Technical Manual

FIRE PREVENTION

Always have a "charged" fire extinguisher on hand and know how to use it. Inspect and service the extinguisher as indicated on its instruction plate.

DO NOT smoke while handling flammables or when near batteries.

Inspect all lines, tubes, and hoses carefully. Tighten all connections to the recommended torque. See the Visual Inspection Schedule for the walk around inspection procedure.

Loose or damaged lines, tubes, and hoses, which leak, can cause a fire.

Make certain that all clamps, guards, and shields are replaced correctly so as to prevent vibration and the rubbing of one part against another which might result in heat build-up during operation.

DO NOT carry flammable fluids such as gasoline or solvents on board the machine.

DO NOT over-bend or strike pressurized hose lines. *DO NOT* install bent or damaged lines, tubes, or hoses. Replace them with new immediately.

DO NOT start the machine or move any of the controls if a warning tag is attached to the controls or the start panel.

Keep all cleaning rags properly stored. *DO NOT* discard them into a pile on board.

Keep all structural frame compartments, walkways, and work areas clean and free of lubricant residue.

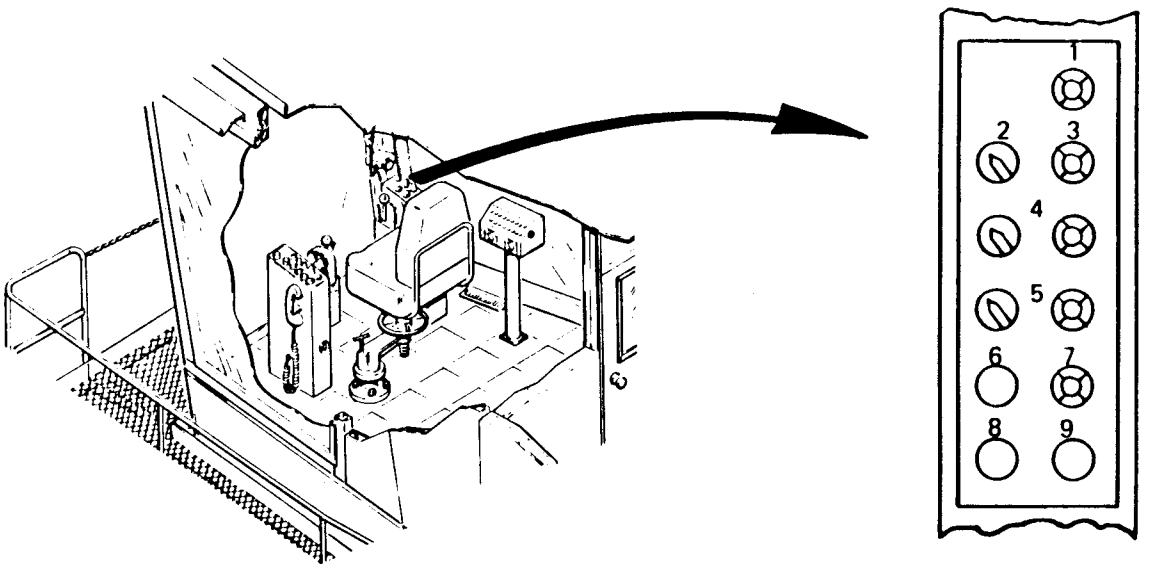
NEVER weld, burn, or perform service on the machine alone.

If a motor or other component is running hot, shutdown the machine until it has cooled and/or the cause eliminated.

back into the power source, thus preventing heat created by mechanical friction brakes.

If hoist or drag controllers are returned to neutral with machine in motion, the control automatically plugs that motion to slow it down and finally come to rest.

CONTROL PANELS on top (incline portion) of each controller stand contains push buttons, selector switches and indicator lights; all clearly marked.



The panel located atop hoist stand (right hand) contains five lights, three selector switches and three push buttons. They are:

1. Propel Brake. This red light will come on when the propel brakes are set.

2. Drag-Propel Brake. This switch will either set or release the drag or propel brakes depending on which mode the machine is in.

3. Drag. This red light, when lit, indicates the drag brakes are set.

4. Swing Brake. Moving this switch to the left sets the swing brakes and right movement releases them. The red light will come on when the brakes are set.

5. Hoist Brakes. This switch either releases or sets the hoist brakes. The red light, when lit, indicates the hoist brakes are in the set position.

Start the filter fan system. First, start the bleed duct fan by depressing "start number one" push button. After allowing the bleed duct fan to run for about 15 seconds, start the main fan by depressing the "start number two" push button. Mkae sure the indicator is lit but the sound of the fans will tell you they are operating. Shutdown immediately if unusual sounds are heard. The filter fans introduce clean air into the house to cool the operating equipment. The fans create a positive pressure, in house, to prevent dust accumulation. Be sure to operate with doors closed.

After all systems are functioning properly, leave the house and proceed to the operator's cab.

Upon entering operator's cab, observe the air pressure gauge. This gauge provides a visual reference of the air system pressure and should read from 95 to 115 psi during operation.

Press the test button on warning panel and all lamps should light. If a lamp doesn't light, either the lamp or fuse is bad, replace if need be. If a lamp is on, investigate the reason before start-up.

Check the hoist, swing and drag/propel brake switches to be sure they are in the set position. Next, check the position of the hoist and drag controllers to be sure they are in neutral and no pressure on swing pedals.

Press **DRAG MODE** push button, bottom left hand on left hand control stand, then press the push button marked excitation start on right hand stand. This will energize the operating controls. Next, turn the hoist, swing and drag brake switches to release position. Push the excitation start button again, this will release the brakes and shut off the red indicator lights. The machine is now operational.

The operator controls the machine, its usefulness and the crew alone thinks for it. Safety, on mind, prevents accidents. PLEASE KEEP safe operating procedures in mind at ALL times.

NOTES:

SECTION 3

LUBRICATION

Application of CORRECT lubricant in the CORRECT amount thru a CORRECT program is required for the successful operation of any machine. Proper lubrication reduces maintenance and increases component life. Absence of proper lubrication wears moving parts quickly and failure results.

LUBRICATION FITTINGS on plain and anti-friction bearings not served by the automatic lubrication system are hydraulic type push on fittings, 1/8" or 1/4" as per MPSD standard. When contamination creates a problem, as in slow speed bearings using labyrinth seals, new grease may be added until clean grease seeps out of the seal. When a bearing runs excessively warm due to overfilling, remove the pressure fitting and allow excess lube to escape. Allow bearing to operate and purge excess lube for 10-15 minutes, then replace fitting.

ANTI-FRICTION BEARINGS, grease lubed, requires the full quantity of lube as specified in the Lubrication Charts. Ball and roller bearings require only a relatively small amount of lube and relube intervals are generally long with good seals. Accurate predetermination of when to add new grease is impossible. Grease in a bearing generally deteriorates gradually, not suddenly. Thus only a small amount need be added. A small amount of lube applied every 500 operating hours, unless otherwise specified, maintains adequate lubricating properties.

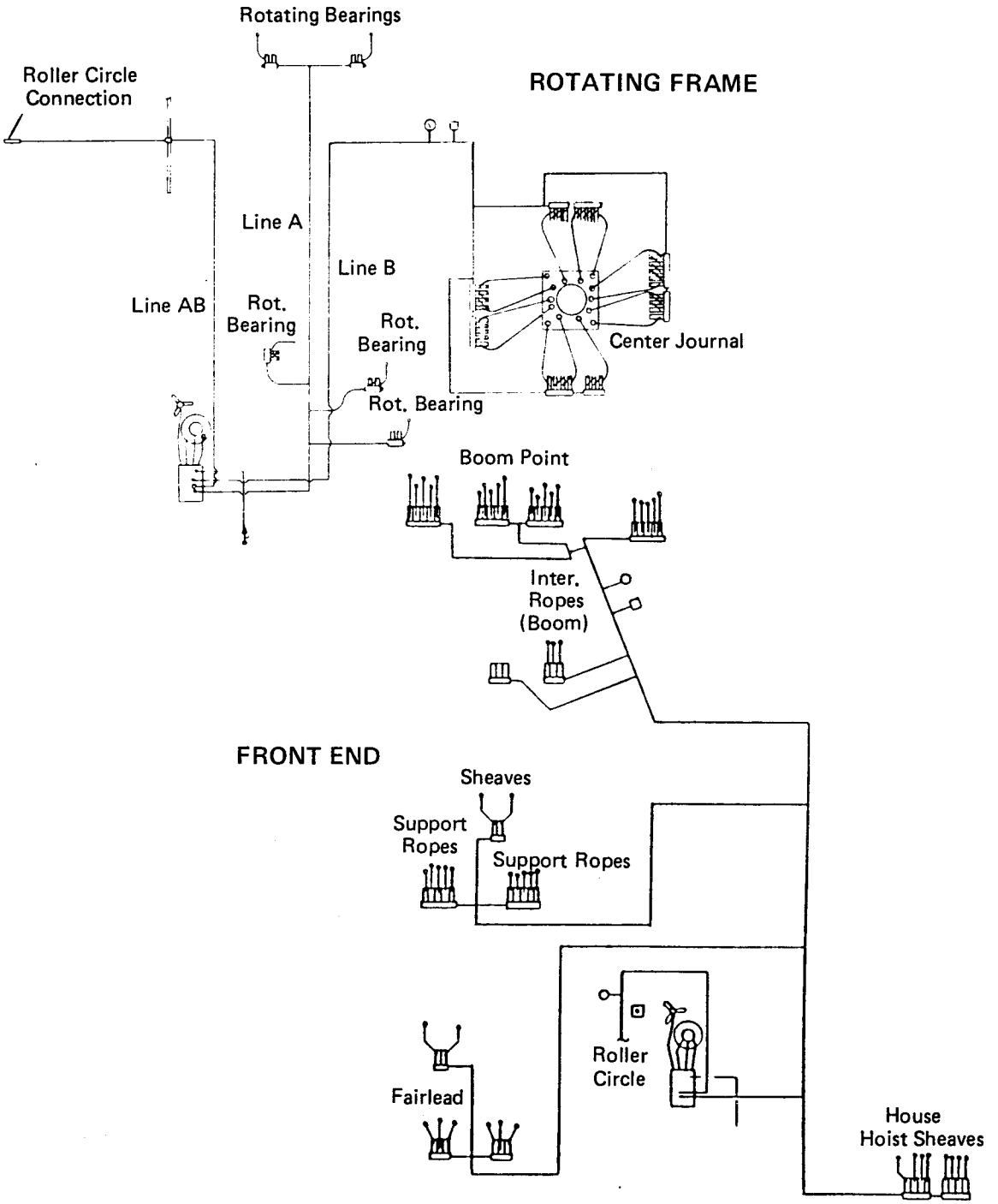
OPEN GEARS and pinions require a constant coat of a good grade of lubricant.

ENCLOSED GEAR CASES must maintain the recommended lubricant level. Check the dipstick or plug at regular intervals. When a seasonal change of lube occurs, pump used oil into a drum for final disposal. Drain all remaining oil from case thru drain plug opening. Flush gear case with fuel oil or light lube oil after draining. Refill with proper lube.

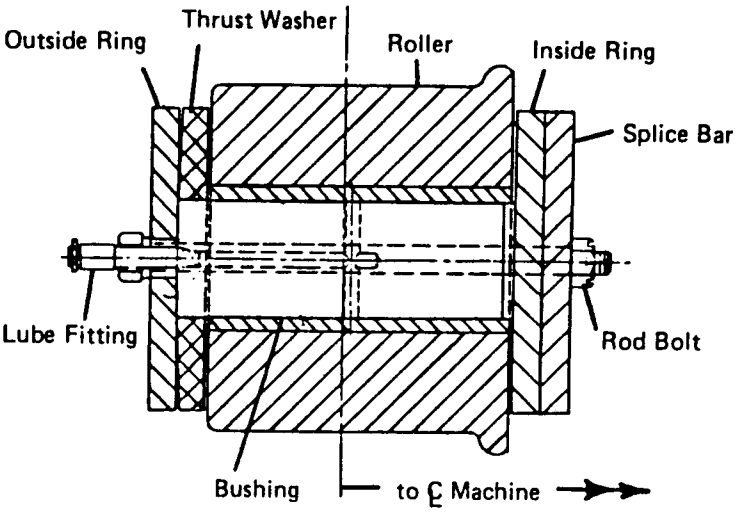
EXTREME TEMPERATURE OPERATION of this machine below -20 degrees F. (-29 degrees C.) or above 110 degrees F. (44 degrees C.) requires special lubrication recommendations. Contact your local supplier or Marion Power Shovel Division at Marion, Ohio 43302. Give full particulars concerning specific conditions of your operation.

NAME OF PART	TYPE	NO. OF POINTS	LOCATION	LUB. SYM.	METHOD AND FREQUENCY
Propel Motor Coupling	—	1	Fill Thru Plug in Flange	MPG	Hand, 500 Hrs.
Propel Motor Extension Shaft	Anti-Friction	—	From Gear Case	GL	—
Intermediate Propel Shaft	Anti-Friction	2	From Gear Case	GL	—
Propel Gear Case	—	1	Fill at Dip Stick	GL	Check Daily, 205 gal. capacity, each case
Propel Motor	Anti-Friction	2	In Motor End Bell	EMG	Hand (See Electrical Section)
Shoe Return Spring Case	—	4	In Top of Spring Case	MPG	Weekly
Rope Deflector Sheave Shoe Return	Bushing	2	In End of Roller Shaft	MPG	Weekly
Shoe Roller	Plain	2	In End of Roller Shaft	MPG	Weekly
Propel Coupler Spline	—	2	At Propel Case	OGL Type B	Keep Coated
LUBRICATION OF CENTER JOURNAL					
Center Journal Bearing	Anti-Friction	4	In Top of Bearing Housing	MPG	Automatic
Center Journal Bushing	Bushing	6	In Top of Bearing Housing	MPG	Automatic
Sleeve	Bushing	4	End of Sleeve	MPG	Automatic
Collector Ring Mount	Nylatron	1	In Conduit Tube	MPG	Hand, 500 Hrs.

The **AUTO LUBE FOR ROTATING FRAME** supplies the center journal area, hose for roller circle, points on boom, mast and gantry. This system cycles Line A once every 3-3/4 minutes when propelling, Line B once every 15 minutes in dig cycle and Line AB will operate in the dig or propel cycle. The alarm is set for 100 seconds. The air pressure regulator is set at 80 psi. The end of line pressure is set at 2500 psi. This system uses a 400 pound drum of MPG grease.

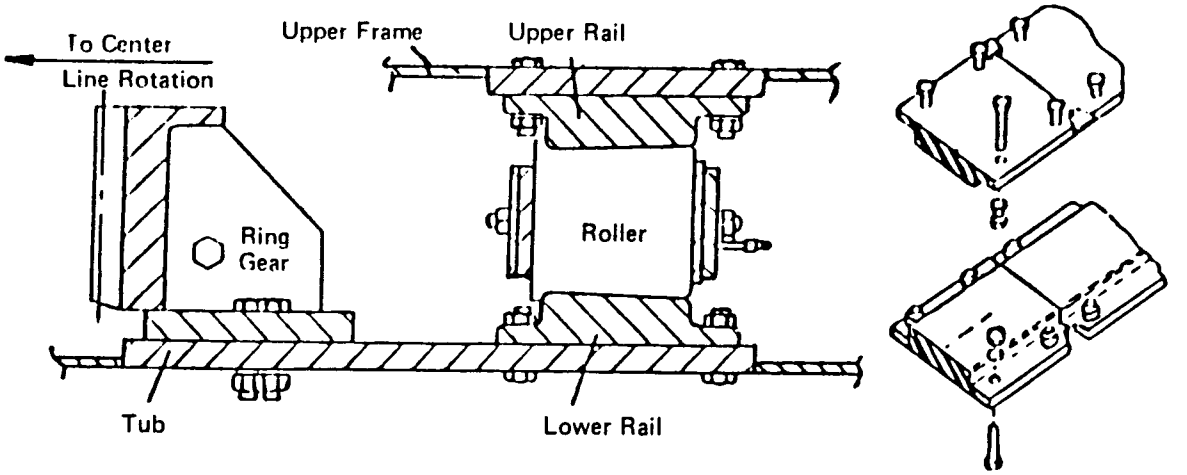


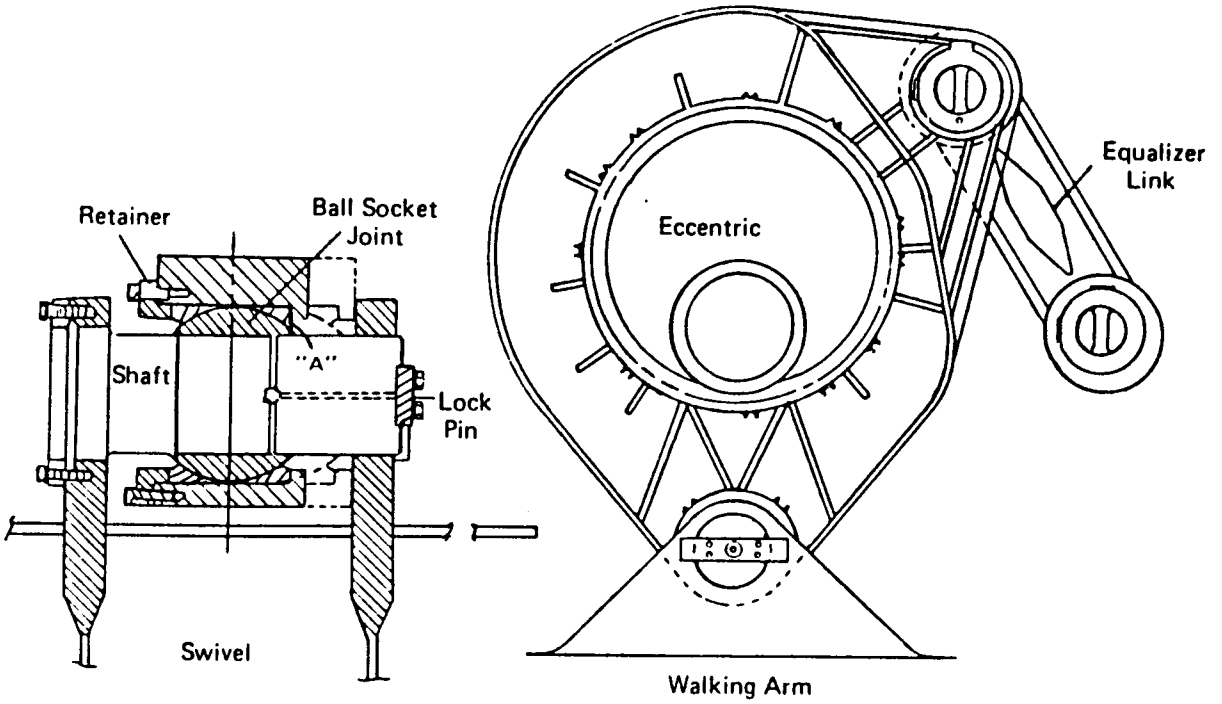
The **ROLLER CIRCLE** contains 120 tapered, single flange, hardened steel rollers. Each roller is held between two concentric steel rings by rod bolts. A thrust washer is located between the roller and outer ring.



Remove roller from the circle AT ONCE if it becomes chipped, broken or damaged in any way to prevent damage to rails and other rollers. Remove roller by rotating machine until damaged roller is directly below opening thru rotating frame, that is at left on machine and to rear of swing gear case. Next remove lube lines and rod bolts, (it may be necessary to loosen the adjacent rollers rod bolt). Use suitable tongs or sling to lift damaged roller from circle. The replacement roller diameter MUST NOT exceed the diameter of the adjacent rollers. Match to (+/-) .002 measured at large end radius. Lower new roller in place and re-assemble rod bolts and lube lines. Be sure roller flange is turned toward center of machine.

Both **ROLLER RAILS** have been accurately aligned concentric with the center journal on a machined surface. The tub rail forms a circle and is bolted in place thru the rail flange.





The female portion of the swivel bushing must be fitted to the ball BEFORE the ball swivel joint is assembled. Be sure the halves fit together at center. Measure clearance at point "A" and match mark.

Assemble joint by inserting inside half of bushing first, next to ball, pin and then the outer. Before retainer ring is assembled make sure dowel holes and lube passage in housing and bushing are in line. Use measurement at "A" to determine if bushings are in the proper place. Assemble bushing retainer ring tight against bushing.

CAUTION: When propelling machine DO NOT use the shoe to pull trail cable.

The **WALKING SHOE RETURN MECHANISM** returns the shoes parallel to the rotating frame after shoe is returned to the park position. This done by two spring loaded wire ropes at each shoe. The spring case is welded to the underside of the rotating frame. The ropes reeve thru a sheave also on bottom of rotating frame and then is attached to an adjustable U-bolt anchor on walking shoe.

Adjust return by turning the clevis nut on return spring rod against spring case end plate until rod is extended 1 foot 9 inches. Run nuts to end on the walking shoe anchor U-bolts to make available 4 inches of adjustment.

Only the drive gear is inside oil tight gear case. The pinion that turns main drum shaft gear is an open gear with suitable guard. A split oil seal on the shaft between gear and pinion is installed with lip turned toward drive gear. See Engineering Data Section for installation of grease seals.

DISASSEMBLE GEAR CASE by removing case cover hold down bolts, the cap screws from top half of bearing retainer plate at intermediate shaft and the motor extension shaft assembly. Loosen cap screws in bottom half of bearing retainer plate, about two turns. Remove split oil seal from intermediate shaft and remove pins from outboard bearing housing. Lift off case cover from over intermediate shafts. It may be necessary to drive a small wedge between case and cover to break seal.

Remove cap screws from lower half of bearing retainer plates. Use a sling around shaft, lift intermediate shaft assembly out of case. Lift assembly along a line perpendicular to surface of gear case and allow gear to turn out of engagement with main drive gear. Separate motor couplings and remove motor extension shaft assemblies from case.

Drain and clean gear case, flush out with light oil.

Reverse procedure to reassemble unit.

ECCENTRIC CARTRIDGE MOUNTING OF EXTENSION SHAFT GEARS – Each hoist, drag or propel motor extension shaft cylindrical roller bearing mounts in an eccentric cartridge housing. Accurate axial alignment of motor extension shaft and pinion is obtained in BOTH planes by using these cartridges.

Each cartridge is machined so the index boss fits the gear case bore. The cartridge has a flange concentric to the index bore with slotted mounting holes. The cylindrical roller bearing bore is machined eccentric to the index bore.

One cartridge mounts in gear case (motor side) to allow the eccentric anti-friction bore movement perpendicular to intermediate gear radius as the cartridge turns in the index bore.

Likewise, the cartridge mounted at the far side allows bore movement parallel to the intermediate gear radius. Each has a flange notch for use to bump the cartridge into position. The bearing bore eccentricity is slight and within the allowable misalignment range of the cylindrical roller bearing.

Tooth contact between gear and pinion indicates TRUE alignment or nature of misalignment.

Slide bearing carrier sleeve over spherical bushing and attach inside bearing retainer ring.

Install sheave hub with tapered roller bearing and bearing spacers. At this time hand pack bearings with MPG. Assemble outside bearing retainer.

Complete assembly with inside split retainer ring and dust boot. Reassemble point shaft assembly in point structure.

Before torsion bar is attached loosen or remove all bolts in anchor plate and center bearing flange plate.

Block or secure point sheaves. The sheaves MUST BE PERPENDICULAR to center line of shaft when torsion bar is installed. Attach top of torsion bar to bearing carrier.

Measure space between bottom flange or torsion bar and bulkhead anchor plate. This space must be completely filled with shims. One of the three shims provided is laminated, peel laminations with sharp knife to obtain proper thickness. Attach flange to bulkhead anchor plate. If holes in the bar flange and holes in bulkhead anchor plate do not align radially, the holes in the anchor plate should be filled with weld and ground smooth, then lay out and redrill new holes.

CAUTION: THE TORSION BAR MUST BE INSTALLED IN A NO STRESS CONDITION. DO NOT BEND, TWIST OR STRETCH.

Install torsion bar center support bearing in similar manner. The center support bearing must not place any bending stress on the torsion bar.

INSTALLATION OF CLASS "C" BOLTS – Class "C" bolts are identified by six (6) radial marks on bolt head. Bolted surfaces must be clean and free of scale, rust, paint and burrs. Use Class "C" flat washers and Class "C" nuts. DO NOT use spring lock washers. Install all bolts to be used in the assembly and draw nuts to SNUG FIT. Snug fit is described, "tight as can be turned with hand tools." Mark position of nut on bolt. Hold head of bolt and advance nut one half turn. Use impact wrench or hand wrench and a heavy hammer. The bolt tension will prevent nut from loosening.

NOTES:

ELECTRICAL TROUBLESHOOTING –

A job well done generally comes from an established procedure, whether a written or mental process. A procedure carries thru the steps from PREPARATION to INVESTIGATION, then on to PERFORMANCE. The absence of this procedure only wastes time. Using a good one cuts down time and ends in a satisfactory job.

PREPARATION: Before efficient troubleshooting begins; a background knowledge of the system is necessary, particularly what happens and how it happens from start to finish.

Practically all electric machines use the same system, whether Amplidyne, Rototrols, Magamps, Amplistats, controlled rectifiers or contactors. That is, when the operator initiates a motion by moving the controller, he produces an output from the master switch. This output connects to the control system containing many simple or complex devices. The control system output feeds into the generator for amplifying and then on to the motor. So, the system simply is a master switch, control, generator and motor.

Knowing the general system is step one. Next, a fair understanding of components, and what and how each functions, is needed.

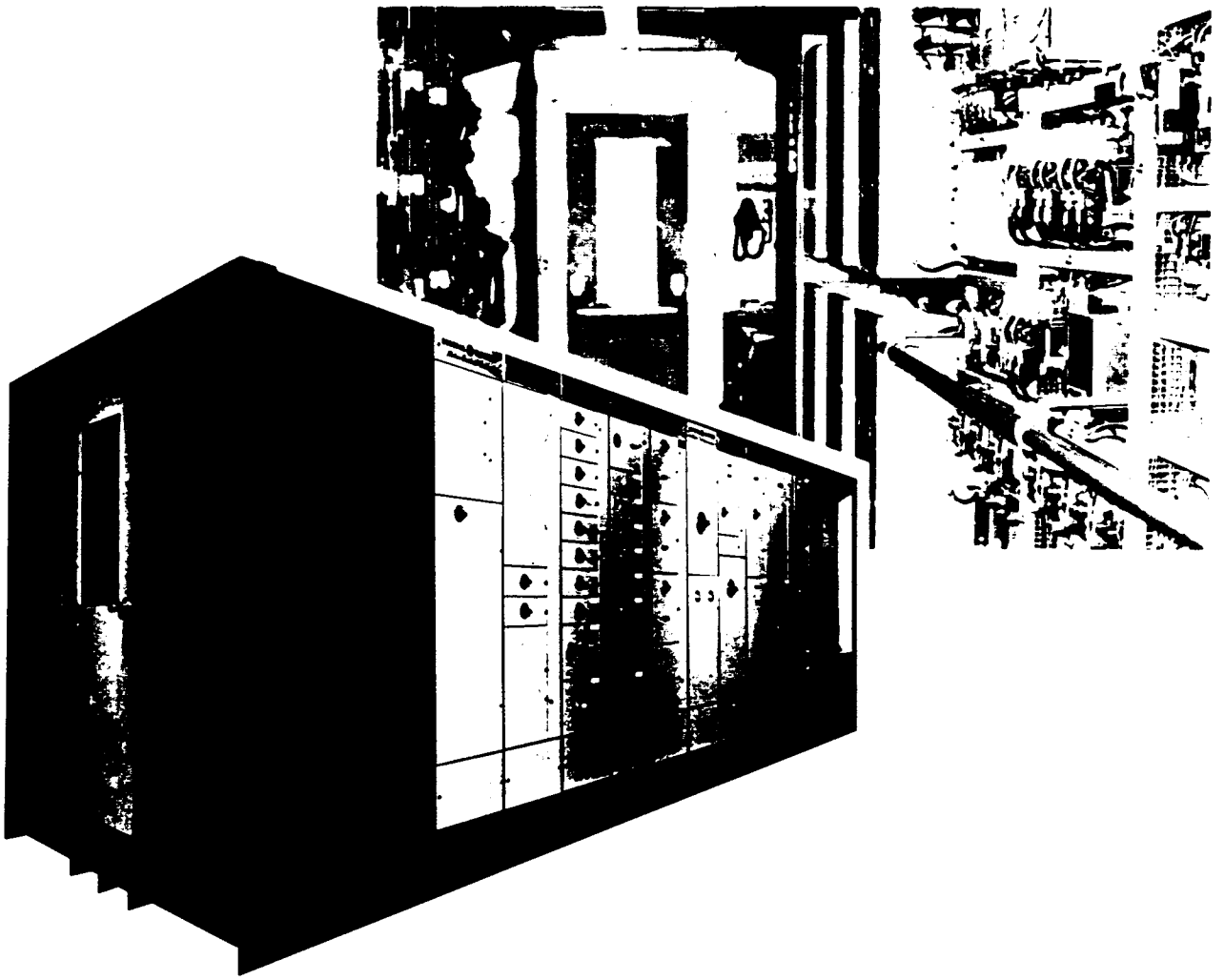
Motors, for example, convert electric energy into mechanical energy. This is done thru armature current interaction and field flux. Before a motor can turn, enough of each of these quantities must exist to overcome the load. Generators are the opposite of motors since they convert mechanical energy into electric energy. Generators require BOTH rotation and field flux to produce output.

Control components often are quite complex. The Instruction Book for the electrical equipment discusses them completely and reading it is a must. However, one can learn to isolate components or part groups without knowing exactly how each device operates.

Another preparatory step requires the wiring diagrams and test data be at hand. If unavailable, contact Marion for a supply. An understanding of the drawing is needed and often redrawing helps this learning process. The test data helps greatly since the normal electrical readings are listed. A major deviation from this recorded data indicates trouble and often pinpoints the location. Test sheets include stall or maximum generator armature current, no-load or open circuit, generator and control exciter field currents and certain measurements made in the control circuit. Other data considered helpful may be obtained from the machine when operating under normal conditions. Each of the items is listed only to easily locate trouble. Learning to use the data speeds the process.

Take the diagrams to machine, locate all devices shown. In many cases, special test points, indicating lights or instruments offer troubleshooting aid. Locate the various test points without these aids (one might fail) to measure the various quantities listed on the test data sheet.

Marion's POWER CONTROL ROOM (PCR) encloses electrical control components away from dirt, grease and dust. The segregation of control components into a room type module centralizes the responsibility of the electrician, thus improving control maintenance.



POWER CONTROL ROOM

The PCR is supplied with a constant source of clean filtered air under pressure affording the ideal environment for efficient operation of electrical components.

PCR is completely factory wired and only the input and output connections must be made during field erection.

TABLE 1
RUNNING CLEARANCES FOR BRONZE BUSHINGS
Inches (Millimeters)

SHAFT			SHAFT		
Nominal Diameter	Outside Diameter	Running Clearance	Nominal Diameter	Outside Diameter	Running Clearance
1 (25.4)	1.000-.999 (25.4-25.375)	.006-.010 (.152-.254)	4.25 (107.95)	4.250-4.248 (107.950-107.899)	.010-.019 (.254-.483)
1.25 (31.75)	1.250-1.249 (31.750-31.725)	.005-.010 (127-.254)	4.50 (114.3)	4.500-4.498 (114.300-114.249)	.010-.019 (.254-.483)
1.50 (38.10)	1.500-1.499 (38.100-38.075)	.008-.013 (.203-.330)	4.75 (120.65)	4.750-4.748 (120.650-120.599)	.014-.022 (.279-.559)
1.75 (44.45)	1.750-1.749 (44.450-44.425)	.008-.013 (.203-.330)	5.0 (127.0)	5.000-4.998 (127.000-126.949)	.011-.020 (.279-.508)
2.0 (50.8)	2.000-1.999 (50.800-50.775)	.007-.012 (.178-.305)	5.25 (133.35)	5.250-5.248 (133.350-133.299)	.011-.020 (.279-.508)
2.25 (57.15)	2.250-2.248 (57.150-57.099)	.006-.013 (.152-.330)	5.50 (139.7)	5.500-5.498 (139.700-139.649)	.012-.020 (.305-.508)
2.50 (63.5)	2.500-2.498 (63.500-63.449)	.006-.013 (.152-.330)	5.75 (146.05)	5.750-5.748 (146.650-145.999)	.012-.021 (.305-.533)
2.75 (69.85)	2.750-2.748 (69.850-69.799)	.008-.015 (.203-.381)	6.0 (152.40)	6.000-5.998 (152.400-152.349)	.012-.021 (.305-.533)
3.0 (76.2)	3.000-2.998 (76.200-76.149)	.008-.015 (.203-.381)	6.25 (158.75)	6.250-6.248 (158.750-158.699)	.012-.021 (.305-.533)
3.25 (82.55)	3.250-3.248 (82.550-82.499)	.008-.015 (.203-.381)	6.50 (165.10)	6.500-6.498 (165.100-165.049)	.012-.021 (.305-.533)
3.50 (88.90)	3.500-3.498 (88.900-82.499)	.008-.015 (.203-.381)	6.75 (171.45)	6.750-6.748 (171.450-171.399)	.013-.022 (.330-.559)
3.75 (95.25)	3.750-3.748 (95.250-95.199)	.011-.019 (.279-.483)	7.0 (177.8)	7.000-6.998 (177.800-177.749)	.013-.022 (.330-.559)
4 (101.6)	4.000-3.998 (101.600-101.549)	.010-.011 (.279-.483)	7.25 (184.15)	7.250-7.248 (184.150-184.099)	.013-.022 (.330-.559)

TABLE 2
ASSEMBLED GEAR BACKLASH TOLERANCES

CENTER DISTANCE inches (millimeters)		DIAMETRIAL PITCH									
		.5 (14)—.625(16)		.75 (19) .875 (22) 1.0 (25)		1.25 (32) 1.50 (38) 1.75 (44)		2.0 (51) 2.5 (64)		3.0 (76) 3.5 (89) 4.0 (101)	
FROM	TO	MIN[1]	MAX[2]	MIN[1]	MAX[2]	MIN[1]	MAX[2]	MIN[1]	MAX[2]	MIN[1]	MAX[2]
	20 (508)					.020 (.51)	.070 (1.78)	.016 (.41)	.062 (1.57)	.010 (.25)	.050 (1.27)
20 (508)	40 (1016)			.026 (.66)	.086 (2.18)	.020 (.51)	.070 (1.78)	.016 (.41)	.062 (1.57)	.012 (.30)	.052 (1.32)
40 (1016)	60 (1524)	.040 (1)	.104 (2.64)	.026 (.66)	.086 (2.18)	.020 (.51)	.070 (1.78)	.018 (.46)	.064 (1.63)		
60 (1524)	80 (2032)	.040 (1)	.104 (2.64)	.028 (.71)	.088 (2.24)	.024 (.61)	.074 (1.88)	.024 (.61)	.070 (1.78)		
80 (2032)	100 (2540)	.044 (1.1)	.108 (2.74)	.030 (.76)	.090 (2.29)	.028 (.71)	.078 (1.98)				
100 (2540)	120 (3048)	.044 (1.1)	.108 (2.74)	.036 (.91)	.096 (2.44)	.036 (.91)	.086 (2.18)				

[1]When adjustment capabilities are designed into the open gear or pedestal mountings, backlash values should be selected between the minimum (MIN) and the *average* values as determined from the range indicated.

[2]Maximum (MAX) values may increase by an additional .010 (.254mm) when an eccentric adjustment for alignment has been made in the plane of centers of an enclosed gear case.

THEORY

Eccentric cartridges are designed to provide one axis of movement for the shaft end and bearing. Refer to Figure 8A for a simplified but typical eccentric cartridge assembly where the shaft end is represented by the intersection of bearing centerline and shaft centerline.

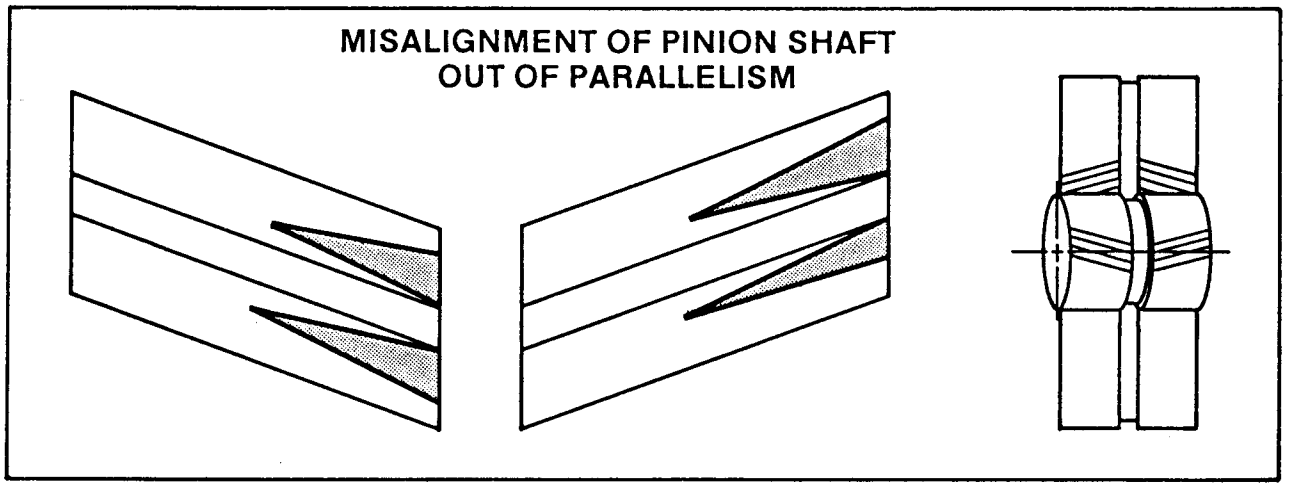
Whenever the cartridge is rotated it revolves about the centerline of the case bore. Furthermore, every point of the cartridge rotates about the same centerline. This includes the shaft end, which is represented by an end view of the shaft centerline.

Figure 8B is an enlarged end view of the relationship between the shaft centerline and the case bore centerline. The shaft end clearly rotates about the case bore centerline at a distance equal to the eccentricity of the cartridge.

If the cartridge is rotated a great amount, as shown in Figure 8C, the shaft end will move along on two axes instead of the required single axis movement. In fact the shaft end will always move on two axes.

However, as shown in Figure 8D, by limiting cartridge rotation the amount of movement on one axis is small enough to ignore and movement is limited to a single axis for all practical purposes.

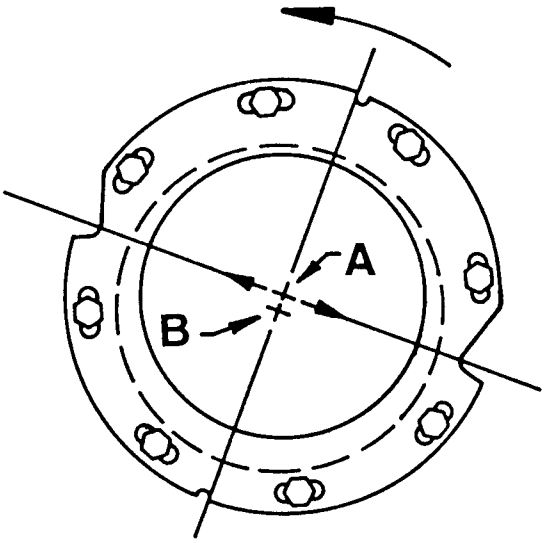
Notice that shaft end movement is measured relative to a reference centerline (Ref. ℄) that must be established on each shaft end. Movement of the shaft end is *always perpendicular* to the reference centerline.



CORRECTIVE ADJUSTMENT

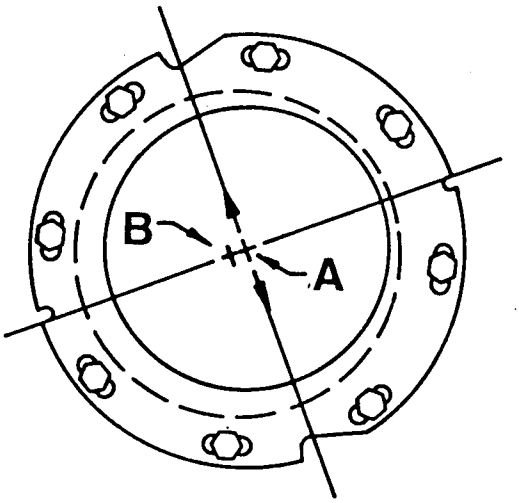
VIEW A-A

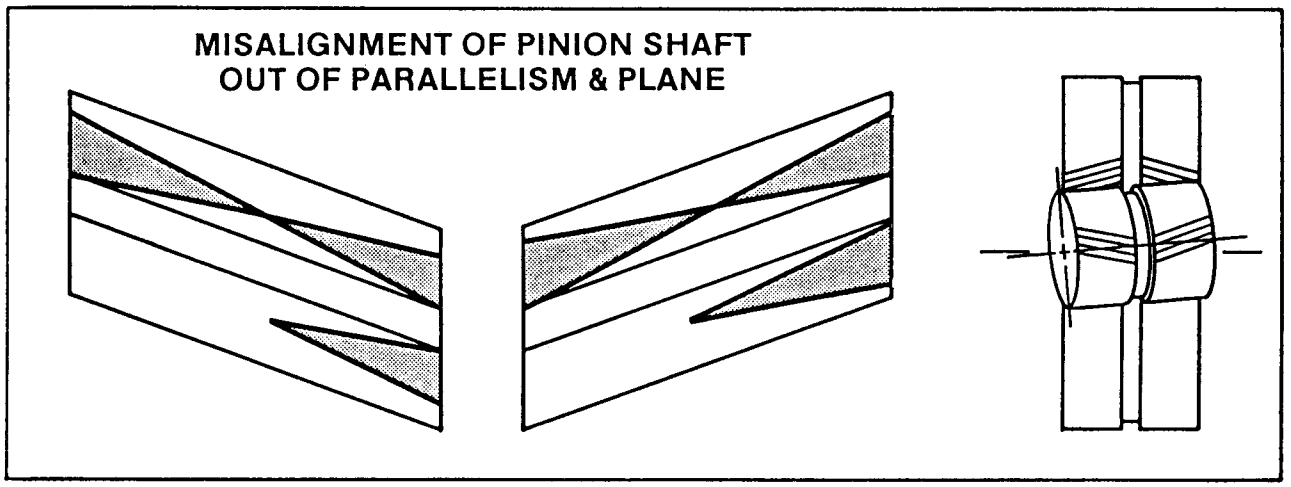
ADJUST ECCENTRIC IN COUNTER-CLOCKWISE DIRECTION.



VIEW B-B

NO ADJUSTMENT REQUIRED.

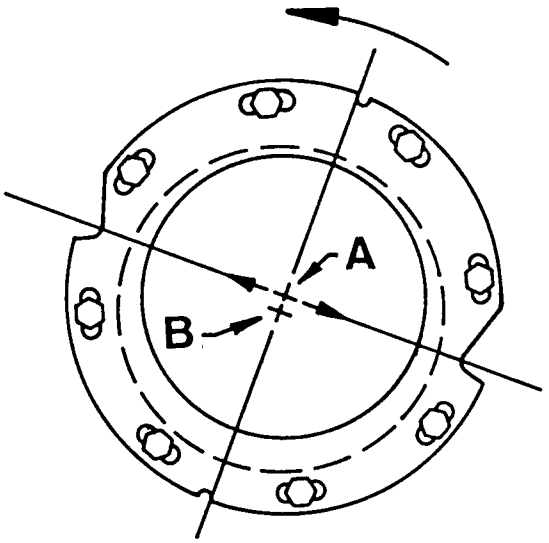




CORRECTIVE ADJUSTMENT

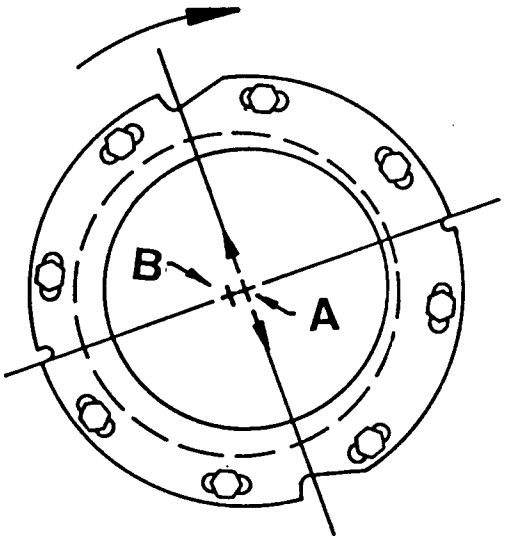
VIEW A-A

ADJUST ECCENTRIC IN COUNTER-CLOCKWISE DIRECTION.



VIEW B-B

ADJUST ECCENTRIC IN CLOCKWISE DIRECTION.



TORQUE METHOD: The recommended torque values listed in the following TABLE apply to non-plated fasteners as received from manufacturer with no special lubricants applied.

Also, the values are based on "Unified Course" threads.

TABLE 5
TORQUE VALUES

Fastener		Grade 5		Grade 8 & Socket Hd.	
Dia. (in.)	(MM)	Ft.-Lb.	Nm	Ft.-Lb.	Nm
5/16 — .31	7.87	17	23	24	33
3/8 — .38	9.65	30	41	43	58
7/16 — .44	11.18	48	65	70	95
1/2 — .50	12.70	75	102	105	142
5/8 — .62	15.75	150	203	210	285
3/4 — .75	19.05	265	359	375	509
1 — 1.00	25.40	645	875	905	1,227
1-1/4 — 1.25	31.75	1,200	1,519	1,820	2,468
1-1/2 — 1.50	38.10	1,950	2,644	3,160	4,285
1-3/4 — 1.75	44.45	2,285	3,098	4,990	6,766
2 — 2.00	50.80	3,440	4,664	7,500	10,170
2-1/4 — 2.25	57.15	5,030	6,820	10.970	14,875
2-1/2 — 2.50	63.50	6,875	9,322	15,000	20,339
2-3/4 — 2.75	69.85	9,320	12,637	17,800	24,136
3 — 3.00	76.20	12,315	16,698	23,510	31,878

WIRE LOCKING CAP SCREWS

Wire locking of cap screws is used when maximum lock assurance is required when periodic visual inspection is not possible.

Illustrations in the Figure 16 show recommended wire lock methods for various right hand thread cap screw patterns. For patterns not shown, wire lock screws "in pairs". For odd numbered patterns, wire lock remaining "three" cap screws together.

STEP 1—Clean the Worn or Fractured Part or Area to be Repaired or Rebuilt

One of the most important considerations of a welding repair procedure is to clean the fractured area or worn part of all oil, grease, paint, moisture, dirt, rust, spalled material, or any other material that may be detrimental to a weld.

Hydrogen has a bad effect on the properties of weld metal and can be found in most of the mentioned contaminates. As molten weld metal cools and solidifies, the hydrogen is rejected from the solution and becomes entrapped in the solidifying weld metal. It will collect at grain boundaries or at discontinuities of any type where it will create high pressures, which will in turn cause high stresses within the weld. Theoretically, these pressures and stresses could lead to minute cracks in the weld metal which could develop into larger cracks. Hydrogen will gradually escape from the solid steel over time.

Any spalled material should be air carbon arc gouged off or ground off because contaminates can be trapped under the spalled material. The spalled material may not allow the welding arc to penetrate to solid material.

Inspect the worn or fractured areas closely by visual inspection and/or non-destructive testing such as magnetic particle inspection or dye penetrant inspection. This will help determine the extent of the fracture. If one of the NDT techniques are used, make sure instructions on proper use are followed.

Some methods of cleaning a part are steam cleaning, blasting, or burning off the oils and greases with a torch. The cleaning process must be analyzed depending on how and where the part will be repaired and the type of material that requires cleaning. If a heating torch should be used, make sure the operator of the torch is supervised closely. The flame should not be concentrated in one spot for long periods of time, but should be swept back and forth across the part. The burned ash can then be brushed off with a wire brush. Clean a large enough area around the fracture or worn part so that no contaminates reach the repair area.

STEP 2—Analyze and Inspect the Fractured or Worn Component for Proper Reporting

The initial task is to seek out and compile as complete a history as possible of the failed or worn part. The following is a list of items that will be useful in analyzing the failure.

1. Determine when, where and how the failure occurred. Interview the operators.

EXAMPLES OF CORRECT WELD REPAIRS: A sheave with a rope groove worn. Rebuild and keep as a spare.

STEP 1: Clean the sheave of all grease and oils for inspection of any fractures and clean it of contaminates that would be detrimental to welding.

STEP 2: Inspect the sheave visually and with magnetic particle inspection for signs of any other fractures. Compare the cost of rebuilding the groove with a new sheave. The decision is made to send the sheave to the manufacturer for rebuilding.

STEP 3: A review of the print shows the material is MN-MO cast material.

STEP 4: The sheave will be prepared for welding by sending it to the machine shop for a light clean-up cut to machine off any spalled material. The sheave will then be mounted on a welding positioner for rebuilding. Make a template to use as a guide to measure the depth of the weld metal.

STEP 5: Since the manufacturer has flame hardening equipment, a heat treatable type electrode will be used such as 4130 flux cored electrode and a constant voltage power source.

STEP 6: Use two preheating torches while rotating the welding positioner to preheat to 350°F (177°C). Use a temperature indicating device to continually check the preheat throughout the welding operation.

STEP 7: With automatic welding equipment, start welding at the center of the groove and as the groove builds up, start each layer at the groove walls and work to the center. Clean each pass of slag. Use the template to determine the correct amount of weld metal build up for machining. Once preheating has begun, do not stop until the job has been completed.

STEP 8: Since this part cannot be stress relieved in a furnace because of the machined hub, continue postheating the groove area for one hour. Keep the heat at 350°F (177°C)—450°F (232°C).

STEP 9: Slow cool by turning the torches down while the sheave is still rotating so it cools at a rate of 50°F (10°C) per hour until it reaches 150°F (66°C).

STEP 10: After the sheave has cooled down to ambient temperature, inspect the weld visually and by magnetic particle inspection.

STEP 11: Send the sheave to the machine shop for remachining to print contour.

Keep in mind: Dust is one of the meanest abrasives, mostly since it is hard to see.

Ozone, oxygen and moisture; over a long period of time act on O-rings also. Most manufacturers now add chemicals to slow or eliminate the effects; but correct storage is still needed.

Excessive heat is a problem, so storing O-rings on the top shelf near the tin roof is not good. Besides that, sunlight and flourescent light tends to age rings earlier. Use Polyethylene or brown glass jars to keep light out.

Contact between rings lying together in bulk or on hooks or pegs damages seal surfaces. When stored in the open, they collect dust and dirt. Also, bulk shipments often cannot be numbered. Keep rings away from steam pipes, heater conduits and areas where contact with water, oils, grease, solvents and other damaging fluids seems likely. Add replacement O-rings to the bottom or back of a bin as older parts move to the top or front to assure issue before a brand new one.

Individually packaged rings seem to have unlimited shelf life. Some maintenance shops use peg boards for individual packages of shop stock used daily. These are arranged by size on each board, but with ONLY ONE compound type per board.

BASIC THINGS TO REMEMBER:

Select the proper O-ring ONLY by part number.

Keep all parts clean.

Use compatible fluids and rings.

Use either individual containers or provide LABELED, clean, low light, storage.

DO NOT USE hardened steel tools when removing or installing rings.

Be sure new rings are not mixed or contaminated when put into labeled storage.

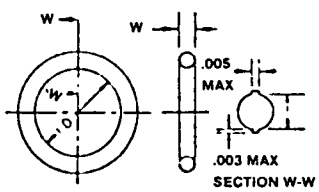
DO NOT INSTALL a dry O-ring on a dry shaft.

O-rings are almost always dimensioned in terms of cross-section diameter and inside diameter either in decimals or fractions.

Example:

Standard Size Cross Sections

Actual mm	Nominal	Actual (inch)
1.7780±0.0762	1/16	0.070±0.003
2.6162±0.0762	3/32	0.103±0.0003
3.5306±0.1016	1/8	0.139±0.004
5.3340±0.1270	3/16	0.210±0.005
6.9850±0.1524	1/4	0.275±0.006



Standard inside diameters for these various cross sections range anywhere from 1/32 to 26 inches. (.794 to 660 mm)

All in all, there are slightly more than 300 standard O-ring sizes.

INSTALLATION DATA* (Dimensions—Inches)

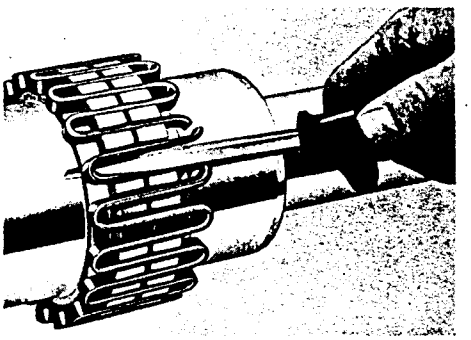
SIZE	Gap			Operating▪ Alignment Limits		Cover Bolt Torque (lb-in)	Max Speed (rpm)	Lube Wt (lb)
	Min	Nor-mal	Max	Offset (Max)	Angular (Max)			
150T	.062	.250	.500	.015	.015	650	1500	4.2
160T	.062	.250	.500	.015	.015	650	1350	6.2
170T	.062	.250	.500	.015	.015	1300	1225	7.7
180T	.062	.250	.500	.015	.015	1300	1100	8.3
190T	.062	.250	.500	.015	.015	1300	1050	9.7
200T	.062	.250	.500	.015	.015	2300	900	12.4
210T	.125	.500	.750	.020	.020	2300	820	25
220T	.125	.500	.750	.020	.020	3580	730	35
230T	.125	.500	.750	.020	.020	3580	680	55
240T	.125	.500	.750	.020	.020	5350	630	75
250T	.125	.500	.750	.020	.020	5350	580	110
260T	.125	.500	.750	.020	.020	5350	540	150

* Refer to Bulletin 421-110 for maximum bores and Engineering 427-108 for reboring instructions.
▪ Align couplings within "Operating Alignment Limits" specified above. Exceeding these limits reduces coupling life and the maximum speed stated.

6 PERIODIC LUBRICATION—Remove all lube plugs and insert lube fitting. Fill with recommended lubricant until an excess appears at an open hole; then insert plug. Continue procedure until all plugs have been inserted. CAUTION: Make certain all plugs have been inserted after lubricating.

COUPLING DISASSEMBLY AND GRID REMOVAL

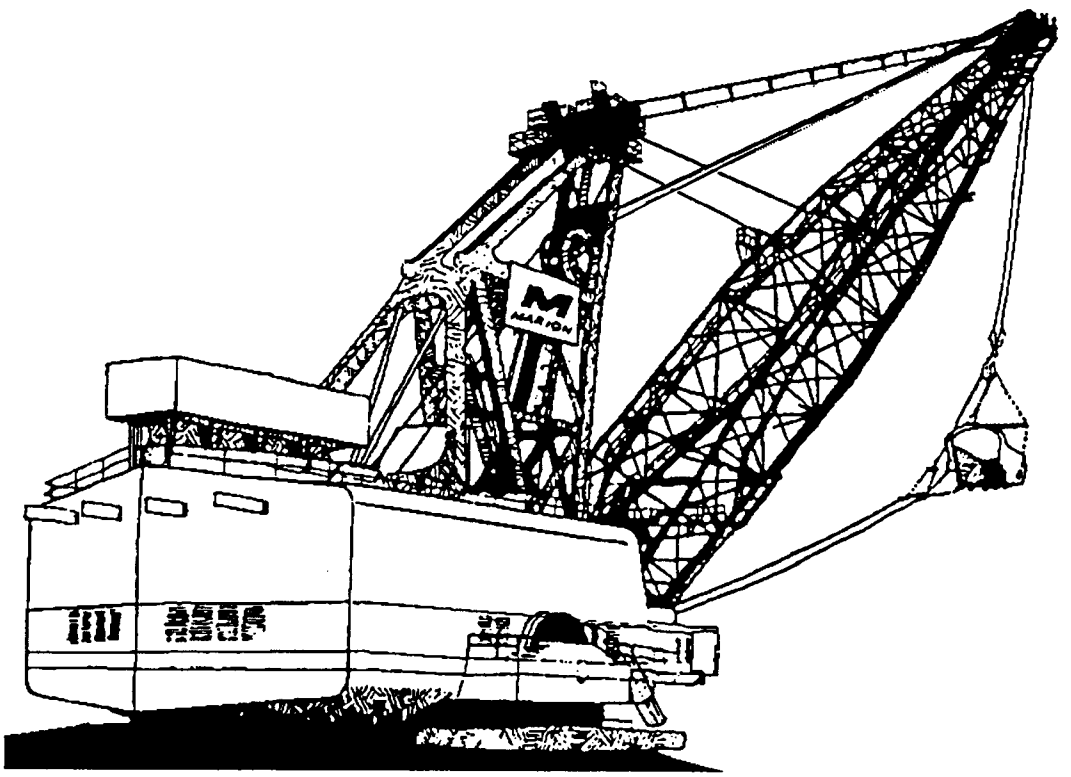
Whenever it is necessary to disconnect the coupling, remove the cover halves and grid. A round rod or screw driver that will conveniently fit into the open loop ends of the grid is required. Begin at the open end of the grid section and insert the rod or screw driver into the loop ends. Use the teeth adjacent to each loop as a fulcrum and pry the grid out radially in even, gradual stages, proceeding alternately from side to side.



Section 8

25,000 Hour
Dragline Maintenance
Inspection Schedule

The following maintenance schedule is based on a typical DRESSER / MARION 8000 series dragline. For any assistance, refer to the appropriate section in this manual, or contact the DRESSER / MARION service representative.



25,000 HOUR MAINTENANCE INSPECTION SCHEDULE
OPERATIONAL CHECK POINTS
WEEKLY — EVERY 150 HOURS

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

DESCRIPTION	STATUS YES	STATUS NO	ACTION / REMARKS
1. Air Compressor V-Belts	☐	☐	Tighten and adjust.
2. Air Compressor Intake Filter	☐	☐	Clean.
3. Autolube Systems Operation	☐	☐	Check leaks.
4. Swing Gear Cases	☐	☐	Shutdown oil circulating systems. Clean filter traps. Check for leaks.
5. Hook Shoe Rail Clearance	☐	☐	Inspect, readjust to ½ in.
6. All Motion Brake(s)	☐	☐	Check operation and readjust accordingly.
7. Center Journal	☐	☐	Check clearance with tub bearing and lock bar.
8. Swing Pinions/Gear Segments	☐	☐	Check mesh and bolts.
9. Rails/Rollers	☐	☐	Check lubrication, cages bushings and rods.
10. Boom	☐	☐	Climb and inspect.
11. Intermediate Support Rope	☐	☐	Check socket and lube.
12. Hoist Rope Deflector Sheave	☐	☐	Check bearing and lube.
13. Boom Point Sheaves	☐	☐	Inspect sheave condition, all bolts and dust boot.
14. Boom Point Torsion Bar Assemblies	☐	☐	Check wear.
15. Boom Automatic Lube Injectors	☐	☐	Check and identify leaks.
16. Boom Support Ropes	☐	☐	Check condition of connectors and lube.
17. Boom Lights	☐	☐	Check wiring runs and general condition.
18. Boom Structure	☐	☐	Check pipe lacing for cracks.
19. Boom Jib Crane	☐	☐	Check operation.
20. Tri Structure	☐	☐	Climb and inspect.
21. Main and Intermediate Support Ropes	☐	☐	Check all connectors and lube.
22. Tri-Structure Sheaves	☐	☐	Check tracking and bearings.