



OWNER'S MANUAL

PROMATE ECOMAX DUO TWIN ALT



Franklin Water Treatment, LLC
hellenbrand.com

This owner's manual is designed to assist owners and installers with the operation, maintenance and installation of your new water softener. It is our sincere hope that this manual is clear, concise and helpful to both owner and installer. We have included detailed instructions on general operating conditions, pre-installation and installation instructions, start-up, and timer and meter programming. We have included a troubleshooting guide, service instructions and parts diagrams to assist you.

Owners will appreciate the simplified, illustrated format for operation, programming and troubleshooting. **In the event that you need professional assistance for servicing your water softener, please contact the dealer who installed this system.**

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Dealer Name _____ Phone _____

Address _____ Email _____

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JOB SPECIFICATION SHEET

MODEL NO. _____

*WATER TEST AT TIME OF INSTALLATION

_____ Hardness CaCO₃ (gpg) _____ Other _____
_____ Iron (ppm) _____ Other _____
_____ pH _____ Other _____

OPTIONAL RELAY SETTINGS

_____ Off

AUX MAV

_____ Brine Reclaim Enabled
_____ Separate Source Enabled

Relay 1 Trigger

_____ On Time
_____ Start Time, Minutes into Regeneration
_____ Run Time

On Gallons

Pulse per _____ Gallons
_____ Time Relay Closed

On Regen Gallons

(Relay activated by flow through meter during service & regeneration)

Pulse per _____ Gallons
_____ Time Relay Closed

On Service Alarm

_____ Years
_____ Gallons

Relay 2 Trigger

_____ On Time
_____ Start Time, Minutes into Regeneration
_____ Run Time

On Gallons

Pulse per _____ Gallons
_____ Time Relay Closed

On Regen Gallons

(Relay activated by flow through meter during service & regeneration)

Pulse per _____ Gallons
_____ Time Relay Closed

On Service Alarm

_____ Years
_____ Gallons

_____ Error

*SIZING INFORMATION

All Water is Softened Except:

_____ Rear Hose Bib _____ Front Hose Bib _____ Kitchen Cold _____ Toilets _____ All Cold
_____ Other _____

The average family uses 50 gallons per person daily for all water uses in the home, about 40 gallons per person daily if soft water is not supplied to the toilets, and about 30 gallons per person daily if only hot water is softened.

_____ Daily Water Usage (Gallons/Person)
x _____ Family Size (Number of people in family)
= _____ Total Gallons Per Day
x _____ Grains Per Gallon of Hardness
(Note: Add 3 grains per gallon of hardness for each ppm iron for total compensated hardness)
= _____ Total Grains Per Day

*INSTALLATION DATE _____

*SERIAL NUMBER _____

NOTES _____

SOFT WATER BASICS

Hardness

Excess amounts of calcium and magnesium in water produce hardness. A water softener removes the majority of calcium and magnesium to produce softened water.

Hardness is measured in terms of grains. (This grain weight is derived from the average weight of a dry grain of wheat.) When your water is tested the grain hardness is calculated and expressed as grains per gallon (gpg). This calculation, as well as the number of people in your household will help determine what type and size of water softener will most efficiently soften your water.

Your water softener contains an ion exchange media (often called resin) which removes the hardness from water as it flows through each softener tank. Eventually so much hardness collects on the exchange media that the softener can no longer soften the water in that tank. At this point it is considered "exhausted". The twin alternating function automatically switches to the standby tank and regeneration occurs immediately on the exhausted tank.

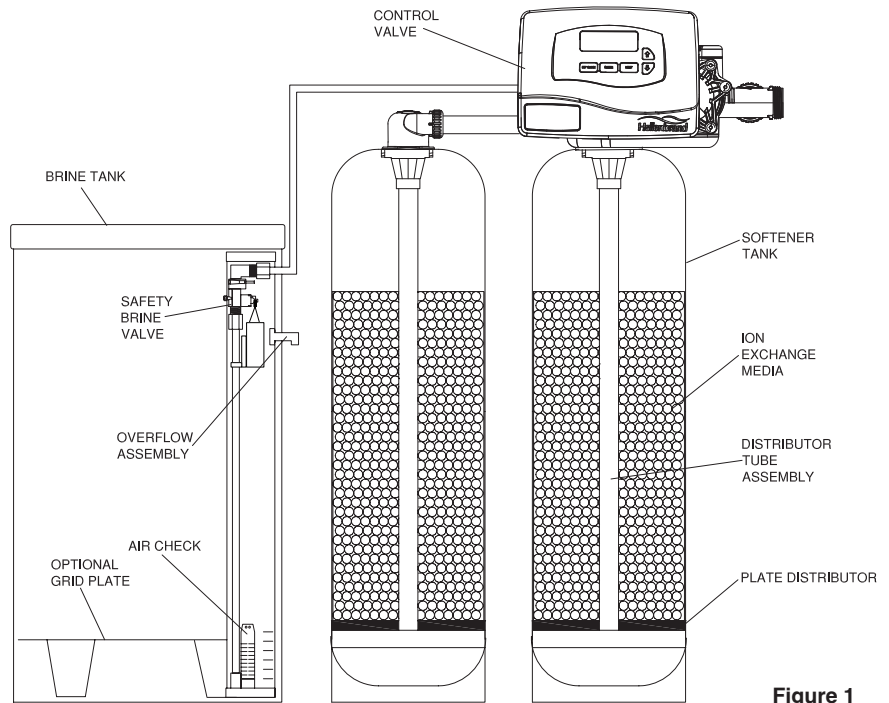


Figure 1

Regeneration

To regenerate the exchange media, it must be rinsed with a brine (salt) solution. This removes the hardness from the exchange media and replaces it with sodium. The exchange media is then ready to remove hardness from water. The hardness minerals and excess brine solution are rinsed down the drain.

During the regeneration cycle the softening media is also backwashed. This reversing of the normal flow of water serves to remove sediment which may have accumulated during the softening process due to the filtering action of the exchange media. Backwashing also loosens and fluffs up the bed of exchange media to insure that during regeneration the brine solution will come into contact with all the media.

Maintenance of Your Softener

Salt: Salt to a softener is what gasoline is to a car. Not only must a softener have salt, but it should be the proper type to insure efficient recharging of the unit. Ask your dealer what type of salt may best suit your needs. Always have an adequate supply of salt on hand. Check the salt level of your brine tank every couple of weeks initially to determine how much salt you use - this will depend on how much water you use. As a rule of thumb, with 20 gpg hard water, about a 1/2 lb. of salt per person per day is used. In other words, a family of four uses 60 lbs. of salt a month. Fill the tank approximately three-fourths full, with a minimum of 12" of salt. If your household does not use much water, do not fill your salt keeper over 1/2 full, salt bridging may occur in the brine tank. This may result in hard water due to ineffective regeneration. **DO NOT USE Block Salt** when the ProMate EcoMax Duo control is programmed with a brine tank prefill. Block salt does not dissolve quickly enough to provide a good regeneration.

Cleaning Salt Tank: The salt tank may require periodic cleaning. Inspect the salt tank at least once a year for buildup of insoluble materials. It is recommended to periodically clean the salt tank no matter what kind of salt you are using. See page 19, Miscellaneous #2 for details on cleaning.

REMEMBER: Salt is the fuel to run your water softener. Buy the **best clean salt available**.

OPERATING CONDITIONS

Your water conditioner has been designed to adequately handle up to 100 grains per gallon of hardness as well as up to 2 ppm of ferrous bicarbonate iron. This is iron that is dissolved in water and not visible to the eye in a freshly drawn sample. After standing in contact with air, the ferrous iron will become oxidized to the ferric state and start to precipitate as a reddish brown floc. It can be seen and may cause discolored water. In order for your softener to remove the iron, air (oxygen) must be kept from coming in contact with water until after it has been

passed through the water conditioner. In some cases, additional equipment may be required to treat water supplies having special characteristics, such as: ferric hydroxide iron, iron bacteria, low pH, taste and odors, etc. If any question should exist, contact your dealer.

This water softener is not intended to be used for treating water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after treatment.

PRE-INSTALLATION CHECK LIST

(All electrical & plumbing should be done in accordance to all local codes)

Water Pressure: A minimum of 25 pounds of water pressure (psi) is required for regeneration. Maximum 125 psi.

Water Quality: On rural water supplies there is often a problem with sand or sediment in the water. (This problem occasionally occurs in public water supplies.) If the water is not filtered before being softened, the sand and sediment may plug up the water softener restricting the flow through the resin bed. This problem often requires rebedding of the mineral tank. **Note:** Well and/or pump problems affecting the operation of the softener are repairs that are not covered under warranty. To prevent these unnecessary, and expensive repairs that are not covered under warranty, we recommend the installation of an in-line filter system ahead of a water softener.

Electrical: A continuous 110 volt 60 cycle current supply is required. Make certain the current supply is uninterrupted and cannot be turned off with another switch. All electrical connections must be connected per local codes. **Surge protection is recommended with all electric controls.**

Existing Plumbing: Existing plumbing must be free from lime and iron build-up. Piping that is built-up heavily with lime and/or

iron must be replaced. If piping is blocked with iron, additional equipment must be installed ahead of the water conditioner to correct the problem.

Drain Line: The softener should be located close to a drain. Avoid overhead drain lines if possible to prevent back pressure on the brine injector. Overhead drains are not to exceed 8 feet above the floor and no more than 20 feet in length. The pipe size for the drain line should be a minimum of 3/4". Backwash flow rates in excess of 7 gpm or length in excess of 20' require 1" drain line.

Bypass Valves: Always provide for the installation of a bypass valve.

Softening: It is recommended that the conditioner be installed to soften both the hot and cold water supply. A separate hard water faucet may be plumbed for drinking purposes if desired. Outside faucets should be left on hard water.

Caution: Water temperature is not to exceed 110°F; the conditioner cannot be subject to freezing conditions, or to a vacuum due to loss of pressure (such as a water main break).

BYPASS VALVE OPERATION

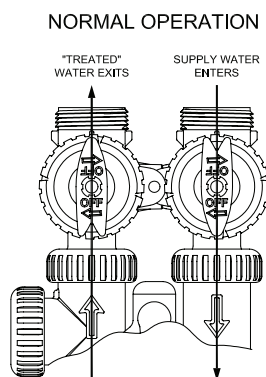


Figure 3

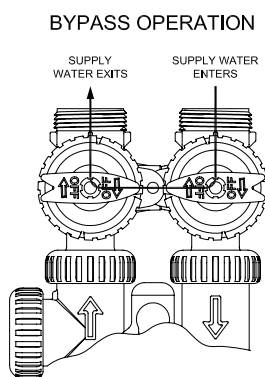


Figure 4

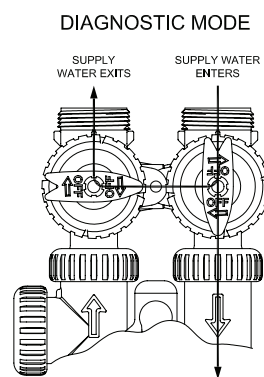


Figure 5

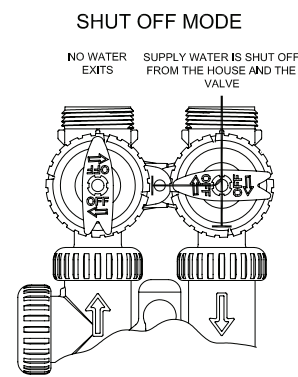


Figure 6

WATER SOFTENER DISINFECTION

The construction materials of your water softener will not support bacterial growth nor will these materials contaminate a water supply. However, the normal conditions existing during shipping, storage, and installation indicate the advisability of disinfecting a softener after installation, before the softener is used to treat potable water. In addition, during normal use a softener may become fouled with organic matter or in some cases, with bacteria from the water supply.

Therefore, every water softener should be disinfected after installation, some will require periodic disinfection during their normal life. You have two choices for disinfection as follows:

- A. SODIUM HYPOCHLORITE (household bleach)
5.25% SODIUM HYPOCHLORITE solutions are available under such trade names such as Clorox, Linco, Bo Peep,

White Sail and Eagle Brand Bleach. If stronger solutions are used, such as those sold for commercial laundries, adjust the dosage accordingly.

1. Dosage:

a. Softening resin; 1.2 fluid ounce per cubic foot of resin.

2. Add the required amount of hypochlorite solution to the brine well of the brine tank.

a. Proceed with the normal regeneration. Press REGEN and allow the water softener to go through a normal regeneration.

- B. EPA and NSF approved Sani-System by Pro Products. This can be purchased from your water treatment provider or at: <http://proproducts.com/products/sani-system>.

INSTALLATION INSTRUCTIONS

(All electrical & plumbing should be done in accordance to all local codes)

CAUTION:

- Do not use vaseline, oils or other hydrocarbon lubricants or spray silicone anywhere. A silicon lubricant may be used on black o-rings but is not necessary. **Avoid any type of lubricants, including silicone, on red or clear lip seals.**
 - Do not use paste or other sealants on threads. Only teflon tape may be used on threads. Teflon tape is not necessary on the nut connection or caps because of o-ring seals.
 - The pipe size for the drain line should be a minimum of 3/4". Backwash flow rates in excess of 7 gpm or length in excess of 20' require 1" drain line.
1. Place the conditioner where it is to be installed, making sure each tank is on a clean, level and firm base.
 2. Do all necessary plumbing (inlet to inlet, outlet to outlet and drain line to drain). The control valve, fittings and/or bypass are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing.
 3. When assembling the installation fitting package (inlet and outlet), connect the fitting to the plumbing system first and then attach the nut, split ring and o-ring. Heat from soldering or solvent cements may damage the nut, split ring or o-ring. Solder joints should be cool and solvent cements should be set before installing the nut, split ring and o-ring. Avoid getting primer and solvent cement on any part of the o-rings, split rings, bypass valve or control valve.
 4. **A jumper ground wire should be installed between the inlet and outlet pipe whenever the metallic continuity of a water distribution piping system is interrupted. Install grounding strap on metal pipes.**
 5. Some contractors make drain line connection using 5/8" polytube (See figure 6a, page 6) or a 3/4" female adapter. If soldering, joints near the drain must be done prior to connecting the drain line flow control fitting. Leave at least 6" between the drain line control fitting and solder joints when soldering pipes that are connected on the drain line control fitting. Failure to do this could cause interior damage to the drain line flow control fitting.
 6. The brine refill flow control assembly is installed in an easy to access refill elbow located on top of the control valve. The refill flow control assembly is attached to the control valve with a locking clip. The locking clip allows the elbow to rotate 270 degrees so the outlet can be orientated towards the salt tank.
 7. Connect the brine line found in the brine tank to the brine connection on the control valve. The control valve has a standard refill elbow to which a 3/8" flexible tube can be connected, see figure 6a, page 6. (An optional elbow can be ordered which accommodates a 1/2" flexible tube for a high regenerant draw rate situation). Both elbows use the same refill flow control and retainer. Make sure the floor is clean beneath the salt tank and that it is level and smooth.
 8. A 1/2" (inside diameter) gravity drain line may be connected to the overflow fitting on the side of the brine tank. This overflow is in case of a malfunction in the brine shut off. If the unit is installed where water may flow in the event of an overflow and cause water damage, connect a length of flexible tubing and run to a drain below the level of the overflow. (**Do not connect the tubing to the drain line on the control valve. Do not run tubing above overflow height at any point.**)



Figure 6a

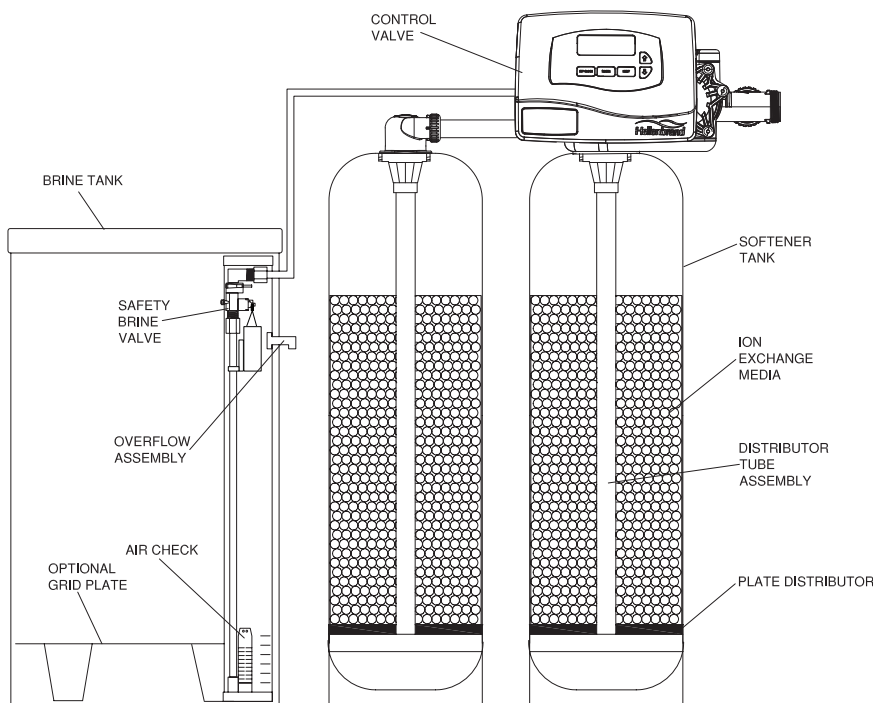


Figure 6b

PROGRAMMING

General Information

The ProMate EcoMax Duo control valve is the “brain” of your twin alternating water softener. It consists of the valve body and powerhead with solid state microprocessor.

The display panel (see Figure 7) consists of the LCD display and five push buttons which are used in displaying and programming the water softener settings.

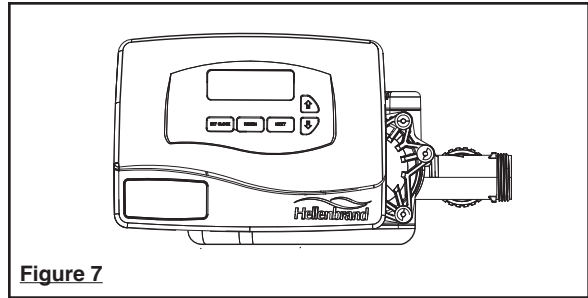


Figure 7

Initial Start Up

The initial start up will probably be done by the technician installing the softener system. If not, the following instructions will step through the process.

1. Complete all plumbing connections: inlet, outlet, drain line and brine line. Do not add salt at this time.
2. Place the bypass valve in the bypass position. (See figure 3 page 6) Turn on the main water supply. Open a cold soft water faucet to flush the piping of any air and/or foreign material. Run until the water is clear.
3. Manually add 6 inches of water to the brine tank.
4. Now plug the transformer into a 110-volt receptacle. (Be certain the outlet is uninterrupted.) Within 5 seconds the control will automatically align itself into the softening mode and display will automatically alternate between time of day, gal/min and gallons remaining. (Figure 8, page 7).
5. Set the time of day by pushing clock button (figure 9, page 8) and using ▲ and ▼ buttons.
6. Push REGEN button and hold it down for 3 seconds. The system will advance to the “First” position. (Note: Depending on how the system is programmed it could read backwash, rinse, brine or fill). Pushing REGEN button until “Rinse” shows in the left upper hand corner of display. Slowly place the bypass into the “diagnostic mode” (see fig 4, page 5). Run water to the drain until it runs clear. Return the bypass valve to the by-pass position (fig 3, page 5). Push REGEN button until unit is back to softening mode. **Repeat with second tank.**
7. Once again, push REGEN button and hold down for 3 seconds. Keep pressing REGEN button until “Back-

wash” appears. Slowly place the bypass valve into the “Diagnostic Mode” 1/2 way. Allow water to slowly fill the mineral tank. When a solid stream of water starts coming out of the drain line, open the bypass inlet valve all the way and allow to run out the drain until water clears. Then slowly place the by-pass into the “normal operation” mode by opening the outlet side of bypass valve, figure 2, page 5.

8. Press the REGEN button until LED display says “RE-GENERANT DRAW DN”. Loosen the brine line from the elbow on control valve in the brine tank. Place finger over the end of the elbow to check for suction. If no suction, see trouble-shooting guide. (See #10, Page 20) If proper suction, reattach brine tube and allow it to draw water down to the bottom of the air check, (figure 6b, page 6).
9. Press REGEN button again until LED once again displays “BACKWASH”. Keep in backwash until water once again runs clear at the drain. **Backwash both tanks.**
10. Press REGEN button again until “RINSE” is displayed. Allow rinse cycle to run its full course. While the rinse cycle is finishing, load brine tank with salt. If utilizing brine reclaim, manually add full volume of water to brine tank for first regeneration.
11. Once the rinse cycle has finished the softener control will return to the softening cycle. The LED screen will scroll between “TIME/GPM/GALLONS REMAINING”.
12. Next set your softeners water hardness and regeneration time settings (see figure 10a, page 8).

Your programming is now complete.

General Operation

When the system is operating, one of several displays may be shown. Pressing NEXT will alternate between the displays. The tank in service is displayed on the left. One of the displays is the current time of day. The second display is the following: days to a regen/gallons remaining. Capacity remaining is the number of gallons that will be treated before that tank goes through a regeneration cycle. The third display is current flow in gal/min. The user can scroll between the displays as desired by pushing NEXT or display will scroll automatically.

When water is being treated (i.e. water is flowing through the system) the word “GPM” flashes on left side of display when other than flow rate is displayed.

Unit A is the tank the control valve is on and Unit B is the tank with in/out head.

USER DISPLAYS/SETTINGS

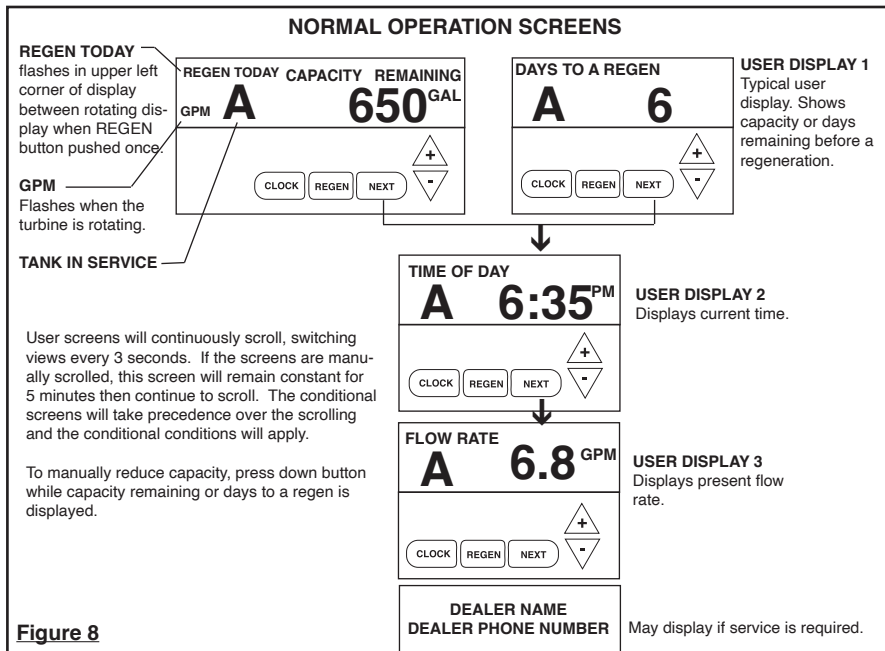
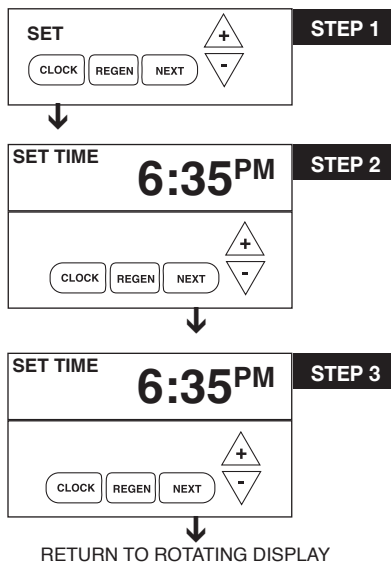


Figure 8

SET TIME OF DAY



▲ = ▲ Up Arrow ▼ = ▼ Down Arrow

Step 1 - Press SET CLOCK.

Step 2 - Current Time (**hour**): Set the hour of the day using ▲ or ▼ buttons. AM/PM toggles after 12. Press NEXT to go to step 3.

Step 3 - Current Time (**minutes**): Set the minutes of day using ▲ or ▼ buttons. Press NEXT to exit Set Clock. Press REGEN to return to previous step.

Power Loss - Lithium battery on circuit board provides up to 2 years of time clock backup during power outages. If the power is out when battery is depleted, only time of day needs to be reset, all other values are stored in non-volatile memory. When time of day is flashing, replace lithium coin type 2032 battery.

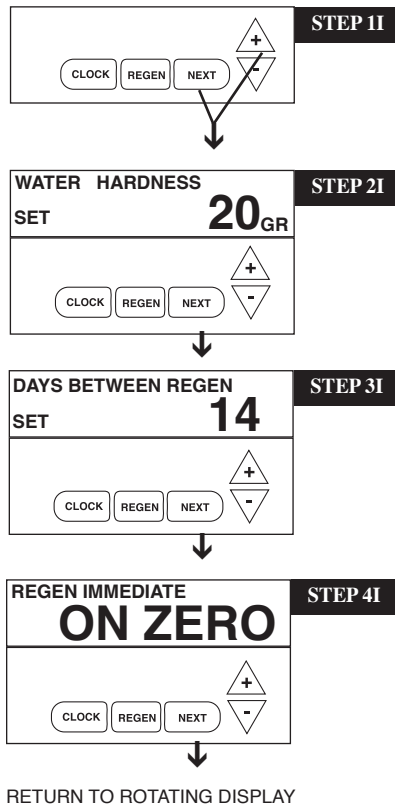
Battery back-up feature will be activated after 24 hours of power.

Do not forget to reset for daylight savings time.

Figure 9

INSTALLER DISPLAYS/SETTINGS

▲ = ▲ Up Arrow ▼ = ▼ Down Arrow



Step 1I - Press NEXT and ▲ simultaneously for 3 seconds.

Step 2I - Hardness: Set the amount of total compensated hardness in grains (hardness as calcium carbonate) per gallon using ▲ or ▼ buttons. **The factory setting is 20** with value ranges from 1 to 150 in 1 grain increments. Note: The grains per gallon should be increased if soluble iron needs to be reduced. Add 3 grains of hardness for each ppm of iron present. If this display shows nA -, then system is set-up in "filter" mode or "AUTO" is not selected in softener system setup. (See page 32). Press NEXT to go to Step 3. Press REGEN to exit Installer Displays/Settings.

Step 3I - Day Override: This sets the number of days between regenerations. If value set to "oFF" regeneration initiation is based solely on gallons used. If value is set as a number (allowable range from 1 to 28) a regeneration initiation will be called for on that day even if sufficient number of gallons were not used to call for a regeneration. Set Day Override using ▲ or ▼ buttons. As twin alternating configuration is soft applied for salt and water efficiency: **Factory setting is Off.**

- number of days between regeneration (1 to 28); or
- "oFF"

Press NEXT to go to step 4. Press REGEN to return to previous step.

Step 4I - Regeneration: This display will show REGEN IMMEDIATE, ON ZERO GALLONS, when set for twin alternating.

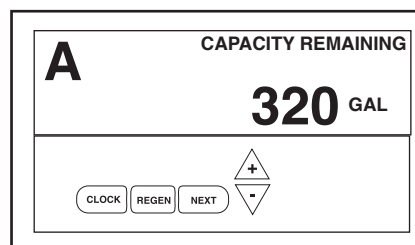
Figure 10a

Manual Regeneration

To initiate a manual transfer of tank, press and hold REGEN button. This will initiate a regeneration on the tank previously in service and put standby tank into service.

Alternate Tanks

To switch tanks manually without cycling the regeneration, press and hold SET CLOCK and ▲ button for 3-4 seconds.



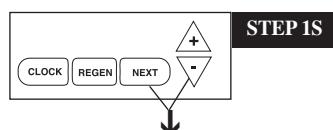
CYCLE TIME ADJUSTMENTS

Normally it is not recommended to adjust the lengths of the cycle times. However, certain water conditions may dictate adjustments. This should only be done from the recommendation of a water conditioning professional. The following chart shows the upper and lower limits of each cycle.

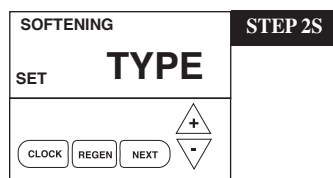
Cycle Options	Units	Lower/Upper Limit	Factory Setting
Fill	Lbs.	0.1 to 200	See Page 38
Softening (Service)	Minutes	1 to 480	120
Backwash	Minutes	1 to 120	8
Regenerant Draw UP Time	Minutes	1 to 180	60
Rinse-Fast	Minutes	1 to 120	4

SOFTENER SETUP

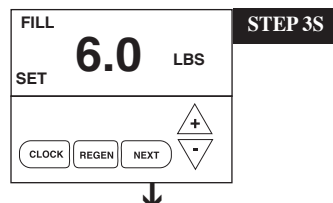
▲ = ▲ Up Arrow ▼ = ▼ Down Arrow



STEP 1S



STEP 2S

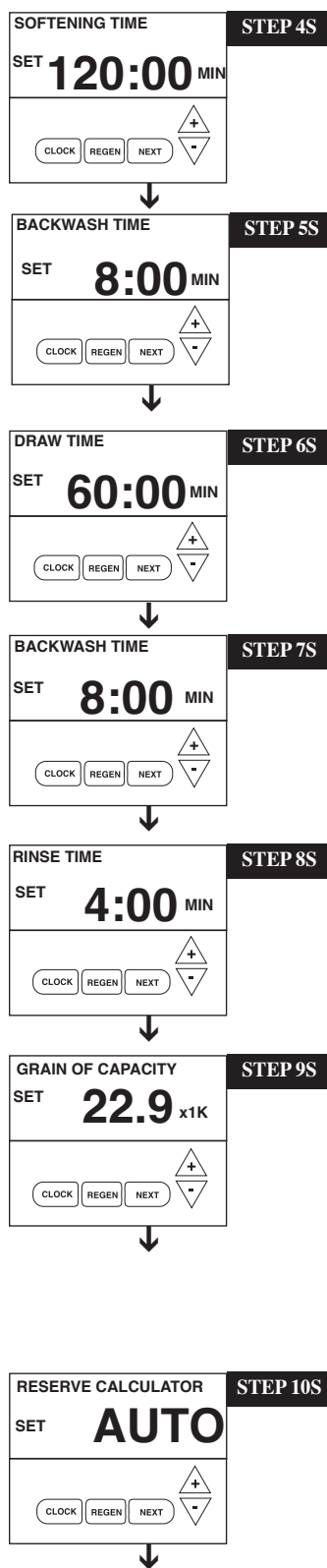


STEP 3S

STEP 1S – Press NEXT and ▼ simultaneously for 3 seconds. If screen in Step 2S does not appear in 5 seconds the lock on the valve is activated.

STEP 2S – Select between softening or filtering. A flashing "SOFTENING" or "FILTERING" will appear. Choose SOFTENING using ▼ or ▲ button. **Factory setting is Softening.** Press NEXT to go to Step 3S. Press REGEN to exit Softener System Setup.

STEP 3S – Select the time for the first cycle (which in this example is FILL, setting is changed by lbs. of salt entered) using the ▼ or ▲ button. **Factory setting is Low Salting,** See page 38. Press NEXT to go to Step 4S. Press REGEN to return to previous step.



STEP 4 S – Select the time for the second cycle (which in this example is SOFTENING) using ▼ or ▲ button. Press NEXT to go to Step 5S. Press REGEN to return to the previous step.

STEP 5 S – Select the time for the third cycle (which in this example is BACKWASH) using the ▼ or ▲ button. Press NEXT to go to Step 6S. Press REGEN to return to the previous step.

STEP 6 S – Select the time for the fourth cycle (which in this example is BRINE DRAW) using the ▼ or ▲ button. Press NEXT to go to Step 7S. Press REGEN to return to the previous step.

STEP 7 S – Select the time for the fifth cycle (which in this example is SECOND BACKWASH) using the ▼ or ▲ button. Press NEXT to go to Step 8S. Press REGEN to return to the previous step.

STEP 8 S – Select the time for the sixth cycle (which in this example is RINSE) using the ▼ or ▲ button. Press NEXT to go to Step 9S. Press REGEN to return to the previous step.

STEP 9 S - Set Grain Capacity using the ▼ or ▲ button. The ion exchange capacity is in grains of hardness as calcium carbonate for the system based on the pounds of salt that will be used. The allowable grains capacity range varies from 5,000 to 3,000,000 grains. The increment increase is 500 for the range from 5000 to 30,000; 1000 for the range of 30,000 to 100,000; and 2000 for the range of 100,000 to 3,000,000. Grains capacity is affected by the fill time. The grains capacity for the selected lbs. salting should be confirmed by testing. The capacity and hardness levels entered are used to automatically calculate gallon capacity when set to AUTO. **Factory setting is the capacity of the softener at low salting.** See Page 38. Press NEXT to go to Step 10S. Press REGEN to return to previous step.

STEP 10 S – Set Gallons Capacity using ▼ or ▲ button. If value is set to:

- “AUTO” gallon capacity will be automatically calculated.
- “oFF” regeneration will be based solely on the day override set (see Installer Display/Settings Step 3, page 8 / proportional brining will not function if OFF selected); or
- as a number of gallons (allowable range 20 to 1,500,000) regeneration will be based on the value specified. For applications that require 1 gpg soft water at peak flows near end of service run, may need to adjust capacity to include safety factor.

Increment increase is 20 for the range 20 to 2000, 100 for the range of 2000 to 10,000 and 500 for the range of 10,000 to 50,000 and 2000 for range of 50,000 to 1,500,000.

If “oFF” or a number is used, hardness cannot be set in Installer Displays/Settings Step 2, page 8. **Factory Setting is AUTO.** Press NEXT to go to Step 11 S. Press REGEN to return to previous step.

Figure 12a

IMMEDIATE

SET **REGEN**

CLOCK REGEN NEXT

▲
▼

STEP 11S

STEP 11 S – Set Regeneration Time Options using the ▼ or ▲ button. If value is set to:

• “IMMEDIATE” means regeneration will occur immediately when the gallons capacity reaches 0 (zero)

Factory Setting is IMMEDIATE. Press NEXT to go to Step 12S. Press REGEN to return to previous step.

RELAY 1 "TIME"

SET **TRIGGER**

CLOCK REGEN NEXT

▲
▼

STEP 12S

STEP 12 S – Set Relay to activate by Time, Gallons, Regen Gallons, Lockout, Off or Service Alarm by using ▼ or ▲ buttons. A relay can be used to operate a chemical feed pump or solenoid, etc. The choices are:

- Relay Triggered on Time - Relay activates after set number of minutes after start of regeneration. Start of regeneration is defined by first backwash cycle, dn brine or up brine, whichever is first. Relay deactivates after set time. Press NEXT for programming.
- Relay Triggered on Gallons - Relay activates every set number of gallons while in service and deactivates after set time. Press NEXT to go to 16S for programming.
- Relay Triggered on Regen Gallons - Relay activates after set number of gallons in service **or** gallons used during regeneration and de-activates after set time or when meter stops registering flow, whichever comes first. Press NEXT to go to 19S for programming.
- Service Alarm - Relay activates on service alarm setting: gallons, time or both, see step 21S. Relay deactivates when alarm is reset.
- Relay Triggered for Lockout - Relay is activated at set number of minutes before or after regeneration start. Regeneration start is the first backwash or draw cycle. Selection of energizing relay for complete regeneration cycle is available by selecting REGEN for time setting, see step 22S.
- **Off** - If off is selected, Steps 13S – 24S will not be shown. **Factory setting = OFF.** Press NEXT to go to step 25S or other selection for relay settings, or 21S if OFF selected.

RELAY 1 SET POINT

SET **10** MIN

CLOCK REGEN NEXT

▲
▼

STEP 13S

STEP 13 S – If off was selected in previous step, this screen does not appear.

Time chosen to Activate Relay, use up and down arrows to set # of minutes AFTER START OF REGEN to activate relay. Start of regeneration is defined as first Backwash or Regenerant Draw mode. Time Range = 1 – 500 minutes. Press NEXT to go to Step 14S.

RELAY 1 DURATION

SET **3:00** MIN

CLOCK REGEN NEXT

▲
▼

STEP 14S

STEP 14 S – Use Up and Down arrows to set duration of relay activation in minutes. Range is 0:01 (1 second) to 500:00 (500 minutes). Press NEXT to go to Step 25S. Press REGEN to return to previous step.

RELAY 1 "GALLONS"

SET **TRIGGER**

CLOCK REGEN NEXT

▲
▼

STEP 15S

STEP 15 S – Gallons chosen to activate relay. If Off or Time was selected in previous steps, this screen does not appear. Press NEXT for trigger programming.

RELAY 1 SETPOINT

SET **1** GAL

CLOCK REGEN NEXT

▲
▼

STEP 16S

STEP 16 S – Use up and down arrows to set # of gallons per relay activation.

Range = 0.1 – 20,000 gallons. Press NEXT for Relay Duration. Press REGEN to return to previous step.

RELAY 1 DURATION

SET **0:01** MIN

CLOCK REGEN NEXT

▲
▼

STEP 17S

STEP 17 S – Use up and down arrows to set duration of relay activation in minutes. Range = 0:01 (1 second) - 500:00 (500 minutes). Press NEXT to go to Step 25S. Press REGEN to return to previous step.

RELAY 1 "REGEN GALLONS"

SET **TRIGGER**

CLOCK REGEN NEXT

▲
▼

STEP 18S

STEP 18 S – REGEN gallons chosen to activate relay. Relay activates after set number of gallons have been used in service **or** during regeneration and then de-activates after set period of time or after flow stops, whichever comes first. Press NEXT to go to Step 19S.

RELAY 1 SET POINT

STEP 19S

SET 1 GAL

CLOCK REGEN NEXT

+

-

STEP 19S – Use up and down arrows to select number of gallons per relay activation of regen gallon setting. Range: 0.1 -20,000 gallons. Press NEXT to go to Step 20S.

RELAY 1 DURATION

STEP 20S

SET 0:01 MIN

CLOCK REGEN NEXT

+

-

STEP 20S – If Off or Time was selected in previous steps, this screen does not appear. Use up and down arrows to set duration of relay activation in minutes. Range = 0:01 (1 second) - 500:00 (500 minutes). Press NEXT to go to Step 25S. Press REGEN to return to previous step.

RELAY 1 SERV ALARM

STEP 21S

SET TRIGGER

CLOCK REGEN NEXT

+

-

STEP 21S

Service Alarm chosen to activate relay, relay closes whenever Service Alarm has triggered. Programming for service reminder is done on Step 26S. Relay opens when service alarm reset. Press NEXT to go to Step 25S to set Relay 2 Settings. If off selected for

- Relay closes on Gallons
- Relay closes on Time
- Relay closes on Both
- Off, **Factory setting is off**

RELAY 1 LOCKOUT

STEP 22S

SET TRIGGER

CLOCK REGEN NEXT

+

-

STEP 22S

Relay Triggered for Lockout, relay closes a set time before or after the start of regeneration. The start of regeneration is first backwash or draw cycle. Negative start time delays regeneration by that amount. Relay remains activated during ERROR, after power failure and after manual advance. Soft reset deactivates relay. Access REGEN setting by pressing DOWN arrow through all the negative numbers in time setting. Press NEXT to Set Start Time.

RELAY 1 SETPOINT

STEP 23S

SET -20 MIN

CLOCK REGEN NEXT

+

-

STEP 23S

Use up or down arrows to select minutes of relay activation. Range = -20 – 500 minutes. Press NEXT to select duration of relay activation. You may select REGEN if relay activation is desired for complete regeneration.

RELAY 1 DURATION

STEP 24S

SET 70:00 MIN

CLOCK REGEN NEXT

+

-

STEP 24S

Use up or down arrows to select duration of relay activation. Range = 0:01 (1 second) - 500:00 (500 minutes). Press NEXT to go to Relay 2 programming.

RELAY 2 TRIGGER

STEP 25S

SET REGEN GAL

CLOCK REGEN NEXT

+

-

STEP 25S – Relay 2 programming includes identical options as Relay 1 with the addition of the ability to trigger Relay 2 in Error Mode. Relay closes when ever control enters Error Mode and immediately deactivates when error resolved and control reset. Press NEXT to go to Step 26S.

SERVICE REMINDER

SERVICE ALARM

SET **BOTH**

CLOCK REGEN NEXT  

STEP 26S

STEP 26S – Set scheduled service display using ▲ or ▼ buttons. Available options are OFF, TIME, ON GAL or BOTH. Selecting OFF disables this feature. If OFF is selected, press NEXT to exit System Setup. If TIME, ON GAL or BOTH is selected press NEXT to select the TIME and/or ON GAL values. See Steps 27S and/or 28S. When days fall below 1 year, display shows "SCHEDULED SERVICE in XXX DAYS", so service technician can reprogram if desired. This can also activate relay if Service Alarm is selected on Step 21S. Press REGEN to return to the previous step.

SCHEDULED SERVICE

SET **0.25** YR

CLOCK REGEN NEXT  

STEP 27S

STEP 27S – Service alarm for TIME ranges from 0.25 to 9.75 years. Press ▲ and ▼ buttons together until "set" appears to select value. Press NEXT to either exit System Setup or if BOTH was selected go to Step 28S. Press REGEN to return to the previous step. When time selected and # of days drops below 1 year, the display in OEM program will show "scheduled service in XXX days" right after screen where service reminder is programmed.

SCHEDULED SERVICE

SET **80000** GAL

CLOCK REGEN NEXT  

STEP 28S

STEP 28S – Service alarm for ON GAL ranges from 100 to 9,999,900 gallons. Press ▲ and ▼ buttons together until "set" appears, use arrows to select value. Press NEXT to exit System Setup. Press REGEN to return to the previous step.

Reset service reminder by pressing up and down arrows together when reminder is displayed.

RETURN TO NORMAL MODE

DIAGNOSTICS

 = ▲ Up Arrow  = ▼ Down Arrow

Reset Diagnostic Values: Hold   NEXT/DOWN buttons for 3 seconds, then hold  UP/DOWN buttons for 3 seconds.

STEP 1D

CLOCK REGEN NEXT  

STEP 1D

STEP 1D – Press ▼ or ▲ simultaneously for three seconds. If screen in step 2D does not appear in 5 seconds the lock on the valve is activated.

DAYS SINCE REGEN

2 DAY

CLOCK REGEN NEXT  

STEP 2D

STEP 2D – Days, since last regeneration: This display shows the days since the last regeneration occurred. Press the NEXT button to go to Step 3D. Press REGEN to exit Diagnostics.

SINCE LAST REGEN

342 GAL

CLOCK REGEN NEXT  

STEP 3D

STEP 3D – Volume, since last regeneration: This display shows gallons of water that has been treated since the last regeneration. This display will equal zero if a water meter is not installed. Press the NEXT button to go to Step 4D. Press REGEN to return to previous step.

USAGE HISTORY

DAY 1 108 GAL

CLOCK REGEN NEXT  

STEP 4D

STEP 4D – Volume of water used, 63-day usage history: This display shows day 0 (for today) and 1 (for yesterday) will show day 2 (which would be the day before yesterday) and flashes the volume of water treated on that day. Continue to press the ▲ button to show the volume of water treated for the last 63 days. If a regeneration occurred on the day, the "letter R" will also be displayed. This display will show dashes if a water meter is not installed. Press the NEXT button at any time to go to Step 5D. Press REGEN to return to the previous step.

MAX FLOW
DAY 6 12.7 GAL

CLOCK REGEN NEXT

▲
- ▼

STEP 5D

"1" 0 DAYS 12:35 PM
A - B 0.00 GAL

CLOCK REGEN NEXT

▲
- ▼

STEP 6D

ALT + FIRST
CYC CCC TTT VVV

CLOCK REGEN NEXT

▲
- ▼

STEP 7D

RETURN TO NORMAL MODE

STEP 5D – Flow rate, maximum of each of last seven days: The maximum flow rate in gallons per minute that occurred in each of the last seven days will be displayed. Press ▲ arrow to display maximum flow rate today = 0, yesterday = 1. This display will equal zero if a water meter is not installed. Resettable by pressing ▲ & ▼ arrows for 5 seconds. Press REGEN to return to the previous step.

STEP 6D – Diagnostic 4T– Tank Transfer History

Up and down arrows scroll through each of the last 10 tank transfers

"1" = Transfer Number (10 Transfers Max)

"A" = Tank Transferring

"3" = Days Ago of Transfer (99 Days Max)

"0.00" = Gallons Used at Time of Transfer Display, viewed in 1.0T Mode only.

STEP 7D – MAV Drive History – Not displayed if MAV set to off.

- First - Average of 1st three drive times of MAV in that direction
- Last - Last drive time measured for that MAV in that direction
- Ave - Average drive time measured for MAV in that direction
- TTT - Drive time (1424 = 14.24 seconds)
- CCC - Total number of cycles for that MAV
- VVV - Relative drive voltage

MAV drives piston "in" is designated by (-) sign.

MAV drives piston "out" is designated by (+) sign.

Any time MAV is rebuilt or replaced, reset diagnostics to reflect new drive characteristics.

VALVE HISTORY (Can not be reset)

AC SOFTWARE VERSION
101.03

CLOCK REGEN NEXT

▲
- ▼

STEP 1VH

TOTAL DAYS
970

CLOCK REGEN NEXT

▲
- ▼

STEP 2VH

TOTAL REGENS
235

CLOCK REGEN NEXT

▲
- ▼

STEP 3VH

TOTAL GALLONS
175 GAL x1K

CLOCK REGEN NEXT

▲
- ▼

STEP 4VH

ERROR LOG XXXX
1 - - -

CLOCK REGEN NEXT

▲
- ▼

STEP 5VH

STEP 1VH – Press ▼ and ▲ simultaneously until display changes, release and press ▼ and ▲ again simultaneously and release. If screen in step 1VH does not appear in 5 seconds the lock on the valve is activated.

STEP 2VH – Days, total since start-up: This display shows the total days since startup. Press the NEXT button to go to Step 3VH. Press REGEN to return to previous step.

STEP 3VH – Regenerations, total number since start-up: This display shows the total number of regenerations that have occurred since startup. Press the NEXT button to go to Step 4VH. Press REGEN to return to previous step.

STEP 4VH – Volume, total used since start-up: This display shows the total gallons treated since startup. This display will equal zero if a water meter is not installed. Press NEXT button to go to Step 5VH. Press REGEN to return to previous step.

STEP 5VH – Error Log history: up to 10 errors. Press ▼ and ▲ buttons to view each recorded error. If no errors have occurred " - - - -" is displayed. With STALL ERRORS 102, 107, 117 in right upper corner of display indicates motor position at time of error detection. Press NEXT to exit valve history.

CYCLE SEQUENCE

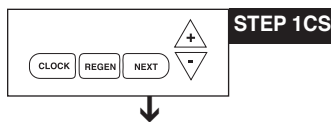
Anytime cycle sequence is modified, softener set-up will revert to manufacturer setting and must be reprogrammed as desired.

Cycle Sequence instructions allows the operator to set the order of the cycle. The Softener System Setup allows the operator to set how long the cycles will last. The operator may choose up to 9 cycles in any order.

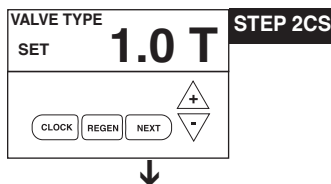
END must be used as the last cycle option. The SOFTENING cycle should only be used in brine prefill applications to allow salt to dissolve.

Cycle Options		
BACKWASH	SOFTENING	FILL
RINSE	REGENERANT DRAW-UP	END

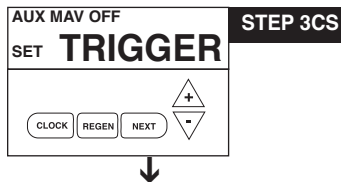
The following is an example of how to set a valve so that when regeneration is initiated, BACKWASH occurs first, REGENERANT DRAW DN occurs second, a second BACKWASH is programmed third (used in high iron applications), RINSE occurs fourth, and FILL occurs fifth. **Factory cycle sequence for downflow is FILL, SOFTENING, BACKWASH, REGENERANT DRAW DOWN and RINSE. Factory cycle sequence for upflow is FILL, SOFTENING, REGENERANT DRAW UP, BACKWASH and RINSE.**



STEP 1CS – Press NEXT and ▼ simultaneously until TYPE appears on screen and release. Then press NEXT and ▼ simultaneously again for 3 seconds and release. If screen in step 2CS does not appear in 5 seconds the lock on the valve is activated.



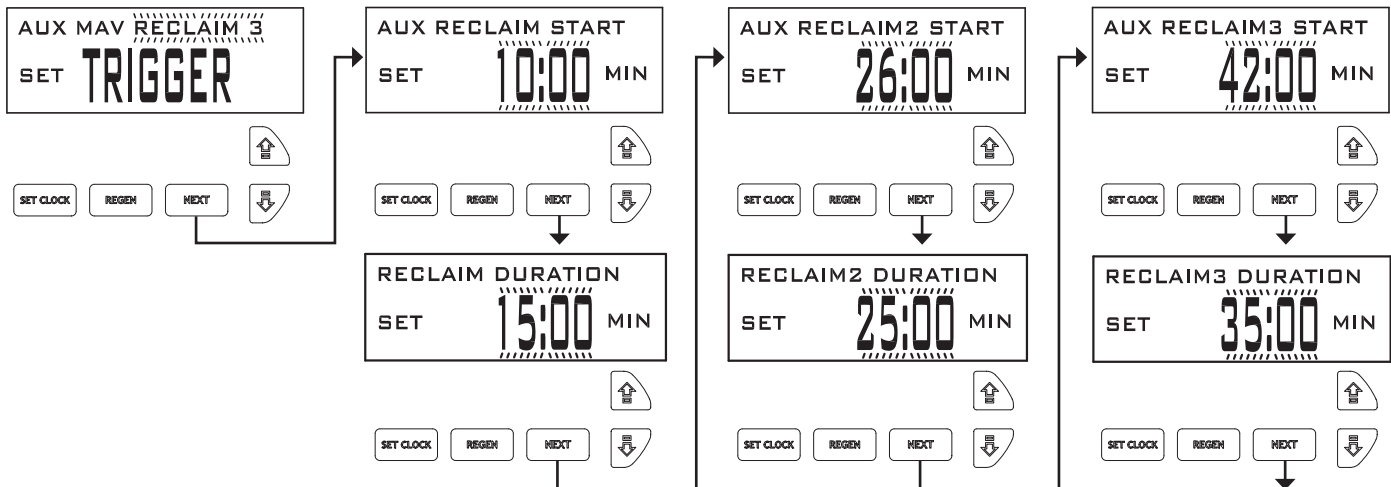
STEP 2CS – Valve Type. Use the ▲ or ▼ to select from 1.0", 1.25", 1.50", 2.0L", 2.0" valve. Twin Alternating is a 1.0 (T)" valve. Press NEXT to go to Step 3CS.



STEP 3CS – Use the ▲ or ▼ buttons to select one of the following:

- Reclaim – Allows brine reclamation. Select Reclaim for 1 Reclaim Event, Reclaim 2x for 2 reclaim events and Reclaim 3x for 3 reclaim events – See instructions ON PAGE 16.
- Separate Source –Allows Auxiliary MAV to switch positions before the start of regeneration and to switch back at the end of regeneration. See instructions in Step 6CS.
- Off - **Factory Setting is Off**

Press NEXT to go to Step 4CS when reclaim selected as trigger. Press REGEN to return to previous step.



AUX RECLAIM START

STEP4CS

SET

30:00 MIN

CLOCK

REGEN

NEXT

▲

▼

↓

STEP 4CS – Only displays if reclamation of brine is enabled in Step 3CS. Use the ▲ or ▼ buttons to select the number of minutes after the start of regeneration the MAV will divert the brine waste water from the plumbing drain receptacle to the brine tank. Start of regeneration is defined as any mode that is not fill or softening. Use Table 1 on page 16 for settings.

Press NEXT to go to Step 5CS. Press REGEN to return to previous step.

AUX DURATION

STEP 5CS

SET

6:00 MIN

CLOCK

REGEN

NEXT

▲

▼

STEP 5CS – Only displays if reclamation of brine is enabled in Step 11CS. Use the ▲ or ▼ buttons to select the number of minutes to divert the brine waste water to the brine tank. After the minutes count down to zero the waste water will once again be diverted to the plumbing drain receptacle.

Press NEXT to go to Step 7CS. Press REGEN to return to previous step.

AUX MAV SEP SOURCE

STEP 6CS

SET

TRIGGER

CLOCK

REGEN

NEXT

▲

▼

↓

STEP 6CS – Separate source selection requires connection of motorized alternator valve (MAV) to Auxiliary Drive two-pin connection on board.

Auxiliary MAV Drive set to operate with a Separate Source trigger. Auxiliary MAV transitions to Bypass before the start of regen cycle #1, AFTER Alternator MAV motor transition. Auxiliary MAV transitions back to Service at the completion of the last programmed regen cycle, once the Valve Motor deactivates and BEFORE Alternator MAV transition (if scheduled). Auxiliary MAV will NOT automatically return to Service while manually stepping valve through regen, MAV will remain in Bypass until regen cycle end. Press NEXT to go to Step 7CS. Press REGEN to return to previous step.

AUXILIARY INPUT

STEP 7CS

SET

OFF

REG

CLOCK

REGEN

NEXT

▲

▼

↓

STEP 7CS – This display will be available to select the use of an outside signal to control the initiation of a regeneration. Selection only matters if a connection is made to the two pin connector labeled DP SWITCH located on the printed circuit board. Following is an explanation of the options:

- **IMMED REGEN** – If the dP switch is closed for an accumulative time of 2 minutes, a regeneration will occur immediately.
- **DELAY REGEN** – If the dP switch is closed for an accumulative time of 2 minutes, a regeneration will occur at the schedule regeneration time.
- **HOLD REGEN** – If the dP switch is closed a regeneration will be prevented from occurring.
- **OFF - Factory setting is off**

Press NEXT to go to Step 8CS. Press REGEN to return to previous step.

BACKWASH

STEP 8CS

SET

CYCLE 1

CLOCK

REGEN

NEXT

▲

▼

↓

STEP 8CS – Press the ▲ or ▼ buttons until selection of first cycle appears in left upper corner, in this example BACKWASH is selected. Press NEXT to go to Step 9CS. Press REGEN to return to previous step.

REGENERANT DRAW DN
SET **CYCLE 2**

CLOCK REGEN NEXT

▲
▼

STEP 9CS

STEP 9CS – Press the ▲ or ▼ buttons until selection of second cycle appears in left upper corner, in this example Regenerant Draw DN is selected. For a H125 control valve: prior to selecting DN or UP or not selecting a regenerant flow cycle, verify the correct valve body, main piston, regenerant piston and stack are being used and the injector or injector plug(s) are in the correct location. On Calendar Day Override on upflow brining, may select 20% or preprogram amount for brining. Press NEXT to go to Step 10CS. Press REGEN to return to previous step.

BACKWASH
SET **CYCLE 3**

CLOCK REGEN NEXT

▲
▼

STEP 10CS

STEP 10CS – Press the ▲ or ▼ buttons until selection of third cycle appears in left upper corner, in this example BACKWASH is selected. A second backwash mode is recommended on iron applications > 1.0 ppm. Press NEXT to go to Step 11CS. Press REGEN to return to previous step.

RINSE
SET **CYCLE 4**

CLOCK REGEN NEXT

▲
▼

STEP 11CS

STEP 11CS – Press the ▲ or ▼ buttons until selection of fourth cycle appears in left upper corner, in this example RINSE is selected. Press NEXT to go to Step 12CS. Press REGEN to return to previous step.

FILL
SET **CYCLE 5**

CLOCK REGEN NEXT

▲
▼

STEP 12CS

STEP 12CS – Press the ▲ or ▼ buttons until selection of fifth cycle appears in upper left corner. Press NEXT to go to Step 13CS. Press REGEN to return to previous step.

END
SET **CYCLE 6**

CLOCK REGEN NEXT

▲
▼

STEP 13CS

STEP 13CS – Press the ▲ or ▼ button until last regeneration cycle; END appears (up to 9 regeneration modes are possible). **End must be selected as last cycle.** Press NEXT to go to Step 14CS.

ALT FILL TRIGGER
SET **REGENS OFF**

CLOCK REGEN NEXT

▲
▼

STEP 14CS

STEP 14CS – Press the ▲ or ▼ button to select number of standard regenerations which would trigger one alternate brine fill amount. Range: 1-99. **Factory setting is Off.** Press NEXT to go to Step 15CS.

ALT FILL AMOUNT
SET **15.0 LBS**

CLOCK REGEN NEXT

▲
▼

STEP 15CS

STEP 15CS – Select amount of salt to be used when alternate regeneration requested. This screen is not displayed if off is selected in previous step. Softener Range 0.1–200 lbs. Filter Range 0.05–20.0 Gallons. Press NEXT to end cycle sequence.

WATER SOFTENER DRAINING PROCEDURE

In cold weather climates it is common for plumbing systems that are not in use to be “winterized” or drained of all water to prevent any damage that may be caused by the excessive expansion of water when it freezes. To prevent damage to a water softener it must be **properly** drained also. A simple way to properly drain or winterize a water softener is to use compressed air to force all of the water out of the softener mineral tank. The following procedure will explain the process:

- 1) Initiate the softener into a manual regeneration cycle. After the refill cycle, advance control to backwash and allow it to complete the backwash cycle (this will clean the media) and start into the brine-draw cycle. Allow the regeneration to continue in the brine draw cycle until the brine is drawn out of the salt tank and the air check at the bottom of the brine pick-up tube shuts off. This should be done with each tank. **NOTE: Be sure you have salt in the brine tank and allow 1 hour minimum to make a saturated brine. It is important that any liquid left in the softener tank when you finished blowing out system be saturated brine solution to prevent any damage to the softener.** At this time no more brine is introduced into the softener and the slow rinse process begins.
- 2) Turn the water supply inlet and outlet valves off to the water softener as soon as the air check shuts off and no more brine is being drawn into the softener (at the beginning of the slow rinse process).
- 3) Unplug the electric power leaving the softener control valve in the brine draw cycle.
- 4) Remove the brine refill elbow assembly from the control valve. Remove the refill flow control retainer assembly from the elbow. Reinstall the elbow assembly and secure with the locking clip. Disconnect the brine tube at the top of the salt keeper and force air into the brine tube toward the softener mineral tank and control valve. The air will force the brine/water solution that was drawn into the mineral tank out to drain through the control valve drain line. (An air compressor blow gun attachment with a portable air compressor works well.) Reinstall the brine line flow control retainer in side of the refill elbow assembly. Reinstall the brine refill elbow assembly and secure with locking clip.

CAUTION: You do not want to apply any more pressure than necessary to force the brine/water out of the mineral tank.

The small amount of brine/water that may be left in the mineral tank will not expand enough to cause any damage to the softener when it freezes.

If your softener is equipped with an optional bottom drain on the mineral tank, you will have to follow all of the same procedures with the exception of the need for compressed air. With the brine tube disconnected from the salt keeper, raise it to a level above the softener control valve and temporarily secure it in this position. Now open the drain valve at the bottom of the mineral tank and allow all brine/water to drain from the mineral tank.

CAUTION: If a hose is connected to the drain valve to direct the brine/water to a floor drain be sure it runs downward and is unobstructed. When brine/water quits running at the drain, be sure to leave the drain valve open until you start the system up again.

- 5) At this time the salt keeper has very little water left in it. What liquid is left in the salt keeper is saturated brine, provided that there is still salt left in the tank. Saturated brine will not freeze solid and cause any damage and does not have to be drained any further from the brine tank.

If there is no salt left in the salt keeper when the system is drained we recommend dumping all of the water out of the brine tank at this time. See brine tank cleaning instructions. (#2 in Miscellaneous section, below)

- 6) **CAUTION:** It is important at this time to be assured that the inlet/outlet water supply piping is properly drained. Depending on how the water supply piping was routed to the water softener control valve, a water loop or trap may have been created. Sometimes drain valve(s) are installed at the bottom of the loop to assure all water can be drained out. If not it may be necessary to disconnect the control valve from the piping system and open the inlet/outlet valve(s) to allow all the water to drain from the piping. This should be done after the rest of the plumbing system is drained.
- 7) Draining or winterizing of your softener is complete. Refer to the start-up procedures on page 7 when you are ready to start your softener.

MISCELLANEOUS

1. Salt Usage: See your water conditioning professional for a recommendation on the best type of salt for your application.
2. Brine Tank Cleaning:
 - a. Remove brine tank cover.
 - b. Scoop out as much old salt as possible.
 - c. Disconnect brine tubing from safety brine valve at brine well.
 - d. Remove safety brine valve from brine well.
 - e. Place one hand in brine well to hold overflow nut and remove 2-piece overflow.
 - f. Remove brine well and optional grid plate, if used, from brine tank.
 - g. Remove any remaining salt and/or impurities from brine tank.
 - h. Using clean water and a brush or rag, wipe and rinse inside of brine tank. Wipe and rinse the grid plate and brine well.
 - i. Reassemble brine tank reversing steps c - f. Note: If grid plate is used and it is damaged or cracked, replace with new one.
 - j. Put brine tank in place making sure there is no debris or foreign material beneath it.
 - k. Reconnect brine tubing to safety brine valve.
 - l. Manually add 6 inches of water to the brine tank (or to approximately 1" above the grid plate, if used).
 - m. Add new salt. Important: Do not add the old salt which was removed earlier unless it is clean and not mushy. We recommend using new salt.
 - n. Follow the disinfection instructions found on page 5.
 - o. Put on brine tank cover.

TROUBLE SHOOTING

PROBLEM	CAUSE	CORRECTION
After resolving the cause of any error code or any service work on valve, press NEXT & REGEN simultaneously for 5 seconds or disconnect power supply for 5 seconds at PC board and reconnect to resynchronize software with piston position.		
VALVE ERROR CODES		
Error Code 101 - Unable to recognize start of regeneration	A1. Control not reading piston position	A1. Resynchronize software with piston position by pressing start of regeneration NEXT and REGEN buttons simultaneously for 5 seconds, until screen changes. Initiate regeneration to verify function by pressing and holding REGEN button until regeneration initiates, step through regeneration modes by pushing REGEN button each time motor stops. A2. Verify motor connection to PC board; motor wires intact and motor fully inserted to engage pinion. A3. Verify correct assembly; PC board snapped onto drive bracket and wires are in backplate guides and drive bracket snapped onto backplate. Verify three drive gears are in place on drive bracket.
Error Code 102 - Unexpected stall	B1. Mechanical Binding B2. Improper voltage being delivered to board	B1a. Check for any foreign material in stack assembly impeding piston movement and remove; verify seals intact and in place in stack assembly, if not replace stack assembly. B1b. Check for incorrect assembly, drive bracket not snapped into place, motor pushed inside of barrel of drive bracket (black gear on motor end should be flush with end of shaft). B1c. Drive gears unable to rotate freely - replace gear(s) if not rotating freely. B2. Motor unable to move piston, check voltage is present on 12V DC motor at start of regeneration modes. Transformer should provide at least 12 volts when plugged into outlet and not attached to board - if not replace transformer
Error Code 103 - Motor ran too long, timed out trying to reach next position	C1. High drive forces on piston	C1. Loosen drive cap gear 1/4 turn C2. Address high drive forces C3. Motor failure during regeneration-replace motor
Error Code 104 - Motor ran too long, timed out trying to reach home position	D1. Piston unable to reach home position	D1. Incorrect assembly; check drive bracket is correctly seated and snapped into place on backplate, wires outside of guides on backplate can impede drive bracket from correct position. D2. Check PC board is seated on posts and snapped into place on drive bracket D3. Drive gear labels dirty or missing, missing or broken gear, replace as needed
MAV ERROR CODES		
After resolving any MAV error or servicing MAV, resynchronize software with piston positioning by pressing NEXT and REGEN buttons simultaneously for 5 seconds or disconnecting power from PC board for 5 seconds and reconnecting.		
ALTERNATING MAV DRIVE - ERROR CODES 106 & 107		
Error Code 106 - Alternating MAV ran too long		A1. Control valve is programmed for alternating without having MAV wire connected to MAV drive on board. Reprogram valve to proper setting or connect MAV wire to MAV drive on PC board
Error Code 107 - Alternating MAV stalled	Mechanical Binding	A2. MAV motor not fully engaged with gears B1. Open MAV drive and check for foreign material on stack assembly, remove if present, verify seals intact and in place. If not, replace stack assembly B2. Drive gear should spin freely-replace if necessary
AUXILIARY MAV DRIVE - ERROR CODES 116 & 117		
Error Code 116 - Auxiliary MAV ran too long		A1. Control valve is programmed for auxiliary MAV without having MAV connected to board. Reprogram valve to proper setting or connect MAV to two-pin connection labeled auxiliary drive on PC board
Error Code 117 - Auxiliary MAV stalled	Mechanical Binding	A2. MAV motor not fully engaged with gears B1. Open MAV and check for foreign material on stack assembly, remove if present, verify seals intact and in place. If not, replace stack assembly B2. Drive gear and reducing gears should spin freely, replace if necessary
1. Control valve stalled in regeneration	A. Motor not operating B. No electric power at outlet C. Defective transformer D. Defective PC board E. Broken drive gear or drive cap assembly F. Broken piston retainer G. Broken main or regenerant piston	A. Replace Motor B. Repair outlet or use working outlet C. Replace transformer D. Replace PC board E. Replace drive gear or drive cap assembly F. Replace drive cap assembly G. Replace main or regenerant piston

TROUBLE SHOOTING

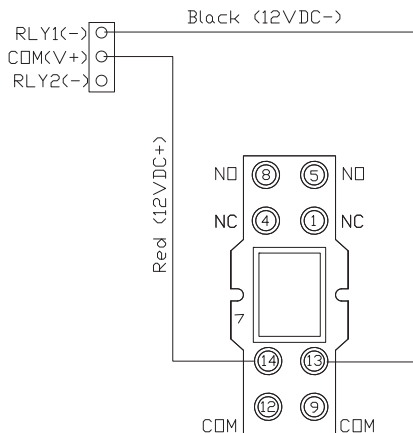
PROBLEM	CAUSE	CORRECTION
2. Control valve does not regenerate automatically when REGEN button is depressed and held	A. Transformer unplugged B. No electric power at outlet C. Broken drive gear or drive cap assembly D. Defective PC board	A. Connect transformer B. Repair outlet or use working outlet C. Replace drive gear or drive cap assembly D. Replace PC board
3. Control valve does not regenerate automatically but does when REGEN button is depressed	A. Bypass valve in bypass position B. Meter connection disconnected C. Restricted/stalled meter turbine D. Programming error E. Defective meter F. Defective PC board	A. Put control valve in service position B. Connect meter to PC board C. Remove meter and check for free rotation or foreign matter D. Check control valve set-up procedure E. Replace meter F. Replace PC board
4. Time of day flashes on and off	A. Battery back-up maintains time-of-day up to 2 years in event of power outage and battery is not depleted. Time of day flashes when battery is depleted. B. Prior to 2/2007, PC board did not have battery back-up - capacitor held time of day up to 2 hours. Power outage > 2 hours.	A. Reset time of day and replace battery on PC Board (Lithium coin type battery 2032) B. Reset time of day.
5. Softener delivers hard water.	A. Bypass valve is open or faulty. B. No salt or low salt level in brine tank. C. Softener fails to draw brine. D. Excessive water usage. E. Insufficient brine level in brine tank. F. Resin level inadequate. G. Meter faulty. H. Raw water hardness fluctuation.	A. Close bypass valve or replace. B. Add salt to brine tank and maintain salt level above water level. C. See problem #10. D. Check gallon capacity settings. E. Check brine refill setting and refill flow restrictor for blockage. F. See problem #7. G. Test meter and clean or replace meter. H. Test raw water hardness and adjust settings to highest known hardness.
6. Unit uses too much salt.	A. Improper brine refill setting. B. Improper settings. C. Excessive water in brine tank. D. Leaking faucets, toilets, etc... E. Brine line flow control out of place	A. Check brine refill setting for proper salt dosage B. Check water hardness and reevaluate capacity setting specification C. See problem #9. D. Repair or replace those items. E. Replace Brine line flow control.
7. Loss of resin.	A. Backwash controller missing. B. Faulty distributor tube assembly. C. Air being drawn in through brine system. D. Air in water supply system	A. Install backwash controller. B. Check distributor tube assembly for cracks or holes. C. Check for leaks in brine lines, fittings, or air check. Repair or replace. D. 1. Install upper distributor if missing. 2. Ensure that water supply system has an air eliminator.
8. Softener delivers salty water.	A. Low water pressure. B. Excessive water in brine tank. C. Wrong size injector.	A. Check incoming water pressure - Must remain at minimum of 25 psi. B. See problem #9. C. Install correct injector.
9. Excessive water in brine tank.	A. Plugged injector. B. Faulty piston/seal assembly. C. Plugged or kinked drain line. D. Backwash flow controller closed off. E. Defective brine line flow control.	A. Remove injector and clean ports. B. Replace piston/seal assembly. C. Correct any kinking or plugging of drain line. D. Check backwash flow controller. E. Replace brine refill flow control.
10. Softener fails to draw brine.	A. Injector is plugged, absent/missing oring(s) B. Faulty piston assembly. C. Brine line connection leak. D. Drain line plugged creating excess back pressure. E. Drain line too long or too high. F. Low inlet pressure.	A. Remove injector and clean ports/replace if necessary B. Check piston assembly. C. Inspect brine line during refill cycle for leaks. D. Inspect drain line for blockage. E. Refer to drain line specifications. F. Increase inlet pressure to a minimum of 25 psi.
11. Continuous flow to drain.	A. Piston assembly failure. B. Motor failure. C. Circuit board failure.	A. Replace piston assembly. B. Replace motor. C. Replace circuit board.
12. Loss of water pressure.	A. Iron build-up in resin. B. Resin bed fouled with sand or sediment. C. Resin bed mushing due to high amount of oxidizers in water supply (chlorine).	A. See problem #13, page 21. B. Rebed softener and install sediment filter ahead of softener. C. Rebed softener. Install dechlorination system ahead of softener

TROUBLE SHOOTING

PROBLEM	CAUSE	CORRECTION
13. Iron in softened water.	A. Iron has fouled resin bed. B. Iron is not in a soluble state. C. Prefilter failure. D. Iron level excessive. E. Control fails to regenerate.	A. Use iron reducing resin cleaner to clean resin bed, and increase salt dosage or regenerate more frequently or rebed softener. Install an Iron Curtain System ahead of the softener. B. Test water to determine type of iron, install iron reduction system. C. Check prefilter. D. Install iron reduction system. E. See problem #3, page 20.
14. Absent or incomplete LED display	A. Transformer unplugged B. No electric power at outlet C. Defective transformer D. Battery < 3 volts E. Defective PC board	A. Plug transformer into uninterrupted outlet B. Repair outlet or use working outlet C. Replace transformer D. Replace 2032 battery E. Replace PC board
15. Control does not display correct time of day	A. Power outage > 2 years B. Power outage < 2 years, time of day flashing, battery depleted	A. Reset time of day B. Replace lithium coin type battery on circuit board Model 2032 battery
16. No "softening" or "filtering" display when water is flowing	A. Bypass valve in bypass position B. Meter connection disconnected C. Restricted/stalled meter turbine D. Defective meter E. Defective PC board	A. Put bypass valve in service position B. Connect meter to PC board C. Remove meter and check for free rotation, clean foreign material D. Replace meter E. Replace PC board
17. Control valve regenerates at wrong time of day	A. Twin Alternating softener can regenerate at any time	

RELAY TROUBLESHOOTING

PROBLEM	CAUSE	CORRECTION
18. Relay does not energize		
A. Relay driver programmed on "Time"	A. Programmed incorrectly B. Defective relay, See figure below C. Defective PC Board D. Faulty wire connections between PC board and relay	A. Reprogram, see pages 11 & 12 B. Replace Relay C. Replace PC Board D. Check and repair wire connections
B. Relay driver programmed on "Gallons"	A. Programmed incorrectly B. Faulty meter connection C. Defective relay, See figure below D. Defective PC Board E. Faulty wire connections between PC board and relay	A. Reprogram, see pages 11 & 12 B. Repair or replace meter assembly C. Replace Relay D. Replace PC Board E. Check and repair wire connections
19. Relay energized during regeneration	A. Relay programmed as "on REGEN gallons"	A. Reprogram, see pages 11 & 12



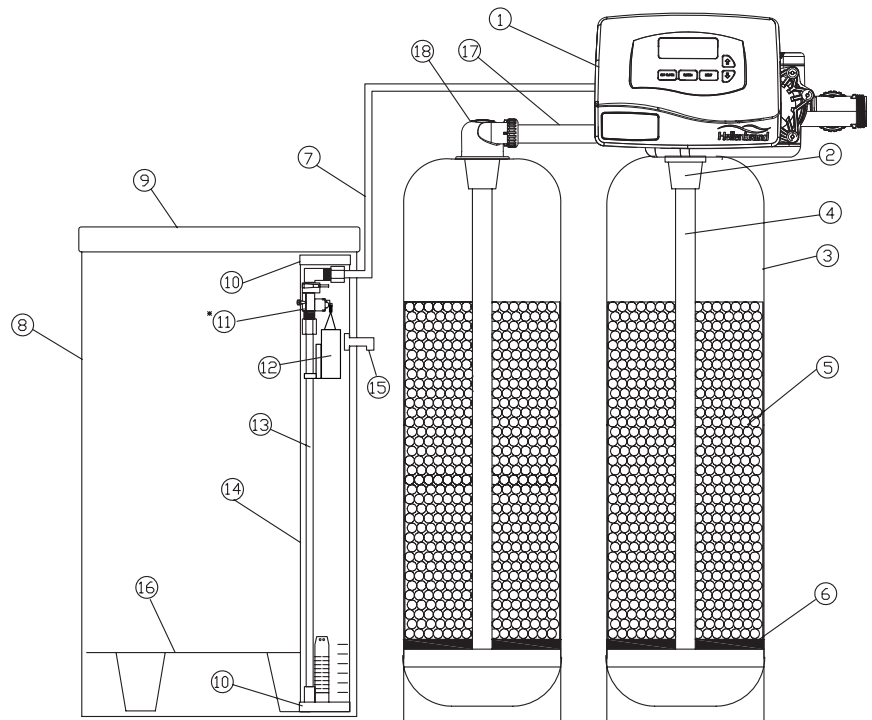
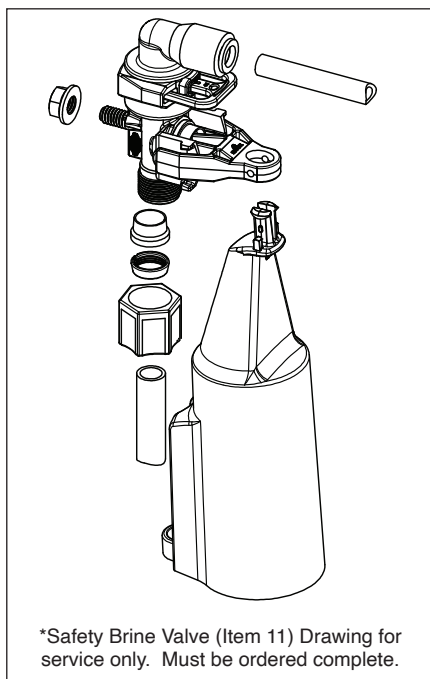
Relay operation while in error modes

1. Relays should turn off immediately whenever a Valve Error occurs.
2. Relays should remain on and continue to operate as programmed if a MAV Error (106/107 or 116/117) occurs and the valve has already entered regen.
3. Relays should remain off, and not operate as programmed, if a MAV Error (106/107 or 116/117) occurs and the valve has not entered regen.
4. Lockout - Relay remains active during error, power outage and manual advance through regeneration cycles.

PROMATE ECOMAX DUO TWIN ALT & BRINE TANK ASSEMBLIES

Item	Description	Qty	Part #	
1	Upflow Metered Control Valve	1	110142	Specify Model - ie 8, 10, 13
2	Top Diffuser	2		
3&4	Mineral Tank Assembly		Item 3 & Item 4	
			Mineral Tank & Distributor Assy	Granite Tank Jacket (not shown)
	PM EcoMax Duo-8	2	110560	103626
	PM EcoMax Duo-9	2	110561	103630
	PM EcoMax Duo-10	2	110563	106745
	PM ExoMax Duo-12	2	110564	
	PM EcoMax Duo-13	2	110565	
	PM EcoMax Duo-14	2	110566	
	PM EcoMax Duo-16	2	110567	
	PM EcoMax Duo-18	2	110568	(Hub & Lateral)
	PM EcoMax Duo-21	2	110569	(Hub & Lateral)
5	Ion Exchange Resin	x2*	111102	*See Specifications for amount
7-15a	Brine Tank Assy (18x40)-Granite	1	104449	
b	Brine Tank Assy (24x41)		104424	
b	24x50 BrineTank-Black	1	104497	
9a	Brine Tank Cvr 18x40	1	101448	
b	Brine Tank Cvr 24x41		Included with 8b	
c	Brine Tank Cvr 24x50		Included with 8c	
10-14 a	Safety Brine Valve Assy 41"		104172	
b	Safety Brine Valve Assy 50"		104173	
10	Cap, Brine Well	2	101365	
11*	Safety Brine Valve	1	101274	
12	Float Assembly	1	101660	
13	Air Check	1	101181	
14 a	Brine Well 40"-41"	1	102877	
b	Brine Well 50"		102878	
15	2-Piece Overflow	1	102217	
16 a	Grid Plate 18" (optional)	1	101758	
b	Grid Plate 24" (optional)	1	101754	
17	Interconnect Fitting	1		
	8-10" Tanks - No Jackets		110194	
	8-10" Tanks with Jackets		110185	
	made for specific tank sizes on larger units			
18	In/Out Head	1	101777	
-	Owners Manual (Not Shown)	1	800662	

*Must be ordered as complete assembly



FRONT COVER AND DRIVE ASSEMBLY

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	101473	Cover	1
2	102096	Motor	1
3	101262	Drive Bracket & Spring Clip	1
4	109807	PC Board	1
5	101746	Drive Gear 12x36	3
6	101459	Drive Gear Cover	1
7	Relay Kit Options: 103724 103723 103730 103729	See Page 24 for Relay Wiring PCM Relay Installed PCM Relay Kit Pigtail Relay Installed Pigtail Relay Kit	1
8	102385	Relay Only	1
Not Shown	111723	Transformer 110V-15V DC	1
9	110038	Battery	1

After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack from the printed circuit board (black wire) and plug back in. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version (ex: 214) and then reset the valve to the service position.

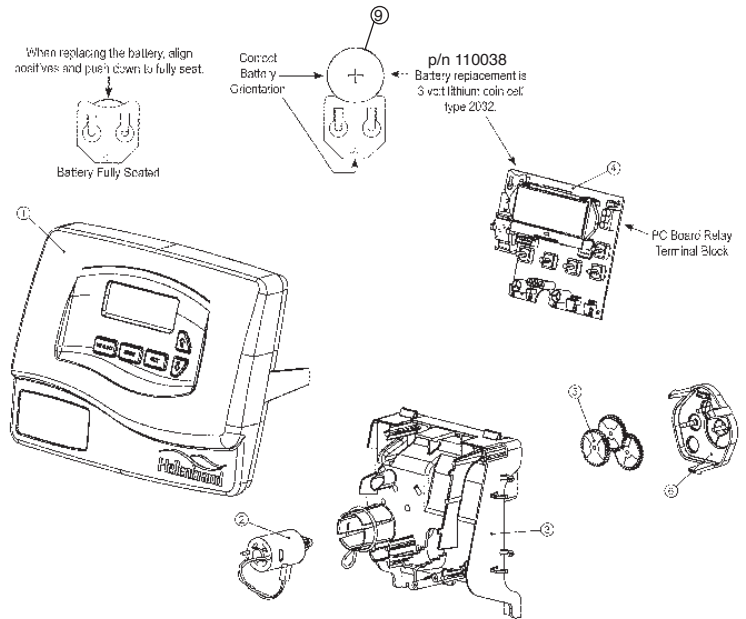


Figure 14

DRIVE CAP ASSEMBLY, DOWNFLOW PISTON, REGENERANT PISTON AND SPACER STACK ASSEMBLY

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102548	Spacer Stack Assy	1
2	101613	Drive Cap Assy.	1
3	102167	O-Ring 228 - Drive Cap Assy.	1
4a	102292	Piston Downflow Assy.	1**
4b	102297	Piston Upflow Assy.	1
5	102296	Regenerant Piston	1
6	102192	O-ring 337-tank	1
7	102165	O-ring - Distributor Tube	1
8	101189	Back Plate	1
9	102892	Service Wrench - Not Shown	1

*102292 is labeled with DN and 102297 is labeled with UP.
Note: The regenerant piston is not used in backwash only applications.
**Standard Option.

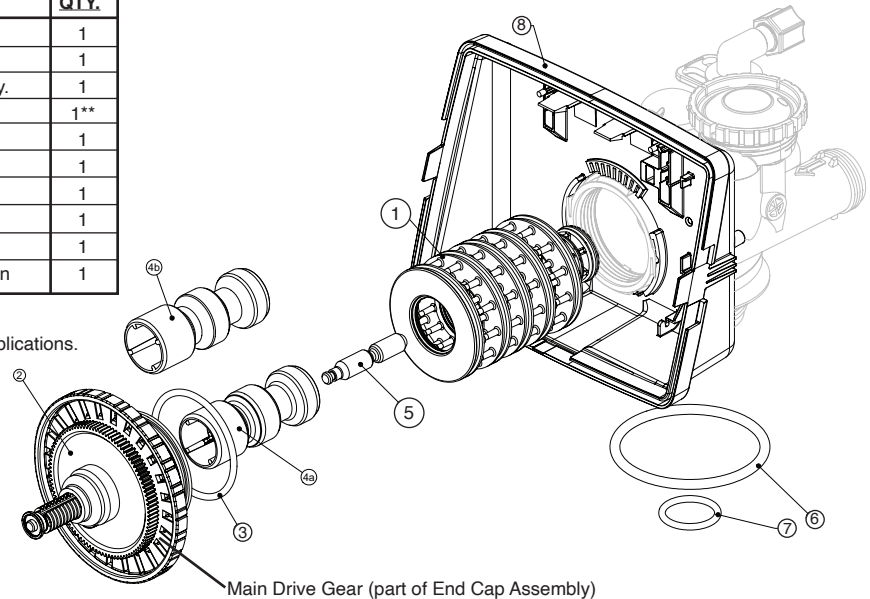


Figure 15

Do not use vaseline, oils, other hydrocarbon lubricants or spray silicone anywhere. A silicone lubricant may be used on black o-rings but is not necessary. **Avoid any type of lubricants, including silicone, on red or clear lip seals.**

After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons, press and hold NEXT and REGEN buttons for 3 seconds or unplug power source jack from the printed circuit board (black wire) and plug back in. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version (ex: 101.3) and then reset the valve to the service position.

INJECTOR CAP, INJECTOR SCREEN, INJECTOR, PLUG AND O-RING

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	101375	Injector Cap	1
2	102159	O-ring 135	1
3	102457	Injector Screen	1
4	102319	Injector Assy. Z Plug-Filter	1
5	101825	Injector Assy. A Black	1
	101826	Injector Assy. B Brown	
	101827	Injector Assy. C Violet	
	101828	Injector Assy. D Red	
	101829	Injector Assy. E White	
	101830	Injector Assy. F Blue	
	101831	Injector Assy. G Yellow	
	101832	Injector Assy. H Green	
	101833	Injector Assy. I Orange	
	101834	Injector Assy. J Light Blue	
	101835	Injector Assy. K Light Green	
Not Shown	106767	O-ring 011	*
Not Shown	106768	O-ring 013	*

* The injector plug and the injector each contain one 011 (lower) and 013 (upper) o-ring.

See system specification, injector color on page 32 for current injector.

Note: For upflow position, injector is located in the up hole and injector plug in the down hole. For a filter that only backwashes injector plugs are located in both holes.

The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary a pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place screwdriver in slots on caps and/or tap with a hammer.

Do not use pipe dope or other sealants on threads. Teflon tape must be used on threads of the 1" NPT connection and on the threads for the drain line connection. Teflon tape is not necessary on the nut connection nor caps because of o-rings seals.

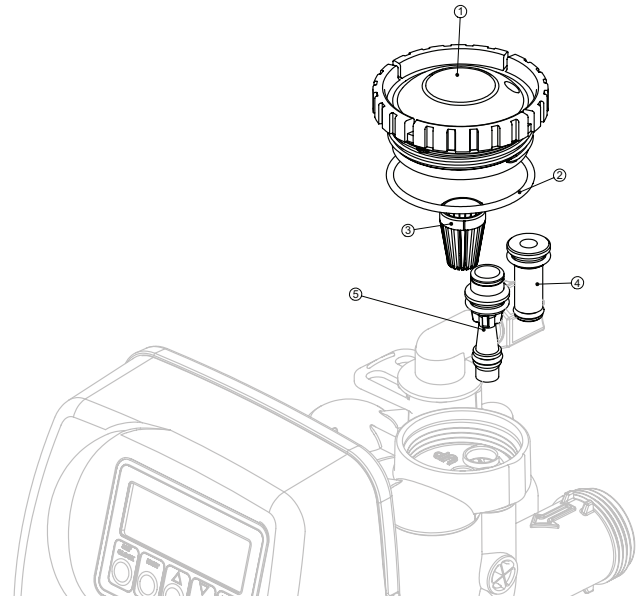
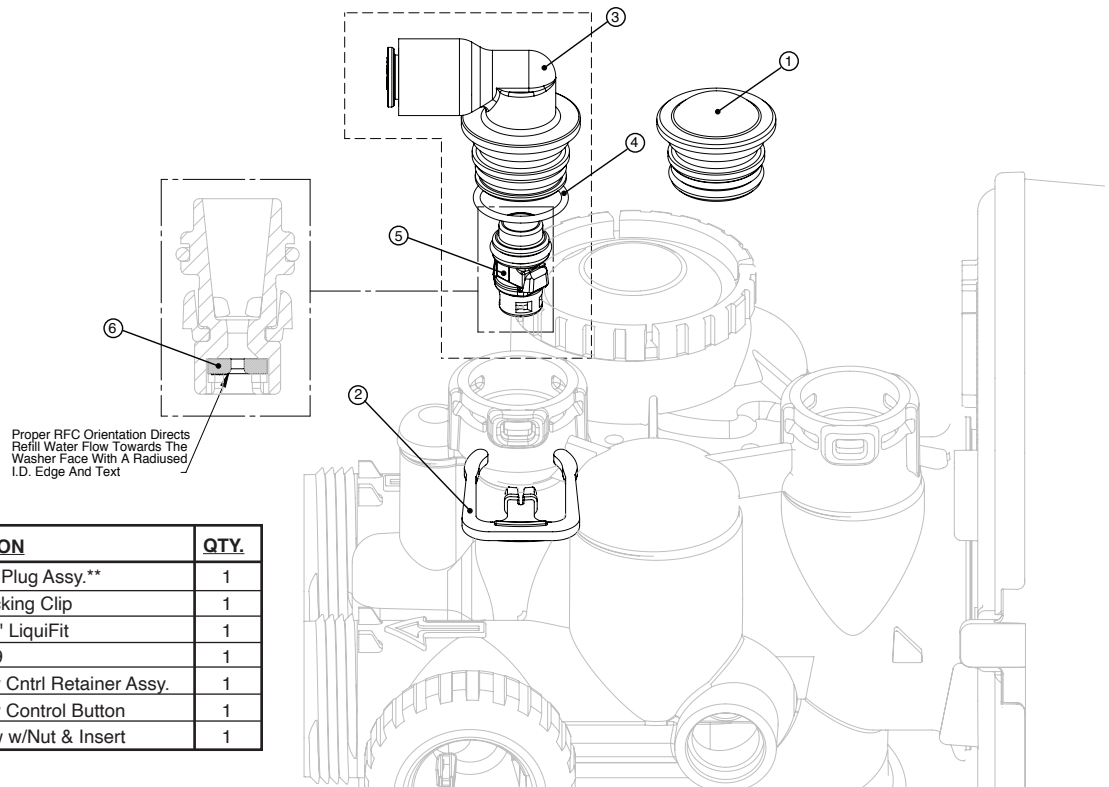


Figure 16

REFILL AND REFILL PORT PLUG



ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102322	Refill Port Plug Assy.**	1
2	101414	Elbow Locking Clip	1
3	111389	Elbow 3/8" LiquiFit	1
4	102153	O-ring 019	1
5	102418*	Refill Flow Cntrl Retainer Assy.	1
6	102421	Refill Flow Control Button	1
Not Shown	101617	1/2" Elbow w/Nut & Insert	1

*Assembly includes item #6.

**This part is required for backwash only systems.

Figure 17

DRAIN LINE - 3/4"

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	101414	Elbow Locking Clip	1
2	101871	Polytube Insert, 5/8"	Optional
3	102131	Nut 3/4" Drain Elbow	Optional
4-5	101618	Drain Elb 3/4" Male Assy-Vent	Optional
4-5	101619	Drain Elb 3/4" Male Assy-No Vent	1
5	102153	O-ring 019	1
6	102406	DLFC Retainer Assy.	1
7	101551	DLFC 0.7 gpm for 3/4"	One DLFC must be used if 3/4" fitting is used
	101552	DLFC 1.0 gpm for 3/4"	
	101556	DLFC 1.3 gpm for 3/4"	
	101559	DLFC 1.7 gpm for 3/4"	
	101574	DLFC 2.2 gpm for 3/4"	
	101577	DLFC 2.7 gpm for 3/4"	
	101583	DLFC 3.2 gpm for 3/4"	
	101588	DLFC 4.2 gpm for 3/4"	
	101591	DLFC 5.3 gpm for 3/4"	
	101593	DLFC 6.5 gpm for 3/4"	
	101594	DLFC 7.5 gpm for 3/4"	

Systems are shipped without 3/4" nut for drain elbow (polytube installation only) and 5/8" polytube insert (polytube installation only).

See System Specifications DLFC on page 32, for correct DLFC size for your unit.

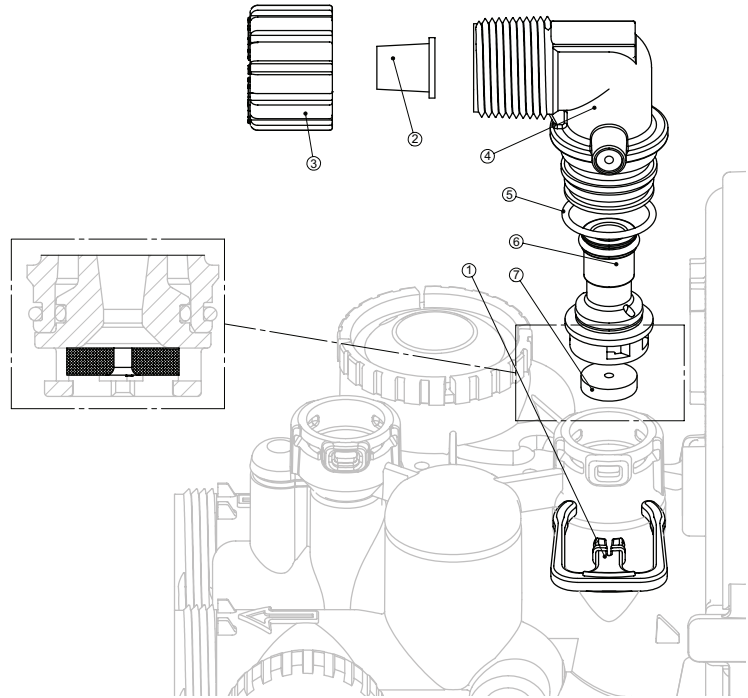


Figure 18

DRAIN LINE - 1"

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	101414	Elbow Locking Clip	1
2	101635	Drain Ftg, 1" Straight Assy-Vent	optional
2	101636	Drain Ftg, 1" Straight Assy-No Vent	1
3*	101244	Drain Ftg Body, 1"	1
4*	101160	Drain Ftg Adapter, 1"	1
5*	102153	O-ring 019	1
6*	102437	Split Ring	1
7*	102141	Nut, 1" QC	1
8*	102165	O-ring 215	1
9	101599	DLFC 9.0 gpm for 1"	One DLFC must be used if 1" fitting is used
	101562	DLFC 10.0 gpm for 1"	
	101564	DLFC 11.0 gpm for 1"	
	101567	DLFC 13.0 gpm for 1"	
	101568	DLFC 15.0 gpm for 1"	
	101571	DLFC 17.0 gpm for 1"	
	101578	DLFC 20.0 gpm for 1"	
	101580	DLFC 25.0 gpm for 1"	

See System Specifications DLFC on page 32, for correct DLFC size for your unit.

The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary a pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place screwdriver in slots on caps and/or tap with a hammer.

Do not use pipe dope or other sealants on threads. Teflon tape must be used on threads of the 1" NPT connection and on the threads for the drain line connection. Teflon tape is not necessary on the nut connection nor caps because of o-rings seals.

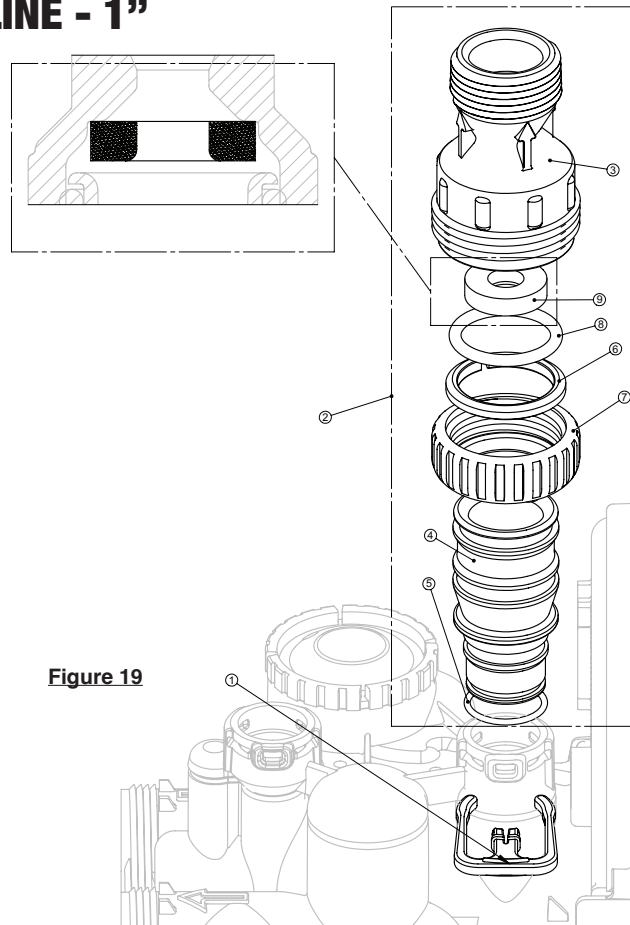


Figure 19

WATER METER AND METER PLUG

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" QC	1
2-4	102051	Meter Assy.	1
3	102687	Turbine Assy.	1
4	102165	O-ring 215	1
5	102321	Meter Plug Assy.**	1

*Order number 102051 includes 102687 and 1102165, which are item numbers 3 & 4.

**Only used if metering is not to be done (time clock units)

The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary a pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place screwdriver in slots on caps and/or tap with a hammer.

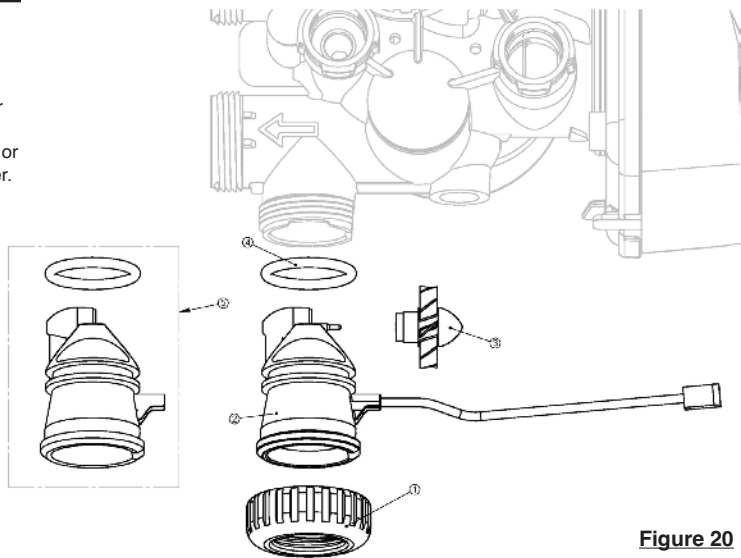


Figure 20

BYPASS VALVE

Bypass Valve

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O'Ring 215	2
4	102450	Bypass 1" Rotor	2
5	110997	Bypass Cap	2
6	110998	Bypass Handle	2
7	109479	Bypass Rotor Seal Retainer	2
8	102159	O-Ring 135	2
9	102161	O-Ring 112	2
10	102160	O-Ring 214	2

(Not Shown) Bypass Vertical Adapter Assembly

ORDER NO.	DESCRIPTION	QTY.
102141	Nut 1" Quick Connect	2
102437	Split Ring	2
102165	O'Ring 215	2
106858	Bypass Vertical Adapter	2

The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary a pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place screwdriver in slots on caps and/or tap with a hammer.

Do not use pipe dope or other sealants on threads. Teflon tape must be used on threads of the 1" NPT connection and on the threads for the drain line connection. Teflon tape is not necessary on the nut connection nor caps because of o-ring seals.

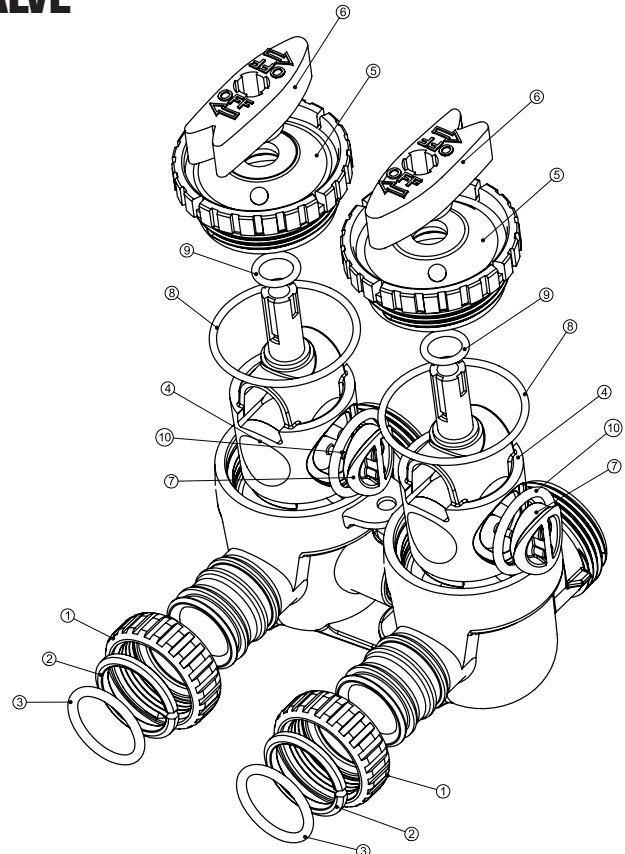
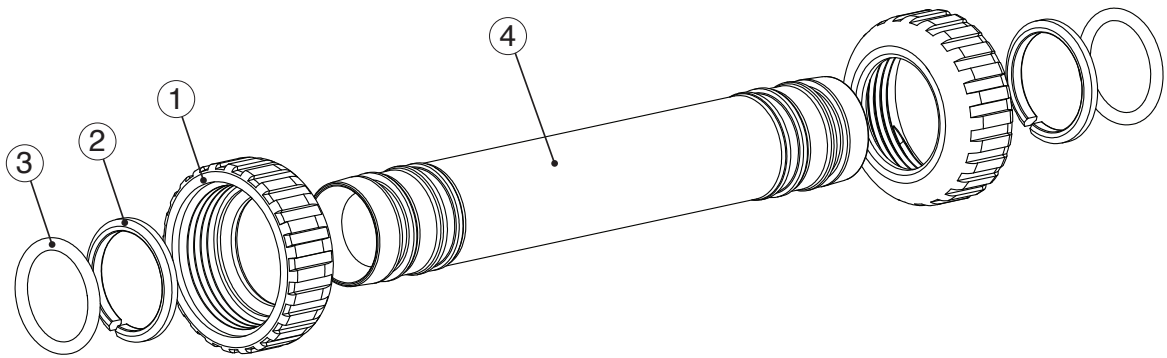


Figure 21

INTERCONNECT FITTING ASSEMBLY – 110194

Used for Tanks up to 10"

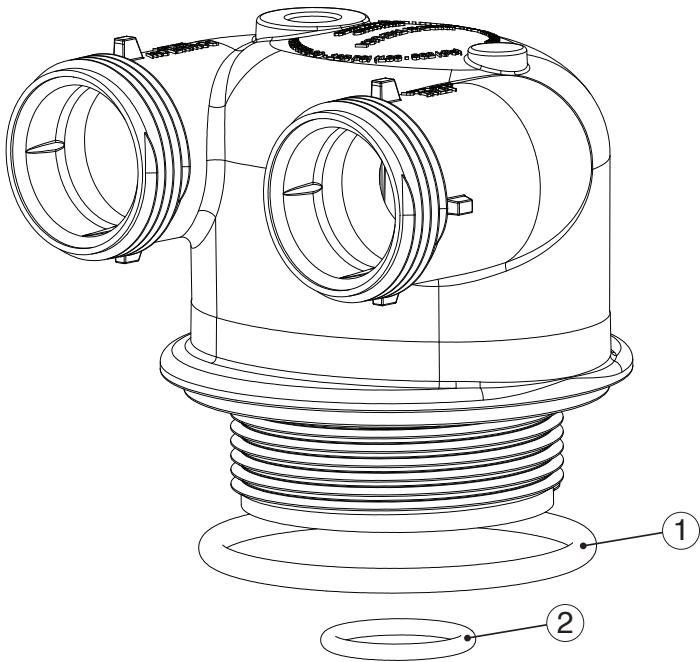


Drawing No.	Order No.	Description	Quantity
1	102141	Nut 1" Quick Connect	4
2	102437	Split Ring	4
3	102165	O-Ring 215	4
4	110184	T1 Interconnect Fitting with jackets	2

Fitting Installation Instructions:

- Installation fittings are designed to accomodate minor plumbing misalignments, but are not designed to support the weight of a system or the plumbing.
- Slide nut on first, then the split ring and o-ring.
- Hand tighten the nut only.

IN/OUT HEAD – 101777

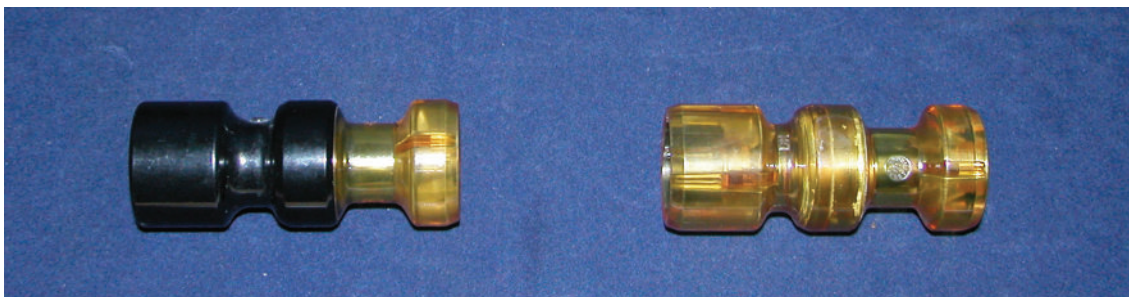
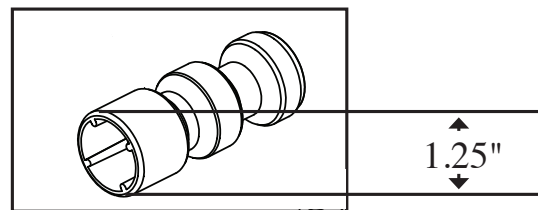
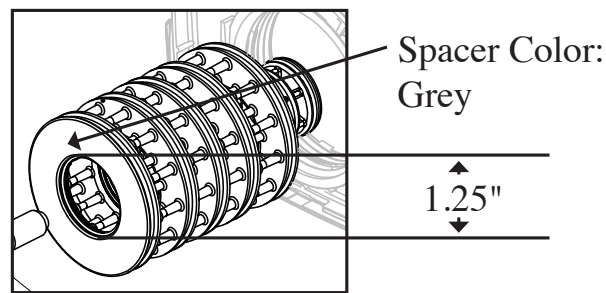


Drawing No.	Order No.	Description	Quantity
1	102192	O-Ring 337	1
2	102165	O-Ring 215 (Distributor Tube)	1

VALVE BODY COMPLIANCE TABLE

Application	Injector and/or Plug(s)	Main Piston	Regenerant Piston	Stack	Body
1" Downflow Softener or Regenerating Filter	Injector in "DN" hole, Plug in "UP" hole	102292	102296	102548	110203
1" Backwash Only Filter	Plug in "DN" and "UP" holes, Install Refill Port Plug	102292	None	102548	110203
1" Upflow Softener	Injector in "UP" hole, Plug in unlabeled hole	102297	102296	102548	110203

TWIN ALTERNATING WITH 1.050" DISTRIBUTOR TUBE OPENING IDENTIFICATION

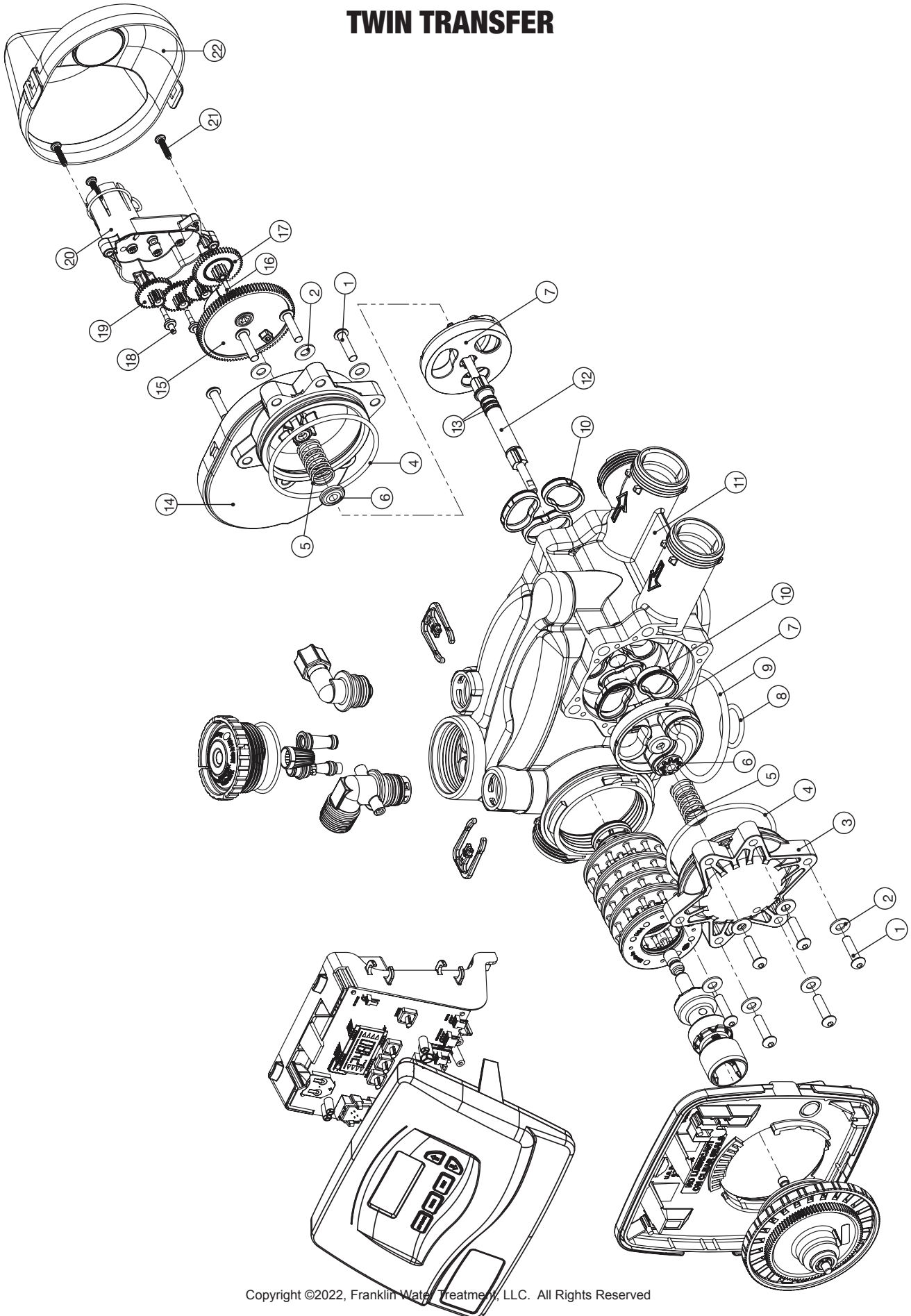


Note:

The upflow piston is black and amber.

The downflow piston is a solid amber color.

TWIN TRANSFER



TWIN TRANSFER

<u>Drawing No</u>	<u>Order No</u>	<u>Description</u>	<u>Quantity</u>
1	110196	Screw, BHC 1/4-20 x 1 SS	12
2	109534	Washer Flat SS 1/4	12
3	110197	T1 Transfer Cap Asy	1
4	110198	O-Ring 236	2
5	110199	T1 Transfer Spring	2
6	110200	T1 Transfer Spring Support	2
7	110201	T1 Rotor Disk Asy	2
8	102165	O-Ring 215 (Distributor Tube)	1
9	102192	O-Ring 337	1
10	110202	T1 Transfer Seal	6
11	110203	T1 Body Sft Wtr Regen	1
12	110204	T1 Transfer Drive Shaft Asy	1
13	110205	O-Ring 110	2
14	110206	T1 Transfer Drive Cap Asy	1
15	110207	T1 Transfer Drive Gear Asy	1
16	110208	T1 Transfer Drive Gear Axle	1
17	110209	T1 Transfer Reduction Gear	1
18	106134	WS2H Bypass Reduction Gear Axle	3
19	101746	WS1 Drive Reducing Gear 12x36	3
20	106133	WS1.5&2 Alt/2BY Reduce Gear Cvr Asy	1
21	106139	Screw #8-1 PHPN T-25 SS	3
22	110210	T1 Cover Assembly	1
Not Shown	110211	T1 Transfer Motor Asy	1
Not Shown	102141	W1 Nut 1 QC	1
Not Shown	102048	WS1.5/2L/2H Meter Commercial Asy	1
Not Shown	110194	T1 Interconnect Fitting Asy	1
Not Shown	101777	1191 In/out Head	1

SERVICE INSTRUCTIONS

CONTROL VALVES

The twin alternating control valve consist of the following components:

1. Drive Assembly
2. Drive Cap Assembly, Main Piston and Regenerant Piston
3. Spacer Stack Assembly
4. Injector Cap, Screen, Injector Plug and Injector
5. Refill Flow Control Assembly or Refill Port Plug
6. Drain Line Flow Control and Fitting Assembly
7. Water Meter
8. Twin Transfer Valve.

DRIVE ASSEMBLY

The drive assembly consists of the following parts:

- Drive Bracket
- Printed Circuit (PC) Board
- Motor
- Drive Gears
- Drive Gear Cover

The drive bracket hold the PC board, the motor, the drive gears and drive gear cover in place.

The PC board receives and retains information, displays the information, determines when to regenerate and initiates regeneration. The display shows different types of information in the initial setup (for softeners or filters), installer display settings, diagnostics, valve history or user display settings.

The PC board powers the motor. The PC board's two-prong jack connects wires to the direct current (DC) motor. The motor is held in place on the drive bracket by a spring-loaded clip and a small bulge in the plastic, which fits in one of the slots on the motor housing. The motor turns drive gears that drive the piston to cycle positions for backwashing, regeneration, rinsing, refill or service. The motor is fully reversible (turns both ways) and changes direction of rotation to change the direction of piston motion. The motor is easily replaced if necessary.

There are three drive gears held in place by the drive gear cover. All three drive gear are the same size. A reflective coating is applied to the gears. As the center drive gear turns a light shines on the coating and a light sensing diode determines if a light pulse was returned. The PC board counts the pulses and determines when to stop driving the motor.

DRIVE CAP ASSEMBLY, MAIN PISTON AND REGENERANT PISTON

The drive gears turn the main gear of the drive cap assembly, which moves the piston. The screw-driven, horizontally moving piston stops at specific positions to direct the flow of water to backwash, regenerate, rinse or refill. The PC board determines the position of the piston by counting pulses produced when the piston is moved. An optical sensor looking at one of the reduction drive gears generates these pulses. Each cycle position is defined by a number of pulses. The counter is zeroed each time the valve goes to the service position. The PC board finds the service position by noting the increase in current delivered to the motor when the mechanical stop at the service position is reached. This method of controlling piston position allows for greater flexibility and requires no switches or cams (US Patent 6444127).

One of two main pistons is always used:

1. A 1.25" diameter downflow piston is used when the control

valve is used as a downflow softener, regenerating filter or non-regenerating filter.

2. A 1.25" diameter upflow piston is used when the control valve is used as an upflow softener.

If the control valve is used as a softener or a regenerating filter, a regenerant piston must be attached to the main piston. If the control valve is to be used on a system that does not require a regenerant to be added, the regenerant piston must be removed.

SPACER STACK ASSEMBLY

The spacer stack assembly provides the necessary flow passage for water during the different cycles. The all-plastic spacer stack assembly is a one-piece design which allows the stack to be removed using your fingers.

The exterior of the stack is sealed against the body bore with self lubricating EPDM o-rings, while the interior surface is sealed against the piston using slippery self cleaning directional (one-way) silicone lip seals. The lip seals are clear in color and have a special slippery coating so that the piston does not need to be lubricated.

INJECTOR CAP, SCREEN, INJECTOR PLUG AND INJECTOR

The screen, injector and/or injector plug(s) are installed under the injector cap in an easy to access location on top of the valve. The injector cap contains four slots so no water accumulates in the cap. The injector cap is designed to be hand tightened.

Under the injector cap there is an easy to clean removable screen to prevent fouling of the injector. There are two holes under the injector cap labeled "DN" and "UP". The holes will be filled with a plug or an injector.

The plug (pn 102319) prevents water from traveling a certain pathway. The injector lets water pass through the pathway. The self-priming injector increases the velocity of the water, creating a zone of negative pressure that draws in the concentrated liquid regenerant, such as sodium chloride (brine), potassium permanganate, etc. The regenerant blends with the stream of water, which passes through the media to regenerate the bed.

The injector provides a consistent regenerant/water mixture ratio over the entire operating pressure range of the control valve. The injector provides good performance in a variety of applications, which may involve elevated drain lines and long regenerant draw lengths. Injectors are chosen by knowing the type, amount, and regenerant flow rate for a particular type of media. Guidelines can be found in the media manufacturer's literature. The color coded injectors give different regenerant draw, slow rinse and total flow rates over the pressure range. See injector graphs (pages 38-39) for total, slow rinse and draw rates.

The control valve has been manufactured to be one of the following:

- regeneration downflow (for softeners or regenerating filters install injector in DN location, plug in UP location)
- regeneration upflow (upflow option is for softeners only. Install injector in UP location, plug in other hole location)
- no regenerant (both the DN and UP holes have injector plugs installed) and plug installed for the refill elbow.

NOTE: It is okay to field convert valves from upflow to downflow and vice versa with the twin alternating valve as long as software supports upflow brine.

SERVICE INSTRUCTIONS

DRIVE ASSEMBLY

Remove the valve cover to access the drive assembly.

Disconnect the power source (black wire) from the PC board prior to disconnecting the motor or water meter plugs from the PC board. The power source plug connects the four-pin jack. The motor plug connects to the two-pin jack on the left-hand side of the PC board. The water meter plug (gray wire) connects to the three-pin jack on the far right-hand side of the PC board.

The PC board can be removed separately from the drive bracket but it is not recommended. Do not attempt to remove the display panel from the PC board. Handle the board by the edges. To remove the PC board from the drive bracket, unplug the power, water meter and motor plugs from the PC board. Lift the middle latch along the top of the drive bracket while pulling outward on the top of the PC board. The drive bracket has two plastic pins that fit into the holes on the lower edge of the PC board. Once the PC board is tilted about 45° from the drive bracket it can be lifted off of these pins. To reinstall the PC board, position the lower edge of the PC board so that the holes in the PC board line up with the plastic pins. Push the top of the PC board towards the valve until it snaps under the middle latch, weave the power and water meter wires into the holders and reconnect the motor, water meter and power plugs.

The drive bracket must be removed to access the drive cap assembly and pistons or the drive gear cover. It is not necessary to remove the PC board from the drive bracket to remove the drive bracket. To remove the drive bracket start by removing the plugs from the power source and the water meter. Unweave the wires from the side holders. Two tabs on the top of the drive back plate hold the drive bracket in place. Simultaneously lift the two tabs and gently ease the top of the drive bracket forward. The lower edge of the drive bracket has two notches that rest on the drive back plate. Lift up and outward on the drive bracket to disengage the notches.

To reassemble, seat the bottom of the drive bracket so the notches are engaged at the bottom of the drive back plate. Push the top of the drive bracket toward the two latches. The drive bracket may have to be lifted slightly to let the threaded piston rod pass through the hole in the drive bracket. Maintain a slight engaging force on top of the drive bracket while deflecting the bracket slightly to the left by pressing on the side of the upper right corner. This helps drive the gears mesh with the drive cap assembly. The drive bracket is properly seated when it snaps under the latches on the drive back plate. If resistance is felt before latching, then notches are not fully engaged, the piston rod is not in hole, the wires are jammed between the drive bracket and drive back plate, or the gear is not engaging the drive cap assembly.

To inspect the drive gears, the drive gear cover needs to be removed. Before trying to remove the gear cover, the drive bracket must be removed from the drive back plate. (Refer to the instructions above regarding removing the drive bracket from the drive back plate. The drive gear cover can be removed from the drive bracket without removing the motor or the PC board.) The drive gear cover is held in place on the drive bracket by three clips. The largest of the three clips is always orientated to the bottom of the drive bracket. With the PC board facing up, push in and down on the large clip on the drive gear cover. Handle the cover and the gears carefully so that the gears do not fall off the pegs in the cover.

Replace broken or damaged drive gears. Do not lubricate any of the gears. Avoid getting any foreign matter on the reflective coating because dirt or oils may interfere with pulse counting.

The drive gear cover only fits on one way, with the large clip orientated towards the bottom. If all three clips are outside of the gear shroud on the drive bracket the drive gear cover slips easily into place.

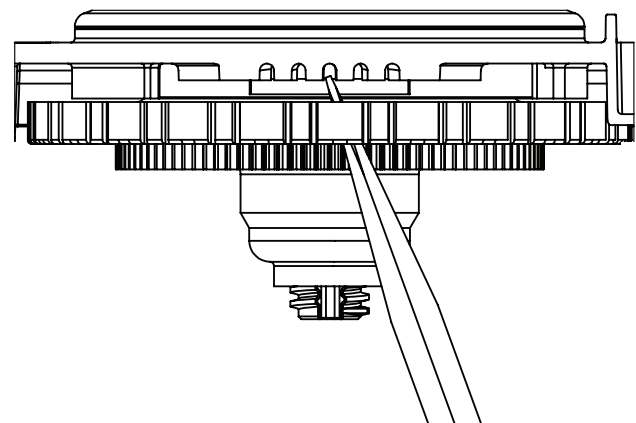
The drive bracket does not need to be removed from the drive plate if the motor needs to be removed. To remove the motor, disconnect the power and motor plugs from the jacks on the PC board. Move the spring clip loop to the right and hold. Rotate the motor at least a 1/4" turn in either direction so the wire are vertical (up & down) before gently pulling on the wire connectors to remove the motor. Pulling directly on the wired without rotating the motor may break the wires off the motor.

Replace the motor if necessary. Do not lubricate the motor or the gears. To reinstall the motor, move the spring clip loop to the right and hold. Gently turn the motor while inserting so that the gear on the motor meshes with the gears under the drive gear cover. Release the spring clip loop and continue to rotate the motor until the wires are horizontal and the motor housing engages the small plastic bulge inside the drive bracket motor retainer. Reconnect the motor plug to the two-pronged jack on the lower left side of the PC board. If the motor will not easily engage with the drive gears when reinstalling, lift and slightly rotate the motor before reinserting. Reconnect the power plug.

Replace the valve cover. After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version and then reset the valve to the service position.

DRIVE CAP ASSEMBLY, MAIN PISTON AND REGENERANT PISTON

The drive assembly must be removed to access the drive cap assembly. The drive cap assembly must be removed to access the piston(s). The drive cap assembly is threaded into the control valve body and seals with an o-ring. To remove the drive cap assembly use the special plastic wrench or insert a 1/4" to 1/2" flat blade screwdriver into one of the slots around the top 2" of the drive cap assembly so it engages the notches molded into the drive back plate around the top 2" of the piston cavity. The notches are visible through the holes. Lever the screwdriver so the drive cap assembly turns counter clockwise. Once loosened unscrew the drive cap assembly by hand and pull straight out.



The drive cap assembly contains the drive cap, the main drive gear, drive cap spine, piston rod and various other parts that should not be disassembled in the field. The only replacement part on the drive cap assembly is the o-ring. Attached to the drive cap assembly is the main piston (downflow or upflow) and if a regenerant is used, a regenerant piston. Upflow if not applicable to EA, EE or EI control valves.

The regenerant piston (the small diameter one behind the main piston) is removed from the main piston by pressing sideways and unsnapping it from its latch. (Chemically clean in dilute sodium bisulfate or vinegar, or replace the regenerant piston if needed. To remove the main piston fully extend the piston rod and then unsnap the main piston from its latch by pressing on the side with the number. Chemically clean in dilute sodium bisulfate or vinegar, or replace the main piston.

Reattach the main piston to the drive cap assembly. Reattach the regenerant piston (if needed) to the main piston. Reinsert the drive cap assembly and piston into the spacer stack assembly and hand tighten the drive cap assembly. Continue to tighten the drive cap assembly using a screwdriver as a ratchet until the black o-ring on the spacer stack assembly is no longer visible through the drain port. Excessive force can break the notches molded into the drive back plate. Make certain that the main drive gear still turns freely. The exact position of the piston is not important as long as the main drive gear turns freely.

Reattach the drive assembly to the control valve and connect all plugs. After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. This resets the electronics and establishes the service piston position. The display should flash all wording, then flash the software version and then reset the valve to the service position.

SPACER STACK ASSEMBLY

To access the spacer stack assembly remove the drive assembly, drive cap assembly and piston. The spacer stack assembly can be removed easily without tools by using thumb and forefinger. Inspect the black o-rings and clear lip seals for wear or damage. Replace the entire stack if necessary. Do not disassemble the stack.

The spacer stack assembly may be chemically cleaned (dilute sodium bisulfite or vinegar) or wiped with a soft cloth.

The spacer stack assembly can be pushed in to the control valve body bore by hand. Since the spacer stack assembly can be compressed it is easier to use a blunt object (5/8" to 1-1/8" in diameter) to push the center of the assembly into the control valve body. The assembly is properly seated when at least four threads are exposed (approximately 5/8"). Do not force the spacer stack assembly in. The control valve body bore interior can be lubricated with silicone to allow for easy insertion of the entire stack.

Reattach the drive cap assembly and piston(s) and the drive assembly.

After completing any valve maintenance involving the drive assembly or the drive cap assembly and pistons unplug power source jack from the printed circuit board (black wire) and plug back in or press and hold NEXT and REGEN buttons for 3 seconds. This resets the electronics and establishes the service piston position. The display should flash all working, then flash the software version and then reset the valve to the service position.

INJECTOR CAP, SCREEN, INJECTOR PLUG AND INJECTOR

Unscrew the injector cap and lift off. Loosen cap with special plastic wrench or pliers if necessary. Attached to the injector cap is a screen. Remove the screen and clean if fouled. The plug and/or injector can be pried out with a small screwdriver. The plug can be wiped clean. If the plug leaks replace the entire plug. The injector consists of a throat and a nozzle. Chemically clean the injector with vinegar or sodium bisulfite. The holes can be blown out with air. Both pieces have small diameter holes that control the flow rates of water to insure that the proper concentration of regenerant is used. Sharp objects, which can score the plastic, should not be used to clean the injector. Scoring the injector or increasing the diameter of the hole could change the operating parameters of the injector.

Two holes are labeled DN and UP. Check for compliance. Refer to Valve Body Compliance Table at the beginning of this manual.

Push the plug(s) and/or injectors firmly in place, replace the screen and hand tighten the injector cap.

REFILL FLOW CONTROL ASSEMBLY AND REFILL PORT PLUG

To clean or replace the refill flow control, pull out the elbow-locking clip and then pull straight up on the elbow. Replace the elbow locking clip in the slot so that it is not misplaced. Twist to remove the white flow control retainer. The flow control can be removed by prying upward through the side slots of the retainer with a small flat blade screwdriver.

Chemically clean the flow control or the white flow control retainer using dilute sodium bisulfite or vinegar. Do not use a wire brush. If necessary, replace the flow control, o-ring on control retainer, or the o-ring on the elbow.

Reseat the flow control so that the rounded end is visible in the flow control. Reseat the white flow control retainer by pushing the retainer into the elbow until the o-ring seats. Remove locking clip, push down on elbow to reseat and insert locking clip.

Do not use Vaseline, oils or other unacceptable lubricants on o-rings. A silicone lubricant may be used on the o-ring on the elbow or the white retainer.

WATER METER

The water meter assembly is connected to the PC board by a wire. If the entire water meter assembly is to be replaced, remove the control valve cover and disconnect the power source and water meter plugs from the PC board. Unlatch the drive assembly and lean it forward. Unthread the water meter wire from the side of the drive assembly and through the drive back plate. To reinstall, rethread the water meter wire through the drive back plate and the side of the drive assembly. Reattach the drive assembly and the water meter and power plugs.

If no water meter wire is visible, then a plug is installed, not a water meter.

The water meter wire does not need to be removed from the PC board if the water meter is only being inspected and cleaned. To remove the water meter assembly, unscrew the meter cap on the left side of the control valve. Pliers may be used to unscrew the nut if necessary.

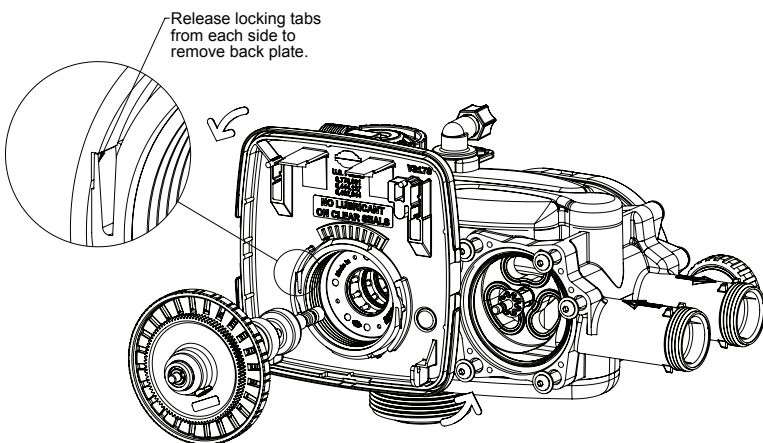
With the nut removed, a slot at the top of the water meter is visible. Twist a flat blade screwdriver in the slot between the control valve body and the meter. When the meter is part way out it is easy to remove the water meter from the housing. Once the water meter is removed from the control valve body, gently pull forward on the turbine to remove it from the shaft.

Do not use a wire brush to clean the turbine. Wipe with a clean cloth or chemically clean in dilute sodium bisulfite or vinegar. The turbine can be immersed in the chemical. Do not immerse electronics. If the turbine is scored or damaged or the bearings on the turbine are worn, replace the turbine.

Do not lubricate the turbine shaft. The turbine shaft bearings are prelubricated. Do not use Vaseline, oils, or other unacceptable lubricants on the o-ring. A silicone lubricant may be used on the black o-ring.

Reinsert the water meter into the side slot. Hand tighten the nut. Do not use a pipe wrench to tighten nut.

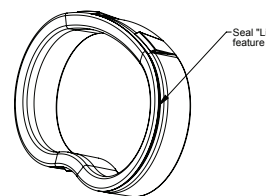
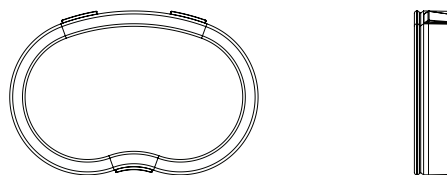
SERVICING TRANSFER CAP ASSEMBLIES



The control valves backplate must be removed first to allow access to removing the transfer cap assembly. NOTE: Hold slight downward pressure on the top left corner of the backplate while using a thin flat screwdriver or knife blade to push in on the locking tabs, this will release the backplate and it will twist to the left off of the valve body. For removal of the drive motor side you will need to remove the drive cover assembly to access the motorized drive. The drive motor can be removed by pressing the spring clip loop to the right then rotate the motor a $\frac{1}{4}$ turn and pull outward to remove the motor from the reducing gear cover assembly. Remove the three Phillips head stainless steel screws that retain the reducing gear cover to the drive cap. Once the cover is removed you have access to the reducing drive gears simply slide them off of the gear axles with your fingers to inspect / check them there are 3 small black gears with foil decals and 1 larger black reducing gear. Remove the large white drive gear from the stainless steel drive shaft. To remove the large white transfer drive gear firmly grab the outside edge of the gear with your fingers and pull it outward away from the control

valve assembly. Now you can use a $\frac{5}{32}$ " or 4mm allen wrench to remove the $\frac{1}{4}$ -20 screws that retain the transfer drive cap assemblies on both sides of the valve.

NOTE: Once the screws are removed from retaining the inlet side transfer valve cap and the outlet drive motor transfer cap from the control valve the cap will spring out away from the valve body. At this point the transfer discs may be removed by pulling the discs outward off of the shaft away from the valve body with your hand. With the disc out you can inspect the flat surface area to be sure it's clean and smooth free of any debris or scratches. Note that the disc is keyed to the drive shaft so that it will only assemble in one orientation. The transfer discs may be chemically cleaned with a dilute sodium bisulfate solution, vinegar or just wiped with a soft clean cloth.



To remove seals gently pull out on the outer lip of the seal to lift the seal out from its cavity being careful not to damage the face surface of the seal. To reassemble re-seat seals into the seal cavity of the control valve body being sure that the lip of the seal is facing outward. With seals in place put a thin film of Dow #7 on the tops of the seals and the flat surface of the discs. Prior to reinstalling the discs the drive shaft should be removed and the O-rings cleaned, inspected and lubricated with Dow #7. The shaft can then be installed into the disc prior to installation. With the outlet disc assembled to the shaft the orientation of the shaft to inlet disc can be assured by installing the set with the through hole on the outlet disc at the 6 o'clock position.

The easiest thing would be to remove both disc drives and assemble the outlet side first. Then each disc could be fitted on the shaft individually. At this point the transfer valve cap assemblies can be reinstalled.

Note: That both transfer caps only mount in one orientation. Prior to installation of cap assembly be sure to check that the stainless steel spring and the plastic spring support is in place attached to the inside of the c assembly. Next you can wipe the outside edge of the O-ring on the cap and the inside mating area of the valve with a clean cloth & re-apply a thin layer of silicone lubricant like Dow #7.

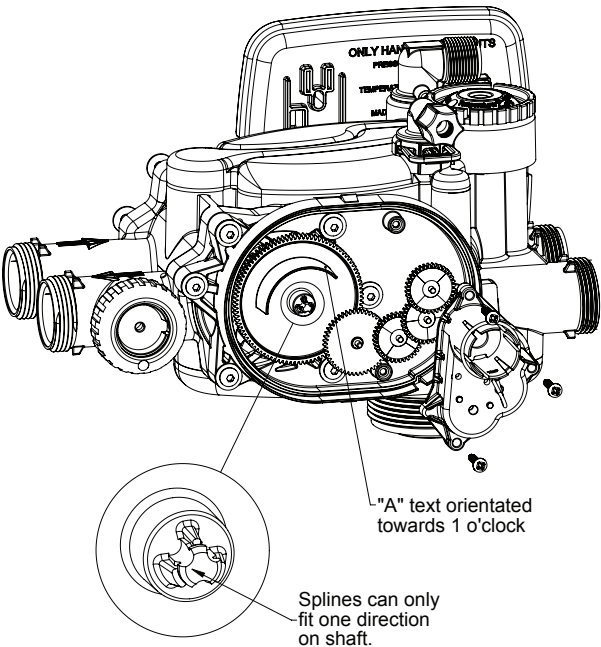
BE SURE NOT TO USE ANYTHING HYDROCARBON BASED SUCH AS VASELINE OR PETROLEUM JELLY TO LUBRICATE PLASTIC COMPONENTS OR O-RINGS AS THEY WILL BE DAMAGED BY THE HYDROCARBONS AND POTENTIALLY CAUSE FAILURES THAT CAN RESULT WITH LEAKS.

Noting the one possible orientation of the transfer drive cap, use one hand to press in and support the transfer drive cap while using the opposing hand to start two screws in, one on the top and one opposing it on the bottom. Tighten the screws in evenly so the cap seats the O-ring without getting pinched or damaged. Screws should only be hand tightened with a 5/32" or 4mm allen wrench, DO NOT OVER TIGHTEN SCREWS.

NOTE: be careful and make sure the meter cable doesn't get under the drive cap while tightening as it will result in damaging the cable.

Position the large white drive gear with the "A" pointing toward the 1 o'clock position and then press it onto the stainless steel drive shaft, make sure it snaps & locks into position. NOTE: The white drive gear is splined to the drive shaft and will only assemble in one orientation. Because of this it is not necessary that the discs and gear be exactly positioned, the positioning needs to be approximate but they have to fit on the shaft.

Next install the larger black reducing gear onto the stainless steel shaft, then install the remaining smaller reducing gears from left to right. Re-install the grey reducing gear cover over the gears and affix with the 3 stainless steel screws. Now you can re-install the drive motor by pressing the spring clip loop to the right then rotate the motor as you are inserting it so the gear of the motor meshes properly with the reducing gears. Release the spring clip loop and rotate the motor until the motor housing engages with the plastic nub inside the housing that holds the motor in place and make sure that the top of the motor is flush with the top of the grey gear housing. Press the drive motor wires down into the strain relief of the drive cap, now you can re-install the cover assembly.



After completing any valve maintenance involving the valve drive assembly or the transfer drive assembly please press and hold the NEXT & the REGEN buttons simultaneously for 3 to 5 seconds to perform a soft reset which will synchronize the control valves positions.

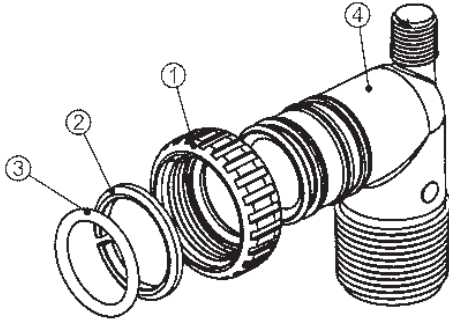
GENERAL SPECIFICATIONS	
OPERATING PRESSURES	
Minimum/Maximum	25 psi-125 psi
OPERATING TEMPERATURES	
Minimum/Maximum	40° - 110° F
METER	
Accuracy.....	±5%
Flow Rate Range.....	0.25 - 27 GPM
Gallon Range	20 - 1,500,000
DIMENSIONS	
Drain Line	3/4" or 1" NPT
Brine Line	3/8" Poly Tube
ELECTRICAL CURRENT DRAW/VOLTAGE/FREQUENCY	0.5A/110v/60Hz
TANK THREAD	2-1/2" - 8 NPSM

Compatible with the following regenerants or chemicals: Sodium chloride, potassium permanganate, sodium bisulfite, sodium hydroxide, hydroxide, hydrochloric acid, chlorine and chloramines.

INSTALLATION FITTING ASSEMBLIES

ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106761	Fitting 1" PVC Male NPT Elbow.	2
1-4	101639	Fitting 1" PVC Male NPT Asy. (Set of 2)	1

Figure 22

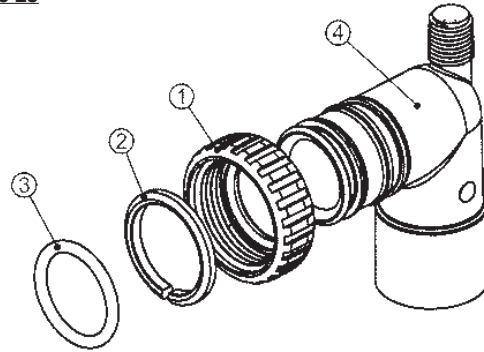


The nuts and caps are designed to be unscrewed or tightened by hand or with the special plastic wrench. If necessary a pliers can be used to unscrew the nut or cap. Do not use a pipe wrench to tighten or loosen nuts or caps. Do not place screwdriver in slots on caps and/or tap with a hammer.

Do not use pipe dope or other sealants on threads. Teflon tape must be used on threads of the 1" NPT connection and on the threads for the drain line connection. Teflon tape is not necessary on the nut connection nor caps because of o-rings seals.

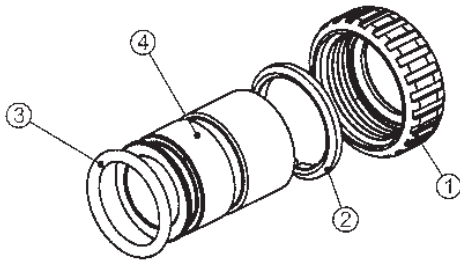
ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106762	Fitting 3/4" & 1" PVC Solv. 90	2
1-4	101640	Fitting 3/4" & 1" PVC Solv 90 (set of 2)	1

Figure 23



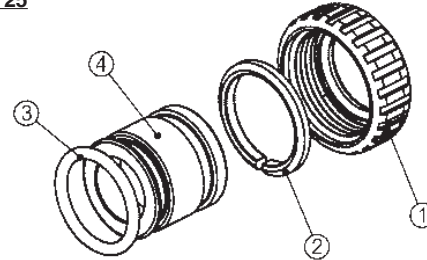
ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106763	Fitting 1" Brass Sweat	2
1-4	108618	Fitting 1" Lead Free Brass Sweat Asy (Set of 2)	1

Figure 24



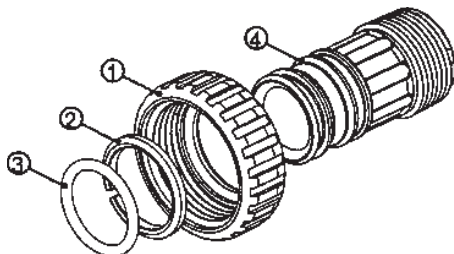
ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106764	Fitting 1" Brass Sweat	2
1-4	108617	Fitting 1" Lead Free Brass Sweat Asy (Set of 2)	1

Figure 25



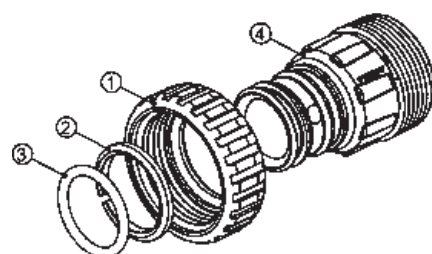
ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106765	Fitting 1" Plastic Male NPT	2
1-4	101643	Fitting 1" Male NPT Asy. (Set of 2)	1

Figure 26



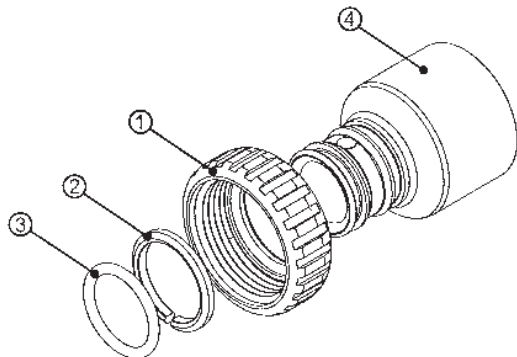
ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106766	Fitting 1-1/4" Plastic Male NPT	2
1-4	101644	Fitting 1-1/4" Male NPT (Set of 2)	1

Figure 27

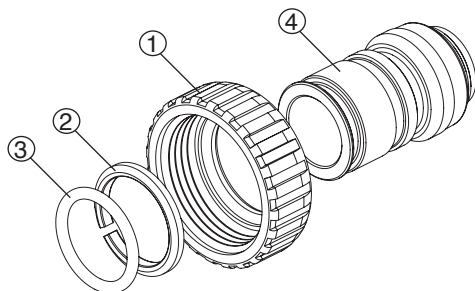


ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106787	Fitting 1-1/4" & 1-1/2" Brass Sweat	2
1-4	108619	Fitting 1-1/4" & 1-1/2" Brass Swt Asy. (Set of 2)	1

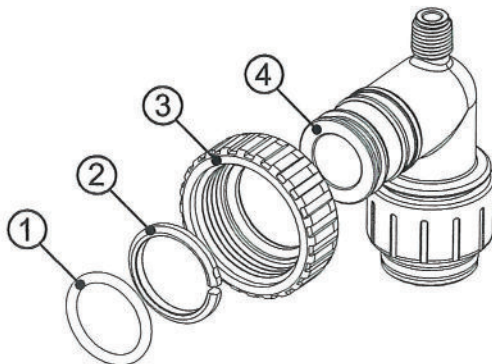
Figure 28



ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106769	Fitting 3/4" Brass Sharkbite	2
1-4	110135	Fitting 3/4" Brass Sharkbite Asy. (Set of 2)	1

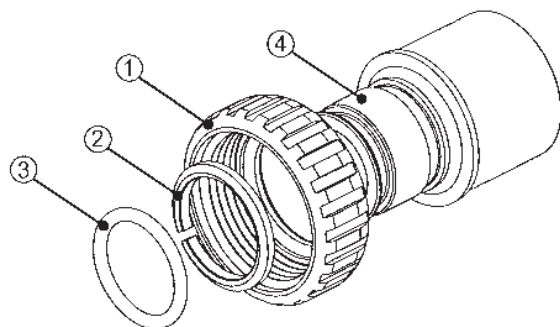


ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	V3790	Fitting 3/4" John Guest	2
1-4	108478	Fitting 3/4" JG QC Assy (Set of 2)	1

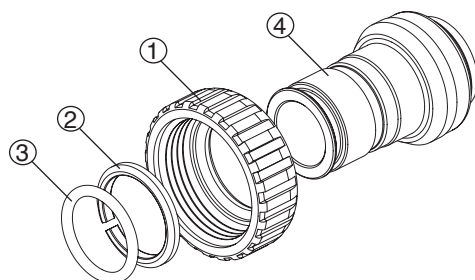


ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106786	Fitting 1-1/4" & 1-1/2" PVC Solvent	2
1-4	101646	Fitting 1-1/4" & 1-1/2" PVC Solvent Asy. (Set of 2)	1

Figure 29



ITEM NO.	ORDER NO.	DESCRIPTION	QTY.
1	102141	Nut 1" Quick Connect	2
2	102437	Split Ring	2
3	102165	O-Ring 215	2
4	106770	Fitting 1" Brass Sharkbite	2
1-4	110136	Fitting 1" Brass Sharkbite Asy. (Set of 2)	1



ECOMAX DUO SYSTEM SPECIFICATIONS

	EcoMax 8	EcoMax 9	EcoMax10	EcoMax12	EcoMax13	EcoMax14	EcoMax16	EcoMax18
Model #	Duo	Duo	Duo	Duo	Duo	Duo	Duo	Duo

Regeneration Gallons on Factory Settings @ 35 psi	24.1	33.5	45.7	62.4	78.7	93.5	127.5	180
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Capacity	Grains	Grains	Grains	Grains	Grains	Grains	Grains	Grains
High Efficiency Salting (5400gr/lb)*	17,820	23,700	32,940	47,520	57,024	65,880	89,100	106,920
Low Salting (5200 grains/lb)	20,800	27,664	38,480	55,640	66,560	76,960	104,000	124,800

Service Flow Rates	GPM	GPM	GPM	GPM	GPM	GPM	GPM	GPM
Service Flow @ 10 psi	5.5	6.8	7.8	10.9	11.6	11.9	12.7	13.6
Peak Flow @ 15 psi	7.9	9	10.4	12.5	14.1	14.7	15.9	16.2
Resin Tank Size	8x44	9x48	10x54	12x52	13x54	14x65	16x65	18x65
Recommended Brine Tank	18x40	18x40	18x40	18x40	18x40	18x40	18x40	18x40
Brine Line Size	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"	3/8"

Factory Settings in bold at 5200 grains/lb.

EcoMax Duo uses soft water to regenerate so the factory programming for capacity will be adjusted for the non-metered regeneration water at 20 gpg. If hardness is other than 20 gpg, adjust capacity setting appropriately. If application hardness is 15 gpg, multiply regeneration gallons by 15 & subtract from capacity. Example: EcoMax8 installed at application with 15 gpg x 24.1 gallons = 361.5, subtract 362 grains from capacity.

Upflow high efficiency water softeners are intended for clean water such as municipal supplies and well water applications with proper pre-treatment. Operating parameters are up to 0.5 ppm of iron and up to 40 gpg of hardness.

System conforms to ANSI/NSF 44 for performance claims as verified and substantiated by test data. EcoMax Duo is a DIR softener which complies with specific performance specifications intended to minimize the amount of regenerant brine and water used in regeneration. Efficiency is only valid at stated salt dosage. *Represents maximum possible efficiency system can achieve. The operational efficiency may be less than the tested efficiency due to individual application factors such as hardness, total dissolved solids, water usage and other contaminants in the water that may reduce the softener capacity.

Hellenbrand products are not for sale or distribution into the State of California effective 8/31/18.

NOTES

Residential Water Softener & Filter Limited Warranty

**INCLUDES – ProMate®, ProMate-1®, ProMate-5®, ProMate-6®, ProMate-7.0®,
ProMate-EcoMax®, ProMate-EcoMax Duo®, E6**

EXCLUDES – Iron Curtain®, Iron Curtain® Jr. and Storm Filter Systems

Hellenbrand warrants to the original consumer purchaser that the System and the parts listed below will be free from defects in material and/or workmanship from the date of the original installation for the following time periods:

For a Period of FIVE YEARS: The filter control valve electrical parts including the motor and board, control valve body, and internal parts.

For a Period of TEN YEARS: Mineral tanks, 6" Diameter - 13" Diameter.

For a Period of FIVE YEARS: Mineral tanks, 14" Diameter - Up.

For a Period of FIVE YEARS: The salt storage/cabinet tank.

For a Period of ONE YEAR: The entire water conditioner system ("System").

Any parts used for replacement are warranted for the remainder of the original warranty period for the applicable part.

THIS WARRANTY IS EFFECTIVE TO THE ORIGINAL CONSUMER PURCHASER ONLY, AND ONLY FOR AS LONG AS THE SYSTEM REMAINS AT THE ORIGINAL INSTALLATION SITE. COVERAGE TERMINATES IF YOU SELL OR OTHERWISE TRANSFER THE SYSTEM OR IF THE SYSTEM IS MOVED FROM THE ORIGINAL INSTALLATION SITE.

No sales representative, distributor, agent, dealer, reseller, authorized seller or any other person or entity is authorized to make any other warranty, or modify or expand the warranty provided herein on behalf of Hellenbrand. Upon expiration of the applicable warranty period, Hellenbrand shall have no further liability related to the System/parts to which the warranty period applies, except with respect to valid warranty claims asserted during the appropriate warranty period.

If the System or any part described above becomes defective within the specified warranty period, you should notify your local authorized seller of Hellenbrand products, and arrange a time during normal business hours for the inspection of the System at the original installation site. You may also contact Hellenbrand and we will provide you with the contact information for your local authorized seller of Hellenbrand products. Hellenbrand, at its option, will repair or replace the System or any part found defective within the terms of this warranty. You are responsible for freight from our factory and any service fees charged by the local authorized seller of Hellenbrand products for installation, repair, removal, replacement, service, etc., of any System or parts. This warranty does not include any labor charges. This paragraph sets forth the exclusive remedy for any valid warranty claims against Hellenbrand.

THIS WARRANTY DOES NOT COVER defects caused by sand, sediment or bacteria fouling, accident, fire, flood, Act of God, misuse, misapplication, neglect, alteration, installation or operation contrary to Hellenbrand's printed instructions, or installation, repair or service by anyone other than Hellenbrand or an authorized seller of Hellenbrand products.

IN ADDITION, THIS WARRANTY DOES NOT COVER UNPROTECTED OUTDOOR INSTALLATIONS. This System, including all of the electrical components, must be protected against windblown dust, falling and windblown rain, freezing temperatures and the formation of ice, with an appropriate enclosure consisting of a floor, roof, walls, ventilation and heat.

As a manufacturer, we do not know the characteristics of your water supply or the purpose for which you are purchasing this system. You should be aware that the quality of water supplies may vary seasonally or over a period of time, and that your water usage rate may vary as well. Water characteristics may change considerably if this System is moved to a new location. For these reasons, Hellenbrand assumes no liability for the determination of the proper equipment necessary to meet your needs; and Hellenbrand does not authorize others to assume such obligations for Hellenbrand.

TO THE EXTENT PERMITTED BY APPLICABLE LAW, REMEDIES FOR DEFECTS OR FAILURES ARE LIMITED TO THE REMEDIES PROVIDED IN THIS WARRANTY. THERE ARE NO EXPRESS WARRANTIES OTHER THAN THOSE SET FORTH HEREIN. ANY IMPLIED WARRANTIES, INCLUDING WITHOUT LIMITATION WARRANTIES OF MERCHANTABILITY, FITNESS FOR PARTICULAR PURPOSE, NON-INFRINGEMENT, OR ANY WARRANTIES ARISING FROM COURSE OF PERFORMANCE, COURSE OF DEALING, OR FROM USAGES OF TRADE, ARE LIMITED IN DURATION TO THE APPLICABLE WARRANTY PERIOD SET FORTH ABOVE.

UNDER NO CIRCUMSTANCES SHALL HELLENBRAND BE LIABLE TO THE ORIGINAL CONSUMER PURCHASER OR TO ANY OTHER PERSON FOR ANY INCIDENTAL, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES OR FOR ANY OTHER LOSS, DAMAGE, OR EXPENSE OF ANY KIND, INCLUDING LOSS OF PROFITS, WHETHER ARISING OUT OF BREACH OF WARRANTY, BREACH OF CONTRACT, IN TORT OR OTHERWISE, AND REGARDLESS OF WHETHER HELLENBRAND WAS AWARE OF THE POSSIBILITY OF SUCH LOSS. THESE LIMITATIONS WILL APPLY REGARDLESS OF ANY FAILURE OF ESSENTIAL PURPOSE OF ANY LIMITED REMEDY.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you. Similarly, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state. Hellenbrand products are not for sale or distribution into the State of California effective 8/31/18.