

Better Water LLC

Wall-Mounted Post-Treatment System

Operator Manual



rev. Nov 2018

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Better Water LLC; 698 Swan Dr; Smyrna, TN 37167; www.betterwater.com

Our Company

Better Water LLC is a leading integrated manufacturer of water treatment equipment and components for the industrial, commercial, and institutional markets.



Located in Smyrna, Tennessee, Better Water LLC continues its history of manufacturing and distribution of equipment specifically designed for the renal dialysis market.

Founded in 1971, Better Water LLC has built a reputation for solving our customers' toughest problems with high quality products and unmatched service.

Contact Us

Better Water LLC
698 Swan Dr
Smyrna, TN 37167

Phone (615) 355-6063
Fax (615) 355-6065

Technical Support:
Phone (615) 355-6063, press "1"
Email support@betterwater.com

Customer Service:
Phone (615) 355-6063, press "3"
Email customerservice@betterwater.com

Technical Phone Support

Support is available regarding all Better Water LLC systems, **24 hours a day, 7 days a week.**

- Normal business hours are [Monday through Friday](#) from **8:00 am until 3:30 pm, Central Standard Time** (*excluding holidays*)

Call (615) 355-6063, press "1" for Technical Support

Emergency assistance is available after normal business hours (*including holidays*) by calling **(615) 708-8627**.

Technical Support Info Online

Our website, www.betterwater.com, which is updated frequently, contains a wealth of technical support information on the **SUPPORT** tab and includes:

- Operator and Service Manuals
- Consumables and Accessories Lists
- Technical Service Bulletins

For your convenience there are also online forms for placing **Orders** and requesting **Returned Goods Authorization**. These are Adobe forms that can be downloaded and either faxed or emailed to us.



Specific Contacts

Technical Support	Phone (615) 355-6063, option "1"
	Email support@betterwater.com
To Place an Order <i>(purchase orders)</i>	Fax (615) 355-6065
	Email orders@betterwater.com
	Phone (615) 355-6063
Customer Service <i>(returns)</i>	Phone (615) 355-6063, option "2"
	Fax (615) 355-6065
	Email customerservice@betterwater.com

Website www.betterwater.com

Helpful information and forms that can be found on our website:

- Operator & Service Manuals
- Technical Service Bulletins
- Consumables and Replacement Parts List
- Brochures
- Order Form
- Return Goods Authorization Request Form

Introduction

The Better Water LLC Wall-Mounted Post-Treatment System is manufactured to the utmost quality. With proper care, preventative maintenance, and proper use, it should provide you with years of reliable service.

Before starting you should first read and have a thorough understanding of this entire Operator Manual. It describes in detail the steps and procedures for safe usage of the Post-Treatment System.

Once the this device has been delivered, it is the responsibility of the Medical Director to ensure that it is used, monitored, and maintained in such a manner so as to satisfy all applicable standards. Guidelines and other related information are available from:

- Food and Drug Administration (FDA)
- National Association of Nephrology Technicians/Technologists (NANT)
- Association for the Advancement of Medical Instrumentation (AAMI)




NOTE concerning pictures in this manual:

Pictures of devices and components may vary slightly due to product changes, and therefore should be for general reference only. Information concerning their use, functionality, or replacement will not differ unless noted.

WARNINGS



1. It is unsafe to operate or service this device without first reading and understanding the **entire** Operator's Manual. Keep this manual and other associated documentation for future reference.
2. Misuse, improper operation, and/or improper monitoring of this system could result in serious injury, death, or other serious reactions to patients undergoing hemodialysis treatment.
3. Misuse, improper use, or handling of disinfectants and chemical cleaning solutions could result in serious injury or even death. You must comply with the information contained in the Material Safety Data Sheet (MSDS) for the chemical being used.
4. To avoid electrical shock hazard, do not operate this device when the covers or panels are removed.
5.  **ELECTROMAGNETIC INTERFERENCE: This device can create and radiate radio frequency energy and may cause harmful interference if not installed according to the manufacturer's instructions.**

CAUTIONS






1. When used as a medical device, federal law restricts this device to sale by or on the authority of a physician. Per CFR 801.109 (b)(1).
2. Improper operation of this device could result in a low or no-flow alarm on the dialysis machines.
3. Misuse or improper operation of this device will void any warranty.
4. Where water is mentioned, unless otherwise noted, it must be AAMI standard quality water.
5. Electrical and plumbing connections must adhere to local statutes and any facility codes. Connect this device to a proper ground connection in accordance with the National Electrical Code. Do not remove the ground wire or ground plug. Do not use an extension cord with this device.
6. Do not remove any Caution, Warning, or any other descriptive labels from the device.
7. Do not operate this device in an explosive environment or in the presence of flammable materials. Do not use this device to store, mix, or transfer flammable liquids.
8. Movement or vibrations during shipment may cause connections to loosen.
9. Do not operate this unit in an environment where temperatures may be below 50° F or above 90° F.
10. This device should not be used for purposes outside the device's stated applications, specifications, or limitations.

QUICK REFERENCES

SPECIFICATIONS		
Capacity at 77°F	30" .03 micron Ultra-Filter 15 gpm	4" x 40" Ultra-Filter 10-20 gpm based on number of ultra-filters
Operating Weight	Abstract since system has multiple optional components	
Dimensions	Abstract since system has multiple optional components	
Electrical	208 vac, 60 Hz, three phase - or - 230 vac, 60 Hz, single phase	
FEATURES		
Ultra-Filters	Two to Four 4" x 40" Ultra-Filters - or - One 30" .03 micron Ultra-Filter	
Components <i>(some components optional based on purchase and which ultra-filter model)</i>	<ul style="list-style-type: none"> - Storage Tank (size will vary) - Single or Dual Repressurization Pumps <i>(auto-alternating if dual)</i> - Repressurization Pump Control Box with Variable Frequency Drive - Flow Meter(s) - UV Light - Multiple Pressure Gauges - Sample Ports <i>(some models have sanitary sample ports)</i> - DI Divert-to-Drain with Resistivity Monitor and Remote Alarm - Conductivity Monitor with Remote Alarm - DI Water Connection - DI Filter - Emergency Water Inlet Connection used in conjunction with DI Tanks 	
Remote Alarms	Conductivity Alarm Resistivity Alarm UV Light Communication Center	
REQUIREMENTS		
Electrical	<ul style="list-style-type: none"> - Dedicated outlets, protected against electrical surges, and be on a stable power supply, within 6 feet of the components requiring power. - Do not use power strips or extension cords. 	
Incoming Water	<ul style="list-style-type: none"> - AAMI Standard Quality Water or DI Water - Feed Water Supply Connection: 1" hose, for which Better Water supplies hose barb connections on the repressurization pumps. - * Emergency Water Inlet Connection: Used in conjunction with DI Tanks and has a male Park fitting. 	
Drains	<ul style="list-style-type: none"> - Floor/Sink drain capable of discharging 20 gallons per minute. - Appropriate plumbing for individual components' drains to drain header. 	

* NOTE: Some of the items detailed above may be optional components, due to varying system configurations.

MAINTENANCE SCHEDULE							
MAINTENANCE TASKS	Each Shift	Daily	Monthly	3 Months	6 Months	12 Months	Other
Check the system for leaks	X	X					
Monitor the system for unusual sounds	X	X					
Record operational values such as pressures and flow-rate	X	X					
Clean external surfaces			X				
Change 4" x 40" Ultra-Filter Ultra-Filters - Part# SUUF01346 <i>(ultra-filters only)</i> - Part# EQSUBUF001 <i>(ultra-filters and adaptors)</i>							Every 3 years or more often if needed
Change 30" .03 micron Ultra-Filter - Part# SUCAOO01941					X		Or more often if needed
Change storage tank vent filter - Part# SUCAOO00557				X			
Change the DI Filter - Part# SUCAOO00551			X <i>(while on DI water)</i>				Remove filter and replace with short bowl when not using DI water
Disinfect			X				As often as needed
Check Control Module Date and Time				X			
Replace UV light bulb						X	
Clean UV quartz sleeve						X	
Replace UV quartz sleeve							Every 2 years
Manual test of the Divert-to-Drain							Periodic




RELATED CONSUMABLE and REPLACEMENT PARTS		
DESCRIPTION	PART#	PICTURE
CONSUMABLES & RELATED ITEMS		
4" x 40" Ultra-Filter for Hydrocomponents Housing with Adaptors - Large O-Ring SUMIOO01587 (2 per housing) - Small O-Ring SUMIOO01588 (2 per housing) - Ultra-Filter only SUUF01346	EQSUBUF001	
30" .03 micron Ultra-Filter	SUCAOO01941	
DI Filter; 10", 5 micron Filter - O-Ring EQFHOO00587  - Filter Wrench SUWROO00584  - Short Bowl for DI Filter PLFIS801951 	SUCAOO00551	
Storage Tank Vent Filter, .10", 2 micron - O-Ring SUMIOO00588  - Filter Wrench SUWROO00582 	SUCAOO00557	
Minncare, Cold Sterilant	SUMCOO00575	
Minncare Cold Sterilant Residual Test Strips, 100 per bottle	SUMCOO00576	
Minncare Cold Sterilant 1% Test Strips, 100 per bottle	SUMCOO00577	
Control Box and Remote Alarm Fuse: - 2 Amp Little Fuse - or - - 3 Amp Little Fuse * Check what is used presently and replace with the same size	ELLFFS00832 - or - ELLFFS00834	
<i>Pictures do not reflect the size of the item in relation to the other pictures</i>		

RELATED CONSUMABLE and REPLACEMENT PARTS		
DESCRIPTION	PART#	PICTURE
REPLACEMENT PARTS		
Variable Frequency Drive (VFD) - 3 Phase-In, 3-Phase-Out, 5 HP - or - - 1 Phase-In, 3-Phase-Out, 10 HP	EQMOBO01350 - or - EQMOBO01343	
VFD Transducer	PLGAOO00110	
3HP, 3 Phase Pump	EQPUEB01600	
Flow Switch, 1" clear	PLFSS800443	
Flow-Meter, 1 - 17 gpm - or - Flow-Meter, .3 - 3 gpm <i>* Based on which flow-meter is used where.</i>	PLGAOO01257 - or - PLGAOO01258	
Digital Resistivity Series 2 Monitor	EQMODI01674	
Resistivity Probe	EQMODI01676	
Digital Conductivity Monitor	EQMOCO01725	
CS-51 Conductivity Probe	EQMOPR01059	

Pictures do not reflect the size of the item in relation to the other pictures

RELATED CONSUMABLE and REPLACEMENT PARTS		
DESCRIPTION	PART#	PICTURE
Remote Alarm Box - For Conductivity Monitor and Resistivity Monitor	EQASSYWQA01844	
Divert-to-Drain, Actuator Valve, 1", 3-Way	PLVA008	
Divert-to-Drain, 1 amp Fuse Fast-Acting	ELLFFS01160	
Divert-to-Drain, SSAC Time Delay Relay	ELIDRL01350	
Pro 20 UV, Replacement Lamp	SUUVOO02021	
Pro 20 UV, Quartz Sleeve	SUUVOO02018	
Pro 20 UV, Power Supply	EQUVOO01926	
Pro 20 UV, Communication Center	SUUVOO01909	
Pro 20 UV, Cool Touch Fan	SUUV02022	

Pictures do not reflect the size of the item in relation to the other pictures

RELATED CONSUMABLE and REPLACEMENT PARTS		
DESCRIPTION	PART#	PICTURE
Pro 20 UV, Sensor	SUUVOO02020	
Storage Tank Proximity Sensor - Upper/RO Off - Mid-Upper/RO Start - Mid-Lower/Low Level Alarm	EQBICB00468 <i>(KG0010)</i>	
Storage Tank Proximity Sensor - Lower/Pump Off	EQBICB00469 <i>(KG0009)</i>	
<i>Pictures do not reflect the size of the item in relation to the other pictures</i>		

DEVICE INFORMATION

MODELS

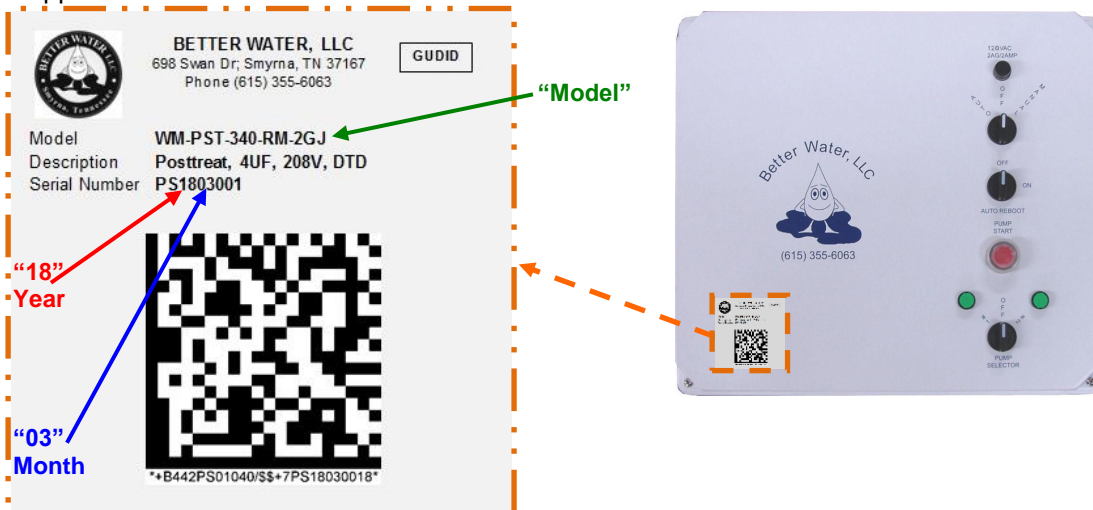
The wall-mounted post-treatment system has two basic filter configurations, each with multiple optional components. The filter options are either two to four 4" x 40" ultra-filters or a single 30" .03 micron ultra-filter.

The differing optional components include the following: Single or dual pumps, Divert-to-Drain with Resistivity Monitor, DI filter and header, UV light, Conductivity Monitor, Storage Tank (*different sizes*) and varying headers. There are also a varied number of electrical options such as single and three phase.

Besides the pumps, these components are intended to be wall-mounted to provide a varying number of possible configurations, but must be plumbed accordingly. The operation, service, and replacement parts of these models are the same with the only difference being the optional components included.

IMPORTANT INFORMATION FOR SUPPORT

Adhered to the front panel of each Post-Treatment Control Box is a label containing important information relating to the specific unit, and details both the **Model** and **Serial Number**. Both of these pieces of information are very important in obtaining support, determining warranty, and properly servicing the unit. Please have this information available if you contact Technical Support.



The first four numbers in the serial number denote the year and month the device was manufactured. *In the example above the Post-Treatment System was produced in 2018, in the month of March.*

DEVICE DESCRIPTION

The Wall-Mounted Post-Treatment System is a complete post-treatment/distribution system with a variable number of optional components. This system works from water pressure boosted with repressurization pumps. It will circulate the water from the storage tank through the post-treatment system, and on to the points of use, and back to the storage tank. It is designed to circulate water 24 hours a day, 7 days a week, and should only be shut down for disinfection and when being serviced.

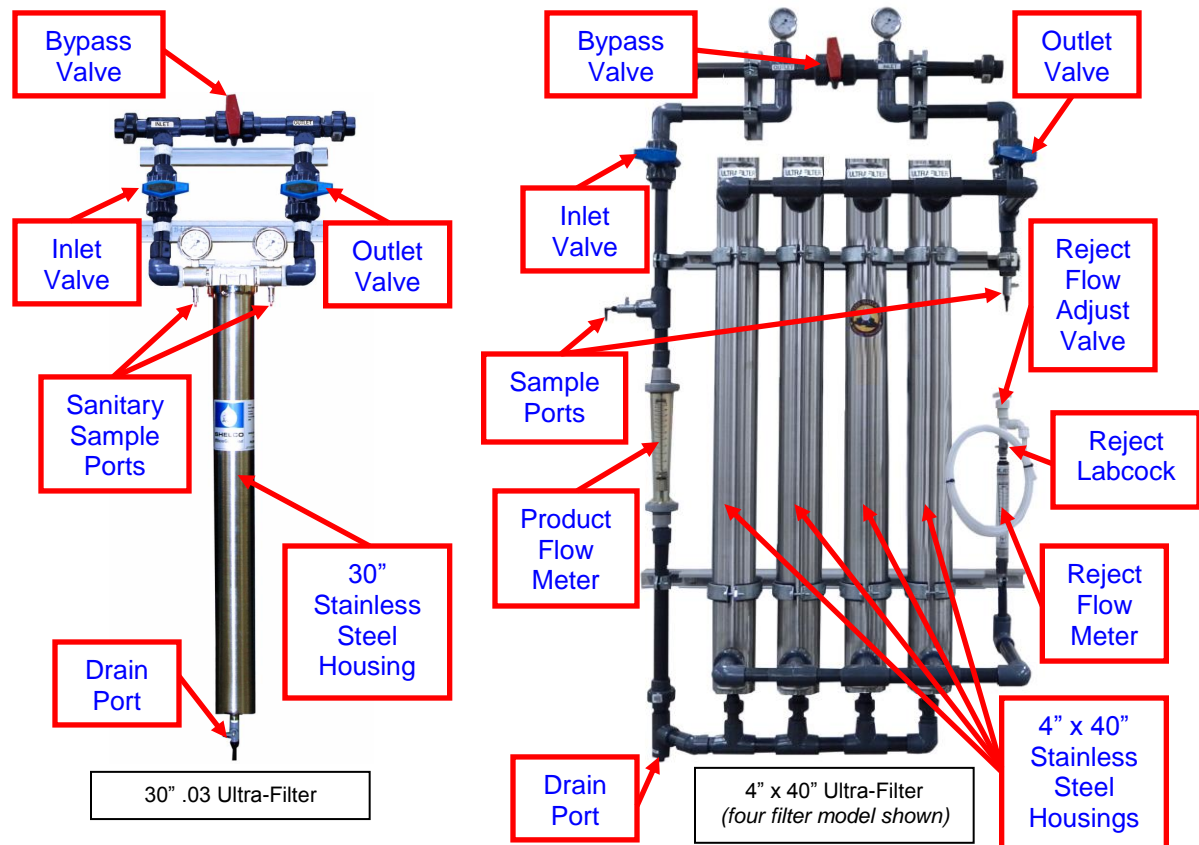
The primary component includes a **control box, single or dual repressurization pump(s)**, and one of two types of ultra-filtration. This can be either a **single 30" .03 micron ultra-filter**, or **two to four 4" x 40" ultra filters**, both of which utilize ultra-filters enclosed in special vessels to process RO product water or DI water, and provide an extremely high recovery rate. Optional components include a **sediment filter, ultra-violet light, divert-to-drain, conductivity meter, DI filter and DI header**, other **headers**, and varying sized **storage tanks**.

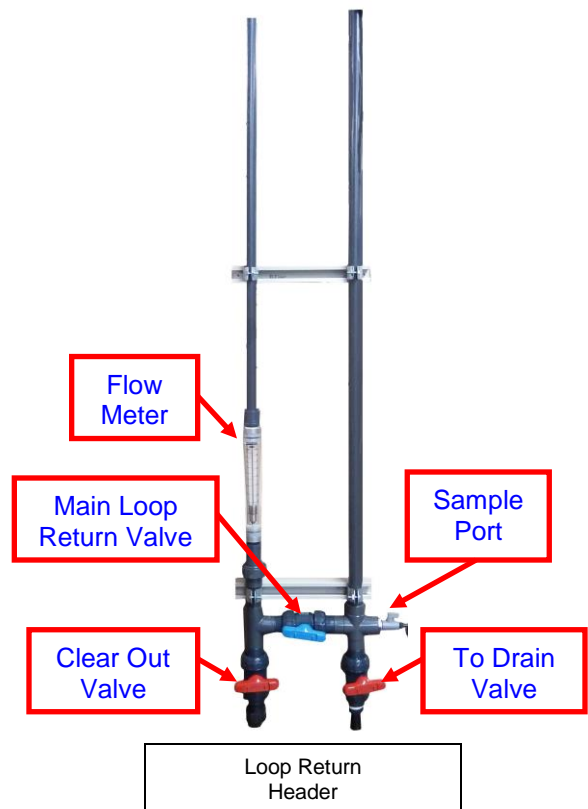
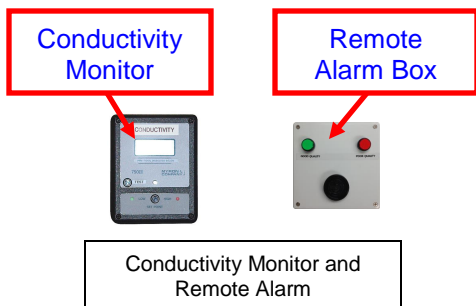
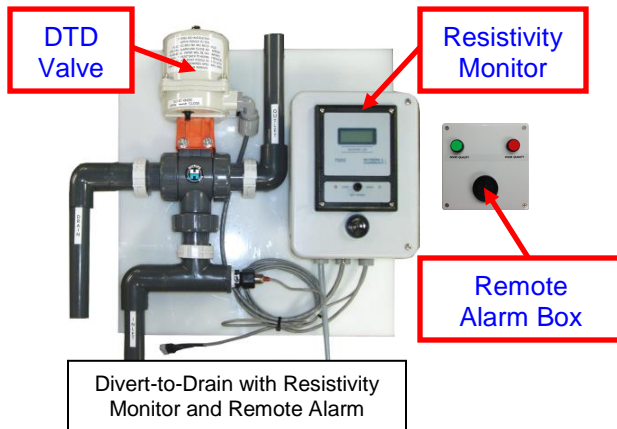
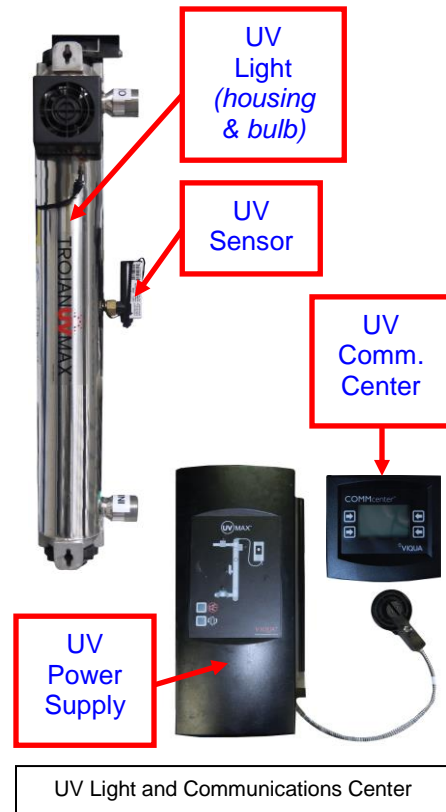
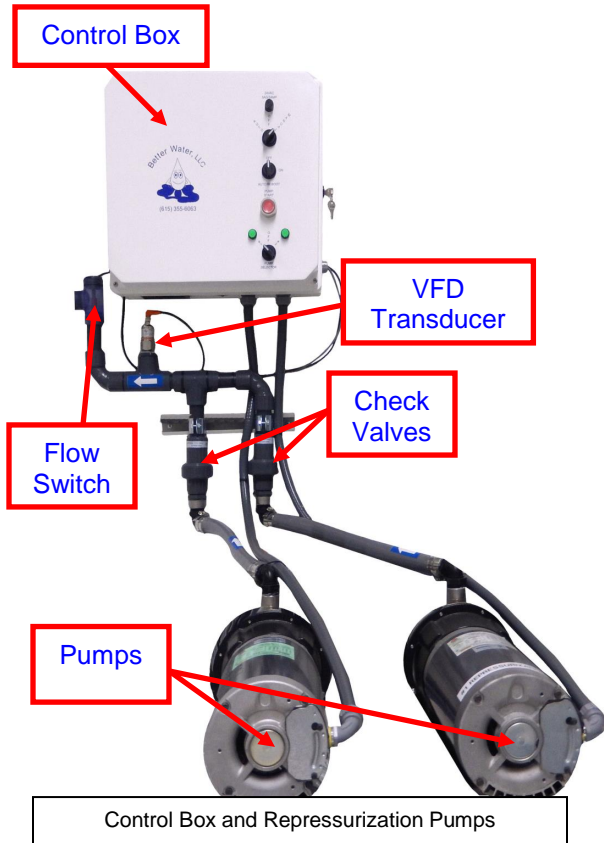
With the exception of the pumps and storage tank, these components, their related headers, and plumbing are intended to be mounted on the wall. The ultra-filters, although manufactured with the highest quality, are still a consumable product. The life of these filters is directly related to the monitoring and routine care programs enacted by the user.

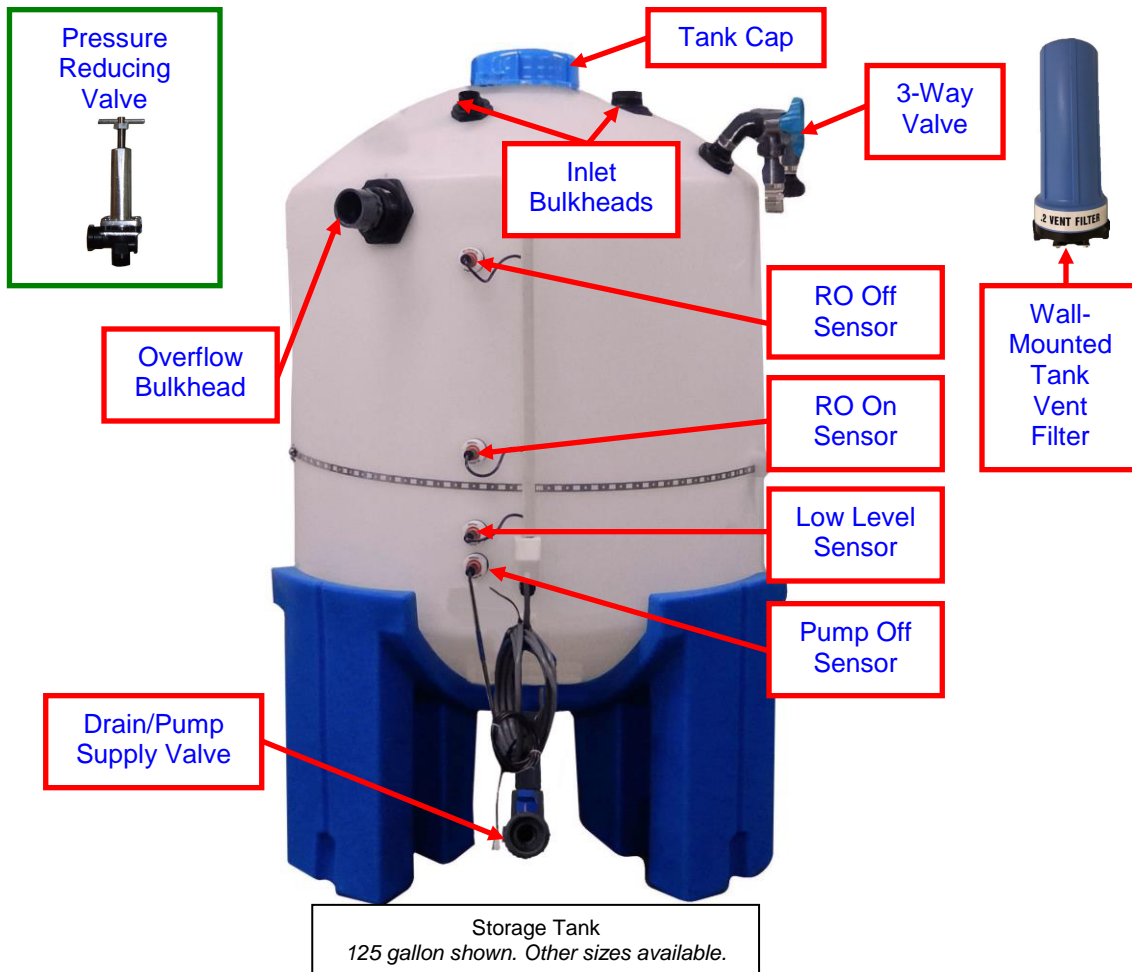
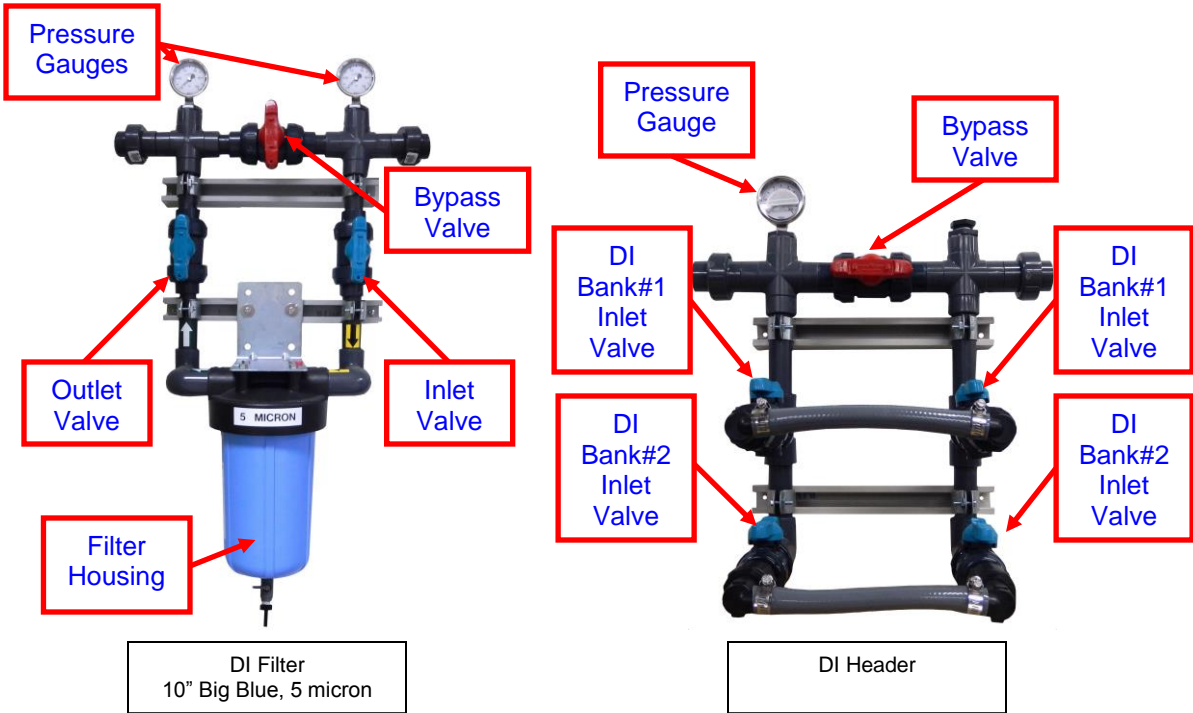
A Post-Treatment system, in conjunction with good disinfecting programs, is a very effective means of reducing bacteria and endotoxins in the post-treatment and distribution segments of a water purification system.

Pictures below are a general representation of the components. Actual devices may vary slightly based on model and installation, include right-to-left or left-to-right orientation of inlet and outlet valves.

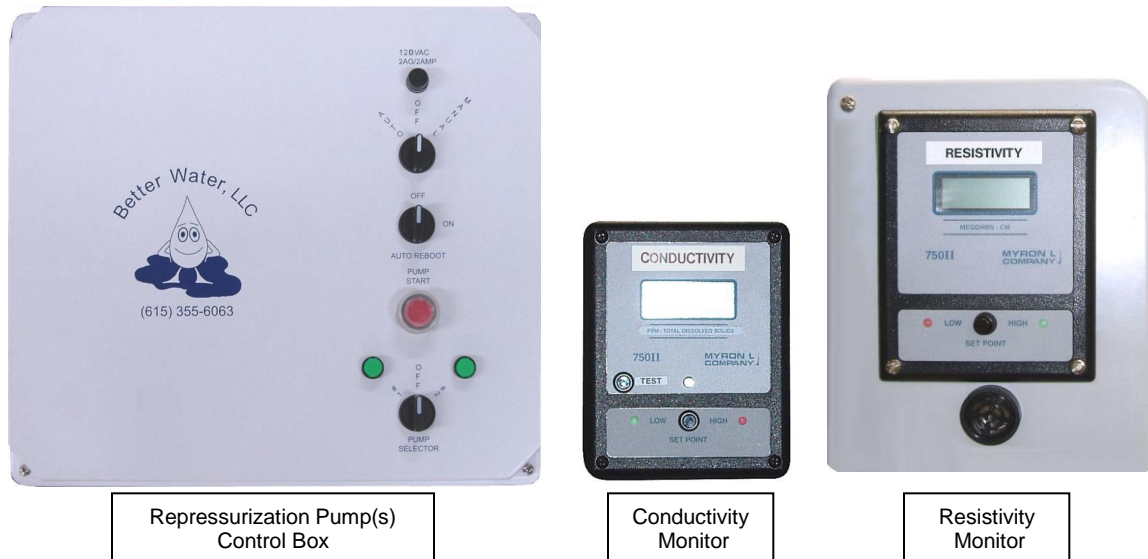
DETAILED VIEWS







MONITOR and CONTROL SYSTEM



The **Control Box** is a chemical resistant box which contains the electronic components needed to operate the Post-Treatment System. Its front panel contains the following: Fuse, Pump Mode Switch, Pump Auto Reboot Switch, Pump Start Button, and the Pump Selector Switch and Indicator Lights. It also houses a **Variable Frequency Drive (VFD)**, to provide maximum pump efficiency to the Repressurization Pump(s).

When not using DI Tanks, a **Conductivity Monitor** is in constant use to monitor the water quality in the post-treatment system and distribution loop. This monitor has a Remote Alarm Box which should be located near a nurses' station or on the patient floor.

When using DI Tanks, the **Divert-to-Drain** system is active, and includes a **Resistivity Monitor** which is mounted on the wall. Based on readings from this monitor, water would automatically be diverted to drain if a poor water quality threshold is reached. This monitor has a Remote Alarm Box which should be located near a nurses' station or on the patient floor.

There are also **Pressure Gauges** on the headers to assist in the monitoring processing, as well as **Sample Ports** for water testing.

POST-TREATMENT FILTRATION

Primary filtration is performed by **Pyrogen Ultra-filters** enclosed in vessels to process RO product water or DI water and provide an extremely high recovery rate. These are made of the highest quality and consumable product which must be replaced periodically.

The **Ultra-violet Light** consists of a UV lamp housed inside a quartz sleeve which seals the lamp from direct water contact. The sleeve, in turn, is housed in a stainless steel treatment chamber. The UV rays pass through the quartz sleeve and into the surrounding water. These UV rays alter the DNA of many common waterborne bacteria and sterilize (*prevent reproduction*) them. The low-pressure germicidal UV lamp produces a slightly shorter UV ray in concentrated form. 90% of the energy produced by this lamp has a wavelength of 254 nanometers, which will reduce many water-borne microorganisms. This UV Light has its own power supply and control unit, as well as an optional communications center for remote monitoring and alarming.

STORAGE TANK

Storage Tanks are an integral part of a tank feed system. They serve as a reservoir for RO water which is then pumped to the loop by the repressurization pumps after flowing through the various post-treatment components. These come in a variety of sizes based on the size of the facility and water demand.

The storage tank has two primary valves. The first is the **Drain/Pump Supply Valve**. This serves as an outlet for water from the tank to either supply the repressurization pumps or to be drained. The second is the **3-Way Valve** which has two positions:

- RO – Water from RO flows into storage tank
- DRAIN – Water from RO does not enter storage tank (*used when disinfecting the RO*)

There are four level **Proximity Sensors** which communicate the water levels with other components of the water system. The purpose and function of these sensors are as follows:

- **Cut Out/RO Off**; Signals a high water level and will signal the RO to turn off
- **Cut In/RO Start**; Signals a need for water, when at a near half empty water level and will signal the RO to turn on
- **Low Level Tank Alarm**; Alerts to a low water level so action can be taken before empty
- **Pump Shut Off**; Will turn the repressurization pumps off when at a very low water level

The storage tank has a **Tank Vent Filter** either on or near the tank to assist with air filtration as the tank fills and empties thus displacing air into and out of the tank. A **Pressure Reducing Valve** is also included on the tank to adjust back-pressure on loop.

OTHER FEATURES and COMPONENTS

The Post-Treatment System may have either one or two **Repressurization Pumps**, which can be either single or three phase, in various horse-powers. The pumps are controlled by the **Variable Frequency Drive (VFD)** which provides maximum pump efficiency.

In the event there is a need to switch to DI water, a **DI Header** can be provided with related inlet, outlet, and bypass valves, to which DI tanks may be connected to. A **DI Filter and Housing** are also provided if DI Tanks are in use, and a short-bowl to be used in place of the filter and housing when not in use. An **Emergency Water Inlet Connection** can also be used in conjunction with DI Tanks to provide connectivity to an alternate water source.

INSTALLATION & SET-UP

INSTALLATION OVERVIEW

Some components and items mentioned below may be optional and not included with the system purchased. Headers may be pre-built or custom built on-site, so these may vary in name and connectivity. Below is a general overview of installation and connectivity.

1. Place **Storage Tank** in position.
 - Plumb from RO to storage tank
 - Plumb storage tank to drain
 - Connect storage tank's top three proximity sensors to RO level control box (*one cable*)
2. Mount **Loop Return Header** to the wall.
 - Plumb to loop return
 - Plumb to storage tank
3. Place **Pump(s)** in position.
 - Plumb to storage tank
4. Mount **Repressurization Pump(s) Control Box** to the wall.
 - Wire pumps to control box
 - Plumb storage tank to the pump(s) inlet(s)
 - Install check valve(s) after the pump(s)' outlet
 - Install VFD transducer
 - Install emergency by-pass valve for use with DI tanks
 - Install flow switch and plug into control box
 - Connect the system's low tank repressurization cut off to the storage tank's lowest proximity sensor. If this wire is not long enough additional wire may be required.
5. Mount **DI Header** to the wall.
 - Plumb to pump(s)
6. Mount **DI Filter** to the wall.
 - Plumb to DI header
7. Mount **UV Light** to the wall.
 - Plumb to the DI filter
8. Mount **Ultra-Filter(s)** to the wall.
 - Plumb to the UV light
 - Plumb sample port drains to drain header
9. Mount **Divert-to-Drain** to the wall.
 - Plumb to the ultra-filter(s)
 - Flip the 2-way toggle switch on the bottom of the resistivity monitor to AUTO for normal operation and verify the diverting valve is in the OPEN position.
 - Plumb drain to drain header.
10. Mount the **Conductivity Monitor** to the wall.
11. Mount **RO Loop Feed Header** to the wall.
 - Plumb to the divert-to-drain.
 - Install conductivity probe.
12. Install **Remote Alarm Boxes** and the **UV Communication Center** near a nurses' station or patient floor. See "*Connecting the Remote Alarm Box*" section for wiring and testing details.

- Wire conductivity monitor to the conductivity remote alarm box.
- Wire resistivity monitor to the resistivity remote alarm box.
- Wire UV light to the UV communication center.

13. Plug each of the components requiring power into an appropriate electrical wall outlet, and check the incoming power with a meter.

14. Turn water ON, and check for leaks.

15. Verify date and time on the **System’s Control Module** located inside the System’s Control Box. See “SYSTEM MAINTENANCE: User Adjustments” section if adjustment required.

16. Perform a manual test of the **Divert-to-Drain**. See “SYSTEM MAINTENANCE: Divert-to-Drain” section for instructions.

17. Apply the required **labels** (if applicable).

CONNECTING the REMOTE ALARM BOX

1. Attach the 3-Pin Connector from either the Resistivity Monitor or the Conductivity Monitor to the 3-position Terminal Strip inside the Alarm Box.

a. For the Conductivity Monitor wire...
 Monitor Wire to Alarm Terminal Strip
 #1 green -----> #1 white
 #2 black -----> #2 black
 #3 red -----> #3 red

b. For the Resistivity Monitor wire...
 Monitor Wire to Alarm Terminal Strip
 #1 green -----> #1 white
 #2 black -----> #3 red
 #3 red -----> #2 black



part#
EQASSYWQA01844
 Water Quality Remote Alarm

2. To verify proper connection for the Resistivity Monitor...

- Under normal operating conditions the green “Good Quality” light should illuminate when the water condition is of good quality.
- See “SYSTEM MAINTENANCE: Divert-to-Drain; Manual Test if DI Tanks Not Online” section on how to perform a manual test.

3. To verify proper connection for the Conductivity Monitor...

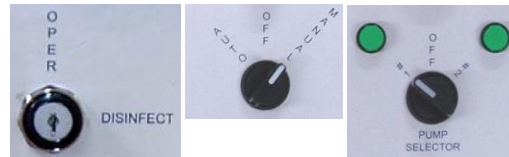
- Under normal operating conditions the green “Good Quality” light should illuminate when the water condition is of good quality.
- Press the “Test” button on the front of the Conductivity Monitor, which should simulate a poor water quality on the remote alarm.
- Another way to test a real poor quality water condition, would be to leave the Conductivity Monitor plugged in during a disinfect in which case the “Poor Quality” light should illuminate and the alarm will sound. Unplug when test complete.

INITIAL START-UP

If not familiar with the Repressurization Pump(s) Control Box, see “*OPERATION: Familiarization with Control Box*” section.

1. Verify the Storage Tank is full.
2. On the RO Loop Feed Header...
... Open the **RO Loop Feed Header's To-Drain Valve**, so that all water will go to drain.
... Close the **RO Loop Feed Header's Main Loop Feed Valve**.
3. Open the **Storage Tank's Pump Inlet Valve(s)**, to allow water to flow from the storage tank to the system's pump(s) and bleed air from the pump(s).
** Instructions for doing this can be found in the “SYSTEM MAINTENANCE: Prime (bleed air from) Repressurization Pump(s)” section.*
4. On the System, close all valves, and open the following valves...
... Open **DI By-Pass Valve** (if applicable)
... Open **DI Filter By-Pass Valve** (if applicable)
... Open **Ultra-Filter By-Pass Valve**.

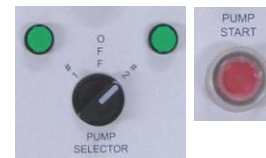
5. Set the specified switches in following positions:
 - **OPER-DISINFECT KEY Switch** to **OPER**
 - **PUMP MODE Switch** to **MANUAL**
 - **PUMP SELECTOR Switch** to **#1**



6. Press the **PUMP START Button**.
 - *NOTE: Verify pump's rotation direction.*
 - Pump should start and water should flow through the system and to drain.



7. If a Dual Pump system, select and start the second pump:
 - **PUMP SELECTOR Switch** to **#2**
 - Press the **PUMP START Button**.
 - *NOTE: Verify the pump's rotation direction.*



8. Slowly open the **DI Inlet** and **DI Outlet Valves** (if applicable).
9. Slowly close **DI By-Pass Valve** (if applicable).
10. Partially open an **Ultra-Filter Sample Port** to allow air to be purged from the filter(s).
- Once a steady stream of water flows from the port, close the **Ultra-Filter Sample Port**.
11. Slowly open the **DI Filter Inlet Valve** (if applicable) and **DI Filter Outlet Valve** (if applicable).
12. Slowly close **DI Filter By-Pass Valve** (if applicable).
13. Slowly open **Ultra-Filter Inlet Valve** and **Ultra-Filter Outlet Valve**.
14. Slowly close **Ultra-Filter By-Pass Valve**.
15. If a 4" x 40" Ultra-Filter, slowly open **Reject Flow Labcock**.

16. If a 4" x 40" Ultra-Filter, fully open the **Reject Flow Adjustment Valve**, located on the Reject Flow-Meter.

17. At this point the unit should be running through the Post-Treatment to drain. Let it run this way until the repressurization pump cuts-off as the storage tank reaches the lowest proximity sensor.

18. Turn the **PUMP MODE Switch** to **OFF**.



19. Allow the Storage Tank to refill, or manually do so.

20. Once the above steps are complete:

- Close the **Main Loop Return Valve**
- Open the **Loop Return to Drain Valve**
- Press the **PUMP START Button** to restart the pump
- Continue in this mode until the Storage Tank is half full.



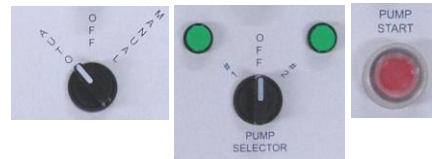
21. Once the Storage Tank is only half full:

- Open the **Main Loop Return Valve**
- Close the **Loop Return to Drain Valve**
- Water should now be returning back to the Storage Tank.

22. Place the specified switches in the following positions:

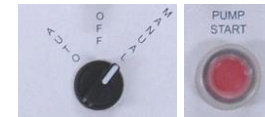
- For Dual Pump systems...

- ... Turn the **PUMP MODE Switch** to **AUTO**
- ... Turn the **PUMP SELECTION Switch** to **OFF**
- ... Push **PUMP START Button** to restart the pump



- For Single Pump systems...

- ... Turn the **PUMP MODE Switch** to **MANUAL**
- ... Push **PUMP START Button** to restart the pump



23. If a 4" x 40" Ultra-Filter, set the Ultra-Filter reject flow to approximately 5% to 10% of Product flow by turning **Reject Flow Adjustment Valve**, located on the Reject Flow-Meter, either clockwise or counter clock-wise.

24. Set the Conductivity Monitor to four times the RO conductivity set-point.

See "SYSTEM MAINTENANCE: Conductivity Monitor" section on how to make the adjustment.

OPERATION

Before you start using this device, operators must read and understand this manual in its entirety. This manual of Operator's Instructions describes in considerable detail all of the steps and procedures required to **safely** operate this device. With proper operation, maintenance, and care, this device should give you years of reliable service.

It is **unsafe** to operate this device without a basic understanding of water treatment and a thorough understanding of the contents of this manual. Inadequately treated water for hemodialysis poses a severe threat to the health and safety of hemodialysis patients. Education and training of the staff in these facilities is critical given the technically complex subject of water treatment. Guidelines and other related information are available from:

- Food and Drug Administration (FDA)
- National Association of Nephrology Technicians/Technologists (NANT)
- Association for the Advancement of Medical Instrumentation (AAMI)

Incoming tap water contaminants, temperature, pH, pressure, and flow-rates have a direct impact on the quality and quantity of the RO output. The operator must be aware of changing tap water conditions. This can be easily accomplished with good, two-way communications with the local municipal water supplier and with routine testing of the tap water.

FAMILIARIZATION with CONTROL BOX

The following is a brief description of the functions and functional settings of each of the controls on the Control Box. Specific operational functions are described in detail in the sections following, some of which require the controls to be used in conjunction with one another.



PUMP MODE SWITCH

This switch has three options:

- **AUTO:** This option is valid only if two pumps are used. In this mode the pumps will automatically alternate between the two pumps every six hours in this order (*4 cycles per day based on smart relay clock*).

- Pump#1 12:00 am to 06:00 am
- Pump#2 06:00 am to 12:00 pm
- Pump#1 12:00 pm to 06:00 pm
- Pump#2 06:00 pm to 12:00 am

AUTO should not be selected if a single pump is used. For dual pump systems, if there is a problem with either pump while it is running, it will automatically switch to the other pump. If there is still a problem, the pumps will shutdown.

- **MANUAL:** In this mode the pump designated by the PUMP SELECTOR SWITCH will run. It will not alternate between two pumps on a two pump system. This mode should be used for single pump systems.

- **OFF:** Turns power off to the system, turning the pumps off.

AUTO REBOOT SWITCH

This switch controls whether the system will attempt to reboot in the event of a power failure. This switch has two options:

- **ON:** In this position the system will attempt to reboot as described above.
- **OFF:** In this position the system will not attempt to reboot as described above.

* **NOTE:** After power is restored it may not restart immediately, but will continue to try rebooting every hour. ON is the recommended position.



PUMP START BUTTON

Pushing this button starts the pump selected.

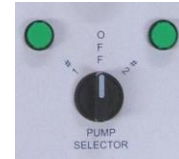
- If in **AUTO** mode, the pump designated to start according to the schedule as described above will start.
- If in **MANUAL** mode, the pump designated by the PUMP SELECTOR SWITCH will start.



PUMP SELECTOR SWITCH

This switch is only active if the PUMP MODE SWITCH is in the MANUAL position. If in AUTO mode, this switch is inactive, and it doesn't matter which position it is in, including the OFF position. This switch has three options:

- **#1** selects Pump# 1. The green light to the right, if lit, will indicate when Pump# 1 is running.
- **#2** selects Pump# 2. The green light to the left, if lit, will indicate when Pump# 2 is running.
- **OFF** turns both pump off if in MANUAL mode. Both green lights will be off.



OPER-DISINFECT KEY SWITCH

This switch is located on the right side of the control box. It is used during the disinfect procedure to turn the UV Light off, as well as to cycle both pumps (for dual pump systems) every 5 minutes during the procedure so the operator doesn't have to. It has two options:

- **OPER** is the position the switch should be in during normal operation.
- **DISINFECT** is the position the switch should be in only during the disinfect procedure.



DAILY START-UP

Normally, the Post-Treatment System runs continuously, but in the event it has been shut-down do the following to start it up.

1. Verify the Reverse Osmosis Machine has been placed into the **Operate** Mode, and that the storage tank is full.

2. Verify that the following switches are set as follows:

- **OPER-DISINFECT KEY Switch** is in the **OPER** position
- **AUTO REBOOT Switch** is in the **ON** position

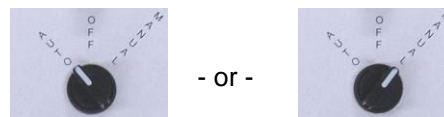
** NOTE: In the event of either a power failure, pump and/or flow problem causing the unit to shut down, the Auto-Reboot will attempt to restart unit every hour. The Auto Reboot will work in either AUTO or MANUAL mode. If Post-Treatment system is NOT running, the unit will attempt a reboot within 1 minute of turning **AUTO REBOOT Switch** to the **ON** position.*



3. If a 4" x 40" Ultra-Filter, open the **Reject Flow Labcock**. Verify that the Ultra-Filter reject flow is set to approximately 5% to 10% of Product flow by turning **Reject Flow Adjustment Valve**, located on the Reject Flow-Meter, either clock-wise or counter clock-wise.

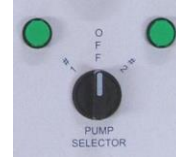
4. Select Pump Mode

- a. For Dual Pump systems, set the **PUMP MODE Switch** to **AUTO**.
- b. For Single Pump systems, set the **PUMP MODE Switch** to **MANUAL**.



5. Select Pump

- a. For Dual Pump systems, it doesn't matter what position the **PUMP SELECTOR Switch** is in, including the off position. It is recommended that it be placed in the **OFF** position.
- b. For Single Pump systems, turn the **PUMP SELECTOR Switch** to the desired pump, either **#1** or **#2**.



6. Start the Pump

- Press the **PUMP START Button**.
- If a Dual Pump system, the pump scheduled for that time will start.
- If a Single Pump system, the pump designated by the PUMP SELECTOR Switch will start.



** NOTE: The appropriate green pump indicator light will be lit according to which pump is running, and will change when alternating for dual pump systems in AUTO mode.*

MONITORING PROCEDURES

The Post-Treatment System **must be monitored** on a **daily** basis by a **qualified technician** recording the items listed below on a **Quality Assurance Checklist**. An example checklist is provided in the **Appendix** of this manual and may be reproduced for use.

1. The Post-Treatment System should be checked when there is **NO** demand for purified water.

2. Monitoring Requirements:

- a. Pressures
- b. Flow Rates
- c. Status of the UV Light
- d. Bacteria/Endotoxins (*check at least monthly; more often if necessary*) must meet established standards.
- e. Check Date & Time on Control Module inside control box quarterly. If incorrect, see "SYSTEM MAINTENANCE: Unit Adjustments: Set Date and Time on Control Module" section.

END of TREATMENT DAY / AFTER-HOURS

Generally, at the end of the treatment day, or after-hours, the Reverse Osmosis Machine would be placed into "Flush" mode. This means that there would be no replacement water being added to your storage tank.

If a 4"x 40" Ultra-Filter, to prevent the storage tank from emptying, and the post-treatment system's pump(s) from shutting down once the storage tank reaches 20 gallons, the reject flow must be shut-off. Therefore, the Post-Treatment System is left running, and the reject flow labcock closed to prevent the storage tank from emptying.

1. Insure there are no requirements for purified water.
2. *If a 4" x 40" Ultra-Filter*, close the **Reject Flow Labcock** until the flow ceases and the Reject Flow Meter indicates zero flow rate.

SHUT-DOWN

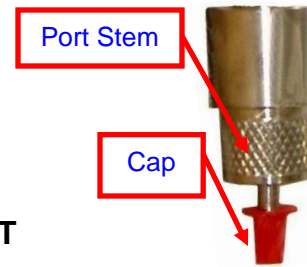
1. To turn the Post-Treatment System completely off, and cease functioning, simply turn the **PUMP MODE Switch** to **OFF**.

2. If a 4" x 40" Ultra-Filter, close the **Reject Flow Labcock** until the flow ceases and the reject flow meter indicates zero flow rate.

**** This is done to prevent draining the storage tank dry during after-hours recirculation.***

SANITARY SAMPLE PORT

For those systems equipped with sanitary sample ports, these must be sanitized immediately BEFORE each sampling operation. Below are procedures on how to sanitize and take samples from them.



PROCEDURE to SANITIZE a SANITARY SAMPLE PORT

1. Put on surgical gloves (or similar) and a face shield.

- **NOTE:** Failure to do so may result in inaccurate and/or false readings from the sampling.

2. Remove the Cap and do not misplace.

3. Turn the port stem to the left to open and allow a flow of liquid to pass out of the port for 1-2 minutes. Then close the port by turning the stem to the right.

4. Fill a 20 ml plastic polypropylene syringe with at least 10 ml of 70% ethanol, 90% isopropyl alcohol, or 3% hydrogen peroxide solution. Attach the port-needle to the syringe.

5. Insert the needle all the way into the port through the stem opening, and express most of the sanitant into the port. Allow a few milliliters to flow out of the port outlet.

6. As the needle is removed from the opening, squirt the remaining few milliliters of sanitant over the outer surface of the stem.

7. Wipe the outside of the port with an alcohol wipe.

8. Open the port for 1 to 2 minutes to allow product water to rinse the residuals and any endotoxins from the sample port.

9. Allow to dry after application.

SAMPLE COLLECTING from a SANITARY SAMPLE PORT

1. Sanitize the port as detailed above, using surgical gloves and a face shield.

- **NOTE:** Failure to do so may result in inaccurate and/or false readings from the sampling.

2. Twist the valve until a steady stream is present.

- Flush at least 1 minute, then close the valve, discarding this water. This ensures that the port (*internally*) has been rinsed of disinfectant residue and possible endotoxins left from the disinfection process.

3. Prepare a sample cup for sampling, and place it cup under the valve.

- Open the Sanitary Sample Port slowly to collect the sample.

- Avoid splatter which could cross contaminate the sample.

- Do not allow the cup to touch or come in contact with the Sanitary Sample Port.

4. Close the valve when enough sample has been taken.

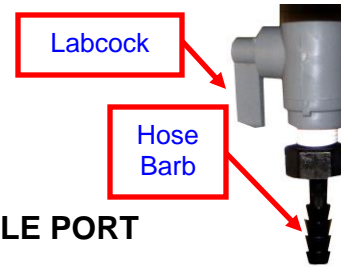
- Immediately replace the lid on the sample cup.

- Avoid sample cup cap contamination by coming in contact with any external surfaces.

5. Follow appropriate procedures for collection of samples with vials for colony count and LAL.

NON-SANITARY SAMPLE PORT

For those systems equipped with non-sanitary sample ports, these must be sanitized immediately BEFORE each sampling operation. Below are procedures on how to sanitize and take samples from them.



PROCEDURE to SANITIZE a NON-SANITARY SAMPLE PORT

1. Put on surgical gloves (or similar) and a face shield.

- **NOTE:** Failure to do so may result in inaccurate and/or false readings from the sampling.

2. Disconnect the hose barb on the end of the labcock.
3. Using a swab, clean the inside of the labcock and hose barb with either bleach or alcohol.
4. Immerse the hose barb into either bleach or 90% isopropyl alcohol for at least two minutes.
5. Reconnect the hose barb to the labcock.
6. Open the labcock to allow water to flow through to rinse both pieces for a minimum of 2 minutes.
7. Wipe the outside of the hose barb with an alcohol wipe.
8. Allow the alcohol to air dry, usually within 30 seconds after application.

SAMPLE COLLECTING from a NON-SANITARY SAMPLE PORT

1. Sanitize the port as detailed above, using surgical gloves and a face shield.
2. Open the labcock until a steady stream is present.
 - Flush at least 1 minute, then close the labcock, discarding this water. This ensures that the port (*internally*) has been rinsed of disinfectant residue and possible endotoxins left from the disinfection.
3. Prepare a sample cup for sampling, and place it cup under the hosebarb.
 - Open the labcock slowly to collect the sample.
 - Avoid splatter which could cross contaminate the sample.
 - Do not allow the cup to touch or come in contact with the hose barb.
4. Close the labcock when enough sample has been taken.
 - Immediately replace the lid on the sample cup.
 - Avoid sample cup cap contamination by coming in contact with any external surfaces.
5. Follow appropriate procedures for collection of samples with vials for colony count and LAL.

GENERAL DISINFECTING INFORMATION

Any Post-Treatment system (*components, loop, and storage tank*) is inherently prone to bacteria growth due to the rich environment that this solution provides. Therefore, it is extremely important to disinfect it on a regular basis to maintain peak efficiency.

The **Disinfecting Process** is designed to significantly reduce bacteria and endotoxins that may build-up in the water and on the surfaces in the form of bio-film. The importance of regular and frequent disinfection cannot be minimized due to the risk associated with bacteria proliferation.

It is recommended that the Post-Treatment system be disinfecting with bleach or an approved cold-sterilant disinfectant at minimum **monthly**, or as often as needed and as specified by company policy.

*** NOTE: Post-Treatment Systems may require more frequent disinfecting, which is ultimately the responsibility of the Medical Director and is typically based on water testing.**

*** WARNING: Ozone should not be used as a disinfectant on the .03 micron Ultra-Filter because the ultra-filter will be damaged.**

DISINFECTING with BLEACH

The use of typical household bleach (5.25%) is common for use in disinfecting water treatment systems for hemodialysis. Bleach is a cost effective disinfectant and generally produces satisfactory results. Varying concentrations of Sodium Hypochlorite (bleach) are used among dialysis facilities for disinfection, and generally speaking, the greater the concentration the shorter the dwell time.

*** WARNING: Better Water LLC recommends using IRON FREE bleach. Care should be taken to select iron free bleach because many discount or generic brands will have high iron content. Iron will be harmful to the equipment and shorten its lifespan.**

*** WARNING: DO NOT USE "SPASH-LESS" BLEACH. The content of "splash-less" bleach may damage the equipment, and will create foam.**

BLEACH SOLUTION FOR POST-TREATMENT SYSTEMS

a. Better Water LLC recommends a minimum of **500 ppm solution** of sodium hypochlorite (*bleach*) at a **1:100 dilution**. So if a 5% strength bleach is used, one gallon of this bleach would be used for 100 gallons of water.

The total volume of water must include not only the storage tank but the volume of water in the loop and filter housings. So if the loop and housings are estimated to contain 20 gallons of water, then the storage tank should be filled with only 80 gallons of water.

It is a common practice is to make a slightly stronger solution than is needed to account for the variable amount of water in the loop and filter housings. Thus using one gallon of 5.25% bleach added to 100 gallons of water would actually equate to a 525 ppm solution which would be adequate on most loops.

*** NOTE: See Appendix for a basic formula on how to calculate the pipe volume.**

There are a number of different bleach strengths available on the market. Below is a basic formula to compute the amount of bleach needed based on the strength of the bleach and 100 gallons of total water volume.

- Step 1: Convert bleach strength to parts per million by multiplying the bleach strength by 10000.
- Step 2: Divide that number by the minimum parts per million of 500 ppm.
- Step 3: Divide that number by the total water volume.
- Step 4: Multiply that number by 128 (*number of ounces in a gallon*) to get the desired number of ounces of the bleach strength required for the total water volume to achieve

500 ppm.

- 1st Example: **5.25%** bleach strength for **100 gallons** of water to achieve **500 ppm**.

Step#1 **5.25% * 10000 = 52500 ppm**

Step#2 **52500 / 500 = 105**

Step#3 **100 / 105 = .95**

Step#4 **128 x .95 = 121.9 ounces of bleach required**

- 2nd Example: **6.25%** bleach strength for **100 gallons** of water to achieve **500 ppm**.

Step#1 **6.25% * 10000 = 62500 ppm**

Step#2 **62500 / 500 = 125**

Step#3 **100 / 125 = .80**

Step#4 **128 x .80 = 102.4 ounces of bleach required**

** NOTE: The greater the parts-per-million dilution rate, the longer it will take to rinse. Continued use of stronger than recommended solutions can shorten the life of the filters. The spiral wound ultra-filters are rated at 5000 ppm hour days with proper disinfection. This means that when disinfecting with a 500 ppm Sodium Hypochlorite solution, the ultra-filters would be rated at 240 hours dwell time. As you can see, the ultra-filters have a high tolerance to oxidizers. See recommendations stated later in this manual on how often the specific type of filter(s) in use should be changed.*

b. Recommended dwell/circulation time is **1 to 2 hours**.

MINNCARE COLD STERILANT SOLUTION

If using Minncare Cold Sterilant as a disinfectant the following is recommended.

a. **1% Minncare Cold Sterilant** solution at a **1:25 dilution**. This equates to **25.36 ounces (750 ml)** of Minncare Cold Sterilant for every 25 gallons of water.

The total volume of water must include not only the storage tank but the volume of water in the loop and filter housings.

** NOTE: See Appendix for a basic formula on how to calculate the pipe volume.*

1st Example:

- Loop and housings are estimated to contain 10 gallons of water

- Desired total water volume is 25 gallons

- Fill storage tank with 15 gallons of water and mix 25.36 ounces of Minncare Cold Sterilant

2nd Example:

- Loop and housings are estimated to contain 20 gallons of water

- Desired total water volume is 50 gallons

- Fill storage tank with 30 gallons of water and mix 50.72 ounces of Minncare Cold Sterilant.

b. Recommended dwell/circulation time is **2 to 4 hours**.

DISINFECTING PROCEDURE

See “General Disinfecting Information” section for recommendations and details for this procedure.

WARNING

Chemical cleaners and disinfectants can cause serious injury or death.

Proper protective equipment must be used.

The preparation of these chemical solutions must be done in accordance with the specifications established for the particular chemical.

These chemical solutions must be handled in accordance with their Material Safety Data Sheet (MSDS).

These procedures should be performed by trained and qualified technicians.

WARNING

Do not disinfect the Post-Treatment System or distribution loop while patients are dialyzing.

FOR DISINFECTING, Use a proper dilution of sodium hypochlorite (*bleach*) or Minncare Disinfectant as previously detailed.

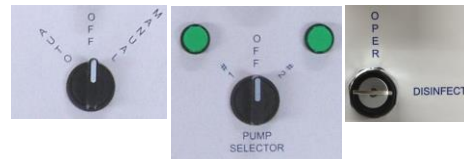
- Other approved cold-sterilant disinfectants can be used following the manufacturer's instructions for dilution ratios and use.

DISINFECTING PROCEDURE

1. Unplug the Conductivity Monitor from its electrical outlet.

2. Set the specified switches in following positions:

- **MODE Switch** to **OFF**
- **PUMP SELECTOR Switch** to **OFF**
- **OPER/DISINFECT Key Switch** to **DISINFECT**



3. PUMP #1 will start first, then 5 minutes later PUMP #2 will start and alternate from that point.

4. Verify that the UV Light is OFF.
- If not unplug it from its power source.

5. Prepare the amount of disinfectant to be used.

6. Record the loop return back pressure so it can be reset back to this value later.

7. Introduce disinfectant into the Storage Tank...

8. Allow solution to circulate for the recommended dwell time based on the type of disinfectant used. For bleach: 1 to 2 hours. For Minncare Cold Sterilant: 2 to 4 hours.

9. One by one, rotate all valves on the post-treatment system to allow these to be disinfected.
 - Simply open and close, or close and open, for several seconds to allow disinfectant solution to flow through the valve.

10. Turn the post-treatment system OFF by turning the **OPER-DISINFECT Switch** to **OPER**,



11. Open the **Storage Tank's Drain Valve** and allow the storage tank to drain.

RINSING PROCEDURE

12. Once the Storage Tank is empty...
 a. Connect a hose from the Storage Tank's 3-Way Valve to the Loop Return Header
 b. Turn the **Storage Tank's 3-Way Valve** to direct flow to the hose

13. On the Loop Return Header...
 a. Open its **Clear-Out Valve**
 b. Open its **Loop Return to Drain Valve**
 c. Close its **Main Loop Return Valve**

14. Place the RO into Direct Feed mode and start the RO to begin rinsing down the Storage Tank for several minutes.

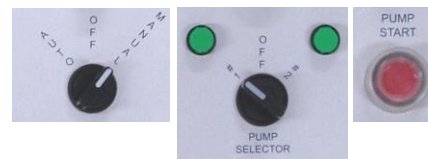
15. Check for disinfectant residuals at the Storage Tank's drain.
 a. Continue rinsing until clear.
 b. Once clear of disinfectant residuals, close the Storage Tank's Drain Valve.

16. Turn the **Storage Tank's 3-Way Valve** to direct flow back to the Storage Tank, close the **Loop Return Header Clear-Out Valve**, and remove the hose previously connected between those two valves.

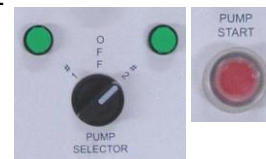
17. Allow the Storage Tank to refill.

18. On the RO Loop Feed Header...
 a. Open the **Loop Feed to Drain Valve**
 b. Close the **Main Loop Feed Valve**

19. Start Pump#1...
 - **MODE Switch** to **MANUAL**
 - **PUMP SELECTOR Switch** to **#1**
 - Press the **PUMP START Button**



20. If a Dual Pump System, after several minutes switch and start Pump#2
 - **PUMP SELECTOR Switch** to **#2**
 - Press the **PUMP START Button**
 * If a Single Pump System, skip this step.



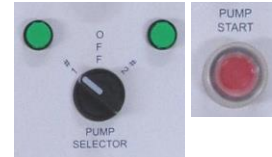
21. One by one, rotate all valves on the system to allow these to be rinsed.
 - Simply open and close, or close and open, for several seconds to allow rinse water to flow through the valve.

22. Check for disinfectant residuals, pre-ultra filter. Continue rinsing until clear, before proceeding.

23. Allow the Storage Tank to refill after pump cuts off at low level signal.

24. Start Pump#1 and run till approximately 30 gallons remain in the Storage Tank.

- **PUMP SELECTOR Switch** to **#1**
- Press the **PUMP START Button**



25. Check for disinfectant residuals, post-ultra filter. Continue rinsing until clear, before proceeding. This may require emptying and refilling the Storage Tank more than once until these post-ultra filter residual checks are clear.

26. Allow the Storage Tank to refill.

27. On the RO Loop Feed Header...

- a. Open the **Main Loop Feed Valve**
- b. Close the **Loop Feed to Drain Valve**

28. Allow the post-treatment system to run in this mode for several minutes, and then check for disinfectant residuals...

- a. Check for disinfectant residuals at the Loop Return Header's End of Loop Sample Port. Continue rinsing until clear before proceeding.
- b. Check for disinfectant residuals at all point-of-use locations. Continue rinsing until clear before proceeding.
- c. This may require emptying and refilling the Storage Tank until these residual checks are clear.

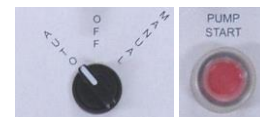
29. On the Loop Return Header...

- a. Open its **Main Loop Return Valve**
- b. Close its **Loop Return to Drain Valve**

30. Place the RO back into Tank Feed mode.

31. When disinfection and rinsing is complete...

- If a dual pump system, turn the **MODE Switch** to **AUTO**.
- If a single pump system, turn the **PUMP MODE Switch** to **MANUAL**.
- Press the **PUMP START Button**



32. Plug the Conductivity Monitor back into its electrical outlet.

33. If the UV Light was previously unplugged, plug it back in to its power source.

SWITCHING TO DI TANKS

In the event the facility needs to be put on DI Tanks, use the following procedure to do so.

GENERAL NOTES CONCERNING THIS PROCEDURE

- Clinic/Facility policies will always supersede these recommendations.
- The connection points and valves not associated with the Post-Treatment System may vary in name based on the composition of the distribution loop and water treatment equipment.
- The operation of divert-to-drain equipment, resistivity monitors, resistivity alarms, and remote alarms will vary based on manufacturer. Operators should be familiar with the instructions specific to the types of equipment being used.
- The following procedure details moving the second DI Tank into the first DI Tank's position once the first DI Tank is exhausted. Some clinics/facilities prefer to change out both tanks when this occurs, which is fine. Simply adjust the instructions accordingly.

INITIAL SET-UP OF THE DI TANKS on BANK#1

1. Turn the **RO OFF**.
 2. Turn the Post-Treatment System's pump(s) off by turning the **PUMP MODE Switch** to **OFF**.
- 
3. Unplug the Conductivity Monitor.
 4. By-pass the Pre-Treatment Water Softener...
 - * *This is not required, but will help in extending the life of the DI Tanks.*
 - a. Open the **Water Softener's By-Pass Valve**
 - b. Close the **Water Softener's Inlet** and **Outlet Valves**
 5. On the Post-Treatment System...
 - a. Remove the DI Filter's short bowl (or false cartridge).
 - b. Install a 5 micron filter into the DI Filter Housing and install the DI Filter Housing.
 - * See "SYSTEM MAINTENANCE: Replace Short Bowl with Filter Housing (or Vice Versa)" section for details on how to do this.
 - c. Close the **DI Filter By-Pass Valve**
 - d. Open the **DI Filter Inlet Valve**
 - e. Open the **DI Filter Outlet Valve**
 6. On the Post-Treatment System...
 - a. Close **DI Bank#1 Inlet Valve**
 - b. Close **DI Bank#1 Outlet Valve**
 - c. Close **DI Bank#2 Inlet Valve**
 - d. Close **DI Bank#2 Outlet Valve**
 7. Connect Pre-Treatment to Post-Treatment System...
 - a. Close the **Main Loop Return Valve** at the end of the Loop.
 - b. Verify Pre-Treatment **Emergency Water Inlet Valve** is closed.
 - c. Verify Post-Treatment System's **Emergency Water Inlet Valve** is closed.
 - d. Connect by-pass hose from Pre-Treatment Emergency By-Pass Valve to the Post-Treatment System's Emergency Water Inlet Connection.
 8. Connect DI Tanks...
 - a. Remove jumper pipe that is connected from the Post-Treatment System's DI Bank#1 Inlet and DI Bank#1 Outlet connections.

- b. Connect hose from the **Post-Treatment System's DI Bank#1 Inlet** to the **DI Tank#1 Inlet**.
** There should be a Resistivity Alarm installed on the outlet of this DI Tank#1.*
- c. Connect hose from the **DI Tank#1 Outlet** to the **DI Tank#2 Inlet**.
- d. Connect hose from the **DI Tank#2 Outlet** to the **Post-Treatment System's DI Bank#1 Outlet**.

9. Start flow from DI Tanks...

- a. Open the Pre-Treatment **Emergency By-Pass Valve** and check for leaks.
- b. Open Post-Treatment System's **Emergency Water Inlet Valve** and check for leaks.
- c. Open Post-Treatment System's **DI Bank#1 Inlet Valve**.
- d. Open **DI Tank#2's Sample Port**, to purge air from the DI Tanks. Allow water to flow until all air is purged and the water runs clear, and then close **DI Tank#2's Sample Port**.
- e. Open Post-Treatment System's **DI Bank#1 Outlet Valve** and check for leaks.

10. Set up resistivity and divert-to-drain...

- a. Turn the **Divert-to-Drain's Resistivity Monitor ON** (*if equipped*).
- b. Plug in the **Divert-to-Drain** and turn it **ON**.
- c. Plug in the **DI Tank#1's Resistivity Alarm**.
- d. If equipped a remote alarm, verify that the remote alarm is monitoring DI Tank#1.

11. The DI Tanks are now online. Monitor the Resistivity Monitor and DI Tank#1's Resistivity Alarm.

SET-UP OF THE DI TANKS on BANK#2

Once the first bank of DI Tanks is setup, it is a good idea to set-up the second bank so once the first bank is exhausted is the second bank is ready to go with minimum interruption.

1. Connect the second bank of DI Tanks...

- a. Remove jumper pipe that is connected from the Post-Treatment System's DI Bank#2 Inlet and DI Bank#2 Outlet connections.
- b. Connect hose from the **Post-Treatment System's DI Bank#2 Inlet** to the **DI Tank#1 Inlet** in the second bank.
** There should be a Resistivity Alarm installed on the outlet of this DI Tank#1.*
- c. Connect hose from the **DI Tank#1 Outlet** to the **DI Tank#2 Inlet**.
- d. Connect hose from the **DI Tank#2 Outlet** to the **Post-Treatment System's DI Bank#2 Outlet**.

2. Do not open any other valves at this point. The second bank of DI Tanks are now connected and need only to be flushed and have the air bled from the tanks, once the first bank is exhausted.

** It is recommended that the second bank of DI Tanks be left dry until ready to use, so do not introduce water into them at this point to flush or bleed air from them.*

SWITCHING from BANK#1 to BANK#2

Once the first DI Tank on the first bank is exhausted use the following procedure to switch to the second bank of tanks which should be ready to go, and swap out that first DI Tank. If switching from the second bank back to the first bank, simply modify the procedure accordingly.

1. Prepare and air purge DI Tanks on Post-Treatment's DI Bank#2...

- a. Open Post-Treatment System's **DI Bank#2 Inlet Valve**.
- b. Open the second bank's **DI Tank#2's Sample Port**, to purge air from the DI Tanks. Allow water to flow until all air is purged and the water runs clear, and then close **DI Tank#2's Sample Port**.
- c. Open Post-Treatment System's **DI Bank#2 Outlet Valve**.

2. Shut-off DI Bank#1...

- a. Close Post-Treatment System's **DI Bank#1 Inlet Valve**.
- b. Close Post-Treatment System's **DI Bank#1 Outlet Valve**.

** The second bank of DI Tanks are now online.*

3. Replace the first bank's, DI Tank#2 with a new tank and air purge...

- a. Open the first bank's **DI Tank#2's Sample Port** and allow the tanks on the first bank to depressurize.
- b. In the first bank, replace DI Tank#1 with DI Tank#2, and put a new tank in the DI Tank#2 position. Make sure the Resistivity Alarm is also moved to monitor the new DI Tank#1.
- c. Open Post-Treatment System's **DI Bank#1 Inlet Valve**.
- d. Open the first bank's **DI Tank#2's Sample Port**, to purge air from the DI Tanks. Allow water to flow until all air is purged and the water runs clear, and then close **DI Tank#2's Sample Port**.
- e. Close Post-Treatment System's **DI Bank#1 Inlet Valve**.

5. Do not open any other valves at this point. The first bank of DI Tanks are now connected and ready to use once the second bank is exhausted.

LONG TERM STORAGE of the POST-TREATMENT SYSTEM

PUTTING SYSTEM INTO STORAGE

1. Disinfect the post-treatment system, loop, and storage tank.
2. Pack the post-treatment system in preservative if putting into storage.
3. Disconnect power, then coil and secure the power cord.
4. Disconnect from water source and drains.
5. Zip-tie plastic bags over all openings to prevent contamination:

BRINGING SYSTEM BACK FROM STORAGE

1. Remove protective plastic bags from openings.
2. Reconnect to water source and drains.
3. Reconnect to power.
4. Rinse preservative from device.
5. Disinfect the post-treatment system, loop, and storage tank.
6. Sample as per your procedures for colony count (cultures), endotoxins (LAL), and AAMI.

SYSTEM MAINTENANCE

MAINTENANCE SCHEDULE							
MAINTENANCE TASKS	Each Shift	Daily	Monthly	3 Months	6 Months	12 Months	Other
Check the system for leaks	X	X					
Monitor the system for unusual sounds	X	X					
Record operational values such as pressures and flow-rate	X	X					
Clean external surfaces			X				
Change 4" x 40" Ultra-Filter Ultra-Filters - Part# SUUF01346 <i>(ultra-filters only)</i> - Part# EQSUBUF001 <i>(ultra-filters and adaptors)</i>							Every 3 years or more often if needed
Change 30" .03 micron Ultra-Filter - Part# SUCAOO01941					X		Or more often if needed
Change storage tank vent filter - Part# SUCAOO00557				X			
Change the DI Filter - Part# SUCAOO00551			X <i>(while on DI water)</i>				Remove filter and replace with short bowl when not using DI water
Disinfect			X				As often as needed
Check Control Module Date and Time				X			
Replace UV light bulb						X	
Clean UV quartz sleeve						X	
Replace UV quartz sleeve							Every 2 years
Manual test of the Divert-to-Drain							Periodic

SYSTEM MAINTENANCE, Unit Adjustments

On occasion, your Post-Treatment System may require minor adjustments. The adjustments should be made by a qualified technician that is thoroughly familiar with the entire water treatment system.

No adjustment to the Post-Treatment System should be made before the upstream equipment and/or systems have been thoroughly checked to insure an upstream component has not caused the out-of-limit readings on the Post-Treatment System.

No adjustment to the Post-Treatment System should be made before a thorough quality assurance check of the Post-Treatment System has been completed.

CAUTION

Adjustment should be made when there is **NO** demand for purified water.

PREPARATION: Before making any adjustments, read this entire section and pay close attention to cautions, notes and items marked important.

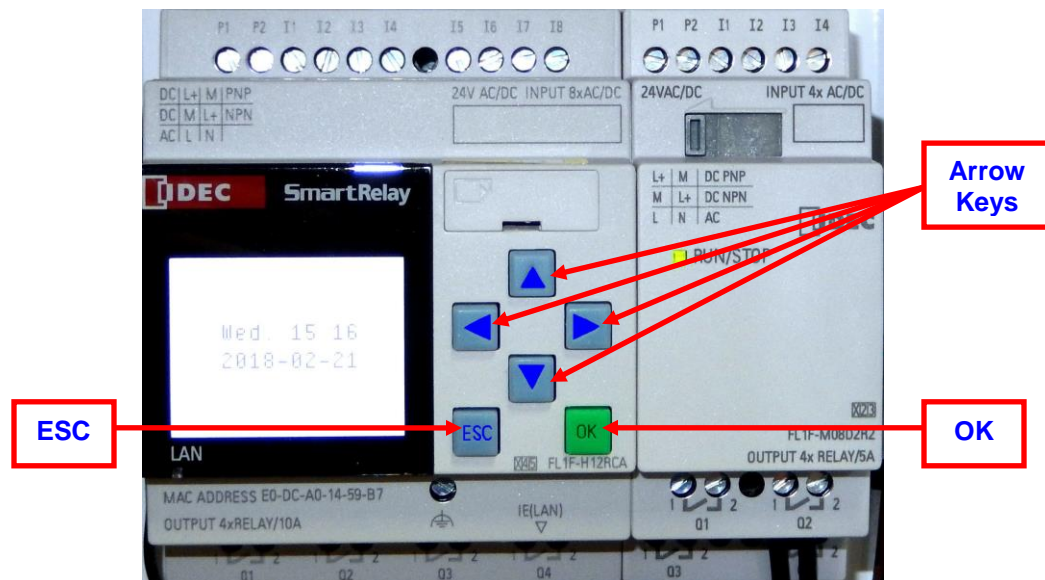
CAUTION

Only qualified RO operators should make adjustments to the RO.

NOTE: AAMI states the flow velocity minimum for an indirect feed system (storage tank fed) is 3 feet per second.

SET DATE AND TIME ON CONTROL MODULE

* **NOTE:** Over the life of the Post Treatment System, more than one brand of smart relay has been used. The picture below shows the IDEC model, but the process and the relay controls are the very similar among all brands and models.



Description of Relay Controls

- **ESC button** – Enters and exits Options Menu, and exits setting screens without saving.
- **OK button** – Saves or confirms changes.

- ◀ or ▶ key – Scrolls left or right to select options
- ▲ or ▼ key – Scrolls up or down to select options.

1. Press **ESC button** to display Options Menu.

2. Select menu options to get to desired function...

- Press ▲ or ▼ key and scroll through options until **“Setup”** or **“Set...”** is highlighted, then press **OK button** to select.
- Press ▲ or ▼ key and scroll through options until **“Clock”** is highlighted, then press **OK button** to select.
- Press ▲ or ▼ key and scroll through options until **“Set Clock”** is highlighted, then press **OK button** to select.

3. Set Day, Hour, Minute, Year, Month, and Day fields...

- Use ▲ or ▼ key and scroll either up or down to set the value of the fields.
- Once the correct value is displayed, press the ◀ or ▶ key to move back and forth between the fields.
- Once the desired field value settings have been achieved, press the **OK button** to save the values.

* Press the ESC button at any time to exit without saving.

- **NOTE:** Following is 24 hour time chart to reference:

Midnight = 00:00	Noon = 12:00
01:00 am = 01:00	01:00 pm = 13:00
02:00 am = 02:00	02:00 pm = 14:00
03:00 am = 03:00	03:00 pm = 15:00
04:00 am = 04:00	04:00 pm = 16:00
05:00 am = 05:00	05:00 pm = 17:00
06:00 am = 06:00	06:00 pm = 18:00
07:00 am = 07:00	07:00 pm = 19:00
08:00 am = 08:00	08:00 pm = 20:00
09:00 am = 09:00	09:00 pm = 21:00
10:00 am = 10:00	10:00 pm = 22:00
11:00 am = 11:00	11:00 pm = 23:00

7. Press the **ESC button** until the main screen with the date and time is displayed.

8. Select menu options to get to desired function...

- Press ▲ or ▼ key and scroll through options until **“Setup”** or **“Set...”** is highlighted, then press **OK button** to select.
- Press ▲ or ▼ key and scroll through options until **“Clock”** is highlighted, then press **OK button** to select.
- Press ▲ or ▼ key and scroll through options until **“S/W Time”** is highlighted, then press **OK button** to select.

9. Set Daylight Savings field...

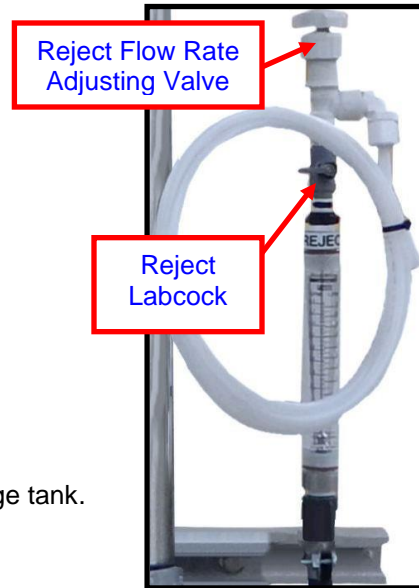
- Use ▲ or ▼ key and scroll either up or down to select **ON**, then press the **OK button** to select and save the value.
- Use ▲ or ▼ key and scroll either up or down to select **US2**, then press the **OK button** to select and save the value.

10. Press the **ESC button** until the main screen with the date and time is displayed.

REJECT FLOW ADJUSTMENT

* This only applies to the 4" x 40" Ultra-Filter.
Adjustments cannot be made to the 30" .03 micron Ultra-Filter.

1. The only adjustment to an Ultra Filter system is the reject flow.
 - a. Fully open the **Reject Labcock**.
 - b. Locate the **Reject Flow Rate Adjust Valve** on the filter system.
 - c. Slowly turn the knob clockwise or counterclockwise as required to increase or decrease the reject flow rate to 5-10% of product flow.
2. Any other adjustments are to the re-pressurization pump and/or to the pressure by-pass on the loop return at the storage tank.



ADJUST LOOP BACK-PRESSURE WITH STORAGE TANK PRESSURE REDUCING VALVE

The back-pressure of the loop can be adjusted by turning the Storage Tank Pressure Reducing Valve to increase and decrease back-pressure. This adjustment should be made in conjunction with any changes to the pump(s)' VFD to achieve and maintain the required 3 feet per second flow velocity rates. See "SYSTEM MAINTENANCE, Variable Frequency Drive (VFD)" section for more information.



SYSTEM MAINTENANCE, Variable Frequency Drive (VFD)

Beginning July 2010 an optional Variable Frequency Drive (VFD) for the Post Treatment System has been offered by Better Water LLC. The VFD was added for energy savings as well as maintaining proper flow velocities through the RO water loop.

AAMI states the flow velocity minimum for an indirect feed system (storage tank fed) is 3 feet per second.

Flow Rate Specs For 3 feet per second Flow Velocity (Loop Pipe Inner Diameter)

3/4" Teflon id	=	0.60in.
3/4" Schedule 80 PVC id	=	0.74in
1" Teflon id	=	0.88in
1" Schedule 80 id	=	0.96in
1 1/2" Schedule 80 id	=	1.48 in
3/4" (25mm) polypropylene id	=	0.80in
1" (32mm) polypropylene id	=	1.03in
1 1/2" (50mm) polypropylene id	=	1.61 in



Flow rates @ 3ft/sec

3/4" Teflon	=	2.64 gpm @ 3ft/sec (Nominal)
3/4" Schedule 80 PVC	=	4.02 gpm @ 3ft/sec (Nominal)
1" Teflon	=	5.69 gpm @ 3ft/sec (Nominal)
1" Schedule 80	=	6.77 gpm @ 3ft/sec (Nominal)
1 1/2" Schedule 80	=	16.1 gpm @ 3ft/sec (Nominal)
3/4" (25mm) polypropylene	=	4.70 gpm @ 3ft/sec (Nominal)
1" (32mm) polypropylene	=	7.79 gpm @ 3ft/sec (Nominal)
1 1/2" (50mm) polypropylene	=	19.0 gpm @ 3ft/sec (Nominal)

* All 3ft/sec flow rates at the loop return flow meter are calculated for the loop inner diameter only. The above flow rates should be set with all dialysis machines running. If Bicarb or Acid makeup water are required both should have the proper flow controls to maintain flow velocity.

VFD CONTROL PANEL OPERATION

The VFD is pre-programmed with operational parameters set by Better Water, which are locked out to the end user from changing them. If trouble-shooting VFD issues call Better Water for technical assistance.

Description of VFD Control Panel Buttons:

- ▲ or ▼ key – scrolls up or down
- RUN button (inactive during operation)
- STOP button (inactive during operation)
- MODE button
- ENT button (ENTER)

Set Set-Point and Loop Product Flow

The VFD set point and loop Product flow is set by using the ▲ or ▼ keys.

To properly set the correct set point for loop flow...

1. Push either the ▲ or ▼ keys to set desired flow
2. When desired set point is reached, push the ENT button. FC will appear in the display.
3. Push either the ▲ or ▼ keys and verify the set point.
4. Push ENT button again to complete the operation.

SYSTEM MAINTENANCE, Prime (bleed air from) Repressurization Pump

The repressurization pump(s) must be primed prior to initial use, or whenever air has been allowed to enter the pump. This will include the initial start-up of the pump, disinfection, and usually every time the pump has shut-down due to a no flow situation.

*** WARNING: Failure to properly complete this procedure may result in damage to the pump and may void all warranties.**

*** NOTE:** Location of the air bleed screw will change based on the model of the pump.

1. Open the inlet valves that supply water to the pump(s), so there is an ample supply of water.
2. Close the outlet valves following the pump(s).
3. Locate the Air Bleed Screw on the Pump.
- **NOTE:** Location of this screw may vary between different pump models.
4. Slowly open the Air Bleed Screw and allow the air to escape until a solid stream of water is flowing from the Air Bleed Screw.
- **NOTE:** It is not necessary to completely remove the Air Bleed Screw, which will make it difficult to replace while water is flowing.
5. Once a solid stream of water is flowing from the Air Bleed Screw, tighten it back up, taking care not to over-tighten which can damage the rubber O-ring beneath the Air Bleed Screw.



SYSTEM MAINTENANCE, Conductivity Monitor (Final Water Quality)

The Post Treatment Final Water Quality Conductivity Monitor is for monitoring water quality going out to the loop. The Monitor is factory calibrated with a matched probe from the manufacturer. If a replacement is required the old probe cannot be used with a new Monitor.

The Alarm Set-Point of the Final Water quality Monitor should be set to 4 times the RO Product Water conductivity.

- Better Water ROs, the conductivity is displayed in parts-per-million (ppm) TDS.
- The Conductivity Monitor displays in $\mu\text{S}/\text{cm}^2$.
- To convert ppm to $\mu\text{S}/\text{cm}^2$, use the following formula:

$$\text{ppm} \times 2.1 = \mu\text{S}/\text{cm}^2$$

** Reference the manufacturer's material for specifics concerning the Conductivity Monitor.*

AUTOMATIC OPERATION

1. Verify the Conductivity Monitor is plugged into an electrical outlet.

MAINTENANCE

For maintenance, calibration, and probe replacement, refer to the manufacturer's instructions specific to the model in use.



part#
EQMOCOP1725
Conductivity Monitor

EQMOPR01059
CS-51 Conductivity
Probe



SYSTEM MAINTENANCE, Divert-to-Drain (Resistivity Monitor)

The Resistivity Monitor is used in conjunction with a Resistivity Probe to monitor water quality while DI Tanks are being used. Based on the actual resistivity of the DI Tanks' water and the set-point, the Resistivity Monitor will automatically control the Divert-to-Drain's 3-Way Valve, to divert water to drain if a poor water quality situation occurs.

** Reference the manufacturer's material for specifics concerning the Resistivity Monitor.*

If actual resistivity is less than the set-point, the water will divert to drain. The unit will divert for 90 seconds (timed) to prevent any back and forth actuation of the cam shaft. This is possible if the water quality jumps above, and then below, the set-point within a 15-30 second time-frame. If the actual resistivity is greater than the set-point, then water will flow to the distribution loop.



part#
EQMODI01674
Resistivity Monitor

EQMODI01676
Resistivity Probe

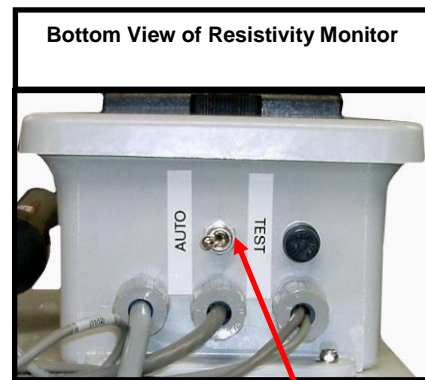


AUTOMATIC OPERATION

The Divert-to-Drain is only used when DI Tanks are online. In this situation, the Resistivity Monitor should be unplugged from the electrical outlet, the **2-Way Toggle Switch** should be in the **AUTO** position, and the diverting valve should be in the **OPEN** position.

Once DI Tanks are placed online...

1. The Resistivity Monitor should be plugged into an electrical outlet.
2. The **2-Way Toggle Switch** on the bottom of the Resistivity Monitor must be in the **AUTO** position for the Divert-to-Drain to operate automatically.



Bottom View of Resistivity Monitor

**2-Way Toggle Switch
AUTO-TEST**

MANUAL TEST IF DI TANKS NOT ONLINE

Switching the **2-Way Toggle Switch** to the **TEST** position will cause the Divert-to-Drain to divert water to drain regardless of the actual resistivity. This is used to test the functionality of the Divert-to-Drain not the Resistivity Monitor.

1. Verify the system's repressurization pump(s) are OFF.
2. Plug the Resistivity Monitor into an electrical outlet.
3. Switch the **2-Way Toggle Switch** to the **TEST** position.
4. Turn the system's repressurization pump(s) ON.
5. Verify the following:
 - Water is going to drain.
 - The Resistivity Monitor should display **0**.
 - If equipped with a Remote Alarm Box, its Poor Quality Light should be lit, and the piezo is

sounding.

6. Turn the Distribution Pump(s) **OFF**.
7. Switch the **2-Way Toggle Switch** to the **AUTO** position.
8. Unplug the Resistivity Monitor from the electric receptacle.
9. Locate the **Reset Knob** on the bottom of the **3-Way Valve Motor**.
 - Note the directional arrow label which indicates which direction to turn the knob to open and close the valve.
10. Using a 5/16 wrench or ratchet, turn the **Reset Knob** toward **OPEN**, as indicated by the directional arrow label.
 - **OPEN** will display in the **OPEN/CLOSE Indicator** on top of the **3-Way Valve Motor**.
11. Turn on the Distribution Pump(s) **ON**.
12. Verify that water is flowing through the Divert-to-Drain's "Outlet" and that no water is flowing to "Drain".
13. Plug the Resistivity Monitor into electrical receptacle.
14. Test Complete.

MANUAL TEST IF DI TANKS ARE ONLINE

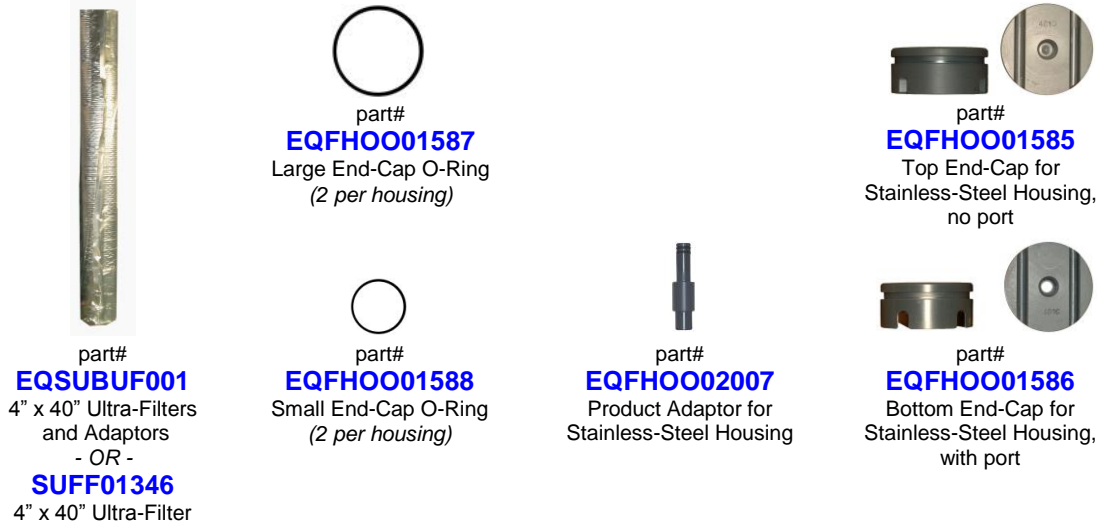
1. Locate the **2-Way Toggle Switch** on the bottom of the Resistivity Monitor, and verify that it is set to the **AUTO** position.
2. Plug the Resistivity Monitor into an electrical outlet.
 - If poor water quality exists the Divert-to-Drain valve will divert to drain and an alarm will be audible.
3. When the water comes to good quality and the rinse up period completes then the Divert-to-Drain valve will be in the loop outlet position.
4. Verify the Divert-to-Drain valve has gone back to the loop outlet position by looking at the loop return flow meter, and water flow from the loop is returning back to the storage tank.
5. When the water resistivity is greater than 2 MΩ/cm set the **2-Way Toggle Switch** on the bottom of the Resistivity Monitor to **TEST**.
 - The DTD valve will go to drain and the alarm will be audible.
 - Next check the Resistivity Monitor's Remote Alarm Box for a Poor Quality light and an audible piezo alarm.
6. Set the **2-Way Toggle Switch** on the bottom of the Resistivity Monitor back to the **AUTO** position.
 - If the resistivity is still above 2 MΩ/cm the Divert-to-Drain valve will stop diverting to drain after 90 seconds. This is a delayed rinse up period. This time cannot be altered by the end user.

MAINTENANCE

For maintenance, calibration, and probe replacement, refer to the manufacturer's instructions specific to the model in use.

SYSTEM MAINTENANCE, 4" x 40" Ultra-Filters

Better Water LLC recommends that the ultra-filters be changed **every 3 years**, unless otherwise dictated by, bacteria/endotoxin testing, and/or higher Delta-P pressure across the system.

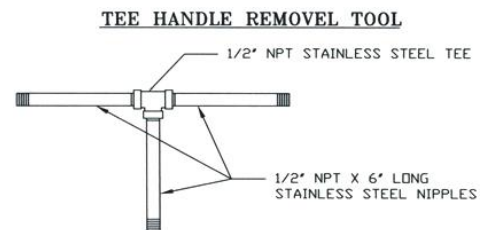


PROCEDURE FOR CHANGING THE ULTRA-FILTERS

Refer to the diagram below for reference.

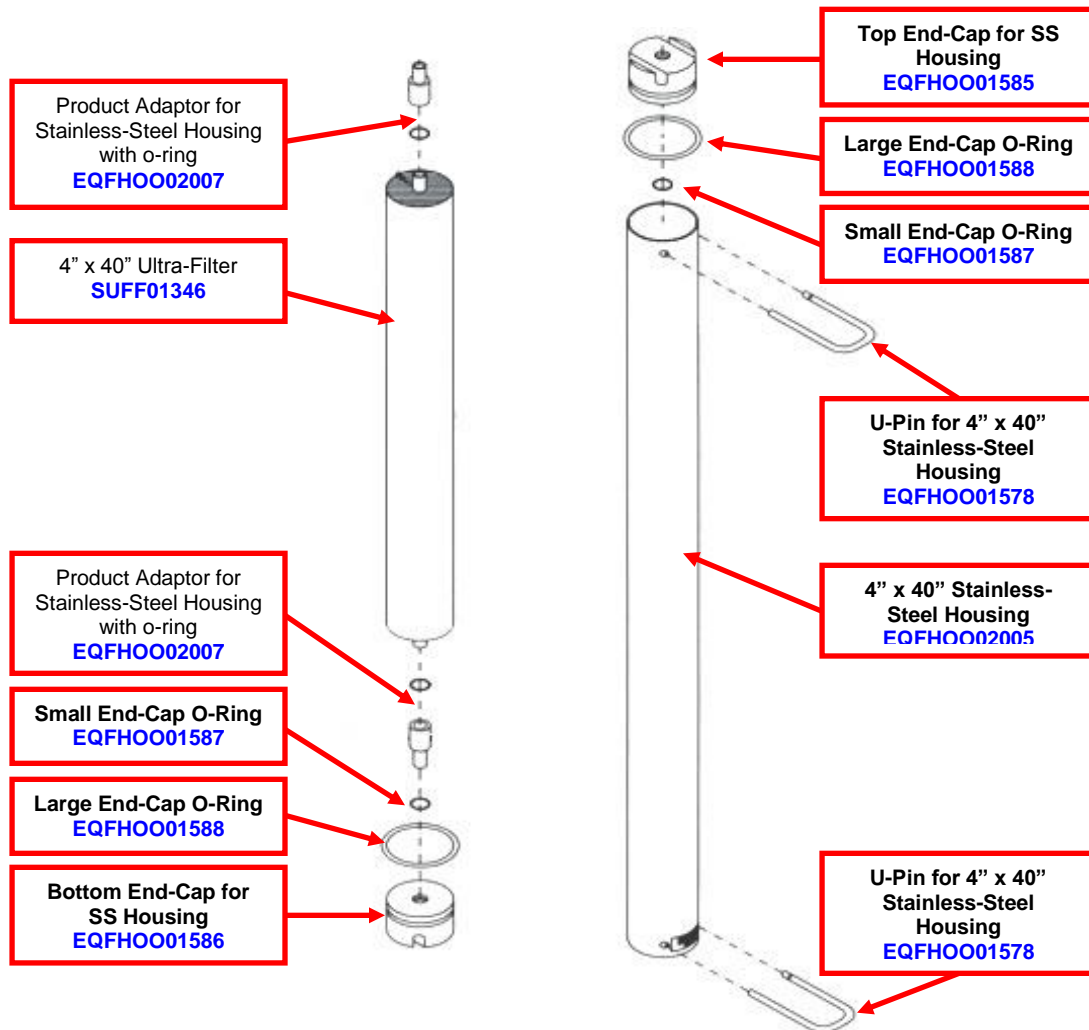
Need the following:

- Tee-handle removal tool
- Medical grade glycerin (*water soluble*)
- Teflon enriched tape thread sealant
- Teflon tape
- Sterile gloves



1. Start with all valves, sample ports, and drain ports closed.
2. Open either the **Reject Flow Labcock** or a **Sample Port** to relieve the pressure, and then close.
3. Remove the **Upper U-Pin** from the **Top End-Cap**.
4. Use the Tee-handle Removal Tool to remove the **Top End-Cap** from the **Housing** by threading the tool into the End-Cap until snug, and then pull up.
5. Remove the **Ultra-filter** and the **Adaptors** on each end.
6. Remove **Lower U-Pin** from the lower part of the housing.
7. Loosen all unions on the product header.
8. Remove each **Product Union Assembly** from each **End-Cap**.
9. Use the Tee-handle Removal Tool to remove the **Bottom End-Cap**.
10. Replace **Inner End-Cap O-rings** for both end-caps and lubricate with medical grade glycerin.

11. Wearing sterile gloves, remove the new **Ultra-Filter** from the box.
12. Prepare the **Adaptors** by ensuring that the O-rings are in place and lubricated, and place onto the **Ultra-Filter** ends.
13. Reinstall **Bottom End-Cap** and reinsert the **Lower U-Pin**.
14. Place **Ultra-Filter** with **Adaptors** into the **Housing**.
15. Reinstall **Top End-Cap** and **Upper U-pin**.
16. Re-tape each product union assembly with about 6 wraps of Teflon tape and then apply Teflon enriched tape thread sealant and re-install.
17. Open inlet and outlet water valves, start the post-treatment-system, and run product water to drain (*not to storage tank*) for a minimum of one storage tank full, and check for leaks.
18. Perform a disinfect.
19. Ultra-Filters are now on-line and ready for use.



SYSTEM MAINTENANCE, 30" .03 micron Ultra-Filter

Better Water LLC, recommends that the .03 micron Pyrogen filter be changed **every 6 months**, unless otherwise dictated by, bacteria/endotoxin testing, and/or higher Delta-P pressure across the system.



part#
SUCAOO01941
30", .03 Micron Filter

PROCEDURE FOR CHANGING THE ULTRA-FILTERS

1. Start with all valves, sample ports, and drain ports closed.
2. Open the drain port on the bottom of the housing to allow the water to drain completely from the system. Close the drain port when water flow stops.
3. Unscrew the filter housing to remove it from the device.
4. Remove the old filter, and replace with the new filter.
5. Verify the O-ring in the top of the housing is properly seated, then turn and lock into place.
6. Screw the filter housing back into place, and hand-tighten.
7. Slowly open the inlet valve to allow water to begin filling the housing.
8. Partially open the outlet sanitary sample port to allow air to be purged from the device.
9. When water flows from the sanitary sample port, signaling that the air has been purged from the device, close the sanitary sample port.
10. Let the filter soak for 10 minutes at a minimum of 45 psi and check for leaks.
11. Slowly open the outlet valve fully to allow water to flow through the device.
12. Perform a disinfect.
13. The filter is now on-line and ready for use.

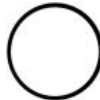
SYSTEM MAINTENANCE, Storage Tank

PROCEDURE FOR CHANGING THE STORAGE TANK VENT FILTER

Better Water LLC, recommends that the storage tank vent filter be changed every 3 months.



part#
SUCAOO00557
10" .2 micron Tank
Vent Filter



part#
SUMIOO00588
Slim Line Housing
O-Ring



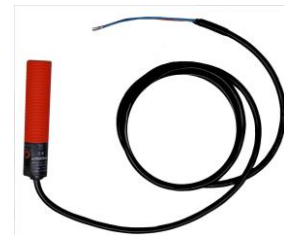
part#
SUWROO00582
Slim Line Housing
Wrench

1. The post-treatment system does not have to be turned off to change this filter.
2. Place a filter wrench onto the filter housing, and turn counter-clockwise until loose, then spin off and remove it.
3. Remove the old filter, and wipe out bowl with a clean towel/cloth, and then place a new filter in the filter housing.
4. Inspect and replace the housing O-ring if necessary. Make sure it is properly seated.
5. Reinstall the filter housing, turning clock-wise to hand tighten.
* **Do not overtighten which will cause the filter-cap to crack.**

PROCEDURE FOR REPLACING A PROXIMITY SENSOR

If one of the four proximity sensors require replacing, take note that there are two types of sensors based on their function and where they are located. Although they look very similar, note the model designation printed on the base of the sensor.

- | | |
|-----------------------------|-----------------------------------|
| - Upper /RO Off | part# EQBICB00468 (KG0010) |
| - Mid-Upper/RO Start | part# EQBICB00468 (KG0010) |
| - Mid-Lower/Low Level Alarm | part# EQBICB00468 (KG0010) |
| - Lower/Pump Off | part# EQBICB00469 (KG0009) |



1. Disconnect the proximity sensor's wire connection from the repressurization pumps(s)' control box's pigtail connection.
2. Carefully unscrew the old proximity sensor from the bulkhead.
3. Place the new proximity sensor into the bulkhead and carefully thread, taking care not to over-tighten it.
4. Reconnect the proximity sensor's wire connection to its corresponding repressurization pump(s)' control box's pigtail connection.

SYSTEM MAINTENANCE, DI Filter

Better Water LLC, recommends that the 5 micron filter while in use be changed monthly, or replaced with the short-bowl after use of DI water is discontinued. The housing O-Ring should be examined and replaced if necessary.



part#
SUCAOO0551
10", 5 micron Filter



part#
SUMIOO0587
Housing O-ring



part#
SUWROO0584
Wrench for Big Blue
Housings



part#
PLFIS801951
Short Bowl for Big Blue
Housing

PROCEDURE FOR CHANGING THE DI FILTER

1. Turn the Post-Treatment System OFF by turning the **PUMP MODE Switch** to **OFF**.
2. Close the following valves:
 - **DI Filter Inlet Valve**
 - **DI Filter Outlet Valve**
3. Open the lab cock on the bottom of the filter housing to relieve the system pressure and allow the water to drain from the filter housing. Close the lab cock when complete.
4. Place a filter wrench onto the filter housing, and turn counter-clockwise until loose, then spin off and remove it.
5. Remove the old filter, and wipe out bowl with a clean towel/cloth, and then place a new filter in the filter housing.
6. Inspect and replace the housing o-ring if necessary. Make sure it is properly seated.
7. Reinstall the filter housing, turning clock-wise to hand tighten.
* **Do not overtighten which will cause the filter-cap to crack.**
8. Once the filter is installed...
 - ... Open the following valves:
 - **DI Filter Inlet Valve**
 - **DI Filter Outlet Valve**
 - ... Place a container under the filter housing's lab cock,
 - ... Open the lab cock to purge all air from the filter.
9. Once the air is purged and only water is flowing from the lab cock, close it.
10. Turn the Post-Treatment System ON by turning the **PUMP MODE Switch** to either **AUTO** (dual pump systems) or **MANUAL** (single pump systems).

REPLACE SHORT BOWL WITH FILTER HOUSING (OR VICE VERSA)

The following steps are the same whether replacing the Short Bowl with a Filter and Filter Housing if using DI water, or replacing the Filter and Filter Housing with a Short Bowl after use of DI water is discontinued.

1. Turn the Post-Treatment System OFF by turning the **PUMP MODE Switch** to **OFF**.
2. Close the following valves:
 - **DI Filter Inlet Valve**
 - **DI Filter Outlet Valve**
3. Open the lab cock on the bottom of the Short Bowl (Filter Housing) to relieve the system pressure and allow the water to drain from it. Close the lab cock when complete.
4. Place a filter wrench onto the Short Bowl (Filter Housing), and turn counter-clockwise until loose, then spin off and remove it..
5. Inspect and replace the Filter Housing (Short Bowl) o-ring if necessary. Make sure it is properly seated.
6. Insert Filter into the Filter Housing.
7. Install the Filter Housing (Short Bowl), turning clock-wise to hand tighten.
*** Do not overtighten which will cause the end-cap to crack.**
8. Once installed...
 - ... Open the following valves:
 - **DI Filter Inlet Valve**
 - **DI Filter Outlet Valve**
 - ... Place a container under the Filter Housing's (Short Bowl's) lab cock,
 - ... Open the lab cock to purge all air from the filter.
9. Once the air is purged and only water is flowing from the lab cock, close it.
10. Turn the Post-Treatment System ON by turning the **PUMP MODE Switch** to either **AUTO** (*dual pump systems*) or **MANUAL** (*single pump systems*).

SYSTEM MAINTENANCE, UV Light

The UV Manufacturer's Operator Instructions should be referenced concerning specific usage and maintenance instructions for the model in question. Below are general instructions and recommendations relating to the UV Lamp and Quartz Sleeve.



UV LAMP MAINTENANCE

The amount of UV light created by the lamp decreases over time, requiring that the lamp be replaced every 12 months. The UV system is designed to operate continuously and should not be shut off for short periods of time, such as a period of less than three weeks.

UV QUARTZ SLEEVE MAINTENANCE

Minerals in the water slowly form a coating on the UV Quartz Sleeve. This coating must be removed because it reduces the amount of UV light reaching the water, thereby reducing purification performance. These sleeves should be cleaned yearly, or more often if necessary, depending on the water quality. Recommended to be replaced every 24 months, or if broken, cracked, or chipped.

- Inspect and replace the o-ring if necessary. The o-ring is not sold separately but comes with the quartz sleeve.

PROCEDURE for REPLACING UV LAMP and/or QUARTZ SLEEVE

- Avoid touching the sides of the quartz sleeve and lamp with bare hands. Use soft gloves, and handle with care.

1. Turn the Post-Treatment System OFF by turning the **PUMP MODE Switch** to **OFF**.
2. Disconnect the power to the UV Light by disconnected the UV's power cord from the back of the System's Control Box.
2. Close the following valves:
 - **DI Filter By-pass Valve**
 - **DI Filter Outlet Valve**
3. Open the lab cock on the bottom of the Short Bowl (Filter Housing) to relieve the system pressure. Close the lab cock when complete.
4. Remove the end of the UV Light to expose the UV Lamp and Quartz Sleeve.

5. Carefully remove the UV Lamp for replacement and/or the Quartz Sleeve for cleaning or replacement.
 - Take care not to remove at an angle, which could put undue pressure on either the bulb or sleeve causing breakage.
 - * *See manufacturer's instructions for removing the quartz sleeve.*
6. Inspect the O-ring and replace if necessary.
7. Perform the necessary maintenance (replacement and/or cleaning).
8. Reinstall the end of the UV Light to the unit.
9. Open the following valves and check for leaks:
 - **DI Filter By-pass Valve**
 - **DI Filter Outlet Valve**
10. Reconnect the power to the UV Light by plugging its power cord into the back of the System's Control Box.
11. Turn the Post-Treatment System ON by turning the **PUMP MODE Switch** to either **AUTO** (*dual pump systems*) or **MANUAL** (*single pump systems*).

PROCEDURE for CLEANING the QUARTZ SLEEVE

1. Remove the Quartz Sleeve following the instructions above.
2. Clean with vinegar consisting of 5-20% acetic acid.
3. Rinse the Quartz Sleeve with RO or DI water after cleaning.
4. Let it air dry before reinstalling.

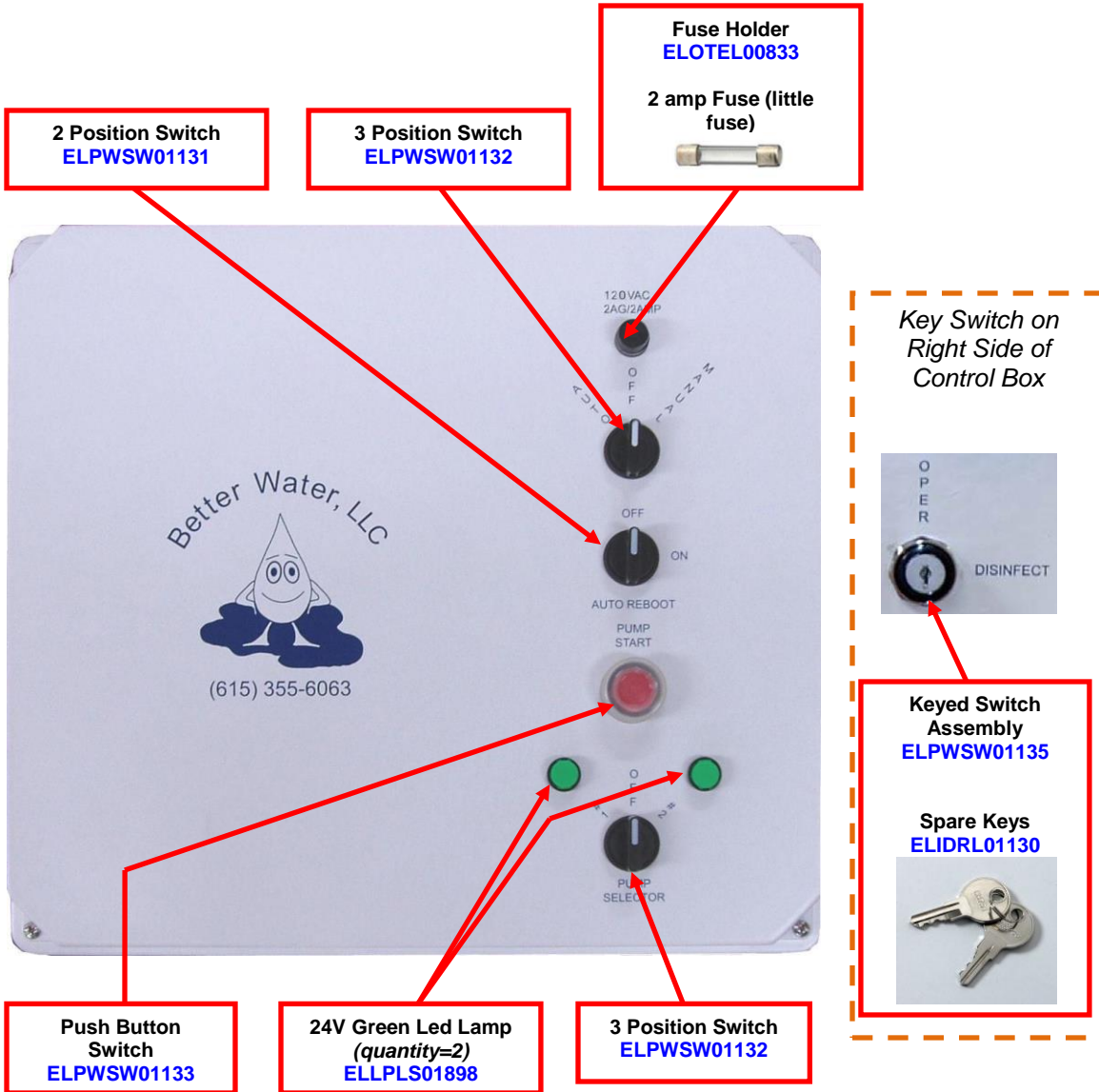
PROCEDURE for CLEANING the UV SENSOR

In the event the UV starts alarming abnormally, try cleaning the UV Sensor.

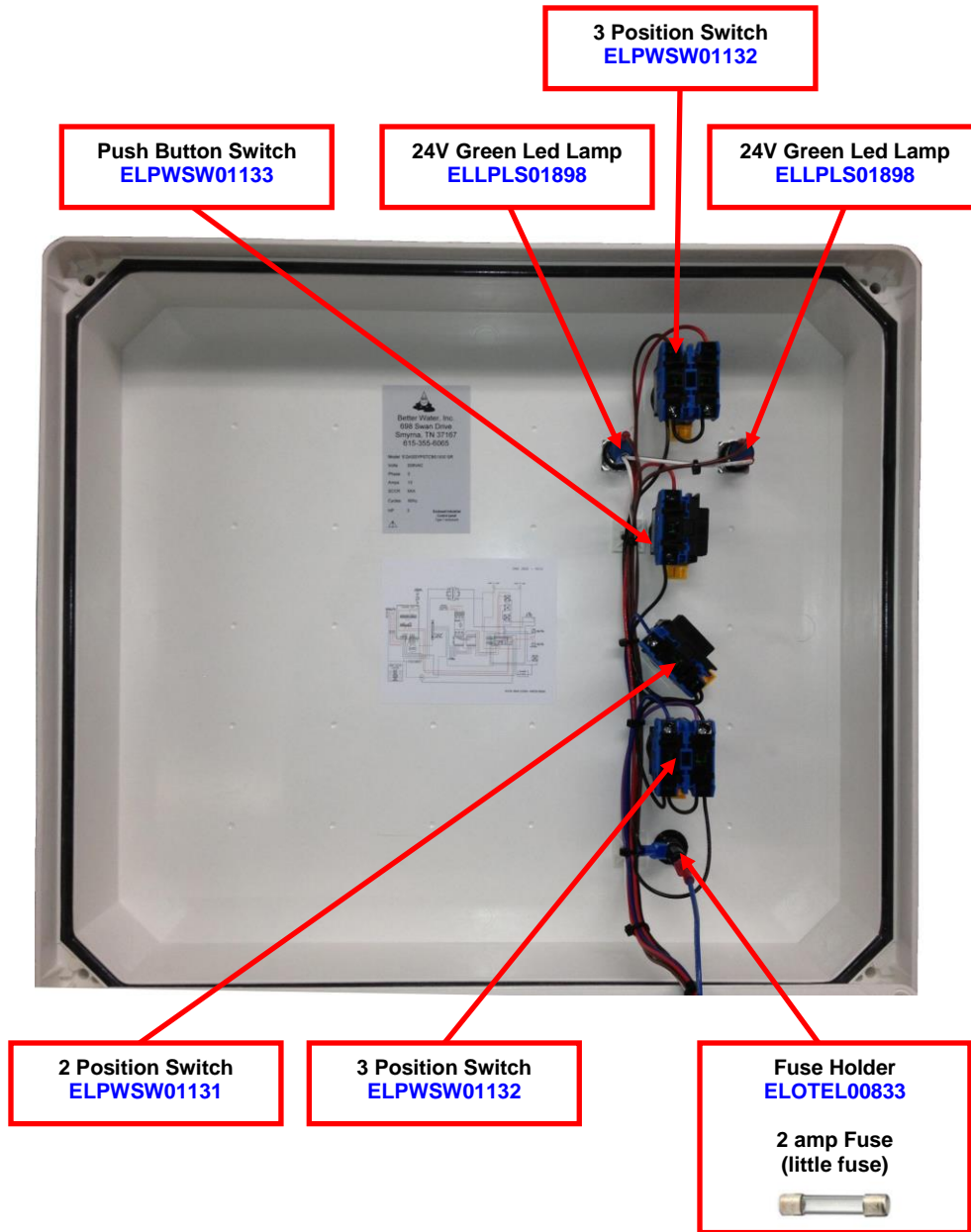
1. Remove the UV Sensor from the UV Housing.
2. Clean the sensor with CLR (calcium, lime, rust remover) to remove any build-up.
3. Rinse the Sensor with RO or DI water after cleaning.
4. Let it air dry before reinstalling.

SERVICE HELP

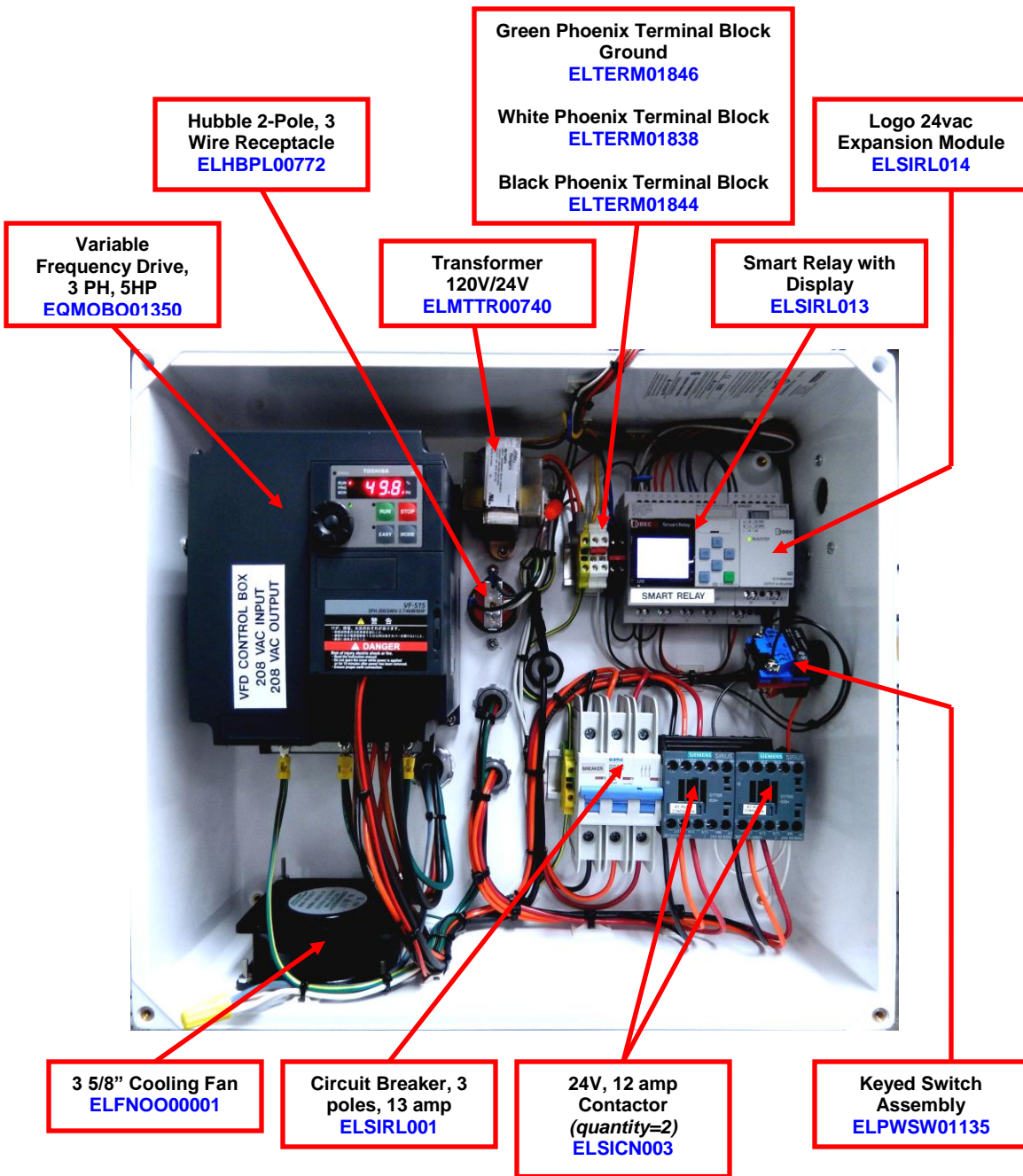
SERVICE HELP: Control Box (Front View)
Control Box, 3 Phase, part# **EQASSYPSTCB01930 SR**



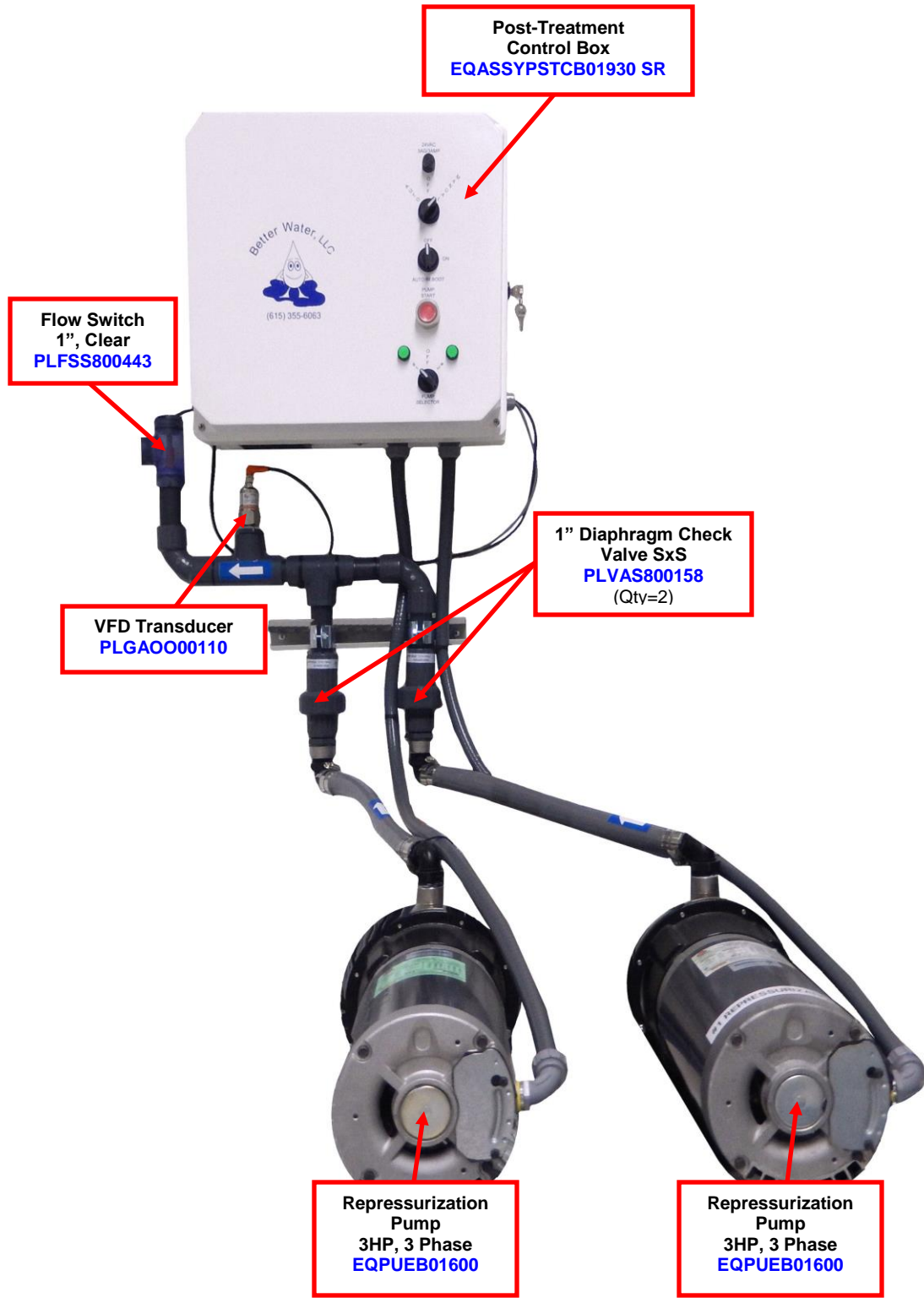
SERVICE HELP: Control Box (Inside Lid View)



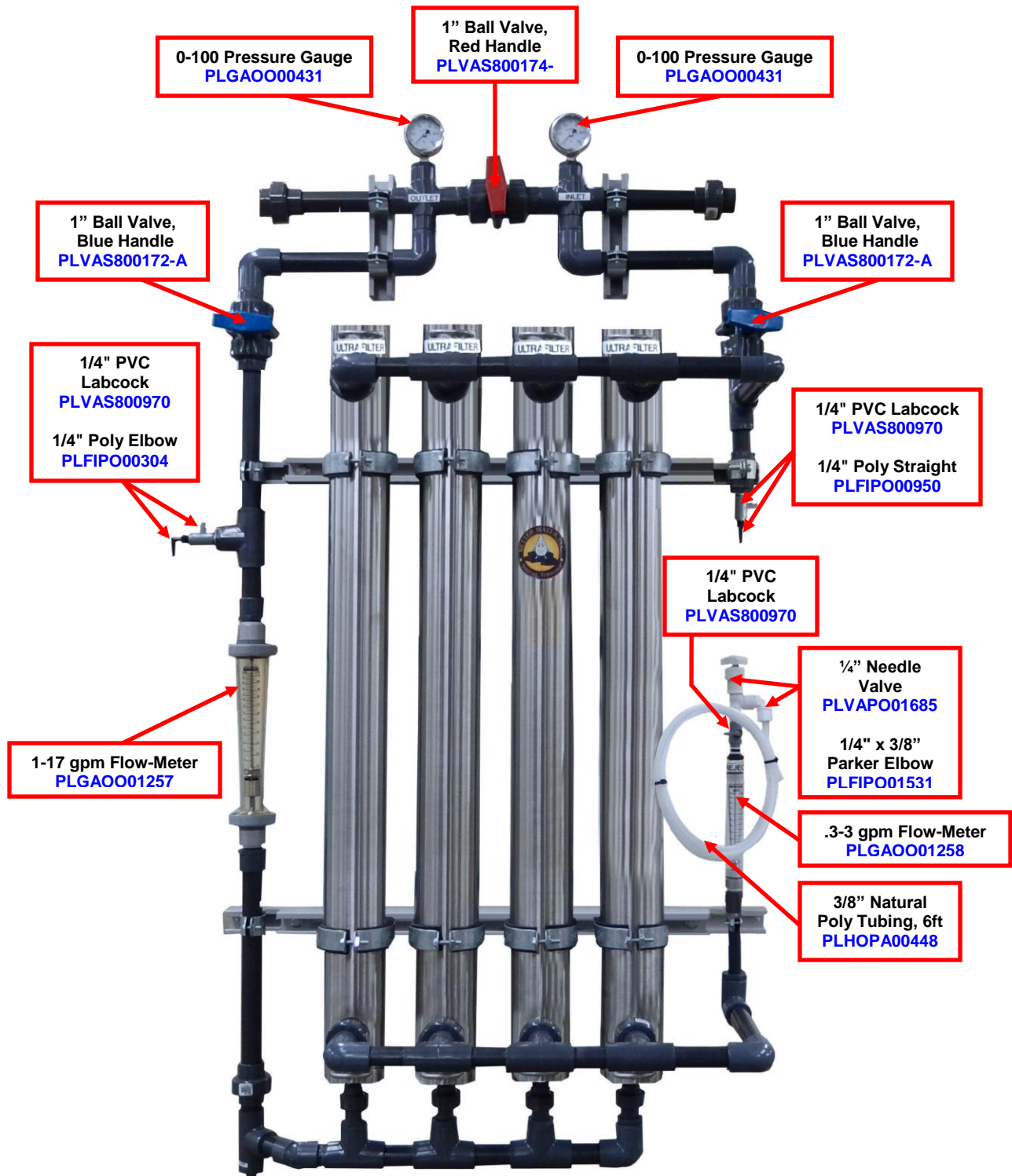
SERVICE HELP: Control Box (Inside View)



SERVICE HELP: Control Box, Pump(s), and Related Parts



SERVICE HELP: 4" x 40" Ultra Filter



0-100 Pressure Gauge
PLGAOO00431

1" Ball Valve,
Red Handle
PLVAS800174-

0-100 Pressure Gauge
PLGAOO00431

1" Ball Valve,
Blue Handle
PLVAS800172-A

1" Ball Valve,
Blue Handle
PLVAS800172-A

1/4" PVC
Labcock
PLVAS800970
1/4" Poly Elbow
PLFIPO00304

1/4" PVC Labcock
PLVAS800970
1/4" Poly Straight
PLFIPO00950

1-17 gpm Flow-Meter
PLGAOO01257







1/4" PVC
Labcock
PLVAS800970

1/4" Needle
Valve
PLVAPO01685
1/4" x 3/8"
Parker Elbow
PLFIPO01531

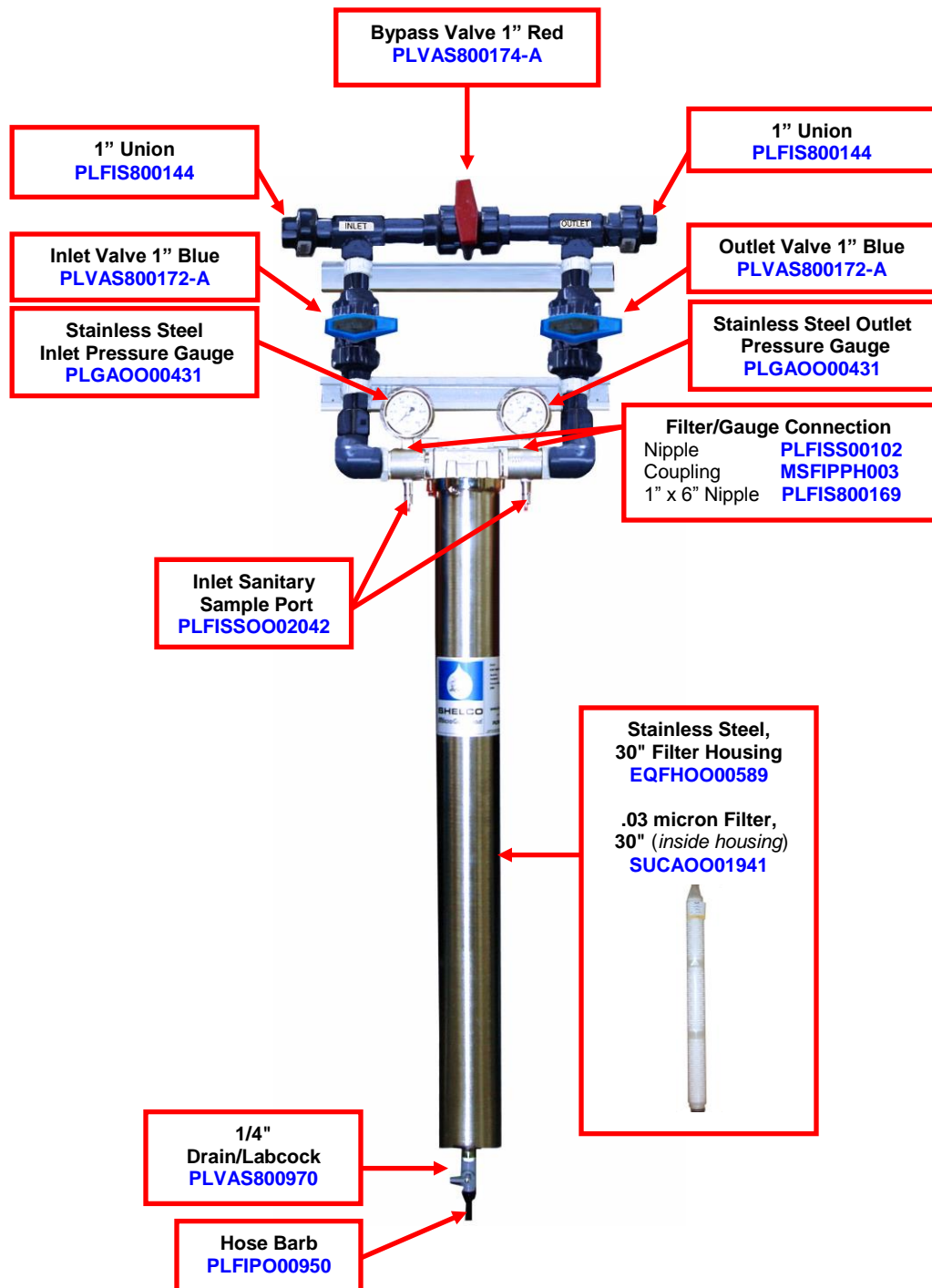
.3-3 gpm Flow-Meter
PLGAOO01258

3/8" Natural
Poly Tubing, 6ft
PLHOPA00448

SERVICE HELP: 4" x 40" Ultra Filter

DESCRIPTION	PART#	PICTURE
Current Model using Stainless Steel Membrane Housings		
4" x 40" Stainless Steel Membrane Housing	EQFHOO02005	< No Picture >
Top End-Cap for Stainless Steel Housing, no port	EQFHOO01585	
Bottom End-Cap for Stainless Steel Housing, with port	EQFHOO01586	
Outer O-ring for Stainless Steel Housing (2 per housing)	EQFHOO01587	
Inner O-ring for Stainless Steel Housing (2 per housing)	EQFHOO01588	
Product Adapter for Stainless Steel Housing	EQFHOO02007	
Membrane and Adapter Subassembly <i>- includes 4"x40" Sanitary/Full-Fit Membrane and adapters</i>	EQSUBUF001	

SERVICE HELP: 30" .03 micron Ultra Filter



SERVICE HELP: Pro 20 UV Light
Complete Unit part# **EQUVOO01906**

Pro20, Cool
Touch Fan
SUUV02022



Pro 20,
Sensor
SUUV002020



Pro 20,
Communications
Center
SUUV0001909

Pro 20,
Replacement
Quartz Sleeve
SUUV0002018



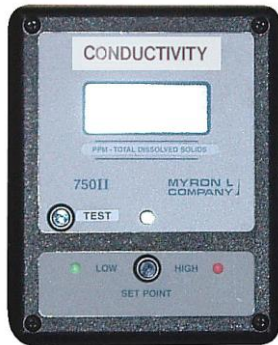
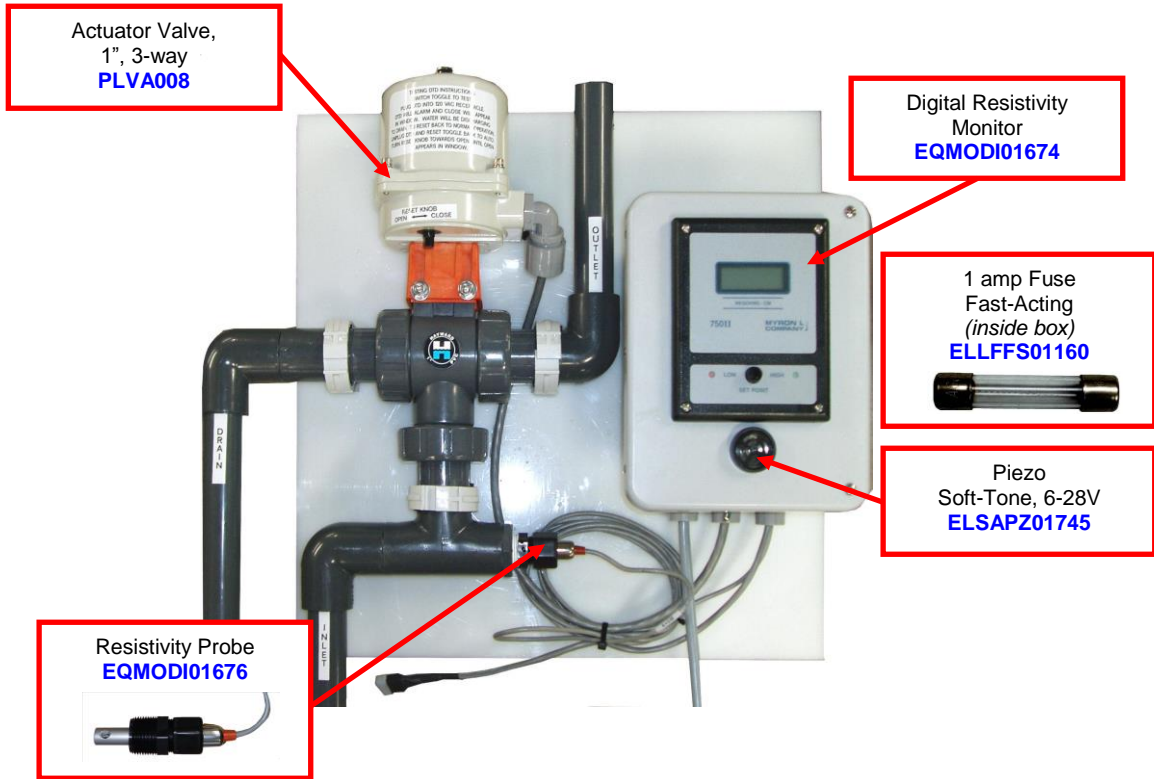
Pro20,
Replacement
UV Lamp
SUUV0002021



Pro 20,
Power Supply
EQUVOO01926



SERVICE HELP: Divert-to-Drain, Conductivity Monitor, and Remote Alarms



Digital Conductivity Monitor **EQMOCO01725**

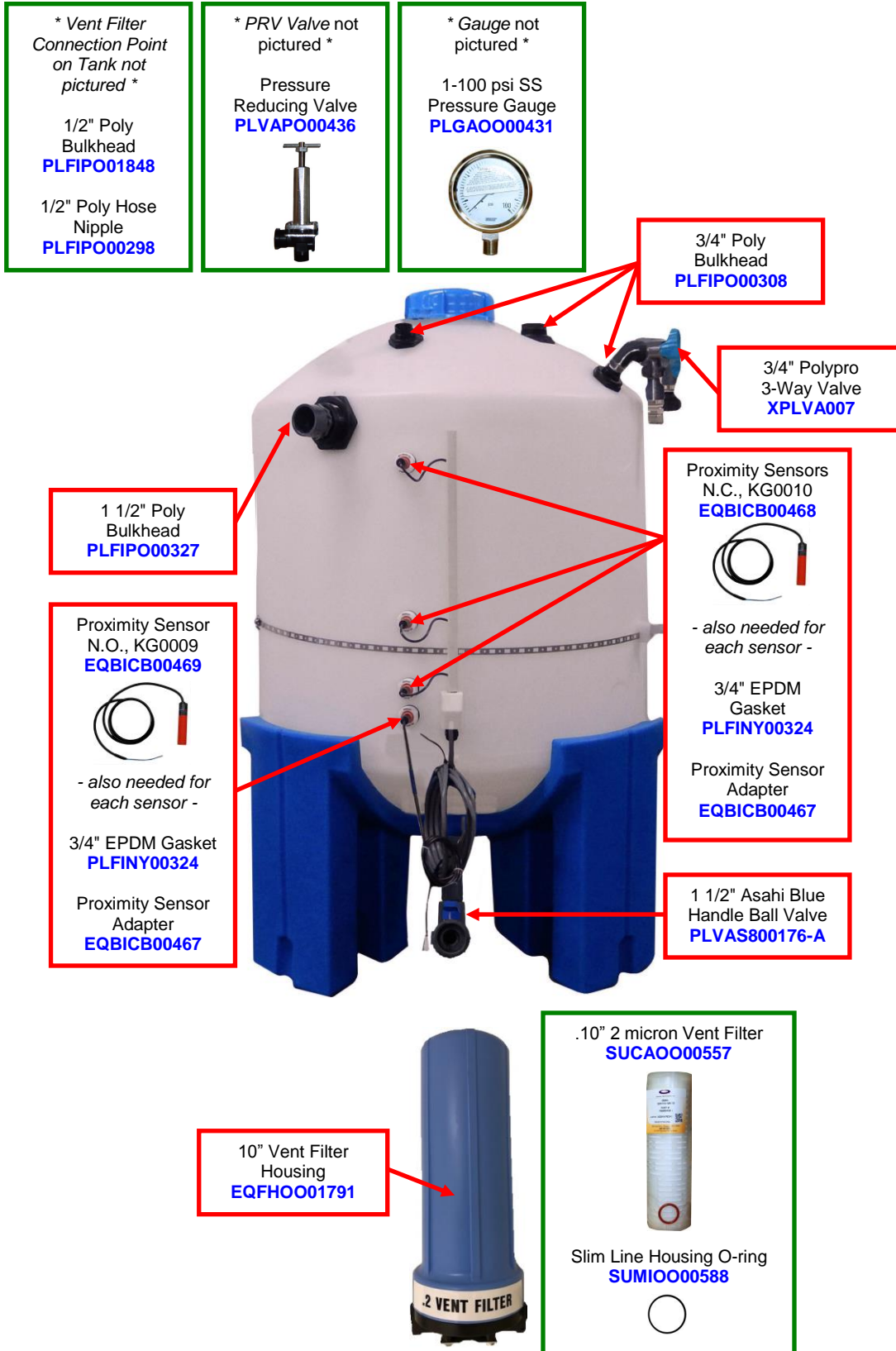
CS-51 Conductivity Probe **EQMOPR01059**



Remote Alarm Box - For Resistivity Monitor and Conductivity Monitor **EQASSYWQA01844**

SERVICE HELP: Storage Tank

NOTE: Some storage tank parts may vary based on tank size and construction.



APPENDIX A

LIMITED WARRANTY TERMS and CONDITIONS

- a. This limited warranty is given only to the original buyer and covers the equipment delivered with this limited warranty.
- b. The buyer shall be barred from any recovery on this limited warranty or otherwise for damages due in whole or in part to...
 - ... unreasonable use
 - ... improper operation
 - ... use beyond normal fashion
 - ... failure to follow instructions
 - ... failure to maintain the product in good condition and repair
 - ... or the like.
- c. If the buyer discovers or should have discovered a defect in which it is reasonable to conclude that damage, either personal, property, or economic, may result, the buyer's continued use of the product shall constitute any assumption of risk by the buyer and a bar to any recovery for breach of this limited warranty or otherwise.
- d. No oral or written representation, information, or advice given by Better Water LLC or any of its representatives shall create a warranty or in any way increase the scope of this express limited warranty and shall not form a part of the basis for bargain.

WHAT IS WARRANTED AND FOR HOW LONG?

- a. All equipment, excluding ion exchange and filtration media and cartridges, are warranted to be free from factory defects in materials, and workmanship under normal use for a period of one (1) year from the date of shipment.
- b. It is a condition precedent to recovery on this limited warranty that the buyer strictly comply with all operating and maintenance guidelines established by Better Water LLC and that the serial number (*if applicable*) is intact and legible on the equipment.
- c. It is a condition precedent to recovery on this limited warranty for damage to the external finish of the equipment that the buyer notifies Better Water LLC at the time of the installation that the finish is damaged.

WHAT IS REMEDY FOR BREACH OF THIS LIMITED WARRANTY or NEGLIGENCE BY BETTER WATER LLC

- a. Buyer's sole and exclusive remedy for any breach of this limited warranty or negligence by Better Water LLC shall be repair or replacement of the defective part, at the option of Better Water LLC, provided such defective part is returned to Better Water LLC for inspection.
- b. Better Water LLC shall not be obligated to supply an exact replacement of the defective part and reserves the right to substitute new and improved parts.
- c. Better Water LLC shall provide at no cost to buyer, labor to remove and/or replace defective parts covered by this limited warranty for a period of ninety (90) days from the date of installation by Better Water LLC of the equipment.
- d. After such ninety (90) day period, buyer shall be responsible for any labor or service charge for the removal and/or replacement of any defective parts.
- e. Buyer shall be responsible for all travel expenses and freight charges at all times.
- f. Better Water LLC shall have no obligation to repair or replace any defective part if buyer fails to follow the procedure set forth in "HOW TO OBTAIN A REPLACEMENT PART UNDER LIMITED WARRANTY".

IN NO EVENT SHALL THIS LIMITED WARRANTY BE CONSTRUED TO COVER, NOR SHALL BETTER WATER LLC BE LIABLE TO BUYER AS ANY OTHER PERSON FOR, ANY

CONSEQUENTIAL, INCIDENTAL, ECONOMIC, DIRECT, INDIRECT, GENERAL OR SPECIAL DAMAGES, WHICH ARE HEREBY EXPRESSLY DISCLAIMED.

HOW TO OBTAIN A REPLACEMENT PART UNDER LIMITED WARRANTY

- a. Buyer should contact the Customer Service or Technical Support Departments and request a Return Goods Authorization.
- b. Described part(s) will be sent with a purchase order.
- c. The returned part(s) will be returned to the factory for limited warranty consideration. If part(s) are not covered under the limited warranty, part(s) will be considered billable against the purchase order supplied.

WHAT IS NOT COVERED BY THIS LIMITED WARRANTY:

By way of example and not limitation, this limited warranty does not cover:

- Damage to or replacement of any ion exchange resin of filter media
- Labor or service charges for the removal and/or replacement of any defective parts after the ninety (90) day period from the date of installation or sale by Better Water LLC
- Freight charges and travel expenses
- Damage from inadequate or defective wiring, improper voltage, improper connections or electrical service, inadequate or defective plumbing, water supply, or water pressure, or in violation of applicable building, plumbing or electrical codes, laws, ordinances or regulations.
- Damage from improper installation or operation, including but not limited to, abuse, accident, neglect, improper maintenance, freezing and fires, or abnormal use.
- Damage caused by contaminants in Buyer's water supply, including hardness, chlorine, chloramines, sulfur, bacterial iron, tannin, algae, oil, organic matter or other unusual substances, if special equipment has not been installed by Better Water LLC to remove such contaminants
- Damage to or caused by filters/membranes or other replacement parts not purchased from Better Water LLC or damage caused by modification, alteration, repair or service of the equipment or any of its parts by anyone other than Better Water LLC or its expressly authorized representatives.

APPENDIX B

CALCULATION & VELOCITY RATES

PIPE VOLUME CALCULATION

The volume of fluid in a pipe can be found given the inner diameter of the pipe and the length, and then convert to gallons. To estimate pipe volume use the following formula:

$$\text{VOLUME (cubic inches)} = \pi (\text{pi} = 3.14) \times \text{Pipe Radius}^2 (\text{inches}) \times \text{Pipe Length (inches)}$$

$$\text{VOLUME (gallons)} = \text{Volume (cubic inches)} \times .004329 (\text{gallons per cubic inch})$$

Example: For a 1 inch diameter pipe that is 500 feet long

Step 1: Calculate pipe radius	$1'' \div 2 = .5$
Step 2: Calculate pipe radius squared	$.5^2 = .25 \text{ in}^3$
Step 3: Convert pipe feet to inches	$500 \text{ feet} \times 12 \text{ inches per foot} = 6000 \text{ in}$
Step 4: Multiply all factors	$3.1415 \times .25 \times 6000 = 4710 \text{ in}^3$
Step 5: Convert cubic inches to gallons	$4710 \times .004329 = 20.68 \text{ gallons}$

Summary: A 1 inch diameter pipe that is 500 feet long, contains 20.69 gallons.

3 FEET per SECOND FLOW VELOCITY RATES

Nominal Loop Pipe Inner Diameter

3/4" Teflon id	=	0.60in.
3/4" Schedule 80 PVC id	=	0.74in
1" Teflon id	=	0.88in
1" Schedule 80 id	=	0.96in
1 1/2" Schedule 80 id	=	1.48 in
3/4" (25mm) polypropylene id	=	0.80in
1" (32mm) polypropylene id	=	1.03in
1 1/2" (50mm) polypropylene id	=	1.61 in

Nominal Flow Rates at 3 Feet per Second

3/4" Teflon	=	2.64 gpm @ 3ft/sec (Nominal)
3/4" Schedule 80 PVC	=	4.02 gpm @ 3ft/sec (Nominal)
1" Teflon	=	5.69 gpm @ 3ft/sec (Nominal)
1" Schedule 80	=	6.77 gpm @ 3ft/sec (Nominal)
1 1/2" Schedule 80	=	16.1 gpm @ 3ft/sec (Nominal)
3/4" (25mm) polypropylene	=	4.70 gpm @ 3ft/sec (Nominal)
1" (32mm) polypropylene	=	7.79 gpm @ 3ft/sec (Nominal)
1 1/2" (50mm) polypropylene	=	19.0 gpm @ 3ft/sec (Nominal)

a. All 3ft/sec flow rates at the loop return flow meter are calculated for the loop inner diameter only.

b. The above flow rates should be set with all dialysis machines running.

c. If bicarb or acid makeup water is required, both should have the proper flow controls to maintain flow velocity.

APPENDIX C

Sample Checklist

Sample QUALITY ASSURANCE CHECKLIST							
ITEMS TO BE CHECKED	MON	TUE	WED	THU	FRI	SAT	SUN
Date							
Time of Day							
Technician Initials							
Is Storage Tank water level above 2 nd float? (YES/NO)							
Pre Ultra-Filter Pressure, psi							
Post Ultra-Filter Pressure, psi							
Product Flow, gpm <i>(if applicable)</i>							
Reject Flow, gpm <i>(if applicable)</i>							
Is the UV Light operating? (YES/NO)							
Storage Tank, Loop Return Flow, gpm							
Storage Tank, Loop Return Pressure, psi							
If using DI Tanks...							
Which DI Bank is in use? (1 or 2)							
Pre Post-DI Filter Pressure, psi							
Post Post-DI Filter Pressure, psi							

APPENDIX D

TECHNICAL SERVICE BULLETINS

TECHNICAL SERVICE BULLETIN

Relocation of Wire on Replacement VFDs

TSB# TSB2012010	Date 11/09/2012	Page 1 of 1
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OVERVIEW:

The manufacturer discontinued the model of the VFD used in Better Water LLC's 3046 ROs and Post-treatment devices in October of 2012. The replacement model is functionally the same with the exception of the use of one of the terminal posts and the location of grounding posts, both requiring the relocation of wires if the old model VFD is replaced with the new model.

Better Water LLC's part number of **EQMOBO01350** which is the "3 Phase-In / 3 Phase-Out / 5 Horsepower VFD" will remain the same. The difference between these two models is mostly cosmetic. See the pictures below of the old and new models.



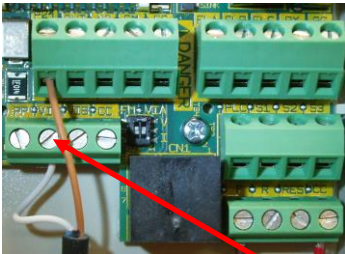
Old Model VFD
White/Cream color with hinged cover
Front View



New Model VFD
Black color, no hinged cover
Front View

TERMINAL POST & GROUND WIRE RELOCATION:

1. Turn off the power, and unplug the device from the electrical outlet before opening the control box.
2. On the old model VFD, take note of the location of the **wire (from the pressure transducer) on the terminal post labeled VIA** and where the **three ground wires** are located.
3. Replace the old model VFD with the new model VFD, reconnecting the wires with the following exceptions.
4. On the new model VFD, relocate the wire (from the pressure transducer) to the terminal post labeled **VIC**.



Old Model VFD
Wire located on terminal post VIA



New Model VFD
Wire located on terminal post VIC

5. Relocate the three ground wires to the three grounding posts on the bottom of the new model VFD.



Old Model VFD
Three ground wires



New Model VFD
Three grounding posts

APPENDIX E

PRE-SHIP TEST DATA

