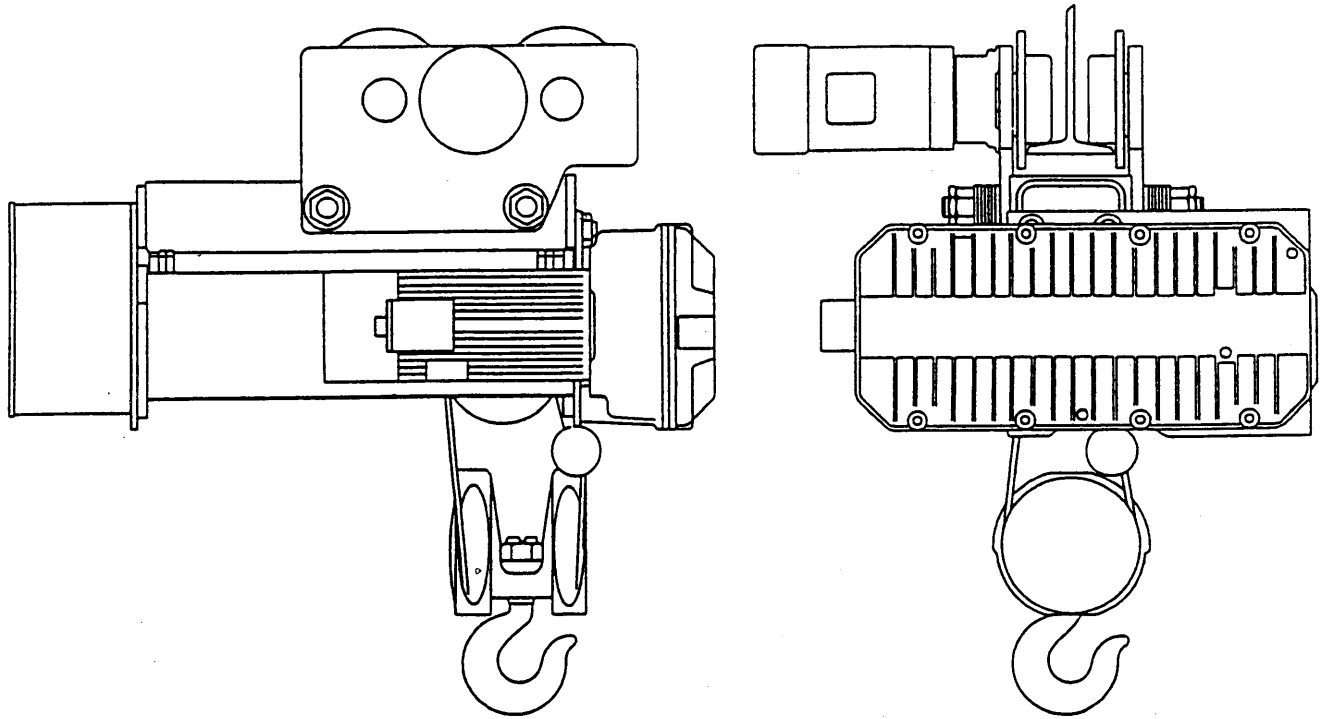


FRAME C

SPACEMASTER II



Series SC & DC HOISTS

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

SERIAL NO.: _____

(RECORD HOIST SERIAL NUMBER FOR FUTURE REFERENCE)



Bulletin C-1997-1

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FOREWORD

This manual has been prepared to acquaint you with the procedures necessary for the installation, operation, and maintenance of the hoist you have purchased.

Proper installation is important to the ultimate performance of this equipment. Careful study of and adherence to the instructions will help assure safe, dependable operation. It is also recommended that you keep this manual readily accessible in case of an emergency.

Information in this manual is subject to change without notice.

Standard Guarantee and Warranty

The Company will repair or replace, at its option, defects in material or workmanship developing within one year from date of shipment from the factory, providing the Company receives immediate written notice of such defects upon their discovery and such claims are substantiated by the Company's inspection department. Correction of such defects by repair or replacement, FOB the Company's factory, shall constitute fulfillment of this guarantee. The return of all parts submitted for inspection under this guarantee must be authorized by the Company and transportation prepaid by the shipper. The guarantee will not be applicable unless the apparatus has been properly cared for and operated under normal conditions. The Company will not be responsible for damage resulting from improper storage or handling prior to placing the apparatus in service. The Company has no liability for any repairs made outside the Company's factory unless with the prior written consent of the Company.

Guarantee on Purchased Items. The guarantee of the Company on purchased items, assemblies, or accessories which are installed as a separate unit shall not extend beyond the guarantee made by the manufacturer of the item, assembly, or accessory.

How to Order Repair Parts Correctly

The Parts Catalog section of this manual covers replacement parts required for your R&M Materials Handling, Inc. hoist and/or crane. To assure prompt service, each repair parts order must contain the following information:

- 1) Hoist and/or crane serial number (see cover).
- 2) Capacity.
- 3) Reference number from applicable bulletin, or Spare Parts Identification sheet.
- 4) Quantity.
- 5) Description.
- 6) Voltage, phase, cycles.
- 7) Correct shipping destination.

On the metal nameplate affixed to the trolley mounting tube or hoist frame side tube will be found the Serial Number of your hoist or crane - i.e., Serial No. H ---, J ---, or C ---, or as in the case of the most recently built units, it may show a five-digit number followed by two letters and another number. An example of this type serial number would be 37885PP1. Without this serial number we cannot be sure of sending you correct parts, so *always mention serial number for prompt service.*

Minimum Charges

All orders for repair parts are subject to a minimum charge.

Return of Parts

R&M Materials Handling, Inc. will not accept return of any parts unless accompanied by a claim tag. These claim tags are issued at the time authorization of such return is made. Tags must be attached to the outside of the package.

Claims for Damage in Shipment

All shipments are carefully inspected and are delivered to the carrier in good order. Upon receipt of shipment caution should be exercised that there is no loss or damage. If damage has occurred, refuse to accept the shipment until the carrier makes the proper notation to that effect. In the event of concealed loss or damage, notify the carrier immediately. By following these suggestions you will encounter less difficulty collecting your claim.

Orders telephoned or telegraphed to us must immediately be confirmed by letter since we cannot assume responsibility for the correctness of the phone or telegraphed message.

R&M Materials Handling, Inc. spare parts are available locally in major industrial areas. Contact our Customer Service Department should you desire the name and address of the Authorized Stocking Parts Distributor for your area.

R & M Materials Handling, Inc.
Customer Service Department
4501 Gateway Blvd.
Springfield, OH 45502

SECTION 1 INSTALLATION

IMPORTANT

Hoists/trolleys are designed for lifting and transporting of materials only. Under no conditions or circumstances, either during initial installation or in regular use, are hoists to be used for lifting or transporting of personnel.

General

Each complete Spacemaster hoist is load tested at the factory at 125% of rated capacity, and shipped assembled. Units purchased and shipped without motors and/or bottom blocks are bench run only and require load testing at the job site by the user after installation.

All hoists/trolleys are designed for the type of mounting specified by the purchaser. The adequacy of the supporting members (monorail beams, cranes, hangers, supports, framing, etc.) is the responsibility of the user and shall be determined by qualified personnel.

Prior to installation, the unit should be checked thoroughly for damage during shipment or handling at the job site. Particular attention should be taken to make sure that the hoisting wire rope and limit switch mechanism has not been damaged by improper use of fork lifts or sling chains.

Read the instructions contained in this manual and observe the warning tags attached before installation is started.

WARNING

Before installation of hoist, insure that the main power switch applying current to the hoist is in the open and locked position.

Mounting

Before installing trolley mounted hoists, rail stops must be installed for all trolleys mounted on open end beams. These stops must be positioned such that

impact forces are absorbed by the trolley side frames only. Do not allow trolley wheel to impact rail stops.

On straight rolled I-beams or WF sections wheel clearance must be such that there is approximately 1/8" clearance between wheel flange and rail with hoist/trolley centered on the beam. For curved tracks this clearance should be 3/16".

Special trolleys designed to run on only patented type rails should have 1/16" clearance each side between wheel flange and rail. See separate trolley manual.

Spacemaster hoists are balanced at the factory for the "as shipped" condition. Any auxiliary devices (control boxes, cable reels, etc.) furnished and mounted by customer may require the addition of counter-weight. Hoists must hang straight without a load or there will be a noticeable kick when a load is applied to the hook.

Reeving

Bottom block must hang straight, and wire ropes must be free of kinks or twists. Make sure limit switch weight is not hung up, hangs freely suspended from its supporting cable/chain, and nothing impedes its upward or downward motions. Bottom block may rotate during initial lifts due to new wire rope not having taken a permanent "set", causing the wire rope falls to twist, or wrap around each other. See Section 4 Operation Maintenance, Wire Rope for corrective action.

See Section 6 on 2 part single, 4 part single and 2 part double reeving. Reference FR-C-18, 19, 20, 21, 22, 23, 24, 25 and 26.

Lubrication

All our hoists are shipped completely lubricated, including gear cases filled with oil or grease; however, to avoid potential damage from low oil or grease levels resulting from leakage during handling/shipping, all levels must be checked, and oil or grease added where necessary. See lubrication schedule, Section 5 for recommended types.

If hoist gearcase has been shipped with solid oil filler plug, replace with attached breather plug to prevent oil leakage due to pressure build up.

Make sure wire rope is adequately greased and free from any contamination or dirt. See Section 5, page 5-4 for proper lubricant, if necessary.

Open wheel gearing has not been greased at the factory. See Section 5, page 5-4 for proper lubricant to add before hoist is installed on the monorail.

Load Hook Throat Opening

It is recommended that the throat opening of the load hook be measured and recorded prior to putting the hoist in service and that a gage be made to provide a quick visual inspection for a bent hook as required during monthly inspections by ANSI B30.16-1981. See Section 4, page 4-4.

Power Connections

Make sure that power supply voltage is the same as that shown on the hoist nameplate, and is protected by fuses or other current overload devices. The power source/conductor must be sized sufficiently to maintain the voltage at the hoist at $\pm 10\%$ of the nominal voltage under all operating conditions. Standard nominal voltages are 230/460/575. Improper voltage maintenance can cause motor overheating or sluggishness, and chattering or inoperative motor brakes and controls.

A wiring diagram is included in this manual showing the identification of the power lead connections. Refer to wiring diagram prior to start up and/or any electrical work. If drawing has been misplaced you may obtain

one from the factory upon request with the serial number of the unit.

CAUTION

Make sure power source disconnect is off and locked in open position while making connections.

Make sure all collectors, if furnished, are compatible and properly lined up and make good contact with conductor bars on rail.

Note: All standard Spacemaster hoists are furnished with motor and control circuit protection which in the Company's interpretation meet the requirements of the National Electrical Code in effect at time of shipment from the factory. The protective devices required for the power feed are outlined in Article 610 of the NEC, and are the responsibility of the user. It is recommended that this article be reviewed by the user for compliance requirements.

Follow National, State and Local Codes when providing electrical service to the hoist.

All electrical connections shall be made only by a qualified electrician.

SECTION 2 INITIAL START-UP

WARNING

Check all "motion" buttons in push button station to insure that none bind or stick in any position before connecting hoist to power supply. Check pendant cable and supporting wires to ensure they are not damaged.

Once power has been supplied to the hoist, several important checks *must* be made.

Proper Hook Motion (Hoist Motor Rotation)

Since direction of rotation of any three-phase A.C. motor can be reversed by reversing any two of the three lines feeding the motor, it is important that the motion travel is in correct relationship with the button being depressed.

To check/correct hook motion (motor rotation), first *carefully* inch the *up button* and observe hook motion. If block does *not* travel up, stop and open the power source disconnect.

WARNING

Do *not* attempt to reverse hoist motion by changing control leads in the push button or at the contactor, and do not change the nameplate on the P/B. The pilot circuit limit switch is in series with the "up" control circuit wiring as furnished from the factory. Changing the push button control leads or nameplates will prevent the limit switch from functioning properly.

IMPORTANT

Do not run the hoist with the down button if direction is reversed. To correct the direction of the hook block travel, reverse any two leads supplying power to the hoist, at the main power source, or at the lead in connections to the hoist. Do not change the internal wiring of the hoist.

Proper Trolley Motion

If necessary to change trolley motion to orient direction with P/B markings, change any two power leads at the *load side of the trolley contactor only*.

CAUTION

Do not reverse main power leads for trolley motion correction. This will cause a reversal also of hoist motion, with resulting hazards at limit switch as listed above.

Trolley Option Adjustments

Optional soft starts may be adjusted to provide optimum starting acceleration for normal load conditions as described in a separate attachment to the service manual.

The optional trolley brake may be adjusted to provide the optimum stopping deceleration for normal load conditions as described in a separate attachment to the Service Manual, Brake Spare Parts Identification Sheet.

Limit Switch Action

Spacemaster Frame "C" hoists are equipped with 2 upper limit switches. The first is a *screw type* limit switch which is factory adjusted to stop the upward travel of the load block approximately 2" below the *weight type* limit switch which acts as an emergency limit should the screw type limit switch be out of adjustment or malfunctioning.

After proper direction has been established, run bottom block down several feet from upper limit and stop. Check weight type upper limit action by slowly lifting the weight manually with a wooden stick or pole, while operating hoist in the hoisting direction. Block should stop after lifting weight no more than 1/4 inch. If block does not stop, immediately release the up button, shut off power to the hoist and check out control circuit wiring, switches, and possible binding of limit switch levers/shafts.

If the weight type limit is operating properly, inch the hoist upward until the screw type limit switch is activated with bottom block approximately 2" below limit weight.

If screw limit is not operating properly check and adjust as instructed in Section 6, FR-C-13.

Lower screw type switch is set to trip with two wraps of wire rope remaining on drum. For adjustment of trip location, refer to Section 6, FR-C-13.

No Load Operational Checks

Check hoist motor brake adjustment. Block should stop without load on hook with maximum 1" of hook drift. See Section 6, Spare Parts Identification Sheet FR-C-27 for adjustment instructions.

Run bottom block to within 6" of weight of upper weight type limit switch. With a wooden stick or pole, lift weight and attempt to raise hook block from push button. If hoist runs, disconnect from power source and check for cause of malfunction and correct before putting hoist into operation.

Next, lower block out of limit 1 to 1 1/2 feet and stop. Run bottom block into upper screw limit at maximum hoist speed. Block motion should be stopped by screw limit switch action before contacting the weight of the weight limit switch. If it does not, readjust the screw limit switch following instructions FR-C-13.

Overload Limit

The hoist is equipped with an electro-mechanical overload device to help protect against the damage

which may be caused by the accidental attempts to lift an over capacity load. This device is not intended as a measuring device and should not be used as such. This device is adjusted at the factory for the designed load capacity of the hoist and should not require field adjustment. Sound operating practices should be followed to avoid attempts to lift over capacity loads.

Load/Run Test

While all Spacemaster hoists are load tested at the factory, full load testing should be performed after installation by the user, and completion of all No Load Operational Checks.

Attach a near-capacity load and lift/lower several feet. The mechanical load brake, when operating correctly, will maintain proper lowering speed when lowering button is depressed and will hold load suspended without drift when motion is stopped. If motor brake or controls chatter under full load, check voltage at motor.

Run trolley full length of monorail or crane and check for binding of trolley wheels on rail and/or interference at splice joints, hanger connections/bolts, etc. Check contact with rail end stops. Contact should be made with trolley side plates or bumpers. *Rail stops designed to make contact with wheels must be avoided.*

Note: See separate Trolley Manual for adjustment if binding of trolley occurs while negotiating curves in tracks.

SECTION 3 SAFE OPERATING PRACTICES

General

There is no one single factor that is more important for minimizing the possibility of personal injury to the operator and those working in the area, or damage to property, equipment, or material, than being familiar with the equipment and using *Safe Operating Practices*.

Hoist/trolleys are designed for *lifting and transporting of material only*. Under no circumstances, either during initial installation or in any other use, should the hoist be used for lifting or transporting personnel.

No operator should be permitted to use the equipment who is not familiar with its operation, is not physically or mentally fit, or has not been schooled in safe operating practices. The misuse of hoists can lead to certain hazards which cannot be protected against by mechanical means; hazards which can only be avoided by the exercise of intelligence, care, and common sense.

Safe Operating Practices also involves a program of periodic inspection and preventative maintenance (covered in separate section). Part of the operator's training should be an awareness of potential malfunctions/hazards requiring adjustments or repairs, and bringing these to the attention of supervision for corrective action.

Supervision and management also have an important role to play in any safety program by assuring that a maintenance schedule is adhered to, and that the equipment provided for the operators is suitable for the job intended without violation of one or more of the rules covering safe operating practices and good common sense.

The Safe Operating Practices shown are taken in part from the following publications:

American National Standard Institute (ANSI)
Safety Standards for Cranes, Derricks, Hoists
ANSI B30.2 - Overhead and Gantry Cranes
ANSI B30.16 - Overhead Hoist

Do's and Don'ts (Safe Operation of Hoists)

The following are Do's and Don'ts for safe operation of overhead hoists. Taking precedence over any specific rule listed here, however, is the most important

rule of all, **USE COMMON SENSE**. A few minutes spent reading these rules can make an operator aware of dangerous practices to avoid and precautions to take for his own safety and the safety of others. Frequent examinations and periodic inspections of the equipment as well as a conscientious observance of safety rules may save lives as well as time and money.

DON'TS - HOISTS

1. Never lift or transport a load until all personnel are clear and do not transport the load over personnel.
2. DO NOT allow any unqualified personnel to operate hoist.
3. NEVER pick up a load beyond the capacity rating appearing on the hoist. Overloading can be caused by jerking as well as by static overload.
4. NEVER carry personnel on the hook or the load.
5. DO NOT operate hoist if you are not physically fit.
6. DO NOT operate hoist to extreme limits of travel of chain or rope without first checking for proper limit switch action.
7. AVOID sharp contact between two hoists or between hoist and end stops.
8. DO NOT tamper with or adjust any parts of the hoist unless *specifically authorized* to do so.
9. NEVER use the hoist rope or chain as a sling.
10. DO NOT divert attention from load while operating hoist.
11. NEVER leave a suspended load unattended.
12. Do not use limit switch(es) for normal operating stop(s). These are *safety devices only* and should be checked on a regular basis for proper operation.
13. Never operate a hoist which has an inherent or suspected mechanical or electrical defect.

14. DO NOT use chain or rope as ground for welding. NEVER touch a live welding electrode to the chain or rope.
15. DO NOT jog controls unnecessarily. Hoist motors are generally high torque, high slip types. Each start causes an inrush of current greater than the running current and leads to over-heating and heat failure, or burn-out, if continued to excess.

DO'S - HOISTS

1. READ and follow manufacturer's instruction, installation, and maintenance manuals. When repairing or maintaining a hoist, use only manufacturer's recommended parts and materials.
2. READ and follow all instruction and warning information on or attached to a hoist.
3. REMOVE the hoist from service and thoroughly inspect and repair, as necessary, if unusual performance or visual defects (such as peculiar noise, jerky operations, travel in improper direction or obviously damaged parts) are noticed.
4. ESTABLISH a regular schedule of inspection and maintain records for all hoists with special attention given to hooks, ropes, brakes, and limit switches. See pages 5-0 and 5-1.
5. CHECK operation of brakes for excessive drift.
6. CHECK operation of limit switches.
7. CHECK for damaged hooks and wire ropes.
8. KEEP load wire rope clean and well lubricated.
9. CHECK the wire rope for improper seating, twisting, kinking, wear, or other defects before operating the hoists.
10. CHECK for broken wires in wire rope. See Wire Rope, Section 4 for complete inspection procedure.
11. MAKE SURE a load clears neighboring stock piles, machinery, or other obstructions when raising, lowering, or traveling the load.
12. CENTER hoist over the load before operating.
13. AVOID swinging of load or load hook when traveling the hoist.
14. BE SURE the load attachment is properly seated in the saddle of the hook. Balance load properly before handling. Avoid hook tip loading.
15. PULL in a straight line, so that neither hoist body nor load chain or rope are angled around an object.
16. TAKE up slack slowly.
17. KNOW the hand signals for hoisting, cross travel, and crane travel if working with cab operated hoists or cranes. Operators should accept the signals of only those persons authorized to give them.

SECTION 4 OPERATION/MAINTENANCE

Typical Construction

While each Series SC and DC model may have some slight variation in design/arrangement, all models have the same basic elements.

1. *Motor/Coupling* - basic drive package.
2. *Hoist Motor Brake* - brings motor to quick stop, and is a part of the braking system that enables a load to be suspended from the hook with power off.
3. *Gearcase Assembly* - three reduction gear reducer coupling the motor to the drum. Also houses the mechanical load brake.
4. *Mechanical Load Brake* - Weston-type friction brake which controls the lowering speed, and, in conjunction with motor brake, provides a double braking system for holding suspended loads.
5. *Frame/Drum* - basic structural components which support the load to be handled.
6. *Bottom Block and Sheaves* - includes bottom block and equalizer sheaves.
7. *Wire Rope* - hoisting rope and end connections for picking up the load.
8. *Controls/Enclosures* - electromechanical devices for supplying power to, and reversing direction of, the motor(s).
9. *Weight Limit Switch* - emergency shut-off switch to stop hook motion at maximum safe upper elevation of bottom block.
10. Adjustable upper and lower travel limit switch.
11. Overload limit switch.

The following details the operation/maintenance instructions for each basic element.

Motors/Couplings

The hoist motors are designed to provide dependable hoisting service. Standard motors are enclosed for protection against normal hazards of dust and mois-

ture. All bearings are sealed and lifetime lubricated and do not require greasing.

Standard motors are furnished with thermal protection in the form of normally closed, automatic reset control circuit thermostats. These are pilot circuit devices which open the control circuit if the motor overheats. The hoist motor protector opens only the "up" circuit.

Couplings are sleeve type with slip fit onto spline of motor and gearcase shaft. Splined couplings are coated with grease at the factory and must be re-greased if coupling and extension shaft are disassembled.

Hoist Motor Brake

Spacemaster Series "C" hoists are furnished with electro-magnetic disc type brakes with minimum torque rating equal to 100% full load torque of the motor. The purpose of the motor brake is twofold:

- 1) To minimize hook drift by bringing the motor to a quick and smooth stop.
- 2) To help hold loads suspended from the hook with power off.

When the hoist motor is energized, the magnet brake coils are also energized, pulling the armature plate against the brake pole plate, thereby releasing the pressure on the friction discs. This permits the discs to turn freely with motor rotation. When the motor is de-energized, the brake coils are simultaneously de-energized, releasing the armature plate which applies pressure to the friction discs and the motor is brought to a quick stop. The kinetic energy of the motor is dissipated as heat on the friction surfaces.

Proper maintenance and adjustment of the motor brake is essential to the reliable operation of the hoist. Heat is generated and wear occurs each time the motor is stopped and the work done by the brake is not reduced with light load or empty hook operation. The brake life and serviceability will be greatly extended by adequate maintenance. The practice of excessive and unnecessary inching of pushbutton by an operator causes unnecessary brake heating and wear. The frequency of brake wear adjustment depends on the duty cycle. To adjust brake, follow instruction on FR-C-23, Section 6.

Gearcase Assembly (See FR-C-5, Section 6)

Drive train consists of three reductions of precision cut helical gears/pinions, keyed or splined to steel shafts, supported on ball bearings. All gears and bearings operate in an oil bath and do not require additional lubrication.

It is recommended that the oil seals and the gearcase cover gasket be replaced whenever inspection or servicing of the gearcase requires cover removal.

CAUTION

Fill gearcase to oil level with lubrication as recommended in lubrication schedule, Section 5, page 5-4, prior to putting hoist back in service.

Mechanical Load Brake

Spacemaster hoists, except those equipped with an optional electric braking system, are furnished with a Weston-type mechanical load brake inside the hoist gearcase, which serves three purposes:

- 1) To suspend the load without power to the hoist and independent of the motor brake.
- 2) Controls the lowering speed by dissipating the energy from the overhauling load off the drum as heat in the sliding friction surfaces.
- 3) Reduces motor heating and motor brake wear by absorbing the potential and kinetic energy of a lowering load rather than dissipating this energy into these elements.

Operation of Load Brake

In the hoisting direction, the load brake gear, which is free to turn on the load brake shaft, rotates with respect to the acme thread. The thrust generated from the matching acme thread surfaces on the load brake shaft and load brake gear compresses and locks the load brake. The freewheeling clutch assembly is free to rotate in the hoisting direction, and the load brake rotates as a unit and simply becomes part of the gear train.

In the down direction, the free-wheeling clutch is locked, preventing rotation of the ratchet gear. Motor rotation causes load brake gear to back off the acme

thread load brake shaft. Pressure on friction discs is relieved allowing the overhauling load off drum to rotate the load brake against the friction surfaces, dissipating energy in the form of heat.

See further instructions for Load Brake Check, Section 6, FR-C-6, Page 6-7.

Frame and Drum

The frame and drum are both constructed of steel, and unless damaged from abuse (impact with another hoist or building structure) require no maintenance. Any hoist with a frame or drum that is no longer serviceable for any reason should be referred to the factory for replacement/repair.

Wire Rope

CAUTION

A hoist should never be used if the wire rope shows any evidence of mechanical damage or excessive wear.

Replacement must be made using wire rope of exact size, quality and fittings with which your hoist was originally equipped from the factory.

Improper wire rope storage or installation procedure can render the wire rope unusable prior to the first lift.

Wire rope inspection should be conducted weekly by a designated person using good judgment in evaluating the remaining service life. Any deterioration of the wire rope resulting in appreciable loss of the original strength, such as situations described below, should be noted and evaluated. A *monthly* inspection should include a written report, dated and signed by the inspector.

- 1) Improper lubrication of wire rope.
- 2) Worn outside wires.
- 3) Broken or corroded wires at the end connections.
- 4) Crushing, slicing, unstranding, or kinking.
- 5) Internal wear caused by grit penetrating the strands.
- 6) Broken outside wires and the concentration of such wires.
- 7) Reduction of original rope diameter.
- 8) Damaged, worn, or improperly applied end connections.
- 9) Birdcaging.

WARNING

Also evaluate those sections which are normally hidden during inspections, such as sections which pass over equalizer sheaves.

CAUTION

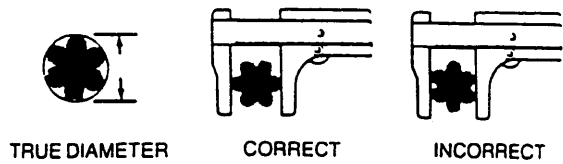
Wear gloves whenever handling wire rope.

The wear life of the wire rope depends mainly upon the frequency and severity of service and its maintenance. All wire rope will eventually deteriorate to a point where it is no longer serviceable or safe.

No precise rules can be given for determination of the exact time for replacement of wire rope because of the many factors involved. Any one of the following conditions is sufficient reason for replacement.

- 1) Twelve randomly distributed broken wires in any one rope lay, or four broken wires in any one strand in one rope lay.
- 2) Wear of one-third of the original diameter of individual outside wires.
- 3) Kinking, crushing, birdcaging, or any damage resulting in distortion of the rope structure.
- 4) Evidence of any heat damage from any cause.
- 5) Reductions from nominal diameter of more than:
 - a) 1/64" for diameters up to and including 5/16".
 - b) 1/32" for diameters 3/8" to 1/2" inclusive.
 - c) 3/64" for diameters 9/16" to 3/4" inclusive.
- 6) The development of 2 broken wires adjacent to a socketed or swaged fitting, or signs of corrosion at that point.

The correct diameter of a wire rope is the diameter of a circumscribed circle which will enclose all the strands. It is the largest cross-sectional measurement as illustrated in Figure 4-1. The measurement should be made carefully with calipers. The illustrations show the correct and incorrect methods of measuring the diameter of wire rope. The measurement of the rope diameter on a new hoist or a replacement cable should be recorded for future checking as in 5 above.

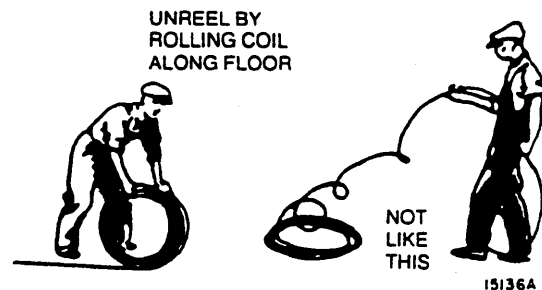


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Figure 4-1

Generalized instructions for inspection/servicing of wire rope follow. Specific reeving instructions are shown on Reeving Diagrams, FR-C-18, 20, 23, 25 and Reeving Instruction Sheets FR-C-19, 21, 24 and 26.

- 1) Hoisting ropes as furnished on new hoists or as a service part from R&M Materials Handling are of special construction, designed specifically for hoist applications. It is recommended that replacement cables with necessary end fittings be obtained from an authorized R&M Materials Handling, Inc. service station or the factory. Use of non-authorized wire rope may seriously shorten the life of the rope.
- 2) When unreeling a new replacement wire rope, follow procedure sketched below to avoid developing kinks or twists.



- 3) Lubrication of the Wire Rope. Depending on the operating conditions, lubrication of the wire rope is sometimes desirable, and is best achieved by pulling the rope through a greased (preferably heated grease) cloth. The rope can be left unlubricated but should then be inspected more often than normal since its service life will be decreased. See Lubrication Schedule, Section 5, page 5-4 for proper lubricant.
- 4) Make sure replacement wire ropes are properly reeved through sheaves and bottom block. See reeving diagrams, Section 6, FR-C-18, 20, 23 and 25.

- 5) Any new or replacement wire rope when first installed may cause the bottom block to turn or twist when a load is applied, resulting in the hoist cables twisting around each other. To correct, run bottom block to the floor and disconnect the wire rope at the end anchor on the hoist frame (or wire rope clamps on each end of drum for 2 part double reeving). See wire rope replacement instructions, Section 6. Turn the end of the wire rope several revolutions in the direction opposite of block twist and reconnect. Run empty bottom block up and down a few times to stabilize wire rope twist. It may be necessary to repeat more than once during the first few days of hoist operation with new wire ropes.

Bottom Block/Sheaves

Sheaves showing evidence of scored grooves or broken/cracked flanges or sharp edges generated from wear, should be replaced. Worn sheaves can greatly reduce the life of the hoisting rope. Check hooks for deformation or cracks. Hooks having a throat opening more than 15% of normal, or more than a 10 degree twist from the plane of the unbent hook, must be replaced. See Figure 4-2.

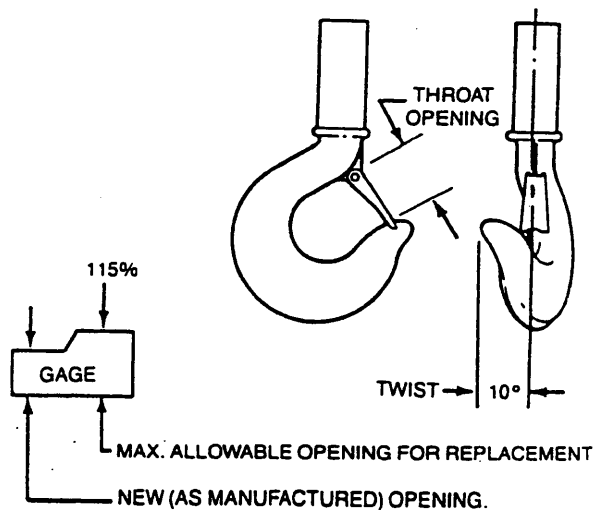
Due to the many types and sizes of hooks which can be furnished and specified by the user, it is recommended that the user measure the actual throat opening of the hook as originally furnished and record on the sketch and retain for a permanent record. This record can then be used for determining when hook must be replaced due to deformation/excessive throat opening. A gage, such as shown, can be used as a quick check of the throat opening.

Note: Any hook that is twisted or has throat opening in excess of normal indicates abuse or overloading of the unit. Other load bearing components should be checked for damage.

Safety latches should be replaced if bent or broken to the extent that they no longer provide proper closure of throat opening of hook.



Repairs by welding or reshaping of hooks is not recommended and *must* be avoided.



15137A

Figure 4-2

Controls/Enclosure

WARNING

Before removing or checking any electrical component, be sure the power supply is shut off, and disconnect locked in the open position.

Standard basic control components consist of the following:

- 1) Motor Contactor - three pole reversing contactor which closes the power leads to the motor when actuated by the push button.
- 2) Push Button Station.
- 3) Control Circuit Transformer - reduces the incoming power supply voltage to 115 volts for control circuit operation.
- 4) Limit Switches (see FR-C-11, 12 and 13).
- 5) Motor Thermal Protection - pilot circuit contact which opens the hoisting circuit if motor overheats.

Note: The number, size, and quantity of control devices vary considerably, depending on the number and types of motors and the many control options that are available. Refer to wiring diagram for specific details on power/control devices.

No specific rules can be given as to the frequency of replacement of electrical devices. Deterioration of electrical components is directly related to the heat generated (on time) in contactor coils and transformers, and the arcing of contactors when motor circuit is opened (starts/stops). Electrical malfunctions can be minimized by a monthly to quarterly inspection for loose connections/broken or frayed wiring, and replacement of contacts on starters/relays when severely pitted.

Limit Switches

Standard upper and lower limit switch is adjustable screw type. Upper weight type overtravel limit switch consists of a weight suspended from a wire rope, which, when lifted by upward motion of the bottom block, opens the hoist control circuit and stops further block travel. See FR-C-11 and 13. An overload limit switch protects against a load in excess of the rated load of the hoist being lifted. See FR-C-12.

CAUTION

The standard limit switches are emergency devices only and are not to be used as *automatic stops*. Consult factory if automatic stops are required.

Hoist motor *must* be properly phased for limit to function as intended. See warnings/instructions under "Installation - Initial Start Up."

Since good hoisting practice dictates the use of the upper limit switches as emergency devices only, and in many installations are seldom used, limit switch parts do not normally need replacement due to wear. Maintenance consists of making sure that the limit remains functional and does not become inoperative due to dirt, dust, corrosion, or physical damage. See Section 5, Preventative Maintenance.

IMPORTANT

When checking the weight type upper limit switch manually, make sure bottom block is lowered several feet below upper limit.

SECTION 5 PREVENTATIVE MAINTENANCE

Inspection/Preventative Maintenance Schedule

The intervals between inspections will vary due to the wide range of applications, duty cycles, and environmental conditions encountered by hoisting equipment. The following schedule lists *minimum* requirements, based on intermittent operation of the hoist on an 8-hour/day, 5-day/week work schedule, under normal environmental conditions (free from excessive dust, moisture, and corrosive fumes). If duty is heavier, or the environment severe, inspections should be more frequent.

The operator should also bring to the attention of maintenance personnel any unusual operating conditions that occur between inspection periods, and *not* operate hoist until unit has been repaired and is functioning properly.

INSPECTION/PREVENTATIVE MAINTENANCE SCHEDULE

Time Interval	Inspection Function
Start of each shift	<p><i>Upper and lower screw limit switch</i> - check both travel limits by carefully inching empty hook into upper and lower design elevations of block. Block should stop at upper level 2" below round weight of overtravel upper limit and with not less than 2 wraps of cable remaining on the rope drum at the lower limit.</p> <p><i>Hoist/trolley brakes</i> - excessive coast without load.</p> <p><i>Reeving</i> - twisted or kinked cables.</p> <p><i>Controls</i> - proper operation from pushbutton.</p>
Weekly	<p><i>Reeving</i> - check for kinks, unstranding, broken wires, corrosion, etc. See Wire Rope, Section 4. A signed monthly report is required by OSHA.</p> <p><i>Bottom Block</i> - check for bent or twisted hook and/or safety latches and damage or cracks on hook.</p> <p>For complete instructions on cable/bottom block, refer to Operation/Maintenance section under Wire Rope, Section 4.</p>
Monthly to Quarterly	<p><i>Motor Brakes</i> - remove, inspect, clean magnetic disc plate and linings. Replace as required. Adjust brake to proper setting. See Operation/Maintenance, Section 6, FR-C-27, Hoist Motor Brakes.</p> <p><i>Lubrication</i> - refer to Lubrication Sheet, page 5-4. Regrease lubrication points and check oil level in gearcases.</p> <p><i>Controls</i> - inspect contacts of motor starters. <i>Note:</i> discoloration and slight pitting are normal. Replace if silver is worn thin or is severely pitted. Check for loose or broken connections.</p> <p><i>Weight Type Overtravel Upper Limit Switch</i> - remove any accumulated dirt/dust on exposed shafts/levers. Lift the limit weight manually, using a wooden stick or pole, to make sure that shaft/bearings rotate freely. (IMPORTANT: When checking manually, make sure bottom block is lowered several feet below upper limit.)</p>

INSPECTION/PREVENTATIVE MAINTENANCE SCHEDULE (Cont)

Time Interval	Inspection Function
Semi Annually to Annually (Includes all items listed above for more frequent inspections)	<p>Drain and replace oil in hoist gearcase. Check for loose bolts and/or connections on both hoist/trolley and suspension system.</p> <p>Check all load carrying parts, such as sheaves, drums, bottom block assembly, wheel pins, frames, suspension bolts and welds on load sustaining components for wear, cracks, distortion or signs of overload. Replace/tighten/secure as required.</p> <p>Check mechanical load brake for holding action. See Operation/Maintenance Section under Load Brake (FR-C-6).</p> <p>If noise level of hoist gearcase has increased, remove cover and inspect for damaged/worn gears, bearings, and shafts.</p>

IMPORTANT

After any major tear down, repair, or alteration, unit should be functionally load tested as described in section "Installation-Initial Start Up." Also, any hoist which has been out of service one month or more should have a complete maintenance/inspection, followed by a functional load test.

TROUBLESHOOTING

While the chart below can be used for diagnosing typical equipmental functions, the basic underlying cause in many cases is insufficient voltage maintenance at motor and control terminals. Not only must the equipment be connected to the proper nominal voltage source, the power supply leads must be of sufficient size to maintain rated voltage during starting and full load operation. Excessive voltage drop during starting or under load can cause:

- 1) Sluggish starting and overheating of motors.
- 2) Chattering and overheating of contactor and brake coils.
- 3) Overheating and possible burn out of transformers.
- 4) Non-release of motor brakes.
- 5) Excessive arcing of electrical contacts.
- 6) Erratic performance of optional electronic overload devices.

WARNING

When any of the following problems are encountered, the hoist should be immediately removed from service and returned to service only after the problem has been diagnosed and corrected.

PROBLEM	DIAGNOSIS	POTENTIAL SOLUTION
Hook does not raise or lower.	<p>No power.</p> <p>Contactor not operating.</p> <p>Limit switch open circuit.</p> <p>Magnetic brake not releasing.</p> <p>Excessive load.</p>	<p>Check switches, breakers, fuses, and power line connections for open circuit, grounded or faulty connections.</p> <p>Check connections in control circuit. Check contactor coils and pushbutton control cable for open or short circuit. Reset overload relay if used. Defective transformer. Check contactor armatures for freedom of movement.</p> <p>Check limit switch contacts.</p> <p>Check adjustment. Check for loose connections. Check auxiliary contacts and brake coil.</p> <p>Check weight of load against rated hoist capacity.</p>
Hook moves in wrong direction.	<p>Phase reversal of three-phase power supply.</p> <p>Hoist cable wound on wrong side of drum.</p>	<p>Interchange any two of the three lead connections either at the power source or at the lead in connections to the hoist. (<i>See Caution - Initial Start Up.</i>)</p> <p>Rewind and check hoist cable for damage. Check operation of lower limit switch.</p>
Hook does not stop at extreme of up travel.	<p>Limit Switch(es) are not opening circuit.</p>	<p>Check operation and setting of both screw type and weight operated limit switch(es).</p>

TROUBLESHOOTING (Cont)

PROBLEM	DIAGNOSIS	POTENTIAL SOLUTION
Hook up motion stops after heavy use.	Thermal detectors sense overheated motor.	Avoid concentrating many lifts in short time period. Avoid excessive jogging of hook.
Motor overheats.	Excessive load. Excessive duty cycle. Incorrect voltage or frequency. Three-phase power supply phase failure or unbalanced current. Wrong voltage. Brake does not release completely.	Check weight of load. Do not exceed hoist capacity. Avoid concentrating many lifts in short time period and excessive jogging. Check for correct power supply. Voltage should be within $\pm 10\%$ of nameplate rating. Check motor windings for open or short circuits. Check supply lines for balanced voltages. Check current rating on motor dataplate against power supply. Check motor connections. Check brake adjustment. Check brake control circuit and brake coil.
Hoist lifts lighter loads but not heavy loads.	Hoist overloaded. Overload device set too low.	Reduce load. This device is adjusted at the factory for the design load capacity of the hoist and should not require field adjustment. <div style="text-align: center; border: 1px dashed black; padding: 5px; width: fit-content; margin: 10px auto;">CAUTION</div> Never set overload device above rated load. Consult factory if adjustment is required.
Bottom block fails to stop quickly.	Magnetic brake slips.	Check motor brake adjustment, FR-C-27. Check brake linings. Clean or repair as necessary, Section 6.
	Load brake slips.	Check load brake operation. See FR-C-6, Section 6.
Load lowers when hoist not being operated.	Both the magnetic brake and the load brake are inoperative.	Refer to Section 4 Operation/Maintenance.
Hoist operates intermittently.	Collectors making poor contact.	Check collectors for free movement of spring loaded arm, weak spring, connections, and free movement of shoe or roller.
	Defective pushbutton.	Check pushbutton inserts.

TROUBLESHOOTING (Cont)

PROBLEM	DIAGNOSIS	POTENTIAL SOLUTION
Excessive cable wear.	Lack of lubrication. Sheaves damaged or worn. Hoist being used for side pulling.	Lubricate cable. See lubrication schedule below and lubrication of wire rope, page 4-3. Check sheaves for narrowing or scored rope grooves and cracked or damaged flanges or sharp edges. Hoist should be centered over the load before starting lift so that cable wraps smoothly on drum.
Magnetic brake does not release.	Low voltage. Magnetic coil is open or shorted. Open brake circuit.	Check voltage. Check connection. Check magnetic coil for open or short circuit.
Oil leaks.	Vent plug clogged. Oil seals worn or damaged. Gasket leaking between gearcase and cover.	Check to be sure vent plug is open. Replace oil seals. Tighten any loose bolts. Replace gasket if necessary.

LUBRICATION SCHEDULE

Frame 1

LOCATION	INTERVAL	TYPE LUBRICANT
Drum drive spline.	During any overhaul or disassembly of drum.	Mobilux EP No. 1 or equal.
Motor drive spline.	During any overhaul or disassembly of motor.	Mobilux EP No. 1 or equal.
Hoist gearcase (capacity 11 quarts).	Check level monthly to quarterly. Drain and refill semi-annually to annually.	Mobil DTE-AA or equivalent. Low or no sulphur mineral oil, ISO viscosity, Grade 320. For extended oil life for very heavy duty, Modil HSC 632 synthetic oil, ISO viscosity, grade 320.
Trolley gearcase DR-2 reduction (capacity 1/2 pint).	Annually.	Multi-purpose 20 or 30 weight lubricating oil.
Open wheel gearing.	Monthly to quarterly.	Dubois outside gear lube of equal.
Hoisting cable.	Monthly to quarterly.	600 W. grease.

Drum stud, rope sheave, and monorail trolley wheel bearings are lifetime lubricated and sealed and normally need no further attention. If disassembled, however, a light coat of grease on shafts and housings is recommended to prevent bearings freezing in place.

SECTION 6 SPARE PARTS IDENTIFICATION/ADJUSTMENT AND REPLACEMENT INSTRUCTIONS

General

The pages in this section all refer to the specific R&M Materials Handling, Inc. hoist whose serial number is on a metal nameplate affixed to the trolley mounting tube or hoist frame side tube.

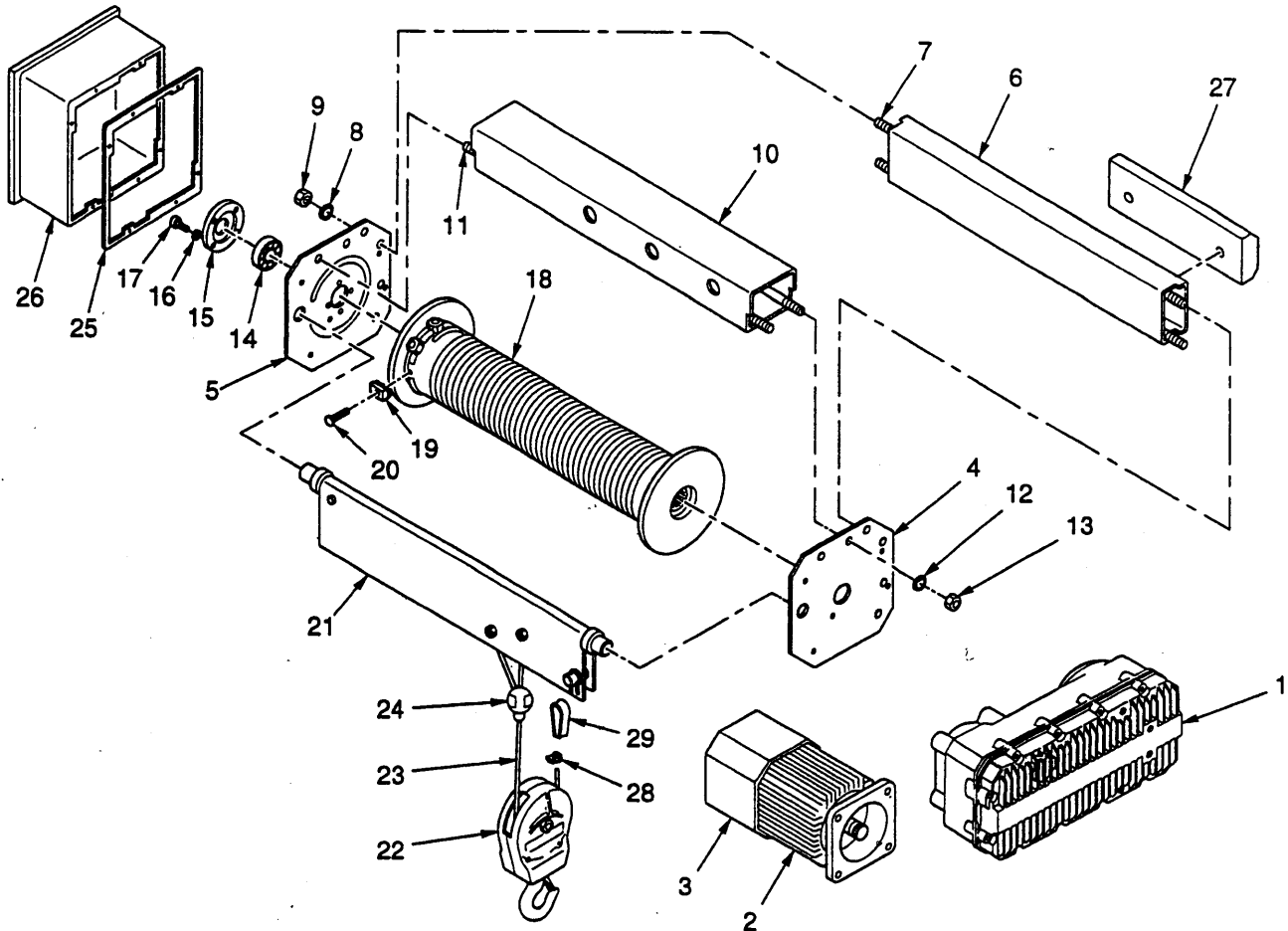
Also included are specific operation and adjustment instructions applying to components and assemblies in the hoist.

IMPORTANT

Both the reference number and the hoist serial number must be provided to ensure the proper ordering of parts.

	FR-C Number	Page No.
Index of Exploded View Parts Illustrations and Adjustment Instructions		
Hoist Frame and Components 2 Part Single Reeved.....	FR-C-1	6-2
Hoist Frame and Components 4 Part Single Reeved.....	FR-C-2	6-3
Hoist Frame and Components 4 Part Double Reeved.....	FR-C-3	6-4
Hoist Frame and Components 8 Part Double Reeved	FR-C-4	6-5
Hoist Gearcase Assembly.....	FR-C-5	6-6
Load Brake Check and Adjustment	FR-C-6	6-7
2 Part Single Reeved Load Bar Assembly.....	FR-C-7	6-8
4 Part Single Reeved Load Bar Assembly.....	FR-C-8	6-9
4 Part Double Reeved Load Bar Assembly.....	FR-C-9	6-10
8 Part Double Reeved Load Bar Assembly.....	FR-C-10	6-11
Weight Type Upper Limit Switch Assembly.....	FR-C-11	6-12
Overload Limit Switch Assembly (2 Part and 4 Part Models)	FR-C-12	6-13
Adjustable Screw Type Limit Switch	FR-C-13	6-15
2 Part Bottom Block Assembly.....	FR-C-14	6-17
4 Part Bottom Block Assembly, 3 Ton Capacity	FR-C-15	6-18
4 Part Bottom Block Assembly, 5 Ton Capacity	FR-C-16	6-19
8 Part Bottom Block Assembly.....	FR-C-17	6-20
2 Part Single Reeving Diagram	FR-C-18	6-21
2 Part Single Reeving Instructions.....	FR-C-19	6-22
4 Part Single Reeving Diagram	FR-C-20	6-24
4 Part Single Reeving Instructions.....	FR-C-21	6-25
Wire Rope Assembly, 2 Part Single Reeved Models.....	FR-C-22	6-27
4 Part Double Reeving Diagram	FR-C-23	6-28
4 Part Double Reeving Instructions.....	FR-C-24	6-29
8 Part Double Reeving Diagram	FR-C-25	6-31
8 Part Double Reeving Instructions.....	FR-C-26	6-32
Hoist Motor Brake and Adjustment.....	FR-C-27	6-34
Hoist Controller Assembly.....	FR-C-28	6-36

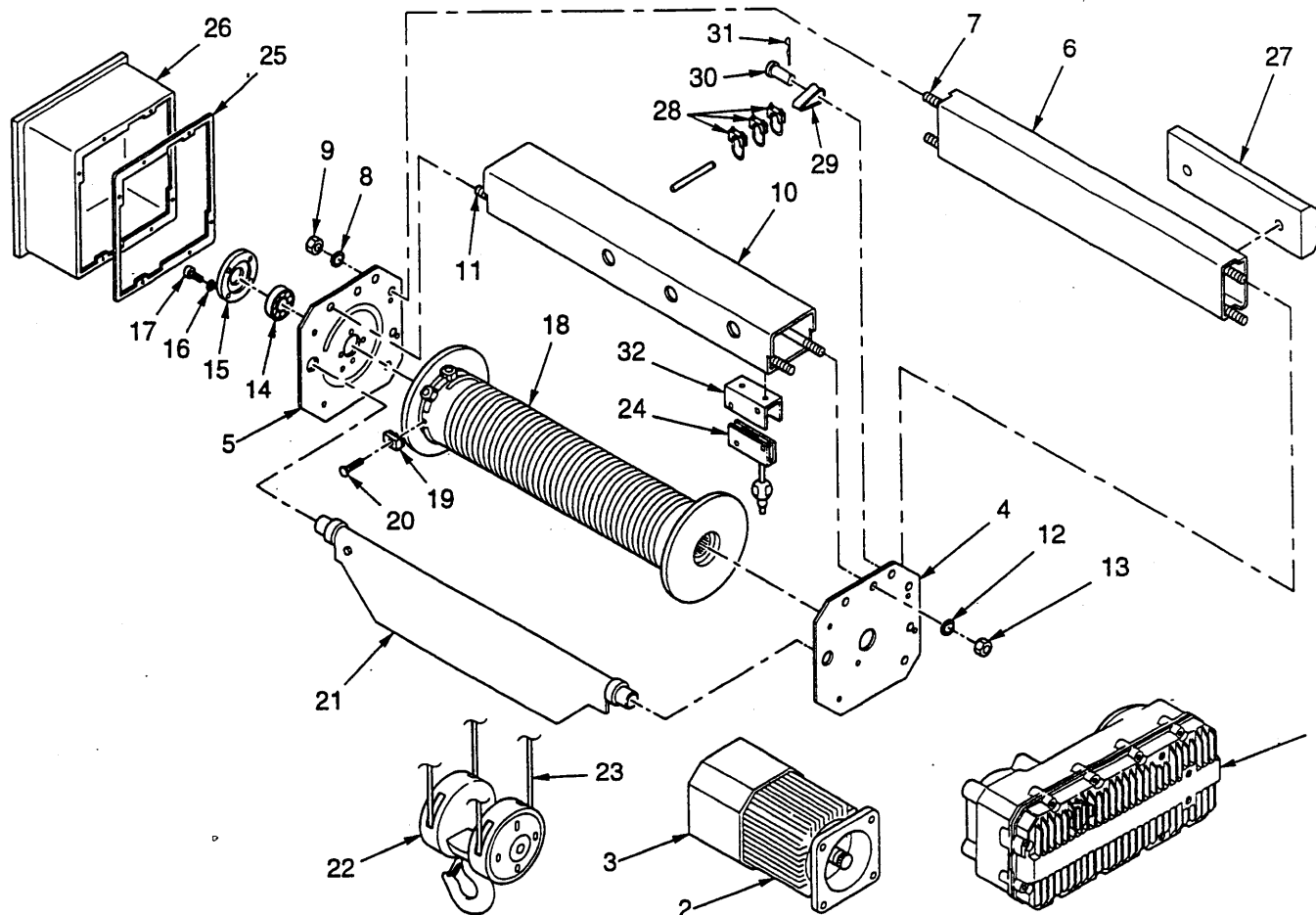
**HOIST FRAME AND COMPONENTS - 2 PART SINGLE REEVED
SPARE PARTS IDENTIFICATION
FR-C-1**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	FR-C-5	GEAR CASE ASSEMBLY	1	24	FR-C-11	UPPER LIMIT SWITCH ASSEMBLY	1
2	C50000	MOTOR, HOIST	1	25	C20001	GASKET, CONTROL BOX	1
3	C40000	BRAKE, HOIST MOTOR	1	26	C20000	CONTROL BOX	1
4	C10002	PLATE, FRONT FRAME	1	27	C10019	COUNTERWEIGHT	A/R
5	C10003	PLATE, BACK FRAME	1	28	C10021	ROPE CLIP	3
6	C10004	TUBE, SIDE FRAME	1	29	C10020	ROPE THIMBLE	1
7	C10005	STUD, SIDE FRAME	2		C50100	MOTOR COVER (NOT SHOWN)	
8	C90006	LOCKWASHER	4		C50101	MOTOR FAN (NOT SHOWN)	
9	C90007	HEX JAM NUT	4				
10	C10008	TUBE, TROLLEY SUPPORT	1				
11	C10009	STUD, TROLLEY SUPPORT	2				
12	C90010	LOCKWASHER	4				
13	C90011	HEX JAM NUT	4				
14	C80012	BEARING, DRUM	1				
15	C10013	RETAINER, DRUM BEARING	1				
16	C90014	LOCKWASHER	4				
17	C90015	SOCKET HEAD CAP SCREW	4				
18	C10016	ROPE DRUM	1				
19	C10017	CLAMP, CABLE	6				
20	C90018	SOCKET HEAD CAP SCREW	6				
21	FR-C-7	LOAD BAR ASSEMBLY	1				
22	FR-C-16	BOTTOM BLOCK ASSEMBLY	1				
23	C10022	CABLE ASSY., WIRE ROPE	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

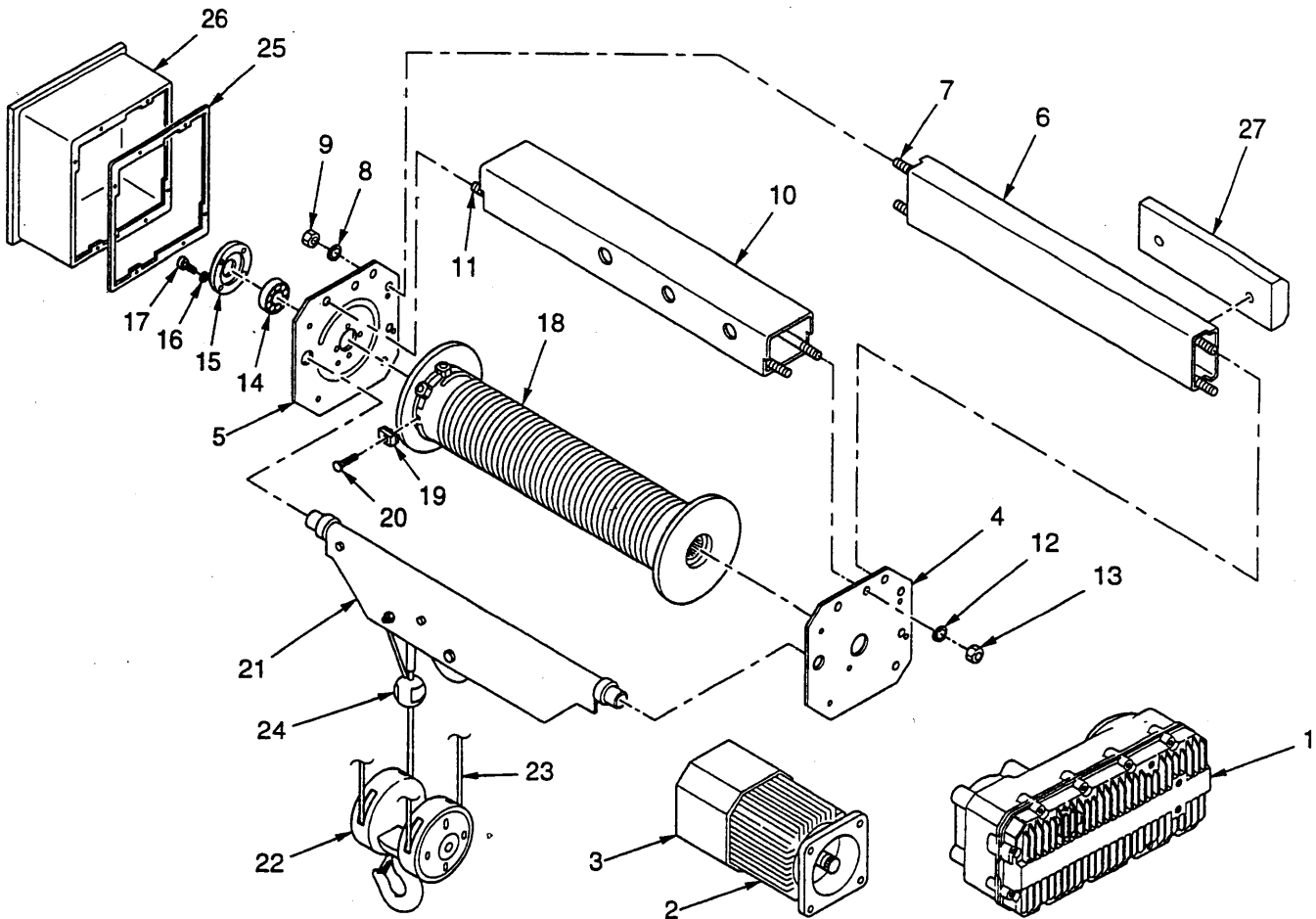
**HOIST FRAME AND COMPONENTS - 4 PART SINGLE REEVED
SPARE PARTS IDENTIFICATION
FR-C-2**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	FR-C-5	GEAR CASE ASSEMBLY	1	24	FR-C-11	UPPER LIMIT SWITCH ASSEMBLY	1
2	C50000	MOTOR, HOIST	1	25	C20001	GASKET, CONTROL BOX	1
3	C40000	BRAKE, HOIST MOTOR	1	26	C20000	CONTROL BOX	1
4	C10002	PLATE, FRONT FRAME	1	27	C10019	COUNTERWEIGHT	A/R
5	C10003	PLATE, BACK FRAME	1	28	C10021	ROPE CLIP	3
6	C10004	TUBE, SIDE FRAME	1	29	C10020	ROPE THIMBLE	1
7	C10005	STUD, SIDE FRAME TUBE	2	30	C10023	DEAD END PIN	1
8	C90006	LOCKWASHER	4	31	C10024	CLIP, DEAD END PIN	1
9	C90007	HEX JAM NUT	4	32	C10025	BRACKET, LIMIT SWITCH MTG.	1
10	C10008	TUBE, TROLLEY SUPPORT	1		C50100	MOTOR COVER (NOT SHOWN)	
11	C10009	STUD, TROLLEY SUPPORT	2		C50101	MOTOR FAN (NOT SHOWN)	
12	C90010	LOCKWASHER	4				
13	C90011	HEX JAM NUT	4				
14	C60012	BEARING, DRUM	1				
15	C10013	RETAINER, DRUM BEARING	1				
16	C90014	LOCKWASHER	4				
17	C90015	SOCKET HEAD CAP SCREW	4				
18	C10016	ROPE DRUM	1				
19	C10017	CLAMP, CABLE	3				
20	C90018	SOCKET HEAD CAP SCREW	3				
21	FR-C-8	LOAD BAR ASSEMBLY	1				
22	FR-C-15, 16	BOTTOM BLOCK ASSEMBLY	1				
23	C10022	CABLE ASSY., WIRE ROPE	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

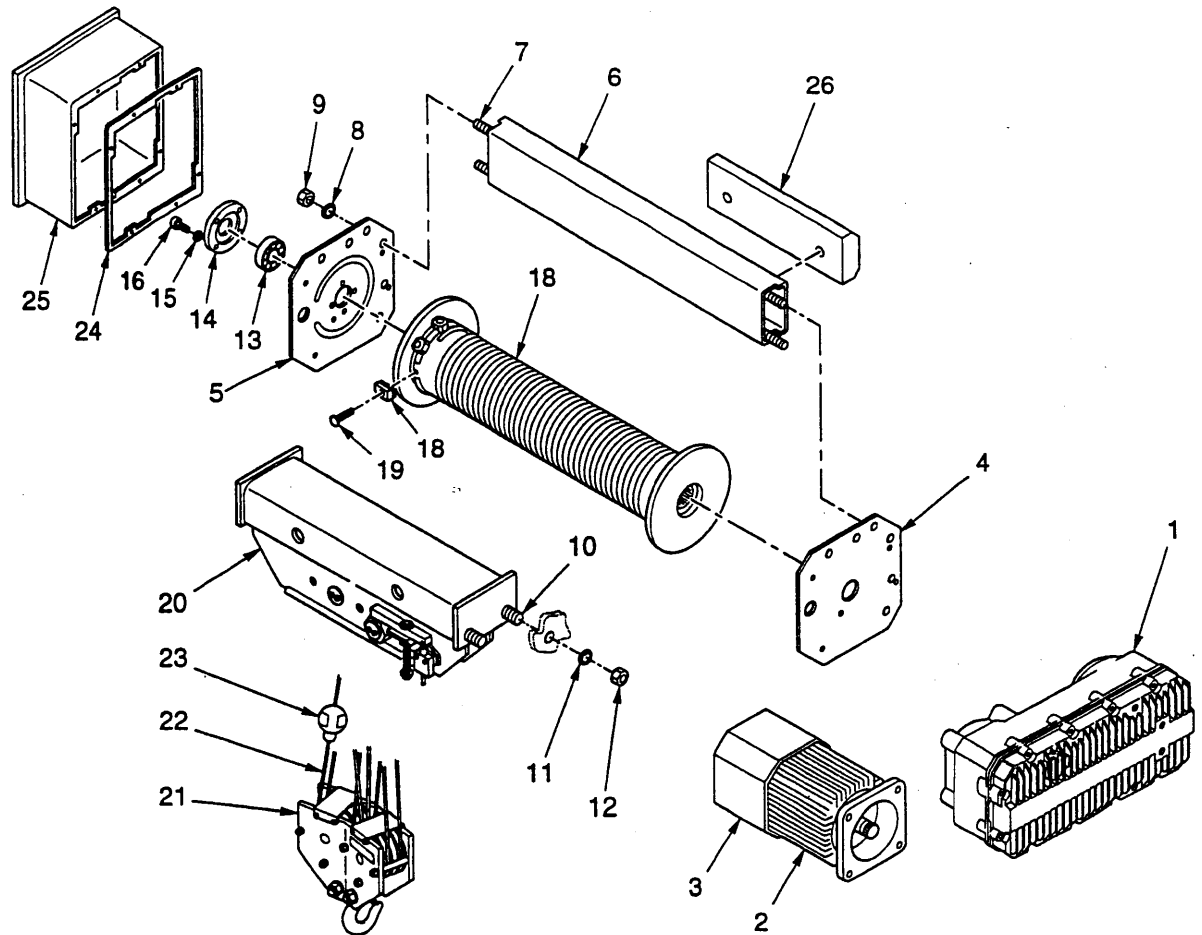
**HOIST FRAME AND COMPONENTS - 4 PART DOUBLE REEVED
SPARE PARTS IDENTIFICATION
FR-C-3**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	FR-C-5	GEAR CASE ASSEMBLY	1	24	FR-C-11	UPPER LIMIT SWITCH ASSEMBLY	1
2	C50000	MOTOR, HOIST	1	25	C20001	GASKET, CONTROL BOX	1
3	C40000	BRAKE, HOIST MOTOR	1	26	C20000	CONTROL BOX	1
4	C10002	PLATE, FRONT FRAME	1	27	C10019	COUNTERWEIGHT	A/R
5	C10003	PLATE, BACK FRAME	1		C50100	MOTOR COVER (NOT SHOWN)	
6	C10004	TUBE, SIDE FRAME	1		C50101	MOTOR FAN (NOT SHOWN)	
7	C10005	STUD, SIDE FRAME	2				
8	C90006	LOCKWASHER	4				
9	C90007	HEX JAM NUT	4				
10	C10008	TUBE, TROLLEY SUPPORT	1				
11	C10009	STUD, TROLLEY SUPPORT	2				
12	C90010	LOCKWASHER	4				
13	C90011	HEX JAM NUT	4				
14	C60012	BEARING, DRUM	1				
15	C10013	RETAINER, DRUM BEARING	1				
16	C90014	LOCKWASHER	4				
17	C90015	SOCKET HEAD CAP SCREW	4				
18	C10016	ROPE DRUM	1				
19	C10017	CLAMP, CABLE	6				
20	C90018	SOCKET HEAD CAP SCREW	6				
21	FR-C-9	LOAD BAR ASSEMBLY	1				
22	FR-C-16	BOTTOM BLOCK ASSEMBLY	1				
23	C10022	CABLE ASSY., WIRE ROPE	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

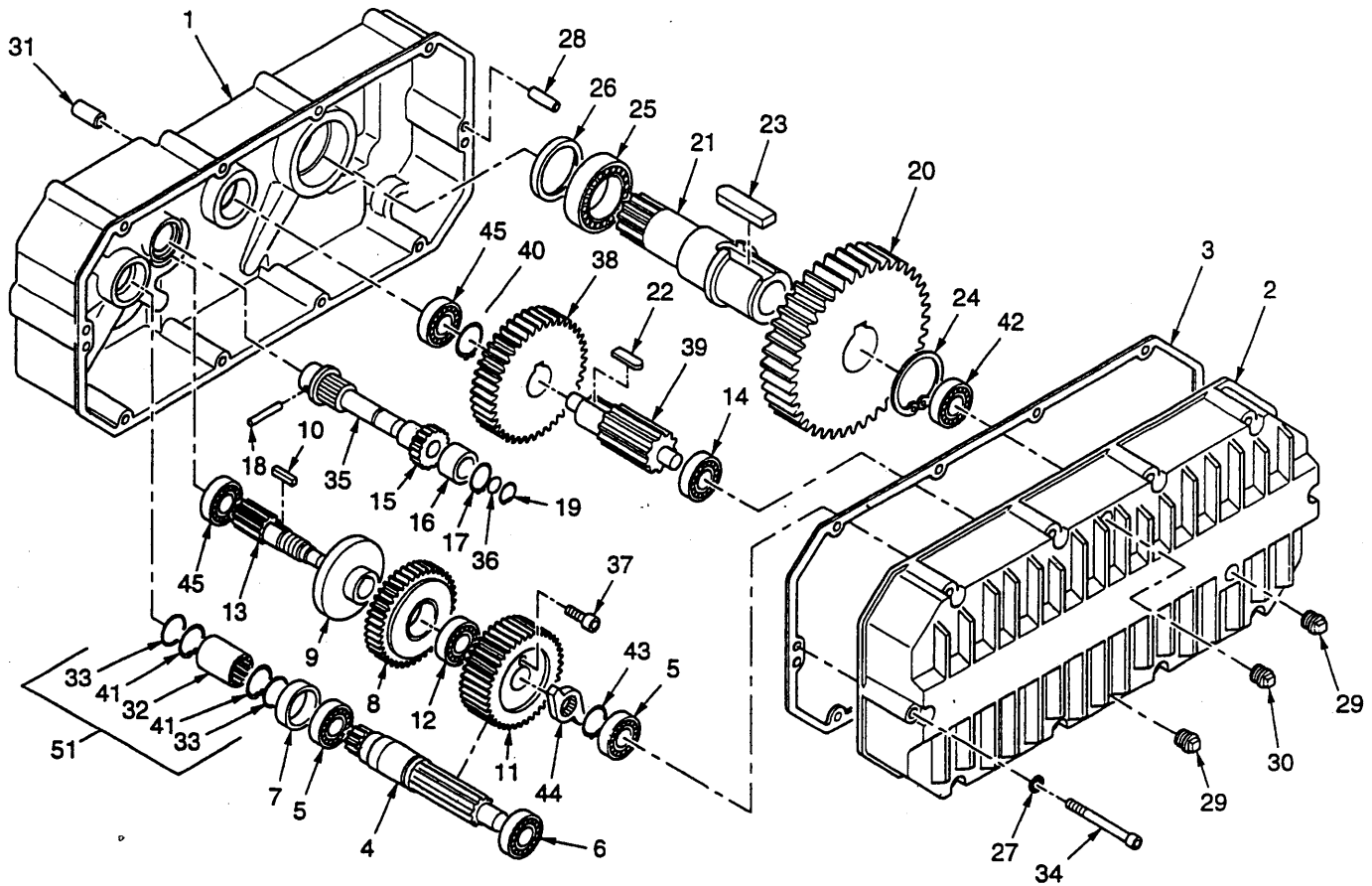
**HOIST FRAME AND COMPONENTS - 8 PART DOUBLE REEVED
SPARE PARTS IDENTIFICATION
FR-C-4**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	FR-C-5	GEAR CASE ASSY	1	24	C20001	GASKET, CONTROL BOX	1
2	C50000	MOTOR, HOIST	1	25	C20000	CONTROL BOX	1
3	C40000	BRAKE, HOIST MOTOR	1	26	C10019	COUNTERWEIGHT	A/R
4	C10002	PLATE, FRONT FRAME	1		C50100	MOTOR COVER (NOT SHOWN)	
5	C10003	PLATE, BACK FRAME	1		C50101	MOTOR FAN (NOT SHOWN)	
6	C10004	TUBE, SIDE FRAME	1				
7	C10005	STUD, SIDE FRAME	2				
8	C90006	LOCKWASHER	4				
9	C90007	HEX JAM NUT	4				
10	C10009	STUD, TROLLEY SUPPORT	2				
11	C90010	LOCKWASHER	4				
12	C90011	HEX JAM NUT	4				
13	C60012	BEARING, DRUM	1				
14	C10013	RETAINER, DRUM BEARING	1				
15	C90014	LOCKWASHER	4				
16	C90015	SOCKET HEAD CAP SCREW	4				
17	C10016	ROPE DRUM	1				
18	C10017	CLAMP, CABLE	3				
19	C90018	SOCKET HEAD CAP SCREW	3				
20	FR-C-10	LOAD BAR ASSY	1				
21	FR-C-17	BOTTOM BLOCK ASSY	1				
22	C10022	CABLE ASSY., WIRE ROPE	1				
23	FR-C-11	UPPER LIMIT SWITCH ASSY	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**HOIST GEARCASE ASSEMBLY
SPARE PARTS IDENTIFICATION
FR-C-5**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C30001	GEARCASE	1	26	C70002	OIL SEAL, DRUM SHAFT	1
2	C30002	COVER, GEARCASE	1	27	C90020	LOCKWASHER	10
3	C30003	GASKET, GEARCASE	1	28	C90021	DOWEL, GEARCASE & COVER	2
4	C30004	PRIMARY SHAFT	1	29	C90022	PIPE PLUG, DRAIN AND FILL	2
5	C63005	BEARING	1	30	C90023	PIPE PLUG, BREATHER	1
6	C63006	BEARING	1	31	C90024	DOWEL, GEAR CASE & FRAME	1
7	C70001	OIL SEAL	1	32	C50001	COUPLING, MOTOR	1
8	C30008	FREE WHEELING GEAR ASSY	1	33	C50002	"O" RING	2
9	C30009	THRUST DISC, LOAD BRAKE	1	34	C90025	CAP SCREWS, COVER	10
10	C30010	KEY, LOAD BRAKE SHAFT	1	35	C30027	SHAFT, FREE WHEELING	1
11	C30011	GEAR, LOAD BRAKE	1	36	C30028	SHIM	2
12	C30012	BEARING, GEAR ASSY	1	37	C30052	GEAR STOPPER	1
13	C30014	SHAFT, LOAD BRAKE	1	38	C30042	GEAR, INTERMEDIATE	1
14	C63007	BEARING	1	39	C30043	SHAFT, INTERMEDIATE	1
15	C30024	PINION, FREE WHEELING	1	40	C30044	RETAINER, RING	1
16	C30054	ONE-WAY CLUTCH	1	41	C50003	RETAINER RING, MOTOR COUPLING	2
17	C30053	RETAINING RING	1	42	C63004	BEARING, DRUM SHAFT	1
18	C30020	ROLL PIN	1	43	C30049	RETAINER RING	1
19	C30021	SNAP RING	1	44	C30048	REVERSING LEVER	1
20	C30032	DRUM GEAR	1	45	C63009	BEARING	2
21	C30033	SHAFT, DRUM	1	46	C50004	MOTOR COUPLING ASSY	1
22	C30045	KEY, INTERMEDIATE SHAFT	1		C30200	LOAD BRAKE ASSY	
23	C30034	KEY, DRUM SHAFT	1		C30300	FREE WHEELING ASSY	
24	C30035	SNAP RING	1		C30400	GEAR CASE ASSY	
25	C63008	BEARING, DRUM SHAFT	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**LOAD BRAKE CHECK AND ADJUSTMENT
INSTRUCTIONS
FR-C-6**

LOAD BRAKE ADJUSTMENT

On your new hoist, the load brake is factory set for proper adjustment. Periodic adjustment to the brake to reset for proper gap may be required due to friction disc wear. During any gear case maintenance, visually check the friction discs for excessive wear and check for proper gap between the reversing lever face and gear stop (cap screw).

FRICTION DISC WEAR

If one or both friction discs on the free wheeling gear shows excessive wear or thickness of disc is reduced to .044 in. (1.2 mm), replace the free wheeling gear assembly.

PROPER GAP

If the gap between the reversing lever face and gear stop (cap screw) exceeds 3/8 in. (9.5 mm), then adjust the reversing lever to achieve a smaller gap. The minimum gap should not be less than 1/8 in. (3.2 mm). A minimum gap is required to allow free wheeling gear assembly to unlock and to rotate during the down direction.

INSTRUCTIONS TO ADJUST GAP

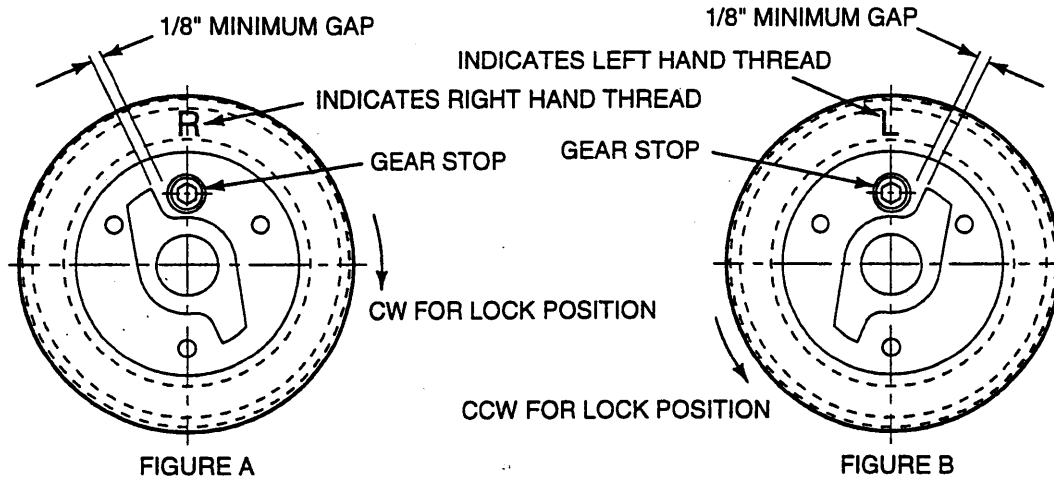
- a. Carefully review your load brake assembly, especially the location of reversing lever face with respect to gear stop (cap screw).
- b. This location is important for proper assembly of your load brake. See CAUTION below.
- c. Remove retaining ring.
- d. Slide reversing lever off spline of the shaft.
- e. Reposition the reversing lever by one spline groove, clockwise for FIGURE A type brakes, counterclockwise for FIGURE B type brakes and then insert lever onto the shaft.
- f. Turn load brake gear down firmly against friction disc so the free wheeling gear can not rotate and to put the load brake in LOCK position.
- g. Measure the gap between the reversing lever face and gear stop. When resetting for smaller gap, minimum gap shall not be less than 1/8 in. (3.2 mm) and initial maximum gap not greater than 3/8 in. (9.5 mm).
- h. If finer adjustment required, rotate the reversing lever to use the opposite face.
- i. Measure gap.
- j. Add the retaining ring.

CAUTION

IF THE GEAR TURNS CLOCKWISE TO PRESS AGAINST DISC FOR LOCK POSITION, AND GEAR IS MARKED WITH R, THEN THE REVERSING LEVER MUST STRIKE THE GEAR STOP FACE AS SHOWN IN FIGURE A. DO NOT ASSEMBLE REVERSING LEVER TO OTHER SIDE OF GEAR STOP. IMPROPER ASSEMBLY WILL RESULT IN LOAD BRAKE MALFUNCTION.

IF THE GEAR TURNS COUNTERCLOCKWISE TO PRESS AGAINST DISC FOR LOCK POSITION, AND GEAR IS MARKED WITH L, THEN THE REVERSING LEVER MUST STRIKE THE GEAR STOP FACE AS SHOWN IN FIGURE B. DO NOT ASSEMBLE REVERSING LEVER TO OTHER SIDE OF GEAR STOP. IMPROPER ASSEMBLY WILL RESULT IN LOAD BRAKE MALFUNCTION.

**LOAD BRAKE CHECK AND ADJUSTMENT
INSTRUCTIONS
FR-C-6**



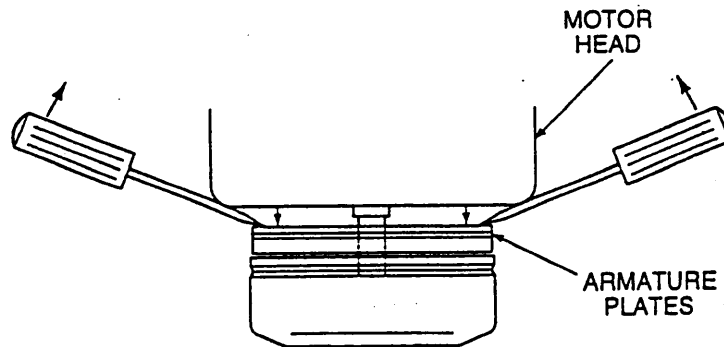
LOAD BRAKE CHECK

To load brake should be checked for proper holding action after any load brake maintenance is performed.

The check to see whether load brake is holding properly, attach approximately a load of 25% of capacity to hook and raise off floor 6 in. (150 mm). Disconnect power source. Release motor brake. Using two screw drivers inserted 180 degrees apart as illustrated below, pry the armature plates away from the motor head. Load should remain suspended. If load drifts to the floor, check for malfunctioning clutch or worn friction discs or improper assembly of the reversing lever.

NOTE

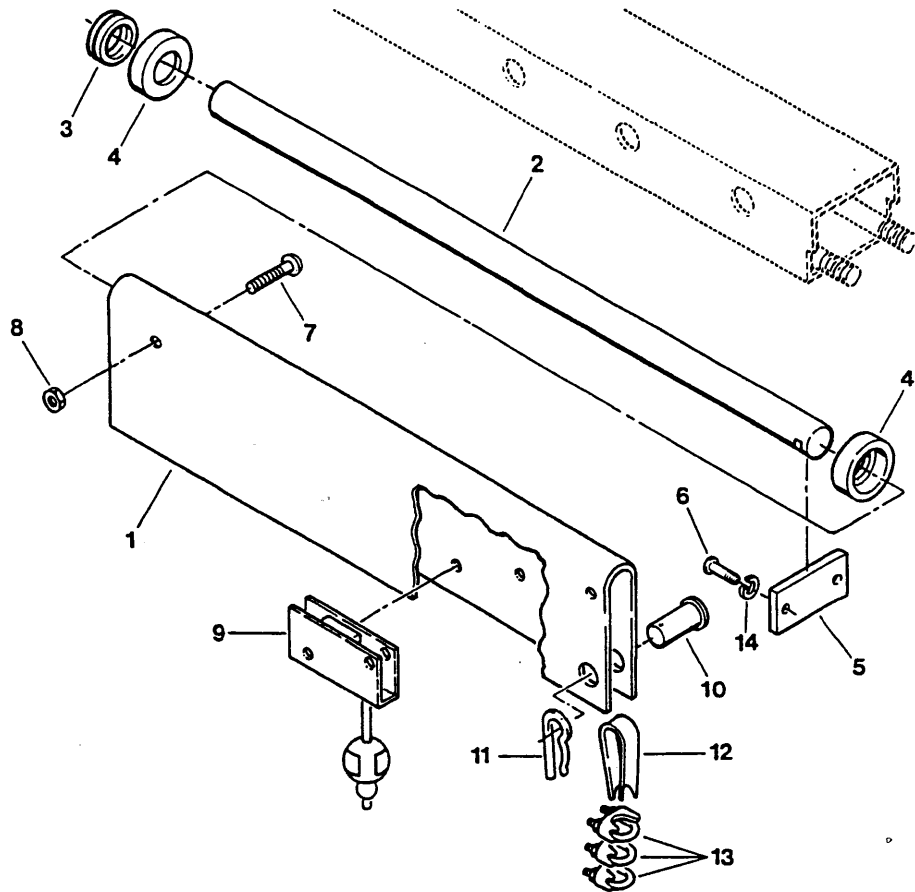
Severe impact or shock loads on hook due to improper handling of loads may result in a locked load brake. Load can be raised, but the motor torque is not sufficient to unlock brake to permit lowering, and motor stalls. If load brake does not release after several inching of the down button, the load must be removed from the hook before manual efforts are made to unlock the brake. It is recommended that unlocking and subsequent inspection of the load brake be performed by a service person experienced in these areas.



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**LOAD BAR ASSEMBLY - 2 PART SINGLE REEVED
SPARE PARTS IDENTIFICATION**

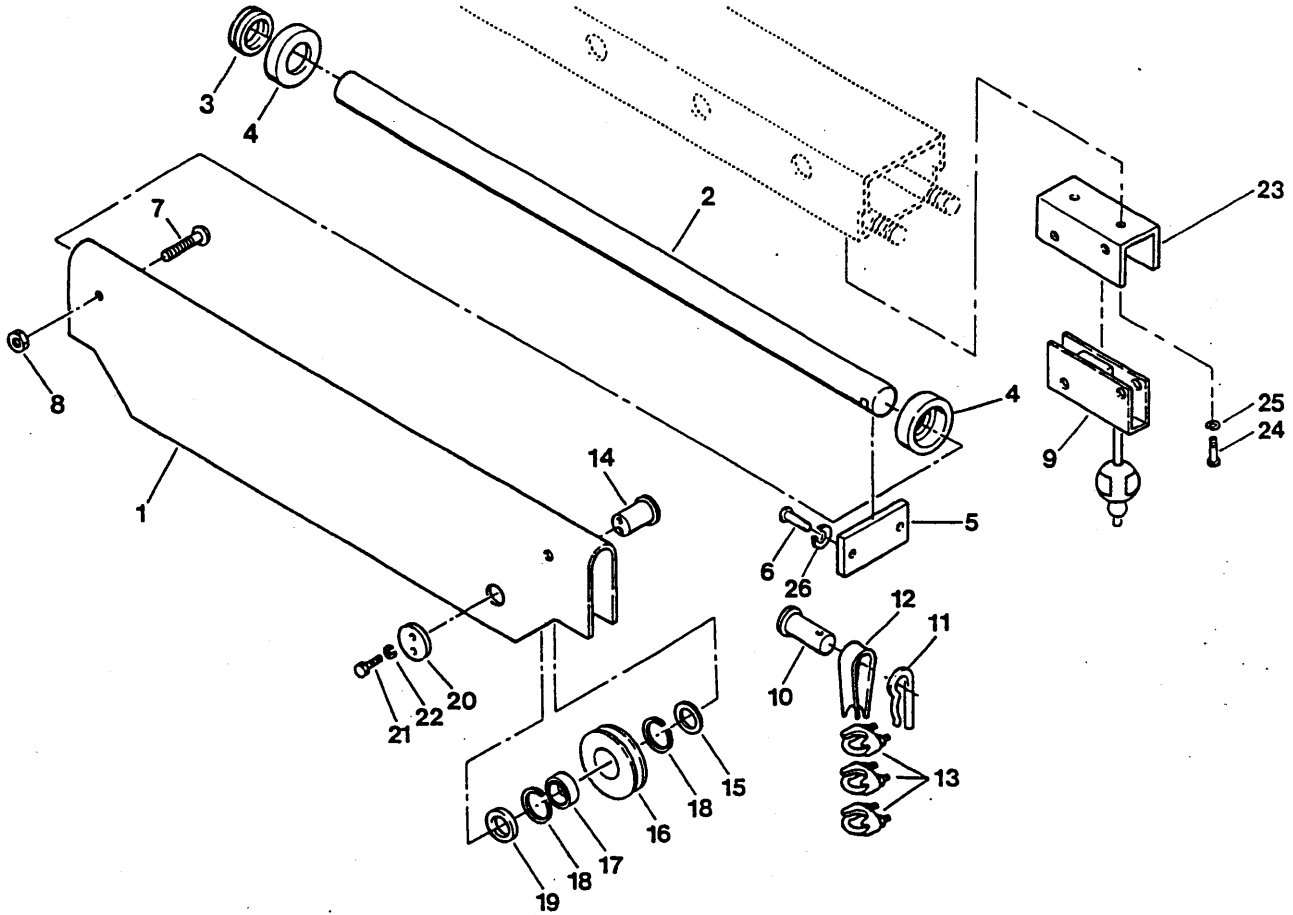
FR-C-7



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10051	LOAD BAR FRAME	1				
2	C10052	LOAD BAR SHAFT	1				
3	C10053	SEAL, SHAFT	1				
4	C10054	SEAL RETAINER	2				
5	C10055	RETAINER, LOAD BAR SHAFT	1				
6	C10056	BUTTON HEAD CAP SCREW	2				
7	C10057	HEX HEAD CAP SCREW	2				
8	C10058	STOP NUT	2				
9	FR-C-11	UPPER LIMIT SWITCH ASSY	1				
10	C10023	HITCH PIN	1				
11	C10024	CLIP, HITCH PIN	1				
12	C10020	ROPE THIMBLE	1				
13	C10021	ROPE CLIP	3				
14	C90026	LOCKWASHER	2				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

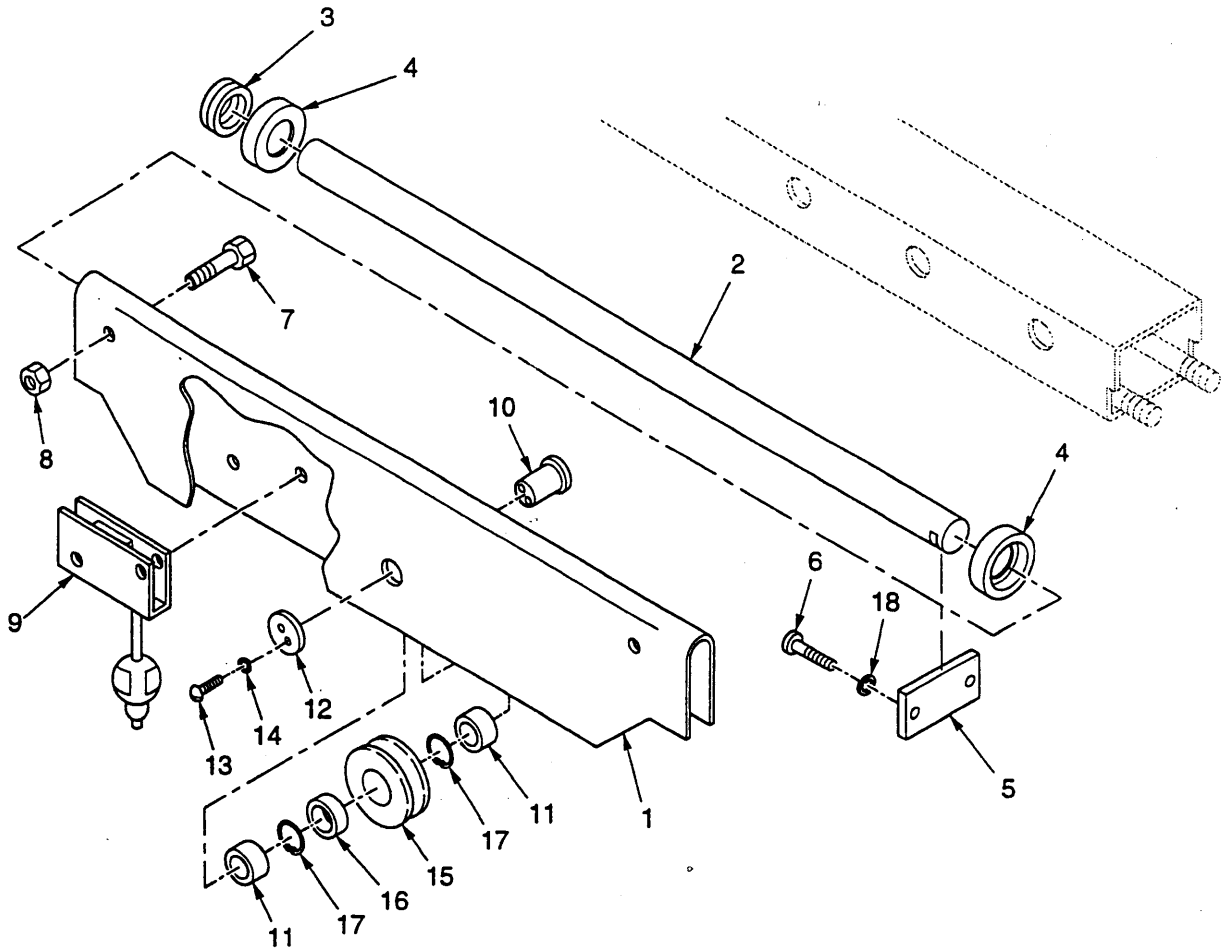
**LOAD BAR ASSEMBLY - 4 PART SINGLE REEVED
SPARE PARTS IDENTIFICATION
FR-C-8**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10051	LOAD BAR FRAME	1	24	C90020	BUTTON HEAD CAP SCREW	2
2	C10052	LOAD BAR SHAFT	1	25	C90021	LOCKWASHER	2
3	C10053	SEAL, SHAFT	1	26	C90026	LOCKWASHER	2
4	C10054	SEAL RETAINER	2				
5	C10055	RETAINER, LOAD BAR SHAFT	1				
6	C10056	BUTTON HEAD CAP SCREW	2				
7	C10057	HEX HEAD CAP SCREW	2				
8	C10058	STOP NUT	2				
9	FR-C-11	UPPER LIMIT SWITCH ASSY	1				
10	C10023	DEAD END HITCH PIN	1				
11	C10024	CLIP, HITCH PIN	1				
12	C10020	ROPE THIMBLE	1				
13	C10021	ROPE CLIP	3				
14	C10070	SHEAVE PIN	1				
15	C10071	SPACER (NARROW)	1				
16	C10072	ROPE SHEAVE	1				
17	C10073	BALL BEARING	1				
18	C10074	SNAP RING	2				
19	C10075	SPACER (WIDE)	1				
20	C10076	RETAINER, SHEAVE PIN	1				
21	C10077	CAP SCREW	2				
22	C10078	LOCKWASHER	2				
23	C10025	BRACKET, LIMIT SWITCH MTG.	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

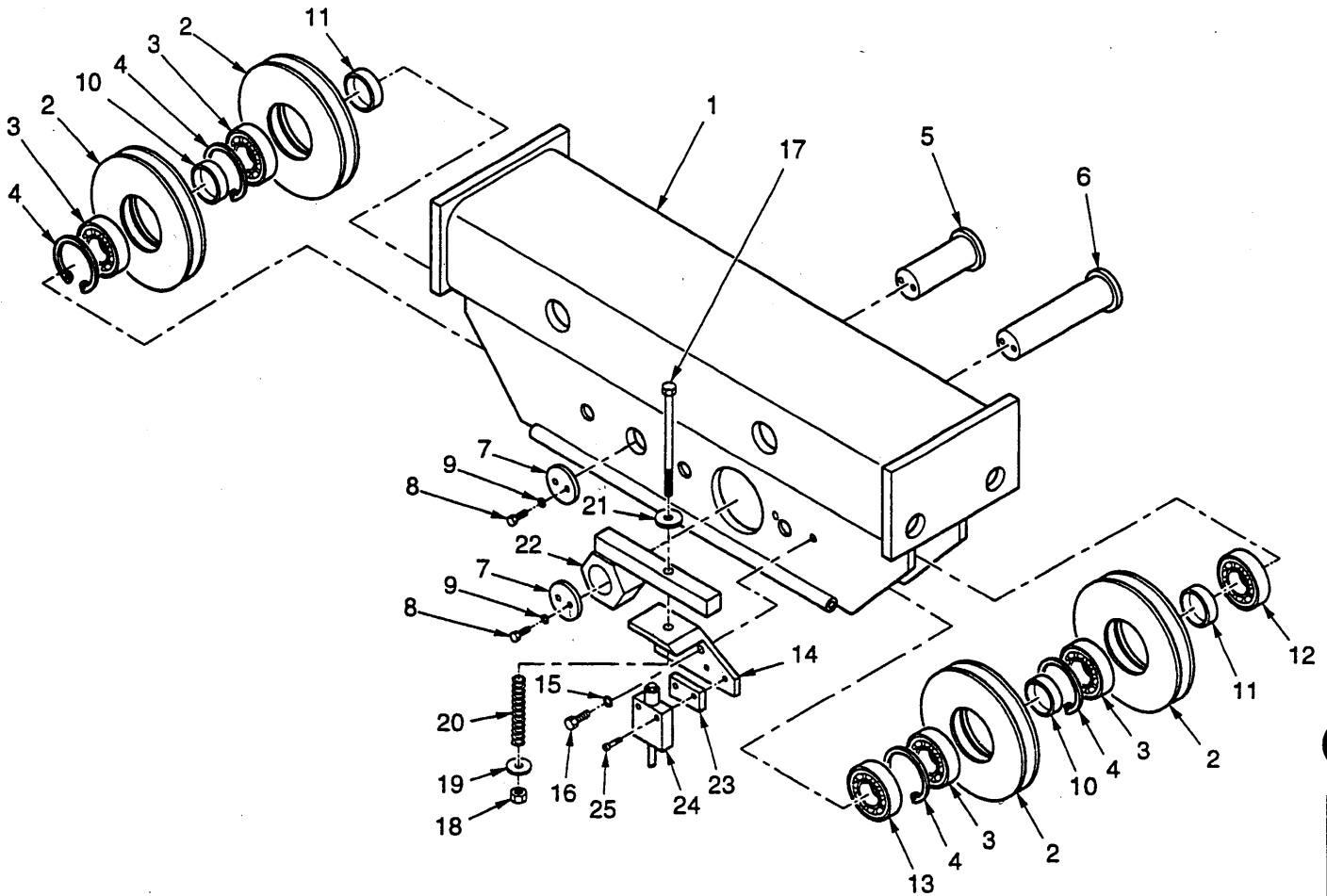
**LOAD BAR ASSEMBLY - 4 PART DOUBLE REEVED
SPARE PARTS IDENTIFICATION
FR-C-9**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10051	LOAD BAR FRAME	1				
2	C10052	LOAD BAR SHAFT	1				
3	C10053	SEAL, SHAFT	1				
4	C10054	SEAL RETAINER	2				
5	C10055	RETAINER, LOAD BAR SHAFT	1				
6	C10056	BUTTON HEAD CAP SCREW	2				
7	C10057	HEX HEAD CAP SCREW	2				
8	C10058	STOP NUT	2				
9	FR-C-11	UPPER LIMIT SWITCH ASSY	1				
10	C10070	SHEAVE PIN	1				
11	C10075	SPACER	2				
12	C10076	RETAINER, SHEAVE PIN	1				
13	C10077	CAP SCREW	2				
14	C10078	LOCKWASHER	2				
15	C10090	ROPE SHEAVE, EQUALIZER	1				
16	C10091	BALL BEARING, ROPE SHEAVE	1				
17	C10092	SNAP RING	2				
18	C90026	LOCKWASHER	2				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

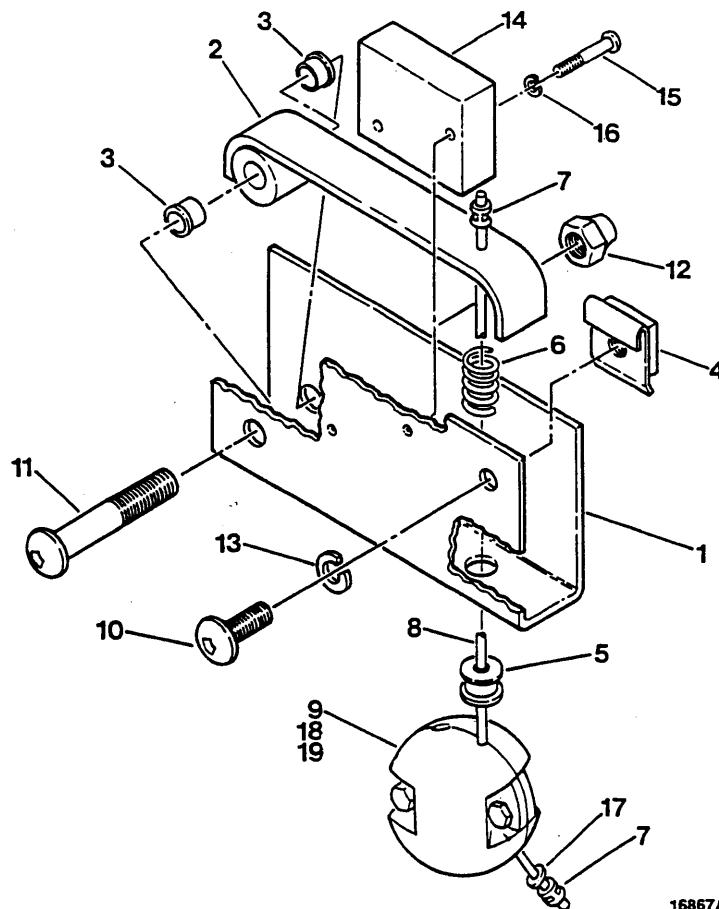
**LOAD BAR ASSEMBLY - 8 PART DOUBLE REEVED
SPARE PARTS IDENTIFICATION
FR-C-10**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10051	LOADBAR FRAME	1	24	C10309	SWITCH, OVERLOAD	1
2	C10090	ROPE SHEAVE	4	25	C10305	SCREW, SWITCH MOUNTING	2
3	C10091	BEARING	4				
4	C10092	SNAPRING	4				
5	C10070	SHEAVE PIN	1				
6	C10122	SHEAVE PIN	1				
7	C10076	RETAINER, SHEAVE PIN	2				
8	C10057	HEX HEAD CAP SCREW	4				
9	C10313	LOCKWASHER	4				
10	C10075	SPACER	2				
11	C10098	SPACER	3				
12	C10100	BEARING & SNAP RING	1				
13	C10101	BEARING & SNAP RING	1				
14	C10301	BRACKET, OVERLOAD LIMIT	1				
15	C10306	LOCKWASHER	2				
16	C10152	HEX HEAD CAP SCREW	2				
17	C10153	HEX HEAD CAP SCREW	1				
18	C10311	HEX NUT	1				
19	C10314	WASHER, FLAT	1				
20	C10338	SPRING	1				
21	C10315	WASHER, FLAT	1				
22	C10302	LEVER, OVERLOAD LIMIT	1				
23	C10154	SPACER	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**WEIGHT TYPE UPPER LIMIT SWITCH ASSEMBLY
SPARE PARTS IDENTIFICATION
FR-C-11**



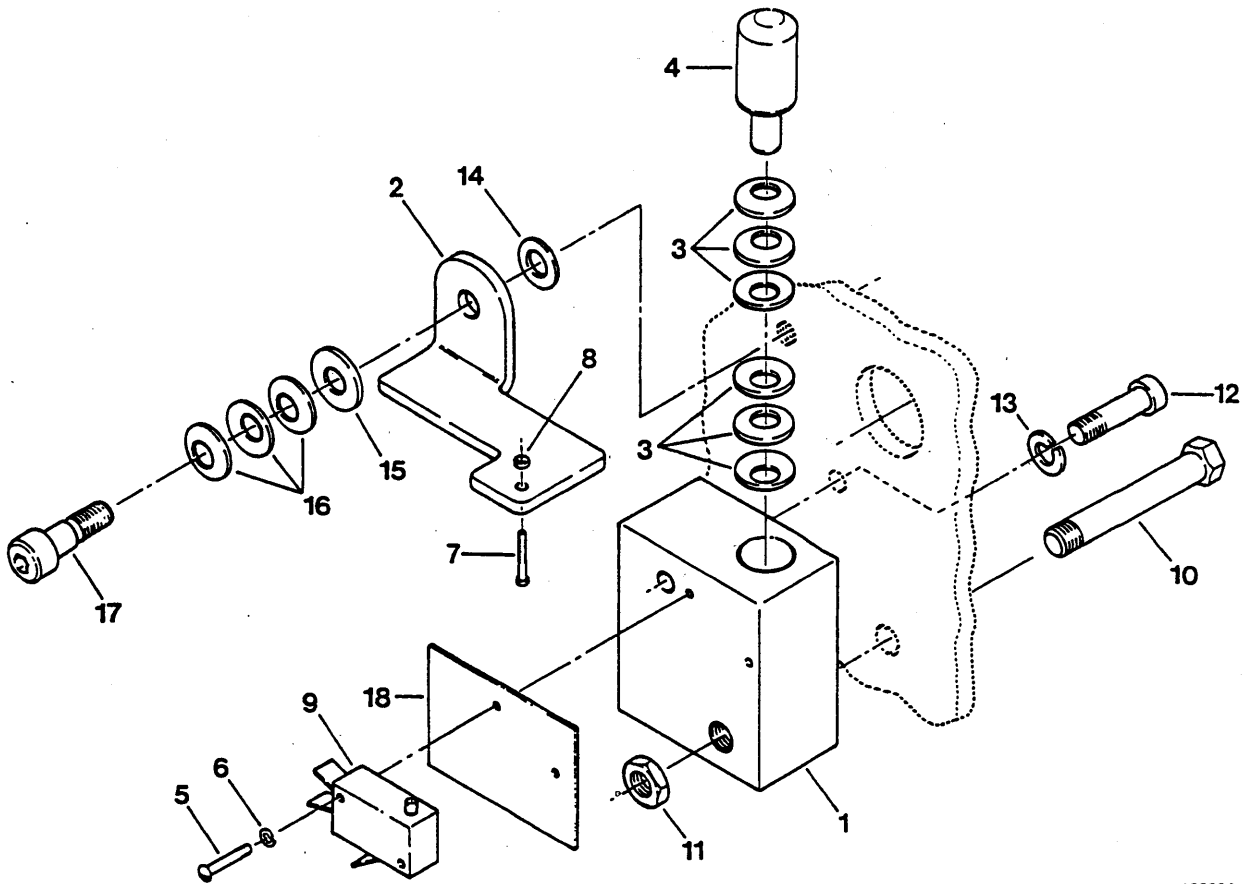
* Parts used for reference only

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DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	*	BRACKET	*				
2	*	LIMIT SWITCH ARM	*				
3	*	BEARING, LIMIT ARM	*				
4	*	TINNERMAN NUT	*				
5	*	BEARING, WEIGHT CABLE	*				
6	*	SPRING, LIMIT ARM SUPPORT	*				
7	*	SOCKET, WEIGHT CABLE	*				
8	*	CABLE, LIMIT WEIGHT	*				
9	C10209	WEIGHT, LIMIT SWITCH	1				
10	*	BUTTON HEAD SCREW	*				
11	*	BUTTON HEAD SCREW	*				
12	*	ELASTIC STOP NUT	*				
13	*	LOCKWASHER	*				
14	C10214	SWITCH, ELECTRICAL	1				
15	*	ROUND HEAD MACHINE SCREW	*				
16	*	LOCKWASHER	*				
17	*	FLATWASHER	*				
18	C10218	HEX HEAD CAP SCREW	2				
19	C10219	STOP NUT	2				
	C10200	COMPLETE LIMIT SWITCH ASSY. LESS WEIGHT					

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**OVERLOAD LIMIT SWITCH ASSEMBLY
(2 PART AND 4 PART ROPE MODELS ONLY) *
SPARE PARTS IDENTIFICATION
FR-C-12, Page 1**



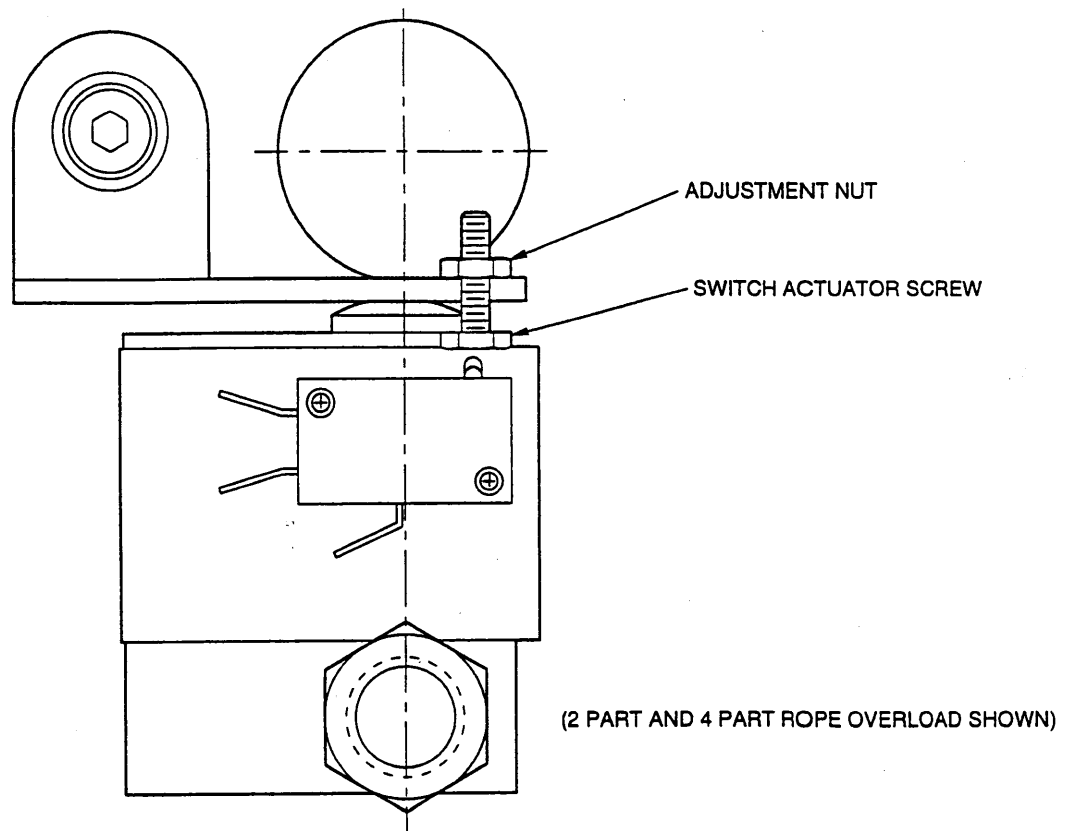
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DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10301	BRACKET, OVERLOAD LIMIT	1				
2	C10302	LEVER, OVERLOAD LIMIT	1				
3	C10303	WASHERS, BELVILLE	A/R				
4	C10304	PLUNGER, SWITCH ACTUATING	1				
5	C10305	SCREW, SWITCH MOUNTING	2				
6	C10306	LOCKWASHER	2				
7	C10307	SCREW, SWITCH ACTUATOR	1				
8	C10308	HEX NUT	1				
9	C10309	SWITCH, OVERLOAD	1				
10	C10310	SCREW, ASSY MOUNTING	1				
11	C10311	HEX NUT	1				
12	C10312	SCREW, ASSY MOUNTING	1				
13	C10313	LOCKWASHER	1				
14	C10314	WASHER, FLAT	1				
15	C10315	WASHER, FLAT	1				
16	C10316	WASHER, BELVILLE	3				
17	C10317	SHOULDER BOLT	1				
18	C10318	INSULATOR	1				

* SEE FR-C-10 FOR 8 PART MODELS

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**OVERLOAD LIMIT SWITCH ADJUSTMENT (ALL MODELS)
INSTRUCTIONS
FR-C-12, Page 2**



An overload limit switch is provided to help prevent the hoist from raising a freely suspended load which would cause permanent deformation of a properly maintained hoist and trolley. The overload switch is pre-set at the factory, if adjustment is necessary, follow the instructions below.

NOTE

The hoist motor contains a thermal overload device which, if tripped, will also prevent the hoist from raising the load. Verify that the motor is not overheated before attempting to adjust the overload switch.

ADJUST LIMIT AS FOLLOWS:

- a. DISCONNECT HOIST FROM POWER SUPPLY. REMOVE CONTROL BOX COVER.
- b. Loosen adjustment nut.
- c. Turn switch actuator screw to adjust the limit switch setting.
Counter-clockwise rotation decreases the load which can be raised on 2 and 4 part rope models.
Clockwise rotation decreases the load which can be raised on 8 part rope models.
Clockwise rotation increases the load which can be raised on 2 and 4 part models.
Counter-clockwise rotation increases the load which can be raised.
- d. Replace control cover and connect hoist to power supply.
- e. Operate hoist with a test load of 100% to verify that the load can be raised. If the load cannot be raised, repeat steps a thru e.
- f. Operate hoist with a test load of 125% to verify that the load cannot be raised. If the load is raised, lower the load and repeat steps a thru f.

WARNING

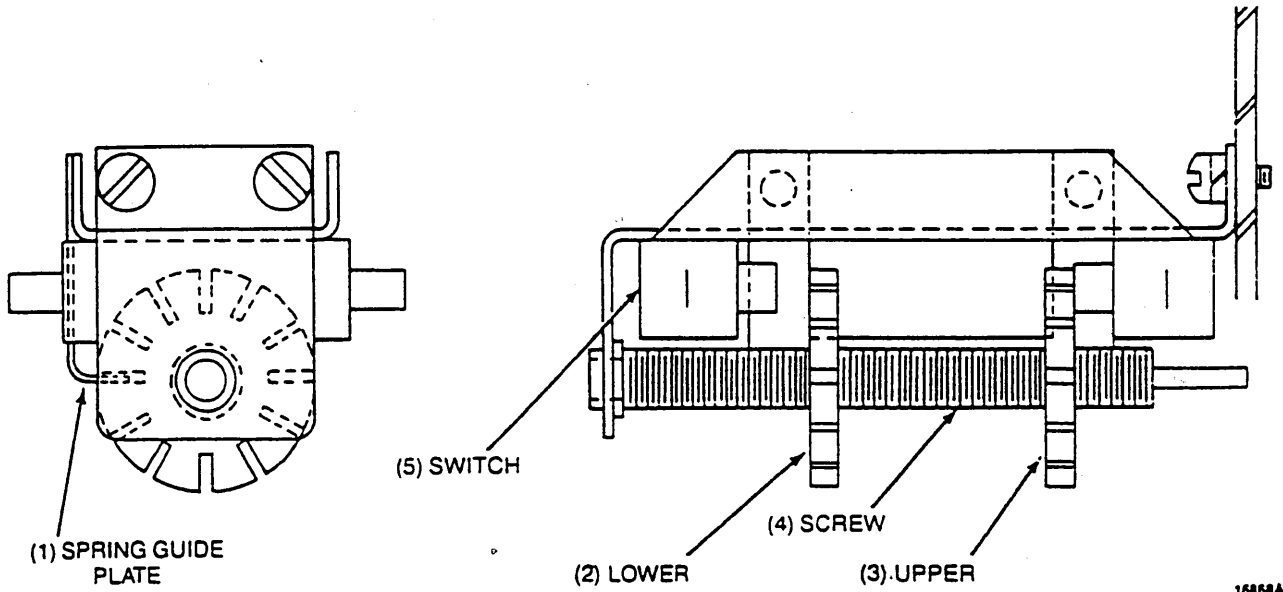
The overload switch adjustment should never be set such that the hoist will try to raise a load greater than 135% of rated capacity.
The overload switch is an emergency device and must not be used as part of normal operation of the hoist or as a load switching device.

ADJUSTABLE UPPER AND LOWER SCREW TYPE LIMIT SWITCH - TYPE RS

INSTRUCTIONS FR-C-13, Page 1

Special instructions for adjusting limit switch after new cable has been installed on hoist.

- a. Disconnect hoist from power supply.
- b. Remove control cover.
- c. With a screwdriver, pry spring guide plate (1) out of slots in the colored limit switch nuts (2) and (3).
- d. Turn nuts *toward* each other 2 full revolutions each.
- e. Reconnect hoist to power supply and proceed with adjustment of upper and lower limits by completing steps a thru e above for each limit of travel.



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
	C10400	LIMIT SWITCH ASSEMBLY	1				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

ADJUSTABLE UPPER AND LOWER SCREW TYPE LIMIT SWITCH - TYPE RS
INSTRUCTIONS
FR-C-13, Page 2

Adjustable upper and lower limit switches are provided to allow setting the hoist travel within a prescribed travel range. Movement of the limit switch nuts toward or away from each other increases or decreases the hook travel respectively. *Care should be exercised when adjusting either limit of travel.*

CAUTION

If the wires running to the limit switches are disconnected for any purpose, refer to applicable wiring diagram for proper location of wires.

Refer to drawing FR-C-13, page 1.

ADJUST UPPER LIMIT (3) AS FOLLOWS:

- a. Carefully raise the load block to a point where the top of it is a minimum of two inches or more below the weight operated limit setting (or to the limit desired in the particular application, allowing the minimum of two inches).

NOTE

In special installations, this limit may be closer than two inches but *special care must be taken when setting it.*

- b. DISCONNECT HOIST FROM POWER SUPPLY. REMOVE CONTROL BOX COVER.
- c. With a screwdriver, pry the spring guide plate (1) out of the slots in the limit switch nuts (2 and 3).
- d. Turn the slotted nut (2) towards its limit switch until the limit switch "clicks", *then turn two SLOTS further. Release the spring guide plate and be sure it slips back into the slots in the colored limit switch nuts. Do not disturb the other slotted nut if it has been set previously.
- e. Replace control cover and connect hoist to power supply.

ADJUST LOWER LIMIT (2) AS FOLLOWS:

- a. Carefully lower the load block to a point where *at least two full wraps* of wire rope remain on the drum.
- b. DISCONNECT HOIST FROM POWER SUPPLY. REMOVE CONTROL BOX COVER.
- c. With a screwdriver, pry the spring guide plate (1) out of the slots in the limit switch nuts (2 and 3).
- d. Turn the slotted nut (3) towards its limit switch until the limit switch "clicks", * then turn two SLOTS further. Release the spring guide plate and be sure it slips back into the slots in the limit switch nuts. do not disturb the other slotted nut if it has been set previously.

*If difficulty is encountered in detecting the "click" of the limit switch, a continuity testing device should be used to determine the point at which the switch breaks the control circuit.

- e. Replace control cover and connect hoist to power supply.

WARNING

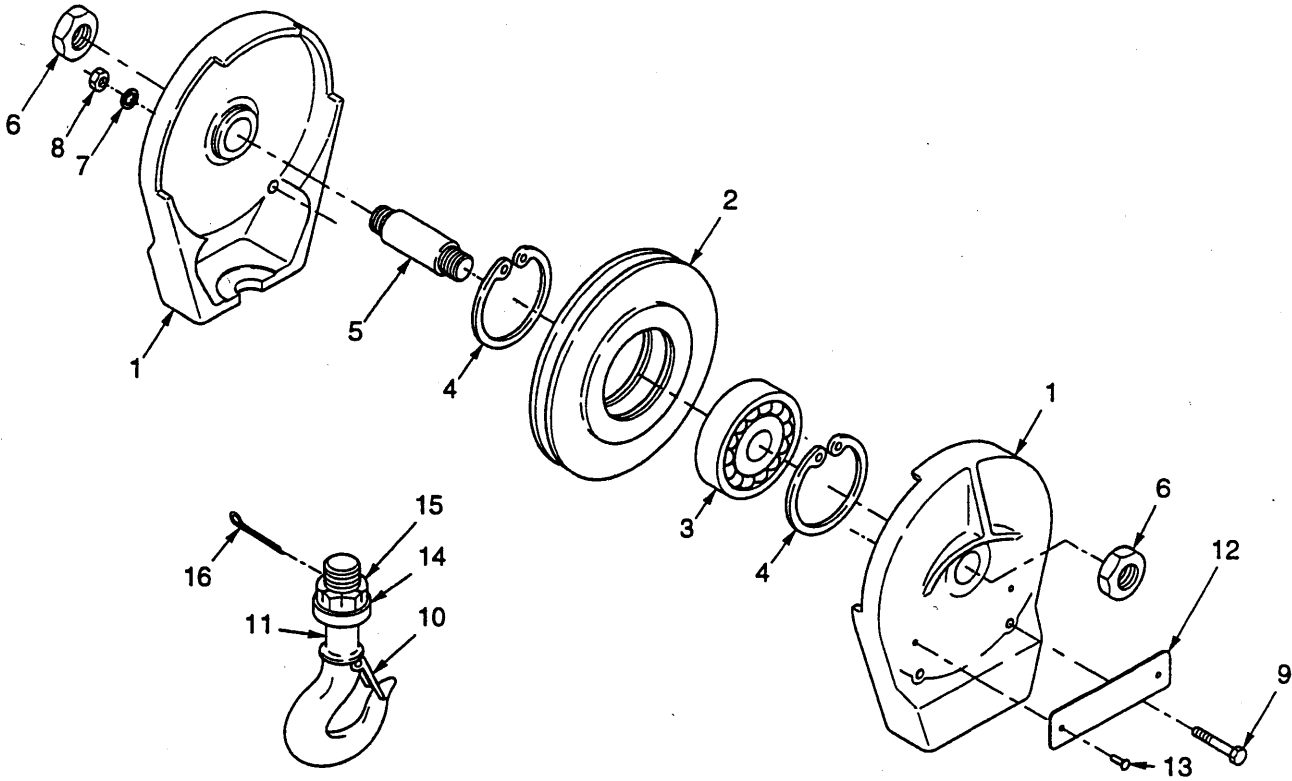
CAREFULLY CHECK OPERATION OF BOTH THE UPPER AND LOWER LIMIT SWITCH AFTER ADJUSTING EITHER SWITCH OR CHANGING WIRE ROPES.

WARNING

THE TYPE RS SWITCH SHOULD NEVER BE USED WITHOUT THE ADDITIONAL PROTECTION OF THE STANDARD WEIGHT OR LEVER OPERATED UPPER LIMIT SWITCH.

CONTINUED ON NEXT PAGE

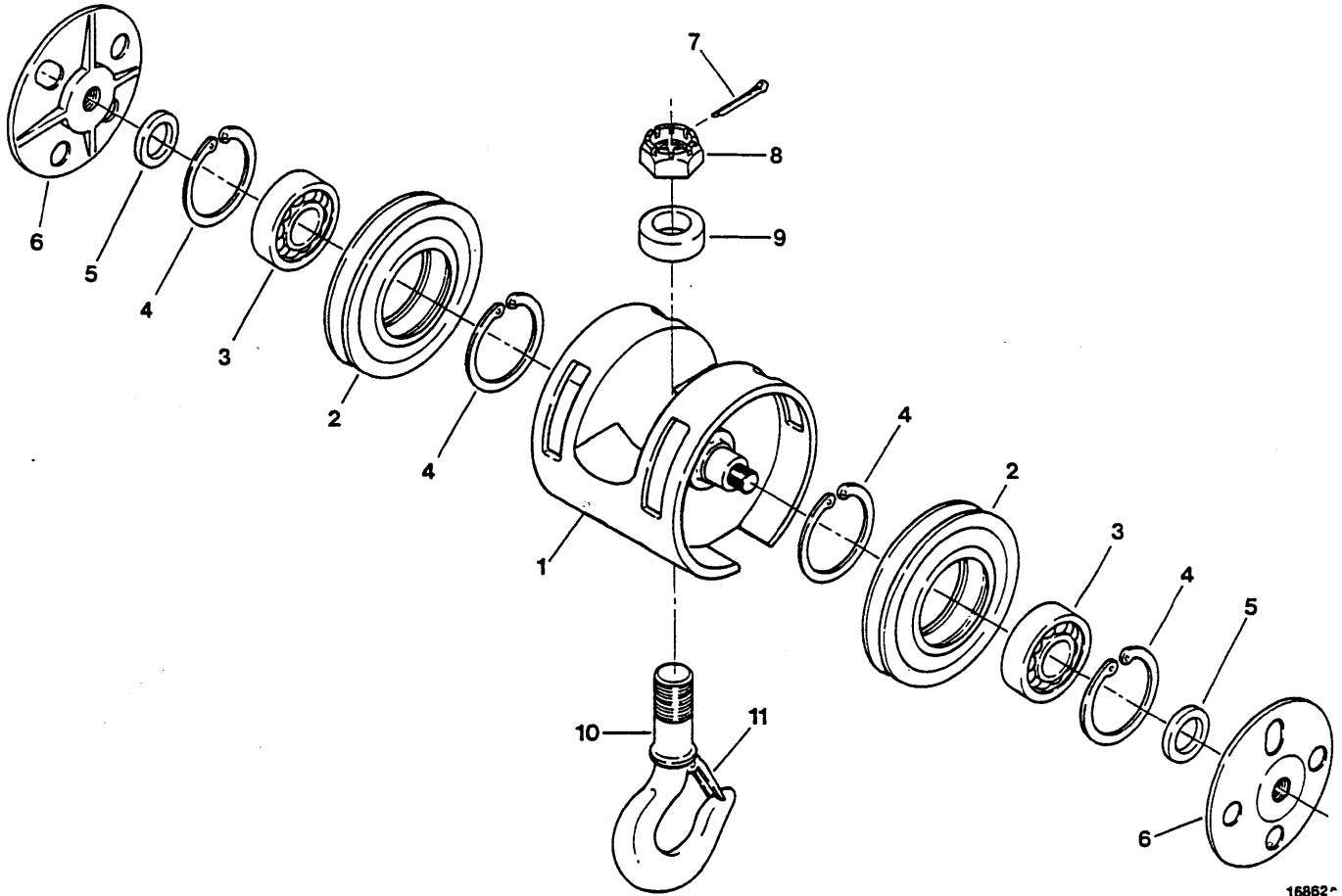
**2 PART BOTTOM BLOCK ASSEMBLY
SPARE PARTS IDENTIFICATION
FR-C-14**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10501	SHEAVE FRAME	2				
2	C10502	ROPE SHEAVE	1				
3	C10503	BEARING, ROPE SHEAVE	1				
4	C10504	SNAP RING	2				
5	C10512	SHEAVE PIN	1				
6	C10516	HEX NUT	2				
7	C10517	LOCKWASHER	2				
8	C10518	HEX NUT	2				
9	C10519	CAP SCREW	2				
10	C10511	LATCH KIT	1				
11	C10510	LOAD HOOK	1				
12	C10520	CAPACITY PLATE 3 TON	2				
13	C10521	DRIVE SCREW	4				
14	C10509	THRUST BEARING	1				
15	C10508	HOOK NUT	1				
16	C10507	COTTER PIN	1				
	C10500	COMPLETE BOTTOM BLOCK ASSY					

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

4 PART BOTTOM BLOCK ASSEMBLY - 3 TON CAPACITY
SPARE PARTS IDENTIFICATION
FR-C-15

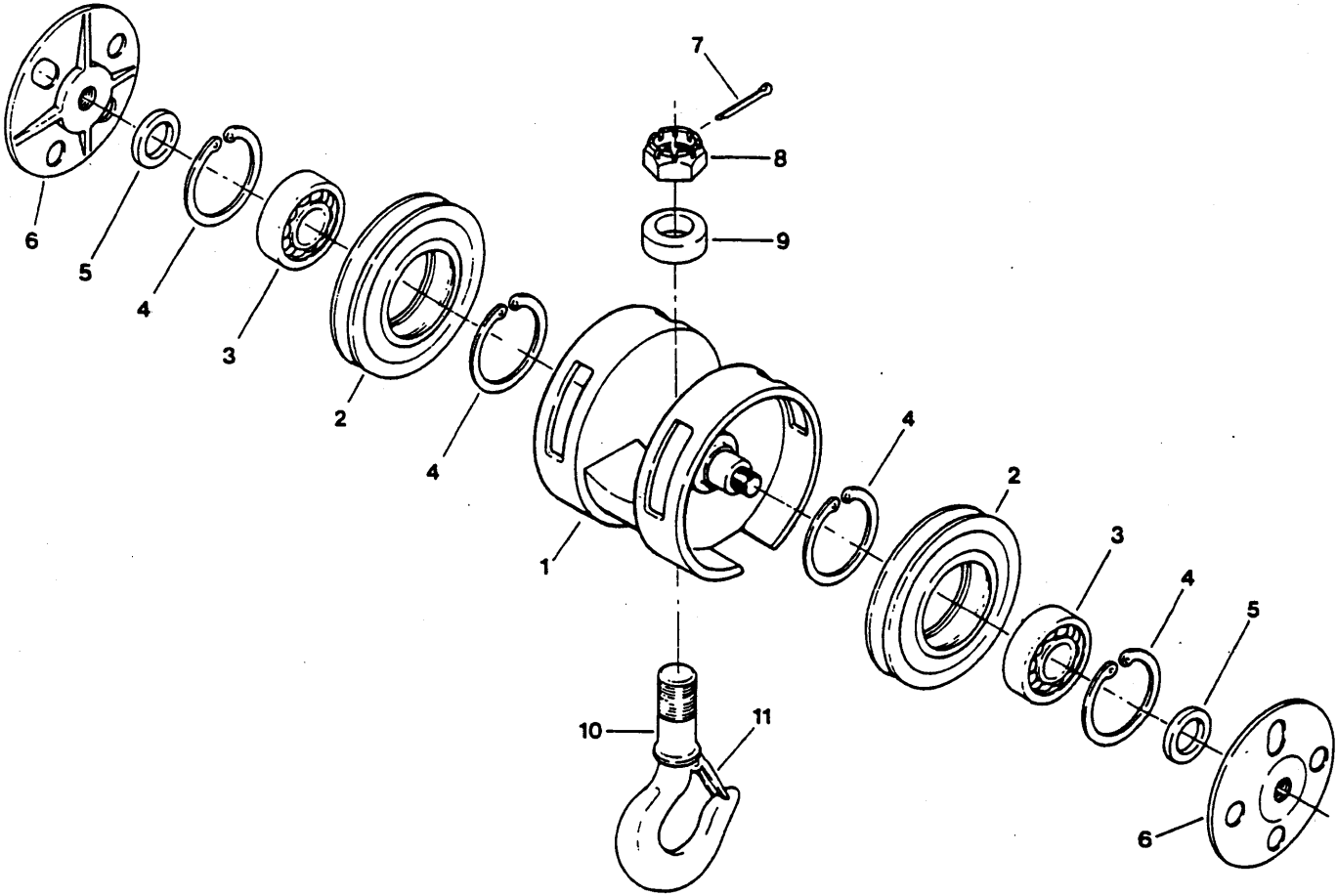


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DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10501	SHEAVE FRAME	1				
2	C10502	ROPE SHEAVE	2				
3	C10503	BALL BEARING	2				
4	C10504	SNAP RING	4				
5	C10505	SPACER	2				
6	C10506	SHEAVE COVER	2				
7	C10507	COTTER PIN	1				
8	C10508	HOOK NUT	1				
9	C10509	THRUST BEARING	1				
10	C10510	LOAD HOOK	1				
11	C10511	SAFETY LATCH	1				
	C10500	COMPLETE BOTTOM BLOCK ASSY					

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

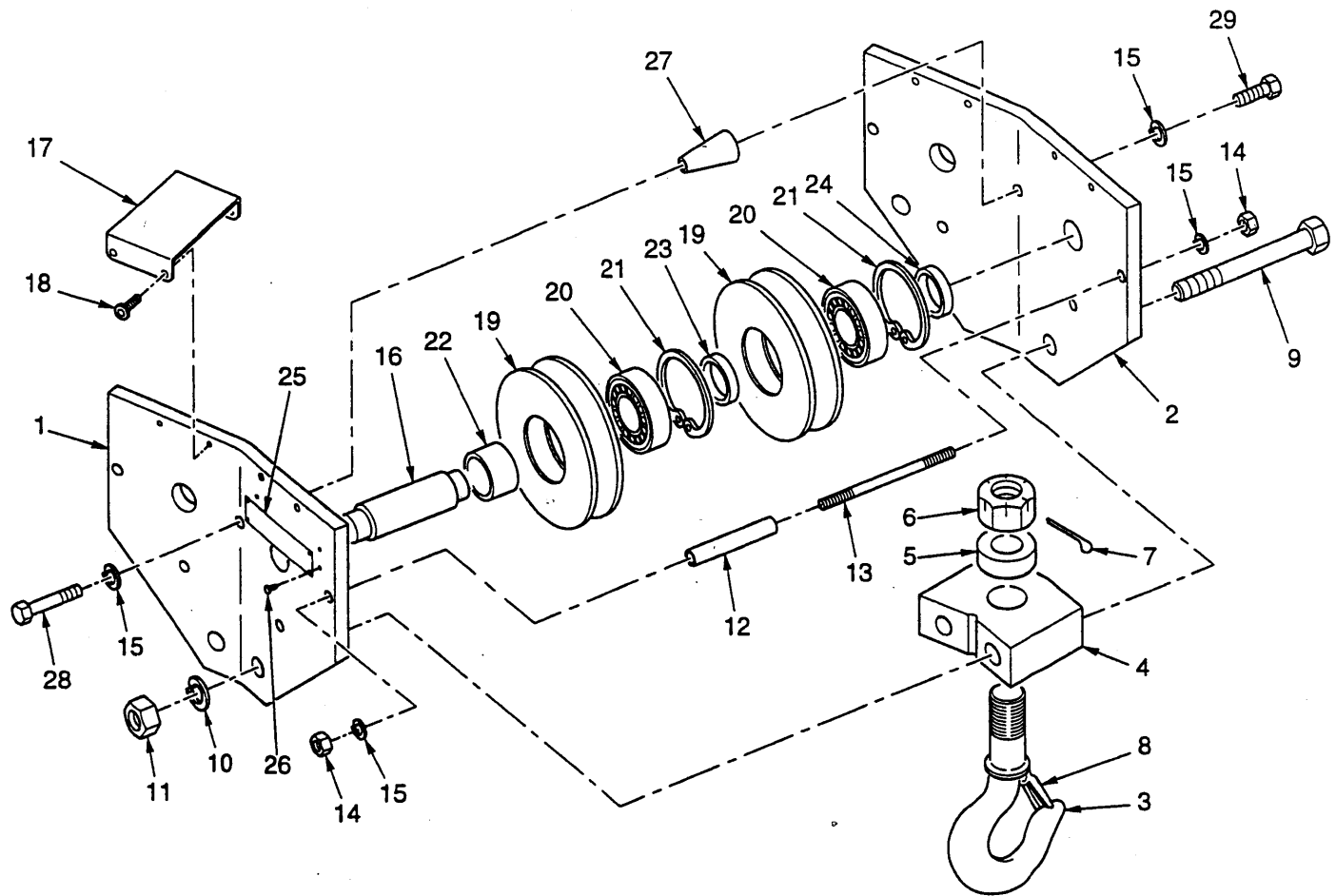
4 PART BOTTOM BLOCK ASSEMBLY - 5 TON CAPACITY SPARE PARTS IDENTIFICATION FR-C-16



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10501	SHEAVE FRAME	1				
2	C10502	ROPE SHEAVE	2				
3	C10503	BALL BEARING	2				
4	C10504	SNAP RING	4				
5	C10505	SPACER	2				
6	C10506	SHEAVE COVER	2				
7	C10507	COTTER PIN	1				
8	C10508	HOOK NUT	1				
9	C10509	THRUST BEARING	1				
10	C10510	LOAD HOOK	1				
11	C10511	SAFETY LATCH	1				
	C10500	COMPLETE BOTTOM BLOCK ASSY					

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**8 PART BOTTOM BLOCK ASSEMBLY
SPARE PARTS IDENTIFICATION
FR-C-17**



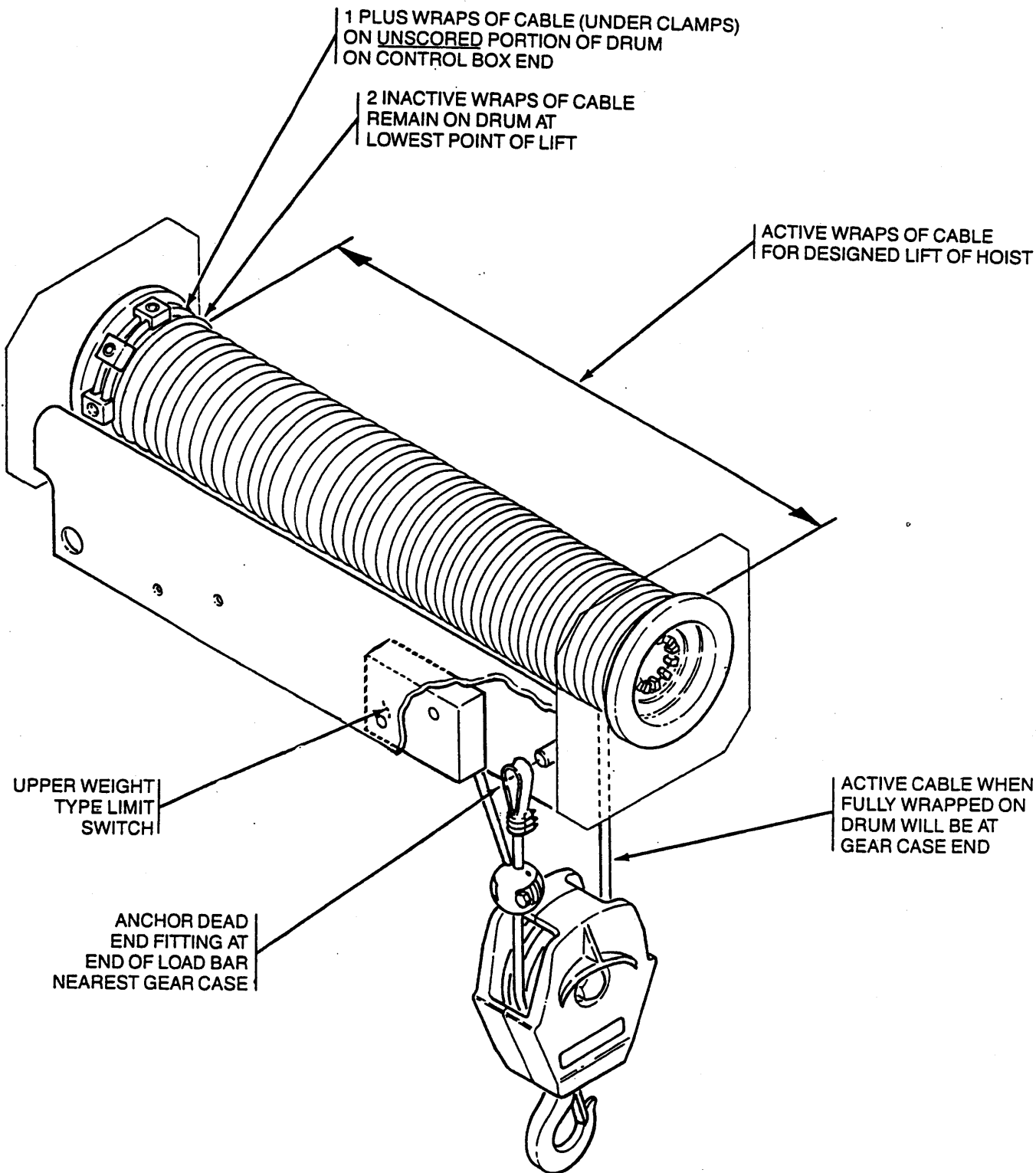
DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C10501	SIDE PLATE, FRONT	1	24	C10535	SPACER	2
2	C10542	SIDE PLATE, REAR	1	25	C10520	CAPACITY PLATE	2
3	C10510	LOAD HOOK	1	26	C10521	DRIVE SCREW	4
4	C10530	TRUNNION	1	27	C10543	ROPE GUARD	1
5	C10509	BEARING, THRUST	1	28	C10540	HEX HEAD CAP SCREW	1
6	C10508	HOOK NUT	1	29	C10544	HEX HEAD CAP SCREW	1
7	C10507	COTTER PIN	1		C10500	COMPLETE BOTTOM BLOCK ASSY	
8	C10511	SAFETY LATCH	1				
9	C10531	HEX HEAD CAP SCREW	2				
10	C10527	LOCKWASHER	2				
11	C10516	HEX NUT	2				
12	C10532	ROPE GUARD	4				
13	C10545	STUD	4				
14	C10518	HEX NUT	8				
15	C10541	LOCKWASHER	10				
16	C10512	SHEAVE PIN	2				
17	C10539	END PLATE	2				
18	C10519	BUTTON HEAD CAP SCREW	8				
19	C10502	ROPE SHEAVE	4				
20	C10503	BEARING	4				
21	C10504	SNAP RING	4				
22	C10505	SPACER	2				
23	C10533	SPACER	2				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**2 PART SINGLE WIRE ROPE REEVING DIAGRAM
INSTRUCTIONS
FR-C-18**

REFER TO FR-C-19 FOR REEVING INSTRUCTIONS

2 PART SINGLE CABLE REEVING



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HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

2 PART SINGLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-19, Page 1

REFER TO FR-C-18 FOR REEVING DIAGRAM

When the need for wire rope replacement has been established, proceed as follows:

CAUTION

Always wear heavy gloves when handling wire ropes to avoid hand injuries from possible broken wires.

To remove wire rope from hoist:

1. Run hoist in the down direction until bottom block is resting on the floor or work platform. Continue to run in the down direction until the lower limit switch is activated (2 wraps of active rope should remain on the drum at this point). Run hoist "up" to position where rope clamps anchoring the rope to the drum are most accessible for step 4.
2. Disconnect hoist from power source.
3. Disassemble the weight of the upper limit switch from the hoist rope.
4. Remove, or loosen rope clamps (3) sufficiently to allow the rope to be freed from the drum.
5. Pull the rope from the bottom block.
6. Remove dead end fitting from the load bar to completely free rope from hoist. Remove rope clips and thimble and retain for use on new rope. Discard cable.
7. Inspect rope sheave, bearings, pins and all other load bearing parts of the bottom block for signs of wear or damage. Especially check rope sheave for signs of reduced groove radius or "imprinting" by the rope. Any indication of such wear of the sheaves would severely shorten the newly installed rope life and could cause premature failure. Such sheaves should be discarded and replaced.

To install new cable:

1. Unreel the replacement wire rope in a clean area free of dirt and inspect for any shipping damage, kinks, etc. Refer to Operation Maintenance Section 4 - Wire Rope. If replacement ropes are held in storage for extended periods of time, check for dried out lubricant or possible corrosion. If necessary, re-lubricate with grease recommended in Lubrication Schedule, Section 5.
2. Install thimble and rope clips on new rope per instructions FR-C-22.
3. Attach dead end fitting of new rope to load bar.
4. Reassemble the upper limit switch weight around the hoist rope and manually move up and down to ensure free movement on the rope.
5. Thread the free end of the rope thru the bottom block and around the bottom of the sheave. (If necessary, use a piece of wire bent to the radius of the sheave to pull the rope around the sheave).
6. Lift the free end of the rope to the rope drum and wrap at least one (1) full wrap of rope *in grooves* at the control box end of the frame, starting on the side closest to the motor, leaving approximately 25" of free rope to wrap one plus turns on the unscored portion of the drum and to pass under all the rope clamps 2 times with a pigtail extension of 3" beyond the last clamp. See reeving diagram. Secure all rope clamps using 17 foot pounds torque, *making sure that the rope is wrapped tightly around the unscored portion of the drum.*
7. Reconnect power source.

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2 PART SINGLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-19, Page 2

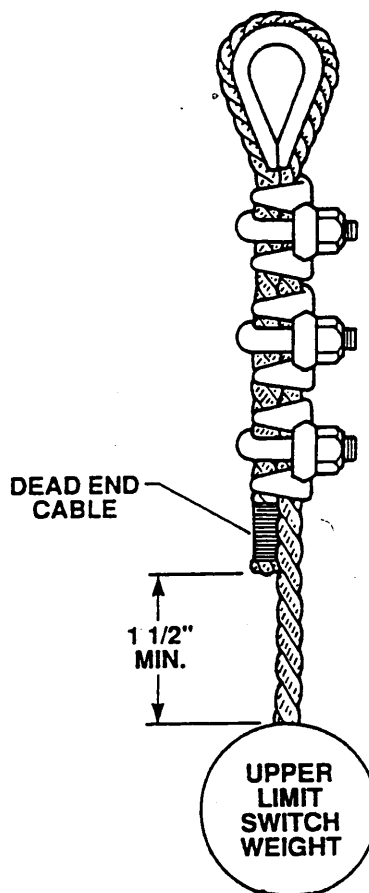
8. Wind the rope on the drum while applying tension to the cable to ensure proper spooling on the drum until the load block is hanging on the ropes. Check to be certain that the rope sheave is rotating freely and that the block hangs properly as shown on the reeving diagram. If ropes are twisted, temporarily disconnect the power source and see section 4 for instructions on correction of twist of new or replacement wire ropes.
9. Reconnect hoist to power source.
10. Operate the block thru the full range of lift 2 or 3 cycles with empty hook using extreme caution not to allow load block to approach closer than 12" to the overtravel limit switch weight - see caution warning at the end of these instructions. Check rope with block at near full up position to insure the bottom block hangs properly. Make 1 or 2 short lifts from the floor with near capacity load. If twisting occurs, see 8 above.
11. Retighten rope clamps *on drum* to torque listed in 5 above.
12. Retighten *dead end rope clamps* per FR-C-22, Wire Rope Dead End Installation Instructions.

CAUTION

The geared limit switch *must* be adjusted to maintain the original stop positions, 1- with 2 active wraps of rope remaining on the drum in the lowest position of the hook (unless set for a shorter than standard design lift) and 2- with the bottom block "strike point" 3" below the weight of the overtravel upper limit switch. See screw limit adjustment instructions in Section 6.

CAUTION

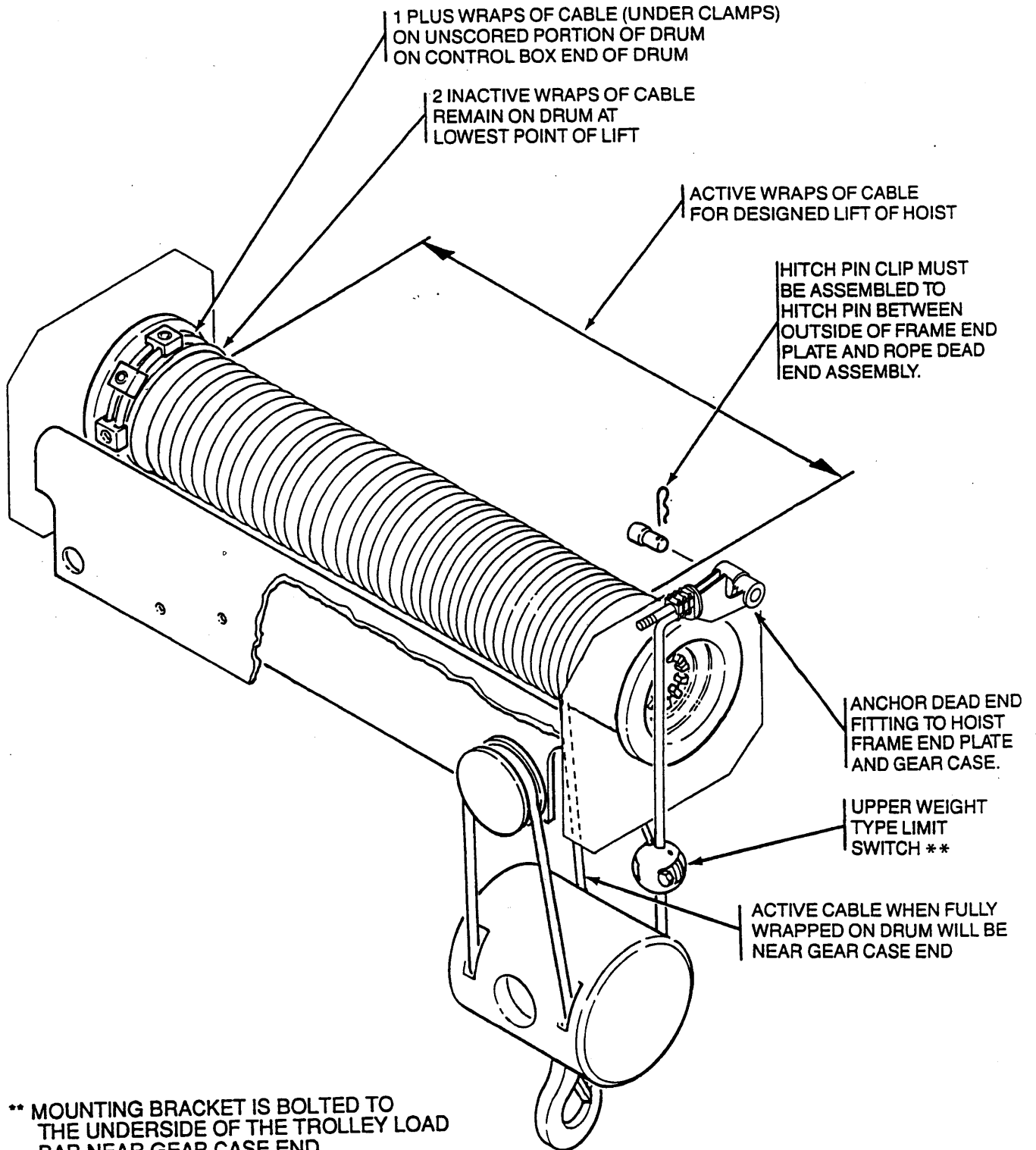
After installation of a new cable there *must* be a *minimum 1 1/2"* of hoisting cable between the upper limit switch weight ball and the end of the dead end cable.



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**4 PART SINGLE WIRE ROPE REEVING DIAGRAM
INSTRUCTIONS
FR-C-20**

REFER TO FR-C-21 FOR REEVING INSTRUCTIONS



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HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

4 PART SINGLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-21, Page 1

REFER TO FR-C-20 FOR REEVING DIAGRAM

When the need for wire rope replacement has been established, proceed as follows:

CAUTION

Always wear heavy gloves when handling wire ropes to avoid hand injuries from possible broken wires.

To remove wire rope from hoist:

1. Run hoist in the down direction until the bottom block is resting on the floor or work platform, and lay the block on its side with axis of sheaves parallel to axis of drum and with hook toward motor side of hoist. Continue to run hoist in down direction until lower limit switch is activated (2 wraps of active rope should remain on the drum). Run hoist "up" to position where rope clamps anchoring the cable to the drum are most accessible for step 4.
2. Disconnect hoist from power source.
3. Disassemble the weight of the upper limit switch from the hoist rope.
4. Remove or loosen, rope clamps (3) sufficiently to allow the rope to be freed from the drum.
5. Pull the rope through the bottom block on one side, from the equalizer sheave, and the other side of the block.
6. Remove the dead end fitting from the hoist frame and gearcase. Remove rope clips and thimble and retain for use on new wire rope. Lower cable from hoist, carefully noting the path of the rope between the gear case and hoist frame as it is lowered. Discard old rope after removing from bottom block and equalizer sheave.
7. Remove bottom block sheave covers and inspect *all* rope sheaves (including equalizer), bearings, pins and all other parts for signs of wear or damage. Especially check rope sheaves for signs of reduced groove radius or "imprinting" by the rope. Any indication of such wear of the sheaves could severely shorten the newly installed rope life and could cause premature failure. Such sheaves should be discarded and replaced. Replace sheave covers.

To install new cable:

1. Unreel the replacement wire rope in a clean area free from dirt and inspect for any shipping damage, kinks, etc. Refer to Operation-Maintenance Section 4 - Wire Rope. If replacement ropes are held in storage extended periods of time, check for dried lubricant or possible corrosion. If necessary, re-lubricate with grease recommended in Lubrication Schedule, Section 5.
2. Raise one end of the new cable up to the hoist and insert it upward between the gear case and the hoist frame end plate being careful that it is properly seated in and around the rope groove cast on the gear case. Install the rope anchor and rope clip per instructions of FR-C-21, page 2.
3. Attach the dead end fitting of the new rope to the hoist frame and gear case with hitch pin and hitch pin clip and with the rope clip nuts facing up to facilitate tightening of rope clips per instruction 14 following.
4. Thread the rope thru the right hand side of the bottom block and around the bottom of the sheaves starting at the side of the block facing down. (If necessary, use a piece of wire bent to the radius of the sheave to pull the rope around the sheave).
5. Lift the free end of rope to the equalizer sheave and pass around the top of the sheave starting on the side closest to gear case.
6. Lower free end of rope to the left hand side of bottom block and thread around sheave starting on the side of the block facing up.

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4 PART SINGLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-21, Page 2

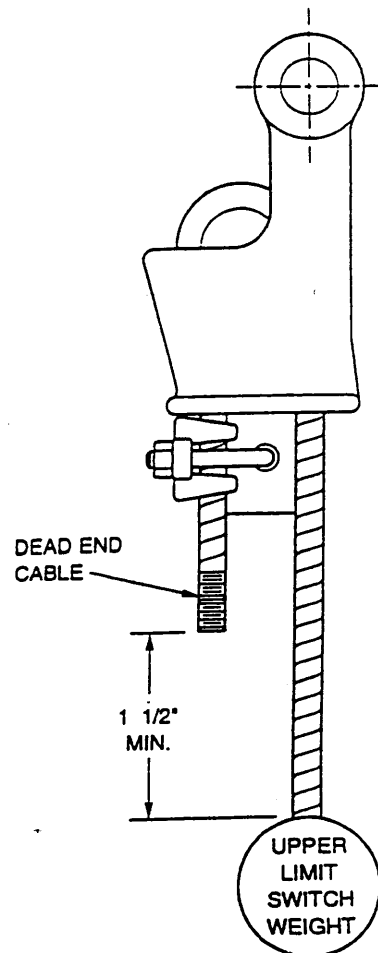
7. Raise free end of rope to rope drum and wrap at least one (1) full wrap *in grooves* at the control box end starting on the side closest to the motor and leaving approximately 25" of free rope to wrap one plus turns on the unscored portion of the drum and to pass under the rope clamps 2 times with a pigtail extension of 3" beyond the last clamp. See reeving diagram. Secure all rope clamp screws to the drum using 17 foot pounds torque, *making sure the rope is wrapped tightly around unscored portion of the drum.*
8. Reassemble upper limit switch weight around hoist rope and move manually up and down to ensure free movement on the rope.
9. Reconnect hoist to power source.
10. Wind rope on the drum while applying tension to the rope to ensure proper spooling on the drum until load block is hanging free on the cables. Check to be certain that *all* rope sheaves are rotating freely and that the block hangs properly as shown on the reeving diagram. If ropes are twisted, temporarily disconnect the power source and see Section 4 for instructions on correction of twist of new or replacement cables.
11. Reconnect hoist to power source.
12. Operate the block through the full range of lift 2 or 3 cycles with empty hook using extreme caution not to allow load block to approach closer than 12" to the overtravel upper limit switch weight - see caution warning at the end of these instructions. Check ropes with block near full up position to ensure they hang properly. Make 1 or 2 short lifts from the floor with near capacity load. If twisting of ropes occurs, see 10 above.
13. Retighten rope clamps *on drum* to torque listed in 6 above.
14. Retighten *dead end rope clamps* per FR-C-22, Wire Rope Dead End Installation Instructions.

CAUTION

The geared limit switch stop must be adjusted to maintain the original stop positions, 1- with 2 active wraps of rope remaining on the drum in the lowest position of the hook (unless set for the shorter than standard design lift) and 2- with the bottom block "strike point" 3 inches below the weight of the overtravel upper limit switch. See screw limit switch adjustment instructions in Section 6.

CAUTION

After installation of a new cable there *must be a minimum 1 1/2" of hoisting cable* between the upper limit switch weight ball and the end of the dead end cable.

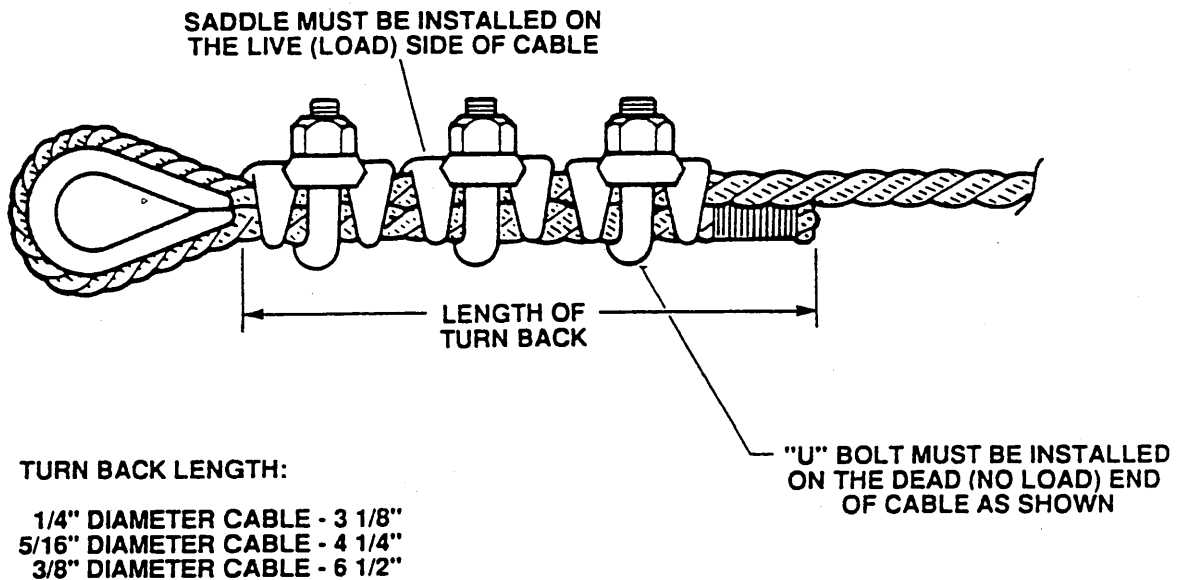


**WIRE ROPE ASSEMBLY - 2 PART SINGLE REEVED MODELS
INSTRUCTIONS
FR-C-22**

HOW TO APPLY CLIPS

Recommended Method of Applying U-Bolt Clips to Get Maximum Holding Power of the Clip

1. Turn back the specified amount of rope from the thimble. Apply the first clip with saddle one rope diameter from the dead end of the wire rope (U-bolt over dead end—live end rests in clip saddle). Tighten nuts evenly to recommended torque.
2. Apply the next clip as near the loop as possible. Turn on nuts firm but do not tighten.
3. Space third clip equally between the first two. Turn on nuts—take up rope slack—tighten all nuts evenly on all clips to recommended torque.
4. **NOTICE!** Apply the initial load and retighten nuts to the recommended torque. Rope will stretch and be reduced in diameter when loads are applied. Inspect periodically and retighten to recommended torque.
5. Both ends of a new cable must be seized with wire wrapping as shown below, or welded to prevent brooming of the strands in order to maintain the integrity of the cable and rope clips.



TORQUE RECOMMENDED FOR SADDLE HEX NUTS:

- 1/4" DIAMETER CABLE - 15 lb/ft
- 5/16" DIAMETER CABLE - 30 lb/ft
- 3/8" DIAMETER CABLE - 45 lb/ft

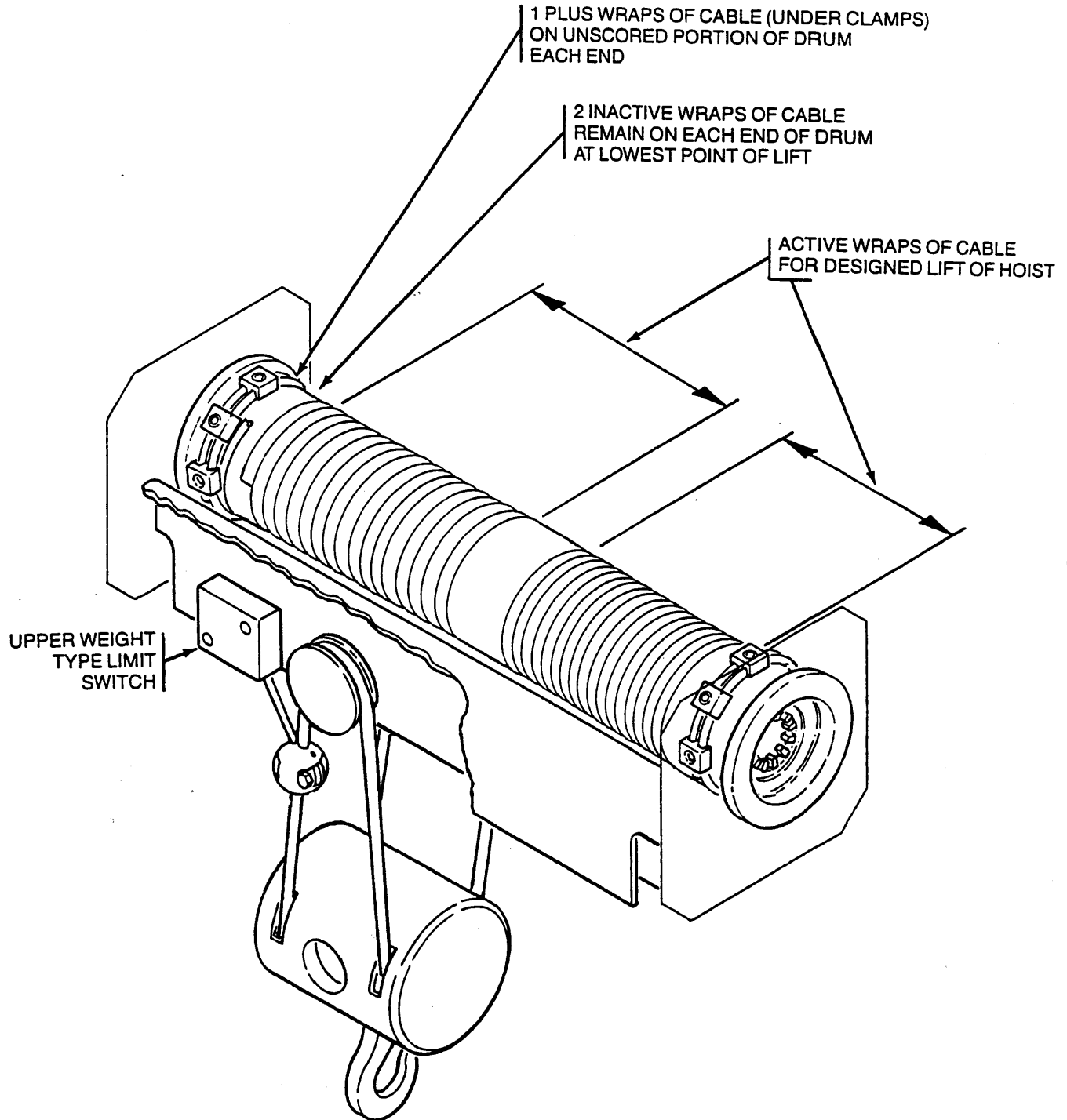
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CAUTION

All newly installed cables must be checked for recommended torque of saddle nuts after initial application of capacity rated load to load hook.

4 PART DOUBLE WIRE ROPE REEVING DIAGRAM
INSTRUCTIONS
FR-C-23

REFER TO FR-C-24 FOR REEVING INSTRUCTIONS



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HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

4 PART DOUBLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-24, Page 1

REFER TO FR-C-23 FOR REEVING DIAGRAM

When the need for wire rope replacement has been established, proceed as follows:

CAUTION

Always wear heavy gloves when handling wire ropes to avoid hand injuries from possible broken wires.

To remove wire rope from hoist:

1. Run load block to the floor, or work platform, and lay on its side with axis of sheaves parallel to the axis of the drum and with the hook toward the motor side of the hoist. Continue to run in down direction until the lower limit switch is activated (2 wraps of active cable should remain on the drum). Run hoist "up" to position where rope clamps anchoring the cable to the drum are most accessible for step 4 below.
2. Disconnect hoist from power source.
3. Disassemble the weight of the upper limit switch from the hoist cable.
4. Remove, or loosen rope clamps (3 each end of drum) sufficiently to allow cable to be freed from the drum.
5. Pull the cable from the bottom block and from the equalizer sheave to completely free it from the hoist. *Discard* cable.
6. Remove bottom block sheave covers and inspect *all* rope sheaves (including equalizer), bearings, pins and other parts for signs of wear or damage. Especially check rope sheaves for signs of reduced groove radius or "imprinting" by the cable. Any indication of such wear of the sheaves could severely shorten the newly installed cable life and could cause premature failure. Such sheaves should be discarded and replaced. Replace sheave covers.

To install new cable:

1. Unreel the replacement cable in a clean area free of dirt and inspect for any shipping damage, kinks, etc. Refer to Operation Maintenance Section 4 - Wire Rope. If replacement cables are held in storage for extended periods of time, check for dried out lubricant or possible corrosion. If necessary, re-lubricate with grease recommended in Lubrication Schedule, Section 5.
2. Pass one end of new cable over top of equalizer sheave and adjust so cable ends hang evenly down to bottom block.
3. Thread each free end of cable thru the bottom block and around the bottom of the sheave, starting on the side of the block facing up. (If necessary, use a piece of wire bent to the radius of the sheave to pull the cable around the sheave.)
4. Raise the free ends of the cable to each end of the drum and wrap at least one (1) full wrap *in grooves* at each end of the drum starting on the side closest to the motor and leaving approximately 25" of free cable to wrap one plus turns on the unscored portion of the drum and to pass under all the rope clamps 2 times with a pigtail extension of 3" beyond the last clamp. See reeving diagram. Secure all rope clamp screws to the rope drum using 17 foot pounds torque, *making sure the cable is wrapped tightly around the unscored portion of the drum.*
5. Reassemble upper limit switch weight around the hoist cable and manually move the weight up and down to ensure free movement on the cable.

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4 PART DOUBLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-24, Page 2

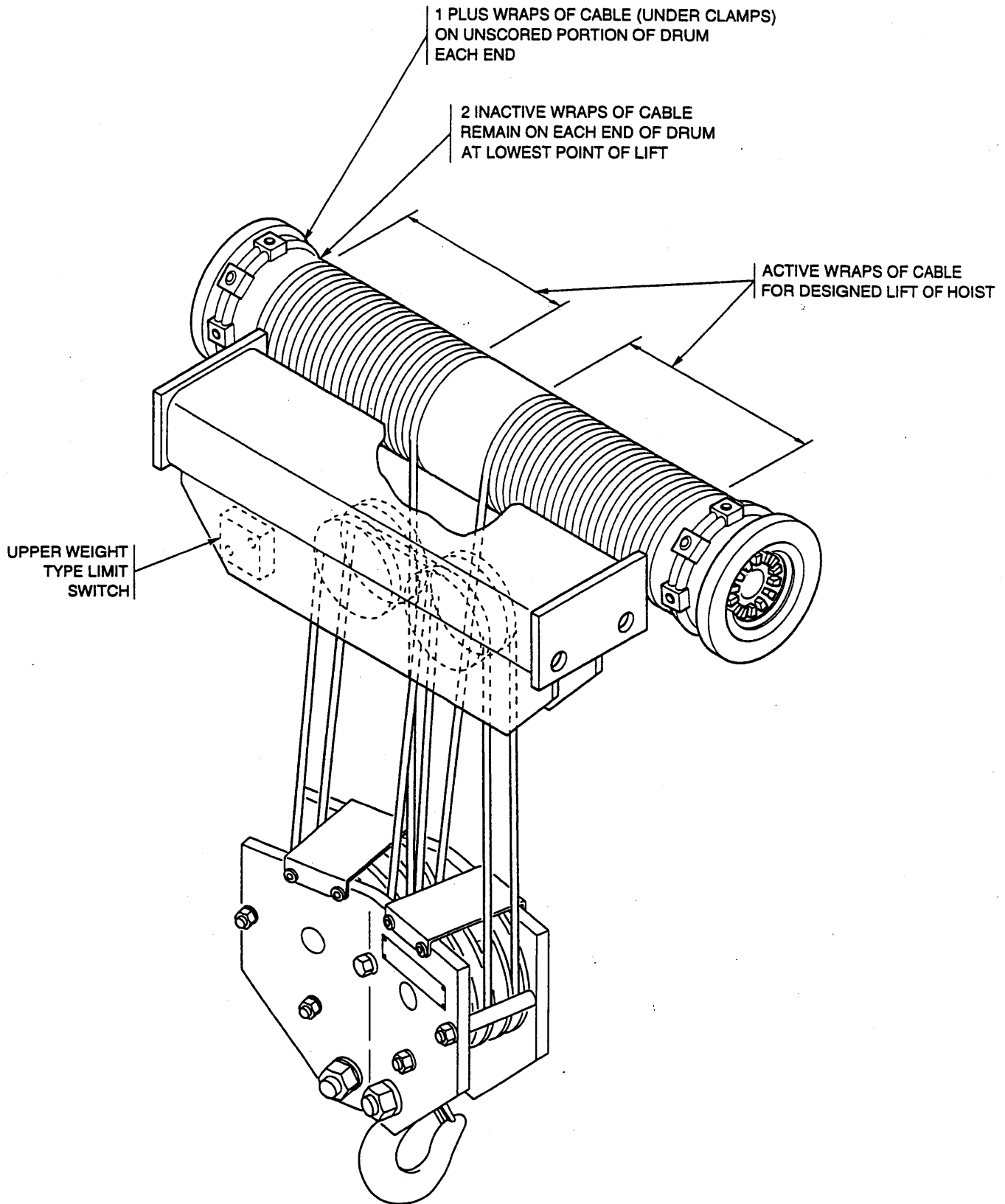
6. Reconnect power source.
7. Wind cable on drum while applying tension to both ends to insure proper spooling on the drum until the load block is hanging free on the cables. Check to be sure that all rope sheaves are rotating freely and that the block hangs properly as shown on the reeving diagram. If cables are twisted, temporarily disconnect the power source and see Section 4 for instructions on correction of twist of new or replacement cables.
8. Reconnect hoist to power source.
9. Operate the block through the full range of lift 2 or 3 cycles with empty hook using extreme caution not to allow load block to approach closer than 12" to the overtravel upper limit switch weight - see caution warning at the end of these instructions. Check cables with block near full up position to ensure they hang properly. Make 1 or 2 short lifts from the floor with a near capacity load. If twisting occurs, see 7 above.
10. Retighten *rope clamps on drum* to torque listed in 4 above.

CAUTION

The geared limit switch *must* be adjusted to maintain original stop positions, 1- with 2 active wraps of cable remaining on the drum in the lowest position of the hook (unless set for a shorter than standard design lift) and 2- with the bottom block "strike point" 3 inches below the weight of the standard overtravel limit switch. See screw limit adjustment instructions in Section 6.

**8 PART DOUBLE WIRE ROPE REEVING DIAGRAM
INSTRUCTIONS
FR-C-25**

REFER TO FR-C-26 FOR REEVING INSTRUCTIONS



HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

8 PART DOUBLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-26, Page 1

REFER TO FR-C-25 FOR REEVING DIAGRAM

When the need for wire rope replacement has been established, proceed as follows:

CAUTION

Always wear heavy gloves when handling wire ropes to avoid hand injuries from possible broken wires.

To remove wire rope from hoist:

1. Run load block to the floor, or work platform, and lay on its side with the hook toward the side of the hoist. Continue to run in down direction until the lower limit switch is activated (2 wraps of active cable should remain on the drum). Run hoist "up" to position where rope clamps anchoring the cable to the drum are most accessible for step 4 below.
2. Disconnect hoist from power source.
3. Disassemble the weight of the upper limit switch from the hoist cable.
4. Remove, or loosen rope clamps (3 each end of drum) sufficiently to allow cable to be freed from the drum.
5. Pull the cable from the bottom block and from the equalizer sheave to completely free it from the hoist. *Discard* cable.
6. Remove bottom block sheave covers and inspect *all* rope sheaves (including equalizer), bearings, pins and other parts for signs of wear or damage. Especially check rope sheaves for signs of reduced groove radius or "imprinting" by the cable. Any indication of such wear of the sheaves could severely shorten the newly installed cable life and could cause premature failure. Such sheaves should be discarded and replaced. Replace sheave covers.

To install new cable:

1. Unreel the replacement cable in a clean area free of dirt and inspect for any shipping damage, kinks, etc. Refer to Operation Maintenance Section 4 - Wire Rope. If replacement cables are held in storage for extended periods of time, check for dried out lubricant or possible corrosion. If necessary, re-lubricate with grease recommended in Lubrication Schedule, Section 5.
2. Pass one end of new cable over top of equalizer sheaves and adjust so cable ends hang evenly down to bottom block.
3. Thread each free end of cable thru the bottom block and around the bottom of the sheave, starting on the side of the block facing down. (See reeving diagram.) Continue reeving the cable around the sheaves. (If necessary, use a piece of wire bent to the radius of the sheave to pull the cable around the sheave.)
4. Raise the free ends of the cable to each end of the drum and wrap at least one (1) full wrap *in grooves* at each end of the drum starting on the side closest to the motor and leaving approximately 25" of free cable to wrap one plus turns on the unscored portion of the drum and to pass under all the rope clamps 2 times with a pigtail extension of 3" beyond the last clamp. See reeving diagram. Secure all rope clamp screws to the rope drum using 17 foot pounds torque, *making sure the cable is wrapped tightly around the unscored portion of the drum.*
5. Reassemble upper limit switch weight around the hoist cable and manually move the weight up and down to ensure free movement on the cable.

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8 PART DOUBLE WIRE ROPE REEVING INSTRUCTIONS
INSTRUCTIONS
FR-C-26, Page 2

6. Reconnect power source.
7. Wind cable on drum while applying tension to both ends to insure proper spooling on the drum until the load block is hanging free on the cables. Check to be sure that all rope sheaves are rotating freely and that the block hangs properly as shown on the reeving diagram. If cables are twisted, temporarily disconnect the power source and see Section 4 for instructions on correction of twist of new or replacement cables.
8. Reconnect hoist to power source.
9. Operate the block through the full range of lift 2 or 3 cycles with empty hook using extreme caution not to allow load block to approach closer than 12" to the overtravel upper limit switch weight - see caution warning at the end of these instructions. Check cables with block near full up position to ensure they hang properly. Make 1 or 2 short lifts from the floor with a near capacity load. If twisting occurs, see 7 above.
10. Retighten *rope clamps on drum* to torque listed in 4 above.

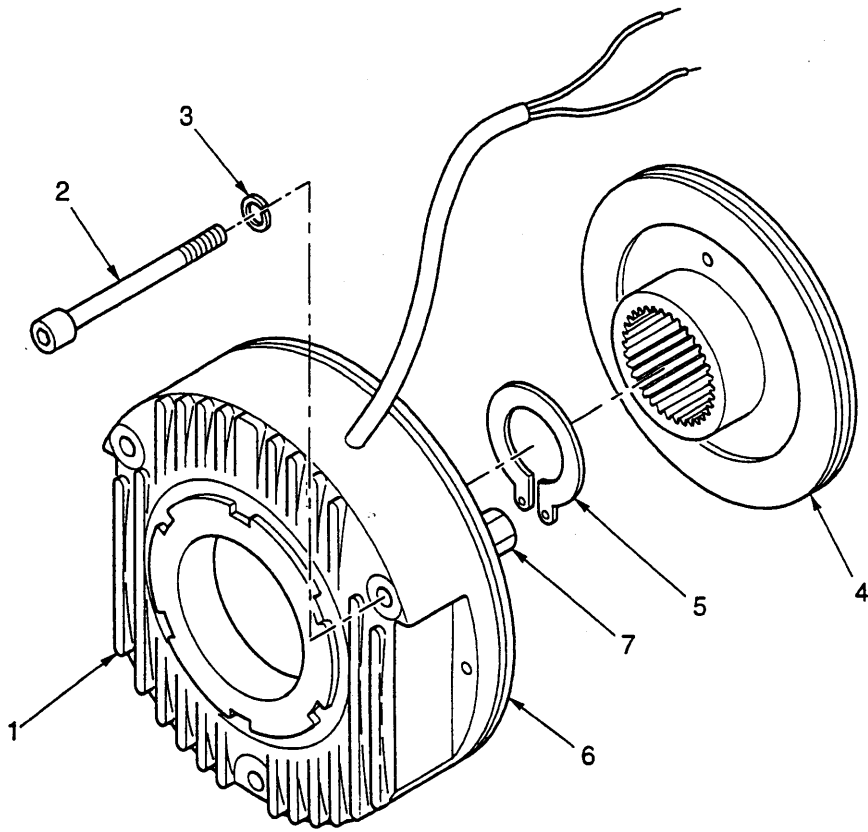
CAUTION

The geared limit switch *must* be adjusted to maintain original stop positions, 1- with 2 active wraps of cable remaining on the drum in the lowest position of the hook (unless set for a shorter than standard design lift) and 2- with the bottom block "strike point" 3 inches below the weight of the standard overtravel limit switch. See screw limit adjustment instructions in Section 6.

HOIST MOTOR BRAKE COMPONENTS AND ADJUSTMENT

SPARE PARTS IDENTIFICATION

FR-C-27, Page 1



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	D40003	MAGNET ASSY	1				
2	D40021	SOCKET HEAD CAP SCREW	3				
3	D40022	LOCKWASHER	3				
4	D40002	HUB & FRICTION DISC	1				
5	D40024	SNAP RING	1				
6	*	ARMATURE PLATE					
7	*	AIRGAP SPACER NUT					
	D40000	COMPLETE BRAKE ASSY					

* THESE ITEMS ARE PART OF THE MAGNET ASSY

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.

**HOIST MOTOR BRAKE AND ADJUSTMENT
INSTRUCTIONS
FR-C-27, Page 2**

Lenze motor brake adjustment

Air gap setting:

The airgap between the armature plates item (8) and the magnet assembly item (1) will require adjustment from time to time. This time interval will depend upon the frequency of operation and wear of the friction disc.

The nominal gap between item (1) and item (8) is set at the factory at 0.008". The maximum gap and the gap at which time the brake must be adjusted should not exceed 0.015".

Regular inspections of the brake will help determine the airgap dimension. If at any time the load hook shows signs of drifting after the push buttons are released, immediately take the hoist out of service and check the motor brake for excessive wear and airgap.

Torque setting:

The hoist motor brake torque is set at the factory and should not require adjustment in the field.

To adjust torque setting after installing a new motor brake turn the adjustment ring clockwise until snug.

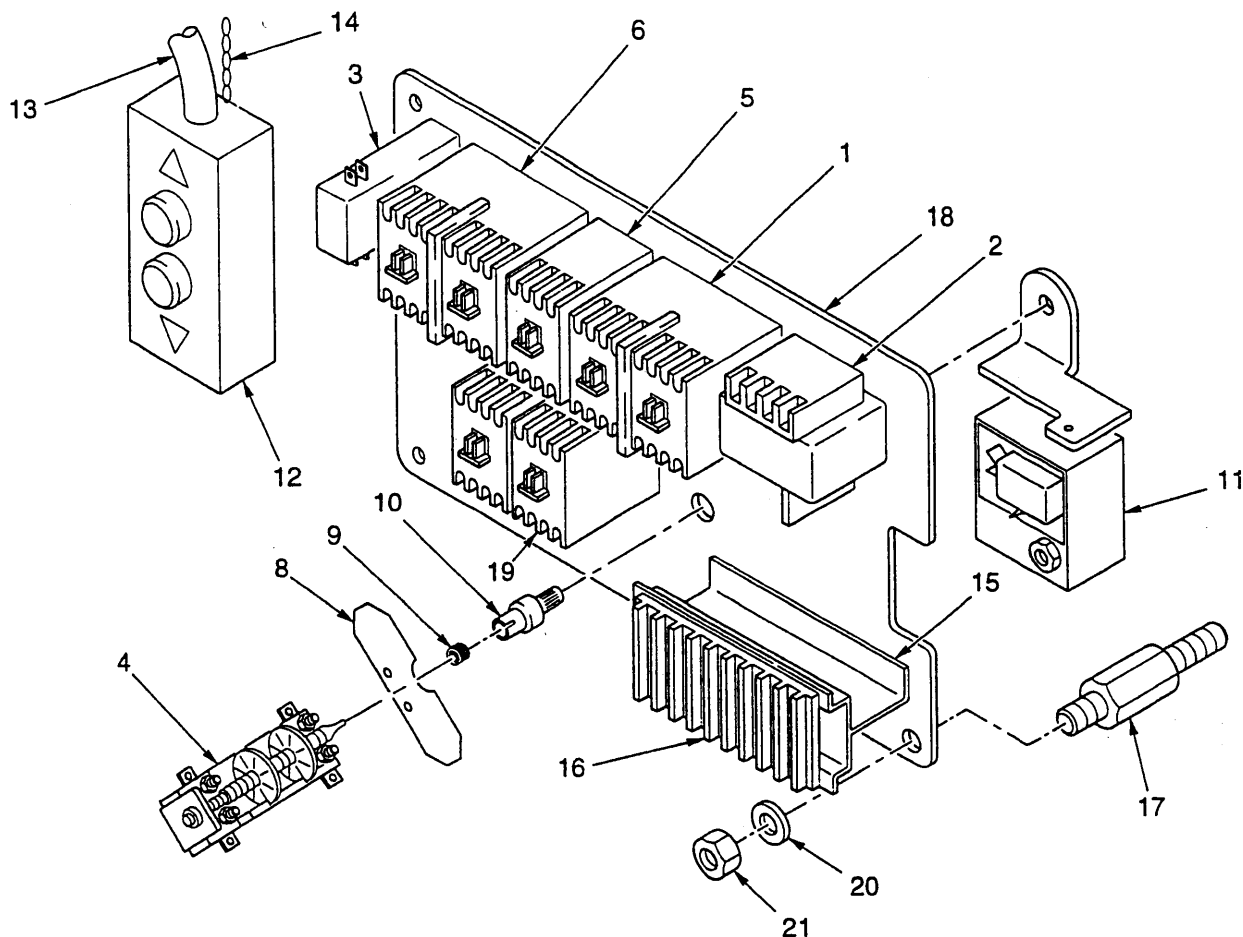
Set torque by moving the adjustment ring counterclockwise in 90 degree increments or clicks.
(One click = 90 degrees.)

Set torque per chart according to hoist motor and brake size.

Note: Air gap must be reset after changing or setting the brake torque.

Motor Horsepower	Motor Rpm	Brake Max Ft/lb	Brake Set Ft/lb	Number of Clicks
2	1800	6	6	0
2	1800/600	12	10	4
3	1800	12	12	0
3	1800/600	12	12	0
3	3600	6	6	0
3	3600/600	12	7	10
5	3600	12	12	0
5	3600/600	12	12	0

**HOIST CONTROLLER ASSEMBLY
SPARE PARTS IDENTIFICATION
FR-C-28**



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	C20002	CONTACTOR, HOIST CONTROL	A/R				
2	C20003	TRANSFORMER	A/R				
3	C40004	RECTIFIER, HOIST BRAKE	A/R				
4	C10400	SCREW LIMIT SWITCH	1				
5	C20005	CONTROLLER, SPEED	A/R				
6	C20012	CONTACTOR, TROLLEY	A/R				
7	C20006	FUSE(S)	A/R				
8	C20007	INSULATOR	1				
9	C20008	SPRING	1				
10	C20009	STUB SHAFT	1				
11	FR-C-12	OVERLOAD LIMIT SWITCH	1				
12	C20100	PUSH BUTTON STATION ASSY.	A/R				
13	C20101	PUSH BUTTON CABLE	A/R				
14	C20102	PUSH BUTTON SUPPORT CHAIN	A/R				
15	C20200	TERMINAL RAIL	A/R				
16	C20201	TERMINAL STRIP	A/R				
17	C20202	STUDS, MTG. PLATE	4				
18	C20203	MOUNTING PLATE	1				
19	C20204	RELAY	A/R				
20	C20205	HEX NUT, 1/4"	4				
21	C20206	LOCKWASHER, 1/4"	4				

HOIST SERIAL NUMBER AND PART REFERENCE NUMBER MUST BE PROVIDED WHEN ORDERING REPLACEMENT PARTS.