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CALGON
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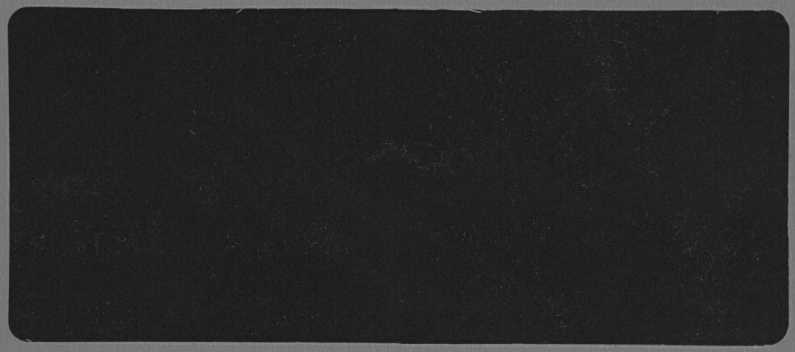


CAMP LEJUENE, NORTH CAROLINA

SOFTENER SYSTEM

CALGON JOB NO. B-02091-76

I N S T R U C T I O N S

PREPARED BY Jeffrey M Brewer

Jeffrey Brewer
Industrial Softener Systems
CALGON CORPORATION
Pittsburgh, Pennsylvania
TELEPHONE: 412/923-2345

DATE March 9, 1977

SPECIFICATIONS

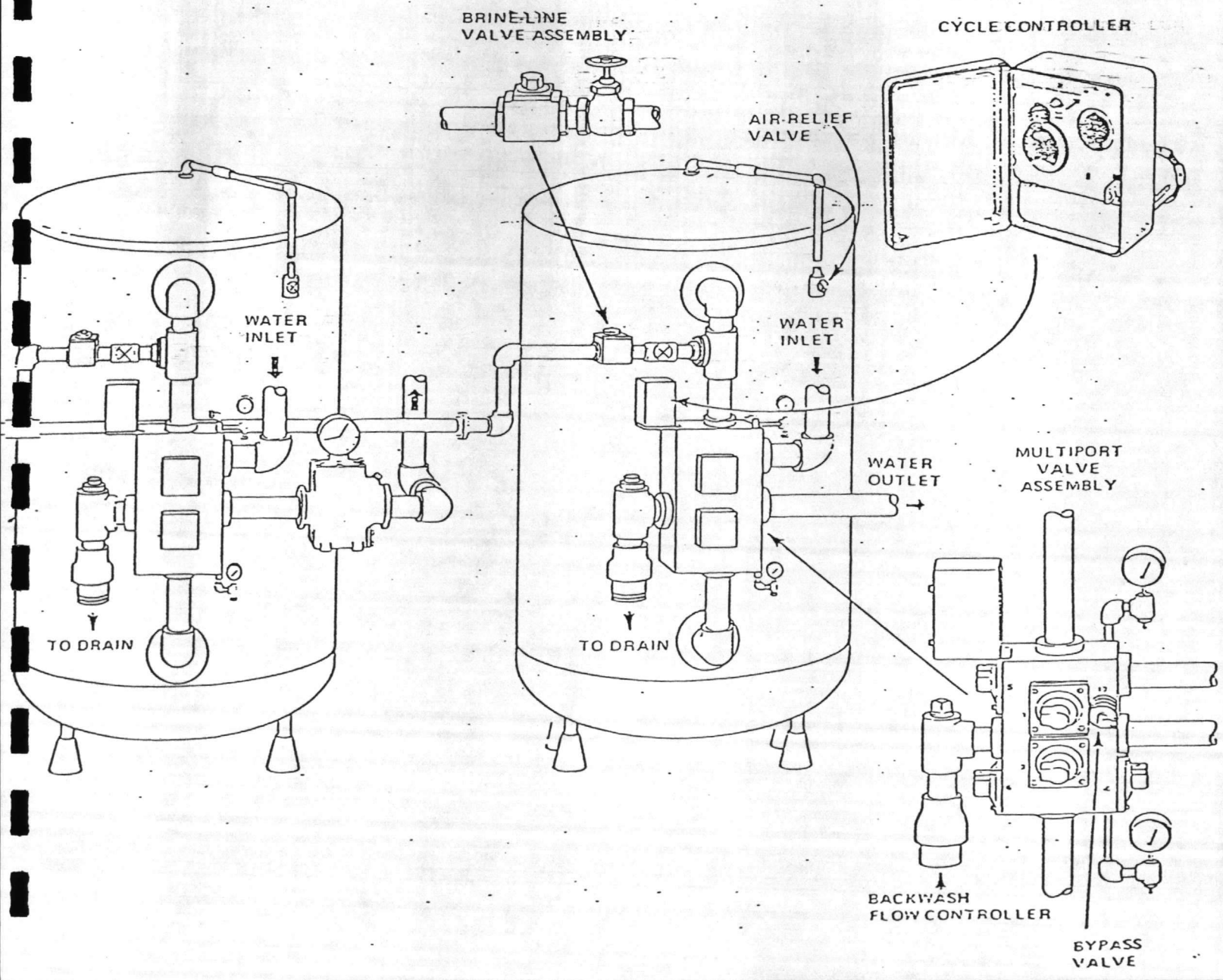
FLOW RATES (GPM)			PIPE SIZE (in.)	SOFTENING MINERAL (cu. ft.)	FREE-BOARD (in.)	GRAVEL (LBS.) 1/8 x 1/16	TANK SIZES (IN.)		BRINE MAKER DATA		
SERVICE	BACK-WASH & FLUSH	SLOW RINSE					SOFTENER	BRINE	SALT CAPACITY (lbs.)	BRINE "H" SETTING	SALT PER REGEN (lbs.)
75GPM Per Tank	45	8.5	2	35	24 1/4	700	42x72	36x48	-----	41"	525 lbs.

Exchange capacity of softener 1,044,000. grains per tank.

Gallons capacity between regeneration 116,000 per tank.
(determined by dividing exchange capacity of softener by compensated hardness.)

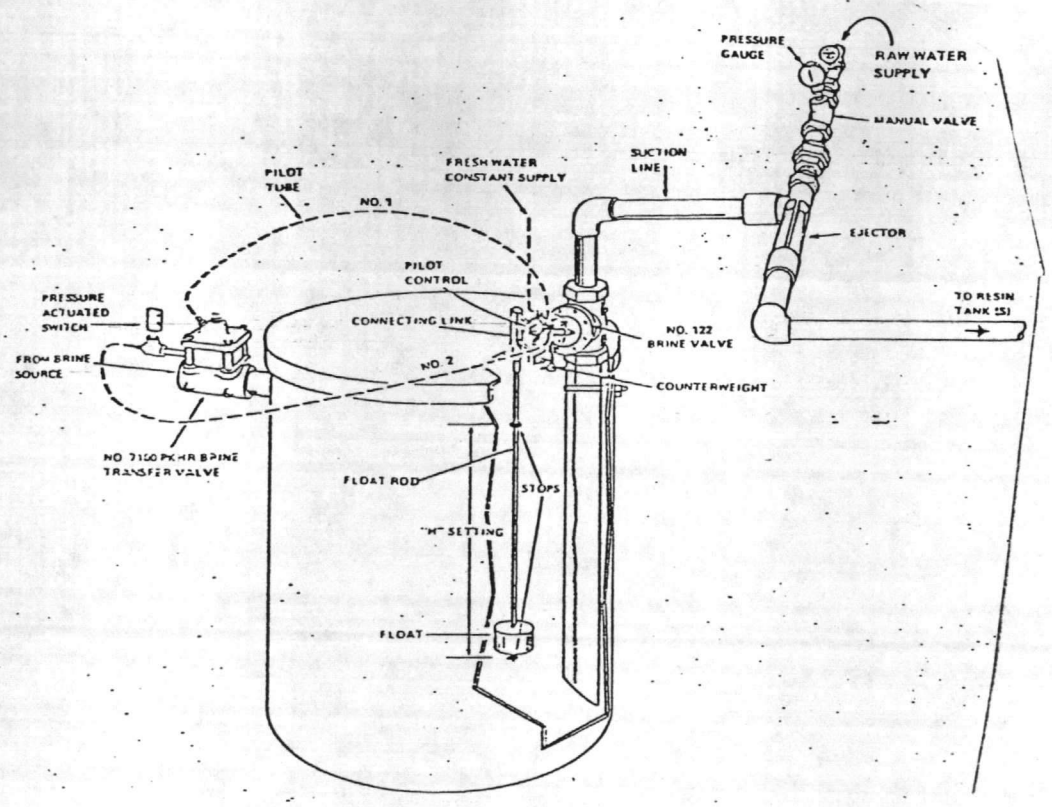
Compensated hardness 9.0 GPG.

The specific outline drawing for your system (Drawing No. c-02091-76-1) is located on Page 14-1.



AN OVERALL LOOK

Before becoming involved in the details, it is a good idea to step back and get a clear picture of the finished project. The drawing below is similar to the system you are about to install. By studying this drawing you can become familiar with the names and locations of the various parts and sub-assemblies that will be referred to later in the text.



INSTALLATION INSTRUCTIONS

FOR

INDUSTRIAL WATER CONDITIONERS

RESIN-TANK PLACEMENT

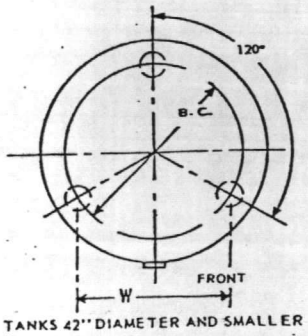
A. Determine Tank Location — see general layout drawing on page 1 and the specific outline drawing for your system located on page ——.

B. Select a Firm Relatively Level Foundation — preferably concrete.

C. Locate Jack-Leg Supports.

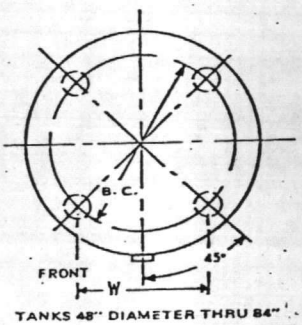
TANK DIAMETER	NUMBER OF JACK-LEGS	H MIN	H MAX	B.C.	C MIN	C MAX	W (IN.)
20"	3	6½	8½	13¼	4	6	12
24"	3	6½	8½	16½	4	6	14½
30"	3	6½	8½	20½	4	6	17¼
36"	3	6½	8½	23½	4	6	21¼
42"	3	6½	8½	28"	4	6	24¼
48"	4	8½	10½	32"	4	6	22-5/8
54"	4	8½	10½	36"	4	6	25½
60"	4	8½	10½	40"	4	6	28½
66"	4	8½	10½	44"	4	6	31-1/8
72"	4	8½	10½	48"	4	6	34
78"	4	10½	12½	52"	4	6	26
84"	4	10½	12½	56"	4	6	28
96"	6	10½	12½	64"	4	6	32
108"	6	10½	12½	72"	4	6	36

NOTE:
THE DIMENSIONS BELOW ARE TO BE USED TO DETERMINE PROPER LOAD DISTRIBUTION AND TO PREPARE ADEQUATE FOUNDATION SUPPORT FOR INDUSTRIAL WATER CONDITIONERS HAVING JACK-LEGS.



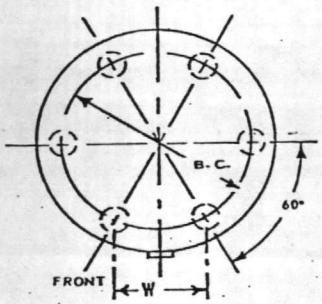
TANKS 42" DIAMETER AND SMALLER

FIGURE 1



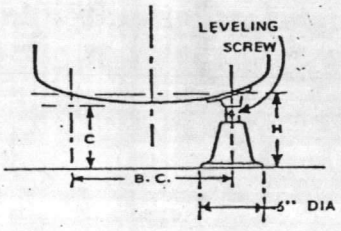
TANKS 48" DIAMETER THRU 84"

FIGURE 2



TANKS 96" DIAMETER THRU 108"

FIGURE 3



FLOOR CLEARANCE

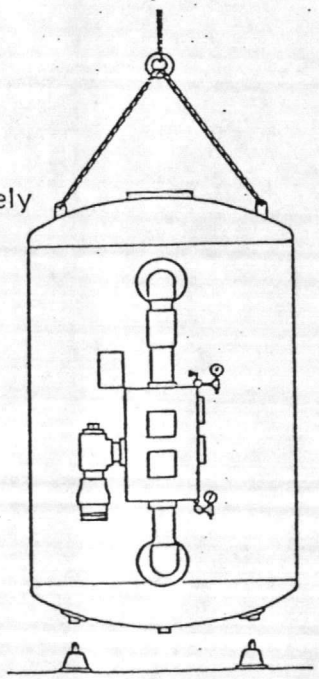
FIGURE 4

D. Set Leveling Screw — Screws provide 2" travel for adjusting height H. Set all at 1" or half-way point. This will provide maximum flexibility during final adjustment.

E. Make Sure Tanks are Straight, Level and Parallel.
   1. Manifold piping will usually face the front. It must be squared up precisely with the inlet and outlet piping. Refer to your specific outline drawing for tank location.
   2. Line up Multiple units. Tank location of multiple units should be as symmetrical as possible.

F. Install Tank on Jack-Legs With Great Care.
   1. Use the rigging at right to prevent possible damage to personnel and equipment.
   2. Provide temporary supports while leveling and piping. Weight of control valve and manifold piping makes tanks extremely unstable until fully installed.
   3. Do not use manhole or handhole as a lifting point.
   4. Do not use manifold piping for lifting.

G. Level Tanks using the adjusting screws on the jack-leg supports.



BRINE-TANK PLACEMENT

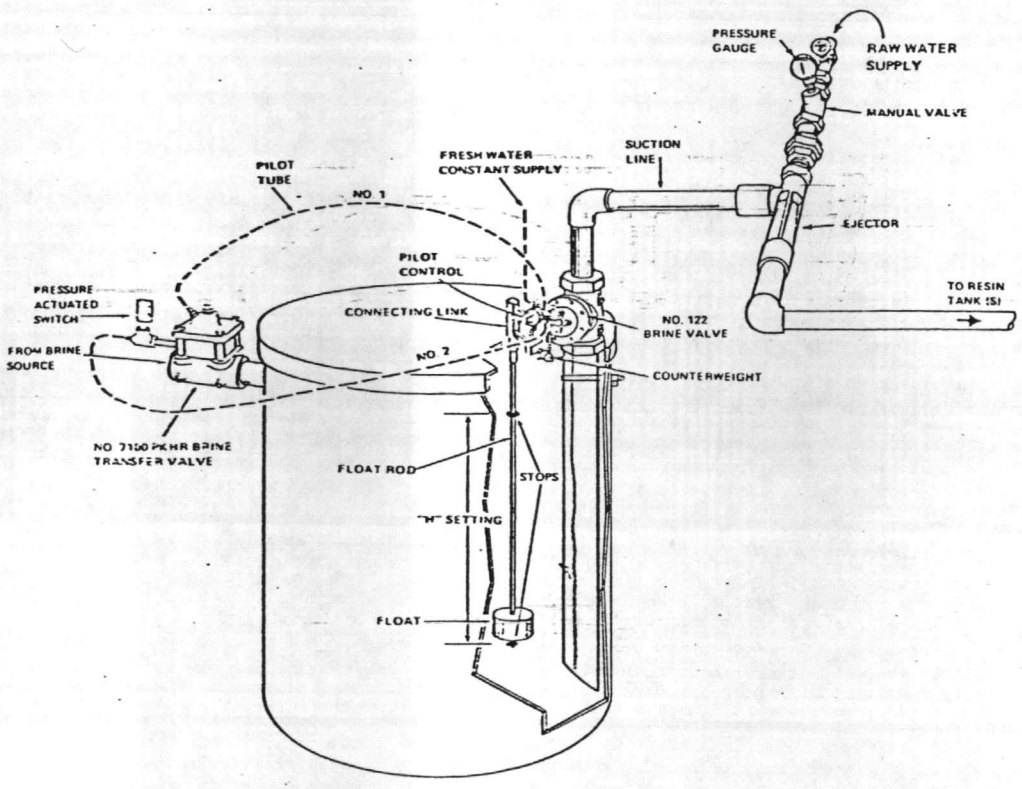
A. Determine Brine-Tank Location — refer to the outline drawing on page 14-1 to determine location and spacing of the brine tank in relation to the resin tank.

B. Provide Solid, Level Foundation — preferably concrete.

C. Align Brine Tank Carefully with piping from the resin tank.

D. Brine tank should be placed on spacers to provide ventilation under it. Be sure to support the center to prevent bowing when loaded. Do not use spacers to level fiberglass tanks.

E. Level the Brine Tank.
   1. Adjust spacers to level steel tanks.
   2. Fiberglass units must be mounted on a fabricated and leveled platform to assure proper support and prevent eventual stress failures.



F. HOW TO INSTALL BRINE-MEASURING TANK

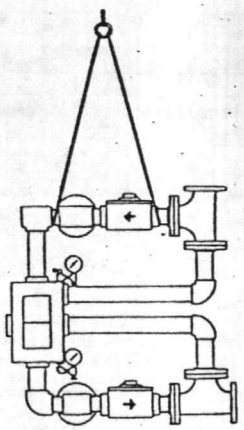
1. Study layout drawing to learn placement of valves and sub-assemblies.
2. Assemble the balance of brine-line piping according to piping layout, making sure to include all valves, fittings, etc.
3. Note flow arrows and make sure direction of flow is correct for all individual valves and check valves.
4. Make pilot tubing connections as shown in sketch above.
5. Connect a fresh-water supply line to ejector and pilot control as shown.
6. Assemble the float rod (without float) and screw into threaded end of connnecting link.
   a. Float rod must hang vertically to enable float to slide freely.
   b. Rod must be free to move up and down without touching bottom of tank.
7. Before installing the float, loosen the set screw on the counterweight and adjust the counterweight so that it counterbalances the weight of the rod and stops.
8. To install the float, disconnect the float rod and remove the top stop. Slide the float on the rod and replace the stop. Connect the float rod to the connecting link.
9. Set the distance between the stops as indicated on Page No. 3 ("H" setting).

PIPING

You will provide the interconnecting plumbing and the field installation of factory-supplied items. Be sure you check and follow all local and state codes. A few words of caution: Do not reduce pipe size. Your system is engineered to work efficiently only with the pipe size specified. Be sure to provide adequate support for piping. The surest way to avoid these pitfalls is to depend on a licensed plumbing contractor.

A. RESIN-TANK PIPING

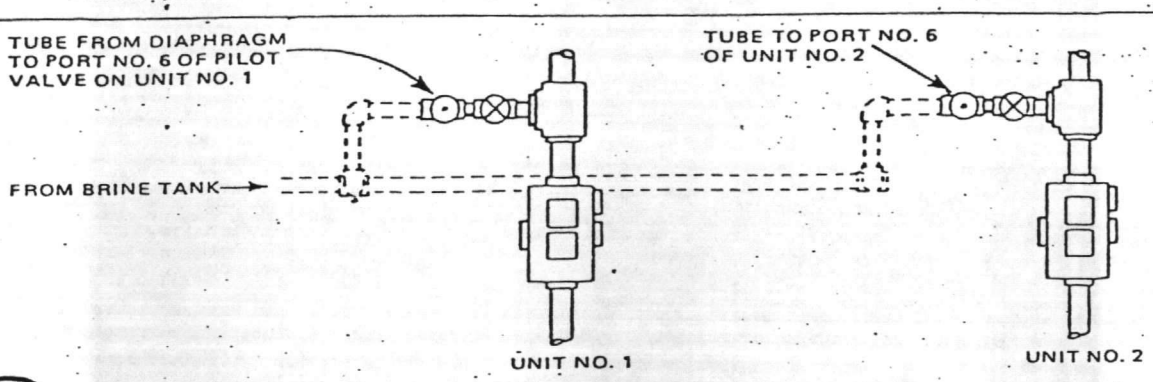
1. If the diameter of your resin tank is less than 48", the face-pipe manifold will be installed at the factory. Also, all internal headers and laterals are factory-installed.
   a. Study the piping layout, then install individual inlet, outlet, and bypass valves to facilitate service. (If your system feeds a water-heater or boiler, install backflow prevention on the outlet to prevent hot water from backing up and possibly damaging your system.)
   b. Notice the flow arrows stamped on the meter, and follow their directions when installing a meter on the outlet line.
   c. Provide meter with adequate independent support when installing it above floor level. Do not use connecting piping for support.
2. If the diameter of your resin tank is 48" or more, the face-pipe manifold will be pre-assembled at the factory, tagged with a number, then shipped unmounted.
   a. Compare numbers. The number on your manifold must correspond to the number on your resin tank. If numbers do not agree, misalignments in flange connections, pipe length, etc., will result.
   b. Lift and position manifold assembly carefully to prevent damage to valve and pilot controls. (See rigging diagram at right.)
   c. Position manifold assembly correctly. Be sure that piping connections leading from the port marked TOP on the control valve connects to upper flange. Mount gaskets and secure to flange with nuts and bolts provided.



B. DRAIN-LINE PIPING

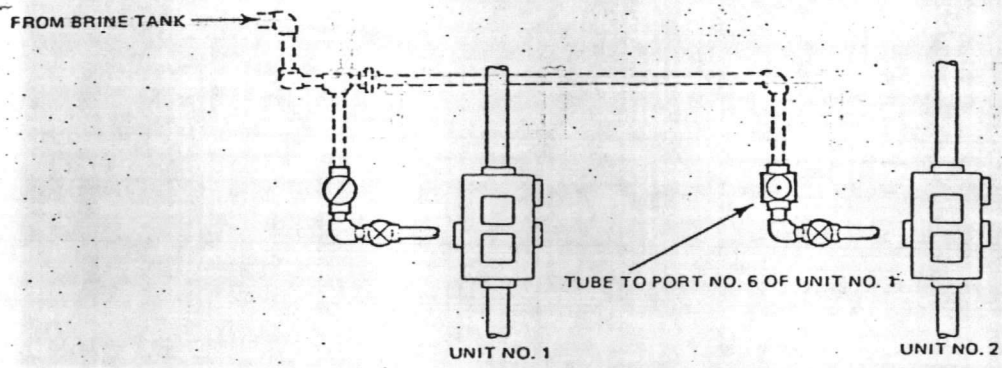
1. Check floor-drain capacity and make sure it is adequate to handle rate of backwash flow indicated in the specifications for your system.
2. Reduce pipe size at flow controls, if desired, in order to keep drain line as small as necessary to adapt to variation in flow-control size. (The flow controller is made larger only to provide room for the flow-control assemblies.)
3. Check drain diameter. A recommended air gap of at least four times the diameter of the drain line should be provided for three reasons:
   a. Plumbing codes prohibit a solid connection into a drain.
   b. It prevents drain back-up from entering resin tank.
   c. It provides a means of observing backwash flow.

3. The tubing connections between the brine-line diaphragm and the pilot valve differ depending on the number of resin tanks and the location of the brine injector. Select the proper tubing arrangement for your system from the drawings below. Refer to page 3 under specifications for proper diagram letter.
4. If Altwinator system is used, tubing should connect from pilot body Port R to Port No. 4 of Unit 2. (Refer to Service Manual, Section D.)



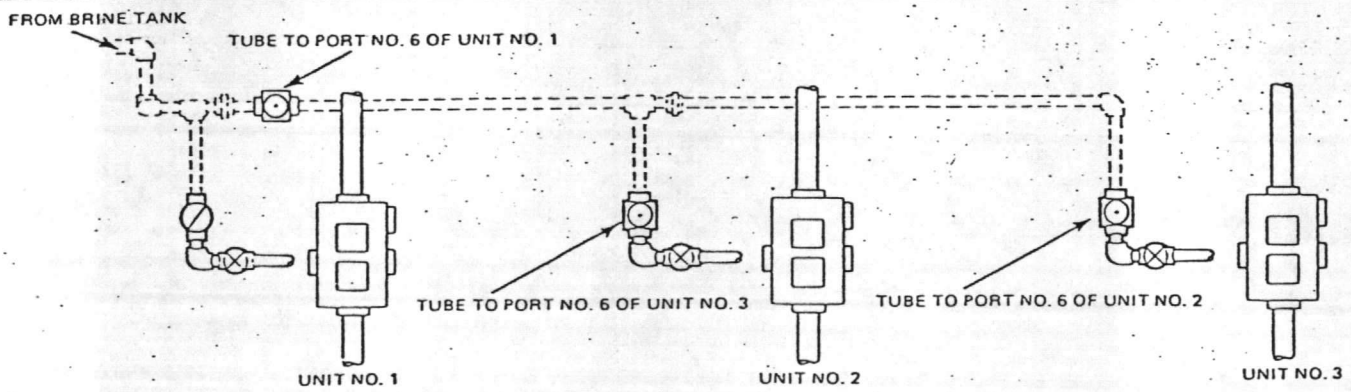
A

ALL SYSTEMS WITH EXTERNALLY MOUNTED EJECTOR
(Typical two-tank system shown)



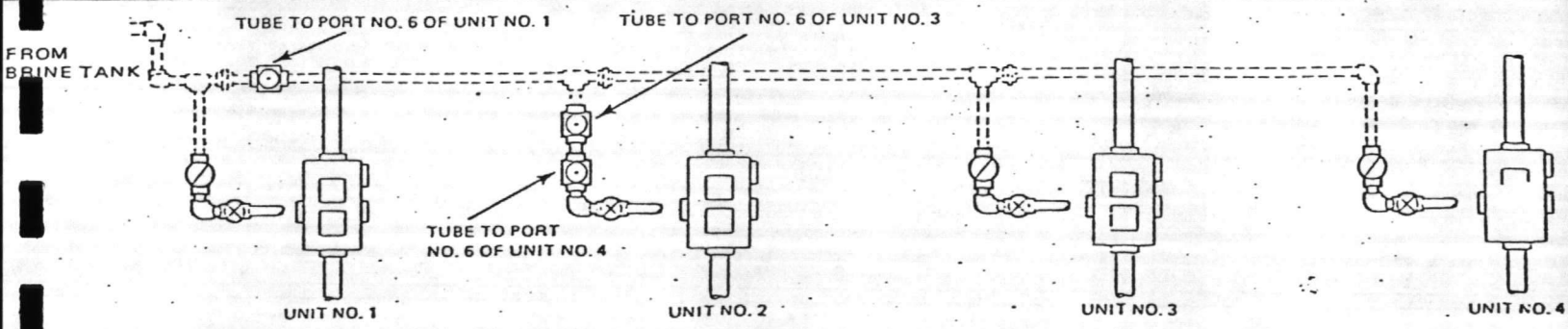
B

TWO-TANK SYSTEM WITH EJECTOR MOUNTED ON MULTIPORT VALVE



C

THREE-TANK SYSTEM WITH EJECTOR MOUNTED ON MULTIPORT VALVE



D

FOUR-TANK SYSTEM WITH EJECTOR MOUNTED ON MULTIPORT VALVE

ELECTRICAL CONNECTIONS

A. Check incoming supply. Be sure it is compatible with the electrical specifications of your system. Power requirements are shown on the inside cover of the cycle controller.

B. Follow the schematic drawings to make electrical connections. The schematic drawings for your system are located in the operating instructions. Also, be sure to follow all local and state electrical codes.

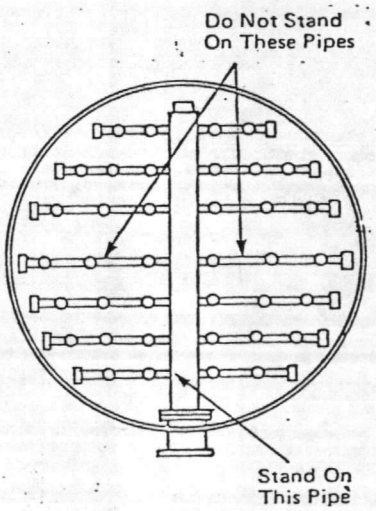
C. Use color-coded wires. It could save you hours of trouble-shooting time in the future.

D. Keep the main "ON-OFF" switch in the "OFF" Position until time of start-up.

RESIN-TANK LOADING

A. GRAVEL LOADING

1. Remove upper manhole or handhole cover carefully. Do not damage the gaskets. NOTE: Typically, tanks 30" in diameter and under are equipped with a handhole in the top head and in the sideshell just above the gravel level. Tanks 36" and larger in diameter are equipped with a manhole in the top head only.
2. If your tank is equipped with a lower handhole, check to be sure that it is tightened securely.
3. Load gravel from top.
   a. If your system has a handhole, introduce gravel carefully to avoid damage to the underdrain system.
   b. If your system has a manhole, let a worker enter the tank to receive and position the gravel.
      1. Protect worker against dust inhalation with a face mask or respirator.
      2. Pre-wet gravel to further reduce dust hazard.
4. Do not use small lateral pipe for support (see drawing at right).
5. You may use the center header pipe as a support.
6. Spread gravel evenly in the resin tank until it covers the slotted distributors completely. Distributors must be completely covered with graded gravel to prevent resin loss.



NOTE: Tanks 30" in diameter and smaller have a single centrally positioned stainless steel lower distributor. Tanks 36" in diameter and larger have a header-lateral lower distributor as in the illustration at the right.

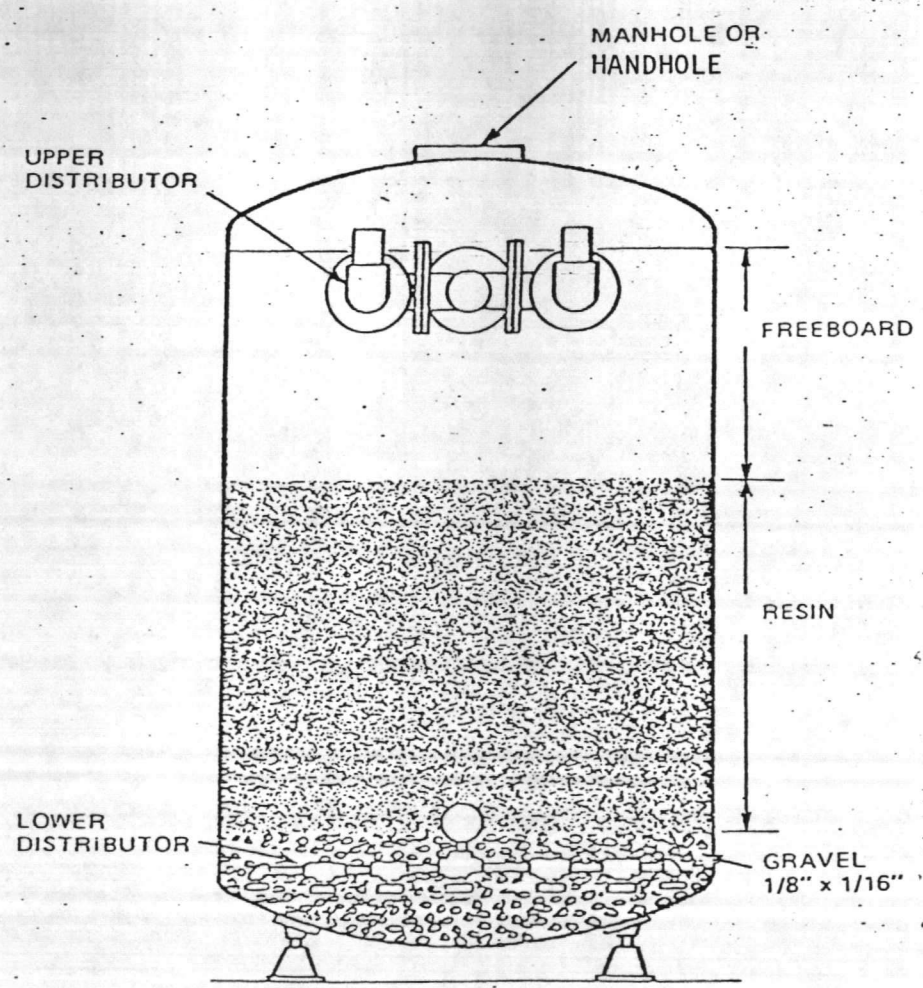
Check to confirm that all distributor nozzles are securely tightened.

B. RESIN LOADING

1. Do not load the resin tank with resin until the system is ready to be put into operation. Storing resin in a tank that is not full of water and under pressure will cause serious corrosion damage and also will cause resin particles to dry out and crack.
2. When the system is ready to put into operation, pour the specified amount of resin into the tank. (Locate the amount to be installed in your tank in the specifications on Page 3.)
3. The sketch below shows a resin tank loaded with gravel and resin. The proper loading can be checked by measuring the freeboard. Freeboard is the distance from the top of the resin bed to the weld seam of the top head. The approximate freeboard for your unit can be located on the specifications on Page No. 3.

C. CLOSING RESIN TANK

1. Fill the tank as full as possible with water by manually turning the Position Dial on the Pilot Valve to "Backwash".
2. Thoroughly clean the contact areas between the manhole gasket and gasket seat. Install and fasten the manhole cover.
3. Apply water pressure to tank with air-release valve open.
4. When all air is expelled, close the valve and check the entire system for any leaks.
5. Re-tighten manhole or handhole after 48 hours of operation.

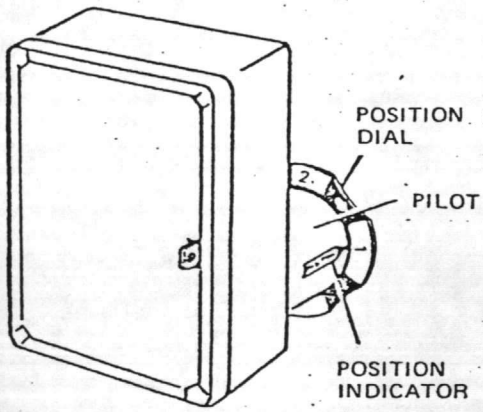


START-UP AND CHECK-OUT PROCEDURE

PRESSURIZING THE RESIN TANK

A. PRELIMINARY CHECKS

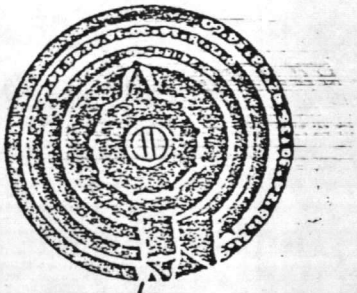
1. Check manholes and/or handholes. Gaskets must be in place. Covers must be closed tightly.
2. Turn all electrical power to equipment off.
3. Turn dials clockwise on pilot assemblies to the SERVICE (1) position.
4. Close inlet, outlet and by-pass valves on each resin tank.
5. Close manual brine valves and air relief valves.
6. Set all cycle controllers at "OFF" position.

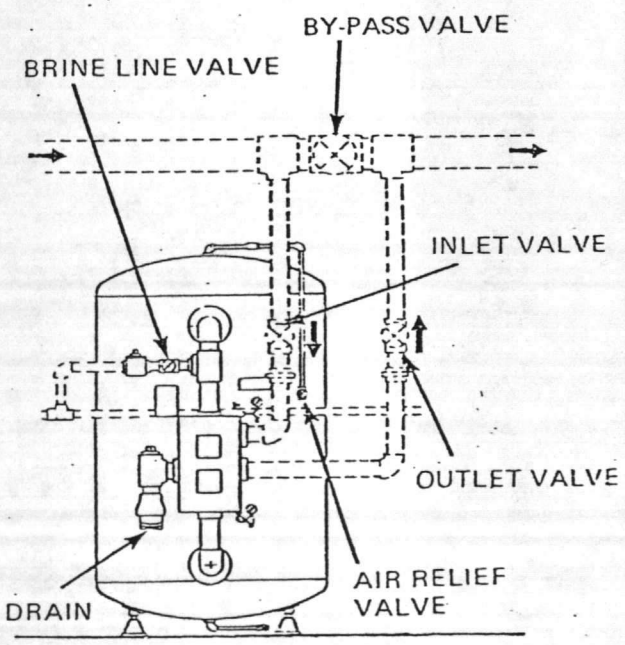


B. PRESSURIZE TANK

(On multiple-unit installations, repeat the following steps separately for each tank)

1. Open the main by-pass valve.
2. Open inlet valve to the resin tank slowly. As tank begins to fill, water will flow from the drain outlet. This will continue until the tank is full and pressure build-up closes the ports in the main control valve. At this point, the flow from the drain and the sound of water entering the tank will stop.
3. Turn the position dial on the controller to FLUSH (No. 4). Water will flow rapidly from the drain.
4. Allow unit to flush for 15 minutes to purge trapped air from the resin bed.
5. Turn the position dial on the controller to SERVICE (No. 1).
6. Close the inlet valve to the resin tank.
7. Open the air relief valve to vent trapped air from the top of the tank.
8. Open inlet valve and refill tank.
9. Close air vent only after the water flowing from vent is steady and free of air bubbles.
10. Set pilot dial to BACKWASH (No. 2) position, allowing unit to backwash for approximately 20 min., or until the flow to drain runs clear.
11. Set pilot dial to FLUSH (No. 4). Allow unit to flush for five minutes. This settles the resin bed and removes turbidity.
12. Turn pilot dial to SERVICE (No. 1) position. Resin tank is now pressurized and ready.





MULTI-PORT VALVE AND CONTROLS

Flow of water through the Multi-Port valve is directed by five individual diaphragm valves and one piston-type by-pass valve. Each is identified by a number cast on front of the main valve.

These valves open and close by water pressure in a sequence regulated by a pilot on the upper left of the Multi-Port valve. When actuated, the controller mechanism in the control panel turns the pilot through the regeneration cycle, correctly timing each step. The Position Dial on the rear of the pilot indicates the valve position.

The electrically powered Cycle Controller in the control panel provides automatic regeneration and return to service. It may function fully automatic (started by a built-in time switch or by an automatic reset water meter) or automatic with "push-button" start. An electric alarm water meter is frequently used with the "push-button" operation. In an emergency, the Cycle Controller can be operated manually by turning the Position Dial from one regeneration step to the next.

At "start-up", it is desirable to bleed air from the pilot control tubing by loosening the tubing nut at the diaphragm cap while the valve is under pressure. When water squirts from the fitting, tighten the nut until leaking stops. Do not tighten excessively. Follow this procedure:

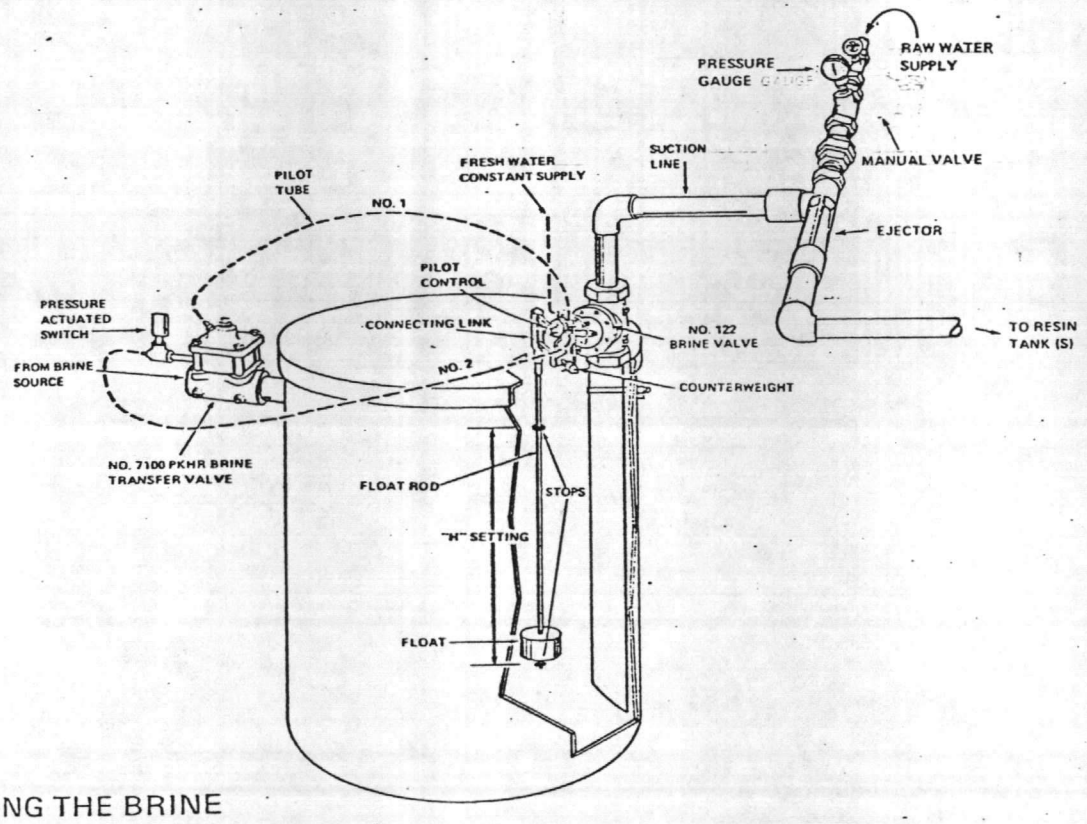
1. Turn Position Dial (clockwise) to #1 (SERVICE) position. Bleed valves #2, #5, #6 and #17.

2. Rotate dial to #2 (BACKWASH) and bleed valves #1 and #4 and allow for INITIAL BACKWASH of softening mineral for 10 to 15 minutes before rotating dial clockwise to the #1 (SERVICE) position.

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.

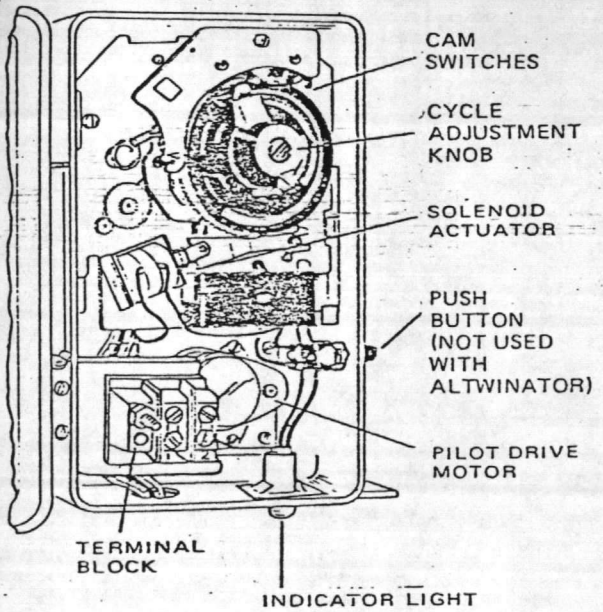
ELECTRICAL CHECK-OUT

A. CYCLE-CONTROLLER CHECKOUT

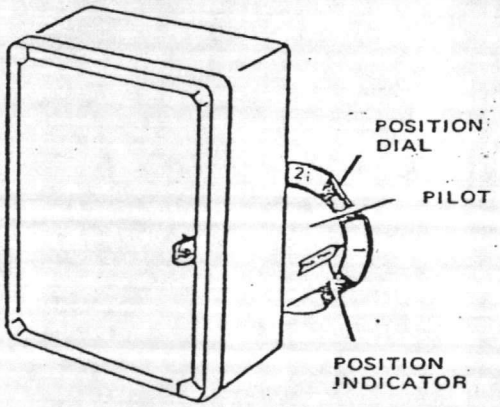
1. Close manual brine valve and brine refill, to prevent loss of brine during check-out.
2. Turn main power switch to the OFF position.
3. Turn cycle-adjustment knob clockwise until red arrow points downward, to "6 o'clock" position. (This is to make certain it is not in any of the switching sequences 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.



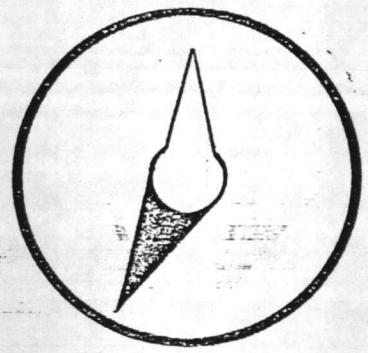
(CONTROLLER SHOWN ABOVE IS ELECTRIC-SIGNAL UNIT)



B. METER-ACTIVATED REGENERATION

1. Follow steps 1 thru 4 under Cycle Controller Checkout.
2. Turn on main electric-power switch and allow the cycle-adjustment knob to advance automatically to IDLE position. This should take about five minutes.
3. Place matching pencil marks on the lower cam and back-plate to detect movement of the cycle-adjustment knob.
4. Open cover plate on the water meter and manually rotate the red pointer counter-clockwise to zero. This will close contact points and initiate the following steps:
   a. The nickel pointer will start to move counter-clockwise.
   b. As it passes zero, it will pick up the red pointer and reset both at a pre-determined gallonage.
   c. A solenoid coil will energize and advance the cycle adjustment knob out of IDLE position. After approximately five minutes, the red light on the bottom of the cycle controller will light and the pilot motor will start.
   d. The pilot motor will advance the position dial 90 degrees to BACKWASH (No. 2) position. This confirms that the electrical circuitry is operating properly.

Both Pointers
In Preset Position



Rotate Red Pointer
to Zero

C. ALTWINATOR CONTROL-METER-ACTIVATED REGENERATION

1. Follow Steps 1 thru 3 under "B" Meter-Activated Regeneration.
2. Open cover plate on the water meter and manually rotate the red pointer counter-clockwise to zero. This will close contact points and initiate the following steps:
   a. The nickel pointer will start to move counter-clockwise.
   b. As it passes zero, it will pick up the red pointer and reset both at a pre-determined gallonage.
   c. A signal will then be sent through the Altwinator control to one of two cycle controllers, energizing its solenoid and advancing its cycle adjustment knob out of IDLE position. If Altwinator dial is on LEFT, signal goes to the left unit and vice versa.
   d. After approximately five minutes, the first tripper switch in the cycle controller will activate, starting the pilot motor. A red light will come on, indicating the unit is in regeneration, and the posistion dial will advance from SERVICE (No. 1) position to BACK-WASH (No. 2) position.
   e. Simultaneously, a signal is sent to start the Altwinator pilot-motor, which indexes the pilot to take one unit off line and place the other unit on line.

Nickel Pointer
Also Moves to Zero

Both Pointers
Return to Preset

OPERATING INSTRUCTIONS

VALVES AND CONTROLS IN CALGON INDUSTRIAL WATER-TREATMENT SYSTEMS

No matter which of the four systems one uses for triggering the regeneration process, the valves and controls brought into play are the same. They are:

- Multiport Valve consists of five individual diaphragm ports and one by-pass port in a single casting. These ports open and close in proper sequence to perform all functions from "Service" through the cycles of regeneration and back again to "Service".

  Ports close under hydraulic pressure and open when pressure is released or vented. An automatic timing device and a hydraulic pilot control regulate the sequence and time span of each of the regeneration functions.

  The by-pass valve will allow for a hardwater by-pass during the regeneration cycle. This by-pass assembly is operational only on single units. On twin or multiple unit applications, the by-pass is rendered inoperative.

- Automatic Cycle Controller is an electric timing device connected to a hydraulic pilot. When regeneration is required, the cycle controller will receive a signal from the particular control device used—i.e., time clock, water meter, or hardness monitor. It also regulates the sequence and length of the various regeneration cycles. It does this by sending signals to the pilot, which hydraulically operates the multiport valve.

  A position dial on the pilot indicates which cycle the softener is in. It may be turned by hand and timed by an operator if a power failure occurs.

- Service Valves are auxiliary inlet and outlet valves which allow the service flow to by-pass the multiport valve. This permits a higher service flow. The pilot automatically opens these valves for service and closes them during regeneration.

- Ejectors are devices used to withdraw salt brine from the storage container and send it through the resin tank at a controlled rate of flow.

  An ejector works on the Venturi principle. Water is forced through a constriction which increases its velocity (like a thumb over the end of a garden hose). The increased velocity creates a vacuum at the point of constriction, which siphons brine from the brine tank.

  Ejectors can be mounted remotely or on the multiport valve. The amount of resin in the softener tank determines the type of ejector to be used.

- Individual Diaphragm Valves are similar to individual ports in a multiport valve. In fact, many of these valves and ports are interchangeable. Some, however, work in reverse. They open under pressure and close when pressure is vented. The most common examples are brine-line piping and brine-refill valving. Their purpose is to isolate a unit in regeneration.

- Wet-Salt Brinemaker. The brinemaker has three functions. It stores salt, converts it into salt brine, and delivers the correctly measured amount of brine to the resin tank during regeneration.

  When regeneration-backwash starts, hydraulic pressure opens a refill valve, allowing fresh water to flow upward through the salt, converting it to salt brine. The refill valve closes automatically when brine reaches to proper level.

  After the predetermined amount of brine has been drawn—or delivered to the resin tank—the automatic brine valve will close, preventing further intake of brine or air. This completes the brinemaker's cycle. Nothing further takes place until the next regeneration-backwash, when fresh water refills through the salt bed.

- Automatic Brine Valve. This valve controls the refill level in the brine tank and prevents air intake after the proper amount of brine has been drawn. It consists of a simple float-and-poppet arrangement. As the level of new liquid rises, the float moves upward to close the poppet, stopping further intake of water. After the brine has been drawn, a rubber diaphragm seals the line, preventing air intake.

WATER SOFTENER THEORY OF OPERATION

What is Hard Water?

Water is said to be hard when it carries too high a concentration of calcium and magnesium.

Why Should the Hardness Be Removed?

Hard water causes scaling and etching which greatly impare the life and efficiency of industrial boilers, air-conditioning systems, cooling towers, refrigerating plants, and other water-using equipment.

What Can We Do About It?

Hard water can be treated very effectively with the use of a water softener.

How Does It Work?

The components of dissolved minerals are called ions. They carry either a positive or negative charge. It happens that the principal hardness ions of minerals dissolved in water carry a positive charge. These positively charged ions (cations) are attracted, like microscopic magnets, to a synthetic softening material called ion-exchange resin.

The heart of the softening system, therefore, is a deep bed of resin which draws calcium and magnesium ions from the water as it passes through.

Can The Resin Draw Out Hardness Ions Indefinitely?

No. During normal operating the resin becomes saturated with positive ions and functions less efficiently. When hardness leakage occurs, the resin should be regenerated to restore its efficiency.

How Do You Regenerate Resin?

You regenerate a resin bed by cleaning it two ways. First, you flush out all dirt and sediment which have been trapped by the bed's filter action. Then you remove the mineral ions. This regeneration process takes approximately 90 minutes. For the exact time for your system, refer to the specific operating instrucitons. It takes four steps to complete this process.

1. Backwash

   During the backwash cycle, water flows rapidly upward (in reverse direction) through the resin bed to expand and loosen the material and flush out accumulated sediment, dirt, or other source of turbidity.

2. Brine

   Salt brine its drawn from a brine-storage container and allowed to flow slowly down through the bed. This brine solution removes the calcium and magnesium ions from the resin.

3. Rinse

   Brine is then followed by a clear-water rinse. This rinse cycle will remove most of the unused brine and the freed calcium and magnesium ions from the bed.

4. Flush

   A very rapid downflow of fresh water removes the last traces of brine and sediment, and settles the resin bed.

How Often Must You Regenerate?

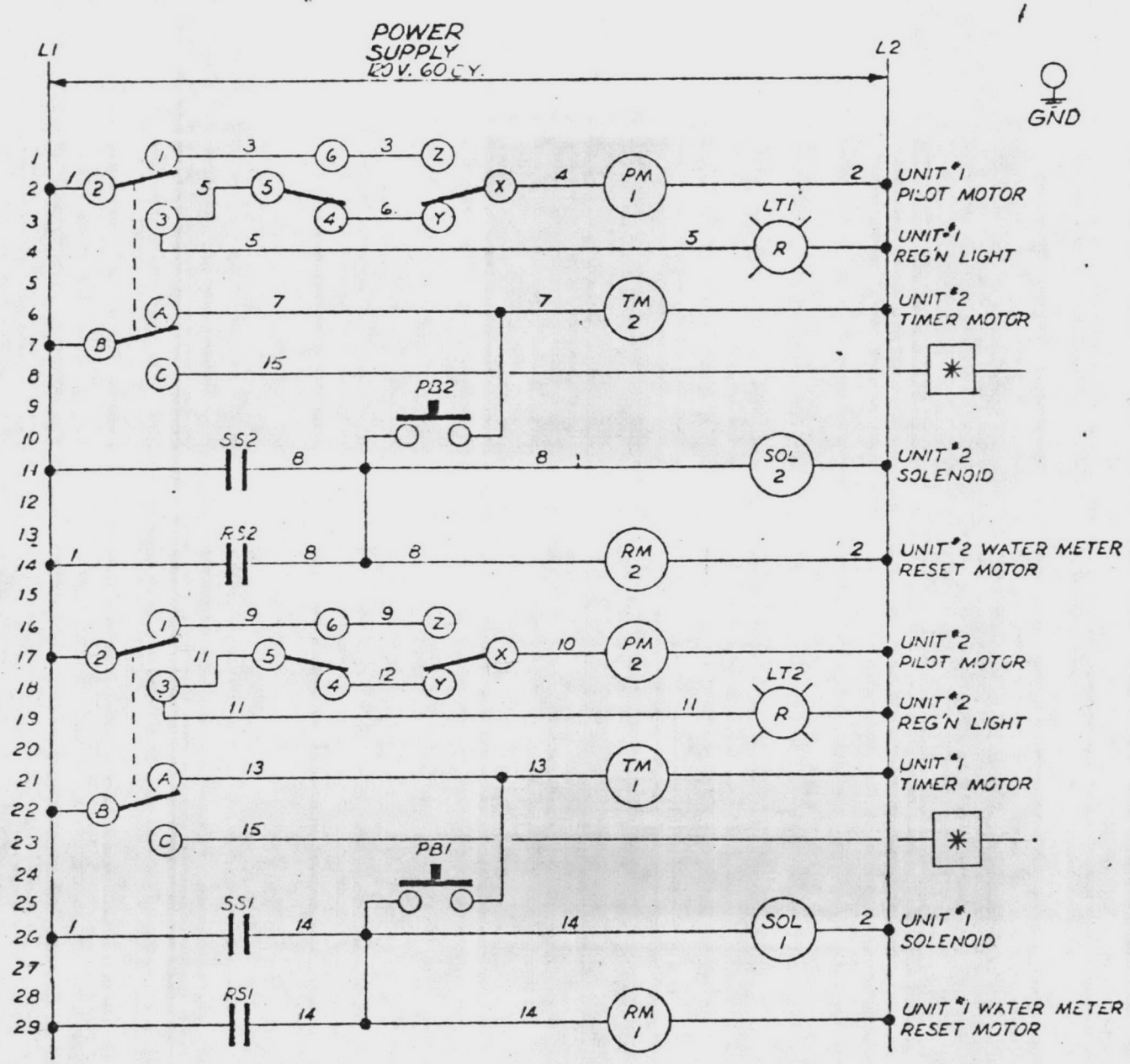
Frequency must be determined for each installation, based on the amount of water usage, its degree of hardness, and the amount of softening resin through which it flows.

How Do You Control The Regenerating Process?

The regeneration can be controlled manually. In this case, an operator would conduct tests to determine when the resin bed was exhausted, then personally time each of the regeneration steps described above. It is more common, however, to employ one of three automatic methods of determining when regeneration should take place, then initiating and timing the cycles.

SEQUENCE OF OPERATIONS

Twin Altwinator System — with Automatic Reset Meter



* TO LOCK IN POWER CIRCUIT TO KEEP WELL PUMPS RUNNING AND DE-ENERGIZE THE BACK PRESSURE VALVE TO CLOSE.

REF. DWG. INTER. WIRING

NO.	DATE	REMARKS	DR.	CHK.	APP'D
1					
2					
3					
4					
5					
6					

REVISIONS

CALGON

SUBSIDIARY OF MERCK & CO., INC.
P.O. BOX 1346 PITTSBURGH, PA. 15230

TITLE LOGIC DIAGRAM TWIN SOFTENER WITH WATER METERS

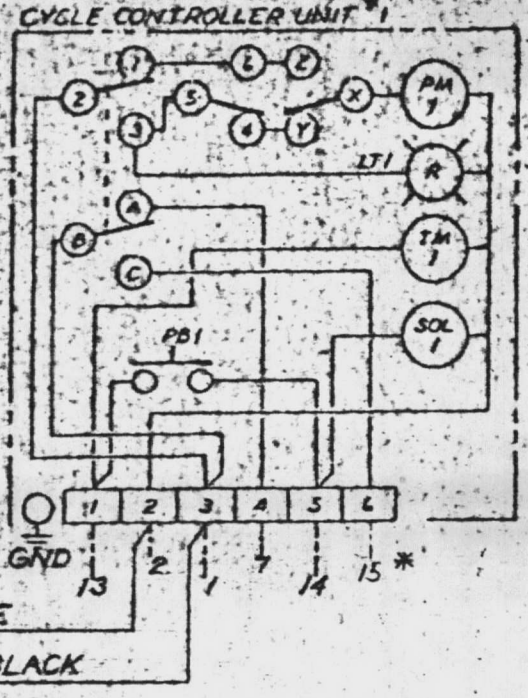
PROJ. NO.

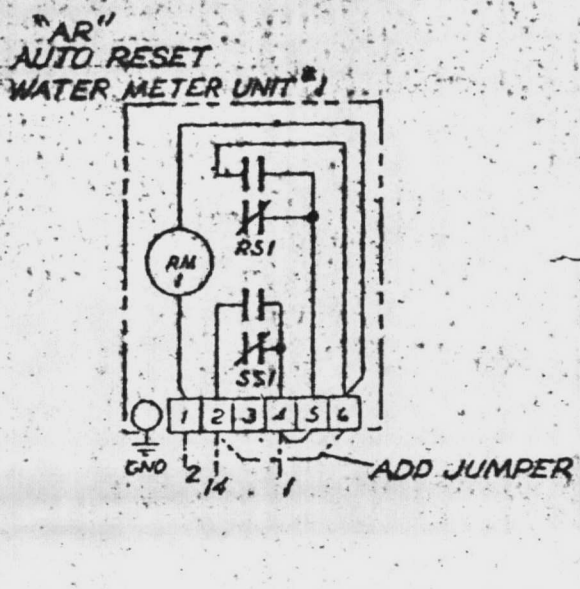
SCALE

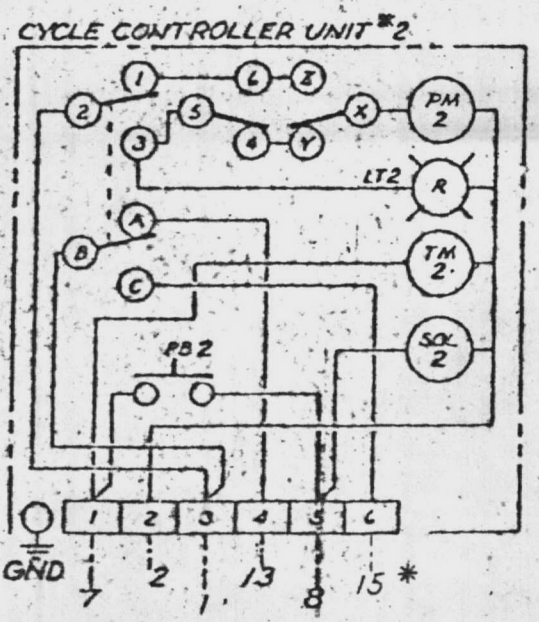
DATE 10-7-76 DRN. J.W.B APP'D MBK

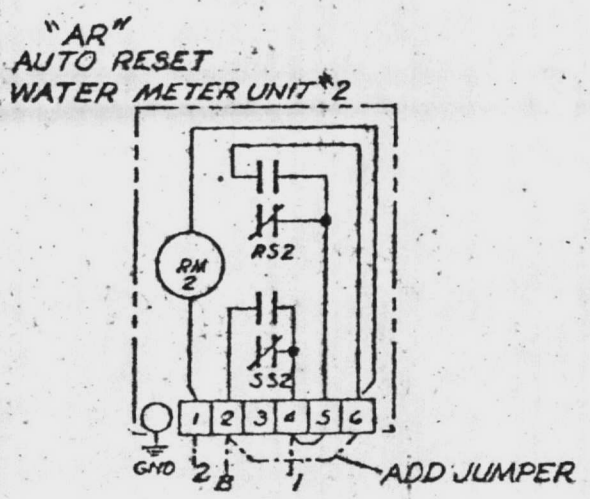
DWG. NO. A-02091-76-6

REV.









* TO LOCK IN POWER CIRCUIT TO KEEP WELL PUMPS RUNNING AND DE-ENERGIZE THE BACK PRESSURE VALVE TO CLOSE.

NOTE: ALL NUMBERED LEADS ON TERMINAL STRIPS ARE INTERCONNECTING WIRES.

REF. DWG. A SCHEMATIC

NO.	DATE	REMARKS
1		
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REVISIONS

CALGON

SUBSIDIARY OF MERCK & CO., INC.
P.O. BOX 1346, PITTSBURGH, PA. 15230

TITLE
INTERCONNECTING WIRING TWIN SOFTENER WITH WATER METERS

PROJ. NO.		SCALE
DATE 10-7-76	DRN. J.W.B.	APP'D MBK
DWG. NO. A-02091-76-7		REV.

SEQUENCE OF OPERATION FOR TWIN SYSTEM WITH AUTOMATIC RESET METERS

NOTE: The position dial on the pilot body shows 4 operating modes:
No. 1– Service, No. 2– Backwash, No. 3– Brine/Rinse, No. 4 – Flush

I. Starting Condition
   1. Unit 1 and Unit 2 are in service.
   2. Logic and interconnecting wiring diagrams are set with all switches in the SERVICE (No. 1) position.

II. Preset gallonage passes through water meter and its switches SS1 and RS1 close when the red pointer on the meter dial reaches zero.
   1. Cycle controller solenoid SOL1 is energized, and indexes its timer mechanism out of its idle position.
   2. Water-meter reset motor RM1 runs and resets the meter in approximately three minutes, switches SS1 and RS1 open, and de-energizes solenoid SOL1.

III. Cycle-controller timer motor TM1 advances the timer mechanism and switches 1-2-3 and A-B-C of the timer mechanism simultaneously go from the 2-1 to the 2-3 and from B-A to the B-C positions respectively.
   1. Regeneration light LT1 glows.
   2. Pilot motor PM1 runs and indexes the pilot of Unit 1 to the BACKWASH (No. 2) position, then its switch X-Y-Z goes from the X-Y to the X-Z position and pilot motor PM1 ceases to run.
   3. Timer motor TM2 ceases to run and power is lost at the regeneration push-button PB2. Thus an electrical lockout through the A-B-C switch of the timer mechanism prevents automatic or manual push-button initiation of regeneration of Unit 2.

IV. After the set BACKWASH period, switch 4-5-6 goes from the 5-4 to the 5-6 position.
   1. Pilot motor PM1 runs and indexes the pilot of Unit 1 to the BRINE /RINSE (No. 3) position, then its switch X-Y-Z goes from the X-Z to the X-Y position and pilot motor PM1 ceases to run.

V. After the pre-set BRINE/RINSE cycle, switch 4-5-6 goes back to the 5-4 position.
   1. Pilot motor PM1 runs and indexes the pilot of Unit 1 to the FLUSH (No. 4) position, then its switch X-Y-Z returns to the X-Z position and pilot motor PM1 ceases to run.

VI. After the set FLUSH period, switches 1-2-3 and A-B-C simultaneously go to the 2-1 and B-A position respectively.
   1. Regeneration light LT1 ceases to glow.
   2. Pilot motor PM1 runs and indexes the pilot of Unit 1 to the SERVICE (No. 1) position, then its switch X-Y-Z goes again to the X-Y position and pilot motor PM1 ceases to run.
   3. Timer motor TM2 runs and power is restored at the regeneration push-button PB2. Thus the electrical lockout through the A-B-C switch no longer prevents automatic or manual push-button initiation of regeneration of Unit 2.

VII. Unit 1 returns to SERVICE (No. 1) position.

CYCLE-CONTROLLER SEQUENCE OF OPERATION				
PILOT-VALVE POSITION	TIMER-MECHANISM SWITCHES			PILOT-VALVE* SWITCHES
	1-2-3	4-5-6	A-B-C	X-Y-Z
Service (No. 1)	2 to 1	5 to 4	B to A	X to Y
Backwash (No. 2)	2 to 3	5 to 4	B to C	X to Z
Brine/Rinse (No. 3)	2 to 3	5 to 6	B to C	X to Y
Flush (No. 4)	2 to 3	5 to 4	B to C	X to Z

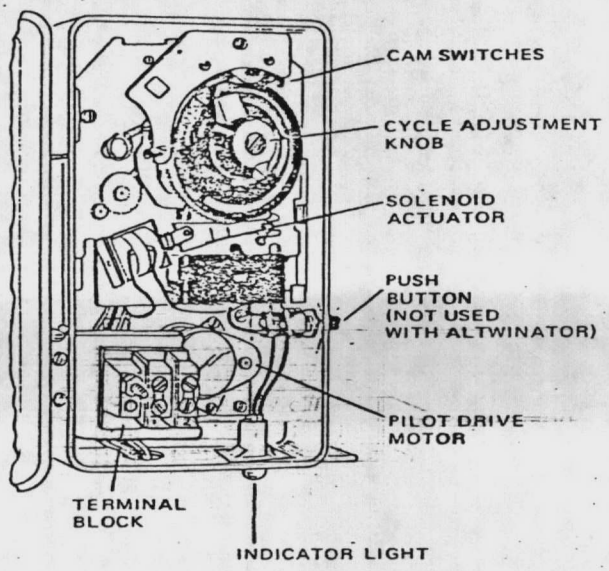
*The X-Y-Z switch indexes after the unit has moved to the next cycle of regeneration.

NOTE 1: To begin regeneration manually, push-button "PB" and hold it for six seconds to insure reset of the water-meter mechanism. The regeneration cycle will continue automatically in the same manner as previously described.

NOTE 2: Regeneration of softener Unit 2 is accomplished in a manner similar to that described for Unit 1.

AUTOMATIC CYCLE-CONTROLLER—OPERATION ELECTRIC-SIGNAL ACTUATED

The function of the automatic cycle controller is to start, regulate, and end the regeneration of a softener or dealkalizer, or the backwash of a filter. The complete cycle controller consists of two subassemblies—an electrical timing mechanism and a motor-driven pilot valve. This cycle controller is actuated by an electric signal from an automatic-reset meter, hardness monitor, or other signal-producing device designed for this use. A built-in push-button switch can be used to initiate regeneration, if desired. In an emergency, the cycle controller can be operated manually by turning the Position Dial by hand and timing each step.



THEORY OF OPERATION:

In operation, the electric timing mechanism is actuated by an electric signal from a automatic-reset meter or hardness monitor, and the cycle adjustment knob begins to rotate slowly in a clockwise direction. This rotation closes a switch which energizes the pilot drive motor. The pilot-drive motor will rotate the pilot valve clockwise 90° when at this point a micro-switch opens, stopping the pilot-drive motor. The cycle-adjustment knob continues to rotate.

The pilot valve, which is under pressure, is connected to the multiport control valve by a series of tubes. The rotation of the pilot vents some of the diaphragm ports, allowing them to open while pressuring others and forcing them closed. This shifts the multiport valve from the SERVICE (No. 1) position to BACKWASH (No. 2). The setting on the cycle-adjustment knob determines the length of the BACKWASH cycle.

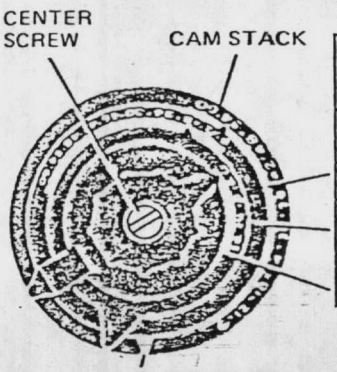
After this period, the cycle-adjustment knob closes a second switch which energizes the pilot-drive motor. The pilot valve will again rotate clockwise 90° where a micro-switch stops the pilot-drive motor. This second rotation of the pilot valve opens and closes a different series of valve ports, and the multiport valve shifts from the BACKWASH (No. 2) position to BRINE/RINSE (No. 3).

After the BRINE/RINSE cycle, the cycle-adjustment knob closes a third switch and energizes the pilot-drive motor. The pilot valve will rotate clockwise 90° where a micro-switch opens, stopping the pilot-drive motor. This rotation of the pilot valve causes a third series of valve ports to open and close, shifting the multiport valve from the BRINE/RINSE (No. 3) position to FLUSH (No. 4).

When the FLUSH cycle has been completed, the cycle-adjustment knob closes a fourth switch, energizing the pilot-drive motor. The pilot valve will again rotate clockwise 90° and shut off. At this point, a different series of valve ports will open and close, shifting the multiport valve from the FLUSH (No. 4) position to SERVICE (No. 1). The cycle controller will remain in the SERVICE position until the next scheduled cycle or until manually started by an operator. Throughout the regeneration, the position of the multiport valve is shown on the Position Dial located at the rear of the pilot valve.

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).

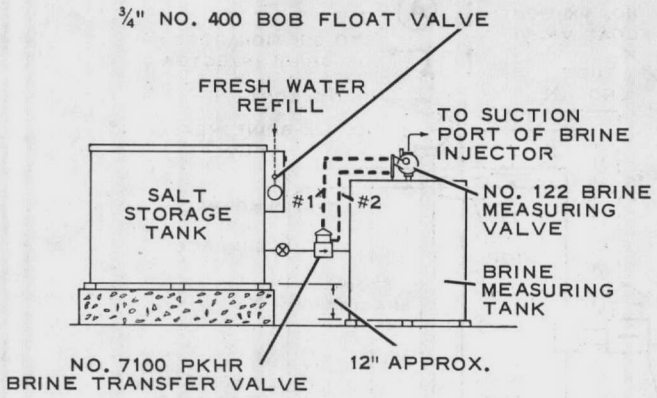
To change FAST FLUSH setting:

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.

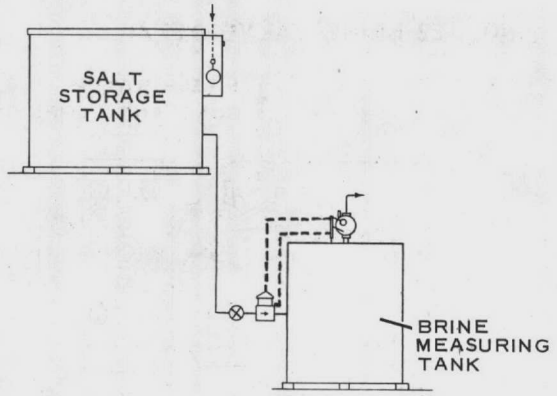
The entire cam stack should turn freely CLOCKWISE when all cams are firmly seated and fastened by the center screw.

INSTRUCTIONS for BRINE MEASURING SYSTEMS with NO. 122 BRINE MEASURING VALVE and NO. 7100 PKHR BRINE TRANSFER VALVE

GRAVITY SYSTEMS



NORMAL INSTALLATION

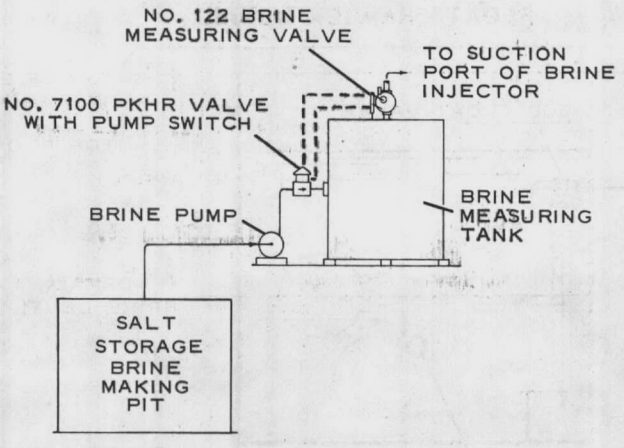


ALTERNATE REMOTE INSTALLATION

OPERATION

1. With the Brine Measuring Tank full and the 122 Brine Measuring Valve in the "Float Up" position, the valve is ready to open when vacuum is applied. The Brine Transfer Valve is positively held closed by pressure thru tube #1.
2. When a unit starts its brine operation, water passes thru the injector, creating a vacuum in the brine line to the 122 Valve.
3. With the control in the "Float Up" position and a vacuum present, the 122 Valve opens to allow brine to flow through the injector into the unit. Brine flows thru the unit and out to waste.
4. As the brine is withdrawn from the Brine Measuring Tank, the float travels down the float rod. Upon contacting the lower stop, the pilot control is positioned to apply positive pressure to the cover chamber of the 122 Valve. Pressure closes the valve and stops the flow of brine to the unit.
5. When the flow of brine stops, only fresh water continues to flow thru the injector to rinse the brine from the unit.
6. The Brine Transfer Valve is held closed until the brine line is repressurized after the brine rinse step.
7. At this time the pressure is directed thru tube #2 to the power unit chamber of the 7100 PKHR transfer valve causing it to open, permitting brine flow from the salt storage tank to the brine measuring tank.
8. As the Brine Measuring Tank refills, the float travels up the float rod. Upon contacting the upper stop, the pilot control is positioned to close the Brine Transfer Valve and hold positive pressure to the cover chamber of the 122 Valve, maintaining it in its already closed position.
9. Fresh water is admitted into the Salt Storage Tank by the Bob Float Valve. The lowest level in the Salt Storage Tank is automatically maintained above the highest level in the Brine Measuring Tank.

BRINE PUMP SYSTEM



BRINE PUMP SYSTEM

The operation of the No. 122 Brine Measuring Valve and the No. 7100 PKHR Brine Transfer Valve is as described under Operation steps 1 thru 7. Refill of the brine measuring tank is then by pumping rather than gravity.

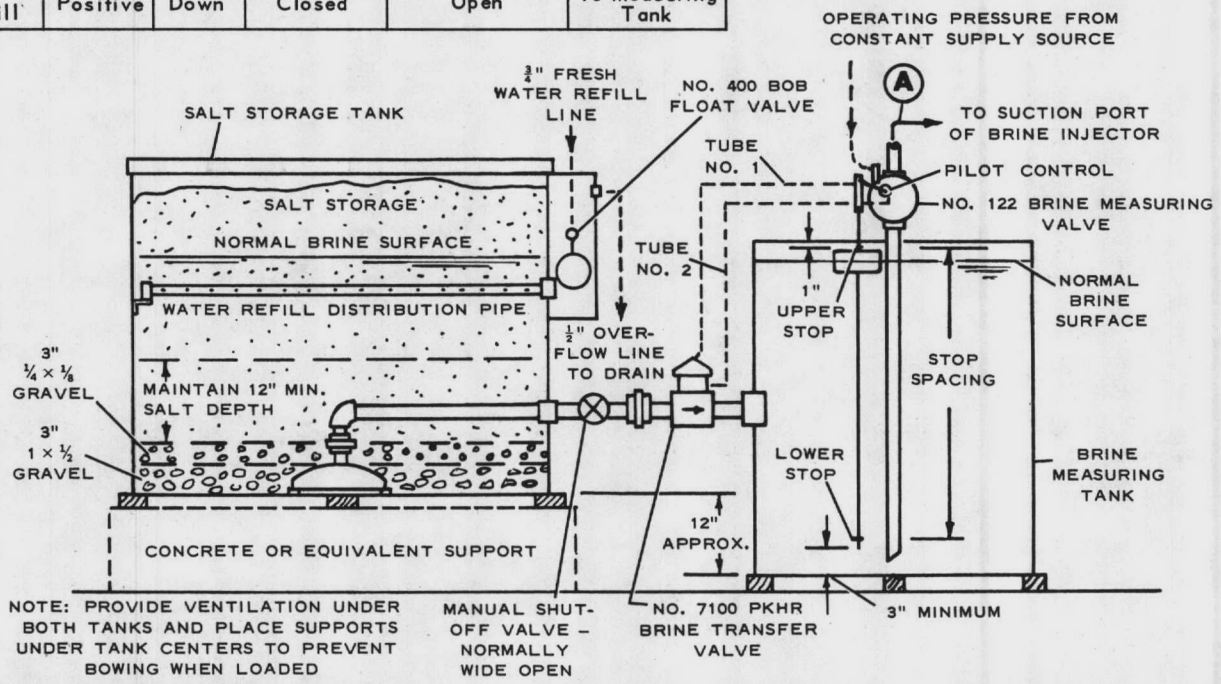
With the Brine Pump System the 7100 PKHR Brine Transfer Valve is fitted with either a mechanical or pressure switch to start and stop the brine pump. A mechanical switch is activated by the vertical movement of the diaphragm in the 7100 valve. A pressure switch is activated by pressure in tube No. 2.

When tube No. 2 is pressured, the 7100 valve opens, the pump starts and brine is pumped into the brine measuring tank until the float bears against the upper stop and positions the Pilot Control. This relieves pressure in tube No. 2 and pressurizes tube No. 1 to close the 7100 valve and stop the brine pump.

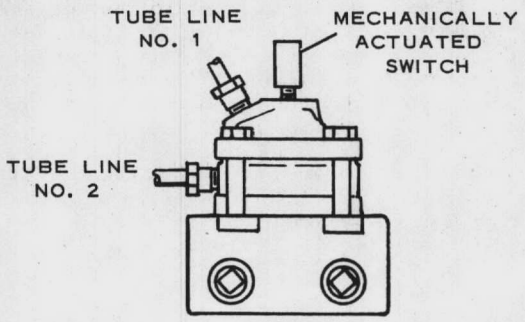
OPERATION CHART

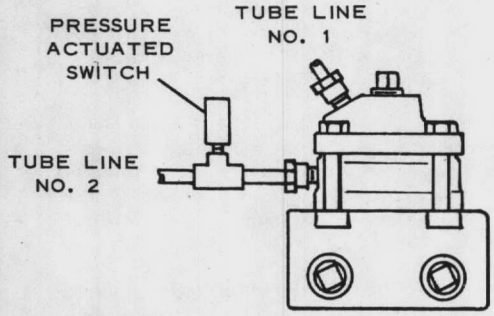
Operation	Pressure At Ⓐ	Pilot Control	No. 122 Brine Valve	No. 7100 PKHR Transfer Valve	Brine Flow
Normal Service	Positive	Up	Closed	Closed	None
Brine	Vacuum	Up	Open	Closed	To Injector
Brine-Rinse	Vacuum	Down	Closed	Closed	None
Fast Rinse	Positive	Down	Closed	Open	To Measuring Tank
Service-Brine Refill	Positive	Down	Closed	Open	To Measuring Tank

GRAVITY SYSTEM

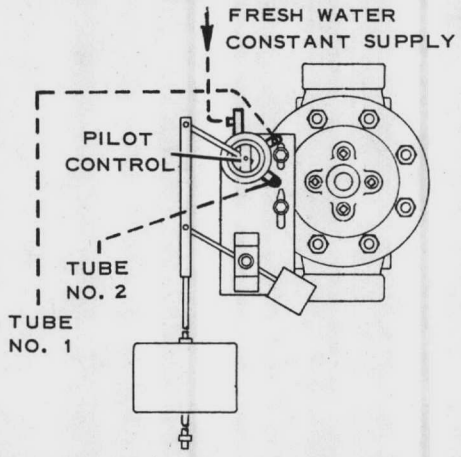


NO. 7100 PKHR BRINE TRANSFER VALVE FITTED FOR BRINE PUMP SYSTEM

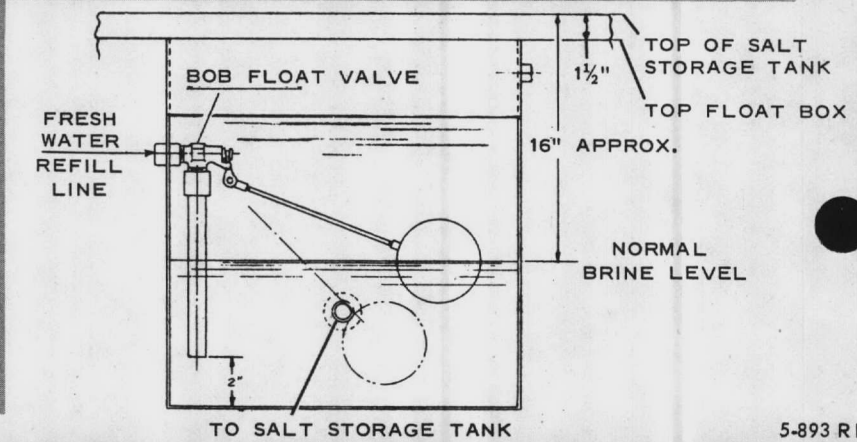


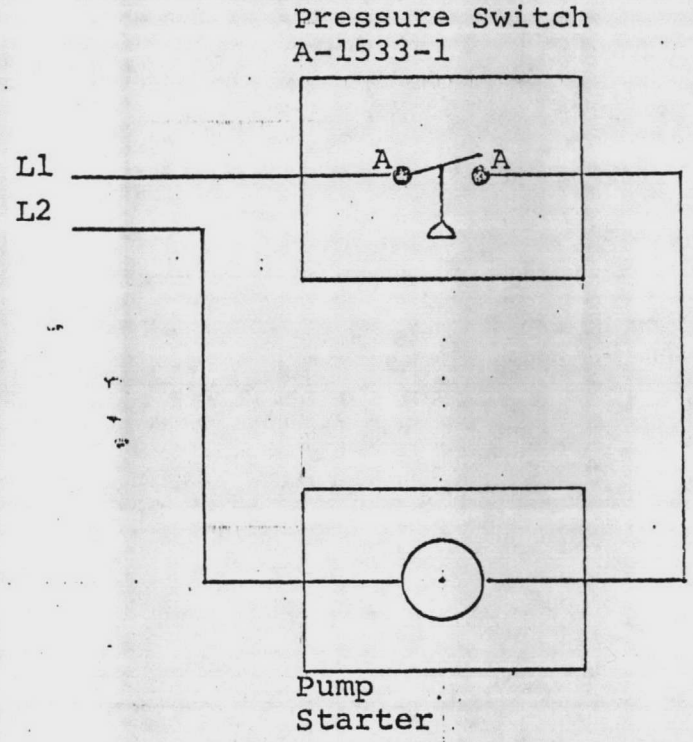


NO. 122 BRINE VALVE DETAIL



FLOAT CHAMBER DETAIL





NOTE: For use with brine systems with #122 Brine Measuring Valve, #7100 PKHR Brine Transfer Valve with pressure switch, and brine pump.

REVISIONS					
NO.	DATE	REMARKS	NO.	DATE	REMARKS
1			4		
[redacted]			5		
			6		

BRUNER DIVISION OF CALGON CORP.
MILWAUKEE, WISCONSIN — SOUTH EL MONTE, CALIFORNIA

WIRING DIAGRAM

DEC. ±
FRAC. ±
UNLESS OTHERWISE SPECIFIED

DRAWN JRH

APPROVED CB

DATE 11-16-73

SCALE

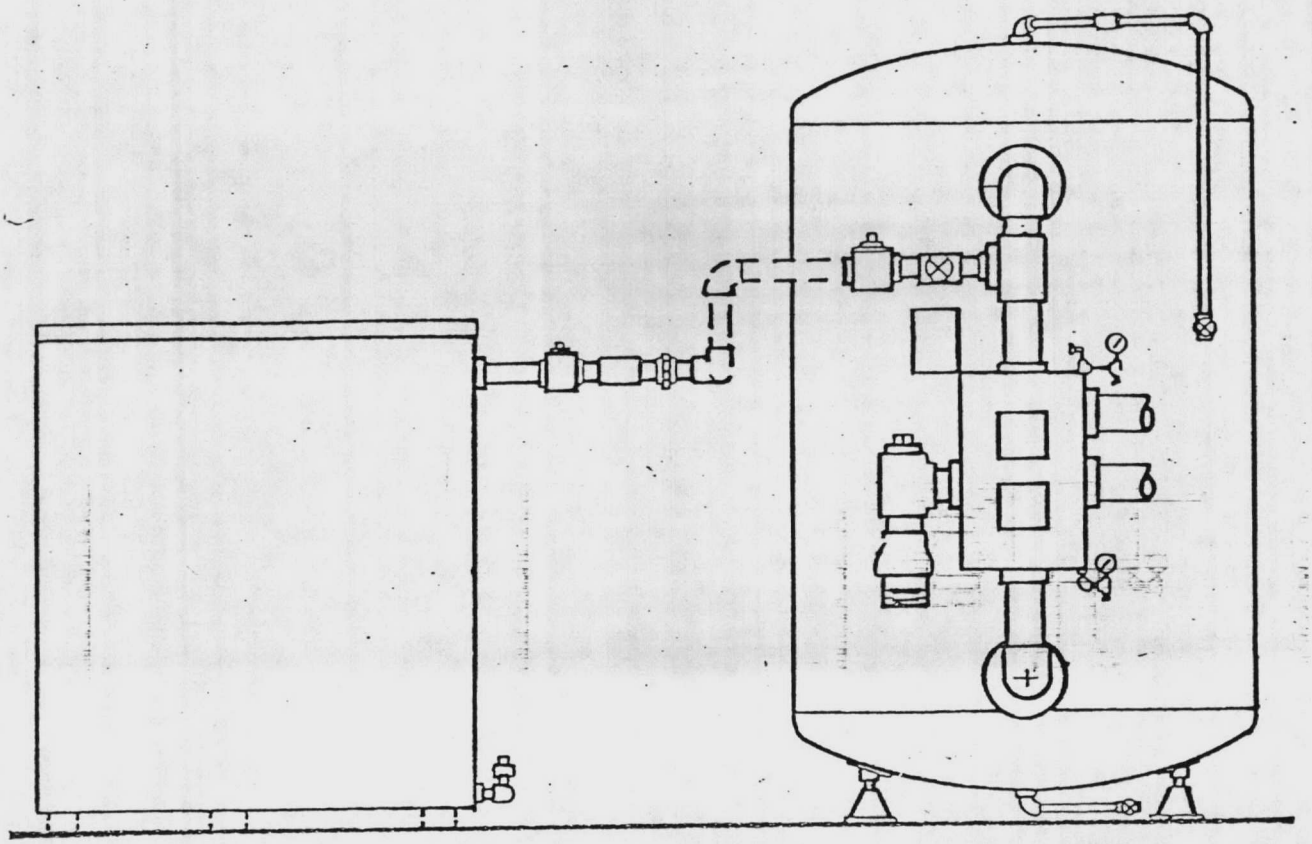
[redacted]619[redacted]5

SERVICE MANUAL CONTENTS

Optional Components

NOTE: Your Service Manual Will Contain Only Pages And Sections Pertaining to YOUR System.

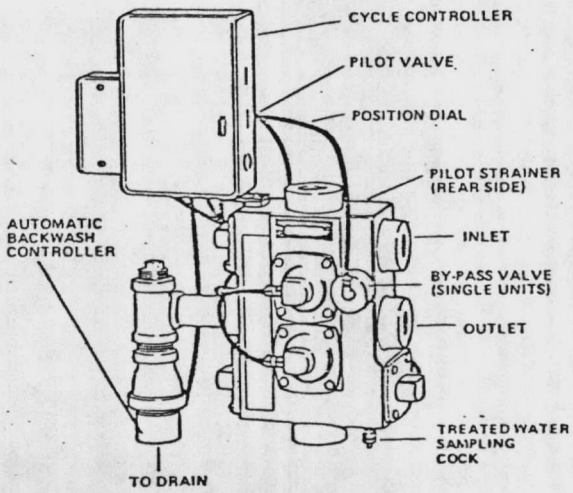
D-180 SERIES
MULTIPORT VALVES



These multiport valves are designed for use with both automatically or manually operated systems. Normal range of application is 25 psi. to 100 psi. water pressure with water temperatures up to 200 ° F. The valve operation is smooth and entirely free of water hammer noises.

The valve is well designed and contructed from the finest material. As with any mechanical device, however, periodic maintenance or repair is required. This manual will describe in detail the operation, disassembly and repair of this control valve. In addition, the various accessary items furnished with the valve, such as pilot valve, by-pass valve, etc. will be explained along with disassembly and service instructions.

The D-180 valve consists of five individual diaphragm valves and one by-pass valve, housed in a compact casting. These valves operate by pressure and are actuated by an external pilot valve (either automatically or manually) in the proper sequence for the regeneration cycle (softeners) or cleaning cycle (filters). An injector, which draws in brine to regenerate the softening mineral (or potassium permanganate solution to regenerate iron filters), is mounted on the back of the valve, or externally.



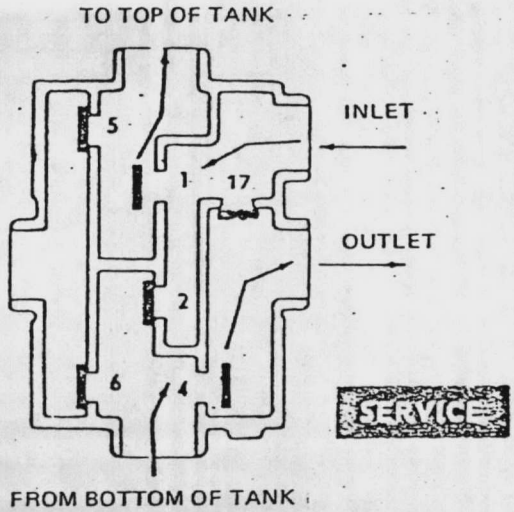
FLOW DIAGRAMS

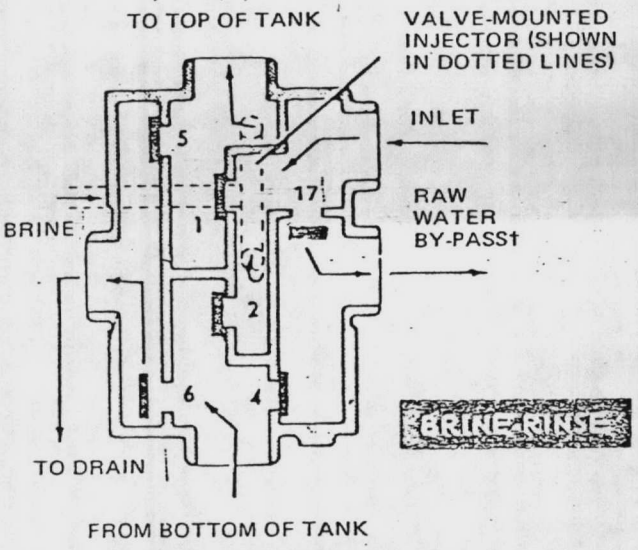
Flow patterns for the regeneration and service cycles are governed by the individual diaphragm valves. These valves close when under pressure and open when pressure is vented. Each is identified by a number cast on the front of the main valve body.

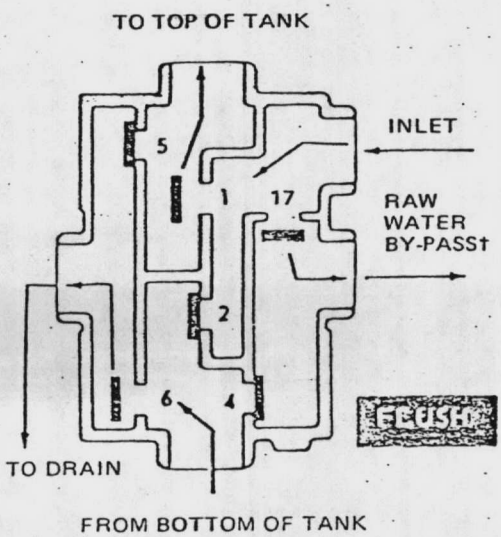
Control tubing connects each numbered valve with the corresponding numbered port of the pilot valve.

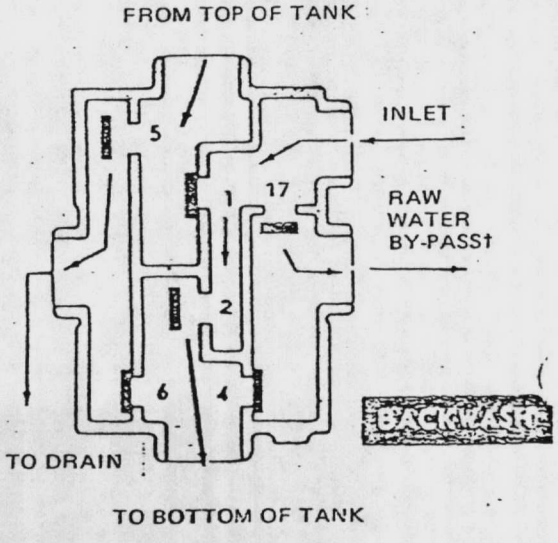
POSITION	VALVES OPEN (No Pressure)	VALVES CLOSED (Under Pressure)
SERVICE	1, 4	2, 5, 6, 17
BACKWASH	2, 5, 17	1, 4, 6
BRINE-RINSE	6, 17	1, 2, 4, 5
FLUSH	1, 6, 17	2, 4, 5

Sequence of the regeneration cycle depends on which Model Cycle Controller is used.





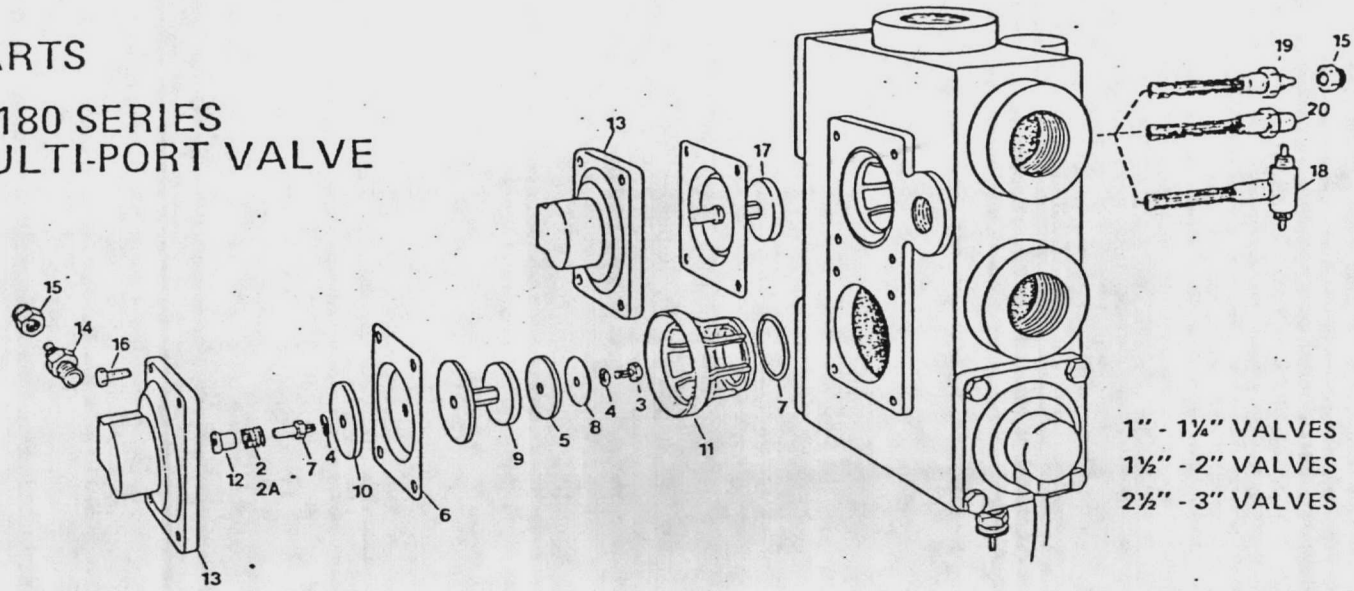




†RAW WATER BY-PASS VALVE NORMALLY USED ONLY ON SINGLE UNITS

PARTS

D-180 SERIES MULTI-PORT VALVE



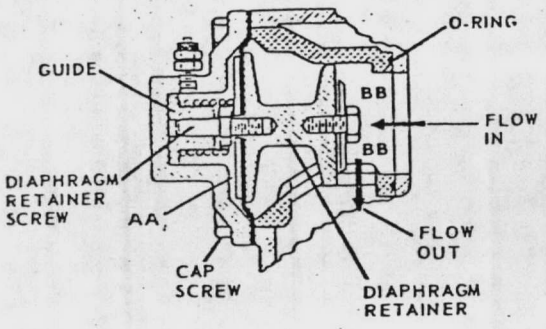
ITEM NO.	DESCRIPTION	NUMBER REQUIRED	PART NUMBERS OF ITEMS		
			1" & 1¼"	1½" & 2"	2½" & 3"
1	O Ring	5	A-604-60	A-604-64	A-604-63
2	Spring (Port No. 6 Only)	1	A-611-24	A-611-26	A-611-27
2A	Spring (Port No. 1, 2, 4, 5 Only)	4	A-611-30	A-611-31	A-611-32
3	Hex. Hd. Cap Screw	5	A-1243-27	A-1243-2	A-1243-35
4	Lock Washer	10	A-1354-8	A-1354-8	A-1354-13
5	Seat Washer	5	A-808-28	A-808-29	A-808-30
6	Diaphragm	5	B-568-2	B-568-3	B-568-4
7	Diaphragm Retainer Screw	5	A-847-5	A-847-6	A-847-7
8	Seat-Washer Retainer	5	A-1109-10	A-1109-11	A-1109-12
9	Diaphragm—Seat-Washer Retainer	5	A-740-8	A-740-10	B-857-1
10	Diaphragm Washer	5	A-1112-9	A-1112-12	A-1112-10
11	Guide Cage	5	C-838-1	C-838-2	C-838-3
12	Guide	5	A-1111-7	A-1111-9	A-1111-10
13	Diaphragm Valve Cover	5	B-537-6	B-537-7	C-855-1
14	¼T x 1/8 MPT Half Union	5	A-1310-1	A-1310-1	A-1310-1
15	¼T Compression Nut & Sleeve	5	A-1313-1	A-1313-1	A-1313-1
16	Hex. Hd. Cap Screw	20	A-1243-2	A-1243-32	A-1243-33
17	Diaphragm Assembly (Includes Items 3 thru 10)	5	B-850-1	B-850-2	B-850-3
18	Pilot Strainer (Used on Twin Units with Poly-flow Tubing)	1	A-1410-3	A-1410-3	A-1410-3
19	Pilot Strainer (Use with Poly-flow Tubing)	1	A-1410-2	A-1410-2	A-1410-2
20	Pilot Strainer (Use with Pipe Fittings and Inlet Gauge)	1	A-1410-1	A-1410-1	A-1410-1
—	Diaphragm Repair Kit (Consists of 5 each of above indicated Parts)		A-1013-94	A-1013-95	A-1013-96

IMPORTANT: Order all repair parts by correct part number.

Multiport Valve consists of five individual diaphragm ports and one by-pass port in a single casting. These ports are opened and closed in proper sequence to perform all functions from "Service" through regeneration and back to "Service"

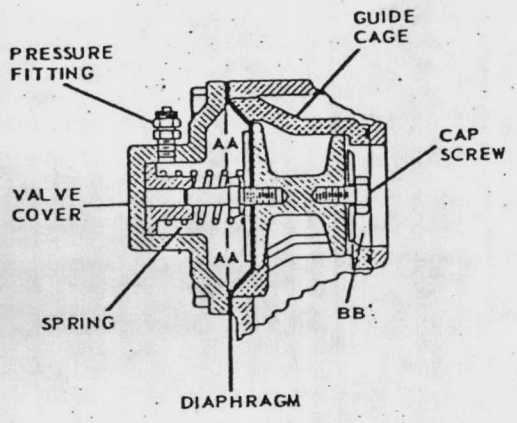
Ports close under hydraulic pressure and open when pressure is released or vented. An automatic timing device and a hydraulic pilot control regulate the sequence and time span of each of the regeneration functions.

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.

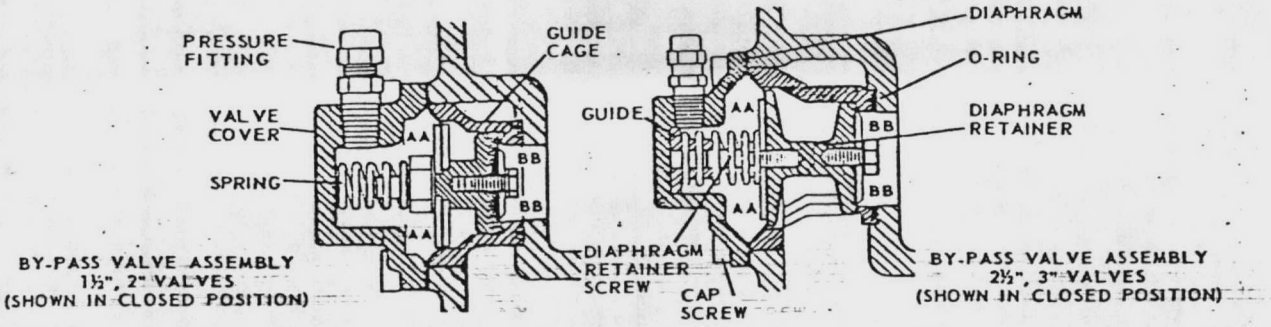
BY-PASS VALVE NO. 17 (1½"—3" VALVES)

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

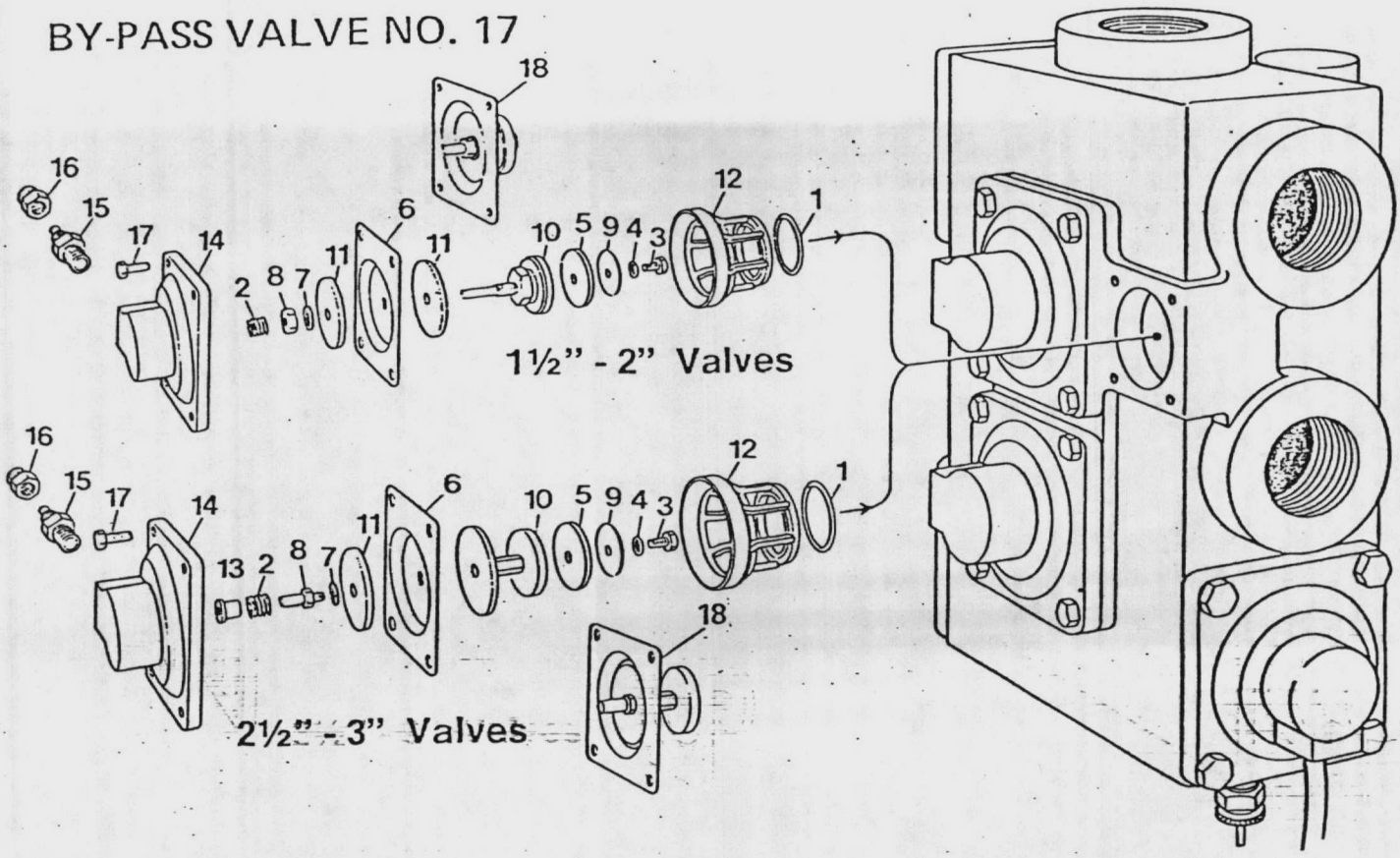
1. With the valve reassembled, the tank cover off, and the unit in the BACKWASH (No. 2) position, open the inlet valve to refill the mineral tank with water. After the unit is filled, replace the tank cover and index the unit to the SERVICE (No. 1) position.

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.

PARTS

BY-PASS VALVE NO. 17



ITEM NO.	DESCRIPTION	NUMBER REQUIRED	PART NUMBERS	
			1½" & 2"	2½" & 3"
* 1	O Ring	1	A-1013-97	A-1013-98
* 2	Spring	1		
* 3	Hex. Hd. Cap Screw	1		
* 4	Lock Washer	1		
* 5	Seat Washer	1		
* 6	Diaphragm	1		
* 7	Lock Washer	1		
* 8	Hex. Hd. Jam Nut (1½" & 2" Valves)	1		
* 8	Diaphragm Retainer Screw (2½" & 3" Valves)	1		
9	Seat Washer Retainer	1	A-1109-13	A-1109-10
10	Diaphragm—Seat Washer Retainer	1	A-740-11	A-740-8
11	Diaphragm Washer	1	A-1112-11	A-1112-9
12	Guide Cage	1	B-849-1	C-838-1
13	Guide	1	—	A-1111-7
14	Diaphragm Valve Cover	1	B-537-8	B-537-6
15	¼T x 1/8 MPT Half Union	1	A-1310-1	A-1310-1
16	¼T Compression Nut & Sleeve	1	A-1313-1	A-1313-1
17	Hex. Hd. Cap Screw	4	A-1243-3	A-1243-3
18	Diaphragm Assembly (Includes Items 3 thru 11)	1	B-852-1	B-852-2

On 1½" - 2" Valves, 2 washers are required. IMPORTANT: Order all repair parts by correct part number.

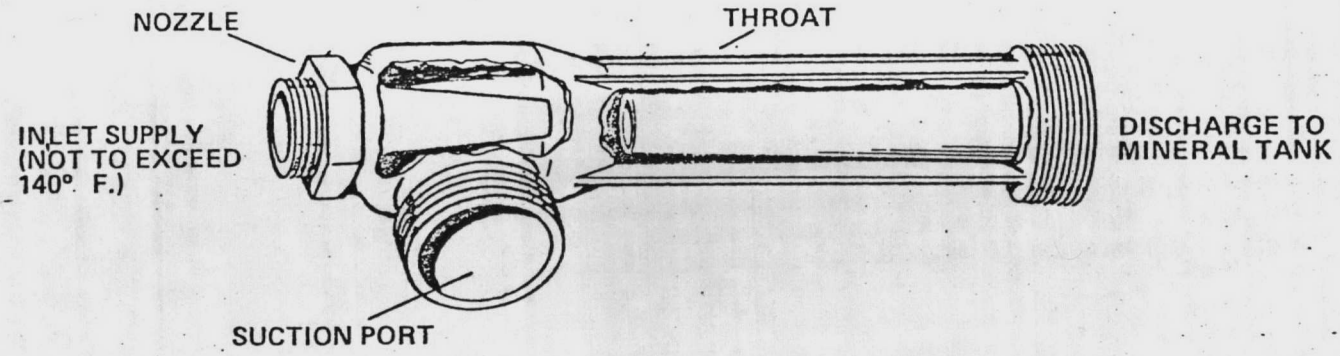
*Items 1-8 available in Kit Form only (A-1013-97 or A-1013-98).

MULTIPORT VALVE
TROUBLESHOOTING CHART

PROBLEM	CHECK PROCEDURE	CAUSE
1. Failure To Draw Brine	Check that manual brine valve or supply-line valve to ejector is open	These valves must be open at all times.
	Check operating pressure	Pressure which falls below 25 psi will not produce satisfactory ejector operation. Raise to a minimum of 25 psi
	Turn position dial clockwise to BRINE/RINSE (No. 3) position and remove bonnet from manual brine valve	If suction is present at bonnet, check automatic brine valve and brine-tank assembly
		If no suction or backpressure is present at bonnet, problem is 1. Water pressure below 25 psi 2. Plugged injector nozzle or eroded injector throat
		If backpressure is present at bonnet, problem is: 1. Valve port No. 1, No. 2, No. 4 not closing (See Diaphragm Valve Does Not Close, Item 3) 2. Injector nozzle missing 3. Plugged injector throat 4. Plugged backwash-flow control 5. Restriction in drain line
2. Slight Leak To Drain During Service	Disconnect pilot tubing at backwash control	Flow from tubing indicates leaky seal in pilot valve (see Pilot Control Service) or ruptured diaphragm in port No. 1 or No. 4 of main valve
		No flow from pilot tubing indicates port No. 5 or No. 6 of main valve is leaking. Check water hardness at drain—if soft, port No. 6 is defective; if hard, port No. 5 is defective. (See Diaphragm Valve Does Not Close, Item 4.)
3. High Rate Of Flow To Drain During Service	Check position dial on pilot controller	If not in SERVICE (No. 1), rotate clockwise to SERVICE; if flow stops, refer to Cycle Controller Service.
		If in service, check water hardness at drain—if soft, port No. 6 is not closing; if hard, port No. 5 not closing. (See Diaphragm Valve Does Not Close, Item 4.)
4. Diaphragm Valve Does Not Close	Valves close under pressure, open when pressure is vented. Rotate pilot to position in which valve in question should close (see flow chart) and remove control tubing from valve cover.	No continuous flow of water from control tubing indicates plugged pilot strainer, plugged of orifice or fitting in pilot valve (See service chart on Pilot Valve.)
		Continuous flow of water from control tubing indicates dirt or physical obstruction in valve port. Disassemble and check for: 1. Dirt, chips, solder, etc. in valve port 2. Defective seat or seat washer Continuous flow of water from valve cover indicates defective diaphragm.

PROBLEM	CHECK PROCEDURE	CAUSE
5. Diaphragm Valve Does Not Open	Valves close under pressure, open when pressure is vented. Rotate pilot to position in which valve in question should open (see flow chart) and remove control tubing from valve cover.	If removing tubing allows valve to open, problem is plugged fitting or orifice in pilot
		If removing tubing produces a continuous flow of water, problem is defective seal in pilot valve. (See service chart on Pilot Valve.)
		If removing tubing does not produce a continuous flow of water, problem is plugged fitting in valve cover or physical obstruction in valve port. Disassemble and clean as necessary.
6. Hard Water Leakage Into Service Line	Check external by-pass valve	By-pass valve must be closed at all times.
	Check automatic by-pass valve (if used)	On 1" and 1¼" valve only, check the following: 1. Check vent hole cylinder of by-pass port No. 17 2. Check U-cup on piston of by-pass and teflon coating on cylinder 3. Check seat washer and seat of by-pass 4. Check for pressure to by-pass port during service. No pressure would indicate plugged plugged pilot screen or fitting
		On 1½" & larger valves, refer to Diaphragm Valve Does Not Close, Item 4
	Check port No. 2 to be certain it closes in SERVICE (No. 1) position	Refer to service on Diaphragm Valve Does Not Close
	Check for ruptured diaphragm on port No. 2	Remove pilot tube from port No. 2. Flow of water from valve cover indicates a defective diaphragm.
7. Restricted Or No Service Flow	Check resin bed	Accumulation of iron sludge, resin fines, dirt may cause restricted service flows. Prolonged backwashing may remove dirt. If not, check with factory for further service suggestions.
	Rotate pilot clockwise to BACKWASH (No. 2) position, and then to FLUSH (No. 4). Compare flow at drain.	Flow for both positions should be the same. (See specification chart for actual flow rate.) If backwash flow is noticeably higher than flush flow, problem is valve port No. 1 not opening. If no difference is noted, problem is valve port No. 4 not opening. (See Diaphragm Valve Does Not Open, Item 5.)
8. Restricted Or No Drain Flow During Backwash or Flush	Rotate pilot clockwise to BACKWASH (No. 2) position and then to FLUSH (No. 4). Compare flow at drain.	Flow for both positions should be the same. (See specification chart for actual flow rates.) If both flows are lower than specifications, problem is: 1. Low water pressure 2. Plugged backwash-flow control 3. Restricted drain (or too small a drain line)
		If flush flow is less than backwash flow, problem is port No. 1 or No. 6 not opening. If backwash flow is less than flush flow, problem is port No. 2 or No. 5 not opening. (See Diaphragm Valve Does Not Open, Item 5.)

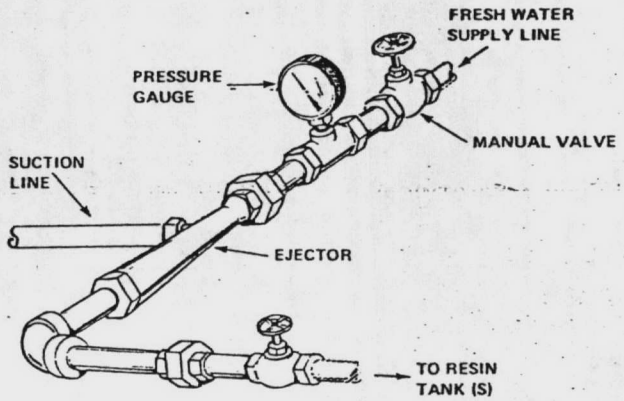
EXTERNAL EJECTORS — OPERATION AND SERVICE



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.

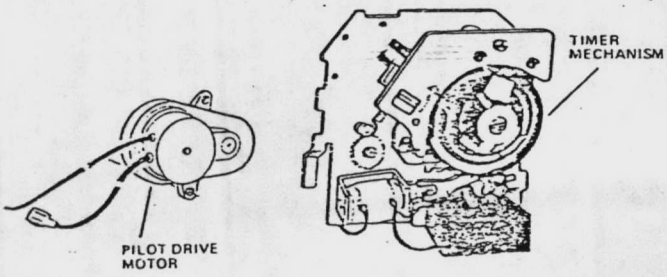
TIMER-DRIVE MOTOR REPLACEMENT

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.



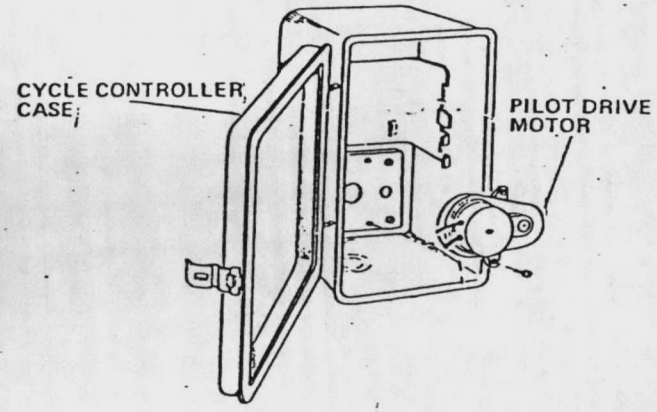
PILOT-DRIVE MOTOR REPLACEMENT

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.

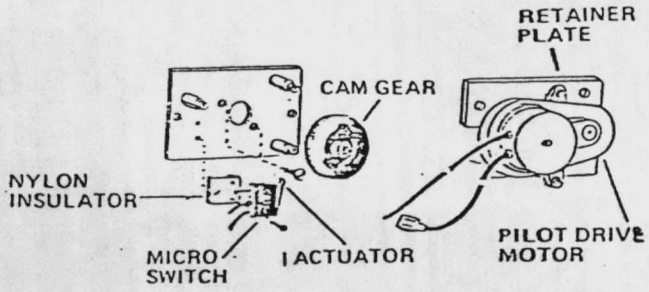
4. When installing replacement micro-switch assembly, components MUST be positioned in the following order: nylon spacer, micro-switch, fiber insulator, switch actuator. Replace 2 round-head machine screws with lock washers.

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.

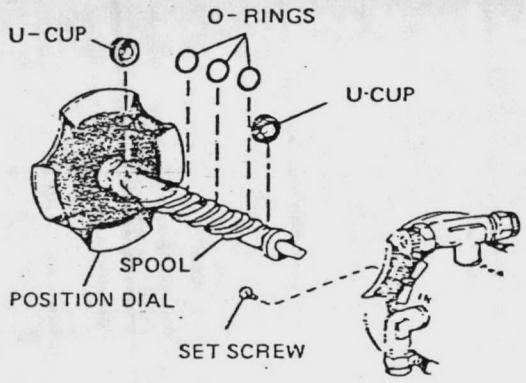
PILOT SPOOL REPLACEMENT

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.

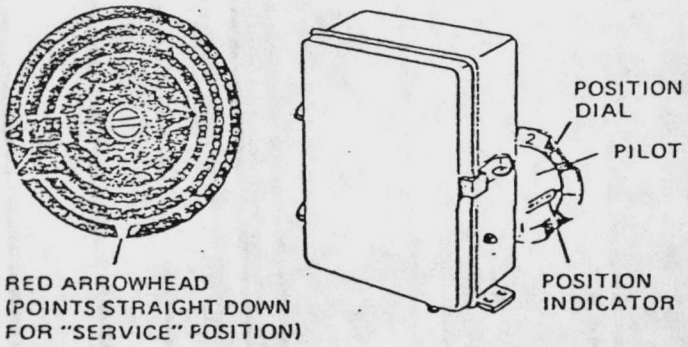
2. LIGHTLY lubricate all seals with silicones grease and reinstall spool into pilot body. Rotate slowly until spool is fully seated into pilot body. Replace pan-head retaining screw.

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.

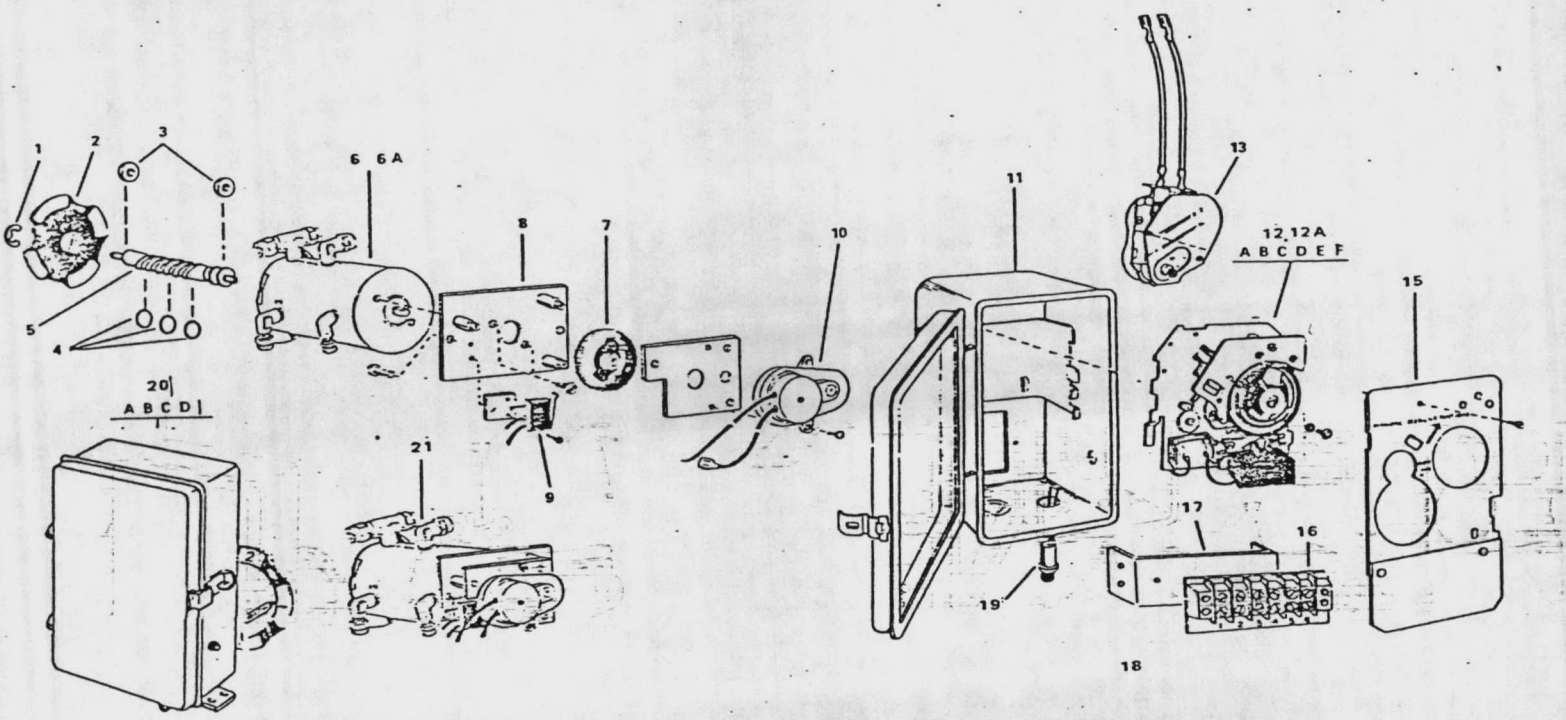
6. Reconnect pilot tubing to pilot valve body.
NOTE: Numbers on pilot body must correspond with numbers on multiport valve.

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.

PARTS LIST FOR ELECTRIC-SIGNAL-ACTUATED CYCLE CONTROLLERS



ITEM NUMBER	DESCRIPTION	PART NUMBER
1	Snap Ring	A-812-4
2	Dial Plate	A-539-9
3	U-Cup Seal	A-1013-8
4	O-Ring Seal	
5	Pilot Spool (Includes Item 3 & 4)	A-1123-1
6	Pilot Body (Includes Item No. 3, 4, 5)	A-1129-4
6A	Pilot Body (Includes Item No. 3, 4, 5) (Filters using diaphragm valve nest and filtered backwash water)	A-1129-5
7	Cam Gear	A-744-4
8	Switch Plate (Includes Item No.9)	A-807-3
9	Micro-Switch w/Wires	A-778-4
10	Pilot-Drive Motor	A-994-3
11	Case	A-665-17
12	Timer Mechanism with Motor (For use with softeners only)	A-664-45
12A	Timer Mechanism with Motor (For use with filters only)	A-664-51
13	Timer Drive Motor	A-709-12

ITEM NUMBER	DESCRIPTION	PART NUMBER
14	Solenoid Coil	A-463-8
15	Panel	A-813-6
16	Terminal Block	A-855-4
17	Bracket	A-1051-21
18	Push button (not used with Altwinator)	A-967-3
19	Pilot Light	A-1222-1
20A	Cycle Controller—SOFTENERS backwash first operation.	B-546-64
20B	Cycle Controller—SOFTENERS backwash first operation, for Altwinator use.	B-546-66
20C	Cycle Controller—FILTERS, unfiltered backwash water	B-546-65
20D	Cycle Controller—FILTERS unfiltered backwash water, for Altwinator use	B-546-67
21	Pilot-Drive Assembly—Includes Items No. 3-10	B-604-1

IMPORTANT: Order all repair parts by correct part number. Item numbers are for reference only and are not to be used for ordering parts.

CYCLE CONTROLLER TROUBLESHOOTING CHART

PROBLEM	CHECK PROCEDURE	CAUSE
1a. Softener Does Not Regenerate Automatically, or Regenerates At Wrong Time (Time Clock Timer Only)	Check electrical supply	No power to timer would indicate faulty wire connections, fuse, or circuit breaker. Also check that power source to timer is continuous. Circuit should not be controlled by switch or other device that might provide intermittent power. Time setting is OFF. Time must be reset after power failure.
	Check frequency levers on cycle controller	Regeneration will occur only when frequency pins are pulled out. If all pins are pushed in, no automatic regeneration will take place. (Refer to instructions on cycle controller adjustment.)
	Electrical or mechanical defect in cycle controller	The following defects will prevent automatic regeneration: 1. Burned-out timer motor or pilot-drive motor 2. Faulty switches in cycle controller 3. Faulty micro-switch in pilot drive 4. Stripped cam gear on pilot drive 5. Jammed pilot spool in pilot body
1b. Softener Does Not Regenerate Automatically (Signal Activated Timer Only)	Check electrical supply	No power would indicate faulty wire connection, fuse, or circuit breaker. Also check that power source is continuous and not controlled by switch or other device that might produce intermittent power.
	Manually activate water meter or hardness monitor to determine if electrical signal is sent. NOTE: These check-outs must be made with cycle controller in "idle" position. Refer to cycle controller operation for additional instructions.	No signal indicates defect in meter head or hardness monitor (refer to operating instruction for for this equipment), or faulty interconnecting wiring.
		If signal is sent, check the following: 1. Burned-out solenoid coil in timer 2. Burned-out relay coil in Altwinator 3. Faulty interconnecting wiring.
		If cycle-controller receives signal, check for: 1. Burned-out timer motor or pilot-drive motor 2. Faulty switches in cycle controller 3. Faulty micro-switch in pilot drive 4. Stripped cam gear on pilot drive 5. Jammed pilot spool in pilot body
2. Pilot Control At End Of Cycle Is In Position Other Than SERVICE (All Timers)	Cycle controller and pilot are out of sequence	Cycle controller or pilot control may have been manually advanced, causing the sequence problem. To return to proper sequence: 1. Rotate cycle-adjustment knob clockwise until red arrow points to "6 o'clock" position. 2. Rotate pilot controller clockwise to a position midway between FLUSH (No. 4) and SERVICE (No. 1). Pilot will rotate to SERVICE position and stop automatically. Units are now in proper sequence. If problem recurs, check following: 1. Faulty wire-connections between timer and pilot drive. 2. Defective mocro-switch on pilot drive 3. Defective pilot drive motor 4. Faulty switches in cycle controller 5. Stripped cam gear on pilot drive

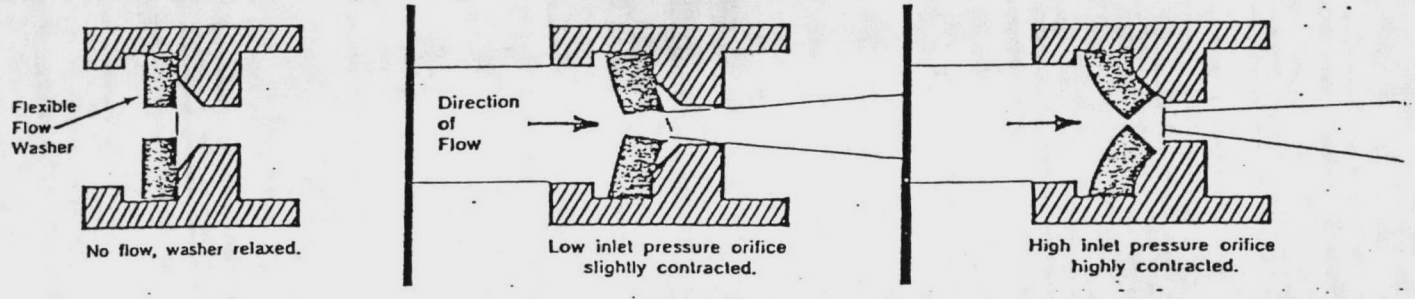
CYCLE CONTROLLER (cont'd)

	PROBLEM	CHECK PROCEDURE	CAUSE
3.	Leak to Drain From Pilot Body (in operation)	Disconnect supply tube to "IN" on pilot valve and observe the effect on the leak	If leak stops, the pilot has defective internal seals
			If leak continues, there is a defective diaphragm on one of the open valve ports
4.	Leak From End Of Pilot Body	Visually inspect U-cup and seals	You can expect to find a defective U-cup or a scratch in the pilot body
5.	Pilot Does Not Pressurize Or Vent Valve Ports Properly	Check pilot screen	Clogged screen prevents pressure from reaching valve ports
		Rotate pilot clockwise until valves in question open. (See valve flow chart.) Remove pilot tubing from valve port. Check for flow of water.	If water flows from the tube, there is a cut seal in the pilot If water flows from the valve cover, there is a defective diaphragm
		Rotate pilot clockwise until valves in question close. (See valve flow chart.) Remove pilot tubing from valve port. Check for flow of water.	If water flows from tube, check fitting in valve cover for obstruction
			If water does not flow from tube, check fitting in pilot valve for obstruction

BACKWASH CONTROLLERS – OPERATION AND SERVICE

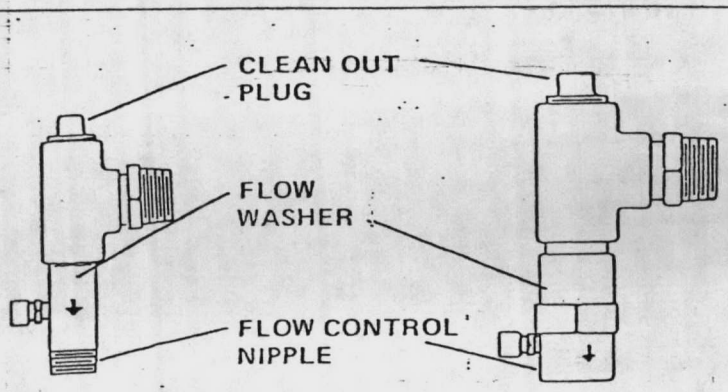
The purpose of the controller is to regulate the up-flow backwash required to expand and agitate the media in the resin tank. The controller will allow maximum expansion of this medium, while preventing any loss to the drain.

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.

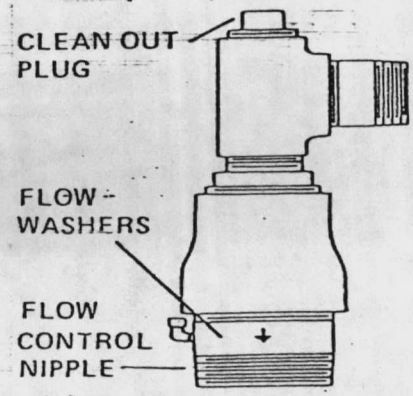


The flow washer is installed, either singly or in multiple, in a special nipple. Increasing the number of flow washers can achieve any desired backwash rate.

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.

REPLACEMENT FLOW WASHERS FOR BACKWASH FLOW CONTROLLERS

To order replacement flow washer(s) for your flow controller, refer to the system specifications in the installation section of this book. Locate the backwash rate for your system, then find the part number and quantity of flow washers required from the tables below.

For flow rates from 2.4 GPM to 11.5 GPM, only one flow washer is required.

BACKWASH RATE GPM	PART NO. FLOW WASHER
2.4	(1) A-708-2
3.5	(1) A-708-3
4.3	(1) A-708-4
5.0	(1) A-708-5
5.5	(1) A-708-6
6.5	(1) A-708-7
7.0	(1) A-708-8
8.3	(1) A-708-9
10.0	(1) A-708-10
11.5	(1) A-708-11

For flow rates from 12 GPM to 30 GPM the entire flow controller must be ordered.

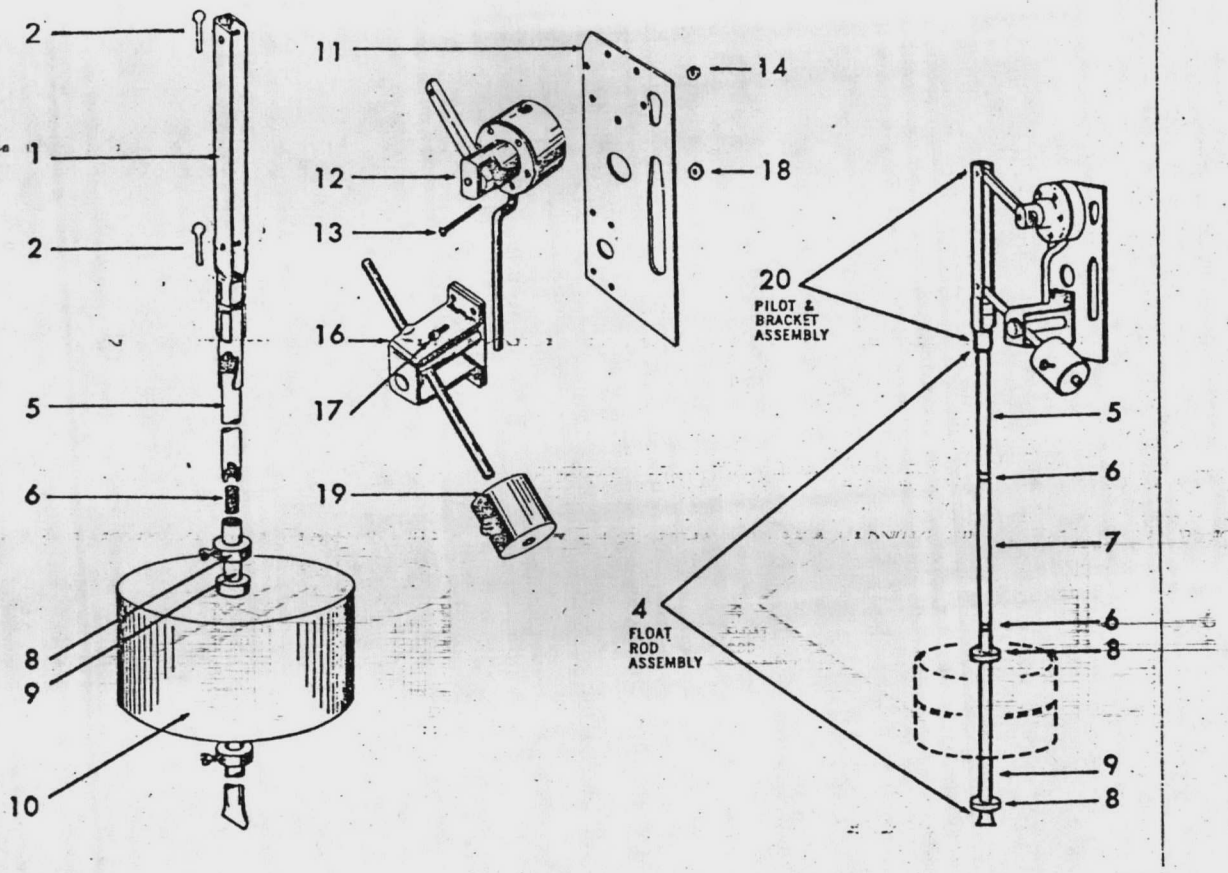
BACKWASH RATE GPM	CONTROLLER PART NO.
12.0	A-1125-1
13.5	A-1125-2
15.0	A-1125-3
20.0	A-1125-4
25.0	A-1125-5
30.0	A-1125-6

For flow rates from 35 GPM to 115 GPM, a number of small flow washers are used in common housing. EXAMPLE: If you wish to order flow washers for a backwash rate of 75 GPM, you would order (4) Part No. A-708-1/ and (3) Part No. A-708-10 flow washers.

BACKWASH FLOW RATE	FLOW WASHERS	PART NUMBERS
35	(3) @ 11.5 GPM	(3) A-708-11
40	(4) @ 10 GPM	(4) A-708-10
45	(4) @ 11.5 GPM	(4) A-708-11
50	(5) @ 10 GPM	(5) A-708-10
55	(3) @ 11.5 GPM (2) @ 10 GPM	(3) A-708-11 (2) A-708-10
60	(6) @ 10 GPM	(6) A-708-10
65	(3) @ 11.5 GPM (3) @ 10 GPM	(3) A-708-11 (3) A-708-10
70	(6) @ 11.5 GPM	(6) A-708-11
75	(4) @ 11.5 GPM (3) @ 10 GPM	(4) A-708-11 (3) A-708-10
80	(7) @ 11.5 GPM	(7) A-708-11
85	(3) @ 11.5 GPM (5) @ 10 GPM	(3) A-708-11 (5) A-708-10
90	(6) @ 11.5 GPM (2) @ 10 GPM	(6) A-708-11 (2) A-708-10
95	(7) @ 11.5 GPM (1) @ 10 GPM	(7) A-708-11 (1) A-708-10
100	(10) @ 10 GPM	(10) A-708-10
105	(3) @ 11.5 GPM (7) @ 10 GPM	(3) A-708-11 (7) A-708-10
110	(7) @ 11.5 GPM (3) @ 10 GPM	(7) A-708-11 (3) A-708-10
115	(10) @ 11.5 GPM	(10) A-708-10

For flow rates not listed in these charts or in excess of 115 GPM or for hot water use (140°-200°F) consult factory.

PARTS LIST
BRINE CONTROL VALVE



ITEM NO.	DESCRIPTION	PART NO.
1	Link Assembly	TV-8316
2	1/8" x 3/4" Brass Cotter Pin	67993-72
4	Float Rod Assembly (Brass) Includes Items 7-9	C-8746
5	Upper Float Road (1 Ft) Brass Upper Float Rod (2 Ft) Brass	TV-6880 C-2744
6	Stud	88264
7	Extension Float Rod (2 Ft) Brass	C-3661
8	Stop Collars (2) Brass	TV-274-1
9	Lower Float Rod (1 Ft) Brass Lower Float Rod (2 Ft) Brass	39940 39944
10	Float Ball	C-9253
11	Base & Mounting Plate	TV-6364
12	Pilot Valve Assembly CF1-A1	TV-9507
13	Machine Screw 6/32 x 1-7/16	67575-76
14	Hex. Nut	67872-02
16	Counter Balance Assembly	45569
17	Machine Screw 10/32 x 9/16	67578-69
18	Hex Nut 10/32	67795-02
19	Counterweight	TV-6230
20	Pilot & Bracket Assembly CF1-A1	TV-9506

LIQUI-DIAL
Automatic Liquid Conditioning Controls

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

Engineering Data

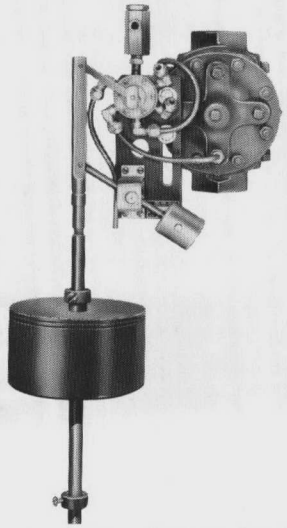
BRINE CONTROL VALVE

Clayton **122**

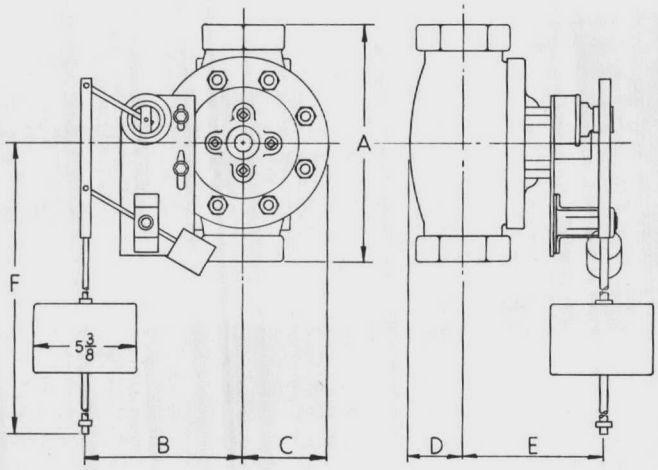
The CLAYTON 122 BRINE VALVE is used on brine measuring tanks to withdraw a measured amount of brine and then close. The brine measuring tank is refilled from a salt storage tank through a brine transfer valve, controlled by the 122 brine valve.

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	5⅛	7¼	7¼	9⅜	11	12½
	B	2⅝	2⅝	5½	6	6	6⅞	6⅞	7⅜
	C	1⅝	1⅝	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	5¾	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.

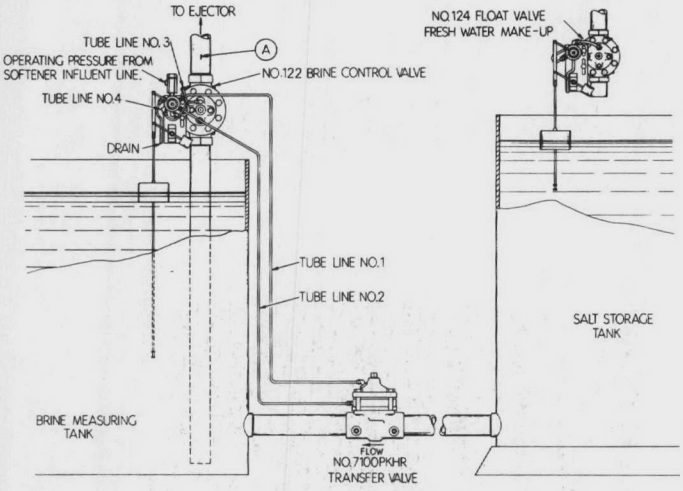
Only one ejector and ejector supply line is required on multiple tanks. The direction of the brine to the proper unit of a multiple unit installation is controlled by individual softener unit valves.

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.

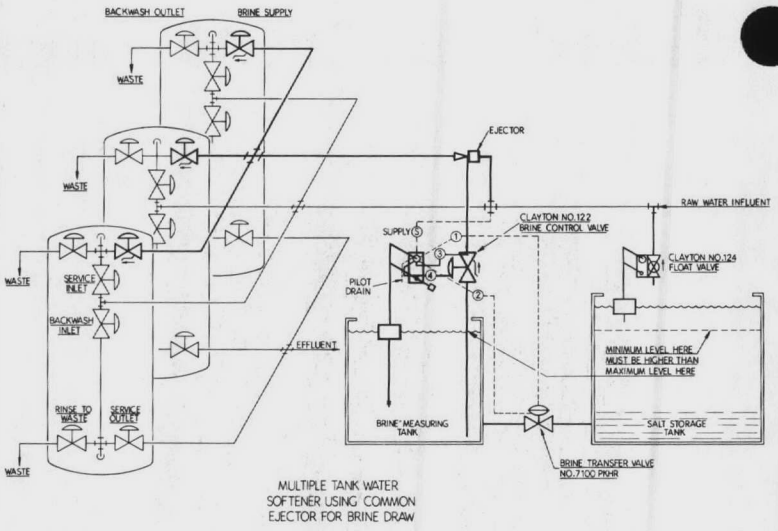
PATENTS ISSUED AND/OR PENDING

TYPICAL APPLICATIONS



OPERATION CHART

OPERATION	PRESSURE AT Ⓐ	FLOAT	NO.122 BRINE VALVE	NO.7100 PKHR TRANSFER VALVE	BRINE FLOW
SERVICE	POSITIVE	UP	CLOSED	CLOSED	STATIC
BRINE	VACUUM	UP	OPEN	CLOSED	TO SOFTENER
SALT RINSE	VACUUM	DOWN	CLOSED	CLOSED	STATIC
FAST RINSE	POSITIVE	DOWN	CLOSED	OPEN	TO MEASURING TANK



MULTIPLE TANK WATER SOFTENER USING COMMON EJECTOR FOR BRINE DRAW

OPERATION

1. With the Brine Measuring Tank full and the Clayton 122 Brine Control Valve in the "Float Up" position, the valve is ready to open when vacuum is applied. The Brine Transfer Valve is positively held closed.
2. When a softener starts its brine operation, water passes through the ejector, creating a vacuum in the brine line to the Brine Control Valve.
3. With the control in the "Float Up" position and a vacuum present, the Brine Control Valve opens to allow brine to flow through the ejector into the softener tank. Brine flows through the softener and out to waste.
4. As the brine is withdrawn from the Brine Measuring Tank, the float ball travels down the float rod. Upon contacting the lower float stop, the pilot control is positioned to apply positive pressure to the cover chamber of the Brine Control Valve. Pressure on the valve diaphragm closes the valve against the vacuum and stops the flow of brine to the softener.
5. When the flow of brine stops, only fresh water continues to flow through the ejector, for brine displacement or slow Rinse.
6. The Brine Transfer Valve is held closed until the brine line to the softener, or softeners, is repressurized after the brine rinse step.
7. At this time the pressure is directed to the power unit chamber of the 7100 PKHR transfer valve causing it to open, permitting brine flow from the salt storage tank to the brine measuring tank.
8. As the Brine Storage Tank refills, the float ball travels up the float rod. Upon contacting the upper float stop, the pilot control is positioned to close the Brine Transfer Valve and hold positive pressure to the cover chamber of the Clayton 122 Brine Control Valve, and maintains it in its already closed position.
9. Raw water is admitted into the Salt Storage Tank by the Clayton 124 Float Valve. The lowest level in the Salt Storage Tank is automatically maintained above the highest level in the Brine Measuring Tank.

PURCHASE SPECIFICATIONS

The valve shall be a pilot controlled, hydraulically operated diaphragm type globe valve, with a single seated composition disc. The seat ring shall be renewable, the diaphragm and disc replaceable, and any necessary repairs made without removing the valve body from the line. The valve stem shall be non-magnetic stainless steel, and the body and cover trim shall be bronze. The valve shall have no packing glands or stuffing boxes.

The valve shall automatically open wide at a pre-set high level and close drip-tight at a pre-set low level when brine is to be withdrawn from the measuring tank. It shall be capable of controlling a transfer valve for refilling the measuring tank from a salt storage tank. It shall not allow the transfer valve to open until the system has completed the salt rinse step. It shall remain drip-tight closed during the refilling of the brine measuring tank and until brine is to again be withdrawn.

Valve to be furnished shall be similar in all respects to the Clayton 122 Brine Control Valve as manufactured by Cla-Val Co., Liqui-Dial Division, Newport Beach, California, or approved equal.

ORDERING INFORMATION

When ordering, please furnish the following information:

1. Size
2. Valve name and catalog number
3. Fluid to be handled
4. Maximum temperature

LITHO IN USA

Manufactured by **CLA-VAL CO.** *Newport Beach, California*

Bulletin IAR-3011
2-76

BADGER SERIES 76 METER REGISTERS

For Water Conditioning

MODEL AR
Automatic Reset Register

MODEL SR
Signal Register

Register Models AR and SR are used to measure predetermined quantities of liquid and then transmit a signal which activates other equipment. Their widest application is in water conditioning systems.

The principal difference between the two registers is that Model AR resets itself automatically for each water conditioning cycle, whereas the SR is reset with a register knob.

The AR register is equipped with a nickel-plated reset pointer and a red sweep pointer which moves counterclockwise from the preset position. When the red pointer reaches zero, a trip cam closes a signal switch and a motor switch. The signal is used to start tank regeneration, while the motor resets the pointers at their original position.

With the SR register, the red pointer is used to preset small quantities and the nickel pointer for larger amounts. When both pointers reach zero, a double-throw switch is actuated. This switch can be connected to an electrical circuit to operate a warning bell or alarm, a pump, valve or other equipment.

Models AR and SR are part of the Series 76 line of interchangeable meter registers for use on Badger's industrial-type meters. Three other Series 76 registers, used primarily for liquid batching, are described in Bulletin IBR-3010.

AR AND SR REGISTER SPECIFICATIONS

PHYSICAL

Housing: Glass-filled polycarbonate—NEMA 4
Internal Plates: Brass
Gears: Brass or Thermoplastic
Shafts: 303 Stainless Steel
Register Size: $7\frac{1}{2}$'' width, $8\frac{7}{8}$'' height, $6\frac{3}{4}$'' depth
Dial Size: $5\frac{3}{4}$''
Totalizer: Six-digit, non-reset

ELECTRICAL

Contact Rating: 7 amps at 115 VAC
AR register available for 24 VAC, 115 VAC, and 230 VAC

Badger Meter, Inc. Flow Products Division
4545 West Brown Deer Road, Milwaukee, Wisconsin 53223

OPERATION OF AR REGISTER

The register is preset by loosening two screws in the pointer hub and moving the pointers to the desired position. This setting is then "locked in" by retightening the hub screws. (For detailed instructions, see Installation Manual IOM-024-01.)

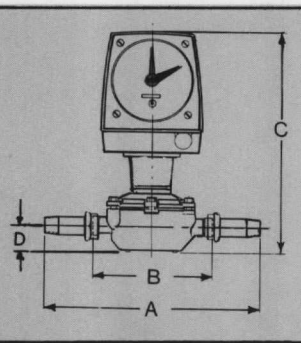
As liquid is metered, the red sweep pointer moves counterclockwise. At the zero reading, a cam on the pointer shaft closes the signal and reset motor switches.

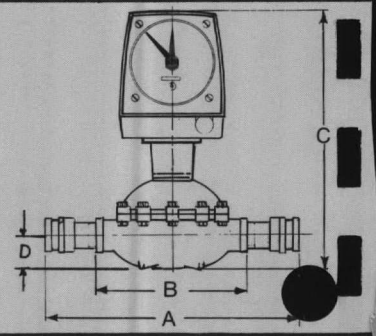
The reset motor drives the nickel-plated reset pointer counterclockwise until it also reaches zero. The nickel pointer "picks up" the red pointer and carries it back to the original preset position.

The motor switch opens, the motor stops, and the signal to external equipment is terminated. The register is now ready for the next metering cycle.

For installations with more than one water conditioning tank, the AR can be supplied with a built-in lockout relay. The relay coil is wired into the control circuit so that it will be energized when another unit is regenerating. This locks out the reset motor until regeneration of the other tank is completed.

DIAL CAPACITIES FOR AR AND SR REGISTERS





AR REGISTERS	5/8" Disc	3/4" Disc	1" Disc	1-1/2" Disc	2" Di
100	x	x	x		
200	x	x	x		
500	x	x	x		
1,000	x	x	x	x	x
2,000	x	x	x	x	x
5,000	x	x	x	x	x
10,000	x	x	x	x	x
20,000	x	x	x	x	x
50,000	x	x	x	x	x
100,000*	x	x	x	x	x
200,000	x	x	x	x	x
500,000	x	x	x	x	x
1,000,000				x	x
2,000,000				x	x
5,000,000				x	x
10,000,000					

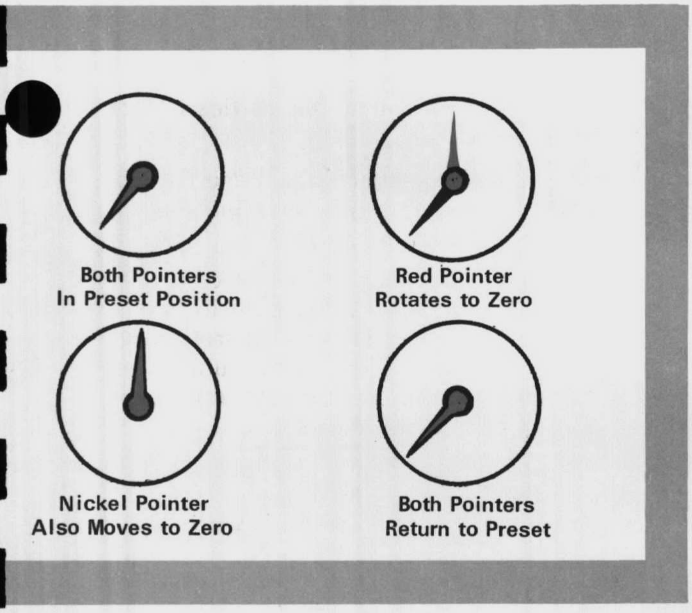
*Basic AR register dials in gallons. Metric dials in litres up to 50,000. Dials 100,000 a

SR REGISTERS						
Inner Pointer	**Outer Pointer**					
3,000	100	x	x	x	x	x
30,000	1,000	x	x	x	x	x
300,000	10,000	x	x	x	x	x
3,000,000	100,000				x	x

Basic SR dials in gallons. Metric scales in litres up to 30,000.
Dials 300,000 and above are m^3.

DIMENSIONS (In Inches)					
A	12-1/4	14	16	18-3/8	21-1/
B	7-1/2	9	10-3/4	12-5/8	15-1/4
C●	15-1/16	15-7/16	16-7/8	18-7/16	20-1/16
D	1-3/8	1-3/4	2-1/4	2-5/8	3-7/
Max. Depth	6-1/2	6-3/4	7-1/8	9-1/2	12-9/

● Add 2-1/2" when using cooling adapter; Allow additional 7-1/4" clearance for remov



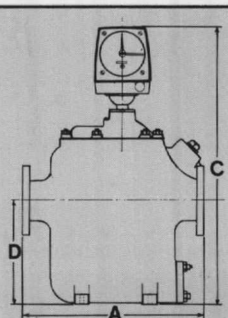
OPERATION OF SR REGISTER

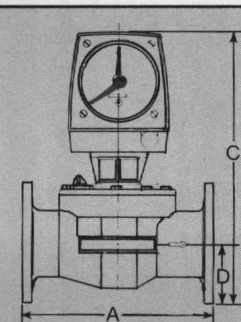
To preset Model SR, push in the knob on the front of the register and turn it counterclockwise until the pointers reach the desired setting. The nickel-plated inner pointer will move one graduation for each complete revolution of the red outer pointer.

Release the knob and the register will be ready for the metering cycle.

As liquid is metered, the pointers will rotate toward zero. When they reach the zero position, a built-in cam closes the signal switch. In a typical installation, the signal is used to operate an alarm or light so the operator knows that a tank needs regeneration.

When regeneration is completed, the operator resets the register to the desired quantity.





2" Turbine	3" Turbine	4" Turbine	2" Turbo	3" Turbo	4" Turbo	6" Turbo
x	x	x	x	x		
x	x	x	x	x		
x	x	x	x	x		
x	x	x	x	x		
x	x	x	x	x		
x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x	x	x	x	x
					x	x

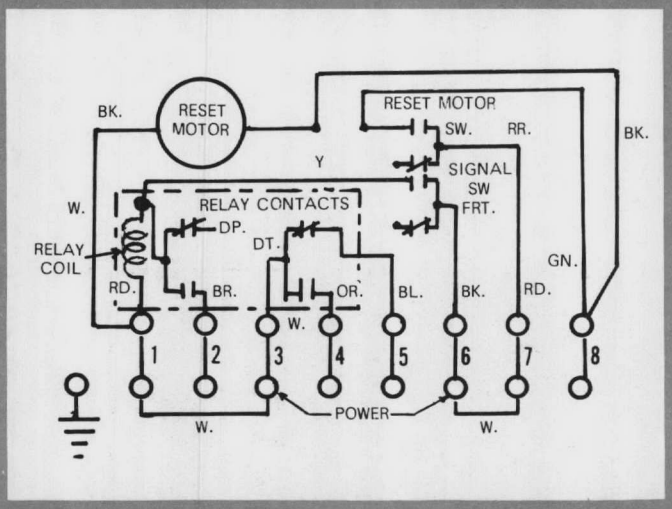
d above are m³.

x	x	x	x	x		
x	x	x	x	x	x	x
x	x	x	x	x	x	x
x	x	x	x	x	x	x

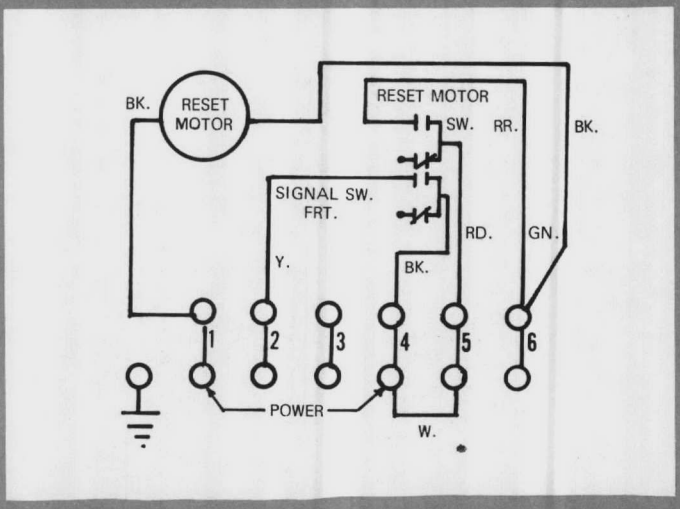
15-1/4	24	24	10	12	14	18
- - - -	- - - -	- - - -	- - - -	- - - -	- - - -	- - - -
28-15/16	35-1/2	35-7/8	16-7/8	17-1/8	20-1/16	22-1/2
8-1/16	12-3/4	13-5/16	2-3/4	3-1/2	4-1/4	5-1/4
8-1/8	12-1/2	12-3/4	6-13/16	7-1/2	9	11

ng register housing.

MODEL AR WIRING DIAGRAMS

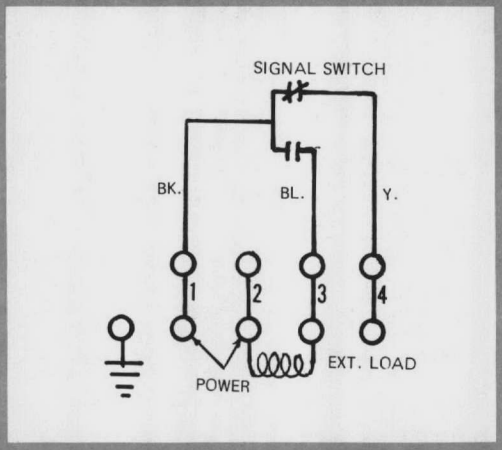


AR With Relay



AR Less Relay

MODEL SR WIRING DIAGRAM

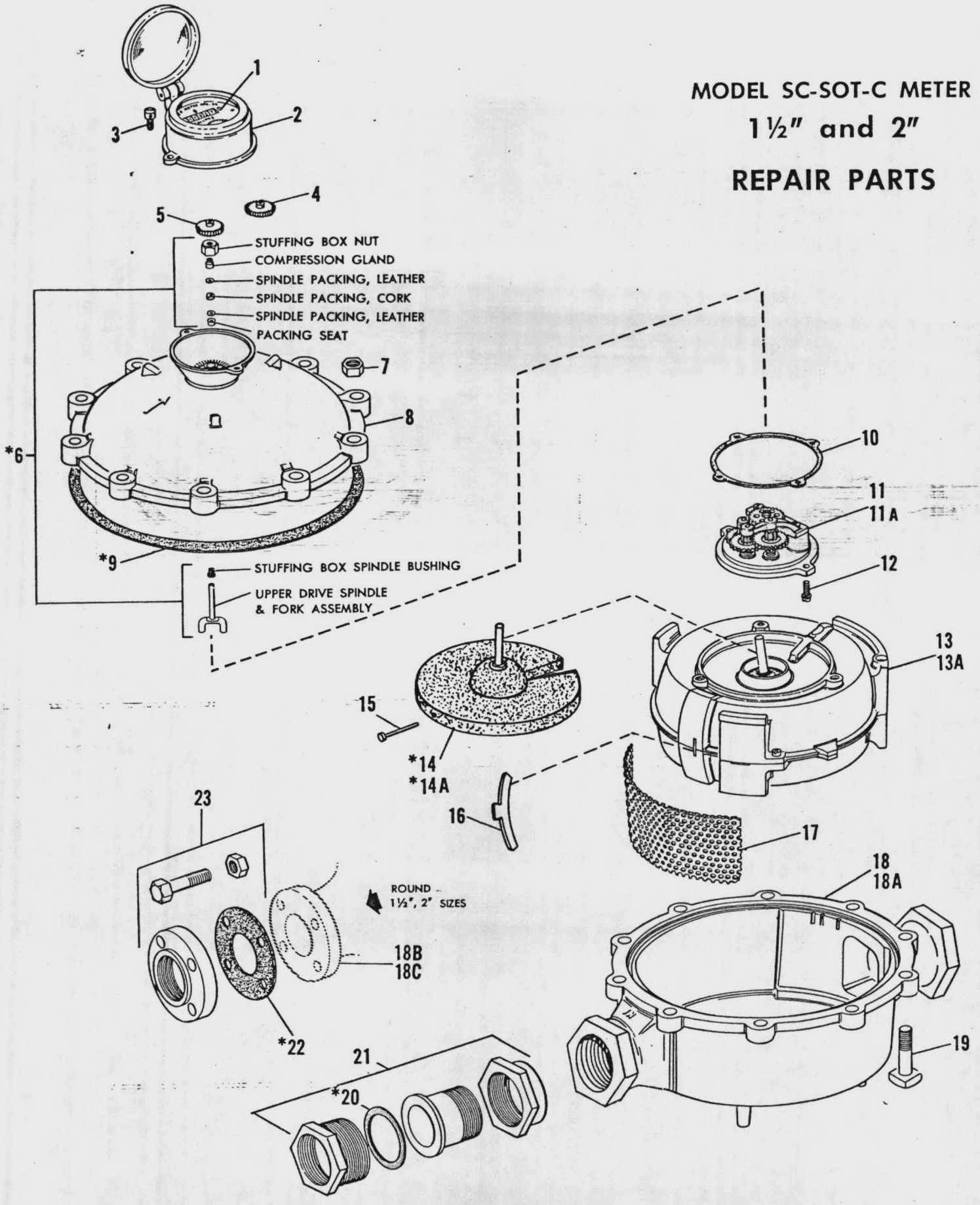


WARRANTY

Badger warrants its meters and accessories to be free from defects in material and workmanship for a period of 18 months from date of shipment or 12 months from date of installation, whichever period shall be shorter. Any Badger meter or part found to be defective in Badger's judgment within such period will, at Badger's option, be repaired or replaced, without charge, or the purchase price thereof will be refunded, upon return thereof to factory or service center designated by Badger, transportation charges prepaid.

THE FOREGOING WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER EXPRESS OR IMPLIED WARRANTIES WHATSOEVER INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. Badger shall not be liable for any defects attributable to acts or omissions of others after shipment, nor any consequential, incidental or contingent damage whatsoever.

MODEL SC-SOT-C METER
1½" and 2"
REPAIR PARTS



	ITEM NO.	PART NO.	DESCRIPTION	REQ	REMARKS
FILL IN DATA FOR ORDERING	1		125 LB.C.I. ORIFICE FLANGE ASSY 4 IN. COMPLETE WITH 1.60 IN.S.S. ORIFICE PLATE SIZED FOR 75 GPM @ 90" WATER DIFFERENTIAL.	1	CLA-VAL X-52-D-1
	2		1½ IN. CLAYTON 20-G-01A DIAPH. VALVE	1	
	3	A-1654-	1½ IN. ACF DIAMOND PORT PLUG VALVE	1	W/INDICATOR PLATE & OPERATING WRENCH
	4	A-860-5	10 FT. COIL ¼" O.D. POLYFLOW TUBING	1	
	5	A-1306-2	¼ T x ¼ MPT COMP. ADAPTER (BRASS)	2	
	6	A-1306-9	¼ T x ⅜ MPT COMP. ADAPTER (BRASS)	2	
	7	20-F	INSTALLATION INSTRUCTIONS	1	

SHOP NOTE:

UNLESS OTHERWISE SPECIFIED, ALL ITEMS TO BE SHIPPED UNASSEMBLED FOR INSTALLATION AT JOB SITE.

JOB # B-02091-76

INDUSTRIAL SPECIFICATION

USE

REVISIONS					
NO.	DATE	REMARKS	NO.	DATE	REMARKS
1			4		
2			5		
3			6		

BRUNER CORP. MILWAUKEE, WIS.

PROPORTIONING SYSTEM COMPONENTS

CLAYTON 20 G-01A BLEND VALVE

DIM. ± UNLESS OTHERWISE SPECIFIED

ENG. ±

DRAWN J.W.B.

SCALE: ——

APPROVED

DATE 10-12-76

A-02091-76-3

CLAYTON *automatic* VALVES

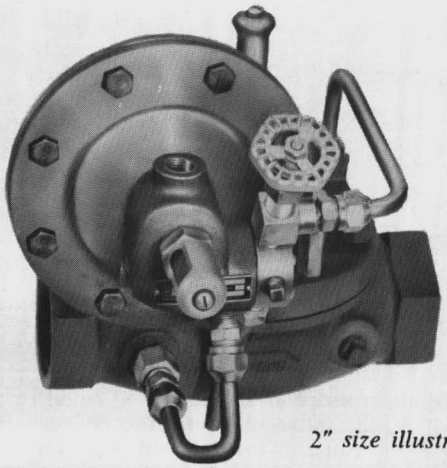
BLENDING VALVE

PRESSURE DIFFERENTIAL — *Clayton* **20F**

DESCRIPTION

The CLAYTON 20F Blending Valve is used in systems for controlling the flow of one fluid in relation to another. It operates to maintain a pre-set percentage of one fluid to the other regardless of fluctuating demands on the blend.

The valve is a hydraulically operated, pilot controlled, diaphragm type. It is operated by line pressure and responds to commands from the pilot control. It maintains equal pressure at two sensing points, one in each line of fluid being blended. With a restriction in each line between the blending point and the sensing point, a flow rate in direct proportion to the capacities of the restrictions will be maintained. By capacity adjustment of one or both restrictions, the percentage of one fluid to the other is adjusted. For sizes ½", ¾", and 1" refer to Clayton 20P.

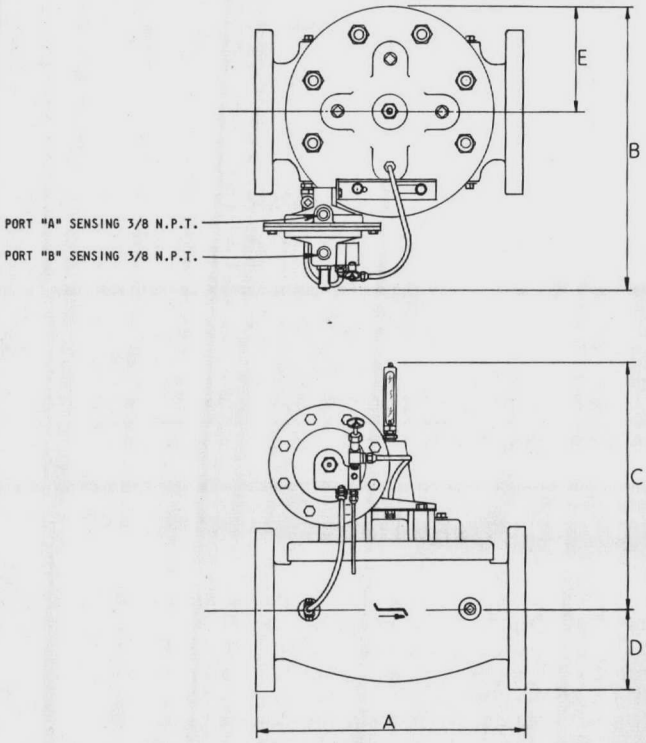


2" size illustrated

FEATURES

- Automatically controls the flow of one fluid in relation to another
- Extreme accuracy maintained regardless of fluctuating supply pressures, or demands on the blend
- Needle valve adjustment for controlling main valve response time
- Makes change of blend readily adjustable
- Simplified design, few moving parts
- Horizontal or vertical installation

DIMENSIONS



SPECIFICATIONS

SIZES
1¼" - 3" Screwed
1½" - 16" Flanged

END DETAILS
125 and 250 ANSI B16.1

PRESSURE RATINGS
125 Class — 175 psi Max.
250 Class — 300 psi Max.

TEMPERATURE RANGE
Water: +32° to 180° F. Max.
Petroleum Products: −40° to 180° F. Max.

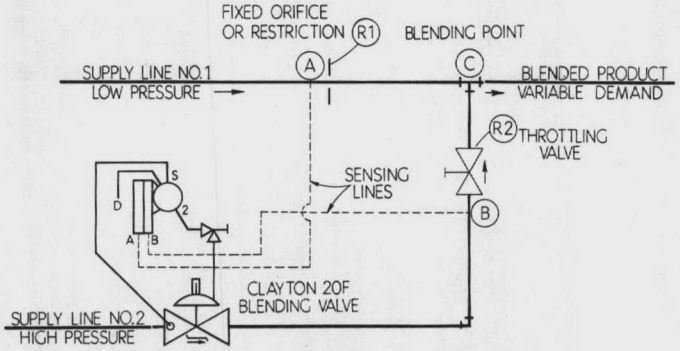
MATERIALS
main valve body and cover:
Cast Iron ASTM A-48
main valve trim:
Naval Brass ASTM B21 & Bronze ASTM B61
pilot control system:
Cast Brass ASTM B62 with 303 Stainless Steel trim and monel
other materials available:
Cast Steel, Bronze, Aluminum

DIMENSIONS IN INCHES

	VALVE SIZE IN INCHES	1¼	1½	2	2½	3	4	6	8	10	12	14	16
	125 & 150 SCREWED	7.25	7.25	9.38	11.00	12.50							
A	125 & 150 FLANGED		8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75	34.00	39.00	41.38
	250 & 300 FLANGED		9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12	35.50	40.50	43.50
B		12.12	12.12	13.25	14.38	15.50	17.50	21.75	25.87	29.75	33.50	38.38	41.12
C		4.87	4.87	8.25	9.38	9.62	14.38	17.12	19.87	25.12	29.00	32.12	34.62
D		2.00	2.00	2.50	2.87	3.12	4.25	6.00	7.62	9.25	10.75	12.75	15.50
E		2.75	2.75	3.38	4.00	4.62	5.75	7.87	10.00	12.00	14.00	16.38	17.75
	APPROX. SHIPPING WEIGHT - LBS.	30	30	50	65	85	160	300	520	800	1270	1725	2365

PATENTS ISSUED AND/OR PENDING

OPERATION



1. Pressure at B is maintained equal to pressure at A within ± 6 inches water pressure. This is accomplished by modulation of the 20F valve installed in the hi-pressure line.

2. With pressure at B maintained equal to pressure at A, the differential pressure between B and C will be equal to the differential pressure between A and C.

3. Flow rate through secondary restriction R2 will be maintained in relation to the flow rate through primary restriction R1. The proportional flow ratios will be directly rated to the capacities of restriction R1 and R2.

4. Primary restriction at R1 can be fixed as shown, or can be adjustable the same as the secondary restriction at R2.

   If the primary restriction at R1 is to be fixed, it must be calibrated in relation to two things:

   A. Accuracy required at Minimum Flow Rate.

   B. Systems allowable pressure loss at Maximum Flow Rate.

   For example: Excellent control will result within approximately ± 5% accuracy when a 60″ water differential is created across the fixed restriction (R1).

As the flow across this restriction increases, the accuracy (in % of flow) also increases. As the flow across the restriction (R1) decreases, the accuracy (in % of flow) slightly decreases.

Therefore, where accuracy of ± 5% or less is required over a wide flow range, at least a 60″ water differential should be created across the fixed restriction (R1) at the lowest flow rate. In sizing the adjustable restriction (R2), consideration must be given to two things:

A. Ratio of blend (flow through R2 as compared to flow through R1).

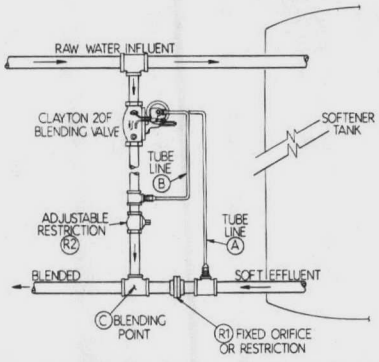
B. Differential across R1.

To obtain a blend ratio of 1 to 1, the differential created by R2, when adjusted to "full open", must not be more than the differential created by R1 when passing an equal flow.

Where the blend ratio requires less flow at R2 than at R1, the differential created by R2 at "full open" can be proportionally more than the differential created by R1 at an equal flow rate.

Where the blend ratio requires more flow at R2 than at R1, the differential created by R2 at "full open" must be proportionally less than the differential created by R1 at an equal flow rate.

TYPICAL APPLICATION



VALVE CAPACITY CHART

MAXIMUM CONTINUOUS FLOW GPM (WATER)	1¼″	1½″	2″	2½″	3″	4″	6″	8″	10″	12″	14″	16″
	55	75	120	180	270	480	1100	1900	2900	4200	5200	6800

ORDERING INFORMATION

When ordering, please furnish the following information:

1. Catalog number
2. Valve size
3. Fluid to be handled
4. Maximum temperature

For factory recommendations on sizing of R1 and R2, the following information must be submitted:

A. Total flow in GPM at blending point. Maximum and minimum.

B. Ratio of blend required (percent of each fluid in the blend).

C. Accuracy required, in percent of flow. At Maximum Flow and Minimum Flow.

D. Size and complete description of pipe used at primary restriction (R1).

PURCHASE SPECIFICATIONS

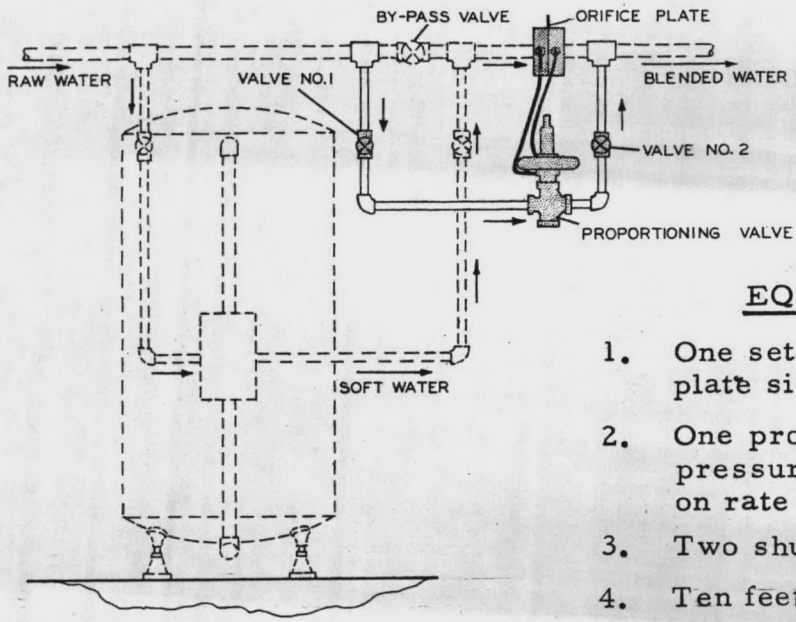
The blending valve shall be a pilot controlled hydraulically operated diaphragm type globe valve with single seated composition disc. It shall be operated by line pressure and respond to commands from the pilot control. In a blending system, the valve shall operate to maintain the flow rate of one fluid in direct proportion to the flow rate of another fluid. It shall maintain the same percent of one fluid to the other in the blend regardless of variable system inlet pressures or variable demands on the blend. It shall automatically adjust the percent of one of the fluids in the blend, in response to any setting of an adjustable restriction in the line being proportioned. Valve shall be model Clayton 20F as manufactured by CLA-VAL CO., NEWPORT BEACH, CALIFORNIA, or approved equal.

Printed in U.S.A.

BRUNER
WATER SOFTENERS & FILTERS

AUTOMATIC PROPORTIONING SYSTEM

INSTALLATION DIAGRAM



EQUIPMENT FURNISHED

1. One set of flanges and an orifice plate sized for design flow.
2. One proportioning valve (differential pressure controller), size depending on rate of hard water blending flow.
3. Two shut-off valves.
4. Ten feet of 1/4" copper tubing.

START-UP PROCEDURE (Refer to Installation Diagram.)

1. Close by-pass valve.
2. Open soft water service line to allow rated service flow thru softener.
3. Slowly open valves No. 1 and No. 2 until both are wide open. Wait several minutes for proportioning valve to adjust to normal operation.
4. Test blended water for hardness.

HOW TO ADJUST (Refer to illustration, page 2.)

If the blended water does not have the desired hardness, proceed as follows:

1. Remove Adjusting Screw Cap and loosen Lock Nut on Adjusting Screw.
2. If the blended water is too hard, turn the Adjusting Screw clockwise several turns.

   If the blended water is too soft, turn the Adjusting Screw counter-clockwise several turns.
3. Retest the blended water for hardness.
4. When the water is at the desired hardness, retighten the Lock Nut and replace the Adjusting Screw Cap.

NOTE: Periodically retest the blended water for the desired hardness. Seasonal changes in the raw water may dictate the need for readjustment of the proportioning valve.

BRUNER CORPORATION
Division of Calgon Corporation

Main Plant and Offices
4767 N. 32nd St.
Milwaukee, Wis. 53209

Western Division Plant
10626 E. Rush St.
South El Monte, Calif. 91733

Printed in U.S.A.

REPLACEMENT PARTS—ORDERING PROCEDURE

The system drawing located in the "Installation" section of this book provides a complete list of all component items used in your water treatment system. The various parts lists, located in the "Service Manuals" section, cover a complete series of valve sizes, pipe sizes, etc. Therefore, it is imperative that you refer to the drawing to determine the exact valve size or style of the components used in your system.

When ordering replacement parts, the complete part number and description should be included on the order.

Replacement parts can be ordered directly from one of two factories:

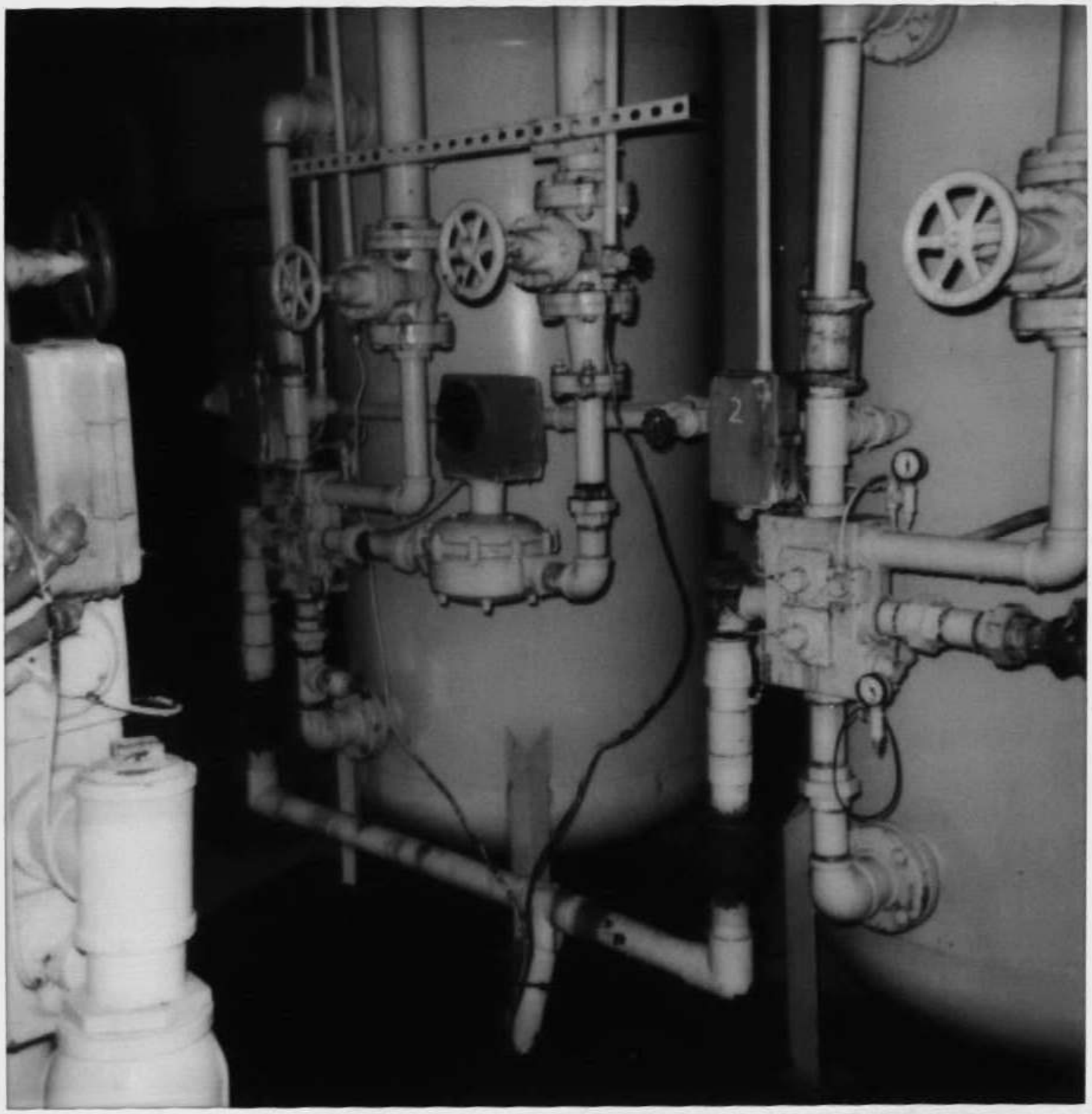
Calgon Corporation
4767 N. 32nd Street
Milwaukee, Wisconsin 53209
TELEPHONE: (414) 442-3200

-or-

Calgon Corporation
14516 E. Bonelli Street
City of Industry, California 91744
TELEPHONE: (213) 968-5588

Parts pricing inquiries should be sent to:

Calgon Corporation
Industrial Softener Department
P.O. Box 1346
Pittsburgh, Pennsylvania 15230
TELEPHONE: (412) 923-2345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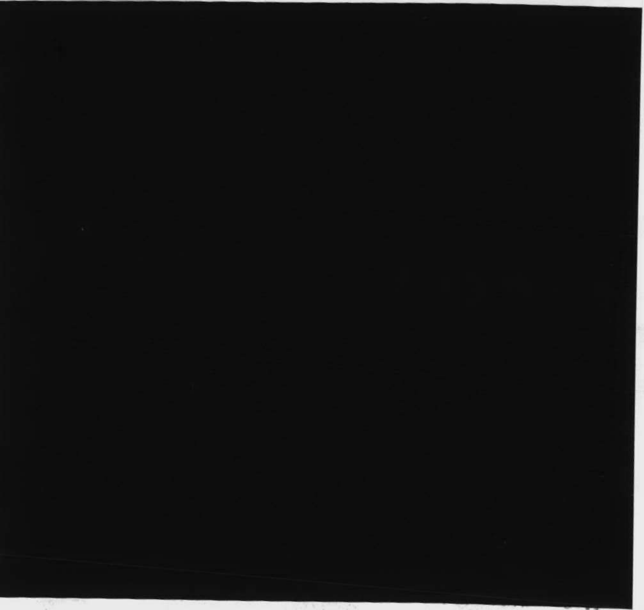

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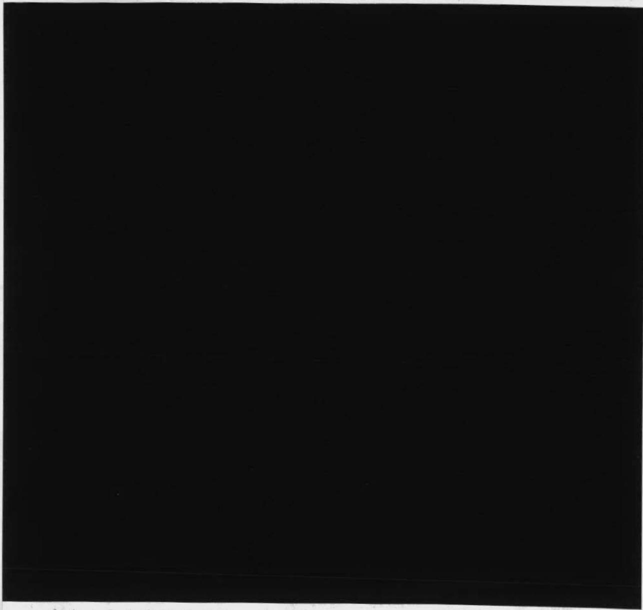
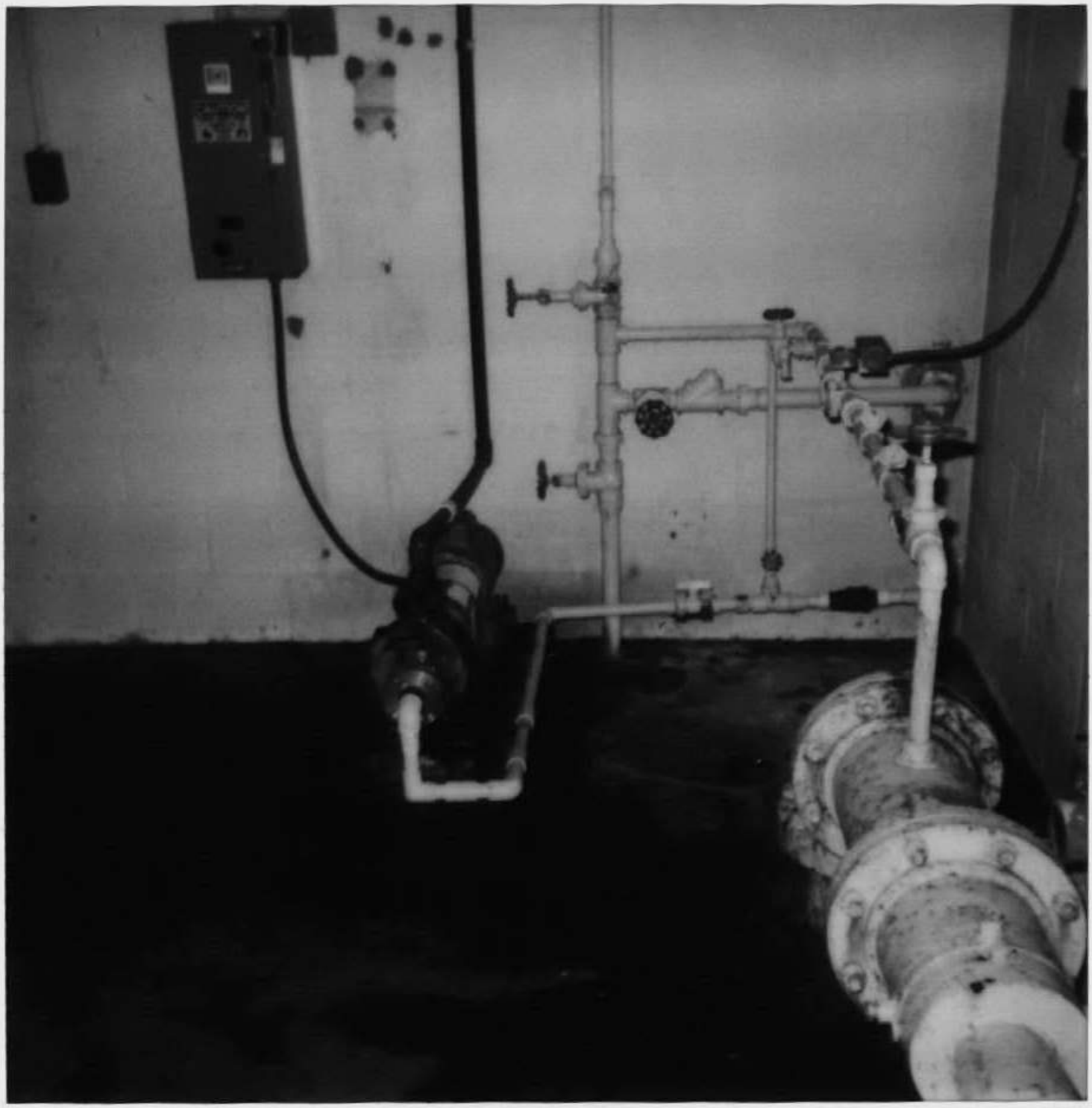
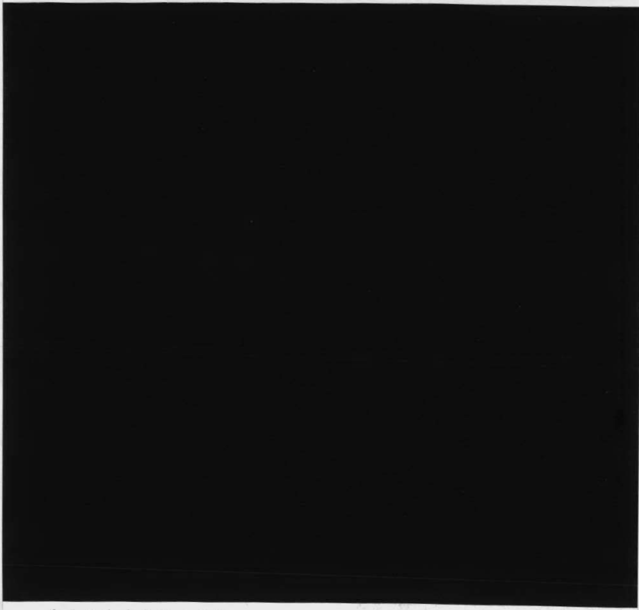
POLAROID® 3W

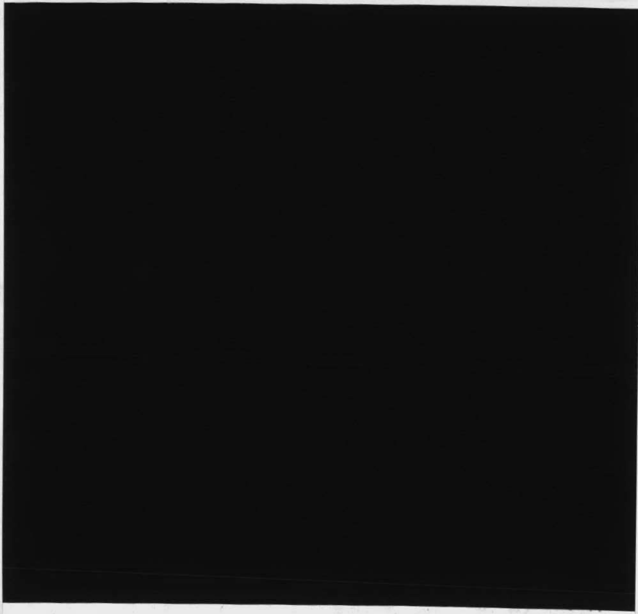


1443083083 POLAROID® 3W




POLAROID® 3W

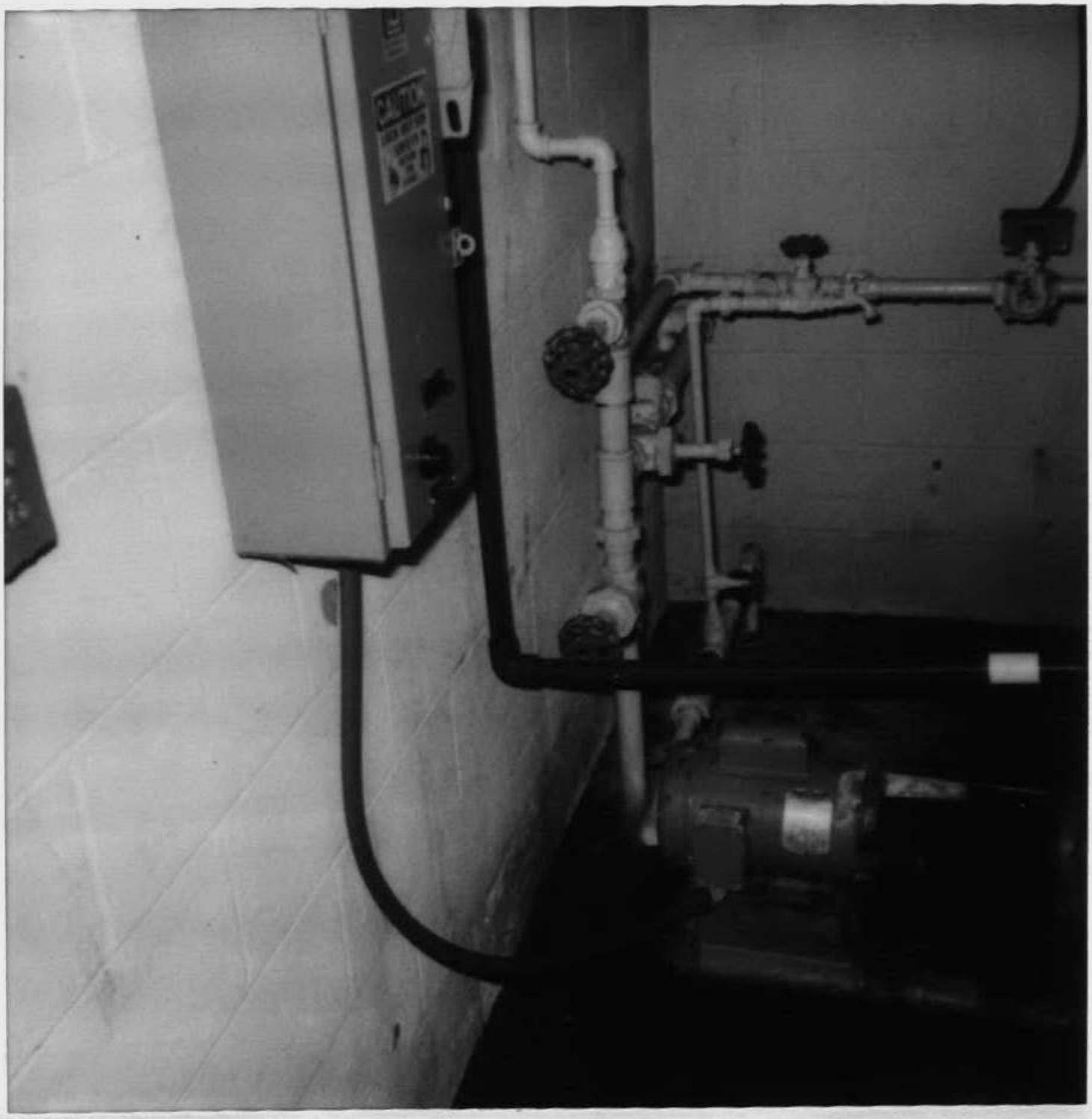

2

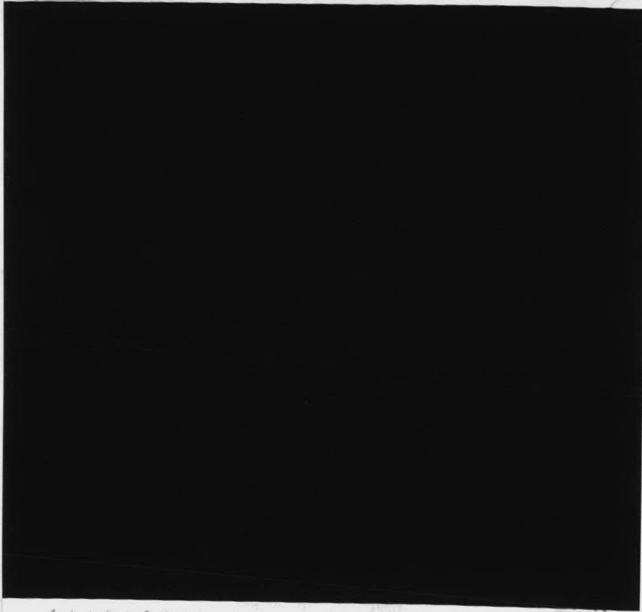


1443083083 POLAROID® 3W

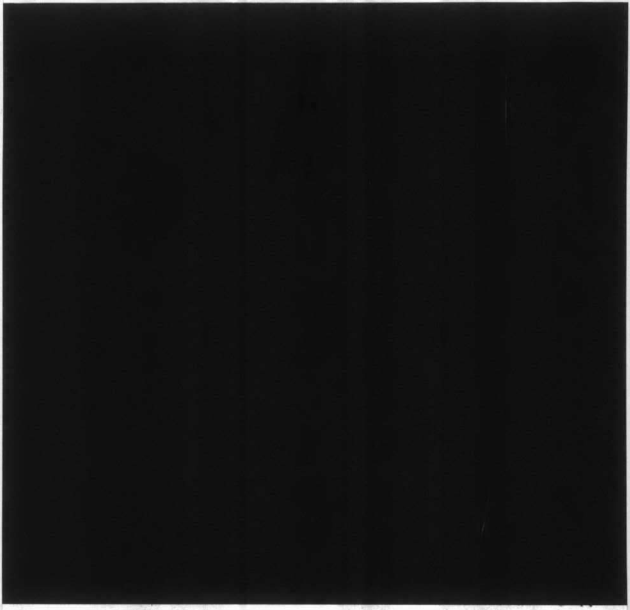
1443083083

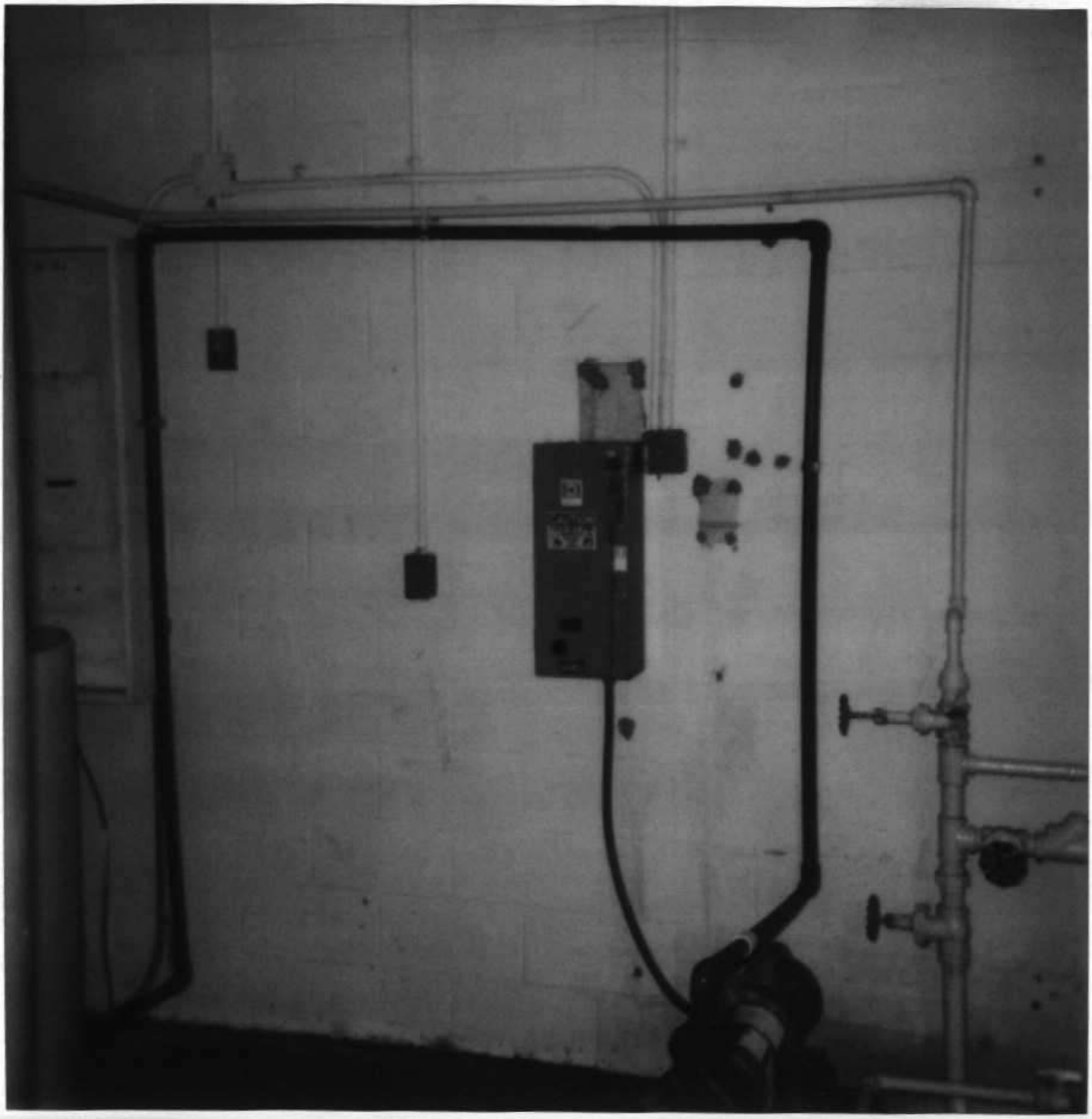
POLAROID® 3 W

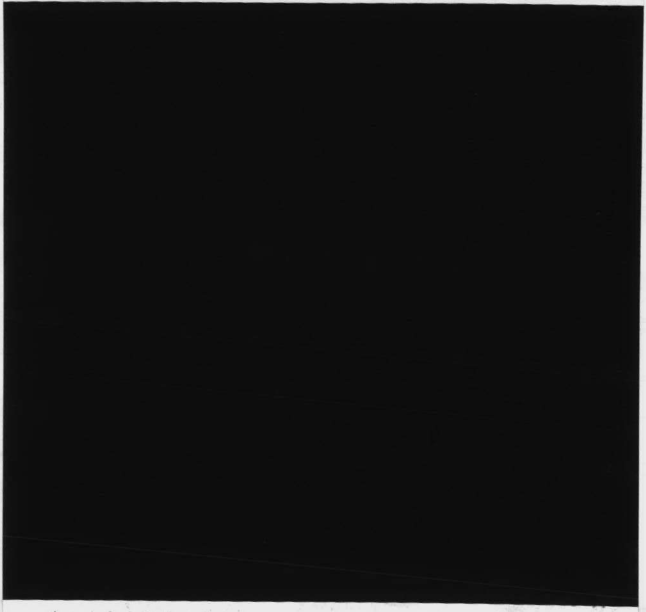




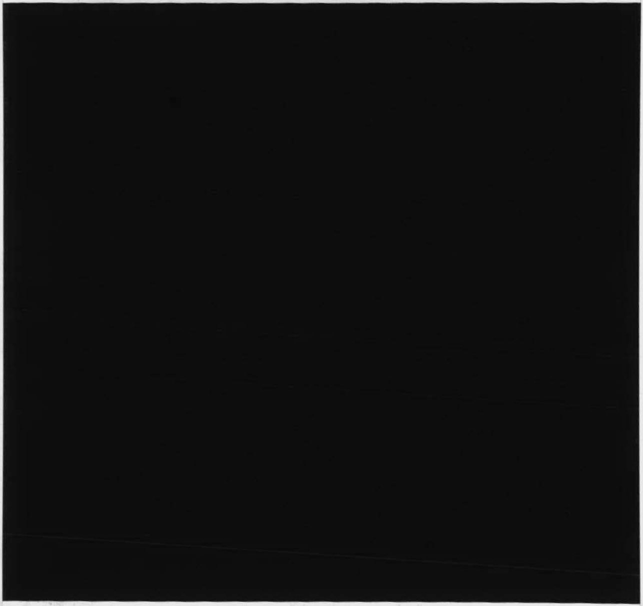
1443083083 POLAROID® 3 W







1443083083 POLAROID® 3W



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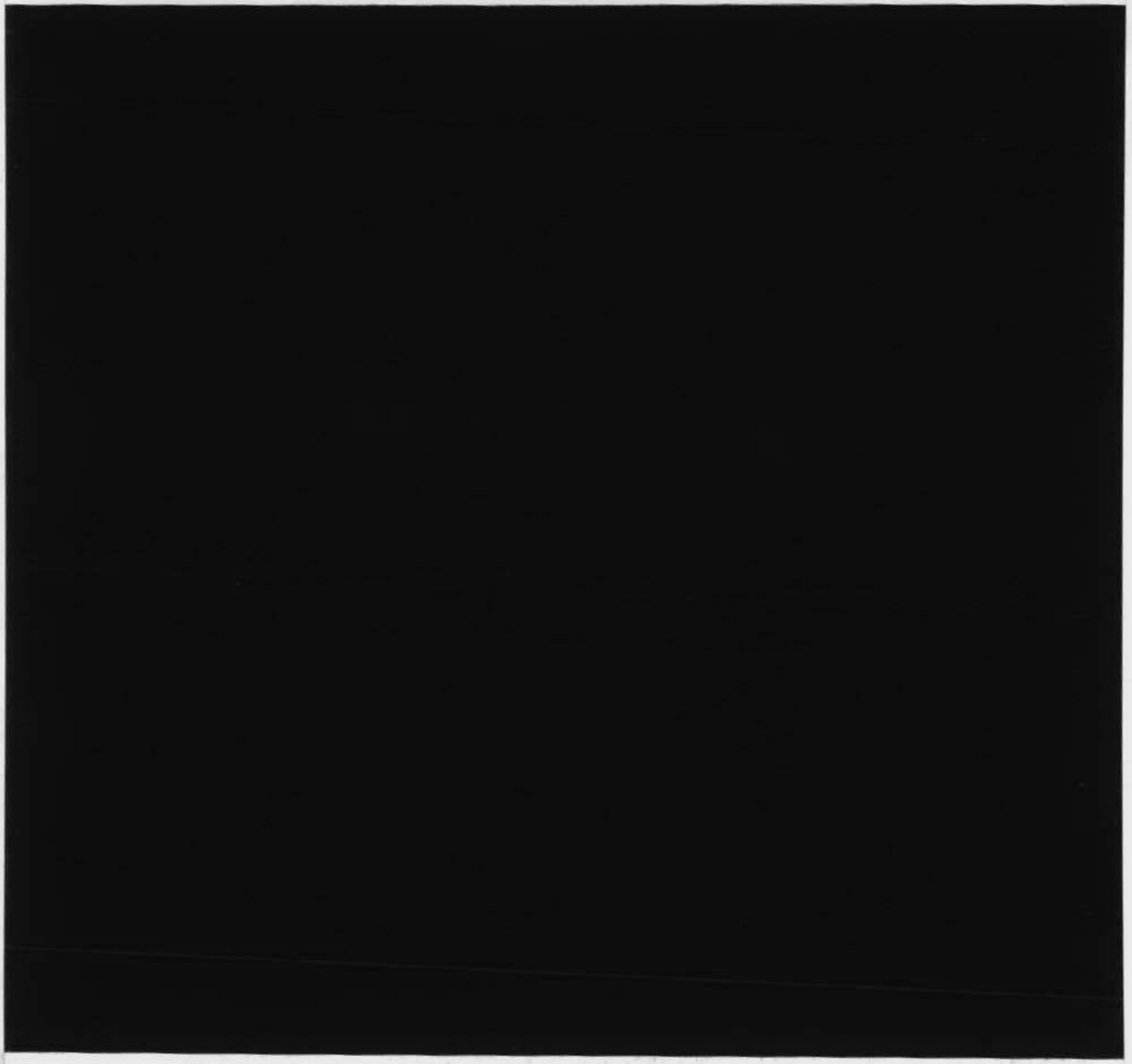

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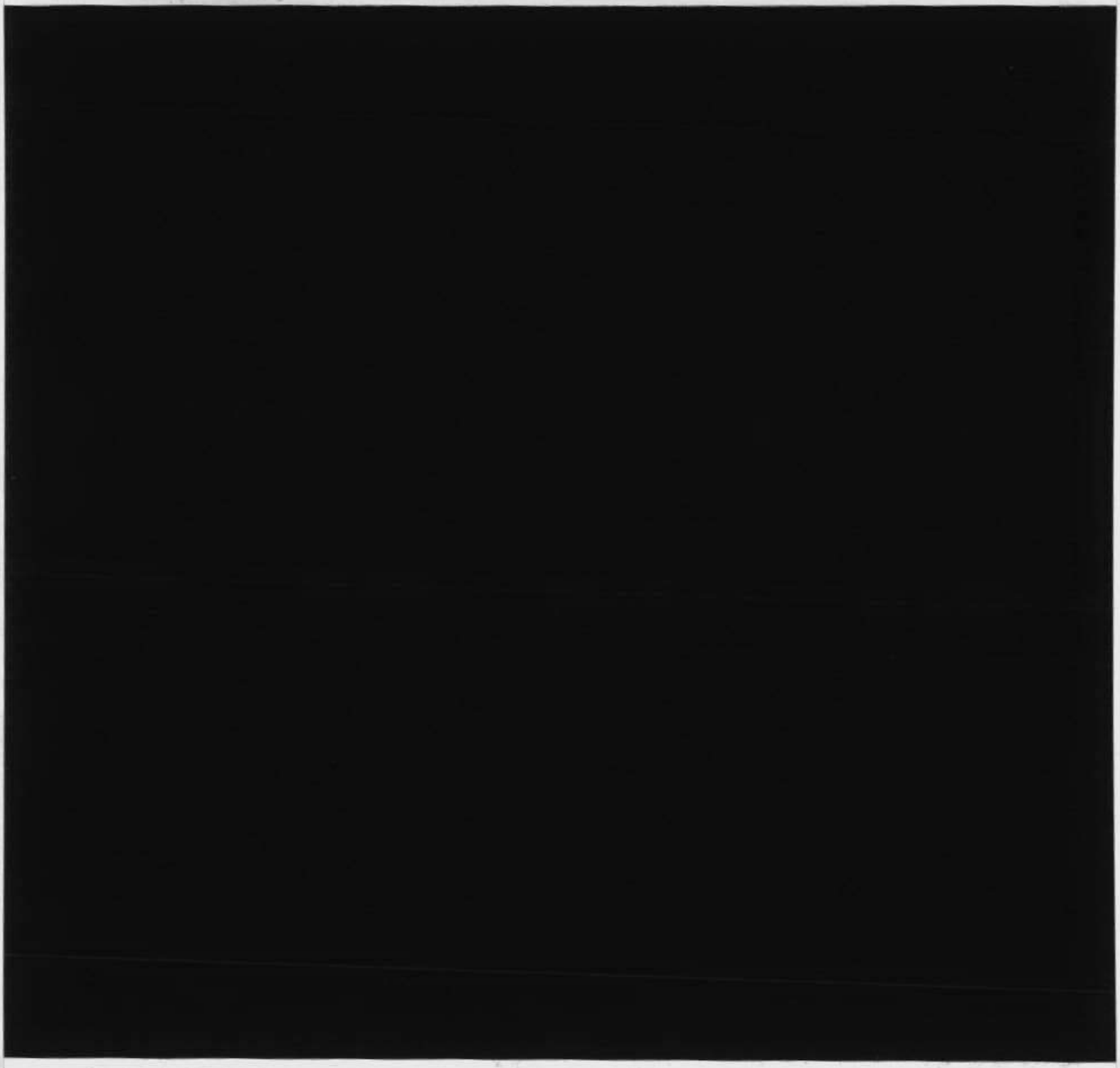
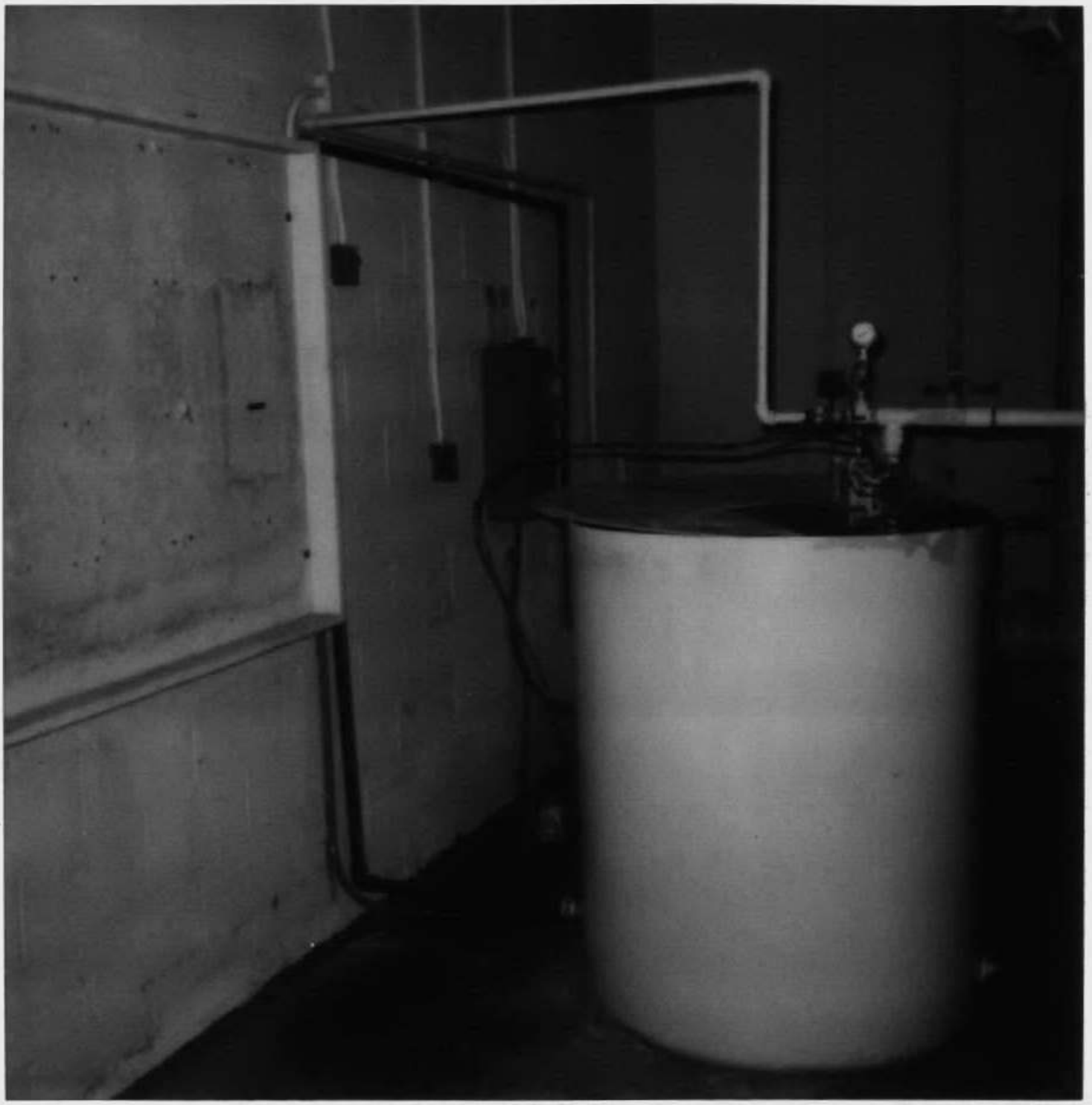
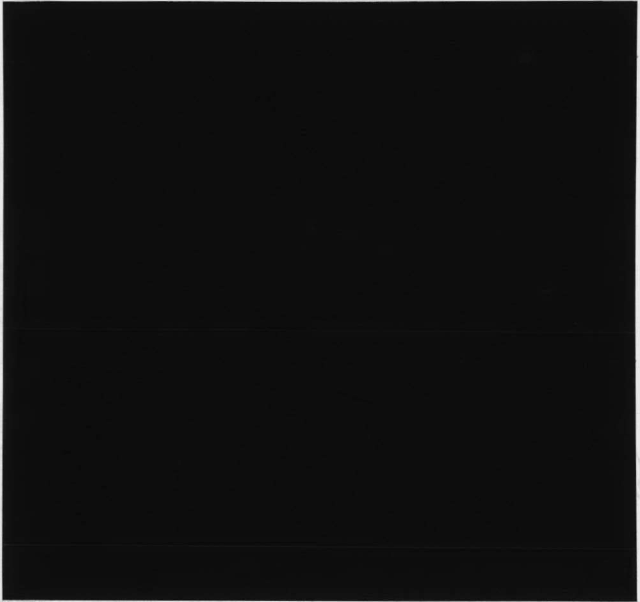
POLAROID® 3W



14+3083083 POLAROID® 3W





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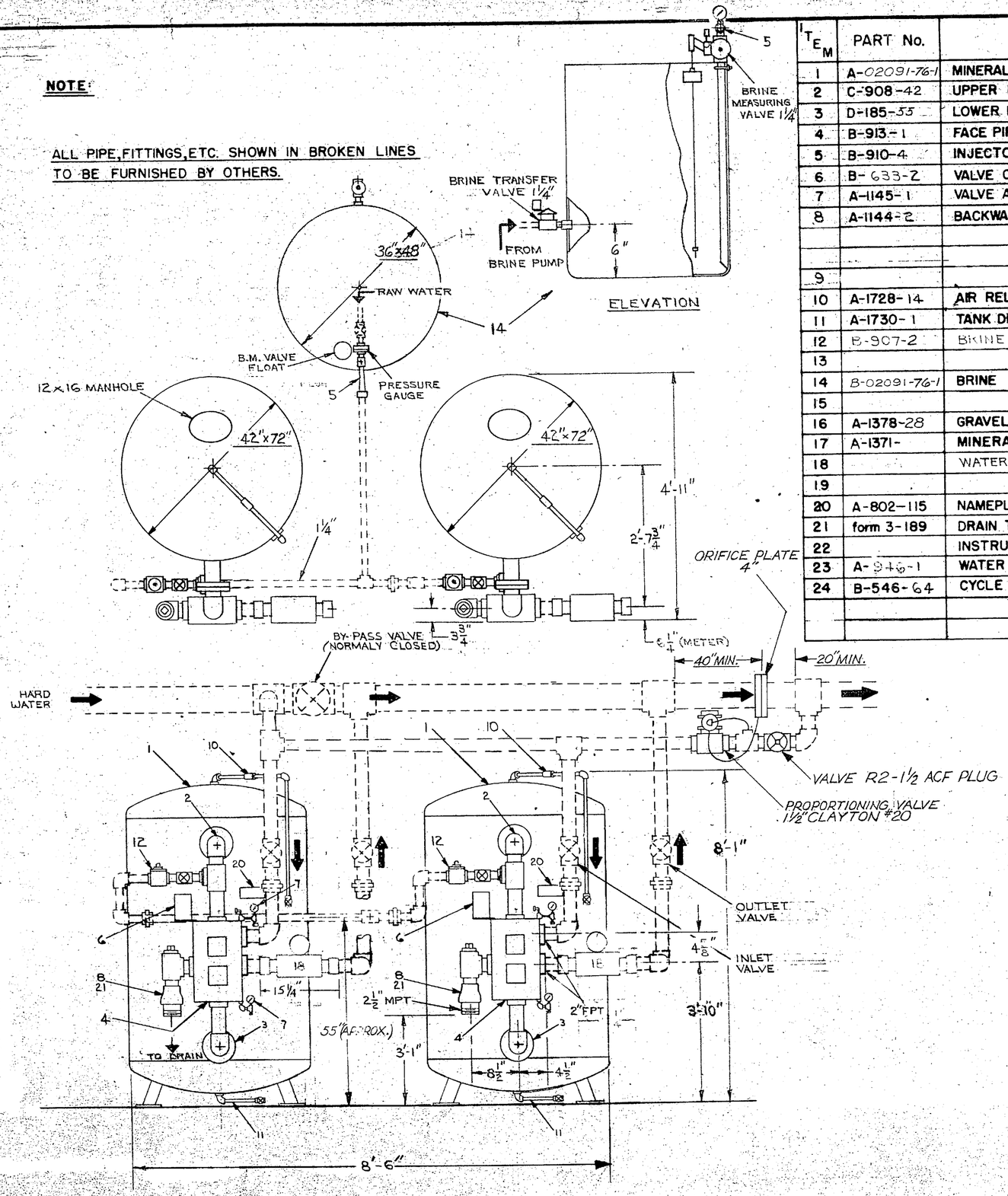
POLAROID® 3W

NOTE:

ALL PIPE, FITTINGS, ETC. SHOWN IN BROKEN LINES TO BE FURNISHED BY OTHERS.



ITEM	PART No.	DESCRIPTION	REQ.	REMARKS
1	A-02091-76-1	MINERAL TANK ASSEMBLY 42x72	2	SPECIAL 100# ASME
2	C-908-42	UPPER DISTRIBUTOR ASSEMBLY	2	
3	D-185-55	LOWER HEADER-LATERAL ASSEMBLY	2	
4	B-913-1	FACE PIPING ASSEMBLY 2-2-0	2	
5	B-910-4	INJECTOR ASSEMBLY MODIFY FOR VERTICAL SUCTION AS SHOWN	1	PART OF ITEM 14
6	B-633-2	VALVE CONTROL ASSEMBLY	2	
7	A-1145-1	VALVE ACCESSORIES	—	PART OF ITEM 4
8	A-1144-2	BACKWASH CONTROL ASSEMBLY	2	4.5 GPM
9				
10	A-1728-14	AIR RELIEF PIPING ASSEMBLY	—	PART OF ITEM 1
11	A-1730-1	TANK DRAIN PIPING ASSEMBLY	—	
12	B-907-2	BRINE PIPING ASSEMBLY 1¼"	2	
13				
14	B-02091-76-1	BRINE MEASURING TANK ASSEMBLY	1	38x48 FIBERGLASS
15				
16	A-1378-28	GRAVEL - LBS. 700/TANK	—	PART OF ITEM 1
17	A-1371-	MINERAL - Cu. Ft. 35/TANK	2	C-3001
18		WATER METER 2" DISC TYPE AR-LR	2	DIAL CAP. 200 M.
19				
20	A-802-115	NAMEPLATE STICKER	2	stamp model no. & serial no.
21	form 3-189	DRAIN TAG	2	check mark drain size
22		INSTRUCTIONS MATERIAL	1	
23	A-946-1	WATER TEST KIT	1	
24	B-546-64	CYCLE CONTROLLER	—	PART OF ITEM 6

CALGON JOB NO. B-02091-76
(PROPOSAL NO. E-047604-A)

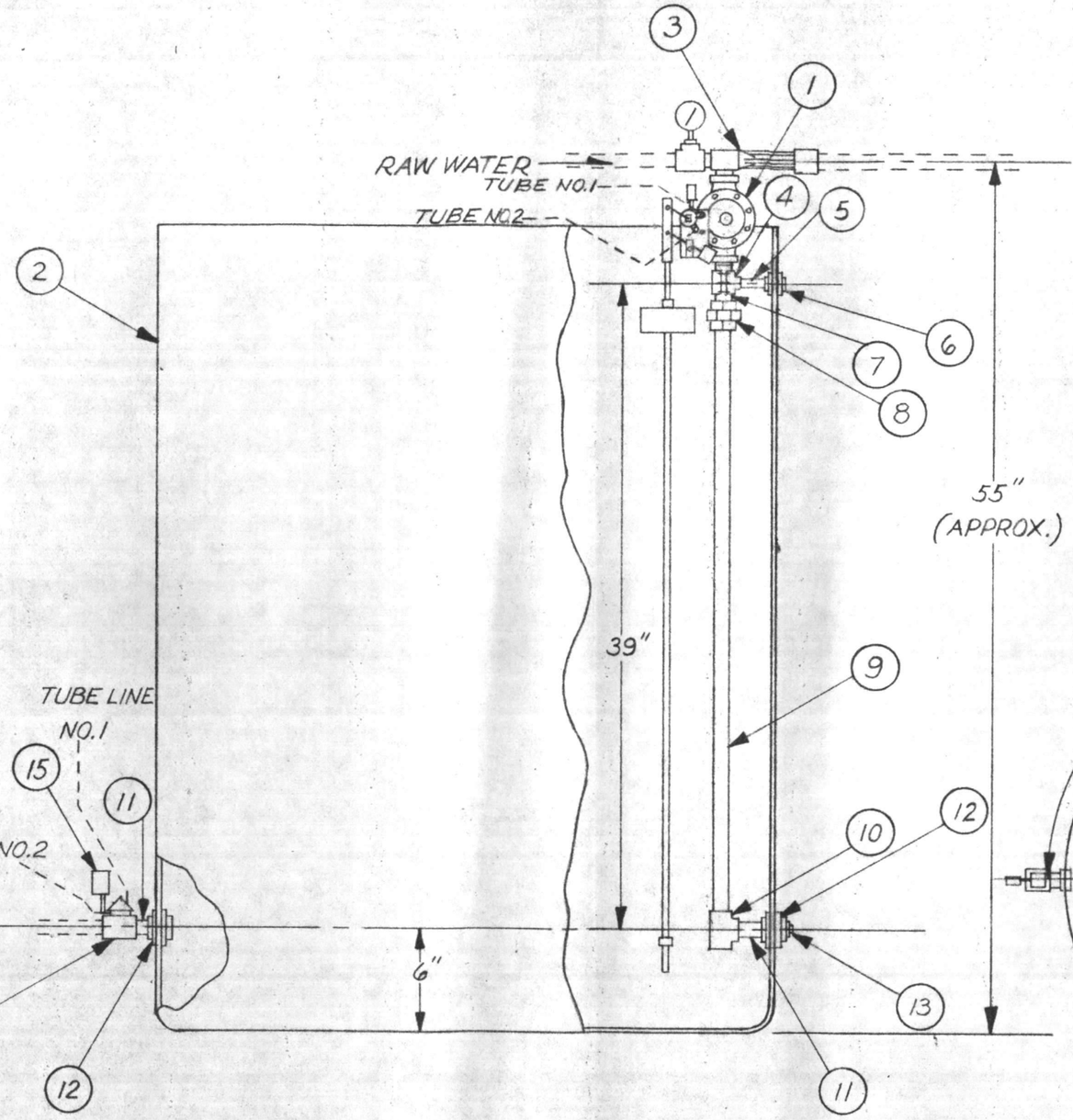
REVISIONS					
NO.	DATE	REMARKS	NO.	DATE	REMARKS
1			4		
2			5		
3			6		

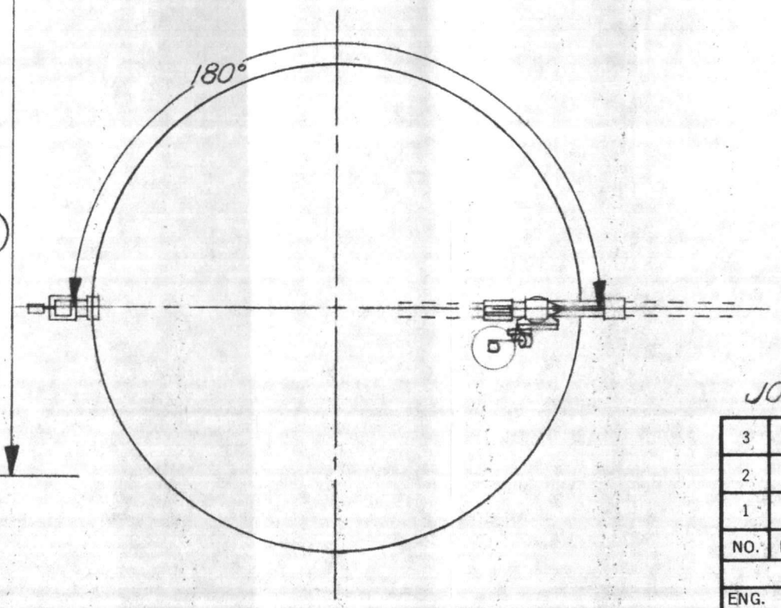
BRUNER DIVISION OF CALGON CORP.
MILWAUKEE, WISCONSIN — SOUTH EL MONTE, CALIFORNIA

AUTOMATIC WATER SOFTENER SYSTEM
WATER PLANT BA-138 CAMP LEJEUNE, N.C.

DEC. ± / FRAC. ± — UNLESS OTHERWISE SPECIFIED
DRAWN R.E.A. — SCALE —
APPROVED —
DATE 6-2-76 — C-02091-76-1

(WAS C-943-3)





ITEM.	PART NO.	DESCRIPTION	REQ.	REMARKS
1	A-1657-3	BRINE CONTROL VALVE 1¼"	1	#122
2	A-1660-3	FIBERGLASS TANK 38×48	1	MOD. SIDE SHELL HT. 48"
3	B-910-4	INJECTOR ASSY. DELETE ITEM NO. 6 COUPLING	1	
4	GSR *	SADDLE TEE 1¼"×¾" PVC.	1	CAT. NO. P40-70
5	A-1529-4	PVC NIPPLE ¾"×4"	1	
6	A-1137-5	BULKHEAD FITTING ¾"	1	
7	A-1337-3	NIPPLE 1¼ T.O.E. CUT TO FIT	1	FOR 55" HT. LEVEL
8	A-1280-10	UNION G.J. 1¼"	1	
9	A-1325-42	PIPE 1¼"×34⅜"	1	
10	A-1280-2	TEE 1¼"	1	
11	A-1325-7	NIPPLE 1¼"×4"	2	
12		BULKHEAD FITTING 1¼"	2	RAVEN
13	A-1280-13	SQ. HD. PLUG 1¼"	1	
14		BRINE TRANSFER VALVE 1¼"	1	NO. 7100 PKHR
15	A-1533-1	PRESSURE SWITCH	1	

* R+G SLOANE MFG. CO.

JOB # B-02019-76

NO.	DATE	BY	CHK'D	APP'D	REMARKS
3					
2					
1					

REVISIONS

ENG.

PROJECT	
SCALE	CHD
DRAWN	J.W.B.
DATE	7-5-76
CHK'D	
APPRV'D	

WATER TREATMENT EQUIPMENT

CALGON CORPORATION

SUBSIDIARY OF MERCK & CO., INC.
P.O. BOX 1346 - PITTSBURGH, PA. 15230

TITLE
BRINE MEASURING TANK ASSY.

DWG. NO. B-02091-76-1

REV.

BRUNING 40-534 27450