

Crystal Right™ CR100 Simplex Installation, Operation and Maintenance Guide

Clack WS1, WS1.25, WS1.5, WS2



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Introduction



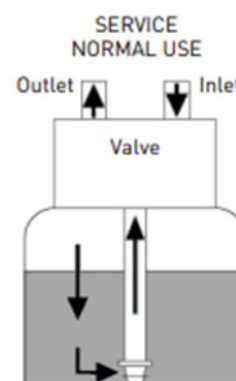
Crystal Right™ is a silica crystal that works by an ion exchange process which removes iron, manganese and hardness (and reduces ammonia). The minimum pH requirement is 6.0 and Crystal Right™ balances the pH in these acidic waters. Crystal Right™ works at it's best on clear water, i.e. when the iron/manganese are in a dissolved form. Crystal Right™ will also reduce hardness with no extra treatment. The media bed can be sanitised with chlorine from time to time (some valves can do this automatically). The regeneration process is exactly the same as that used in a water softener and requires regeneration with salt (sodium chloride).

There are two types of Crystal Right™, CR100 is used where the pH is between 6 and 7 and CR200 is used where the pH is 7 or above.

Crystal Right has a number of advantages over conventional systems in that pH correction, iron/manganese removal, ammonia reduction and softening can all be addressed in a single process. It can reduce dissolved iron and manganese even at pH 6 (most other medias can not).

How an Organic Scavenger works

Water flows into the valve at the top, down through the media and then up through the 'riser' tube in the middle of the vessel. As the water travels through the media the iron and manganese are removed leaving crystal clear water. There are timer options that can be set to automatically self clean (backwash) and wash away any of the accumulated iron and manganese. Cleaning can be set for a given time or after a certain amount of water has been used. With Crystal Right™ salt is also added to regenerate it ready for service. Iron and manganese filters can also be used in conjunction with other filters such as sand filters if the water has high turbidity or pH correction filters if the pH of the water very low.



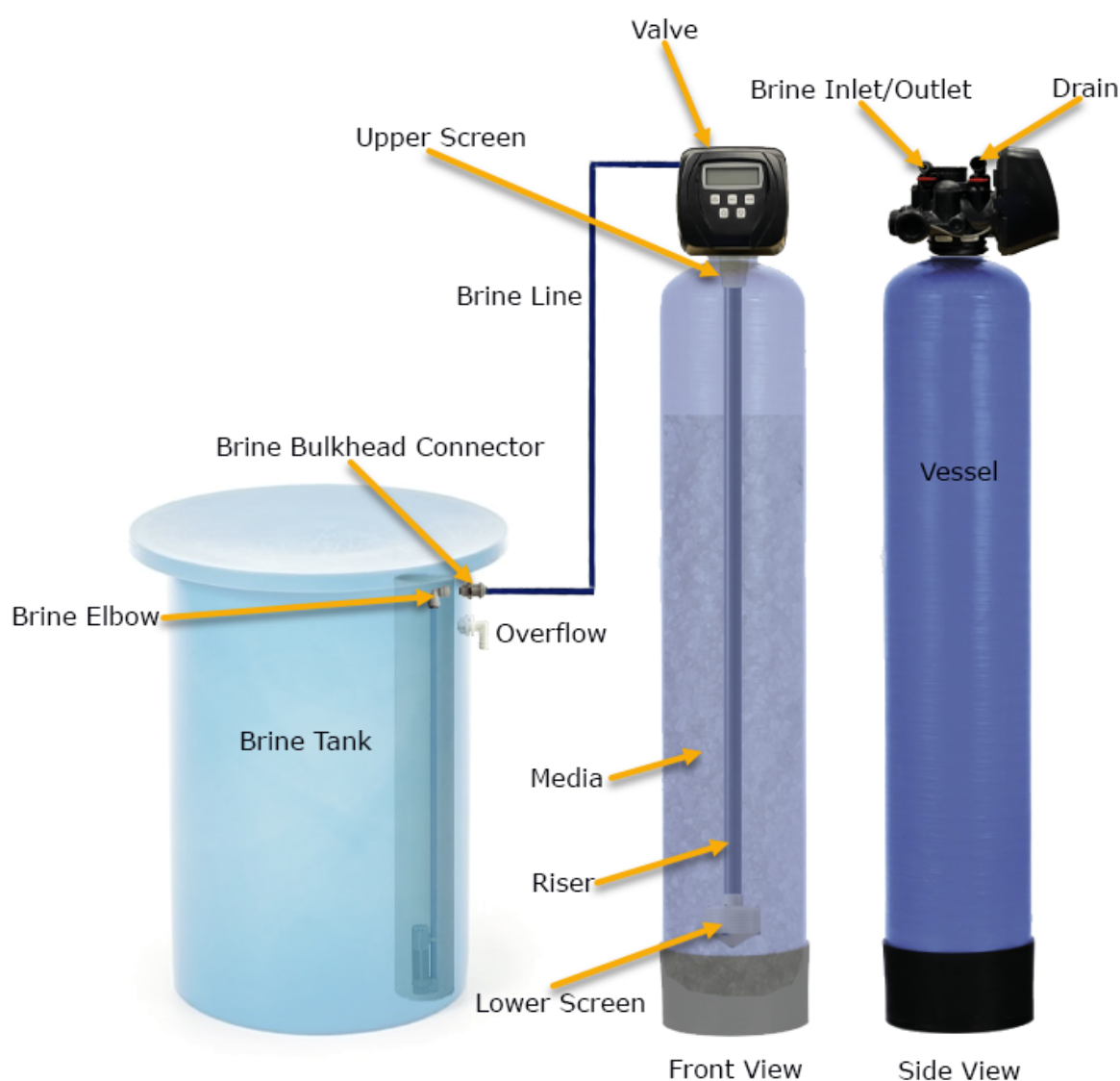
Unpacking

Pease Use the accompanying packing document to check that all items are present and correct.

If any item is missing or damaged your carrier and supplier must be notified within 2 days of receipt if a claim is to be made.

If installation is not to start immediately after delivery, the equipment should be stored in a clean dry area, where it will not be damaged, or be subjected to temperatures below freezing.

Parts included in your kit:



1. Installation

Please observe the local regulations concerning the installation of your system. Check that you have allowed space for access to the unit for possible future maintenance. This installation may require plumbing work and will require an electrical outlet to be fitted near the system.

This guide does not include plumbing directions.
Only attempt this if you have the necessary skills.

1.1 Pre-installation checks

- o The area needs to be level
- o Frost free
- o Access to electricity
- o Access to open drain.
- o Check the incoming water quality is within any parameters specified for that media (contact your supplier).
- o Incoming water pressure is between 2 and 8 bar (preferably approx. 4 bar)
- o Water temperature between 3°C and 45°C.

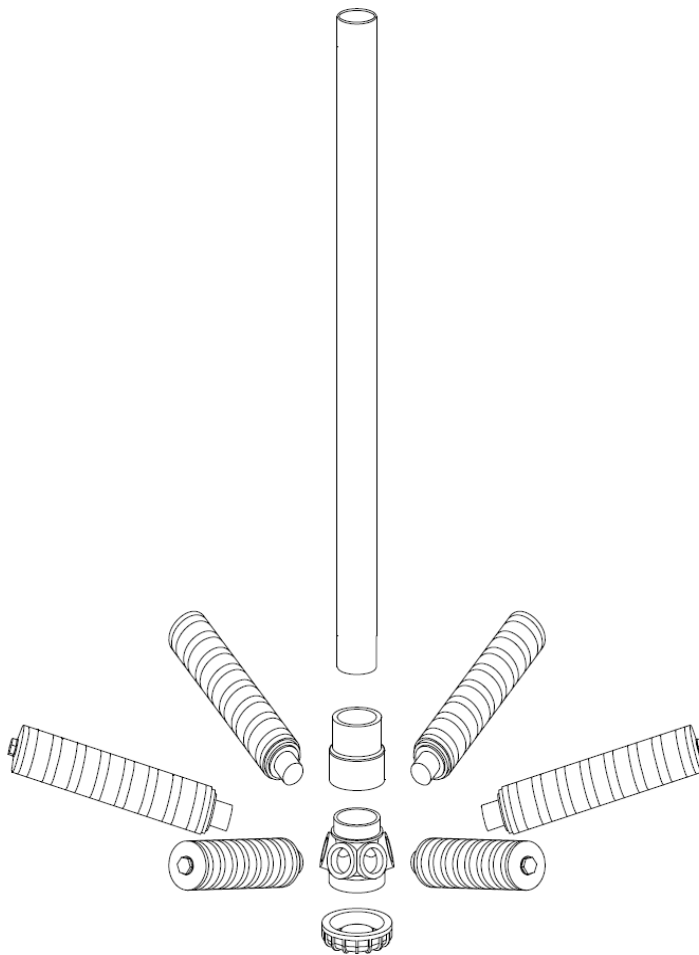
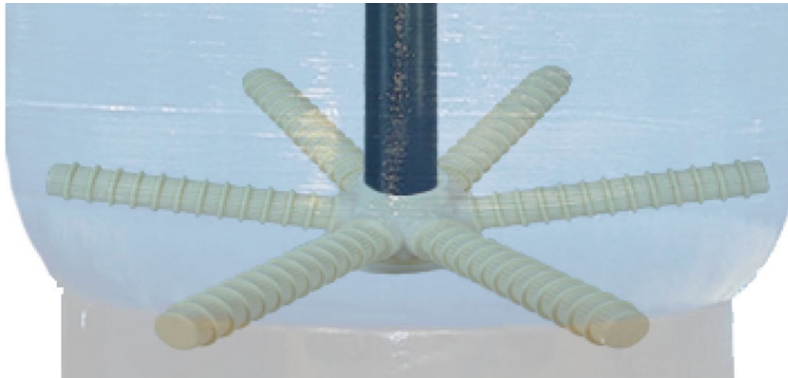
1.2 Fitting the Distribution System



Systems up to 13" x 54" (75 litres) have a simple riser tube and bottom screen. The bottom screen will be pre-glued so no further assembly is required. Simply place the riser tube with bottom screen into the vessel



For larger systems bottom laterals are used. These need to be assembled inside the vessel



Move the vessel into its final position as it will be difficult to move once the media has been added.

1.3 Adding the Media



Block the top of the riser tube to stop media getting down the tube. This can be accomplished with tape or a small plastic bag over the end of the tube.

Fill the vessel with water until it is around a third full. This will prevent the bottom screen from getting damaged when you add the media. It will also allow enough movement of the riser tube when the media is added for you to re-centre.

Add the supplied media but ensure you leave around 30% free space above the media (there may be some media left over). This is so the media can expand into the space during regeneration allowing sediment and contaminants to be washed away. It also allows the water to pass more evenly through the media.

You may want to employ a funnel to make this process easier (this can be bought as an optional extra).



The media can be poured from the bag but we recommend using a smaller container to scoop out the media and pour into the vessel.

Once complete unblock the riser tube.

1.4 Fitting the valve

Add a small amount of silicone grease to the valve outer and inner o-rings



Fit the lower screen to the bottom of the valve. This is a bayonet fitting (twist to lock into place).



Slide the valve onto the riser tube ensuring the riser tube is fully inserted into the valve.

Gently place it onto the vessel threads and screw onto the thread in a clockwise direction until it squeezes tightly onto the main o-ring. Then finally give the valve a final tighten by tapping the rear side of the valve with the palm of your hand.



1.5 Brine Tank Connections

Attach the brine line to the brine connection on the brine tank and the brine inlet/outlet on the Clack valve



The brine system consists of a moulded polyethylene tank into which the brine well and brine pick up are assembled. The tank forms the salt storage container.

The brine pick-up tube is connected to the pipe from the control valve which sucks the brine from the tank. At the bottom of the brine pick-up tube is an air check valve. This serves to prevent air entering the valve when all the brine has been drawn in. Air in the system could cause spurting and 'hammering' at the taps or outlets.

1.6 Connecting your water supply

(Further notes on plumbing your system in can be found at the back of the manual).

Connect your pipe work to the inlet / outlet connections; use the supplied tails provide for 1" and 1.25" valves or direct BSP threaded connections on the 1.5" or 2" valves.



For the 1" and 1.25" valves an optional bypass valve is available which fits to the back of the valve and allows you to isolate the system when out of service (eg during routine maintenance)



Flexible hoses are available to make your installation easier (1" only)

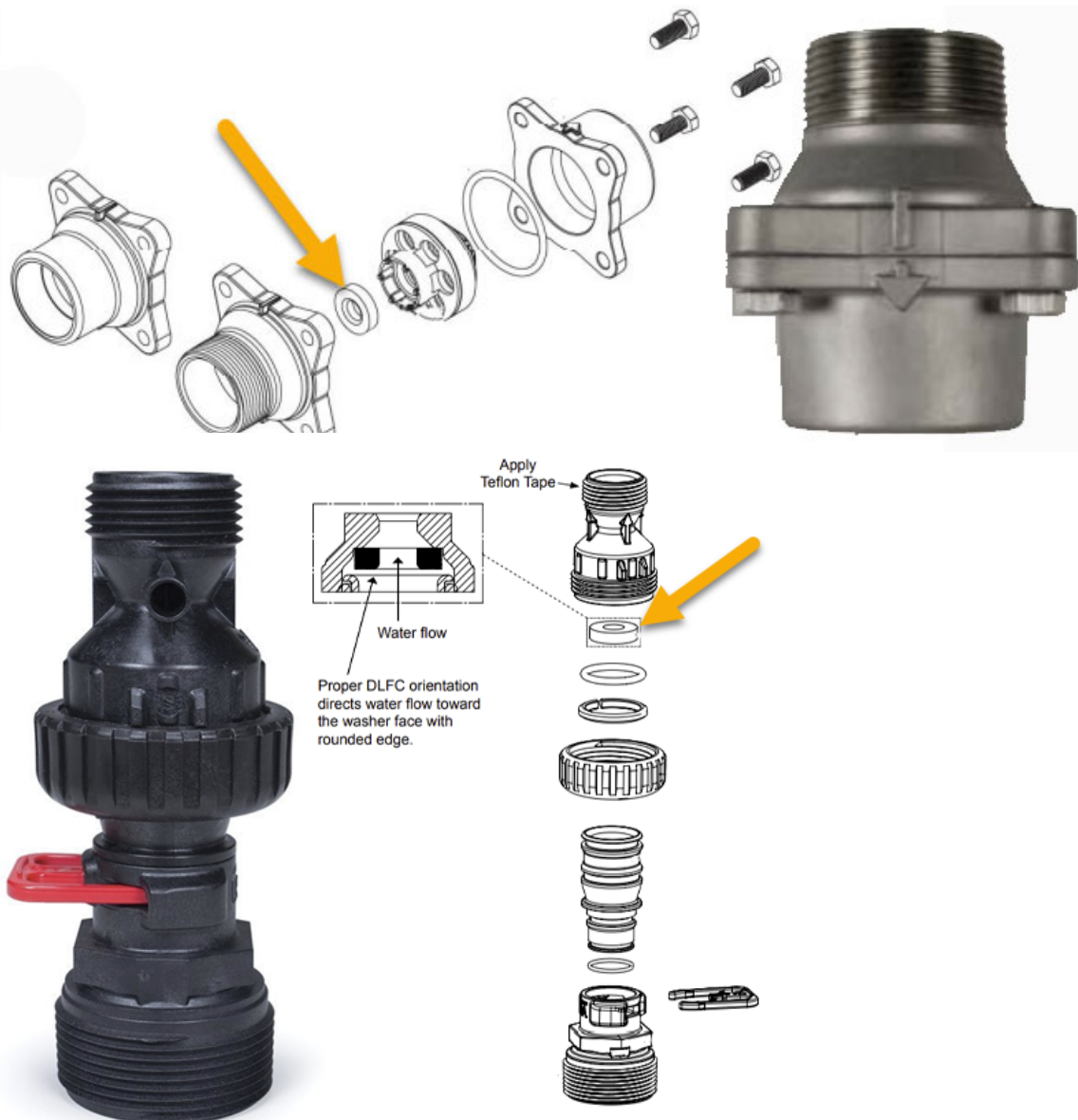
1.7 Drain Line Flow Control

This is possibly the most important component so it is important to check that it has been installed. The DLFC controls the backwash flow rate and without it the system will not function correctly.



On most of the valves the DLFC is internal but easy to check. Simply pull the red tag on the drain fitting and remove the complete fitting. The DLFC is a small rubber disk with a hole in the centre located on the bottom of the fitting.

Larger systems have an external DLFC which can be dismantled to check the DLFC is fitted.



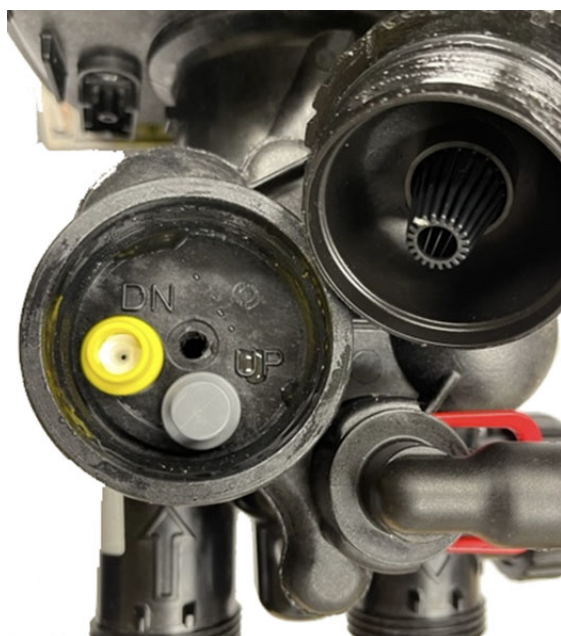
A hose barb fitting is included for the drain on the smaller systems allowing you to easily connect a braided hose which can be secured with a jubilee clip or similar should you choose. You can also utilise the male threaded fitting to customise the drain for your preferred pipework.



1.8 Injector

The injector is another important item in the functioning of the system.

Unscrew the cap indicated below.



Please check that the injector is fitted in the DN position and that the UP position has been plugged.

The injector colour will vary depending on the size of the system, this should be listed on the items list.

1.9 Electrical Connections

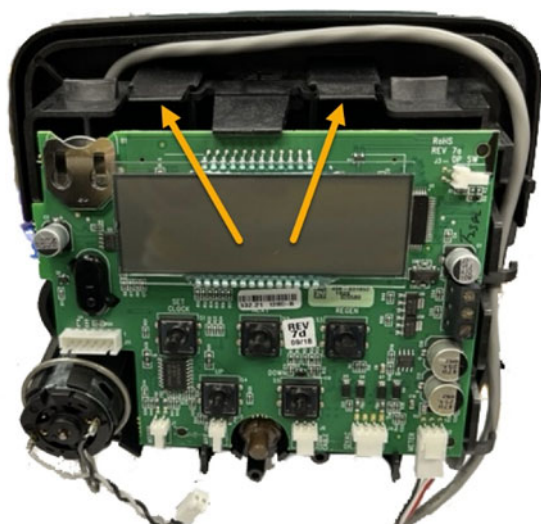
To connect the power cable you need to firstly remove the cover.



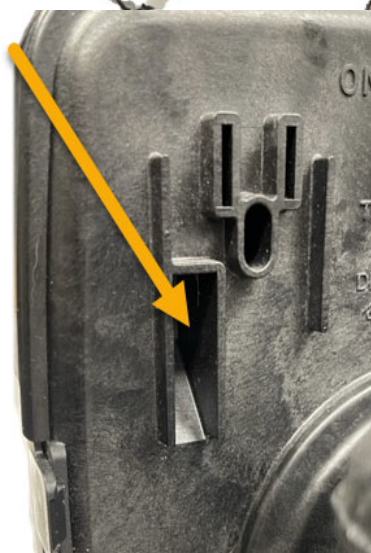
Gently push the release tabs on either side of the cover and pull the cover.



Now remove the drive bracket assembly by pressing up on the drive brackets release tabs and pulling towards you.



The drive bracket including PCB can now be lifted away to reveal the back plate. (Note the pictures show the meter cable which is not included with your head)



Thread the wire through the hole in the back plate



Thread the wire through the strain relief

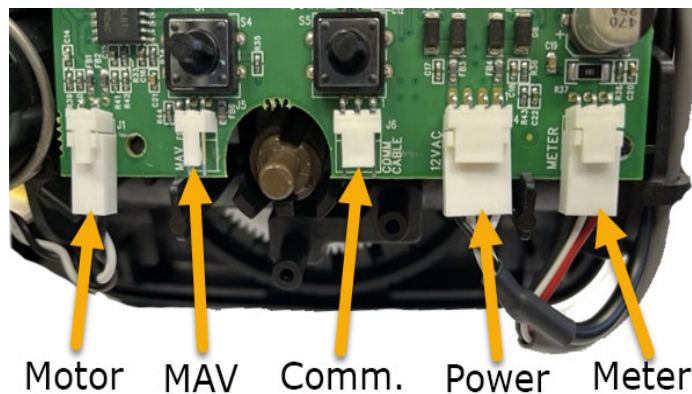
You can now re install the drive bracket into its original position.

Please make sure that this has been replaced correctly as this can cause problems at a later date.



Use the wire guides to hold the wire in position

Plug in the connectors



If fitting a MAV (Motorised Alternating Valve) or NHBP (No Hard water Bypass) locate the knock out plate and push through.



Remove the tabs at the bottom of the strain relief.



Thread the cables.



Fit the cover (supplied with your MAV or NHBP)

You can now plug your MAV or HHBP into the MAV connector.

1.10 Quick Start

The valves are pre-programmed with the exception of the time. It is pre-set to regenerate every 2 days at 2:00 AM which you may want to adjust to suit your conditions. Do not extend it further than every 7 days to keep the resin in good condition.

Set Time of Day



Press **SET CLOCK**. Set time will appear in the top left hand corner. The hours will flash.

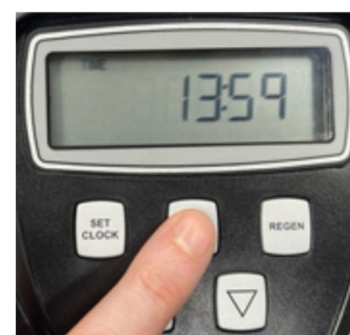
Use the **UP** and **DOWN** arrows to set the hour



Press **NEXT**. The minutes will now flash

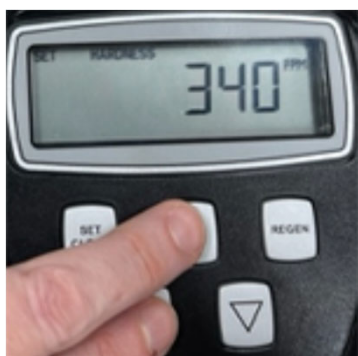


Use the **UP** and **DOWN** arrows to set the minutes



Press **NEXT**. You are now back in service mode.

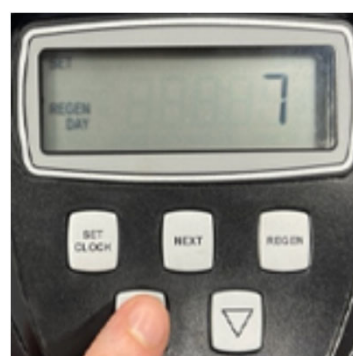
Set the Regeneration Interval



Press **NEXT** and **UP** for 3 seconds until "HARDNESS" and 340 appear. Use the **UP** and **DOWN** arrows to adjust to your hardness level*
(see notes on page 19)



Press **NEXT** Hardness and 2 will appear. Set to "0" using **UP** and **DOWN** arrows.



Press **NEXT**. Regen day will appear use the **UP** and **DOWN** arrows to set the regeneration override day. Eg you can set the softener to regen. every 7 days even if capacity has not been met or it can be set to off.**



Press **NEXT**. The regen time will appear with the hours flashing. It is set to 2:00am. Use **UP** and **DOWN** arrows to adjust if necessary.



Press **NEXT**. The minutes will now flash. Use **UP** and **DOWN** to adjust if necessary



Programming is now complete.

* On a crystal right system the hardness figure is calculated by adding the following figures together:

Calcium Carbonate (CaCO₃) ppm

2 x Sodium (Na) ppm

Iron (Fe) ppm

Manganese (Mn) ppm

Note mg/l = ppm

Example : If you have 250 ppm CaCO₃, 50 ppm Sodium, 500 ppm Fe and 100 ppm Mn

$$250 + (50 \times 2) + 500 + 100 = 950$$

Therefore hardness would be set to 950 ppm

** Do not extend regeneration past 7 days to keep the media in good condition.

During service the screen will show time, flow (if meter fitted) and days to next regeneration. Pressing the “Next” button will scroll through these 3 screens



2. Programming the Valves in case of memory loss

YOUR CRYSTAL RIGHT SYSTEM IS SUPPLIED PRE-PROGRAMMED!

(excluding settings that need to be done on site)

THE SETTINGS BELOW ARE JUST IN CASE YOU NEED TO REPROGRAM THE UNIT

Should the programming have been lost the following instructions in conjunction with the relevant setting sheet will allow you to re-set them. When the power has been connected the valve will display the software number and initialise itself and then display TIME; you can then start to program the valve.



Press **NEXT** and **DOWN** simultaneously for 3 seconds



"SET" will appear in the corner with softener beneath flashing. If it instead reads "Filtering" use the **UP** or **DOWN** arrow to change to softening

Press **NEXT** and **DOWN** simultaneously for 3 seconds



"1.0" will flash. This denotes that it is a WS1 valve. If you have a different valve use the UP and DOWN arrows to adjust to your model (1.25, 1.5 or 2.0).

Press **NEXT**

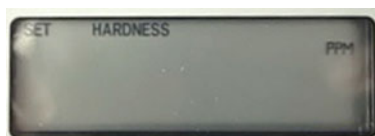


The screen will alternate between "ALT" and "off".

Press **NEXT**



Press **NEXT**



The hardness units can be changed from ppm (shown) to French degrees or German degrees

Press **NEXT**

The following settings allow you to set the order of the stages of regeneration. Use the **UP** and **DOWN** arrows to adjust if necessary. Press **NEXT** to move to next screen.



Set 1 to "Backwash"



Set 2 to "dn Brine" (down draw flow brine)



Set 3 to "Rinse"



Set 4 to "Fill"



Set 5 to "End"

Press **NEXT**

You will come out of programming.

System Set UP



Press **NEXT** and **DOWN** simultaneously for 3 seconds



"SET" will appear in the corner with softener beneath flashing

Press **NEXT** to scroll through the following settings using the **UP** and **DOWN** arrows to make adjustments using the chart below as your guide...

Vessel Size	1044	1054	1252	1354	1465	1665	1865	2160	2469	3072	3672
Media Volume (litres)	28.3	42.5	56.6	70	99	127	170	198	311	538	679
Cycle 1 Backwash	14	14	14	14	14	14	14	14	14	14	14
Cycle 2 Brine Draw dn	66	52	64	57	81	67	75	55	61	49	67
Cycle 3 Fast Rinse	7	7	7	7	7	7	7	7	7	7	7
Cycle 4 Fill kg	4	5	6.75	8.5	12	15.25	20.5	23.75	37.5	64.5	81.5
Cycle 5	End										
Capacity kg	0.7	1.3	1.7	2.2	3	3.8	5.1	5.9	9.3	16.1	22.1
Regen	Auto										
Regen	Normal										
Relay1 rLY 1	off										
Relay 2 rLY 2	off										
Salt	off										



For all sizes this should be set for **14** minutes



Refer to the chart above for your setting. Example, for a 10" x 54" Vessel **BRINE draw** should be set to **52** minutes.



For all sizes set **Rinse** to **7** minutes



Refer to the chart above for your setting. Example, for a 10" x 54" Vessel **FILL** should be set to **5** Kg



Refer to the chart above for your setting. Example, for a 10" x 54" Vessel **CAPACITY** should be set to 2.1 Kg



For all sizes set to "AUTO"



For all sizes set to "NORMAL"



Unless you're using the relay 1 this should be set to "off"



Unless you're using the relay 2 this should be set to "off"



For all sizes set to "off"

Press **NEXT**

You will come out of programming.

CR100 QUICK REFERENCE SETTINGS SHEET

Please apply the settings in the following sequence.

Selections are made using the **UP** and **DOWN** buttons until the required setting is displayed.

After each setting press **NEXT** to continue.

Vessel Size	1044	1054	1252	1354	1465	1665	1865	2160	2469	3072	3672
Media Volume (litres)	28.3	42.5	56.6	70	99	127	170	198	311	538	679
Valve	WS1CI	WS1CI	WS1CI	WS1CI	WS1CI	WS1CI	WS1CI	WS1CI			
	WS1.25CI	WS1.25CI	WS1.25CI	WS1.25CI	WS1.25CI	WS1.25CI	WS1.25CI	WS1.25CI			
			WS1.5CI	WS1.5CI	WS1.5CI	WS1.5CI	WS1.5CI	WS1.5CI	WS1.5CI		
			WS2CI	WS2CI	WS2CI	WS2CI	WS2CI	WS2CI	WS2CI	WS2CI	WS2CI
			WS2LCI	WS2LCI	WS2LCI	WS2LCI	WS2LCI	WS2LCI	WS2LCI	WS2LCI	WS2LCI

Step 1, Cycle Sequence

Press **NEXT** and **DOWN** simultaneously for 3 seconds and release.

Screen will display SOFTENING flashing.

Press **NEXT** and **DOWN** simultaneously for 3 seconds, the screen will display SET 1.0 (set to the correct valve - WS1 - 1.0, WS1.25 - 1.25

WS1.5 - 1.5, WS2 - 2.0)

Vessel Size	1044	1054	1252	1354	1465	1665	1865	2160	2469	3072	3672
Media Volume (litres)	28.3	42.5	56.6	70	99	127	170	198	311	538	679
Alternating (ALT)	off										
DP	off										
Hardness	PPM										
Set Cycle 1	Backwash										
Set Cycle 2	Brine Draw dn										
Set Cycle 3	Fast Rinse										
Set Cycle 4	Fill										
Set Cycle 5	End										

Step 2, System Setup

Press **NEXT** and **DOWN** simultaneously for 3 seconds and release.

SET with SOFTENING flashing should appear on screen.

Vessel Size	1044	1054	1252	1354	1465	1665	1865	2160	2469	3072	3672
Media Volume (litres)	28.3	42.5	56.6	70	99	127	170	198	311	538	679
Cycle 1 Backwash	14	14	14	14	14	14	14	14	14	14	14
Cycle 2 Brine Draw dn	66	52	64	57	81	67	75	55	61	49	67
Cycle 3 Fast Rinse	7	7	7	7	7	7	7	7	7	7	7
Cycle 4 Fill kg	4	5	6.75	8.5	12	15.25	20.5	23.75	37.5	64.5	81.5
Cycle 5	End										
Capacity kg	0.7	1.3	1.7	2.2	3	3.8	5.1	5.9	9.3	16.1	22.1
Regen	Auto										
Regen	Normal										
Relay1 rLY 1	off										
Relay 2 rLY 2	off										
Salt	off										

Step 3, Display Settings

Press **NEXT** and **UP** simultaneously for 3 seconds and release.

HARDNESS with 340 flashing should appear on screen.

Hardness	Set on Site
Hardness 2	N/A set to "0"
Regen Day	Override set to 5 days
Regen Time	Preset to 2:00 AM Adjust if you prefer a different time

Notes:

Hardness calculated as follows: 1 x CaCO₃ ppm + 2 x Na ppm + Fe ppm + Mn ppm.

Total Reset: Press & Hold REGEN & NEXT for three seconds

If using a NHWB this must be selected during programming and the NHWB must be connected to the valve to prevent an error message. (Additional information will be provided with the NHWB)

3. Commissioning the System

With the system fully plumbed in and the valve programmed commissioning can start

3.1 Regeneration

When the system is fully functional the regeneration will happen at the pre-set time (see programming the valve section). However, running a manual regeneration during commissioning is the best way of removing air from the system, bedding in the resin and flushing the system through.



Fill the brine tank with approximately 100mm of water and fill the brine tank with tablet salt or 3/4 full if using granular salt (SALT IS NOT SUPPLIED WITH YOUR KIT BUT CAN BE PURCHASED AS AN EXTRA).

Under no circumstances use cooking salt or Pure Vacuum Dried (PVD) salt to fill the cabinet as either of these will damage the resin and the internal components of the regeneration valve and brine draw system.

Make sure the water inlet and outlet are closed.

Press and hold the **REGEN** button for 3 seconds.

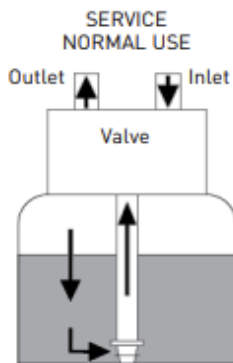
The piston will move to the backwash position.

Slowly half open the water inlet to the system, and then slowly open the outlet to allow the air to be purged from the system.

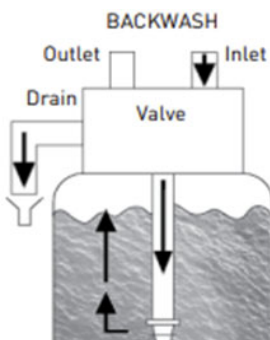
Once this has been done you can fully open the inlet and outlet and allow the system to continue through the regeneration cycle, this will allow you to check for leaks and also purge any remaining air from the system.

After a backwash the system will move through a brine draw routine, rinse and fill before stopping in the service position....

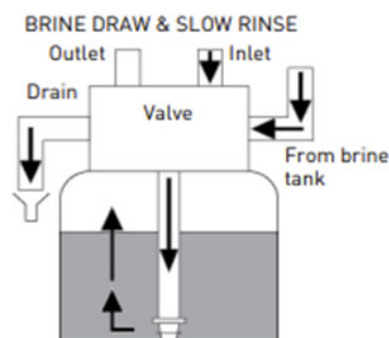
Stages of Regeneration....



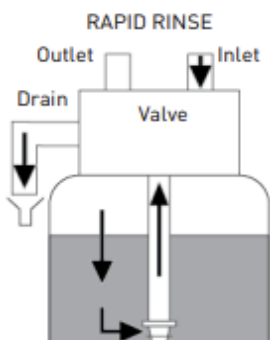
In normal service the water passes through the inlet, down through the resin, up the riser tube to the outlet



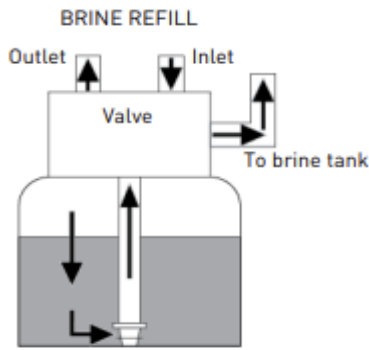
The first stage of regeneration is the backwash. The valve reverses the flow of water so that water now travels down the riser and up through the resin which lifts the bed and loosens any debris that may be trapped in the resin. The water then goes to waste.



During this stage water is sucked from the brine tank. The concentrated brine is mixed with water from the inlet to reduce the concentration to the correct level. It travels down the riser and up through the resin, when the correct amount of brine has been drawn water from the inlet continues to be drawn up through the resin to push the remaining brine through the resin. This process exchanges the organic molecules attached to the resin for sodium ions in the brine thus refreshing the resin and making it ready to attract organics again. During commissioning it is important to observe that water is being sucked from the brine tank and going to drain



During Rapid rinse water is passed down through the resin and up the riser (same as in service) then to drain. This stage flushes out any residual salt and organics that might be present and re-beds the resin ready for use.



During brine refill a quantity of water sufficient to dissolve the correct amount of salt for the next regeneration is passed through the resin into the brine tank to ensure treated water is used to make the brine for the next regeneration.

The unit will automatically go back into service after regeneration is complete.

For new systems or after a media change it may be necessary to run two regenerations to fully charge the media (check the water at the end of the backwash is running clear).

To initiate a delayed regeneration press the regeneration button once quickly this will start flashing Regen Today in the bottom left corner of the screen and the system will regenerate at the pre-set regeneration time. If you wish to cancel this just press the regeneration button again and the display will disappear.

To initiate an immediate regeneration press and hold the regeneration button until the valve motor starts to turn.

If during a regeneration cycle you need to skip through the cycle this can be done in the following way. To skip to the next stage quickly press the regeneration button and this will take it to the next stage of the regeneration, this can be repeated to get to the end of the regeneration cycle.

4. Routine Maintenance

Your system is designed to run with the minimum of maintenance and does not normally require much adjustment.

Weekly

Check the salt level (this may need to be done more regularly dependant on consumption) The salt level should always be above the water level. Check there is no sign of damage or leaks, Check the quality of the treated water.

Monthly

Check the quality of the incoming water to see if it has changed significantly.

Yearly

Check for leaks or damage.

Soda Ash Regeneration

Crystal Right is a well proven iron and manganese reduction media. Provided that the guidelines are followed with regard to the water analysis and selecting the correct grade and volume of media, then problems are rare. However there can be certain ground conditions where dissolved gases in the raw water may lead to a reduction in operating capacity.

During the normal service run gases present in ground water will be absorbed by the Crystal Right, and most of these gases are released during the standard brine regeneration. However some gases [especially CO₂] may not be and stay retained in the crystals. This leads to a small reduction in Crystal-Right's exchange capacity per cycle which after a while can lead to a significant decrease in the exchange capacity of the unit.

To reverse the loss of capacity we have to carry out a regeneration that will release the remaining elements retained by the crystals that have not been removed by the standard brine regenerations. The way we can achieve this is to do regeneration with Sodium Carbonate [Na₂CO₃] which is also known as Soda Ash.

To reverse capacity loss we would suggest 'shock treatment' regeneration with Soda Ash followed by further routine regenerations at set intervals to

prevent a further build up of problem elements on the crystals. It can also be beneficial to periodically regenerate Crystal-Right units that are working satisfactorily with Soda Ash purely as a preventative measure; it will be beneficial to the crystals.

Soda Ash Regeneration Procedure As a Routine Maintenance

Soda Ash is a powder which needs to be dissolved in water to make a liquid that can be drawn into the unit during a regeneration cycle, warm water will dissolve the Soda Ash faster, stirring the mixture also helps to dissolve it. Once the measured amount has been dissolved it is added to the brine solution in the brine tank and regeneration is initiated, during the injection cycle the mixture of brine and liquid soda ash will be drawn into the Crystal-Right bed in the normal way. If the brine tank is fitted with a brine well you can ensure the liquid soda ash makes direct contact with the brine by introducing it via the top of the brine well. Soda Ash is a powder which needs to be dissolved in water to make a liquid that can be drawn into the unit during a regeneration cycle, warm water will dissolve the Soda Ash faster, stirring the mixture also helps to dissolve it. Once the measured amount has been dissolved it is added to the brine solution in the brine tank and regeneration is initiated, during the injection cycle the mixture of brine and liquid soda ash will be drawn into the Crystal-Right bed in the normal way. If the brine tank is fitted with a brine well you can ensure the liquid soda ash makes direct contact with the brine by introducing it via the top of the brine well.

Soda Ash Shock Treatment

The Soda Ash is prepared in the same way and to the same strength as the routine procedure, the difference being during the shock procedure it is drawn direct from the container it is prepared in. The easiest way to do this is to disconnect the regular brine draw tube from the brine elbow, re-connect a piece of flexible tube to the elbow the other end of which is put into the Soda Ash solution.

- I. The first stage of the shock treatment is to backwash the unit for the standard length of time
- II. After the backwash the liquid soda ash is drawn into the bed as per the above guidelines, **immediately** all the soda ash solution has been drawn into the valve the original brine line is re attached to the brine elbow and the brine draw initiated and the standard regeneration cycle allowed to run its course.

III. **Important** When using the shock method monitor the pH of the rinse water going to drain, if CO₂ is being released from the Crystal-Right the pH of the rinse water will drop, the lower the pH the more gas is being released from the crystals.

What Concentration and how much Soda Ash

The correct solution strength is made by dissolving 200 grams of Soda Ash in 1 litre of water. Each cubic foot of Crystal Right will require 2 Litres of Soda Ash solution for regeneration.

CRYSTAL RIGHT SODA ASH REGENERATION CHART			
Vessel Size	Crystal Right Volume	Soda Ash Amount	Dissolved in Water
10" x 44"	1.0 cu.ft	400 g	2 litres
10" x 54"	1.5 cu.ft	600 g	3 litres
12" x 52"	2.0 cu.ft	800 g	4 litres
13" x 54"	2.5 cu.ft	1.0 kg	5 litres
14" x 65"	3.5 cu.ft	1.4 kg	7 litres
16" x 65"	4.5 cu.ft	1.8 kg	9 litres
18" x 65"	6.0 cu.ft	2.4 kg	12 litres
21" x 60"	7.0 cu.ft	2.8 kg	14 litres
24" x 69"	11 cu.ft	4.4 kg	22 litres
30" x 72"	19 cu.ft	7.6 kg	38 litres
36" x 72"	26 cu.ft	10.4 kg	52 litres
Mixing the Soda Ash with warm water will dissolve the granuals quicker			

5. Troubleshooting

On the following pages you will find a guide as to the most common problems that may arise; please consult this section before contacting your supplying dealer as most problems are easily cured using the troubleshooting information.

Troubleshooting

TC control valves do not have meters so shaded areas are not applicable for TC control valves

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

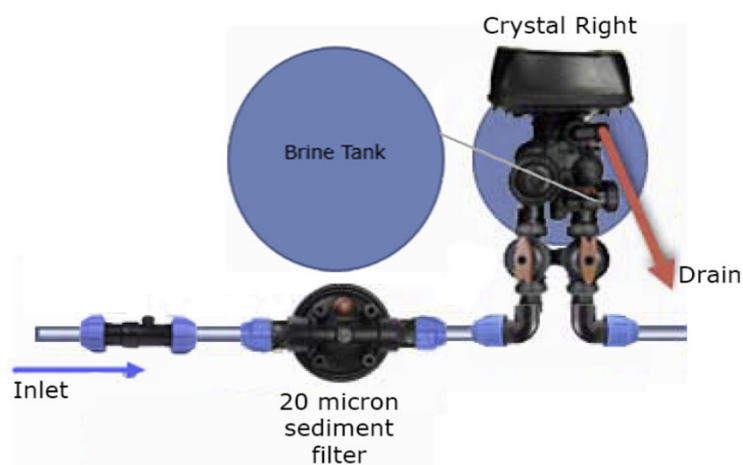
Crystal Right CR100 Installation, Operation and Maintenance Guide

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

Problem	Possible Cause	Solution
13. Water running to drain	a. Power outage during regeneration	a. Upon power being restored control will finish the remaining regeneration time. Reset time of day.
	b. Damaged seal/ stack assembly	b. Replace seal/ stack assembly
	c. Piston assembly failure	c. Replace piston assembly
	d. Drive cap assembly not tightened in properly	d. Re-tighten the drive cap assembly
14. E1, Err – 1001, Err – 101 = Control unable to sense motor movement	a. Motor not inserted full to engage pinion, motor wires broken or disconnected	a. Disconnect power, make sure motor is fully engaged, check for broken wires, make sure two pin connector on motor is connected to the two pin connection on the PC Board labeled MOTOR. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. PC Board not properly snapped into drive bracket	b. Properly snap PC Board into drive bracket and then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. Missing reduction gears	c. Replace missing gears
15. E2, Err – 1002, Err – 102 = Control valve motor ran too short and was unable to find the next cycle position and stalled	a. Foreign material is lodged in control valve	a. Open up control valve and pull out piston assembly and seal/ stack assembly for inspection. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. Mechanical binding	b. Check piston and seal/ stack assembly, check reduction gears, check drive bracket and main drive gear interface. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. Main drive gear too tight	c. Loosen main drive gear. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	d. Improper voltage being delivered to PC Board	d. Verify that proper voltage is being supplied. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.

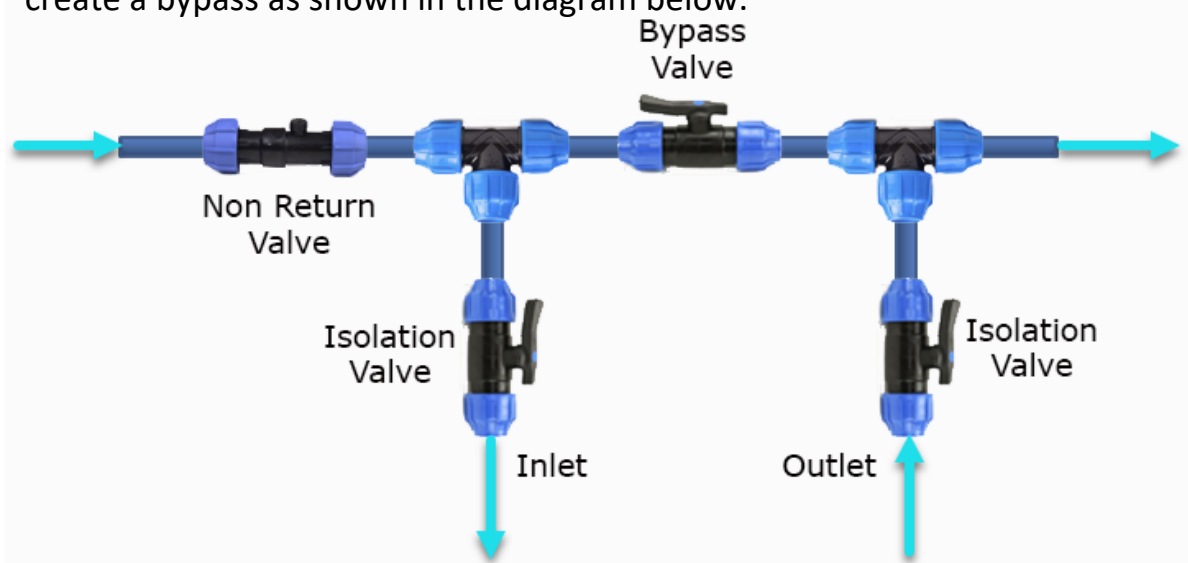
Problem	Possible Cause	Solution
16. E3, Err – 1003, Err – 103 = Control valve motor ran too long and was unable to find the next cycle position	a. Motor failure during a regeneration	a. Check motor connections then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out motor	b. Replace piston and stack assemblies. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface	c. Snap drive bracket in properly then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
17. Err – 1004, Err – 104 = Control valve motor ran too long and timed out trying to reach home position	a. Drive bracket not snapped in properly and out enough that reduction gears and drive gear do not interface	a. Snap drive bracket in properly then Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
18. Err -1006, Err – 106, Err - 116 = MAV/ SEPS/ NHBP/ AUX MAV valve motor ran too long and unable to find the proper park position Motorized Alternating Valve = MAV Separate Source = SEPS No Hard Water Bypass = NHBP Auxiliary MAV = AUX MAV	a. Control valve programmed for ALT A or b, nHbP, SEPS, or AUX MAV with out having a MAV or NHBP valve attached to operate that function	a. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect. Then re-program valve to proper setting
	b. MAV/ NHBP motor wire not connected to PC Board	b. Connect MAV/ NHBP motor to PC Board two pin connection labeled DRIVE. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	c. MAV/ NHBP motor not fully engaged with reduction gears	c. Properly insert motor into casing, do not force into casing Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	d. Foreign matter built up on piston and stack assemblies creating friction and drag enough to time out motor	d. Replace piston and stack assemblies. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
19. Err – 1007, Err – 107, Err - 117 = MAV/ SEPS/ NHBP/ AUX MAV valve motor ran too short (stalled) while looking for proper park position Motorized Alternating Valve = MAV Separate Source = SEPS No Hard Water Bypass = NHBP Auxiliary MAV = AUX MAV	a. Foreign material is lodged in MAV/ NHBP valve	a. Open up MAV/ NHBP valve and check piston and seal/ stack assembly for foreign material. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.
	b. Mechanical binding	b. Check piston and seal/ stack assembly, check reduction gears, drive gear interface, and check MAV/ NHBP black drive pinion on motor for being jammed into motor body. Press NEXT and REGEN buttons for 3 seconds to resynchronize software with piston position or disconnect power supply from PC Board for 5 seconds and then reconnect.

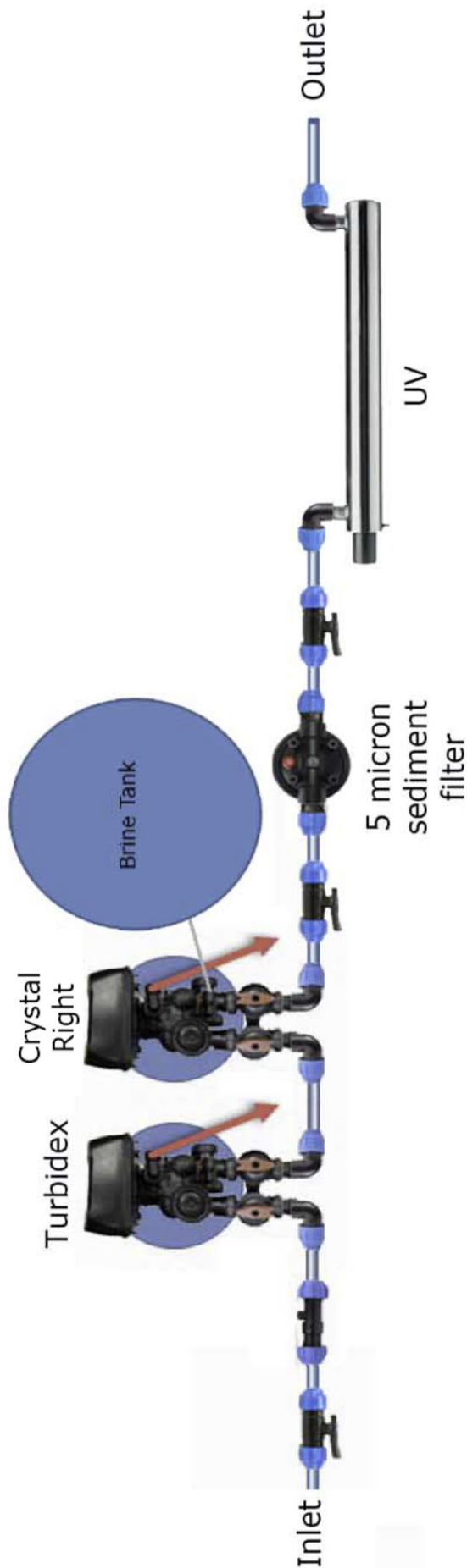
6. Typical Installation Layouts



In this example a 20 micron sediment pre-filter has been added. The crystal right system is fitted with a bypass valve so that the system can easily be isolated and the inlet water will bypass the system so there is no loss of water.

Without the bypass valve we recommend that you use your pipework to create a bypass as shown in the diagram below.





In this example the water has high turbidity so a turbidex system has been fitted before the Crystal Right system as Crystal Right will not work well in high turbidity water (it works best in clear water).

Turbidex - removes sediment in the water down to 5 micron (nominal) which not only makes the water clearer it also acts as a pre-filter for the Crystal Right system

Crystal Right - removes iron, manganese, hardness and ammonia

5 micron sediment filter - pre-filtration for the UV. This makes sure microbes don't hide behind sediment and avoid getting a full dose of UV

UV - kills bacteria, viruses, spores and moulds.

7.0 Further Installation Notes

7.1 MECHANICAL

7.1.1 Foundation/Drainage

The Crystal Right System will not require any special foundations, provided that a firm, level area which is capable of supporting the working weight is available.

Unwanted water from the regeneration process must flow to drain, and so an open drain or gully, capable of passing the necessary flow is required. The drain may be at a level no higher than 500mm above the softener valve.

A second drain is required for the brine tank overflow. This is a safety drain which will only discharge water if there is a malfunction in the control valve. Where possible this should be installed through an outside wall like a cistern overflow, where it will give a visual indication of any failure.

7.1.2 Operating Space

Access will be required to refill the brine tank, and to carry out adjustments or maintenance on the equipment. It is therefore recommended that a minimum of 500mm clearance be allowed in front of the unit for this purpose.

7.1.3 Incoming Water

The raw water to be fed to the organic scavenger must comply with the following:-

1. Available at all times at a flow equal to the required service flow or greater
2. At a pressure between 1.7 and 5.5 bar
3. Temperature between 1 and 40°C
4. Suspended solids less than 1 ppm
5. Iron less than 0.2 ppm, Manganese less than 0.1 ppm, Free Chlorine less than 1 ppm if temperature is less than 15°C, less than 0.3 ppm if temperature higher (up to 30°C)

7.1.4 Pipework

Pipework to be connected to the Crystal Right System should not have an excessive amount of hardness scale deposit. Piping that is heavily built up with scale (or Iron deposits) should be replaced.

Make sure that the pipework can be connected to the scavenger in such a way as to impose no stresses on the control valve, and that it is properly aligned and supported.

A system for the complete by-passing and isolation of the scavenger should be installed

7.1.5 Water Supply Company Requirements

It is essential that if the equipment is to be connected directly to a mains water supply, the local bylaws must be adhered to. These cover both plumbing and the prevention of backflow into the mains. If there is any doubt, the local water inspector should be consulted, but in general, the installation of a 'Double check valve assembly' conforming to BS6282 part 2 will be required in the feed pipework to the scavenger.

If the pressure available from the mains is not adequate it will be necessary to install a booster pump arrangement. Such a system would be covered by additional bylaws, and the water storage tank needed must comply with these.

7.2 ELECTRICAL

A continuous supply is required by the system. A transformer is provided, which should be connected to an uninterrupted mains supply, which is separately 1 Amp fused, and does not have any additional switch.

It is recommended that the transformer be attached to a nearby wall, within 500 mm of the softener in an area free from water spray or excessive heat or condensation.

Electrical installation is very straightforward, but should still be carried out by a competent electrician, and must conform to the appropriate standards of safety.