LB 14,000

With SP-20 Pearson Pump Technology and Spectra Connect Controls

Installation and Operating Manual

LB-14000

With SP-20 Pearson Pump Technology and Spectra Connect Controls

Produced by Katadyn Desalination, LLC
Manufacturer of Spectra Watermakers

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Getting Started

Thank you for trusting Spectra Watermakers for your water purification needs. The Spectra LB-14,000 comes equipped with the revolutionary Spectra Pearson Pump, a unique high pressure pump with integrated energy recovery that allows users to purify up to 420 gallons of seawater per hour on as little as 3.5 Kilowatts. If properly installed and cared for, your system will provide you with years of high quality, potable, fresh water.

LB System shipping list:

- **LB-14,000 Watermaker in Powder Coated Stainless Steel Frame, Including:**
  - Inlet and Brine Discharge Service Connections**
  - Spectra Connect Control Box with Main Circuit Breaker**
  - Feed Valve**
  - 24VDC Power Supply (for controls)**

** components built into frame assembly

- **Install kit;**
  - Service hoses and filter wrench
  - Pre-filtration assembly, two 4x20" 5 micron filters
  - Oiler Kit
  - User's Manual

- **Optional items - Can be ordered with system or after installation;**
  - Boost Pump with VFD speed control
  - Media Filter(s)
  - UV Lamp
  - Pressure Regulator for feed **

Note: See Pg. 51 for electrical specifications.

Please take a moment to review your Spectra LB 14,000 Watermaker and this user manual before operation. If you have any questions contact: techsupport@spectraWatermakers.com

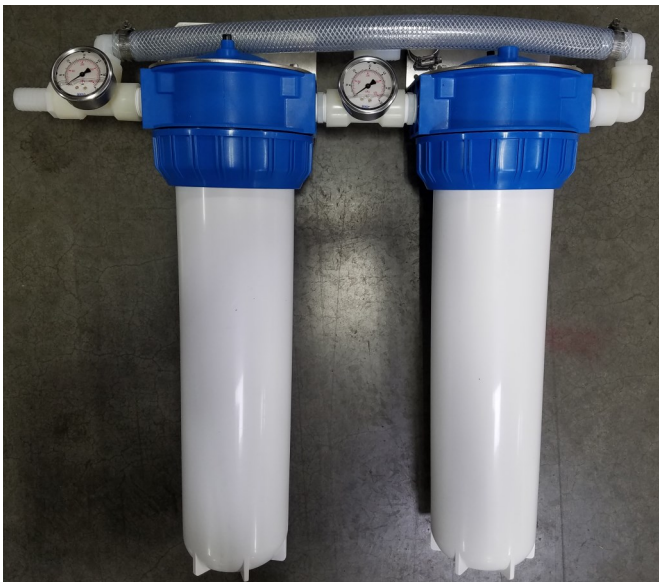
Any shipping damage must be reported to the carrier within 24 hours of receipt, so please inspect the contents of your shipment to ensure that all parts have arrived undamaged. It is the responsibility of the receiver to report any missing or damaged parts to Spectra within one week of taking delivery. Spectra is not responsible for claims made outside this one week window .

Introduction To Your System

The Spectra LB-14,000 Watermaker is designed for use in land-based installations. Feed water must be supplied to the system within the range of 19 GPM (72 lpm) and 21 GPM (79 lpm) at 10-25psi (0.7 - 1.7 Bar) pressure. The machine separates the feed water into two streams: product and the brine stream which contains the dissolved solids, and salt separated from the product water. Brine discharge may be as high as 13 GPM (50L/min) and should be discharged consistent with local regulations, please consult your applications engineer if you have questions. The brine discharge must go to a drain with an air gap so there is no possibility of suction on the discharge port.

The LB-14,000 frame is constructed of powder coated 304 stainless steel and includes the Spectra Pearson Pump, Motor and Belt drive system coupled to four 8" x 40" seawater membranes. All high pressure connections between the membranes and the pump come pre-assembled and tested. The high pressure hoses use 1" JIC 37 deg. flare fittings.

20" Prefilter Housings are two 5 micron filter housings to be plumbed in parallel, preferably after a Media Filter. Each filter housing has a spring loaded "purge" button on top to released air from the filters. Do not install the filters above any electrical devices as water will be spilled when changing the filters or purging air and allow at least 2' below the filter housing so the bowl can be removed.



Note: Filter housings should always be tightened by hand, do not use the wrench. Overtightening the collar will not improve sealing. If the housing leaks when hand tightened then the O-ring needs to be cleaned and greased (silicone grease only). A small amount of silicone grease on the threads will make it easier to remove the collar.

Introduction To Your System - Cont.

A short discussion about nomenclature

The Spectra Connect control system displays membrane pressure as “Feed Pressure”, though when we are talking about the pressure of the “Feed” water or Feed Flow coming into the system we refer to it as Boost Pressure. All the feed water entering the system goes through the membrane(s) and we **boost** the pressure going into the Pearson Energy Recovery Pump which increases feed (membrane) pressure so the system will make water. The pressurized water going into the system is Boost Pressure and the membrane pressure is “Feed Pressure”.

Note: “Feed Pressure” on the Spectra Connect can be viewed in analogue form on the “System Pressure” Gauge.

Boost Pump requirements

The LB-14,000 Watermaker requires a reliable feed water source that is filtered down to 5 microns and supplied at 19-21 GPM and regulated between 10-25psi. The actual boost pressure requirement will be determined when commissioning the system and should be set as high as possible without causing the Pearson Pump to knock. The final boost pressure setting depends on the final installation configuration.

Warning: Excessive feed pump pressure can lead to hose failure.

Optional Boost Pump:

Boost Pump Speed Control

The boost pump we recommend is a Lifestar Aquatic Pump designed by Hayward for seawater and easily meets the requirements of the LB-14,000 system. The 14,000 is provided with a VFD speed control to allow for boost pressure adjustment.

The VFD (Variable frequency Drive) speed control for the optional boost pump can be mounted on a wall near the Watermaker control box or can be mounted to the frame of the unit.

Introduction To Your System - Cont.

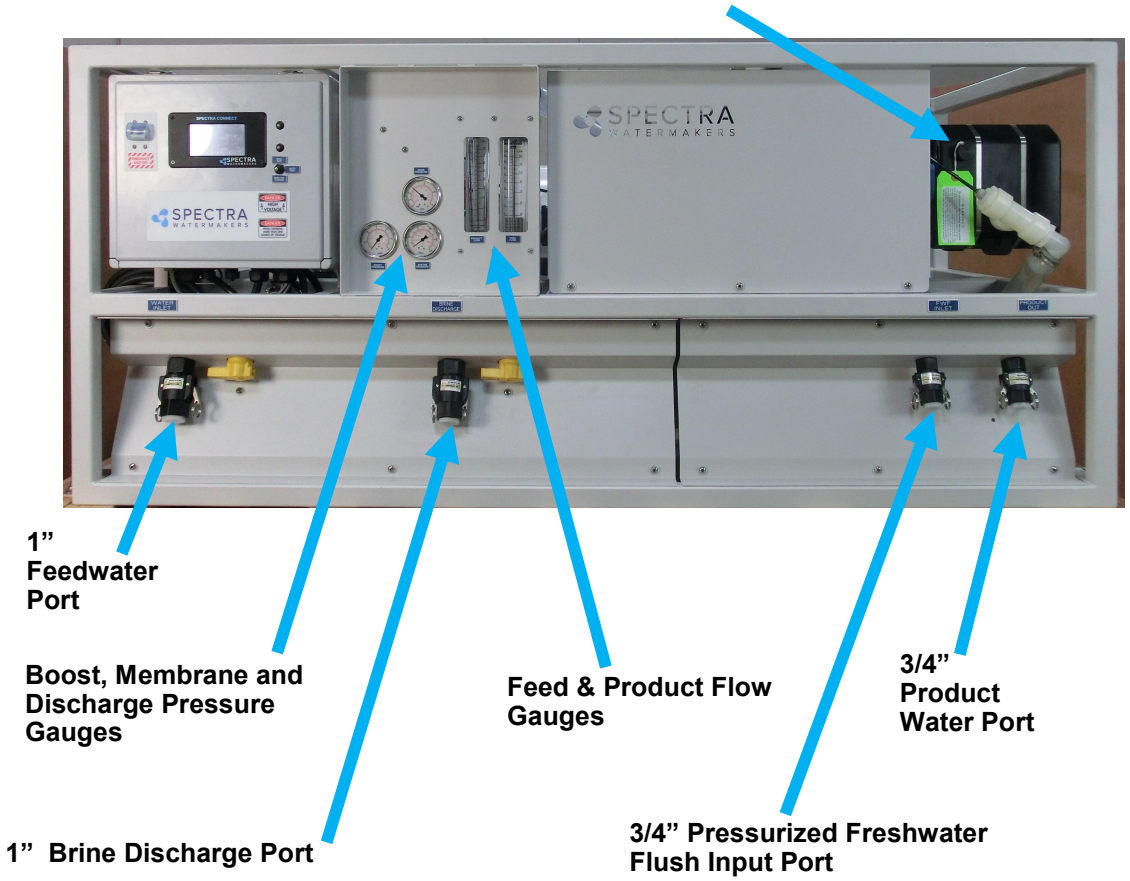
The basic system layout and controls are shown in the picture below

Control Box The molded water resistant box contains the Spectra Connect controls, relays, and terminal blocks. Do not operate the machine with the control box open as it can be a shock hazard. Should the need arise to open the electrical box after installation, use caution as there is live 220VAC in the box.

The brine discharge must lead to an open vented drain so there is no suction on the discharge port. A small amount of back pressure on the discharge is desirable (3-10psi).

Note: **For smooth and safe operation always open the pressure relief valve prior to starting or stopping the Watermaker. The pressure relief valve is always open when there are chemicals in the system, failure to do so will damage the membranes.**

Front View



Note**:** The valves for the feed and the brine ports in the photo above are shown in the **‘Run’** position.

Installation and Set-up

Installation and Service Access: Your LB 14,000 system is designed to be installed on a level surface and bolted into place. There are cleats supplied with the system or holes can be drilled through the frame to bolt it into place.

Be sure to allow for service access to the unit, we recommend:

- A minimum of 40” (1m) to the right of the unit so membranes can be changed.
- A minimum of 24” (60cm) on the front and above the unit.

Cables and Hoses: Route all hoses and power cables in the most direct route possible and do not allow hoses to kink or make excessive bends. Hoses should be supported to take any load off the fittings to reduce leaks caused by vibration. Protect all cables and hoses against chafing and size all wiring according to industry standards and local regulations.

CAUTION: Undersized or improperly terminated cabling can result in serious injury or death. Always follow best industry practices when sizing, terminating, and routing both cables and hoses.

***Note*: Running the system manually (not using the Spectra Connect control system) overrides all the safety circuits and there is no system protection for low boost pressure or high system pressure. The system should not be left unattended when running in manual mode.**

There must be a vacuum break on the brine discharge line so that there is no suction. The Pearson Pump needs a small amount of pressure which is supplied by a restriction in the brine discharge plumbing, more back pressure can be applied by slightly closing the brine discharge valve.

Initial power-up

Be sure the toggle switch is in the RUN AUTO position and the main breaker is off. When power is applied to the unit and the main breaker (Emergency Shut-Off) is in the ON position the display will light up and go through a start up sequence. If no instructions appear, turn off for 30 seconds and then back on.

Control Box Installation

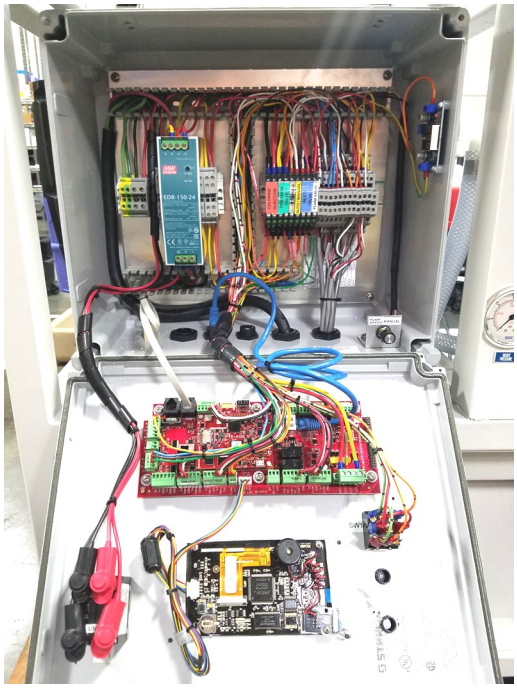
Spectra Connect

Electrical Cables

All units use 24V DC for the control circuits and a power supply is included in the box. There is a cord grip in the bottom of the box for the power cable.

Optional equipment

Depending on the configuration ordered, the system may have an additional control for relays or speed controls.



Pearson Pump speed control

The VFD speed control for the Pearson Pump can be mounted in the frame or on the wall next to the unit. The VFD is preprogrammed at the factory so no adjustment should be required unless the voltage is more than 5% different from what was specified on the order.

If you believe you need to make an adjustment to the VFD please contact Technical support.

Tank Switch or Tank Level Sensor Installation

Optional Factory Supplied Tank Switches

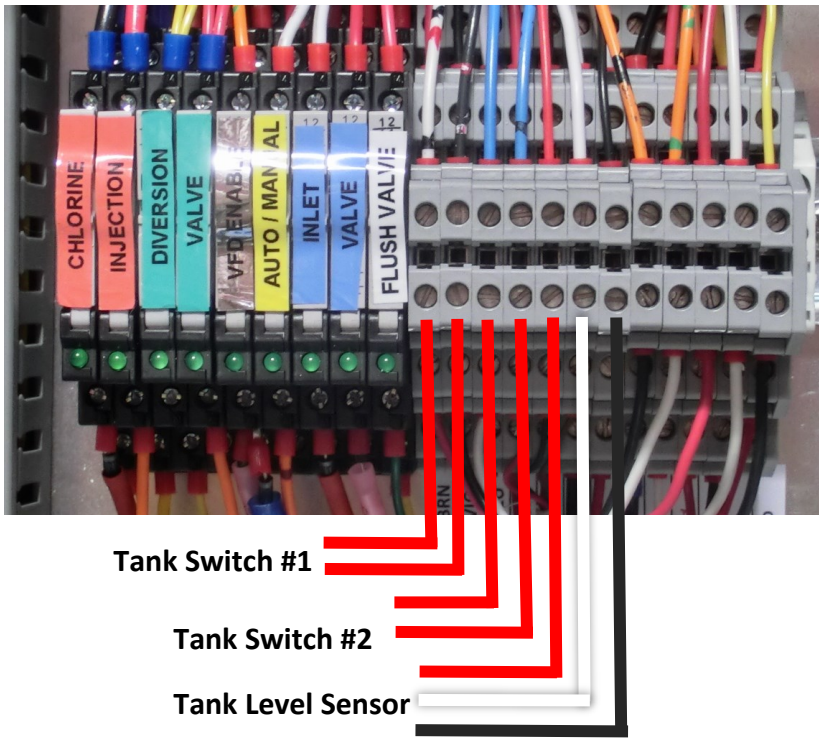
The system can be started and stopped with tank level switches. The system will start when the low level switch opens and will then stop when the high level switch closes. There are two types of tank float switches available depending on your installation requirements. Often making an assembly as pictured below (right) is a good solution as there is only a single penetration and it can be above the high water level.

Top mounted float switch
EL-SWT-LV

Side mounted float switch
EL-SWT-SMLV

Use the Dealer Access settings (pg.45) to enable the tank switches

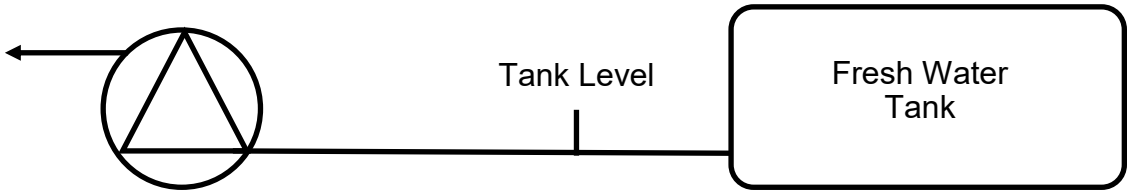
Tank Setup - Enable/disable tank level sensors.
Enable Tank Switch High - Enable/disable tank high switch high. If this is disabled Auto Fill and Fill Tank run modes will not be available.
Enable Tank Switch Low - Enable/disable tank high switch low. If this is disabled Auto Fill mode will not be available. Both High and Low tank switches must be enabled for Auto Fill mode.
Enable Tank Level 1 - Enable/disable tank level sensor 1.
Enable Tank Level 2 - Enable/disable tank level sensor 2.



Optional Tank Level Sensor Installation

The optional Tank Level sensor (**EL-SSR-5PSI**) allows even greater control of your ship's fresh water systems. This unique level monitoring system requires no holes to be drilled into your tank while measuring tank volume with greater accuracy than a standard resistive float.

Install a tee in the **water supply hose at the bottom of the tank, or at the inlet to the domestic water pump**. Connect open leg of the tee to the Tank Level Sensor. ***Note***: The tank level sensor requires a 1/4" NPT connection. We recommend installing a minimum 1/2" tee, and using a reducing bushing to connect the sensor.



***Note*: Be sure the pipe between the tank and the tank level sensor is large enough to eliminate pressure drop when the product pump is running.**

Route the 3 conductor cable back to the Spectra Connect control board at the feed pump module. Extend the wires as necessary. *If you must extend the wires beyond 50' contact the factory to ensure proper operation.*

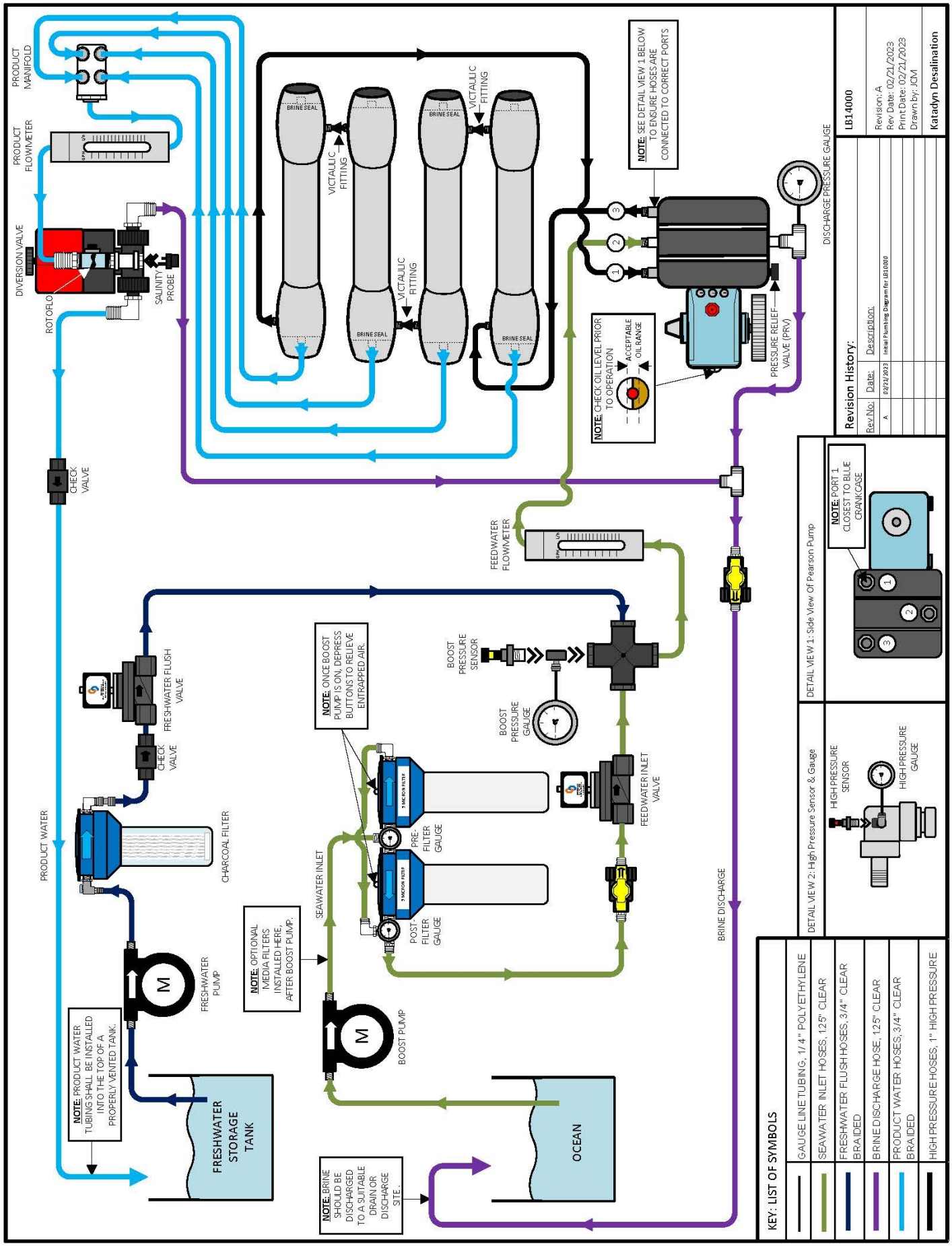
Connect the Tank Level Sensor cables to the appropriate terminals in the Control Junction Box (pg. 23) and refer to the wiring diagram on pg.51 to identify the correct terminals. **Polarity must be maintained!**

If a 2nd Tank Level Sensor is going to be installed, it should be installed at the base of the second tank. **If monitoring 2 connected water tanks, they must be isolated from each other with a valve to read properly.**

The wiring connections for the second Tank Level Sensor are located inside the Spectra Connect control box. **See System Settings section of this manual for instructions on enabling the second Tank Level Sensor.**

See the Tank Level Calibration page (pg. 24) in the manual.

LB 14,000 Plumbing Diagram



Notes

Optimizing Pump Performance

Warning: If the Pearson Pump is making a loud “knocking” sound, the operator must take **immediate** action to understand why. Knocking can be caused when the boost pressure is either too high or too low.

The Pearson Pump works best when there is a balance between the boost pressure and the brine discharge pressure. The brine discharge is restricted slightly to create back pressure which improves the Pearson Pump performance and the boost pressure is adjusted to the maximum possible without the pump knocking. Increasing the boost pressure actually lowers the total system power consumption and needs to be adjusted on sight as it is impacted by the feed water plumbing and pre-filtration configuration.

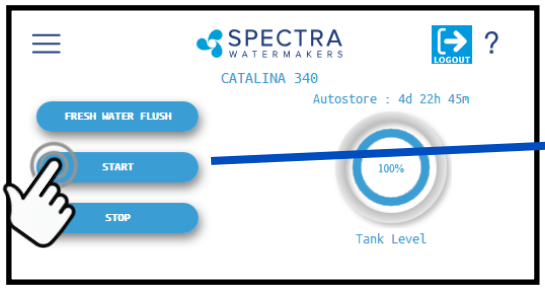
The boost pressure is adjusted with the large knob on the boost pump speed control. You will notice that as you change the boost pressure the sound of the Pearson Pump will change.

Proper boost pressure is critical to optimize system performance. If the pressure is too low or too high the Pearson pump will knock. When the system is running change the boost pressure to find where the pump sounds the smoothest. Set the boost pressure as high as possible without knocking.

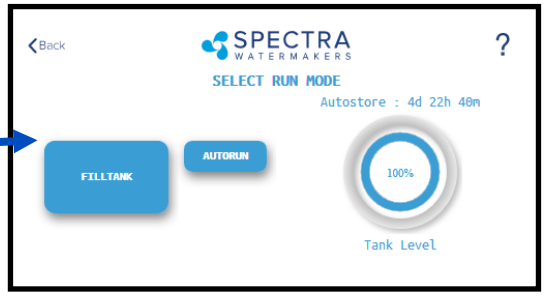
Note: Knocking will not damage the pump in the short term, but will need to be addressed **immediately** if it continues for longer than a few seconds. If knocking continues and adjusting your boost pressure does not remedy the situation, contact Technical Support at techsupport@spectraWatermakers.com.

Spectra Connect Quick Start Guide

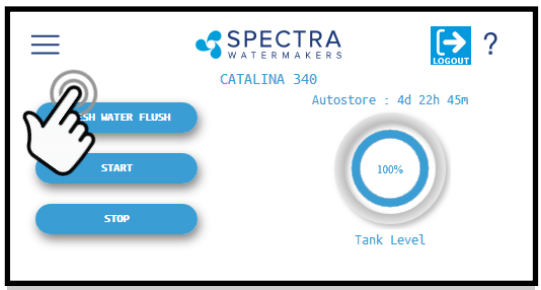
When you first power up the system, you will get a warning message, asking **if the system has been stored with chemicals. If the system has been pickled, winterized, this is the first startup, or the condition of the system is unknown, go to New System Start-Up and Testing on the next page, or serious damage may occur.**



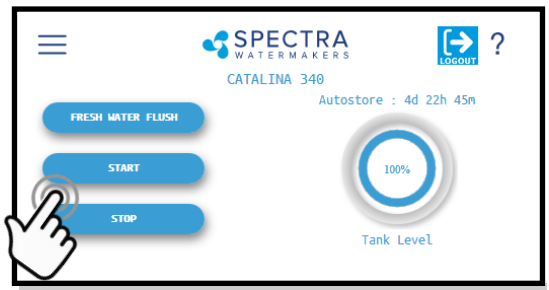
Start
Pressing the 'Start' button once advances to the Run Mode selection screen.



Run Mode
Select your desired Run Mode to start making water and filling your tanks. See details on Run Mode options on p. 37



Fresh Water Flush
Pressing the 'Fresh Water Flush' button flushes the Watermaker with fresh water from the vessel's domestic water tanks. After completing the flush, Spectra Connect will automatically enter the Auto Store mode.



Stop
Pressing the 'Stop' button from the Home Screen will end the Auto Store mode countdown timer and leave your Watermaker in Standby mode.

Spectra Connect Modes and Definitions

Auto Store: After the Watermaker fresh water flushes, it will start a countdown timer that can be seen on the Home screen. The timer indicates the next programmed fresh water flush if the Watermaker is not started again, or the 'Stop' button is not pressed.

Fill Tank: The Watermaker will automatically run until the Tank Full switch in the water storage tanks closes. Once the Tank Full switch closes, the Watermaker automatically fresh water flushes, then reverts to the *Auto Store* mode.

Auto Run: The Watermaker can be set to run for a number of hours, or for a quantity of water to be produced. When the desired quantity of water is produced or the run timer expires, the Watermaker will Fresh Water Flush and enter the *Auto Store* mode.

New System Start-Up and Testing

Use this procedure when the system contains preservative or cleaning chemicals.

Warning! Damage will occur if the system is not purged of the storage chemicals before pressurizing the system.

1. **First Check that:**
- Brine discharge is directed to a suitable location. The brine discharge will contain a small amount of propylene glycol (non-toxic potable anti-freeze) during the purge cycle

- **Confirm there is oil in the crankcase for the Pearson pump.**

- **Pressure Relief Valve is OPEN one full turn**

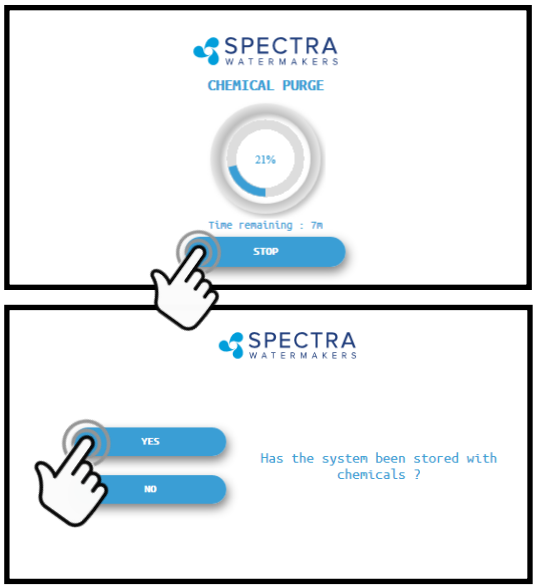
- Feed water is set-up to be pressurized and available to the system.

2. **Feed flow and pressure gauges**
During start up the feed water solenoid will open and Boost Pressure gauge will show the boost pressure after the filters.

3. Confirm the Yellow Handled inlet valve is in the RUN position.

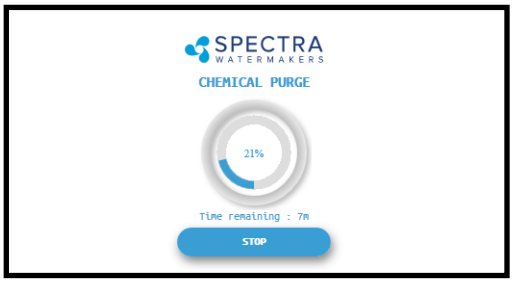
4. Confirm toggle switch on the control box is in the RUN AUTO position.

5. Turn on the power to the system and the Spectra Connect screen will display, "Has the system been stored with chemicals?" Press 'Yes', to start the Purge sequence. ***Note*: The Watermaker will shut down if the pressure relief valve is left closed during the Purge mode.**



New System Start-Up and Testing - Cont.

6. The system will start purging and the display will show the progress and time remaining for the purge cycle.



7. Note that the boost pressure gauge is after the feed valve so it will only show pressure after the system has been started and should be about 15-25 psi during operation.

***Note*: Boost pressure in excess of 25psi can cause hose failure.**

If the optional boost pump was included the boost pressure can be adjusted with the knob on the boost pump control box.

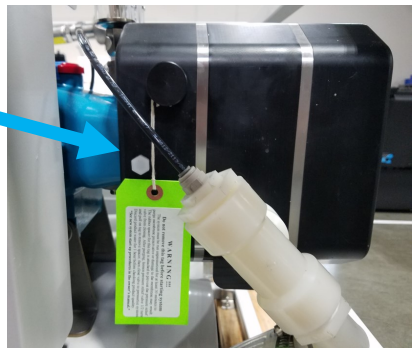
8. Using the buttons on top of the filter housings, bleed out the air in the filter housings until water is coming out.

9. Check the brine discharge for water flow. The system should fully prime within 60-90 seconds and all air should be out of the feed water hoses. The Pearson pump should sound smooth and if there is any knocking adjust the boost pressure up or down until the pump is running smoothly. Note that if the filter pressure drops below 10 psi the system will alarm and tell you to check the prefilters.

Note: If you must stop the purge sequence for any reason, the control will default back to

New System Start-Up and Testing - Cont.

10. After the purge sequence the display will alarm with the message “Close pressure relief valve.” Close the valve and proceed by pressing “OK” to resume the Purge Cycle running pressurized and purging the product water to drain.



Technical tip: Knocking in the Pearson Pump is caused by the boost pressure being either too low or too high. Adjust the boost pressure as high as possible and close the brine discharge valve to add 3-5psi of back pressure.

11. The system will now run under pressure and desalinate water. This mode diverts the product water overboard in case there is any residual chemicals in the membrane. Carefully inspect for leaks over the entire system! Shut down the system and repair any leaks you find.

12. After the Product Purge cycle completes, the system will prompt to Restart, then advance to the Main Menu. If this is a NEW INSTALLATION, continue to the Calibration Instructions to finalize the installation. If you are putting your Watermaker back into service after storage or cleaning your system is now ready for use.

If the system is stored with Propylene Glycol, additional purging time may be required if there is chemical odor to the product water, or if salinity remains high after the purge sequence. <u>All systems are shipped from the factory stored with Propylene Glycol.</u>

Sensor Calibration

Many of the settings on your system have been pre-calibrated during standard factory testing, however, there are a few settings that will vary based on the installation conditions. **If the system has just been installed you must calibrate the prefilter Condition graph before proceeding.**

Prefilter Gauge Calibration

This procedure does **not** need to be done with each filter change under normal operation, it should **ONLY BE DONE IF THE FILTER CONDITION GAUGE WON'T RESET TO 100% WITH NEW FILTERS.**

1. During the calibration sequence the system will automatically start, begin to make water for several minutes and then shut itself down. *Make sure that new filters are in place before proceeding.*
2. Follow the steps in Figures 1-4 below to initiate the Calibration Sequence.

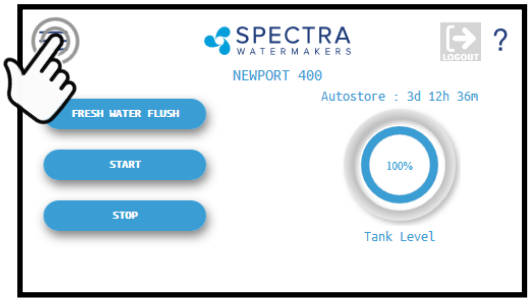


Fig. 1

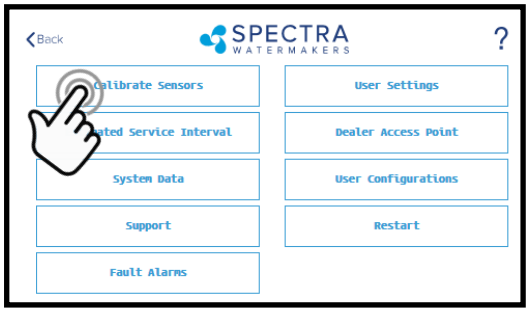


Fig. 2

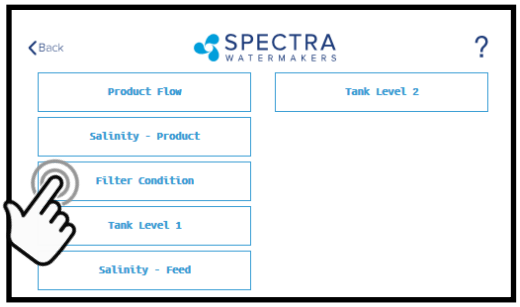


Fig. 3

Fig. 4

3. When the Calibration Sequence is complete, press the Back button in the upper left corner to return to the Main Menu.
   *When prompted by the display, Click **Save** to make sure that the Calibration is stored in the system memory.*
4. The **Filter Condition gauge** has now been calibrated to match your installation.

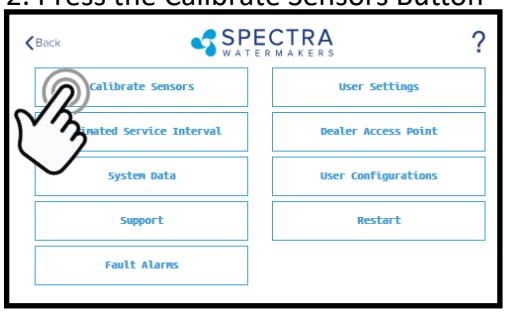
Tank Level Sensor Calibration
(with optional transducer installed)

Installing the optional tank level sensor (**EL-SSR-5PSI**) will allow the control to display tank levels in up to two tanks. Follow the steps below to enter the calibration sequence for the optional Tank Level Sensor(s).

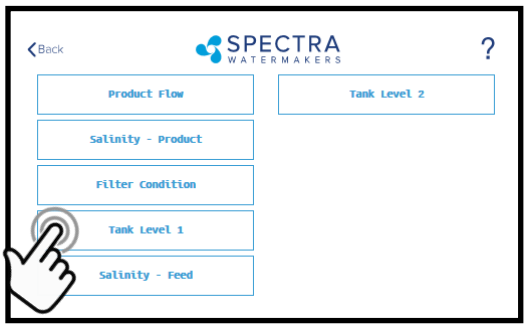
The tank needs to be full to proceed with the calibration process and you need to measure the approximate height of the tank.

1. With a full tank, press the Menu Button

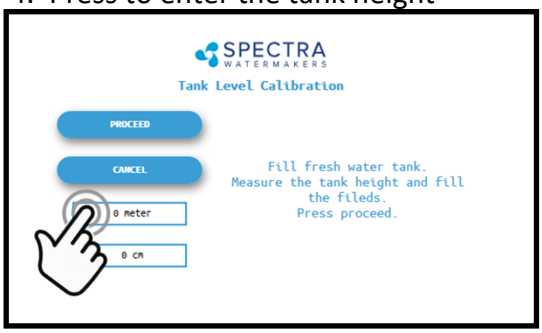
2. Press the Calibrate Sensors Button



3. Press the Tank Level 1 button



4. Press to enter the tank height

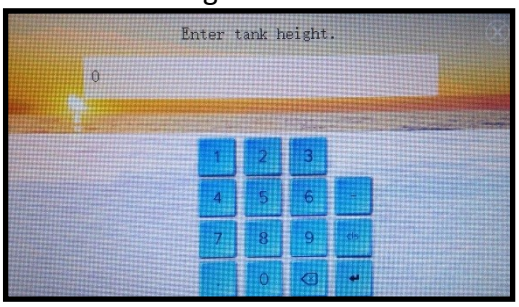


Press the Feet (Meter) field to enter the tank height in feet (meters).

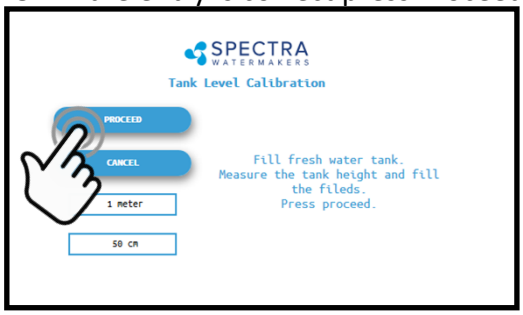
Press the Inch (cm) field to enter the height in inches.

Ex: If the Tank height is 150cm:
Enter '1' in the field labeled 'Meter'
Enter '50' in the field labeled 'cm'

5. Enter the height



8. If the entry is correct press Proceed.



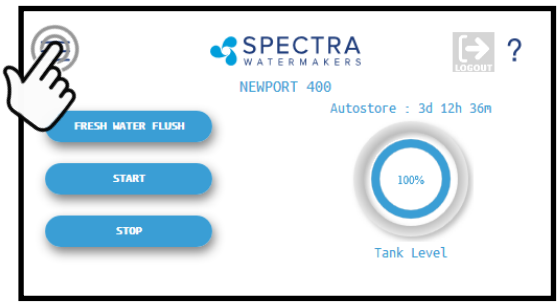
8. Press OK to save the settings

Salinity Calibration

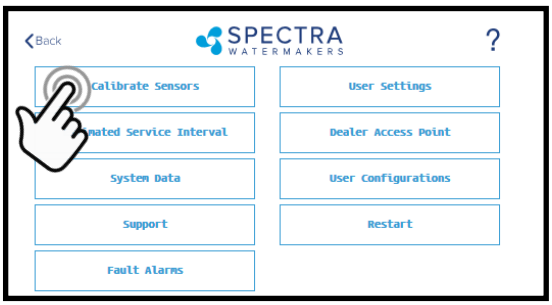
The Salinity probe has been calibrated at the factory during testing and is not normally required during commissioning. If the product quality is not reading accurately, follow calibration steps.

A handheld salinity meter (or other reliable device) is required to perform this calibration as you need to confirm the salinity of the product water.

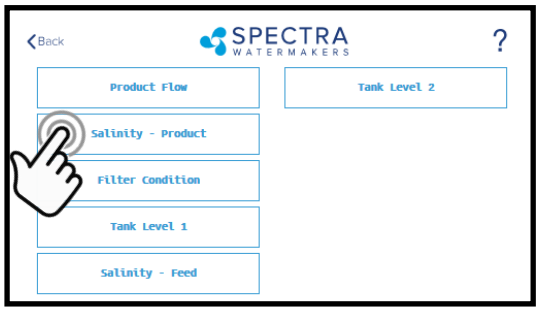
1. Press the Menu Button



2. Press the Calibrate Sensors Button

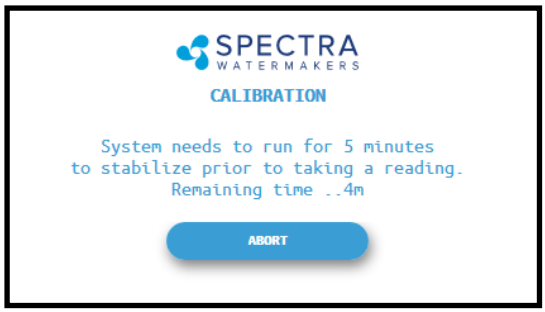


3. Press the Salinity—Product Button

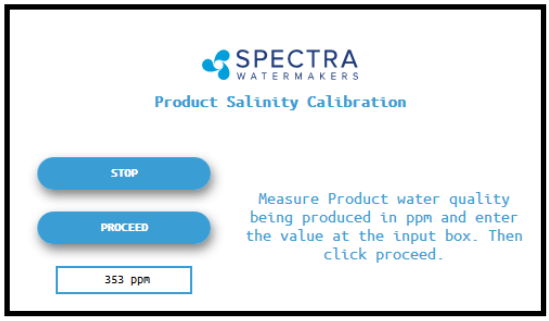


4. Press Continue to acknowledge the warning

5. Allow the salinity to stabilize for 5 minutes.



6. Press the PPM field and enter the PPM you measured. Press Proceed to save your entry.

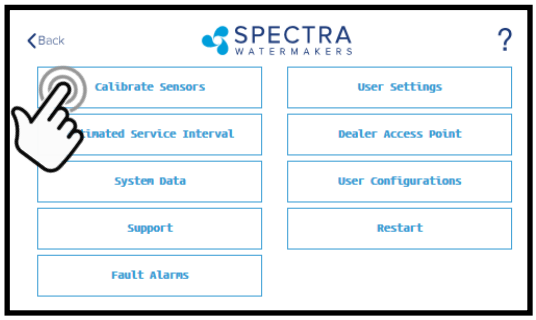


Product Flow Calibration

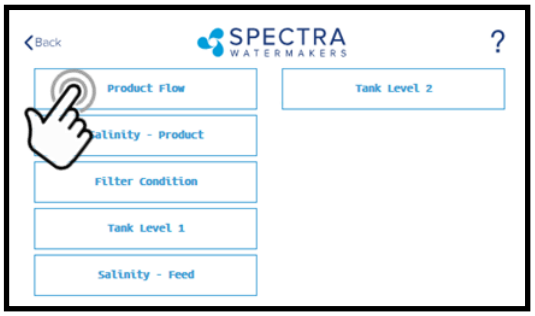
The Product Flow sensor has been calibrated at the factory during testing and isn't normally required during commissioning. If the product flow is not reading accurately, confirm the product flow rate by following the Product Flow calibration steps.

1. Press the Menu Button

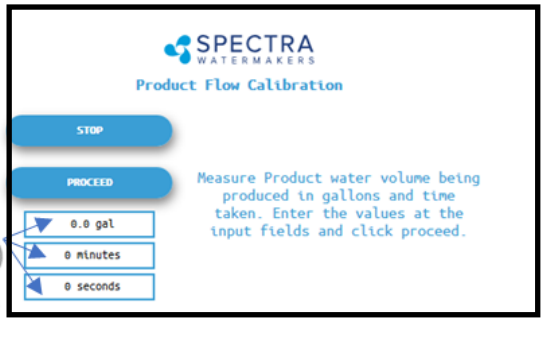
2. Press the Calibrate Sensors Button



3. Press the Product Flow Button



4. Measure the product flow per the process described below, enter the numbers below and press Proceed.



4. Allow the system to run for a few minutes to stabilize and then time in minutes and seconds, how long it takes to fill a container of a known volume.
5. Touch the 'Gal' ('Liter') field to enter the volume of the container used.
6. Touch the 'Minutes' field to enter the minutes it took to fill the container. *Only enter the minutes, ex: 3 min 15 sec should be entered as 3.*
7. Touch the seconds field to enter the seconds it took to fill the container. *Only enter the seconds, ex: 3 min 15 sec should be entered as 15.*
8. Press 'Proceed'. *You must save all changes when prompted after exiting the settings menu.*

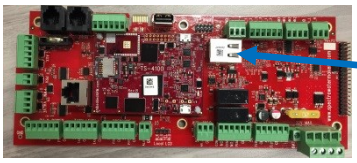
Networking

Your Spectra Connect is equipped with state of the art networking options to allow the maximum user control in a wide variety of installations. The instructions below will help you get the most out of your Spectra Connect.

***Note**: Your Spectra Connect is only available when your device is connected to the same local network as the Spectra Connect control board. If you have difficulty connecting to your Watermaker control application, double check the that your device network is the same as your Spectra Connect*

Connecting to the existing Network

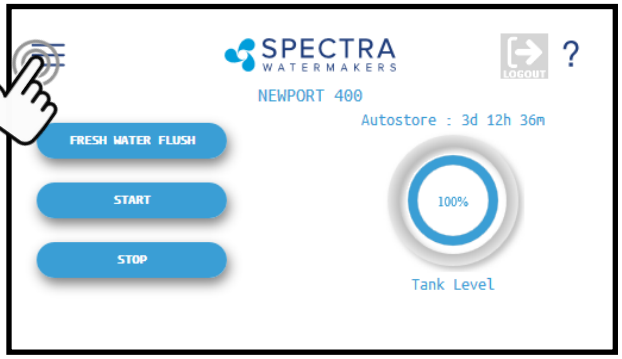
1. Turn power to the system off.
2. Connect a standard Cat5e or Cat6 ethernet cable from the control board located inside the feed pump module to your router or networking switch.

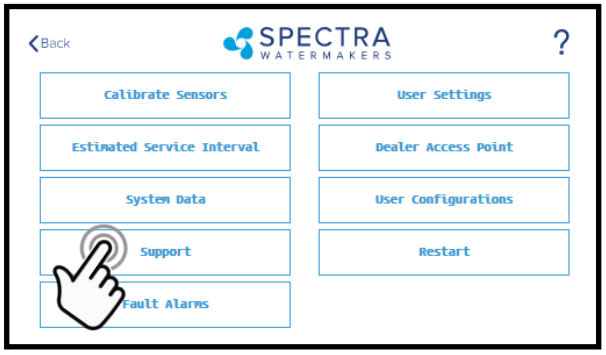


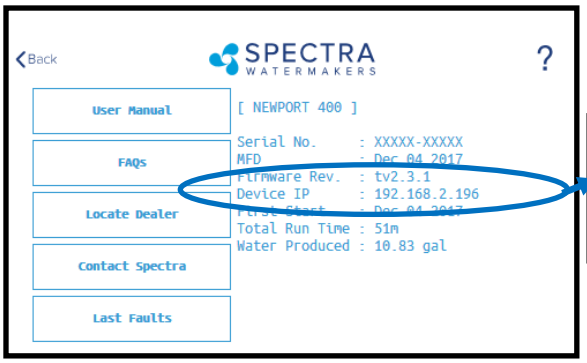
Ethernet Jack

Note: If you are connecting directly into a wireless router, **DO NOT CONNECT TO THE WLAN (Wireless Local Area Network)** ethernet port. You must connect to one of the LAN ports typically labeled 1, 2, 3, 4, etc.

3. Turn power to the system back on.
4. Follow the screen prompts below:







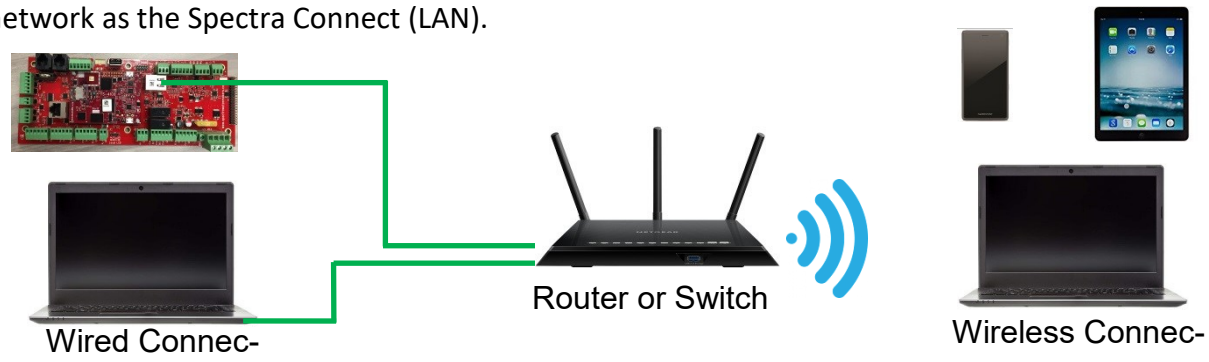
5. ***Note*** the 'Device IP' address shown in and record the 10-digit numerical address on the front of this manual for future reference.

Connecting To The Existing Network - Cont.

6. Connect your computer, tablet or smart phone to the local network your Spectra Connect is plugged into;

Wired Connection: simply plug your computer's ethernet port directly into the router or switch where you connected the Watermaker.

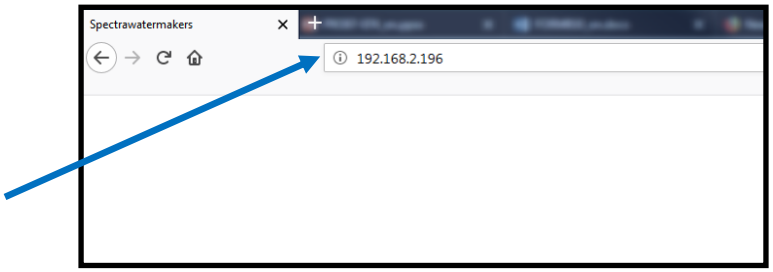
Wireless Connection: make sure your device is connected to the same local wireless network as the Spectra Connect (LAN).



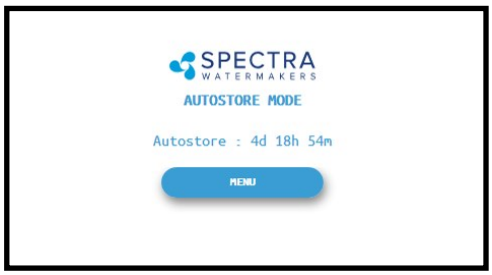
7. On the computer, tablet or smartphone, open a web browser such as Firefox, Chrome, or Safari. In the web address bar at the top, type the 'Device IP' address previously recorded. Press 'Enter'.

***Note*: Internet Explorer may not be compatible with your Spectra Connect web app. If formatting issues occur, use another browser such as Firefox, Safari, or Chrome.**

Ex: Address Bar—Firefox



8. Your computer should now show the same image as shown on your local Spectra Connect



9. Your web browser is now synced with your Spectra Connect. Any buttons you press on your web browser will be controlling your Watermaker.

Caution! If operating your Watermaker from a computer, phone, or tablet, you must keep the tab open while the system is in operation and the volume turned up on your device in order to hear any audible alarm faults.

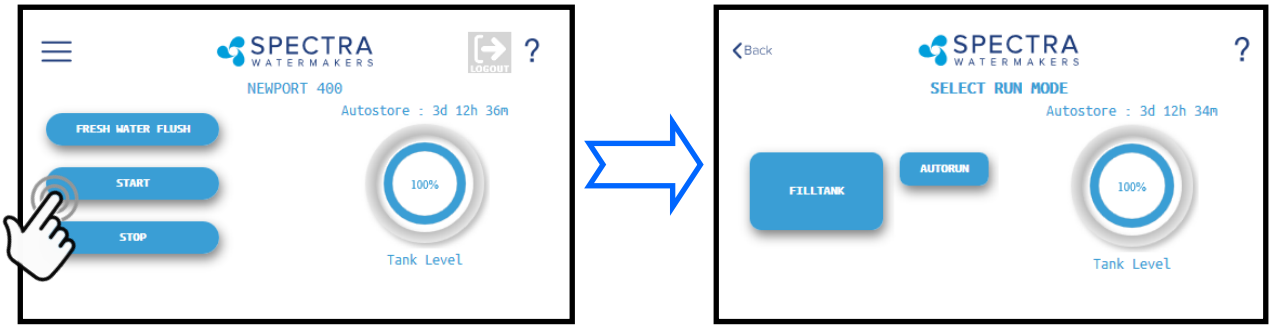
Normal Operation

If the system has been pickled or stored with chemicals, use the New System Startup procedure.

Your Watermaker will fresh water flush **after every use**. Remember that you need to run the system approximately half an hour to make enough fresh water for one flush.

1. Check to see that the inlet and brine discharge seacocks are open and the domestic pressurized water system is turned on.

2. Press the 'Start' button, then select the desired operating mode.

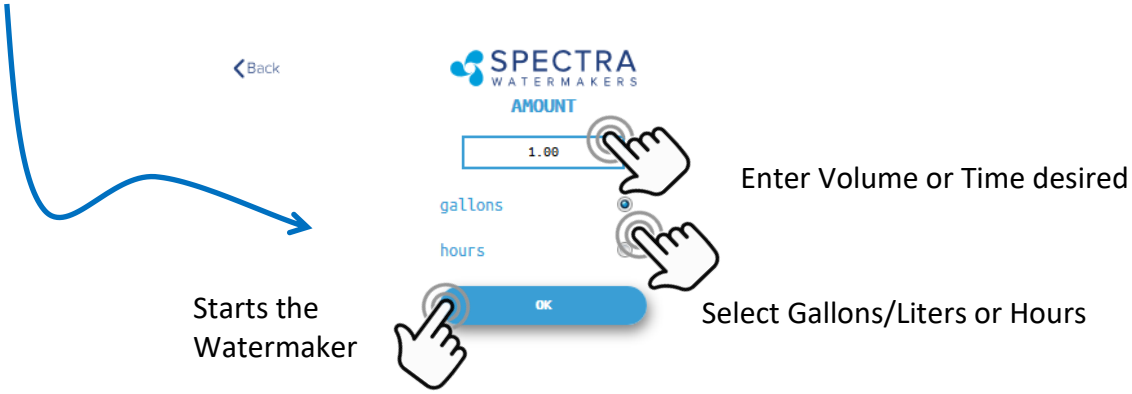


Standard Operating Modes

3. Runs your Watermaker until the Tank Full switch closes, fresh water flushes the system, then goes into 'Auto Store' mode and the Flush Interval timer starts. *This is the default mode of operation.*

-OR-

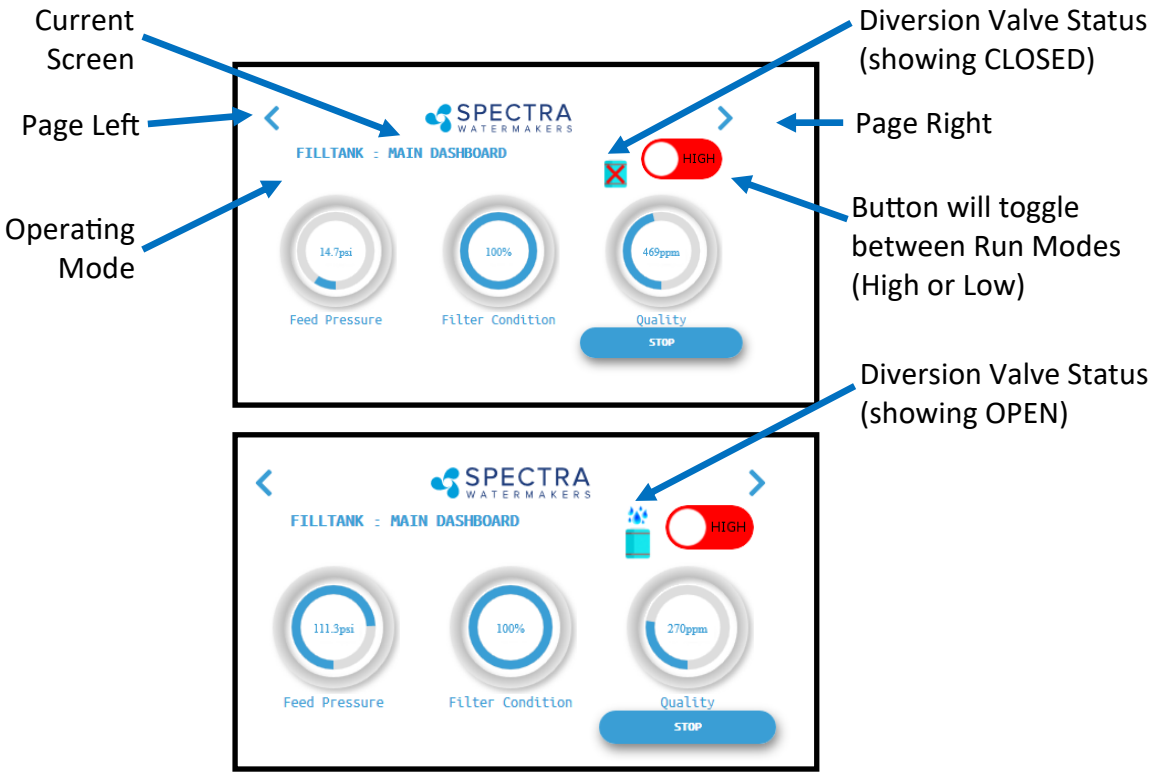
4. Gives you the option to run for a preset amount of time, or a preset volume of water to be produced. **If no tank switches are installed, and they have been disabled in the system settings**, this is the only Operating Mode available.



Normal Operation - Cont.

5. The system will now begin the start sequence and will count down to the pump starting. Pressing 'Stop' will stop the sequence and bring you back to the Main Menu.

6. Once the Boost Pressure reaches the minimum threshold, the system starts operating and you will be taken directly to the Main Dashboard which shows the current status.



7. When the Product Water Quality is better than the programmed threshold, the Diversion Valve opens, allowing water to enter the tanks and the screen image changes.

Verify that the system is operating according to the factory specifications detailed on p.36. See the Troubleshooting section to identify any anomalies.

8. Pressing the < (Page Left) or > (Page Right) arrows while the system is running will scroll through the different screens with operating information for your Watermaker.

Normal Operation - Cont.

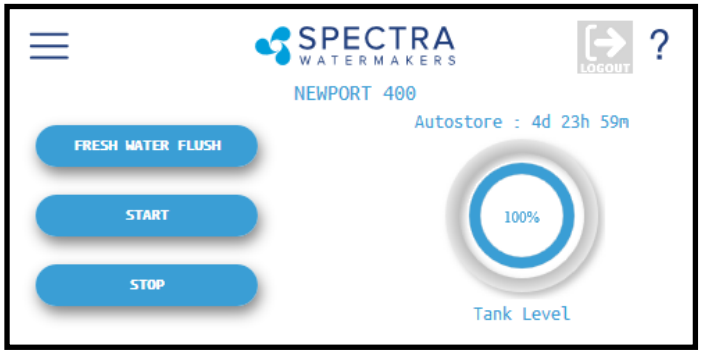
9. When the Run Cycle completes, the system will start the Fresh Water Flush cycle. If you stop the system (interrupting the run cycle) the system will also start a flush cycle.

NOTE: The system must be FRESH WATER FLUSHED AFTER EACH USE, or serious damage can occur.

***Note*: If the pump is knocking during the flush cycle changing the pump speed (either up or down) can help. This is done in the Dealer Access section by changing the "Pump 3" settings. Pump 3 are the voltage settings for the different run speeds, 10 volts is full speed, 5 volts is half speed. The system needs to be stopped to make this adjustment and you need to save the setting before restarting.**

10. After Fresh Water Flushing, the system will enter standby mode waiting for the next run cycle.

***Note*: See pg. 26 for ways to utilize the Auto Store mode.**



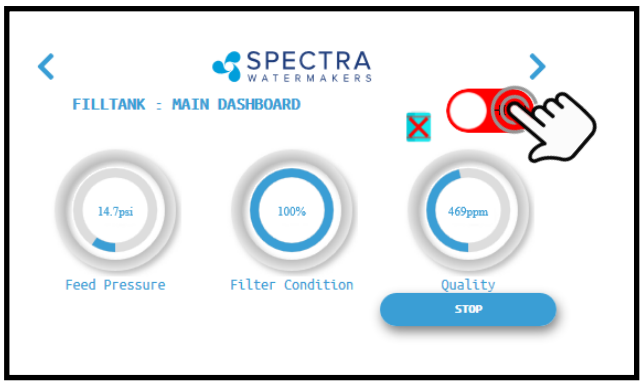
Normal Operation - Cont.

Other Operating Modes

Run Low Mode

You can toggle back and forth between Run High Mode and Run Low Mode by tapping the 'High' toggle button.

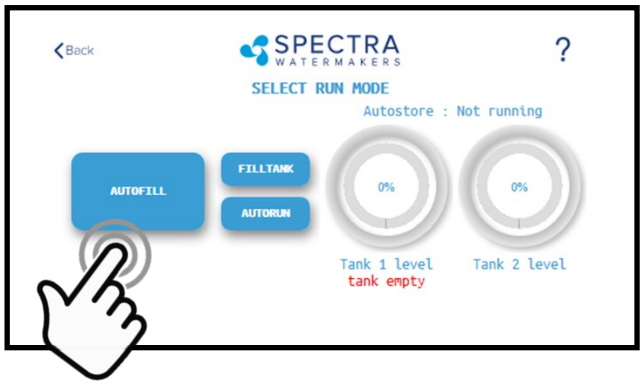
Run Low Mode may be selected to reduce power consumption, lower the membrane pressure, or prolong filter life.



***Note**: The system will automatically drop to Low Mode when it senses high membrane pressure, or low boost (feed) pressure.*

Auto Fill Mode

If using the Tank Low and Tank Full switches, **and both are enabled in the system settings**, then your Start Menu will allow the system to be operated in Auto Fill mode.



In Auto Fill Mode the Spectra Connect will automatically fill your water tank, stop itself, fresh water flush, return to Auto Store mode with the flush interval timer running, and then turn itself on again to fill the tank as soon as the water level drops below the Tank Low Switch with no additional user commands.

Additionally, if power is interrupted at any stage of operation, the Spectra Connect will return to Auto Fill mode, ensuring that your tanks will always have water.

LB-10,000F Operating Sequence

Operating State	Off	Normal Start-Up				Normal Run	Normal Stop Flushing	Flush Cycle	Normal Stop
Component			>10 Seconds	>5 Seconds	60 to 90 seconds		Fresh Water Flush	≈7 Minutes	
Feed Water Pump	Off	On	On	On	On	On	Off	Off	Off
Feed Valve	Closed	Open	Open	Open	Open	Open	Closed	Closed	Closed
Feed pressure sensor (>10psi required to start Pearson Pump)	---	>0psi	When >10psi	>10psi	>10psi	10 to 20psi	10 to 20psi	10 to 20psi	---
Pearson Pump (full Speed is 20gpm)	Off	Off	Start	Full Speed	Full Speed	Full Speed	Drop to Flush Speed	Flush Speed	Off
Salinity Probe	---	---	Salinity Display Starts	Salinity Dropping	When over <748 ppm	<748 ppm	---	---	---
Diversion Valve	Closed	Closed	Closed	Closed	Start Opening	Open	Closing	Closed	Closed
Flush Valve	Closed	Closed	Closed	Closed	Closed	Closed	Open	Open	Closed
Membrane Pressure Sensor (900psi max)	---	---	Rising	Rising	>600psi	>600psi	Dropping	Dropping	---

Maintenance

General

Periodically inspect the entire system for leaks and chafe on the tubing and hoses. **Repair any leaks as soon as possible.** Check for corrosion around the fittings. If any rust or salt appears, clean and tighten the fitting or remove, clean, and reassemble the fitting as necessary. Rust can lead to crevice corrosion inside the fitting and must be dealt with promptly.

Some salt crystal formation around the Spectra Pearson Pump mating surfaces is normal. Wash down any salt encrusted areas with a damp cloth. Keep the Watermaker clean, dry, and salt free.

The Spectra Pearson Pump should have the plunger seals replaced annually, every 2,500 hours of operation, or when leaks are present, whichever comes first.

Prefilters

A clogged filter will cause the controls to shut down the Watermaker. Avoid letting the filters get so dirty the unit shuts down automatically and check the Prefilter pressure drop frequently during operation. Knowing the pressure drop across the filters is the best way to monitor filter loading. If you only let the pressure drop get to 5 psi you can carefully rinse the filters, let them dry and then reuse them. They will not last as long as when they are new but you can “clean” them about 3 times. Inspect any filter before reusing to insure there are no rips or tears in the filter material. Damaged filters will lead to a damaged pump or worse.

After a filter change it may be necessary to expel the air from the feed line using the purge buttons, located on top of the filter housings.

When the system is put into storage, remove, rinse, and re-install new dry filters to impede corrosion and fouling. Check frequently during operation.

The filters must be properly maintained to protect the Spectra Pearson Pump. Use only Spectra approved filters.

Use silicone grease on the O-ring to ensure a proper seal between the filter bowl and lid. **Do not use a petroleum based product, such as petroleum jelly or mineral oil, as it will permanently damage the filter housing bowl.**

The Crankcase

Change the crankcase oil every 5000 hours or if it begins to darken in color or become milky. Milky oil indicates seal failure so replace seals if this happens. Use high quality synthetic motor oil. SAE 5W-30 or equivalent is recommended in most climates.

Belt Tension

The belt alignment and tension have been pre-set at the factory prior to shipping. Check both tension and alignment weekly for signs of wear or slipping. You should just be able to just twist the belt 90 degrees when it is properly tensioned.

Replace the belt immediately if it looks worn or damaged, or if it cannot be properly tensioned.

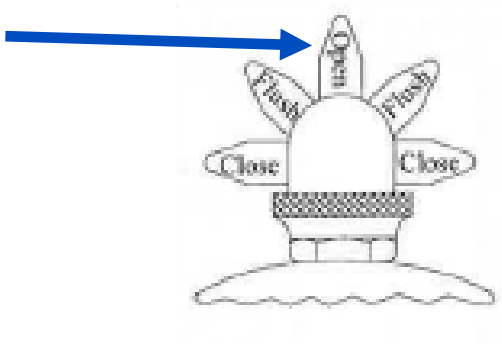
Maintenance - Seal Oilers

Seal / Ceramic Oilers

The Pearson Pump comes with drip oilers which are used to extend the service life of the seals. Allow the system to run for at least one hour before allowing the seal oilers to drip. Use the same 5W-30 synthetic oil as used in the Pearson Pump crankcase. Do not overfill the reservoirs with oil.

Following this procedure will dramatically increase the seal life. We have some customers with 20,000 hours on their systems and they have never replaced the seals.

Each time you start the Watermaker open the oiler lever (pointing up) and allow 4-5 drips to fall.
Unscrew the top of the oiler to increase the drip rate.



The oilers will drip when opened, which can be seen in the window below the reservoir.

Drip Windows

Another option is to leave the drip valve open and add two pumps each week from the supplied oil can (1/3 oz. or 8-10 ml).

Either option is acceptable, but make sure one of them becomes part of the regular maintenance schedule.

Do not use more than the recommended amount of oil as damage to the membranes may result.

Membrane Maintenance

The Membranes

- Membranes need to be cleaned only when membrane pressure has risen 10% or production has dropped 10% *due to fouling*, or the product quality degrades. Causes of fouling are: Biological growth that occurs when the system is left unused without flushing or pickling, and mineral scaling if the feed water contains carbonates, sulfates, silicates or other sparingly soluble salts. Colloidal particles can also clog the membrane. Monitor the product salinity and boost pressure for higher than normal readings for the conditions. Look for all other causes before cleaning the membrane, i.e. feed water temperature and salinity, pump speed, hose restrictions, membrane life can be shortened by unnecessary cleaning.

- There are two types of cleaners: acid and alkaline. The acid cleaner (SC-3) will remove mineral scaling. The alkaline cleaner (SC-2) is used to remove biological by-products, oil, and dirt particles that get past the prefilters. The acid cleaner should be used first. If the membrane fails to respond to both cleanings, this is an indication of another problem with the system, or that it is time to replace the membrane. Contact Spectra Watermakers before removing a membrane.

Membrane Cleaning

For normal cleaning, the SC-3 Acid Cleaning Compound is used first, then the SC-2 Alkaline Cleaning Compound, if necessary. If known bio-fouling is present, the SC-2 may be used first. Using warm water if possible, up to 120°F (50ºC) is recommended as it greatly enhances the ability of the cleaners to do their jobs.

***Note*: Procedures are the same for the SC-2 and SC-3 cleaners**

Warning! The pressure relief valve on the Spectra Pearson Pump must be open for this procedure or membrane damage may result.

Spectra Cleaning Compounds (SC-2 or SC-3) must be mixed with unchlorinated fresh water at a ratio of two containers (16oz. Total) of compound to 10 gallons (45L) of water to have the proper solution. An LB 14,000 system has about 8 gallons of water inside it (after being flushed with fresh water so with about two gallons of water in a 5 gallon bucket you will use two containers (16oz) either of compound.

SC-2 and SC-3 are never mixed together. Do not use them for storage pickling solution.

Maintenance - Cont.

Cleaning Procedure:

You will need 10 gal (38 L) of chlorine free water and the system must have already been thoroughly flushed. Mix the bag of Spectra Watermakers cleaning chemical into the water and stir until well dissolved. Some chemical may remain out of solution in the bucket, this is normal.

Open the Pressure Relief Valve on the Pearson Pump.

You will need 1 bag of the cleaning chemical to be used, 10 gal. (38L) of chlorine free water, and the system must have already been thoroughly flushed. The feed water supply must be shut off.

Mix the bag of Spectra Watermakers cleaning chemical into a bucket of the unchlorinated water, stir until well dissolved.

Attach the service hoses, place the open ends of the hoses in the bucket and turn both the service valves to SERVICE (valves in picture shown in run position)

Use the Service toggle switch on the front of the control panel to run the pump at slow speed.

Circulate cleaning chemicals for up to 6 hours depending on the level of fouling present (contact Tech Support for advise on cleaning).

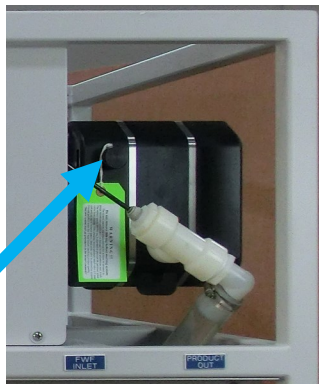
Turn both the service valves to the off position (pointing straight out) and remove the service hoses. You can reinstall the feed and discharge hoses at this time.

Leave the pressure relief knob open.

The prefilter housings should be drained and new filters installed.

Leave the pressure relief knob open. The Watermaker can now be stored for up to six

Long Term Storage



If the machine will not be used for more than seven days it should be placed in Auto store mode to flush the system every 5 days or fill with preservative to store. Spectra Watermakers SC-1 powdered preservative may be used if there is no danger of freezing. **Do not use other brands of preservative, they will damage the equipment!** If there is danger of freezing use a Propylene Glycol based potable water antifreeze instead of Spectra Watermakers SC-1.

Open the Pressure Relief Knob on the Pearson Pump.

If SC-1 chemical is to be used: You will need 8 bags of SC-1, 8 gal of chlorine free water, and the system must have already been thoroughly flushed with fresh water. The system holds about 16 gal of water. The total volume of water (system and chlorine free water) is 21 gal. Eight bags of SC-1 to the 21 gal of water is considered the correct ratio of SC-1 to water. The feed water supply must be shut off.

Mix 8 bags of SC-1 storage chemical into a bucket of 8 gal of unchlorinated water, stir until well dissolved. Warm water will allow the SC-1 to dissolve more quickly.

Attach the service hoses, place the open ends of the hoses in the bucket and open both valves.

Use the Service switch on the control panel to run the pump and the preservative will begin to circulate. Circulate the solution for about 20 minutes.

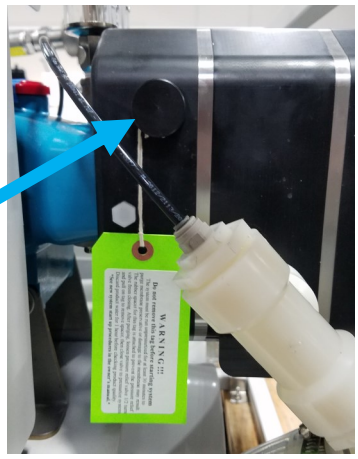
Turn the Service switch to off, remove the brine hose from the bucket and put it to a drain.

Turn the Service switch to on again and pump the remaining solution out of the bucket to the drain. Turn off the Service switch before the bucket is drained.

Turn both service valves to off (vertical) so no water will circulate through the system. These valves will need to be turned to the Run position so the system is ready go through the Purge Cycle (see New System Start up) when it is time to use the Watermaker again.

Leave the pressure relief knob open. The Watermaker can now be stored for up to six months. If the machine has not been used for six months the preservative procedure should be repeated.

Storing with Antifreeze (Winterizing)



You will need approximately 8 US gal (30L) of Propylene Glycol potable water antifreeze*. **The system must have been fresh water flushed thoroughly.**

Open the Pressure Relief Knob on the Pearson Pump.

Attach the service hoses, place the open ends of the hoses in the bucket and turn both the service valves to SERVICE (valves in picture shown in run position)

Use the Service toggle switch on the front of the control panel to run the pump at slow speed.

Circulate the antifreeze for 20 minutes.

Turn both the service valves to the off position.

Leave the pressure relief knob open.

The prefilter housings should be drained and new dry filters installed.

***USE THE MOST CONCENTRATED FORMULA PROPYLENE GLYCOL AVAILABLE, –100 FORMULA OR HIGHER CONCENTRATION.**

We recommend a sign be placed on the frame above the feedwater inlet and the brine discharge connections so the next person knows what is required to restart the Watermaker.

Spectra Land Based System Troublshooting

Fault	Probable Cause	Remedy
Pump runs constantly, will not turn off	Toggle switch on control box to RUN MAN or SERVICE	Turn switch on control box to RUN AUTO
	Speed Control damaged	Replace Speed Control
Pearson Pump knocking	Low or high Boost pressure	Adjust Boost pressure
	Intake blocked	Re-prime system (restart)
	Air in system	Check fresh water flush module for leaks
No lights or display, system does not operate	Display has gone to sleep	Touch the screen to wake it up
	Remote display not connected	Check display cable connections at back of display and at control box
	No power to control box	Check and reset main DC supply breaker
		Check for voltage control box, check 20A fuse on control board.
		Try manual switch on control box: If pump runs, then control or display may be defective
Display activates, but pump will not run	Loose or broken pump wire connection	Check wiring at terminal block inside control box
	Tanks are full (if equipped with tank switch)	Check tanks– system cannot be started if tanks are full when in Auto Fill mode.
		Improve cooling
System runs, no product water delivered to water tanks, Product volume gauge good, Diversion valve shows activated on display	Diversion valve inoperative or wiring fault.	Check wiring at diversion valve and inside control box
	Disconnected or broken product tubing	Check product tubing
	Diversion valve plunger stuck	Exercise diversion valve by pressing the manual button top, retest.
		Replace diversion valve.
System runs, no product water delivered to water tanks, Product volume gauge good, Diversion valve shows deactivated on display	Poor product water quality diversion valve open	Check for low feed pressure
	Salinity probe out of calibration or defective, bad cable	Check for leaks at high pressure hoses
	Chlorine damage to membranes	Test product water with hand-held tester– if over 500 PPM for 1 hour, see 'Poor Product Quality'
	Pressure relief valve partially open	Close pressure relief valve
"System Stalled" alarm is caused ty the Rotoflow not reading properly,or no product flow	Pressure relief valve open	Close pressure relief valve
	Intake thru-hull closed	Check thru-hull
	Airlocked system	Purge air
	No signal from Rotoflow meter	Check wiring, confirm Rotoflow is spinning, clean or replace Rotoflow meter

Spectra Land Based System Troublshooting Cont.

“High Pressure”	Blocked brine discharge or product line	Check brine discharge and Product line
	Fouled membrane	Clean membrane
“Service Prefilter”	Clogged filters	Install new filters
	Loose or defective pressure sensor wires	Check sensor wiring
		If the error persists, follow Prefilter Calibration instructions.
“Salinity High”	High product water salinity	Confirm pressure relief valve is closed
	Chlorine damage to membranes	Check for low feed (membrane) pressure
	Defective salinity probe or cable	Check for leaks at high pressure hoses
	Bad or defective connector	Remove and clean probe contacts. Check calibration
		Check cable connections
		Clean membrane (See Tech Bulletin)
“Can’t Connect to Watermaker from Web Browser”	Device (phone/tablet/computer) not connected to same network	Check the wireless network on your mobile device or computer
	Router/Switch turned off	If using a wired connection, confirm you are connected to the same network.
	Watermaker turned off	Make sure Router/switch has power.
	Connecting to wrong web address	Restart Router/Switch
		Make sure watermaker is powered on
		Confirm Device IP address matches address typed into browser

Spectra Connect Settings

Your new Spectra Connect is designed to make your Watermaker easier than ever to operate, maintain and enjoy. This section will guide you through some of the more advanced settings options available.

Always use caution when changing any factory default settings, as serious damage can occur.

The Spectra Connect automatically monitors the operation of the system to ensure a long and trouble-free service life. If an operating parameter changes, the Connect can switch operating modes, shut itself down, or automatically store itself in order to protect your Watermaker.

It includes advanced calibration sequences to make proper setup and maintenance of your Watermaker easier than ever.

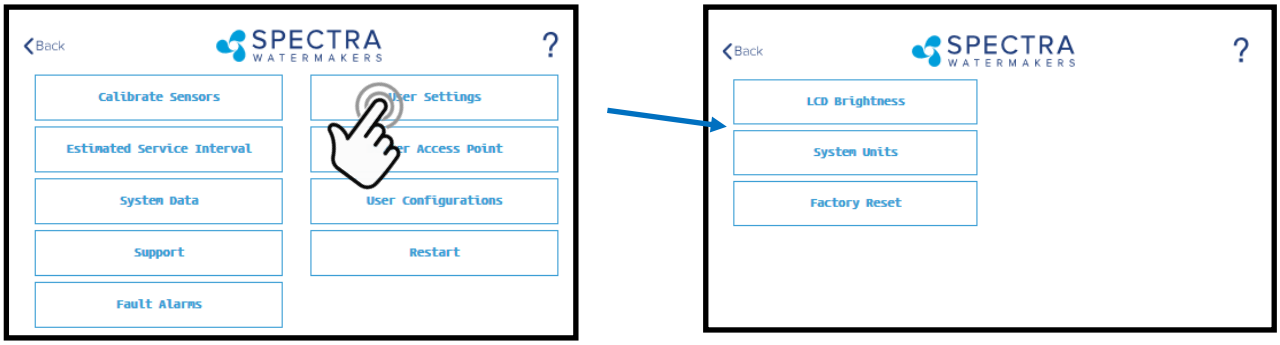
The onboard clock feature allows for temporary power interruptions without detrimental effects on the system. In some cases your Watermaker will continue to function in its last known operating state.

The Spectra Connect has built in data logging, allowing for easy access to historical operating data—which can indicate a wearing component or spares to be carried along before a failure occurs.

Built in warnings for preventative maintenance automatically alert a user of pending maintenance items, helping to keep your Watermaker's up-time to 100%! Advance warnings are pre-programmed for Prefilter Life, Pump rebuilds, membranes, Z-Ion reactor rod life, and carbon filter life. These warnings are resettable, allowing you to perform the maintenance before a catastrophic failure, then reset the interval—so you're always on top of the maintenance cycle!

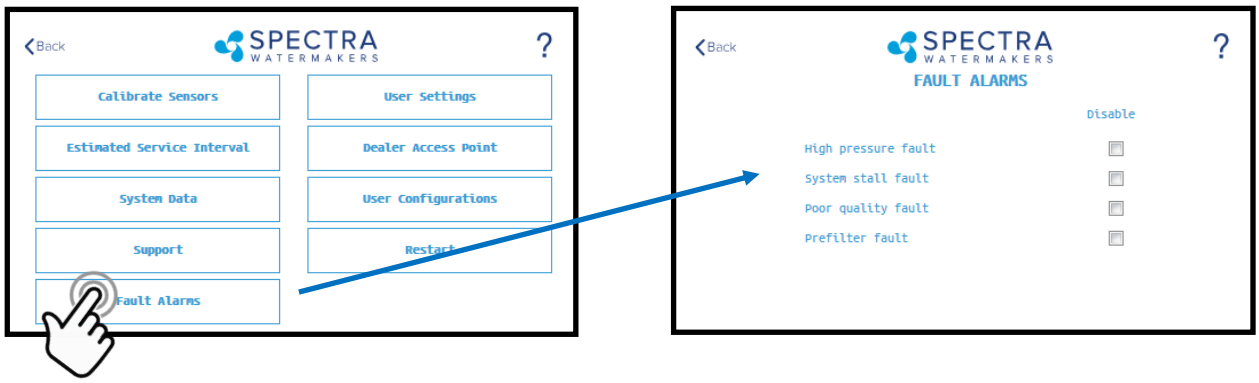
Spectra Connect Settings - Cont.

User Settings



LCD Brightness: Set brightness of the hardwired display(s) from 10 - 100%
System Units: Change from US Standard units to Metric
Factory Reset: Resets any changed parameters a user has made back to the factory defaults for that configuration.

Fault Alarms



CAUTION! Never disable a Fault Alarm without being certain that the issue is with a bad sensor. Disabling a fault and running the system can cause serious damage or injury.

High Pressure Fault: Disables the 'High Pressure' shutdown fault in the event of a feed pressure sensor failure.

System Stall Fault: Disables the 'System Stalled' shutdown fault in the event of a failed rotoflow sensor. System stalled alarms occur when the control board does not sense any product water being produced, and shuts down to protect the pump from running dry.

Poor Quality Fault: Disables the 'High Salinity' shut down fault in the event that the salinity probe has failed or cannot be calibrated within range. ***NOTE*: The diversion valve will always be active when this fault is disabled. ALWAYS VERIFY PRODUCT QUALITY BEFORE DRINKING. Serious health risks may occur.**

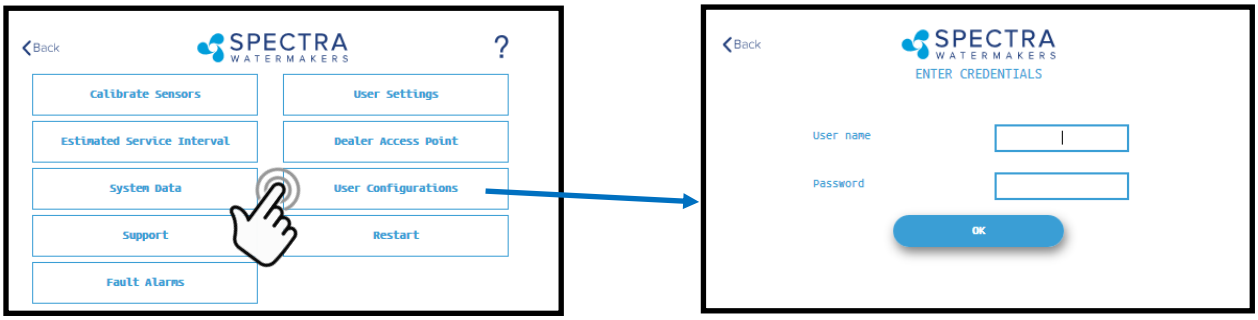
Prefilter Fault: Disables the 'Service Prefilter' shut down fault in the event that the boost pressure sensor has failed or cannot be calibrate within range. **CAUTION: Permanent damage to the feed pump can occur if this fault is disabled, use caution when operating this system with this fault disabled.**

Dealer Access Point - Settings

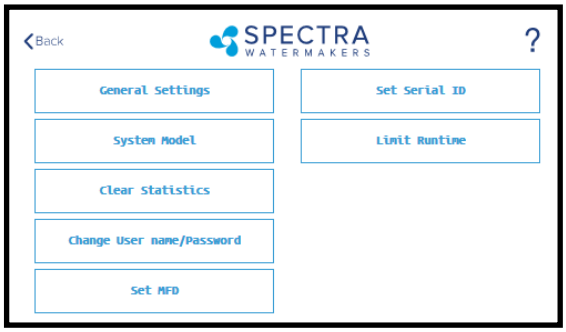
Dealer Access Settings

It is highly recommended that users consult with a factory trained technician before altering any settings behind the 'Dealer Access Point'. **Changing this settings without understanding the full effect of each change can void the warranty of your system, and cause irreparable damage.**

If any settings are inadvertently changed, they can be reverted back to the defaults by using the 'Factory Reset' feature.



Default Login: admin
Default Password: admin



System Model: Configures the Spectra Connect for a different system model from a preset list of options.

Clear Statistics: Resets all of the Estimated Maintenance Intervals back to 100%. This feature should only be used on a brand new system.

Change Username/password: Changes the default username and password. If you forget your changed username and password, a Factory Reset will revert back to the default username and password.

Set MFD: Changes the Manufactured Date on the system. This should only be adjusted if a control board is being replaced on an older system.

Set Serial ID: Changes the Serial Number recorded in the Spectra Connect. This should only be adjusted if a control board is being replaced on an older system.

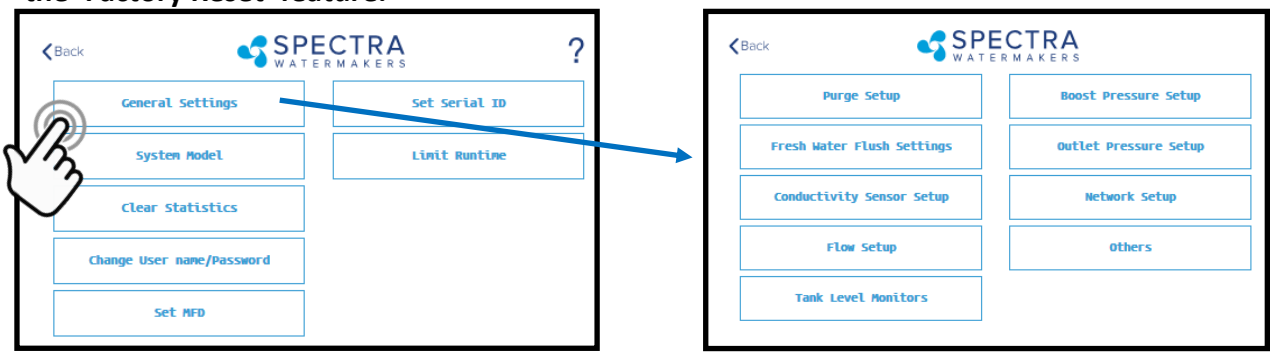
Limit Runtime: Limits the maximum run time for the system before shutting down and fresh water flushing. Disabling this setting allows the Watermaker to be operated 24/7.

Dealer Access Point Settings - Cont.

Dealer Access Settings

It is highly recommended that users consult with a factory trained technician before altering any settings behind the 'Dealer Access Point'. **Changing this settings without understanding the full effect of each change can void the warranty of your system, and cause irreparable damage.**

If any settings are inadvertently changed, they can be reverted back to the defaults by using the 'Factory Reset' feature.



Purge Setup: Adjusts the time and maximum feed pressure allowed for the Purge Mode. **CAUTION: Permanent damage to the membrane can occur if this setting is adjusted. Consult the factory before making any adjustments.**

Fresh Water Flush Settings: Allows adjustment of the fresh water flush duration and the interval between flushes. If the Z-Ion is installed, the Flush Interval should be changed to 30 days.

Conductivity Setup: Allows for enabling or disabling conductivity sensors on the feed water and product water. Set the threshold for the diversion valve to divert water to the tanks.

Flow Setup: Allows the user to adjust the flow sensor settings, or disable a flow sensor circuit altogether. **DO NOT USE THIS SETTING TO CALIBRATE THE PRODUCT FLOW.** Follow instructions on calibrating the flow sensor in this manual.

Tank Level Monitors: Enable and disable the Tank Level Sensors, which read the % remaining in the tank, and the tank switches, which allow the system to turn on/off automatically.

Boost Pressure Setup: Enable alternate Boost Pressure sensors, change the Low Vacuum Limit, or Boost Pressure Setpoint. **CAUTION: Permanent damage to the pump can occur if this setting is adjusted. Consult the factory before making any adjustments.**

Low Vacuum Limit: The minimum boost pressure required at the inlet to the pump. This setting prevents the pump from getting damaged by running under high vacuum. Adjusting it to a lower number in creases the risk that the pump will suffer damage during normal operation.

Boost Pressure Setpoint: During startup the controller turns on the boost pump and waits for the Boost Pressure to reach the Boost Pressure Setpoint. If the boost pressure fails to reach this setpoint, then the main pump won't turn on. Reducing the Boost Pressure Setpoint may cause the system to start, then immediately shut down due to low boost pressure.

Outlet Pressure Setup: Set High Pressure Limit, enable alternate high pressure sensors, select pressure sensor scaling. **CAUTION: Permanent damage to the pump can occur if this setting is adjusted. Consult the factory before making any adjustments.**

Network Setup: Enabling the Spectra Connect Wireless access turns on a Power Over Ethernet feature on the wired connection. **ENABLING THIS FEATURE CAN CAUSE SERIOUS DAMAGE TO YOUR SHIP'S NETWORK. DO NOT ENABLE THIS FEATURE WITHOUT CONSULTING A QUALIFIED TECHNICIAN OR THE FACTORY.**

Dealer Access Point Settings - Cont.

Dealer Access Settings

It is highly recommended that users consult with a factory trained technician before altering any settings behind the 'Dealer Access Point'. **Changing this settings without understanding the full effect of each change can void the warranty of your system, and cause irreparable damage.**

If any settings are inadvertently changed, they can be reverted back to the defaults by using the 'Factory Reset' feature.

Other Setups—Default is all disabled

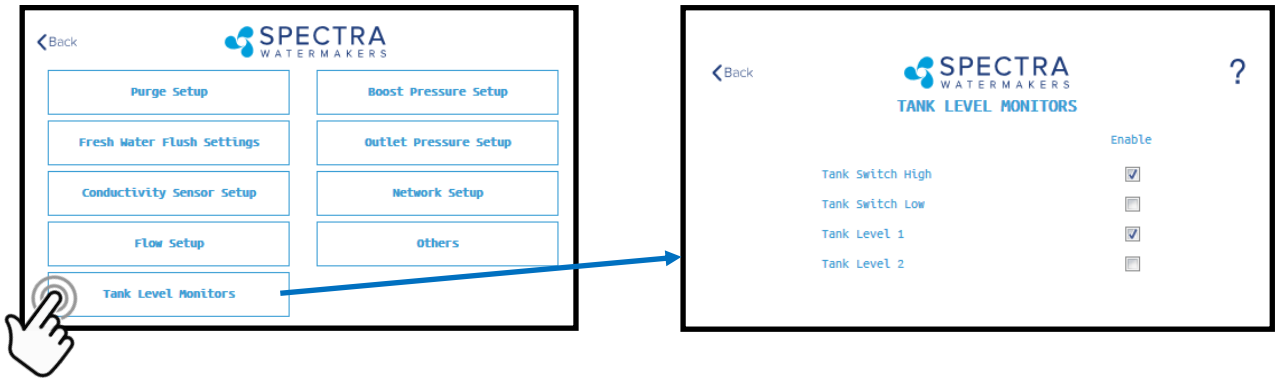
Automatic PRV: Enables an optional Automatic Pressure Relief Valve, after it is installed. This setting should remain off unless you are certain that you have this feature installed on your system.

Power Sensor: Enables or disables an optional power sensor, after it is installed.

PH/ORP: Enables an optional pH or ORP meter, after it is installed.

Z-Ion: Enables or Disables the optional Z-Ion system, after it is installed. If the Z-Ion is enabled, you should also adjust the Flush Interval to 30 days.

Tank Level Monitors



Tank Setup - Enable/disable tank sensors.

Enable Tank Switch High - Enable/disable tank high switch high. If this is disabled Auto Fill and Fill Tank run modes will not be available.

Enable Tank Switch Low - Enable/disable tank high switch low. If this is disabled Auto Fill mode will not be available. Both High and Low tank switches must be enabled for Auto Fill mode.

Enable Tank Level 1 - Enable/disable tank level sensor 1. If this is disabled there will be no tank level reading and tank level gauge will read "!".

Enable Tank Level 2 - Enable/disable tank level sensor 2..

Handling Spectra Connect Alarms or Faults

Faults are (potentially hazardous) conditions that might occur during running of your Watermaker. The control board has the ability to monitor these faults in real time and take necessary actions to prevent damaging your equipment.

HIGH PRESSURE FAULT

High pressure fault is triggered if

Outlet pressure (Feed/Membrane pressure) > Pressure Limit

If a high pressure fault is triggered, the system goes to low production mode if it is running in high production mode, or stops the operation if it is already running in low production mode. Then the system will begin the Auto Store mode.

Resolutions

Check for kinked or blocked hoses.
Confirm “#3 Sensor PSI High limit” and “#3 Sensor PSI Offset” options on Outlet Settings.
Clean membrane.

SYSTEM STALL FAULT

System stall fault is triggered if

There is no product flow for 1 minute continuously.

If system stall fault is triggered, machine will stop the current run cycle and will prompt to restart. If restarted it will retry the previous running mode. If the stall condition persists even after restart, the system will begin the Auto Store mode.

Resolutions

Confirm product water at membrane endcap.
Check intake line for restrictions, blockages or air leaks.
Close Pressure Relief Valve on Pump.
Confirm controller settings correct.

SERVICE PREFILTER FAULT

The Service Prefilter fault is triggered if

Inlet Pressure(boost pressure) < Low Vacuum Limit

If the Service Prefilter fault triggers, the system goes to low production mode if it is running in high production mode or stops the operation if it is already running in low production mode. Then the system will begin the Auto Store mode.

Resolutions

Change prefilters and the sea strainer screen.
Confirm adequate boost pressure in inlet pressure settings.
Check for obstructions in intake line.
Check sensor for proper operation

POOR QUALITY FAULT

The High Salinity fault triggers if

The Salinity of the product water is above the threshold (measured salinity > Salinity 1 threshold) for more than 8 minutes.

If the High Salinity fault is triggered, the machine will stop the current run cycle and will prompt to restart. If restarted it will retry the previous running mode. If the High Salinity fault condition persists even after restart, the system will begin the Auto Store mode.

Resolutions

Check pump operation - Clark Pump (pressure relief valve closed), Feed Pump (moving water).
Confirm product water quality.
Membrane damage - clean or replace.
Salinity probe out of calibration.
Clean or replace salinity probe.

Tech Bulletin Example

This is an example of the many technical service bulletins available on our website.

https://www.spectraWatermakers.com/us/us/support/downloads

Poor Product Water Quality

With any product water quality issue, you must ensure accurate calibration if you are using a salinity meter. For general quality evaluation, your taste is always good enough.

Membranes are not an exact science and two identical systems can have different product quality. World health standards deem water of up to 1000 PPM of total dissolved solids acceptable for drinking. We consider any thing below 750 PPM acceptable, and anything below 500 PPM excellent. Factors that could affect water quality are addressed below.

LOW SYSTEM FLOW OR PRESSURE will equate to lower product quality (higher PPM).

DAMAGE TO THE MEMBRANE by chlorine contamination. Flushing the system with chlorinated water will irreparably damage the membrane. Charcoal filters are used to absorb any chlorine which might be present in flush water. They must be of proper specification to be suitable. There is no test for chlorine damage except the process of elimination of other causes.

DIRTY OR SCALED membranes. A dirty (foreign material), scaled (mineral deposits), or contaminated (bacterial growth) membrane can result in poor water quality and abnormal operating pressures. If operating pressures are above normal, then cleaning is indicated. If the system pressures are within normal operating range, cleaning may have little result. Low water quality after storage with propylene glycol can usually be remedied by flushing with the pressure relief valve open for several hours or if that is not effective a SC-2 cleaning should effectively raise the quality of the product water.

MECHANICAL LEAKAGE within the membrane pressure vessel. This is an unlikely but possible cause of poor water quality. A pinched or damaged O-ring within the pressure vessel, a scratch on the product tube on the membrane, a scratch within one of the end caps, or a seal fouled by contamination could allow sea water into the product water.

Specifications

Electrical Input

240 volt systems: 208-240 volts single or three phase 50/60 Hz 19.5 amps max**

** includes boost pump

Power consumption will vary depending on feed water conditions and motor RPM. Do Not Exceed Factory Recommended Max/Min values.**

Feed Water Supply

Minimum Pressure after filters: 10 psi, .7 bar

Maximum Pressure after filters**: 25 psi, 1.7 bar

Flow Rate: 20GPM, 76 L/min.

Total Dissolved solids: 0-45,000 mg/L

pH range: 4-11

Continuous free chlorine: 0 ppm

Temperature: 0° to 45° C

Turbidity: 1 NTU max

Silt Density Index: 1 max (after pre-filtration)

Product

Rejection: 99.5%

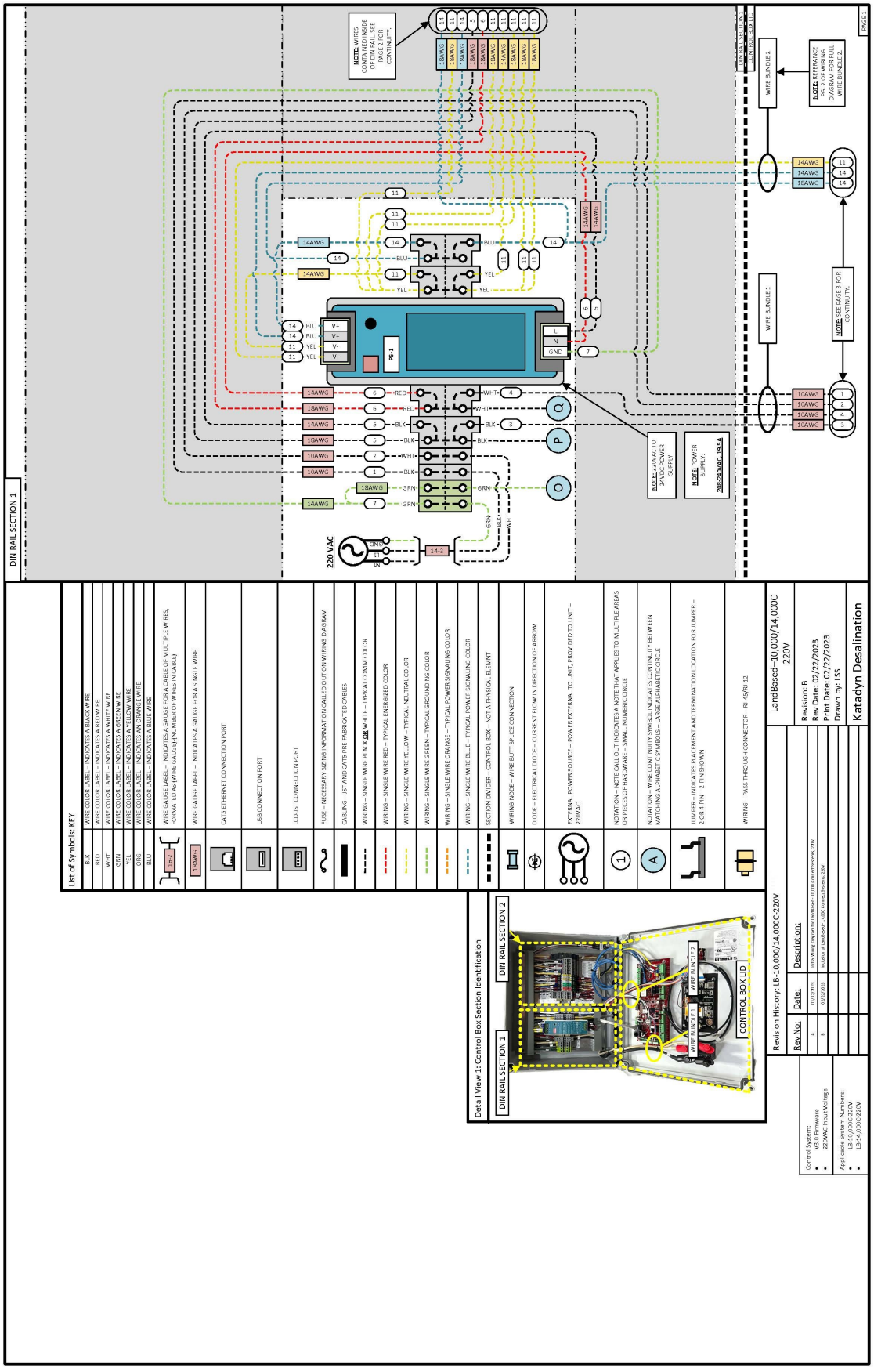
Flow: 6.5—7.2 GPM, 24.5—27.25 lpm

Lubricant:

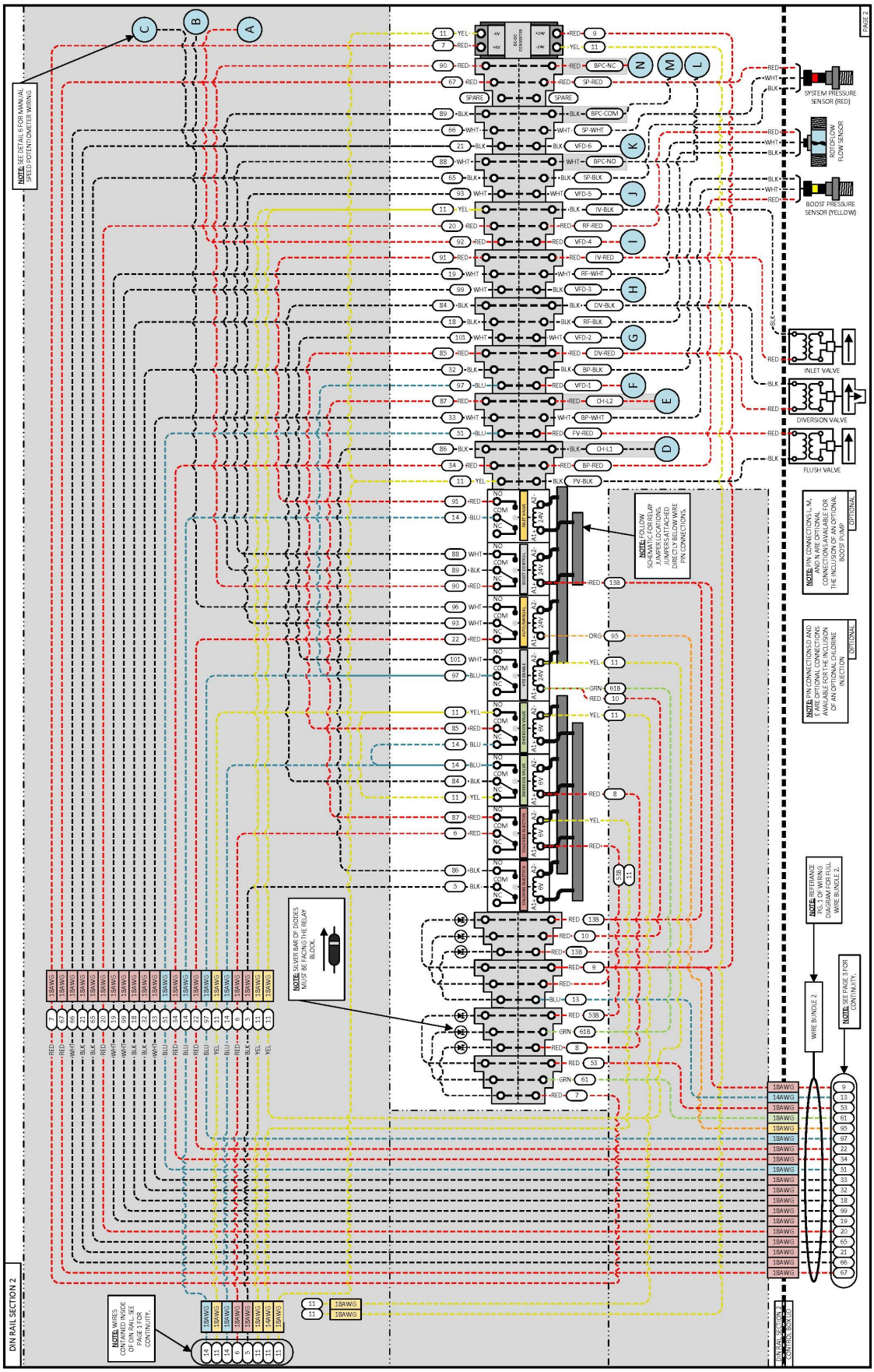
O-rings and seals: Dow Corning Silicon Lubricant

CAT Crankcase: 5W-30 or equivalent synthetic motor oil

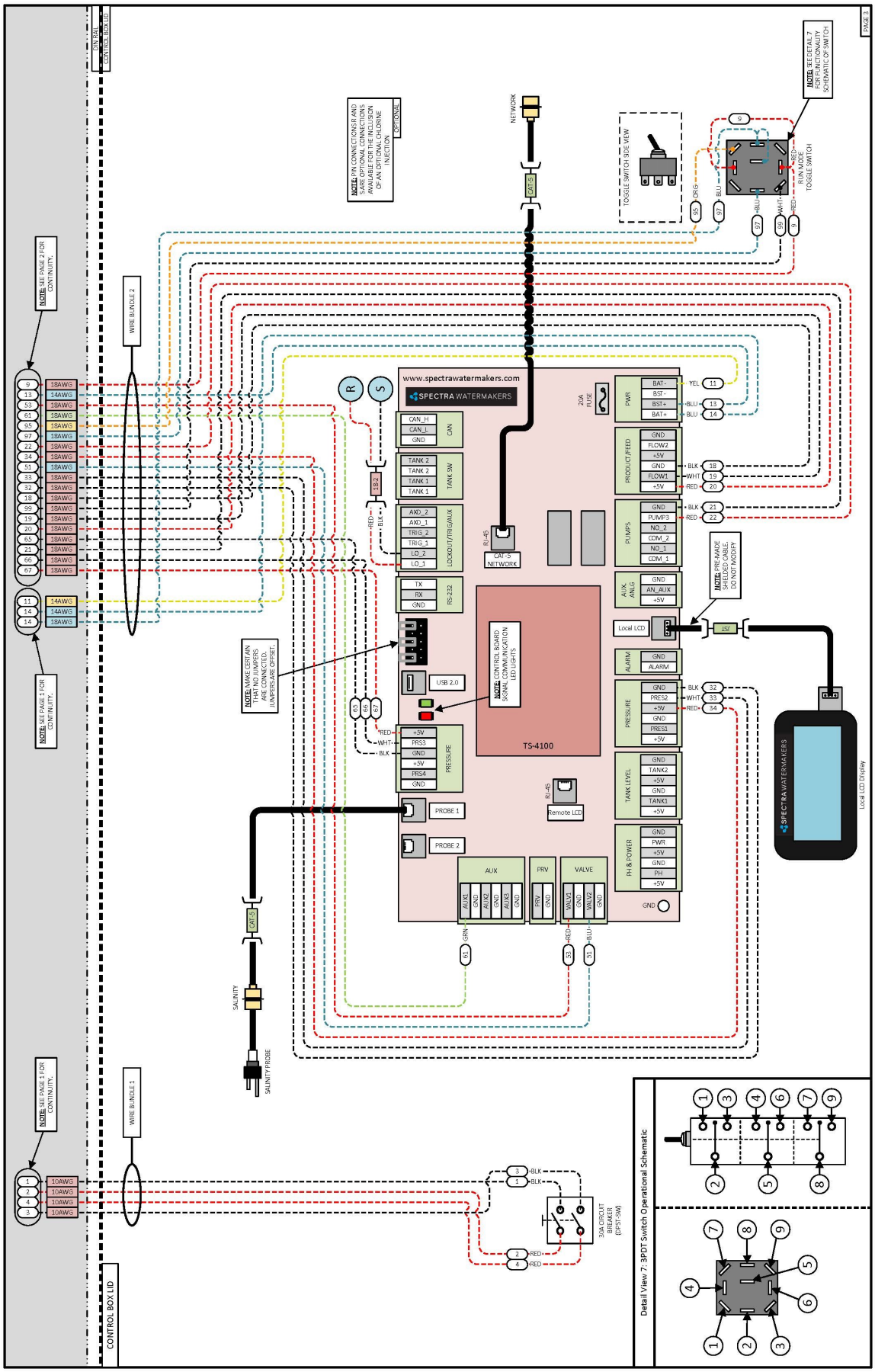
LB 14,000 Plumbing Diagram



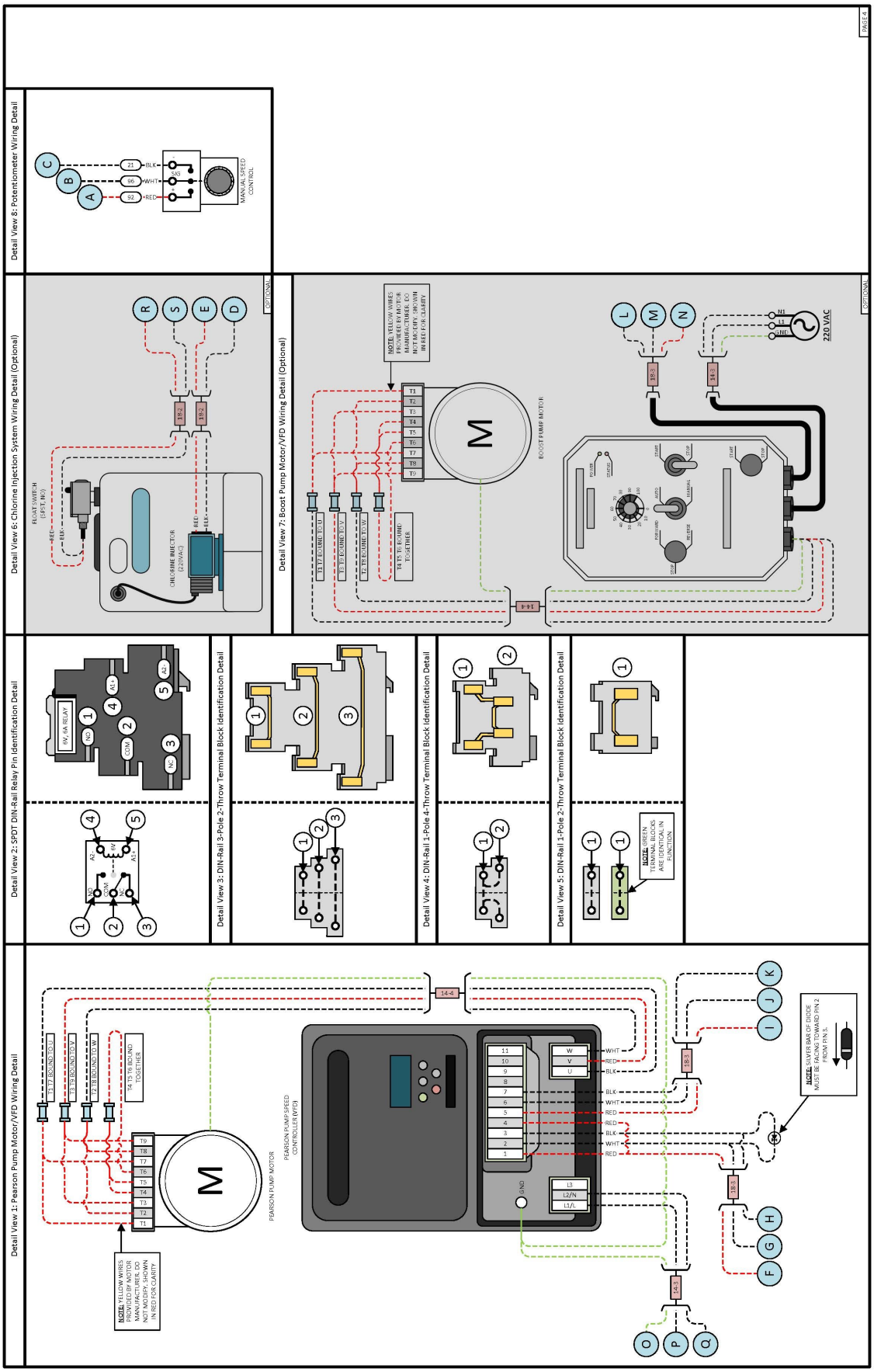
LB 14,000 Plumbing Diagram Cont.

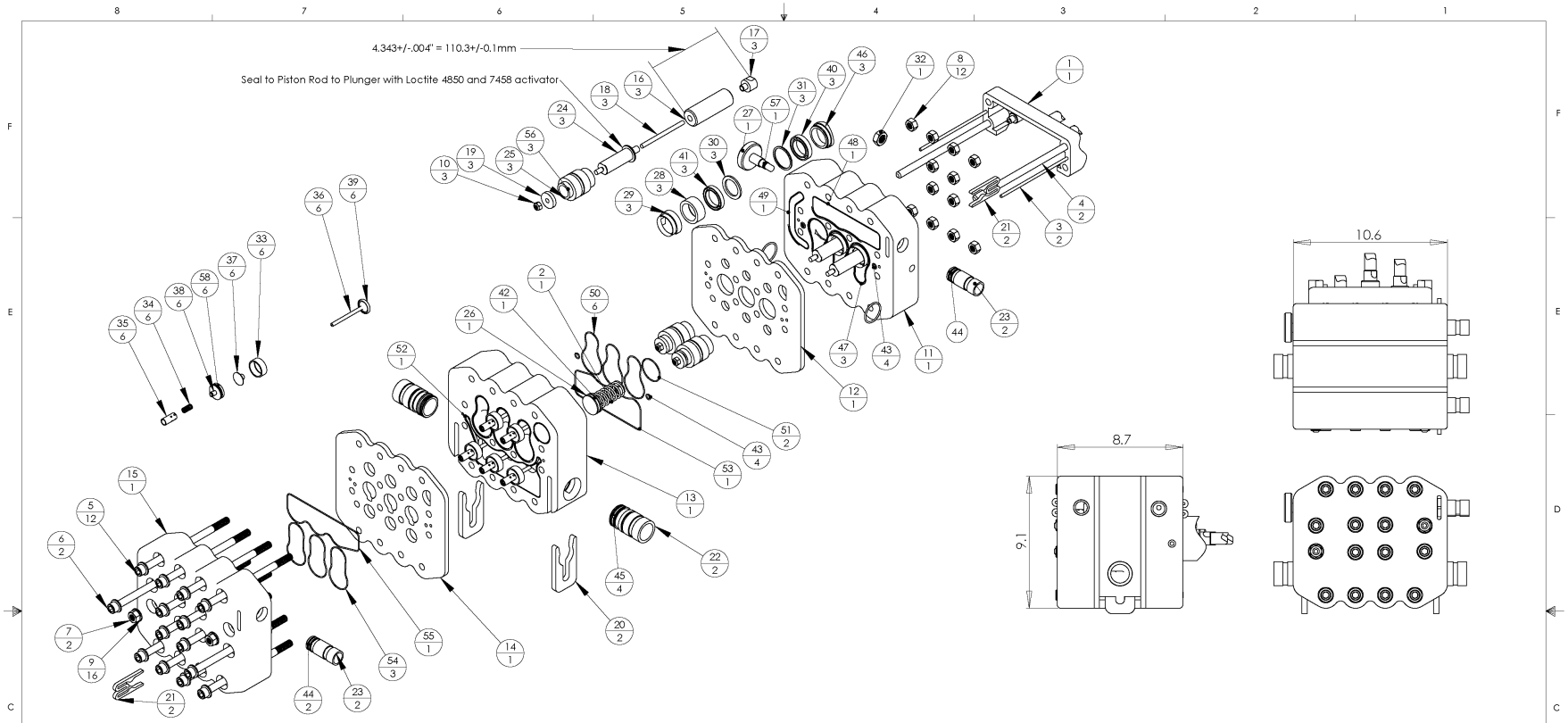


LB 14,000 Plumbing Diagram Cont.



LB 14,000 Plumbing Diagram Cont.





ITEM NO.	PartNo	TITLE	QTY.	Change
1	PP-20-CC-CCA	PP20 Crankcase Cat 25 Frame	1	
2	PP-20-DP-SPR	PP20 Damper Spring	1	
3	PP-20-DW	PP20 Dowel Rev A	2	Larger chamfers
4	PP-20-HWR-LYS	PP20 Layer Stud Rev A	2	New
5	PP-20-HWR-M1221	Screw Skt Cap M12x1-75 210 long 316SS Grade 70	12	
6	PP-20-HWR-M1223	Screw Skt Cap M12 x 1-25 FINE 230 long 316SS Grade 70	2	Was 4ea
7	PP-20-HWR-M12FNB	Nut Hex M12x1-25 FINE Bronze	2	New
8	PP-20-HWR-M12NB	M12 x 1.75 Hex Nut Bronze DIN934	12	Was 316SS
9	PP-20-HWR-M12WS	Washer M12 316SS DIN125	16	
10	PP-20-HWR-M8AT	PP20 M8x1.75 Hex Nut Nyloc 316SS	3	
11	PP-20-LY1	PP20 Layer 1 Rev A	1	All P section grooves
12	PP-20-LY2	PP20 Layer 2 Rev A	1	
13	PP-20-LY3	PP20 Layer 3 Rev A	1	All P section grooves
14	PP-20-LY4	PP20 Layer 4 Rev A	1	
15	PP-20-LY5	PP20 Layer 5 Rev A	1	
16	PP-20-PG-50PG	PP20-50 Plunger 32 x 93mm Cat 45749	3	
17	PP-20-PG-50SP	PP20-50 Plunger Spacer Rev A	3	Longer, no shim
18	PP-20-PG-STD	PP20 Plunger Stud 316SS M7 x 103mm Cat 48679	3	
19	PP-20-PG-WS	PP20 Plunger Top Washer Rev A	3	
20	PP-20-PI-FC11/4	PP20 Fitting Clip 1 1-4 in LP Rev A	2	

ITEM NO.	PartNo	TITLE	QTY.	Change
21	PP-20-PI-FC3/4	PP20 Fitting Clip 3-4in HP Rev A	2	
22	PP-20-PL-FTI 14VS	PP20 Fitting Tube 1 1-4 in LP Victaulic SS Rev A	2	Was PVC now 316
23	PP-20-PL-FTI3/4	PP20 Fitting Tube 3-4in HP Rev A	2	
24	PP-20-PT-50PTR	PP20-50 Piston Rod Rev A	3	
25	PP-20-PT-50PTS	PP20-50 Piston Rev A	3	
26	PP-20-PT-DPPT	PP20 Damper Piston Rev A	1	
27	PP-20-RS	PP20 Relief Valve Screw Rev A	1	Larger handle
28	PP-20-SEAL-5HSP	PP20-50 HP Seal Spacer Rev A	3	
29	PP-20-SEAL-5HSR	PP20-50 HP Seal Retainer Rev A	3	
30	PP-20-SEAL-5HSW	PP20-50 HP Seal Washer Rev A	3	
31	PP-20-SEAL-5LSW	PP20-50 LP Seal Washer Rev A	3	
32	PP-20-VLV-RVN	PP20 Relief Nut 5-8x11 3-8 H 15-16 AF Nylon 6-6	1	
33	PP-20-VLV-SLV	PP20 Valve Sleeve Rev A	6	
34	PP-20-VLV-SPR	PP20 Valve Spring Rev A	6	
35	PP-20-VLV-VCG	PP20 Valve Cage Rev A	6	
36	PP-20-VLV-VLV	PP20 Valve Rev A	6	
37	PP-20-VLV-VPB	PP20 Valve Plug Bottom Rev A	6	
38	PP-20-VLV-VPT	PP20 Valve Plug Top Rev A	6	
39	PP-20-VLV-VS	PP20 Valve Shoe Rev A	6	
40	S0-PP20-50LPS	PP20-50 LP Seal NBR Cat 44098	3	

ITEM NO.	PartNo	TITLE	QTY.	Change
41	SO-PP20-50HPS	PP20-50 HP Seal Cat 45832	3	
42	SO-PP20-DPPT	PP20 Damper O Ring -320 NBR Sh70A	1	
43	SO-PP20-FLUSH	PP20 O Ring Flush -011 NBR Sh70A	4	
44	SO-PP20-HPF	PP20 O Ring HP Fitting -020 NBR Sh70A	2	
45	SO-PP20-LPF	PP20 O Ring LP Fitting -126 Viton Sh90A	4	
46	SO-PP20-LPSR	PP20 LP Seal Retainer CAT 110672	3	
47	SO-PP20-LY1CYL	PP20 O Ring L1 Cylinder -038 NBR Sh70A	3	
48	SO-PP20-LY1HP	PP20 O Ring L1 HP In -049 NBR Sh70A	1	
49	SO-PP20-LY1RV	PP20 O Ring L1 Relief -044 NBR Sh70A	1	
50	SO-PP20-LY3CYL	PP20 O Ring L3 Cylinder -038 NBR Sh70A	6	
51	SO-PP20-LY3DPP	PP20 O Ring L3 Damper -030 NBR Sh70A	2	
52	SO-PP20-LY3LPI	PP20 O Ring L3 LP In -562 NBR Sh70A	1	
53	SO-PP20-LY3LPO	PP20 O Ring L3 LP Out -049 NBR Sh70A	1	
54	SO-PP20-LY5CYL	PP20 O Ring L5 Cylinder -038 NBR Sh70A	3	
55	SO-PP20-LY5HPO	PP20 O Ring L5 HP Out -050 NBR Sh70A	1	Was -550: typo?
56	SO-PP20-PT	PP20 O Ring Piston -324 NBR Shore70A	3	
57	SO-PP20-RV	PP20 O Ring Relief Valve -012 NBR Sh70A	1	
58	SO-PP20-VLV	PP20 O Ring Valve -021 NBR Sh70A	6	

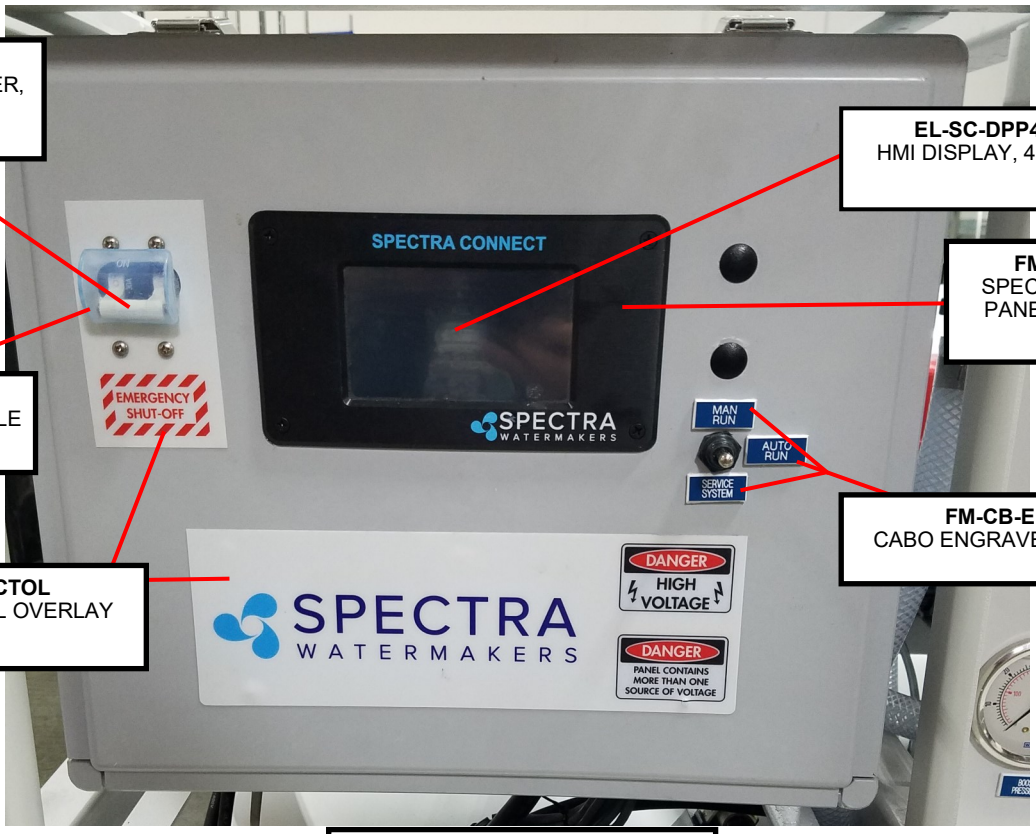
Remove all burrs and sharp edges, max radius 0.010"					
Material					
Surface Finish					
Dimensions	Inches				
Tolerances			A	140605	SP16 50% Assembly Exploded Rev A plus changes as BOM above
SCALE:1:10	Do not scale	Third Angle Projn.	Rev	Date	Purpose & Changes

SP20-50 Pump Assembly Rev A

Contact	Colin Pearson
Phone	+44 / 0 20 8340 8333
Mobile	+44 / 0 7980 093137
email	colin.pearson.spectra@gmail.com

Drg No.	SP20-50	Size C	Sht 1 of 1

Parts I.D.



EL-BRK-30ADP
30A CIRCUIT BREAKER, 2 POLE

EL-BRKBRK2P
BREAKER BOOT, 2 POLE

PT-STK-LB5ECTOL
CONTOL BOX PANEL OVERLAY

EL-SC-DPP4.3B
HMI DISPLAY, 4.3 INCH

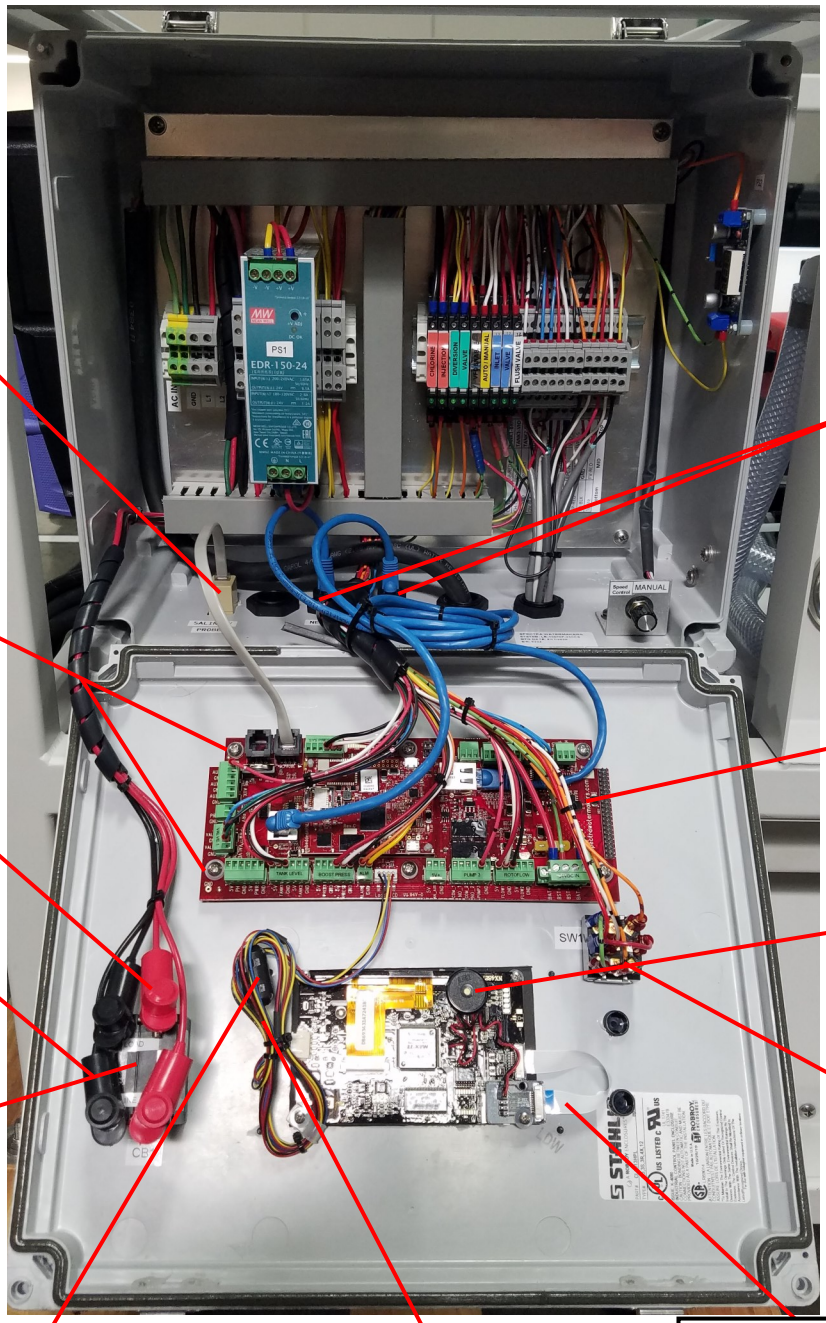
FM-SPC-PNBZ
SPECTRA CONNECT PANEL BEZEL ONLY

FM-CB-ENGVPNS
CABO ENGRAVED PANELS SET

Control Box Mounting Hardware:

HD-WSH-5/16NL	
5/16" NYLON WASHER	**(x4)**
HD-BLT-5/16X1	
5/16" X 1" SS. BOLT	**(x4)**

Part Numbers



EL-TM-RJ12COUP
RJ-12 MODULAR COUPLER PANEL MOUNT

HD-SPN-1/4BNS
1/4" Nylon Spacers (6x)
- Under Connect Board

EL-TM-1/4PPCPR
1/4" Cable Cap Stud (Red)

EL-TM-1/4PPCP
1/4" Cable Cap Stud

EL-BRK-30ADP
30A Breaker

EL-MAG-7MNSP
7MM NOISE SUPPRESSOR

EL-SC-48JSTMM
Display Cable

EL-SC-DPIOA
SPECTRA CONNECT DISPLAY I/O ADAPTER

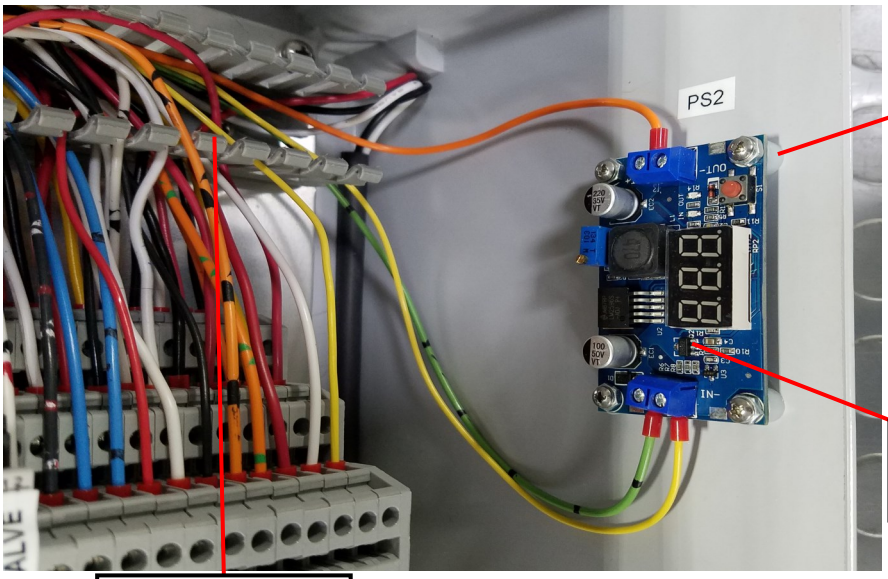
EL-TM-RJ45BHCR
RJ-45 WATERPROOF COUPLER STRAIGHT

EL-SC-CTRBA
Spectra Connect Board

EL-EL-SC-RMPBZ
5V BUZZER

EL-SWT-TG-3PDT
3-POLE DOUBLE THROW SWTICH 15A

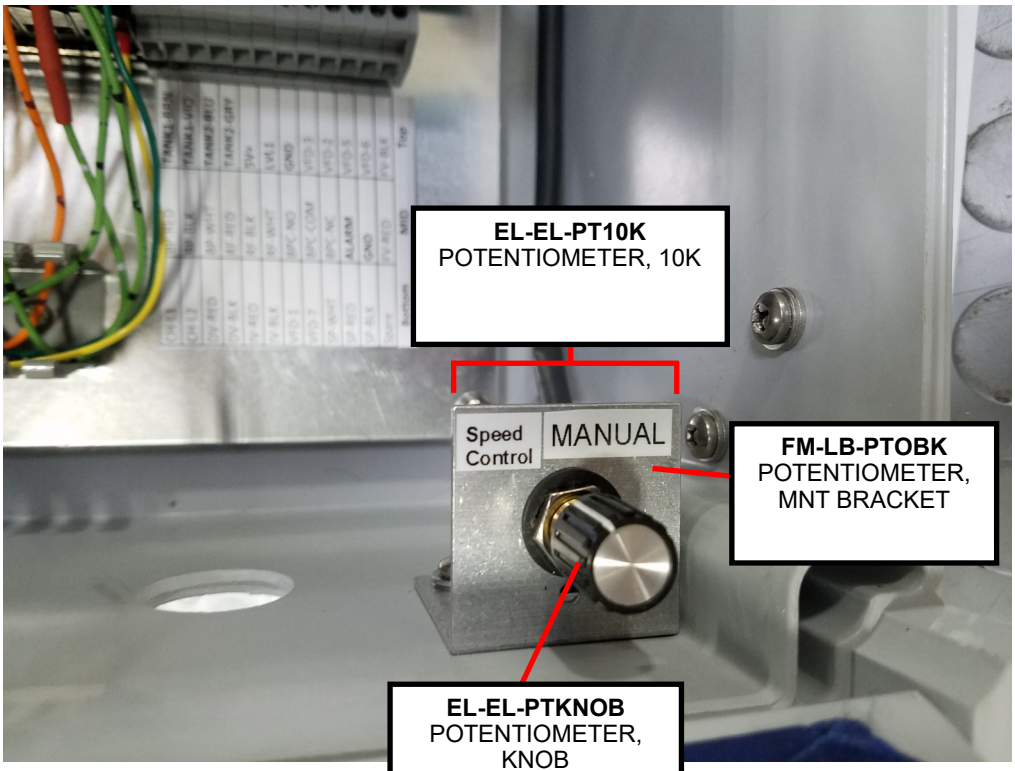
Part Numbers



HD-SPN-1/4BNS
1/4” Nylon Spacers (4x)

EL-PS-DC2AVADJ
DC TO DC CONVERTER, 6VDC OUT

EL-CD-1X11/2G
WIRING DUCT GREY

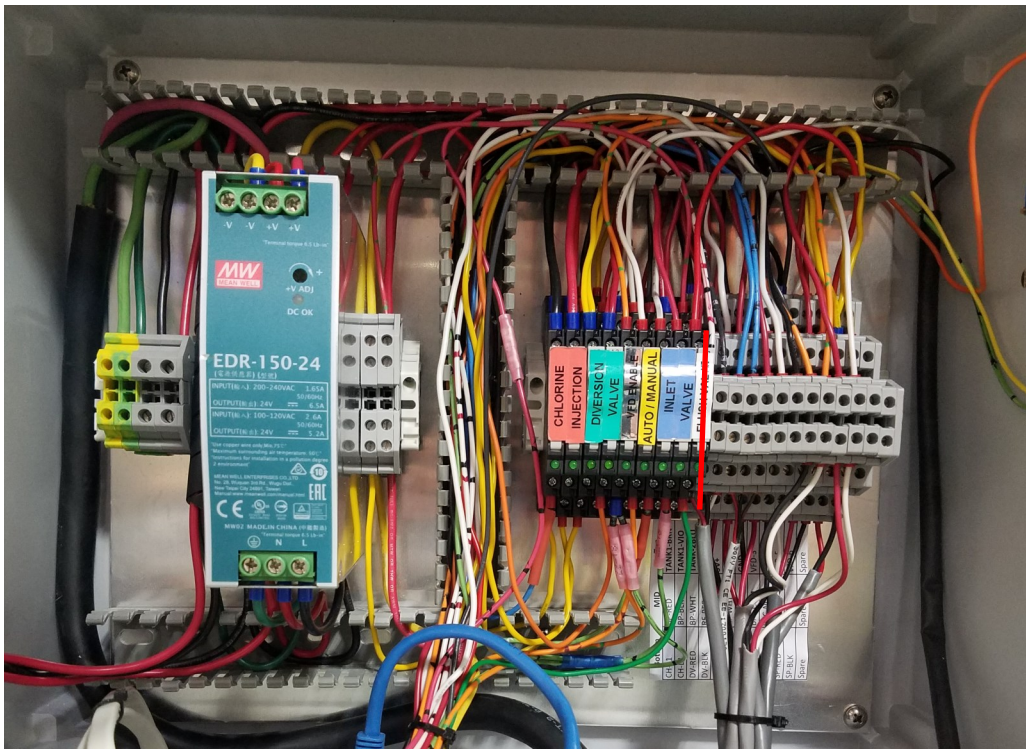


EL-EL-PT10K
POTENTIOMETER, 10K

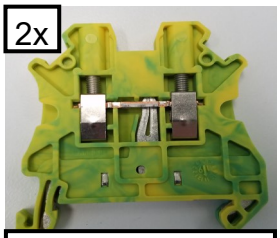
FM-LB-PTOBK
POTENTIOMETER, MNT BRACKET

EL-EL-PTKNOB
POTENTIOMETER, KNOB

Part Numbers



2x

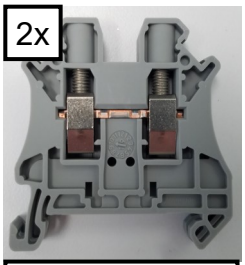


EL-TM-DR1P12-26
DIN RAIL GROUNDING TERMINAL 1P 12-26 AWG

4x

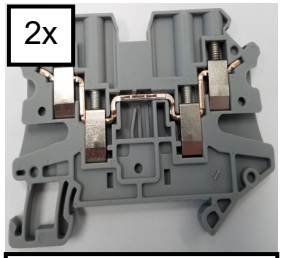
EL-RL-35MMDRSP
DIN RAIL STOPPER 35MM

2x



EL-TM-DR1P8-24
DIN RAIL TERMINAL 1P 8-24 AWG

2x

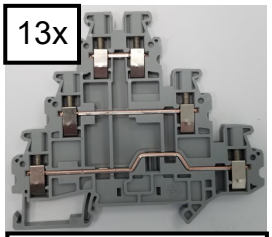


EL-TM-DR1P10-26
DIN RAIL TERMINAL 1P 10-26 AWG

1x

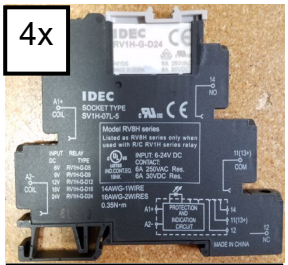
EL-TM-DREP1P
DIN RAIL TERMINAL 1P END COVER

13x



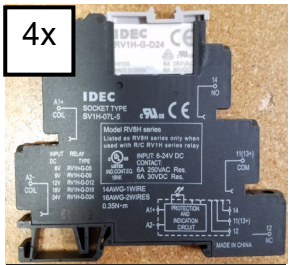
EL-TM-DR3P12-26
DIN RAIL TERMINAL 3P 12-26 AWG

4x



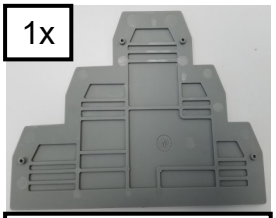
EL-RL-6ASPDT24D
6A SPDT RELAY 24V DIN MOUNT

4x



EL-RL-6ASPDT6D
6A SPDT RELAY 6V DIN MOUNT

1x



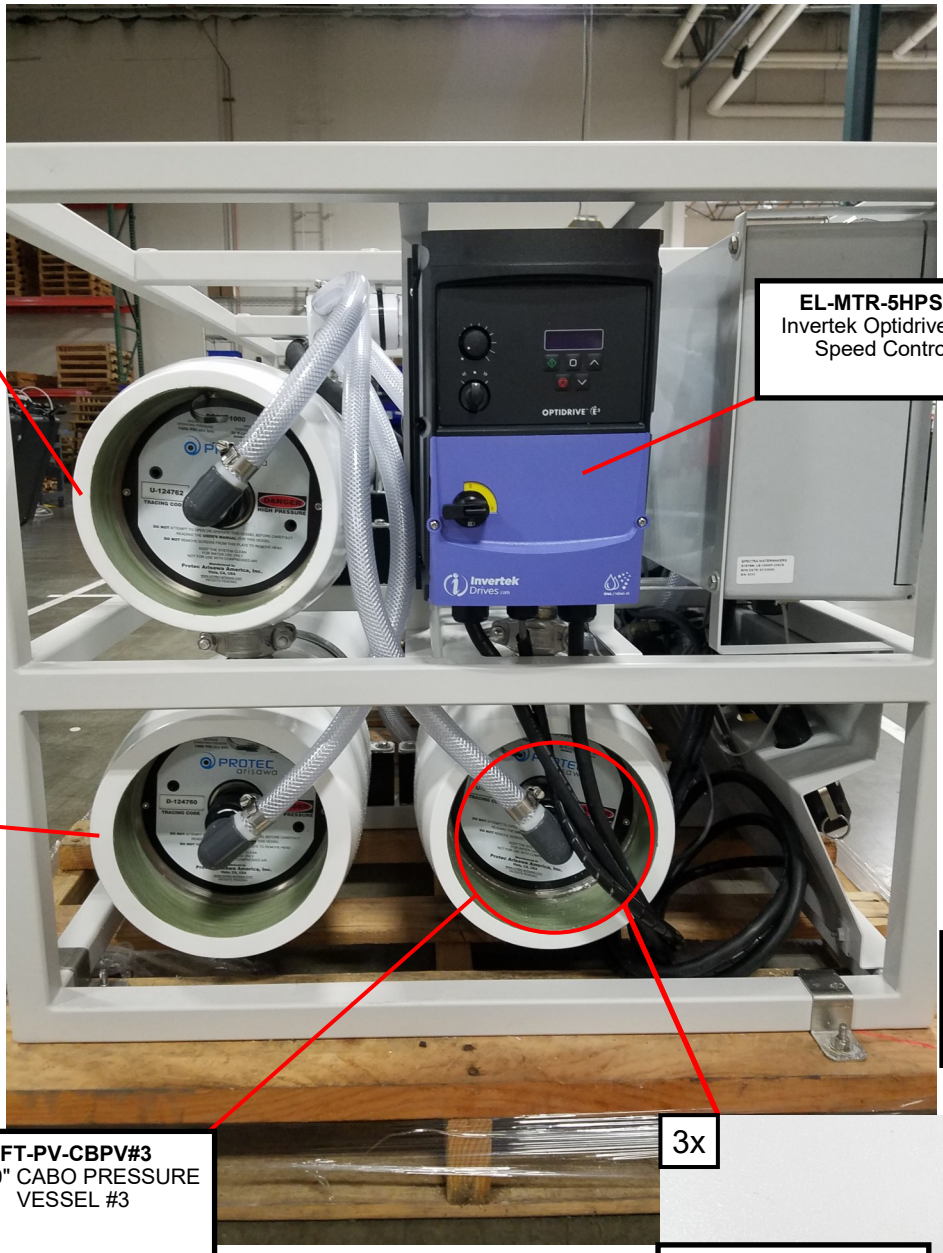
EL-TM-DREP3P
DIN RAIL TERMINAL 3P END PLATE

Part Numbers

(Not Pictured):
FT-MB-SW8X40
8"X40" SEA WATER MEMBRANE (3x)

FT-PV-CBPV#1
8"X40" CABO PRESSURE VESSEL #1

EL-MTR-5HPSC2N4
Invertek Optidrive (Motor Speed Controller)



FT-PV-CBPV#2
8"X40" CABO PRESSURE VESSEL #2

FT-PV-CBPV#3
8"X40" CABO PRESSURE VESSEL #3

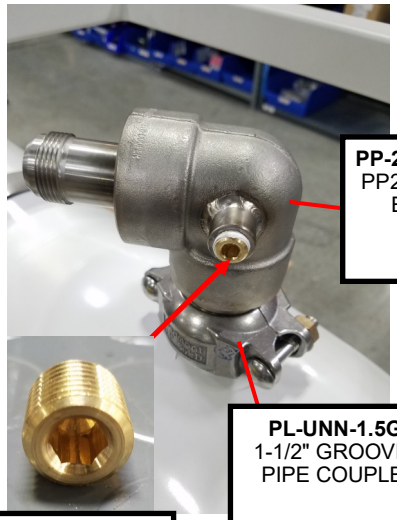
PL-HBS-3/4X3/4
3/4" NPT X 3/4" HOSE BARB ST. NYLON

3x

PL-UNN-3/4FPVCE
3/4" FPT PVC SCH80 ELBOW

PL-NP-1X3/4BPP
1" NPT X 3/4" NPT NIPPLE BLACK POLY

Part Numbers

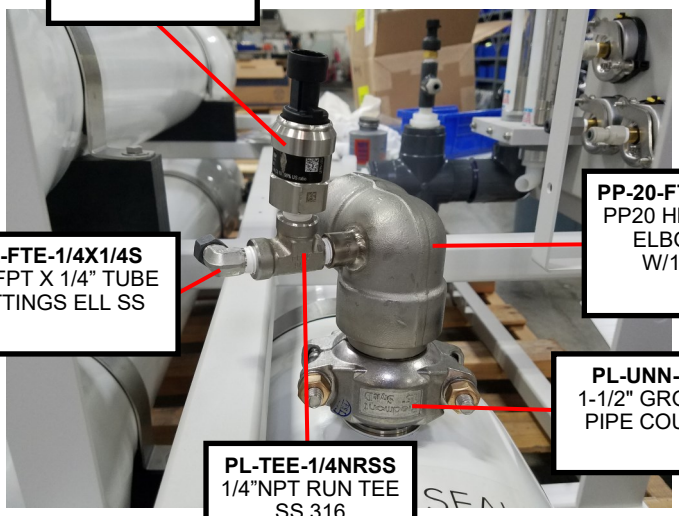


PP-20-FT-HPFEFL
PP20 HP 37D JIC
ELBOW SS
W/1/4"HP

PL-UNN-1.5GEPC
1-1/2" GROOVE END
PIPE COUPLER SS

PL-HP-1/4BR
1/4" COUNTER
SUNK HEX
PLUG (BRASS)

EL-SSR-1500PT1
0-1500 PSI
PRESSURE
TRANDUCER SS 1



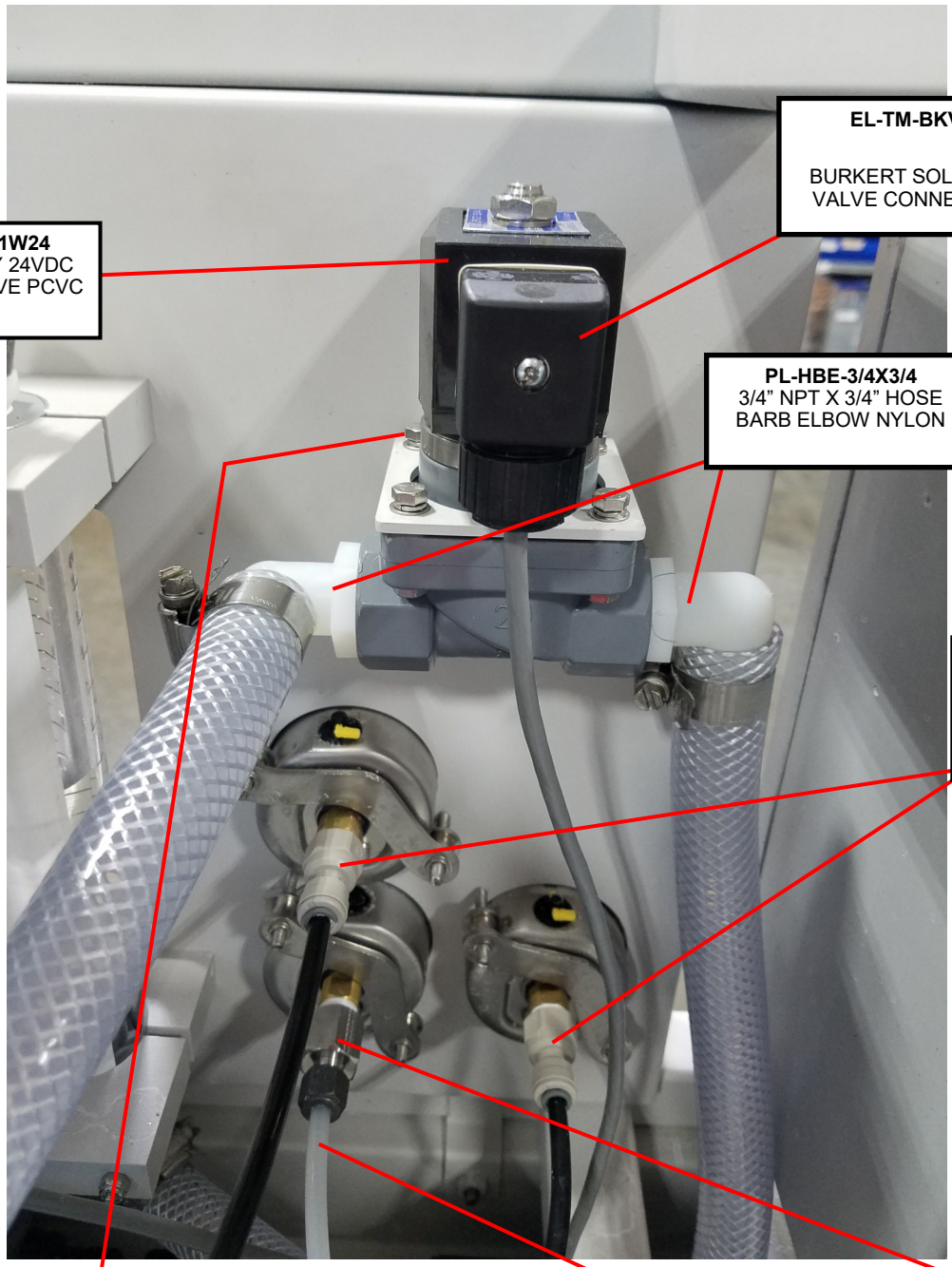
PL-FTE-1/4X1/4S
1/4"FPT X 1/4" TUBE
FITTINGS ELL SS

PP-20-FT-HPFEFL
PP20 HP 37D JIC
ELBOW SS
W/1/4"HP

PL-UNN-1.5GEPC
1-1/2" GROOVE END
PIPE COUPLER SS

PL-TEE-1/4NRSS
1/4"NPT RUN TEE
SS 316

Part Numbers



EL-TM-BKVC

BURKERT SOLENOID VALVE CONNECTOR

PL-SLN-3/4F1W24
3/4" FPT 1-WAY 24VDC SOLENOID VALVE PCVC

PL-HBE-3/4X3/4
3/4" NPT X 3/4" HOSE BARB ELBOW NYLON

PL-FTS-1/4X1/4J
1/4" FPT X 1/4" TUBE FITTING St. JG

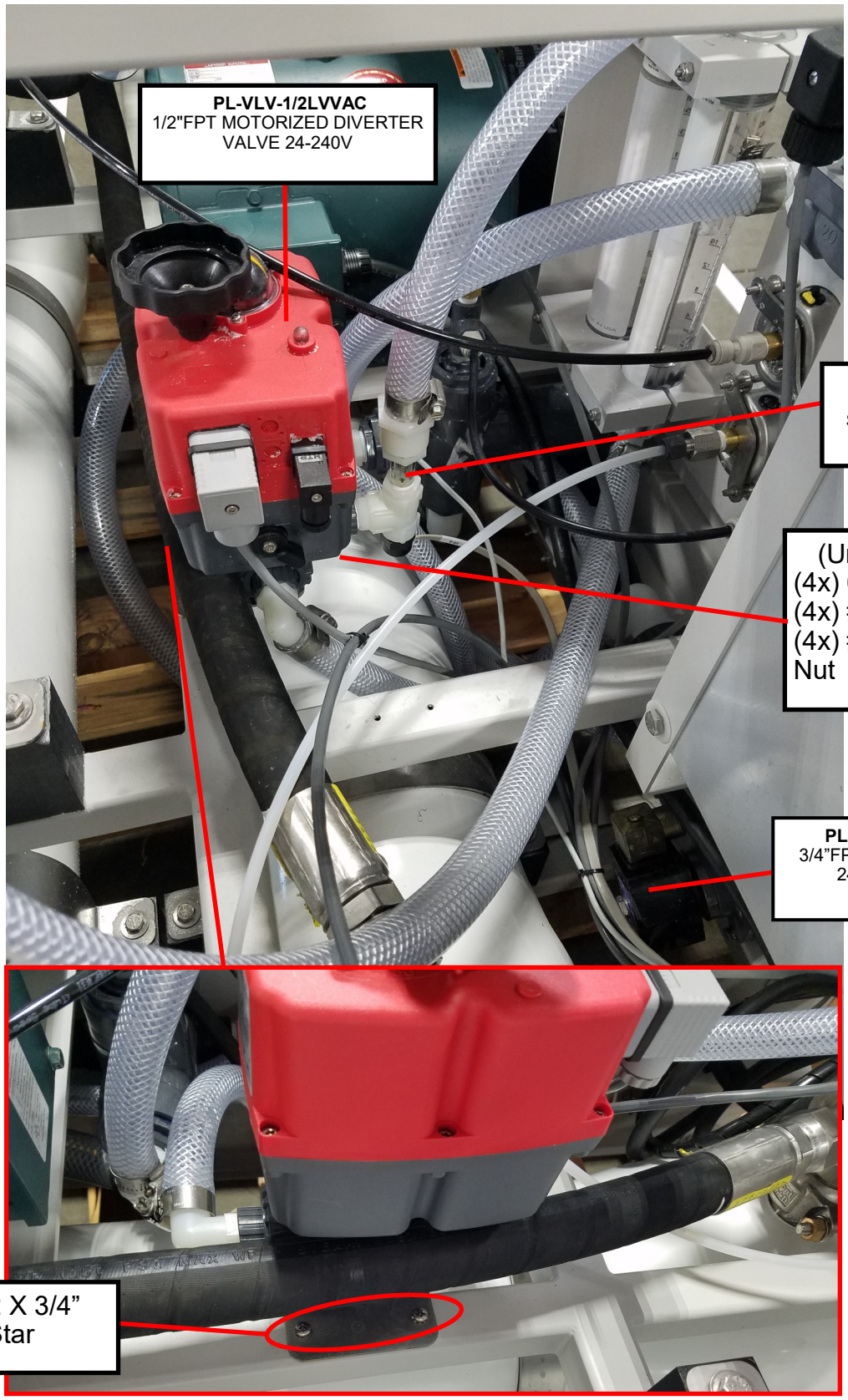
PL-NLT-1/4HP
1/4" HIGH PRESSURE TUBE

PL-FTS-1/4X1/4S
1/4" X 1/4" SS HIGH PRESSURE TUBE FITTING JG

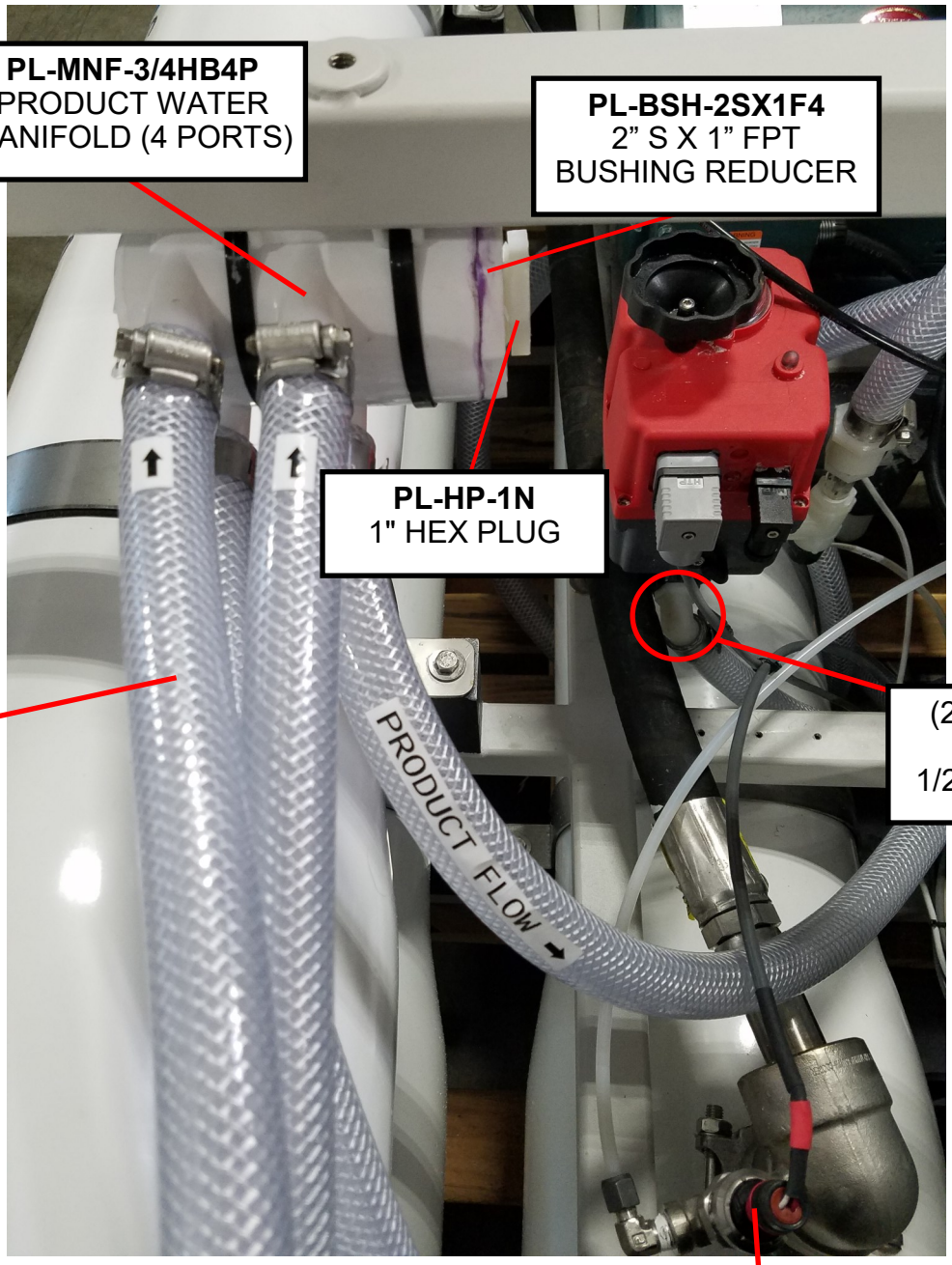
Bracket to Panel:

(2x) HD-PMS-102412	10 X 24 X 1/2" PHMS SS
(2x) HD-WSH-10N	10 FLAT NYLON WASHER

Part Numbers



Part Numbers



PL-MNF-3/4HB4P
PRODUCT WATER MANIFOLD (4 PORTS)

PL-BSH-2SX1F4
2” S X 1” FPT BUSHING REDUCER

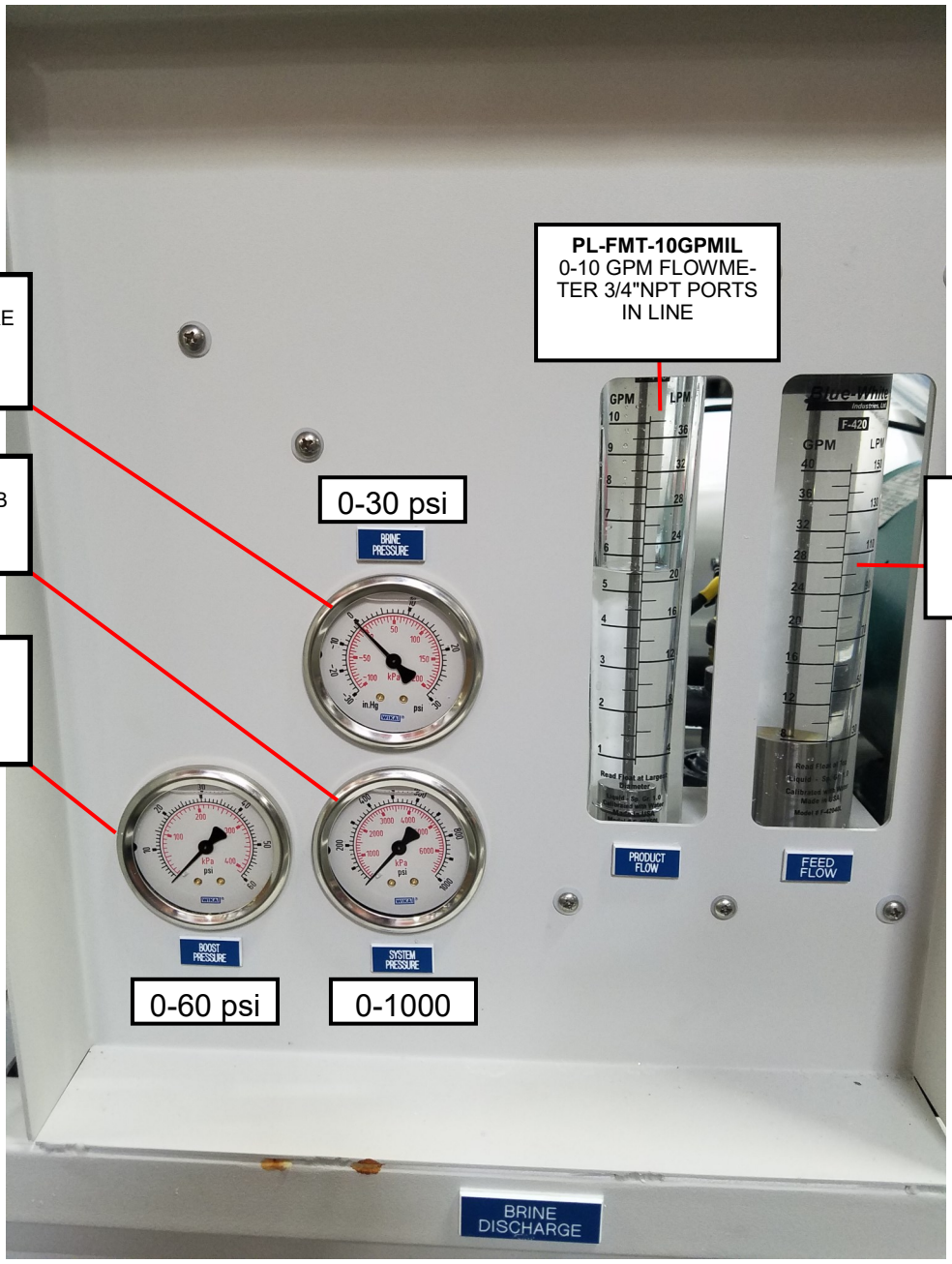
PL-HP-1N
1" HEX PLUG

3/4”
Reinforced

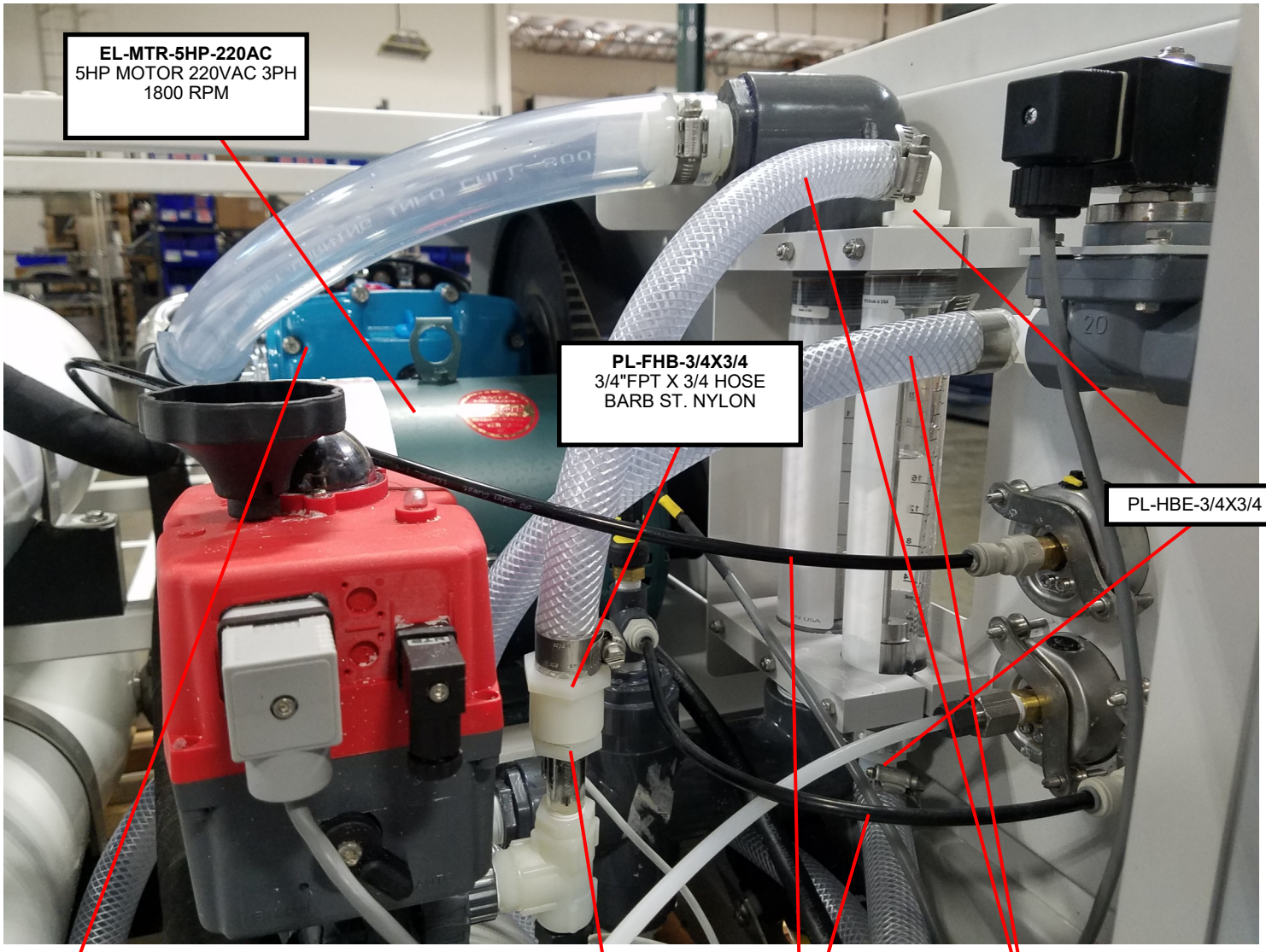
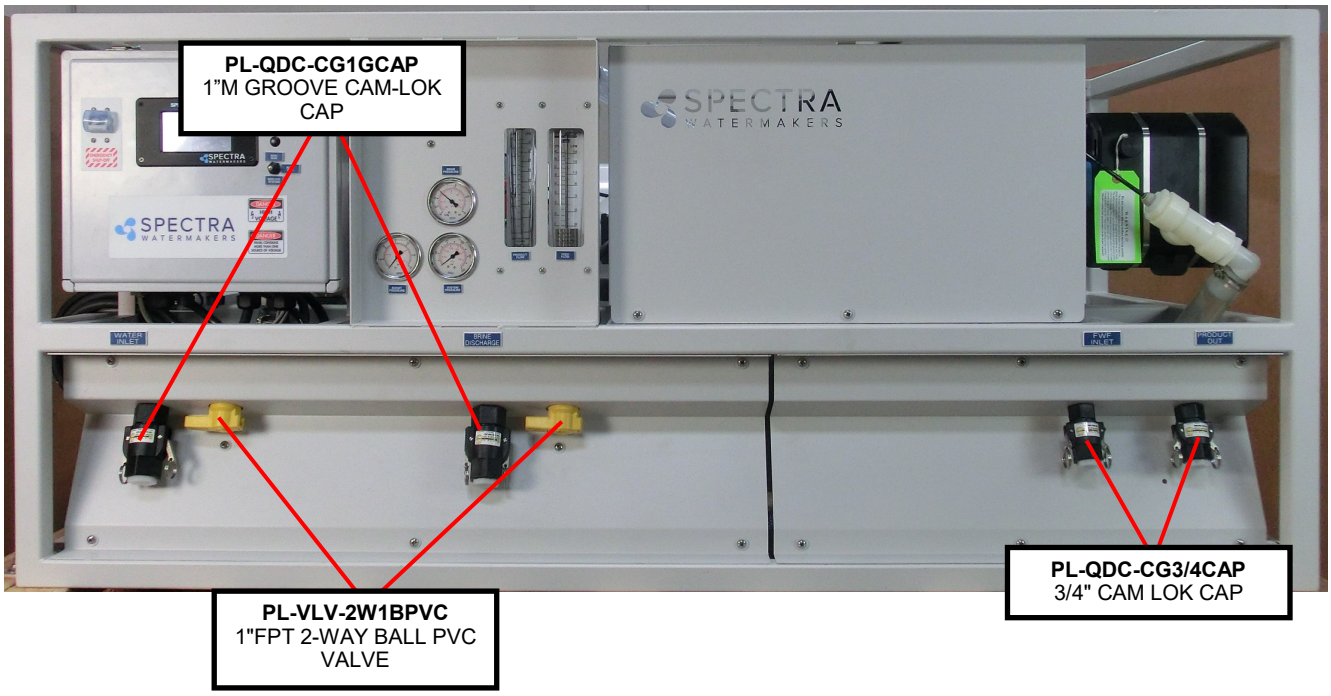
(2x) **PL-HBE-1/2X3/4**
1/2" NPT X 3/4"

EL-SSR-1500PT1
0-1500 PSI

Part Numbers



Part Numbers



Part Numbers