Technical Manual

PREVENTIVE MAINTENANCE

Machine downtime is costly to owners in lost ore production. All mechanical or electrical components and devices will eventually stop. The task of identifying when this machine shut down could occur is the purpose of preventive maintenance.

WARNING: 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 Marion 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 10 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.

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

INSPECTION CHECKLIST

- Check condition of roller chain and chain sprockets
- Test all hold down bolts with impact wrenches
- Check crawler shoes, load rollers and shoe sprocket for wear
- Inspect steel structures for cracks
- Check auto-lube system for loose or damaged fittings and injector conditions
- Inspect rotary gear box alignment in hoist and pull down

DANGER: Remove electrical power from machine whenever inspection of electrical components is performed. Use extreme care in removing guards and protective devices.

12. TEST – Push button to test the lights on the annnunciator. See Annunciator Panel for detail.

13. RESET – Push button to reset the lights on the annunciator panel. See Annunciator Panel.

14. PSI OR BIT LOAD – In DRILL MODE ONLY; move toggle switch up (PSI) for hydraulic system pressure (PSI) in hoist on item 18 and pull down on item 19. Move switch down (Bit Load) to read on item 19 actual weight on drill bit in pounds.

NOTE: Readouts can be obtained in English or Metric by the position of the top toggle switch located on the enclosed panel above.

15. INITIAL – This push button establishes base "0" on Hole Depth readout (item 8). Press this button AFTER the depth (of hole) is determined on item 16 and drill bit at ground line.

16. HOLE DEPTH – Adjustable indicator to set depth of hole to be drilled. Functional only in automatic drill mode.

17. ALARM – An On/Off toggle switch to silence the depth beeper item 21.

18. HOIST L.H. CRAWLER – Indicates hydraulic pressure in the hoist direction OR pressure to the left hand crawler propel motor depending on the machine mode.

19. PULL DOWN R.H. CRAWLER – Indicates hydraulic pressure in the pull down direction OR pressure to right hand crawler propel motor if machine is in propel mode.

20. WARNING – This buzzer alerts the operator of a malfunction on the Annunciator Panel. Silence by depressing the ACK button.

21. DEPTH – This beeper sounds when the drill bit reaches the hole depth set on the Hole Depth indicator (item 16).

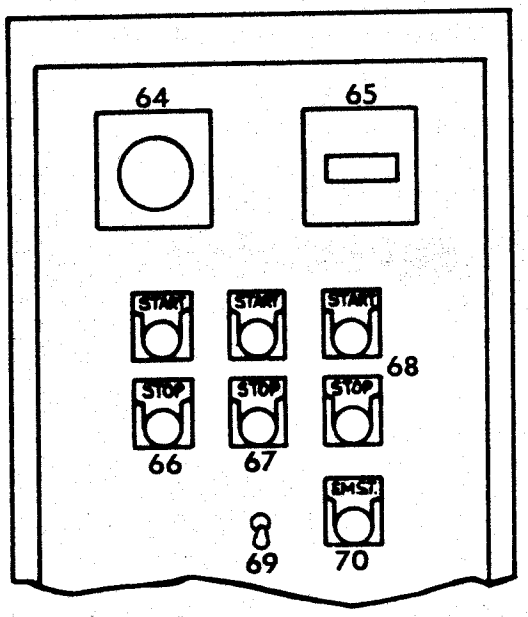
22. PROPEL – Red light indicates that the machine is in the propel mode and the Propel Control station is energized with item 23 in the propel mode.

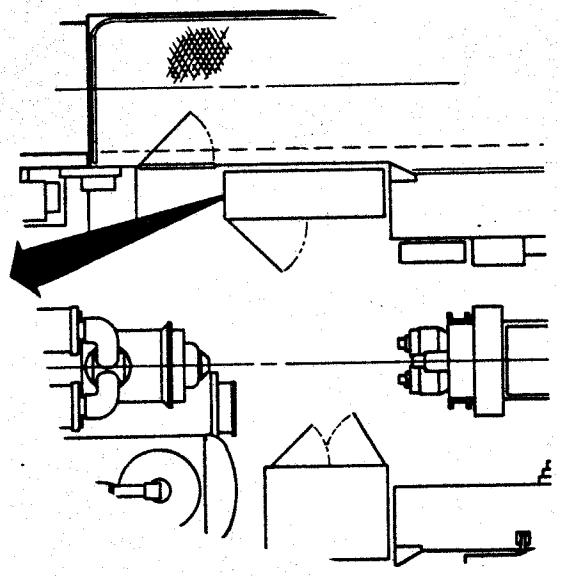
23. HOIST/STANDBY/PROPEL SWITCH – This selector switch determines the drilling or propel mode, sets hoist brakes and energizes or de-energizes the leveling system.

    PROPEL/LEVELING SET. This position automatically sets hoist brakes, deactivates the levers on the drilling control station and actuates the Propel Control Station.

STARTING PANEL is located on the end of the A.C. cabinet (inside machinery house) and is used by the operator for start-up and shut down of the machine.

NOTE: See Start-up and Shut Down for operation of this panel.





64. VOLTMETER – A.C. voltage of the transformer secondary. Normal voltage is 480 V.

65. ELAPSED TIME METER – Indicates the operating hours of the hydraulic system.

66. MAIN AIR COMPRESSOR – Start and stop push buttons controls for the drill air compressor.

67. HOUSE FILTER FAN – Start and stop push buttons for the machinery house filter system.

68. HYDRAULIC PUMP – Start and stop push buttons for the motor that drives the hydraulic pumps.

69. DIESEL ENGINE – Off switch for diesel engine.

70. EM. ST. – Emergency stop push button will shut down all systems except diesel engine.

MACHINE LEVELING uses the hydraulic jacks, controlled by levers in cab, mounted on the machinery frame in conjunction with the spirit levels mounted on the Drilling Control Station.

One jack (second jack optional) mounts at front and one jack at each side of the drill table. On a four jack machine, one control lever operates the front jacks as though only one existed.

REQUIRED METHOD OF LEVELING begins by extending (lowering) both REAR jacks until the rear of machine is slightly higher than front of machine as indicated by the level.

NOTE: The level and hydraulic pressure gauges should be watched throughout this operation.

With this accomplished, LATERALLY LEVEL the machine by extending (lowering) the rear jack on low side until the level indicates lateral leveling. Now, extend front jack(s) until machine levels front to rear.

CAUTION: Never raise machine with front jack(s) when the mast is in the lowered position.

Once machine is level and the jack(s) control lever is returned to neutral position, hydraulic valves hold the machine in position.

If machine does not remain level (assuming ground does not yield), check for leaks at cylinders.

WARNING: Leveling of machine must be completed before starting the drilling operation.

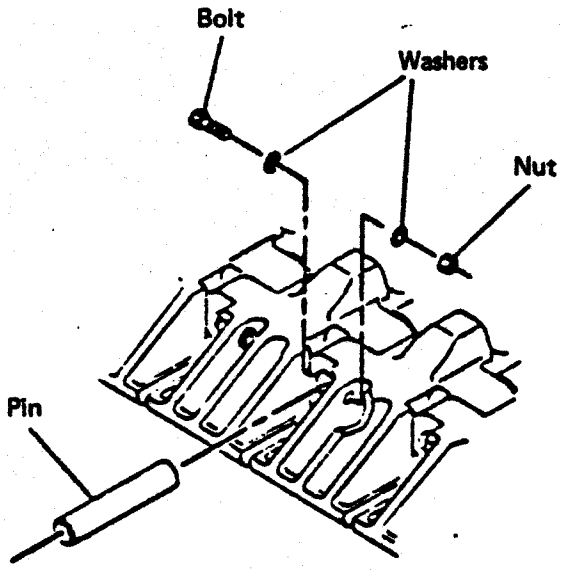
RETRACTING JACK – Reverse the above operation to lower machine. The front jack(s) MUST ALWAYS be retracted first.

ASSEMBLY OF DRILL STRING after mast is raised and machine is level, place hoist brake switch at Release position and mode switch at Manual. Hoist gear box high enough to clear top of stem that is in rack. Then set the brake.

Next, place the deck bushing over the upper end of the stabilizer. Screw the lifting bail onto the stabilizer and attach the winch line to lifting bail, lift the assembly and lower it into position in drill table opening until the deck bushing seats. Engage the stabilizer with the stem locks by moving the lock lever to the hold position. Remove the winch line and lifting bail from the stabilizer. Lubricate the threads of the stabilizer with a good quality drill pipe thread lubricant.

CRAWLER TRACKS on each side frame consists of forty (40) separate shoes. The shoes interconnect with two, hardened steel pins, each locked in place by a bolt thru the shoe web. Every third shoe is a cleated type.

Periodically check shoe pin(s) lock bolts. Replace missing bolts at once. Propelling without lock bolts causes the shoe pins to work out and separates the track.



ADJUST TRACK tension by moving the front roller assembly forward to tighten or to rear to loosen.

The crawler is in proper adjustment when the bottom of track is straight and tight, with six to eight inches of sag in top strand between front roller and center support roller. A crawler too tight causes loss of power. A loose crawler track results in serious damage as it may climb the drive sprocket.

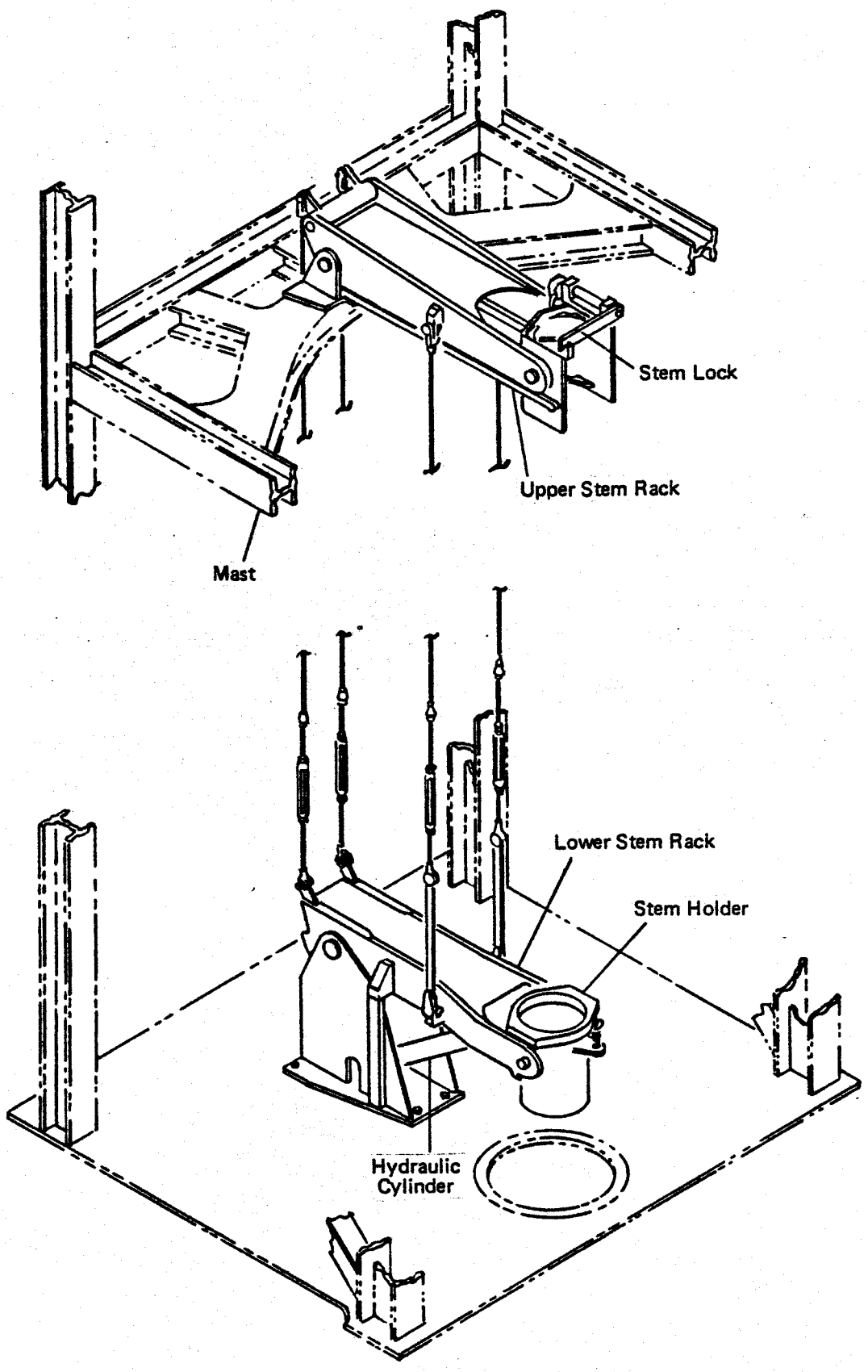
The front roller mounts on two adjusting blocks fitted into rectangular openings at each side of the crawler side frame. Two shoulder pins install thru the adjusting blocks and roller shaft and extend thru rear wall of openings. These pins lock roller assembly in place and facilitate moving assembly for adjustment.

Two (2) hydraulic jacks are required to make the crawler track adjustment.

Remove the cover plate from each side of crawler side frame. Place hydraulic jacks, one at each side, in space behind front roller adjusting block and against shoulder pin. Operate jack enough to release shims and remove ALL shims. Now blocks freely move forward or to rear.

IMPORTANT: Move both roller shaft ends at SAME time and SAME amount to keep roller shaft at right angles to crawler side frame.

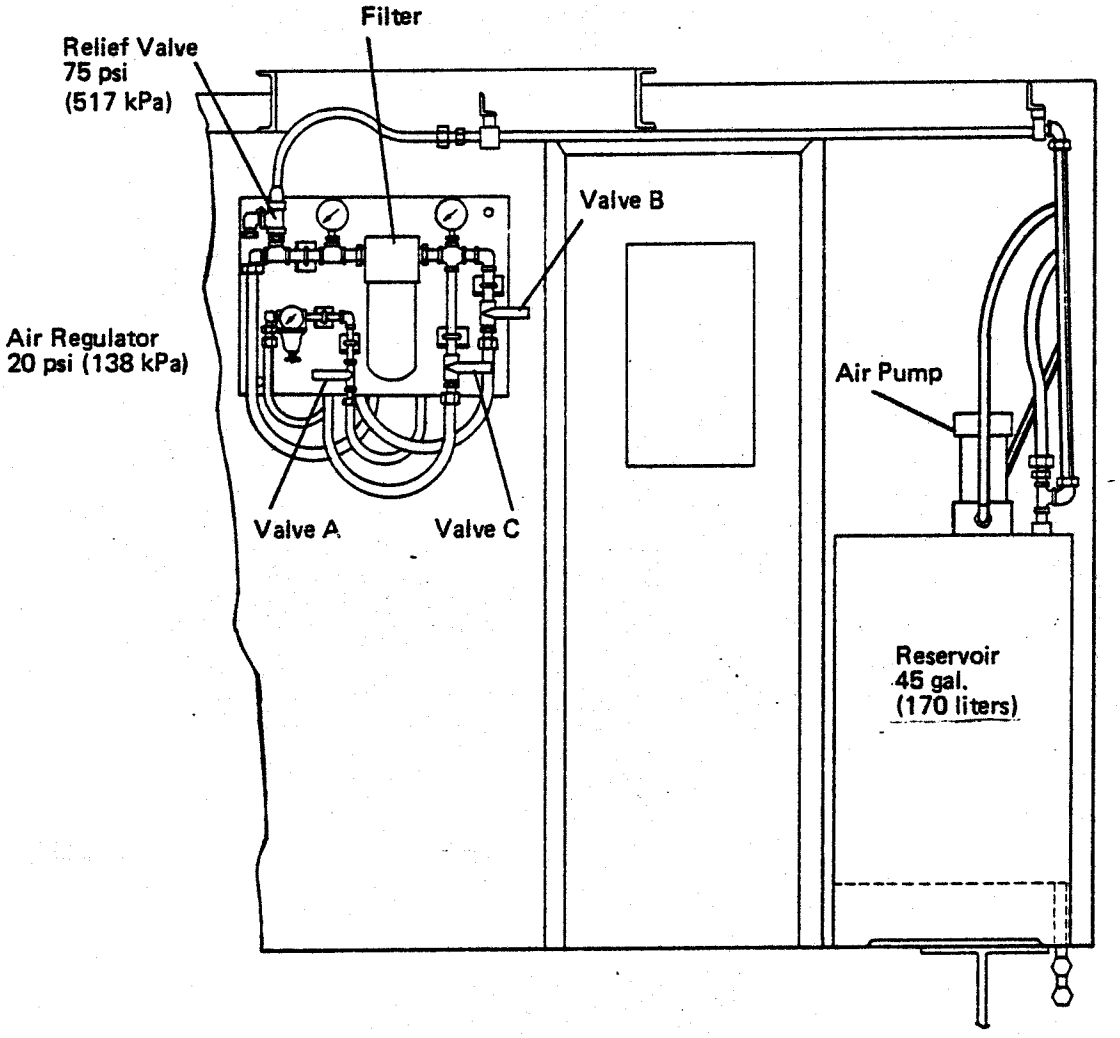
Move adjusting block (front roller assembly) forward by operating hydraulic jacks. If weight of tracks will not move roller assembly to rear when jacks are retracted; carefully propel machine back and forth until block releases.


Stem Lock
Upper Stem Rack
Mast
Lower Stem Rack
Stem Holder
Hydraulic Cylinder

Section 4 — Hydraulic Systems (cont.) Page

FLUID TRANSFER SYSTEM – This manual operated system is used to supply make-up hydraulic fluid from an on board 45 gallon holding reservoir, thru a filter, to the main or auxiliary reservoir.

The filter in this system uses a K10 element. This is the same type used in the main and auxiliary hydraulic systems. The element in this system should be changed when a 25 psi pressure drop is registered across the element.



SETTINGS – Open the air valve "A" to start system operating. Adjust the air regulator to 20 psi.

Close the oil valve "B" and "C" to set the relief valve at 75 psi (517 kPa).

OPERATION – The hydraulic fluid in the holding reservoir should be cycled for one hour, thru the filtration loop, after it is added to the holding reservoir and before it is transfered to main or auxiliary reservoir.

of inferior quality. Purchase fittings and hoses furnished with plastic caps to seal out dirt. Do not remove caps until ready to use. Clean all other parts not so furnished with a high quality degreaser and treat with a derust compound, if held in storage. Keep all parts clean and free from scale and rust.

Make sure all parts are secure to prevent movement and vibration.

HYDRAULIC FILTERS – The main hydraulic system uses suction filters in top of the tank and pressure filters on the manifold.

The main suction filters, equipped with a 10 micron, K-10 throw type element, is furnished with a vacuum gauge. Replace element when the gauge indicates 10 inches of mercury. To change elements, remove the four cap screws on inner bolt circle and pull element from enclosure. Replace element and tighten cap screws.

The two main hydraulic system inline filters, located at the manifold also contain a 10 micron, K-10 throw away filter element to replace the filter shut down (pump motor stopped) system. With a wrench on the square lug on top of the filter, unscrew the internal plug cap and lift out the element from the filter enclosure, replace the K-10 filter element, replace cap and tighten securely. Bleed off trapped air thru valve at filter top.

The inline filters are furnished with an electric dirt alarm. Replace the element when the red light in the cab comes on. The inline filter enclosures each contain a by-pass valve with 20 psi setting for cold weather.

The auxiliary hydraulic system uses one inline filter, located under auxiliary valve one. The element is the same as the other filters. Use the same procedure for changing element.

On the suction of the auxiliary gear type pump, a suction separator consists of four magnetic rings within a perforated metal enclosure. This device cleans metal (ferrons) particles from oil.

Check the vacuum gauges which monitor suction filters daily. The lights on the operator's control panel monitors two main pressure line filters and the auxiliary system filter.

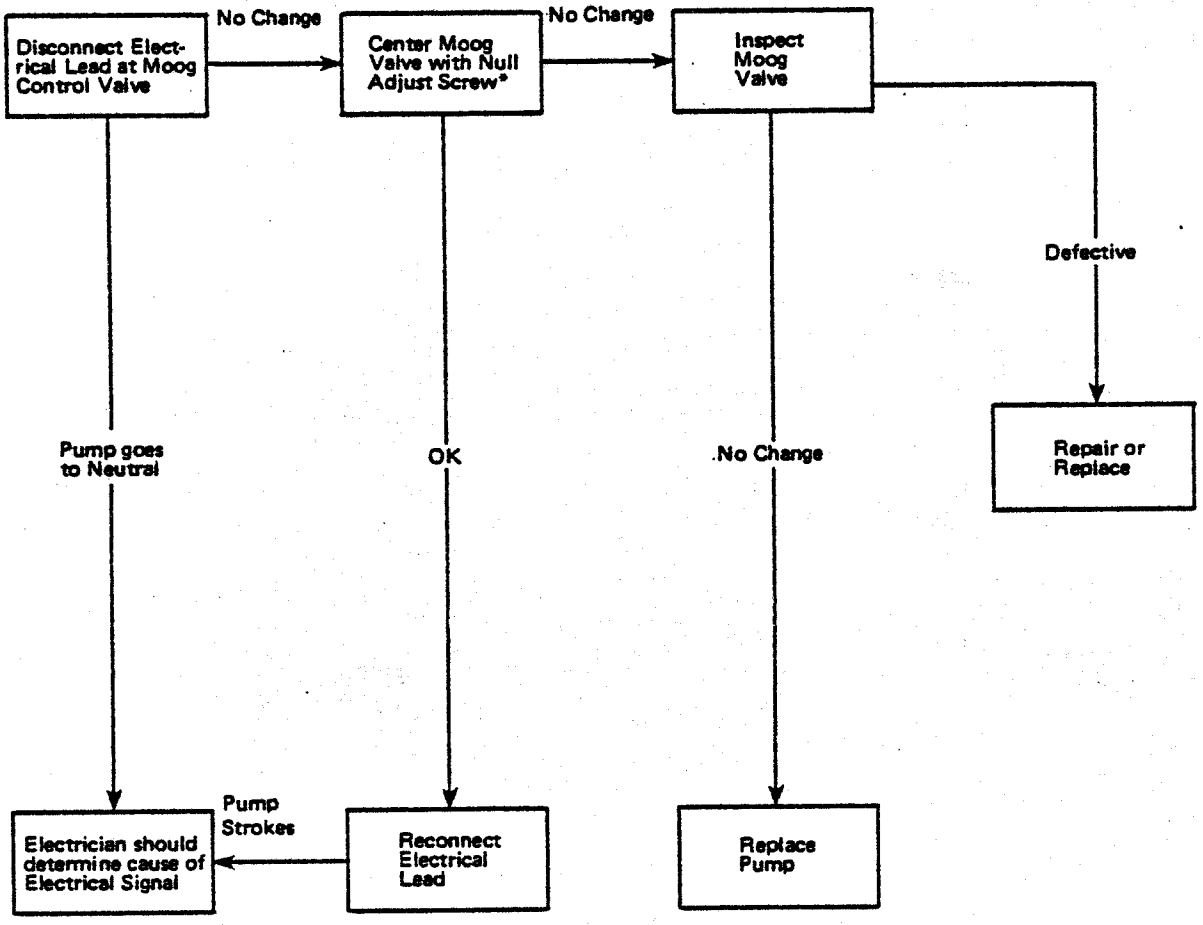
MAIN HYDRAULIC CONTROL VALVES – Three, four way hydraulic valves located on the hydraulic module manifold, are hydraulic pilot operated.

All three valves work together and all are two position; solenoid operated, spring return to the center position. Valve 1 and valve 3 control flow to the propel motors and valve 2 control flow to hoist/pull down motors. If these valves leak or fail, replace entire valve assembly with standby equipment.

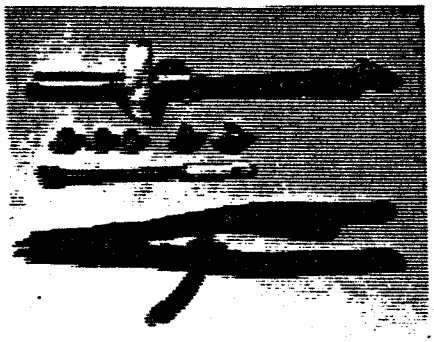
NEUTRAL DIFFICULT OR IMPOSSIBLE TO FIND

Crawlers or Gear Box creep with controls in the neutral position.

NOTE: The Gear Box will always creep down in the hoist mode if the brake is not set.



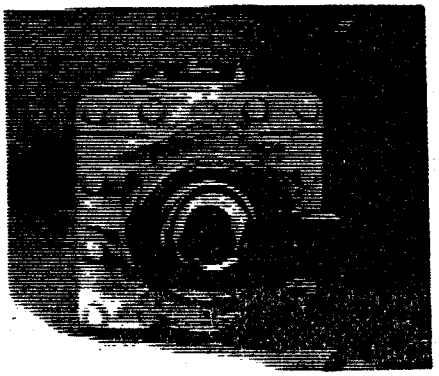
* It is best to do this in the propel mode with jack extended so that the crawlers are off the ground.



Special Tools
Certain tools are required that are not normally carried which are as follows:

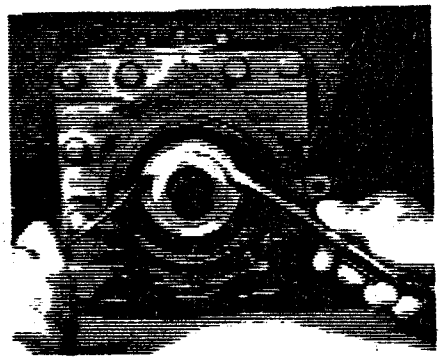
1. Waldes Truarc No.7 Retaining Ring Pliers
2. Drag Link Socket
3. Torque Wrench

REPLACEMENT OF PUMP SHAFT SEALS:

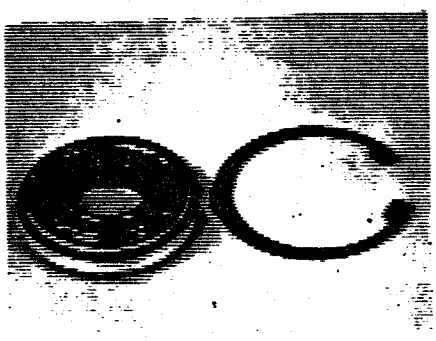


It is recommended that all shaft seal parts be replaced. If parts are to be reused, they must be protected from being damaged by the shaft during removal.

Remove the large retaining ring located on the shaft end of the pump. Remove the side opposite the tangs from the groove first.



The aluminum housing is removed next. It is held in place by the friction of the O-ring on its O.D. Pry the housing toward the end of the shaft until the O-ring is free.



Remove the housing from the shaft. This part is actually an assembly that is being held together by the friction of an internal O-ring. It will normally remain assembled until physically separated.

Pull or push valve spool from valve housing at either end in a quick smooth motion. Due to close tolerance, jamming may occur when the last valve portion is still in the housing. When jamming occurs, gently tap valve back into housing with soft mallet and repeat procedure again.

Remove the 12 seal rings from valve. The two sealing screws in the valve end (where fitted) are used in manufacturer only, but may be removed for valve passage cleaning.

CRANKSHAFT REMOVAL AND PISTON ASSEMBLY BREAK DOWN begins with support of motor case with drive shaft point straight up.

Clean all burrs and rust from shaft next to seal. Remove front cover and shim plate (if fitted). Use the two front cover screws in the jacking holes provided.

Remove upper connecting rod retaining ring. Carefully lift connecting rod shippers clear of lower ring. Push connecting rod and piston assemblies up into cylinder bores.

Lift out crank shaft. Remove rear connecting rod retaining ring.

Note position of each connecting rod in its bore and pull it towards motor center until piston is clear of bore. Release circle clip in piston skirt and shake connecting rod clear of split retaining ring. Now, remove the two seal rings.

REMOVE BEARINGS FROM MOTOR, by first pushing out rear bearing from motor case using a press, or by tapping with a tubular drift toward motor center.

If bearing plate is a single unit, take out bearing extractor hole seal screws. Then extract front bearing cup using two jacking screws in these holes.

If a composite bearing plate of front cover and shim plate is fitted to motor, remove shim(s). Now, press out front bearing cup from front cover.

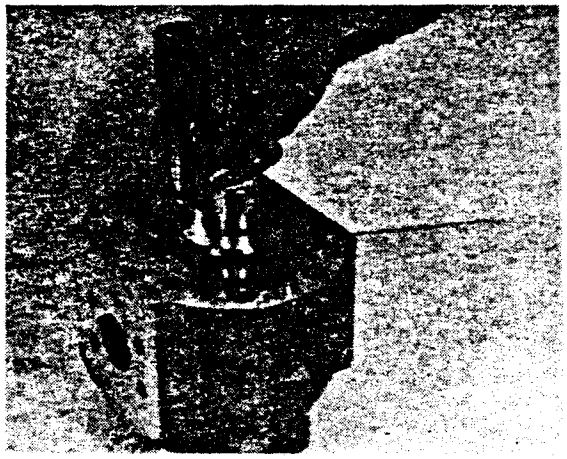
Remove shaft seal by pressing toward motor center.

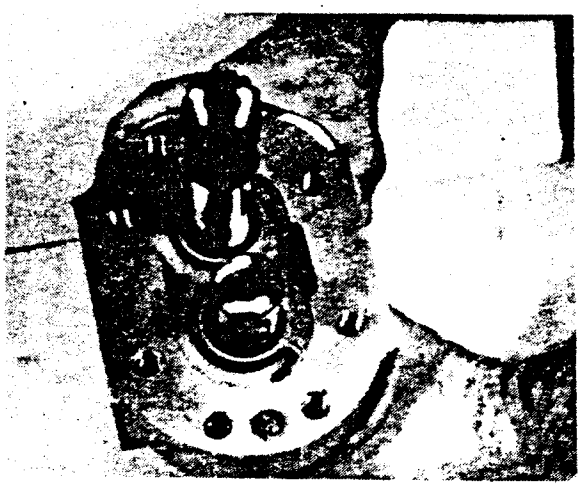
Remove bearing cones from crankshaft using suitable extractor placed over bearing rollers.

NOTE: This operation damages bearings so replacement is necessary. Take care not to damage the crank throw surface or surface on which shaft seal runs.

20. With pump discharge port facing you, install drive gear in gear bore to the left for counterclockwise rotation. Install idler gear in opposite bore. See Fig. 11.

21. Install pressure plate with bronze side down and round traps to the discharge side of body. See Fig. 12.





22. Install isolation plate on the suction side, back-up ring, O-ring and ring retainer on the discharge side. See Fig. 13.

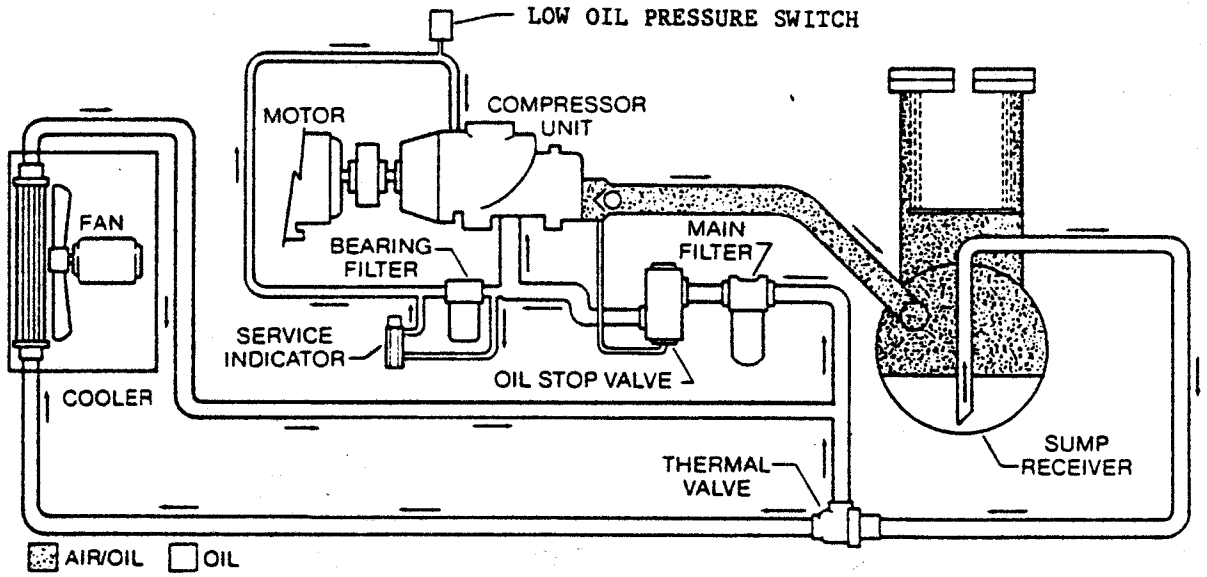
23. Install the dowels in pump body.

2. Seals leakage paths between the rotors and stator and between the rotors themselves.

3. Acts as a lubricating film between the rotors, allowing one rotor to directly drive the other, which is an idler.

After the air/oil mixture has been discharged from the compressor, the oil is separated from the air. At this time, the air flows to your service line and the oil is cooled in preparation for reinjection.

OIL SYSTEM, FUNCTIONAL DESCRIPTION – The oil cooling system (water-cooled version) consists of a shell and tube heat exchanger, water-flow regulating valve, main line filter, extra-fine bearing lube filter, thermal valve, oil stop valve and interconnecting piping. Air-cooled models are schematically the same as water-cooled models with the exceptions being a radiator-type cooler and a fan used in place of the shell and tube heat exchanger and the water flow regulating valve.



COMPRESSOR OIL SYSTEM DIAGRAM (AIR-COOLED SHOWN)

The pressure in the receiver/sump causes oil flow by forcing the oil from the high pressure area of the sump to an area of lower pressure in the compressor unit.

Oil flows from the bottom of the receiver/sump to the thermal valve. The thermal valve is fully open when the oil temperature is below 140 degrees F. (60 degrees C.). The oil passes thru the thermal valve, the main filter and directly to the compressor unit where it lubricates, cools and seals the rotors and the compression chamber.

PURPOSE OF CONTROLS:

Control or Indicator	Purpose
HOURMETER	Records accumulative hours of compressor operation; useful for planning and logging service schedules.
LINE PRESSURE GAUGE	Continually monitors service line air pressure. Located on dry side of receiver downstream from check valve.
SUMP PRESSURE GAUGE	Continually monitors receiver/sump pressure at various load and/or unloaded conditions.
DISCHARGE TEMPERATURE GAUGE	Monitors temperature of air leaving the compressor unit. For both air and water cooled compressors, normal reading is approximately 170-195 degrees F. (76-90 degrees C.).
BEARING FILTER MAINTENANCE INDICATOR	Indicates when a bearing filter element change is required. A red signal is indicated when the pressure drop thru the filter is excessive.
SEPARATOR MAINTENANCE INDICATOR	Indicates when separator element change is required. A red signal is indicated when pressure drop thru the separator is excessive. Do not clean the separator elements.
OIL SIGHT GLASS	Monitors oil level in the sump. Proper oil level is apparent when you can visually notice oil thru the sight glass. Check the level when the machine is shutdown. DO NOT OVER FILL.
SEPARATOR RETURN LINE SIGHT GLASS	Used to indicate oil flow in the return line. When the compressor is running at full load, oil flow should be visible in this sight glass. There may be little or no flow when the compressor is running unloaded, but a sluggish flow from the return line at full load indicates a need to clean the return line strainer.
OIL STOP VALVE	Cuts off flow of oil to compressor unit at machine shutdown and allows flow of oil to the unit on startup.

TO INCREASE CAPACITY FROM A REDUCED LEVEL:

1. With the compressor running at full load (the Sullicon lever is against the full load stop screw), loosen the full load stop screw jam nut. Turn the full load stop screw clockwise until the inlet vacuum corresponds to the desired capacity as shown in chart on page 5–37. The inlet vacuum is read on a gauge mounted on the instrument panel.

2. Tighten the jam nut.

3. Check to see that the Sullicon return spring is holding the lever against the full load stop screw. If not, tighten the spring adjusting screw accordingly.

If that pressure is not 110 PSI (759 kPa) an adjustment is required in the pressure switch. Follow the instructions below for adjustments of both the pressure range and the differential.

1. Remove cover to pressure switch.

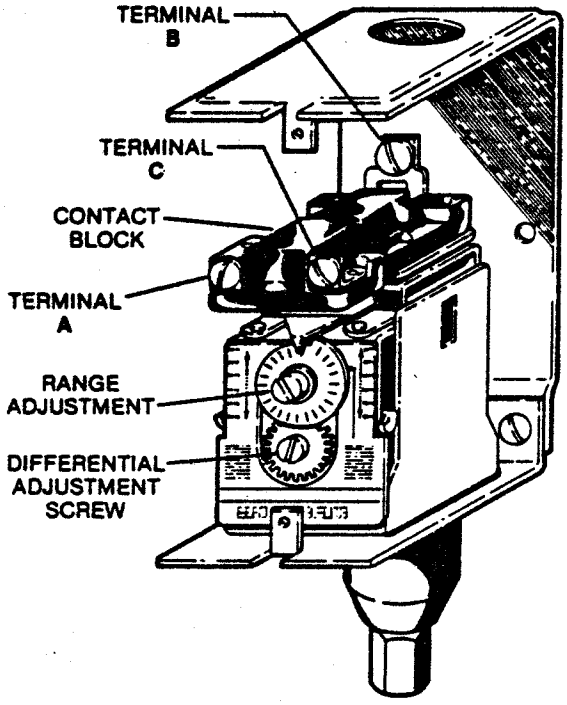
2. Turn the range adjusting screw to the high pressure setting. Turning the screw counterclockwise lowers both the high and low pressure settings equally.

FOR DIFFERENTIAL ADJUSTMENT:

Differential is the difference between the high and low pressure settings.

1. Turn the differential adjusting screw to the lower (reset) setting. Turning the screw counterclockwise widens the differential by lowering the reset (lower) setting only.

ALLEN BRADLEY PRESSURE SWITCH



After the control pressures have been adjusted, the "unload" sump pressure must be adjusted. This is best done by closing the service line shutoff valve, allowing the pressure switch to open and causing the control system to go into the unload phase of operation. When the Sullicon Control lever is in the unload position, turn the stop-screw until the sump pressure gauge reads 70-80 PSI (482-551 kPa). The stop screw is turned clockwise to increase pressure and counterclockwise to decrease pressure. Cycle the control system several times and recheck air pressure settings.

SPECIAL NOTES

1. Assembly of the gaskets can be made easier by dipping the gaskets in water or the fluid to be sealed. Do not use other rubber lubricants.

2. Self-restrained gasket installation: To simplify installation of a self-restrained gasket, install the lower half of the gasket first, leaving the split area in the steel retaining ring free at the top. Stretch the gasket and split area of the retaining ring until they slip over the pipe into position. Refer to Step 4.

3. Flexmaster joints are not intended to support end loads caused by internal pressure or other forces causing pipe separation.

PRESSURE REGULATOR VALVE MAINTENANCE – Pressure regulator valve maintenance normally requires the replacement of the internal diaphragm, use repair kit No. 41742 and follow the procedure below for proper installation.

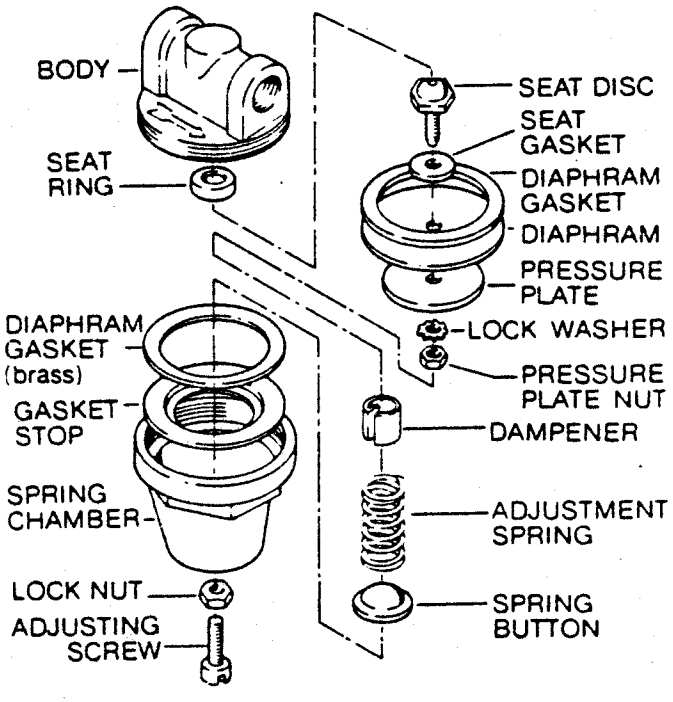
1. Loosen the locknut and turn the adjusting screw counterclockwise until the inner spring tension is relieved. The adjusting screw should turn freely when the spring tension is relieved.

2. Remove the spring chamber from the body to allow access to internal parts.

3. Next, remove the spring button and spring the dampener, located inside the spring. The dampener will stay inside the spring as it is removed. Leave the dampener inside the spring as there is no need to remove it.

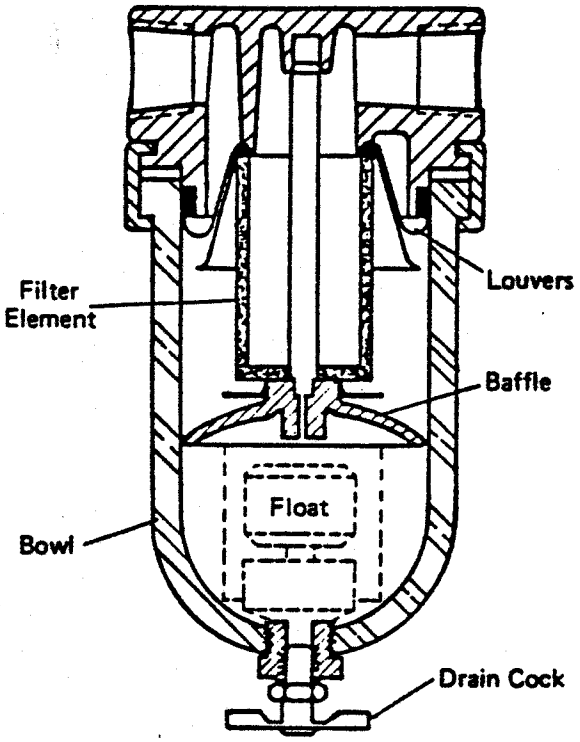
4. After removing the spring, remove the gasket stop and brass gasket.

PRESSURE REGULATOR VALVE

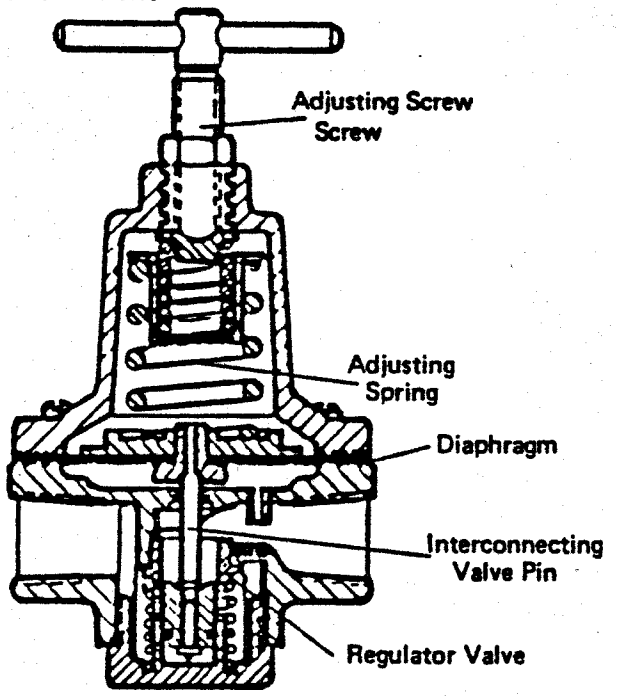


5. At this time, remove the pressure plate nut and disassemble the pressure plate, diaphragm, diaphragm gasket (rubberized asbestos), seat disc and seat ring.

Before disassembling the air filter, shut off the air pressure. Remove clamp ring and separate body from the intermediate body. To remove the filter element, insert a metal bar 1/4" x 1-1/4" x 4" (6 mm x 22 mm x 102 mm) long into the slots provided in the underside of the deflector and unscrew it with a wrench. To remove the bowl from the intermediate body, take out the snap ring and baffle. The float will drop out when the bowl is turned upside down. The automatic drain assembly is easily removed by loosening the retaining ring. Care should be taken when reassembling to install the gasket on the automatic drain assembly before placing in the bowl. The float and automatic drain assembly are not repairable items.



Inspect and clean each part thoroughly with clean warm water or kerosene. Clean the air filter element in a cleaning solvent and blow it out with compressed air. Do not use any harsh chemicals on the polycarbonate bowl. They can damage the bowl and cause failure of the filter.



FILTER PRESSURE REGULATOR– A pressure regulator installs in the air line near compressor between filter and lubricator.

Adjust regulator by turning T-handle on regulator top. Turning handle clockwise increases pressure and turning handle counterclockwise decreases pressure.

When adjusting operating pressure, start with zero (0) pressure reading. Turn handle right.

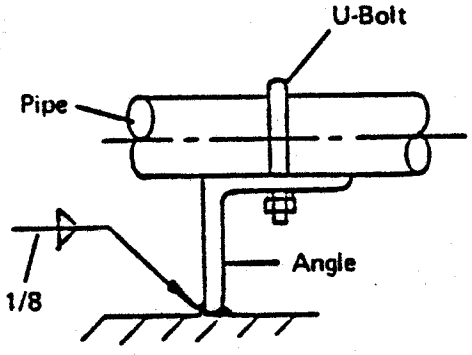
Increase pressure by turning handle right until reaching desired pressure.

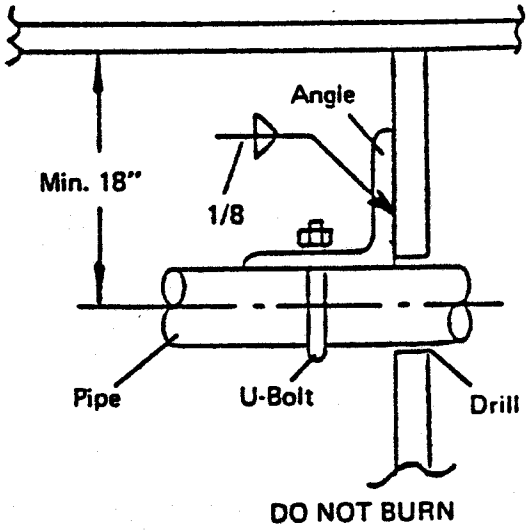
DESCRIPTION OF OIL AND GREASE CLASSIFICATION

CODE	NAME	DESCRIPTION
MPG	Multipurpose Grease	A well manufactured E.P. grease having good resistance to both heat and water, possessing good mechanical stability and oxidation resistance. It must be suitable for use in Farval, Lincoln and Trabon automatic dispensing systems. It shall be free of corrosive and deleterious foreign matter of any kind. Special products not meeting the requirements of the Engineering Standard may be required for operation at sub-zero ambient temperatures. MPSD should be consulted regarding products intended for service at low ambient temperatures. USES – Anti-friction bearings both packed and gun lubricated, chassis and plain bearings and central lubricating systems.
RGL	Regular Gear Lubricant	Semi-fluid greases having just enough body to retain them in a semi-enclosed case. It must have good adhesive, load carrying and non-channeling properties. USES – Semi-enclosed gear cases.
OGL	Open Gear Lubricants	Either of two types of product may be specified. They are intended for use on open gearing where retention is a problem. Both must be adhesive in nature and resist dripping from or flinging off the exposed gearing either idle or in motion. They must be water and corrosion resistant and have E.P. properties. 1. Type B must be suitable for application without heat or diluent and should be suitable for use in automatic dispensing systems if required.

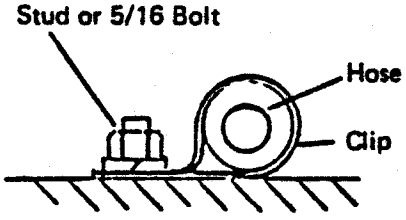
STANDARD LUBRICATION INSTALLATION

TYPICAL PIPE MOUNTING

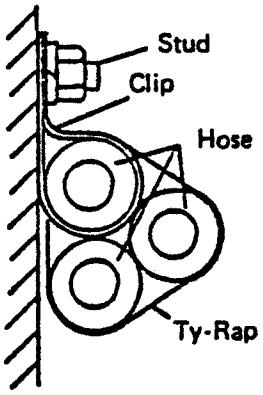




TYPICAL HOSE MOUNTING



Every 3 Feet or as Required



For more than one Hose, clip one, secure others to it with Ty-Rap

Before INSTALLATION OF VEE TYPE GREASE SEALS, measure bore depth with micrometer. Measure stacked height of packing. This indicates the rings and filler firmly bottomed in bore.

1. Remove ALL roughness and burrs. Clean shaft and bore. Lightly coat shaft and bore with oil.

2. Insert filler into bore.

3. Insert BOTTOM adaptor ring, CONVEX FIRST. Place split a quarter turn (90 degrees) from filler ring joint. NOTE: If split flex rings appear too long, DO NOT CUT or TRIM ends. COMPRESS ring against itself to insert into bore.

4. Insert Vee ring with OPEN side toward the oil, one at a time, with split a quarter turn (90 degrees) from the insert before it. Bottom each ring with mallet and wood block shaped to fit the contour of ring.

5. Insert TOP adaptor ring LAST.

6. Assemble split retainer ring and cap screws. Draw up just enough to maintain slight pressure on seal. Too much pressure causes rings to burn. Too little pressure allows oil to leak past the seal.

7. Determine the number of shims needed and insert under retainer ring. If oil seeps past seal, remove ONLY enough shims to stop the leak.

SURFACE PREPARATION requires removing ALL foreign matter, grease, oil and dirt, from the mating parts. A wiping cloth soaked with chlorinated solvent or vaporphase degreaser will do the trick.

Acceptable solvents are:

MPSD Standard Solvent	—	Chlorothene
Loctite Safety Solvent	—	Trichlorothene
Loctite Primer Grade T #47	—	Perchlorothene

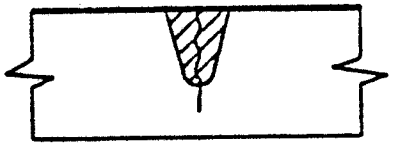
ADHESIVE REMOVAL, when uncured, thru use of solven soaked wiping cloth. If cured, this resin strips off with Oakite #156 solution or abrasive remover.

After center portion is repaired, V out either of remaining ends. Taper end of V out for proper fusion and access. Complete weld of this area.

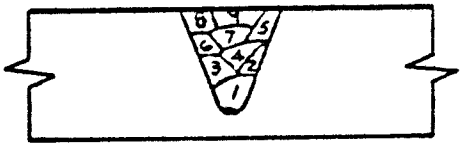
Complete weld on final one-third of repair area.

f. Determine if ALL the crack has been removed after air carbon-arcing by magnaflux and/or dye penetration of the joint. Give particular attention to bevel walls, since cracks have different patterns and it is possible the cleaned out area may appear free of cracks; when actually it is not.

PROPER PREPARATION FOR WELDING is half the job. First V out defective material, so repair weld will be as thick as original metal. REMOVE slag, rust, grease, paint, water, etc., from repair area. ALIGN parts correctly and brace, clamp, or tack weld to maintain alignment. Use the specified welding preheats for ALL air carbon-arcing or burning.



Crack not completely removed reappears in repair weld

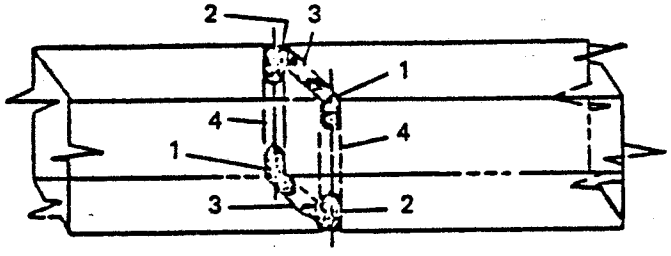


Whenever possible make center pass last as shown

PREHEAT adjacent area (to the weld area) a minimum of three inches in all directions to the specified temperatures shown under WELDING SPECIFICATIONS. It is VERY IMPORTANT TO MAINTAIN preheat until weld is completed. Some type of temperature indicating device(s) is helpful for temperature determination.

POSTHEAT area adjacent to weld 100 degrees fahrenheit (F) higher than preheat specified. MAINTAIN postheat for one hour PLUS 30 minutes for each inch of thickness. Control cooling rate so temperature decreases about 50 degrees F. per hour until temperature reaches 150 degrees F. THIS IS IMPORTANT.

ORDER OF WELDING reduces warpage and provides a favorable locked up or residual stress pattern. The use of block welding (short, full size welds) helps reduce warpage. In many cases, V-ing out small areas and rewelding each of these areas; continuing until completing repair eliminates warpage. A favorable locked up or residual stress condition is obtained by making FULL DEPTH welds at the area farthest from the neutral axis first; then making welds closest to this neutral axis last.

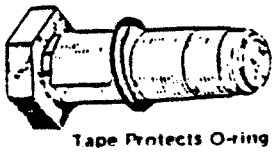


Preferred sequence for blocking in butt joint in box section

In hydraulic systems, flow wash bearing surfaces with hydraulic fluid and wipe parts, if needed ONLY with a dust free cloth.

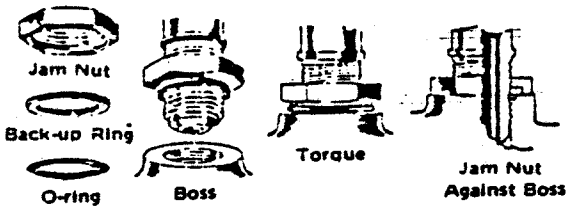
In an oxygen system, DO NOT PERMIT OIL AND GREASE around the O-ring. The mixture of oxygen; oil and grease causes an explosion.

INSTALLATION on a piston does require a bit of stretching, but try to keep it uniform. Once installed, remove any and ALL twists. When pushing piston into cylinder, push straight in; DO NOT TURN while pushing. Turning causes bunching and eventually a leak. Most installations are the removal procedure in reverse.

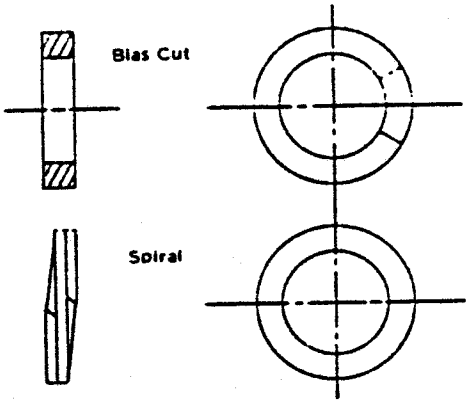


Tape Protects O-ring During Installation

Some installation require the O-ring to slip over sharp edges, such as screw threads. Cover these edges with thin plastic tape or aluminum foil, lube ring and work into place. Perhaps making a thimble of plastic to place over threads first is even easier.



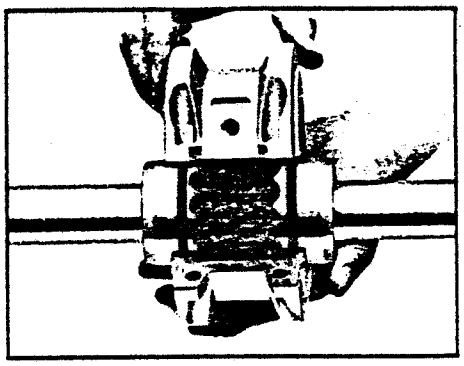
Other installations, such as placing a ring in a positioning type universal fitting, are more involved. In this case, a backup ring is lightly coated with lube and then worked into the counterbore of the jamb nut. The O-ring is stretched and rolled over fitting threads and into smooth threadless surface designed for the backup and O-rings. Next, jamb nut is pushed firmly against lower threaded section of fitting. Fitting installs in boss until ring contacts boss and increases torque. Jamb nut is held stationary in this position while applying 1-1/2 turns to fitting. Then turn fitting into boss NOT MORE than ONE added turn to position it. Final step is to hold fitting and torque jamb nut properly.

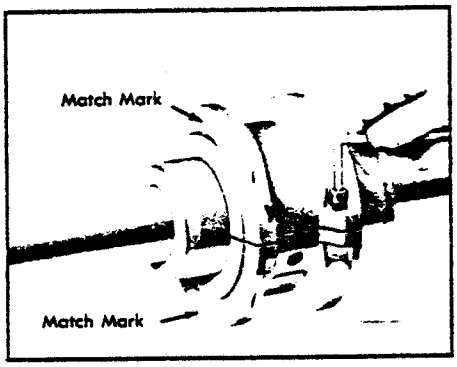


A similar procedure is used for non-positioning fittings, but the jamb nut and backup ring may be omitted.

BACKUP RINGS provide a firm surface for O-rings to press against to avoid extrusion, under high pressures, into clearance between sealed surfaces. Any surface movement with O-ring, so extruded, results in high wear rate which finally leads to ring failure.

Backup rings are needed on each side of an O-ring when pressure is in alternate directions. Using a single ring, install on the downstream side of the O-ring.





5 PACK WITH GREASE AND ASSEMBLE COVERS

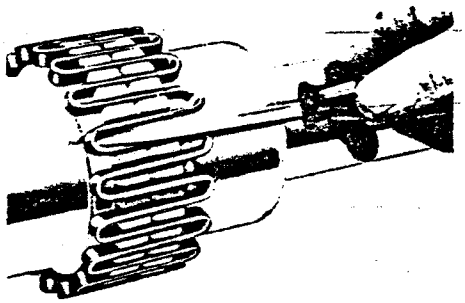
Pack the spaces between and around the grid with as much lubricant as possible and wipe off excess flush with top of grid. Position seals on hubs to line up with grooves in cover. Position gaskets on flange of lower cover half and assemble covers so that the match marks are on the same side (see above). If shafts are not level (horizontal) or coupling is to be used vertically, assemble cover halves with the lug and match mark UP, or on the high side. Secure cover halves with fasteners and tighten to torque specified in Table 1. (Note that Sizes 20 thru 70 have a self-locking feature for the stop nuts.) CAUTION: Make certain lube plugs are installed before operating.

VERTICAL COUPLINGS

6 PERIODIC LUBRICATION — Remove both lube plugs and insert lube fitting. Fill with recommended lubricant until an excess appears at the opposite hole. 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.



WHEN ORDERING SPARE PARTS,

SPECIFY COUPLING **SIZE** AND **TYPE** AS SHOWN ON COUPLING COVER

SECTION 9

ELECTRICAL MAINTENANCE

INDEX

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,

DAILY MECHANICAL INSPECTION

AUXILIARY AIR COMPRESSOR:

1. Is air compressor operating properly?
2. Is the compressor and motor bolted down properly?
3. Is the crankcase oil level correct?
4. Are the high and low operating pressures correct per instruction?
5. Are the air filters clean?
6. Are the guards in position and secure?
7. Are there any air leaks?
8. Are all air lines secure and undamaged?
9. Is the reservoir tank drained?
10. Any excessive bearing heat?
11. Any vibration or noise?
12. Is lubricator operating properly?
13. Is the V-belt drive adjusted?