



**INSTALLATION, OPERATION, AND
MAINTENANCE MANUAL**

**MR 150-1050M
PLC CONTROLLER
COMMERCIAL
WATER CONDITIONERS**

FILL IN FOR FUTURE REFERENCE

MODEL NO:
SERIAL NO:
DATE INSTALLED:
DEALER:

Marlo Incorporated
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P.O. Box 044170
Racine, WI 53404-7003
Ph. (262) 681-1300
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IMPORTANT PLEASE READ:

- Warranty of this product extends to manufacturing defects.
- The information, specifications and illustrations in this manual are based on the latest information available at the time of printing. The manufacturer reserves the right to make changes at any time without notice.
- This product should be installed by a plumbing professional on potable water systems only.
- This product must be installed in compliance with all local and state and municipal plumbing and electrical codes. Permits may be required at the time of installation.
- If operating pressure exceeds 100 psi a pressure reducing valve must be installed. If operating pressure drops below 30 psi a booster pump must be installed.
- Do not install the unit where temperatures may drop below 32°F or rise above 100°F.
- A prefilter should be used on installations in which free solids are present.
- A constant voltage of 120V/60Hz (unless otherwise specified) must be supplied to the controller to maintain proper function.
- Union or flange fittings are recommended at the control valve's inlet, outlet, and drain connections
- If distance of drain line is over a 10 ft. vertical or 25 ft. horizontal run, increase drain line one pipe size over that provided on the control valve.
- Do not make a direct connection to the drain. Provide an air gap of at least four times the diameter of the pipe to conform to sanitation codes and to permit observation of the flow.

Please Circle and/or Fill in the Appropriate Data for Future Reference:

Softener Model: MR _____

System Size: Single/Twin/Triple/Quad

Meter Size: _____

Configuration: Timeclock/Twin Alt/Parallel/Progressive

Unit Capacity: _____ Grains

Feed Water Hardness: _____ Grains

Treated Water: _____ Gallons/Liters

BW/Regen Time _____ AM/PM or OFF

Additional Notes: _____

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PRODUCT WARRANTY

Manufacturer's warrants all water treatment products manufactured and / or distributed by it to be free from defects in materials and workmanship for a period of one (1) year from the date of shipment. If within that period any products shall be proven to manufacturer's satisfaction to be defective, those products will be replaced, or the price refunded at manufacturer's option.

Manufacturer'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 manufacturer'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.

Manufacturer 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 the manufacturer or any undertakings, acts, or omissions relating thereto.
3. All consequential, incidental, and contingent damages.

Labor charges, change backs or handling charges are excluded from manufacturer's warranty provisions.

WATER SOFTENER GUARANTEE

Under normal operating conditions:

1. The softener effluent shall be zero soft as determined by a soap test.
2. The loss of softening resin through attrition during the first three (3) years shall not exceed 3% per year.
3. The softening resin shall not be washed out of the system during backwash.
4. The color and turbidity of the softener effluent shall not be greater than the incoming water.

Any mechanical equipment proving defective in workmanship or material within one year after installation or (18) months after shipment, whichever comes first, shall be replaced FOB factory.

SPECIFICATION NOTES

Maximum salting is 15 pounds of salt per cubic foot of resin. This setting gives the longest time between regenerations. It has an efficiency of 2,000 grains of hardness removed per pound of salt. The Brine tank and Regeneration timer are setup for maximum salting at the factory.

Minimum salting is 6 pounds of salt per cubic foot of resin. It has an efficiency of 3,300 grains of hardness removed per pound of salt.

Freeboard is the distance between the surface of the resin and the top side shell of the tank.

On continuous flow rates pressure loss does not exceed 15 psig.

On peak flow rates pressure loss does not exceed 25 psig.

Minimum operating pressure is 30 psi.

Maximum operating pressure is 100 psi.

Standard units are designed to soften unheated water in the range is 35-100°F.

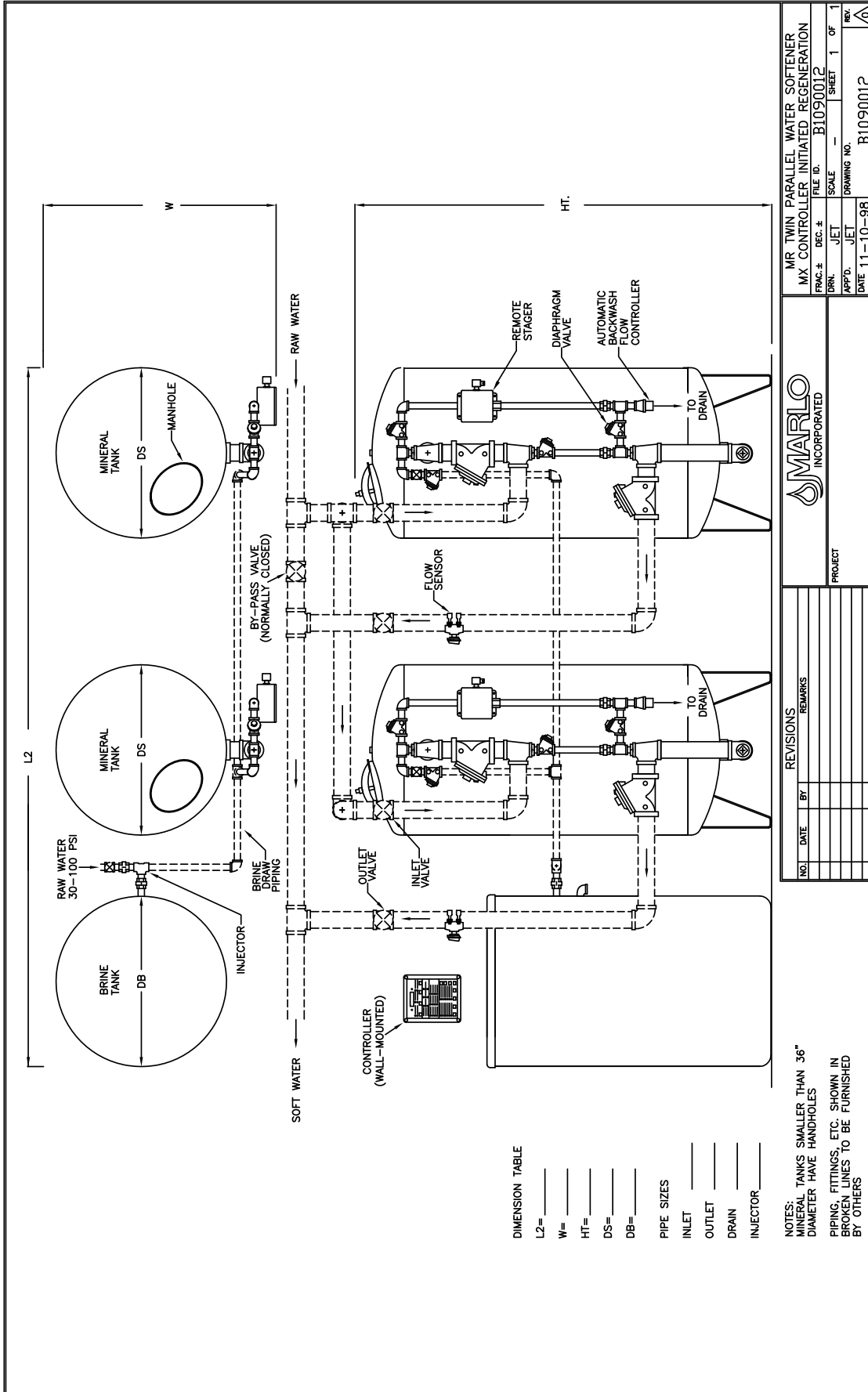
Power requirements are 120 Volt, 60 Hertz, Single Phase, 2 amps

Salt specifications are pelletized or solar salt, 99% pure, containing less than 1% insolubles.

The Pinwheel Setting time intervals are adjustable.

SPECIFICATION TABLE

MODEL		MR	150				210				300				450				600				750			900			1050			
Valve Size		inches	1	1 1/4	1 1/2	2	1 1/4	1 1/2	2	2 1/2	1 1/2	2	2 1/2	3	1 1/2	2	2 1/2	3	1 1/2	2	2 1/2	3	2	2 1/2	3	2	2 1/2	3	2	2 1/2	3	
Capacity (Kgrains)		Max	150				210				300				450				600				750			900			1050			
		Min	100				140				200				300				400				500			600			700			
FLOW RATE (GPM)	Service	Cont's.	32	42	45	57	41	64	80	115	68	92	140	165	63	82	120	140	72	110	140	175	90	140	160	105	150	188	95	135	173	
		Peak	55	78	69	97	57	86	110	160	92	125	190	230	90	115	170	190	94	125	190	250	116	190	230	133	218	279	124	210	259	
	Backwash & Flush	10				15				20				20				30				30			45			45				
	Brine Draw & Rinse	2.5				3.5				5				5				7				7			10			10				
	TIMER PINWHEEL SETTINGS	Backwash	Pins	5				5				5				5				5				5			5					
Minutes			10				10				10				10				10				10			10						
Brine Draw & Rinse		Pins	30				30				30				30				30				30			30						
		Minutes	60				60				60				60				60				60			60						
Fast Flush		Pins	3				3				3				3				3				3			3						
		Minutes	6				6				6				6				6				6			6						
Return to Service		Pins	2				2				2				2				2				2			2						
		Minutes	4				4				4				4				4				4			4						
SOFTENER TANK		Size	Dia x Ht Inches	20x54				24x54				30x54				30x60				36x60				36x72			42x72			42x72		
		Gravel Subfill	Pounds	100				200				300				300				400				400			600			600		
		Resin	Cubic Feet	5				7				10				15				20				25			30			35		
		Freeboard	Inches	23 1/2				24				26 1/2				20				23				26 1/2			19 1/2			25		
BRINE SYSTEM	Tank Size	Dia x Ht Inches	24X50				24x50				24x60				30x60				39x60				39x60			42x60			50x60			
	Injector	Code	2.0-050				3.5-075				5.0-075				5.0-075				7.0-100				7.0-100			10.0-100			10.0-100			
		Color	Red				White				Blue				Blue				Red				Red			White			White			
	Max Salt Storage	Pounds	700				600				600				1000				1900				1700			1900			2300			
	Salt Dosage	Max.	75				105				150				225				300				375			450			525			
		Min.	30				42				60				90				120				150			180			210			
	Regens per Salt Refill	Max.	9				5				4				4				6				4			4			4			
		Min.	23				14				10				11				15				11			10			10			
	Brine Valve Float Height	Max.	12				19				26				26				19				26			26			19			
		Min.	3				8				9				9				8				9			9			8			



DIMENSION TABLE

- L2= _____
- W= _____
- HT= _____
- DS= _____
- DB= _____
- PIPE SIZES**
- INLET _____
- OUTLET _____
- DRAIN _____
- INJECTOR _____

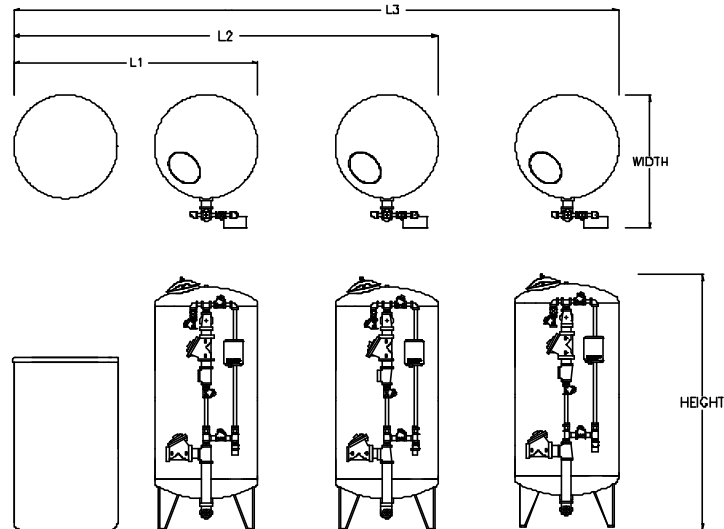
NOTES: TANKS SMALLER THAN 36" DIAMETER HAVE HANDHOLES
PIPING, FITTINGS, ETC. SHOWN IN BROKEN LINES TO BE FURNISHED BY OTHERS

MR TWIN PARALLEL WATER SOFTENER			
MX CONTROLLER INITIATED REGENERATION			
FRAC. #	DEC. #	FILE ID.	B1090012
DRN.	JET	SCALE	SHEET 1 OF 1
APP'D.	JET	DRAWING NO.	B1090012
DATE	11-10-98		

MARLO INCORPORATED	
PROJECT	

NO.		DATE		BY		REVISIONS		REMARKS	

INSTALLATION DIMENSIONS AND SPECIFICATIONS



MODEL	Approx. Height (inches)	Length			Width (Inches)	Brine Pipe Size (inches)	Drain Pipe Size (inches)	Pipe Size (inches)
		L1 Single	L2 Twin	L3 Triple				
MR-150-1	72	50	88	126	29	¾	1	1
MR-150-1¼					30			1¼
MR-150-1½					30			1½
MR-150-2					34			2
MR-210-1¼	73	54	96	138	32	¾	1¼	1¼
MR-210-1½					32			1½
MR-210-2					36			2
MR-210-2½					37			2½
MR-300-1½	76	60	108	156	38	¾	1¼	1½
MR-300-2					42			2
MR-300-2½					43			2½
MR-300-3					44			3
MR-450-1½	82	66	114	162	38	¾	1¼	1½
MR-450-2					42			2
MR-450-2½					43			2½
MR-450-3					44			3
MR-600-1½	89	81	135	189	44	1	1½	1½
MR-600-2					48			2
MR-600-2½					49			2½
MR-600-3					50			3
MR-750-2	101	81	135	189	48	1	1½	2
MR-750-2½					49			2½
MR-750-3					50			3
MR-900-2	94	90	150	218	54	1	2½	2
MR-900-2½					55			2½
MR-900-3					56			3
MR-1050-2	106	98	158	218	54	1	2½	2
MR-1050-2½					55			2½
MR-1500-3					56			2½

*When less than 4 hours is expected between regeneration's of a twin or triple softener, a brine tank for each softener is required.

SOFTENER INSTALLATION INSTRUCTIONS

GENERAL INFORMATION

Before beginning installation, thoroughly review the following instructions to familiarize yourself with the general placement and identification of all components.

These instructions are written for a single unit installation, but they also generally apply to twin and triple units. Refer to specific equipment layout drawing, water meter installation instruction, and interconnecting electrical wiring diagram for your system.

Minimum operating pressure is 30 psi.

If pressure less than 30 psi is encountered, a pump must be installed.

Maximum operating pressure is 100 psi.

If pressure greater than 100 psi is encountered, a pressure regulator must be installed.

Power requirements are shown on electrical wiring diagram.

Standard units are designed to soften unheated water in the range is 35-100°F.

Special valve assemblies are available to handle heated water supplies exceeding 100°F.

Consult factory if applicable.

Catalog softeners are shipped fully assembled with face piping and controllers. Care must be taken not to damage valves or controllers during uncrating and installation.

During unpacking the brine tank miscellaneous parts are shipped inside the brine tank. These parts include hardness test kit, injectors, extra manuals and other parts that may apply to your particular system. Care should be taken when unpacking the brine tank.

SOFTENER LOCATION

1. Select a position near a floor drain that has adequate carrying capacity to handle the water softener backwash rate. See the Specification Table for the backwash rate of your system.
2. Refer to your specific equipment layout drawing located on page 31 for tank locations. The approximate dimensions required for your particular system is shown on page 4. Make sure the softeners are placed on a level concrete surface.

PIPING INSTALLATION

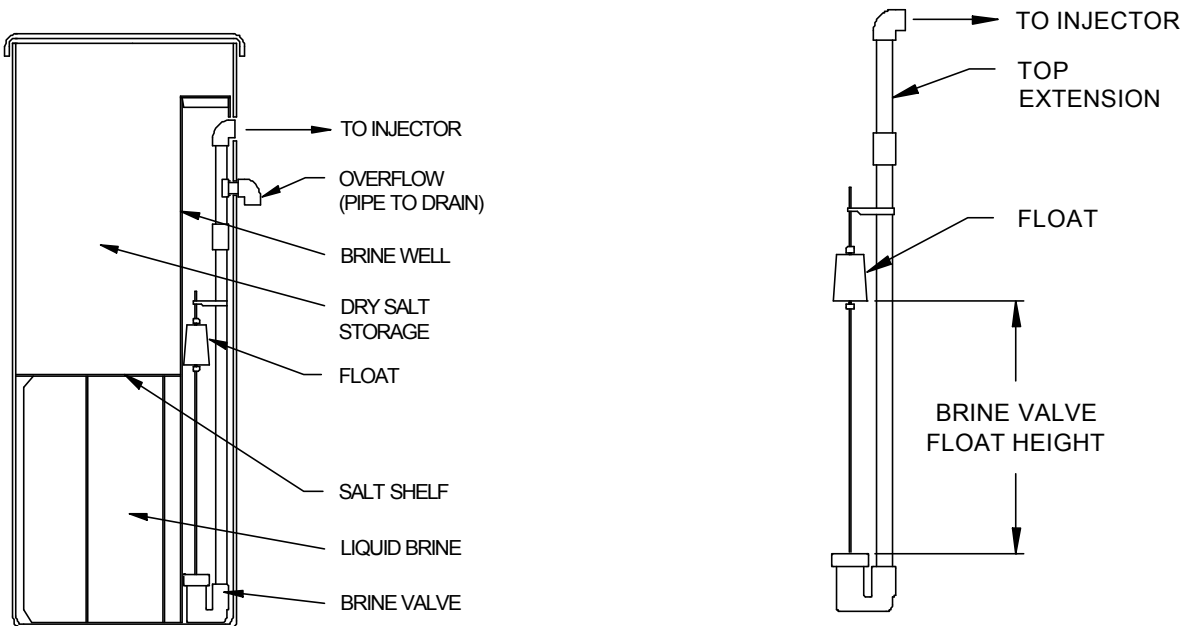
Note:

- Install the piping conforming to federal, provincial, and local codes.
 - Union or flanges are recommended at the control valve's inlet, outlet, and drain connections
 - To enhance the monitoring of the system's performance sample valves and pressure gauges can be installed at the inlet and outlet piping to each control valve.
 - If distance of drain line is over a 10 ft. vertical or 25 ft. horizontal run, increase drain line one pipe size over that provided on the control valve.
 - Do not make a direct connection to the drain. Provide an air gap of at least four times the diameter of the pipe to conform to sanitation codes and to permit observation of the flow.
 - It is not recommended that an overhead or a long horizontal drain run be used. The increase of backpressure will cause problems when drawing brine.
1. Install piping as shown on the layout drawing located on page 31. Include unions and shut-off valves on the inlet and outlet of each softener. Also, include a shut-off valve for each injector provided with the system. It is recommended that a union be installed in each softener drain-line to facilitate cleaning the backwash flow control.

Note: Do **not** reduce drain-line pipe size. Do **not** install a shut off valve in the drain-line. Provide an air gap in the drain line in accordance with local codes (minimum four (4) pipe diameters).

2. If your system has a water meter thoroughly read the meter instructions manual located in the back of this manual before installing any water meters or flow sensors,. Water meters typically must be installed in a particular manner (i.e. horizontal, plane or with recommend pipe lengths) to function properly.
3. After the piping has been completed, make sure to close all isolation valves.

BRINE TANK INSTALLATION



1. The brine tank is placed as shown on the installation drawing, on a smooth level surface. If not, the tank should be placed on a smooth piece of exterior plywood and leveled by placing shims beneath the plywood.
2. Make sure that the salt shelf inside the tank is level and that the brine well is near to vertical as possible. Check the specifications table and make sure that the float setting is the proper height for the model provided. Brine tanks are shipped with the float set for maximum salting. If incorrect, slide the float to the proper setting. Float should be one inch above grid plate.
3. Place brine valve into the brine well and set at the bottom of the brine tank.

Note: If minimum brine draw is desired, remove the pipe nipple and coupling from the brine assembly. Install remaining brine valve assembly into elbow using Teflon tape or Teflon paste, and set float to minimum salt level see Specification Table on page 3 for settings. Place brine valve into brine well. Brine valve assembly will not sit on bottom of brine tank.

4. Connect the brine valve to the brine injector.
5. Open the injector feed water valve and allow the brine tank to fill with water. To speed this process the tank can be filled with hose to about 2" below the platform. The tank will continue to fill until the float rises and shuts of the flow (approximately 1" above the platform).

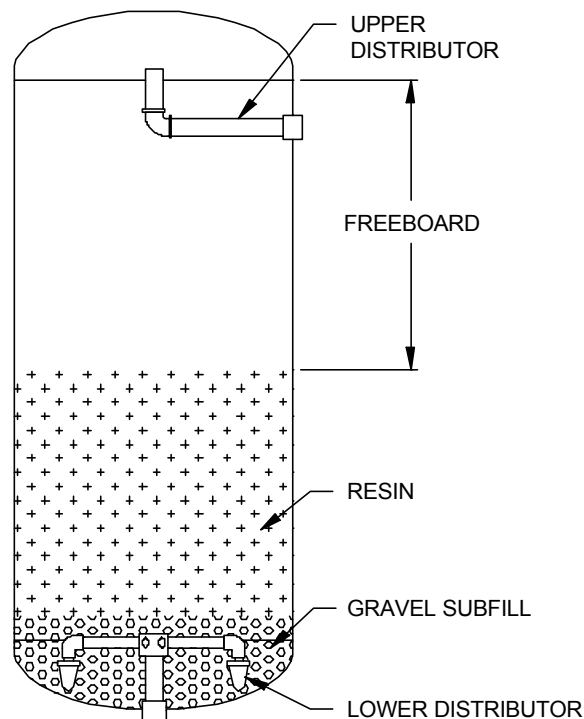
Note: In the process of making brine for the first regeneration, the solution volume will increase (one gallon of water will be 1.2 gallons of brine). The final level of the liquid will be several inches above the platform.

6. If the refill water shuts off below the platform or too far above the platform, the brine valve should be remove and the float adjusted up or down until is shuts off approximately 1" above the platform. Place the brine well cap seal in place and open the manual valve in the brine line to the softener tank.

SOFTENER TANK LOADING

GRAVEL LOADING

1. See the Specification Table on page 3 for the correct amount of gravel and resin. Do **not** begin loading until you have confirmed all of the required media is on site.
2. Before loading, visually check the lower distributor for shipping damage. All radial arms and baskets strainers are in place and pointing downward. Tighten any loose laterals. Do **not** load tank if there is damage is evident. Call the factory if any damage is observed.
3. Slowly open the inlet valve and fill the tank half way or as full as possible with water. There might be a flow of water to drain.
4. The equipment provided has a plastic lower distributor system. Care should be exercised in the loading of the gravel in order to insure that the distributors are not damaged.
5. Slowly and gently pour the gravel marked for the mineral tank into the unit.
6. Drain the tank down until the gravel and water levels are the same.
7. Carefully level the gravel before loading the resin.



RESIN LOADING

1. Reopen the inlet valve and fill the tank to 1/3 to 1/2 full of water.
2. Pour the quantity of resin marked for the tank in through the top opening.
3. Reopen the inlet valve and fill the tank with water to the top access opening. Close and secure the top access opening.
4. Open inlet valve and continue to fill the tank with water until it is fully pressurized.

START-UP INSTRUCTIONS

PLC PROGRESSIVE CONTROLLER

Note: Read the controls description section located in this manual before proceeding.

With all piping and installation complete, and the mineral in the tank, proceed as follow:

1. Open the manual by-pass valve. The manual inlet and outlet valves are to remain closed.
2. Connect the power to the PLC controller. This operator interface display will light up. Advance the operator interface to the **Main Screen**.
3. Open the remote stager enclosure cover on Unit 1 and manually rotate the stager to the #1 (backwash) position. The stager motor will rotate back to the #4 (service) position. This is done to confirm the controller's homing signal is operational.
4. Manually advance the operator interface to the **Presets Screen**. Verify the cycle time and K factor are correct for your unit size. Change if required.
5. Manually advance the operator interface to the **Flow Rate Presets for Progressive Flow**. Verify the flow presets are correct for your unit using the flow chart in this manual. Change if required.
6. Manually advance the operator interface to the **Operator Control 1 Manually Start/Advance Regeneration**.

7. Advance Unit 1 to the backwash step. The unit 1 stager should rotate to the step 1 (backwash) position.
8. Slowly open the manual inlet supply valve. Do not open fully. Full flow of water could cause loss of media. Continue to fill slowly until all air is expelled and only water flows to the drain. Water will enter from the bottom of the resin tank as air is expelled from the top drain. If the system is supplied with an air vent make sure that the valve is open during this process.
9. When only water flows to the drain and out the air vent (if applicable), open the manual inlet valve all of the way. Backwash until the water looks clean when caught in a container.
10. Advance Unit 1 to the brine/slow rinse step. The Unit 1 stager should rotate to the step 2 brine/slow rinse position. There will be a slow flow to the drain.
11. While the Unit 1 is in the Brine/Slow Rinse position, check the level in the brine tank. The level should be dropping at a slow rate (approximately 2" per minute).
12. Advance Unit 1 to the Fast Rinse position. The Unit 1 stager should rotate to the step 3 (Fast rinse) position. There will be a high flow of water to the drain. Allow the water to flow to the drain until clear. During this time, the brine tank will fill with water until the float closes the brine tank valve. Check that all brine fittings are tight and that the water level in the brine tank is according to the unit specifications.
13. Advance Unit 1 to the service position. The unit 1 stager should rotate to the step 4 Service position. There will be no flow of water to the drain.
14. Perform steps 3-13 to the other units.

15. Fill the brine tank with the proper amount and type of salt recommended for use with the system. See RECOMMENDED TYPES OF SALT.

16. Close the manual by-pass valve and open all outlet valves fully. The system is now in service.

TWIN PROGRESSIVE SOFTENER ELECTRICAL CONTROLS OPERATION

General:

The main control panel (MCP) contains the programmable logic controller (PLC) and the operator interface (OIT). The system is controlled by the PLC. Operator intervention and control along with some program setpoint access is through the OIT. The PLC controls the system so that one or more units will be online (in service) based on flow demand. If flow is low then only one unit will be online. If flow increases past the set point for bringing the second unit online then the second unit will come online. As flow decreases, the additional unit(s) that were brought online will be taken offline to standby status. A unit will be automatically regenerated when its gallon batch throughput setpoint has been reached. A unit can also be manually forced into regeneration by using a pushbutton on the OIT.

A regeneration lockout is built into the logic so that only one unit can be in regeneration at a time.

Note: Follow **all** applicable codes and regulations when wiring in this system.

Caution: **Verify all power is disconnected before servicing the equipment.**

INTERCONNECT WIRING

Power: Wire a single phase 120volt 15 amp max. fused circuit to MCP terminals "L", "N", "G". This power supply should be surge protected
Dashed Lines on the wiring diagram indicate field wiring. If your unit is skid mounted then normally the only wiring that is needed is incoming power.

ELECTRICAL CONTROLS OPERATION continued

Operator Interface Screens:

Screen Summary:

Main Screen for Status Indication

Presets 1 Screen (cycle times and batch and k factor)

Flow Delay Presets

Screen Changes

Operator Control 1 Manually Start/Advance Regeneration

Operator Control 2 System Reset and Panelview Configuration

Flow Rate Presets for Progressive Flow

Service Flow Totals

Alarm History

Note: no screens are secured

OPERATOR INTERFACE SCREENS
SCREEN 1-MAIN SCREEN

The main screen displays the following:

Top Line-

Mode-each unit's mode is displayed here. The modes indicate which cycle the unit is in. These can be any one of the following:

- Service (serv)
- Standby (stdby)
- Backwash (bw)
- Brine/Slow rinse (br/sr)
- Fast Rinse (fr)

Flow-each units flow rate is shown here in gallons per minute (gpm)

Batch-each units gallons remaining in the batch is displayed here.

This display counts the gallons down from the preset to zero.

Status- The last vertical column lists the units status. This can be the number 1 or 2
1 indicates that the unit is primary and is currently the main softener. It is the unit that will be online if the flow demand is low. 2 indicates that the unit is secondary. When flow increases above setpoint the secondary unit will be brought online.

Lower right hand corner of the screen- in the lower right hand corner of the screen (above F4 change screen) the regeneration cycle time remaining will be displayed if a unit is in regeneration.

Function Keys- Along the bottom of the screen are two function key indicators. Use these keys to quickly go to the indicated screens.

CONTROLS CONTINUED:

OPERATOR INTERFACE SCREENS

SCREEN 1-MAIN SCREEN cont'd

	MODE	FLOW	BATCH
A	BRN/SLOHSE	000	0000000 1
B	SERVICE	000	0000000 1
REGEN CYCLE TIME		000	: 00
F1 FLOW TOTALS		F4 CHNG SCREEN	

CONTROLS CONTINUED:

OPERATOR INTERFACE SCREENS

SCREEN 2 PRESETS 1 SCREEN

This screen can be used to change the following set points:

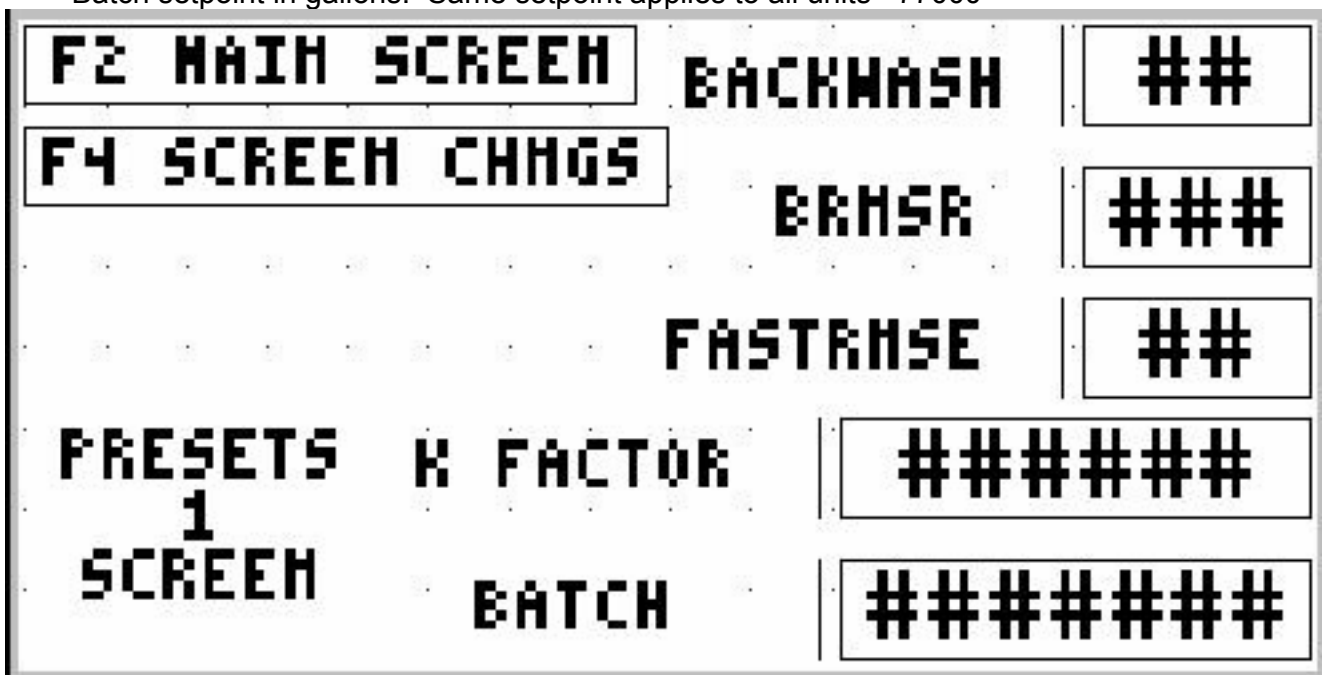
- Backwash cycle time in minutes
- Brine Slow Rinse time in minutes
- Fast rinse time in minutes
- K factor
- Batch setpoint in gallons. Same setpoint applies to all units.

The initial optimal setpoints except batch were entered in at the factory and shouldn't need to be changed. These set points are displayed on this screen. Batch needs to be field set.

If a change is necessary then use the left and right arrow keys to force the cursor to scroll to the desired setpoint. Press the enter key (long arrow key) to allow access to changing that value. Use the left and right arrow keys to move to the desired digits place and use the up/down arrow to adjust the value. There is a minimum and maximum value that can be entered. This value is displayed on the screen when changing the value. When the new value is entered then press the enter key.

Initial set points were as follows:

- Backwash cycle time in minutes=12
- Brine slow rinse time in minutes=60
- Fast rinse time in minutes=6
- K factor=x- depends on flow sensor fitting and pipe size
- Batch setpoint in gallons. Same setpoint applies to all units =77000



CONTROLS CONTINUED:

OPERATOR INTERFACE SCREENS

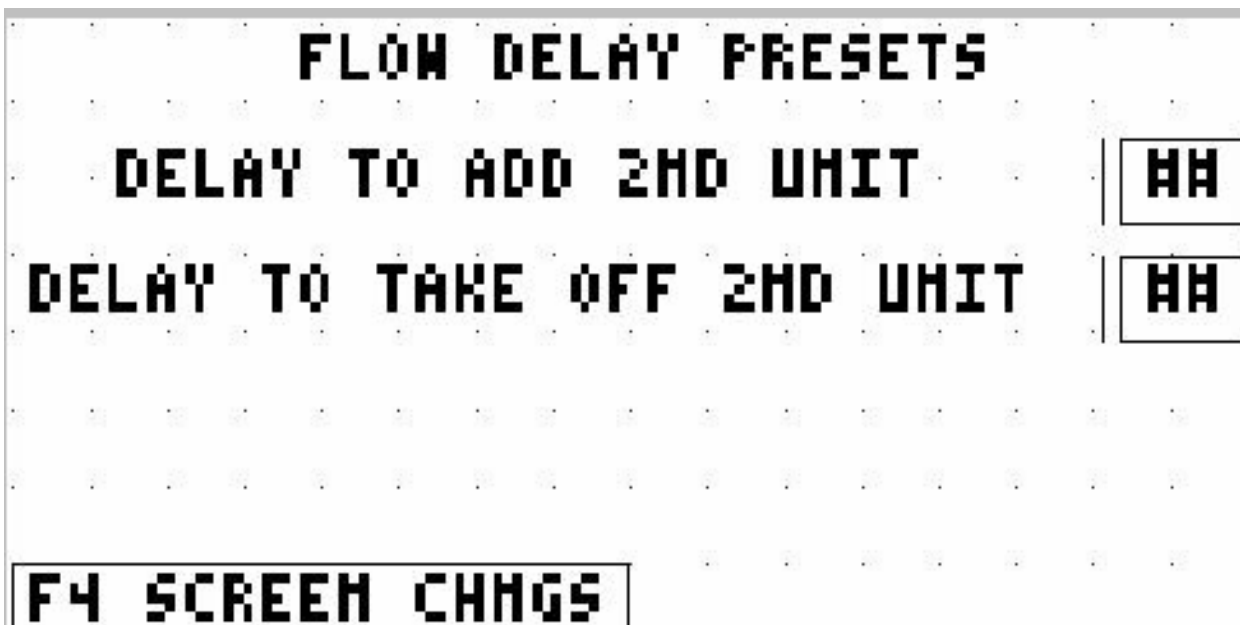
SCREEN 3 FLOW DELAY PRESETS

This screen can be used to change the following set points:

Delay in time (seconds) before the second unit will be added due to flow exceeding the “add second unit setpoint”.

The initial optimal set points were entered in at the factory and shouldn't need to be changed. These set points are displayed on this screen. Initial factory presets were 10 seconds for all delays

If a change is necessary then use the left and right arrow keys to force the cursor to scroll to the desired setpoint. Press the enter key (long arrow key) to allow access to changing that value. Use the left and right arrow keys to move to the desired digits place and use the up/down arrow to adjust the value. There is a minimum and maximum value that can be entered. This value is displayed on the screen when changing the value. When the new value is entered then press the enter key.



CONTROLS CONTINUED:

OPERATOR INTERFACE SCREENS

SCREEN 4 SCREEN CHANGES

This screen can be used to change to a different screen. On some screens there are shortcuts to often used screens using a function key. This screen allows the user to scroll through the list of screens and choose which one they want.

Use the up/down arrow keys to scroll through the list. Press enter when the cursor is on the desired screen.



CONTROLS CONTINUED:

OPERATOR INTERFACE SCREENS

SCREEN 5 OPERATOR CONTROL 1 MANUAL REGENERATION START/ADVANCE

This is the main screen used for manual operator control. It is mainly used to manually start and advance a unit through its regeneration steps. Once a manual regeneration start is begun regeneration cycle timing is automatic and the unit will advance itself automatically through the regeneration steps if the start/advance regeneration function button is not used.

Along the top row are two function pushbuttons. These allow the operator to manually start a regeneration on any of the units.

Once in regeneration this button also allows the operator to manually advance the unit to its next regeneration cycle. Only one unit can be sent into regeneration at a time.

There is a 4 second delay on these buttons to verify operator intent.

Once a button is activated the operator will be locked out from activating the button again for 20 seconds in order to allow the stager time to rotate to its next position. This lockout is indicated by the text "pb/lo" (pushbutton lockout) flashing in the lower left corner of the screen.

If another unit is currently in regeneration, the program will not allow another unit to be manually sent into regeneration via its button. There is no memory of this button being depressed if another unit is already in regeneration.



CONTROLS CONTINUED:

OPERATOR INTERFACE SCREENS

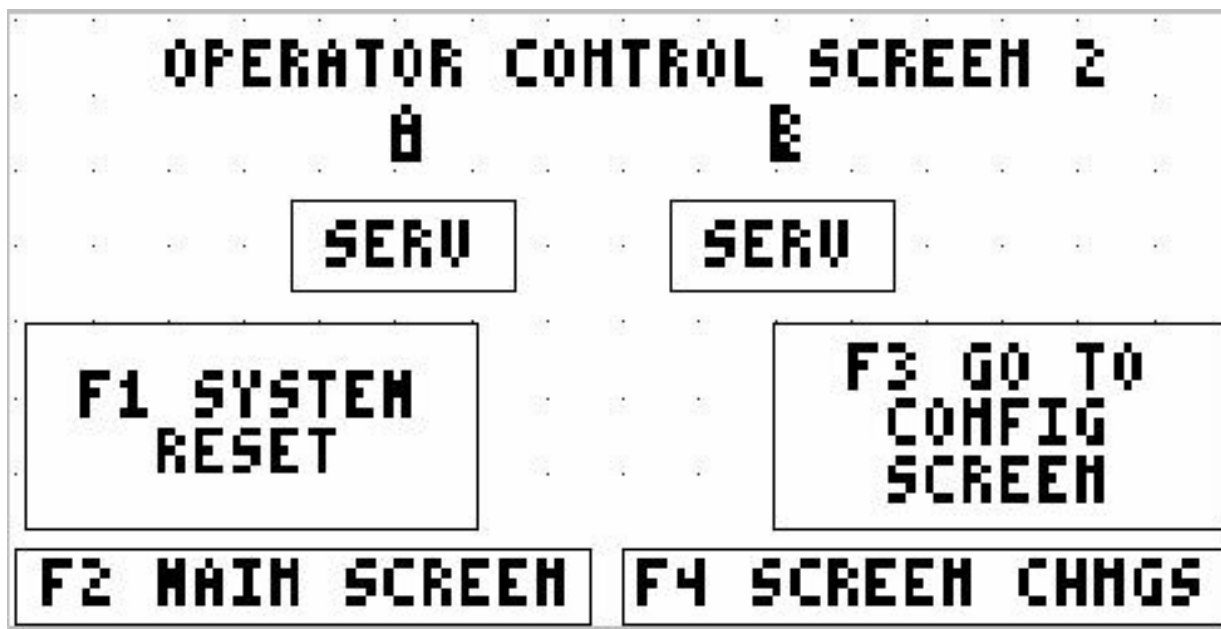
**SCREEN 6 OPERATOR CONTROL SCREEN 2 SYSTEM RESET AND PANELVIEW
CONFIGURATION**

This screen allows the system to be reset or allows access to the configuration of the OIT.

F1 system reset-this button when depressed for a minimum of 5 continuous seconds will reset the system. This will take any unit that is currently in regeneration out of regeneration to service or standby.

Unit A will be set as primary, B as secondary.

F3 go to configuration screen- this allows the operator to go to the OIT configuration menu. This has already been preset and access to this should not be necessary. Only operator 1 is allowed access to this screen.



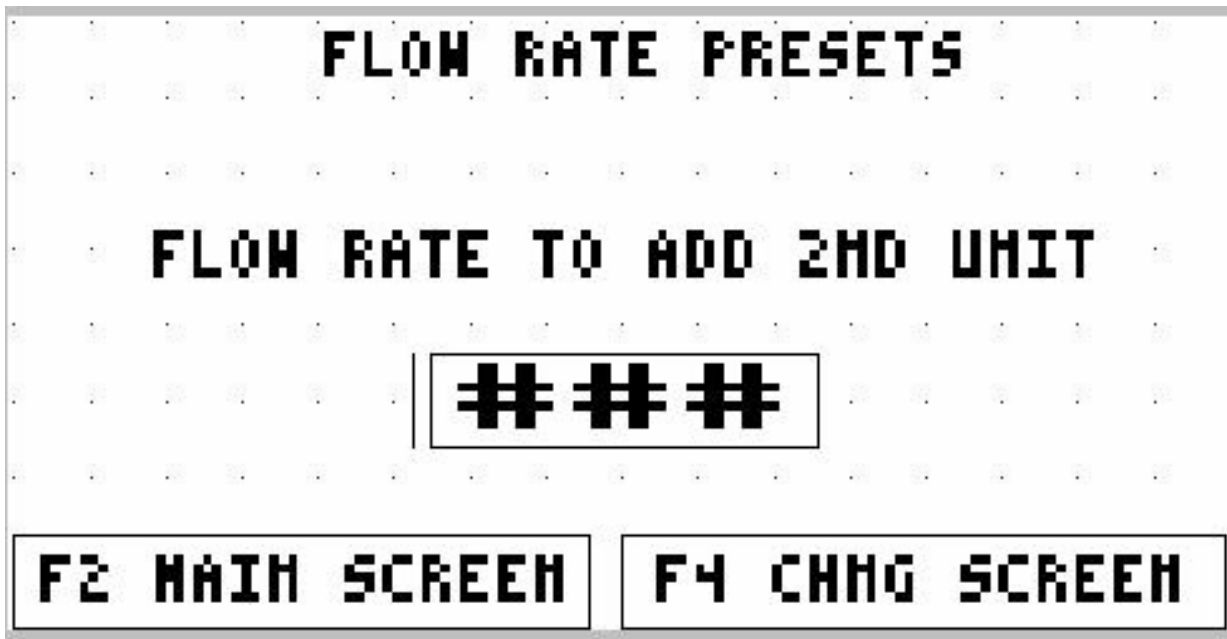
CONTROLS CONTINUED:

OPERATOR INTERFACE SCREENS
SCREEN 7 FLOW RATE PRESETS SCREEN

This screen can be used to change the following set points:

Flow rate to add second unit online-this setpoint is the value in which the second unit will be brought online. There is an adjustable delay before this occurs. This delay is located on flow rate delay setpoint screen. When the flow rate exceeds this flow rate value for the preset delay the second unit will be brought on line. If the total flow rate decreases below setpoint for a delayed amount of time the second unit will be taken offline.

If a change is necessary then use the left and right arrow keys to force the cursor to scroll to the desired setpoint. Press the enter key to allow access to changing that value. Use the left and right arrow keys to move to the desired digits place and use the up/down arrow to adjust the value. There is a minimum and maximum value that can be entered. This value is displayed on the screen when changing the value. When the new value is entered then press the Enter key.



CONTROLS CONTINUED

OPERATOR INTERFACE SCREENS

Screen Saver- after 20 minutes of no activity on the screen, the screen will go blank. This is the screen saver. Press any key on the OIT and the screens will come back on.

STAGER OPERATION

STAGERS-Each stager is located in its own enclosure on the individual units themselves. They operate the diaphragm vales on the unit. The stager has multiple ports on it to pressurize and vent diaphragm valves in order to open and close them. Pressure to a valve opens the valve. A vent to a valve allows the valve to open. The stager has 4 numbers on its indexing wheel inside of the enclosure. Each position represents a different regeneration cycle. 4= service/standby, 1= backwash, 2= brine/slow rinse, 3= fast rinse.

If for some reason power is disrupted the stager can be manually rotated to the different positions in order to manually regenerate the unit.

Stager homing- if for some reason the stager gets out of sync with the PLC, the PLC will drive the stager back to its service #4 position. This can occur if someone manually rotates the stager out of service while there is power to the unit. This is designed to correct the situation if someone happens to tamper with the stagers.

SOLENOIDS- there are solenoids mounted on the side of each stager enclosure. They are used to override the stager.

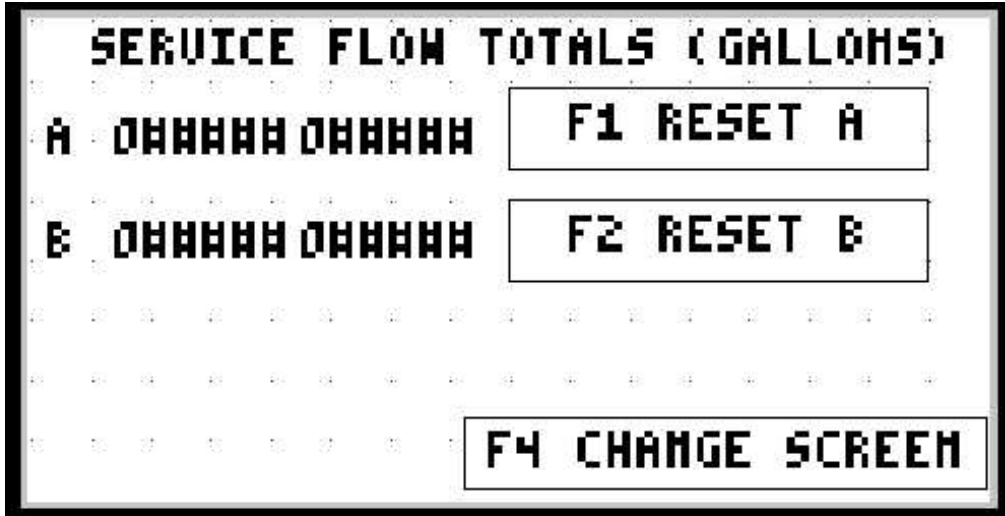
The solenoid is used to override the service outlet valve. It will force the valve shut if flow demand does not call for that unit to be on line.

Stager Homing Failure - PLC Output 9 terminal 209 will energize when a stager has failed. This can be wired to a 24 VAC relay for remote or local alarm. Wire the coil of a 24 VAC relay between terminals 209 & 71.

NOTE: If a unit is not in its service position it will lock out the other units from entering an automatic regen via batch.

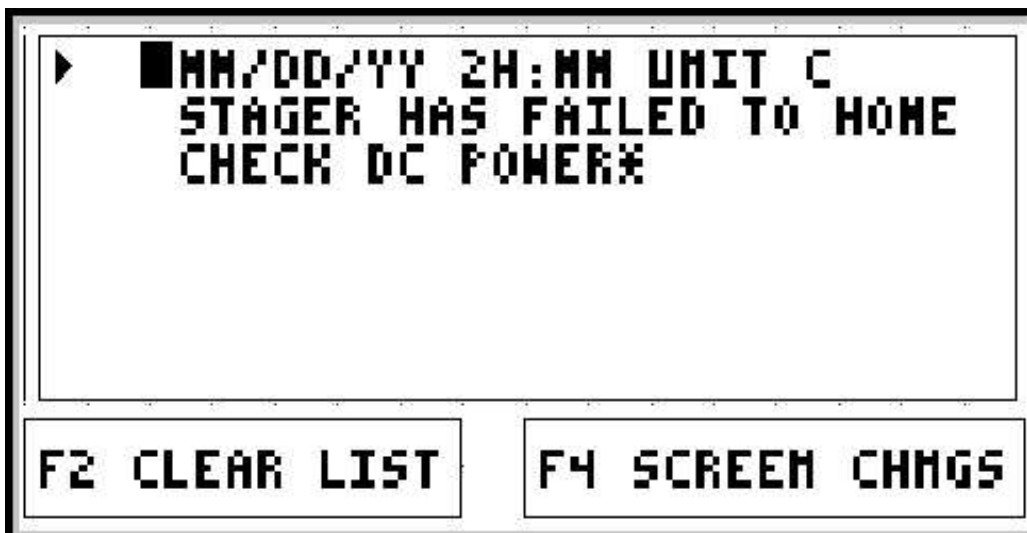
CONTROLS CONTINUED:
OPERATOR INTERFACE SCREENS
SCREEN 8 FLOW TOTALS SCREEN

This screen displays the service flow totals for all the units. Use the reset button to reset the total.



CONTROLS CONTINUED:
OPERATOR INTERFACE SCREENS
SCREEN 9 ALARM HISTORY SCREEN

This screen displays all alarms that have occurred.



HOW TO CALCULATE SOFTENERS CAPACITY

“Batch size” is the term used for the amount of water passing through and being softened by the water softener between regenerations. This is a simple calculation provided two pieces of information are known:

- Size of the water softener in grains (gr.) (i.e. MR-300 has 300,000 grains capacity per tank).
- Hardness of the raw water being treated by the water softener.

BATCH SIZE EQUATION

Grain capacity of softener divided by the grains of hardness equals batch size.

SAMPLE CALCULATION

Assume: unit is a MR-300-2

Assume: the hardness of the water was measured to be 20 grains

Using our equation take $300,000 \div 20 = 15,000$ gallons.

10% reserve capacity = 1500 gallons.

$15,000 \text{ gallons} - 1500 \text{ gallons} = 13,500 \text{ gallons (batch size)}$

For immediate regeneration type meter control the meter setting would be at 15,000 gallons. Commonly this value is adjusted to 90 percent of the actual value (in this example 13,500 gallons) to assure not over-running the softener.

For time delay type meters the amount of gallons is determined as in our example except an additional amount of gallons must be deducted from the actual gallons to allow soft water to be available until the softener regenerates at the selected delay time of day or night. This compensation is necessary since the meter will indicate regeneration-required time prior to the set delay time.

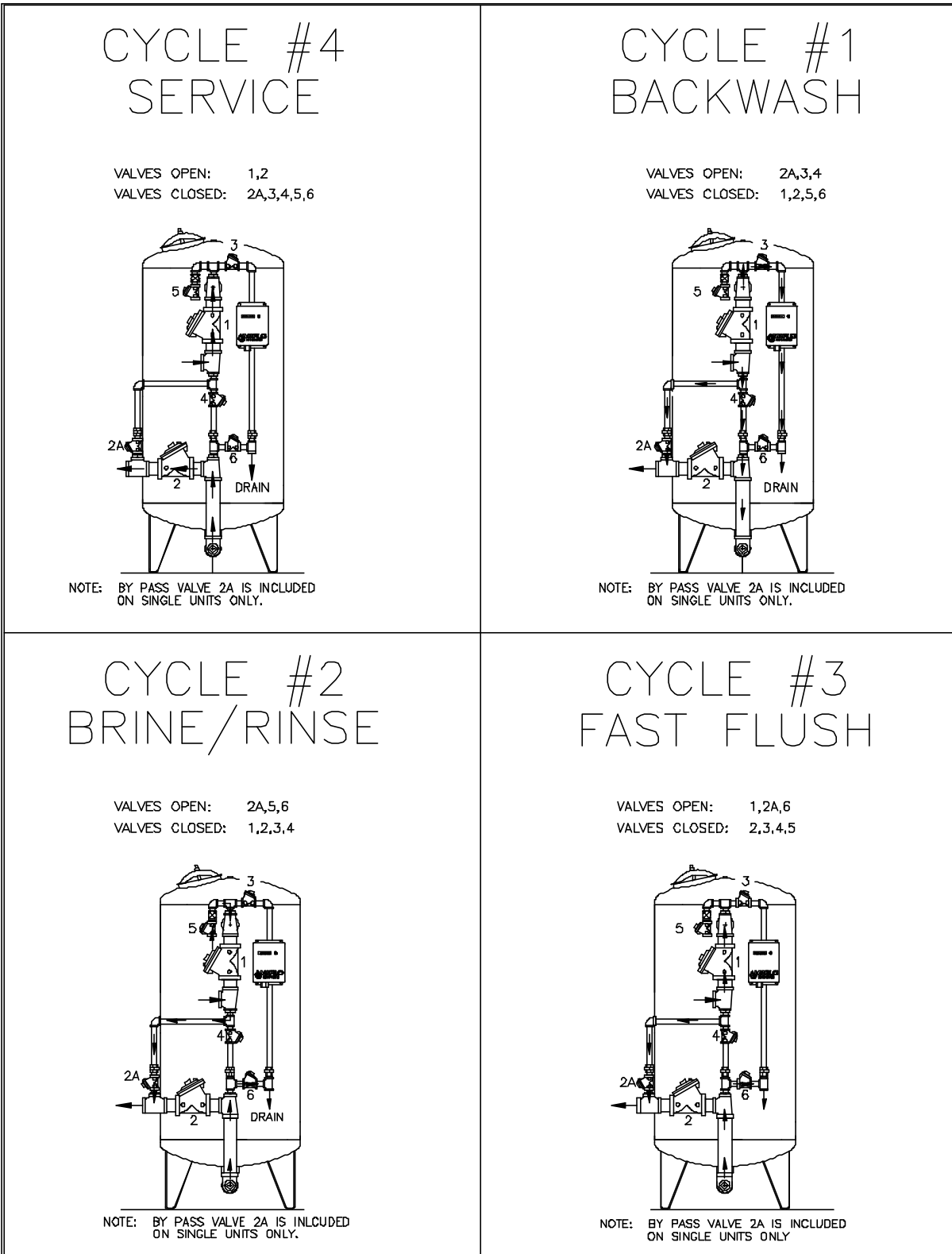
WATER SOFTENER GENERAL OPERATION

Hard water passes through the valve manifold into the top of the softener tank. It flows downward through the mineral bed and out through the bottom of the tank to service. As the water passes through the mineral bed, the hardness present is removed through the process of ion exchange and at the same time sediment present is removed by filtration action of the mineral.

Once the mineral has extracted all the hardness it can, it must be regenerated and have its capacity restored by the following procedure:

1. **Backwash:** The flow through the mineral bed is reversed and allowed to flow to drain. The up-flow action washes any sediment or foreign material collected in the unit out to drain. At the same time the mineral itself is restratified, thereby eliminating any possibility of channeling (approximately 10 minutes).
2. **Brine/Rinse:** The flow through the unit is returned to down-flow to drain at a slow controlled rate and during the first stage of this step the brine is injected to react with the mineral and restore its softening capacity. The second stage of this step is a continued slow flow of water to rinse all of the exchanged hardness and salt from the unit before its return to service (approximately 60 minutes).
3. **Fast Flush:** The downward flow to drain in this step is increased to a high rate which will repack the mineral bed and remove the last traces of salt and hardness from the regenerated equipment just before its return to service (approximately 6 minutes).

FLOW DIAGRAM

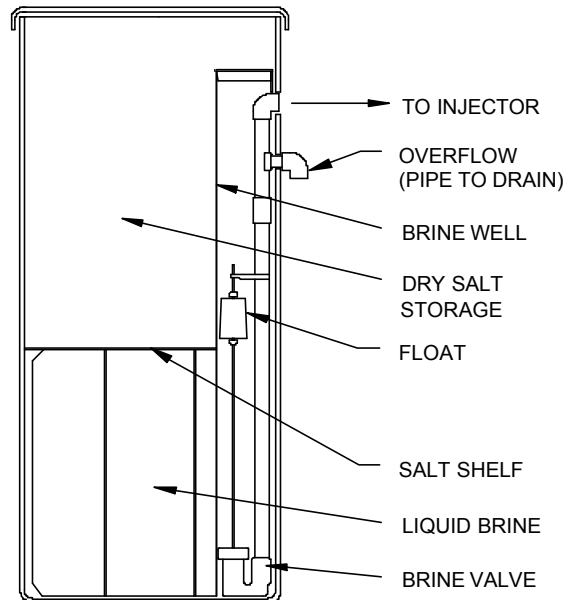


BRINE MAKER OPERATION

The brine-maker is an automatic brining system, which is easily adjusted to provide maximum operating efficiency of your water softener. It is a combination salt storage and brine-measuring tank complete with an automatic valve.

The brine-maker consists of:

1. An open brine tank with a platform dividing it into sections:
 - The upper section is used for dry salt storage
 - The lower section for brine storage.
2. An automatic brine valve which is housed in a closed tube or "well".



After each regeneration, water flows from the brine valve and into the brine tank. When the water level rises slightly above the platform, a float closes the automatic brine valve. Salt slowly dissolves to form concentrated brine.

As brine is formed, the liquid volume increases and the level rises in the salt. The resulting level may be 2 to 10 inches above the platform depending on the amount of salt for regeneration.

During regeneration, the brine injector creates suction, which opens the brine valve and draws into the softener tank. When the brine level falls below the brine valve, the valve seats and prevents air from entering the system.

RECOMMENDED TYPES OF SALT

Only purified salt should be used in the brining system. Palletized salt ("Button", "Nugget", and "Pellet") or block salt (free binders) is recommended. Do **not** use granulated salt, as it will fall through the platform screen.

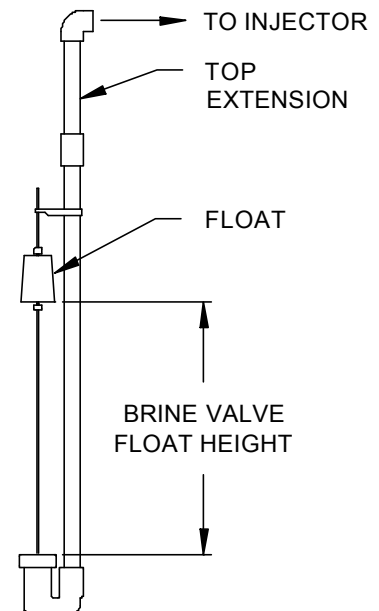
Rock salt is not normally recommended. Most rock salt contains sludge-forming insoluble that collect on the platform and prevents proper salt-water contact.

Only salt containing 0.5% or less of insolubles will provide continued satisfactory operation. If, salt with more insolubles is used, the brine maker will require periodic cleaning.

MINIMUM SALTING ADJUSTMENT

Minimum salting is the most efficient use of salt. But it does minimize the capacity of the unit, which will decrease the time between regenerations. **Only** make this adjust after the unit has completed a brine tank refill step and the water level was checked to be above the salt platform. Follow these instructions to adjust your unit to regenerate with minimum salt usage.

- Adjust brine tank refill time to the minimum setting according to the specification table. Refer to the "Setting the regeneration cycle timer page.
 - Monitor the water daily for hardness. It may also be necessary to adjust the regeneration frequency, since the capacity of the unit has changed.
1. Remove brine valve assembly from brine well.
 2. Remove air check from assembly.
 3. Shorten the riser tube by removing the top extension pipe.
 4. Reassemble brine valve assembly.
 5. Reinstall the assembly into the brine well.
The assembly will no longer reach the bottom of the brine tank.



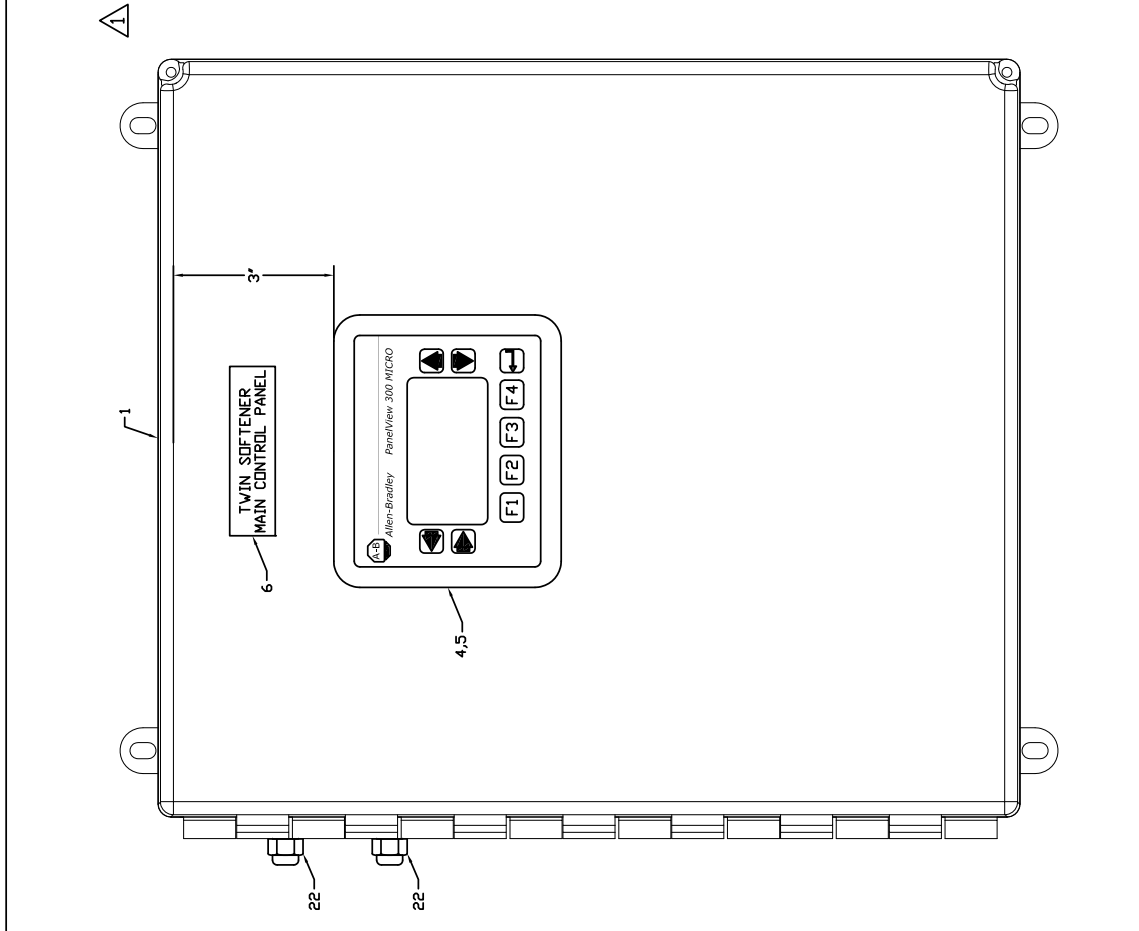
Flow Rate Trip Point Table Program Values for A, B, C & D

MODEL		Alternating Operation (gpm)		Parallel Operation (gpm)			
		Second Unit Trip Flow Range		Second Unit Trip Flow Range		*Third Unit Trip Flow Range	
Exchange Capacity	Pipe Size	Min	Max	Min	Max	Min	Max
		A	B	A	B	C	D
150	1	30	40	7	30	15	60
150	1 1/4	40	60	10	40	20	80
150	1 1/2	50	80	15	50	30	100
150	2	70	100	25	70	50	140
210	1 1/4	40	60	10	40	20	80
210	1 1/2	60	90	15	60	30	120
210	2	80	120	25	80	50	160
210	2 1/2	110	160	30	110	60	220
300	1 1/2	70	100	15	70	30	140
300	2	90	130	25	90	50	180
300	2 1/2	120	190	35	140	70	280
300	3	140	230	50	160	100	320
450	1 1/2	70	90	15	60	30	120
450	2	110	120	25	80	50	160
450	2 1/2	140	170	35	120	70	240
450	3	175	190	50	140	100	280
600	1 1/2	90	100	20	70	40	140
600	2	110	130	25	110	50	220
600	2 1/2	140	190	35	140	70	280
600	3	175	250	50	175	100	350
750	2	90	120	25	90	50	180
750	2 1/2	140	190	35	140	70	280
750	3	160	230	50	160	100	320
900	2	105	140	30	105	60	210
900	2 1/2	150	220	35	150	70	300
900	3	190	280	50	190	100	380
1050	2	95	130	40	95	80	190
1050	2 1/2	145	210	45	145	90	290
1050	3	175	260	50	175	100	350

K FACTOR Table

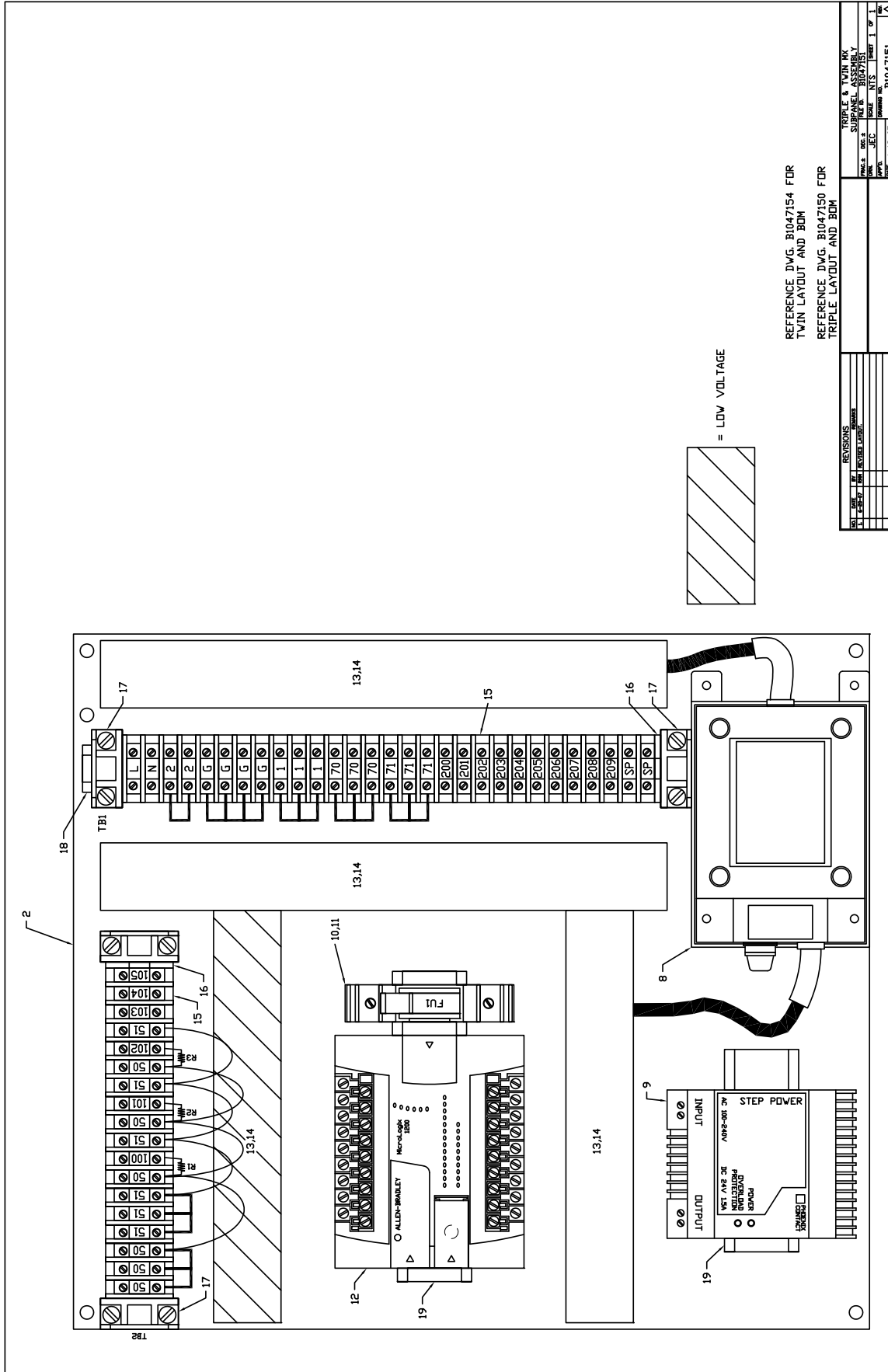
PIPE SIZE (Inches)	Program values for XX				
	TEE Galvanized	TEE PVC	SADDLE Iron	SADDLE PVC	WELDOLET Carbon Steel
1	213	352			
1 1/4	128	177			
1 1/2	94	118			
2	59	67	54	67	
2 1/2		43	38	43	38
3		27	23	27	24
4		15	13	15	14
6			7	8	8

Seqn	Item Number	Vendor No	Qty	Description
1	A2147029	A16148CHSCFG	1	ENCLOSURE 16X14X8 FRP SCREW/CVR
2	A2148010	A16P14	1	SUBPANEL 16 X 14
4	A2586005	2711-M0A19L1	1	PANEL VIEW/300 MICRO 24VDC DH-485
5	A2325013	1761-CBL-HM02	1	CABLE ASSY 6.5FT 8P-8P(1761CBL-HM02
6	A2150200	200221 BE/ADH	1	NAMEPLATE 7/8X3.25 BLANK W/TAPE VHT
8	A2242018	41034	1	TRANSFORMER 5AMP 120/24 100VA/41034
9	A2331035	2938947	1	POWER SUPPLY 1.5AMP 24VDC UL STEP
10	A2399019	3048386(3004906	1	FUSEHOLDER W/DISC LEVER 10.3 38MM
11	A2392008	FNH45(FLM45)	1	FUSE 250V 5AMP
12	A2331001	1762-L24BWA	1	CONTROL MICRO 1200 PLC 120V 14DC
13	A2647010	G1X2M46	4	DUCT WIRE 1X2 WHITE
14	A2103098	C1M46	4	COVER WIRE DUCT 1 W-HITE
15	A2307004	1492-F2	38	BLOCK TERMINAL
16	A2318002	1492-N18	2	BARRIER TERMINAL END (1492N18)
17	A2307007	1492-N23	4	ANCHOR END TERMINAL BLOCK
18	A2328023	1492-N1	0.31	BRACKET/MTG RAIL (1492-N1)(39" LONG
19	A2328008	199-DR1	12	RAIL MOUNTING (199DR1)
20	A2199009	71007	8	WASHER #8 FLAT SS
21	A2457007	72522	8	SCREW/8-32X3/8 MACH PH HD SS
22	A2394007	3444-01W3165	2	GRIP CORD .064-.210 (3444-01)
23	A2173046	MTV18GY	20	WIRE MTW18 STRANDED GRAY
23	A2173015	MTV18OE	20	WIRE MTW18 STRANDED ORANGE
23	A2173014	MTV18BE(COLEMAN)	10	WIRE MTW18 STRANDED DARK BLUE
23	A2173005	MTV18WE	10	WIRE MTW18 STRANDED WHITE
23	A2173004	1015/18B16-1	20	WIRE MTW18 STRANDED RED
23	A2173003	MTV18GN	1	WIRE MTW18 STRANDED GREEN
23	A2173002	MTV18BK	1	WIRE MTW18 STRANDED BLACK



REFERENCE DWG. B1047151 FOR SUB-PANEL LAYOUT

REVISIONS		TWIN PLC	
REV	DATE	BY	CHKD
1	05/11/15	W. J. WILSON	W. J. WILSON
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100	05/11/15	W. J. WILSON	W. J. WILSON

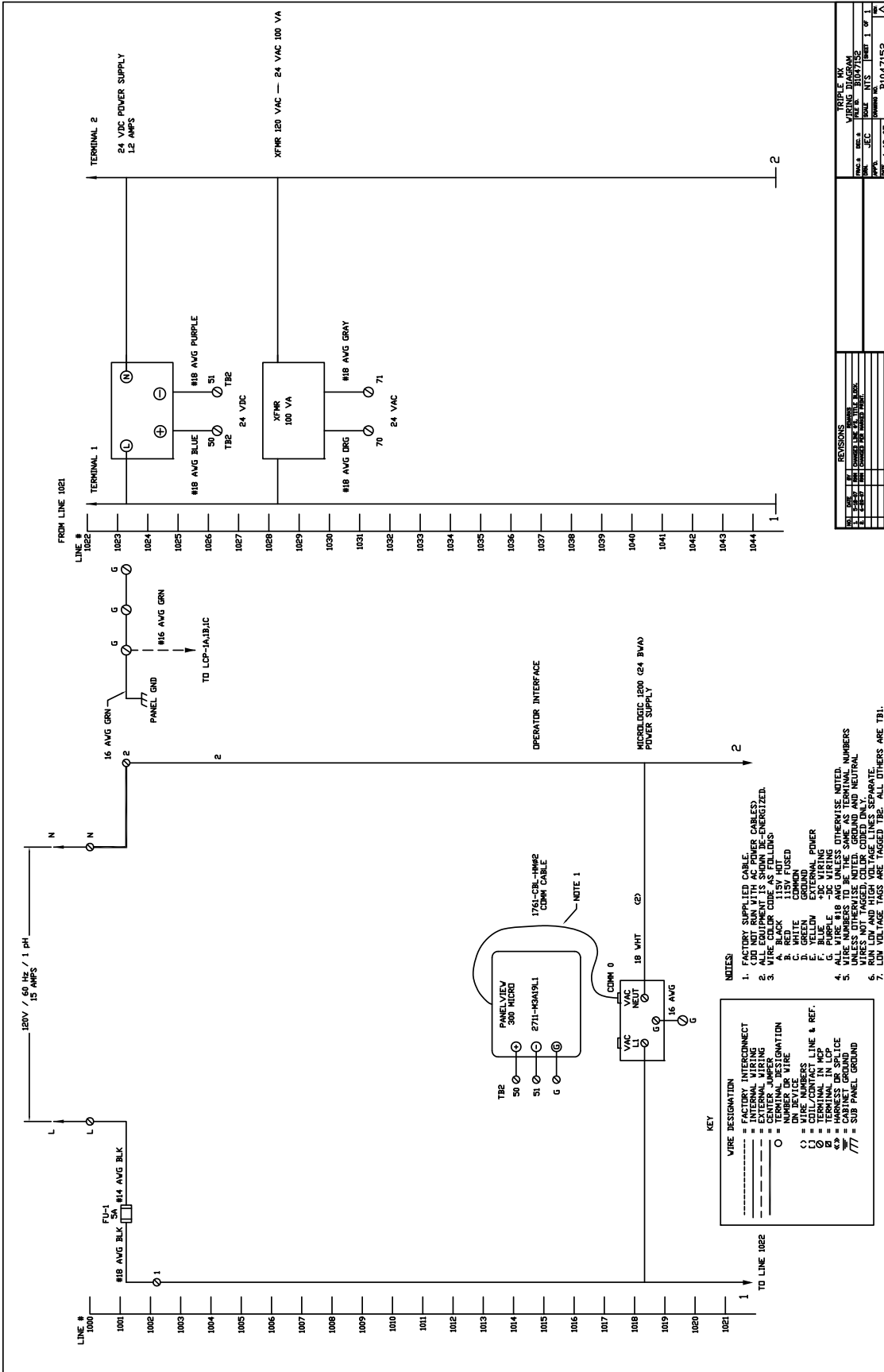


REVISIONS			
NO.	DATE	BY	REVISION

TRIPLE & TWIN MK SUPPLEMENTARY ASSEMBLY			
NO.	DATE	BY	REVISION

REFERENCE DWG. B1047154 FOR
TWIN LAYOUT AND BDM
REFERENCE DWG. B1047150 FOR
TRIPLE LAYOUT AND BDM

= LOW VOLTAGE



REVISIONS		TRIPLE X	
NO.	DATE	BY	CHKD BY
1	1-19-07		
2			
3			
4			
5			
6			
7			
8			
9			
10			

Seq#	Item Number	Vendor No	Qty	Description
1	A2147021	A1086CHSCFCG	1	ENCLOSURE 108X86 NEMA-4X
2	A2150201	200221	1	NAMEPLATE 7/8X3.25 BLANK NO TAPE WHT
3	A2435043	7000-4000	2	KIT SURGE SUPPRESSOR FOR 7000 CONTROL
4	A2155094	V9925-01	1	STAGER 4 POS NOTCH 2 SWITCH 24VAC
5	A2130007	W169PL-4-2	11	ELBOW MALE 1/4"TX1/8"MP
6	A2445043	260-361	2	PLATE END W/EXTR FLANGE
7	A2148003	A10P8	1	SUBPANEL 10 X 8
8	A221002	8320S124601	1	VALVE SOLENOID ASCO 24601 8320G1
9	A2730013	W172PL-4-2	2	TEE BRANCH 1/4"TX1/8"MP
10	A2394002	CG1250	1	GRIP CORD 1/2 .125-.187 (CG1250)
11	A2455007	5282	1	RING SEALING 1/2
12	A2150202	A2150202	1	NAMEPLATE 50X75 BLANK NO TAPE WHT
13	A2307015	260-331	7	TERMINAL BLOCK MODULAR GREY
14	A2307016	260-337	7	TERMINAL BLOCK MODULAR GREEN
15	A2173017	1015/18B1P-U	3	WIRE MTW 18 STRANDED LIGHT BLUE
16	A2173003	MTW18GN	1	WIRE MTW 18 STRANDED GREEN
17	A2173016	MTW18BN	2	WIRE MTW 18 STRANDED BROWN
18	A2173018	MTW18PE	2	WIRE MTW 18 STRANDED PURPLE
19	A2173015	MTW18OE	3	WIRE MTW 18 STRANDED ORANGE

VIEW OF TERMINALS ENLARGED FOR CLARITY

STAGER INTERNAL WIRING DIAGRAM

24VAC STAGER MOTOR

NOTES:

- ALL WIRE 18 AWG UNLESS NOTED OTHERWISE.
- SPS-1B = STAGER PULSE SWITCH
- SAUX-1B = STAGER AUXILIARY SWITCH 1 IN SERVICE #4 STEP
- MTR = STAGER MOTOR
- SV = SOLENOID VALVE
- S-1, 2 = SURGE SUPPRESS
- GROUND STAGER MOTOR TO PANEL.

STAGER TUBE FIG CHART

PORT	TYPE	SOLENOID TUBE FIG CHART
1	ELBOW	
2	ELBOW	1
3	ELBOW	2
4	ELBOW	3
5	ELBOW	
6	ELBOW	
IN	TEE	
DR	ELBOW	

SOLENOID TUBE FIG CHART

PORT	TYPE
1	ELBOW
2	ELBOW
3	ELBOW
4	ELBOW
5	ELBOW
6	ELBOW
IN	TEE
DR	ELBOW

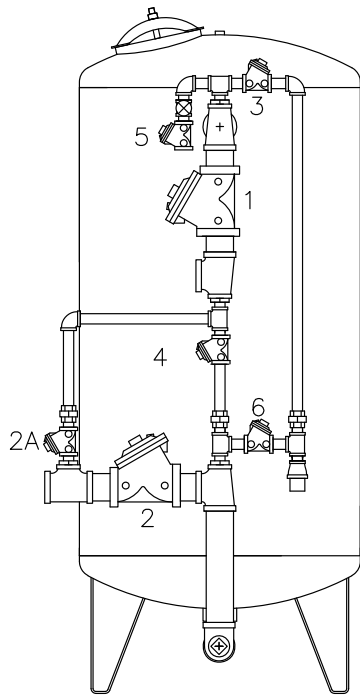
REVISIONS

NO.	DATE	BY	DESCRIPTION
1	7-19-07	BM	ENCLOSURE CHANGE TO MAX
2	9-20-07	BM	STAGER PORT 5 WAS PLUS
3	11-30-07	BM	ITEM 8 WAS QTY. 4.
4	7-2-08	BM	ADDED TERMINALS FOR STAGER
5	7-2-08	BM	ADDED SOLENOID FROM STE. TO BUTTON

UNIT 2 STAGER LCP-1B WIRING DIAGRAM AND ASSEMBLY

FRAC. #	DEC. #	SCALE	FILE #	SHEET	OF
			B1048151	1	1

DATE: 1-19-07 DRAWING NO.: B1048151



Replacement Valve Table

Location#	Function	Position
1	Service Inlet	NORMALLY OPEN
2	Service Outlet	NORMALLY OPEN
2A	Bypass Valve - Single Systems Only	NORMALLY CLOSED
3	Backwash Outlet	NORMALLY OPEN
4	Backwash Inlet	NORMALLY OPEN
5	Brine Inlet	NORMALLY OPEN SPRING ASSIST OPEN
6	Brine/Flush Outlet	NORMALLY OPEN SPRING ASSIST OPEN

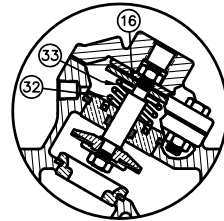
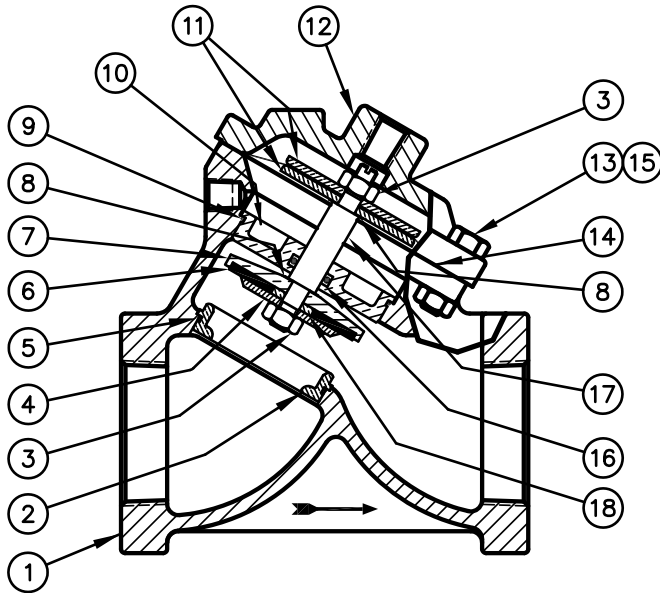
Valve 2A - Is Used on Single Systems Only

MR Model	Pipe Size	Valve 1	Valve 2	Valve 2A	Valve 3	Valve 4	Valve 5	Valve 6
150	1	B2010102B	B2010202B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	1.25	B2010103B	B2010203B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	1.5	B2010104B	B2010204B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	2	B2010105B	B2010205B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
210	1.25	B2010103B	B2010203B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	1.5	B2010104B	B2010204B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	2	B2010105B	B2010205B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	2.5	B2010107B	B2010207B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
300	1.5	B2010104B	B2010204B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	2	B2010105B	B2010205B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	2.5	B2010107B	B2010207B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	3	B2010108B	B2010208B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
450	1.5	B2010104B	B2010204B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	2	B2010105B	B2010205B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	2.5	B2010107B	B2010207B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
	3	B2010108B	B2010208B	A2009001B	A2010001B	B2010201B	A2007001B	A2007001B
600	1.5	B2010104B	B2010204B	A2009002B	A2010002B	B2010202B	A2007002B	A2007002B
	2	B2010105B	B2010205B	A2009002B	A2010002B	B2010202B	A2007002B	A2007002B
	2.5	B2010107B	B2010207B	A2009002B	A2010002B	B2010202B	A2007002B	A2007002B
	3	B2010108B	B2010208B	A2009002B	A2010002B	B2010202B	A2007002B	A2007002B
750	2	B2010105B	B2010205B	A2009002B	A2010002B	B2010202B	A2007002B	A2007002B
	2.5	B2010107B	B2010207B	A2009002B	A2010002B	B2010202B	A2007002B	A2007002B
	3	B2010108B	B2010208B	A2009002B	A2010002B	B2010202B	A2007002B	A2007002B
900	2	B2010105B	B2010205B	A2009002B	A2010003B	B2010203B	A2007002B	A2007002B
	2.5	B2010107B	B2010207B	A2009002B	A2010003B	B2010203B	A2007002B	A2007002B
	3	B2010108B	B2010208B	A2009002B	A2010003B	B2010203B	A2007002B	A2007002B
1050	2	B2010105B	B2010205B	A2009002B	A2010003B	B2010203B	A2007002B	A2007002B
	2.5	B2010107B	B2010207B	A2009002B	A2010003B	B2010203B	A2007002B	A2007002B
	3	B2010108B	B2010208B	A2009002B	A2010003B	B2010203B	A2007002B	A2007002B

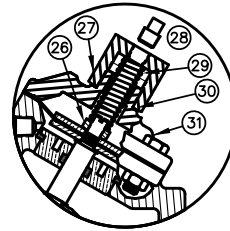
Valve 1 is Drilled and Tapped with 1/4" Female Thread on Boss #1

Valve 2 and 4 are Drilled and Tapped with 1/4" Female Thread on Boss #2

AQUAMATIC REPAIR KITS



SPRING ASSIST OPEN

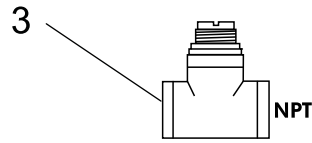
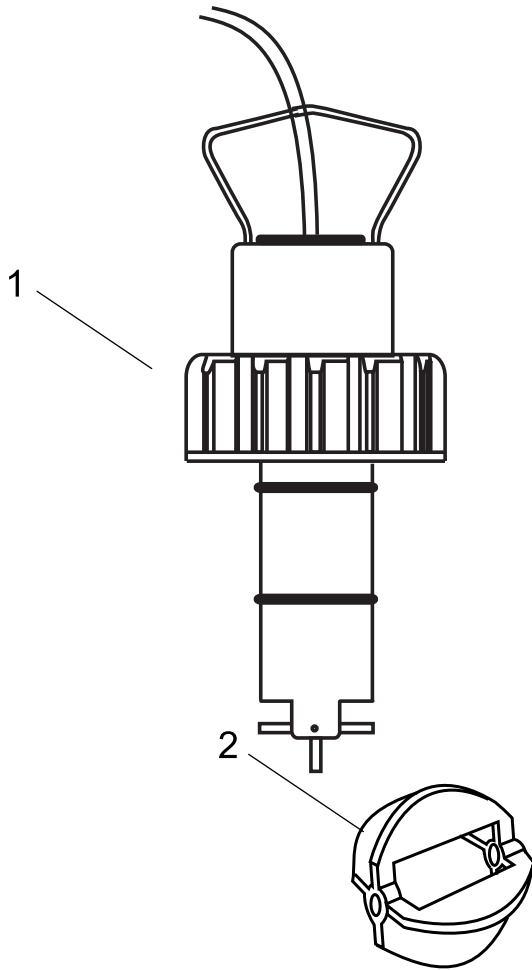


SPRING ASSIST CLOSED

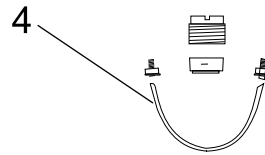
- RA - Diaphragm & Seal Kits - Includes Buna N Seals and Diaphragm (Items 3(2),5,6,8(2),9,14&16)
- RF - Metal Parts Kit (Normally Open) - (Items 4,7,10,11(2), 17)
- RG - Metal Parts Kit (Normally Closed) - (Items 4,7,10,11(2), 23)
- SC - Repair Kit (Spring Assist Closed) - (Items 24,27,28)
- SO - Repair Kit (Spring Assist Open) - (Items 8,31,32)
- GT - Tool - To Install & Remove O-Ring Retainer (Not Shown)

VALVES		REPAIR KITS						SHAFTS	
VALVE SIZE	CASTING #	RA	RF	RG	SC	SO	GT	NO	NC
3/4"	421	A2089028	A2089071	A2089078	A2089085	A2089092	A2089098	A2137001	A2137008
1"	421	A2089028	A2089071	A2089078	A2089085	A2089092	A2089098	A2137001	A2137008
1 1/4"	424	A2089029	A2089072	A2089079	A2089086	A2089093	A2089099	A2137002	A2137009
1 1/2"	424	A2089029	A2089072	A2089079	A2089086	A2089093	A2089099	A2137002	A2137009
2"	425	A2089030	A2089073	A2089080	A2089087	A2089094	N/A	A2137003	A2137010
2 1/2"	426	A2089031	A2089074	A2089081	A2089088	A2089095	N/A	A2137004	A2137011
3"	427	A2089032	A2089075	A2089082	A2089089	A2089096	N/A	A2137005	A2137012
3" FLGD	427	A2089032	A2089075	A2089082	A2089089	A2089096	N/A	A2137005	A2137012
4" FLGD	428	A2089033	A2089076	A2089083	A2089090	A2089097	N/A	A2137006	A2137013
6" FLGD	429	A2089034	A2089077	A2089084	A2089091	N/A	N/A	A2137007	A2137014

2536 Standard Mount Sensor



**Galvanized Iron Threaded Tee
with NPT Threads
PVDF Insert**



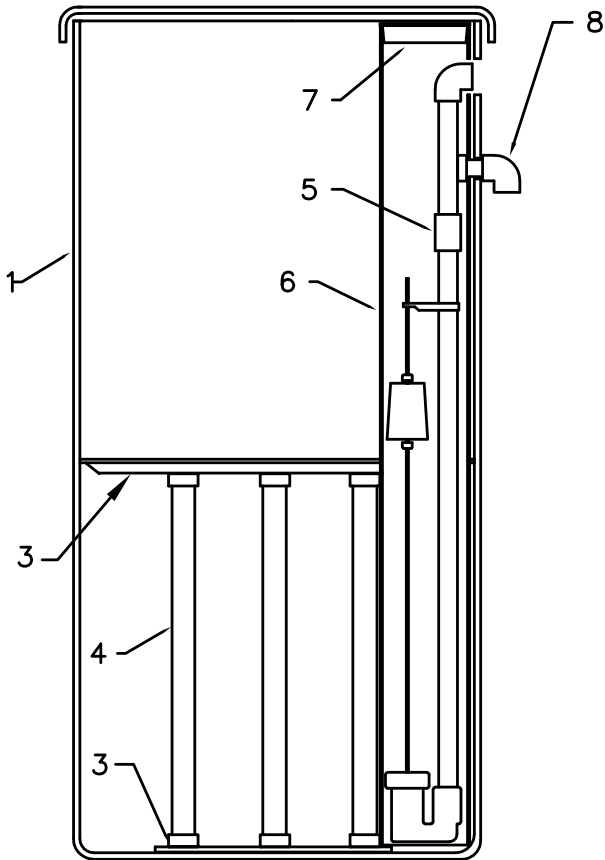
**Iron Strap-on Saddle with
PVDF Insert**

K- Factor Table

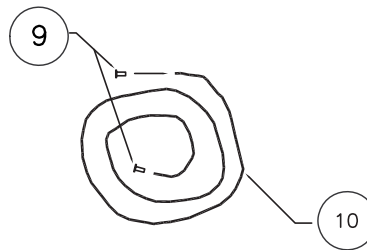
Pipe Size Inches	(Pulses per Gallon)	
	Tee Galvanized	Saddle Iron
1	213	
1-1/4	128	
1-1/2	94	
2	59	54
2-1/2		38
3		23

Item Number	Part Number	Description
1	A2296001	FLOW SENSOR
2	A2456004	ROTOR/PADDLE
3	A2294012	TEE INSTALL 1 GALV
	A2294002	TEE INSTALL 1-1/4 GALV
	A2294003	TEE INSTALL 1-1/2 GALV
	A2294004	TEE INSTALL 2 GALV
4	A2295001	SADDLE 2-1/2 IRON
	A2295002	SADDLE 3 IRON

BRINE SYSTEM FOR MGT 150-450



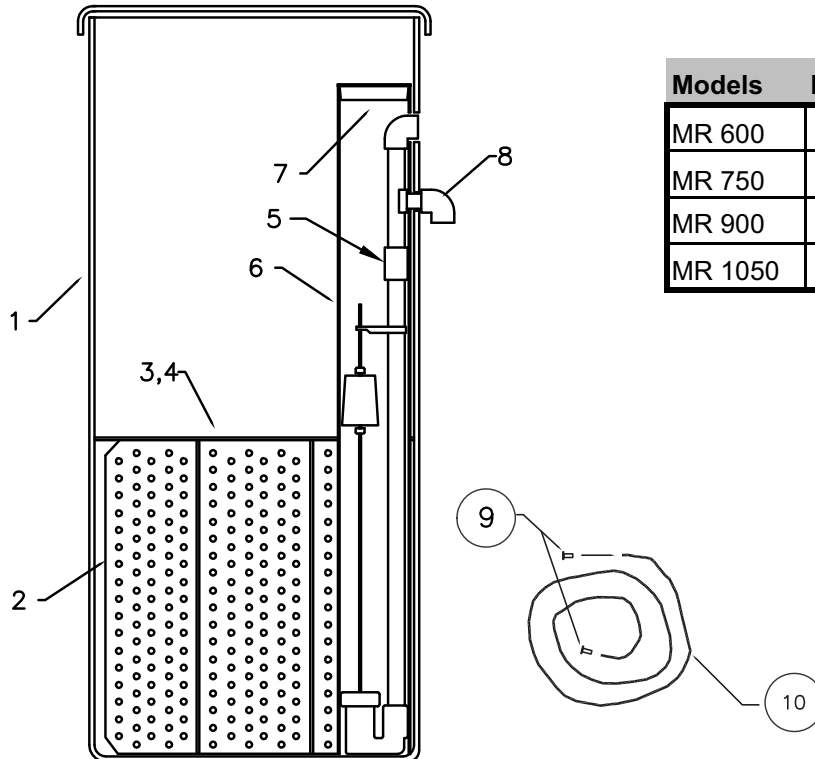
Models	Part Number	Shelf Height
MR 150	B1039001	15"
MR 210	B1039002	22"
MR 300	B1039003	29"
MR 450	B1039009	29"



Item Number	Part Number	Item Description
1	B1002007	BRINE TANK W/HOLES 24x50-MR 150-210
	B1002008	BRINE TANK W/HOLES 24x60-MR 300
	B1002009	BRINE TANK W/HOLES 39x60-MR 450
3	A2284007	GRID PLATE PLASTIC 24DIA 5BW
	A2284010	GRID PLATE PLASTIC 30DIA 5BW
4	A2275007	PIPE 1-1/2 SDR OR SCH40 DWV
5	B1042001	BRINE VALVE ASSEMBLY-MR 150
	B1042002	BRINE VALVE ASSEMBLY-MR 210
	B1042003	BRINE VALVE ASSEMBLY-MR 300-450
6	B1015008	BRINE WELL 5x46 DRILLED
7	A2072001	CAP PLUG RED 5 INCH
8	A21200002	ELBOW OVERFLOW 1/2" W/NUT
9	A2476001	INSERT 1/2 POLY
10	A2165002	TUBING 1/2x3/8 BLACK POLY

BRINE SYSTEM FOR MGT 600-1050

39", 42" & 50" TANK DIAMETERS



Models	Part Number	Shelf Height
MR 600	B1039005	22"
MR 750	B1039005	22"
MR 900	B1039007	29"
MR 1050	B1039008	22"

Item Number	Part Number	Item Description
1	B1002010	BRINE TANK W/HOLES 39x60 - (MR 600-750)
	B1002011	BRINE TANK W/HOLES 42x60 - (MR 900)
	B1002012	BRINE TANK W/HOLES 50x60 - (MR 1050)
2	B1043010	GRID SUPPORT SET 39" DIA, 22" HT - (MR 600-750)
	B1043011	GRID SUPPORT SET 42" DIA, 29" HT - (MR 900)
	B1043014	GRID SUPPORT SET 50" DIA, 22" HT - (MR 1050)
3	B1041003	SALT SHELF 38-1/8" DIA - (MR 600-750)
	B1041004	SALT SHELF 41-1/4" DIA - (MR 900)
	B1041005	SALT SHELF 49" DIA - (MR 1050)
4	B1040003	SALT SCREEN 39" DIA. - (MR 600-750)
	B1040004	SALT SCREEN 42" DIA. - (MR 900)
	B1040005	SALT SCREEN 50" DIA. - (MR 1050)
5	B1042002	BRINE VALVE ASSY 22" GRID - (MR 600,750,1050)
	B1042003	BRINE VALVE ASSY 29" GRID - (MR 900)
6	B1015008	BRINE WELL 5x46 DRILLED
7	A2250003	ELBOW OVERFLOW 1/2" W/NUT
8	A2072001	CAP PLUG RED 5"
9	A2476001	INSERT 1/2" POLY
10	A2165002	TUBING 1/2"x3/8" BLACK POLY

SERVICE CHART STAGER CONTROLLER

SYMPTOM	PROBABLE CAUSE	HOW TO CORRECT
Softener does not regenerate.	1. No electrical power.	Check circuit. Start a regeneration with Manual Regeneration Lever.
	2. Frequency levers on Time Dial not set properly.	Refer to “How to Set Regeneration Cycle Program 3200 Series Mechanical Timer”.
	3. Faulty timer mechanism or defective timer motor.	Replace.
	4. Defective stager drive motor.	Replace
	5. Defective micro-switch in stager drive assembly.	Replace drive assembly.
Softener regenerates as wrong time.	6. Interrupted electrical power. Time dial set improperly	Reset Time Dial to correct time. Refer to “How to Set Cycle Controller”.
Position dial does not rotate.	7. Stager drive motor burned out.	Replace.
	8. Loose Electrical connections.	Repair.
	9. Jammed stager valve.	Replace.
Softener Diaphragm Valves end regeneration cycle in wrong position.	10. Controller out of sequence due to: A. Turning position dial manually when time switch is not in “OFF” position or turning the cycle adjustment knob too quickly for stager to index.	With time switch mechanism in normally “OFF” position, (Red arrowhead pointing straight down), manually turn Position Dial clockwise to No. 4 “Service” position.
	B. Temporary low voltage condition of poor electrical connection.	Check circuitry.
	C. Jammed Stager.	Replace.
	D. Defective time switch assembly.	Replace.
	E. Defective time switch assembly.	Replace.
	F. Defective drive motor.	Replace.
Leak to drain from stager valve during service.	11. Leaky or cut seal in stager valve.	Replace.
Hardness Leakage or Improper cycling or valves. Individual valves not being pressurized or vented correctly.	12. Faulty seal in stager valve.	Replace.
	13. Clogged stager strainer.	Clean strainer.
	14. Clogged or kinked stager tubing.	Replace tubing or clean.

SERVICE CHART WATER SOFTENERS

IMPORTANT: Many softener complaints result from oversights (poor electric connections, out of salt, regenerating at wrong hour etc.) rather than from a mechanical failure. Troubleshooting guide for the MX controller is located in the back of this manual page 33.

PROBLEM OR SYMPTOM	CHECK PROCEDURE	CAUSE
Slight leak to drain.	1. Disconnect tubing at backwash control.	Flow from indicates leaky seal in stager valve.
	2. If stager is not leaking, use soap test kit and check hardness of water at drain.	If water tests soft, Valve #6 is leaking: If hard, Valve #3. See procedures 10, 11, 12 and 13.
High flow to drain during service	3. Check position dial.	If not in position #4, rotate clockwise to this position.
	4. If position dial is in position #4, check for water leakage from Valve #3 or #6 vent holes.	Leakage indicates: 1. Ruptured diaphragm. 2. Loose diaphragm nut.
	5. If vent hole is not leaking, use soap test kit and check hardness of water at drain.	If water tests soft, Valve #6 is open: If hard, Valve #3. See procedures 10, 12 and 13.
Failure to draw brine	6. Check that manual brine valve is open wide.	Valve must be open at all times, except when servicing.
	7. Check water pressure	Water pressure must be a least 30 psi during regeneration.
	8. Turn position dial clockwise to position #2. Break union in suction line to injector and feel for suction.	If there is suction, automatic brine valve may be clogged. No suction indicates: 1. Drain pipe to small or discharging at level too high above floor. 2. Plugged pilot strainer. 3. Plugged injection nozzle. 4. Valve #1, #4, or #2 not closing fully. See items 10, 11 and 13. 5. Plugged backwash controller. 6. Dirty mineral bed.
Slight leak from vent hole.	9. Turn position dial clockwise to a position, which relieves pressure on valve.	If leaking stops leak results from loose diaphragm nut, small Tear in diaphragm or special washer under diaphragm is missing. If leaking does not stop, shaft guide O-ring is damaged, shaft guide is not seated against gasket or shaft is damaged.
Diaphragm valve does not close.	10. Check that vent hole is not plugged.	If vent hole is plugged, air in space between diaphragm and shaft guide will compress and prevent valve from closing.
	11. Check for water leak at vent hole.	See Procedure 9.
	12. Loosen tubing nut at diaphragm cap.	If there is not flow, pilot strainer may be plugged.
	13. Turn off water pressure and disassemble diaphragm valve.	1. Seat washer may be dirty, worn or loose. 2. Seat may be eroded.

SERVICE CHART WATER SOFTENERS continued

PROBLEM OR SYMPTOM	CHECK PROCEDURE	CAUSE
Diaphragm valve does not open.	14. Check that vent hole is not plugged.	If vent hole is plugged, a partial vacuum will be created in the space between the diaphragm and shaft guide, preventing valve from opening.
	15. Loosen tubing nut at diaphragm cap.	<ol style="list-style-type: none"> 1. If there is flow, stager valve is leaking. 2. If there is no flow, tubing fitting may be plugged.
Hard water leakage into service lines.	16. Close inlet and outlet valves and inspect by-pass valve.	<ol style="list-style-type: none"> 1. Seat washer may be loose or worn. 2. Seat may be rough. 3. Shaft orifice plugged. 4. Diaphragm ruptured.
	17. Check that valve #4 is seating.	See Procedures 9, 10, 12 and 13.
Restricted or not drain flow during backwash.	18. Either valve #1 or valve #2 is not opening fully. To determine which one: Turn position dial to position #1 and then to position #3. Compare flow at drain.	<p>Flow should be the same for both positions.</p> <ol style="list-style-type: none"> 1. If no difference is noted, valve #4 is not opening properly. 2. If backwash flow is higher, valve #1 is not opening properly. See procedures 14 and 15.
Restricted or no drain flow during backwash.	19. Turn position dial to position #1 and then position #3. Compare flow at drain.	<p>Flow should be the same. If flow for position also is low.</p> <ol style="list-style-type: none"> 1. Inlet water pressure may be low. 2. Backwash flow control may be plugged. <p>If position #3 flow rate is higher, either valve #4 or valve #3 is not opening. See procedures 14 and 15.</p>
Losses of softening resin (evidence of resin in drain lines).	20. Open vent in top of softener tank and check for air in tank.	<ol style="list-style-type: none"> 1. If air is present, vent completely and recheck prior to next regeneration. 2. If recheck discloses a recurring build-up of air, check brine system(s) for possible leaks in suction line or brine valve not seating properly. 3. If brine system is functioning properly source of air may be the water supply to unit. Use of an automatic air relief vale is indicated in this situation (consult factory for recommendation).
	21. Check automatic backwash control valve for rate of flow in excess of listed flow (gpm).	Check for excessive inlet water supply pressures – reduce to rated pressure.
Losses of softening resin (evidence of resin and/or gravel in service lines).	22. Check for damage to softener under-drain system.	Investigation of damage to under-drain generally requires unloading of softener tank. Consult factory for recommended procedures before proceeding.

NOTES



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8-217 MR 150M-1050M TWIN PLC CONTROLLER