



Technical Manual

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PREVENTIVE MAINTENANCE

Machine downtime is costly to owners in lost production. Preventive maintenance is the task of identifying, replacing or repairing machine components before they fail so that downtime is minimized.



CAUTION: Do not perform inspection activities while machine is in operation.

Due to variations in operational wear rates of machine components and machine application conditions, component life cycles are different. A scheduled program of machine inspection with accurate record keeping can identify machine component and their rates of wear.

A continuous careful inspection routine can spot unusual conditions or fatiguing components before a failure occurs. Maintenance, repair and component replacement schedules should conform to scheduled machine shutdowns. If during daily, weekly or monthly inspection routines any part shows wear or distortion beyond expected normal patterns replace them with genuine Dresser parts at the next scheduled maintenance interval. The cost of parts is small when compared to unscheduled breakdowns with their resulting lost man-hours and machine production.

Machines which operate 24 hours, 7 days per week should have a scheduled 8-hour preventive maintenance period each 7-day period. See Section 8 for recommended inspection schedules.

Preventive maintenance inspection procedures listed below are suggested as an example of specific typical inspection activities. Each owner should establish his own preventive maintenance inspection schedule based on machine application conditions and production cycle.



CAUTION: Maintenance and operating personnel should be aware of mechanical and electrical hazards inherent in servicing this machine.

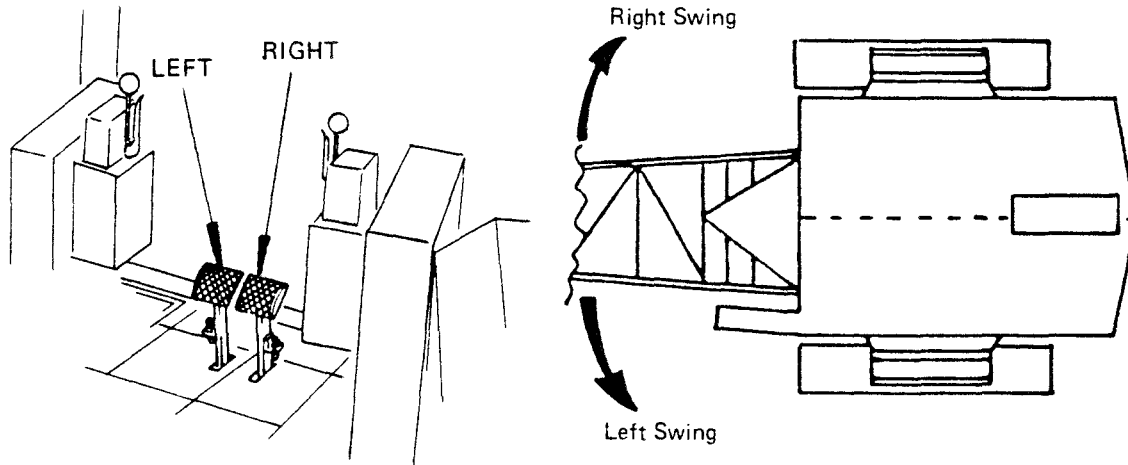
INSPECTION CHECKLIST

- Check condition of rope sheave grooves and bearings
- Test all hold down bolts with impact wrenches
- Check rope guides and bails for wear
- Inspect all rope for broken wire or loss in diameter
- Check auto-lube system for loose or damaged fittings and injector condition
- Inspect dipper/bucket for cracks



DANGER: Remove electrical power from machine whenever inspection of center journal, collector rings, rails or roller circle is performed. Use extreme care in removing guards and protective devices.

The swing pedals, centered on floor in front of seat, control the machine rotation. Pressing right pedal, machine swings right. Left pedal causes a left swing or rotation. The swing motion is stopped also by plugging the controls, that is, depressing opposite swing pedal to



slow or stop motions. The pedals are linked together so that only one pedal can be pressed. When no pressure is applied, the pedals will self-neutralize in the neutral position.

COMMENT ABOUT PRIMARY CONTROLS — The hoist and drag controller is a **SPEED REGULATOR**. Practically full torque or line pull is obtained with the slightest handle movement. Move lever only far enough to obtain desired speed. Do not move lever(s) too far, then back off. Use smooth movements, lever jockeying is not required and only results in overheating the motors.

The swing pedals are a **TORQUE REGULATOR**. The swing torque applied to machine increases as the pedal is pushed farther down and thus the acceleration rate is increased. This means full swing speed is obtainable at any pedal position.

PLUGGING THE MOTION means reversing the generator field to act as a braking force and stop motion. In normal operation, stop or retard the motion of D.C. drive motors by moving the control lever (or pedal) in the opposite direction. This reverses the current in the generator field. This reversing of field acts as a braking force, retarding or stopping the motion. At the same time the rotation reaches zero, you must move the controller lever (or pedal) to the neutral position. Plugging the motion rapidly dissipates the energy of heavy rotating parts by regenerating back into the power source, thus preventing overheat of mechanical friction brakes. If hoist or drag controllers are returned to neutral with machine in motion, the control automatically plugs the motion to slow it down and finally come to rest.

- 36. Kilowatt-Hour Meter — Totalizes power used by the machine.
- 37. Hand Reset Relay — Used for shutdown functions of frequency relay.
- 38. Propel Step Counter — Totalizes propel steps of the machine.
- 39.—43. Elapsed Time Meters for:
 - M-G set running time.
 - Hoist motion operating time.
 - Drag motion operating time.
 - Swing motion operating time.
 - Propel motion operating time.

NOTES:

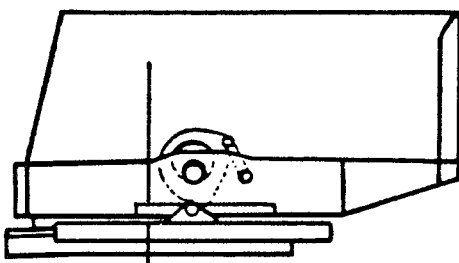
The shoes may be automatically stopped on PARK position in the following manner:

During the last desired step, press the SHOE PARK pushbutton and release. The illuminated pushbutton will flash, acknowledging the park command. When the shoes reach the PARK position, the light will go steady and the brakes automatically set and the drag controller de-energizes. Then move the drag-propel brake selector switch to SET and return the master switch to neutral.

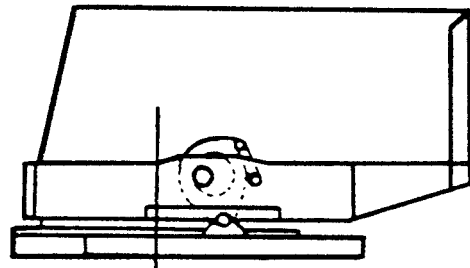
The propel machinery can be moved in either forward (normal) or reverse direction. The L.E.D. position indicators, located in the operator's cab, show the position of each mechanism.

If at any time the walking mechanism is not synchronized, the propel error warning light will light up. To synchronize mechanism, the propel error bypass push button, on drag stand, is used to override the synchronization circuit. The shoes are then realigned for parking.

WALKING MACHINERY — Two propel machine assemblies are located at each machine side. These assemblies operate independently except for an electrical (selsyn) connection that synchronizes the walking step.

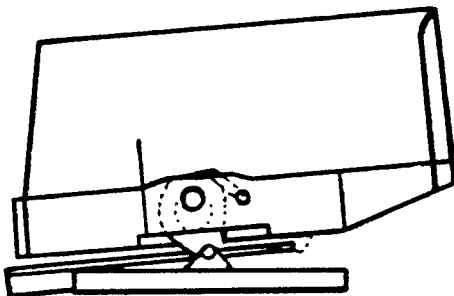


Park Position

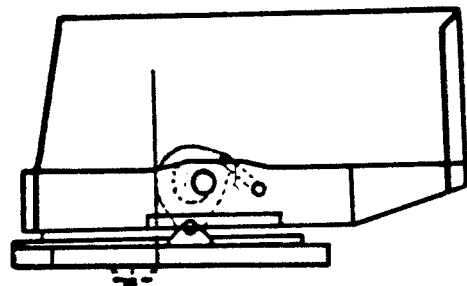


Phase 1 - Shoe on Ground

Movement of Machine



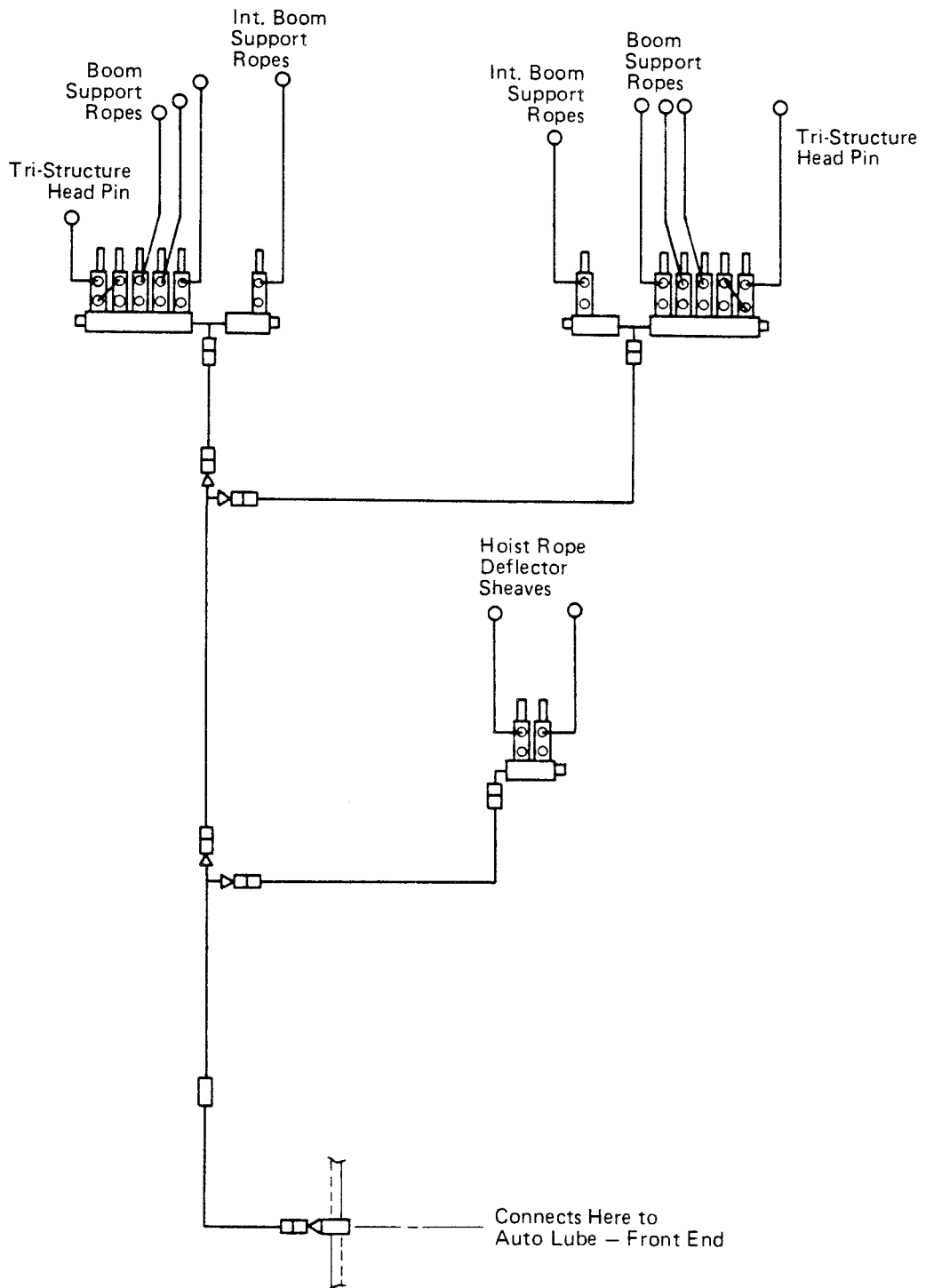
Phase 2



Phase 3

CODE	NAME	DESCRIPTION
OGI	Open Gear Lubricants	<p>2. Type H is usually an asphaltic type product requiring heat or a diluent for application. Diluents used in solvent cut-back products must have a fast evaporation rate and be non-flammable. They must not show separation in storage or service and should be suitable for use in automatic dispensing systems at low ambient temperatures.</p> <p>USES -- Open gears.</p>
EO	Engine Crankcase	<p>Diesel engine crankcase oils may be one of two (2) viscosity grades, SAE 20-20W or 30.</p> <p>1. Oil suitable for use in Cummins Engines of at least MIL-L-2104A, Sup. 1 level.</p> <p>2. A qualified series 3 oil for use in Caterpillar Engines.</p>
MO	Motor Oil	<p>A rust and oxidation inhibited non-detergent motor oil suitable for use in DeVilbiss and/or Ingersoll Rand piston type reciprocal air compressor crankcase lubrication.</p>
HL	Hand Lubrication	<p>Use oil (MO) above or a general machine oil (S-SAE 30, W-SAE 20W).</p>
GL	Enclosed Gear Case	<p>Use the same weight oil throughout the year if possible. Use as viscous a product as possible for maximum gear life.</p> <p>Loading shovels and smaller machines of crawler type:</p> <p>1. Use GL-140 in lower frame propel gear cases and other gear cases outside machinery house.</p> <p>2. For gear cases inside machinery house in older machines where oil is pumped, use GL-90 in winter and GL-140 in summer.</p>

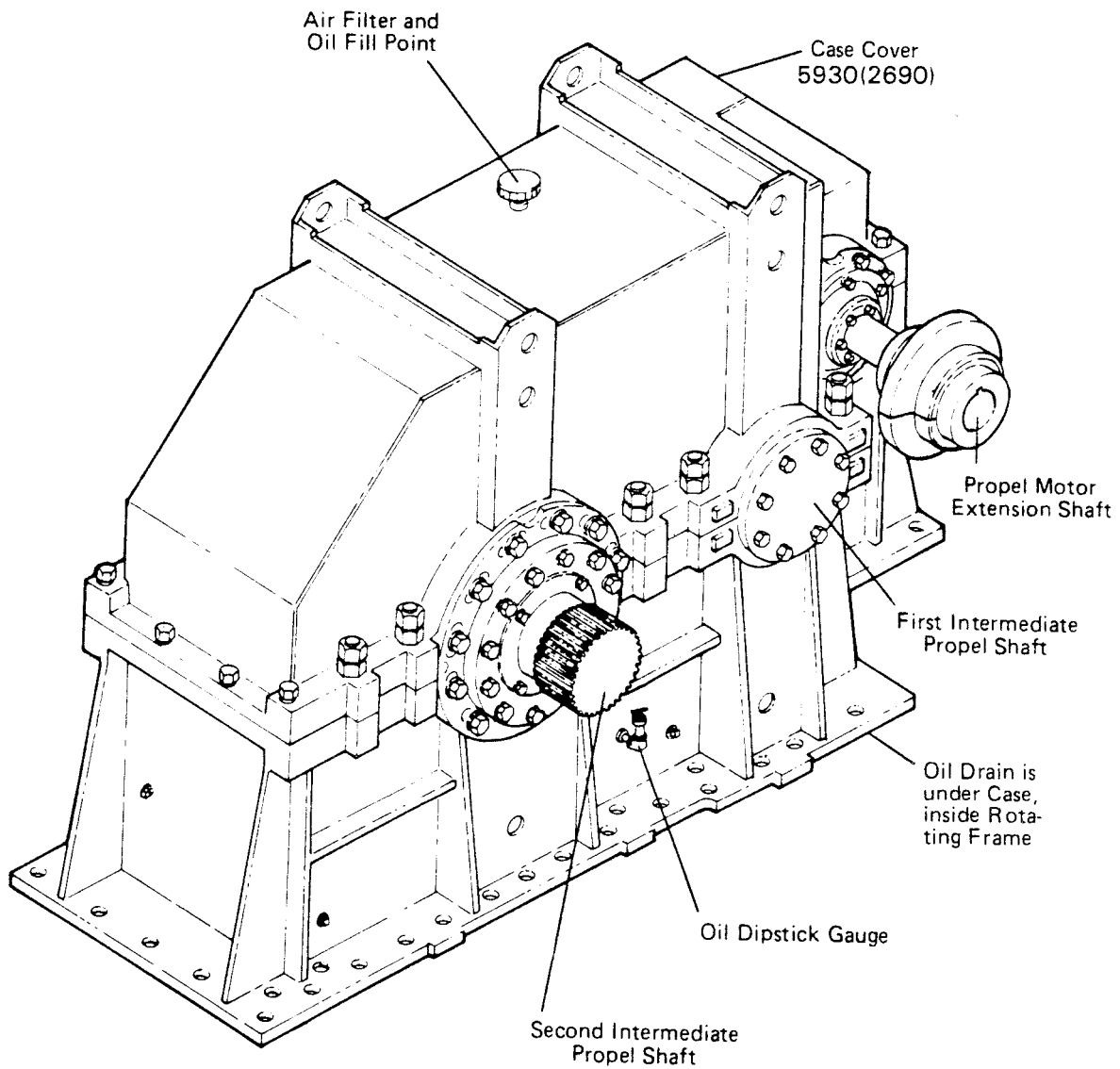
<u>NAME OF PART</u>	<u>TYPE</u>	<u>NO. OF POINTS</u>	<u>LOCATION</u>	<u>LUB. SYM.</u>	<u>METHOD & FREQUENCY</u>
LUBRICATION OF MISCELLANEOUS POINTS					
Filter House	Anti-Friction	5	In Motor End Bell	EMG	Hand (see Electrical Section)
Filter Ducts	Anti-Friction	10	In Motor End	EMG	Hand (see Electrical Section)
Fans	Pillow Block Bearing	10	In Bearing Housing	MPG	Hand, 500 Hrs.
Operator's Seat	Jack Screw Shaft	1	Under Seat	Light Oil	Hand, as Required
Operator's Seat	Swivel Joint	1	Base	Light Oil	Hand, as Required
Swing Pedals	Needle Bearings	2	Under Floor	MPG	Hand, 500 Hrs.
Main Traveling Crane	Anti-Friction	8	End of Axle Pins	MPG	Hand, as Required
Jib Crane	Bushing	4	End of Shaft	MPG	Before Use
Auxiliary Rope Winch	-	2	At Top of Gear Case	GL	Change at 6 Mo., Fill to Oil Level Plug
Auxiliary Rope Winch Drum Bearings	Anti-Friction	4	In Housings	MPG	Hand, 12 Mo.
Float Sheaves on House Roof	Bushing	2	End of Shaft	MPG	Automatic



SCHEMATIC
AUTO LUBE - TRI-STRUCTURE

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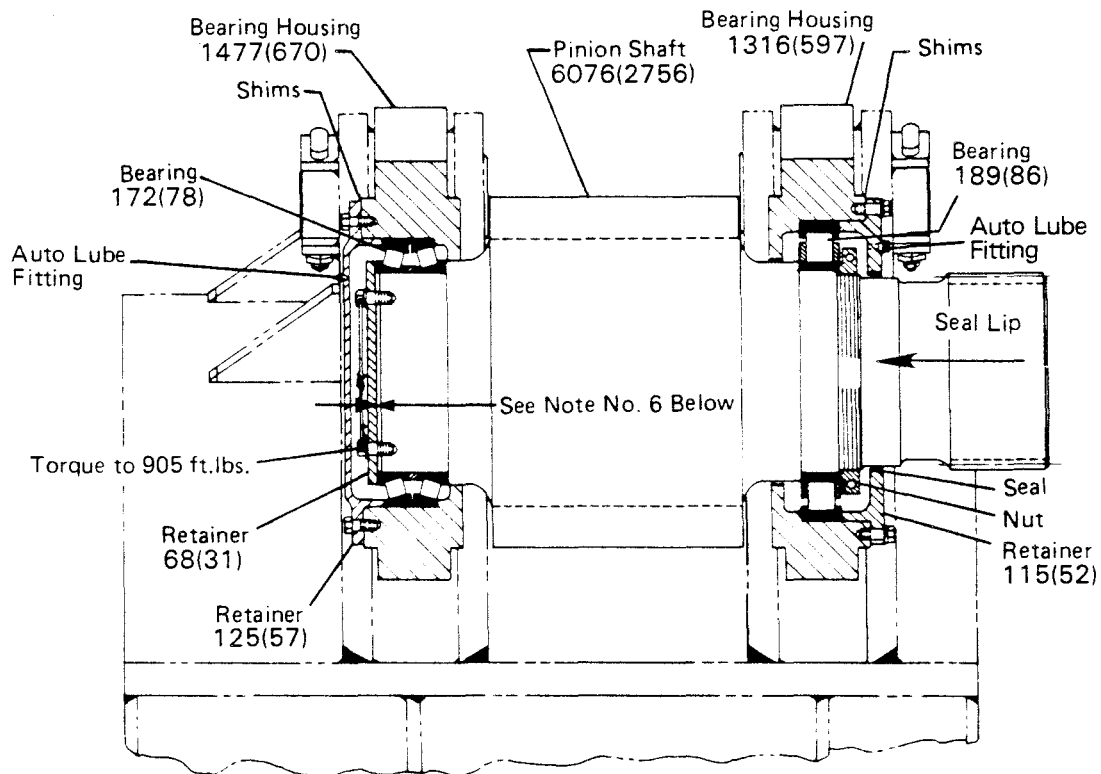
PROPEL GEAR CASES are oil tight and enclose first three shaft assemblies of propel gear train. These shaft assemblies are propel motor extension shaft, first intermediate propel shaft and second intermediate propel shaft.



NOTE: Gear Case capacity is 360 U.S. gallons (1363 liters).

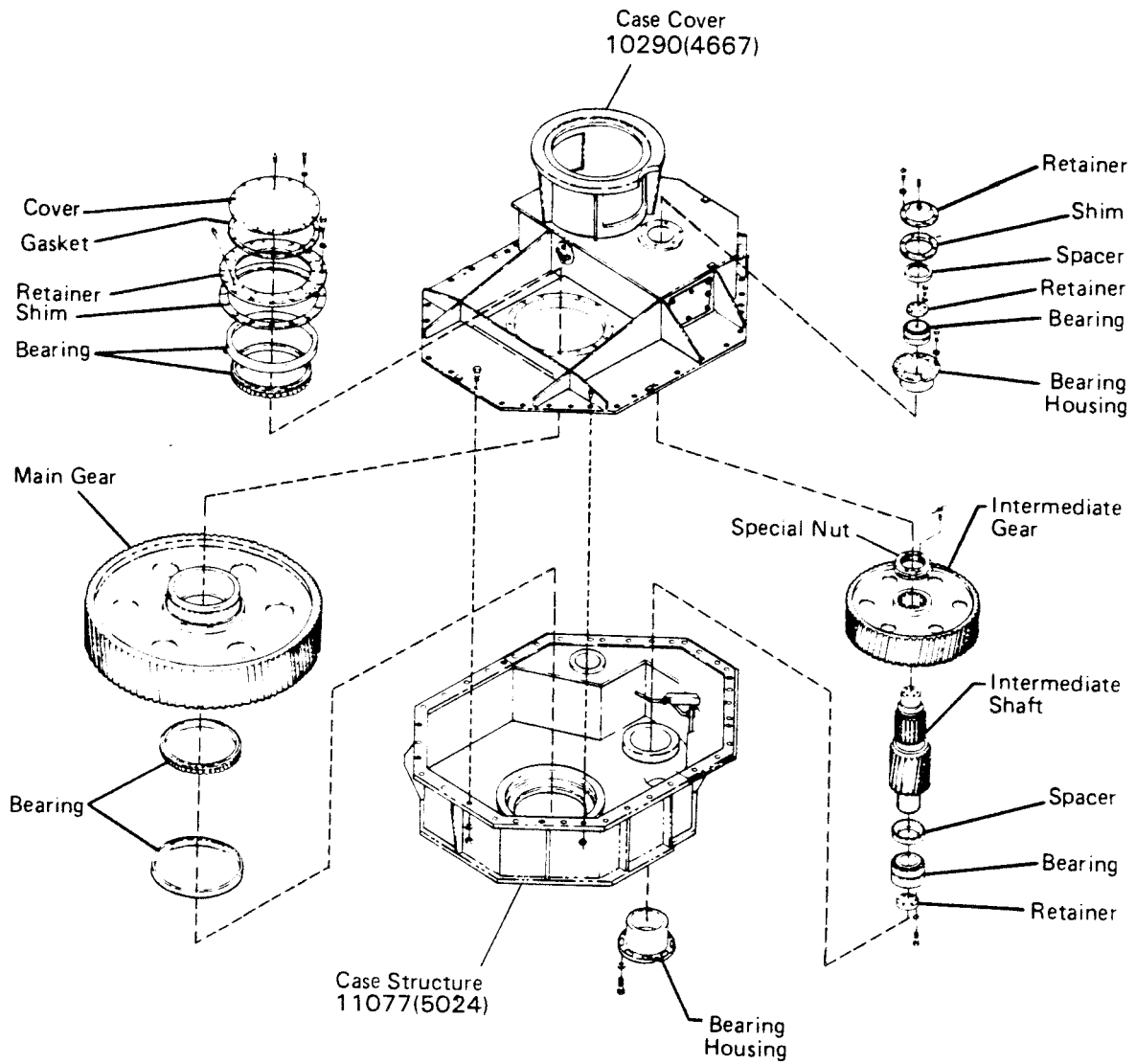
PROPEL GEAR CASE

MAIN PROPEL DRIVE PINION SHAFT is coupled to second intermediate propel shaft and drives main propel shaft.

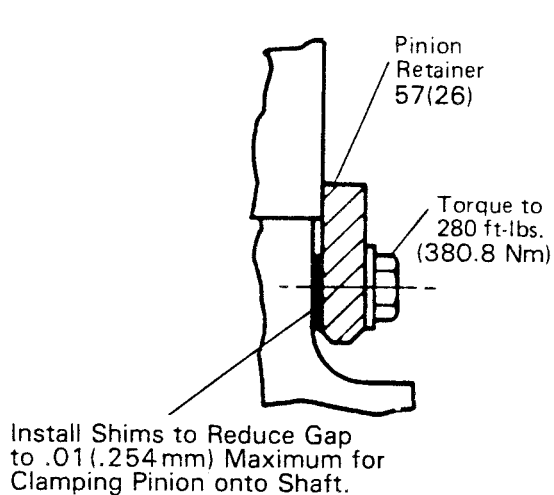
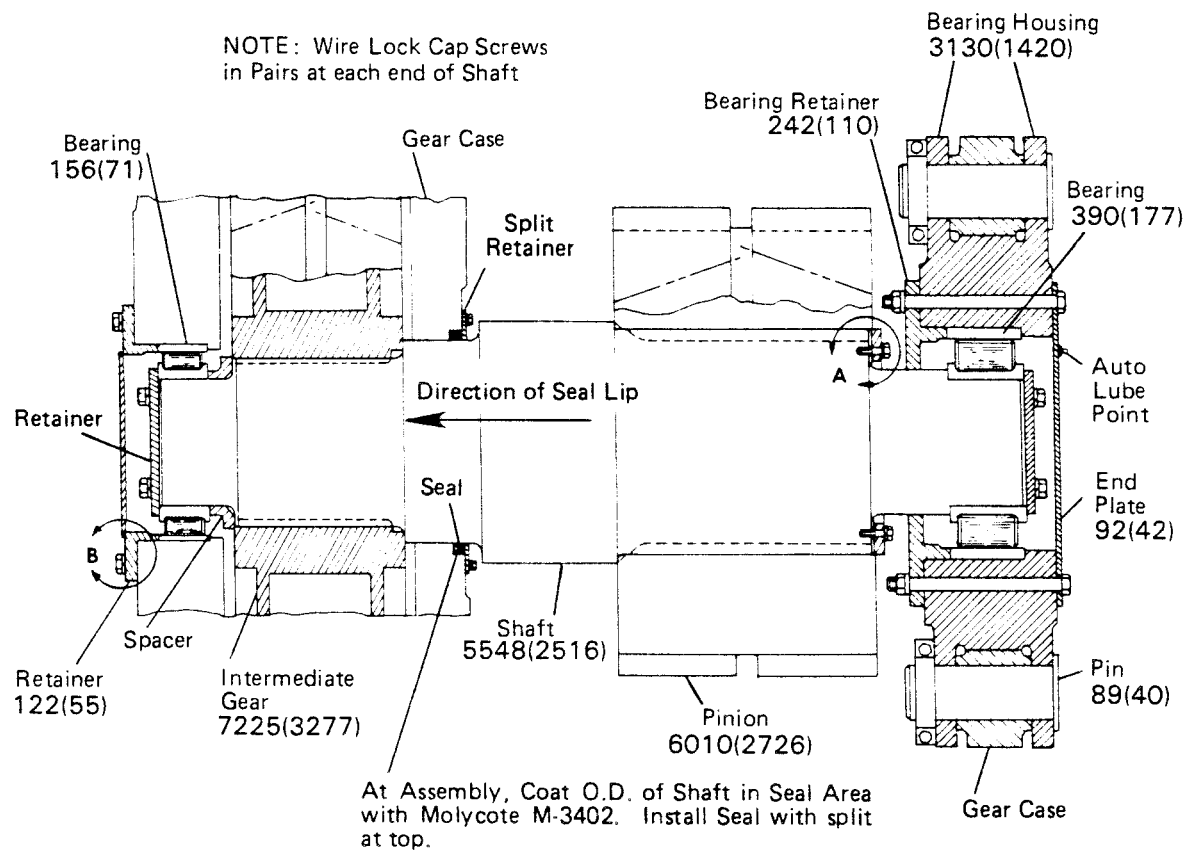


Assembly notes:

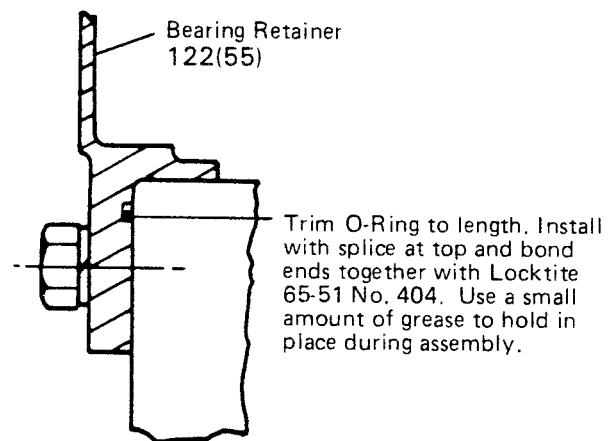
1. Coat coupling splines with type "B" OGL at assembly.
2. Bearing adjustment — tighten caps (retainers) at each end of shaft and measure gap between cap and housing (three places minimum) and average the measurement. Shim caps to this measurement. Rotate bearing while clamping up tightly thru cones to assure proper seating of rollers.
3. Grease bearings with multi-purpose grease at assembly.
4. Single-row bearing must be assembled on shaft with bearing housing in place at coupling end of shaft. Tighten special nut until inner race of bearing is secured in place. Lock nut onto shaft with cap screws.
5. Spray coat shaft in lip seal area with Molycote M3402 (Dresser No. 170025-1).
6. After assembling bearings, measure gap under retainer and add shims, leaving .010 (.254mm) for clamping.



ROTATING GEAR CASE ASSEMBLY

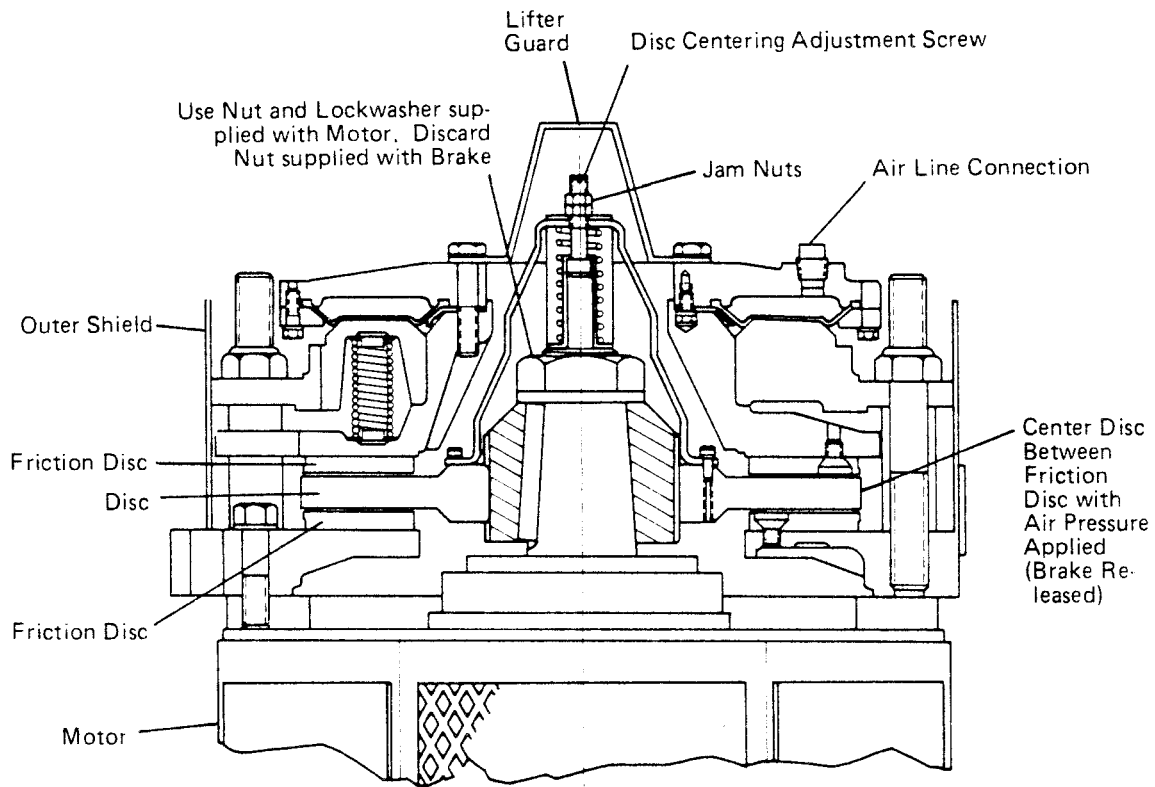


VIEW A



VIEW B

INTERMEDIATE SHAFT ASSEMBLY

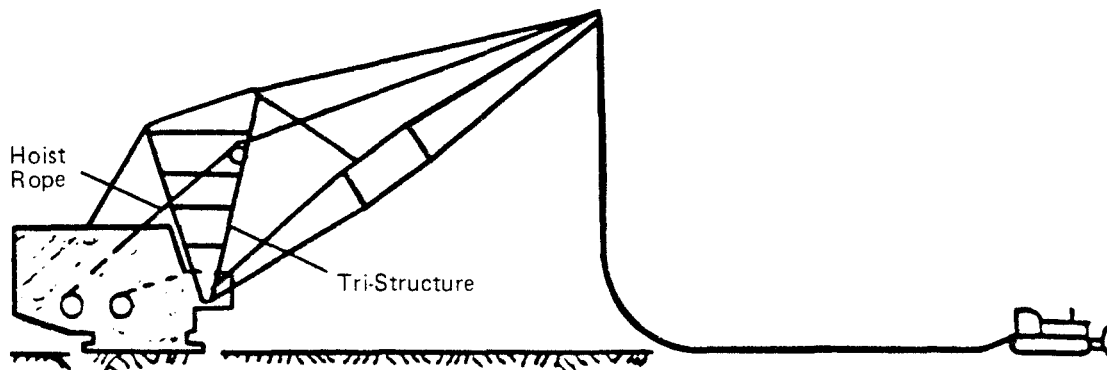


DANGER: Make sure power to motor is off before removing outer shield and lifter guard.

Figure A
SWING BRAKE MOUNTING

After the swing brake (single disc unit) has been installed, the disc must be centered, see Figure A:

1. Remove the outer shield and lifter guard.
2. Bypass any interlocks or use manual overrides on air valves so that static actuation may be made.
3. Remove the top hex jam nut. Release the brake.
4. Hold bottom nut and turn the adjusting screw to obtain equal running clearance between disc and each friction disc.
5. With clearance established, install top hex jam nut and tighten.
6. Remove bypasses and interlocks which may have been used and reinstall the shield and lifter guard.



CHANGE DRAG ROPE(S) by disconnecting them from bucket and unwinding rope from drum. Pull ropes away from machine with dozer or truck.

Reeve winch and attach it to one drag rope at drum. Remove rope from clamps on drum. Operate winch to remove drag rope from machine.

Reverse procedure to reassemble drag ropes. Attach winch rope to other drag rope and replace it in same manner.

NOTE: Reset drum limit switch after changing rope(s). See Dresser Programmable System instruction manual.

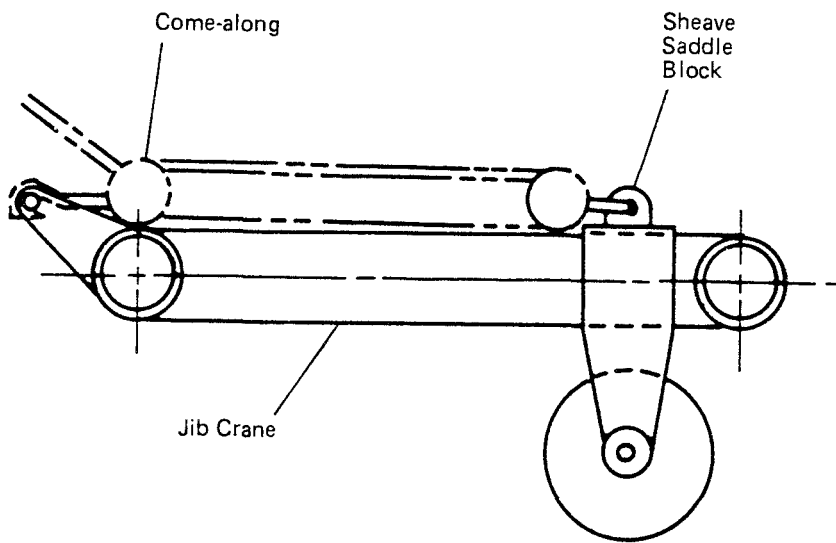
METHOD OF LOWERING BOOM – Position machine on near level ground as possible. This spot should be solid ground and have good drainage. Obtain cribbing to support boom and place under rear of machine to prevent rear end settling when there is no boom load.

Set up and maintain communication between workmen at the various locations and machine operator.

Disconnect the hoist and drag ropes from the bucket. Swing machine clear of bucket and set swing brakes. Remove all hoist and drag ropes from the machine. Drag ropes are 510 feet (155m) long. Drag ropes, 535 feet (163m) long, will be required to lower boom.

Remove all lube lines from points on top of tri-structure. Plug lines and points to prevent dirt from entering. Lubricate the bushing and grooves of the sheaves on top of tri-structure and sheaves at rear of tri-structure near top back leg connection.

Reeve auxiliary winch ropes as shown in Views A and B.



**VIEW L – FOR ATTACHING COME-ALONG (6 TON RECOMMENDED)
(Shown with Sheave Saddle in Position No. 1)**

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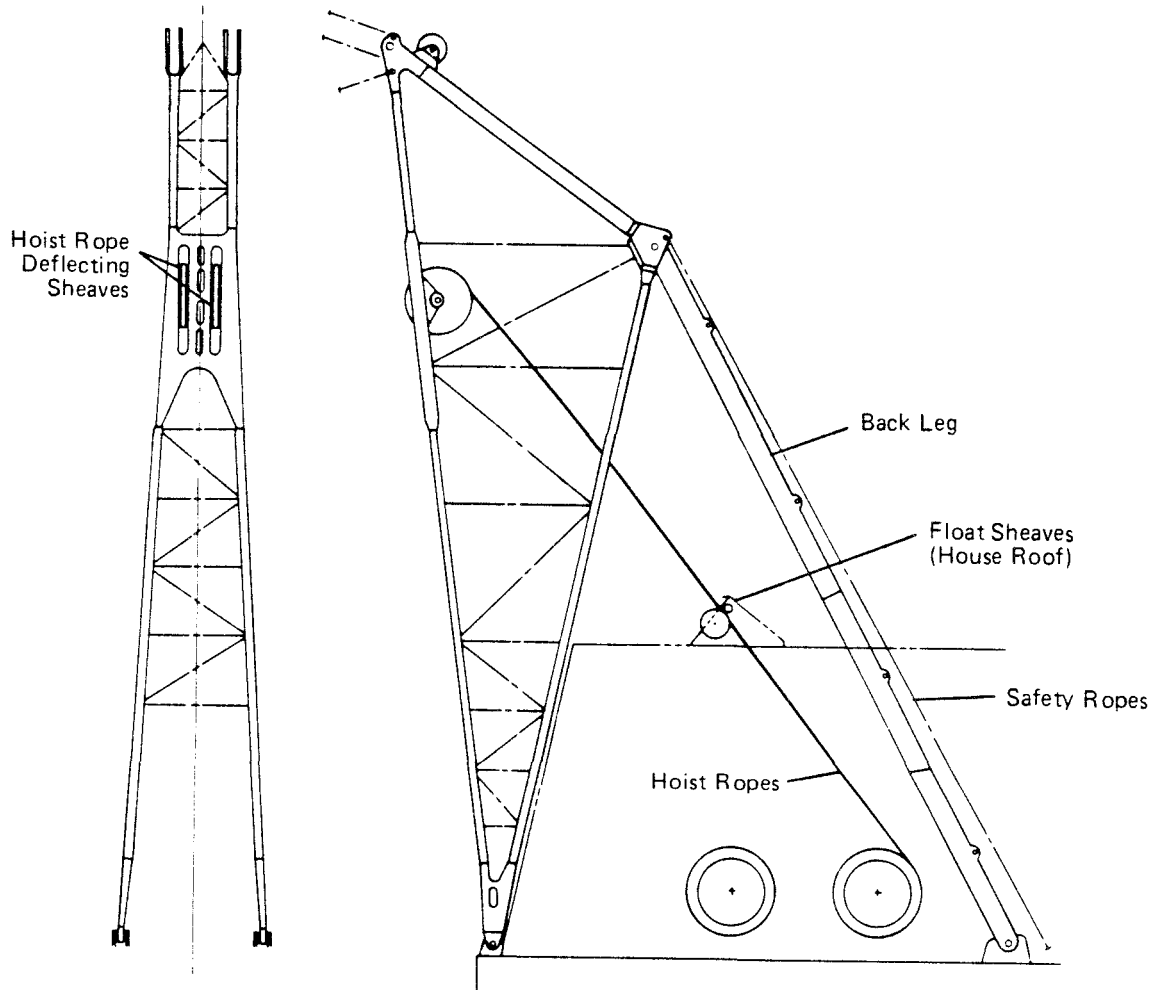
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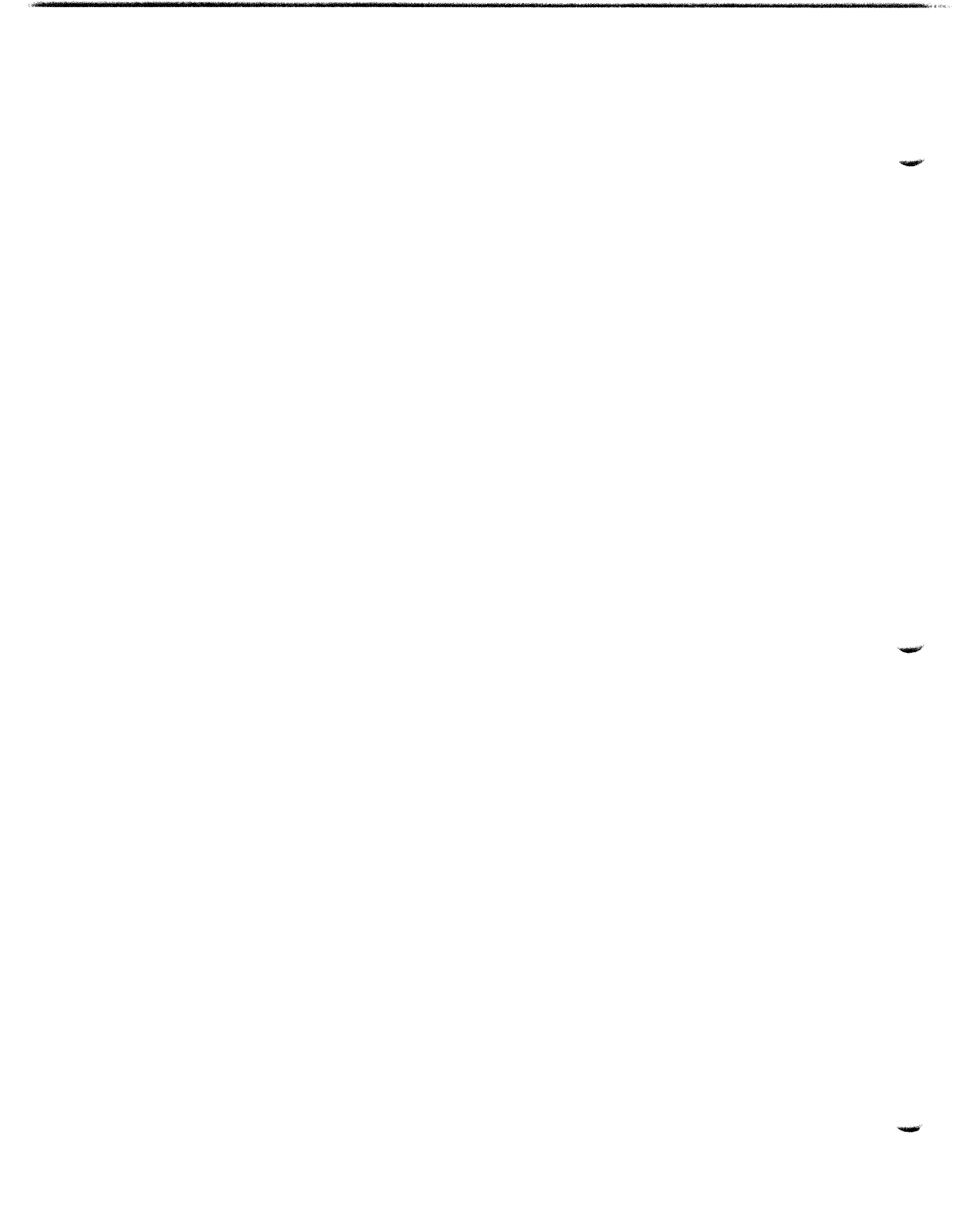
TRI-STRUCTURE ASSEMBLY is a welded structure connected by pins to front girder of rotating frame and to back leg assembly. Back legs and two safety ropes anchor tri-structure assembly to rotating frame deck. Boom support rope bridles and intermediate support ropes are attached to top of tri-structure. Hoist ropes are routed thru tri-structure over deflecting sheaves.



TRI-STRUCTURE ASSEMBLY

Two **HOIST ROPE DEFLECTING SHEAVES** are located in the upper front section of the tri-structure assembly. These sheaves lead the hoist ropes from the boom point to the hoist drum.

Each sheave is supported by a fixed shaft and rotates on two single row roller bearings.



Has speed increased or decreased for light loads?

Has speed increased or decreased for heavy loads?

Next, question other witnesses and determine what they saw or heard; getting every detail. Then make a quick visual inspection of equipment for obvious things as flashover, smoke or other evidence of over-heating or broken components. (One electrician checked for hours—then noticed the generator stopped.) Moral — look for the obvious.

After listening to witnesses and making the first inspection, stop and consider ALL the facts before proceeding. Valuable time is lost by going off quickly in the wrong direction. So, carefully examine the problem logically, using what you know about the system. Consider all the data collected. Do not make hasty decisions on what to use or what info to discard. Give special value to obvious facts, easily confirmed (a stopped generator) and reserve opinion on contradictory facts.

Barring the obvious, you gain a direction from all this and knowledge of the system. For example, if no motion operates; look in circuits common to all motions, such as: D.C. exciter or A.C. circuits. Likewise, if one motion is normal in one direction; but not in the other, check the components for the separate directions. A few minutes spent analyzing here saves time spent in false, misled direction later.

Once a founded suspicion exists as to which set of components or circuits is faulty, select a starting point for tests that meets the following:

You know approximate value expected here for test conditions; whether at stall, no-load, neutral, hoist, lower, etc.

No false indications exist, you've avoided points where reading is effected by a sneak circuit.

This point, logically, is in the suspected circuit.

Also, it allows checking as many circuits as possible at one time.

With proper instrument, measure at a selected point and compare to expected value. If measurement is correct, apparently all system parts leading to this point are correct. Trouble exists further down the line. With an incorrect reading, trouble probably lies further back toward start of the system.

Based on first test, proceed toward system start or end and seek expected reading. The trouble, of course, lies between points where correct and incorrect readings occur. In other words, the faulty stage has correct input, but incorrect output. Be positive the correct stage

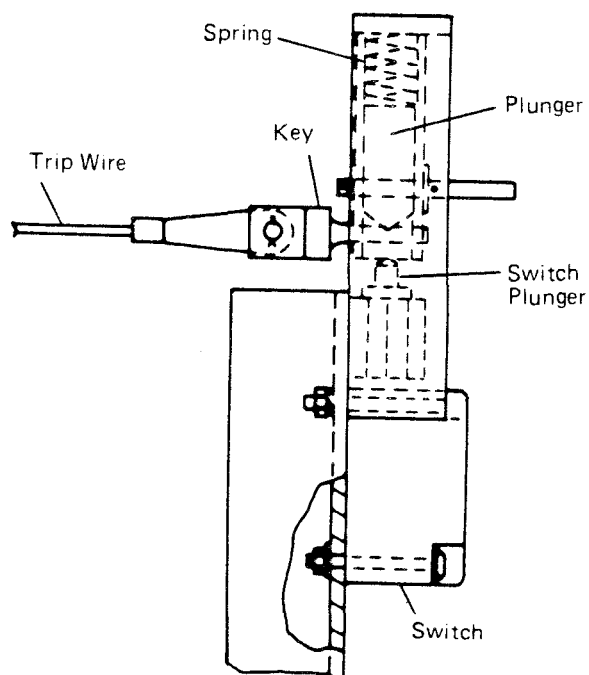
The **SLACK ROPE LIMIT SWITCH** operates to prevent excessive backlash when the hoist drum or drag drum rotates faster than the rope can be payed out.

The slack rope strikes the switch trip wire which pulls the key from the limit switch. Actuation of the limit switch shuts down the affected motion and sets the brake. The Slack Rope Limit Light will illuminate on the operator's control panel.

A limit switch and trip wire are located under both hoist drum and drag drum. Operation of the switch should be checked weekly.

NOTES:

1. Lube all moving and sliding parts with MPG.
2. Adjust trip wire for 1.00 inch sag measured at center of wire.
3. To adjust switch, remove key so mechanism is in activated position. Then slide switch up or down until plunger on switch is depressed enough to actuate switch. Plunger must be depressed at least .05 inch to trip and has a permissible overall travel of .15 inch.



SLACK ROPE LIMIT SWITCH

CHARGING PROCEDURE – PRESSURIZED WELDMENTS

1. Blow out air line from machine compressor before attaching to "Air Charging Apparatus" to remove any water accumulation.
2. With valve on "Air Charging Apparatus" closed, attach compressed air line.
3. Attach air supply hose leading from "Air Charging Apparatus" to weldment using quick disconnect coupling and charging equipment located on the weldment.
4. Open air valve slowly and observe both gauges simultaneously for positive reading.
5. Set pressure as determined by ambient temperature (see chart), close air valve, and separate quick disconnect coupling.

Ambient Temp. °F (°C)		Gauge Press. PSI (kPa)		Ambient Temp. °F (°C)		Gauge Press. PSI (kPa)	
-30	-34.5	9.5	65	60	15.5	14.5	100
-20	-29.0	10.0	69	68	20.0	14.5	100
-10	-23.0	10.5	72	80	26.5	14.5	100
0	-18.0	11.0	76	90	32.0	14.5	100
10	-12.0	11.5	79	100	37.5	14.5	100
20	-6.5	12.5	86	110	43.5	14.5	100
30	-1.0	13.0	90	120	49.0	14.5	100
40	4.5	13.5	93	130	54.5	14.5	100
50	10.0	14.0	97	140	60.0	14.5	100

PROCEDURE WHEN LOSS OF AIR PRESSURE OCCURS:

1. Reset air pressure.
2. Check all charging and monitoring hardware for leaks.
3. Check weld seams over entire weldment for air leaks.
4. Make any necessary repairs.
5. Repeat charging procedure.

TABLE 1
RUNNING CLEARANCES FOR BRONZE BUSHINGS
Inches (Millimeters)

Shaft		Running Clearance	Shaft		Running Clearance
Nominal Diameter	Outside Diameter		Nominal Diameter	Outside Diameter	
32 (812.8)	32.000-31.994 (812.8-812.647)	.043-.065 (1.092-1.651)	35.75 (908.05)	35.750-35.744 (908.05-907.897)	.048-.070 (1.219-1.778)
32.25 (819.15)	32.250-32.244 (819.15-818.99)	.043-.065 (1.092-1.651)	36.0 (914.4)	36.000-35.994 (914.4-914.247)	.048-.070 (1.219-1.778)
32.50 (825.5)	32.500-32.494 (825.5-825.347)	.044-.066 (1.117-1.676)	36.25 (920.75)	36.250-36.244 (920.75-920.597)	.048-.070 (1.219-1.778)
32.75 (831.85)	32.750-32.744 (831.85-831.697)	.044-.066 (1.117-1.676)	36.50 (927.1)	36.500-36.494 (927.1-926.947)	.048-.070 (1.219-1.778)
33.0 (838.2)	33.000-32.994 (838.2-838.047)	.044-.066 (1.117-1.676)	36.75 (933.45)	36.750-36.744 (933.45-933.297)	.049-.071 (1.244-1.803)
33.25 (844.55)	33.250-32.244 (844.55-818.997)	.044-.066 (1.117-1.676)	37.0 (939.8)	37.000-36.994 (939.8-939.647)	.049-.071 (1.244-1.803)
33.50 (850.9)	33.500-33.494 (850.9-850.747)	.046-.068 (1.168-1.727)	37.25 (946.15)	37.250-37.244 (946.15-945.997)	.049-.071 (1.244-1.803)
33.75 (857.25)	33.750-33.744 (857.25-857.097)	.046-.068 (1.168-1.727)	37.50 (952.5)	37.500-37.494 (952.5-952.347)	.049-.071 (1.244-1.803)
34.0 (863.6)	34.000-33.994 (863.6-863.447)	.046-.068 (1.168-1.727)	37.75 (958.85)	37.750-37.744 (958.85-958.697)	.051-.073 (1.295-1.854)
34.25 (869.95)	34.250-34.244 (869.95-869.797)	.046-.068 (1.168-1.727)	38.0 (965.2)	38.000-37.994 (965.2-965.047)	.051-.073 (1.295-1.854)
34.50 (876.3)	34.500-34.494 (876.3-876.147)	.046-.068 (1.168-1.727)	38.25 (971.55)	38.250-38.244 (971.55-971.397)	.051-.073 (1.295-1.854)
34.75 (882.65)	34.750-34.744 (882.65-882.497)	.046-.068 (1.168-1.727)	38.50 (977.9)	38.500-38.494 (977.9-977.747)	.051-.073 (1.295-1.854)
35.0 (889.0)	35.000-34.994 (889.0-888.847)	.046-.068 (1.168-1.727)	38.75 (984.25)	38.750-38.744 (984.25-984.097)	.051-.073 (1.295-1.854)
35.25 (895.35)	35.250-35.244 (895.35-895.197)	.046-.068 (1.168-1.727)	39.0 (990.6)	39.000-38.994 (990.6-990.447)	.051-.073 (1.295-1.854)
35.50 (901.7)	35.500-35.494 (901.7-901.547)	.046-.068 (1.168-1.727)	39.25 (996.95)	39.250-39.244 (996.95-996.797)	.051-.073 (1.295-1.854)

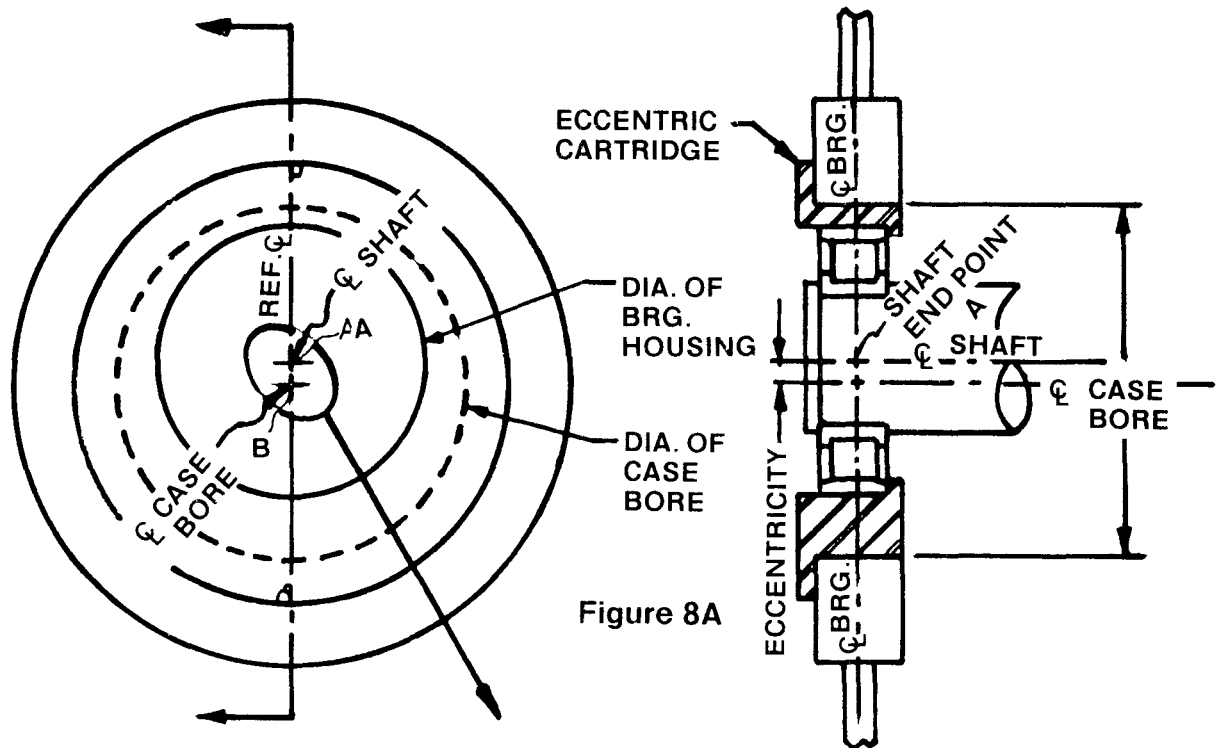


Figure 8A

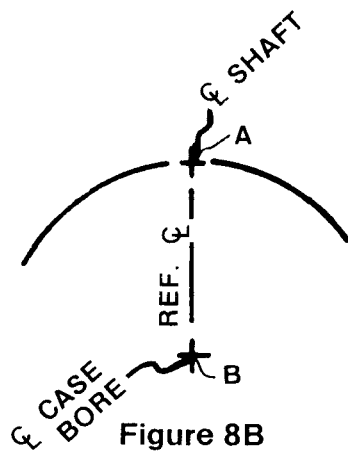


Figure 8B

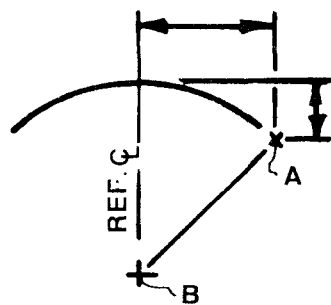


Figure 8C

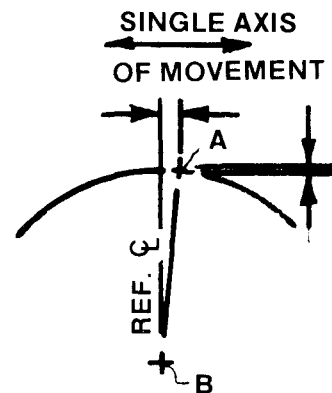
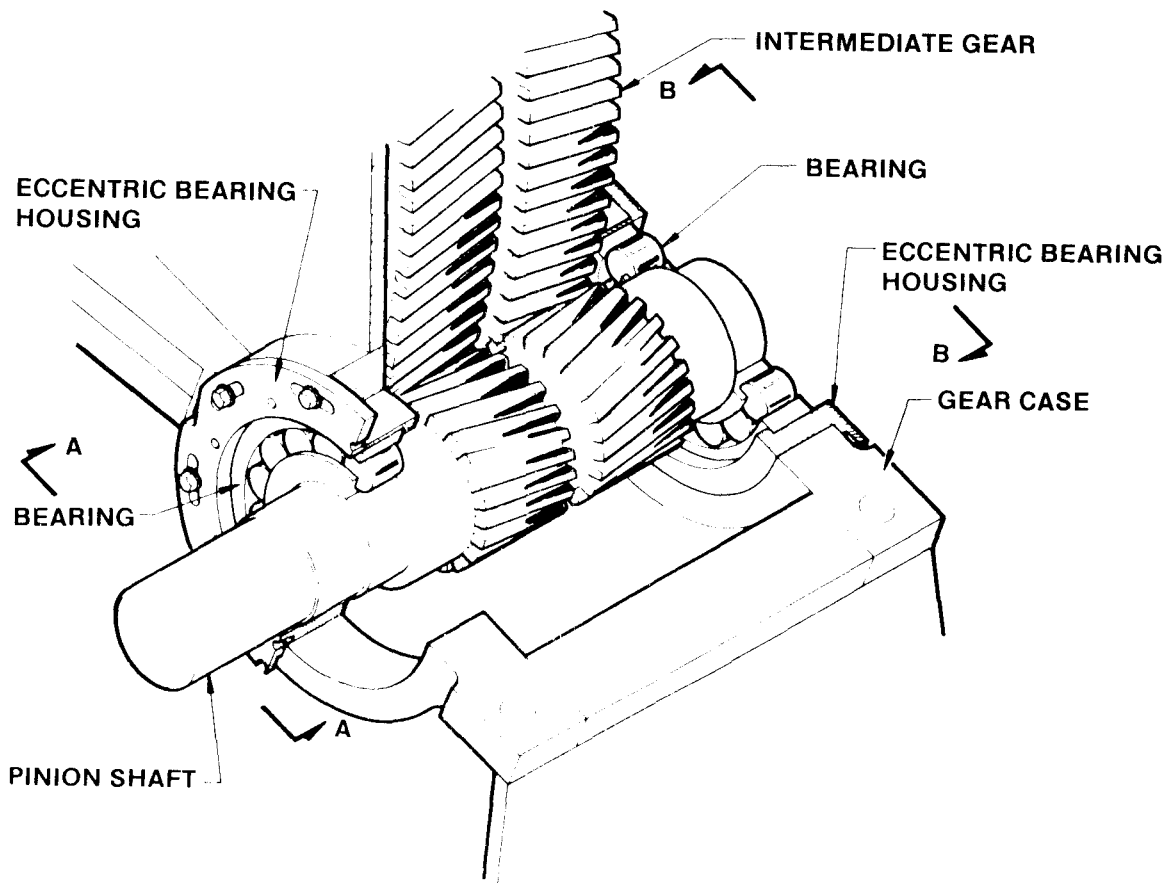
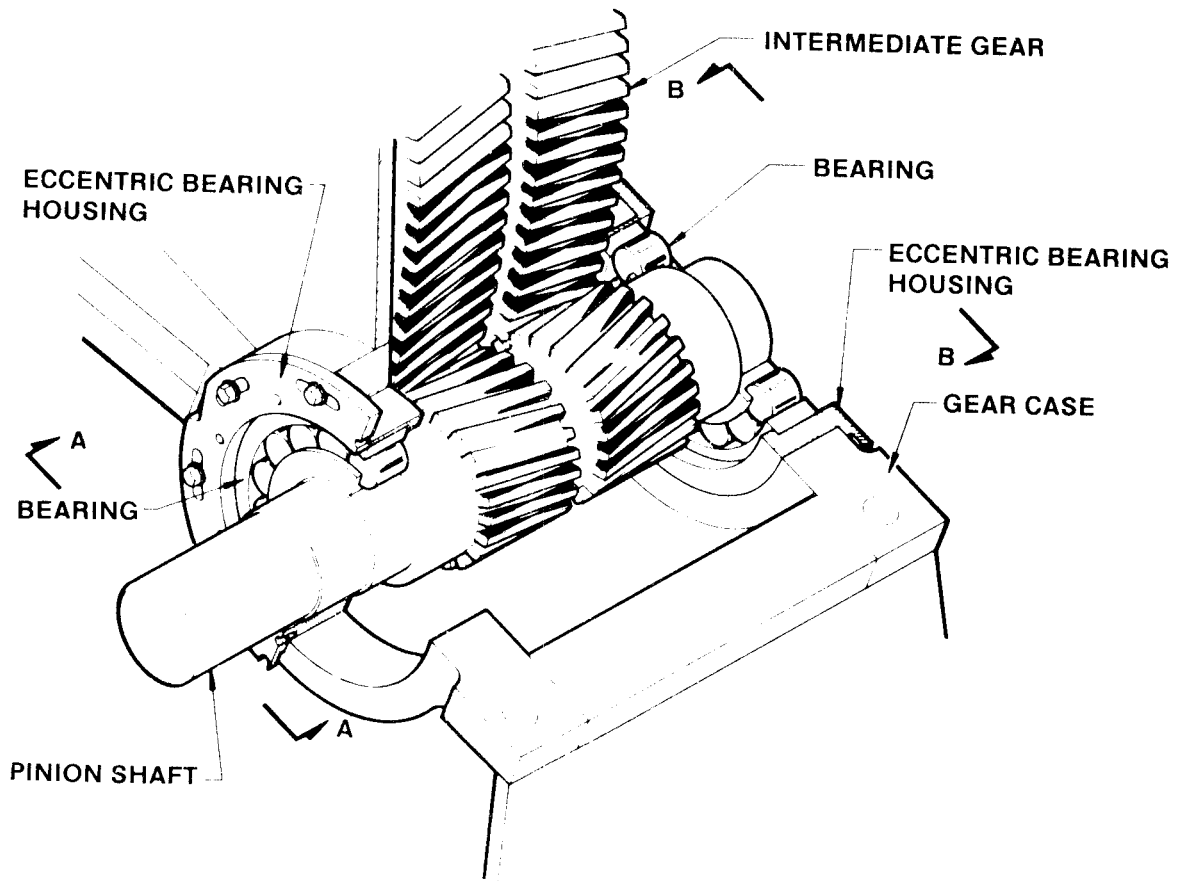


Figure 8D

Figure 8





CAP SCREW (BOLT) GRADE. The grade classification of a cap screw (bolt) is identified by the marks on the head as shown below:

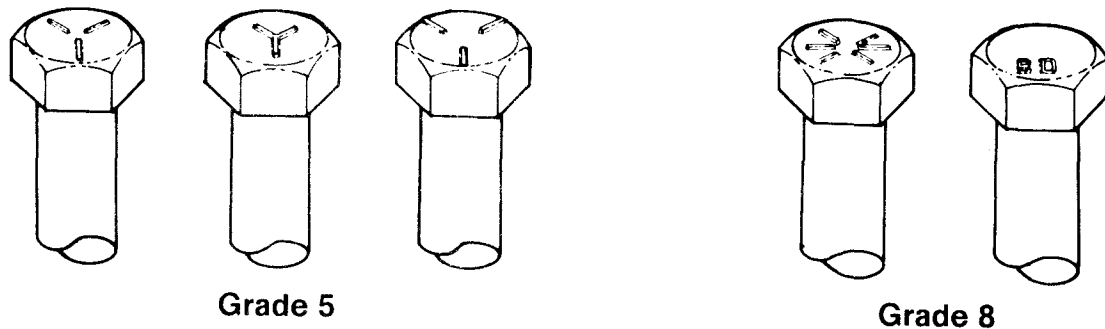


Figure 15
Cap Screw Grade Markings

Use the SAME GRADE washer and nut as bolt.

Selection of the proper method TORQUE VS. TURN-OF-NUT depends on certain conditions. Use one of the two methods described based on the specific application:

TURN-OF-NUT METHOD

- Small quantities involved
- Inconsistent thread conditions and fits
- Usually exceeds 2,000 foot pounds (2712 Nm)
- Torque measuring equipment impractical for assembly

TORQUE METHOD

- Large quantities involved
- Consistent thread conditions and fits
- Usually less than 2,000 foot pounds (2712 Nm)
- Torque measuring equipment available at assembly

TURN-OF-NUT METHOD: Install bolts and tighten to SNUG FIT. This means tight with a hand tool or if using impact wrench, when the drive stops and racheting starts.

Use crayon, chalk or paint to mark nut at side and clamped surface to indicate the SNUG FIT position. Mark impact drive socket when used.

Hold bolt head with wrench and using a heavy duty impact, hand wrench and heavy hammer (or sensible alternate method); advance nut one-half-turn.

Tighten nuts progressively from fixed edge to free edge. This achieves tension and prevents loosening under most severe conditions.

REPAIR WELDING PROCEDURES

When weld repair is required, it is extremely important it be done correct because weld repairs can cause damage to an entire structure if performed incorrectly. Since several difficult to control variables can ruin a weld repair such as impurities in raw materials, defective welding equipment and state of normal wear it is recommended that you request a factory weld procedure.

The Weld Engineering Department at Marion issues repair procedures when a request is received from a customer. It is always better to see the repair problem, however, this is not always possible. Therefore, information received must be accurate. For example, its important to know the exact size of the defect, its exact location, available welding equipment, and whether the repair will be done on the machine or in a building. Machine information, serial number, part name and identification should also be sent to the service department. Pictures and sketches are also helpful to develop a good repair procedure.

Each step of a welding procedure must be followed. Years of experience in the manufacture of mining equipment have proven major failures have occurred due to inadequate field repair of certain structures.

Weld repair jobs should not be rushed. The worn or fractured area must be evaluated carefully to determine how the repair should be accomplished. It is good practice to listen to experienced welders and ask for their input if available.

Here is a ten-step outline to follow when developing any weld repair procedure.

1. Clean the worn or fractured part or area to be repaired.
2. Analyze and inspect the fractured or worn component for proper reporting.
3. Determine the type of material you will be repairing or rebuilding.
4. Prepare the part to be repaired or rebuilt.
5. Determine the electrode and process to be used.
6. Preheat before welding if required.
7. Weld by using good welding techniques.
8. Post heat if required.
9. Slow cool.
10. Inspect the repair.

STEP 8—Postheating

The best practice is to thermally stress relieve a part that is highly stressed or requires machining. This is not always possible since parts of mining equipment are large and too complicated to stress relieve. Many times electric resistant heaters can be used for preheating and postheating of the weld area.

Weld repairs in alloy steels where it is not possible to stress relieve, but must be used as welded because of the size and configuration of the part, the preheat and interpass temperature should be held for one hour after welding. The objective is to permit the weld to transform from Austenite to a softer microconstituents rather than to martensite and thereby to minimize the possibility of cracking without undue sacrifice in mechanical properties. Postheating will also help in releasing entrapped hydrogen. Every precaution is important when making weld repairs.

STEP 9—Slow Cooling

It is very important to keep any cool drafts away from parts which have been preheated, welded, and postheated. All parts should be covered by insulating blankets, returned to a furnace, covered with insulation or covered with sand for slow cooling. Cooling rates should be controlled so the temperatures decreases about 50°F (10°C) per hour until reaching 150°F (66°C).

Many times welders will set a repair job on beams and will cover the top of part but forget about the area between the floor and the part. Unfortunately, the greatest draft occurs along the floor. This could cool the part unevenly and cracking could occur. Therefore, it is important to slow cool the whole part evenly.

STEP 10—Inspection of Repair

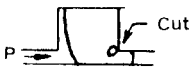

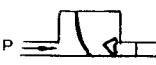
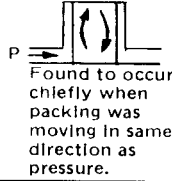
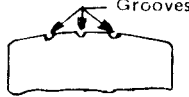

The last important step is to inspect the completed weld after it has cooled to the ambient temperature. Make sure there are no notches which could become a stress riser. Grind welds so they blend in with the parent material.

Non-destructively inspect the repaired welds with dye penetrant or magnetic particle inspection discussed earlier. If it is important to examine the whole weld, then a technician with ultrasonics or x-ray expertise should be contacted.

If any questionable weld should appear, it should be examined and repaired before the part is put back into service or it will not be long until the part will again have to be removed and repaired.

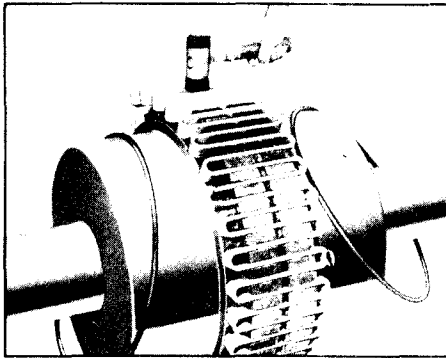
Make a final measurement of all important dimensions. This will show your success of staying within the dimension or tolerances. If the repair is successful, record the procedure for future reference.

**TABLE 7
MODES OF FAILURE**

FAILURE	GENERAL CONDITION	EXAMPLE
Progressive cutting by corner of piston groove.	Pulsating pressure on O-Ring.	
Progressive cutting as in static packing plus abrasive wear.	Pulsating pressure on O-Rings.	
Knibbling extrusion. Rupture of material, large pieces torn off.	Fatigue from shock loads, high temperature, local seizure, pulsating pressure, etc.	
Rotation of part or all of circumference of packing in groove. (Sometimes called "spiral failure")	Complete explanation not found. Occurrence not predictable. Possibly sudden increase in friction on working face.	
Axial grooves worn in working surface.	Imperfections in cylinder surface. Particles of dirt, metal, or rubber.	
Axial grooves as above.	Rapid passage of oil across working face.	See above sketch
Packing totally extrudes thru clearance space.	Large radial clearance. Soft packing.	

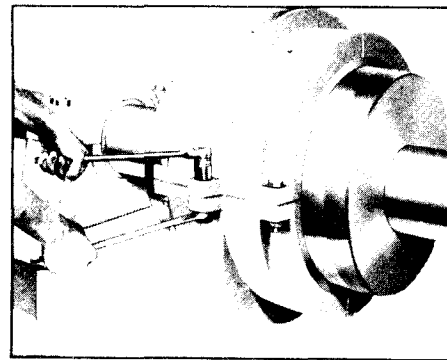
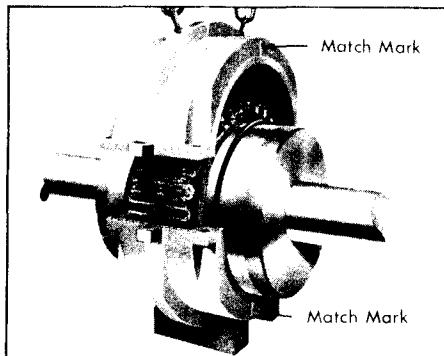
**TABLE 8
DECIMAL
EQUIVALENTS**

	INCHES	MILLIMETERS
	.0156 - 1/64	.3962
1/32	.0312 - 3/64	.7925
	.0468 - 5/64	1.1887
1/16	.0625 - 7/64	1.5875
	.0781 - 9/64	1.9837
3/32	.0937 - 11/64	2.3799
	.1094 - 13/64	2.7788
1/8	.1250 - 15/64	3.1750
	.1406 - 17/64	3.5712
5/32	.1562 - 19/64	3.9675
	.1719 - 21/64	4.3663
3/16	.1875 - 23/64	4.7625
	.2031 - 25/64	5.1587
7/32	.2187 - 27/64	5.5550
	.2344 - 29/64	5.9538
1/4	.2500 - 31/64	6.3500
	.2656 - 33/64	6.7462
9/32	.2812 - 35/64	7.1425
	.2969 - 37/64	7.5413
5/16	.3125 - 39/64	7.9375
	.3281 - 41/64	8.3337
11/32	.3437 - 43/64	8.7230
	.3594 - 45/64	9.1288
3/8	.3750 - 47/64	9.5250
	.3906 - 49/64	9.9212
13/32	.4062 - 51/64	10.3175
	.4219 - 53/64	10.7163
7/16	.4375 - 55/64	11.1125
	.4531 - 57/64	11.5087
15/32	.4687 - 59/64	11.9050
	.4844 - 61/64	12.3076
1/2	.5000 - 63/64	12.7000
	.5156 - 65/64	13.0962
17/32	.5312 - 67/64	13.4925
	.5469 - 69/64	13.8913
9/16	.5625 - 71/64	14.2875
	.5781 - 73/64	14.6837
19/32	.5937 - 75/64	15.0800
	.6094 - 77/64	15.4788
5/8	.6250 - 79/64	15.8750
	.6406 - 81/64	16.2712
21/32	.6562 - 83/64	16.6675
	.6719 - 85/64	17.0663
11/16	.6875 - 87/64	17.4625
	.7031 - 89/64	17.8598
23/32	.7187 - 91/64	18.2550
	.7344 - 93/64	18.6538
3/4	.7500 - 95/64	19.0500
	.7656 - 97/64	19.4462
25/32	.7812 - 99/64	19.8425
	.7969 - 101/64	20.2413
13/16	.8125 - 103/64	20.6375
	.8281 - 105/64	21.0337
27/32	.8437 - 107/64	21.4230
	.8594 - 109/64	21.8288
7/8	.8750 - 111/64	22.2250
	.8906 - 113/64	22.6212
29/32	.9062 - 115/64	23.0175
	.9219 - 117/64	23.4163
15/16	.9375 - 119/64	23.8125
	.9531 - 121/64	24.2087
31/32	.9687 - 123/64	24.6050
	.9843 - 125/64	25.0012
1	1.0	25.4000



4 INSERT GRID

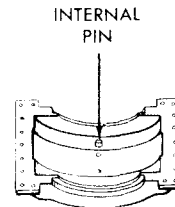
Pack gap and grooves with specified lubricant before inserting grid. Install grid segments so that all cut ends extend in the same direction, this will assure correct grid contact with non-rotating pin in cover halves. Spread grid segments slightly to pass over the coupling teeth and seat with a soft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



5 PACK WITH GREASE AND ASSEMBLE COVERS

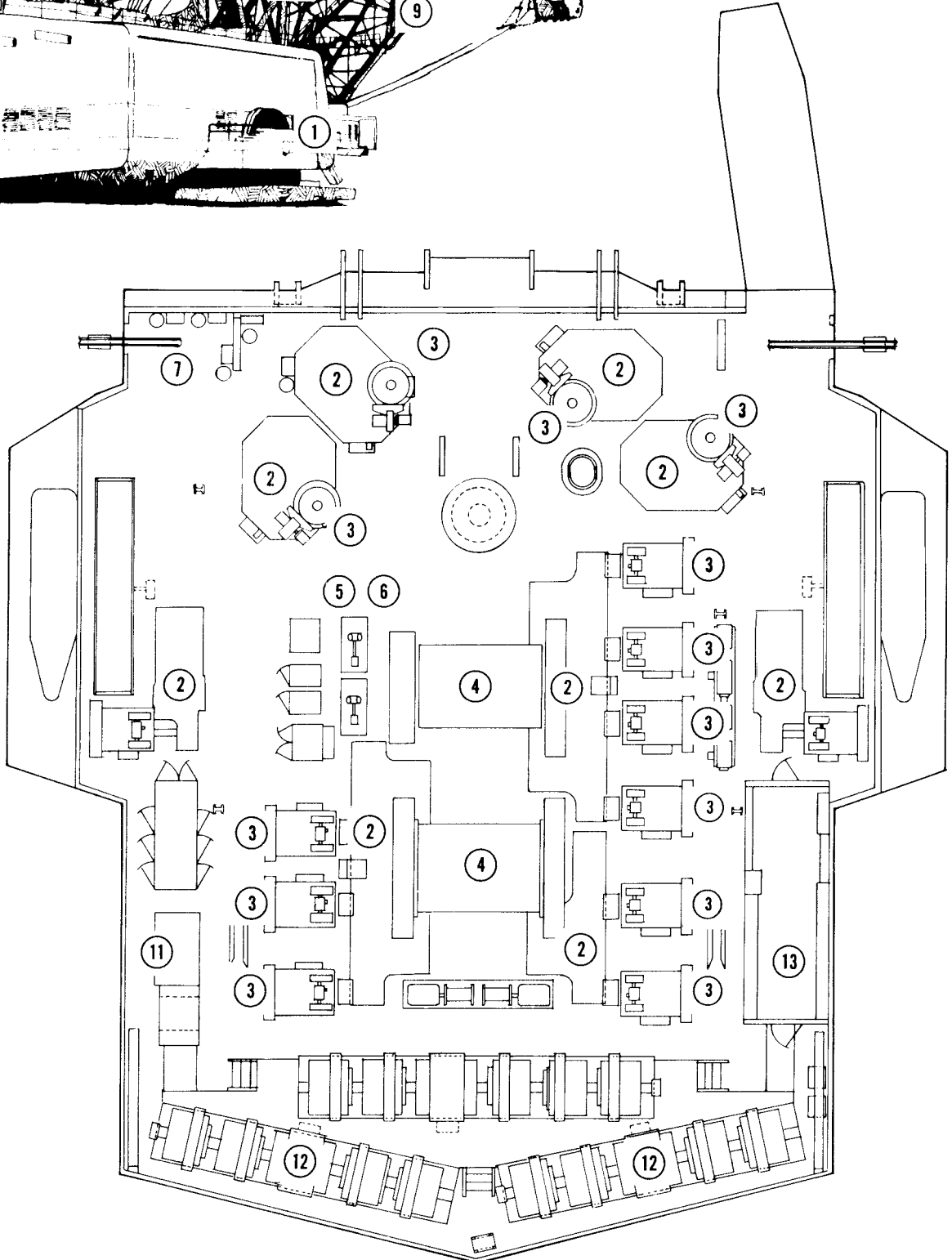
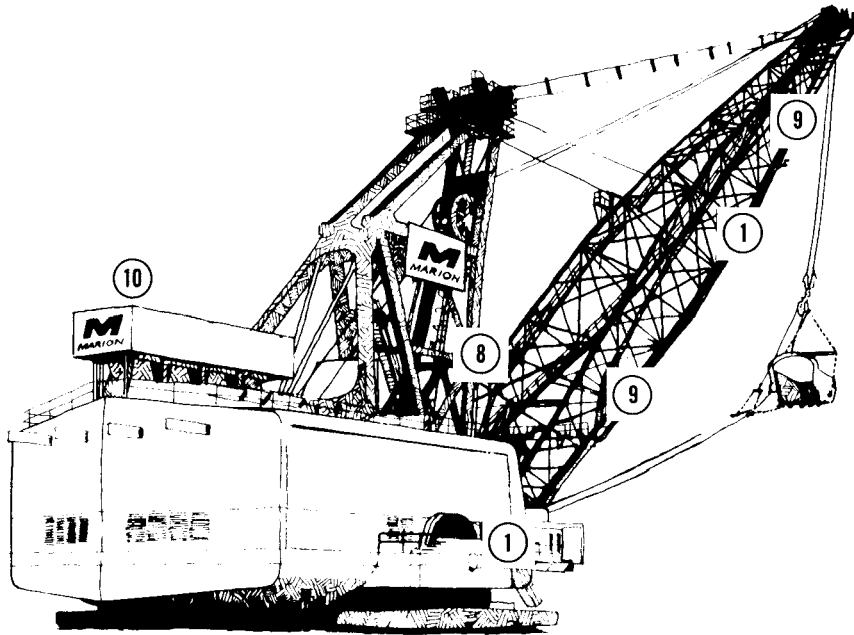
Pack the spaces between and around the grid with as much lubricant as possible and wipe off excess flush with top of grid. Position seals on hubs to line up with grooves in cover. Move lower cover half into position and block-up in place.

Sizes 150 thru 230—Position gaskets on flange split and assemble upper cover half with the match mark on the same side as the lower half (see above). Secure cover with fasteners and tighten to torque specified in Table. CAUTION: Make certain all lube plugs are installed before operating.

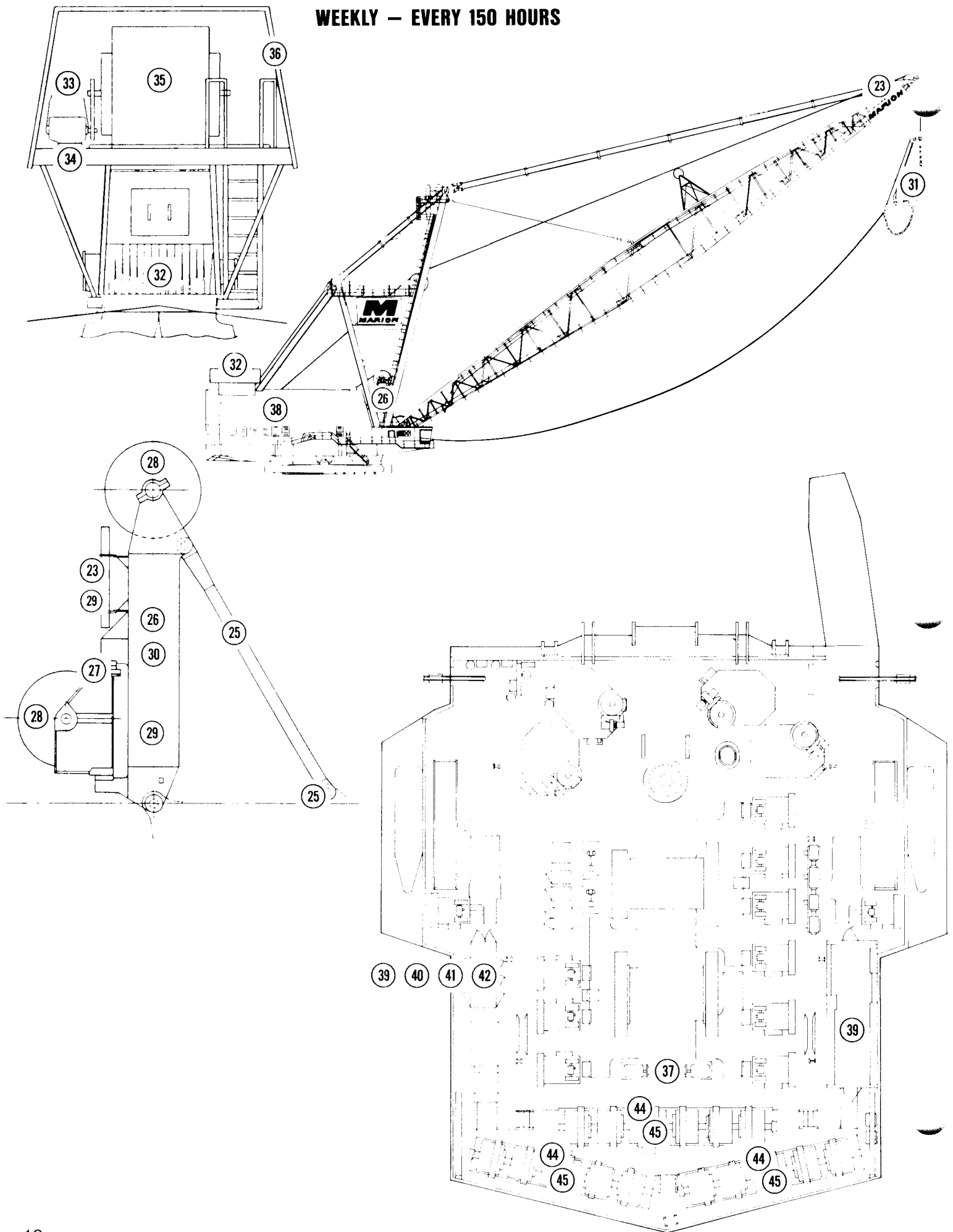


Sizes 240 thru 260—Check all flange faces for burrs and coat either half with Permatex No. 2 or equivalent. Assemble upper cover half with the internal pin (see drawing at right above) on same side as the lower half. Secure cover with fasteners and tighten to torque specified in Table. Assemble split seal retainers so the split is 90 degrees from the cover split. Secure with fasteners. CAUTION: Make certain all lube plugs are installed before operating.

DAILY — EVERY 24 HOURS



WEEKLY — EVERY 150 HOURS



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