

Series 155 Valve / 460 MP

**Water Conditioning Control System
Installation, Operation and Maintenance Manual**

File Name:

Autotrol WaterConditionerSvs 155 460MP iom D893

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Introduction

Series 155 Control System

The Series 155 control system combines design simplicity with fiberglass construction to provide the user with an uncommonly reliable appliance. The inherent reliability of the system means a long life of efficient, trouble-free, uninterrupted soft water luxury.

Should maintenance become necessary, the Series 155 offers a unique "separation" capability which is illustrated in this manual.

Of interest to both the owner and his water conditioning dealer are the design and operation benefits detailed below.

Superior Design

- **Fewer parts** than any control system of comparable function and most controls of lesser function.
- **Single synchronous electric motor** provides all the power for the 460 timer and the operation of the control. Other systems use two or more electric motors and/or solenoid valves.
- **Electrical wiring is factory assembled.** System cannot be connected incorrectly.
- **Program clock (timer) and 460 Demand System are interchangeable.** Both units provide guest regeneration capability.
- **System indexes manually with or without power** to any one of its service or regeneration positions. Readout on timer face plate indicates control valve position.
- **No dynamic seals** that could cause leakage through wear or fatigue.

- **Control accepts NORYL* or brass manifold, or modular bypass valve without modification,** offering complete versatility and easy plumbing for any installation.
- **Brining control valve built into system** eliminates need for an external brine valve.
- **Automatic backwash controller** is incorporated in the system.

* NORYL is a Trademark of GE Plastics

Superior Operation

- **Direct acting system** functions independently of water pressure. No pistons or diaphragms that require a minimum water pressure to operate.
- **Five-cycle operation** provides for downflow service, upflow backwash, downflow brining, downflow rinse, downflow purge or fast rinse. A sixth position is included for time refill of brine tank.
- **Valve discs are held closed by water pressure** and therefore, are leak tight. The sealing forces are increased as the water pressure is increased. Valve seats are in a vertical position, which is the design position least vulnerable to plugging.
- **System operation cannot get out of phase or sequence.** Control always returns to a fixed service position after regeneration regardless of where in the regeneration cycle it was started.
- **Adequate purge rates are possible** since fast rinse is not restricted through the backwash controller.
- **Bypass water is automatically available** during regeneration.

460 MP Electronic Demand System

The two key components of the 460 MP electronic demand system are the microprocessor, a miniature computer located on the circuit board, and a water meter located at the valve outlet. The flow of conditioned water through the meter generates electrical impulses that tell the computer the amount of water being used.

Every night, at 2 AM, the past 7 days' water usage is statistically averaged to anticipate the amount of water that will be used the next day. The computer then determines if the water conditioner has enough remaining capacity to supply the next day's needs. If not, the unit will regenerate.

If the water usage pattern changes, the computer automatically compensates for the change and regenerates only when needed. This results in higher operating efficiency and lower salt usage than a conventional conditioner operating on a fixed regeneration schedule.

Special Features

- **Memory Retention.** During a power outage, all of the data in the microprocessor's memory is stored in a special electronic chip called NOVRAM, Nonvolatile Random Access Memory. This data includes the time-of-day, water usage amounts, and the number of days since the last regeneration.

The NOVRAM will maintain the data in its memory. When power is restored, the NOVRAM returns the data to the microprocessor and operation resumes as if an outage never occurred.

The time of day will be late by the length of the power outage. Most power outages are less than one minute in duration. Therefore, it may be months or years before the time display would require resetting. If an outage of one or more hours occurs, the time of day should be reset...no other reprogramming is necessary.

The microprocessor calculates how much soft water was used and adjusts the reserve capacity accordingly at the end of each day. As a result, the reserve is kept at a minimum for optimum economy.

- **Self-adjusting Reserve.** The 460 MP is programmed to react to a sudden increase in water usage. If a day's usage is more than double the current average, the computer anticipates that a second day of high usage is likely to occur. The high usage amount will be used as the reserve when the 460 MP performs its regeneration computation.
- **Low or No Water Usage.** The 460 MP is programmed to recognize a day of very little or no water usage as an abnormality. It will not use data from such a day to compute the average usage. For example, if the family is on vacation for a week, the prior average will be maintained. When household activity resumes, the 460 MP will operate as if the vacation had not occurred.
- **Design Reliability.** Solid-state electronics assure many years of troublefree performance. And, the metering system has only one moving part...the rotating turbine that measures water usage and generates electrical pulses that are continually counted by the microprocessor to determine the need to regenerate.
- **Time Display.** The correct time will continually appear in the time display during normal conditioning operation. To change the hour display, depress the TIME SET BUTTON until the present hour appears. The PM light will be on when the time is between 12 noon and midnight. The light is off during the AM hours.
- **Flow Indicator.** The water flow indicator on the time display flashes whenever service water is flowing through the valve. This allows an easy determination of proper meter operation.
- **Hardness and Capacity Settings.** Once the hardness and capacity settings have been set, the information cannot be lost due to a power outage and reprogramming is not necessary.
- **Guest Cycle.** An extra regeneration can be achieved at any time by depressing the red pointer knob. It will take a few minutes for the regeneration to start. The unit will return to service in two hours. This feature is beneficial when you expect to use more than the normal amount of water, for example: guest visits, extra heavy laundry day.

Control Module

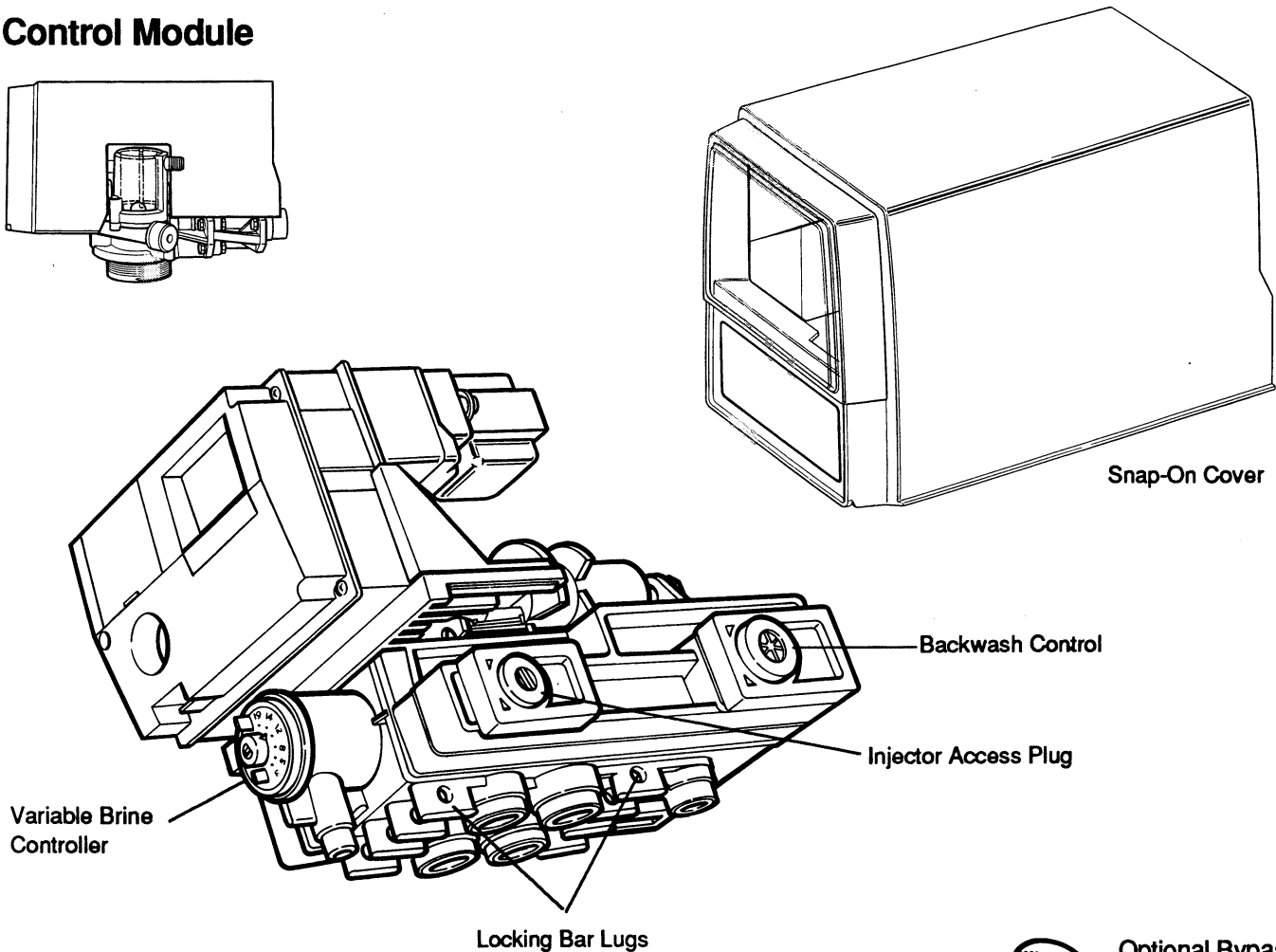


Figure 1

Tank Adapter Module

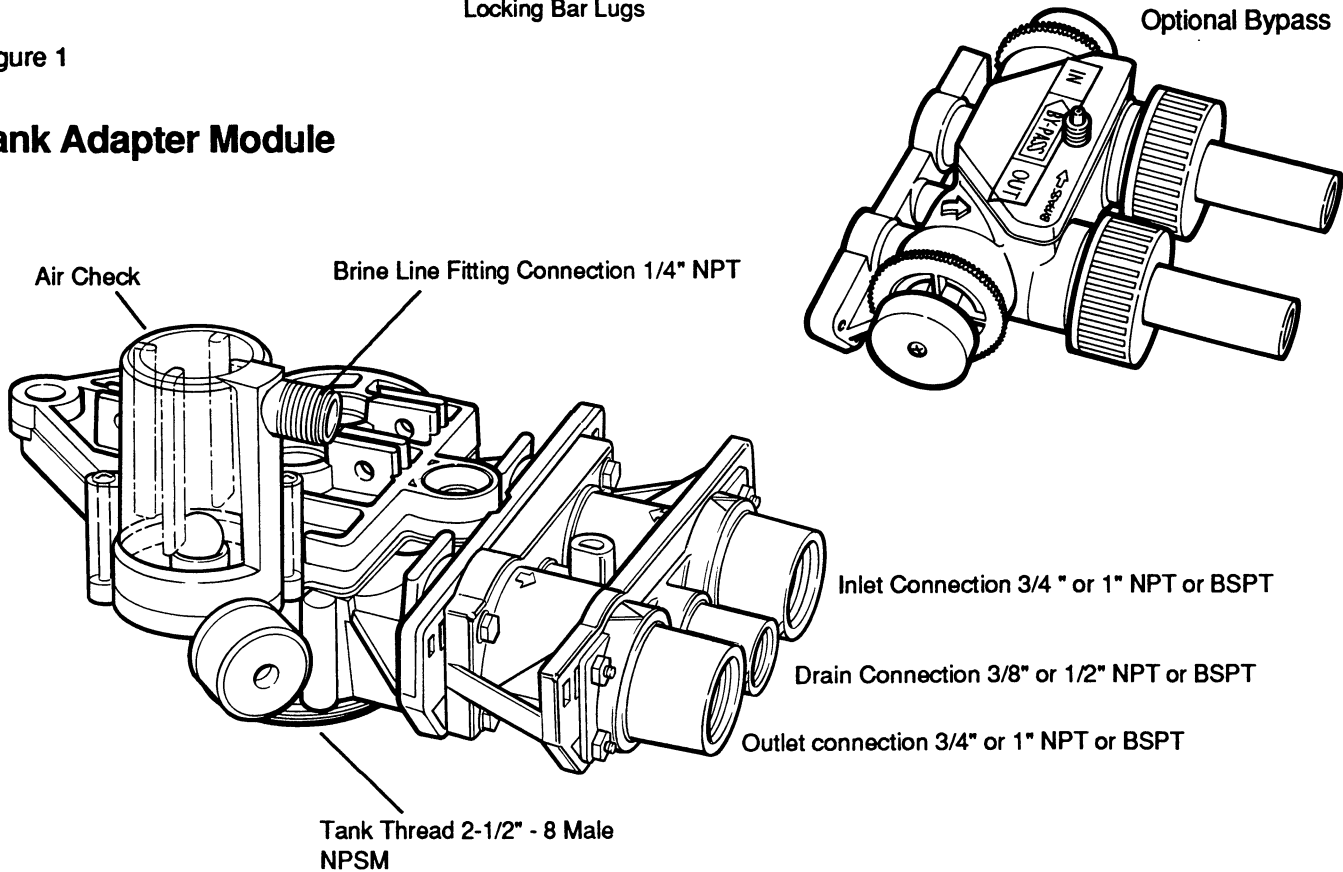


Figure 2

Installation

All plumbing must conform to local codes.

Inspect unit carefully for carrier shortage or shipping damage.

Location Selection

1. The distance between the unit and a drain should be as short as possible.
2. If it is likely that supplementary water treating equipment will be required, make certain adequate additional space is available.
3. Since salt must be added periodically to the brine tank, the location should be easily accessible.
4. Do not install any unit closer to a water heater than a total run of 10 feet (3 m) of piping between the outlet of the conditioner and the inlet to the heater. Water heaters can sometimes overheat to the extent they will transmit heat back down the cold pipe into the unit control valve.

Hot water can severely damage the conditioner. A 10 foot (3 m) total pipe run, including bends, elbows, etc., is a reasonable distance to help prevent this possibility. A positive way to prevent hot water from flowing from heat source to the conditioner, in the event of a negative pressure situation, is to install a check valve in the soft water piping from the conditioner. If a check valve is installed, make certain the water heating unit is equipped with a properly rated temperature and pressure safety relief valve. Also, be certain that local codes are not violated.

5. Do not locate unit where it or its connections (including the drain and overflow lines) will ever be subjected to room temperatures under 34° F (1°C) or over 120° F (49°C).
6. Do not install unit near acid or acid fumes.

Water Line Connection

A bypass valve system must be installed since there will be occasions when the water conditioner must be bypassed for hard water or for servicing.

The most common bypass systems are the Autotrol Series 156 Bypass Valve (Figure 3) and plumbed-in globe valves (Figure 4). Though both are similar in function, the 156 Autotrol Bypass offers simplicity and ease of operation.

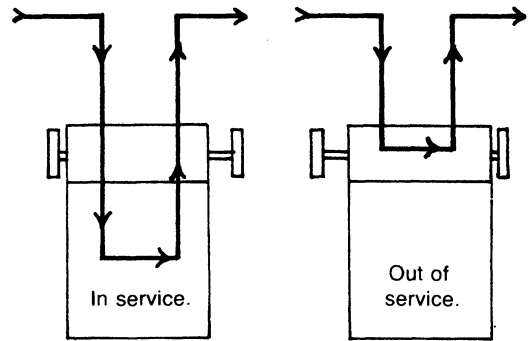


Figure 3. Autotrol Series 156 Bypass Valve

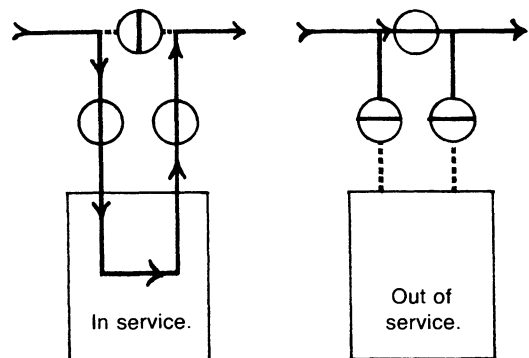


Figure 4 Typical globe valve bypass system

Drain Line Connection

1. If ideally located, the unit will be above and not more than 20 feet (6.1 m) from drain. For such installations connect 1/2-inch (1.3 cm) I.D. plastic tubing to DRAIN LINE CONNECTION located on CONTROL (Figure 2).
2. If unit is located more than 20 feet (6.1 m) from drain, use 3/4-inch (1.9 cm) tubing for runs up to 40 feet (12.2 m). Also, purchase adapter to bush tubing down to DRAIN LINE CONNECTION FITTING.
3. If unit is located where drain line must be elevated, you may elevate the line up to 6 feet (1.8 m) providing the run does not exceed 15 feet (4.6 m) and water pressure at conditioner is not less than 40 psi (2.8 BAR). You may elevate an additional 2 feet (61 cm) for each additional 10 psi (0.7 BAR).
4. Where drain line is elevated but empties into a drain below the level of the control valve, form a 7 inch (18 cm) loop at the far end of the line so that the bottom of the loop is level with the DRAIN LINE CONNECTION. This will provide an adequate siphon trap.
5. Where a drain empties into an overhead sewer line, a sink-type trap must be used.



Caution

Never connect drain line into a drain, sewer line or trap. Always allow an air gap between the drain line and the wastewater to prevent the possibility of sewage being back-siphoned into conditioner.

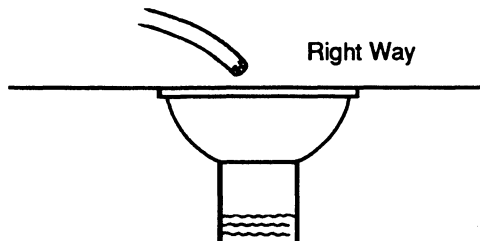


Figure 5

Note: Standard commercial practices have been expressed here. Local codes may require changes to these suggestions.

Brine Line Connection

It will be necessary to install the brine tube and connect the line to a fitting installed on the air check.

Be sure all fittings and connections are tight so that premature checking does not take place. Premature checking is when the ball in the air check falls to the bottom before all brine is drawn out of the brine tank. See **Placing Conditioner Into Service** section.

* Teflon is a registered Trademark of E. I. Dupont and Co.

Overflow Line Connection

In the absence of a safety overflow and in the event of a malfunction, the TANK OVERFLOW will direct "overflow" to the drain instead of spilling on the floor where it could cause considerable damage. This fitting should be on the side of the cabinet or brine tank.

To connect overflow, locate hole on side of brine tank. Insert overflow fitting into tank and tighten with plastic thumb nut and gasket as shown (Figure 6.) Attach length of 1/2-inch (1.3 cm) I.D. tubing (not supplied) to fitting and run to drain. Do not elevate overflow line higher than 3 inches (7.6 cm) below bottom of overflow fitting. Do not tie into drain line of control unit. Overflow line must be a direct, separate line from overflow fitting to drain, sewer or tub. Allow an air gap as per drain line instructions.

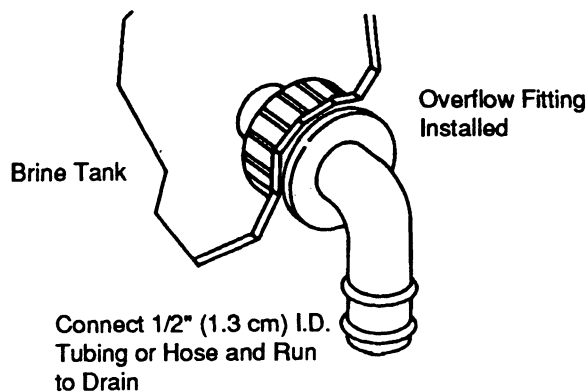


Figure 6

Electrical Connection

Remove twist tie from cord set and extend cord to its full length. Make sure power source matches the rating printed on the timer. Plug into socket that will accept a 3-prong plug and is properly grounded. Be sure the outlet you select is not controlled by a wall switch.

Note: Proper electrical grounding is essential to prevent electronic circuit board damage due to voltage spikes.

Placing Conditioner into Operation

After all previous steps have been completed, the unit is ready to be placed into operation. Follow these steps carefully.

1. Remove control valve cover.

Note: The following steps will require your turning the red pointer knob, (Figure 8), to various positions. Insert a wide blade screwdriver into arrow slot in pointer knob and press in firmly. With knob held in, rotate COUNTERCLOCKWISE only until arrow on knob points to desired position. (Rotation is made much easier if you grasp the camshaft with your free hand and turn it at the same time.) Then permit knob to spring back out.

2. Insert screwdriver into slot in pointer knob, (Figure 8). Press in and rotate knob COUNTERCLOCKWISE until arrow points directly to the word BACKWASH.

3. Fill mineral tank with water.

- A. With water supply off, place the bypass valve(s) into the service position.
- B. Open water supply valve very slowly to approximately the 1/4 open position.



Caution

If opened too rapidly or too far, resin may be lost. In this position, you should hear air escaping slowly from the drain line.

- C. When all of the air has been purged from the tank (water begins to flow steadily from the drain), open the main supply valve all the way.
 - D. Allow water to run to drain until clear.
 - E. Turn off water supply and let the unit stand for about 5 minutes. This will allow all trapped air to escape from the tank.
 - F. Proceed to step 4.
4. Add water to brine tank (initial fill).

With a bucket or hose, add approximately 4 gallons (15 liters) of water to regenerant tank. If the tank has a salt platform above the bottom of the tank, add water until the level is approximately 1 inch (25 mm) above the platform.

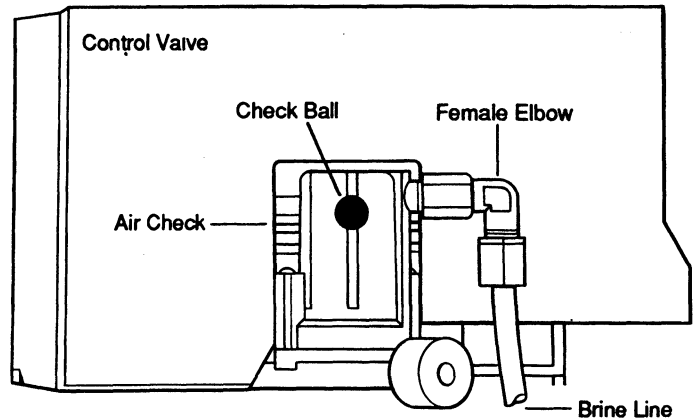


Figure 7

5. Put into operation.

- A. Open water supply valve slowly to full open position.
- B. Carefully advance pointer knob COUNTERCLOCKWISE to center of BRINE REFILL position and hold there until air check (Figure 7) fills with water and water starts to flow through brine line into brine tank. Do not run for more than 1 or 2 minutes.
- C. Advance pointer knob COUNTERCLOCKWISE until arrow points to the center of the BRINE AND RINSE position.
- D. With the conditioner in this position, check to see if water is being drawn from the brine tank. The water level in the brine tank will recede very slowly. Observe for at least 3 minutes. If the water level does not recede or goes up, or if air enters the transparent air check chamber and the ball falls and seats, reference Troubleshooting section.
- E. Advance pointer knob COUNTERCLOCKWISE to SERVICE.
- F. Run water from a nearby faucet until the water is clear and soft.

Note: The use of resin cleaners in an unvented enclosure is not recommended.

Programming the 460 Controller

1. Plug the power cord into a functioning, grounded electrical outlet that is not controlled by a switch.



Caution

Be sure the electric outlet for the softener is properly grounded to protect the user from injury or possibly fatal shock. Do not remove the ground pin from the plug.

2. Open the access door by inserting a small screwdriver into the small opening at the bottom of the door and gently pry up (Figure 8).

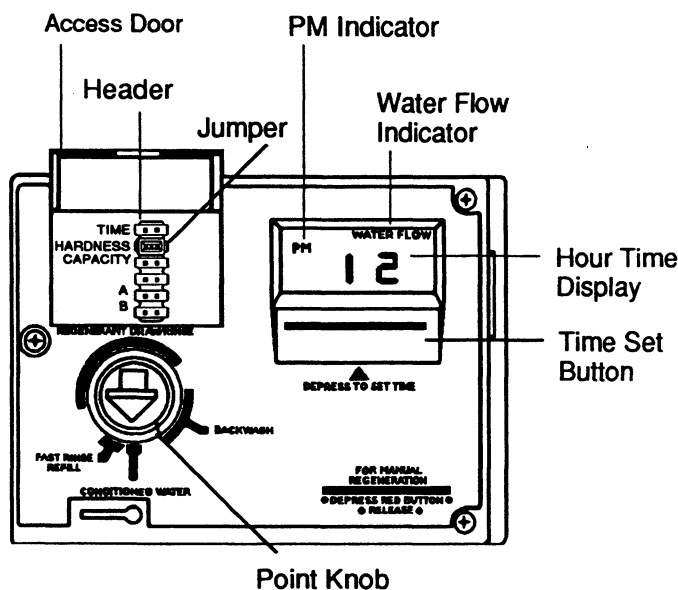


Figure 8

3. With the "jumper" on the set of pins next to the word **TIME** (Figure 9), set the time of day to the closest hour by depressing the black TIME SET BUTTON. PM hours are indicated by a light next to the letters PM on the display window.

NOTE: The unit is factory set to regenerate at 2 AM. If you prefer to have the unit regenerate at an earlier or later time, simply set the current time of day accordingly. E.g., to have the unit regenerate at 4 AM, 2 hours later, set the clock 2 hours earlier than the actual current time.

4. Pull the jumper off the top set of pins and place it on the set of pins next to the word **HARDNESS** (Figure 10). Depress the black TIME SET BUTTON until the correct hardness is displayed. The hardness range is from 1 to 99 grains per gallon.

To change water hardness stated in parts per million, PPM, to grains per gallon, GPG, use this formula.

$$\frac{\text{Parts per Million}}{17.1} = \text{Grains per Gallon}$$

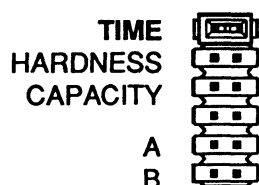


Figure 9

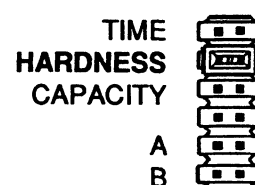


Figure 10

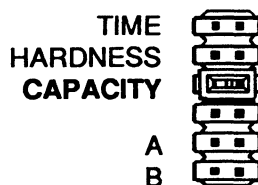


Figure 11

5. Place the jumper on the set of pins next to the word **CAPACITY** (Figure 11). Depress the black TIME SET BUTTON until the correct capacity value is displayed. The capacity range is 1,000 to 99,000. Refer to the salt setting chart (Figure 13).
6. Return the jumper to the top set of pins next to the word **TIME** and close the access door. The bottom 3 sets of pins are used for factory testing and are not used in normal operation. The jumper must **NOT** be left on any pins other than the top pair next to the word **TIME**. Failure to do this will cause the unit not to operate.

In the event that the time, hardness or capacity setting must be changed, simply follow Steps 1 through 6.

Manual Regeneration

Electricity is used only to run the timer and to rotate the camshaft. All other functions are operated by water pressure. Therefore, in the event of a power outage, all the various regeneration positions may be dialed manually by depressing the red pointer knob with a wide bladed screwdriver and turning COUNTERCLOCK-WISE.

Manual time cycles:

- Backwash...14 minutes
- Brine and rinse...52 minutes
- Brine refill...10 minutes
- Purge...6 minutes

Do not exceed 10 minutes for the brine refill cycle as this will cause excessive salt usage during the next regeneration and possibly a salt residue in the conditioned water.

DO NOT advance the red pointer knob directly to the service position, 6 o'clock, when manually advancing the camshaft to place the conditioner in service after a manual regeneration or when servicing the conditioner. Advance it short of the service position to just past the purge position, approximately 7 o'clock. The timer will then advance itself to the service position where the internal switch will turn the motor off. The internal switch will not be operated and the motor will continue to run if advanced directly to the service position.

If power fails during a conditioner regeneration, the cycle will be completed normally when the power is restored.

Adjustment of Brine Control

The amount of salt placed into the regenerant storage tank has nothing to do with the amount of salt used during the regeneration cycle. Water will dissolve and absorb salt only until it becomes saturated. A given amount of brine, salt saturated water, contains a specific amount of salt.

The salt dial controls the amount of brine used during the regeneration cycle, e.g. when set at 15 lbs. (6.8 kg), the amount of brine the conditioner will use for each cycle will contain 15 lbs. (6.8 kg) of salt. Never let the amount of salt in the brine tank be less than the amount required for the next regeneration. Do not overload the brine tank with salt.

Refer to the salt setting chart (Figure 13) for proper salt settings. To set the salt dial, insert a small screwdriver into the white pointer knob (Figure 12) and move the pointer to the proper setting.

NOTE: To convert the salt settings from English to Metric, divide by 2.2.

Example: 13 pounds ÷ 2.2 = 5.5 kg of salt.

The use of resin cleaners in an unvented enclosure is not recommended.

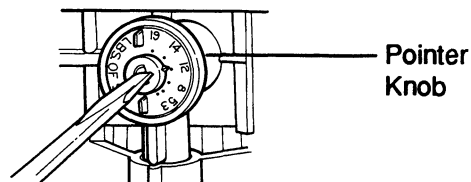


Figure 12

Suggested Salt Dial Settings (Pounds of Salt) For Various Size Softeners

Grains of Hardness Capacity Setting	.5 Ft. ³	.75 Ft. ³	1.0 Ft. ³	1.25 Ft. ³	1.5 Ft. ³	1.75 Ft. ³	2.0 Ft. ³	2.5 Ft. ³
12,000	4.5	—	—	—	—	—	—	—
16,000	9.0	5.0	—	—	—	—	—	—
20,000	—	8.5	6	—	—	—	—	—
24,000	—	14.0	8.4	7.0	—	—	—	—
30,000	—	—	15.0	11.0	9.0	—	—	—
32,000	—	—	18.5	12.5	10.0	9.0	—	—
35,000	—	—	—	16.0	12.0	10.0	9.0	—
40,000	—	—	—	11.5*	17.0	14.0	12.0	—
48,000	—	—	—	—	14.0*	10.5*	17.0	13.0
60,000	—	—	—	—	—	—	15.0*	10.5*

*This setting requires use of "XS (Extra Salt) cam and doubles the amount of the setting

Figure 13

Removing the Series 155 Control Module for Servicing

1. Unplug electric cord.
2. Shut off water supply or put bypass valve(s) into bypass position.
3. Remove cover (Figure 14-A) and with screwdriver, relieve system pressure by opening valve number 6 (at rear) (Figure 14-B).

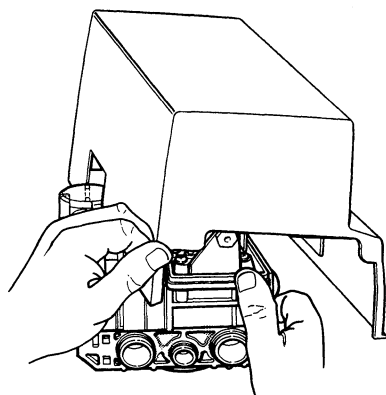


Figure 14-A

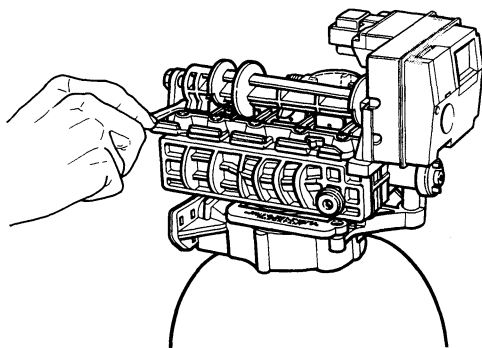


Figure 14-B

4. Remove screw in locking bar (Figure 10-C).

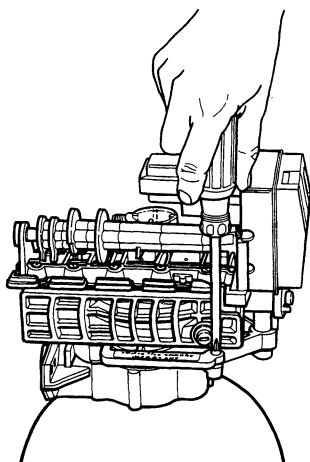


Figure 14-C

5. Apply downward hand pressure on control and pull locking bar out (Figure 14-D).

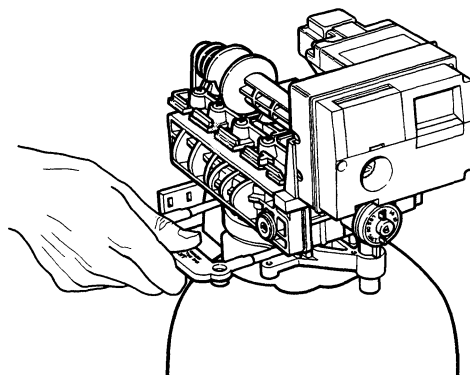


Figure 14-D

6. Using a rocking motion, lift control from the tank adapter (Figure 14-E). If o-Ring seals come off with control, put them back into tank adapter sockets. Lubricate o-Rings with silicone lubricant.

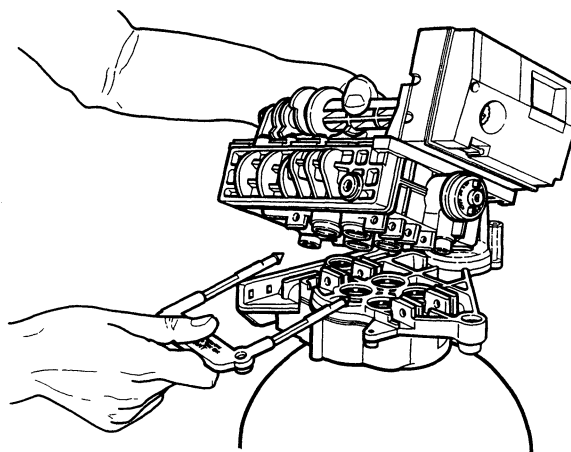
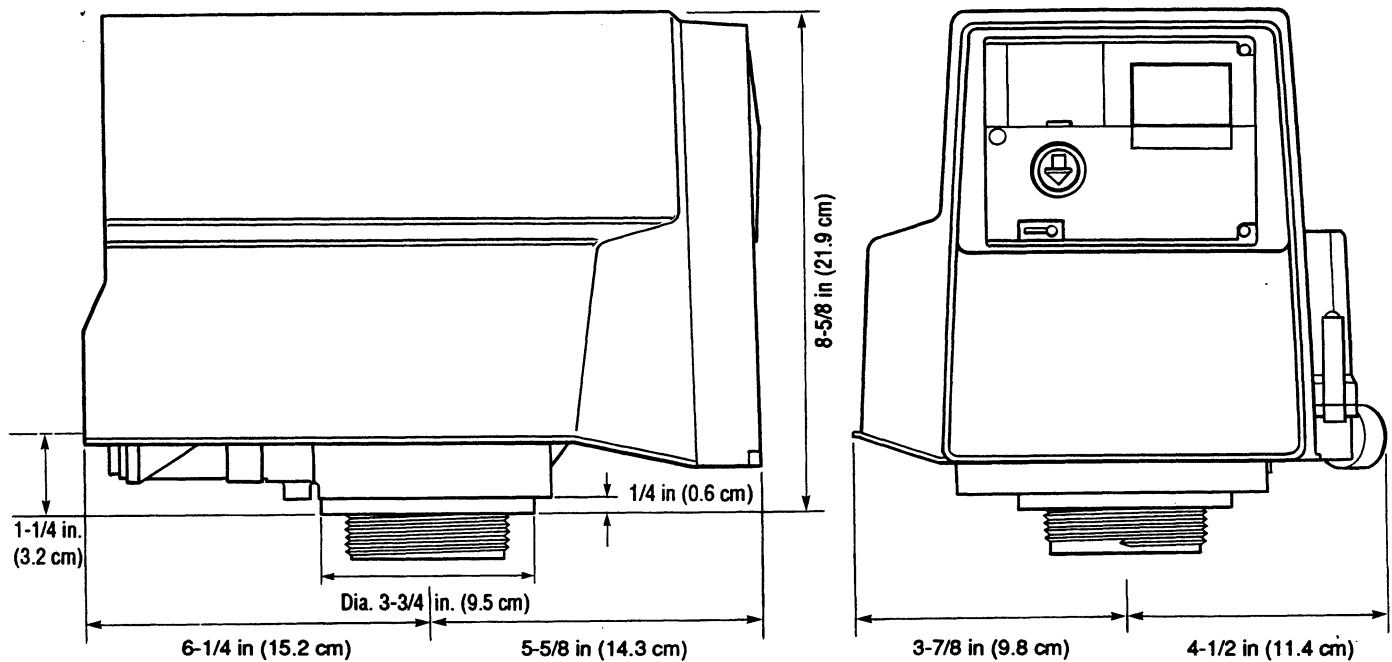


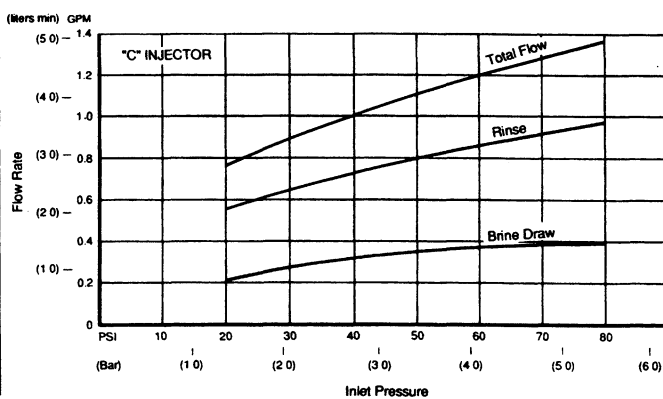
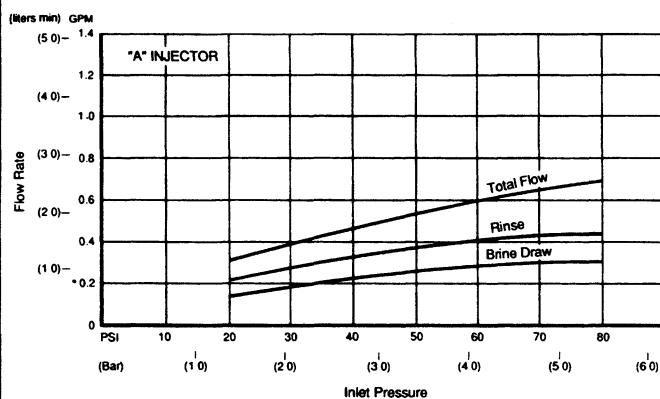
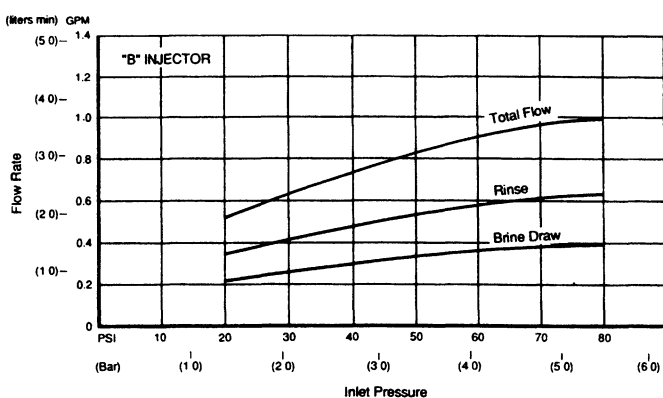
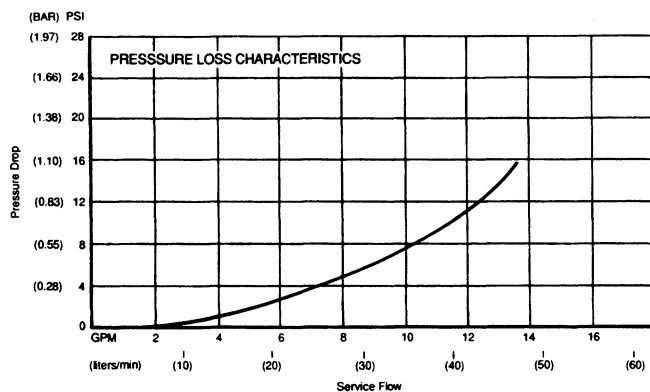
Figure 14-E

7. To replace control module, reverse above procedure.

Specifications

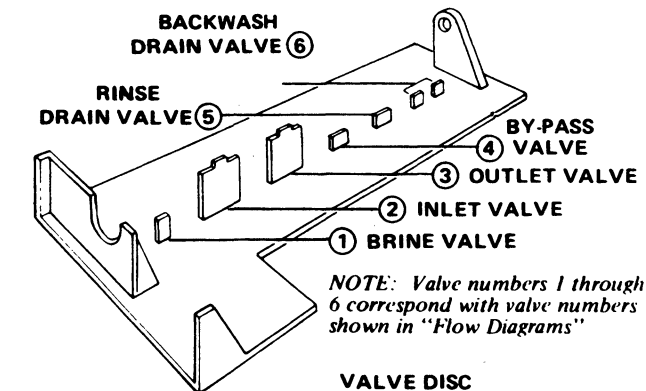


Hydrostatic Test Pressure	300 psi (20.69 BAR)
Working Pressure	20-127 psi (1.38-8.76 BAR)
Standard Electrical Rating	115V 60 Hz
Optional Electrical Rating	115V 50 Hz, 230V 50 Hz, 200V 60 Hz, 24V 60 Hz, 24V 50 Hz, 100V 60Hz, 100V 50 Hz
Electric Cord	60 in (1.5 m) long, 3-wire with plug
Pressure Tank Thread	2 1/2 in -8 male
Brine Line Thread	1/4 in NPT male
Distributor Tube Diameter Required	13/16 in OD (20.6 mm)
Distributor Tube Length	1 1/4 in (31.8 mm) higher than top of mineral tank
Standard Manifold Connection	3/4 in NPT inlet-outlet, 3/8 in NPT drain
Optional Manifold Connections	1 in NPT inlet-outlet, 1/2 in NPT drain; 3/4 in BSPT inlet-outlet, 3/8 in BPST drain; 1 in BPST inlet-outlet, 1/2 in BSPT drain
Optional Bypass Valve	3/4 in (19.1 mm) or 1 in (25.4 mm) copper tailpiece, 1/2 in NPT male drain
Control Module, Tank Adapter, Optional Bypass Valve	Fiberglass reinforced NORYL
Inlet-Outlet Manifold	Brass or glass reinforced NORYL
Rubber Goods	Compounded for cold water service
Brine Refill Control	1 to 10 lbs (0.45 to 4.5 kg) of salt or 3 to 19 lbs (1.3 to 8.6 kg) of salt
Injector Size "A" White	Nozzle .042 in (1.1 mm) Diameter, Throat .089 in (2.3 mm) Diameter
Injector Size "B" Blue	Nozzle .052 in (1.3 mm) Diameter, Throat .099 in (2.5 mm) Diameter
Injector Size "C" Red	Nozzle .059 in (1.5 mm) Diameter, Throat .099 in (2.5 mm) Diameter
Backwash Controllers Available for	6, 7, 8, 9, 10, 12 in (15.2, 17.8, 20.3, 22.9, 25.4, 30.5 cm) diameter mineral tanks. All are sized to flow 4.5 gpm/sq ft (183 l/m/m2) of bed area.

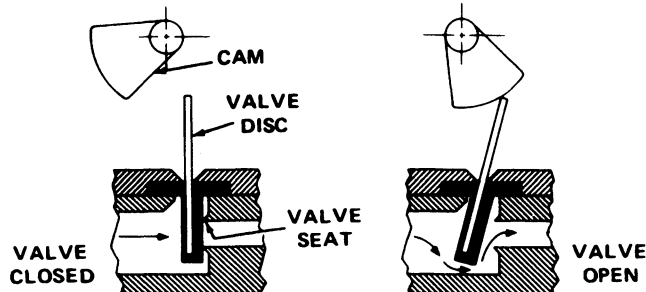


Flow Diagrams

IDENTIFICATION OF CONTROL VALVING



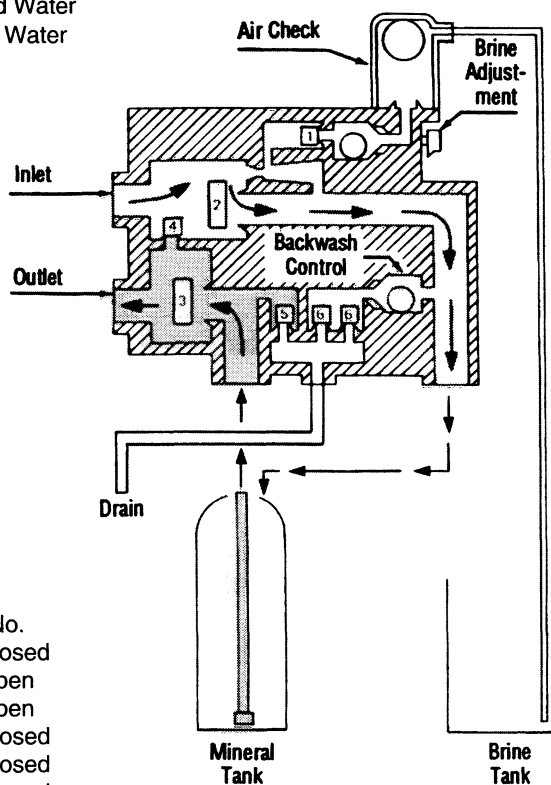
VALVE DISC (PRINCIPLE OF OPERATION)



1 Service Position

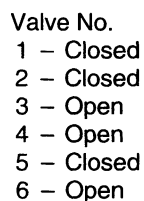
Hard Water

Soft Water

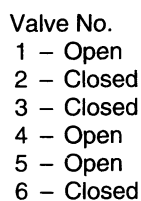


- Valve No.
- 1 - Closed
 - 2 - Open
 - 3 - Open
 - 4 - Closed
 - 5 - Closed
 - 6 - Closed

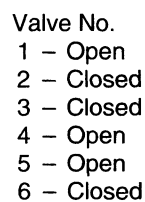
☐ Hard Water
☒ Soft Water



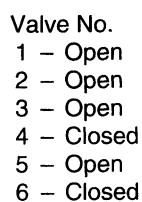
☐ Hard Water
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☐ Hard Water
☒ Soft Water

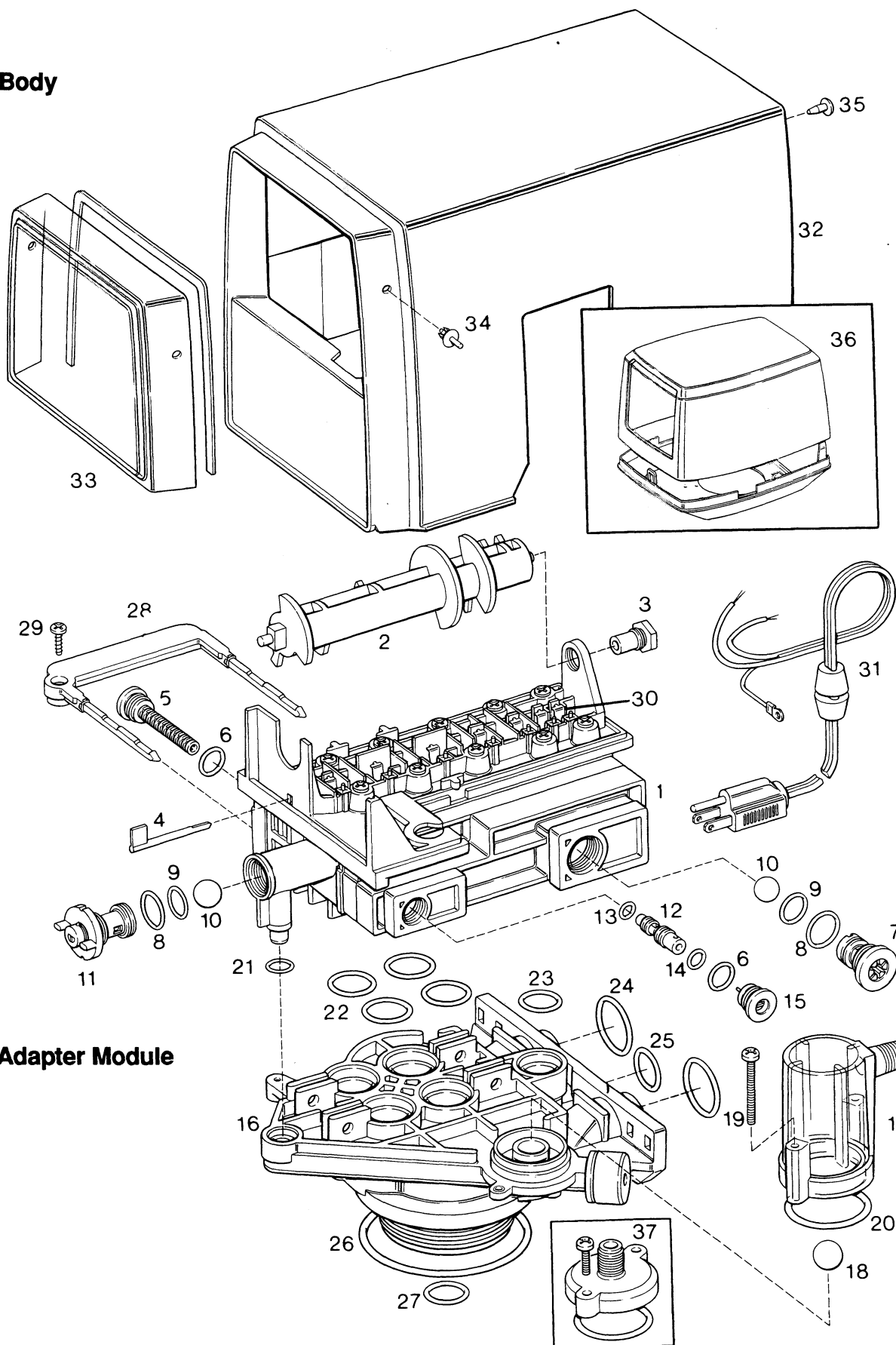


☐ Hard Water
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Replacement Parts

Valve Body

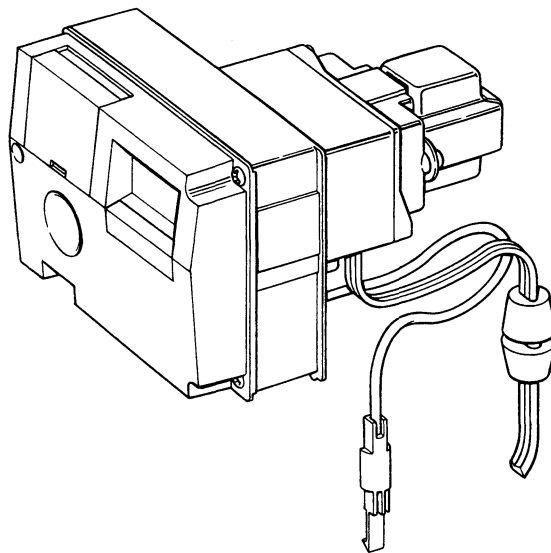


Valve

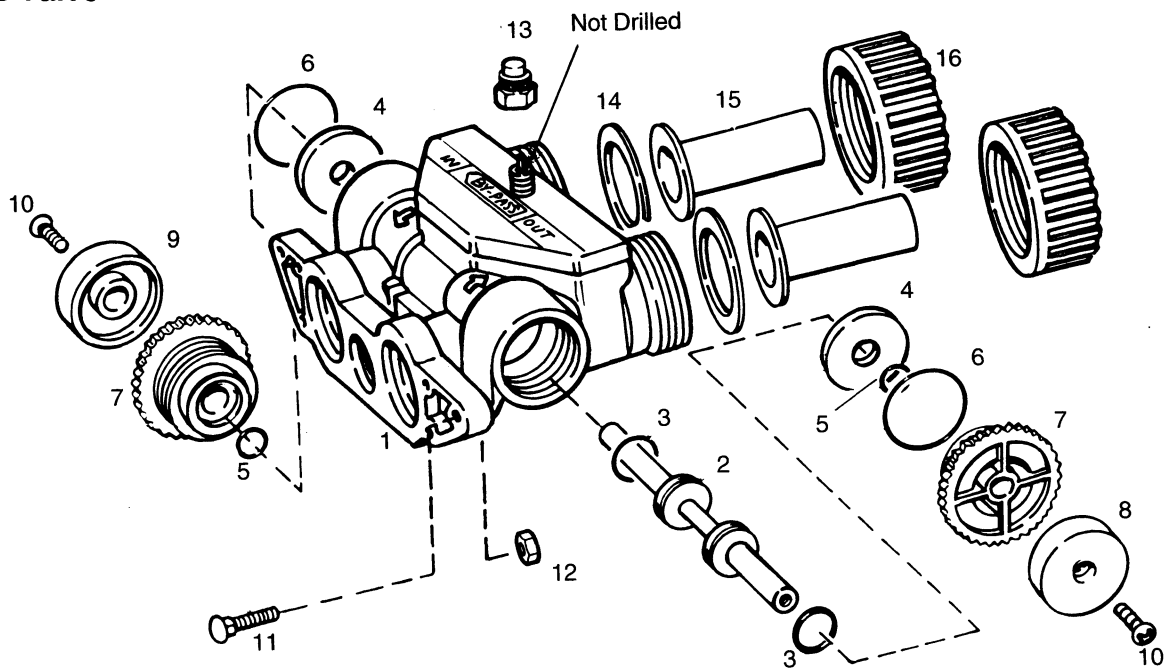
Code	Item No.	Part No.	Description	Qty.	Code	Item No.	Part No.	Description	Qty.
1	24N	155A77	Valve Body Assembly	1	17		100C142-001	Body, Aircheck	1
2			Camshaft:	1	18		150A61	Ball	1
	21F-3	155C174	Standard, One-Piece		19		22A352-039	Screw, No 8-32 x 1.5 in.	2
	21F	155N59	Standard, Segmented		20		40A220	O-Ring	1
	21F-1	155A80	Extra Salt, Segmented		21	32F	40A110	O-Ring	1
	21F-2	155A153	Long Rinse, Segmented		22	35F	40A118	O-Ring	4
3	22F	100A24	Camshaft Bearing	1	23	37F	40A114P1	O-Ring	1
4	5F	150A71	Timer Locking Pin	1	24	38F	40A121	O-Ring	2
5	7F	155A200G4	Screen Cap with O-Ring	1	25	39F	40A115	O-Ring	1
6	6F	40A014	O-Ring	2	26	43F	40A338	O-Ring	1
7			Backwash Control with O-Rings:	1	27	44F	40A210	O-Ring	1
	25F-6	150N151G2	No. 6 for 6 in. Diameter Tank		28	34F	155B169	Locking Bar Available in English, German, French or Japanese Language	1
	25F-7	150N151G3	No. 7 for 7 in. Diameter Tank						
	25F-8	150N151G4	No. 8 for 8 in. Diameter Tank		29	33F	22A132	Screw, No. 8 x 9/16 in.	1
	25F-9	150N151G5	No. 9 for 9 in. Diameter Tank		30	23F-2	155A155P1	Spring	9
	25F-10	150N151G6	No. 10 for 10 in. Diameter Tank		31	90F	25A28	Cord Set, Flat (SPT-2)	1
	25F-12	150N151G7	No. 12 for 12 in. Diameter Tank		32		165D76P4	Valve Cover	1
8	2F	40A017	O-Ring	2	33	109F	460B71	Faceplate - option	1
9	3F	40A015	O-Ring	2	34		22A199	Plastic Rivet	1
10	4F	100A30P1	Ball	2	35		30A35	Cover Clip	1
11			Brine Refill Control:	1	36		HSC-3	High-Style Cover:	1
	1F-10	100N65	1 to 10 lbs. Salt				HSC-4	Beige/Tan	
	1F-19	100N108	3 to 19 lbs. Salt					Black/White	
12			Injector with O-Rings:	1	37		100A140-802	Adapter Kit	1
	28F-AA	150N150G4	"A" Injector - White		*		155A152	Valve Disc Kit	
	28F-BB	150N150G5	"B" Injector - Blue		*		150A129	O-Ring Kit:	
	28F-CC	150N150G6	"C" Injector - Red					40A110 (1), 40A114P1 (1), 40A118 (4)	
13	26F	40A010	O-Ring	1			150A144	O-Ring Kit:	
14	27F	40A011	O-Ring	1				40A115 (1), 40A121(2)	
15			Injector Cap with O-Ring:	1					
	8F-AA	150N150G7	"A" Cap						
	8F-BB	150N150G8	"B" Cap						
	8F-CC	150N150G9	"C" Cap						
16		100C139-701	Tank Adapter Assembly	1					

*Not Shown

460 Timer

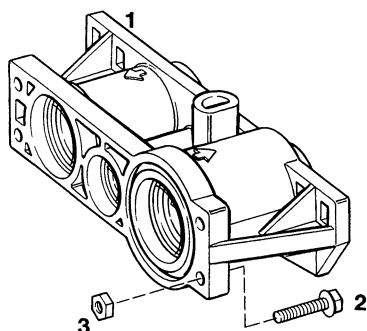


Bypass Valve

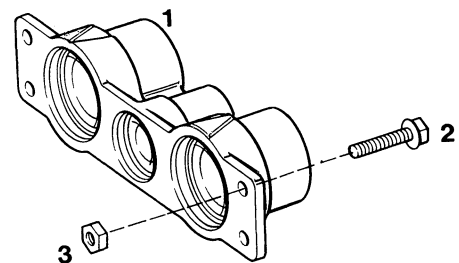


Note: Do not use pipe joint compound when threading pipe into the Noryl piping boss. Use only Teflon® pipe tape. Do not overtighten pipe into Noryl piping boss.

Meter Adapter



Piping Boss



460 Timer

Code	Item No.	Part No.	Description	Qty.
			460 Timer	1

Bypass Valve

Code	Item No.	Part No.	Description	Qty.
1	100N	156N54P1	Bypass Body Assembly	1
2	101N	156N56	Valve Stem with O-Rings	1
3	102N	40A208	O-Ring	2
4	50F	151A16	Washer	2
5	48F	40A012	O-Ring	2
6	49F	40A122	O-Ring	2
7	47F	151A13	End Cap	2
8	46F-2	151A15P2	Knob, Black	1
9	46F-1	151A15P1	Knob, White	1
10	33F	22A132	Screw, No 8 x 9/16 in.	2
11	52N	22A196	Screw, No. 10 -24 x 1 in.	4
12	53F	22A54	Nut, No. 10 - 24	4
13	61F	30A10	Nut, Compression	1
14			Gasket:	2
	54F	156A31	For 1 in. Pipe or Tube	
	54F-1	151A20	For 3/4 in. Pipe or Tube	
15			Plumbing Adapter:	2
	55F-1	151A18	3/4 in. Copper Tube	
	55F-2	151A22	1 in. Copper Tube	
	55F-4	156A40	1 in. NPT, Brass	
	55F-5	156A226	3/4 in. BSPT, Brass	
	55F-6	156A39	1 in. BSPT, Brass	
		156A222	22 mm Copper Tube	
		156A223	28 mm Copper Tube	
		156A231	3/4 in. PVC Pipe	
		156A232	1 in. PVC Pipe	
16			Adapter Nut	2
	56F-1	156A43	For 3/4 in. Copper Tube	
	56F-2	156A44	For 1 in. Copper Tube	
	56F-3	156A32	For 3/4 in. Pipe	
	56F-4	156A38	For 1 in. Pipe	

Piping Boss

Code	Item No.	Part No.	Description	Qty.
1			Kit, Piping Boss (With Hardware):	1
		150A140	3/4 in. NPT, Brass	
		150A141	1 in. NPT, Brass	
		150A142	3/4 in. BSPT, Brass	
		150A143	1 in. BSPT, Brass	
		157A140	3/4 in. NPT, Noryl	
		157A141	1 in. NPT, Noryl	
		157A142	3/4 in. BSPT, Noryl	
		157A143	1 in. BSPT, Noryl	
2	41F	22A93	Screw, No. 10-32 x 9/16 in.	4
3	42F	22A15	Nut, No. 10-32	4

Meter Adapter

Code	Item No.	Part No.	Description	Qty.
1		460C664	Kit, Meter Adapter	1
2	52N	22A196	Screw, No. 10-24 x 1 in.	4
3	53F	22A54	Nut, No. 10-24	4

Preventive Maintenance

Inspect and clean brine tank and screen filter on end of brine pick-up tube once a year or when sediment appears in the bottom of the brine tank .

Injector Screen and Injector

Clean injector screen and injector **once a year** (Figure 16):

1. Unplug electric cord.
2. Shut off water supply or put bypass valve(s) into bypass position and remove cover (Figure 14-A).
3. Relieve system pressure by opening valve No. 6 (at rear) with a screwdriver (Figure 14-B).
4. Using a screwdriver, unscrew and remove screen cap.
5. Clean screen using a fine brush. Flush until clean.
6. Lubricate o-ring with silicone lubricant and reassemble. See CAUTION note.
7. Using a screwdriver, unscrew and remove injector cap.
8. Using needle nose pliers, pull injector straight out.
9. Clean and flush injector.
10. Lubricate all injector o-rings with silicone lubricant.
11. Reinstall injector and push all the way in. Tighten cap. See CAUTION note. Reinstall cover.
12. Plug electric cord into outlet; reset time of day.
13. Open water supply valve or return bypass valve(s) to service position.



Caution

Do not overtighten the plastic cap. Seat the cap lightly into position. Overtightening may cause breakage of the plastic cap that may not be immediately evident.

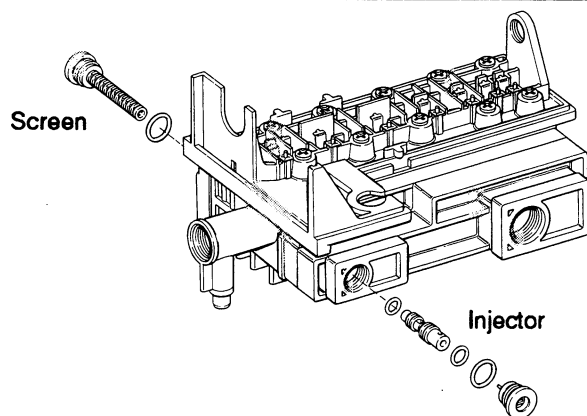


Figure 16

Water Meter

In rare instances, the turbine wheel of the water meter may collect small particles of oxidized iron, eventually preventing the wheel from turning. The turbine wheel may be serviced as follows (Figure 17).

1. Shut off the water supply or put bypass valve(s) into bypass position.
2. Relieve system pressure by opening valve number 6 (at rear) with a screwdriver (Figure 14-B).
3. Loosen and remove the fasteners that hold the meter adapter to the tank adapter and the fasteners that hold the piping boss or bypass valve to the meter adapter.
4. Remove the meter adapter, being careful not to misplace any of the o-rings.
5. Using a needle-nose pliers, grasp one of the four vanes of the gland and, pulling straight out, remove the gland from the adapter.
6. Carefully remove the turbine wheel from the housing. Using a toothbrush, lightly scrub the iron off the magnet. Iron build-up on the wheel surfaces may be removed by soaking the wheel in a mild sodium hydrosulfite (e.g., RoVer*) solution for a few minutes, then flushing thoroughly with water.
7. Carefully reinstall the turbine wheel into the adapter, being certain that the shaft of the wheel seats into the bearing of the adapter and that the "dimple" on the wheel faces you.
8. Carefully reinstall the gland into the adapter, being certain that the shaft of the wheel seats into the bearing of the gland; press the gland all the way in, being sure the wheel rotates freely.
9. Reinstall the meter adapter, o-rings, piping boss or bypass valve, tighten all fasteners and re-establish the water supply to the system
10. Check for proper water meter operation by opening a downstream faucet and observing the water flow indicator light on the 460 display.

*RoVer is a trademark of Hach Chemical Company.

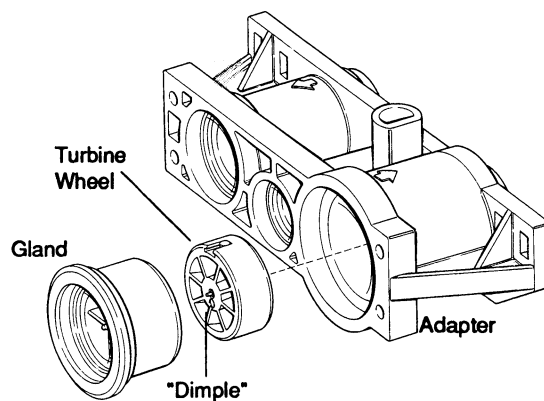


Figure 17

Troubleshooting

The technology upon which the Series 155 / 460 control is based is well established and proven in service over many years. However, should a problem or question arise regarding the operation of the system, the control can be very easily serviced. The control module can be quickly replaced or adjustments can be made at the installation. For parts mentioned, refer to exploded views in the **Replacement Parts** section of this manual

Problem	Possible Cause	Solution
1. Timer does not display time of day	a. Electric cord unplugged. b. No electric power at outlet. c. Defective transformer. d. Defective circuit board.	a. Connect Power. b. Repair outlet or use working outlet. c. Replace transformer. d. Replace timer.
2. Timer does not display Correct time of day.	a. Outlet operated by switch. b. Incorrect voltage or frequency (Hz). c. Power outages.	a. Use outlet not controlled by switch. b. Replace timer with one of correct voltage and frequency (Hz). c. Reset timer.
3. Time display continues to advance.	a. Defective time set switch.	a. Replace timer.
4. Time display shows something other than time of day.	a. Electrical interference. b. Defective circuit board.	a. Disconnect power to unit. Restore power and rest time of day display. b. Replace timer.
5. No water flow display when water is flowing.	a. Bypass valve in bypass. b. Meter probe disconnected or not fully connected to meter housing. c. Restricted meter turbine rotation due to foreign material in meter. d. Defective meter probe. e. Defective circuit board.	a. Shift bypass valve into service position. b. Fully insert probe into meter housing. c. Remove meter housing, free up turbine and flush with clean water. Turbine should spin freely. If not, see Water Meter Maintenance. d. Replace timer. e. Replace timer.
6. Control regenerates at wrong time of day.	a. Power outages. b. Timer set incorrectly.	a. Reset timer to correct time of day. b. Reset timer to correct time of day.
7. Timer stalled in regeneration cycle.	a. Motor dead. b. Motor runs backwards. c. No electric power at outlet. d. Incorrect voltage or frequency (Hz). e. Broken gear. f. Defective switch. g. Air leak in brine connections h. Binding of camshaft. i. Water pressure greater than 125 psi during regeneration. j. Defective circuit board.	a. Replace motor. b. Replace motor. c. Repair outlet or use working outlet. d. Replace timer with one of correct voltage and frequency (Hz). e. Replace timer. f. Replace timer. g. Check all junction points and make appropriate corrections. h. Remove foreign object obstruction from valve discs or camshaft. i. Install pressure regulator. j. Replace timer.
8. Continuous regeneration. Camshaft does not stop at the end of regeneration.	a. Broken projection on red gear. b. Defective switch.	a. Replace timer. b. Replace timer.
9. Control will not regenerate automatically or when red button is depressed.	a. Electric cord unplugged. b. No electric power at outlet. c. Defective motor. d. Broken gear. e. Binding in gear train. f. Defective switch.	a. Connect power. b. Repair outlet or use working outlet. c. Replace motor. d. Replace timer. e. Replace timer. f. Replace timer.
10. Control will not regenerate automatically but will regenerate when red button is depressed.	a. If water flow display is not operative, refer to Item 5. b. Defective circuit board. c. Incorrect hardness and capacity settings.	a. Same as Item 5. b. Replace timer. c. Set to correct values. See Programming section.

11. Run out of soft water between regenerations.	<ul style="list-style-type: none"> a. Improper regeneration. b. Fouled softener resin. c. Incorrect salt setting. d. Incorrect hardness or capacity settings. e. Water hardness has increased. f. Restricted meter turbine rotation due to foreign material in meter housing. g. Excessive water usage below 1/5 gallon per minute. 	<ul style="list-style-type: none"> a. Repeat regeneration making certain that correct salt dosage is used. b. Use resin cleaner. c. Set salt control to proper level. Reference salt setting chart. d. Set to correct values. See Programming section. e. Set hardness to new value. See Programming section. f. Remove meter housing, free up turbine and flush with clean water. Do not disassemble turbine from meter housing. Turbine should spin freely, if not, replace meter. g. Repair leaky plumbing and/or fixtures.
12. Control will not draw brine.	<ul style="list-style-type: none"> a. Low water pressure. b. Restricted drain line. c. Injector plugged. d. Injector defective. e. Valve disc 2 and/or 3 not closed. f. Air check valve prematurely closed. 	<ul style="list-style-type: none"> a. Make correct setting according to instructions. b. Change drain to remove restriction. c. Clean injector and screen. d. Replace injector and cap. e. Remove foreign matter from disc and check disc for closing by pushing in on stem. Replace if needed. f. Put control momentarily into brine refill. Replace or repair air check if needed.
13. Brine tank overflow.	<ul style="list-style-type: none"> a. Brine valve disc 1 being held open. b. Uncontrolled brine refill flow rate. c. Valve disc 2 and/or 3 not closed during brine draw causing brine refill. d. Air leak in brine line to air check. 	<ul style="list-style-type: none"> a. Manually operate valve stem to flush away obstruction. b. Remove variable salt controller to clean it and ball. c. Flush out foreign matter holding disc open by manually operating valve stem. d. Check all connections in brine line for leaks. Refer to instructions.
14. System using more or less salt than salt control is set for.	<ul style="list-style-type: none"> a. Inaccurate setting. b. Foreign matter in controller causing incorrect flow rates. c. Defective controller. 	<ul style="list-style-type: none"> a. Make correct setting. b. Remove variable salt controller and flush out foreign matter. Manually position control to brine draw to clean controller (after so doing position control to "purge" to remove brine from tank) c. Replace defective part.
15. Intermittent or irregular brine draw.	<ul style="list-style-type: none"> a. Low water pressure. b. Defective injector. 	<ul style="list-style-type: none"> a. Set pump to maintain 20 psi at softener. b. Replace both injector and injector cap.
16. No conditioned water after regeneration.	<ul style="list-style-type: none"> a. Unit did not regenerate. b. No salt in brine tank. c. Plugged injector. d. Air check valve closed prematurely. 	<ul style="list-style-type: none"> a. Check for power. b. Add salt to brine tank. c. Remove injector and flush it and injector screen. d. Put control momentarily into brine refill to free air check. Replace or repair air check if needed. Refer to instructions.
17. Control backwashes at excessively low or high rate.	<ul style="list-style-type: none"> a. Incorrect backwash controller used. b. Foreign matter affecting controller operation. 	<ul style="list-style-type: none"> a. Replace with correct size controller. b. Remove controller and clean it and ball.
18. Flowing or dripping water at drain or brine line after regeneration.	<ul style="list-style-type: none"> a. Drain valve (5 or 6) or brine valve (1) held open by foreign matter or particle. b. Valve stem return spring on top plate weak. 	<ul style="list-style-type: none"> a. Manually operate valve stem to flush away obstruction. b. Replace spring.
19. Hard water leakage during service.	<ul style="list-style-type: none"> a. Improper regeneration. b. Leaking of bypass valve. c. O-seal around riser tube damaged. 	<ul style="list-style-type: none"> a. Repeat regeneration making certain correct salt dosage used. b. Replace o-ring. c. Replace o-ring.