DOMETIC | seaXchange Sea Water Reverse Osmosis + spotZero Fresh Water Reverse Osmosis

USERS MANUAL / INSTALLATION GUIDE

XZ Double Pass
Patent Pending

XZ1200-2000 XZ1800-2000 XZ2200-2000 XZ2200-3000

www.spotzerowater.com

TABLE OF CONTENTS

ACRONYMS AND DEFINITIONS

ACRONYM/SYMBOLS	DEFINITION
FWF	FRESH WATER FLUSH
RO	REVERSE OSMOSIS
PSI	POUNDS PER SQUARE INCH
GPM	GALLONS PER MINUTE
GPD	GALLONS PER DAY
TDS	TOTAL DISSOLVED SOLIDS
PPM	PARTS PER MILLION
TCF	TEMPERATURE CORRECTION FACTOR
LP SWITCH	LOW PRESSURE SWITCH
HP SWITCH	HIGH PRESSURE SWITCH
Φ	PHASE
SW	SEA WATER
FW	FRESH WATER

INTRODUCTION

Your Sea Xchange XZ-Series Reverse Osmosis System is a durable piece of equipment that, with proper care, will last for many years. This User's Manual outlines installation, operation, maintenance, and troubleshooting details vital to the sustained performance of your system.

If your system is altered at the site of operation or if the feed water conditions change, please contact your local dealer or distributor to determine the proper recovery for your application.

NOTE: PRIOR TO OPERATING OR SERVICING THE REVERSE OSMOSIS SYSTEM, THIS USER'S MANUAL MUST BE READ AND FULLY UNDERSTOOD. KEEP THIS AND OTHER ASSOCIATED INFORMATION FOR FUTURE REFERENCE AND FOR NEW OPERATORS OR QUALIFIED PERSONNEL NEAR THE SYSTEM.

SAFETY

The safety section of this User's Manual outlines the various safety headings used throughout this manual's text and are enhanced and defined below:

NOTE: INDICATES STATEMENTS THAT PROVIDE FURTHER INFORMATION AND CLARIFICATION.

CAUTION: INDICATES STATEMENTS THAT ARE USED TO IDENTIFY CONDITIONS OR PRACTICES THAT COULD RESULT IN EQUIPMENT OR OTHER PROPERTY DAMAGE.

WARNING: INDICATES STATEMENTS THAT ARE USED TO IDENTIFY CONDITIONS OR PRACTICES THAT COULD RESULT IN INJURY OR LOSS OF LIFE. FAILURE TO FOLLOW WARNINGS COULD RESULT IN SERIOUS INJURY OR EVEN DEATH.

DO NOT UNDER ANY CIRCUMSTANCE; REMOVE ANY CAUTION, WARNING, OR OTHER DESCRIPTIVE LABELS FROM THE SYSTEM.

PRINCIPLES OF REVERSE OSMOSIS

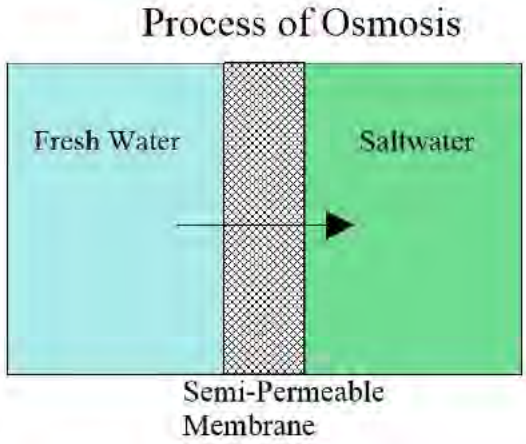
REVERSE OSMOSIS

How Fresh Water Is Produced

Reverse Osmosis or “RO” is a process where freshwater water is produced by pumping saltwater through a semi-permeable membrane.

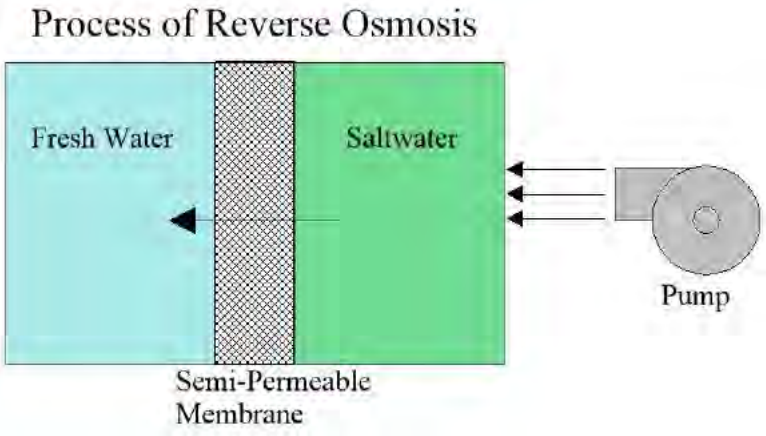
Osmosis

Osmosis is a naturally occurring process where a weak solution will cross a semi-permeable membrane to mix with a highly concentrated solution. For example a freshwater solution will naturally want to mix with a saltwater solution.



Reverse Osmosis

To reverse this process work is put into the system using a pump. The pump causes pressure to build up on the saltwater side of the membrane. This pressure forces water across the semi-permeable membrane. The membrane is designed to allow the water molecules to pass while preventing the salt and other solids from doing so. Fresh water is collected on the other side of the membrane as a result.



UNIT SPECIFICATIONS

XZ MODEL	1200-2000	1800-2000	2200-2000	2200-3000
SW Configuration (Sea Xchange)	2 Vessels	3 Vessels	4 Vessels	3 Vessel
FW Configuration (Spot Zero)	1 Vessel	1 Vessel	1 Vessel	2 Vessels
Feed Water Source	Sea Water/Fresh Water	Sea Water/Fresh Water	Sea Water/Fresh Water	Sea Water/Fresh Water
Rated production Sea Water-gpd (lpd)	1200(45430)	1800(6814)	2200(8328)	2200(8328)
Rated Production Dock Water –gpd(ldp)	2000(7571)	2000(7571)	2000(7571)	2000(7571)
Rated Production Double Pass Mode (Sea Xchange + Spot Zero)	800(3028)	1400(5300)	1800(6813)	1800(6813)
Rejection and Flow Rates				
SW Nominal Salt Rejection % (Sea Xchange)	99.4%	99.4%	99.4%	99.4%
FW Nominal TDSRejection % (Spot Zero)	95%	95%	95%	95%
SW Minimum Feed Flow gpm (lpm)	4.2 (15.9)	4.2 (15.9)	4.2 (15.9)	4.2 (15.9)
FW Minimum Feed Flow gpm (lpm)				
Minimum Concentrate Flow gpm (lpm)	3.79 (14.3)	3.79 (14.3)	3.3 (12.5)	2.95 (11.2)
Connections				
Feed inch	¾” Hose	¾” Hose	¾” Hose	¾” Hose
Product inch	3/8” QC 9.5mm	3/8” QC 9.5mm	3/8” QC 9.5mm	3/8” QC 9.5mm
Concentrate inch	1/2” QC 2.7mm	1/2” QC 2.7mm	1/2” QC 12.7mm	1/2” QC 12.7mm
Membranes				
Membrane Per Vessel Sea Water	1	2	3	4
Membrane Size	2540	2540	2540	2540
Pumps				

Pumps				
High Pressure Pump Type	Piston	Piston	Piston	Piston
HP motor amps	10.6	10.6	10.6	10.6
High Pressure Motor HP (kw)	2.5	2.5	2.5	2.5
Booster motor amps	4.3	4.3	4.3	4.3
Booster Pump RPM @ 60 (50Hz)	1750 (1450)	1750 (1450)	1750 (1450)	1750 (1450)
LP motor amps	5.1	5.1	5.1	5.1
Electrical				
Voltage	230V 50/60Hz 1Φ	230V 50/60Hz 1Φ	230V 50/60Hz 1Φ	230V 50/60Hz 1Φ
Amp Draw	20	20	20	20
Weight lb. (kg)	295(134)	320(145)	345(156.5)	370(168)

OPERATION SPECIFICATIONS

BEFORE STARTING

The reverse osmosis process causes the concentration of impurities. The impurities may precipitate (fall out of solution) when their concentration reaches saturation levels when operated beyond rated production. This precipitation can scale or foul the membranes. In order to prevent this, your XZ unit should never be operated over the **rated production** listed in the **UNIT SPECIFICATION** chart (page 6) and also should not be run above **850psi pump pressure**. Water temperature and inlet water ppm are variables that affect product flow rate and pump pressure

***CAUTION: THE RATED PRODUCTION WILL HAVE TO BE CORRECTED FOR TEMPERATURE OF SEA WATER WHEN DETERMINING RATED FLOW FOR YOUR UNIT. SEE* 'TEMPERATURE CORRECTION FACTORS FOR WATER PRODUCTION' CHART (PAGE 41-42) FOR AN EXAMPLE ON CORRECTING THE RATED FLOW RATE.**

PRE-FILTRATION

XZ-Series systems are supplied with a 5-micron (part number 252404298) HIGH CAPACITY sediment filters. These filters are made from Typar™ filter media and contain 30% more media than most 4.5" x 20" pleated sediment cartridges To prevent damage to the system, we recommend using the sediment filters supplied with this system. Change the pre-filter once the pressure differential is greater than 15psi.

Spot Zero™ systems are supplied with a combination of 1 micron sediment pre-filter that filters out most particles over 1 microns, and a Cartridge that removes chlorine, chloramine, VOCs and heavy metals. CAUTION: a traditional carbon block filter must not be used as it will not remove chloramines and will cause permanent membrane damage. Pre Filters should be changed every 100 hours.

BOOSTER PUMP

XZ-series systems are supplied with a stainless steel centrifugal pump. The pump must be located below the water line to maintain a positive suction head for priming purposes. Refer to page 122 for the Booster Pump Manual.

THE BOOSTER PUMP MUST NEVER BE RUN DRY. OPERATING THE PUMP WITHOUT SUFFICIENT FEED WATER WILL DAMAGE THE PUMP.

HIGH PRESSURE PUMP

The high pressure pump used on the XZ-Series systems is a piston type constructed of stainless steel. Follow these guidelines to ensure proper operation of the pump:

- Refer to the CAT High Pressure Pump in manufacturer's index for recommended maintenance (page 113).
- The pump must **NEVER** be run dry. Operating the pump without sufficient feed water will damage the pump.
- **ALWAYS** use the required filters when operating the unit. The high pressure pump is susceptible to damage from sediment and debris.
- If any damage occurs to your system's pump, a re-build kit is available. Contact your local dealer or distributor and inform them of your system's model and pump size.

Follow the instructions in the FWF section on page 42.

MEMBRANES

XZ-Series reverse osmosis systems come pre-loaded with DOW FILMTEC™ sea water membranes unless otherwise specified. For the best longevity of membranes, use the manufacturer's recommended pre-filters, operate it within it limits, and ensure the system is performing its regular FWF. Membrane element guidelines can be found in the Dow FILMTEC™ Membranes Manual on page 135.

DIVERSION VALVE

The diversion valve controls the product water after the membranes. If the controller determines that the salinity of the water is acceptable, (based on the salinity set point) it will energize the diversion valve solenoid, causing the water to flow to the vessels tank. If the electrical portion of the solenoid fails or the controller fails to energize the solenoid, a manual bypass on the diversion valve may be utilized if the product water is found to be acceptable. Refer to the Diversion Valve Manual on page 138.

SYSTEM CONTROLLER

The controller is a logic based pc board that can analyze and control the electrical components within the system. Its primary functions are to monitor safety switches (high and low pressure), perform the program sequence of operations to optimize the start, normal operation, and shutdown sequence.

FEED WATER & OPERATION SPECIFICATIONS

Nothing has a greater effect on a reverse osmosis system than the feed water quality

NOTE: IT IS VERY IMPORTANT TO MEET THE MINIMUM FEED WATER REQUIREMENTS. FAILURE TO DO SO WILL CAUSE THE MEMBRANES TO FOUL AND VOID THE MANUFACTURER'S WARRANTY.

Maximum Feed Temperature °F (°C)	95 (29)	Maximum Free Chlorine ppm	0
Minimum Feed Temperature °F (°C)	40 (4.4)	Maximum TDS ppm	45,000
Maximum Ambient Temperature °F (°C)	110 (48.9)	Maximum Hardness gpg	0
Minimum Ambient Temperature °F (°C)	40 (4.4)	Maximum pH (Continuous)	11
Maximum Feed Pressure psi (bar)	40 (5.9)	Minimum pH (Continuous)	5
Minimum Feed Pressure psi (bar)	15(3.1)	Maximum pH (Cleaning 30 Min.)	12
Maximum Operating Pressure psi (bar)	850(68.95)	Minimum pH (Cleaning 30 Min.)	2
Minimum SDI Rating SDI	<1	Maximum Turbidity NTU	1

Test Parameters: 35,000 TDS Filtered (5 Micron), De-Chlorinated, Feed Water, 40 psi (4.5 bar) Feed Pressure, 850 psi (58.61 bar) Operating Pressure, 77

Degrees F (25 Degrees C), Recovery as stated, 7.0 pH. Data taken after 60 minutes of operation.

NOTE: HIGHER TDS AND/OR LOWER FEED WATER TEMPERATURES WILL REDUCE THE SYSTEM'S PRODUCTION.

REJECTION, RECOVERY, & FLOW RATES

Sea Xchange XZ-Series Reverse Osmosis Systems are designed to produce product water at the capacities indicated For example, the XZ 2200-2000 produces 1.53 gallons per minute (2200/24/60min=1.53gpm) of permeate water at the listed operating test conditions.

The amount of total dissolved solids (TDS) rejected by the membrane is expressed as a percentage. For example, a 99.4% rejection rate means that 99.4% of total dissolved solids do not pass through the membrane. To calculate the % rejection, use the following formula:

% Rejection = [(Feed TDS – Product TDS) / Feed TDS] x 100

Example:

99.4% = [(35,000-210)/35,000] x 100

NOTE: ALL TDS FIGURES MUST BE EXPRESSED IN THE SAME UNITS, TYPICALLY PARTS PER MILLION (PPM) OR MILLIGRAMS PER LITER (MG/L).

XZ-Series Reverse Osmosis Systems are designed to reject up to 99.4% NaCl, unless computer projections have been provided or stated otherwise.

The amounts of product water recovered for use is expressed as a percentage. To calculate % recovery and % rejection, use the following formulas:

% Recovery = (Product Water Flow Rate / Feed Water Flow

Rate) x 100 Example:

36% = (1.52/4.22) x 100

% Rejection = (Feed TDS – Product TDS)/(Feed TDS)

x 100 Example:

99.4% = [(35,000-210)/35,000] x 100

NOTE: ALL FLOW RATES MUST BE EXPRESSED IN THE SAME UNITS.

INSTALLATION KIT

ITEMS INCLUDED WITH EACH SYSTEM

MAIN INSTALLATION ITEMS

252404258 – stainless steel booster pump and motor assembly

252404295 - 2.5” x 10” carbon block filter

252404327 – 4.5” filter housing wrench

252404202 – 50’ of ¾“ white double walled hose. **(Not to be used on the suction side of feed pump. Always use wire reinforced hose from the seacock to the suction side of the feed pump.)**

252404004 – 50’ of ¼ ” Spot Zero white nylon tubing **(for FWF)**

252404003 – 50’ of ½” Spot Zero white nylon tubing **(for overboard)**

252404002 - 50’ of 3/8” Spot Zero white nylon tubing **(for product)**

252404099 – (2) 3/8” x ½” connectors

252404109 – (3) 3/8”QC x 3/8”QC 90° elbow

252404118 – (20) 3/8” red locking clip

252404117--(20)1/4” red locking clip

252404116-(20) 1/2” red locking clip

254404094 – (4) ½” elbow tube

252404093 –(1) ½” connector male

252404115 – (10) ½” red locking clip

252404040-(1) TDS hand held tester

(16) – Stainless steel 5/16” x 1” lag bolts

(16) – Stainless steel 5/16” flat washers

CONSUMABLE ITEMS

252404298 – 4.5” x 20” 5 micron pre-filter

252404301– 4.5” x 20”5 FW pre-filter

252404015 – 21oz. bottle CAT pump oil

252404179 – Sea Water membrane

252404000--Fresh Water mebrane

OPTIONAL ITEMS

252404121 – Spare fittings kit

252404040 – Hand held TDS meter

252404333--Remote touch screen

Membrane and vessel array upgrade

NOTE: Items listed are 1 unit supplied unless noted within parentheses.

ELECTRICAL REQUIREMENTS

ELECTRICAL

The XZ Series are available in 1Φ (phase).

230 volts at 20 amps (including booster pump)

50/60 Hertz available in the 230 volt unit

NOTE: IT'S RECOMMENDED THAT A QUALIFIED ELECTRICIAN WIRE YOUR SYSTEM IN ACCORDANCE WITH ALL APPLICABLE COD ES, RULES, AND REGULATIONS.

 ***WARNING: TO REDUCE THE RISK OF ELECTRICAL SHOCK, THE INCOMING POWER SUPPLY MUST INCLUDE A PROTECTIVE GROUND.***

PLUMBING AND PIPING CONNECTIONS

PLUMBING

The membranes and high pressure pumps used on XZ-Series Reverse Osmosis Systems require a continuous flow of water with a maximum temperature not to exceed 113°F. ***Please see Complete Install Guide and the connection drawings on the following pages.***

CAUTION: ANY RESTRICTIONS OR BLOCKAGE IN THE CONCENTRATE LINE CAN CAUSE BACKPRESSURE, WHICH WILL INCREASE THE SYSTEM'S OPERATING PRESSURE. THIS CAN RESULT IN DAMAGE TO THE SYSTEM'S MEMBRANES AND COMPONENTS.

TUBE CUTTING AND INSTALLATION PROCEDURE

Cut the tube square

Cut the tube square and remove burrs and sharp edges. Ensure the outside diameter is free of score marks. For soft or thin walled tube we recommend the use of a tube insert.

Push up to tube stop

Push the tube into the fitting, to the tube stop.

Pull to check secure

To disconnect

Push in collet and remove tube

To disconnect, ensure the system is depressurized, push the collet square against the fitting. With the collet held in this position the tube can be removed.

INSTALLATION

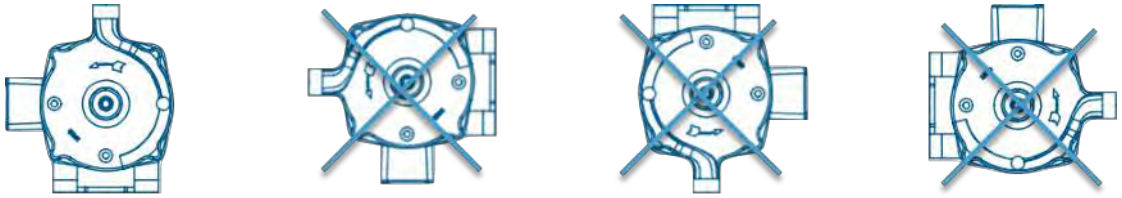
Sea Water Plumbing Connections

1. Locate a dedicated sea cock to be used for booster pump supply. Sea cock should be a minimum of 3/4” with a speed scoop to prevent a Venturi effect while vessel is underway.

2. Install a sea strainer with at least a 50 mesh rating after sea cock.

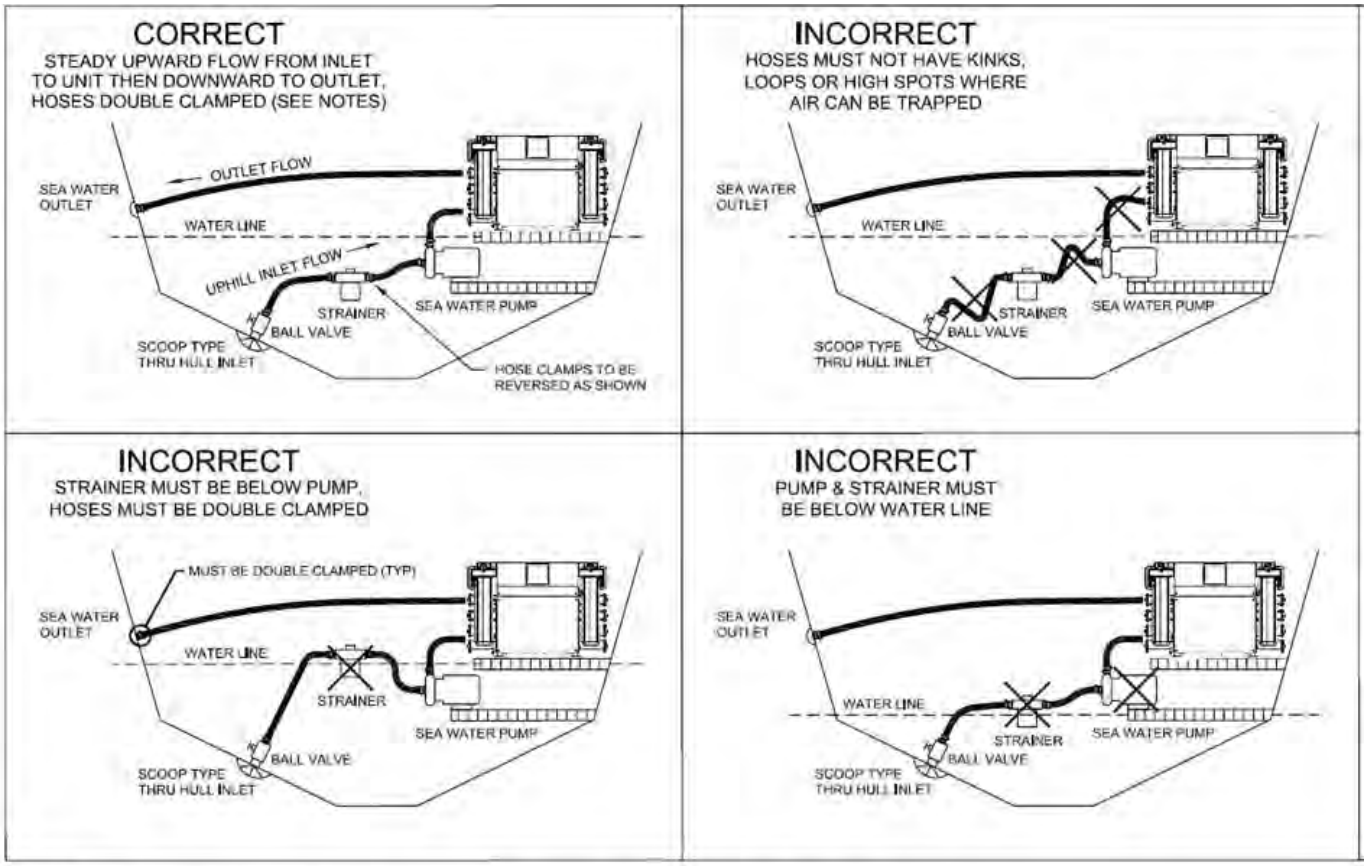
3. Install supplied booster pump below water line.

Note - Booster pump outlet must remain the highest point of pump and cannot be rotated 90



4. Run reinforced suction hose from sea cock to sea strainer to booster pump in an upward flow manner to prevent air traps.

5.



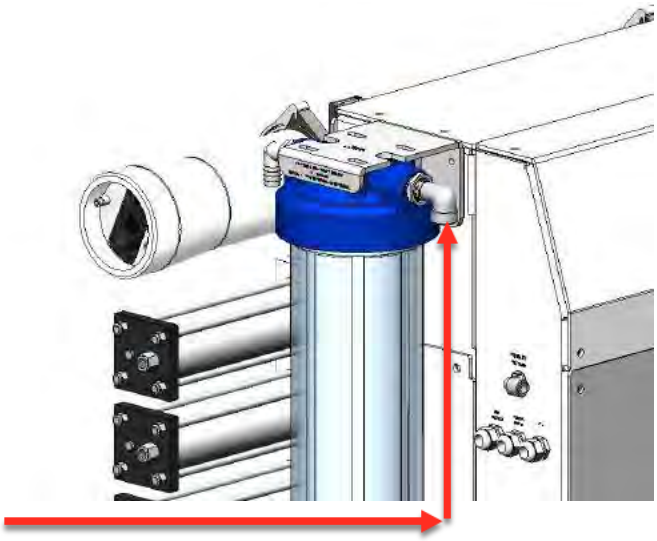
NOTES:
1) THRU HULL INLET, BALL VALVE, HOSE AND STRAINER SHOULD BE SIZED NO SMALLER THAN PUMP INLET.
2) INSTALL THRU HULL FITTING AS FAR BELOW THE WATER LINE AS POSSIBLE.
3) PUMP NEEDS DEDICATED THRU HULL NOT SHARED WITH OTHER PUMPS.
4) AVOID OR MINIMIZE 90° ELBOW FITTINGS AS MUCH AS POSSIBLE, ROTATE PUMP HEAD TOWARDS DIRECTION OF WATER FLOW.

Use supplied white 3/4" flexible hose from discharge of booster pump to **Pre-Filter Inlet** connection on **XZ Sediment** filter assembly located on left side of system. Filter assembly may be remote mounted if desired. Be sure that there are no kinks in hose run and avoid 90's where possible to prevent restricted flow.

PRE-FILTRATION

XZ-Series systems are supplied with a 5-micron sediment filter. Change when a 10-15 psi differential exists between the pre-filter inlet and outlet. Ask your local dealer or distributor about Pre-Filtration systems, if required. SEE DWG# SX

NOTE: THE SYSTEM MUST BE OPERATED IN ACCORDANCE TO FEED WATER SPECIFICATIONS.

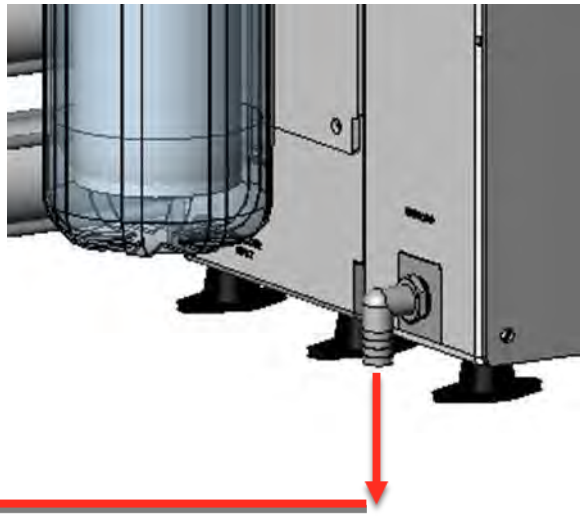


¾" Flexible hose from Booster Pump

7. Double clamp all sea water hose connections to prevent potential leaks.

8. Locate connection labeled "**Overboard**" on lower left side of system. Run supplied white 3/4" hose to a dedicated overboard connection.

Warning - Sea water overboard must never be closed or obstructed while system is operational. Closing or obstructing the overboard flow on system may cause permanent damage to system.



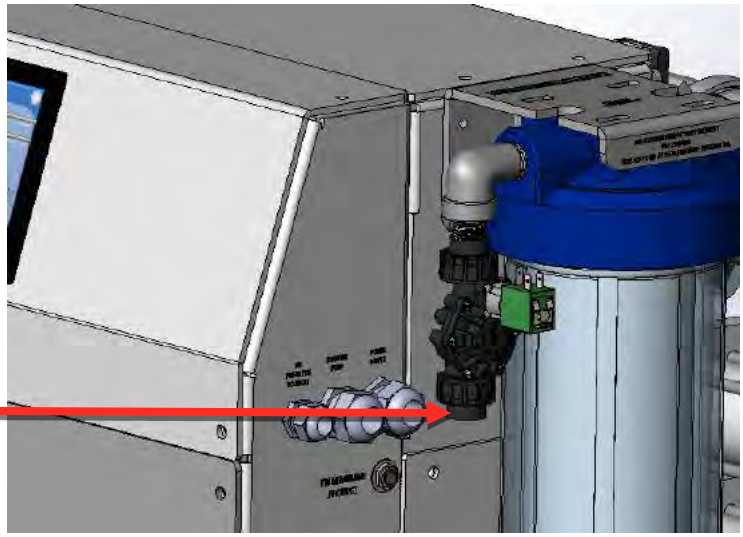
3/4" Hose to dedicated overboard.

Dock Water Plumbing Connection

1. Install a dedicated connection on exterior of vessel to connect dock water supply.

2. Run hose or tubing with a minimum inside diameter of 5/8” (0.625 inches/15mm) from dedicated dockside connection to **Spot Zero Pre-Filtration Cartridge** assembly located on right side of system. Filter assembly may be remote mounted if desired. Be sure that there are no kinks in hose run and avoid 90’s where possible to prevent restricted flow.

.625” minimum I.D. hose or tubing from dockside feed.



Product to Tank Connection

1. Locate the fitting labeled **Product to Tank** on left side of system. Connect supplied white 3/8” tubing from system to the inlet of supplied filter assembly labeled **Bacteriostatic Re-Mineralizer**

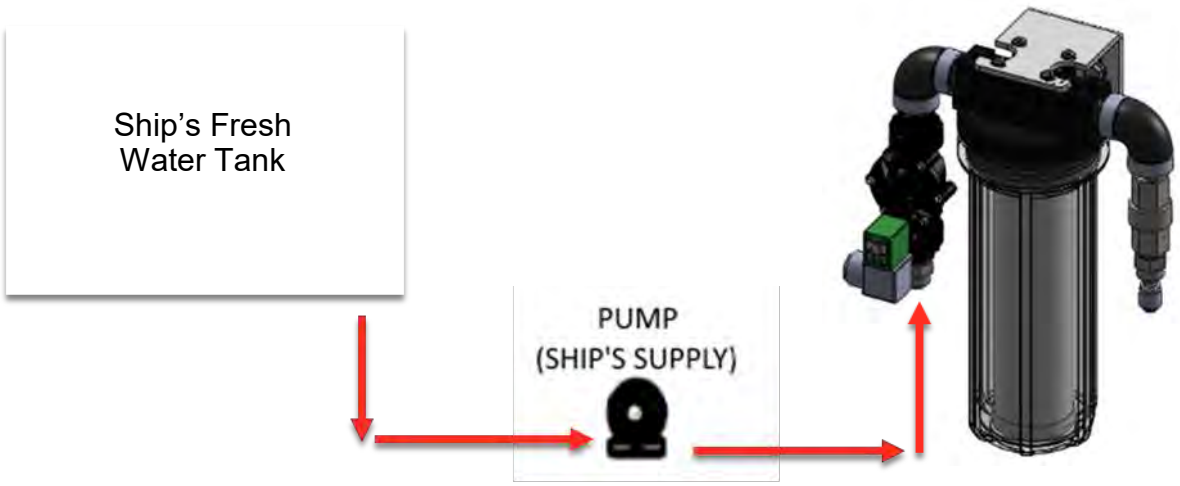
2. Run supplied white 3/8” tubing from filter assembly labeled **Bacteriostatic Re-Mineralizer** outlet to a dedicated fitting on or near the top of the ships fresh water tank. Be sure that there are no kinks in hose run and avoid 90’s where possible to prevent restricted flow.

Warning - Ships fresh water tank must be vented properly to avoid back pressure on system. Failure to do so may cause permanent damage to system and/or to not function properly.

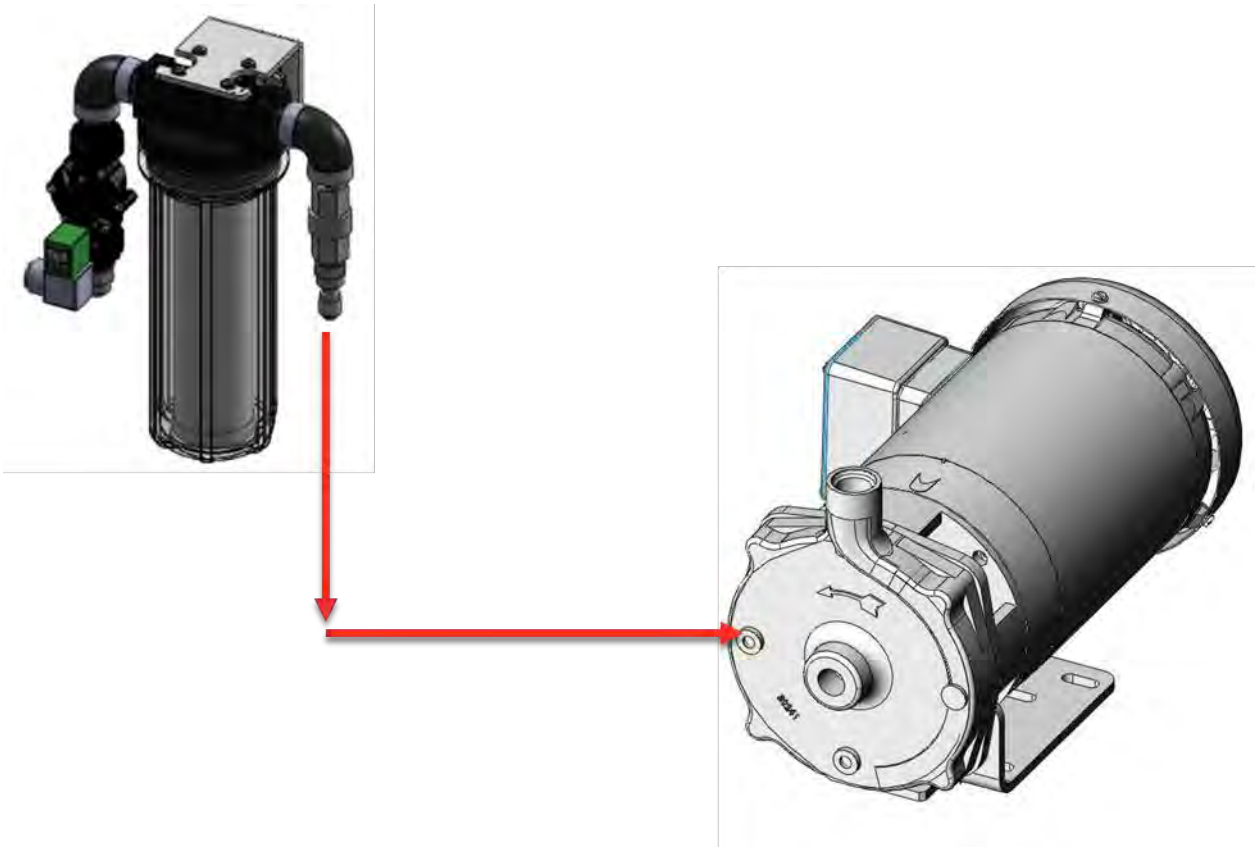
Warning - Product to tank must never be closed or obstructed while system is operational. Closing or obstructing the product flow on system may cause permanent damage to system and/or to not function properly.

Fresh Water Flush Connection

1. Locate filter assembly labeled **Fresh Water Flush** and connect the inlet of fresh water flush solenoid to the ships pressurized fresh water system.
   Note - a shut off valve is recommended to be installed on supply line to fresh flush assembly for service.



2. Run supplied white 3/8" tubing from outlet filter assembly labeled **Fresh Water Flush** and connect to 3/8" tubing fitting on face of booster pump.



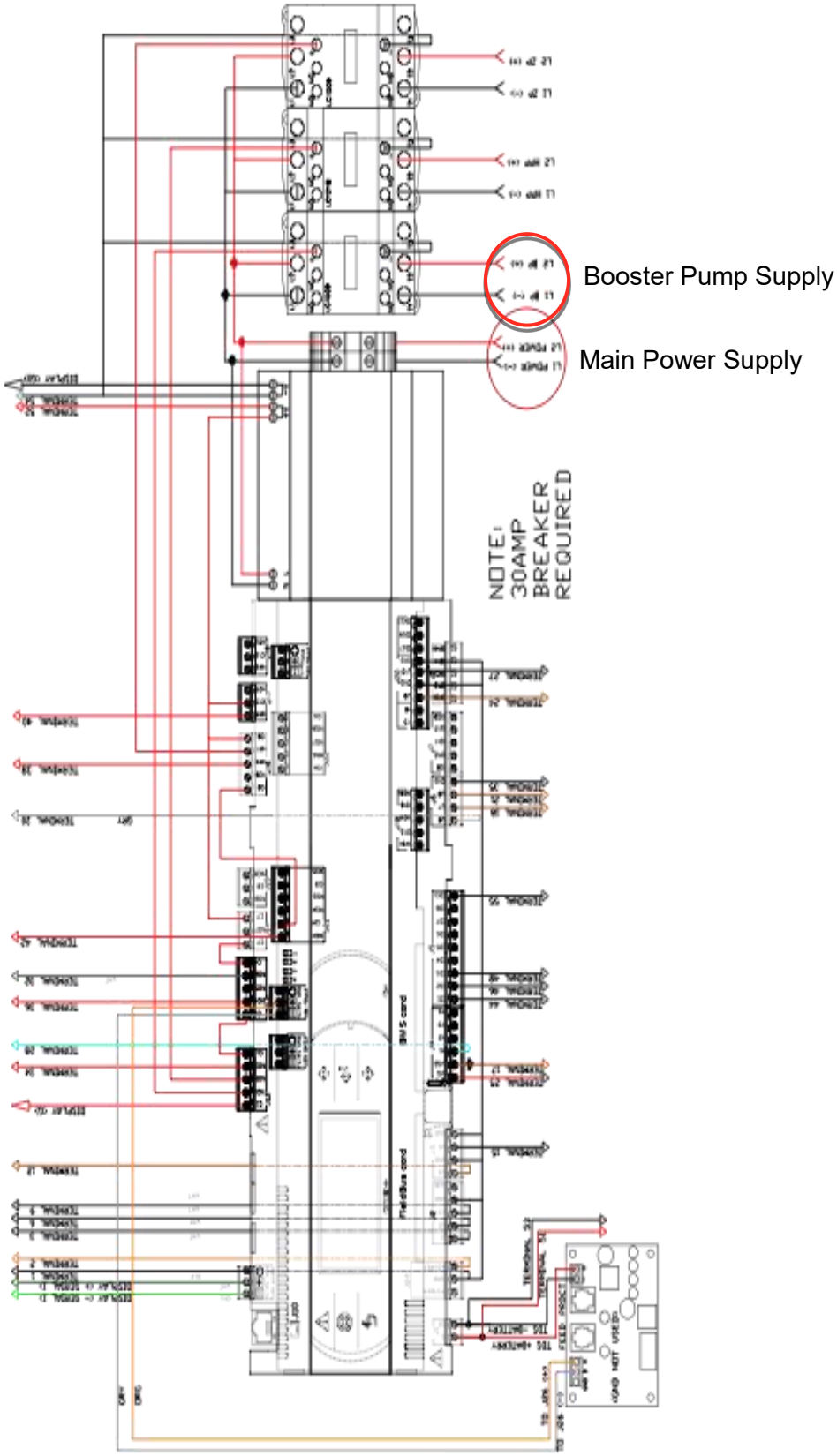
Electrical Connections

1. Connect main power supply to main power terminal blocks, connect power to booster pump from contactor as shown below. Ground main power supply and booster pump to grounding bus bar. 30 amp breaker required. Reference DWG SX

- The XZ-Series systems pump and motor are available in 230 Volt, 50/60 Hertz, 1 Phase

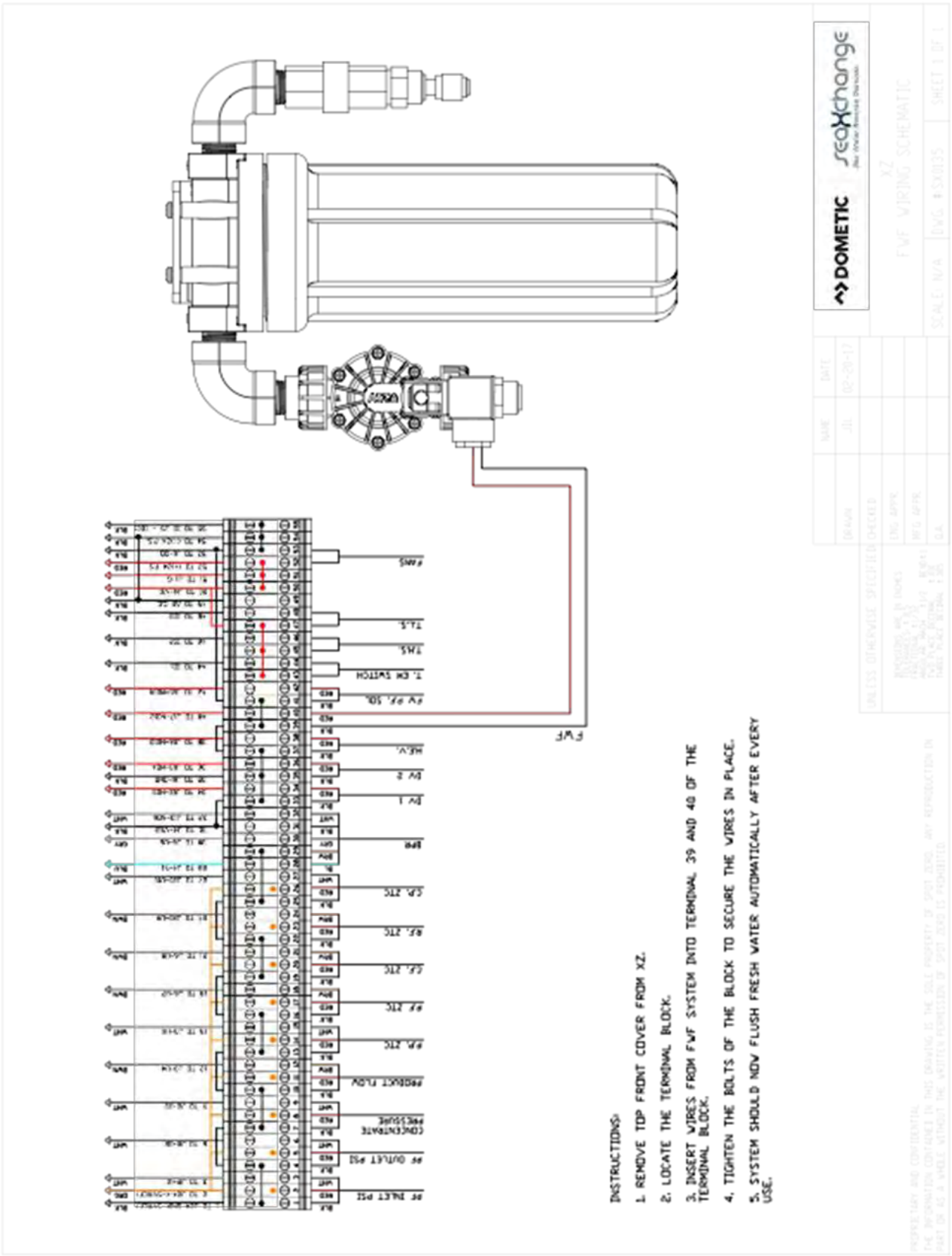
- Ensure that the electrical circuit supplying the system is compatible with the requirements of the specific XTC model you are installing.

NOTE: IT'S RECOMMENDED THAT A QUALIFIED ELECTRICIAN WIRE YOUR SYSTEM IN ACCORDANCE WITH ABYC REQUIREMENTS.



WARNING: TO REDUCE THE RISK OF ELECTRICAL SHOCK, THE INCOMING POWER SUPPLY MUST INCLUDE A PROTECTIVE GROUND.

2. Connect fresh water flush power leads as shown below



PUMP MAINTENANCE

The pump used on the XZ-Series systems is a piston style stainless steel type.

Follow these guidelines to ensure proper operation of the pump:

1. IMPORTANT! Change oil after initial 50 hours of operation and every 500 Hours thereafter.
2. The pump must **NEVER** be run dry. Operating the pump without sufficient feed water will damage the pump.

ALWAYS feed the pump with filtered water. The pump is susceptible to damage from sediment and debris.

If any damage occurs to your system's pump, a re-build kit is available. Contact your local dealer or distributor and inform them of your system's model and pump size.

Please refer to the appendix section for CAT PUMPS service manual.

MEMBRANE CARE

- Maximum Operating Temperature 113°F (45°C)
- Maximum Operating Pressure 850 psi (58 bar)
- Maximum Pressure Drop 15 psig (1.0 bar)
- pH Range, Continuous Operation [a] 7-9
- pH Range, Short-Term Cleaning [b] \1 - 13
- Maximum Feed Silt Density Index SDI 5
- Free Chlorine Tolerance [c] <0.0 ppm

a. Maximum temperature for continuous operation above pH 10 is 95°F (35°C).

Operating Limits

b. Under certain conditions, the presence of free chlorine and other oxidizing agents will cause premature membrane failure.

c. Since oxidation damage is not covered under warranty, FilmTec recommends removing residual free chlorine by pretreatment prior to membrane exposure. Please refer to technical bulletin 609-22010 for more information.

Proper start-up of reverse osmosis water treatment systems is essential to prepare the membranes for operating service and to prevent membrane damage due to overfeeding or hydraulic shock. Following the proper start-up sequence also helps ensure that system operating parameters conform to design specifications so that system water quality and productivity goals can be achieved.

Membrane Operation Guidelines

Avoid any abrupt pressure or cross-flow variations on the spiral elements during start-up, shut-down, cleaning or other sequences to prevent possible membrane damage. During start-up, a gradual change from a standstill to operating state is recommended as follows:

- Feed pressure should be increased gradually over a 30-60 second time frame.
- Cross-flow velocity at set operating point should be achieved gradually over 15-20 seconds.
- Permeate obtained from first hour of operation should be discarded.

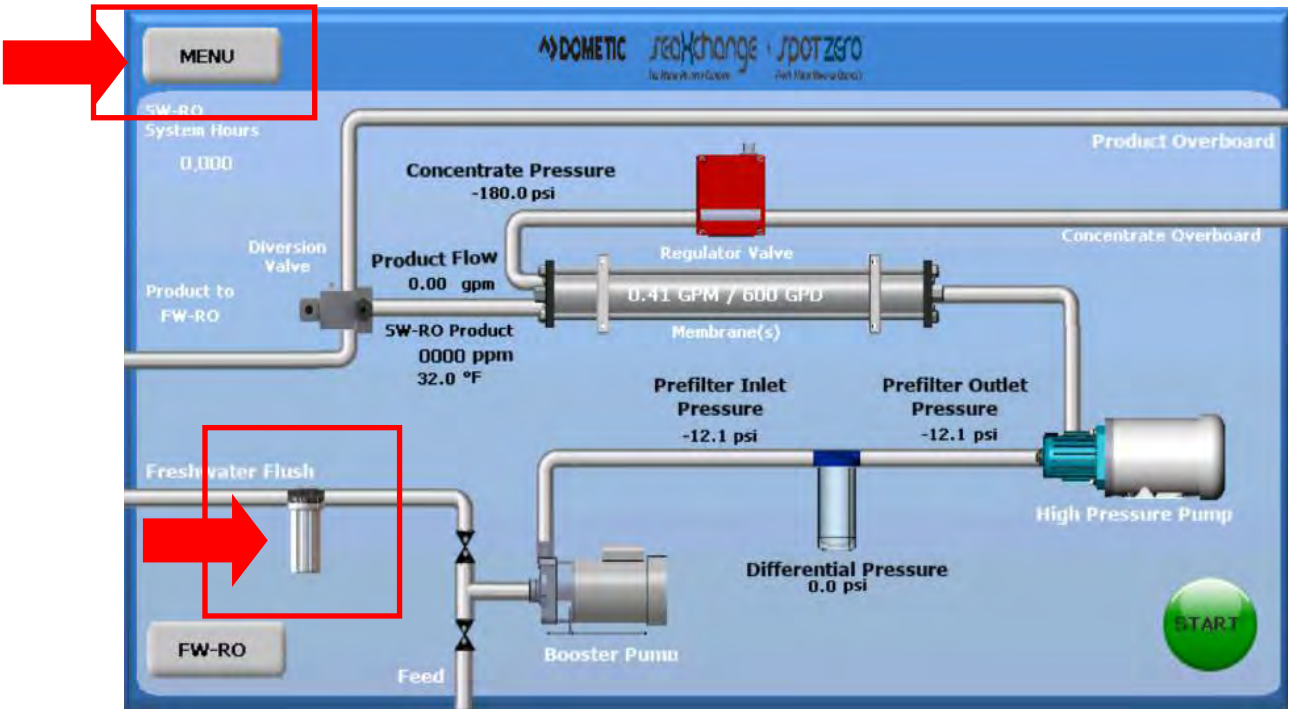
Membrane General Information

- Keep elements moist at all times after initial wetting.
- If operating limits and guidelines given in this bulletin are not strictly followed, the limited warranty will be null and void.
- To prevent biological growth during prolonged system shutdowns, it is recommended that membrane elements be immersed in a preservative solution.
- The customer is fully responsible for the effects of incompatible chemicals and lubricants on elements.
- Maximum pressure drop across an entire pressure vessel (housing) is 50 psi (3.4 bar).
- Avoid static permeate-side backpressure at all times.

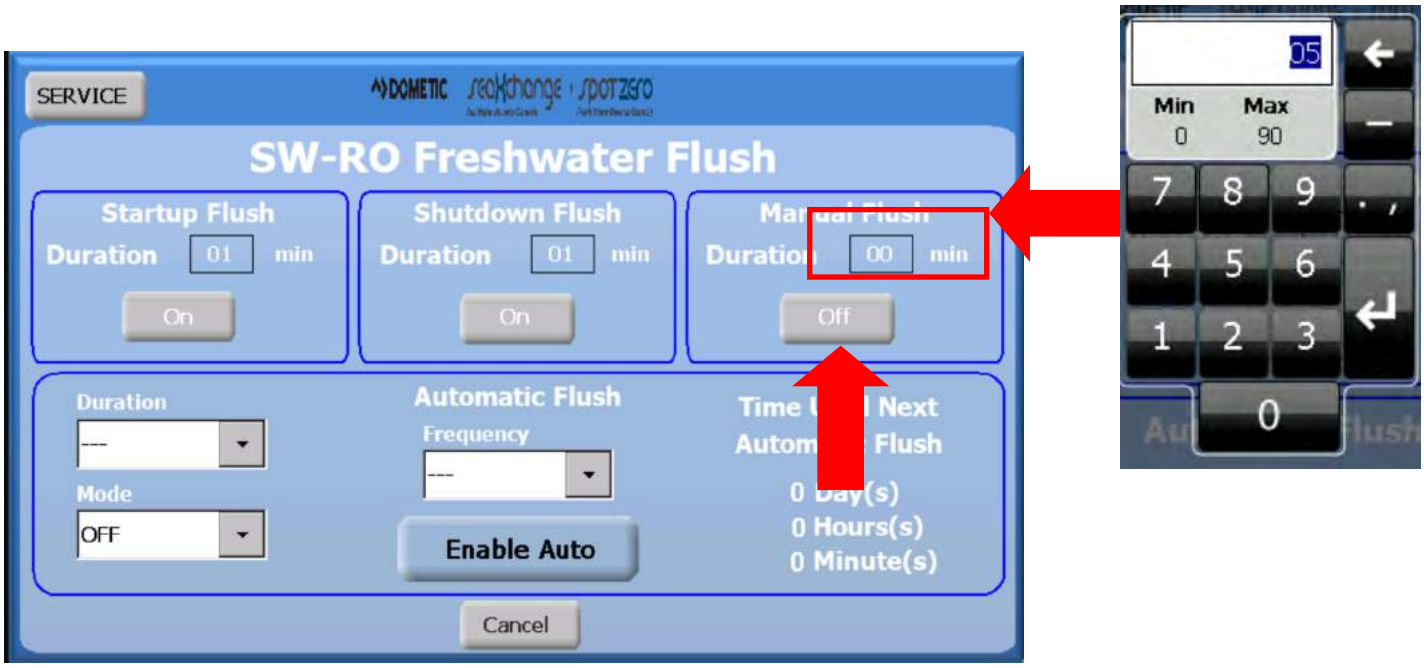
INITIAL START- UP

Carefully inspect your system before initial start-up. Check that all plumbing and electrical connections are not loose or have not come undone during shipment. A User's Manual, Test Results, and Filter Housing Wrench will accompany your XZ-Series Reverse Osmosis System.

1. Maintain the permeate water line (Product to Tank) to drain for this procedure.
2. Perform a MANUAL FRESH WATER FLUSH as indicated below in order to purge all air out of the system.
3. Press the Fresh Water Flush image or select Fresh Water Flush from the service menu.
4. MENU—>SERVICE MENU—>FRESHWATER FLUSH

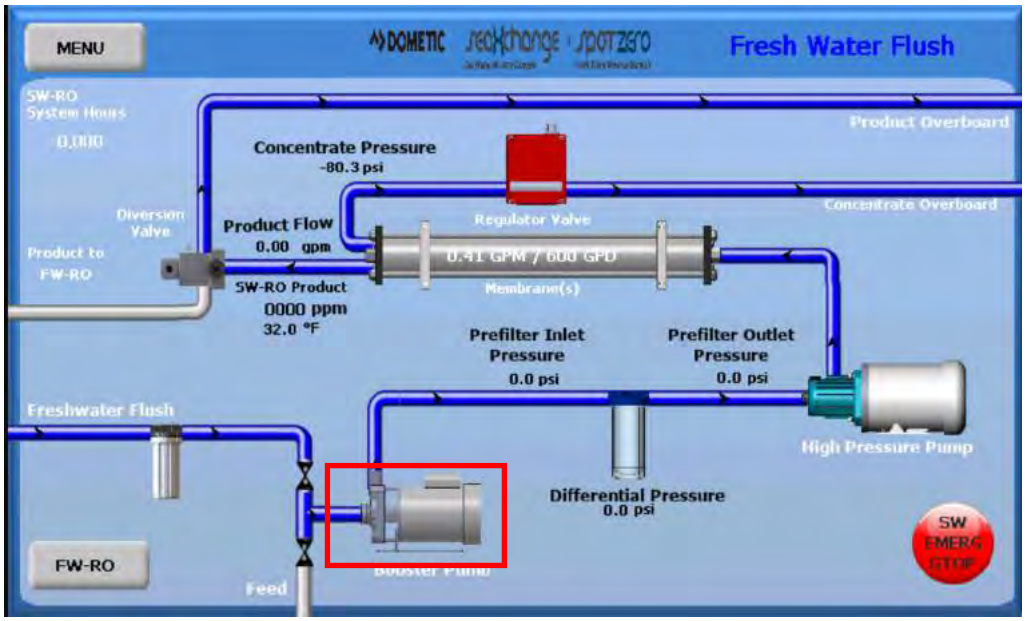


4. Press the timer on the Manual Flush menu to enter 30 minutes.

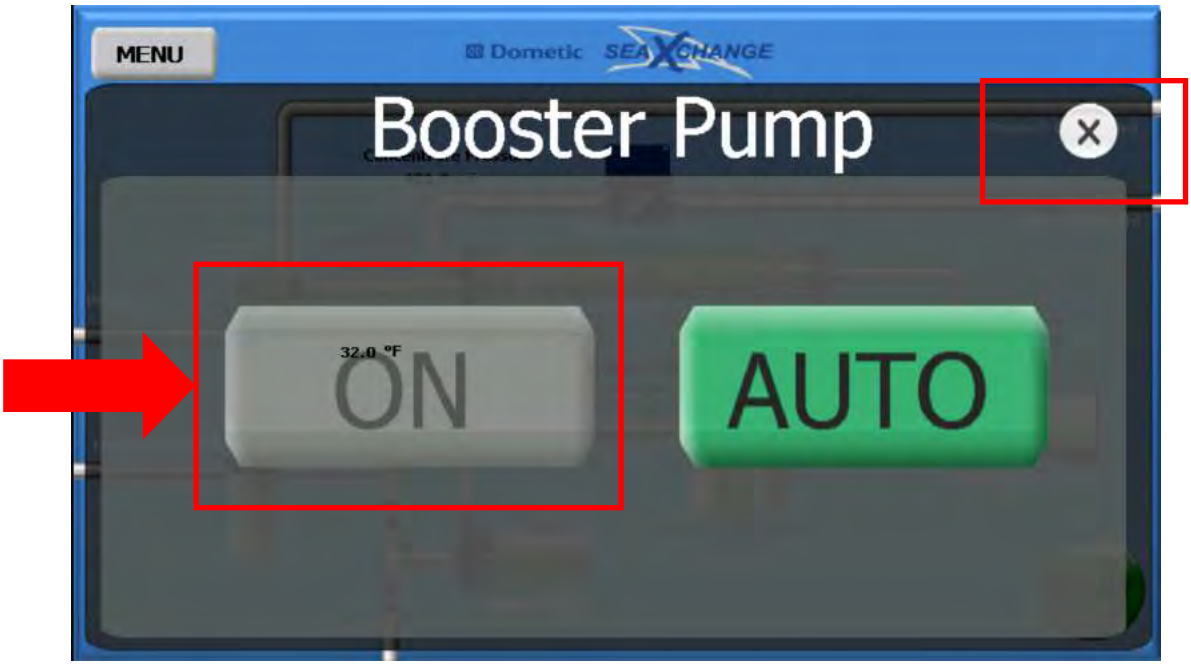


5. Press the OFF button the initiate the FWF operation.

6. Press the Booster Pump image.



7. Press the “ON” button, then press the “X” button to exit the menu. When the Booster Pump is running wavy line should appear to the right of the Booster Pump image indicating that the motor is on.



8. Let the Booster pump run for 30 minutes to flush out all membrane preservative.

9. Check system for any leaks.

10. Return Booster Pump to AUTO mode and return FWF to AUTO mode

11. Re-direct the product water back to the tank or point-of-use.

12. Proceed to STANDARD OPERATION on the next section.

STANDARD OPERATION

1. Simply press the Start button and the system will automatically adjust to produce water.

2. You can set the system to automatically shut down as instructed on pages 35-38 or simply press the STOP button to stop the system.

OPTION 1

OPTION 2

3. The Fresh Water RO side is automatic and will start producing water without any user interference .

SEA XCHANGE COMMISSIONING REPORT FORM

System Information:

Model number - _____ Serial number - _____

Date of Commission - _____ Commissioned by- _____

Installed by - _____ Vessel hull number- _____

First step to commissioning a new system is to look over the install to be sure everything is installed correct. This check-list must be gone through prior to powering up the system.

___ Have all plumbing connections have been made, and secured?

___ Have all plumbing lines been run to the correct locations?

___ Is the boost pump installed below the water line?

___ Has wire reinforce hose been used on the suction side of the boost pump?

___ Is raw water intake open?

___ Is the overboard open and free of obstructions?

___ Is the system _____voltage, _____hertz, and _____phase correct?

___ Is the circuit breaker sized properly with sufficient wire gauge?

___ Is the power cable connected to the power inlet terminals of the system?

Now power up the system,

___ Are all displays on and functional?

At this time follow the start-up procedure in the manual and operate the system for an hour at its rated capacity, then record the following data.

System operating readings

Pre-filter inlet _____ psi Pre-filter outlet _____ psi

Concentrate pressure _____ psi Concentrate flow _____ gpm

Product flow _____ gpm Product TDS _____ ppm

Feed water TDS _____ ppm Feed water temperature _____ F or C

Hours on system _____ hrs Amp draw _____ Voltage _____

Location system was tested_____

Problems or other notes:

OPERATING DO's & DON'Ts

DO:

1. Change the cartridge filters regularly
2. Monitor the system and keep a daily log
3. Adjust the system product to the recommended value
4. Always feed the pump with filtered water

DON'T:

1. Permit chlorine to be present in the feed water
2. Shut down the system for extended periods without preservation
3. Close the control valves completely
4. Operate the system with insufficient feed flow
5. Operate the pump dry
6. Do not tee together the product reject with the brine discharge unless directly at the overboard

OPERATION & M A I N TEN A N CE

The reverse osmosis process causes the concentration of impurities. The impurities may precipitate (fallout of solution) when their concentration reaches saturation levels.

NOTE: PRECIPITATION CAN SCALE OR FOUL MEMBRANES AND MUST BE PREVENTED.

DO NOT OPERATE SYSTEM BEYOND RATED PRODUCTION!

SEA WATER MEMBRANE REMOVAL & REPLACEMENT

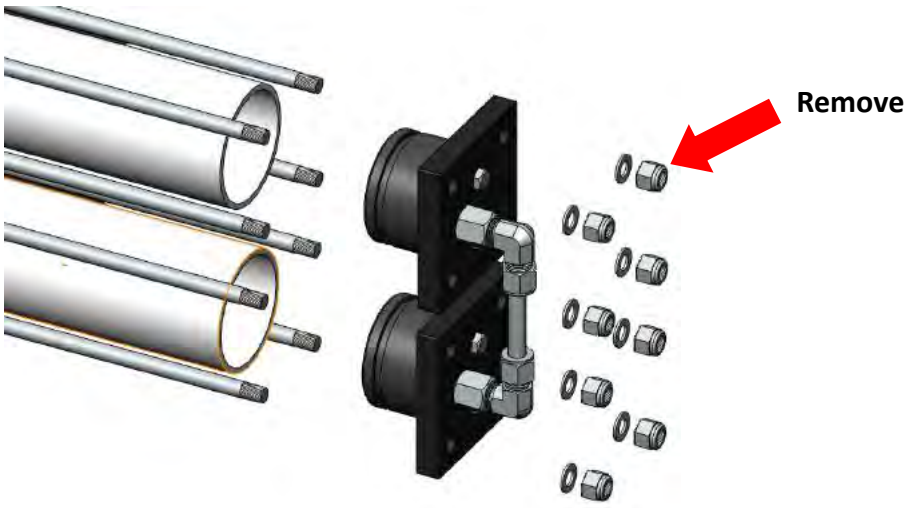
Replacing membranes in the pressure vessels is an easy process if you have the proper information and tools at hand. Please refer to the following instructions when removing and replacing membrane elements:

WARNING: ALL PRESSURE GAUGES MUST READ ZERO BEFORE PROCEEDING.

BEFORE ATTEMPTING, DISCONNECT THE POWER FROM THE SYSTEM AND BLEED ALL WATER

PRESSURE FROM THE SYSTEM.

1. Remove the end plugs from the side of the pressure vessels. This is done by removing the four 3/8” nuts and washers. The end plugs should then freely slide out of the pressure vessel.

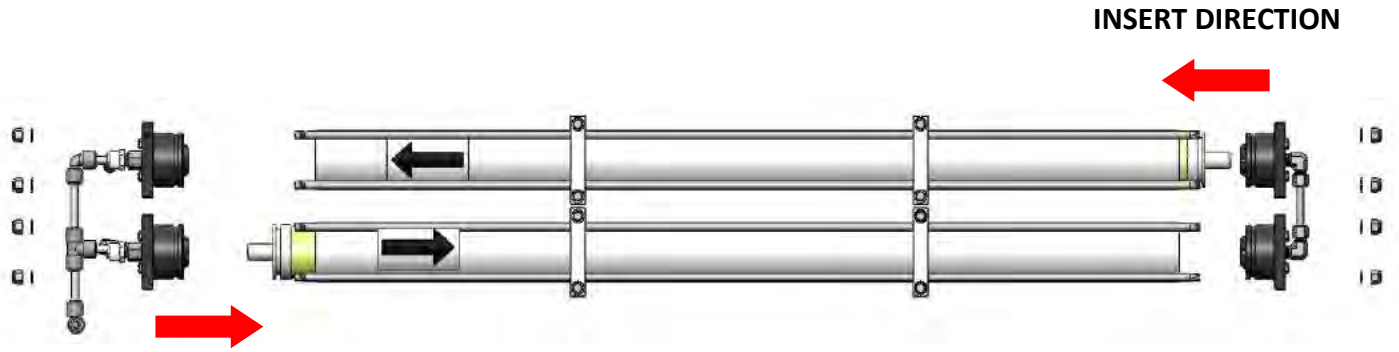


2. Remove the replacement membrane element(s) from the shipping box; the membrane(s) should be contained within a plastic oxygen barrier bag.

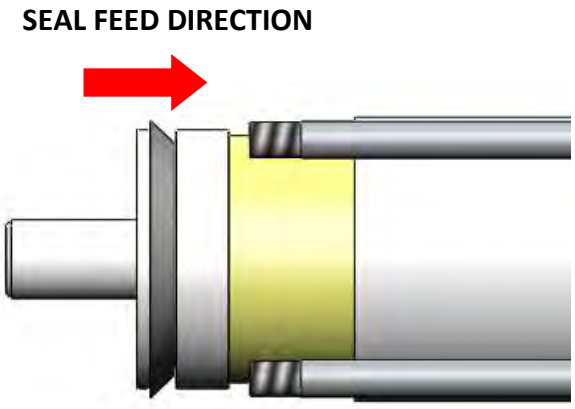
NOTE: WEAR GLOVES FOR THE FOLLOWING STEPS IN ORDER NOT TO CONTAMINATE THE MEMBRANE.

3. Cut the bag open as close as possible to the seal at one end of the bag, so the bag may be re-used if necessary.
4. Make sure that all parts are clean and free from dirt. Examine the brine seal, and permeate tube for nicks or cuts. Replace the O-rings or brine seal if damaged.

5. Flow directions should be observed for installation of each element into their respective pressure vessels.



6. Remove one membrane element at a time from the pressure vessels, from the side of each housing. Long nose pliers may be necessary to pull the old membrane element out of the membrane element housing.
6. Lubricate the brine seal with a non-petroleum based lubricant, such as Dow Corning® 111.
7. Install membranes with brine seal location depicted.



8. With a smooth and constant motion, push the membrane element into the housing so the brine seal enters the housing without coming out of the brine seal groove.

WARNING: THE BRINE SEAL MUST BE IN THE SAME POSITION FOR EACH MEMBRANE ELEMENT HOUSING. THE BRINE SEAL IS A RUBBER SEAL THAT PROTRUDES ON ONE SIDE OF THE MEMBRANE AND IS ALWAYS ON THE FEED SIDE OF THE MEMBRANE

9. Re-install the end plugs by gently twisting the end cap while pushing it onto the housing.

10. Ensure that you do not pinch or fatigue any O-rings while re-installing the end plug. Push the end

    plug on until the plug is flush with the pressure vessel.

11. Insert the four rods through the plate and fasten using a 3/8 wrench and a flat screw driver.

12. Reconnect any fittings that may have been disconnected when the membrane pressure ves-sels were disassembled.

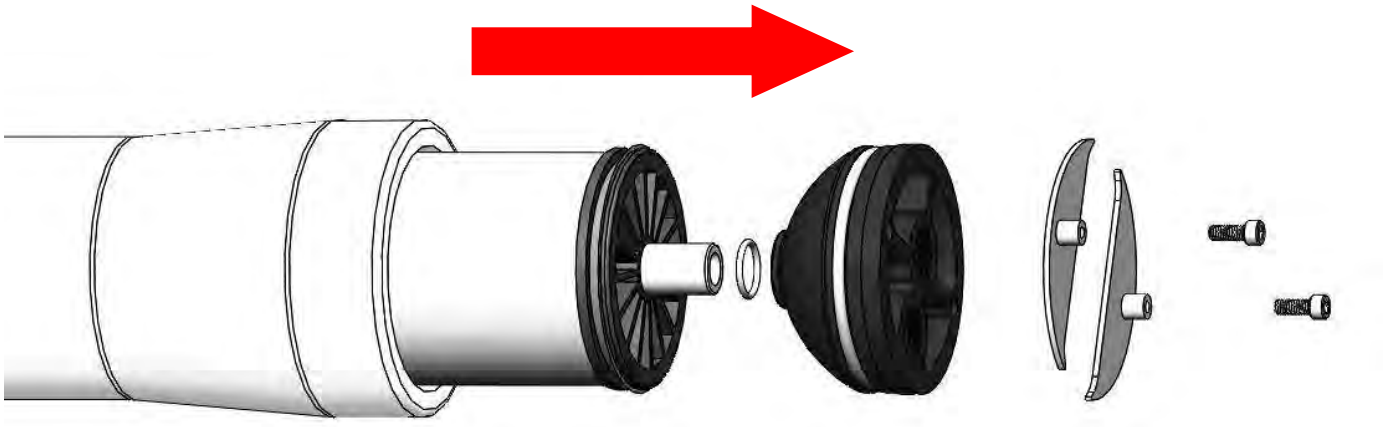
13. To Start-Up the system, please refer to the Initial Start-Up section of this manual. (See page 25).

CAUTION: WET MEMBRANES ARE SHIPPED IN A PRESERVATIVE SOLUTION. THE MEMBRANES MUST BE FLUSHED FOR AT LEAST 30 MINUTES TO RE-MOVE THE PRESERVATIVE FROM THE MEMBRANE. DISCARD ALL OF THE PERMEATE AND CONCENTRATE, WHICH IS PRODUCED DUR ING THE FLUSH PERIOD.

Fresh Water Membrane Change

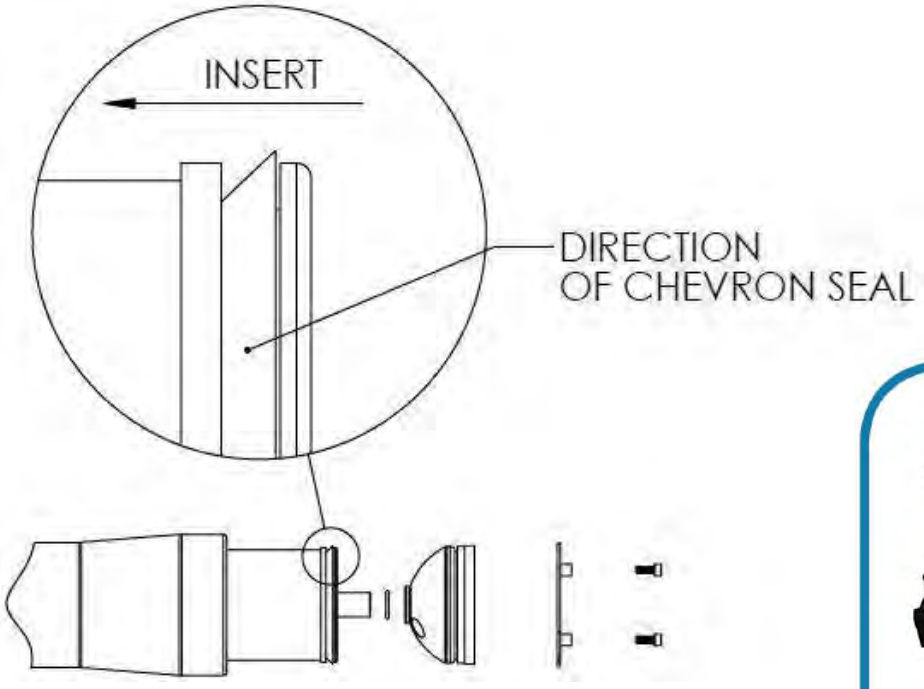
NOTE: The system must be off.

1. Locate the inlet end of the pressure vessel, that is opposite to the flow direction.
2. Remove the screw from the yellow snap ring lock at the end of the pressure vessel
3. Remove the white Nylon snap ring from the end cap.
4. Remove the end cap from the pressure vessel.



5. Slowly remove the membrane element from the pressure vessel being careful not to grasp it by the permeate tube. Needle nose pliers may be necessary to pull the old membrane element out of the pressure vessel.

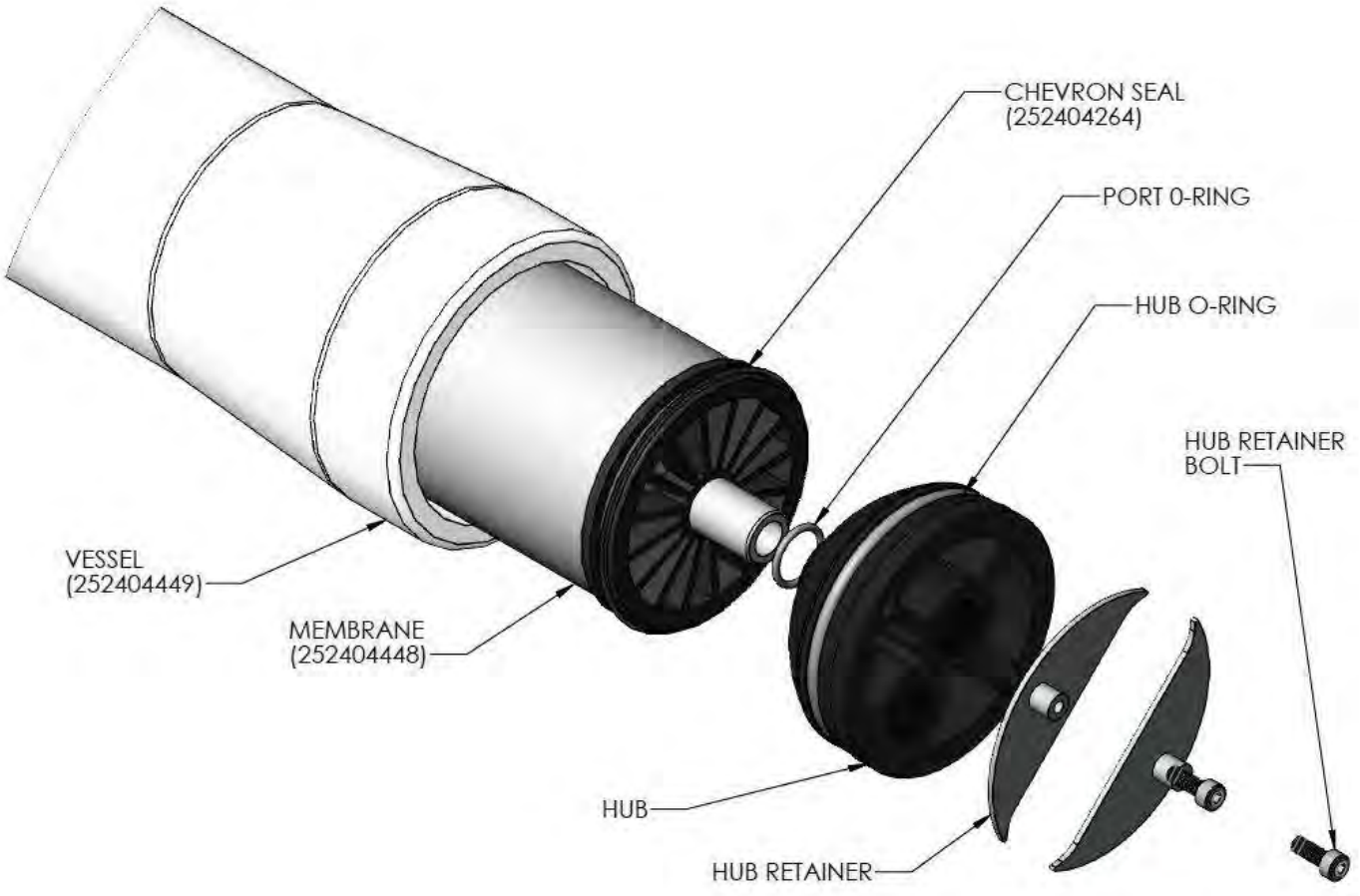
6. Remove new membrane element from container and inspect. Make sure that all parts are clean and free from dirt. Examine the brine seal, and permeate tube for nicks or cuts. Replace the O-rings or brine seal if damaged.
7. Lubricate the brine seal with a food grade lubricant
8. Install the membrane element so the brine seal will be located and the opposite end of the flow direction.
9. At a slight angle insert membrane while slightly rotating element being careful not to tear or flip the brine seal. Re-lube the brine seal if necessary.



10. With a smooth and constant motion, push the membrane element into the housing so that the brine seal enters the housing without coming out of the brine seal groove. A slow twisting motion should be used to insert the membrane element, to ensure that the brine seal stays in place.
11. Re-install the end caps by gently twisting the end cap while pushing it onto the housing. Ensure that you do not pinch or fatigue any O-rings while pushing the end plug on. Push the end plug on until the outer diameter of the plug is flush with the outer diameter of the membrane housing. (A rubber mallet may be necessary).
12. Re-install the white nylon snap ring and the yellow snap ring lock
13. These directions should be observed for installation of each element in each housing

NOTE: As time progresses, the efficiency of the membrane will be reduced. The permeate flow rate will begin to decline slightly after one year of operation, but can be extended with diligent flushing and cleaning of the system. A high pH and/or precipitation of hardness can cause premature loss in rejection of membrane elements in the system.

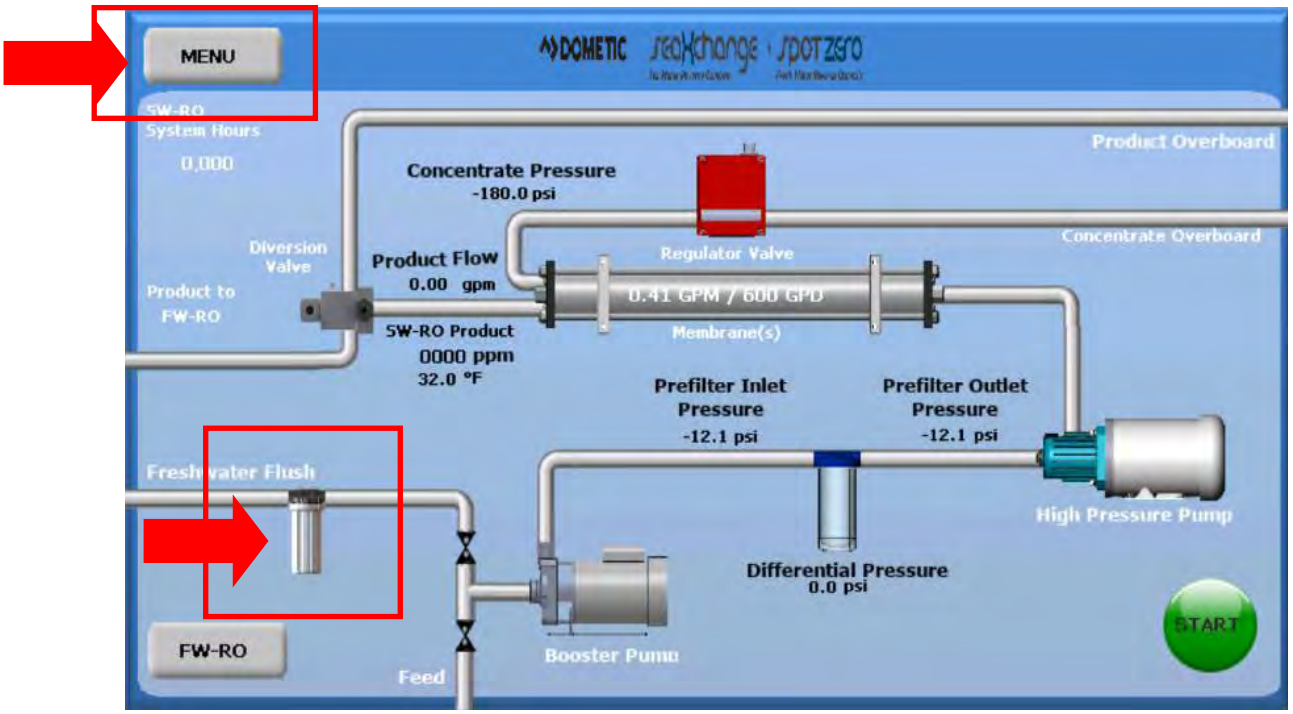
NOTE: To get best results from the system change membranes every 1,000 hours.



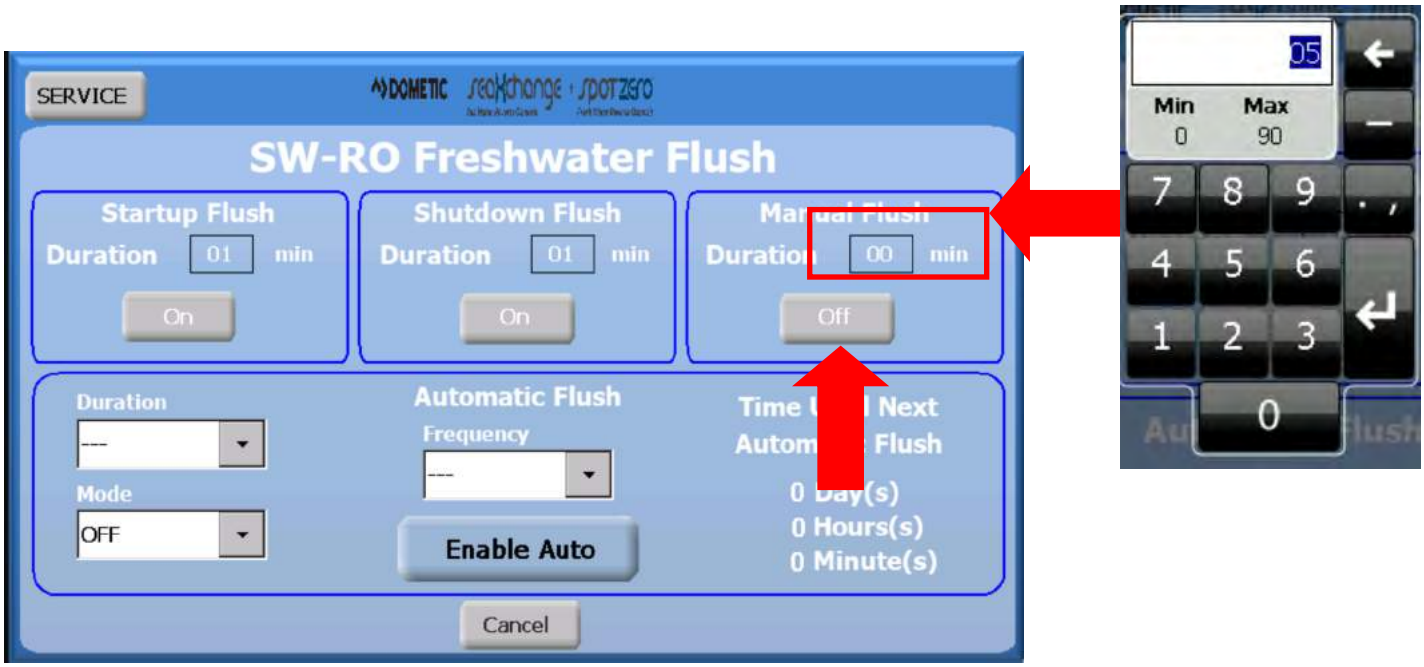
MANUALY FLUSHING THE SYSTEM

To manually flush the system, follow the preceding steps:

1. Press the Fresh Water Flush image or select Fresh Water Flush from the service menu.
2. MENU—>SERVICE MENU—>FRESHWATER FLUSH

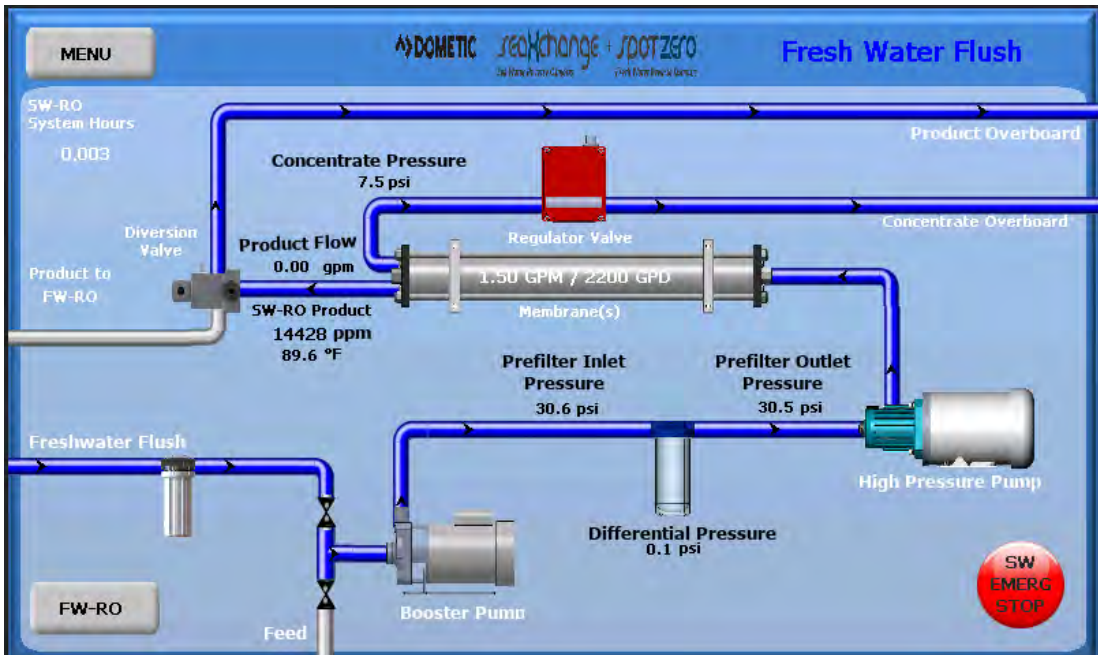


3. Press the timer on the Manual Flush menu to enter 30 minutes.



4. Press the OFF button the initiate the FWF operation.

5. Allow the system to run .



6. Press the EMERG STOP button to stop the manual FWF if you decide to terminate the operation before the timer goes off.

PREPARING UNIT FOR STORAGE OR SHIPMENT

PRIOR TO SHIPPING OR STORING YOUR SYSTEM, THE SYSTEM SHOULD BE CLEANED WITH AN APPROPRIATE CLEANER, FLUSHED WITH WATER, AND PROTECTED FROM BIOLOGICAL ATTACK WITH AN APPROPRIATE SOLUTION FOR MEMBRANE ELEMENTS. THE MEMBRANE HOUSING(S) AND PLUMBING LINES OF THE SYSTEM MUST BE COMPLETELY DRAINED. ANY WATER REMAINING IN THE PLUMBING OF A SYSTEM MAY FREEZE, CAUSING SERIOUS DAMAGE.

1. Totally immerse the elements in the membrane housing in a solution of 2 % Memstor, venting the air outside of the pressure vessels. Use the overflow technique: circulate the Mestor solution in such a way that the remaining air in the system is minimized after the recirculation is completed. After the pressure vessel is filled, the Memstor solution should be allowed to overflow through an opening located higher than the upper end of the highest pressure vessel being filled.

2. Separate the preservation solution from the air outside by closing all valves.

3. Repeat this process at least once a month.

During the shutdown period, the plant must be kept frost-free, or the temperature must not exceed 113°F (45°C).

ABNORMAL PERMEATE FLOW

As time progresses, the efficiency of the membrane will be reduced. In general, the salt rejection does not

change significantly until two or three years after installation when operated on properly pretreated feed

water. The permeate flow rate will begin to decline slightly after one year of operation, but can be

extended with diligent flushing and cleaning of the system. A high pH and/or precipitation of hard-ness

can cause premature loss in rejection.

Permeate flow should be within 20% of the rated production, after correcting the feed water temper-atures

above or below 77°F. Check your permeate flow meter to determine the permeate flow rate.

NOTE: TO DETERMINE THE TEMPERATURE CORRECTION FACTOR, LOCATE THE TEMPERATURE CORRECTION TABLE IN THIS USER'S MANUAL AND FOLLOW THE DIREC-

TEMPERATURE CORRECTION FACTORS FOR MEMBRANE

Find the temperature correction factor (TCF) from the table below. Divide the rated permeate flow at 77°Fby the temperature correction factor. The result is the permeate flow at the desired temperature. (Seeexample on the next page)

°F = (°C x 9/5)+ 32 Corrected Flow Rate = (Measured Flow Rate)*(TCF @ Feed

Temperature °F (°C)	Temperature Correction Factor	Temperature °F (°C)	Temperature Correction Factor	Temperature °F (°C)	Temperature Correction Factor	Temperature °F (°C)	Temperature Correction Factor	Temperature °F (°C)	Temperature Correction Factor
50.0 (10.0)	1.711	57.2 (14.0)	1.475	64.4 (18.0)	1.276	71.6 (22.0)	1.109	78.8 (26.0)	0.971
50.2 (10.1)	1.705	57.4 (14.1)	1.469	64.6 (18.1)	1.272	71.8 (22.1)	1.105	79.0 (26.1)	0.968
50.4 (10.2)	1.698	57.6 (14.2)	1.464	64.8 (18.2)	1.267	72.0 (22.2)	1.101	79.2 (26.2)	0.965
50.5 (10.3)	1.692	57.7 (14.3)	1.459	64.9 (18.3)	1.262	72.1 (22.3)	1.097	79.3 (26.3)	0.962
50.7 (10.4)	1.686	57.9 (14.4)	1.453	65.1 (18.4)	1.258	72.3 (22.4)	1.093	79.5 (26.4)	0.959
50.9 (10.5)	1.679	58.1 (14.5)	1.448	65.3 (18.5)	1.254	72.5 (22.5)	1.090	79.7 (26.5)	0.957
51.1 (10.6)	1.673	58.3 (14.6)	1.443	65.5 (18.6)	1.249	72.7 (22.6)	1.086	79.9 (26.6)	0.954
51.3 (10.7)	1.667	58.5 (14.7)	1.437	65.7 (18.7)	1.245	72.9 (22.7)	1.082	80.1 (26.7)	0.951
51.4 (10.8)	1.660	58.6 (14.8)	1.432	65.8 (18.8)	1.240	73.0 (22.8)	1.078	80.2 (26.8)	0.948
51.6 (10.9)	1.654	58.8 (14.9)	1.427	66.0 (18.9)	1.236	73.2 (22.9)	1.075	80.4 (26.9)	0.945
51.8 (11.0)	1.648	59.0 (15.0)	1.422	66.2 (19.0)	1.232	73.4 (23.0)	1.071	80.6 (27.0)	0.943
52.0 (11.1)	1.642	59.2 (15.1)	1.417	66.4 (19.1)	1.227	73.6 (23.1)	1.067	80.8 (27.1)	0.940
52.2 (11.2)	1.636	59.4 (15.2)	1.411	66.6 (19.2)	1.223	73.8 (23.2)	1.064	81.0 (27.2)	0.937
52.3 (11.3)	1.630	59.5 (15.3)	1.406	66.7 (19.3)	1.219	73.9 (23.3)	1.060	81.1 (27.3)	0.934
52.5 (11.4)	1.624	59.7 (15.4)	1.401	66.9 (19.4)	1.214	74.1 (23.4)	1.056	81.3 (27.4)	0.932
52.7 (11.5)	1.618	59.9 (15.5)	1.396	67.1 (19.5)	1.210	74.3 (23.5)	1.053	81.5 (27.5)	0.929
52.9 (11.6)	1.611	60.1 (15.6)	1.391	67.3 (19.6)	1.206	74.5 (23.6)	1.049	81.7 (27.6)	0.926
53.1 (11.7)	1.605	60.3 (15.7)	1.386	67.5 (19.7)	1.201	74.7 (23.7)	1.045	81.9 (27.7)	0.924
53.2 (11.8)	1.600	60.4 (15.8)	1.381	67.6 (19.8)	1.197	74.8 (23.8)	1.042	82.0 (27.8)	0.921
53.4 (11.9)	1.594	60.6 (15.9)	1.376	67.8 (19.9)	1.193	75.0 (23.9)	1.038	82.2 (27.9)	0.918
53.6 (12.0)	1.588	60.8 (16.0)	1.371	68.0 (20.0)	1.189	75.2 (24.0)	1.035	82.4 (28.0)	0.915
53.8 (12.1)	1.582	61.0 (16.1)	1.366	68.2 (20.1)	1.185	75.4 (24.1)	1.031	82.6 (28.1)	0.913
54.0 (12.2)	1.576	61.2 (16.2)	1.361	68.4 (20.2)	1.180	75.6 (24.2)	1.028	82.8 (28.2)	0.910
54.1 (12.3)	1.570	61.3 (16.3)	1.356	68.5 (20.3)	1.176	75.7 (24.3)	1.024	82.9 (28.3)	0.908
54.3 (12.4)	1.564	61.5 (16.4)	1.351	68.7 (20.4)	1.172	75.9 (24.4)	1.021	83.1 (28.4)	0.905
54.5 (12.5)	1.558	61.7 (16.5)	1.347	68.9 (20.5)	1.168	76.1 (24.5)	1.017	83.3 (28.5)	0.902
54.7 (12.6)	1.553	61.9 (16.6)	1.342	69.1 (20.6)	1.164	76.3 (24.6)	1.014	83.5 (28.6)	0.900
54.9 (12.7)	1.547	62.1 (16.7)	1.337	69.3 (20.7)	1.160	76.5 (24.7)	1.010	83.7 (28.7)	0.897
55.0 (12.8)	1.541	62.2 (16.8)	1.332	69.4 (20.8)	1.156	76.6 (24.8)	1.007	83.8 (28.8)	0.894
55.2 (12.9)	1.536	62.4 (16.9)	1.327	69.6 (20.9)	1.152	76.8 (24.9)	1.003	84.0 (28.9)	0.892
55.4 (13.0)	1.530	62.6 (17.0)	1.323	69.8 (21.0)	1.148	77.0 (25.0)	1.000	84.2 (29.0)	0.889
55.6 (13.1)	1.524	62.8 (17.1)	1.318	70.0 (21.1)	1.144	77.2 (25.1)	0.997	84.4 (29.1)	0.887
55.8 (13.2)	1.519	63.0 (17.2)	1.313	70.2 (21.2)	1.140	77.4 (25.2)	0.994	84.6 (29.2)	0.884
55.9 (13.3)	1.513	63.1 (17.3)	1.308	70.3 (21.3)	1.136	77.5 (25.3)	0.991	84.7 (29.3)	0.882
56.1 (13.4)	1.508	63.3 (17.4)	1.304	70.5 (21.4)	1.132	77.7 (25.4)	0.988	84.9 (29.4)	0.879
56.3 (13.5)	1.502	63.5 (17.5)	1.299	70.7 (21.5)	1.128	77.9 (25.5)	0.985	85.1 (29.5)	0.877
56.5 (13.6)	1.496	63.7 (17.6)	1.294	70.9 (21.6)	1.124	78.1 (25.6)	0.982	85.3 (29.6)	0.874
56.7 (13.7)	1.491	63.9 (17.7)	1.290	71.1 (21.7)	1.120	78.3 (25.7)	0.979	85.5 (29.7)	0.871
56.8 (13.8)	1.486	64.0 (17.8)	1.285	71.2 (21.8)	1.116	78.4 (25.8)	0.977	85.6 (29.8)	0.869
57.0 (13.9)	1.480	64.2 (17.9)	1.281	71.4 (21.9)	1.112	78.6 (25.9)	0.974	85.8 (29.9)	0.866

If a system is rated to produce 5 gpm of permeate water @ 77° F. The same system will produce more water at a higher temperature. It will also produce less water at a lower temperature. Use the temperature correction table to obtain the correct flow.

Example:

1.25 gpm @ 59° F (1.25÷1.42=.88 gpm)

1.25 gpm @ 77° F (1.25÷1=1.25 gpm)

1.25 gpm @ 84° F (1.25÷0.89=1.4 gpm)

XZ
TOUCH SCREEN
NAVIGATION

HOME SCREEEN

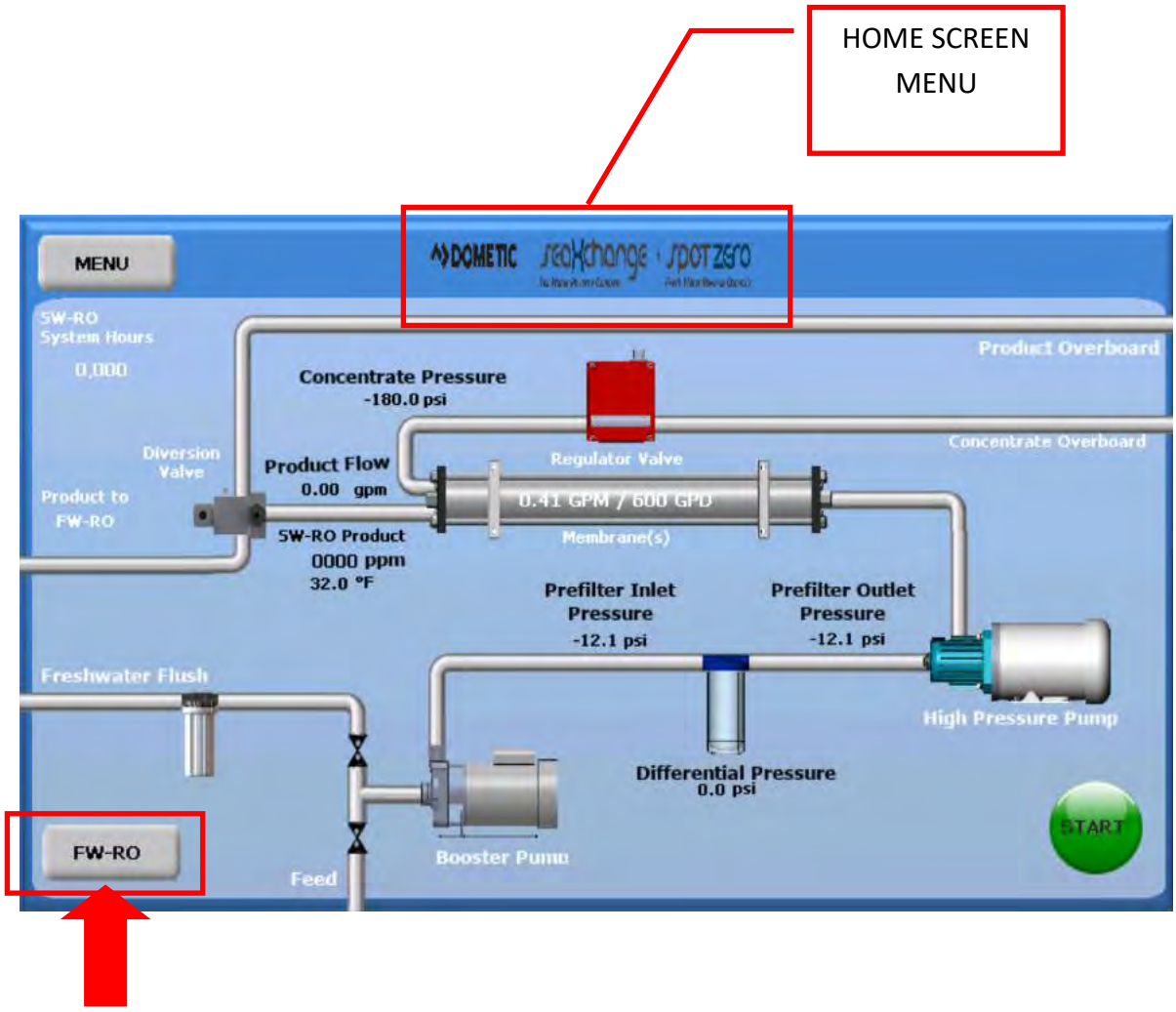
From any screen the “Sea Xchange + Spot Zero” logo can be pressed to return to the home screen.

There is a lot of information on the home screen that is crucial for the proper operation of the system. Different component images can be pressed to bring up sub-menus for those components.

Those components are:

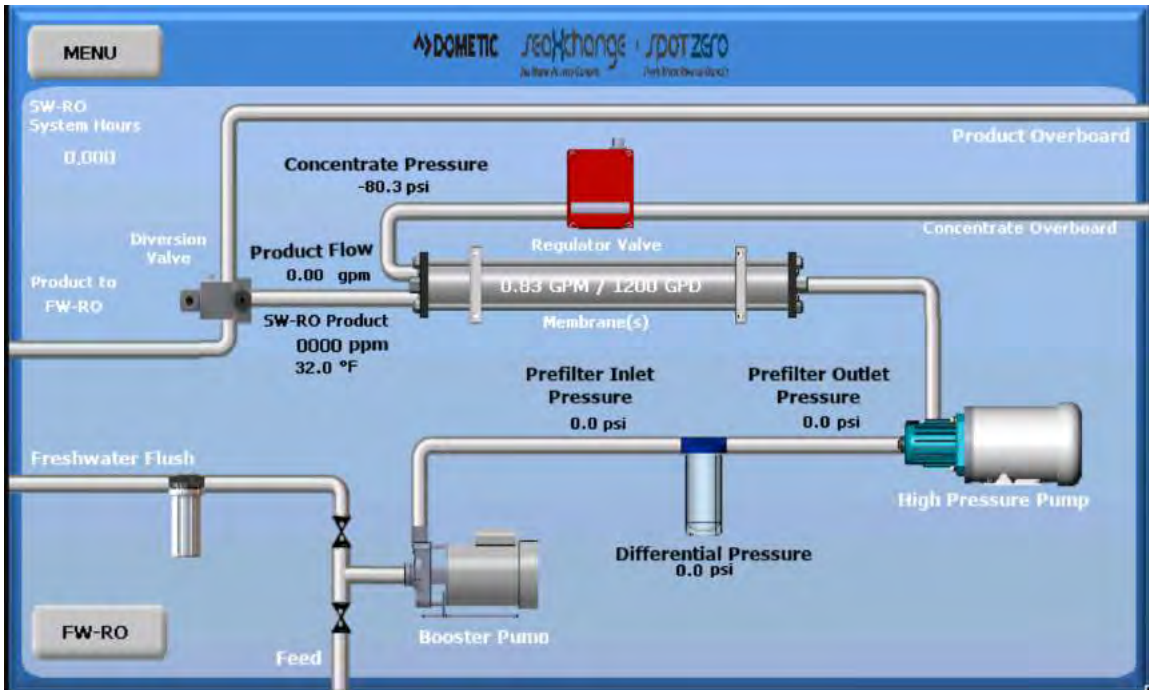
- Regulator Valve
- Diversion Valve
- High Pressure Pump
- Booster Pump

This sub-menus give the user information or options for the specific component. This manual will go through all the different options available.

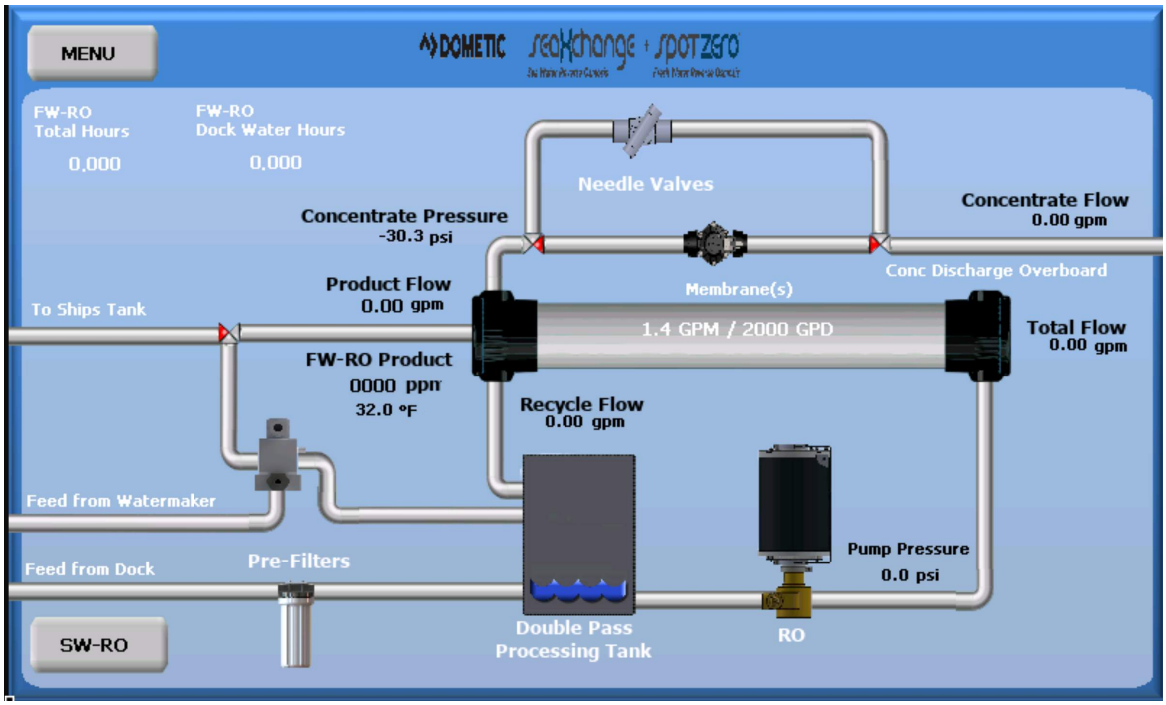


Press this button to go to the FW-RO home screen and vice-versa.

SW-RO HOME SCREEN



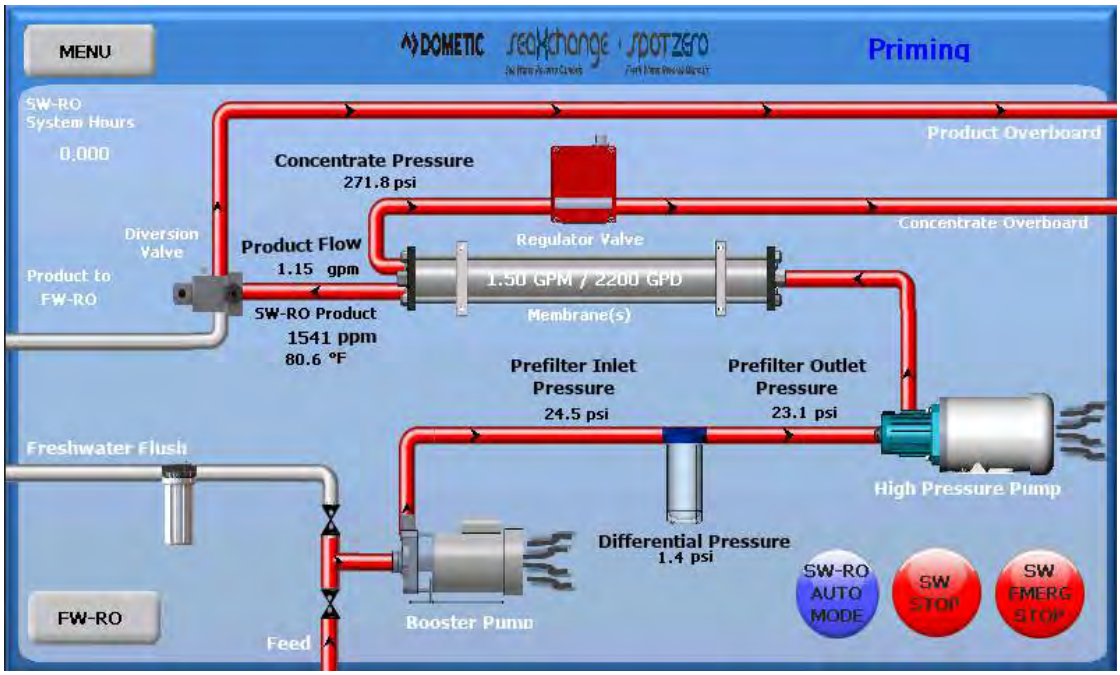
FW-RO HOME SCREEN



STANDARD OPERATION

1. Simply press the Start button and the system will automatically adjust to produce water.

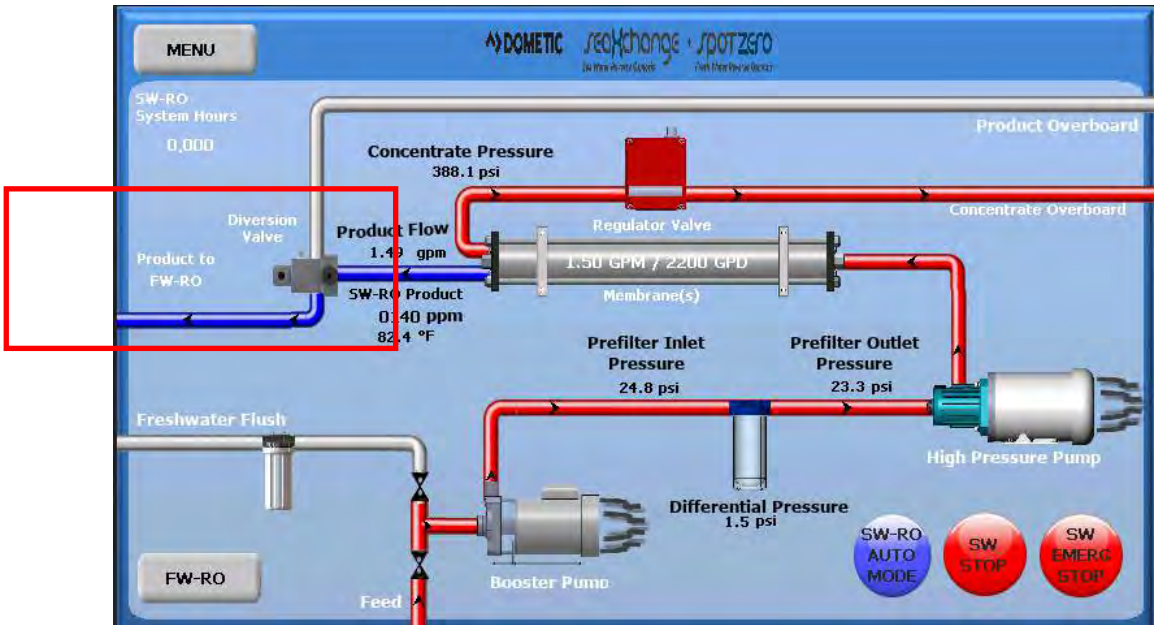
The booster pump will start to run, and the high pressure pump will start to count down its delay. The screen will indicate water flow, inlet pressure and outlet pressure. It will also show the pressure differential between the pre-filters. The emergency stop button will appear at this time if a shut down is necessary.



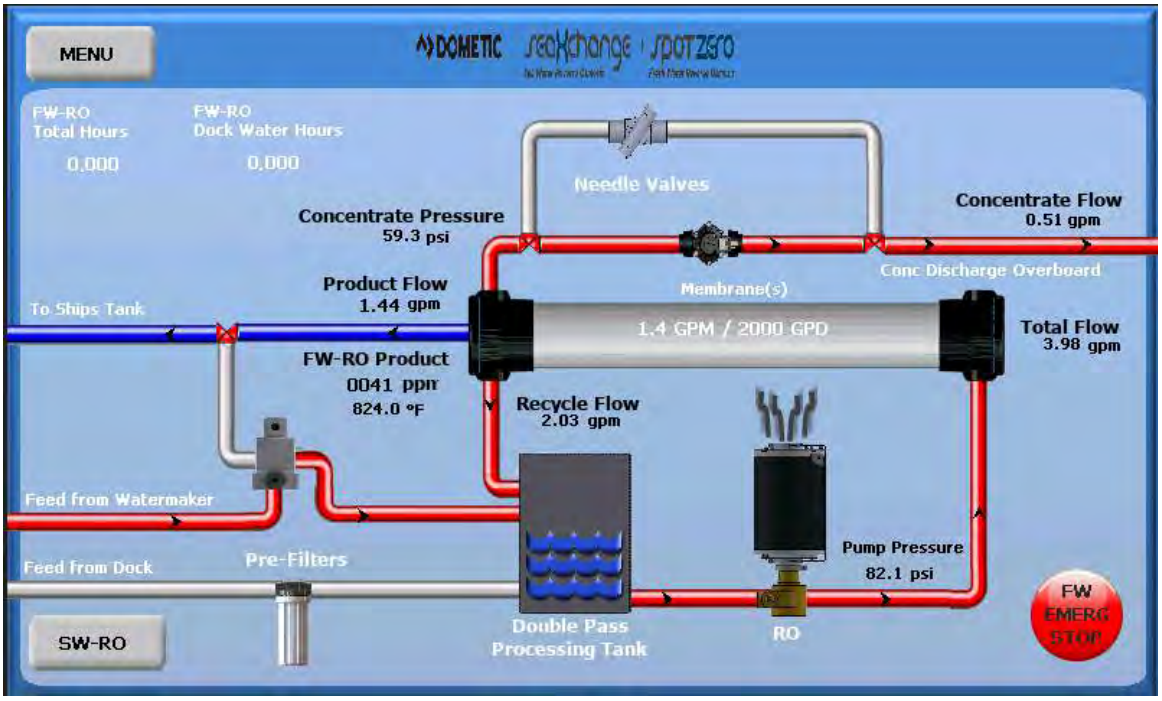
2. After the high pressure pump delay has expired it will begin to operate. The regulator valve will start to close automatically to the systems rated flow. The flow rates, and pressures will start to register.

3. As the unit operates and pressure starts to build up, the stop and the auto shut down buttons will appear.

4. When the unit starts making product water below the diversion's valve set point, the valve will activate and send the product water to the FW-RO tank or it can be manually diverted to the ship's fresh water tank.



5. Once the FW-RO tank is full the unit will start producing Spot Zero water and sending it to the ships fresh water tank.



6. To stop operation of system there are three choices:

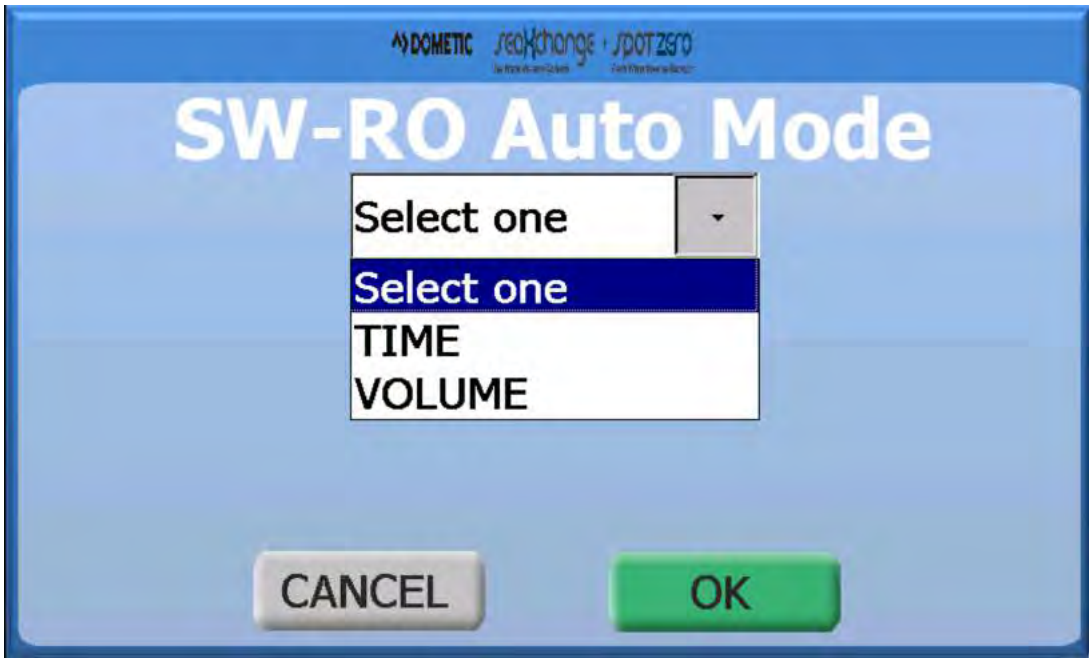
   A. Normal shut down process is to press the stop button. Shutting down will appear on the screen and the high pressure pump will stop, and the regulator valve will begin to open.

B. Emergency Shut Down button . Selecting this option will shut down the system as fast as possible and it will not do a fresh water flush.

C. Auto Shut Down button. Press this button and get the following options:

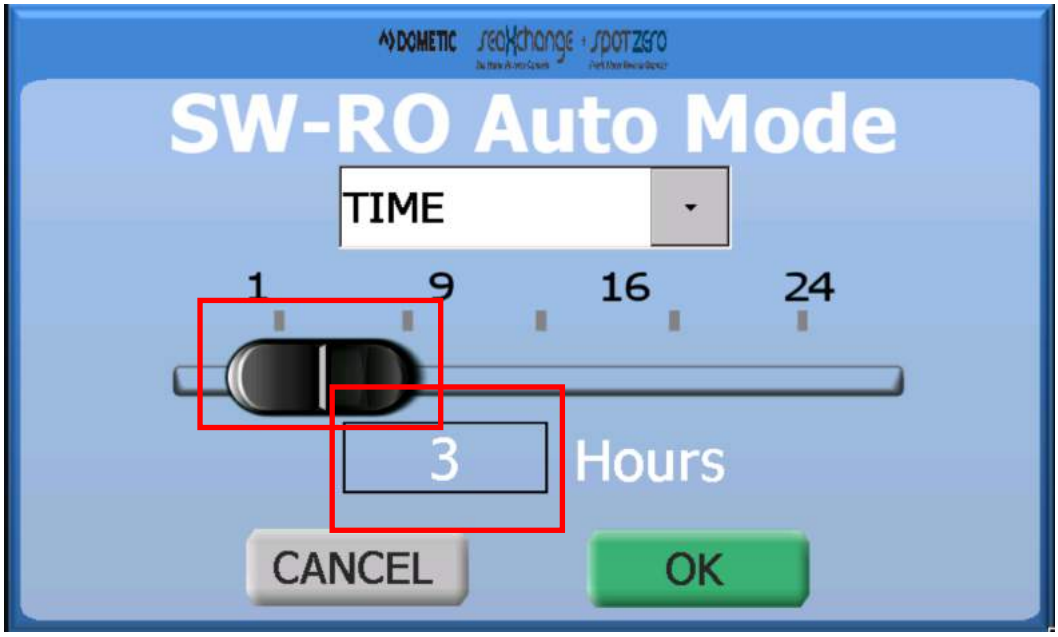
I. Auto Shut Down by time

II. Auto Shut Down by volume

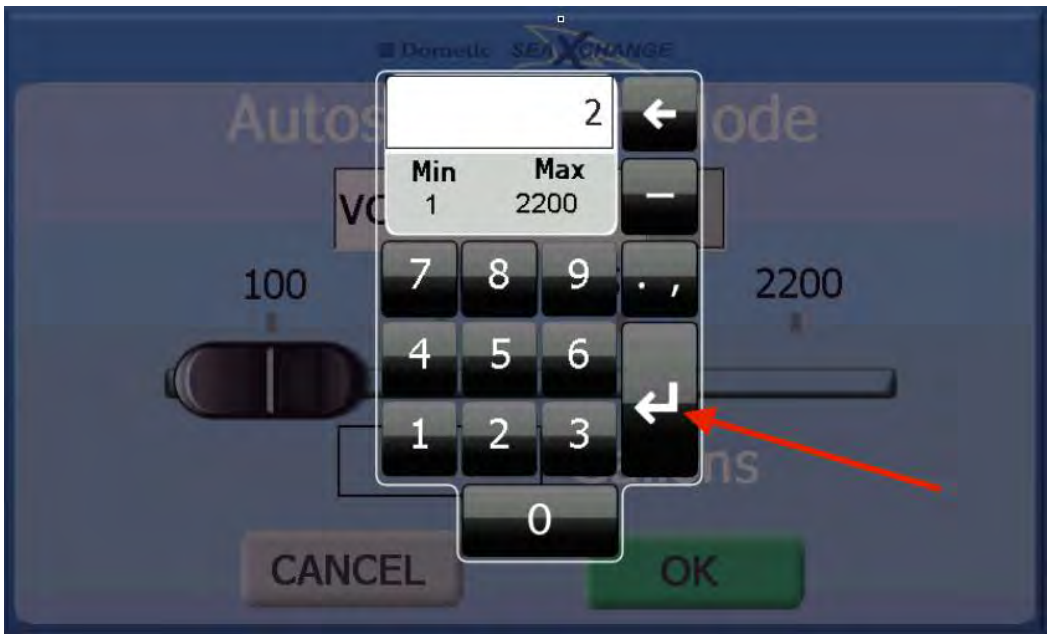


I. Auto Shut Down by time

When “Time” is selected, there will be a sliding scale to select the amount of time the system will operate for.

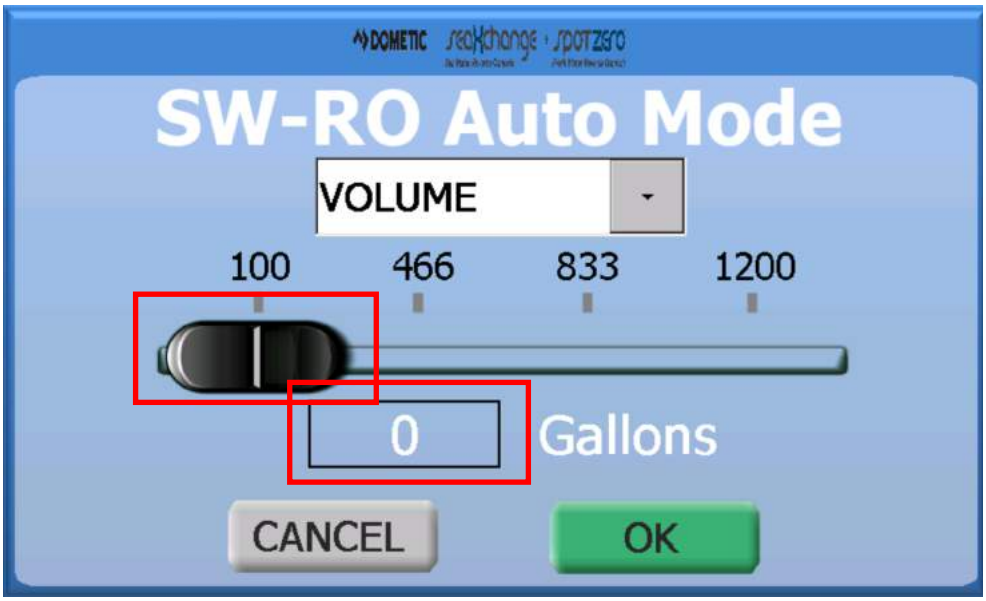


Touch the “Hours” box and you can manually type in the hours. Press enter after entering the hours. Then press OK.

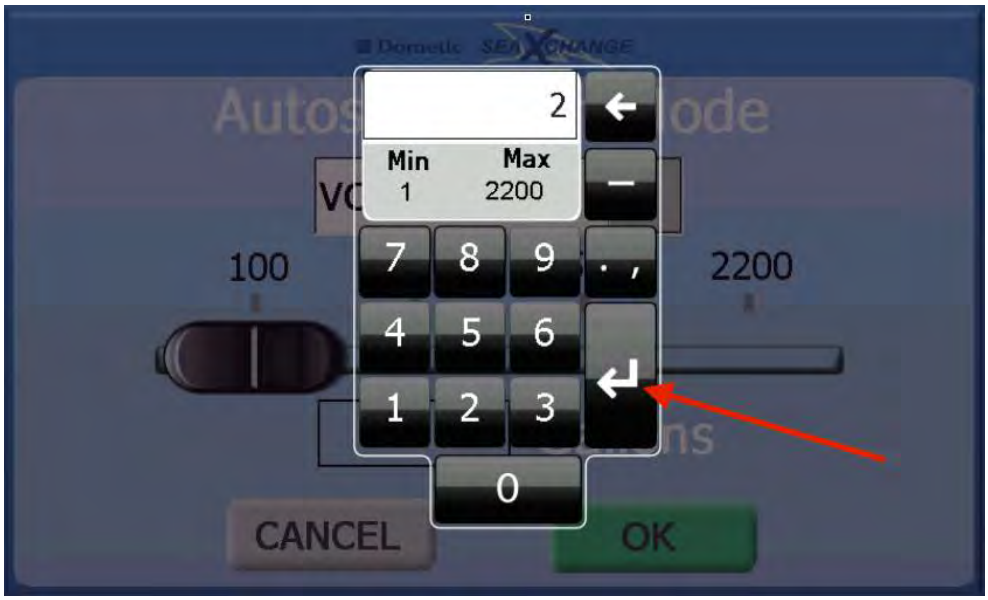


I. Auto Shut Down by volume

When “Volume” is selected, there will be a sliding scale to select the volume of water the system will produce.

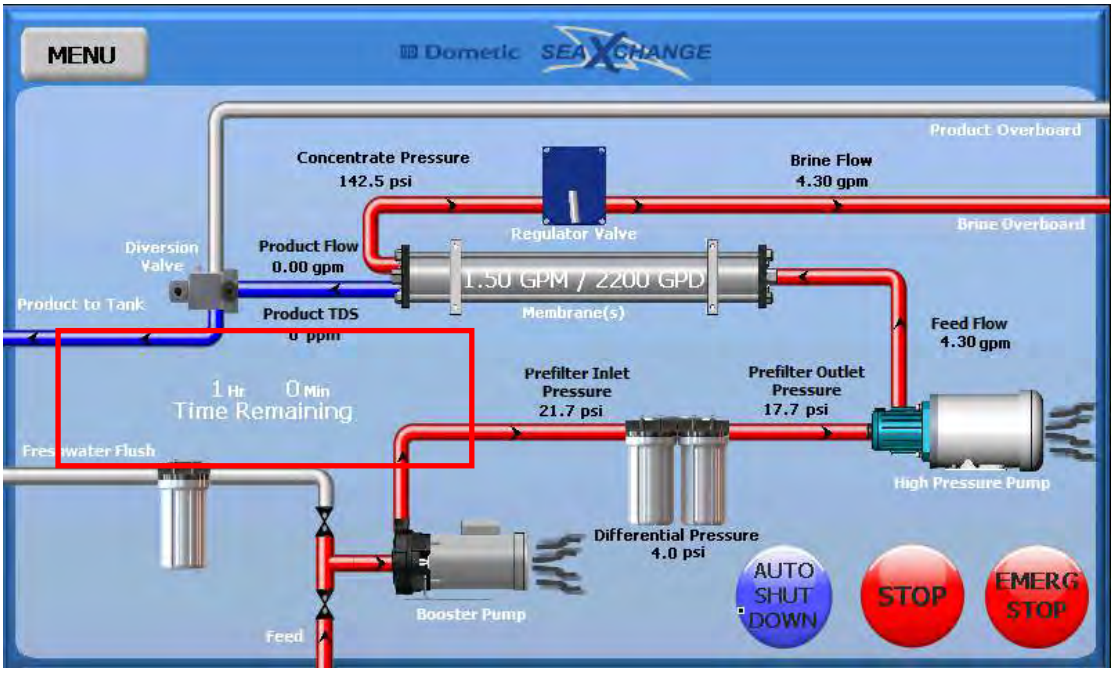


Touch the “Gallons” box and you can manually type in the gallons. Press enter after entering the gallons. Then press OK.

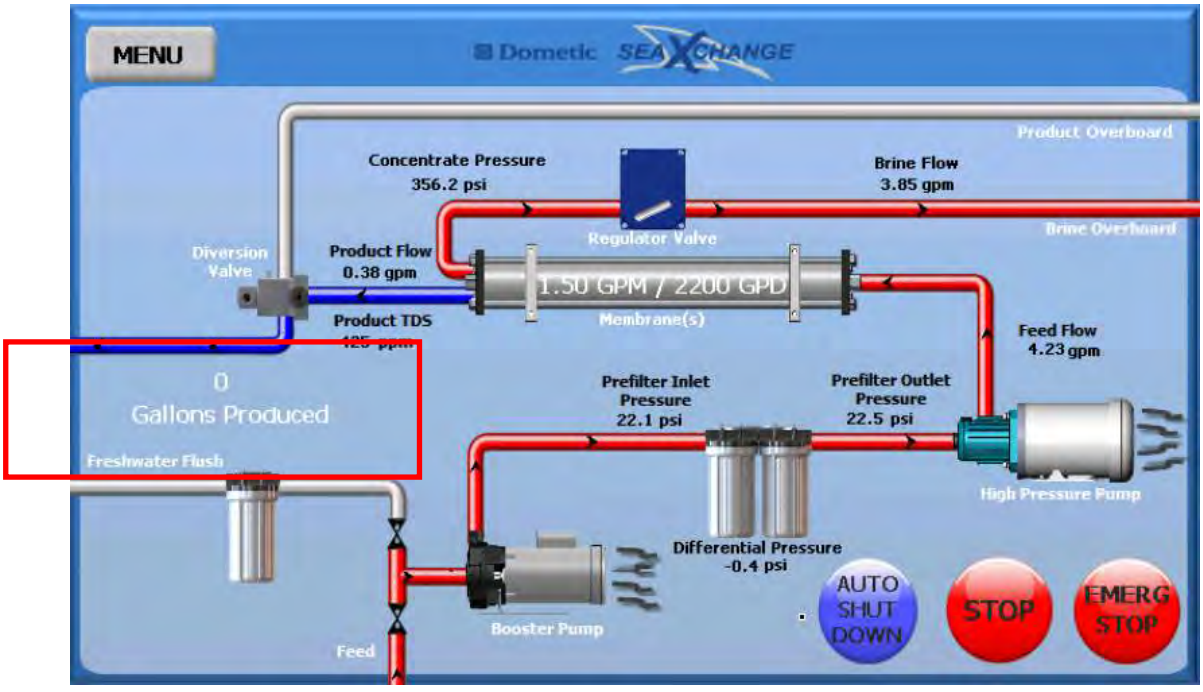


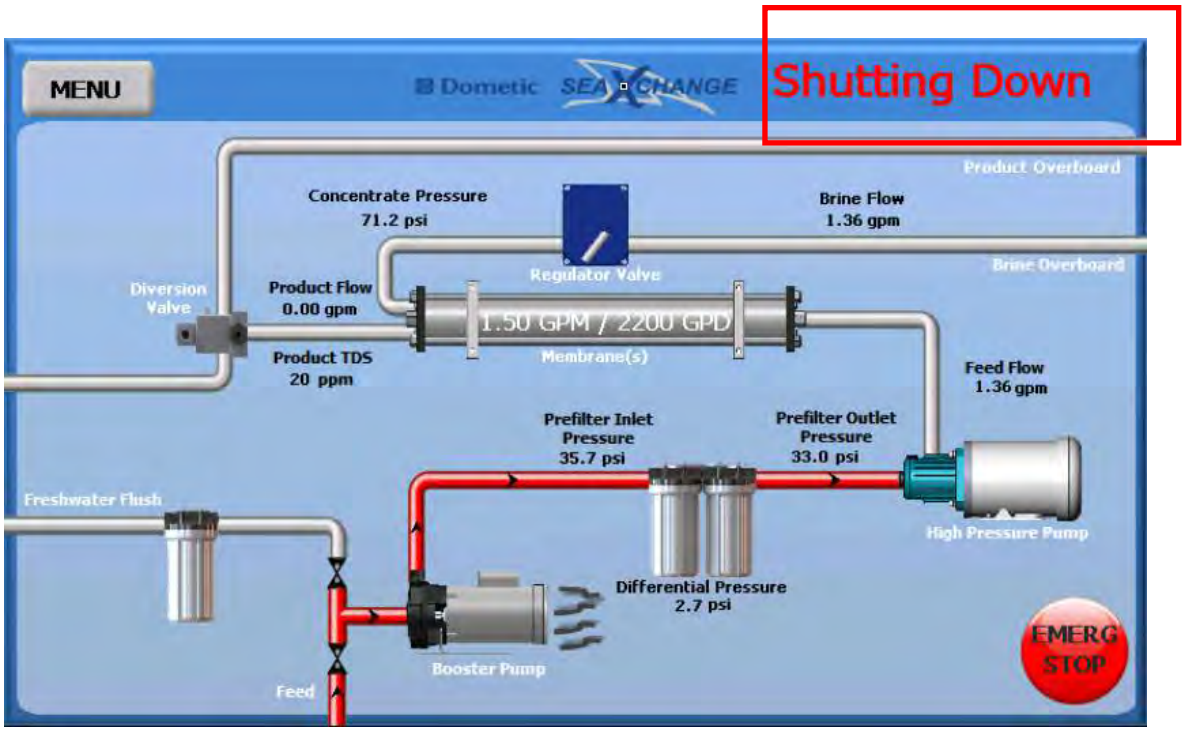
When the is in auto shut down mode, there will be a count on the home screen that will track the production or the time of operation. When the system has satisfied the setting, it will shut down and do a fresh water flush.

Time Remaining

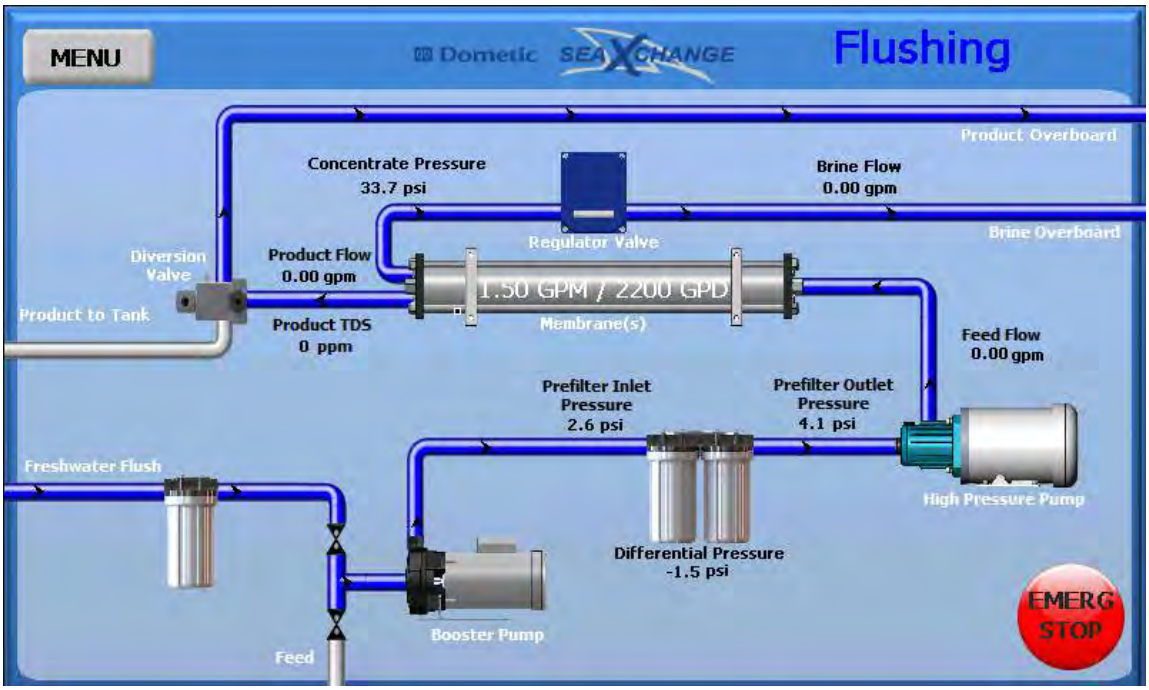


Gallons Produced



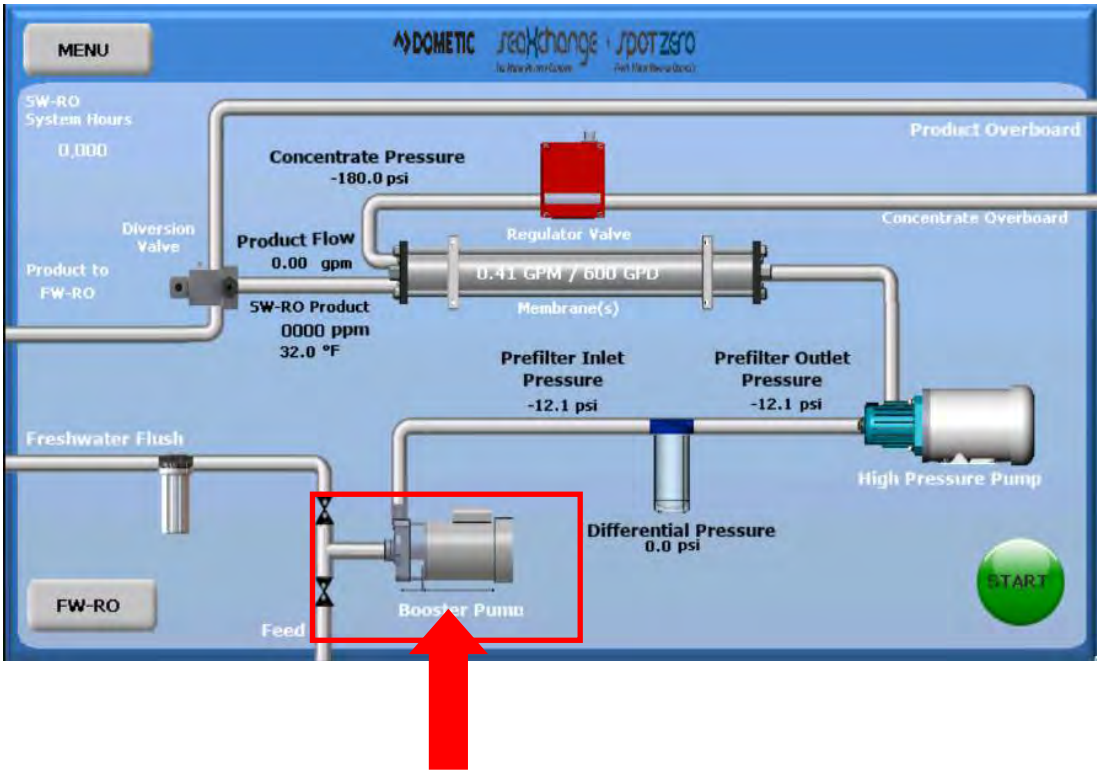


After the valve is all the way open, the booster pump will stop. After the system has shut down, it will do an automatic fresh water flush.

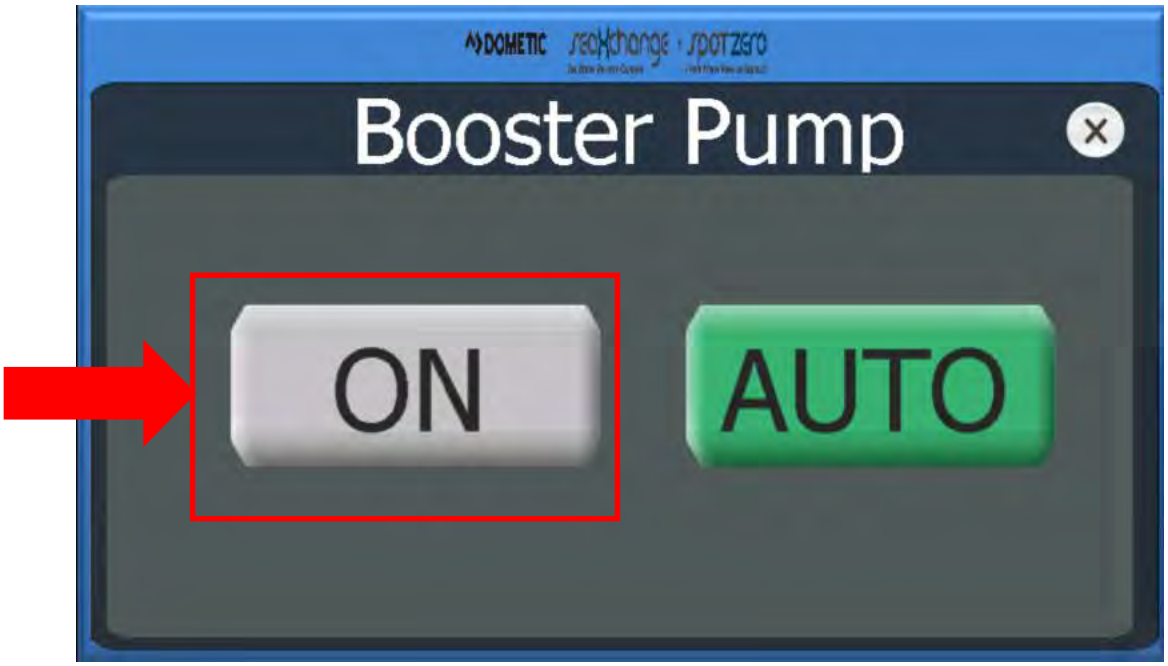


MANUAL RUN PROCEDURE

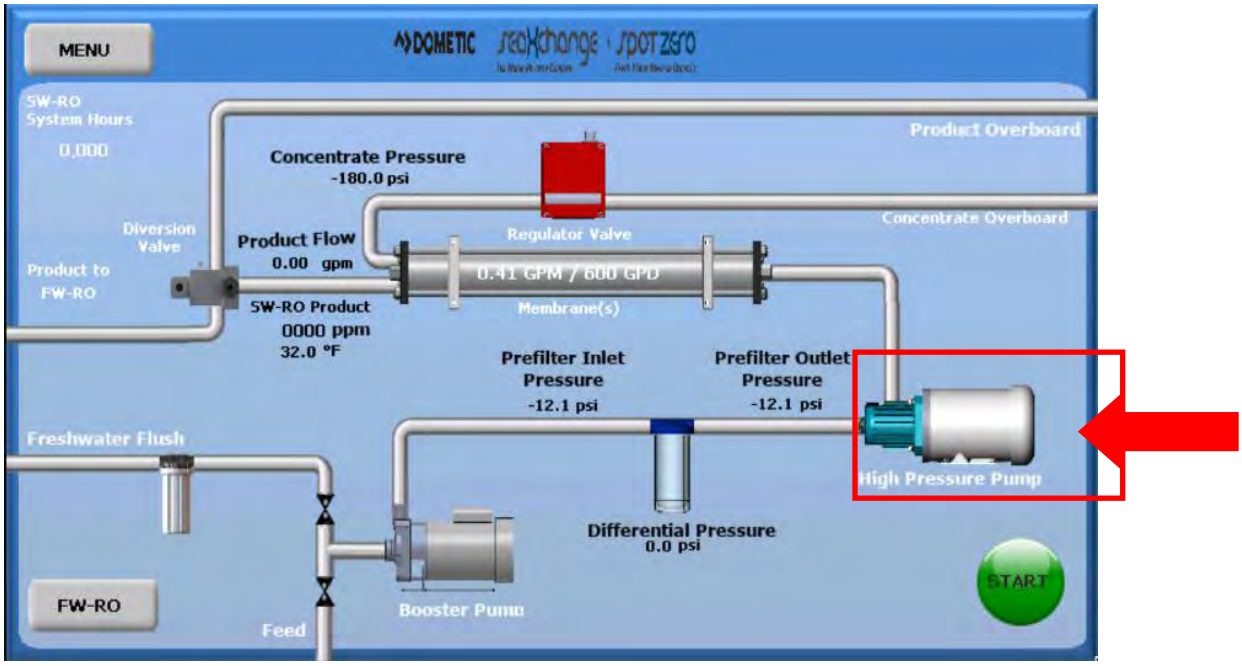
1. Prime the system by touching the Booster Pump image



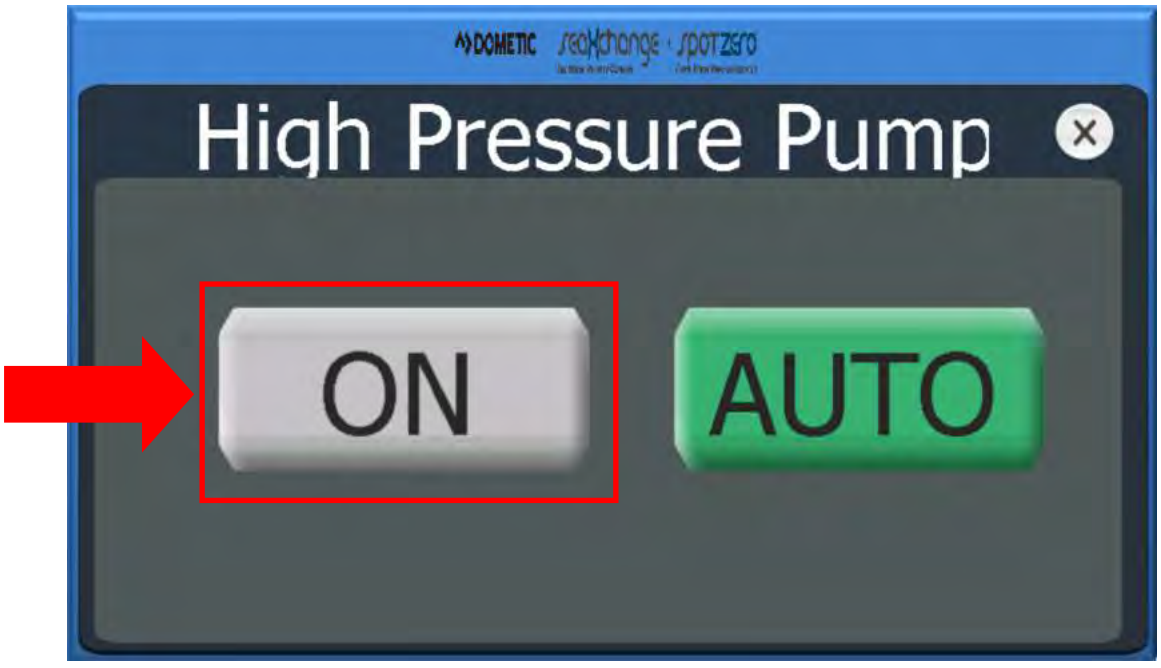
2. Press the "ON" button, then press the "X" button to exit the menu. When the Booster Pump is running wavy line should appear to the right of the Booster Pump image indicating that the motor is on.



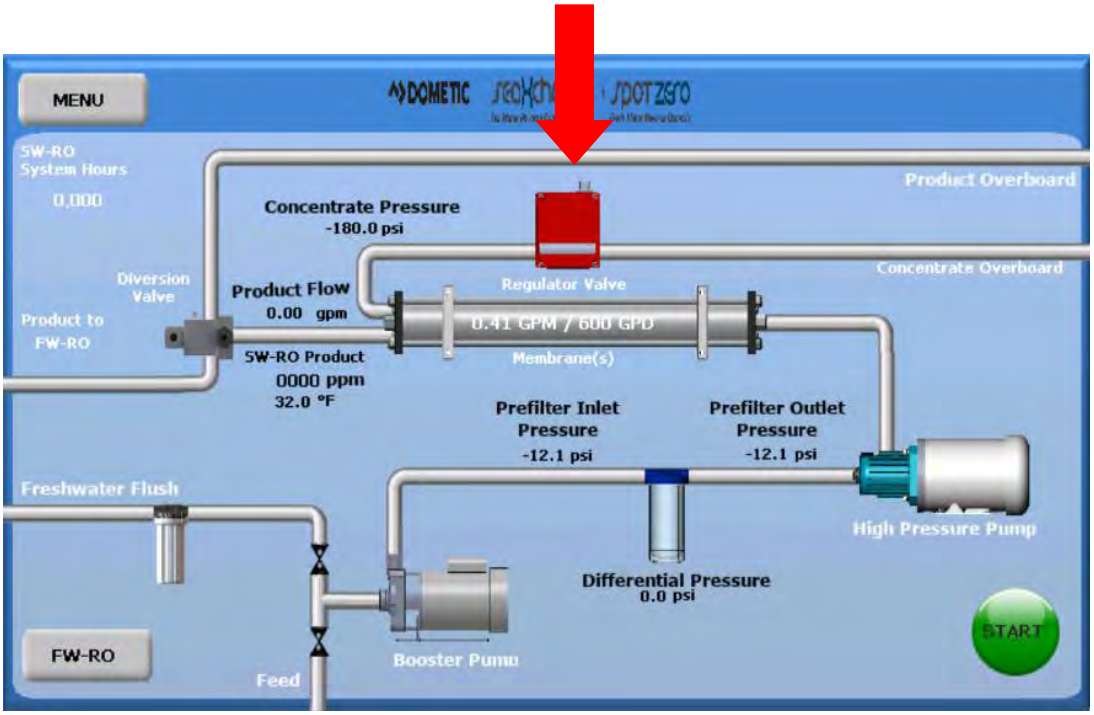
3. Press the High Pressure Pump image



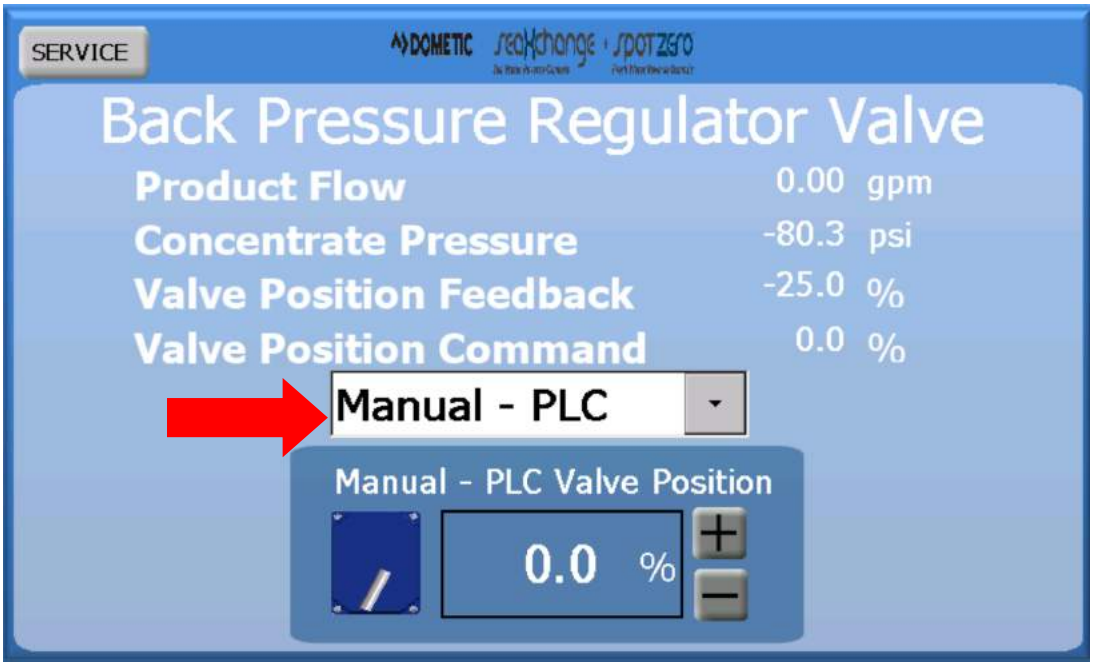
4. Press the "ON" button, then press the "X" button to exit the menu.



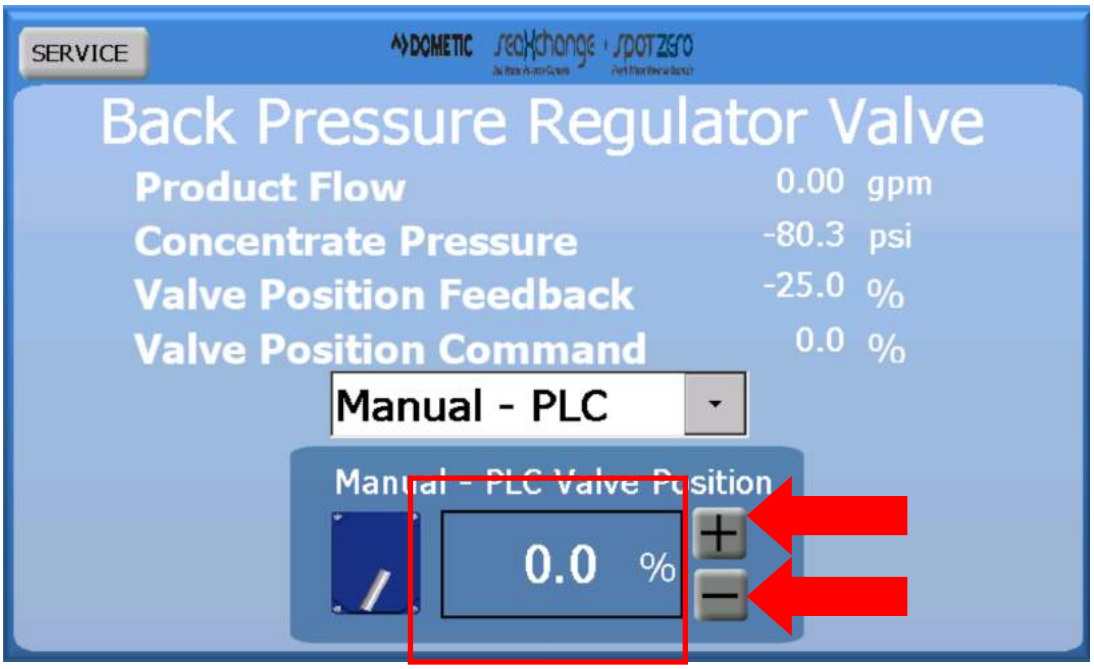
5. Press the Regulator Valve icon



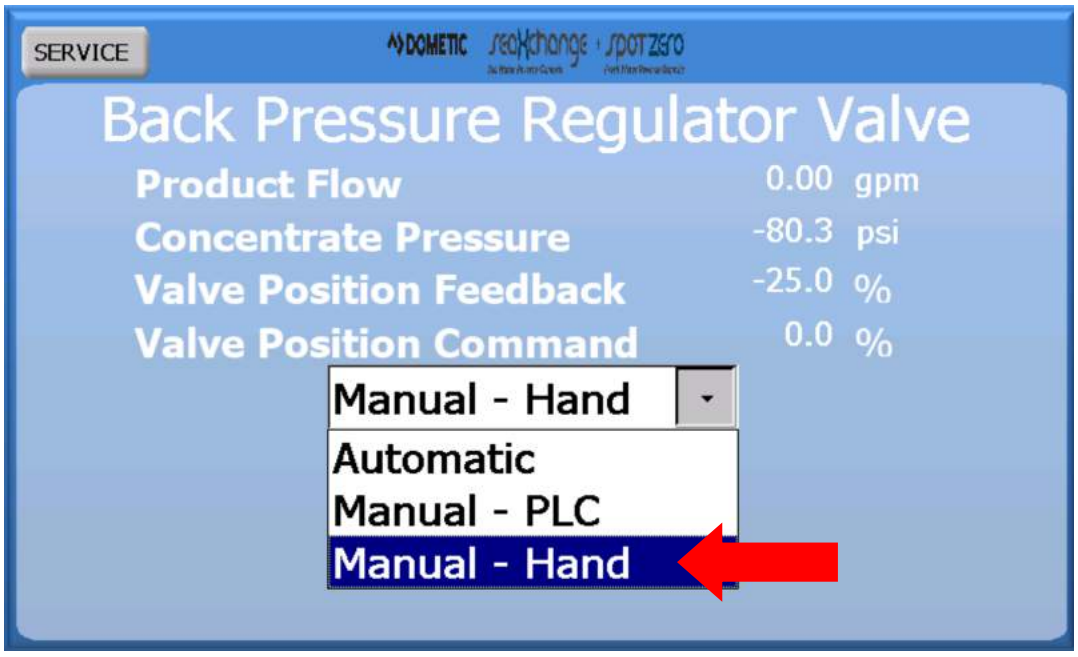
6. Press the down arrow to select “Manual –PLC” to digitally input a number for the valve to turn. The valve closes in % numbers.



6. Press the plus or minus icons to move close or open the valve digitally. You can also press the number box to enter set number for the valve to go to.



When the "Manual-Hand option is pressed you are able to mechanically turn the valve with you hand.



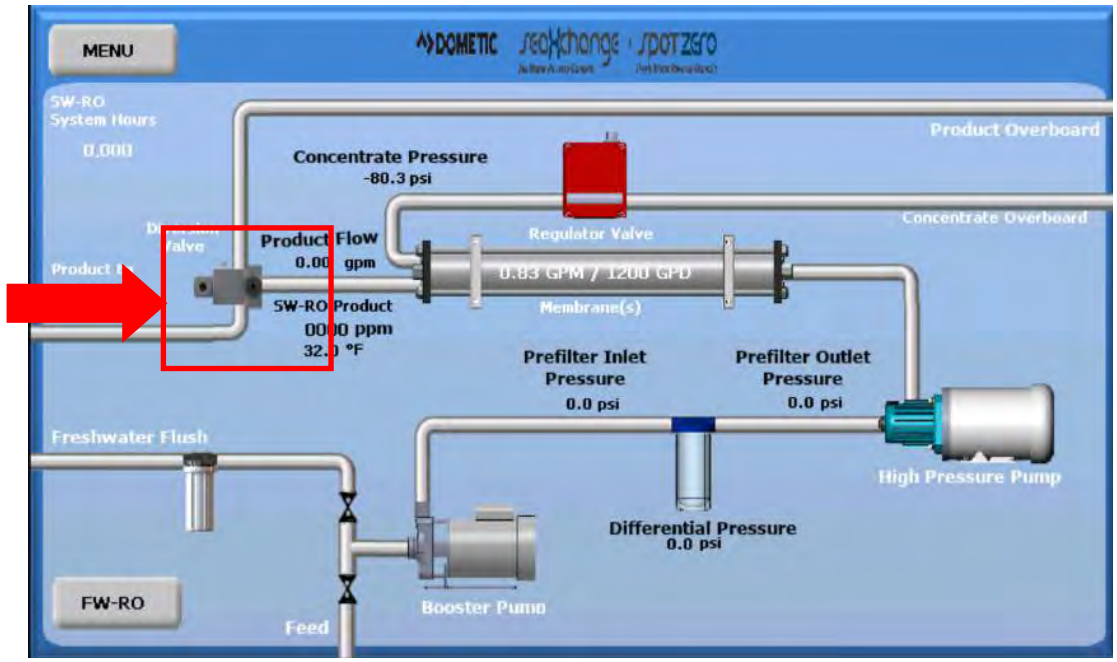
The following icon message will appear on the Home Screen:

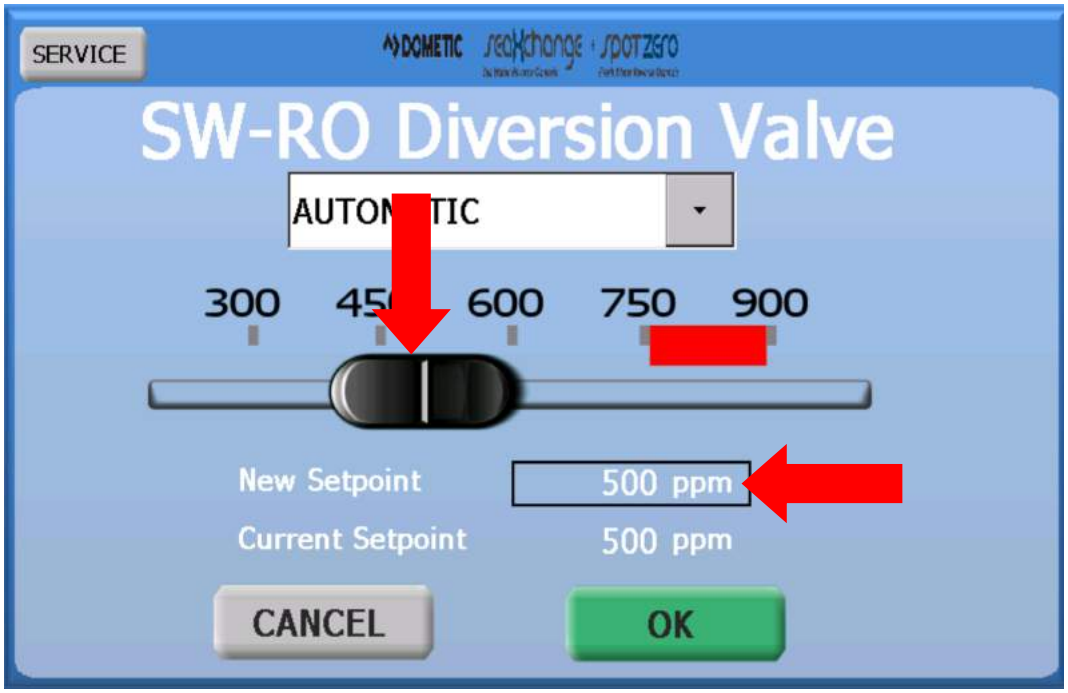
Manually or electronically start turning the valve until you reach you rated product flow or you reach 850 PSI, which ever comes first.

7. The Diversion valve is factory set to 650 ppm.

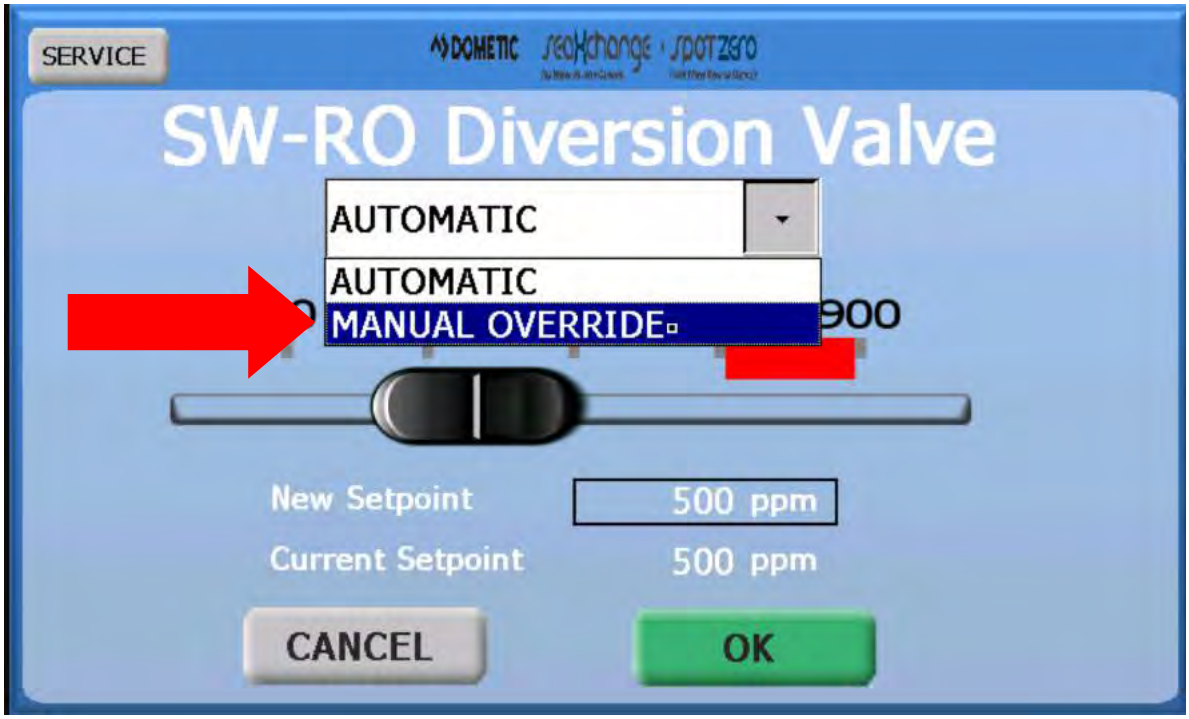
A. To change the set point, just press the Diversion valve image access the sub-menu. Slide the scale to adjust the

Set point or simply press the box and manually enter a number followed by the Enter key.





8. Press the Diversion Valve icon and select the down arrow from the selection menu and choose manual override.

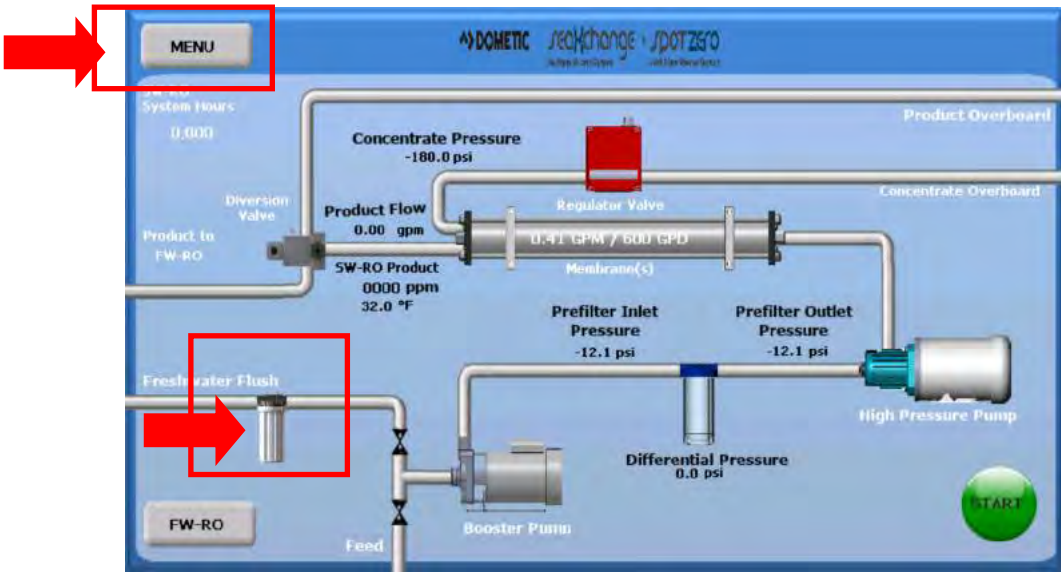


DIVERT WATER will send water to the ships fresh water tank

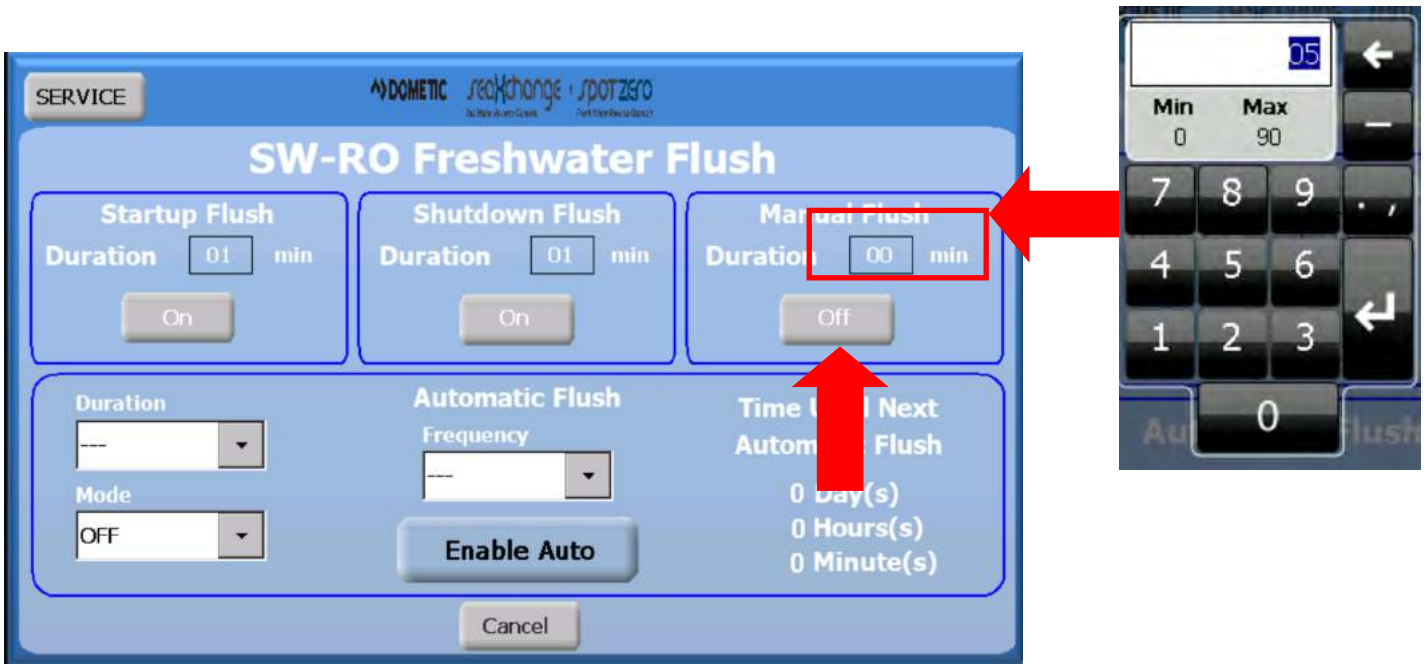
9. To **SHUT DOWN** the system simply reverse steps 1 though 8 and continue to do a Fresh Water Flush as depicted on the following page.

MANUAL FRESH WATER FLUSH

1. Press the Fresh Water Flush image or select Fresh Water Flush from the service menu.



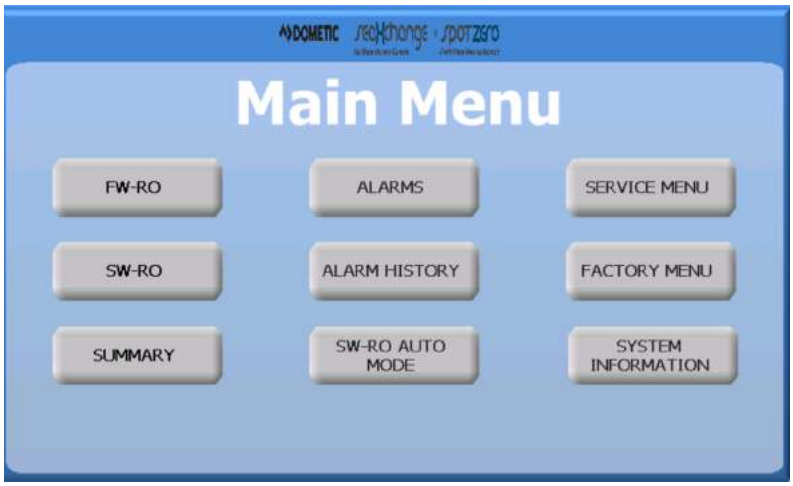
2. In Manual Flush, enter the amount of time you want to run the FWF and press the OFF button to activate it.



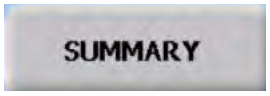
MENU OPTIONS

1. Press the MENU button on the Home Screen

2. The MENU screen should appear.

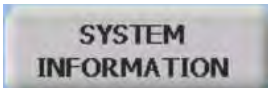


SUMMARY

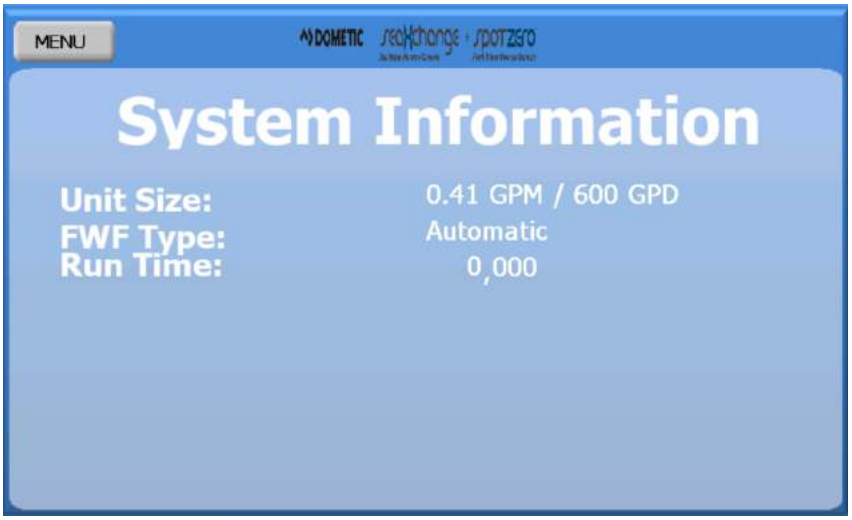


Pressing the SUMMARY button will show the systems current values. Pressing the arrow on the bottom right hand side of the screen will scroll to the components of the system.

SYSTEM INFORMATION



Pressing the SYSTEM INFORMATION will bring up the systems specification

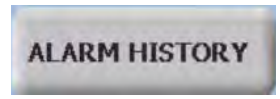


ALARMS

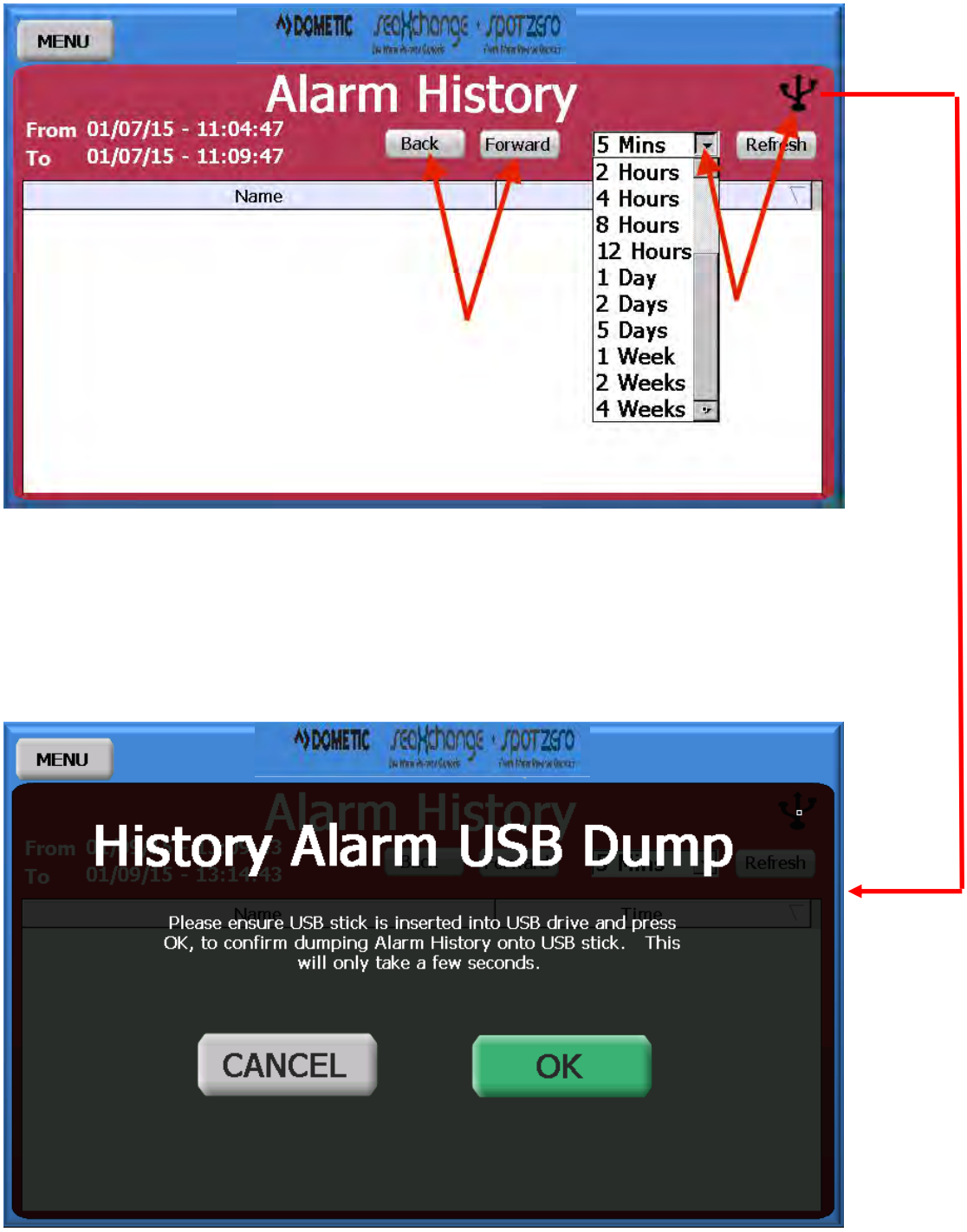
Pressing the ALARMS will show any active alarms present.

If any active alarms are present a flashing red bell will appear to the left of the Dometic Sea Xchange logo.

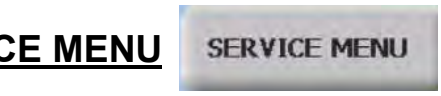
ALARM HISTORY



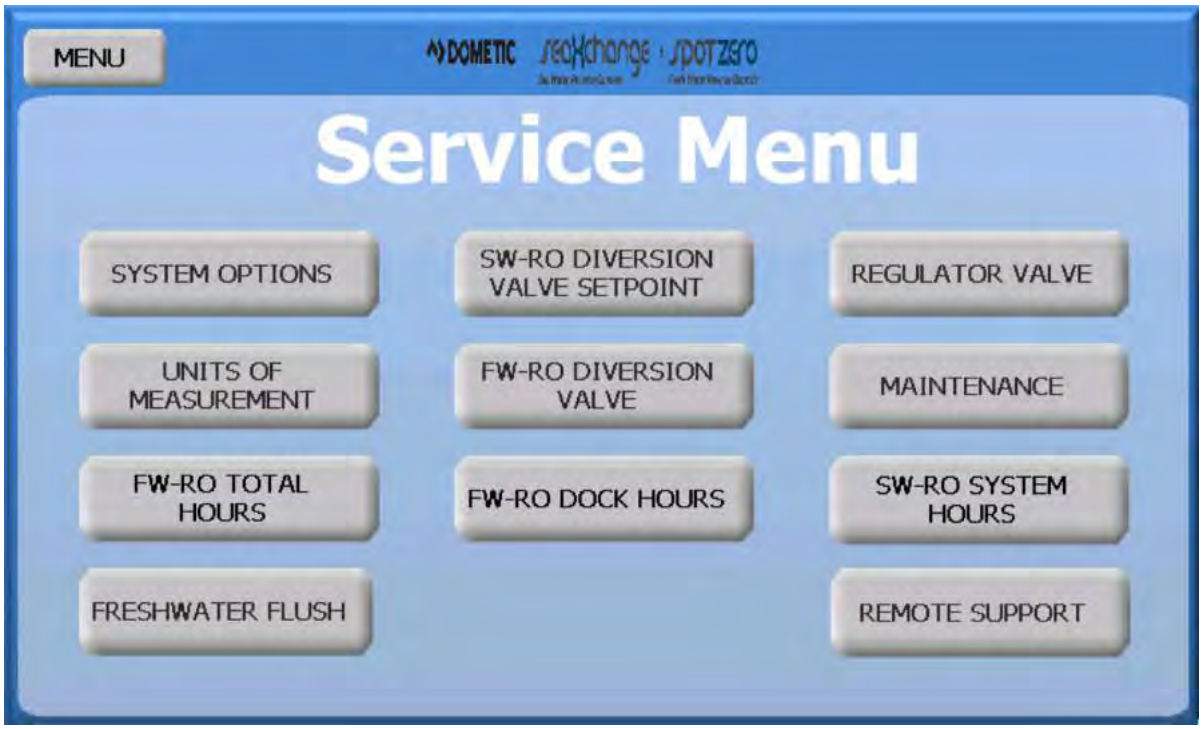
ALARM HISTORY will display any past and current alarms in the system. Pressing Back and Forward will scroll though the systems alarm history. The down arrow menu can also scroll through different time parameters. The USB icon can be selected to transfer history to a USB thumb drive.



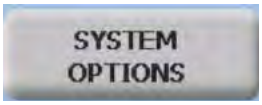
SERVICE MENU



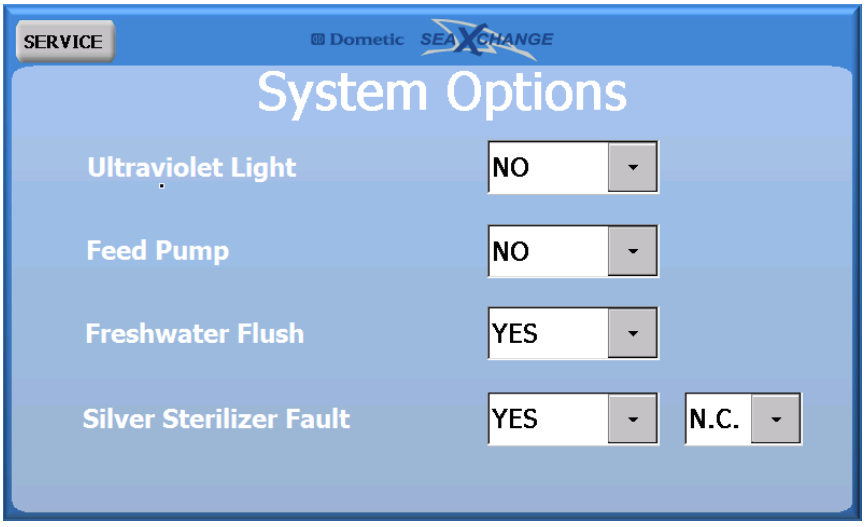
The Service Menu gives you access to several option in the system. Some of this options can also be selected by pressing the images on the Home Screen as depicted on the MANUAL SYSTEM OPERATION.



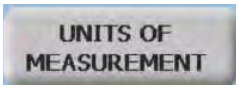
SYSTEM OPTIONS



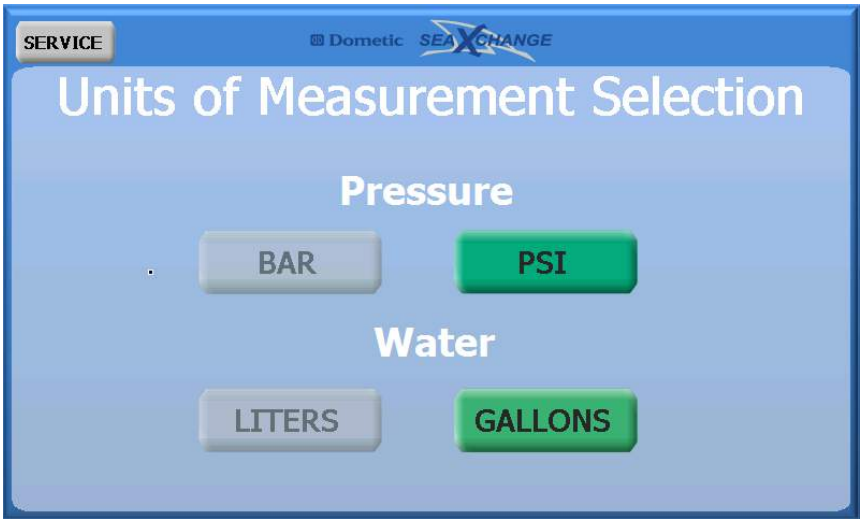
System Options give you the ability to add or remove components to the system. Or turn OFF some components when they are not being used.



UNITS OF MEASUREMENT

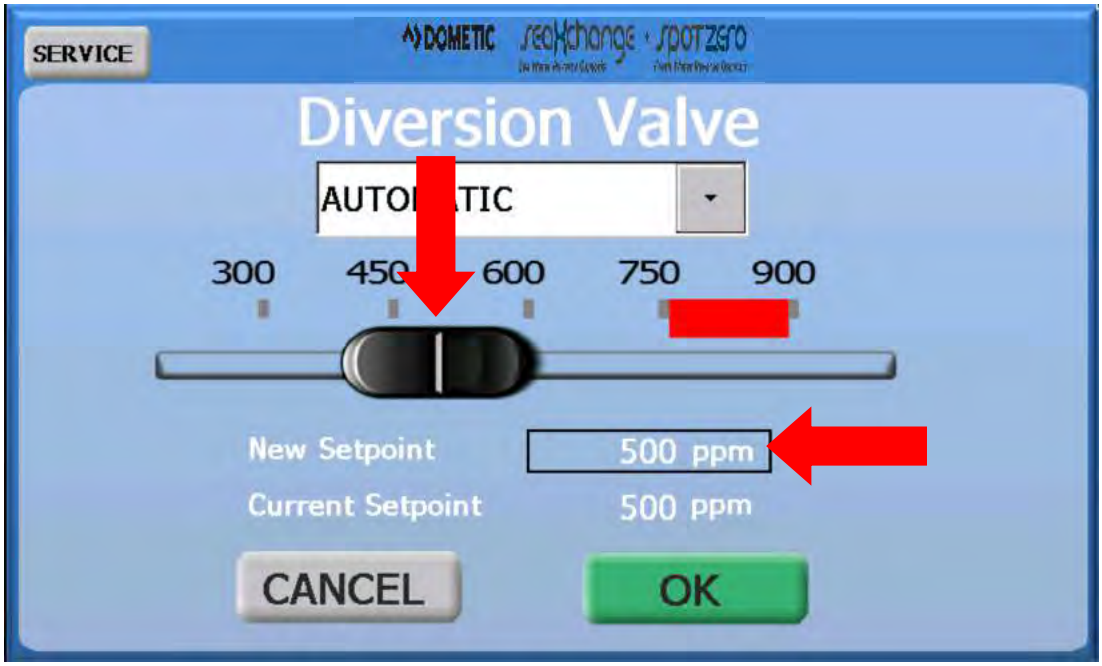


The units of measurement on the system can be changed from within this menu. Simply press the measurement you want to display and press the Home Screen logo or the Service button to go back.

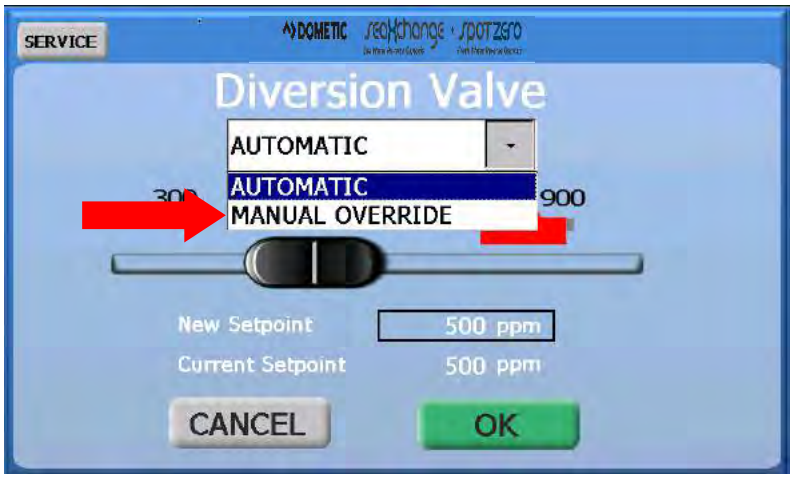


DIVERSION VALVE SETPOINT

This can also be accessed from the home screen by pressing the diversion valve image. The set point is factory set at 650 ppm. To change the set point there is a sliding scale, or press the box and type in the set point desired. Then press ok to change it, or cancel.



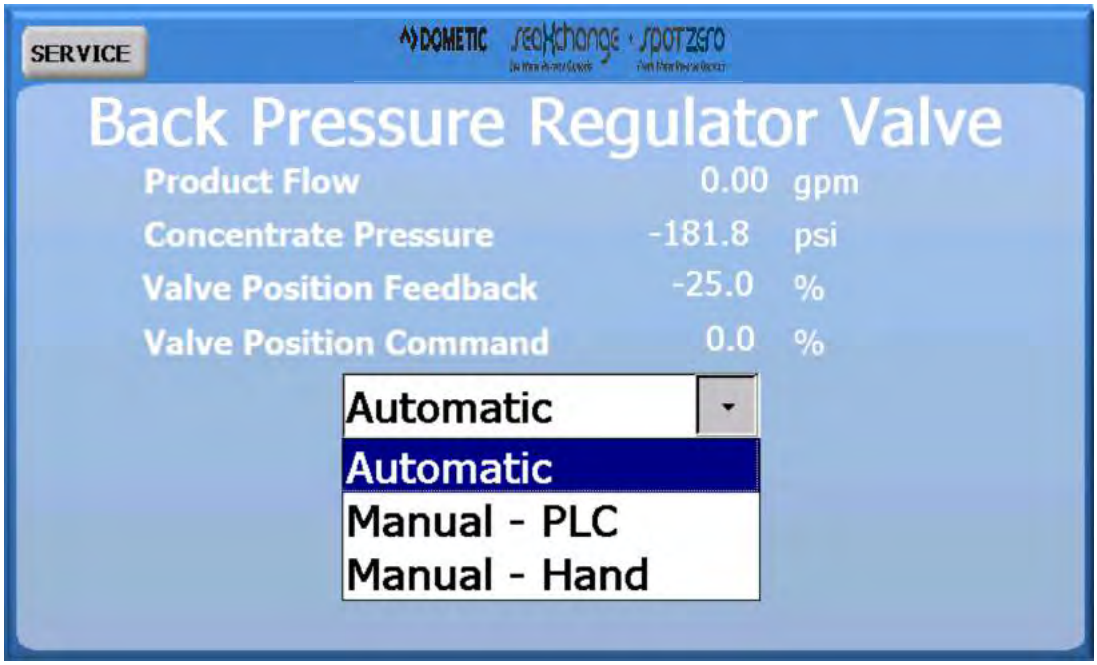
The diversion valve can be manually operated, by selecting the **MANUAL OVERRIDE** then pressing divert water button.



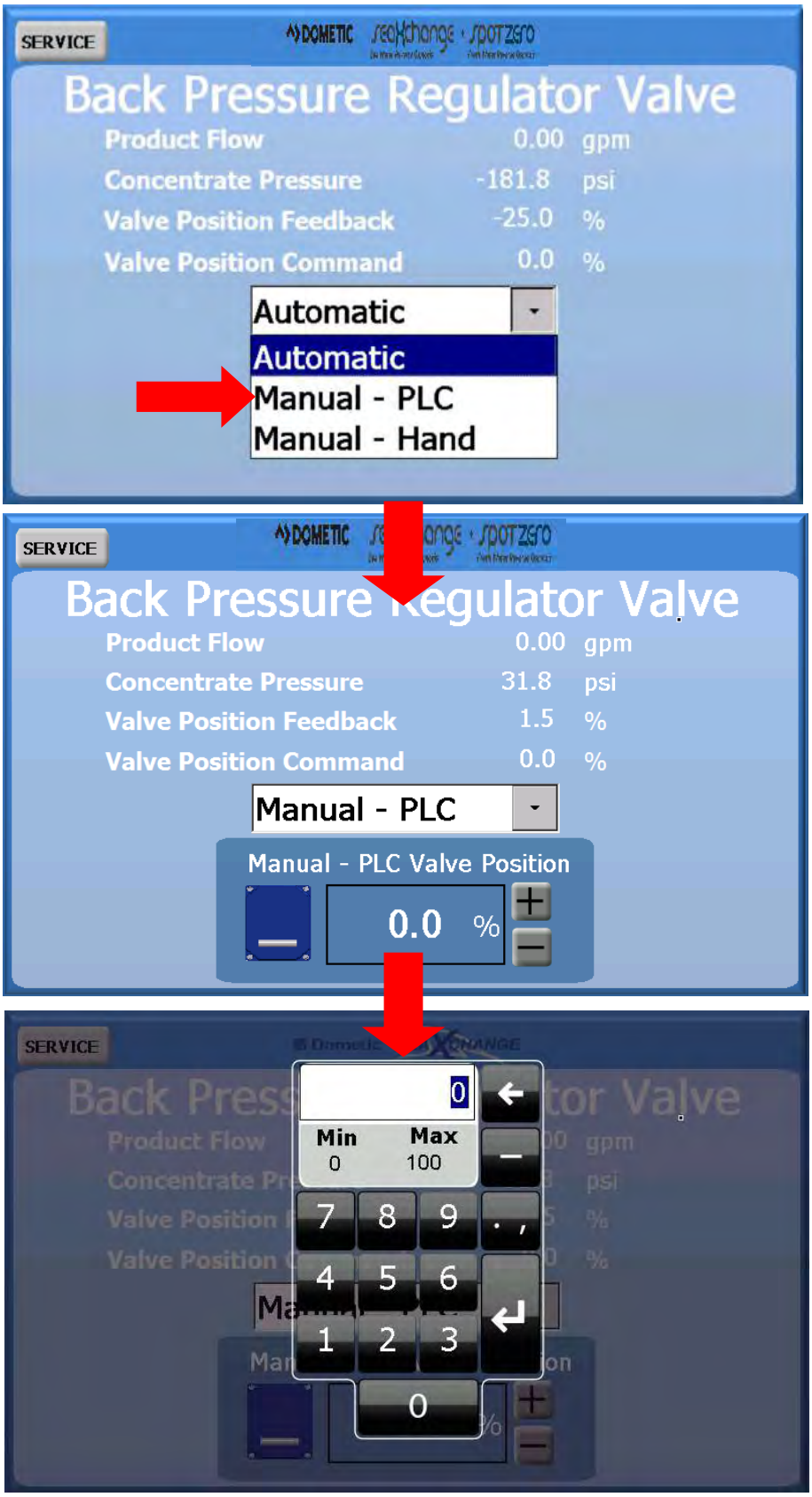
DIVERT WATER will send water to the ships fresh water tank

REGULATOR VALVE

This menu can also be accessed from the home screen by pressing the image of the regulator valve. The regulator valve is normally in the automatic selection. There are also two manual selections used for manual operation, and troubleshooting. The manual PLC selection allows the regulator valve to be open and closed by entering a percentage. The manual hand selection cuts the electronic functions of the regulator valve off so it may be turned by hand. *NOTE: After manual hand has been selected, the system will go into alarm when it is switched back to automatic. The alarm will have to be cleared to go back to normal operation.

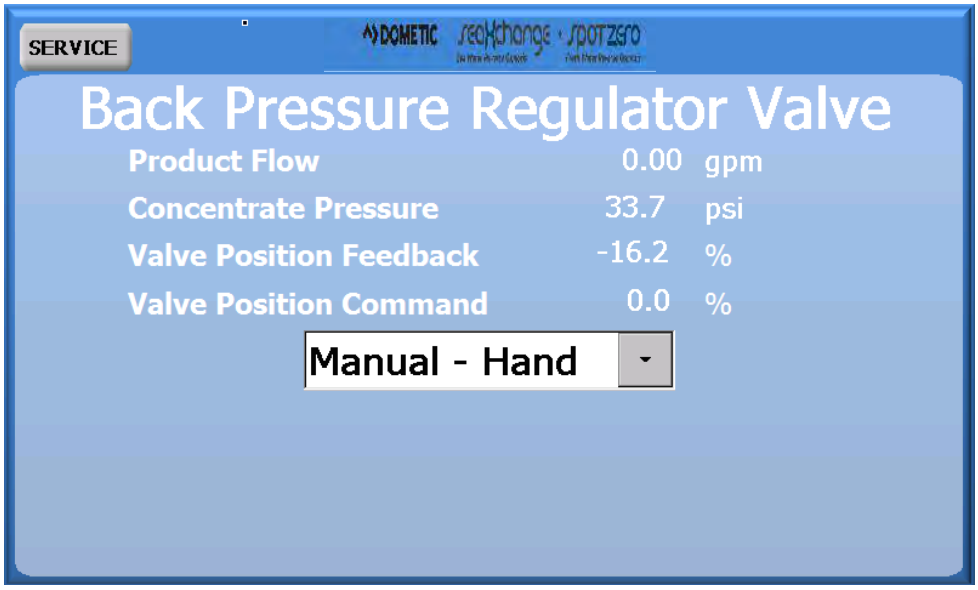


Manual-PLC will allow the user to move the valve by entering a percentage. Press the box to enter the numbers, then press enter. The valve will open or close according to the percentage entered. This will be displayed by the valve position command. The valve position feedback is the actual current position of the valve. The plus and minus buttons can be used to move the valve in smaller increments.

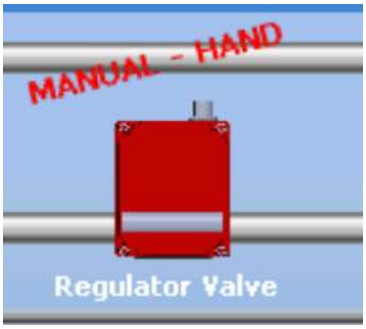


Manual-Hand will be displayed over the valve on the home screen.

*NOTE: After manual hand has been selected, the system will go into alarm when it is switched back to automatic. The alarm will have to be cleared to go back to normal operation.

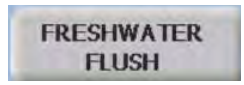


The following icon message will appear on the Home Screen:

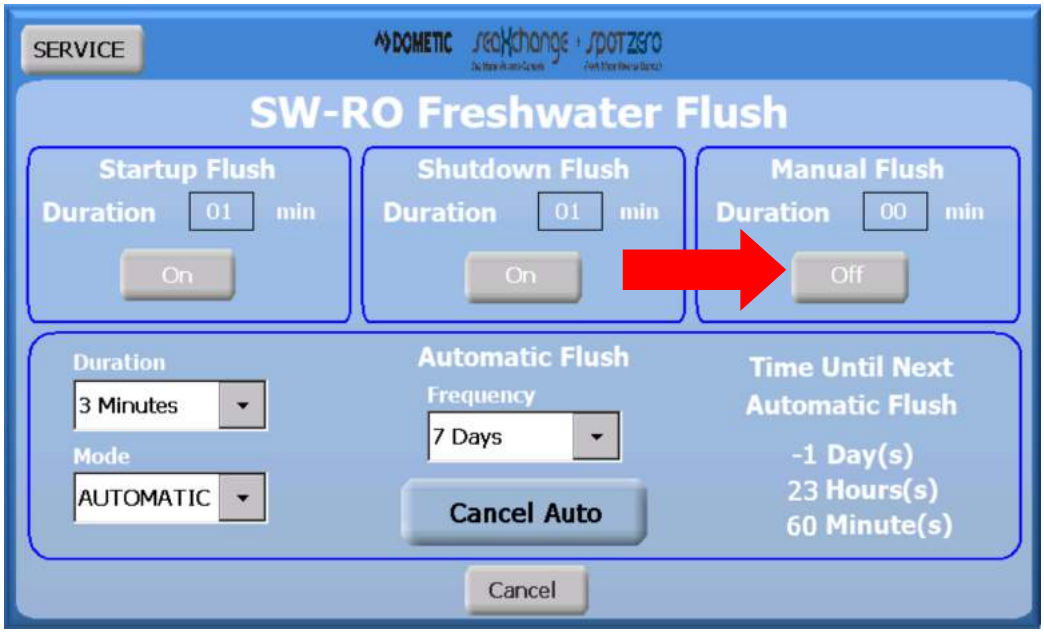


Manually start turning the valve until you reach you rated product flow or you reach 850 PSI, which ever comes first.

FRESH WATER FLUSH



This screen is also accessible from the home screen by pressing the fresh water flush image. The mode, duration and frequency can be changed here. The fresh water flush can also be canceled. The time until the next flush is displayed and counted down at the bottom of this screen. A Manual flush can be done by selecting the mode and the duration preferred.



Startup Flush

A FWF is performed before machine starts operating in order to prime all lines and purge all air out of the system.

Shutdown Flush

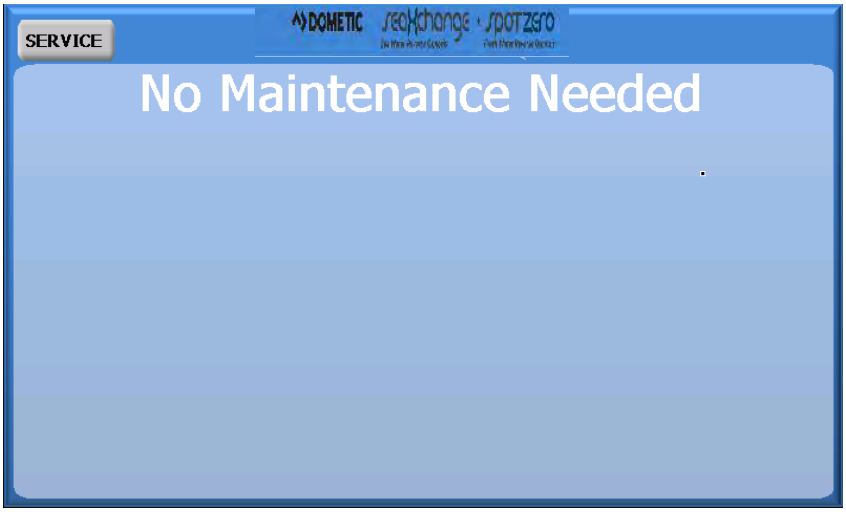
A FWF is performed after the machine has operated. Time can be adjusted to determine the length of time to perform a FWF after machine operation.

Automatic Flush

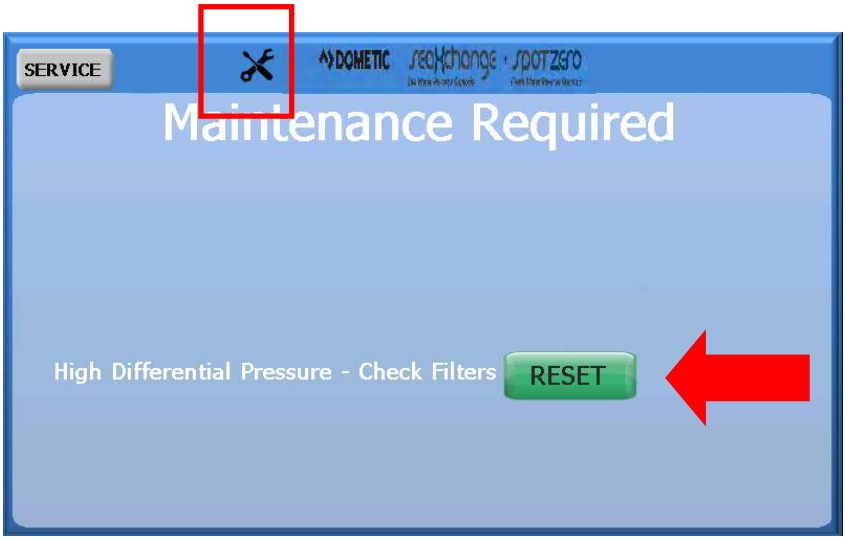
A FWF is performed periodically in order to prevent the membrane from fouling. The time can be adjusted in order to increase or decrease the frequency of the FWF.

MAINTENANCE

This will show any maintenance that is necessary to preform at the time. If no maintenance is needed at this time this will be displayed.



When maintenance is required a wrench and screwdriver symbol with appear at the top of the display. On the home screen this symbol can be pressed to bring up this screen. Preform the required maintenance then press reset.

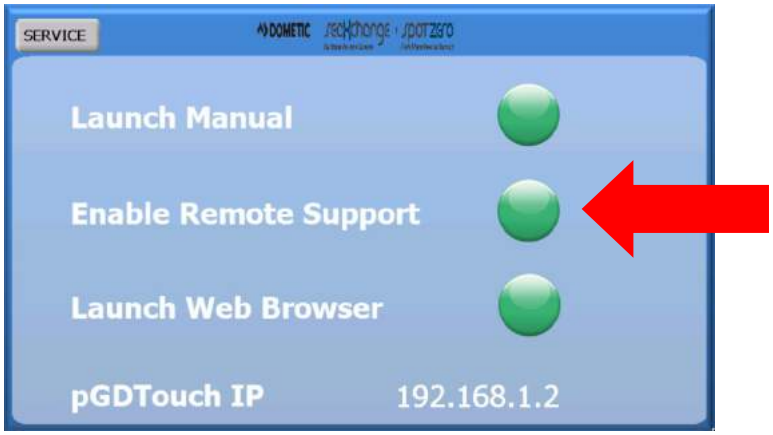


REMOTE SUPPORT

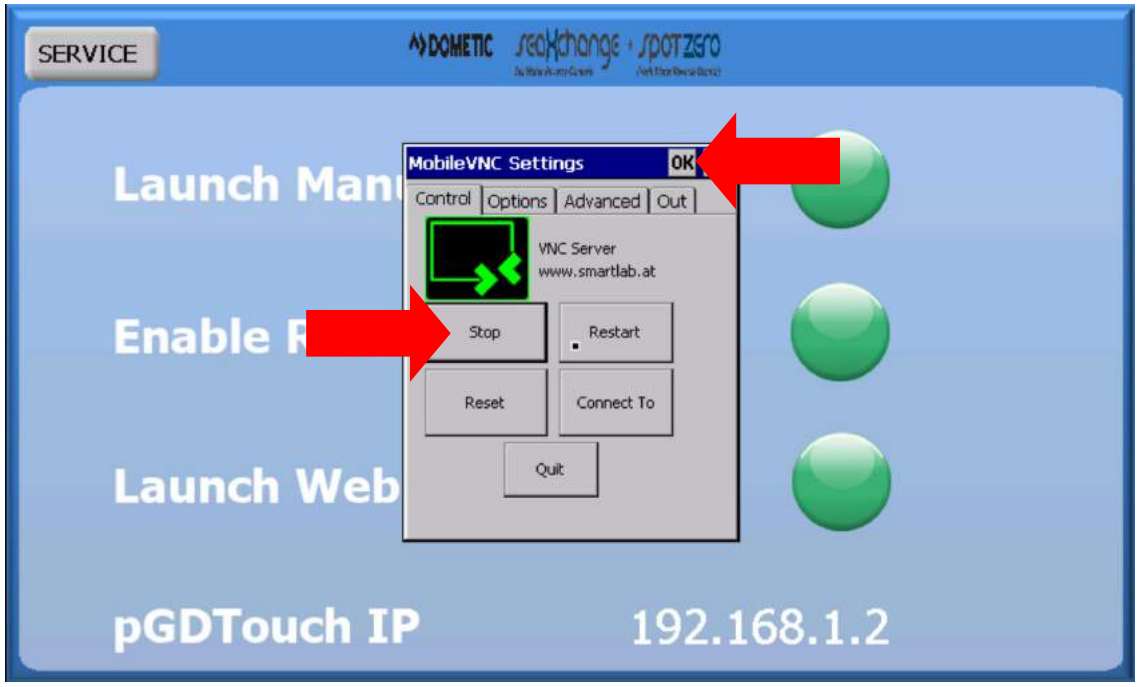
In this menu the pGD Touch IP address will be shown at the bottom of the screen if the system is wired to a router. This will be needed to connect to the VNC viewer app. This manual will be brought up if the launch manual button is pressed. The VNC viewer menu will pop up if the enable remote support is pressed. The web browser will pop up is the launch web browser is pressed. To enable remote support, see the VNC viewer procedure section of the manual.

Enable Remote Support

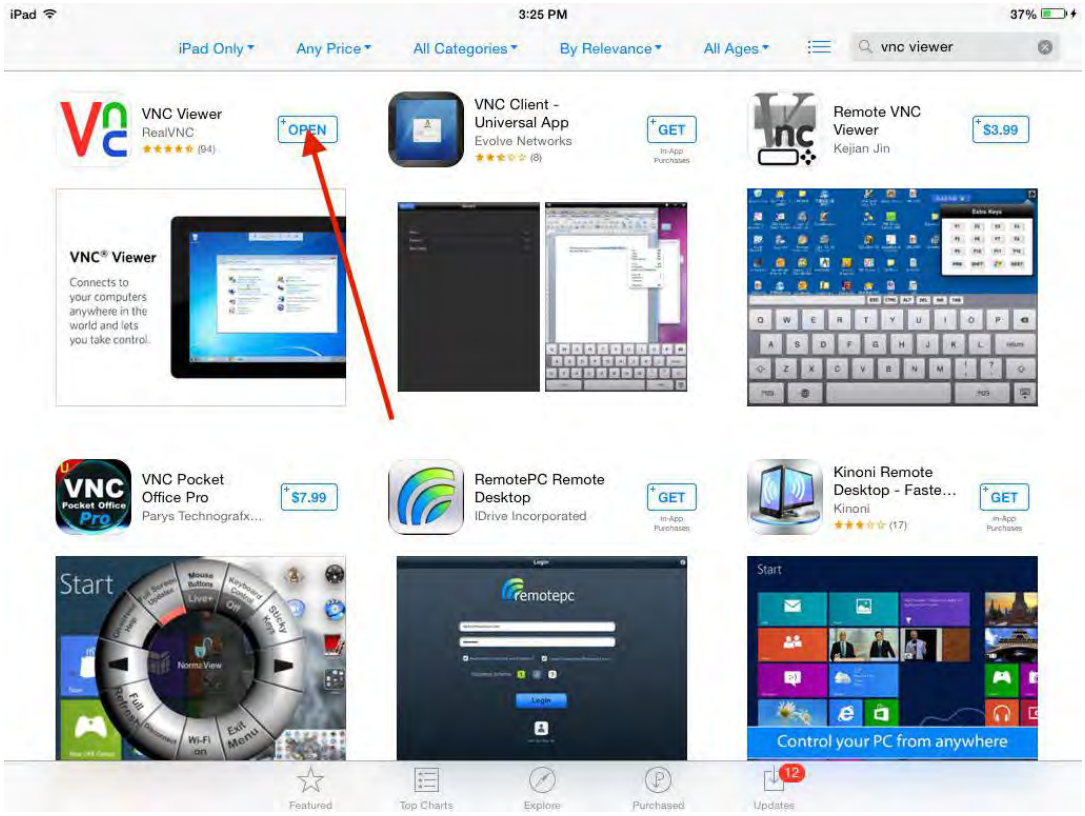
1. Press the green button next to Enable Remote Support



2. In the service menu, press the enable remote support button. Another menu will pop up. Press the start VNC server button, then press ok

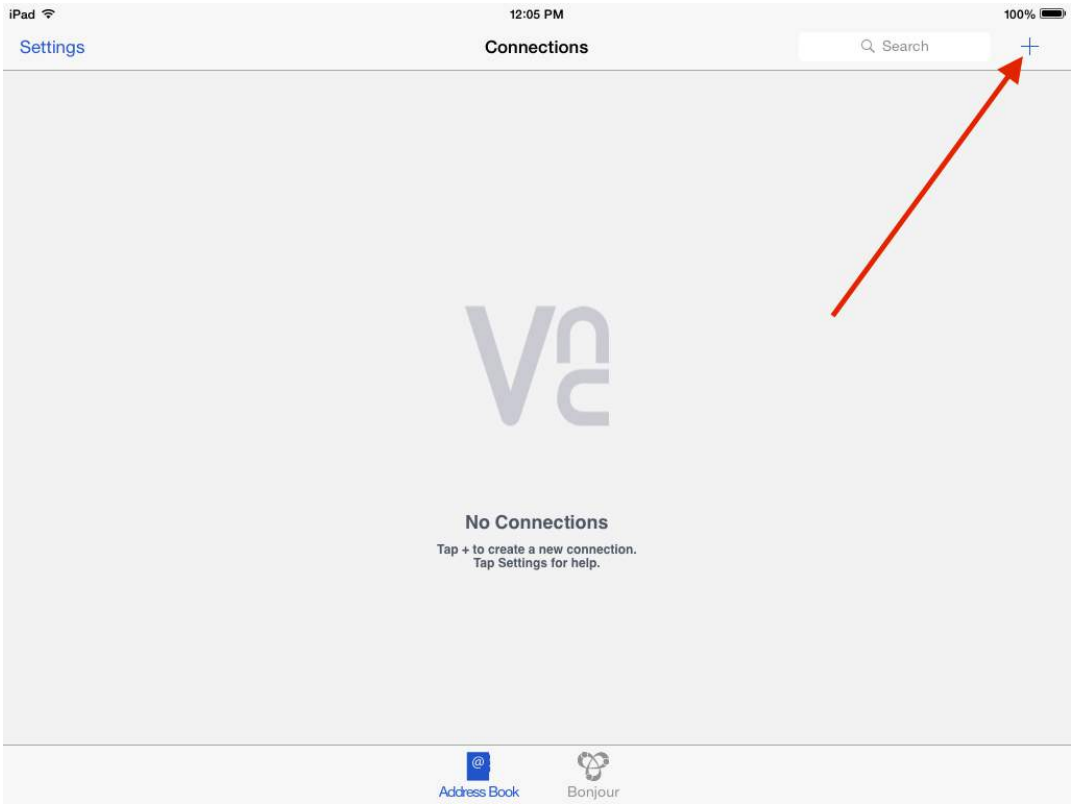


3. Download the Free VNC Viewer app from the app store.

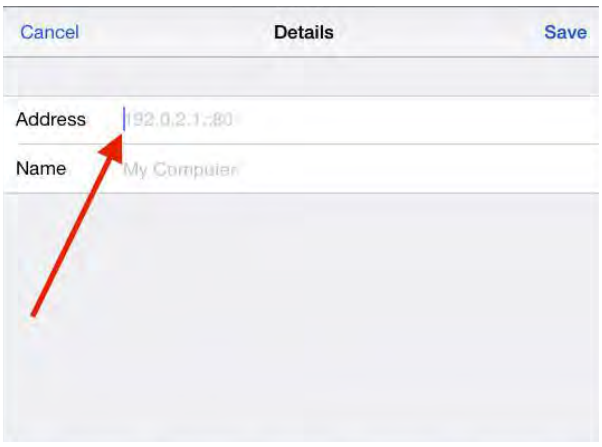


4. Search for the VNC Viewer Icon on you device and open it.

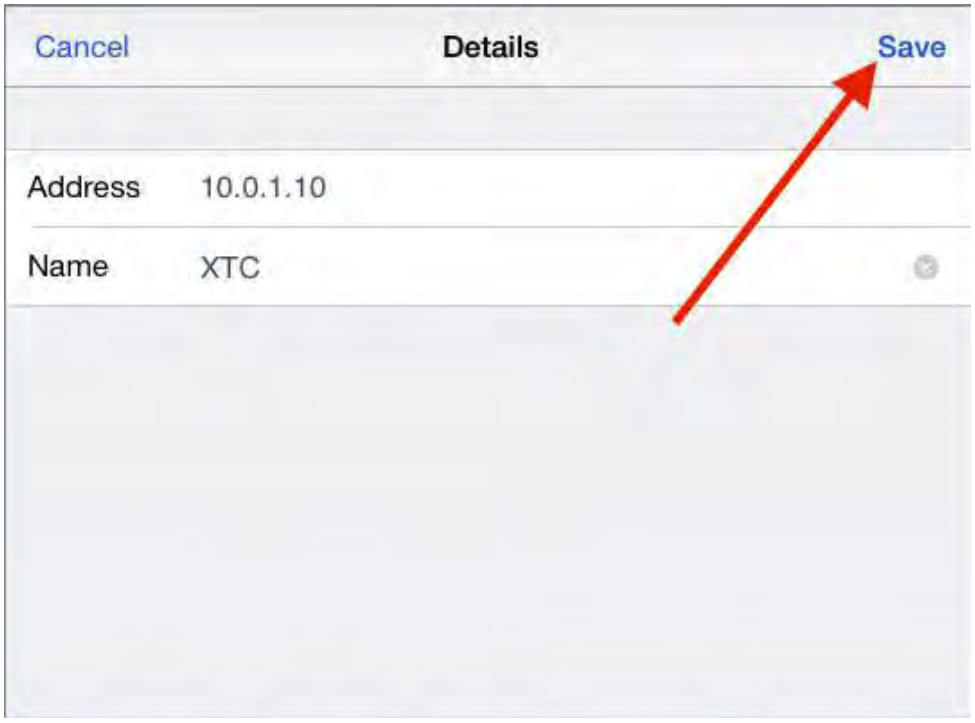
5. Press the plus sign in the upper right hand corner to set up new connection.



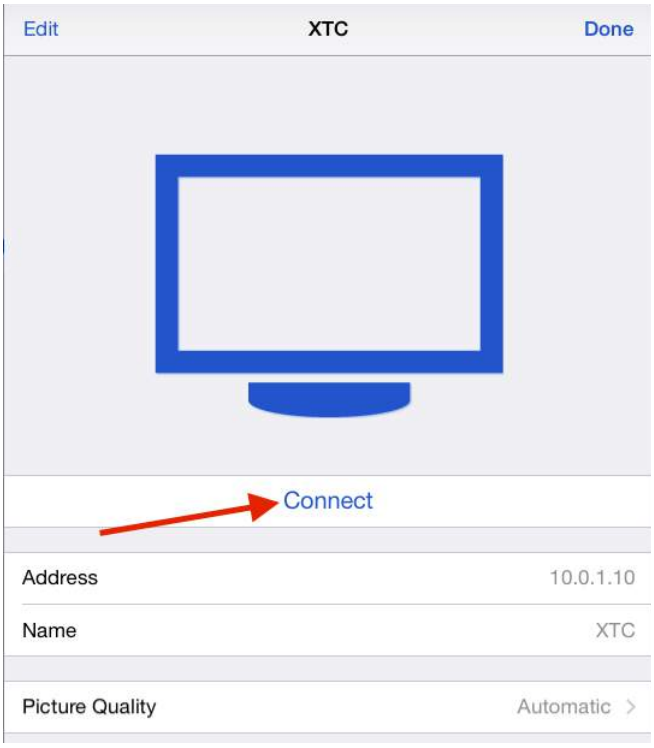
6. Type in the IP Address found in the unit's service menu, in the remote support menu at the bottom of the screen. Then give it a name.



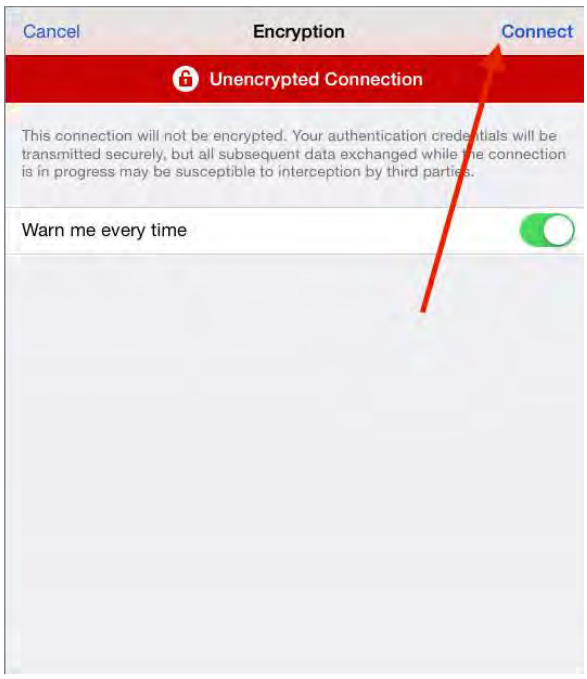
EXAMPLE



7. Next, press the “Connect” button

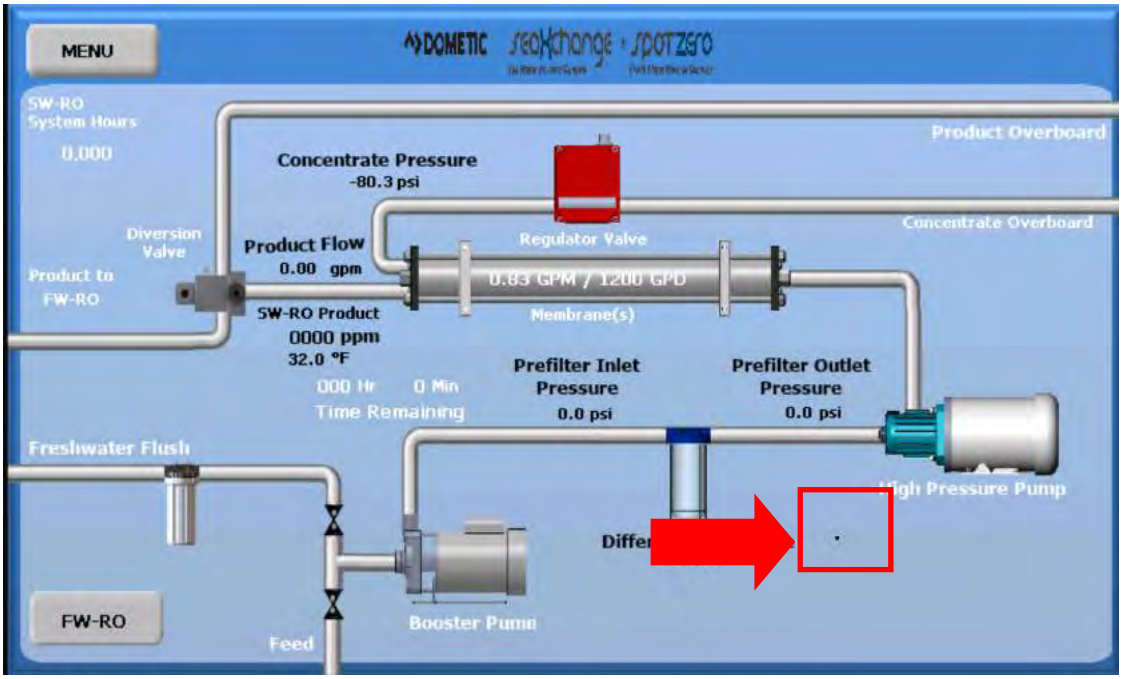


8. The following screen will pop up. Simply press the “Connect” option.

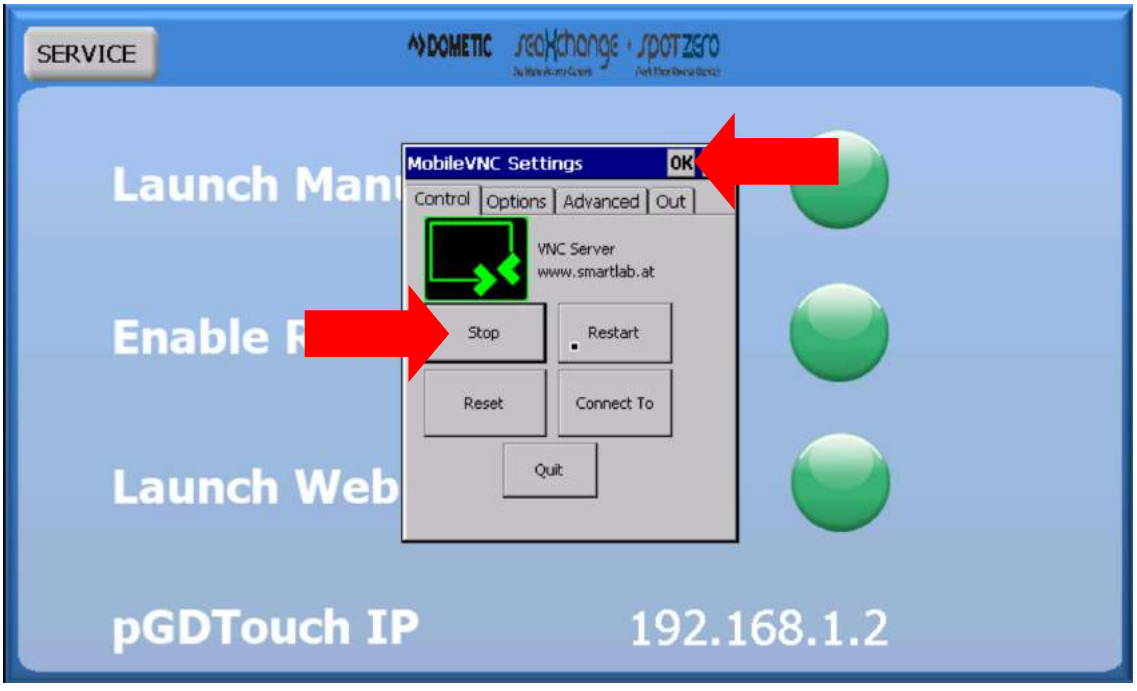


9. Finally it will show you the connecting screen. When it is done connecting you will see the same image on your display and your device

10. In order to browse and navigate the screen on you phone, a small dot will appear. This is a cursor that allows you to select icons and menus. Move the cursor with your finger to an icon you want to press and tap the screen to select it.

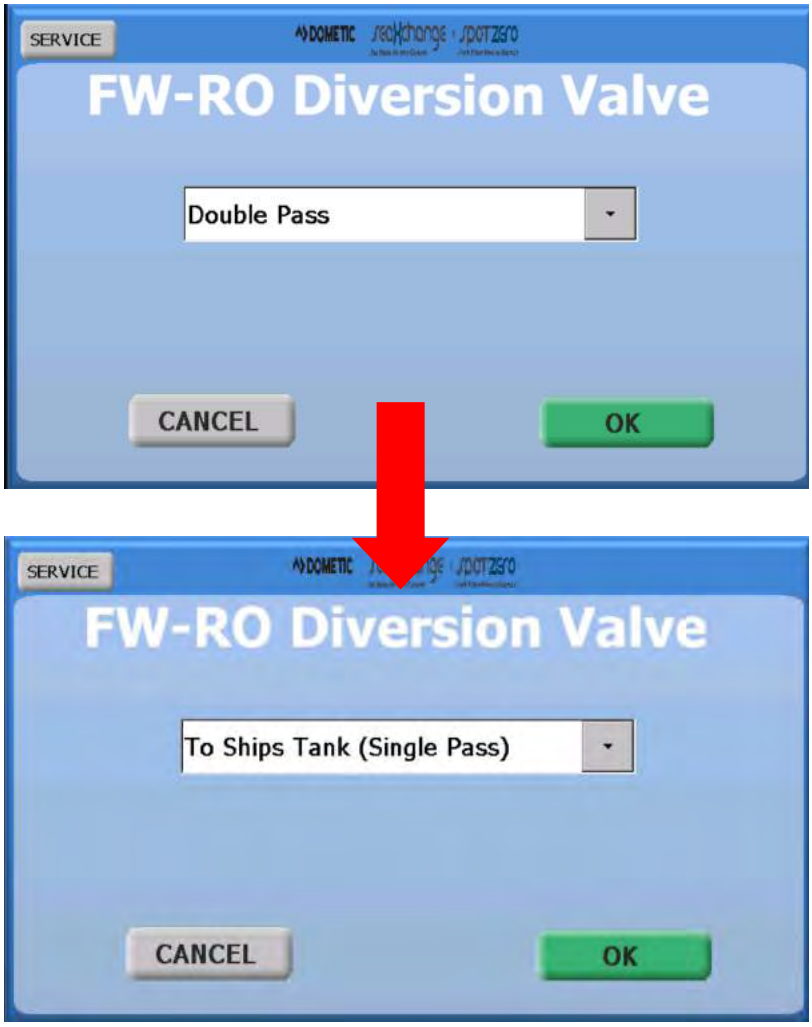


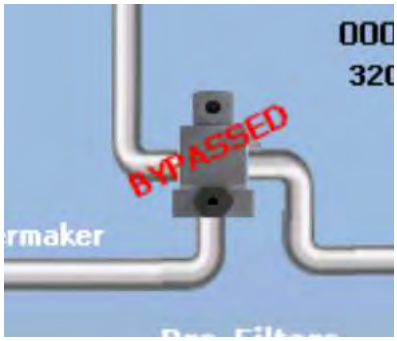
11. If there is a problem connecting, the enable remote support button can be pressed. Another menu will pop up. Select the start VNC server button, and press ok. Try to connect again.



FW-RO DIVERSION VALVE

Pressing this button will give you the option of bypassing the DOUBLE PASS system and sending water directly to the ships tank.

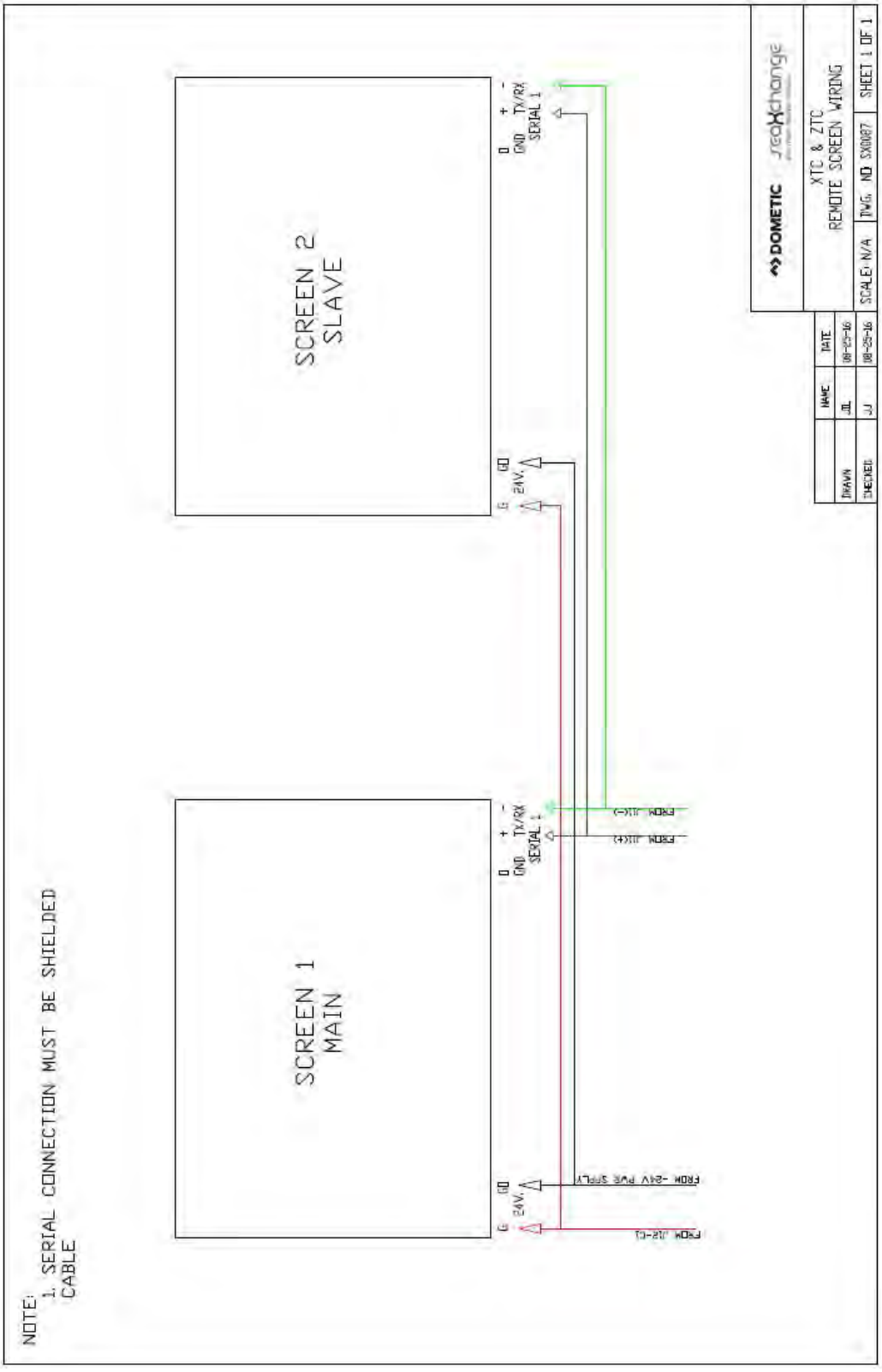




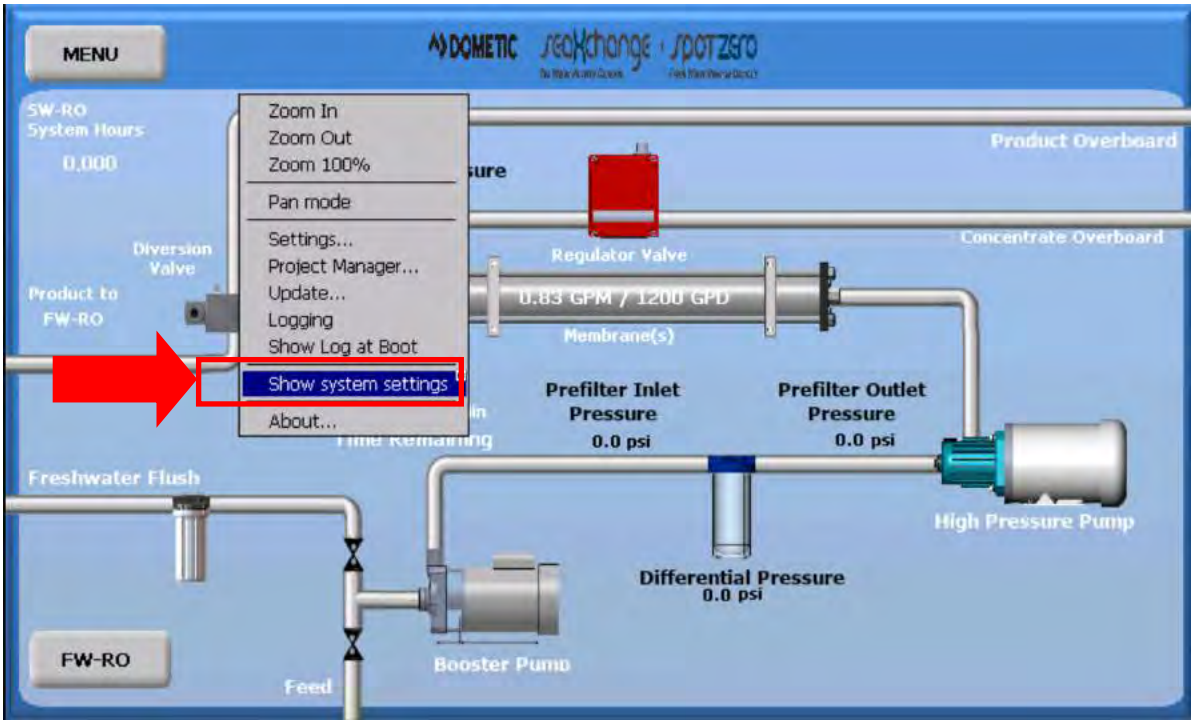
When Single Pass is selected the diversion valve image will be displayed with a text across it that reads “BYPASSED”

REMOTE TOUCH SCREEN SETUP

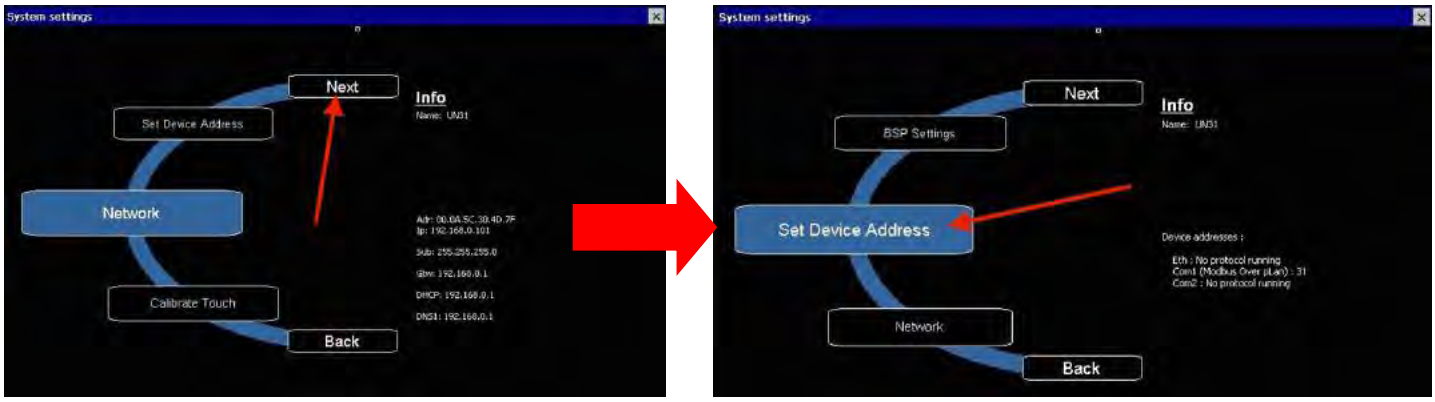
1. Run a 4 conductor cable piggy backed on the power terminal and communication terminal on the display on the unit to the same terminals on the remote display .



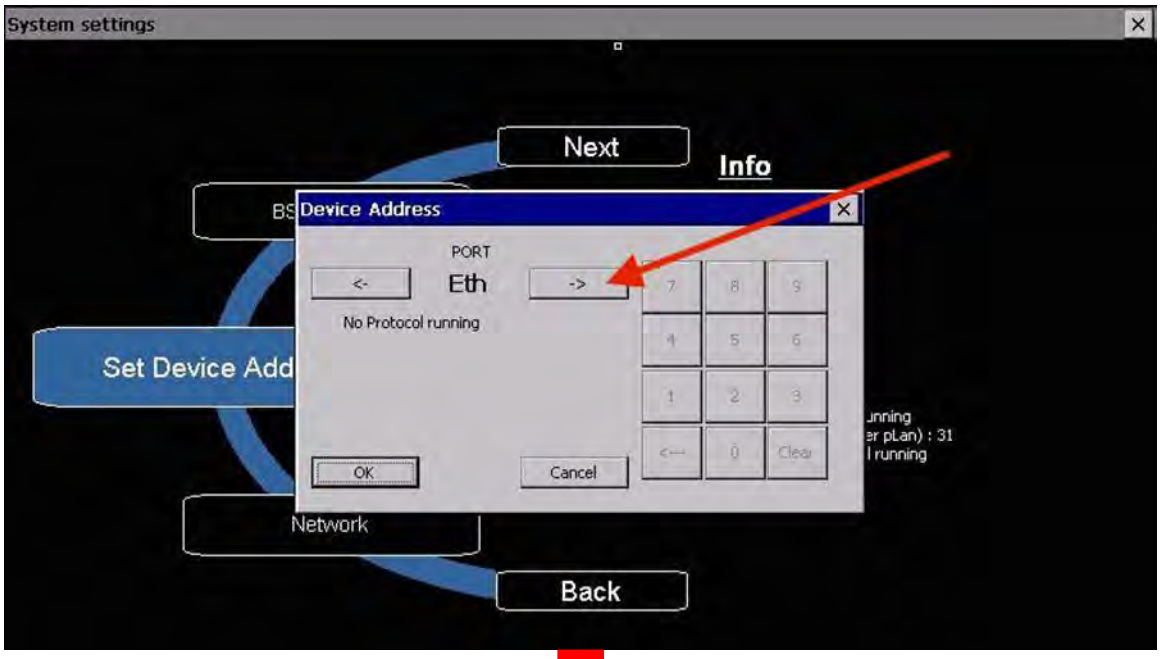
2. Press and hold the screen in a spot that does not bring you to another screen. A hidden menu will pop up. Press the Show System Settings selection.

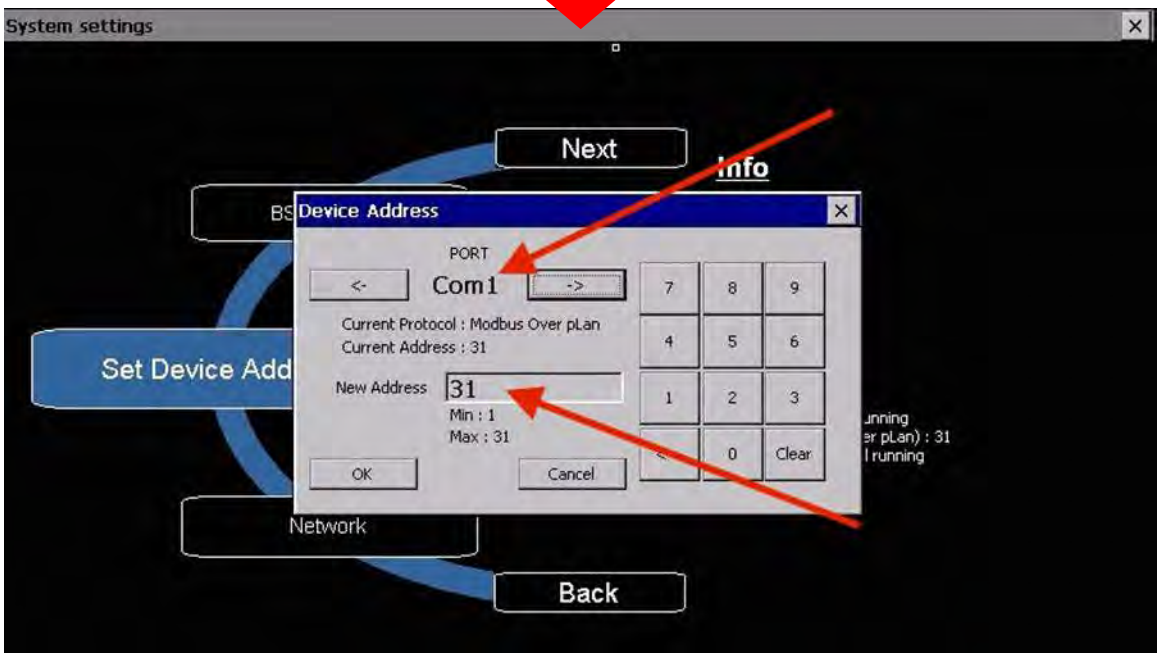


3. Press the “Next” button until Set Device Address is highlighted. Then press “Set Device Address”.

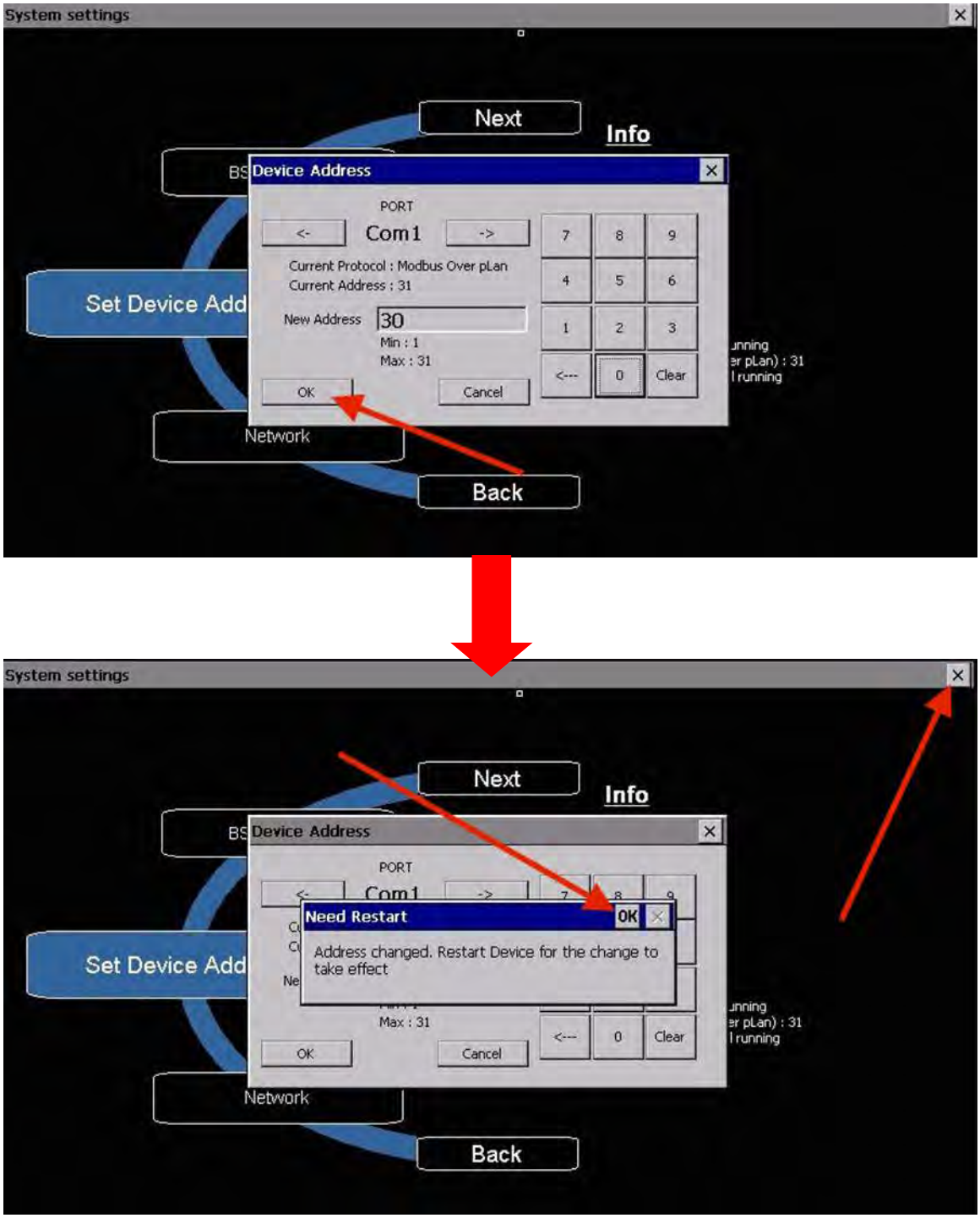


4. Press the Port selection button to select “COM 1”. You will see it set for address 31. Press the box that has the 31 in it and change it to 30.





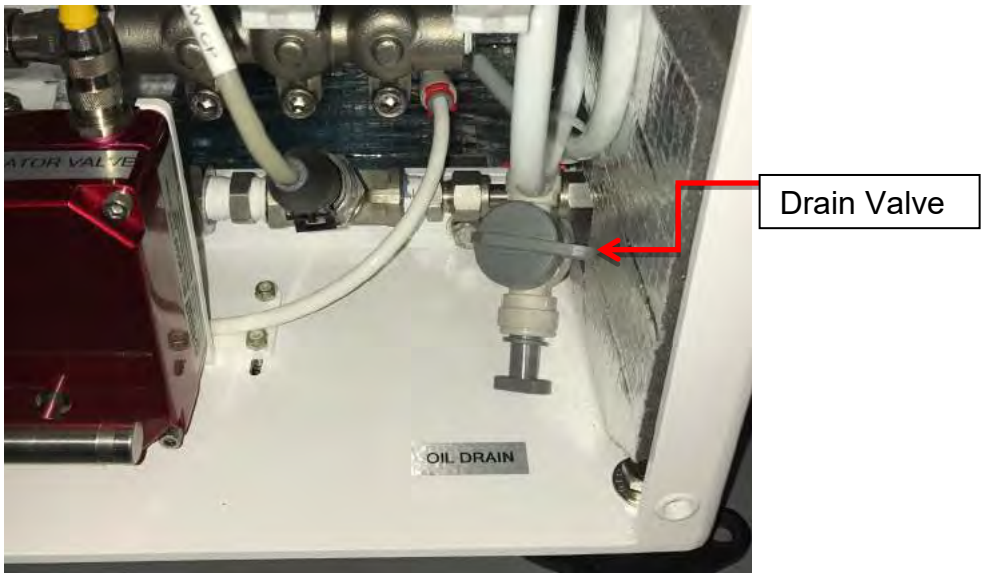
5. Press “ok”. You will then be instructed to cycle the power of the unit for the changes to take effect. Press “ok”, then “x” out of the screen and cycle the power to the machine. Now the display should be functioning correctly.



HIGH PRESSURE PUMP OIL CHANGE

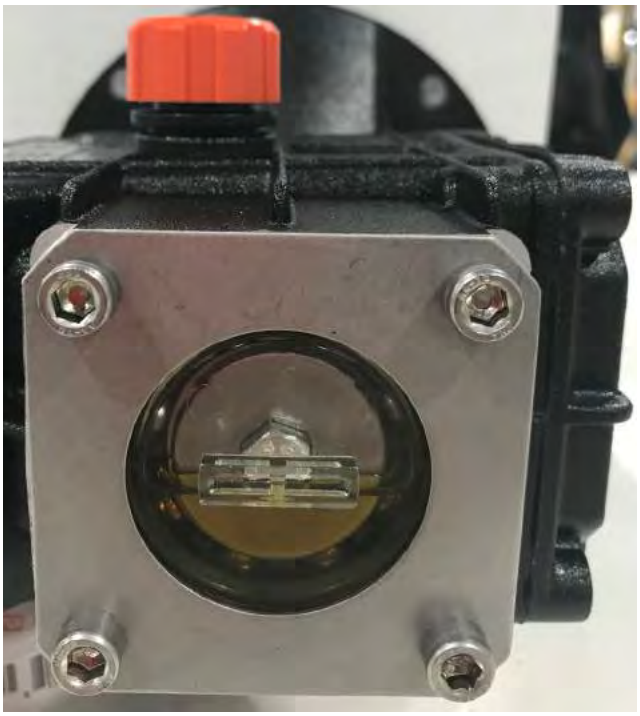
OIL CHANGE STEPS

1. Run unit for 30 minutes prior to draining oil
2. Drain the oil out of the pump by opening the oil drain valve. Dispose of oil properly.



3. Close the drain valve on the high pressure pump drain.
4. Locate and remove oil fill cap.

5. Fill oil above the center of sight glass not exceeding the very top of the site glass. (refer to picture below)



6. Screw fill cap back onto top of high pressure pump

NOTE: OIL LEVEL CAN ONLY BE CHECKED WITH THE UNIT NOT RUNNING

ABNORMAL PRODUCT FLOW

As time progresses, the efficiency of the membrane will be reduced. In general, the salt rejection does not change significantly until two or three years after installation when operated on properly pretreated feed water. The product flow rate will begin to decline slightly after one year of operation, but can be extended with fresh water flushing of the system. A high pH and/or precipitation of hardness can cause premature loss in rejection.

Product flow should be within 20% of the rated production, after correcting the feed water temperatures above or below 77°F. Check your product flow meter to determine the product flow rate.

NOTE: TO DETERMINE THE TEMPERATURE CORRECTION FACTOR, LOCATE THE TEMPERATURE CORRECTION TABLE IN THIS USER'S MANUAL ON PAGE 41 AND FOLLOW THE DIRECTIONS.

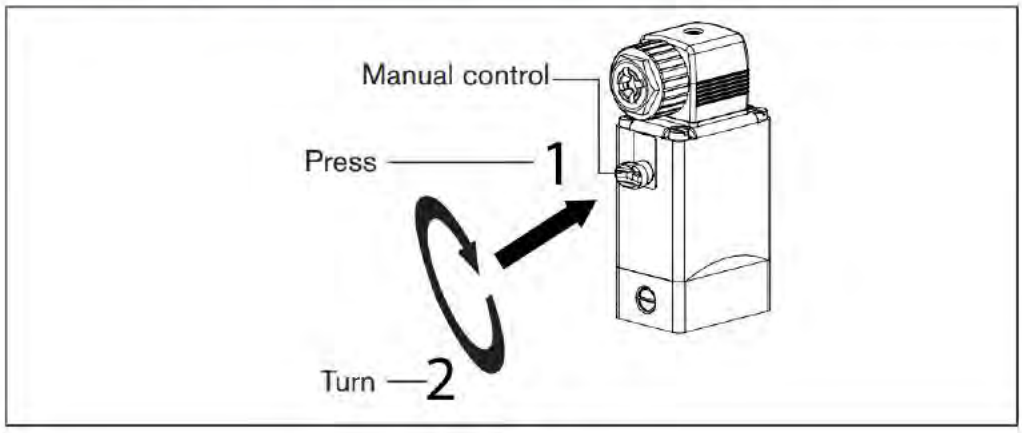
DIVERSION VALVE

BY-PASS

If the electrical portion of the solenoid fails or the controller fails to energize the solenoid, a manual bypass on the diversion valve may be utilized if the product water is found to be acceptable. Refer to picture below and the Diversion Valve Manual on page 138.

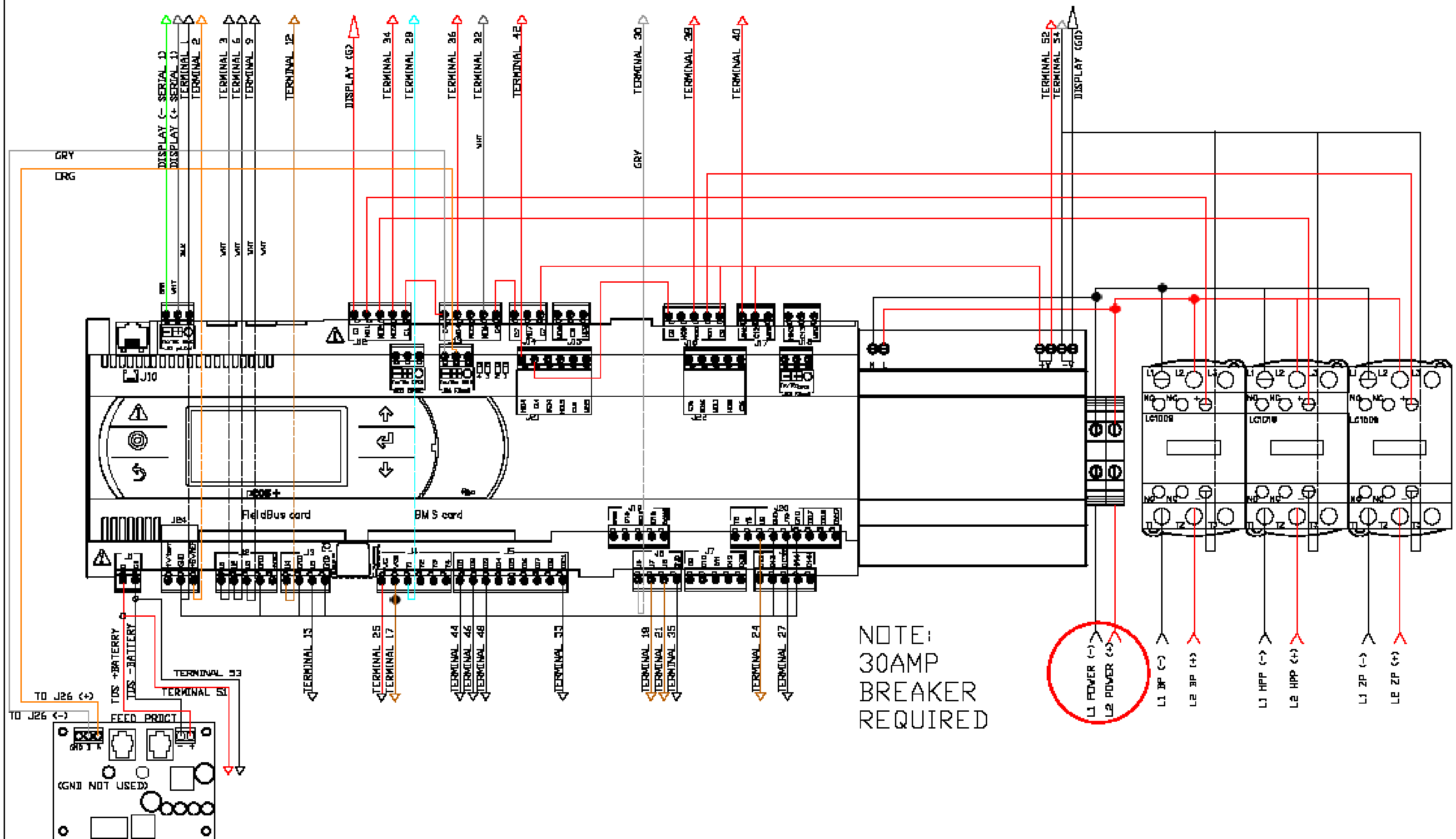
NOTE!

- When the manual control is locked, the valve cannot be actuated electrically.



XZ

SYSTEM SCHEMATICS



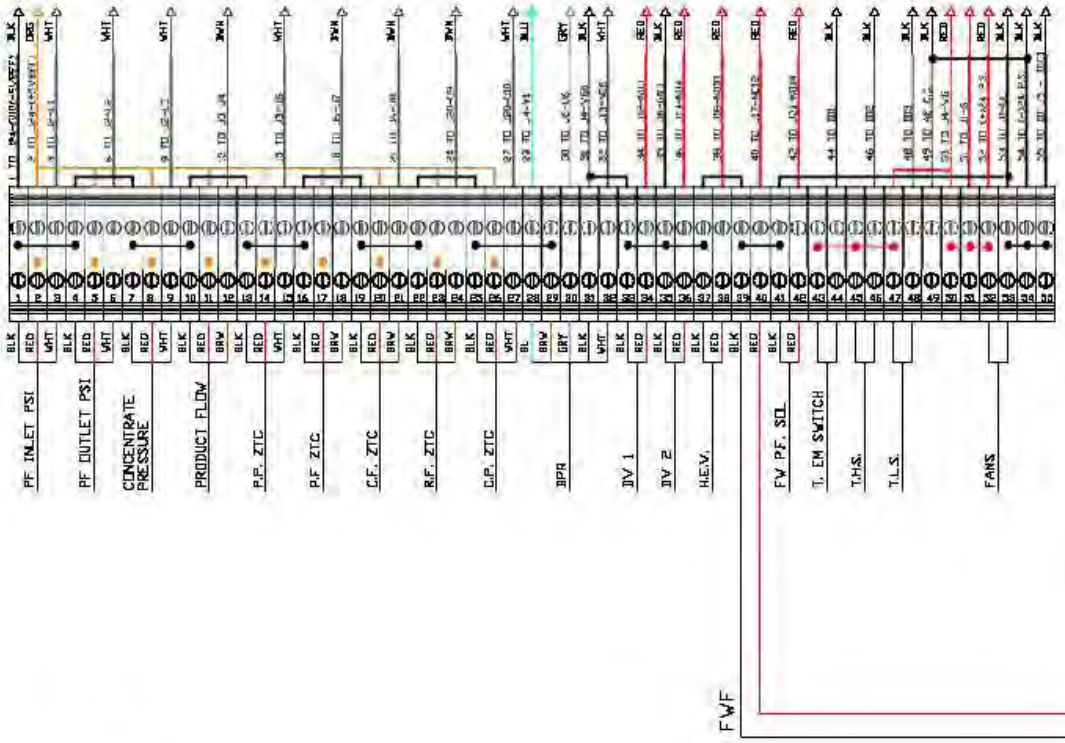
DOMETIC seaXchange · spotzero

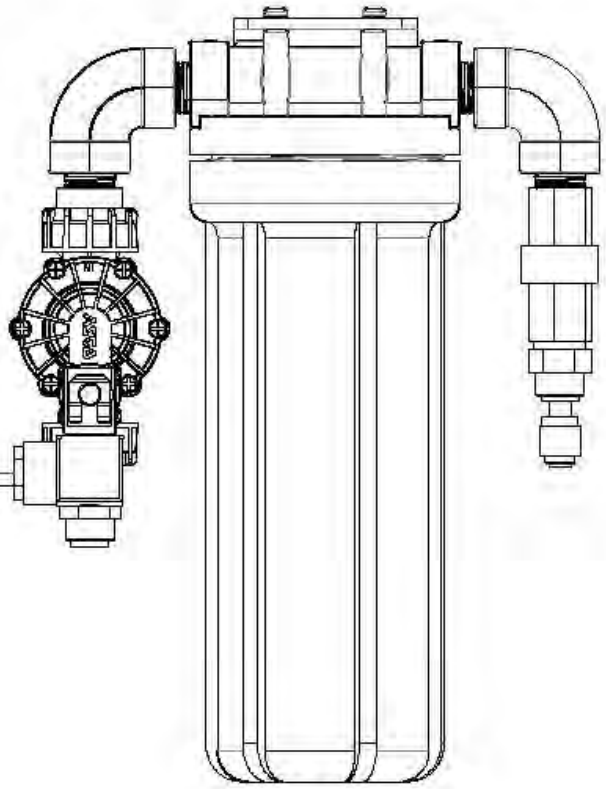
XZ WIRING DIAGRAM
DETAIL 1

	NAME	DATE
DRAWN	JJL	03-06-17
CHECKED	JJ	08-06-14

SCALE: N/A	DWG. NO: SX0034.	SHEET 1 OF 2

DOMETIC
seaXchange
spotZero
XZ WIRING DIAGRAM
DETAIL 2
SCALE: N/A
DWG. NO: SX00034
SHEET 2 OF 2
NAME
DATE
DRAWN
JJL
03-06-17
CHECKED
JJ
08-06-14
PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPOT ZERO. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPOT ZERO IS PROHIBITED.
PF INLET PSI
PF OUTLET PSI
CONCENTRATE PRESSURE
PRODUCT FLOW
P.P. ZTC
P.F. ZTC
C.F. ZTC
R.F. ZTC
C.P. ZTC
BPR
DV 1
DV 2
H.E.V.
FWF
FW P.F. SOL
T. EM SWITCH
T.H.S.
T.L.S.
FANS
1 TO J24-GND(-SVREF) BLK
2 TO J24-(+5VREF) ORG
3 TO J2-U1 WHT
6 TO J2-U2 WHT
9 TO J2-U3 WHT
12 TO J3-U4 BRN
15 TO J3-U6 WHT
18 TO J6-U7 BRN
21 TO J6-U8 BRN
24 TO J20-U9 BRN
27 TO J20-U10 WHT
28 TO J4-Y1 BLU
30 TO J6-U6 GRY
31 TO J4-VG0 BLK
32 TO J13-NO6 WHT
34 TO J12-NO3 RED
35 TO J6-GND BLK
36 TO J13-NO4 RED
38 TO J16-NO10 RED
40 TO J17-NO12 RED
42 TO J21-NO14 RED
44 TO I01 BLK
46 TO I02 BLK
48 TO I03 BLK
50 TO J4-VG RED
51 TO J1-G
52 TO (+)24 P.S. RED
53 TO J1-G0 BLK
54 TO (-)24 P.S. BLK
55 TO I0 J5 - I0C1 BLK





INSTRUCTIONS:

1. REMOVE TOP FRONT COVER FROM XZ.
2. LOCATE THE TERMINAL BLOCK.
3. INSERT WIRES FROM FWF SYSTEM INTO TERMINAL 39 AND 40 OF THE TERMINAL BLOCK.
4. TIGHTEN THE BOLTS OF THE BLOCK TO SECURE THE WIRES IN PLACE.
5. SYSTEM SHOULD NOW FLUSH FRESH WATER AUTOMATICALLY AFTER EVERY USE.

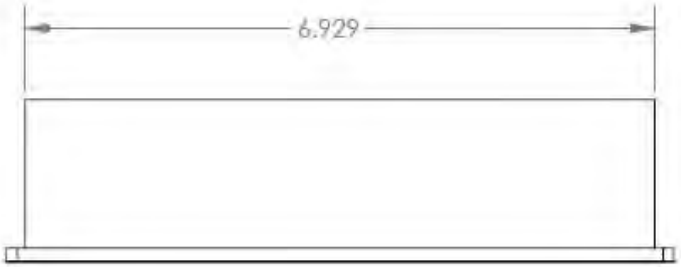
	NAME	DATE
DRAWN	JIL	02-20-17
CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

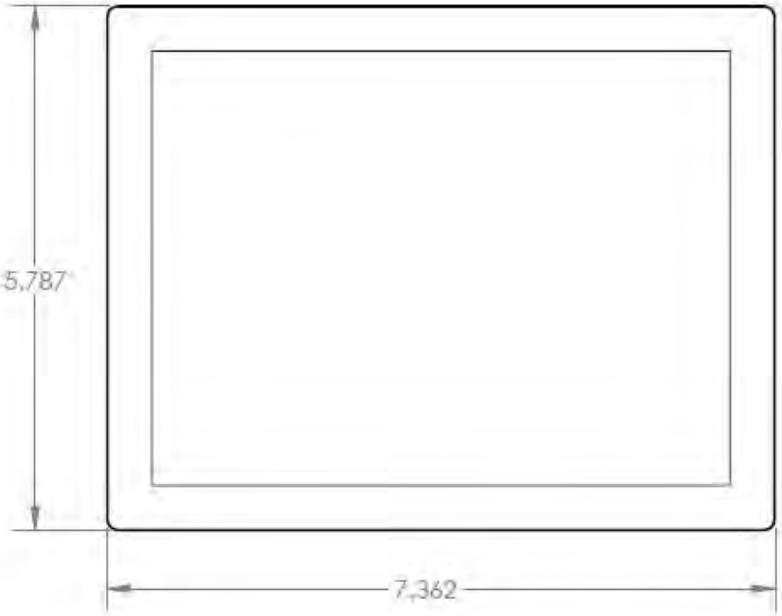
UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES: ±.015
FRACTIONAL ±1/32
ANGULAR: MACH ±1/2 BEND ±1
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005

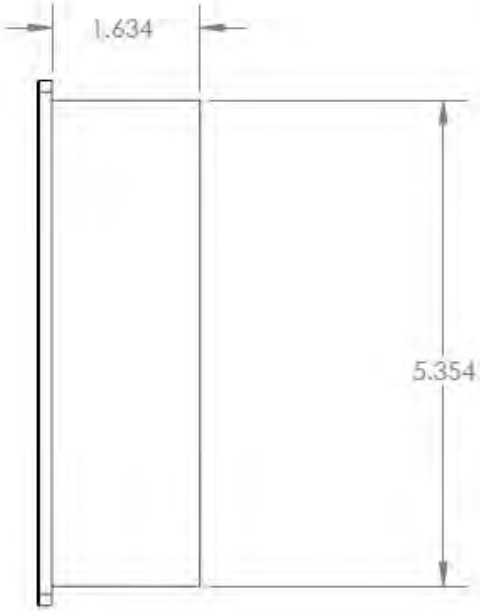
DOMETIC seaXchange

XZ
FWF WIRING SCHEMATIC

SCALE: N/A | DWG. #:SX0135 | SHEET 1 OF 1







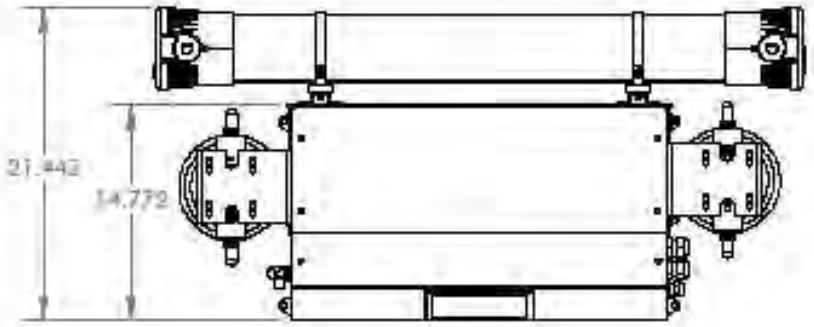
		NAME	DATE
	DRAWN	JIL	12-14-15
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ±.015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

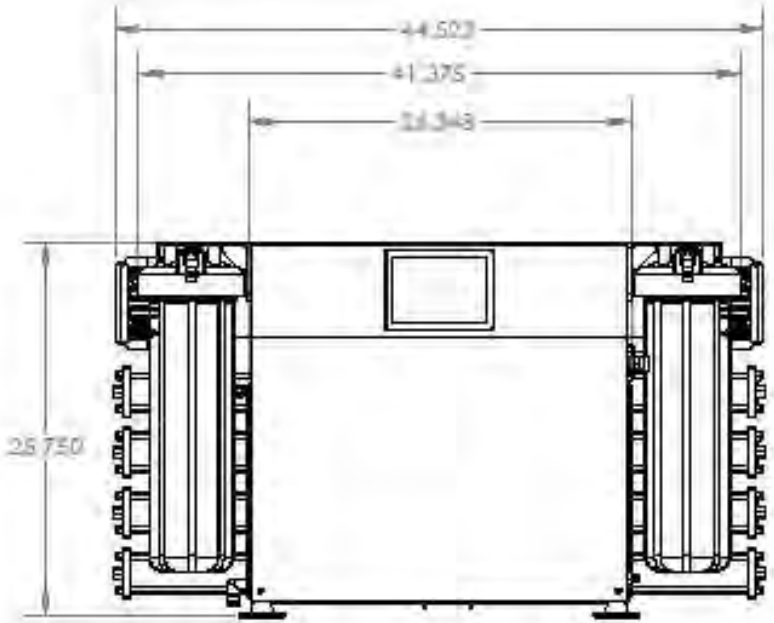
DOMETIC seaXchange

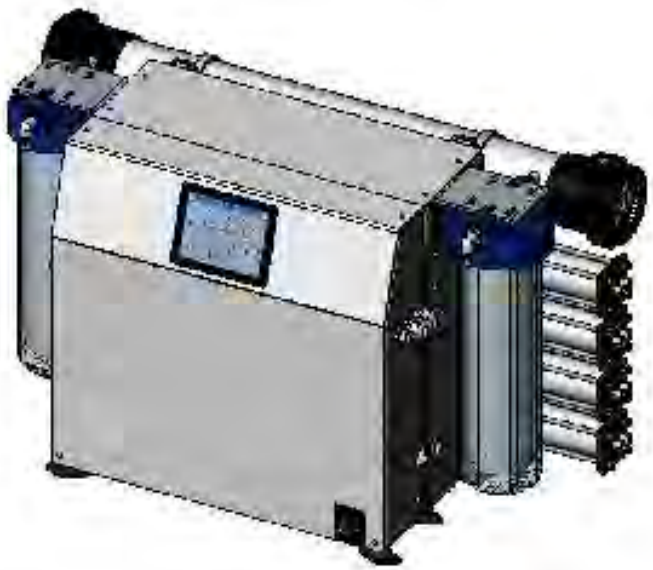
SEA XCHANGE
TOUCH SCREEN CONTROL

SCALE: 1:2 | DWG. #: SX0071 | SHEET 1 OF 1

XZ
SYSTEM
SPECIFICATIONS







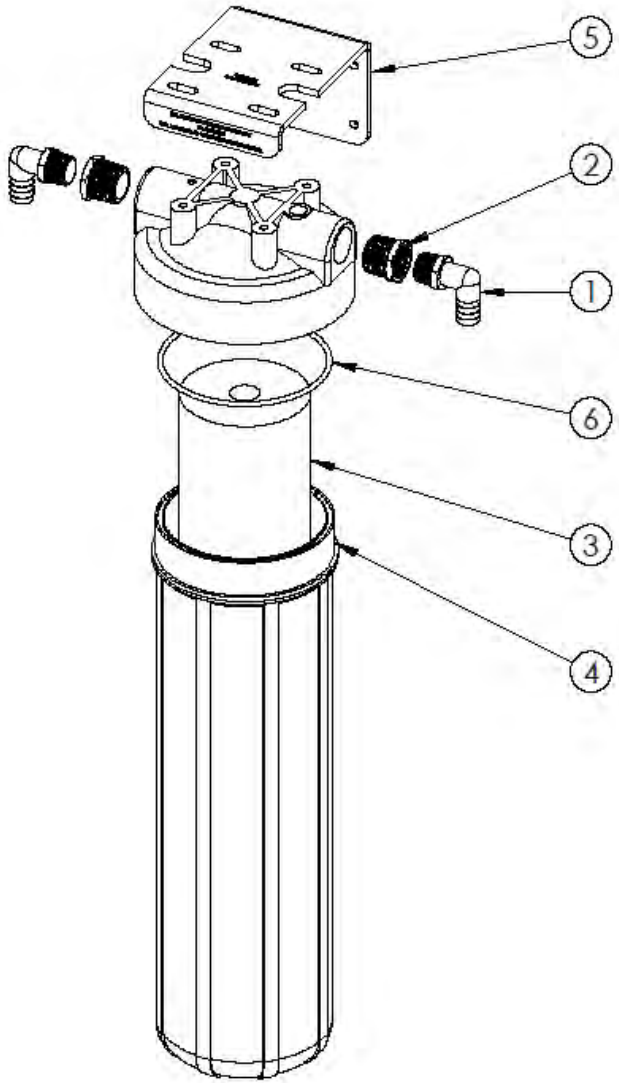
		NAME	DATE
	DRAWN	JE	05-11-16
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ±.015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

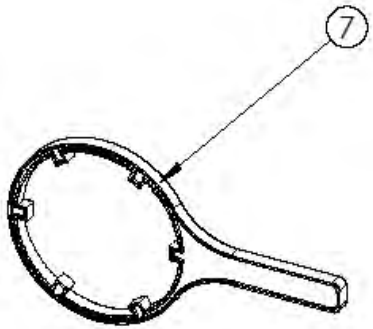
DOMETIC | seaXchange | spotzero

XZ 2200/2000
2200 GPD SEA WATER
2000 GPD FRESH WATER

SCALE: N/A | DWG. #: SX0073 | SHEET 1 OF 3

ITEM #	PART #	DESCRIPTION
1	252404882	Hose Barb Elbow 3/4 Barb x 3/4 MPT"" 316SS
2	252404883	Hex Bushing, 1 X 3/4 IN, Threaded, 316SS
3	252404298	Sea Xchange High Capacity Sediment
4	252404323	4.5 X 20 Blue/Clear Housing w/ PR
5	252404880	4.5 x 10 Single Pre Filter Bracket-Sea Xchange
6	252404303	O-RING FOR 4.5 X 20 CLEAR HOUSING
7	252404327	4.5" Wrench for Clear Housing



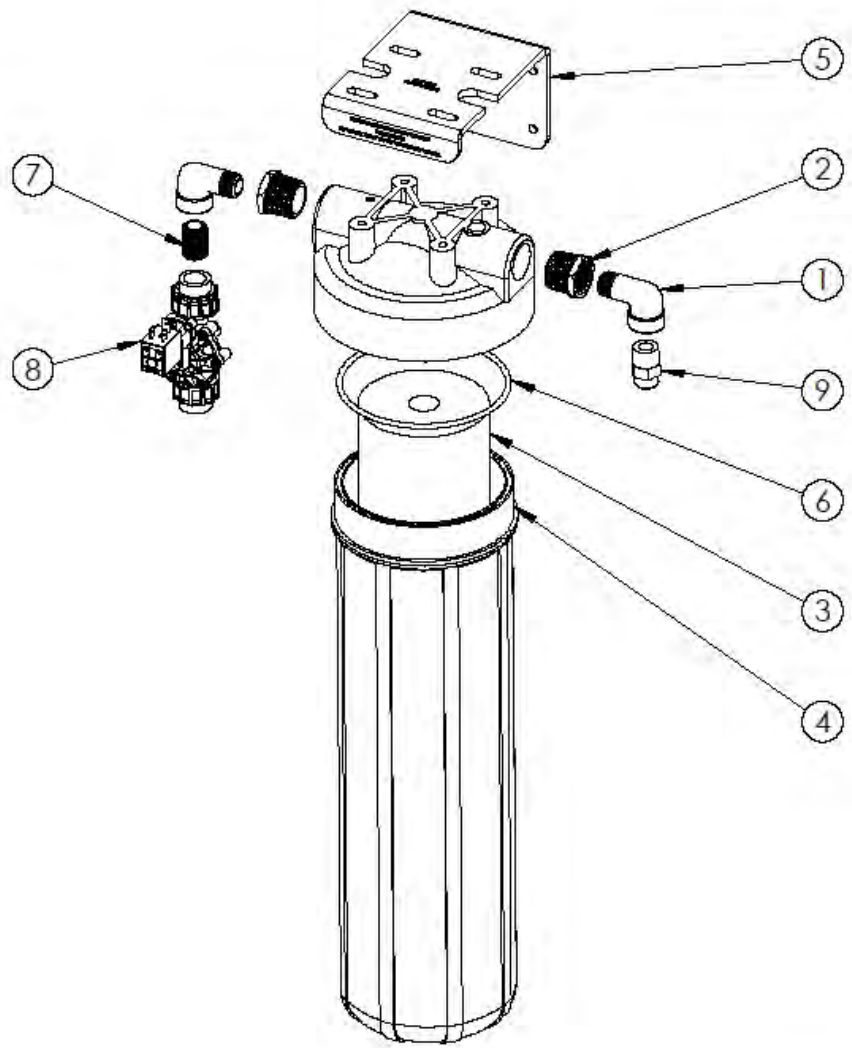


		NAME	DATE
	DRAWN	JIL	06-15-17
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ± .015 FRACTIONAL ± 1/32 ANGULAR: MACH ± 1/2 BEND ± 1 TWO PLACE DECIMAL ± .010 THREE PLACE DECIMAL ± .005	ENG APPR.		
	MFG APPR.		
	Q.A.		

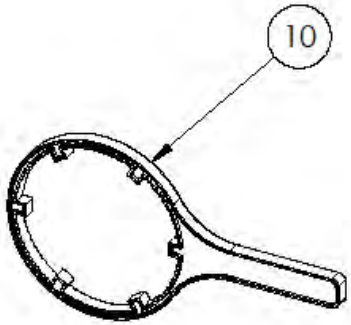
DOMETIC seaXchange

SX HIGH CAPACITY
PRE-FILTER ASSY

SCALE:	DWG.#: SX0141	SHEET 1 OF 1



ITEM #	PART #	DESCRIPTION
1	252404884	1/2" SS STREET 90
2	252404885	Hex Bushing, 1 X 1/2 IN, Threaded, 316SS
3	252404301	Fresh Water Double Stack 4.5x20 Pre-Filter
4	252404323	4.5 X 20 Blue/Clear Housing w/ PR
5	252404881	4.5 x 10 Single Pre Filter Bracket-Spot Zero
6	252404303	O-RING FOR 4.5 X 20 Clear Housing
7	252404851	1/2 SS Threaded Nipple
8	252404860	2-Way SOLENOID 24V 1/2 NPT-NPT
9	252404886	Connector Male 1/2 QC
10	252404327	4.5" Wrench for Clear Housing

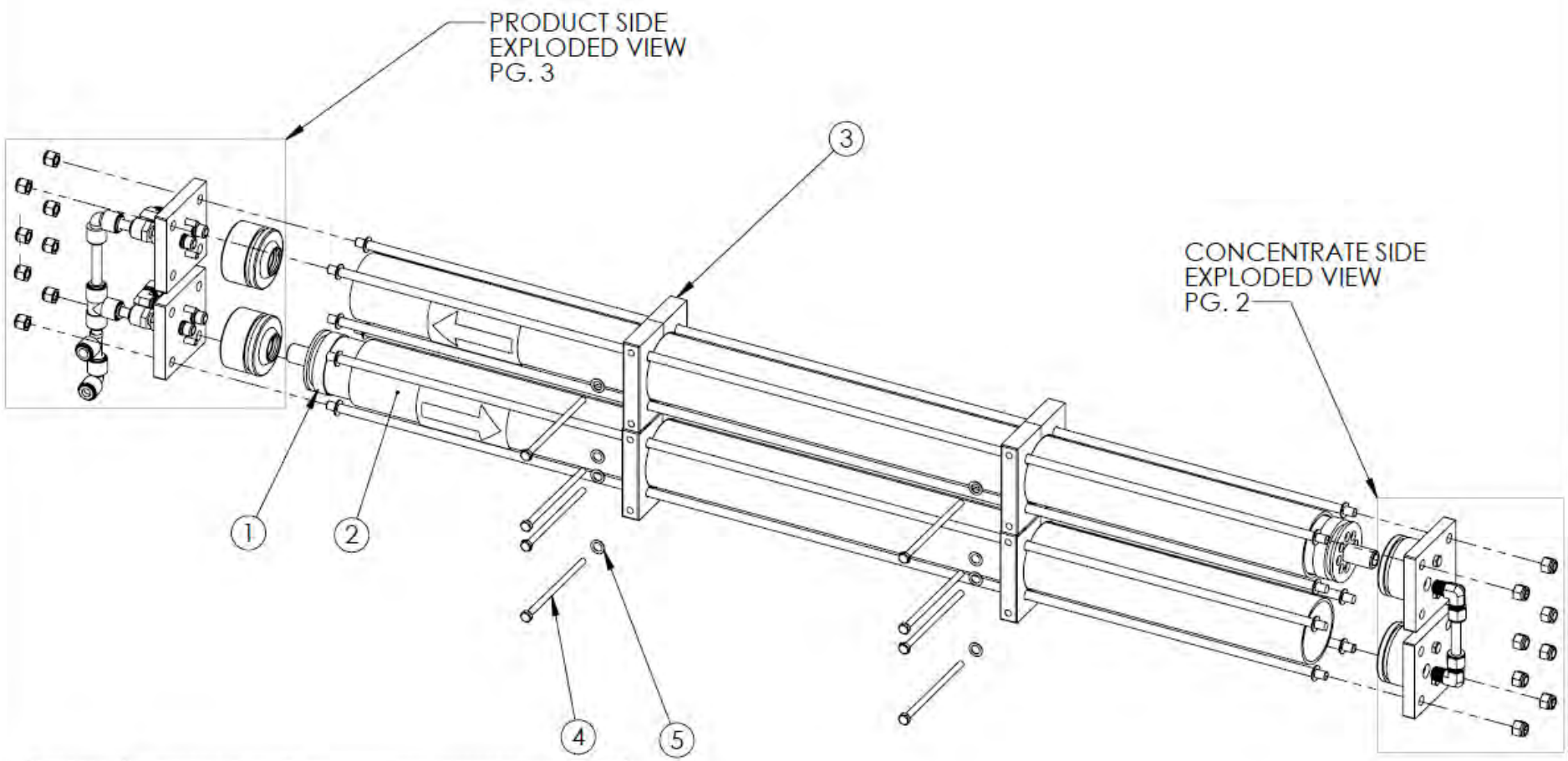


		NAME	DATE
	DRAWN	JIL	06-15-17
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ±.015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

DOMETIC seaXchange

SZ HIGH CAPACITY
PRE-FILTER ASSY

SCALE: 1:12 | DWG.#: SX0142 | SHEET 1 OF 1



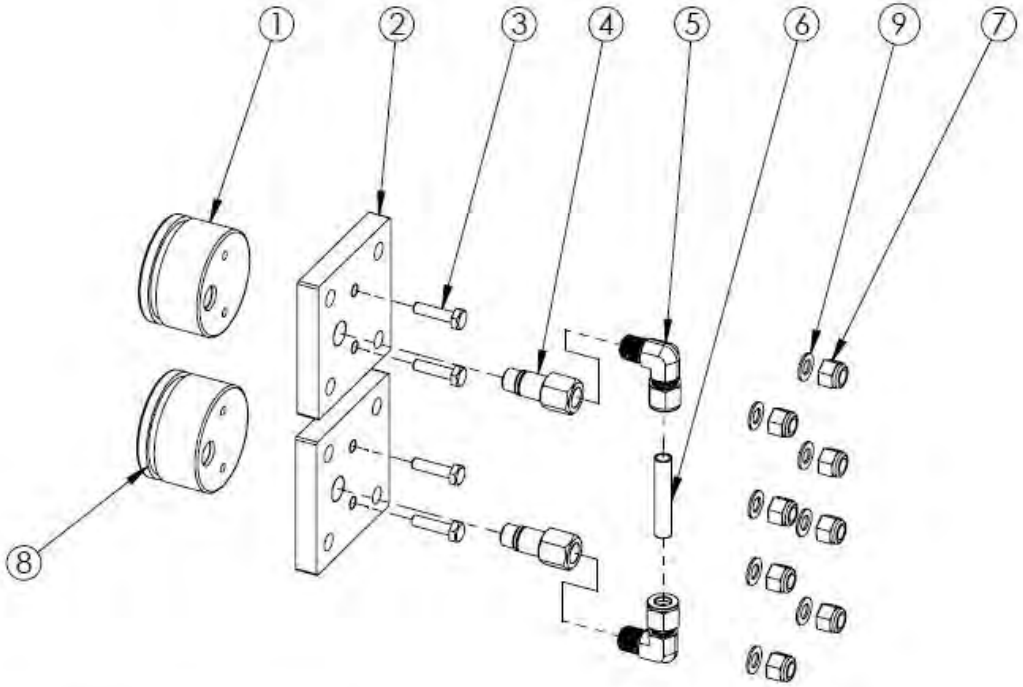
ITEM #	PRODUCT #	DESCRIPTION
1	252404179	SW MEMBRANE 40" LONG
2	252404312	SW PRESSURE VESSEL 40" LONG
1	252404178	SW MEMBRANE 20" LONG
2	252404281	SW VESSEL 20" LONG
3	252404868	MEBRANE MOUNTING BLOCK
4	252404869	1/4-20 X 5 HEX BOLT
5	252404870	1/4 WASHER

		NAME	DATE
	DRAWN	JIL	03-22-17
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ± .015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

DOMETIC | seaXchange

SEA XCHANGE
VESSEL EXPLODED VIEW

SCALE: 1:16	DWG. #: SX0105	SHEET 1 OF 3



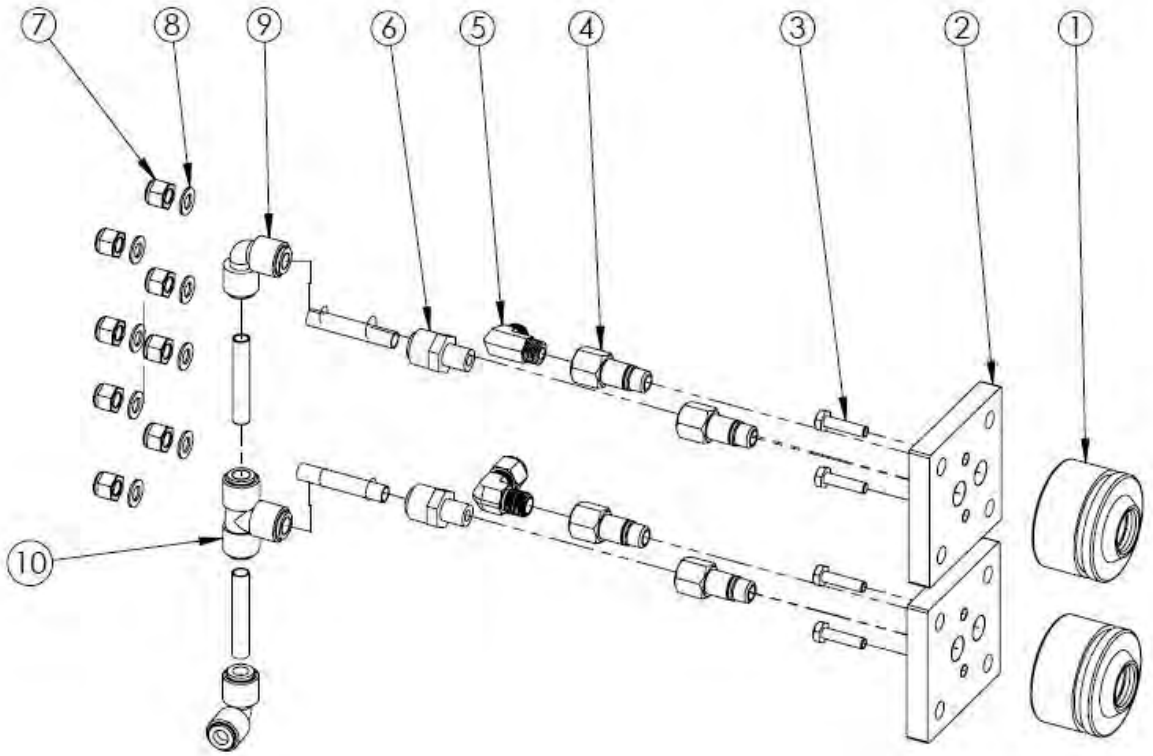
ITEM #	PRODUCT #	DESCRIPTION
1	252404814	END PLUG ONE PORT
2	252404815	BEARING PLATE ONE PORT
3	252404816	1/4-20 X BOLT SET OF 4
4	252404817	HEX PORT
5	252404818	1/4MNPT X 3/8 COMP. ELBOW SS
6	252404868	3/8 SS S HP TUBING FOR CONC. SIDE 3" LONG
7	252404819	3/8-16 LOCK NUT SET OF 8
8	252404820	END PLUG O-RING
9	252404821	1/4 SS WASHER

		NAME	DATE
	DRAWN	JILI	01-26-17
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ±.015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

DOMETIC seaXchange

CONCENTRATE SIDE PARTS

SCALE: 1:16 | DWG. #SX0105 | SHEET 2 OF 4



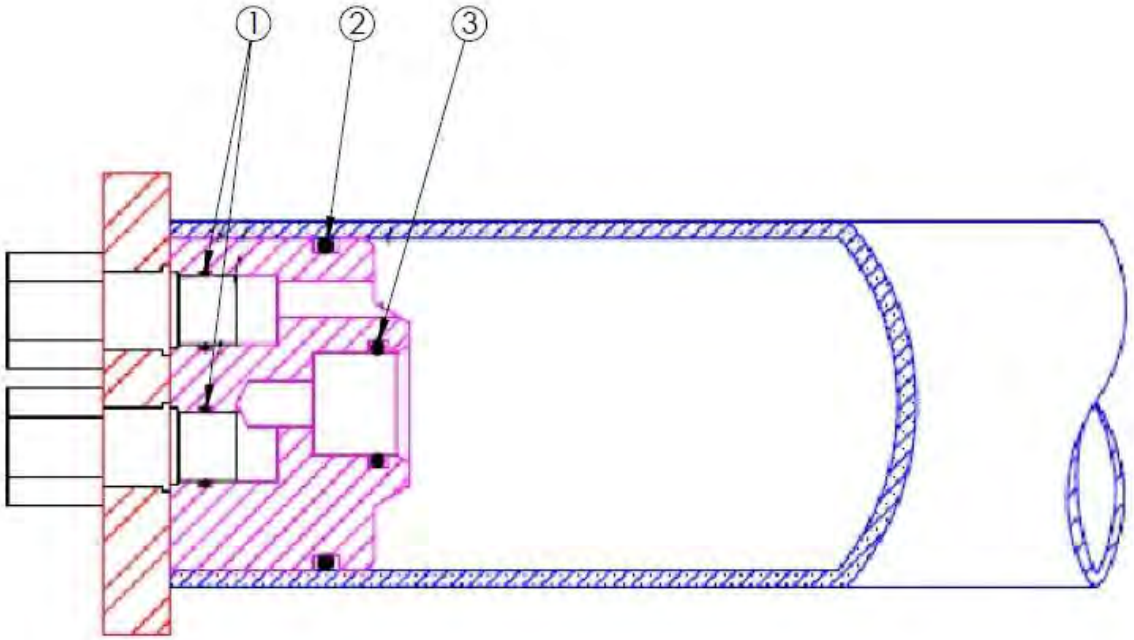
ITEM #	PRODUCT #	DESCRPITION
1	252404822	END PLUG TWO PORT
2	252404823	TWO PORT BEARING PLATE
3	252404816	1/4-20 X BOLT SET OF 4B1
4	252404817	HEX PORT
5	252404274	1/4MNPT X 3/8 FLARE ELBOW SS
6	252404125	1/4MNPT X 3/8QC ACETAL
7	252404819	3/8-16 LOCK NUT SET OF 8
8	252404821	3/8 WASHERS SET OF 8
9	252404824	3/8QC X 3/8QC ELBOW ACETAL
10	252404825	3/8QC TEE ACETAL

		NAME	DATE
	DRAWN	JIL	01-26-117
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ±.015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

DOMETIC seaXchange

PRODUCT SIDE PARTS

SCALE: N/A | DWG.#: SX0105 | SHEET 3 OF 4



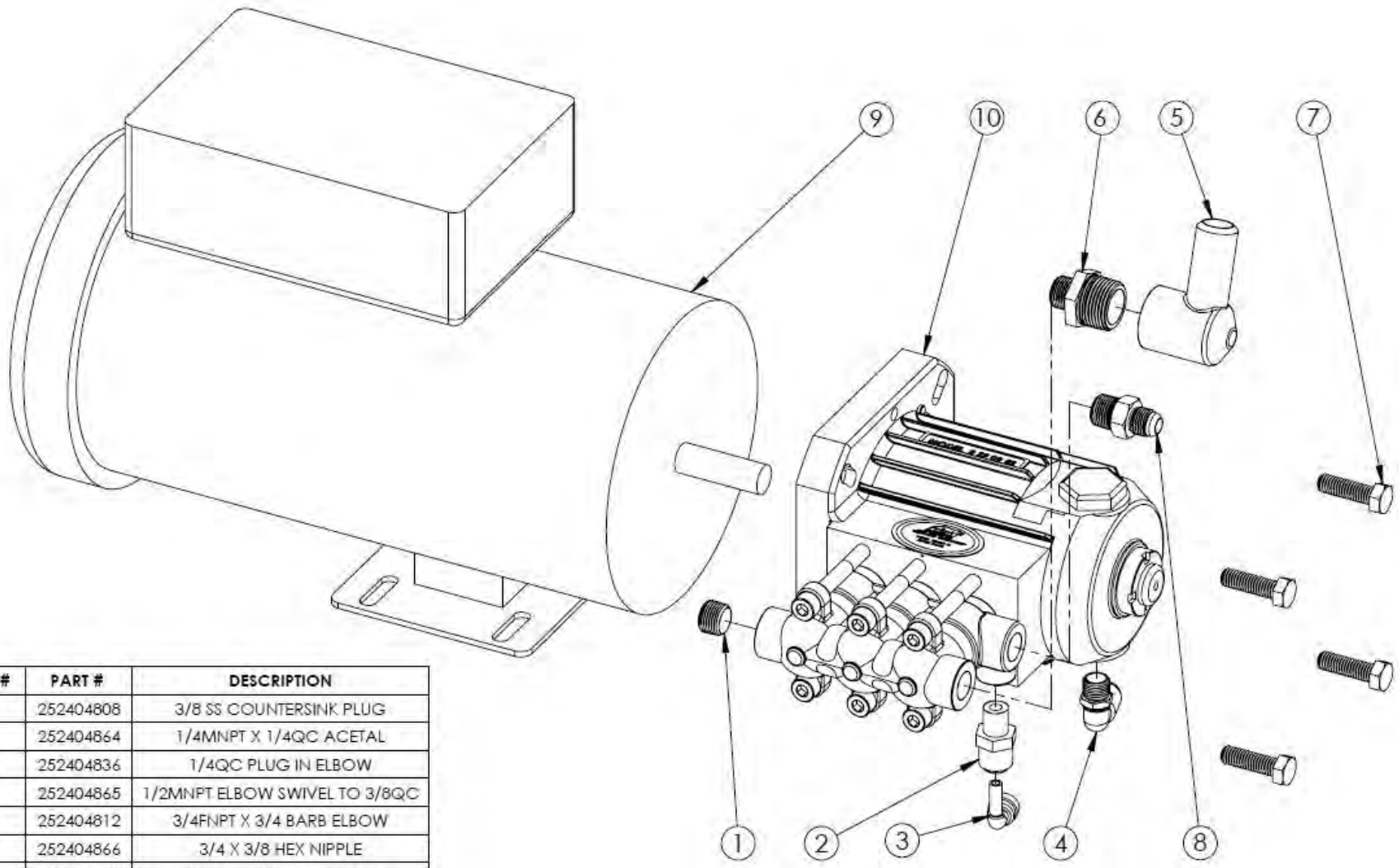
ITEM #	PART #	DESCRIPTION
1	252404826	PORT SEAL O-RING
2	252404827	END PLUG SEAL O-RING
3	252404828	HUB SEAL O-RING

		NAME	DATE
	DRAWN	JIL	01-26-17
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ± .015 FRACTIONAL ± 1/32 ANGULAR: MACH ± 1/2 BEND ± 1 TWO PLACE DECIMAL ± .010 THREE PLACE DECIMAL ± .005	ENG APPR.		
	MFG APPR.		
	Q.A.		

DOMETIC seaXchange

SW VESSEL O-RINGS

SCALE: 1:16 | DWG. #SX0105 | SHEET 4 OF 4



ITEM #	PART #	DESCRIPTION
1	252404808	3/8 SS COUNTERSINK PLUG
2	252404864	1/4MNPT X 1/4QC ACETAL
3	252404836	1/4QC PLUG IN ELBOW
4	252404865	1/2MNPT ELBOW SWIVEL TO 3/8QC
5	252404812	3/4FNPT X 3/4 BARB ELBOW
6	252404866	3/4 X 3/8 HEX NIPPLE
7	252404867	3/8-16 X 1 1/4 SS HEX BOLT
8	252404273	3/8MNPT X 3/8 FLARE STRAIGHT
9	252404155	2.5HP MOTOR
10	252404161	4.2GPM PUMP

		NAME	DATE
	DRAWN	JIL	01-31-17
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ±.015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

DOMETIC seaXchange

SXII/XTC
PUMP AND MOTOR PARTS

SCALE: 1:8 | DWG. #: SX0126 | SHEET 1 OF 1

CONCENTRATE FLOW SENSOR

PART#: 252404875

PRODUCT FLOW SENSOR

PART#: 252404874

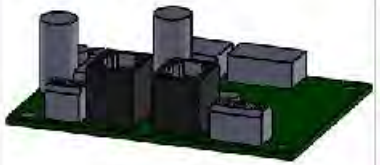
LOW PRESSURE TRANSDUCER

PART#: 252404878

HIGH PRESSURE TRANSDUCER

PART#: 252404877

TDS PC BOARD

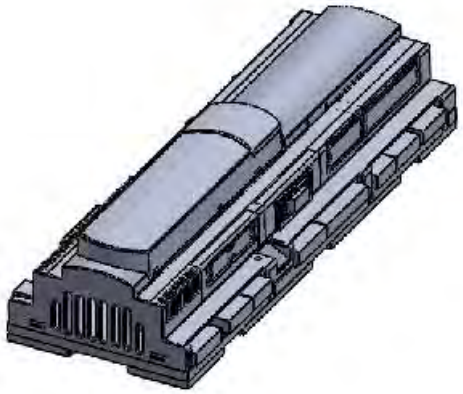


PART#: 252404277

TOUCH SCREEN

PART#: 252404180

PCO BOARD



PART#: 252404336

POWER SUPPLY

PART #: 252404873

DIVERSION VALVE (24V)

PART #: 252404875

		NAME	DATE
	DRAWN	JIL	04-19-17
UNLESS OTHERWISE SPECIFIED:	CHECKED		
DIMENSIONS ARE IN INCHES TOLERANCES: ± .015 FRACTIONAL ±1/32 ANGULAR: MACH ±1/2 BEND ±1 TWO PLACE DECIMAL ±.010 THREE PLACE DECIMAL ±.005	ENG APPR.		
	MFG APPR.		
	Q.A.		

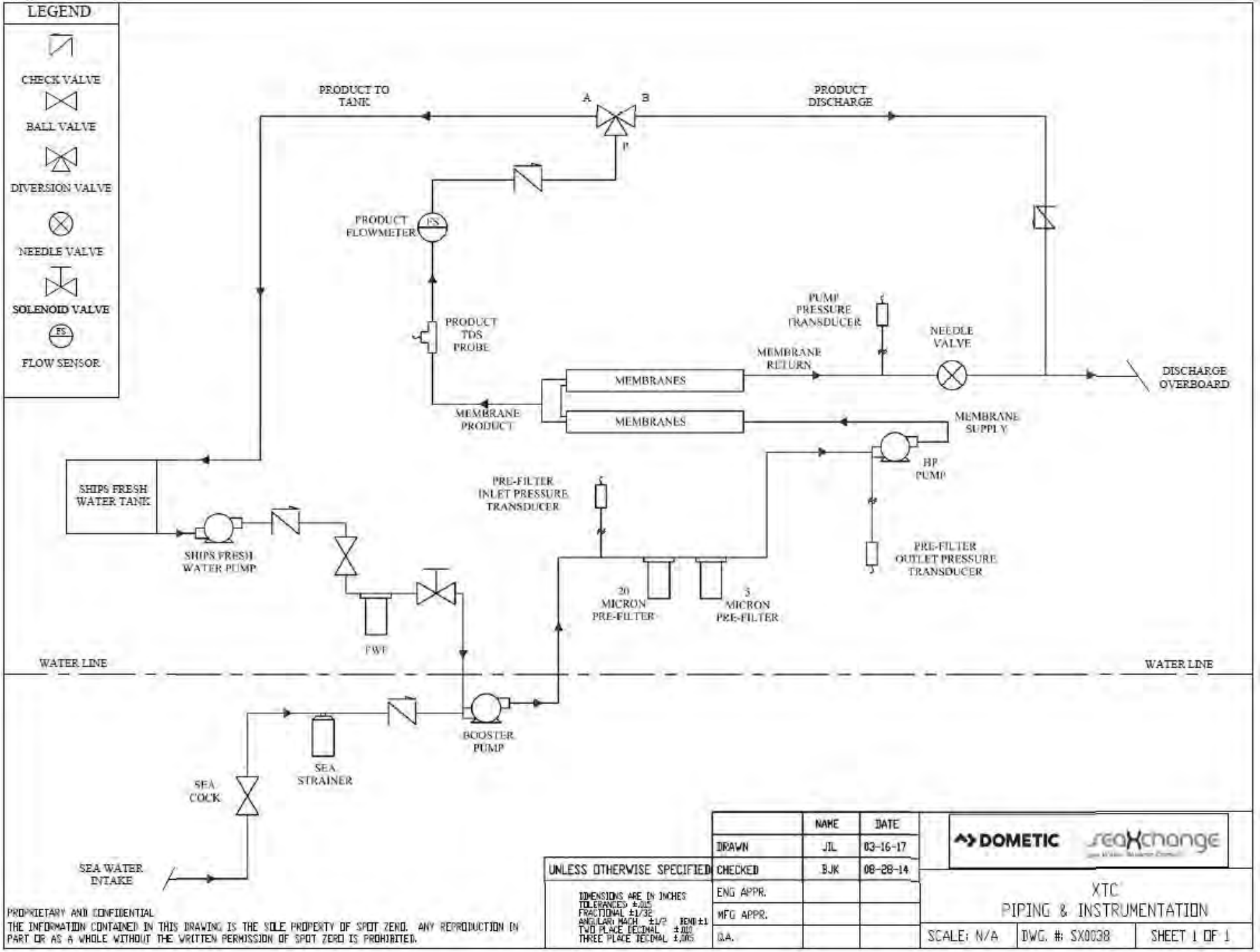
DOMETIC seaXchange

SPARE PARTS

SCALE: N/A | DWG.#: SX0137 | SHEET 1 OF 1

XZ

PLUMBING


LEGEND
CHECK VALVE
BALL VALVE
DIVERSION VALVE
NEEDLE VALVE
SOLENOID VALVE
FS
FLOW SENSOR
PRODUCT TO TANK
A
B
P
PRODUCT DISCHARGE
PRODUCT FLOWMETER
FS
PRODUCT TDS PROBE
PUMP PRESSURE TRANSDUCER
NEEDLE VALVE
MEMBRANE RETURN
MEMBRANES
MEMBRANES
DISCHARGE OVERBOARD
MEMBRANE PRODUCT
MEMBRANE SUPPLY
HP PUMP
SHIPS FRESH WATER TANK
PRE-FILTER INLET PRESSURE TRANSDUCER
SHIPS FRESH WATER PUMP
PRE-FILTER OUTLET PRESSURE TRANSDUCER
20 MICRON PRE-FILTER
3 MICRON PRE-FILTER
FWF
WATER LINE
WATER LINE
BOOSTER PUMP
SEA STRAINER
SEA COCK
SEA WATER INTAKE
NAME
DATE
DRAWN
JIL
03-16-17
CHECKED
BJK
08-28-14
ENG APPR.
MFG APPR.
Q.A.
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
TOLERANCES ±.015
FRACTIONAL ±1/32
ANGULARI MACH ±1/2 BEND ±1
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005
DOMETIC
seaXchange
XTC
PIPING & INSTRUMENTATION
SCALE: N/A
DWG. #: SX0038
SHEET 1 OF 1
PROPRIETARY AND CONFIDENTIAL
THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF SPOT ZERO. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF SPOT ZERO IS PROHIBITED.

LOCATIONS	DESCRIPTION	SIZE
A	SEA WATER INLET	3/4" HOSE
B	FRESH WATER INLET	1/2" TUBE
C	PRODUCT WATER TO SHIPS TANK OUTLET	3/8" TUBE
D	OVERBOARD OUTLET	3/4" HOSE
E	SW MEMBRANE SUPPLY OUTLET	3/8" FLARE
F	FW MEMBRANE SUPPLY OUTLET	1/2" TUBE
G	FW MEMBRANE PRODUCT INLET	3/8" TUBE
H	FW MEMBRANE RETURN INLET	1/2" TUBE
I	SW PRODUCT WATER INLET	3/8" TUBE
J	SW CONCENTRATE RETURN INLET	3/8" FLARE
K	FROM SHIPS FW TANK	3/8" TUBE
L	TO BOOSTER PUMP	1/4" TUBE
M	PRODUCT WATER PASS	3/8" TUBE

FWF

BACTERIOSTATIC REMINERALIZER

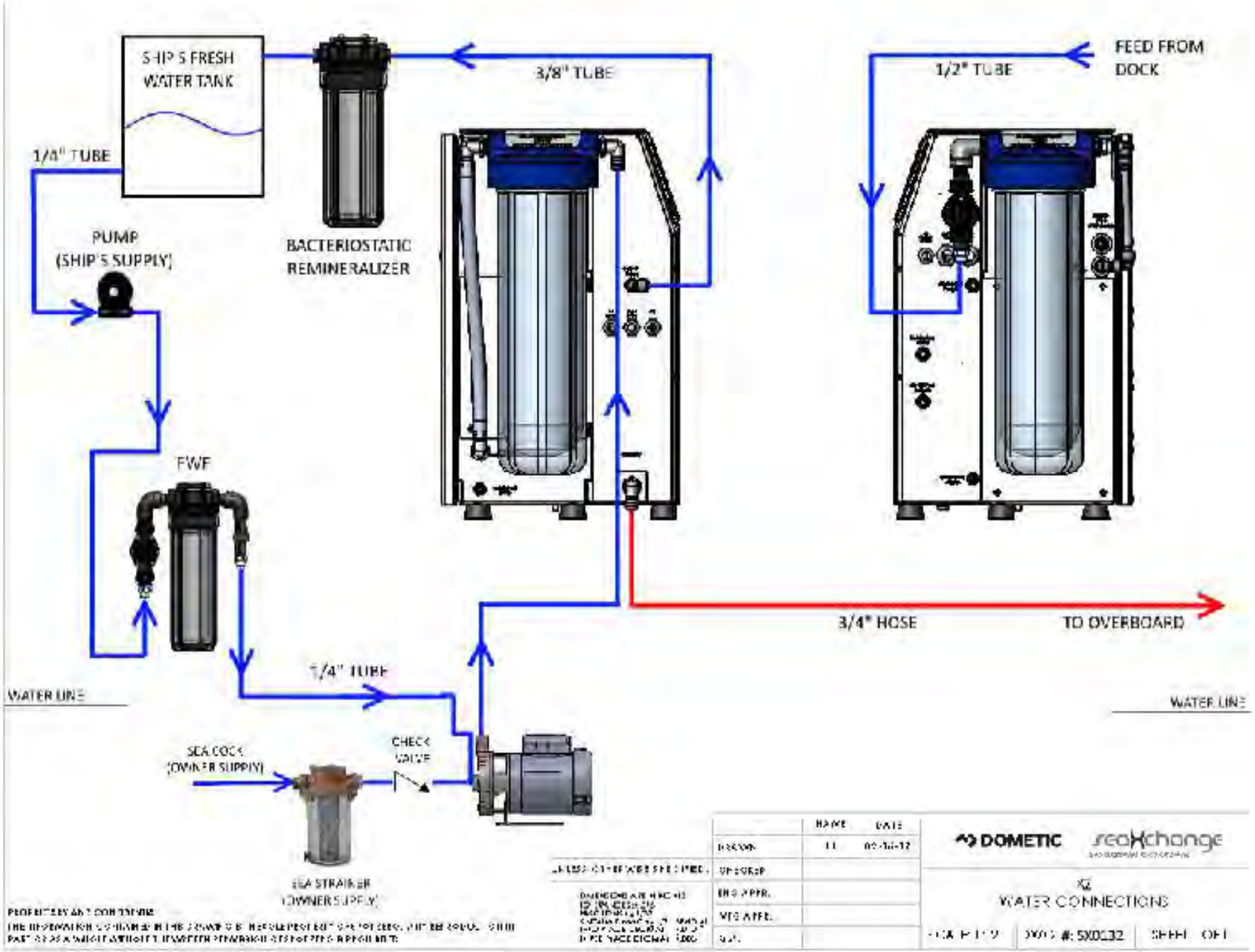
	NAME	DATE
DRAWN	JB	02-16-17
UNLESS OTHERWISE SPECIFIED: CHECKED		
ENG APPR.		
MFG APPR.		
Q.A.		

DIMENSIONS ARE IN INCHES
TOLERANCES: ±.015
FRACTIONAL ±1/32
ANGULAR: MACH ±1/2 BEND ±1
TWO PLACE DECIMAL ±.010
THREE PLACE DECIMAL ±.005

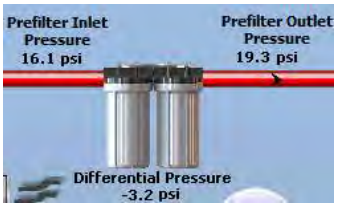
DOMETIC | seaXchange | sportzero

XZ
INLET AND OUTLET LOCATIONS

SCALE: 1:12 | DWG. #:SX0131 | SHEET 1 OF 1


SHIP'S FRESH WATER TANK
1/4" TUBE
PUMP (SHIP'S SUPPLY)
BACTERIOSTATIC REMINERALIZER
3/8" TUBE
1/2" TUBE
FEED FROM DOCK
FWF
3/4" HOSE
TO OVERBOARD
1/4" TUBE
WATER LINE
WATER LINE
SEA COCK (OWNER SUPPLY)
CHECK VALVE
SEA STRAINER (OWNER SUPPLY)
DOMETIC
seaXchange
WATER CONNECTIONS

TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
System is going off on low pressure alarm	1. Sea cock valve is closed 2. There is air in the system. 3. The Pre-filters are clogged. 4. Leaks	1. Open the sea cock valve 2. Perform a "Manual FWF" for at least 1 minute. This will help purge any air out of the system. SEE MANUAL FWF. 3. Check the pressure difference between the Pre-filter Inlet and the Pre-filter outler. Pressure difference should not be more than 15psi. If yes, change the Pre-filter for new ones.  4. Tighten or replace leaking part.
Low product water flow	1. Cold feed water 2. Defective membrane brine seal or membrane installed backwards. 3. Fouled or scaled membranes.	1. See temperature correction guide in the manual. 2. Replace brine seal or reposition membrane. SEE MEMBRANE INSTALLATION. 3. Replace membrane.
High product water flow	1. Warm water feed 2. Damaged membrane O-rings 3. Damaged or oxidized membranes.	1. See temperature correction guide in the manual. 2. Open the membrane vessel and inspect O-rings. If damaged, replace the O-rings. SEE DWG SX0105 PG 4. 3. Replace membrane
Poor water quality	1. Damaged product O-rings. 2. Damaged or oxidized membranes.	1. Open the membrane vessel and inspect O-rings. If damaged, replace the O-rings. SEE DWG SX0105 PG 4. 2. Replace membrane.

APPENDIX

Motorized pump unit 2SF42SEEL251 Shown

Stainless Steel
Direct-Drive Plunger Pump

Models 2SF05SEEL, 2SF10SEEL 2SF15SEEL, 2SF22SEEL 2SF25SEEL, 2SF29SEEL 2SF35SEEL, 2SF42SEEL

FEATURES

- Unique spring loaded inlet valves and the flow through ceramic plungers provides a smooth, steady flow.
- Optional EPDM and FPM elastomers for compatibility with many liquids.
- Hollow shaft direct drive to provide the smallest possible footprint for challenging spaces.

COMMON SPECIFICATIONS

Discharge Pressure Range	100-1200 psi	7-85 bar
Inlet Pressure Range	Flooded to 60 psi	Flooded to 4 bar
Shaft Diameter	5/8"	15.9 mm
RPM	1725 rpm	1725 rpm
Bore	0.709"	18 mm
Bore (2SF42SEEL Only)	0.787"	20 mm
Maximum Liquid Temperature	160°F	70°C
Above 130°F call CAT PUMPS for inlet conditions and elastomer recommendations.		
Crankcase Capacity	11.15 oz.	0.33 l
Inlet Port (1)	3/8" NPT(F)	3/8" NPT(F)
Discharge Ports (2)	3/8" NPT(F)	3/8" NPT(F)
By-Pass Return Port (1)	1/4" NPT(F)	1/4" NPT(F)
Weight (Pump Only)	8.9 lbs.	4 kg
Dimensions (Pump Only)	6.8 x 8.7 x 5.2"	173 x 221 x 133 mm

⚠ CAUTIONS AND WARNINGS

All High Pressure Systems require a primary pressure regulating device (i.e. regulator, unloader) and a secondary pressure relief device (i.e. pop-off valve, relief valve). Failure to install such relief devices could result in personal injury or damage to pump or property. CAT PUMPS does not assume any liability or responsibility for the operation of a customer's high pressure system.

Read all CAUTIONS and WARNINGS before commencing service or operation of any high pressure system. The CAUTIONS and WARNINGS are included in each service manual and with each Accessory Data sheet. CAUTIONS and WARNINGS can also be viewed online at www.catpumps.com/cautions-warnings or can be requested directly from CAT PUMPS.

WARRANTY

View the Limited Warranty on-line at www.catpumps.com/warranty.

SPECIFICATIONS

	U.S. Measure	Metric Measure
MODEL 2SF05SEEL		
Flow (60 Hz-1725 rpm)	0.5 gpm	1.9 lpm
Flow (50 Hz-1450 rpm)	0.42 gpm	1.6 lpm
Stroke	0.071"	1.8 mm
MODEL 2SF10SEEL		
Flow (60 Hz-1725 rpm)	1.0 gpm	3.8 lpm
Flow (50 Hz-1450 rpm)	0.84 gpm	3.1lpm
Stroke	0.122"	3.1 mm
MODEL 2SF15SEEL		
Flow (60 Hz-1725 rpm)	1.5 gpm	5.7 lpm
Flow (50 Hz-1450 rpm)	1.26 gpm	4.8 lpm
Stroke	0.177"	4.5 mm
MODEL 2SF22SEEL		
Flow (60 Hz-1725 rpm)	2.2 gpm	8.3 lpm
Flow (50 Hz-1450 rpm)	1.84 gpm	7.0 lpm
Stroke	0.248"	6.3 mm
MODEL 2SF25SEEL		
Flow (60 Hz-1725 rpm)	2.5 gpm	9.5 lpm
Flow (50 Hz-1450 rpm)	2.1 gpm	7.9 lpm
Stroke	0.287"	7.3 mm
MODEL 2SF29SEEL		
Flow (60 Hz-1725 rpm)	2.85 gpm	10.8 lpm
Flow (50 Hz-1450 rpm)	2.4gpm	9.1 lpm
Stroke	0.335"	8.5 mm
MODEL 2SF35SEEL		
Flow (60 Hz-1725 rpm)	3.5 gpm	13.2 lpm
Flow (50 Hz-1450 rpm)	2.9 gpm	11.0 lpm
Stroke	0.402"	10.2 mm
MODEL 2SF42SEEL		
Flow (60 Hz-1725 rpm)	4.2 gpm	15.9 lpm
Flow (50 Hz-1450 rpm)	3.5 gpm	13.2 lpm
Discharge Pressure Range	100-1000 psi	7-70 bar
Stroke	0.402"	10.2 mm

Refer to pump **Service Manual** for repair procedure and additional technical information.

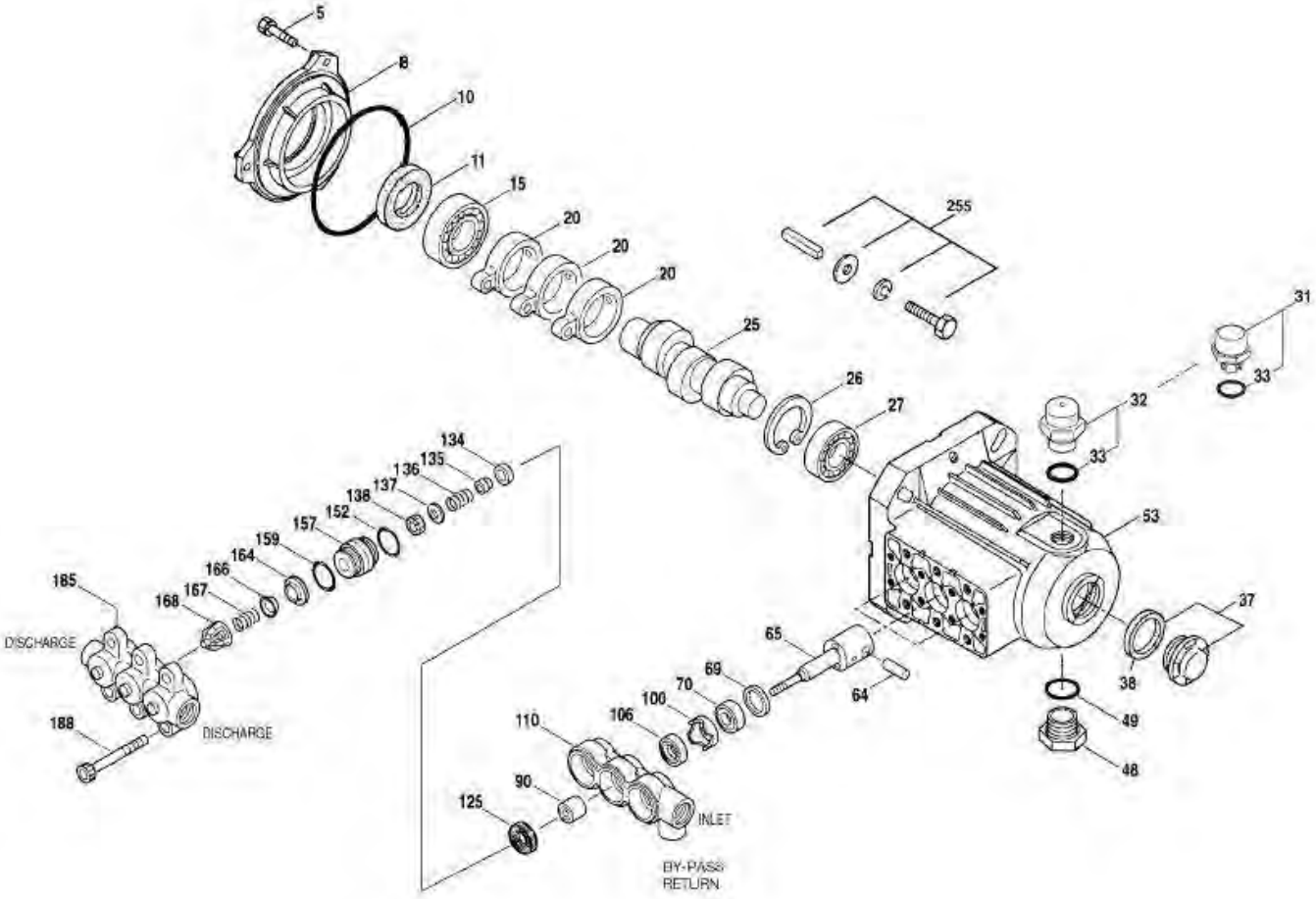
PARTS LIST

ITEM	P/N	MATL	DESCRIPTION	MODEL USED	QTY
5	547445	S	Screw, HHC Sems (M6x14) [3/03]	All	3
8	547153	AL	Cover, Bearing [3/03]	All	1
10	14041	NBR	O-Ring, Bearing Cover-70D [3/03]	All	1
11	55337	NBR	Seal, Oil, Crankshaft - 70D [3/03]	All	1
15	14488	STL	Bearing, Ball - Inner	All	1
20	547046	TNM	Rod, Connecting	All	3
25	**831987**	**CM**	Crankshaft, 1.8mm	05SEEL	1
	46109	**CM**	Crankshaft, 3.1mm	10SEEL	1
	44931	**CM**	Crankshaft, 4.5mm	15SEEL	1
	45160	**CM**	Crankshaft, 6.3mm	22SEEL	1
	544693	**CM**	Crankshaft, 7.3mm	25SEEL	1
	45914	**CM**	Crankshaft, 8.5mm	29SEEL	1
	544694	**CM**	Crankshaft, 10.2mm	35SEEL, 42SEEL	1
26	12385	STL	Ring, Retaining, Bearing	All	1
27	15710	STL	Bearing, Ball - Outer	All	1
31	*549726*	—	*Cap, Vented w/O-Ring (Rain Cap)*	*All*	*1*
32	547961	RTP	Cap, Oil Filler w/O-Ring	All	1
33	14179	NBR	O-Ring, Oil Filler Cap - 70D	All	1
37	92241	–	Gauge, Oil w/Gasket - 80D	All	1
38	44428	NBR	Gasket, Flat, Oil Gauge - 80D	All	1
48	44842	NY	Plug, Drain	All	1
49	14179	NBR	O-Ring, Drain Plug - 70D	All	1
53	547285	AL	Crankcase (See Tech Bulletin 92)	All	1
64	16948	CM	Pin, Crosshead	All	3
65	544695	SSZZ	Rod, Plunger	All	3
69	126259	STCP R	Washer, Oil Seal	All	3
70	25461	NBR	Seal, Oil Crankcase	All	3
90	**544697**	**CC**	Plunger, Ceramic (M18x18)	05-35SEEL	3
	831290	**CC**	Plunger, Ceramic (M20x18)	42SEEL	3
100	44869	PVDF	Retainer, Seal	All	3
106	**547683**	**NBR**	Seal, LPS w/SS-Spg	All	3
	545192	***FPM***	*Seal, LPS w/SS-Spg*	*All*	*3*
	546507	***EPDM***	*Seal, LPS w/SS-Spg*	*All*	*3*
110	**547704**	**SS**	Manifold, Inlet	05-35SEEL	1
	831288	**SS**	Manifold, Inlet	42SEEL	1
125	**44652**	**SNG**	Seal, HPS w/SS	05-35SEEL	3
	46652	***HT****	*Seal, Hi-Temp, 2-Pc w/S-Support*	*05-35SEEL*	*3*
	44649	**SNG**	Seal, HPS w/SS	42SEEL	3
	44936	***FPM***	*Seal, HPS w/SS*	*42SEEL*	*3*
	46667	***HT****	*Seal, Hi-Temp, 2-Pc w/S-Support*	*42SEEL*	*3*
134	**543691**	**SS**	Valve, Inlet (See Tech Bulletin 91)	05-35SEEL	3
	33873	***NY***	*Valve, Inlet* (See Tech Bulletin 91)	*05-35SEEL*	*3*
	831400	**SS**	Valve, Inlet	42SEEL	3
135	543689	SS	Spacer	All	3
136	543690	SS	Spring, Inlet Valve	All	3
137	88575	S	Washer, Conical (M6)	All	3
138	543692	SS	Nut (M6)	All	3

ITEM	P/N	MATL	DESCRIPTION	MODEL USED	QTY
152	† 26089	**NBR**	O-Ring, Adapter Spacer, Inner-80D	05-35SEEL	3
	11377	***FPM***	*O-Ring, Adapter Spacer, Inner-80D*	*05-35SEEL*	*3*
	46647	***EPDM***	*O-Ring, Adapter Spacer, Inner-80D*	*05-35SEEL*	*3*
	549539	**NBR**	O-Ring, Adapter Spacer, Inner-70D	42SEEL	3
	129977	***FPM***	*O-Ring, Adapter Spacer, Inner-70D*	*42SEEL*	*3*
	129978	***EPDM***	*O-Ring, Adapter Spacer, Inner-70D*	*42SEEL*	*3*
157	**544700**	**SS**	Adapter, Valve	05-35SEEL	3
	831289	**SS**	Adapter, Valve	42SEEL	3
159	† 26089	NBR	O-Ring, Adapter Spacer, Outer-80D	All	3
	11377	*FPM*	*O-Ring, Adapter Spacer, Outer-80D*	*All*	*3*
	46647	*EPDM*	*O-Ring, Adapter Spacer, Outer-80D*	*All*	*3*
164	544293	SS	Seat	All	3
166	543669	SS	Valve	All	3
167	543700	SS	Spring	All	3
168	44565	PVDF	Retainer, Spring	All	3
185	547705	SS	Manifold, Discharge	All	1
188	544701	S	Screw, HSH (M8x80)	All	6
255	30517	STZP R	Assy, Bolt Mount	All	1
283	*990394*	—	*Kit, Oil Drain*	*All*	*1*
285	*80228*	*STL*	*Screw (M8-1.25x80) (Motor Removal) (Not Shown)*	*All*	*2*
300	***34973***	***NBR***	*Kit, Seal (Inckds: 106, 125, 152, 159)*	*05-35SEEL*	*1*
	33453	***FPM***	*Kit, Seal (Inckds: 106, 125, 152, 159)*	*05-35SEEL*	*1*
	30536	***EPDM****	*Kit, Seal (Inckds: 106, 125, 152, 159)*	*05-35SEEL*	*1*
	76973	***NBR***	*Kit, Seal (Inckds: 106, 125, 152, 159)*	*42SEEL*	*1*
	76955	***FPM***	*Kit, Seal (Inckds: 106, 125, 152, 159)*	*42SEEL*	*1*
	76996	***EPDM***	*Kit, Seal (Inckds: 106, 125, 152, 159)*	*42SEEL*	*1*
310	***34972***	***NBR***	*Kit, Valve (Indds: 152,159,164,166,167,168)*	*05-35SEEL*	*1*
	33454	***FPM***	*Kit, Valve (Indds: 152,159,164,166,167,168)*	*05-35SEEL*	*1*
	30546	***EPDM***	*Kit, Valve (Indds: 152,159,164,166,167,168)*	*05-35SEEL*	*1*
	76972	***NBR***	*Kit, Valve (Indds: 152,159,164,166,167,168)*	*42SEEL*	*1*
	76445	***FPM***	*Kit, Valve (Indds: 152,159,164,166,167,168)*	*42SEEL*	*1*
	76446	***EPDM***	*Kit, Valve (Indds: 152,159,164,166,167,168)*	*42SEEL*	*1*
311	***39668***	***NBR***	*Kit, Inlet Valve w/SS-IV (Incdds:134-138,152,159)*	*05-35SEEL*	*1*
	34974	***NBR***	*Kit, Inlet Valve w/NY-IV (Incdds:134-138,152,159)*	*05-35SEEL*	*1*
	33460	***FPM***	*Kit, Inlet Valve w/NY-IV (Incdds:134-138,152,159)*	*05-35SEEL*	*1*
	30556	***EPDM***	*Kit, Inlet Valve w/NY-IV (Incdds:134-138,152,159)*	*05-35SEEL*	*1*
	76668	***NBR***	*Kit, Inlet Valve w/SS-IV (Incdds:134-138,152,159)*	*42SEEL*	*1*
	76465	***FPM***	*Kit, Inlet Valve w/SS-IV (Incdds:134-138,152,159)*	*42SEEL*	*1*
	76466	***EPDM***	*Kit, Inlet Valve w/SS-IV (Incdds:134-138,152,159)*	*42SEEL*	*1*
352	*44050*	*STZP*	*Tool, Oil Gauge Removal*	*All*	*1*
–	*6107*	–	*Oil, Bottle (21 oz) ISO-68 Hydraulic (Fill to specified crankcase capacity prior to start-up)*	*All*	*1*

Bold print part numbers are unique to a particular pump model. *Italics are optional items.*
[ ] Date of latest production change. † Production parts are different than repair parts. R Components comply with RoHS Directive.
*Review individual parts in each kit for material code identification.
View Tech Bulletins 002, 036, 043, 055, 064, 070, 073, 074, 091, 092 and 095 for additional information.
NOTE: Discard Key that may come standard with most motors and engines and use only the key included in Bolt kit.
MATERIAL CODES (Not Part of Part Number): AL=Aluminum CC=Ceramic CM=Chrome-Moly
EPDM=Ethylene Propylene Diene Monamer FPM=Fluorocarbon HT=Hi-Temp (EPDM Alternative) NBR=Medium Nitrile (Buna-N) NY=Nylon
PVDF=Polyvinylidene Fluoride RTP=Reinforced Composite S=304SS SNG=Special Blend (Buna) SS=316SS SSZZ=316SS Zamak STL=Steel
STCP=Steel/Chrome Plated STZP=Steel/Zinc Plated TNM=Special High Strength

EXPLODED VIEW

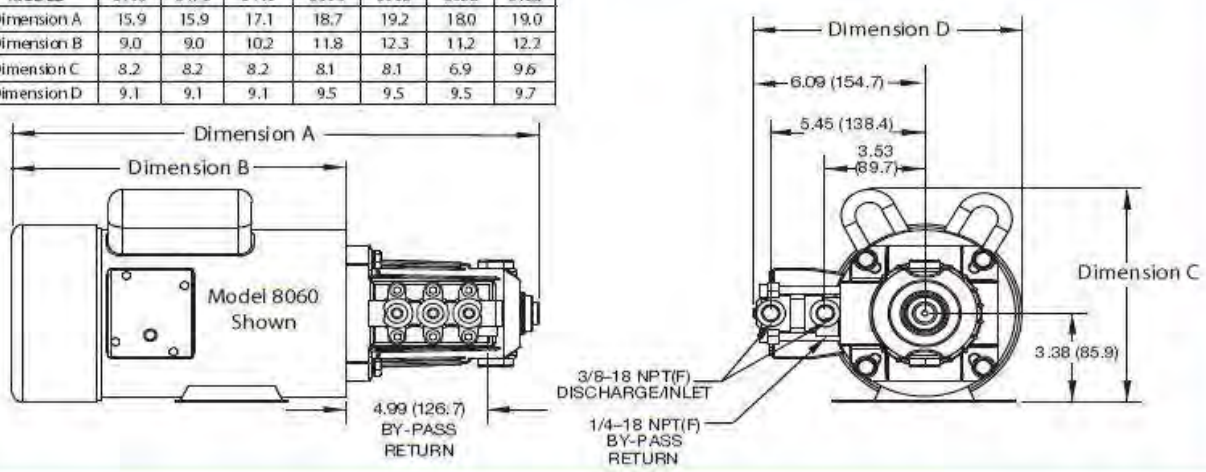


Models

2SF05SEEL, 2SF10SEEL
2SF15SEEL, 2SF22SEEL
2SF25SEEL, 2SF29SEEL
2SF35SEEL, 2SF42SEEL

April 2014

MODEL	8105	8175	8110	8060	8062	8082	8125
Dimension A	15.9	15.9	17.1	18.7	19.2	18.0	19.0
Dimension B	9.0	9.0	10.2	11.8	12.3	11.2	12.2
Dimension C	8.2	8.2	8.2	8.1	8.1	6.9	9.6
Dimension D	9.1	9.1	9.1	9.5	9.5	9.5	9.7



Models 2SF05SEEL, 2SF10SEEL, 2SF15SEEL, 2SF25SEEL, 2SF29SEEL, 2SF35SEEL, 2SF42SEEL

MOTOR SPECIFICATIONS

MODEL	8105	8175	8110	8060	8062	8082	8125
HorsePower	0.5	0.75	1.0	1.5	2.0	2.0/1.5	2.5
Phase	Single	Single	Single	Single	Single	Three	Single
RPM	1750	1745	1750	1725	1725	1725/1425	1750/1450
Frame Size	56C TEFC	56C TEFC	56C TEFC	56C TEFC	56C TEFC	56HC TEFC	56HC TEFC
Shaft Diameter (inches)	5/8	5/8	5/8	5/8	5/8	5/8	5/8
Maximum Volts	115/208-230	115/208-230	115/208-230	115/230	115/230	230/460 190/380	115/230 110/220
FULL LOAD AMPS	7.4/3.6-3.7	10.6/5.2-5.3	14/6.8-7.0	14.0/7.0	17.0/8.5	5.9-5.6/2.8 5.2/2.6	21/11.5 23.6/11.8
Hertz	60	60	60	60	60	60/50	60/50
Service Factor	1.15	1.15	1.15	1.2	1.15	1.15	1.2/1.0
Max. Ambient Temp. (°F)	104	104	104	104	104	104	104
Capacitor Start	Yes	Yes	Yes	Yes	Yes	No	Yes
Thermal Overload-Manual Reset	No	Yes	No	Yes	Yes	No	No
Weight (lbs.)	25	28	34	42	45.7	40	52.9

NOTE: Motor start-up AMPS may vary, then settle within FULL LOAD AMPS rating after initial run time.

ELECTRIC HORSEPOWER REQUIREMENTS

FLOW		PRESSURE psi (bar)			PUMP rpm
U.S. gpm	Metric lpm	700 (50)	1000 (70)	1200 (85)	
0.5	1.9	0.24	0.35	0.41	1725
1.0	3.8	0.48	0.68	0.82	1725
1.5	5.7	0.72	1.03	1.23	1725
2.5	9.5	1.19	1.71	2.05	1725
2.85	10.8	1.36	2.0	2.3	1725
3.5	13.2	1.67	2.39	2.87	1725
4.2	15.9	2.01	2.88	N/A	1725

DETERMINING REQUIRED H.P.

$$\frac{\text{gpm x psi}}{1460} = \text{Electric Brake H.P. Required}$$

★★ Before mounting pump on motor, apply P.N. 6106 Antiseize Lubricant to pump shaft.
Refer to Tech Bulletin 055 for instructions on removing pump from electric motor.
For warranty consideration contact Cat Pumps for the local Authorized Service Center. If you are uncertain as to the cause of failure (Pump or Motor), secure **Returned Goods Authorization number** and return complete assembly **PREPAID** to CAT PUMPS for evaluation.

SF PLUNGER PUMP SERVICE MANUAL

2SF, 2SFX, CEE, SEEL MODELS:

2SF10, 2SF20, 2SF22,
2SF25, 2SF29, 2SF30, 2SF35
2SF05, 10, 15, 25, 29, 35SEEL

4SF MODELS:

4SF32ELS, 4SF40ELS, 4SF45ELS, 4SF50ELS,
4SF30GS1, 4SF35GS1, 4SF40GS1, 4SF45GS1,
4SF45GS118, 4SF50GS1

INSTALLATION AND START-UP INFORMATION

Optimum performance of the pump is dependent upon the entire liquid system and will be obtained only with the proper selection, installation of plumbing, and operation of the pump and accessories.

SPECIFICATIONS: Maximum specifications refer to individual attributes. It is **not** implied that **all maximums** can be performed **simultaneously**. If more than one maximum is considered, check with your CAT PUMPS supplier to confirm the proper performance and pump selection. Refer to individual pump Data Sheet for complete specifications, parts list and exploded view.

LUBRICATION: Fill crankcase with special CAT PUMP oil per pump specifications [2SF, 2SFX: prior 3/03-11.83 oz., after 3/03-10.15 oz., 4SF: 23.66 oz.]. DO NOT RUN PUMP WITHOUT OIL IN CRANKCASE. Change initial fill after 50 hours running period. Thereafter, change oil every **3 months or 500 hour intervals.**

MOTOR SELECTION: Identify the pump shaft size. (2SF) "ES" and "ELS" models have 5/8" electric shaft; "GES" models have 3/4" electric shaft; "GS" and "GZ" models have 3/4" gas shaft. (4SF) "ELS" models have 1-1/8" electric shaft; "GS" models have a 1" gas shaft. The motor or engine driving the pump must be of adequate horsepower to maintain full RPM when the pump is under load. Select the electric motor from the Horsepower Requirement Chart according to required pump discharge flow and maximum **pressure at the pump!** Consult the manufacturer of gas or diesel engine for selection of the proper engine.

MOUNTING: All 2SF and 4SF are direct drive and do not need to be mounted to another surface. Only the solid shaft 2SF22SLS with attachment brackets needs to be mounted to a rigid, horizontal surface. An uneven mounting surface will cause extensive damage to the pump base. Use the correct belt; make sure pulleys are aligned. Excessive belt tension may be harmful to the bearings. To minimize piping stress, **use appropriate flexible hose to inlet and discharge ports.** Before mounting pump to motor or gas engine, apply PN 6106 antiseize lubricant to pump shaft. Refer to Tech Bulletin 055 for instructions on removing pump from gas engine or electric motor.

LOCATION: If the pump is used in extremely dirty or humid conditions, it is recommended pump be enclosed. Do not store or operate in excessively high temperature areas or without proper ventilation.

INLET CONDITIONS: Refer to complete **Inlet Condition Check-List** in this manual before starting system. DO NOT STARVE THE PUMP OR RUN DRY. Temperatures above 130°F are permissible. Add 1/2 PSI inlet pressure per each degree F over 130°F. Elastomer or RPM changes may be required. See Tech Bulletin 002 or call CAT PUMPS for recommendations.

DISCHARGE CONDITIONS: OPEN ALL VALVES BEFORE STARTING SYSTEM to avoid deadhead overpressure condition and severe damage to the pump or system.

A **reliable Pressure Gauge** should be installed near the discharge outlet of the high pressure manifold. This is extremely important for adjusting pressure regulating devices and also for proper sizing of the nozzle or restricting orifice. The pump is rated for a maximum pressure; this is the **pressure** which would be **read at the discharge manifold of the pump**, NOT AT THE GUN OR NOZZLE.

Use PTFE thread tape or pipe thread sealant (sparingly) to connect accessories or plumbing. Exercise caution not to wrap tape beyond the last thread to avoid tape from becoming lodged in the pump or accessories. This condition will cause a malfunction of the pump or system.

All 2SF and 4SF Pumps come complete with a Pressure Regulating Unloader. NOTE: Except "CEE" and "SEEL" Models.

PRESSURE REGULATION: All systems require both a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve). The primary pressure device must be installed on the discharge side of the pump. The function of the primary pressure regulating device is to protect the pump from over pressurization, which can be caused by a plugged or closed off discharge line. Over pressurization can severely damage the pump, other system components and can cause bodily harm. The secondary safety relief device must be installed between the primary device and pump. This will ensure pressure relief of the system if the primary regulating device fails. Failure to install such a safely device will void the warranty on the pump.

When the high pressure system is left running with the trigger gun off, the by-pass liquid can be routed to drain or to the pump inlet. If routed to the pump inlet, the **by-pass liquid can quickly develop excessive heat and result in damage to the pump.** A THERMO VALVE installed in the by-pass line is recommended to protect the pump. An AUTO SHUT-OFF ASSEMBLY may also be used.

NOZZLES: A worn nozzle will result in loss of pressure. Do not adjust pressure regulating device to compensate. Replace nozzle and reset regulating device to system pressure.

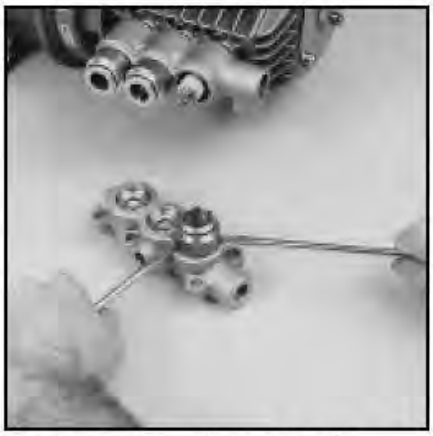
PUMPED LIQUIDS: Some liquids may require a **flush between operations or before storing.** For pumping liquids other than water, contact your CAT PUMPS supplier.

STORING: For extended storing or between use in cold climates, drain all pumped liquids from pump and **flush with antifreeze solution to prevent freezing and damage** to the pump. DO NOT RUN PUMP WITH FROZEN LIQUID (refer to Tech Bulletin 083).

⚠ WARNING

All systems require both a primary pressure regulating device (i.e., regulator, unloader) and a secondary pressure safety relief device (i.e., pop-off valve, safety valve). Failure to install such relief devices could result in personal injury or damage to the pump or to system components. CAT PUMPS does not assume any liability or responsibility for the operation of a customer's high pressure system.

Removal of Discharge Manifold



Removal of Adapter from Discharge Manifold

Removal of Adapter from Inlet Manifold

SERVICING THE VALVES

Disassembly of the Discharge Valve Assembly

1. Disconnect all plumbing and remove unloader for ease in servicing.

   NOTE: CEE and SEEL models do not come with standard unloader.

2. Inspect oil for proper level, presence of water or discoloration and replace as needed.
3. Using a standard M6 allen wrench remove the six (6) (2SF) or eight (8) (4SF) Socket Head Screws from the manifold. Remove the outer screws first, then the center screws.
4. Using a soft mallet tap the back side of the Discharge Manifold from alternate sides to maintain alignment and avoid damage to the plungers.
5. Grasp the Discharge Manifold from the from underside and gradually lift manifold while you pull away from the Crankcase.
6. The Adapter Spacers may stay with either the Discharge or Inlet Manifold. By inserting two opposing screwdrivers between Spacer and manifold you can easily pry them out of the Discharge Manifold. If they stay in the Inlet Manifold, gently work them up and down as you pull away from the Inlet Manifold.
7. The valve assemblies are in the Discharge Manifold ports and will fall out when manifold is turned over. A complete valve assembly includes: Retainer, Spring, Valve and Seat.

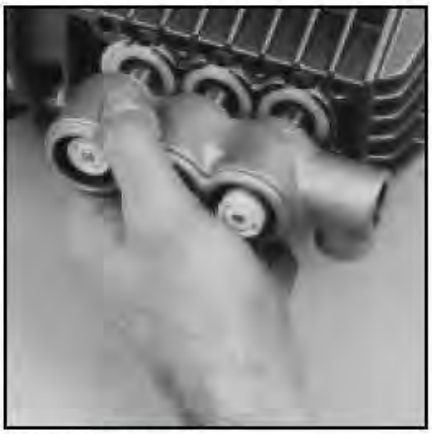
   NOTE: On "X" models the Adapter and Seat are one-piece.

   NOTE: The "GZ" models use the standard "SF" Valve Kit.

Discharge Valve Assembly (4SF)

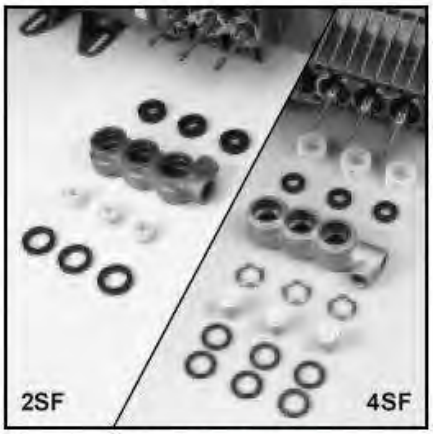
Adapter and Discharge Valve Assembly (2SF)

Inlet Valve Assembly



Removal of Inlet Manifold

Removal of Lo-Pressure Seal



Plunger, Seals and V-Packing Arrangement

Reassembly of the Discharge Valve Assembly

1. Examine Adapter Spacer O-Rings and replace if worn. Lubricate and install O-Rings and Back-up-Rings **on both front and rear of the Adapter Spacer.**
2. Examine the Valve Retainers for scale buildup or wear and install into each Discharge Manifold port with tab down into the manifold chamber.
3. Replace worn or damaged Springs and place into Retainers.
4. Examine Valve and Seats for pitting, grooves or wear and replace as needed.
5. Place Valves over Springs with **concave side down.**
6. Place Valve Seats on Valves with **concave side down.**

   NOTE: On "X" Models, the Adapter and Seat are one-piece.
7. Lubricate O.D. of Adapter Spacer and insert **smaller I.D. into Discharge Manifold ports**. Snap into position. Exercise caution not to cut or pinch o-rings.
8. Carefully guide Discharge Manifold with Spacers over Plunger Rod ends and press into Inlet Manifold.
9. Replace Socket Head Screws and torque per chart. Use torque sequence chart.
10. If oil was not changed, be certain oil is to mark on Oil Gauge before resuming operation.

Installation of Lo-Pressure Seals

V-Packing Positioning

Installation of V-Packings

SERVICING THE SEALS

Disassembly of the Seal Assembly

1. Remove the Inlet Valve Assembly from the exposed plunger rod ends, including Cotterpin, Nut, Washer, Spring, Spacer and Inlet Valve.
2. Grasp the Inlet Manifold from the front and underside and pull to remove from Plunger Rods.
3. Carefully examine back side of Lo-Pressure Seal before removing from the Inlet Manifold as it will be damaged during removal. If worn, insert screwdriver into I. D. of seal and pry out from the backside of the I.M. Exercise caution to avoid damage to the Inlet Manifold.
4. Press ceramic Plunger with thumb or soft tool from **back side of Inlet Manifold.**

   On the Model 2SF the Hi-Pressure Seal may stay with the plungers or remain in the Inlet Manifold. If on the plungers, slide off by hand. If in the manifold, use a reverse pliers to remove.

   On the Model 4SF the V-Packing and Female Adapters may stay with the plungers or remain in Inlet Manifold. If on the plungers, slide off by hand. If in the manifold, use a reverse pliers to remove.
5. Remove Seal Retainers from Crankcase by grasping tab with pliers and pulling out.
6. Examine Crankcase Oil Seal to determine if Crankcase servicing is needed.
7. Examine Ceramic Plunger, Lo-Pressure Seals, V-Packings for scoring, cracks and wear and replace.

   NOTE: The "S" versions of the 4SF pumps have a replaceable Sleeve.
8. Examine the Sleeve for grooves for scale buildup and replace as needed. Grasp the Sleeve by hand and pull from the Plunger Rod.
9. Examine the O-Ring and Back-up-Ring under the Sleeve for cuts or wear and replace.
10. Examine the Barrier Slinger for wear and replace as needed. Install the Barrier Slinger with the concave side facing away from the Crankcase.

Reassembly of Seal Assembly

1. With Inlet and Discharge Manifold removed, examine Seal Retainers and replace if worn or damaged. Install on Plunger Rod and press into Crankcase **with tab out.**
2. Place Inlet Manifold on work surface with **Crankcase side up.**
3. Lubricate new Lo-Pressure Seals and press into position with **garter spring down.** Be certain the seal is seated squarely on the shoulder in the inlet manifold chamber.
4. Place Inlet Manifold on work surface with **Crankcase side down** (larger I.D. ports up).
5. On the Model 4SF place new Female Adapter into Inlet Manifold chamber with **v-groove facing up.**
6. Carefully examine the Plungers for scoring or cracks and replace if worn.
7. On the Model 2SF lubricate Ceramic Plungers and new Hi-Pressure Seals. Press the plunger into the seal and position seal in middle of plunger.

   NOTE: Place the deeper recessed end of the plunger into the seal from the metal back side.

   NOTE: The "Hi-Temp" 2SF models use a special Hi-Pressure Seal and Hi-Temp Seal Kit.

   On the Model 4SF lubricate Ceramic Plungers and new V-Packings. Press Plunger into the V-Packings and position in the middle of plunger.

   NOTE: The deeper recessed end of the plunger should face the same direction as the v-groove on the V-Packing.
8. On the Model 4SF lubricate the Plunger Rod O-Ring to avoid cutting during installation. Install the Back-up-Ring first then the O-Ring into the groove on the Plunger Rod.
9. Install the Sleeve with the tapered end facing out. Gently press towards the Plunger Rod shoulder until flush with the Barrier Slinger.
10. Carefully install Inlet Manifold over Plunger Rod ends and slowly press into Crankcase.
11. Install the Plungers onto the plunger rods. Press into position using the **larger I.D. end of Valve Spacer.**

12. Examine Inlet Valve and replace if worn. **Inlet valves cannot be reversed if worn.** The S.S. Inlet Valves may be lapped if not badly worn. Install the S.S. Inlet valves with **square edges towards the plungers** (round edges towards the discharge). Install the Nylon Inlet Valve with **ridged side towards the discharge**.

    NOTE: The "Hi-Temp" 2SF models use a Nylon Inlet Valve (order individual parts, not standard Inlet Valve Kit).

13. Examine Spacers for wear and replace as needed. Install Spacer on each Plunger Rod with **smaller O.D. towards inlet valve**.

14. Examine Springs for damage or fatigue and replace as needed. Place on Plunger Rods.

15. Install Washers next with **concave side towards Inlet Manifold.**

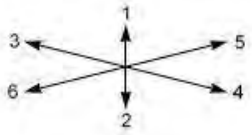
16. Install Nuts and torque per chart.

17. On 2SF and 4SF models **always install new Cotterpins** and turn ends to secure in position.

    NOTE: "X" and S.S. Models do not use Cotterpins.

18. Refer to steps 7-10 under Servicing Valves-Reassembly to replace the Discharge Manifold.

2SF Torque Sequence



4SF Torque Sequence

Torque diagonally in order shown. The outer four (4) screws then center screws all hand tight. Then repeat series to specifications in torque chart.

1. While Inlet Manifold, Plungers and Seal Retainers are removed, examine Crankcase Seals for wear.
2. Check oil level and for evidence of water in oil.
3. Rotate Crankshaft by hand to feel for smooth bearing movement.
4. Examine Crankshaft Oil Seal externally for drying, cracking or leaking.
5. Consult CAT PUMPS or your local distributor if Crankcase service is required.

    See section VIII of the Plunger Pump Service Video for additional information.

PREVENTATIVE MAINTENANCE CHECK-LIST

Check	Daily	Weekly	50 hrs.	500 hrs.*	1500 hrs.**	3000 hrs.**
Clean Filters	x					
Oil Level/Quality	x					
Oil Leaks	x					
Water Leaks	x					
Belts, Pulley		x				
Plumbing		x				
Initial Oil Change			x			
Oil Change				x		
Seal Change					x	
Valve Change						x
Accessories					x	

* If other than CAT PUMPS special multi-viscosity ISO68 oil is used, change cycle should be every 300 hours.

** Each system's maintenance cycle will be exclusive. If system performance decreases, check immediately. If no wear at 1500 hours, check again at 2000 hours and each 500 hours until wear is observed. Valves typically require changing every other seal change.

Duty cycle, temperature, quality of pumped liquid and inlet feed conditions all effect the life of pump wear parts and service cycle.

** Remember to service the regulator/unloader at each seal servicing and check all system accessories and connections before resuming operation.

Refer to video for additional assistance.

TORQUE CHART

Pump Item	Thread	Tool Size [Part No.]	Torque in. lbs.	ft. lbs.	Nm
Outer Bearing Case Screw	M6	M10 Hex/Phil. [25082]	50	4.0	6
Inner Bearing Case Screw	M6	M10 Hex/Phil. [25082]	50	4.0	6
Manifold Screw	M8	M6 Allen [30941]	115	9.4	13
Plunger Rod Nut	M6	M10 Hex [25082]	55	4.4	6
Bubble Oil Gauge	M28	Oil Gauge Tool [44050]	45	3.6	5
Mounting 2SF					
Adapter Plate to Gas Engine	5/16-24	1/2" Hex	90	7.2	10
Pump to Adapter Plate	3/8-16	9/16" Hex	110	9.0	12
Pump to Electric Motor	3/8-16	9/16" Hex	110	9.0	12
Mounting 4SF					
Adapter Plate to Gas Engine	3/8-16	9/16" Hex	110	9.0	12
Pump to Adapter Plate	1/2-13	3/4" Hex	150	12.5	17
Pump to Electric Motor	1/2-13	3/4" Hex	150	12.5	17

TECHNICAL BULLETIN REFERENCE CHART

No.	Subject	Models
002	Inlet Pressure VS Liquid Temperature	All Models
024	Lubrication of Lo-Pressure Seals	All Models
043	LPS and HPS Servicing	All Plunger Models
055	Removing Pumps from Gas Engine or Electric Motor	2SF, 2SFX, 2DX, 4SF, 5DX, 6DX
057	Set Screw and Hardened Key	4SF
064	By-Pass Hose Sizing	All Unloaders/Regulators
065	Higher Performance Ratings	2SF and 4SF
070	Maximum Performance	2SF and 4SF
073	Hi-Temp HPS	3PFR, 5PFR, 2SF
074	Torque Chart	Piston and Plunger Pumps
075	Sleeved Plunger Rod	4SF"S"
083	Winterizing a Pump	All Models
091	2SF Inlet Valve	2SF Models
092	Crankcase Changes	All 2SF-2SFX

INLET CONDITION CHECK-LIST

Review Before Start-Up

Inadequate inlet conditions can cause serious malfunctions in the best designed pump. Surprisingly, the simplest of things can cause the most severe problems or go unnoticed to the unfamiliar or untrained eye. REVIEW THIS CHECK-LIST BEFORE OPERATION OF ANY SYSTEM. Remember, no two systems are alike, so there can be no **ONE** best way to set-up a system. All factors must be carefully considered.

INLET SUPPLY should be adequate to accommodate the maximum flow being delivered by the pump.

- ❑ Open inlet shut-off valve and turn on water supply to avoid cavitating pump. **DO NOT RUN PUMP DRY.**
- ❑ Temperatures above 130°F are permissible. Add 1/2 PSI inlet pressure per each degree F over 130°F. Elastomer or RPM changes may be required. See Tech Bulletin 002 or call CAT PUMPS for recommendations.
- ❑ Avoid closed loop systems without a Thermo Valve high temperature protection.
- ❑ Avoid low vapor pressure and high viscosity liquids.
- ❑ Higher temperature liquids tend to vaporize and require positive heads.
- ❑ When using an inlet supply reservoir, size it to provide adequate liquid to accommodate the maximum output of the pump, generally a minimum of 6-10 times the GPM (however, a combination of system factors can change this requirement); provide adequate baffling in the tank to eliminate air bubbles and turbulence; install diffusers on all return lines to the tank.

INLET LINE SIZE should be adequate to avoid starving the pump.

- ❑ Line size must be a minimum of one size larger than the pump inlet fitting. Avoid thick walled fittings, tees, 90 degree elbows or valves in the inlet line of the pump to reduce the risk of flow restriction and cavitation.
- ❑ The line MUST be a FLEXIBLE hose, NOT a rigid pipe, and reinforced on SUCTION systems to avoid collapsing.
- ❑ The simpler the inlet plumbing the less the potential for problems. Keep the length to a minimum, the number of elbows and joints to a minimum (ideally no elbows) and the inlet accessories to a minimum.
- ❑ Use pipe sealant to assure air-tight, positive sealing pipe joints.

INLET PRESSURE should fall within the specifications of the pump.

- ❑ Optimum pump performance is obtained with +20 PSI (1.4 BAR) inlet pressure. With adequate inlet plumbing, most pumps will perform with flooded suction. Maximum inlet pressure is 75 PSI (5.25 BAR).
- ❑ After prolonged storage, pump should be purged of air to facilitate priming. Disconnect any discharge port and allow liquid to pass through pump.

INLET ACCESSORIES are designed to protect against over pressurization, control inlet flow, contamination or temperature and provide ease of servicing.

- ❑ A shut-off valve is recommended to facilitate maintenance.
- ❑ A stand pipe can be used in some applications to help maintain a positive head in the inlet line.
- ❑ Inspect and clean inlet filters on a regular schedule.
- ❑ A pressure gauge is recommended to monitor the inlet pressure and should be mounted AS CLOSE TO THE PUMP INLET as possible. **Short term,intermittent cavitation will not register on a standard gauge.**
- ❑ All accessories should be sized to avoid restricting the inlet flow.
- ❑ All accessories should be compatible with the solution being pumped to prevent premature failure or malfunction.

BY-PASS TO INLET Care should be exercised when deciding the method of by-pass from control valves.

- ❑ It is recommended the by-pass be directed to a baffled reservoir tank, with at least one baffle between the by-pass line and the inlet line to the pump.
- ❑ The 2SF and 4SF come standard with a Regulating Unloader to handle by-pass liquid directed to the inlet line of the pump. If other than standard valve is used, exercise caution to use proper flexible hose and adequate diameter. A PRESSURE REDUCING VALVE may be needed on the inlet line (**BETWEEN** THE BY-PASS CONNECTION AND THE INLET TO THE PUMP) to avoid excessive pressure to the inlet of the pump. It may also be necessary to use a THERMO VALVE in the by-pass line to monitor the temperature build-up in the by-pass loop to avoid premature seal failure.
- ❑ A low-pressure, **FLEXIBLE CLOTH BRAID** (not metal braid) hose should be used from the by-pass connection to the inlet of the pump.
- ❑ If standard unloader valve is not used, check the pressure in the by-pass line to avoid over pressurizing the inlet.

HOSE FRICTION LOSS

Water* Flow Gal/Min	PRESSURE DROP IN PSI PER 100 FT OF HOSE WITH TYPICAL WATER FLOW RATES Hose Inside Diameters, Inches						
	1/4	5/16	3/8	1/2	5/8	3/4	1"
0.5	16	5	2				
1	54	20	7	2			
2	180	60	25	6	2		
3	380	120	50	13	4	2	
4		220	90	24	7	3	
5		320	130	34	10	4	
6			220	52	15	7	1
8			300	80	25	10	2
10			450	120	38	14	3
15			900	250	80	30	7
20			1600	400	121	50	12
25				650	200	76	19
30					250	96	24
40					410	162	42
50					600	235	62
60						370	93

*At a fixed flow rate with a given size hose, the pressure drop across a given hose length will be directly proportional. A 50 ft. hose will exhibit one-half the pressure drop of a 100 ft. hose. Above values shown are valid at all pressure levels.

WATER LINE PRESSURE LOSS

PRESSURE DROP IN PSI PER 100 FEET

Water GPM	Steel Pipe—Nominal Dia. 1/4	3/8	1/2	3/4	1	1¼	1½	Brass Pipe—Nominal Dia. 1/4	3/8	1/2	3/4	1	1¼	1½	Copper Tubing O.D. Type L 1/4	3/8	1/2	5/8	3/4	7/8
1	8.5	1.9						6.0	1.6						120	13	2.9	1.0		
2	30	7.0	2.1					20	5.6	1.8					400	45	10	3.4	1.3	
3	60	14	4.5	1.1				40	11	3.6						94	20	6.7	2.6	
5	150	36	12	2.8				100	28	9.0	2.2					230	50	17	6.1	3.0
8	330	86	28	6.7	1.9			220	62	21	5.2	1.6				500	120	40	15	6.5
10	520	130	43	10	3.0			320	90	30	7.8	2.4					180	56	22	10
15		270	90	21	6.2	1.6			190	62	16	5.0	1.5					120	44	20
25		670	240	56	16	4.2	2.0		470	150	40	12	3.8	1.7				330	110	50
40				66	17	8.0						59	11	5.0				550	200	86
60					37	17							23	11						
80					52	29							40	19						
100					210	107	48						61	28						

RESISTANCE OF VALVES AND FITTINGS

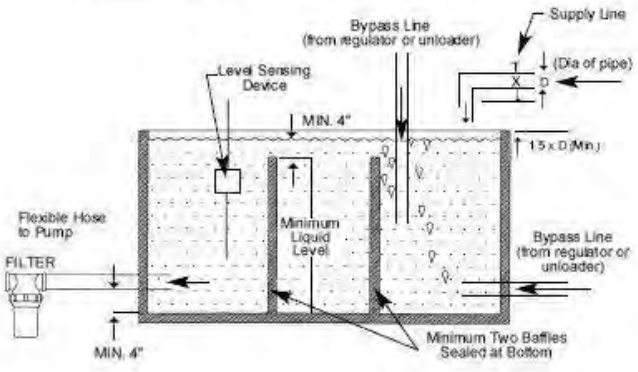
Nominal Pipe Size Inches	Inside Diameter Inches	Equivalent Length of Standard Pipe in Feet: Gate Valve	Globe Valve	Angle Valve	45° Elbow	90° Elbow	180° Close Ret	Tee Thru Run	Tee Thru Branch
1/2	0.622	0.41	18.5	9.3	0.78	1.67	3.71	0.93	3.33
3/4	0.824	0.54	24.5	12.3	1.03	2.21	4.90	1.23	4.41
1	1.049	0.69	31.2	15.6	1.31	2.81	6.25	1.56	5.62
1¼	1.380	0.90	41.0	20.5	1.73	3.70	8.22	2.06	7.40
1½	1.610	1.05	48.0	24.0	2.15	4.31	9.59	2.40	8.63
2	2.067	1.35	61.5	30.8	2.59	5.55	12.30	3.08	11.60
2½	2.469	1.62	73.5	36.8	3.09	6.61	14.70	3.68	13.20
3	3.068	2.01	91.5	45.8	3.84	8.23	18.20	4.57	16.40
4	4.026	2.64	120.0	60.0	5.03	10.80	23.90	6.00	21.60

Arriving at a total line pressure loss, consideration should then be given to pressure loss created by valves, fittings and elevation of lines.

If a sufficient number of valves and fittings are incorporated in the system to materially affect the total line loss, add to the total line length, the equivalent length of line of each valve or fitting.

TYPICAL RESERVOIR TANK

RECOMMENDED 6 TO 10 TIMES SYSTEM CAPACITY



Handy Formulas to Help You

Q. How can I find the RPM needed to get specific GPM (Gallons Per Minute) I want?

A. $\text{Desired RPM} = \text{Desired GPM} \times \frac{\text{Rated RPM}}{\text{Rated GPM}}$

Q. I have to run my pump at a certain RPM. How do I figure the GPM I'll get?

A. $\text{Desired GPM} = \text{Desired RPM} \times \frac{\text{Rated GPM}}{\text{Rated RPM}}$

Q. Is there a simple way to find the approximate horsepower I'll need to run the pump?

A. $\text{Electric Brake Horsepower Required} = \frac{\text{GPM} \times \text{PSI}}{1460}$ (Standard 85% Mech. Efficiency)

Q. What size motor pulley should I use?

A. $\text{Pump Pulley (Outer Diameter)} \times \frac{\text{Pump RPM}}{\text{Motor/Engine RPM}}$ (Consult Engine Mfr.)

Q. How do I calculate the torque for my hydraulic drive system?

A. $\text{Torque (ft. lbs.)} = 3.6 \left(\frac{\text{GPM} \times \text{PSI}}{\text{RPM}} \right)$

Avoid Cavitation Damage

One or several of the conditions shown in the chart below may contribute to cavitation in a system resulting in premature wear, system downtime and unnecessary operating costs.

CONDITION	SOLUTION
Inadequate inlet line size	• Increase line size to the inlet port or one size larger
Water hammering liquid acceleration/ deacceleration	• Install C.A.T. Tube • Move pump closer to liquid supply
Rigid Inlet Plumbing	• Use flexible wire reinforced hose to absorb pulsation and pressure spikes
Excessive Elbows in Inlet Plumbing	• Keep elbows to a minimum and less than 90°
Excessive Liquid Temperature	• Use Thermo Valve in bypass line • Do not exceed pump temperature specifications • Substitute closed loop with baffled holding tank • Adequately size tank for frequent or high volume bypass • **Pressure feed high temperature liquids** • Properly ventilate cabinets and rooms
Air Leaks in Plumbing	• Check all connections • Use PTFE thread tape or pipe thread sealant
Agitation in Supply Tank	• Size tank according to pump output — **Minimum 6-10 times system GPM** • Baffle tank to purge air from liquid and separate inlet from discharge
High Viscosity Liquids	• Verify viscosity against pump specifications before operation • Elevate liquid temperature enough to reduce viscosity • Lower RPM of pump • Pressure feed pump • Increase inlet line size
Clogged Filters	• Perform regular maintenance or use clean filters to monitor buildup • Use adequate mesh size for liquid and pump specifications

DIAGNOSIS AND MAINTENANCE

One of the most important steps in a high pressure system is to establish a regular maintenance program. This will vary slightly with each system and is determined by various elements such as the duty cycle, the liquid being pumped, the actual specifications vs rated specifications of the pump, the ambient conditions, the inlet conditions and the accessories in the system. A careful review of the necessary inlet conditions and protection devices required before the system is installed will eliminate many potential problems.

CAT PUMPS are very easy pumps to service and require far less frequent service than most pumps. Typically, only common tools are required, making in-field service convenient, however, there are a few custom tools, special to certain models, that do simplify the process. This service manual is designed to assist you with the disassembly and reassembly of your pump. The following guide will assist in determining the cause and remedy to various operating conditions. You can also review our **FAQ** or **SERVICE** sections on our **WEB SITE** for more facts or contact CAT PUMPS directly.

PROBLEM	PROBABLE CAUSE	SOLUTION
Low pressure	•Worn nozzle.	•Replace with properly sized nozzle.
	•Belt slippage.	•Tighten belt(s) or install new belt(s).
	•Air leak in inlet plumbing.	•Tighten fittings and hoses. Use PTFE liquid or tape.
	•Pressure gauge inoperative or not registering accurately.	•Check with new gauge. Replace worn or damaged gauge.
	•Relief valve stuck, partially plugged or improperly adjusted.	•Clean/adjust relief valve. Replace worn seats/valves and o-rings.
	•Inlet suction strainer (filter) clogged or improperly sized.	•Clean filter. Use adequate size filter. Check more frequently.
	•Abrasives in pumped liquid.	•Install proper filter.
	•Leaky discharge hose.	•Replace discharge hose with proper rating for system.
	•Inadequate liquid supply.	•Pressurize inlet and install C.A.T.
	•Severe cavitation.	•Check inlet conditions.
	•Worn seals.	•Install new seal kit. Increase frequency of service.
	•Worn or dirty inlet/discharge valves.	•Clean inlet/discharge valves or install new valve kit.
Pulsation	•Faulty Pulsation Dampener.	•Check precharge. If low, recharge, or install a new dampener.
	•Foreign material trapped in inlet/discharge valves.	•Clean inlet/discharge valves or install new valve kit.
Water leak		
•Under the manifold	•Worn V-Packings, Hi-Pressure or Lo-Pressure Seals.	•Install new seal kit. Increase frequency of service.
	•Worn adapter spacer o-rings.	•Install new o-rings.
•Into the crankcase	•Humid air condensing into water inside the crankcase.	•Install oil cap protector. Change oil every 3 months or 500 hours.
	•Excessive wear to seals and V-Packings.	•Install new seal kit. Increase frequency of service.
Knocking noise		
•Inlet supply	•Inadequate inlet liquid supply.	•Check liquid supply. Increase line size, pressurize or install C.A.T.
•Bearing	•Broken or worn bearing.	•Replace bearing.
•Pulley	•Loose pulley on crankshaft	•Check key and tighten set screw.
Oil leak		
•Crankcase oil seals.	•Worn crankcase oil seals.	•Replace crankcase oil seals.
•Crankshaft oil seals and o-rings.	•Worn crankshaft oil seals or o-rings on bearing cover.	•Remove bearing cover and replace o-rings and/or oil seals.
•Drain plug	•Loose drain plug or worn drain plug o-ring.	•Tighten drain plug or replace o-ring.
•Bubble gauge	•Loose bubble gauge or worn bubble gauge gasket.	•Tighten bubble gauge or replace gasket.
•Rear cover	•Loose rear cover or worn rear cover o-ring.	•Tighten rear cover or replace o-ring.
•Filler cap	•Loose filler cap or excessive oil in crankcase.	•Tighten filler cap. Fill crankcase to specified capacity.
Pump runs extremely rough		
•Inlet conditions	•Restricted inlet or air entering the inlet plumbing	•Correct inlet size plumbing. Check for air tight seal.
•Pump valves	•Stuck inlet/discharge valves.	•Clean out foreign material or install new valve kit.
•Pump seals	•Leaking V-Packings, Hi-Pressure or Lo-Pressure seals.	•Install new seal kit. Increase frequency of service.
Premature seal failure	•Scored plungers.	•Replace plungers.
	•Over pressure to inlet manifold.	•Reduce inlet pressure per specifications.
	•Abrasive material in the liquid being pumped.	•Install proper filtration at pump inlet and clean regularly.
	•Excessive pressure and/or temperature of pumped liquid.	•Check pressure and inlet liquid temperature.
	•Running pump dry.	•DO NOT RUN PUMP WITHOUT LIQUID.
	•Starving pump of adequate liquid.	•Increase hose one size larger than inlet port size. Pressurize and install C.A.T.
	•Eroded manifold.	•Replace manifold. Check liquid compatibility.

PRICE® BOOSTER PUMP

Price® Pump Co.

INSTALLATION, OPERATING AND MAINTENANCE MANUAL

TYPE HP CENTRIFUGAL PUMPS

MODELS: HP75 CN/CS, BN/BS, KN/KS, NN
HP75 SS/SC, AB
HP100 SS/SC, AB

PLEASE FILL IN FROM PUMP NAMEPLATE

Pump Model_____

BOM. No._____

Serial No._____

RETAIN MANUAL FOR REFERENCE

Price® Pump Company
21775 8th. Street East
Sonoma, CA 95476
Tel: 707-938-8441
Fax 707-938-0764
Email: sales@pricepump.com

IN158-HP rev. H

INSTALLATION / OPERATING INSTRUCTIONS
CENTRIFUGAL PUMPS

Warning

Before installing, repairing or performing maintenance on this pump, read these instructions completely.

Disconnect power to pump before servicing to avoid dangerous or fatal electrical shock.

Match supply voltage and frequency to motor nameplate values. Incorrect voltage can cause fire or serious motor damage and void warranty.

Ground motor before connection to electrical power supply! Failure to ground motor can cause severe or fatal electrical shock!

Do not ground to gas supply line!

Before disassembling pump, be certain all liquid has been removed. If pump was used to pump hazardous or toxic fluid, it must be decontaminated prior to disassembly.

Close Coupled Motor Pumps

It is suggested that these pumps be firmly bolted to a level surface. Adequate air movement around motor will help prevent overheating.

Do not over tighten inlet and outlet piping or volute may be damaged.

Power Frame Mounted Pumps

Power Frame mounted pumps must be mounted on a rigid base that will not warp or flex. Each pump must be mounted such that the pump shaft centerline is in-line with the driver shaft centerline. Pads and/or shims will be required on the pump, the driver or both to insure proper alignment. The two shafts should not touch each other (end to end) and the distance between them depends on the coupling used to connect them.

Misalignment will cause vibration, bearing failure and void warranty. Pumps are rough aligned at the factory but must be realigned after shipment and installation.

Pulley driven pump must have pulleys inline and proper belt tightness practices followed.

Direction of Rotation

Note: Motor shaft rotation is viewed from the suction end of pump. A rotational arrow is shown on the front of the pump volute casing. Incorrect rotation can cause pump damage, failure or reduced performance, voiding warranty. It is best to check rotation by momentarily energizing or jogging the motor prior to filling pump with liquid.

Warning! Do not operate pump without liquid as damage may result to the pump internal wear surfaces.

Plumbing

All piping needs to be supported independently of the pump. Piping connections should not exert any stress on the pump volute or fittings.

INSTALLATION / OPERATING INSTRUCTIONS

Suction Piping (Inlet)

(Horizontal Pumps)

Suction line must provide adequate suction pressure and even (Laminar) liquid flow for proper pump operation. Air, entrapped in the suction line due to leaks or improper piping design, may cause the pump to lose prime. Non-priming pumps must have their suction 'flooded' at start up (see datasheets for minimum NPSHR). Also, the suction line must provide sufficient pressure (NPSH) and even flow to pump inlet to prevent pump cavitation. The suction pipe entering the pump should be straight and a minimum length of 5 times and preferably 10 times the pump inlet diameter. Elbows, fittings or valves installed close to the pump inlet can disrupt liquid flow and cause cavitation. Suction lines must be at least the same diameter as the pump inlet or larger if possible.

Price Pump Company recommends against using foot valves in the suction line to maintain liquid in the pump when it's not operating. If foot valves are used, due to suction lift conditions, they must be properly maintained to avoid leaks resulting from wear or fouling. Suction piping must be designed to prevent vapor from being trapped in high spots in the piping. This condition may cause the pump to vapor lock.

Discharge Piping (Outlet)

To control flow and discharge head, it is advisable to install a valve (globe, ball, or other adjustable and non-leak type) in the discharge line adjacent to the pump. The valve may be closed during system repairs to prevent backflow. By installing a check valve in the discharge line, backflow can also be prevented during maintenance or during periods of pump stoppage.

Operation

All centrifugal pumps must be filled with liquid prior to start up. It is suggested that during initial start up the discharge valve be closed and then opened as the motor reaches full rpm's. If pump does not build up pressure as motor speed increases, shut down and make sure that liquid flow into pump is not restricted (see "Troubleshooting").

Note: A centrifugal pumps flow rate and head (pressure) will vary with the amount of resistance (pipe friction and flow restrictions) in the discharge line. As the valve on the discharge line opens, the flow rate and motor amperes draw will increase and head (pressure) will decrease. As the valve on the discharge line is closed, the flow rate and amperes draw will decrease and the head (pressure) will increase.

If resistance in the discharge line is not sufficient, the pump will operate at a condition of maximum flow, sometimes called "end of curve" performance. Maximum horse-power is required to operate at this point and motor overload may result. If excessive amperes draw and motor overload is occurring, reduce the system flow rate by installing a valve or orifice in the discharge line to control (restrict) the pumps flow rate. Alternatively, reduce pump head by trimming impeller to a smaller diameter.

Consult Price Pump or a local Price Pump distributor for assistance.

appsupport@pricepump.com

TROUBLESHOOTING

1. Pump fails to build head pressure:

Check for:

a. Pump not primed.

b. Incorrect pump rotation.

c. Driver speed too low.

d. Suction line restricted.

e. Driver failure.

f. Plugged or damaged impeller.

g. Pump or impeller undersized.

h. Pump cavitation.

i. Improper impeller clearance.

2. Pump fails to provide enough flow rate.

Check for:

a. System resistance too high.

b. Pump undersized.

c. Pump not primed.

d. Driver speed too low.

e. Poor suction conditions.

f. Improper impeller clearance.

3. Excessive noise or vibration during operation.

Check for:

a. Motor bearing failing.

b. Pump cavitation.

c. Improper impeller clearance.

4. Leaking mechanical seal.

Check for:

a. Improper assembly.

b. Worn or cracked seal faces.

c. Abrasive material in fluid.

d. Liquid flashing at seal faces (Fluid temperature too high).

e. Seal pressure rating too low for the service.

f. Chemical attack of seal components.

g. Seal operated dry or with a liquid having poor lubricating properties.

5. Pump gradually loses pressure and head.

Check for:

a. Increasing temperature causing cavitation or liquid vaporization.

b. Driver failure.

c. Suction lift too high.

d. Air entering suction line.

6. Motor overheating.

Check for:

a. Excessive flow and amp draw (Throttle discharge).

b. Low voltage or frequency.

c. Flow rate too low with resulting heat rise.

d. Bearing failure.

e. System temperature too high.

TYPE HP MAINTENANCE AND REPAIR

Before attempting any repairs under warranty, contact Distributor to obtain factory authorization. Repairs carried out without authorization may void warranty. Many causes of pump system failure are due to improper system design. Refer to the trouble shooting -list in this manual before carrying out pump inspection.

DISASSEMBLY

1. Disconnect power source to motor.

2. Disconnect electrical connections tagging wires carefully to preserve correct rotation. Loosen motor base.

3. Remove pump and motor assembly to repair area. Observe position of all parts prior to disassembly. (Note: Volute may be left in piping.)

4. Remove bolts and remove volute from pump.

5. Remove impeller. Unscrew CCW. (note: remove center cap from rear of moto r, insert screwdriver to hold shaft while un -screwing impeller).

6. Remove seal head from motor shaft. Type 8 & 9: Loosen set screws and slide seal head off shaft.

7. Remove motor bolts and remove bracket from motor.

8. Remove seal seat from bracket using fingers.

REASSEMBLY

1. Clean seat cavity of the bracket thoroughly. (For Bell Gasket Design, assure that there are no cuts or tearing in the end bell gasket.)

2. Thoroughly clean pump shaft. Assure that the shaft is not grooved and that there is no evidence of pitting or fretting. Polish the shaft with extra fine emery cloth if needed. If the shaft is grooved, fretted or worn, replace the motor.

3. **For Type 6, 8, 9 and 21 seals:**

a. Place the bracket on a firm surface with the seat cavity (pump end) up. (Fo r Bell Gasket Design, place new end bell gasket on bracket).

b. Install seal seat into seat cavity. (For Bell Gasket Design remove the rubber seat cup and discard). Evenly push seat into cavity with fingers. To help ensure the seat is not damaged place cardboard disk over the seat face then gently tap seat into place with a wooden dowel or plastic rod (1 -1/8" outside diameter).

T6 seal only:

a. Set seal on shaft with carbon facing ceramic seat. Do not push seal head past shoulder on shaft (note: when imp eller is threaded onto motor shaft seal height will automatically be set.)

T21 only:

a. Lubricate shaft and elastomer with vegetable oil.

b. Install rotary seal head onto motor shaft and slide toward seat until carbon face touches seal seat.

c. Install sea l spring and seal retainer.

T 8 & 9 only:

a. Install seal head onto pump shaft sliding gently past shoulder of shaft. Slide seal head toward seat until carbon face contacts ceramic seat.

b. Tighten seal head setscrews to pump shaft. Remove clips in seal head and discard.

4. Install impeller. Thread impeller onto shaft CW. (For st ainless steel / bronze impellers, apply L octite 242, For CPVC / Noryl impellers, apply L octite 248 or equivalent to the motor shaft before threading the impeller onto the motor shaft) Place screwdriver in motor shaft slot in rear of motor to hold while tightening impeller firmly. (For O-ring Design, install the O - ring on to the bracket face).

Note: For type 21: Ensure that the spring retainer does not slip between the shoulder of the shaft and the hub of the impeller.

5. Install volute and tighten bolts evenly (star pattern) to required torque.

Volute Bolt Torque Specifications

SS / Bronze - 10-12 ft/ lbs.
(13.5-16.3 Nm)

CPVC - 6 ft / lbs.
(9.5 Nm)

Noryl- 10 ft / lbs.
(13.5 Nm)

6. Rotate shaft by hand to make sure impeller does not rub against volute.

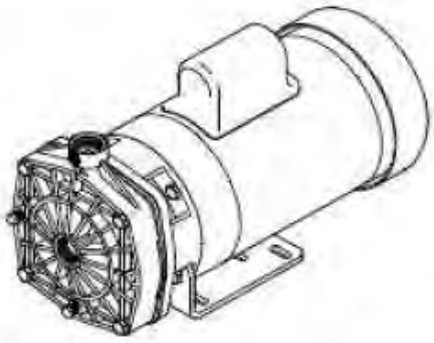
7. Return pump to installation, reconnect electric connections.

8. Start pump momentarily to observe shaft rotation. If rotation corresponds to the rotation arrow pump may be put into service. If rotation is incorrect, switch any two leads on 3 -phase motors. Check the wiring diagram of motor for single phase rotation.

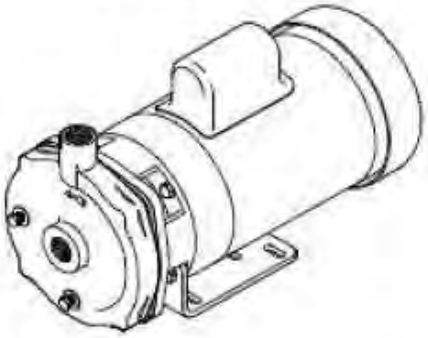
9. Prime pump thoroughly, making sure all air is purged.

10. Start pump allowing adequate time to purge any additional air from system. Observe any gauges, flow meters, etc. to verify that pump is performing properly.

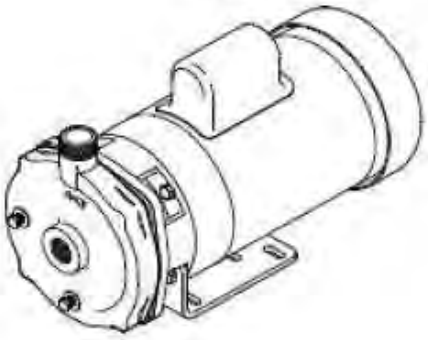
HP75 CN/CS/NN



HP75 BN/BS/KN/KS/SS/SC/AB



HP100 SS/AB



INSTALLING A PEO (PUMP END ONLY) STUB SHAFT PUMP

a. Place the bracket on a firm surface, loosen stub shaft setscrews and carefully remove shipping plug.

b. Place motor in an upright position with motor shaft pointing upward. Make sure motor shaft and end bell flange are free of burrs and surfaces are clean.

c. Align PEO stub shaft setscrews (if applicable) with motor shaft keyway and carefully slid the PEO onto the motor shaft until it sits firmly onto the motor end bell flange.

d. Oriented the PEO's discharge port or base to preferred motor configuration while referencing the motors electrical box position.

e. Install flange bolts and tighten. (Install pump base if applicable)

f. Reposition pump back onto motor base.

g. Refer to pump Reassembly Instructions and proceed to **setting the impeller clearance** (if applicable).

INSTALLING A PEO (PUMP END ONLY) NON-STUB SHAFT PUMP

a. Carefully un-pack all components received with your shipment and remove any shipping plugs.

b. Place the bracket on a firm surface with the s eat cavity (pump end) up. Follow seal Installation / reassembly instructions contained within this manual.

c. Make sure motor shaft and motor end bell flange are free of burrs and surfaces are clean.

d. Carefully place the Bracket assembly over the motor shaft and align bracket with motor end bell flange.

e. Install impeller, gasket or o -ring, volute and volute mounting bolts.

f. Oriented the PEO's discharge port or base to preferred motor configuration while referencing the motors electrical box position.

g. Install motor flange bolts and tighten all bolts to proper torque . (Install pump base if applicable)

PRICE PUMP CO.

HP75/HP100 (O-Ring Design) Parts List

Key #	Description	QTY.	HP75/100 SS&SC:	HP75/100 AB:	HP75 NN:
A.	Volute HP75	1	0241(A[1])	0229-0(A[1])	8300NN(A[1])
	Volute HP100	1	0241-2(A[2])	0229-2(A[2])	N/A
B.	1/8" Pipe Plug	2	0559(B[1])	0558(B[1])	8012BF(B[2]) (1ea)
C.	Volute Bolts	4	0579(C[1])	0592(C[1])	0723(C[2])
D.	Washers	12	N/A	N/A	1137
E.	Volute Nuts	4	N/A	N/A	1138
F.	Impeller	1	0918SS-(dia.)	0918BR-(dia.)	N/A
	Impeller CPVC	1	0918-(dia.)	N/A	0918-(dia.)
G.	Bracket	1	0238(SS)(G[1])	0242(BR)(G[1])	8019NN-1(G[1])
H[1].	T.21 Viton	1	0553 (std)	0553 (std)	0553
H[2].	T.8 Viton	1	2394-PU	2394-PU	N/A
H[2].	T.9 Teflon	1	1150	1150	N/A
H[3].	T.6 Buna	1	N/A	N/A	0118 (std)
J.	O-ring	1	3565	3565	0871
K.	Slinger	1	0515	0515	0515
L.	Base	1	0197	0197	0198
M.	Bolts, Motor				
	Upper	2	0579	0579	0588
	Lower	2	0724	0724	0673
N[1].	Motor	1	Specify P/N	Specify P/N	Specify P/N
N[2].	Power Frame	1	5479	5479	5479

HP75 / HP100 Repair Parts Kits (O-ring Design)

(Repair kits for SC pumps only)

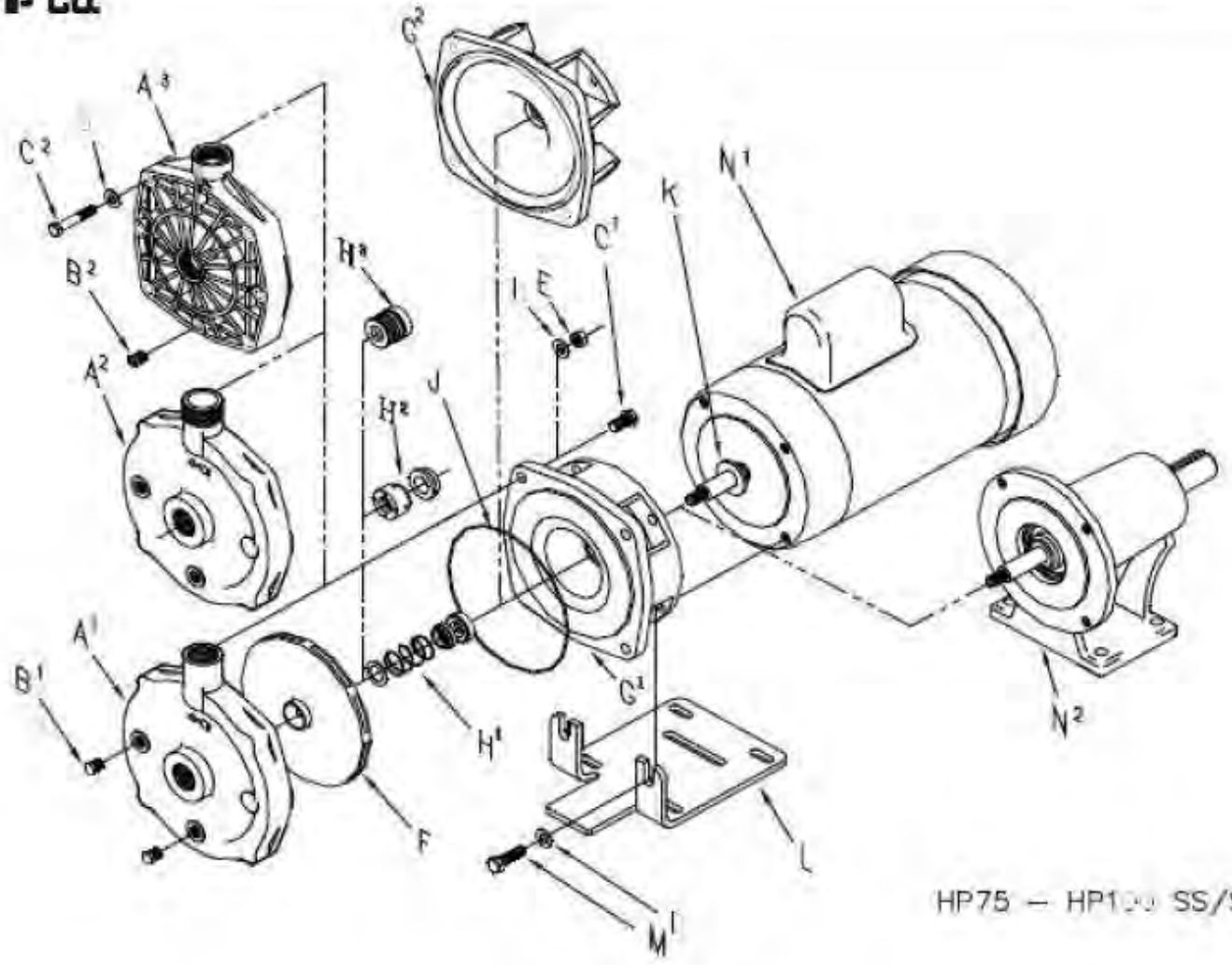
P/N	Includes
0661SC-8	4.00" CPVC Imp., Viton O-ring, and Slinger
0661SC-6	4.25" CPVC Imp., Viton O-ring, and Slinger
0661SC-5	4.50" CPVC Imp., Viton O-ring, and Slinger
0661SC-7	4.75" CPVC Imp., Viton O-ring, and Slinger
0661SC-4	5.00" CPVC Imp., Viton O-ring, and Slinger
0661SC-3	5.25" CPVC Imp., Viton O-ring, and Slinger
0661SC-2	5.50" CPVC Imp., Viton O-ring, and Slinger
0661SC-1	5.75" CPVC Imp., Viton O-ring, and Slinger
0661SC	6.00" CPVC Imp., Viton O-ring, and Slinger

Note: Seal/Seat must be ordered in addition to repair kit

Standard Pump Configurations

Model:	Volute Material:	Bracket Material:	Impeller Material:
SS	316SS	316SS	316SS
SC	316SS	316SS	CPVC
AB	Bronze	Bronze	Bronze
NN	Noryl	Noryl	CPVC

PRICE PUMP CO.



HP75 – HP1[illegible] SS/SC/AB/NN

Price Pump Co.
21775 Eighth Street East * Sonoma, CA 95476-0329 * (707) 938-8441 * Fax (707) 938-0764

PRICE PUMP CO.

HP75 (Gasket Design) Parts List

Key #	Description	QTY.	HP75 BN/BS:	HP75 KN/KS:	HP75 CN / CS:
A.	Volute	1	0229(A[1])	0229KP(A[1])	8300CP(A[2])
B.	1/8" Pipe Plug	2	0558(B[1])	0559(B[1])	8012PF(B[2]) (1ea.)
C.	Volute Bolts	4	0592(C[2])	0588(C[2])	1136(C[2])
D.	Washers	4	N/A	N/A	1137
E.	Volute Nuts	4	N/A	N/A	1138
F.	Impeller CPVC	1	0918-(Imp. Dia.)	0918-(Imp. Dia.)	0918-(Imp. Dia.)
	Impeller 316SS	1	0918SS-(Imp. Dia.)	0918SS-(Imp. Dia.)	0918SS-(Imp. Dia.)
G[1].	T.6 Buna (std)	1	0118	0118	0118
G[2].	T.21Viton	1	0553	0553	0553
H.	Gasket, EPDM	1	0232	0232	0232
J.	Bracket	1	0228	0228	0228
K.	Slinger	1	0515	0515	0515
L.	Base	1	0198	0198	0198
M.	Bolts, Motor				
	Upper	2	0588	0588	0588
	Lower	2	0673	0673	0673
N[1].	Motor	1	Specify P/N	Specify P/N	Specify P/N
N[2].	Power Frame	1	5479	5479	5479

HP75 Repair Parts Kits (Bell Gasket Design)

(Repair kits for BN, KN, & CN pumps only)

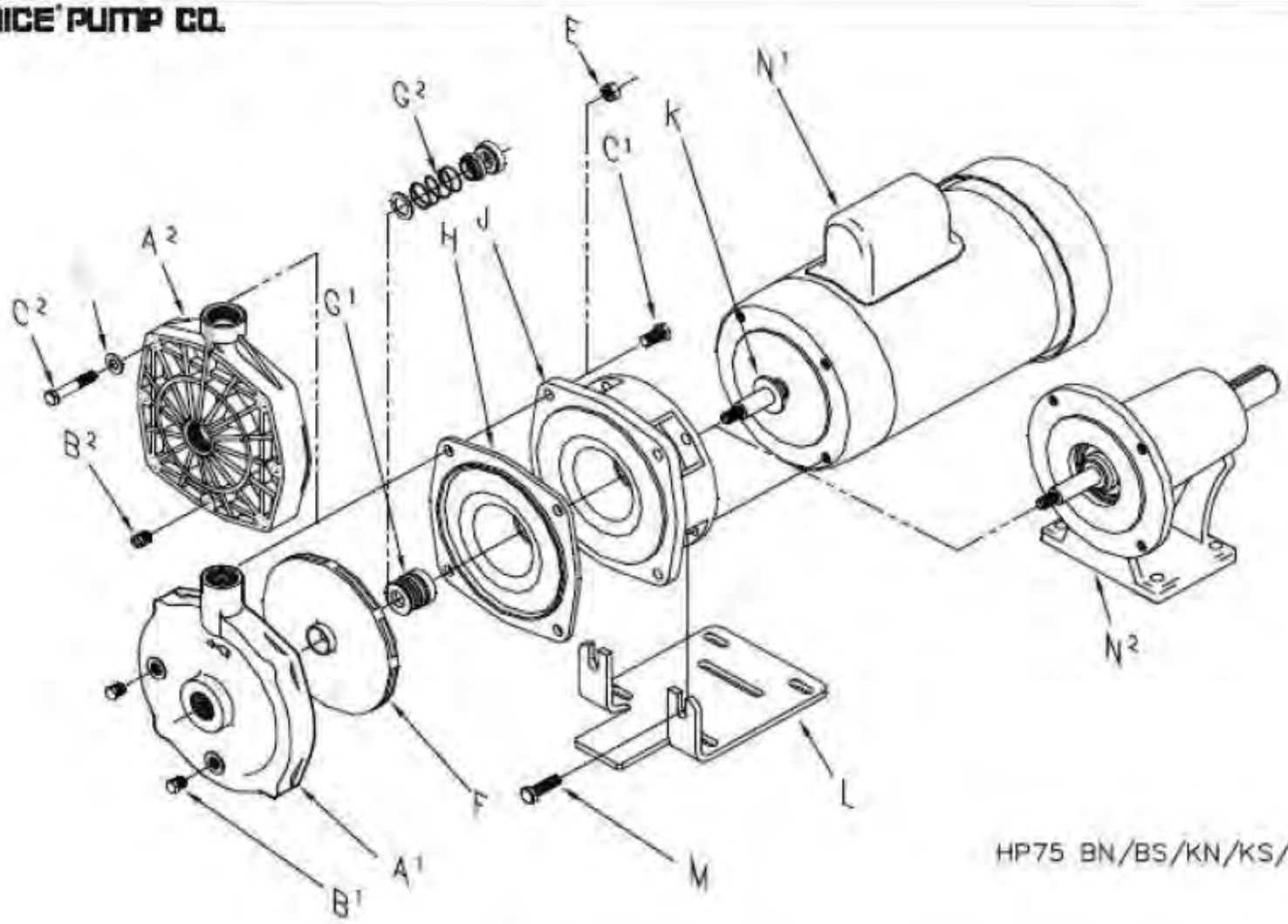
P/N	Includes
0661-8	4.00" CPVC Imp., EPR Gasket, and Slinger
0661-6	4.25" CPVC Imp., EPR Gasket, and Slinger
0661-5	4.50" CPVC Imp., EPR Gasket, and Slinger
0661-7	4.75" CPVC Imp., EPR Gasket, and Slinger
0661-4	5.00" CPVC Imp., EPR Gasket, and Slinger
0661-3	5.25" CPVC Imp., EPR Gasket, and Slinger
0661-2	5.50" CPVC Imp., EPR Gasket, and Slinger
0661-1	5.75" CPVC Imp., EPR Gasket, and Slinger
0661	6.00" CPVC Imp., EPR Gasket, and Slinger

Note: Seal/Seat must be ordered in addition to repair kit .

Standard Pump Configurations

Model:	Volute Material:	Bracket Material:	Impeller Material:
BN	Bronze	Cast Iron	CPVC
KN	Kanigen	Cast Iron	CPVC
CN	CPVC	Cast Iron	CPVC
BS	Bronze	Cast Iron	316SS
KS	Kanigen	Cast Iron	316SS
CS	CPVC	Cast Iron	316SS

PRICE PUMP CO.



HP75 BN/BS/KN/KS/CN/CS

Price® Pump Co.
21775 Eighth Street East • Sonoma, CA 95476-0329 • (707) 938-8441 • Fax (707) 938-0764

PRICE CENTRIFUGAL PUMP CAUTIONS & WARNINGS

- **CAUTION:** Price Pump centrifugal pumps must be operated above minimum flow rate to avoid damage.
- **CAUTION:** All Price Pump centrifugal pumps require the suction to be flooded.
- **CAUTION:** It is recommended that all piping connections to the pump be flexible.
- **WARNNING:** Verify chemical compatibility of the pump materials of construction with the fluid being pumped.
- **WARNNING:** Price centrifugal pumps are not designed for use in sanitary or food applications.
- **CAUTION:** Use only Price Pump original equipment factory replacement parts.
- **WARNNING:** Price pump fluid temperature limits must be observed. Maximum operating temperature is 300°F.
- **CAUTION:** The pump should be thoroughly flushed and drained before disassembly.
- **CAUTION:** For larger pump motor units, weight may exceed 65 1bs. (30 kg)

CAUTION: Maximum working pressure for seals:

Type 6 Seal	**75 PSI** (5.2 bar)
Type 6A Seal	**75 PSI** (5.2 bar)
Type 8 Seal	**325 PSI** (22.4 bar)
Type 9 Seal	**350 PSI** (24.1 bar)
Type 21 Seal	**150 PSI** (10.3 bar)
Type 2106 Seal	**150 PSI** (10.3 bar)

CAUTION: Maximum solid size by pump

HP75 / MS50	**0.030"** (0.76mm)
SP150	**0.060"** (1.50mm)
LT25	**0.120"** (3.05mm)
F50/75/95	**0.150"** (3.81mm)
OH75	**0.150"** (3.81mm)
CD100/150	**0.150"** (3.81mm)
CL150	**0.150"** (3.81mm)
RC200/300	**0.380"** (9.60mm)
XJ-JB100	**0.120"** (3.05mm)
XJ-JB150	**0.250"** (6.40mm)
XJ-JB200	**0.440"** (11.2mm)
XL-XT100	**0.120"** (3.05mm)
XL-XT150	**0.250"** (6.40mm)
XL-XT200	**0.440"** (11.2mm)

CAUTION: Minimum flow rate by pump

HP75 / MS50	**0.5 GPM** (1.9 LPM)
SP150	**10 GPM** (38 LPM)
LT25	**0.5 GPM** (1.9 LPM)
F50/75/95	**5.0 GPM** (19 LPM)
OH75	**7.0 GPM** (26 LPM)
CD100	**12 GPM** (45 LPM)
CD150	**25 GPM** (94 LPM)
CL150	**40 GPM** (150 LPM)
RC200	**10 GPM** (38 LPM)
RC300	**50 GPM** (189 LPM)
XJ-JB150	**20 GPM** (75 LPM)
XJ-JB150	**40 GPM** (150 LPM)
XJ-JB200	**90 GPM** (340 LPM)
XL-XT100	**10 GPM** (38 LPM)
XL-XT150	**35 GPM** (132 LPM)
XL-XT200	**50 GPM** (189 LPM)

DOW FILMTEC™ MEMBRANES

DOW FILMTEC™ Membranes

DOW FILMTEC Seawater RO Elements for Marine Systems

Features

Improved DOW FILMTEC™ seawater reverse osmosis elements offer the highest productivity while maintaining excellent salt rejection.

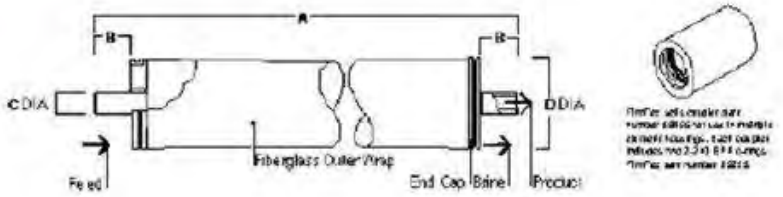
- DOW FILMTEC SW30 membrane elements have the highest flow rates available to meet the water demands of both sea-based and land-based desalinators.
- DOW FILMTEC SW30 elements may also be operated at lower pressure to reduce pump size, cost and operating expenses.
- Improved DOW FILMTEC seawater membrane combined with automated, precision element fabrication result in the most consistent product performance available.

Product Specifications

Product	Part Number	Applied Pressure psig (bar)	Permeate Flow Rate gpd (m^3/d)	Stabilized Salt Rejection (%)
SW30-2514	60733	800 (55)	150 (0.6)	99.4
SW30-2521	60734	800 (55)	300 (1.1)	99.4
SW30-2540	60737	800 (55)	700 (2.6)	99.4
SW30-4021	60740	800 (55)	800 (3.0)	99.4
SW30-4040	60741	800 (55)	1,950 (7.4)	99.4

1. Permeate flow and salt rejection based on the following test conditions: 32,000 ppm NaCl, pressure specified above, 77°F (25°C) and the following recovery rates: SW30-2514 – 2%, SW30-2521 & SW30-4021 – 5%, SW30-2540 & SW30-4040 – 8%.
2. Permeate flows for individual elements may vary +/-20%.
3. For the purpose of improvement, specifications may be updated periodically.

Figure 1



Product	Maximum Feed Flow Rate gpm (m^3/h)	Dimensions – Inches (mm) A	B	C	D
SW30-2514	6 (1.4)	14.0 (356)	1.19 (30.2)	0.75 (19)	2.4 (61)
SW30-2521	6 (1.4)	21.0 (533)	1.19 (30.2)	0.75 (19)	2.4 (61)
SW30-2540	6 (1.4)	40.0 (1,016)	1.19 (30.2)	0.75 (19)	2.4 (61)
SW30-4021	16 (3.6)	21.0 (533)	1.05 (26.7)	0.75 (19)	3.9 (99)
SW30-4040	16 (3.6)	40.0 (1,016)	1.05 (26.7)	0.75 (19)	3.9 (99)

1. Refer to DOW FILMTEC Design Guidelines for multiple-element systems.
2. SW30-2514, SW30-2521 and SW30-2540 elements fit nominal 2.5-inch I.D. pressure vessels. SW30-4021 and SW30-4040 elements fit nominal 4-inch I.D. pressure vessel.

1 inch = 25.4 mm

Operating Limits

• Membrane Type	Polyamide Thin-Film Composite
• Maximum Operating Temperature	113°F (45°C)
• Maximum Operating Pressure	1,000 psi (69 bar)
• Maximum Pressure Drop	15 psig (1.0 bar)
• pH Range, Continuous Operation[a]	2 - 11
• pH Range, Short-Term Cleaning[b]	1 - 13
• Maximum Feed Silt Density Index	SDI 5
• Free Chlorine Tolerance[c]	<0.1 ppm

[a] Maximum temperature for continuous operation above pH 10 is 95°F (35°C).
[b] Refer to Cleaning Guidelines in specification sheet 609-23010.
[c] Under certain conditions, the presence of free chlorine and other oxidizing agents will cause premature membrane failure. Since oxidation damage is not covered under warranty, DOW FILMTEC recommends removing residual free chlorine by pretreatment prior to membrane exposure. Please refer to technical bulletin 609-22010 for more information.

Important Information

Proper start-up of reverse osmosis water treatment systems is essential to prepare the membranes for operating service and to prevent membrane damage due to overfeeding or hydraulic shock. Following the proper start-up sequence also helps ensure that system operating parameters conform to design specifications so that system water quality and productivity goals can be achieved.

Before initiating system start-up procedures, membrane pretreatment, loading of the membrane elements, instrument calibration and other system checks should be completed.

Please refer to the application information literature entitled "Start-Up Sequence" (Form No. 609-02077) for more information.

Operation Guidelines

Avoid any abrupt pressure or cross-flow variations on the spiral elements during start-up, shutdown, cleaning or other sequences to prevent possible membrane damage. During start-up, a gradual change from a standstill to operating state is recommended as follows:

- Feed pressure should be increased gradually over a 30-60 second time frame.
- Cross-flow velocity at set operating point should be achieved gradually over 15-20 seconds.
- Permeate obtained from first hour of operation should be discarded.

General Information

- Keep elements moist at all times after initial wetting.
- If operating limits and guidelines given in this bulletin are not strictly followed, the limited warranty will be null and void.
- To prevent biological growth during prolonged system shutdowns, it is recommended that membrane elements be immersed in a preservative solution.
- The customer is fully responsible for the effects of incompatible chemicals and lubricants on elements.
- Maximum pressure drop across an entire pressure vessel (housing) is 50 psi (3.4 bar).
- Avoid static permeate-side backpressure at all times.

DOW FILMTEC™ Membranes
For more information about DOW FILMTEC membranes, call the Dow Water & Process Solutions business:

North America:	1-800-447-4369
Latin America:	(+55) 11-5188-9222
Europe:	(+32) 3-450-2240
Pacific:	+60 3 7958 3392
Japan:	+813 5460 2100
China:	+86 21 2301 1000

www.dowwaterandprocess.com

BURKERT DIVERSION VALVE

Type 0121, 0330, 0331 (0124, 0125, 0332, 0333)

2/2- and 3/2-Way Solenoid Valve
2/2- und 3/2-Wege-Magnetventil
Electrovanne à 2/2 et 3/2 voies

Operating Instructions
Bedienungsanleitung
Manuel d'utilisation

MAN 1000010161 ML Version: G Status: RL (released | freigegeben) printed: 24.10.2016

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www.burkert.com

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Bedienungsanleitungen und Datenblätter im Internet: www.buerkert.de
Instructions de service et fiches techniques sur Internet : www.buerkert.fr

www.burkert.com

Table of Contents

1 THE OPERATING INSTRUCTIONS

The operating instructions contain important information.

- Read the instructions carefully and follow the safety instructions.
- Keep the instructions in a location where they are available to every user.

The liability and warranty for the device are void if the operating instructions are not followed.

1.1 Symbols

- Designates instructions for risk prevention.

→ Designates a procedure which you must carry out.

DANGER!

Immediate danger! Serious or fatal injuries.

WARNING!

Possible danger! Serious or fatal injuries.

CAUTION!

Danger! Moderate or minor injuries.

NOTE!

Warns of damage to property.

Important tips and recommendations.

Refers to information in these operating instructions or in other documentation.

1.2 Definitions of terms

In these instructions, the term "device" always refers to the Type 0121, 0330, 0331, (0124, 0125, 0332, 0333).

2 AUTHORIZED USE

The device is designed to control, shut off and meter neutral and aggressive media up to a viscosity of 37 mm²/s.

- Use according to the authorized data, operating conditions and conditions of use specified in the contract documents and operating instructions.
- Provided the cable plug is connected and installed correctly, e.g. Bürkert Type 2508, the device satisfies degree of protection IP65 in accordance with DIN EN 60529 / IEC 60529.

Only operate the device

- when in perfect condition and always ensure proper storage, transportation, installation and operation.
- Use the device only as intended.

2.1 Restrictions

If exporting the device, observe any existing restrictions.

MAN 1000010161 ML Version: G Status: RL (released | freigegeben) printed: 24.10.2016

3 BASIC SAFETY INSTRUCTIONS

These safety instructions do not make allowance for any contingencies and events which may arise during assembly, operation and maintenance.

Risk of injury from high pressure in the system/device.

- Before working on the system or device, switch off the pressure and vent/drain lines.

Risk of injury due to electrical shock.

- Before working on the system or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

Risk of burns/risk of fire if used for a prolonged switch-on time through hot device surface.

- Keep device away from highly flammable substances and media and do not touch with bare hands.

Risk of injury due to malfunction of valves with alternating voltage (AC).

Sticking core causes coil to overheat, resulting in a malfunction.

- Monitor process to ensure function is in perfect working order.

Risk of short-circuit/escape of media through leaking screw joints.

- Ensure seals are seated correctly.
- Carefully screw valve and pipelines together.

General hazardous situations.

To prevent injuries:

- In a potentially explosive area, the device may be used only in accordance with the specification on the type label. For the use, observe the supplementary instructions manual enclosed with the device with safety instructions for the explosion-risk area.
- The enclosed UL instructions must be followed in the UL area.
- Do not carry out any external or internal modifications and do not subject the device to mechanical loads (e.g. by placing objects on it or standing on it).
- Secure the device against unintentional activation.
- Only trained technicians may perform installation and maintenance work.
- The valves must be installed in accordance with the regulations applicable in the country.
- After an interruption in the power supply, ensure that the process is restarted in a controlled manner.
- Observe the general rules of technology.

4 SYSTEM DESCRIPTION

4.1 General description

The pivoted armature valves are direct acting 2/2 or 3/2-way solenoid valves in a wide variety of circuit functions and models. Solenoid system and media chamber are separated from one another by a separating diaphragm system. The valves are fast acting and have a long service life.

Type 0121	2/2 or 3/2-way solenoid valve, socket valve body
Type 0330	2/2 or 3/2-way solenoid valve, socket valve body
Type 0331	2/2 or 3/2-way solenoid valve, flange valve body
Type 0332	Bistable 2/2 or 3/2-way solenoid valve with 2 coil windings, socket valve body
Type 0333	Bistable 2/2 or 3/2-way solenoid valve with 2 coil windings, flange valve body
Type 0124	2/2 or 3/2-way solenoid valve, socket valve body
Type 0125	2/2 or 3/2-way solenoid valve, flange valve body

5 TECHNICAL DATA

The following values are indicated on the type label:

- **Voltage** (tolerance ±10 %) / **current type**
- **Coil power consumption** (active power in W - at operating temperature)
- **Pressure range**
- **Body material** (MS=brass, VA=stainless steel, PV=PVC, TE=PTFE, PP=polypropylene, PD=PVDF)
- **Sealing material** (F=FKM, A=EPDM, B=NBR, C=FFKM)

5.1 Conformity

The Types 0121, 0330, 0331, (0124, 0125, 0332, 0333) are compliant with the EC Directives according to the EC Declaration of Conformity.

5.2 Standards

The applied standards, which are used to demonstrate compliance with the EC Directives, are listed in the EC type test certificate and/or the EC Declaration of Conformity.

5.3 Operating conditions

Ambient temperature

Type 0121	max. +50°C
Other types	max. +55°C

Duty cycle

for body material

Brass or stainless steel	long-term operation, duty cycle 100%
Plastic	max. permissible duty cycle see data sheet

Important information for functional reliability.
If switched off for a long period, 1-2 switching actions are recommended prior to restart.

Service life

High switching frequency and high pressures reduce the service life.

Degree of protection	IP65 in accordance with DIN EN 60529 / IEC 60529 with correctly connected and installed cable plug, e.g. Bürkert Type 2508

5.4 Mechanical data

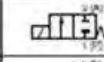
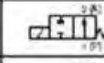
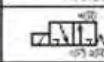
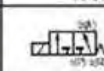
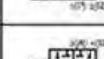
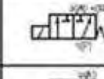
Dimensions	see data sheet
Coil material	epoxide
Connections	G 1/4 (NPT 1/4, G 1/8, G 3/8, Rc 1/4 on request)

5.5 Fluidic data

Media	aggressive, neutral, gaseous and liquid media, which do not attack body and sealing materials. (see resistance table at www.buerkert.de).

Medium temperature for sealing material

FKM	0 °C – +90 °C
EPDM	-30 °C – + 90 °C
NBR	0 °C – + 60 °C
FFKM	+5 °C – +90 °C

Circuit functions		
A (NC)		2/2-way valve, closed in rest position
B (NO)		2/2-way valve, open in rest position
C (NC)		3/2-way valve; closed in rest position, output A unloaded
D (NO)		3/2-way valve, in rest position, output B pressurized
E		3/2-way mixing valve; in rest position, pressure connection P2 connected to output A, P1 closed
F		3/2-way distribution valve, in rest position, pressure connection P connected to output B
T		3/2-way all purpose valve

5.6 Electrical data

Connections DIN EN 175301-803 (DIN 43 650), shape A for cable plug Type 2508 or 2509

5.7 Type label

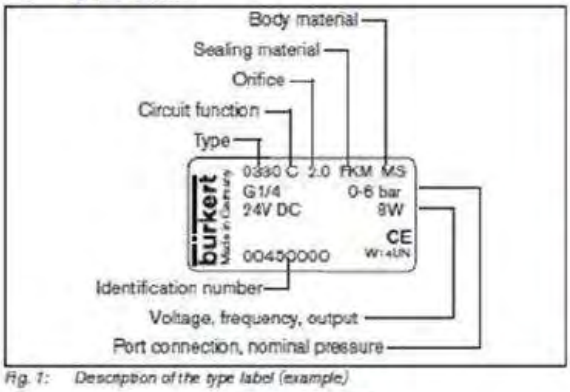


Fig. 1: Description of the type label (example)

6 ASSEMBLY

DANGER!

Risk of injury from high pressure in the system/device.

- Before working on the system or device, switch off the pressure and vent/drain lines.

Risk of injury due to electrical shock.

- Before working on the system or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

WARNING!

Risk of injury from improper assembly.

- The assembly may be carried out only by trained technicians and with the appropriate tools.
- Secure system against unintentional activation.
- Following assembly, ensure a controlled restart.

6.1 Before installation

Installation position:

The installation position is optional. Preferably: Actuator at the top.

→ Prior to installation check pipelines for dirt and clean if necessary.

Dirt filter: To ensure that the solenoid valve functions reliably, a dirt filter (≤ 500 µm) must be installed in front of the valve input.

6.2 Installation

→ Observe flow direction:
Functioning of the device is only ensured if the circuit function is maintained.

Devices in socket model

→ Use PTFE tape as sealing material.

→ Determine the maximum screw-in depth of the connecting threads as this does not comply with any standard.

NOTE!

Caution risk of breakage.

- Do not use the coil as a lifting arm.

→ Hold the device with a suitable tool (open-end wrench) on the body; screw into the pipeline.

Attaching the device:

→ Via bore holes M4x8 (made from brass or stainless steel) or self-tapping screws 3.9 DIN 7970 (made from plastic, max. screw-in depth 10 mm) on the bottom side of the body at drill pattern 38x24.

Devices in flange model

Attaching the device:

→ Via supplied screws on basic devices or manifold.

→ Tighten fastening screws on the coil to a maximum torque of 2 Nm.

6.3 Manual control

NOTE!

- When the manual control is locked, the valve cannot be actuated electrically.

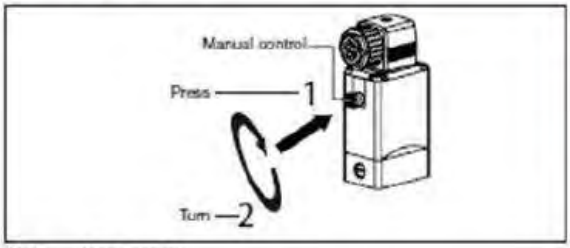


Fig. 2: Manual control

7 ELECTRICAL CONNECTION

DANGER!

Risk of injury due to electrical shock.

- Before working on the system or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

If the protective conductor is not connected, there is a risk of electric shock.

- Always connect protective conductor and check electrical continuity between coil and housing.

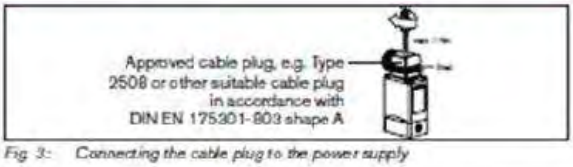


Fig. 3: Connecting the cable plug to the power supply

Note the voltage and current type as specified on the type label.

7.1 Standard model

→ Connect L1/+ and N/– to terminals 1 and 2, independent of the polarity.

→ Connect protective conductor.

→ Attach seal and check for correct fit.

→ Tighten cable plug (Type 2508 or 2509 in accordance with DIN EN 175301-803 (DIN 43 650), shape A, for order numbers see data sheet); while doing so, observe the maximum torque of 1 Nm.

→ Check electrical continuity between coil and body (protective conductor function).

7.2 Pulse model (CF 02)

In accordance with the terminals on the valves, the connection terminals in the cable plug are marked with the numbers 1 to 3.

→ Connect as shown in "Fig. 4". Pulse on terminal 1 closes the valve; pulse on terminal 2 opens the valve.

→ Attach seal and check for correct fit.

→ Tighten cable plug (Type 2508 or 2509 in accordance with DIN EN 175301-803 (DIN 43 650), shape A, for order numbers see data sheet); while doing so, observe the maximum torque of 1 Nm.

→ Check electrical continuity between coil and body (protective conductor function).

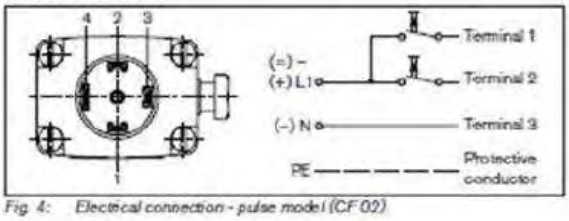


Fig. 4: Electrical connection - pulse model (CF 02)

NOTE!

- Prevent simultaneous pulsing on both coil windings.
- Parallel to the terminals, no other consumers (relay, etc.) may be connected.
- The respective coil connection that does not carry current must be galvanically isolated (open).
- In case two or more valves are connected in parallel, the use of two-pole or multi-pole switches must ensure that this requirement is met.

8 DISASSEMBLY

DANGER!

Risk of injury from high pressure in the system/device.
- Before working on the system or device, switch off the pressure and vent/drain lines.

Risk of injury due to electrical shock.
- Before working on the system or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

WARNING!

Risk of injury from improper disassembly.
- Disassembly may be carried out only by trained technicians and with the appropriate tools.

Risk of injury from hazardous media.
- Before loosening lines or valves, flush out hazardous media, depressurize and drain the lines.

9 MAINTENANCE, TROUBLESHOOTING

9.1 Safety Instructions

DANGER!

Risk of injury from high pressure in the system.
- Turn off the pressure and vent the lines before loosening lines or valves.

Risk of injury due to electrical shock.
- Before working on the system or device, switch off the power supply and secure to prevent reactivation.
- Observe applicable accident prevention and safety regulations for electrical equipment.

WARNING!

Risk of injury from improper maintenance work.
- Maintenance may be carried out only by trained technicians and with the appropriate tools.
- Secure system against unintentional activation.
- Following maintenance, ensure a controlled restart.

9.2 Malfunctions

If malfunctions occur, check whether:

→ the device has been installed according to the instructions,

→ the electrical and fluid connections are correct,

→ the device is not damaged,

→ all screws have been tightened,

→ the voltage and pressure have been switched on,

→ the pipelines are clean.

Malfunction	Possible cause
Valve does not switch	Short circuit or coil interrupted
	Medium pressure outside the permitted pressure range
	Manual control locked
Valve does not close	Inner compartment of the valve is dirty
	Manual control locked

9.2.1 Repairs

Repairs may only be carried out by the manufacturer. Operating data may change if spare parts are replaced by the user.

10 TRANSPORTATION, STORAGE, DISPOSAL

NOTE!

Transport damage.

Inadequately protected devices may be damaged during transportation.
- Protect the device against moisture and dirt in shock-resistant packaging during transportation.
- Prevent the temperature from exceeding or dropping below the permitted storage temperature.

Incorrect storage may damage the device.
- Store the device in a dry and dust-free location.
- Storage temperature -40 – +80°C.

Damage to the environment caused by parts contaminated with media.
- Dispose of the device and packaging in an environmentally friendly manner.
- Observe applicable disposal and environmental regulations.

WARRANTY

OWNER'S LIMITED WARRANTY

Dometic Corporation (Dometic) warrants to the original purchaser/owner, and to subsequent owners during the applicable Limited Warranty Period, Dometic's Water Purification Products, Pumps, Related Accessories and Replacement Parts against failure from defects in material or workmanship arising in the periods specified in the Table of Limited Warranty Periods below. If a covered product or part fails during the applicable warranty period, Dometic will remedy same by repairing or replacing the defective warranted product or part as outlined below in the Table of Limited Warranty Periods. Defective parts shall be replaced free of charge and labor shall be paid for by Dometic only as set forth in the Table. Dometic reserves the right to refund the purchase price of the subject product or part as an alternative remedy to repair or replacement. The remedy allowed hereunder (repair, replacement or refund) shall be at Dometic's sole option.

SECTION I

WHAT'S COVERED

What does the Limited Warranty cover?

Water Purification Products, Pumps, Related Accessories and Replacement Parts manufactured and/or marketed by Dometic for the durations set forth in the Table of Limited Warranty Periods.

What is disclaimed, and are the warranties and remedies exclusive of all others?

Dometic does not disclaim the implied warranty of merchantability, but limits the duration of that implied warranty to the duration of the Limited Warranty offered herein.

This Limited Warranty, as well as the implied warranty of merchantability and the remedies offered by Dometic herein, are EXCLUSIVE and are made or provided in lieu of all other express or implied warranties, obligations, or liabilities. In no event shall Dometic be responsible or liable for any incidental or consequential damages alleged to have resulted from any defect in or failure of any warranted product or part. In those instances in which a cash refund is made, **such refund shall effect the cancellation of the contract of sale and such refund shall constitute full and final satisfaction of all claims which the purchaser has or may have against Dometic due to any actual or alleged breach of warranty, either express or implied, including, without limitation, the implied warranty or merchantability or fitness for a particular purpose.** Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation may not apply to you. Some states do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply to you.

The Dealer is not an agent for Dometic, except for the purpose of administering the above warranty to the extent herein provided. Dometic does not authorize the dealer or any other person to assume for Dometic any liability in connection with such warranty, or any liability or expense incurred in the replacement or repair of its products other than those expressly authorized herein. Dometic shall not be responsible for any liability or expense except as is specifically authorized and provided herein.

Dometic reserves the right to improve its products, through changes in design or material without being obligated to incorporate such changes in products of prior manufacture. Dometic can make changes at any time in design, materials, or part of units of any one, model year, without obligation or liability to owners of units of the same year's model of prior manufacture.

This warranty gives you, the purchaser/owner, specific legal rights, and you may also have other rights which vary from state to state.

OWNER'S LIMITED WARRANTY

SECTION II

WHAT'S NOT COVERED

What does this Limited Warranty not cover?

This Warranty Shall Not Apply to:

1. Failures resulting from improper installation or use contrary to instructions.
2. Failures resulting from abuse, misuse, accident, fire, or submergence.
3. Any part manufactured by Dometic, which shall have been altered so as to impair its original characteristics.
4. Any parts which fail as a result of misuse, improper application or improper installation.
5. Items not manufactured by Dometic, i.e., items, which are purchased from another manufacturer and supplied as received by Dometic without alteration or modification except as any part of a Dometic manufactured unit or component.
6. Components or parts used by or applied by the purchaser, as an integral part of products not manufactured by Dometic.
7. Labor resulting from difficult access to a Dometic product. The original installer or OEM is responsible for accessibility of unit.
8. Leaks due to improper installation of system, for example: hose clamps, fittings, flare nuts, quick disconnects.
9. Freight Damage.
10. Pumps that have been run dry, are water damaged or have blown freeze plugs.
11. Pumps with cracked heads.
12. Pump seals are not covered.
13. UV light bulbs are not covered.
14. Sea strainer elements are not covered.
15. Cartridge filter elements are not covered.
16. Sand & gravel in a multi-media filter are not covered.
17. Pump packing assemblies are not covered.
18. Pump valve assemblies are not covered.
19. Pump crankcase oil is not covered.
20. Gauge instrument calibration is not covered.
21. Fuses are not covered.
22. Valve seals and packings are not covered.
23. Exterior corrosion is not covered.
24. Membrane elements are not covered.
25 Logic boards with water damage.
26. Logic boards with blown MOV's (Power Surge)
27. Mis-programmed displays.
28. Displays or remotes with water damage.
29. Failures due to improper winterization.
30. Unit damage as a result of improper return packaging.
31. Travel costs are included in the hourly labor allowances and should not be billed as a separate item without preapproval from the factory.

Installation and application of Dometic components are not warranted by Dometic, because Dometic has no control or authority over the selection, location, application, or installation of these components.

OWNER'S LIMITED WARRANTY

SECTION III

COVERAGE PERIOD

What is the period of coverage?

SEE TABLE OF LIMITED WARRANTY PERIODS BELOW.

How does one determine when the Limited Warranty Period begins? All Dometic products bear a data plate on which there are model and serial numbers. The date of manufacture of the product can be determined by Dometic based on the serial number on the product. To determine whether or not any Dometic component is in warranty, proceed as follows:

1. Determine the model and serial number on the data plate located on the product. Write or call the Dometic Customer Service Department to obtain the manufacture date of the product. The hours of the Customer Service Department are 8:00 a.m. - 5:00 p.m. (USA, Eastern Standard Time Zone) Monday through Friday excluding holidays.

2. It is possible that a considerable time lag exists between the date a product or component is manufactured and the date it is put in service. In such instances, the date of manufacture could indicate that the item is out of warranty. However, based on the date the equipment is first put in service, the item may still be covered by the Dometic Limited Warranty. For proof of date put in service, Dometic will require a copy of the bill of sale of the Dometic equipment from the installer or new boat dealer to the original owner.

OWNER'S LIMITED WARRANTY

SECTION IV

GETTING COVERED WARRANTY SERVICE

How does the purchaser/owner get warranty service?

Please read the following Warranty Procedure: If the failure of a Dometic component is determined to be covered under the Dometic warranty and the time in service is determined to be within the warranty time limit, the owner has the following three options:

1. Preferred option: Have a Dometic authorized Servicing Dealer, perform the work needed. The customer needs to call Dometic Customer Service Department for a recommendation as to the closest dealer. If the customer already knows an authorized servicing dealer, the dealer should be contacted directly.

2. Second option: If the customer contacts Dometic Service Department for a Servicing Dealer and Dometic has no one in that particular area, Dometic will authorize the use of a local service company and Dometic will work with the local company to assist in any way possible.

The customer may contact the Dometic Service Department at 1(800) 542-2477, Monday through Friday, 8:00am - 5:00pm.

TABLE OF LIMITED WARRANTY PERIODS

Important Notes Regarding Product Start-up/ Commissioning:

1. Warranty periods begin from the date of possession of the boat/vessel by the first owner if OEM installed or date of installation if dealer installed, but not to exceed three (3) years from date of production of the product. However, if the product is started for any reason by the OEM or dealer, notwithstanding any provision to the contrary, the warranty period will be for a period of one (1) year commencing from the date that the product was started by the OEM or dealer. The warranty is transferable and will carry the remainder of the original owner's warranty based on the original date of purchase or date of installation.

2. Proof of purchase or installation may be required to verify warranty coverage.

3. Any unit or replacement part installed due to a warranty failure carries the remainder of the original warranty. Warranty coverage does not start over from the repair/replacement date.

4. Warranty coverage shall not exceed three (3) years from the date of production of the product.

5. These warranty periods are effective February 1, 2014.

WATER PURIFICATION PRODUCTS:

PRODUCT SALE TYPE WARRANTY COVERAGE

Spot Zero OEM 1-year warranty, parts and labor, from date of delivery of vessel. Not to exceed 3 years from date of production of product, and subject to **Important Notes above**. Pump warranty, see Pump section.

Dealer Installed 1-year warranty, parts and labor, from date of installation. Not to exceed 3 years from date of production of product, and subject to **Important Notes above**. Pump warranty, see Pump section.

Sea Xchange OEM 1-year warranty, parts and labor, Not to exceed 3 years from date of production of product, and subject to **Important Notes above**. Pump warranty, see Pump section.

Dealer Installed 1-year warranty, parts and labor, from date of installation. Not to exceed 3 years from date of production of product, and subject to **Important Notes above**. Pump warranty, see Pump section.

(SE SERIES, SX SERIES FROM DATE OF DELIVERY OF VESSEL. XTC SERIES, CX SERIES)

PUMPS, ACCESSORIES, REPLACEMENT PARTS:

PRODUCT SALE TYPE WARRANTY COVERAGE

Pumps OEM or Dealer Installed 1 year warranty, parts and labor. Wearable parts such as pump seals, brushes and plastic valves are not covered under warranty.

OWNER'S LIMITED WARRANTY

SECTION IV (CONTINUED)

Dealer Installed and 1 year warranty, parts only. Wearable parts such as pump seals, brushes and plastic valves are not covered under warranty.

Accessories OEM, Dealer Installed, 1 year warranty, parts only.

Replacement Parts Aftermarket sales. 90-Day warranty, parts only.