



LB 1800 F Manual



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Getting Started

Spectra Watermakers Land Based Desalination Systems are shipped pre-tested and pickled with propylene glycol for shipment. The system is ready for installation with the options specified with your order. Please unpack the system and inspect it to make sure that it has not been damaged in shipment.

Refer to the shipping list for your system to make sure you have received all of the components listed. Do not discard any packaging until you have found and identified all of the parts. A pick list is included in the poly bags containing small parts and fittings.

We will not be held responsible for shortages that are not reported within thirty days of the ship date. Shipping damage must be reported to the carrier within 24 hours of receiving goods.

Next, please study the system layout diagram, component photos and descriptions before beginning your installation. This will assist you in understanding the function of each component.

Layout the system. Before starting the installation identify the location where each module and component will be placed. Insure that there is proper clearance around the components for removal of filters and system service. Also check to make sure you have adequate tubing and hose before starting so additional parts may be ordered.

LB 1800F and LB 2800F shipping list:

- Spectra-Pearson Pump Module in Stainless Steel Frame, Including:
 - Pre-filtration assembly**
 - Fresh Water Flush and Service Pump**
 - Inlet and Brine Discharge Service Connections**
 - Control Box with Automated Control System and Display**
 - Automated Diversion Valve with In-Process Conductivity Sensor**
 - Boost Pump Control Box (optional)
 - DC Power Supply (optional)
- Service Kit
- User's Manual
- Log Book
- Boost Pump (optional)
- Pressure Regulator for feed (optional)
- Valve for feed (optional)**
- UV Lamp (optional)

** components built into frame assembly

INSTALLATION

The LB 1800/2800 F desalinator should be protected from direct sun and weather. It is recommended that it be under a roof or other cover. If no cover is available place a sheet of plywood on top of the frame to protect the electrical components from the elements. Locate the desalinator in a location with good ventilation and drainage.

Product Water tubing

The Product Water Outlet is a male cam lock fitting. Route the product water tube from the product water outlet fitting on the front of the unit into the top of the storage tank. Ideally the product water should fall into the tank so there is no back pressure on the product line. Install a tee in the water tank fill or tap a pipe thread into an inspection port in the top of the tank. Do not feed the water into a manifold or bottom of the tank. Make sure there is no restriction in this plumbing. **The top of the water tank must be no more than 10 feet (3M) above the top of the desalinator frame.**

The limit on the system pumping product water is the back pressure created on the membrane when the system shuts down. If you need the unit to pump water over 10 ft. install a good quality check valve (with low cracking pressure) in the product line as this will eliminate back pressure on the membrane when the system shuts down.

Product water comes from the membrane into the pump module manifold where it passes through the flow meter, the salinity probe and the diversion valve. If the salinity is below 750ppm the diversion valve energizes and the product goes to the Product Water Outlet. If the diversion valve is not energized the product goes into the brine discharge.

A product sampling tap can be installed along the tank fill hose between the outlet and the tank connection. If a sampling tap or filling manifold is to be installed on the product water line, then an "open-before-close" type 3 way valve should be used to ensure that the product water line is never accidentally pressurized.



Product water **flow restriction or discharge head pressure will cause damage to the machine.** Do not use the desalinator as a product water delivery pump. If the product water must be delivered up hill or to a tank more than 50 feet/15M away, run it to a local tank and use a separate pump to transfer it from the local tank to the desired location.

Product to
Fresh Water
Tank

INSTALLATION

Brine Discharge must go to an open drain with an air gap so there is no suction possible

Route the Brine discharge from the cam lock fitting to a second "injection well" or appropriate drain back to the feed water source, or to another ecologically acceptable location. The brine flow will be roughly 4.5gpm (17lpm) and it will be 1.25 times as salty as the feed water.



Feed Water Inlet

Feed water must be supplied to the feed water inlet at a Minimum pressure of 20psi (1.3bar) and a Minimum Available Flow Rate of 6.5gpm (24.5lpm). Silt density must be less than 3 SDI. If the water supply has a lot of silt in it a settling tank is recommended. Pipe the feed water to the tank bottom and the supply to the desalinator from near the top of the settling tank. In especially difficult applications contact the manufacturer for assistance in designing an intake system. Obtain a complete feed water laboratory analysis before requesting assistance.

Feed Water Source

If the water source for the Spectra system is higher than the inlet, the system will continue to allow feed water to flow after the system is stopped, necessitating a shutoff valve for the source water.

Pressure Regulator and inlet valve

If the pressure from your feed water source cannot be regulated you may need to add the optional pressure regulator and or a solenoid valve to the system inlet. The system requires a regulated inlet pressure of 20 psi and no pressure when the system is off. The picture at right shows the optional pressure regulator and solenoid valve assembly.



Adjust the pressure regulator with a 3/8" Allan wrench so the boost pressure shown on the Pre Filter screen on the MPC control reads 20psi.

INSTALLATION

Control System

MPC-5000 Controls (all units)

To protect the microprocessor control during transport all the connections to the MPC board are un-plugged prior to shipping (see picture at right). Prior to installation plug all connectors into the nearest receptacle, the harness is tied together so it is easy to determine what goes where.



Electrical Cables

The mains power is connected to the Feed Pump Module and then to the Watermaker. Be sure to use a properly sized GFI (Ground Fault Protector) between the equipment and the power source. The unit is shipped with a length of SO cable to connect to the power source. All units use 24v DC for the control circuits and a power supply is included in the box (on AC units).

Optional equipment

Depending on the configuration ordered the system may have a separate control box for the boost pump contactor or speed control. All the electrical connections are done so that the system cannot be hooked up incorrectly.

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 light up and go through a start up sequence. The system will sound an alarm and the red light will flash, press the ALARM/DISPLAY button to silence the alarm. The display will read; OPEN PRESSURE RELIEF VALVE NOW which is part of the standard start up procedure sequence. Power the unit off and confirm all plumbing connections are complete.

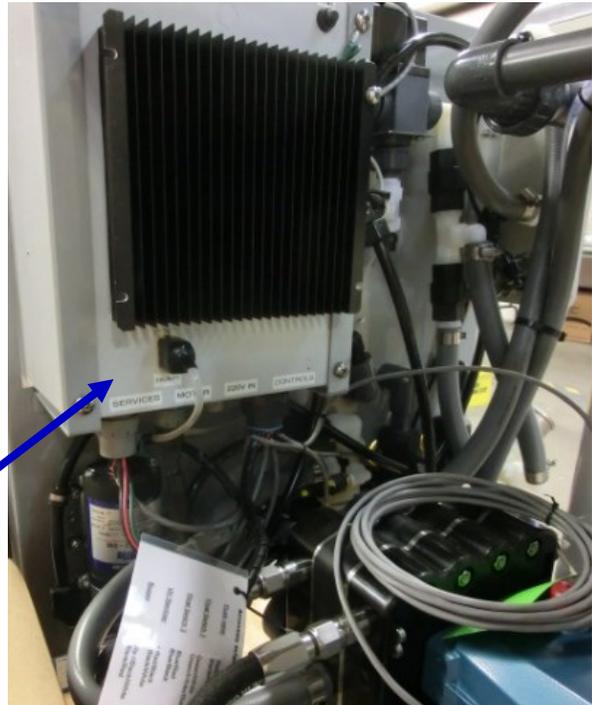


INSTALLATION

Electrical Cables

All connections to the control box are clearly labeled next to the corresponding connector. The connectors on the control box for the boost pump may not be marked as there is only way to connect the plugs.

All plug connections are labeled



MPC Display

Manual Run/
Auto Run Switch

Main Breaker



Connection of Optional Accessories

Use of any external devices not approved by the factory may cause permanent damage to the controller and is not covered by the Spectra warranty. Accessory outputs are limited to 2 amps maximum load! Do not connect motors, pumps, etc to accessory outputs, please contact Techsupport@spectrawatermakers.com if you have questions.

Ultraviolet Sterilizer

The UV sterilizer is typically wired into the unit unless specified otherwise. Detailed instructions are included with the sterilizer kit. If the wires must be extended, use minimum 16AWG wire.



External Buzzer(s)

In addition to the external buzzer(s) installed at each remote control display panel, a buzzer unit may be installed at the control box. The buzzer RED wire connects to the "BUZZ" terminal on the MPC board, and the buzzer BLACK wire connects to "GND."



Float Switches

The Spectra LB 1800F and 2800F can have optional tank float switches installed for complete automated operation. See next page for details on installation.

Optional Tank Switch Installation and Operation

There are control wires external to the control box with a laminated tag for connecting float switches. Any float switch can be used that makes a closed contact

For automatic fill and stop.....the unit is wired with both tank full and tank empty switches. Enter **AutoFill Mode** by pushing and holding the Auto Run button on the MPC-5000 display for 5 seconds. In this mode the system will start whenever one or both tank switches are open. When the tank fills up and both the tank switches have remained closed for two minutes, the watermaker will shut down and flush itself. The water maker will start back up when the water level drops below the tank empty switch and both remains open for 2 minutes, so this configuration allows for completely automatic operation. If the watermaker does not need to start up within five days it can be programmed to automatically do a fresh water flush (Contact factory for details). **AutoFill mode** can be ended by pushing the stop button or the Autoflush button. If the watermaker is in Autorun mode it can be put into **Autofill mode** without stopping it by holding down the Autorun button for 5 seconds.

For manual start and automatic stop.....only the tank full switch is used. Jump the low lever tank switch wires together to enable the high level switch to operate independently, because the watermaker will only shut down if both sets of terminals are closed. You can start the watermaker by pressing the **Autorun** button or the **Stop** button (which is a **Start/Stop** button) and it will shut off automatically (and do a flush) when the tank is full. **DO NOT press and hold the 'Auto Run' button, as this will enter the 'Auto Fill Mode' and the watermaker will not function properly.**

It is possible to use the Autofill feature with 2 tanks. A double throw electrical switch must be installed in a convenient location. If only the single tank full switch is installed in each tank connect the wire from the Float Switch 1 terminal "1" to the common on the switch and run separate wires from the switch to each tank switch. The second wires can both be run to the Float Switch 1 terminal 2. If you are using two switches in each tank you will need a double pole double throw switch.

See wiring schematics beginning on pg.35 for detailed drawings.



New System Start-Up and Testing

Use this procedure when starting a new watermaker for the first time, when the last known state of the system is unknown, or **whenever the system contains Preservative or cleaning chemicals.**

Warning! Damage will occur if the purge sequence is bypassed and the membrane is pressurized with storage chemical in it.

1. First Check That:

- Feed water is available at the Feed Water Inlet
- Brine discharge is directed to a suitable location. The brine discharge will contain a small amount of propylene glycol (potable antifreeze) during the purge cycle
- Manual/ Auto/ Service Switch is in “Auto” Position
- **The shipping Oil Plug on the crankcase has been removed and replaced with the attached VENTED DIPSTICK prior to running the machine.**
- **Pressure Relief Valve is OPEN**
- Power is supplied to the control box.

Open pressure relief valve 1 full turn!

3. Place the Master Circuit Breaker on the front of the control box in the ON position.

4. Confirm the DC powered display is on, it should read “*Open Pressure Relief Now*” Confirm that the Pressure Relief Valve is open.

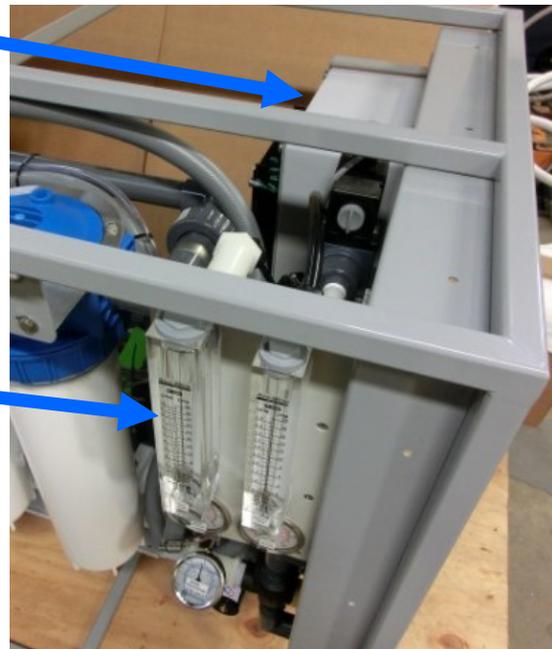


5. Hold down the “Purge Button” on the back of the main control box to run the feed pump so you can purge air out of the filter housings (see picture on the top of the next page).

If the Feed Pump is controlled separately turn it on now and use the buttons on top of the filter housings to purge air out of the filter housings.

Note that this system includes an analogue gauge panel that shows feed and product flow rates along with the feed pressure (after the filters) and membrane pressure.

The feed flow gauge is a good place to check for air bubbles in the feed water while going through the startup process.



New System Start-Up and Testing (cont.)

6. Wait until the system is completely filled with feed water and water begins to flow out of the brine discharge.

NOTE: It may be necessary to bleed excess air out of the filter housings using the buttons located on the filter housing lid.

7. Or if the boost pump is controlled by the MPC then just Press **Auto Run Button** and the purge process will begin.

The feed pump will start (bleed the filters as above) and the system will go into Purge mode with the Spectra-Pearson Pump running at low speed. The system should prime within 60-90 seconds and if it alarms just start the process again. Check the brine discharge for water flow, there should be no bubbles anywhere in the intake hoses and the Spectra-Pearson Pump should sound smooth after priming. If the pump sound rough, is likely due to low feed pressure, find the reason before continuing! Inspect the system for leaks. If the Service Pre-filters alarm is set off, check to make sure that the boost pump is primed and that water is flowing through the system. The air may need to be bled from the filter housings in order to keep the error from recurring.



Note; The system must purge for at least 20 minutes before being pressurized. If the Purge sequence is interrupted the system can always be operated using the RUN MANUAL switch to get the full 20 minutes or more of purging.

8. After the purge sequence the control will alarm with the message “Close pressure relief valve” - **Close the pressure relief valve** and proceed by pressing “**Auto Run.**”

9. The system is now running under pressure and making water. The display will read “**purging product water.**” This mode sends the product water to the brine discharge for ten minutes in case there are any residual chemicals in the membrane. After ten minutes the diversion valve will energize and purified fresh water will begin to fill the flush tank. When the flush tank is full water will begin to flow out of the Product Water Outlet.

10. **Carefully inspect for leaks over the entire system!** Shut down the system and repair any leaks you find.

11. Check that the system is operating within its normal parameters. Compare with the chart on the next page.

12. Stop the system by pressing the “Stop” button. If you wish to continue making water restart the system using the Normal Operation instructions on the next page. If the system is stopped with the **STOP** button it will not flush automatically, so if it is not going to run automatically push the AUTO STORE button to flush the system.

MPC Display Functions

Product Flow

LB 1800 Will produce 74 - 76 GPH (280-293LPH)

LB 2800 Will produce 115 - 117 GPH (435-443LPH)

NOTE: To toggle between US standard and Metric Units access the program mode as described in section 2 of this manual.



Salinity

Salinity reads in parts per million. System rejects water higher than 750 PPM. Anything below 500 is excellent.



Membrane Pressure

Membrane pressure will vary depending on feed water conditions. Normal operation will see pressures between 600 and 800 psi when desalinating seawater. At no time should membrane pressure exceed 900psi.



Filter Condition

PREFILTER warns that filters are getting dirty. Clean filters as soon as convenient. If the graph reaches full scale the machine will automatically slow down to Run Low speed. If it reaches full scale again it will alarm Service Prefilters and shut off the watermaker. The number in the top right corner represents Boost Pressure from the Boost Pump. As boost pressure drops, more boxes will fill in, indicating clogged filters.



Normal Start Up Using the Auto Run Button

If the system contains preservative or cleaning chemicals follow the directions for New System Startup or Membrane damage will occur!

Normal Run

- Press Auto Run button once and the system will prime and run for 1 hour. The display reads “AUTO RUN MODE—1:01” then “STARTING” with a 10 second priming countdown. Each time you tap the “**Auto Run**” button an hour of run time is added, up to a total of 12 hours. An additional hour can be added at any time during the run cycle.
- Pressing the Alarm/Display button will scroll through the system data.
- When the run timer reaches the end of its sequence the system will automatically fresh water flush for the designated amount of time.
- Pressing the Stop button stops the system, regardless of mode of operation, at any time with no flushes.
- The system can be re-started from any mode by pressing the “**Auto Run**” button, and the sequence above will start all over again
- For optimum performance, run the system as long as possible at one time using the “**Auto Run**” feature. **Never let the system sit with salt water in it.** Never allow air leaks in the intake, these can damage the Spectra-Pearson Pump.

Normal Shut Down

- If the system was started using the “**Auto Run**” button, the system will shut off on its own when the selected run time is over and will automatically fresh water flush itself.
- Pressing the Stop button at any time will shut off the system with no automated flush.
- If the *Auto Run Cycle* was stopped before the timer ran out then immediately press the “**Auto Store**” button to initiate the fresh water flush sequence.

Note: Periodically Check all plumbing connections for leaks, including the oil pump and filter assembly.

If the gauge on the outlet of the optional charcoal filter reaches 15psi during operation, this filter has been fouled and should be replaced.

Start Up Using the 'Stop' Button

If the system contains preservative or cleaning chemicals follow the directions for New System Startup or Membrane damage will occur!

Normal Start Up

- Turn on the Power supply.
- Check the feed, brine, and product water connections.
- Start the Boost Pump* (feed water supply) if controlled separately and check that there is pressure at the desalinator by depressing one of the bleed buttons on the prefilters or checking the pressure gauge on the supply pump.
**If the machine is equipped with the optional Boost Pump and Controller from the factory then skip this step.*
- **Close the pressure relief valve**
- Press the "Stop" button. The Stop button is actually a Start/Stop button. Pressing the Stop button will cause the system to start up and run indefinitely.

Normal Shut Down

- Press the "Stop" button.
- *Turn off the feed water supply pump.
**Skip this step if optional boost pump is supplied from the factory*
- Press the "Auto Store" button. The flush water pump will activate and the display will read **'FRESH WATER FLUSH'** with a countdown timer. The Spectra-Pearson Pump will start, and the system will flush for the pre-programmed time.
- For optimum performance, run the system as long as possible at one time. **Never let the system sit with salt water in it.** Never allow air leaks in the intake, these can damage the Spectra-Pearson Pump.

Log Book

Keep an accurate daily log of the operating conditions. If any of the parameters change it may indicate that chemical treatments or mechanical repairs are required.

- An increase in membrane pressure may indicate membrane fouling.
- A decrease in product water quality (higher ppm) may indicate membrane damage.
- A decrease in product water production may indicate Pearson pump damage or wear.

Monitoring the System

Pressing the Alarm/Display button will scroll through the system data readouts.

Product Flow

LB 1800 Will produce 74 - 76 GPH (280-293LPH)

LB 2800 Will produce 115 - 117 GPH (435 - 443 LPH)

NOTE: To toggle between US standard and Metric



Salinity

Salinity reads in parts per million. System rejects water higher than 750 PPM. Anything below 500 is excellent.



Membrane Pressure

Membrane pressure will vary depending on feed water conditions. Sea Water operation will see pressures between 600 and 800 psi. If the membrane pressure exceeds 900psi (60bar) the high pressure pump will slow down to "Run Low Mode" If the pressure is still too high the controls will shut down the system and alarm "High Pressure".



If necessary membrane pressure can be reduced by reducing feed pump rpm using the speed control potentiometer inside the control box. Contact the factory for detailed instructions.

Filter Condition

PREFILTER warns that filters are getting dirty. Clean filters as soon as convenient. If the graph reaches full scale the machine will automatically slow down to Run Low speed. If it reaches full scale again it will alarm Service Prefilters and shut off the desalinator. The number in the top right corner represents Boost Pressure from the Boost Pump. As boost pressure drops, more boxes will fill in, indicating clogged filters.



Manual Operation

In the event of a component failure resulting in a shut down due to a false alarm, the failed component can be overridden using the Programming Function on the display. **High Pressure, Service Prefilter, System Stalled** (airlock), and **Salinity Probe Failed** alarms can be defeated. If one safety shutdown is disabled, the other safety shutdowns will still be active. The pressure sensors and salinity probe can also be calibrated from the display. Complete instructions are found in Part 2 of this manual under “Programming from the Display”. **Be absolutely certain that the alarm is false before defeating the automatic controls.**

In the event of complete MPC control failure, the system may be operated manually by using the manual run switch on the Electrical Box and manually opening the diversion valve. **The automatic safety controls are disabled in manual mode.**

- For manual operation, start the Boost Pump if not controlled by the MPC. Start the Spectra-Pearson high pressure pump by setting the run manual switch to “MAN RUN”. Close the Pressure relief valve. Shut the unit down if the Spectra-Pearson Pump knocks loudly or sounds rough or if air is continuously present in the intake line.
- The diversion valve, an electrically operated three way valve which is normally energized by the MPC controls to send water to the tank, will not open automatically in manual mode. Instead, it must be opened using the mechanical override button on the valve. The button is located on the side of the valve opposite the electrical connection and above the plumbing fittings. Firmly *press the button in* as far as it will go and *rotate it 90 degrees Clockwise*. This locks the diversion valve open.
- Each time the system starts the product water will be about 2000ppm, but will quickly drop to an acceptable range in the first minute or two of operation so you will get about ½ gallon of high salinity water at the beginning of the production cycle. As long as you run the watermaker for more than 2 or 3 hours the average salinity of the water in your tank will be acceptable.



Diversion Valve
Manual Bypass

Manual Run
Toggle Switch



Manual Operation (Cont.)

Manual Shutdown

- To shutdown the watermaker when operating manually switch the Manual/Auto/Service switch to “Auto.”
- Turn off the feed water supply pump, if manually operated.
- Switch the Manual/Auto/Service switch to Service. The flush pump and high pressure pump will start, and the flush tank will begin to empty.
- When the flush tank is nearly empty, or the flush pump starts sucking air, return the Manual/Auto/Service switch to Auto. Both pumps will stop.
- Return the diversion valve to the “divert” position by rotating the button 90 degrees and allowing it to pop out so it is read for automatic operation.

WARNING: Do not let the pumps run dry as Permanent damage will result.

Long Term Storage Procedures

Watermakers are best run continuously. When not in use, biological growth in the membrane is the leading cause of membrane fouling. A warm environment will cause more growth than a cold environment. The fresh water flush system will greatly reduce biological growth but may not stop it completely in certain conditions.

System Storage for up to 6 months, “Pickling”

If the system is to be left unused for more than 2 weeks, perform the following storage procedure. The procedure introduces a chemical compound, SC-1, into the system that prevents biological growth.

Spectra SC-1 is a special storage compound used by the US Navy. It is formulated to be compatible with the modern engineering plastics and composites in the Spectra pumps. Do not use any substitute except propylene Glycol, SC-1 Storage Compound has to be mixed at a ratio of 1 Spectra container to 3 gallons (12L) of fresh water to have the proper solution. An average of 3 gallons (11L) of water is in the system. This water has to be figured in to the mixture. The system uses two SC-1 containers.

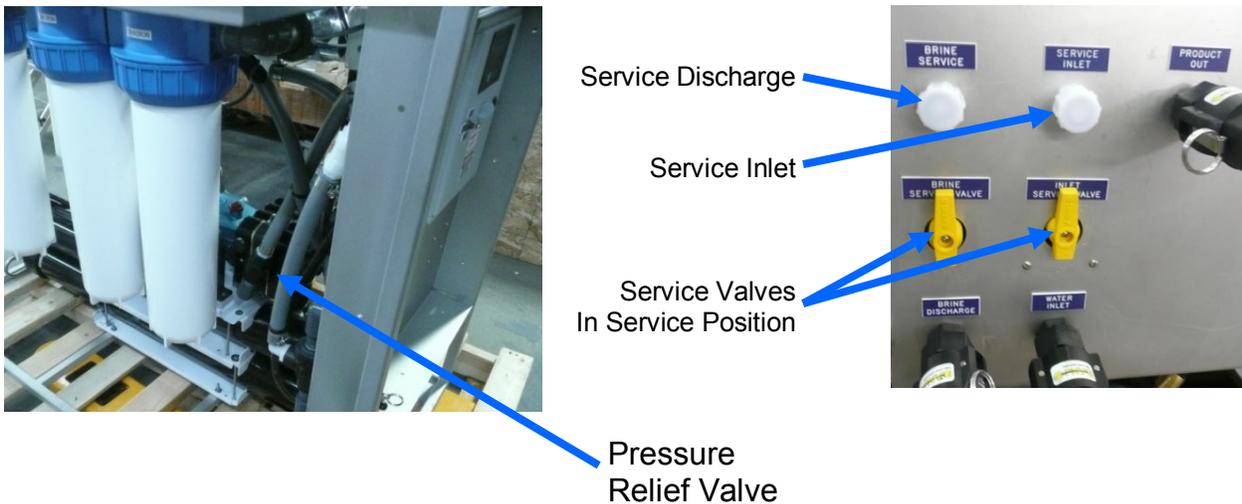
Caution! Avoid contact with skin, eyes, or lungs with the storage chemical.



Long Term Storage Procedures

Storage Procedure using SC-1 powdered preservative (good for 6 months):

- Step 1: Fill a bucket with 3 gallons of fresh unchlorinated water. Mix 2 containers of the SC-1 storage chemical compound into the water in the bucket.
- Step 2: If the flush tank is full push the “Auto Flush” button on the MPC-5000 display. If the machine has already been flushed go to step 3.
- Step 3: Install the braided vinyl service hoses from the service kit on to the service connections front of the unit and move the yellow service valve handles to the “Up” service position.



- Step 4: Make sure the pressure relief valve on the Spectra-Pearson high pressure Pump is Open (unpressurized).
- Step 7: Set the switch on the pump module to “Service” to turn on the feed pump and flush pump. Circulate the storage chemical in the system for approximately 20 minutes. Set the switch to “Run Auto” when finished.

Clean Up:

- Remove the service hoses and replace the dust caps. Turn the valves back to the ‘Run’ position.
- Discard the remaining liquid in the bucket to a suitable drain.
- Turn off the power to the system.
- **LEAVE THE PRESSURE RELIEF VALVE OPEN**

Storage & Winterizing

**Warning! Use only potable water antifreeze (Propylene Glycol).
Do not use automotive antifreeze (Ethylene Glycol).**

Propylene Glycol is an effective biocide and antifreeze only at concentrations above 25%. Commercially available products range from 25 to 60 percent. They are usually labeled with a temperature rating. “Minus 50” antifreeze is already diluted to 25%. “Minus 100” is a 60% solution. Purchase the strongest antifreeze available. Use enough to ensure that the system contains at least a 25% solution even after dilution with the residual water inside the desalinator.

- Step 1: If the flush tank is full push the “Auto Flush” button on the MPC-5000 display. If the machine has already been flushed go to step 2.
- Step 2: Open pressure relief valve on the Spectra-Pearson Pump.

- Step 3: Pour the propylene glycol into a bucket.

- Step 4: Connect the service hoses to the service ports on the front to the unit. Lead the inlet hose into the bucket. Turn the service valves to the service position.

Service Discharge

Service Inlet

Service Valves
In Service Position



- Step 5: Set the switch on the Electrical Box to “Service” to turn on the Spectra Pearson Pump. Discard the water remaining inside the water maker to a nearby drain. Run the feed pump until you see antifreeze begin to appear in the brine service hose.
- Step 6: Lead brine discharge service hose into the bucket as soon as antifreeze appears. Circulate the antifreeze for about 5 minutes.

Clean Up:

- Remove the service hoses and return the valves to the run positions.
- Turn off the power to the system and the MPC control.
- **LEAVE THE PRESSURE RELIEF VALVE ON THE SPECTRA-PEARSON PUMP OPEN.**

MAINTENANCE

General

Periodically inspect the entire system for leakage and chafe on the tubing and hoses. Repair any leaks you find as soon as practical. Some salt crystal formation around the Spectra-Pearson Pump blocks is normal. Wipe down any salt encrusted areas with a damp cloth.

The Prefilters

- Service the prefilters as soon as possible after the prefilter condition graph begins to rise. If the filter condition graph gets all the way to “Replace” the machine will slow down. When the display reaches “Replace” a second time the alarm sounds and the system will shut down to prevent damage. If cleaning and re-using filter elements, clean when the first segment appears on the filter condition bar graph on the display.
- To service the filters shut off the system including the feed water supply pump. Open the housings and discard or clean the old filters. Clean out the housing bowls, reassemble the housings with new 20 and 5 micron filter elements. The 5 micron filter goes downstream from the 20 micron. Leave dry until next startup.
- It may be necessary to bleed excess air out of the filter housings using the Purge buttons, located on the filter housing lid
- Use only Spectra approved filters or you may void your warranty. The filters may be cleaned a limited number of times by soaking them in water in a bucket overnight and letting them dry. Do not use a brush or water jet to clean the filters. If filters are to be re-used clean when the filter condition bar graph first begins to rise. Occasionally, lightly lube the O-rings with silicone grease.



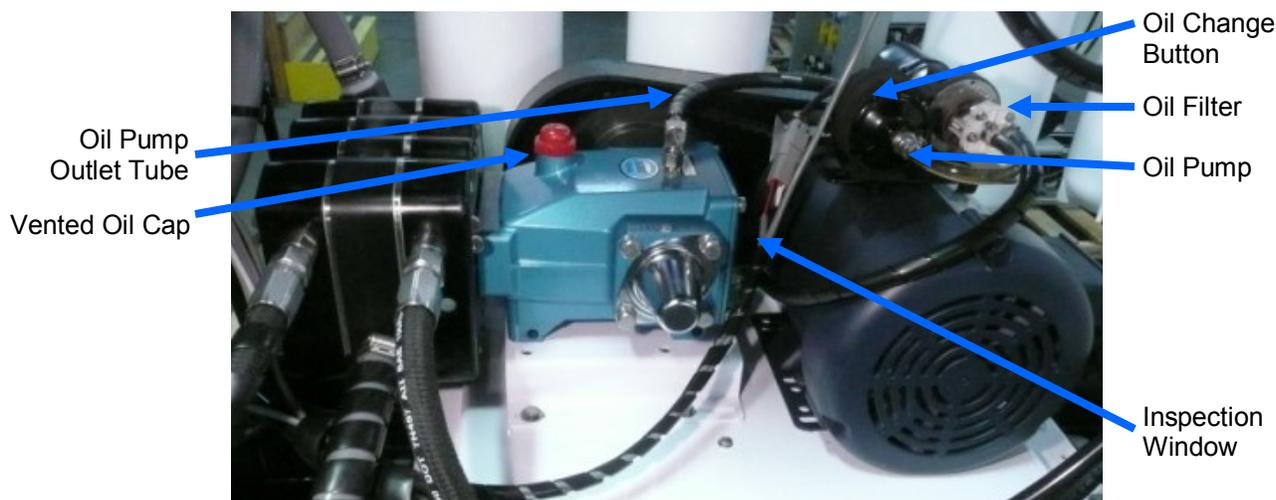
MAINTENANCE

GEARCASE LUBE OIL

Use only 5W-30 synthetic oil in Spectra-Pearson Pump crankcase. Do not overfill the crankcase with oil. Check oil condition and level frequently. The Oil, Filter, and Pump assembly should be replaced every 5000 hours or annually, whichever comes first.

The Spectra– Pearson Pump comes mounted on a counterclockwise rotating Giant™ crankcase with integrated oil pump and filter. This system is designed for easy maintenance with long intervals between required oil changes. **Inspect the oil level and condition often.**

The oil in the crankcase should be changed every 5,000 hours or when the oil appears milky. There is an inspection window that is visible from the plumbing manifold side of the Spectra-Pearson Pump, or the oil can be checked by the vented dipstick on the top of the crankcase.



CHANGING THE OIL

1. Place a container in or near the Spectra-Pearson Pump Module that can hold up to 2 pints of liquid.
2. Disconnect the Oil Pump Outlet tube from the filter and lead it to the container.
3. With DC power to the Control Box on, press the Oil Change Button on the top of the crankcase.
4. Run the small oil pump manually until no more oil comes out of the tube.
5. Replace the filter with new, p/n FT-FTC-1/4FLFD, and reconnect tubing, and plug. *See instructions included with oil change kit for more detail.*
6. Using a small funnel fill the crankcase with oil until the level reaches the halfway point on the inspection window, or the marked line on the dipstick. Run the oil pump to fill the filter with oil and add oil until the oil is at the correct level. Replace the vented dipstick.

Maintenance continued....

The Membranes

The membranes need to be cleaned only when operating pressures have risen more than 10% or the product quality degrades. The leading cause of fouling in marine use is from biological growth that occurs when the system is left unused without flushing or pickling. Fouling from mineral scaling can happen during operation under certain sea water conditions, and from rust. Monitor the product salinity and feed pressure bar graphs for higher than normal readings for the conditions. Other conditions can cause high pressure such as cold feed water or clogged filters. Low product flow is usually due to low voltage, damaged feed pump or Clark Pump issues. Look for all other causes before cleaning the membrane. Membrane life can be shortened by excessive 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. If membrane performance is reduced and they have not been pickled recently, cleaning with both chemicals is recommended. 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 Water-makers 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 known bio-fouling is present, the SC-2 may be used first. Use hot water if possible, up to 120° F (45C) is recommended as it greatly enhances the ability of the cleaners to do their jobs.

If the history of the system is unknown or has been left “unpickled” for an extended length of time and biological growth is present, it is recommended that the system is cleaned with SC-2, using an alternate source of unchlorinated fresh water before the system is run under pressure. A simple test can be performed to see if biological growth has occurred. Before running the system, remove the prefilters and examine their condition. If the housings are full of smelly discolored water, the system was not properly stored. Install clean prefilters if they were bad. Next check the membrane. Attach the brine discharge service hose and lead to a bucket. Open the pressure relief valve one turn, and manually run the system for 30 seconds. Examine the brine water: if it's discolored and smells bad, perform an SC-2 cleaning with an alternate source of unchlorinated water before running the system pressurized. If the brine is fairly clean, the system can be purged, run normally, and checked for performance. Clean the membranes only if performance is reduced.

Heating the water is preferable. One way to do this is to find a camp stove and use a large stainless steel pot to heat the solution in. The cleaning solution throughout the system will heat as it circulates in and out of the pot. An alternative is to heat the one or two gallons of initial water to 120° on the main stove before mixing in the cleaner and circulating it into the system. Periodically stop and reheat the solution.

Spectra Watermakers World Water Troubleshooting Procedures

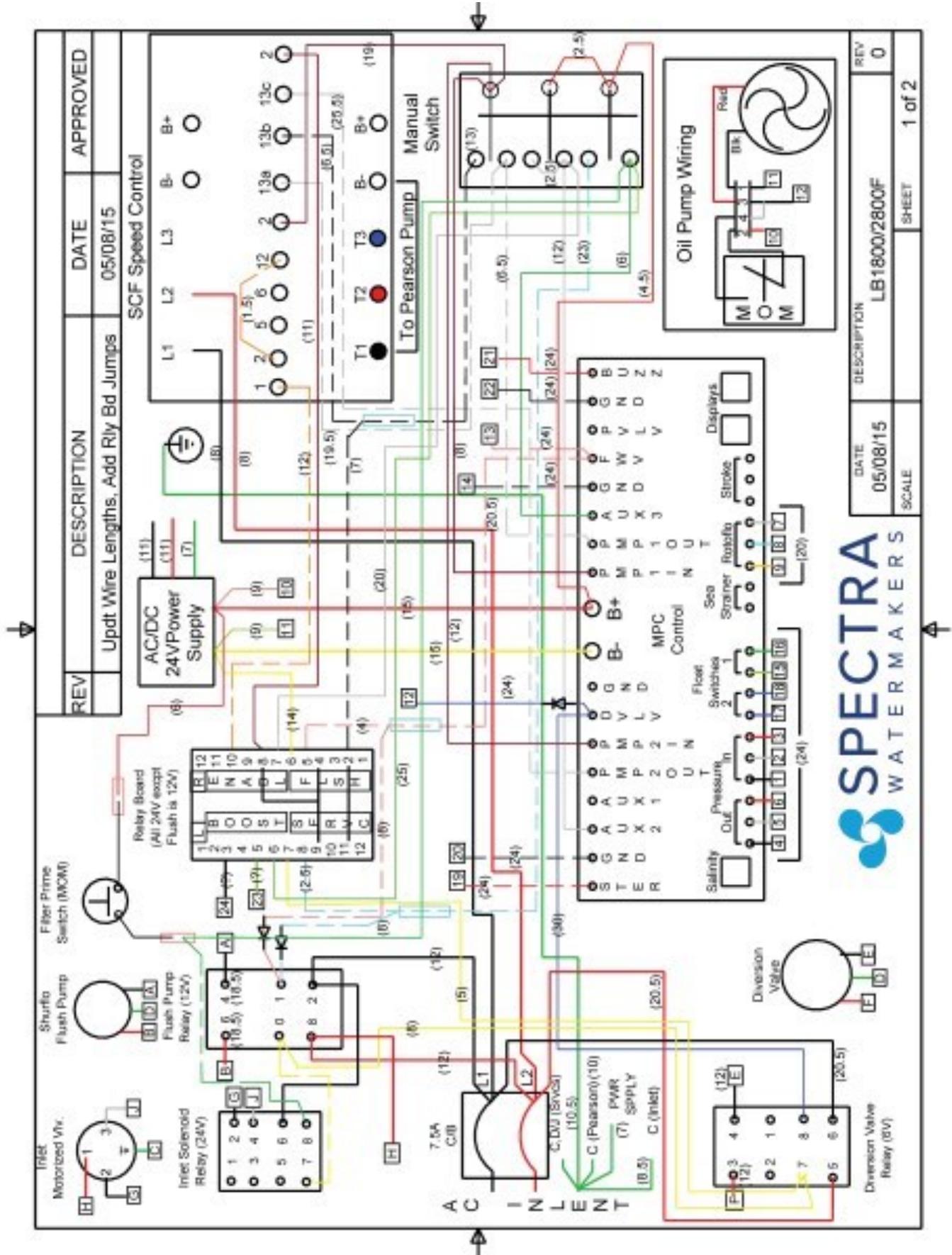
SYMPTOMS	PROBABLE CAUSE	REMEDY
Spectra-Pearson Pump runs constantly, will not turn off	Manual override switch in “MANUAL” position	Turn off manual switch on control box
Spectra-Pearson Pump knocks and bangs loudly	Air in system Boost Pressure too high	- check feed water delivery system - Replace feed pressure regulator
No lights or display, system does not operate	- No DC power to control box	- Check display cable connections at back of display and at control box - Check and reset main DC supply breaker - Check for voltage (12 or 24vDC) at control box power input studs - Try manual bypass switches; if pumps run, then control or display is defective
Display activates, but pump will not run	- loose or broken pump wire connection - speed control shutdown - AC power not turned on to system	- Check wiring at terminal block inside MPC - check speed control fault display - Check AC power
System runs, no product water delivered to water tanks, GPH display shows OK, “Good” LED activated	- diversion valve inoperative wiring fault. - disconnected or broken product tubing - diversion valve faulty	- Check wiring at diversion valve and inside control box - Check product tubing - Replace valve (contact factory)
System runs, no product water delivered to water tanks, GPH shows OK, “reject” LED activated	- high salinity of product water, causing system to reject water - salinity probe out of calibration or defective, bad cable - chlorine damage to membranes	- Check for proper boost/membrane pressure, - Check for leaks at high pressure hoses - Test product water with handheld tester– if over 750ppm for 1 hour, contact factory

Spectra Watermakers World Water Troubleshooting Procedures

Error Messages

SYMPTOMS	PROBABLE CAUSE	REMEDY
<p>“System stalled”</p> <p>(“system stalled” may alarm when using the control panel to run system for servicing with the pressure relief valve open– use manual override switch instead)</p>	<ul style="list-style-type: none"> - pressure relief valve open - no signal from flow meter 	<ul style="list-style-type: none"> - Close pressure relief valve - Check flow meter wiring at control box - Replace flow meter
<p>“High Pressure”</p>	<ul style="list-style-type: none"> - blocked brine discharge - fouled membrane - feed salinity too high 	<ul style="list-style-type: none"> - Check brine discharge - Clean membrane - Reduce high pressure pump rpm
<p>“Voltage Too High”</p> <p>“Voltage Too Low”</p>	<ul style="list-style-type: none"> - battery voltage too high or low - loose wires or poor connections 	<ul style="list-style-type: none"> - Charge batteries - Check charging voltage - Check power connections
<p>“Re-starting”</p>	<ul style="list-style-type: none"> - no signal from flow meter at startup. 	<ul style="list-style-type: none"> - See “system stalled”
<p>“Check Fuse” (followed by fuse number)</p>	<ul style="list-style-type: none"> - blown fuse at circuit board 	<ul style="list-style-type: none"> - Replace fuse (mini automotive type ATM) - Look for cause
<p>“Service Prefilter”</p>	<ul style="list-style-type: none"> - clogged filters - loose or defective pressure sensor wire - Incorrect setting on MPC 	<ul style="list-style-type: none"> - Install new filters - Check sensor wiring - Check Program setting parameters
<p>“Salinity High”</p>	<ul style="list-style-type: none"> - high product water salinity - chlorine damage to membranes - defective salinity probe or cable - cable disconnected 	<ul style="list-style-type: none"> - Check for low feed pressure - Check for leaks at high pressure hoses - Remove and clean probe contacts check calibration. - Check cable connections - Clean membrane

AC SYSTEM WIRING

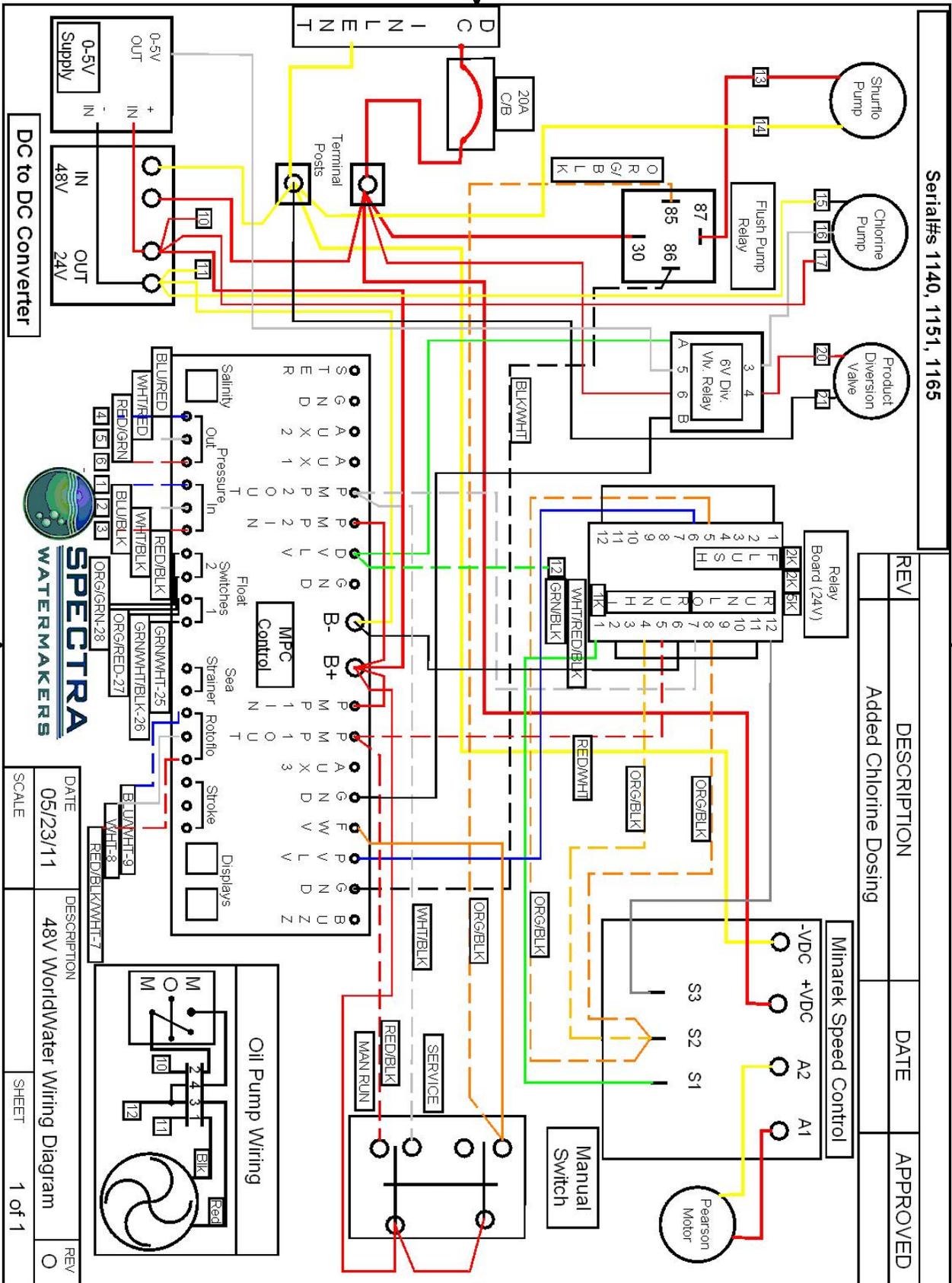


SPECTRA
WATER MAKERS

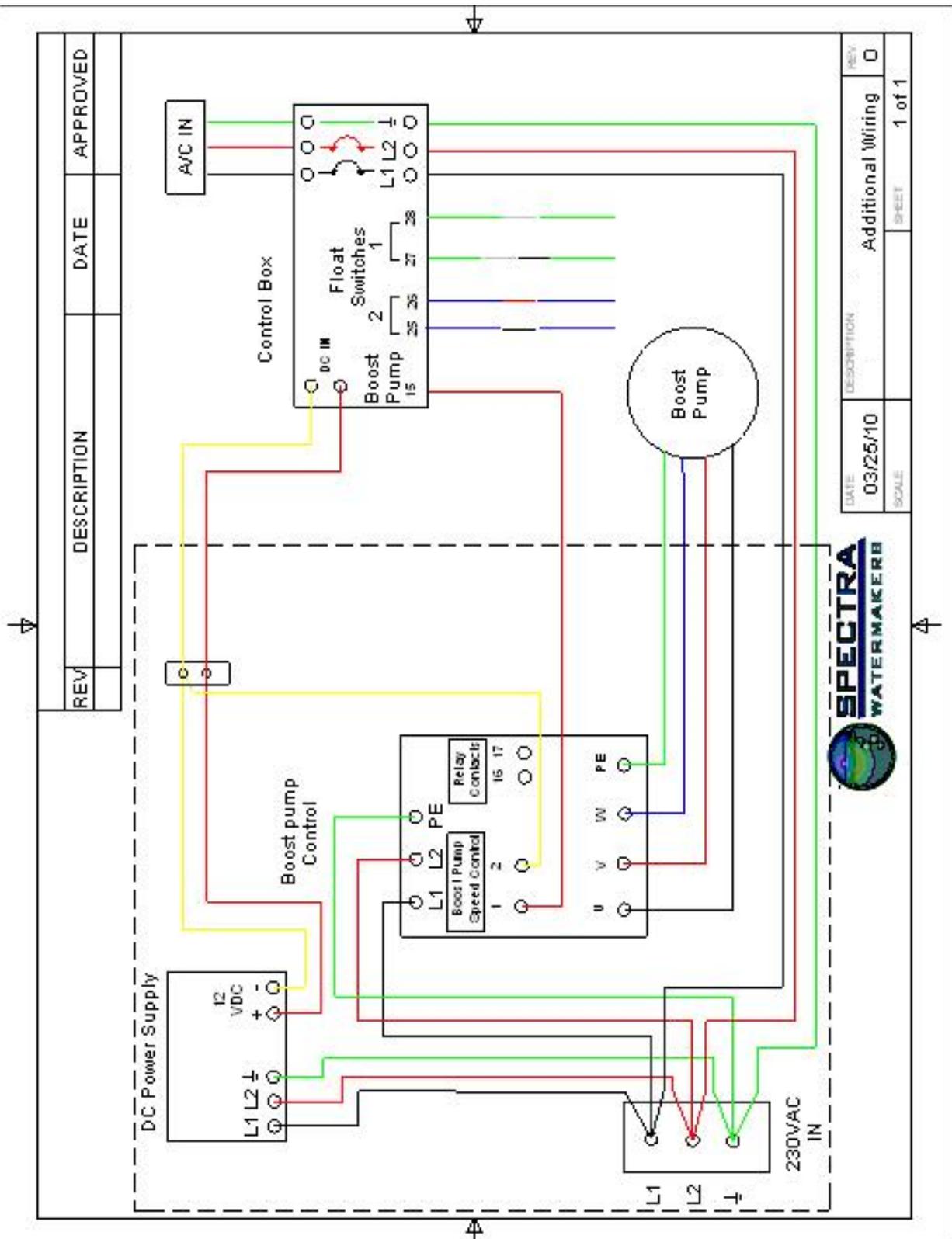
REV	DESCRIPTION	DATE	APPROVED
	Updt Wire Lengths, Add Rly Bd Jumps	05/08/15	
	SCF Speed Control		

DATE	DESCRIPTION	SHEET	REV
05/08/15	LB1800/2800F	1 of 2	0
SCALE			

48 VDC WIRING

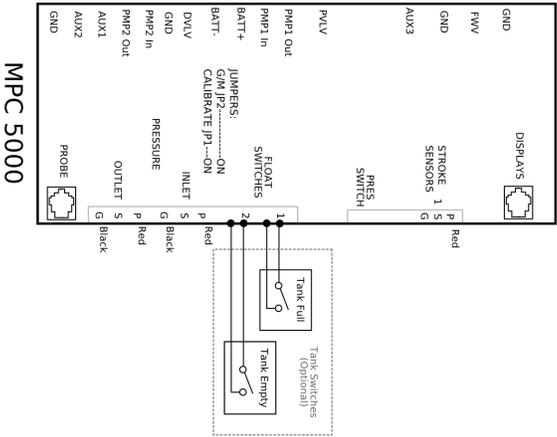


OPTIONAL DC POWER AND BOOST PUMP CONTROL BOX

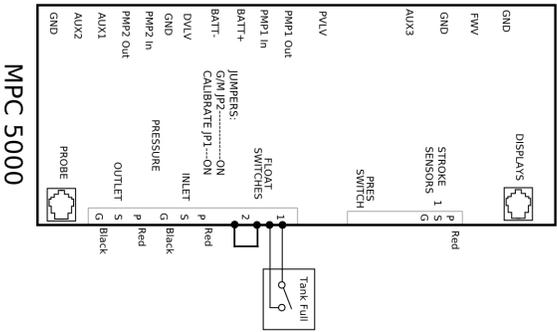


MPC Tank Switch Wiring

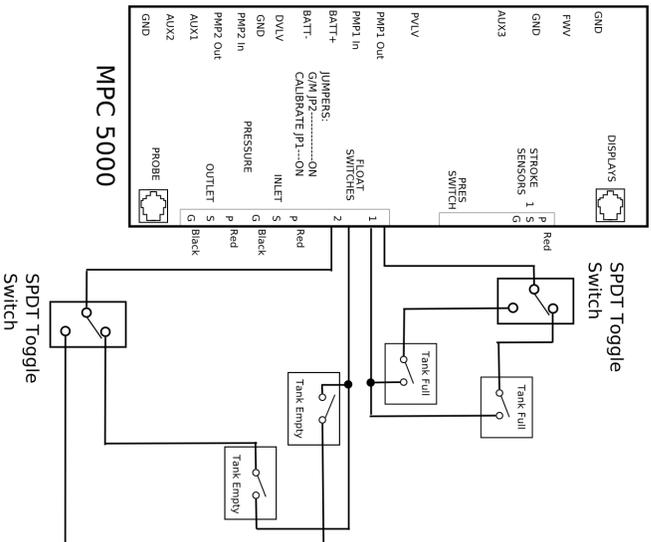
Option 1:
Tank Empty and Tank Full Switches Installed



Option 2:
Tank Full Switch Installed, Tank Empty Terminals Connected



Option 3:
Multiple Tanks Connected to MPC



Operation and Repair Bulletins

The following documents are sections of our complete service bulletin set available on our website Spectrawatermakers.com. Technical Support, - Service Bulletins.

MB-2 MEMBRANE CARE

Membrane life is affected by a large number of factors and is somewhat unpredictable. A big commercial plant running 24/7 will get 10 to 12 years out of a set of membranes. But they do all kinds of fancy chemical injections and never shut the thing off. Most cruisers are lucky to get five or six years out of one. The biggest killers of membranes are lack of use, chlorine damage, and improper storage.

Don't let membranes sit around with sea water or stale fresh water in them. Biological growth will occur in the membrane. Here at the factory we frequently get back membranes for inspection that reek of hydrogen sulfide (rotten eggs). This odor is produced by anaerobic bacteria that live in an unused membrane, feeding on whatever animal or vegetable matter is trapped in it from the plankton that gets through the system. Membranes badly fouled in this way can seldom be saved. These bacteria are always present but are inhibited by the oxygen in sea water while the unit is in frequent use. If you won't be frequently using your membrane you can prevent biological growth by Fresh Water Flushes or by Pickling your membrane. Keeping the prefilters clean is also important in preventing bio-fouling. If your prefilters are allowed to become a breeding ground for bacteria (get smelly), the contamination will spread throughout the system. When we cut open a failed membrane we also find mildew, another form of bio fouling, probably due to long term storage with no biocide or stale biocide.

After many hours of water making mineral deposits will form and must be dissolved away with an acid cleaner. Alkaline cleaners are used for bio-fouling. Cleaning chemicals, especially the alkaline, are not good for the membrane. Every time you clean the membrane it shortens its life. Clean only when necessary, and avoid cleaning as a "diagnostic tool".

Chlorine destroys a membrane in minutes. It attacks the material that the membrane is made from. Always use product water or water filtered through a charcoal filter for flushing and chemical treatments.

Oil clogs the membrane. We have brought back oil fouled membranes with Joy soap (See MB-5 Cleaning with Detergent.)

For storage we recommend using propylene glycol potable water system antifreeze if available. It can safely be left in the system for one year and will keep things from freezing in cold conditions. It is hard to find in warm climates, and takes up a lot of room on a small boat, so our SC-1 is best for tropical cruising.



SPECTRA
WATERMAKERS

MB-5 MEMBRANE CLEANING WITH DETERGENT

If the membrane has been fouled with oil it may be possible to save it by cleaning with dish soap such as Joy. Do not use anything that contains bleach. You will need a lot of chlorine free fresh water. If using shore water run it through a charcoal filter at a rate of not more than 1.5 gallons (6 liters) per minute.

Use the “Membrane Cleaning Procedure”

Fill a bucket with fresh water and mix in a couple squirts of the detergent. Run the system unpressurized (with pressure relief valve open) with the watermaker drawing water from the bucket and discharging overboard. When about half the water is gone from the bucket stop the unit and let the membrane soak for a few minutes. Restart and pump the remaining solution overboard. Repeat until the discharge appears clean.

After most of the oil is cleaned out you can put the brine discharge into the bucket and run the system with the soapy water circulating as you would for the other cleaning chemicals. Run the Fresh Water Flush cycle to clean membrane, then flush for twenty minutes using sea water. Pressurize and test.



SPECTRA
WATERMAKERS

MPC-5 PURGE MODE BYPASS

Whenever the control power (12 or 24 volt DC) has been shut off the system will prompt you through the purge mode when it is turned back on.

This is because the only time the MPC-5000 should be turned off is after the system has been pickled.

Purge Mode prompts the operator to open the pressure relief and then runs seawater through the system for 20 minutes to clear away the chemicals. Normally, during periods of disuse the MPC-5000 will remain powered up so that it can do the five day flush cycles, and no storage solution will be present. If watermaker has not been filled with storage solution, Purge Mode can be bypassed by tapping the two left hand buttons at the same time until the display reads PURGE MODE BYPASSED. Push **Auto Run** and **Stop** simultaneously.



BAD SMELLING PRODUCT WATER

The reverse osmosis membrane is permeable by many gases including hydrogen sulfide, the gas that causes rotten egg smell. If there are bad odors in the feed water they will go through the membrane and the product water will be affected. Usually the source of the odor is from the decay of plankton trapped in the sea strainer and pre-filters. These tiny oxygen loving creatures soon suffocate and die inside the prefilter housings when the unit is shut down and begin to decay. Once this decay starts the only solution is to rinse the prefilter and let it dry completely (to kill the bacteria) or just replace it with a new filter. If the system is making smelly water, it will be the prefilters that are the source of the problem. In cold climates this process of decay can take weeks, but in very warm waters this can happen overnight. These bacteria can spread throughout the watermaker, and begin to grow on the membrane, causing poor water quality and high feed pressures.

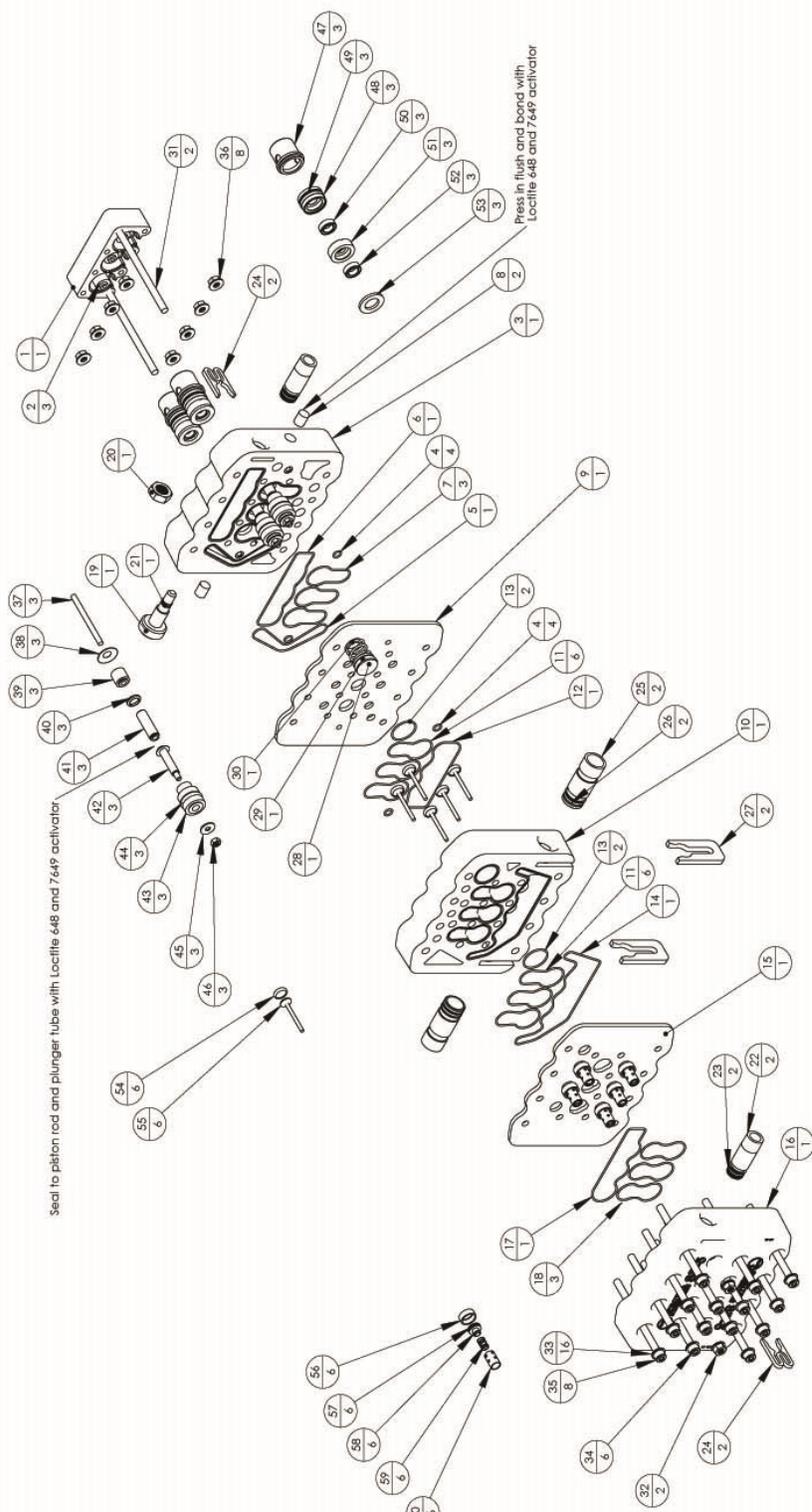
Flushing the system with fresh water after every use greatly slows this process, allowing the automated spectra units to operate with less frequent prefilter changes, but units operated for only an hour or so a day will probably need to have the filters changed due to odor before they are dirty enough to restrict water flow. After shutting down the unit remove the used prefilters and install a clean set. Leave the housings full of air until the next use. Given gentle handling, prefilters can be cleaned and reused up to 3 times.

If the rotten egg smell does not go away after operating the watermaker for 6 or 8 hours it may be time to clean the membrane with SC-2. Typically the smell will go away with use, but if it persists cleaning may be indicated.

The Z-ION was created to eliminate this problem by disinfecting the system during each fresh water flush, disinfecting the filters and the membrane.

More on this subject is available on our website at www.spectrawatermakers.com.

Oct 2013



Seal to piston rod and plunger tube with Loctite 648 and 7649 activator.

ITEM NO.	QTY.	Title	ITEM NO.	QTY.	Title	ITEM NO.	QTY.	Title
1	1	SCP Malle Face 37	21	1	SP5M O Ring Relief Valve -012 NBR Shore 70A	41	1	Plunger Tube 12mm Rev C
2	3	Cal 5CP Closhhead Rev A	22	2	Fitting Tube 1-2in Rev C	42	3	SP5M 5CP Piston Rod 20% Rev A
3	1	SP5M 5CP Layer 1 Rev A	23	2	Fitting O Ring 1.2in-017 NBR Shore 70A	43	3	SP5M 5CP Piston 20% Rev A
4	4	SP5M O Ring Flush-011 NBR Shore 70A	24	2	Fitting O Ring 1.2in HP Rev A	44	3	SP5M O Ring Piston-313 NBR 70A Rev A
5	1	SP5M O Ring L1 Relief-041 NBR Shore 70A	25	2	Fitting Tube 3-4in LP Rev B	45	3	M6 Washer DIN9021 316 MCM 95211A160
6	1	SP5M O Ring L1 Relief-043 NBR Shore 70A	26	2	Fitting O Ring 3-4in-020 NBR Shore 70A	46	3	M6 Nut 316 MCM 941 50A-345
7	3	SP5M O Ring L1 Cylinder-031 NBR Shore 70A	27	2	Fitting Clip 3-4in LP Rev A	47	3	SP5M 5CP Seal Retainer Rev A
8	2	SP5M Layer 1 Plug Rev A	28	1	Damper piston	48	3	SP5M 5CP LP Seal Case 20% Rev A
9	1	SP5M 5CP Layer 2 20-50% Rev A	29	1	SP5 O Ring Piston + Damper -313 NBR Shore 70A	49	3	SP5M 5CP O Ring Seal Case -023 NBR Shore 70A
10	1	SP5M 5CP Layer 3 Rev A	30	1	SP5M Damper Spring	50	3	SP5 LP Seal 20% 12x20x6 Rev A
11	6	SP5M O Ring L3 Cylinder-031 NBR Shore 70A	31	2	SP5M 5CP M8 x 1.50 Stud Rev A	51	3	SP5M 5CP HP Seal Case 20% 20x6 Rev A
12	1	SP5M O Ring L3 Waffle-042 NBR Shore 70A	32	2	M8 Nut	52	3	SP5 HP Seal 20% 12x20x6 Rev A
13	2	SP5M O Ring L3 Damper-024 NBR 70 Shore A	33	16	SP5M M8 washer	53	3	SP5M 5CP HP Seal Washer 20-30% Rev A
14	1	SP5M O Ring L3 In. Out NBR Shore 70A	34	6	M8x1.00 SH Cap 316 Grade 70	54	6	Valve Shoe
15	1	SP5M 5CP Layer 4 Rev A	35	6	M8x1.00 SH Cap 316 Grade 70	55	6	Valve Rev B
16	1	SP5M 5CP Layer 5 Rev A	36	6	M8 Flange Nut DIN 9123	56	6	Valve Sleeve - Stepped
17	1	SP5M O Ring L5 Out-043 NBR Shore 70A	37	3	SP5M 5CP Plunger Stud Rev A	57	6	SP5 O Ring Valve Plug -013 NBR Shore 70A
18	1	SP5M O Ring L5 Cylinder-032 NBR Shore 70A	38	3	Cal 5CP Slinger Washer Large-4330B Rev A	58	6	Valve Plug 0.50x Groove
19	3	SP5M Relief Screw Rev B	39	3	SP5M 5CP Plunger Adaptor 20% Rev A	59	6	SP5 Valve Spring 2009
20	1	SP5M Relief Nut 5.8 MCM 96557A140	40	3	SP5M 5CP Plunger Ring 20% Rev A	60	6	Valve Cogge

Remove all burrs and sharp edges, max radius 0.010"

