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FOR BA-138

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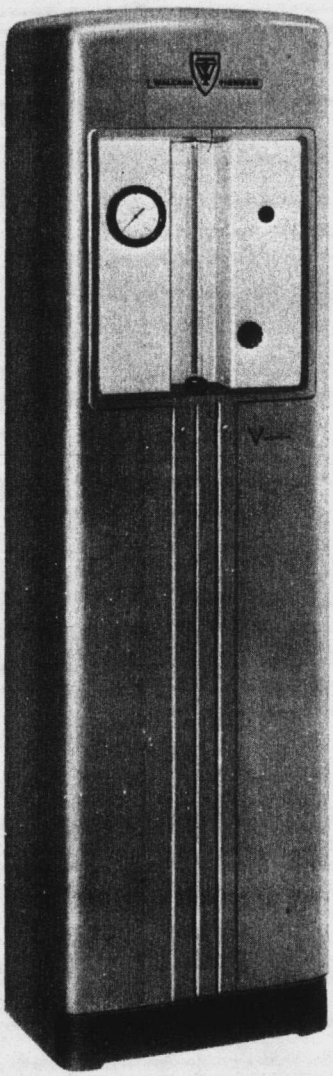
First Chlorinator at Onslow Beach
Serial # A-731095-K-K 24854 V-notch

WALLACE & TIERNAN

V-notch chlorinator

Series A-731



Series A-731
V-notch Chlorinator

The Wallace & Tiernan Series A-731 Chlorinator features the V-notch Variable-Orifice for chlorine flow control. This provides wide-range adjustment and excellent reproducibility of chlorine flow with substantially linear flow readings on a rotameter feed rate indicator.

Vacuum operation of the chlorinator assures safety for plant personnel and equipment. The chlorine inlet pressure regulating valve shuts off instantly at any interruption of the vacuum produced by the water operated injector.

With material selection giving particular emphasis to long term corrosion resistance, the Series A-731 is designed to give years of dependable service under the most severe conditions. A two-tone green, fiber glass plastic cabinet makes the chlorinator an attractive addition to any plant.

The Series A-731 chlorinator is adaptable to any type of chlorinator control. The feed rate may be controlled manually or it may be controlled on a program or automatic basis by the addition of suitable actuating devices and auxiliary apparatus. Because of its adaptability the Series A-731 Chlorinator offers maximum flexibility and operating ease for any plant which requires chlorination.

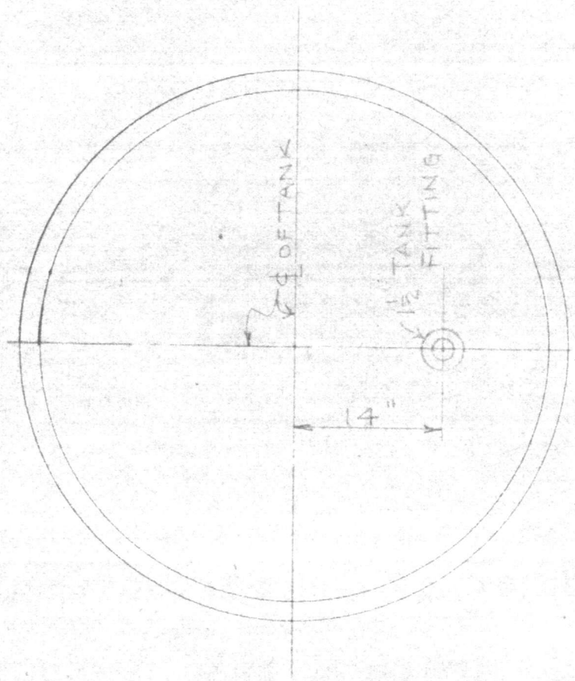
ATLANTIC DIVISION, BUREAU OF YARDS & DOCKS
NORFOLK 11, VA.

APPROVED:
SUBJECT TO THE REQUIREMENTS OF
CONTRACT NBy 54077 JKP SPEC 31357/63
APPROVAL OF MATERIALS AND/OR EQUIPMENT INDICATES COMPLIANCE WITH SPECIFICATION REQUIREMENTS ONLY — THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING PROPER PHYSICAL DIMENSIONS & WEIGHTS, COORDINATION OF TRADES, ETC., AS REQUIRED.
W. C. G. CHURCH
RADM. CEC, USN

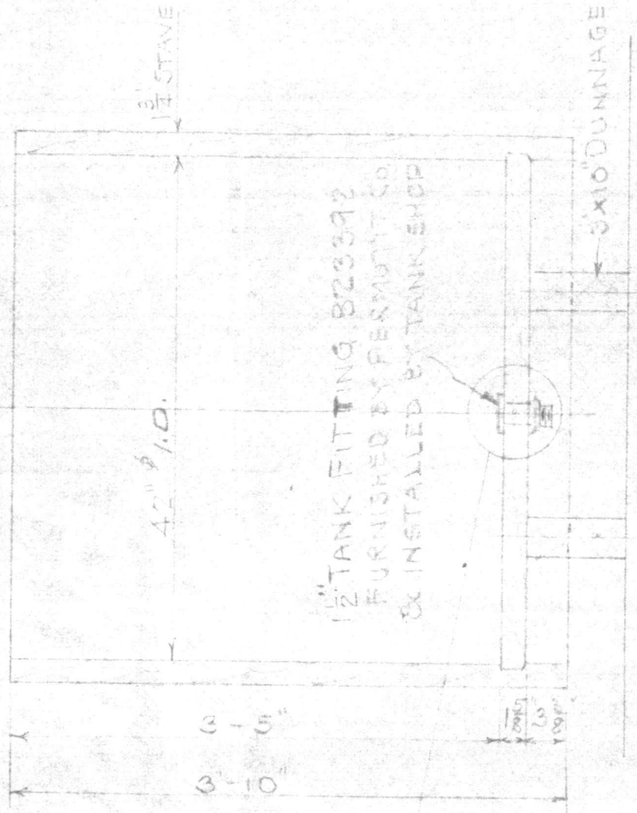
WALLACE & TIERNAN INC.
25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

CAT. FILE NO. 25.11
REV. 2-62

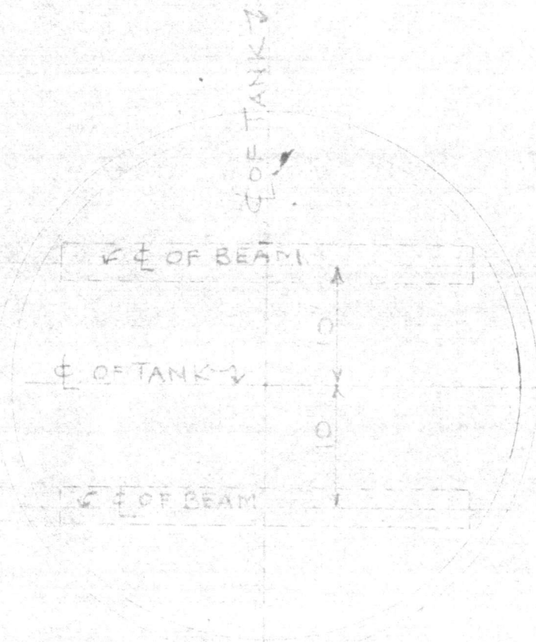
NOTE: DO NOT SCALE THIS DRAWING. USE DIMENSIONS ONLY.



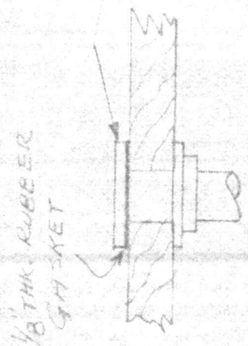
PLAN



SECTIONAL ELEVATION



PLAN OF DUNNAGE



NOTES:-
TANK TO BE WATERTIGHT
TANK STAVES & BOTTOM TO BE 2" CYPRESS.
4 HOOPS ¾" ϕ WITH MALEABLE FULLINGS PURCHASED TO FURNISH
3"x10" DUNNAGE BEAMS.
SHIP TANK SET UP.

42" ϕ x 46" WOOD STAVE ALUM. TANK

Permutit
Water Conditioning

UNLESS OTHERWISE SPECIFIED all pressure vessels in this plant are designed for maximum working pressure of 50 lbs. per square inch

JOB # BKE 35825

THE PERMUTIT COMPANY
NEW YORK, N. Y.

DRAWN BY	
TRACED BY	
CHECKED BY	

THE PERMUTIT COMPANY SUPPLIES, UNLESS OTHERWISE SPECIFIED, only water purification units proper and does not furnish any labor, material for erection, masonry, steel or wood construction, or alterations to existing structures.

THE PURCHASER SUPPLIES, UNLESS OTHERWISE SPECIFIED, labor, materials for all foundations, supports, platforms, ladders, etc., storage tanks, water pumps, motors, electrical connections, piping to inlet and from outlet of the water purification plant proper, by-pass connections, sumps, drains, and all piping shown shaded on this drawing.

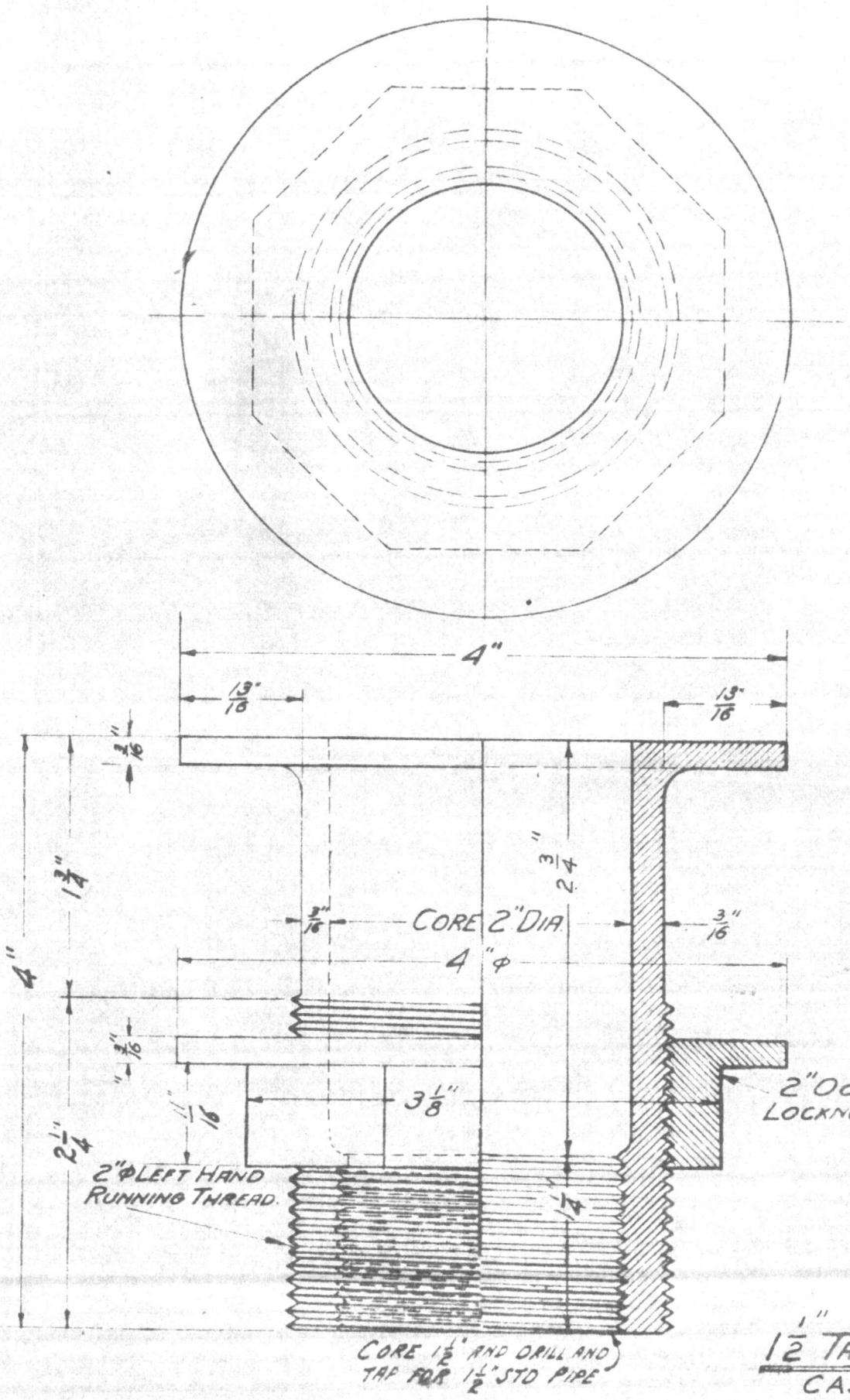
OPERATING WEIGHTS:

Softener	Lbs.
Filter	"
Salt Storage Tank	"
Brine Measuring Tank	"

REVISIONS		
A		
B		
C		
D		

SCALE 1" = 1'-0"
DATE 1-27-44

G- 7282



TANK FITTING - PATT. P.P. 441.
LOCKNUT - PATT. P.P. 442.

NOTE:
FURNISH ONE 1/8" THICK RUBBER GASKET - 2 1/2" INSIDE DIA. AND 4" OUTSIDE DIAMETER.

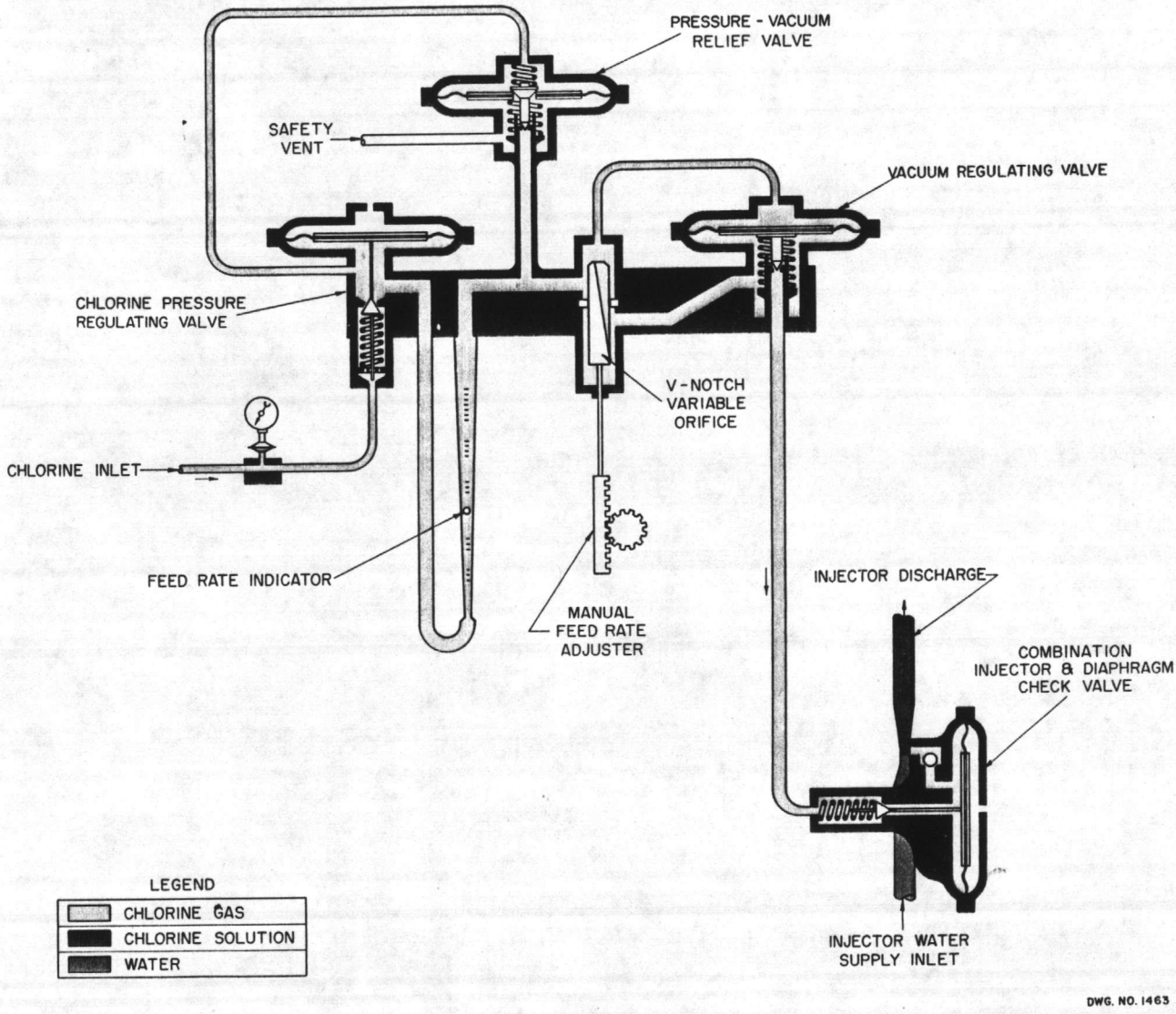
1 1/2" TANK FITTING.
CAST IRON

THE PERMUTIT COMPANY
NEW YORK, N.Y.

SCALE ~~~ DATE 9-7-43

B-23392

SIMPLIFIED FLOW DIAGRAM



OPERATION (Continued)

The feed rate is adjusted by changing the area of the V-notch Variable-Orifice. This is accomplished by positioning the V-notch plug within its ring.

The chlorine pressure regulating valve, which regulates the vacuum ahead of the metering orifice, also shuts off the chlorine if interruption of the injector water supply should destroy the operating vacuum.

Intermittent start-stop or program operation is obtained by interrupting the injector water supply. Automatic operation is accomplished either by positioning the V-notch plug to change the size of the orifice or by varying the vacuum differential across the V-notch Variable-Orifice to adjust the feed rate.

FOR BA138 CHLORINATOR

1 GENERAL

WARNING: EXCEPT IN CASES OF LEAK DETECTION OR CALIBRATION ADJUSTMENTS, THE CHLORINE GAS SUPPLY MUST BE SHUT OFF AND THE CHLORINE GAS IN THE SYSTEM EXHAUSTED BEFORE SERVICING THE EQUIPMENT.

Maintenance of a Series 731 Chlorinator System consists of three periodically performed operations:

a. Periodic Performance Checks to detect the onset of any deteriorating conditions before their progress leads to serious malfunction.

b. Periodic Cleaning to remove contaminants and deposits brought to the cylinder units and control units by the gas flow and to the injector by the water flow.

c. Periodic Preventive Maintenance to disassemble, inspect, clean and accomplish recommended parts replacement. Kits of replacement parts required for this periodic maintenance are available and are listed in Section 6, "Preventive Maintenance Kits".

PROTECT YOUR EQUIPMENT INVESTMENT
MINIMIZE DOWNTIME
REORDER A PREVENTIVE MAINTENANCE KIT NOW
KEEP ONE ON HAND

2 PERIODIC PERFORMANCE CHECKS (at 3-month intervals)

To assure that all elements of your system are functioning in a normal manner, it is recommended that the following checks be made at approximately 3-month intervals. These checks are easy to perform and require no tools.

a. With the chlorine turned on at the cylinder valve and at the vacuum regulator-check unit, and with the injector operating, turn the V-notch plug clockwise and then counterclockwise to vary the feed of the chlorinator through its full range. The chlorinator should feed steadily and hold any rate set from the maximum of the rotameter down to 1/20th of maximum. The rotameter float should not stick or behave erratically at any point.

b. With the injector still operating, turn off the chlorine at the cylinder valve. In a few moments the vacuum gauge should indiate 35 to 44 inches H_2O and the cap screw on top of the vacuum regulator-check unit should be depressed into the black knob. After initially rising, the rotameter ball will sink lower and lower in the tube until finally it is resting on the bottom stop. Partially close the V-notch if necessary to prevent the ball from bouncing violently and damaging the glass tube. An incorrect vacuum reading indicates inadequate injector vacuum or an air leak into the system. Failure of the float to settle down indicates an air leak somewhere upstream of the rotameter.

c. When the vacuum level is 35 to 44 inches H_2O and the rotameter float has settled down, turn off the injector operating water. A rapid decrease in vacuum indicates an air leak somewhere in the system.

d. If the system is equipped with the automatic switchover units, operate the chlorinator with only one unit turned on. Turn on the second unit and then close the chlorine cylinder valve on the cylinder originally feeding. The vacuum level should momentarily increase and then decrease, and the cap screw in the center of the knob of the second unit should be observed to snap down about 3/32 inch as it assumes the feeding function. Repeat the procedure, reversing which unit is turned on first to check that the opposite one will also pull in automatically. If either unit does not switch on automatically, it is an indication that the detents and spring in the cap need servicing.

e. Close the cylinder valve. Shut off the injector and let normal back pressure remain. Remove the tubing from the connection at the injector. Note if any water drips from the end of the disconnected tubing (there should be none) and leave the tubing disconnected for approximately 10 minutes. Note if any water appears at the outer end of the connection fitting on the injector. If any water is seen, service the injector back check.

f. With the injector shut off and the chlorine cylinder valve closed, turn the vacuum regulator-check unit off. Remove the tubing from its connection on the unit. Open the chlorine cylinder valve 1/8 turn, press in the red indicator button and use an ammonia dauber near the outlet of the unit to verify that the unit shuts off tightly (no white vapors). A slight trace of vapor at the moment of disconnection may be ignored, but any continuing vapor formation is an indication of chlorine gas passing the valve seat. If continuing vapor is observed, close the chlorine cylinder valve and service the unit stem and seat parts.

3 PERIODIC CLEANING

To ensure that all elements of your system are free of contaminants, it is recommended that the following checks be made at the stated intervals. Before starting the work, ensure that the appropriate spare parts are on hand. Refer to Section 6 for appropriate spare parts listing.

PERIODIC CLEANING - Perform at intervals tabulated below:

MAINTENANCE ITEM	WHEN TO PERFORM
Vacuum Regulator-Check Unit	Refer to separate instruction book.
Rotameter	When deposits are seen inside the glass tube or the float sticks in one place.
V-Notch Plug	At same time as Rotameter
Injector Nozzle and Tailway	Every 6 months.

NOTE: The actual frequency of cleaning will depend on calendar time, the feed rate and amount of gas fed, the care exercised in cylinder changing, the source of chlorine and the quality of the operating water. The above maintenance schedule provides recommended cleaning intervals. However, your own operating experience is the best guide to preventative maintenance and may result in significant variations from the recommended schedule.

3.1 CLEANING ROTAMETER

If a milky white, powdery white, green slimy or brown oily deposit is visible inside the rotameter tube or if the float shows particles clinging to it or tends to stick to the tube wall at lower feeds, it is time to clean the rotameter. Proceed carefully to avoid dropping the glass tube or losing the float down a floor drain or grating. Have a clean cup (such as a coffee cup or a small beaker) and a pair of tweezers at hand before starting. Proceed as follows:

a. Turn the knob on the vacuum regulator to OFF. Turn off the injector operating water.

b. Exert downward force on lower bell of rotameter with one hand. Use two fingers of other hand to swing top of rotameter outward. Lift rotameter. Take care not to lose the end stops, the float or any of the O-rings.

c. Place the end stops and float into the cup mentioned above.

d. Many (but not all) chlorine contaminants are soluble in water. Hold the tube end under running warm (110-125°F) water so that the water enters the tube at one end and exits at the other to flush out deposits. Alternately, soak the tube in a container of warm water for about 30 seconds. Then hold the half full tube with palms or stoppers capping the ends and shake vigorously endwise for a few seconds. Discharge the water and repeat until clean. A common pipe cleaner may be used to scrub the interior. A detergent will promote cleaning action.

e. If water does not remove the deposits use any of the approved solvents mentioned in the CHLORINE MANUAL and repeat the process using solvent in place of water. Discharge the solvent. Flush or soak in warm water.

f. Drain and let dry. Do not use a pipe cleaner as a drying tool because the lint from it will stick to the tube interior. Place the tube at an angle between a horizontal and a vertical surface (as between a shelf and a wall) with both ends open so air can flow through. Drying will be hastened by heat, as from a light bulb nearby. Do not blow through the tube as moisture from the breath will condense on the tube walls.

g. To clean the float pour about an inch of warm to hot (130-150°F) water into the cup containing the float. Grasp the float with tweezers and shake it side to side while submerged for a few seconds. Release the float and pick it up again and repeat the action several times so all surfaces are washed. Hold the float with the tweezers, discard the wash water and repeat the above. A few drops of detergent will improve the process. Do not use your fingers to hold the float. If non-water-soluble deposits are on the float, use any of the approved solvents mentioned in the CHLORINE MANUAL and repeat the process using solvent in place of water. Allow the float to dry on a clean surface and then, with tweezers, place it in a clean dry cup.

NOTE: Do not attempt to dry the float with a rag or paper towel as electrostatic forces will make lint and other particles stick to the float.

h. Clean stops with water or solvent as necessary. These may be handled with the fingers. Dry thoroughly before reassembly.

i. When tube, float, and stops are clean and dry, wipe a thin film of silicone grease on the bottom O-ring and proceed with reassembly as described in INSTALLATION. Resume operation of the chlorinator.

3.2 CLEANING V-NOTCH PLUG (see Dwg. 910.175.000.010)

The same contaminants seen in the rotameter are in the gas stream flowing through the V-notch orifice and may also deposit at this point. When the rotameter is cleaned, clean the V-notch plug at the same time. If at any time float movement in the rotameter is not proportional to V-notch plug rotation (a sudden marked rise or drops for a small amount of plug turning) the V-notch plug requires cleaning.

a. Turn the knob on the vacuum regulator to OFF. Shut off the injector water supply.

b. Remove the V-notch assembly completely from the control unit by unscrewing the extension chamber. Unscrew the adjusting knob completely and withdraw the V-notch plug

c. Using running water or a cup full of water and a small, stiff brush (such as an old tooth brush), scrub out the V-notch groove and the shank of the plug. If a solvent is required to loosen the deposit, do not soak the plug in solvent. Merely dip it, immediately withdraw it and scrub out the groove. Do not use a knife or scraper or a file to clean out the groove. Dissolving action and scrubbing are all that

is required.

d. Dry the plug with a clean cloth or paper towel.

e. Remove seal clamping screw . Clean and inspect orifice and O-rings and replace if necessary.

f. Wipe a thin film of silicone grease on the gaskets of the V-notch assembly. Reinstall it in the control unit and resume operation.

3.3 CLEANING INJECTOR THROAT AND TAILWAY

Water containing carbonates, manganese or iron will frequently leave a deposit in injector tailways. As this deposit increases in thickness it can become scaly or rough and adversely affect pressure recovery or increase back pressure so that the injector fails to develop adequate operating vacuum. If the upstream strainer becomes corroded or perforated and passes a small pebble or other tramp material, such particles can partially plug the throat and prevent adequate flow. Water containing suspended silt or sand particles can erode the opening in the throat. As it becomes larger the velocity developed goes down and the vacuum becomes less.

The injector should develop a dynamic vacuum of at least 6 inches of mercury at maximum chlorine flow rate. At lower chlorine feed rates it tends to be higher for the same hydraulic conditions. With the chlorine completely shut off the static vacuum should be about 25 to 28 inches of mercury. These vacuums are measured by taking the plug out of the 1/4-inch port on the left side of the injector and connecting a vacuum gauge or mercury manometer.

If the chlorinator fails to operate, inadequate vacuum is the most common reason and the injector is the first place to check. Proceed as described in TROUBLE LOCATING.

4 PERIODIC PREVENTIVE MAINTENANCE

Because of aging of elastomeric components and the desirability of checking internal zones for possible accumulations of deposits not seen in routine maintenance, it is recommended that at 2 year intervals, each of the principal components of a system be completely disassembled. Before starting the work, ensure that the appropriate preventive maintenance kits are on hand.

Refer to the following tabulated listing in Section 6 of this book for appropriate kit numbers.

Disassembly and reassembly instructions necessary to install the maintenance kits parts are included in the kit.

Servicing of Wallace & Tiernan chlorination equipment including installation of parts from maintenance kits should be restricted to trained, authorized personnel who are completely familiar with the entire contents of the equipment Instruction Book and the Chlorine Institute Manual.

The dealer from whom you purchased the equipment can provide the preventive maintenance kits or overhaul service.

MAINTENANCE ITEM	WHEN TO PERFORM	MAINTENANCE KIT NO.
Vacuum Regulator-Check Unit	Refer to separate instructions supplied with equipment.	
Control Panel (including injector)	At 2-year intervals.	
Plastic tubing corporation cock and solution tube.	At 2-year intervals	Refer to parts lists.

V-800 SERIES CHLORINATOR BA138

SECTION 4 - SERVICE

LIST OF CONTENTS

NOTE: Servicing of this equipment should be restricted to trained authorized personnel.

WARNING: EXCEPT WHEN DETECTING LEAKS OR MAKING CALIBRATION ADJUSTMENTS, TO PREVENT POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, THE CHLORINE GAS SUPPLY MUST BE SHUT OFF AND THE CHLORINE GAS IN THE SYSTEM EXHAUSTED BEFORE BREAKING ANY CONNECTIONS OR SERVICING THE EQUIPMENT. TO DO THIS, TURN OFF THE CHLORINE GAS SUPPLY AT THE CONTAINER VALVE, WAIT UNTIL THE GAS PRESSURE GAUGE SHOWS ZERO AND THE ROTAMETER FLOAT RESTS ON THE BOTTOM STOP, AND THEN TURN OFF THE INJECTOR WATER SUPPLY.

1 GENERAL CARE OF EQUIPMENT

Chlorinator maintenance is simplified if certain general precautions are taken. These are usually easy to accomplish and will contribute to reducing maintenance costs by maintaining normal operating conditions. The recommended precautions are as follows:

WARNING: ELECTRIC HEATER MAY BE HOT.

1.1 CHECKING FOR LEAKS

a. Chlorine Leaks

WARNING: IT IS GOOD PRACTICE TO HAVE AN APPROVED GAS MASK AVAILABLE WHEN MAKING LEAK CHECKS.

WARNING: DO NOT TOLERATE ANY LEAKS. THEY ALWAYS GET PROGRESSIVELY WORSE AND MUST BE CORRECTED PROMPTLY.

NOTE: For leak testing, use W&T U409 or Commercial 26° Baume' aqua ammonia. Household ammonia is not strong enough.

A bottle of aqua ammonia U409 is furnished for checking leakage of chlorine gas at joints, valves, etc. Hold the moistened dauber close to the joint or suspected leakage area. If leakage exists, a white cloud will form. When a leak is found, immediately shut off chlorine gas supply and remove the escaped gas by ventilation. Continue injector operation until gas pressure gauge reads zero to remove all gas from the machine.

WARNING: ESCAPED GAS MUST BE EXHAUSTED TO OUTSIDE ATMOSPHERE. THE EXHAUST SYSTEM MUST TERMINATE IN AN AREA WHERE GAS FUMES CANNOT CAUSE DAMAGE OR INJURY TO PERSONNEL. DO NOT TERMINATE THE EXHAUST SYSTEM AT A LOCATION ROUTINELY USED BY PERSONNEL, SUCH AS WORK AREAS OR PATHWAYS NOR NEAR WINDOWS OR VENTILATION SYSTEM INTAKES.

Eliminate the leak before proceeding.

As a routine practice, check chlorine connections for leaks once a day. Green or reddish deposits on metal parts indicate possible leaks. When any connection is broken even for a short time, the openings must be plugged to prevent the entrance of moisture which, when mixed with chlorine gas, corrodes metal parts. No odor should be in evidence around equipment except when a joint is temporarily opened.

b. Water Leaks

NOTE: As a matter of routine maintenance, tolerate no water leaks. Repair all water leaks as soon as they are discovered.

c. Moisture

CAUTION: When any connection is broken even for a short time, immediately plug the resultant openings with a rubber stopper or equivalent to prevent the entrance of moisture. Moisture must be excluded from any part of the equipment which is normally exposed to dry chlorine only. While dry chlorine is non-corrosive, moist chlorine is extremely corrosive to common metals, such as brass or steel.

1.2 PLASTIC PARTS

Whenever threaded plastic parts are assembled, use silicone grease on the threads to prevent the parts from freezing together. In general, do not use tools to make up plastic connections. Make this type of connection by hand only.

2 CLEANING CHLORINATOR PARTS

If the rotameter tube, the rotameter float, the V-notch plug or any valve seats or passages become contaminated with impurities sometimes found in chlorine, remove and clean them. Most of the residue that accumulates on the chlorinator parts can be removed with warm water and a detergent. Pipe cleaners, scrapers and the like should be avoided as they will damage the parts. If further cleaning is necessary, refer to the section on CLEANING in the CHLORINE MANUAL. Where solvents are used on plastic parts, prolonged contact between the solvent and the plastic part is to be avoided as it may damage the part.

All traces of detergent, moisture or solvent must be removed from the parts before they are returned to service. Do not use heat on plastic parts.

3 TOOLS

When working with screws, bolts, nuts and other hardware, use the proper size tools to avoid damage to screw heads, nuts, etc. This precaution will make it easier to remove these parts when necessary.

4 GASKETS/O-RINGS

Keep a supply of gaskets and O-rings on hand so that gasketed joints can be maintained in proper condition. A regular replacement program for gaskets will do much to eliminate operating difficulties.

WARNING: NEVER REUSE A LEAD GASKET. ALWAYS REPLACE WITH A NEW LEAD GASKET.

5 CHANGING SUPPLY CYLINDERS

WARNING: PRIOR TO PERFORMING THIS OPERATION YOU MUST BE COMPLETELY FAMILIAR WITH CHLORINE INSTITUTE RECOMMENDED PROCEDURES AND YOUR LOCAL PLANT OPERATING AND EMERGENCY PROCEDURES.

When changing a chlorine cylinder, it is of the utmost importance that air is not allowed to enter chlorine lines due to the corrosion problem encountered when ambient air is mixed with dry chlorine.

CAUTION: When any connection is broken even for a short time, immediately plug the resultant openings with a rubber stopper or equivalent to prevent the entrance of moisture. Moisture must be excluded from any part of the equipment which is normally exposed to dry chlorine only. While dry chlorine is non-corrosive, moist chlorine is extremely corrosive to common metals, such as brass or steel.

It is unnecessary to shut off injector when changing a cylinder. To replace a cylinder, proceed as follows:

a. Close the cylinder valve and the auxiliary cylinder valve.

b. Break connection between auxiliary cylinder valve and valve on cylinder using wrench P8201.

c. If necessary to make or break the connection between the auxiliary cylinder valve and the copper tubing, use two wrenches P8200.

CAUTION: Avoid any turning of the nut brazed to the tubing as twisting the tubing even slightly sets up stresses which become increasingly susceptible to corrosion.

WARNING: CHLORINE CYLINDERS MUST BE SECURED IN SUCH A MANNER (e.g. WITH CHAIN) AS TO PREVENT THEIR BEING KNOCKED OVER.

6 MAINTENANCE

Maintenance of a Series V-800 Chlorinator system consists of three periodically performed operations:

a. Periodic Performance Checks to detect the onset of any deteriorating

conditions before their progress leads to serious malfunction.

b. Periodic Cleaning to remove contaminants and deposits brought to the chlorinator by the gas flow and to the injector by the water flow.

c. Periodic Preventive Maintenance to disassemble, inspect, clean and accomplish recommended parts replacement. Kits of replacement parts required for this periodic maintenance are available and are listed in Section 4 of this book.

PROTECT YOUR EQUIPMENT INVESTMENT
MINIMIZE DOWNTIME
REORDER A PREVENTIVE MAINTENANCE KIT NOW
KEEP ONE ON HAND

6.1 PERFORMANCE CHECK - At three-month intervals

To assure that all elements of your system are functioning in a normal manner it is recommended that the following checks be made at approximately 3-month intervals. These checks are easy to perform and require no tools.

a. With the chlorine supply turned on and with the injector operating, vary the feed of the chlorinator through its full range. The chlorinator should feed steadily and hold any rate set from the maximum of the rotameter down to 1/20th of maximum. The rotameter float should not stick or behave erratically at any point.

b. With the injector still operating, turn off the chlorine supply. In a few moments the pressure gauge should indicate zero supply pressure. After initially rising, the rotameter float will sink lower and lower in the tube until finally it is resting on the bottom stop. Decrease the feed rate if necessary to prevent the ball from bouncing violently and damaging the glass tube. Failure of the float to settle down indicates an air leak somewhere upstream of the rotameter.

c. When the rotameter float has settled down, turn off the injector operating water. A rapid decrease in vacuum below 3" Hg indicates an air leak somewhere in the system.

6.2 CLEANING -At intervals as tabulated below:

MAINTENANCE ITEM	WHEN TO PERFORM
Rotameter	When deposits are seen inside the glass tube or the float sticks in one place.
V-Notch Plug	At same time as rotameter.
Injector Throat & Tailway	Every six months.

NOTE: The actual frequency of cleaning will depend on calendar time; the feed rate and amount of gas fed; the care exercised in supply container changing; the source of chlorine and on the quality of the operating water. The above maintenance schedule provides recommended cleaning intervals. However, your own operating experience is the best guide to preventive maintenance and may result in significant variations from the recommended schedule.

6.3 PERIODIC PREVENTIVE MAINTENANCE

Because of aging of elastomeric components and the desirability of checking internal zones for possible accumulations of deposits not seen in routine maintenance, it is recommended that at two-year intervals, each of the principal components of a system be completely disassembled. Before starting the work, ensure that the appropriate preventive maintenance kits are on hand.

Refer to the tabulated listing below and Section 6 of this book for appropriate kit numbers.

Disassembly and reassembly instructions necessary to install the maintenance kit parts are included in the kit.

Servicing of Wallace & Tiernan chlorination equipment including installation of parts from maintenance kits should be restricted to trained, authorized personnel who are completely familiar with the entire contents of the equipment Instruction Book and the Chlorine Institute Manual. The dealer from whom you purchased the equipment can provide the preventive maintenance kits or overhaul service.

MAINTENANCE ITEM	WHEN TO PERFORM	MAINTENANCE KIT NO.
Chlorinator.	At two-year intervals.	U26225
Plastic tubing, Corporation cock and solution tube.	At two-year intervals.	Refer to parts list.

6.4 GAS PRESSURE REGULATING VALVE TEST (see Dwg. 25.050.42.011)

To ensure that there is no leakage of gas past the stem U17377 and seat P37049 when the chlorinator is shut-off, proceed as follows:

a. Turn off the chlorine supply.

b. Remove the purge plug P34476.

c. Turn off the injector water supply.

d. Turn on the gas supply and test for leaks at the opening from which the purge plug was removed.

6.5 CHLORINE STRAINER (see Dwg. 50.150.005.032)

Clean filter screen U20768 in chlorine strainer U17409 (see Dwg. 50.150.005.032). Remove bolts on cover. Screen is welded to cover and will come out for cleaning when cover is removed. After cleaning replace screen and cover using new gasket P37621. If screen cannot be adequately cleaned, replace screen U20768.

6.6 PRESSURE-VACUUM RELIEF VALVE (see Dwg. 25.130.004.015)

The force exerted by the spring (11) must be such that sufficient vacuum may be created in the chlorinator to permit operation at full capacity and yet have the vacuum relief valve function to prevent excessive vacuum in the event of failure or shut-off of the chlorine gas supply. The factory setting may be checked as follows:

a. Connect a manometer capable of measuring at least 50 inches of water in the 1/4-inch tap at the bottom of the rotameter inlet block.

b. Start the chlorinator. Set the feed rate at 5% of maximum feed.

c. Turn off the chlorine gas supply only. The vacuum indicated on the manometer should be at least 35 but not more than 44 inches of water. If necessary, install a new spring (11).

NOTE: If sufficient vacuum cannot be obtained with the safety vent line temporarily plugged, check for inadequate injector operation or a vacuum leak in the chlorinator.

d. Remove the manometer and restore the chlorinator to normal operation.

7 REMOVAL OF V-NOTCH PLUG (see Dwgs. 25.050.21.011 or 25.050.41.011)

a. Shut down the chlorinator and exhaust all chlorine per OPERATION-STOPPING-For Extended Period.

b. Rotate the knob U20892 to lower the rack P34480 as far as possible.

c. Disconnect the clamp U16082.

d. Unscrew the extension chamber.

e. Pull the plug stem straight down until the V-notch plug is free.

f. Reassemble in reverse order.

8 REMOVAL OF INJECTOR PLUG (2-inch Bellofram Type Injector, Dwg. 25.100.006.087)

CAUTION: If the injector plug is to be removed for cleaning or replacement, it is essential that the stem P40559 be held with a wrench so it cannot rotate when the plug is unscrewed. Rotation of the stem will cause damage to the bellofram P34567.

9 REPLACEMENT OF BELLOFRAM (see Dwg. 25.100.006.087)

Damage to the bellofram P34567 is indicated by a continuous flow of water from the injector shut-off valve drain when the valve is in the OFF position or by failure of the injector to operate when the valve is in the ON position.

To replace the bellofram:

a. Remove the spring holder P40572 with the adjusting screw, lock nut and the spring P34566.

b. Remove the connecting tube P40574.

c. Remove the 1/2-inch cap bolts PB-21381 and lower the entire lower portion of the injector including the stem and plug.

d. Remove the old bellofram and assemble the new one on the stem.

e. Locate the bellofram on the backing cup.

f. Reassemble the injector.

10 VACUUM OR PRESSURE GAUGE

CAUTION: Do not disassemble diaphragm unit from pressure sensor.

11 INJECTOR

The injector is a highly important part of the chlorinator since proper operation of the machine depends upon good injector performance. Each chlorinator is equipped with an injector which is selected at the factory to suit the installation conditions. Before shipment, the chlorinator is tested under actual operating conditions to ensure that it will deliver the required flow of chlorine when operated under the hydraulic conditions specified on the Wallace & Tiernan shipping order. Therefore, if difficulty is experienced in obtaining the specified capacity at time of installation, check the injector operating water pressure and the back pressure to see that they conform with the values specified on your order.

12 ADJUSTMENT OF TRIMMER-DRAIN RELIEF VALVE (see Dwg. 25.130.005.015)

The injector suction gauge line is connected to the seat (26) in the trimmer drain relief valve. If this connection is moved to a port in the body (24), the indicated vacuum at maximum feed should be 5 inches. The vacuum may be adjusted by positioning the nuts (2).

13 DISASSEMBLY OF GAS PRESSURE REGULATING VALVE (see Dwg. 25.050.42.011)

a. Unscrew clamping ring (P37001) from inlet valve body (U17403).

b. Unscrew clamping nut (P36931).

c. Withdraw complete inlet valve. Remove gasket (P36988). (Refer to inlet valve cleaning procedure.)

d. Remove four machine screws (P35114), machine screws (P35113) and hex nuts (P35110).

e. Separate valve housing (P38592) from valve body (U20914). Take note of diaphragm convolution (curvature). Remove diaphragm (P36942) and two O-rings (P36943).

f. Remove three silver screws (P4123). Remove three gaskets (P34504).

14 REASSEMBLY OF GAS PRESSURE REGULATING VALVE

a. Refer to cleaning procedure.

b. Wipe a thin film of silicone grease U10242 onto all O-rings before reassembling.

c. Reassemble in the reverse order of disassembly.

15 DISASSEMBLY OF PRESSURE-VACUUM RELIEF VALVE (see Dwg. 25.130.004.015)

a. Remove machine screws (6), machine screws (9) and 16 hex nuts (4).

b. Separate casing (10) from body unit (1). Take note of diaphragm convolution (curvature), remove diaphragm unit (7). Remove O-ring (8).

16 REASSEMBLY OF PRESSURE-VACUUM RELIEF VALVE

a. Refer to cleaning procedure.

b. Wipe a thin film of silicone grease U10242 onto all O-rings before reassembling.

c. Reassemble in the reverse order of disassembly.

17 DISASSEMBLY OF VACUUM REGULATING VALVE (see Dwg. 25.130.003.015)

a. Remove machine screws (5), machine screws (11) and hex nuts (3).

b. Separate upper plate (2) from body unit (15). Remove diaphragm unit (9). Remove O-ring (10).

c. Remove stem holder (12) and stem (14) from diaphragm unit. Remove O-ring (13).

18 REASSEMBLY OF VACUUM REGULATING VALVE

a. Refer to cleaning procedure.

b. Wipe a thin film of silicone grease U10242 onto all O-rings before reassembling.

c. Reassemble in the reverse order of disassembly.

19 DISASSEMBLY OF TRIMMER-DRAIN RELIEF VALVE (see Dwg. 25.130.005.015)

NOTE: Valve will require readjustment.

a. Remove machine screws (23), machine screws (10) and hex nuts (9). Remove body unit (24). Remove O-ring (8).

b. Mark position of hex nuts (2) on valve rod (1). Remove hex nuts, seal adapters (16 and 18) and spring (17).

c. Pull diaphragm unit (21) and valve rod assembly from drain body unit (7).

d. Restore hex nuts (9) to original positions during reassembly.

20 REASSEMBLY OF TRIMMER-DRAIN RELIEF VALVE

a. Refer to cleaning procedure.

b. Wipe a thin film of silicone grease U10242 onto all O-rings before reassembling.

c. Reassemble in the reverse order of disassembly.

21 CLEANING INLET VALVE (CARTRIDGE) OF GAS PRESSURE REGULATING VALVE (see Dwg. 25.050.42.011)

NOTE: Ensure that two new lead gaskets P37005 are available before starting this procedure.

a. Shut off gas supply at nearest valve upstream of chlorinator.

b. Operate chlorinator until gas pressure gauge on machine falls to zero.

c. Remove purge plug P34476 from GPRV housing while injector is still operating to sweep away any remaining chlorine.

d. Loosen and remove two hex head bolts (16, Dwg. 25.050.040.002) at each end of gas inlet line (40).

e. Lift out the gas inlet line. Peel away and discard the old lead gaskets.

f. Unscrew and set aside clamping ring P37001 from inlet valve body U17403.

g. Unscrew and set aside PVC clamping nut P36931.

h. Withdraw U17402 inlet valve and its gasket P36988.

i. Pull stem extension P36998 off stem U17377.

j. Using needle-nose or slip-joint pliers, rotate retaining disc P37047 about 45 degrees in either direction to release the spring and stem from valve body.

k. Flush all parts of the inlet valve with warm to hot water (110-140°F). Use a small brush such as an old toothbrush to scrub the interior and the coils of the spring.

CAUTION: Do not use a test tube brush in the plastic valve seat. Do not scrape the cone on the stem with a knife or other hard instrument.

l. Wipe the seat and cone with a clean cloth or paper towel.

m. If contaminants that are not soluble in hot water remain, use one of the following chlorinated solvents to remove them: chlorothene, trichlorethane or perchlorethylene.

WARNING: WHEN USING SOLVENTS, WORK IN A WELL VENTILATED AREA. AVOID PROLONGED OR REPEATED BREATHING OF SOLVENT VAPORS. DO NOT USE CARBON TETRACHLORIDE AS THE VAPORS ARE A SERIOUS HEALTH HAZARD.

n. Allow all traces of solvent to evaporate before reassembly. If any water remains it must be thoroughly dried, particularly from internal cracks and grooves. Gentle warmth may be helpful but excessive heat will damage plastic parts.

o. Install the stem extension and check gasket P36988. If usable, lightly coat with silicone grease (W&T U10242 or Dow #33).

p. Install the gasket and inlet valve assembly into the housing and secure with the clamping nut. Hand tight is sufficient.

CAUTION: Do not use a wrench or channel-lock pliers to tighten.

q. Rotate the clamping ring a sufficient number of turns so that the inlet valve body end projects beyond it at least 1/16 inch.

r. Using new gaskets, reinstall and tighten the gas inlet line. Replace the purge plug in the GPRV housing.

s. Turn on the gas about 1/4 of a turn of the controlling valve and check for leaks at both ends of the gas inlet line using ammonia bottle U409. Connect a single leg water manometer at the 1/4-inch plastic pipe plug, P31295 in the GPRV and check for a possible gas pressure leak through the stem and seat, or a possible vacuum leak past the P36988 gasket, check for proper operating vacuum. If any leaks are detected, correct them immediately and recheck. The chlorinator may then be placed back in normal service.

22 CLEANING CHLORINE VALVE PARTS

If any valve seats or passages become contaminated with impurities sometimes found in chlorine, remove and clean them. Most of the residue that accumulates on parts can be removed with warm water and a detergent. Pipe cleaners or soft brushes may facilitate cleaning but wire brushes, scrapers, and the like should be avoided as they will damage the parts. If

further cleaning is necessary, refer to the section on "cleaning" in the Chlorine Manual. Where solvents are used on plastic parts, prolonged contact between the solvent and the plastic part is to be avoided as it may damage the part.

All traces of detergent, moisture or solvent must be removed from the parts before they are returned to service. Do not use heat on plastic parts.

23 TROUBLE SHOOTING GUIDE

The following guide is provided to assist in locating some malfunctions which may occur.

TROUBLE-SHOOTING WITH A MANOMETER AND VACUUM GAUGE

Basic Instructions:

1. Measure the vacuum over the full range of gas flow (low flow, half feed, full feed).
2. Compare what you measure with figures given on the Schematic Flow diagram for your chlorinator or on signal data sheets. If the figures are right, leave that component alone and check the next element.
3. Make checks, as necessary, to pin-point the problem.

WARNING: TO PREVENT POSSIBLE PERSONAL INJURY OR EQUIPMENT DAMAGE, TURN OFF THE CHLORINE GAS SUPPLY AT THE CONTAINER VALVE, WAIT UNTIL THE GAS PRESSURE GAUGE SHOWS ZERO AND THE ROTAMETER FLOAT RESTS ON THE BOTTOM STOP, AND THEN TURN OFF THE INJECTOR WATER SUPPLY BEFORE PERFORMING ANY DISASSEMBLY OPERATIONS.

CHLORINATOR OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	ADDITIONAL CHECKS	REMEDY
Manual chlorinator will not come up to full feed. Gas pressure adequate.	Insufficient injector vacuum.	Injector vacuum.	Observe gauge on machine if it has one. If there is no built-in gauge, connect a vacuum gauge or a mercury manometer at gas inlet to injector.	With gas flowing, 5" Hg minimum for manual control machines. With gas shut off you should see 25" to 28-1/2" Hg. static vacuum.	Measure operating water pressure just upstream of injector and back pressure just downstream of injector. Compare with injector data. Check piping for smooth flow immediately downstream of injector tailway. (No elbows, tees, reducers, etc.).	Clean injector throat and tailway. Clean or replace solution discharge tubing. Provide adequate operating water pressure. NOTE: A larger throat and tailway may only compound the problem as the greater flow creates greater back pressure.

CHLORINATOR OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	ADDITIONAL CHECKS	REMEDY
Manual chlorinator will not come up to full feed. Gas pressure adequate. (Cont'd)					Check for air leaks through diaphragm of diaphragm-type injector. Check valves.	(Refer back to previous page).
		V-Notch Differential.	Connect a U-tube water manometer upstream and downstream of V-Notch chamber.	11-1/2" to 17" H_2O.	Where injector vacuum is marginal or hydraulics are borderline, V-Notch differential is a more sensitive indicator of adequate operating vacuum than the injector vacuum gauge. A "bobbing" rotameter float indicates marginal vacuum.	

CHLORINATOR OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	ADDITIONAL CHECKS	REMEDY
Manual chlorinator feeds OK at high rates but will not control at lower rates.	CPRV not throttling sufficiently. (Held open by a particle of rust, ferric chloride, etc.).	CPRV vacuum.	Connect a single leg water manometer at pipe plug opening in the CPRV.	11" to 17" H_2O.	Note especially if vacuum falls at lower feeds. If it does, either air or chlorine must be causing it. To determine which, turn off gas at cylinder. If rotameter float drops, excess gas was flowing. If turning off gas does not cause the float to drop, air must be leaking in. Then, close off vent opening. If float drops, air was leaking through the diaphragm. If closing the vent has no effect, air is leaking past a gasket.	Clean CPRV cartridge. Check CPRV diaphragm for "pin hole" leaks. Check CPRV gaskets.
	-OR-					
	Possibly a bad diaphragm in Vacuum Regulating Valve is causing by-passing of the V-Notch control valve.	Vacuum Regulating Valve.	Connect a U-tube water manometer across Vacuum Regulating Valve.	11-1/2" to 17" H_2O difference.		Replace diaphragm.

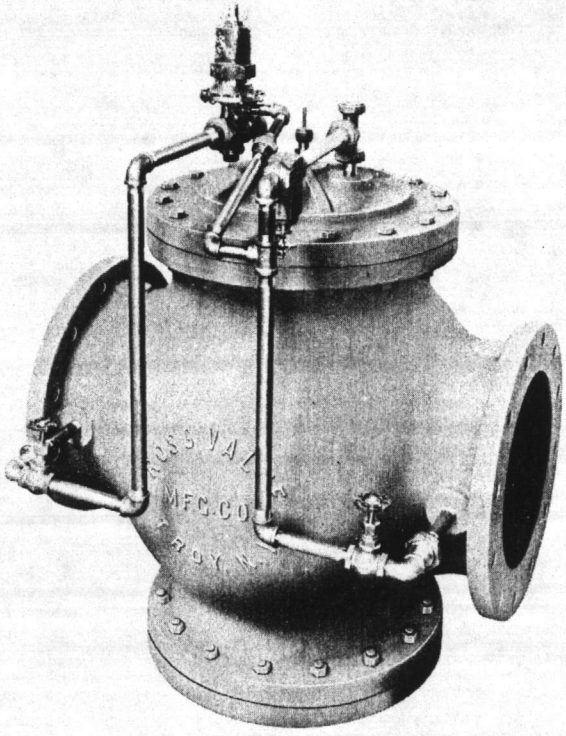
CHLORINATOR OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	ADDITIONAL CHECKS	REMEDY
					Pressurize top of Vacuum Regulating Valve with air and check for leaks in water.	
Manual Chlorinator controls OK at low feeds but is erratic when full feed is attempted. Injector vacuum OK.	Not enough chlorine entering to satisfy demand. Dirty CPRV or partially clogged gas line.	CPRV vacuum.	Connect a single leg water manometer at pipe plug opening in the CPRV.	11" to 17" H_2O. If gas line or cartridge is partially clogged CPRV vacuum will increase to vacuum relief level. CAUTION: Start at low feed rates and gradually increase feed to prevent "blowing" manometer.	Check gas supply pressure. See if air is entering vacuum relief port at high feeds. Check vacuum relief level with a single leg manometer.	Clean CPRV cartridge. Clean high pressure gas line. Supply adequate chlorine gas pressure. (20 psig is the minimum for full feed performance except on low rate apparatus).

CHLORINATOR OPERATING SYMPTOMS	PROBABLE CAUSE	WHAT TO MEASURE	HOW TO MEASURE	TYPICAL VALUES FOR PROPER OPERATION	ADDITIONAL CHECKS	REMEDY
Chlorinator does not feed. Gas pressure is adequate. Injector vacuum is OK.	Tube connection from upstream of V-Notch to top of differential valve is disconnected or leaking.	CPRV vacuum.	Connect a single leg water manometer at pipe plug opening in the CPRV.	11" to 17" H_2O. As feed rate is decreased toward 20% CPRV vacuum falls abruptly. Vacuum should never be below 11" H_2O.		Re-connect tube.line. Replace tube if cracked, kinked or defective at ends. Tighten tube nuts.

RELIEF, SURGE CONTROL and BACK PRESSURE VALVES

Instructions

Installation - Operation - Inspection - Maintenance



Model 50 RWR
Model 50 RWR-A
Model 50 RWR-E

ROSS VALVE MFG. CO., INC.

6 OAKWOOD AVE · P. O. BOX 595 · TROY, NEW YORK 12181 · TEL. 518 · 274-0961

INSTRUCTIONS

SHIPMENT:

When shipped, the valve is tagged with all necessary identification marks. On test before shipment, the valve is adjusted so that it is prepared to operate when installed.

INSTALLATION:

1. Flush line if possible before inserting valve.
2. Place valve in line with flange marked "inlet" toward the high pressure source.

CAUTION: Do not obstruct vent hole at bottom of **GLOBE** valve. Allow enough clearance above valve for removal of stem.

3. If external piping and controls are not attached to valve when shipped, connect couplings identified with tags which are numbered.

   Petcocks are provided for attaching gauges to back side of valve.

   The indicator rod (Part No. 20) shows position of stem of valve.

CAUTION: Arrow on pilot valve body points in direction of flow through the pilot valve. Flow is always **AWAY** from the top cap of the main valve.

STARTING OPERATION:

1. Open ½" or ¾" isolation valves in control piping.
2. Open the main line gate valve on the discharge side of the valve (if installed).
3. Open main line gate valve (if installed) on high pressure or inlet side of valve slowly.
4. If the valve discharges to atmosphere it may be necessary to create line pressure at the valve artificially during initial start-up. This may be done by closing the main line gate on the valve discharge if so equipped. In other cases it may be necessary to press firmly on the valve indicator rod with a wrench handle or block of wood until the valve operating chamber is pressurized. Loosening the union on the top cap side of the pilot valve will help bleed the air and give a positive indication when the operating chamber is full.

MAINTENANCE:

The valve, less external controls and piping, is here referred to as "Main Valve". It consists of cast iron body, top cap and bottom cap with bronze and leather internal working parts. Repairs, as is characteristic of all Ross Valves, are made through the top of the valve. When packing is to be replaced, the top cap of the valve is removed and the piston removed by means of an eyebolt (4" and 6" valves), or a clevis (8" to 30" valves). After removal of piston, replacement of packings is self-evident.

Packing to be replaced:

No. 5. Bottom cup leathers (2) — both cups look up.

No. 13. Main cup leathers (2) — bottom cup looks down; top cup looks up.

No. 9. Seat leather (1) — sliding seat leather is bolted between main valve body and seat leather support (10). Flat seat packing is bolted between two bronze plates (8 and 10).

When replacing cup leathers, inspect Bushing No. 14 and Cap Cylinder No. 23. If a deposit is found and smooth polished surface destroyed, use a fine sandpaper or emery to restore the polished finish. If deep score marks are present, replace the cylinder. When replacement of threaded type bottom cylinder is required, a **strap wrench** must be used. **(Not a pipe wrench.)**

Although not necessary, it is recommended that a good grade of soluble grease be applied to the cup leathers when installing.

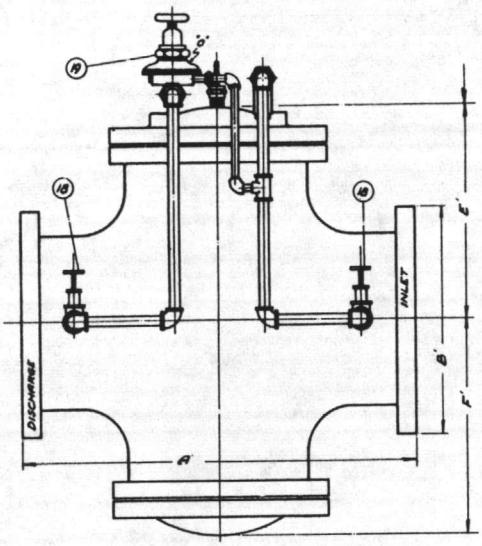
The stem should fit firmly in the cylinders but be free enough to drop of its own weight. (In some cases, especially the smaller valves, a slight pressure from the hand should move the piston closed.)

IMPORTANT: Do not over-tighten the packing follower nuts. This will result in a deformed cup and poor service life. Forty-five degrees additional wrench movement after initial packing contact should be sufficient to hold the packing. Make sure all locking nuts are TIGHT.

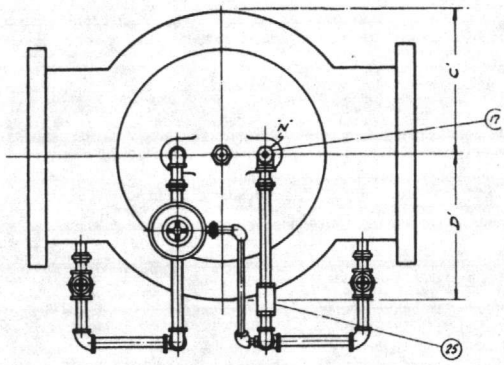
INSPECTION:

Inspection is governed by the experience with the valve. Quality of water, rate of flow, operating pressures — all have a bearing on the kind and length of service.

So that some recommendation may guide the operator, it is suggested that after the first year of service, the top cap of the Main Valve be removed and the piston withdrawn for inspection. This inspection will help to decide the interval for next inspection.



SIDE ELEVATION



PLAN

PARTS LIST

17.	Needle Valve	19.	Pilot Valve
18.	Gate Valve	25.	Strainer

SURGE RELIEF VALVE - Model 50 RWR (Fig. 37)

The Model 50 RWR is a pilot operated relief valve capable of rapid opening when the line pressure exceeds its setting. This valve may be installed on a tee off a transmission main or distribution line or in a by-pass around a pump. It insures a safe operating pressure by discharging a sufficient volume of water to maintain its set pressure. This discharge may be to atmosphere, a zone of lower pressure or, in the case of the pumping unit, to pump suction.

The main valve piston is operated by line pressure using an external control circuit. The piston is hydraulically closed when the seat in the pilot valve (Part No. 19) closes. This closure is accomplished by trapping high pressure water from the valve inlet in the operating chamber above the valve piston. Closing speed is adjusted by changing the setting of the needle valve (Part No. 17).

BACK PRESSURE VALVE - Model 50 RWR (Fig. 37)

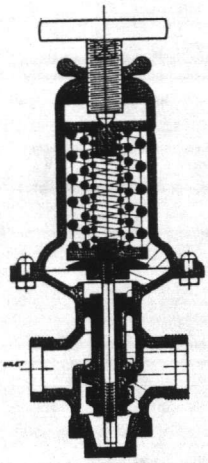
The Model 50 RWR may also be installed as a back pressure control valve. When so used the valve is installed in the direct path of flow rather than on a side tee or by-pass line as in the case of a relief valve. The back pressure valve will open to permit flow when its inlet pressure reaches the pilot setting. If this incoming pressure is not sufficient to maintain full pipeline flow, the valve will throttle to pass only that quantity of water necessary to sustain the set inlet pressure.

Back Pressure control valves are usually installed on deep well pumps to protect the well against over pumping in the event of a line break or excessive demand. They are also used between two pressure zones to permit the higher pressure zone to reinforce the lower pressure zone without lowering the high zone pressure.

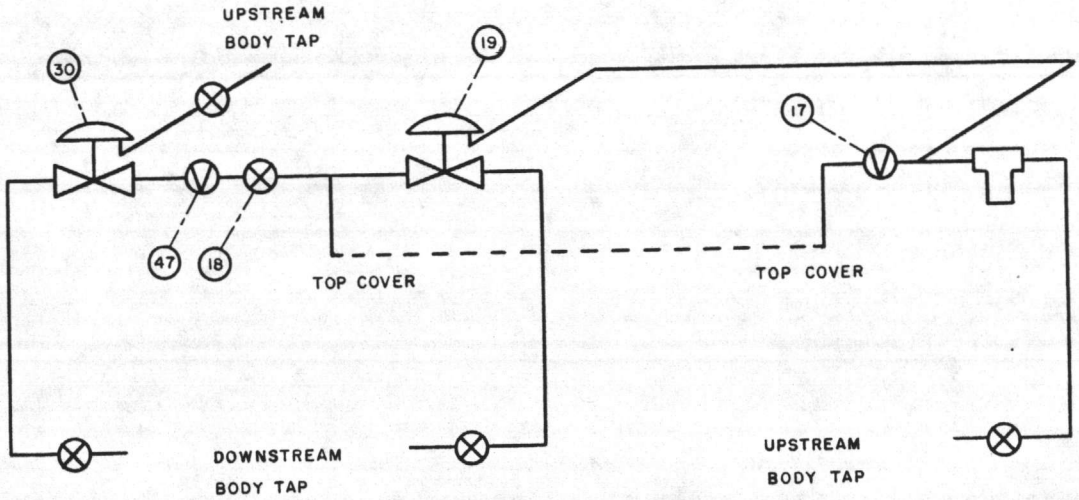
When the pilot discharge is piped to the downstream line, a pressure loss of approximately 10 psi is imposed on the valve. This loss may be eliminated by wasting the pilot to atmospheric pressure, such as the well casing or a convenient drain.

ADJUSTMENT: To increase the pressure setting, turn the pilot valve adjusting screw **clockwise.** For most standard pilots in the 60 to 180 psi range, one turn of the adjusting screw changes the set point approximately 15 psi.

Surge Control Valve - Model 50 RWR-A (Fig. 37A)



Auxiliary Pilot
(low pressure)



Schematic Control Diagram

In addition to the standard overpressure relief feature, this valve is designed to anticipate a high pressure surge by sensing the low portion of the sine wave. This valve is actuated by the falling line pressure so that the seat is open by the time the high pressure wave reaches the valve. It is most commonly used in pumping stations and is installed on a side outlet on the system side of the pump check valve with its discharge piped to waste or pump suction.

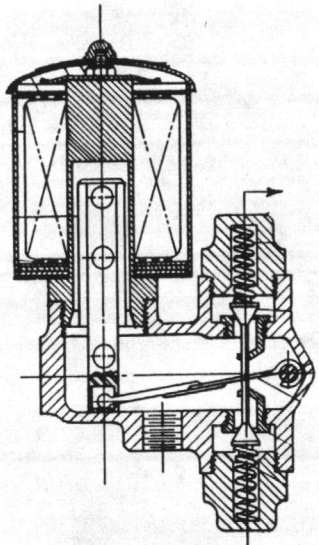
In the external control circuit are two pilots (No. 19 and No. 30). Pilot (No. 19) opens the valve on a high pressure wave and pilot (No. 30) opens the valve on a low pressure wave. The rate of opening when the low pressure pilot is in control is regulated by Needle Valve (No. 47). By adjusting this Needle Valve, the piston stroke can be timed so that only enough water is passed to dissipate the surge wave.

ADJUSTMENT: The inlet needle valve (No. 17) should be set between ½ and 1½ turns open, depending upon valve size and operating pressure.

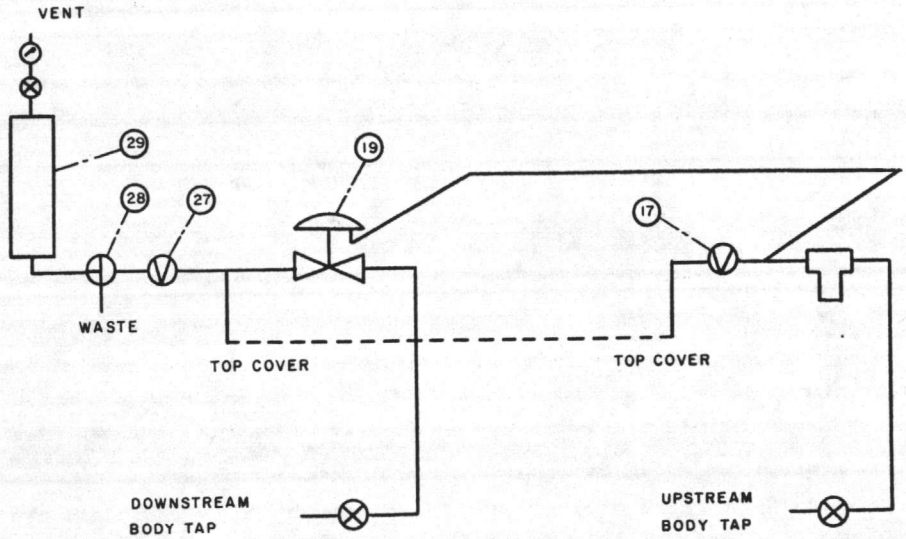
To start the valve on a new installation or when the valve has been isolated for repairs it will probably be necessary to shut off the low pressure opening feature of the valve. This is accomplished by closing isolation valve (No. 18) in series with low pressure pilot (No. 30). See Page 2 (starting operation) for further suggestions. Leave the low pressure feature isolated and check the high pressure pilot setting (No. 19) by starting the pump and observing the pressure at which the main piston opens. If the pump does not cause the valve to operate, throttle a main line valve to increase the back pressure on the pump until the valve opens. Adjust the pilot, if necessary, to obtain the desired maximum line pressure. Turning the pilot adjusting screw down **(clockwise)** will increase the set point approximately 20 psi.

Once the high pressure pilot has been properly set, the low pressure pilot should also be tested. Open the isolation valves for (Pilot No. 30) and throttle the main line isolation valve ahead of the surge conrtol valve. Bleed water from the line between the surge valve and the isolation valve and observe the pressure at which the valve opens. This "bleed" may be through a test cock, gauge connection or loose union on the control piping. Once the valve has opened it is necessary to close the isolation valve at the inlet of Pilot (No. 30) in order to reclose the valve. It may also be necessary to open the throttled main line isolation valve and follow the steps outlined on Page 2 to reclose the valve. If a change in the low pressure set point is desired, turning the adjusting screw down **(clockwise)** on this pilot one turn will raise the opening pressure 10 to 15 psi. As a general rule of the thumb, a good starting setting for this pilot is approximately 15 psi below the normal static pressure. Because of the infinite variety of pumping conditions, this setting can be used as a guide only and must be checked in the field. Once the low pressure pilot has been set, test the surge control ability by stopping the pump. The needle valve (No. 47) in series with the low pressure pilot should be used to control the rate of opening so that the valve does not open too far or too quickly during the negative part of the sine wave. Recovery of static line pressure should result in no flow through either the high or low pressure pilot lines. When the valve wastes to atmospheric pressure, this can best be checked by loosening the union connection at each pilot discharge.

Surge Control Valve - Model 50 RWR-E (Fig. 37B)



Solenoid Valve
(Automatic Switch Co.)



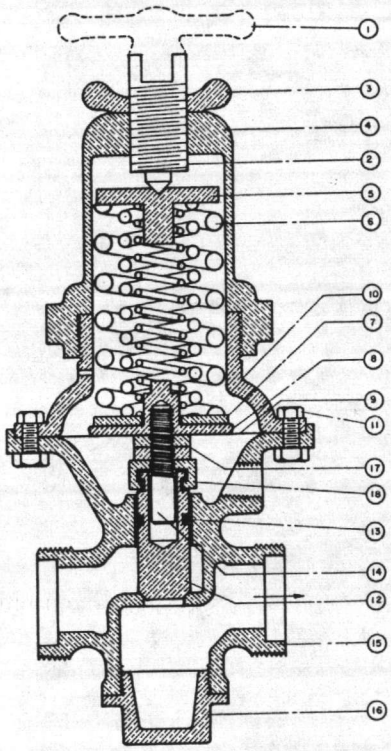
Schematic Control Diagram

This variation of the surge relief valve is similar to the Fig. 37A valve in that it also incorporates a feature designed to anticipate the approach of a high pressure wave. Instead of using a hydraulic pilot as in the Fig. 37A valve this model starts the valve open on loss of electrical power. The solenoid may be wired into the pump motor circuit or connected directly to station power.

In addition to the standard overpressure relief pilot (No. 19), the control circuit contains either one normally open and one normally closed solenoid valves or a single three-way solenoid valve, depending upon line size and operating pressure.

ADJUSTMENT: The solenoid valves are arranged to either pass water from the surge valve operating chamber to the control tank (on power outage) or drain the control tank on restoration of power. There is no adjustment required for the solenoid valves. Rate of transfer of water to the control tank is determined by the setting of needle valve (No. 27). More rapid opening is obtained by turning the needle valve **counter-clockwise.** When the control tank fills, the small check valve on the top of the tank is closed by the momentary discharge of water. This creates a closed system and the surge valve should start to close. Rate of closure is determined by the setting of the inlet needle valve (No. 17). Setting of this needle valve should be between ½ and 1½ turns open. The high pressure surge pilot may be adjusted to limit the maximum line pressure by turning the adjusting screw **clockwise** to increase the opening point and **counter-clockwise** to lower the opening point. One full turn will change the set point approximately 20 psi.

50 RWR PILOT VALVE (High Pressure)



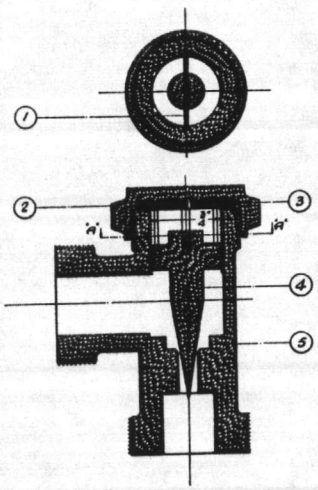
PARTS LIST

1. Adjusting Key
2. Adjusting Screw
3. Wing Nut
4. Spring Chamber
5. Top Spring Washer
6. Springs
7. Bottom Spring Washer
8. Diaphragm Button
9. Diaphragm
10. Diaphragm Cover
11. Assembly Bolts
12. Pilot Stem
13. "O" Ring Packing
14. Diaphragm Stem
15. Shell
16. Bottom Cap
17. Lock Nuts
18. Link Nut

OPERATION: Upstream pressure is communicated to the under side of the diaphragm. When this pressure exceeds the loading on the springs, the stem lifts to open the pilot valve and in turn the main valve.

Diaphragm connection is located 90° from the position shown.

NEEDLE VALVE

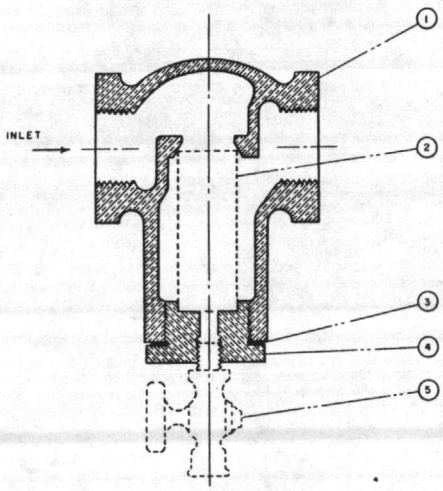


PARTS LIST

1. Lock
2. Cap
3. Washer
4. Needle
5. Shell

REMARKS: The needle valve operates in conjunction with the pilot valve and is adjusted for proper timing of the piston travel. Operating pressures influence the adjustment of the needle. This adjustment for shipment is usually permanent with the position of the needle ½ to 1½ turns off the seat depending upon the size valve and type of operation required. The needle valve may be adjusted without shutting down the main valve. The cap may be removed under pressure and needle adjusted with a screw driver. To increase the speed of the piston for closure turn the needle counter-clockwise.

STRAINER



PARTS LIST

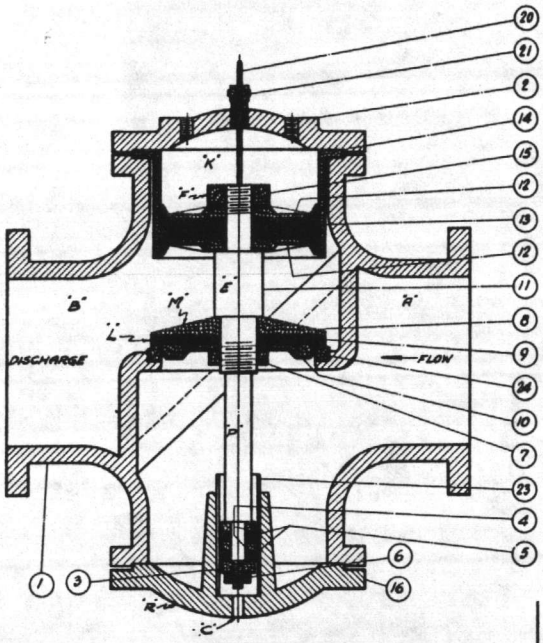
1. Shell
2. Screen
3. Cap Gasket
4. Cap
5. Flushing Cock

REMARKS: To clean strainer without shutting down the valve, open pet cock and flush. If screen requires additional cleaning, shut down valve and remove screen.

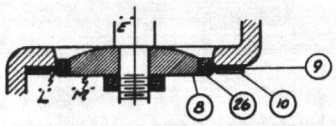
Screen is made of Monel screening with fine mesh.

MAIN VALVE (Globe Body)

FLAT SEAT



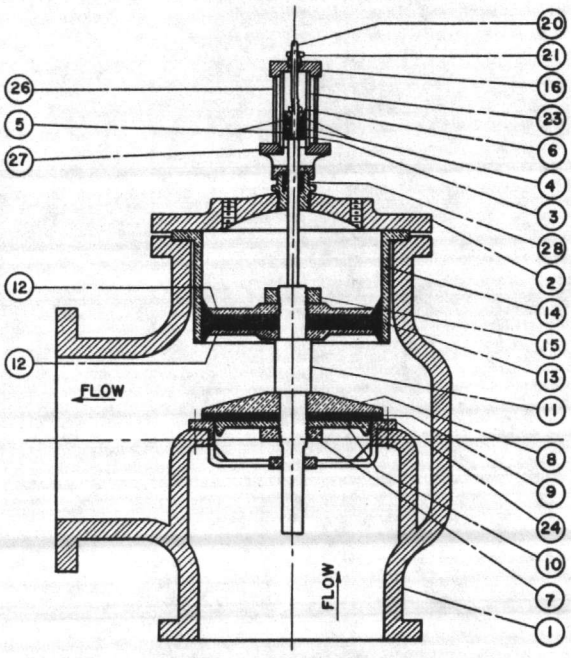
SLIDING SEAT



	PARTS LIST	MATERIAL
1.	Valve Shell	Cast Iron
2.	Top Cap	Cast Iron
3.	Bottom Stem Guide Nut	Bronze
4.	Bottom Cup Follower (2)	Bronze
5.	Piston Cup Leather (2)	Leather
6.	Bottom Stem Lock Nut	Bronze
7.	Stem Nut	Bronze
8.	Seat Disc (flat seat)	Bronze
9.	Seat Packing (flat seat)	Leather or Rubber
10.	Seat Support (flat seat)	Bronze
11.	Stem	Bronze
12.	Cup Plate (2)	Bronze
13.	Main Cup Leather (2)	Leather
14.	Main Bushing	Bronze
15.	Top Stem Nut	Bronze
16.	Bottom Cap	Cast Iron
20.	Indicator Rod	Bronze
21.	Indicator Stuffing Box	Bronze
23.	Bottom Cap Cylinder	Bronze
24.	Seat Ring (flat seat)	Bronze
	Bolts (Top and Bottom Cap)	Steel
	Bolts (Cup Plate)	Bronze
	Bolts (Seat Ring — Flat Seat)	Bronze
8.	Seat Disc (sliding seat)	Cast Iron
9.	Seat Leather (sliding seat)	Leather
10.	Seat Leather Support (sliding seat)	Bronze
26.	Disc Ring (sliding seat)	Bronze
	Bolts (Seat Leather Support — Sliding Seat)	Bronze

Note: In the sliding seat assemby, Parts (8) and (26) are a one piece bronze disc for sizes 4" to 12".

MAIN VALVE (Angle Body)



LONGITUDINAL SECTION

	PARTS LIST	MATERIAL
1.	Valve Shell	Cast Iron
2.	Top Cap	Cast Iron
3.	Guide Washer	Bronze
4.	Piston Cup Follower	Bronze
5.	Piston Cup Leather	Leather
6.	Lock Nut	Bronze
7.	Nut	Bronze
8.	Seat Disc	Bronze
9.	Seat Packing	Rubber or Leather
10.	Seat Packing Support	Bronze
11.	Stem	Bronze
12.	Plate	Bronze
13.	Main Cup Leather	Leather
14.	Main Bushing	Bronze
15.	Top Nut	Bronze
16.	Cylinder Cap	Cast Iron
17.	Needle Valve	Bronze
18.	Isolation Valve	Bronze
19.	Pilot Valve	Bronze
20.	Indicator Rod	Bronze
21.	Indicator Stuffing Box	Bronze
23.	Cap Cylinder	Bronze
24.	Seat Ring and Guide	Bronze
25.	Strainer	Bronze
26.	Stay Bolt	Steel
27.	Bracket	Cast Iron
28.	Stuffing Box and Guide	Bronze

TROUBLE SHOOTING

Condition of the main valve packing can be accurately gauged by observing the leakage through vent hole "C". Negligible leakage usually indicates serviceable packing.

No. 1. When Valve does not close:

Cause (a): Incorrect adjustment of the Pilot (or pilots — see detailed page for Model in question).
Correction: Turn adjustment screw on pilot clockwise until valve closes on a relief type pilot.

Cause (b): Fouled Needle Valve.
Correction: Flush needle valve. Remove needle valve cap and locking device; and, with screw driver, turn needle counter-clockwise two full turns. After two or three seconds of flushing, restore needle to its original position.

Cause (c): Fouled strainer.
Correction: Flush clean-out cock. If evidence of badly fouled screen, shut down valve, remove cap and screen and thoroughly clean.

Cause (d): Foreign material lodged on main seat.
Correction: Dismantle main valve and remove. Replace seat packing and ring if damaged.

Cause (e): Foreign material on pilot seat.
Correction: Try reducing pilot setting to flush particle through. If unsuccessful, disassemble pilot, clean, and, if necessary, replace packing.

Cause (f): Internal leakage by upper main cup.
Correction: Disassemble and repack valve.

Cause (g): Upstream control piping isolation valve "GG" is closed.
Correction: Open gate valve "GG".

Cause (h): Leaking indicator stuffing box.
Correction: Tighten packing nut or replace packing and rod.

Cause (i): Valve is "air bound" — occurs during initial start-up.
Correction: See Paragraph No. 4 under "Starting Instructions" Page 2.

Cause (j): Plugged vent hole (or obstructed).
Correction: Clear obstruction.

No. 2. When Valve will not open:

Cause (a): Incorrect adjustment of pilot.
Correction: Turn pilot screw counter-clockwise for relief type pilot.

Cause (b): Needle valve open too far.
Correction: Remove needle valve cap and locking device. With screw driver, turn needle clockwise to seat; then back needle valve away from seat 2/3 turn for 4" to 6" size valves; 1-1/3 turns for 8" to 16" valves; 1½ turns for 18" to 24" size valves.

Cause (c): Isolation valve "G" in series with pilot valve closed.
Correction: Open isolation valve "G".

To help operator locate source of trouble:

(a) If valve is open, close isolation valve in series with pilot valve and the valve should close. If water continues to pass through the valve it may indicate worn cup leathers (No. 13), seat packing (No. 9), leaking indicator rod, fouled needle valve or strainer, or plugged vent hole "C". Partial closure usually indicates mechanical blockage of the piston by stones or some foreign object.

(b) If the valve closes when the above procedure is followed but re-opens when the pilot isolation valve is re-opened it means either the pilot is set too low or the pilot seat is fouled or badly worn and the pilot should be returned to the factory for re-working. Screw the adjusting screw clockwise (down) one or more turns. If the pilot is set too low, the valve inlet pressure will increase approximately 20 psi per turn. Continue to increase the pilot setting until no further increase in valve inlet pressure is observed. The pilot discharge union may be loosened and the waste pipe moved aside to visibly insure that the pilot seat is tight if the valve discharges to atmospheric pressure.

PERMUTIT
SYBRON CORPORATION

SIMPLEX CONTROLS
INSTRUCTION NO. 5358

DELIVERED WATER BA138

OPERATION AND SERVICE

SIMPLEX TOTALIZER COUNTERS

For K IRT Pneumatic Receivers and Mechanical Flow Meters

Part III Service

A. Lubrication

No lubrication of any kind is necessary on the counter.

The entire front surface of the cam should be oiled once every 6 months with No. 20 or No. 30 SAE motor oil. Before oiling, clean cam with a soft cloth soaked in cleaning fluid Part No. A5700. Wipe surface dry, then apply oil to the cam with a finger while the cam is rotating. Only a light film of oil is required.

Oil the two lifter-plate-shaft bearings once a year with light clock oil. Apply the oil sparingly with a toothpick or Presto oiler. Before oiling, clean bearings with a camel's hair brush soaked in cleaning fluid. Let dry before oiling.

B. Mercury Switch

After shipment or long service, a portion of the mercury may stick to the sides of the glass tube with the results that not enough mercury will be left in the bottom of the tube to make electric contact. To dislodge the mercury, gently tap the clips holding the class tube.

1. Replacing mercury switch. To replace a mercury switch proceed as follows:

   a. Disconnect switch lead wires from terminal block.

   b. Gently break the sealing cement holding the two clips to the switch.

   c. Remove mercury switch and slip a new one into the clips. Adjust switch so that the moving steel vane inside the switch is exactly opposite the poles of the permanent manget. The clearance between mercury switch and magnet should be approximately 3/32". It may be necessary to readjust the gap between the permanent magnet and the switch for proper opera-

tion. This may be done by loosening the screw holding the magnet and repositioning the magnet.

d. Connect switch leads to terminal block, test for correct action of the mercury switch by raising and lowering lifter plate with the fingers. Movement of the steel vane inside the switch can be both seen and heard. Clearance between vane and switch should be approximately .005". Vane should have 1/32" overtravel.

e. After switch has been correctly positioned and tested, cement it in place with Duco cement or white shellac.

FOREWORD

"INSTALLATION AND SERVICE OF SIMPLEX STANDARD K PNEUMATIC RECEIVERS"

The Type K Pneumatic Receiver will operate in conjunction with a remote transmitter to indicate, record and totalize a rate of flow. Separate instructions for adjustment of the transmitter are included in another section of this instruction manual if the transmitter is being furnished by Simplex Control Systems with the Receiver.

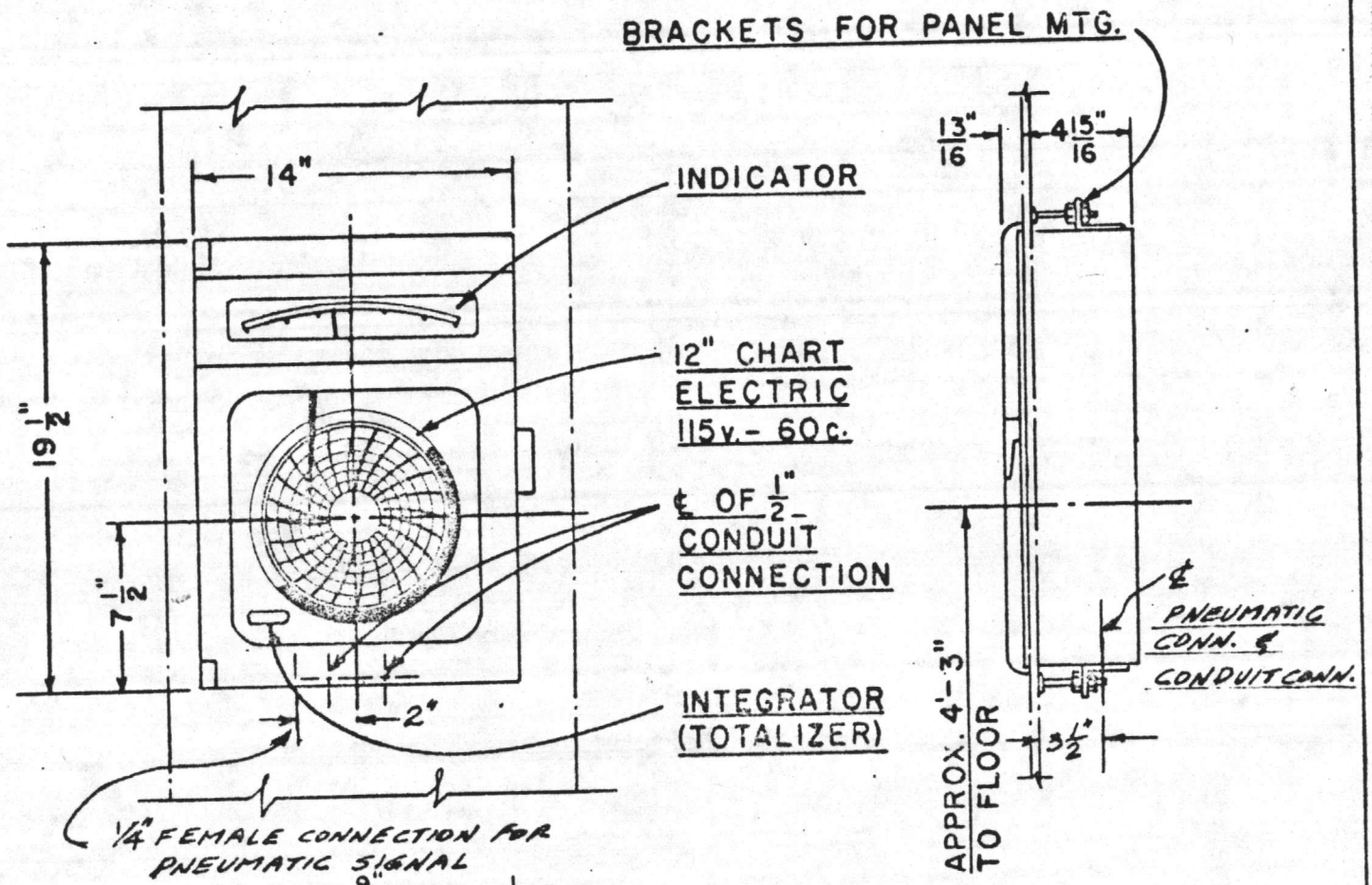
The transmitter should be adjusted to provide the proper air pressure to the receiver from zero to maximum range of the instrument. The K Pneumatic Receiver should be set at zero when the transmitter is providing the proper output pressure for zero flow (usually 3 psig), and checked at points upscale by manipulation of the transmitter to provide an increased signal. Refer to transmitter instruction section of these Operating Instructions or to instructions provided with transmitter.

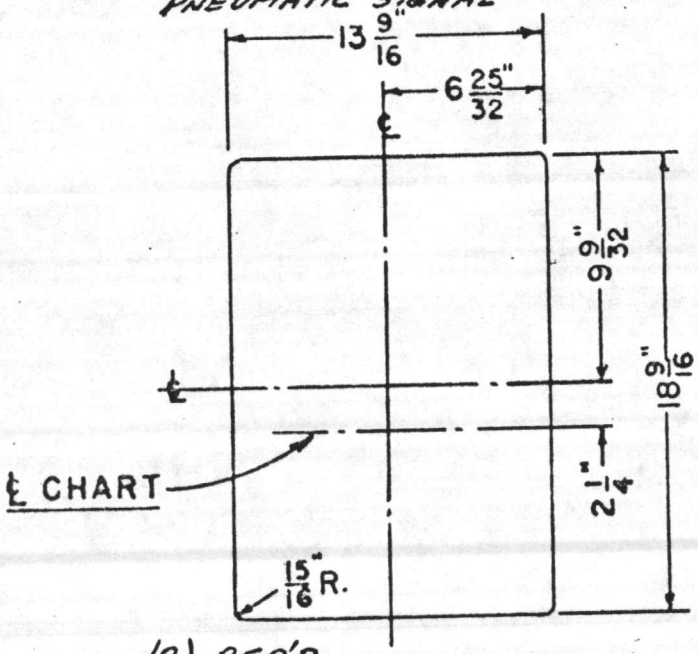
The K Pneumatic Receiver is designed to respond to air pressure as this pressure increases in linear increments with linear increments of flow increase, and the pressures generally will be transmitted between the range of 3 psig. at zero flow to 15 psig. at meter maximum.

Ordinarily, recalibration such as is described in Instruction 5355 should not be necessary since the K Receiver (s) will have been calibrated in the factory prior to shipment. Therefore it would be expected that only adjustment to coordinate the transmitter and receiver would be required in the field at the time of installation.

JOB NO. A173E48112

FINISH - BLACK





(2) REQ'D
TAG (1) - RAW WATER
TAG (1) - FINISHED WATER
PANEL CUT OUT

INDICATOR READS -
0-6 Million Gallons
Day

Weekly CHART READS -
0-6 Million Gallons
Day

ITEM 118.9.1

OUTLINE
SIMPLEX TYPE "K" PNEU. REC
INDICATING - RECORDING - TOTALIZING
PANEL MTD.
FOR
Camp Lejeune, N. C.

SIMPLEX CONTROL SYSTEMS
THE PERMUTIT CO.

501-51945

F.T. 2-24-66

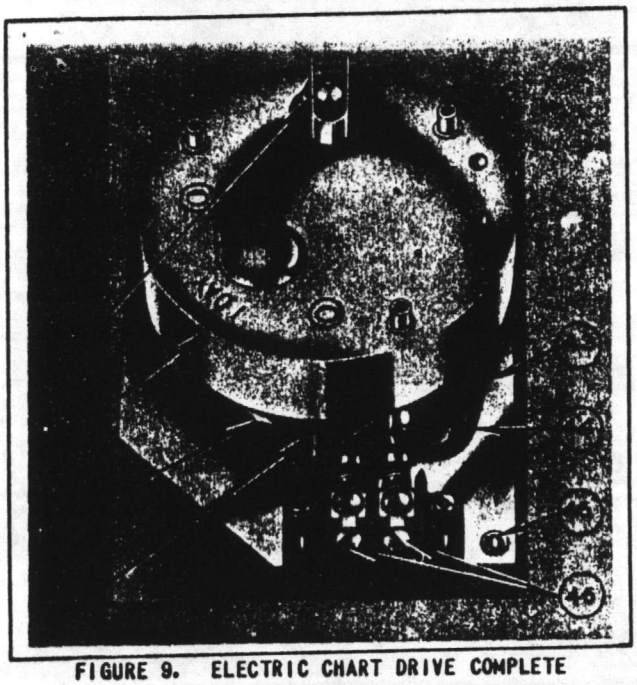


FIGURE 9. ELECTRIC CHART DRIVE COMPLETE

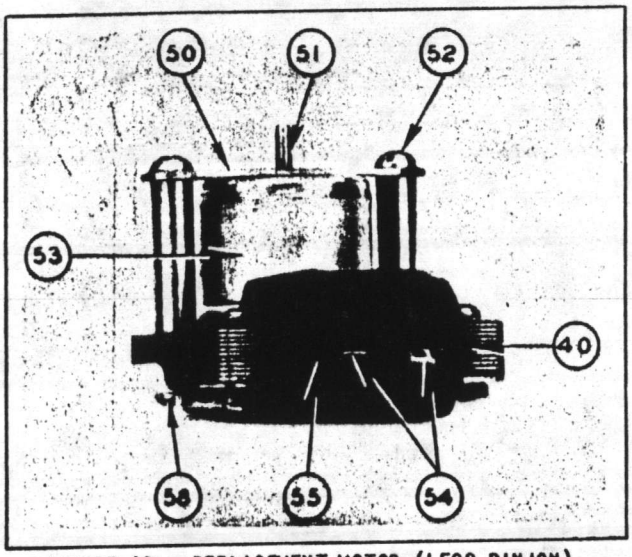


FIGURE 10. REPLACEMENT MOTOR (LESS PINION)

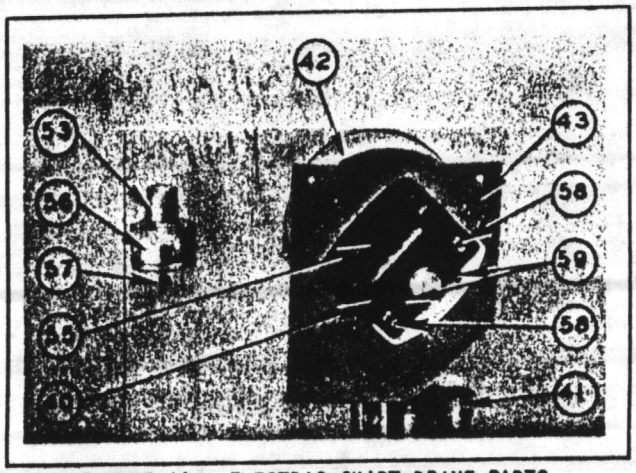


FIGURE 11. ELECTRIC CHART DRIVE PARTS

2. Electric Chart Drives. Electric chart drives are powered by a 2-watt, self-starting synchronous motor which depends for its timing on the frequency of the alternating-current supply. Therefore, the frequency must be exactly as listed on name plate to obtain accurate chart timing. Where frequency is unregulated, we recommend use of spring chart drives.

Most recorders require power-supply wires to be connected directly to the terminal block on the chart drive.

Caution: Before connecting power supply to chart drive, be sure to check on chart-drive base plate for correct voltage and frequency.

A supply-voltage variation of plus or minus 10% or less will not affect accuracy of timing.

There is no starting knob or speed regulator on electric chart drives. Electric chart drives will restart automatically after power failure, but the lost time must be made up by manually advancing the chart to correct time.

SIMPLEX Control Systems can supply a reactor for installation in the chart-drive supply circuit to permit a 120-volt chart drive to operate on a 240-volt supply. This is especially convenient for portable test recorders, which can thus be operated from either 120- or 240-volt supply lines.

a. Replacement of Parts. Electric-chart-drive parts are supplied in three arrangements:

1. Complete drive as in Figure 9.
2. Motor unit complete as in Figure 10.
3. Rotor and pinion only shown in Figure 11. (Items 53, 56 & 57).

See parts list for complete chart-drive listing. As a rule either the motor complete or the rotor only need be replaced because of wear. Motor complete is furnished with shipping plate and screws to hold it together during shipment. These should be removed and discarded when motor unit is put into use.

By changing motor units and/or rotor units, any electric chart drive can be rebuilt to produce any standard combination of voltage and frequency. In ordering replacement parts, specify all

data on the motor name plate. In ordering rotors, specify all data stamped on its barrel. Direction of rotation can be reversed by turning over the laminated magnet and field coil assembly (Items 40 and 55).

b. Disassembly of Chart Drive. Turn off power supply and disconnect leads from terminals. Unscrew 3 screws (45) and remove complete chart drive from instrument case. Turn chart drive upside down and remove 2 screws (58) which permits rotor and motor to be removed from gear train. Note carefully position of the 2 copper shading coils (59) on laminated core before disassembly.

Replace rotor, motor, etc., as required and reassemble. Be sure to replace laminated magnet with copper shading coils (59) in same position as before. The direction of rotation of the rotor and consequently that of the chart can be reversed by turning magnet over and installing it with shading coils in the reverse position.

Note that the rotor has the word "top" stamped into edge of barrel. In assembling, turn rotor so "top" will be uppermost when chart drive is mounted in the instrument case to assure proper lubrication.

Replace chart drive in case and reconnect to power supply.

c. Lubrication. Rotor unit never requires lubrication. After 2 or 3 years use, the gear train only (motor and rotor removed) should be cleaned with benzine, allowed to dry and then oiled with SIMPLEX. clock oil Part No. A3885.

3. Combination Electric and Spring Chart Drives. A combination electric and spring chart drive is designed so that if the electricity fails, the spring movement will take over to drive the chart.

The instrument, when first received, will have its spring movement fully unwound. When the electric power supply (120 V. 60 cy.) is applied to the chart drive, the electric movement will automatically wind up the spring movement. It will take approximately 30 hours for the electric drive to fully wind up the spring movement. When fully wound and with the electric power off, the spring drive will operate continuously for at least 24 hours..

The chart drive is fast in transition from electric to emergency spring operation and vice versus. The balance wheel is held at peak tension by a magnetic field while the electric unit is in operation.

PERMUTIT
SYBRON CORPORATION

SIMPLEX CONTROLS
INSTRUCTION NO. 5358

RAW WATER BA138

OPERATION AND SERVICE

SIMPLEX TOTALIZER COUNTERS

For K IRT Pneumatic Receivers and Mechanical Flow Meters

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JOB NO. A173E48112

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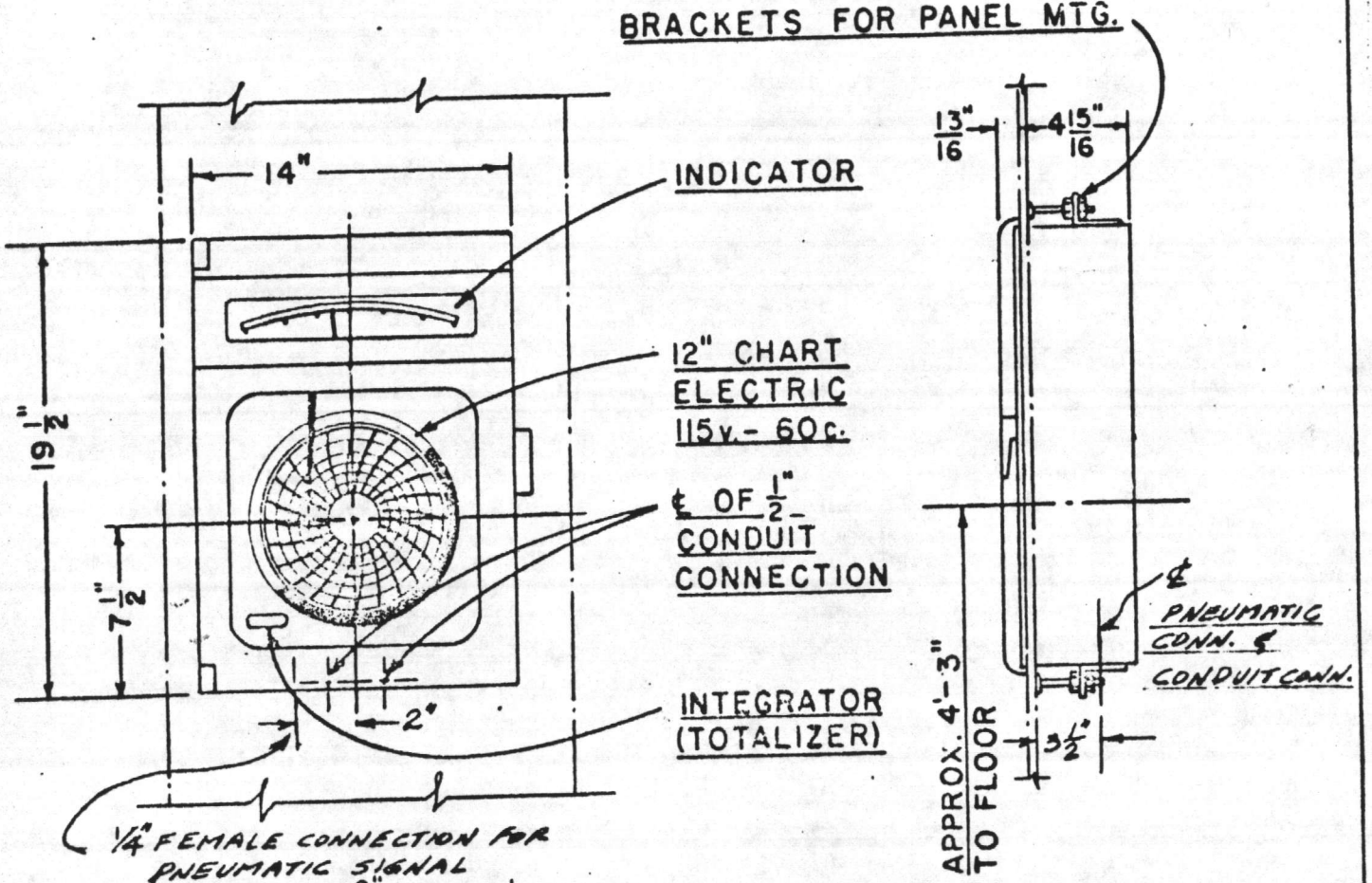

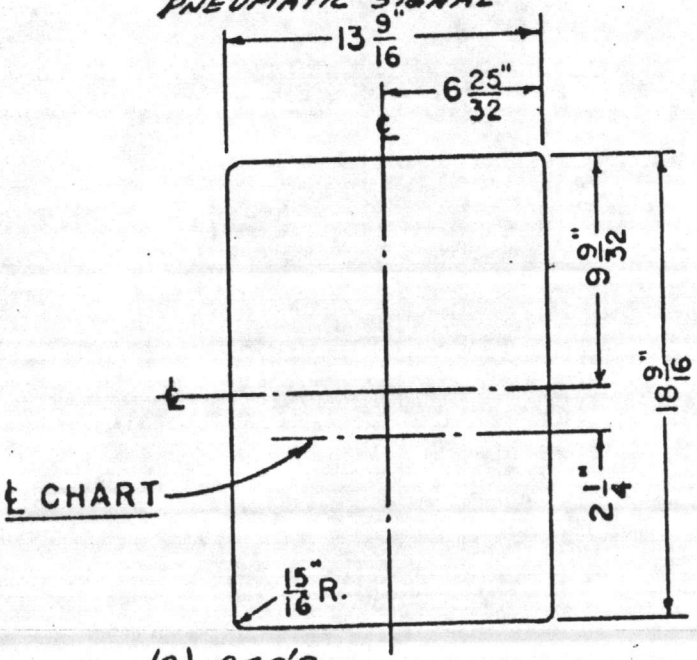

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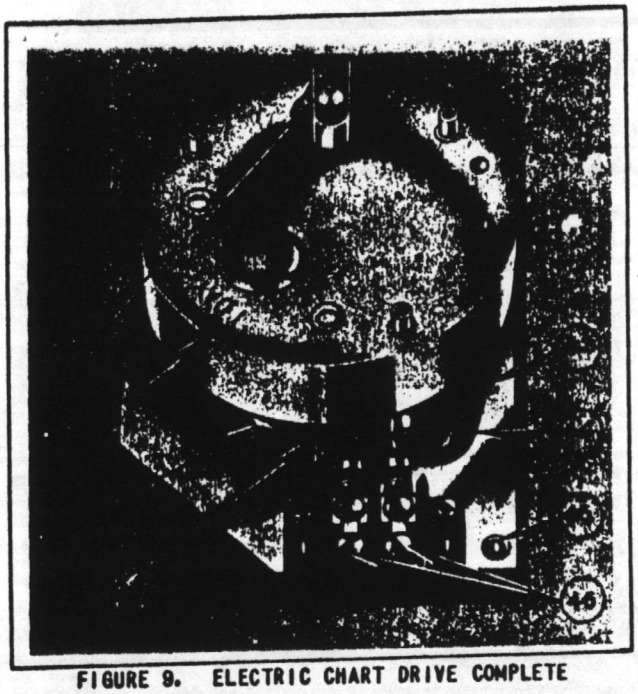

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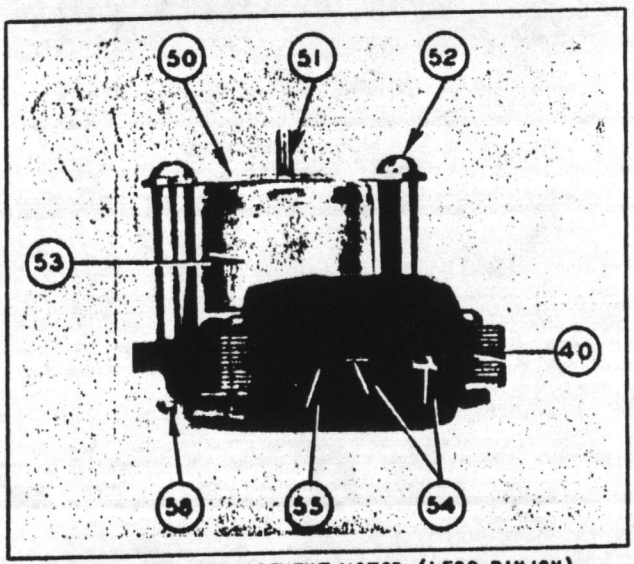

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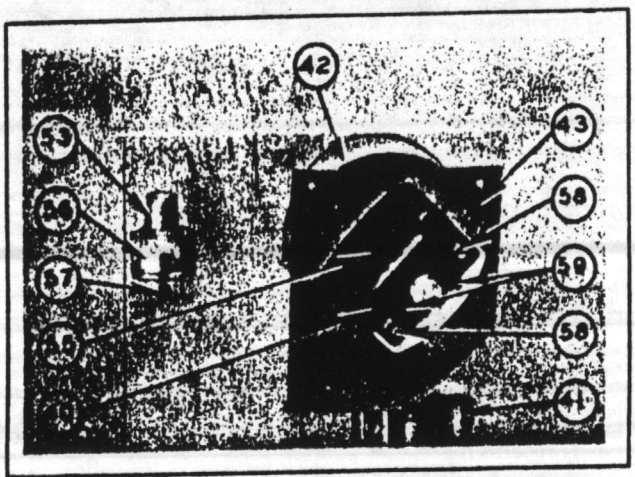

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Note that the rotor has the word "top" stamped into edge of barrel. In assembling, turn rotor so "top" will be uppermost when chart drive is mounted in the instrument case to assure proper lubrication.

Replace chart drive in case and reconnect to power supply.

c. Lubrication. Rotor unit never requires lubrication. After 2 or 3 years use, the gear train only (motor and rotor removed) should be cleaned with benzine, allowed to dry and then oiled with SIMPLEX. clock oil Part No. A3885.

3. Combination Electric and Spring Chart Drives. A combination electric and spring chart drive is designed so that if the electricity fails, the spring movement will take over to drive the chart.

The instrument, when first received, will have its spring movement fully unwound. When the electric power supply (120 V. 60 cy.) is applied to the chart drive, the electric movement will automatically wind up the spring movement. It will take approximately 30 hours for the electric drive to fully wind up the spring movement. When fully wound and with the electric power off, the spring drive will operate continuously for at least 24 hours..

The chart drive is fast in transition from electric to emergency spring operation and vice versus. The balance wheel is held at peak tension by a magnetic field while the electric unit is in operation.

DELIVERED WATER TRANSMITTER BA138

DIRECTIONS
FOR
ERECTION & OPERATION
OF
SIMPLEX TYPE "PN" PNEUMATIC TRANSMITTER

THIS IS AN ACCURATE INSTRUMENT USED TO MEASURE THE FLOW IN PIPE LINES. IT IS DESIGNED TO OPERATE WITHIN AN ERROR NOT GREATER THAN 2%, PLUS OR MINUS, AT ANY POINT OVER A SPECIFIED RANGE.

FOR SATISFACTORY OPERATION, THE FOLLOWING CONDITIONS ARE ESSENTIAL:

1. The instrument be kept in calibration
2. The pressure lines be kept clean.
3. The lines and instrument be kept free of air.
4. Certain parts be oiled.
5. Periodic cleaning schedule be followed.

ADJUSTMENT PROCEDURE

A setting weight or "test weight" is ordinarily furnished with each "PN" type transmitter. For "PNG" and "PNB" transmitters, the weight is used to set the instrument at 30% capacity. For "PNE" transmitters the setting point is 50% capacity.

The water manometer test outfit, as described herein, is supplied on special order only. If the manometer is supplied, follow the procedure starting on Page 5. If a setting weight has been supplied, follow the procedure below.

SETTING WEIGHT

The exact weight of the "Setting Weight" has been determined during factory calibration. When placed on top of the float guide tube, the weight positions the float to its calibrated 30% capacity position. (50% capacity for Type "PNE").

Refer to Figures C, E, and F. With water level at top of cylinder cover and equalizer valve E open, close valves M and T. Screw the "setting weight" onto the knurled cap screw, since the cap screw must remain in position during the setting procedure. Refer to Figure F. This positions the float to its 30% (or 50%) capacity position. Tap lightly on cylinder and, if necessary, adjust the indicator pointer to read exactly 30% capacity. Use the pointer adjusting screw, Fig. D, to adjust pointer.

After transmitter has been set, remove the "setting weight", indicator pointer should return to zero. If it does not, adjust float zero stop, Fig. C, by screwing in or out until pointer reads zero. Mount zero stop cover. Open high pressure valve M slightly. Vent air from cylinder at both the air vent in the cylinder cover and at the top of zero stop cover.

Transmitter is now ready to place in service.

ASSEMBLY OF TEST OUTFIT

The water manometer test fittings supplied with the meter are to be attached to meter as shown on Fig. "E".

Having all valves at the meter open, except (M), (T), and (D), which should have been tightly closed, fill supply pan with clean cool water. Open the cylinder air vent cock and vent thoroughly, then close.

Flow dial pointer should indicate approximately zero.

CALIBRATION TEST BY
MEANS OF WATER MANOMETER:

Upon this adjustment depends the accuracy of the meter. The principle will be evident and the methods will prove simple and easy if the following notes are read carefully, and the operation performed as described.

The distance between the bottom of each meniscus in the test glasses (Gm) and (Gt) is to be used when measuring from zero to 30% on test scale, or for any other graduation which might be considered. See Fig. "F".

The test scale is used to determine the theoretical value of the rate of flow in terms of difference in water levels between glasses (Gm) and (Gt).

It is necessary that valves (M), (T), (E) and (D) close tightly in order that this test may be made satisfactory. If dirt should be beneath the seat of the valve, (T), Fig. E, test glass (Gt) will overflow. Leakage in valve (E) or float air vent screw, Fig. "C" will cause water to rise in glass (Gt). If leakage occurs in valve (M), Fig. "E", water will rise in supply pan and short test glass (Gm).

Tighten all gland nuts on all valve stems. THEY MUST NOT LEAK.

WATER MANOMETER TEST DESCRIBED:

For a meter having a maximum differential head of 64", use the white graduations on the test scale; for the maximum differential of 114" use the red graduations. Refer to Dwg. "B" which shows the maximum differential for this meter. The maximum differential is also shown on the third line of the meter name plate, which is mounted on the inside surface of the meter box door.

Forward and backward movement of flow dial pointer should be observed for each different head selected and compared with the theoretical percentage rate.

When the water manometer is properly adjusted, using 30% on test scale, pointer should read 30% on dial.

This water manometer test outfit makes it very easy for the operator to check meter accuracy from time to time. When the meter does not respond properly, it may be necessary to adjust, clean, or repair it.

In the operation to be described, only two valves; namely (E) and (D) need be operated to establish the water level difference.

To lower water level in test glass (Gt) close valve (E) and open valve (D) slightly.

Drainage from valve (D), if caught in a suitable receptacle, may be used to replenish supply pan. DO NOT ALLOW SUPPLY PAN TO BECOME EMPTY DURING TEST.

To raise water level in test glass (Gt) or equalize water level differences, open valve (E) slightly.

With valve (E) open, adjust scale on test glasses so that zero line matches bottom of meniscus in both glasses (Gm) and (Gt). If water in both glasses is not equalized (same level) - it indicates that the glasses are greasy or dirty. Clean glasses. Valve (E) should be closed after columns are equalized.

FORWARD MOVEMENT OF FLOW DIAL POINTER:

Thirty percent of capacity for PNG and PNB meters, and fifty percent of capacity of PNE meters has been selected as a standard point for factory setting and is to be used in the field for resetting each meter. The calibration procedure described uses the 30% setting point; however, the 50% point should be substituted when the meter is a Type PNE.

Lower the water level in test glass (Gt) slowly until bottom of meniscus is exactly in line with the 30% line of test scale. Each time a change in water differential is made, adjust scale so that zero line and bottom of meniscus in short glass (Gm) agree.

The meter pointer should now be adjusted so that it indicates slightly minus the 30% setting point line. This adjustment is made by turning the pointer adjusting screw (Fig. "D"). Do not disturb the setting of the adjusting collar or the transmission spool. Should the meniscus happen to go beyond the 30% line on scale, raise water level in glass (Gt) by opening valve (E) and start over again.

FORWARD MOVEMENT OF FLOW DIAL POINTER"

Lower water level in test glass (GT) so that pointer advances about 1/2" above the 30% line on meter dial. Raise water in test glass (GT) slowly until the differential from zero to 30% line of scale is again obtained, checking the zero on scale with meniscus on glass (GM) each time the differential is changed. Note the position of pointer compared to its previous position.

When pointer is set in position so that the lag will be equally distributed on either side of the 30% line on the dial, the adjustment is correct.

SETTING ZERO STOP:

When the pointer is correctly adjusted, open valve (E). Meter should now read EXACTLY zero. If meter does not read zero, remove zero stop cover and adjust float zero stop by screwing in or out until meter reads zero. Replace zero stop cover.

CALIBRATION OF TRANSMITTER:

In order to calibrate the pneumatic output of the transmitter to the receiver, it is of the utmost importance that the transmitter be first set to an output of 3 lbs. (since 3# output=zero). Attach a mercury "U" tube manometer to the output opening. With the water manometer attached to the cylinder and the pointer at zero, check the deflection in the "U" tube mercury manometer; "O" should be 3 psi or 6.13" deflection of the mercury. If the "U" tube mercury manometer does not read 6.13" deflection, turn the knurled thumb screw, Fig. "D" until the correct deflection is obtained. Now check the output at 30% on the checking dial. Refer to the attached table for any other checking points. The output "U" tube manometer should show a deflection of 13.48" mercury. Should there be a difference in output, it may be necessary to disturb the setting of the adjusting collar. The function of the adjusting collar and the transmission spool (Fig. "D") is only to adjust for the difference in the tolerances in the linkage. Should there be a varibale error in the overall range of the transmitter, it may be necessary to change the position of the adjusting collar. To do this, loosen the screw in the center of the adjusting collar and move it to the right or left on the elongated slot in the pointer hub. For an increase in the range, move the adjusting collar toward the dial, and for a decrease, move it toward the main shaft. After making this adjustment it will be necessary to completely retest the transmitter. Once the transmitter has been checked, connect the receiver and check the comparative readings with those listed on the table.

PLACING METER IN SERVICE:

After the calibration has been completed, close valves (A) and (B) which were opened for the test outfit, and close valves (E) and (D) which were used during the calibration. The test outfit may then be removed from the meter and stored away safely until required again or it may be left on place.

Open valve (M) and (T) on the main and throat lines which lead to the primary devices, such as Venturi tube, orifice plate, etc. and check float for air again.

To put register in service at end of test, have valves (Mp), (Tp), and (M) and (T) wide open, and valve (E) closed.

MAINTENENCE INSTRUCTIONS

PERIODIC INSPECTION:

No instrument will remain in correct adjustment indefinitely. Every day handling as well as the ordinary effects of meter operation, eventually result in the need for rechecking. Therefore, the establishment of a regular inspection procedure is definitely recommended. The interval may be six months to one year, depending on the aforementioned factors.

Another unusual occurance, such as complete shut-down, a long idle period, or drainage of the system, likewise calls for special attention. After such occurrences the meter should be thoroughly checked and adjusted.

TEST OF PRESSURE PIPING:

Buried pressure piping may be tested for tightness thusly; close valve (Tp) at primary device (Venturi Tube, etc.). If the pointer is stationary, there is no leakage in "THROAT" pressure line. If it moves forward, the line leaks, and thereupon open valve (E) to stop further movement. Repair leaking pipe.

If the pointer drops backward toward zero, it would indicate leakage through valve (E), or air vent screw in top of float.

Again open valve (Tp) and close (Mp) at Venturi Tube. If the pointer is stationary, the "MAIN" pressure pipe is tight.

If it goes backward toward zero, there is leakage in "MAIN" pipe. Thereupon close valves (M) and (T). Open valve (E) and repair pipe.

CAUTION:

Mercury can be removed from the meter cylinder by unscrewing mercury plug. Have plug tight when meter is in operation.

Make no connections to the meter pressure piping or pressure belts of Venturi tube for chlorine machines or other water supplies. THIS IS IMPORTANT.

Allow a slight perceptible end play between all thrust bearings.

INDICATING DIAL:

The dial may be cleaned with a clean, soft cloth just moistened with water. Gentle rubbing should remove all marks.

VENT VALVES:

Open blow-off on air vent valves at Venturi tube or meter register cautiously.

PACKING GLAND:

The stuffing box for the main shaft, as packed by the factory, should not leak under normal operating pressure. However, if some leakage should occur, the packing may be tightened by turning the knurled stuffing box nut until leakage is stopped. DO NOT TIGHTEN THE STUFFING BOX NUT TOO HARD.

Additional packing may be added to the stuffing box from the supply furnished with the meter. Shut off valves (M) and (T) and release pressure from the meter cylinder, then remove the knurled packing nut and pull brass bushing from the gland. Add packing as required, and replace the bushing and nut.

When packing becomes hardened after a long period of use, it should be completely removed and replaced. USE ONLY THE SPECIAL PACKING furnished by the SIMPLEX CONTROL SYSTEMS.

OIL:

A one-ounce bottle of clock oil is furnished for those parts which require oiling.

FACILITIES FOR TESTING:

This meter is unique, among other reasons, in that it may be readily tested by the attendent to prove its accuracy.

PROOF OF PROPER INDICATION OF POINTER:

This test may be made as often as desired and affords positive proof of the accuracy of pointer indications. The test may be accomplished at any time by the use of the water manometer test outfit and the test scale furnished with the meter. See "Calibration Procedure".

The following common conditions will interfere with correct meter registration, and if these conditions become sufficiently acute, will put the meter entirely out of service. Recommended methods of correcting or eliminating these conditions are given below.

Sediment in Meter Cylinder

Remove cylinder head and float. Flush meter cylinder with clear water until sediment is cleaned out. Entire contents of cylinder, including mercury may be removed by removing mercury drain plug. Flush cylinder thoroughly, weigh mercury and replace correct amount in cylinder. The correct amount of mercury is recorded on line "eight" of the name plate. Reassemble meter and replace in service. This cleaning procedure is recommended every six months to one year.

Leaks in pressure lines from Primary Device

Tighten all joints or replace pipe lines, if necessary. See separate paragraph - "Test of Pressure Piping".

Obstructions in Pressure Lines

Flush pressure lines to wash out sediment. Replace lines if blockage cannot be flushed out.

Air Trapped in Cylinder - Above or below float.

See instruction book for method of air venting.

Air Trapped in Meter Pressure Lines

Flush pressure lines and vent air at blow-off valves, as shown on Drawing A. Make sure pressure lines are properly graded to avoid air pockets.

Obstructions in Primary Device, Particularly in Throat of Venturi Tube

Remove obstruction. Simplex Venturi tubes are provided with inspection holes for this purpose. When orifice plates or other primary devices are used, it is usually necessary to remove a section of the pipe line itself in order to make an inspection.

AIR UNDER FLOAT

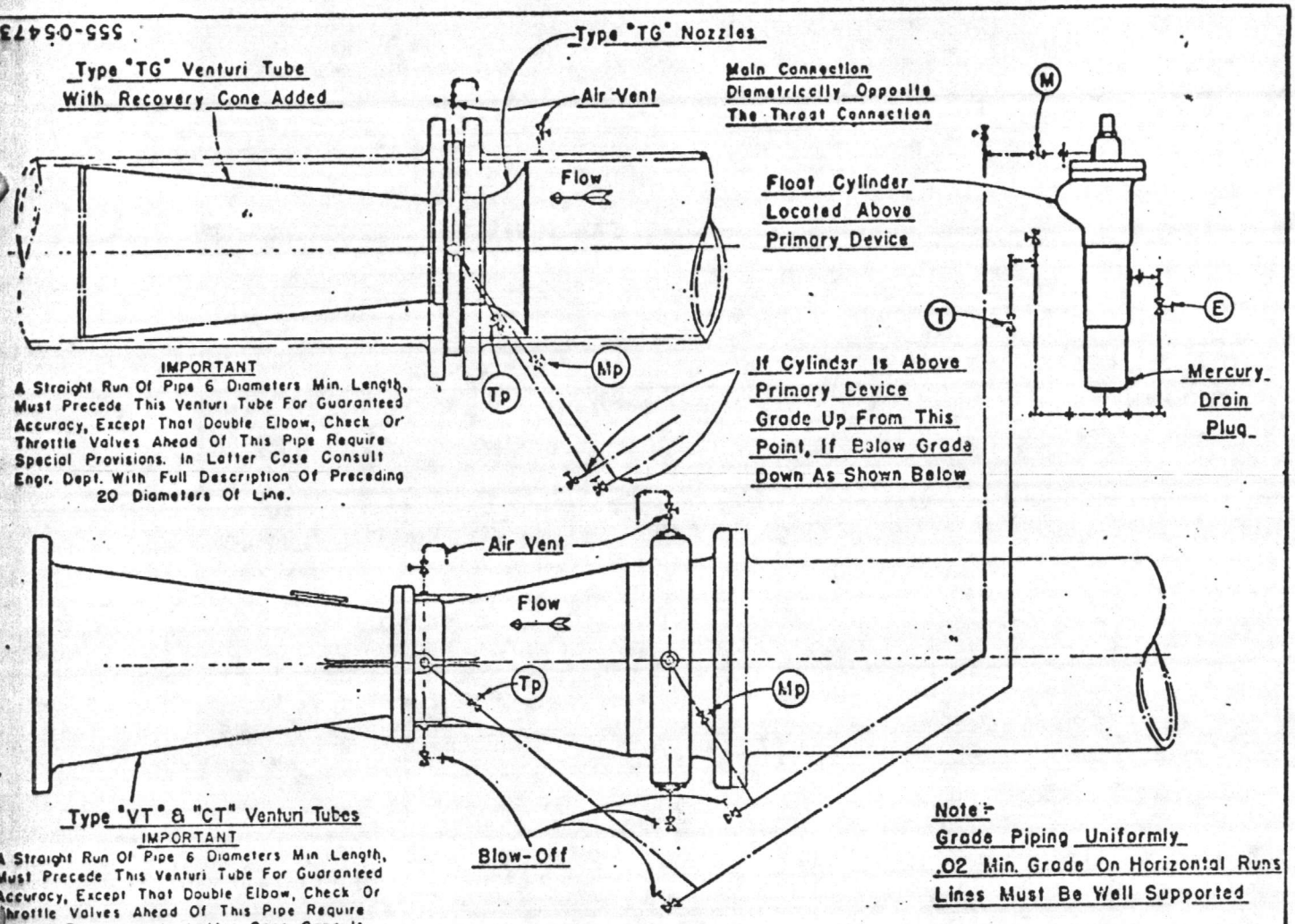
In normal operation if pressure piping is properly arranged, air will never accumulate under the float, but after emptying of line or pressure piping, its absense may be assured by the following methods:

Close valves (M) and (T), open (E), Fig. E other outlets closed, allowing float, etc. to go to zero position. Remove zero stop cover (See Figure C). The float air vent screw will be revealed. Remove the air vent screw and release any air which may have collected beneath the float. Replace air vent screw and zero stop cover. Place meter in service by opening valves (M) and (T), and closing valve (E).

* *

Percent	Lbs. Pressure	Inches of Mercury
0	3.0	6.13
10	4.2	8.58
20	5.4	11.03
30	6.6	13.48
40	7.8	15.93
50	9.0	18.39
60	10.2	20.84
70	11.4	23.29
80	12.6	25.74
90	13.8	28.23
100	15.0	30.64

555-05473



IMPORTANT

A Straight Run Of Pipe 6 Diameters Min. Length, Must Precede This Venturi Tube For Guaranteed Accuracy, Except That Double Elbow, Check Or Throttle Valves Ahead Of This Pipe Require Special Provisions. In Latter Case Consult Engr. Dept. With Full Description Of Preceding 20 Diameters Of Line.

IMPORTANT

A Straight Run Of Pipe 6 Diameters Min Length, Must Precede This Venturi Tube For Guaranteed Accuracy, Except That Double Elbow, Check Or Throttle Valves Ahead Of This Pipe Require Special Provisions. In Latter Case Consult Engr. Dept. With Full Description Of Preceding 20 Diameters Of Line.

IMPORTANT

A Straight Run Of 30 Diameters Of Pipe Preceding The Orifice And 4 Diameters Following It Is Ordinarily Satisfactory For Standard Metering Accuracy, Except When It Is Preceded By A Regulating Valve; When More May Be Needed. If Actual Conditions Are Otherwise, Advise Engineering Department With Full Description Of These Lengths For Recommendations.

LEGEND

"M" Valve — Main or High Pressure Valve at Float Cylinder
"T" Valve — Throat or Low Pressure Valve at Float Cylinder
"E" Valve — Equalizing Valve at Float Cylinder
"Mp" Valve — Main or High Pressure Valve at Primary Device
"Tp" Valve — Throat or Low Pressure Valve at Primary Device

DWG "A"

TYPICAL PIPING ARRANGEMENT FOR CLEAR WATER SIMPLEX TYPE "K" METER TO PRIMARY DEVICE

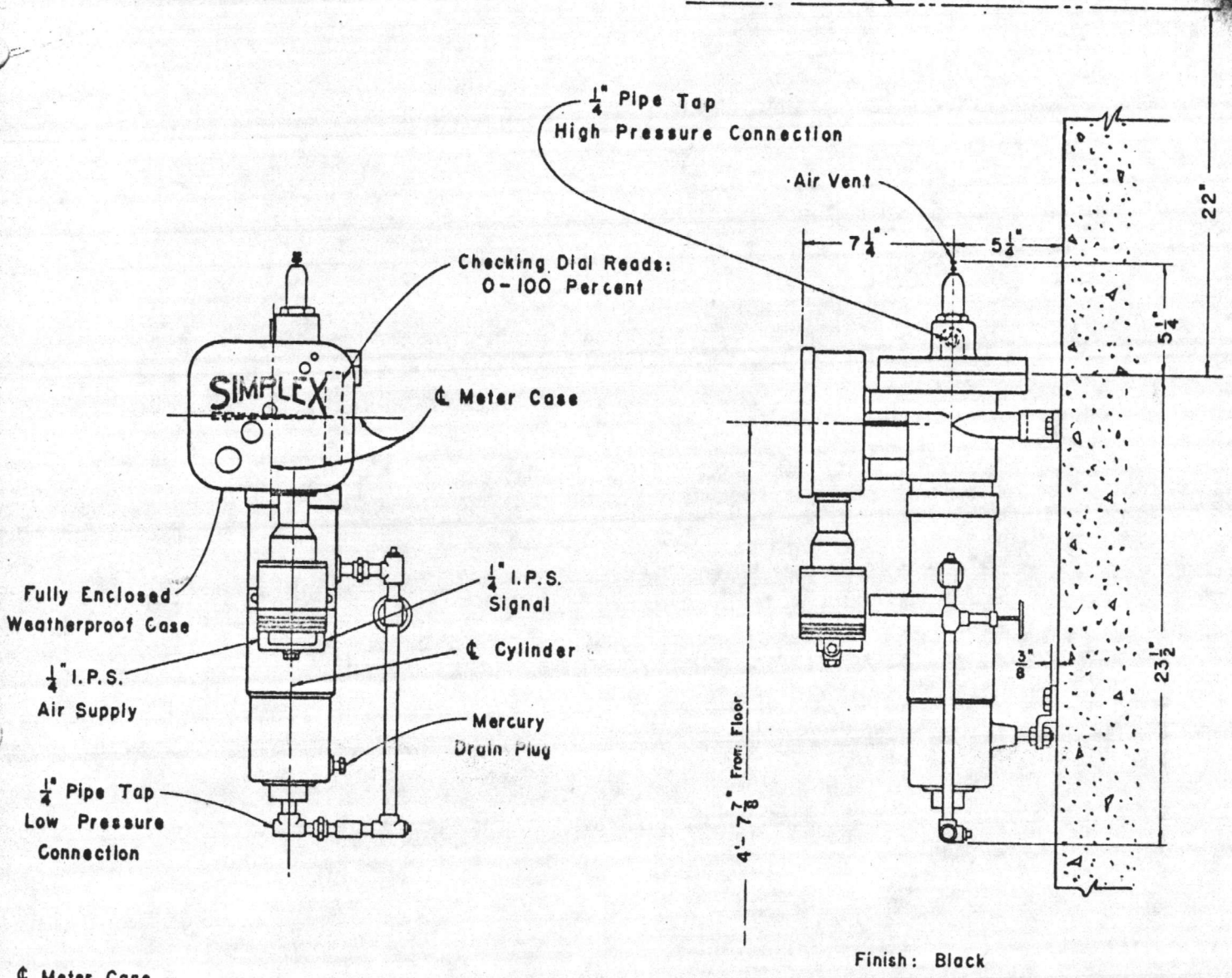
SIMPLEX CONTROL SYSTEMS
THE PERMUTIT CO.

JOB NO. P.O. NO.

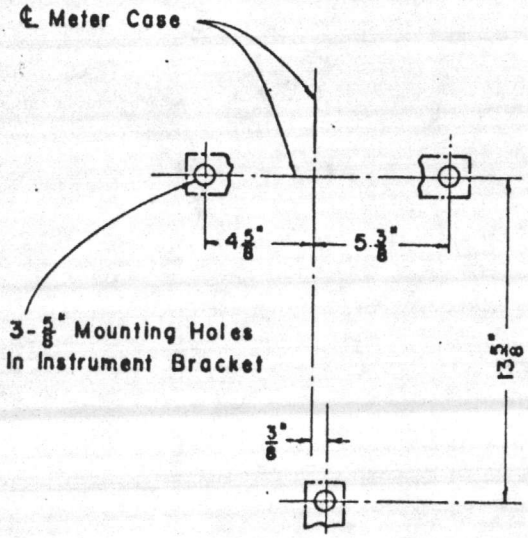
555-05473

555-08777

Contract A/73E48112
P.O. 15376-1683



Finish: Black



Mounting Template

ITEM 11B.9.1

Maximum Working Pressure For This Meter 250 P.S.I.G. Unless Otherwise Specified	TYPE	DIFFERENTIAL
	~~PNB~~	~~XXXX"~~
	~~PNE~~	~~XXX"~~
	PNG	64.5"
	~~PNS~~	~~XX"~~
	~~PNP~~	~~XXX"~~

2-REQ'D
TAG 1 UNIT - RAW WATER
TAG 1 UNIT - FINISHED WATER
SIMPLEX PNEUMATIC TYPE TRANSMITTER
HIGH HEAD METER
TYPE PNG
WALL MOUNTED
CAMP LEJEUNE, N.C. DWG. B

Primary Device:
24"x11.032" Permutube

SIMPLEX CONTROL SYSTEMS
THE PERMUTIT CO.

555-08777

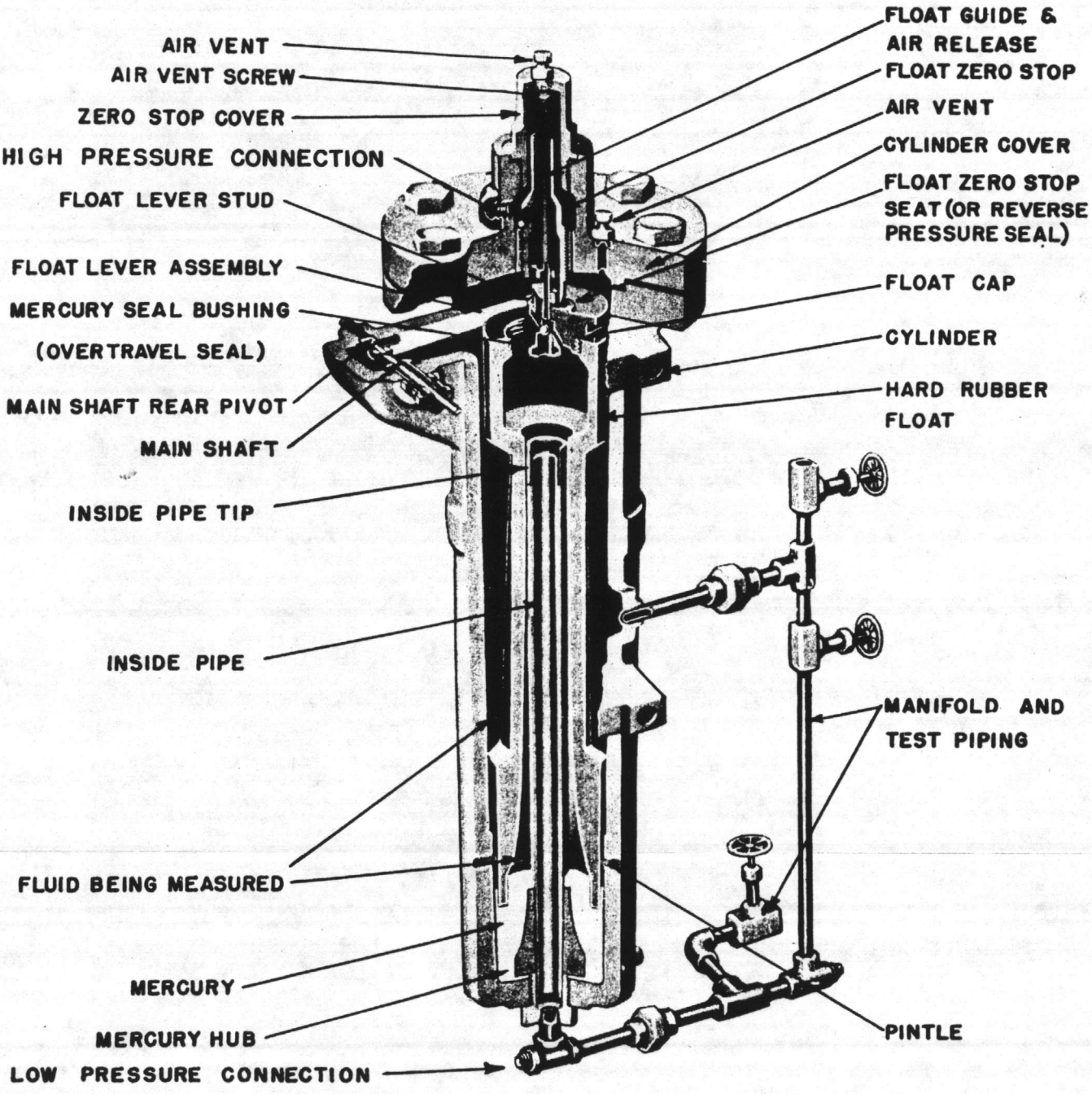
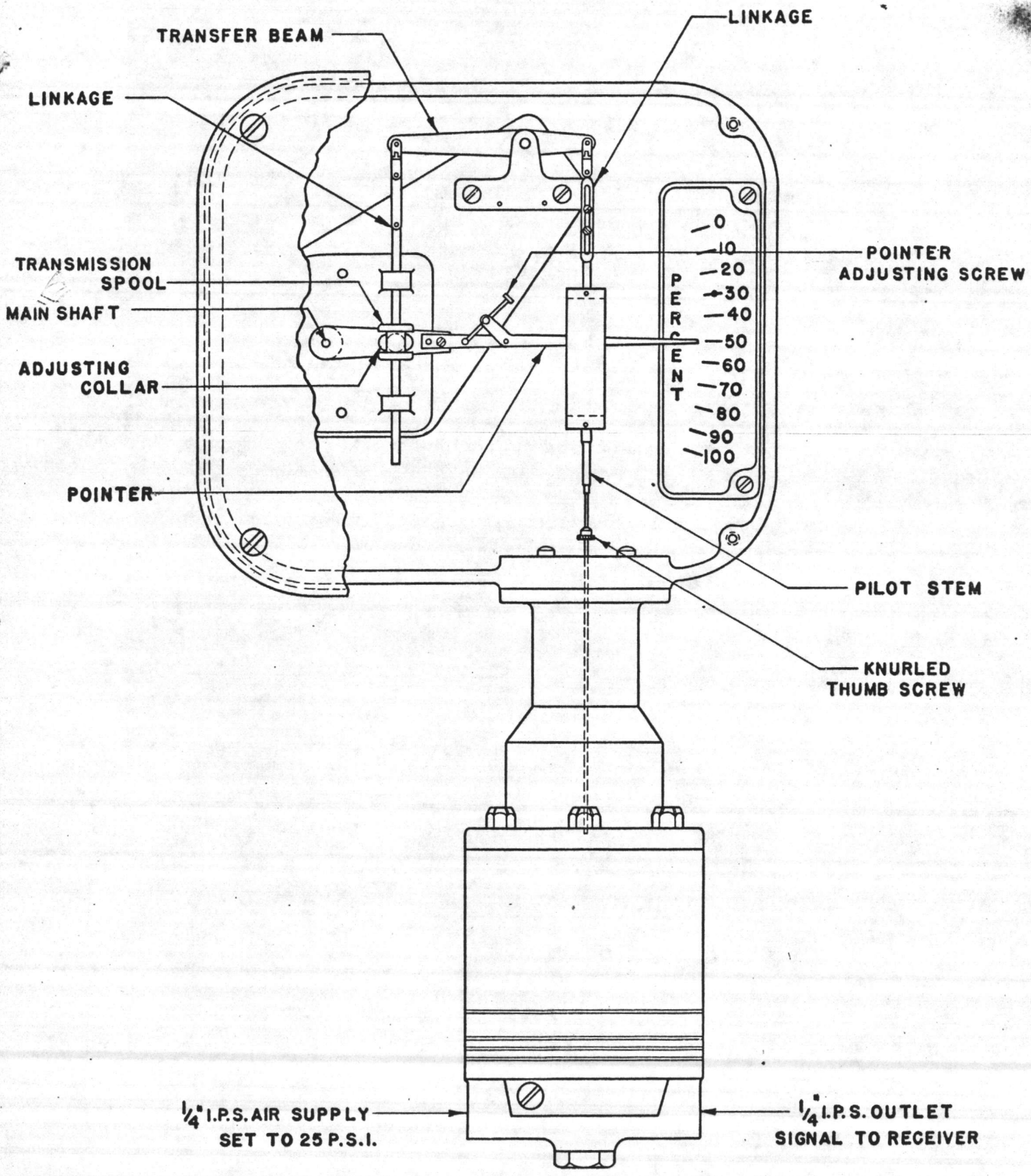
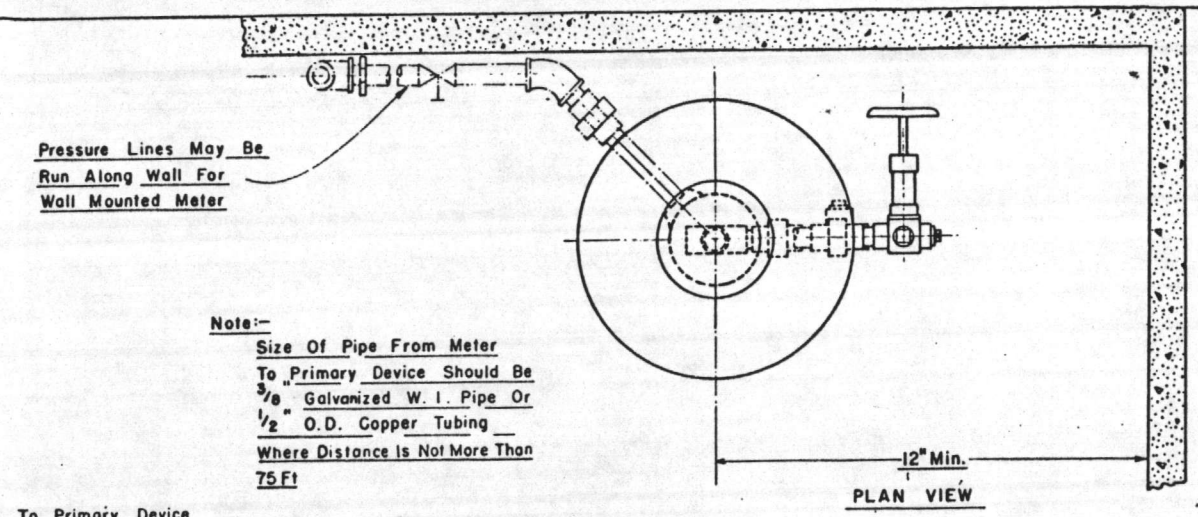


Fig."C" - Interior View of Mercury Cylinder



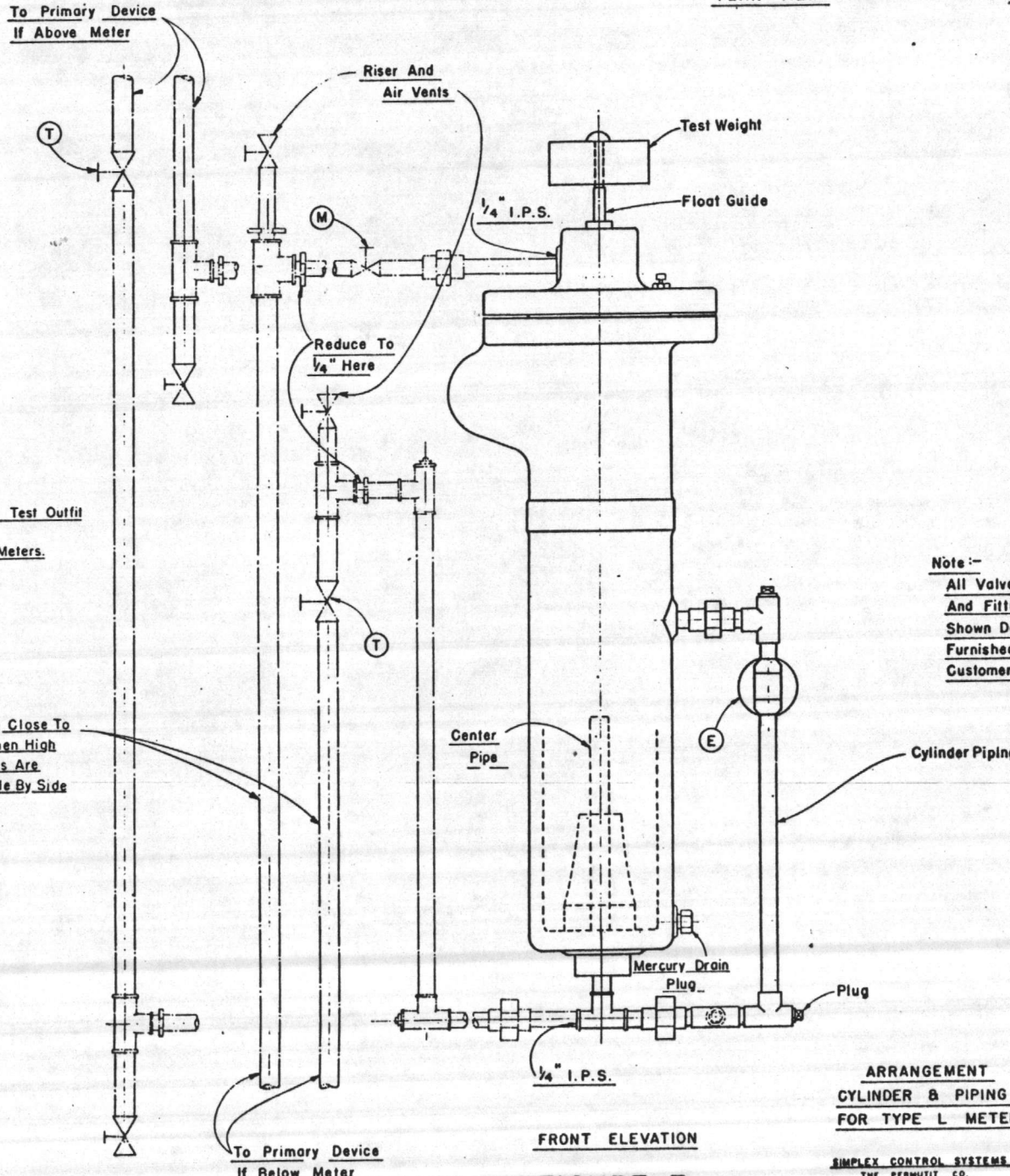
"FIGURE D"

form #5207-365-5C



PLAN VIEW

Note:-
Size Of Pipe From Meter To Primary Device Should Be 3/8" Galvanized W. I. Pipe Or 1/2" O.D. Copper Tubing Where Distance Is Not More Than 75 Ft



Note:-
Cylinder Piping And Test Outfit Opposite Hand For Type HL & HLA Meters.

Note:-
All Valves, Pipe And Fittings Shown Dot & Dash Furnished By Customer

FRONT ELEVATION

FIGURE E

ARRANGEMENT
CYLINDER & PIPING
FOR TYPE L METER

SIMPLEX CONTROL SYSTEMS
THE PERMUTIT CO.
a division of PFAUDLER PERMUTIT INC.

J.F.B. 9-28-64

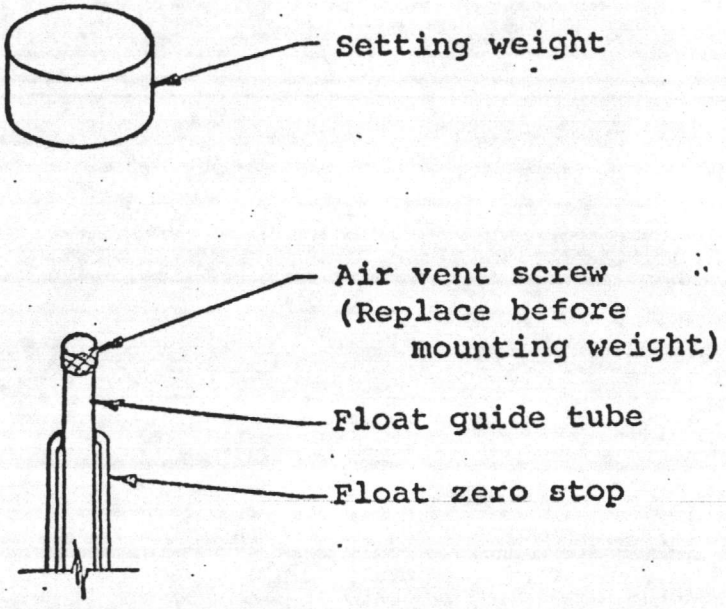


FIGURE F

30% capacity setting for PNB & PNG

50% capacity setting for PNE

DETAIL SHOWING SETTING WEIGHT

SIMPLEX TYPE "PN" TRANSMITTER

RAW WATER TRANSMITTER BA138

DIRECTIONS FOR ERECTION & OPERATION OF SIMPLEX TYPE "PN" PNEUMATIC TRANSMITTER

THIS IS AN ACCURATE INSTRUMENT USED TO MEASURE THE FLOW IN PIPE LINES. IT IS DESIGNED TO OPERATE WITHIN AN ERROR NOT GREATER THAN 2%, PLUS OR MINUS, AT ANY POINT OVER A SPECIFIED RANGE.

FOR SATISFACTORY OPERATION, THE FOLLOWING CONDITIONS ARE ESSENTIAL:

1. The instrument be kept in calibration
2. The pressure lines be kept clean.
3. The lines and instrument be kept free of air.
4. Certain parts be oiled.
5. Periodic cleaning schedule be followed.

ADJUSTMENT PROCEDURE

A setting weight or "test weight" is ordinarily furnished with each "PN" type transmitter. For "PNG" and "PNB" transmitters, the weight is used to set the instrument at 30% capacity. For "PNE" transmitters the setting point is 50% capacity.

The water manometer test outfit, as described herein, is supplied on special order only. If the manometer is supplied, follow the procedure starting on Page 5. If a setting weight has been supplied, follow the procedure below.

SETTING WEIGHT

The exact weight of the "Setting Weight" has been determined during factory calibration. When placed on top of the float guide tube, the weight positions the float to its calibrated 30% capacity position. (50% capacity for Type "PNE").

Refer to Figures C, E, and F. With water level at top of cylinder cover and equalizer valve E open, close valves M and T. Screw the "setting weight" onto the knurled cap screw, since the cap screw must remain in position during the setting procedure. Refer to Figure F. This positions the float to its 30% (or 50%) capacity position. Tap lightly on cylinder and, if necessary, adjust the indicator pointer to read exactly 30% capacity. Use the pointer adjusting screw, Fig. D, to adjust pointer.

After transmitter has been set, remove the "setting weight", indicator pointer should return to zero. If it does not, adjust float zero stop, Fig. C, by screwing in or out until pointer reads zero. Mount zero stop cover. Open high pressure valve M slightly. Vent air from cylinder at both the air vent in the cylinder cover and at the top of zero stop cover.

Transmitter is now ready to place in service.

ASSEMBLY OF TEST OUTFIT

The water manometer test fittings supplied with the meter are to be attached to meter as shown on Fig. "E".

Having all valves at the meter open, except (M), (T), and (D), which should have been tightly closed, fill supply pan with clean cool water. Open the cylinder air vent cock and vent thoroughly, then close.

Flow dial pointer should indicate approximately zero.

CALIBRATION TEST BY MEANS OF WATER MANOMETER:

Upon this adjustment depends the accuracy of the meter. The principle will be evident and the methods will prove simple and easy if the following notes are read carefully, and the operation performed as described.

The distance between the bottom of each meniscus in the test glasses (Gm) and (Gt) is to be used when measuring from zero to 30% on test scale, or for any other graduation which might be considered. See Fig. "F".

The test scale is used to determine the theoretical value of the rate of flow in terms of difference in water levels between glasses (Gm) and (Gt).

It is necessary that valves (M), (T), (E) and (D) close tightly in order that this test may be made satisfactory. If dirt should be beneath the seat of the valve, (T), Fig. E, test glass (Gt) will overflow. Leakage in valve (E) or float air vent screw, Fig. "C" will cause water to rise in glass (Gt). If leakage occurs in valve (M), Fig. "E", water will rise in supply pan and short test glass (Gm).

Tighten all gland nuts on all valve stems. THEY MUST NOT LEAK.

WATER MANOMETER TEST DESCRIBED:

For a meter having a maximum differential head of 64", use the white graduations on the test scale; for the maximum differential of 114" use the red graduations. Refer to Dwg. "B" which shows the maximum differential for this meter. The maximum differential is also shown on the third line of the meter name plate, which is mounted on the inside surface of the meter box door.

Forward and backward movement of flow dial pointer should be observed for each different head selected and compared with the theoretical percentage rate.

When the water manometer is properly adjusted, using 30% on test scale, pointer should read 30% on dial.

This water manometer test outfit makes it very easy for the operator to check meter accuracy from time to time. When the meter does not respond properly, it may be necessary to adjust, clean, or repair it.

In the operation to be described, only two valves; namely (E) and (D) need be operated to establish the water level difference.

To lower water level in test glass (Gt) close valve (E) and open valve (D) slightly.

Drainage from valve (D), if caught in a suitable receptacle, may be used to replenish supply pan. DO NOT ALLOW SUPPLY PAN TO BECOME EMPTY DURING TEST.

To raise water level in test glass (Gt) or equalize water level differences, open valve (E) slightly.

With valve (E) open, adjust scale on test glasses so that zero line matches bottom of meniscus in both glasses (Gm) and (Gt). If water in both glasses is not equalized (same level) - it indicates that the glasses are greasy or dirty. Clean glasses. Valve (E) should be closed after columns are equalized.

FORWARD MOVEMENT OF FLOW DIAL POINTER:

Thirty percent of capacity for PNG and PNB meters, and fifty percent of capacity of PNE meters has been selected as a standard point for factory setting and is to be used in the field for resetting each meter. The calibration procedure described uses the 30% setting point; however, the 50% point should be substituted when the meter is a Type PNE.

Lower the water level in test glass (Gt) slowly until bottom of meniscus is exactly in line with the 30% line of test scale. Each time a change in water differential is made, adjust scale so that zero line and bottom of meniscus in short glass (Cm) agree.

The meter pointer should now be adjusted so that it indicates slightly minus the 30% setting point line. This adjustment is made by turning the pointer adjusting screw (Fig. "D"). Do not disturb the setting of the adjusting collar or the transmission spool. Should the meniscus happen to go beyond the 30% line on scale, raise water level in glass (Gt) by opening valve (E) and start over again.

FORWARD MOVEMENT OF FLOW DIAL POINTER"

Lower water level in test glass (GT) so that pointer advances about 1/2" above the 30% line on meter dial. Raise water in test glass (GT) slowly until the differential from zero to 30% line of scale is again obtained, checking the zero on scale with meniscus on glass (GM) each time the differential is changed. Note the position of pointer compared to its previous position.

When pointer is set in position so that the lag will be equally distributed on either side of the 30% line on the dial, the adjustment is correct.

SETTING ZERO STOP:

When the pointer is correctly adjusted, open valve (E). Meter should now read EXACTLY zero. If meter does not read zero, remove zero stop cover and adjust float zero stop by screwing in or out until meter reads zero. Replace zero stop cover.

CALIBRATION OF TRANSMITTER:

In order to calibrate the pneumatic output of the transmitter to the receiver, it is of the utmost importance that the transmitter be first set to an output of 3 lbs. (since 3# output=zero). Attach a mercury "U" tube manometer to the output opening. With the water manometer attached to the cylinder and the pointer at zero, check the deflection in the "U" tube mercury manometer; "O" should be 3 psi or 6.13" deflection of the mercury. If the "U" tube mercury manometer does not read 6.13" deflection, turn the knurled thumb screw, Fig. "D" until the correct deflection is obtained. Now check the output at 30% on the checking dial. Refer to the attached table for any other checking points. The output "U" tube manometer should show a deflection of 13.48" mercury. Should there be a difference in output, it may be necessary to disturb the setting of the adjusting collar. The function of the adjusting collar and the transmission spool (Fig. "D") is only to adjust for the difference in the tolerances in the linkage. Should there be a varibale error in the overall range of the transmitter, it may be necessary to change the position of the adjusting collar. To do this, loosen the screw in the center of the adjusting collar and move it to the right or left on the elongated slot in the pointer hub. For an increase in the range, move the adjusting collar toward the dial, and for a decrease, move it toward the main shaft. After making this adjustment it will be necessary to completely retest the transmitter. Once the transmitter has been checked, connect the receiver and check the comparative readings with those listed on the table.

PLACING METER IN SERVICE:

After the calibration has been completed, close valves (A) and (B) which were opened for the test outfit, and close valves (E) and (D) which were used during the calibration. The test outfit may then be removed from the meter and stored away safely until required again or it may be left on place.

Open valve (M) and (T) on the main and throat lines which lead to the primary devices, such as Venturi tube, orifice plate, etc. and check float for air again.

To put register in service at end of test, have valves (Mp), (Tp), and (M) and (T) wide open, and valve (E) closed.

MAINTENENCE INSTRUCTIONS

PERIODIC INSPECTION:

No instrument will remain in correct adjustment indefinitely. Every day handling as well as the ordinary effects of meter operation, eventually result in the need for rechecking. Therefore, the establishment of a regular inspection procedure is definitely recommended. The interval may be six months to one year, depending on the aforementioned factors.

Another unusual occurance, such as complete shut-down, a long idle period, or drainage of the system, likewise calls for special attention. After such occurrences the meter should be thoroughly checked and adjusted.

TEST OF PRESSURE PIPING:

Buried pressure piping may be tested for tightness thusly; close valve (Tp) at primary device (Venturi Tube, etc.). If the pointer is stationary, there is no leakage in "THROAT" pressure line. If it moves forward, the line leaks, and thereupon open valve (E) to stop further movement. Repair leaking pipe.

If the pointer drops backward toward zero, it would indicate leakage through valve (E), or air vent screw in top of float.

Again open valve (Tp) and close (Mp) at Venturi Tube. If the pointer is stationary, the "MAIN" pressure pipe is tight.

If it goes backward toward zero, there is leakage in "MAIN" pipe. Thereupon close valves (M) and (T). Open valve (E) and repair pipe.

CAUTION:

Mercury can be removed from the meter cylinder by unscrewing mercury plug. Have plug tight when meter is in operation.

Make no connections to the meter pressure piping or pressure belts of Venturi tube for chlorine machines or ohher water supplies. THIS IS IMPORTANT.

Allow a slight perceptible end play between all thrust bearings.

INDICATING DIAL:

The dial may be cleaned with a clean, soft cloth just moistened with water. Gentle rubbing should remove all marks.

VENT VALVES:

Open blow-off on air vent valves at Venturi tube or meter register cautiously.

PACKING GLAND:

The stuffing box for the main shaft, as packed by the factory, should not leak under normal operating pressure. However, if some leakage should occur, the packing may be tightened by turning the knurled stuffing box nut until leakage is stopped. DO NOT TIGHTEN THE STUFFING BOX NUT TOO HARD.

Additional packing may be added to the stuffing box from the supply furnished with the meter. Shut off valves (M) and (T) and release pressure from the meter cylinder, then remove the knurled packing nut and pull brass bushing from the gland. Add packing as required, and replace the bushing and nut.

When packing becomes hardened after a long period of use, it should be completely removed and replaced. USE ONLY THE SPECIAL PACKING furnished by the SIMPLEX CONTROL SYSTEMS.

OIL:

A one-ounce bottle of clock oil is furnished for those parts which require oiling.

FACILITIES FOR TESTING:

This meter is unique, among other reasons, in that it may be readily tested by the attendent to prove its accuracy.

PROOF OF PROPER INDICATION OF POINTER:

This test may be made as often as desired and affords positive proof of the accuracy of pointer indications. The test may be accomplished at any time by the use of the water manometer test outfit and the test scale furnished with the meter. See "Calibration Procedure".

The following common conditions will interfere with correct meter registration, and if these conditions become sufficiently acute, will put the meter entirely out of service. Recommended methods of correcting or eliminating these conditions are given below.

Sediment in Meter Cylinder

Remove cylinder head and float. Flush meter cylinder with clear water until sediment is cleaned out. Entire contents of cylinder, including mercury may be removed by removing mercury drain plug. Flush cylinder thoroughly, weigh mercury and replace correct amount in cylinder. The correct amount of mercury is recorded on line "eight" of the name plate. Reassemble meter and replace in service. This cleaning procedure is recommended every six months to one year.

Leaks in pressure lines from Primary Device

Tighten all joints or replace pipe lines, if necessary. See separate paragraph - "Test of Pressure Piping".

Obstructions in Pressure Lines

Flush pressure lines to wash out sediment. Replace lines if blockage cannot be flushed out.

Air Trapped in Cylinder - Above or below float.

See instruction book for method of air venting.

Air Trapped in Meter Pressure Lines

Flush pressure lines and vent air at blow-off valves, as shown on Drawing A. Make sure pressure lines are properly graded to avoid air pockets.

Obstructions in Primary Device, Particularly in Throat of Venturi Tube

Remove obstruction. Simplex Venturi tubes are provided with inspection holes for this purpose. When orifice plates or other primary devices are used, it is usually necessary to remove a section of the pipe line itself in order to make an inspection.

AIR UNDER FLOAT

In normal operation if pressure piping is properly arranged, air will never accumulate under the float, but after emptying of line or pressure piping, its absense may be assured by the following methods:

Close valves (M) and (T), open (E), Fig. E other outlets closed, allowing float, etc. to go to zero position. Remove zero stop cover (See Figure C). The float air vent screw will be revealed. Remove the air vent screw and release any air which may have collected beneath the float. Replace air vent screw and zero stop cover. Place meter in service by opening valves (M) and (T), and closing valve (E).

* *

Percent	Lbs. Pressure	Inches of Mercury
0	3.0	6.13
10	4.2	8.58
20	5.4	11.03
30	6.6	13.48
40	7.8	15.93
50	9.0	18.39
60	10.2	20.84
70	11.4	23.29
80	12.6	25.74
90	13.8	28.23
100	15.0	30.64

555-05473

Type "TG" Venturi Tube
With Recovery Cone Added

Type "TG" Nozzles

Air Vent

Flow

Tp

Mp

Main Connection
Diametrically Opposite
The Throat Connection

M

Float Cylinder
Located Above
Primary Device

T

E

Mercury
Drain
Plug

If Cylinder Is Above
Primary Device
Grade Up From This
Point, If Below Grade
Down As Shown Below

IMPORTANT

A Straight Run Of Pipe 6 Diameters Min. Length, Must Precede This Venturi Tube For Guaranteed Accuracy, Except That Double Elbow, Check Or Throttle Valves Ahead Of This Pipe Require Special Provisions. In Latter Case Consult Engr. Dept. With Full Description Of Preceding 20 Diameters Of Line.

Air Vent

Flow

Tp

Mp

Blow-Off

Type "VT" & "CT" Venturi Tubes

IMPORTANT

A Straight Run Of Pipe 6 Diameters Min Length, Must Precede This Venturi Tube For Guaranteed Accuracy, Except That Double Elbow, Check Or Throttle Valves Ahead Of This Pipe Require Special Provisions. In Latter Case Consult Engr. Dept. With Full Description Of Preceding 20 Diameters Of Line.

Note:-
Grade Piping Uniformly
.02 Min. Grade On Horizontal Runs
Lines Must Be Well Supported

Orifice Plate

Air Vent

Flow

Tp

Mp

Blow-Off

Type "KG" Or "KB" Mercury
Cylinder Flange Joint
Must Be Placed 7 Ft. Or 11 Ft.
Respectively Below Minimum
Hydraulic Gradient Of
Primary Device.

M

Blow-Off Valve

Float Cylinder Located
Below Primary Device

E

T

Mercury
Drain
Plug

Blow-Off Valve

IMPORTANT

A Straight Run Of 30 Diameters Of Pipe Preceding The Orifice And 4 Diameters Following It Is Ordinarily Satisfactory For Standard Metering Accuracy, Except When It Is Preceded By A Regulating Valve; When More May Be Needed. If Actual Conditions Are Otherwise, Advise Engineering Department With Full Description Of These Lengths For Recommendations.

LEGEND

"M" Valve — Main or High Pressure Valve at Float Cylinder
"T" Valve — Throat or Low Pressure Valve at Float Cylinder
"E" Valve — Equalizing Valve at Float Cylinder
"Mp" Valve — Main or High Pressure Valve at Primary Device
"Tp" Valve — Throat or Low Pressure Valve at Primary Device

DWG "A"

TYPICAL PIPING ARRANGEMENT FOR CLEAR WATER SIMPLEX TYPE "K" METER TO PRIMARY DEVICE

SIMPLEX CONTROL SYSTEMS
THE PERMUTIT CO.

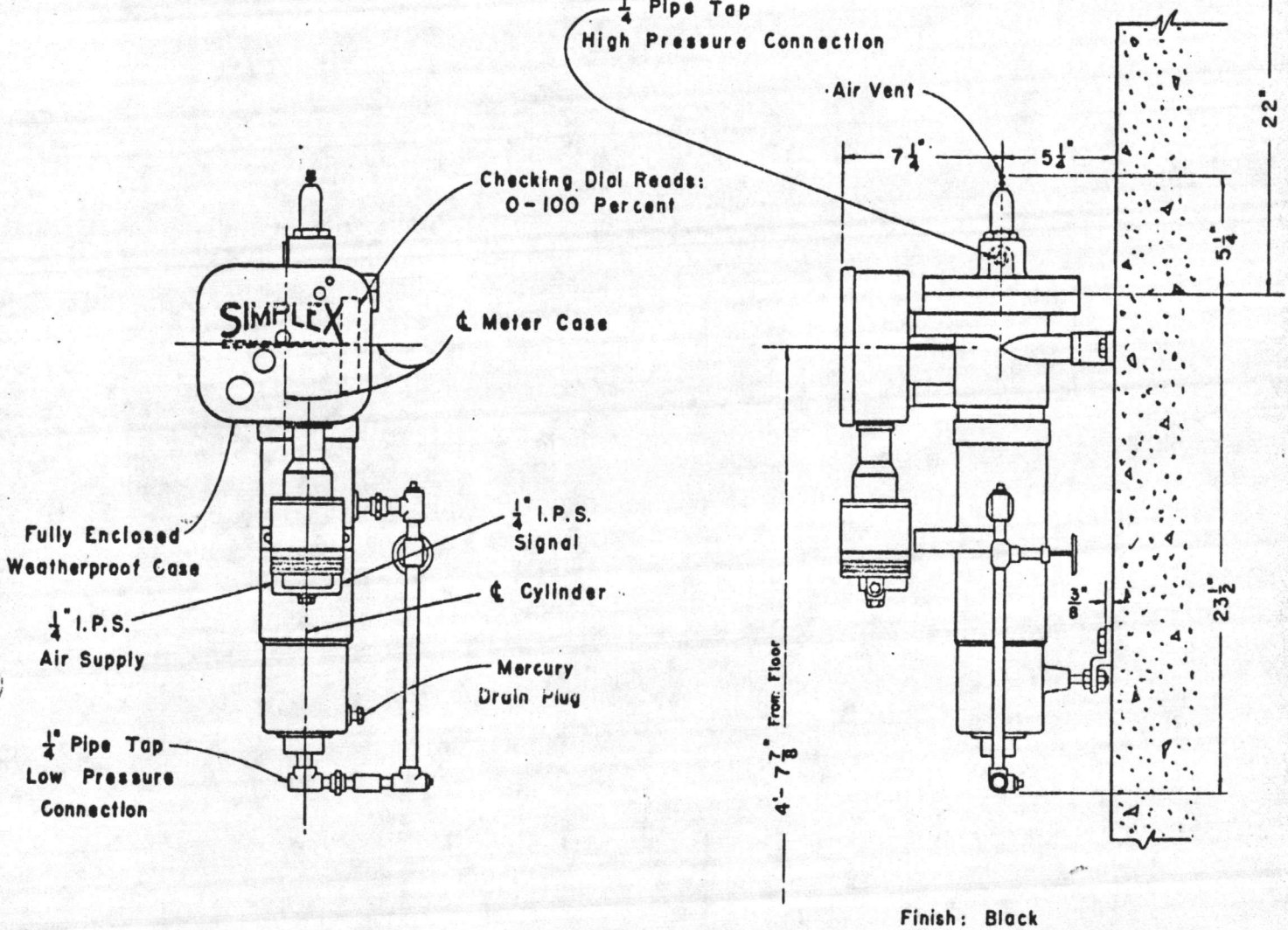
555-05473

JOB NO.

P.O. NO.

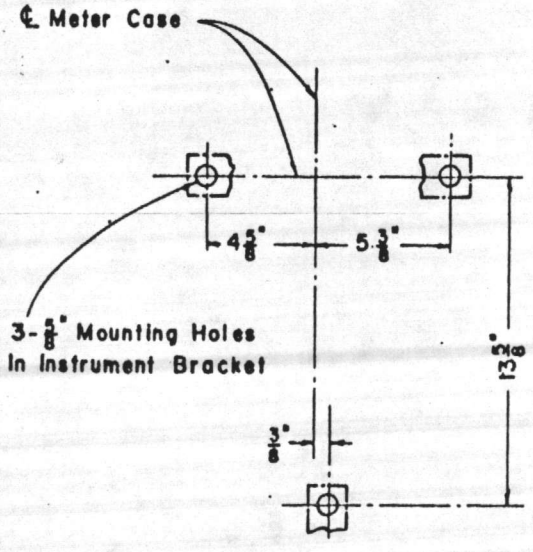
555-08777

Contract A173E48112
P.O. 15376-1683



Finish: Black

ITEM 11B.9.1



Mounting Template

Maximum Working Pressure For This Meter 250 P.S.I.G. Unless Otherwise Specified	TYPE	DIFFERENTIAL
	~~PNB~~	~~[illegible]~~"
	~~PNC~~	~~[illegible]~~"
	PNG	64.5"
	~~PNH~~	~~[illegible]~~"
	~~PNP~~	~~[illegible]~~"

2-REQ'D
TAG 1 UNIT - RAW WATER
TAG 1 UNIT - FINISHED WATER
SIMPLEX PNEUMATIC TYPE TRANSMITTER
HIGH HEAD METER
TYPE PNG
WALL MOUNTED
CAMP LEJEUNE, N.C. DWG. "B"

Primary Device:
24" X 11.032" Permutube

SIMPLEX CONTROL SYSTEMS
THE PERMUTIT CO.

555-08777

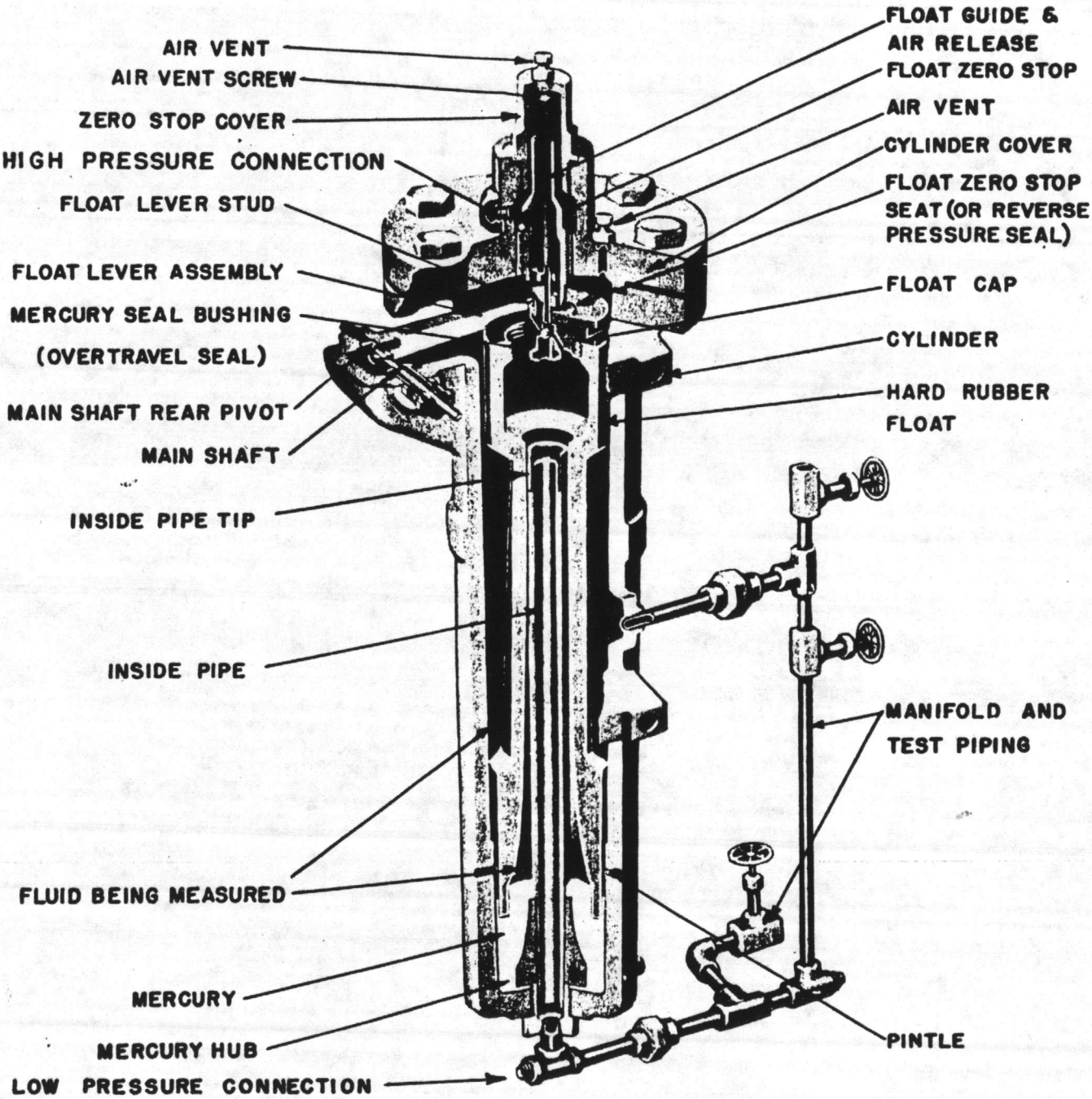
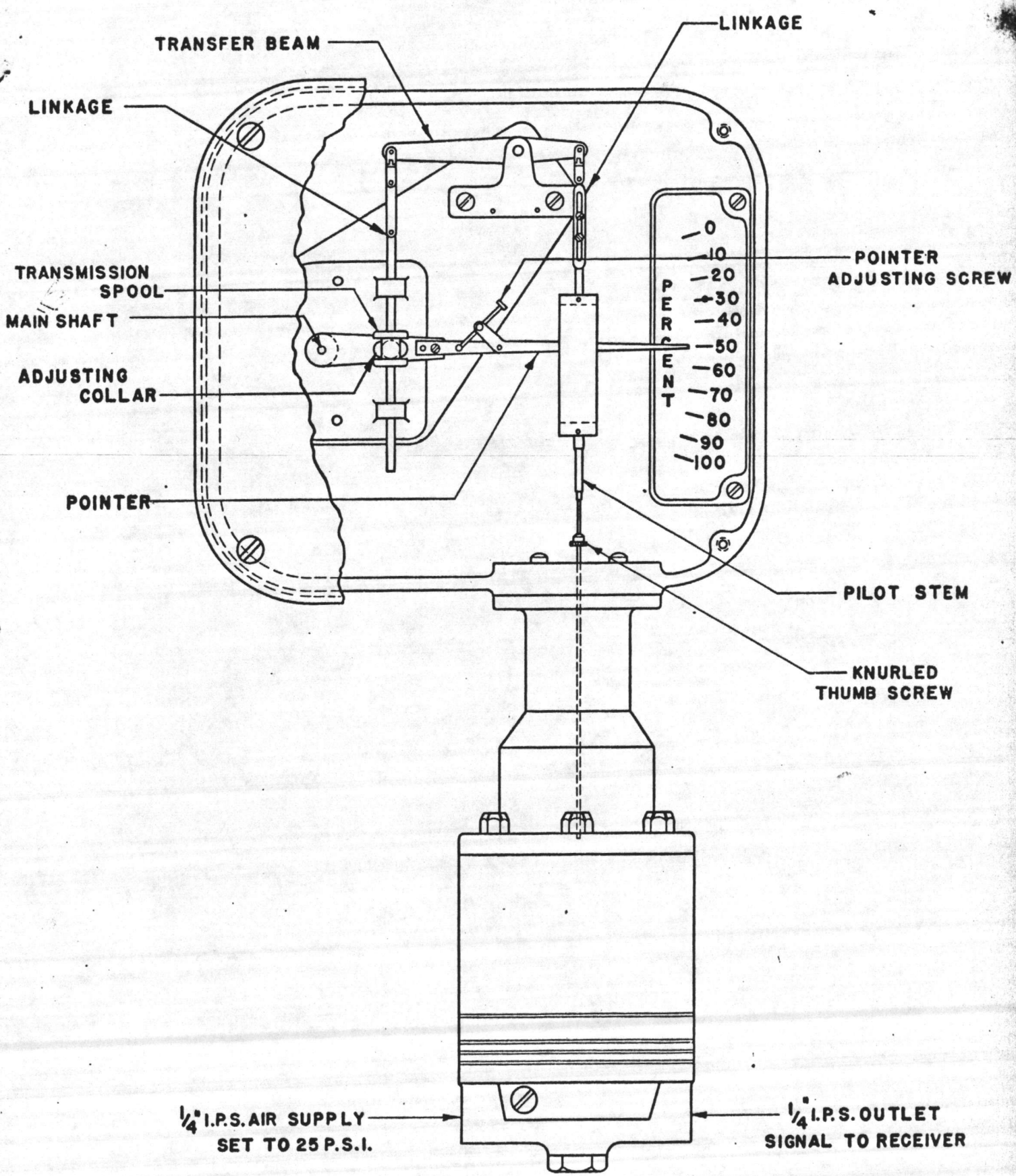
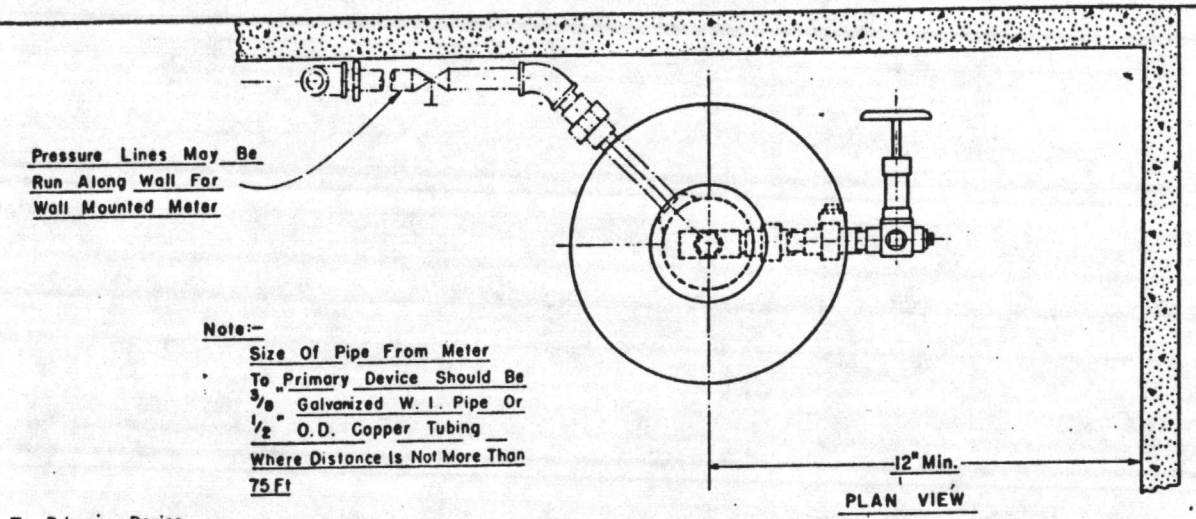


Fig."C" - Interior View of Mercury Cylinder



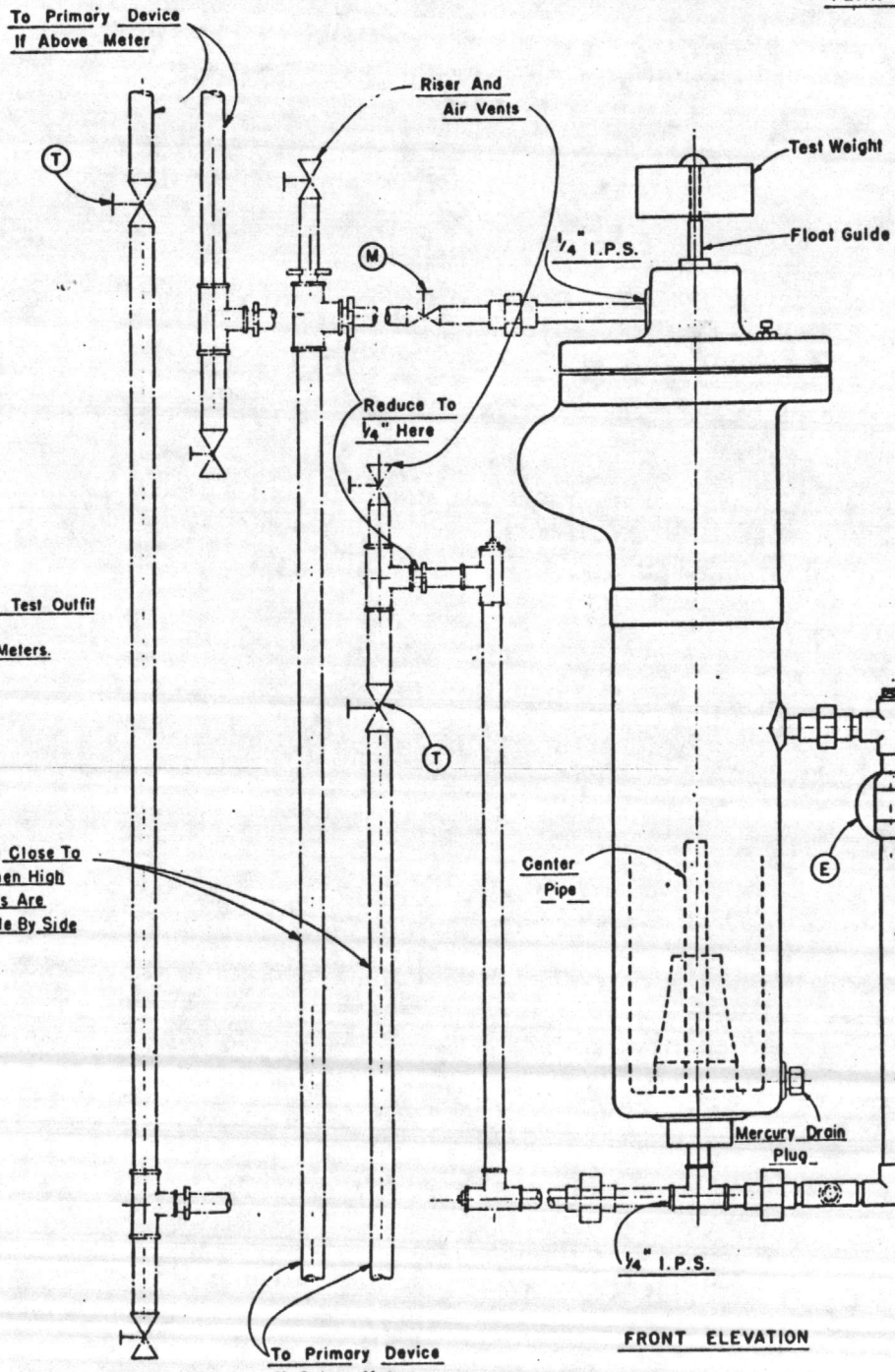
"FIGURE D"

form #5207-365-5C



PLAN VIEW

Note:-
Size Of Pipe From Meter To Primary Device Should Be 3/8" Galvanized W. I. Pipe Or 1/2" O.D. Copper Tubing Where Distance Is Not More Than 75 Ft



FRONT ELEVATION

Note:-
All Valves, Pipe And Fittings Shown Dot & Dash Furnished By Customer

ARRANGEMENT
CYLINDER & PIPING
FOR TYPE L METER

SIMPLEX CONTROL SYSTEMS
THE PERMUTIT CO.
A DIVISION OF PFAUDLER PERMUTIT INC.

FIGURE E

5
7254

J.F.B. 9-28-64

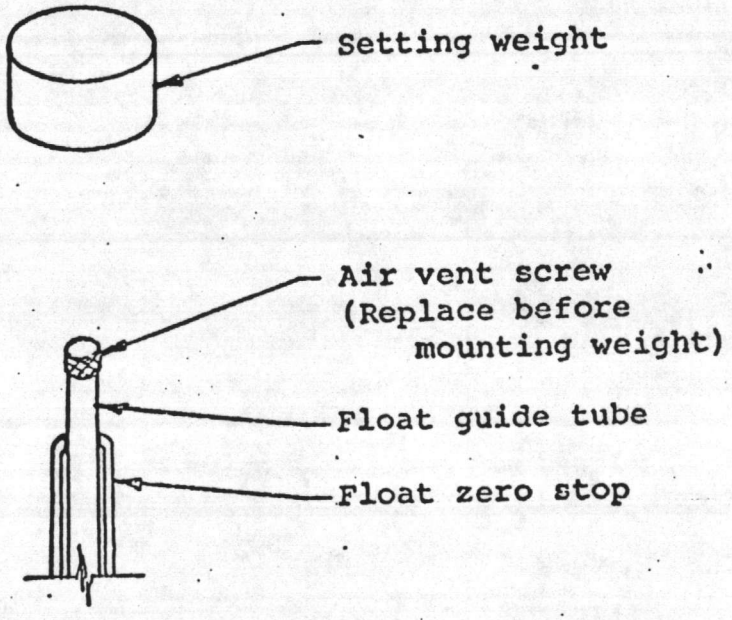


FIGURE F

30% capacity setting for PNB & PNG

50% capacity setting for PNE

DETAIL SHOWING SETTING WEIGHT

SIMPLEX TYPE "PN" TRANSMITTER

OVERHEAD TANK U.B.

INSPECTION

Regular inspection and good records on all cathodic protection rectifiers can result in less outages, better performances and lower cost in the long run. The following inspection procedure should be followed at least twice each year, or preferably, once a month.

The first part of any inspection of equipment is what is sometimes referred to as the "look, feel, smell" procedure. In a rectifier, this should be done on the inside and outside of the unit. On the inside, the first thing to check immediately after turning the unit off is the operating temperature of the plates by simply feeling the plates in each stack of the unit. Uneven operating temperature of the plates is a very definite indication of trouble. For example, in a four stack, single phase rectifier, if we should find that two stacks in the unit are warm and two stacks are cold, this can mean only one thing - lightning surge or some other hazard has damaged one of the stacks in the unit. Since a bridge rectifier containing four stacks has two pairs in a bridge, a fault in one of the stacks would completely eliminate one of the paths in the bridge which would cause the other path to carry all the current, and thus result in two warm stacks and two cold stacks. If this condition is allowed to continue with two of the stacks carrying all of the load, the result will be failure of the unit. Also, while the unit is operating in this manner, the output will be half-wave instead of full-wave, which causes interference problems.

Another thing to look for is the tell-tale burned arc that is caused by lightning when an arc has occurred across an insulator or some other component. Another check, which should be made as soon as possible after turning the unit off, is the operating temperature of all contacts throughout the unit. All bolted pressure type connections of any kind in a rectifier can become loosened and result in a bad contact, which will cause heating. The heating will cause oxidation resulting in still poorer contact; and this will continue until failure. Any of these can be spotted before actual trouble develops by simply checking the temperature of all contacts immediately after turning the unit off.

Proper cooling of all the components in the rectifier is always a problem. Accumulations of dust, bird or insect nests, or anything of this type on the components or on the screens can cause overheating and failure of the unit. Most rectifiers are ventilated through screens which have a maximum opening of 1/8". This will prevent the entrance of most insects that can cause trouble; therefore, special care should be taken to see that no holes in the unit are left unplugged to allow the insects to enter the rectifier.

While the unit is turned off, the electrical watt-hour meter should be checked for creep. The creep in the meter can indicate either a faulty electric meter or electrical leakage of some kind in the wiring to the unit. This leakage might be in the actual wiring itself or, if lightning arresters are used, could possibly be in the lightning arresters themselves.

For the next step, the unit should be turned on and the meters in the rectifier should be checked using portable voltmeters and ammeters, which are known to be accurate. The accuracy of the meters can be checked by a DC voltmeter and by connecting a 50 millivolt meter to the shunt in the unit. This check is possibly not necessary on each inspection; but should be carried out at least once per year. Poor contacts in meter switches can cause erroneous readings. This can

be avoided by pushing the switch and taking readings until four identical consecutive readings are obtained. The latest type Good-All meter switch is a sealed, submersible type, which will give many years of reliable operation.

The efficiency of the unit should then be checked. The efficiency of the unit is simply the ratio of the average DC output to the AC input times 100. The DC output is the DC volts times the DC amps.

$$\% \text{ Efficiency} = \frac{\text{DC Volts} \times \text{DC Amps}}{\text{AC Watts}} \times 100$$

The input can be determined by connecting a wattmeter into the primary circuit of the rectifier, or, in most cases, can be measured easier by counting the turns of the disc in the watt-hour meter and applying the following formula:

$$\text{AC Watts} = \frac{K \times N \times 3600}{T}$$

where K is the meter constant (shown on the dial face), N is the number of revolutions of the meter disc, and T is the time of measurement in seconds.

If a DC filter is present, the choke and capacitors should be visually inspected and checked for overheating. Each capacitor fuse should be inspected to insure the operation of all the capacitors. Poor filtering will decrease efficiency of the unit, and may cause interference problems.

The above outlined inspection procedure should take approximately one hour's time. If complete records of this inspection are maintained, a history of the unit will be developed, which will make it possible to determine the remaining life of the rectifier, and predict its performance and dependability. In most cases, this inspection can be carried out in connection with routine checks of the cathodic protection system, in connection with routine pipe line patrols, or other operations.

The efficiency record is particularly helpful because as stacks age in a rectifier, the efficiency will drop, and any sudden changes in the efficiency is usually an indication that some component is faulty. In most cases where the efficiency of the rectifier has dropped 20%, the increased power consumption is costing enough money that it would be cheaper to replace the stacks in the unit. This would also result in better performance of the unit. When checking efficiencies, only D'Arsonval type DC meters should be used. The first reading in the efficiency record should be the one supplied by the manufacturer showing what the efficiency was when the machine was inspected at the factory. (See Page 9). The efficiencies, which should be expected of various types of rectifiers, can be found in the engineering data contained in the Good-All catalog.

It is essential that each water tank be observed at least twice a month to assure that the systems are operating within the parameters as established in the field reports. Annual service should be entered into by the Owner so that the system can be inspected for deficiencies and re-adjusted for environmental changes, such as water chemistry, coating deterioration, etc. The company supplying this service shall have had no less than five continuous years of experience in servicing cathodic protection on water tanks and shall be accomplished by or under the direction of a Corrosion Specialist certified by the National Association of Corrosion Engineers (NACE).

SAMPLER BA138 POND

Serial # A-3159-55

INSTRUCTION MANUAL

MODEL 1680

SAMPLER WITH L.E.D. READOUT

PART #60-1683-069

ISCO, INC.
531 Westgate Boulevard
Lincoln, Nebraska, U.S.A., 68528
PHONE: Sales (800) 228-4373
Service (800) 228-4374
In Nebraska (402) 474-2233
TELEX: 43-8028

ISSUED October, 1975

REVISED May, 1982

SECTION III

3.0 ROUTINE MAINTENANCE - This third section of the Model 1680 Instruction Manual presents detailed instructions for the routine maintenance necessary to keep the sampler in top operating condition. Included are paragraphs providing information on cleaning the sampler and components, charging the optional batteries, replacing pump and suction tubing, reactivating the desiccator, and lubricating the sampler.

It is strongly recommended that the user thoroughly familiarize himself with the routine maintenance procedures presented in the following paragraphs. The Model 1680 Sampler, although ruggedly built to withstand difficult field operating conditions, will function best and maintain maximum reliability when these simple maintenance procedures are followed. As with any piece of field operated equipment, a certain amount of preventive maintenance is necessary to keep the sampler functioning properly.

3.1 Cleaning the Sampler - The following paragraphs present instruction for cleaning the sampler case, the suction line and pump tubing, and the sample bottles.

3.1.1 Case - The top cover, distributor plate, and sample bottle tub may be cleaned by submersion in warm soapy water or by spraying them with a hose. The pump and control section may also be cleaned in a similar manner provided that the stainless steel cover is tightly latched to the control box and that the flow meter external electrical connector is tightly capped.

The sampler may be disassembled for cleaning by following the instructions found in paragraph 2.1.1. To clean the distributor funnel, remove the sampler pump and control section and turn this section over, as shown in Figure 3.1-1. Then, unscrew the funnel retaining nut from the distributor shaft, and pull the funnel straight off of the funnel key. This will expose the splash shield, which may also be pulled off of the funnel key. The funnel, splash shield, and underside of the pump and control section may now be cleaned as above. The funnel and splash shield may be reinstalled by generally reversing the above instructions. Be sure that the flange on the splash shield is facing away from the underside of the pump and control section, and that the pump discharge tube extends through the hole in the splash shield, as shown in Figure 3.1-1.

3.1.2 Tubing - The suction line, pump tubing, and pump discharge tube may be cleaned by placing the end of the suction line in a cleaning solution and pumping this solution through the tubing system using the FWD position of the PUMP switch. Follow with a clean water rinse.

3.1.3 Sample Bottles - Both the standard plastic bottles and the optional glass bottles have a wide mouth to facilitate cleaning. The plastic bottles can be washed in a dishwasher, but not autoclaved. The glass bottles, of course, can be autoclaved.

3.2 Optional Nickel-Cadmium and Lead Acid Batteries - As discussed in paragraph 2.1.7, there are two optional power sources available for use with the Model 1680 Sampler, the Nickel-Cadmium (Nicad) Battery Pack, and the rechargeable sealed lead-acid battery. The following paragraphs present some general comments on the use and care of the two optional batteries, on recharging the batteries, and on battery charge duration.

3.2.1 Use and Charging of the Nicad Battery Pack - A nickel-cadmium type battery offers the following advanctages over other type batteries, particularly lead acid batteries. The number of charge/discharge cycles is virtually unlimited. They may be allowed to remain in a discharged state, even at very low temperatures, indefinitely without being damaged. Provided that the charging current is properly regulated (one of the functions of the ISCO Power Pack), they may be left on charge for unlimited periods without damage.

To prevent a dangerous rate of energy release in case of a malfunction causing a short circuit, the battery is internally fused at approximately 50 amperes.

CAUTION

Do not test these batteries for state of charge by "sparking the output", and be extremely careful in introducing voltmeter probes into the output socket. Any accidents which result in a shorted output will do damage to the battery in less than three seconds.

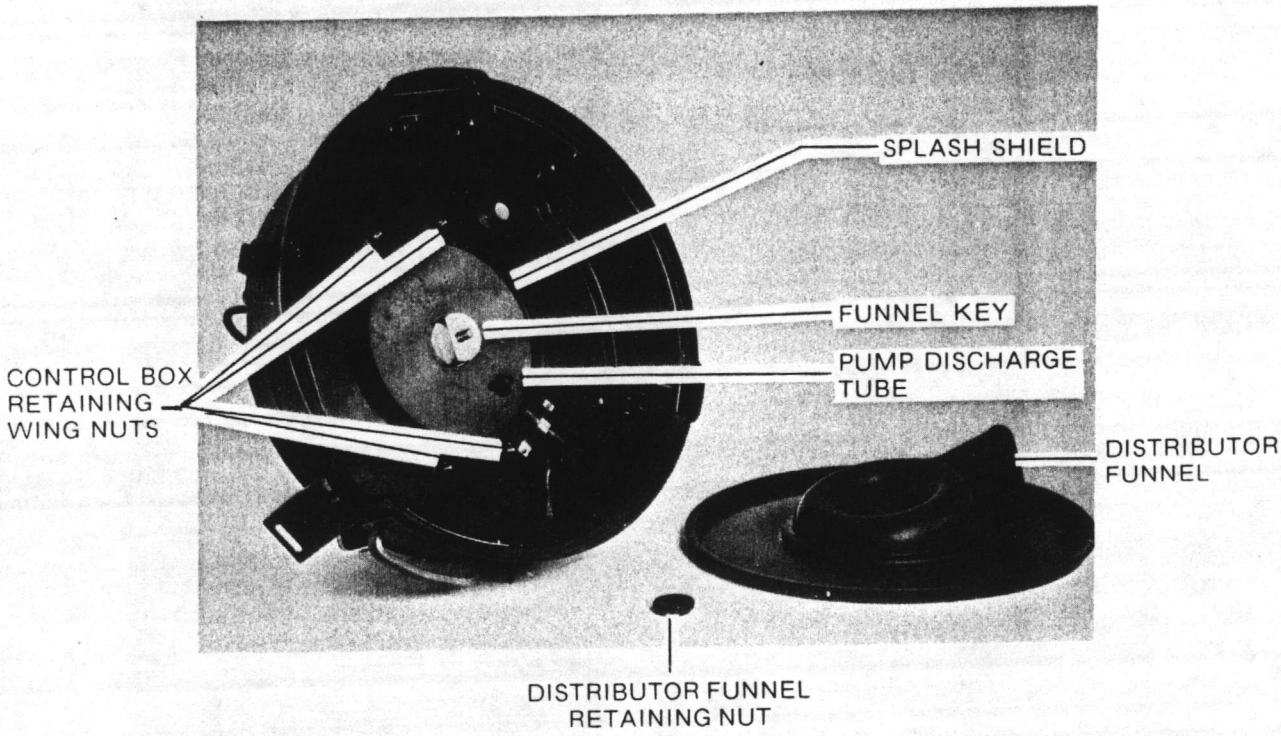


Figure 3.1-1 Bottom View of Pump and Control Section Showing Funnel Removal

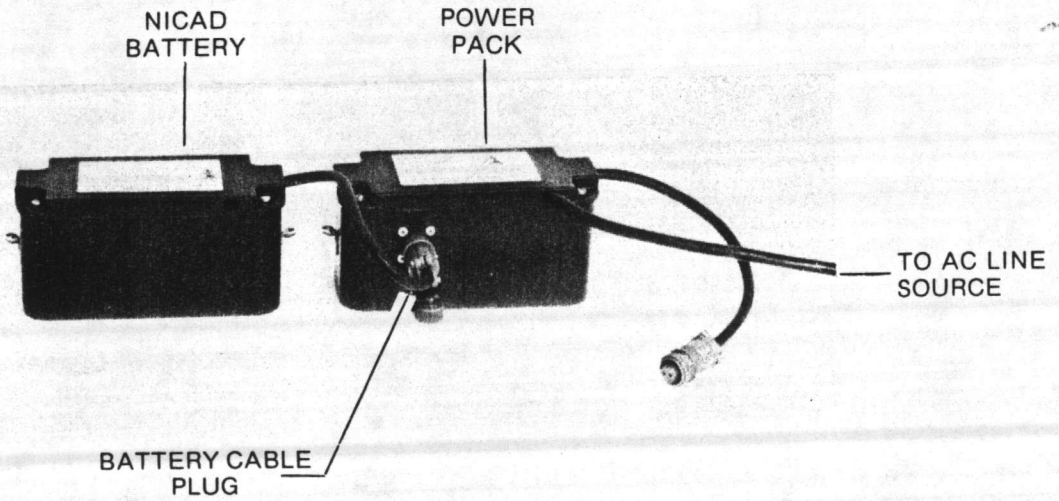


Figure 3.2-1 Charging the Nicad Battery Pack with the Power Pack

If for any reason, the internal fuse link is blown, the battery will have to be disassembled to repair the fuse. Refer to paragraph 6.1.1 for details on this operation.

The optional Nicad Battery Pack should be charged with the Power Pack supplied with each Model 1680 Sampler. The Power Pack, when connected to an appropriate AC line source, will supply a regulated DC charging current to the Nicad Battery Pack. To charge the battery, connect the plug on the battery cable to the mating receptacle on the Power Pack, as shown in Figure 3.2-1. Since the battery will not be harmed by overcharging, it is recommended that every charge cycle be from 15 to 18 hours.

Nicad batteries exhibit an almost constant output voltage, even under load, as the battery is discharged. Therefore, unless the battery is almost completely discharged, output voltage measurements cannot be used to determine the level of charge. Refer to paragraph 3.2.3, below for approximate battery charge durations.

Previously, it was generally accepted that nicad batteries exhibited "memory" effects, and that a rather complete charge/discharge cycle (exercising the battery) was necessary so as not to permanently reduce battery capacity. It is now known, however, that the "memory" effect is not a problem under normal operating conditions, and even if it should occur it is only temporary and may be reversed by a deep discharge and charge. If, as in normal use, the battery is discharged to random depths, overcharged for random amounts of time, and subjected to various duty cycles, the "memory" effects will not manifest themselves.

If the Nicad Battery Pack is to be charged from a current source other than an ISCO Power Pack, the charging current must be limited to 400 milliamperes or less. Greater charging currents will overheat and damage the battery.

3.2.2 Use and Charging of the Lead-Acid Battery - The ISCO sealed lead-acid battery offers the advantages over ordinary lead-acid batteries of being leak and spillproof, of not requiring the addition of water, and of being operable in any position. They can also tolerate below freezing temperatures while discharged without damage, although this practice is not recommended. Even these lead-acid batteries do have three distinct disadvantages when compared with nickel-cadmium batteries. First, if left in a completely discharged state for any length of time, lead acid batteries will be permanently damaged or destroyed. Second, lead-acid batteries have a normal life which is limited to appproximately 200 complete charge-discharge cycles. Third, to obtain maximum life, the batteries should not be left on charge longer than is necessary to bring the batteries to full charge.

Lead-acid batteries exhibit a much higher internal impedance than a nickel-cadmium battery. Therefore, internal fusing is not necessary and is not provided. The cells within the battery are coated with a greasy corrosion preventative compound. Leakage of this substance from the battery does not indicate a malfunction or failure.

CAUTION

Any short circuit lasting more than a few seconds may damage the output cord, internal conductors, and possibly the plastic case.

The optional lead-acid battery should be charged with the Power Pack supplied with each Model 1680 Sampler. The Power Pack, when connected to an appropriate AC line source, will supply a regulated DC charging current to the lead-acid battery. To charge the battery connect the plug on the battery cable to the mating receptacle on the Power Pack. The charge level of the lead-acid battery may be determined by measuring the output voltage. A chart is provided on the side of the battery which lists the level of charge and time required to recharge for various output voltages.

The lead-acid battery may be charged from a current source other than an ISCO Power Pack, at a current higher than that provided by the Power Pack, but the useful battery life may be shortened. In no case should the batteries be charged at a rate higher than 2 amperes.

3.2.3 Nicad and Lead-Acid Battery Charge Duration - Table 3.2-1 is an indication of the

		NUMBER OF SAMPLES WHICH CAN BE COLLECTED ON A FULL CHARGE OF THE NICAD OR LEAD-ACID BATTERY.									
20'	44'	105	112	119	127	135	143	152	161	171	
16⅔'	36⅔'	119	127	135	143	152	161	171	182	195	
13⅓'	29⅓'	135	143	152	161	171	182	195	210	228	
10'	22'	152	161	171	182	195	210	228	248	273	
6⅔'	14⅔'	171	182	195	210	228	248	273	304	342	HEAD FT.
7⅓'	3⅓'	195	210	228	248	273	304	342	390	445	
⅜" I.D.	¼" I.D.	600	530	460	390	320	250	180	110	40	3
		532	466	400	334	268	202	136	70	4	8
		434	379	324	269	214	159	104	49	0	14
SUCTION LINE LENGTH SETTING		336	290	244	198	152	106	60	12	0	18
		237	202	167	132	97	62	27	0	0	21
		VOLUME SELECTOR SETTING									

Table 3.2-1 Nicad and Lead-Acid Battery Charge Duration

full charge duration capability of the two optional batteries. The values are applicable to batteries which have not deteriorated to less than 80% of their new capacity. The drain which will be imposed on the battery is of course, dependent upon the duration of the pumping cycle, and the duration of the pumping cycle is dependent upon the settings of the VOLUME SELECTOR and SUCTION LINE LENGTH switches. Larger sample volumes and longer suction line lengths will impose greater drains on the battery and vice versa. Note that Table 3.2-1 is based on relatively short duration total sampling periods. Nickel-cadmium batteries typically have a self-discharge rate of 1 percent per day. This self-discharge rate must be taken into account if the sampling is to be accomplished over a long time period.

To determine the number of samples which can be collected on a full charge of a battery, locate the VOLUME SELECTOR switch setting being used in the lower center portion of the table, and the SUCTION LINE LENGTH switch setting being used in the upper left portion of the chart. Follow up in the VOLUME SELECTOR setting column and across in the SUCTION LINE LENGTH setting row until the two intersect. The number at the intersection is an approximation of the number of samples which can be collected on a full charge of the battery, at the VOLUME SELECTOR setting being used through the indicated length of suction line.

For example, at a VOLUME SELECTOR switch of 269 ml at a 14 foot head and a SUCTION LINE LENGTH switch setting of 14-2/3 feet (1/4" ID) the number of samples which can be collected is indicated as 210. This means that over 7 full complements of 28 bottles (210 ÷ 28 = 7-1/2) may be collected before the battery must be recharged. Be sure to keep in mind that when the optional Multiplex SAMPLES PER BOTTLE mode is being used, a total of up to 112 samples (28 x 4) may be collected in one sampling program.

Note:

Table 3.2-1 is based on relatively short duration total sampling periods. Nickel-cadmium batteries typically have a self-discharge rate of 1 percent per day. This self-discharge rate must be taken into account if the sampling is to be accomplished over a long time period.

3.3 Replacement of Pump Tubing - The tubing used in the peristaltic pump of the Model 1680 Sampler is a special grade of silicone rubber tubing which is extremely reliable and long lived. However, due to the constant mechanical strain placed on the tubing by the peristaltic action of the pump, it will eventually fatigue and fail. It is good practice to periodically remove the outer pump case half (as described below) and inspect the pump tubing for wear, replacing it with the spare pump tube included with the sampler if necessary. Additional pump tubing sections are available from ISCO. If the liquid being sampled contains a high percentage of fairly large suspended solids, the inspections should be fairly frequent. If the liquid is relatively free of solids, the inspections may be less frequent.

To replace the pump tubing, first pull the outlet of the pump tubing off of the inlet of the pump discharge tube, as shown in Figure 3.3-1. Then remove the outer pump case half by removing the three screws indicated in Figure 2.1-2. This will expose the pump tubing which is squeezed between one of the pump rollers and the curved surface of the inner pump case half. Extract the pump tubing and pump tubing guide and clamp assemblies from the inner case half. Then, loosen and remove both pump tubing guide and clamp assemblies from the pump tubing. Remove the suction line, if attached, as described in paragraph 3.4 below. This completes the removal of the old pump tubing.

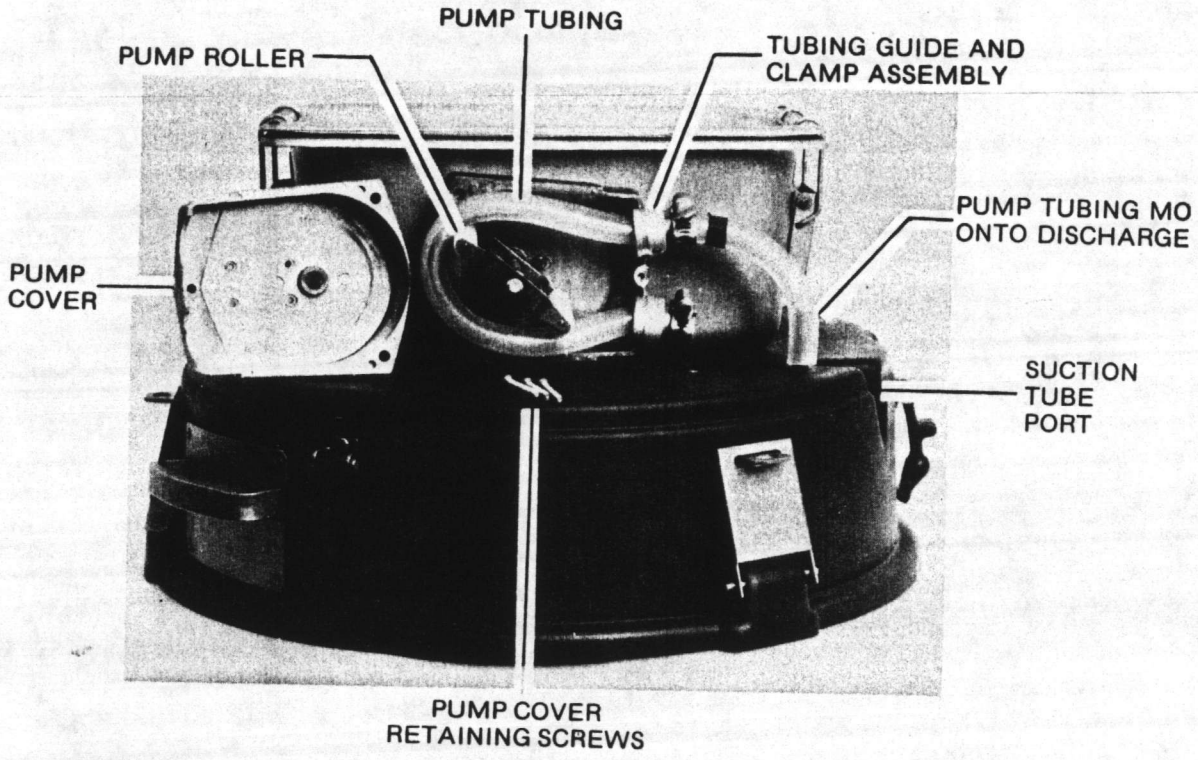


Figure 3.3-1 Model 1680 Pump with Outer Case Half Removed

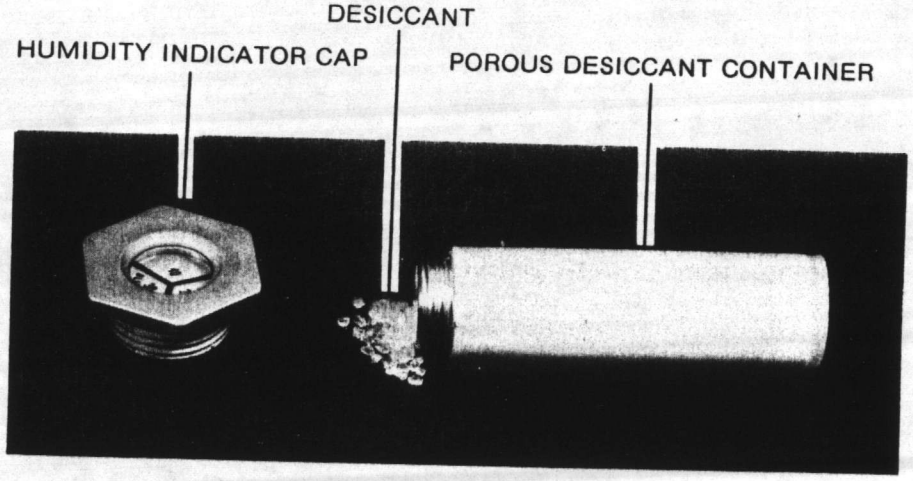


Figure 3.5-1 Disassembled Desiccant Cartridge

To install the new pump tubing, first reinstall the suction line, as described in paragraph 2.1.4. Then, replace and tighten the pump tubing guide and clamp assemblies, as shown in Figure 3.3-1. Be sure that pump tubing guide and clamp assembly at the outlet end of the pump tubing is positioned at the edge of the black band on the pump tube. The edge of the black band is located 13.5 inches (34.3 cm) from the inlet end of the pump tube and is used for placement of the outlet pump tubing guide and clamp assembly. This placement is critical to prolong the life of the pump tube and assure efficient operation and accurate delivery volumes.

The pump tubing guide and clamp assemblies may now be replaced in the inner pump case half so that their grooves mate with the semi-circular openings in the pump case. Slip the pump tubing under the rollers so that the pump tubing does not interfere with the installation of the outer pump case half. Replace the outer pump case half so that the grooves of the pump tubing guide and clamp assembly fit properly into both halves of the pump, and reinstall the three screws. Finally, force the outlet end of the pump tubing over the exposed end of the pump discharge tube approximately 1 inch (2.5 cm), as shown in Figure 3.3-1.

3.4 Replacement of Suction Tubing - It may be desirable to replace the sampler suction tubing for one of several reasons. The suction tubing may have been worn, cut, contaminated, or otherwise damaged. In the case of critical sampling, it may be necessary to replace the suction line between sampling programs, to avoid cross-contamination or it may be necessary to replace the suction line with a line of a different length, when changing sampling site conditions (as discussed in paragraph 2.2.1.6 above on the use of the SUCTION LINE LENGTH switch).

In any case, it is good practice to periodically inspect the suction line for damage. The suction line and the remainder of the pump tubing system should be cleaned occasionally as described in paragraph 3.1.2.

Replacement suction lines are available from ISCO in two forms. First, a complete suction line, with inlet ferrule and weighted strainer, is available in a 22 foot length for 1/4" ID suction tube and a 20 foot length for 3/8" ID suction tube. Second, bulk suction tube in the 1/4" ID and 3/8" ID tube is available in 100, 500, and 1000 foot rolls.

The following paragraphs discuss the replacement of the complete suction line-strainer assemblies, the sizing of the suction line, and the assembly and installation of the bulk tubing.

3.4.1 1/4 Inch ID Suction Line - The suction tube is removed from the pump by first removing the outer pump case half by unscrewing the three screws indicated in Figure 2.1-2. Extract the pump tubing and loosen the pump inlet tubing guide and clamp assembly, and slip it up the pump tube to expose the junction between the suction line and pump tube. Finally, pull the suction line out of the pump tube.

If a complete new suction line-strainer assembly of the standard 22 foot length is to be used, it is installed as described in paragraph 2.1.4.1.

If it is desired to utilize one of the two SUCTION LINE LENGTH switch settings shorter than 22 feet (14-2/3 feet or 7-1/3 feet), the suction line will have to be shortened. This is most conveniently done by first removing the strainer. Loosen the hose clamp securing the strainer to the suction tube, shown in Figure 2.1-3, and pull the strainer out of the suction tube. Shorten the suction line to the desired length by cutting it with a sharp knife. Reinstall the strainer and tighten the hose clamp. Finally, the shortened suction line may be installed in the pump as described in paragraph 2.1.4.1.

If it is desired to utilize one of the three SUCTION LINE LENGTH switch settings longer than 22 feet (29-1/3 feet, 36-2/3 feet, or 44 feet), and/or utilize bulk suction tubing, it will first be necessary to disassemble the old suction line, which was just removed. First, remove the small stainless steel ferrule from within the end of the suction line by slitting the tubing with a sharp knife. This ferrule is necessary to prevent the collapse of the pump and suction tubing when the pump tubing guide and clamp assembly is tightened. Then, remove the strainer and hose clamp from the opposite end of the suction line, as described above. Cut the new suction tube to the desired length, and force the

stainless steel ferrule into the end of the suction line, as described above. Cut the new suction tube to the desired length, and force the stainless steel ferrule into the end of the suction tube until the ends are flush. Install the strainer on the opposite end of the suction tube and tighten the hose clamp. The new suction line may now be installed in the pump as described in paragraph 2.1.4.1.

3.4.2 3/8 Inch ID Suction Line - The suction tube is removed from the pump by first removing the outer pump case half by unscrewing the three screws indicated in Figure 2.1-1. Extract the pump tubing and loosen the pump inlet tubing guide and clamp assembly, and slip it up the pump tube to expose the junction between the suction line and pump tube. Finally, pull the suction line out of the pump tube.

If a complete new suction line-strainer assembly of the standard 20 foot length is to be used, it is installed as described in paragraph 2.1.4.2.

If it is desired to utilize one of the five SUCTION LINE LENGTH switch settings shorter than 20 feet (16-2/3 feet, 13-1/3 feet, 10 feet, 6-2/3 feet, or 3/1/3 feet), the suction line will have to be shortened. This is most conveniently done by first removing the strainer. Loosen the hose clamp securing the strainer to the suction tube, shown in Figure 2.1-3, and pull the strainer out of the suction tube. Shorten the suction line to the desired length by cutting it with a sharp knife. Reinstall the strainer and tighten the hose clamp. Finally, the shortened suction line may be installed in the pump as described in paragraph 2.1.4.2.

If it is desired to utilize bulk suction tube in replacing the suction line, it will first be necessary to disassemble the old suction line, which was just removed. First, remove the small stainless steel ferrule from within the end of the suction line by loosening the hose clamp, and slipping the ferrule out of the tube. The ferrule serves as a union between the suction tubing when the pump tubing guide and clamp assembly is tightened. Then, remove the strainer and hose clamp from the opposite end of the suction line, as described above. Cut the new suction tube to the desired length, and force the stainless steel ferrule into the end of the suction tube, until approximately half of it is in the suction tube, and secure it in place with the hose clamp. Install the strainer on the opposite end of the suction tube and tighten the hose clamp. The new suction line may now be installed in the pump as described in paragraph 2.1.4.2.

3.5 Reactivation of the Desiccator - A desiccant cartridge is located in the lower left hand corner of the front panel. This cartridge will absorb any moisture which might be present in the control box. In time, the numbered areas under the glass face of the desiccant will turn light pink or white, beginning with the area number "20". This would mean that the humidity inside the control box is exceeding 20% relative humidity. When the "30" area turns light pink or white, but before the "40" area turns, replace the spent desiccant cartridge with the extra desiccant cartridge shipped with the Model 1680. The cartridge unscrews counter-clockwise from its mounting. If the "40" area of the indicator on the cartridge turns light pink or white before replacement, damage to the internal circuitry is a possibility. Of course, 40% relative humidity will do no damage, but this may also indicate that 100% relative humidity has been present. The control box may be opened for inspection for possible damage by checking for the presence of contaminants by following the instructions of paragraph 6.3.

To recharge the desiccator cartridge, first unscrew the cartridge from the control panel. Next, unscrew the white porous plastic section from the hexagonal aluminum cap and pour out the desiccant particles, as shown in Figure 3.5-1. Refill the plastic tube with the extra desiccant provided. Spent desiccant may be reactivated by heating at 250°F for 2 hours in an oven with good air circulation.

CAUTION

Do not attempt to reactivate the desiccator by placing the entire cartridge into a drying oven. The white porous tubular container is plastic and will melt.

3.6 Lubrication - The only bearings requiring lubrication are the bronze bearings of the pump housing. It is suggested that a small amount of silicone lubricant be placed on these bearings every six months or more often if they appear dry.

SOFTENERS BA138

LIQUI-DIAL
Automatic Liquid Conditioning Controls

CLA-VAL CO. - LIQUI-DIAL DIVISION · *Newport Beach, California*

Engineering Data

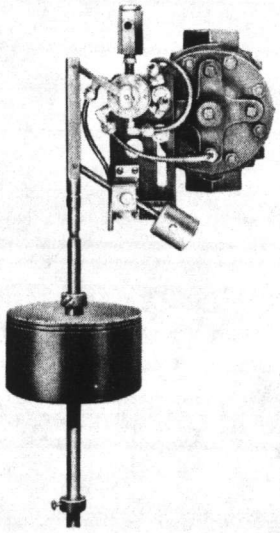
BRINE CONTROL VALVE

Clayton **122**

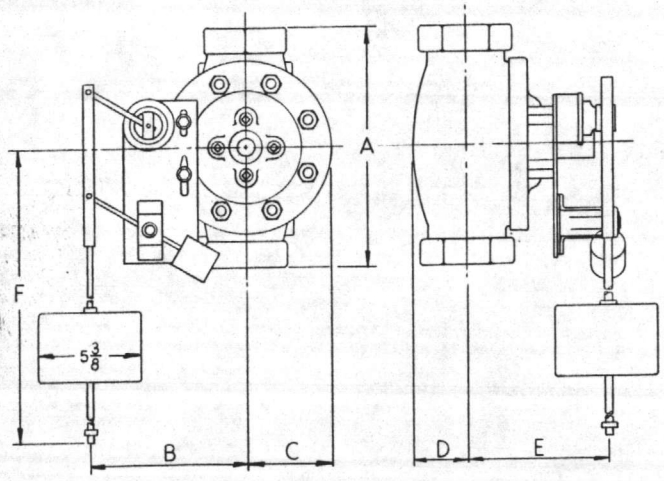
The CLAYTON 122 BRINE VALVE is used on brine measuring tanks to withdraw a measured amount of brine and then close. The brine measuring tank is refilled from a salt storage tank through a brine transfer valve, controlled by the 122 brine valve.

The 122 Brine Valve is hydraulically operated by line pressure conditions and responds to commands from the pilot control. The control is actuated by a float which moves freely up and down on a float rod with changing liquid levels. Operating points are easily adjusted by varying the location of stop collars on the float rod.

With the float in the high level position and the brine inlet line under vacuum, the 122 Brine Valve opens to allow a measured quantity of brine to be withdrawn and then closes. With the float in the low level position, the brine transfer valve is opened only after the system has completed the salt rinse step. When the brine reaches the high level in the measuring tank, the 122 Brine Valve closes the brine transfer valve.



DIMENSIONS



VALVE SIZE IN INCHES →		½	¾	1	1¼	1½	2	2½	3
DIMENSIONS IN INCHES	A	3½	3½	5½	7¼	7¼	9⅜	11	12½
	B	2⅝	2⅝	5½	6	6	6⅜	6⅞	7⅜
	C	1⅞	1⅞	2 3/16	2 13/16	2 13/16	3⅜	4	4⅝
	D	1	1	1⅝	2	2	2½	2⅞	3⅛
	E	3½	3½	4¾	5¼	5¼	5¼	6¾	6½
	F	55	55	55	55	55	55	55	55

SPECIFICATIONS

SIZES	½″ to 3″ Screwed 1″ to 3″ Flanged available
PRESSURE CLASS	125 ASA and 250 ASA
PRESSURE RATINGS	*Maximum:* 125 ASA - 175 psi 250 ASA - 300 psi
TEMPERATURE RANGE	— 40° F. to + 160° F.
FLUIDS	Water and Salt Brine
MATERIALS	*Main Valve Body and Cover:* ⅜″ - ¾″ Bronze ASTM B-61 1″ - 3″ Cast Iron ASTM A-48 *Main Valve Trim:* Bronze ASTM B-61 *Pilot Control:* Bronze ASTM B-61 *Pilot Control Trim:* Stainless Steel Bar AISI 303 *Float Ball:* Plastic *Float Rod and Stop:* Plastic
SPECIAL MATERIALS	Cast steel, bronze and aluminum available at extra cost
ADJUSTMENT RANGE	42″ maximum.

INSTALLATION

For installations where salt storage is provided in a tank separate from the brine measuring tank, the Clayton 122 Brine Control Valve offers a positive means of performing the functions of:

1. Controlling the volume of brine to be withdrawn.
2. Controlling brine tank refill from a salt storage tank.

Only one ejector and ejector supply line is required on multiple tanks. The direction of the brine to the proper unit of a multiple unit installation is controlled by individual softener unit valves.

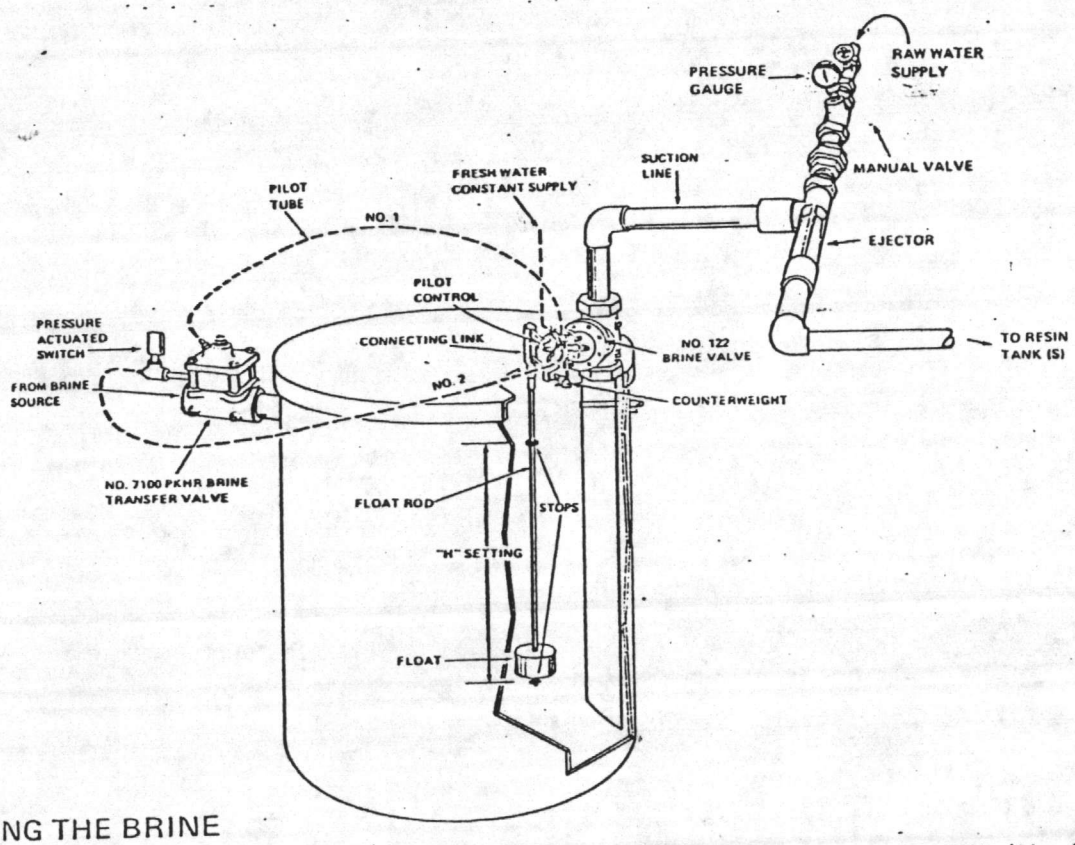
FEATURES

- Automatically opens to allow a measured quantity of brine to be withdrawn—and then closes.
- After the rinse operation, opens the brine transfer valve to fill the measuring tank from the salt storage. Closes the brine transfer valve when the brine measuring tank is filled.
- Volume of brine to be withdrawn can be adjusted by setting the float stop positions.
- Drip tight closure maintained after measuring tank refill.

BRINE-TANK PREPARATION
(Brine-Measuring Tank)

A. FILLING THE TANK

1. Make sure that the "H" setting has been adjusted properly as described in the installation instructions.
2. Connect a fresh water supply to the pilot control of the No. 122 valve.
3. Open the supply valve to the brine ejector.
4. When water pressure is supplied to the pilot control of the No. 122 valve and the float is in the low position, pressure is directed through pilot tubing No. 2 to the No. 7100, brine-transfer valve which causes it to open. This will allow brine to flow into the tank. If a brine pump is used, a pressure switch located on the No. 7100 valve will send a signal to start the pump.
5. The brine tank will fill until the float reaches the top stop. At this point, pressure is relieved from Tube No. 2 and applied to Tube No. 1 which causes the brine transfer valve to close. If a brine pump is used, the pressure switch will signal the pump to stop.



B. DRAWING THE BRINE

1. Manually rotate the position dial on the cycle controller to the BRINE/RINSE (No. 3) position. Water will begin to flow through the ejector creating a vacuum on the brine line to the No. 122 valve.
2. With the control in the "float up" position, and a vacuum present, the No. 122 valve opens to allow brine to flow through the ejector into the softener tank.
3. When the level in the tank drops to a pre-set point, the valve will close, preventing air from entering the system.
4. The valve will stay closed until the brine line is repressurized.
5. Manually rotate the position dial to the FLUSH (No. 4) position and purge brine from the softener tank for 20 minutes. With the cycle controller in the FLUSH position, the brine line will pressurize and allow the measuring tank to refill.
6. Return the position dial to the SERVICE (No. 1) position.

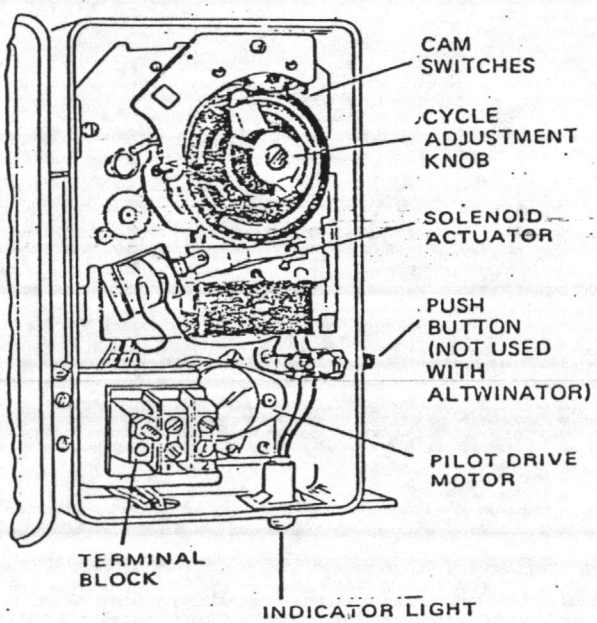
ELECTRICAL CHECK-OUT

A. CYCLE-CONTROLLER CHECKOUT

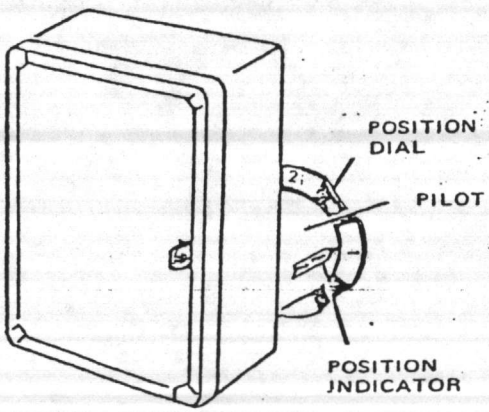
1. Close manual brine valve and brine refill, to prevent loss of brine during check-out.
2. Turn main power switch to the OFF position.
3. Turn cycle-adjustment knob clockwise until red arrow points downward, to "6 o'clock" position. (This is to make certain it is not in any of the switching sequences at the start of the check.)
4. Turn the position dial on the pilot valve to the No. 1 position.
5. Turn on main electric-power switch.
6. Turn the cycle-adjustment knob slowly clockwise until you feel resistance. This indicates that the cam on the adjustment knob has contacted the tripper switch.
7. Allow the tripper switch to actuate automatically. It will take about two minutes. The position dial will slowly advance 90 degrees and stop automatically at BACKWASH (No. 2) position. The first portion of this check is completed and electrical circuits are operational.
8. Advance cycle adjustment knob until you feel its cam contact a second switch. Again, allow it to trip automatically and rotate the position dial to BRINE AND RINSE (No. 3) position.
9. Using the same procedure, allow the cycle adjustment knob to advance to FLUSH (No. 4) position and then to SERVICE (No. 1) position. At this point, drain flow will stop, and cycle adjustment knob will continue slowly until it comes to rest at IDLE position.

RED ARROWHEAD FACES DOWN FOR "SERVICE" POSITION

NOTE: BE SURE THAT CONTROLLER IS IN "IDLE" POSITION.

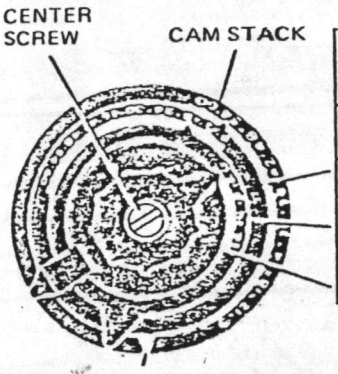


(CONTROLLER SHOWN ABOVE IS ELECTRIC-SIGNAL UNIT)



AUTOMATIC CYCLE CONTROLLER
CYCLE-TIME SETTINGS

The cycle controller's cycle-adjustment knob is used to control the duration of the different stages of the regeneration. It is factory pre-set for the average operating conditions. For the precise settings for your system, refer to the "SPECIFIC OPERATION" section of this book.



RED ARROWHEAD MUST FACE DOWNWARD FOR "SERVICE" POSITION.

NORMAL CAM SETTINGS FOR STANDARD CONTROLLERS

	REGENERATION SEQUENCE		
	BACKWASH before BRINE/RINSE		
SCALE COLOR	INDICATES DURATION OF	NORMAL SETTING	DURATION MINUTES
RED	BACKWASH	12	12
WHITE	BRINE/RINSE AND FAST FLUSH	74 (54+20)	54
YELLOW	FAST FLUSH ONLY	20	20

To obtain proper white scale setting, the desired Fast Flush time must be added to the BRINE/RINSE setting since the white and yellow scales are cumulative.

HOW TO CHANGE SETTINGS

First loosen center screw of cam stack.

To change BACKWASH setting:

Lift and rotate the cam with white markings. Set the arrow of this cam at the desired time on the Red scale. Make sure cam seats squarely and firmly.

To change BRINE/RINSE & FAST FLUSH:

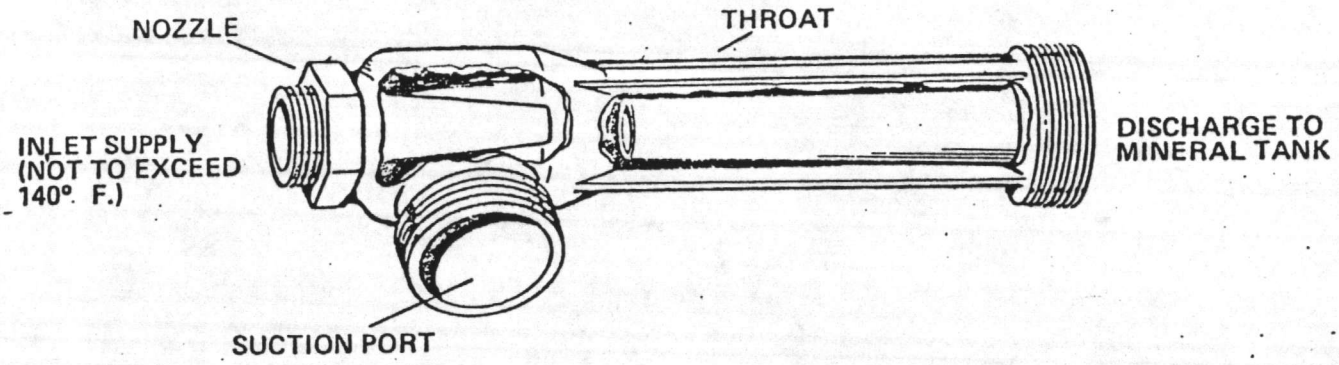
Lift and rotate the cam with yellow markings. Set the arrow of this cam at the desired time on the White scale, making sure cam seats properly. Note that the actual White scale setting must always include the FAST FLUSH time (see above).

To change FAST FLUSH setting:

Lift and turn top portion of knob, setting the pointer at the desired time on the Yellow scale. Any increase must also be added to the White scale setting.

The entire cam stack should turn freely CLOCKWISE when all cams are firmly seated and fastened by the center screw.

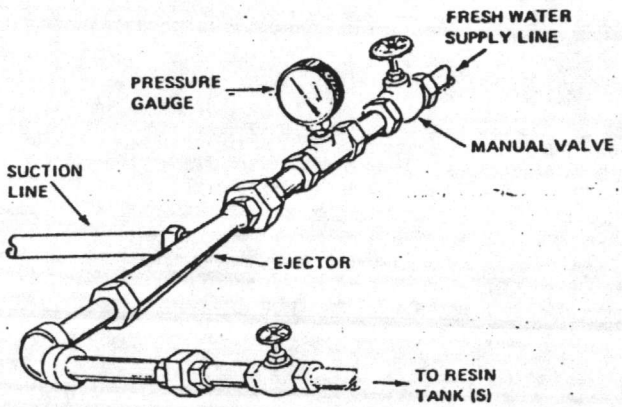
EXTERNAL EJECTORS — OPERATION AND SERVICE



The purpose of the ejector is to draw regenerants (salt-brine softeners, potassium permanganate filters) from the storage container and inject this liquid into the resin tank. Once the proper amount of regenerant is withdrawn, the ejector provides rinse water to displace this liquid from the mineral tank. The ejector, mounted separate from the multiport valve, has an external source of water pressure as shown below.

Water pressure, necessary to operate the ejector, is applied to a restriction called the NOZZLE. Water moving through this nozzle under pressure will increase tremendously in velocity. This high-velocity flow will cause a vacuum to develop in the suction port, which draws the regenerant from the storage container into the ejector.

The nozzle flow will force the regenerant to enter the THROAT area causing a 50/50 mixture of fresh water and regenerant to occur. This mixture is then discharged from the ejector into the resin tank. This is possible because, during the BRINE/RINSE (No. 3) cycle, the resin tank is not under line pressure.



SERVICE

Failure to draw brine—

1. Ejector nozzle plugged. To correct this condition, disconnect inlet water supply to ejector and remove obstruction from nozzle.
2. Lack of inlet pressure. Pressure at the inlet of the ejector should be at least 30 psi while the softener is in the BRINE/RINSE (No. 3) phase.

EJECTOR DATA TABLE

Diameter of Mineral Tank	Part No. of Complete Ejector	Identification Number	Inlet Supply Line Size (NPT)	Suction and Discharge Size (NPT)	Nozzle Size (Drill Size)	Throat Size (Drill Size)	Rinse Rate (At 50 PSI)
30"	A-1365-1	62A STD.	3/8"	3/4"	20	3/8"	5.4 gpm
36"	A-1365-7	62A MOD.	3/8"	3/4"	15	3/8"	7.0 gpm
42"	A-1365-2	63A STD.	1/2"	1"	7	1/2"	8.5 gpm
48"	A-1365-3	64A STD.	3/4"	1¼"	1/4"	5/8"	13.9 gpm
54"	A-1365-8	64A MOD.	3/4"	1¼"	17/64"	5/8"	15.5 gpm
60"	A-1365-4	65A STD.	1"	1½"	5/16"	45/64"	21.4 gpm
66"	A-1365-9	65A MOD.	1"	1½"	21/64"	49/64"	23.6 gpm
72"	A-1365-5	66A STD.	1¼"	2"	3/8"	15/16"	30.0 gpm
84"	A-1365-11	66A MOD.	1¼"	2"	13/32"	15/16"	37.5 gpm
96"	A-1365-6	67A STD.	1½"	2½"	1/2"	1¼"	53.4 gpm
108"	A-1365-13	67A MOD.	1½"	2½"	17/32"	1¼"	62.0 gpm
120"	A-1365-15	68A STD.	2"	3"	5/8"	1 21/32"	87.0 gpm

AUTOMATIC CYCLE CONTROLLER – SERVICE
ELECTRIC-SIGNAL ACTUATED

TIMER MECHANISM REPLACEMENT

1. Disconnect power supply to cycle controller.

2. Open cycle-controller case and remove timer mechanism by removing pan-head machine screw on the left side of timer and tilting it forward. Disconnect power leads and interconnecting leads from the pilot drive assembly.

3. Reconnect wire leads to replacement mechanism. Refer to wiring diagram.

4. To install timer mechanism, locate the bottom of the assembly in the tabs of the controller case. Push timer mechanism into controller case and replace pan-head machine screw.

5. Reconnect electrical power.

6. Refer to PHASING ADJUSTMENTS for final setting.

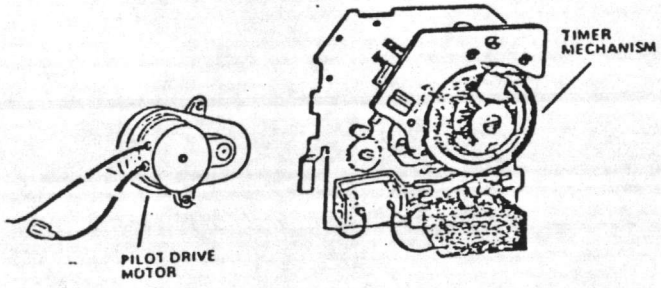
TIMER-DRIVE MOTOR REPLACEMENT

1. Refer to steps 1 & 2 under TIMER MECHANISM REPLACEMENT.

2. Drive motor is held in place with 2 machine screws. Remove machine screws and disconnect motor leads.

3. Install replacement drive motor, making certain gears are properly engaged. Securely tighten the machine screws and reconnect motor leads. (Refer to wiring diagram.)

4. Replace timer mechanism following steps 3, 4, 5, 6 under TIMER MECHANISM REPLACEMENT.



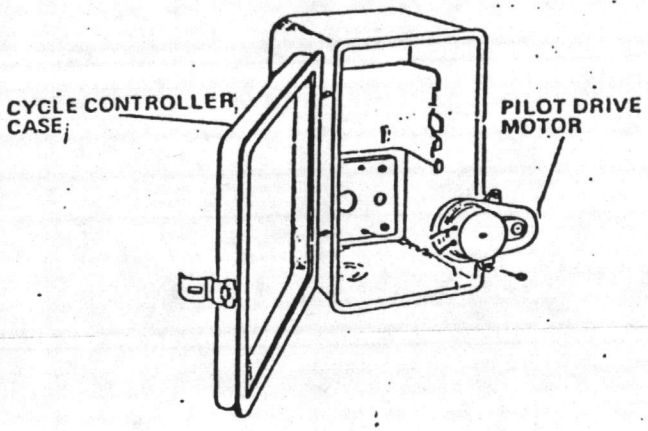
PILOT-DRIVE MOTOR REPLACEMENT

1. Refer to steps 1 & 2 under TIMER MECHANISM REPLACEMENT. Remove terminal strip bracket by loosening the 4 sheet-metal screws on the outside of the cycle-controller case.

2. Pilot-drive motor is held in place with 2 sheet-metal screws. Remove sheet-metal screws and disconnect motor leads.

3. Install replacement drive motor, making certain gears are properly engaged. Securely tighten the sheet-metal screws & reconnect motor leads. (Refer to wiring diagram.) Replace terminal-strip bracket.

4. Replace timer mechanism following steps 3, 4, 5, 6 under TIMER MECHANISM REPLACEMENT.



CAM GEAR OR MICRO-SWITCH REPLACEMENT

1. Refer to steps 1 & 2 under TIMER MECHANISM REPLACEMENT. Remove terminal-strip bracket by loosening the 4 sheet-metal screws on the ouside of the cycle-controller case.

2. Remove 3 pan-head machine screws holding retainer plate with pilot-drive motor in place. Retainer plate with motor can now be removed for access to cam gear and micro-switch.

3. Remove cam gear. Micro-switch with actuator is held in place with 2 round-head machine screws. To replace micro-switch assembly, remove screws, actuator, micro-switch, and insulators. Disconnect wire leads.

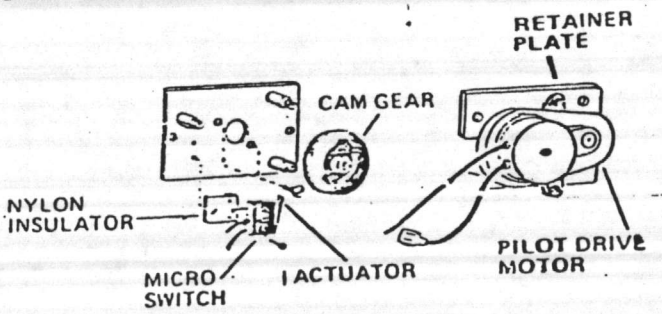
4. When installing replacement micro-switch assembly, components MUST be positioned in the following order: nylon spacer, micro-switch, fiber insulator, switch actuator. Replace 2 round-head machine screws with lock washers.

5. Replace cam gear, making certain that the lobes face rear of timer case. NOTE: When installing cam, extreme care must be used to prevent micro-switch actuator from becoming damaged.

6. After cam gear has been installed, rotate cam in a CLOCKWISE direction to verify micro-switch operation. Re-positioning of micro-switch closer to cam may be necessary.

7. Reinstall retainer plate with drive motor, making certain gears mesh properly. Securely tighten 3 pan-head machine screws. Reconnect wire leads, referring to diagram. Replace terminal strip bracket.

8. Replace timer mechanism, following steps 3, 4, 5, 6 under TIMER MECHANISM REPLACEMENT.



AUTOMATIC CYCLE CONTROLLER – SERVICE

PILOT SPOOL REMOVAL

1. Shut off hard-water inlet and treated-water outlet and any external source of pressure to the pilot. If system is equipped with an external ejector, this supply must also be closed.

2. Manually rotate the Position Dial on the Pilot Valve to the BACKWASH position (No.2) to relieve pressure.

3. Remove pan head retaining screw at rear of pilot body. Grasp position dial and pull pilot spool from pilot body.

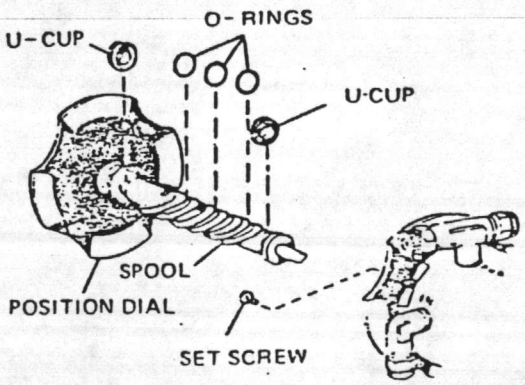
PILOT SPOOL REPLACEMENT

1. If replacement seals are required, be certain the respective U-cup grooves and O-ring seal areas are clean and free of any dirt, nicks, scratches, etc.

NOTE: U-cups must be installed on the spool with the lips facing each other.

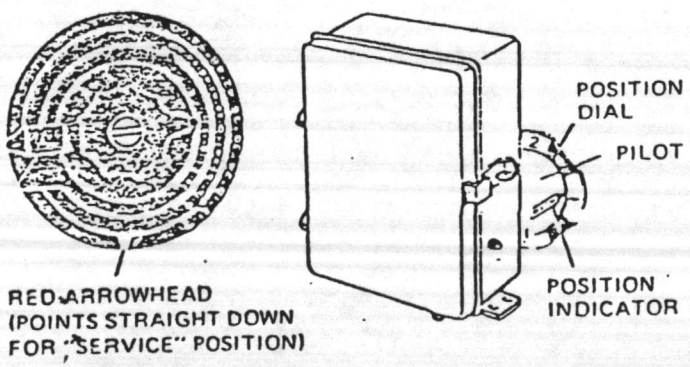
2. LIGHTLY lubricate all seals with silicones grease and reinstall spool into pilot body. Rotate slowly until spool is fully seated into pilot body. Replace pan-head retaining screw.

3. Reopen inlet and outlet valves. Restore pressure to external injector and pilot body if required.



PHASING ADJUSTMENTS

Make certain the red arrow on the cycle adjustment knob is pointing straight down and the Position Dial at the rear of the pilot body indicates SERVICE (No. 1).



PILOT BODY REMOVAL

1. Shut off hard-water inlet and treated-water outlet and any external source of pressure to the pilot. If the system is equipped with an external injector, this supply must also be closed.

2. Remove all pilot tube connections from the pilot-valve body.

3. Disconnect power supply to cycle controller.

4. Open cycle controller case and remove timer mechanism by removing pan-head machine screw on the left side of timer mechanism and tilting timer forward. Remove terminal strip bracket by loosening the 4 sheet-metal screws on the outside of the cycle-controller case. Disconnect power leads and inter-connecting leads from the pilot drive assembly.

5. Remove 3 pan-head machine screws holding retainer plate with pilot-drive motor in place. Retainer plate with motor can now be removed.

6. Remove cam gear. The pilot-valve body can now be removed from the cycle-controller case by loosening the 2 pan-head machine screws located behind the cam.

PILOT BODY REPLACEMENT

1. When inserting replacement pilot valve body to rear of cycle controller, make certain the word "TOP" faces upward. Securely tighten the 2 pan-head machine screws.

2. Replace cam gear making certain lobes face rear of timer case. (Refer to parts breakdown.)

NOTE: When installing cam, extreme care must be used to prevent micro-switch actuator from becoming damaged.

3. After cam gear has been installed, rotate cam in a CLOCKWISE direction to verify micro-switch operation. Repositioning of micro-switch closer to cam may be necessary.

4. Reinstall retainer plate with drive motor, making certain gears mesh properly. Securely tighten 3 pan-head machine screws. Replace terminal-strip bracket.

5. Reconnect wire leads referring to wiring diagram. To install timer mechanism, locate the bottom of the assembly in the tabs of the controller case. Push timer mechanism into controller case and replace pan head machine screw. Replace face plate.

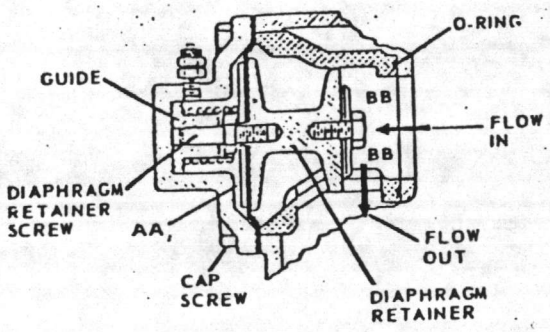
6. Reconnect pilot tubing to pilot valve body.
NOTE: Numbers on pilot body must correspond with numbers on multiport valve.

7. Reopen inlet and outlet valves. Restore pressure to external injector and pilot body if required.

8. Reconnect power to cycle controller.

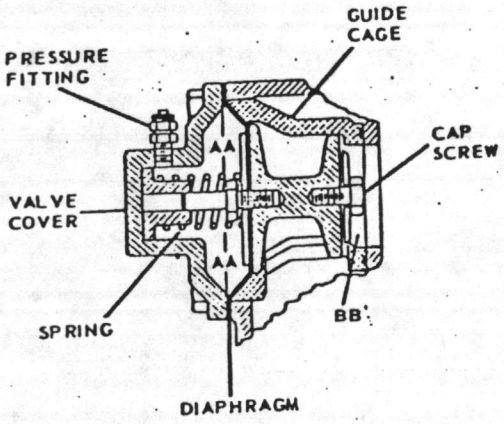
9. Refer to PHASING ADJUSTMENTS for final timer setting.

VALVE-PORT OPERATION AND SERVICE



VALVE SHOWN IN OPEN POSITION

To open valve port...chamber "AA" is vented to atmosphere. Pressure at seat area "BB" overcomes spring tension and forces the diaphragm assembly to open allowing flow through valve port.



VALVE SHOWN IN CLOSED POSITION

To close valve port...pressure is applied to chamber "AA". This pressure along with a spring assist causes the diaphragm assembly to seat at area "BB". Once seated the diaphragm assembly is held closed because the surface area in chamber "AA" is larger than that of seat "BB".

VALVE PORT DISASSEMBLY

1. Shut off the inlet and outlet valves and supply line to external ejector (if furnished.)
2. Manually rotate the Position Dial on the Pilot Valve to the BACKWASH position (No. 2) to relieve tank pressure.
3. Remove the mineral tank cover and drain the tank down to a level below the valve casting.
4. Remove 4 hex-head cap screws holding valve cover to casting. Valve cover can now be removed along with helper spring. (NOTE: It is not necessary to disconnect pilot tubing unless cover replacement is necessary.)
5. Diaphragm assembly can now be removed from casting along with guide cage and guide cage O-ring. (NOTE: O-ring may adhere to inside of valve casting.)

DIAPHRAGM REPLACEMENT

1. For diaphragm replacement, remove diaphragm retainer screw and lock washer and diaphragm washer. Diaphragm can now be removed.
2. Position replacement diaphragm as shown in valve port detail "CLOSED" (shown above).
3. Install diaphragm washer with rounded edge against diaphragm. Replace lock washer. Securely tighten diaphragm retainer screw.

SEAT-WASHER REPLACEMENT

1. For seat washer replacement, remove hex head cap screw lock washer and seat washer retainer. Rubber seat washer can now be removed.
2. Install replacement-seat washer and seat-washer retainer. Seat-washer retainer must be positioned so chamfered edge leads away from seat washer (see above drawing). Replace lock washer and securely tighten hex-head cap screw.

VALVE-PORT REASSEMBLY

1. Inspect and clean, if necessary, guide cage O-ring seal area in valve casting.
2. Inspect and clean, if necessary, guide cage O-ring groove and O-ring. Inspect guide cage seat area for nicks, scratches, gouges etc. If defects are noted on this seat, guide cage MUST be replaced.
3. Lubricate guide cage O-ring with silicone grease or vasoline and reinstall guide cage in casting.
4. Insert diaphragm assembly into guide cage. Replace helper spring*, valve cover and securely tighten 2 hex-head cap screws. Reconnect pilot tube, if removed.

(*NOTE: Valve ports No. 1, 2, 4, & 5 MUST have long helper spring. Valve Port No. 6 MUST have short helper spring.)

RETURN OF EQUIPMENT TO SERVICE

1. With the valve reassembled, the tank cover off, and the unit in the backwash position, open the inlet valve to refill the mineral tank with water. After the unit is filled, replace the tank cover and index the unit to the service position.
2. Open outlet valve and supply line valve to external injector (if furnished). Make certain that the Manual By-Pass valve is closed.

NEW DIAPHRAGMS are stiff, and initially may not permit the valves to close tightly. Close the manual brine valve and slowly turn the Position Dial clockwise 3 to 6 complete revolutions. This will open and close the valves several times stretching the diaphragm sufficiently to provide a proper seal. Return Position Dial to SERVICE (No. 1) position, and open manual brine valve.

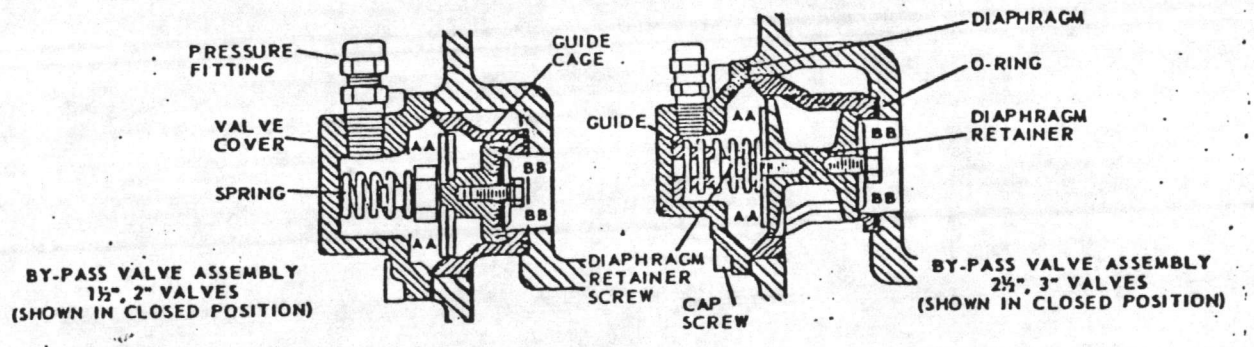
BY-PASS VALVE NO. 17 (1½"–3" VALVES)

One of the features this multiport valve provides is a raw-water by-pass during the entire regeneration cycle. While the by-pass water is untreated, it will prevent salt brine or backwash water from entering the service lines. The by-pass assembly is operational only on single units. On twin or multiple-unit applications the by-pass is rendered inoperative.

When chamber "AA" is vented to atmosphere, pressure at seat area "BB" overcomes spring tension, forces the diaphragm assembly to open, and allows the flow of by-pass water.

The various sizes of multiport valves which are available (1" thru 3") necessitate variations in the by-pass construction. By-pass valve construction details, and methods for rendering by-pass inoperative (for twin or multiple applications), are shown below.

To close valve port, pressure is applied to chamber "AA" This pressure, along with a spring assist, causes the diaphragm assembly to seat at area "BB". Once seated, the diaphragm assembly is held closed because of the surface area in chamber "AA" is larger than that of seat "BB". With valve port closed, the flow of by-pass water is stopped.



BY-PASS VALVE-PORT DISSASSEMBLY

1. Shut off the inlet and outlet valves and the supply line to external ejector (if furnished.)

2. Manually rotate the Position Dial on the Pilot Valve to the BACKWASH (No. 2) position to relieve tank pressure.

3. Remove the resin-tank cover, and drain the tank down to a level below the valve casting.

4. Remove the 4 hex-head cap screws holding valve cover to casting. Valve cover and now be removed along with helper spring (NOTE: It is not necessary to disconnect pilot tubing unless cover replacement is necessary.)

5. Diaphragm assembly can now be removed from casting along with guide cage and guide cage O-ring. (NOTE: O-ring may adhere to inside of valve casting.)

DIAPHRAGM REPLACEMENT

1. For diaphragm replacement, remove diaphragm retainer screw, lock washer, and diaphragm retainer(s). Diaphragm can now be removed.

NOTE: By-pass assemblies used on 1½" and 2" valves have a removable diaphragm retainer under the diaphragm.

2. Position replacement diaphragm as shown in valve port detail "CLOSED" (shown above).

3. Install diaphragm retainer(s) with rounded edge against diaphragm. Replace lock washer, and securely tighten diaphragm-retainer screw. NOTE: On 1½" and 2" valves install lower diaphragm retainer, replacement diaphragm, and upper diaphragm retinaer. On 2½" and 3" valves, only 1 diaphragm retainer is required.

SEAT-WASHER REPLACEMENT

1. For seat-washer replacement, remove hex-head cap screw, lock washer, and seat-washer retainer. Rubber seat washer can now be removed.

2. Install replacement seat washer and seat-washer retainer. Seat-washer retainer must be positioned so chamfered edge leads away from seat washer. Replace lock washer and securely tighten hex-head cap screw.

BY-PASS VALVE-PORT REASSEMBLY

1. Inspect and clean, if necessary, the guide cage O-ring seal area in valve casting.

2. Inspect and clean, if necessary, the guide cage O-ring groove and O-ring. Inspect guide-cage-seat area for nicks, scratches, gouges, etc. If defects are noted on this seat, cage MUST be replaced.

3. Lubricate guide-cage O-ring with silicone grease or vaseline, and reinstall guide cage in casting.

4. Insert diaphragm assembly into guide cage. Replace helper spring and valve cover, and securely tighten 4 hex-head cap screws. Reconnect pilot tube if removed.

RETURN OF EQUIPMENT TO SERVICE

1. With the valve reassembled, the tank cover off, and the unit in the BACKWASH (No. 2) position, open the inlet valve to refill the mineral tank with water. After the unit is filled, replace the tank cover and index the unit to the SERVICE (No. 1) position.

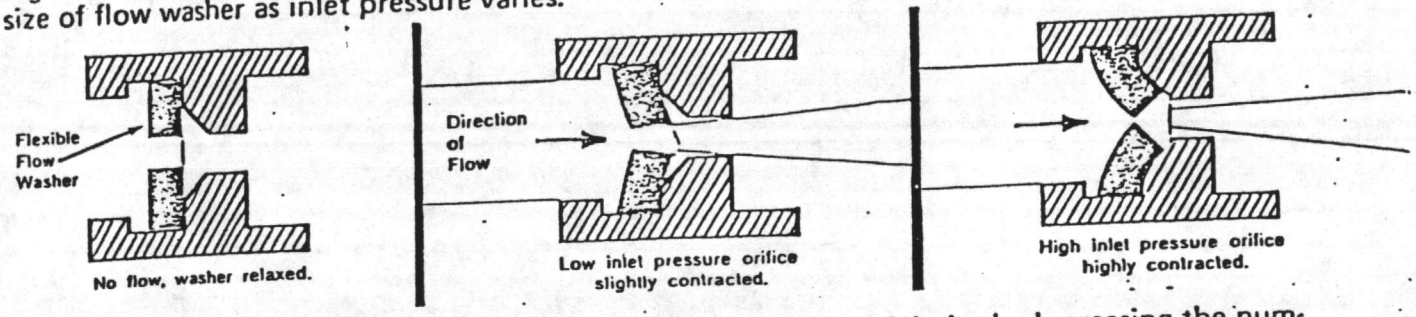
2. Open outlet valve and supply line valve to external injector (if furnished). Make certain Manual By-Pass valve is closed. NEW DIAPHRAGMS are stiff and initially may not permit the valves to close tightly. Close the manual brine valve and slowly turn the Position Dial clockwise 3 to 6 complete revolutions. This will open and close the valves several times stretching the diaphragm sufficiently to provide a proper seal. Return Position Dial to Service (No. 1) and open manual brine valve.

TWIN AND MULTIPLE UNITS: The by-pass valve is normally not used with twin or multiple unit installations. On those units the by-pass valve is present but is held closed with a constant source of pressure.

BACKWASH CONTROLLERS – OPERATION AND SERVICE

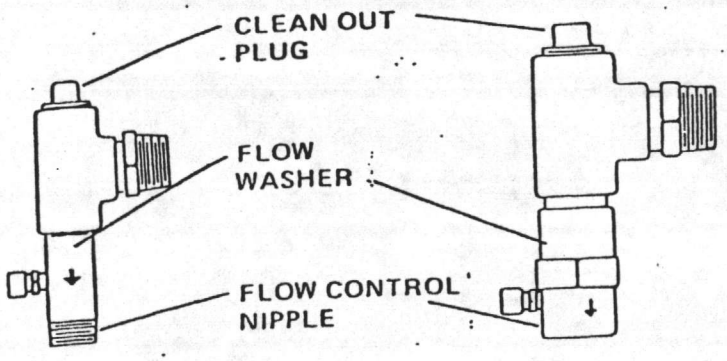
The purpose of the controller is to regulate the up-flow backwash required to expand and agitate the media in the resin tank. The controller will allow maximum expansion of this medium, while preventing any loss to the drain.

The flow-control principle is simple and trouble-free. The specified rate of flow will be constant regardless of inlet-pressure variations. This is accomplished by the automatic change in orifice size of flow washer as inlet pressure varies.

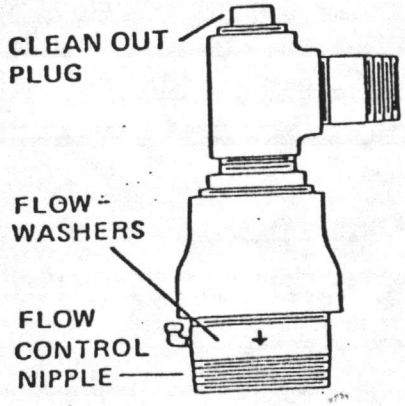


The flow washer is installed, either singly or in multiple, in a special nipple. Increasing the number of flow washers can achieve any desired backwash rate.

TYPICAL BACKWASH-CONTROL ASSEMBLIES



The controllers shown above use only one flow washer.



The controller shown above uses more than one flow washer.

Occasionally, the Backwash Controller may become plugged with scale, rust, or other foreign material. If this occurs, cleaning is required. This can be done while the softener is in the SERVICE (No. 1) position and under pressure.

BACKWASH-CONTROLLER DISASSEMBLY

1. Remove cleanout plug and inspect the flow-washer area.
2. Remove any foreign material lodged in or near the flow washer(s).

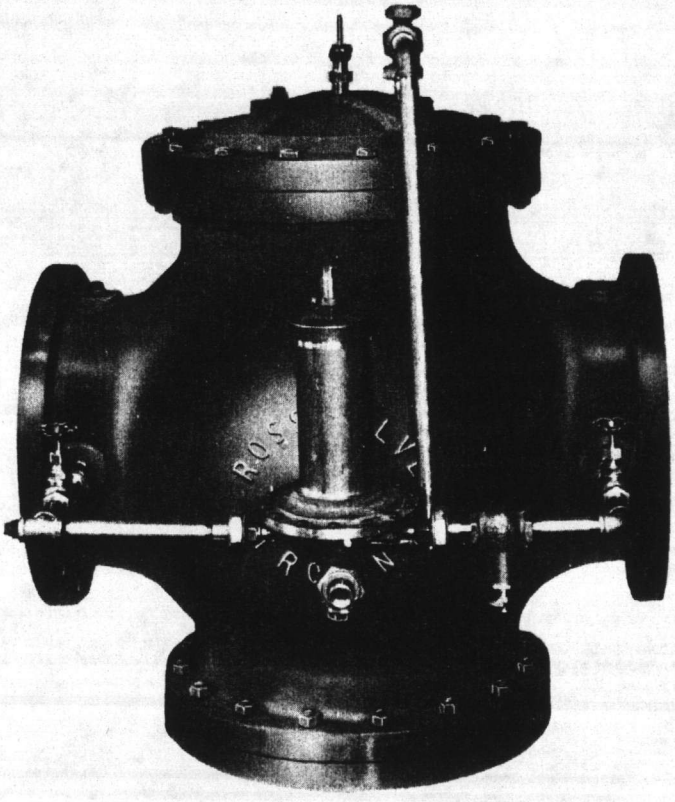
   (NOTE: AVOID USING A SHARP OBJECT WHICH MIGHT CUT OR DAMAGE THE RUBBER FLOW WASHER. SHOULD IT NOT BE POSSIBLE TO CLEAR THE CONTROLLER THROUGH THE CLEANOUT PLUG, REMOVAL OF THE FLOW CONTROL NIPPLE WILL BE REQUIRED TO GAIN BETTER ACCESS OF THE FLOW-WASHER AREA.)
3. If removal of the Flow Control nipple is necessary, disconnect the flexible tubing from the compression fitting. Carefully separate the nipple from both the drain line and the Brunermatic valve. Inspect and clean flow washer(s).

BACKWASH CONTROLLER REASSEMBLY

1. When replacing the Flow Control nipple, make certain the compression fitting is downstream from the flow washer.
2. Connect the flexible tubing to the compression fitting located in the side of the Flow Control nipple.
3. Insert and tighten cleanout plug.

SINGLE ACTING ALTITUDE VALVE

Instructions for
Installation - Operation - Inspection - Maintenance



Model 30 AWR

ROSS VALVE MANUFACTURING CO.
INCORPORATED

TROY, NEW YORK

SINGLE ACTING ALTITUDE VALVE

Model 30AWR

Installation - Operation - Inspection - Maintenance

The Single Acting Altitude Valve permits flow into tank, reservoir, or basin and prevents overflow by shutting off when water level is within 3 to 12 inches of desired elevation.

The stem of this valve has no throttling action because it assumes only two possitions, wide open and closed.

Shipment: When shipped, the valve is tagged with all necessary identification marks. On test before shipment, the valve is adjusted so that it is prepared to operate when installed (¾ " gate valves in external controls must be open).

Installation: 1. Flush line before inserting valve.

2. Place valve in line with flange marked "tank side" toward tank or basin; and flange marked "inlet" toward the distribution or source of supply. **Caution:** Do not obstruct vent hole at bottom of valve. Allow enough clearance above valve for removal of stem for repacking.

3. If external piping and controls are not attached to valve when shipped, connect couplings identified with tags which are numbered.

Pet Cocks are provided for attaching gauges to back side of main valve.
The Indicator No. 20 shows position of stem.

A ¾ " plugged Tee is provided on downstream side of control piping for connection of separate static pressure line from tank (when required).

Starting Operation: 1. Fill tank by means of by-pass gate valve (if there is a by-pass).

Caution: Arrow on pilot valve body points in direction of flow through pilot valve to waste. Flow is from top cap of the main valve to waste.

2. Open shut off valves in control piping.

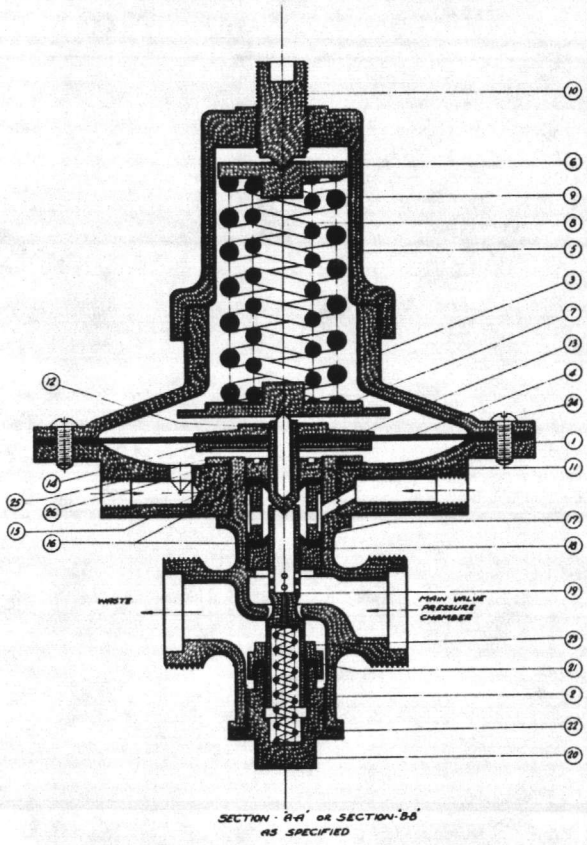
3. Open main line gate valve on tank side of valve.

4. Open main line gate valve on inlet side of valve slowly.

5. When elevation of water in tank or basin reaches the maximum desired height, the altitude valve should be completely closed.

(**Note**—To increase maximum elevation, turn pilot valve regulating screw clockwise; and to lower water elevation, turn regulating screw counter-clockwise.)

Pilot Valve

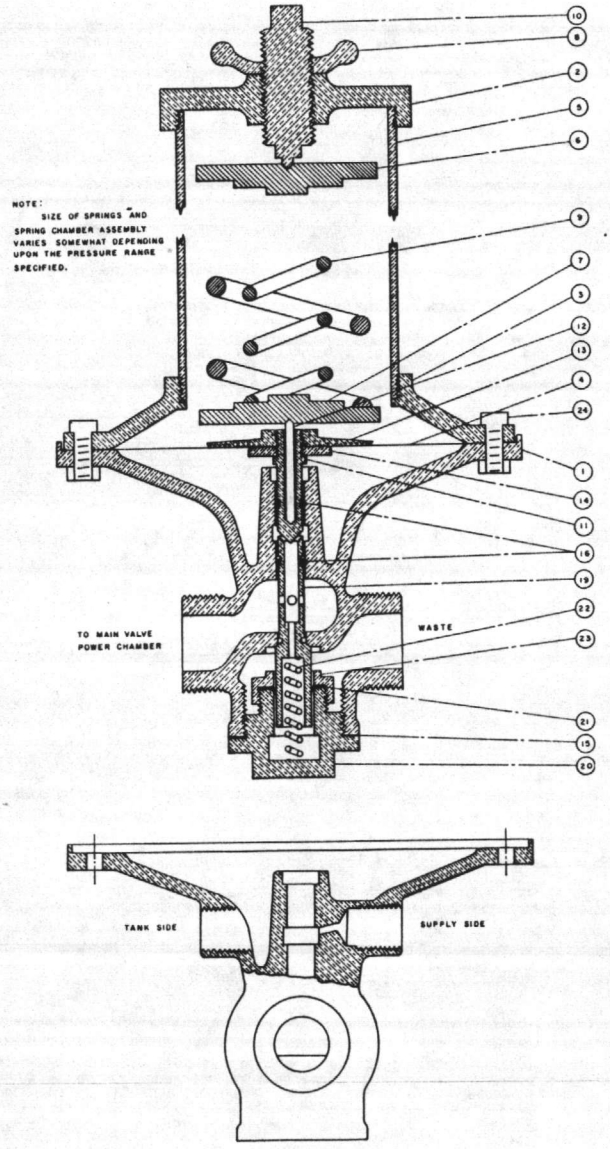


(Old Style — .04 and .05)

Note: Part No. 2, Lower Shell, usually assembled 90° from position shown

Parts List

1. Upper Shell
2. Lower Shell
3. Diaphragm Cover
4. Diaphragm
5. Spring Chamber
6. Spring Washer, Top
7. Spring Washer, Bottom
8. Inner Spring
9. Outer Spring
10. Adjusting Screw
11. Upper Stem
12. Centering Pin
13. Diaphragm
14. Diaphragm Button
15. Upper Packing Nut
16. Upper Packing (2)
17. Thimble
18. Spacer
19. Lower Stem
20. Bottom Cap
21. Lower Packing
22. Bottom Spring
23. Lower Packing Nut
24. Diaphragm Bolt
25. Lock Nut
26. Packing



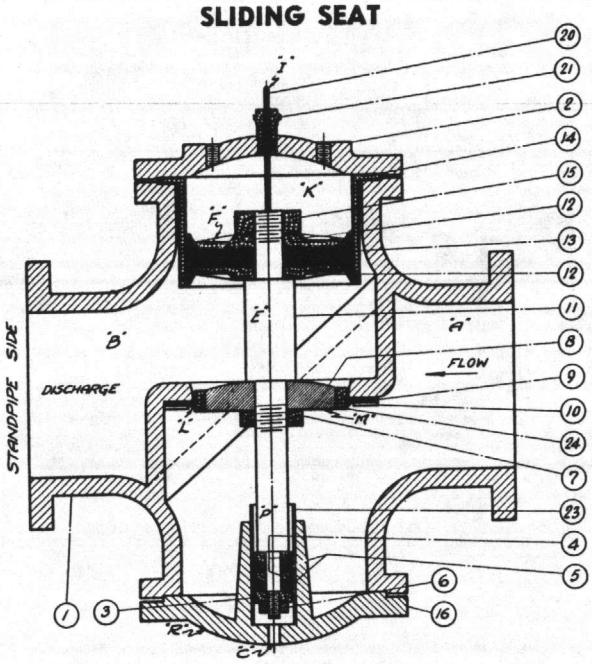
(New Style — .06)

Parts List

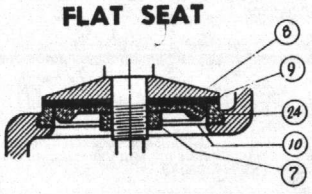
1. Shell
2. Spring Chamber Top
3. Diaphragm Cover
4. Diaphragm
5. Spring Chamber
6. Top Spring Washer
7. Bottom Spring Washer
8. Wing Nut
9. Springs
10. Adjusting Screw
11. Upper Stem
12. Centering Pin
13. Diaphragm Nut
14. Diaphragm Button
15. Cap Gasket
16. "O" Ring Packing (2)
19. Lower Stem
20. Bottom Cap
21. Lower Packing
22. Bottom Spring
23. Lower Packing Nut
24. Diaphragm Bolts

Main Valve

SLIDING SEAT



FLAT SEAT



PARTS LIST	MATERIAL
1. Valve Shell	Cast Iron
2. Top Cap	Cast Iron
3. Bottom Stem Guide Nut	Bronze
4. Bottom Cup Follower (2)	Bronze
5. Piston Cup Leather (2)	Leather
6. Bottom Stem Lock Nut	Bronze
7. Stem Nut	Bronze
8. Seat Disc	Bronze
9. Seat Leather	Leather
10. Seat Leather Support	Bronze
11. Stem	Bronze
12. Cup Plate (2)	Bronze
13. Main Cup Leather (2)	Leather
14. Main Bushing	Bronze
15. Top Stem Nut	Bronze
16. Bottom Cap	Cast Iron
20. Indicator Rod	Brass
21. Indicator Stuffing Box	Bronze
*23. Bottom Cap Cylinder	Bronze
24. Seat Ring	Bronze
Bolts (Top and Bottom Cap)	Steel
Bolts (Cup Plate)	Bronze
Bolts (Seat Ring)	Bronze

NOTE: Parts (8) and (24) one piece bronze sliding seat disc for sizes 4" to 12".

7. Stem Nut
8. Flat Seat Disc
9. Flat Seat Leather
10. Flat Seat Leather Support
24. Flat Seat Ring

*Screwed or bolted in place

Inspection: Inspection is governed by the experience with the valve. Quality of water, rate of flow, operating pressures—all have a bearing on the kind and length of service.

So that some recommendation may guide the operator, it is suggested that after the first year of service, the top cap of the Main Valve be removed and the stem withdrawn for inspection. This inspection will help to decide interval for next examination.

Maintenance: The valve, less external controls and piping, is here referred to as "Main Valve". It consists of cast iron body, top cap and bottom cap with bronze and leather internal working parts. Repairs, as is characteristic of all Ross Valves, are made through the top of the valve. When packing is to be replaced, the top cap of the valve is removed and the stem removed by means of an eyebolt (4" and 6" valves), or a clevis (8" to 30" valves). After removal of stem, replacement of packings is self-evident.

Stem assembly—see above.

No. 5 Bottom cup leathers (2)—both cups look up.

No. 13 Main cup leathers (2)—bottom cup looks down; top cup looks up.

No. 9 Seat leather (1)—Sliding seat leather is bolted between main valve body and seat leather support (10). Flat seat leather is bolted between two bronze plates (8 & 10).

When replacing cup leathers, inspect Bushing No. 14 and Cap Cylinder No. 23. If a deposit is found and smooth polished surface destroyed, use a fine sandpaper or emery to restore the polished finish.

Although not necessary, it is recommended that a good grade of soluble grease be applied to the cup leathers when installing.

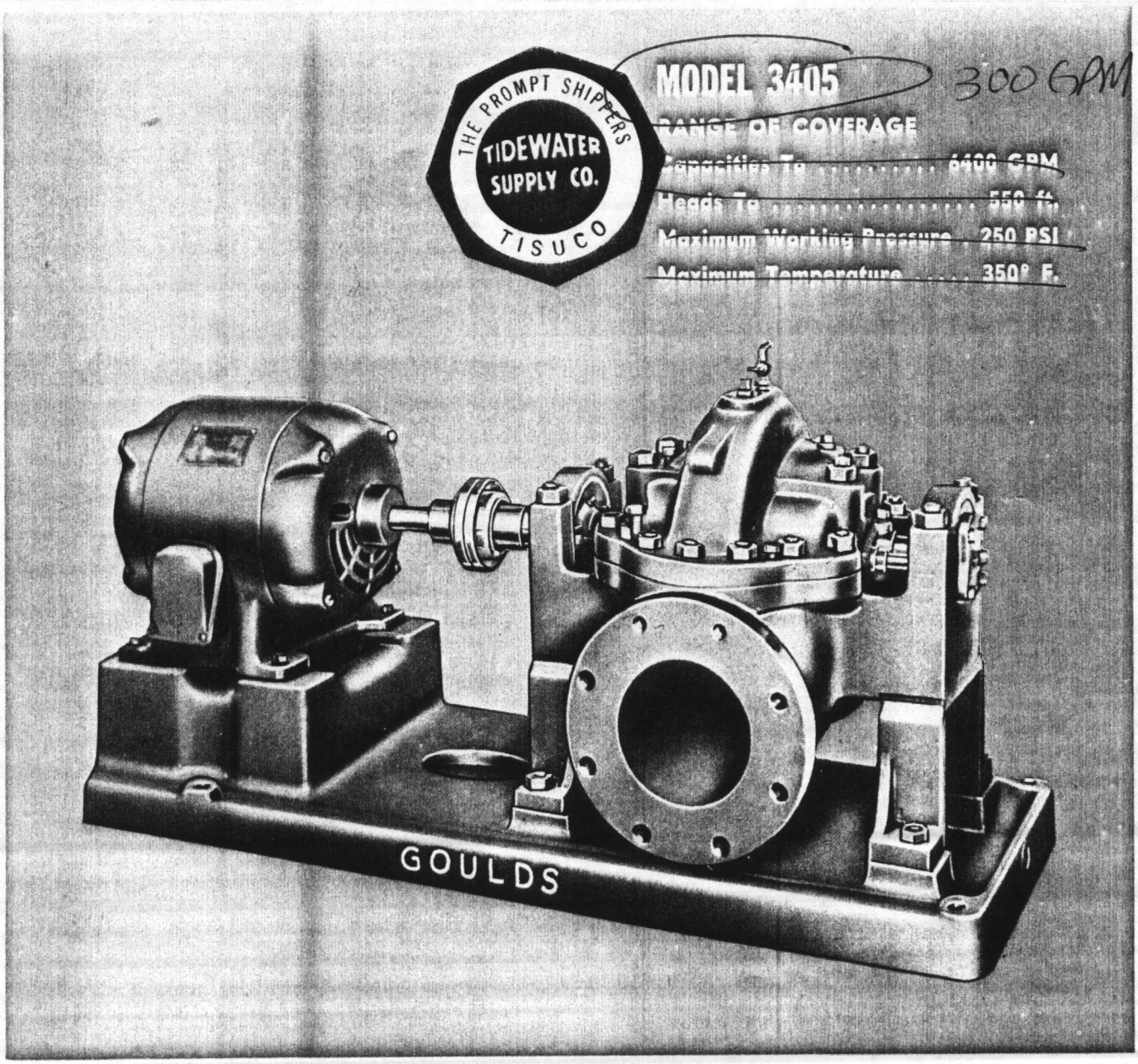
When refitting the stem of the Main Valve, care should be taken to avoid undue friction by the cup leathers. After the lower of the two main cup leathers has entered the Main Bushing No. 14, the stem of its own weight or pressure of the hand should fall to closed position.

BULLETIN 721.6
AUGUST 15, 1970
Sup. 9-1-68

GOULDS PUMPS

#1 H/L

HORIZONTALLY SPLIT CASE / SINGLE STAGE / DOUBLE SUCTION CENTRIFUGAL PUMPS



PREVENTIVE AND CORRECTIVE MAINTENANCE

IV-A. Lubrication

Oil lubricated units require only that oil be visible in reservoir or the oiler. Grease lubricated units should be regreased every 2,000 hours or 3 month intervals, whichever occurs first. Use a sodium or lithium grease and fill until grease comes out grease relief fittings. Follow motor and coupling manufacturers' lubrication instructions.

IV-B. Stuffing Box

1. Packing Stuffing Box: Periodically inspect stuffing box to see that there is sufficient leakage to lubricate the packing and maintain a cool box. Never restrict the leakage from the packing as this will cause damage to both packing and shaft sleeve. Draw up gland nuts slowly and evenly and only while pump is running.

After pump has been in operation for some time and the packing has been completely "run-in", a leakage of 40 to 60 drops per minute of the liquid should be allowed to flow from the stuffing box at all times for cooling and lubricating the packing and shaft sleeve.

2. Stuffing Boxes with Mechanical Seal: This type of box requires no attention other than to make sure that the circulating lines do not become clogged.

IV-C. Vibration

It is a good practice to periodically monitor vibration of the pump. Normally, the vibration level will be well within accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting, Section VII.

IV-D. Alignment—Final

Alignment should be checked after unit has reached operating temperature, following startup. Repeat alignment procedures outlined in Section II-E. Check alignment again after one week of operation.

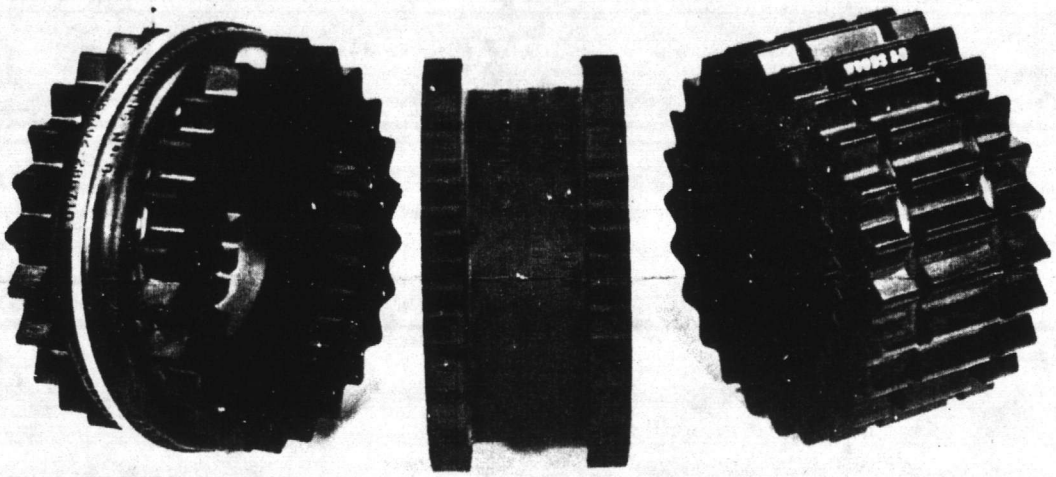
IV-E. Performance

If performance deteriorates, refer to Trouble Shooting, Section VII.

COUPLING FOR BA138

INSTALLATION INSTRUCTIONS

J and S Type Sure-Flex Flanges
And All Sure-Flex Coupling Sleeves



Type S **Type J** **Type U**

1. Position one flange on each shaft.

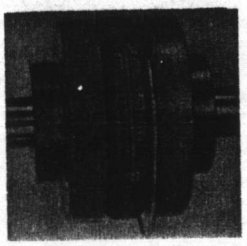
2. Then tighten one flange on one shaft in its final position.

   Note No. 1 If the shaft does not extend completely through the bore of the flange, it must engage the bore a distance equal to or greater than the diameter of the shaft. For example, a flange with a 1 inch bore must grasp at least 1 inch of the shaft.

   Note No. 2 In no case should the distance between shafts be less than 1/8 inch.

3. Assemble the sleeve into one of the flanges. If using a 2-piece sleeve, hang the wire ring loosely in the groove next to the teeth. Slide the loose flange into position so that the teeth of the sleeve are fully engaged in both flanges. See Fig. 1.

   Fig. 1



   Note No. 3 If this coupling is being used on a sleeve bearing electric motor, the coupling should be assembled with the motor armature at its electrical center.

4. Tighten the loose flange onto the shaft. Be certain this flange also grasps the shaft as described in Step 2, Note No. 1.

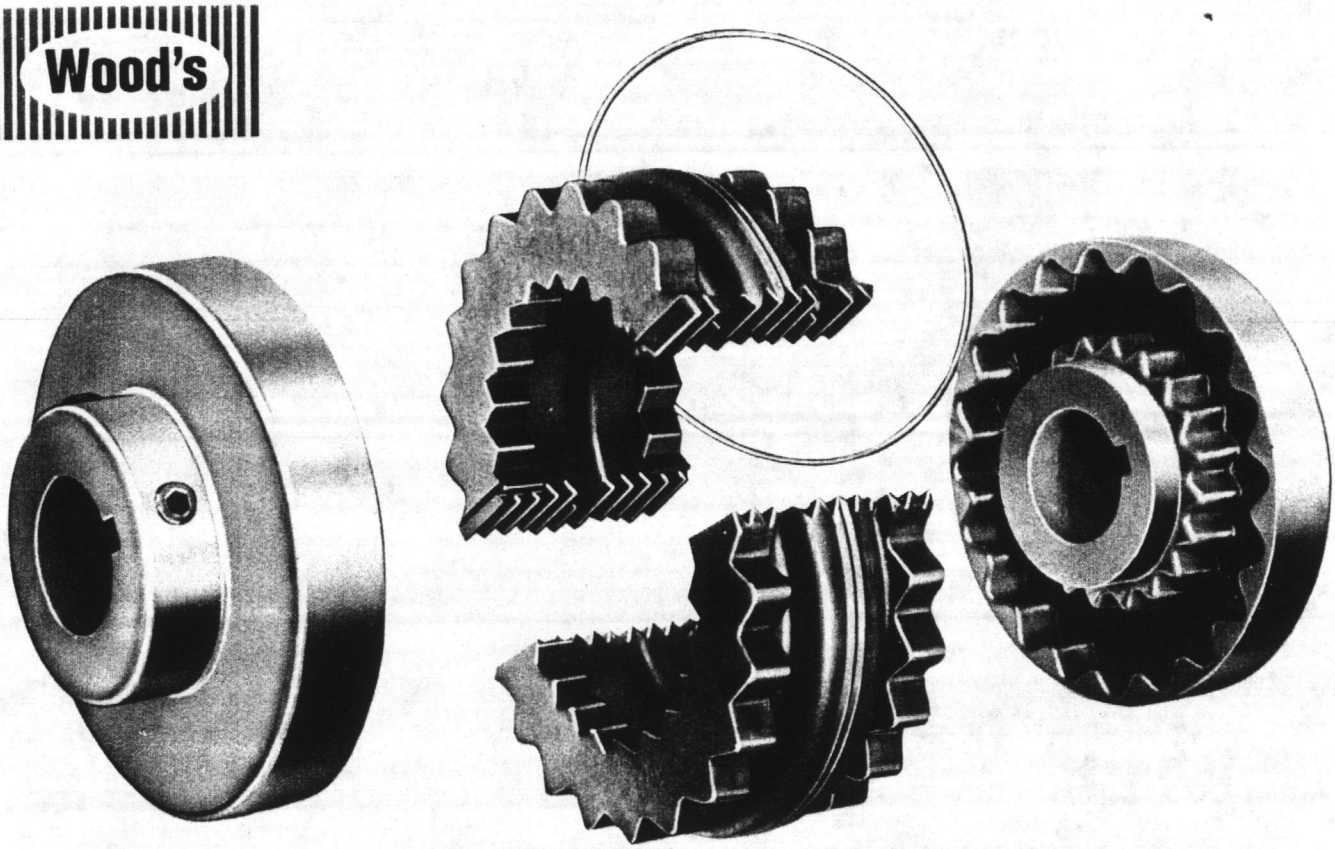
5. **Check parallel and angular misalignment.**

   Note No. 4 The life of this sleeve will be greatly increased if the misalignment is kept to a minimum. The misalignment should be kept to an absolute minimum and should in no case exceed the maximum allowable misalignment values given in Table No. 1.

   Note No. 5 Do Not rotate the coupling while making alignment checks.

(Continued)

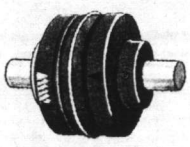
Wood's



SURE-FLEX®

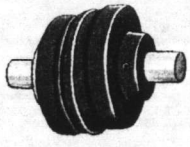
4-Way Flexing Action

ABSORBS ALL TYPES OF SHOCK, VIBRATION AND MISALIGNMENT



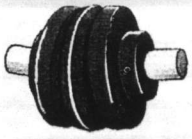
TORSIONAL

Sure-Flex Couplings have 15° torsional flexibility at peak torque, assuring absorption of vibration and shock loads.



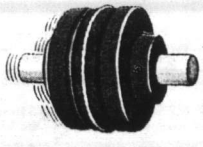
PARALLEL

Sure-Flex Couplings take parallel misalignment up to ⅛-in. depending upon coupling size.



ANGULAR

Sure-Flex Couplings will take up to 1° angular misalignment without wear.



AXIAL

Sure-Flex Couplings are designed to take free end float up to ¼-in. depending upon coupling size.

Wood's standard Sure-Flex Couplings provide dependable power transmission while withstanding all types and combinations of shock, vibration and shock misalignment and end float. These couplings have exceptional torsional flexibility. They absorb up to 15 times more shock and vibration than other leading flexible couplings, assuring longer bearing, motor and machine life, as well as smoother operation of both driver and driven equipment. Sure-Flex Couplings are unaffected by abrasives, dirt or moisture. There is no wear . . . no need for lubrication or maintenance. Operation is noiseless and clean. Installation is quick and easy.

MISALIGNMENT WITHOUT WEAR

As a result of its unique design and sleeve materials, the standard Sure-Flex coupling does not impose a load on the shafts when running misaligned and it gives quiet performance. It is not necessary to press-fit Sure-Flex couplings on the shaft since there is no shaft fretting at the coupling bore.

FLEXIBLE MEMBER

Sure-Flex standard couplings use a rubber (EPDM) or neoprene sleeve. The EPDM sleeves are best suited for most applications and are furnished unless neoprene is specified. Type J Sure-Flex couplings have a one-piece sleeve; all other standard couplings have a two-piece sleeve. However, the Type J one-piece sleeve can be used in standard couplings.

The temperature range for EPDM sleeves is −40° to +150° F and neoprene sleeves −30° to +200° F. For unusual operating conditions, or if in question, contact the factory or a Wood's Field Sales Engineer.

FILTERS BA138

AUTOMATIC CYCLE CONTROLLER – SERVICE ELECTRIC-SIGNAL ACTUATED

TIMER MECHANISM REPLACEMENT

1. Disconnect power supply to cycle controller.

2. Open cycle-controller case and remove timer mechanism by removing pan-head machine screw on the left side of timer and tilting it forward. Disconnect power leads and interconnecting leads from the pilot drive assembly.

3. Reconnect wire leads to replacement mechanism. Refer to wiring diagram.

4. To install timer mechanism, locate the bottom of the assembly in the tabs of the controller case. Push timer mechanism into controller case and replace pan-head machine screw.

5. Reconnect electrical power.

6. Refer to PHASING ADJUSTMENTS for final setting.

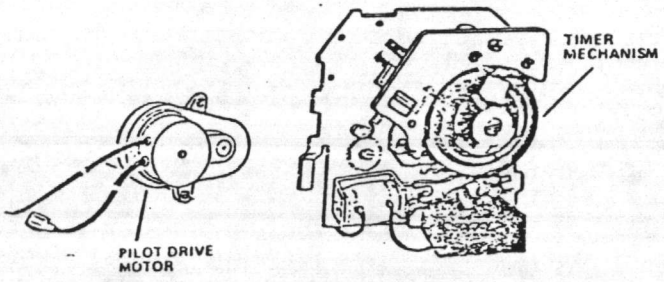
TIMER-DRIVE MOTOR REPLACEMENT

1. Refer to steps 1 & 2 under TIMER MECHANISM REPLACEMENT.

2. Drive motor is held in place with 2 machine screws. Remove machine screws and disconnect motor leads.

3. Install replacement drive motor, making certain gears are properly engaged. Securely tighten the machine screws and reconnect motor leads. (Refer to wiring diagram.)

4. Replace timer mechanism following steps 3, 4, 5, 6 under TIMER MECHANISM REPLACEMENT.



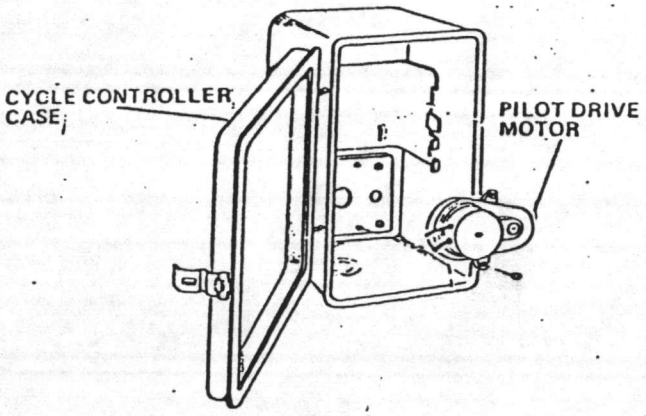
PILOT-DRIVE MOTOR REPLACEMENT

1. Refer to steps 1 & 2 under TIMER MECHANISM REPLACEMENT. Remove terminal strip bracket by loosening the 4 sheet-metal screws on the outside of the cycle-controller case.

2. Pilot-drive motor is held in place with 2 sheet-metal screws. Remove sheet-metal screws and disconnect motor leads.

3. Install replacement drive motor, making certain gears are properly engaged. Securely tighten the sheet-metal screws & reconnect motor leads. (Refer to wiring diagram.) Replace terminal-strip bracket.

4. Replace timer mechanism following steps 3, 4, 5, 6 under TIMER MECHANISM REPLACEMENT.



CAM GEAR OR MICRO-SWITCH REPLACEMENT

1. Refer to steps 1 & 2 under TIMER MECHANISM REPLACEMENT. Remove terminal-strip bracket by loosening the 4 sheet-metal screws on the ouside of the cycle-controller case.

2. Remove 3 pan-head machine screws holding retainer plate with pilot-drive motor in place. Retainer plate with motor can now be removed for access to cam gear and micro-switch.

3. Remove cam gear. Micro-switch with actuator is held in place with 2 round-head machine screws. To replace micro-switch assembly, remove screws, actuator, micro-switch, and insulators. Disconnect wire leads.

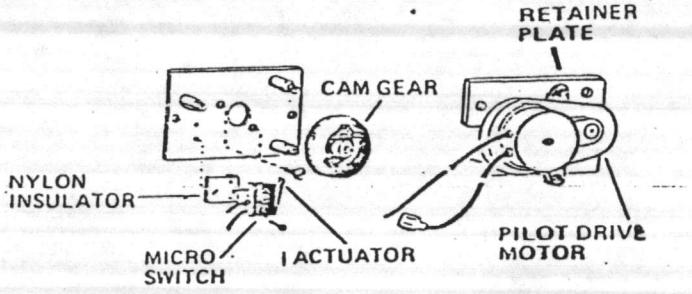
4. When installing replacement micro-switch assembly, components MUST be positioned in the following order: nylon spacer, micro-switch, fiber insulator, switch actuator. Replace 2 round-head machine screws with lock washers.

5. Replace cam gear, making certain that the lobes face rear of timer case. NOTE: When installing cam, extreme care must be used to prevent micro-switch actuator from becoming damaged.

6. After cam gear has been installed, rotate cam in a CLOCKWISE direction to verify micro-switch operation. Re-positioning of micro-switch closer to cam may be necessary.

7. Reinstall retainer plate with drive motor, making certain gears mesh properly. Securely tighten 3 pan-head machine screws. Reconnect wire leads, referring to diagram. Replace terminal strip bracket.

8. Replace timer mechanism, following steps 3, 4, 5, 6 under TIMER MECHANISM REPLACEMENT.



AUTOMATIC CYCLE CONTROLLER – SERVICE

PILOT SPOOL REMOVAL

1. Shut off hard-water inlet and treated-water outlet and any external source of pressure to the pilot. If system is equipped with an external ejector, this supply must also be closed.

2. Manually rotate the Position Dial on the Pilot Valve to the BACKWASH position (No.2) to relieve pressure.

3. Remove pan head retaining screw at rear of pilot body. Grasp position dial and pull pilot spool from pilot body.

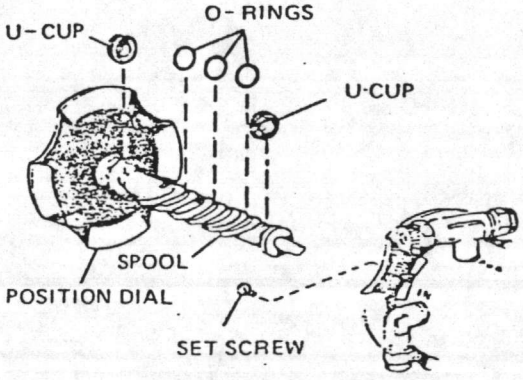
PILOT SPOOL REPLACEMENT

1. If replacement seals are required, be certain the respective U-cup grooves and O-ring seal areas are clean and free of any dirt, nicks, scratches, etc.

NOTE: U-cups must be installed on the spool with the lips facing each other.

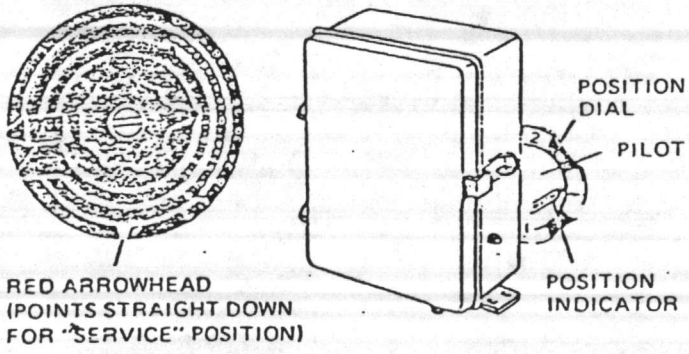
2. LIGHTLY lubricate all seals with silicones grease and reinstall spool into pilot body. Rotate slowly until spool is fully seated into pilot body. Replace pan-head retaining screw.

3. Reopen inlet and outlet valves. Restore pressure to external injector and pilot body if required.



PHASING ADJUSTMENTS

Make certain the red arrow on the cycle adjustment knob is pointing straight down and the Position Dial at the rear of the pilot body indicates SERVICE (No. 1).



PILOT BODY REMOVAL

1. Shut off hard-water inlet and treated-water outlet and any external source of pressure to the pilot. If the system is equipped with an external injector, this supply must also be closed.

2. Remove all pilot tube connections from the pilot-valve body.

3. Disconnect power supply to cycle controller.

4. Open cycle controller case and remove timer mechanism by removing pan-head machine screw on the left side of timer mechanism and tilting timer forward. Remove terminal strip bracket by loosening the 4 sheet-metal screws on the outside of the cycle-controller case. Disconnect power leads and inter-connecting leads from the pilot drive assembly.

5. Remove 3 pan-head machine screws holding retainer plate with pilot-drive motor in place. Retainer plate with motor can now be removed.

6. Remove cam gear. The pilot-valve body can now be removed from the cycle-controller case by loosening the 2 pan-head machine screws located behind the cam.

PILOT BODY REPLACEMENT

1. When inserting replacement pilot valve body to rear of cycle controller, make certain the word "TOP" faces upward. Securely tighten the 2 pan-head machine screws.

2. Replace cam gear making certain lobes face rear of timer case. (Refer to parts breakdown.)

NOTE: When installing cam, extreme care must be used to prevent micro-switch actuator from becoming damaged.

3. After cam gear has been installed, rotate cam in a CLOCKWISE direction to verify micro-switch operation. Repositioning of micro-switch closer to cam may be necessary.

4. Reinstall retainer plate with drive motor, making certain gears mesh properly. Securely tighten 3 pan-head machine screws. Replace terminal-strip bracket.

5. Reconnect wire leads referring to wiring diagram. To install timer mechanism, locate the bottom of the assembly in the tabs of the controller case. Push timer mechanism into controller case and replace pan head machine screw. Replace face plate.

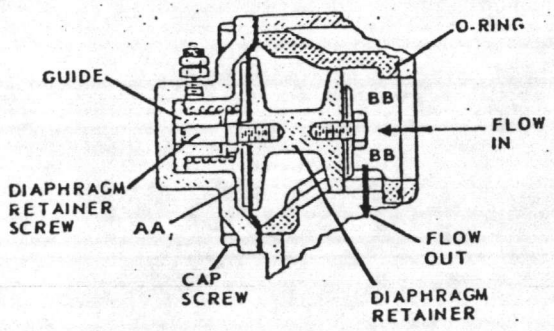
6. Reconnect pilot tubing to pilot valve body.
NOTE: Numbers on pilot body must correspond with numbers on multiport valve.

7. Reopen inlet and outlet valves. Restore pressure to external injector and pilot body if required.

8. Reconnect power to cycle controller.

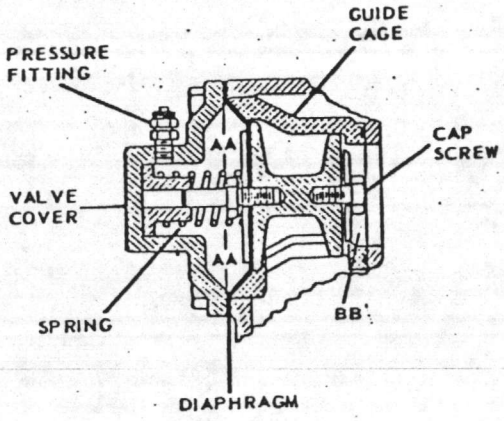
9. Refer to PHASING ADJUSTMENTS for final timer setting.

VALVE-PORT OPERATION AND SERVICE



VALVE SHOWN IN OPEN POSITION

To open valve port...chamber "AA" is vented to atmosphere. Pressure at seat area "BB" overcomes spring tension and forces the diaphragm assembly to open allowing flow through valve port.



VALVE SHOWN IN CLOSED POSITION

To close valve port...pressure is applied to chamber "AA". This pressure along with a spring assist causes the diaphragm assembly to seat at area "BB". Once seated the diaphragm assembly is held closed because the surface area in chamber "AA" is larger than that of seat "BB".

VALVE PORT DISASSEMBLY

1. Shut off the inlet and outlet valves and supply line to external ejector (if furnished.)
2. Manually rotate the Position Dial on the Pilot Valve to the BACKWASH position (No. 2) to relieve tank pressure.
3. Remove the mineral tank cover and drain the tank down to a level below the valve casting.
4. Remove 4 hex-head cap screws holding valve cover to casting. Valve cover can now be removed along with helper spring. (NOTE: It is not necessary to disconnect pilot tubing unless cover replacement is necessary.)
5. Diaphragm assembly can now be removed from casting along with guide cage and guide cage O-ring. (NOTE: O-ring may adhere to inside of valve casting.)

DIAPHRAGM REPLACEMENT

1. For diaphragm replacement, remove diaphragm retainer screw and lock washer and diaphragm washer. Diaphragm can now be removed.
2. Position replacement diaphragm as shown in valve port detail "CLOSED" (shown above).
3. Install diaphragm washer with rounded edge against diaphragm. Replace lock washer. Securely tighten diaphragm retainer screw.

SEAT-WASHER REPLACEMENT

1. For seat washer replacement, remove hex head cap screw lock washer and seat washer retainer. Rubber seat washer can now be removed.
2. Install replacement-seat washer and seat-washer retainer. Seat-washer retainer must be positioned so chamfered edge leads away from seat washer (see above drawing). Replace lock washer and securely tighten hex-head cap screw.

VALVE-PORT REASSEMBLY

1. Inspect and clean, if necessary, guide cage O-ring seal area in valve casting.
2. Inspect and clean, if necessary, guide cage O-ring groove and O-ring. Inspect guide cage seat area for nicks, scratches, gouges etc. If defects are noted on this seat, guide cage MUST be replaced.
3. Lubricate guide cage O-ring with silicone grease or vasoline and reinstall guide cage in casting.
4. Insert diaphragm assembly into guide cage. Replace helper spring*, valve cover and securely tighten 2 hex-head cap screws. Reconnect pilot tube, if removed.

(*NOTE: Valve ports No. 1, 2, 4, & 5 MUST have long helper spring. Valve Port No. 6 MUST have short helper spring.)

RETURN OF EQUIPMENT TO SERVICE

1. With the valve reassembled, the tank cover off, and the unit in the backwash position, open the inlet valve to refill the mineral tank with water. After the unit is filled, replace the tank cover and index the unit to the service position.
2. Open outlet valve and supply line valve to external injector (if furnished). Make certain that the Manual By-Pass valve is closed.

NEW DIAPHRAGMS are stiff, and initially may not permit the valves to close tightly. Close the manual brine valve and slowly turn the Position Dial clockwise 3 to 6 complete revolutions. This will open and close the valves several times stretching the diaphragm sufficiently to provide a proper seal. Return Position Dial to SERVICE (No. 1) position, and open manual brine valve.

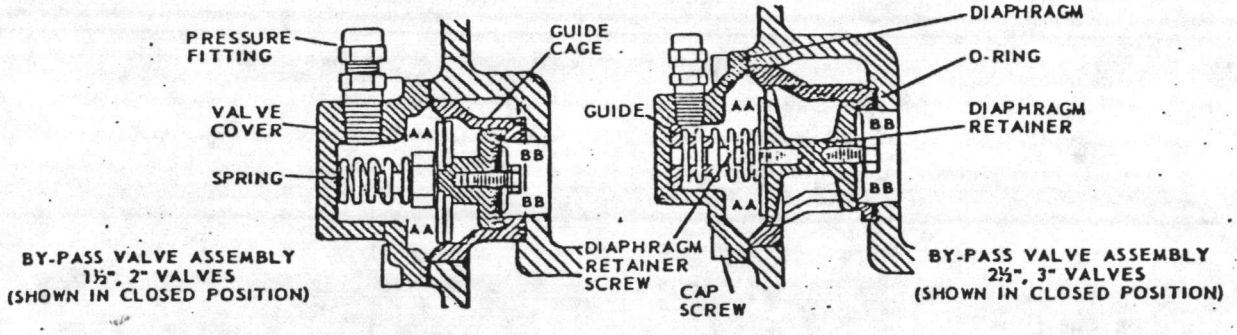
BY-PASS VALVE NO. 17 (1½"–3" VALVES)

One of the features this multiport valve provides is a raw-water by-pass during the entire regeneration cycle. While the by-pass water is untreated, it will prevent salt brine or backwash water from entering the service lines. The by-pass assembly is operational only on single units. On twin or multiple-unit applications the by-pass is rendered inoperative.

When chamber "AA" is vented to atmosphere, pressure at seat area "BB" overcomes spring tension, forces the diaphragm assembly to open, and allows the flow of by-pass water.

The various sizes of multiport valves which are available (1" thru 3") necessitate variations in the by-pass construction. By-pass valve construction details, and methods for rendering by-pass inoperative (for twin or multiple applications), are shown below.

To close valve port, pressure is applied to chamber "AA" This pressure, along with a spring assist, causes the diaphragm assembly to seat at area "BB". Once seated, the diaphragm assembly is held closed because of the surface area in chamber "AA" is larger than that of seat "BB". With valve port closed, the flow of by-pass water is stopped.



BY-PASS VALVE-PORT DISSASSEMBLY

1. Shut off the inlet and outlet valves and the supply line to external ejector (if furnished.)

2. Manually rotate the Position Dial on the Pilot Valve to the BACKWASH (No. 2) position to relieve tank pressure.

3. Remove the resin-tank cover, and drain the tank down to a level below the valve casting.

4. Remove the 4 hex-head cap screws holding valve cover to casting. Valve cover and now be removed along with helper spring (NOTE: It is not necessary to disconnect pilot tubing unless cover replacement is necessary.)

5. Diaphragm assembly can now be removed from casting along with guide cage and guide cage O-ring. (NOTE: O-ring may adhere to inside of valve casting.)

DIAPHRAGM REPLACEMENT

1. For diaphragm replacement, remove diaphragm retainer screw, lock washer, and diaphragm retainer(s). Diaphragm can now be removed.

NOTE: By-pass assemblies used on 1½" and 2" valves have a removable diaphragm retainer under the diaphragm.

2. Position replacement diaphragm as shown in valve port detail "CLOSED" (shown above).

3. Install diaphragm retainer(s) with rounded edge against diaphragm. Replace lock washer, and securely tighten diaphragm-retainer screw. NOTE: On 1½" and 2" valves install lower diaphragm retainer, replacement diaphragm, and upper diaphragm retinaer. On 2½" and 3" valves, only 1 diaphragm retainer is required.

SEAT-WASHER REPLACEMENT

1. For seat-washer replacement, remove hex-head cap screw, lock washer, and seat-washer retainer. Rubber seat washer can now be removed.

2. Install replacement seat washer and seat-wasner retainer. Seat-washer retainer must be positioned so chamfered edge leads away from seat washer. Replace lock washer and securely tighten hex-head cap screw.

BY-PASS VALVE-PORT REASSEMBLY

1. Inspect and clean, if necessary, the guide cage O-ring seal area in valve casting.

2. Inspect and clean, if necessary, the guide cage O-ring groove and O-ring. Inspect guide-cage-seat area for nicks, scratches, gouges, etc. If defects are noted on this seat, cage MUST be replaced.

3. Lubricate guide-cage O-ring with silicone grease or vaseline, and reinstall guide cage in casting.

4. Insert diaphragm assembly into guide cage. Replace helper spring and valve cover, and securely tighten 4 hex-head cap screws. Reconnect pilot tube if removed.

RETURN OF EQUIPMENT TO SERVICE

1. With the valve reassembled, the tank cover off, and the unit in the BACKWASH (No. 2) position, open the inlet valve to refill the mineral tank with water. After the unit is filled, replace the tank cover and index the unit to the SERVICE (No. 1) position.

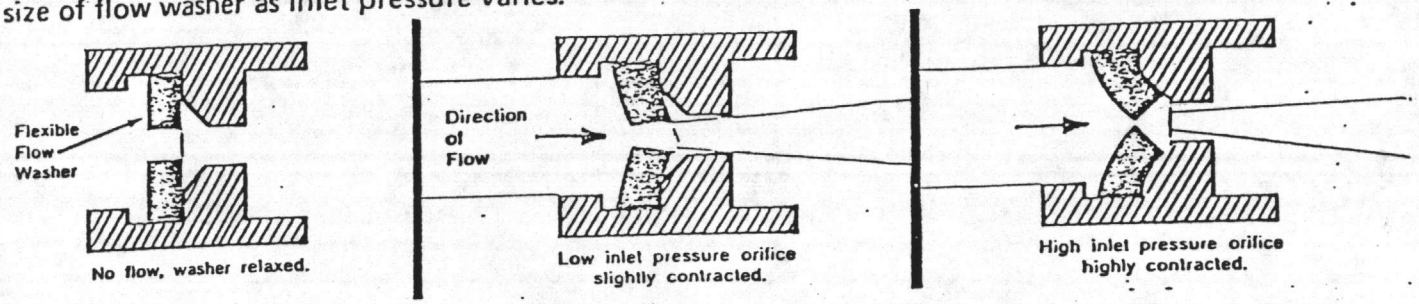
2. Open outlet valve and supply line valve to external injector (if furnished). Make certain Manual By-Pass valve is closed. NEW DIAPHRAGMS are stiff and initially may not permit the valves to close tightly. Close the manual brine valve and slowly turn the Position Dial clockwise 3 to 6 complete revolutions. This will open and close the valves several times stretching the diaphragm sufficiently to provide a proper seal. Return Position Dial to Service (No. 1) and open manual brine valve.

TWIN AND MULTIPLE UNITS: The by-pass valve is normally not used with twin or multiple unit installations. On those units the by-pass valve is present but is held closed with a constant source of pressure.

BACKWASH CONTROLLERS – OPERATION AND SERVICE

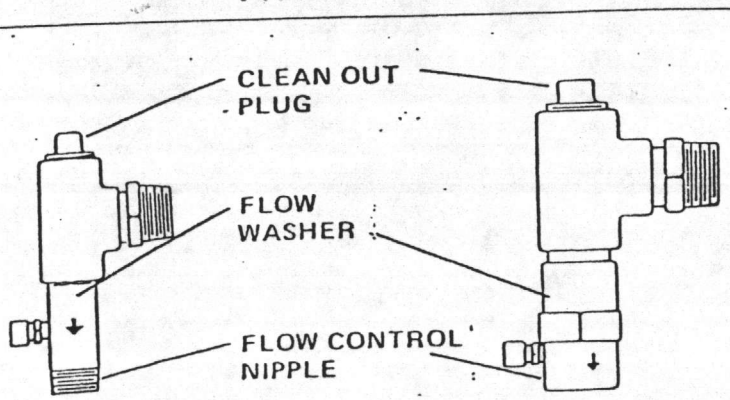
The purpose of the controller is to regulate the up-flow backwash required to expand and agitate the media in the resin tank. The controller will allow maximum expansion of this medium, while preventing any loss to the drain.

The flow-control principle is simple and trouble-free. The specified rate of flow will be constant regardless of inlet-pressure variations. This is accomplished by the automatic change in orifice size of flow washer as inlet pressure varies.

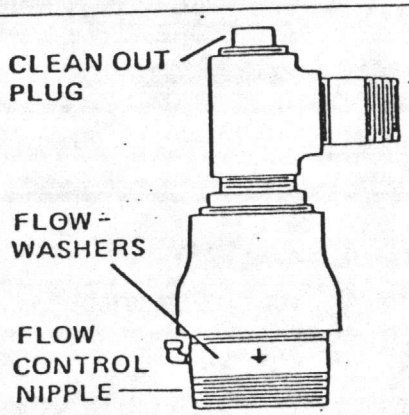


The flow washer is installed, either singly or in multiple, in a special nipple. Increasing the number of flow washers can achieve any desired backwash rate.

TYPICAL BACKWASH-CONTROL ASSEMBLIES



The controllers shown above use only one flow washer.



The controller shown above uses more than one flow washer.

Occasionally, the Backwash Controller may become plugged with scale, rust, or other foreign material. If this occurs, cleaning is required. This can be done while the softener is in the SERVICE (No. 1) position and under pressure.

BACKWASH-CONTROLLER DISASSEMBLY

1. Remove cleanout plug and inspect the flow-washer area.
2. Remove any foreign material lodged in or near the flow washer(s).

   (NOTE: AVOID USING A SHARP OBJECT WHICH MIGHT CUT OR DAMAGE THE RUBBER FLOW WASHER. SHOULD IT NOT BE POSSIBLE TO CLEAR THE CONTROLLER THROUGH THE CLEANOUT PLUG, REMOVAL OF THE FLOW CONTROL NIPPLE WILL BE REQUIRED TO GAIN BETTER ACCESS OF THE FLOW-WASHER AREA.)
3. If removal of the Flow Control nipple is necessary, disconnect the flexible tubing from the compression fitting. Carefully separate the nipple from both the drain line and the Brunermatic valve. Inspect and clean flow washer(s).

BACKWASH CONTROLLER REASSEMBLY

1. When replacing the Flow Control nipple, make certain the compression fitting is downstream from the flow washer.
2. Connect the flexible tubing to the compression fitting located in the side of the Flow Control nipple.
3. Insert and tighten cleanout plug.

FAIRBANKS, MORSE & CO. 14680CP

PUMP No. K-845554 REFERENCE SIZE-FIGURE 4"-5.813

TESTED Kelly 8-6-57 DRIVER TEST MOTOR IMPELLER D4AIP

PLOTTED TURNER 8-7-57 Atlanta 38721 IMP. DIA. 12 3/4"

TOTAL SUCTION 10.0 FT. MAXIMUM ON TEST R. P. M. 1750

2 #2

Certified Correct by [redacted] 8-9-57
CHIEF ENGR.

CERTIFIED PUMP PERFORMANCE CURVE

EFFICIENCY

BRAKE HORSE POWER

CHARACTERISTIC

EFFICIENCY

TOTAL HEAD IN FEET

U. S. GALLONS PER MINUTE

PREVENTIVE AND CORRECTIVE MAINTENANCE

IV-A. Lubrication

Oil lubricated units require only that oil be visible in reservoir or the oiler. Grease lubricated units should be regreased every 2,000 hours or 3 month intervals, whichever occurs first. Use a sodium or lithium grease and fill until grease comes out grease relief fittings. Follow motor and coupling manufacturers' lubrication instructions.

IV-B. Stuffing Box

1. Packing Stuffing Box: Periodically inspect stuffing box to see that there is sufficient leakage to lubricate the packing and maintain a cool box. Never restrict the leakage from the packing as this will cause damage to both packing and shaft sleeve. Draw up gland nuts slowly and evenly and only while pump is running.

After pump has been in operation for some time and the packing has been completely "run-in", a leakage of 40 to 60 drops per minute of the liquid should be allowed to flow from the stuffing box at all times for cooling and lubricating the packing and shaft sleeve.

2. Stuffing Boxes with Mechanical Seal: This type of box requires no attention other than to make sure that the circulating lines do not become clogged.

IV-C. Vibration

It is a good practice to periodically monitor vibration of the pump. Normally, the vibration level will be well within accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting, Section VII.

IV-D. Alignment—Final

Alignment should be checked after unit has reached operating temperature, following startup. Repeat alignment procedures outlined in Section II-E. Check alignment again after one week of operation.

IV-E. Performance

If performance deteriorates, refer to Trouble Shooting, Section VII.

646729-10B

#3

CERTIFIED PUMP PERFORMANCE CURVE

PUMP No. K-80250 REFERENCE SIZE-FIGURE 5"-5813

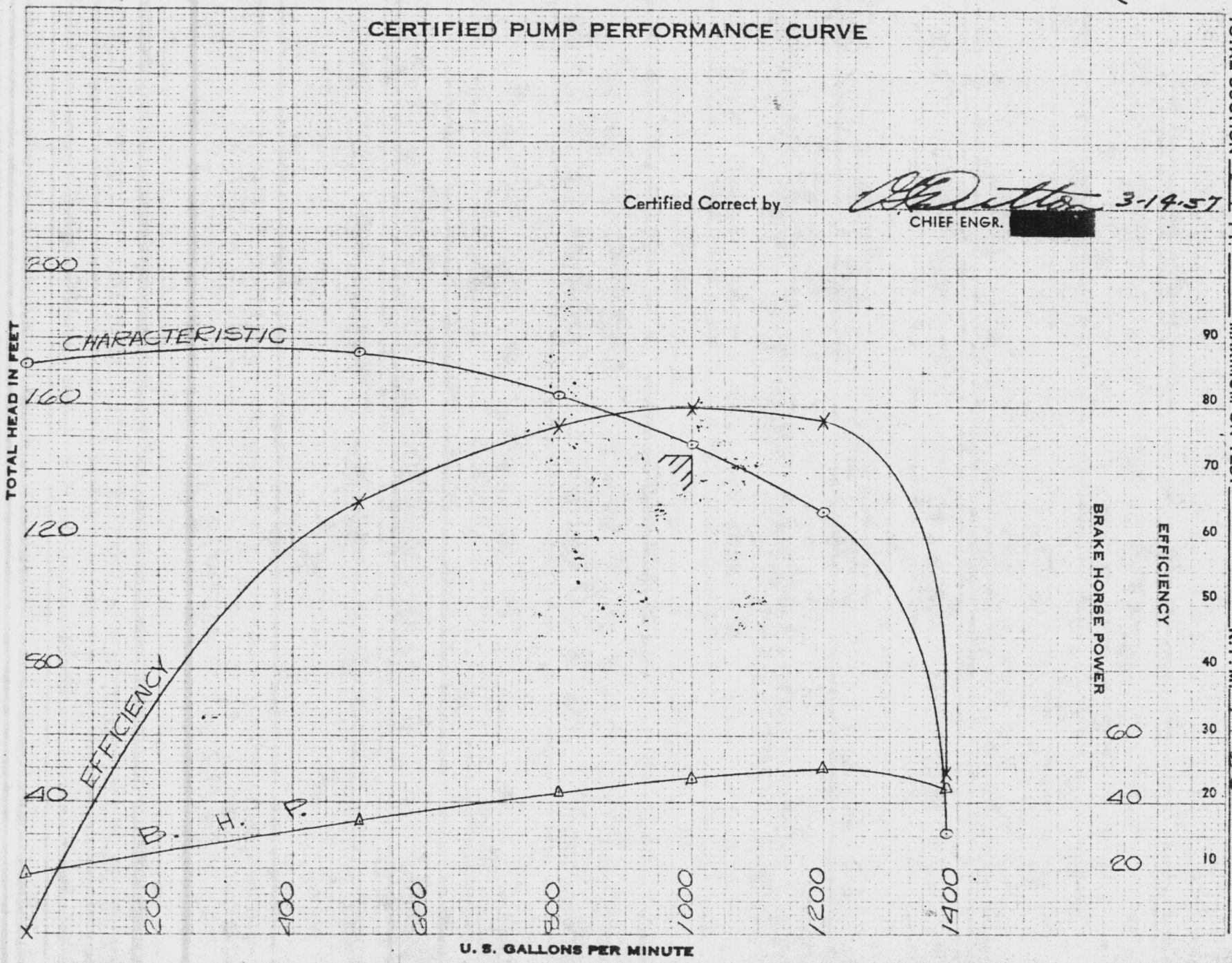
TESTED Kelly 3-5-57 DRIVER Test Motor IMPELLER DEALS

PLOTTED CT 3-8-57 Atlanta Lab IMP. DIA. 13"

TOTAL SUCTION 2.1 FT. MAXIMUM ON TEST R. P. M. 1760

Certified Correct by [signature] 3-19-57

CHIEF ENGR. [redacted]



PREVENTIVE AND CORRECTIVE MAINTENANCE

IV-A. Lubrication

Oil lubricated units require only that oil be visible in reservoir or the oiler. Grease lubricated units should be regreased every 2,000 hours or 3 month intervals, whichever occurs first. Use a sodium or lithium grease and fill until grease comes out grease relief fittings. Follow motor and coupling manufacturers' lubrication instructions.

IV-B. Stuffing Box

1. Packing Stuffing Box: Periodically inspect stuffing box to see that there is sufficient leakage to lubricate the packing and maintain a cool box. Never restrict the leakage from the packing as this will cause damage to both packing and shaft sleeve. Draw up gland nuts slowly and evenly and only while pump is running.

After pump has been in operation for some time and the packing has been completely "run-in", a leakage of 40 to 60 drops per minute of the liquid should be allowed to flow from the stuffing box at all times for cooling and lubricating the packing and shaft sleeve.

2. Stuffing Boxes with Mechanical Seal: This type of box requires no attention other than to make sure that the circulating lines do not become clogged.

IV-C. Vibration

It is a good practice to periodically monitor vibration of the pump. Normally, the vibration level will be well within accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting, Section VII.

IV-D. Alignment—Final

Alignment should be checked after unit has reached operating temperature, following startup. Repeat alignment procedures outlined in Section II-E. Check alignment again after one week of operation.

IV-E. Performance

If performance deteriorates, refer to Trouble Shooting, Section VII.

BRINE Pump.

PREVENTIVE AND CORRECTIVE MAINTENANCE

IV-A. Lubrication

Oil lubricated units require only that oil be visible in reservoir or the oiler. Grease lubricated units should be regreased every 2,000 hours or 3 month intervals, whichever occurs first. Use a sodium or lithium grease and fill until grease comes out grease relief fittings. Follow motor and coupling manufacturers' lubrication instructions.

IV-B. Stuffing Box

1. Packing Stuffing Box: Periodically inspect stuffing box to see that there is sufficient leakage to lubricate the packing and maintain a cool box. Never restrict the leakage from the packing as this will cause damage to both packing and shaft sleeve. Draw up gland nuts slowly and evenly and only while pump is running.

After pump has been in operation for some time and the packing has been completely "run-in", a leakage of 40 to 60 drops per minute of the liquid should be allowed to flow from the stuffing box at all times for cooling and lubricating the packing and shaft sleeve.

2. Stuffing Boxes with Mechanical Seal: This type of box requires no attention other than to make sure that the circulating lines do not become clogged.

IV-C. Vibration

It is a good practice to periodically monitor vibration of the pump. Normally, the vibration level will be well within accepted standards. Of equal importance is that the vibration level not increase. If a problem with vibration is encountered, refer to Trouble Shooting, Section VII.

IV-D. Alignment—Final

Alignment should be checked after unit has reached operating temperature, following startup. Repeat alignment procedures outlined in Section II-E. Check alignment again after one week of operation.

IV-E. Performance

If performance deteriorates, refer to Trouble Shooting, Section VII.