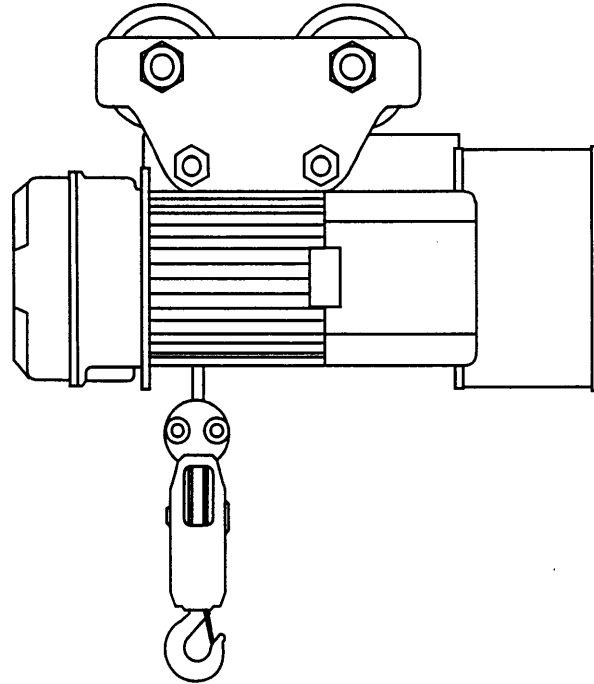


FRAME A SPACEMASTER II



Series SA & DA Hoists

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

SERIAL NO.: _____

(RECORD HOIST SERIAL NUMBER FOR FUTURE REFERENCE)



Before proceeding with the installation, operation or maintenance of the hoist it is important that the installation, operating and maintenance personnel read this bulletin carefully in order to ensure the safe and efficient use of the hoist.

Also, it is strongly recommended that the personnel responsible for the operation, inspection and servicing of this hoist, read and follow the Safety Standard ANSI B30.6 1987 (or current revised edition) covering Overhead Hoists (underhung) as promulgated by the American National Standards Institute and published by the American Society of Mechanical Engineers. Copies of this publication are available from the Society at United Engineering Center, 345 East 47th St., New York, NY 10017.

If any instructions are unclear contact the manufacturer or distributor of the hoist before attempting to install or use the hoist.

IMPORTANT

An electrical wiring diagram has been packed with this manual. Also, if an optional hand geared or motorized trolley has been purchased, a manual has also been included for it.

If these items are missing, contact the manufacturer or distributor before attempting to install or use the hoist.

Manufactured by: **R&M Materials Handling, Inc.**
SPACEMASTER Hoist & Crane Products
4501 Gateway Boulevard
Springfield, Ohio 45502
(937) 328-5100
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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 nameplate typically affixed to the trolley mounting tube will be found the Serial Number of your hoist or crane - i.e. The Serial Number begins with a letter followed by seven numbers. An example of this type Serial Number would be A9800000. 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.
SPACEMASTER Hoist & Crane Products
4501 Gateway Boulevard
Springfield, Ohio 45502

SECTION 1 INSTALLATION

IMPORTANT

Hoists/trolleys are designed for lifting and transporting of materials only. Under no conditions, 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, 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 5/32"

Special trolleys designed to run on only patented type rails should have 1/16" clearance each side between wheel flange and rail. See 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 4 part double reeving. Reference FR-A-16, -17, -18, -19, -20 and -21.

Lubrication

All Spacemaster hoists are shipped completely lubricated, including gear cases filled with oil; however, to avoid potential damage from low oil levels resulting from leakage during handling /shipping, all levels must be checked, and oil 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/conductors 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.



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.

WARNING

Do *not* attempt to reverse hoist motion by changing control leads in the push button or at the contactor, or 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.

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.

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

The optional ballast resistors 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 "A" 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, or 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-A-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-A-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-A-22 and FR-A-23 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 limit at maximum hoist speed. Block motion should be stopped by limit switch action.

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.

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. 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 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.
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 SA and DA 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* - two 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 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 regreased if coupling extension shaft are disassembled.

Hoist Motor Brake

Spacemaster Series "A" 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.

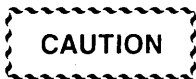
When the hoist motor is energized, the magnet brake coils are also energized, pulling the armature plate against the brake pole plate, thereby releasing the pressure on the friction discs. This permits the discs to turn freely with motor rotation. When the motor is de-energized, the brake coils are simultaneously 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-A-22 and FR-A-23, Section 6.

Gearcase Assembly (See drawing FR-A-4, Section 6)

Drive train consists of two 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.



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 in 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

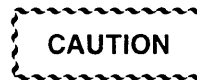
thread load brake shaft. Pressure on friction discs is relieved allowing the overhauling load off drum to rotate the load brake against the friction surfaces, dissipating energy in the form of heat.

Load brake adjustment instructions are shown in Section 6 of the Gearcase Parts Identification Sheet. See FR-A-5.

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



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 monthly 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. *Each* 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 checking as in 5 above.

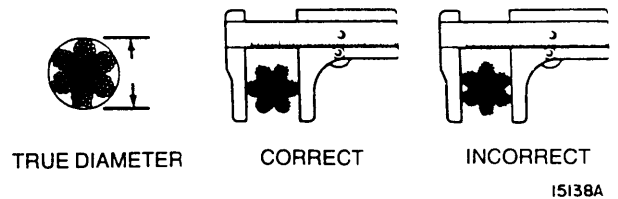
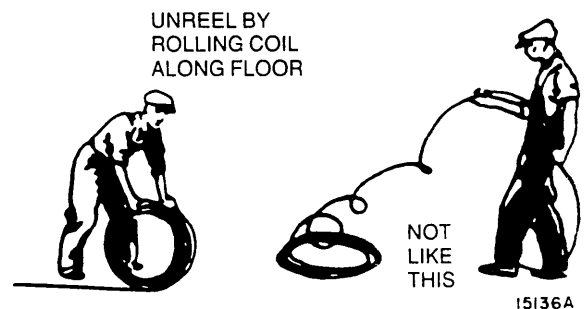


Figure 4-1

Generalized instructions for inspection/servicing of wire rope follow. Specific reeving instructions are shown on Reeving Diagrams, FR-A-16, 18 and 20 and Reeving Instruction Sheets FR-A-17, 19 and 21.

- 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 an oiled (preferably heated oil) tissue. 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-A-16, 18 and 20.

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 4 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 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.

CAUTION

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

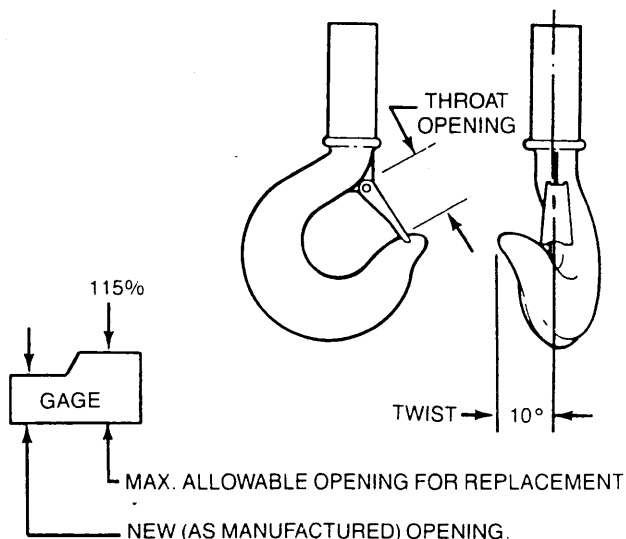


Figure 4-2

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-A-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-A-11 and 13. An overload limit switch protects against a load in excess of the rated load of the hoist being lifted. See FR-A-12.

CAUTION

Both upper limit switches are emergency devices only and are not to be used as an *automatic stop*.

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 limit switch</i> - check by carefully inching empty hook into 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-A-22 and FR-A-23, 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 only if silver is worn thin or is severely pitted. Check for loose or broken connections.</p> <p><i>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-A-5).</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 and rated 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.	Limit Switch(es) are not opening circuit.	Check operation and setting of limit switch(es).

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. Check brake linings, clean, or replace as necessary. Check load brake operation. Refer to Section 4 Operation/Maintenance. Check load brake adjustment, Section 6, FR-A-5.
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. Defective pushbutton.	Check collectors for free movement of spring loaded arm, weak spring, connections, and free movement of shoe or roller. Check pushbutton inserts.

TROUBLESHOOTING (Cont)

PROBLEM	DIAGNOSIS	POTENTIAL SOLUTION
Excessive cable wear.	Lack of lubrication.	Lubricate cable. See Lubrication Schedule, page 5-4.
	Sheaves damaged or worn.	Check sheaves for narrowing or scored rope grooves and cracked or damaged flanges or sharp edges.
	Hoist being used for side pulling.	Hoist should be centered over the load before starting lift so that cable wraps smoothly on drum.
Magnetic brake does not release.	Low voltage.	Check voltage.
	Magnetic coil is open or shorted. Open brake circuit.	Check connection. Check magnetic coil for open or short circuit.
Oil leaks.	Vent plug clogged.	Check to be sure vent plug is open.
	Oil seals worn or damaged. Gasket leaking between gearcase and cover.	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 3 quarts). Trolley gearcase (capacity 1/2 pint).	Check level monthly to quarterly. Drain and refill semi-annually to annually.	Multi-purpose lubricating oil 20 wt. or 30, non-detergent. Sohio factovis No. 52 (20 wt.), or No. 65 (30 wt.); Shell Turbo No. 33 (20 wt.), or No. 41 (30 wt.); Gulf Harmony No. 53 (20 wt.), or No. 61 (30 wt.); Mobil DTE Hvy. Medium, 20 wt.
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.

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

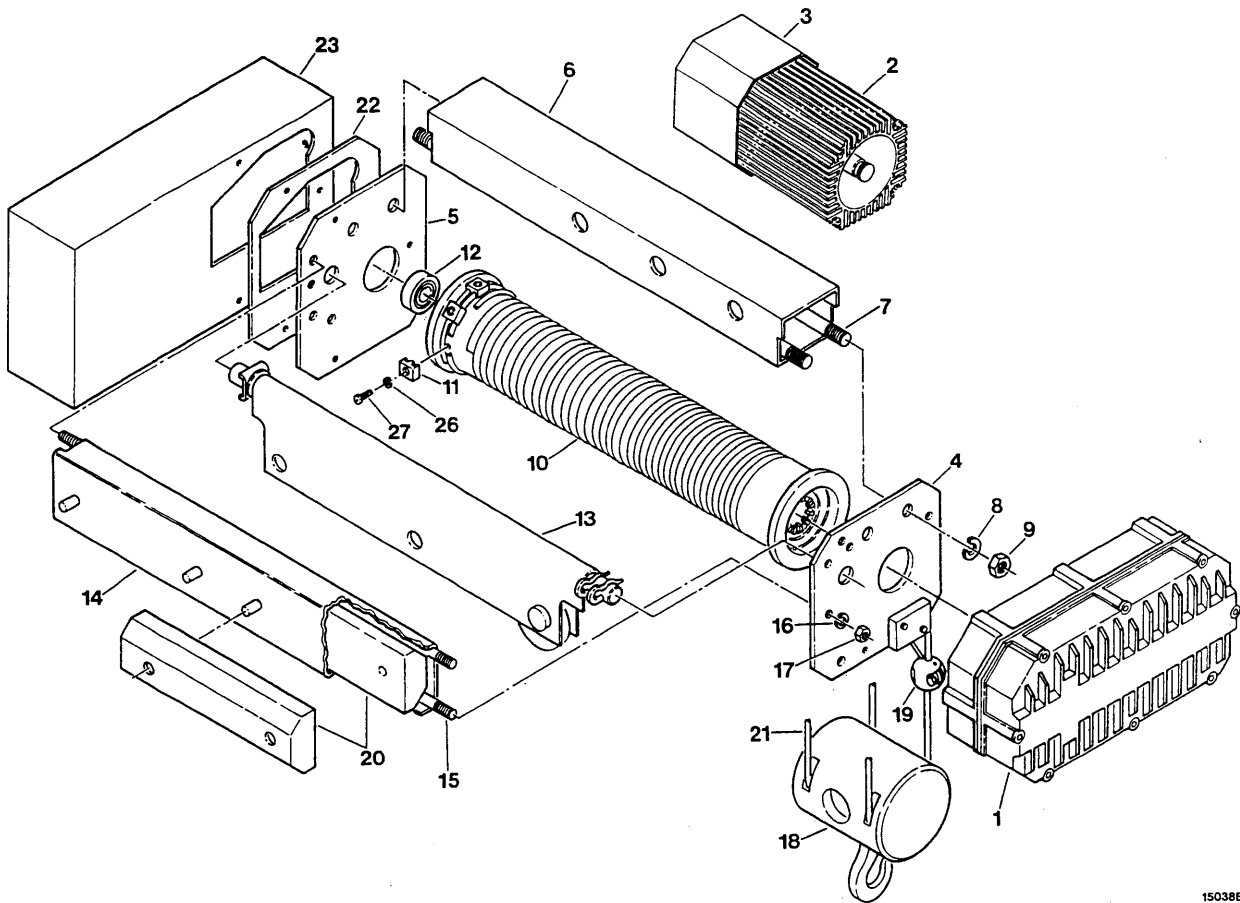
IMPORTANT

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

Index of Exploded View Parts Illustration and Adjustments Instructions	Number	Page No.
Hoist Frame and Components Models SA-1-20 and SA-1-46	FR-A-1	6-2
Hoist Frame and Components Model SA-2-18	FR-A-2	6-3
Hoist Frame and Components Model DA-1-20	FR-A-3	6-4
Hoist Gear Assembly	FR-A-4	6-5
Load Brake Check and Adjustment	FR-A-5	6-6
2 Part Single Load Bar Assembly Models SA-1-20 and SA-1-46	FR-A-6	6-7
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Weight Type Upper Limit Switch Assembly	FR-A-11	6-10
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Adjustable Screw Type Limit Switch	FR-A-13	6-13
2 Part Bottom Block Assembly	FR-A-14	6-15
4 Part Bottom Block Assembly	FR-A-15	6-16
2 Part Single Reeving Diagram	FR-A-16	6-17
2 Part Single Reeving Instructions	FR-A-17	6-18
4 Part Single Reeving Diagram	FR-A-18	6-20
4 Part Single Reeving Instructions	FR-A-19	6-21
4 Part Double Reeving Diagram	FR-A-20	6-23
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Hoist Motor Brake and Adjustment Type KO	FR-A-22	6-26
Hoist Motor Brake and Adjustment Type LENZE	FR-A-23	6-27
Hoist Controller Assembly	FR-A-24	6-28
Hoist Gearcase Cover Bolt Torque Instructions	FR-A-25	6-29

**HOIST FRAME AND COMPONENTS 4 PART SINGLE REEVED 2 TON
CAPACITY MODEL SA-2-18**

**SPARE PARTS IDENTIFICATION
FR-A-2**



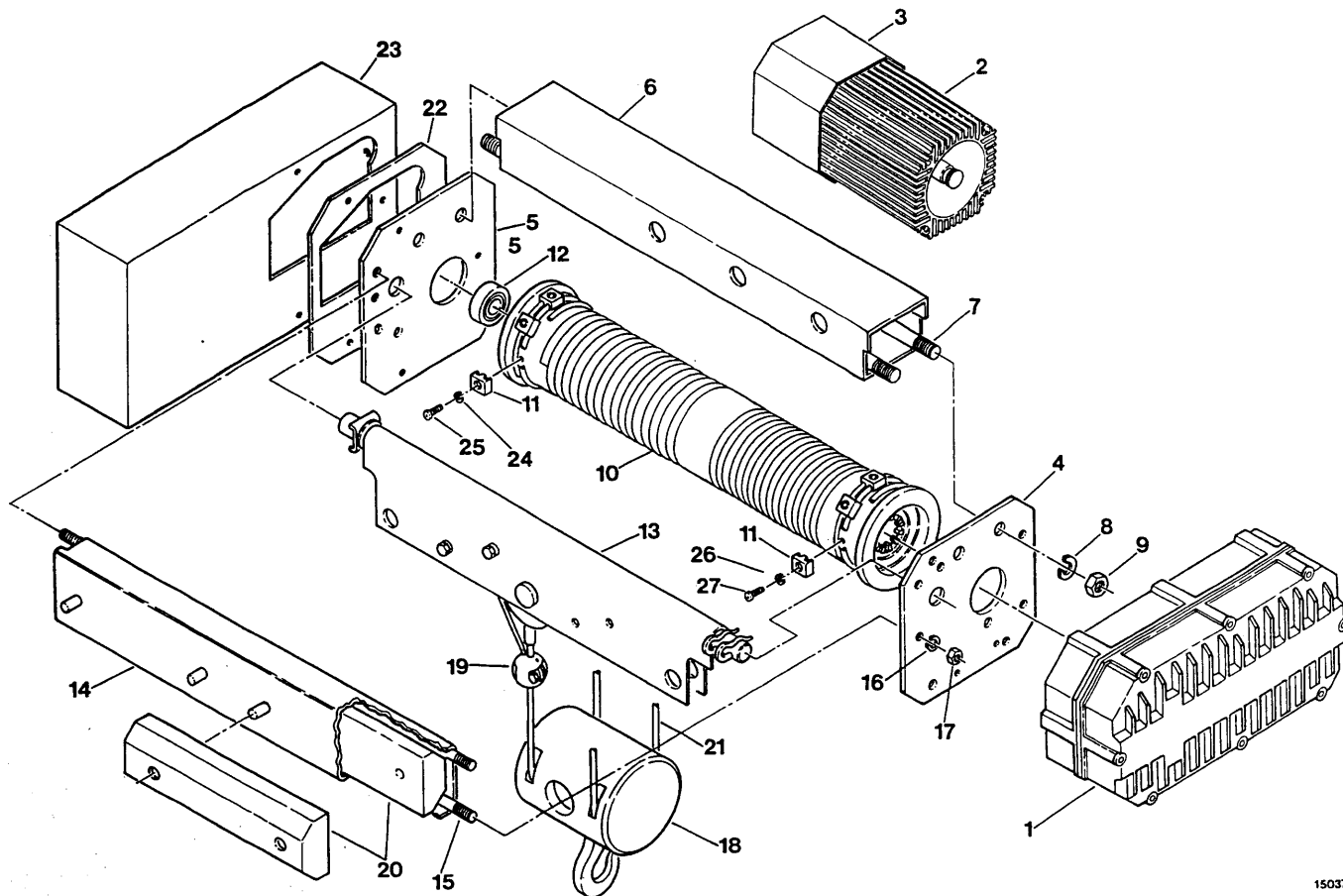
150388

DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	FR-A-4	GEAR CASE ASSEMBLY	1	24	A90014	LOCKWASHER, CABLE CLAMP	3
2	A50000	MOTOR, HOIST	1	25	A90018	SCREW, CABLE CLAMP	3
3	A40000	BRAKE, MOTOR HOIST	1				
4	A10002	PLATE, FRONT FRAME	1				
5	A10003	PLATE, BACK FRAME	1				
6	A10008	TUBE, TROLLEY SUPPORT	1				
7	A10009	STUD, TROLL. SUPP. TUBE	2				
8	A90010	LOCKWASHER, TROLL. TUBE STUD	4				
9	A90011	HEX NUT, TROLL. TUBE STUD	4				
10	A10016	DRUM, ROPE	1				
11	A10017	CLAMP, CABLE DRUM	3				
12	A60012	BEARING, ROPE DRUM	1				
13	FR-A-7	LOAD BAR ASSEMBLY	1				
14	A10004	TUBE, SIDE FRAME	1				
15	A10005	STUD, SIDE FRAME TUBE	2				
16	A90006	LOCKWASHER, SIDE TUBE STUD	4				
17	A90007	HEX NUT, SIDE TUBE STAND	4				
18	A10500	BOTTOM BLOCK ASSEMBLY	1				
19	FR-A-11	ASSEMBLY, UPPER LIMIT SWITCH	2				
20	A10019	COUNTERWEIGHT	2				
21	A10022	CABLE ASSEMBLY, LOAD	1				
22	A20001	GASKET, CONTROL BOX FRAME	1				
23	A20000	BOX, CONTROL	1				

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

**SPARE PARTS IDENTIFICATION
FR-A-3**

**HOIST FRAME AND COMPONENTS 4 PART DOUBLE REEVED 1 TON
CAPACITY MODEL DA-1-20**



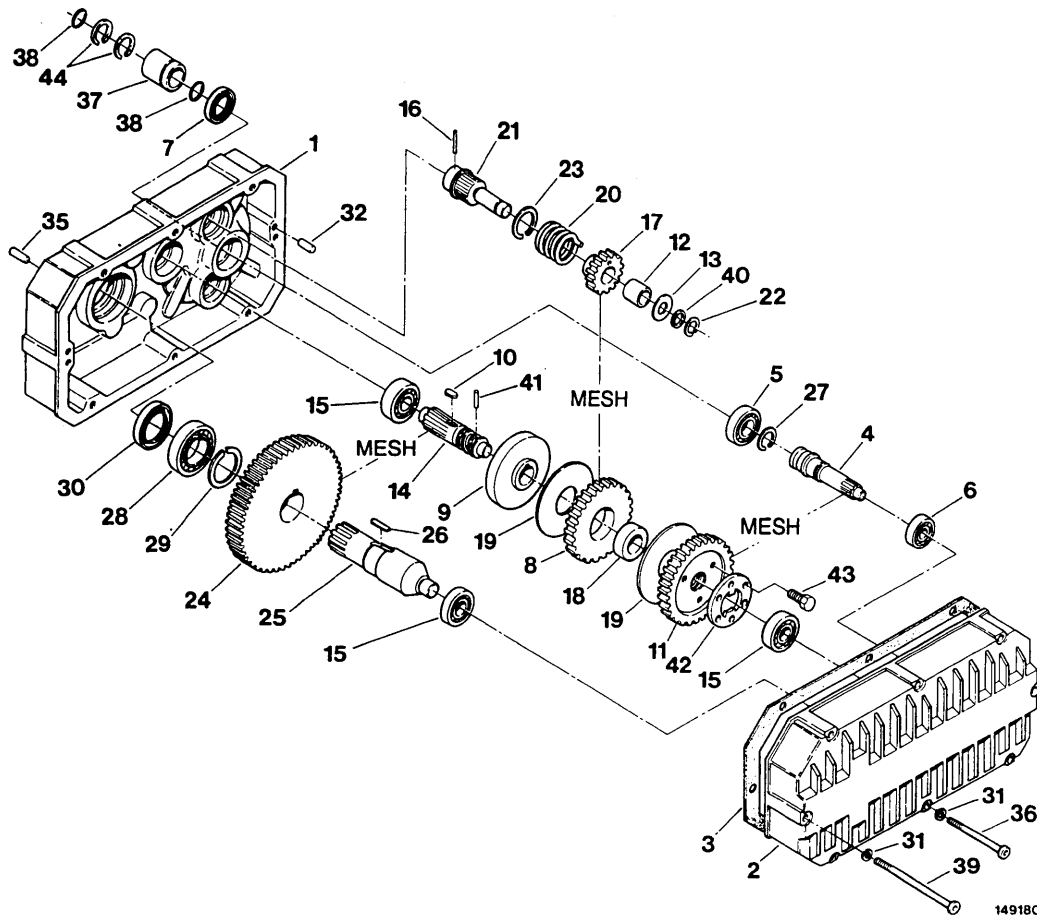
15037B

DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	FR-A-4	GEAR CASE ASSEMBLY	1	24	A90014	LOCKWASHER, CABLE CLAMP	6
2	A50000	MOTOR, HOIST	1	25	A90018	SCREW, CABLE CLAMP	6
3	A40000	BRAKE, HOIST MOTOR	1				
4	A10002	PLATE, FRONT FRAME	1				
5	A10003	PLATE, BACK FRAME	1				
6	A10008	TUBE, TROLLEY SUPPORT	1				
7	A10009	STUD, TROLL. SUPP. TUBE	2				
8	A90010	LOCKWASHER, TROLL. TUBE STUD	4				
9	A90011	HEX NUT, TROLL. TUBE STUD	4				
10	A10016	DRUM, ROPE	1				
11	A10017	CLAMP, CABLE DRUM	3				
12	A60012	BEARING, ROPE DRUM	1				
13	FR-A-8	LOAD BAR ASSEMBLY	1				
14	A10004	TUBE, SIDE FRAME	1				
15	A10005	STUD, SIDE FRAME TUBE	2				
16	A90006	LOCKWASHER, SIDE TUBE STUD	4				
17	A90007	HEX NUT, SIDE TUBE STUD	4				
18	A10500	BOTTOM BLOCK ASSEMBLY	1				
19	FR-A-11	ASSEMBLY, UPPER LIMIT SWITCH	1				
20	A10019	COUNTERWEIGHT	A/R				
21	A10022	CABLE ASSEMBLY, LOAD	1				
22	A20001	GASKET, CONTROL BOX FRAME	1				
23	A20000	BOX, CONTROL	1				

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

HOIST GEARCASE ASSEMBLY

SPARE PARTS IDENTIFICATION FR-A-4



DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.	DWG. ITEM	REFERENCE NUMBER	PART DESCRIPTION	QTY.
1	A30001	GEARCASE	1	25	A30033	SHAFT, DRUM	1
2	A30002	COVER, GEARCASE	1	26	A30034	KEY, DRUM SHAFT	1
3	A30003	GASKET, GEARCASE	1	27	A80004	RETAINING RING, PRIMARY SHAFT	1
4	A30004	PRIMARY SHAFT	1	28	A63008	BEARING, LOAD BRAKE SHAFT	1
5	A63005	BEARING, PRIMARY SHAFT	1	29	A30035	RETAINING RING, DRUM SHAFT	1
6	A63006	BEARING, PRIMARY SHAFT	1	30	A70002	OIL SEAL, DRUM SHAFT	1
7	A70001	OIL SEAL	1	31	A90014	LOCKWASHER, COVER SCREW	8
8	A30008	GEAR, FREE WHEELING	1	32	A90021	DOWEL PIN, GEARCASE COVER	2
9	A30009	THRUST DISC, LOAD BRAKE	1	33	A90022	PIPE PLUG, DRAIN	3
10	A30010	KEY, LOAD BRAKE SHAFT	1	34	A90023	PIPE PLUG, BREATHER	1
11	A30011	GEAR, LOAD BRAKE	1	35	A90024	DOWEL PIN, FRAME	2
12	A30025	BUSHING, FREE WHEELING	1	36	A90025	SOCKET HEAD CAP SCREW	6
13	A30023	THRUST BUSHING	1	37	A50001	COUPLING, PRIMARY SHAFT	1
14	A30014	SHAFT, LOAD BRAKE	1	38	A50002	O-RING, PRIMARY SHAFT	2
15	A63006	BEARING, DRUM SHAFT	3	39	A90025	CAP SCREW, GEARCASE COVER	2
16	A30020	ROLL PIN, FREE WHEELING	1	40	A30028	WASHER, FREE WHEELING	3
17	A30024	PINION, FREE WHEELING	1	41	A90044	DOWEL PIN	1
18	A30012	BUSHING, LOAD BRAKE	1	42	A30051	ADJUSTING COLLAR	1
19	A30013	FRICTION DISC LOAD BRAKE	2	43	A90084	CAP SCREW, DRILLED HEAD	6
20	A30026	SPRING, FREE WHEELING	1	44	A50003	SNAP RING	2
21	A30027	SHAFT, FREE WHEELING	1				
22	A30021	RETAINING RING	1				
23	A30022	WASHER, FREE WHEELING	2				
24	A30032	GEAR, DRUM	1				

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

LOAD BRAKE ADJUSTMENT

The load brake will self-adjust over a wide range of operating cycles and requires a minimum of maintenance. Wear on the friction discs should be checked during any gear case maintenance and discs replaced when the thickness is reduced to 1/32".

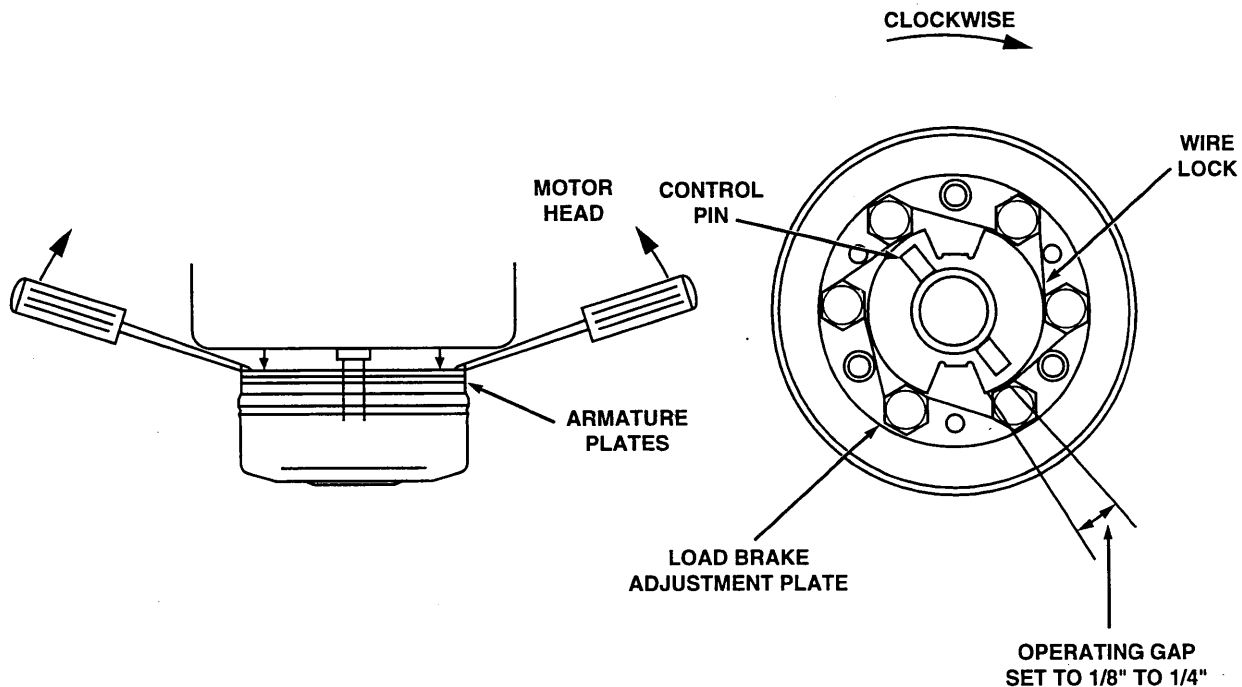
To adjust for disc wear, or to reset after disc replacement, remove the load brake adjustment plate from the load brake gear. Turn the load brake gear clockwise against the load brake linings to firmly seat the gear and linings in the "locked" position.

Reassemble the load brake adjustment plate using the combination of holes in it and in the load brake gear to maintain an operating gap of 1/8" to 1/4".

LOAD BRAKE CHECK

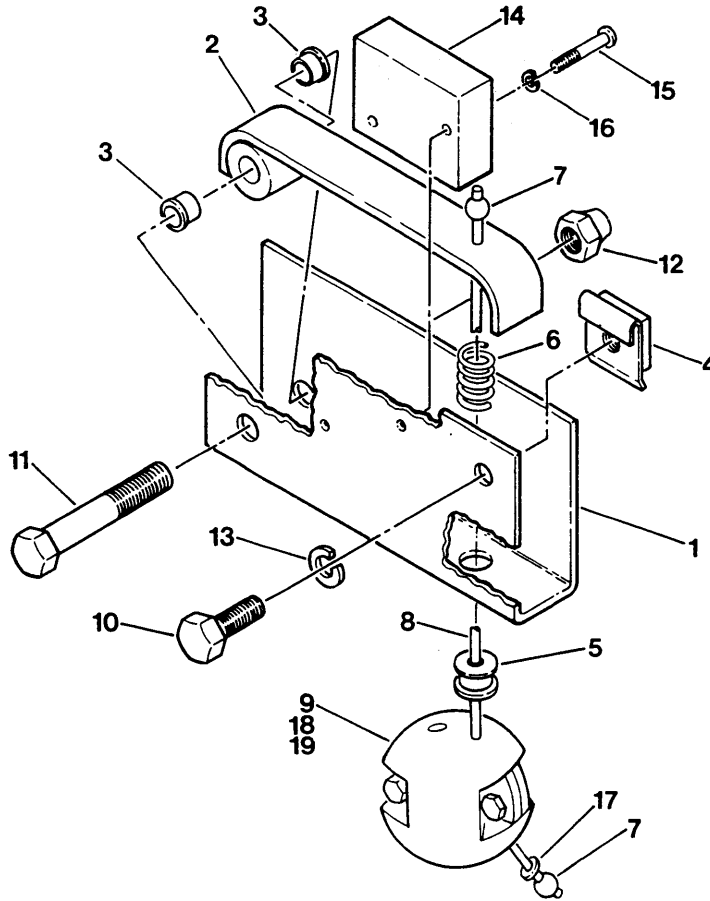
After load brake adjustment, check to see if the load brake is holding properly. Attach a 25% capacity load to the load hook and raise it 6" off the floor. Disconnect the power source and remove the motor brake cover. Using two screwdrivers inserted 180°, apart as illustrated below, pry the armature plates away from the motor head to release the brake. If the load drifts to the floor, check for malfunctioning of the spring clutch assembly or excessively worn friction discs. Repair or replace as necessary. Replace brake cover and reconnect the power source.

NOTE: Severe impact or shock loads on the hook due to improper handling of loads may result in a locked load brake. The load can be raised but the motor torque is not sufficient to unlock the load brake to permit lowering and the motor will stall. If the load brake does not release after several "inchings" 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 the unlocking and subsequent inspection of the load brake for the cause of the problem be performed by a serviceman experienced in this area.



**SPARE PARTS IDENTIFICATION
FR-A-11**

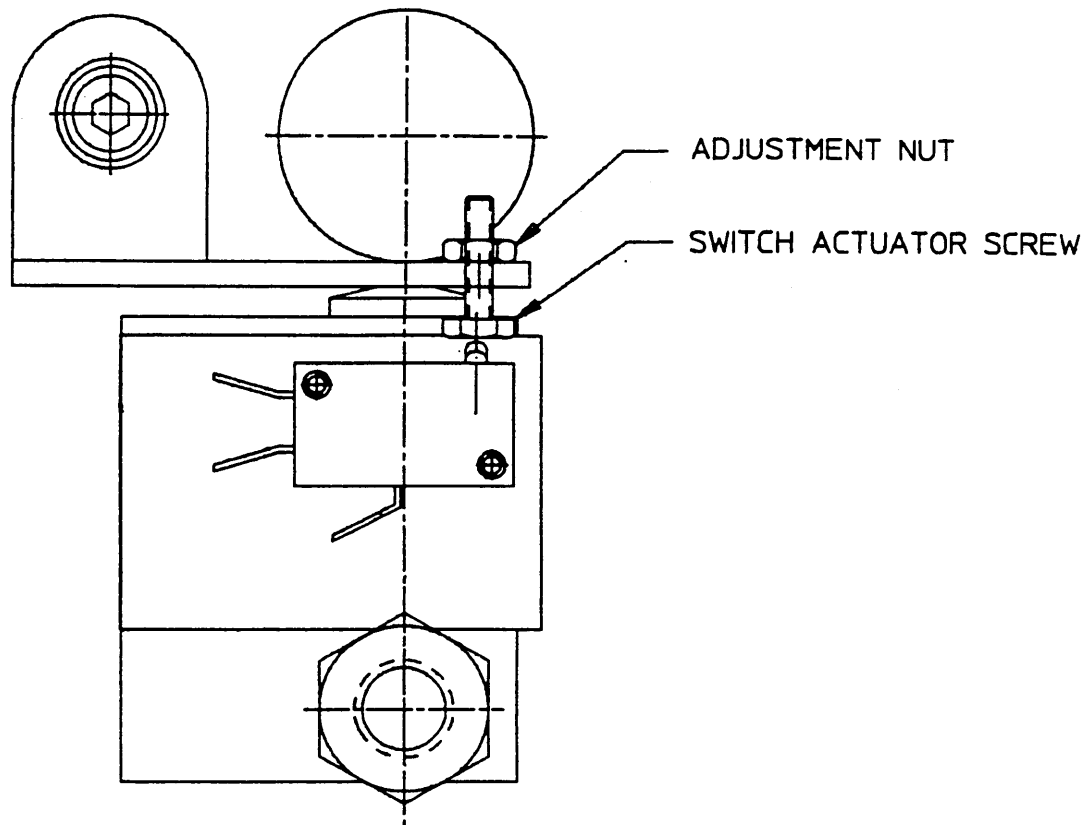
WEIGHT TYPE UPPER LIMIT SWITCH ASSEMBLY



15031A

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	*	BALL SPROCKET, WEIGHT CABLE	*				
8	*	CABLE, LIMIT WEIGHT	*				
9	A10209	WEIGHT, LIMIT SWITCH	1				
10	*	HEX HEAD CAP SCREW	*				
11	*	HEX HEAD BOLT	*				
12	*	ELASTIC STOP NUT	*				
13	A10214	LOCK WASHER	1				
14	*	SWITCH, ELECTRICAL	*				
15	*	ROUND HEAD MACHINE SCREW	*				
16	*	LOCKWASHER	*				
17	*	FLATWASHER	*				
18	A10218	HEX HEAD CAP SCREW	2				
19	A10058	STOP NUT	2				
20	A10200	COMPLETE LIMIT SWITCH ASSY. — LESS WEIGHT	1				

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



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.
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 weighing device.

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.*



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

ADJUST UPPER LIMIT (2) 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 (3) 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 colored 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.

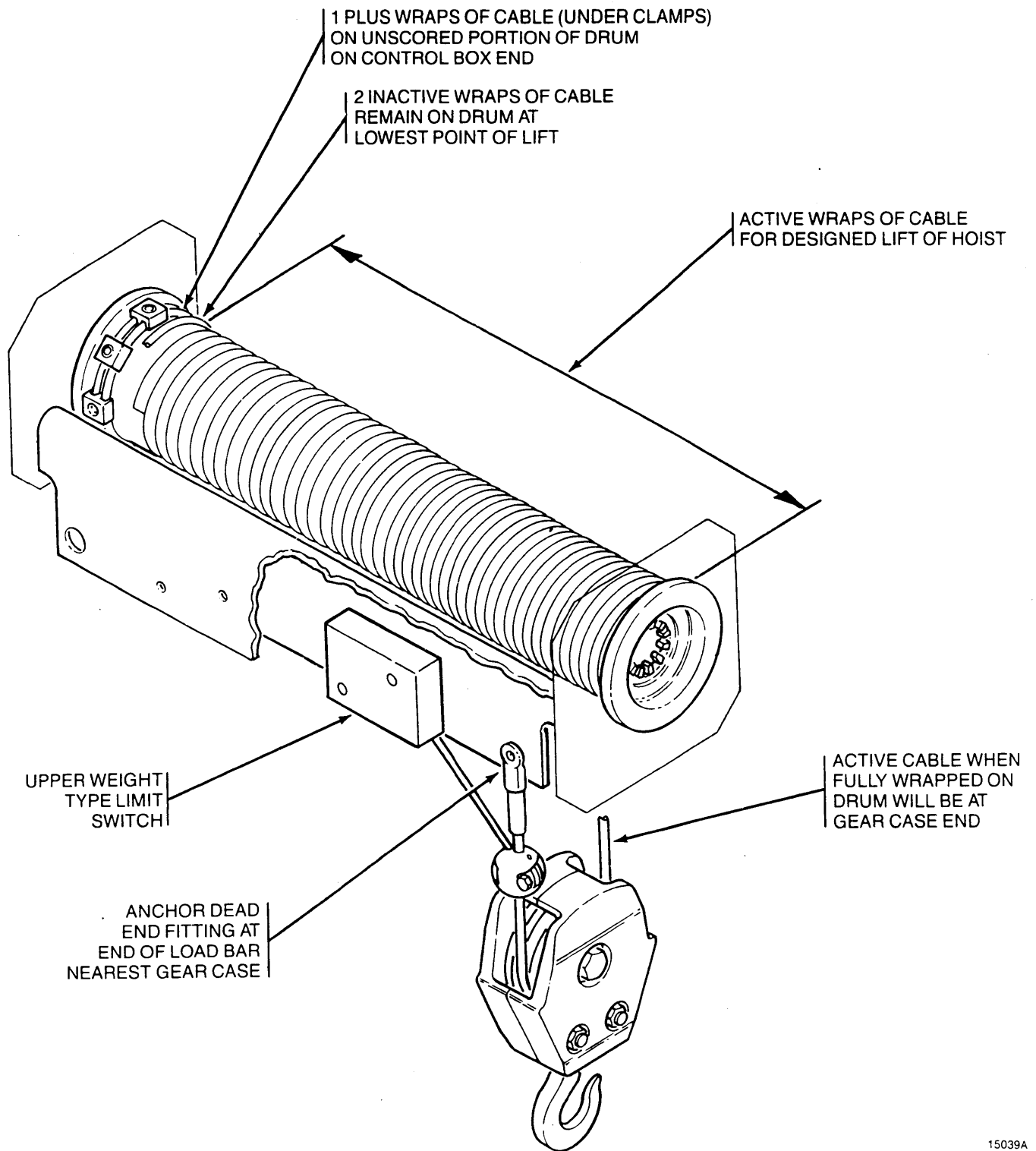
WARNING

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.

REFER TO FR-A-17 FOR REEVING INSTRUCTIONS



15039A

REFER TO FR-A-16 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 swaged dead end fitting from the load bar to completely free rope from hoist. *Discard* rope.
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 sheaves 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:

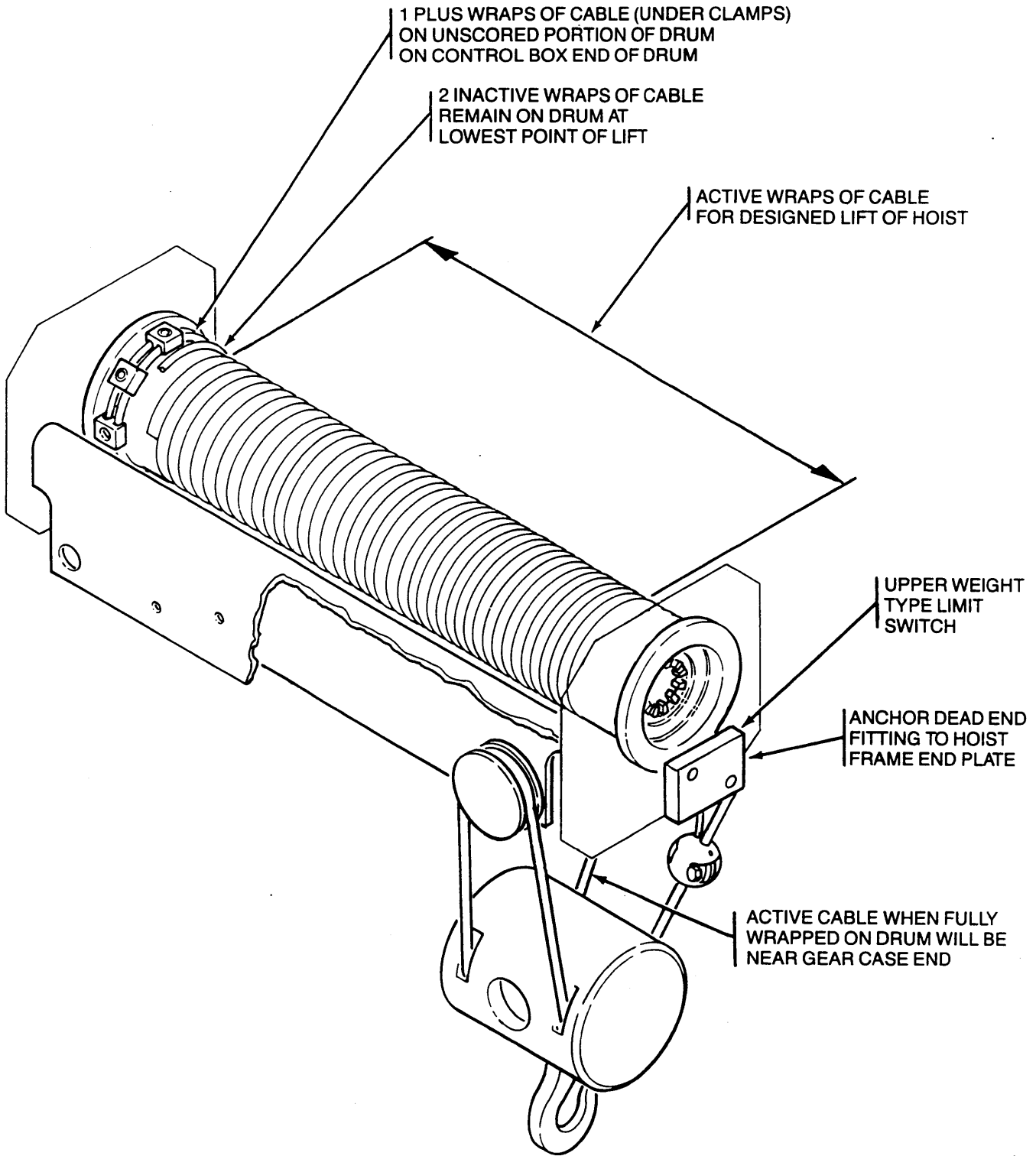
1. Unreel the replacement wire rope in a clean area free of dirt and inspect for any shipping damage, kinks, etc. Refer to Operation Maintenance Section 4 - Wire Rope. If replacement ropes are held in storage for extended periods of time, check for dried out lubricant or possible corrosion. If necessary, re-lubricate with grease recommended in Lubrication Schedule, Section 5.
2. Attach swaged dead end fitting of new rope to load bar.
3. Reassemble the upper limit switch weight around the hoist rope and manually move up and down to ensure free movement on the rope.
4. 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).
5. 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 motor side, leaving approximately 20" 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.*
6. Reconnect power source.

7. 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.
8. Reconnect hoist to power source.
9. 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 7 above.
10. Retighten rope clamps on drum to torque listed in 5 above.

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.

REFER TO FR-A-19 FOR REEVING INSTRUCTIONS



15041A

REFER TO FR-A-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 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 swaged dead end fitting from the hoist frame to completely free rope from hoist. *Discard* rope.
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:

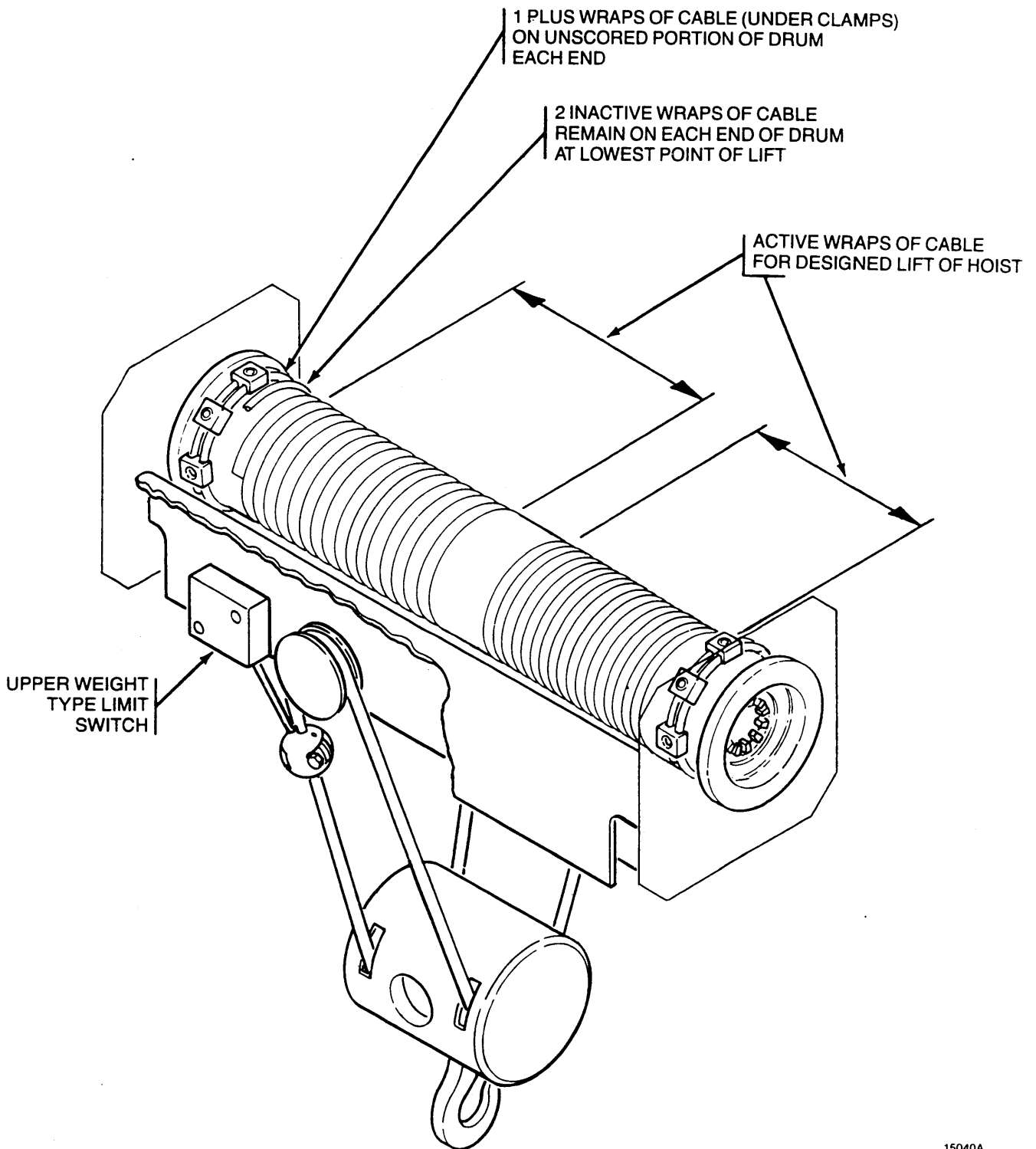
1. Unreel the replacement wire rope in a clean area free from dirt and inspect for any shipping damage, kinks, etc. Refer to Operation-Maintenance Section 4 - Wire Rope. If replacement ropes are held in storage extended periods of time, check for dried lubricant or possible corrosion. If necessary, re-lubricate with grease recommended in Lubrication Schedule, Section 5.
2. Attach the swaged dead end fitting of the new rope to the hoist frame.
3. Thread the rope thru the left hand side of the bottom block and around the bottom of the sheaves starting at the side of the block facing up. (If necessary, use a piece of wire bent to the radius of the sheave to pull the rope around the sheave).
4. 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.
5. Lower free end of rope to the right hand side of bottom block and thread around sheave starting on the side of the block laying on the floor.

6. 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 motor side and leaving approximately 20" 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.*
7. Reassemble upper limit switch weight around hoist rope.
8. Reconnect hoist to power source.
9. Wind rope on the drum while applying tension to the rope to ensure proper spooling on the drum until load block is hanging free of 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.
10. Reconnect hoist to power source.
11. 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 9 above.
12. Retighten rope clamps on drum to torque listed in 6 above.

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 inches below the weight of the overtravel upper limit switch. See screw limit switch adjustment instructions in Section 6.

REFER TO FR-A-21 FOR REEVING INSTRUCTIONS



15040A

REFER TO FR-A-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 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.

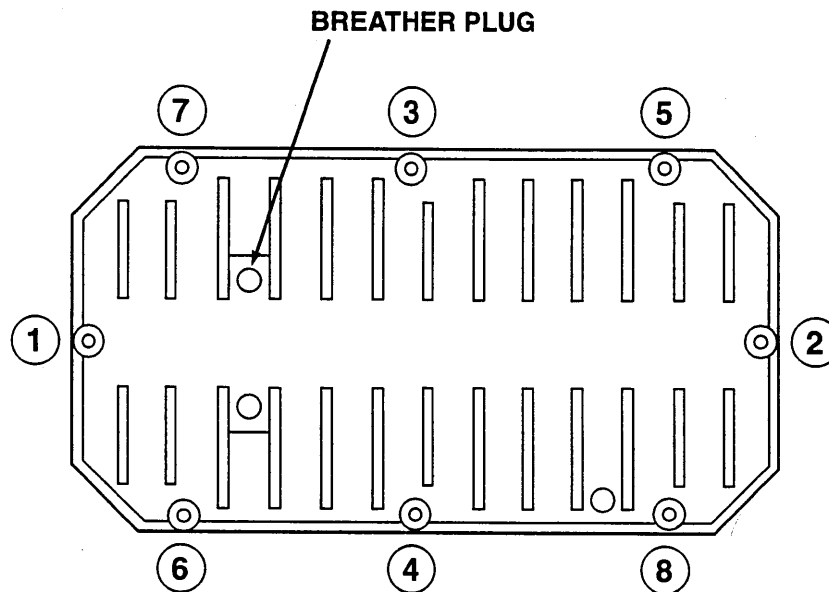
To install new cable:

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 down. (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 motor side and leaving approximately 20" 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.

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.



GEARCASE COVER BOLT TORQUE PATTERN

STEP 1:

Check mating surfaces for nick or dings.

STEP 2:

Bolt gearcase cover to the gearcase with 5/16-18 socket head capscrews & 5/16 lock washers. DO NOT use plated bolts.

STEP 3:

Torque the capscrews in order 1 thru 8. Torque bolts to 10 ft. lbs.

STEP 4:

Torque the capscrews in order 1 thru 8. Torque bolts to 19 ft. lbs.

STEP 5:

Add 2 solid plugs & 1 breather plug. Use teflon pipe dope on threads.

STEP 6:

Fill with oil.

STEP 7:

Retorque the capscrews in order 1 thru 8. When the gearcase is to operating temperature, torque bolts to 19 ft. lbs.