

# Operation and Maintenance Manual for

Model KF  
Twin-Tank  
Softener System  
with Single 1" or 1½" Valve

U.S. Filter Project # \_\_\_\_\_

USF Document P/N 133100180

November 23, 1998

MODEL NO. AND DESCRIPTION	KF	S	T	0							
Power Required:	115 VAC/1 ph/60 Hz = Z										Options: No options = X Min. resin volume = Y Max. resin volume = Z
	220 VAC/1 ph/50 Hz = F										
Media Type:	Softener = S										Pipe Size: 1.0" = A, 1.5" = B
Mode:	Twin = T										Controls: 9000/9500 w/ meter = N 3200ET w/ meter = O
Softener Diameter:	07, 09, 10, 12, 14, 16, 18, 21, or 24"										Assy: Stand-alone unit = Z Skid-mounted = P
Vessel Design:	Standard non-code fiberglass = F ASME designed and stamped fiberglass = G										
Control Enclosure:	Std NEMA 1 rating = X, NEMA 3 rating (3200ET) = P										
<p>Example: <b>Model #KFZST007FXZNAX</b> = 115 VAC softener, twin, w/ 7" non-code vessel, NEMA 1 panel, stand-alone assembly, #9000/9500 timer w/ meter, 1.0" inlet and outlet pipes, and no options.</p>											
TIME OF REGEN - O controls only:	<input type="checkbox"/> 2:00 a.m. (std) <input type="checkbox"/> Other ____ a.m./p.m.										
SALT DOSAGE (fill in req'd dosage) <sup>1</sup>	_____ lbs of 100% NaCl per cubic foot of resin (range: 9 to 15 #/ft <sup>3</sup> )										

At higher salt dosages, the softener will treat more water between regenerations, create less overall waste, and produce lower-hardness effluent. At lower salt dosages, the softener will use less overall salt. For dosages below 9 #/ft<sup>3</sup>, consult U.S. Filter Customer Service.

# U.S. FILTER

U.S. Filter  
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Rockford, Illinois 61105  
Tel: 815-877-3041 ☐ Fax: 815-877-0172

Congratulations on your purchase of one of the finest water treatment products available!

Through proper installation, operation, and maintenance, this system will provide you with

many years of satisfactory service. U.S. Filter values your business and is committed to your satisfaction in our products. Thank you for purchasing this product—we believe your investment will be a good one.

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## GENERAL SAFETY INFORMATION

### CODES

Be sure to comply with all applicable local, state, and federal codes.

### EQUIPMENT INSPECTION

Thoroughly inspect the equipment upon receipt and account for all items on the packing slip. Claims for items lost or damaged in shipment must be filed with the delivery carrier immediately

### TRAINING

All operators must be properly trained and familiar with the operation of the equipment.

### UNSECURED VESSELS

Empty vessels must be securely braced until they are permanently mounted. Small vessels which are not loaded with media may be unbalanced when stood upright

### ELECTRICAL COMPONENTS

All electrical components must be properly wired and grounded, and must not be allowed

to come in contact with liquids. Be sure to unplug the controller before servicing any electrical components.

### TEMPERATURES

The maximum operating temperature is 100°F.

### AUTOMATIC COMPONENTS

Before working on automatically controlled components, disable the controller so that it will not operate the components. Sudden and unexpected operation of components being serviced can cause severe injury.

### PRESSURES

Verify that all pressures are relieved before working on this system and its components. Inlet pressure must be 30-110 psi.

### MATERIAL SAFETY DATA SHEETS

These data sheets contain important safety and first-aid information for supplied Materials. The MSDS sheets are included in the Appendix section of this manual (section 8).

## SECTION 1.0 INTRODUCTION

### 1.1 ABOUT THIS MANUAL

This manual has been written with both you and your U.S. Filter area representative in mind. Most of the information contained in this manual will help you to install, start up, and operate your water treatment system. Therefore, you should read this manual before commissioning this system. In addition, details have been added to the manual to assist your representative in filling out the Specification Sheet on page 2.

If problems or questions should arise during system operation, refer to the troubleshooting table in section 3.4 for assistance. If the problem is not resolved, contact your representative; be sure to have the Title Page Specification Sheet in hand when you call.

### 1.2 SYSTEM SPECIFICATIONS

The Specification Sheet for your system in included on the next page.

**Table 1: Equipment and Process Specifications**

Tank Size ("D x "H)	Pipe Size (in.)	Resin Vol. (ft <sup>3</sup> )	1/8"x 1/16" Gravel in Tnk (lbs)	Motor Speed (rpm)	Capacity @ 15#/ft <sup>3</sup> dosage (Kgr)	Max. Service Flow (gpm)		Backwash/ Rapid Rinse Flow DLFC (gpm)	Inj. Size/ Color	Fill Flow BLFC (gpm)	Cycle Times @ 15#/ft <sup>3</sup> dosage (minutes)				Brine Tank ("D x "H)	Max. Salt in Tk (lbs.)	
						R.O. Pretreat	Stand Alone				Back-wash	Brine In	Slow Rinse	Rapid Rinse			Brine Tank Fill
7 x 44	1.0	0.5	none	1/15	15	---	15.0	1.2	0/R	0.5	10	20	22	10	9	18 x 40	350
9 x 40	1.0	1.0	none	1/15	30	2.6	18.0	2.0	1/W	0.5	10	21	29	10	12	18 x 40	350
10 x 54	1.0	1.5	none	1/15	45	---	18.0	2.4	1/W	0.5	10	31	48	10	17.5	18 x 40	350
12 x 52	1.0	2.0	none	1/15	60	4.7	19.0	3.5	2/B	0.5	10	32	31	10	24	18 x 40	350
12 x 52	1.5	2.0	none	1/15	60	4.7	39.0	3.5	2/B	1.0	10	32	31	10	12	18 x 40	350
14 x 65	1.0	3.0	40	1/30	90	6.4	22.0	5.0	3/Y	1.0	10	26	46	10	16	18 x 40	350
14 x 65	1.5	3.0	40	1/30	90	6.4	42.0	5.0	3/Y	1.0	10	26	46	10	16	24 x 50	700
16 x 65	1.0	4.0	55	1/30	120	8.4	23.0	7.0	3/Y	1.0	10	34	58	10	22	24 x 50	700
16 x 65	1.5	4.0	55	1/30	120	8.4	46.0	7.0	3/Y	1.0	10	34	58	10	22	24 x 50	700
18 x 65	1.5	5.0	100	1/30	150	10.6	48.0	9.0	3C/Y	2.0	10	26	64	10	16	24 x 50	700
21 x 62	1.5	6.0	100	1/30	180	12.7	55.0	12.0	4C/G	2.0	10	14	48	10	18	24 x 50	700
21 x 62	1.5	7.0	100	1/30	210	14.4	55.0	12.0	4C/G	2.0	10	16	48	10	18	24 x 50	700
24 x 72	1.5	8.0	175	1/30	240	16.8	57.0	15.0	5C/W	2.0	10	20	54	10	24	24 x 50	700
24 x 72	1.5	9.0	175	1/30	270	18.8	56.0	15.0	5C/W	2.0	10	24	54	10	26	24 x 50	700
24 x 72	1.5	10.0	175	1/30	300	21.2	56.0	15.0	5C/W	2.0	10	26	54	10	26	30 x 48	1000

1 For other salt dosages, use the formula:  $Kgr\ capacity = \frac{\#(30 - \#) + 16}{8} \times ft^3\ resin$ , where # = salt dosage in lbs/ft<sup>3</sup>

2 The Brine In and Slow Rinse times are set on each valve timer as a single cycle time, which is the two cycle times added together.

3 For other salt dosages, adjust the Brine In and Brine Tank Fill times using this formula:  $Cycle\ time = Time\ shown \times Salt\ Dosage \div 15$ .

4 For an inlet pressure other than 35 psig, adjust the Brine In and Slow Rinse times using the graphs in Section 8.4 and this formula:  $Cycle\ time = Time\ shown \times Flow\ at\ 35\ psig \div Flow\ at\ actual\ psig$ .

5 For tank sizes that are listed with more than one possible resin amount, refer to the last letter of the model # (see above) to determine whether to use the minimum (Y), median (X), or maximum (Z) resin volume.

6 At higher salt dosages, use 440 lbs of salt instead; if more salt is loaded, the tank may overflow during the Brine Refill step.

## SECTION 2.0 INSTALLATION

### 2.1 EQUIPMENT INCLUDED

Your U.S. Filter system has been shipped to you in the following assemblies. Check to make sure that none of these appear damaged or missing. For more component details, refer to the drawings and parts lists in section 7.

**NOTE:** For skid-mounted systems ("P" Assembly in the model # on cover), refer instead to the addendum in section 8.8.

The vessel assembly consists of (see Figure 1):

- (2) vessels w/ bottom distributors installed\*
- (1) drain line flow control (DLFC)/injector kit
- (1) DLFC housing (1½" valve only)
- (1) control valve w/ cover
- (1) tank-to-valve bushing (1" valves only)\*
- (1) tubing fitting for brine inlet line
- (1) upper dispersers (installed on 1" valve and adapter)

**Figure 1: Components Common to All Softeners**



Softeners with 1" piping also have (see Figure 2):

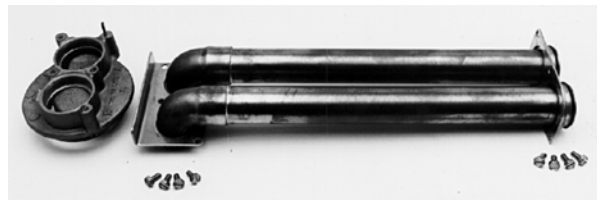
- (1) tank adapter
- (1) tank-to-adapter bushing
- (1) interconnecting piping assembly
- (1) lot of couplings & clips
- (1) lot of fasteners

**Figure 2: Components for 1" Softener**

Softeners with 1-1/2" piping also have (See Figure 3):

- (1) tank adapter
- (2) (1) interconnecting piping assembly
- (1) water meter (installed on 1" valve)\*
- (1) length of copper tubing w/ clips for inlet\*
- (1) lot of gravel (if applicable) & cation resin (see page 2)\*
- (2) Operating Manuals\*
- (1) Hardness Test Kit
- (1) 9VDC battery (units with 3200ET only)

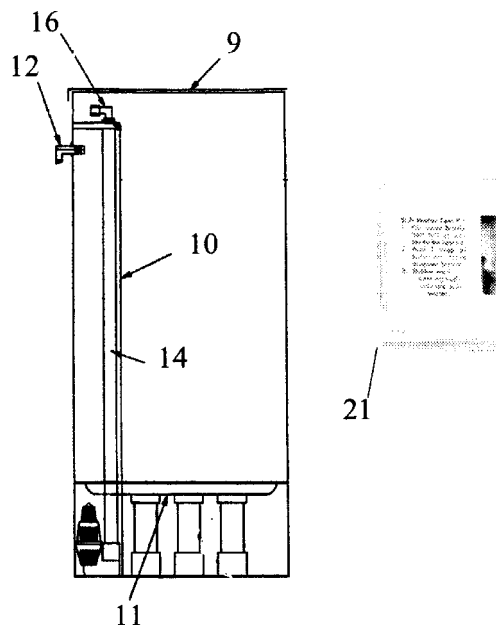
**Figure 3: 1-1/2" Softener Components**



The brine tank assembly installed consists of (see Figure 4):

- (1) brine tank with cover
- (1) well with cap
- (1) salt grid
- (1) overflow fitting
- (1) air check/safety valve (18" brine tank)\*
- (1) air check assy (24" brine tank)
- (1) 3/8" tube elbow, fittings (7-16" dia)\*
- (1) ½" bushing, elbow, fitting (18-24" dia)
- (1) length 18' tubing w/ tee (14-30" dia)\*
- (1) grommet for brine line hole in tank\*

**Figure 4: Brine Tank Components**



### 2.2 GENERAL INSTALLATION GUIDELINES

**CODES:** Be sure to comply with all applicable local, state, and federal codes.

**WATER PRESSURE:** The regeneration valve needs 30-110 psi pressure to operate effectively. For pressures outside this range, install a booster pump or regulator in the feed line.

**TEMPERATURES:** The operating temperature is 32-100°F. For temperatures outside this range, special valve assemblies and conversion kits are available.

**ELECTRICAL FACILITIES:** For most systems, an electrical supply of alternating current (A/C) is required - refer to the Specification Sheet in section 1.2. Make sure the supply is always on and cannot be turned off with another switch.

**EXISTING PLUMBING:** Condition of existing plumbing should be free from lime and iron buildup. If piping is clogged with iron, a separate iron filter unit should be installed ahead of the water softener.

**LOCATION OF SOFTENER AND DRAIN:** The softener should be located close to a drain.

**MANUAL VALVES:** Always install manual inlet, outlet, and by-pass valves on systems without skids ("X" Assembly in the model # - see cover).

**CAUTION**

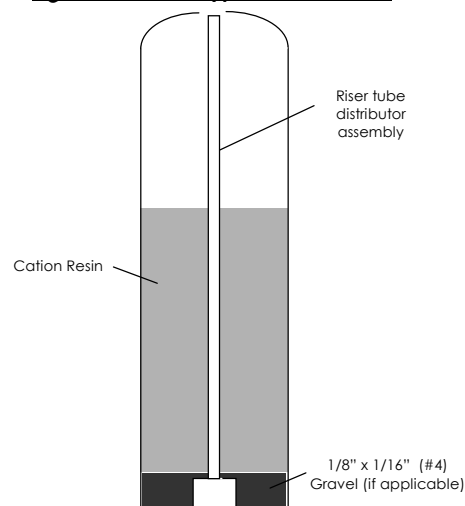
**Water pressure is not to exceed 110 p.s.i., water temperature is not to exceed 100°F, and the unit cannot be subjected to freezing conditions.**

**2.3 GRAVEL AND RESIN LOADING**

**NOTE:** For skid-mounted softeners, refer instead to the addendum in section 8.8.

1. Place the softener tanks on a firm foundation as close to the floor drain as possible, and level the vessels.
2. A riser tube distributor assembly has been shipped in each softener vessel - see Figure 5. Inspect the slotted basket (bottom distributor) to be sure it is not damaged. Also make sure that the top of the riser pipe is flush with the top of the tank flange when the basket is in the middle of the tank and flat on the bottom. Cover the top of the riser tube with tape or a plastic cap to prevent gravel and resin from getting inside the riser pipe.

**Figure 5: Media Types for Softeners**



3. Fill the tank about ¼ full with water. Center the riser tube distributor assembly in the top opening of the softener tank. Pour the proper quantity of 1/8" x 1/16" (#4) gravel (see Table 1 on page 2) into the softener tank - make or buy a large funnel to prevent the gravel from spilling.

**NOTE:** Gravel is not used in vessels with 7", 9", 10", and 12" diameters.

4. Level the gravel as best as possible, making sure that all of the strainer slots are covered.
5. Using the same funnel, pour the quantity of resin (see Table 1 on page 2) into the softener tank. Fill the tank with water and soak the resin for at least 2 hours.

**CAUTION**

**Before installing the valve, remove the tape or cap from the top of the riser tube.**

**2.4 VALVE AND PIPING INSTALLATION**

**NOTE:** For skid-mounted softeners, refer instead to the addendum in section 8.8.

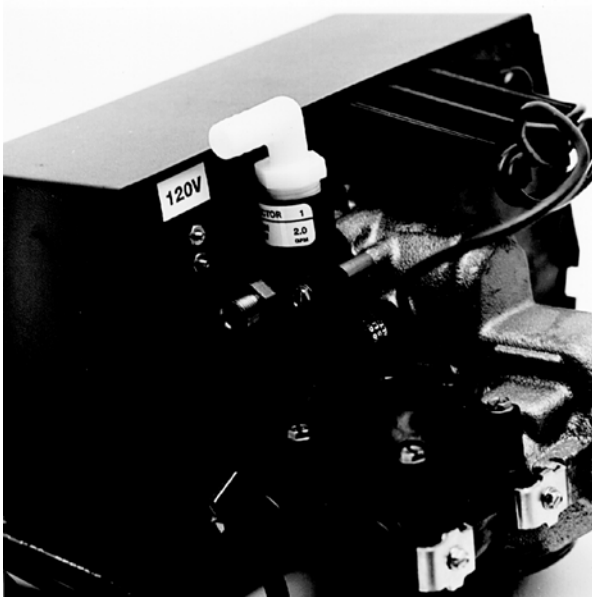
Refer to Table 1 on page 2 for injector and Drain Line Flow Control (DLFC) sizes.

1. (Units with 1' piping and 7-12" diameter vessels) The control valve has been configured for use with a 9" or 10" diameter tank. If a smaller or larger tank

is used instead, reconfigure the control valve using the following procedures.

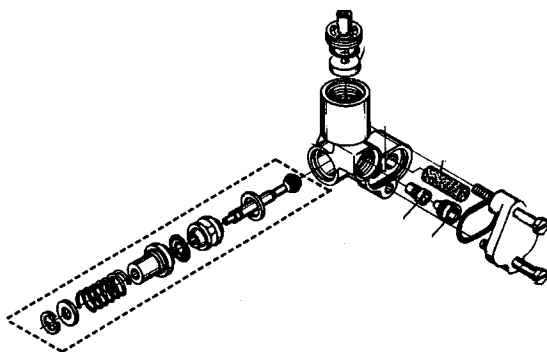
- A. On the Injector Assembly (see Figure 6), remove the two mounting bolts and lift off the cover and gasket.

***Figure 6: Injector Location on 1" Valve***



- B. Using a standard screwdriver, unscrew the installed white #1 injector nozzle (see Figure 7) from the injector body.

***Figure 7: Injector Components for 1" Valve***



- C. Using a standard screwdriver, unscrew the installed white #1 injector throat from the injector body.
- D. Install instead the required red or blue injector nozzle and throat, -

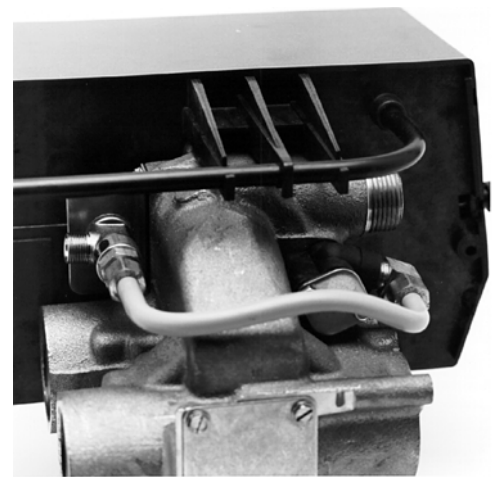
these are included in the supplied kit (see Figure 1). Screw them into the injector body until snug, but do not overtighten.

- E. Reinstall the injector gasket, cover, and bolts.

- 2. (Units with 1½" piping and 12-16" diameter tanks) The control valve has been configured for use with a 14" or 16" diameter tank. If a 12" diameter tank is used instead, reconfigure the control valve using the following procedures.

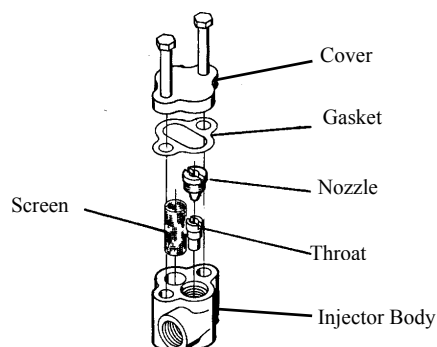
- A. On the #1600 Injector Assembly (see Figure 8), remove the two mounting bolts and lift off the cover and gasket.

***Figure 8: 1600 Injector Location on 1-1/2" Valve***



- B. Using a standard screwdriver, unscrew the installed yellow #3 injector nozzle and throat (see Figure 9) from the injector body.

**Figure 9: 1600 Injector Components**



C. Install instead the required blue #2 injector nozzle and throat, which are included in the supplied kit (see Figure 1)- be sure to seat them tightly.

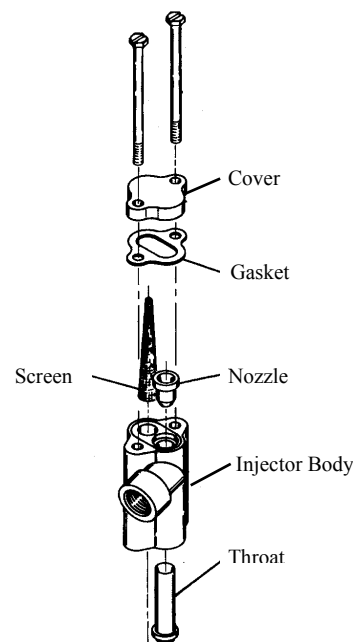
D. Reinstall the injector cover gasket, injector cover, and bolts.

3. (Units with 18-24" diameter tanks) The control valve has been configured for use with a 21" diameter tank. If a 18" or 24" diameter tank is used instead, reconfigure the valve using the following procedures.

A. On the #1700 Injector Assembly (see Figure 8), remove the two mounting bolts and pull off the injector cover and its gasket.

B. Using a standard screwdriver, unscrew the installed green #4C injector nozzle and throat (see Figure 10) from the injector body.

**Figure 10: 1700 Injector Components**

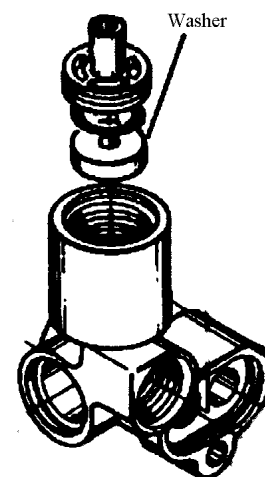


C. Install instead the required injector nozzle and throat - these are included in the supplied sizing kit (see Figure 1). Screw them into the injector body until snug, but do not overtighten.

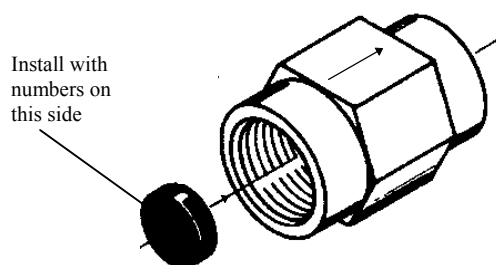
D. Reinstall the injector gasket, injector cover, and bolts.

4. Note the required Backwash/Rapid Rinse DLFC flow in Table 1, page 2, and install the proper DLFC flow washer (see Figure 11 or 12) into the DLFC housing.

**Figure 11 DLC Washer Installation for 1" Valve**



**Figure 12: DLFC Washer Installation for 1-1/2" Valve**



On 1" valves, this housing is the uppermost part of the valve - unscrew the retainer piece that is threaded into the housing, place the washer in the housing, and screw the retainer on top of the washer to hold it in place.

On 1½" valves, the DLFC housing is shipped loose with the control valve (see Figure 1).

The washers are included in the supplied kit (Figure 1, item TBD), each marked with its flow rate. Make sure the number on the washer is facing in the opposite direction of the arrow that is on the housing.

5. (1½" valves only) Using Figure 15, thread the DLFC housing onto the valve's drain connection. This is the smaller connection on the left side of the valve, as observed from the front (where the timer is mounted). Make sure that the arrow on the housing is pointing away from the valve.

**NOTE:** Teflon tape is the only sealant to be used on any threaded fittings.

6. Use a silicone base grease to lubricate the two (2) O-rings at the base of the control valve. Also lubricate the two (2) O-rings at the base of the tank #2 adapter.
7. (Units with 1-1/2" valves only) Install the supplied upper disperser to the bottom of each valve by pushing the large end of the disperser into the groove on the bottom of the valve until the disperser locks in place.
8. Carefully thread the control valve and the adapter clockwise into the center

opening in the top of each tank. On 1" valves, first install the supplied tank-to-valve bushing. Make sure that the riser pipe goes into the center opening in the base of the valve or adapter. Hand tighten only - do not use a wrench or any device to apply additional torque or leverage.

**NOTE:** Teflon tape is the only sealant to be used on any threaded fittings.

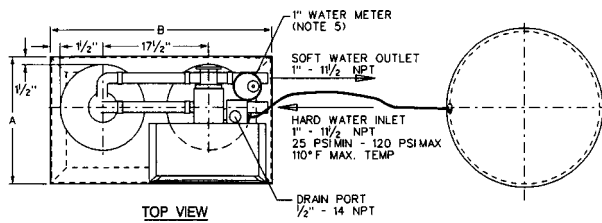
9. Connect the control valve (on tank #1) to the adapter (on tank #2). For 1" valves, lubricate the four (4) o-ring couplings (Figure 1), insert them into both ends of the interconnecting piping yoke, and use the four (4) clips to attach the yoke to the valve and adapter. For 1½" valves, lubricate the four (4) o-rings on the ends of the interconnecting piping yoke, plug the yoke into the valve and adapter, and secure with the eight (8) fasteners.

**NOTE:** The two tanks must be positioned to relieve any strain on the yokes or piping.

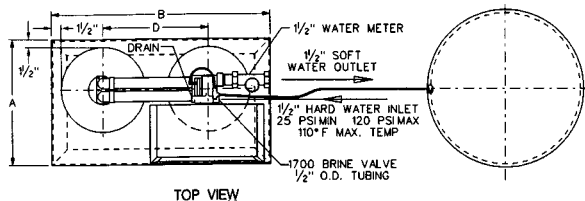
10. Locate the brine tank near the mineral tanks. The brine tank location should be such that it will not interfere with access to the mineral tank control valve or filling the brine tank with salt. The tank must be placed on a smooth firm foundation and leveled.
11. Install the piping using the following procedures and Figures 13 and 14. For greater detail, refer to the applicable installation drawing in section 8.6. Comply with all local, state, and federal plumbing codes.



**Figure 13: Inlet/Outlet Connectors - 1" Valve**



**Figure 14: Inlet/Outlet Connectors - 1-1/2" Valves**



- A. Install the water meter using the applicable installation drawing and the meter drawing in section 7.3. On units with ¾" meters, clip one side of the meter to the valve's inlet and outlet connections and the other side to the supplied 1" FNPT threaded pipe yoke, making sure that the arrows on the meter point toward the valve inlet.

On units with 1" meters, clip the side of the meter with the o-rings and couplings to the valve's inlet and outlet connections. On units with 1½" meters, thread the male end of the meter into the valve's outlet.

**NOTE:** Make sure the meter is installed with its dome on top (face up).

- B. Connect the inlet and outlet piping to the valve and/or meter (see Figure 11 or 12); include unions for easy servicing.

**NOTE:** Teflon tape is the only sealant to be used on any threaded fittings.

**CAUTION**

**Solder joints at the drain must be done prior to connecting the drain line to the valve. Failure to do this**

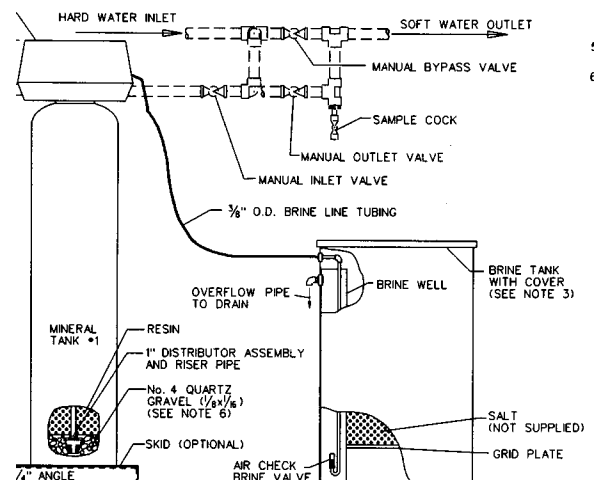
**could cause interior damage to the drain line flow control (DLFC) washer.**

- C. Connect the open port of the DLFC housing (the larger connection on the side of the valve) to an open floor drain (see Figure 11 or 12).

There must be a 4" air gap between the drain pipe and the floor drain. Teflon tape is the only sealant to be used on the drain fitting. Do not reduce the pipe or tube size of the drain port connection. Make as short a run of drain piping as possible. If it is necessary to run the drain line overhead, consult the factory for proper recommendations.

- D. Loosely thread the supplied tubing fitting for the brine inlet line (Figure 1) onto the valve's brine inlet connection. On 1" valves, the brine inlet is on the brine line flow control (BLFC) (see Figure 13). On 1½" valves, the brine inlet is on the brine valve assembly (see Figure 14).
- E. Run the brine tubing between the air check valve on the brine tank to the control valve's brine inlet connection (see Figure 13). Cut any excess tubing.

**Figure 13. Brine Tubing Connection**



**NOTE:** The dotted portions on the drawings indicate piping and components by

- others. The shaded portions are also supplied by others except on models with "P" Assemblies (see page 2).
- F. U.S. Filter recommends that drain tubing be installed connecting the overflow elbow on the side of the brine tank to an open floor drain. Do not run this line overhead; it must be to a gravity drain. Do not make a direct connection to the floor drain.
12. Place approximately 12" of water in the brine tank. Do not add salt at this time.
  13. Open the bypass valve, close the inlet and outlet valves, and slowly turn on the main water supply. Open a cold soft water tap nearby and let it run a few minutes or until the system is free from foreign material that may have resulted from the installation. Once clean, close the water tap and bypass valve, and open the inlet valve (leave outlet shut).
  14. Plug the loose end of the meter cable into the meter cap assembly (the other end is attached to the control drive).
  15. Plug the control unit into an outlet that can deliver the proper type of electrical power (see section 1.2).
  16. Program Level #2 on the 3200ET timer using the following procedure. Where needed, refer to the 3200ET Timer Service Manual (supplied separately).
    - A. Push and hold the PROGRAM button until the display changes (approx. 5 seconds). The above the Program Display Indicator will turn on.
    - B. Push and hold the EXTRA CYCLE button until the display changes again (approx. 5 seconds).
    - C. Push and release the PROGRAM button until an "A" appears on the left side of the display. This is the Regeneration Day Override option, which sets the timer to regenerate after the preset number of days even if the volume setpoint has not been exceeded. Use the and buttons until the right side of the display shows the desired number of days or OFF (to disable the option).
    - D. Push and release the PROGRAM button once to go to the Volume Override option, which sets the timer to regenerate when the entered number of gallons has been exceeded (the timer will NOT calculate the volume using the water hardness and resin capacity). Use the and buttons until the right side of the display shows the desired number of gallons or OFF (to disable the option).
    - E. Push and release the PROGRAM button until an "o" appears on the left side of the display. This is the Valve Type setting, which tells the timer which type of valve it is controlling. Use the and buttons until the right side of the display shows "4" (for valves 9000 and 9500).
    - F. Push and release the PROGRAM button once to go to the Regeneration Type setting, which tells the timer how a regeneration should be initiated. Use the and buttons until the right side of the display a "2" (for Meter Immediate Regeneration). With this regen type, the Service softener regenerates immediately when its volume setpoint is reached, and the Standby softener goes into Service.
    - G. Push and release the PROGRAM button once to go to the Flow Meter Size setting, which tells the timer what size meter is being used. Use the and buttons until the right side of the display shows a "1" (for 7-12" diameter units with 1" piping), a "2" (for 14-16" diameter units with 1" piping), or a "3" (for units with 1½" piping). To find the vessel and pipe sizes for your system, refer to the Specification Sheet on page 2.
    - H. Push and release the PROGRAM button until a "9" appears on the left side of the display. This is the System Type setting, which tells the timer

which type of system the controller has been wired for. Use the and buttons until the right side of the display shows a "4" .

- I. Push and release the PROGRAM button once to go to Program Protection, which can be used to disable changes to the 3200ET program. Use the and buttons until the right side of the display shows "OFF" (to cancel protection) or "ON" (to turn on protection).

**NOTE:** *Do NOT select to put Program Protection ON unless absolutely certain none of the programmed settings will ever need changing. The only way to access the settings again is to hold the PROGRAM button in for 25 seconds, which will then return all of your settings to the default values - you will then have to redo all of the programming.*

- J. Push and release the PROGRAM button one more time to exit the programming mode (the above the Program Display Indicator turns off). This completes the Level #2 programming on the 3200ET timer.
17. Program Level #1 on the 3200ET timer using the following procedure. Where needed, refer to the 3200ET Timer Service Manual (supplied separately).
    - A. Push and hold the PROGRAM button until the display changes (approx. 5 seconds). The above the Program Display Indicator will turn on.
    - B. The first setting on the display should be for the water hardness (in grains/gallon), unless the Volume Override option was not turned off (see previous page). Use the and buttons until the right side of the display shows the proper inlet water hardness.
    - C. Push and release the PROGRAM button once to go to the System Capacity setting. Use the and buttons until the right side of the display shows the resin capacity of

your system, in grains. To find the capacity for your system, refer to Table 1 on page 2.

- D. Push and release the PROGRAM button once to go to the Backwash step time setting. (The Regeneration Time setting will be skipped because the timer has been set up for Immediate Regeneration - see previous page). Use the and buttons until the right side of the display shows "100" (for 10.0 mins).
  - E. Push and release the PROGRAM button once to go to the Brine Draw / Slow Rinse step time setting. Use the and buttons until the right side of the display shows the combined Brine In and Slow Rinse times from Table 1 on page 2, multiplied by 10. For instance, if the two step times combined are 52.0 minutes, enter 520 into the timer.
  - F. Push and release the PROGRAM button once to go to the Rapid Rinse step time setting. Use the and buttons until the right side of the display shows "100" (for 10.0 minutes).
  - G. Push and release the PROGRAM button once to go to the Brine Tank Refill step time setting. Use the and buttons until the right side of the display shows the Brine Tank Fill time from Table 1 on page 2, multiplied by 10. For instance, if the step time is 12.0 minutes, enter 120 into the timer.
  - H. Push and release the PROGRAM button once to return the display to normal (the above the Program Display Indicator turns off). This completes the programming on the 3200ET timer.
18. Proceed with the Startup instructions given in the next section, 3.0.

## SECTION 3.0 STARTUP AND OPERATION

### 3.1 REGENERATION SETUP

Before placing your softener in Service, use these steps to make sure the regeneration cycle and step times function properly.

1. Initiate a regeneration manually, as described under 3.3, Operation - the tank in Service will go into Backwash, and the tank in Standby will go into Service.
2. Let water flow out the drain line until all of the air has been purged from the vessel in Backwash, typically 2-3 minutes.
3. Manually advance to the next step - Brine/Rinse - as described under 3.3, Operation. Check the Brine Tank to see if the level of water in the Brine Tank is dropping and that water is flowing slowly out the drain line.
4. Manually advance to the next step - Rapid Rinse. Check the drain line to ensure water is flowing swiftly.
5. Manually advance to the next step - Brine Tank Fill. Leave the control in this position until the level of water in the brine tank is approximately 12".
6. Manually advance the softener into Standby. Briefly open the product valve and make sure the meter is functioning. On units with N controls, make sure the small gear at the top of the Capacity Wheel is rotating. On units with O controls (the 3200ET timer), press the TOTALIZER/FLOW RATE button once to display the flow.
7. Initiate a regeneration of the other softener tank, and repeat the above procedures on that unit.
8. Fill the brine tank with salt to about 6" from the top. Use rock salt or pellets that contain less than 0.6% calcium and magnesium, less than 1.5% sulfate salts, less than 2.0% water-insoluble impurities, and no grease, fat, or oil.

9. The regeneration cycle program on this water softener has been factory set. However, portions of the cycle or program may be lengthened or shortened in time to suit local conditions. **To check the step times on models with N controls**, perform the following procedures.

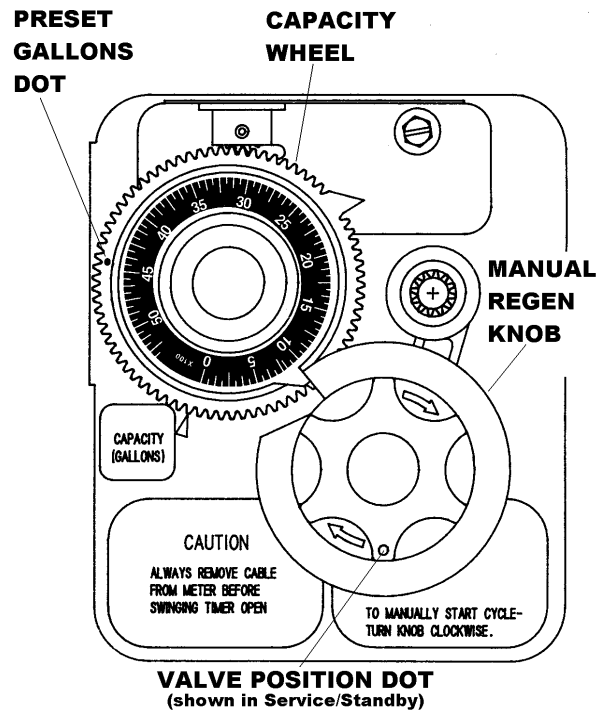
**NOTE:** *The procedures for checking or changing step times on models with the 3200ET timer are described in a separate 3200ET manual.*

- A. Remove the cover on the valve's timer by loosening the cover screw.
- B. Remove the meter cable from the meter dome.
- C. Grasp the front of the timer at its lower right corner, and swing the timer outward to expose the Program Wheel on the rear of the timer backplate (see Rear View on the next page).
- D. Look at the small holes on the outer edge of the Program Wheel, some with metal pins sticking out of them (shown as black dots in the figure on the next page) but most empty. Each hole (or pin) represents one or two minutes of a regeneration step - one minute for units with the 1/15<sup>th</sup> RPM motor, and two minutes for units with the 1/30<sup>th</sup> RPM motor (see section 1.2). For example, the five pins between the 0 and the 10 on the timer dial set the time of the first regeneration step, Backwash, to 10 minutes (at 1/30<sup>th</sup> RPM motor speed).

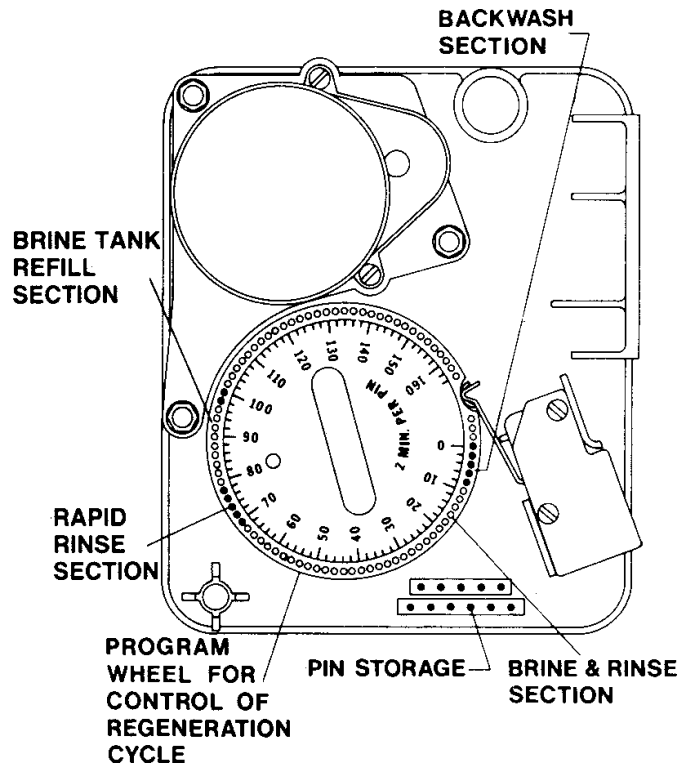
As indicated in the figures on the next page, the first group of pins (starting at 0 on the dial) sets the time for the Backwash step. The group of holes following the Backwash pins sets the total time for the Brine Draw and Slow Rinse steps. The second group of pins sets the time for the Rapid Rinse step.

***N (Electromechanical) Controls***

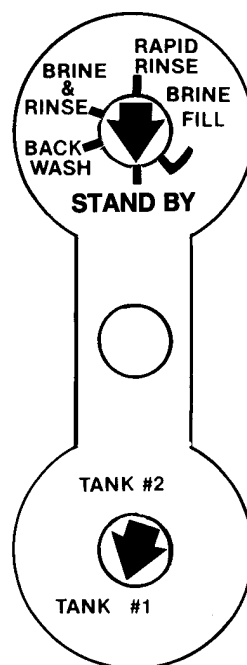
*Front View of Timer*



*Rear View of Timer*



*Valve Position Indicator on Right Side of Controller*



The group of holes following the Rinse pins sets the time for the last regeneration step, Brine Tank Refill. The last two pins determine the end of the Refill step and place the softener into Standby.

The Brine Draw step by itself will last until all of the brine has been drawn from the tank. This will depend on how long the Brine Tank Refill was during the previous regeneration. The Slow Rinse step will then use the rest of the Brine Draw/Slow Rinse time set on the Program Wheel.

As mentioned, the Brine Tank Refill step determines how much brine will be used during the next regeneration by controlling how much water goes into the brine tank during the present regeneration.

- E. The times set on the Program Wheel should match the times given for your softener on the table in section 1.2, assuming that the inlet pressure is 35 psig and the desired salt dosage is 15 lbs/ft<sup>3</sup>. If the pressure or salt dosage is different, refer to the footnotes beneath the table to calculate the needed step times.
- F. If no times need changing, swing the timer back into position, reconnect the meter cable, and replace the cover.

9. **To change a step time on models with N controls**, perform these procedures.

- A. Check the step times as described in the above procedure.
- B. Remove the Program Wheel from the rear of the backplate. To do this, locate the two plastic clips sticking out of the center of the wheel, then pinch them together with one hand and use the other hand to lift the wheel up and away from the shaft.
- C. Use a needle-nosed pliers to add or subtract pins on the program wheel dial until the times for all steps are

proper. Extra pins should be placed in the Pin Storage holes below the wheel.

- D. Once the new times have been set, swing the timer back into position, reconnect the meter cable, and replace the cover.

**3.2 SERVICE TIME/VOLUME ADJUSTMENT**

Use the following procedure to set the gallons between regenerations on the N controls Capacity Wheel.

**NOTE:** *The procedures for setting Service time or volume on the models with the 3200ET timers are given in a separate 3200ET manual.*

- 1. Calculate the gallons of water the softener can treat between regenerations using this formula:

$$\text{Gals} = \frac{\text{Resin capacity, gr/ft}^3}{\text{Water hardness, gr/gal}} \times \text{ft}^3 \text{ resin}$$

The media within the softener that removes the hardness is called the "resin". The capacity of the resin is shown below for different salt settings. For the SALT SETTING PER REGENERATION, WATER TEST hardness, and CUBIC FEET of resin, refer to the Specification Sheet in section 1.2.

Salt Setting at	Capacity/Regen
15 lb. /ft <sup>3</sup>	30,000 grains /ft <sup>3</sup>
12 lb. /ft <sup>3</sup>	28,400 grains /ft <sup>3</sup>
10 lb. /ft <sup>3</sup>	27,000 grains /ft <sup>3</sup>
9 lb. /ft <sup>3</sup>	25,600 grains /ft <sup>3</sup>

*For instance:* If the Specification Sheet in section 1.2 shows a SALT SETTING PER REGENERATION of 15 lb. per cubic foot, the Capacity per Regeneration (from the table above) will be 30,000 grains per cubic foot. If the Specification Sheet also shows a WATER TEST hardness of 18.75 grains/gallon and 1.0 CUBIC FEET of resin, the gallons of water that can be treated will be:

$$\text{Gals} = \frac{30,000 \text{ gr/ft}^3 \times 3 \text{ ft}^3 \text{ resin}}{18.75 \text{ gr/gal}} = \mathbf{4,800}$$

- Since the control valve uses soft water from the tank in service to regenerate with, calculate the gallons of soft water needed for a single regeneration.

For each step, multiply the step time (in minutes) by the step flow rate (in gallons/minute) to get the step volume (in gallons). Then, add all of the step volumes together to find the total regeneration volume.

**NOTE:** *The Backwash and Rapid Rinse flows are set with the Drain Line Flow Control (DLFC), and the Refill flow is set with the Brine Line Flow Control (BLFC) - for these rates, refer to the spec sheet in section 1.2. For the Brine/Rinse flow, note the injector size on the spec sheet, then look up the slow rinse flow for that injector on the graph in section 8.4*

*For instance:* if the DLFC rate is 5.0 gpm, the BLFC rate is 1.0 gpm, the slow rinse flow is 0.89 gpm, the Backwash time is 10 minutes, the Brine/Rinse time is 70 minutes, the Rapid Rinse time is 10 minutes, and the Fill time is 16 minutes:

- Backwash volume =  $10 \times 5.0 = 50$  gal
- Brine/Rinse volume =  $70 \times .89 = 62$  gal
- Rapid Rinse volume =  $10 \times 5 = 50$  gal
- Fill volume =  $16 \times 1.0 = 16$  gal
- Total volume =  $50+62+50+16=$  **178 gal**

- In addition to the soft water used for regeneration, soft water is also being produced *after* the service volume reaches 0 but before the unit begins its regeneration sequence. This delay is 9 minutes for softeners with 1/15<sup>th</sup> RPM motors and 18 minutes for softeners with 1/30<sup>th</sup> RPM motors. This delay time must be multiplied by the average service flow to calculate the volume of water used.

*For instance:* if the average service rate is 10 gpm, and the softener uses a 1/30<sup>th</sup> RPM motor with an 18 minute delay, the

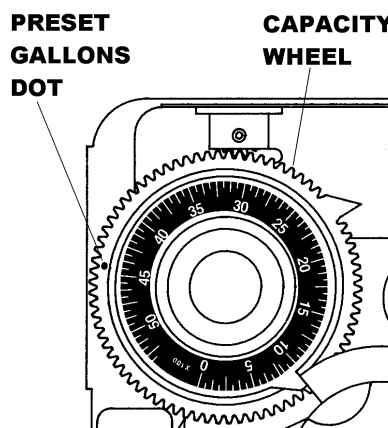
delay volume will be  $10 \times 18$ , or **180 gallons**.

- Subtract the regeneration volume (calculated in step 2) and the delay volume (calculated in step 3) from the Service volume (calculated in step 1) to get the setting for the Capacity Wheel.

*For instance:* if the calculated Service volume is 4,800 gallons, the calculated regeneration volume is 178 gallons, and the calculated delay volume is 180 gallons, the volume setting will be  $4,800 - 178 - 180$ , or **4,442 gallons**.

- Set this volume on the Capacity Wheel. To do this, lift and turn the wheel's inner dial (with the gallons label) until the gallonage calculated in step 3 is lined up with the white dot on the outer edge of the wheel - see the figure below.

**Capacity Wheel Set at 4,442 Gallons**



### 3.3 OPERATION

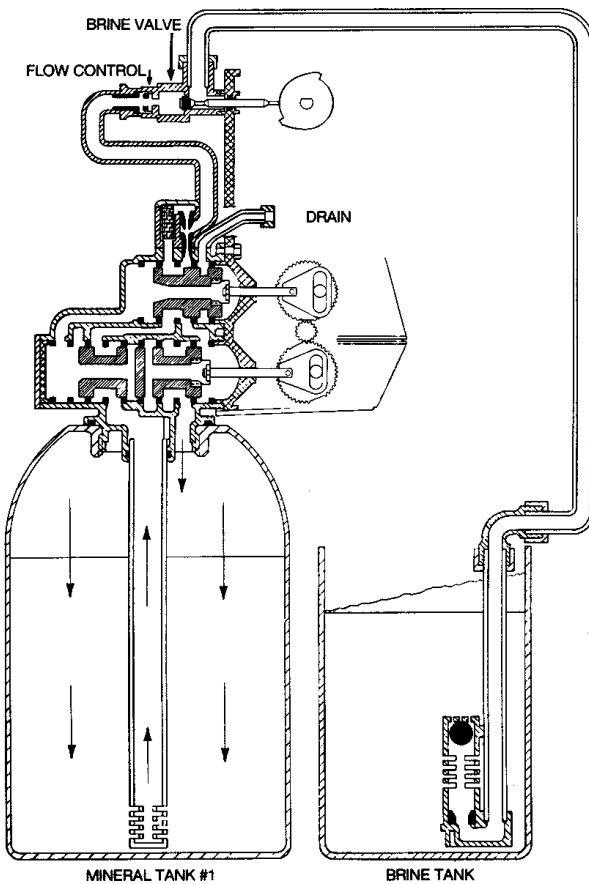
Your U.S. Filter twin-tank softener is now in operation, with one tank in Service and the other in Standby. Simply open any valves on the product line to begin using softened water.

The softener sequence contains six (6) steps: Service, Standby, and four regeneration steps - Backwash, Brine/Slow Rinse, Rapid Rinse, and Brine Tank Fill. These steps are described in this subsection, along with any procedures that may need to be performed during the steps.

### 1. Service

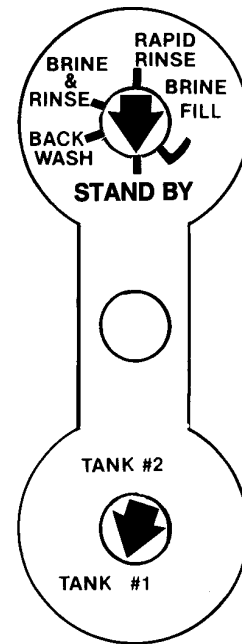
During the Service step, hard water enters the unit at the valve inlet, flows around the lower piston, and down through the mineral in the first tank. Conditioned water enters the center tube through the bottom distributor, flows up through the center tube, around the lower piston, through the meter, and out the valve outlet. The second mineral tank is regenerated and on standby.

**Service Flow Pattern**



The valve position indicator on the right side of the controller should indicate which tank is in Service and that the other tank is in Standby - see the figure below.

**Valve Position Indicator for Service/Standby Mode**  
**(Tank #1 in Service, Tank #2 in Standby)**



### **Service Mode - Models with N Controls**

As softened water flows past the meter, the impeller within the meter spins, turning a cable connecting the meter to the Program Wheel, which in turn rotates counter-clockwise. The reading on the wheel directly across from the Capacity (Gallons) arrow indicates the gallons that can still be treated before a regeneration is required. Once this indicator shows "0" gallons left, the lever attached to the hub of the wheel pushes up on the lever attached to the Manual Regeneration Knob. This begins the Regeneration timer.



The Manual Regeneration Knob on the front of the timer is attached directly to the Program Wheel on the rear of the timer. These wheels will begin to rotate clockwise very slowly (as viewed from the front) and will continue rotating for its full cycle (165-minutes for units with a 1/30<sup>th</sup> RPM motor, 82 minutes for units with a 1/15<sup>th</sup> RPM motor), signaling the starting and stopping points for each regeneration step.

After a time delay (9 minutes on units with 1/15<sup>th</sup> RPM motors, and 18 minutes on units with 1/15<sup>th</sup> RPM motors), the timer will have rotated enough for the outer microswitch arm to contact the first set of pins on the Program Wheel. This puts the the tank in Standby into its Service step and the other tank into its Backwash step.

To initiate a manual regeneration, slowly rotate the Manual Regeneration Knob clockwise until the control valve begins to rotate automatically.

### CAUTION

**Never rotate the Manual Regeneration Knob until both control valve pistons have stopped rotating - the timer may no longer be synchronized with the control valve.**

If the timer and valve are no longer synchronized, turn off power to the timer and rotate the Manual Regeneration Knob clockwise until the arm of the outer microswitch on the rear of the timer is in the proper step on the Program Wheel (refer to the timer's rear view on page 9). Turn the power back on and resume the regeneration.

### Service Mode - Models with the 3200ET

The arrows beneath the Service and Time labels on the control panel should be on, and the panel display should show the present Time Of Day (see the figure at the beginning of this section). Every 5 seconds, the display will alternate between Time Of Day (with the

Time arrow on) and volume (with the Volume Remaining arrow on - see figure below). As water flows through the system, the arrow beneath the Meter label flashes at a rate proportional to the flow, and the Volume Remaining Display counts down from its preset value to 0.

To display the flow rate, press the TOTALIZER/ FLOW RATE button - the arrow above the Flow Rate label will turn on. To display the volume that has been treated since the display was last reset, press the button a second time - the arrow below the Totalizer label will turn on. To reset the volume, press the button and hold until the totalizer arrow stops flashing (approx. 25 seconds).

### Volume Remaining Display Showing 525 Gallons



The controller calculates the total volume (between regenerations) using the preset Water Hardness and System Capacity. A regeneration will begin immediately once the Volume Remaining drops to 0.

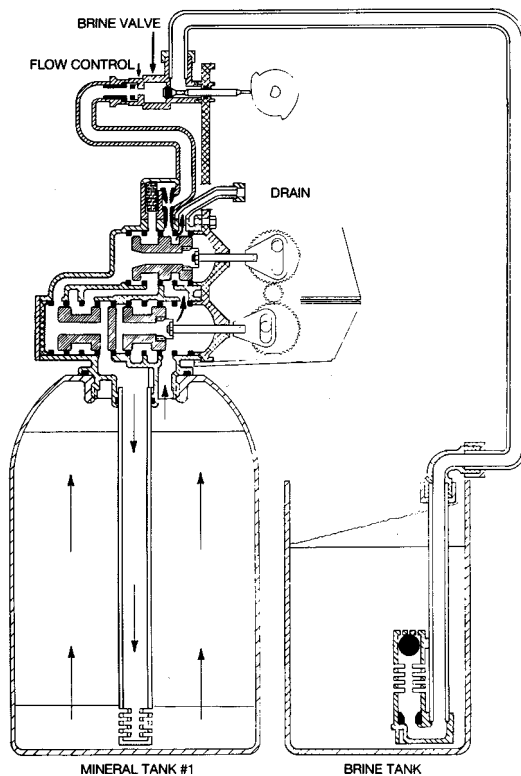
**NOTE:** For other operating options, refer to the separate 3200ET manual.

To initiate a manual regeneration immediately, press and hold in the Extra Cycle Button for 5 seconds. The Service arrow will turn off, the Regen arrow will turn on, and a regeneration will begin.

## 2. Backwash

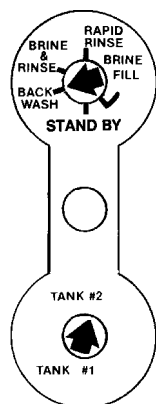
Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, through the center of the lower piston, down the center tube, up through the mineral, around the upper piston, and out the drain line.

**Backwash Flow Pattern**



The valve position indicator on the right side of the controller shows one tank in Service and the other tank in Backwash - see the figure below.

**Valve Position Indicator for Backwash Step  
 (Tank #2 in Service, Tank #1 in Backwash)**



**Backwash - Models with N Controls**

The group of pins starting at zero on the Program Wheel (on the rear of the timer) determines the length of time the

control will backwash, in 1- or 2-minute intervals (depending on motor speed - refer to the note on the Program Wheel). For example: If there are five pins in this section, and the note on the Program Wheel is "2 MIN. PER PIN", the step time will be 10 minutes. To change this time, add or remove pins as required at the end highest on the dial (see section 3.1).

The Capacity Wheel is rotated so that its preset volume (next to the white dot on the outer gear) is across from the Gals. Capacity arrow.

When the Program Wheel has rotated past the pins, the control valve advances to the next step, Brine/Rinse.

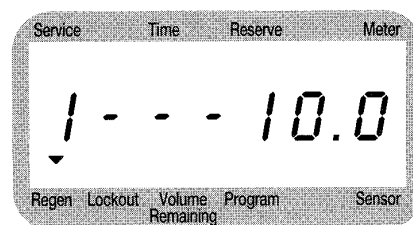
To advance the control valve manually, slowly rotate the Manual Regeneration Knob clockwise until the control valve begins to rotate. The Program Wheel will click once for each pin it is advanced past.

**Backwash - Models with the 3200ET**

The Regen arrow on the control panel should be on. As the valve rotates to the Backwash position, a "1" (for step #1) flashes on the left side of the panel display.

When the valve stops cycling, the step number will stay on solid, the step time will appear in the right side of the display, and the Backwash LED will turn on (see figure below). The display will then alternate between the two tanks, showing the status of the Regeneration tank (in Backwash) for 10 seconds, and the status of the Service tank (Volume Remaining) for 5 seconds.

**Panel Display During Backwash**



The step time will count down from the programmed preset to 0. To change the time remaining at any point during the step, use the Up/Down Set Buttons. (This will not change the programmed preset.)

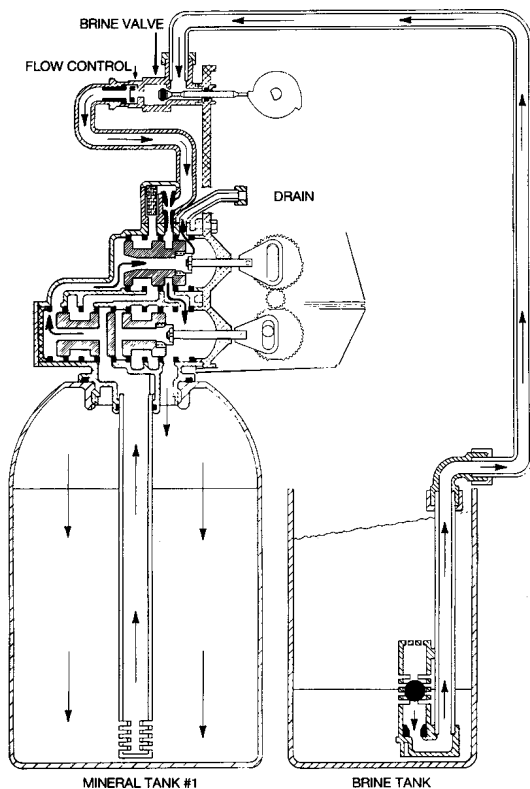
When the step time expires, the system advances into its next step, Brine/Rinse.

To advance the unit manually, press the Extra Cycle Button.

### 3. Brine/Slow Rinse

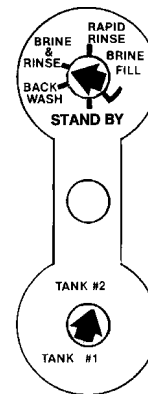
Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, into the injector housing, and down through the nozzle and throat to draw brine from the brine tank. Brine flows around the upper piston, down through the mineral, into the center tube through the bottom distributor, up the center tube, through the center of the lower piston, through the center of the upper piston, and out through the drain line.

**Brine Flow Pattern**



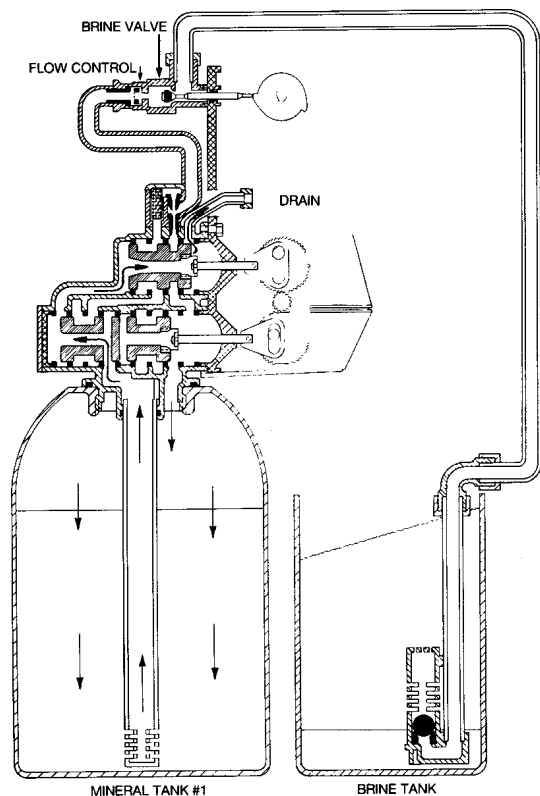
The valve position indicator on the right side of the controller shows one tank in Service and the other tank in Backwash - see the figure below.

**Valve Position Indicator for Brine/Rinse Step  
 (Tank #2 in Service, Tank #1 in Brine Rinse)**



When the brine level drops below the air check valve in the bottom of the brine tank, the unit enters the Slow Rinse portion of the step: brine flow is stopped but the water flow continues, displacing the brine slowly through the resin bed.

**Slow Rinse Flow Pattern**



### Brine/Rinse - Models with N Controls

The group of holes following the Backwash pins on the Program Wheel determines the length of the total step time, in 1- or 2-minute intervals (refer to the note on the Program Wheel). For example: If there are 30 holes in this section, and the note on the Program Wheel is "2 MIN. PER PIN", the step time will be 60 minutes. To shorten or extend this time, move the next group of pins - for Rapid Rinse (see section 3.1).

When the Program Wheel has rotated past the holes, the control valve advances to the next step, Rapid Rinse.

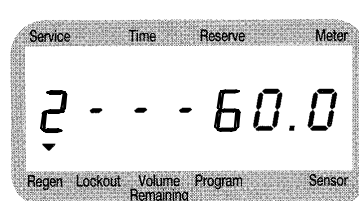
To advance the control valve manually, slowly rotate the Manual Regeneration Knob clockwise until the control valve begins to rotate. The Program Wheel will click once for each pin it is advanced past.

### Brine/Rinse - Models with the 3200ET

The Regen arrow on the control panel should be on. As the valve rotates to the Brine/Rinse position, a "2" (for step #2) flashes on the left side of the panel display.

When the valve stops cycling, the step number will stay on solid, the step time will appear in the right side of the display, and the Brine/Rinse LED will turn on (see the figure at the top of the next column). The display will then alternate between the two tanks, showing the status of the Regeneration tank (in Brine/Rinse) for 10 seconds, and the status of the Service tank (Volume Remaining) for 5 seconds.

### Panel Display During Brine/Slow Rinse



The step time will count down from the programmed preset to 0. To change the time remaining at any point during the step, use the Up/Down Set Buttons. (This will not change the programmed preset.)

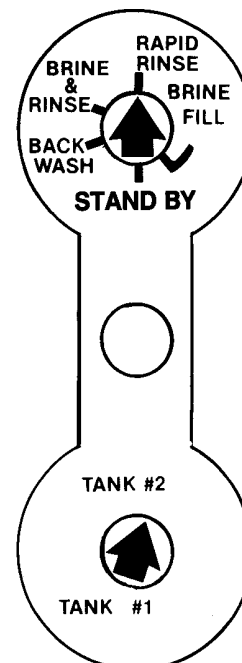
When the step time expires, the system advances into its next step, Rapid Rinse.

To advance the unit manually, press the Extra Cycle Button.

### 4. Rapid Rinse

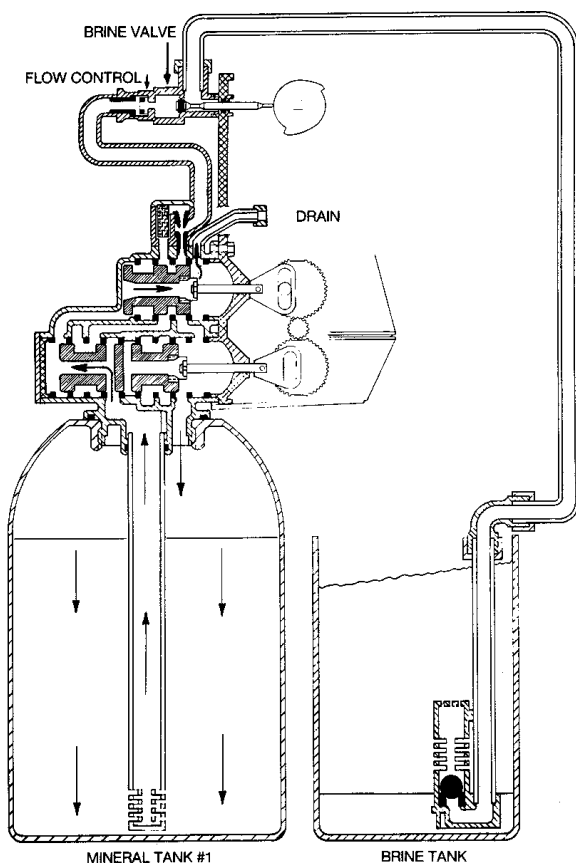
The valve position indicator on the right side of the controller shows the tank in Service and that the other tank in Rapid Rinse - see the figure below.

**Valve Position Indicator for Rapid Rinse Step**  
 (Tank #2 in Service, Tank #1 in Rapid Rinse,)



Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, and down through the mineral in the first tank. Rinse water from the mineral bed enters the center tube through the bottom distributor, flows up the center tube, through the center of the lower piston, through the center of the upper piston, and out through the drain line.

**Rapid Rinse Flow Pattern**



**Rapid Rinse - Models with N Controls**

The group of pins following the Brine/Rinse holes on the Program Wheel determines the length of the step time, in 1- or 2-minute intervals (refer to the note on the Program Wheel). For example: If there are 6 pins in this section, and the note on the Program Wheel is "2 MIN. PER PIN", the step time will be 12 minutes. To change this time, add or remove pins as required at the end farthest from the Brine/Rinse holes (see section 3.1).

When the Program Wheel has rotated past the pins, the control valve advances to the next step, Brine Tank Fill.

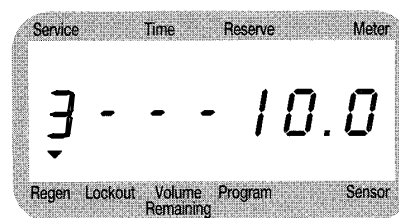
To advance the control valve manually, slowly rotate the Manual Regeneration Knob clockwise until the control valve begins to rotate. The Program Wheel will click once for each pin it is advanced past.

**Rapid Rinse - Models with the 3200ET**

The Regen arrow on the control panel should be on. As the valve rotates to the Rapid Rinse position, a "3" (for step #3) flashes on the left side of the panel display.

When the valve stops cycling, the step number will stay on solid, the step time will appear in the right side of the display, and the Rapid Rinse LED will turn on (see figure below). The display will then alternate between the two tanks, showing the status of the Regeneration tank (in Rapid Rinse) for 10 seconds, and the status of the Service tank (Volume Remaining) for 5 seconds.

**Panel Display During Rapid Rinse**



The step time will count down from the programmed preset to 0. To change the time remaining at any point during the step, use the Up/Down Set Buttons. (This will not change the programmed preset.)

When the step time expires, the system advances into its next step.

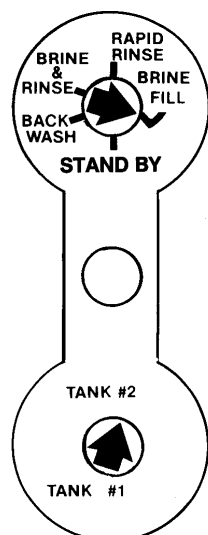
To advance the unit manually, press the Extra Cycle Button.

## 5. Brine Tank Fill

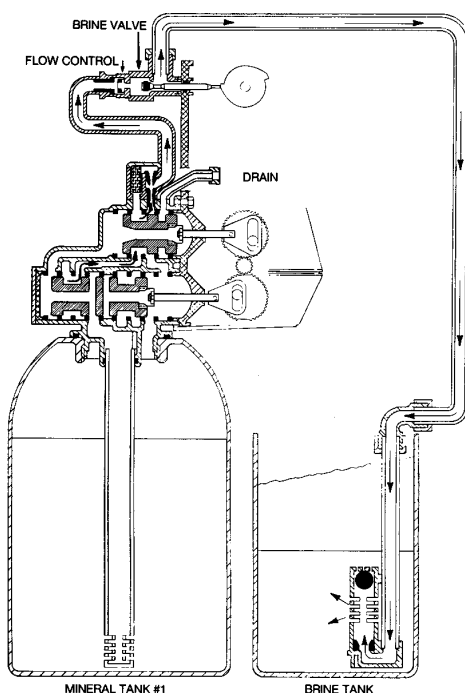
**NOTE:** Check the brine tank daily to establish a salt refill schedule. Fill above water level.

The valve position indicator on the right side of the controller shows the tank in Service and that the other tank in Brine Tank Fill - see the figure at the top of the next page.

**Valve Position Indicator for Brine Tank Fill Step**  
**(Tank #2 in Service, Tank #1 in Brine Tank Fill)**



**Brine Tank Fill Flow Pattern**



Conditioned water from the second mineral tank flows around the lower piston, around the upper piston, into the injector housing, through the brine line flow control, through the brine valve, and into to brine tank No water flows through the first mineral tank

### **Brine Tank Fill - Models with N Controls**

The group of holes following the Rapid Rinse pins on the Program Wheel determines the length of the total step time, in 1- or 2-minute intervals (refer to the note on the Program Wheel). For example: If there are 3 holes in this section, and the note on the Program Wheel is "2 MIN. PER PIN", the step time will be 6 minutes. To change this time, move the last pair of pins (see section 3.1).

When the Program Wheel has rotated past the holes, the control valve advances to the next mode, Standby, where it stays until the tank in Service regenerates.

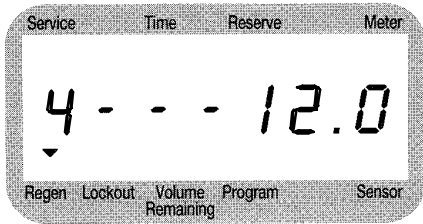
To advance the control valve manually, slowly rotate the Manual Regeneration Knob clockwise until the control valve begins to rotate. The Program Wheel will click once for each pin it is advanced past.

### **Brine Tank Fill - Models with the 3200ET**

The Regen arrow on the control panel should be on. As the valve rotates to the Brine Tank Fill position, a "4" (for step #4) flashes on the left side of the panel display.

When the valve stops cycling, the step number will stay on solid, the step time will appear in the right side of the display, and the Tank Fill LED will turn on (see figure on next page). The display will then alternate between the two tanks, showing the status of the Regeneration tank (in Brine Tank Fill) for 10 seconds, and the status of the Service tank (Volume Remaining) for 5 seconds.

***Panel Display During Brine Tank Fill***



**Tank Fill**

The step time will count down from the programmed preset to 0. To change the time remaining at any point during the step, use the Up/Down Set Buttons. (This will not change the programmed preset.)

When the step time expires, the control valve advances to the next mode, Standby, where it stays until the tank in Service regenerates.

To advance the unit manually, press the Extra Cycle Button.

**6. Salt Replacement**

This is not an automatic step. Operators must check the brine tank periodically to establish a salt refill schedule. Refer to the table on page 2 for the maximum salt allowable in the brine tank.

### 3.4 TROUBLESHOOTING

Symptom	Probable Cause	Correction
1. Softener fails to regenerate automatically.	a) Cord plugged into dead or intermittent power source.	a) Connect to constant power source.
	b) Disconnected meter cable.	b) Reconnect cable.
	c) Defective power cord.	c) Replace cord.
	d) Defective timer, meter or sensor.	d) Replace or repair.
2. Regeneration at wrong time. (Model TC only)	a) Timer improperly set, due to Power failure.	a) Reset timer.
3. Loss of capacity.	a) Increased raw water hardness.	a) Reset unit to the new capacity.
	b) Brine concentration and/or quantity.	b) Keep brine tank full of salt at all times. Clean it yearly. Salt may be bridged. If using a salt grid plate, ensure refill water covers it.
	c) Resin fouling.	c) Call Customer Service, find out how to confirm it, clean the resin and prevent future fouling.
	d) Poor distribution, Channeling (uneven bed surface).	d) Call Customer Service. Check distributors and backwash flow.
	e) Internal valve leak.	e) Call Customer Service. Replace spacers, seals, or piston.
	f) Resin age.	f) Call Customer Service. Check for resin oxidation caused by Chlorine. Mushy resin.
	g) Resin Loss.	g) Call Customer Service. Check for correct resin quantity. Broken distributors. Air or gas in bed; Well gas eliminator; Loose brine line.
	h) Service flow too low.	h) If flow gets below 2 gpm/ft <sup>2</sup> , increase the flow and recycle the extra product.



### 3.4 TROUBLESHOOTING (cont'd)

Symptom	Probable Cause	Correction
4. High salt usage.	a) Fill step time too long.	a) Adjust step time.
	b) Excessive water in brine tank.	b) See symptom No. 6.
5. Loss of water pressure.	a) Scaling/Fouling of inlet pipe.	a) Clean or replace pipeline. Pretreat to prevent.
	b) Fouled resin.	b) Clean the resin. Pretreat to prevent.
	c) Improper backwash.	c) Too many resin fines and/or sediment. Check DLFC for plugging, prefilter if needed.
6. Excessive water in brine tank and/or salty water to service.	a) Plugged Drain Line.	a) Check flow to drain Clean flow control.
	b) Dirty or damaged brine valve.	b) Clean or replace brine valve.
	c) Plugged injector.	c) Clean injector and replace screen.
	d) Low inlet pressure.	d) Increase pressure to allow injector to perform properly (30 psig minimum).
	e) Timer not cycling.	e) Replace timer.
7. Softener fails to use salt.	a) Plugged/restricted drain line.	a) Clean drain line and /or flow control.
	b) Injector is plugged.	b) Clean or replace injector and screen.
	c) No water in brine tank.	c) Check for restriction in BLFC.
	d) Water pressure is too low.	d) Line pressure must be at least 30 psi.
	e) Brine line injects air during brine draw.	e) Check brine line for air leaks.
	f) Internal control leak.	f) Check piston, seal, spacers for scratches or dents. Call Customer Service.
8. Control cycles continuously.	a) Faulty timer.	a) Replace timer.

### 3.4 TROUBLESHOOTING (cont'd)

Symptom	Probable Cause	Correction
9. Continuous flow to drain.	a) Foreign material in control.	a) Clean valve, rebuild unit. Call Customer Service.
	b) Internal control leak.	b) Same as above.
	c) Valve jammed in brine or backwash position.	c) Same as above.
	d) Timer motor stopped or jammed.	d) Replace timer motor.
10. Poor water quality.	a) Check items listed in #3.	
	b) Bypass valve open.	b) Close bypass valve.
	c) Channeling.	c) Check for too slow or high service flow. Check for media fouling.
	d) Program Wheel not turning w/ meter (N controls only)	d) Make sure wheel rotates freely, check for jammed impeller.
	e) Meter not measuring flow	e) Check for loose wiring (models with 3200ET) or jammed impeller (models with N controls)
11. No volume indication	a) Problem with meter	a) Make sure meter is installed correctly (see section 2), meter cable is plugged into cap, there's power across terminals 1 and 6 in the meter controller, impeller is clean and spins freely, and cap is working (use meter checker, if supplied).
	b) Service flow too low.	b) If flow gets below 2 gpm/ft <sup>2</sup> , increase the flow and recycle the extra product.
12. Regenerates before or after volume is reached (Model with N controls)	a) Problem with meter controller	a) Check reset motor and pulse switch, and replace if necessary.
13. Other problems		a) Consult Customer Service.

## SECTION 4.0 SHUTDOWN AND STORAGE

If the system must be shut down and stored, perform the following steps.

1. Regenerate the unit.
2. When the system returns to Service, close all valves in the inlet and outlet piping.
3. (Timeclock models only - F controls)  
Disconnect the power to the controller.
4. Once each week, open the inlet valve and put the unit into Rapid Rinse for 10 minutes; on timeclock units (F controls), power must be restored to do this. Once complete, repeat steps 2 and 3.
5. When the softener is returned to service, reopen the inlet and outlet valves, restore power to the timeclock controller, and regenerate the unit again.

## SECTION 5.0 SAMPLING AND TESTING

This section covers sampling and testing procedures that may apply to your softener.

Selected sampling and testing procedures should be performed regularly during the operation of this system. A well-kept log book of test dates and results and of operator observations is an invaluable tool for troubleshooting future performance problems. Any tests used with this system must be performed on a regular basis and must be accurately recorded in a log book.

The frequency of sampling and testing is normally at the discretion of the customer.

### 5.1 SAMPLING AND TESTING GUIDELINES

1. Regular and complete record-keeping is critical to maintaining proper operation of a softener.  
  
Close monitoring of performance will allow operators to detect operating problems early.
2. The most important operating data is generated during the initial operation of new equipment. This point forms a baseline that is used to evaluate all future operation.
3. Always record a complete set of data immediately before and after performing a regeneration.
4. Refer to the remainder of this section for recommended sampling

procedures.

### 5.2 SAMPLING AND TESTING

Hardness is the measurement of calcium and magnesium, which are dissolved minerals that have only limited solubility in water and, therefore, frequently precipitate as scale on piping, water heaters, etc. Your U.S. Filter softener contains a material known as resin, which removes these hardness minerals from the water.

The amount of hardness in the feed water will determine the number of gallons a water softener can treat between regenerations.

If the feed water hardness changes, the length of the service runs must be changed to avoid overrunning the unit or wasting water and salt on excessive regenerations.

The amount of hardness in the product water is typically used as an endpoint for service runs. When the amount of hardness in the product rises to a setpoint, the resin is exhausted and must be regenerated with a salt solution (brine).

The proper quantity of brine must be present in the storage tank prior to a regeneration. Refer to the Specifications Sheet in Section 1.2 for the required quantity.

Your softener system includes a hardness testing kit. Use this kit and the included instructions to periodically check the hardness of the softener feed and product streams.

### 5.3 RESIN SAMPLING PROCEDURE

The softening material inside your U.S. Filter conditioner - called resin - should give you years of soft water, provided your softener is operated within the guidelines given in this manual. Over the years, the resin will gradually lose its capacity to remove hardness minerals and will eventually require replacement. To determine resin capacity, or solve any of the resin-related problems identified in Troubleshooting section 3.4, the resin will have to be sampled and tested using the following procedures.

**NOTE:** Brackets ( ) refer to item numbers on the drawing/parts list in section 7.1.

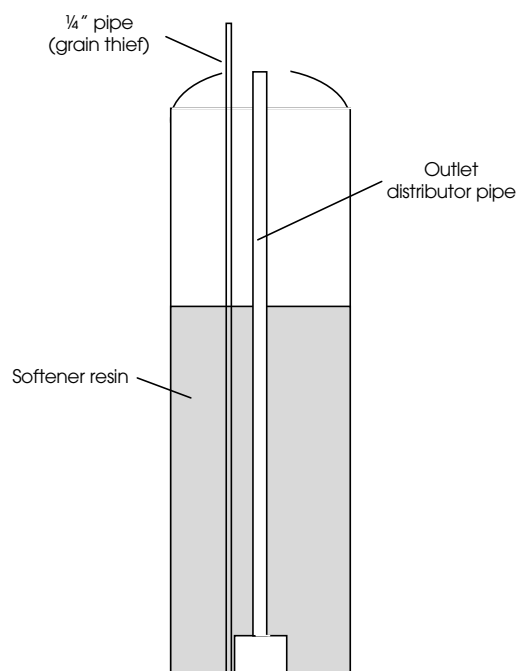
1. Turn off power to the valve timer.
2. Open the valve in the bypass line, then close the valves at the conditioner inlet and outlet.
3. Relieve water pressure in the conditioner by putting the control into Regeneration (Backwash) momentarily (see section 3.3). Then advance the valve back to service.
4. Disconnect the inlet, outlet, drain, brine, and interconnecting piping/tubing at the valve. To disconnect the interconnecting piping between the two tanks, remove the two clips (1" valves) or four screws (1½" valves) holding the piping to the valve body.
5. To sample tank #1, spin the whole brine valve and timer assembly off of the tank's top flange, and discard the old O-rings (items 5 and 6 for 1" valves, 13 and 14 for 1½" valves).
6. To sample tank #2, spin the whole adapter assembly off of the tank's top flange, and discard the old O-rings (items 2 and 3 for 1" valves, 13 and 14 for 1½" valves).
7. To provide the most accurate information on resin condition, a

resin sample must be representative of the entire bed. Use a "grain thief" or related device to take a core sample of the resin bed (refer to the figure below).

**NOTE:** Do not take a sample by taking resin from only the top of the bed. The particulates and resin that normally collect at the top of the bed will not accurately represent the entire bed.

- A. Insert a clean ¼" pipe into the softener vessel and twist it all of the way down to the bottom of the resin bed.
  - B. Plug the top end of the pipe and slowly lift it out of the vessel. Empty the plug of resin inside the pipe into a clean container.
  - C. Take enough resin from the bed to fill a quart jar, and contact your dealer to have the sample tested.
8. Apply silicone lubricant to the top edge of the outlet distributor pipe and to two new tank o-rings. Reverse steps 1 - 4 on the left to put the softener back into operation.

**Resin Sampling**



## SECTION 6.0 MAINTENANCE

### MAINTENANCE AND SAFETY

Before working on this system, operators must be familiar with the General Safety Precautions at the beginning of this manual.

### VESSELS

The vessel for this system is fiberglass and requires no maintenance.

If exposed to freezing temperatures, the vessel and its piping must be insulated and heated, or shut down and drained.

### PIPING

Operators should check all piping connections periodically for leaks. Any flanges used on the piping may require periodic tightening to prevent leaks.

If the system is operated within the temperature and pressure limits, little maintenance is required.

### MANUAL VALVES

Manual valves should be operated through their full range, at least every 6 months, to assure they function properly and are free of debris.

### PRESSURE REGULATORS

Any pressure regulators used in conjunction with this system should be inspected occasionally to assure they are set properly.

### LEAK CHECKING

Operators should be alert for leaking pipes, valves, and components. Detecting and repairing a leak while it is still small may prevent lengthy downtime later.

## 6.1 SUBASSEMBLY MAINTENANCE OR REPLACEMENT

### 1. Powerhead (Control Drive) Replacement

**NOTE:** Brackets ( ) refer to item numbers on the drawing/parts list in section 7.4.

- A. Remove the cover on the valve timer and turn off power to the controller.

- B. Open the valve in the bypass line, then close the valves at the conditioner inlet and outlet.
- C. Relieve water pressure in the conditioner by putting the control into Regeneration (Backwash) momentarily (see section 3.3). Then advance the valve back to service.
- D. Unplug the meter cable from the meter cap assembly (item 1 in section 7.3).
- E. Remove the three mounting bolts holding the control drive backplate to the upper valve piston and the four mounting bolts holding the backplate to the lower valve piston.
- F. (1½" valves only) Disconnect the tubing from the brine valve assembly at the upper rear of the control drive (see section 7.2). Then remove the valve assembly by holding its front fitting while spinning the valve body.
- G. Pull the entire powerhead assembly and piston assemblies straight out until the pistons clear the control valve housing.
- H. Remove the two connecting link pins that hold the valve's piston assemblies to the powerhead's cam assemblies.
- I. Using the same connecting link pins, connect each piston assembly to the cam assembly on the new powerhead.
- J. Reverse all previous steps to mount the new powerhead to the front of the control valve, reconnect the meter, and turn on the water and electrical supplies.
- K. Cycle the control valve to assure proper function (see section 3.3). Make sure the control valve is returned to the Service/Standby position.



## 2. Injector and Screen Replacement

**NOTE:** Brackets ( ) refer to item numbers on the drawing/parts list in section 7.1.

- A. Open the valve in the bypass line, then close the valves at the conditioner inlet and outlet.
- B. Relieve water pressure in the conditioner by putting the control into Regeneration (Backwash) momentarily (see section 3.3). Then advance the valve back to service.
- C. (Models with 7-16" tanks - see section 1.2) Remove the two bolts holding the #1600 injector cap and discard its seal. With screwdriver, unthread the injector nozzle (item 9 on the 1" valve, and item 3 on the 1½" valve) and lift both it and the throat assembly (item 8 on the 1" valve, and item 4 on the 1½" valve) gently from the injector housing.
- D. (Models with 18-24" tanks - see section 1.2) Remove the two bolts holding the #1700 injector cap and discard its seal. With screwdriver, pry off the injector nozzle (8) and lift both it and the throat assembly (9) gently from the injector housing.
- E. Install a new injector nozzle and throat assembly. Be sure they are all the way in. Clean or install a new screen (item 10 on 1" valves, and item 2 or 7 on 1½" valves).
- F. Install new Injector cap seal.
- G. Re-install the injector bolts and tighten.
- H. Close bypass valve and reopen inlet valve. Water pressure should now be applied to the conditioner.
- I. Check for leaks at the seal.

## 3. Piston Replacement

**NOTE:** Brackets ( ) refer to item numbers on the drawing/parts list in section 7.1.

- A. Remove the cover on the valve timer and turn off the power.
- B. Open the valve in the bypass line, then close the valves at the conditioner inlet and outlet.
- C. Relieve water pressure in the conditioner by putting the control into Regeneration (Backwash) momentarily (see section 3.3). Then advance the valve back to service.
- D. Unplug the meter cable from the meter cap assembly (item 1 in section 7.3).
- E. Remove the three mounting bolts holding the control drive backplate to the upper valve piston and the four mounting bolts holding the backplate to the lower valve piston.
- F. (1½" valves only) Disconnect the tubing from the brine valve assembly at the upper rear of the control drive (see section 7.2). Then remove the valve assembly by holding its front fitting while spinning the valve body.
- G. Pull the entire powerhead assembly and piston assembly straight out until the pistons clear the control valve housing.
- H. Inspect the inside of the valve to make sure that all spacers and seals are in place, and that there is no foreign matter that would interfere with valve operation.
- I. Remove the two connecting link pins that hold the valve's piston assemblies (items 1 and 4 for 1" valves, items 13 and 18 for 1½" valves) to the powerhead's cam assembly.

- J. Using the same connecting link pins, connect the new piston assemblies to the cam assembly on the powerhead.
- K. Reverse all previous steps to mount the powerhead with new pistons to the side of the control valve, reconnect the meter, and turn on the water and electrical supplies.
- L. Cycle the control valve to assure proper function (see section 3.3). Make sure the control valve is returned to the service position.
- G. Pull the entire powerhead assembly and piston assembly straight out until the pistons clear the control valve housing.
- H. Remove the end spacer with your fingers.
- I. Remove the first seal using the wire hook with the finger loop.
- J. The spacer tool (used only for removing the spacers) has three retractable pins, retained by a rubber ring, at one end. They are retracted or pushed out by pulling or pushing the center button on the opposite end.

#### 4. Seals and Spacers Replacement (requires 3 special tools)

**NOTE:** Brackets ( ) refer to item numbers on the drawing/parts list in section 7.1.

- A. Remove the cover on the valve timer and turn off power.
- B. Open the valve in the bypass line, then close the valves at the conditioner inlet and outlet.
- C. Relieve water pressure in the conditioner by putting the control into Regeneration (Backwash) momentarily (see section 3.3). Then advance the valve back to service.
- D. Unplug the meter cable from the meter cap assembly (item 1 in section 7.3).
- E. Remove the three mounting bolts holding the control drive backplate to the upper valve piston and the four mounting bolts holding the backplate to the lower valve piston.
- F. (1½" valves only) Disconnect the tubing from the brine valve assembly at the upper rear of the control drive. Then remove the valve assembly by holding its front fitting while spinning the valve body.
- K. Insert the pin end of the spacer tool into the valve body with the pins retracted (button pulled back). Push the tool tight against the spacer and push the button in. When the button is pushed in, the pins are pushed out to engage the holes in the spacer. Remove the tool from valve body. The spacer will be on the end. Pull the center button back, the pins will be retracted and the spacer can be removed from the spacer tool.
- L. Alternately remove the remaining seals and spacers in accordance with steps H and J.
- M. The last end spacer does not have any holes for the pins of the spacer tool to engage. Use the wire hook with finger loop to remove.
- N. To install new seals, spacers, and end rings, use the special tool with the brass sleeve on one end. This is a double-purpose tool. The male end acts as a pilot to hold the spacers as they are pushed into the valve body and the brass female end is used to insert the seals into the valve body.



- O. To load the valve, press the button on the brass sleeve end with your thumb. Inner portion of tool is now exposed. Place the end ring on this pilot - with the lip of the end ring facing the tool - and push the tool into the valve body bore until it bottoms. While tool is in the valve body, press a seat into the inside diameter of the exposed brass female end.
- P. Remove the tool, turn it end for end and insert it into the valve body bore. While holding the large diameter of the tool, slide it all the way into the valve body bore until it bottoms. Press in the center button to push the seal out of the tool and leave it in place in the valve body.
- Q. Remove the tool from the valve body and push the center on the brass female end to expose the pilot on the opposite end. Place a spacer on this end and insert the spacer and tool into the valve. While the tool is still in the valve, press another seal into the inside diameter of the exposed brass sleeve end.
- R. Alternately repeat steps O and P until all seals and spacers have been pushed into the valve.
- S. Replace top end spacer by hand, with lip on spacer down.
- T. Reverse steps A-F to reinstall the powerhead and piston assemblies to the side of the control valve, reconnect the meter, and turn on the water and electrical supplies.
- U. Cycle the control valve to assure proper function (see section 3.3). Make sure the control valve is returned to the service position.
- A. Open the valve in the bypass line, then close the valves at the conditioner inlet and outlet.
- B. Relieve water pressure in the conditioner by putting the control into Regeneration (Backwash) momentarily (see section 3.3). Then advance the valve back to service.
- D. Pull cable (item 3 for the 3200ET timer, other timers not shown) out of meter cap assembly (item 4 for the 3200ET, 1 for extended range).
- E. Remove the four screws holding the cap to the meter housing.
- F. Lift the cap off of the meter housing and discard o-ring. If necessary, meter cap can be rotated to help loosen the o-ring.
- G. Remove impeller and inspect for gear or spindle damage. Replace if necessary.
- H. Apply silicone lubricant to new o-ring and assemble to the smallest diameter on meter cap assembly.
- I. Assemble cap to meter assembly. Be sure impeller spindle enters freely into cap. Press firmly on cap and rotate if necessary to assist in assembly.
- J. Reinstall the four screws and tighten.
- K. Return by-pass or inlet valving to normal service position. Water pressure should now be applied to the conditioner, and any by-pass line shut off.
- L. Check for leaks at all seal areas.
- M. Plug cable into meter cap assembly. If necessary, rotate cable to align drive flats on the meter cable with those on the impeller (models with N controls only).

## 5. Meter Cover and Impeller Replacement

**NOTE:** Brackets ( ) refer to item numbers on the drawing/parts list in section 7.3.

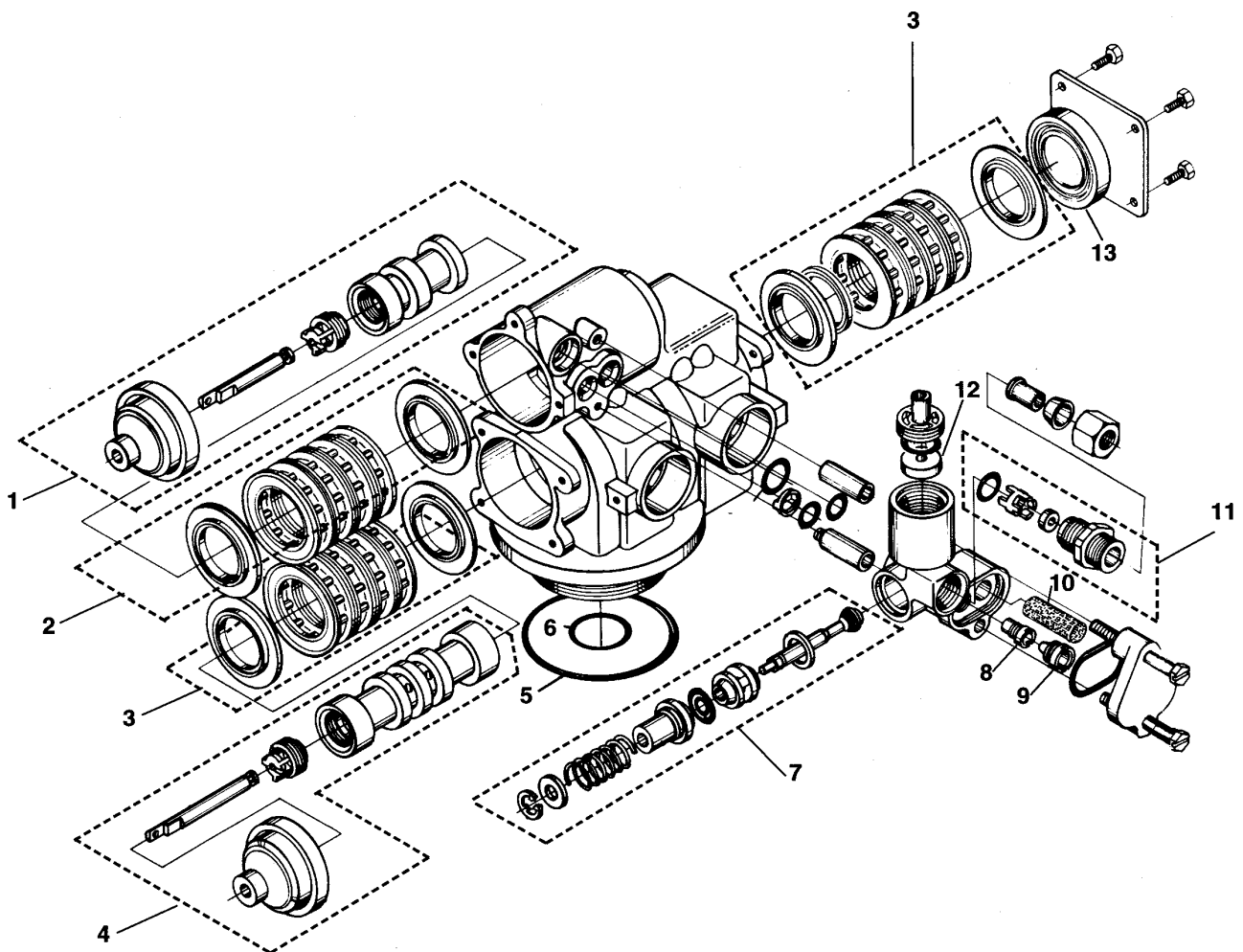
## SECTION 7.0 PARTS LIST

This section contains the parts lists and illustrations for each subassembly. These subassemblies are:

- 7.1 CONTROL VALVE ASSEMBLY
- 7.2 BRINE VALVE ASSEMBLIES
- 7.3 METER ASSEMBLY
- 7.4 POWERHEAD (CONTROL DRIVE) ASSEMBLIES
- 7.5 ELECTRO-MECHANICAL TIMERS
- 7.6 MODEL 3200ET DIGITAL TIMER (D CONTROLS)

### 7.1 CONTROL VALVE AND ADAPTER ASSEMBLIES

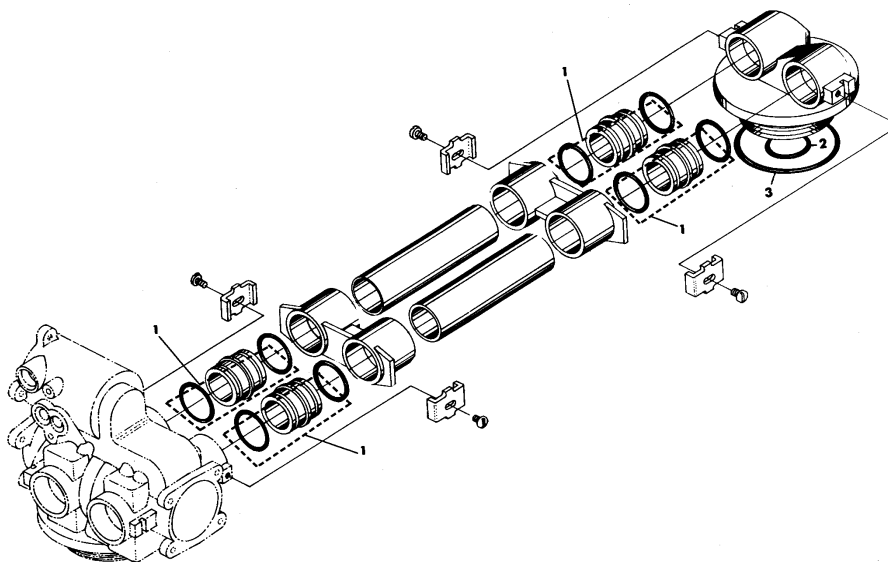
#### 1" Control Valve Assembly



**1" Control Valve Assembly - Parts List**  
 (drawing on previous page)

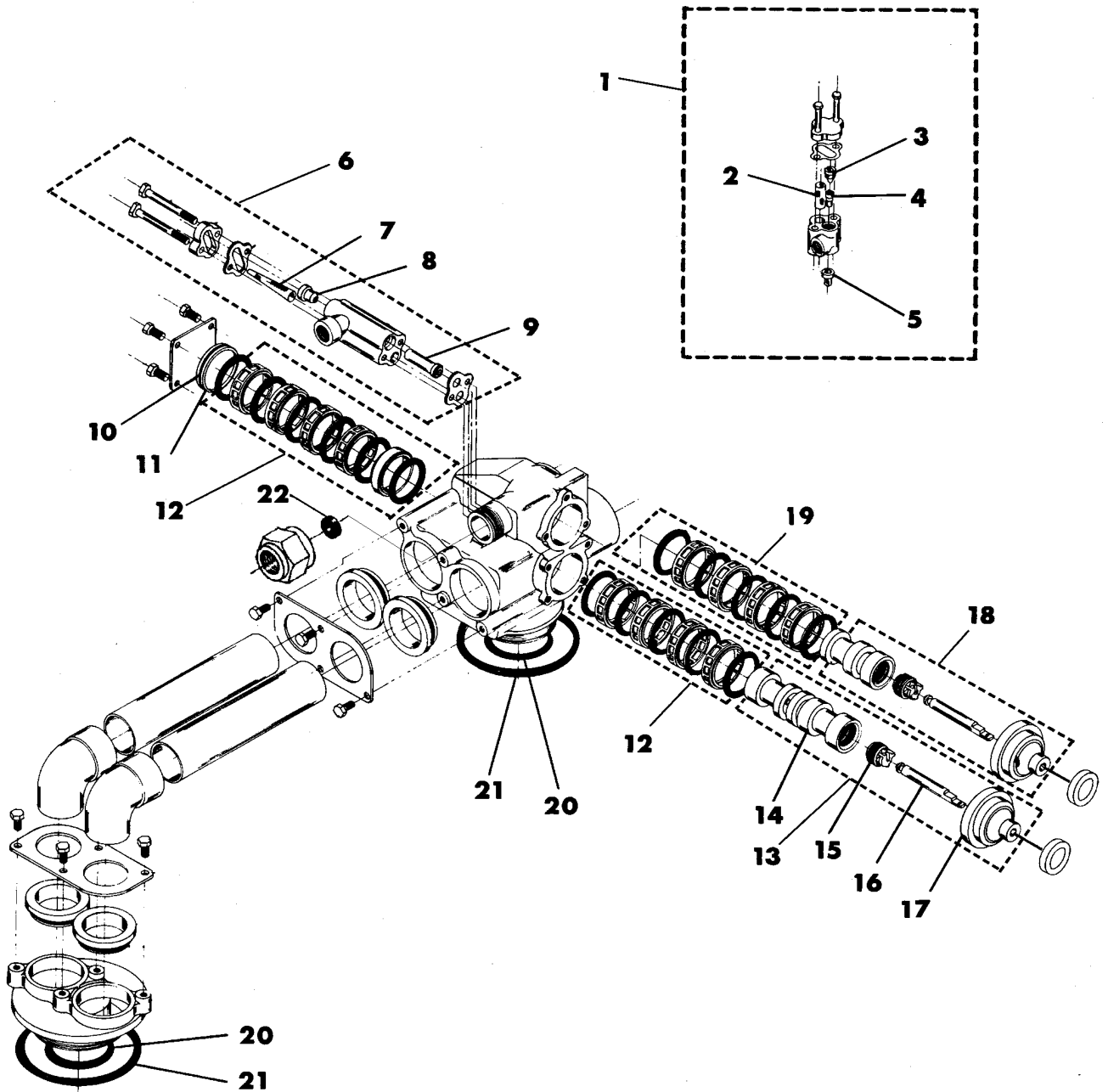
Item No.	Quantity	Part No.	Description	USF No.
Valve Assy	1	900TC16M.75	9000 vlv, 1/15 rpm timeclock, 1600 brine, 3/4" meter..	900006027
		900TC16M1	9000 vlv, 1/30 rpm timeclock, 1600 brine, 1" meter...	900006028
1	1	60400	Upper piston assy (part of spacer/seal/piston kit) ...	900007218
2	1	60125	Upper spacer/seal kit (part of spacer/seal/piston) ...	900007218
3	1	60421	Lower spacer/seal kit (part of spacer/seal/piston) ...	900007218
4	1	60401	Lower piston assy (part of spacer/seal/piston kit) ...	900007218
5	1	12281	O-ring - Top of tank (part of o-ring kit).....	900007220
6	1	11710	O-ring - Distributor (part of o-ring kit) .....	900007220
7	1	60350	#1600 Brine valve assembly .....	900006263
8	1	10914-01	#1600 Inj throat - #1 injector.....	900006310
		10914-03	#1600 inj throat - #3 injector.....	900006311
9	1	10913-01	#1600 Inj nozzle - #1 injector .....	900006312
		10913-03	#1600 inj nozzle - #3 injector.....	900006313
10	1	10227	#1600 Injector screen (no USF #)	
11	1	60022-50	BLFC washer - 0.5 gpm (no USF #)	
11A	1	60022-100	BLFC washer - 1.0 gpm .....	900006264
12	1	Varies	DLFC washer (part of conversion kit A) .....	903001513
			DLFC washer (part of conversion kit G).....	903001519
13	1	14928	Stub end plug .....	900006265
14	1	13061	Spacer puller (not shown - part of tool kit).....	900007222
15	1	12763	Spacer stuffer (not shown - part of tool kit) .....	900007222
16	1	12874	Seal hook (not shown - part of tool kit).....	900007222

**1" Control Valve Adapter Assembly**



Item No.	Quantity	Part No.	Description	USF No.
1	4	15078	Coupling .....	900007214
	8	13305	O-ring - adapter .....	900007215
2	1	11710	O-ring - distributor (part of o-ring kit) .....	900007220
3	1	12281	O-ring - Top of tank (part of o-ring kit).....	900007220

1½" Control Valve Assembly

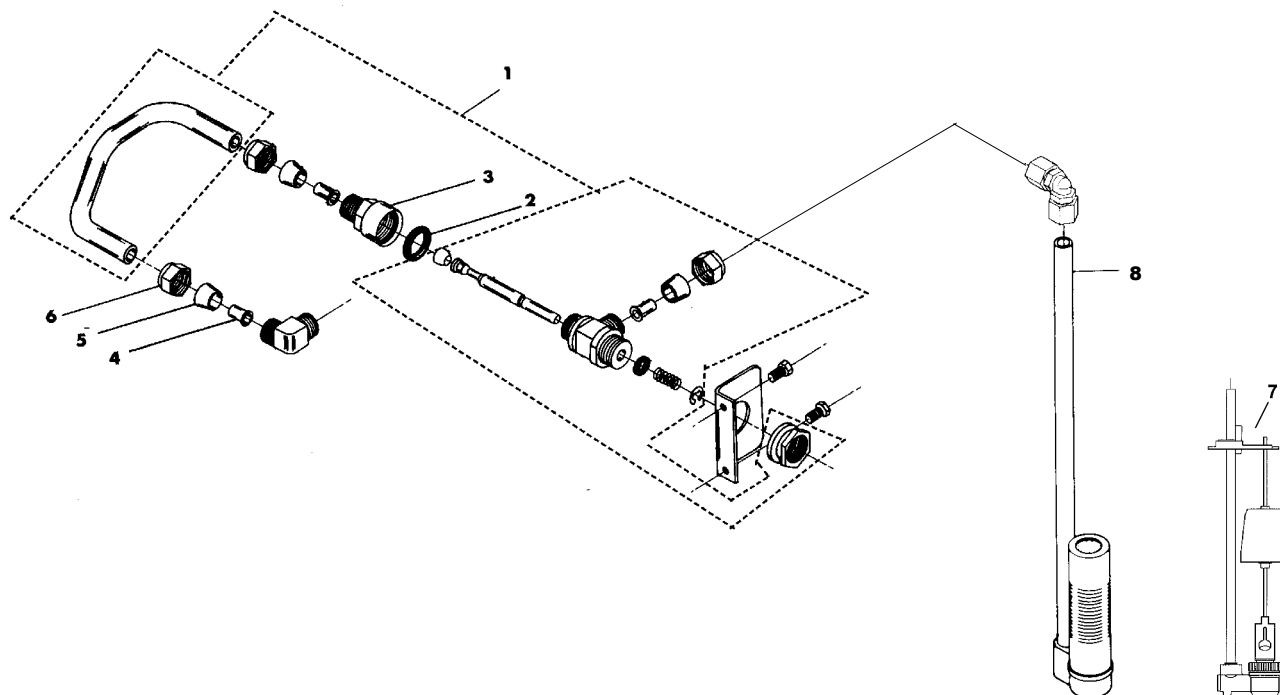


***1½" Control Valve Assembly - Parts List***  
*(drawing on previous page)*

Item No.	Quantity	Part No.	Description	USF No.
Valve Assy	1	950TC16M1.5	9500 vlv, 1/30 rpm timeclock, 1600 brine, 1½" metr..	900006029
		950TC17M1.5	9500 vlv, 1/30 rpm timeclock, 1700 brine, 1½" metr..	900006030
1	1	60080-03	#1600 Injector assy - w/#3 inj (12-16" tks)	90006138
2	1	10227	Injector screen (part of 1600 injector kit)	900006138
3	1	10913	Injector nozzle (part of 1600 injector kit)	900006138
4	1	10914	Injector throat (part of 1600 injector kit)	900006138
5	1	16221	Air dispenser (No USF #)	
6	1	60381-4C	#1700 Injector assy w/#4C inj (18-24" tks)	900006155
7	1	14803	Injector screen (part of 1700 injector kit)	900006155
8	1	14801	Injector nozzle (part of 1700 injector kit)	900006155
9	1	14802	Injector throat (part of 1700 injector kit)	900006155
10	1	16394	O-ring - end plug	900006266
11	1	16955	End plug	900006267
12	1	60133	Lower seals/spacers (part of spacer/seal/piston kit)	900007219
13	1	60109	Lower piston assy (part of spacer/seal/piston kit) ...	900007219
14	1	17111	Lower piston (No USF #)	
15	2	14309	Piston rod retainer (No USF #)	
16	2	16956	Piston rod (No USF #)	
17	2	17212	End plug assembly (No USF #)	
18	1	60108	Upper piston assy (part of spacer/seal/piston kit) ....	900007219
19	1	60134	Upper seals/spacers (part of spacer/seal/piston kit)	900007219
20	2	16455	O-ring - distributor (part of o-ring kit)	900007221
21	2	13577	O-ring - top of tank (part of o-ring kit)	900007221
22	1	Varies	DLFC washer (part of conversion kit A)	903001513
			DLFC washer (part of conversion kit D)	903001516
23	1	17623	Spacer puller (not shown - part of tool kit)	900006889
24	1	16516	Spacer stuffer (not shown - part of tool kit)	900006889
25	1	12874	Seal hook (not shown - part of tool kit)	900006889

**7.2 BRINE VALVE AND AIR CHECK ASSEMBLIES**

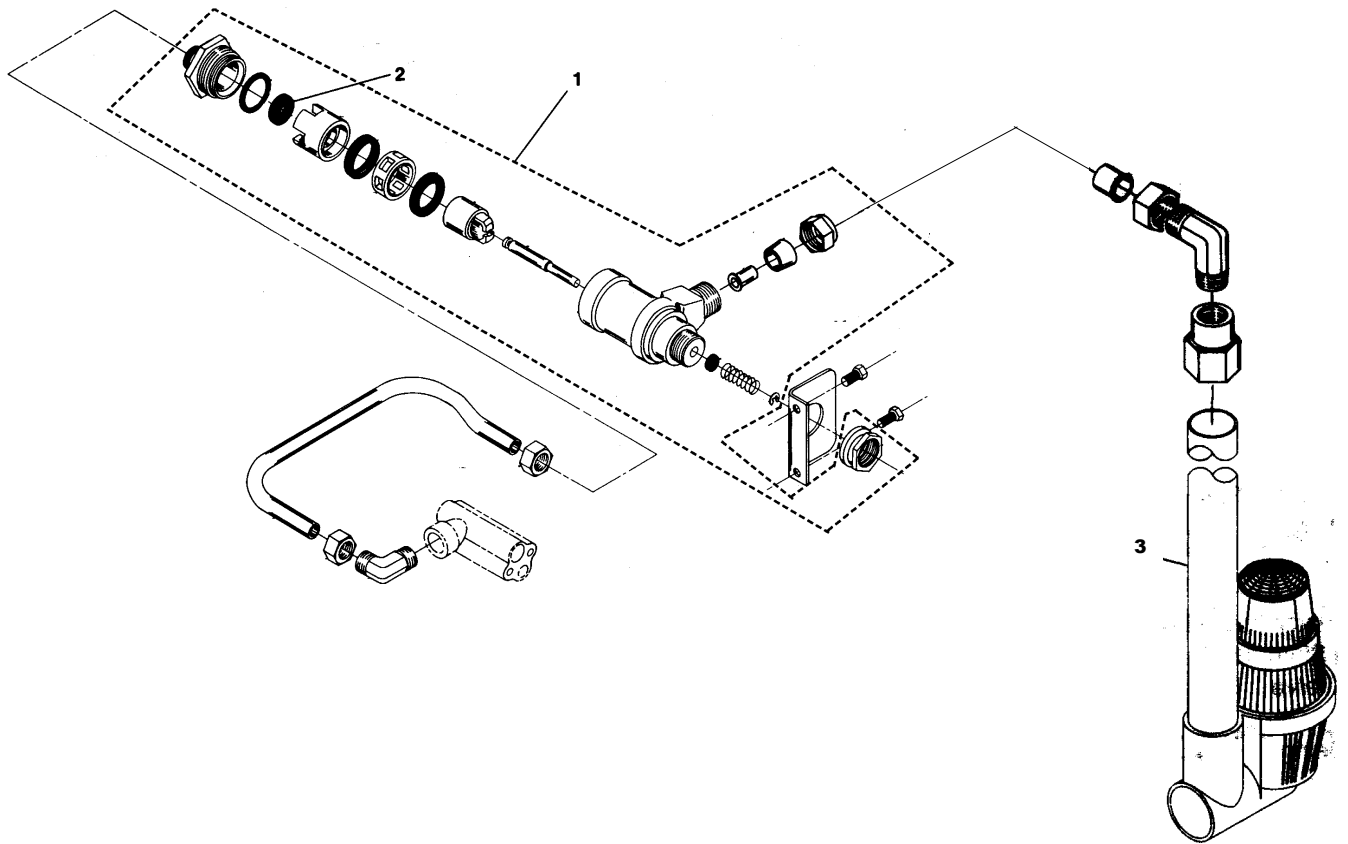
***#1600 Brine Assembly - used on models with 12-16" diameter softeners w/ 1½" valves***



***#1600 Brine Assembly Parts List***

Item No.	Quantity	Part No.	Description	USF No.
1	1	60037	Brine valve assembly (1½" valve only)	900006272
2	1	11982	O-ring (1½" valve only) (No USF #)	
3	1	60022-100	BLFC housing w/1 gpm washer (1½" vlv only)	900006264
4	4	10332	Insert sleeve, 3/8" tubing (1½" valve) (No USF #)	
5	4	10330	Delrin sleeve, 3/8" tubing (1½" valve) (No USF #)	
6	4	10329	Fitting nut, 3/8" tubing (1½" valve) (No USF #)	
7	1	H7076-36HF	36" float valve, 3/8" draw line (18" brine tank)	900006240
8	1	60002	#500 air check w/ 3/8" elbow (24" brine tank)	900006103

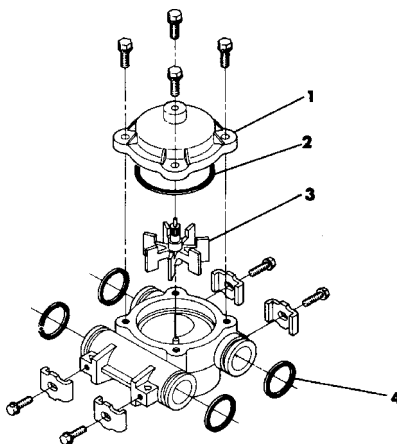
**#1700 Brine Assembly - used on models with 18-24" diameter softeners**



Item No.	Quantity	Part No.	Description	USF No.
1	1	60039-20	Brine valve assembly w/2 gpm washer	900006273
2	1	12087	BLFC - 2 gpm washer (part of brine valve assy)	900006273
3	1	60009	#900 air check w/ 1" coupling	900005827

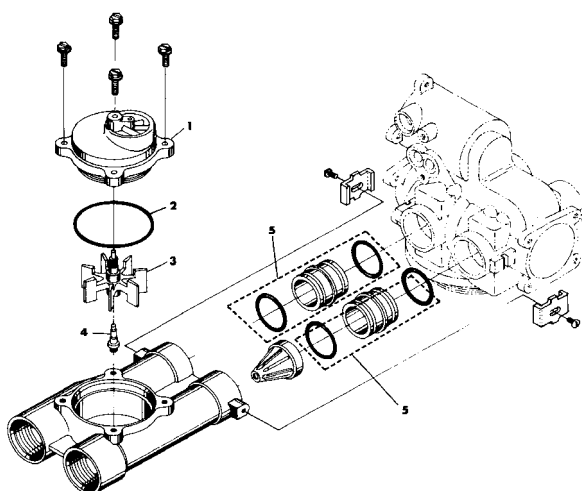
**7.3 METER ASSEMBLY**

***¾" Meter (used on 7-12" softeners with 1" piping)***



Item No.	Quantity	Part No.	Description	USF No.
1	1	15150	Meter Cap, Ext Range (625-10,625 gals)	136000432
2	1	13847	O Ring, -Cap (part of meter cap kit)	136000432
3	1	13509	Turbine (part of meter cap kit)	136000432
4	4	13305	O Ring, Coupling (part of meter cap kit)	136000432

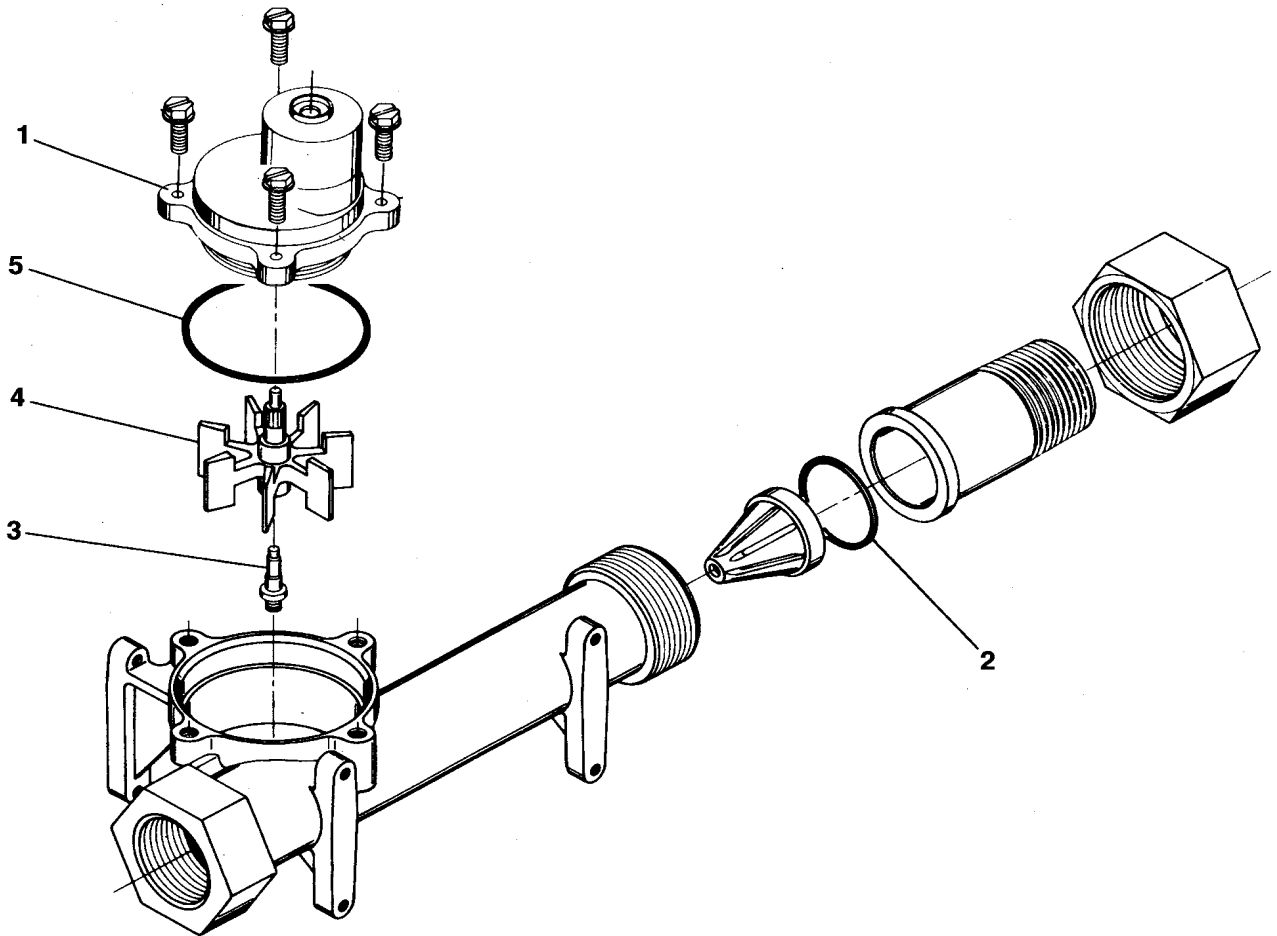
***1" Meter (used on 14-16" softeners with 1" piping)***



Item No.	Quantity	Part No.	Description	USF No.
1	1	15237	Meter Cap, Ext Range (1,550-26,350 gals)	136000433
2	1	13847	O Ring, -Cap (part of meter cap kit)	136000433
3	1	13509	Turbine (part of meter cap kit)	136000433
4	1	13882	Turbine post (part of meter cap kit)	136000433
5	2	13305	O Ring, Coupling (part of meter cap kit)	136000433
		15078	Coupling	900007214

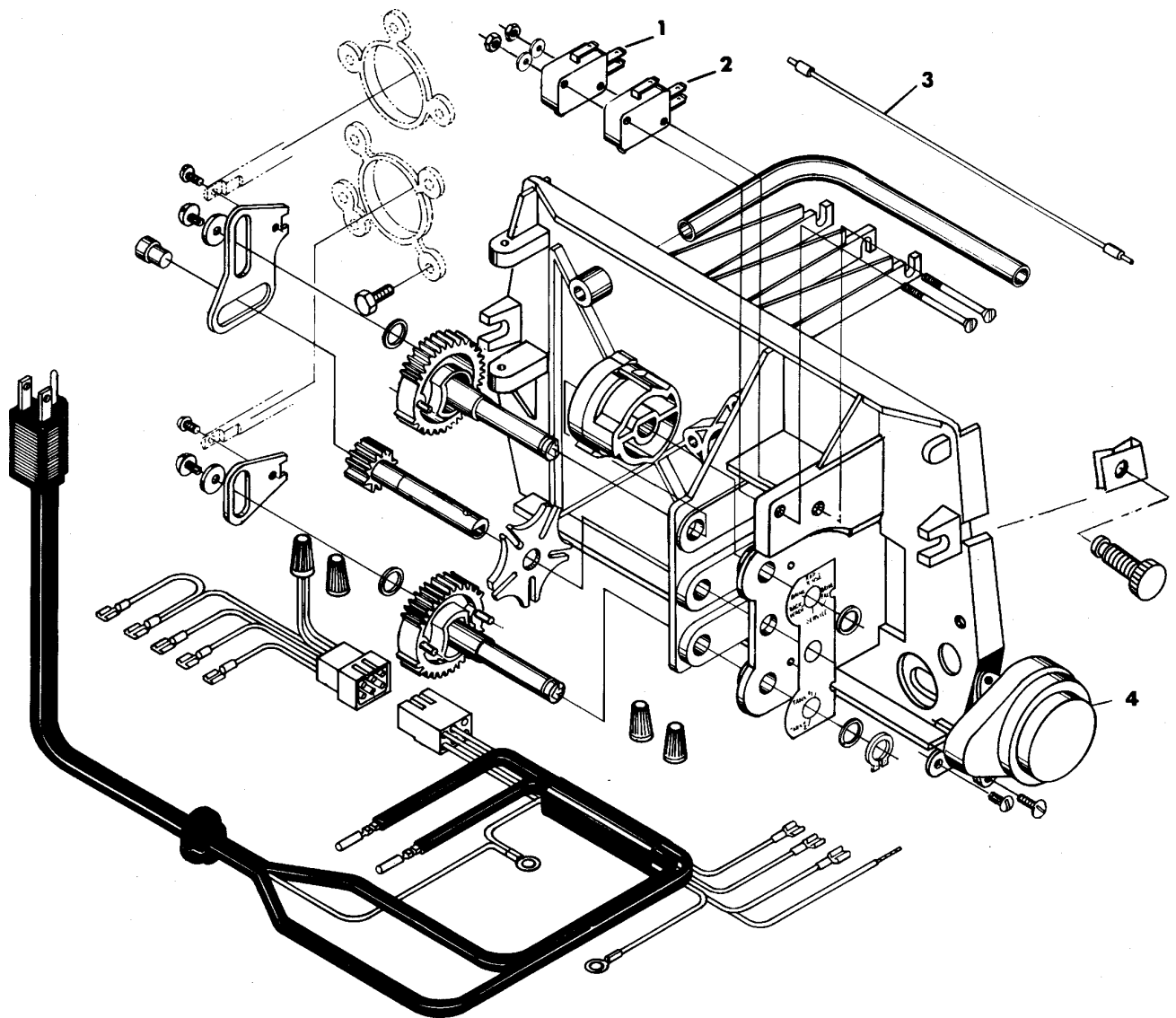


***1½" Meter (used on softeners with 1½" piping)***



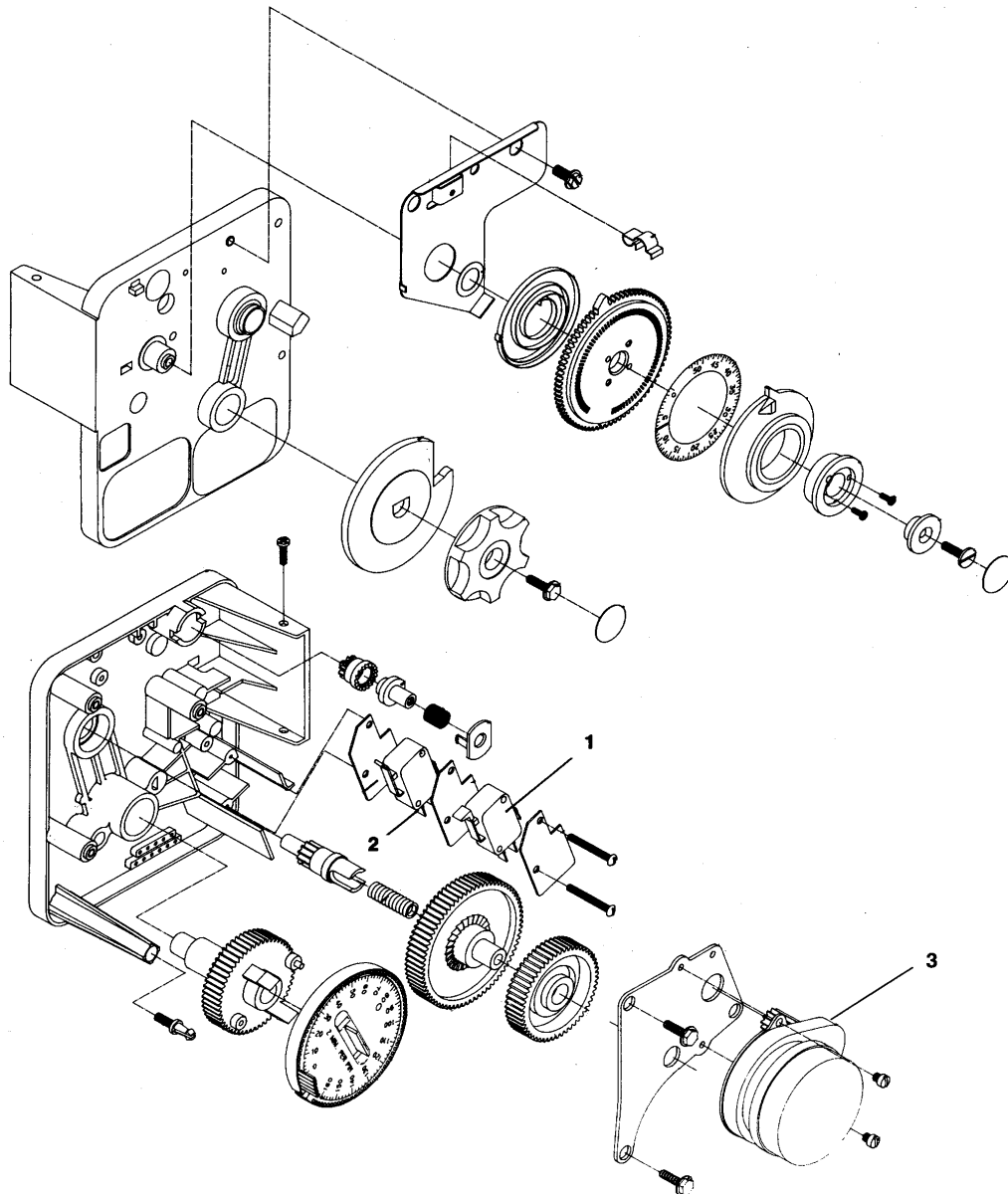
Item No.	Quantity	Part No.	Description	USF No.
1	1	15237	Meter Cap, Ext Range (3,125-53,125 gals)	136000434
2	1	12733	O Ring - union	132102738
3	1	13882	Turbine Post Assembly (part of meter cap kit)	136000434
4	1	13509	Turbine (part of meter cap kit)	136000434
5	1	13847	O Ring, -Cap (part of meter cap kit)	136000434

**7.4 POWERHEAD (CONTROL DRIVE) ASSEMBLY**



Item No.	Quantity	Part No.	Description	USF No.
1	1	10218	Microswitch (part of switch kit)	136000430
2	1	16433	Microswitch - program (part of switch kit)	136000430
3	1	15216	Cable Assembly	136000361
4	1	14927	Motor, 120 VAC/60Hz, for 1" valves	136000362
		17610	Motor, 120 VAC/60 Hz, for 1 ½" valves	136000363
		17509	Motor, 220 VAC/50 Hz	136000364

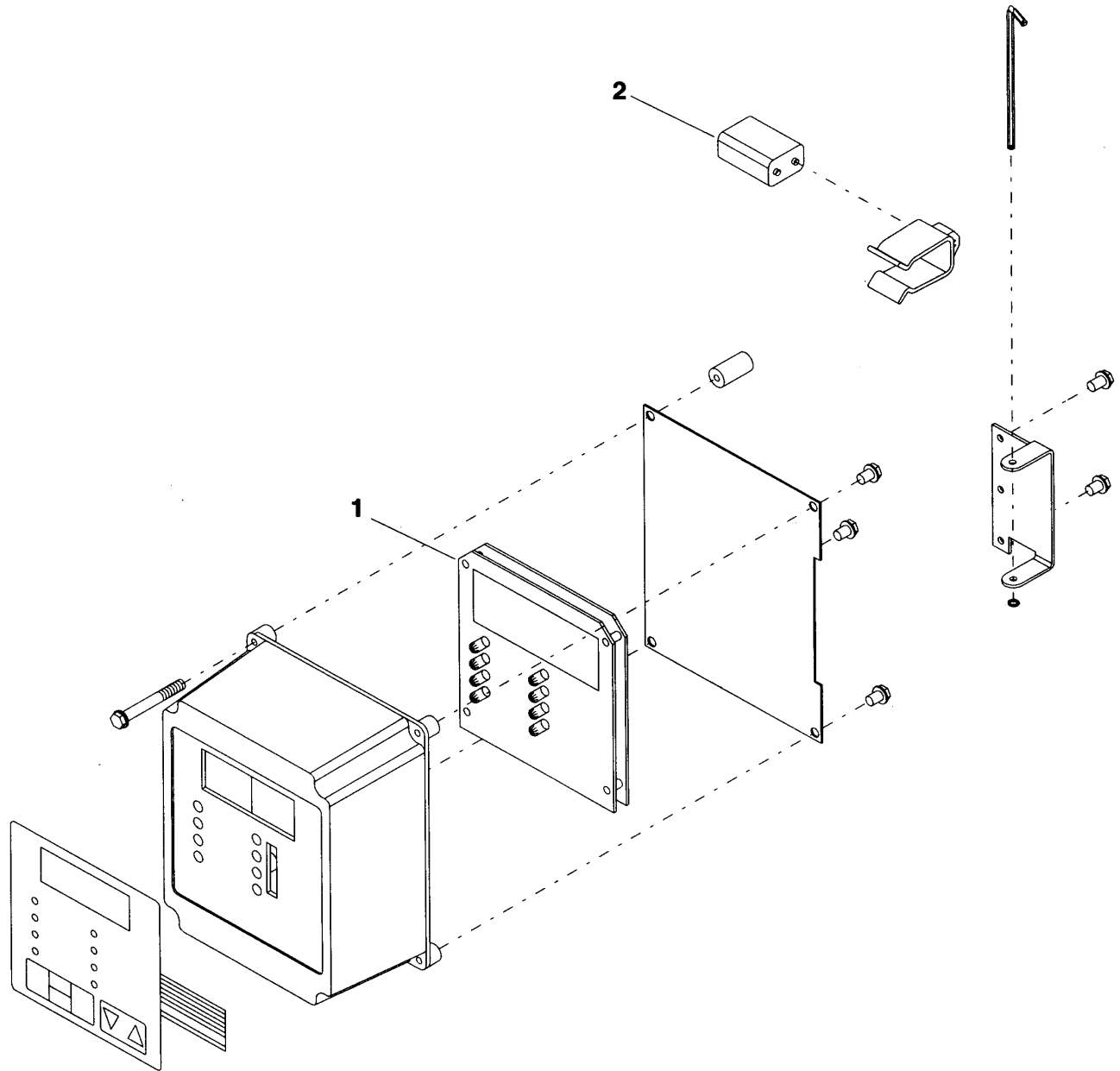
**7.5 ELECTROMECHANICAL TIMER (models with N controls only)**



Item No.	Quantity	Part No.	Description	USF No.
1	1	15320	Microswitch (part of switch kit)	136000431
2	1	15314	Microswitch (part of switch kit)	136000431
3	1	13944	Motor, 115V/60 Hz, 1/30 <sup>th</sup> RPM	136000365
3A	1	14973	Motor, 115V/60 Hz, 1/15 <sup>th</sup> RPM	136000366
		14254	Motor, 220V/50 Hz, 1/30 <sup>th</sup> RPM	136000367
		15442	Motor, 220V/50 Hz, 1/15 <sup>th</sup> RPM	136000368

**7.6 MODEL 3200ET DIGITAL TIMER (D controls)**

Valve Timer Assembly For Softeners With O Controls



3200ET Digital Timer Parts List

Item No.	Quantity	Part No.	Description	USF No.
1	1	18298-13	Circuit Board, 115 VAC/60 Hz	136000428
		18298-14	Circuit Board, 220 VAC/50 Hz (no USF No.)	
2	1		9V Alkaline Battery	130200013

## SECTION 8.0 APPENDIX

### 8.1 GLOSSARY OF SOFTENER TERMINOLOGY

<u>Backwash:</u>	The counter-current flow of water through a resin bed (i.e. in at the bottom of the vessel, out at the top) to clean and reclassify the bed after exhaustion.	<u>Fines:</u>	Extremely small particles of ion-exchange resin.
<u>Bed Expansion:</u>	The effect produced during backwashing: the resin particles become separated and rise in the column. The expansion of the bed due to the increase in space between resin particles may be controlled by regulating backwash flow.	<u>Flow Rate:</u>	The volume of solution which passes through a system within a given time. Flow rate is usually expressed in terms of gallons per minute.
<u>Bed:</u>	The resin contained in a vessel.	<u>Freeboard:</u>	The space provided above the resin bed in an ion-exchange column to allow for expansion of the bed during backwash.
<u>Brine:</u>	Water saturated with salt.	<u>Grains/gallon:</u>	An expression of concentration of material in solution. One grain per gallon is equivalent to 17.12 parts per million.
<u>Capacity:</u>	The ability of the resin to remove hardness, measured in kilograins per cubic foot.	<u>Grain:</u>	A unit of weight; 0.0648 grams; 0.000143 pounds.
<u>Concentration:</u>	The amount of substance in weight, moles, or equivalents contained in a unit volume.	<u>Hardness:</u>	The scale-forming and lather-inhibiting qualities which water, high in calcium and magnesium ions, possesses.
<u>Contaminant:</u>	Any foreign component present in another substance; e.g., anything in water that is not H <sub>2</sub> O is a contaminant.	<u>Influent:</u>	The solution which enters a system unit.
<u>Cycle:</u>	A complete sequence of operation. For instance, a complete softener cycle of would involve: Service, Backwash, Brine In / Slow Rinse, Fast Rinse, Brine Tank Refill, and back into Service.	<u>Ion Exchange:</u>	A process by which certain undesired ions of given charge are removed from solution with an absorbent, being replaced in the solution by desirable ions of similar charge from the absorbent.
<u>Effluent:</u>	The solution which emerges from a system unit.	<u>Ion</u>	Any particle of less than colloidal size possessing either positive or negative electric charge.
<u>Exhaustion:</u>	The state in which the resin is no longer capable of removing enough hardness from the feed water.	<u>Kilograin:</u>	A unit of weight; one thousand grains. There are seven kilograins per pound.
		<u>Media:</u>	The material (resin, carbon, quartz) that is used in a fluid-treatment vessel.

<u>Mineral:</u>	A natural inorganic substance having a definite chemical composition and structure.	<u>Scale:</u>	The precipitate that forms on surfaces in contact with water.
<u>Raw Water:</u>	Untreated water from wells or from surface sources.	<u>Softening:</u>	The removal of hardness - calcium and magnesium - from water.
<u>Regeneration:</u>	The process by which a system is conditioned to ready it for another service cycle.	<u>Specific Gravity:</u>	The ratio of the mass of a body to the mass of an equal volume of water at 4° C or other specified temperature.
<u>Resin:</u>	Typically, a synthetic plastic bead with attached ions that will exchange (trade places with) with other ions in a process feed stream. Used in ion-exchange applications.	<u>TDS:</u>	Total Dissolved Solids, in parts per million (ppm).
<u>Rinse:</u>	The final step in a unit regeneration, in which water is flushed through the unit until the effluent quality is proper.	<u>Throughput Volume:</u>	The amount of solution passed through an exchange bed before exhaustion of the resin occurs.

## 8.2 MATERIAL SAFETY DATA SHEETS

The end of this section contains Material Safety Data Sheets (MSDS's) for the resin used with this

equipment. These sheets contain important information about specific hazards and first aid procedures and must be reviewed by those operating this equipment.

## MATERIAL SAFETY DATA SHEET

**Product Name:** Ion Exchange Resin C-211  
**Product Number:** 109104110

**Effective Date:** 01 Jan 1995  
**Date Printed:** 11 July 1995

**U.S. Filter/IWT**  
4669 Shepherd Trail  
Rockford, Illinois 61105

**Phone:** (815) 877-3041  
**Inquiry:** (815) 877-3041  
**EMERGENCY:** (800) 424-9300 Chemtrec

### SECTION I - INGREDIENTS

(% W/W, unless otherwise noted)

#### Occupational Exposure Limits

Sulfonated copolymer of styrene and  
divinylbenzene in sodium form  
Water

CAS #069011-22-9	50-65%
CAS #007732-18-5	35-50%

### SECTION II - PHYSICAL DATA

Physical State:	Solid
Boiling Point:	N/A
Freezing Point:	0° C (Water)
Vapor Pressure:	17mmHg at 20°C (Water)
Evaporation Rate:	1 (H <sub>2</sub> O = 1)
Specific Gravity:	1.3
Density:	N/A
Water Solubility:	Insoluble
pH:	N/A
Appearance:	Light amber to yellow beads
Odor:	Odorless

### SECTION III - FIRE AND EXPLOSION HAZARD DATA

Flash Point:	N/A
Auto-Ignition Temp:	Above 500°C (900°F)
Flammable Limits:	LFL: N/A UFL: N/A
Fire Extinguishing Media:	Dry Chemical

Alkylbenzenes, vinylbenzenes, naphthalene, benzaldehydes, phenol, carbon dioxide, water, organic amines, chlorine, nitrogen oxides, ammonia, methyl chloride and oxides of sulfur are possible combustion products.

**Fire Fighting Equipment:** NIOSH approved, self contained breathing apparatus and full protective clothing where appropriate.







### 8.3 WARRANTY

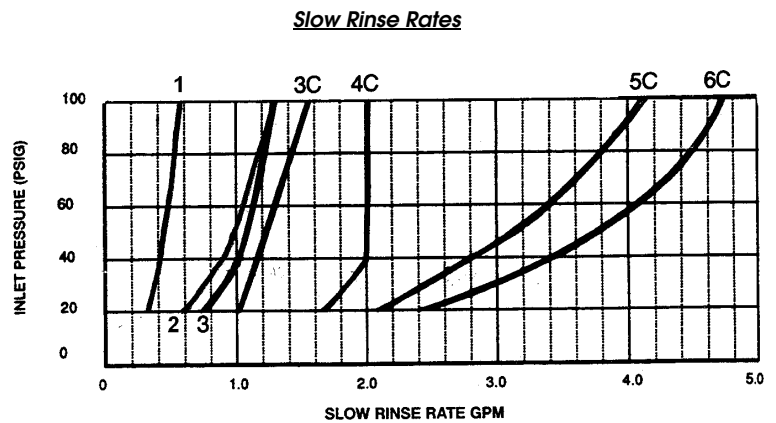
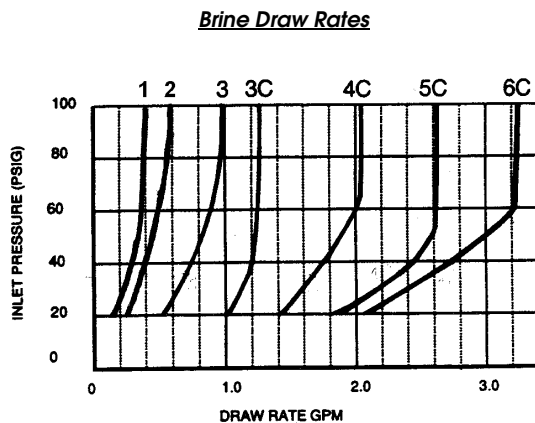
The manufacturer guarantees that, under normal operating conditions; that the loss of resin through attrition during the first three years shall not exceed 3% per year; that the resin shall not be washed out of the system during backwash; that the turbidity or color of the effluent, by reason of passing through the system, shall not be greater than the influent. The manufacturer also guarantees that any mechanical equipment defective in workmanship or materials within one year after installation or 18 months after shipment, whichever occurs first, shall be replaced F.O.B. factory.

### 8.4 FLOW RATE CURVES

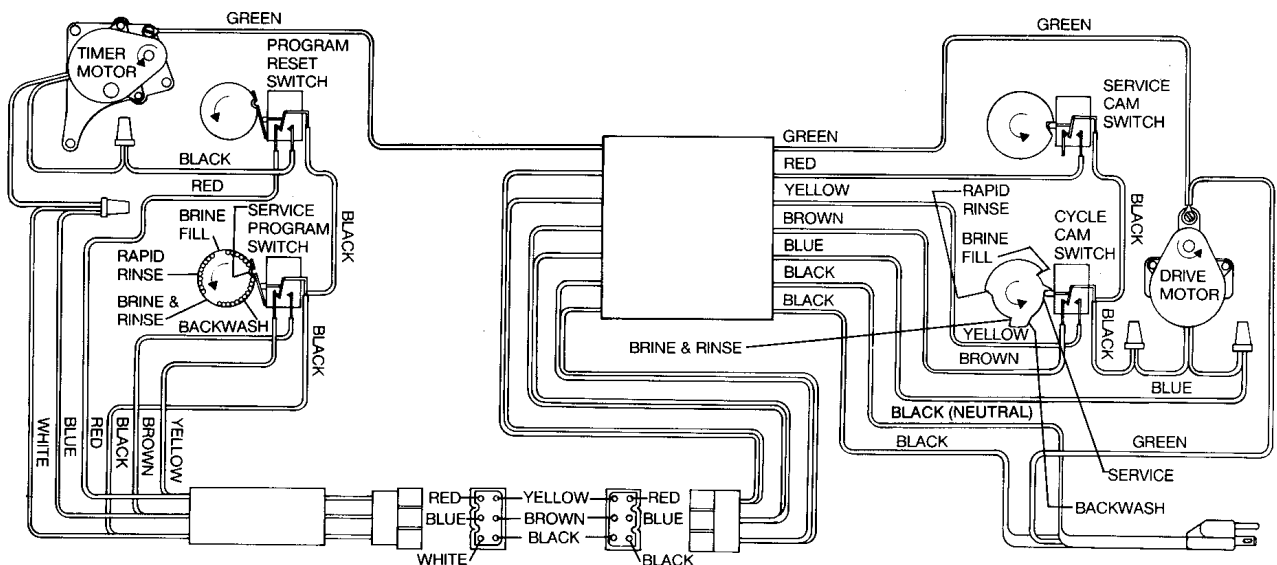
The curves below show the relationship between the step flows and the system pressures. These curves can be used to optimize the performance of your system or to determine if changing out the Brine Line Flow Control (BLFC) device would be advantageous. The numbers at the top of the curves refer to the injector number listed in section 1.2.

### 8.5 INTERNAL TIMER WIRING (N controls only)

The schematic drawing below details the wiring inside the electromechanical timer.



**Internal Timer Wiring Diagram - Model with N Controls**



### 8.6 INSTALLATION DRAWINGS

The pages that follow contain the Installation drawings for the twin-tank softeners.

### 8.7 SERVICE REQUESTS AND REPLACEMENT PARTS

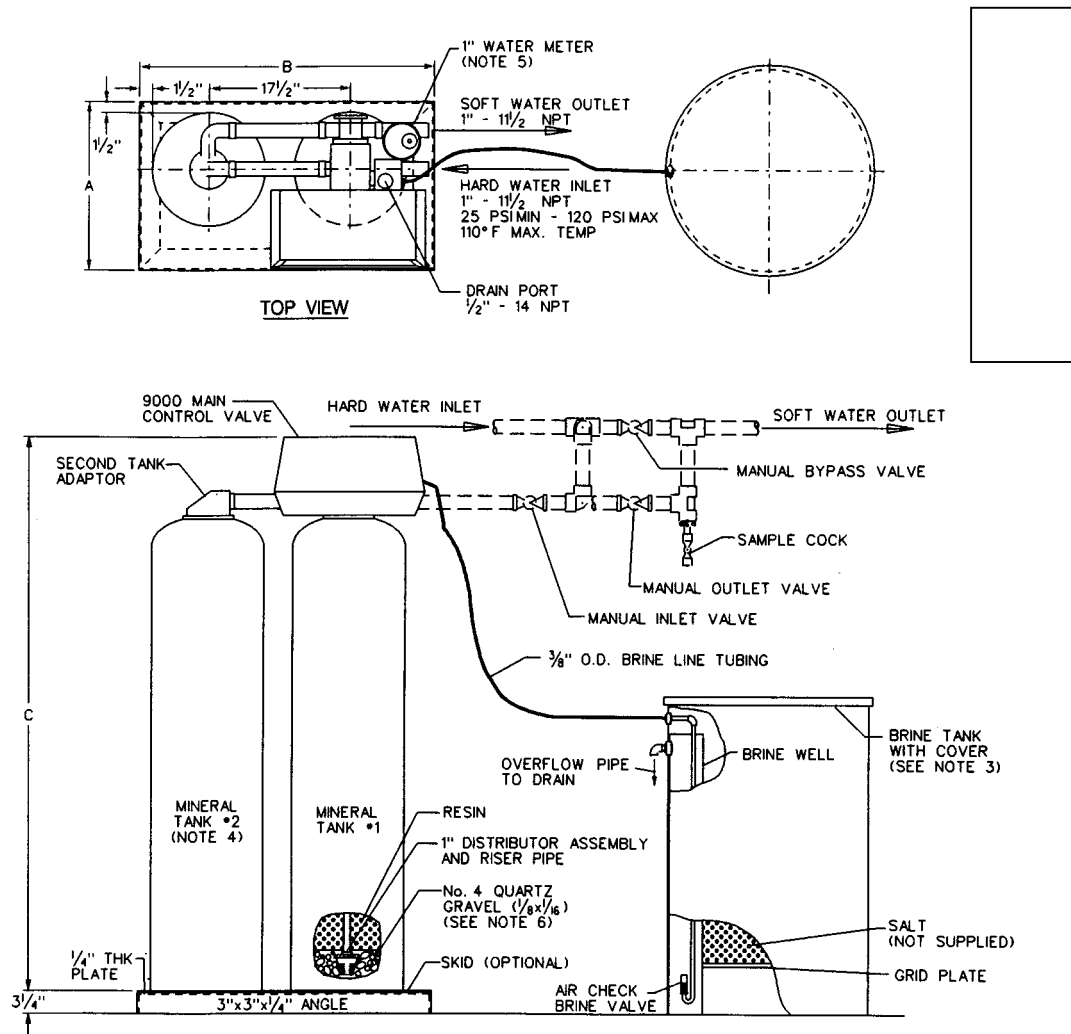
When requesting service, ordering replacement parts, or in need of warranty services, please call the U.S. Filter/Kisco Service Department at (815)877-3041 or fax them at (815)877-0946. Remember to have the following information available prior to calling:

- Softener model number (see section 1.2)
- Date unit was placed into service
- This Operating Manual
- Description of problems or required part

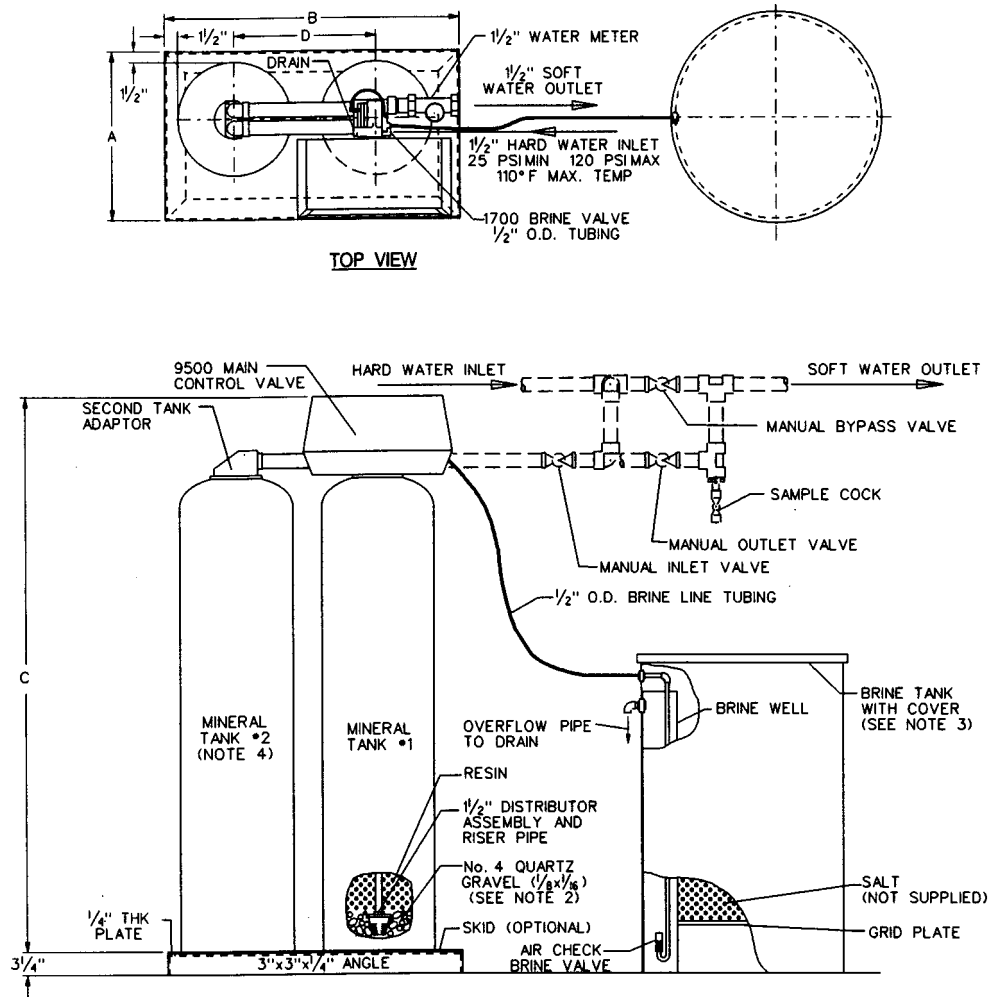
### 8.8 ADDENDUM FOR SKID-MOUNTED OPTION

Following the resin MSDS's is an addendum covering the installation of skid-mounted softeners. Use these procedures in place of those given in sections 2.1, 2.3, and 2.4.

*Dimensional Drawing of Twin-Tank Softener with 1" Valve*



**Dimensional Drawing of Twin-Tank Softener with 1½" Valve**



## ADDENDUM FOR SKID-MOUNTED OPTION

Your KF Twin-Tank Softener includes the option for mounting the two softener vessels on a single skid, completely assembled, tubed, and wired. This addendum consists of the portions of the manual that differ from that of the stand-alone system.

### 2.1 EQUIPMENT INCLUDED

Your U.S. Filter system has been shipped to you in the following assemblies.

- (2) tanks on (1) skid w/ these *installed*:
  - (2) bottom distributors
  - (1) valve w/ cover
  - (2) drain line flow controls (DLFC)
  - (2) brine line flow controls (BLFC)
  - (2) brine injector throats & nozzles
  - (2) upper dispersers
  - (1) tank adapter
  - (1) water meter
  - Interconnect piping, couplings, clips
- (1) tubing fitting for brine inlet line
- (1) brine tank assy with these *installed*:
  - (1) brine tank
  - (1) well
  - (1) salt grid
  - (1) overflow fitting
  - (1) air check/safety vlv (18" brine tank)
  - (1) air check assy (24" brine tank)
  - (1) 3/8" tube elbow, fittings (7-16" dia)
  - (1) 1/2" bushing, elbow, fitting (18-24" dia)
  - (1) 6' length of brine tubing
  - (1) grommet for brine line hole in tank
- (1) lot of gravel (if appl.) & cation resin
- (2) Operating Manuals
- (1) Hardness Test Kit
- (1) 9VDC battery (units with 3200ET only)

Check to make sure that none of these appear damaged or missing. For more component details, refer to the drawings/lists in section 7.

### 2.3 GRAVEL AND RESIN LOADING

1. Place the skid on a firm and level foundation, preferably concrete, as close to the floor drain as possible. Be sure the skid is level; if not, set shims under the skid until plumb on all sides.
2. Disconnect the interconnecting piping from the valve on top of mineral tank #1 (the one with the controller attached to it), and remove this valve and the

adapter on mineral tank #2. To remove the valve or adapter, spin it counter-clockwise and lift it off its tank.

3. The riser pipe-distributor assemblies have been shipped in the mineral tanks. Inspect the assemblies to be sure they are not damaged; if so, replace before proceeding. Cover the top of the riser pipes with tape or a plastic cap to prevent gravel and resin from getting inside the riser pipes.
4. Fill each tank with water to about 1/3 full. Center the riser pipe-distributor in the top opening of the mineral tank. Pour the proper quantity of gravel (as shown on the specification table in section 1.2) in the mineral tank - make or buy a large funnel to prevent the gravel from spilling. Level the gravel.

**NOTE:** *Gravel is not used in vessels with diameters of 7", 9", 10", or 12".*

5. Using the same funnel, pour the proper quantity of resin (see section 1.2) into each softener. Fill the tank with water and soak the resin for at least 2 hours.

#### CAUTION

**Before installing the valve or adapter, remove the tape or cap from the top of the riser pipes.**

### 2.4 VALVE AND PIPING INSTALLATION

**NOTE:** *Refer to section 1.2 for injector and Drain Line Flow Control (DLFC) sizes. The brackets ( ) refer to item numbers on the drawing/parts list in section 7.1.*

1. Use a silicone base grease to lubricate the two(2) O-rings at the base of the control valve (items #5 and 6 for the 1" valve, or items #20 and 21 for the 1 1/2" valve). Also lubricate the two(2) O-rings at the base of the tank #2 adapter items 2 and 3 for the 1" valve, or items #20 and 21 for the 1 1/2" valve).

2. Carefully thread the control valve and the adapter clockwise into the center opening in the top of each tank. Make sure that the riser pipe goes into the center opening in the base of the valve or adapter. Hand tighten only - do not use a wrench or any device to apply additional torque or leverage.
3. Connect the control valve (on tank #1) to the adapter (on tank #2). For 1" valves, lubricate the four (4) o-ring couplings (items 1 on the 1" adapter drawing), insert them into both ends of the interconnecting piping yoke, and use the four (4) clips to attach the yoke to the valve and adapter. For 1½" valves, lubricate the four (4) o-rings on the ends of the interconnecting piping yoke, plug the yoke into the valve and adapter, and secure with the eight (8) fasteners.

**NOTE:** *The two tanks must be positioned to relieve any strain on the yokes or piping.*

4. Locate the brine tank near the mineral tanks. The brine tank location should be such that it will not interfere with access to the mineral tank control valve or filling the brine tank with salt. The tank must be placed on a smooth firm foundation.
5. Install the piping using the following procedures and the applicable installation drawing on the next page. Comply with all local, state, and federal plumbing codes.
  - A. Reconnect the inlet and outlet piping to the valve and/or meter connections.

#### **CAUTION**

**Solder joints at the drain must be done prior to connecting the drain line to the valve. Failure to do this could cause interior damage to the drain line flow control (DLFC) washer.**

- B. Connect the open port of the DLFC housing (the larger connection on the side of the valve) to an open floor drain.

There must be a 4" air gap between the drain pipe and the floor drain. Teflon tape is the only sealant to be used on the drain fitting. Do not reduce the pipe or tube size of the drain port connection. Make as short a run of drain piping as possible. If it is necessary to run the drain line overhead, consult the factory for proper recommendations.

- C. Loosely thread the tubing for the brine inlet line onto the valve's brine inlet connection. On 1" valves, the brine inlet is on the brine line flow control (BLFC) - item (11) in section 7.1. On 1½" valves, the brine inlet is on the brine valve assembly - item (1) in section 7.2.
- D. Run the brine tubing between the air check valve on the brine tank to the control valve's brine inlet connection. Cut any excess tubing.
- E. U.S. Filter recommends that drain tubing be installed connecting the overflow elbow on the side of the brine tank to an open floor drain. Do not run this line overhead; it must be to a gravity drain. Do not make a direct connection to the floor drain.
6. Place approximately 12" of water in the brine tank. Do not add salt at this time.
7. Open the bypass valve, close the inlet and outlet valves, and slowly turn on the main water supply. Open a cold soft water tap nearby and let it run a few minutes or until the system is free from foreign material that may have resulted from the installation. Once clean, close the water tap and bypass valve, and open the inlet valve (leave outlet shut).
8. Plug the loose end of the meter cable into the meter cap assembly (the other end is attached to the control drive).
9. Plug the control unit into an outlet that can deliver the proper type of electrical power (see section 1.2).

10. Using steps 16 and 17 in the standard section 2.4 (near the front of this manual), program the 3200ET for alternating service and immediate regeneration.

11. Proceed with the Startup instructions given in the next section, 3.0.