

# **Installation / Operation Manual**

## **Demand Regeneration Tannin / Hardness System**

### *Signature Series* **Control Valve**

For Model Numbers :

- MST24**
- MST32**
- MST48**
- MST64**

***CSI Inc.***

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General Specifications	Two Tank			
	MST24	MST32	MST48	MST64
Grains Capacity / Hardness Regeneration	16,000	24,000	32,000	48,000
Salt Used / Regeneration (pounds)	9.0	12.0	15.0	24.0
Maximum Raw Water Hardness (grains)	25	50	75	100
Maximum Clear Iron / Manganese (ppm)	.50	.50	.50	.50
Exchange Resin (cu. ft.)	.50	.75	1.0	1.5
Tannin Resin (cu. ft.)	.25	.25	.50	.50
Mineral Tank (polyglass)	8 x 44	9 x 48	10 x 54	13 x 48
Brine Tank (polyethylene with grid & safety)	18 x 33	18 x 33	18 x 33	18 x 33
Service Flow Rate (gpm) *	8.0	10.0	11.0	12.0
Backwash Flow Rate (gpm)	1.0	1.2	1.5	2.0
Gallons Used / Regeneration	53	58	65	100
Space Required (D x W x H inches)	18 x 26 x 52	18 x 27 x 56	18 x 28 x 62	18 x 31 x 56
Approximate Shipping Weight (pounds)	108	130	163	204

*\* The pressure drop does not exceed 15.0 psi at Service Flow Rate.*

## PLEASE NOTE THESE SPECIFICATIONS BEFORE PROCEEDING

OPERATING PRESSURE RANGE : 20 - 125 PSI  
OPERATING TEMPERATURE RANGE : 33° F - 120° F  
INLET / OUTLET PIPE SIZE : 3/4" FNPT

PLEASE COMPLY WITH ALL APPLICABLE PLUMBING CODES  
PROTECT THE SOFTENER AND PIPING FROM FREEZING TEMPERATURES

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*Please read the entire Owner's Manual and Instruction before installation.  
This Owner's Manual must stay with the unit.*

### How A Water Softener Works

Water hardness is derived from **Calcium and Magnesium** minerals that have been dissolved into the water under the earth's surface. These minerals are found in limestone deposits and are the source of hard water. The amount of hardness in a given water supply is dependent upon the quantity of Calcium and Magnesium present and the length of time water has been in contact with them. This can vary dramatically from well-to-well and, for this reason, a water analysis is imperative in order to determine the proper treatment method. The degree of hardness increases as the concentration of Calcium and Magnesium "ions" increase and is measured in **Grains Per Gallon (gpg)**.

The problem of hard water in the home / business comes to light in many facets of daily use. Water spots and scum left behind on bathtubs, fixtures and showers; wear and tear on appliances; calcium build-up in hot water heaters and piping; and, greater amounts of soap and detergents being used are just a few examples.

The modern water softener is designed to reduce hardness ions and their unpleasant side effects. Special resin beads in the softener mineral tank are used to change hard water into soft water. The surfaces of these beads are covered with sodium ions. As hard water enters the mineral tank and comes into contact with the resin, an exchange of ions takes place as dissolved Calcium and Magnesium ions cling to the resin surface and sodium ions take their place, thus softening the water. This process is called **Ion Exchange**. Over time, the sodium ions used for the exchange process become depleted and must be replenished.

The water softener provides a **Regeneration** process whereby brine solution enters the mineral tank, driving-off the collected hardness ions and replenishes the surface of the resin beads with more sodium ions. This process is automatically initiated by the control valve on the mineral tank. The regeneration process has five basic cycles as follows:

1. **Backwash** - The control valve directs the water flow in a reverse direction through the mineral tank, separating the resin beads and flushing any accumulated particles to a waste drain.
2. **Brine & Rinse** - In the first part of this cycle, the control valve directs brine solution downward through the mineral tank, driving-off collected hardness ions and replenishing the resin beads with sodium ions. The second part of the cycle rinses hardness ions and excess brine from the mineral tank to the waste drain.
3. **Rapid Rinse** - The control valve directs the water flow downward, settling and recompacting the resin bed.
4. **Brine Refill** - The control valve directs fresh water into the salt compartment to create new brine solution for the next scheduled regeneration.
5. **Service** - This is the normal "operating" cycle where hard water enters the mineral tank, comes into contact with the resin beads and exchanges hardness ions for sodium ions - the water then becomes "soft" and ready for use.

### Pre-Installation Check List

**A water test should always be performed** in order to determine total water hardness (in gpg) and total dissolved iron (in parts per million - ppm). This is critical for proper equipment selection, sizing and for determining the program for regeneration frequency. If concentrations of iron (above .5 ppm), iron coloration, iron bacteria or sediment are present, filtration prior to the softener will most generally be required. Certain states may require a licensed plumber for installation.

**Note :** Flexible water supply connectors and flexible drain line tubing may not be allowed in your locale. Please check with local plumbing code officials prior to installation.

## Installation Requirements

- A level floor position ahead of piping into water heater.
- Unit must be installed at least 10' ahead of the inlet to a water heater to prevent damage due to back-up of hot water.
- **DO NOT** install the unit in an area of direct sunlight or where freezing temperatures may occur!  
(See Installation Diagrams for proper placement and plumbing connections.)

### Major System Components :

1. **Brine Tank** - This tank holds the salt that is added to the softener. This salt is dissolved with water to form a brine solution used in the softener regeneration process.
2. **Resin Tank** - This tank contains the ion exchange resin media. Water flows through the resin tank under pressure to come into contact with the resin for water softening.
3. **Control Valve** - The valve directs water through the resin tank for water softening and controls the flow of water / brine for the regeneration process.

## Softener Location / Other Requirements

- Locate the unit near an unswitched, 120 volt / 60 Hz grounded electrical outlet.
- Check for distance and proper drain installation (e.g. floor drain, washing machine standpipe).
- Determine type and size of piping required for softener connection (e.g. copper, galvanized, PVC plastic).

**Note :** If household plumbing is galvanized and you intend to make the installation with copper (or vice versa), obtain di-electric unions to prevent dissimilar metal corrosion.

**Note :** Where the drain line is elevated above the control valve or exceeds 20' in length to reach the drain, use 3/4" I.D. drain line tubing instead of 1/2" I.D. Drain line tubing is not included.

**Caution :** *If sweat soldering copper pipe (remember to always use lead free solder and flux), cover yoke and bypass valve with wet rags to prevent heat damage to connections and control valve! If using PVC or plastic pipe, primers and solvent cements specifically recommended for use with potable water are required.*

**Note :** All plumbing lines not requiring "soft" water should be connected "upstream" of the softener. (See Typical Installation Diagrams.)

## Installation Procedure

### - Water Supply Connections and Bypass Valve -

To allow for softener servicing, swimming pool filling or lawn sprinkling, a manual bypass valve has been installed at the factory. The bypass allows hard water to be manually routed around the softener.

1. Position softener at desired location for installation. (See Installation Diagram.)
2. Turn OFF main water supply and OPEN nearest faucet to relieve pressure.
3. Cut main line and install appropriate elbows and extensions. Inlet and outlet connections on the control valve are 3/4" FNPT.

**Note :** An optional 1" FNPT yoke is available.

**Caution :** *Raised arrows located on the sides of control valve body and bypass valve indicate proper direction of water flow. Install inlet and outlet piping in direction of arrows.*

4. Rotate inlet and outlet knobs on bypass valve to the bypass position (position of bypass knobs are at right angles to inlet / outlet piping).
5. Turn the main supply line on to restore water service to the home.
6. OPEN nearest faucet to evacuate air and repressurize plumbing lines.
7. Check for leaks!

### - Drain Line Connection -

1. Pull out clip and remove drain line assembly located on the left side of control valve. Remove drain line hose barb and wrap threads with Teflon tape. Reinstall drain line hose barb. **Caution :** *Hand tighten only!!!* Replace drain line assembly and reinstall clip.
2. Install 1/2" I.D. drain line tubing (not included) from hose barb to an open drain. A 4" gap between the end of the drain line and the open drain is required to prevent waste water backflow. Keep the drain line as short as possible. An overhead drain line can be used if necessary, but should discharge below the control valve. A syphon trap (taped loop) at the outlet of the drain line is advisable to keep the drain line full and assure correct flow during regeneration. Elbows or other fittings must be kept at a bare minimum.

**Note :** Where the drain line is elevated above the control valve or exceeds 20' in length, 3/4" I.D. drain line tubing should be used.

### **- Brine Line and Overflow Connection -**

1. Position brine tank on a smooth, level surface near the softener resin tank. If necessary, the brine tank can be placed at a higher level than the resin tank, but **never at a lower level.**
2. Install one end of 3/8" O.D. by 1/4" I.D. brine line tubing (included with unit) to compression fitting located on left side of control valve.
3. Remove brine tank cover.
4. Remove cap from brine well.
5. Insert opposite end of brine line through outer hole in brine tank.
6. Connect brine line to compression fitting on safety brine valve located inside brine well.
7. Install 1/2" I.D. drain line tubing (not included) to the overflow fitting on brine tank located just below the brine line.
8. Run the opposite end of brine tank drain line to a suitable drain.

**Note :** The brine tank drain line is gravity flow and must discharge below the overflow fitting.

**Caution :** Do not "TEE" to the main drain line from control valve.

**Notice :** The brine overflow is provided as a back-up in the event the safety float shut-off should fail, allowing the brine tank to overflow. This drain connection would then carry the excess water to the drain and prevent flooding of the floor. Therefore, no liability will or can be assumed by the manufacturer of the softener should this occur.

### **- Electrical Connection -**

1. Connect the power supply to the control valve and plug into a 115 volt / 60 Hz receptacle.

**Note :** Do not plug into an outlet controlled by a wall switch or pull chain that could inadvertently be turned off.

### **- Installing Battery Back-Up -**

1. Remove the rear cover.
2. Install a 9 volt battery. Refer to page 3, item 3 of the Signature Series Manual.
3. Reinstall rear cover.

### **- Pressurizing The System -**

1. Slowly rotate inlet knob of the bypass valve to the **SERVICE** position. Slowly rotate outlet knob to the **SERVICE** position. (Position of bypass knobs are parallel to inlet / outlet piping.)
2. Open the nearest faucet to evacuate air from plumbing lines.
3. Check for leaks!

### **- Programming The Control Valve -**

Refer to page 2 of the Signature Series Service Manual for main menu programming and instruction.

1. Set time of day.
2. Set a.m. or p.m.
3. Set water hardness in grains per gallon (gpg).

**Note :** If the water contains tannin, iron and / or manganese, multiply the total parts per million (ppm) by "four" (4) and then add to the grains per gallon (gpg) of hardness. Use this COMPENSATED HARDNESS level when programming the regeneration frequency.

Refer to page 7 of the Signature Series Service Manual for master programming and instruction.

1. Set regeneration day override. (This is particularly useful when iron is being treated to prevent fouling of the resin.)
2. Set regeneration time, if other than 2:00 a.m. is desired.

**- Control Valve Operation -**

Refer to page 4, item 2 of the Signature Series Service Manual Instructions.

1. Manually index control valve to **BACKWASH** (cycle 1) position and allow water to run to drain 3 to 4 minutes.  
**Warning :** Close inlet valve on bypass prior to selecting the backwash position. After backwash position has been established, slightly open inlet valve on bypass to evacuate air from the media tank. Fully open inlet valve when all air is depleted. This procedure will prevent media from begin uplifted into control valve.
2. Manually index control valve to **BRINE REFILL** (cycle 4) position and allow the brine tank to fill just over the salt grid plate.
3. Manually index control valve to **BRINE & RINSE** (cycle 2) and allow the control valve to draw water from the brine tank until it stops.
4. Manually index control valve to **SERVICE** (cycle 0) position.
5. Manually index control valve to **BRINE TANK REFILL** (cycle 4) position and allow the control valve to automatically fill the brine tank.

**Note :** Control valve will advance to service position automatically.

**Start Up Procedure**

**- Disinfection -**

The material used in the construction of the modern water softener will not support the growth of bacteria. However, the conditions existing during shipment, storage and installation are unknown and thus dictates the disinfecting of a softener after installation, before it is used to treat potable water. With this in mind, your newly installed water softener should be disinfected using the recommended procedure described in this section. Ordinary laundry bleach is an excellent disinfecting agent for this purpose. The proper dosage for your particular softener model is listed below.

**Figure 5**

<b>Model</b>	<b>Cubic Feet of Resin</b>	<b>Chlorine Dosage</b>
MST24	.50	.6 ounces
MST32	.75	.9 ounces
MST48	1.00	1.2 ounces
MST64	1.50	1.8 ounces

1. Measure the proper amount of chlorine bleach as shown above.
2. Pour the chlorine directly into brine well located inside brine tank.
3. Replace brine well cap.

**- Filling The Brine Tank With Salt -**

To expect a high level of performance and reliability, a salt manufactured specifically for water softeners must be used. Salt of this grade is virtually free from dirt and other particulates that would eventually cause the softener to malfunction. A pellet type salt is recommended, although any high quality water softener salt (such as solar salt) will suffice. If iron is present in raw water, use of iron inhibiting salt is recommended. The salt level will decrease after each regeneration cycle. Consequently, the brine tank will need to be checked and replenished periodically.

1. Fill the brine tank with water softener salt as described above. This will be approximately 250 pounds of salt.

**Warning :** Do not fill salt above level of the brine well.

2. Replace brine tank lid.

**- Final Check -**

1. Be certain the bypass valve is in the **SERVICE** position.
2. Make sure the power supply is connected to an uninterrupted 115 volt outlet.
3. Check that the time of day is set.
4. Double check regeneration schedule.
5. Make final check for leaks!
6. Fill out and mail warranty card.
7. Leave all manuals with unit.

**Operation, Care and Cleaning**

When the inlet / outlet knobs on the bypass valve are in the **SERVICE** position (position of bypass knobs are parallel to the inlet / outlet piping), water is directed through the water softener. Water may be bypassed by turning the inlet / outlet knobs to the bypass position (position of bypass knobs are at right angles to inlet / outlet piping). Water to the home will bypass the softener and be *untreated*.

You should manually bypass the softener if :

1. The outside lines do not bypass the water softener and water is to be used for lawn sprinkling or other similar uses.
2. Servicing the water softener.
3. A water leak from the water softener is evident.
4. *Shock treating* water well and piping with chlorine or other disinfectant.

**- Extra Regeneration -**

If soft water demands are unusually heavy, an extra regeneration can be initiated manually :

Refer to page 4, item 2 of the Signature Series Service Manual.

**- To Skip A Regeneration -**

1. For vacations or extended periods of absence, the power supply can be disconnected from the control valve.
2. Upon return, plug in cord and reset the time of day, if 9 volt battery was not installed. If battery was installed, replace battery.

**- General Care and Cleaning -**

1. Do not place heavy or sharp objects on water softener.
2. Use only mild soap and warm water to clean exterior of the unit. Never use harsh, abrasive cleaners.
3. Protect the water softener and drain line from freezing.
4. Reset time for daylight saving time periods.
5. Replace 9 volt battery once a year.
6. Inspect and clean the brine tank when sediment appears in the bottom of the brine tank.
7. Always keep the brine tank supplied with good quality salt, a type designed for use in water softeners.