

# 2400TS SERIES

## Technical Manual



**Water Treatment Controls**

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# Introduction

The electronic 2400TS is a 4-cycle regeneration control valve for softening of drinking and feed water supplies. The unique motor driven rotor assembly has a minimum of moving parts; together with the 1-piece Noryl® body, this guarantees extremely high flow rates and exceptional reliability. The microprocessor controlled programmer with NOVRAM®, offers unrivalled programming simplicity for use in time clock systems. The control valve is designed for hard water bypass during regeneration. A built in adjustable blending device for mixing hard and soft water to suit the particular needs of each installation, is a standard feature. The valve requires only an aircheck; a conventional float-controlled brine valve system can be used as a double security. The following sequence is followed:

## **1. SERVICE:**

Untreated water flows down through the resin bed and up through the riser tube; the water is conditioned when passing through the resin. The throughput is dependent on the maximum permissible pressure drop for the complete water softener and the maximum permissible specific load of the resin (generally taken as 40 litres soft water per hour per litre resin).

## **2. BACKWASH:**

Water flows down through the riser tube and up through the resin bed to drain; the resin bed is fully expanded and all foreign materials are thoroughly washed from the resin, allowing a good brine cycle to occur.

## **3. BRINE:**

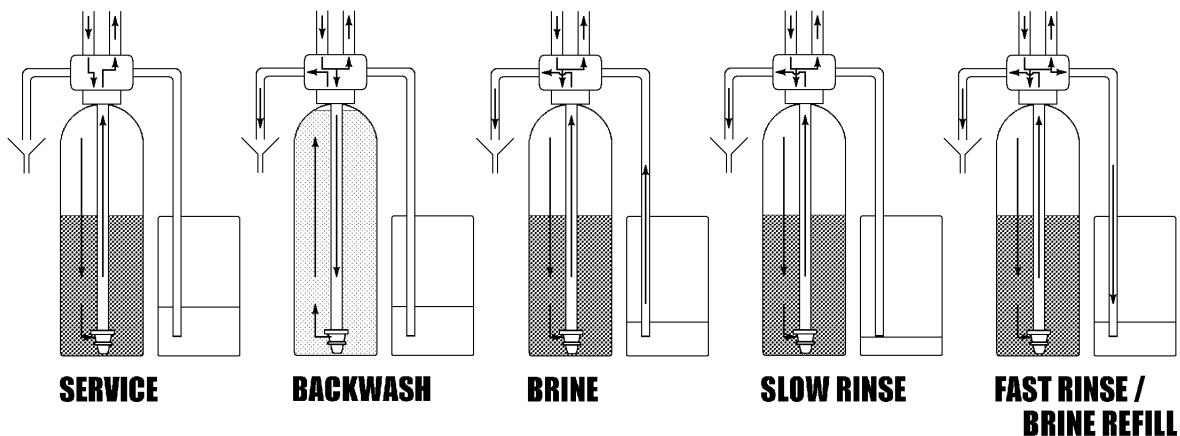
Salt brine, drawn from the brine tank by the injector, slowly flows down through the resin bed and up through the riser tube to drain; the resin is being regenerated when the salt brine passes through. The brine cycle is terminated when the air check is shut.

## **4. SLOW RINSE:**

Slow rinse continues for the remainder of the brine cycle; the injectors motive water slowly flows down through the resin bed and up through the riser tube to drain, slowly washing the brine from the resin tank.

## **5. FAST RINSE/BRINE REFILL:**

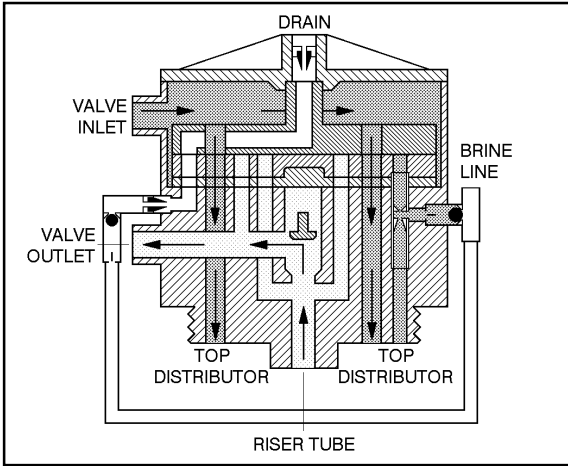
Water flows to the brine tank and at the same time down through the resin bed and up through the riser tube to drain, ensuring that all traces of brine are washed out and that the resin bed is compacted. The resin bed is now ready for the next service cycle.



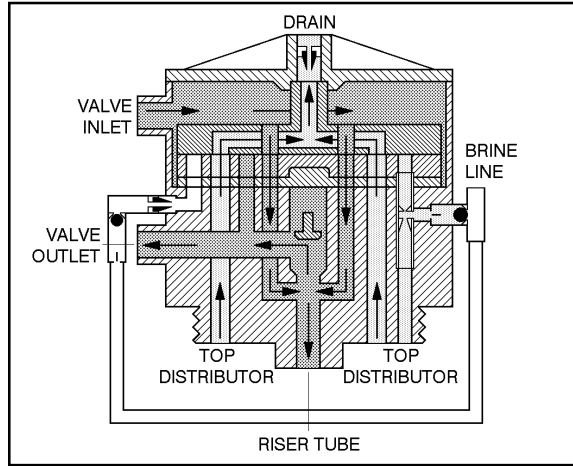
# Technical Specifications

<ul style="list-style-type: none"> <li>• Valve body material</li> <li>• Connections             <ul style="list-style-type: none"> <li>- inlet/outlet (optional)</li> <li>- drain line</li> <li>- brine line</li> <li>- tank</li> <li>- riser tube</li> </ul> </li> <li>• Mixing valve</li> </ul>	<p>Glass filled Noryl®</p> <p>Brass adapters BSP, 3/4" male/female, 1" male 3/4" NPT with hose barb 13 mm Compression fitting 3/8" polytube 2 1/2" - 8 NPSM 1,050" / 26,7 mm Standard</p>
<ul style="list-style-type: none"> <li>• Flow rates (valve with riser)             <ul style="list-style-type: none"> <li>- service</li> <li>- backwash</li> <li>- fast rinse</li> </ul> </li> </ul>	<p>Kv = 5,5 / Cv = 6,4 Kv = 1,7 / Cv = 2,0 Kv = 1,0 / Cv = 1,2</p>
<ul style="list-style-type: none"> <li>• Application</li> </ul>	<p>Softener 7" - 16"</p>
<ul style="list-style-type: none"> <li>• Operating pressure</li> <li>• Operating temperature</li> <li>• Electrical rating</li> </ul>	<p>1,4 - 8,3 bar / 20 - 120 psi 2 - 48 °C / 35 - 120 °F 24V - 50 Hz, max. 400 mA</p>
<ul style="list-style-type: none"> <li>• Regeneration</li> <li>• Controller             <ul style="list-style-type: none"> <li>- software</li> <li>- regeneration initiation</li> <li>- regeneration type</li> <li>- time of regeneration</li> <li>- regeneration interval</li> <li>- backwash</li> <li>- brine draw/slow rinse</li> <li>- fast rinse/brine refill</li> </ul> </li> </ul>	<p>4 cycles, co-current brining Electronic with <math>\mu</math>-processor and NOVAM® EAZY Time clock or manual Delayed Adjustable Adjustable: OFF, 1 - 30 days Adjustable: 0 - 20 min Adjustable: 0 - 120 min Adjustable: 0 - 65 min</p>

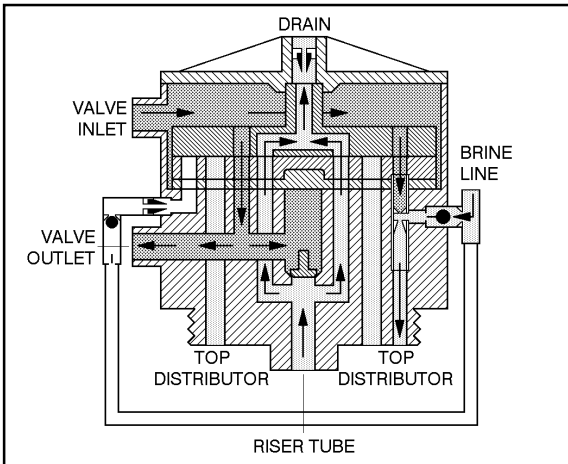
# Flow Diagrams



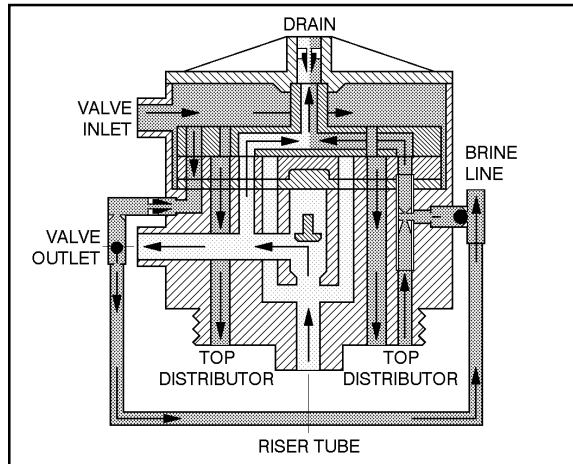
**SERVICE**



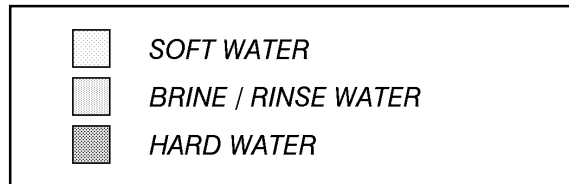
**BACKWASH**



**BRINE / SLOW RINSE**



**FAST RINSE / BRINE REFILL**



# Injector & Flow Control Selection

## Injector

The injector determines the brine concentration (ratio between brine suction and rinse water) and the brine flow through the resin bed, thus the contact time between brine and resin. Injector performances vary significantly with inlet pressure.

Press. inlet bar	Inj. 4 (PURPLE)		Inj. 1 (RED)		Inj. 2 (YELLOW)		Inj. 5 (GREEN)	
	Brine L/min	Rinse L/min	Brine L/min	Rinse L/min	Brine L/min	Rinse L/min	Brine L/min	Rinse L/min
1,38	0,64	0,72	1,32	1,21	1,63	1,86	1,14	3,14
2,07	0,64	0,91	1,63	1,40	1,97	2,08	1,48	3,56
2,76	0,64	0,98	1,82	1,51	2,23	2,27	1,70	3,94
3,45	0,68	1,06	2,01	1,63	2,42	2,46	1,97	4,28
4,14	0,68	1,17	2,04	1,78	2,61	2,65	2,20	4,58

**!!! The following table is only an indication and is valid for an inlet pressure of 3 bar and a bed height of 30".**

Ø Tank		Injector	
inch	mm	Nr.	Colour
7	178	4	PURPLE
8	203	4	PURPLE
9	229	4	PURPLE
10	254	1-4	RED-PURPLE
12	305	1	RED
13	330	1	RED
14	356	2-1	YELLOW-RED
16	406	5-2	GREEN-YELLOW

## Backwash flow control

The backwash flow control determines the resin bed expansion during backwash, independent of the inlet pressure. The optimal bed expansion is generally obtained at a backwash flow of 1,8 L/min per dm<sup>2</sup> of resin bed surface.

Ø Tank		Backwash F.C.	
inch	mm	Nr.	Gal/min (L/min)
7	178	E	1,6 (6,1)
8	203	E	1,6 (6,1)
9	229	G	2,0 (7,6)
10	254	J	2,6 (9,8)
12	305	K	3,5 (13,2)
13	330	L	4,0 (15,1)
14	356	M	5,0 (18,9)
16	406	N	6,0 (22,7)

## **Brine refill flow control**

Together with the time of the fast rinse/brine refill cycle, the brine refill flow control determines the quantity of refill to the brine tank, independent of the inlet pressure:

$$\text{flow control} \times \text{cycle time} = \text{quantity of refill}$$

Do mind that the fast rinse/brine refill cycle can only be set by increments of 1 min!

**!!! The following tables are only an indication and are valid for a brine valve with a refill rate that equals or exceeds the rate of the refill flow control.**

Nr.	Brine refill F.C.		Program: 3 <sup>e</sup> cycle	Quantity of refill
	Gal/min (L/min)		min	L (±10 %)
A	0,25	(1,0)	4	3,8
A	0,25	(1,0)	6	5,7
A	0,25	(1,0)	8	7,6
A	0,25	(1,0)	10	9,5
B	0,5	(1,9)	6	11,4
B	0,5	(1,9)	8	15,1
B	0,5	(1,9)	10	18,9
D	1,0	(3,8)	6	22,7
D	1,0	(3,8)	8	30,3
D	1,0	(3,8)	10	37,9
D	1,0	(3,8)	12	45,4
/	K <sub>v</sub> = 0,27		/	/

∅ Tank		Brine refill F.C.
inch	mm	Nr.
7	178	A-B
8	203	A-B
9	229	B
10	254	B-D
12	305	D
13	330	D
14	356	D
16	406	/

# Installation

## Assembly

For proper assembly of control valve and resin tank, proceed as follows:

1. Rinse the resin tank well before use.
2. Attach the lower distributor to the riser tube using PVC-glue or a stainless steel pin.
3. Lower the riser tube into the resin tank so that it touches the bottom.
4. Cut the riser tube 13 mm (= 1/2") below the top of the tank threads and chamfer the tube to prepare for insertion into the control valve.
5. Temporary plug the top of the riser tube to prevent resin from entering the tube and fill the tank with resin for max. 3/4 full.
6. Make sure the O-ring in the riser insert of the control valve is in the correct position; screw the upper distributor onto the control valve.
7. Lubricate the threads, the top of the riser tube and the tank O-ring of the control valve.
8. Lower the control valve straight down onto the riser tube and screw it onto the tank.

## Installation

### !!! ATTENTION

- For proper functioning of the unit, incoming water pressure should be between a minimum of 1,4 bar during regeneration and a maximum of 8,3 bar in service; if necessary, a pressure reducer must be installed ahead of the system.
- Installation must only be undertaken by a person competent in plumbing.
- All plumbing and electrical connections must be done in accordance with local codes.
- Do not install the unit too close to a water heater (min. 3 m of piping between outlet of unit and inlet of heater); water heaters can sometimes transmit heat back down the cold pipe into the control valve; always install a check valve at the outlet of the system.
- If the control valve is not equipped with a bypass, a three valve bypass system must be installed to enable bypassing during servicing.


For proper installation of the unit, proceed as follows:

1. **Inlet/outlet:** connect the inlet and outlet to the control valve; when facing the front of the control valve, the inlet is at the left and the outlet at the right side.
2. **Drain line:** connect a hose to the drain line fitting on the control valve and secure it; insert the drain hose into a standpipe, with siphon if required; make sure the drain hose is:
  - as short as possible,
  - not elevated too much,
  - free of kinks,as this will all create undesired counter-pressure.
3. **Brine line:** an aircheck is required for proper brining during regeneration, but a float-controlled brine valve system can be used as a double security; 3/8" polytube must be used to connect the brine system to the control valve; do not overtighten the nut.
4. **Transformer:** make sure the power source carries the same rating as the transformer; plug transformers output lead (with plug  $\varnothing$  2,5 mm x 5,5 mm) into socket at the timers power lead and plug transformer into socket; the connection can be secured by means of the wire clip.



## Installation check-out



When installation has been completed, the unit is ready to be placed into service. Proceed as follows, while checking the unit for any leakages:

1. Place unit in bypass and turn on main water supply; open a cold water tap nearby and allow water to run for a few minutes until all foreign material that may have resulted from the installation is washed out; close the tap.
2. Slowly shift the bypass valve to the service position and secure it; allow water to completely fill the resin tank.
3. Carefully open a cold water tap and allow water to run for at least 2 minutes to set the resin bed and purge air from the unit; close the tap.
4. Program the control valve according to the specific installation (refer to “Programming” on pg. 11).
5. Push the **scroll**  button until the display shows:


**Regen in 10 sec**

6. Leave the control valve in this position; the countdown timer will countdown to 0 sec and start a regeneration.
7. The motor will start and the display will show:

**Rgn:XX Cyc1:YY**

8. You can push the **scroll**  button again to switch the motor to full speed, which will shorten the transfer time needed by the control valve to reach the next position.
9. The motor will move the control valve into backwash position; allow water to run to drain until all of the air is purged from the system.
10. Fill the brine tank with water, higher than the air-check level.
11. Push the **scroll**  button; the motor will start and the display will show:

**Rgn:XX Cyc2:YY**

12. The motor will move the control valve into brine/slow rinse position; allow it to draw water from the brine tank until the aircheck closes.
13. Push the **scroll**  button; the motor will start and the display will show:

**Rgn:XX Cyc3:YY**

14. The motor will move the control valve into fast rinse/brine refill position; allow water to run to drain and brine tank for the entire cycle time, to fill the brine tank to the programmed level.
15. Add salt to the brine tank.

## Mixing valve

To adjust the residual hardness, the incorporated mixing valve must be regulated in function of the hardness of the incoming water and the desired residual hardness

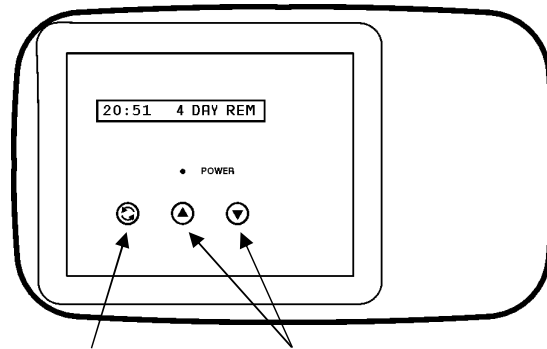
- To increase the residual hardness: turn screw counter clockwise.
- To decrease the residual hardness: turn screw clockwise.

# The Electronic Timer

## Basic features

### Control pad

The electronic timer uses a Printed Circuit Board (PCB), equipped with a microprocessor and NOVRAM®. All programming is done by use of the 3-button control pad with LCD-display.

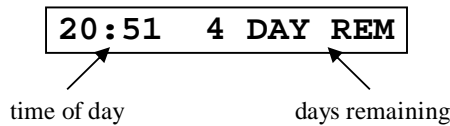


*scroll button*  
to advance  
through the  
parameters

*up / down buttons*  
to adjust the  
value of the  
parameter

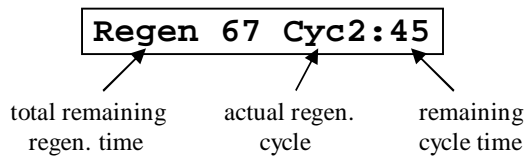
### Service mode

In **service mode** the display shows the time of day and the number of days remaining until the next regeneration:



### Regeneration mode

In **regeneration mode** the display shows the total remaining regeneration time, the actual regeneration cycle and the remaining cycle time:



The control valve can be **reset to service mode** at any time by pushing the *scroll* ⏪ button, as such manually advancing it through the regeneration cycles.

### Power failure

In the event of a power failure, the program remains stored in the NOVRAM® during an undefined period, while an incorporated SuperCap (capacitor) will maintain the correct time of day during a period of several hours; consequently, in case of prolonged power failure, the time of day might not be maintained; if this happens, the time of day indication will, when the power supply is re-established, be *flashing*, indicating that the time of day needs to be set; refer to “Programming instructions for the End-User level” to set the correct time of day.

When the power failure occurs during the execution of an automatic regeneration, the control valve will remain in its last position; when the power supply is re-established, the control valve will return to the service position, stay there for 60 sec. and restart a complete regeneration from the beginning.

**Timer failure**

In the event of a timer failure, the display will show the message:

**Service Required**

In such case, entering one of the programming levels can possibly solve the problem. However if the problem persists, professional service is required.

## Programming

### !!! ATTENTION

- During programming, it is necessary to enter the desired change within 60 sec. Otherwise the microprocessor will automatically break off the programming and return to the service mode, *while all possibly entered changes to the program are lost*. If this occurs, it will be necessary to re-initiate the programming process.
- All programming parameters are grouped into different user-specific levels (End-User / Parameter Set / Diagnostics). The end-user level is accessible freely; in order to access one of the other specific levels, the proper access code, i.e. key sequence, needs to be entered.
- In the programming modes, a *flashing* indication implicates that this parameter can be adjusted by pushing the *up* ▲ button or *down* ▼ button; in this technical manual this is indicated by means of an *italic* font.

### Programming instructions for the End-User level

The basic configuration of the unit has been pre-programmed; the End-User level allows the end-user to rapidly program the operating parameters, according to his own specific situation.

- Make sure that the control valve is in the service mode.
- Push the *scroll* ⌂ button; the display will show:

Set time: 20:51

- Push the *up* ▲ button or *down* ▼ button to *set the time of day*.
- Push the *scroll* ⌂ button again; the display will show:

Interval:XX Days


- Push the *up* ▲ button or *down* ▼ button to *set the number of days between regenerations*.
- Push the *scroll* ⌂ button again; the display will show:

Regen in 10 sec

- If the control valve is left in this position, the countdown timer will countdown to 0 sec and *start a regeneration*.
- To cancel this mode, push the *scroll* ⌂ button before the countdown timer has reached 0 sec; the control valve will return to the service mode.

### Programming instructions for the Parameter Set level




In the Parameter Set level the basic configuration parameters of the unit can be programmed, depending on the specific configuration of the unit.

- Make sure that the control valve is in the service mode.
- Push the *scroll*  button and hold it for 5 sec until the display shows:




**System Check**

- Within 10 sec, push the *up*  button; the display will show:




**Cycle 1: 10 min**

- Push the *up*  button or *down*  button to *set the length of the backwash cycle* from 0 to max. 20 min.
- Push the *scroll*  button again; the display will show:




**Cycle 2: 60 min**

- Push the *up*  button or *down*  button to *set the length of the brine/slow rinse cycle* from 0 to max. 120 min.
- Push the *scroll*  button again; the display will show:



**Cycle 3: 5 min**

- Push the *up*  button or *down*  button to *set the length of the fast rinse/brine refill cycle* from 0 to max. 65 min.
- Push the *scroll*  button again; the display will show:

**Regen @ 2:00**

- Push the *up*  button or *down*  button to *set the time of regeneration*.
- Push the *scroll*  button again; the display will show:

**Exit**

- Push the *up*  button or *down*  button to save the program to the NOVRAM® and exit the Parameter Set level.

## Diagnostics level

Besides of all programming parameters, a series of operating parameters can be consulted in the diagnostics level; particularly during a service intervention, these parameters can be helpful to identify the cause of a problem.

### 1. Accessing the Diagnostics level:

- Make sure that the control valve is in the service mode.
- Push the *scroll* ⤴ button and hold it for 5 sec until the display shows:

System Check

- Within 10 sec, push the *down* ⬇ button; the display will show:

In Srvc      Xdays

- You are now in the Diagnostics level; use the *scroll* ⤴ button to advance through the different diagnostics parameters.

### 2. Exiting the Diagnostics level:

- If no button is pushed within a time frame of 5 minutes, the microprocessor will exit the diagnostics level and return to the service mode.
- Push the *scroll* ⤴ button until the display shows:

Exit

- Push the *up* ⬆ button or *down* ⬇ button to exit the Diagnostics level.

### 3. Available diagnostic parameters:

- **In Srvc:** displays show many days the unit has been in service.
- **# of Regens:** display shows the number of regenerations that have taken place since installation.
- **MP Resets:** display shows the number of resets of the microprocessor (*for factory purpose only*).
- **Memory Reset:** display shows the number of corrupt memory start-ups (*for factory purpose only*).
- **EZ:** display shows the software version (*for factory purpose only*).



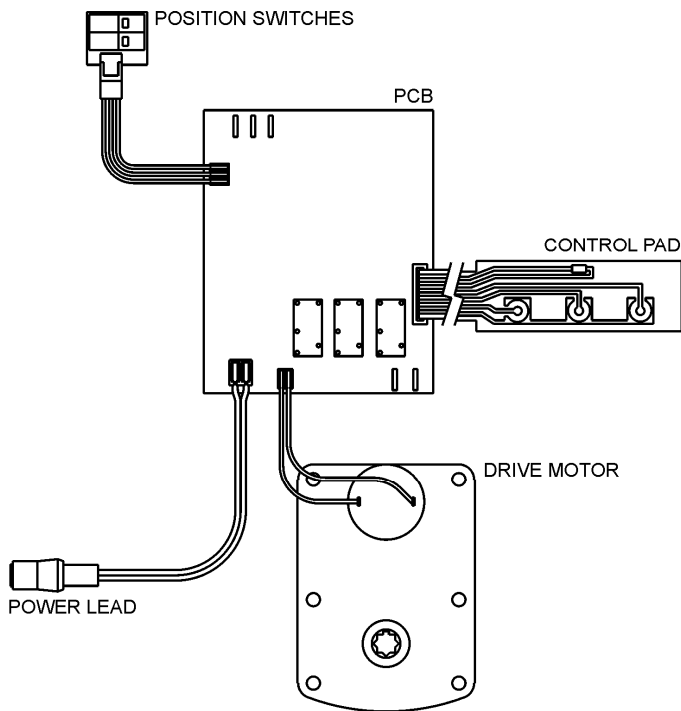
# Parts Replacement

## !!! BEFORE SERVICING:

- **MAKE SURE THE CONTROL VALVE IS IN SERVICE POSITION**
- **DISCONNECT ALL ELECTRICAL POWER TO THE UNIT**
- **BYPASS OR DISCONNECT THE WATER SUPPLY**
- **RELIEF THE WATER PRESSURE**

## Printed Circuit Board

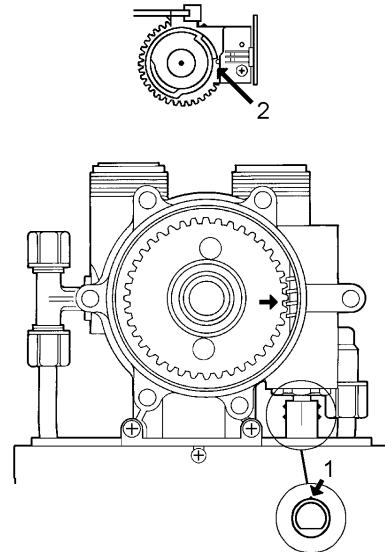
1. Loosen the 3 front cover screws and remove the front cover.
2. Disconnect all connectors from the PCB.
3. Remove the flat cable of the 3-button control pad from the push-in connection on the PCB.
4. Remove the screws holding the PCB in place.
5. Push aside the clip holding the PCB in place and remove the PCB.
6. Reverse the procedure for reassembly; refer to wiring diagram for proper lead connections.





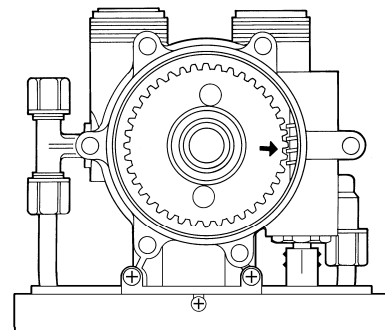
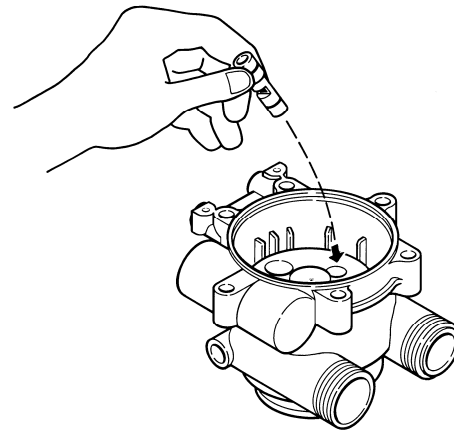
## Drive motor

1. Remove the timer head assembly; refer to Parts Replacement “Timer head assembly”.
2. Loosen the 3 front cover screws and remove the front cover.
3. Disconnect the wire connector from the drive motor.
4. At the back of the back plate, remove the 2 screws holding the drive motor assembly in place and remove the micro switch assembly and drive motor.
5. Remove the retaining ring securing the worm and remove the worm from the drive shaft.
6. Pull the drive shaft out of the drive motor.
7. Install the drive shaft in the drive motor, with the flat side on the drive shaft pointing down (mark on the drive shaft pointing up (1)).
8. Install the worm on the drive shaft and install the retaining ring securing the worm.
9. Put the micro switch assembly on the drive motor; make sure the switch cam is in the service position (2).
10. Install the micro switch assembly and drive motor on the back plate and secure it with the 2 screws.
11. Connect the wire connector on the drive motor; refer to wiring diagram for proper connection.
12. It is now necessary to check the synchronisation of valve body and timer head; refer to to Parts Replacement “Synchronising valve body and timer head”.



## Injector

1. Remove the drain hose from the drain elbow.
2. Remove the 6 bolts holding the valve body and cover together.
3. Lift the valve cover away from the valve body.
4. Remove the rotor assembly from the valve cover; the white Teflon O-ring will remain in the valve cover.
5. Remove the seal plate from the valve body.
6. Remove the insert plate and gasket from the valve body.
7. Using a needle nose pliers grasp one side of the injector and pull the injector straight out of the valve body.
8. Make sure the float valve is straight up into the float chamber of the valve body.
9. Install the insert plate and gasket in the valve body.
10. Lightly lubricate the O-rings of the new injector with a soap water solution.
11. Install the injector with one of the rectangular openings on the injector facing directly towards the centre of the valve body; push the injector firmly down.
12. Install the seal disk in the valve body, with the green side facing up.
13. Install the rotor assembly into the valve body ensuring that the arrow on the worm gear is pointing directly towards the second tooth on the worm drive shaft (facing the front of the control valve); the 2 holes in the rotor assembly should now be exactly aligned with the corresponding holes in the seal disk.
14. Centre the PVC sleeve on the worm gear.
15. Make sure the valve cover O-ring is clean and securely installed around the raised rib on the valve cover.
16. Lower the valve cover straight down onto the valve body and press it down firmly and evenly to seat the valve cover.
17. Install the 6 bolts and tighten them in a cross pattern.
18. Install the drain hose to the drain line fitting.



### **Backwash flow control**

1. Remove the drain hose from the drain elbow and remove the drain elbow.
2. Unscrew the backwash flow control using a 3/8" Allen wrench.
3. Reverse the procedure for reassembly.

### **Brine refill flow control**

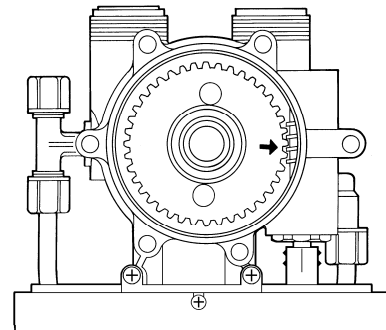
1. Remove the clip securing the refill elbow.
2. Remove the brine refill flow control from the refill elbow.
3. Reverse the procedure for reassembly.

### **Brine tee**

1. Remove the brine line and brine refill tube from the brine tee.
2. Remove the brine tee by turning it counter clockwise.
3. Remove the O-ring, the retainer and check ball from the brine tee.
4. Reverse the procedure for reassembly.

### **Rotor assembly**

1. Remove the drain hose from the drain elbow.
2. Remove the 6 bolts holding the valve body and cover together.
3. Lift the valve cover away from the valve body.
4. Remove the rotor assembly from the valve cover; the white Teflon O-ring will remain in the valve cover.
5. Inspect the rotor plate's surface; it should be smooth and free of any circular grooves or scratches; replace if necessary.
6. Install the rotor assembly into the valve body ensuring that the arrow on the worm gear is pointing directly towards the second tooth on the worm drive shaft (facing the front of the control valve); the 2 holes in the rotor assembly should now be exactly aligned with the corresponding holes in the seal disk.
7. Centre the PVC sleeve on the worm gear.
8. Make sure the valve cover O-ring is clean and securely installed around the raised rib on the valve cover.
9. Lower the valve cover straight down onto the valve body and press it down firmly and evenly to seat the valve cover.
10. Install the 6 bolts and tighten them in a cross pattern.
11. Install the drain hose to the drain line fitting.

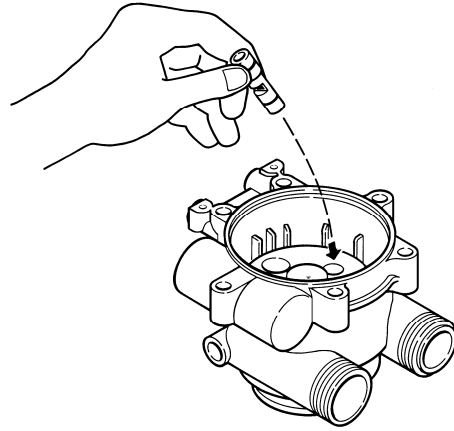


### **Seal disk**

1. Remove the rotor assembly; refer to Parts Replacement "Rotor assembly".
2. Remove the seal disk from the valve body.
3. Inspect the seal disk; make sure the raised ribs are intact; the green Teflon coating may be worn off of the ribs, but this won't affect the sealing performance of the seal disk; replace if necessary.
4. Use silicone base lubricant to lubricate the green side of the seal disk.
5. Install the seal disk in the valve body, with the green side facing up.
6. Reverse the procedure for reassembly; refer to Parts Replacement "Rotor Assembly".

## **Gasket**

1. Remove the seal disk; refer to Parts Replacement “Seal disk”.
2. Remove the insert plate and gasket from the valve body
3. Inspect the insert plate; make sure the ribs are intact.
4. Using a needle nose pliers grasp one side of the injector and pull the injector straight out of the valve body.
5. Clean the surface of the valve body.
6. Make sure the float valve is straight up into the float chamber of the valve body.
7. Install the insert plate and gasket in the valve body.
8. Install the injector with one of the rectangular openings on the injector facing directly towards the centre of the valve body; push the injector firmly down.
9. Reverse the procedure for reassembly; refer to Parts Replacement “Seal disk”.



## **Float valve**

1. Remove the gasket; refer to Parts Replacement “Gasket”.
2. Remove the float valve straight out of the float valve chamber of the valve body.
3. Remove the spring from the float valves shaft.
4. Clean all sealing surfaces inside of the float chamber.
5. Install the spring inside of the float valves shaft.
6. Install the float valve straight up into the float chamber of the valve body.
7. Reverse the procedure for reassembly; refer to Parts Replacement “Gasket”.

## **Timer head assembly**

1. Remove the 2 back plate mount screws and take away the timer head assembly.
2. Reverse the procedure for reassembly.


## **Worm drive shaft**

1. Remove the timer head assembly; refer to Parts Replacement “Timer head assembly”.
2. Unscrew the packing gland nut.
3. Remove the packing gland nut/worm drive shaft from the valve body.
4. Separate the packing gland nut from the worm drive shaft.
5. Inspect the worm drive shaft; the threads should not be deformed or damaged; replace if necessary.
6. Install the worm drive shaft in the valve body, by turning it clockwise as far as possible.
7. Lubricate the O-rings of the worm drive shaft.
8. Install the packing gland nut over the worm drive shaft and screw it into the valve body.
9. Install the timer head assembly to the valve body and tighten the 2 back plate mount screws.
10. It is now necessary to check the synchronisation of valve body and timer; refer to Parts Replacement “Synchronising valve body and timer head”.

### Synchronising valve body and timer head

To insure the proper operation of the control valve, valve body and timer head should be synchronised in the service position. Proceed as follows:

#### Step 1: Timer head

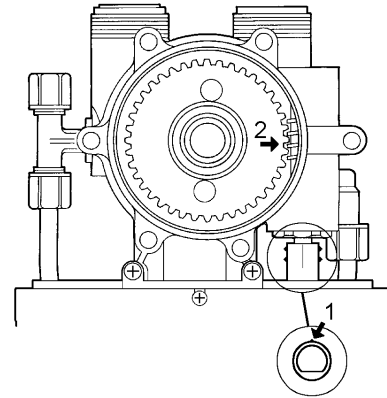
1. Make sure that the control valve is in the service mode; if the control valve is in regeneration, push the **scroll**  button, thus manually advancing it through the regeneration cycles, until the display shows the time of day:

**20:51 4 DAY REM**

2. The flat side on the drive shaft should be pointing down (mark on the drive shaft pointing up (1)); if this is not the case: refer to Parts Replacement “Drive motor”.

#### Step 2: Valve body

1. Remove the drain hose from the drain elbow.
2. Remove the 6 bolts holding the valve body and cover together.
3. Lift the valve cover away from the valve body.
4. Make sure the arrow on the worm gear is pointing directly towards the second tooth on the worm drive shaft (facing the front of the control valve) (2); the 2 holes in the rotor assembly should now be exactly aligned with the corresponding holes in the seal disk.
5. Make sure the valve cover O-ring is clean and securely installed around the raised rib on the valve cover.
6. Lower the valve cover straight down onto the valve body and press it down firmly and evenly to seat the valve cover.
7. Install the 6 bolts and tighten them in a cross pattern.
8. Install the drain hose to the drain line fitting.





# **Troubleshooting**

## **Hard (untreated) water to service**

<b>Cause</b>	<b>Solution</b>
1. Open or defective bypass	1. Close or verify bypass
2. Control valve in regeneration	2. /
3. Leak between rotor and seal disk	3. Verify or replace rotor and seal disk
4. Loss of resin	4. Refer to problem "Loss of resin"
5. Mixing valve open	5. Reduce mixing valve opening
6. Change in raw water hardness	6. Adjust programming accordingly
7. Valve body and timer out of synchronisation	7. Synchronise valve body and timer
8. Unit fails to regenerate	8. Refer to problem "Unit fails to regenerate"
9. Control valve fails to draw brine	9. Refer to problem "Control valve fails to draw brine"
10. Decreasing exchange capacity of resin	10. Clean or replace resin bed
11. No salt in brine tank	11. Add salt
12. Leak at riser tube	12. Verify that riser tube is seated correctly and is not cracked

## **Unit fails to regenerate**

<b>Cause</b>	<b>Solution</b>
1. Faulty electrical supply	1. Verify electrical service (fuse, transfo,...)
2. Defective PCB	2. Replace PCB
3. Defective drive motor	3. Replace drive motor
4. Defective micro switch	4. Replace micro switches

## **Control valve fails to draw brine**

<b>Cause</b>	<b>Solution</b>
1. Low inlet pressure	1. Verify operating pressure; must exceed 1,4 bar
2. Plugged injector	2. Clean injector
3. Restricted drain line	3. Verify drain line for kinks, verify backwash flow control to insure it is free of debris
4. Restricted brine line	4. Verify brine line for kinks or restrictions
5. Leak in brine line	5. Verify brine line and connections for air leakage
6. Not enough water in brine tank	6. Refer to problem "Control valve fails to refill brine tank"

## **Control valve cycles continuously**

<b>Cause</b>	<b>Solution</b>
1. Defective or shorted micro switch	1. Replace micro switches

## **Excessive water in brine tank**

<b>Cause</b>	<b>Solution</b>
1. Control valve fails to draw brine	1. Refer to problem "Control valve fails to draw brine"
2. Improper fast rinse/brine refill time setting	2. Verify that fast rinse/brine refill time corresponds to the proper salt level and amount of resin
3. Improper or missing brine refill flow control	3. Verify that flow control is installed and properly sized
4. Leak between rotor and seal disk	4. Verify or replace rotor and seal disk

## **Control valve fails to refill brine tank**

<b>Cause</b>	<b>Solution</b>
1. Improper fast rinse/brine refill time setting	1. Verify that fast rinse/brine refill time corresponds to salt level and amount of resin
2. Improper refill flow control	2. Verify that flow control is properly sized
3. Plugged refill flow control	3. Verify that flow control is free of debris

## **Unit uses too much salt**

<b>Cause</b>	<b>Solution</b>
1. Excessive water in brine tank	1. Refer to problem "Excessive water in brine tank"
2. Unit regenerates too frequently	2. Verify program

## **Salt water to service**

<b>Cause</b>	<b>Solution</b>
1. Excessive water in brine tank	1. Refer to problem "Excessive water in brine tank"
2. Injector undersized	2. Verify injector selection
3. Improper brine/slow rinse time setting	3. Verify that brine/slow rinse time corresponds to the proper salt level and amount of resin
4. Improper fast rinse/brine refill time setting	4. Verify that fast rinse time corresponds to the proper salt level and amount of resin

## **Loss of resin through drain line**

<b>Cause</b>	<b>Solution</b>
1. Improper or missing backwash flow control	1. Verify that flow control is installed and correctly sized
2. Lower and/or upper distributor damaged	2. Replace distributor(s)
3. Leak between riser tube and upper distributor	3. Verify that riser tube is seated correctly and is not cracked

## **Loss of water pressure**

<b>Cause</b>	<b>Solution</b>
1. Mineral or iron build-up in resin tank	1. Clean resin bed and control valve; increase regeneration frequency
2. Plugged lower and/or upper distributor	2. Verify that distributors are free of debris
3. Crushed lower and/or upper distributor	3. Replace distributor(s)

## **Drain flows continuously**

<b>Cause</b>	<b>Solution</b>
1. Defective PCB	1. Replace PCB
2. Defective micro switch	2. Replace micro switches
3. Defective drive motor	3. Replace drive motor
4. Valve body and timer out of synchronisation	4. Synchronise valve body and timer
5. Leak between rotor and seal disk	5. Verify or replace rotor and seal disk



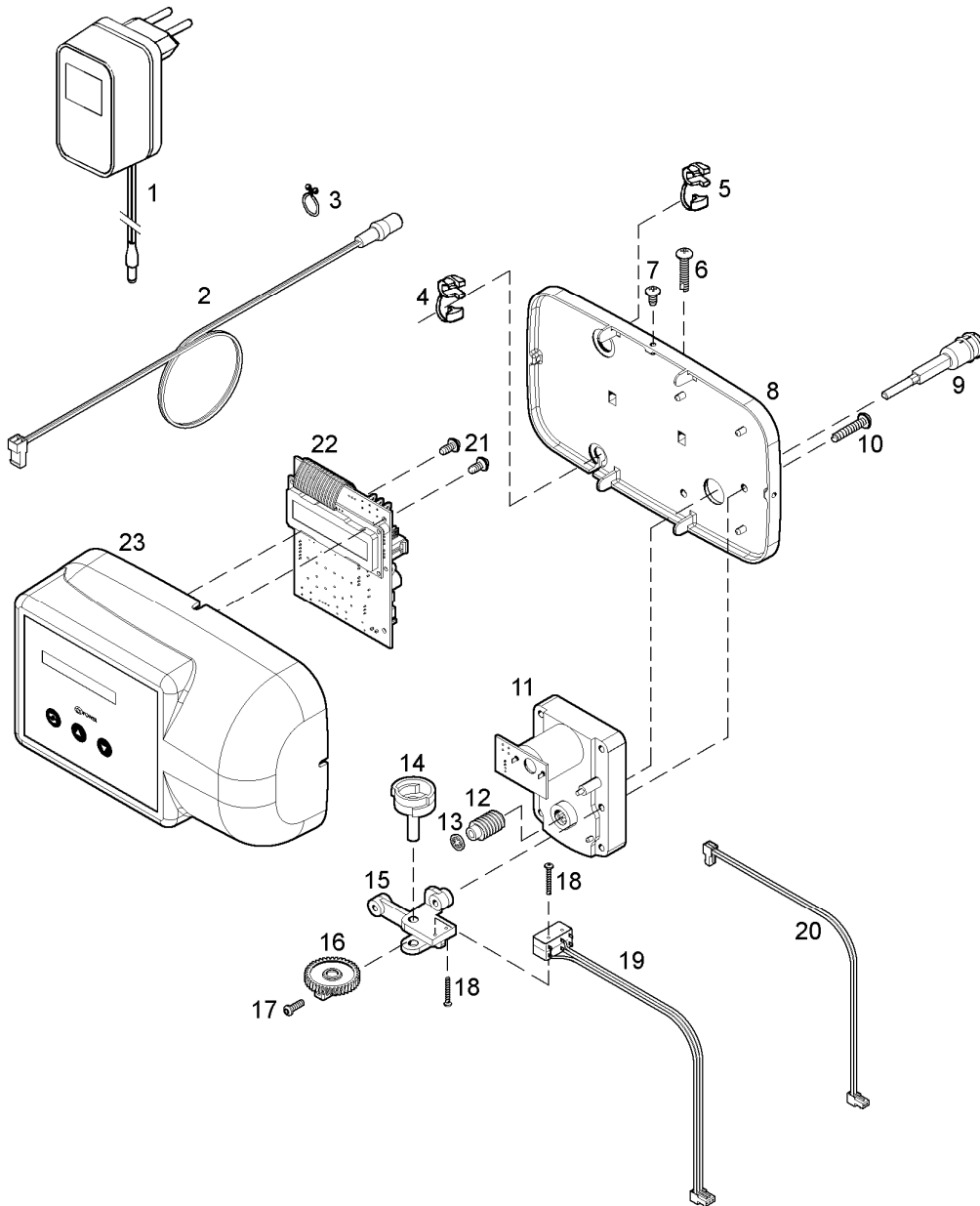
## Annual Maintenance

To assure the correct functioning of the control valve, the following items must be checked annually:

1. Clean out injector.
2. Clean brine refill flow control.
3. Clean backwash flow control.
4. Verify correct functioning of flow meter; clean impeller if necessary.
5. Verify programming of timer; re-program timer if necessary.
6. Measure the residual hardness; adjust mixing valve if necessary.
7. Verify min and max. pressure; install pressure reducer if necessary.

# Exploded Views & Part Numbers

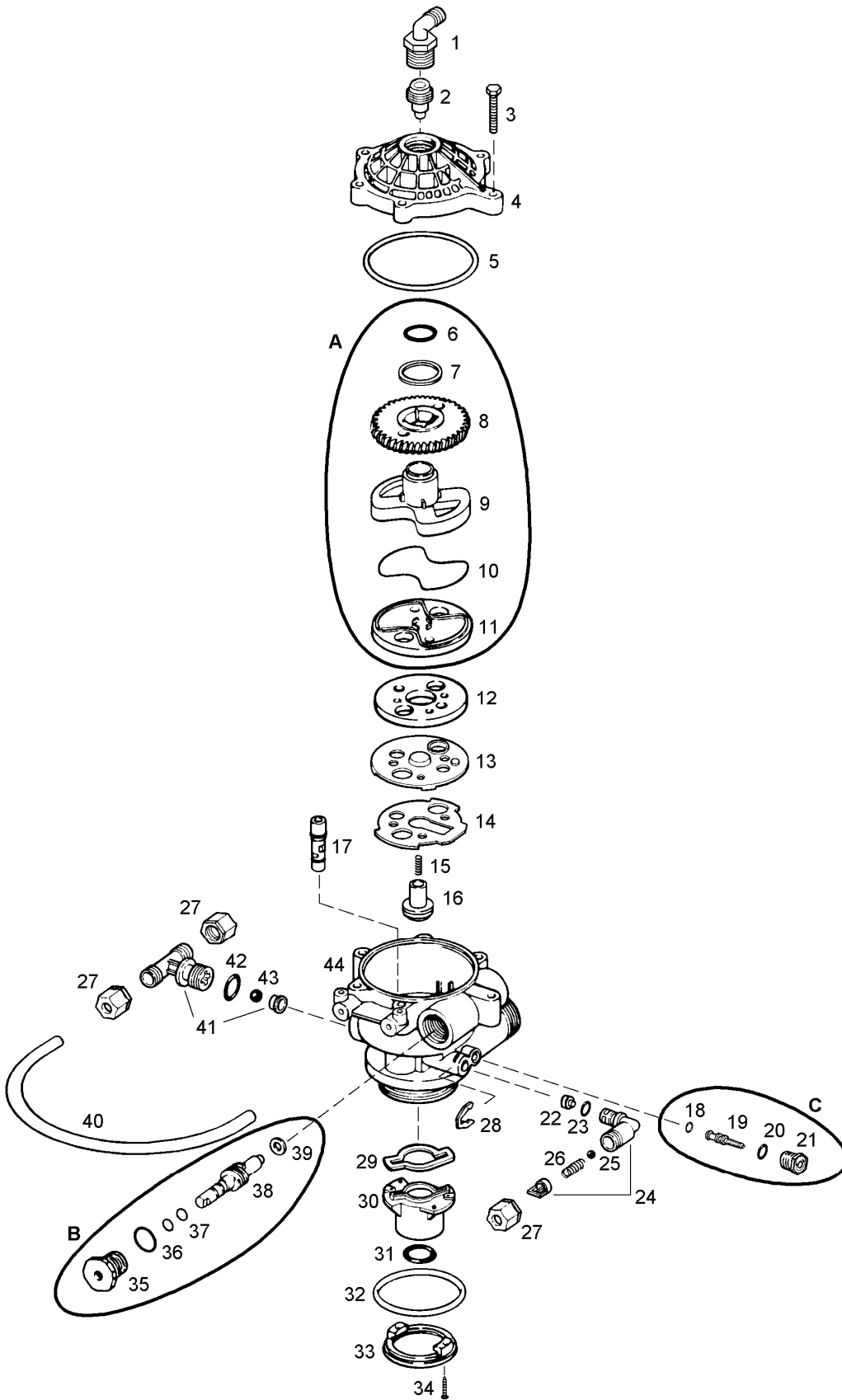
## Electronic timer



## 2400TS SERIES

ITEM	PART NUMBER	DESCRIPTION
1	28/297/11	Transfo 230/24V - 50 Hz, 12VA, EuroT plug
	28/297/18	Transfo 230/24V - 50 Hz, 12VA, UK plug
2	70971	Power lead with plug
3	72263	Wire clip
4	70312	Strain relief, power lead
5	28/8/7	Strain relief, flow meter cable
6	15/222	Screw, back plate (2x)
7	71502	Screw, timer cover (3x)
8	70962	Back plate
9	2100/206	Drive shaft
10	15/222	Screw, drive motor assy (2x)
11	72261	Drive motor
12	568/227/2	Worm
13	19/48	Retaining ring
14	70965	Switch cam
15	568/386	Bracket, micro switches
16	568/310	Gear, switch cam
17	15/184/7	Locking screw, switch cam
18	15/173/12	Screw, micro switches (2x)
19	72451	Micro switch assy
20	71679	Cable set, drive motor
21	15/102	Screw, PCB (2x)
22	72628	Printed Circuit Board
23	72614	Timer cover

Valve body



## 2400TS SERIES

ITEM	PART NUMBER	DESCRIPTION
1	21/83	Drain connection
2	568/271/*	Backwash flow control
3	72678	Bolt, valve cover (6x)
4	568/254/3	Valve cover
5	185/154/1	O-ring, valve cover
6	186/112	O-ring, Teflon
7	72327	Washer, PE
8	568/260	Worm gear
9	568/259	Rotor cam
10	185/041/1	O-ring, rotor
11	568/345/2	Rotor plate
12	568/256	Seal disk
13	568/383	Insert plate
14	568/384	Gasket
15	413/62	Spring, float valve
16	568/270/4	Float valve
17	568/274/*	Injector
18	185/007/6	O-ring, mixing valve
19	568/406	Mixing valve
20	186/118	O-ring, sleeve
21	568/407/L	Sleeve, mixing valve
22	568/385/2/*	Brine refill flow control
23	186/118	O-ring, refill elbow
24	568/336	Refill elbow
25	541/275	Checkball, refill elbow
26	413/62	Spring, refill elbow
27	21/88	Nut, refill elbow/brine tee (3x)
28	541/254	Spring clip
29	570/251	Gasket, riser insert
30	568/334	Riser insert 1,050"
31	185/214/1	O-ring, riser tube
32	185/337/1	O-ring, tank
33	541/232	Adapter ring
34	15/207/12	Screw, adapter ring (2x)
35	72772	Packing gland nut
36	185/211/1	O-ring, packing gland nut
37	186/115	O-ring, worm drive shaft (2x)
38	568/208/2	Worm drive shaft
39	14/43	Washer, worm drive shaft
40	EB64/33	Brine refill tube
41	568/340	Brine tee
42	185/208/1	O-ring, brine tee
43	26/47/12N	Checkball, brine tee
44	72801	Valve body
A	RK/568/259/2	Repair kit rotor
B	RK/75154	Repair kit packing gland nut
C	RK/568/406	Repair kit mixing valve

\* Size: refer to "Sizing Table"

# Order Specifications

## 2400TS/VIBR

*V = Voltage:*    **L** = transfo 230/24VAC, 12VA, EuroT plug  
                      **R** = transfo 230/24VAC, 12VA, UK plug  
                      **J** = no transfo

*I = Injector:*    **4, 1, 2, 5**

*B = Backwash flow control:*

**0** = no flow control

Nr.	Gal/min	(L/min)
<b>E</b>	1,6	(6,1)
<b>F</b>	1,8	(6,8)
<b>G</b>	2,0	(7,6)
<b>H</b>	2,2	(8,3)
<b>J</b>	2,6	(9,8)
<b>T</b>	3,0	(11,4)
<b>K</b>	3,5	(13,2)
<b>L</b>	4,0	(15,1)
<b>M</b>	5,0	(18,9)
<b>N</b>	6,0	(22,7)
<b>P</b>	7,0	(26,5)
<b>Q</b>	8,0	(30,3)
<b>R</b>	9,0	(34,1)
<b>S</b>	10,0	(37,9)

*R = Refill flow control:*

**0** = no flow control

Nr.	Gal/min	(L/min)
<b>A</b>	0,25	(1,0)
<b>B</b>	0,5	(1,9)
<b>D</b>	1,0	(3,8)

