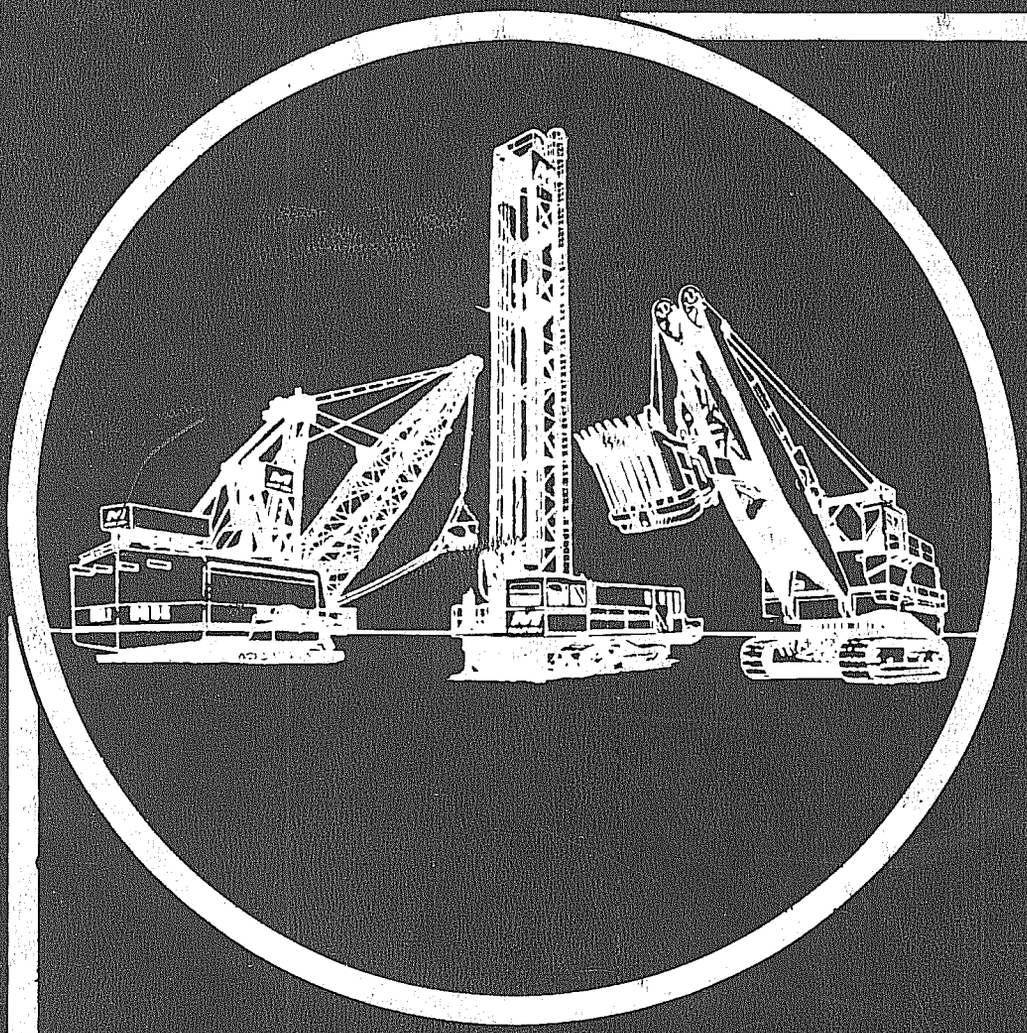
EM029421-0 (en-us)



MARION DRESSER

MARION POWER SHOVEL DIVISION ■ DRESSER INDUSTRIES, INC.

SECTION 1

INTRODUCTION

GENERAL INFORMATION

This manual is designed to assist the owner in the operation and preventive maintenance of this machine. Following easy to understand step-by-step procedures, maintenance personnel can perform these tasks in a safe manner. When a systematic and thorough maintenance/ service procedure (a responsibility of the maintenance superintendent) is used for this machine, minimum unplanned downtime and reliable operation will result.

THIS MANUAL IS NOT THE PARTS BOOK, and cannot be used to order parts. A separate, detailed parts book has been supplied. Please carefully read the instructions in it. All parts are listed by group and/or product code numbers with item/part numbers for THIS SPECIFIC MACHINE. Order parts in exact quantity. Parts ordered by mistake and returned, are subject to a rehandling charge. RIGHT and LEFT HAND PARTS on the upper frame correspond to the operator's hands at the controls; as seated when operating the machine. Please state the correct machine SERIAL NUMBER (located on a plate in the operator's cab) when corresponding or contacting factory service or parts departments. Records on each machine are filed by serial number and when given this number, your machine's specific design and original equipment is accessed quickly by the Marion parts representative.

Periodic additions or revisions may be made to this manual. These will be mailed direct to you from the factory. Should you require additional information or factory service assistance contact your regional service representative or

Service Department
Marion Power Shovel Division
Dresser Industries, Inc.
617 West Center Street
P.O. Box 505
Marion, OH 43302

or:

Telephone 614/383-5211
Telex 24-5307
TWX 810/487-2772
Telecopier 614/383-5211

It is Marion Power Shovel Division policy to improve its products whenever possible and practical to do so. Marion reserves the right to make changes or add improvements at any time without incurring any obligation to install such changes on machines sold previously.

Due to this continuous program of product research and development some procedures, specifications and parts may be altered in a constant effort to improve machines.

SECTION 2

OPERATION

INDEX

Page

Operator's Cab and Anteroom 2–1

Primary Controls 2–2

Comment About Primary Controls 2–4

Plugging the Motion 2–4

Control Panels 2–5

Annunciator Readout Panel 2–8

Overtemperature Alarm Panel 2–11

Controls in Machinery House 2–12

Visual Inspection 2–14

General Check List 2–14

Tub Check List 2–14

House Check List 2–14

Front End Check List 2–15

Typical Start-up 2–15

Drag Mode 2–17

Typical Digging Cycle 2–18

Propel Control 2–19

Ground Preparation 2–20

The items on the annunciator panel are as follows:

1. Main Transformer Alarm Light indicates that the slow gas, oil level or oil temperature relay on the 10,000 KVA transformer has operated.

2. Over-Under Frequency Light indicates a fault or malfunction in incoming power supply.

3. AC Undervoltage Light indicates that incoming voltage is dropping below 85 percent of its nominal value.

4. M-G Overspeed Light indicates that an M-G set is overspeeding. This condition will stop the affected M-G set and shut down the machine.

5. 480 Volt Ground Light indicates that a ground has occurred on one of the phases of the auxiliary transformer.

6. DC Motor Field Loss Light indicates the loss of DC motor field excitation.

7. DC Loop Unbalance Light indicates that a loop unbalance has occurred. The motion in which unbalance occurs will be shut down.

8. DC Loop Ground Light indicates a ground in a DC motor armature loop. Latching relays in the power control room will identify which loop has grounded. This is a warning light only, with no machine shutdown.

9. DC Motor Blower Loss Light indicates when any DC motor blower loses power and stops.

10. DC Motor Overtemperature Light indicates overheating in any of the DC motors. This is a warning only, there is no shutdown.

11. Synchronous Motor Protection Light indicates that the pullout or field current relay, on one of the synchronous motors, has operated.

12. Propel Error Light indicates that walking shoes are out of sync.

13. Rope Limit Light indicates that bucket has either entered a final hoist or drag limit position or is in a final tightline limit.

14. Limit System Fault Light indicates that the electronic rope limit control system self-diagnostic feature has detected a malfunction in one of the components of this control.

As bucket clears the ground the swing pedal, which corresponds to desired direction of swing is slowly depressed. (This avoids excessive bucket and rope swing). Swing and hoist bucket at same time so that dumping height is reached at same time bucket reaches spoil.

CAUTION: When swinging, make sure the bucket has been raised to clear all obstructions and rear of machine has clearance.

As dump point is reached, reverse swing pedals bringing swing to a smooth stop. When machine comes to rest, the pedal should be brought immediately to neutral position (no pressure on pedals) or else the machine will start to swing in the opposite direction.

Now, release tension on drag ropes allowing bucket to dump. As bucket dumps the hoist controller must be returned, moved forward to a point of less power. Do not allow excessive amount of drag to run out.

DO NOT hold load longer than necessary to complete the dumping cycle. After material clears bucket, slowly depress swing pedal (direction desired) to start return swing to pit and at same time lower bucket into pit.

While operating, the operator should observe components in his vision and be alert for pins coming out around bucket, boom support and running ropes for broken strands, fraying, etc. The wire ropes are expendable items. Kinks cause permanent damage. Replace these ropes promptly.

Also, note any uncommon feel or noise in the machine and notify maintenance of any problems while they are still minor.

PROPEL CONTROL – Electrically, the propel equipment consists of:

1. D.C. drive motor on each machine side
2. A drag propel contactor and
3. A control and timing system

The motor, one each side, independently drives its propel machinery. The drag-propel contactors electrically disconnects the drag motors from the drag generators and connects the propel motors to these generators. Thus, the drag master switch controls the propel motors when walking. Since the two sets of propel machinery are not connected mechanically, the two shoes are electrically timed or synchronized. This is done using a selsyn system that

CAUTION: Contact with or swallowing of lube products can prove harmful. Lubrication system operates under pressure. Relieve pressure in system before performing maintenance.

LUBRICATION SPECIFICATIONS – GREASES

CODE OR SYMBOL NO.	ASTM	MPG or TEST	RGL	OGL TYPE B	OGL TYPE H
Penetration Worked 60X					
Summer, NLGI	D-271	2	semi-	1	—
Winter, NLGI		1	fluid	0	—
Penetration Worked 10,000, Max. Change	D-217	10%	—	—	—
Dropping Point, Min. °F (°C)	D-566	350 (177)	—	325 (163)	—
Base Oil Viscosity @ 210°F (99°C), Min.	D-446	75 SUS	140 SUS	2000 SUS	2000 SUS
Oxidation Stability Max. psi (kPa) Drop—100 Hrs.	D-942	10 (68)	—	—	—
Water Resistance Max. Loss @ 100°F (38°C)	D-1264	20%	—	10%	10%
Texture	Visual	Buttery	—	Adhesive	Tacky
EP Timken, Min. OK, lbs. (kg)	—	35 (16)	—	35 (16)	35 (16)

SPECIFICATION – OILS

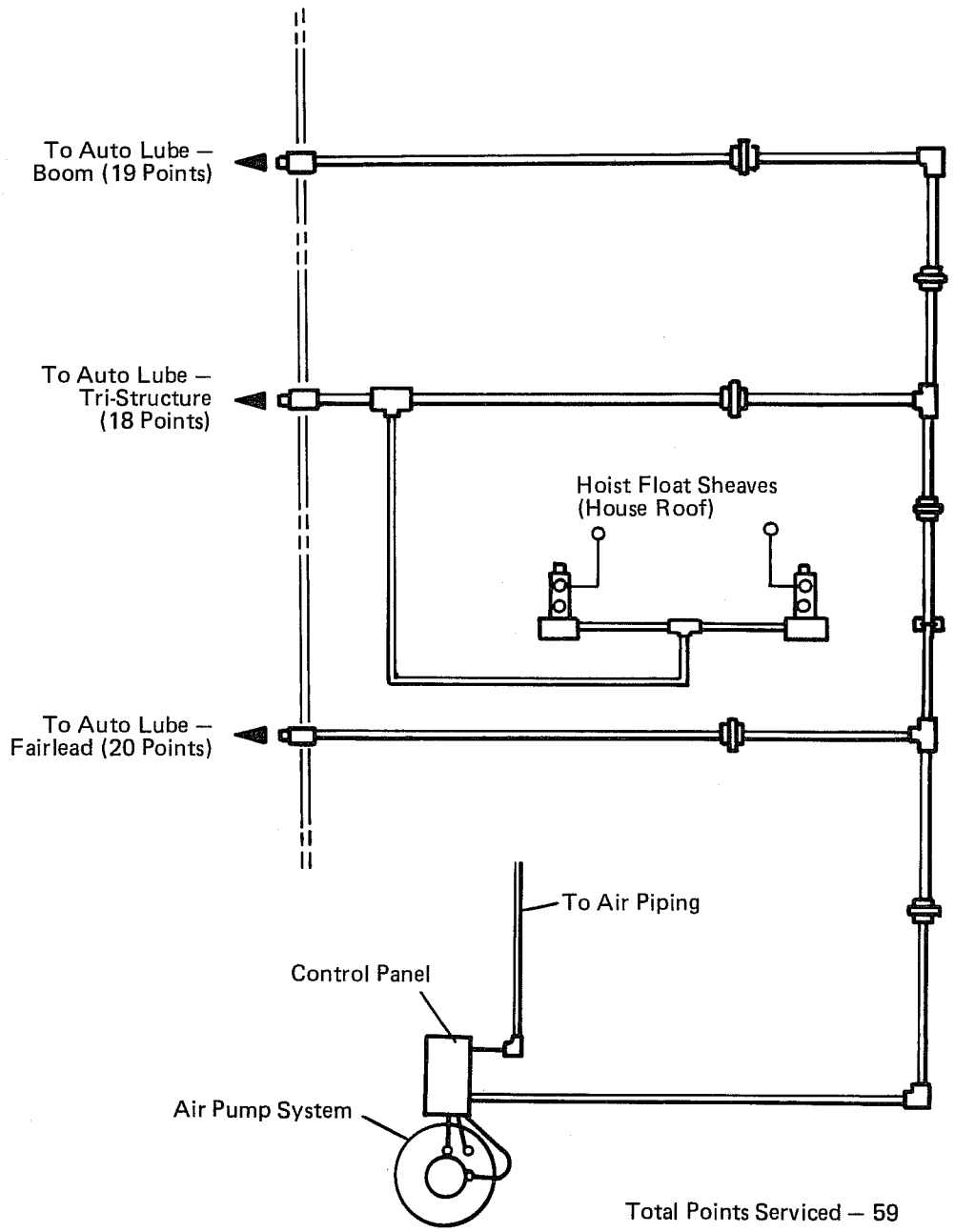
CODE OR SYMBOL NO.		ASTM or Test	MO	OIL PO
Pour Point °F (°C), Max.	Summer	D-97	5 (-15)	15 (-9)
	Winter		0 (-18)	15 (-9)
Flash Point °F (°C), Min.	Summer	D-92	450 (232)	410 (210)
	Winter		420 (216)	410 (210)
Viscosity @ 100°F (38°C) SUS		D-446	—	150 (66) Min.

NAME OF PART	TYPE	NO. OF POINTS	LOCATION	LUB. SYM.	METHOD & FREQUENCY
Hoist Motor	Anti-Friction	10	In Motor End Bell	EMG	Hand (see Electrical Section)
Hoist Rope	—	—	Spray on at Tri-Structure and Boom	WRL	Semi-auto, 8 Hrs.

LUBRICATION OF DRAG MACHINERY

Drag Drum Support Bearing	Anti-Friction	2	In Bearing Retainer	MPG	Automatic
Intermediate Drag Shaft (In Case)	Anti-Friction	2	From Gear Case Fill at Air Filter	GL	95 U.S. gal. each case, Check Weekly at Dipstick, Keep Full
Intermediate Drag Shaft (Inboard)	Anti-Friction	2	In Bearing Retainer	MPG	Automatic
Drag Motor Extension Shaft	Anti-Friction	8	From Gear Case	GL	—
Drag Motor Coupling	—	4	Plug in Coupler Flange	MPG	Hand, 3 Mos. Keep Filled
Drag Gear and Pinions	—	4	Drip on	OGL	Automatic
Drag Motor	Anti-Friction	8	In Motor End Bell	EMG	Hand (see Electrical Section)
Drag Ropes	—	—	Spray on at Fairlead	WRL	Semi-auto, 8 Hrs.

AUTO LUBE FOR FRONT END supplies the tri-structure, fairlead, boom and house roof float sheaves. The system time cycle is 15 minutes. Alarm is set at 150 seconds. Air pressure is regulated at 70 psi. Pressure switch at boom point is set at 2500 psi. The system uses a 400 pound drum of MPG.



SCHEMATIC
AUTO LUBE – FRONT END

SECTION 4

MECHANICAL ADJUSTMENTS

INDEX

	Page
Tub	4–1
Center Journal	4–2
Disassembly of Center Journal	4–3
Roller Circle	4–4
Roller Rails	4–5
Hook Shoes	4–5
Propel Machinery	4–6
Propel Gear Cases	4–7
Propel Motor Extension Shaft Assembly	4–8
First Intermediate Propel Shaft Assembly	4–10
Second Intermediate Propel Shaft Assembly	4–12
Disassembling Propel Gear Case	4–14
Assembling Gear Case	4–15
Main Propel Drive Pinion Shaft	4–16
Main Propel Shaft	4–17
Walking Shoe	4–18
Walking Shoe Rollers	4–20
Walking Shoe Return Mechanism	4–21

DISASSEMBLY OF THE CENTER JOURNAL in the field is not usually performed, however it can be accomplished if necessary. Park the machine on level ground and, with the bucket still suspended, crib firmly under the ballast section of the upper frame. Now, tie the upper and lower frames together with at least three sets of X bracing on each side to prevent tilting between the two frames.

Next, set the bucket on the ground but keep tension on the hoist ropes.

Take electric power off the machine, disconnect the trail cable and bring it into the machinery house and up to the high voltage cabinet. Disconnect the leads from the collector rings and connect the trail cable in their place. This will provide power to the lights and overhead cranes but not to the collector rings.

Remove a section of the drag rope dirt chute above the center journal to provide access for the overhead crane lines.

Remove the floor covering from above the center journal, then disconnect and remove the collector ring assembly.

DANGER: Be sure power is off rings and locked out before working on rings.

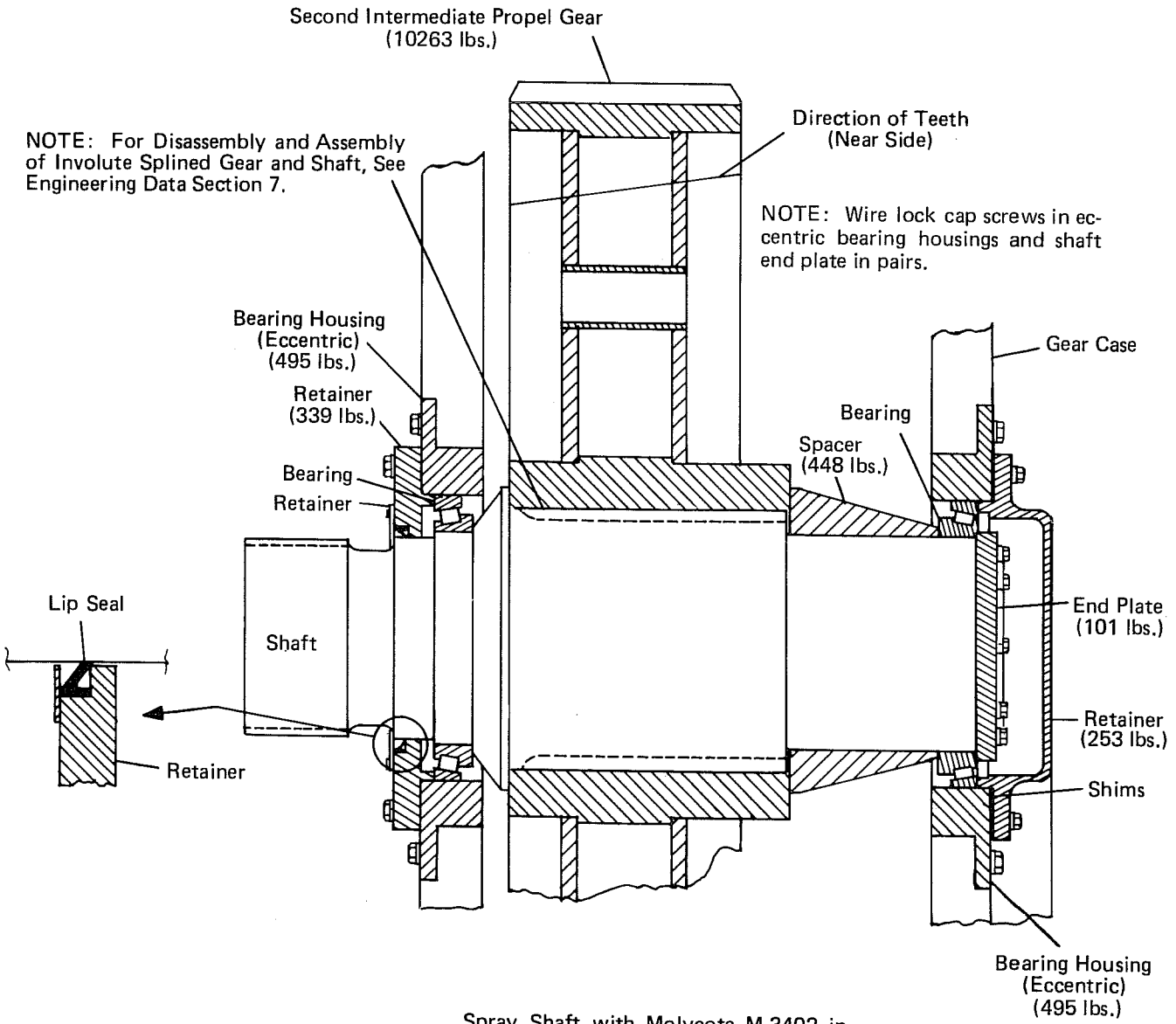
Remove the guard and top bearing retainers, then remove the bearing from the upper frame bore.

Remove the lock bars from the lower end of the center journal. Use a jack and overhead cranes to remove the center journal pin from the tub base. If removal of the center journal pin has to be done in an area of blasting, arrange for **"no blasting"** until the pin has been replaced.

NOTE: The center journal pin has provisions for hydraulic assisted removal from the tub bore. There is a hole stamped "HR" on top of pin for connecting hydraulic line from pump.

To remove center journal bushing, remove bearing and bearing retainers, then remove four brass dowel pins which secure bushing in the upper frame bore.

Reverse this procedure to reassemble the center journal. Be sure to fill bearing cavity with MPG multi-purpose grease before installation of the bearing.

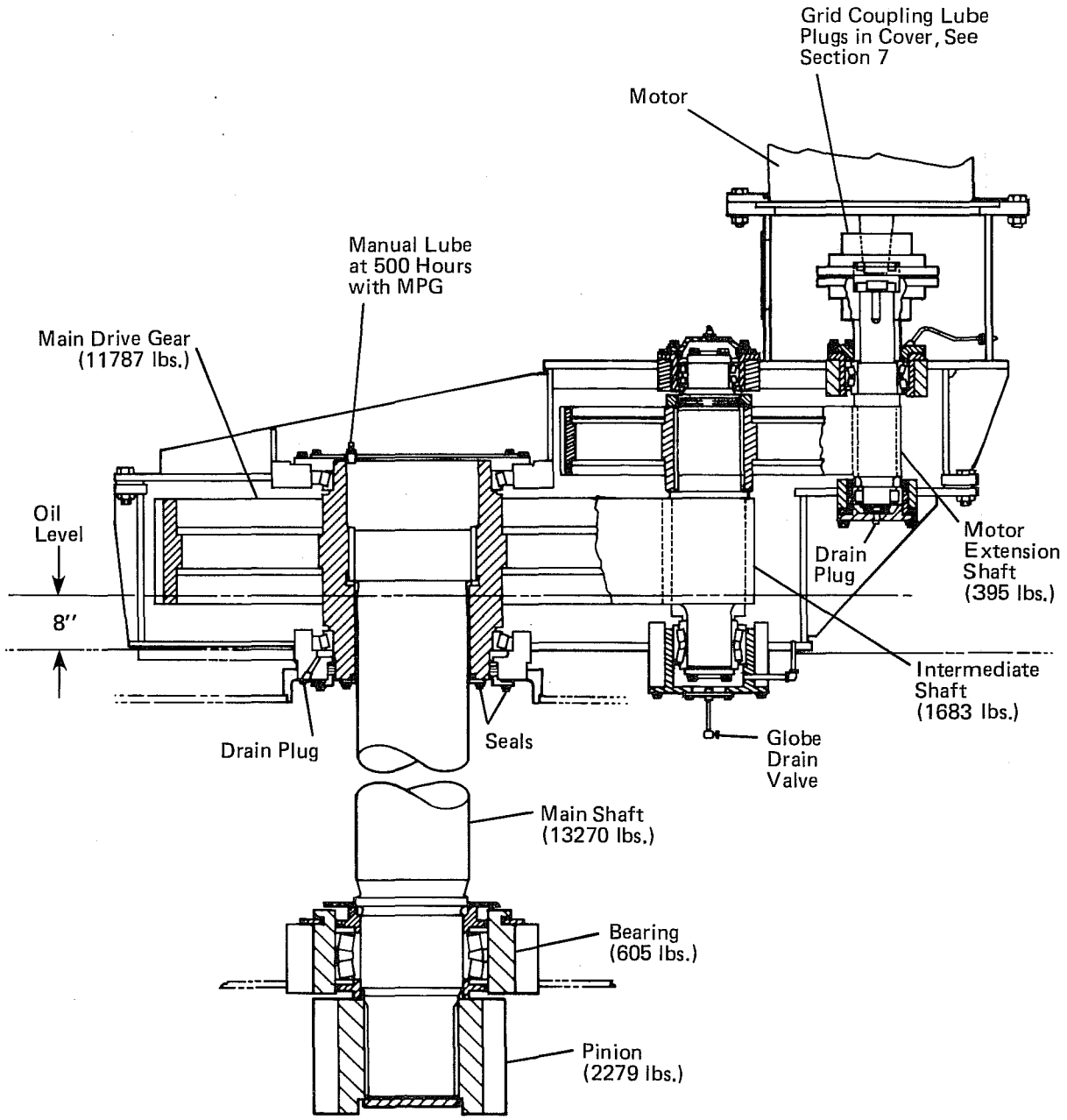


Spray Shaft with Molycote M-3402 in Lip Seal area. Pack Seal Cavities with Belray Silicone Valve Seal Lubricant Before Installing Seal.

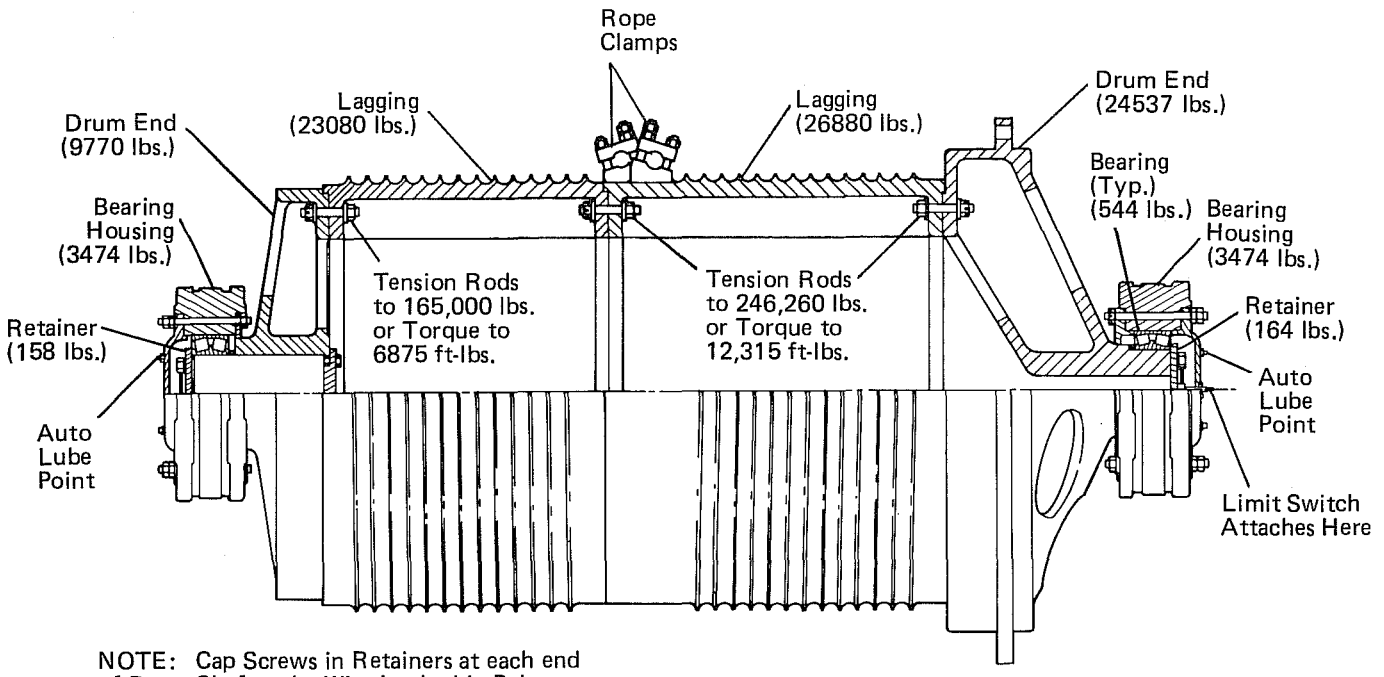
NOTE: Correct position of Eccentric Bearing Housings is set at time of manufacture and fixed by installation of a Dowel Pin.

BEARING SET-UP PROCEDURE: Take up on cup follower until bearings bind slightly in rotation. Install sufficient shims to give .003 to .005 preload.

SECOND INTERMEDIATE PROPEL SHAFT ASSEMBLY



Gear Case Capacity is 280 U.S. gal. of GL oil



NOTE: Cap Screws in Retainers at each end of Drum Shaft to be Wire Locked in Pairs.

Use Witness Holes for alignment of Drums and Drum Ends.

Weight of Assembly is 99,580 lbs.

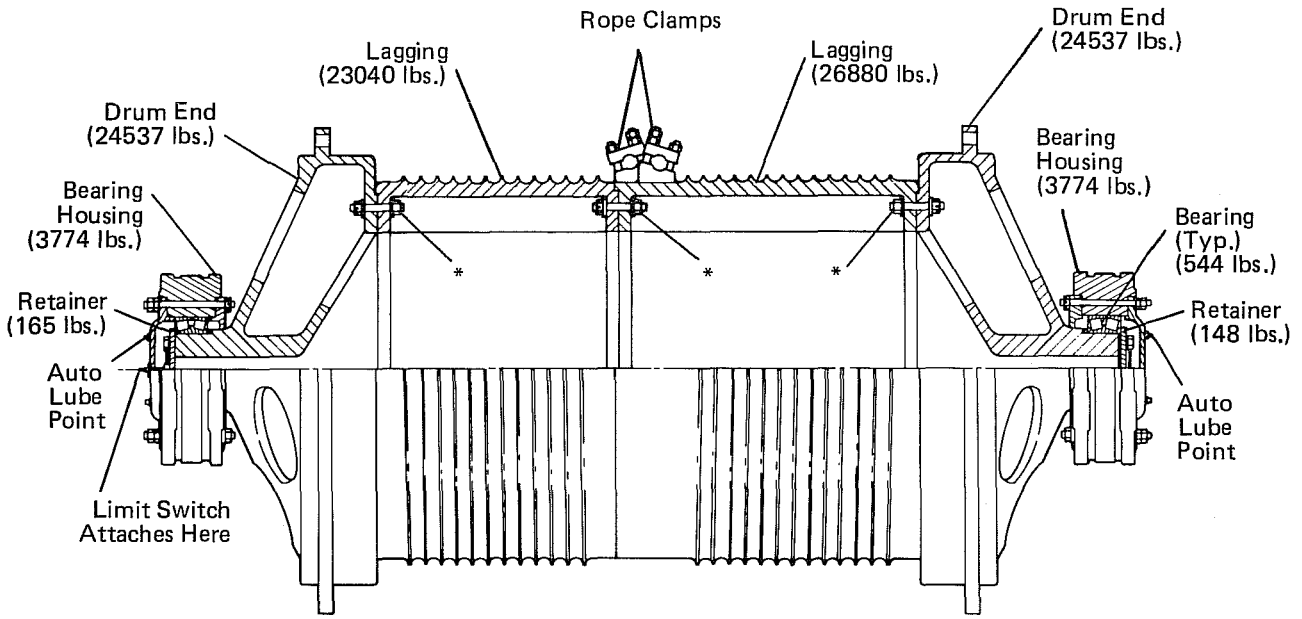
DRAG DRUM SHAFT ASSEMBLY
(Viewed from rear of Machine)

TIGHTENING NOTE FOR DRAG DRUM RODS:

Use hydraulic tensioner (bolt stretcher) to apply a clampload in 3.00 inch dia. finished rods of 246,260 lbs. If tensioner cannot be used, torque to 12,315 ft-lbs. Tension 2.50 inch dia. finished rods to 165,000 lbs. or torque to 6875 ft-lbs.

DRUM SHAFT ASSEMBLY INSTRUCTIONS:

1. All finished drum end surfaces should be free of metal chips and surface obstructions. Clean all finished drum end surfaces with an approved solvent without an oil base and wipe dry before assembly.
2. Install bearings and housings on drum ends; ensure that correct housing is used on correct drum end. Assemble housings with cast note "outside" facing away from drum.
3. Install drum ends on drum barrels using witness holes for alignment of drums and drum ends.
4. Using hydraulic tensioner, tighten rod bolts at top of drum to specified clampload. Rotate drum 180 degrees and again tighten top bolts to their required clampload. Follow this procedure until all bolts are at their required clampload which should only be measured while bolt is at top of drum so that drum weight does not affect actual clampload.



NOTE: Cap Screws in Retainers at each end of drum to be wire locked in pairs.

Use Witness Holes for alignment of drums and drum ends.

*Tension Rod Bolts to 246,260 lbs. or Torque to 12,315 ft-lbs.

Weight of Assembly is 113,520 lbs.

HOIST DRUM SHAFT ASSEMBLY
(Viewed from rear of Machine)

TIGHTENING NOTE FOR HOIST DRUM RODS:

Use hydraulic tensioner (bolt stretcher) to apply a clampload in 3.00 inch dia. finished rods of 246,260 lbs. If tensioner cannot be used, torque to 12,315 ft.lbs.

DRUM SHAFT ASSEMBLY INSTRUCTIONS:

1. All finished drum end surfaces should be free of metal chips and surface obstructions. Clean all finished drum end surfaces with an approved solvent without an oil base and wipe dry before assembly.
2. Install bearings and housings on drum ends; ensure that correct housing is used on correct drum end. Assemble housings with cast note "outside" facing away from drum.
3. Install drum ends on drum barrels using witness holes for alignment of drums and drum ends. Tighten rod bolts to approximately 70% of their required clampload or torque.
4. Using hydraulic tensioner, tighten rod bolts at top of drum to specified clampload. Rotate drum 180 degrees and again tighten top bolts to their required clampload. Follow this procedure until all bolts are at their required clampload which should only be measured while bolt is at top of drum so that drum weight does not affect actual clampload.

6. Reassemble springs, clamp tubes, discs, and reaction plate

CAUTION: Springs are to be assembled on every other stud. Improper assembly will result in cocking of the reaction plate and uneven brake release.

7. Reassemble wear spacers, end plate, spring housing and pressure plate as an assembly.

8. Lubricate stud threads with 30 weight oil or "Never Seez". Assemble locknuts using assembly sequence shown in Figure G. Torque locknuts to 200 ft.-lbs. (271 Nm).

CAUTION: While reassembling the end plate, spring housing, and pressure plate assembly, take care to install wear spacers in the proper position. See Figure D.

9. Reinstall shield.

E. REPLACEMENT OF SPRINGS is done by the following steps:

DANGER: Prior to removal of the brake, make sure that the machinery will remain in a safe position.

1. Remove the brake from the machine, place it on a clean working surface with the end plate facing up and remove the shield.

2. Remove locknuts in alternating sequence (as shown in Figure G) in increments of 1/4 of exposed stud thread length. If a stud comes loose, clean threads thoroughly, then apply Loctite 277 or equivalent. Thread stud back in until it bottoms in mounting flange.

3. Remove the end plate, spring housing and the pressure plate as an assembly.

4. Remove hex head screw and lockwasher from end plate in alternating (see Figure H) sequence two turns at a time. The end plate diaphragm, outer clamp ring and inner-clamp ring can be removed as an assembly.

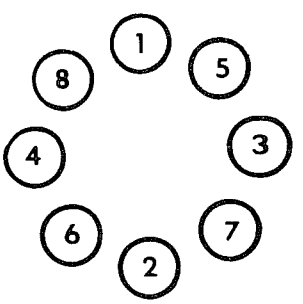


Figure H

Remove winch ropes and snatch blocks. Reconnect all lubrication lines.

Reinstall hoist and drag ropes. Be sure to reset hoist and drag drum limit switches in accordance with Marion Protection System instruction manual.

BOOM POINT SHEAVE ASSEMBLY consists of two single groove sheaves mounted on a shaft and trunnion assembly. Each sheave turns on two tapered roller bearings. Trunnion allows sheave assembly to rotate to follow fleet angle of hoist ropes.

DISASSEMBLY OF BOOM POINT SHEAVES requires removal of hoist ropes and removal of sheave assembly from boom point structure. Four pins secure the two trunnion bearing housings to boom point structure. Disconnect lubrication lines and hook up auxiliary crane to lifting lugs on top of trunnion.

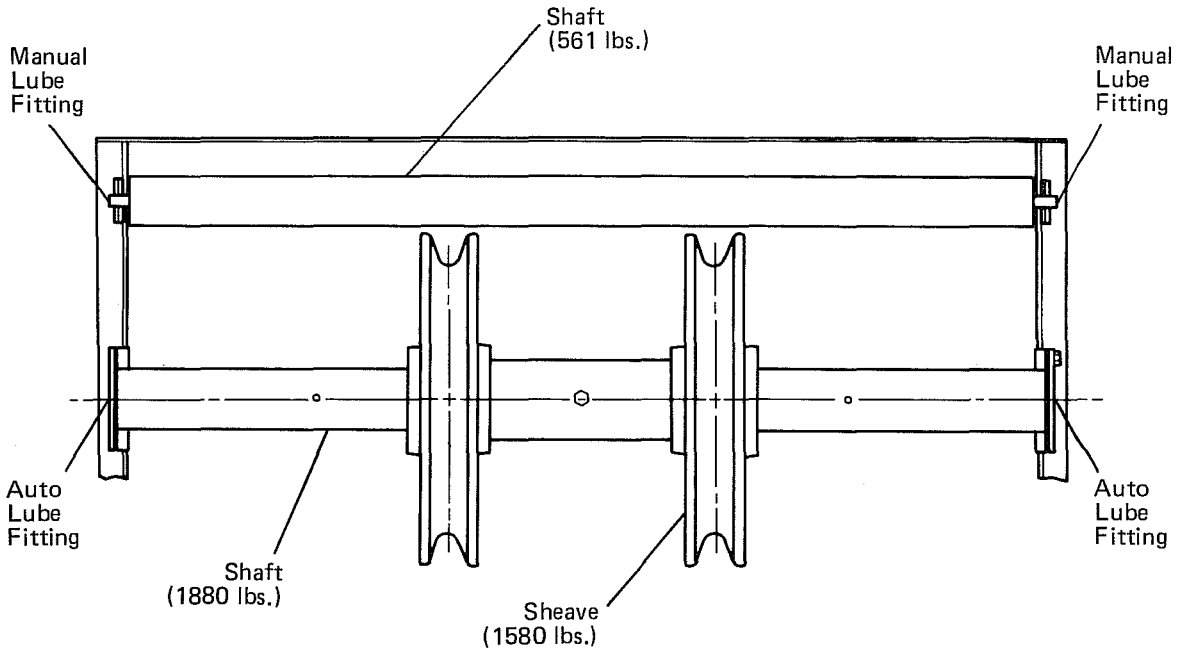
CAUTION: Weight of sheave assembly is 47,280 pounds.

Remove four trunnion bearing housing pins and lower sheave assembly to rest on cribbing at ground level. Sheave shaft should be horizontal for disassembly of sheaves.

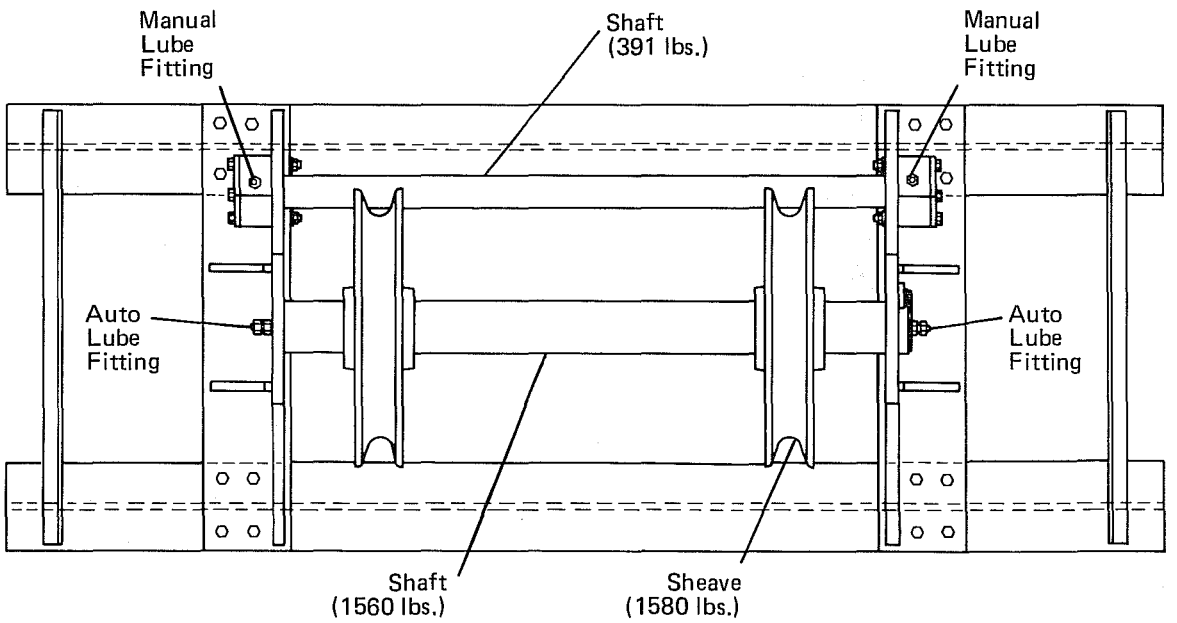
Remove retainer bolts and two end retainers and pull sheaves from shaft. Remove, clean, inspect and replace parts as required.

CAUTION: Weight of each sheave is 11,610 pounds.
Weight of shaft is 3,960 pounds.

NOTES:



HOIST ROPE FLOAT SHEAVES – HOUSE ROOF



HOIST ROPE FLOAT SHEAVES – TRI-STRUCTURE

SECTION 5

ELECTRICAL MAINTENANCE

CARE OF D.C. MOTORS AND GENERATORS holds one watchguard – cleanliness. Keeping this equipment free of dirt, oil and grease is of prime concern. The operator generally recognizes and may correct the few common problems. Failure of this equipment is rare. Serious problems require a competent electrician. In the case of poor commutation, where simple remedies can not solve the problem, consult the electrical equipment manufacturer.

BRUSHES with an excessive amount of arcing between brush and commutator when operating under normal loads and speeds need checked for the following:

Are brushes sticking in holders?
Are brushes making full contact on commutator?
Are contact surfaces of the brushes clean?

NOTE: Determine this by removing the brush and looking at it's surface. The surface is smooth and polished where the brush rubs. Any portion not in contact has a rough, dark appearance. Loose brush holder studs throw brushes out of line and cause excessive arcing. Here the brush rides on heel or toe out of normal commutating plane. Tighten brush holder into correct position to solve the problem. Loose brush holder yoke set screws permit the yoke to rotate and shift all the brushes. So they arc. Reposition the holder yoke and tighten. Another problem solved. Keep even spring pressure on ALL brushes. This exact pressure varies with unit type. Call the factory for specific information on your unit. The brush springs are set originally at one point. One may assume this pressure setting as correct and keep it exact when installing a new brush. This initial brush pressure should be the same for all brushes on any one motor or generator. Inspect all brushes regularly. Brushes worn beyond a point of good contact need replaced. Put in new one(s). Avoid allowing rapid brush wear. This results in improper brush pressure and causes severe arcing. Excessive brush wear may even cause the pigtail to wear into the commutator proper. Check the brush springs. Are they in their slots? When using fairly long brushes, it's a good practice to increase spring tension after brushes wear to make up for brush pressure loss. Use the same brush type as originally furnished with the unit when replacing. Serious problems occur when using an incorrect brush. A change in brushes sometimes improves a condition of poor commutation and severe arcing. First, consult manufacturer before making this change.

BRUSH INSTALLATION—Brush should properly fit holder or guide, to work up and down freely. Grind brush with 2/0 or 3/0 sandpaper until contact surface matches the commutator contour. Use the following procedure: Place brush in holder, release spring and insert sandpaper (wider than brush, rough side to brush) between brush and commutator. Exert

Rectifiers normally fail by shorting, but the effect depends upon the circuit. With rectifiers used to convert A.C. to D.C., shorting provides A.C. in output; detected by a multimeter on the output circuit. Shorted, blocked rectifiers allow current flow when the wrong polarity of voltage is detected.

Rectifier failure detection using the ohmmeter works, but the low voltage batteries in the meter do not always give a good test. Best results show up using the high resistance scale, but even this may not be conclusive.

The best test for rectifiers uses D.C. voltage at least 1/4th its rating. Connect a resistor in series with rectifier to limit current to a safe value. Connect resistor and rectifier across D.C. voltage, then read voltage across resistor. Reverse rectifier and measure resistor voltage. A good rectifier gives voltage across resistor with only one polarity.

Many other failures occur and often good intuition and ingenuity is needed to find them.

The trouble discussed thus far usually results in complete and permanent malfunction.

Perhaps more common and more difficult to find are intermittent failures resulting in only partial power loss. These trouble types distinguish a good troubleshooter from an average one.

Start as before, interviewing operator, oiler and witnesses. Try in questioning to determine the exact nature of trouble. When complaint indicates partial power loss, find the effect under various load conditions and determine the cause of this effect.

Often a cause for weakening may be determined in a similar manner as locating complete failure. Select a starting point and compare measurements taken against recorded data. Compare honestly. A slight difference shows due to aging, temperature or an inaccurate instrument along with failure. Tests under one condition might not give a true problem indication. For example, tests at stall do not indicate no-load voltage is incorrect. Likewise, test for proper motor field voltage ONLY with controller (master switch) in proper position. In addition, check that stall current or no-load voltage varies properly with master switch position, since trouble could be failure of master switch.

In locating trouble of the weakening kind, one needs to know the various devices functions used to augment or increase power under certain conditions. Master switch contacts fall in this device class. Motor field contactors increase field strength under certain conditions. Conversely, current or voltage feedback circuits limit certain quantities to acceptable values. Failures resulting in decreased or increased outputs generally come from failure in these supplementary circuits.

Help here comes from knowing the effects certain changes have on performance. Naturally,

SECTION 6

COMPRESSED AIR SYSTEM AND COMPONENTS

INDEX

	Page
Air Compressors	6–1
Inspect Drive Belt	6–1
Anti-Freezer	6–1
Magnet Valves	6–2
Pressure Regulators	6–2
Air Cylinder Valves	6–2
Air Filters	6–3
Air Valves	6–3
Lubricators	6–3
Quick Release Valve	6–4
Air Filter System	6–5
Charging Procedure – Pressurized Weldments	6–6
Procedure When Loss of Air Pressure Occurs	6–6

SECTION 7

ENGINEERING DATA

LIST OF TABLES

		Page
Running Clearances for Bronze Bushings (1.0" thru 7.25)	Table 1	7—2
Running Clearances for Bronze Bushings (7.75 thru 16.75)	Table 1	7—3
Running Clearances for Bronze Bushings (17.0 thru 24.25)	Table 1	7—4
Running Clearances for Bronze Bushings (24.50 thru 31.75)	Table 1	7—5
Running Clearances for Bronze Bushings (32.0 thru 39.25)	Table 1	7—6
Running Clearances for Bronze Bushings (39.50 thru 42.75)	Table 1	7—7
Assembled Gear Backlash Tolerances	Table 2	7—12
Circular to Diametral Pitch Conversion	Table 3	7—13
Hub Advance and Temperature Chart	Table 4	7—45
Cap Screw Torque Values	Table 5	7—47
Wire Rope Clip Spacing	Table 6	7—53
O-Ring Modes of Failure	Table 7	7—76
Decimal Equivalents—Inches to Millimeters	Table 8	7—76
Permissible Coupling Misalignment and End Float	Table 9	7—82
Coupling Installation Data	Table 10	7—90

Follow this installation procedure for split seals:

Remove garter spring and separate at the hook and eye

Open the seal ends sideways for installation on shaft as shown in Fig. 2 by moving the butt ends along the axis of the seal.

Lubricate spring and install around shaft. Connect ends and insert spring in lip groove with spring ends 90° away from butt joint.

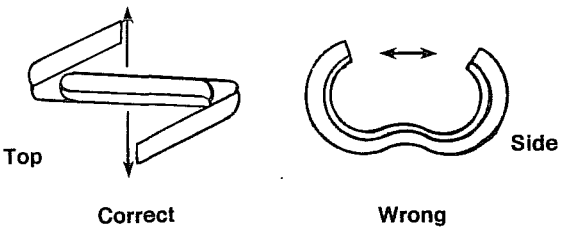


Figure 2
Split Seal Installation

CAUTION: Do not trim or cut ends of split seals or pull ends apart. This will destroy seal.

Gear case seals used for all oil tight gear case assemblies require surface preparation on one side of case flanges with a 1/100 inch thick Form-a-Gasket #3 (Permatex Co.) coating. If using a manila paper gasket always replace with a new one, never reuse. Apply Form-a-Gasket #3 to both sides of the paper gasket. Tighten gear case cover bolts until seal material "squeezes out" at joint.

When surface finishes range up to 250 microinches a compression type gasket seal is recommended. This material (VELLUMOID available in standard thickness inches (mm) 1/64 (.397), 1/32 (.794) 1/16 (.063) and 1/8 (.125) should also be installed with Permatex applied to both sides.

7

GEAR ALIGNMENT ECCENTRICS (Draglines Only)

There are two methods of sealing Marion gear alignment eccentrics. For eccentrics that are rigid (without o-ring seal) coat the surface of the eccentric with permatex liquid sealer FORM-A-GASKET No. 3 (MPSD 134562-1) Coating of sealer should be brushed over the total surface area of both contacting surface's according to the illustration and notes.

A. Coat this surface thoroughly with "Permatex" prior to assembly.

B. This contact surface may or may not receive a laminated shim depending on design. Coat this surface thoroughly prior to assembly and when shims are used coat surfaces on both sides of shim material.

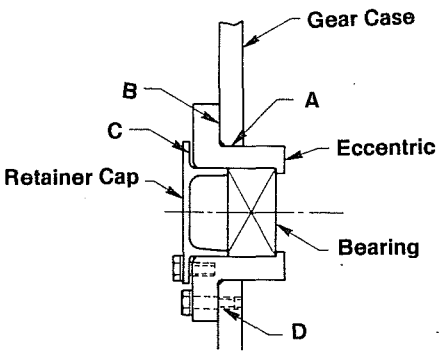


Figure 3
Eccentric Cartridge

ORIENTATION

Reference centerlines are selected relative to a plane defined by the pinion and gear axis of rotation as shown in Fig. 9A and 9B. They are selected for the pinion shaft ends only. One reference centerline is in the plane (X-X) and the other is perpendicular (Y-Y) to the plane.

It does not matter if the reference centerlines were opposite from those selected in Fig. 9B, as long as one reference centerline is in the plane and the other one is perpendicular to the plane.

From the previous section on eccentric cartridge theory, shaft end No. 1 will move perpendicular to the reference centerline, that is, along the X-X axis. This movement could also be described as moving shaft end No. 1 "into" or "out of" mesh. Obviously then, shaft end No. 2 would move in a direction perpendicular to end No. 1 or along the Y-Y axis. This movement is often referred to as the "cross-bearing" adjustment.

OUT OF PLANE ADJUSTMENT

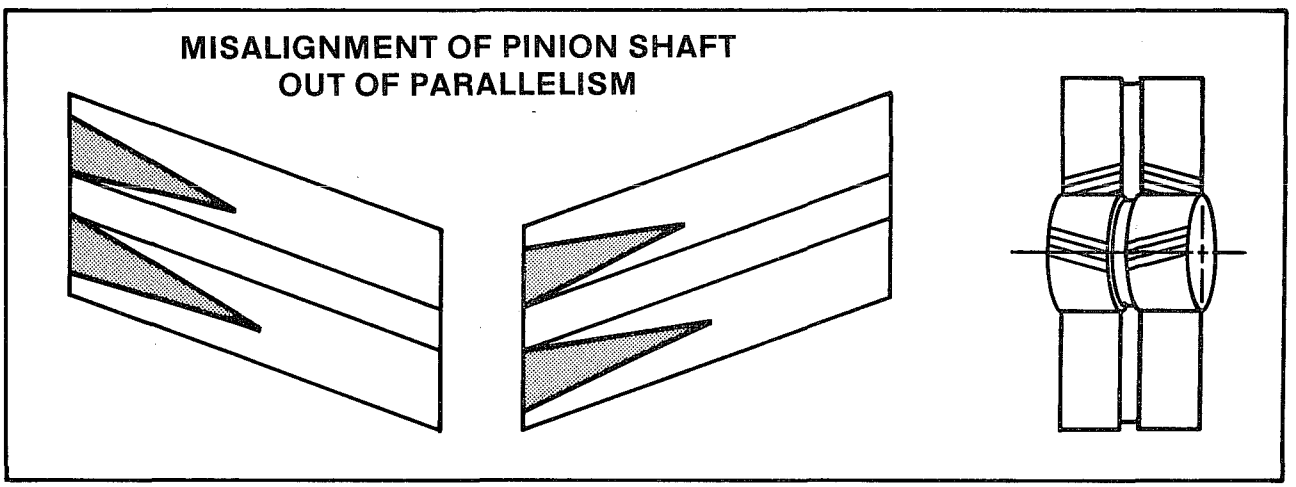
When shaft end No. 2 is moved along the Y-Y axis (Fig. 9B) the adjustment is called out of plane because it seems to move out of the plane of interest.

OUT OF PARALLEL ADJUSTMENT

When shaft end No. 1 is moved along the X-X axis (Fig. 9B) the adjustment is called out of parallel because it seems to move the shafts out of parallel.

COMMENT

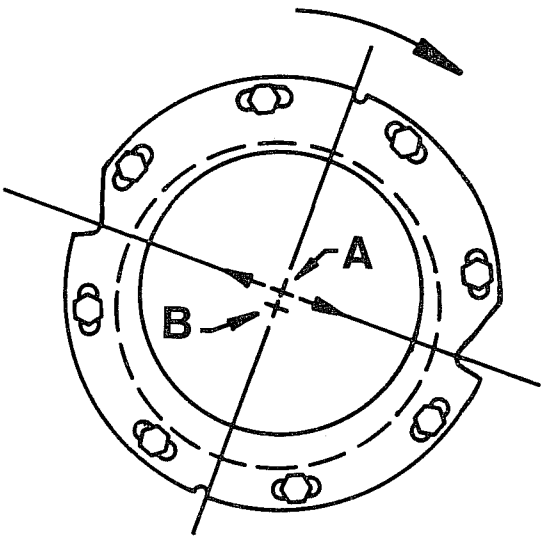
It is recognized that both of the aforementioned adjustments seem to move the shafts out of parallel. However, to identify the direction of adjustment the "out of parallel" and "out of plane" nomenclature are used.



CORRECTIVE ADJUSTMENT

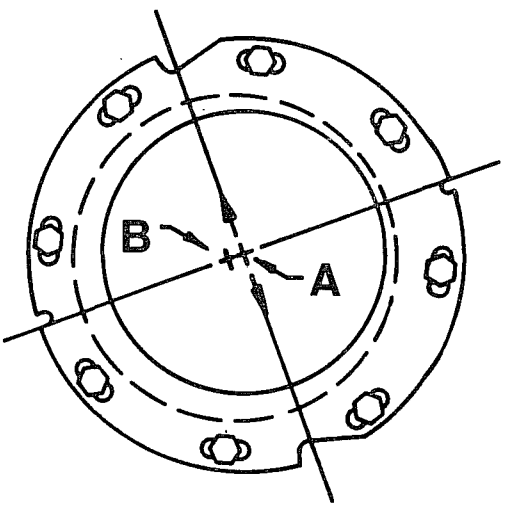
VIEW A-A

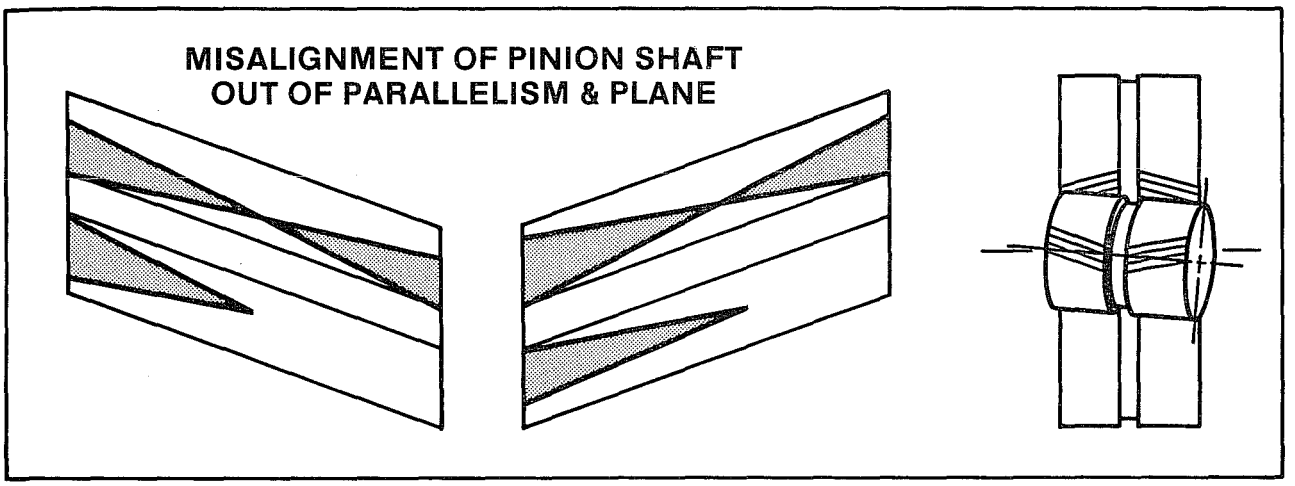
ADJUST ECCENTRIC IN CLOCKWISE DIRECTION.



VIEW B-B

NO ADJUSTMENT REQUIRED.

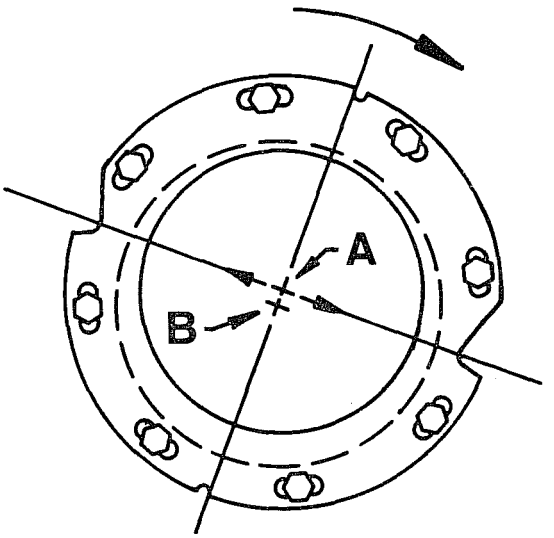




CORRECTIVE ADJUSTMENT

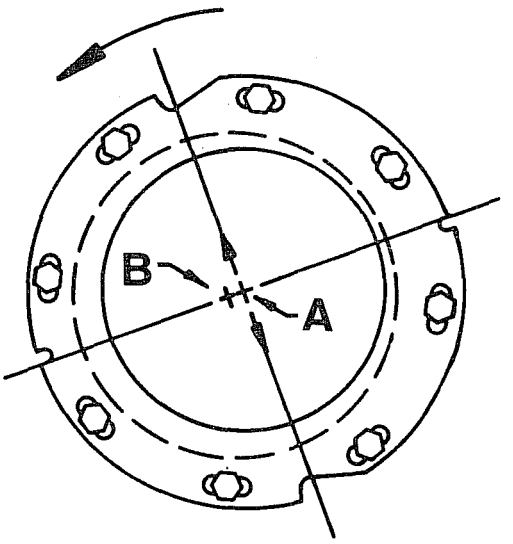
VIEW A-A

ADJUST ECCENTRIC IN CLOCKWISE DIRECTION.



VIEW B-B

ADJUST ECCENTRIC IN COUNTER-CLOCKWISE DIRECTION.



WIRE ROPE CARE

Wire rope manufacture uses the finest material available. Wire rope is more vulnerable to abuse and neglect than any other component on this machine. By comparison to other industrial applications, wire rope on mining equipment remains relatively short lived and hence considered an expendable item. Replacement of hoist and support ropes represents a sizeable investment; so every effort must be applied to extend the useful life of ropes.

The vulnerability to abuse and mishandling may cause a new rope permanent damage during installation. Improper removal from reel or coil often causes kinks. Pulling on rope until loop radius reduces to point where wire rope bends beyond the metal elastic limit creates these kinks. Pulling rope over a small sized sheave causes a kink also. Even when kink appears straightened, the strand damage and weakness remains.

Abrasion or nicks caused by pulling a rope over sharp objects weakens the rope. Wire rope needs protection from possible damage when a winch or lifting device attaches to strands forming a dogleg bend in the rope.

A coil of rope correctly unwound is rolled, (like a hoop), along a smooth surface and away from the rope end.

When removing rope from reel, place a heavy shaft or pipe thru reel center and raise until reel turns freely. Allow this free turning as rope end is carried straight away from the reel. Use a wedge block or plank against the flange to act as a brake. Whenever possible, transfer rope directly from reel to drum. (See sketch). In case of overwind, transfer rope from top of reel to top of drum. Likewise, for underwind; transfer rope from bottom of reel to bottom of drum. Avoid any methods where a reverse bend in rope might occur.

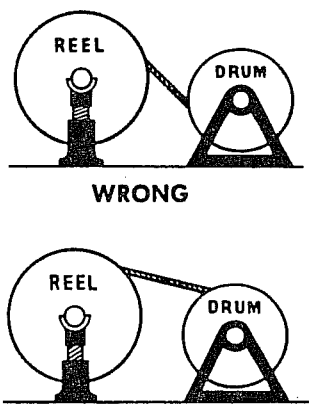


Figure 17
Rope Coiling Procedure

A good operator and maintenance crew develops the habit of watching ropes during work cycle to determine any damage in rope appearance caused by accident, broken wires, etc. Inspection determines, by careful measurement and comparison with a new rope, any loss in rope diameter. This loss at isolated spots indicates core failure. Where core failure occurs, the rope collapses and lay length (one full strand wrap) increases.

Diameter loss over a large area indicates normal outer wire wear. Wires wear more rapidly on a new rope due to minimum surface contact of each wire. As these wires wear, they present a flattened surface and the rate of normal wear decreases.

Step three is perhaps the best possible method of determining the material. If the above methods are not feasible and it is determined the risks are minimal, an analysis of the equipment can be made by categorizing the parts. The categories would be structural components such as plates, beams and bars, castings, and forgings. The structural components (plates, beams, and bars) can be divided into four areas; such as, (1) mild steel, (2) medium strength steel, (3) high strength steel, and (4) wear resistant type steels. Steel castings and forgings can be categorized the same way; (1) low carbon, (2) medium strength and wear, and (3) high strength and wearability.

The electrode tensile strength and the preheat parallel the material categories as follows:

Type of Steel	Electrode	Preheat
Mild Steel	E70XX	70°F (21°C) to 150°F (66°C)
Medium Strength Steel	E70XX, E80XX	70°F (21°C) to 250°F (121°C)
High Strength and Wearability Steels	E90XX, E100XX, E110XX	150°F (66°C) to 300°F (149°C)
Castings & Forgings		
—Low Carbon	E70XX	70°F (21°C) to 150°F (66°C)
—Medium Carbon	E70XX, E80XX	100°F (38°C) to 450°F (232°C)
—High Strength and Wearability	E90XX, E100XX, E110XX	250°F (121°C) to 600°F (316°C)

Lower and upper frames of draglines and mining shovels are usually made of structural mild steel. The boom and its components are made of medium strength steel. Buckets and dippers use high strength wear resistant type steels. There are very few castings made of low carbon steel. The majority of steel castings can be classified as to the job they perform. Hubs and bearing supports can be considered as medium strength and wear while gears, sheaves, shafts, bucket castings are high strength, high wear components.

Brake shoe components are usually made of cast iron, therefore, it is not recommended to weld on these parts because of the product liability risk and the poor reliability of the weld.

Do not weld or tack any lifting lugs, aligning lugs, or hold down lugs on any parts unless you know the type of material. The lugs could pull out at the weld because the right procedure was not used. This could cause damage to a part, a person, or some other parts. Do not over-weld when adding attachments such

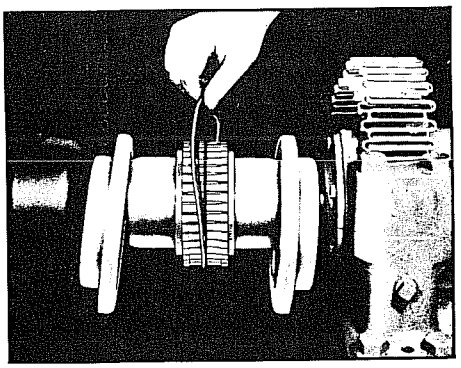
use a balance welding technique by alternating a pass on each side of the tooth. Do not weave but use a stringer bead technique. Clean each pass of slag. If a GTAW welding machine is available, blend in the last two layers with this process. Peen each bead except for the first bead and last layer. Visual inspect the completed repair job. Use the template during the welding operation to check on any distortion.

STEP 8: Postheat by holding the heat at 550°F (288°C) for one hour after welding has been completed.

STEP 9: Allow the gear to slow cool at a rate of 50°F (10°C) per hour until it reaches 150°F (66°C). After it reaches ambient temperature, grind the root contour.

STEP 10: Inspect the repair visually and with magnetic particle inspection. Check all critical dimensions. Check the hardness of the tooth.

A weld repair can be very successful if it is thought out carefully and these repair weld procedures are followed.

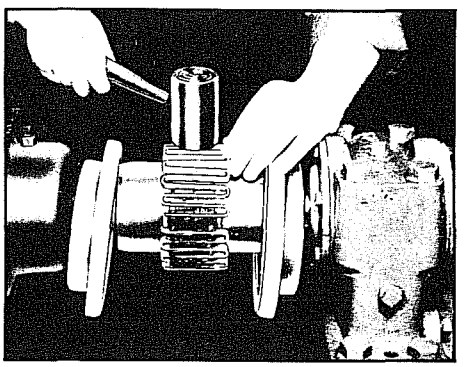


4 INSERT GASKET AND LUBRICATE

4. Once aligned, carefully insert gasket between hubs and hang it on either hub. DO NOT DAMAGE gasket. Force as much lube as possible into gap and gridmember grooves.

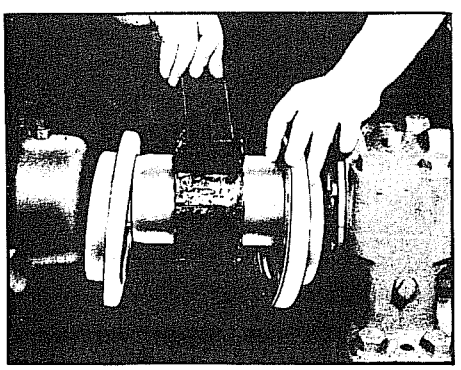
5. Insert gridmember. Coupling sizes 3 thru 11 use a single layer grid, painted aluminum. Size 12 thru 190 use a two layer grid with the inner layer painted aluminum and stamped IN while the outer layer is painted bronze and stamped OUT.

   Installation—Gridmember rungs, truly radial, need spreading slightly to pass over coupling tooth at its O.D. To do this with minimum spreading, start grid at either end and tap rungs only part way into grooves. Once all rungs are partially into respective grooves, tap grid all the way in. When installing a two layer grid, center the outer layer sections over free ends of inner layer.



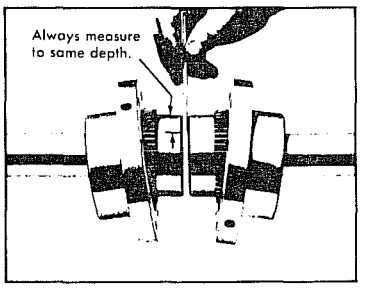
5 INSERT GRID

Removal—A round rod or screwdriver of a size to easily fit into open loops ends of grid is all that's needed. Begin at open end of grid section and insert rod into loop ends. Use next tooth as a pry point and pry grid out radially, in EVEN and gradual stages. Proceed alternately from side to side, lifting grid about halfway out until end of grid is reached. By repeating same steps again, grid clears teeth.



6 PACK WITH LUBRICANT

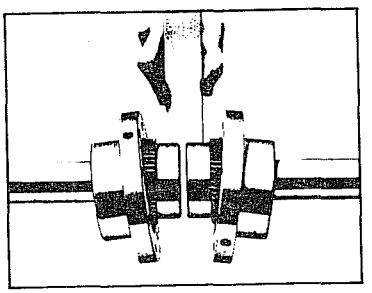
6. Pack spaces between and around grid with as much lube as possible. Scrape or wipe excess lube off flush with grid. Lightly oil hubs to ease sliding covers onto hubs.



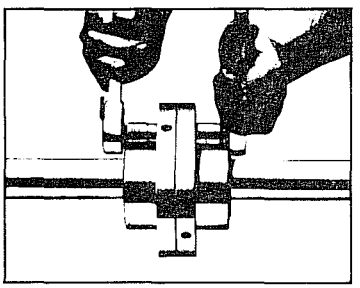
3 GAP AND ANGULAR ALIGNMENT

3. GAP AND ANGULAR ALIGNMENT—Use a spacer bar equal in thickness to gap specified in Table. Insert bar, as shown, to same depth at 90 degrees intervals and measure clearance between bar and hub face with feelers. The difference in minimum and maximum measurements should NOT exceed the ANGULAR limit specified in Table.

4. OFFSET ALIGNMENT—Align so that a straight edge rest squarely on both hubs as shown and also at 90 degree intervals. Check with feelers. Clearance should NOT exceed OFFSET limit specified in Table. Tighten ALL foundation bolts and repeat steps 3 and 4. Realign coupling if necessary. Grease hub teeth.



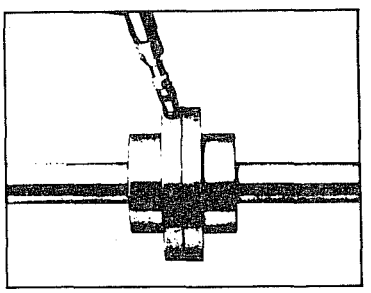
4 OFFSET ALIGNMENT



5 INSERT GASKET AND JOIN FLANGED SLEEVES

5. INSERT GASKET AND JOIN FLANGED SLEEVES—Insert gasket, DO NOT DAMAGE GASKET, between flanges. Position flanged covers with lube holes at 90 degrees and draw flanged cover into position. Use bolts, nuts and lockwashers furnished with couplings. IMPORTANT: Tighten flange bolts and nuts to torque specified in Table.

6. LUBRICATION—Fill with grease until excess appears at an open hole; then insert plug. Continue procedure until all plugs have been inserted. IN ADDITION, vent TOP flanged sleeve by inserting a 0.010 inch thick SMOOTH feeler gauge between seal and hub. Fill until excess appears at feeler. Repeat at 90 degree intervals. **CAUTION:** INSERT ALL plugs after lubricating.



6 LUBRICATE

25,000 HOUR MAINTENANCE INSPECTION SCHEDULE
VISUAL CHECK POINTS
DAILY — EVERY 24 HOURS

MACHINE IDENTIFICATION			
MODEL		S/N	
SHIFT	1	2	3
OPERATOR			
INSPECTOR			

DESCRIPTION	STATUS		ACTION / REMARKS
	YES	NO	
14. Bucket — Hoist Chain — Upper/Lower	☐	☐	Check links for twist and cracks.
15. Bucket — Drag Chain — Upper/Lower	☐	☐	Check links for twist and cracks.
16. Bucket — Wire Rope Sockets/Connections	☐	☐	Check condition of rope and connections.
17. Bucket — Spreader Bar Assemblies — Upper and Lower	☐	☐	Check for cracking.
18. Bucket — Trunnion Connect Points	☐	☐	Check for cracking RH and LH.
19. Bucket — Dump Rope Rigging	☐	☐	Check condition of chain.
20. Bucket — Wire Rope Dump Line	☐	☐	Check condition of anchor.
21. Bucket — Arch Structure	☐	☐	Check for cracks.
22. Bucket — Corner Castings	☐	☐	Check for cracks.
23. Bucket — Lip Casting	☐	☐	Check for cracks.
24. Bucket — Teeth	☐	☐	Identify missing and replace.
25. Bucket Wear Plates	☐	☐	Check material remaining.
26. Bucket Heel Casting	☐	☐	Check wear.
27. Basket Structure	☐	☐	Check for cracks.
28. Lubrication — Bucket Rigging	☐	☐	Verify distribution.

25,000 HOUR MAINTENANCE INSPECTION SCHEDULE
OPERATIONAL CHECK POINTS
MONTHLY — EVERY 600 HOURS

MACHINE IDENTIFICATION			
MODEL		S/N	
SHIFT	1	2	3
OPERATOR			
INSPECTOR			

DESCRIPTION	STATUS YES	STATUS NO	ACTION / REMARKS
1. Compressor Crank Case Oil	☐	☐	Change.
2. Walking Shoe Return Assembly	☐	☐	Check rope and spring condition. Clean and readjust accordingly to obtain correct shoe position.
3. Intermediate Boom Support Rope	☐	☐	Verify gauge tension and adjust to correct specifications.
4. Perform Electrical Ground Circuit Check	☐	☐	Electrician Megger check. Trip relays for grounding system.

MONTHLY — EVERY 600 HOURS