

DRS4-RM Manual

Set Up Instructions for DRS4 Series Single Tank

Inspect the packaging of the equipment to confirm that nothing was damaged during shipping. (Figure 1)

Remove the resin tank(s) and valve(s) from the packaging. Make sure everything is included and without damage. Notice that the valve(s), Brine Line 'T', brine line hose, and MAV valve will be found in the brine tank. Below is a checklist with everything you should have received.

- _____ 1) Control Valve
(Figure 2)

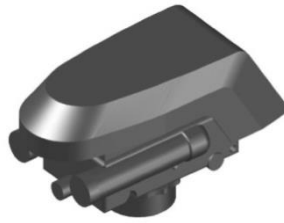


Figure 2: Control Valve

- _____ 2) Brine Tank (Figure 4)
- _____ 3) Brine Line Hose (Figure 6)
- _____ 4) Softener Tank (Figure 5)

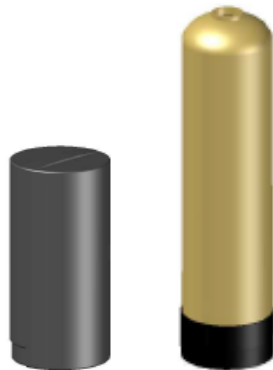


Figure 4:
Brine Tank

Figure 5:
Softener Tank

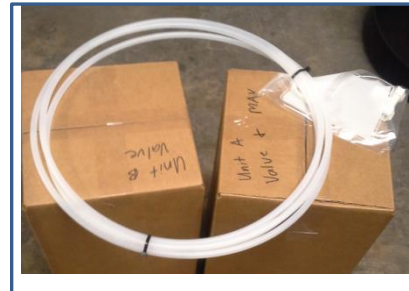


Figure 6: Brine Line Hose, Control valve packaging, Brine Line 'T' (in bag)



Figure 1: Original Packaging
This is how the packages will generally arrive

- _____ 5) Correct Amount of Resin (from Model and Media Requirements Table on page 2)

Call Diamond H2O right away if anything is missing. Contact the freight company **immediately** if anything is damaged. Diamond H2O will not be liable for any damage received after shipping.

Packaged By: _____

Date: _____

Received By: _____

Date: _____

DRS4-RM Manual

Contents

1.	Obtain the required tools listed below:.....	2
2.	Place the tanks near a water source.....	3
3.	Setting up the tank:.....	3
4.	Connect the brine tank.	4
5.	Connect the Valves to the Water Source.....	5
6.	Electrical.....	5
7.	Start up the system for the first time.	6
8.	Bypass Valve Operations.....	6
9.	Main Operating States	9
10.	<i>Program the Valve</i>	10
11.	Backwashing.....	13
12.	Troubleshooting.....	14
13.	System Specifications.....	14
14.	Error Codes	15

Table 1: Media Requirements.

Model Number	Amount of Resin per Tank (cu. ft.)
DRS4-EM-15	0.5
DRS4-EM-24	0.75
DRS4-EM-32	1
DRS4-EM-33	1.5
DRS4-EM-49	2
DRS4-EM-66	2.5

1. Obtain the required tools listed below:

- A. Utility Knife
- B. Pliers
- C. Phillips Screwdriver
- D. Hammer

DRS4-RM Manual

2. Place the tanks near a water source.

- A. Select a position near a floor drain that has adequate carrying capacity to handle the backwash flow rate. Refer to the specification Table in Section 8 for the appropriate flow rate.
- B. Place the softener(s) and brine tank on a level, firm foundation, like concrete.

C. **Determine the “front” of each tank** received. For each tank:

- a. Make sure that the distributor riser is flush with the top of the resin tank.
- b. Before placing any water, gravel, or resin in the resin tank, screw in a control valve to the point where it is secure. The valve does not need to be forced on, but should be snug.
- c. The two tanks should be placed next to each other, with the brine tank off to the side. The correct distance between the two tanks can be determined by connecting the MAV to both valve outlets.

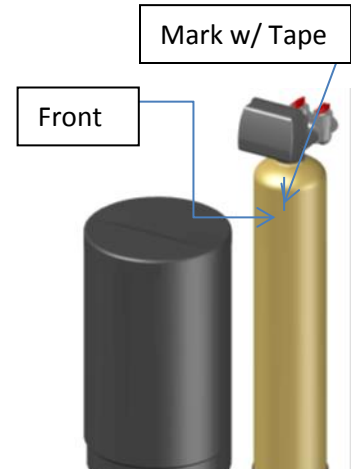


Figure 7: Front of tank

- d. Mark the “front” of each resin tank (shown in Figure 7) with either a marker or tape. The front of the resin tank is determined by the location of the face of the control valve once it has been secured to the face of the control valve. Make sure that the system is positioned in a way that the plumbing can be installed.

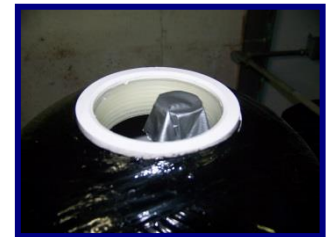


Figure 8: How to Block Distributer Tube

D. **Before Filling the Tanks:**

- e. Remove the valve(s)
- f. Ensure that the front(s) of the tank(s) is/are positioned correctly. Once filled, the resin tanks will be very difficult to move.
- g. Cover the exposed end of the distributor riser(s) to make sure no resin gets inside. Covering up the riser(s) with duct tape is one option, shown in Figure 8.
- h. Obtain a funnel to assist placing the resin in the resin tanks. (A funnel designed specifically for our resin tanks can be ordered from Diamond H2O Conditioning. The part numbers for the two types of funnels are table 3.)

3. Setting up the tank:

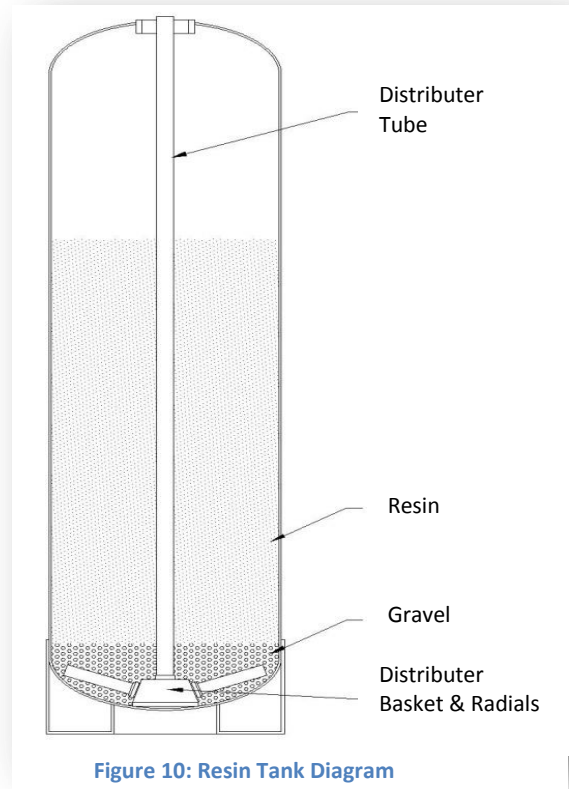
- A. Fill the tank up to 30% full of water.
- B. Check the system specifications on page 2 to determine the correct amount of resin needed for your system.
- C. Position the distributor tube so it is in the center of the tank, shown in Figure 9. The distributor tube should sit about an inch higher than the tank.



Figure 9: Centered Distributer Tube

DRS4-RM Manual

- D. **SLOWLY**, pour the correct amount of resin into the tank. Again, try to keep the media level by carefully rocking the tank back and forth.
 - E. Fill the rest of the tank with water to prevent air from getting in the tanks and potentially losing media.
 - F. Verify that there is a large O-ring on the control valve(s) adapter base.
 - G. Place the control valve on the tank, making sure that the distributor tube fits into the bottom of the control valve.
4. Tighten the control valve onto the tank to the point that it is snug. Double check that the valve is in a correct position to be able to install the plumbing.



5. Connect the brine tank.

- A. Remove the ties on the brine line hose (included in the brine tank).
- B. Remove the well cap and connect one end of the brine line hose to the brine line connection (Shown in Figure 11) of the brine tank. Tighten the brine line hose to the brine line connection by turning the cap of the brine line connection clockwise by hand. Make sure that no air can get into the line, or the softener will not regenerate properly.

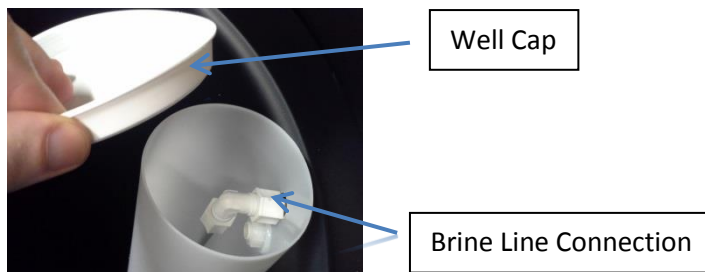


Figure 11: Brine Well Picture

- C. Safely dispose of any leftover tubing.
- D. Fill the brine tank with salt.

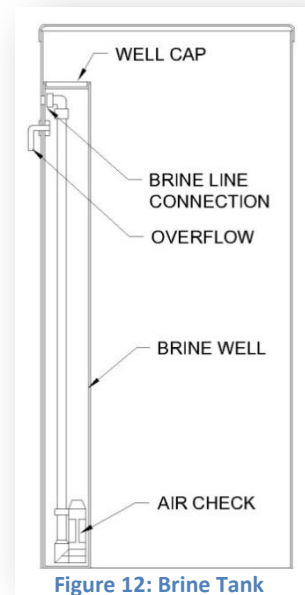
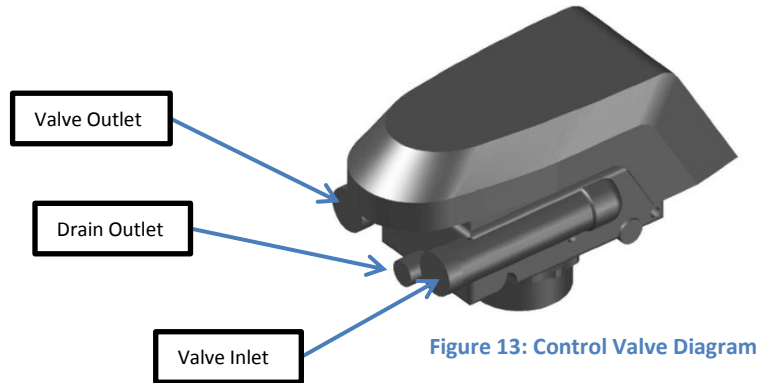


Figure 12: Brine Tank

DRS4-RM Manual



6. Connect the Valves to the Water Source

- A. Pipe or tube a line from the Control Valve Drain (Figure 13) to the drain. Refer to section 9 for the proper sized drain line.

DO NOT

- install a valve in this line
 - use a pipe smaller than the valve sizes listed on section 9
 - make a direct connection to the drain
 - Provide an air gap at least four times the diameter of the drain pipe to conform to sanitation codes and be able to observe the drain flow.
 - use an excessive amount of elbows in the plumbing
- B. Connect the facility plumbing to the control valve inlet following all local codes.
- C. Temporarily run the control valve outlet to the drain.

Note: Make sure all piping is free of thread chips and other foreign matter.

7. Electrical

The Water Filter use requires single-phase 110 volt, 1 phase, 60 hertz, and 5 amp service; it is equipped with a 10 foot electrical cord and a wall plug-in transformer.

NOTE: We recommend that a licensed electrician install your system in accordance with local and national electrical codes.

WARNING: To reduce the risk of electrical shock, the incoming power supply must include a protective earth ground.

NOTE: Some Filters are supplied with an optional micro-switch that closes during Backwashing. The wires with connectors can be located coming out the back of the control valve.

8. Start up the system for the first time.

- A. Add about three gallons of water to the brine tank.
- B. Make sure the tanks are filled with water.
 - a. Manually put the control valve into regeneration (Hold the regen button)
(Hold the regen button)
 - b. A mixture of air and water will flow from the drain line.
 - c. Slowly open the bypass valve's inlet to allow water to slowly enter the tank.
(shown in figure 14)
 - d. Once the tank is filled, only water will be coming out of the drain line. Put the system back into bypass operation. Run each step of the regen cycle (Figure 20) for a few minutes.
- C. Program the Valve. Most of the settings were pre-programmed by Diamond H2O. The installer must enter the installer settings shown in part 8 section C of this manual.



Figure 14: Opening bypass valve's inlet

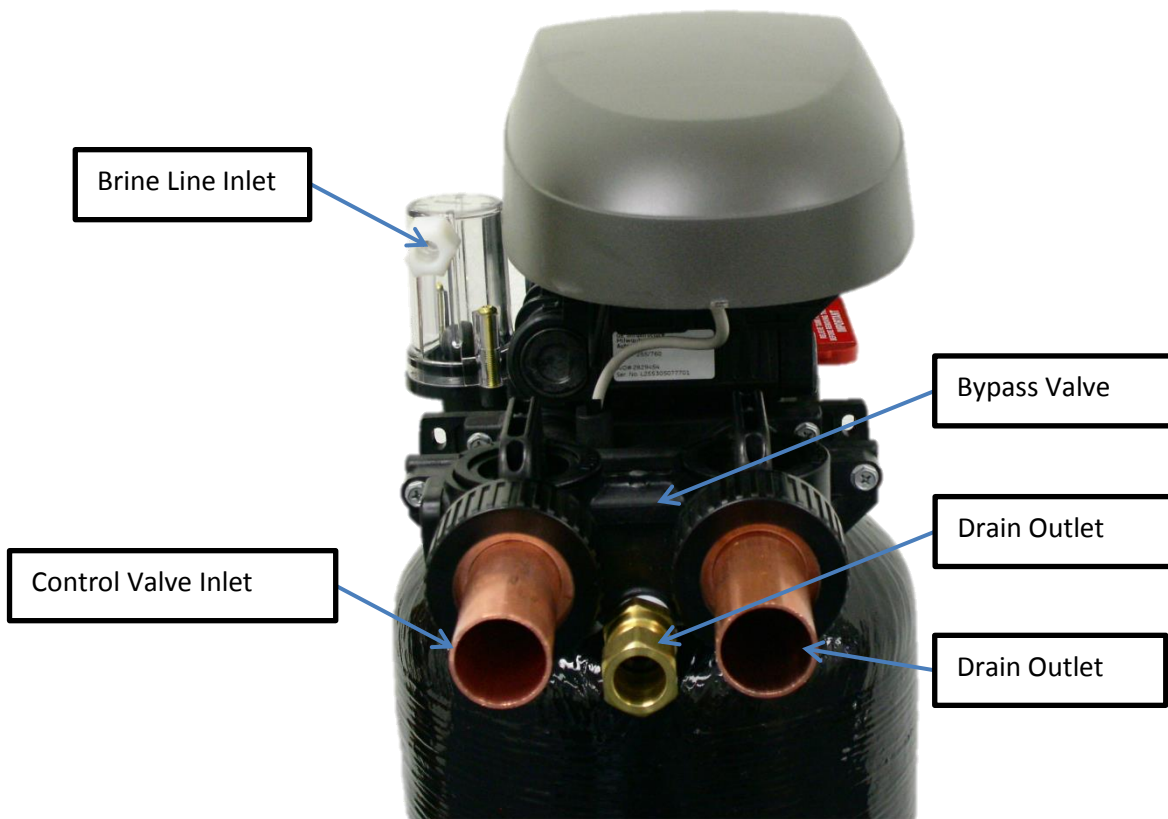


Figure 15: DRS4 Diagram

9. Bypass Valve Operations

A. The red controls of the bypass valve can be turned 90° resulting in four modes of operation.

“Treated”
Water Exits Supply Water
Enters

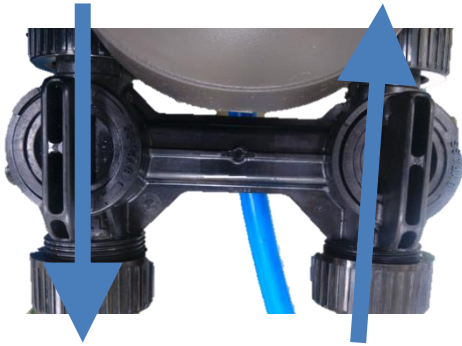


Figure 16: Normal Operation

Supply Water Supply Water
Exits Enters



Figure 17: Bypass Operation

Supply Water Supply Water
Exits Enters

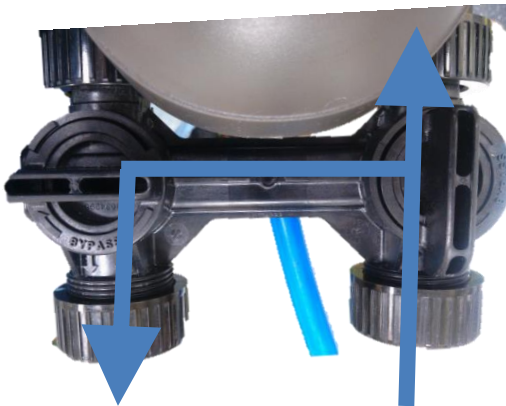


Figure 18: Diagnostic Mode

No Water Supply Water is Shut
Exits Off from the House
and the Valve.

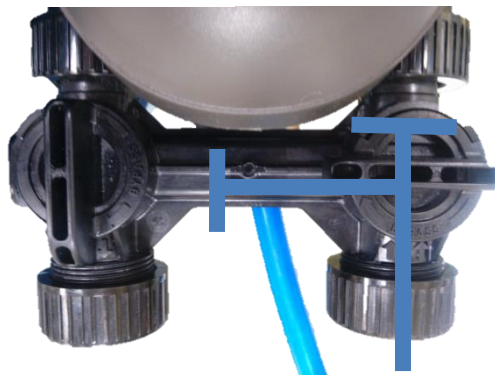
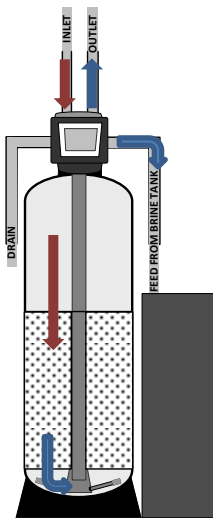
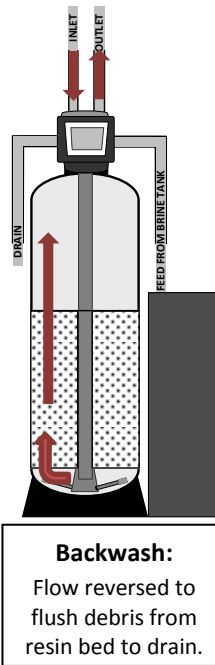
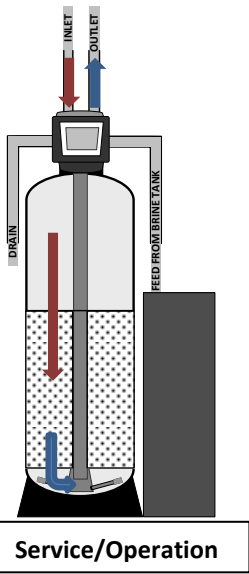
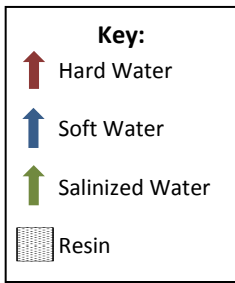


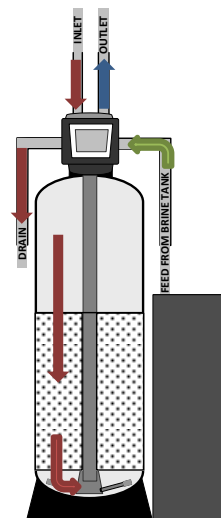
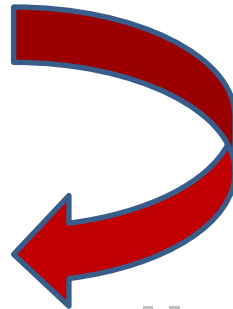
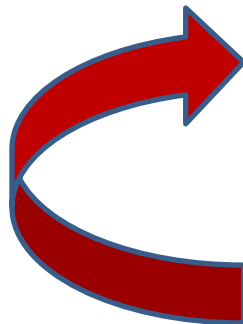
Figure 19: Shut Off Mode

DRS4-RM Manual

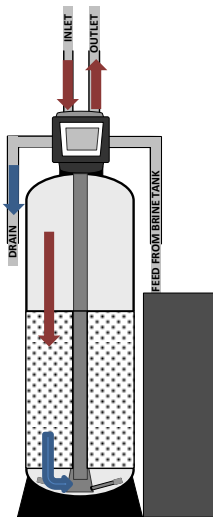
Figure 20: General Softener Operations



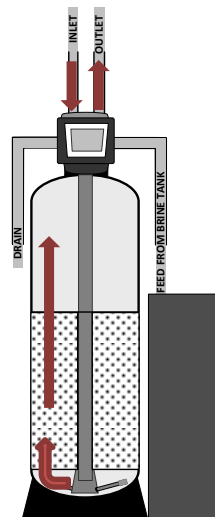
Regenerate Fill:
Water is sent to the Brine Tank to create regenerant for next regeneration cycle.



Regenerant Draw/ Slow Rinse:
After one Tank's Resin Bed is exhausted, Regenerate is drawn from Brine Tank through Brine Line Valve to Resin Bed. Hardness ions are then replaced by sodium ions, preparing Resin for another treatment cycle. The Regenerate flows through resin (at a specific rate) to exchange ions. Resin is now 'Regenerated' and ready for another cycle.



Fast Rinse:
Removes any residual regenerant from resin bed. (Water travels through the resin bed and up the riser tube drain).



Second Backwash:
Flow reversed to flush debris from resin bed to drain.

10. Main Operating States

Figure 21 shows the main operating states for the software and how they interact.

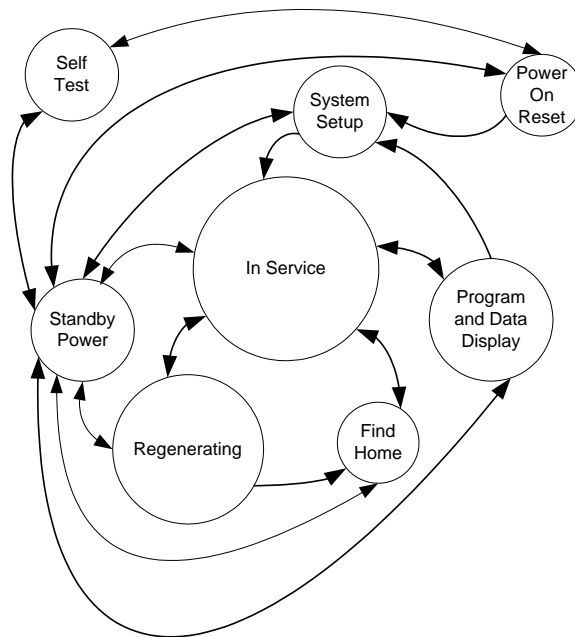


Figure 21: 762 State Diagram

- A. Power On Reset
This will monitor the AC input to determine if the control is operating on 50 or 60 hertz power. Function will pass to the self-test routine if the set key is pressed. The routine initializes all ports and time bases. It reads data from the information memory and checks the validity of the data. The control will set a flag indicating the time of day needs to be set.
- B. Self-Test
The self-test routine will enter from and return to the power on reset routine. The self-test routine will test all inputs and outputs. A simple test fixture will be used to connect to the outputs and inputs.
- C. Standby Power
The standby power routine is called anytime the unregulated voltage falls to a level indicating that AC power has been lost. The microcontroller is placed in a sleep mode waking to maintain the current time of day. Power to operate the microcontroller is supplied by a super capacitor. The display will show the programmed valve number when it wakes from standby power.
- D. System Setup
The initial programming routine is used to load a set of programmable variables based on the resin volume in the softener. The system setup is a two-step process. First the valve is selected, and then the resin volume is selected. The system setup routine is normally entered from the

DRS4-RM Manual

power on reset routine if the initial setting (resin volume) is “no setting”. The initial setting can be cleared in the Program and Data Display State.

E. Program and Data Display

The program and data display state consists of several routines that allow for setting and displaying programmable values.

F. In Service

The in service state uses several routines that handle the monitoring and display function while the valve is in service.

G. Regenerating

The regenerating routine handles the operation of the motor to position the cam in various positions as needed to perform regeneration of the resin bed.

11. Program the Valve

All of the parameters on the valve can be displayed on the LCD Display. Use the Down Key and Up Keys to navigate through the parameters. Each parameter can be edited by pressing the Set Key. After the value has been changed, the value can be saved by pressing the Set Key again. Most of the parameters have already been set by Diamond H₂O. All of the parameters are shown in Table 2, 3 and 4.

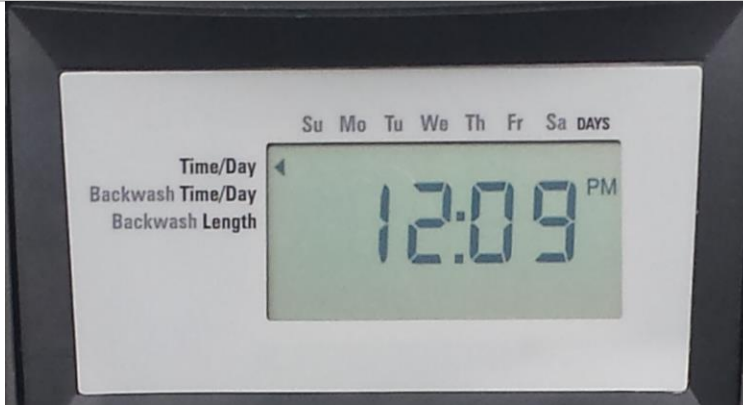


Figure 18: Key Pad and LCD Display

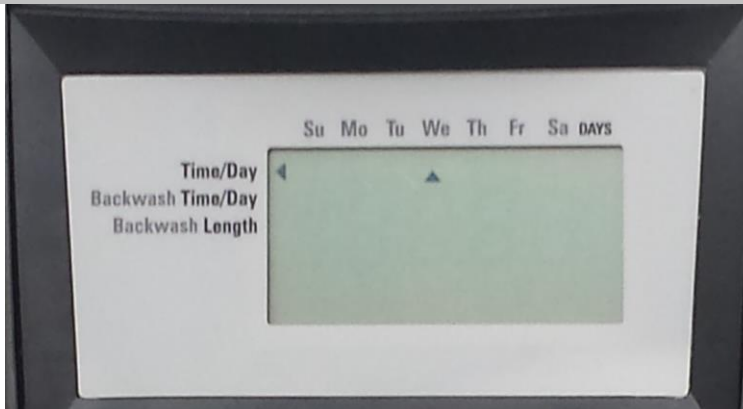
DRS4-RM Manual

Table 3: Level I Programming

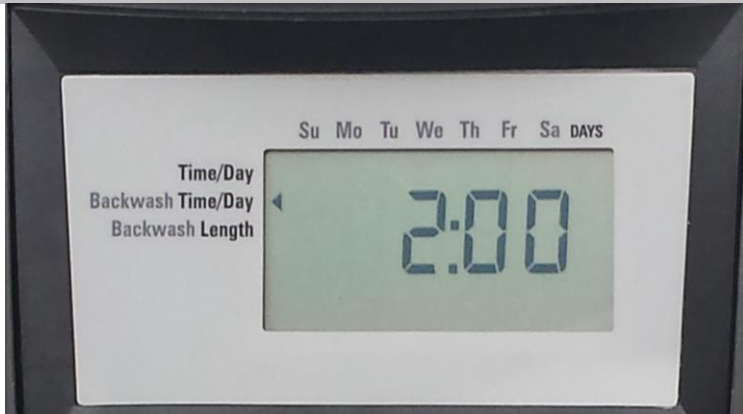
Parameter Description	Range of Values	Minimum Increment	Default	Units of Measure	Notes
P1 Time of Day	1:00 - 12:59 AM or PM 0:00 - 23:59	1 minute	12:00 PM	hour minute	Range depends on value selected for P10



P2 Day of Week	N/A	1 day	None	N/A	Uses arrows under days of week on overlay.
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P3 Time of Regeneration	1:00 - 12:59 AM or PM 0:00 - 23:59	1 minute	2:00 AM	hour minute	Range depends on value selected for P10
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DRS4-RM Manual

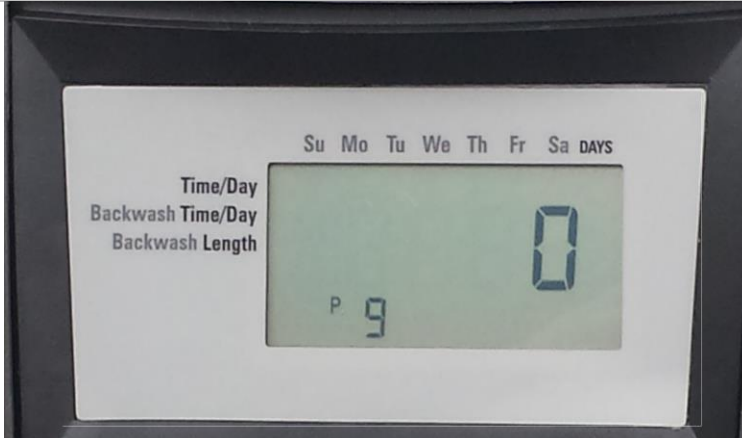
Table 3: Level I Programming (2).

Parameter Description	Range of Values	Minimum Increment	Default	Units of Measure	Notes
P4 Set Calendar Override	0-99	1	0	days	0 = no calendar override, 0.5 = regeneration twice a day at time of regeneration and 12 hours later. Calendar Override skipped if at least one Day of Regeneration selected. Can be locked out of changes in Level I programming.
P6 Set Amount of Regenerant	S, H, L	N/A	S	N/A	S – Standard (9lbs/ft ³ resin) H – High (15lbs/ft ³ resin) L – Low (3lbs/ft ³ resin) Lower salt settings are more efficient, but will regenerate more often.
P7 Estimated Capacity	N/A	N/A		kg	Cannot be changed Displays calculated capacity (based on volume of resin used)
P8 Hardness	0-99	1	25	Grains per gallon	Sets Water hardness level This value is used to calculate estimated capacity

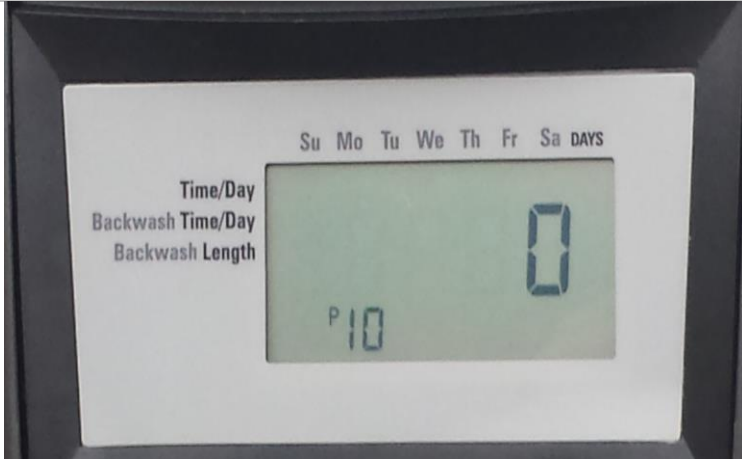
DRS4-RM Manual

Table 4: Level II Programming.

Parameter Description	Range of Values	Minimum Increment	Default	Units of Measure	Notes
P9 Units of measure	0-1	1	0		0 = US 1 = Metric.



P10 Clock mode	0-1	1	0		0 = 12 hour clock 1 = 24 hour clock.
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DRS4-RM Manual

12. Troubleshooting

A. Manual Backwashing

Delayed Manual Backwash

A delayed manual regeneration is programmed by pressing the REGENERATION key. The regeneration icon on the LCD will flash indicating regeneration will start when the time of day reaches the programmed time of regeneration. Pressing the REGENERATION key again will turn off the regeneration icon and cancel the delayed regeneration.

Immediate Manual Backwash

An immediate manual regeneration is programmed by pressing and holding the REGENERATION key for three seconds. The regeneration icon on the LCD will turn on. The control will go to the regenerating mode.

Delayed Second Backwash

A delayed second regeneration is programmed by pressing the REGENERATION key while the control is in the regenerating mode. The x2 icon next to the regeneration icon will flash indicating a second regeneration will start when the time of day reaches the programmed time of regeneration.

Double Immediate Manual Backwash

Back to Back manual regenerations are programmed by pressing and holding the REGENERATION key for three seconds while the control is in the regenerating mode. The x2 icon next to the regeneration icon will turn on indicating a second manual regeneration will start immediately after current regeneration is complete.

B. Power Loss

Only the current time of day will need to be reset if power is lost for greater than 8 hours. If power is lost while the system is regenerating, the control will complete regeneration at the point of interruption once power is restored.

13. System Specifications

Table 6: System Specifications

MODEL	CAPACITY & SALT per REGENERATION				SERVICE FLOW RATE (GPM) @ PSI DROP	SOFTENER TANK(S)		BRINE TANK (With Grid)		PLUMBING		
	MAXIMUM		MINIMUM			DIMEN's Dia x Ht (in)	CAPACITY Cu Ft	DIMEN's Dia x Ht (in)	CAPACITY Lbs.	SERVICE Inches	DRAIN Inches	DRAIN BW flow (gpm)
	Capacity	Salt/Regen	Capacity	Salt/Regen								
DRS4-EM-15	15,300	7.0 lb	9,600	2.5 lb	4.0 @ 5	7 x 35	0.5	18 x 33	300	¾, 1, 1 ¼	½	1.2
DRS4-EM-24	24,600	10.5 lb	15,500	3.8 lb	6.0 @ 9	8 x 44	0.75	18 x 33	300	¾, 1, 1 ¼	½	1.6
DRS4-EM-32	32,800	14.0 lb	20,700	5.0 lb	10.0 @ 15	9 x 48	1	18 x 33	300	¾, 1, 1 ¼	½	2.0
DRS4-EM-33	32,800	14.0 lb	20,700	5.0 lb	5.7 @ 6	10 x 54	1.5	18 x 33	300	¾, 1, 1 ¼	½	2.5
DRS4-EM-49	49,100	21.0 lb	31,000	7.5 lb	9.6 @ 15	12 x 52	2	18 x 40	400	¾, 1, 1 ¼	½	2.5
DRS4-EM-66	65,500	28.0 lb	41,400	10.0 lb	11.2 @ 15	13 x 54	2.5	18 x 40	400	¾, 1, 1 ¼	½	3.5

DRS4-RM Manual

14. Error Codes

Problem	Possible Cause	Solution
E1, Err-1001, Err-101 = Control unable to sense motor movement	Motor not inserted full to engage pinion, motor wires broken or disconnected	Disconnect power, make sure motor is fully engaged, check for broken wires, and make sure two-pin connector on motor is connected to the two pin connection on the PC board labeled MOTOR. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
	PC board not properly snapped into drive bracket	Properly snap PC board into drive bracket and then press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
	Missing reduction gears	Replace missing gears
E2, Err-1002, Err-102 = Control valve motor ran too short and was unable to find the next cycle position and stalled	Foreign material is lodged in control valve	Open up control valve and pull out piston assembly and seal/stack assembly for inspection. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
	Mechanical binding	Check piston assembly and seal/stack assembly, check reduction gears, check drive bracket and main drive gear interface. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
	Main drive gear too tight	Loosen main drive gear. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
	Improper voltage being delivered to PC board	Verify that proper voltage is being supplied. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.

DRS4-RM Manual

Error Codes Cont...

Problem	Possible Cause	Solution
E3, Err-1003, Err-103 = Control valve motor ran too long and was unable to find the next cycle position and stalled	Motor failure during a regeneration	Check motor connections. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
	Foreign material built up on piston and stack assemblies creating friction and drag enough to time out motor	Replace piston and seal/stack assemblies. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
	Drive bracket not snapped in properly that reduction gears and drive gear do not interface	Snap drive bracket in properly. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.
E4, Err-1004, Err-104 = Control valve motor ran too long and timed out trying to reach home position	Drive bracket not snapped in properly that reduction gears and drive gear do not interface	Snap drive bracket in properly. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC board for 5 seconds and then reconnect.