



Installation Manual:

For: AMPAC USA Sea Water Reverse Osmosis System

Model: *SW2000-LX*



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General Information

I.A. The Manual

This manual has been prepared to provide the operator with information regarding the installation, use, maintenance, and troubleshooting of the RO System. Most procedures mentioned in this manual can be performed by the operator. Any exceptions will be clearly identified by a qualifying statement.

I.B. Safety Summary

This safety summary does not contain all the safety statements in the manual. Other safety statements are included within the manual text and are enhanced and defined as follows.

NOTE: Statements that require further clarification.

CAUTION: Statements that identify conditions or practices that could result in equipment or other property damage.

WARNING: Statements that identify conditions or practices that could result in injury or loss of life.

READ THIS MANUAL: Prior to operation or servicing this unit, this manual must be read and understood. If anything is not clear, call for assistance before proceeding. Keep this and other associated manuals for future reference and for new operators or qualified service personnel.

USE PROPER POWER CONNECTIONS: Use proper wiring and connections methods to satisfy local electrical codes.

DO NOT REMOVE COVERS OR PANELS: To avoid electrical shock hazard, do not remove covers or panels when power is supplied to the unit. Do not operate the unit when covers or panels are removed.

SHOCK HAZARD: Connect this unit to a properly grounded connection in accordance with the National Electric Code. DO NOT, under any circumstances, remove the ground prong from any power plug. Do not use extension cords or adapters without proper consideration.

UNIT COMPONENT LABELING: Do not, under any circumstances, remove any Caution, Warning, or other descriptive labels from the unit or components until the conditions warranting the labels are eliminated.

DO NOT OPERATE IN FLAMMABLE ATMOSPHERES: To avoid fire, or explosions, do not operate this unit in an explosive environment.

CAUTION: Reverse Osmosis Elements in this unit are thin film composite (TFC). The unit must be supplied a de-chlorinated feed water supply or irreparable harm to the elements will occur.

I.C. Applications

This RO System is designed to purify water by forcing water through a semi-permeable membrane. Water purified by reverse osmosis has had often greater than 95% of dissolved ions, and 99% of most other contaminants removed. The quality of the purified water, referred to as product water (or permeate), depends on the quality of the feed water, and normally exceeds ASTM type III or IV. Such water is suitable for applications as glassware, rinsing, beverage reconstitution, solution preparation, and numerous other scientific, commercial and industrial applications.

I.D. Indications

This RO System is designed, sold, or intended for use with Sea Water Desalination process.

Furthermore, this RO System is not intended to be used outside of the unit's specifications or limitations. The system must not be used in an explosive environment.

I.E. Environmental Considerations

Prior to the installation of the RO System, it will be necessary to provide utilities and create an environment suitable for the trouble free operation of the RO System and its accessories.

Power: All 120 volts and 220 volts components operate on single phase power. 380/460 volt systems operate on 3 phase power. Histories of power failure, power surges, and low line voltages should be noted and reported to the manufacturer or their agent as they may create adverse conditions for the operation of equipment.

Water: Reverse Osmosis Systems require a reliable water source. The RO System needs a minimum of 40 psi inlet pressure. It is important to run water at the design flow rate when testing water pressure, rather than reading static pressure.

Drain: A drain outlet is required by the RO System. The drain must have a capacity equal to the designed concentrate flow rate as long as and as often as the RO is operating.

TEMPERATURE: the RO System is normally connected to a cold water supply. The membrane performance specifications of the RO are based on 77°F, 25°C feed temperature. For each degree Fahrenheit the feed water temperature falls, the RO product flow decreases approximately 1.5%. In climate where or increase the number of membranes in the RO unit. Refer to the inlet water specifications for the maximum operation for your unit. It is also necessary to keep the unit from freezing to prevent serious damage to the RO.

Noise the RO unit does not generate significant noise levels. Hard walls absorb noise poorly and will make the unit appear noisier.

IMPORTANT

Please read the entire manual before proceeding with the installation and startup:

- Do not use where the water is microbiologically unsafe.
- Always turn off the unit, shut off the feed water, and disconnect the electrical power when working on the unit.
- Never allow the pump to run dry.
- Never start the pump with the reject valve closed.
- Never allow the unit to freeze or operate with a feed water temperature above 100° F.

NOTES

- Changes in operating variables are beyond the control Ampac USA. The end user is responsible for the safe operation of this equipment. The suitability of the product water for any specific application is the responsibility of the end user.
- Successful long-term performance of a RO system depends on proper operation and maintenance of the system. This includes the initial plant startup and operational startups and shutdowns. Preventing fouling or scaling of the membranes is not only a matter of system design, but also a matter of proper operation. Record keeping and data normalization is required in order to know the actual plant performance and to enable corrective measures when necessary. Complete and accurate records are also required in case of a system performance warranty claim.
- Changes in the operating parameters of a RO system can be caused by changes in the feed water, or can be a sign of more serious problems. The best insurance against problems leading to membrane failures is to maintain a log on the operation of the RO system, water quality, and temperature.

Description of The Water-maker (Front & Rear)

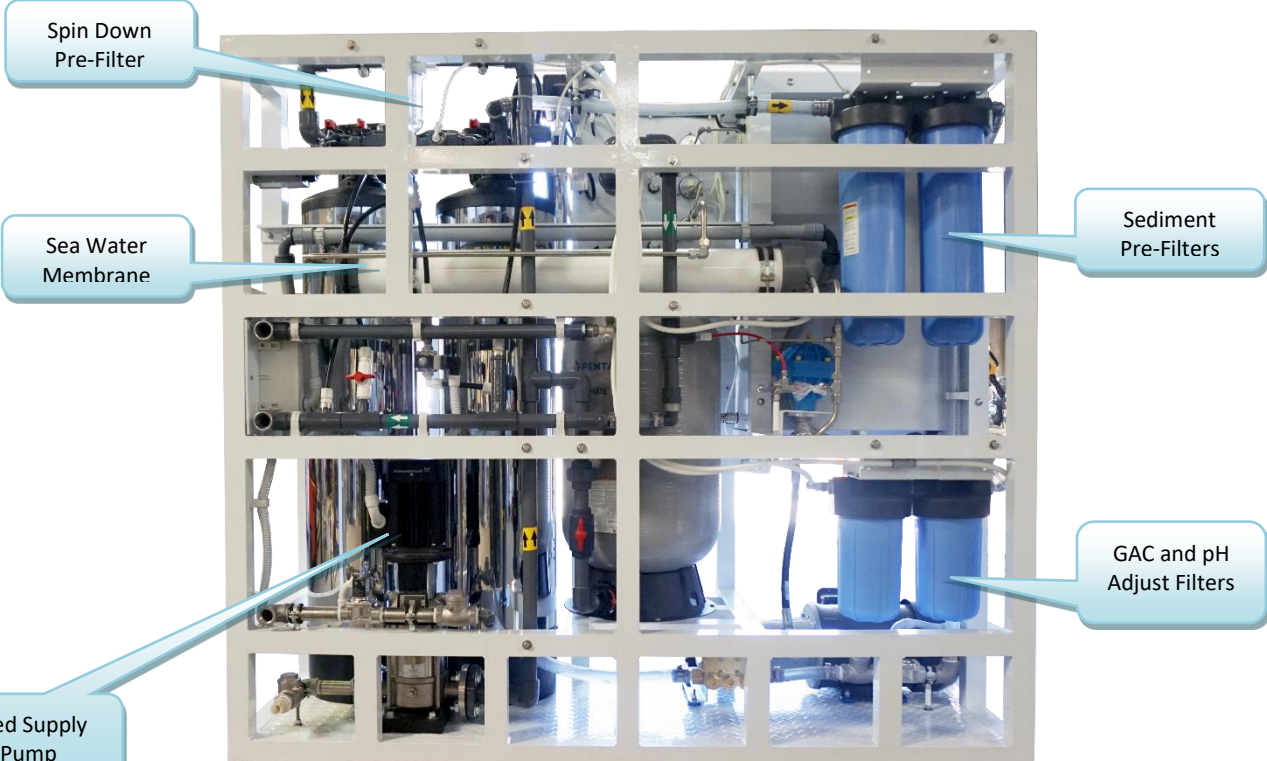
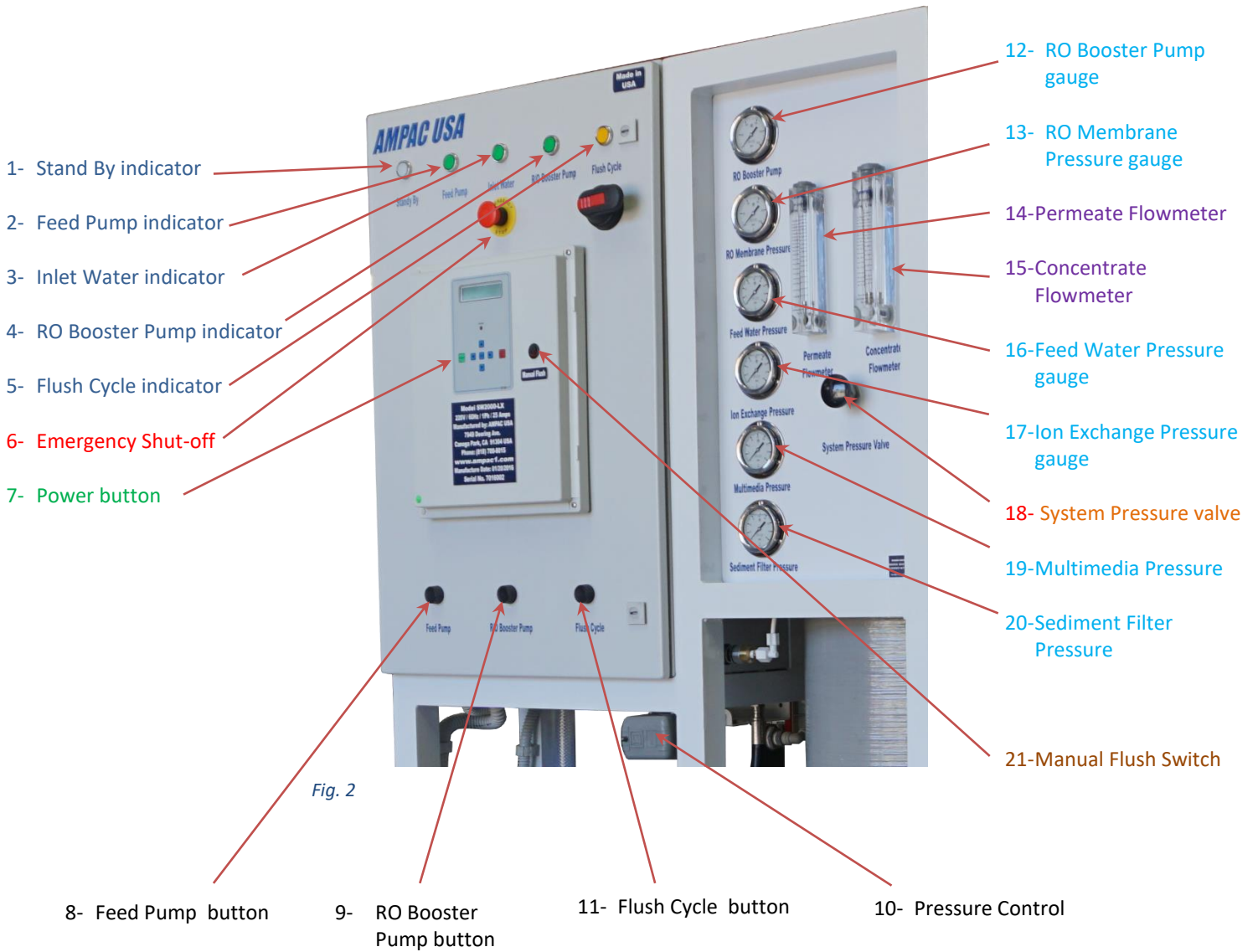


Fig. 1

Panel Description



System Connection:

Connecting the pipes

Permeate Water Output

Concentrate Water Output

Clean water for flush input

Feed water input

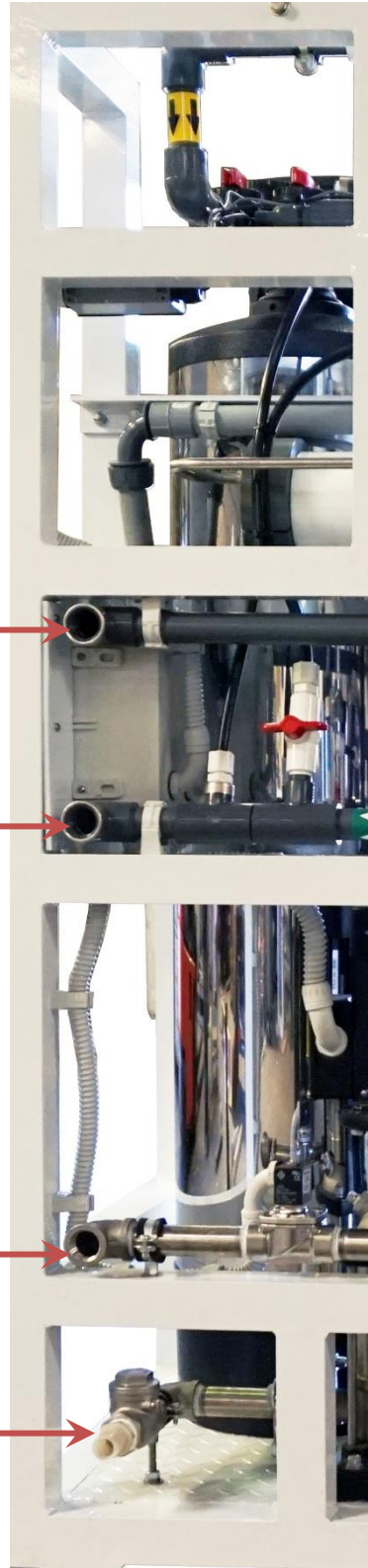


Fig. 3

Setting up the UV Disinfector

UV controller
Retaining Nut
Lamp connector base
UV Reactor



Fig. 4

For installing the UV lamp for the first time upon receiving your plant, you only need to follow steps 3 through 7. Follow the 8 steps when replacing the lamp is needed.

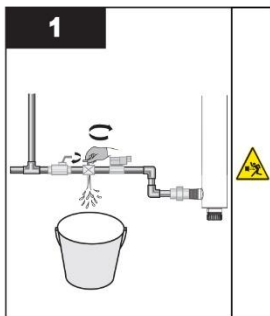
Check the UV Disinfector manual that included in the documents

NOTICE

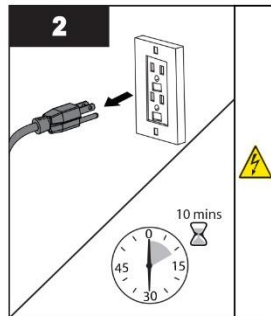
- Reset UV lamp life timer after UV lamp replacement. Refer to [Section 5.1.3](#). Refer to www.lamprecycle.org for UV lamp disposal.
- DO NOT use water during replacement of UV lamp.

UV lamp replacement is a quick and simple procedure requiring no special tools. The UV lamp must be replaced after 9000 hours of continuous operation (approximately one year) in order to ensure adequate disinfection.

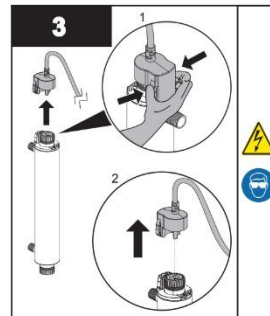
Procedure:



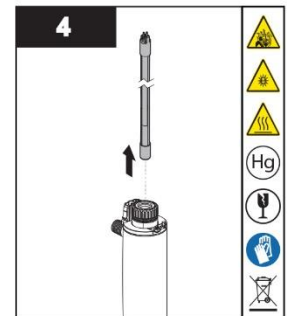
- Shut off the water line to chamber and release system pressure before servicing.



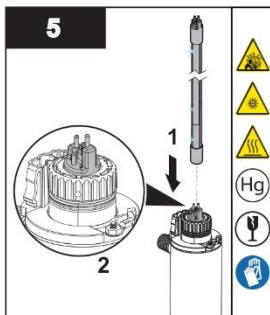
- Disconnect main power source and allow the unit to cool for 10 minutes.



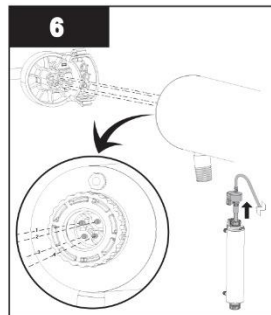
- Remove the lamp connector by squeezing the plastic locking tabs on the side of the connector.



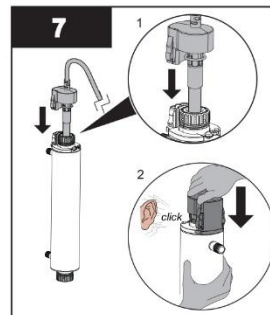
- Remove the lamp in upward direction from the chamber and lamp connector base.
- Always hold the lamp at the ceramic ends.



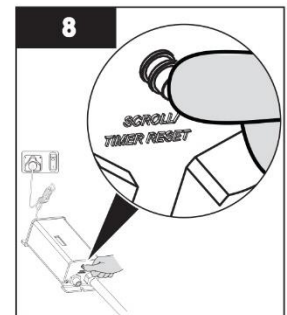
- Insert the new lamp fully into the chamber leaving about two inches of the lamp protruding from the chamber.



- Attach the connector to the lamp and note that the connector will only allow correct installation in one position.

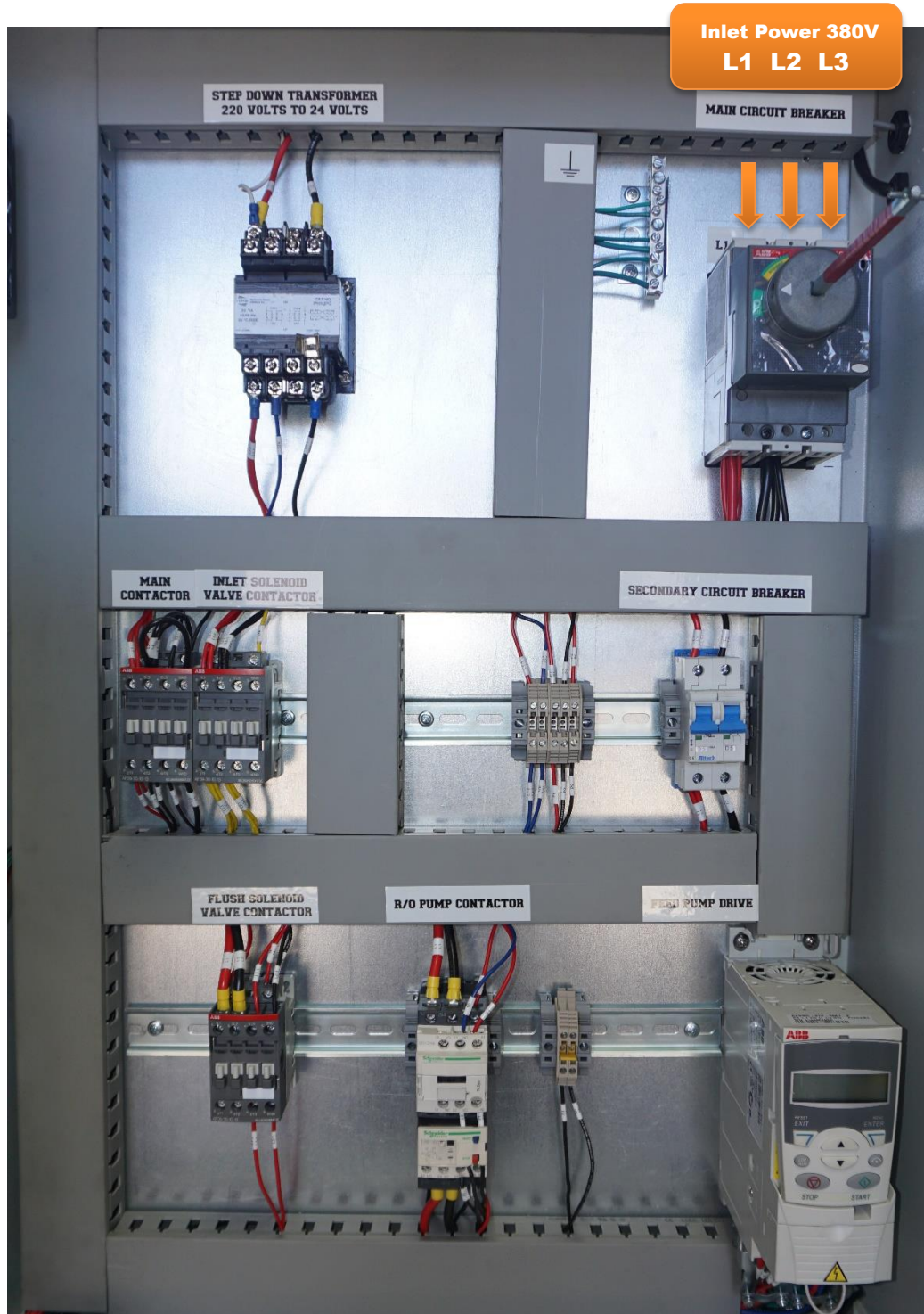


- Push the lamp connector against lamp connector base together until an audible click is heard.
- Re-pressurize the system to check for leaks.



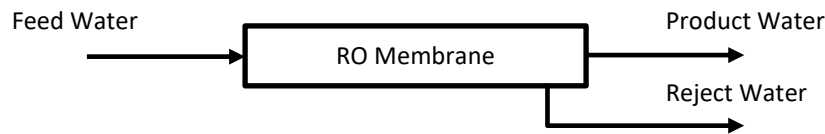
- Hold down the timer reset button and reapply power to the controller until you see **FSET**, then release timer reset button.
- A 5 second delay will occur until you hear an audible tone and LED display will read once again **365**.

Electric power connection



RO Overview

Reverse osmosis systems utilize semipermeable membrane elements to separate the feed water into two streams. The pressurized feed water is separated into purified (product) water and concentrate (reject) water. The impurities contained in the feed water are carried to drain by the reject water.



Starting the system:

Refer to Fig. 2 on Page 6

1. Ensure Open Seawater Supply to the water-maker.
2. Locate and fully open counter clockwise (ccw), the System Pressure valve (18)
3. Open the water supply valve feeding the system.
4. Press Feed Pump button (8), wait until system pressurize. The feed pump will stop automatically when reaches 80 PSI. Keep watching Feed Water pressure Gauge (16)
5. Press R/O Pump Switch (9)
6. Push the **Green** power switch (7) located on the keypad
7. Now the inlet valve is open to fill the system with water. After 5 seconds delay, the pump will start, keep an eye on the Booster Pump pressure gauge (13)
8. Allow the system to run like this for 30 Seconds to purge out all air and fill the vessels with water.
9. Once a constant flow of water can be seen flowing, slowly close (cw) the Pressure control valve (18) while keeping an eye on the RO Booster pump pressure gauge (13) and stop when it reaches **800 psi**.
10. Never allow the RO Booster pump pressure gauge (13) to exceed **900 psi**, yet maintaining the Feed Water pressure Gauge (16) at a minimum of 40-60 PSI. After the system run for a while check for any possible leaks.
11. Once Tank is ½ way full, Press Flush Pump Switch (11)
12. Flush Cycle will start automatically when your permeate water storage tank is full.
13. **Emergency Shut-Off Switch (6)** is for Emergencies only.
14. **NEVER TURN PRESSURE VALVE (cw) ALL THE WAY THIS MAY RISK THE SYSTEM TO DISFUNCTION AND TUBINGS CAN BURST.**
15. After The R/O system fill tank the Flush cycle will open for five minutes to flush system with fresh water. This step has been designed to ensure that salt water will never stay inside system while system is off. This will prevent R/O system from building any corrosion and extend the life of the seawater membrane elements and other components.
16. Keep records of the system operation values and parameters. For reference, an example of log sheet will be at the end of this manual

Setting The Recovery:

Once the system has been running for a while at 800 psi, read the flow rate on both the product and the concentrate streams. Calculate the system recovery as follows:

$$\% \text{ Recovery} = \frac{\text{Product Water Flow (gpm)}}{\text{Product Water Flow (gpm)} + \text{drain flow (gpm)}} \times 100$$

Lowering the Recovery:

The R/O system should be running at the best recovery rate at 800 psi. To lower the recovery further requires that the pressure be decreased.

Decreasing the system pressure also decreases product flow and increases the pump flow thereby reducing the recovery rate. The system pressure can be decreased by opening (ccw) the pressure valve until the desired pump pressure is attained.

To lower the recovery:

1. Open the pressure control valve (8) (ccw) until the Booster pump pressure drops by 50 psi (to 750 psi)
2. Take product and concentrate flow rates and recalculate the recovery.

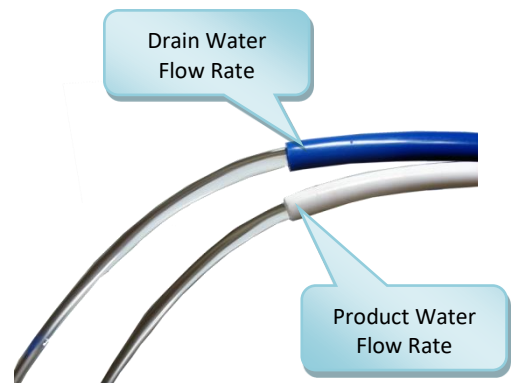
Repeat steps 1 - 2 until the desired recovery is reached.

Raising the Recovery:

Raising the recovery is best done in steps with the pump pressure at 800 psi.

1. Close the drain valve (cw) until the pump pressure increased by 50 psi (back to 800 psi).
2. Take product and drain flows rate and recalculate the recovery.

Repeat steps 1 - 2 until the desired recovery is reached. **Never completely close the drain valve,** this will cause the membranes to be damaged.



MAINTENANCE AND SERVICE:

1. SYSTEM PERFORMANCE CHECKS:

There are very little maintenance that- needs to be performed on the reverse osmosis system; however, periodic system checks will ensure trouble-free operation. It is strongly recommended to keep a system performance record. This record can be a useful trouble-shooting tool in the future.

1.1 Daily:

- Check Feed Water Pressure.
- Check the Booster Pump pressure.
- Check the product and drain flow rates.
- Adjust the system pressure if necessary.

1.2 Weekly/Monthly:

- Check and record the flow rates of both the product and drain.
- Check and record the feed water temperature.
- Check and record the TDS of the product water.
- Make sure all fittings are tight and well connected, vibration created from pump can make fittings and bolts loose, check also for bolts attaching pumps to frame.

Flushing and cleaning

In order to maintain system full capacity and extends the life of the RO membranes, the system needs to be cleaned and flushed according to a routinely maintenance schedule or when needed.

To start the flushing process, simply press the “Manual Flush” switch on the control panel (Fig.2). Let the process running for 5 minutes then turn it off.

Maintaining for long period storage

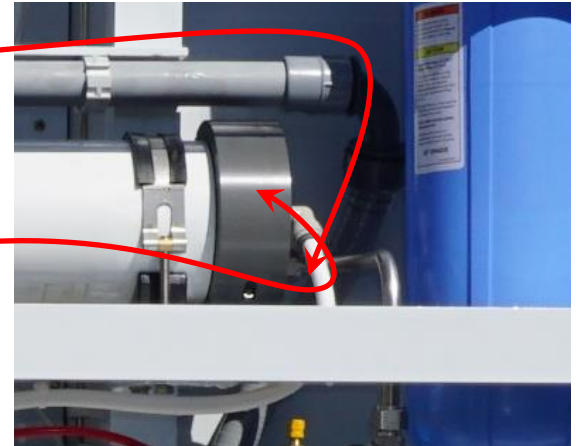
Preparing the system for storage

To store the system for long time without working you need to drain the system from water as much as possible. Keeping water inside will make it rot and clog the filters.

To drain the water for the system:

1. Flush the system following the previous instructions
2. Open the red valve at the bottom of the Spin-Down filter and wait till all the pressure gauges go to Zero. Close the valve back after that
3. Open the Sediment filters, GAC, and pH filter housings using the housing wrench. Drain the water and leave the filters to dry.
4. With the housing opened, try to push compressed air thru the feed inlet to push the water out of the Multimedia Carbon and Ion Exchange tanks. The water will exit from the open filter housings. You will need to cover the RO Booster Pump during this step to keep the water away.
5. Now you need to extract the RO membrane from the pressure vessel. Any element that has been used and removed from the pressure vessel for storage or shipping must be preserved in a preservation solution as follows:

- a. Go the end of the pressure vessel behind the control enclosure, you will see a stainless steel pipe and a quick connect tube. Disconnect both of them from the pressure vessel.
- b. Remove the grey collar by unscrewing the two bolts holding the pieces together.
- c. Pull out the end cap. You may need to use some force to remove it.
- d. Pull the membrane element that's inside the vessel. If needed, you can open the other end of the vessel to push the element out. Mark both end caps so they don't get swapped
- e. Use the standard storage solution of 1% food-grade Sodium Metabisulfite SMBS (not cobalt-activated) in good-quality water (preferably reverse osmosis (RO) or nanofiltration (NF) permeate).
- f. Soak the element for 1 h in the solution; keep it in a vertical position so that the entrapped air can escape. Allow it to drip out, and seal it into an oxygen barrier plastic bag. We recommend reusing the original bag or original spare bags. Do not fill the plastic bag with the preservation solution—the moisture in the element is sufficient, and leaking bags might create a problem during transport.
- g. Identify the element and the preservation solution on the outside of the bag.



- h. Re-preserved elements should be visually inspected for biological growth every three months. If the preservation solution appears to be not clear the element should be re-preserved and repacked as above.
 - i. The pH of the preservation solution must never drop below pH 3. In the absence of a buffer such as is used in the original preservative for wet FILMTEC elements, a pH decrease can occur when bisulfite is oxidized to sulfuric acid. Therefore, the pH of the bisulfite preservation solution should be spot checked at least every 3 months. Re-preservation is mandatory when the pH is 3 or lower.
 - j. Wear protective gloves and sleeves to avoid prolonged contact with skin and sleeves when working with preservative.
6. When finish with the RO membrane preservation, reclose the pressure vessel, replace the filter housing back and dry any spilled water on the frame. The system is ready to be stored.

Operating the system after storing:

1. Follow steps a to c to open the pressure vessel.
2. Get the membranes out of the preservation package.
3. Lightly lubricate the brine seals on the new membranes with clean water.
4. Install the new membranes in the direction of flow with the brine seal end going in last.
5. Lightly lubricate the end cap internal and external o-rings with glycerin.
6. Close the pressure vessel and reconnect the tubes.
7. Follow steps 1-8 on how to start the system. Let the system run for 20-30 minutes with the System Pressure valve fully opened.
8. After that, start the manual flushing process to clean the membrane.
9. Start the system as normal by following all the steps for how to run the system.
10. If there is a big drop in permeate flow comparing to last operation before storing the system, repeat steps 7 & 8.

2. SERVICE:

- **Water-makers perform best when used daily.** Daily operation inhibits biological growth and is preferable to running it less frequently but for longer periods. Consider flushing the system with non-chlorinated freshwater after each use.
- **Flush the system with biocide** when your water-maker is inactive for a week or more (three days in tropical climate). After each treatment remember to discard the water produced during the first 20 minutes of the next session. Installing two Y-valves on the water-maker intake makes it easy to draw in water from the freshwater tank for daily flushing, or to take in biocide when preparing for longer-term storage.
- **Rinse the pre-filter at least once a week** during regular use to prevent silt from accumulating and entering the water-maker.
- **Change the pre-filter once it loses its rigidity.** Be sure to replace it with a same size and type as indicated on the housing.

- **After every 1000 to 1200 hours of use, replace all O-rings and check valves.** (parts come in a Seal Repair Kit.) Consider it a 3000-mile oil change. Cost is around \$40 and the entire job takes about an hour.
- **Use acid and alkaline cleaners** at least once per year to remove stubborn biological growth and mineral scaling.
- **Add a pre-filter:** When operating your water-maker in areas with high silt content, install a more elaborate pre-filtration system, using a 5-micron pre-filter (in addition to the 20-micron pre-filter) to ensure that the water-maker gets enough water flow.

Factors affecting maintenance schedules

Water-makers are designed for use in clean seawater, not harbor water or tap water. The maintenance intervals given will drop if your water-maker is used in other environments and the following conditions:

1. **High salinity and cold water** will decrease output and cause a modest increase in amp draw.
2. **Silt or sand** can damage components of the high-pressure pump if not removed during pre-filtration.
3. **High ambient temperatures** foster growth in the reverse osmosis membrane.
4. **Pollutants** such as oil or chlorine will eventually destroy the membrane. Avoid operating the unit in harbor water. While the membranes are replaceable, they are quite expensive.
5. **Air bubbles** caused by a leak in the intake line or turbulence around the intake thru-hull can be very destructive to the membrane.

Saving water aboard

- Plumb your galley, and possibly your head, with salt water. One of our favorite cruiser/advisors recommends installing a diverter-valve on the inlet water to the pressure water pump. When in conservation mode, use the pressure pump to deliver salt water to the galley and head. In non-conservation mode (as when marina-hopping), change back to fresh pressurized water.
- If there's no pressurized water, have salt- and freshwater pumps in the galley. Using foot pumps instead of pressurized water can save 50%-75% of the water consumed. And having a dual pump set up with fresh- and saltwater will really stretch the drinking water supply.
- Cook and clean with salt water. While you can't substitute salt water for fresh in all applications, you can use it to cook certain types of fish, and mixed with 80-90% fresh water, to boil pasta (10-20% salt). See The Offshore Cruising Encyclopedia for more ideas.
- Use salt water to rinse vegetables and clean pots and pans and only use fresh water for drinking, sensitive recipes and a final rinse of dishes.

Inspecting and replacing the Filters:

Depressurize the feed side of the RO system by doing the following:

- Turn Off Pump Switches
- Turn the PLC selector switch to ON position on the PLC.
- Close the feed water valve that feeds the system.
- Wait until you see all the gauges drop to **0 PSI**



- Once the system has been depressurized, unscrew the Clamp around the top part of the Sediment Filter Housings.
- Pull out the pre-filter cartridges and inspect it for discoloration or scale and replace if necessary
- Thoroughly clean out the pre-filter housing with soap and water. Never use any solvents such as acetone to clean any plastic part on the system.
- Inspect the O-ring for cuts or rough spots and replace it if necessary. Lubricate the O-ring with a thin coat of silicone O-ring lubricant. Do not use any Vaseline or other petroleum based lubricants, they will degrade the O-ring. Place the O-ring into its gland in the filter housing.
- Insert new filter cartridge into the filter housing. Make sure the hole in the center of the filter fits down over the stem in the bottom of the housing. Some filter cartridges have white or black rubber washers at the top and bottom. Care must be taken to be sure these washers stay in place while installing the filter cartridge into the housing.
- Screw the filter housing into the filter-housing lid in a clockwise direction until the housing meets the lid. Hand tight is usually sufficient but a wrench may be used if necessary.
- Start the system as usual and check for leaks.

Consumables List:

Part Number	Description	Life Span	QTY
S20-20	20 Micron Sediment Pre Filter	3-6 Months	1
S20-5	5 Micron Sediment Pre Filter	3-6 Months	1
APC10-BB	Carbon Block Post Filter	12 Months	1
CX10	Ceramic .05 Micron Post Filter	12-24 Months	1
UV12	Ultra Violet Sterilizer Bulb	12 Months	1
SW30-4040	Reverse Osmosis Membranes	24-36 Months	2

System Rating & Specifications:

System Production: 10,000 gallons per day at 900 PSI & 77°F.

Membrane Production: Count "1" element Thin Film Composite (SW-TFC) rated at 2,000 GPD

Membrane Total Dissolved Solids (TDS) Reduction: 95% Minimum

Drain Flow (Reject Water): 3 – 5 x Product Flow

Recommended Operating Parameters for Feed Water:

Feed Water Pressure:	40 – 100 PSI (280 – 680 kPa)
Total Dissolved Solids:	45,000 ppm NaCl Max.
Pressure:	900 psig (62 bar)
Temperature:	77° F (25° C)
pH:	3 – 11
Hydrogen Sulfide:	None
Chlorine:	None
Bacteria:	Max. Potable Standards

Permeate flow rates for individual elements may vary +/-20%.

For the purpose of improvement, specifications may be updated periodically.

Note: Chlorine will damage a TFC membrane. Sediment & Carbon pre-filters will remove chlorine from incoming feed water.

Change filters every 6 months or more often if water contains more than 1ppm chlorine.

Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before and after the system.

Troubleshooting Guide

Maintaining a healthy watermaker largely involves taking proper care of the pre-filter assembly and seawater intake plumbing. Failure to do so is the most common cause of the two most frequent types of watermaker “failure” as follows:

(A) product: diminished or no freshwater output

(B) product: bad-smelling product freshwater.

1) No freshwater output: The most common cause of diminished or no product freshwater output is air entering the seawater intake system at some point. The pump volume is small and the pressure required to press water through the membrane is rather high (about 800 psi). Since air is highly compressible, a very small amount of air can keep the pump from producing enough pressure to produce product freshwater. Periodically inspect and test the entire seawater intake system to assure that all joints and fittings are airtight, especially the connections at the pre-filter assembly.



Note: Be aware that a stable air gap at the top of the pre-filter housing is not uncommon, and doesn't necessarily mean that air is getting to the pump itself.

2) Bad-smelling product freshwater: The purpose of the pre-filter assembly is to trap any particulates in the intake seawater that are larger than 20 microns. A coarse strainer (Spin-Down Pre-Filter if installed) performs the same chore for contaminants of larger size. In each case, trapped material remains in the pre-filter housing (or strainer bowl) until removed.

Much of the trapped material is organic: plankton, seaweeds and flotsam of all types. After a watermaker has been turned off, this material soon begins to decompose. As it does, it breaks down into a number of chemicals composed of smaller molecules. Some of these molecules are small enough to pass through the watermaker membrane along with the product freshwater. Perhaps the best-known example of such a chemical is hydrogen sulfide, a gas which (in small concentrations) smells like “rotten eggs.”

Two main factors affect the speed with which these products of organic decomposition will contaminate a watermaker system: (1) the ambient temperature and (2) the quantity of trapped material. We realize that many ships run their watermakers in near-shore situations while anchored. The amount of trapped material is usually high in such locations, and the pre-filter assembly will require more frequent attention. Moreover, the high ambient temperatures in tropical locations greatly accelerate the rate of such decomposition. Users in temperate climate areas or users processing open-ocean seawater during offshore passages are less likely to require the same diligence.

3) R/O System Does not Start:

- Check Position of Switches
- Check outlet and circuit breaker / fuse panel
- Check fuses in the processor

4) Improper line voltage:

- Verify compatibility of line voltage and equipment requirement.

5) Pump Motor does not start:

- Check for fuse
- Verify Voltage on pump
- Wait for 15 minutes and start again for motor to cool off.

6) Production Less than rated:

- Make Sure you have sufficient Water Supply & Feed Pressure 40-60 PSI
- Close Drain Valve Clock Wise up to a max of 900 PSI
- Make sure filters and membrane elements are not clogged
- Change pre-Filters on Time
- Please refer to Equipment Maintenance Schedule

7) Motor Runs Hot:

- Voltage Too Low, Check label on motor and correct condition.
- Excessive Current Draw, Verify Flow Rates, confirm amps draw.

8) Rejection Percentage decrease:

- Adjust Drain and Recycle Valves
- Check for pre-filters
- Check for membrane
- Verify water quality table
- Replace membrane element

9) Membrane Scaled or Fouled:

- Verify Operation of pre-treatment equipment
- See Membrane Cleaning Procedure

10) Connection Leaking:

- Tighten or Reconnect Fitting
- If Quick Disconnect, cut edge and re-insert tubing
- If O-Ring Leak, call us to send you a new O-Ring.

Watermaker Glossary:

Biocide: a chemical used to inhibit biological growth in the reverse osmosis membrane during storage or extended periods of non-use.

Filter: a device that removes suspended solids from a fluid stream. A filter is not the same as a reverse osmosis membrane.

Micron: a metric unit of measurement equal to one thousandth of a millimeter, or one millionth of a meter.

Osmosis: the process of diffusion between two water sources through a semi-permeable membrane, resulting in both water sources striving to reach equilibrium in the concentrations of dissolved substances.

Pickling: a slang term for the process of flushing the membrane with biocide solution (see Biocide).

Potable: suitable for drinking, especially water. With regard to a watermaker, it is generally defined as water with 1,500ppm or lower of dissolved solids that is relatively free of harmful microorganisms.

PPM: parts per million. Used as a measure of the quantities of substances dissolved in water.

Pre-filter: a filter placed in the watermaker system to remove suspended solids from the feed water before it reaches the high-pressure pump and reverse osmosis membrane.

Pressure relief valve: a valve that relieves pressure in a system to prevent damage to system components. In the Ampac USA Marine Watermaker Series, the relief valve is set to open at 1,000psi, to prevent damage to the pump and membrane.

Product freshwater: potable water produced by the reverse osmosis process.

PSI: pounds per square inch—a unit for measuring pressure.

Reverse Osmosis (RO): a reversal of the natural osmosis process between two fluids that occurs when water is forced under pressure through a semi-permeable membrane. It produces potable water.

Salinity: a measure of the amount of salts, minerals, and other dissolved solids contained in a water source. Salinity (see TDS) is measured in ppm.

Salt: the common name for the chemical sodium chloride. Open-ocean seawater is about 3% dissolved salt, or about 33,000ppm of sodium chloride.

Seal: a device (such as an O-ring) used to prevent fluid leakage between two system components.

Semi-permeable: the characteristic of some materials (e.g., a reverse osmosis membrane) that makes them relatively porous to some substances while blocking the passage of others. Unlike normal filters, semi-permeable membranes usually operate at the molecular or atomic level, allowing much finer “filtering” than simple mechanical filters.

TDS: Total Dissolved Solids—a type of measure commonly used to indicate the purity of water, usually expressed in ppm. A standard TDS meter measures only the electrical conductivity of the water being tested. Therefore, it is only able to measure dissolved substances that are ionized in solution (e.g., sea salt). In particular, they do not indicate the presence of non-ionized substances, such as bacteria, viruses and many other soluble chemicals.

Ampac USA Water Purification Systems

CERTIFICATE OF LIMITED INTERNATIONAL WARRANTY

Series I for AMPAC USA SW2K-LX

WHAT DOES YOUR WARRANTY COVER:

If any part of your AMPAC Reverse Osmosis System is defective in workmanship (excluding replaceable filters), return unit, less the tank. Within 1 year of date of original purchase, Neftech will repair or, at Neftech option, replace it at no charge.

TO OBTAIN WARRANTY SERVICE:

For warranty service, please call for return authorization number before returning items. No credit or exchange will be given without a valid RGA number. To obtain your authorization number, you will need to provide us with the reason for return, the date of purchase. All returns and exchanges must be received within 25 days of the RGA number. The RGA number will not be accepted after 30 days from the invoice date.

WHAT YOUR WARRANTY DOES NOT COVER:

This warranty does not cover defects resulting from improper installation. Or contrary to Neftech printed instructions, from abuse, misuse, misapplication, improper maintenance, neglect alteration, accidents, casualties, fire, flood, freezing, environmental factors, or acts of God.

This warranty will be voided if defects occur due to failure to observe the following conditions:

1. The Reverse Osmosis System must be hooked up to a potable municipal cold water supply.
2. The pH of the water must not be lower than 3 or higher than 11.
3. The water pressure must be between 40 and 80 pounds per square inch.
4. Incoming water to the R.O. cannot exceed 105° F (40.5° C).
5. Incoming TDS/Total Dissolved Solids not to exceed 45,000 PPM.

Claims:

This warranty does not cover any equipment, which is relocated from the site of its original installation.

LIMITATIONS AND EXCLUSIONS:

NEFTECH WILL NOT BE RESPONSIBLE FOR ANY IMPLIED WARRANTIES, INCLUDING THOSE OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

NEFTECH WILL NOT BE RESPONSIBLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING TRAVEL EXPENSES, TELEPHONE CHARGES, LOSS OF REVENUE, LOSS OF TIME, INCONVENIENCE, LOSS OF USE OF THE EQUIPMENT, AND DAMAGE CAUSED BY THE EQUIPMENT AND ITS FAILURE TO FUNCTION PROPERLY.

THIS WARRANTY SETS FORTH ALL OF NEFTECH RESPONSIBILITIES REGARDING THIS EQUIPMENT. RETURNS SUBJECT TO 15% RESTOCKING FEE.

OTHER CONDITIONS:

If Neftech chooses to replace the equipment, Neftech may replace it with reconditioned equipment. Parts used in repairing or replacing the equipment will be warranted for 90 days from the date the equipment returned to you or for the remainder of the original warranty period. This warranty is not assignable or transferable.

