MARLO INCORPORATED®

INSTALLATION, OPERATION, AND MAINTENANCE MANUAL

MATC SERIES

1” TWIN ALTERNATING

COMMERCIAL WATER CONDITIONERS

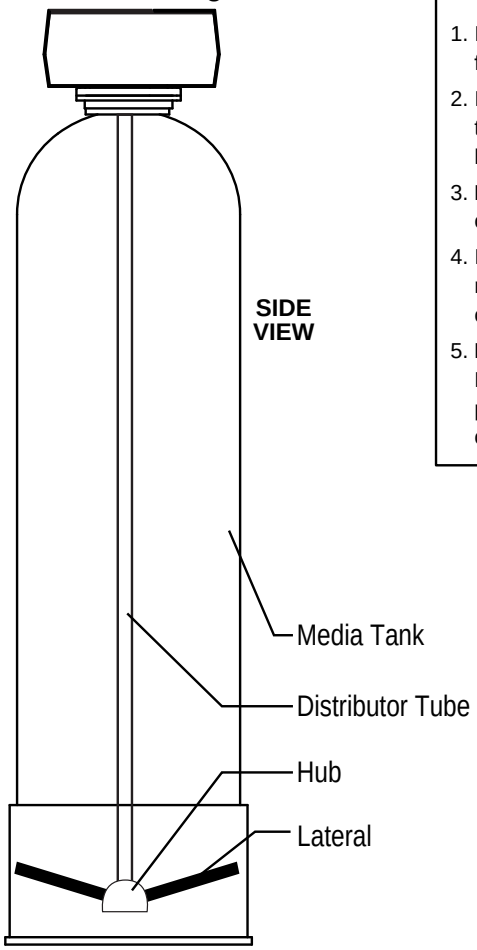
(FOR MODELS BUILT POST-SEPTEMBER 2013)

COMPLETE FOR FUTURE REFERENCE:

MODEL NO:
SERIAL NO:
DATE INSTALLED:
DEALER:

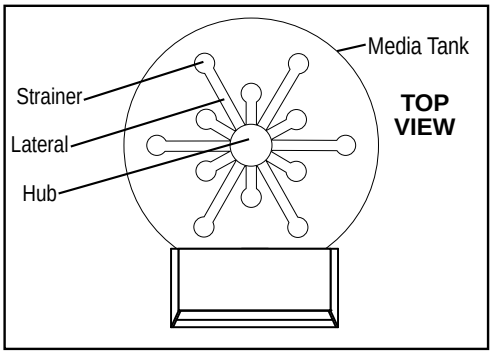
INSTALLATION WARNING

PRIOR TO Media Loading

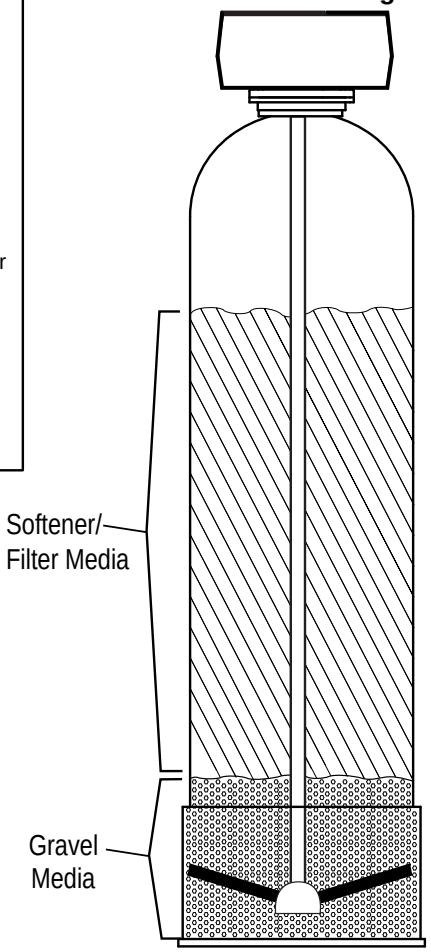


Inspection Requirement
Prior to Loading Media

1. Inspect condition of upper distributor piping. Verify fittings are tight and positioned as shown.
2. Inspect condition of strainers, laterals and hub through top or side access ports. Verify fittings are secured to hub and strainers, if present are secured to laterals.
3. **DO NOT** load media if damaged components are observed. Contact factory.
4. Installer is responsible for media loss into treated water resulting from failure to report and repair damaged components inside media tank prior to media loading.
5. **INSTALLER WARNING:** Refer to installation instructions for media loading procedure. Improper loading of media will damage components inside media tank.



AFTER Media Loading



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Ordering:
Orders may be phoned, faxed, or emailed to Marlo Incorporated Purchase orders must include Marlo Incorporated part numbers and pricing. Purchase orders must also state if partial shipments are allowed. If you do not have the correct part numbers, pricing, or case quantities, please contact our customer service department.

Order Confirmations:
All purchase orders will be confirmed by phone, fax, or email. Any discrepancies in part numbers, pricing, descriptions, or case quantities will be listed in the order confirmation. It is the customer’s responsibility to review the order confirmations and advise if any changes are to be made. If we do not hear from the customer regarding the confirmation within 24 hours, we will assume everything is correct and will invoice and ship accordingly.

Quotes & Prices:
Quotations are valid for a period of up to 45 days or for the term stated on the quote, whichever term is shortest. We make every effort to notify customers with price change information. However, prices are subject to change or correction without notice. Shipping weights, dimensions and anticipated ship dates are all approximate and subject to change.

Minimum Orders:
Minimum order accepted is $25.00, not including freight or taxes.

Taxes:
Taxes are not included. Quoted prices are exclusive of all taxes. Purchaser shall be responsible for payment of all applicable state/local taxes. Orders shipped within Wisconsin are subject to applicable state tax rates unless a completed resellers card or exempt certificate is on file.

Freight:
All shipments are F.O.B. Marlo Incorporated Racine, Wisconsin, unless otherwise specified.

Shipment:
The shipment method should be specified by the customer on the purchase order; otherwise, Marlo Incorporated will choose the best method of shipment.

Packaging:
Pricing includes packaging that is satisfactory for air, truck, or containerized shipment at no additional cost, unless otherwise stated. Ocean export crating will require an additional charge.

Terms - Domestic Customers:
Terms of payment on open accounts are net 30 days from the date of invoice, unless otherwise stated and mutually agreed upon by both parties. This agreement is subject to credit approval. Terms will only be issued to companies which reside in the United States of America. Orders will not be shipped if any account is past due and/or until payment by check has cleared.

Orders in excess of $60,000 will require partial payments prior to shipment. A specific progress payment schedule will be stated in the quotation. Partial payments may also be required for orders involving special engineering or custom ordered items regardless of order amount.

Interest will be charged on past due accounts. Interest charges will be calculated on the unpaid balance at 1.5% per month. All questions regarding invoices and terms must be addressed with our accounting department before invoices become due.

Unless specifically included as a separate item, prices quoted do not include any city, county, state or federal taxes, or transportation of merchandise.

Terms - International Customers:
All payments due are in U.S. dollars and must be made in advance by check (must clear before shipment), money orders, wire transfer, or credit card. Credit cards that are accepted are Visa, MasterCard, and American Express. Irrevocable Letters of Credit are accepted with a minimum order of $25,000.00 U.S. dollars, per order. Unless specifically included as a separate item, prices quoted do not include any city, county, state or federal taxes, or transportation of merchandise. A deposit may be required for special or custom ordered items.

Freight Claims:
Any damage, discrepancies and/or freight claims must be made immediately and directly, in writing within ten (10) days to Marlo Incorporated. Marlo Incorporated will help as much as possible in settling claims. However, Marlo Incorporated will not be held responsible for breakage or shortage after products are accepted by common carrier. All shipments must be inspected for damages and counted for shortages at the time of delivery.

Order Changes:
Additions to an order may be made at no charge prior to the processing of an order. Processing of an order typically begins within one hour of receipt of a purchase order and is typically accomplished within one working day.

Orders cancelled after the order has been processed and sent to shipping or engineering, will be subject to a minimum 10% cancellation fee, assuming manufacturing has not commenced, and no detailed engineering or special parts have been ordered. Additional fees may be charged depending on the level of completion of detailed engineering, manufacturing, and/or if any special parts have been ordered.

Returns & Restocking:
A Return Goods Authorization (RGA) number must be obtained from Marlo Incorporated before any product returns can be accepted and/or replacements shipped. All returns for warranty consideration are to be shipped prepaid and must be returned within ten (10) business days from the RGA issuance. Returns determined to be in warranty will be replaced or repaired and will be returned to Buyer prepaid. Products returned, other than valid warranty claims, may be subject to a restocking charge of up to 25%. Orders shipped incorrectly by Marlo Incorporated are not subject to restocking charges and correct items will be shipped to Buyer prepaid.

Excusable Delays:
Marlo Incorporated shall not be in default for failure to deliver or delay in delivery arising out of causes beyond its control and without its negligence, including but not limited to Acts of God or the public enemy; acts of the Government in either its sovereign or contractual capacity; fires; floods; epidemics; quarantine restrictions; strikes; shortages of materials or supplies; labor disputes; freight embargoes; delays in transit; consignments lost or damaged by freight agent(s); and unusually severe weather.

Warranty:
Marlo Incorporated warrants its products to be free from defects in design, material, or workmanship for a period of 18 months from shipment date or 12 months from installation, whichever occurs first, when said products are installed and operated in accordance with the written instructions provided. The fiberglass reinforced polyester (FRP) resin/media tanks used in certain products alone have an extended warranty period of five (5) years from the shipment date. If within that period any products shall be proven to Marlo, Inc.’s satisfaction to be defective, those products will be replaced, or the price refunded at Marlo Inc.’s option. Marlo Inc.’s obligations or nonperformance, defective, or any damage caused by its products or their use, and buyer’s exclusive remedy therefore, shall be limited to product replacement or refund and shall be conditioned upon Marlo Inc.’s receiving written notice together with a demand for such replacement or refund:

The foregoing warranty is exclusive and in lieu of all other expressed implied warranty (except of title) including but not limited to implied warranty of merchantability and fitness for particular purpose.

Marlo Inc. will not be subject to and disclaims the following:

1. Any other obligations or liabilities arising out of breach of contract or out of warranty.

2. Any obligations whatsoever arising from tort claims (including negligence and strict liability) or arising under other theories of law with respect to products sold or services rendered by Marlo Inc. or any undertakings, acts, or omissions relating thereto.

3. All consequential, incidental, and contingent damages including labor charges, back charges or handling charges are excluded from Marlo Inc.’s warranty provisions.

Policy:
These terms and conditions may be superseded by specific provisions provided by Marlo Incorporated. However, should any of these terms and conditions be contrary to or inconsistent with any terms and conditions contained in any purchase order form or other document between Marlo Incorporated and the buyer, which is prepared by the buyer and whenever executed, the provisions hereof shall be controlling and shall supersede the conflicting terms and conditions which are contained in such other document. No changes shall be made to our terms and conditions unless prior written authorization by Marlo Incorporated

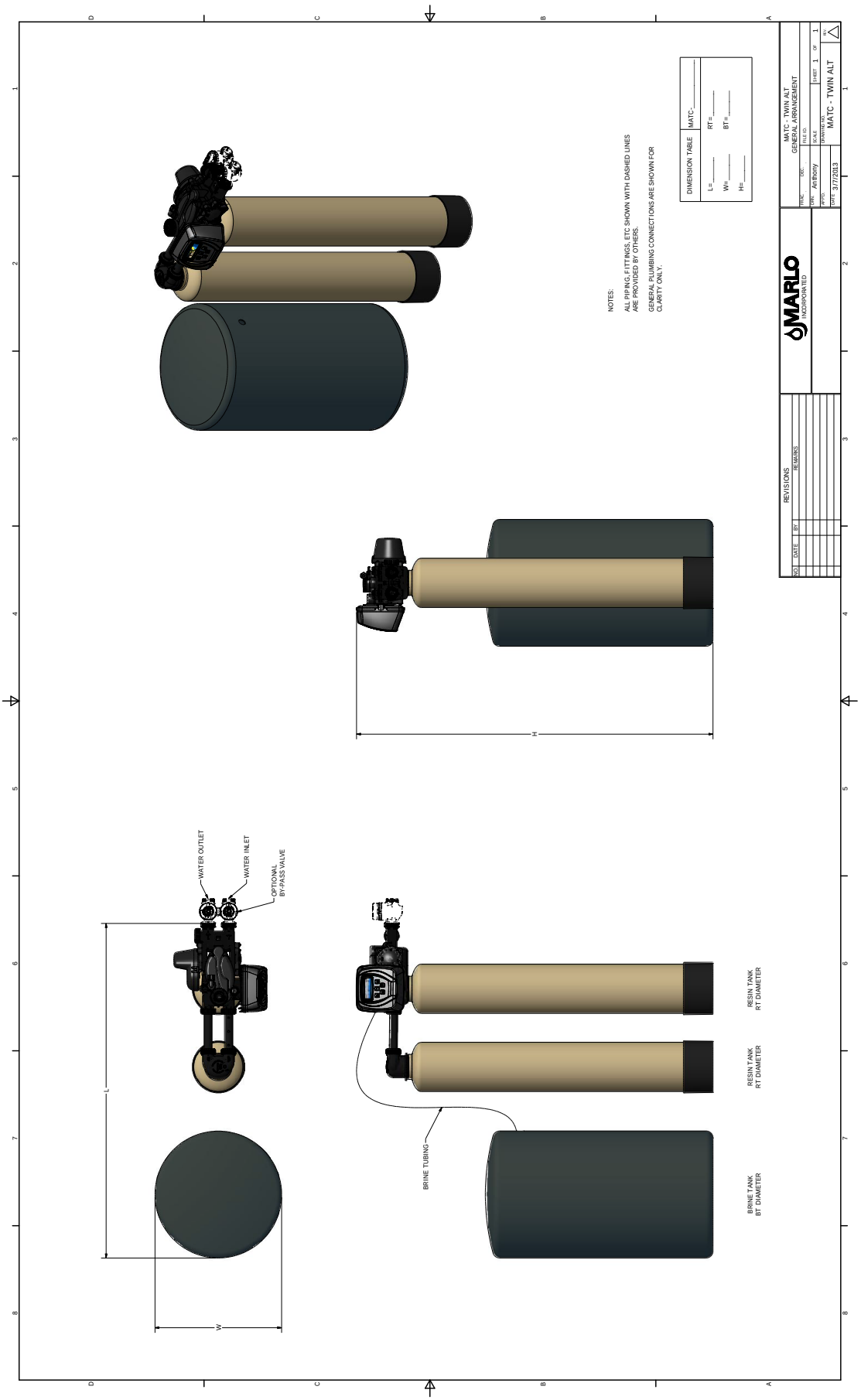
SPECIFICATION CHART

		MODEL MATC -	15	30	45	60	90	120	150
SYSTEM SIZE		Valve Size (In)	1	1	1	1	1	1	1
		Max Capacity (Kilograins)	15	30	45	60	90	120	150
		Min Capacity (Kilograins)	10	20	30	40	60	80	100
		Overall Dimensions (LxWxH) (In.)	50x18x52	51x18x56	51x18x62	54x18x60	57x18x73	66x24x73	69x24x75
FLOWRATE (GPM)		Peak Flowrate (Gpm)	18	20	22	25	26	30	31
		Continuous Flowrate (Gpm)	13	15	17	20	21	23	25
		Backwash & Fast Flush (Gpm)	1.3	2.2	2.7	3.2	4.2	5.3	7.5
		Brine Draw & Rinse (Gpm)	0.2	0.36	0.37	0.52	.79	1.05	1.3
		Brine Tank Refill (Gpm)	0.5	0.5	0.5	0.5	0.5	0.5	0.5
TIMER SETTINGS		Backwash & Fast Flush (Min)	8	8	8	10	10	10	10
		Brine Draw & Rinse (Min)	60	60	60	60	60	60	60
		Fast Flush (Min)	8	8	8	10	10	10	10
		Brine Tank Refill (LBS.)	7.5	15	22.5	30	45	60	75
SOFTENER TANK		Size (In)	7x44	9x48	10x54	12x52	14x65	16x65	18x65
		Gravel (Lbs)	0	0	0	0	30	35	40
		Resin (Ft^3)	0.5	1.0	1.5	2.0	3.0	4.0	5.0
		Freeboard (In.)	8	8	17	16	21	21	24
BRINE SYSTEMS	EQUIPMENT	Tank Size	18x33	18x33	18x40	18x40	18x40	24x41	24x50
		Max Salt Storage (Lbs)	300	300	350	290	290	555	650
		Injector Code	1B	1D	1E	1F	1H	1I	1J
		Injector Color	BROWN	RED	WHITE	BLUE	GREEN	ORANGE	LT BLUE
	MAX	Salt Dosage- Max (Lbs)	7.5	15	22.5	30	45	60	75
		Refill Time - Max (Min)	5	10	15	20	30	40	50
	MIN	Salt Dosage- Min (Lbs)	3	6	9	12	18	24	30
		Refill Time - Min (Min)	2	4	6	8	12	16	20
	REGENERATION WASTE VOLUME (GAL)		35	55	65	80	115	150	200

NOTES:

1. FLOW RATES
   Continuous: pressure loss does not exceed 15 psig.
   Peak: pressure loss does not exceed 25 psig
   Backwash & Flush: maximum flow to drain
   Brine & Rinse: Injector flow to drain @50 psi inlet pressure
   Brine Tank Refill: flow to refill Brine Tank
2. SOFTENER TANK
   Freeboard: distance in inches from surface of resin to top sealing flange of tank
3. SALT DOSAGE
   Maximum 15 lbs./cu.ft. - regeneration efficiency: 2,000 grains/pound of salt (factory setting)
   Maximum 6 lbs./cu.ft. - regeneration efficiency: 3,000 grains/pound of salt
4. REGENERATION WASTE VOLUME - Total gallons water discharged per regeneration
5. DIMENSIONS:
   Leave a minimum 24 inch clearance to the height of the unit for loading media.
   Dimensions are for general arrangement use only.

MATC 1” GENERAL ARRANGEMENT DRAWING



INSTALLATION FITTING ASSEMBLIES

Installation fittings connect to the control valve or the bypass valve (bypass valve is optional) **using nuts that only require hand tightening**. Hand tighten nut connections between control valve and installation fittings, control valve and bypass valve, and bypass valve and installation fittings allow for ease serviceability. Do not use a pipe wrench to tighten nuts on installation fittings. **Hand tighten only.**

Split ring retainer design holds the nut on and allows load to be spread over the entire nut surface area reducing the chance for leakage. The split ring design, incorporated into the installation fittings allows approximately 2 degrees off axis alignment to the plumbing system. The installation fittings are designed to accommodate minor plumbing misalignments but are not designed to support the weight of a system or the plumbing.

When assembling the installation fitting package, 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 cements on any part of the o-rings or split rings, bypass valve or control valve. Solvent cements and primers should be used in accordance with the manufacturer’s instructions.

Slip the nut onto the fitting first, then the split ring second and the o-ring last. hand tighten the nut. If the fitting is leaking, tightening the nut will not stop the leak. Remove the nut, remove the fitting, and check for damage or misalignment of the o-ring.

Do not use the pipe dope or other sealant on threads. Teflon tape must be used on the threads of the 1” NPT elbow and the 1/4” NPT connection and on the threads for the drain line connection. Teflon tape is not necessary on the nut connection or caps because of o-ring seals.

Do not use Vaseline, oils or other unacceptable lubricants on o-rings. A silicon lubricant may be used on black o-rings.

Bypass Valve

The optional bypass valve easily connects to the control valve body using nuts that only require hand tightening. Hand tighten nut connections between control valve and fittings, control valve and bypass valve, and bypass valve and installation fittings allow for easy serviceability. The split ring retainer design holds the nut on and allows load to be spread over the entire nut surface area reducing the chance for leakage. The split ring design, incorporated into the bypass, allows approximately 2 degrees off axis alignment to the plumbing system. The bypass is designed to accommodate minor plumbing misalignments but is not designed to support the weight of a system or the plumbing.

Avoid getting primer and solvent cements on any part of the o-rings or split rings, bypass valve or control valve. Do not use pipe dope or other sealant on threads. Teflon tape is not necessary on the caps because of o-ring seals.

Do not use Vaseline, oil or other unacceptable lubricants on o-rings. A silicon lubricant may be used on black o-rings.

A. GENERAL

1. Shut off all water at main supply valve.
2. Shut off the fuel supply to water heater.
3. Open faucets (hot and cold) nearest pump or water meter to relieve pressure and drain system.
4. Move softener into the installation position. Loosely attach all fittings to measure for bypass valve assembly (if used), or manual bypass valve.
5. Level the unit. Place shims under cabinet or brine tank as needed. (Do Not use metal shims.)
6. Cut the cold water supply line as required.
7. Install the bypass valve assembly if used.

B. PLANNING INSTALLATION

1. All installation procedures must conform to local plumbing, electrical and sanitation codes and ordinances.
2. It is recommended that outside faucets for lawn service be on the hard water line, ahead of the softener, to conserve softened water, save salt and prevent lawn damage.
3. If this isn’t practical, use the convenient integral bypass valve assembly during irrigation flows.
   CAUTION: The inlet water temperature MUST NOT exceed 110 F.
4. Do not locate softener where ambient temperature drops below 40 F.
5. Allow space around the softener for ease of servicing.
6. The softener drain lines must never be solidly connected to the sewer line. (Always provide an air gap at the END of the drain line). Valve drain line must not be elevated over 5’ from the top of the softener on well systems, and not over 8’ on municipal water systems.
7. Move the softener into position. MATC-15, 30, 45 & 60 systems have been pre-loaded at the factory. For systems larger than the MATC-60, complete section C before continuing on to section D.
8. **IMPORTANT:** Be sure that the water inlet line is connected to the “inlet” side of the bypass valve or to the inlet fitting. (Bypass valve both inlet/outlet fittings are marked.) If water lines are reverse, (inlet/outlet) resin may be forced from the water softener into the plumbing system. If this occurs, household plumbing system must be clean.
   NOTE: The twin tanks need to be a specific distance from each other. Refer to the table in paragraph F for the correct center-to-center distance for the tanks.

C. LOADING SOFTENER TANK

1. On Model MATC-15, 30, 45 and 60 the softening media has been pre-loaded at the factory. Skip this section and go to “Connect All Fittings”.
2. Fill tank(s) approximately 1/3 full of water using a hose, bucket, etc. Plug the PVC distributor manifold pipe using a plastic cap, cork, rag, etc. NO gravel or resin should go into this distributor manifold pipe.=
3. Verify the distributor manifold is center in the tank with the distributor resting on the bottom of the tank. Verify the riser pipe is still plugged.
   NOTE: Reference the specification table in the front of this manual for the correct quantities of gravel and resin. Note that these quantities are for each tank. Make sure you have the required amounts on site before you begin. Gravel is not required on systems with 12” tanks or smaller.
4. With care not to damage any lateral, pour in the gravel provided for each tank through the top opening in the tank and level out evenly. This will cover the distributor assembly.
   NOTE: Wetting the gravel in the bags before loading will eliminate the normal amount of dust.
5. When gravel is loaded and leveling is completed, proceed as follows:
6. With the distributor riser pipe still plugged, add the proper amount of resin supplied for each tank through the top opening in the tank.
   Caution: The softener resin is very slippery. Take care when stepping on any spilled resin. Remove spilled resin from standing surface immediately.
7. When loading is complete, remove plastic cap, cork, or rag that was used to plug the distributor riser pipe. Be careful not to let any foreign debris fall into the pipe. The result could be damage to system.
8. Repeat instruction steps 1-7 for each softener tank (if applicable).

D. MOUNTING CONTROL VALVE ASSEMBLY

1. Verify that the distributor riser pipe is not plugged.
2. Lubricate the distributor o-ring on the bottom of the control valve with silicone.
3. Screw the control valve into top opening of tank making sure the distributor riser pipe slides easily through the distributor o-ring. Care must be taken not to “nick” this o-ring as hard water leakage could result.
4. Tighten down the control valve to ensure positive o-ring seal at top of tank.
5. Repeat steps 1-4 for the second tank adapter.

E. CONNECT ALL FITTINGS

CAUTION: Care must be used when working with copper tubing. Do not allow the flame from torch to contact any portion of the Valve assembly.

1. Attach 1/2” drain line to drain elbow with insert and nut. Use optional 3/4” drain fittings if drain run exceeds 25 ft.
2. Do not elevate the drain line over 5’ above the top of the valve (8’ on municipal systems) or to exceed 25’ in length at either height.

CAUTION: An air gap must be provided upon sewer entry. (Conform to local plumbing and sanitation codes and ordinances).

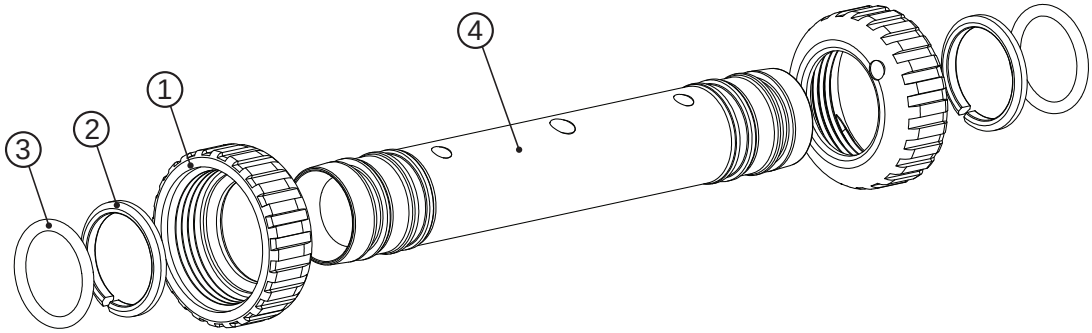
3. The salt storage cabinet or brine tank provides an overflow. Attach 1/2” ID flexible plastic tubing to the overflow fitting and direct it to the drain. DO NOT connect to the main drain line. Use a separate gravity flow line.
4. For pre-loaded systems, connect to bypass assembly (if used). The integral manual bypass option is a connection which eliminates the need for a 3-valve manifold. This makes installation easier and provides a more convenient method of bypassing.

F. TWIN ALTERNATING PLUMBING

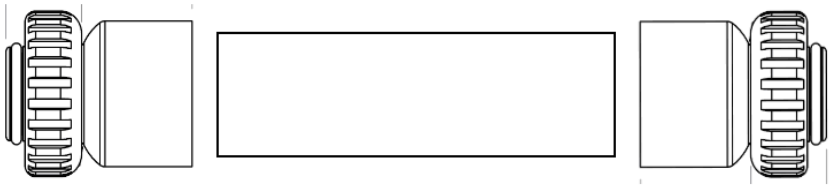
The tanks should have been placed at the distance shown in the chart below. Locate the interconnect pipes (there are two).

Tank Placement based on Diameter	
Tank Diameter (in.)	Center-to-Center Distance (in.)
7”, 8”, 9”, 10”	11.5”
12”	13.5”
14”	15.5”
16”	17.5”
18”	19.5”

For systems with tank diameters from 7” to 10”, place the quick-connect nut (1), o-ring (2) and then split ring (3) on each end of each pipe (4). Insert the pipes between the main valve and the second tank adapter. Secure the pipes on each end using the quick-connect nut. Hand tighten only.



For systems with tanks 12” diameter and larger – additional connectors are needed to adapt the interconnecting pipes to the valve and second tank adapter. Locate the two interconnecting pipes (1-1/4” PVC) and the four (4) connectors and glue one connector to each end of the two interconnecting pipes using PVC glue. Once the glue is set up, insert the interconnecting piping assemblies between the main valve and the second tank adapter. Secure the pipes on each end using the split ring and quick-connect nut. Hand tighten all quick-connect nuts.



The inlet and outlet of the valve can be connected to an optional bypass assembly, or a 3-valve bypass as shown on the layout drawing. The integral manual bypass option is a connection which eliminates the need for a 3-valve manifold. This makes installation easier and provides a more convenient method of bypassing.

The softener system includes a 1” NPT male connector kit. Insert the two connectors into the inlet and outlet (of the valve or optional bypass) and hand tighten the quick-connect nuts. The raw water inlet line and soft water outlet lines are to be attached to the 1” male connectors.

G. PRESSURE TEST THE INSTALLATION

At this point, the water supply is still off and the softener bypass valve is open (inlet and outlet valves are closed). The unit can be plugged in at this time. The plumbing system can now be checked for any possible leaks.

1. Put the unit into fast rinse. To do this, push and hold the REGEN button for 3-5 seconds. When the Valve stops cycling, push the REGEN button again to advance to the next cycle. Continue until FAST RINSE is shown in the display, then unplug the unit. With water supply off, take the softener out of bypass and into the service position.
2. Open water supply line valve very slowly. Water should escape slowly from the drain line. If water enters too quickly, resin may be lost to the drain.
3. When all of the air has been purged from the mineral tank (water flows steadily from the drain) open the main supply valve fully.
4. Allow water to run to drain until clear. CHECK FOR LEAKS!
5. Plug the unit back in.
6. Manually step the unit through the remaining steps, stopping at the fill cycle (to do this, push the REGEN button). Once the piston has stopped moving, push the REGEN button again to the next cycle. Continue until Fill appears on the screen. The unit will now fill the brine tank to the appropriate level. (This sequence is for softeners with post fill brine)
7. Allow control to return to the home position.
8. Check for leaks!
9. Make sure the power cord is plugged into a properly grounded wall receptacle.

H. MANUAL REGENERATION

The user can initiate manual regeneration. The user has the option to request a manual regeneration at the delayed regeneration time or to have the regeneration occur immediately:

1. Pressing and releasing the REGEN button. “Regen Today” will flash on the display and the regeneration will occur at the delayed regeneration time. The user can cancel the request by pressing and releasing the REGEN button. This method of manually initiating regeneration is not allowed when the system is set to immediately regenerate when the gallon capacity reaches zero.
2. Pressing and holding the REGEN button for approximately 3 seconds will immediately start the regeneration The user cannot cancel this request.

NOTE: Program Timer “Lockout” Feature

The Program Timer is initially set to allow access to all Programming, Diagnostic and History screens

The Installer can limit access to (lockout) most screens by activating the Lockout Feature.

Activating “Lockout” allows the user to view and change only Water Hardness, Days Override, Time of Regeneration and Time of day.

Activate “Lockout” Feature: Press DOWN then NEXT then UP then SET CLOCK in sequence. LOCK will briefly appear in the display.

De-activate “Lockout” Feature: Press DOWN then NEXT then UP then SET CLOCK. UNLOCK will briefly appear in the display.

When in operation normal user displays such as time of day, gallons remaining or days remaining before regeneration are shown. When stepping through a procedure if no buttons are pressed within five minutes the display returns to a normal user display. Any changes made prior to the five minute time out are incorporated. The one exception is current flow rate display under the diagnostic procedure. The current flow rate display has a 30 minute time out feature.

CONTROL VALVE FUNCTION AND CYCLES OF OPERATION

This glass filled Noryl™ fully automatic control valve is designed as the primary control center to direct and regulate all cycles of a water softener or filter. When the control valve is set up as a softener, the control valve can be set to perform down flow or up flow regeneration with the proper piston. When the control valve is set up as a filter, the control valve can be set to perform down flow regeneration or simply backwash. The control valve can be set to regenerate on demand (consumption of a predetermined amount of water) and/or as a time clock (passage of a particular number of days). The control valve can be set so that the softener can meet the Water Quality Association (WQA) or NSF International efficiency rating.

The control valve is compatible with a variety of regenerants and resin cleaners. The control valve is capable of routing the flow of water in the necessary paths to regenerate or backwash water treatment systems. The injector regulates the flow of brine or other regenerants. The control valve regulates the flow rates for backwashing, rinsing and the replenishing of treated water into a regenerant tank, when applicable.

The 1” control valve is designed to deliver high service (30 gpm @ 15 psig) and backwash (16 gpm @ 25 psig) flow rates when the bypass has straight fittings and a 1.050” distributor. The control valve uses no traditional fasteners (e.g. screws), instead clips, threaded caps, nuts and snap type latches are used. Caps and nuts only need to be firmly hand tightened because radial seals are used. Tools required to service the valve include one small blade screwdriver, pliers and a pair of hands. Disassembly for servicing takes much less time than comparable products currently on the market. Control valve installation is made easy because the distributor tube can be cut 1/2” above to 1/2” below the top of the tank thread. The distributor tube is held in place by an o-ring seal and the control valve also has a bayonet lock feature for upper distributor baskets.

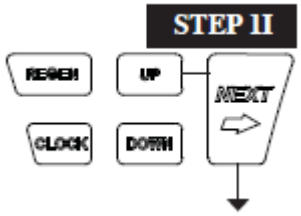
The transformer power pack comes with a 15-foot power cord and is designed for use with the control valve. The transformer power pack is for dry location use only. The control valve remembers all settings for up to 8 hours if the power goes out and the battery is not depleted. After 8 hours, the only item that needs to be reset is the time of day; other values are permanently stored in the nonvolitile memory. If a power loss lasts less than 8 hours and the time flashes on and off, the time of day should be reset and the non rechargeable battery should be replaced. The replacement battery is a commercially available 3 volt Lithium coin cell type 2032.

Table 3 shows the order of the cycles when the valve is set up as a softener.

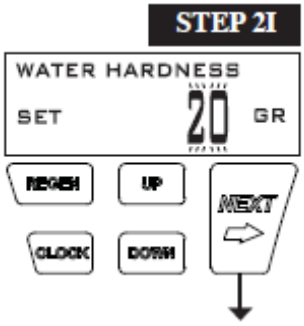
Table 3
Regeneration Cycles Time

		Down Flow Softener
Grains Capacity / LB NaCl		3500 to 2501
Lbs. NaCl/cu ft resin		7.5 to 1.2
Cycle Time In Minutes	1st Cycle: Backwash Normal	8-10 minutes
	2nd Cycle: Brine Slowrinse	60 minutes
	3rd Cycle: Rinse	8-10 minutes
	4th Cycle: Fill	minutes will vary depending on softener capacity
	5th Cycle: End	0.011–200

VALVE PROGRAMMING



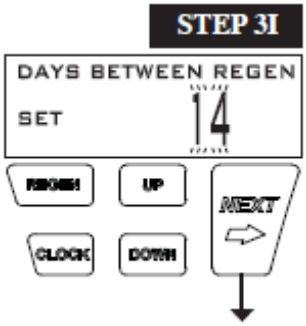
STEP 1I - Press NEXT and UP simultaneously for 3 seconds.



STEP 2I – **Hardness:** The default is 20 with value ranges from 1 to 150 in 1 grain increments. Note: The grains per gallon can be increased if soluble iron needs to be reduced.

Set the amount of hardness in grains of hardness as calcium carbonate per gallon using DOWN or UP.

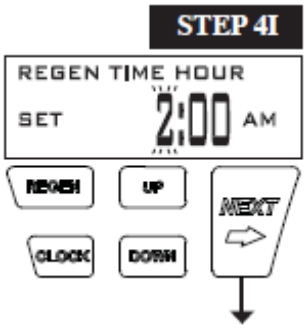
This display will not show if 'AUTO' is not selected in Set Volume Capacity in OEM Softener System Setup. Press NEXT to go to step 3I. Press REGEN to exit Installer Display Settings.



STEP 3I – **Day Override:** Number of days between regeneration (1 to 28); or "OFF".

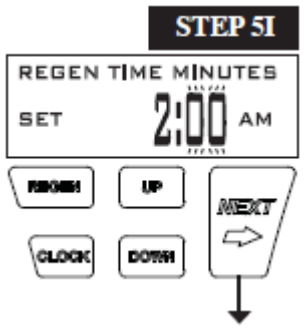
If value set to "OFF", regeneration initiation is based solely on volume used. If value is set as a number (allowable range from 1 to 28) a regeneration initiation will be called for on that day even if sufficient volume of water were not used to call for a regeneration. Set Day Override using DOWN or UP.

When volume capacity is set to "OFF" (time clock), sets the number of days between regenerations. When volume capacity is set to AUTO or to a number (metered), sets the maximum number of days between regenerations. See Setting Options Table 8 for more detail on setup. Press NEXT to go to step 4I. Press REGEN to return to previous step.



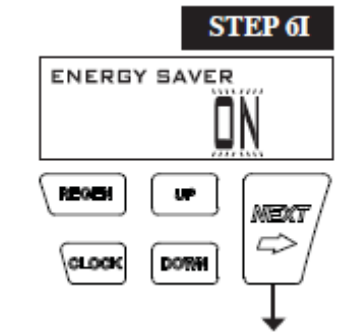
STEP 4I – **Next Regeneration Time (hour):** The default time is 2:00 AM. AM/PM toggles after 12.

Used for DELAY regeneration. Set the "hour" of day for regeneration using DOWN or UP. If "IMMEDIATE" is selected in Set Regeneration Time Option in OEM Softener System Setup, this display will show "REGEN IMMEDIATE ON ZERO GAL". Press NEXT to go to step 5I. Press REGEN to return to previous step.



STEP 5I – **Next Regeneration Time (minutes):**

Used for DELAY regeneration. Set the "minutes" of day for regeneration using DOWN or UP. This display will not be shown if "IMMEDIATE" is selected in Set Regeneration Time Option in OEM Softener System Setup. Press NEXT to go to Step 6I. Press REGEN to return to previous step.



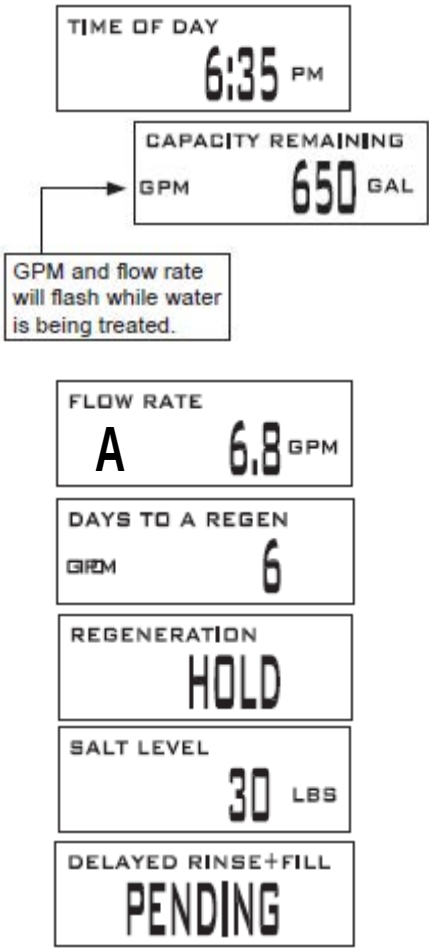
STEP 6I – **Energy Saver operation:** Set to "OFF" or "ON".

When set to OFF, the display backlight is always on. When set to ON, the display backlight will go off after 5 minutes of no keypad activity.

A valve error or salt level alert will activate the display backlight, and prevent deactivation until the error or alert is reset by the user. Press NEXT to exit Installer Display Settings. Press REGEN to return to the previous step.

User Display Settings

When the system is operating, several displays may be shown. Pressing NEXT will alternate between the displays.

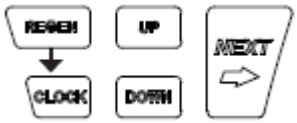


- Current TIME OF DAY.
- CAPACITY REMAINING is the gallons that will be treated before the system goes through a regeneration cycle (Metered units only). Pressing DOWN while in the Capacity Remaining display will decrease the capacity remaining in 10 gallon increments and will also increase the volume used impacting the recorded values in Diagnostics Steps 3D, 4D and 5D and Valve History, Step 4VH.
- If a water meter is installed, GPM flashes (and alternates with the flow rate) on the display when water is being treated (i.e. water is flowing through the system). A tank in service indicator (A or B) will show which tank is in service.
- DAYS TO A REGEN is the number of days left before the system goes through a regeneration cycle. Pressing UP or DOWN while in this screen will temporarily increase or decrease the displayed value by 1 day.
- Contact information will be displayed if it was edited. For concerns with phone number or banner text displays, contact OEM for instructions.
- DP or HOLD if the dP switch is closed.
- REGEN TODAY will alternate with the header on the display if the system has called for a regeneration that will occur at the pre-set time of regeneration.
- If Salt Level Monitor has been set to ON in Step 16S, the SALT LEVEL screen will appear. To adjust the salt level, press CLOCK, and use UP or DOWN to set the current value. The salt level is adjustable from 0 to 500 lbs. in 10 lb. increments
- DELAYED RINSE+FILL PENDING will be displayed whenever a zero-capacity tank has transferred to an off-line state and is currently waiting to initiate the second portion of a regeneration cycle. Viewed only when Delayed Rinse and Fill is set to ON.

Regeneration Mode

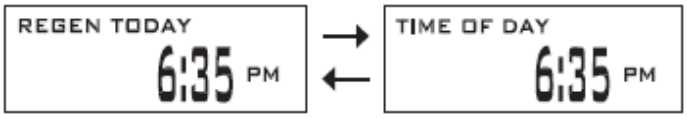
Typically a system is set to regenerate at a time of low water usage. An example of a time with low water usage is when a household is asleep. If there is a demand for water when the system is regenerating, untreated water will be used.

When the system begins to regenerate, the display will change to include information about the step of the regeneration process and the time remaining for that step to be completed. The system runs through the steps automatically and will reset itself to provide treated water when the regeneration has been completed.



Manual Regeneration

Sometimes there is a need to regenerate the system sooner than when the system calls for it, usually referred to as manual regeneration. There may be a period of heavy water usage because of guests or a heavy laundry day. To initiate a manual regeneration at the preset delayed regeneration time, when the regeneration time option is set to "DELAYED REGEN" or "DELAY + IMMEDIATE", press and release "REGEN".

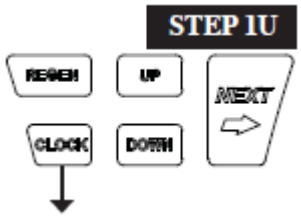


The words "REGEN TODAY" will periodically be shown on the display to indicate that the system will regenerate at the preset delayed regeneration time. If you pressed the "REGEN" button in error, pressing the button again will cancel the request.

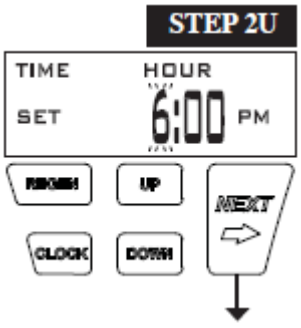
Note: If the regeneration time option is set to "IMMEDIATE" there is no set delayed regeneration time so "REGEN TODAY" will not activate if "REGEN" button is pressed. To initiate a manual regeneration immediately, press and hold the "REGEN" button for three seconds. The system will begin to regenerate immediately. The request cannot be cancelled. Note: For softeners, if brine tank does not contain salt, fill with salt and wait at least two hours before regenerating.

Set Time of Day

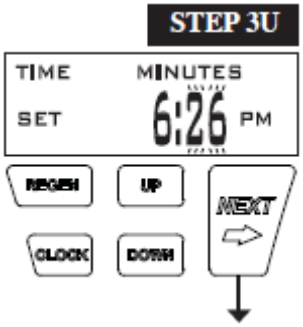
The user can also set the time of day. Time of day should only need to be set if the battery has been depleted because of extended power outages or when daylight saving time begins or ends. If an extended power outage occurs, the time of day will flash on and off which indicates the time of day should be reset. The non rechargeable battery should also be replaced.



STEP 1U – Press CLOCK



STEP 2U - Current Time (hour): Set the hour of the day using DOWN or UP. AM/PM toggles after 12. Press NEXT to go to Step 3U.



RETURN TO NORMAL MODE

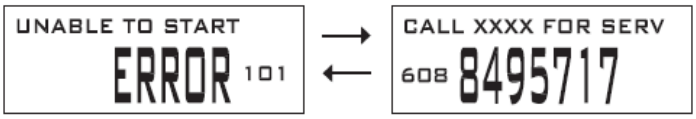
STEP 3U - Current Time (minutes): Set the minutes of the day using DOWN or UP. Press NEXT to exit Set Time of Day. Press REGEN to return to previous step.

Power Loss

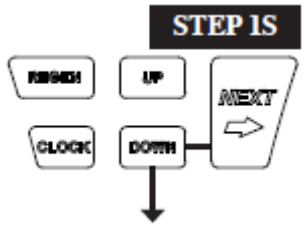
If the power goes out the system will keep time until the battery is depleted. If an extended power outage occurs, the time of day will flash on and off which indicates the time of day should be reset and the non rechargeable battery replaced. The system will remember the rest.

Error Message

If the word "ERROR" and a number are displayed contact the OEM for help. This indicates that the valve was not able to function properly. If the number and banner text in the Contact Screens has been edited, the two displays below will alternate.

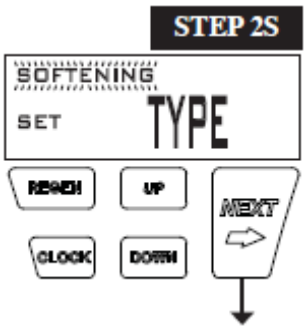


Manufacturers Softener System Setup

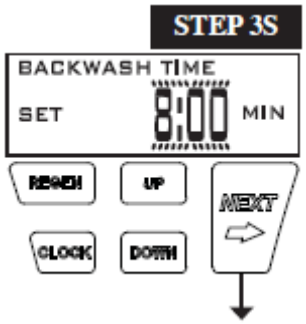


Step 1S – Press NEXT and DOWN simultaneously for 3 seconds and release. If screen in Step 2S does not appear in 5 seconds the lock on the valve is activated. To unlock press DOWN, NEXT, UP, and SET CLOCK in sequence, then press NEXT and DOWN simultaneously for 3 seconds and release**.**

It is not necessary for the installer or end user to program these screens. All screens have been programmed for your specific equipment.

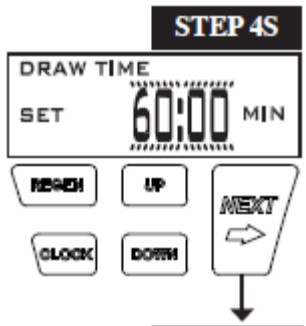


Step 2S – Choose SOFTENING using UP or DOWN. Press NEXT to go to Step 3S. Press REGEN to exit OEM Softener System Setup.



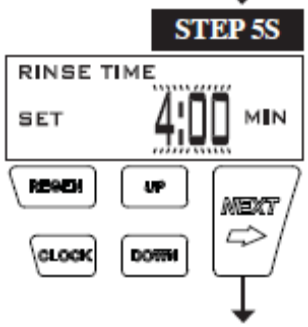
Step 3S – Select the time for the fi rst cycle (which in this example is BACKWASH) using UP or DOWN. Press NEXT to go to Step 4S. Press REGEN to return to previous step.

This is already programmed for your specific unit at Marlo Inc. You do not need to change.



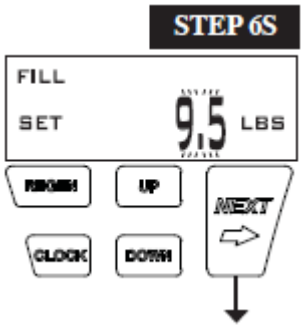
Step 4S – Select the time for the second cycle (which in this example is DRAW) using UP or DOWN. Press NEXT to go to Step 5S. Press REGEN to return to previous step.

This is already programmed for your specific unit at Marlo Inc. You do not need to change.



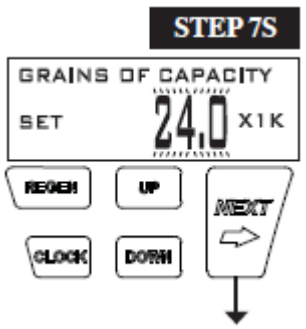
Step 5S – Select the time for the third cycle (which in this example is RINSE) using UP or DOWN. Press NEXT to go to Step 6S. Press REGEN to return to previous step.

This is already programmed for your specific unit at Marlo Inc. You do not need to change.



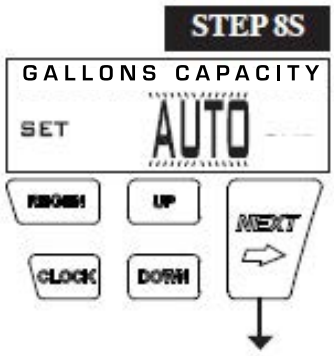
Step 6S – Select the LBS for the fourth cycle (which in this example is FILL) using UP or DOWN. When both 2.0L and 2.0 are options in Step 2CS, and 2.0 is selected, FILL is in minutes. Press NEXT to go to Step 7S. Press REGEN to return to previous step.

This is already programmed for your specific unit at Marlo Inc. You do not need to change.



Step 7S – Set Grains Capacity using UP or DOWN. 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. Calculate the pounds of salt using the fill time previously selected. Grains capacity is affected by the fill time. The grains capacity for the selected fill time should be confirmed by OEM testing. The capacity and hardness levels entered are used to automatically calculate reserve capacity when volume capacity is set to AUTO. Press NEXT to go to Step 8S. Press REGEN to return to previous step.

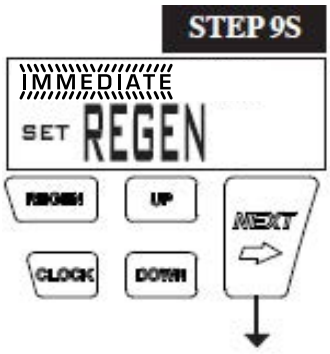
Capacity is already set by Marlo Inc.



Step 8S – Set Gallons Capacity using UP or DOWN. If value is set to:

- "AUTO" capacity will be automatically calculated and reserve capacity will be automatically estimated; **AUTO is the default of all Marlo equipment.**
- "OFF" regeneration will be based solely on the day override set (see Installer Display Settings Step 3I); **"OFF" feature is for Time Clock units only**; or
- "GAL", regeneration initiation will be based off the value specified.

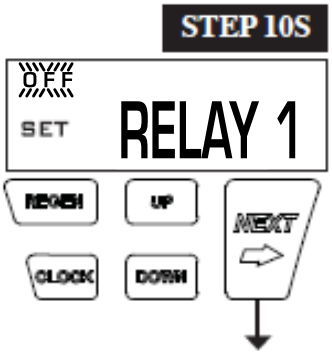
If "OFF" or a number is used, hardness display will not be allowed to be set in Installer Display Settings Step 2I.
If "OFF" is selected, Regeneration Time is automatically "Delayed", so Step 9S will not appear.
See Setting Options Table 8 for more detail. Press NEXT to go to Step 9S. Press REGEN to return to previous step



Step 9S – Set Regeneration Time Options using UP or DOWN. If value is set to:

- "DELAYED" means regeneration will occur at the preset time
- "IMMEDIATE" means regeneration will occur immediately when the volume capacity reaches 0 (zero). "IMMEDIATE" is the default on all Marlo equipment configured as twin alternating

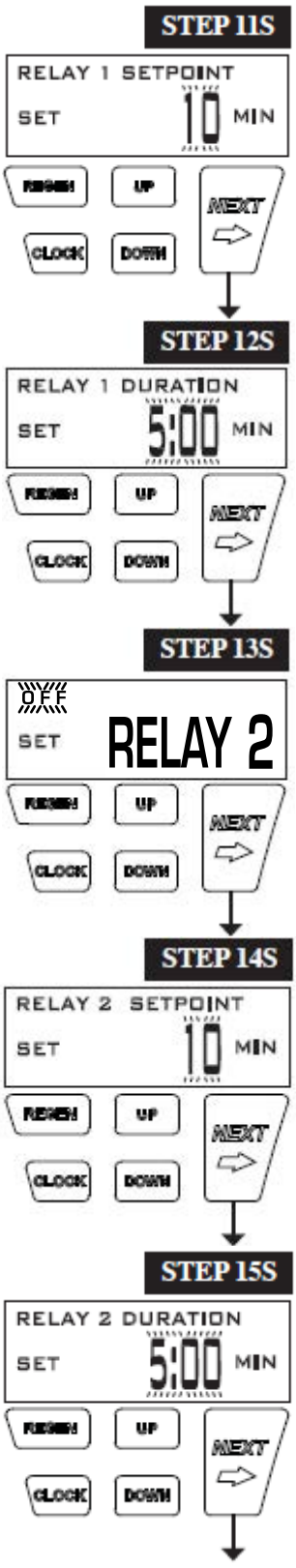
See Setting Options Table 8 for more detail. Press NEXT to go to Step 10S. Press REGEN to return to previous step.



Step 10S: Set Relay 1 operation using UP or DOWN. The choices are:

- Set TIME: Relay activates after a set time at the beginning of a regeneration and then deactivates after a set period of time. The start of regeneration is defined as the first backwash cycle or Regenerant Draw UP (1" only) or DN, which ever comes first. See steps 11S & 12S.
- Set GALLONS: Relay activates after a set number of gallons have been used while in service and then deactivates after a set period of time or after the meter stops registering flow, whichever comes first.
- Set REGEN GAL: Relay activates after a set number of gallons have been used while in service or during regeneration and then deactivates after a set period of time or after the meter stops registering flow, whichever comes first.
- Set OFF: If set to Off, Steps 11S and 12S will not be shown.

Press NEXT to go to Step 11S. Press REGEN to return to previous step.



Step 11S: Set Relay 1 SETPOINT Time or Gallons using UP or DOWN. The choices are:

- Relay Actuation Time: After the start of a regeneration the amount of time that should pass prior to activating the relay. The start of regeneration is defined as the first backwash cycle or Regenerant Draw UP (1" only) or DN, which ever comes first. Ranges from 0 to 500 minutes.
- Relay Actuation Gallons: Relay activates after a set number of gallons have passed. Ranges from 1 to 20,000 gallons.

Press NEXT to go to Step 12S. Press REGEN to return to previous step.

Step 12S: Set Relay DURATION TIME using UP or DOWN.

- If TIME is selected in Step 10S, the relay will deactivate after the time set has expired. Ranges from 0:01 to 500:00 minutes.
- If GALLONS or REGEN GAL is selected in Step 10S, the relay will deactivate after the time set has expired.

Press NEXT to go to Step 13S. Press REGEN to return to previous step.

Step 13S: Set Relay 2 operation using UP or DOWN. The choices are the same as Step 10S.

- If set to Off, Steps 14S and 15S will not be shown.

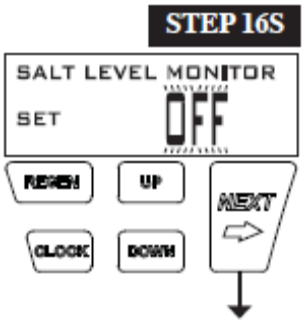
Press NEXT to go to Step 14S. Press REGEN to return to previous step.

Step 14S: Set Relay 2 SETPOINT Time or Gallons using UP or DOWN. The choices are the same as Step 11S. Press NEXT to go to Step 15S. Press REGEN to return to previous step.

Step 15S: Set Relay DURATION TIME using UP or DOWN.

- If TIME is selected in Step 13S the relay will deactivate after the time set has expired.
- If GALLONS or REGEN GAL is selected in Step 13S the relay will deactivate after the time set has expired or after the meter stops registering fl ow, whichever comes first.

Press NEXT to go to Step 16S. Press REGEN to return to previous step



RETURN TO NORMAL MODE

Step 16S: Marlo does not turn this option on. Set Salt Level Monitor. This screen will not appear if Step 2CS is set to 2.0. Press NEXT to exit Softener System Setup. Press REGEN to return to the previous step.

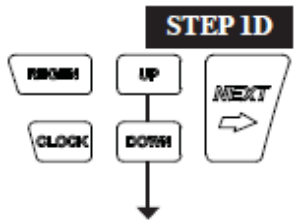
All Marlo equipment has “OFF” as the default.

SETTING OPTIONS TABLE 8

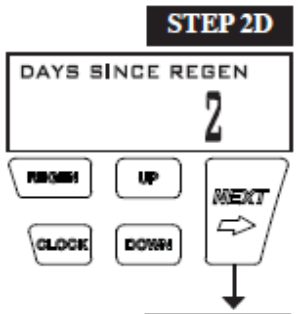
Volume Capacity	Regeneration Time Option	Day Override	Result4
AUTO	DELAYED REGEN	OFF	Reserve capacity automatically estimated. Regeneration occurs when volume capacity falls below the reserve capacity at the next Regen Set Time
AUTO	DELAYED REGEN	Any number	Reserve capacity automatically estimated. Regeneration occurs at the next Regen Set Time when volume capacity falls below the reserve capacity or the specified number of days between regenerations is reached.
Any number	DELAYED REGEN	OFF	Reserve capacity not automatically estimated. Regeneration occurs at the next Regen Set Time when volume capacity reaches 0.
OFF	DELAYED REGEN	Any number	Reserve capacity not automatically estimated. Regeneration occurs at the next Regen Set Time when the specified number of days between regenerations is reached.
Any number	DELAYED REGEN	Any number	Reserve capacity not automatically estimated. Regeneration occurs at the next Regen Set Time when volume capacity reaches 0 or the specified number of days between regenerations is reached.
AUTO	IMMEDIATE	OFF	Reserve capacity not automatically estimated. Regeneration occurs immediately when volume capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur when volume capacity reaches 0.
Any number	IMMEDIATE	OFF	Reserve capacity not automatically estimated. Regeneration occurs immediately when volume capacity reaches 0. Time of regeneration will not be allowed to be set because regeneration will always occur when volume capacity reaches 0.

4 Reserve capacity estimate is based on history of water usage

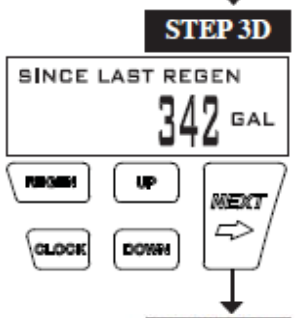
DIAGNOSTICS



STEP 1D – Press UP and DOWN simultaneously for three seconds. If screen in step 2D does not appear in 5 seconds the lock on the valve is activated. To unlock press DOWN, NEXT, UP, and CLOCK in sequence, then press UP and DOWN simultaneously for 3 seconds.

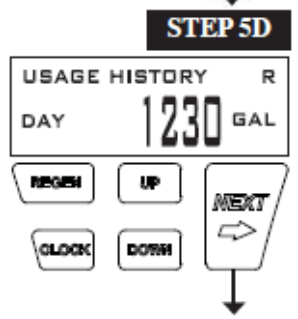


STEP 2D – Days, since last regeneration: This display shows the days since the last regeneration occurred. Press NEXT to go to Step 3D. Press REGEN to exit Diagnostics.

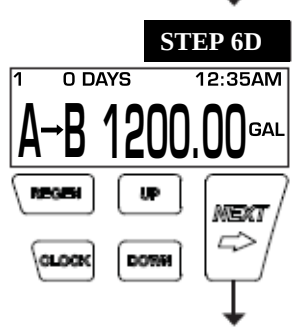


STEP 3D – Volume, since last regeneration: This display shows the volume of water that has been treated since the last regeneration. This display will equal zero if a water meter is not installed. Press NEXT to go to Step 4D. Press REGEN to return to previous step.

STEP 4D – Reserve History Volume used for last 7 days: If the valve is set up as a softener, a meter is installed and Set Volume Capacity is set to "Auto," this display shows 0 day (for today) and the reserve capacity. Pressing UP will show day 1 (which would be yesterday) and the reserve capacity used. Pressing UP again will show day 2 (the day before yesterday) and the reserve capacity. Keep pressing UP to show the capacity for days 3, 4, 5 and 6. DOWN can be pressed to move backwards in the day series. This screen is not displayed if fi lter, time clock, meter immediate, alternator or volume override regeneration is selected. Press NEXT at any time to go to Step 5D. Press REGEN to return to previous step.

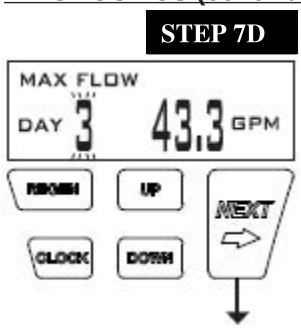


STEP 5D - Volume, 63-day usage history: This display shows day 0 (for today), day 1 (for yesterday), etc., and the volume of water treated that day. Press UP to show the volume of water treated for the last 63 days.
For the 1" twin valve, the usage for tank 1 & tank 2 is combined in this display. If a regeneration occured on the day the letter "R" will also be displayed. This display will show dashes if a water meter is not installed. Press NEXT at any time to go to Step 6D. Press REGEN to return to previous step.



STEP 6D- Tank Transfer History
This display shows data for the last 10 transfers. Flashing number indicates transfer number. A→B or B→A shows which direction transfer occurred. Days shows how many days ago the transfer happened. The number of gallons used at time of transfer is shown. Use UP or DOWN to scroll through each transfer. Press NEXT at any time to go to step 7D. Press REGEN to return to previous step.

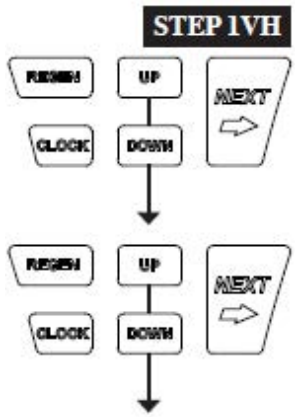
DIAGNOSTICS (continued)



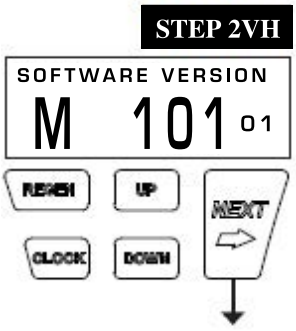
STEP 7D – Flow rate, maximum last seven days: Use UP or DOWN to display the maximum flow rate in gallons per minute that occurred in each of the last seven days. This display will equal zero if a water meter is not installed. Press NEXT to exit Diagnostics. Press REGEN to return to previous step.

RETURN TO NORMAL MODE

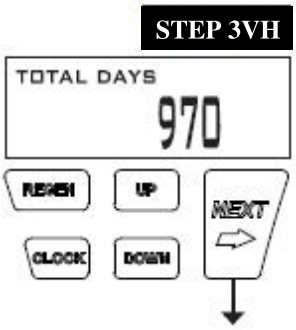
Valve History



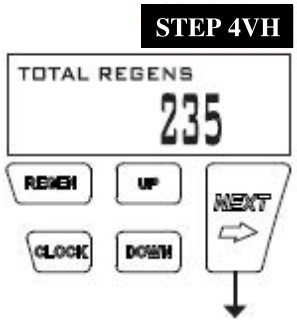
STEP 1VH – Press UP and DOWN simultaneously for three seconds and release. Then press UP and DOWN simultaneously and release. If screen in step 2VH does not appear in 5 seconds the lock on the valve is activated. To unlock press DOWN, NEXT, UP, and CLOCK in sequence, then press UP and DOWN simultaneously for 3 seconds and release. Then press UP and DOWN simultaneously and release.



STEP 2VH – Software Version displays current software version programmed.

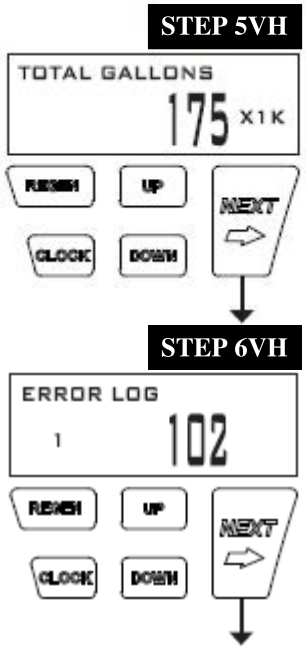


STEP 3VH$_5$ – Days, total since start-up: This display shows the total days since startup. Press NEXT to go to Step 3VH. Press REGEN to return to previous step



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

DIAGNOSTICS (continued)



STEP 5VH – 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 to go to Step 5VH. Press REGEN to return to previous step.

STEP 6VH – Error Log: This display shows a history of the last 10 errors generated by the control during operation. Press UP or DOWN to view each error recorded. Press NEXT to exit Valve History. Press REGEN to return to previous step.

RETURN TO NORMAL MODE

5 Values in steps 3VH through 6VH cannot be reset.

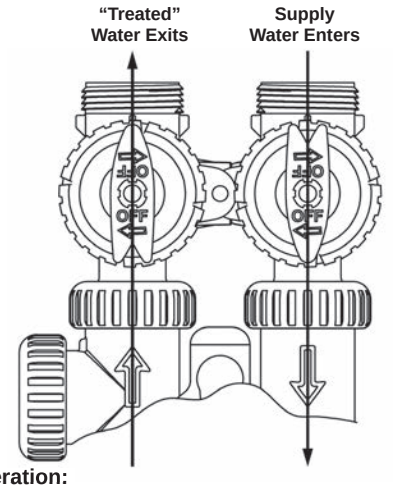
BYPASS VALVE (OPTIONAL)

The bypass valve is typically used to isolate the control valve from the plumbing system's water pressure in order to perform control valve repairs or maintenance. The WS1 bypass valve is particularly unique in the water treatment industry due to its versatility and state of the art design features. The 1" full flow bypass valve incorporates four positions including a diagnostic position that allows service personal to work on a pressurized system while still providing untreated bypass water to the facility or residence. Its completely non-metallic, all plastic, design allows for easy access and serviceability without the need for tools.

The bypass body and rotors are glass filled Noryl and the nuts and caps are glass filled polypropylene. All seals are self-lubricating EPDM to help prevent valve seizing after long periods of non-use. Internal o-rings can easily be replaced if service is required.

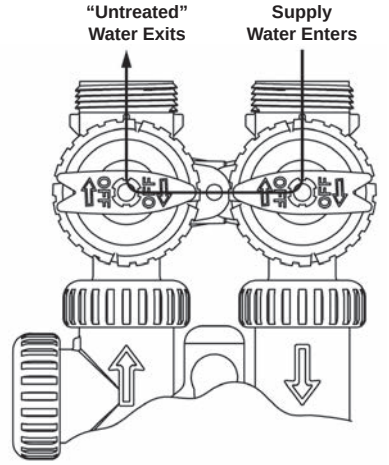
The bypass consists of two interchangeable plug valves that are operated independently by red arrow shaped handles. The handles identify the flow direction of the water. The plug valves enable the bypass valve to operate in four positions.

Figure 1
NORMAL OPERATION



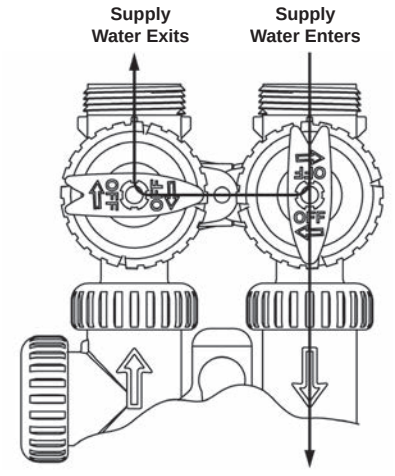
Normal Operation:
The inlet and outlet handles point in the direction of flow indicated by the engraved arrows on the control valve. Water flows through the control valve during normal operation and this position also allows the control valve to isolate the media bed during the regeneration cycle.

Figure 2
BYPASS OPERATION



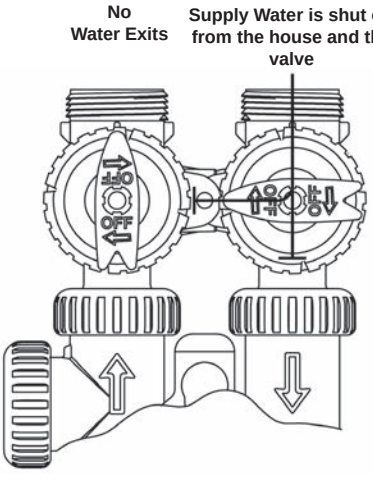
Bypass:
The inlet and outlet handles point to the center of the bypass, the control valve is isolated from the water pressure contained in the plumbing system. Untreated water is supplied to the plumbing system.

Figure 3
DIAGNOSTIC MODE



Diagnostic:
The inlet handle points in the direction of flow and the outlet handle points to the center of bypass valve, system water pressure is allowed to the control valve and the plumbing system while not allowing water to exit from the control valve to the plumbing.

Figure 4
SHUT OFF MODE

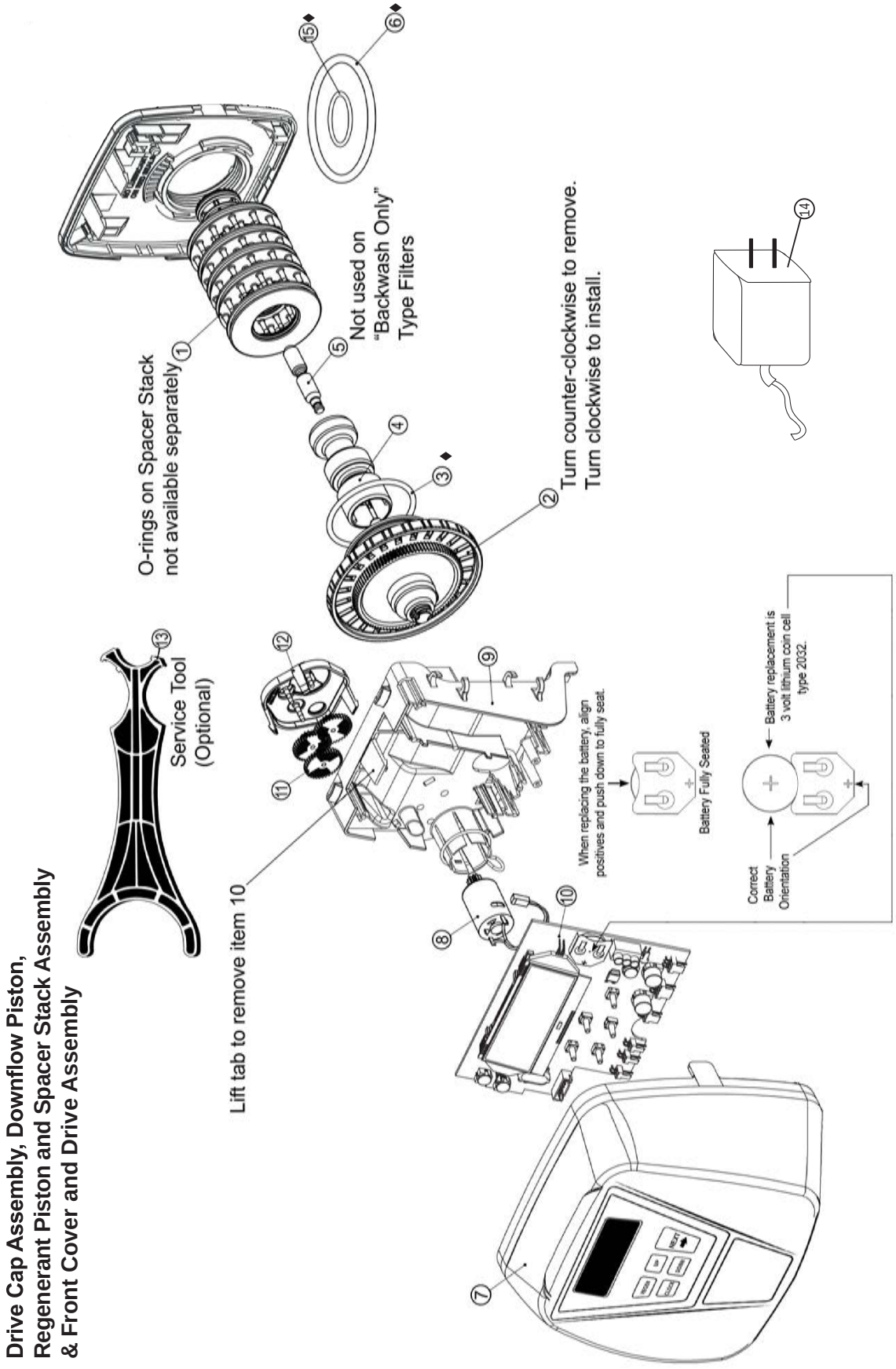


Shut Off:
The inlet handle points to the center of the bypass valve and the outlet handle points in the direction of flow, the water is shut off to the plumbing system. If water is available on the outlet side of the softener it is an indication of water bypass around the system (i.e. a plumbing connection somewhere in the building bypasses the system).

MATC PARTS LISTING

Part Number	No.	Description
B3950550	1	Complete control valve for MATC-15-1 Metered
B3950551	1	Complete control valve for MATC-30-1 Metered
B3950552	1	Complete control valve for MATC-45-1 Metered
B3950553	1	Complete control valve for MATC-60-1 Metered
B3950554	1	Complete control valve for MATC-90-1 Metered
B3950555	1	Complete control valve for MATC-120-1 Metered
B3950556	1	Complete control valve for MATC-150-1 Metered
A2042062	2	Brine Tank Complete for MATC-15, 30
B1300023	2	Brine Tank Complete for MATC-45
A2042064	2	Brine Tank Complete for MATC-60 & MATC-90
B1295015	2	Brine Tank Complete for MATC-120
B1295016	2	Brine Tank Complete for MATC-150
A2071005	3	Brine Well for MATC-15, 30
A2071003	3	Brine Well for MATC-45, 60 & 90
B1015008	3	Brine Well for MATC-120 & MATC-150
A2072003	4	Brine Well Cap for MATC-15, 30, 45 & 90
A2072001	4	Brine Well CAP for MATC-120
A2250003	5	Overflow Elblow 1/2” w/Nut - All
B1180001	6	Brine Valve Assembly MATC-15, 30
B1180004	6	Brine Valve Assembly MATC-45, 60 & 90
B1180014	6	Brine Valve Assembly MATC-120
B1180015	6	Brine Valve Assembly MATC-150
B1020003	7	Brine Line w/Inserts
A2126200	8	Mineral Tank Only MATC-15
A2126203	8	Mineral Tank Only MATC-30
A2126206	8	Mineral Tank Only MATC-45
A2126208	8	Mineral Tank Only MATC-60
A2126105	8	Mineral Tank Only MATC-90
A2126107	8	Mineral Tank Only MATC-120
A2126108	8	Mineral Tank Only MATC-150
A2121047	9	Resin - Please order the quantity indicated next to your unit
A2121047	9	MATC-30 - qty. 0.5 per tank
A2121047	9	MATC-30 - qty. 1 per tank
A2121047	9	MATC-45 - qty. 1.5 per tank
A2121047	9	MATC-60 - qty. 2 per tank
A2121047	9	MATC-90 - qty. 3 per tank
A2121047	9	MATC-120 - qty. 4 per tank
A2121047	9	MATC-150 - qty 5 per tank
A2123001	9	Gravel Subfill - Please order the qty indicated next to your unit - 15, 30, 45 & 60 do not use subfill
A2123001	9	MATC-90 - qty. 30# per tank
A2123001	9	MATC-120 - qty. 35# per tank
A2123001	9	MATC-150 - qty 80# per tank
B1023052	10	Distributor Tube Assembly for MATC-15
B1023054	10	Distributor Tube Assembly for MATC-30
B1023056	10	Distributor Tube Assembly for MATC-45
B1023055	10	Distributor Tube Assembly for MATC-60
B1023057	10	Distributor Tube Assembly for MATC-90
B1201002	10	Distributor Tube Assembly for MATC-120
B1201008	10	Distributor Tube Assembly for MATC-150

MATC CONTROL VALVE PARTS DIAGRAM (see parts listing on next page)



MATC CONTROL VALVE PARTS LISTING (see parts diagram on previous page)

Drive Cap Assembly, Downflow Piston, Upflow Piston, Regenerant Piston and Spacer Stack Assembly

Item No.	Part No.	Description	Quantity
1	A2466034	1” Spacer Stack Assembly w/o o-rings (V3005)	1
2	A2080077	Drive Cap Assembly (V3004)	1
♦3	See Item 51	O-Ring 228 (use Valve O-ring Kit)	1
▲4	A2309040	1” Piston Downflow Assembly (V3011)	1
⊗5	A2498033	Regenerant Piston (V3174)	1
♦6	Use Item 51	O-Ring 337 (use Valve O-ring Kit)	1
15	Use Item 51	O-Ring 215 (use Valve O-ring Kit) 1” Valve	1

▲Item #4 identified with “DN” code.

⊗Item #5 not used with Backwash Only filter applications.

♦ See page 28 For Valve O-Ring Kit

Front Cover and Drive Assembly

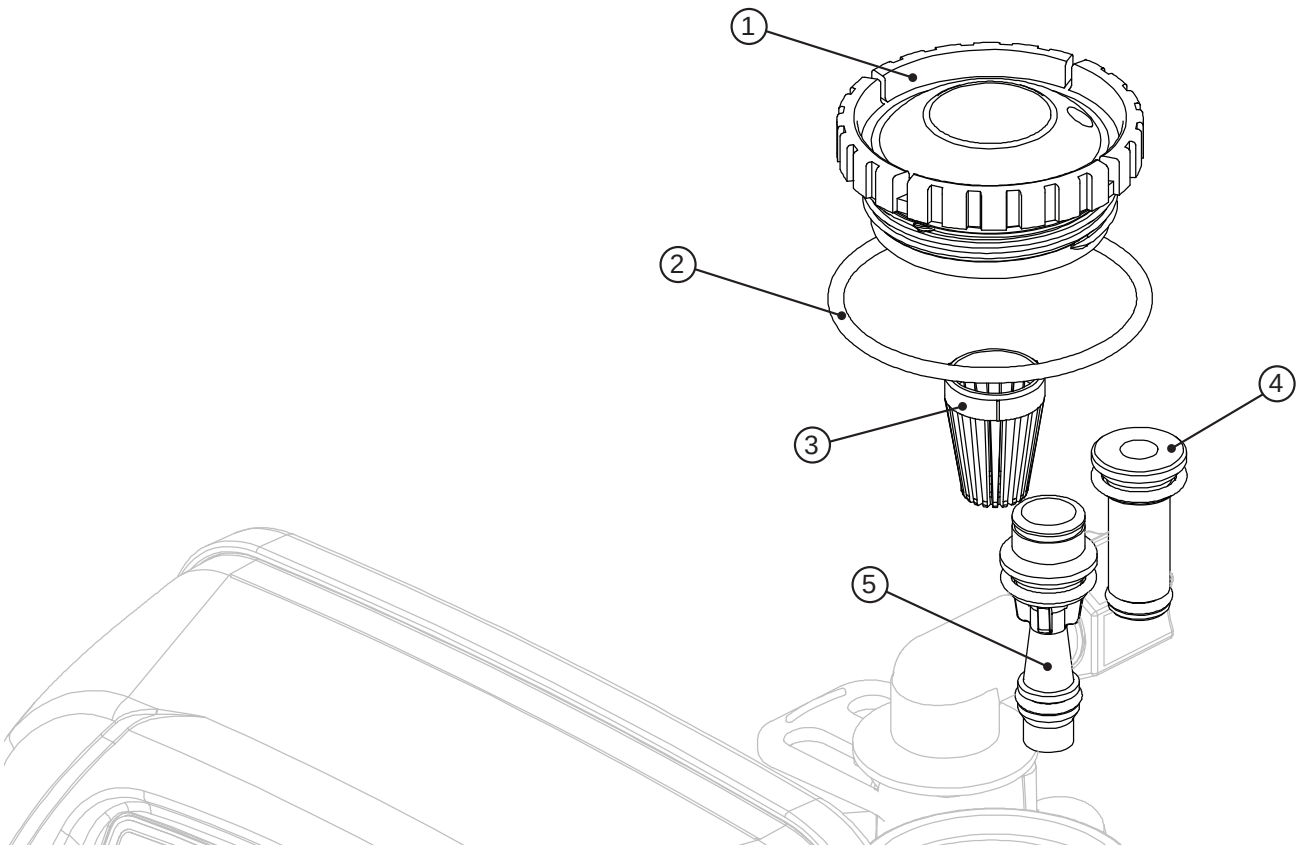
Item No.	Part No.	Description	Quantity
7	A2103160	Front Cover ASSY V3948-01	1
8	A2085050	Motor (V3107-01)	1
9	A2328046	Drive Bracket & Spring Clip (V3106-01)	1
10	A2341033	PC Board V3955MA-BOARD	1
11	A2393046	Drive Gear 12 x 36 (V3110)	3
12	A2103132	Drive Gear Cover (V3109)	1
13	A2491086	Service Tool (V3193-02)	1
14	A2242054	Transformer 110V - 12V (V3186)	1

Injector Cap, Injector Screen, Injector, Plug and O-Ring

Drawing No.	Marlo Part #	Order No.	Description	Quantity
1	A2080079	V3176	INJECTOR CAP	1
2	Use Item 51	V3152	O-RING 135	1
3	A2142016	V3177-01	INJECTOR SCREEN CAGE	1
4	A2079059	V3010-1Z	WS1 INJECTOR ASY Z PLUG	1
5	A2079060	V3010-1A	WS1 INJECTOR ASY A BLACK	1
	A2079048	V3010-1B	WS1 INJECTOR ASY B BROWN	
	A2079046	V3010-1C	WS1 INJECTOR ASY C VIOLET	
	A2079045	V3010-1D	WS1 INJECTOR ASY D RED	
	A2079049	V3010-1E	WS1 INJECTOR ASY E WHITE	
	A2079047	V3010-1F	WS1 INJECTOR ASY F BLUE	
	A2079050	V3010-1G	WS1 INJECTOR ASY G YELLOW	
	A2079055	V3010-1H	WS1 INJECTOR ASY H GREEN	
	A2079062	V3010-1I	WS1 INJECTOR ASY I ORANGE	
	A2079063	V3010-1J	WS1 INJECTOR ASY J LIGHT BLUE	
	A2079064	V3010-1K	WS1 INJECTOR ASY K LIGHT GREEN	
Not Shown	A2077225	V3170	O-RING 011	*
Not Shown	A2077226	V3171	O-RING 013	*

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

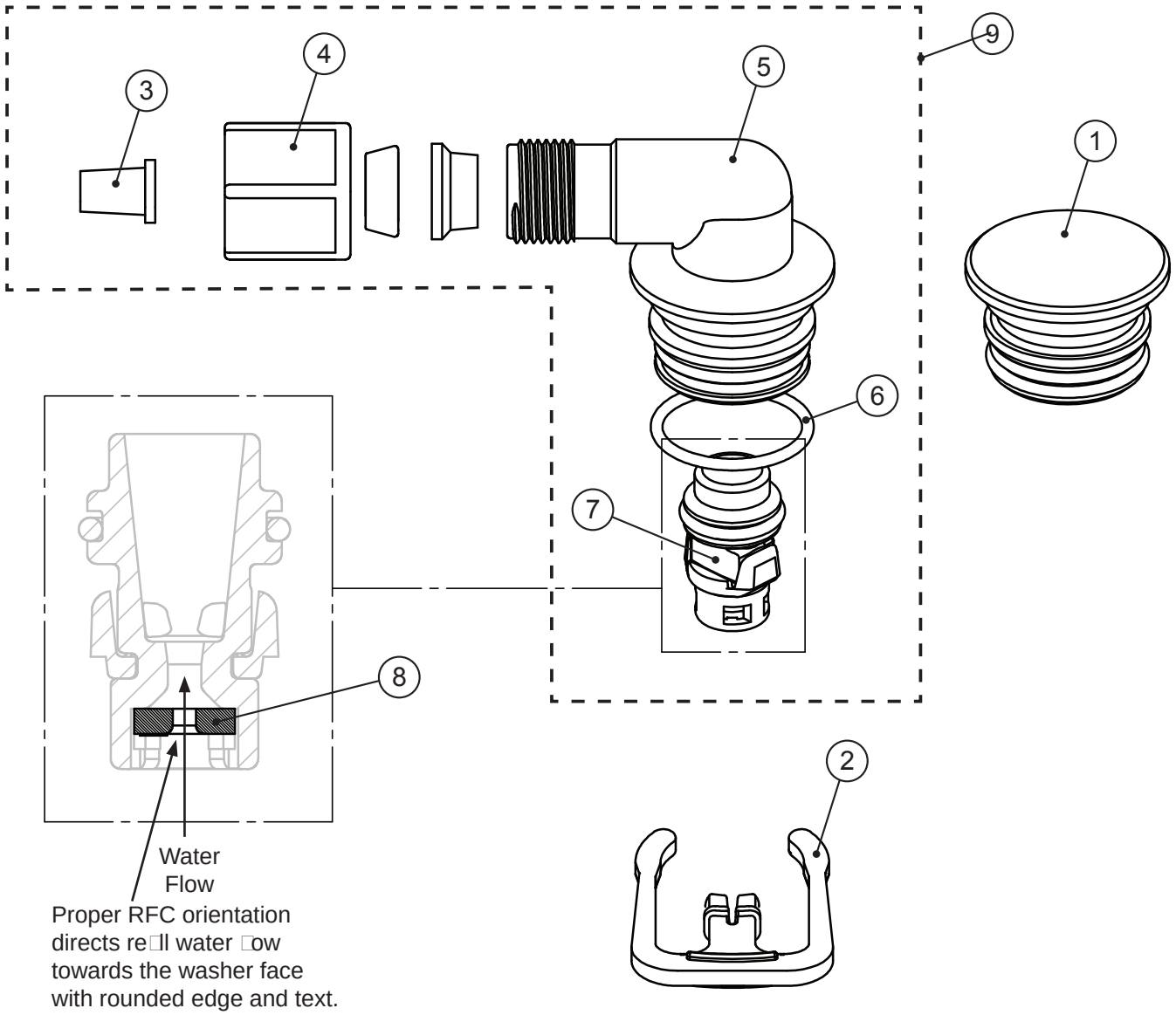
Note: For up□ow position, injector is located in the up hole and injector plug is in the other hole. Up□ow option is not applicable to EA, EE or EI control valves.
For a □lter that only backwashes, injector plugs are located in both holes.



Refi ll Flow Control Assembly and Refi ll Port Plug

Drawing No.	Marlo Part #	Order No.	Description	Quantity
1	A2287059	V3195-01	WS1 Refill Port Plug Asy	This part is required for backwash only systems
2	A2411015	H4615	Elbow Locking Clip	1
3	A2409016	JCP-P-6	Polytube insert 3/8”	1
4	A2095071	JCPG-6PBLK	Nut 3/8”	1
5	A2080078	H4613	Elbow Cap 3/8”	1
6	Use Item 51	V3163	O-ring 019	1
7	A2104033	V3165-01*	WS1 RFC Retainer Asy (0.5 gpm)	1
8	A2253108	V3182	WS1 RFC	1
9	A2078049	V3330-01	WS1 Brine Elbow Asy w/RFC 3/8"	1
Not Shown	NA	V3552	WS1 Brine Elbow Asy w/RFC 1/2"	Option
Not Shown	A2129100	H4650	Elbow ½” with nut and insert	Option

*Assembly includes V3182 WS1 (0.5 gpm) RFC.

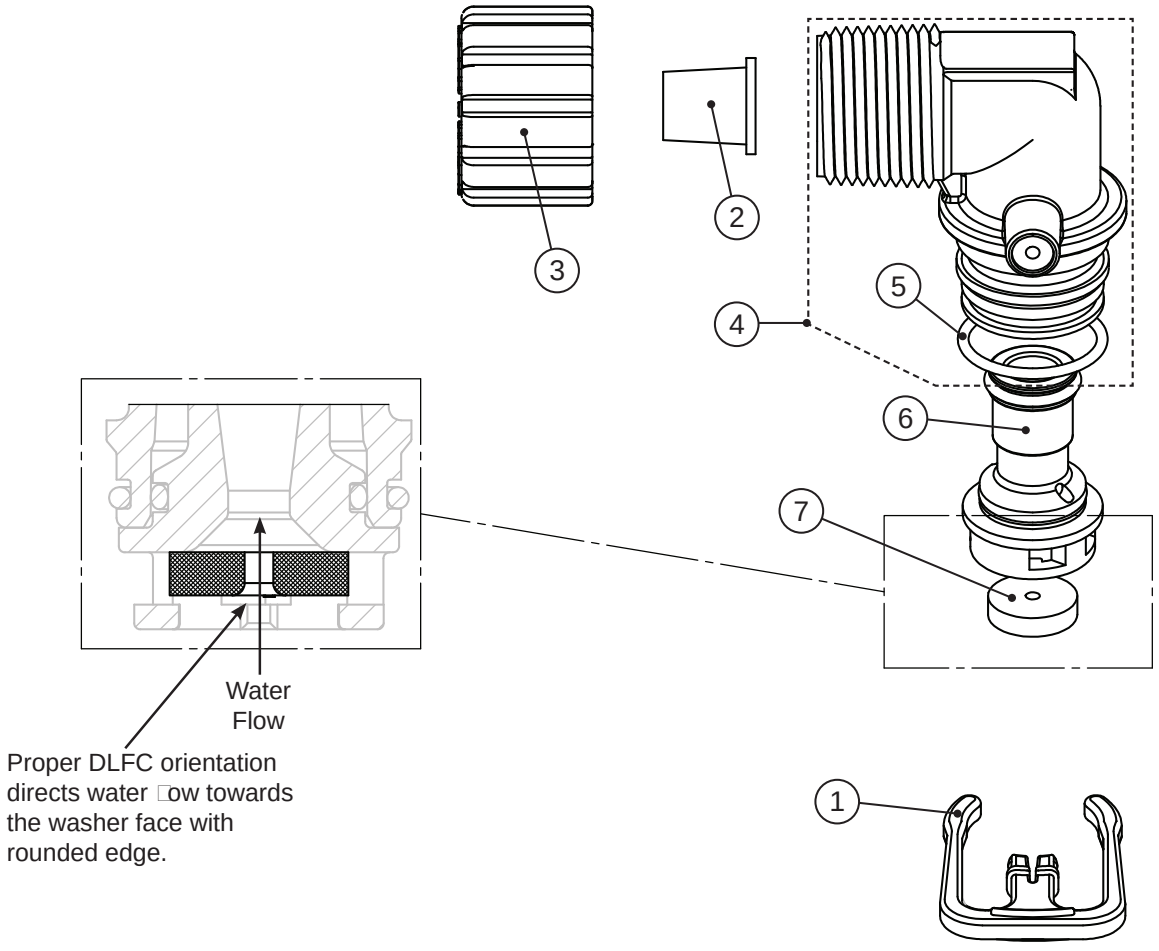


Drain Line – 3/4”

Drawing No.	Marlo Part #	Order No.	Description	Quantity
1	A2411015	H4615	Elbow Locking Clip	1
2	A2409013	PKP10TS8-BULK	Polytube insert 5/8	Option
3	A2095065	V3192	WS1 Nut ¾ Drain Elbow	Option
4*	A2099056	V3158-01	WS1 Drain Elbow ¾ Male	1
5	Use Item 51	V3163	O-ring 019	1
6*	A2104034	V3159-01	WS1 DLFC Retainer ASY	1
7	A2253114	V3162-007	WS1 DLFC 0.7 gpm for ¾	One DLFC must be used if ¾ fitting is used
	A2253099	V3162-010	WS1 DLFC 1.0 gpm for ¾	
	A2253084	V3162-013	WS1 DLFC 1.3 gpm for ¾	
	A2253083	V3162-017	WS1 DLFC 1.7 gpm for ¾	
	A2253081	V3162-022	WS1 DLFC 2.2 gpm for ¾	
	A2253082	V3162-027	WS1 DLFC 2.7 gpm for ¾	
	A2253085	V3162-032	WS1 DLFC 3.2 gpm for ¾	
	A2253086	V3162-042	WS1 DLFC 4.2 gpm for ¾	
	A2253087	V3162-053	WS1 DLFC 5.3 gpm for ¾	
	A2253111	V3162-065	WS1 DLFC 6.5 gpm for ¾	
	A2253112	V3162-075	WS1 DLFC 7.5 gpm for ¾	
	A2253105	V3162-090	WS1 DLFC 9.0 gpm for ¾	
	A2253133	V3162-100	WS1 DLFC 10.0 gpm for ¾	

*4 and 6 can be ordered as a complete assembly - V3331 WS1 Drain Elbow and Retainer Asy

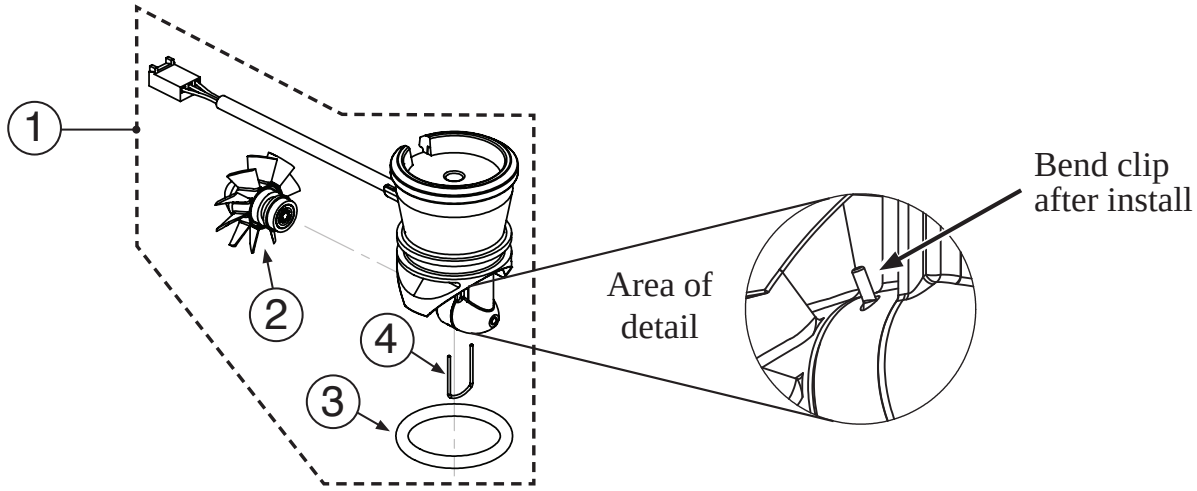
Valves are shipped without drain line flow control (DLFC) - install DLFC before using. Valves are shipped without ¾ nut for drain elbow (polytube installation only) and 5/8" polytube insert (polytube installation only).



Meter Assembly

Service or replace the turbine by:
1. Turn the bypass for the system on and relieve the pressure on the system before removing the meter.
2. Remove the nut and take the meter assembly out of the housing.
3. Remove the bend from the two exposed tips of the retaining clip V3501 and remove clip.
4. Service or replace the V3118-03 WS15/2 Turbine Assembly and place it back on the turbine shaft.
5. Insert the V3501 WS15/2 Turbine Clip and re-bend the exposed ends of the clip. The V3118-03 turbine has a groove to line up with the V3501 WS15/2 Turbine Clip.
6. Insert meter assembly back into the meter housing.
7. Re-install the nut.
8. Open the bypass for the system slowly to bring back into service and check to be sure you have no water leaks.

The V3118-03 has a groove to line up with the V3501 WS1.5/2 Turbine Clip.



Drawing No.	Marlo Part #	Order No.	Description	Quantity
1	A2360075	V3003-02	COMMERCIAL METER ASSEMBLY, 28” CABLE	1
2	A2100029	V3118-03	COMMERCIAL METER TURBINE ASSEMBLY	1
3	B1213022	V3105	O-RING, -215	1
4	NA	V3501	TURBINE CLIP	1
Not Shown	A2095069	V3151	WS1 NUT 1” Q C	1

THIS WATER METER SHOULD NOT BE USED AS THE PRIMARY MONITORING DEVICE FOR CRITICAL OR HEALTH EFFECT APPLICATIONS

BYPASS VALVE PARTS LISTING AND DIAGRAM

Item No.	Part No.	Description	Quantity
41	A2095069	Nut 1” Quick Connect	2
42	A2453012	Split Ring	2
●43	use item 52	O-Ring 215 (Kit available - see Item #10)	2
44	A2607004	Bypass 1” Rotor	2
45	A2080090	Bypass Cap	2
46	A2395009	Bypass Handle	2
47	A2104036	Bypass Rotor Seal Retainer	2
●48	use item 52	O-Ring 135 (use Bypass Valve Kit)	2
●49	use item 52	O-Ring 112 (use Bypass Valve Kit)	2
●50	use item 52	O-Ring 214 (use Bypass Valve Kit)	2

●Part of Kit, O-ring By-Pass(Item 52)

♦Valve O-ring Kit

51	B1213022	KIT O-ring (contains 1 each of 3, 6, 15, 17, 26, & 33)	1 per valve

●Bypass Valve O-ring Kit

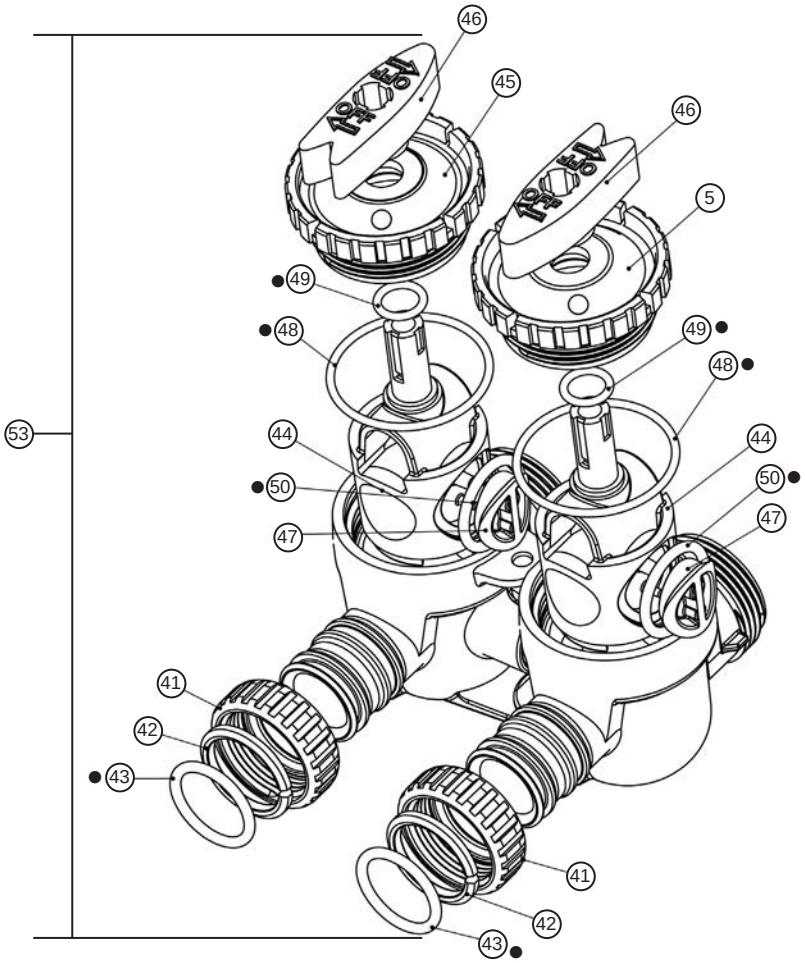
52	B1213021	KIT O-ring Bypass (Incl. 2 ea. of items 43,48,49,& 50)	1 per valve

(Not Shown) Order No. A2412076, Description Bypass Vertical Adapter Assembly

Complete Assembly

53	A2354023	Bypass Valve Complete / Less Connectors	1 per valve

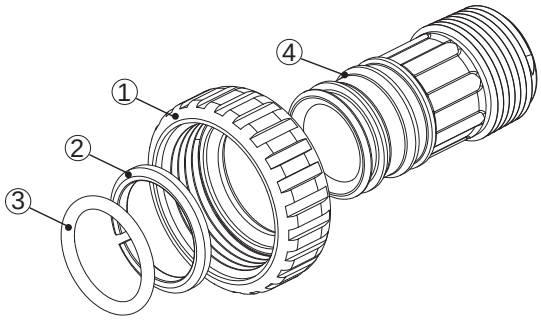
Bypass is optional on 1” units.



FITTINGS PARTS LISTINGS AND DIAGRAMS

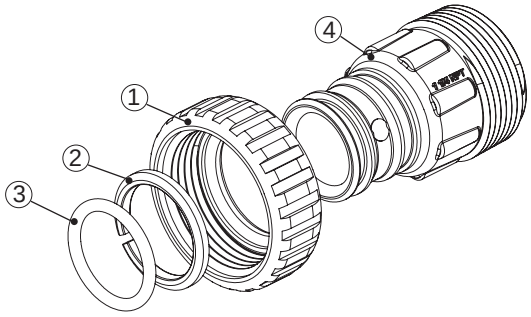
Order No: **A2435081 (std on 1” units)**
Description: **Fitting 1” Plastic Male NPT Assembly**

Drawing No.	Order No.	Description	Quantity
1	A2095069	Nut 1” Quick Connect	2
2	A2453012	Split Ring	2
3	A2077178	O-Ring 215	2
4		Fitting 1” Plastic Male NPT	2



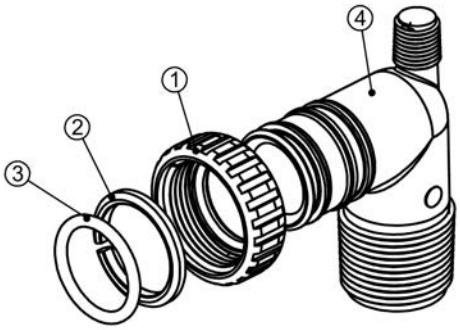
Order No: **A2435080 (std on 1-1/4” units)**
Description: **Fitting 1-¼” Plastic Male NPT Assembly**

Drawing No.	Order No.	Description	Quantity
1	A2095069	Nut 1” Quick Connect	2
2	A2453012	Split Ring	2
3	A2077178	O-Ring 215	2
4		Fitting 1-¼” Plastic Male NPT	2



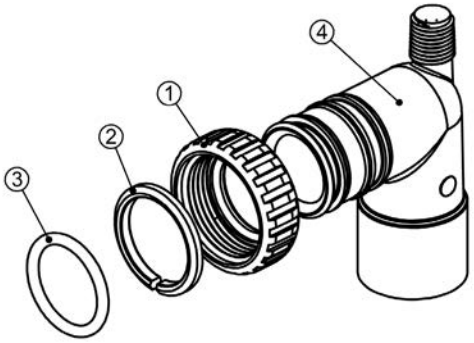
Order No: **A2129080** (Optional)
Description: **Fitting 1” PVC Male NPT Elbow Assembly**

Drawing No.	Order No.	Description	Quantity
1	A2095069	Nut 1” Quick Connect	2
2	A2453012	Split Ring	2
3	A2077178	O-Ring 215	2
4	A2129101	Fitting 1”PVCMaleNPT Elbow	2



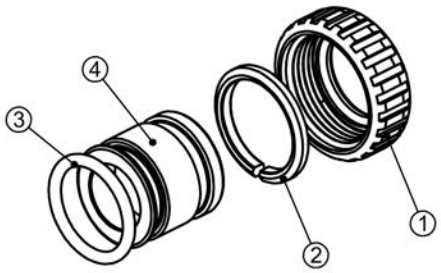
Order No: **A2099054** (Optional)
Description: **Fitting 3/4” & 1” PVC Solvent 90⁰ Asy**

Drawing No.	Order No.	Description	Quantity
1	A2095069	Nut 1” Quick Connect	2
2	A2453012	Split Ring	2
3	A2077178	O-Ring 215	2
4	A2569008	Fitting 3/4&1 PVC Solvent 90	2



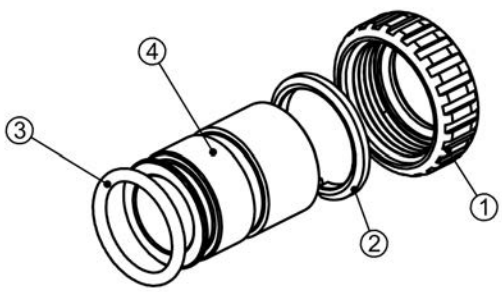
Order No: **A2435068** (Optional)
Description: **Fitting 1” Brass Sweat Assembly**

Drawing No.	Order No.	Description	Quantity
1	A2095069	Nut 1” Quick Connect	2
2	A2453012	Split Ring	2
3	A2077178	O-Ring 215	2
4	A2569006	Fitting 1” Brass Sweat	2



Order No: **A2435072** (Optional)
Description: **Fitting 3/4” Brass Sweat Assembly**

Drawing No.	Order No.	Description	Quantity
1	A2095069	Nut 1” Quick Connect	2
2	A2453012	Split Ring	2
3	A2077178	O-Ring 215	2
4	A2569007	Fitting 3/4” Brass Sweat	2



Troubleshooting

Problem	Possible Cause	Solution
1. No Display on PC Board	a. No power at electric outlet	a. Repair outlet or use working outlet
	b. Control valve Power Adapter not plugged into outlet or power cord end not connected to PC board connection	b. Plug Power Adapter into outlet or connect power cord end to PC Board connection
	c. Improper power supply	c. Verify proper voltage is being delivered to PC Board
	d. Defective Power Adapter	d. Replace Power Adapter
	e. Defective PC Board	e. Replace PC Board
2. PC Board does not display correct time of day	a. Power Adapter plugged into electric outlet controlled by light switch	a. Use uninterrupted outlet
	b. Tripped breaker switch and/or tripped GFI	b. Reset breaker switch and/ or GFI switch
	c. Power outage	c. Reset time of day. If PC Board has battery back up present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
	d. Defective PC Board	d. Replace PC Board
	a. Meter is not connected to meter connection on PC Board	a. Connect meter to three pin connection labeled METER on PC Board
	b. Restricted/ stalled meter turbine	c. Remove meter and check for rotation or foreign material
	c. Meter wire not installed securely into three pin connector	c. Verify meter cable wires are installed securely into three pin connector labeled METER
	d. Defective meter	d. Replace meter
	e. Defective PC Board	e. Replace PC Board
4. Control valve regenerates at wrong time of day	a. Power outage	a. Reset time of day. If PC Board has battery back up present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
	b. Time of day not set correctly	b. Reset to correct time of day
	c. Time of regeneration set incorrectly	c. Reset regeneration time
	d. Control valve set at “on 0” (immediate regeneration)	d. Check programming setting and reset to NORMAL (for a delayed regen time)
	e. Control valve set at “NORMAL + on 0” (delayed and/ or immediate)	e. Check programming setting and reset to NORMAL (for a delayed regen time)
5. Time of day flashes on and off	a. Power outage	a. Reset time of day. If PC Board has battery back up present the battery may be depleted. See Front Cover and Drive Assembly drawing for instructions.
6. Control valve does not regenerate automatically when the REGEN button is depressed and held.	a. Broken drive gear or drive cap assembly	a. Replace drive gear or drive cap assembly
	b. Broken Piston Rod	b. Replace piston rod
	c. Defective PC Board	c. Defective PC Board
7. Control valve does not regenerate automatically but **does** when the REGEN button is depressed and held.	a. Meter is not connected to meter connection on PC Board	a. Connect meter to three pin connection labeled METER on PC Board
	b. Restricted/ stalled meter turbine	b. Remove meter and check for rotation or foreign material
	c. Incorrect programming	c. Check for programming error
	d. Meter wire not installed securely into three pin connector	d. Verify meter cable wires are installed securely into three pin connector labeled METER
	e. Defective meter	e. Replace meter
	f. Defective PC Board	f. Replace PC Board

Problem	Possible Cause	Solution
8. Hard or untreated water is being delivered	a. Media is exhausted due to high water usage	a. Check program settings or diagnostics for abnormal water usage
	b. Meter not registering	b. Remove meter and check for rotation or foreign material
	c. Water quality fluctuation	c. Test water and adjust program values accordingly
	d. No regenerant or low level of regenerant in regenerant tank	d. Add proper regenerant to tank
	e. Control fails to draw in regenerant	e. Refer to Trouble Shooting Guide number 12
	f. Insufficient regenerant level in regenerant tank	f. Check refill setting in programming. Check refill flow control for restrictions or debris and clean or replace
	g. Damaged seal/stack assembly	g. Replace seal/stack assembly
	h. Control valve body type and piston type mix matched	h. Verify proper control valve body type and piston type match
	i. Fouled media bed	i. Replace media bed
9. Control valve uses too much regenerant	a. Improper refill setting	a. Check refill setting
	b. Improper program settings	b. Check program setting to make sure they are specific to the water quality and application needs
	c. Control valve regenerates frequently	c. Check for leaking fixtures that may be exhausting capacity or system is undersized
10. Residual regenerant being delivered to service	a. Low water pressure	a. Check incoming water pressure – water pressure must remain at minimum of 25 psi
	b. Incorrect injector size	b. Replace injector with correct size for the application
	c. Restricted drain line	c. Check drain line for restrictions or debris and clean
11. Excessive water in regenerant tank	a. Improper program settings	a. Check refill setting
	b. Plugged injector	b. Remove injector and clean or replace
	c. Drive cap assembly not tightened in properly	c. Re-tighten the drive cap assembly
	d. Damaged seal/ stack assembly	d. Replace seal/ stack
	e. Restricted or kinked drain line	e. Check drain line for restrictions or debris and or straighten drain line
	f. Plugged backwash flow controller	f. Remove backwash flow controller and clean or replace
	g. Missing refill flow controller	g. Replace refill flow controller
12. Control valve fails to draw in regenerant	a. Injector is plugged	a. Remove injector and clean or replace
	b. Faulty regenerant piston	b. Replace regenerant piston
	c. Regenerant line connection leak	c. Inspect regenerant line for air leak
	d. Drain line restriction or debris cause excess back pressure	d. Inspect drain line and clean to correct restriction
	e. Drain line too long or too high	e. Shorten length and or height
	f. Low water pressure	f. Check incoming water pressure – water pressure must remain at minimum of 25 psi
13. Water running to drain	a. Power outage during regeneration	a. Upon power being restored control will finish the remaining regeneration time. Reset time of day.
	b. Damaged seal/ stack assembly	b. Replace seal/ stack assembly
	c. Piston assembly failure	c. Replace piston assembly
	d. Drive cap assembly not tightened in properly	d. Re-tighten the drive cap assembly

Problem	Possible Cause	Solution
14. E1, Err – 1001, Err – 101 = Control unable to sense motor movement	a. Motor not inserted full to engage pinion, motor wires broken or disconnected	a. Disconnect power, make sure motor is fully engaged, check for broken wires, make sure two pin connector on motor is connected to the two pin connection on the PC Board labeled MOTOR. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. PC Board not properly snapped into drive bracket	b. Properly snap PC Board into drive bracket and then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. Missing reduction gears	c. Replace missing gears
15. E2, Err – 1002, Err – 102 = Control valve motor ran too short and was unable to find the next cycle position and stalled	a. Foreign material is lodged in control valve	a. Open up control valve and pull out piston assembly and seal/ stack assembly for inspection. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. Mechanical binding	b. Check piston and seal/ stack assembly, check reduction gears, check drive bracket and main drive gear interface. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. Main drive gear too tight	c. Loosen main drive gear. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	d. Improper voltage being delivered to PC Board	d. Verify that proper voltage is being supplied. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
16. E3, Err – 1003, Err – 103 = Control valve motor ran too long and was unable to find the next cycle position	a. Motor failure during a regeneration	a. Check motor connections then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out motor	b. Replace piston and stack assemblies. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface	c. Snap drive bracket in properly then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
17. Err – 1004, Err – 104 = Control valve motor ran too long and timed out trying to reach home position	a. Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface	a. Snap drive bracket in properly then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.

Problem	Possible Cause	Solution
18. Err -1006, Err – 106, Err - 116 = MAV/ SEPS/ NHBP/ AUX MAV valve motor ran too long and unable to find the proper park position Motorized Alternating Valve = MAV Separate Source = SEPS No Hard Water Bypass = NHBP Auxiliary MAV = AUX MAV	a. Control valve programmed for ALT A or b, nHbP, SEPS, or AUX MAV with out having a MAV or NHBP valve attached to operate that function	a. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect. Then re-program valve to proper setting
	b. MAV/ NHBP motor wire not connected to PC Board	b. Connect MAV/ NHBP motor to PC Board two pin connection labeled DRIVE. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. MAV/ NHBP motor not fully engaged with reduction gears	c. Properly insert motor into casing, do not force into casing Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	d. Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out motor	d. Replace piston and stack assemblies. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
19. Err – 1007, Err – 107, Err - 117 = MAV/ SEPS/ NHBP/ AUX MAV valve motor ran too short (stalled) while looking for proper park position Motorized Alternating Valve = MAV Separate Source = SEPS No Hard Water Bypass = NHBP Auxiliary MAV = AUX MAV	a. Foreign material is lodged in MAV/ NHBP valve	a. Open up MAV/ NHBP valve and check piston and seal/ stack assembly for foreign material. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. Mechanical binding	b. Check piston and seal/ stack assembly, check reduction gears, drive gear interface, and check MAV/ NHBP black drive pinion on motor for being jammed into motor body. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.