



# SC MODELS

## USERS MANUAL

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## ***I. SK Watermakers Introduction***

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***CONGRATULATIONS, YOU HAVE JUST PURCHASED THE MOST TROUBLE-FREE, ECONOMICAL MARINE DESALINATOR AVAILABLE!!!***

*All of our units are manufactured using the highest quality components and utilizing the latest technologies available in the industry today. SL's innovative engineering has changed the conception of marine desalinators from an expensive, maintenance prone product of choice, to an affordable and reliable necessity for all types of watercraft.*

*We understand the importance of each and every watermaker. We manufacture and design all of our units to be simple, reliable and easy to maintain. We currently have desalinators operating in extreme conditions from the freezing arctic waters of Antarctica to the warm humid climates of the Amazon.*

*SK Watermakers line of Marine Desalinators are reliable and easy to install but the greatest advantage of purchasing a unit from us is affordability.*

## II. General Product Specifications

### DESCRIPTION

<b>Membrane Housing</b>	Fiberglass/aluminum (Lifetime Warranty)
<b>Membranes</b>	Thin composite R.O. membranes

### TEST CONDITIONS

<b>Temperature</b>	78° F (25° C)
<b>Operating Pressure</b>	800 PSI. 900 PSI Max
<b>Feed Water Quality</b>	32,000 PPM Total Dissolved Solids (32.0K mg/L)
<b>Salt Rejection Performance</b>	99.2% Rejection NaCl (Typical)

### AMPERAGE

<b>HC/SC 200-1500</b>	115v @ 28-30 amps	230v @ 14-16 amps
<b>DB/HC/SC 200-600</b>	115v @ 15 amps	230v @ 8.0 amps
<b>DB/HC/SC 600</b>	115v @ 20 amps	230v @ 11.0 amps
<b>DC 150</b>	22 amps	(available in 24v )

*Note: (Larger units will vary with capacity)*

### WATER PRODUCTION CAPABILITIES

Model	GPD	GPH	LPH
<b>SC 200</b>	200	6 – 10	23 - 38
<b>SC 400</b>	400	15 – 18	57 – 69
<b>SC 500</b>	500	16 – 21	69 – 84
<b>SC 600</b>	600	22 – 26	84 – 99
<b>SC 800</b>	800	30 – 36	100 – 136
<b>SC 1000</b>	1000	38 – 44	144 – 167
<b>SC 1200</b>	1200	46 – 52	174 – 197
<b>SC 1500</b>	1500	60 – 65	227 – 246
<b>SC 2000</b>	2000	84 - 120	318 - 454

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### **III-a. Installation Instructions for SC Self-Contained Units**

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#### **Select a seawater supply**

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Smaller units (600 GPD or under can share a thru hull with saltwater washdown or toilet pickups, but if one is not available, you will have to install a new thru hull and seacock. 3/4" I.D. The thru hull must be positioned as close to the bottom center of the boat as possible. Make sure there is nothing in the slip stream in front of the intake, or if in a sailboat, the thru hull is as low as possible so that the thru hull will not be above the waterline at a large heel angle. It is advisable to install an intake strainer at this time. It would also be advantageous to keep the intake ahead of the prop wash. (Air bubbles or negative pressure are a high pressure pump's greatest enemy!!!)

#### **Select a location for the prefilter pump**

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Locate the prefilter pump below the waterline, in a fairly dry location and as close to the seacock as space permits.

#### **Select an area for the RO unit**

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The RO unit can be above or below the waterline. If located more than 25 feet away from the prefilter pump, go to the next size hose.

#### **Select another 1/2" thru hull for the brine overboard dump**

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It should be located above the waterline. Location is not critical and you may share an air conditioning drain if installed properly

#### **Seacock/Prefilter connection**

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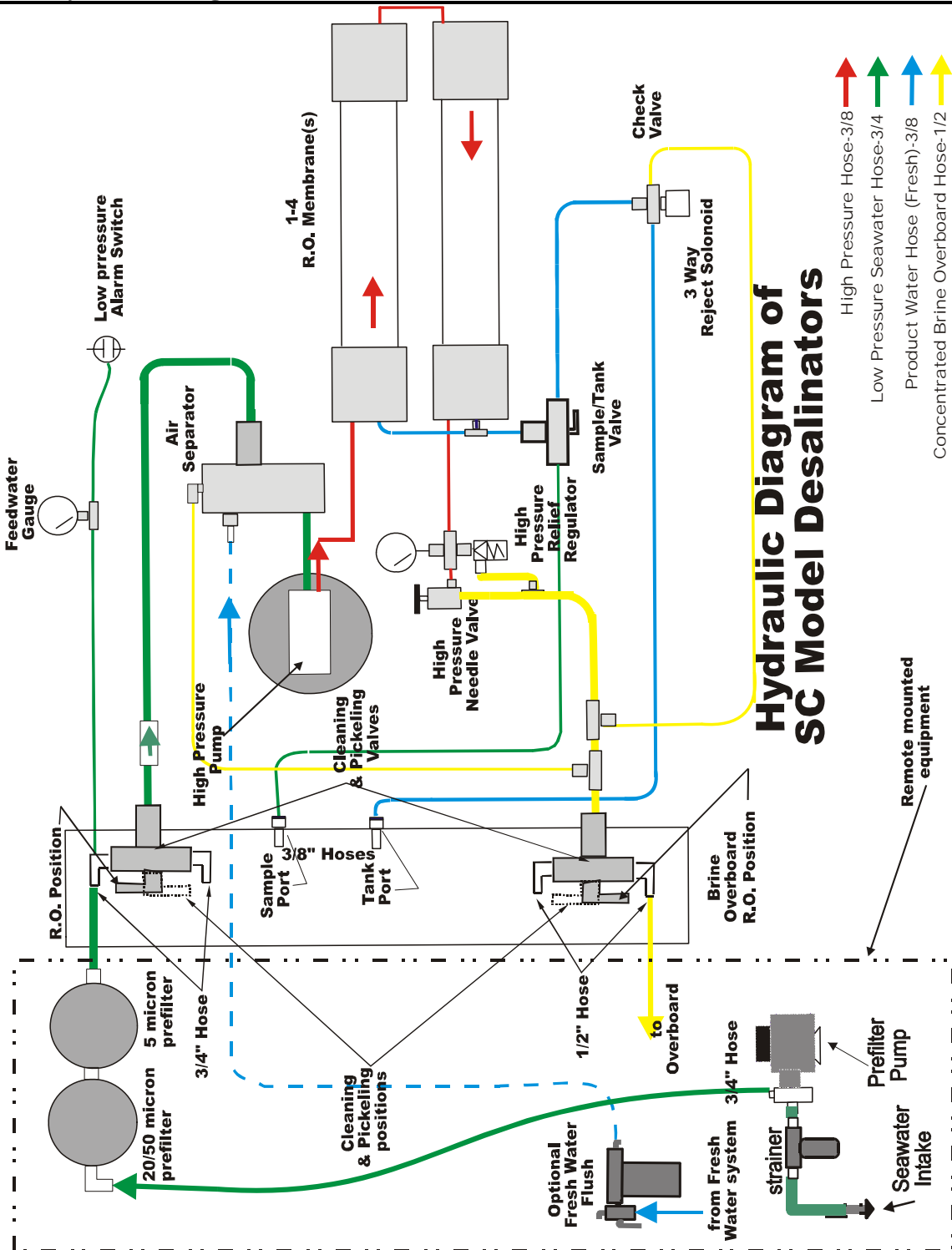
Connect the seacock to prefilter with a 3/4" suction hose. Use clear braid hose furnished. Connect the output from the prefilter to the RO unit with a 3/4" minimum hose. (reinforced beverage is a good choice, supplied with most units)

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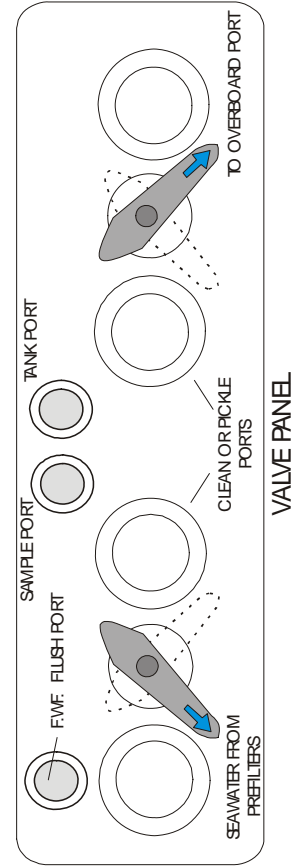
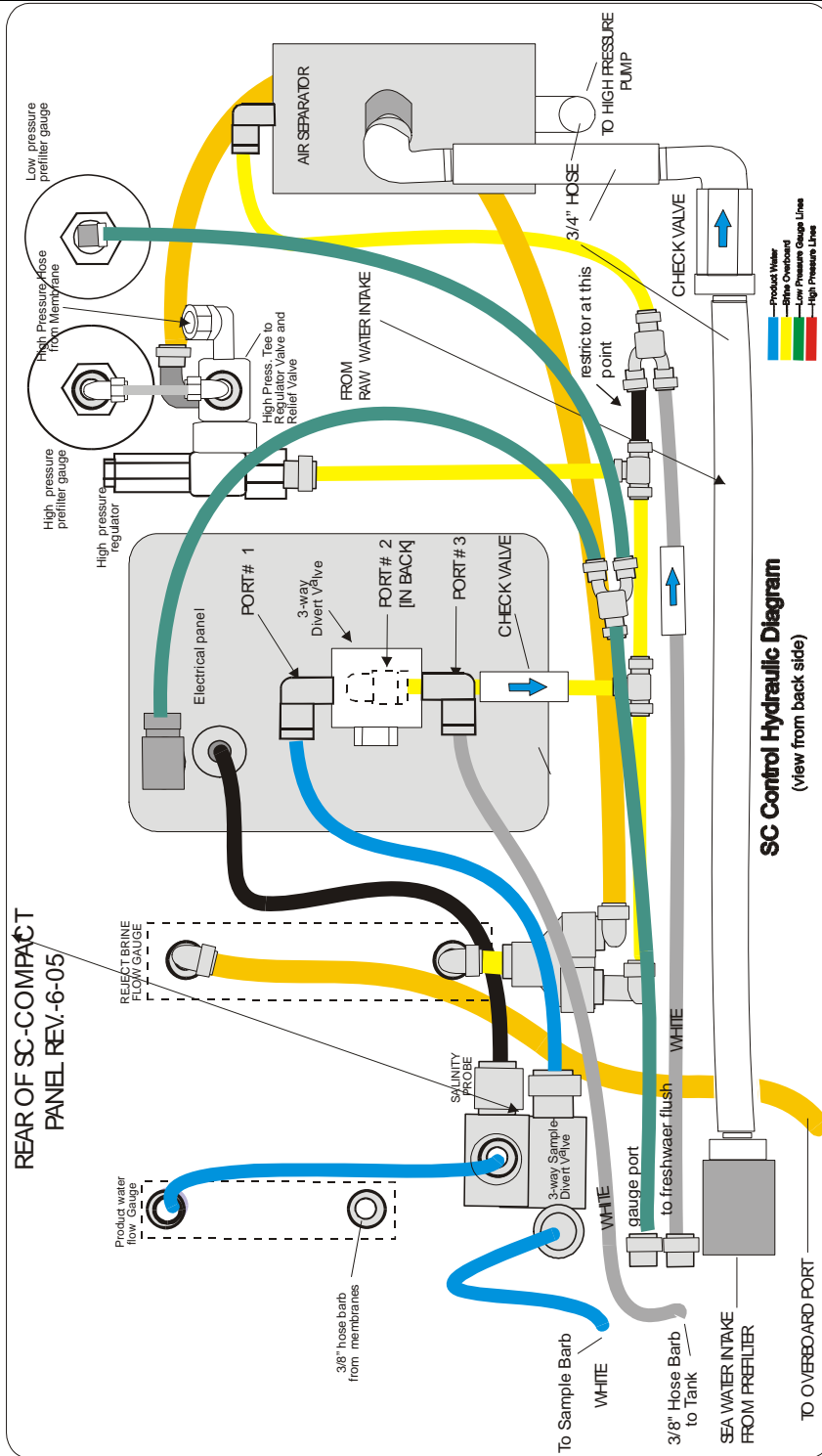
**NOTE: INTAKE AND REJECT WATER FITTINGS ARE BOTH 3/4" ON 1500 GALLON PER DAY UNITS**

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## IV. Hydraulic Diagram for Self-Contained

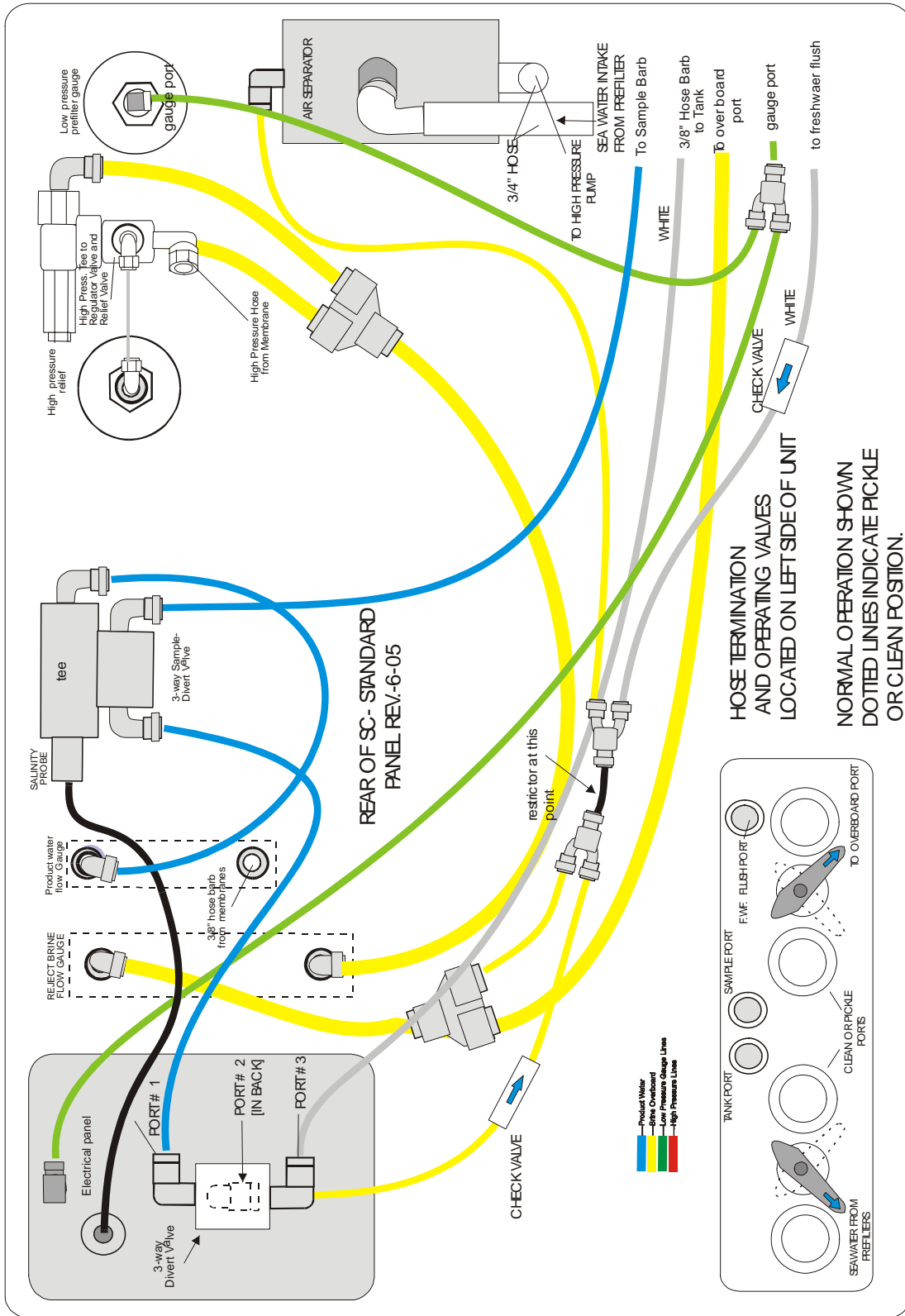


# V. SC Compact Panel Layout (Rear)

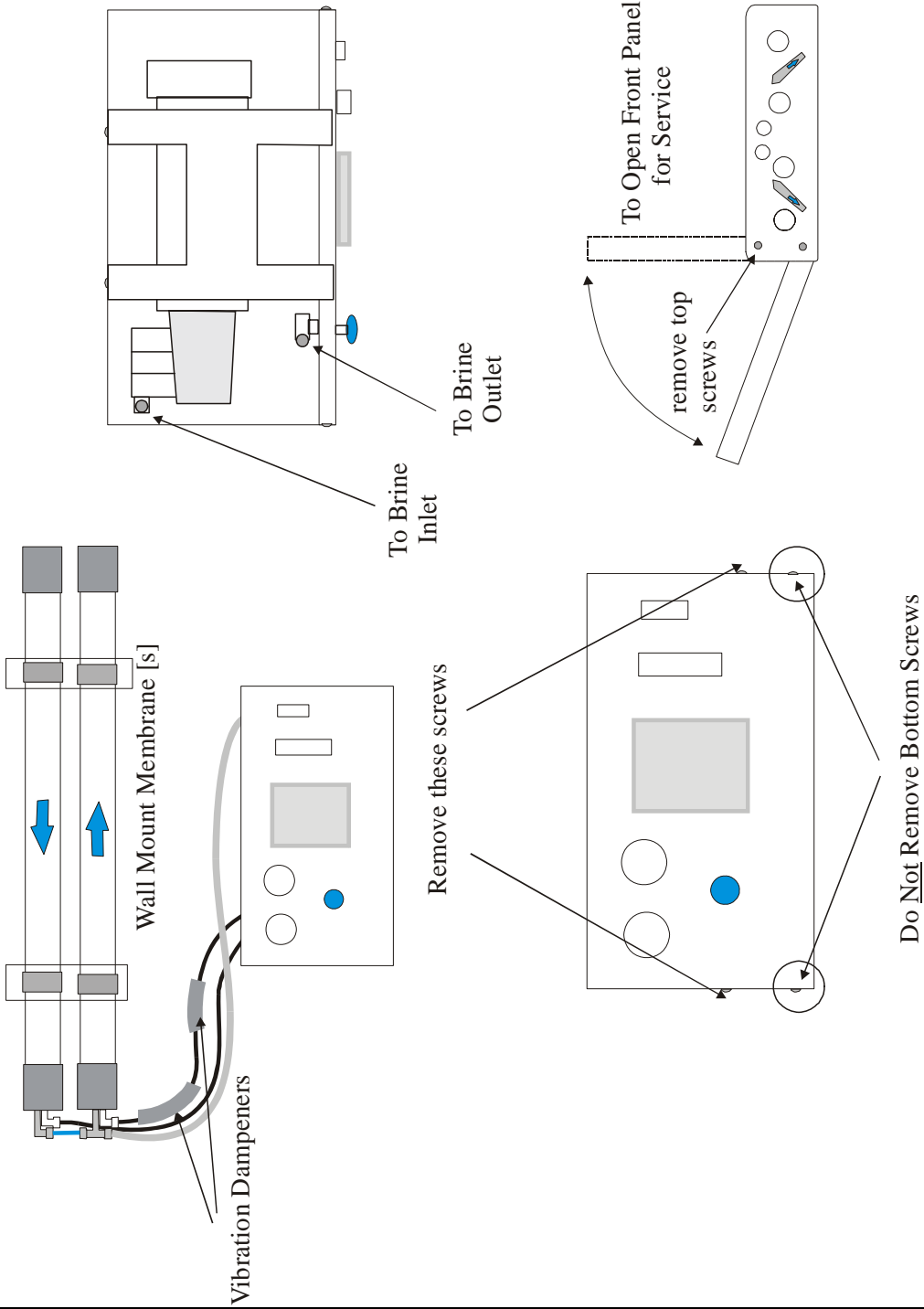


NORMAL OPERATION SHOWN  
 DOTTED LINES INDICATE PICKLE  
 OR CLEAN POSITION.

VI. SC Standard Panel Layout (rear)



## VII. Remote Membrane Installation



**Supplement For Compact SC Manual  
with Remote Membrane (s)**



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### **III-a. Installation Instructions of SC Self-Contained Units (cont.)**

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Connect the freshwater to the top of the tank with 3/8" soft tubing, there should not be a shut off in this line because a stoppage of the product water will damage the unit or burst a hole. It should be run high enough above the tank so that any tank water will not siphon back to the RO unit.

#### **Wiring**

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Run stranded wire to junction box from breaker panel. Use #12 for 200 – 600 GPD units and #10 for 1000 – 1500 GPD units. Use the next size gauge wire over 30 ft. The wire should be fused at 20 amps for #12 and 30 amps for #10 wire. (#14 wire may be used with 200 – 800 GPD @ 220 Volt units. Fuse at 15 amps) #12 for 1000 – 1500 GPD @ 220 Volt Units.

#### **Initial Start-Up**

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Fill prefilter with clean saltwater, back off the high pressure all the way counter-clockwise, press start switch and observe the clear braided hose for water flow. The water should start flowing within a minute. If no water is moving in the system, check for an air leak in the low pressure hose fittings (with a prefilter pump this is generally not a problem). When, after a couple of minutes, the water is flowing clear with no bubbles observed, slowly turn the high pressure valve clockwise to 800 PSI. The adjustable automatic regulator has been preset to approximately 800 PSI at the factory. We suggest you do not increase this for long life of your system, but it will operate up to 900 PSI without a problem. **Status Lights:** In normal operation after starting, the yellow led in the center of the logo will come on until the TDS (total dissolved solids) drops below the set point on the TDS controller. This is preset at the factory for approx. 700 PPM (parts per million), (the suggested, max by the World Health Organization is 800 PPM). The product water can also be manually diverted with the sample valve. At this time water will be rejected to the overboard automatically, although the sample valve and flow gauge will be operational at all times if needed for test purposes. After the aforementioned delay, water will be diverted to tank and the: **Product water to tank** green led light will come on. Now the RO will be in normal operational mode. Be sure to turn the sample valve to sample and let the product water run overboard for 1 hour to rinse out any preservative. This only has to be done when the unit has been pickled, then turn sample valve handle to TANK and enjoy a drink of pure water.

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### **III-b. Installation Instructions for Shore or Home Units**

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The primary concerns with installation of shore based units are problems with feedwater. The most universally used and desired intake source would be from a well. A well will usually filter out most of the large matter. The passage of the sea water through sand rock does a remarkably good job as a filter. One of the disadvantages of a well is the possibility of contamination by a large amount of iron, maganese or calcium, but in general, it is the preferred intake. Another option would be group of 3 or 4 well points set at the beach line. (the amount of tide would have to be considered)

The sea itself can also be used if is not drawn from a dirty or oily harbor. A large strainer of some sort (a long piece of .030 PVC well screen would be a good choice). Advise from professional in the well business would be advisable.

After the feedwater source is decided on and installed, it should be manually primed and tested for leaks and air intrusion. The feedwater pressure should be between 25 and 35 PSI when the prefilters are fresh. An adjustable relief is provided to install in your feed line.

When the RO is first turned on it should be run at low pressure to check your equipment for leaks and to remove trapped air.

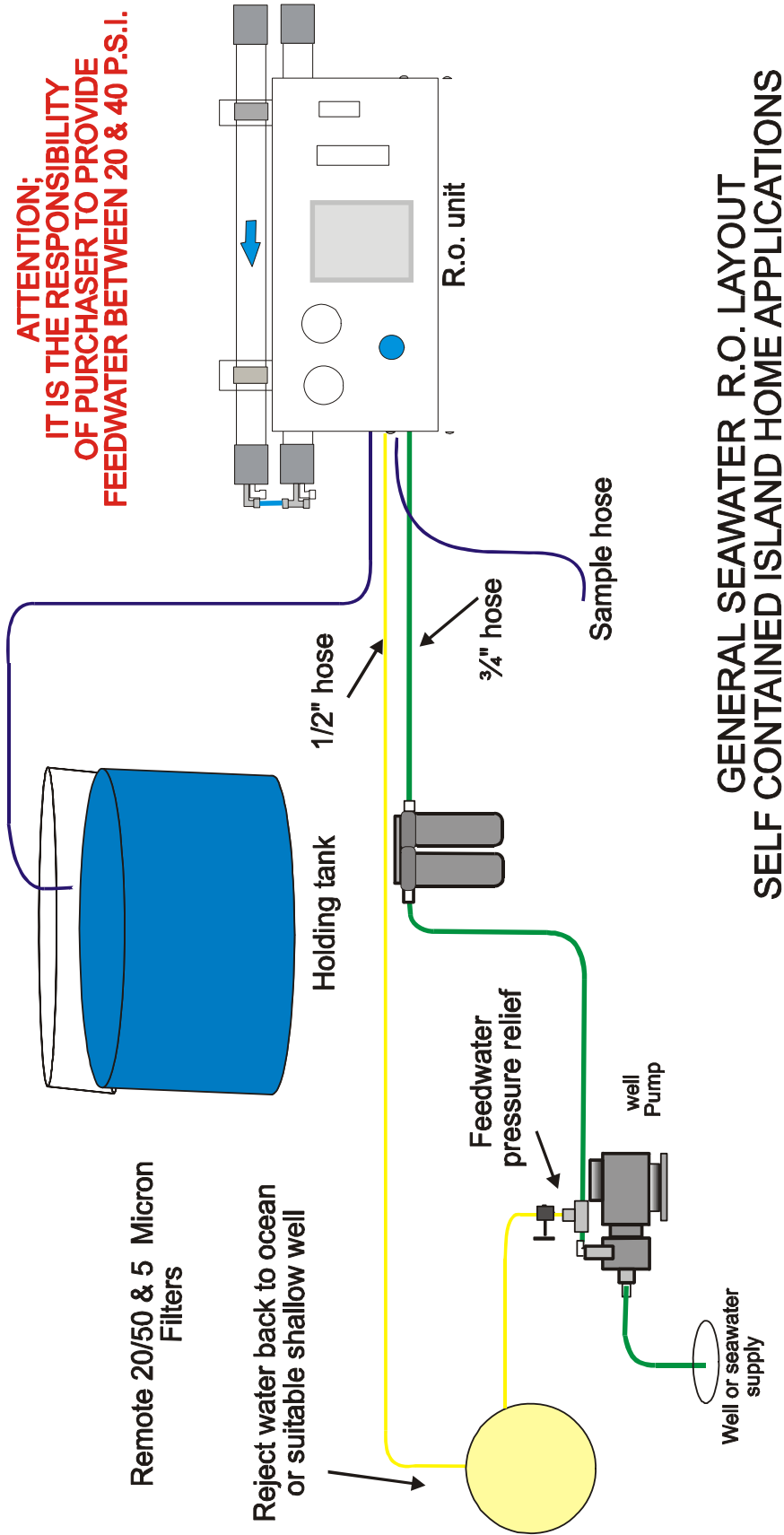
#### **Operation of Fully Automatic Shore Based Units**

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**CAUTION!!! BE AWARE THAT THE PUMPS MAY START AUTOMATICALLY. KEEP YOUR HAND FREE AND ELECTRIC BOXES SHUT WHEN OPERATING.**

Set time clock to desired start time and desired stop time with metal pointers supplied with the time clock. Example: 8:00AM start, 6:PM stop = 10 hours of operation. The first start-up after installation should be done manually. Turn the high pressure control valve all the way counterclockwise (low pressure). Turn the auto-off-manual selector switch on the control panel to the right (manual) position and press the start switch. You may not hear anything right away, but the feedwater pump should turn on at this time. There is an adjustable time delay relay that will turn the high pressure pump on after 8 minutes. At this time the electrically operated high pressure bypass valve will close, you will then be able to adjust the high pressure control valve clockwise (to the right) and raise the pressure to 800 PSI. Then manually divert the product water for about 1/2 hour to clean the preservative from the RO unit. If after 15 minutes the unit is producing more product water that is stated in your manual it would be wise to turn your product water output is close to its rated output.

The high pressure is now set for both types of operation. Do not turn the high pressure control valve up or down. At this time turn the RO unit off and turn the selector switch to the left t "AUTO", manual turn the switch lever on the time clock to "ON". The feedwater pressure gauge should read over 20 lbs., 8 minutes later the main pressure pump will energize and ramp up to the preset pressure. The unit is now ready for service.



**GENERAL SEAWATER R.O. LAYOUT  
SELF CONTAINED ISLAND HOME APPLICATIONS**

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## VIII. Operating Instructions

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### Normal Startup

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- Turn high-pressure control valve counterclockwise to fully open position
- Turn selector switch to **Manual** position and press start button firmly and release observing normal operation
- If autostart ramp up or inverter is furnished, wait at least 1 minute then slowly turn high-pressure control valve clockwise until pressure reaches 700 PSI. (in seawater), or until product water output reaches designed output.
- When using Auto start you may leave pressure set without adjusting on every start up.
- Check for leaks. Make sure water is flowing
- If water is not flowing after 1 minute stop here, shut down the system and

### **TROUBLE-SHOOT**

### Automatic Soft Start Operation

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- Start unit in manual and adjust the pressure as described above.
- Turn unit off by pressing the stop button. **DO NOT** adjust the pressure control knob.
- Adjust time clock to desired hours of operation.
- Turn selector switch to **AUTO**.
- When in auto, the unit will not start until the time clock switch trips. After the switch trips to "ON" it will take 10-12 minutes to start main pump and produce water.
- This unit is equipped with **Soft Start** system and controlled by a logic controller and for proper operation do not rapidly switch to different positions.

### Manual Water Quality Check

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- Let system run for 30 minutes
- Sample water and use the handheld salinity provided to test water quality.
- If reading is under 800 you may divert product to the tank.

### Operation in Brackish or Fresh Water

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- Seawater normally has about 32000 – 35000 parts per million of salt and the normal operating pressure should be at 800 - 850 PSI. However, as the salinity drops in brackish water, less pressure will be required for normal production. Do not exceed your unit's rated capacity. Use your flow gauge to determine operating pressure. For instance, totally fresh & brackish water will require approximately only 100 - 3000 PSI for rated production. Water in higher salinity areas such as the Middle East will have to operate at higher pressure (950 PSI) to achieve drinkable water and high production.

The system is filled with preservative solution. Salinity (TDS) will improve after a short period of operation. When in operation it is advisable to start up with no pressure for a minute or two. When stopping the RO unit, the pressure should be turned down first. The above steps are not necessary, but will help increase the life of the unit.

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## **IX. Water Quality Testing**

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The water quality produced by the RO unit upon starting will be low due to the normal osmotic pressure (salt tends to diffuse into fresh sea level). Under normal everyday use drinkable water would become available in a very short time (usually under a minute). If the unit sits without use for an abnormal period, the time required to produce acceptable water will increase.

### **Low Water Quality Symptoms Causes**

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- Time between use (every day use would be best)
- Temperature (hot climates and engine rooms tend to increase bacterial activity)
- Seawater quality
- Salinity

### **Low Water Quality Symptoms Reduction**

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- Every day use
- Locate the membrane in a cooler area
- Fresh or permeate water flush
- Preserving (pickling the membrane)

Depending on the model you purchased, your unit will be provided with a electronic tester (handheld or built in). The built in models will read directly in T.D.S. (total dissolved solids) which will be salt content in parts per million. The hand held meter will also read directly in T.D.S.

**The world health organization recommends approximately 800 PPM as a limit, but if your unit has increased to 700 or higher, we recommend you clean or replace your membrane. Also for an accurate reading, let the RO unit run for 10-15 minutes before sampling.**

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## **X. Maintenance and Cleaning**

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### **Short Duration Shut Down Procedure-(less than 2 weeks)**

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*If you have a **freshwater flush** with your system see section on fresh water flush operation instead of this section*

- Connect a 3/8" hose to sample port
- Stick the other end of the hose in a 5 gallon bucket
- Turn on RO unit
- Turn sample valve to sample position and fill bucket with RO product water
- Stop RO unit
- Connect 3/4" hose to clean/flush port on pickling valves
- Stick the other end of the 3/4" hose into 5 gallon bucket of water
- Turn high-pressure control valve counter-clockwise to fully open position
- Turn the 3/4" 3-way valve handle toward clean/flush port
- Turn RO on
- Run system until almost all of the water has been sucked out of the 5 gallon bucket
- Shut system off!!

**WARNING!!!**

**DO NOT LET THE PUMP SUCK AIR-LEAVE SOME WATER IN BUCKET**  
**Do not use water from on board tanks. Chlorine may have been used in the tanks.**  
**Chlorine will permanently damage the RO membranes.**

### **Long Duration Shut Down Procedure - (more than 2 weeks)**

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- 1.) Collect (2) 5 gallon containers of RO water if unit does not have a flush, only (1) is needed if it has a flush. This water can also be pure fresh water with no chlorine or ozone.
- 2.) Turn high pressure control all the way counterclockwise (lowest pressure) and place sample valve in sample position and flush for 10 minutes if unit has a flush.
- 3.) If unit does not have a flush system: (a) turn intake valve on left to pickling position. (no. 2) Leave valve on right in normal overboard position. (b) place short hoses on pickling valves long enough to reach bottom of 5 gallon container. Place 3/4" or left hose in the container, turn RO on until water is almost empty (do not run dry), this will flush most of the seawater from the system.
- 4.) Now place the right-hand valve in the pickling position, both valves should have the arrow pointing towards the center. (see diagram on P.14) Pour the container of pickling material in the 5 gallon bucket of water previously made in step 1. Make sure high pressure valve is turned all the way down and start RO, the pickling solution will then be drawn into the system and back out the reject valve to the bucket, circulating in a closed loop. Run for approximately for 30 minutes.
- 5.) Turn valves back to the original position.

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## **X. Maintenance and Cleaning (cont.)**

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### **Long Duration Shut Down Procedure - (more than 2 weeks) - (cont.)**

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- 6.) Stop RO unit
- 7.) When resuming normal operation turn sample valve to sample position.
- 8.) Start system and let it run for 30 minutes
- 9.) Check product water with the salinity meter provided. If within operation limits you can now send product water back to tank

### **Pump Maintenance**

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Change pump seals on Cat Pumps after 2000 hours of use, or when leakage is encountered. Change the pump oil every 500 hours after initial 50 hour oil change.

### **Prefilters**

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Observe prefilter gauge pressure. This will give you a good indication of your prefilters condition. If pressure falls below 0 PSI it time to change your prefilter and clean intake strainer (plankton filter-if one is in line). It is advisable to clean the intake strainer more often.

### **Control Housing**

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Check fittings for leaks, clean housing with plain soap and water. Check high-pressure pump for leaks at fittings.

### **Membrane**

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If production falls and TDS goes above 700 PPM the membrane may need to be cleaned. If production does not come up after cleaning, repeat procedure. If the cleaning procedure is not successful, the membrane will need to be replaced.

### **Membrane Cleaning Procedure**

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Follow the Long Duration Shut Down Procedure detailed previously but instead of using 1/3 lb. preservative, dissolve 1/3 lb. Alkaline Membrane Cleaner into your 5 gallons of water. Cleaner should be at 95 to 100 degrees for proper cleaning. Discard contents of container and change cleaning valves to normal position and run for 30 minutes at lowest pressure. (high pressure regulator valve turned all the way counterclockwise). Return to normal operating pressure and discard product water for 30 minutes.

### **WARNING!!!**

**Use of any cleaning or pickling cartridges or chemicals not specifically recommended by SK will void your warranty on ALL SK Watermakers equipment.**

## **XI. Trouble-Shooting Guide**

<b>CONDITION</b>	<b>CAUSES</b>	<b>REMEDY</b>
<b>High negative reading on prefilter</b>	Clogged water inlet	Check for stoppage
	Stopped up or kinked hose from inlet	Remove debris or replace hose
	Dirty prefilter or strainer	Clean strainer or change filters
<b>High pressure gauge will not come up to 800 PSI</b>	No intake water	Check prefilter and vacuum gauge, check intake, replace filters if necessary
<b>High pressure pump runs rough</b>	Air in inlet plumbing	Tighten connections and check for proper location of inlet through hull.
	Restrictions in inlet plumbing	Check for kinks or dirty filters
	Defective valve or seals in HP pump	Repair or replace pump
<b>Low product water</b>	Fouled or worn RO membrane	Clean or replace RO membrane
<b>Higher product water flow</b>	Failed RO membrane	Replace membrane
	Using RO in fresh or brackish water with pressure set too high	Lower pressure



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**XI. Trouble-Shooting Guide (cont.)**

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<b>CONDITION</b>	<b>CAUSES</b>	<b>REMEDY</b>
<b>Hp Pump does not run</b>	Defective electric motor	Repair or replace motor
	Defective breaker, switch or fuse	Replace breaker, switch or fuse
<b>Product water quality above 800 PPM</b>	Fouled membrane	Clean or replace membrane

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## **XII. Installation and Operation of Fresh Water Flush (Manual or Auto) *optional***

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### **Installation of Manual Freshwater Flush**

- Locate convenient location and install flush
- Run 3/8" hose or line to pressurized water from ship's freshwater system supply
- Run 3/8" hose from freshwater flush to 3/8" barb on prefilter (if installed by owner, run hose from flush to tee installed as shown in install diagram (see diagram 5))

### **Operation of Manual Freshwater Flush**

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- RO unit should be **OFF** while flushing
- High pressure valve on control should be in the open position (all the way counterclockwise)
- Turn blue handle on the fresh water flush so the handle is inline with the valve and let it flush for 5 to 10 minutes
- Close valve on fresh water flush filter - flushing is complete
- Flushing is very good insurance against membrane failure and will increase the life of your entire system
- Flushing may be done at any time after RO shutdown with a simple turn of the valve on the carbon filter
- A good practice would be to flush your RO after every use, if it is not to be used everyday

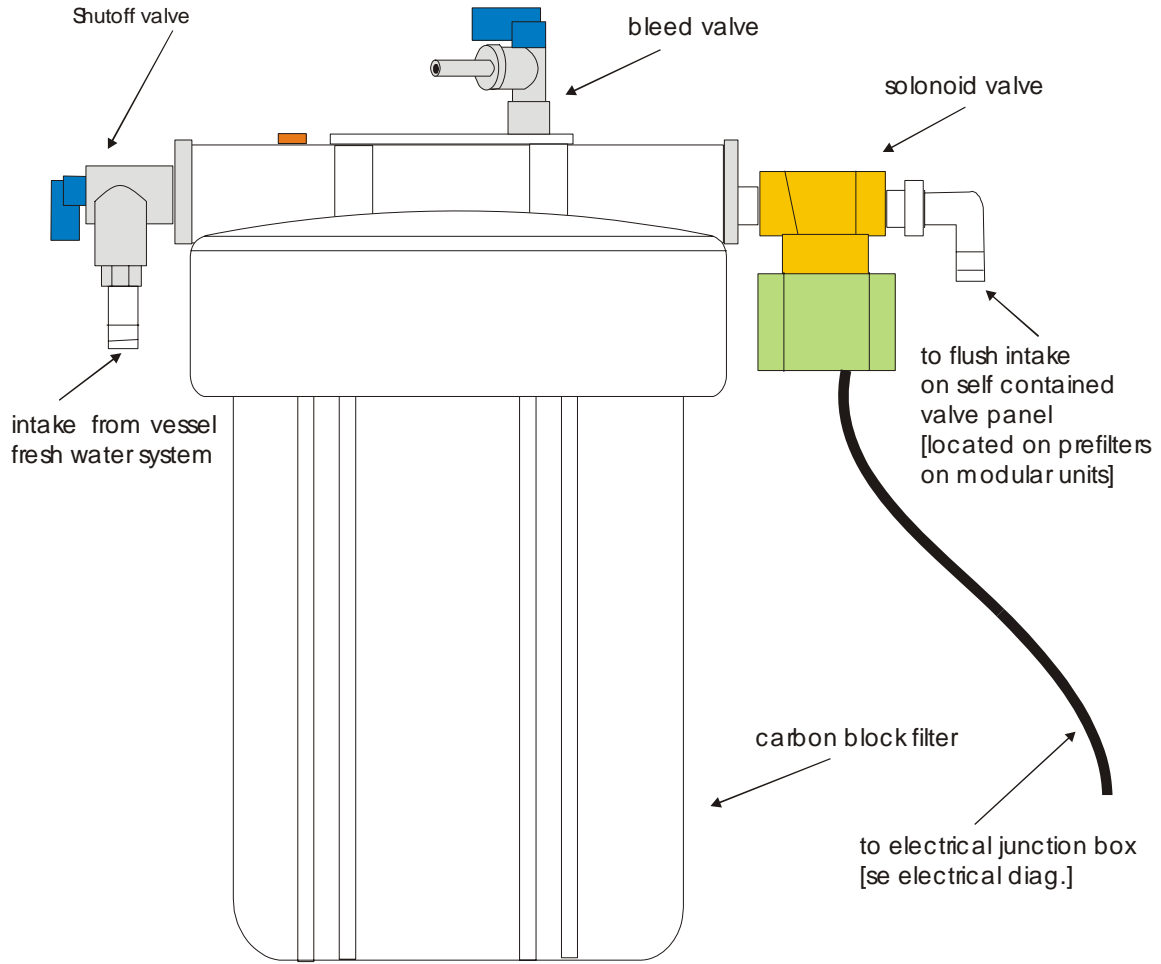
### **Operation of Automatic Freshwater Flush**

1. Normal operation is initiated when the RO unit pressure is backed down to zero and red stop button is pressed after RO operation.
2. Fresh water then flows over the carbon block filter into the RO system and membrane. This will flush contaminants and bacteria from the membrane.
3. The RO unit does not have to be running to operate the flush. For instance, if it is desirable to flush unit once a week while not in service, simply press the green start button then immediately push the red stop button and flushing will start.
4. Flushing will take between 5 to 10 minutes. The carbon block filter should be changed every 6 months to a year.
5. After new carbon filter is installed, remove hose from output side of filter if a manual flush is used. If an auto flush is used, turn purge valve on top turn on flush (push stop button on unit) to flush carbon fines from new cartridge. This should take only about 1 minute, then turn off valve on opposite side of filter housing. Replace the 3/8" hose and open the shut off valve. Unit is now ready for operation. Freshwater flush is energized upon stopping unit. Push stop button firmly. Do not start and stop rapidly (cycle Unit). Do not start unit for 10 minutes after stopping. However, starting unit during the flush cycle will terminate the flush and not damage the unit.

**The activated carbon filter must be changed at a maximum of 12 months regardless of use. Use a high quality filter as any chlorine will damage the RO membrane(s)**

### XIII. Diagram of Auto/Timed Flush

NOTE! When changing filters, turn off water, and open bleed valve to relieve pressure, turn water back on and bleed for 1 minute to clear any foreign material.



FRESH WATER AUTO / TIMED FLUSH

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## **XIV. Tips for Operation of Marine Desalinators**

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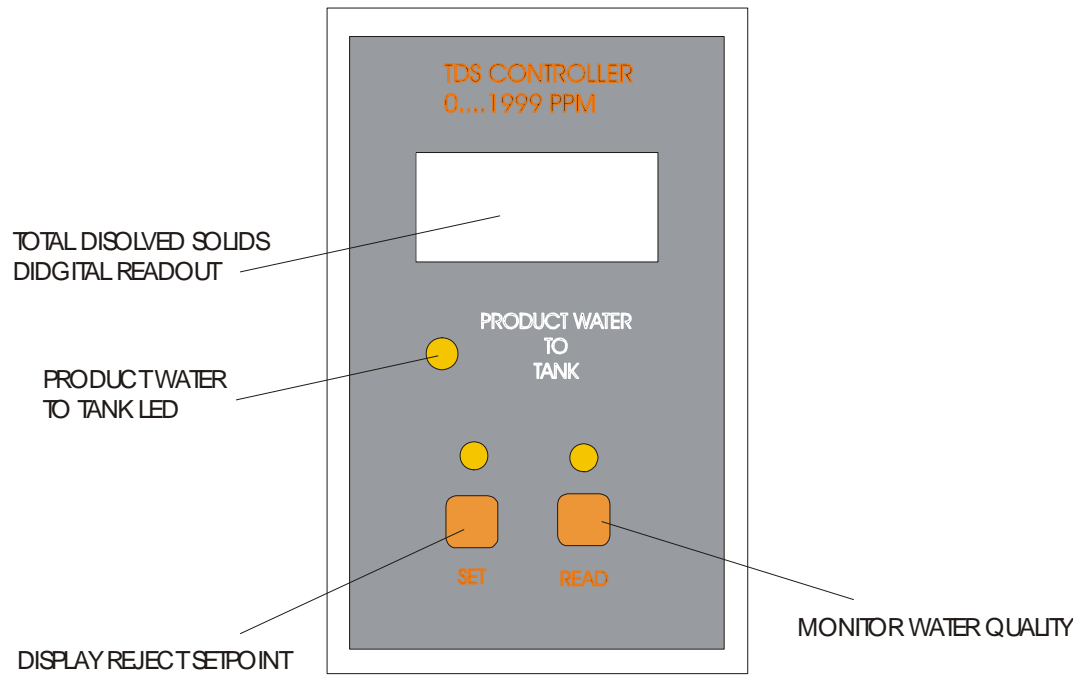
### **THE DO'S**

- Lower pressure before stopping and starting
- Lower pressure in brackish water. (Stay within the GPH rating of the unit)
- Flush RO unit with fresh water whenever possible. **(NO CHLORINE)** A freshwater flush is available at a low cost
- Preserve RO membrane with pickling solution for long time storage. (up to 6 months)
- Monitor prefilters carefully for blockage. (a prefilter pump will extend their life many times)
- Change oil in high pressure pump. (check pump recommendations)
- Clean equipment with soap and water or alcohol. (no acetone)

### **THE DON'TS**

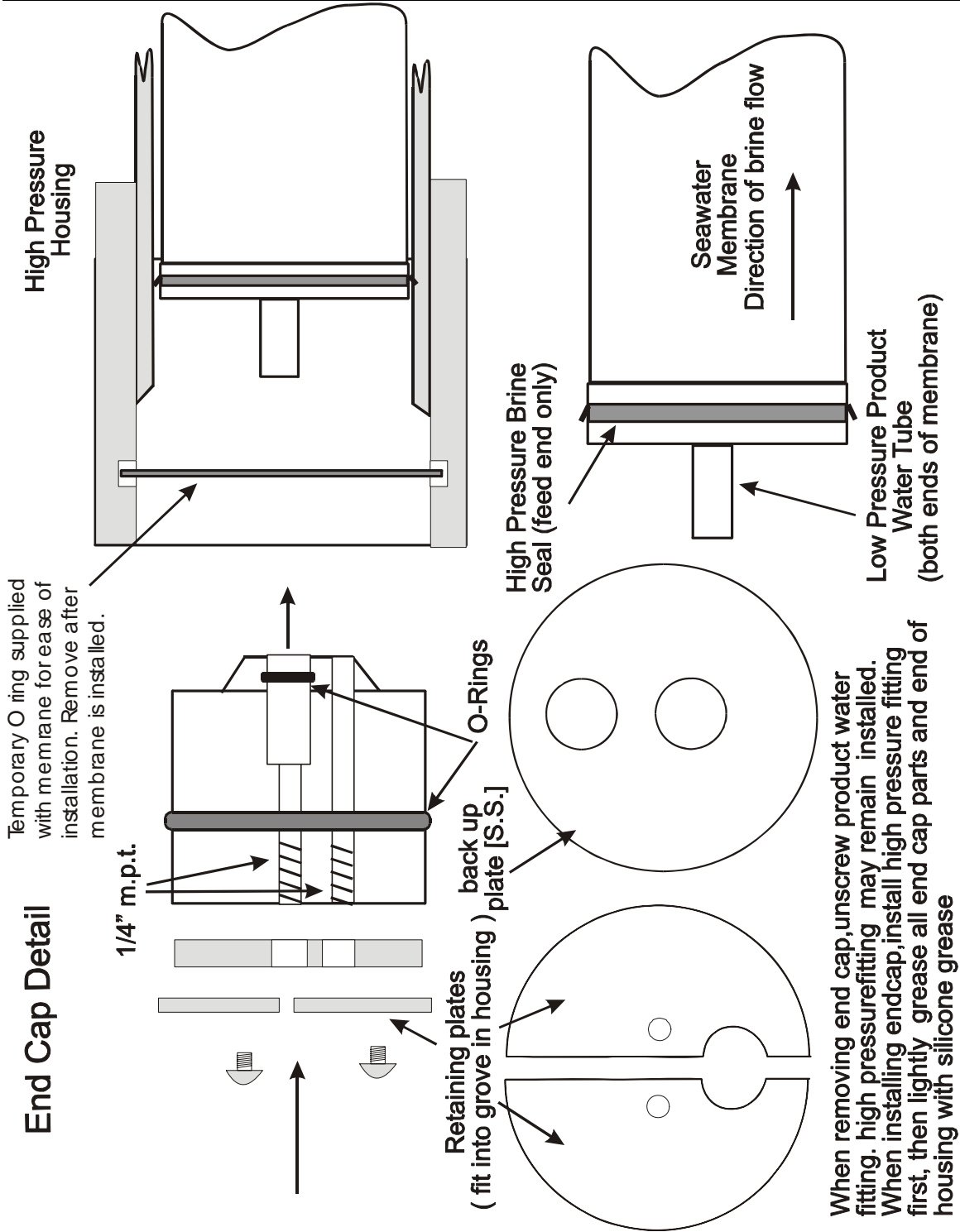
- Operate in very silty conditions, some silt is very fine and can bypass even a 5 micron filter. (this may scale membranes and require acid cleaning)
- Operate in any situation with oil in the seawater
- Let the RO membrane(s) dry out, they will be irreversibly damaged
- Share a thru hull with any other devices aboard. **(EXCEPTION!!)** Saltwater wash down pump)
- Operate under low voltage conditions

**XVI. Explanation of TDS Controller**



**TOTAL DISOLVED SOLIDS  
MONITOR AND CONTROLLER**

**XVII. End Cap Detail**



## **LIMITED WARRANTY**

SK Watermakers (from herein called SKW) warrants each new reverse osmosis unit/system to be free from defects in materials and workmanship under normal use, if installed and operated under SKW's design specifications, under the conditions listed below.

HARDWARE LIMITED WARRANTY: For a period of 1 year from initial use, SKW will repair and replace, at its option, any part of the HARDWARE which we find to be defective due to faulty materials or workmanship. Shipping charges shall be the responsibility of the purchaser.

This warranty shall only cover the original purchaser. Any damage caused by alteration, physical damage, installation, or operation contrary to our written specifications or instructions are not covered by this warranty.

IN ADDITION: it is the responsibility of the owner/user to change crankcase oil in pumps every 500 hours after the initial 50 hour oil change, also change unit. Failure to comply or evidence of failure to comply with these requirements shall also void this warranty.