

# North Star<sup>®</sup>

WATER CONDITIONING

## City Softener Model NSR 17CS

How to install, operate  
and maintain your  
Ultra Demand Automatic  
Water Conditioner



# Installation and Operation Manual

If you have any questions or concerns when installing, operating or maintaining your water conditioner, call our toll free number:

**1-800-972-0135**

Monday- Friday, 7 AM - 6 PM CST

or visit **[www.northstarconditioning.com](http://www.northstarconditioning.com)**

When you call, please be prepared to provide the model, date code and serial number of your product, found on the rating decal, located on the rim below the salt lid hinges.

Point-of-entry system tested and certified by NSF International for NSF/ANSI 372, and is not certified for material safety, contaminant reductions or structural integrity by NSF International.

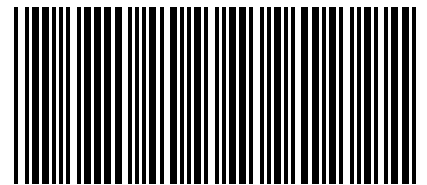


Certified to  
NSF/ANSI 372



Designed, Engineered &  
Assembled in the U.S.A.

Manufactured and warranted by  
North Star Water Conditioning  
1890 Woodlane Drive  
Woodbury, MN 55125



7351101 (Rev. B 8/20/15)

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## Inspect Shipment

The parts required to assemble and install the water softener are included with the unit. Thoroughly check the water softener for possible shipping damage and parts loss. Also inspect and note any damage to the shipping carton.

Remove and discard (or recycle) all packing materials. To avoid loss of small parts, we suggest you keep the small parts in the parts bag until you are ready to use them.

### WATER CONDITIONER WARRANTY

**Warrantor: North Star Water Conditioning, 1890 Woodlane Drive, Woodbury, MN 55125**

Warrantor guarantees, to the original owner, that:

#### **One Year Full Warranty:**

- For a period of one (1) year from the date of purchase, all parts will be free from defects in materials and workmanship and will perform their normal functions.

#### **Limited Warranties:**

- For a period of ten (10) years from the date of purchase, the salt storage tank and fiberglass mineral tank will not rust, corrode, leak, burst, or in any other manner, fail to perform their proper functions.
- For a period of three (3) years from the date of purchase, the electronic control board and valve body will be free of defects in materials and workmanship and will perform their normal functions.

If, during such respective period, a part proves to be defective, Warrantor will ship a replacement part directly to your home, without charge.

#### **General Provisions**

Damage to any part of this water conditioner because of misuse, misapplication, neglect, alteration, accident, installation or operation contrary to our printed instructions, or damage caused by any unusual force of nature such as, but not limited to, freezing, flood, hurricane, tornado, or earthquake is not covered by this warranty. In all such cases, regular parts and service charges will apply.

We assume no warranty liability in connection with this water conditioner other than specified herein. This warranty is in lieu of all other warranties, expressed or implied, including warranties of fitness for a particular purpose. We do not authorize any person or representative to assume for us any other obligations on the sale of this water conditioner.

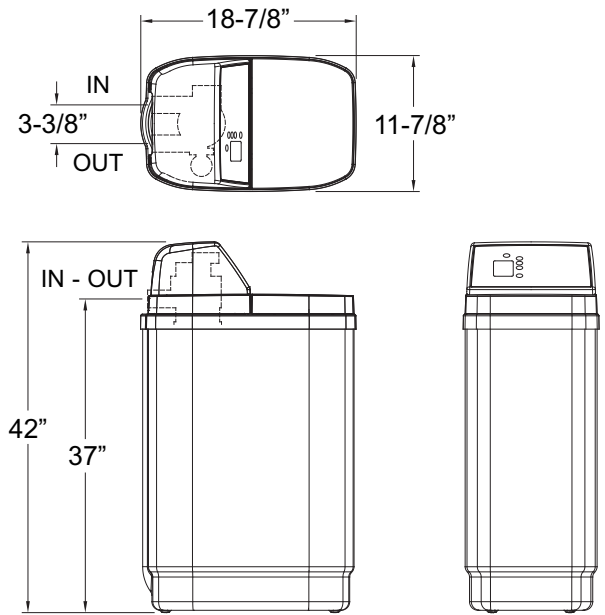
Should a defect or malfunction occur, contact your contractor. If you are unable to contact your contractor, return the part, freight prepaid, directly to the factory at the address below. Enclose with the part a full description of the problem, with your name, full address, date purchased, model and serial numbers, and selling contractor's name and address. We will repair or replace the part and return it to you at no cost if our repair department determines it to be defective under the terms of the warranty.

This warranty gives you specific legal rights and you may have other rights which vary from state to state.

This water conditioner is manufactured by  
North Star Water Conditioning, 1890 Woodlane Drive, Woodbury, MN 55125  
Customer Information Telephone No. 1-800-972-0135

# Specifications & Dimensions

		Model NSR 17CS
Model Code	CS17	
Nominal Media Tank Size	9" dia. x 35"	
Softening Capacity (Grains @ Salt Dose)	9,388 @ 1.85 lbs. 14,175 @ 3.12 lbs. 18,951 @ 5.66 lbs.	
Efficiency (Grains/Pound of Salt @ Min. Salt Dose)	5,075 @ 1.85 lbs.	
Water Used During Regeneration @ Min. Salt Dose	4.8 gal. / 1,000 grains	
Total Water Used Per Regeneration @ Max. Salt Dose	46.2 gallons	
Service Flow Rate	6.0 gpm	
Amount of High Capacity Ion Exchange Resin	0.62 cu. ft.	
Amount of Activated Carbon	0.21 cu. ft.	
Pressure Drop at Service Flow Rate	9.0 psig	
Water Supply Max. Hardness	50 gpg	
Intermittent Flow* @ 15 PSI	8.2 gpm	
Water Pressure Limits (min. / max.)	20 - 125 psi	
Water Temperature Limits (min. / max.)	40 - 120 °F	
Minimum Water Supply Flow Rate	3 gpm	
Maximum Flow Rate to Drain during Recharge	2.0 gpm	
Capacity at Chlorine Concentration** of:	0.50 ppm	1,770,000 gal.
	0.75 ppm	1,160,000 gal.
	1.0 ppm	870,000 gal.
	1.5 ppm	580,000 gal.
	2.0 ppm	450,000 gal.



**FIG. 1**

\*Intermittent flow rate does not represent the maximum service flow rate used for determining the conditioner's rated capacity and efficiency. Continuous operation at flow rates greater than the service flow rate may affect capacity and efficiency performance.

\*\*Typical residential chlorine concentration is 0.5 to 1.0 ppm.

**Variable Salt Dose:** The salt dose is selected by the electronic controls at regeneration time based on the amount needed.

## Before You Start

- The water softener requires a minimum water flow of 3 gallons per minute at the inlet. Maximum allowable inlet water pressure is 125 psi. If your house water pressure is over the maximum, install a pressure reducing valve in the water supply pipe to the system (Adding a pressure reducing valve may reduce the flow). If your home is equipped with a back flow preventer, an expansion tank must be installed in accordance with local codes and laws.
- The water softener works on 28V DC electrical power, supplied by a direct plug-in power supply (included). Be sure to use the included power supply and plug it into a nominal 120V, 60 Hz household outlet that is in a dry location only, grounded and properly protected by an overcurrent device such as a circuit breaker or fuse.
- Do not use this system to treat water that is microbiologically unsafe or of unknown quality without adequate disinfection upstream or downstream of the system.



European Directive 2002/96/EC requires all electrical and electronic equipment to be disposed of according to Waste Electrical and Electronic Equipment (WEEE) requirements. This directive or similar laws are in place nationally and can vary from region to region. Please refer to your state and local laws for proper disposal of this equipment.

# Installation Requirements

## LOCATION REQUIREMENTS

Consider all of the following when selecting an installation location for the water softener.

- Do not locate the water softener where freezing temperatures occur. Do not attempt to treat water over 120°F. Freezing temperatures or hot water damage voids the warranty.
- To condition all water in the home, install the water softener close to the water supply inlet, and upstream of all other plumbing connections, except outside water pipes. Outside faucets should remain on hard water to avoid wasting conditioned water and salt.
- A nearby drain is needed to carry away regeneration discharge (drain) water. Use a floor drain, laundry tub, sump, standpipe, or other options (check your local codes). See "Air Gap Requirements" and "Valve Drain Requirements" sections.
- The water softener works on 28V DC electrical power, supplied by a direct plug-in power supply (included). Provide nearby a 120V, 60 Hz electrical outlet, in accordance with national and local codes.
- Always install the water softener between the water inlet and water heater. Any other installed water conditioning equipment should be installed between the water inlet and water softener (See Figure 3 below).
- Avoid installing in direct sunlight. Excessive sun heat may cause distortion or other damage to non-metallic parts.

## PLUMBING CODES

All plumbing must be completed in accordance with national, state and local plumbing codes.

In the state of Massachusetts: The Commonwealth of Massachusetts plumbing code 248-CMR shall be adhered to. A licensed plumber shall be used for this installation.

## AIR GAP REQUIREMENTS

A drain is needed for regeneration water (See Figure 2). A floor drain, close to the water softener, is preferred. A laundry tub, standpipe, etc. are other drain options. Secure valve drain hose in place. Leave an air gap of 1-1/2" between the end of the hose and the drain. This gap is needed to prevent backflow of sewer water into the water softener. Do not put the end of the drain hose into the drain.

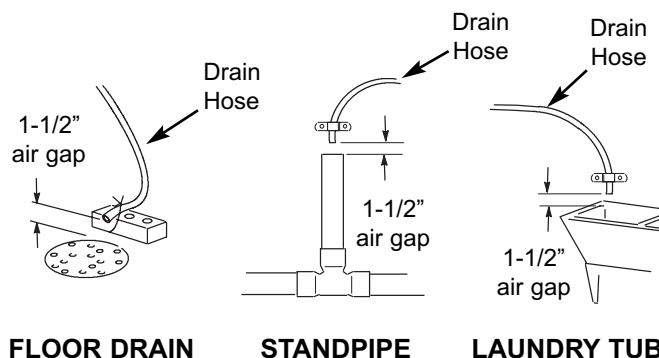


FIG. 2

## THE PROPER ORDER TO INSTALL WATER TREATMENT EQUIPMENT

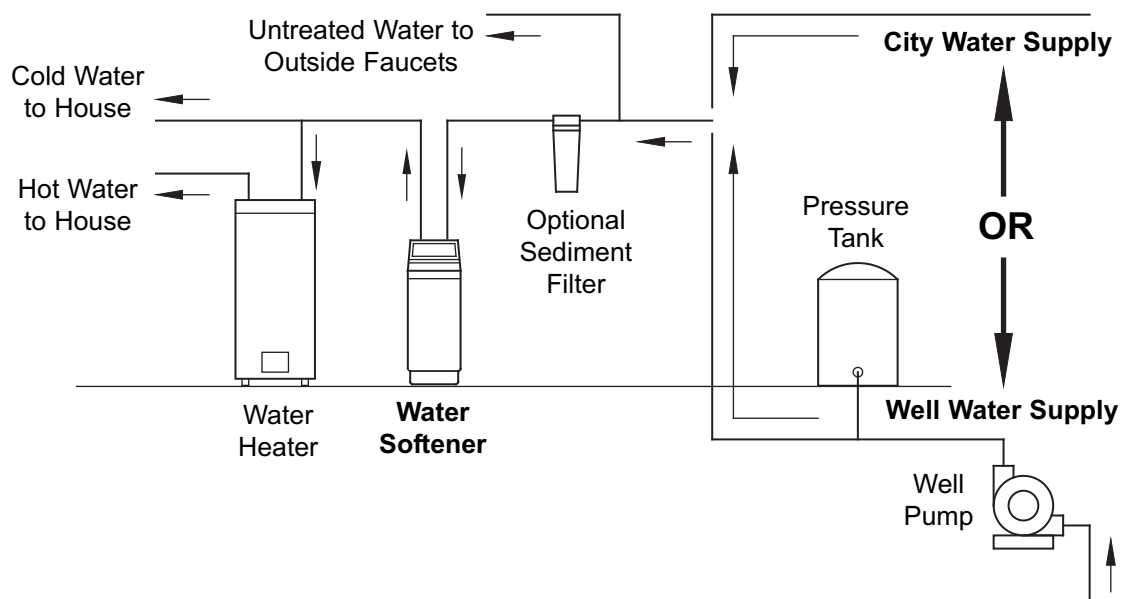


FIG. 3

# Installation Requirements

## VALVE DRAIN REQUIREMENTS

Using the flexible drain hose (included), measure and cut to the length needed. Flexible drain hose is not allowed in all localities (check your plumbing codes). If local codes do not allow use of a flexible drain hose, a rigid valve drain run must be used. Purchase a compression fitting (1/4 NPT x 1/2" minimum tube) and 1/2" tubing from your local hardware store. Plumb a rigid drain as needed (See Figure 5).

**NOTE:** Avoid drain hose runs longer than 30 feet. Avoid elevating the hose more than 8 feet above the floor. Make the valve drain line as short and direct as possible.

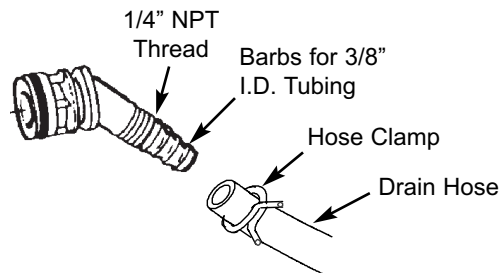


FIG. 4

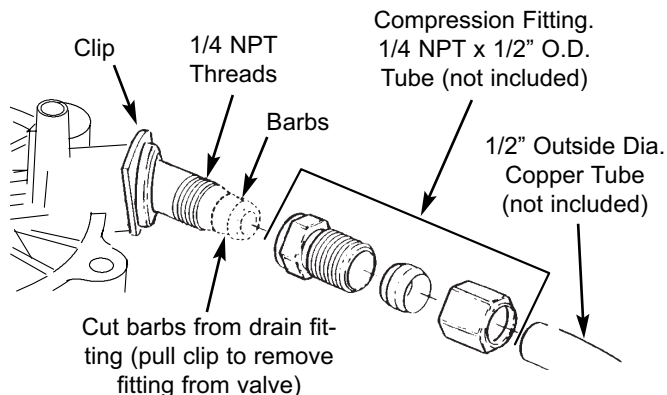


FIG. 5

## INLET / OUTLET PLUMBING OPTIONS

Always install either a single bypass valve (provided), as shown in Figure 6, or, if desired, parts for a 3 valve bypass system (not included) can be purchased and assembled, as shown in Figure 7. Bypass valves allow you to turn off water to the softener for maintenance if needed, but still have water in house pipes. Pipe fittings must be 3/4" minimum.

Use:

- Copper pipe
- Threaded pipe
- PEX (Crosslinked Polyethylene) pipe
- CPVC plastic pipe
- Other pipe approved for use with potable water

**IMPORTANT:** Do not solder with plumbing attached to installation adaptors and single bypass valve. Soldering heat will damage the adaptors and valve.

### SINGLE BYPASS VALVE

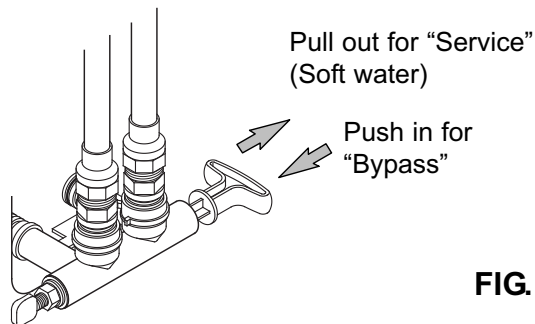


FIG. 6

### 3 VALVE BYPASS

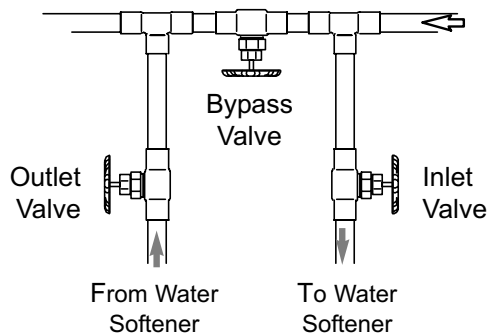
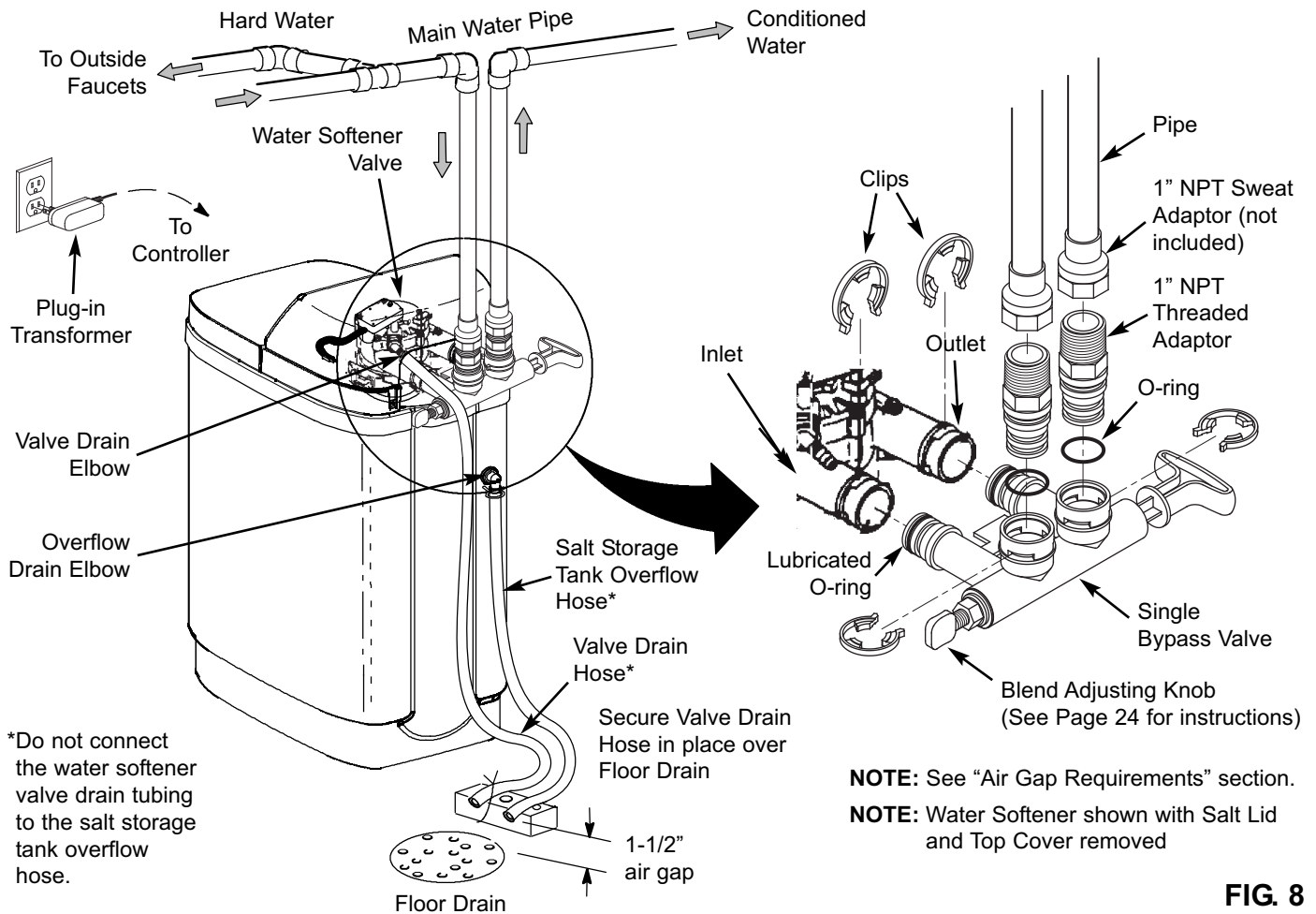


FIG. 7

# Installation Instructions

## TYPICAL INSTALLATION



**FIG. 8**

## TURN OFF WATER SUPPLY

1. Close the main water supply valve, located near the well pump or water meter.
2. Shut off the electric or fuel supply to the water heater.
3. Open all faucets to drain all water from house pipes.

**NOTE:** Be sure not to drain water from the water heater, as damage to the water heater elements could result.

## ASSEMBLY

1. North Star models are factory assembled. During installation, remove the salt lid and set it aside to prevent damage. Check the brinewell to be sure it is secured and vertical (See Figure 11). Unsnap the faceplate cover to expose the softener valve assembly.

2. Lift the brine valve out of the brinewell. Make sure the float stem is parallel to the stand tube so the seals will seat properly during operation. Place the brine valve back into the bottom of the brinewell and reinstall the brinewell cover.
3. Install the brine tank overflow grommet and elbow into the 13/16" diameter hole in the back of the salt storage tank wall.

## MOVE THE UNIT INTO PLACE

1. Move the water softener into the desired location. Set it on a solid, level surface.

**IMPORTANT:** Do not place shims directly under the salt storage tank to level the softener. The weight of the tank, when full of water and salt, may cause the tank to fracture at the shim.

continued on next page

# Installation Instructions

continued from previous page

2. Visually check and remove any debris from the water softener valve inlet and outlet ports.
3. Make sure the turbine assembly spins freely in the "out" port of the valve (See Figure 9).
4. If not already done, put a light coating of silicone grease on the single bypass valve o-rings.
5. Push the single bypass valve into the softener valve as far as it will go. Snap the two large holding clips into place, from the top down as shown in Figures 12 & 13.

**IMPORTANT:** Be sure the clips snap firmly into place so the single bypass valve will not pull out.

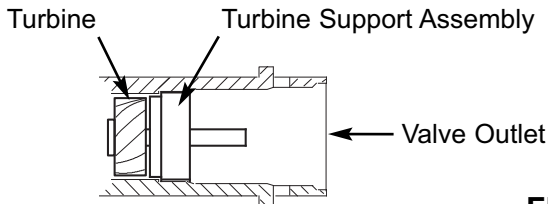


FIG. 9

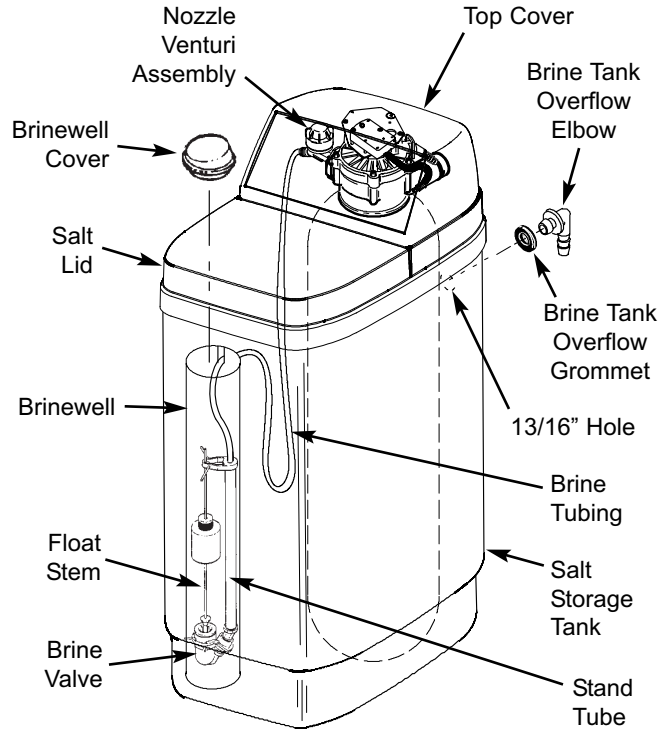


FIG. 11

## COMPLETE INLET AND OUTLET PLUMBING

Measure, cut, and loosely assemble pipe and fittings from the main water pipe to the inlet and outlet ports of the water softener valve. Be sure to keep fittings fully together, and pipes squared and straight.

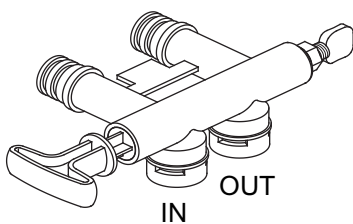
Be sure hard water supply pipe goes to the water softener valve inlet side.

**NOTE:** Inlet and outlet are marked on the water softener valve. Trace the water flow direction to be sure hard water is to inlet.

**IMPORTANT:** Be sure to fit, align and support all plumbing to prevent putting stress on the water softener valve inlet and outlet. Undue stress from misaligned or unsupported plumbing may cause damage to the valve.

Complete the inlet and outlet plumbing for the type of pipes you will be using.

## ALTERNATE BYPASS VALVE INSTALLATION



If connecting to floor level plumbing, install the bypass valve turned downward, as shown.

FIG. 10

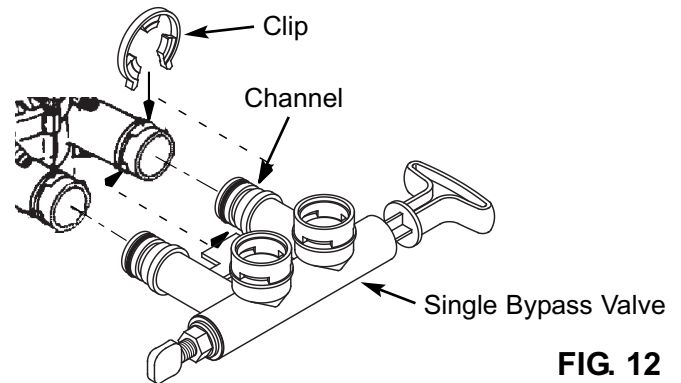


FIG. 12

### Correct Assembly

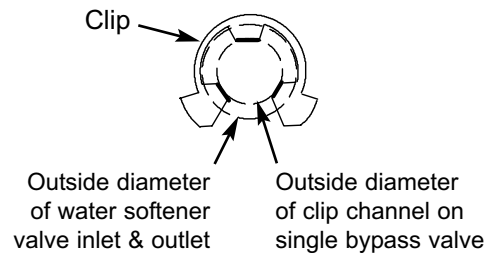


FIG. 13

**NOTE:** Be sure all 3 tabs of the clip go through the matching holes on the water softener valve inlet or outlet, and fully into the channel on the single bypass valve. Make sure that the tabs are fully seated.

# Installation Instructions

## GROUNDING INFORMATION (for Installations on Metal Pipe)

The house main incoming water pipe is often used to ground electrical outlets in the home. Grounding protects you from electrical shock. Installing the water softener with a plastic bypass valve will break this ground. Before beginning installation, purchase and securely install two grounding clamps and a #4 copper wire across the location where the softener will be, tightly clamping it at both ends, as shown in Figure 14.

**NOTE: Check local plumbing and electrical codes for proper installation of the ground wire. The installation must conform to them. In Massachusetts, plumbing codes of Massachusetts shall be conformed to. Consult with your licensed plumber.**

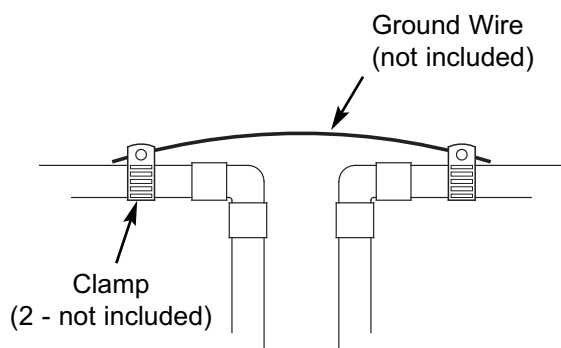


FIG. 14

## INSTALL VALVE DRAIN HOSE

**NOTE: See valve drain options on page 4.**

1. Measure, cut to needed length and connect the 3/8" drain line (provided) to the water softener valve drain fitting. Use a hose clamp to hold the hose in place.

**IMPORTANT:** If codes require a rigid drain line see "Valve Drain requirements" section.

2. Run the drain hose (or a rigid line) to the floor drain. Secure drain hose. This will prevent "whipping" during regenerations. **Be sure to provide a 1-1/2" minimum air gap to prevent possible sewer water backup.** See "Air Gap Requirements" section.

**NOTE:** In addition to a floor drain, you can use a laundry tub or standpipe as a good drain point for this hose.. Avoid long drain hose runs, or elevating the hose more than 8 feet above the floor.

## INSTALL SALT STORAGE TANK OVERFLOW HOSE

1. Measure, cut to needed length and connect the 3/8" drain line (provided) to the salt storage tank overflow elbow and secure in place with a hose clamp.
2. Route the hose to the floor drain, or other suitable drain point no higher than the drain fitting on the salt storage tank (This is a gravity drain). If the tank overfills with water, the excess water flows to the drain point. Cut the drain line to the desired length and route it neatly out of the way.

**IMPORTANT:** For proper operation of the water softener, do not connect the water softener valve drain tubing to the salt storage tank overflow hose.

## TEST FOR LEAKS

To prevent air pressure in the water softener and plumbing system, complete the following steps in order:

1. Fully open two or more softened cold water faucets close to the water softener, located downstream from the water softener.
2. Place the bypass valve (single or 3 valve) into the "bypass" position. See Figures 6 & 7 on Page 5.
3. Slowly open the main water supply valve. Run water until there is a steady flow from the opened faucets, with no air bubbles.
4. Place bypass valve(s) in "service" or soft water position as follows:
  - Single bypass valve: Slowly move the valve stem toward "service," pausing several times to allow the water softener to fill with water.
  - 3 valve bypass: Fully close the bypass valve and open the outlet valve. Slowly open the inlet valve, pausing several times to allow the water softener to fill with water.
5. After about three minutes, open a hot water faucet until there is a steady flow and there are no air bubbles, then close this faucet.
6. Close all cold water faucets and check for leaks at the plumbing connections that you made.
7. Check for leaks around clips at softener's inlet and outlet. If a leak occurs at a clip, depressurize the plumbing (turn off the water supply and open faucets) before removing clip. When removing clips at the softener's inlet or outlet, push the single bypass valve body toward the softener (See Figure 15). Improper removal may damage clips. Do not reinstall damaged clips.



# Installation Instructions

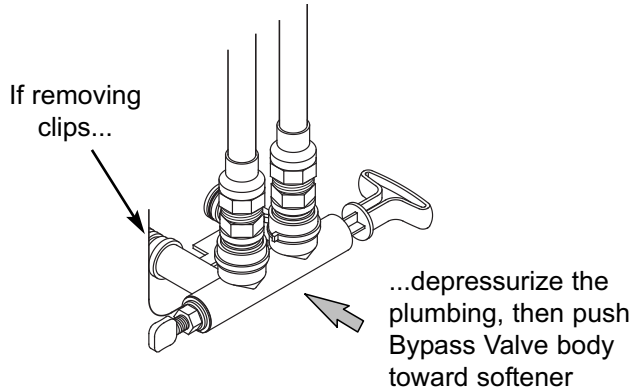


FIG. 15

## ADD WATER AND SALT TO THE SALT STORAGE TANK

1. Using a container, add about three gallons of clean water into the salt storage tank.
2. Add salt to the storage tank. Use nugget, pellet or coarse solar salts with less than 1% impurities.

## PLUG IN THE POWER SUPPLY

During installation, the water softener wiring may be moved or jostled from place. Be sure all leadwire connectors are secure on the back of the electronic board and be sure all wiring is away from the valve gear and motor area, which rotates during regenerations.

1. Plug the power supply into an electrical outlet that is not controlled by a switch.

## PROGRAM THE CONTROLLER

1. Install the softener's top cover and salt lid.
2. Complete the programming steps on Page 10.

## SANITIZE THE WATER SOFTENER / SANITIZE AFTER SERVICE

Care is taken at the factory to keep your unit clean and sanitary. Materials used to make the unit will not infect or contaminate your water supply, and will not cause bacteria to form or grow. However, during shipping, storage, installation and operation, bacteria could get into the unit. For this reason, sanitizing as follows is suggested\* when installing.

1. Slide open the salt lid, remove the brinewell cover and pour about 3 oz. (6 tablespoons) of household bleach into the softener brinewell. Replace the brinewell cover.
2. Make sure the bypass valve(s) is in the "service" (open) position.
- 3 **Start a recharge:** Press the RECHARGE button and hold for 3 seconds, until "Recharge Now" begins to flash in the display. This recharge draws the sanitizing bleach into and through the water softener. Any air remaining in the unit is purged to the drain.
4. After the recharge has completed, fully open a cold water faucet, downstream from the softener, and allow 50 gallons of water to pass through the system. This should take at least 20 minutes. Close the faucet.

\*Recommended by the Water Quality Association. On some water supplies, the unit may need periodic disinfecting.

## RESTART THE WATER HEATER

1. Turn on the electricity or fuel supply to the water heater and relight the pilot, if applicable.

**NOTE:** The water heater is filled with hard water and, as hot water is used, it refills with conditioned water. In a few days, the hot water will be fully conditioned. To have fully conditioned hot water immediately, wait until the initial recharge (previous step) is over. Then, drain the water heater (following instructions for water heater) until water runs cold.

# Programming the Water Softener

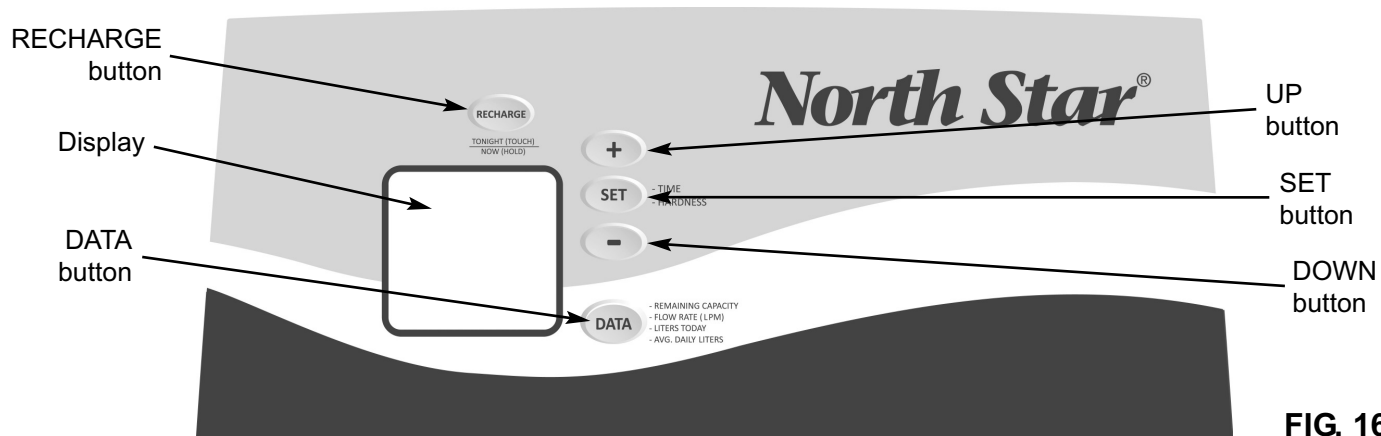


FIG. 16

## PROGRAM THE SOFTENER

When the power supply is plugged into the electrical outlet, the model code (CS17) and a test number (example: J3.8), are briefly shown in the display. Then the words "PRESENT TIME" appear and 12:00 PM begins to flash.

### SET PRESENT TIME OF DAY

If the words "PRESENT TIME" do not show in the display, press the SET button until they do.

1. Press the UP (+) or DOWN (-) buttons to set the present time. Up moves the display ahead; down sets the time back. Be sure AM or PM is correct.

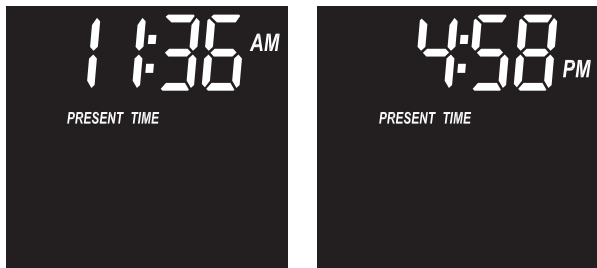


FIG. 17

**NOTE:** Press buttons and quickly release to slowly advance the display. Hold the buttons down for fast advance.

### SET WATER HARDNESS NUMBER

1. Press the SET button once again to display a flashing "25" and the word "HARDNESS".



FIG. 18

2. Press the UP (+) or DOWN (-) buttons to enter the hardness of your water supply in grains per gallon (gpg)

**NOTE:** If your water supply contains iron, compensate for it by adding to the water hardness number. For example, assume your water is 20 gpg hard and contains 2 ppm iron. Add 5 to the hardness number for each 1 ppm of iron. In this example, you would use 30 for your hardness number.

$$\begin{array}{r}
 20 \text{ gpg hardness} \\
 2 \text{ ppm iron} \times 5 = 10 \quad +10 \\
 \text{(times)} \qquad \qquad \qquad 30 \text{ HARDNESS NUMBER}
 \end{array}$$

3. Press the SET button once again to return to normal operating display.



FIG. 19

# Programming the Water Softener

## START A RECHARGE

1. Press the RECHARGE button and hold for three seconds, until "RECHARGE" begins to flash in the display, starting a recharge. This recharge draws the sanitizing bleach into and through the water softener. Any air remaining in the water softener is purged to the drain. During this time, periodically check for leaks.

**NOTE:** As with all other water system applications, leaks may occur. Leaks may not be immediately apparent. Recheck for leaks 24 hours after first recharge cycle is complete.

## POWER OUTAGE MEMORY

If electrical power to the water softener is lost, "memory" built into the timer circuitry will keep all settings for several hours. While the power is out, the display is blank and the water softener will not regenerate. When electrical power is restored, the following will occur:

Reset the present time only if the display is flashing. The HARDNESS and RECHARGE TIME never require resetting unless a change is desired. Even if the clock is incorrect after a long power outage, the softener operates as it should to keep your water soft. However, regenerations may occur at the wrong time of day until you reset the clock to the correct time of day.

**NOTE:** If the water softener was regenerating when power was lost, it will now finish the cycle.

# Customizing Features / Options

## RECHARGE NOW

The RECHARGE button is used to initiate an immediate recharge.

1. Press and hold the RECHARGE button until the words "RECHARGE NOW" flash in the display.

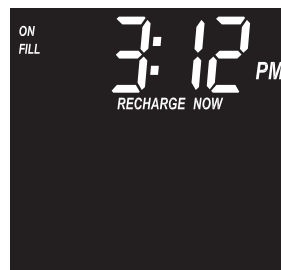


FIG. 20

RECHARGE NOW initiated

The softener enters the fill cycle of regeneration right away. "RECHARGE NOW" will flash during the regeneration. When completed, full water conditioning capacity is restored..

**NOTE:** Avoid using hot water while the softener is regenerating, because the water heater will refill with bypass hard water.

## RECHARGE TONIGHT

If you do not want to start an immediate recharge, but would like to schedule an extra recharge at the next preset recharge time, do the following:

1. Press and release (do not hold) the RECHARGE button.

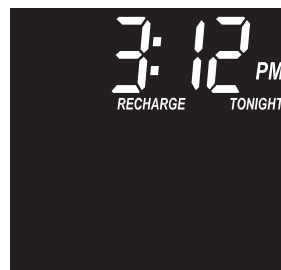


FIG. 21

RECHARGE TONIGHT initiated

The words "RECHARGE TONIGHT" flash in the display, and the softener will recharge at the next recharge time. The words "RECHARGE NOW" will flash during the regeneration. When completed, full water conditioning capacity is restored.

# Customizing Features / Options

## DATA DISPLAYS

With repeated presses of the DATA button, you can obtain operational information about your water softener.

### Capacity (remaining)

This is the percentage of water softening capacity remaining. Immediately after a regeneration, 100% shows. Then, as water is used, the percentage decreases until the next regeneration. During regenerations, the percentage increments upward.

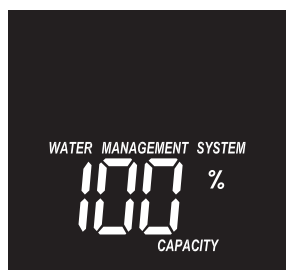


FIG. 22

### Flow Rate, GPM\*

When using soft water, this display shows the gallons per minute flow rate passing through the softener. Zero shows if water is not in use.

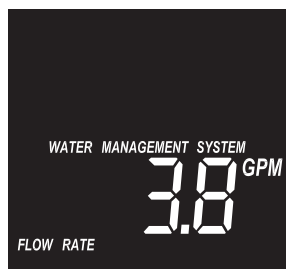


FIG. 23

### Gallons\* Today

Each day, beginning at midnight, the timer keeps a running count of the total gallons of water passing through the softener.

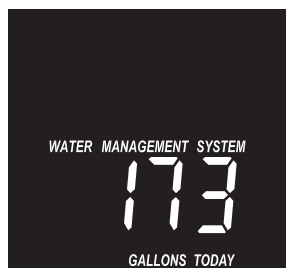


FIG. 24

### Average Daily Gallons\*

The figure displayed is the average gallons of water used by the household each day, over the past seven day period.

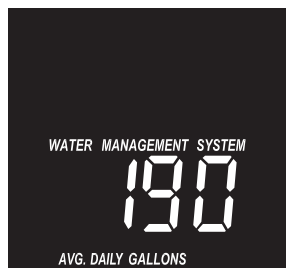


FIG. 25

\*You can change the units displayed from gallons to liters, or vice versa, as described on page 14. If gallons today, or average daily gallons exceeds 1999, a (x 10) indicator appears. This means you must multiply the number shown times 10.

## SET RECHARGE (REGENERATION) TIME

1. Press the SET button and hold for three seconds, until a flashing "2:00AM" and the words "RECHARGE TIME" are displayed. This is a good time for the recharge to start in most households, because water is not in use.



FIG. 26

2. If you want to change the recharge start time, press the UP (+) or DOWN (-) buttons until the desired time shows. Be sure AM or PM is correct.
3. Press the SET button five times to return to the normal run display (See Fig. 19).

## VACATION NOTE

North Star demand water softeners, as set at the factory, recharge only while water is being used and softening capacity must be restored. For this reason, the softener will not recharge when you are away from home for extended periods. However, if you set the "Maximum Days Between Recharges" feature, the softener will regenerate even when no water is used.

## MAXIMUM DAYS BETWEEN REGENERATIONS

The water softener automatically controls regeneration frequency. This provides the greatest operating efficiency and, under most conditions, this feature should be left in this automatic mode. However, you may modify this feature if you want to force a regeneration every set number of days. For example, if your water supply contains clear water iron, you may want the softener to regenerate every few days to keep the resin bed clean. The maximum days between recharges may be set from 1 to 15 days, as follows:

**NOTE:** The softener will recharge on its own if needed, even if it is before the set number of days.

1. Press the SET button and hold for three seconds, until the "Recharge Time" screen (Figure 26) is displayed.
2. Once in this display, press the SET button again and the display in Figure 27 is shown.

# Customizing Features / Options

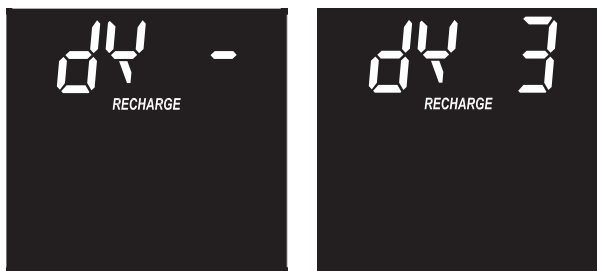


FIG. 27

3. Press the UP (+) or DOWN (-) buttons to set the number of days.
4. Press the SET button four times to return to the normal time of day screen.

## 97% FEATURE

If this feature is set ON, the unit will automatically recharge when 97% capacity has been used, at any time of day. The softener is shipped with this feature set OFF.

1. Press the SET button and hold for three seconds, until the "Recharge Time" screen (Figure 26) is displayed.
2. Once in this display, press the SET button twice and the display in Figure 28 is shown.

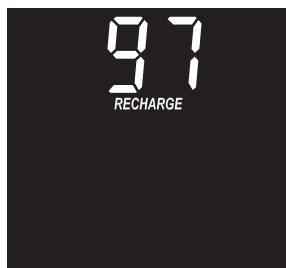


FIG. 28

3. Press the UP (+) or DOWN (-) buttons to set ON or OFF.
4. Press the SET button three times to return to the normal run display.

## ADJUST BACKWASH TIME AND FAST RINSE TIMES

If you experience salty tasting water after regeneration, you may need to increase the backwash and fast rinse times. The default backwash and fast rinse times depend on which model code is set. You may increase or decrease the backwash and fast rinse times, in 1 minute increments.

1. Press the SET button and hold for three seconds, until the "Recharge Time" screen (Figure 26) is displayed.
2. Once in this display, press the SET button three times and the "Backwash Time" screen (Figure 29) is displayed.
3. Use the UP (+) or DOWN (-) buttons to set the number of minutes desired for backwash.
4. Press the SET button again to advance to the "Rinse Time" screen (Figure 30).

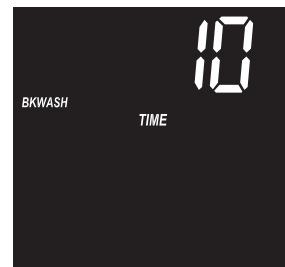


FIG. 29

5. Use the UP (+) or DOWN (-) buttons to set the number of minutes desired for fast rinse.
6. Press the SET button once again to return to the normal run display.



FIG. 30

## MODEL CODE

The model code is factory set at assembly and testing. The model code should never require resetting, but to check, or to set if previously omitted, follow the steps below.

1. Press the SET button and hold for three seconds, until the "Recharge Time" screen (Figure 26) is displayed.
2. Again, press the SET button and hold for three seconds. Either " - - - " or the previously set code will appear.



FIG. 31

3. Use the UP (+) or DOWN (-) buttons to select the correct model code (CS17).
4. Press the SET button three times to return to the normal time of day screen.

# Customizing Features / Options

## 12 OR 24 HOUR CLOCK

All time displays are shown in 12 hour (AM/PM) clock format at the default setting. If 24 hour clock format is desired, follow steps below:

1. Press the SET button and hold for three seconds, until the "Recharge Time" screen is displayed.
2. Again, press the SET button and hold for three seconds, until the model code screen is displayed.

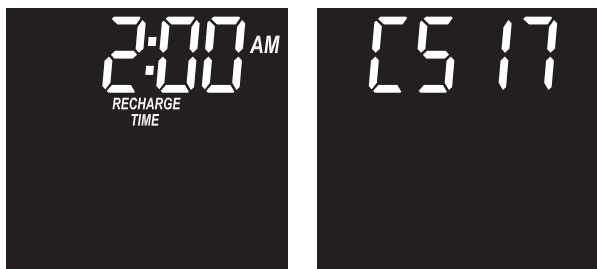


FIG. 32

3. Once in this display, press the SET button again and one of the two displays in Figure 33 is shown.

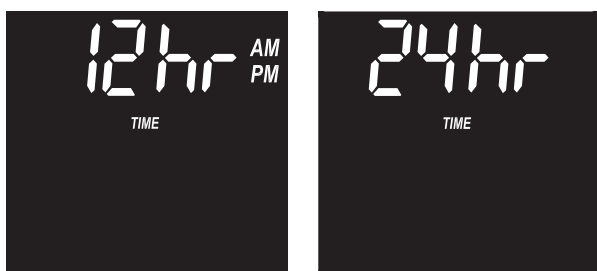


FIG. 33

4. Press the UP (+) or DOWN (-) buttons to select the time format.
5. Press the SET button twice to return to the normal time of day screen.

## GALLON OR LITER VOLUME UNITS

At the default setting, all water flow rate and usage displays are shown in gallons (GALS). Alternatively, you may select liters for volume units to display.

1. Press the SET button and hold for three seconds, until the "Recharge Time" screen is displayed.
2. Again, press the SET button and hold for three seconds, until the model code screen is displayed.
3. Once in this display, press the SET button twice and one of the two displays in Figure 34 is shown.

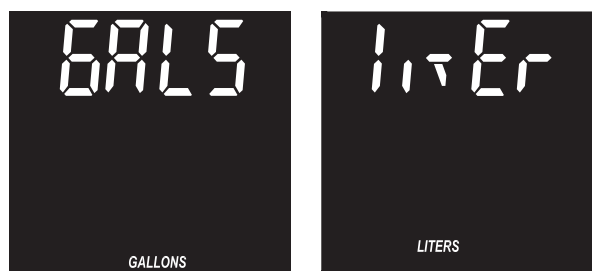


FIG. 34

4. Press the UP (+) or DOWN (-) buttons to select the volume units.
5. Press the SET button once again to return to the normal time of day screen.

# Water Softener Maintenance

## REFILLING WITH SALT

Brine (salt dissolved in water) is needed for every regeneration. The water for making brine is metered into the salt storage area by the softener valve and timer. If the water softener uses all the salt before more is added, hard water will result. Lift the brine tank lid and check the salt level every week. Be sure that the brinewell cover is on when adding salt.

**NOTE:** In humid areas it is best to keep the salt level less than half full and refill more often.

**RECOMMENDED SALT:** Cube, pellet, coarse solar, etc., water softener salt is recommended. This type of salt is high purity evaporated crystals, sometimes formed and pressed into briquets. It has less than 1% insoluble (not dissolvable in water) impurities. Clean, high grade rock salts are acceptable, but may require frequent brine tank cleaning to remove the "sludge" residue (insolubles) collecting at the bottom of the tank.

**SALT NOT RECOMMENDED:** Rock salt high in impurities, block, granulated, table, ice melting, or ice cream making salts, etc., are not recommended.

**SALT WITH IRON REMOVING ADDITIVE:** Some salts have an additive to help a water softener handle iron in the water supply. Although this may help keep the resin bed clean, it may also release corrosive fumes that will weaken and shorten the life of some water softener electronic parts.

## BREAKING A SALT BRIDGE

Sometimes a hard crust or salt "bridge" forms in the brine tank. This is usually caused by high humidity or the wrong kind of salt. When the salt bridges, an empty space forms between the water and the salt. Then salt will not dissolve in the water to make brine. Without brine, the resin bed is not recharged and hard water will result.

If the storage tank is full of salt, it is difficult to tell whether there is a salt bridge. A bridge may be underneath loose salt. The following is the best way to check for a salt bridge:

Salt should be loose all the way to the bottom of the tank. Hold a broom handle, or like tool, up to the softener, as shown in Figure 35. Make a pencil mark on the handle 1-2" below the top of the rim. Then, carefully push it straight down into the salt. If a hard object is felt before the pencil mark is even with the top, it is most likely a salt bridge. Carefully push into the bridge in several places to break it. **Do not try to break the salt bridge by pounding on the outside of the salt tank. You may damage the tank.**

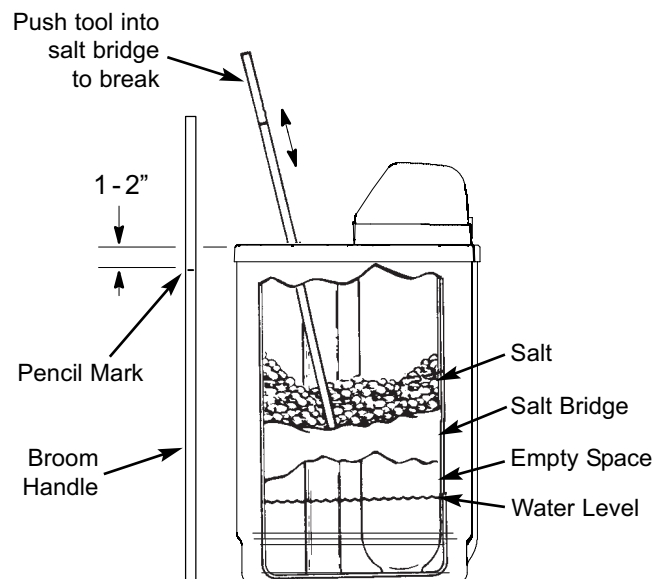


FIG. 35

# Water Softener Maintenance

## CLEANING THE NOZZLE & VENTURI

A clean nozzle & venturi (See Figure 36) is necessary for the water softener to work properly. This small unit creates the suction to move brine from the brine tank into the resin tank. If it should become plugged with dirt, silt, sand, etc., the water softener will not work and hard water will result.

To get access to the nozzle & venturi, remove the softener's top cover. Put the bypass valve(s) into the bypass position. Be sure the softener is in the service cycle (no water pressure at the nozzle & venturi). Then, holding the nozzle & venturi housing with one hand, turn the cap to remove it. Do not lose the o-ring seal. Lift out the screen support and screen. Then, remove the nozzle & venturi. Wash the parts in warm, soapy water and rinse in fresh water. If needed, use a small brush to remove iron or dirt. Be careful not to scratch, misshape, etc., surfaces of the nozzle & venturi. Also, check and clean the gasket and flow plug(s) if dirty.

Carefully replace all parts in the correct order. Lubricate the o-ring seal with silicone grease and put in place. Install and tighten the cap, by hand only. Do not overtighten, which could break the cap or housing. Put the bypass valve(s) into service (soft water) position.

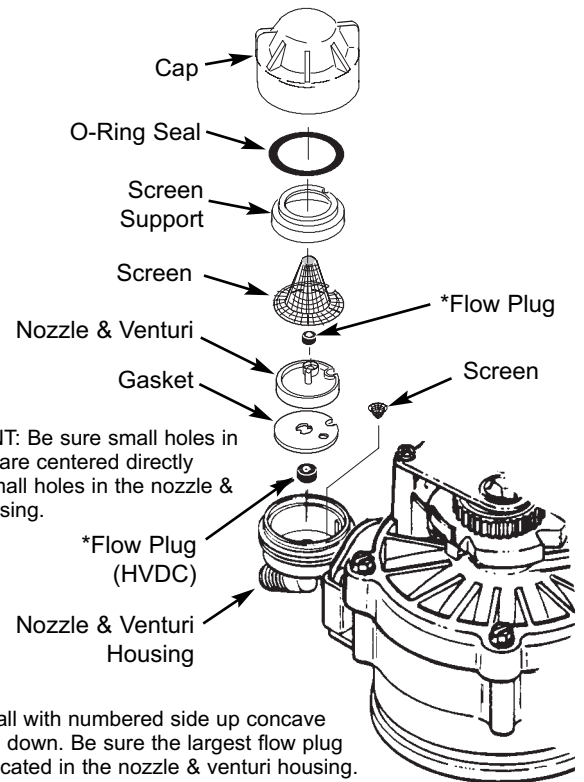


FIG. 36

## RESIN BED CLEANING

If the water supply contains clear water iron, regular resin bed cleaning is needed to keep the bed from coating with iron. Use resin bed cleaner, following directions on the container. Clean the resin every six months, or more often if iron appears in the conditioned water supply.

## Wiring Schematic

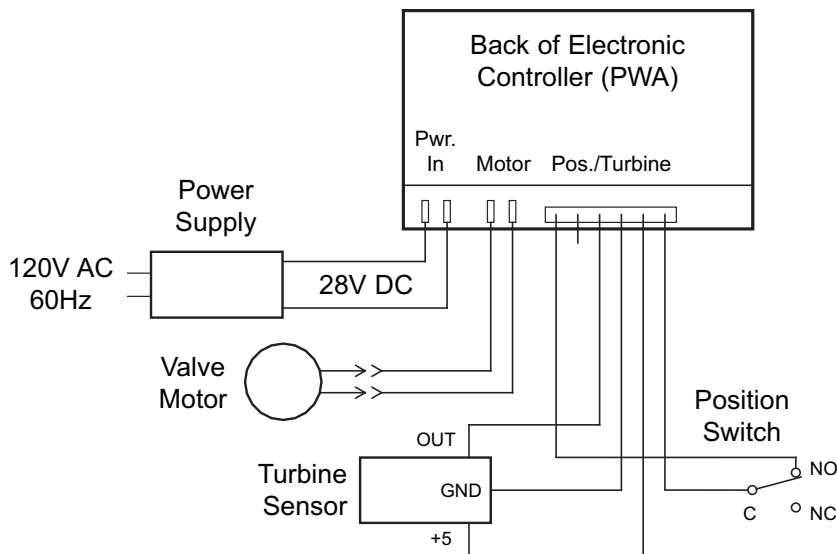


FIG. 37



# Troubleshooting

## TROUBLESHOOTING GUIDE

PROBLEM	CAUSE	CORRECTION
<b>No soft water</b>	No salt in the storage tank.	Add salt (See Page 15) and then initiate a "Recharge now," as shown on Page 11.
	Salt is "bridged."	Break salt bridge (See Page 15) and then initiate a "Recharge now," as shown on Page 11.
	If display is blank, power supply may be unplugged at wall outlet, power cable leads may be disconnected from the electronic control board, fuse may be blown, circuit breaker may be popped, or power supply may be plugged into a switched outlet which is "off."	Check for power loss due to any of these and correct. When power is restored, if the time is flashing in the display, it means time was lost during the outage. Set the present time (See Page 10). Other settings such as hardness are retained in memory during a power loss.
	Manual bypass valve(s) in bypass position.	Place bypass valve(s) in service position.
	Dirty, plugged or damaged nozzle & venturi.	Take apart, clean and inspect the nozzle & venturi assembly, as shown on Page 16.
	Valve drain hose plugged or restricted.	Drain hose must not have any kinks, sharp bends, or be raised too high above the softener.
<b>Water hard sometimes</b>	Bypassed hard water being used during recharge, due to present time or recharge time settings being incorrect.	Check the present time displayed. If not correct, refer to "Set Present Time" on Page 10. Check the recharge start time, as described on Page 12.
	Hardness number setting is too low.	Referring to "Setting Hardness" on Page 10, check the current hardness setting and increase if needed.
	Hot water being used when softener is recharging.	Avoid using hot water during recharges, because water heater refills with hard water.
	Increase in actual hardness of water supply.	Have unsoftened water sample tested. Referring to Page 10, check the current hardness setting and increase if needed.
<b>Motor stalled or clicking</b>	Motor malfunction or internal valve fault causing high torque on motor.	Contact your dealer for service.
<b>Error code E1, E3 or E4 displayed.</b>	Fault in wiring harness, connections to position switch, switch, valve or motor.	Contact your dealer for service.
<b>Error code E5 displayed.</b>	Electronic control malfunction.	Contact your dealer for service.

### TROUBLESHOOTING - INITIAL CHECKS

**Always make these initial checks first:**

1. Is display blank? Check power source.
2. Is Error code displayed? If so, go to "Automatic Electronic Diagnostics" on the next page.
3. Is correct time displayed? If not, recharges occur at the wrong time. Set the present time (See Page 10.)
4. Is there salt in the brine tank? If not, refill.
5. Is salt "bridged" (See Page 15)?
6. Are plumbing bypass valve(s) in service position?
7. Are inlet and outlet pipes connected to the water softener inlet and outlet respectively?
8. Is valve drain hose free of kinks and sharp bends, and not elevated over 8 feet above the floor.
9. Is the brine tube connected?
10. Check the hardness setting (See "Setting Hardness" on Page 10). Be sure it is correct for the household's water supply. Perform a hardness test on a raw water sample to compare with the setting.
11. Perform a hardness test on a softened water sample to determine whether a problem exists.

If no problem is found after making the initial checks, proceed to "Manually Initiated Electronic Diagnostics" on the next page.

# Troubleshooting

## AUTOMATIC ELECTRONIC DIAGNOSTICS

This water softener has a self-diagnostic function for the electrical system (except input power and/or water meter). The water softener monitors electronic components and circuits for correct operation. If a malfunction occurs, an error code appears in the display.



FIG. 38

While an error code appears in the display, all buttons are inoperable except the SET button. SET remains operational so the service person can perform the Manually Initiated Electronic Diagnostics, see below, to further isolate the problem.

### Procedure for removing error code from display:

1. Unplug power supply from electrical outlet.
2. Correct problem.
3. Plug power supply back in.
4. Wait 8 minutes. The error code will return if the problem was not corrected.

## MANUALLY INITIATED ELECTRONIC DIAGNOSTICS

Use the following procedures to advance the water softener through the regeneration cycles to check operation.

Lift off the salt lid, remove the top cover by unlocking the tabs in the back and rocking forward, to observe cam and switch operation during valve rotation.

1. Press and hold the DATA button for 3 seconds until one of the two displays in Figure 39 is shown, then release. The number in the top part of the display, after "dY", is days since the last recharge.

**NOTE:** If the softener is in the middle of a regeneration, the top part of the display shows the cycle of regeneration, and minutes of the cycle remaining. If two cycle names are flashing, the valve is in transition between the cycles.

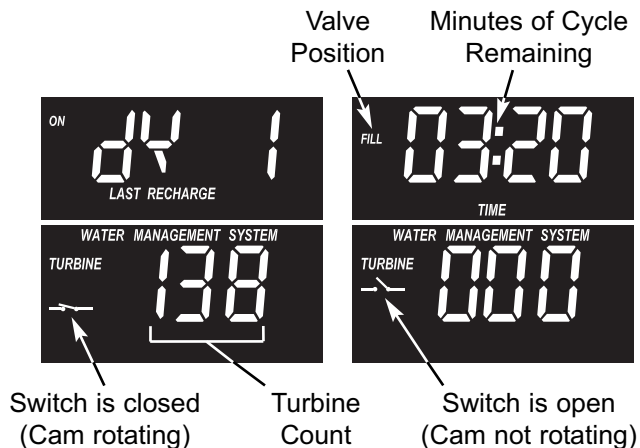


FIG. 39

2. The 3 digits under WATER MANAGEMENT SYSTEM indicate water meter operation as follows:

000 (steady) = Soft water not in use, and no flow through the meter.

Open a nearby soft water faucet.

000 to 199 (continual) = Repeats for each gallon of water passing through the meter.

3. Symbols in the display indicate POSITION switch operation (See Figure 39).
4. Use the RECHARGE button to manually advance the valve into each cycle and check correct switch operation.

**NOTE:** Be sure water is in contact with the salt, and not separated by a salt bridge (See "Breaking A Salt Bridge" section).

5. Press the DATA button again. The following information is available and may be beneficial for various reasons. This information is retained by the computer from the first time electrical power is applied to the face plate.

- a. The top half of the display shows the total number of recharges since the timer was connected to electrical power.



FIG. 40

- b. The bottom half of the display shows the number of days since the timer was connected to electrical power. If over 1999 days, a (x 10) indicator shows, meaning you must multiply the number shown times 10.

6. Press DATA once again to return to the normal time of day screen.

# Troubleshooting

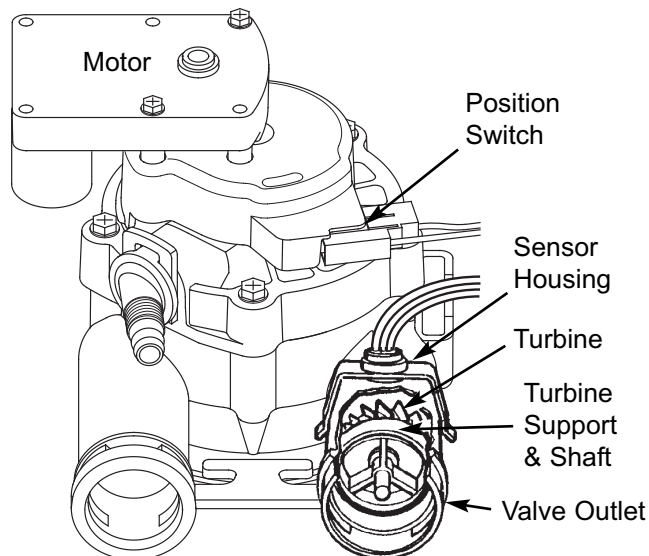


FIG. 41

## RESETTING TO FACTORY DEFAULTS

To reset the electronic controller to its factory default for all settings (time, hardness, etc.):

1. Press the SET button and hold it until the display changes twice to show the flashing model code.
2. Press the UP (+) button (a few times, if necessary) to display a flashing "SoS".

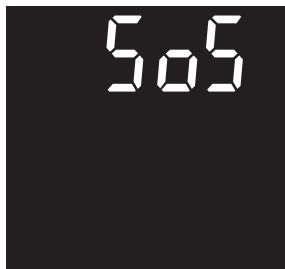


FIG. 42

3. Press the SET button three times, and the electronic controller will restart.
4. Set the present time and hardness, as described on page 10.

## MANUAL ADVANCE REGENERATION CHECK

This check verifies proper operation of the valve motor, brine tank fill, brine draw, regeneration flow rates, and other controller functions. Always make the initial checks, and the manual initiated diagnostics.

**NOTE:** The electronic control display must show a steady time (not flashing). If an error code

shows, first press the SET button to enter the diagnostic display.

1. Press the RECHARGE button and hold in for 3 seconds. RECHARGE begins to flash as the softener's valve advances from the service to fill position. Remove the brinewell cover and, using a flashlight, observe fill water entering the tank. If water does not enter the tank, look for an obstructed nozzle, venturi, fill flow plug, brine tubing, or brine valve riser pipe.
2. After observing fill, press the RECHARGE button to move the softener's valve into the brine position. A slow flow of water to the drain will begin. Verify brine draw from the brine tank by shining a flashlight into the brinewell and observing a noticeable drop in the liquid level. This may take 15 to 20 minutes.

**NOTE:** Be sure water is in contact with the salt, and not separated by a salt bridge (See "Breaking A Salt Bridge" section).

If the water softener does not draw brine, check for (most likely to least likely):

- Dirty or plugged nozzle and venturi, see "Cleaning the Nozzle and Venturi" section.
- Nozzle and venturi not seated on the gasket, or gasket deformed.
- Valve seals leaking (See Troubleshooting).
- Restriction in valve drain, causing a back-pressure (bends, kinks, elevated too high, etc.). See "Install Valve Drain Hose" section.
- Obstruction in brine valve or brine tubing.

**NOTE:** If water system pressure is low, a too-long or elevated drain hose may cause back pressure, stopping brine draw. Avoid drain hose runs longer than 30 feet. Avoid elevating the hose more than 8 feet above the floor.

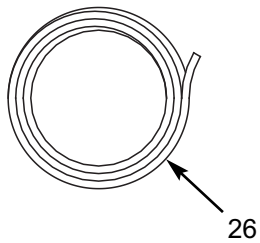
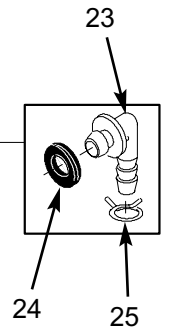
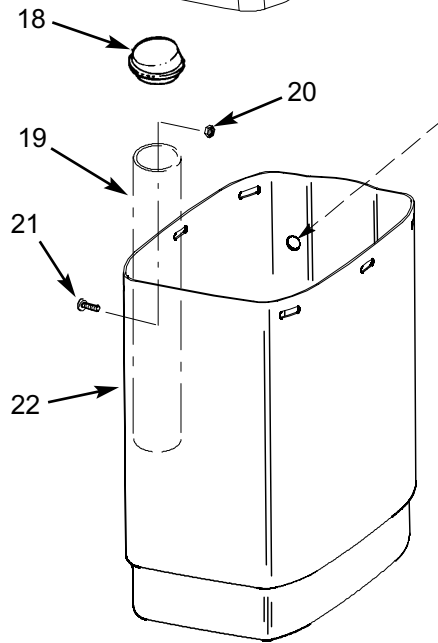
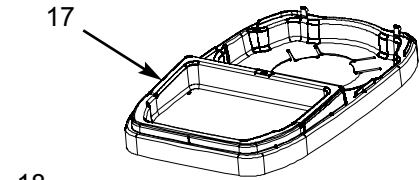
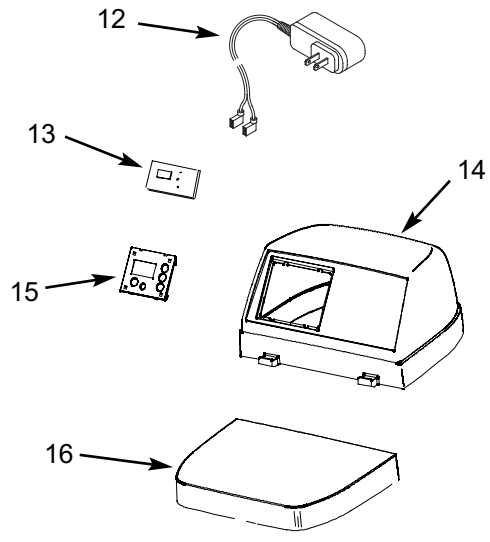
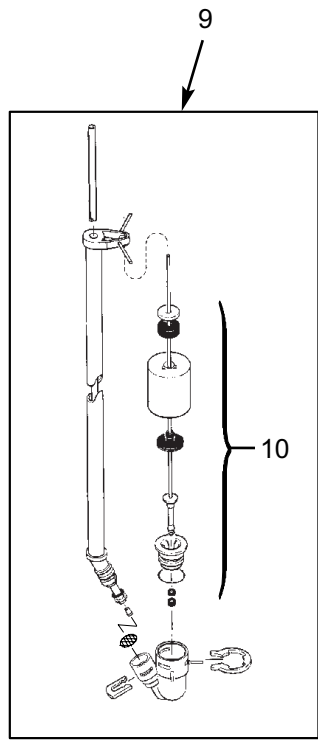
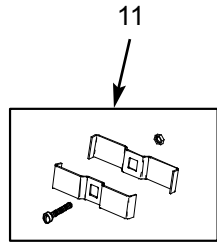
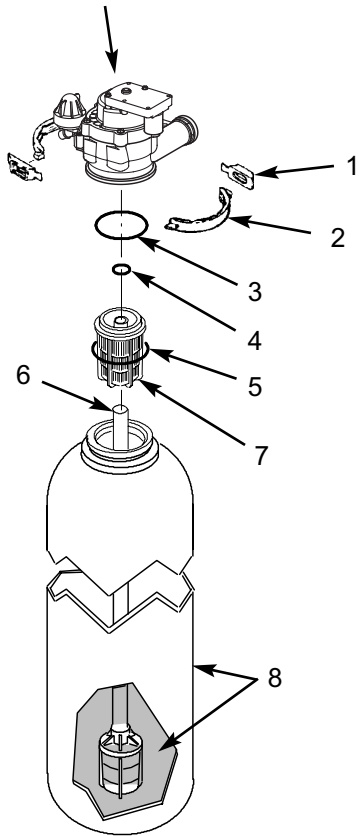
3. Press the RECHARGE button to move the softener's valve into the backwash position. Look for a fast flow of water from the drain hose. Check that the drain can adequately handle the flow and volume.

An obstructed flow indicates a plugged top distributor, backwash flow plug, or drain hose.

4. Press the RECHARGE button to move the softener's valve into the fast rinse position. Again look for a fast drain flow. Allow the softener to rinse for a few minutes to flush out any brine that may remain in the resin tank from the brining cycle test.
5. To return the softener's valve to the service position, press the RECHARGE button.

# Water Softener Exploded View

**Valve Assembly**  
See Pages 22 & 23  
for parts



# Water Softener Parts List

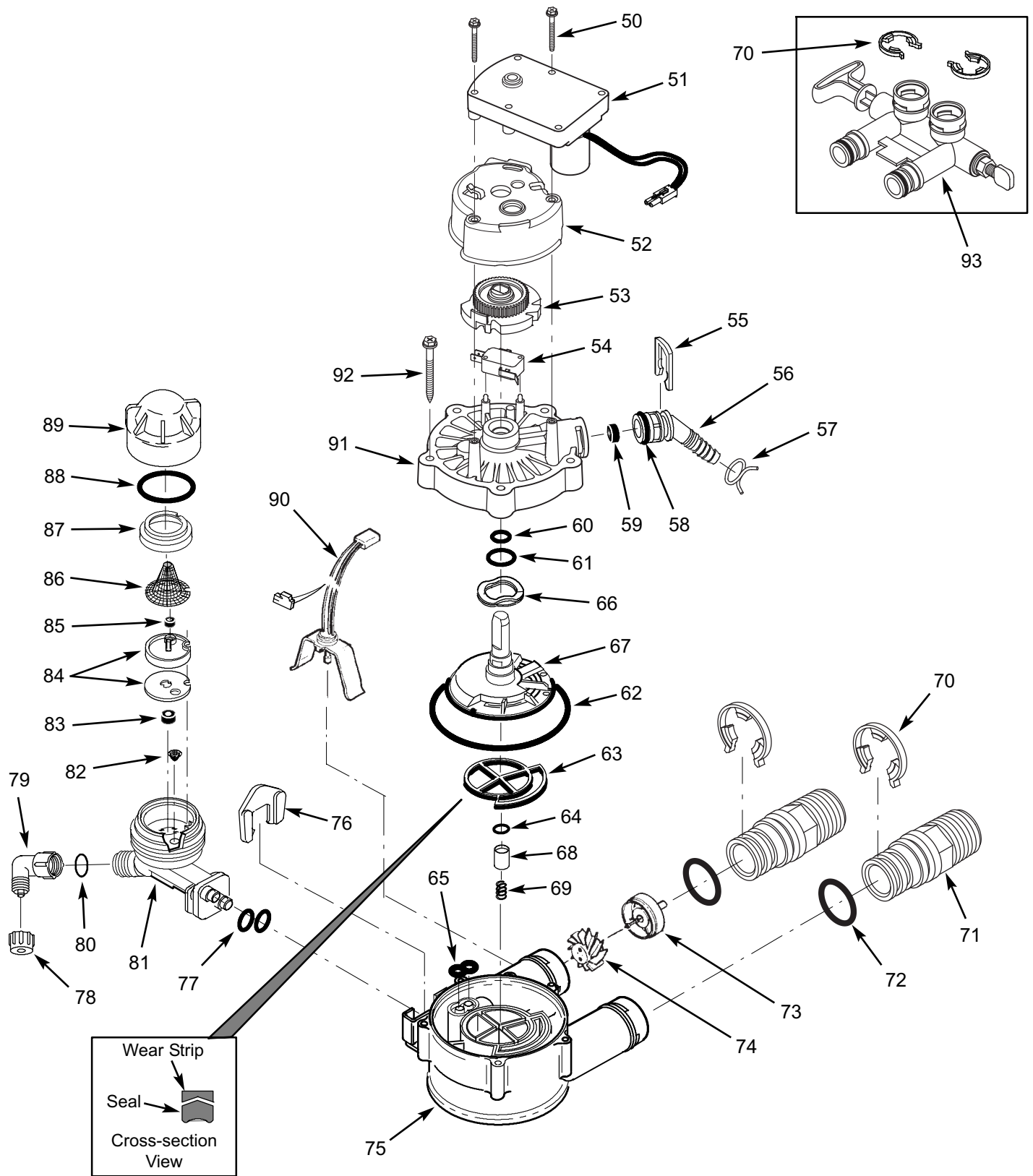
Key No.	Part No.	Description
–	7331177	Tank Neck Clamp Kit (includes Key Nos. 1 & 2)
1	↑	Retainer Clip (2 req.)
2	↑	Clamp Section (2 req.)
–	7112963	Distributor O-Ring Kit (includes Key Nos. 3-5)
3	↑	O-Ring, 2-7/8" x 3-1/4"
4	↑	O-Ring, 13/16" x 1-1/16"
5	↑	O-Ring, 2-3/4" x 3"
6	7105047	Repl. Bottom Distributor
7	7077870	Top Distributor
8	7343857	Filled Media Tank, 9" dia. x 35" ❶
9	7320202	Brine Valve Assembly
10	7327568	Float, Stem & Guide Assembly
11	7248706	Ground Clamp Kit
12	7337482	Power Supply, 28V DC
13	7309366	Repl. Electronic Control Board (PWA)

Key No.	Part No.	Description
14	7266746	Top Cover (order decal below)
■	7346774	Faceplate Decal
15	7267417	Control Panel
16	7201398	Salt Lid
17	7344104	Rim
18	7155115	Cover, Brinewell
19	7109871	Brinewell
–	7331648	Brinewell Mounting Hardware Kit (includes Key Nos. 20 & 21)
20	↑	Wing Nut, 1/4-20
21	↑	Screw, 1/4-20 x 5/8"
22	7270745	Repl. Brine Tank
–	7331258	Overflow Hose Adaptor Kit (includes Key Nos. 23-25)
23	↑	Adaptor Elbow
24	↑	Grommet
25	↑	Hose Clamp
26	7139999	Drain Hose, 20 ft.

■ Not illustrated

❶ Filled media tank for refiner includes activated carbon, resin, top and bottom distributors, associated o-rings, neck clamp kit and shipping cap, assembled.

# Valve Assembly Exploded View



# Valve Parts List

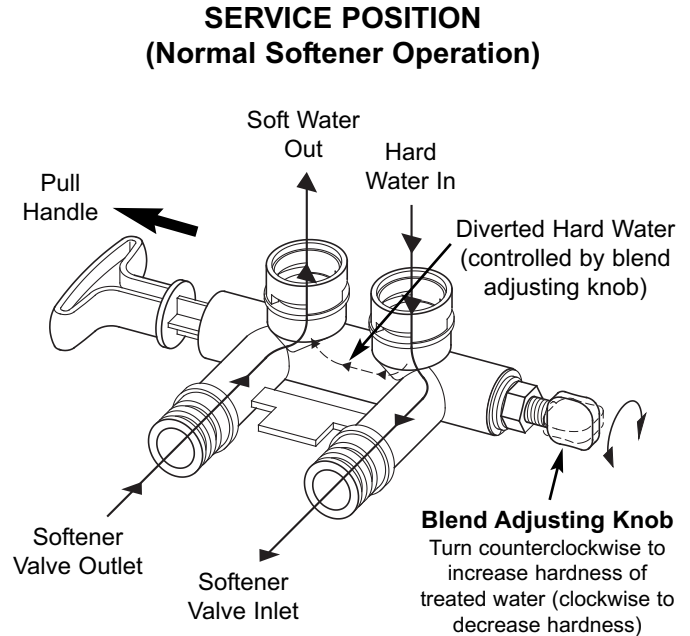
Key No.	Part No.	Description
50	7338111	Screw, #6-19 x 1-3/8" (2 req.)
51	7281291	Motor
52	7337474	Motor Mount
53	7284964	Cam & Gear
54	7030713	Switch
-	7331185	Drain Hose Adaptor Kit (includes Key Nos. 55-59)
55	↑	Clip, Drain
56	↑	Drain Hose Adaptor
57	↑	Hose Clamp
58	↑	O-Ring, 5/8" x 13/16"
59	↑	Flow Plug, 2.0 gpm
-	7129716	Seal Kit (includes Key Nos. 60-65)
60	↑	O-Ring, 7/16" x 5/8"
61	↑	O-Ring, 3/4" x 15/16"
62	↑	O-Ring, 3-3/8" x 3-5/8"
63	↑	Rotor Seal
64	↑	O-Ring, 3/8" x 9/16"
65	↑	Seal, Nozzle & Venturi
66	7082087	Wave Washer
67	7199232	Rotor & Disc
-	7342665	Drain Plug Kit, 3/4" (includes Key Nos. 64, 68 & 69)
68	↑	Plug, Drain Seal
69	↑	Spring
70	7337563	Clip, 3/4", pack of 4
71	7342673	Installation Adaptor, 3/4", pack of 2, including 2 ea. Clips & O-Rings (See Key Nos. 70 & 72)

Key No.	Part No.	Description
72	7337571	O-Ring, 15/16" x 1-3/16", pack of 4
-	7113040	Turbine & Support Assembly, including 2 O-Rings (See Key No. 72) & 1 ea. of Key Nos. 73 & 74
73	↑	Turbine Support & Shaft
74	↑	Turbine
75	7082053	Valve Body
76	7081201	Retainer, Nozzle & Venturi
77	7342649	O-Ring, 1/4" x 3/8", pack of 2
78	1202600	Nut - Ferrule
79	7120526	Elbow
80	7292323	O-Ring, 3/16" x 7/16"
-	7238450	Nozzle & Venturi Assembly (incl. Key Nos. 76, 77 & 81-89)
81	7081104	Housing, Nozzle & Venturi
82	7095030	Cone Screen
83	1148800	Flow Plug, .3 gpm
84	7187772	Nozzle & Venturi Gasket Kit
	7204362	Gasket Only
85	0521829	Flow Plug, .1 gpm
86	7146043	Screen
87	7167659	Screen Support
88	7170262	O-Ring, 1-1/8" x 1-3/8"
89	7199729	Cap
90	7309803	Wire Harness, Sensor
91	7337466	Valve Cover
92	7342657	Screw, #10-14 x 2", pack of 5
93	7327631	Bypass Valve Assembly, 3/4", including 2 O-Rings (See Key No. 72)

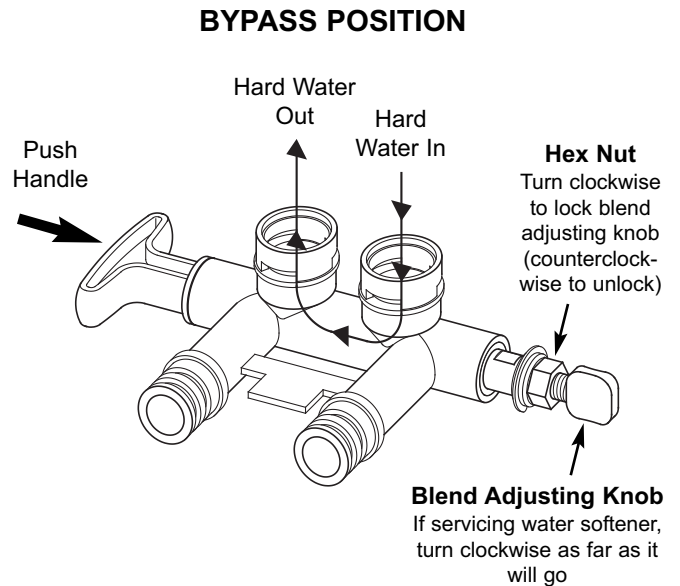
# Bypass Blending Valve

The bypass blending valve works as a typical push-pull bypass valve, but has the added ability to finely adjust hardness of the treated water leaving the water softener. If slightly harder water is desired than is normally output by the water softener, this bypass blending valve can divert a small stream of hard water before it enters the water softener and blend it with the exiting softened water. The amount of water diverted is controlled by turning a blend adjusting knob on the end cap of the valve stem (See Figure 43).

1. When the bypass valve is in service position (normal softener operation), with handle pulled all the way out (See Figure 43), **increase hardness** of treated water by turning the blend adjusting knob **counterclockwise** up to 6 turns from the fully closed position. While adjusting this knob, hold the bypass valve handle to prevent the stem from rotating.
2. Do not continue to turn the knob counterclockwise beyond 6 turns from the fully closed position, as this would eventually pull the screw's internal o-rings out of their seat and water would leak from the bypass valve.
3. **Decrease hardness** of treated water by turning the blend adjusting knob **clockwise** while holding the bypass handle. When the knob will not turn any more, hard water is no longer being blended with treated water.
4. Once the desired hardness is achieved, the adjustment knob may be locked in place by tightening the hex nut clockwise against the end cap using an adjustable wrench. Hold the bypass valve handle to prevent the stem from rotating, or else use another wrench to grip the stem on the flats between the end cap and the bypass valve body. Loosen the hex nut (turn it counterclockwise) before readjusting the hardness or closing the diversion path for servicing (see next step)
5. If the water softener is to be serviced or disconnected from the bypass valve, the blend adjusting knob must be turned all the way clockwise to close the diversion path and prevent water leaking from the softener valve inlet of the bypass valve.



**FIG. 43**



**FIG. 44**