ISLAND EXPLORER SERIES

REVERSE OSMOSIS DESALINATOR

INSTALLATION
&
OPERATION MANUAL

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***US*WATERMAKER, INC.**

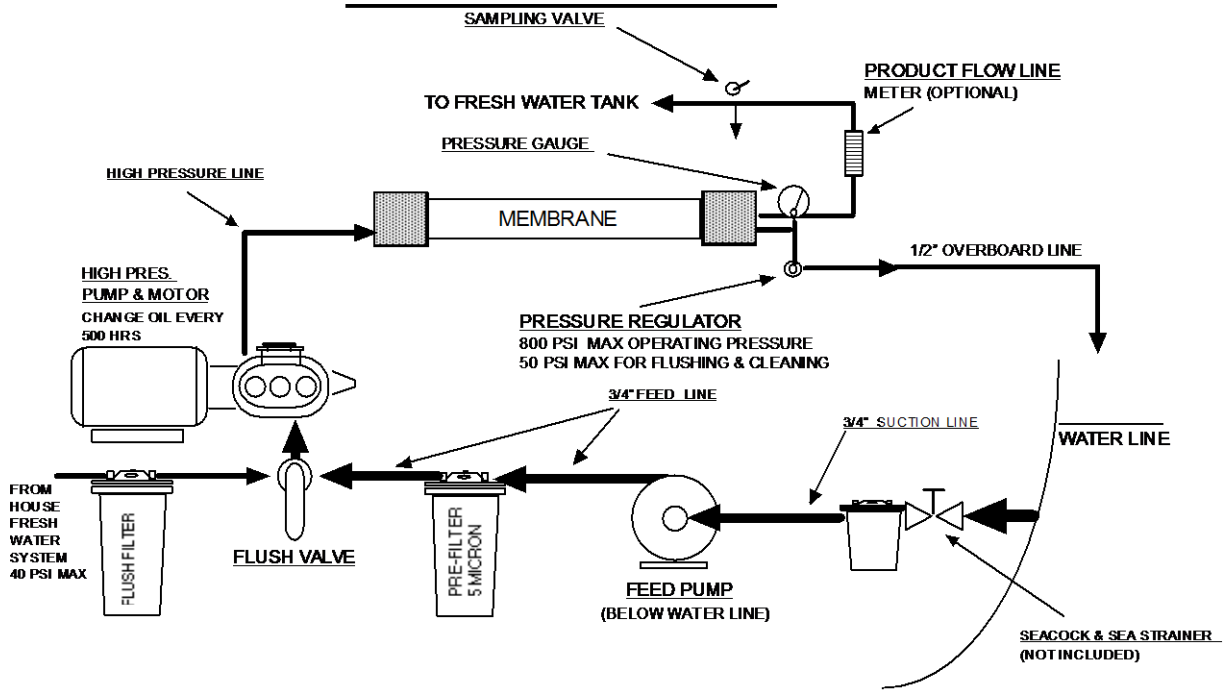
ISLAND EXPLORER SERIES REVERSE OSMOSIS DESALINATOR

INTRODUCTION

***US*WATERMAKER, INC.** watermakers are designed to provide the owner with the highest quality of potable water. This manual will inform the user of the operation and the major components of the ***US*WATERMAKER, INC.** watermaker. Understanding the system operation and component function is paramount for effective use and maintenance. Early problem detection and proper maintenance is the key to keeping a watermaker operating efficiently. Thank you for selecting ***US*WATERMAKER, INC.** Please call 1-800-548-4502 if you have any questions.

SYSTEM SCHEMATIC

FLOW DIAGRAM



Island Explorer 500 Series

FOR PARTS, SERVICE, OR TECHNICAL SUPPORT CALL 1-800-548-4502

SYSTEM COMPONENTS & MAINTENANCE

1. PRE-FILTER

The pre-filter consists of a filter housing with a 5 Micron filter. The pre-filter removes suspended solids of particulate matter from the feed water to protect the Reverse Osmosis element(s). The filter cartridge should be replaced if it becomes fouled or plugged with particulate matter.

2. HIGH PRESSURE PUMP

A positive displacement pump is supplied to produce the pressure required to force feed water through the R.O. membrane. This pump is a triplex ceramic plunger type designed for seawater. It has corrosion resistant materials for all wetted parts.

MAINTENANCE: Change oil after first 50 hours of operation. Check oil level during pre-filter changes. Change oil every three months or 500 hours of operation.

3. HIGH PRESSURE GAUGE

This gauge shows feed water pressure entering the R.O. element pressure vessel from the high pressure pump. The pressure should be maintained at 850 Psig. or below by setting the pressure regulator.

4. R.O. ELEMENT

This element separates salt and raw water impurities from the product water. The R.O. element (membrane) is provided in many configurations. Sizes depend on the production capacity and whether for seawater or well water.

MAINTENANCE: Consists of three procedures:

a. Flush with non-chlorinated water for shutdown period of 1 - 3 weeks.

b. Chemical cleaning and preserving for shutdown periods of longer than 3 weeks.

c. Chemical cleaning when the product flow rate decreases by 10% of normal production.

NOTE; SEE WARRANTY INFORMATION REGARDING ELEMENT CARE (section 8)

5. PRESSURE REGULATING VALVE

This valve is mounted on the R.O. membrane end plug, below the high pressure gauge. Turning the valve knob clockwise closes the valve creating back pressure to build in the pressure vessel(s). The high pressure gauge indicates this pressure and should not exceed 850 PSI.

6. PRESSURE VESSEL

The pressure vessel(s) holds the R.O. element. It contains the pressure needed for reverse osmosis to occur across the R.O. membrane.

MAINTENANCE: Routine pressure vessel maintenance is not required. Visually inspect the pressure vessel(s) for leaks from the end-plugs weekly and correct.

INSTALLATION INSTRUCTIONS

TYPICAL SHIPBOARD INSTALLATION

NOTICE: HIGH PRESSURE PUMP MUST BE INSTALLED BELOW WATER-LINE OF VESSEL TO INSURE ADEQUATE FEED WATER SUPPLY! IF THIS IS NOT PRACTICAL, A "FEED PUMP" WILL BE NECESSARY.

1. REQUIRED OWNER SUPPLIED MATERIALS

NOTE: ALL FITTINGS AND PIPE MUST BE OF NON-FERROUS, NON-CORROSIVE TYPE.

a. BELOW WATER LINE

Thru-hull fittings with a seacock valve:
Seacock valve should be 1/4 turn shut-off valve with a minimum 3/4" diameter orifice.

2. COMPONENT LOCATION

a. Location of pre-filter should be as close to high-pressure pump as possible. This prevents pressure drop associated with excessive piping. All components should be readily accessible for visual inspection and maintenance. Pre-filter must have space to remove housing and replace pre-filter cartridge. These components should be located below the water line in shipboard installations. **NOTE: A feed pump is necessary if high-pressure pump is unable to be mounted below water-line. Consult *US*WATERMAKER, INC.**

3. WATER CONNECTIONS

a. Intake or feed water line from the thru-hull fitting to the high pressure pump to be a minimum of 3/4" pipe.

b. Waste water line from the R.O. unit to overboard fitting to be a minimum of 1/2" pipe.

c. Product line from the R.O. unit to the potable water tank to be a minimum of 1/4" pipe. A 3-way valve should be installed to sample product. **NOTE: DO NOT USE SHUT-OFF VALVES IN EITHER THE WASTE OR PRODUCT WATERLINES. IF 3-WAY VALVES ARE INSTALLED INSURE THEY CANNOT BE CLOSED TO INDUCE BACK PRESSURE INTO THE R.O. UNIT. SEE WARRANTY INFO.**

NOTE: IF FERROUS METAL PIPING CANNOT BE AVOIDED, DIELECTRIC COUPLINGS SHOULD BE USED BETWEEN FERROUS AND NON-FERROUS MATERIALS.

4. POTABLE WATER STORAGE TANK

If the product water is to be run to potable water storage tank:

a. The tank must be non-pressurized type.

b. The line from the R.O. unit should enter into the top of the tank. Tank should be vented and be fitted with an overflow line.

SEE WARRANTY INFORMATION

5. ELECTRICAL

Wire size for electrical power to the R.O. unit should meet the electrical code for the required current carrying capacity. The line voltage and the frequency must meet the system requirements. Refer to the control schematic for the electrical hook-up to the unit.

START-UP AND SHUT DOWN

PROCEDURES

START-UP PROCEDURE

This information provides start-up and R.O. System checkout. Failure to observe and follow these procedures could lead to serious unit damage.

1. Check and make certain the electrical power to the R.O. unit is off at the source.

2. Open control panel cover and check electrical power connections to the unit.

3. Recheck the three water line connections for proper flow paths, inlet and outlet directions for field installed components, and tightness of all connections.

4. Check the high-pressure pump for the proper amount of lubricating oil.

5. Open the pressure-regulating valve to its fully open position. (CCW)

6. Turn on electrical power from the power source to the R.O. units, **but do not** push the start button yet.

7. Using a voltmeter, check voltage at the R.O. unit for correct power. Close and latch the control enclosure cover if power is correct.

8. Open intake water seacock.

9. Operate unit for minimum of 10 minutes at zero system pressure. While operating in this condition check for water leaks and correct as required, stopping the pump if necessary.

10. The system pressure may be increased after leaks are corrected and proper water flows have been achieved. Slowly, increase the pressure with the pressure-regulating valve in increments of 100 PSI to a maximum of 800 PSI. Check system with each step for leaks and proper operation. If leaks develop, stop the system and correct the problem. Restart the system at zero pressure. Slowly, increase system pressure to the next step.

11. Between 500 and 600 PSI product water should begin to flow. It may take a few minutes for the system to produce acceptable potable water. 3-way valve installed on product line should be in “overboard” position until water quality is determined.

If salinity monitor is used, discharge product until monitor reads less than 500 ppm.

All product water for the first 30 minutes of operation after cleaning or protecting should be discarded. This prevents any preservative chemical remaining in the R.O. element from getting into the product water storage system.

SHUTDOWN PROCEDURE

1. Lower the system pressure.

2. Shut down the R.O. unit.

3. Close the inlet water seacock (if necessary)

4. Turn off the electrical power to the R.O. unit (if necessary)

MEMBRANE CLEANING AND PRESERVATION

Note. It is recommended that you install a three-way valve after the feed pump and before the pre-filter in order to introduce NON-CHLORINATED fresh water in order to flush the system.

CHEMICAL CLEANING AND PRESERVING

FOR SHUTDOWN PERIODS LONGER THAN 3 WEEKS

CLEANING PROCEDURE

1. Flush unit with fresh **NON-CHLORINATED** water for 3 minutes.

2. Make sure the pressure regulating valve is at low pressure

3. Remove the pre-filter housing and discard the old pre-filter. Insert new pre-filter and place Cleaning Solution 1 around the pre-filter inside the pre-filter housing, and reattach the housing.

CAUTION: Cleaning Solution 1 contains Citric Acid. Avoid contact with skin and eyes

DO NOT TAKE INTERNALLY. Keep away from food. IF SWALLOWED: Give tap water or milk of magnesia: GET MEDICAL ATTENTION.

IN CASE OF SKIN OR EYE CONTACT: immediately flush with plenty water for at least 15 minutes. GET MEDICAL ATTENTION.

KEEP AWAY FROM CHILDREN.

4. Open the three-way valve to fill the system with fresh water.

5. When the system is full of water, start the high pressure pump This will allow the high pressure pump to re-circulate the cleaning solution.

6. After 30 minutes, stop the pump and flush the system with fresh water. **(Follow all laws regarding discharge of cleaning solution overboard. If discharge is not allowed, the waste line can be run to a waste holding tank.)**

7. Remove the pre-filter housing and place Cleaning Solution 2 around the pre-filter inside the pre-filter housing, and re-attach the housing.

CAUTION: Cleaning Solution 2 contains Tri-sodium Phosphate. Avoid contact with skin or eyes.

DO NOT TAKE INTERNALLY. Keep away from food. IF SWALLOWED: give plenty of tap water. GET MEDICAL ATTENTION.

IN CASE OF SKIN OR EYE CONTACT: Immediately flush with plenty of water for at least 15 minutes. GET MEDICAL ATTENTION.

KEEP AWAY FROM CHILDREN.

8. Fill the system with water.

9. When the system is full of water, press the start the high pressure pump. This will allow the high pressure pump to re-circulate the Cleaning Solution 2.

10. After 30 minutes, stop the pump and flush the system with fresh water. **(Follow all laws regarding discharge of cleaning solution overboard. If discharge is not allowed, the waste line can be run to a waste holding tank.)**

DISCARD THESE WASTE CHEMICALS PROPERLY.

PRESERVATION OF MEMBRANE

NOTE: Protectant does not need to be installed to preserve the membranes if the watermaker is shutdown for less than three weeks.

1. Make sure the pressure regulating valve is at low pressure.

2. Remove the pre-filter housing and place Membrane Protectant around the pre-filter inside the pre-filter housing, and re-attach the housing.

CAUTION: Membrane Protectant contains Sodium Metabisulfite. Avoid contact with skin and eyes.

DO NOT TAKE INTERNALLY. Keep away from food. IF SWALLOWED: Give plenty of tap water. GET MEDICAL ATTENTION.

IN CASE OF SKIN OR EYE CONTACT: Immediately flush with plenty of water for at least 15 minutes. GET MEDICAL ATTENTION.

KEEP AWAY FROM CHILDREN.

3. Fill the system with water.

4. When the system is full of water, press the start the high pressure pump. This will allow the high pressure pump to re-circulate the protectant solution.

5. Re-circulate the protectant solution for 5 minutes. Turn the watermaker off. Allow the protectant to remain inside the watermaker. Your membranes are now preserved.

NOTE:

New pre-filter element can be installed now or prior to reactivation of the unit. Follow the startup procedure with the exception that the 3-way valve is opened to the product sampling. Flush port to discharge the product water for at least 30 minutes. This will flush protectant from the system.

CAUTION! DO NOT OPERATE HIGH PRESSURE PUMP AT HIGH PRESSURE WHILE CLEANING. THIS MAY SEVERELY DAMAGE MEMBRANES.

ISLAND EXPLORER SERIES R.O. TROUBLE-SHOOTING GUIDE

ABNORMAL CONDITION	POSSIBLE CAUSE	REPAIR PROCEDURE
Unable to bleed air (no water)	Feed water inlet valve plugged or closed	Clear debris Open valve
	Pre-filter clogged	Replace element or pre-filter bag
Low system pressure from high pressure pump	Worn high pressure seals	Replace seals, Part #30983. (Refer to CAT PUMPS® service bulletin)
	Water leak from below the high pressure pump	Replace low pressure seals Part #30983. (Refer to Cat pump service bulletin)
	R.O. pressure vessel leaks from end plug	Replace O-Ring seal Part #10826.
	Air leaks before high pressure pump inlet	Locate source and correct
Additionally, the high pressure gauge reads zero	Worn or defective parts in the high pressure pump	Repair or replace parts in pump. (See CAT PUMPS® Service Bulletin)
	Dirty, fouled or worn pump inlet or discharge valves	Clean or replace valve. (See CAT PUMPS® service bulletin)
Salinity remains high	Worn product port O-ring at the end of the plug	Remove the end plug and replace O-Ring
	Membrane(s) fouled	Clean as outlined in manual
	Hole in the membrane	Replace the membrane

ABNORMAL CONDITION	POSSIBLE CAUSE	REPAIR PROCEDURE
High pressure pump runs roughly and product water flow is low	Air entering suction line	Check for air leaks and check for clogged inlet
	Worn or stuck discharge valves in pump	Replace valves. (See CAT PUMPS® service bulletin)
Product water flow fluctuates and/or declines gradually	Break down of water seals	Replace seals. (See CAT PUMPS® service bulletin)
	Dirty valve, worn valve or valve seal	Clean or replace valves and seals. (See CAT PUMPS® service bulletin)
	Dirt in pressure regulating valve	Clean Valve
	Sea strainer and/or pre-filter clogged	Clean or replace filters
Oil leaking in the area of the high pressure pump	Worn plunger seals, or loose crankcase rear cover	Replace seals. (See CAT PUMPS® service bulletin). Tighten cover screw, and/or worn shaft seal screws. If oil sight gauge is damaged, replace sight gauge, replace seal and refill crankcase to proper oil level
	Loose oil drain plug	Tighten drain plug and refill crankcase to proper oil level
Oil appears milky color in sight gauge, but level does not rise	Condensation in oil gauge	Change oil more frequently. Remove sight gauge drain, clean and reinstall

ABNORMAL CONDITION	POSSIBLE CAUSE	REPAIR PROCEDURE
Oil turns milky color in sight gauge, level rises	Plunger seals leak	Replace seals. (See CAT PUMPS® service bulletin)
Loud knock in the high pressure pump	Damaged connecting rod knocking on the crankshaft. Could be caused by lack of lubrication including water in the oil	Replace high pressure pump
When system is started motor hums, motor does not turn	Motor starting capacitor	Replace the starting capacitor
Start button is depressed but system does not start	Power source is off	Reset circuit breaker
	Blown control circuit fuse	Replace fuse
	Switch is faulty	Replace switch
	Power source is not proper voltage for system	Install proper power configuration source
	Loose electrical connections	Check all electrical connections. NOTE: Be cautious of electrical shock, do all such work with the system disconnected from the power source.

MAJOR PARTS LIST

Island Explorer Series Watermaker

Part Description	Part Number
Feed Pump - March	TE-5C-MD
10” Pre-filter Housing	150071
5 Micron Pre-filter Element	10211
High Pressure Gauge	CBM-1000
High Pressure Pump - CAT PUMPS®	2SF25SEEL
1.5 HP, 60 HZ, Single Phase Motor	8060
Pressure Vessel Assembly with End Plugs	PV-2540.5S
Membrane	2540 SW
Pressure Regulator	7350
Pressure Control Ball Valve 1/4”	SS-43GS4
Product Flow Meter	5828.135
Salinity Monitor	PRIMO

*US*WATERMAKER, INC. WATERMAKER LIMITED WARRANTY

***US*WATERMAKER, INC**. watermakers are warranted to be free from defects in workmanship and material for one year from date of manufacturer's shipment. This warranty is limited to repairing or replacing the product or component which manufacturer's investigation shows were defective at time of shipment by the manufacturer. All products and components subject to this warranty shall be returned F.O.B. ***US*WATERMAKER, INC**., 3000 E 2nd Street, The Dalles, OR 97058, for examination repair and/or replacement.

THE EXPRESS WARRANTY SET FORTH IS IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ALL SUCH WARRANTIES ARE HEREBY DISCLAIMED AND EXCLUDED BY THE MANUFACTURER. Repair or replacement of the defective product or component as provided above is the sole and exclusive remedy provided hereunder. The manufacturer shall not be liable for any loss, cost, damages, or expenses, including, but not limited to economic, incidental or consequential damages, directly or indirectly arising from or related to the sale or use of this product.

This warranty is subject to the following warranty conditions concerning R.O. membranes:

1. At no time shall the feed water to the membrane contain oil, grease, or other organic or inorganic matter harmful to the membrane.
2. The feedwater temperature shall not exceed 113 degrees F. (45 C).
3. Feed water shall contain no colloidal sulphur.
4. Membranes shall not be exposed to pressure greater than 1000 psi for Seawater or 600 psi for Brackish Water.
5. Backpressure (where permeate/product static pressure exceeds reject static pressure) shall not exceed 5 psi at any time.
6. The membrane(s) shall be operationally protected against shock loading (water hammer).
7. During continuous operation the pH shall be no less than 2.0 nor greater than 11.0 pH. Adjust if required, with H_2SO_4 or approved equivalent.
8. Recovery ratio shall be consistent with concentration of sparingly soluble salts.
9. There shall be no membrane scaling caused by failure of the chemical dosing system (e.g., Ca, Ba or Sr salts).
10. There shall be no membrane fouling by colloidal or precipitated solids.
11. The feed water shall contain no ozone, permanganate or other strong oxidizing agents.
12. Adequate provisions against microbiological contamination shall be incorporated into the system design, as well as into operating and maintenance procedures.
13. Cleaning shall be initiated at 10% to 15% normalized product flow decline.
14. The membrane(s) shall not be exposed during cleaning, or in shutdown periods, to a pH less than 1 or greater than 12.
15. Any chemical agent, whether cleaner, protectant or otherwise, must be approved by ***US*WATERMAKER, INC**. prior to use.