



BI010935
October 2012

Service Manual

7295 Electric Rope Shovel

141403

SM141403-EN

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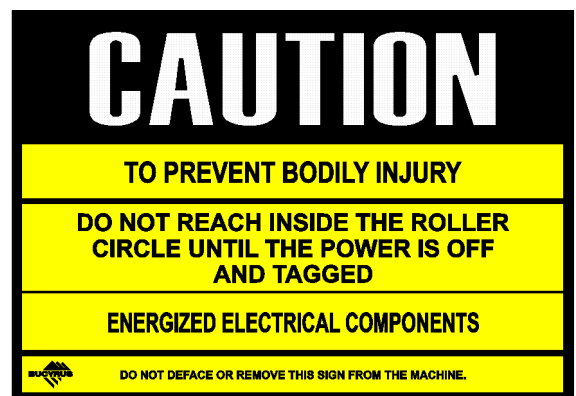
Maintenance Precautions:

- Do not wear rings, wristwatches or loose fitting clothing when working on machinery. They could get caught on moving parts causing serious injury.
- Always wear a safety belt or harness when the danger of falling exists.
- Always have a second person to monitor the lifeline when working in confined spaces.
- Do not start an engine indoors unless adequate exhaust ventilators are provided and in operation.
- Never utilize the machine air or hydraulic systems for support when working on the machine. Deactivate or isolate the entire system prior to performing maintenance.
- Equipment should be parked on level ground at all times during machine servicing and periods of idleness.
- Cranes and hoists must be of sufficient capacity to lift the heavier components (gearcases, etc.) Always work within the limitations of the equipment being utilized.
- Be sure heavy items are properly rigged and supported from cranes or hoists before removing supporting members from the machine.
- Utilize guide lines or ropes to minimize the swing of suspended heavy components.
- Have sufficient service personnel available when removing or installing large heavy items to maintain control at all times.
- Always use safety stands in conjunction with hydraulic jacks or hoists. Do not rely on the jack or hoist to carry the load, they could fail.
- When disassembling a machine, be sure to use safety stands and adequate cribbing to prevent tipping or rollover of components.
- When using an oxy/acetylene torch, always wear welding goggles and gloves. Keep a charged fire extinguisher within reach. Be sure the acetylene and oxygen tanks are separated by a metal shield and are chained to the cart.
- Use pullers to remove bearings, bushings, gears, cylinder sleeves, etc. when applicable. Use hammers, punches and chisels only when absolutely necessary. Always be sure to wear safety glasses.
- Use extreme caution when using compressed air to dry parts. Use approved air blowguns, do not exceed 30 PSI (207 kPa), wear safety glasses or goggles and use proper shielding to protect everyone in the work area.
- Be sure to promptly reinstall safety devices, guards or shields after adjusting and/or servicing the machine.
- Protective eye goggles should be worn at all times when working on the air conditioning system. Work on the air conditioning system only in a well ventilated area.
- Wipe away excess lubricants around bearings and gears. Never lubricate parts in motion.

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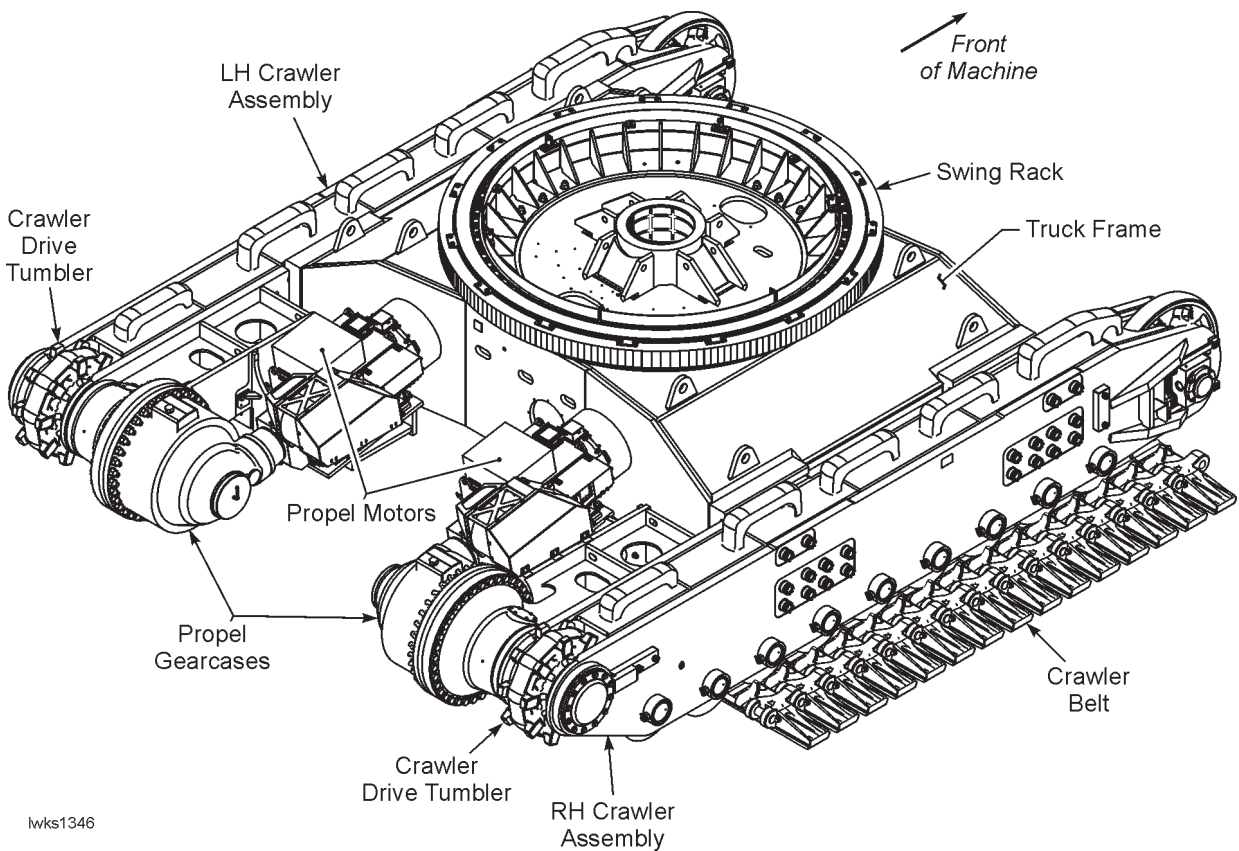
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Stored Energy Decals

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Lower Works

The lower works is comprised of the truck frame, right and left crawler frames, crawler belts, propel machinery, swing rack and roller circle.

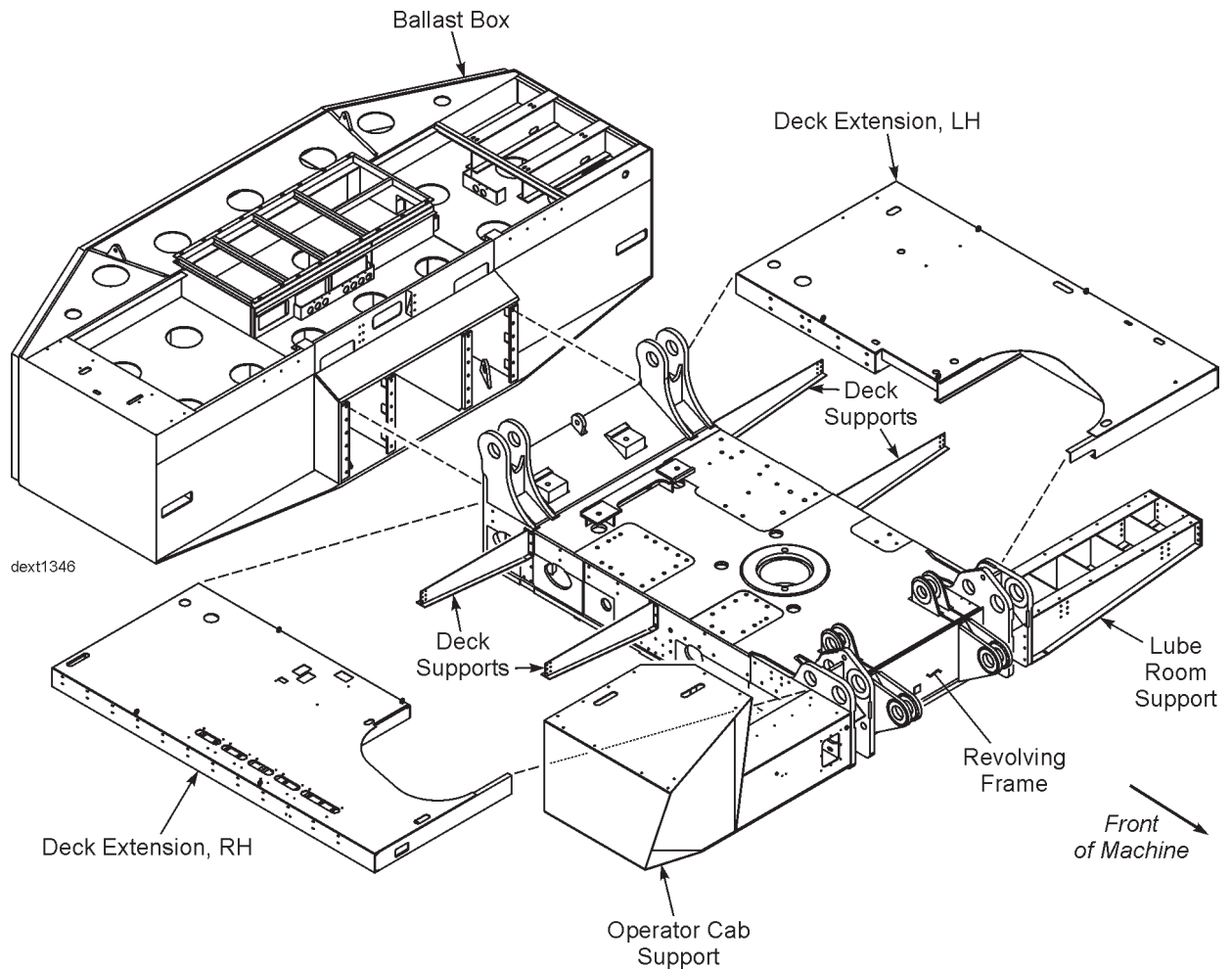


Truck Frame and Crawlers

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Deck Extensions

Right and left side deck extensions are bolted to each side of the revolving frame. They provide a mounting area for the electrical transformers and accessory machinery as well as supporting the machinery house walls.

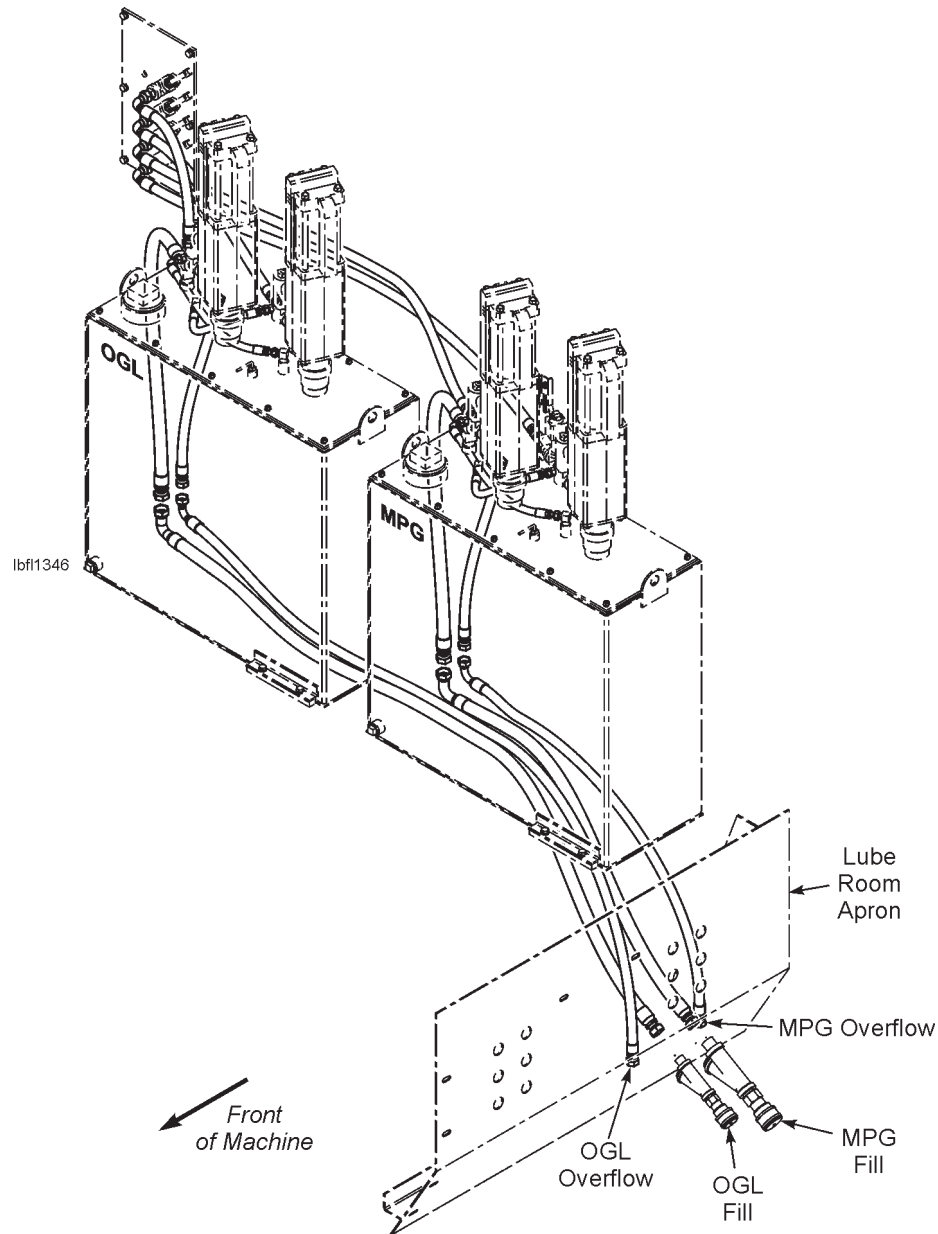


Deck Extensions and Ballast Box

Ballast Box

The ballast box is an all-welded steel fabrication located at the rear of the main revolving frame. A series of vertical plates in the box form compartments for holding ballast.

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Lube Reservoir fill / Overflow Plumbing

Lube Reservoir Fill / Overflow Plumbing

The lube reservoir fill/overflow plumbing is located in the support structure directly below the lube room at the front, left side of the machine. Lubricants can be added at this location. The overflow connections are also located here. **DO NOT** plug the overflow connections.

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	<i>Quantity</i>	<i>Weight Each</i> <i>(U.S. Pounds)</i>
Propel Components		
Motor, Propel/Guards Assembly	1	17,130
Propel Motor	2	4,000
Propel Blower	2	230
Brake, Propel	2	490
Adapter, Propel Brake	2	230
Coupling, Propel	2	140
Guard, Propel Coupling	2	80
Support, Propel Motor	2	2,960
Duct Assembly, Propel Blower	2	220
Inlet Guard	2	130
Crawler Components		
Crawler Assembly	1	217,630
Crawler Assembly, RH	1	93,990
Crawler Assembly, LH	1	93,990
Crawler, Frame Weldment, RH	1	57,910
Crawler, Frame Weldment, LH	1	57,910
Flange, Mounting	2	2,680
Retainer	2	190
Roller, Load, Rear	2	2,230
Roller, Load, Assembly	16	1,440
Roller, Front Idler	2	3,480
Sprocket, Crawler	2	4,980
Shaft, Roller, Front	16	410
Shaft, Roller, Rear	2	530
Adjusting Block Assembly	4	460
Shaft, Idler	2	1,060
Shaft, Main Propel	2	3,180
Bearing, Roller, Crawler Sprocket	2	340
Rod, w/Torquenut Assembly	40	80
Gearcase Assembly, Propel	2	12,600
Cabinet, Lube, Crawler	2	330
Belt, Crawler	2	68,950
Link, Crawler, 72 Inch	96	1,370

2 Lubrication

Always refer to the safety information in Section 1 of this manual before starting any maintenance procedure on this machine.

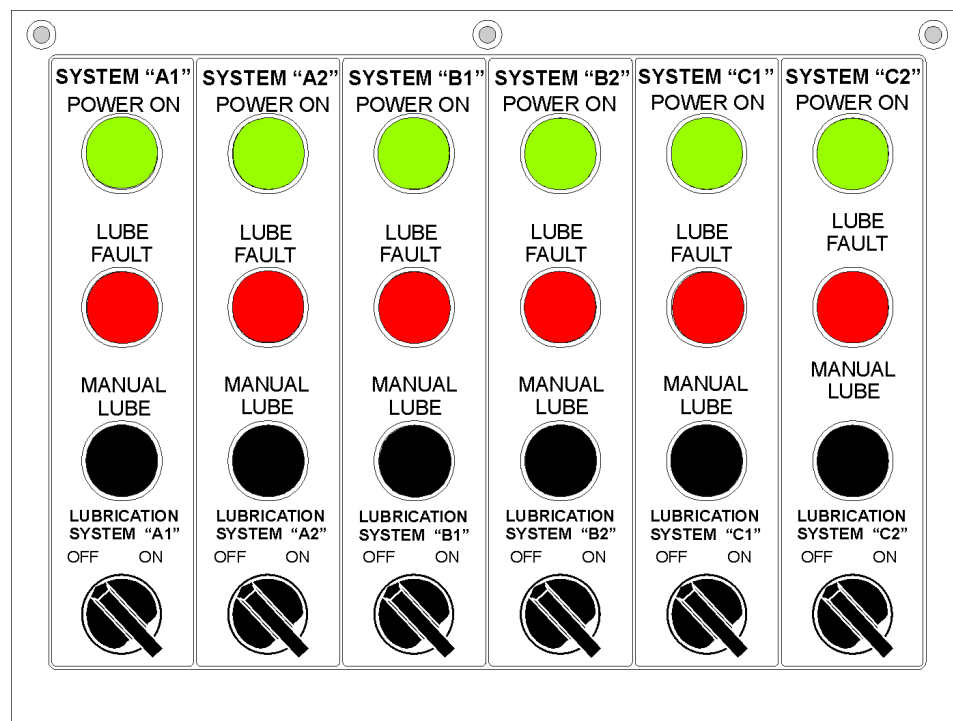
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Auto Lube Control Panel

The Automatic Lubrication Control Panel is mounted on the inboard most wall of the lubrication room. The panel provides the switches and override functions required to activate, reset and override the automatic functions.

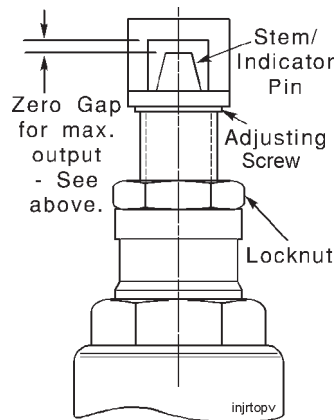
- POWER ON - Allows electrical power to energize the system.
- LUBE FAULT - A light that, when lit, indicates that a fault is present in that system. Reset the fault by turning the affected system off and then on.
- MANUAL LUBE - A pushbutton that will disperse (on command) 1 measured quantity of lubricant to the injectors on that system.
- ON /OFF - Energizes the system for normal operation.



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To reduce an injector's output:



Adjusting Injectors

1. Remove protective cap.
2. Loosen locknut.
3. Turn adjusting nut clockwise (CW) until desired discharge rate is obtained. This forces the stem into the body, retarding the stem's movement.
4. Set the locknut.
5. Install protective cap.

CAUTION

Do not turn adjusting nut down (clockwise) more than 5 full turns from the maximum discharge setting. Check output flow from injector at this time to ensure it is still operating. If not, back off adjusting nut until injector does consistently operate. Inspect the adjusted injector for operation over 3 or 4 cycles after returning machine to work to make sure it is functioning.

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Oil Pump

The heart of the power unit is the hydraulic pump. It is self-lubricating. Preventive maintenance is limited to keeping the system fluid clean. This is done by changing the filters frequently. The recommendations listed below are a minimum requirement.

All return line filters and pressure filters should be changed a minimum of two times per year or, upon the visual or electrical indicator signaling otherwise.

The suction strainer (immersed below the oil level in the reservoir) should be cleaned once a year or every 4000 operating hours. The suction strainer should be removed from the reservoir and can be cleaned with compressed air, blowing from the inside out. If there are holes in the mesh or if there is mechanical damage, the strainer should be replaced. It is especially important that the suction or inlet piping and fittings be tight and in good condition to prevent air from being drawn into the pump.

The reservoir air breather should be changed or cleaned once a year or every 4000 hours. The air breather filters all air drawn into the reservoir.

NOTICE

Failure to change or clean this filter can result in pump failure.

The electric motor requires very little attention when kept clean and dry.

Table -3 - Approved Synthetic (Poly-a-olefin) Oil Lubricants (ISO VG 320)

Manufacturer	Product Description
Bel-Ray	Synth. Gear Oil 6692
BP	Energyn EP-XF 320
	Energyn HTX 320
Castrol	Optigear Synth. A 320
	Optigear Synth. X 320
	Alphasyn EP 320
	Alphasyn T 320
	Tribol 1510/320
	Tribol 1710/320
Chevron	Tegra Synth. Gear Lube 320
Fuchs	Renolin Unisyn CLP 320
Mobil	Mobil SHC 632
	Mobilgear SHC XMP 320
Petro-Canada	Ultima Synth. EP 320
	Traxon E Synth. 80W-140
Shell	Omala HD 320
Texaco	Pinnacle EP 320
Whitmore Mfg. Co.	Decathlon F 320

Shaded lubricants are approved for use in the Planetary Hoist, Swing and Propel Gearcases as well as the Non-Planetary type Crowd Gearcase.

Non-shaded lubricants are approved for use only in the Planetary Propel and Non-Planetary type Crowd Gearcase.

Specification Revisions

This specification is subject to change without notice.



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Frequency Of Inspection And Maintenance

The suggested maintenance schedule is developed on a planned usage of 5,000 operating hours per year. This is a planned reference only. The actual conditions within the mine site, operator's abilities and habits, along with the quality of components and consumables will ultimately drive the inspection schedule used on the machine.

Care should be taken to properly evaluate the maintenance approach during the initial period after machine commissioning.

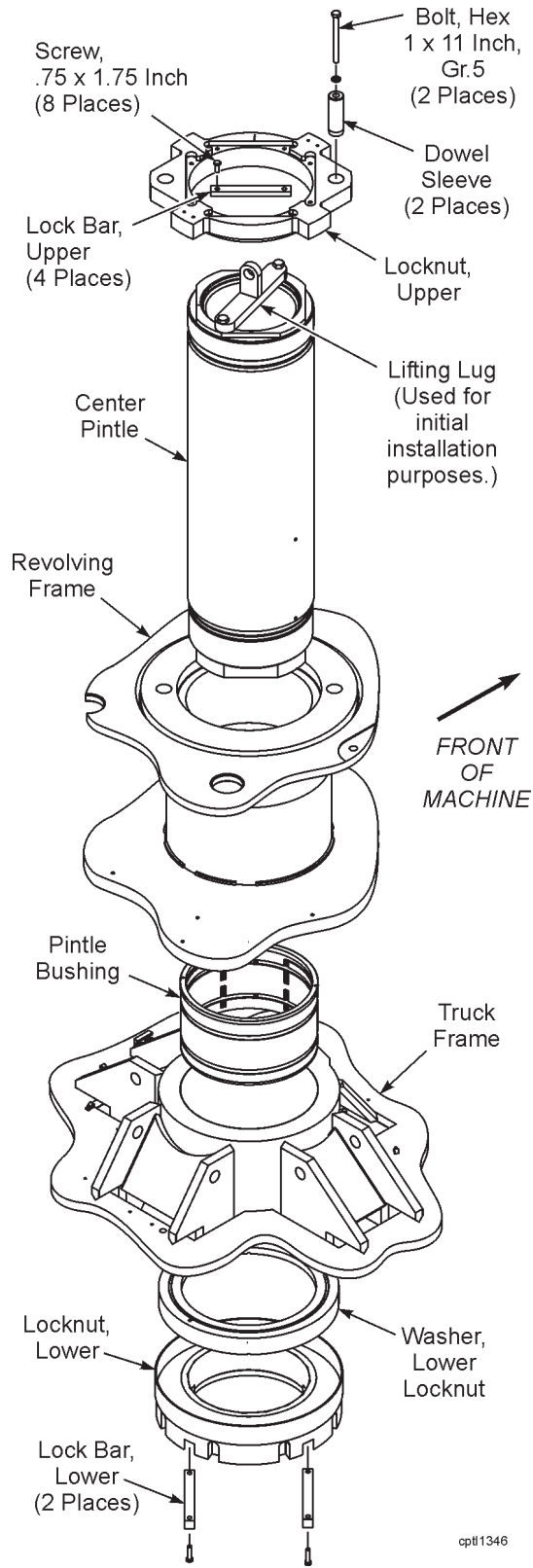
Maintenance Schedules

The following maintenance schedule is based on a typical machine. Certain features or configurations may be different on a specific machine. This maintenance schedule is intended to outline the intervals for the various repetitive maintenance requirements. For any assistance, refer to the appropriate section in this Maintenance Manual.

For locations of the specified components, refer to the graphics at the end of this section.

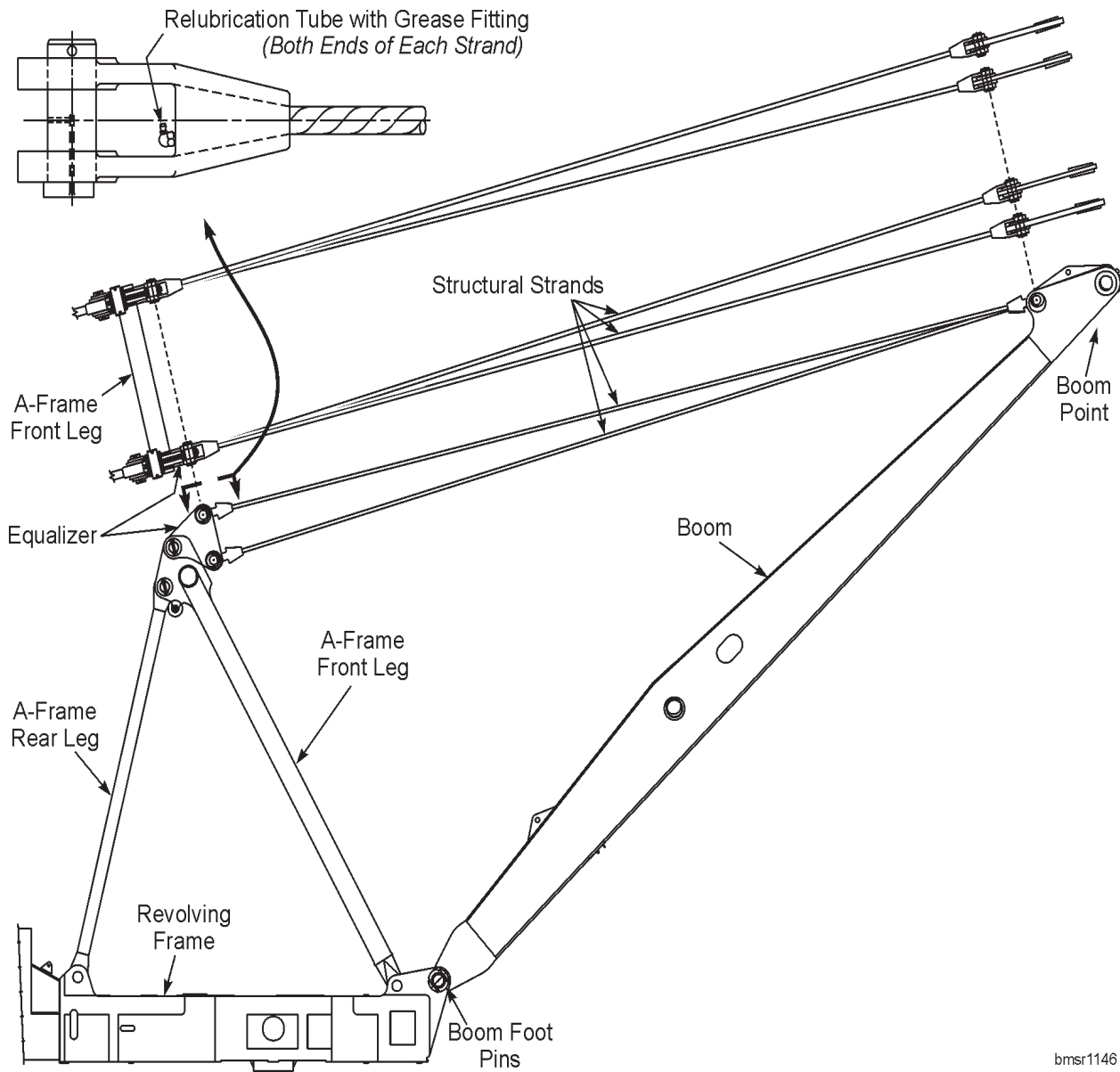
Maintenance Inspection Check Points

The recommended check point schedules in this section are scheduled inspection guides. Perform inspection based on hours of use or time lapse intervals, which ever comes first. To verify inspection, copy the schedule pages of this manual, check all items inspected. If needed, add comments to the *Noted Discrepancy* column.



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Center Pintle Assembly



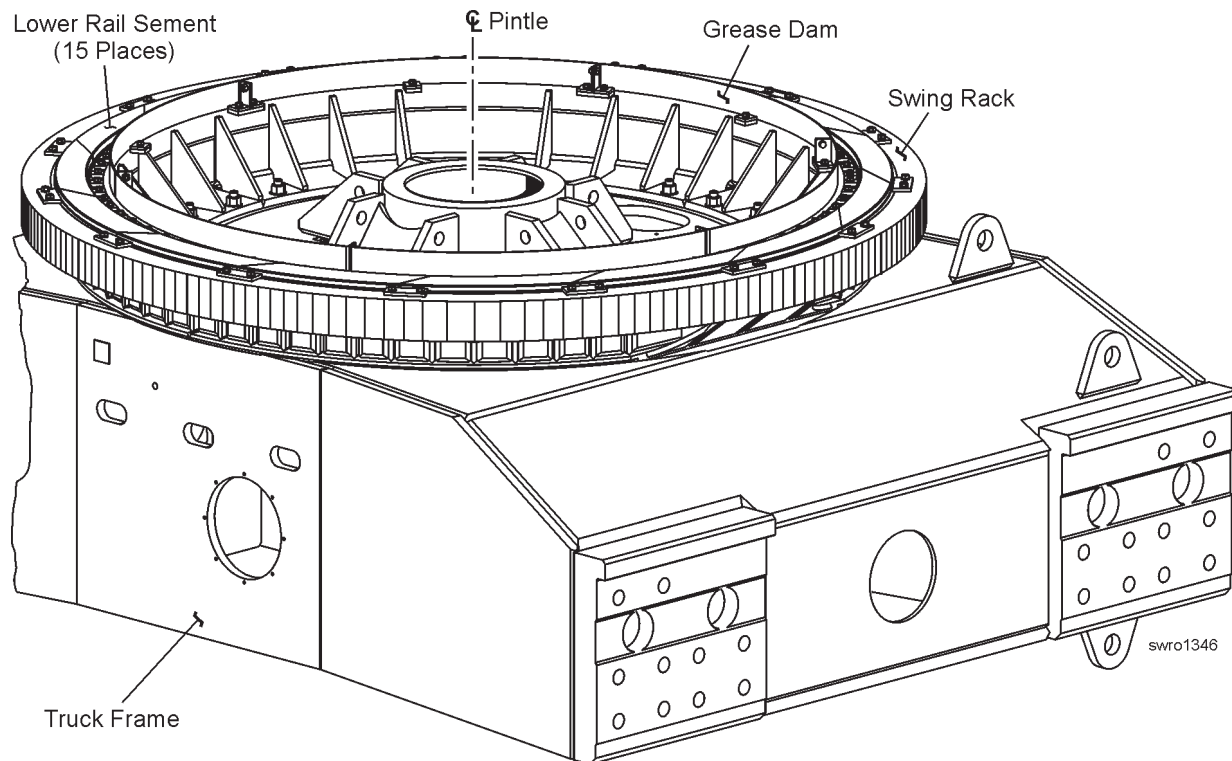
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Boom Support Ropes

Each propel motor is equipped with a spring set, air released disc brake. These brakes require no adjustment. Inspect friction disc wear by removing the assembly cover and observe remaining amount of friction material on the disc. When wear reaches the change notch, replacement is required. Since these are holding brakes, wear rate will be slow. For brake maintenance, refer to the *BRAKES & COUPLINGS* section in this manual.

Swing Rack Assembly

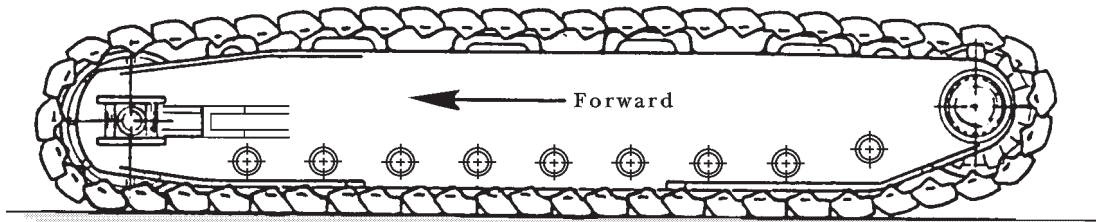
The swing rack assembly includes a 1-piece cast gear and 15 lower roller circle rail segments. A series of rail clamps and clamp bars secure the lower rail segments to the swing rack. Capscrews fasten the swing rack to the truck frame structure.



Should the swing rack need to be replaced, it can be installed without complete separation of upper and lower frame structures. Maintenance inspection of the swing rack consists of a periodic check of torque on capscrews (semi-annual or 2500 hours, whichever comes first).

⚠ DANGER

HIGH VOLTAGE! DO NOT ENTER THE TRUCK FRAME OR THE AREA BETWEEN THE REVOLVING FRAME AND THE TRUCK FRAME, UNLESS THE POWER SUPPLY TO THE MACHINE HAS BEEN DISCONNECTED. Isolate the machine from the mine substation and confirm that the collector rings have been grounded by a qualified electrician. Failure to comply with these instructions could result in serious injury or death.



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Correct Belt Tension

- NOTES:**
- **BEFORE** the drive lugs on the shoes touch the top of the crawler frame, replace or rebuild the slide bars to their original height.
 - To check for the correct belt tension - while propelling the machine ensure that the crawler shoes effectively engage the drive tumbler. This is achieved when there is a minimum of radial shoe movement as it enters the load area of the drive tumbler.

Crawler Shoe Replacement

⚠ DANGER

STORED ENERGY! SECURE THE CRAWLER BELT BEFORE SEPARATING IT SO UNEXPECTED MOVEMENT UNDER ITS OWN WEIGHT IS PREVENTED. Failure to secure the belt could result in bodily injury or death.

1. Park the machine safely on a level work area with the shoe to be replaced at the front idler at the belt separation point.
2. Add blocking between the top of the crawler frame and the shoes to remove any slack in the belt.
3. Using hydraulic jacks, remove any belt tension by removing the shims behind the adjusting blocks on each side of the front idler shaft.

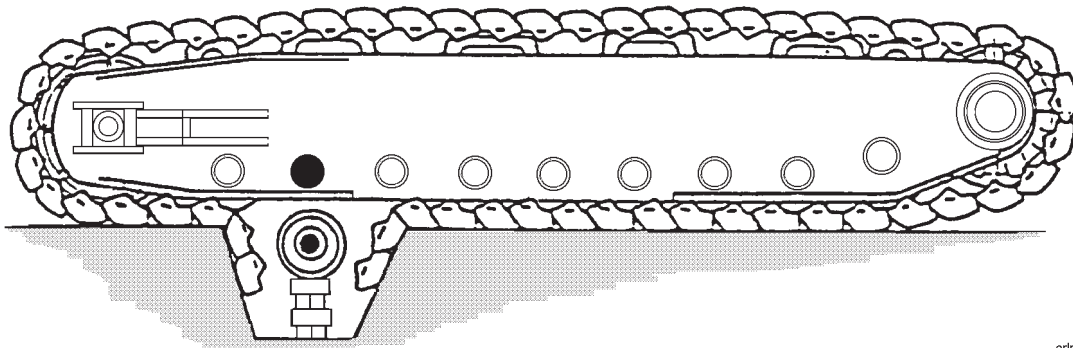
NOTE: Propel the machine slightly back and forth to unseat the adjusting blocks rearward in the frame slots if they do not move on their own.

3. Block or support the shoe below the one to be removed. To separate the belt, remove the pin locking hardware and the pin from 2 places on the bottom of the shoe to be removed.
4. Sling and support the shoe to be removed and then remove the pin locking hardware and the pin from 2 places on the top of the shoe to be removed. Remove the shoe from the belt.
5. Position the new shoe into the belt. To fasten one end of the new shoe to the belt, insert the pins and locking hardware in 2 places to secure one end of the shoe. Remove the sling.

Roller Removal Or Replacement

Since the rollers are captured between the sides of the crawler frame, removal or replacement requires the separation of the crawler belt and the lowering of the roller below the crawler side frame. This is best accomplished by digging a pit to the dimensions shown in the following chart:

Pit Size	Height	Width
REAR IDLER	55 inches	79 inches
LOAD ROLLER	39 inches	63 inches



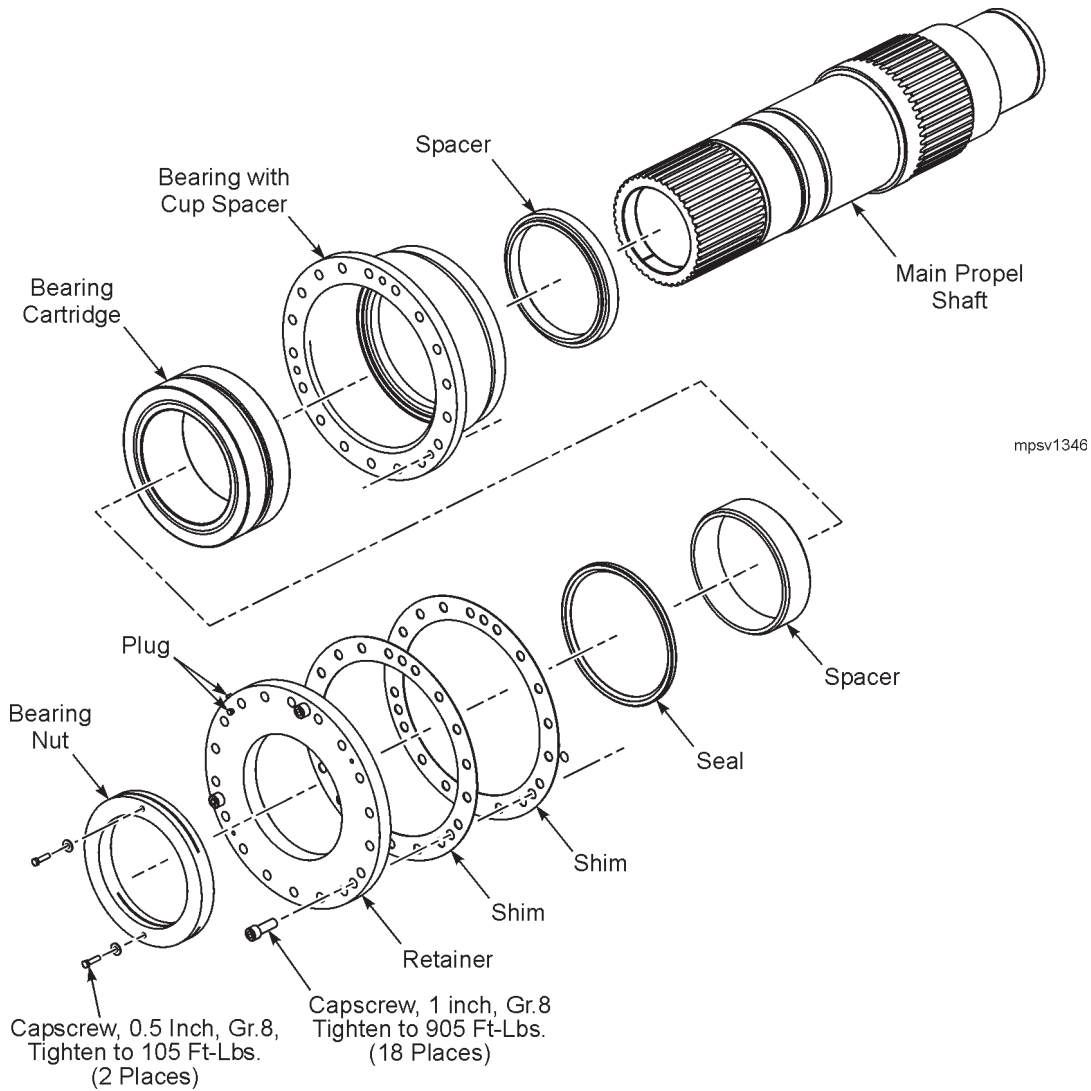
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Load Roller Removal

To remove a roller from the crawler side frame:

1. After a pit has been prepared, position a handling fixture under the roller for support when the shaft is removed.
2. Propel the machine forward to a position where the roller to be removed is directly over the hole. Separate the belt by removing the lock bolts. Lower each end of the belt into the pit exposing the roller for removal.
3. Disconnect the auto lube line from the end of the roller shaft. Plug the line to prevent dirt entry.
4. Remove the shaft retaining bolt.
5. Drive shaft out of the crawler frame, to the outside, being careful to support the roller on a handling fixture, jack or cribbing. Remove the thrust plates as they come free.

The same procedure can also be used to remove the rear idler roller.



Reassembly is the reverse of disassembly:

1. Install the inboard spacer, bearing cartridge, bearing and spacer.
2. The double tapered bearing may be heated for assembly to the shaft. Use a dry heat source and do not permit the temperature of bearing to exceed 300°F (149° C). Allow the bearing to cool to ambient temperature before assembling any other parts to it.
3. Install the bearing retainer with new lip seal.

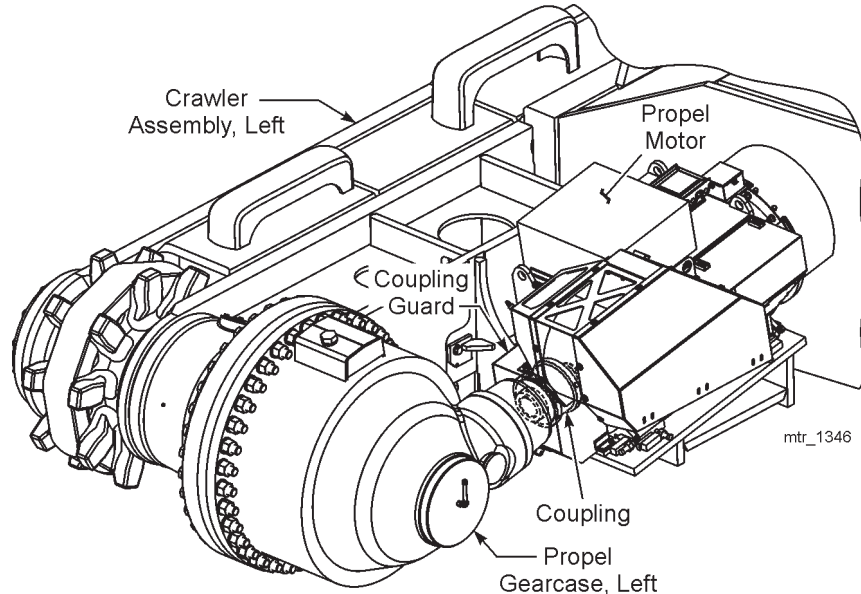
Propel Motor Removal

1. Park the machine on a level work area and rotate the upper frame to gain access to the propel motor.
2. Have a qualified electrician disconnect the power from the machine and wiring from the propel motor.

⚠ DANGER

HIGH VOLTAGE! ONLY QUALIFIED PERSONNEL ARE PERMITTED TO PERFORM HIGH VOLTAGE ELECTRICAL SERVICE AND MAINTENANCE. Failure to comply could result in bodily injury or death.

3. Remove any dirt guards and/or cable support from around the motor and brake assembly.



4. Remove the guard over the motor coupling. Open the coupling and remove the grid.

NOTE: Match marking on the coupling covers is for use in reassembly.

5. Disconnect and plug the air supply at the disc brake.

⚠ CAUTION

RELEASE THE AIR PRESSURE TO THE BRAKE BEFORE DISCONNECTING THE AIRLINE. Plug the line immediately after disconnecting. Failure to comply could result in personal injury.

6. Support the motor (approx. 4,000 lbs.) with a crane.

12. Remove the bolts, lockwashers and dowels that fasten the upper locknut to the revolving frame. Remove the upper lock bars and their hardware. Remove the upper locknut from the pintle sleeve.
13. Using the auxiliary winch, lift the sleeve out of the revolving frame. Replace a worn or damaged sleeve with a new one. Check the pintle sleeve bushing for wear or damage. Replace if required. Check the truck frame around the pintle structure for cracks. If the pintle structure area needs repair, contact the manufacturer for instructions.

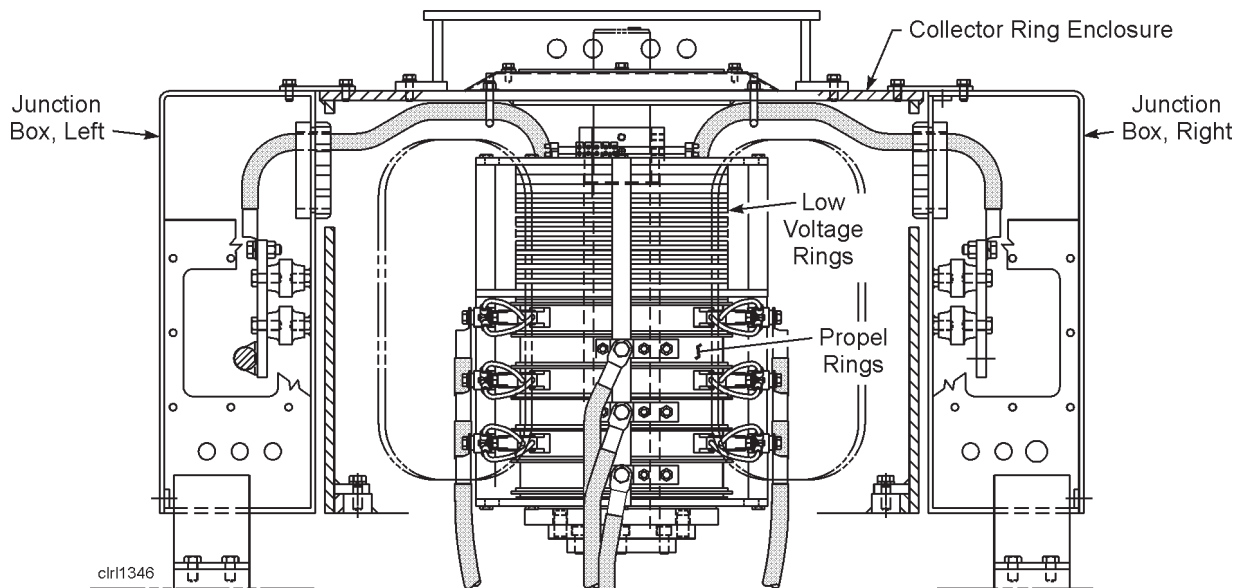
Center pintle sleeve installation is the reverse of disassembly.

⚠ DANGER

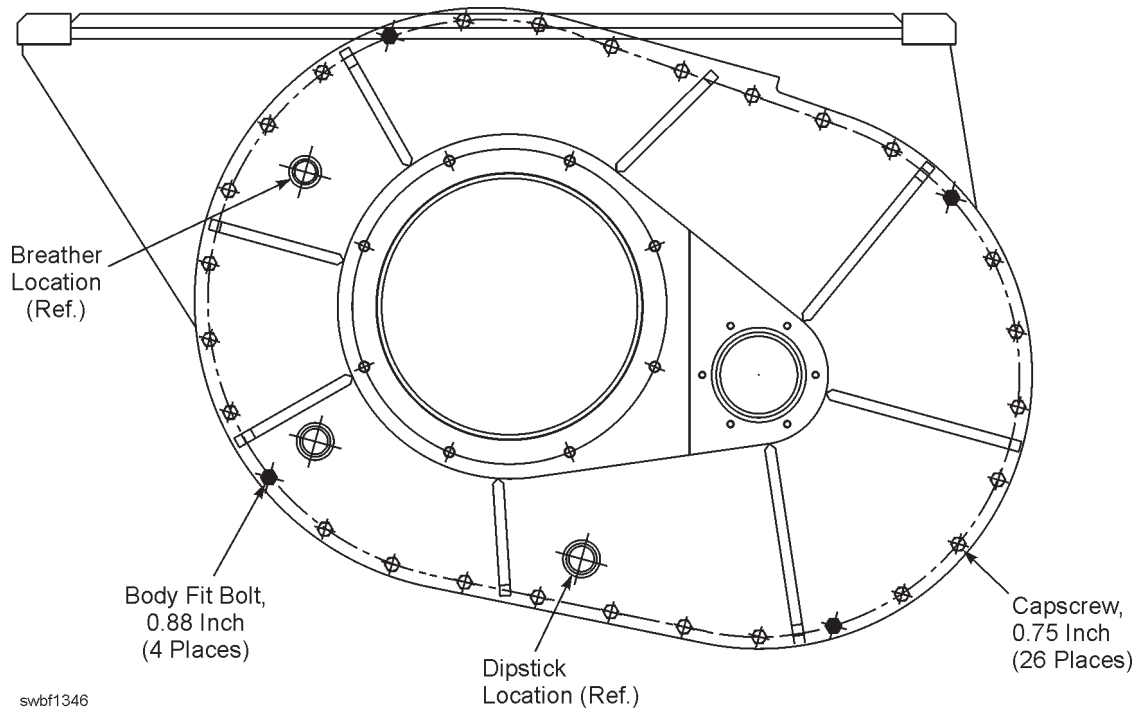
HIGH VOLTAGE! Be sure the electrical lines are correctly connected and all connections are tight. Also make sure that the air and lube lines are connected to the correct outlets in the swivel assembly and that the connections do not leak.

Collector Rings

There are three sets of collector rings on the machine - low voltage, propel and high voltage. The low voltage collector rings transfer power from the revolving frame back to the propel motors. The propel collector rings provide control to the propel motors and power for the propel blower motor.



*Collector Rings - Propel and Low Voltage
(Rear Section View)*



3. Remove the 6 - .62 inch socket head capscrews securing the upper bearing retainer of the intermediate shaft to the gearcase cover and separate the O-ring and lube fitting from the retainer.
4. Remove the 26 - .75 inch capscrews and 4 - .88 inch body fit bolts securing the gearcase cover to the gearcase and remove the cover.

NOTE: The bearing cage and seal will stay with the gearcase cover. Remove the intermediate shaft, upper bearing cage and oil seal from the gearcase cover.

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6. Assemble the oil seal, and bearing retainer O-ring to the lower bearing retainer.
 7. Assemble the lower bearing retainer assembly, bearing and lower bearing spacers, to the bearing housing. Set the bearing spacer on top of the bearing housing assembly. Run a cable through the base of the housing and spacers and attach a support bar to the cable. Run the cable up through the vertical shaft bore and attach it to a crane. With the crane, raise the bearing housing assembly up to the top of the swing rack and slide the upper spacer and bearing housing into position in the gearcase. Be sure the boss on the bearing housing engages in the groove in the gearcase. Be sure the bearing housing O-ring is in place. Install and tighten new bearing housing bolts using the TURN-OF-NUT METHOD in the *ENGINEERING DATA* section of this manual.
 8. Screw an eyebolt into the end of the vertical shaft and pinion. Run the cable from the crane down through the bore in the gearcase and attach the cable to the eyebolt. Using the crane, lift the vertical shaft and pinion into the gearcase.

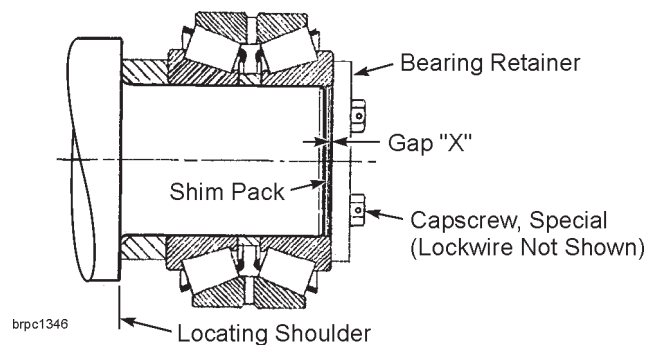
NOTE: Apply Molykote to the taper journal and spline before assembly of vertical shaft and pinion.

9. Securely block under the vertical shaft and pinion to prevent the shaft from falling. Remove the eyebolt and install the vertical shaft retainer and shaft retainer capscrews. Tighten to 20 Ft-Lbs.
10. Measure the distance from the top of the shaft to the top of the vertical shaft retainer and record the measurement.
11. To draw the vertical shaft and pinion into the tapered bore of the lower shaft bearing, tighten the upper retainer capscrews sequentially in a cross pattern. Nominal torque is approximately 650 ft.-lbs. The bearing is properly seated on the shaft and against the lower bearing lower spacer when a sharp increase in nominal torque is noticed and when the measurement in Step 10 is reduced by 0.162 inch.
12. Measure the gap between the vertical shaft and pinion and the vertical shaft retainer. Remove the retainer capscrews and the retainer and install a shim pack equal to the measured gap minus 0.002 to 0.005 inch. Re-install the retainer and capscrews and torque the capscrews to 100 Ft-Lbs.
13. Re-install the vertical shaft cover and O-ring.

Hoist Motor Pinion Bearing Installation

NOTE: The bearings are assembled with an interference fit. Preheat the bearings in an oil bath to ease assembly.

1. Ensure the ends of the drum shaft are free of any burrs prior to assembly.
2. Assemble the preheated bearing on the shaft snug against the locating shoulder.



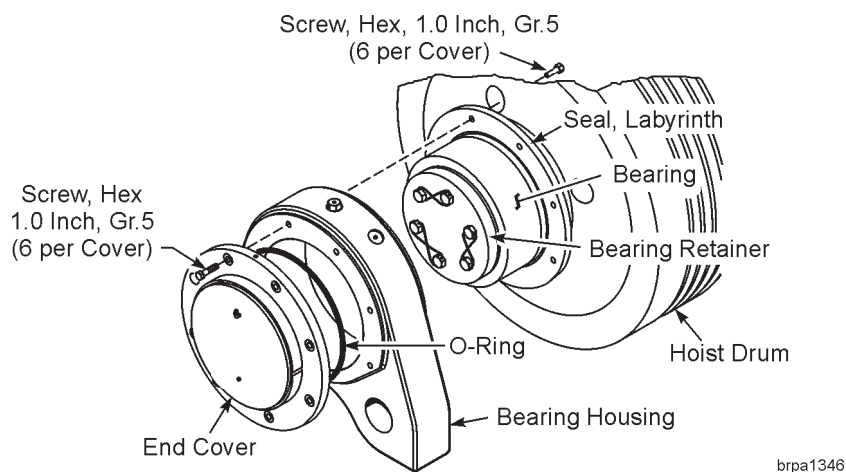
View C

3. Assemble the bearing retainer to the drum shaft using 4 - 0.75 inch capscrews. Preload the bearing and allow the entire assembly to cool.
4. Remove the bearing retainer. Measure the gap "X" as shown in View C.
5. Assemble shim pack with thickness equal to the gap measurement (.002 - .005 inch).
6. Assemble the bearing retainer and secure with 4 - 0.75 inch capscrews. Snug all capscrews to 53 Ft-Lbs using a STAR pattern.
7. Continue to tighten capscrews using a STAR pattern until all capscrews reach a torque value 1/3 the torque value - approximately 67 Ft-Lbs.
8. Continue to tighten capscrews using a STAR pattern until all capscrews reach a torque value 75% of proof load torque - 200 Ft-Lbs.
9. Install lockwire to capscrews. Refer to *Wire Locking Capscrews* in the *ENGINEERING DATA* section of this manual.

Hoist Drum Bearing Removal

To remove or replace the hoist drum shaft bearings, it is best to remove the drum assembly from the machine. Refer to *HOIST DRUM REMOVAL* in this section of the manual, then *proceed as follows*:

1. Ensure the drum assembly is resting *horizontally* on cribbing (not shown).
2. Remove the 6 - 1 inch hex screws that fasten each of the end covers to the bearing housings. See View A.



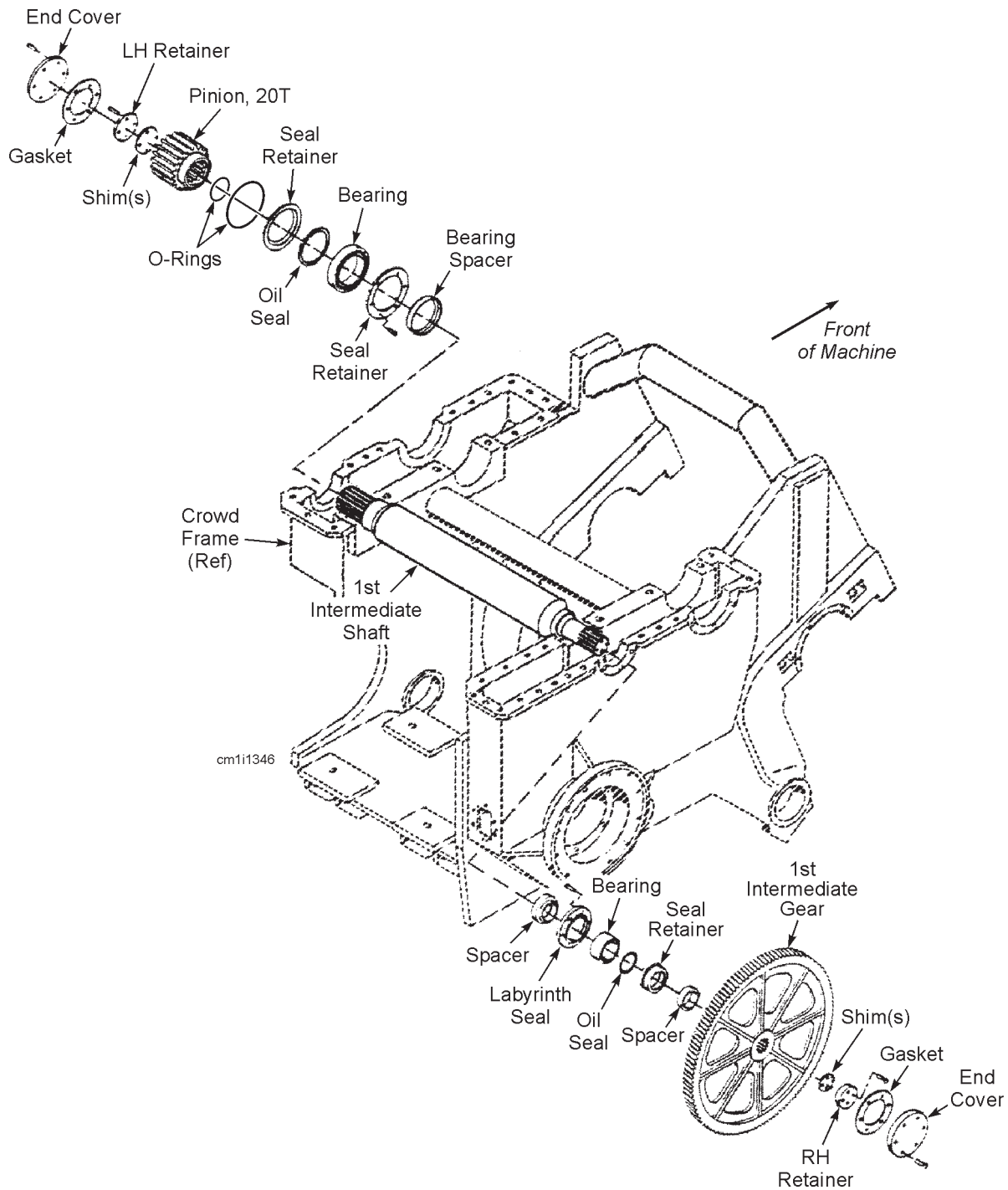
View A - Right Side Shown

3. Mark then remove each end cover. Each cover weighs approximately 250 lbs each.

NOTE: These parts are not interchangeable. Inspect the O-Ring on the inside of each end cover. Replace if required.

4. Remove the 6 - 1.00 inch hex screws that fasten each of the labyrinth seals to the bearing housings shown in View A.
5. Using a suitable lifting device to support the weight of the bearing housing (approximately 2,820 lbs each), pull the bearing housings from the bearings.

Crowd 1st Intermediate Reduction Gears



Crowd Motor Removal

For lubrication of the drive motor, refer to *GREASING MAIN AC DRIVE MOTORS* in the LUBRICATION section of this manual. If removal of the crowd motor is necessary, follow the instructions below.

1. Park the machine in a stable, level area. Position the dipper flat on the ground.
2. Remove appropriate roof panels above the crowd motor.
3. Remove the crowd and retract ropes. Refer to the procedure CROWD ROPE REEVING AND REPLACEMENT in this section of the manual.
4. Disconnect and identify the electrical leads to the crowd blower motor and the crowd motor.

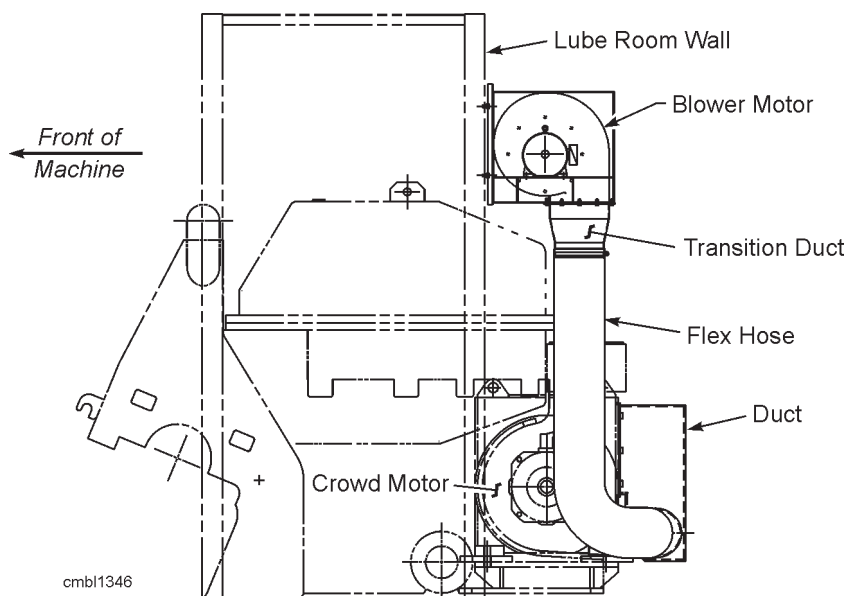
⚠ DANGER

BEFORE ATTEMPTING TO DISCONNECT ANY POWER LEADS, PRESS THE MAIN POWER OFF BUTTON AND TAG IT TO AVOID INADVERTENT ENERGIZING OF THE ELECTRICAL CIRCUIT. Electrocutation or serious injury may occur if appropriate safety measures are not followed. Electrical connections should only be handled by trained electrical personnel.

⚠ DANGER

STORED ENERGY! Gearing or drum must be blocked prior to removal of components in order to prevent unwanted movement. Failure to comply could result in death, severe personal injury, or damage to the machine.

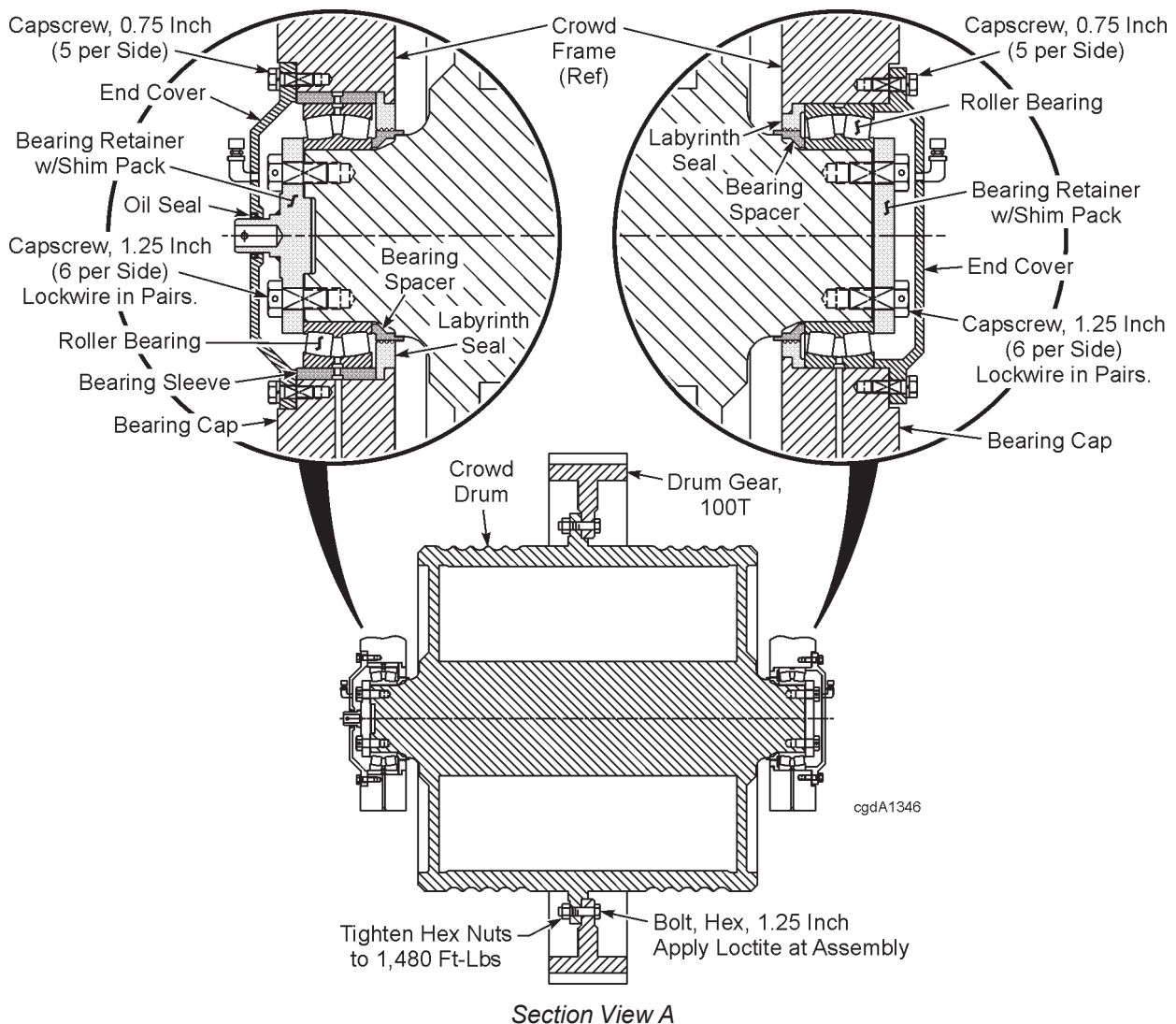
5. Block gearing and drum to prevent unwanted movement.



Service Procedures

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8. Cut the lock wire and remove the 6 - 1.25 inch capscrews from each end of the shaft. See Section View A. Remove the bearing retainers. Remove the shim pack, bearings, bearing spacer and labyrinth seals and wire together for future use.
9. If necessary, remove the hardware securing the drum gear to the drum and remove the gear. Consult the manufacturer for repair procedures for the drum and gear.
10. Inspect the bearings for pitting, scoring, scratches and other defects. Replace defective bearings.



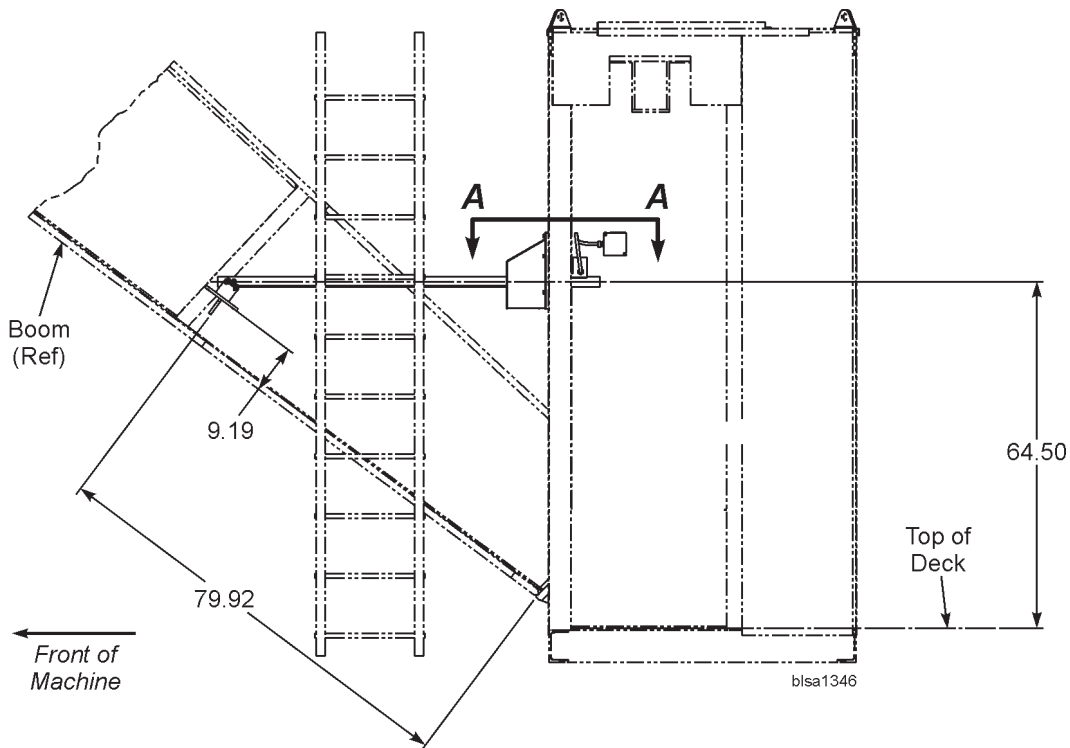
Boom Limit Switch Installation

To adjust the Boom Limit Switch:

1. Ensure that the machine is level, the dipper is resting on the ground, and that the hoist ropes are slack. The crowd must be allowed to unload all forces against the rack.

NOTE: Refer to Section - A on the following page.

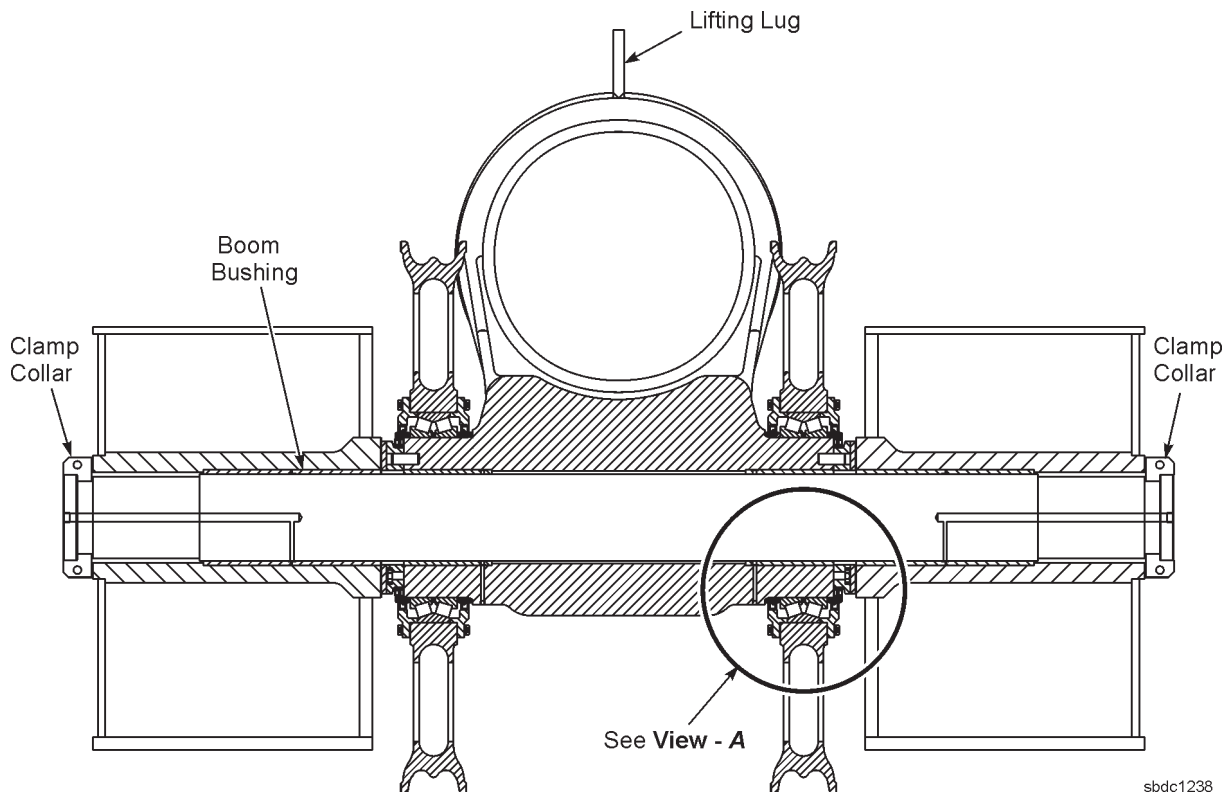
2. Loosen the .38 inch capscrews that fasten the proximity switch bracket to the mounting angle. The slotted holes in both pieces allow for both horizontal and vertical adjustment.
3. Adjust the position of the proximity switch to the dimensions shown in Section A on the following page.



Saddle Block Removal

For any work to be done on the saddle block other than replacement of liners, the saddle block must be removed from the machine. Remove the saddle block as follows:

1. Remove the crowd and retract ropes as described under Crowd & Retract Rope Removal.
2. Remove the dipper handle as described under Dipper Handle Removal.



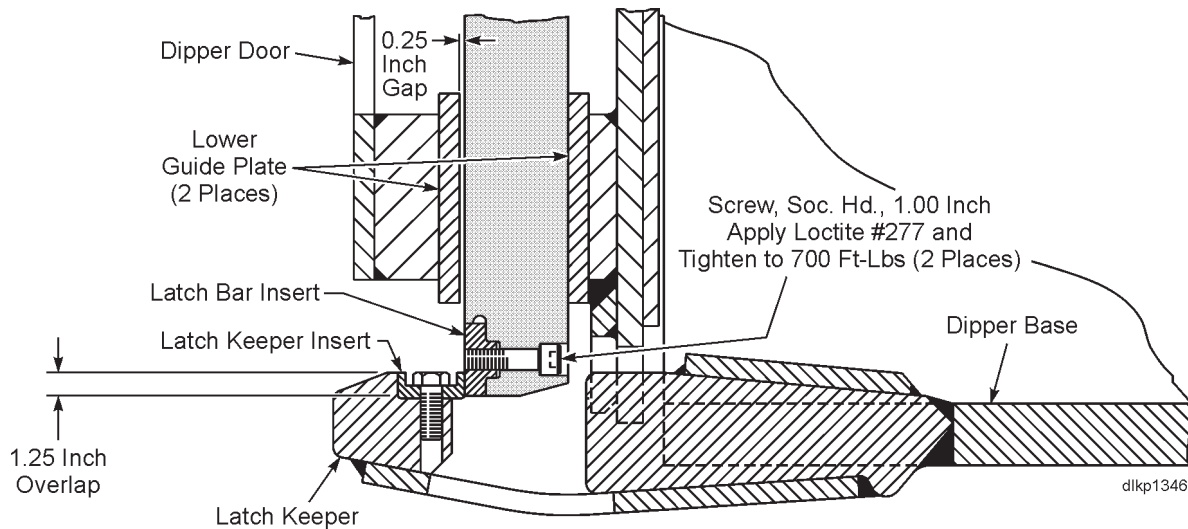
3. Two cranes are required to remove the saddle block. One crane is used to support and remove the saddle block. The other crane is used to remove the shipper shaft.
4. Separate and plug the lube lines to the saddle block.
5. With a crane supporting the saddle block, remove the shipper shaft clamp collars and slide the shipper shaft to either side to remove it from the saddle block and boom. Lower the saddle block to the ground.
6. Check the shipper shaft bushings in the boom and replace if required. Consult the manufacturer prior to starting repair.

Service Procedures

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Check the latch bar and the latch keeper inserts for wear and replace if required.

Check the latch lever and latch keeper insert for proper adjustment. Adjust the latch bar to overlap insert by 1.25 inches as shown in Section D.



Section D

Latch Bar Adjusting Procedure

1. Ensure door is stable so that it will not move during adjustment procedure.
2. Use jack lever to rotate screw jack to raise latch lever and pivot bracket.
3. Remove shim retaining bar and add or remove shims as desired.
4. Install shim retaining bar.
5. Lower screw jack with jack lever until it clears latch lever pivot bracket and bracket has solid contact with shims.
6. Store jack lever in retaining hole provided.

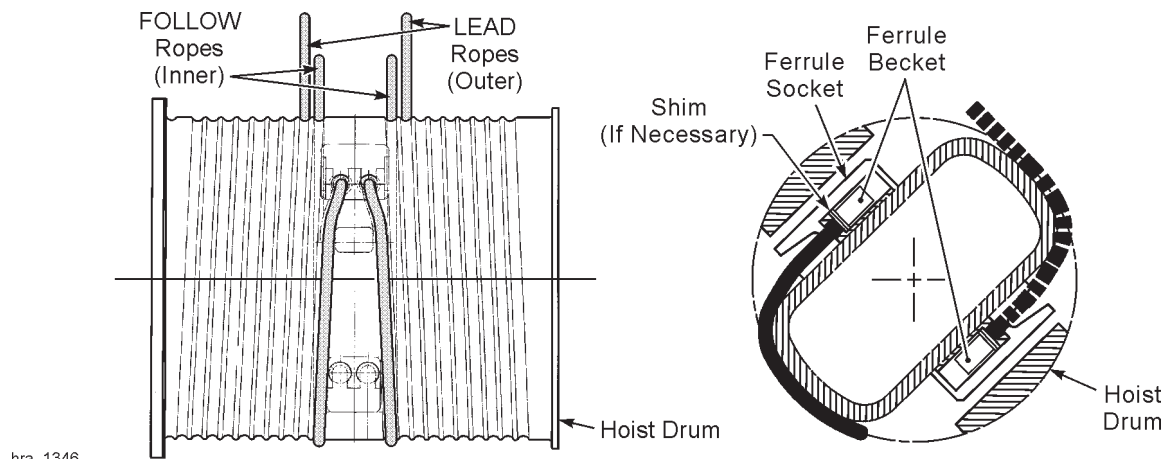
To Repair the Dipper Padlock:

1. Place the dipper on the ground. Remove enough tension from the hoist ropes to remove the weight from the dipper lug pin, but not allowing enough slack to permit the weight of the padlock to rest on the pin.
2. Remove the clamp collars from the lug pin, as shown in Section C-C. Remove the lug pin (approximately 450 Lbs.) with a suitable pulling device.
3. Using the hoist ropes, lift the padlock from the dipper padlock lug and lower the padlock to the ground. Remove the thrust washers and the dowels from the lug.
4. Remove the clamp collar from the link pin, as shown in Section B-B. Strike the clamp collar end with enough force to expose enough of the link pin head to secure a suitable pulling device. Remove the link pin (approximately 267 Lbs.) from the padlock frame and the link.
5. Remove the bushings from the link and from the lower padlock frame. The bushings have an interference fit.
6. Support the padlock frame and the sheave. Remove the T-bolts retaining the padlock sheave pin, as shown in Section A-A. Remove the sheave pin (approximately 366 Lbs.) with a suitable pulling device.
7. Using a suitable lifting device, lift the padlock sheave from the padlock frame. Remove the thrust washers and the dowels from the sheave.
8. Remove the hoist rope from the sheave. Remove the sheave pin bushings from the sheave and the frame. The bushings have an interference fit.
9. Clean and inspect all parts. Repair or replace all damaged or worn parts.
10. Reassemble in reverse of disassembly. Be sure all the dowels are flush with, or below, the surface of the thrust washers.

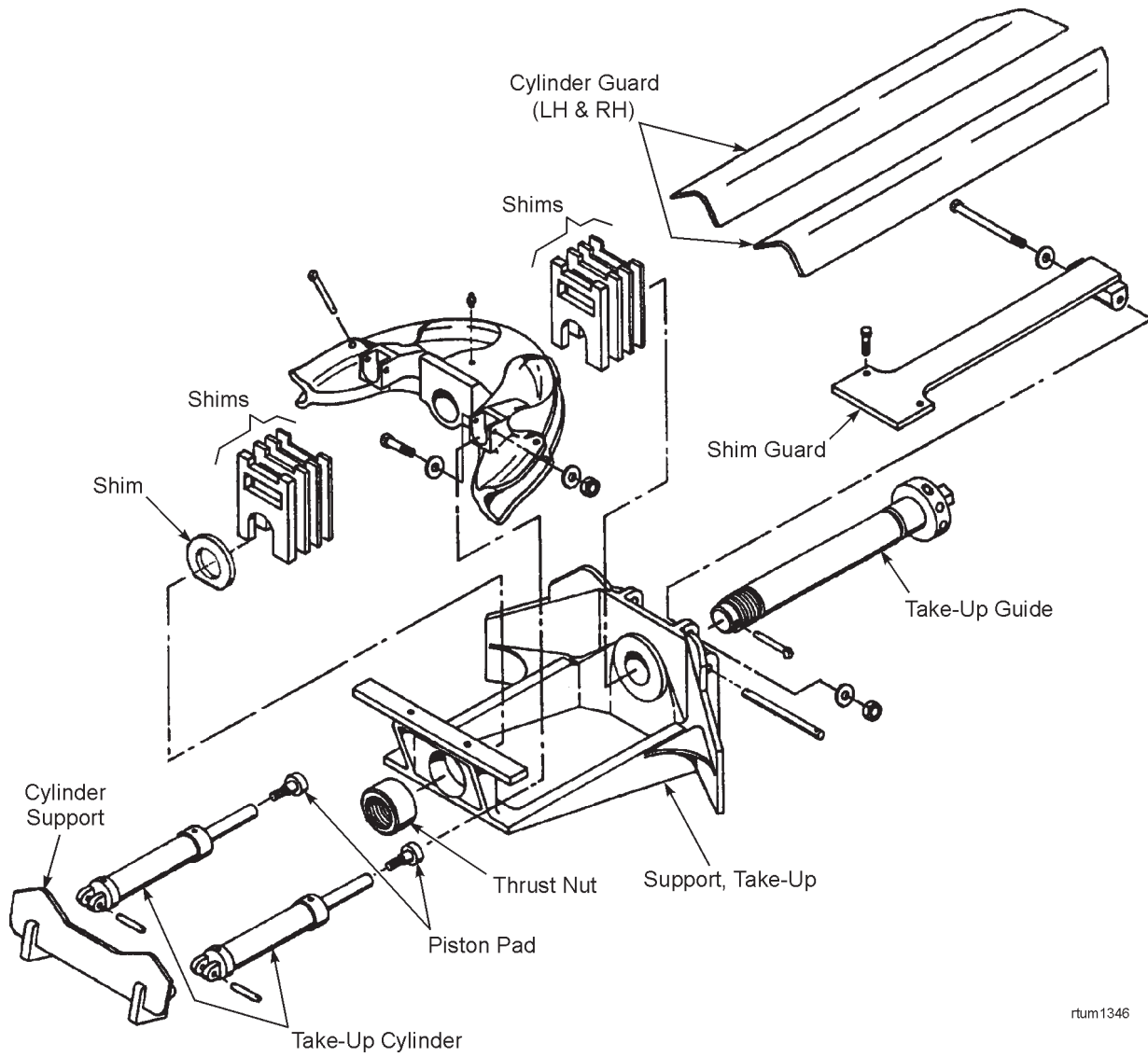
NOTE: The sheave pins and the lug pins are the same size but have different attaching hardware. Ensure they are replaced in the proper location during assembly.

NOTE: Each hoist rope is a continuous length of rope.

- The “LEAD ROPE” is the portion of rope from the hoist drum, over the outer groove of the point sheaves, and down to the back of the padlock. The socket on the hoist drum for this rope “LEADS” the socket for the “FOLLOW” rope.
- The “FOLLOW ROPE” is the portion of rope from the front of the padlock, over the inner groove of the point sheaves, and back to the hoist drum.



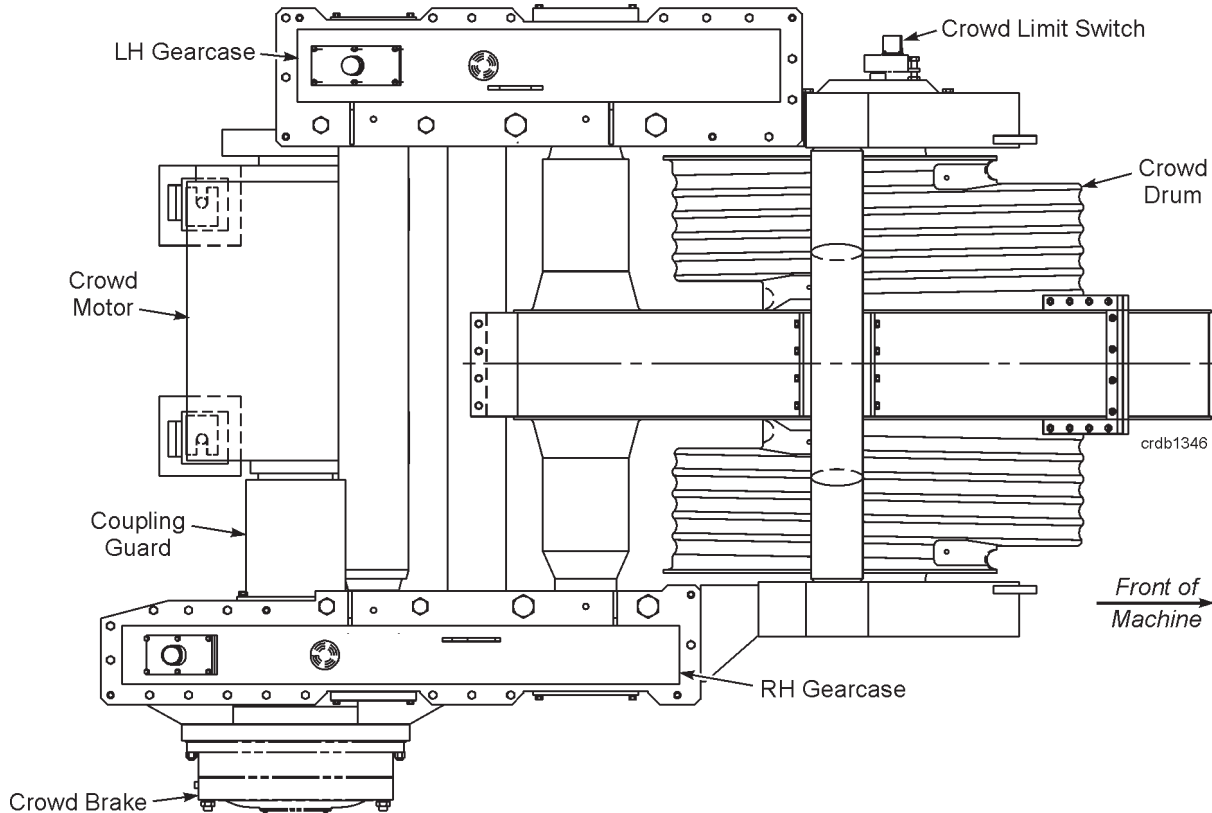
- hra_1346
4. Attach an auxiliary winch line to each follow rope becket. Remove the keeper that attaches the follow ropes to the hoist drum.
 5. Pull the ferrules out of the becket receivers. Lower the auxiliary winch line until the hoist rope can be tied off. Tie-off the follow ropes.
 6. Carefully rotate the drum 180° in the *LOWER* direction to unwrap the remainder of the lead ropes from the drum.
 7. With the lead rope sockets in the lower rear quadrant of the drum, stop the drum.
 8. Attach the auxiliary winch line to each lead rope becket. Remove the lead rope keeper. Payout the winch line until the lead rope can be tied off then tie it off.



rtum1346

Retract Rope Take-Up Mechanism

Crowd Brake



*Crowd Brake Location
(TOP VIEW of CROWD MACHINERY)*

The crowd brake is located on the right side of the crowd motor. The crowd brake contains a single friction disc and is non adjustable; refer to Section View B-B. Once the stroke reaches 0.20 inch, the friction disc must be replaced. Visual inspection of the brake's internal components can be made after removing the brake guard. Periodically inspect the brake friction disc, wear plate, pressure plate and center plates for signs of uneven or excessive wear. If found, disassemble brake to determine the extent of damage.

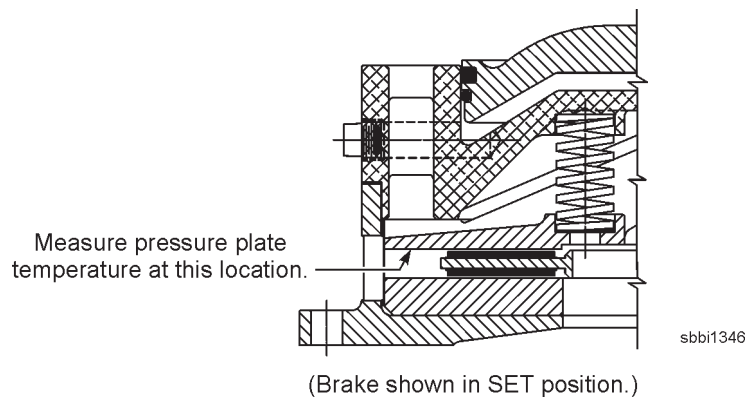
⚠ DANGER

PRIOR TO INSPECTION OR MAINTENANCE ON A BRAKE, MAKE SURE THAT MACHINE OR MACHINERY IS BLOCKED TO PREVENT MOVEMENT. Failure to do so could result in serious personal injury or machine damage.

Swing Brake Burnishing

The swing brake on this machine is a “single disc assembly” consisting of a ductile iron disc to which multiple metallic lining segments are riveted. The burnish-in procedure for a new or relined disc brake initiates a controlled wear process to develop the maximum contact area between braking surfaces. The burnish-in process will also start the formation of an oxide layer on the surface of the linings to stabilize and to establish the coefficient of friction.

Prior to beginning the burnish-in procedure check and record the brake pressure plate temperature with a hand held temperature measuring device. Between each stop, continue monitoring the pressure plate temperature. *Do not allow the pressure plate temperature to exceed 300° Fahrenheit (149° C).*



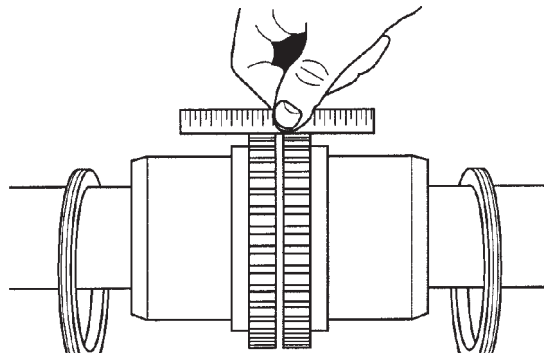
NOTE: Check the temperature of each brake on the machine. If the temperature exceeds 300°F (149°C) stop the burnishing procedure and allow the brakes to cool to 200°F (93°C). If overheated or malfunctioning brakes are found, check if the brake is releasing properly. It is normal for a small amount of disc particles to be ejected from the brake and for sparking to occur during this operation. Large amounts of either situation may indicate overheating or improper release and should always be corrected prior to continuing.

BURNISH-IN PROCEDURE (DIPPER EMPTY)

# of Stops at Speed	Time Between Stops
4 stops/1/4 speed	1 minute minimum
8 stops/1/2 speed	2 minutes minimum

Perform one additional full load, 3/4-speed stop with the dipper handle in the horizontal position and the hoist rope vertical on the swing motion. This will ensure that the brakes are functional. Record the swing stopping times and angles. Forward these recorded readings to the manufacturer.

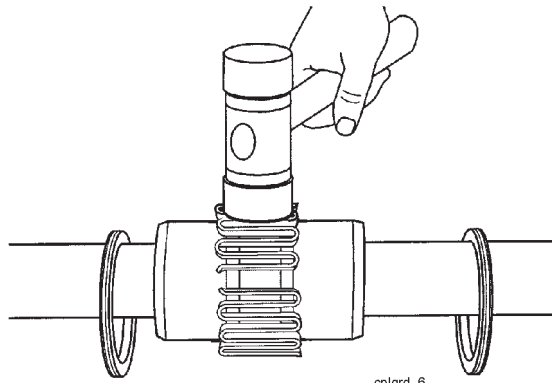
3. Offset Alignment



Align hubs so that a straight edge rests squarely (or within the limit specified) on both hubs as shown here. Check at 90° intervals with feelers. The clearance must not exceed the *OFFSET* limit specified. Tighten all foundation bolts and repeat Steps 2 and 3. Realign coupling if necessary.

NOTE: Use a dial indicator for more accurate alignment.

4. Insert Grids



Pack gap and grooves with specified lubricant before inserting grids. Install grid segments so that all cut ends extend in the same direction; this will assure correct grid contact with non-rotating pin in cover halves. Spread grid segments slightly to pass over the coupling teeth and seat with a soft mallet.

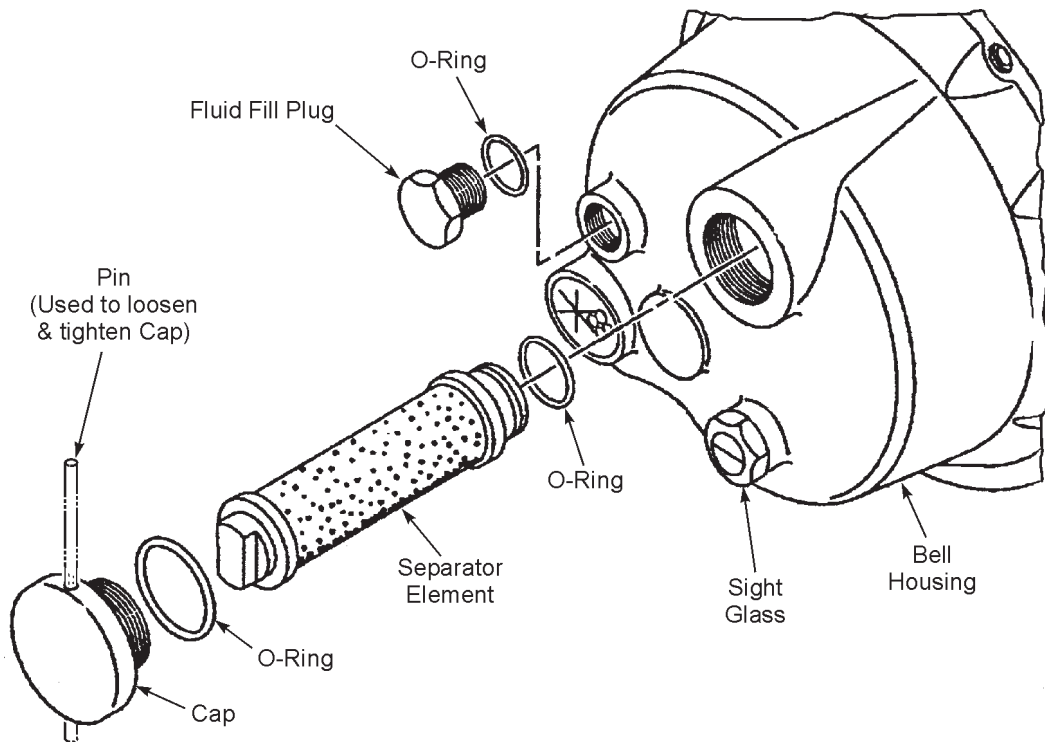
Compressed Air System

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Air / Fluid Separator Element Change

NOTE: Under normal service conditions the air/fluid separator element should be changed every 8,000 hours of operation or once a year. Compressors using SRF 1/4000 fluid should be changed every 4,000 hours. Anytime measured pressure loss exceeds 10 psig (0.7 bar) the air/fluid separator element should be changed.

1. Insert a 1/4" diameter pin through the hole in the separator cap. Remove the cap.
2. Using channel lock pliers, remove the old separator element. Remove old o-ring from the separator cap.
3. Clean separator cap and install new o-ring. Install new o-ring to new separator element. Lightly lubricate to make installation easier.
4. Insert and push the new element in place.
5. Reinstall the cap using the 1/4" diameter pin inserted in the separator cap. Remove the pin and store for later use



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Air Conditioner

SIGMA MPV9 climate control units are heavy duty systems providing superior performance in a variety of climate and environmental conditions.

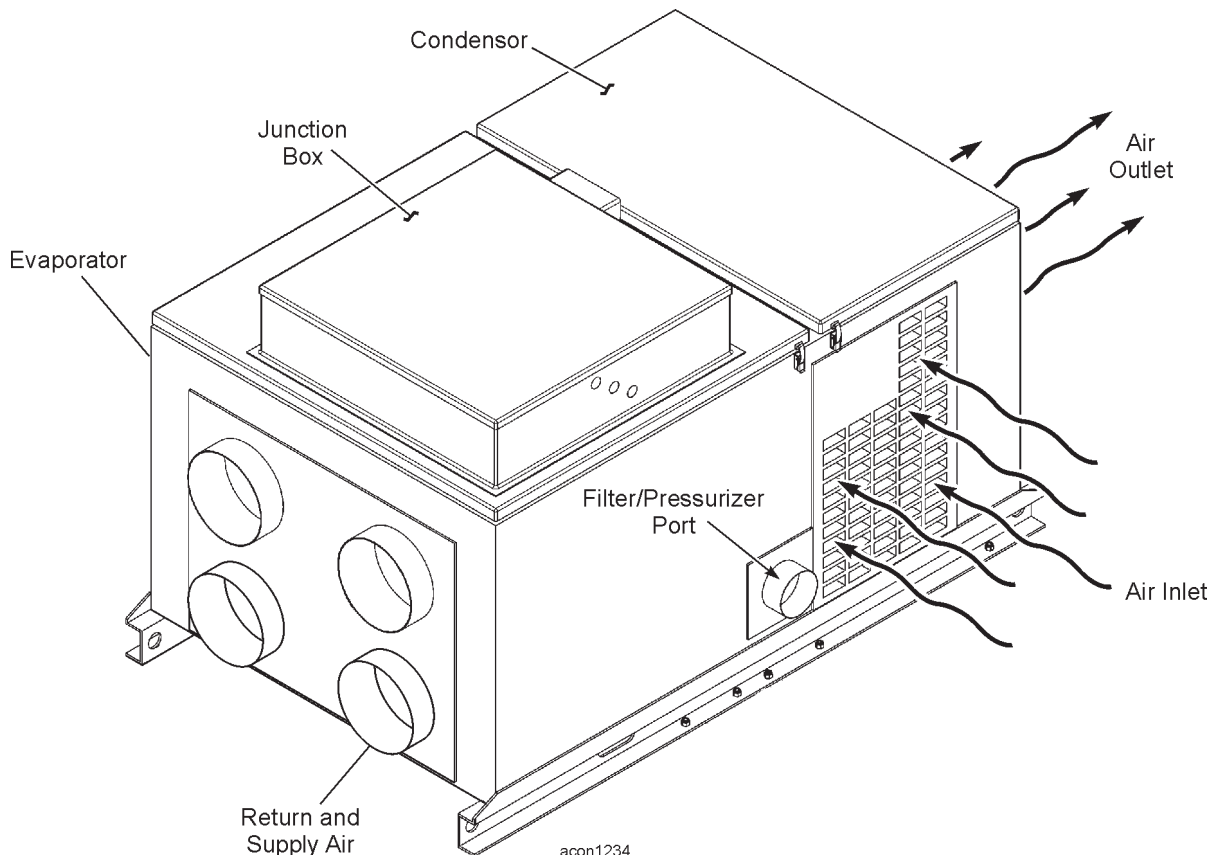
Air is drawn from beneath the unit, passes over the heat exchanger coil and the heating elements into a double-wheel fan where it is discharged through the base of the unit into the conditioned space below.

The refrigerant is metered by an externally mounted TX valve, and is cut off by a liquid line solenoid valve. The heat exchanger is large, constructed of heavy gauge tubing with a coarse fin pitch to reduce clogging. The fan motor is a large shaft, totally enclosed unit that is air cooled.

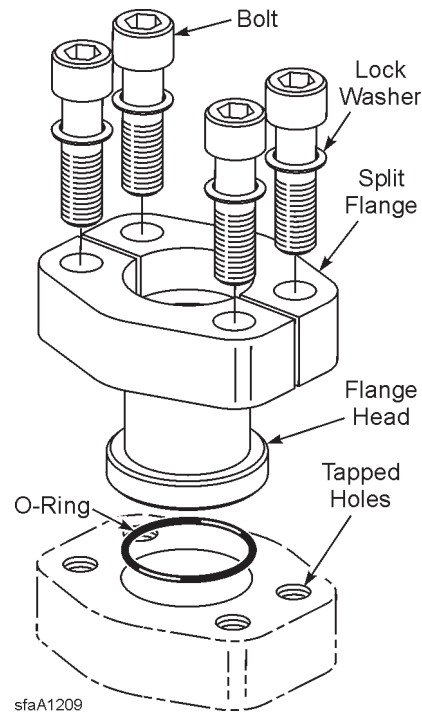
All pressure controls within the evaporator unit are fully sealed, preset and O-ring connected.

The compressor is a heavy duty, fully sealed scroll-type device. The unit is mounted in flexible mounts in an effort to reduce noise and vibration. All connections are either soldered, O-ring type or rotalok.

A large liquid drier is placed within the liquid line to filter moisture from the refrigerant. The condenser operates at a single speed only.



Split Flange Assembly Procedure



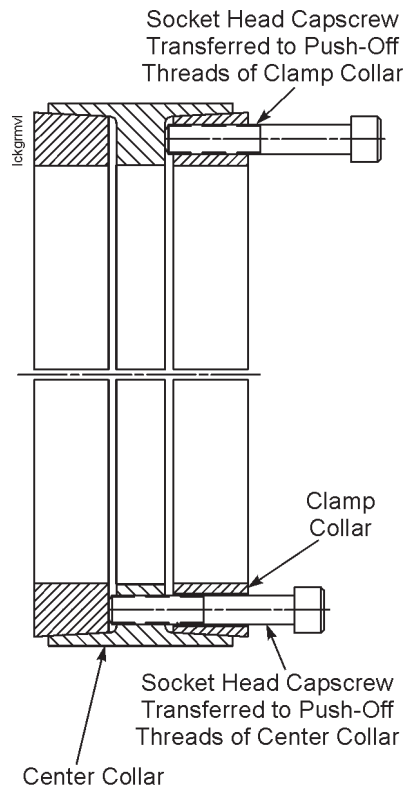
The 4 bolt split flange connection consists of four main components.

- Body of Flange Head (part of hose or tube)
- O-Ring
- Pair of Split Flange Clamps
- Bolts and Lockwashers

To assemble split flange connection:

1. Ensure that all sealing surfaces are free of burrs, nicks, scratches or any foreign particles.
2. Lubricate the o-ring with light grease or oil and insert into groove.
3. Position flange head and clamp halves.
4. Apply retaining compound to the bolt threads. Place lock washers on bolts and insert through clamp halves.
5. Hand tighten bolts.

Locking Assembly Removal



Locking Assembly Removal
Series 1015 Shown

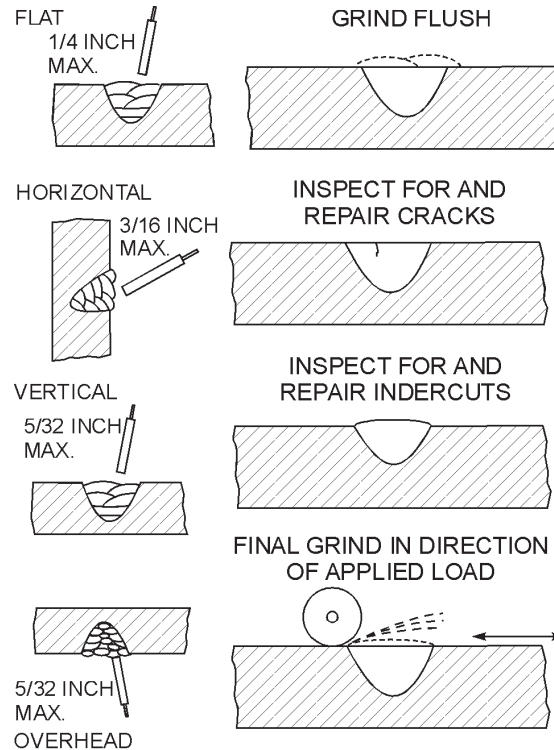
For series 1015 assemblies with a center collar:

1. Loosen all capscrews on the locking assembly by at least 2 turns in 1/4 turn increments.
2. Transfer all the capscrews to the push-off threads provided in the clamp collar and in the center collar.
3. Progressively tighten all screws in a diametrical pattern - except the screws adjacent to the slit in the clamp collar - these should be tightened one after the other.

For series 4000 assemblies with NO center collar:

1. Loosen all capscrews on the locking assembly by at least 2 turns in 1/4 turn increments.
2. The locking assembly incorporates a self-releasing taper, which should allow the assembly to be removed. However if the thrust rings jam, tap on the heads of 3 equally spaced capscrews to positively release the connection.
3. Insert pullout screws in the threads under the cadmium plated locking screws to remove the assembly.

Welding Technique



REPAIR WELDING TECHNIQUES wdrpr-c

Maximum electrode sizes are 1/4 inch for flat position, 3/16 inch for horizontal position and 5/32 inch for vertical and overhead positions. Use a split weave as soon as bead width is large enough to accommodate beads side by side. Throughout all welding be certain thorough fusion with the base metal and adjacent weld beads is obtained on all weld passes. Clean off all slag between passes and all craters before starting the next electrode.

Inspect closely for cracks, undercut or overlap of beads, and gouge out or grind flaws where they occur before continuing. It is very important on highly loaded parts, particularly members subject to cyclic or dynamic stresses, to obtain sound repair welds.

The presence of any stress risers on the surface of a part is detrimental to fatigue life and can result in future cracking. Therefore, it is essential that the finished repair be smooth and well blended into the base metal. Repair weld any undercuts, grind off overlapped weld beads and blend out any notches or gouges. The best condition in a repair weld location is provided by grinding the repair smooth and flush with the surface of the base metal. Final grinding direction is to be identical with the direction of applied load on the structure. Refer to the figure.

Wire Rope Care And Maintenance

Storage

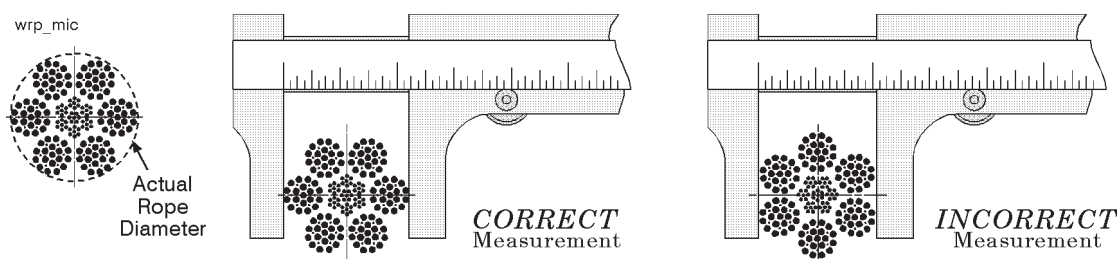
Reels of wire rope stock may be kept on hand for a considerable length of time. This is particularly true of slow-moving special ropes that may not be disposed of completely for several years. Consequently, wire rope should be stored in an area that is well-ventilated and stable with regard to temperature and humidity.

Do not store rope in contact with the bare ground or expose it to the elements. Excessive atmospheric vapors will condense moisture on the rope causing corrosion. If exposed to the direct sun, next to a boiler or in similarly warm conditions, the original lubrication will dry out and lose its preservation properties.

Similarly, storage in a dusty or chemical laden environment may coat the surface of the rope with corrosive materials or even deteriorate the fiber core. If it should be necessary to store rope outside, the reel should be set on blocks or raised off the ground, and covered with a waterproof covering.

Checking Diameter

It is critical to check the diameter of the delivered rope BEFORE installation on the machine. This is to ensure that the rope diameter meets the specified requirements for the given machine or equipment. An **UNDERSIZE** diameter rope will bring about a condition where stresses are exceeding design limitations. This will increase the possibility of injury or machine damage as the chances of breaking the rope will be increased. Use of an **OVERSIZE** diameter rope will bring about premature wear of that rope. The rope constantly being pinched and compressed in the grooves of the sheaves and drum causes this.



Correct Method for Checking Wire Rope Diameter

When checking it is imperative that the actual rope diameter is measured. This is defined as the diameter of the circumscribing circle, or its largest cross-sectional dimension. To ensure accuracy this measurement should be made with a wire rope caliper to obtain the outside dimension of 2 diametrically opposing strands of the rope. When measuring a rope with an odd number of outer strands, special techniques must be employed. Refer to the manufacturer of the product for accurate information.

6. After checking alignment increase the load GRADUALLY until the wedge is properly seated.

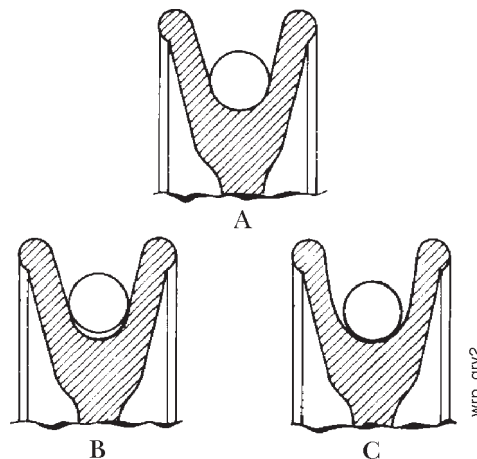
NOTICE

Avoid sudden shock loads.

NOTE: This is the recommended procedure. If variations are made to suit special conditions, they should be carefully evaluated beforehand.

Inspection of Sheaves and Drums

Machines should receive periodic inspections, and the results concerning their over-all condition recorded. Such inspections usually include the drum, sheaves, and any other parts that may come into contact with the wire rope. These are considered high wear items. As an additional precaution, any rope-related working parts, particularly those in the areas described below, should be re-inspected prior to the installation of a new wire rope.



Examples of Sheave Groove Conditions

These cross-sections are illustrating three sheave-groove contact areas. “A” is correct, “B” is too tight, and “C” is too loose.

The very first item to be checked when examining sheaves and drums is the condition of the grooves. To accurately check the size, contour and amount of wear, a groove gauge is used. As shown in the figure, the gauge should contact the groove for about 150 degrees of arc when in optimal condition.

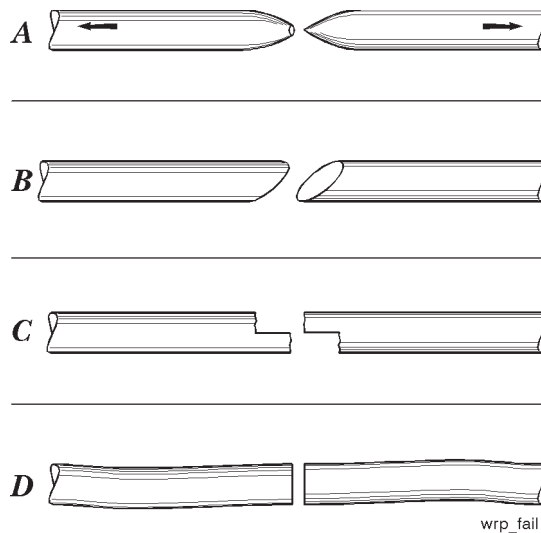
There are two types of groove gauges in general use. The two differ by their respective percentage over nominal.

On occasion, a single wire will break shortly after installation. However, if no other wires break at that time, there is no need for concern. On the other hand, should more wires break, the cause should be immediately investigated.

On any application, valley breaks (where the wire fractures between strands) should be given serious attention. When two or more such fractures are found, the rope should be replaced immediately.

NOTE: No valley breaks are permitted in elevator ropes.

Once broken wires appear within a rope operating under normal conditions many more will show up within a relatively short period. Attempting to squeeze the last measure of service from a rope that is beyond the allowable number of broken wires will create an intolerably hazardous situation.



Examples of Broken Wires

A wire broken under a tensile load that has exceeded its strength is recognized by the “cup and cone” configuration at the fracture point (Rope A). The necking down of the wire at this point shows that failure occurred while the wire retained its ductility. Shear-tensile fracture (Rope B) occurs in wire subjected to a combination of transverse and axial loads. Fatigue breaks are usually characterized by squared-off ends perpendicular to the wire either straight across or Z-shaped (Ropes C and D).

Electric Arc

Rope that has either been in contact with a live power line or been used as “ground” in an electric welding circuit, will have wires that are fused, discolored and/or annealed, and must be removed.

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