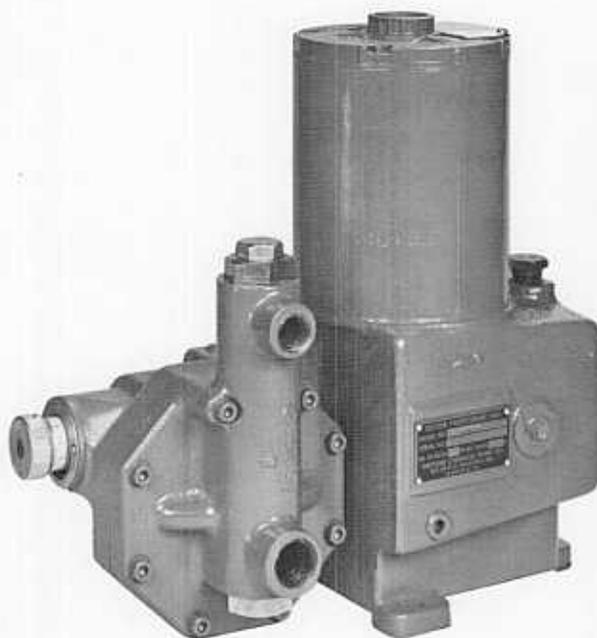


OPERATING & INSTRUCTION MANUAL

for
NEPTUNE
SERIES 560 "dia-PUMPS"



Neptune
CHEMICAL PUMP CO., INC.

Lansdale, Pa. 19446 • Tel.: 215-699-8700 • FAX: 215-699-0370

WARNING

**LOCKOUTS ARE REQUIRED BEFORE
SERVICING THIS EQUIPMENT.
READ INSTRUCTION SERVICE
MANUALS FOR DETAILS.**

SAFETY INSTRUCTIONS:

**Shut off / Lockout pump Power
before Servicing, bleed Pressure /
Chemical off, etc.**

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SECTION I

GENERAL DESCRIPTION

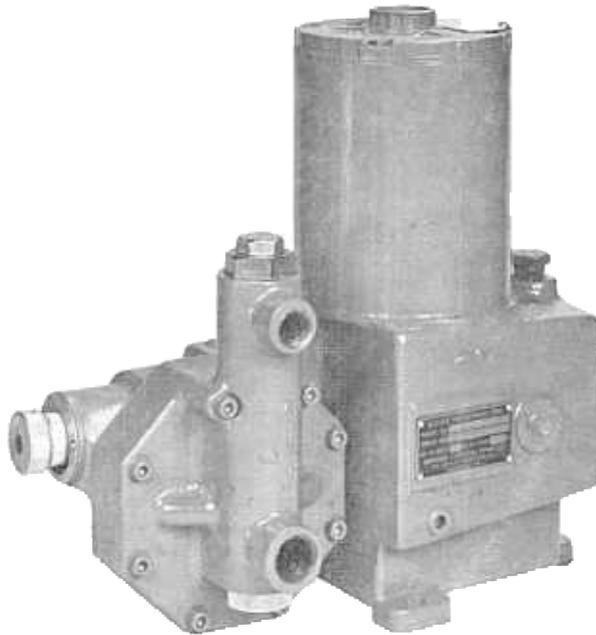
The Neptune Series 560 "dia-Pump" is a reliable metering pump of the hydraulically actuated diaphragm type. Under constant conditions of temperature, pressure, and capacity adjustment settings, a plus or minus range of 1% metered discharge volume is maintained.

A plunger reciprocating at a fixed stroke displaces hydraulic fluid which actuates a flexible, chemically inert, Teflon[®], diaphragm to create pumping action. The capacity of the pump is regulated by controlling the volume of hydraulic fluid which by-passes the diaphragm cavity.

Capacity adjustment can be made manually or automatically by instrument signal.

Metering accuracy is maintained by a control rod which allows hydraulic fluid replacement and air venting automatically with each stroke, while also taking into account temperature changes of the hydraulic fluid. Metering accuracy is also insured by the use of double ball check valves on the suction and discharge of the pump.

PLEASE READ THE INSTRUCTION MANUAL COMPLETELY BEFORE INSTALLING THE PUMP.



LIMITED WARRANTY

All Neptune Pumps are tested at the factory prior to shipment. Each part used in their construction has been carefully checked for workmanship.

If the pump is installed properly, Neptune Chemical Pump Company, Inc., warrants to the purchaser of this product for a period of twelve months from the date of first use or eighteen months from shipment, whichever occurs first, this product shall be free of defects in material and/or workmanship, as follows:

1. Neptune Chemical Pump Company, Inc., will replace, at no charge, any part that fails due to a defect in material and/or workmanship during the warranty period, FOB our factory, Lansdale, Pennsylvania. To obtain warranty service, you must forward the defective parts to the factory for examination, freight pre-paid.¹
2. This warranty period does not cover any product or product part which has been subject to accident, misuse, abuse or negligence. Neptune Chemical Pump Company shall only be liable under this warranty if the product is used in the manner intended by the manufacturer as specified in the written instructions furnished with this product.

Any express warranty not provided in this warranty document, and any remedy for breach of contract that, but for this provision, might arise by implication or operation of law, is hereby excluded and disclaimed. Under no circumstances shall Neptune Chemical Pump Company, Inc., be liable to purchaser or any other person for any charge for labor, repairs, or parts, performed or furnished by others, nor for any incidental consequential damages, whether arising out of breach of warranty, express or implied, a breach of contract or otherwise. Except to the extent prohibited by applicable law, any implied warranty of merchantability and fitness for a particular purpose are expressly limited in duration to the duration of this limited warranty.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or allow limitations on how long any implied warranty lasts, so the above limitations may not apply to you. This warranty gives you specific legal rights, and you may have other rights which may vary from state to state.

IMPORTANT

SHOULD IT BE NECESSARY TO SEND THE PUMP TO THE FACTORY FOR REPAIR OR MAINTENANCE REBUILDING, DRAIN ALL OIL AND CHEMICAL FROM PUMP BEFORE SHIPPING. FAILURE TO DO SO CAN CAUSE EXTENSIVE DAMAGE TO THE MOTOR.

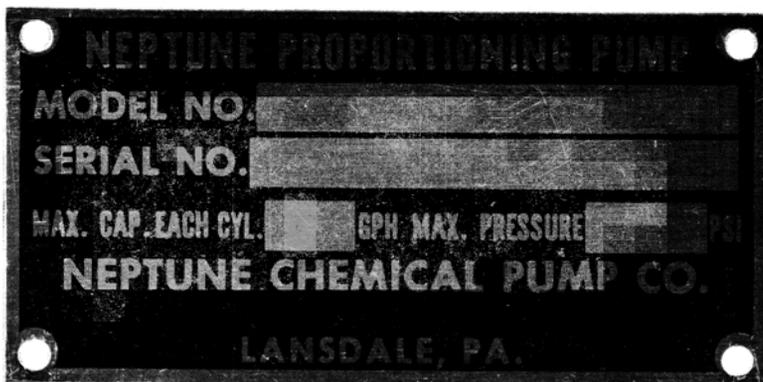
¹ SEE IMPORTANT NOTICE — RETURN GOODS AUTHORIZATION

IMPORTANT NOTICE RETURN GOODS AUTHORIZATION

- (1) All equipment returned to Neptune Chemical Pump Company, Inc., requires proper Returned Goods Authorization Number (RGA) and tags.
- (2) All equipment returned to the factory for repair or service must first be thoroughly flushed and have all chemical contact areas neutralized.
- (3) All equipment which has been in contact with chemicals must be accompanied by a copy of the Chemical Product Material Safety Data Sheet (MSDS).
- (4) Failure to comply with the above instructions, will result in equipment being returned to sender, freight collect, without service.

PARTS ORDERING INSTRUCTIONS

The complete model number and serial number of the pump must be furnished to insure prompt and accurate parts service. These numbers are found on the name plate (sample photo below) located on the side of the pump. Refer to Section VII for complete parts lists.



Send all orders or inquiries for parts to:

Parts Department
Neptune Chemical Pump Company, Inc.
P.O. Box 247
Lansdale, PA 19446
Tel: 215-699-8700
FAX: 215-699-0370

SECTION II

INSTALLATION INSTRUCTIONS

1.0 GENERAL

- 1.0.1 When unpacking a pump or chemical feed system, be certain that no parts are thrown away. Examine the equipment for possible damage. If damage has occurred, file claim with the common carrier within 24 hours. Neptune will assist in estimating the repair costs.

The "dia-Pump" should be located so as to avoid an ambient temperature above 120°F, 50°C. Free air circulation is important when considering the location of the pump.

The "dia-Pump" should be located on a level surface. Three mounting holes are provided to anchor the pump securely to the mounting surface. PVC head pumps must be mounted on three, one-inch spacers provided.

- 1.0.4 All piping to the pump should be supported to prevent stress on the pump input and output fittings.

Before connecting the pump, make sure that all fittings are completely clean by flushing thoroughly. Any foreign matter entering the pump can damage the internal parts and severely limit the life of the pump.

- 1.0.6 A "Y" STRAINER MUST BE INSTALLED IN THE SUCTION LINE OF THE PUMP TO INSURE AGAINST FOREIGN MATTER ENTERING THE PUMP. ALL SUCTION LIFT APPLICATIONS REQUIRE A FOOT VALVE STRAINER TO PREVENT LOSS OF PRIME, AND TO PREVENT FOREIGN MATERIAL FROM ENTERING THE PUMP.

- 1.0.7 Shut-off valves and unions should be placed in the suction and discharge lines to facilitate servicing the pump.

- 1.0.8 Care should be exercised when piping to PVC head pumps. In cases where vibration or stress is unavoidable, flexible connections should be used.

- 1.0.9 The electrical supply to the pump must match the motor name plate characteristics. The motor rotation is counter clockwise when viewed from the top of the motor, looking down on the pump. (See Figure 1).

- 1.0.10 Discharge Piping should be the same size or larger than the discharge connection. Suction Piping should be one size larger than the suction connection. Limit the total length of the suction line to 3-4 feet suction lift or 6-7 feet flooded suction. Minimize bends, elbows, or other restrictions.

Important

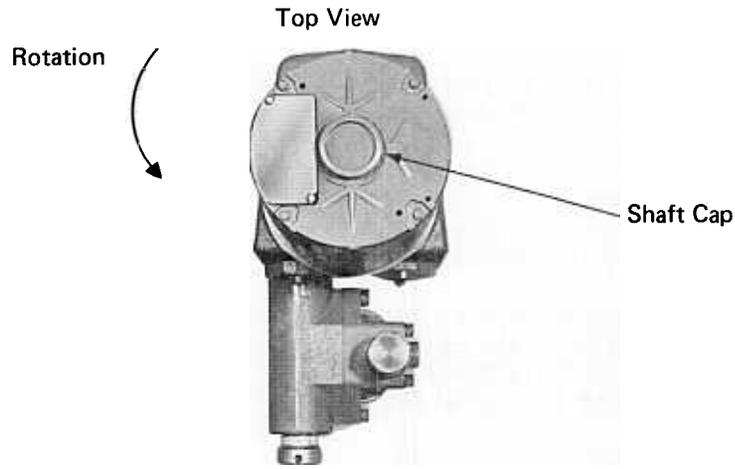
On single phase, integrally mounted motors, the rotation is set at the factory and must not be changed.

On three phase, integrally mounted motors, rotation is determined by prying the 3/4" diameter shaft cap from the top of the motor and noting the shaft rotation.

On all flange mounted motors the motor rotation may be viewed by removing the plug in the opening on the side of the adapter.

Please note Figure 1, indicating the correct rotation. (An arrow on the gear box also indicates proper rotation.) Operation with the incorrect rotation will damage the pump and motor.

1.0.9 (Continued)



FIGURE

- .0.1 Set capacity knob to zero and remove Air Bleed Plug from the top of Oil Chamber, refer to drawings 5670 and C-002030 for location of Plug. Fill gear box and pump by pouring the hydraulic fluid supplied through the fill opening at the rear of the pump. Pour fluid in slowly until it has reached 1/4" below the bottom of the fill hole. Do not over fill as this can cause damage to the motor.

Allow a few minutes for the hydraulic fluid to make its way into the pump chamber and then recheck fluid level, reinstall Air Bleed Plug.

The hydraulic fluid supplied by Neptune is:

EP Gear Oil, ISO #68, Norton Petroleum Corp., 290 Possum Park Road, Newark, DE 19711 (302) 731-8220 CAS No. 64742-54-7, 64742-65-0 or 64741-88-4.

Heavier hydraulic fluid supplied by Neptune for Hi Pressure Systems is EP SAE 90.

Alternate Oils For Standard	Mfg.	High Pressure Oils
Omala #68	Shell Oil	Omala #220
Mobil Gear #626	Mobil Oil	Mobil Gear #629
Sun EP #68	Sun Oil	Sun Oil #220
Meropa #68	Texaco	Meropa #220

- 1.0.12 Please note that this manual describes both metal head pumps (Material Code N1, N3 or N4) and PVC head pump (Material Code N-5). The figure number references used throughout the manual are for the metal head pumps. The metal head pumps are shown on drawing 5670 on page 19. The comparable PVC head pump parts are shown on drawing C-002030 on page 21.

2.0 SUCTION PIPING

The suction piping to the pump must be absolutely air tight. It is suggested that the suction piping be tested with low air pressure and a soap solution to assure that no leaks exist.

Neptune recommends that the "dia-Pump" be operated with a flooded suction, as this will facilitate start up and increase the service life of the pump. It is, however, possible to operate the "dia-Pump" with a suction lift of up to 5 feet, if absolutely necessary. A foot valve strainer must be used on this type of application.

It is highly recommended that all solution tanks be purchased with a low level cut off switch or low level alarm and cut off switch to prevent the pump from running dry. OPERATION AGAINST A DRY SYSTEM WILL CAUSE DAMAGE TO THE PUMP DIAPHRAGM AND REDUCE THE OPERATING LIFE OF THE PUMP.

3.0 DISCHARGE PIPING

- 3.0.1 It is recommended that the "dia-Pump" operate against a minimum discharge pressure of 50 psig. An anti-siphon spring is supplied loose with the pump. If 50 psig back pressure is not provided by the application, the anti-siphon spring (FIG. #5666*) should be installed on the pin under the vent plug (FIG. #5604*). Installation of the anti-siphon spring artificially creates a discharge head.

*Refer to Drawing #C-002030 for appropriate N-5 pump part.

4.0 ADJUSTMENT OF INTERNAL RELIEF VALVE

- 4.0.1 All Neptune Series 560 "dia-Pumps" are supplied with an internally pre-set relief valve. THIS RELIEF VALVE IS SET AT 175 PSI AND IS DESIGNED TO PROTECT THE PUMP SHOULD A DISCHARGE PRESSURE BEYOND THE RATED LIMIT OF THE PUMP OCCUR.

If a customer order specifies a relief valve setting above those indicated above, the specified setting will be set at the factory. All pumps are tagged with the relief valve setting used by the factory.

To protect the external piping system, it is recommended that a relief valve as manufactured by Neptune Chemical Pump Company, or equal, be placed in the discharge line of the pump. It is further recommended that this relief valve be piped into return of the tank with clear PVC tubing so that it can be determined if the solution is by-passing through the valve and returning to the tank, indicating a line blockage.

Drawing 5670 illustrates the location of the Internal Relief Valve (FIG. #5648 through #5652)

The drawing shows a passage connecting the hydraulic fluid reservoir with the hydraulic fluid side of the diaphragm.

The passage is interrupted by the Relief Valve Ball (FIG. #5648) which is backed up by a Relief Valve Spring (FIG. #5650).

If, during the pump operation, the pressure on the hydraulic fluid side of the pump exceeds the set pressure of the internal relief valve, the ball is forced from its seat allowing the hydraulic fluid to flow back to the reservoir.

- 4.0.2 To reset the relief valve to a higher pressure, (the relief valve setting cannot be reduced because of design considerations) instructions are as follows:
- 4.0.21 Connect a test set-up as shown in Figure IV below.
 - 4.0.22 Start and run the pump until all air is relieved from the discharge liquid (hand valve open).
 - 4.0.23 Remove Relief Valve Plug (FIG. #5651).
 - 4.0.24 Close hand valve; pressure gauge should read 175 psi, depending on pump model.
 - 4.0.25 Use 1/4" Allen wrench to adjust spring tension by turning Relief Valve Adjusting Screw (FIG. #5652).
 - (1) To increase pressure, turn Relief Valve Adjusting Screw (FIG. #5652) in.
 - (2) To decrease pressure, turn Relief Valve Adjusting Screw (FIG. #5652) out.
 - 4.0.26 After resetting or adjusting pressure, replace Relief Valve Plug (FIG. #5651).

CAUTION

Never turn Relief Valve Adjusting Screw (FIG. #5652) completely in.

Do not attempt to set the internal relief valve more than 200 psi in excess of name plate rating.

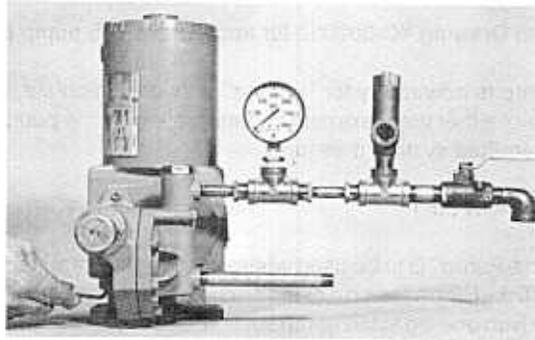


FIGURE IV

4.0.3 Parts required to test or adjust Relief Valve Pressure.

- 1 Pc. 1/2" x 1/4" reducer bushing
- 1 Pc. 1/2" steel el
- 3 Pcs. 1/2" pipe nipple 2" long
- 1 Pc. 1/2" hand valve
- 2 Pcs. 1/2" tee
- 1 Pc. 3/4" MNPT x 5/8" hose (fitting)
- 1 Pc. 5/8" hose, as required
- 1 Pc. 1/4" pressure gauge (minimum gauge pressure 500 psi)
- 1 Pc. Allen wrench 1/4"
- 1 Pc. External relief valve (optional)

NOTE

The above parts must have a working pressure rating above the required set pressure.

5.0 INSTALLATION OUTDOORS

The “dia-Pump” is a totally enclosed pump which can be used outdoors or indoors. When installed outdoors, make sure that the pump is protected against extremes of nature, as follows:

Running of the pump when exposed to tropical sunshine with ambient temperature above 90°F (32°C) would cause excessive oil and motor temperatures. The pump should be shaded and located in such a way as to permit ample air circulation.

Under cold conditions, the pump should be insulated and a heater should be supplied in order to maintain the hydraulic fluid at an ambient temperature above 30°F (-1°C).

6.0 START UP PROCEDURE—FLOODED SUCTION

The following start up procedure is complete and does repeat instructions on filling the gear box and pump.

Flooded Suction: Refer to Section I, Paragraph 1.0.9, for instructions on filling gear box with hydraulic fluid. **NOTE: Refer to Paragraph 12.3 for special start-up instructions after replacing diaphragm.**

6.0.2 After having let pump stand for 30 minutes and having rechecked fluid level, set pump capacity indicator at approximately 30%. Be certain that pump suction and discharge lines are open.

Make certain that pumping chamber is flooded by loosening Vent Plug (FIG. #5604*) and allowing solution to appear. Then tighten discharge vent plug. This procedure will also allow air to vent from pumping chamber. The “dia-Pump” WILL NOT FUNCTION IF AIR IS TRAPPED IN THE HYDRAULIC FLUID OR LIQUID PUMP CHAMBERS. Start pump.

*Refer to Drawing #C-002030 for appropriate N-5 pump part

The pump is now ready for “on line” service. Calculate what the desired capacity as a percentage of either the maximum capacity rating on the pump data plate, or the nominal capacity at the required system pressure.

7.0 START UP—SUCTION LIFT

7.0.1 If the “dia-Pump” is to be used where suction lift is required, A FOOT VALVE STRAINER MUST BE INSTALLED on the end of the suction line. A pipe tee is installed on the top end of the suction line with one leg to the pump suction, one leg to the suction line, and one leg pointing straight up and valved. Open valve and force prime pump and piping with water. Start pump.

WARNING: Beware of application where water is not compatible with chemical to be pumped. Example: Never force prime when pumping acid or oil based products.

8.0 START UP AFTER SUCTION HAS RUN DRY

In applications where the suction tank does not have a low level cutoff interconnected into the pump motor circuit, the pump may occasionally run dry. THIS MUST BE AVOIDED BECAUSE DAMAGE TO THE PUMP CAN RESULT AND THE SERVICE LIFE WILL BE SIGNIFICANTLY REDUCED WHEN THE PUMP IS ALLOWED TO RUN WITH A DRY LIQUID END.

Before restarting a pump that has run dry and which has not damaged itself, follow the procedure in Paragraphs 6.0 through 6.0.3 of Section II.

SECTION III

NORMAL MAINTENANCE

MAINTENANCE

Under normal conditions, the “dia-Pump” should not require any significant amount of maintenance. It is advised that periodic visual observations be made of the oil level to make sure that it is within 1/4” of the bottom of the fill opening. The liquid end of the pump should also be inspected for leakage. These observations should be made regularly, at least every 48 hours.

The hydraulic fluid should be drained and replaced TWICE a year, using the drain plug (FIG. #510) on the side of the pump. This change can be scheduled with the normal factory maintenance at seasonal periods.

CHECK VALVES: REMOVING, CLEANING, AND REPLACING

The “dia-Pump” incorporates a unique check valve design whereas the discharge and suction piping NEED NOT be disturbed in order to service the valves.

Should the valves need cleaning, remove as follows:

- 10.0.1 Remove vent plug (FIG. #5604*) with anti-siphon spring (FIG. #5666*) if installed.
- 10.0.2 Remove discharge cap (FIG. #5610*).
- 10.0.3 Remove suction cap (FIG. #5612*).
- 10.0.4 With heavy wood dowel or bar of soft material, tap and push complete valve stack out of pump from top through to bottom. The valve stack consists of:
 - 4 Valve Balls (FIG. #2340*)
 - 4 Valve Seats (FIG. #5695*)
 - 1 Stack Spacer (FIG. #5693*)
 - 3 Ball Guides (FIG. #5691*)
 - 4 Valve Seat O-rings (FIG. #2342*)
- 10.0.5 Clean valve stack parts with suitable solvent. Replace in same order as removed from top to bottom, putting suction valve cap (FIG. #5612*) in place with O-ring first.

*REFER TO DRAWING #C-002030 FOR APPROPRIATE N-5 PUMP PART.

CAUTION: Suction and discharge caps—Do not overtighten PVC as the PVC material is not able to withstand excessive force and can fail. Teflon® paste is an excellent thread lubricant and may be applied.

11.0 PROCEDURE FOR REPLACING CONTROL ROD O-RING (FIG. #2334)
AND SEALING PLATE O-RING (FIG. #516)

Remove hydraulic fluid from gear box.

11.0.2 Remove indicator plate (FIG. #520) by removing two indicator plate screws (FIG. #521).

Remove control rod assembly with control rod attached (FIG. #524, #523, and #5615) by turning counter clockwise until threads are disengaged, then pulling out. **NOTE: Some pump models may have O-ring on sealing nut, refer to FIG. #5699 if O-ring is needed or requires replacement.**

Use an 11/16" Hex socket on the sealing nut (FIG. #526) and screw out of pump in a counter clockwise direction. Then, remove sealing plate (FIG. #5602) using a small brass hook to pull loose.

11.0.5 Replace control rod O-ring (FIG. #2334) and/or sealing plate O-ring (FIG. #516-C).

11.0.6 When replacing sealing plate, take care so as to not shear the sealing plate O-ring (FIG. #516-C).

11.0.7 Replace balance of parts and fill pump with hydraulic fluid per previous instructions.

Follow start-up procedure as if starting a new pump.

12.0 PROCEDURE FOR REPLACING DIAPHRAGM

12.1.0 Removal of pump head and replacement of diaphragm.

12.1.1 Remove drain plug (FIG. #510), and drain hydraulic fluid.

12.1.2 Remove long and short pump head bolts (FIG. #551). Lift pump head (FIG. #5660) away from pump.

12.1.3 Remove and examine teflon diaphragm (FIG. #2310). Remove and examine the liquid side diaphragm backup plate (FIG. #2330). Replace with new part, if required. When replacing the teflon diaphragm, be certain to line it up properly with the sealing grooves.

12.1.4 To reassemble, reverse the above procedure. Reassembly is facilitated by laying the pump on its side. Be certain to tighten all bolts evenly. Tighten to 25 ft. lbs.

12.2.0 Removal of pump head and replacement of diaphragm PVC head model.

12.2. Remove drain plug (FIG. #510) and drain hydraulic fluid.

12.2.2 Remove two upper valve body bolts (FIG. #5643). Remove four shroud plate bolts (FIG. #5645). Remove valve body with shroud plate attached from pump.

12.2.3 Remove two diaphragm chamber bolts (FIG. #5645). Lift chamber (FIG. #5621) away from pump.

12.2.4 Remove and examine teflon diaphragm (FIG. #2310). Remove and examine the liquid side diaphragm backup plate (FIG. #5622). Remove O-ring (FIG. #2337) from diaphragm chamber and examine. Replace with new parts, if required. When replacing the teflon diaphragm, be certain to line it up properly with the sealing grooves. When replacing the O-ring (FIG. #2337), be certain to properly seat it within the O-ring groove in the diaphragm chamber.

12.2.5 To reassemble, reverse the above procedure. Reassembly is facilitated by laying the pump on its side. Be certain to tighten all bolts evenly. Tighten to 15 ft. lbs.

12.3.0 Start-up instructions after replacing diaphragm.

Fill pump with oil (leaving ¼-½ inches of air space). Using a warm oil is best.

Let pump set for 1 hour to allow oil to fill oil cavity.

Remove anti-syphon spring under discharge cap (to be replaced after pump start up if needed).

Run pump at 0% to allow pump to warm up. (Start pumping on test bench or testing area.) (Liquid supply is required—water is recommended.)

Start up at a low percentage. Try 20% for about 15 minutes then increase to 40% for 15 minutes and repeat for 60%-80%-100%.

Recheck 0% setting and test for proper pump capacity.

Pump is now ready for hook-up to system.

SECTION IV

MOTOR OPERATING CONDITIONS

13.0 The standard Series 560 "dia-Pump" is supplied with 1/3 HP, single phase, capacitor start, totally enclosed non-ventilated motor as an integral part of the pump itself.

The normal temperature rise for this motor is 40°C above ambient temperature and, thus, it might appear that the motor is operating at a higher than normal temperature. This situation is normal and should not cause concern.

As a precaution against motor overheating, it is recommended that the pump be located where adequate ventilation is available. It is also highly RECOMMENDED THAT A MOTOR STARTER WITH THE PROPER OVERLOAD PROTECTION BE SUPPLIED AS AN ADDITIONAL SAFETY DEVICE.

SECTION V

TROUBLE SHOOTING CHART

Symptom	Cause	Remedy
1. Pump motor will not operate.	A. Blown fuse.	Check for short circuit or overload.
	B. Blow liquid in level (where low level cutoff is used).	Fill tank.
	C. Broken wire.	Locate & repair.
	D. Low voltage.	Check for too light wiring.
	E. Oils "frozen" in pump.	Thaw out.
2. Pump does not deliver rated capacity.	A. Starved suction.	Replace suction piping with larger size.
	B. Leaky suction piping.	Pressure test, repair, or replace defective piping.
	C. Excessive suction lift.	Rearrange equipment location to reduce suction lift.
	D. Liquid too close to boiling point.	Lower temperature or increase suction pressure slightly.
	E. Air or gas trapped in oil or chemical solution.	Decrease capacity to 20% for 7 minutes, then increase to 100% for 7 minutes.
	F. Worn or dirty valves or seats, or both.	Clean or replace.
	G. Viscosity of liquid too high.	(1) Reduce viscosity by heating or other means.
		(2) Increase size of suction piping.
H. Insoluble materials, crystallization or solids settling.	(3) Increase suction pressure slightly.	
	Limit solution strength to 5% by weight. Flush and clean solution tank periodically. Suction connection should be 2" - 4" from bottom of solution tank.	

	Low discharge pressure.	A minimum discharge pressure of 50 psi is required to insure proper capacity control.
	J. Air in hydraulic system.	Bleed system.
3. Pump delivers erratically.	A. Leaky suction line.	Repair or replace piping.
	B. Worn or dirty valve seats, or both.	Clean or replace suction & discharge valve assemblies.
	C. Excessive excursion of ball from valve seats (indicated by ball chatter).	Increase back pressure (install anti-siphon spring).
	D. Insufficient suction pressure.	Increase suction pressure. Raise tank level.
	E. Liquid too close to boiling point.	Reduce temperature or raise suction pressure.
	F. Leaky system relief valve.	Repair or replace relief valve.
	G. Low hydraulic fluid.	Add hydraulic fluid.
4. Motor overheats.	A. Power supply does not match motor.	Check power supply against motor nameplate data.
	B. Overload caused by operating pump beyond rated capacity.	Check operating pressure against pump manufacturer's data plate maximum rating.
5. Noisy Operation (1) In Pump	A. Pump Valves.	Valves must move to open and close and they will make a clicking noise as they operate. These noises are sometimes amplified by natural resonances in piping system. They are usually indications of normal valve functioning.
(2) In Gear Reducer	A. Pounding noise at high discharge pressure.	Fluid compressibility causes reversal of load on gears at end of pressure stroke. Not considered detrimental.
6. Oil level overflows reservoir.	A. Flexible diaphragm punctured.	Replace diaphragm and hydraulic fluid (drive lubricant) if contaminated.

SECTION VI

SPECIAL INSTRUCTIONS FOR SERIES 560 "dia-PUMPS" WITH PNEUMATIC STROKE CONTROL

14.0 FUNCTION OF THE PNEUMATIC STROKE CONTROL UNIT

The Neptune pneumatic stroke control unit controls the capacity of the "dia-Pump" over the full operating range. Control is normally effected by an instrument air signal of 3 to 15 psi applied to a Moore Products Model 73N control valve (other air signal parameters also available), which is an integral part of Neptune stroke control unit.

The variation of instrument air signal changes the air pressure on the diaphragm (FIG. #583) in the control unit, which in turn changes the position of the pump capacity control rod (FIG. #5654).

The position change of the control unit can be observed on a capacity percentage scale seen through the clear plexi-glass shell of the control unit.

The pneumatic control unit may be attached to any Series 560 "dia-Pump".

The operating range of supply air may vary between 40 and 80 psi. The Moore control valve is preset at the factory for a supply air pressure of 60 psi.

The "Pneumatic Stroke Control Unit" is accurately preset and tested at the factory. If the unit does not appear to perform correctly, please contact your local representative or the factory. Do not attempt to adjust the unit in the field without factory advice.

14.0.1 The Moore control valve which is attached to the Neptune actuator supplies a varying air pressure to the flexible diaphragm (FIG. #583) which is, in turn, balanced by operating spring (FIG. #587). The capacity control rod (FIG. #5654) is attached to this system.

With the required air signal, the Moore control valve maintains the correct constant air pressure on the flexible diaphragm (FIG. #583); i.e., constant position of the capacity control rod (FIG. #5654). The springs in the actuator and Moore control valves insure that the controlled position is maintained without fluctuation. Only changes in the air signal will cause variations in position of the diaphragm (i.e., capacity control rod). Supply air and instrument input ports are clearly marked on the Moore control valve.

The Moore control valve connections are marked for "Supply Air" and "Instrument Air". It is important that clean, dry air be furnished to the "Pneumatic Stroke Control Unit". Cross sectional drawings of the complete unit and the Moore control valve are included with the instruction manual.

14.0.2 Maintenance

The Neptune "Pneumatic Stroke Control Unit" is normally maintenance free. Should, however, any parts be required, use attached drawing No. 002387 and the parts list as an assembly guide.

14.0.3 Moore Control Valve

If more complete information is required on the Moore Model 73N control valve, request Moore Bulletin #SD73-5 in writing from Neptune.

SECTION VII

PARTS LIST

15.0 PARTS LIST FOR STANDARD SERIES 560 "DIA-PUMP" WITH METAL PUMP HEAD (REFER TO DRAWING #5670)

FIG. NO.	DESCRIPTION	QTY.	PART NO.
501	Worm Gear 37 SPM	1	000164
	Worm Gear 72 SPM	1	000166
	Worm Gear 117 SPM	1	000163
	Worm Gear 144 SPM	1	002818
502	Connecting Rod	1	000167
506	Worm 37 SPM	1	000170
	Worm 72 SPM	1	000172
	Worm 117 SPM	1	000169
	Worm 144 SPM	1	002817
507	Bearing Cup	1	100179
508	Bearing Cone	1	100180
509	Worm Spring Pin	1	100181
510	Drain Plug	1	100182
511	Connecting Rod Pin	1	100183
512	Fill Plug	1	002827
516-C	Sealing Plate "O" Ring	1	100186
519	Control Rod Spring Pin	1	100189
520	Indicator Plate	1	000188
521	Indicator Plate Screws	2	100190
522	Control Knob Set Screw	1	100191
523	Control Knob Positioner	1	000189
524	Control Knob Assembly	1	002071
525	Capacity Indicator Scale	1	100192
526	Sealing Nut	1	002069
530	Pipe Plug	1	100196
534	Pump Body Cap Screws	2	100197
551	Screw 5/16 x 1 1/4" (N1)	8	100205
	Screw 5/16 x 1" (N3, N4)	8	100206
557	Hydraulic Fluid (2 qts.)		003089
590	Gasket or Sealer* (Retainer)	1	106290
2309	Pump Body Side Backup Plate	1	000387
2310	Teflon Diaphragm	1	000388
2330	Pump Head Backup Plate (N1, N3)	1	000406
	Pump Head Backup Plate (N4)	1	000407
2334	Control Rod "O" Ring	1	100323
2337	Vent Plug "O" Ring	1	100325
2340	Valve Balls (N1, N3)	4	100078
	Valve Balls (N4)	4	100079
2342	Valve Seat "O" Ring	4	100327

FIG. NO.	DESCRIPTION	QTY.	PART NO.
2343	Discharge & Suction Cap "O" Ring	2	
5002	Shaft Retainer Assembly		
5004	Thrust Washer		
5025	Shaft Retainer Screws	3	100254
5601	Gear Box	1	000296
5602	Seal Plate	1	000307
5604	Vent Plug (N1, N3)		
	Vent Plug (N4)	1	
5606	Suction Spacer (N1, N3)	1	000310
	Suction Spacer (N4)	1	000311
5608	Discharge Spacer (N1, N3)	1	000312
	Discharge Spacer (N4)		
5610	Discharge Cap (N1, N3)	1	000303
	Discharge Cap (N4)	1	000304
5612	Suction Cap (N1, N3)	1	000301
	Suction Cap (N4)	1	000302
5614	Piston	1	000314
5615	Control Rod	1	000315
5648	Relief Valve Ball	1	100550
5650	Relief Valve Spring 1/2 & 1/2 HP	1	100276
	Relief Valve Spring 3/4 & 1 HP		
5651	Relief Valve Plug	1	100332
5652	Relief Valve Adjusting Screw	1	100277
5660	Pump Head (N1)		000298
	Pump Head (N3)		
	Pump Head (N4)		
5663	Pump Body		
5666	Anti-Siphon Spring (N1, N3)		
	Anti-Siphon Spring (N4)	1	000341
5668-A	Mtr. Assembly 37 SPM**	1	002404
	Mtr. Assembly 72 SPM**	1	002405
	Mtr. Assembly 117 SPM**	1	002406
N 5691	Ball Guide (N1, N3)	3	001260
	Ball Guide (N4)	3	001261
N 5693	Stack Spacer (N1, N3)		002828
	Stack Spacer (N4)		
N 5695	Valve Seat (N1, N3)	4	002831
	Valve Seat (N4)	4	002832
5697	Gasket or Sealer* Oil Head		106292
5699	Sealing Nut "O" Ring		

*Silicon Sealant may be substituted for Gasket.

**Includes Part Nos. 506, 508 and 509. 1/3-1-115-60-TENV-CAP-48Y.

"N"—Indicates new part.

Valve stacks of all Series 560 (except PVC models) have been *improved* by the attention of close tolerance ball guides which allow better accuracy and higher pressure performance.

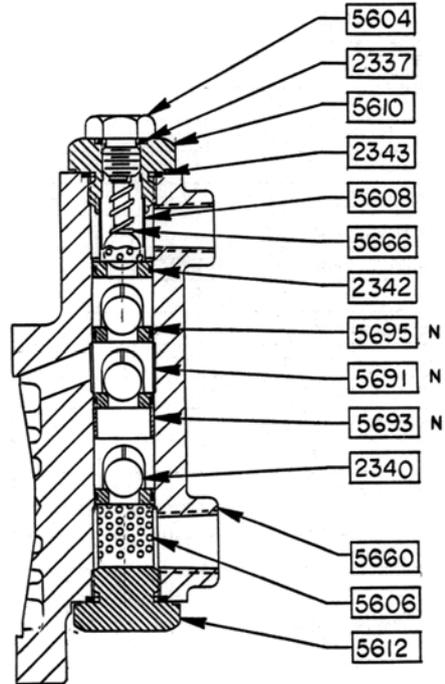
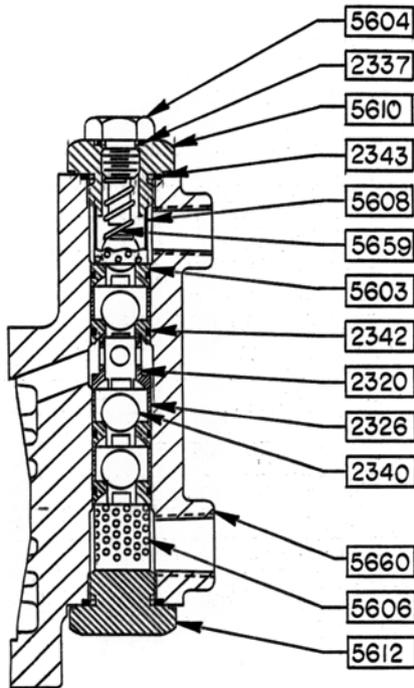
Original and *improved* stack arrangements are shown in the figures on page 16.

Parts are currently furnished only for the *improved* version. When ordering replacement seats for an *original* valve stack design, order the ball guides (FIG. #5691) and spacer (FIG. #5693). Installing these parts and discarding the old spacers (FIG. #2320 and FIG. #2326) will upgrade the pump to the *improved* valve arrangement.

If seats are not replaced, it is not necessary to change the spacers and ball guides. If seats are replaced (the new seats are of a different thickness) the ball guides and spacers *must* be replaced.

15.0.1 PARTS LIST FOR SERIES 560 "dia-PUMP" WITH PVC HEAD. THESE ARE NOT COMMON TO "dia-PUMP" WITH METAL HEADS. (REFER TO DRAWING #C-002030)

FIG. DWG. NO.	DESCRIPTION	PART NO.	QUANTITY REQUIRED
2337	Vent Plug/Cross Connection "O" Ring	100325	2
5619	Head Retainer Plate (SS)	000319	1
5621	Pump Head Diaphragm Chamber	000318	1
5622	Pump Head Backup Plate	000330	1
5623	Vent Plug	000331	1
5624	Valve Seat	000332	2
5625	Discharge Cap	000321	1
5626	Suction Cap	000322	1
5627	Anti-Syphon Spring	000339	1
5628	Discharge & Suction Cap "O" Ring	100274	2
5630	Valve Seat "O" Ring	100273	2
5633	Spacer	000325	4
5635	Washer	100069	2
5638	Upper Spacer	000334	1
5639	Spacer	000336	1
5642	Suction Ball Retainer & Spacer	000338	1
5643	Valve Body Screw - 5/16" x 4 1/2" Lg.	100249	2
5645	Valve Body Screw - 5/16" x 2 1/4" Lg.	100279	6
5646	Valve Body Screw - 1/4" x 2 1/4" Lg.	108100	2
5649	Valve Ball	100275	2
5667	Valve Body Assembly	002188	1



VALVE STACK WITH IMPROVED GUIDES (N—Indicates new part)

PARTS ORDERING INSTRUCTIONS

Note: For prompt entry of parts orders; your order must include both model number and serial number.

15.0.2 RECOMMENDED SPARE PARTS:

IMPORTANT: When ordering spare parts, please show MODEL NUMBER AND SERIAL NUMBER of pump for which parts are being ordered. This information can be found on a stainless steel nameplate riveted to the side of the pump.

Recommended Spare Parts (for metal head "dia-PUMP"). It is recommended that the following parts be kept in stock for a pump:

FIG. NO.	DESCRIPTION	Kit No. 002719 Fits all "N1/N3"		Kit No. 002720 Fits all "N4" Models	
		QTY.	PART NO.	QTY.	PART NO.
516-C	Sealing Plate "O" Ring	2	100186	2	100186
2310	Teflon Diaphragm	1	000388	1	000388
2334	Control Rod "O" Ring	2	100323	2	100323
2337	Vent Plug "O" Ring	2	100325	2	100325
2340	Valve Ball (316SS) or	4	100078		—
	Valve Ball (C-20)		—	4	100079
2342	Valve Seat "O" Ring	8	100327	8	100327
2343	Discharge & Suction Cap "O" Ring	4	100328	4	100328
5695	Valve Seat (316SS) or	4	002831		—
	Valve Seat (C-20)		—	4	002832

15.0.3 RECOMMENDED SPARE PARTS FOR PVC HEAD "dia-PUMP"

FIG. NO.	DESCRIPTION	Kit No. 002721 Fits all "N5" Models	
		QTY.	PART NO.
516-C	Sealing Plate "O" Ring	2	100186
2310	Teflon Diaphragm	1	000388
2334	Control Rod "O" Ring	2	100323
5624	Valve Seat (PVC)	2	000322
5628	Discharge & Suction Cap "O" Ring	4	100274
5629	Vent Plug "O" Ring	2	100272
5630	Valve Seat "O" Ring	4	100273
5649	Valve Ball (Ceramic)	2	100275

15.0.4 PARTS FOR "dia-PUMP" ORDERED WITH OTHER THAN STANDARD INTEGRALLY MOUNTED MOTOR (REFER TO DRAWING HP-1132)

The following group of parts are sometimes referred to as a motor conversion set. These parts allow the "dia-PUMP" to accept any standard 56C frame motor.

FIG. NO.	DESCRIPTION	QTY.	PART NO.
506	Worm 37 SPM	1	000170
	Worm 72 SPM	1	000172
	Worm 117 SPM	1	000169
	Worm 144 SPM	1	002817
507	Bearing Cup	1	100179
508	Bearing Cone	1	100180
509	Worm Spring Pin	1	100181
558	Motor Flange Adapter	1	000227
559	Worm Shaft	1	000228
560	Lovejoy Coupling	1	100053
561	Oil Seal	1	100214
562	Adapter to Gear Box Bolts	4	100215
563	Adapter to Motor Bolts	4	100216
564	Lock Washer	4	100217
565	Coupling Key	2	100218
566	Lock Washer	4	100219
	Silicone Sealant	1	

PARTS ORDERING INSTRUCTIONS

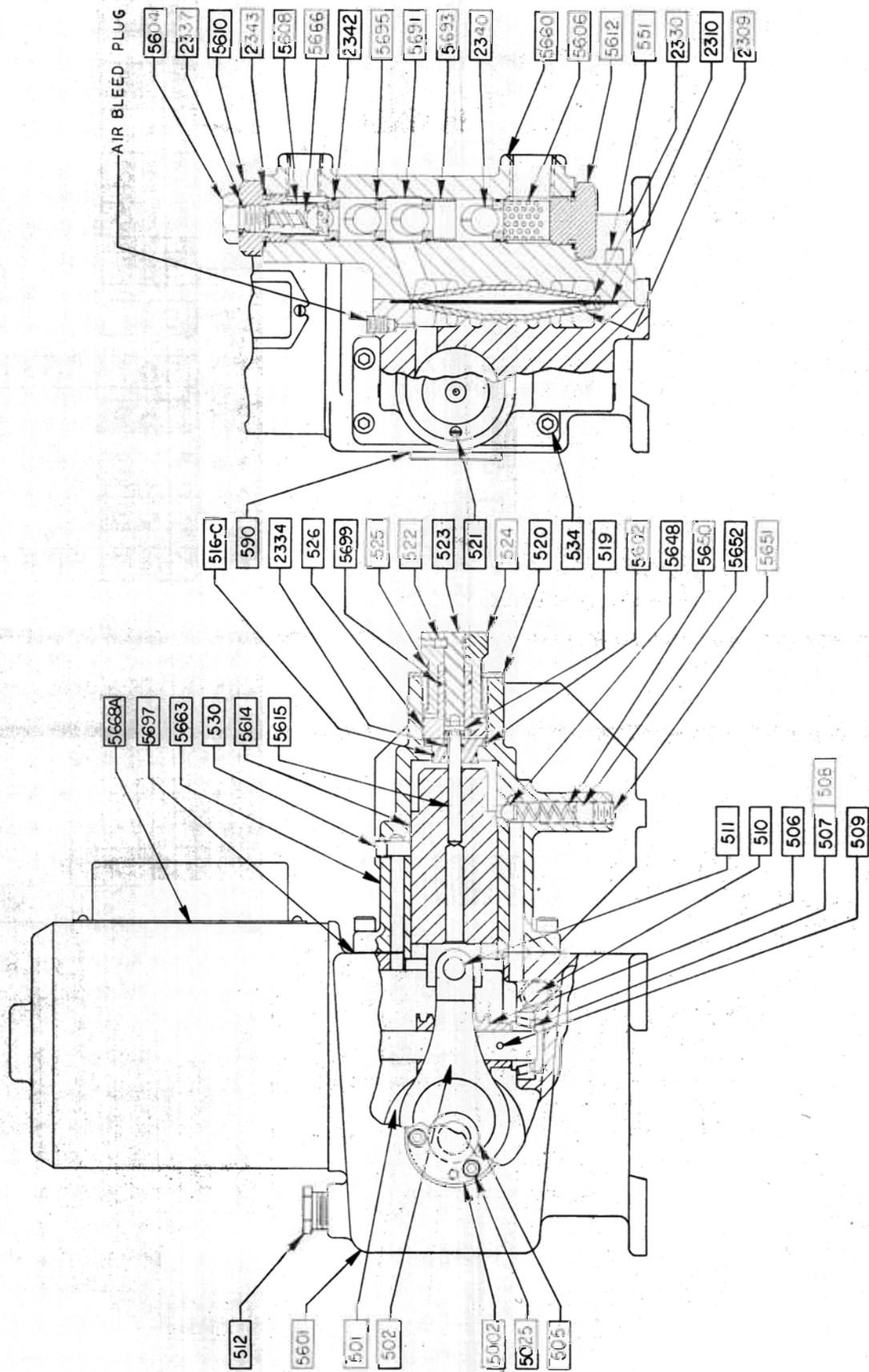
Note: For prompt entry of parts orders; your order must include both model number and serial number.

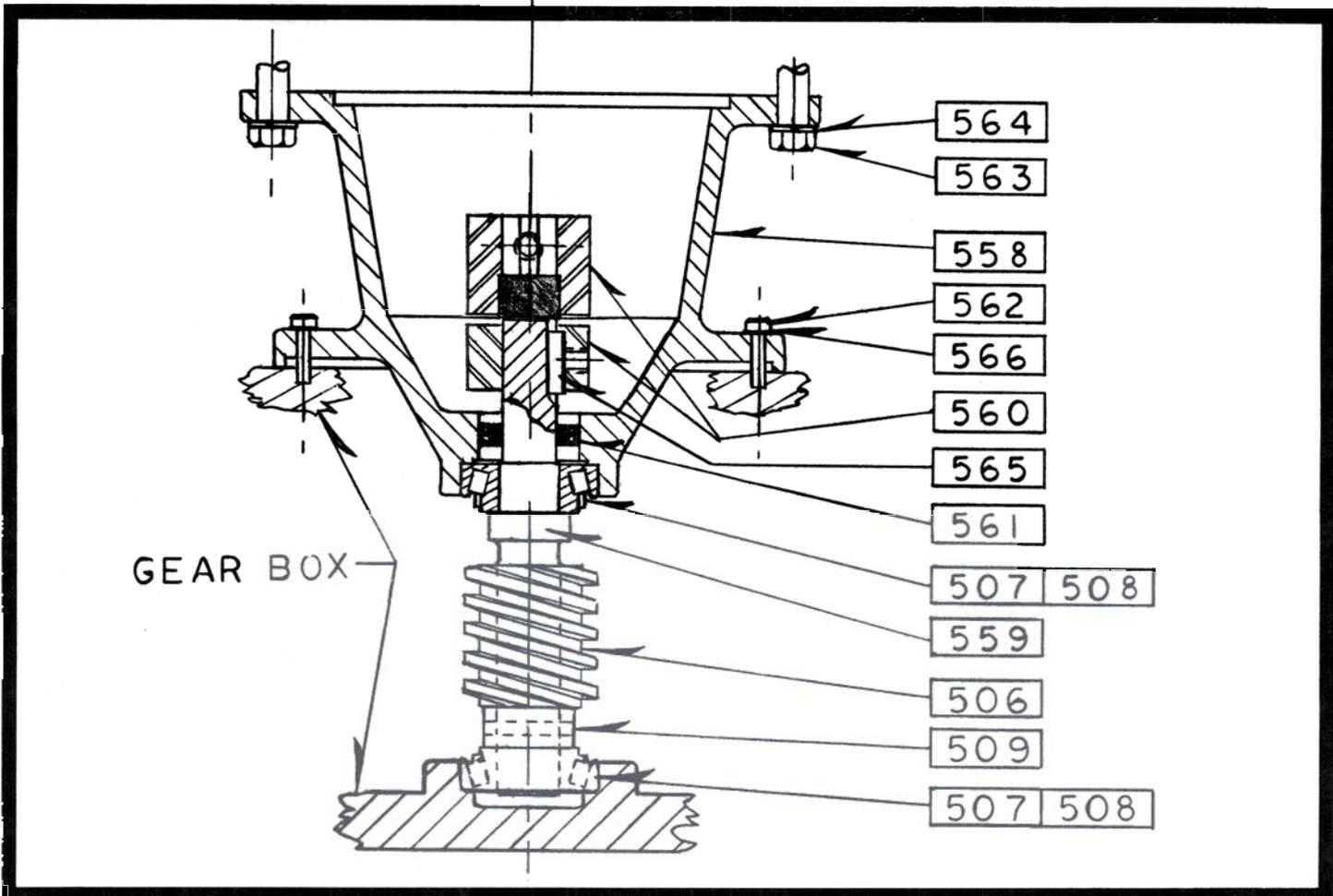
15.0.5 PARTS UNIQUE TO PUMPS SUPPLIED WITH NEPTUNE PNEUMATIC STROKE CONTROL.
(REFER TO DRAWING 002387)

FIG. NO.	DESCRIPTION	QTY.	PART NO.
5654	Control Rod "P"	1	000316
571	Control Mount	1	000274
572	Short Mounting Bolt	3	100259
573	Plexi-Glass Shell	1	000275
575	Indicator Scale	1	100307
576	Piston	1	000276
578	Range Spring	1	100260 3-15 psi
			100262 5-25 psi
			100263 3-27 psi
579	Housing	1	000277
580	Moore 73N Control Valve	1	100265
			100266 Reverse Acting
581	Retainer Bolt	1	100267
583	Pneumatic Diaphragm	1	100268
584	Control Rod Adapter	1	000280
585	Control Spring Pin	1	100269
586	Long Mounting Bolt	3	100270
587	Operating Spring	1	100271
589	Retainer Plate	1	000281

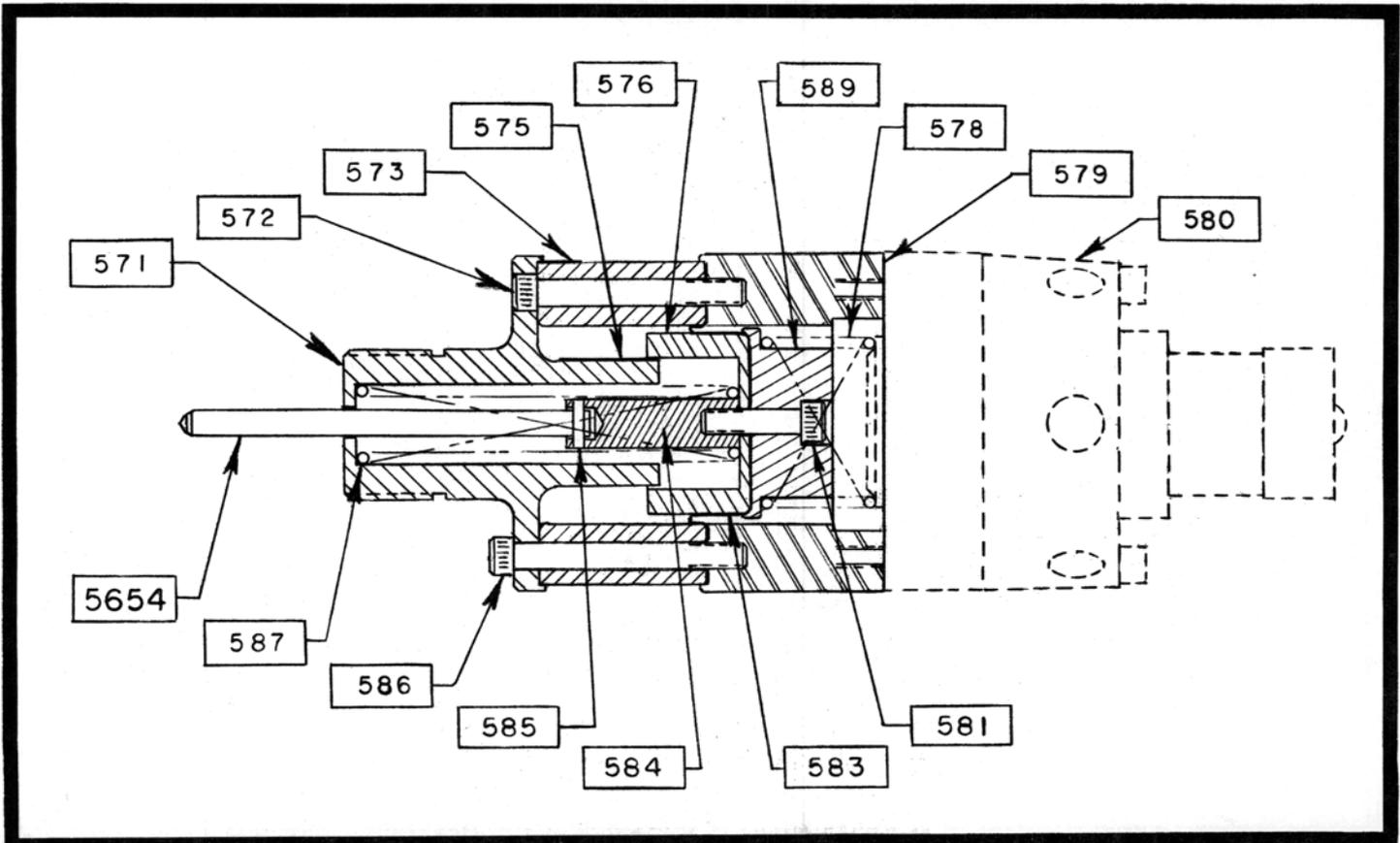
PARTS ORDERING INSTRUCTIONS

Note: For prompt entry of parts orders; your order must include both model number and serial number.

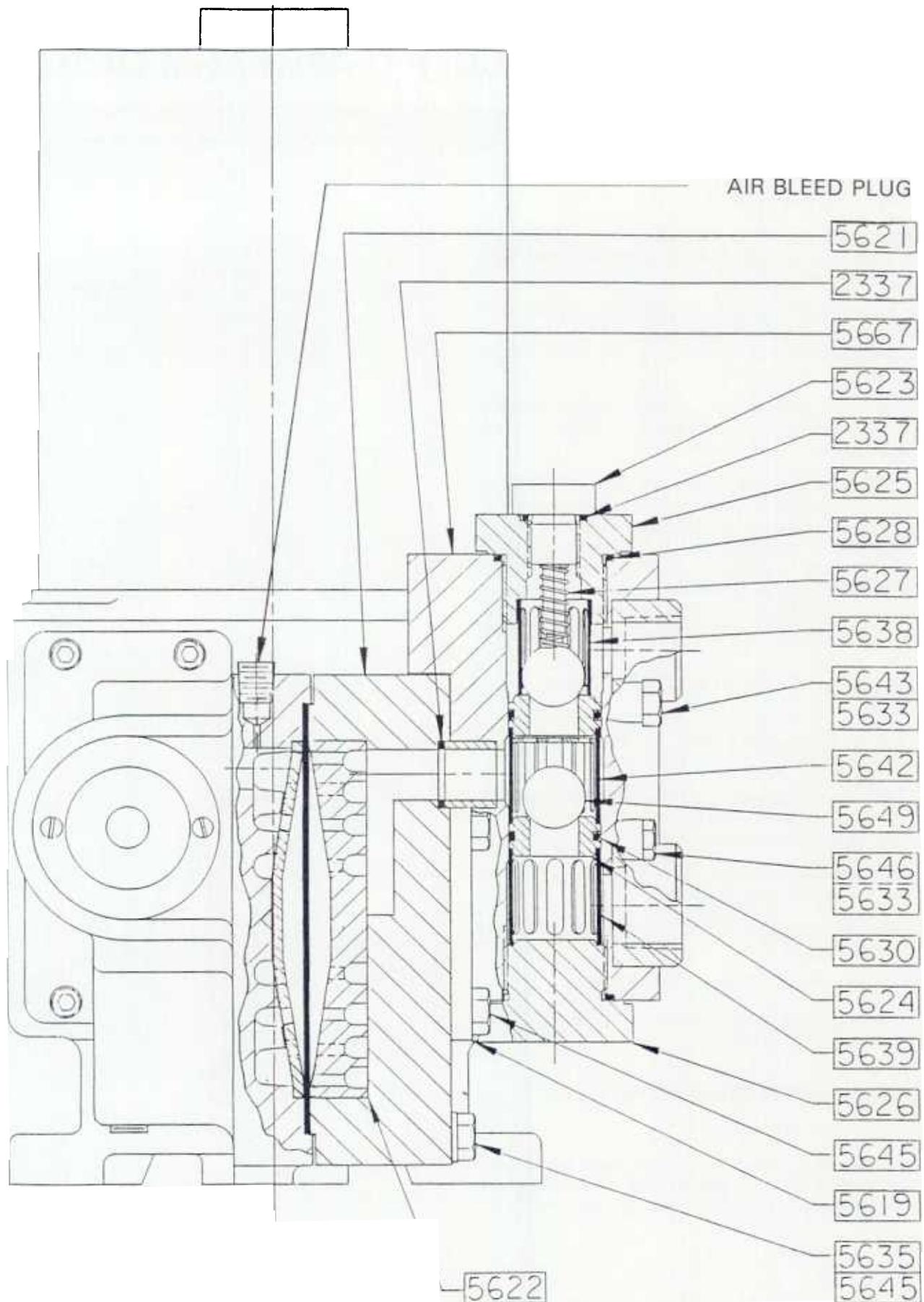




DRAWING # HP 1132



DRAWING #002387



560-N5 LIQUID HEAD
 PARTS DRAWING
 #C-002030

THEORY OF OPERATION

The instructions below are for Neptune's optional Double Diaphragm Kit which is available for the Neptune Series 500, 500A and 560 "dia-Pumps".

Use of a double diaphragm allows diaphragms to be monitored and provides an early warning upon failure of either diaphragm allowing repairs to be made before process fluid mix with the pump hydraulic fluid.

Neptune's double diaphragm is a kit which may be retrofitted to any pump currently in service or may be installed on a new pump at the factory.

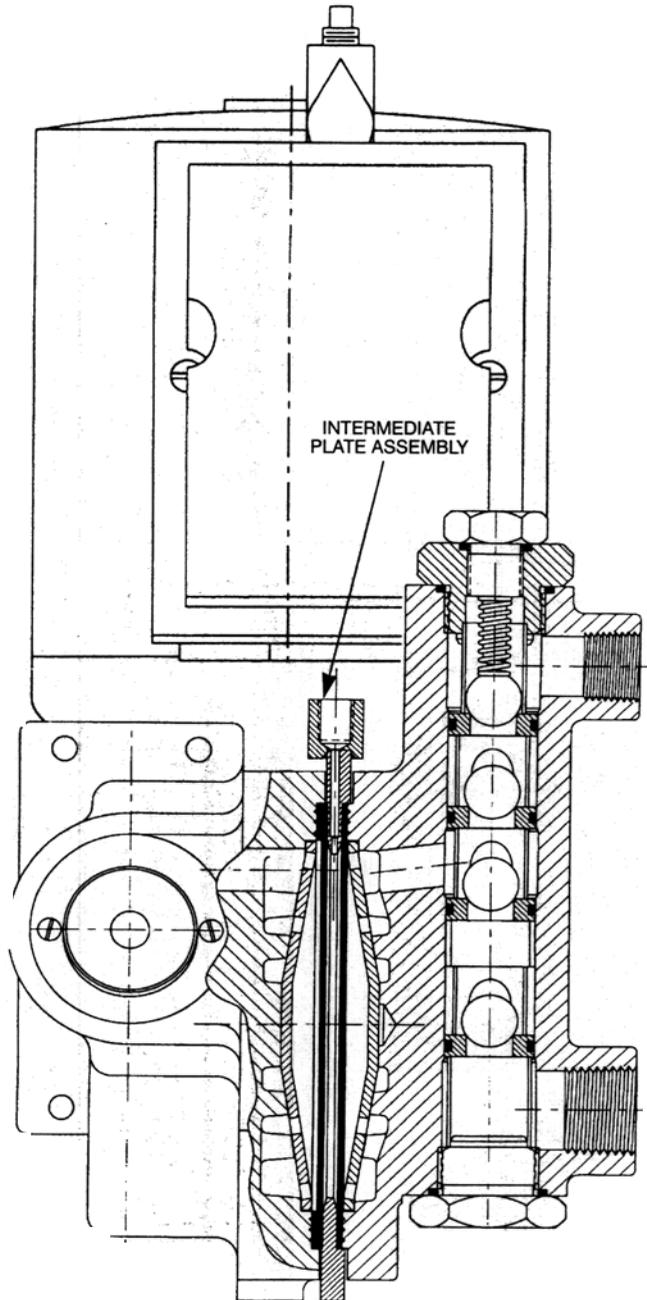
Figure 1 illustrates a Double Diaphragm Assembly. An intermediate plate is located between the oil and liquid heads with one diaphragm on each side of the intermediate plate. The Intermediate Plate is connected to a rupture alarm or pressure switch via a capillary system. The area between the diaphragms is evacuated. Rupture in either diaphragm produces an increase in volume and, therefore, a pressure increase which can be sensed by a pressure switch for alarm purposes.

DISASSEMBLY OF INTERMEDIATE PLATE

- 1.0.0 Shut pump off and disconnect suction and discharge piping. Remove drain plug and drain hydraulic fluid from the gear box.
- 1.0.1 Remove 8 Screws and remove the liquid head assembly. Some hydraulic oil and process fluid will spill out when the head is removed.
- 1.0.2 The intermediate plate, which is between the pump heads can be removed easily.
- 1.0.3 Remove the rupture alarm (pressure switch) and clean the capillary system.
- 1.0.4 Replace one or both diaphragms if needed.
- 1.0.5 To reassemble, reverse above procedure. Be certain that parts align properly.

VACUUM AIR FROM INTERMEDIATE SPACE

- 1.0.6 Open valve #5 (Figure 2).
- 1.0.7 To remove air, attach the vacuum pump with a hose connection #6 to the valve #5. The intermediate space is evacuated to 3 psig for normal operating conditions.



560 PUMP

FIGURE 1

APPENDIX

DOUBLE DIAPHRAGM OPTION

ADDENDUM: Special Instructions for Series 500, 500A & 560 "dia-Pumps" with Double Diaphragm

- 1.0.8 Close valve #5.
- 1.0.9 Remove the vacuum pump. Plug the valve #5 with 1/8 NPT 316SS pipe plug #12.
- 1.0.10 Reinstall the pump.
- 1.0.11 Follow procedure in Neptune Standard Operating and Instruction Manual for initial pump start up.

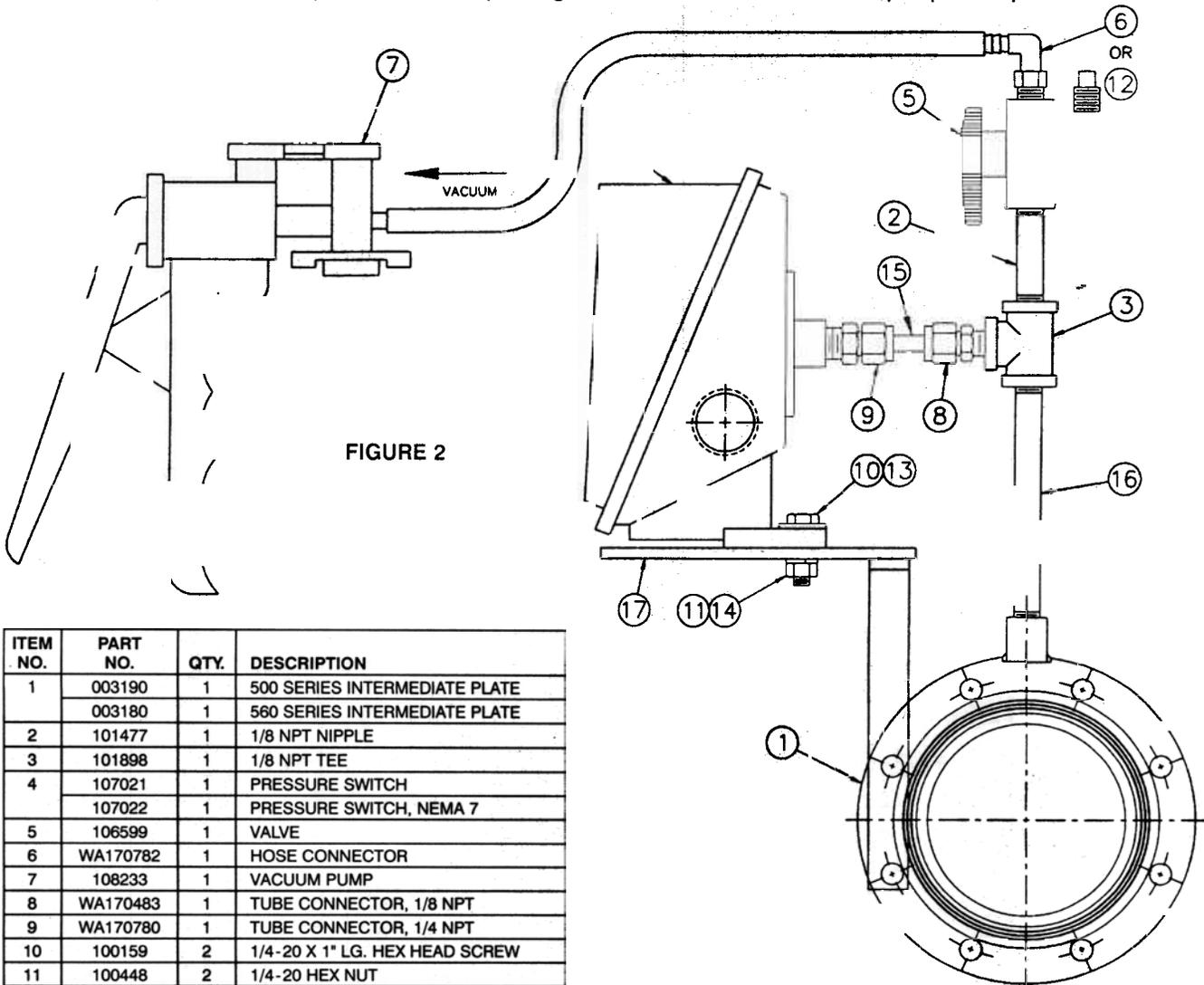


FIGURE 2

ITEM NO.	PART NO.	QTY.	DESCRIPTION
1	003190	1	500 SERIES INTERMEDIATE PLATE
	003180	1	560 SERIES INTERMEDIATE PLATE
2	101477	1	1/8 NPT NIPPLE
3	101898	1	1/8 NPT TEE
4	107021	1	PRESSURE SWITCH
	107022	1	PRESSURE SWITCH, NEMA 7
5	106599	1	VALVE
6	WA170782	1	HOSE CONNECTOR
7	108233	1	VACUUM PUMP
8	WA170483	1	TUBE CONNECTOR, 1/8 NPT
9	WA170780	1	TUBE CONNECTOR, 1/4 NPT
10	100159	2	1/4-20 X 1" LG. HEX HEAD SCREW
11	100448	2	1/4-20 HEX NUT
12	101859	1	1/8 NPT PIPE PLUG, 316SS
13	108426	2	1/4" FLAT WASHER
14	100169	2	1/4" LOCK WASHER
15	003578	1	VACUUM TUBE
16	101478	1	1/8 NPT NIPPLE X 3" LG. "560 PUMP"
	101479	1	1/8 NPT NIPPLE X 4" LG. "500 PUMP"
17	003577	1	BRACKET ASSEMBLY
	003600	1	BRACKET ASSEMBLY (DUPLIX PUMP)
	003173	1	TEFLON WASHER, "560 PUMP ONLY"

NOTE: Neptune furnishes a Mityvac® vacuum pump from a Mityvac® No. 6810 automotive test kit available at many automotive stores. (Unit furnished by Neptune is less gage and automotive adapters.)

SECTION 4 - REACTIVITY HAZARD DATA

STABILITY

- Stable
 Unstable

Conditions
To Avoid

Incompatibility
(Materials to Avoid)

Strong acids, alkalines, and oxidizers such as liquid chlorine and oxygen.

Hazardous
Decomposition Products

Burning or excessive heating may produce harmful gases/vapors.

HAZARDOUS POLYMERIZATION

- May Occur
 Will Not Occur

Conditions
To Avoid

SECTION 5 - HEALTH HAZARD DATA

**PRIMARY ROUTES
OF ENTRY**

- Inhalation
 Skin Absorption
 Not Hazardous

**CARCINOGEN
LISTED IN**

- NTP
 IARC Monograph
 OSHA
 Not Listed

HEALTH HAZARDS

Acute

Threshold limit value: 500 MG/M3 suggested for oil mist.

Chronic

Signs and Symptoms
of Exposure

None

Medical Conditions
Generally Aggravated by Exposure

None

EMERGENCY FIRST AID PROCEDURES - Seek medical assistance for further treatment, observation and support if necessary.

Eye Contact

This product is expected to be non-irritating.

Wash with water 15 minutes; consult physician.

Skin Contact

No significant adverse effects are expected to occur.

Wash with soap and water.

Inhalation

No significant adverse effects are expected to occur.

Remove to source of fresh air.

Ingestion

No significant adverse effects are expected to occur.

Induce vomiting, consult physician.

SECTION 6 - CONTROL AND PROTECTIVE MEASURES

Respiratory Protection
(Specify Type)

None is needed under anticipated use with adequate ventilation.

Protective Gloves

Not normally needed.

Eye Protection

Needed if spraying or splashing.

**VENTILATION
TO BE USED**

- Local Exhaust
 Mechanical (general)
 Special
 Other (specify)

None needed.

Other Protective
Clothing and Equipment

None needed.

Hygienic Work
Practices

Wash after skin contact.

SECTION 7 - PRECAUTIONS FOR SAFE HANDLING AND USE / LEAK PROCEDURES

Steps to be Taken if Material
is Spilled or Released

Clean up with oil absorbent.

Waste Disposal
Methods

Shovel up and dispose of at an appropriate waste disposal facility.

Precautions to be Taken
in Handling and Storage

Empty containers may contain explosive vapors or dangerous residues.

Do not cut, puncture, or weld on or near container.

Other Precautions and/or Special Hazards

All labeled hazardous precautions must be observed.

NFPA Rating* Health ___ Flammability ___ Reactivity ___ Special ___ HMIS Rating* Health 1 Flammability 1 Reactivity 0 Personal Protection ___

