spotzero WaterPurifiers + seaXchange WaterMakers

Membrane Replacement, Installation, and Winterization Guide

XTC II | XZ II | ZTC II

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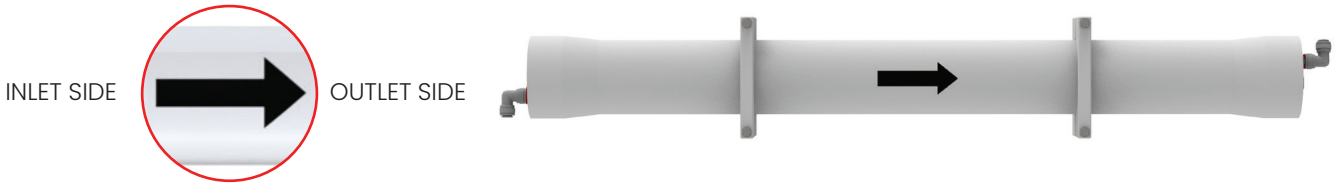
FW Membrane Replacement / Installation

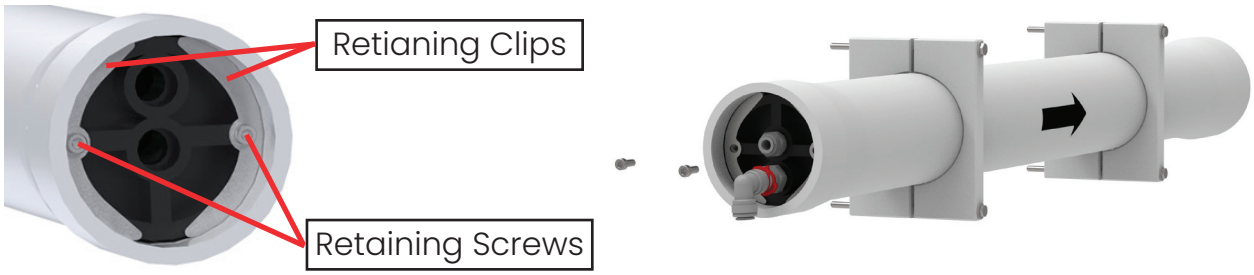
NOTE	REPLACEMENT OF THE FW MEMBRANES WILL LIKELY RESULT IN WATER SPILLING THROUGHOUT THE BILGE OF THE BOAT. USE A BUCKET TO COLLECT WATER WHEN POSSIBLE. ENSURE NO CONTACT WITH ELECTRICAL EQUIPMENT OCCURS.

Removing the FW Membrane Element

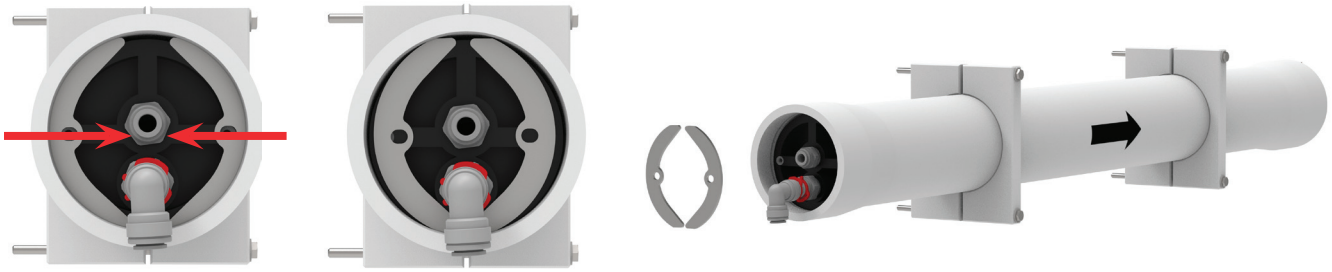
1. Locate the inlet side (arrow tail end) of the membrane housing. If there are 2 membrane vessels in series, the below steps will have to be repeated for each housing.



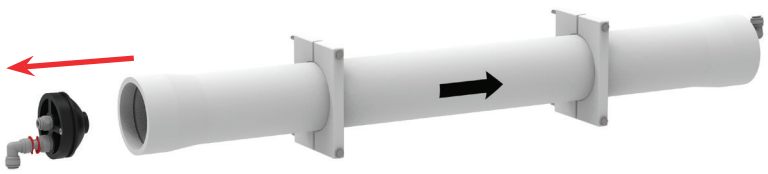
2. Remove the 1/2" LDPE QC tubing from the FW Supply on the membrane housing and insert a short length of tubing to act as a drain line. NOTE: This step is not critical and is customer preference.
3. Allow water to drain into a bucket or directly to the bilge. Once drained, remove the tubing.
4. Locate and remove the two M6 x 1.0 x 10 bolts that secure the retaining plates in place with a 5mm Allen head wrench as show in the image below.



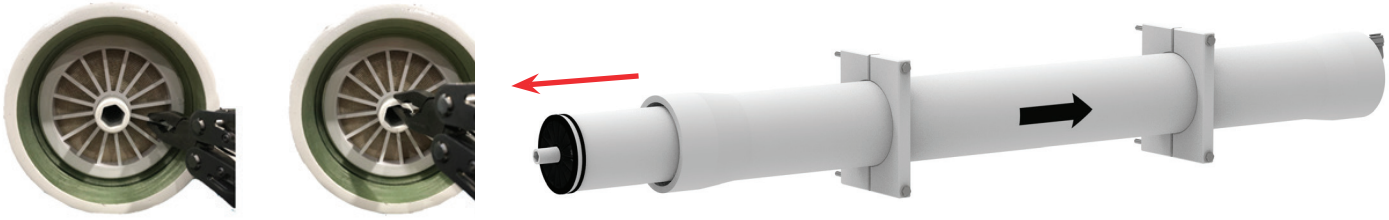
5. After removing the retaining bolts, slide the retaining clips toward the center to release the clips from the groove. NOTE: You may need to use the tip of 5mm Allen key or pliers to dislodge the clip.
6. Once dislodged, remove the clips from the housing and set aside.



7. Remove the end cap from the pressure vessel. This may take a bit of force to remove as the end cap may have come tightly pressed to the walls of the vessel due to the operating conditions. A pair of pliars may be used to pull on the end cap fins only.



8. Once reomved, set the end cap, retaining screws, and retaining clips aside.
9. Slowly remove the membrane from the pressure vessel, being careful not to grasp it by the permeate tube (white core). A pair of needle nose pliars may be required to remove the mebrane as it may have become tightly compressed in the housing during operating conditions. Set aside the membrane once removed.



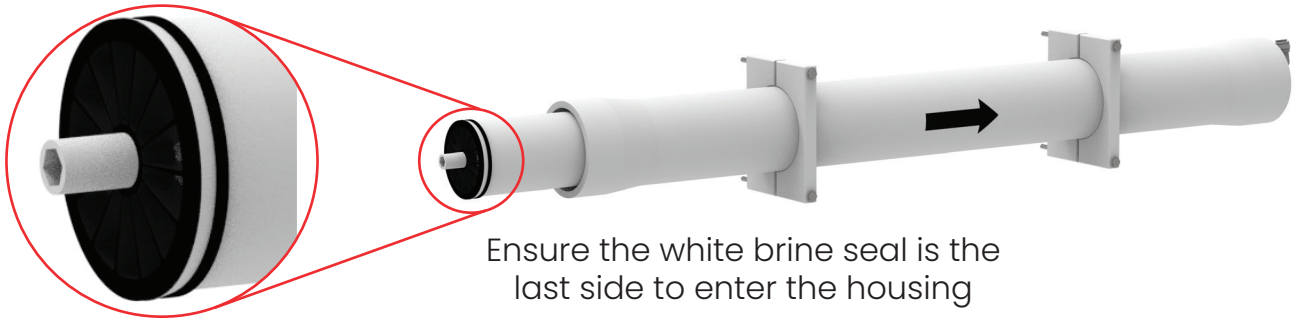
CORRECT INCORRECT

Inserting the WaterPurifier Membrane Element

1. Remove the replacement membrane elements from the shipping boxes. The membranes should be contained in plastic oxygen barrier bags.
2. Cut open the bag being very careful not to cut or knick any portion of the membrane.
3. Make sure all components are clean and free of dirt. Examine the brine seal and permeate tube for any knicks or cuts.
4. Lubricate the brine seal with a food grade lubricant. We recommend Molykote® 111 Compound.

⚠ CAUTION	THE MEMBRANE CAN ONLY BE INSERTED IN ONE DIRECTION. INSTALLING THE MEMBRANE FROM THE WRONG DIRECTION WILL CAUSE THE SEAL TO NOT SEAT PROPERLY, RESULTING IN POOR MEMBRANE PERFORMANCE.

5. Install the membrane so that the white brine seal is located on the inlet side of the vessel.
6. With a smooth and constant motion, push the membrane element into the housing so that the brine seal is the last side the enter the housing.



Ensure the white brine seal is the last side to enter the housing

⚠ CAUTION	ENSURE THAT YOU DO NOT PINCH OR FATIGUE ANY O-RINGS WHILE RE-INSTALLING THE END PLUG. PUSH THE END PLUG ON UNTIL IT IS SEATED ON THE MEMBRANE AND THE TOP SURFACE IS FLUSH WITH THE GROOVED RINGS.

7. To reassemble the membrane vessel, repeat steps 2-7 in reverse order as described on the next page.

8. Re-install the end cap by gently twisting the end cap while pushing it into the housing.
9. Reinstall the two retaining clips by pushing them in against the hub and then sliding them outwards until they seat in the grooved ring and are lined up with the tapped holes.
10. Reinstall the two M6x1.0x10 bolts that secure the retainer plates in place with a 5mm Allen head wrench.
11. Reconnect any fittings that may have been disconnected when the membrane pressure vessels were disassembled.

⚠ **CAUTION**	MEMBRANES ARE SHIPPED IN A PRESERVATIVE SOLUTION. THE MEMBRANES MUST BE FLUSHED FOR AT LEAST 30 MINUTES PRIOR TO USE TO REMOVE THE PRESERVATIVE FROM THE MEMBRANE. DISCARD ALL THE PERMEATE AND CONCENTRATE WHICH IS PRODUCED DURING THE FLUSH PERIOD.

SW Membrane Replacement / Installation

NOTE	REPLACEMENT OF THE SW MEMBRANES WILL LIKELY RESULT IN WATER SPILLING THROUGHOUT THE BILGE OF THE BOAT. USE A BUCKET TO COLLECT WATER WHEN POSSIBLE. ENSURE NO CONTACT WITH ELECTRICAL EQUIPMENT OCCURS.

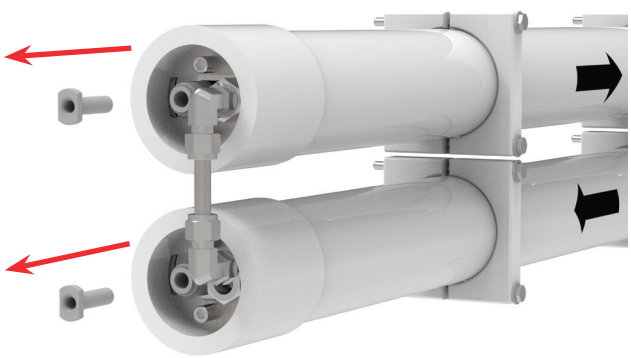
NOTE	THE NUMBER OF MEMBRANES THAT WILL NEED TO BE CHANGED IS BASED ON THE SPECIFIC SYSTEM MODEL NUMBER AND CAPACITY. THE FOLLOWING IMAGES AND GUIDE ARE PROVIDED FOR A 1200 GPD SYSTEM CONFIGURATION, THE MAIN PRINCIPLES OF THE GUIDE CAN BE APPLIED TO ALL OTHER CONFIGURATIONS.

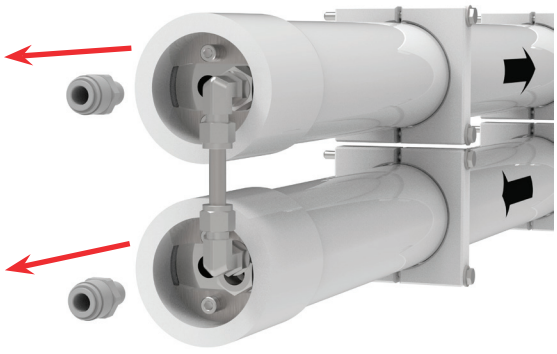
Removing the SW Membrane Element

1. Metal oxidation and mineral deposits such as salt can interfere with vessel end cap removal and can damage the membrane element. Remove contmainants with a small abrasive pad or cloth as needed. Flush away deposits with clean freshwater.

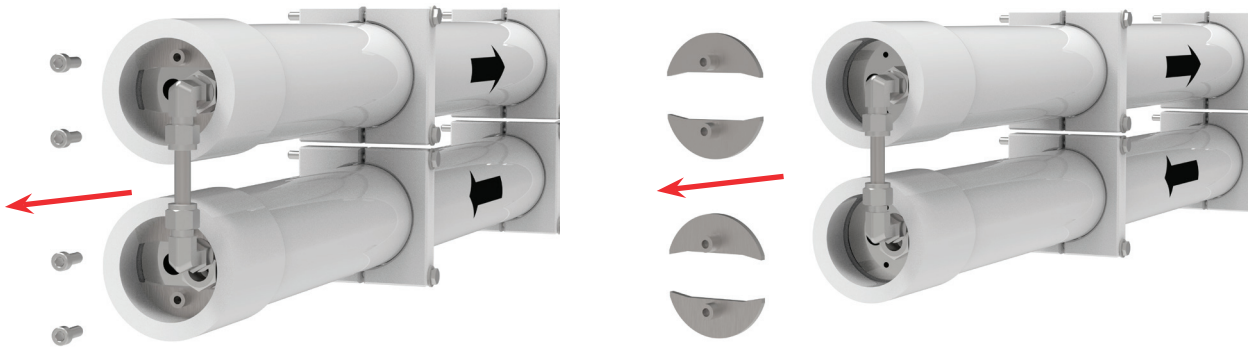
NOTE	IT IS RECOMMENDED TO TAKE DETAILED PICTURES OF EACH SIDE OF THE FULL ASSEMBLY FOR REFERNCE DURING END CAP AND MEMBRANE REINSTALLATION.

2. Go to the side of the vessel array with stainless steel ubing connecting the two membranes.
3. Remove the LDPE Quick Connect plugs from the 3/8" QC fittings.
4. Remove the remaining threaded QC fittings using a 13/16" socket. Set aside.

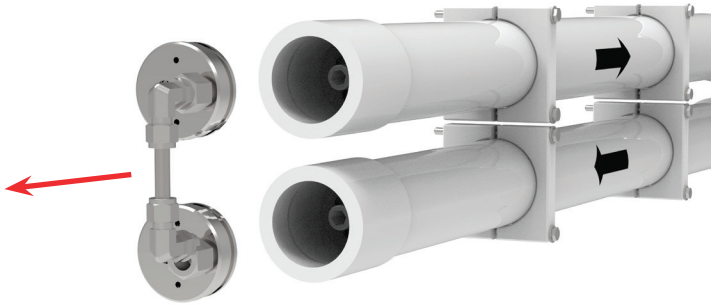




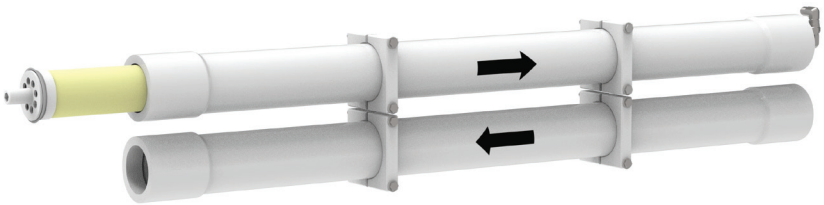
5. Locate and remove the two M6 x 1.0 x 10 bolts that secure the retaining plates in each membrane housing with a 5mm Allen head wrench as show in the image below.
6. After removing the retaining bolts, slide the retaining clips toward the center to release the clips from the groove. NOTE: You may need to use the tip of 5mm Allen key or pliers to dislodge the clips.



7. Both endcaps will need to be removed. The high pressure stainless steel tubing that connects the endcaps together does not need to be removed. The two end caps can remain tied together and still be slid out of the housing as shown below.
   NOTE: This may take a bit of force to remove as the end cap may have come tightly pressed to the walls of the vessel due to the operating conditions. You may need to grab the stainless fitting and using pliers wiggle the fitting side to side and up and down while pulling out to release the end cap from the housing.



8. Locate the pressure vessel with the directional arrow pointed away from the open end cap. In the example below, this specific vessel is located on the top of the membrane rack.
9. Slowly remove the membrane from the pressure vessel, being careful not to grasp it by the permeate tube (white core). A pair of needle nose pliars may be required to remove the mebrane as it may have become tightly compressed in the housing during operating conditions. Set aside the membrane once removed.



Inserting the WaterMaker Membrane Element

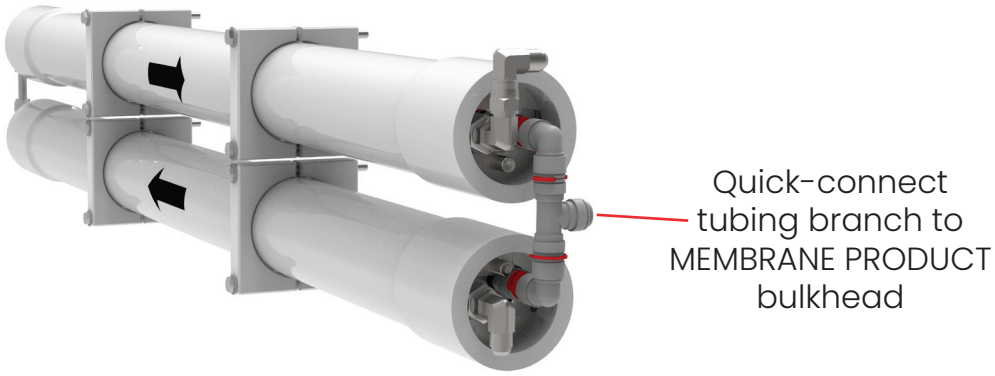
1. Remove the replacement membrane elements from the shipping boxes. The membranes should be contained in plastic oxygen barrier bags.
2. Cut open the bag being very careful not to cut or knick any portion of the membrane.
3. Make sure all components are clean and free of dirt. Examine the brine seal and permeate tube for any knicks or cuts.
4. Lubricate the brine seal (the large white angled o-ring on the end of the membrane element) and replace the o-rings on the end cap. There should be 3 o-rings that need to be replaced. Two for the product port and one for the sealing edge of the o-ring with a food grade lubricant. We recommend Molykote® 111 Compound.

⚠ **CAUTION**	ENSURE THAT YOU DO NOT PINCH OR FATIGUE ANY O-RINGS WHILE RE-INSTALLING THE END PLUG. PUSH THE END PLUG ON UNTIL IT IS SEATED ON THE MEMBRANE AND THE TOP SURFACE IS FLUSH WITH THE GROOVED RINGS.

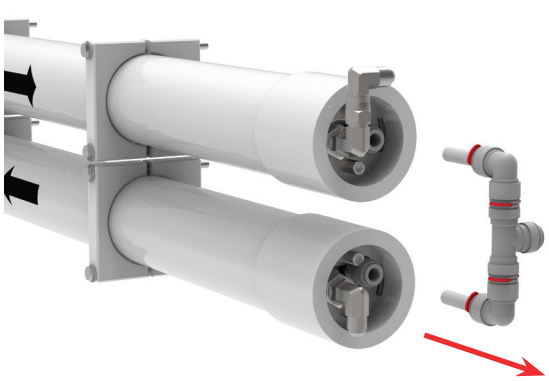
⚠ **CAUTION**	THE MEMBRANE CAN ONLY BE INSERTED IN ONE DIRECTION. INSTALLING THE MEMBRANE FROM THE WRONG DIRECTION WILL CAUSE THE SEAL TO NOT SEAT PROPERLY, RESULTING IN POOR MEMBRANE PERFORMANCE.

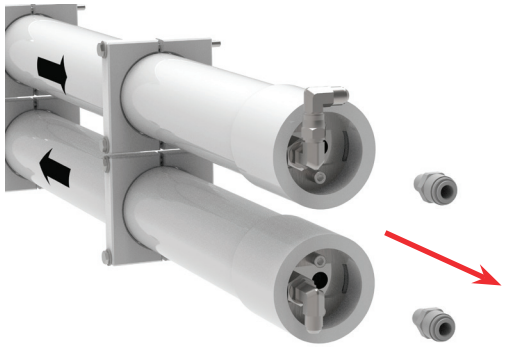
Membrane Replacement Continued

10. After the membrane element is installed, repeat steps 2-9 in reverse order to reinstall the membrane endcaps and plumbing.
11. To remove the second membrane element, go to the opposite end of the membrane array with the quick-connect tubing branch that leads to the MEMBRANE PRODUCT bulkhead on the WaterMaker portion of the system.
12. Disconnect the QC tubing branch from the fittings installed in the membrane end caps. To remove the tubing from the fittings, remove the red lockign clips, press in on the grey retaining collar of the fittting and pull the tubing away from the fittings.

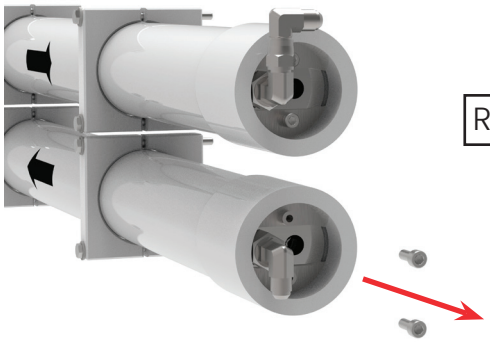


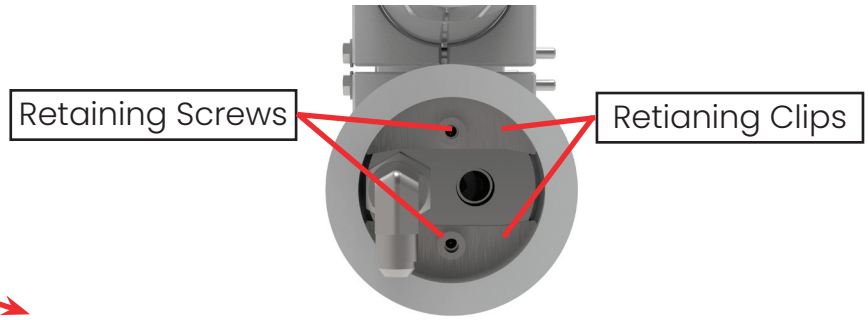
13. After removing the tubing assembly, remove the remaining threaded QC fittings using a 13/16" socket. Set aside.

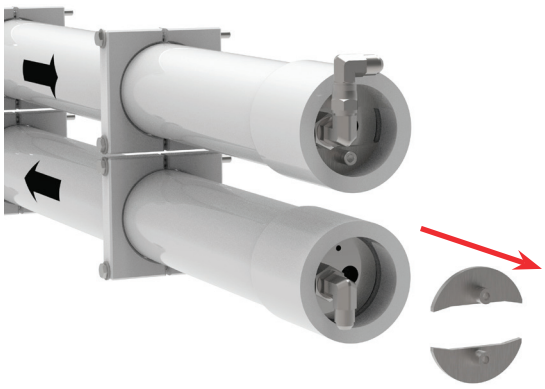


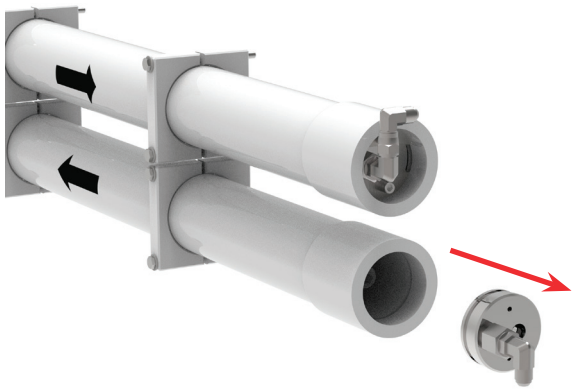


14. Locate and remove the two M6 x 1.0 x 10 bolts that secure the retaining plates in place with a 5mm Allen head wrench as show in the image below.
15. After removing the retaining bolts, slide the retaining clips toward the center to release the clips from the groove. NOTE: You may need to use the tip of 5mm Allen key or pliers to dislodge the clip.
16. Once dislodged, remove the clips from the housing and set aside.

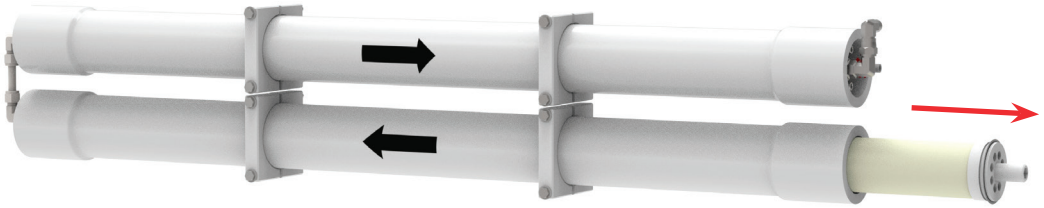








17. Remove the end cap from the pressure vessel. This may take a bit of force to remove as the end cap may have come tightly pressed to the walls of the vessel due to the operating conditions. You may need to grab the stainless fitting and using pliers wiggle the fitting side to side and up and down while pulling out to release the end cap from the housing.
18. Slowly remove the membrane from the pressure vessel, being careful not to grasp it by the permeate tube (white core). A pair of needle nose pliars may be required to remove the mebrane as it may have become tightly compressed in the housing during operating conditions. Set aside the membrane once removed.



19. Apply Molykote to the brine seal and replace the o-rings on the end cap. There should be 3 o-rings that need to be replaced. Two for the product port and one for the sealing edge of the o-ring
20. Reinstall the new membrane and install the end cap following steps 12-18 in reverse order. It is important that the orientation of the endcap is the same as when it was removed so the plumbing runs can be connected properly
21. Once new membranes have been installed, the system should be fresh water flushed to wet the membranes. Before using the system after a membrane change it is important to discard any product water overboard for the first 30 minutes of use. Do so by following the Manual Quality Control Valve Override on Pg. XX.

⚠ **CAUTION**	DO NOT TOLERATE ANY LEAKS. LEAKS CAN RESULT IN CORROSION AND EVENTUAL CATASTROPHIC VESSEL FAILURE.

Long Term Storage and Winterization

RO membranes are sensitive to biological growth, chemical degradation, and drying out. If not properly stored chemically, membranes can suffer from fouling, reduced permeability, and ultimately, failure. Using a membrane preservative helps maintain membrane integrity and readiness by preventing these issues. It is vital to ensure that membranes are kept in a chemically stable environment when the system is idle to avoid costly replacements and downtime. In the same respect, if a system is going to be stored in conditions where temperatures drop below freezing (32 °F / 0 °C), proper winterization procedures must be followed to prevent permanent system damage from freezing.

There are two options for winterizing your XZII system. It is the responsibility of the user to determine the best method for their application and use due diligence for following all required steps.

Option 1: Storage in a Stable Above Freezing Environment (32°F/0°C)

The best practice for winterization is to store the XZII system in a heated storage climate. During this storage, the system still needs to be ran and flushed once a month for five minutes to prevent the membranes from fouling. If the system cannot be run for five minutes once a month, you must follow the Membrane Preservation Guide for Long Term Storage below.

Option 2: Storage in an Uncontrolled Environment

If the system is stored in freezing or near freezing temperatures, and will not be stored in a heated climate, the following should must done to avoid permanent damage. If the system will also sit without flushing for more than a month at a time, the membrane vessels must have static water replaced with membrane storage chemical solution. The CH-03 Membrane Storage Chemical is **Part #:252404263** and can be purchased through any dealer of Spot Zero. To prepare for storage, please follow the steps below.

⚠ CAUTION	PRODUCT WATER FROM THE MOBILE UNIT MUST BE USED FOR THE BELOW STEPS, FAILURE TO DO SO MAY RESULT IN PERMANENT MEMBRANE DAMAGE.

Membrane Preservation Guide for Long Term Storage **ABOVE** Freezing Temperatures

With temperatures that remain above freezing, only the membrane needs to be preserved, the control unit can be bypassed. This bypass is only possible on the WaterPurifier.

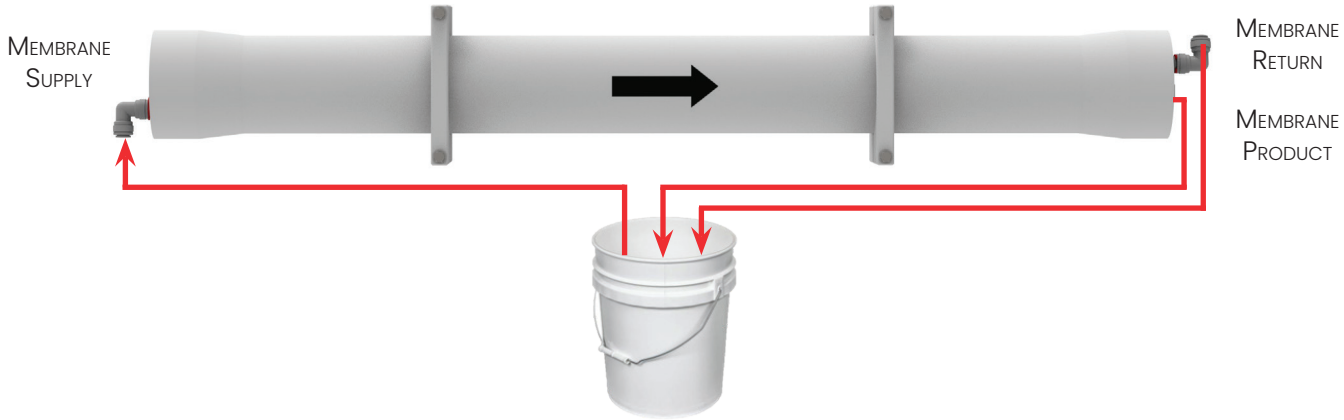
Components Required for System Preservation

- Clean bucket for creating a closed loop system
- Chemical injection pump
- Necessary tubing and hoses

1. Turn the system on and fill a 5-gallon bucket with the Spot Zero product water that comes out of the WaterPurifier portion of the XZII.
2. Mix the storage solution using the specific ratios provided in the table below. Ensure the preservative is completely dissolved.

Membrane Preservation Ratios Chart for Temperatures Above 32°F / 0°C		
Substance	**Quantity (US)**	**Quantity (Imperial)**
Purifier or Distilled Water ONLY	5 Gallons	18.9 Liters
Preservative Solution Part Number: **252404263**	1 Bottle or 1 Pound	1 Bottle or 0.45 kilogram

3. Connect the chemical injection pump outlet directly into the “Membrane Supply Line”.
4. The chemical injection pump or inlet line should be submerged in the solution bucket.
5. Connect tubing to the Membrane Return and Membrane Product ports on the membrane.
6. Place the Membrane Return and Membrane Product tubes into the bucket with the solution.



7. Run the pump for approximately 3-5 minutes to properly staturate the membrane.
8. After saturating the membrane, install plugs to each port on the membrane housing.
9. Replace the storage solution every three months to maintain effectiveness. Chemical degradation can occur over time, reducing the preservative’s ability to protect the membrane.

⚠ **CAUTION**	ENSURE THE PUMP DOES NOT EXCEED 30-PSI INTO THE SYSTEM AND THE WATER IS BELOW 110°F (44°C).

To preserve the WaterMaker portion of the system, the steps will be the same as those laid out below in the Membrane Preservation in Freezing Conditions section.

Membrane Preservation Guide for Long Term Storage **BELOW** Freezing Temperatures

With temperatures that dip below freezing, the entire system needs to be preserved to prevent system damage. For an XZII system, perform the steps listed below for both the WaterMaker and WaterPurifier portions.

Components Required for System Preservation

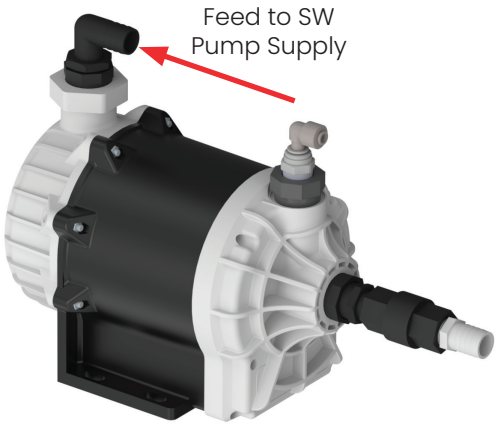
- Clean bucket for creating a closed loop system
- Chemical injection pump
- Necessary tubing and hoses

1. Turn the system on and fill a 5-gallon bucket approximately half-way (3-gallons) with the Spot Zero product water that comes out of the WaterPurifier portion of the XZII.
2. Mix the storage solution using the specific ratios provided in the table below. Ensure the preservative is completely dissolved.

Substance	Quantity (US)	Quantity (Imperial)
Purifier or Distilled Water ONLY	3 Gallons	11.3 Liters
Preservative Solution Part Number: 252404263	1/2 Bottle or 1/2 Pound	1/2 Bottle or 0.22 kilogram
Non-Ethylene Propylene Glycol	2 Gallons	7.5 Liters
TOTAL	**5 Gallons**	**18.8 Liters**

⚠ **WARNING**	DO NOT USE ETHYLENE GLYCOL, ONLY NON-TOXIC PROPYLENE GLYCOL SHOULD BE USED.

3. Remove the filter element and water from the filter housing.
4. For the WaterPurifierm, connect the chemical pump outlet directly into the "Feed from Pre-filtration" port located on the control unit. For the WaterMaker, connect the chemical pump outlet to the inlet of the Boost Pump Assembly as shown below.



5. Connect tubing to the Overboard and Product to Tank ports on the control unit.
6. Place the Overboard and Product to Tank tubes into the bucket with the solution.
7. Run the pump for approximately 10 minutes to properly staturate the system.
8. After saturating the system, reconnect all tubing and install plugs on open ports if needed.
9. Replace the storage solution every three months to maintain effectiveness. Chemical degradation can occur over time, reducing the preservative's ability to protect the membrane.

Recommissioning System After Storage - WaterPurifier

1. Ensure all plumbing connections are correctly positioned.
2. Install a new prefilter to the WaterPurifier system.
3. Disconnect the Product to Tank line from the control unit.
4. Use two 5-gallon buckets to collect the flushing output of the "Product to Tank" line to ensure all the preservative solution and glycol can be discarded properly.

⚠ WARNING	ENSURE ALL OF THE PRODUCT WATER DURING THE 30-MINUTE FLUSH IS DISCARDED OVERBOARD. THIS IS NON-POTABLE, HIGH PPM WATER AND COULD FOUL PLUMBING FIXTURES AND/OR DISCOLOR OR STAIN MATERIALS IT CONTACTS.

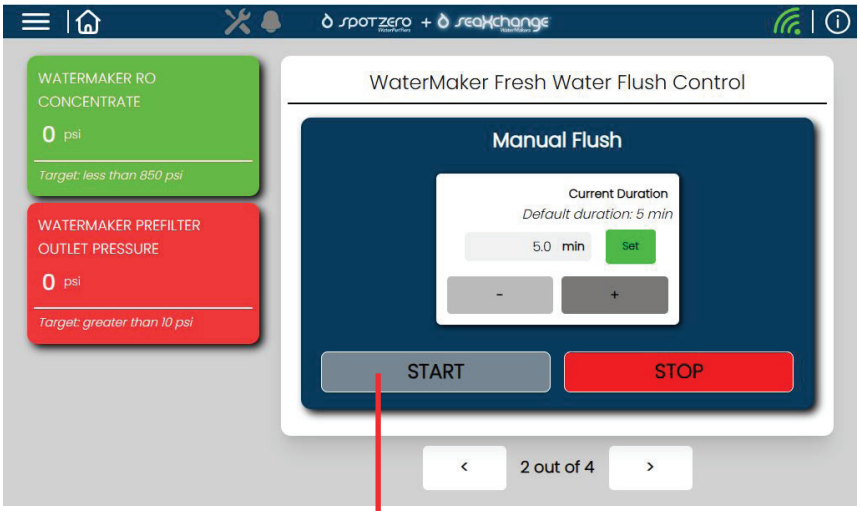
5. Turn ON dock water supply to the system and allow the system to run for 30-minutes to each all storage solution is removed from the system.
6. After the 30-minute flush, turn OFF the dock water supply and allow the system to shutdown.
7. Reconnect the "Product to Tank" line and resume normal operation.

Recommissioning System After Storage - WaterMaker

1. Ensure all plumbing connections are correctly positioned.
2. Disconnect the Product to Tank line from the control unit.
3. Use two 5-gallon buckets to collect the flushing output of the "Product to Tank" line to ensure all the preservative solution and glycol can be discarded properly.

⚠ WARNING	ENSURE ALL OF THE PRODUCT WATER DURING THE 30-MINUTE FLUSH IS DISCARDED OVERBOARD. THIS IS NON-POTABLE, HIGH PPM WATER AND COULD FOUL PLUMBING FIXTURES AND/OR DISCOLOR OR STAIN MATERIALS IT CONTACTS.

4. Turn ON the manual freshwater flush to the system and allow the system to flush for at least 5-minutes.
5. Turn OFF the manual flush and reconnect the "Product to Tank" line to resume normal operation.



Tap to manually activate the freshwater flush