" push button, lower load a short distance and release button. Hoist should stop immediately and hold load at that level.

NOTE:

If load drifts downward slowly in step 2 or 3 above, motor brake requires adjustment - see Motor Brake Adjustment - SECTION VII, Paragraph 7-1.

SECTION VI - TROUBLESHOOTING

6-1. GENERAL

This section contains possible causes and solutions to common hoist problems. Please attempt to remedy your hoist problems by following these steps, before contacting the factory.

Whenever servicing electrical components, be sure to shut off and lock out power following proper lockout/tagout procedures.

⚠ WARNING

Working in or near exposed energized electrical equipment presents the danger of electric shock.

TO AVOID INJURY:

DISCONNECT POWER AND IMPLEMENT LOCKOUT/ TAGOUT PROCEDURE BEFORE REMOVING COVER OR SERVICING THIS EQUIPMENT.

SECTION VI - TROUBLESHOOTING

TROUBLE	PROBABLE CASE	REMEDY
6-1. Hoist Will Not Operate	a. No power to hoist	a. Check switches, circuit breakers or fuses and connections in power supply lines. Check power collectors.
	b. Wrong voltage	b. Check voltage required on motor data plate against power supply.
	c. Loose or broken wire connections in hoist electrical system	c. Shut off and lock out power supply; remove electrical cover on hoist and check wiring connections. Also check connections in push button station and limit switches.
	d. Contactor assembly not functioning	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. No control voltage	e. Check transformer fuse. If blown, check for grounding and/or shorts in the push button 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.
	f. Motor burned out	f. Replace motor. Check input power supply. Check hoist motor connections.
	g. Reverse phasing on three-phase hoists	g. Check phase protection device (PPD), if amber LED is steady; interchange any two power supply line leads per Section II, Paragraph 2-4.b.
6-2. Hook Moves in Wrong Direction	a. Reverse phasing on three-phase hoists	a. Check PPD, if green LED is steady; interchange any two sets (each winding) of motor power leads.
	b. Hoist wired incorrectly	b. Check wiring connections with appropriate wiring diagram.
6-3. Hook Will Raise But Not Lower	a. Lower electrical circuit open	a. Check for loose connections. See that necessary jumper wires are properly installed on contactor.
	b. Contactor assembly not functioning	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.
	c. Down, push button inoperative	c. Check push button contacts and wires.

SECTION VI - TROUBLESHOOTING

TROUBLE	PROBABLE CASE	REMEDY
6-4. Hook Will Lower But Not Raise	a. Excessive load	a. Reduce loading to rated load of hoist, as shown on nameplate.
	b. Hoist electrical circuit open	b. Check for loose connections. See that necessary jumper wires are properly installed on contactor.
	c. Contactor assembly not functioning	c. 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.
	d. Up, down button inoperative	d. Check push button contacts and wires.
6-5. Hoist Will Not Lift Rated Load	a. Low voltage	a. See that power supply current is the same voltage listed on motor data plate. Check hoist motor connections. Check size of power supply lines.
6-6. Hoist Motor Overheats	a. Excessive load	a. Reduce loading to rated load as shown on nameplate.
	b. Excessive duty-cycle	b. Reduce frequency of lifts or amount of jogging.
	c. Wrong voltage or frequency	c. Check current rating on motor data plate against power supply. Check hoist and inspect for defective, worn or damaged parts.
	d. Defective motor or worn bearings in hoist frame	d. Disassemble hoist and inspect for defective, worn or damaged parts.
	e. Brake not adjusted properly	e. Adjust brake per Section VII, Paragraph 7-1.
6-7. Load Drifts Excessively When Hoist Is Stopped	a. Excessive load	a. Reduce loading to rated load, as shown on nameplate.
	b. Motor brake not holding	b. With No Load, check hoist for drift. If drifting is excessive, inspect motor brake (Section V, paragraph 5-10) and adjust as outlined in Section VII, paragraph 7-1.
6-8. Hoist Operates Intermittently	a. Collectors make poor contact	a. Check collectors for free movement of spring arm, weak spring or electrical connections.
	b. Loose connections	b. Check all wiring for loose connections.

SECTION VII - ADJUSTMENTS

7-1. MOTOR BRAKE ADJUSTMENT

These brakes are designed so that adjustment is seldom required. If, after a period of service, the load hook "drifts" downward more than usual for your hoist before coming to a stop, the motor brake may require adjustment to compensate for brake disc wear.

⚠ WARNING

Check to be certain main power switch is locked in open position (OFF) before removing brake cover.

Refer to Figure 5-9 and proceed as outlined in Section V, Paragraph 5-10.

7-2. BLOCK OPERATED LIMIT SWITCH ADJUSTMENT

The block operated limit stop, furnished as optional equipment, is minimally adjustable and designed to stop the lower block at the safest high point of travel to eliminate any possibility of double-blocking. When the safest high point is reached, the limit switch automatically stops hook travel. If the block switch is not tripping after contact with the lower block body, loosen the limit switch hub retaining screw and rotate the hub and rod downward to ensure earlier contact. Retighten and test, repeat as needed until switch functions properly.

7-3. GEARED ROTARY LIMIT SWITCH ADJUSTMENT

The geared rotary type limit switch is standard equipment and is located on the drum end opposite the gearcase end.

This limit switch has a rotary screw driven by a gear reduction that 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 circuit. The switch assembly must be wired in accordance with the appropriate wiring diagram, which is shipped with the hoist. Instructions for adjusting limit switch are inside cover and are repeated below (see Figure 7-2).

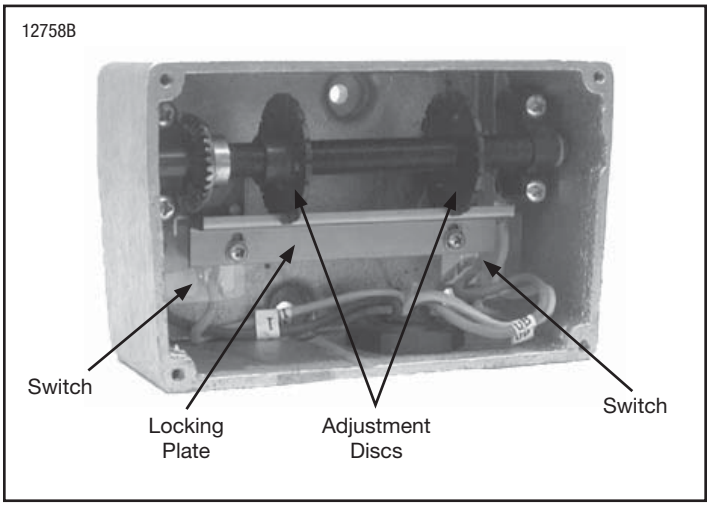


Figure 7-2. Screw-Type Limit Switch Adjustment (Wires Not Shown for Clarity.)

⚠ WARNING

Be certain that electrical power supply is OFF and locked in the open position before removing limit switch cover.

a) Remove four screws and lift off switch cover.

b) Loosen locking plate screws. Slide locking plate away from adjustment disc.

c) Turn proper adjustment disc (right for up, left for down) toward switch to reduce hook travel or away from switch to increase hook travel.

d) Slide locking plate back into position ensuring slots on adjustment discs are fully engaged, tighten locking plate screws to 4 in-lbs.

e) Replace cover.

f) Carefully check limit switch operation without load before placing hoist in service. If misadjusted, repeat steps above. Allow 3" for hook drift in both directions. Never allow less than two (2) complete wraps of rope on drum with hook in lowest position.

⚠ WARNING

Check limit switch operation carefully, without load, before placing hoist in service. If misadjusted, SEVERE DAMAGE AND/OR A DROPPED LOAD COULD RESULT. Allow 3" for hook drift in both directions. Never allow less than two (2) complete wraps of rope on drum with hook in lowest position.

Provide a light film of **MPG** grease (Paragraph 4-7) on gear of both limit switches.

7-4. OVER-CAPACITY LIMIT SWITCH ADJUSTMENT

The over-capacity limit switch is standard equipment and is integrated into the wire rope dead end assembly (see Figure 7-3). The device is designed to prevent overloading of the equipment, but is not intended to be used as a load-measuring device.

The limit switch is factory preset to prevent the lifting of loads weighing 125-150% of rated capacity. At times, it may be necessary to adjust the limit switch setting.

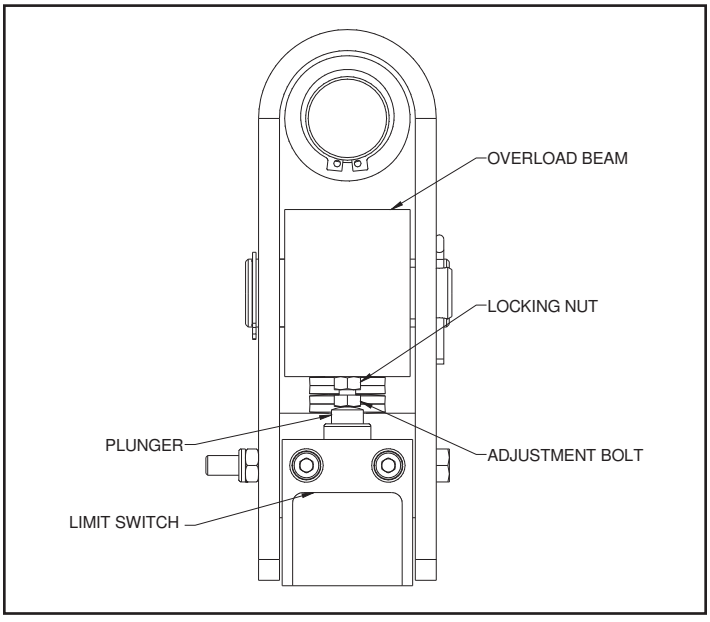


Figure 7-3. Over-Capacity Limit Switch

To adjust the limit switch setting, simply loosen the locking nut (see Figure 7-3) and then either loosen or tighten the adjustment bolt into the overload base to achieve the desired setting. Loosening the adjustment bolt will increase the load required to trip the limit switch plunger while tightening will reduce this setting. Only very small adjustment is required. Adjusting the limit switch setting to increase the capacity limit beyond 125% is not permitted.

7-5. SHORTENING OF PUSHBUTTON CABLE

⚠ WARNING

Be certain that electrical power supply is OFF and locked in the open position before attempting shortening of push button cable.

a) Loosen screws at cable connectors and clamps at top of cable.

b) Adjust steel support cable to proper length and tighten screws.

c) Loosen upper cable grip and pull excess cable into connection box at hoist.

d) Tighten cable grip and cut off excess cable.

e) Strip cable sheath and connect wires with the same type of terminals previously furnished (care must be taken to match previous wire color coding with wire markers in accordance with the wiring diagram furnished with the hoist).

SECTION VIII - WIRING DIAGRAMS

8-1. GENERAL

Comprehensive wiring diagrams for YALE electric hoists have been omitted from this book because of the many possible variations. This is due to different currents and types of electrical components used in their construction. Figures 8-1 and 8-2 are examples of typical two-speed hoist and trolley wiring diagrams respectively. However, please consult the exact wiring diagrams for your hoist. A print of the correct wiring diagram for each hoist is furnished as a separate insert and shipped with the hoist. We suggest you carefully file the wiring diagram with this book for future reference.

NOTES

FIGURE 8-1. ELEMENTARY WIRING DIAGRAM FOR A TWO-SPEED HOIST AND TROLLEY WITH STANDARD FEATURES

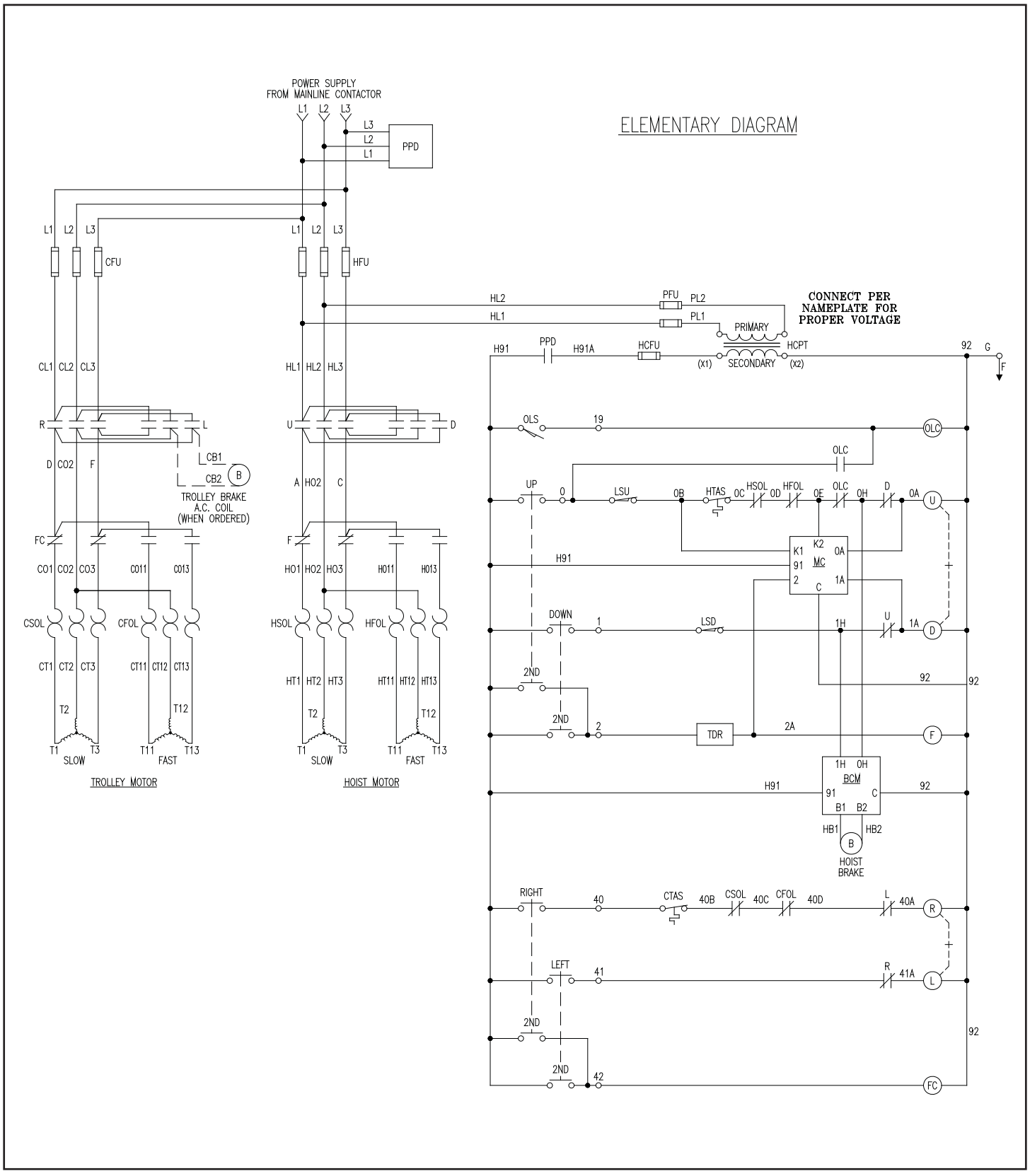
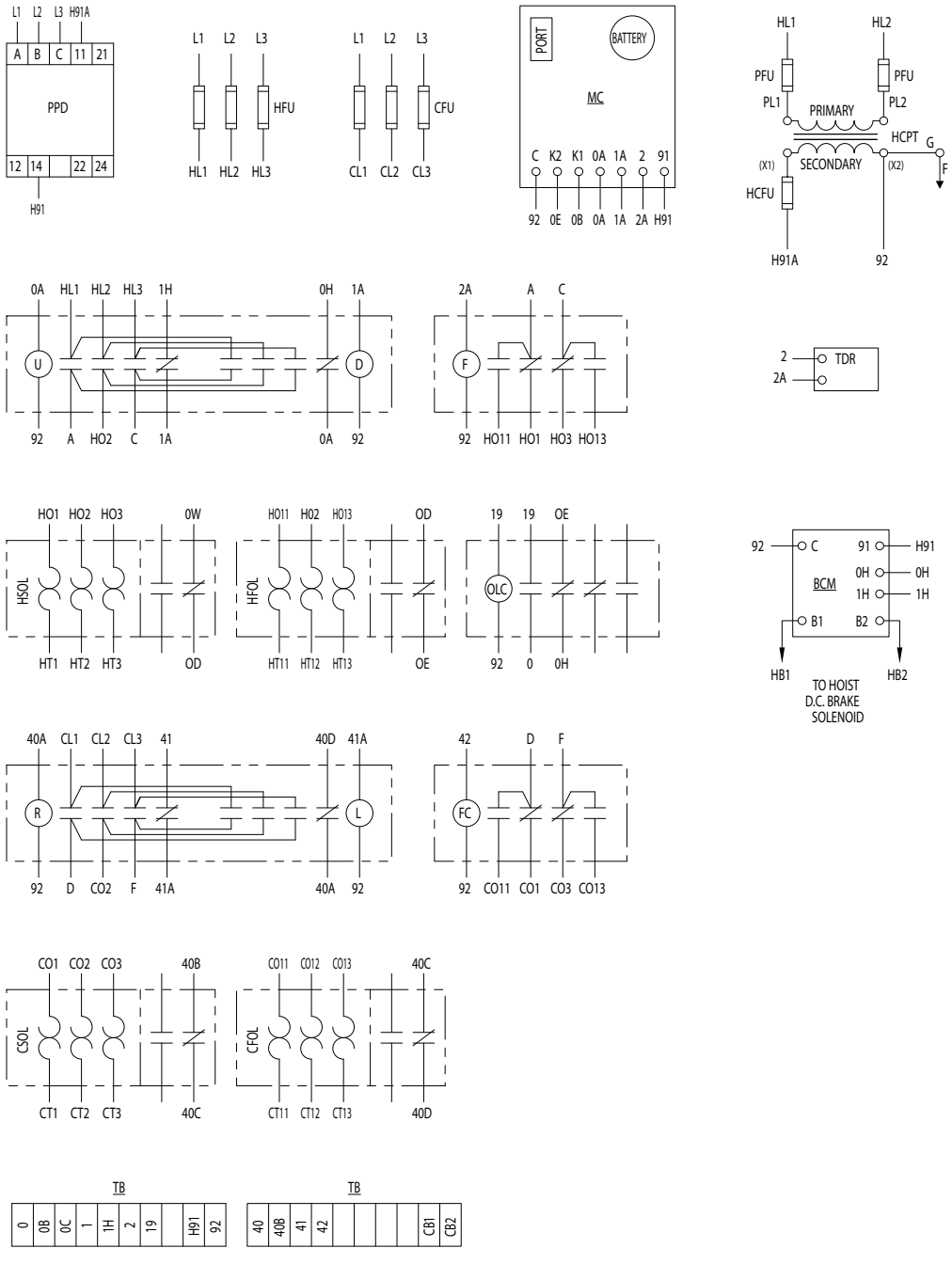


FIGURE 8-2. COMPONENT DIAGRAM FOR A TWO-SPEED HOIST AND TROLLEY WITH STANDARD FEATURES

WIRE #	DEVICE CONNECTED	
L1		HFU, CFU, PPD
L2		HFU, CFU, PPD
L3		HFU, CFU, PPD
HL1		HFU, U-D, PFU
HL2		HFU, U-D, PFU
HL3		HFU, U-D
CL1		CFU, R-L
CL2		CFU, R-L
CL3		CFU, R-L
PL1		PFU, HCPT
PL2		PFU, HCPT
A		U-D, F
C		U-D, F
D		R-L, FC
F		R-L, FC
HO1		F, HSOL
HO2		U-D, HSOL, HFOL
HO3		F, HSOL
HO11		F, HFOL
HO13		F, HFOL
CO1		FC, CSOL
CO2		R-L, CSOL, CFOL
CO3		FC, CSOL
CO11		FC, CFOL
CO13		FC, CFOL
HT1		HSOL
HT2		HSOL
HT3		HSOL
HT11		HFOL
HT12		HFOL
HT13		HFOL
CT1		CSOL
CT2		CSOL
CT3		CSOL
CT11		CFOL
CT12		CFOL
CT13		CFOL
0	TB	OLC
0A		D, U, MC
0B	TB	MC
0C	TB	HSOL
0D		HSOL, HFOL
0E		HFOL, OLC, MC
0H		OLC, D, BCM
1	TB	
1A		U, D, MC
1H	TB	U, BCM
2	TB	TDR
2A		TDR, F, MC
19	TB	OLC
40	TB	
40A		L, R
40B	TB	CSOL
40C		CSOL, CFOL
40D		CFOL, L
41	TB	
41A		R, L
42	TB	FC
H91	TB	PPD, BCM, MC
H91A		HCFU, PPD
92	TB	HCPT, OLC, U, D, F, BCM, MC, R, L, FC
CB1	TB	R-L
CB2	TB	R-L
HB1		BCM
HB2		BCM



DANGER:

(PPD) - PHASE REVERSAL/LOSS PROTECTION DEVICE SHOWS A STEADY AMBER LED WHEN IN PHASE REVERSAL CONDITION.
CORRECT IMPROPER PHASING BY INTER-CHANGING INPUT POWER LEADS L1 AND L2. DO NOT CHANGE PUSHBUTTON OR MOTOR CIRCUIT WIRING.

WARNING:

THIS EQUIPMENT MUST BE EFFECTIVELY GROUNDED ACCORDING TO APPLICABLE CODES.

AVERTISSEMENT:

CET EQUIPMENT DOIT ETRE MIS A'LA TERRE EN ACCORDANCE AVEC LES NORMES EN VIGUEUR.

SYMBOL DESIGNATIONS

PPD - PHASE REV./LOSS PROTECTION DEVICE
HFU - HOIST MOTOR CIRCUIT FUSING
PFU - TRANSFORMER PRIMARY FUSING
HCPT - CONTROL CIRCUIT TRANSFORMER
HCFU - CONTROL CIRCUIT FUSING
U - HOIST UP CONTACTOR
D - HOIST DOWN CONTACTOR
F - HOIST FAST SPEED CONTACTOR
HSOL - HOIST SLOW SPEED THERMAL OVERLOAD RELAY
HFOL - HOIST FAST SPEED THERMAL OVERLOAD RELAY
LSU - HOIST UPPER GEAR TYPE LIMIT SWITCH
LSD - HOIST LOWER GEAR TYPE LIMIT SWITCH
BCM - D.C. BRAKE CONTROL MODULE
TDR - TIMER DELAY MODULE
HTAS - HOIST MOTOR TEMPERATURE ACTUATED SWITCH
OLS - OVERLOAD LIMIT SWITCH
OLC - OVERLOAD LIMIT SWITCH CONTACTOR
CFU - TROLLEY MOTOR CIRCUIT FUSING
R - TROLLEY RIGHT CONTACTOR
L - TROLLEY LEFT CONTACTOR
FC - TROLLEY FAST CONTACTOR
CSOL - TROLLEY SLOW SPEED THERMAL OVERLOAD RELAY
CFOL - TROLLEY FAST SPEED THERMAL OVERLOAD RELAY
CTAS - TROLLEY MOTOR TEMPERATURE ACTIVATED SWITCH
MC - MONITOR CARD
TB - TERMINAL BOARD
G - FRAME GROUND
F

SECTION IX - PARTS LIST

9-1. GENERAL

The parts lists and illustrations in this section of the manual cover parts for models of YALE "Global King" Electric hoists. A typical hoist is shown as the basis for the exploded parts illustrations; therefore, certain variations may occur from the information given. For this reason, always give the Hoist Serial Number, Catalog Number, Motor Horsepower, Voltage, Phase, Frequency and Capacity of Hoist when ordering parts.

Throughout this manual, you will see references to the "S2" and "S4" Frame hoists. If you are unsure about which frame you have, count the number of rope falls that are supporting the lower block and/or see Section IV, Paragraph 4-2 for a simple gearcase measurement to determine the configuration of your hoist. Your gearcase should have a similar shape to that shown and will measure 10 in width and requires approximately 3 quarts of oil.

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. These parts are listed at the end of this manual.

The numbers assigned to parts of our various assemblies in our Parts List are the part numbers used in manufacturing. Some of these itemized parts are not for individual sale, but must be grouped with other related replacement items.

WHEN ORDERING PARTS OR INFORMATION ON THIS EQUIPMENT, ALWAYS INCLUDE MODEL AND SERIAL NUMBER ON ORDER.

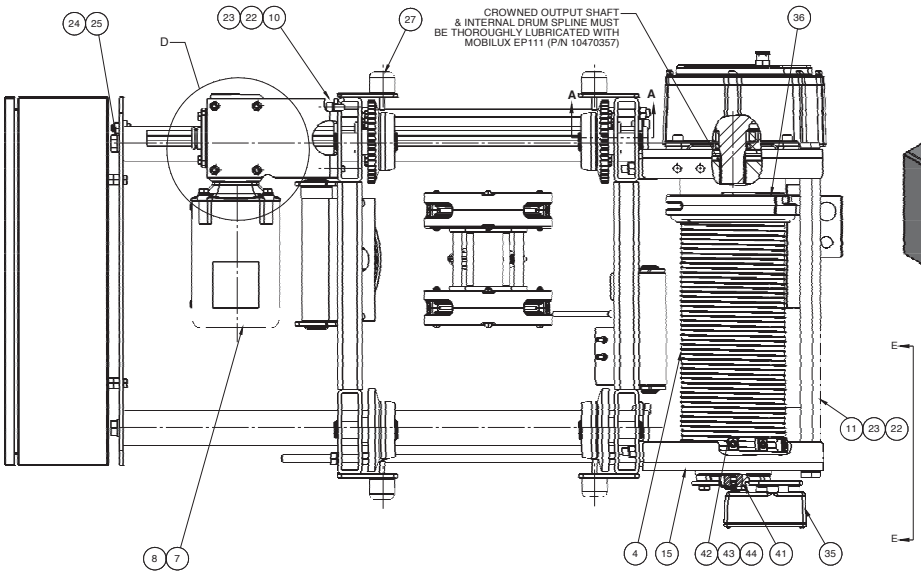
⚠ WARNING

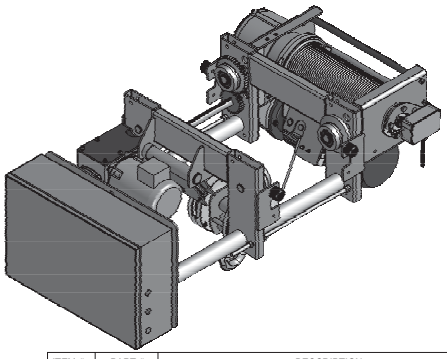
Using "Commercial" or other manufacturer's parts to repair Global King Hoists may cause load loss.

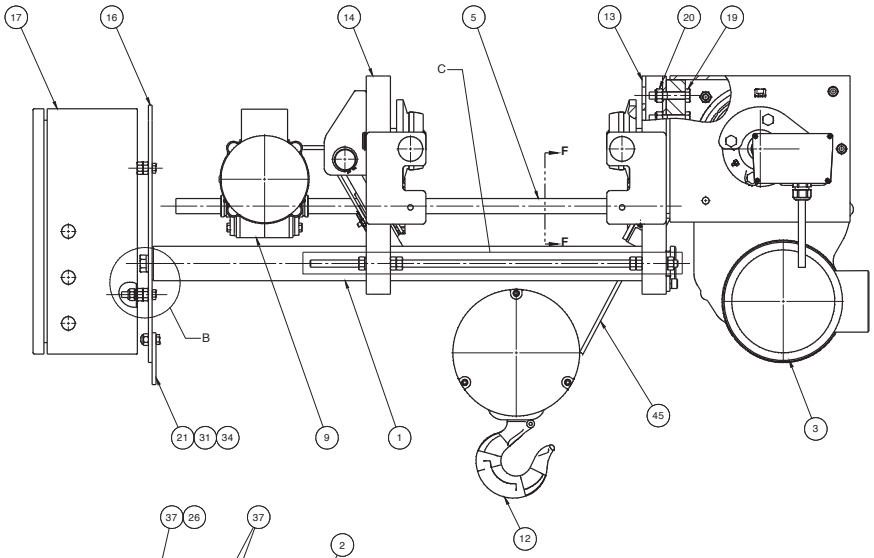
TO AVOID INJURY:

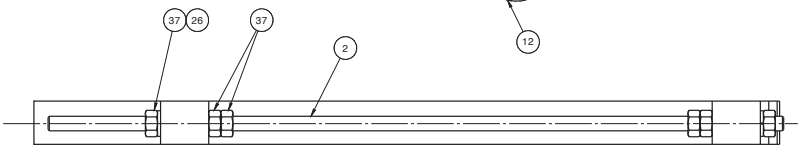
Use only YALE Hoist supplied parts. Parts may look alike but YALE Hoist parts are made of specific materials or processed to achieve specific properties.

LIST OF PART ILLUSTRATIONS







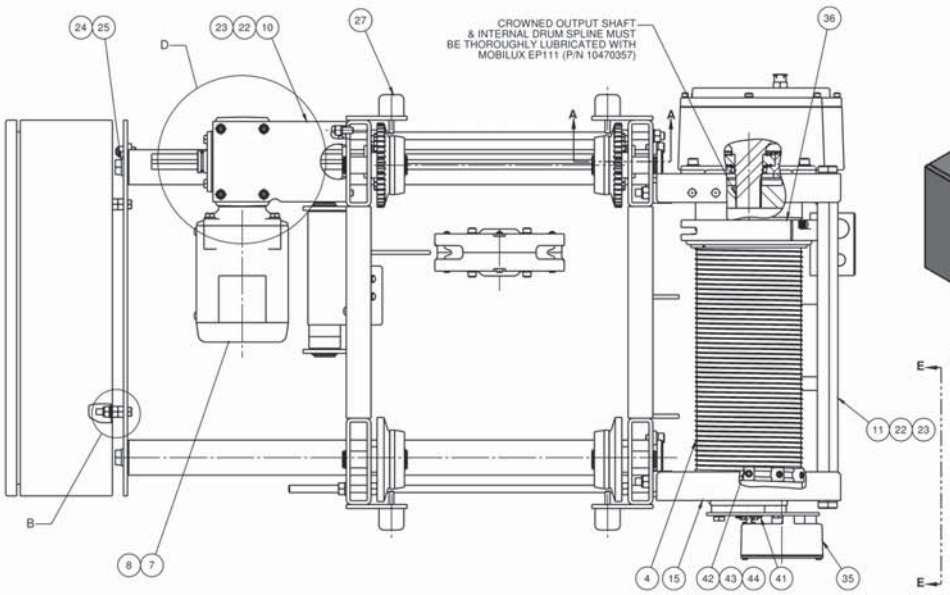


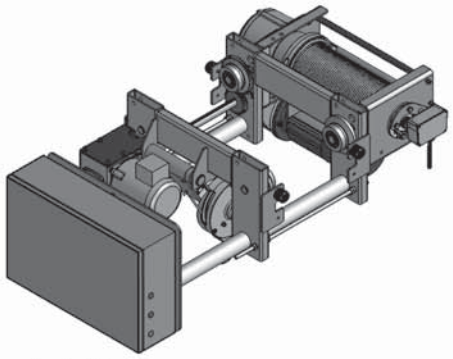
DETAIL C
SCALE 1 : 2
2 PLACES

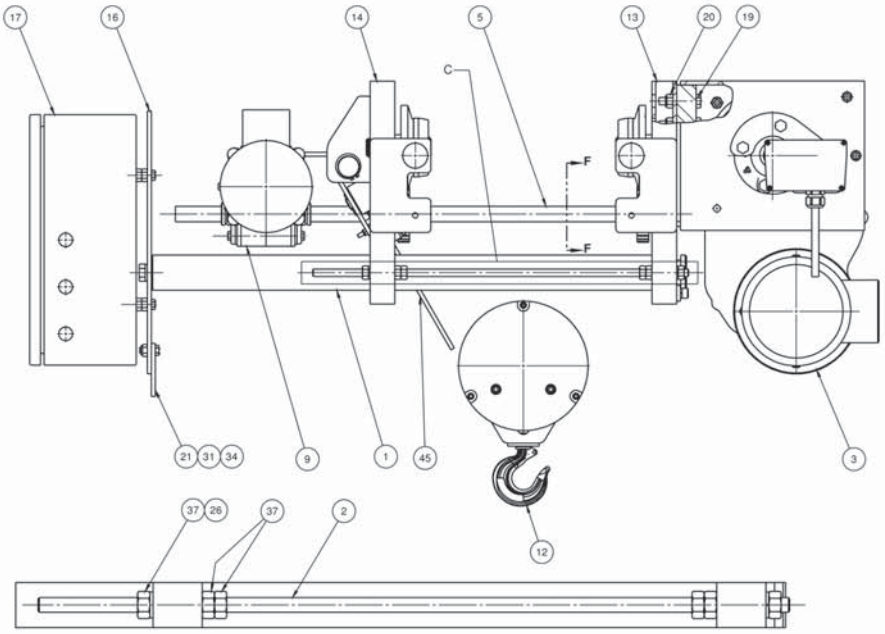
ITEM #	PART #	DESCRIPTION	QTY.
1	SEE TABLE	BAR ALIGNMENT 2 1/4 X 34 3/16	2
2	SEE TABLE	THREADED ROD, M12 X 24"	2
3	44945003	MOTOR/GEAR CASE ASSEMBLY	1
4	SEE TABLE	ROPE DRUM-6.4 mm ROPE	1
5	SEE TABLE	CROSS SHAFT 1 DIA. X 32 LONG	1
6	23384001	PINION TRAVERSE	2
7	32879626	MOTOR 0.5/0.167 HP, 1800 RPM, 460v-3-60	1
8	11784001	CAPLUG 1/4"	2
9	905378	SINGLE WORM GEAR REDUCER	1
10	23383901	TORQUE ARM BRACKET	1
11	SEE TABLE	DRUM FRAME ROD - 3/4 DIA. X "A" LONG	2
12	44943601	LOWER BLOCK ASSEMBLY	1
13	SEE TABLE	DRUM SIDE ASM.	1
14	SEE TABLE	TRANSVERSE SIDE ASM.	1
15	33296601	OUTBOARD ASSEMBLY	1
16	SEE TABLE	COUNTER WEIGHT	1
17	45042501	CONTROL ENCLOSURE - 24 x 16 x 6.8	1
18	10378807	BALL BEARING WITH SNAP RING (6205-16-2RSNR)	2
19	118025-20	HIGH STRENGTH BOLT, HEX HEAD 12mm-1.75 x 60mm Lg. CLASS 8.8	6
20	11803003	12mm-1.75 ESNA SELF LOCKING NUT (PLATED)	6
21	31493324	KEEPER PLATE	3
22	11803203	M10, HI-COLLAR LOCKWASHER	10
23	118027-07	10mm-1.50 HEX SHCS	10
24	11803402	M16 LOCKWASHER	2
25	118026-04	HIGH STRENGTH BOLT, HEX HEAD 16mm-2.00 x 40mm Lg. CLASS 8.8	2
26	11803401	M12 LOCKWASHER	4
27	11680704	SIZE 40 BUMPER, M8 STUD WITH NUT AND LOCKWASHER	4
28	NO-8526	5/16 LOCKWASHER, MEDIUM SERIES (PLATED)	4
29	10392029	5/16-18 X 0.875 SHCS PLAIN SELF-LOCKING	4
30	NO-1951	3/8 LOCKWASHER, MEDIUM SERIES (PLATED)	4
31	10791731	HEX BOLT GRADE 5, 3/8-16 x 1 (PLATED)	5
32	10387202	HEX TAP BOLT, 3/8-16 x 2 (PLATED)	4
33	NO-1948	3/8-16 SEMIFINISHED HEX NUT (PLATED)	8
34	10327304	3/8 ESNA SELF LOCKING NUT	5
35	43981305	LIMIT SWITCH GEARED NEMA 4/12	1
36	44943801	ROPE GUIDE "A" FRAME	1
37	11802906	M12-1.75 HEX NUT, CLASS 8	12
38	10231001	WASHER FLAT 1	2
39	11849801	M6-1.00 x 10mm CUP POINT SET SCREW	6
40	11781101	1/4 x 1/4 x 3/4 LG KEY	2
41	10846002	EXTERNAL RETAINING RING (TRUARC 5160-118)	1
42	23397701	ROPE CLAMP	3
43	118027-21	M6-1.00 HEX SHCS	3
44	11803205	M6, HI-COLLAR LOCKWASHER	3
45	SEE TABLE	ROPE ASSEMBLY	1

PART NUMBER	ITEM 1 BAR ALIGNMENT	ITEM 5 TRANSVERSE CROSS SHAFT	ITEM 4 ROPE DRUM	ITEM 11 DRUM FRAME ROD	ITEM 13 DRUM SIDE ASM.	ITEM 14 TRANSVERSE SIDE ASM.	ITEM 2 TREADED ROD M12	ITEM 16 COUNTER WEIGHT	ITEM 45 ROPE ASSEMBLY	BEAM FLANGE WIDTH	LIFT (FT)
45403401	23384204	23382908	44943901	23385903	45414204	45414304	10424761	45406501	23397901	3.25	20
45403402	23384207	23382911			45414201	45414301				4.63 - 6	
45403403	23384201	23382901					10424768			6.13 - 10	
45403404	23384202	23382902					10424769			10.13 - 14	
45403405	23384204	23382908	44943902	23385904	45414205	45414305	10424761	45406502	23397902	3.25	40
45403406	23384207	23382911			45414202	45414302				4.63 - 6	
45403407	23384201	23382901					10424768			6.13 - 10	
45403408	23384202	23382902					10424769			10.13 - 14	

"A" Frame
S4 Reeved







ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	SEE TABLE	BAR ALIGNMENT 2 1/4 X 34 3/16	2
2	SEE TABLE	THREADED ROD, M12 X 24"	2
3	44945023	GEARCASE/MOTOR/DRUM BRACKET SUB-ASSEMBLY	1
4	SEE TABLE	ROPE DRUM-6.4 mm ROPE	1
5	SEE TABLE	CROSS SHAFT 1 DIA. X 32 LONG	1
6	23384001	PINION TRAVERSE	2
7	32879616	MOTOR 0.25/0.08 HP, 1800/600 RPM, 460v-3-60	1
8	11784001	CAPLUG 1/4"	2
9	905378	SINGLE WORM GEAR REDUCER	1
10	23383901	TORQUE ARM BRACKET	1
11	SEE TABLE	DRUM FRAME ROD - 3/4 DIA. X "A" LONG	2
12	44944101	LOWER BLOCK ASSEMBLY	1
13	SEE TABLE	DRUM SIDE ASM.	1
14	SEE TABLE	TRANSVERSE SIDE ASM.	1
15	33296601	OUTBOARD ASSEMBLY	1
16	SEE TABLE	COUNTER WEIGHT	1
17	45042501	CONTROL ENCLOSURE - 24 x 16 x 6.8	1
18	10378807	BALL BEARING WITH SNAP RING (6205-16-2RSNR)	2
19	118025-20	HIGH STRENGTH BOLT, HEX HEAD 12mm-1.75 x 60mm Lg. CLASS 8.8	6
20	11803003	12mm-1.75 ESNA SELF LOCKING NUT (PLATED)	6
21	31493324	KEEPER PLATE	3
22	11803203	M10, HI-COLLAR LOCKWASHER	10
23	118027-07	10mm-1.50 HEX SHCS	10
24	11803402	M16 LOCKWASHER	2
25	118026-04	HIGH STRENGTH BOLT, HEX HEAD 16mm-2.00 x 40mm Lg. CLASS 8.8	2
26	11803401	M12 LOCKWASHER	4
27	11680704	SIZE 40 BUMPER, M8 STUD WITH NUT AND LOCKWASHER	4
28	NO-8526	5/16 LOCKWASHER, MEDIUM SERIES (PLATED)	4
29	10392029	5/16-18 X 0.875 SHCS PLAIN SELF-LOCKING	4
30	NO-1951	3/8 LOCKWASHER, MEDIUM SERIES (PLATED)	4
31	10791731	HEX BOLT GRADE 5, 3/8-16 x 1 (PLATED)	5
32	10387202	HEX TAP BOLT, 3/8-16 x 2 (PLATED)	4
33	NO-1948	3/8-16 SEMIFINISHED HEX NUT (PLATED)	8
34	10327304	3/8 ESNA SELF LOCKING NUT	5
35	43981305	LIMIT SWITCH GEARED NEMA 4/12	1
36	44943801	ROPE GUIDE "A" FRAME	1
37	11802906	M12-1.75 HEX NUT, CLASS 8	12
38	10231001	WASHER FLAT 1	2
39	11802301	M6-1.00 x 10mm CUP POINT SET SCREW	6
40	11781101	1/4 x 1/4 x 3/4 LG KEY	2
41	10846002	EXTERNAL RETAINING RING (TRUARC 5160-118)	1
42	23397701	ROPE CLAMP	3
43	11803205	M6, HI-COLLAR LOCKWASHER	3
44	118027-21	M6-1.00 HEX SHCS	3
45	SEE TABLE	ROPE ASSEMBLY	1

PART NUMBER	ITEM 1	ITEM 5	ITEM 4	ITEM 11	ITEM 13	ITEM 14	ITEM 2	ITEM 16	ITEM 45	BEAM FLANGE WIDTH	LIFT (FT)
	BAR ALIGNMENT	TRANSVERSE CROSS SHAFT	ROPE DRUM	DRUM FRAME ROD	DRUM SIDE ASM.	TRANSVERSE SIDE ASM.	TREADED ROD M12	COUNTER WEIGHT	ROPE ASSEMBLY		
45416001	23384204	23382908	44943901	23385903	45415602	45415902	10424761	45406501	23397903	3.25	40
45416002	23384207	23382911			45415601	45415901				4.63 - 6	
45416003	23384201	23382901					10424768			6.13 - 10	
45416004	23384202	23382902					10424769			10.13 - 14	

"A" Frame
S2 Reeved

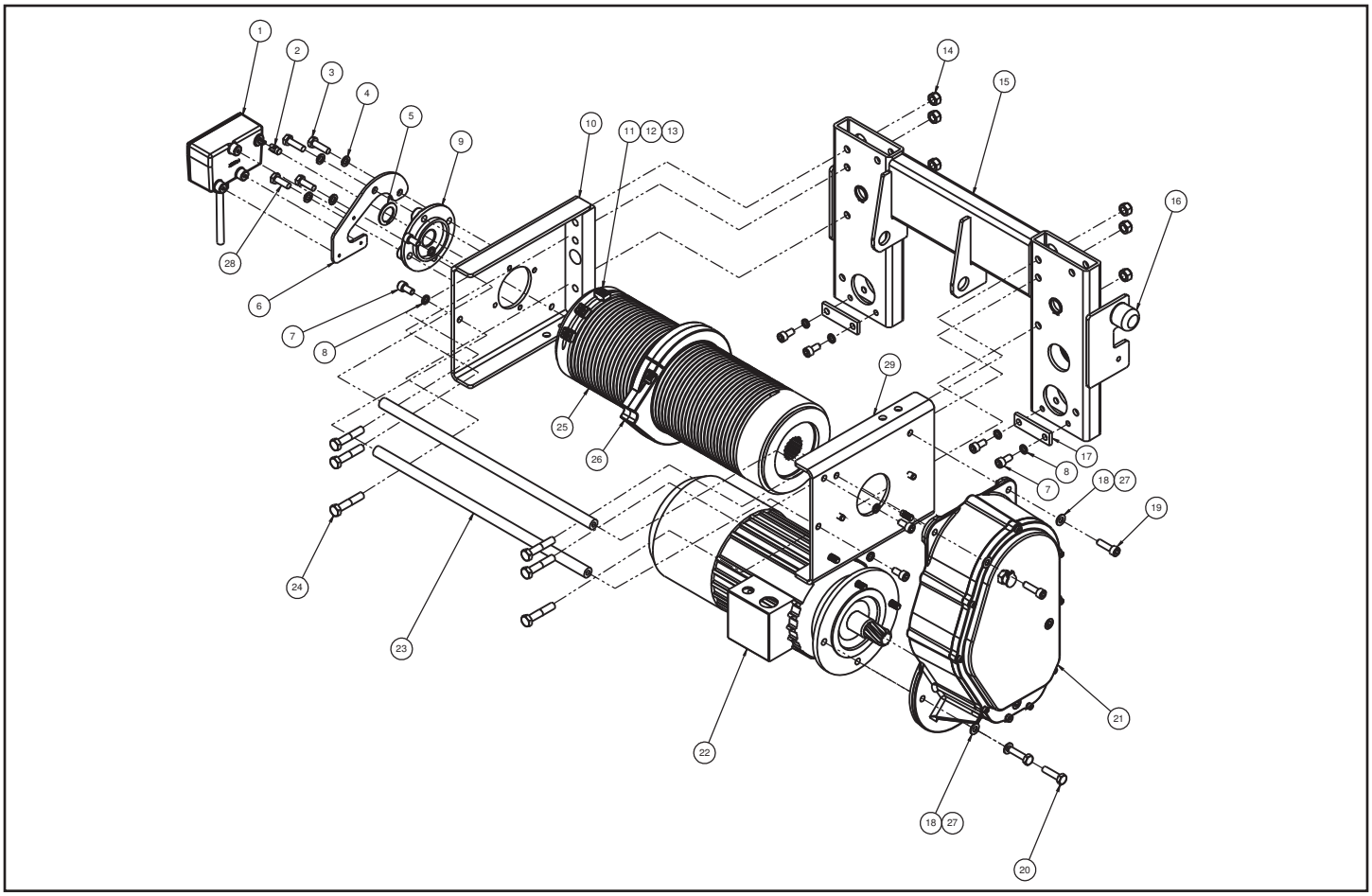


Figure 9-1. Hoist Drum, Drum Frame, Gearcase, Motor, Rope Guide and Screw Type Limit Switch

"A" Frame: Hoist Components for Figure 9-1.			
REF. No.	Part Number	Description	Qty. Req'd
1	43981305	LIMIT SWITCH GEARED NEMA 4/12	1
2	11593901	DRUM SHAFT INSERT	1
3	11802612	HIGH STRENGTH BOLT, HEX HEAD 10mm-1.50 x 35mm Lg. CLASS 8.8	2
4	11803404	M10 LOCKWASHER 4	
5	10846002	RETAINING RING EXTERNAL	1
6	23395801	MOUNTING BRACKET	1
7	11802707	10mm-1.50 HEX SHCS	8
8	11803203	M10, HI-COLLAR LOCKWASHER	8
9	11801805	FLANGED CARTRIDGE BEARING FHFC206-30-NLC	1
10	33296332	DRUM FRAME BRACKET (LH)	1
11	23397701	ROPE CLAMP	3
12	11802721	M6-1.00 HEX SHCS	3
13	11803205	M6, HI-COLLAR LOCKWASHER	3
14	11803003	12mm-1.75 ESNA SELF LOCKING NUT (PLATED)	6
15	45402901	DRUM SIDE ASM. (MACHINED)	1
16	11680704	SIZE 40 BUMPER, M8 STUD WITH NUT AND LOCKWASHER	2
17	31493324	KEEPER PLATE	2
18	11803101	M10 FLAT WASHER	4
19	11802723	10mm-1.50 HEX SHCS	2
20	11802606	HIGH STRENGTH BOLT, HEX HEAD 10mm-1.50 x 40mm Lg. CLASS 8.8	2
21	44943501C 44943502C	GEARCASE ASSEMBLY (3.2 tonne) GEARCASE ASSEMBLY (1.6 tonne)	1

(continued on next page)

"A" Frame: Hoist Components for Figure 9-1.			
REF. No.	Part Number	Description	Qty. Req'd
22	See charts below	HOIST MOTOR (TWO SPEED) (1.6 TONNE) HOIST MOTOR (TWO SPEED) (3.2 TONNE)	1
23	23385903 23385904	DRUM FRAME ROD - S2 MODEL & 20 FT. LIFT, S4 MODEL DRUM FRAME ROD - 40 FT. LIFT, S4 MODEL	2
24	11802520	HIGH STRENGTH BOLT	6
25	44943901 44943902	DRUM FRAME ROD - S2 MODEL & 20 FT. LIFT, S4 MODEL DRUM FRAME ROD - 40 FT. LIFT, S4 MODEL	1
26	44943801	ROPE GUIDE "A" FRAME	1
27	---	LOCK NUT, M10	8
28	11802613	HIGH STRENGTH BOLT	2
29	33296331	DRUM FRAME BRACKET	1

ABM HOIST MOTORS

MOTOR 5.0/1.25 HP 3600/900 RPM	3.2 TONNE (S4 REEVING)	MOTOR 3.0/.75 HP 3600/900 RPM	1.6 TONNE (S2 REEVING)
POWER SUPPLY	PART NUMBER	POWER SUPPLY	PART NUMBER
208V-3PH-60HZ	33295001	208V-3PH-60HZ	33295501
230V-3PH-60HZ	33295002	230V-3PH-60HZ	33295502
460V-3PH-60HZ	33295003	460V-3PH-60HZ	33295503
575V-3PH-60HZ	33295004	575V-3PH-60HZ	33295504
380V-3PH-50HZ	33295005	380V-3PH-50HZ	33295505

ABM HOIST MOTORS (OUTDOOR SERVICE)

MOTOR 5.0/1.25 HP 3600/900 RPM	3.2 TONNE (S4 REEVING)	MOTOR 3.0/.75 HP 3600/900 RPM	1.6 TONNE (S2 REEVING)
POWER SUPPLY	PART NUMBER	POWER SUPPLY	PART NUMBER
208V-3PH-60HZ	33297001	208V-3PH-60HZ	33297101
230V-3PH-60HZ	33297002	230V-3PH-60HZ	33297102
460V-3PH-60HZ	33297003	460V-3PH-60HZ	33297103
575V-3PH-60HZ	33297004	575V-3PH-60HZ	33297104
380V-3PH-50HZ	33297005	380V-3PH-50HZ	33297105

MGM HOIST MOTORS

MOTOR 5.0/1.25 HP 3600/900 RPM	3.2 TONNE (S4 REEVING)	MOTOR 3.0/.75 HP 3600/900 RPM	1.6 TONNE (S2 REEVING)
POWER SUPPLY	PART NUMBER	POWER SUPPLY	PART NUMBER
208V-3PH-60HZ	33330601	208V-3PH-60HZ	N/A
230V-3PH-60HZ	33330602	230V-3PH-60HZ	N/A
460V-3PH-60HZ	33330603	460V-3PH-60HZ	N/A
575V-3PH-60HZ	33330604	575V-3PH-60HZ	N/A
380V-3PH-50HZ	CALL FACTORY	380V-3PH-50HZ	N/A

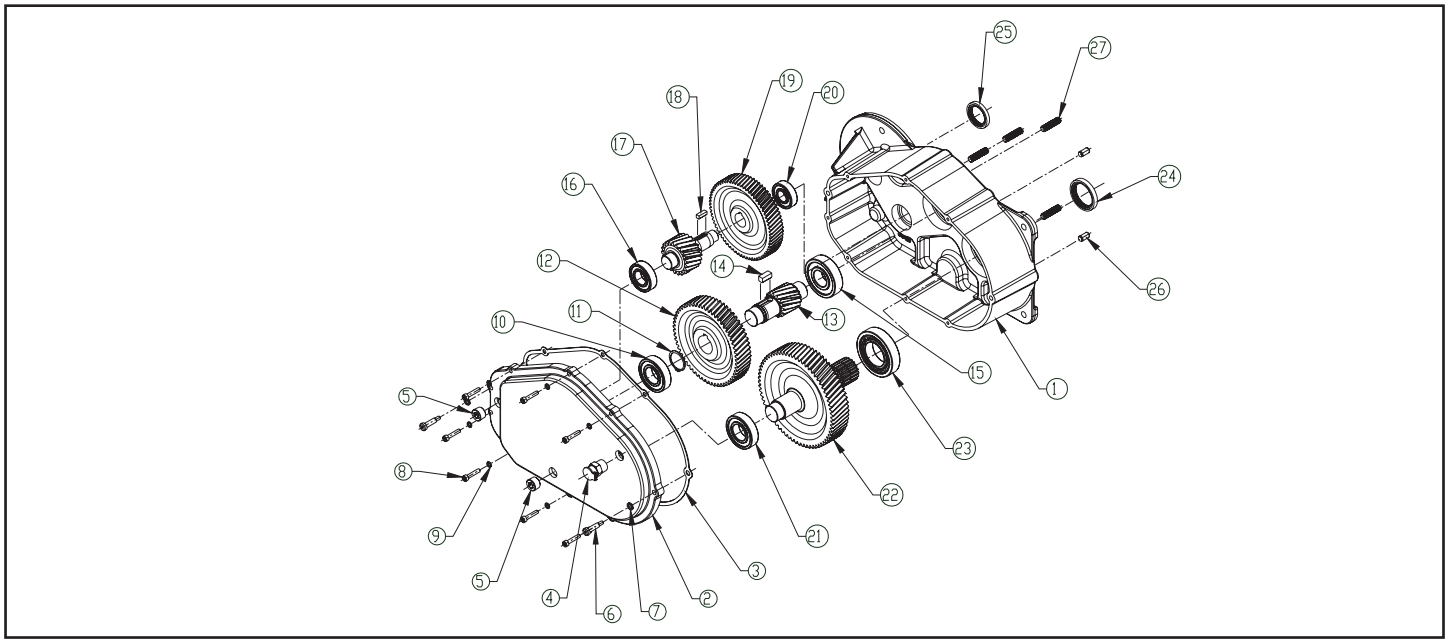


Figure 9-2. Hoist Gearing

"A" Frame S4 Reeved: Hoist Gearing for Figure 9-2.			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	44943501C	**Complete 3200kg Hoist Gearcase Ass'y. - 75.14:1 Ratio**	**1**
	44943590	**Gearcase Gasket/Seal Kit (Incl. Ref. Nos. 3, 24, 25)**	
	44943591	**Gearcase Gasket/Bearings Kit (Incl. Ref. Nos. 3, 10, 15, 16, 20, 21, 23, 24, 25)**	
1	N/A	Gearcase	1
2	N/A	Cover	1
3	N/A	Gasket	1
4	-	Vent Plug	1
5	-	Drain/Fill Level Plug	2
6	N/A	Socket Head Shoulder Screw, M6	2
7	N/A	Hi-Collar Lockwasher, M8	2
8	N/A	Socket Head Cap Screw, M6	7
9	N/A	Hi-Collar Lockwasher, M6	7
10	N/A	Ball Bearing	1
11	N/A	External Retaining Ring	1
12	N/A	Intermediate Gear	1
13	N/A	Drum Pinion Shaft	1
14	N/A	Key	1
15	N/A	Ball Bearing	1
16	N/A	Ball Bearing	1
17	N/A	Intermediate Pinion Shaft	1
18	N/A	Key	1
19	N/A	Motor Gear	1
20	N/A	Ball Bearing	1
21	N/A	Ball Bearing	1
22	N/A	Output Shaft	1
23	N/A	Roller Bearing	1
24	N/A	Output Shaft Oil Seal	1
25	N/A	Motor Shaft Oil Seal	1
26	N/A	Torque Pin	2
27	N/A	Threaded Stud, M10	4

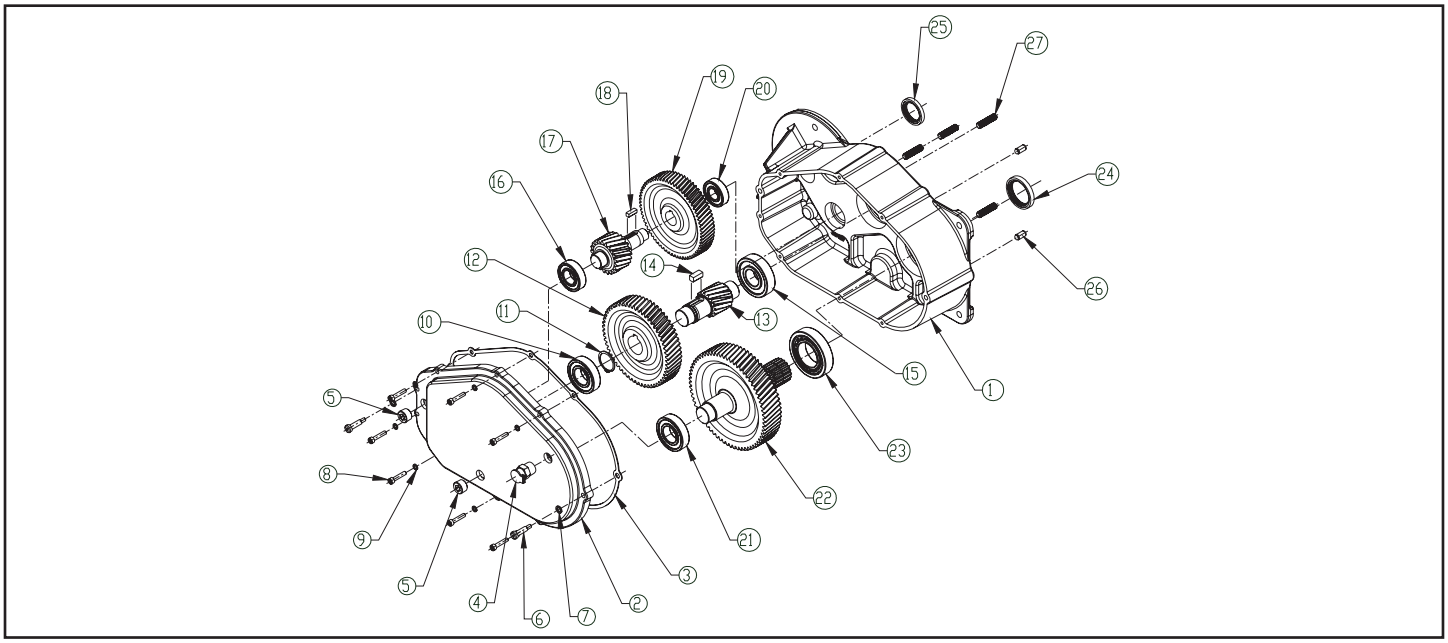


Figure 9-2. Hoist Gearing

"A" Frame S2 Reeved: Hoist Gearing for Figure 9-2.			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	44943502C	**Complete 1600kg Hoist Gearcase Ass'y. - 126.3:1 Ratio**	**1**
	44943590	**Gearcase Gasket/Seal Kit (Incl. Ref. Nos. 3, 24, 25)**	
	44943591	**Gearcase Gasket/Bearings Kit (Incl. Ref. Nos. 3, 10, 15, 16, 20, 21, 23, 24, 25)**	
1	N/A	Gearcase	1
2	N/A	Cover	1
3	N/A	Gasket	1
4	-	Vent Plug	1
5	-	Drain/Fill Level Plug	2
6	N/A	Socket Head Shoulder Screw, M6	2
7	N/A	Hi-Collar Lockwasher, M8	2
8	N/A	Socket Head Cap Screw, M6	7
9	N/A	Hi-Collar Lockwasher, M6	7
10	N/A	Ball Bearing	1
11	N/A	External Retaining Ring	1
12	N/A	Intermediate Gear	1
13	N/A	Drum Pinion Shaft	1
14	N/A	Key	1
15	N/A	Ball Bearing	1
16	N/A	Ball Bearing	1
17	N/A	Intermediate Pinion Shaft	1
18	N/A	Key	1
19	N/A	Motor Gear	1
20	N/A	Ball Bearing	1
21	N/A	Ball Bearing	1
22	N/A	Output Shaft	1
23	N/A	Roller Bearing	1
24	N/A	Output Shaft Oil Seal	1
25	N/A	Motor Shaft Oil Seal	1
26	N/A	Torque Pin	2
27	N/A	Threaded Stud, M10	4

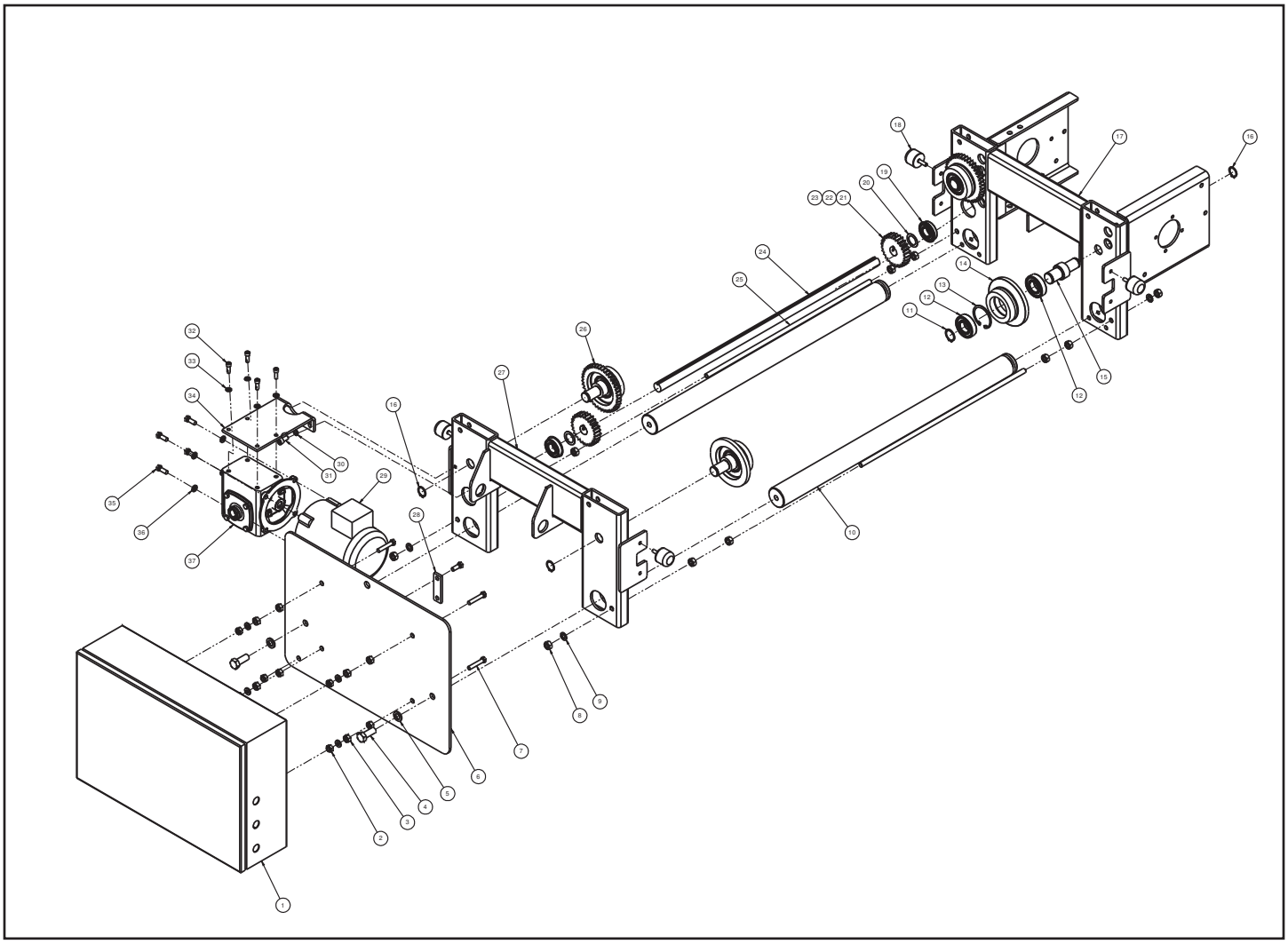


Figure 9-3. Motor Driven Trolley Frame and Drive

"A" Frame: Trolley Frame and Drive Components for Figure 9-3.			
REF. No.	Part Number	Description	Qty. Req'd
1	45042501	CONTROL ENCLOSURE - 24 x 16 x 6.8	1
2	10327304	3/8 ESNA SELF LOCKING NUT	5
3	NO1948	3/8-16 SEMIFINISHED HEX NUT (PLATED)	8
4	11802604	HIGH STRENGTH BOLT, HEX HEAD 16mm-2.00 x 40mm Lg. CLASS 8.8	2
5	11803402	M16 LOCKWASHER	2
6	45406501	COUNTER WEIGHT	1
7	10387202	HEX TAP BOLT, 3/8-16 x 2 (PLATED)	4
8	11802906	M12-1.75 HEX NUT, CLASS 8	12
9	11803401	M12 LOCKWASHER	4
10	23384202	BAR ALIGNMENT 2 1/4 X 34 3/16	2
11	10119401	EXTERNAL RETAINING RING (TRUARC 5100-118)	4
12	NO8135	BEARING - SINGLE ROW RADIAL (TWO SHIELDS)	8
13	10008311	TRUARC SIZE 244 INTERNAL SNAP RING	4
14	23400406	PATENTED TRACK TROLLEY WHEEL	2
15	23400301	WHEEL AXLE	4
16	10119409	EXTERNAL RETAINING RING (TRUARC 5100-100)	4
17	45402901	DRUM SIDE ASM. (MACHINED)	1
18	11680704	SIZE 40 BUMPER, M8 STUD WITH NUT AND LOCKWASHER	2

(continued on next page)

"A" Frame: Trolley Frame and Drive Components for Figure 9-3.			
REF. No.	Part Number	Description	Qty. Req'd
19	10378807	BALL BEARING WITH SNAP RING (6205-16-2RSNR)	2
20	10231001	WASHER FLAT	2
21	23384001	PINION TRAVERSE	2
22	11781101	1/4 x 1/4 x 3/4 LG KEY	2
23	11849801	M6-1.00 x 10mm CUP POINT SET SCREW	6
24	23382902	TRAVERSE CROSS SHAFT	1
25	10424769	THREADED ROD, M12 X 24"	2
26	23400405	TRACK TROLLEY WHEEL	2
27	45403101	TRANSVERSE SIDE ASM.	1
28	31493324	KEEPER PLATE	1
29	See chart below	MOTOR 0.5/0.167 HP, 1800 RPM, 460v-3-60	1
30	11803203	M10, HI-COLLAR LOCKWASHER	2
31	11802707	10mm-1.50 HEX SHCS	2
32	10392029	5/16-18 X 0.875 SHCS PLAIN SELF-LOCKING	4
33	NO8526	5/16 LOCKWASHER, MEDIUM SERIES (PLATED)	4
34	23383901	TORQUE ARM BRACKET	1
35	10791731	HEX BOLT GRADE 5, 3/8-16 x 1 (PLATED)	4
36	NO1951	3/8 LOCKWASHER, MEDIUM SERIES (PLATED)	4
37	905378	SINGLE WORM GEAR REDUCER	1

TROLLEY MOTORS

MOTOR .5/.17 HP 1800/600 RPM	3.2 TONNE (S4 REEVING)	MOTOR .25/.08 HP 1800/600 RPM	*1.6 TONNE (S2 REEVING)
POWER SUPPLY	PART NUMBER	POWER SUPPLY	PART NUMBER
208V-3PH-60HZ	32879624	208V-3PH-60HZ	32879615
230V-3PH-60HZ	32879625	230V-3PH-60HZ	32879615
460V-3PH-60HZ	32879626	460V-3PH-60HZ	32879616
575V-3PH-60HZ	32879627	575V-3PH-60HZ	32879617
380V-3PH-50HZ	11704229	380V-3PH-50HZ	11704128

***Note:** 1.6 tonne models with bolted frame use .25/.08 HP motors.
1.6 tonne models with new welded frame use .5/.17 HP motors.
Please verify HP rating of trolley motor prior to order.

NOTES

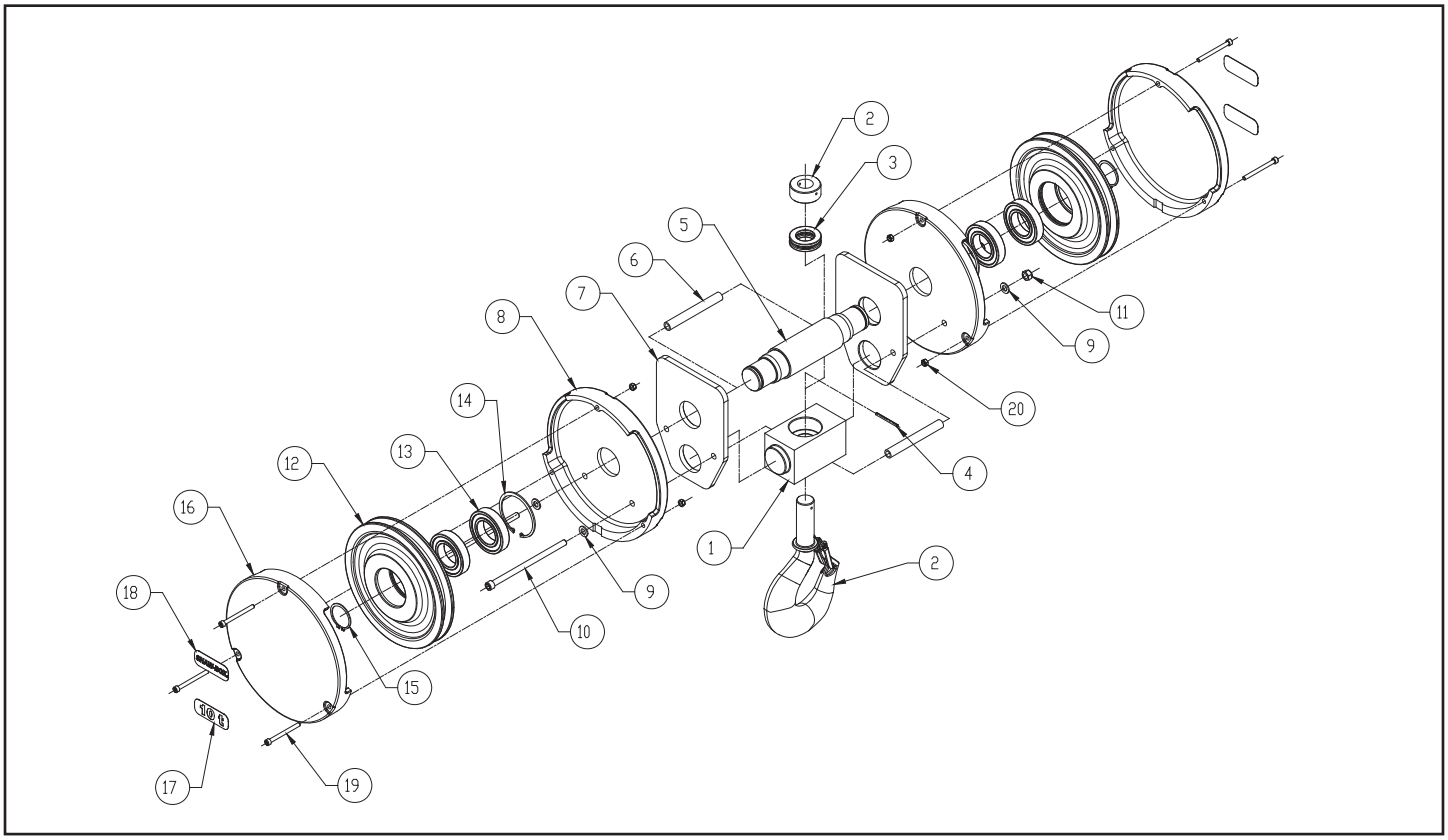


Figure 9-4a. Lower Block Assembly

"A" Frame S4 Reeved: Lower Block Components for Figure 9-4a.			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	44943601C	**Lower Block Assembly (Excludes Ref. Nos. 17 & 18)**	**1**
	33296201	**Sheave Assembly (Incl. Ref. Nos. 12, 13, 14)**	
	4X1307	**Hook Latch Kit (Not shown)**	
	23398091	**Hook Assembly (Incl. Ref. Nos. 2, 3, 4)**	
1	N/A	Trunnion Crosshead	1
2	N/A	Hook & Nut Assembly	1
3	N/A	Thrust Bearing	1
4	N/A	Roll Pin	1
5	N/A	Sheave Pin	1
6	N/A	Spacer Tube	2
7	N/A	Lower Block Strap	2
8	33296501	Inner Sheave Cover	2
9	N/A	Flat Washer, M8	4
10	N/A	Socket Head Cap Screw, M8	2
11	N/A	Locknut, M8	2
12	N/A	Rope Sheave	2
13	N/A	Ball Bearing	4
14	N/A	Internal Retaining Ring	2
15	N/A	External Retaining Ring	2
16	33296511	Outer Sheave Cover	2
17	23382880	3200 kg Capacity Label	2
18	23382802	YALE Brand Label	2
19	N/A	Socket Head Cap Screw, M6	6
20	N/A	Locknut, M6	6

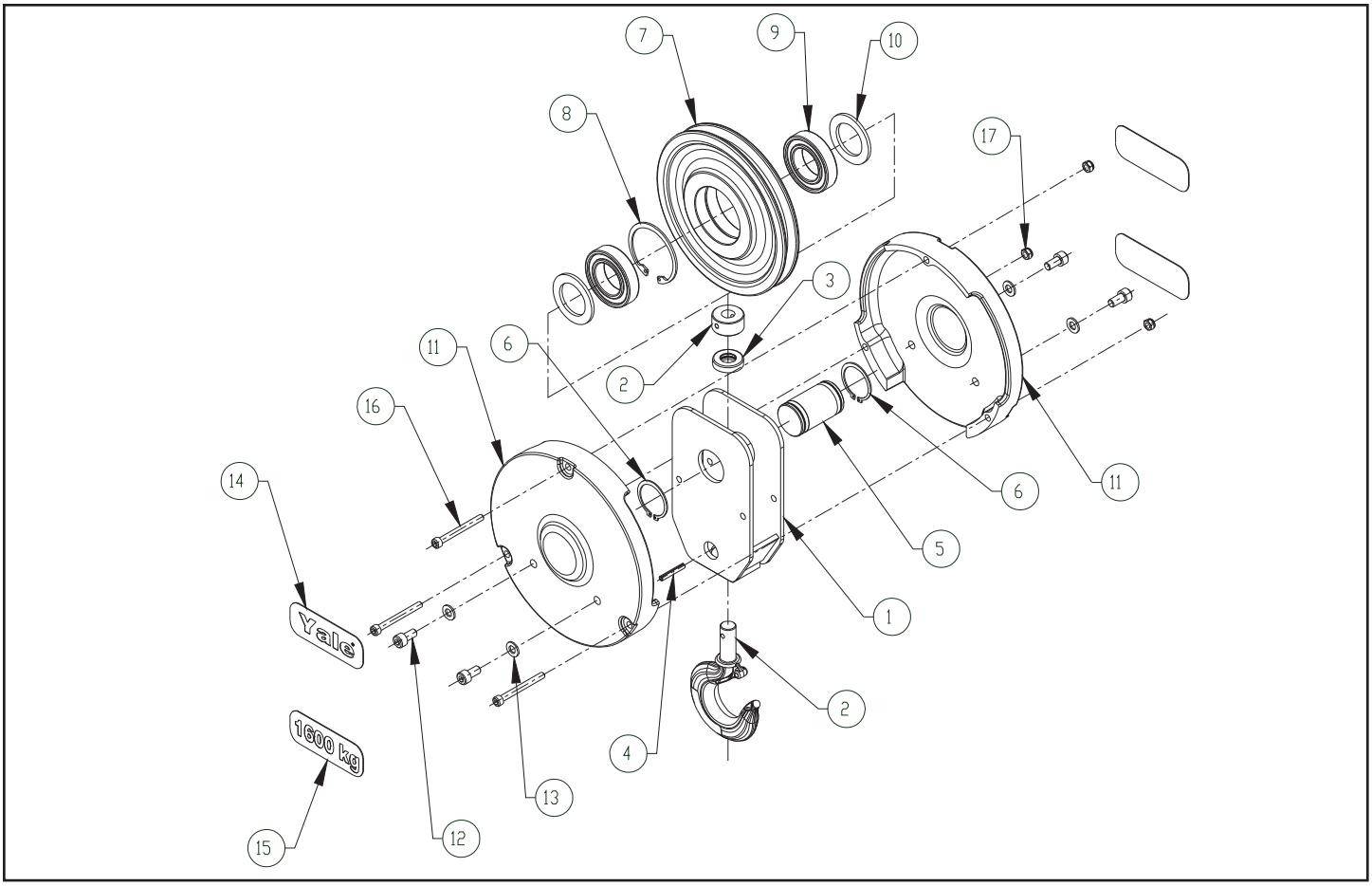


Figure 9-4b. Lower Block Assembly (S2 Reeved)

"A" Frame S2 Reeved: Lower Block Components for Figure 9-4b.			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	44944101C	**Lower Block Assembly (Excludes Ref. Nos. 14 & 15)**	**1**
	33296201	**Sheave Assembly (Incl. Ref. Nos. 7, 8, 9)**	
	4X1304	**Hook Latch Kit (Not Shown)**	
	23398691	**Hook Assembly (Incl. Ref. Nos. 2, 3, 4)**	
1	N/A	Crosshead Weldment	1
2	N/A	Hook & Nut Assembly	1
3	N/A	Thrust Bearing	1
4	N/A	Roll Pin	1
5	N/A	Sheave Pin	1
6	N/A	External Retaining Ring	2
7	N/A	Rope Sheave	1
8	N/A	Internal Retaining Ring	1
9	N/A	Ball Bearing	2
10	N/A	Spacer Washer	2
11	33296701	Outer Sheave Cover	2
12	N/A	Socket Head Cap Screw, M8	4
13	N/A	Flat Washer, M8	4
14	23382802	YALE Brand Label	2
15	23382881	1600 kg Capacity Label	2
16	N/A	Socket Head Cap Screw, M6	3
17	N/A	Locknut, M6	3

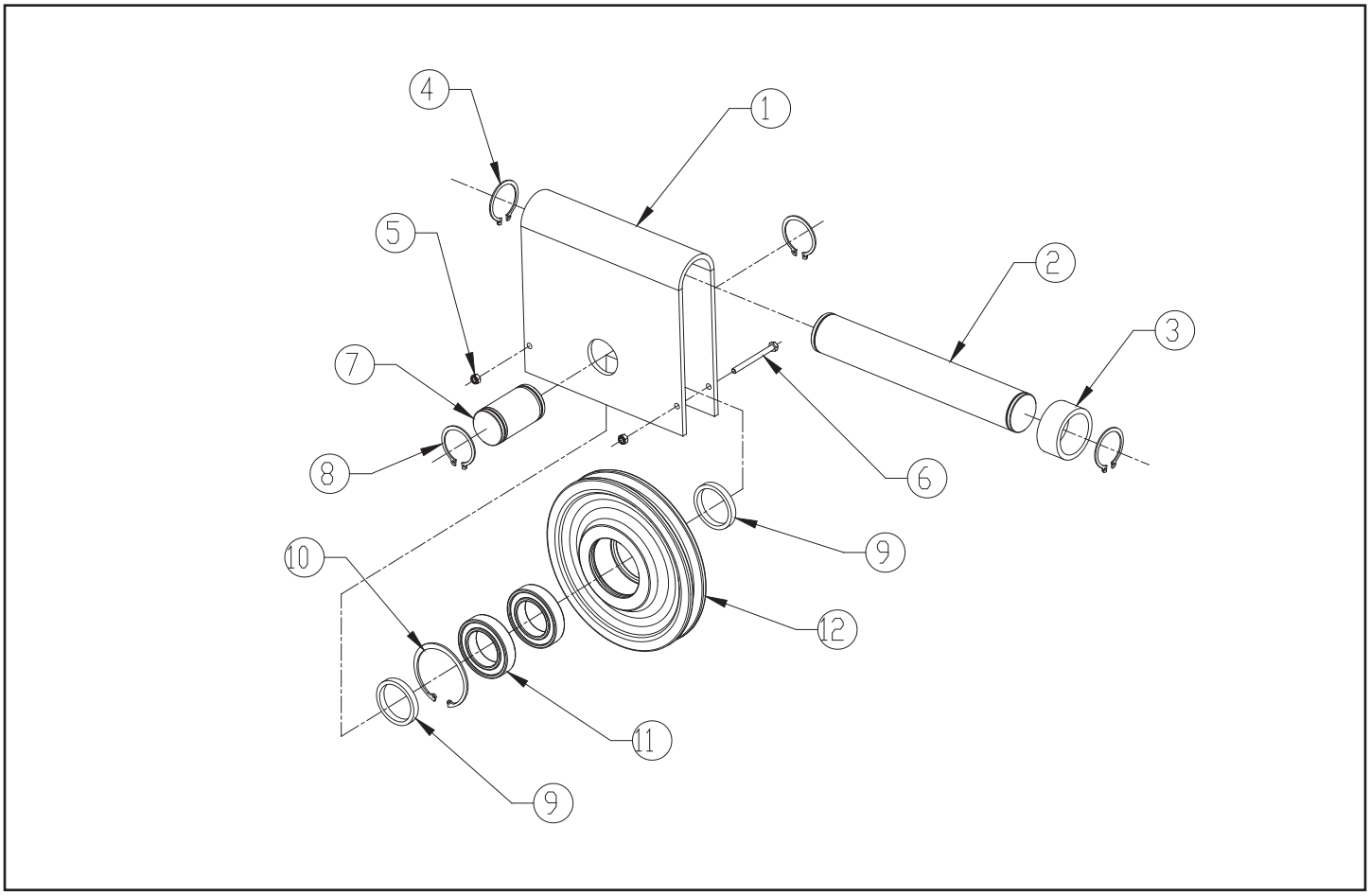
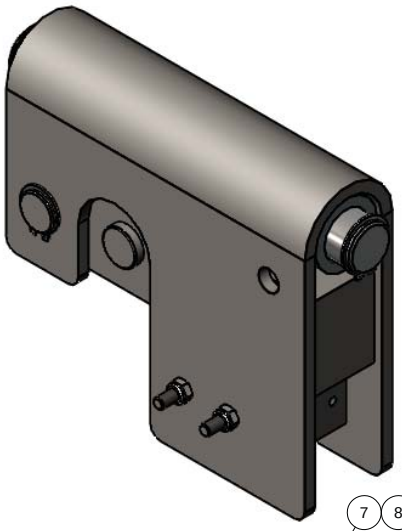


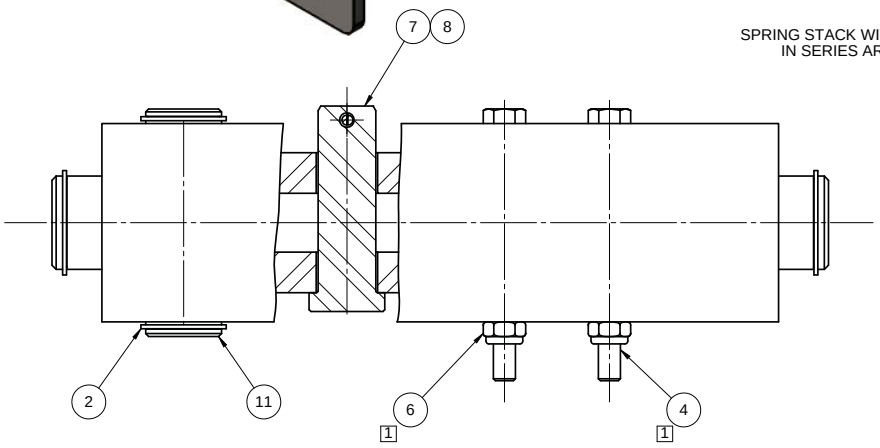
Figure 9-5. Upper Block Assembly (S4 Reeved)

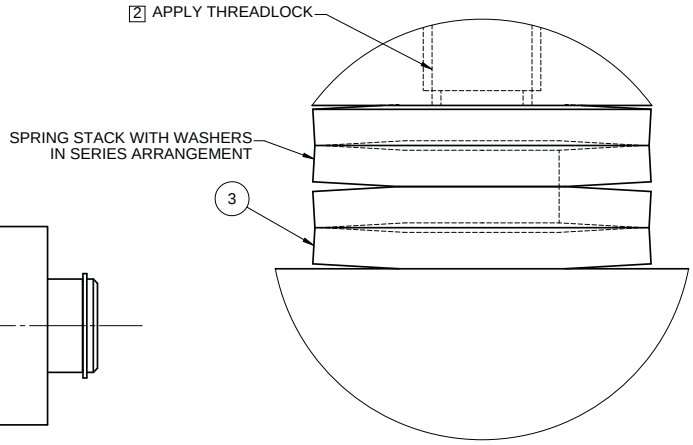
"A" Frame S4 Reeved: Upper Block Components for Figure 9-5.			
REF. No.	Part Number	Description	Qty. Req'd
	44944001	**"A" Frame Hoist Upper Block Assembly**	**1**
	33296201	**Sheave Assembly (Incl. Ref. Nos. 10, 11, 12)**	
1	N/A	Upper Block Yoke	1
2	N/A	Yoke Pin	1
4	N/A	External Retaining Ring	2
5	N/A	Locknut, M6	2
6	N/A	Hex Head Bolt, M6	2
7	N/A	Sheave Pin	1
8	N/A	External Retaining Ring	2
9	N/A	Spacer Washer	2
10	N/A	Internal Retaining Ring	1
11	N/A	Sealed Ball Bearing	2
12	N/A	Rope Sheave	1

Figure 9-6
"A" Frame S4 Reeved: Dead End/Overload Limit Assembly

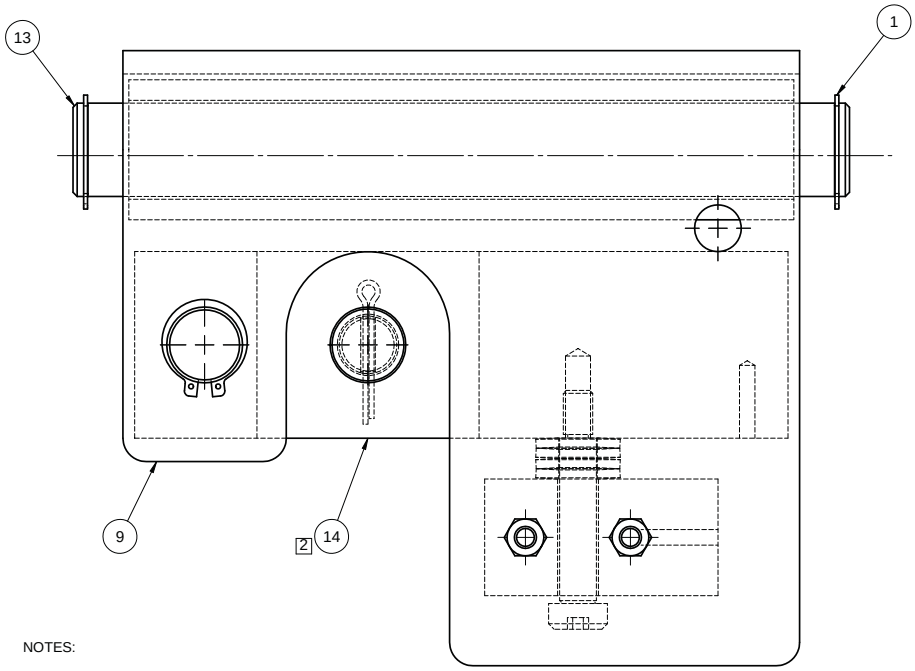
ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	10119409	EXTERNAL RETAINING RING (TRUARC 5100-100)	2
2	10119445	EXTERNAL RETAINING RING (TRUARC 5100-81)	2
3	11781503	BELLEVILLE SPRING, HDS10 (PRESET)	4
4	11802501	M6 X 70mm HEX HEAD CAP SCREW	2
5	11802801	M10 X 45mm SHOULDER SOCKET HEAD CAP SCREW	1
6	11803001	M6-1.00 ESNA SELF LOCKING NUT (PLATED)	2
7	11850701	CLEVIS PIN	1
8	11850801	COTTER PIN	1
9	23385401	YOKE DEAD END	1
10	23385701	OVERLOAD SPRING BASE FOR DEAD END	1
11	23385801	DEAD END PIN	1
12	23398802	YOKE SLEEVE	1
13	23399403	PIN YOKE	1
14	23566801	OVERLOAD BEAM	1

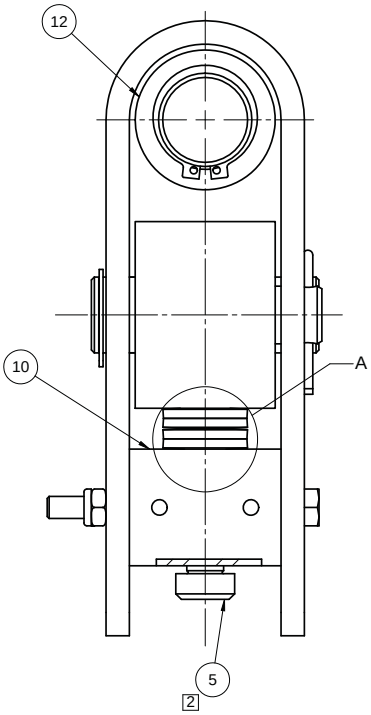






DETAIL A
SPRING STACK (IN SERIES) DETAIL
SCALE: (4 : 1)

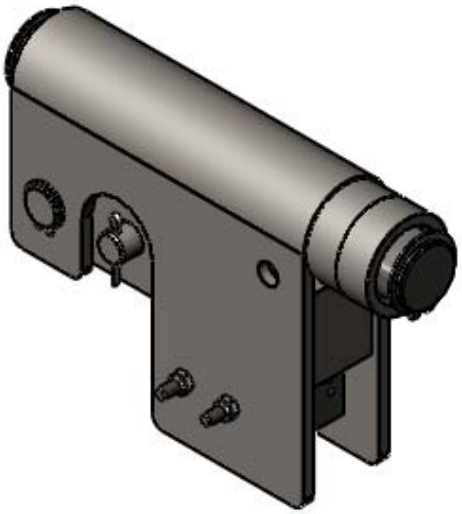




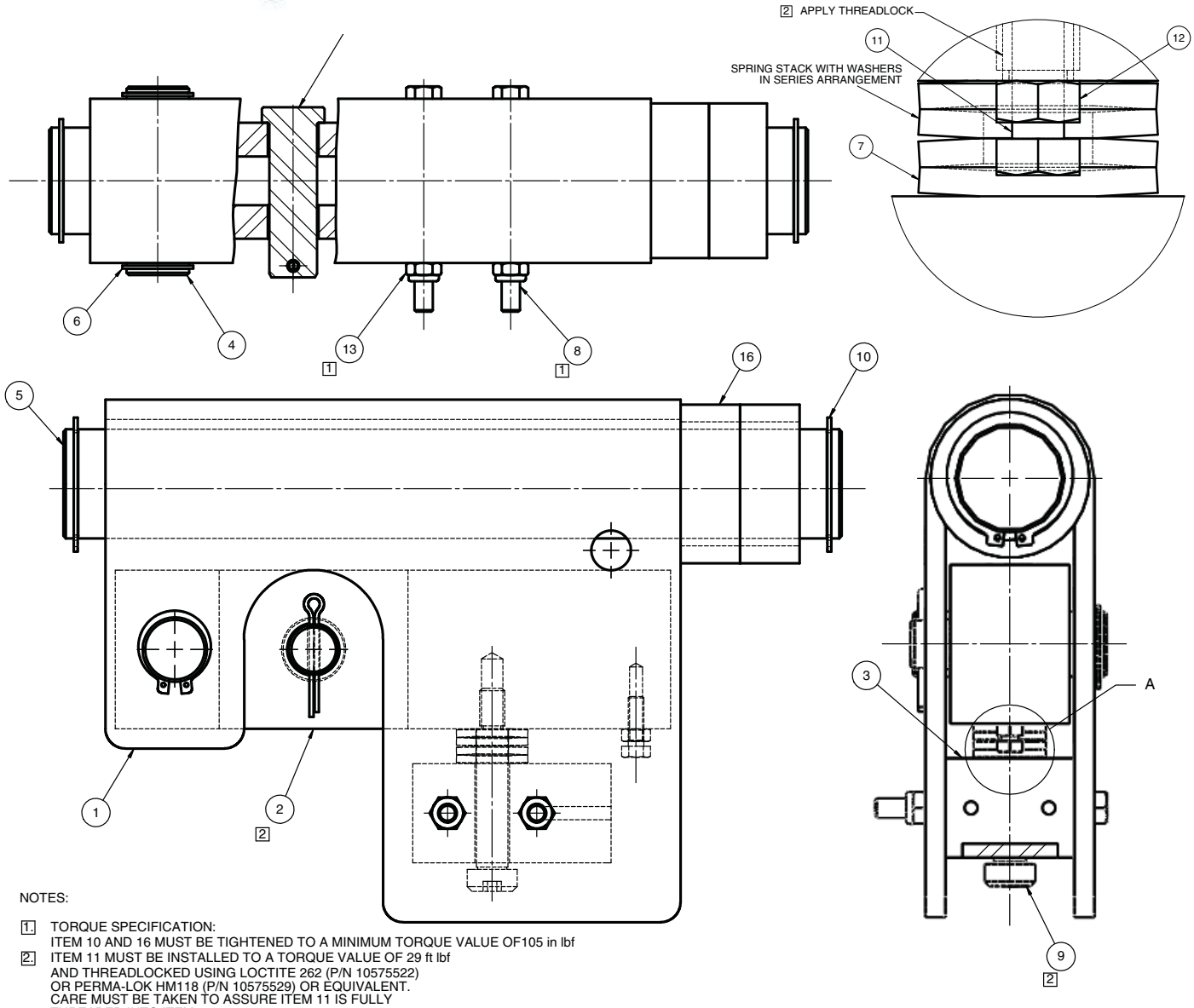
NOTES:

1. TORQUE SPECIFICATION:
   ITEM 10 AND 16 MUST BE TIGHTENED TO A MINIMUM TORQUE VALUE OF105 in lbf
2. ITEM 11 MUST BE INSTALLED TO A TORQUE VALUE OF 29 ft lbf
   AND THREADLOCKED USING LOCTITE 262 (P/N 10575522)
   OR PERMA-LOK HM118 (P/N 10575529) OR EQUIVALENT.
   CARE MUST BE TAKEN TO ASSURE ITEM 11 IS FULLY
   THREADED INTO ITEM 2.
3. SEE INDIVIDUAL PART DRAWINGS FOR SURFACE TREATMENT REQUIREMENTS.

Figure 9-6
"A" Frame S2 Reeved: Dead End/Overload Limit Assembly



ITEM NO.	PART NUMBER	DESCRIPTION	45423301/ QTY.
1	23385401	YOKE DEAD END	1
2	23566801	OVERLOAD BEAM	1
3	23385701	OVERLOAD SPRING BASE FOR DEAD END	1
4	23385801	DEAD END PIN	1
5	23397601	YOKE PIN WITH GROOVES	1
6	10119445	EXTERNAL RETAINING RING (TRUARC 5100-81)	2
7	11781503	BELLEVILLE SPRING, HDS10 (PRESET)	4
8	11802501	M6 X 70mm HEX HEAD CAP SCREW	2
9	11802801	M10 X 45mm SHOULDER SOCKET HEAD CAP SCREW	1
10	10119407	EXTERNAL RETAINING RING (TRUARC 5100-137)	2
11	11802601	M5 X 16mm HEX HEAD CAP SCREW	1
12	11802901	M5 HEX NUT	1
13	11803001	M6-1.00 ESNA SELF LOCKING NUT (PLATED)	2
14	11850701	CLEVIS PIN	1
15	11850801	COTTER PIN	1
16	11804901	YOKE SPACER	2



NOTES:

1. TORQUE SPECIFICATION:
   ITEM 10 AND 16 MUST BE TIGHTENED TO A MINIMUM TORQUE VALUE OF105 in lbf
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   AND THREADLOCKED USING LOCTITE 262 (P/N 10575522)
   OR PERMA-LOK HM118 (P/N 10575529) OR EQUIVALENT.
   CARE MUST BE TAKEN TO ASSURE ITEM 11 IS FULLY
   THREADED INTO ITEM 2.
3. SEE INDIVIDUAL PART DRAWINGS FOR SURFACE TREATMENT REQUIREMENTS.

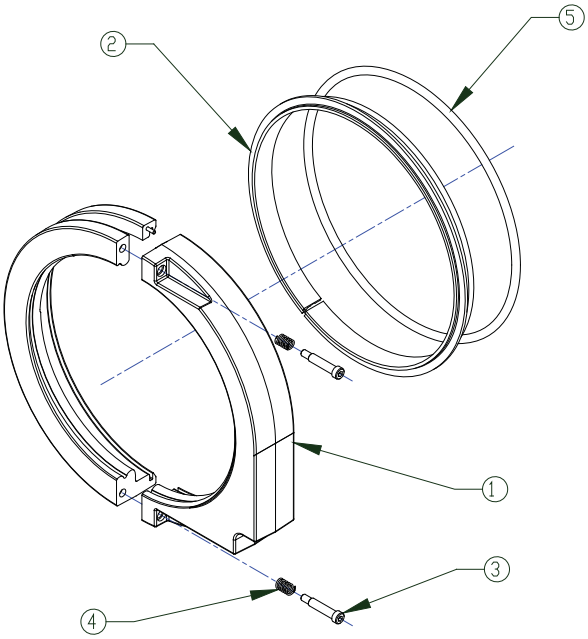


Figure 9-7. Rope Guide Assembly

"A" Frame: Rope Guide Components for Figure 9-7.			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	44943801C	**"A" Frame Rope Guide Assembly**	**1**
1	N/A	Rope Guide Body	1
2	N/A	Plastic Shroud	1
3	N/A	Socket Head Shoulder Bolt, M6 Thread	2
4	N/A	Compression Spring	2
5	N/A	Extension Spring	1

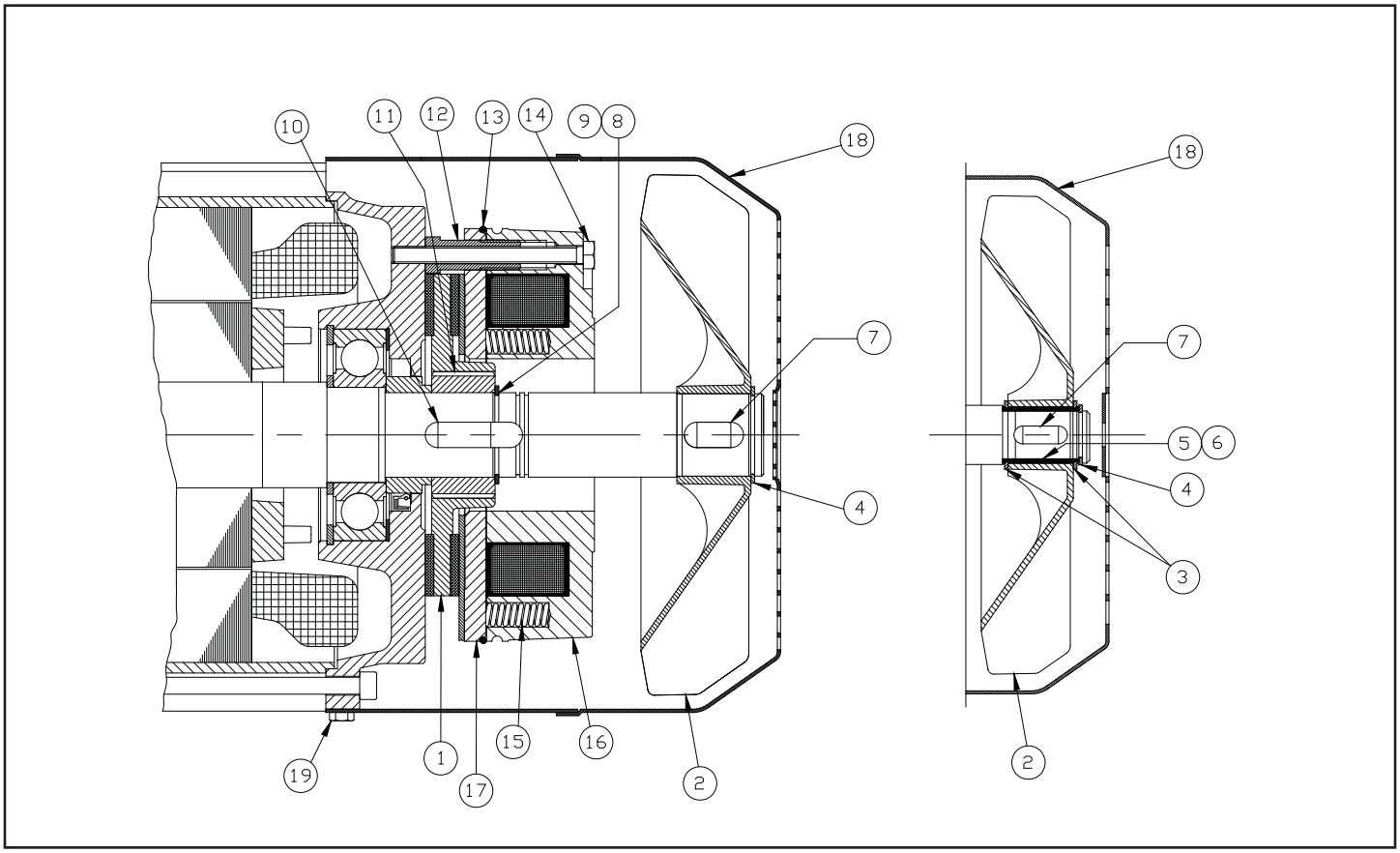


Figure 9-8. Standard Hoist Motor Brake

"A" S4 Frame: Hoist Brake Components for Figure 9-8. (ABM Motor)			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	33295049	Complete Brake Assembly (Includes Ref. Nos. 1,11,16,17 & P/N 33313853)	1
1	33313850	Brake Friction Disc	1
2		Fan	1
3	33295051	External Retaining Rings (Fan Hub)	-
4	BRAKE	External Retaining Ring (Fan)	1
5	FAN	Fan Hub	-
6	KIT	Key (Fan Hub)	-
7		Key (Fan)	1
8	33313852	External Retaining Ring (Brake Hub)	1
9	BRAKE	Spacer (Brake Hub)	1
10	HUB	Key (Brake Hub)	1
11	KIT	Brake Hub	1
12	33313853	Hollow Core Bolts	3
13	HARD-	O-Ring	1
14	WARE	Bolts (Brake Mounting)	3
15	KIT	Compression Springs	5*
16	N/A	Magnet Body - Order Complete Brake	1
17	N/A	Armature Plate - Order Complete Brake	1
18	33295055	Fan Shroud	1
19	SHROUD KIT	Bolts (Fan Shroud)	4

* Kit comes with (7) springs, but only (5) are utilized in this assembly.

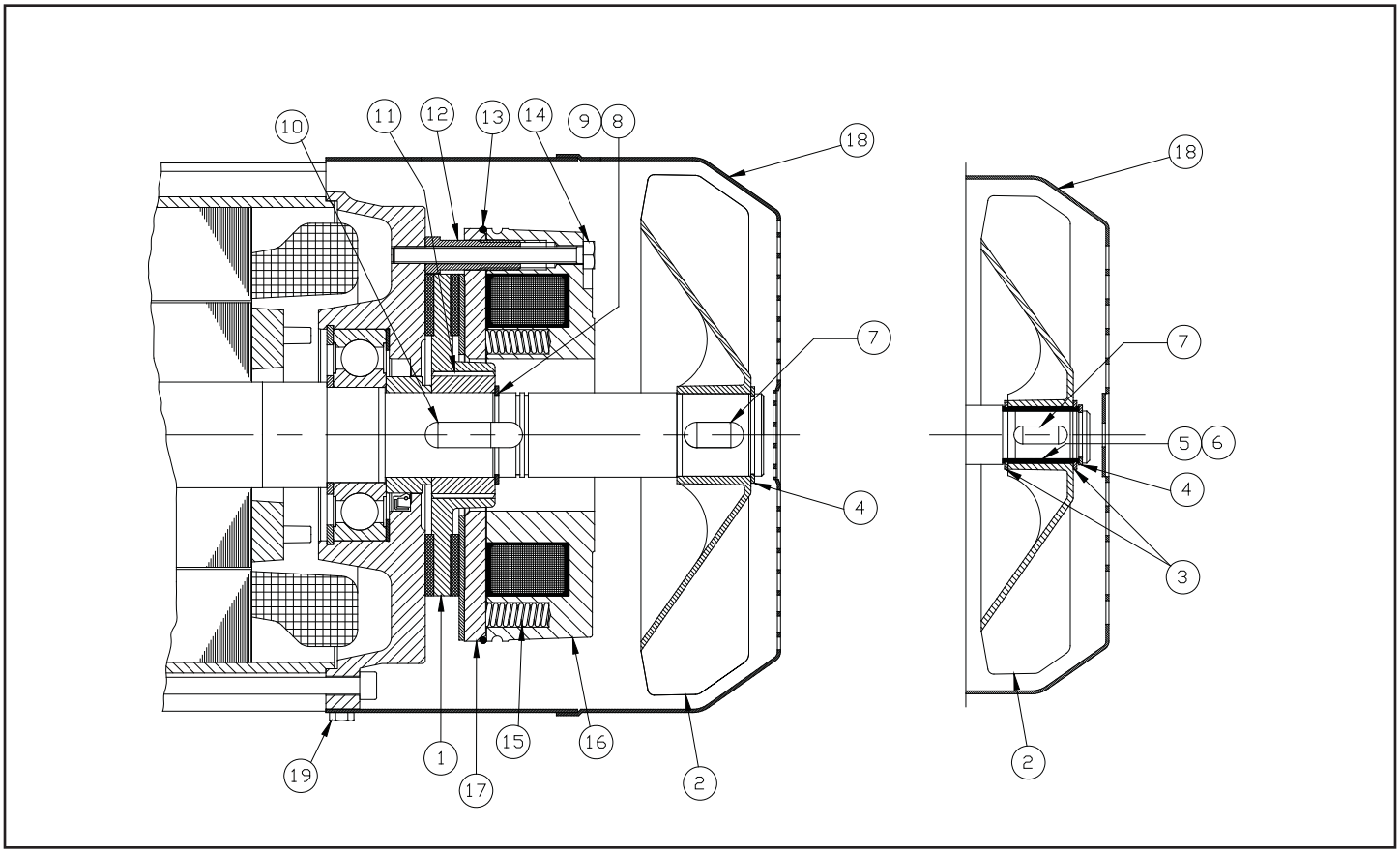


Figure 9-8. Standard Hoist Motor Brake

"A" S2 Frame: Hoist Brake Components for Figure 9-8. (ABM Motor)			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	33295549	Complete Brake Assembly (Includes Ref. Nos. 1,11,16,17 & P/N 33295553)	1
1	33295550	Brake Friction Disc	1
2		Fan	1
3	33295551	External Retaining Rings (Fan Hub)	-
4	BRAKE	External Retaining Ring (Fan)	1
5	FAN	Fan Hub	-
6	KIT	Key (Fan Hub)	-
7		Key (Fan)	1
8	33295552	External Retaining Ring (Brake Hub)	1
9	BRAKE	Spacer (Brake Hub)	1
10	HUB	Key (Brake Hub)	1
11	KIT	Brake Hub	1
12	33295553	Hollow Core Bolts	3
13	HARD-	O-Ring	1
14	WARE	Bolts (Brake Mounting)	3
15	KIT	Compression Springs	7
16	N/A	Magnet Body - Order Complete Brake	1
17	N/A	Armature Plate - Order Complete Brake	1
18	33295555	Fan Shroud	1
19	SHROUD KIT	Bolts (Fan Shroud)	4

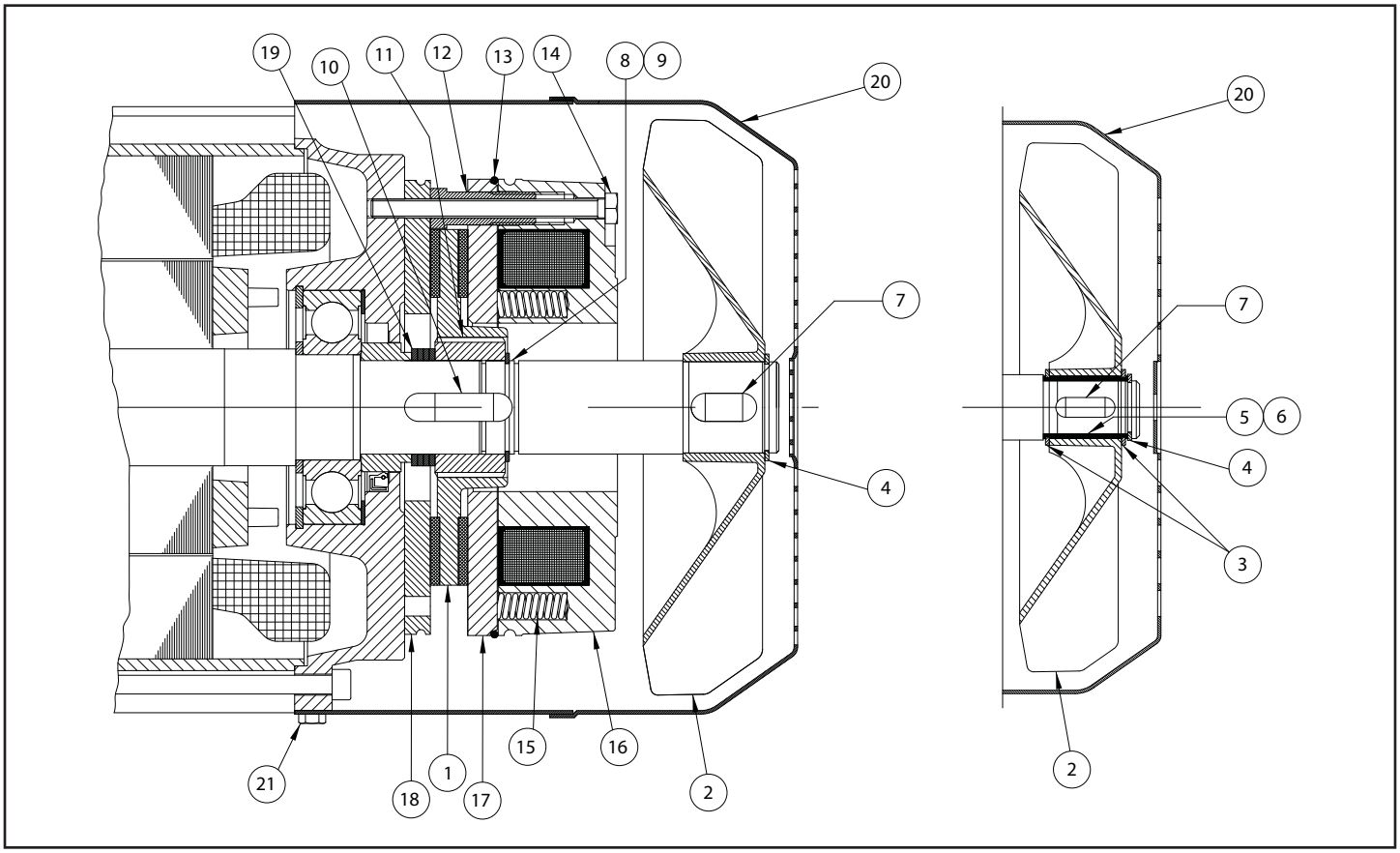


Figure 9-9. Outdoor Service Hoist Motor Brake

"A" S4 Frame: Hoist Brake Components for Figure 9-9. (ABM Motor)			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	33297049	Complete Brake Assembly (Includes Ref. Nos. 1,11,16,17, 18 & P/N 33294053)	1
1	33313850	Brake Friction Disc	1
2		Fan	1
3	33295051	External Retaining Rings (Fan Hub)	-
4	BRAKE	External Retaining Ring (Fan)	1
5	FAN	Fan Hub	-
6	KIT	Key (Fan Hub)	-
7		Key (Fan)	1
8	33294052	External Retaining Ring (Brake Hub)	1
9	BRAKE	Spacer (Brake Hub)	1
10	HUB	Key (Brake Hub)	1
11	KIT	Stainless Steel Brake Hub	1
12	33294053	Hollow Core Bolts	3
13	HARD-	O-Ring	1
14	WARE	Bolts (Brake Mounting)	3
15	KIT	Compression Springs	5*
16	N/A	Magnet Body - Order Complete Brake	1
17	N/A	Stainless Steel Armature Plate - Order Complete Brake	1
18	N/A	Stainless Steel Friction Disc - Order Complete Brake	1
19	11803105	Spacer Washers	4
20	33295055	Fan Shroud	1
21	SHROUD KIT	Bolts (Fan Shroud)	4

* Kit comes with (7) springs, but only (5) are utilized in this assembly.

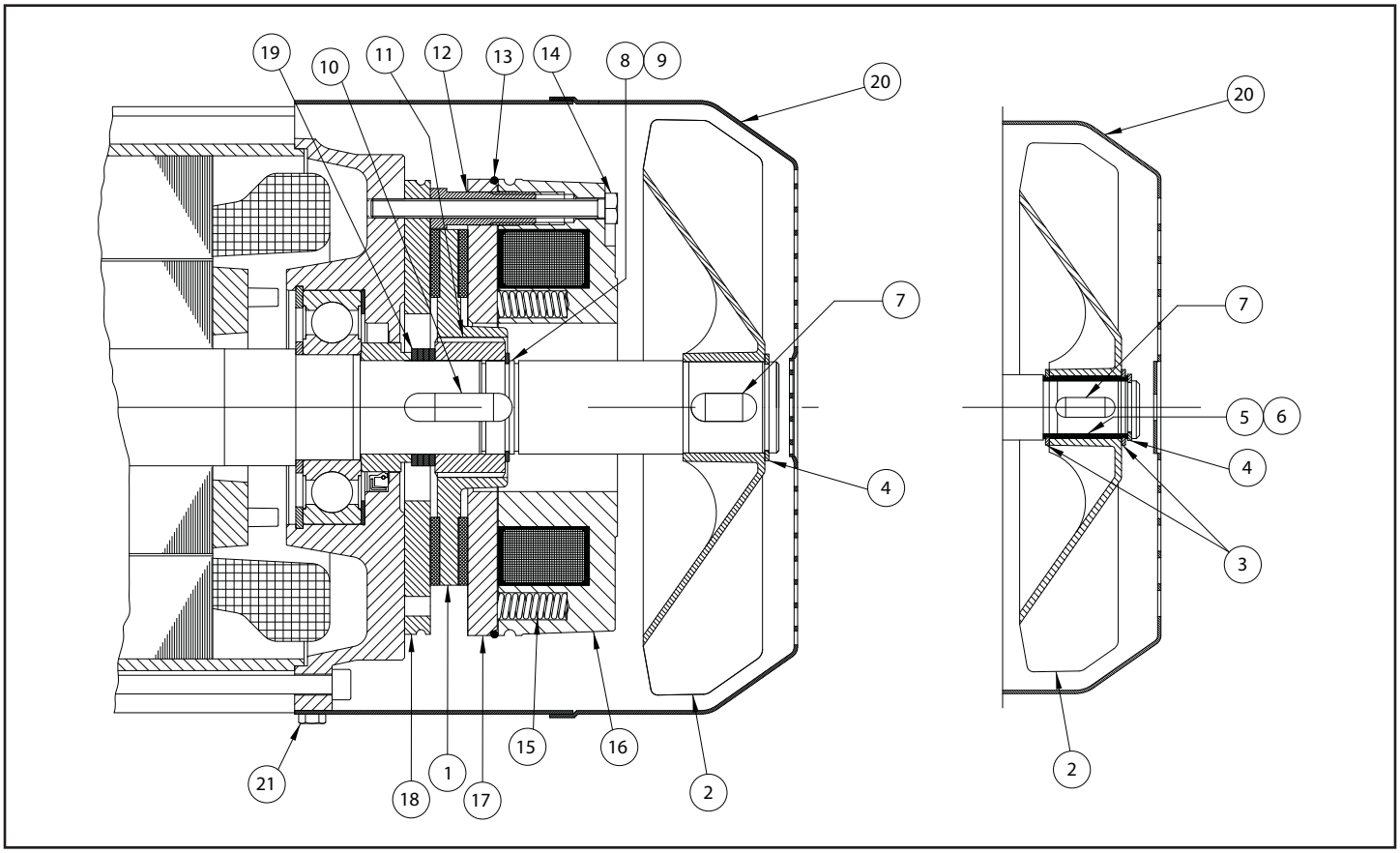
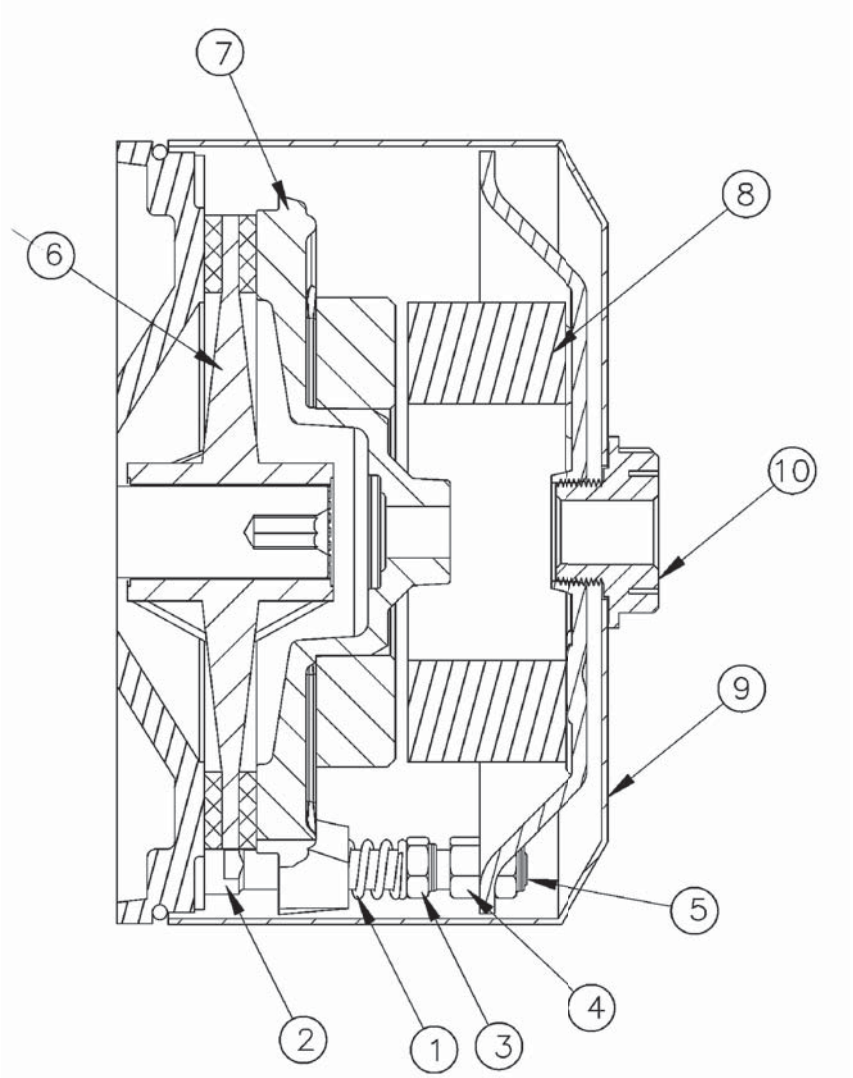


Figure 9-9. Outdoor Service Hoist Motor Brake

"A" S2 Frame: Hoist Brake Components for Figure 9-9. (ABM Motor)			
REF. No.	**Part Number**	**Description**	**Qty. Req'd**
	33297149	Complete Brake Assembly (Includes Ref. Nos. 1,11,16,17, 18 & P/N 33297153)	1
1	33295550	Brake Friction Disc	1
2		Fan	1
3	33295551	External Retaining Rings (Fan Hub)	-
4	BRAKE	External Retaining Ring (Fan)	1
5	FAN	Fan Hub	-
6	KIT	Key (Fan Hub)	-
7		Key (Fan)	1
8	33297152	External Retaining Ring (Brake Hub)	1
9	BRAKE	Spacer (Brake Hub)	-
10	HUB	Key (Brake Hub)	1
11	KIT	Stainless Steel Brake Hub	1
12	33297153	Hollow Core Bolts	3
13	HARD-	O-Ring	1
14	WARE	Bolts (Brake Mounting)	3
15	KIT	Compression Springs	7
16	N/A	Magnet Body - Order Complete Brake	1
17	N/A	Stainless Steel Armature Plate - Order Complete Brake	1
18	N/A	Stainless Steel Friction Disc - Order Complete Brake	1
19	11803107	Spacer Washers	4
20	33295555	Fan Shroud	1
21	SHROUD KIT	Bolts (Fan Shroud)	4



ITEM NO.	DESCRIPTION
1	SPRINGS
2	BRAKE ADJUSTERS
3	LOCK NUTS
4	NUTS
5	NUTS
6	BRAKE DISC
7	MOVING ELEMENT
8	BRAKE COIL
9	END COVER
10	REAR NUT

Figure 9-10 & 9-11. Standard and Outdoor Service Hoist Motor Brakes

“A” S4 Frame: Standard Hoist Brake Components for Figure 9-10. (MGM Motor)			
REF. No.	**Part Number**	**Description**	**Qty. Req’d**
	33330649	Complete Brake Assembly (Includes Ref Nos. 1-10)	1
	33330650	Brake Adjuster Set (Includes Ref Nos. 1-5)	1
6	33330651	Brake Disc	1
7	33330652	Brake Moving Element	1
8	33330653	24V DC brake Coil	1
9	33330654	Brake Cover	1
10	33327355	Plastic Hexagonal Nut (Standard Brake)	1

“A” S4 Frame: Outdoor Service Hoist Brake Components for Figure 9-11. (MGM Motor)			
REF. No.	**Part Number**	**Description**	**Qty. Req’d**
	33330659	Complete Brake Assembly (Includes Ref Nos. 1-10)	1
	33330650	Brake Adjuster Set (Includes Ref Nos. 1-5)	1
6	33330651	Brake Disc	1
7	33330652	Brake Moving Element	1
8	33330653	24V DC brake Coil	1
9	33330654	Brake Cover	1
10	33327360	Hexagonal Nut with Seal (IP55 Brake)	1

RECOMMENDED SPARE PARTS

Certain parts of your hoist 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.

One Brake Friction Disc
One Brake Control Module
One Brake Hardware Kit
One Set of Contactors
One Transformer
One Wire Rope Assembly

Note: When ordering parts always furnish Hoist Serial Number, Catalog Number, Motor Horsepower, Voltage, Phase, Frequency and Rated Load of Hoist on which the parts are to be used.

PARTS AND SERVICES ARE AVAILABLE IN THE UNITED STATES AND IN CANADA
Parts for your hoist or trolley are available from your local authorized repair station. For the name of the nearest parts or service center, visit our website www.cmworks.com or call the Columbus McKinnon customer service department at (800) 888-0985.

WARRANTY

WARRANTY AND LIMITATION OF REMEDY AND LIABILITY

A. Seller warrants that its products and parts, when shipped, and operating (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 mechanical components under this warranty must be made in writing immediately upon discovery and in any event, within three (3) years from shipment of the applicable item unless Seller specifically assumes installation, construction or start-up responsibility. All claims for defective mechanical components when Seller 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 three (3) years from completion of the applicable work by Seller, provided; however, all claims for defective mechanical components must be made in writing no later than (42) months after shipment. All claims for defective electrical components 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 electrical components when Seller 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 electrical components 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 FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL SELLER BE LIABLE TO BUYER OR ANY THIRD PARTY WITH RESPECT TO ANY GOOD, WHETHER IN CONTRACT, TORT OR OTHER THEORY OF LAW, FOR LOSS OF PROFITS OR LOSS OF USE, OR FOR ANY INCIDENTAL, CONSEQUENTIAL, SPECIAL, DIRECT OR INDIRECT DAMAGES, HOWSOEVER CAUSED.

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. All claims are to be submitted in accordance with our published warranty process.

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

D. Seller shall not be liable for any damage, injury or loss arising out of the use of the goods if, prior to such damage, injury or loss, such goods are: (i) damaged or misused following Seller's delivery to the carrier; (ii) not maintained, inspected, or used in compliance with applicable law and Seller's written instructions and recommendations; (iii) installed, repaired, altered or modified without compliance with such laws, instructions or recommendations; or (4) repaired with parts or accessories other than those supplied by CMCO.

E. 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. Any action for breach of this agreement must be commenced within one (1) year after the cause of action has accrued.

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P/N: 11817505 REV. AA 10/2013 BJB