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Water Maker Manual

Installation, Operation, and Maintenance

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INTRODUCTION

We'd like to thank you for selecting a Sun Pure R.O. Water Maker to supply fresh pure water for your vessel. Because this system was designed specifically for you by a cruiser, we're confident that you will be happy with your choice.

It is important that you familiarize yourself with the water maker and that you have a solid understanding of how it works. This manual will introduce you to the system and will walk you through its installation, operation, and maintenance.

By taking proper care of your water maker, you'll not only extend the life of your investment, but you should also be able to easily diagnose any issues that may arise.

If you have any questions about the installation, operation, or maintenance of your Sun Pure R.O. Water Maker, please feel free to contact us any time.

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QUICK GUIDE TO OPERATION

1. Turn on the valve supplying seawater.

2. Turn Fresh Water valves to Sample Position.

3. Place the Sample hose into a 5-gallon bucket.

4. Turn the Pressure Adjustment Needle Valve counterclockwise until it stops.

5. Turn on Seawater Booster Pump.

6. Turn on the High-Pressure Pump and let the system run for 1 minute to purge air with no pressure.

7. Slowly turn the Pressure Adjustment Needle Valve clockwise, increasing to operating pressure to 800 PSI. If you exceed 950 PSI the overpressure relief valve will open. DO NOT EXCEED 950 PSI. If running at a pressure over 800 PSI make sure the electric motor does not pull more than it's rated for (one hp is 11-13 amps), and that you never exceed 28 gallons per 2.5 inch by 40-inch membrane (one membrane=28 gallons product water per hour), 2 membranes = 2x28=56 gallons of product water per hour. Product water is a function of electric motor horsepower and number of membranes & saltwater flow GPM.

8. When the bucket is full (+/- 4 gallons) turn the freshwater valve to the storage tank position and set the bucket aside.

9. Monitor Membrane pressure and level of water in tanks. Pressure will vary with pre-filter cleanliness and seawater temperature.

10. When finished making water; slowly turn the Pressure Adjustment Needle Valve counterclockwise until the pressure drops to ZERO PSI and turn Seawater Booster Pump & High-Pressure Pump off & close the Seawater in Valve.

    The Flushing procedure is different if a Fresh Water Flush Kit is installed. See page 18.

11. Place the pickle water intake hose into a bucket of previously made product water.

12. Turn the pickling valve to the ON position.

13. Turn on Booster Pump & High-Pressure Pump. Turn up the pressure to 40-50 PSI by turning the Pressure Adjustment Needle Valve Clockwise.

14. Let the water flow through the system until the bucket is almost empty. Don't suck air into the system.

15. Turn the Needle valve counterclockwise until pressure is 0, then turn off Booster and High-Pressure pumps.

16. Turn the pickling valve off. Turn tank selector valve to Sampling position.

17. Your R.O. system is now flushed with fresh water. In hot weather, flush 3-4 gallons per membrane every 2-3 days. In cool weather, re-flush every 5-7 days. For longer periods of time, pickle the system (see page 11).

STARTING YOUR WATERMAKER

Before starting your water maker:

Oil, chlorine, and other chemicals will do permanent damage to your water maker membrane. Always confirm that your feed water source is free of chemicals before starting the system. Never run it in the Marina! Only in clear seawater.
If the water maker has been in storage and this is the first start-up since pickling the unit, follow the normal set-up procedure, but discard all product water for the first 30 minutes of operation to ensure that the biocide solution (pickling solution) has been completely flushed from the system. Ingestion of the solution will cause gastrointestinal issues. Then save +/- 4 gallons of product water.

1. Open the Seawater intake valve.

2. Place the hose labeled Sample into a clean 5-gallon bucket.

3. Make sure to turn the Pressure Adjustment Needle Valve counterclockwise so the pressure is 0 PSI.

4. Turn on the Seawater booster pump, then turn on the high-pressure pump.

5. Verify the following:

    A. Water is running through the system and is being discharged overboard.
    B. The Membrane High-Pressure Gauge indicates zero pressure.

6. When you start the High-Pressure Pump, you should see the flow of water through the system increase.

7. Let the water maker run for a few minutes to clear any air from the system and to be sure that a steady flow of water is being discharged overboard.
   Air under pressure can ruin the pressure pump and/or the membranes.

8. Very slowly, turn the Pressure Adjustment Needle Valve in a clockwise direction until the pressure increases to 700 PSI. (Make sure no air bubbles are in the system). Let the system stabilize. Product water should now be flowing into your bucket.

9. Verify that everything running is properly and that the pressure is being maintained at 700 PSI. Now turn the Pressure Adjustment Needle Valve in a clockwise direction (SLOWLY) again to increase the pressure to its final rate (the actual pressure will depend upon water temperature, salinity, etc.).
   The normal operational PSI is 800 for maximum membrane life expectancy. NEVER EXCEED 950 PSI.

Your water maker output will vary based on the temperature and salinity of the seawater. The properties of the water will change based on temperature; the rule of thumb is the colder the water, the lower the output at a given pressure. The same is true for a higher salt content; in warmer climates, a higher output can be expected. It is IMPORTANT that the pressure remain constant at 800 PSI at all times. Do NOT increase ABOVE 950 PSI PRESSURE to achieve a higher product output.

For maximum R.O. Life do not run over 800 PSI. If you run at pressures over 800 PSI, make sure that you are not overloading the electric motor. Check the amps you are pulling on your main electric distribution panel and make sure you do not exceed the amp rating on your electric motor.

10. Let the bucket fill with water; while you're waiting, take a moment to do a routine check for any leaks in the system. When you are satisfied with the product water, turn the Fresh Water valve to the "To storage tank" position. Remove and coil the hose and put the full bucket aside for use during shut down.

11. Check the Membrane Pressure Gauge occasionally to verify that the pressure is constant.

12. Monitor the level of water in your tank. When the tank is full or when you are finished making water, proceed to the shutdown process on the following pages.

SHUTTING DOWN YOUR WATER MAKER AND SHORT-TERM STORAGE

1. When your tanks are full or you are finished making water, slowly turn the Pressure Adjustment Needle Valve counterclockwise. The pressure on the gauge above should decrease to zero PSI and the product water should stop flowing. Turn off the High-Pressure Pump and Booster pump.

2. Turn the Fresh Water valve to the "Sample" position, so that it's ready for the next time you make water.

3. Upon shutdown, organic matter in the saltwater is in the system, which will cause microorganisms to grow that can clog/damage your membrane. You must Flush the system with product water after shut down to eliminate most organic matter and keeps your membrane clean. (If your water maker will be inactive for more than 7 days, the membrane must be pickled, see "Long Term Storage" page 9).

4. Put the hose labeled "Pickle intake" into the bucket of product water (set aside during start-up) and turn the Sea Water Valve to Off position and turn the pickling valve to On. Turn on the booster pump and high-pressure pumps (pressure = 0).

5. The water will flow from the bucket back through the system; let it run until the bucket is almost empty.

   Do not draw air into the system.

6. Turn off the booster and High-Pressure Pumps. Do not let the pump run dry, this will damage your system. Never let the pump run dry and never turn off the Seawater Booster Pump while the High-Pressure Pump is running. When shutting down the system, always turn the Pumps off first then close the seawater intake valve.

7. It is recommended to flush 2 gallons/membrane every 3 to 4 days thereafter. More often in hotter temperatures.

LONG TERM STORAGE

If you do not intend to use your water maker again for a while and won't be able to flush with freshwater, the water maker should be pickled. Pickling introduces chemicals into the system to prevent the growth of microorganisms that will damage the membrane.

If the water maker may be exposed to freezing temperatures, antifreeze must be introduced into the system.

The pickling process will preserve the membrane for up to 6 months (4 months in hot climates). If the water maker will be inactive for longer, durations, the pickling process must be repeated every 6 months.

THE PICKLING PROCESS SHOULD BE DONE AFTER THE SYSTEM HAS BEEN FRESHWATER FLUSHED.

1. Using the +/- 4 gallons of freshwater, add 8 tablespoons of sodium metabisulfite to the bucket and mix until dissolved. (Sodium metabisulfite is readily available wherever you find beer brewing supplies).

2. Put the hose labeled "pickling" into the bucket and turn the pickling valve on, leaving the seawater valve closed.

3. Turn on the Booster Pump. Then turn on the High-Pressure Pump (make sure the pressure is 0 PSI).

4. The pickling solution will flow from the bucket back through the system. When the bucket is almost empty turn the pumps off.

5. Turn off the pickling valve after turning off High-Pressure Pump & Booster Pump. Do not let the pumps run dry; this will damage your system.

6. After turning off the pumps close the pickling valve. Your system is now good for 6 months of non-use or storage.

COLD WEATHER STORAGE

If the water maker will be exposed to Freezing temperatures, Propylene glycol antifreeze (also known as RV antifreeze or potable water antifreeze) can be used for cold storage or storage for up to 1 year.

1. Starting with the water maker off, fill your 5-gallon bucket with water and propylene glycol antifreeze.

2. Put the hose labeled “pickling” into the bucket and turn the pickling valve on.

3. Turn on the booster and High-Pressure Pump.

4. Watch the brine dump and turn off the High-Pressure Pump as soon as you see antifreeze going overboard, then close the pickling valve.
   Keep a close watch on the 5-gallon bucket to be sure it does not run dry. When the bucket is near empty or antifreeze is flowing overboard, turn off all pumps and close all valves.

5. Your system is now safe from freezing temperatures.

MAINTENANCE MANUAL

PRE – FILTERS

Use only 5-micron & 20-micron polyester filter elements. These can be found at Home Depot and most marine and water supply stores. Pre-filters should be cleaned or replaced as needed. To determine the status of your Pre-Filter element, look through clear filter housing, and if dirty or product water gallons/hour drops, it is time to clean or replace the element.

1. Shut down the system and ensure that the Seawater Boost Pump is OFF and the through-hull is closed.

2. Unscrew the Pre-filter Housing and remove the Pre-filter element.

3. Discard or clean the used element and install new 5-micron and/or 20-micron polyester elements then fill the housing with water.

4. Reassemble by securely screwing the Pre-filter Housing back together. When restarting the system, be sure to check the Pre-filter Housing for leaks.

5. If cleaning, use clean seawater or fresh (no chlorine) in the bucket and swirl around to clean. I have tied mine to a line and towed it behind while sailing to clean!

HIGH-PRESSURE PUMP

Your water maker system includes an AR North America high-pressure pump (see data sheets on the following pages). Designed for long life, the pump should provide years of trouble-free operation if maintained and inspected regularly.

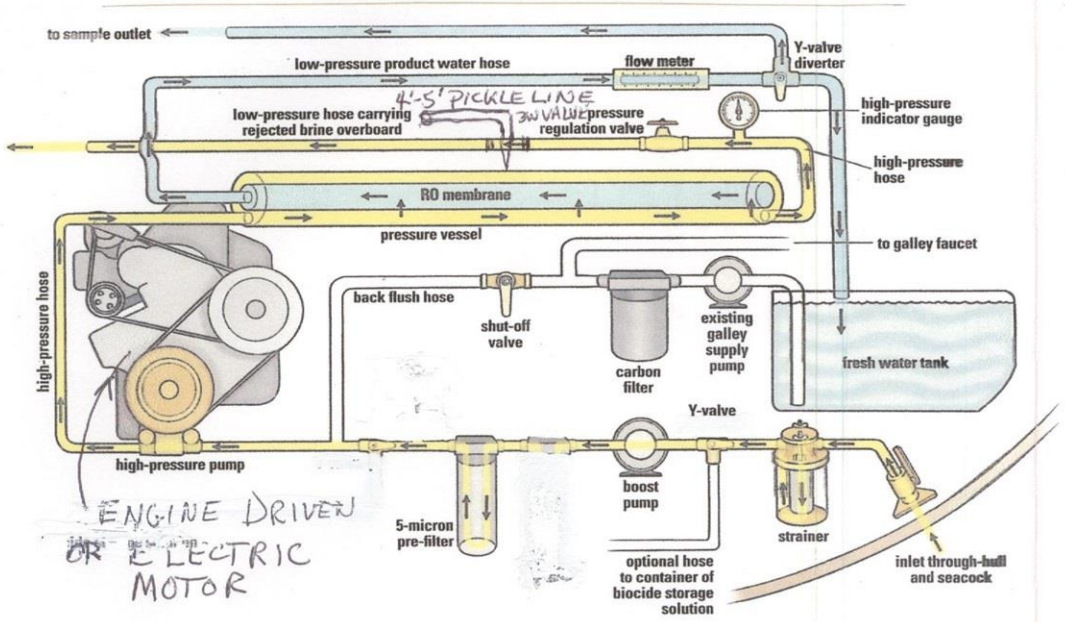
During installation, the gear case was filled with 9.81 oz. ISO 100 – NA 30 weight hydraulic oil and the bolts and/or belts were adjusted. It is good practice to inspect the belts and check the gear case oil every 20 hours of operation (if your system has belts).

INSTALLATION MANUAL

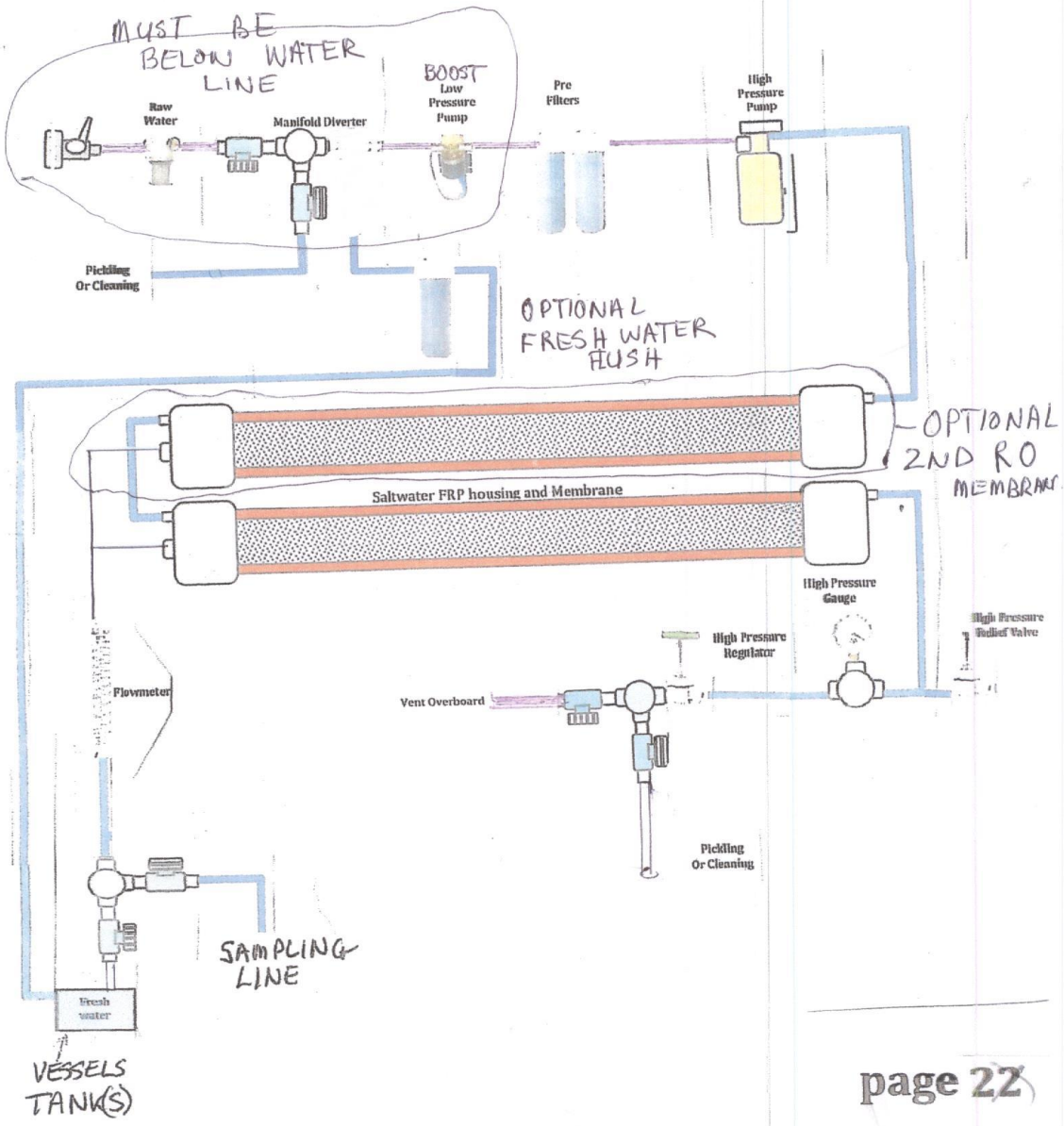
1. Please read and understand all directions before installing. If you have questions, please call or email.

2. Keep RO membranes sealed until installation into Pressure vessels! DO NOT ALLOW TO DRY OUT! Use only distilled or fresh clean water – no chlorine!

3. USE SILICONE GREASE ONLY IN THE SYSTEM ON ALL "O" RINGS. DO NOT USE PLUMBERS CREASE, VASOLINE ETC.



SYSTEM DIAGRAM



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WHAT'S INCLUDED IN YOUR KIT

- (1) Controls on Membrane
- (1) Seawater booster pump
- (1) High-Pressure Pump and motor
- (1) Pre-filter housing with a wrench (optional freshwater flush)
- (1 or 2) Pre-filter (5-micron standard-extra 20 microns optional)
- Reverse Osmosis Membrane with Housing
- High-Pressure tubing, 6'standard length
- Flowmeter
- 20' of 3/8" low-pressure hose with barbed fittings
- 10' of suction hose with barbed fittings
- Sodium metabisulfite (pickling chemical)
- Membrane housing mounting brackets with rubber padding
- Installation & operations manual

Optional Features

- Second reverse osmosis membrane on some systems
- 115V/230V (single or 3-phase) AC motor for marine or land use – clutch for engine-driven units
- 12/24/48V DC motor for marine or land use
- 50 Hz for European Systems
- Freshwater Flush Kit
- Cleaning chemicals
- Extra pre-filter elements and charcoal filters
- Self-priming pump for installations above water level

Items You Will Need

- ¾” (min) Seawater source
- Seawater strainer
- Brine discharge location
- Motor mounting for engine-driven units
- Belts if engine driven
- Two electric switches and two plastic electric boxes and marine-grade wire
- Stainless Steel Hose Clamps

System Installation

Locate areas where Pre-filter and optional freshwater flush housings, High-Pressure control valves, and Membrane are accessible. Consider saltwater tubing runs, freshwater (product) water runs, and electrical wiring runs. You will want convenient, easy access to Pre-filters and the High-Pressure pump needle valve, flow meter, and electric switches.

Start by mounting Pre-filter and optional freshwater flush filter housings. The housings will need to be checked regularly and cleaned as needed so make sure you mount them with good access. Next, securely mount the electric motor and high-pressure pump. It can be anywhere, but hopefully close to the R.O. membrane(s). The pump and motor should be mounted level.

Do not drill or lag through the hull!

Next, after your seawater strainer (provided by you) you will mount the Valve assembly which includes a seawater shut-off valve, an optional freshwater flush system, and the cleaning and pickling valves. Right after this, you will mount the seawater booster pump. This pump is not self-priming and must be mounted below the waterline. We can provide a self-priming pump for above waterline installations for $210.

Next, mount the R.O. membrane with Needle Valve and Flowmeter preferably in a horizontal position where you have access to the control needle valve and flowmeter.

You now should run all tubing. First, run tubing from the seawater strainer to the valve assembly (seawater shut off valve). Double clamp all fittings that are below the waterline!

Now run tubing to the prefilters from the seawater strainer, then to the high-pressure pump. All suction tubing to be webbed vinyl (Suction = Thru-Hull to High-Pressure Pump).

Low-Pressure Hose

1. Install a ¾" hose run from the output of the Pre-filter Housing to the inlet of the High-Pressure Pump, securing with 2 hose clamps.

2. Install a 3/8" hose run from the Brine Dump 3-way valve after the needle valve port on the overboard/recirculate valves to the brine discharge. Leave 5 feet or so on the recirculate/pickling valve.

Though it may be necessary to "T" into another drain for the brine discharge, it is preferable that a new through-hull be installed specifically for the water maker. This through-hull should be located above the waterline and in a spot where the flow can be verified from on deck.

Product Water Hose

Install a 3/8" hose run from the product port on the top fitting on the flow meter to the sampling/tank valves and secure with hose clamps. Many times a good place for this valve is under the galley sink. During start-up, the sampling water can go into the sink and overboard, and then the 5-gallon bucket can be filled before switching the valve to the tank.

- Because it is important that the product water line never becomes blocked, we discourage the use of shut-off valves in the product water tubing.

- We recommend that the product water from your water maker be connected to its own fill on your water tank. However, as we understand that this is not always possible and because all installations are different, any solution that will not block the flow of water is acceptable.

Seawater Source (not supplied)

The seawater source must remain underwater during operation so air cannot enter the system. This seawater source must not be located near discharge lines that could introduce foreign materials such as head discharge or engine exhaust.

RUNNING TUBING AND HOSES

Your water maker comes with 6 feet of high-pressure tubing fittings. If your installations will require more than 6 feet of tubing, please contact us.

Now (if you purchase the fresh water kit) go to the freshwater flush kit and bring the ship fresh water line to the charcoal filter housing and connect using 3/8" to ½" lines. Run line from charcoal filter and valve assembly to the Tee near/in front of the Booster Pump. Add 4-6 feet of 3/8" line to pickling valve for future use to the 3rd position on Valve.

Hook the high-pressure hose provided on the high-pressure pump, then run it up to the R.O. membrane to the inlet labeled HP in. Tighten both ends securely as this will carry 800 PSI water.

Now connect the 3/8" needle valve to RO Membrane per diagrams. Run brine hose from 3-way needle valve to brine discharge (provided by you). The other (3rd) port should have 4-6' of loose 3/8" line for pickling/cleaning purposes. This brine discharge should be above the waterline and visible so you can physically check the water flow.

From the R.O. membrane(s) connect a 3/8" line to the back of the Flow Meter and run to sampling/tank valves (normally under Galley sink). Connect one of the valve ports to the freshwater tank and put 4 to 6 feet of line on the other (sampling valve) for testing product water before diverting to the tank. You are now done with the plumbing.

Next, run properly sized wire from a dedicated properly sized A/C circuit breaker on your ship's electric panel. Mount a single gang (plastic) box with an A/C switch and cover plate. Wire the electric motor with properly sized (marine grade) wire.

Now, mount another single gang box next to the first one and run a properly sized wire from D.C. side of the electric panel to a switch for the booster pump. This wire should come from a dedicated properly sized DC breaker. DO NOT USE A DOUBLE GANG BOX and put the A/C & DC switches together!

All wiring should be done to ABYC standards. Included with each system is the wiring diagram specific to each motor from the manufacturer.

INITIAL SYSTEM START-UP

Pre Start-up Checklist

_____All hose fittings are secured with hose clamps
_____Seawater source valve is open
_____All wiring connections are secure
_____Breaker is on
_____Belt tension on High-Pressure Pump is adjusted (if engine driven)
_____Verify Pressure Adjustment Needle Valve is turned counterclockwise to reduce pressure to 0 psi.
_____Purge Pre-filter of air by turning on booster pump and high-pressure pump with 0 PSI. As soon as the water is flowing and has no or very little air bubbles turn off the pumps.

1. Starting with the Seawater valve in the "Seawater Intake" position and the Fresh Water value in the Sample position, place the hose into a clean 5-gallon bucket.

2. Turn on the Seawater Booster Pump

3. Verify water is flowing out the Brine discharge
   Take a moment to check for leaks.

4. Turn on the High-Pressure Pump
5. Take a moment to check for leaks again and verify additional flow through the system
6. Let the system run for 30 minutes to flush the pickling solution and then increase the pressure by turning the Pressure Adjustment Needle Valve clockwise until it reaches 700 psi. Make sure ALL air has been purged before going to 800 PSI.

7. Do another check for leaks.

8. Verify output flow to 5-gallon bucket

9. Let the system operate, discarding water for 5 minutes before tasting, checking one last time for leaks.

10. Adjust the needle valve to a pressure of 800 PSI. Collect 4 gallons of fresh water in the bucket, then switch to tank.

11. This procedure is different if you have the optional Freshwater Flush Kit. See page 16

CONGRATULATIONS YOU NOW HAVE A WATER MAKER AND ALL THE WATER YOU WANT!

If there are ever any questions, please email us at support@sunpurewatermakers.com or call 231.238.3570

Thank you for choosing Sun Pure Water Makers.

Supplemental Instructions

1. Please read and understand all directions before installing. If you have questions, please call or email .

2. Keep RO membranes sealed until installation into Pressure vessels! DO NOT ALLOW TO DRY OUT! Use only distilled or fresh clean water – no chlorine!

3. USE SILICONE GREASE ONLY IN THE SYSTEM ON ALL "O" RINGS. DO NOT USE PLUMBERS GREASE, VASOLINE ETC.

Typical 1½ HP dual RO membrane watermaker
40GPH Watermaker

View of complete system before installation. THIS shows an engine driven HIGH Pressure (HP) pump and 2 High Pressure Vessels (PV) and 2 R.O. membranes. Some systems only have 1 PV and 1 RO membrane and maybe motor driven instead of engine driven.

Typical Large Engine Driven 40GPH DualRO Watermaker

Typical 1 HP 1 RO 20GPH membrane watermaker Optional second RO membrane can be added to increase output to 30 GPH Can run on Honda Generator

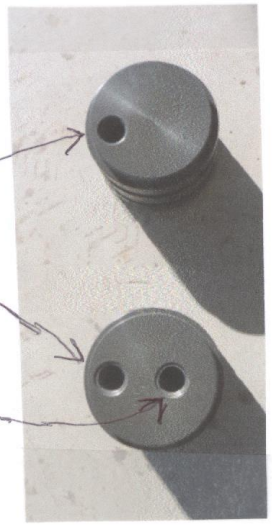
After unpacking and laying out all parts, you will want to install the R.O. membrane(s) in the PV(s). INSTALL ALL "O" rings on R.O. Membrane with silicone grease (kept in plastic bag and expose only the end you are working on). DO NOT LET THE MEMBRANE DRY OUT! Notice one end of membrane has a black "O" ring already installed on the outside. THIS is the incoming pressure end. AFTER INSERTING MEMBRANE into PV and clamping ends on, use a marking pencil and put HP on end of PV that the "O" ring is located.

End of membrane(s)
No "O" Ring

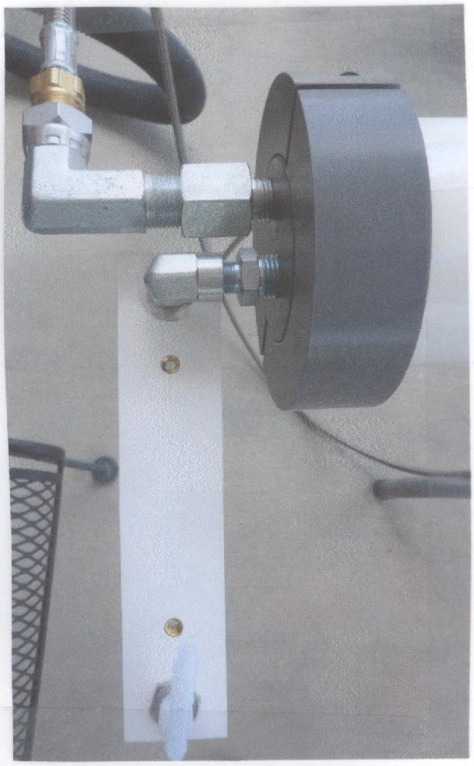
Other End Has Black "O" Ring

Aluminum End Caps
of Pressure Vessel(s)

Either end can be High Pressure
In From Pump (Outer holes only)
The more centered hole(s) is product
water out to flow meter

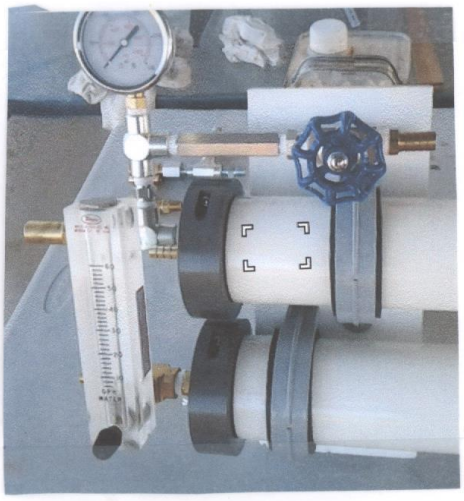


Notice the ends have 1 or 2 threaded ports. The outer port is always HIGH PRESSURE in or out. The centered port in product water out. Notice it is not exactly centered, but more so than the outer HP port. If you have only one PV, then the high pressure line from the High pressure pump goes to the end with 2 ports and connects to the outer port. The middle port will have the Flow meter and product line attached to it. The other end of the PV has the High pressure needle Value and gauge attached to it. If you have 2 PV please refer to drawing #4.



Single RO Membrane
Port Connections

Dual RO
Membrane
Arrangement



Typical installation of High Pressure fittings and product water fittings on RO membrane ends.

TROUBLESHOOTING GUIDE

Problem	Solution
Seawater Lift Pump will not start	• Check fuse in Control Panel • Check wiring • Make sure the seawater source is clear of debris • Check Sea strainer for obstruction
High-Pressure Pump will not engage	• Check circuit breakers • Verify wiring • Check belt
No/low product water output	• Run system unpressured for 15-30 minutes • Check operating pressure
Poor quality/high salinity product water	• Check O-Ring Seal • Replace Membrane
Product water smells bad	• Check pre-filter • Run system unpressurized for 15 minutes • Clean with acid and alkaline membrane cleaners • Clean R.O. membranes with Alkaline and acid chemicals
High-pressure fittings are leaking	• Remove fittings and apply thread sealant
Unable to obtain pressure	• Check all hose connections • Make sure air is purged from Pre-filter • Replace needle valve

SERVICE INTERVAL RECORD

DATE	HOURS	SERVICE PERFORMED