



# DB MODELS

## USERS MANUAL

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# I.

## 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. SK'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.*

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## II. General Product Specifications

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### DESCRIPTION

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Membrane Housings:           Fiberglass/aluminum (Lifetime Warranty)  
Membranes:                   Thin composite R.O. membranes

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### TEST CONDITIONS

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

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### AMPERAGE

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<u>AMPERAGE</u>			
DB/HC/SC 200-600	115v @ 15 amps	230 @ 8.0	amps
DB/HC/SC 600	115v @ 20 amps	230 @ 11.0	amps
DC 150	12v @ 21 - 24 amps		
<i>Note: (larger units will vary with capacity)</i>			

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### WATER PRODUCTION CAPABILITIES

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

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### **III. Installation Instructions of Panel Mount Units**

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#### **Control Panel Location**

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Locate the panel on cabinet or bulkhead near the bilge area where the membrane and high pressure pump are to be placed. The units are furnished with 7 feet of high pressure hose so the farthest distance for the control panel to the high pressure pump would be about 6-7 feet. If a longer distance is required, a longer high pressure hose may be ordered. (See Diagram page 15)

#### **High Pressure Pump Location**

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Locate the area where the high pressure pump is to be located. They must be located approximately at the water level or lower, unless a feed pump (prefilter pump) is to be installed. Mount the pump in a dry location and level as possible. Secure with lag bolts or thru bolts.

#### **Thru Hull and Prefilter Location**

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The prefilter should be in an area that is readily serviceable to facilitate filter changing. **(refer to standard installation instructions)**

#### **Membrane Mounting**

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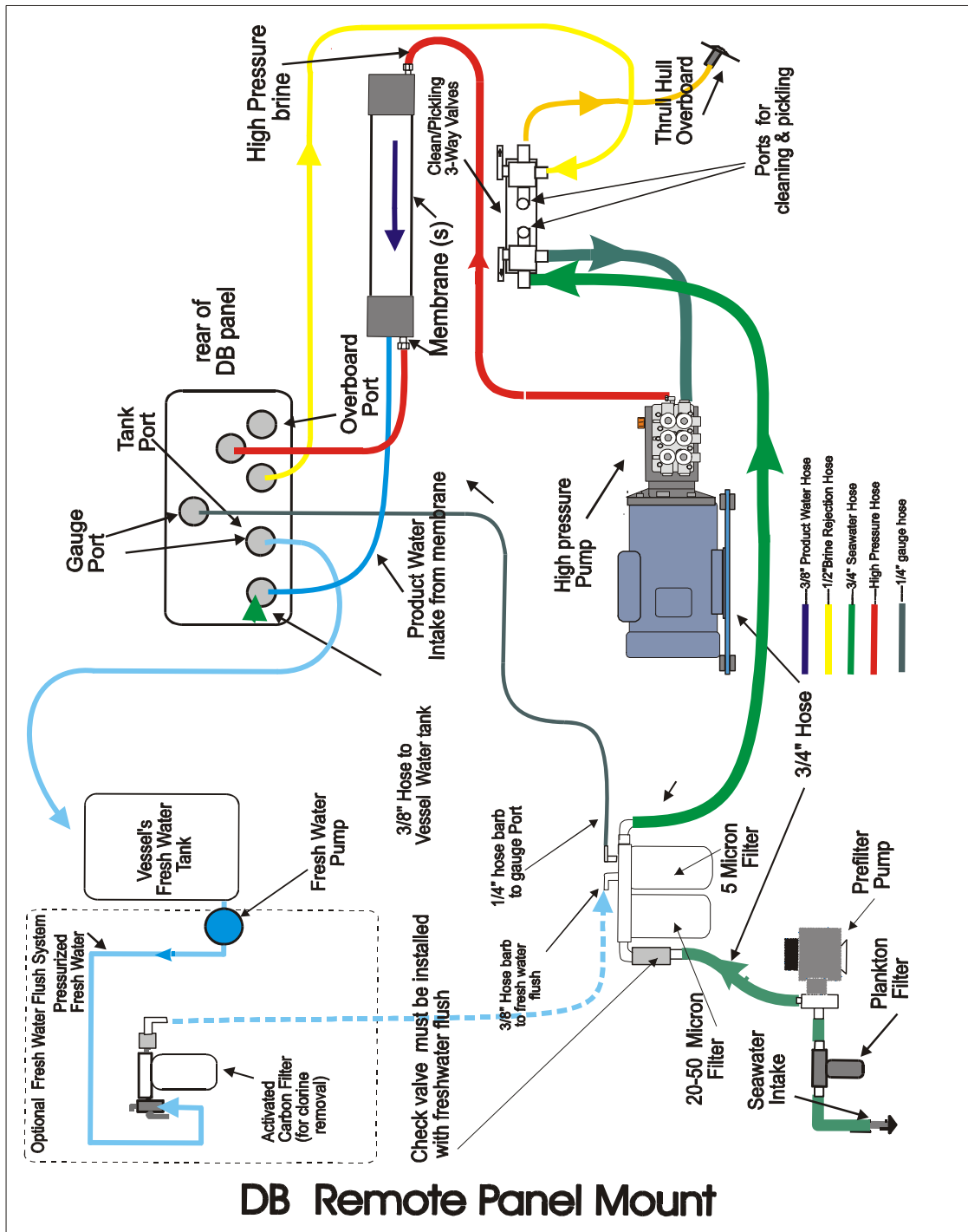
The membrane(s) may be placed anywhere between the high pressure pump and the control panel.

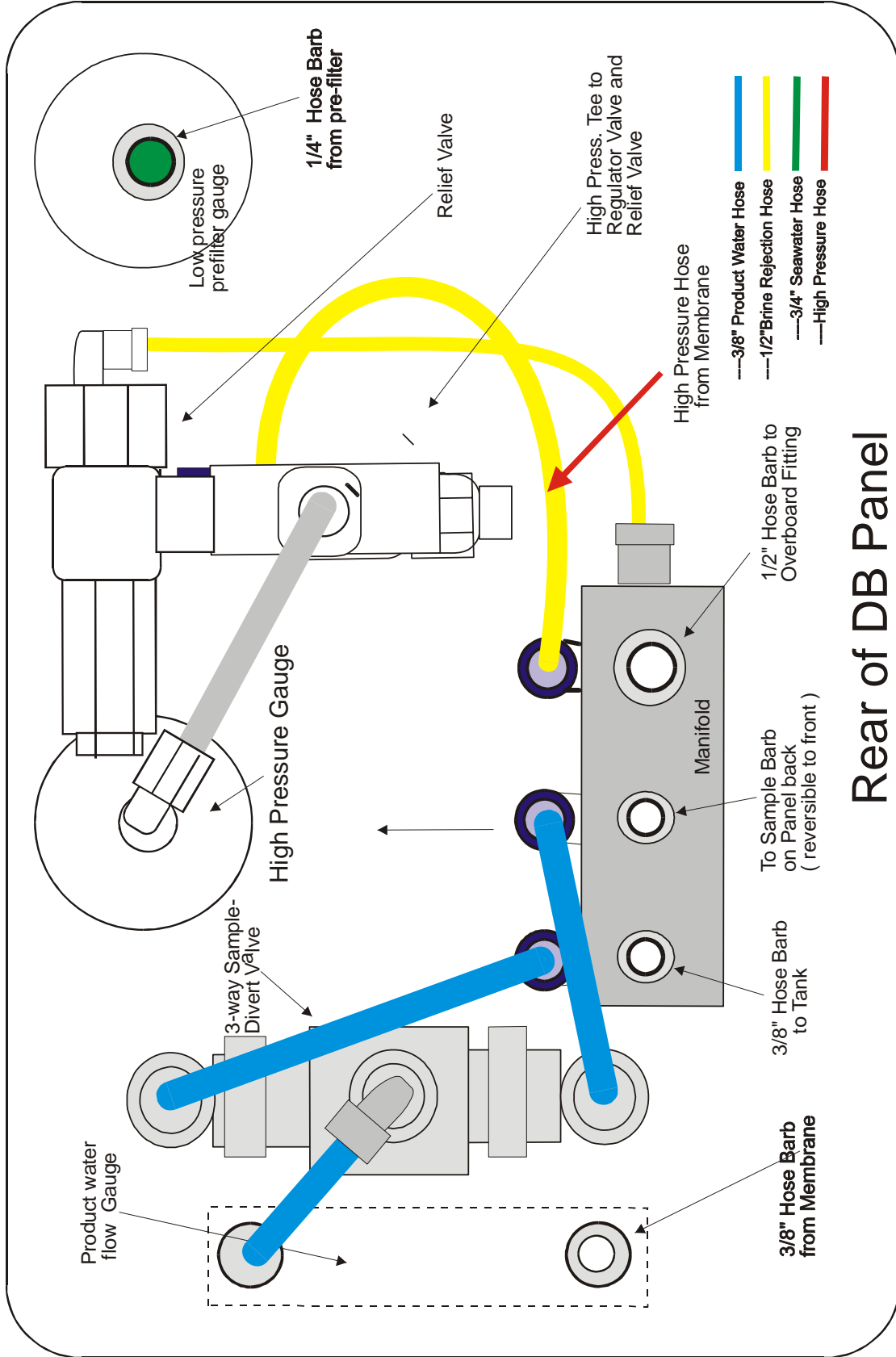
#### **Hoses and Clamps**

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Run 3/4" clear braid (or equivalent) from salt water intake to prefilter pump. Run 3/4" clear braid to nylon port marked "**INTAKE**" on high pressure pump.  
Run 3/8" high pressure hose from stainless steel fitting to stainless steel fitting on membrane housing marked "**FEED**".  
Run 3/8" high pressure hose from stainless steel fitting on membrane marked "**BRINE**" to stainless steel fitting marked "**BRINE**" on panel.  
Run 3/8" clear braid on membrane housing to "**PRODUCT WATER IN**" on panel.  
run 1/2" clear braid from 1/2" nylon hose barb marked "**OVERBOARD**" to the thru hull fitting on hull of vessel. (it must be above the waterline)  
Run 1/4" clear braid from 1/4" nylon barb on low pressure gauge on panel to 1/4" nylon barb on prefilter.  
Run 3/8" clear braid to nylon hose barb on panel marked "**TANK**" to top of water tank.

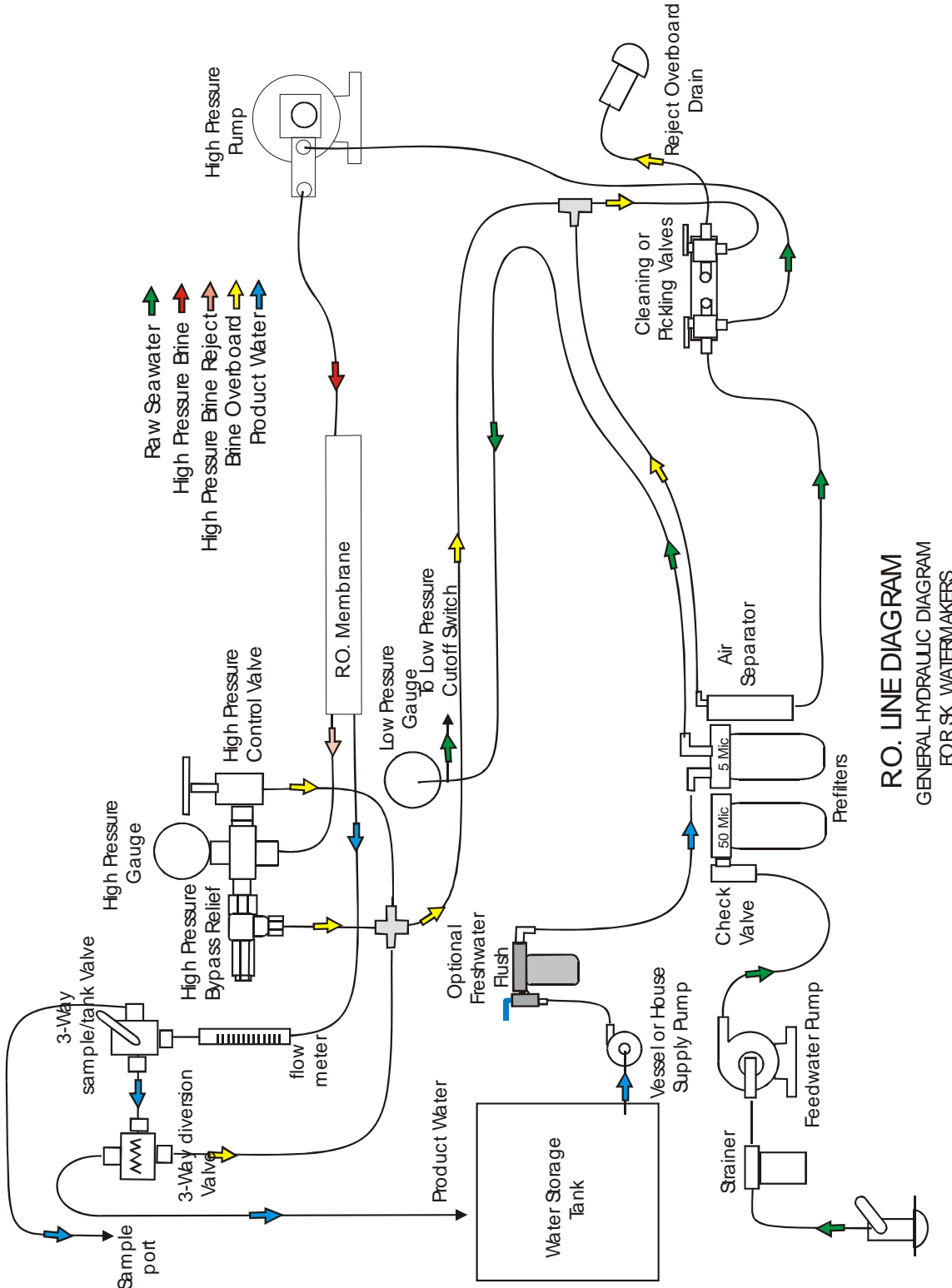
IV.. DB Panel Mount Diagram Installation





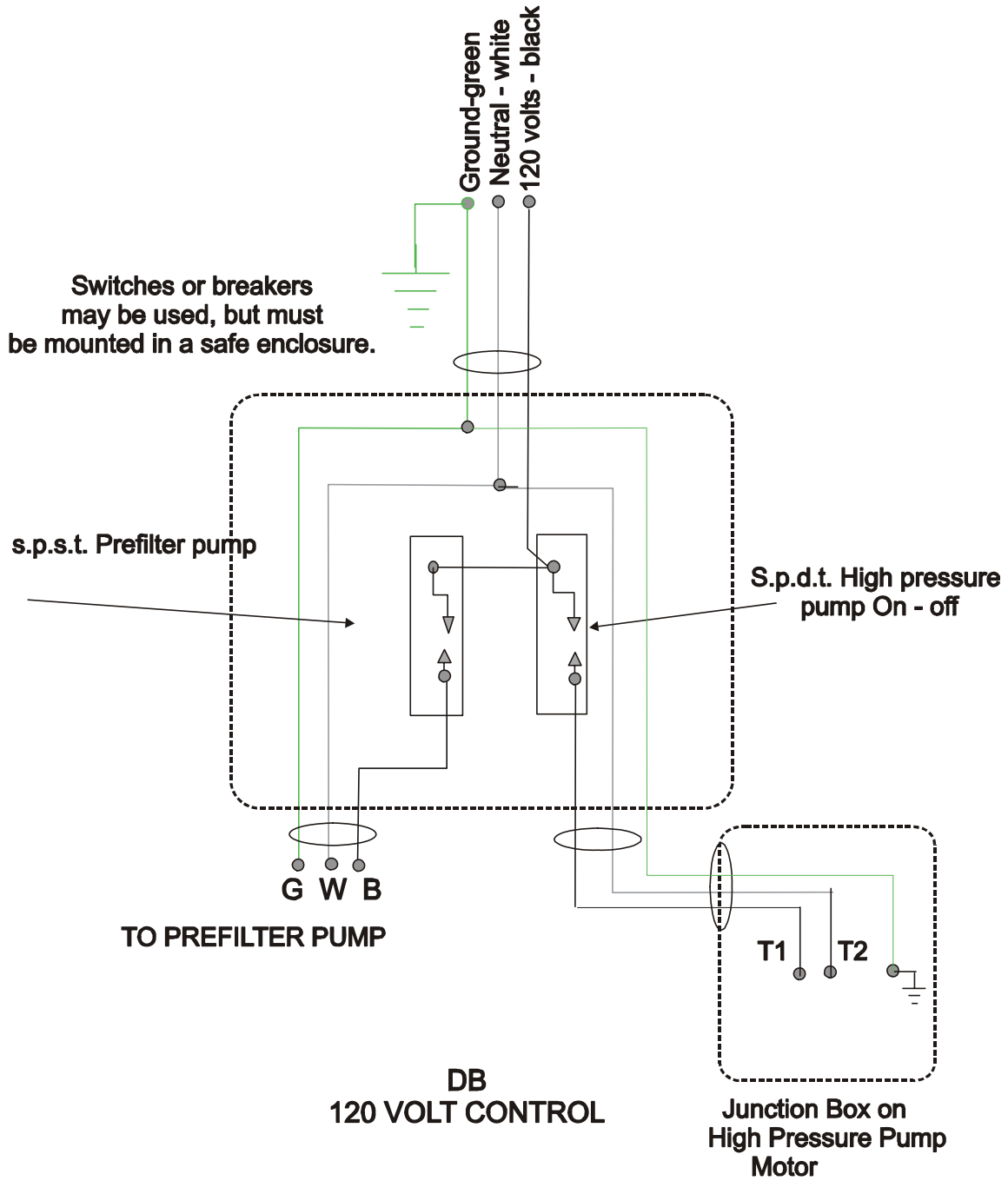
## Rear of DB Panel

V. RO Line Diagram...(some parts shown may not be all units)

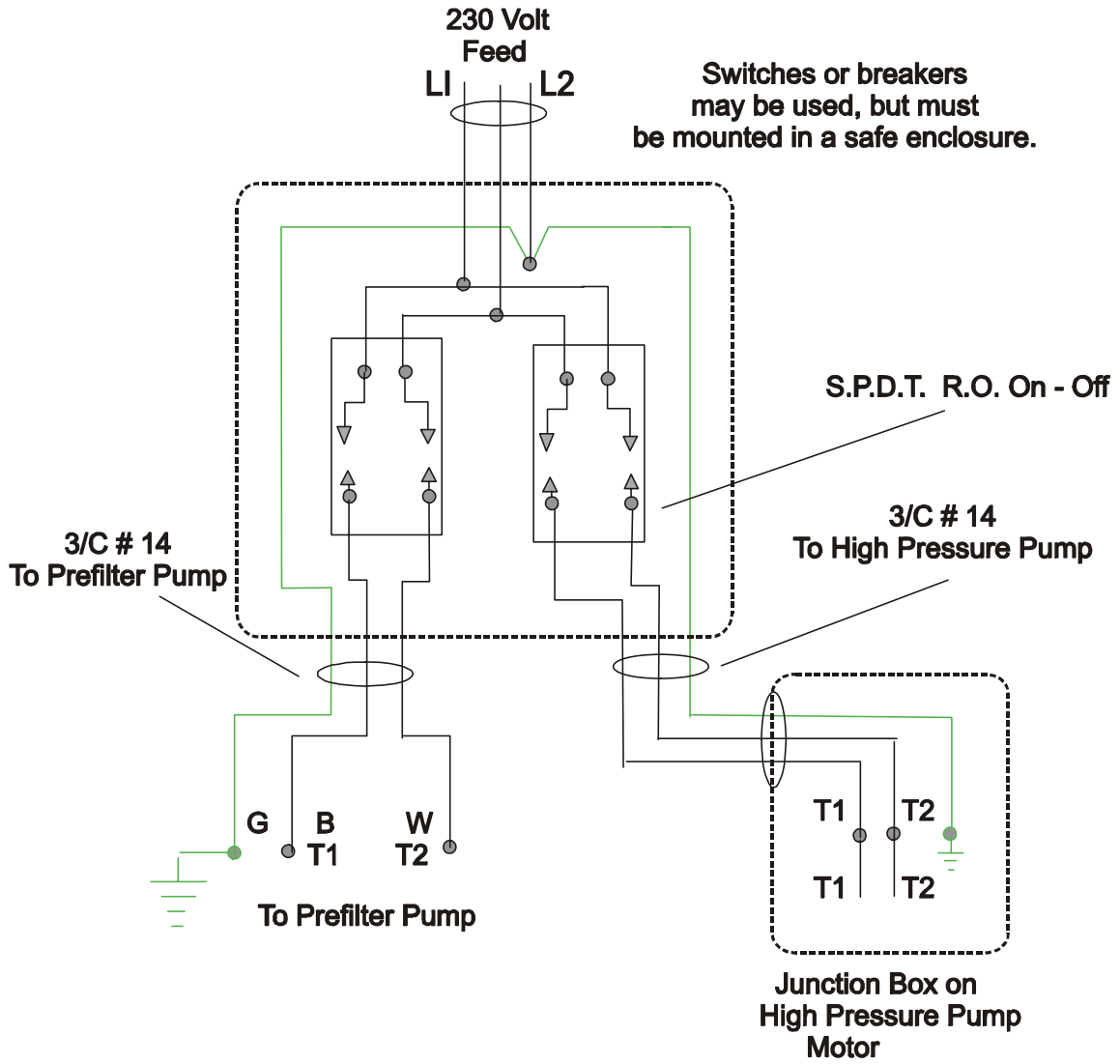


RO. LINE DIAGRAM  
 GENERAL HYDRAULIC DIAGRAM  
 FOR SK WATERMAKERS

# VI. 120 Volt Control



# VI..230 Volt Control



**DB**  
**230 VOLT CONTROL**

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## VII. Operating Instructions

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### Check Connections

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- Check all hose connections for tightness and seaworthiness
- Make sure all hose clamps are securely tightened. (Failure to do so will allow air into the system. The suction side of the high-pressure pump is a key area of concern.)
- Carefully open the thru hull seacock valve to feed the system with seawater.

### Start the System

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- Turn high-pressure control valve counter-clockwise to fully open position.
- Turn sample valve to **SAMPLE** position.
- Turn power switch to **RO ON** position, observing normal operation.
- Check for leaks. Make sure water is flowing.
- If water is not flowing after 1 to 2 minutes stop here, shut down the system and

### Trouble-Shoot.

- Allow system to run for a few minutes or until no air is in the system.
- Slowly turn high-pressure control valve clockwise until pressure reaches 800 PSI.
- Check for leaks and make sure product water is flowing (see general specifications for flow-rates).

### Check Water Quality

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

The system is filled with a 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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### WARNING!

It is advisable not to use an RO unit in a highly polluted or silted harbor. If it is necessary, carefully monitor the prefilters. The pump should be shut down when low-pressure gauge reads negative 5" H

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## VIII. 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.

### 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

### Symptoms Reduction

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- Everyday use
- Fresh or permeate water flush
- Preserving (Pickling the membrane)

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Depending on the model you purchased, your unit will be provided with a electronic tester (hand held 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 TDS.

**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 on an accurate reading, let the RO unit run for 10-15 minutes before sampling.**

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## **IX. Maintenance and Cleaning**

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

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*If your system contains a **fresh water flush**, see the section on fresh water flush operation instead of this section*

- With system running connect a 3/8" hose to sample port
- Stick the other end of hose in 5 gal bucket
- Turn sample valve to sample position and fill bucket with RO water before continuing
- Turn high-pressure control valve counter-clockwise to fully open position
- Connect 1/2" hose to clean/flush port on prefilter housing's 3-way valve
- Stick the other end of 1/2" hose into the bucket of RO water
- Turn 3-way valve handle on prefilter toward clean/flush port
- Run unit until almost all of the water has been sucked out of the 5 gal 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.

*When resuming normal operation turn sample valve to sample position. Start system and let it run for 30 minutes. Check product water with the salinity meter provided. If within operating limits you can now send product water back to tank.*

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

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### **Pump Maintenance**

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Change the pump seals on the high-pressure pumps after 2000 hours of use, or when necessary due to leakage. Replace pump oil every 500 hours after the initial 50 hour oil change.

### **Prefilters**

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Observe prefilter gauge pressure. This will give you a good indication of your prefilters's condition. If pressure falls below 0 PSI it is 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 5 gallons of water. Cleaner should be at 95 to 110 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!!!**

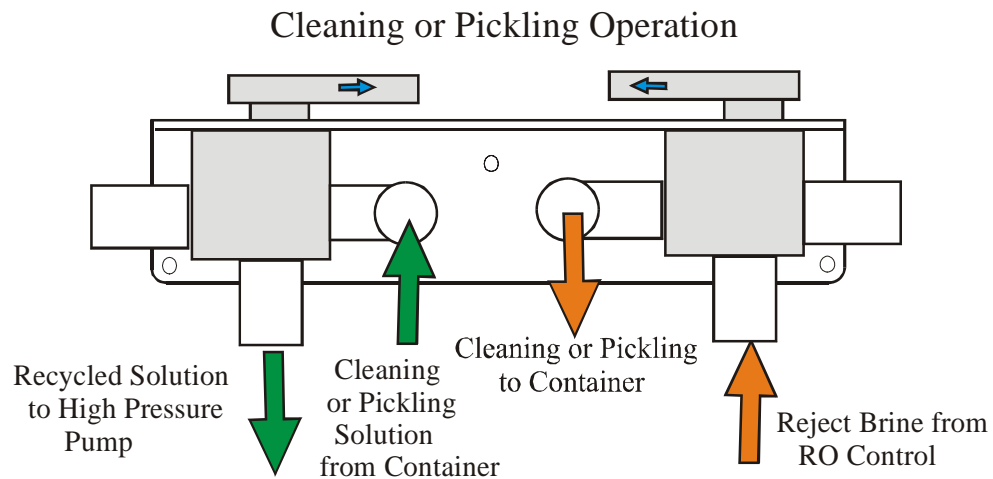
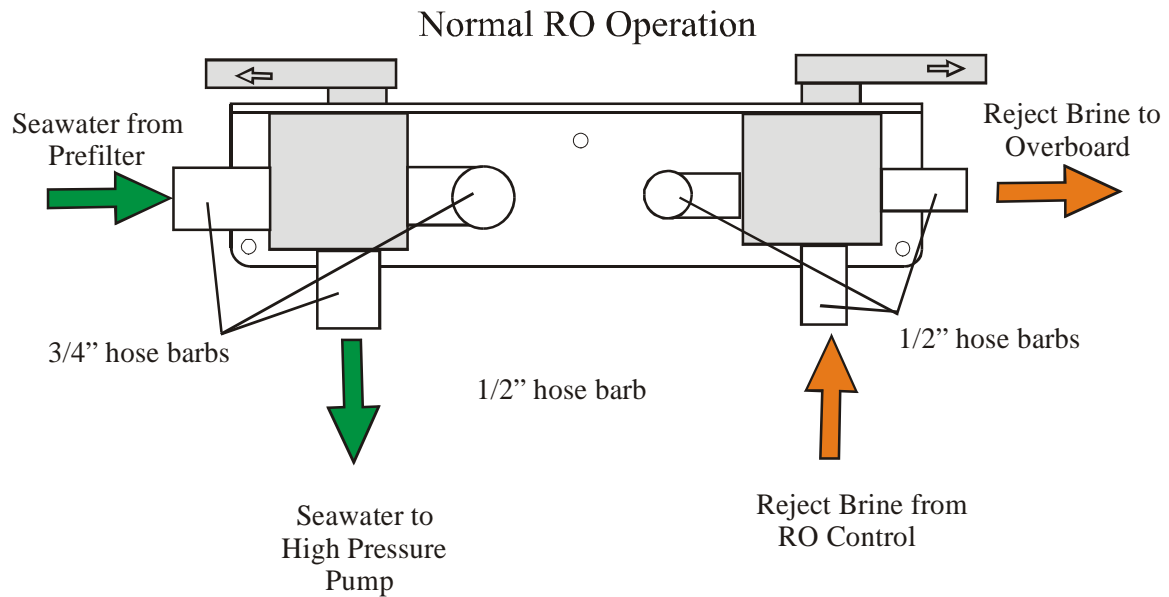
**Use of any cleaning or pickling cartridges or chemicals not specifically recommended by SK will void your warranty on ALL SK Watermakers equipment.**

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## X. Cleaning and Pickling Valve Instructions

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### Operation and Installation of wall-mounted Cleaning and Pickling Valves



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

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<b>CONDITION</b>	<b>CAUSES</b>	<b>REMEDY</b>
<b>High negative reading on prefilter gauge</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
	Defective HP Pump	Repair or Replace HP Pump  Check Valves in Pump (valves may stick after being shut down for a long period without being flushed)
<b>HP pump runs rough</b>	Air in inlet plumbing	Tighten connections check for proper location of inlet thru hull
	Restrictions in inlet plumbing	Check for kinks or dirty prefilters
	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>CONDITION</b>	<b>CAUSES</b>	<b>REMEDY</b>
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<b>Higher product water flow</b>	Failed RO membrane	Replace membrane
	Using RO unit in fresh or brackish water with pressure set too high	Lower pressure
	Defective O-Rings in end cap	Replace O-Rings

<b>HP pump does not run</b>	Defective electric motor	Repair or replace electric motor
	High Resistance (bad) electrical connections	Clean and tighten
	Defective breaker, switch or fuse	Replace breaker, switch or fuse
	Defective Control possible causes	Defective low press. switch or Contactor

<b>Product water quality above 800 PPM</b>	Fouled membrane	Clean or replace membrane
	Defective O-Rings in end cap	Replace O-Rings

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## **XII. Installation and Operation of Fresh Water Flush (Optional) .**

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### **Installation**

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- Locate convenient location and install flush
- Run 1/2" 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 Drawing 5)

### **Operation**

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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 freshwater 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 every day

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.

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

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#### **THE DO'S**

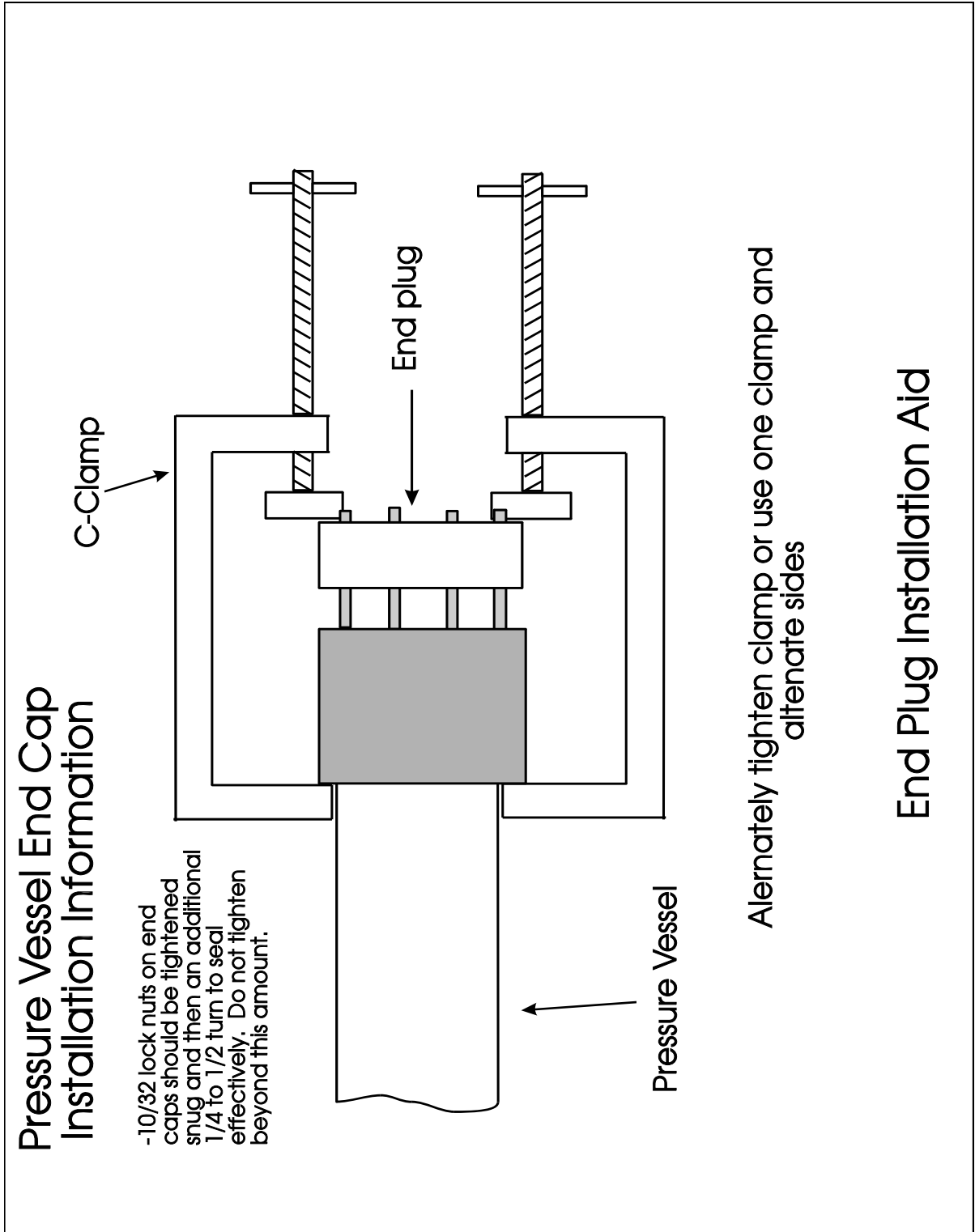
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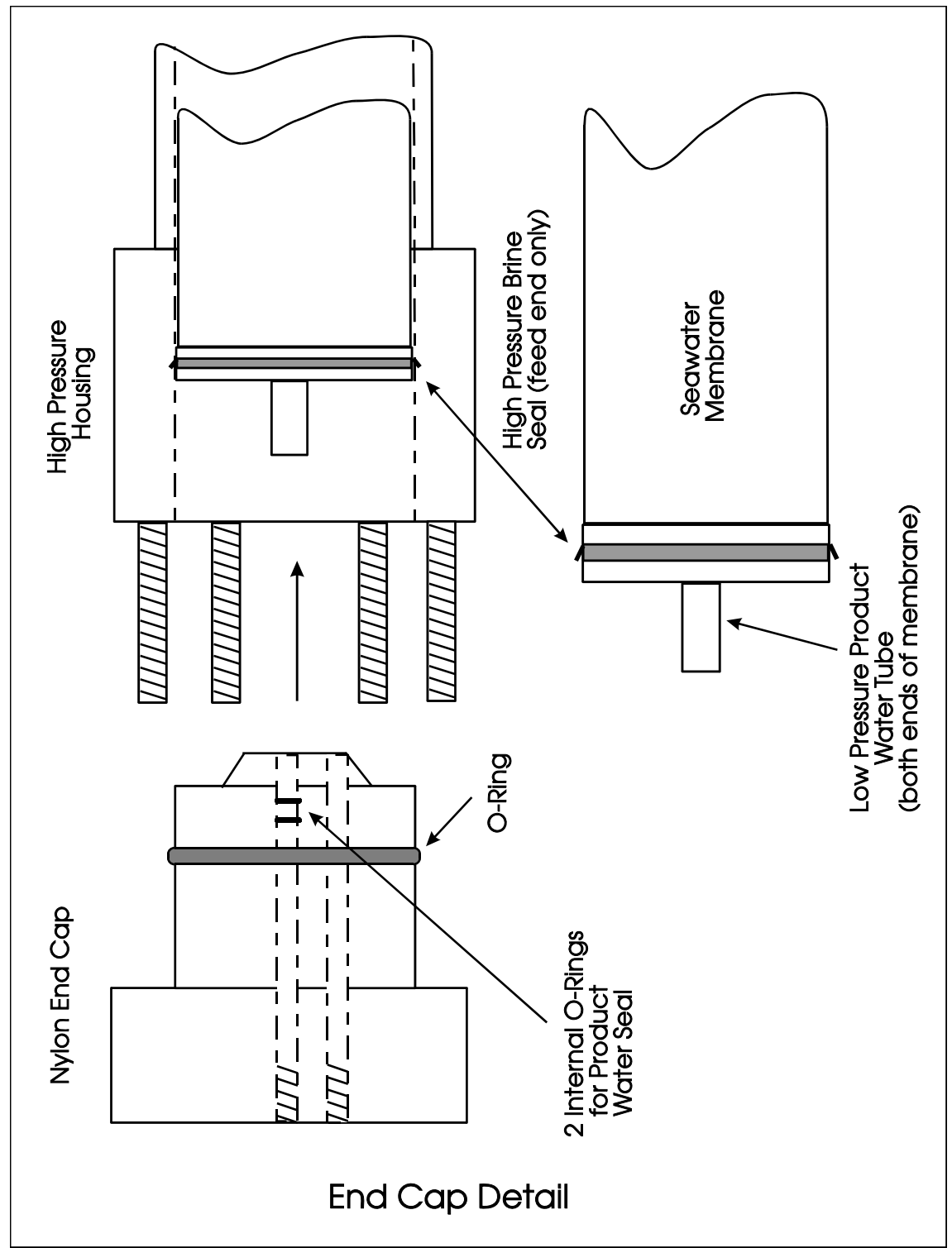
- Lower pressure before stopping and starting.
- Lower pressure in brackish water. (Stay within the GPH rating of the unit)
- Flush RO unit with fresh water whenever possible. **(NO CHLORINE)** A freshwater flush is available at a low cost.
- Preserve RO membrane with pickling solution for long time 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)

#### **THE DON'TS**

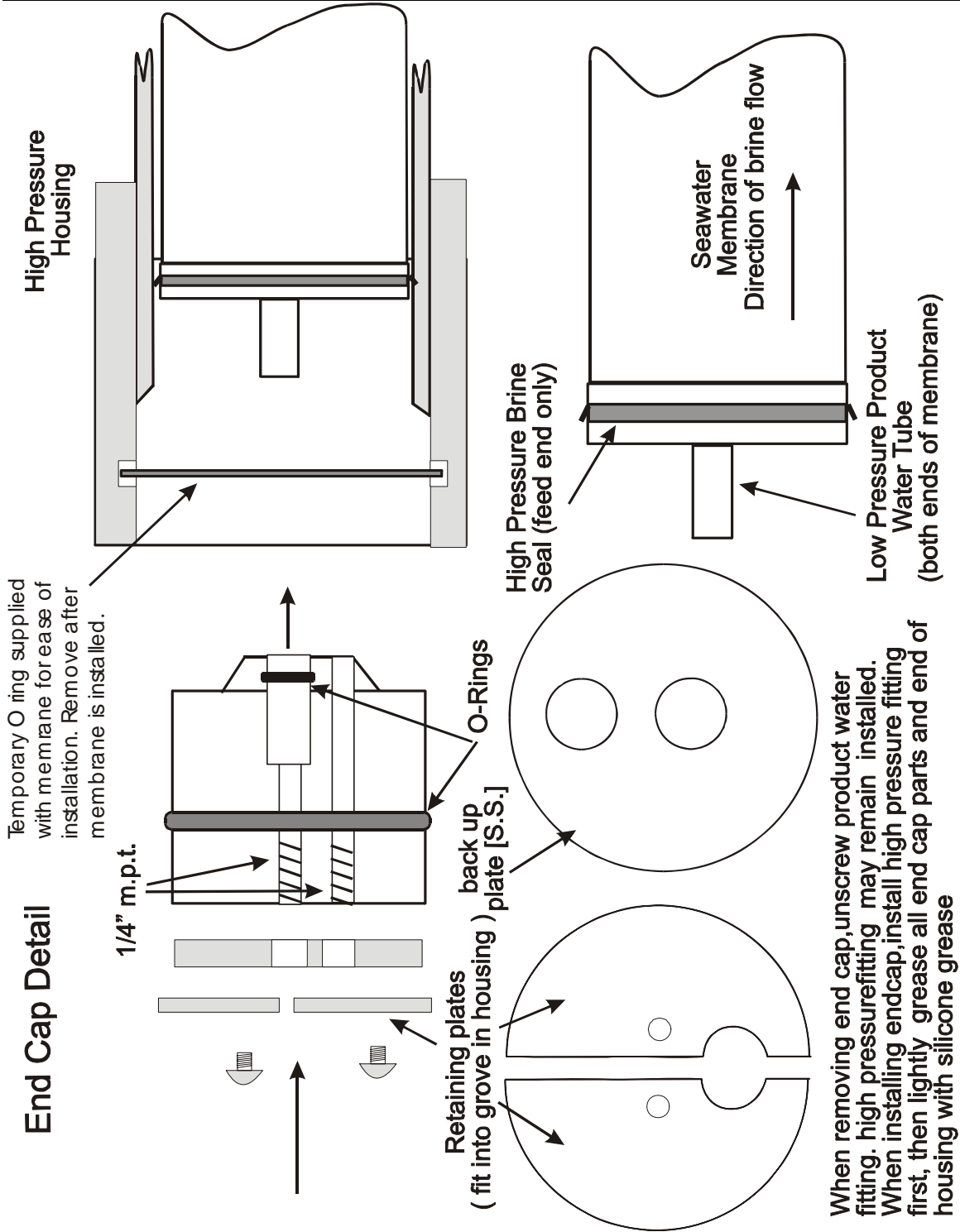
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- Operate in very silty conditions. (this may scale membranes and require acid cleaning)
- Operate in any situation with oil in the seawater.
- Let the RO membrane(s) dry out, they will be irreversibly damaged.
- Share a thru hull with any other devices aboard. **(EXCEPTION!!!** Saltwater wash down pump)
- Operate under low voltage conditions.
- Clean equipment with anything but soap and water or alcohol. (no acetone)





**End Cap Detail used after 1998**



## **LIMITED WARRANTY**

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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 prefilters as advised in the manual and furnish an AIR FREE supply of feedwater to the unit. Failure to comply or evidence of failure to comply with these requirements shall also void this warranty.